BURNY 10 LCD PLUS
AND OEM VERSION
[WITH SOFTWARE VERSION 5.X]

TECHNICAL MANUAL

MAN-70400-0

REVISION
AA

Cleveland Motion Controls
An IMC Company

REVISION HISTORY

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

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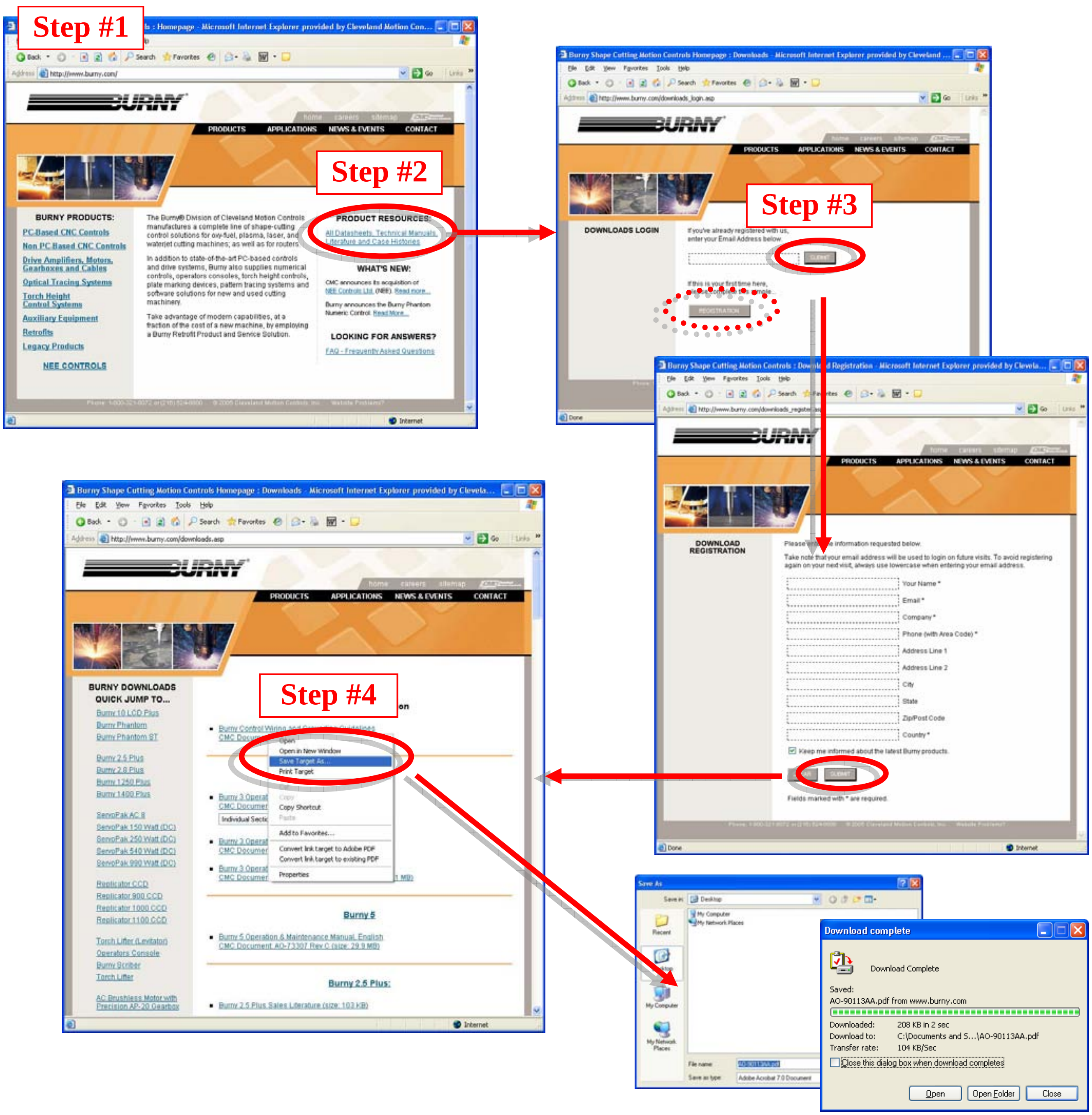

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1 SYSTEM DESCRIPTION

1.1 INTRODUCTION

The ***BURNY 10 LCD Plus (and OEM Version)*** shape-cutting control uses Microsoft Windows® XP Embedded-based motion control software on a PC base to maximize shape-cutting productivity. This control enables the operator to quickly select, modify, and run an unprecedented number of part programs on any new or existing shape-cutting machine.

The system is designed to allow the user to run a number of tasks simultaneously, i.e. after the user has started cutting a part, he can perform other tasks such as preparing the next part to be cut, load or modify other part programs, etc., then return to a screen that monitors the part cutting operation running in the background. The user can configure the ***BURNY 10 LCD Plus*** for specific day-to-day operations and these selections will be maintained after power is recycled.

** Windows is a registered trademark of Microsoft Corporation in the United States and other countries.*

1.2 OVERVIEW

1.2.1 PHYSICAL DESCRIPTION

The system consists of a metal enclosure with a front panel that has a touch-sensitive LCD color display, a floppy disk drive, and several membrane control buttons. The back panel of the enclosure has 9 connectors for power input and data input/output. The front panel can be unbolted and tipped forward into a horizontal position to give access to interior components; it is held in place by two brackets.

The Burny 10 LCD Plus cabinet may contain potentially lethal voltages. Do not open the cabinet unless you are qualified to work on this equipment and have been authorized to do so.

1.2.2 FRONT PANEL

The front panel of the BURNY 10 LCD Plus is shown in Figure 1-1 and consists of several important elements:

- LCD Touch Screen
- Floppy Drive and USB Port
- Jog Pad
- Membrane Control Buttons

Figure 1-1 - Burny 10 LCD Plus Front Panel

1.2.3 TOUCH SCREEN

The touch sensitive LCD screen allows the operator to monitor and control the BURNY. Most functions and features are intuitive.

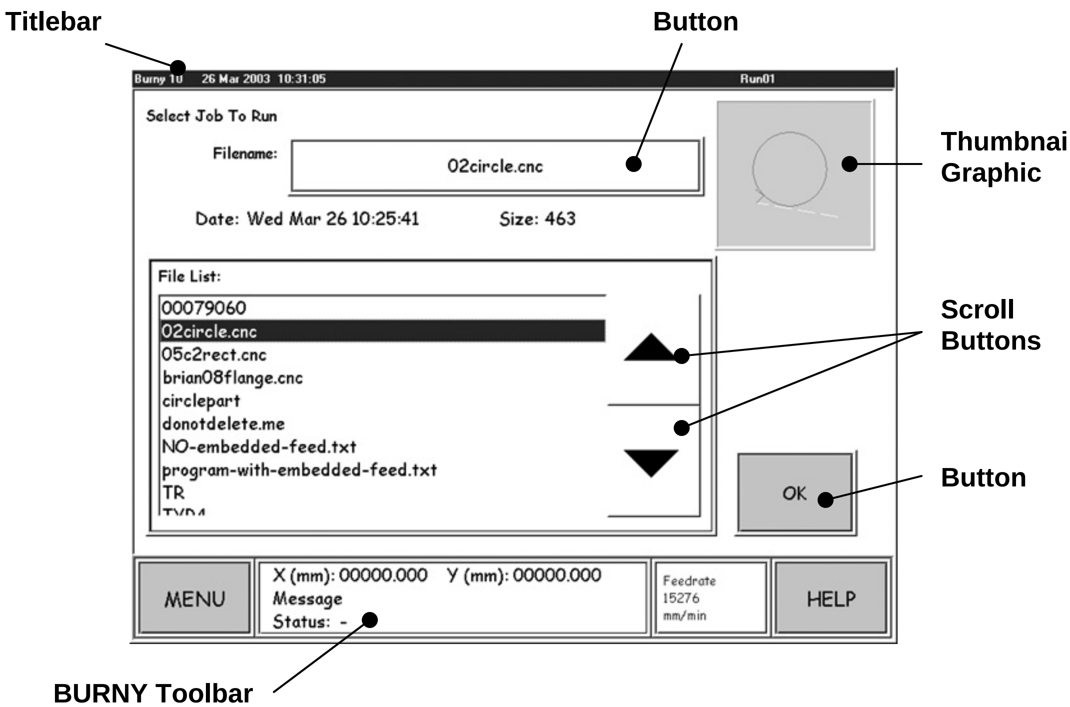

Figure 1-2 – The LCD Touch Screen

- **Titlebar** - Displays the Date, Time, current Screen Name and notification if the password is enabled.
- **Thumbnail Graphic** – press to view the Expanded Graphic Window showing the part in greater detail.
- **Scroll Buttons** – press to scroll up or down a list. The selected filename will be highlighted.
- **Button** - touch sensitive area on the screen. Press firmly to activate the button and display the associated screen or function.
- **BURNY Toolbar** – used to view the Menu, Help, Status and Feedrate Screens – it is common to every screen.

1.2.4 MEMBRANE CONTROL BUTTONS

Figure 1-3 – Membrane Control Buttons

Press:	To:
GO TO	move to pre-defined places in the active part program or to home table positions.
REVERSE	backtrack along the cutting path as long as the button is depressed. The cut process is stopped during Reverse. Press the Start Membrane button to restart cutting.
START	start the cutting operation
STOP	stop the cutting process or current motion activity

1.2.5 JOG PAD

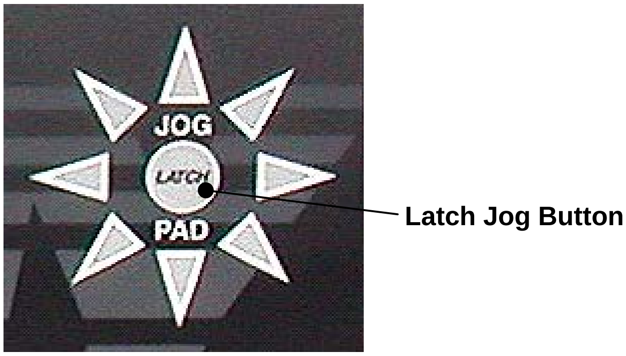

Figure 1-4 – The Jog Pad

The Jog Pad enables the operator to move the cutting head in any of the 8 directions indicated and will continue to move in that direction for as long as the button is held down. The direction of travel can be "locked" by first pressing the Latch Jog Button followed by the required direction. The motion will continue until one of the following conditions is met:

- The Latch Jog button is pressed again
- The Stop button is pressed
- The machine stop is reached

1.2.6 NAVIGATING BETWEEN MODES AND SCREENS

The user can start or switch between modes of operation by pressing the ***MENU*** button at the lower left of every screen to display the **Main Menu** screen and then select one of the 8 modes available. For more information on Modes, refer to section 1.5.2 – Description of Modes or to the individual mode sections in this manual.

To navigating between Modes of Operation and Screens, do the following:

- When the **Main Menu** screen is displayed, pressing the ***MENU*** button again displays the **Run** mode, showing the last active screen.
- Press ***OK*** to move to the next mode screen or ***Cancel*** to return to the previous one. The screens in each mode have a logical order that fits their function.
- The screen that appears after the mode key is pressed will be the last screen active in that mode. To return to a previous screen in that mode, press ***Cancel***; to move to the next screen, press ***OK***.

1.2.7 MOVING THROUGH A LIST

Some screens display lists of file names or parameter values that can be configured. To select an item on the list so that it can be used or changed, the cursor must be moved to the item. This can be done in one of three ways:

- Press the item on the monitor face.
- Press the ***Up*** or ***Down Arrowhead*** buttons to move the cursor to the item.
- If the screen has a name field, press it to display the keyboard and enter the first few letters or the entire desired name, and then press ***OK***.

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*Press the **HELP** button at the lower right of the screen at any time for assistance. Press it again to return to the current screen.*

1.2.8 BACK PANEL

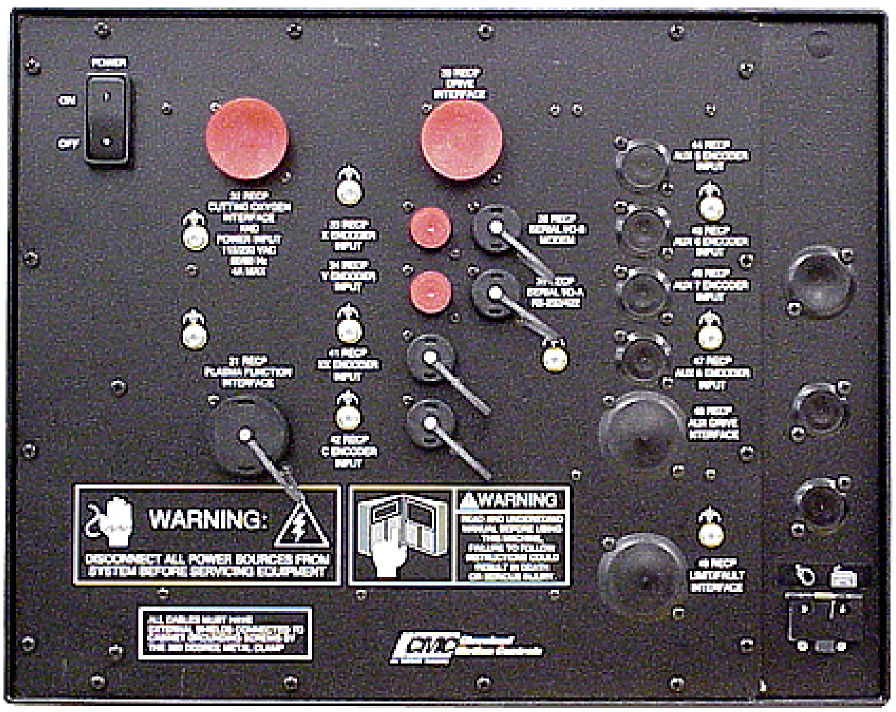


Figure 1-5 – Burny 10 LCD Plus Back Panel

The back panel of the enclosure has 9 connectors for power input and data input/output. Refer to the schematics provided with your system for wiring. Blank openings are provided for options such as:

- keyboard and mouse connectors
- fiber optic cable line
- remote pendant
- auxiliary line power output

1.3 POWER-UP

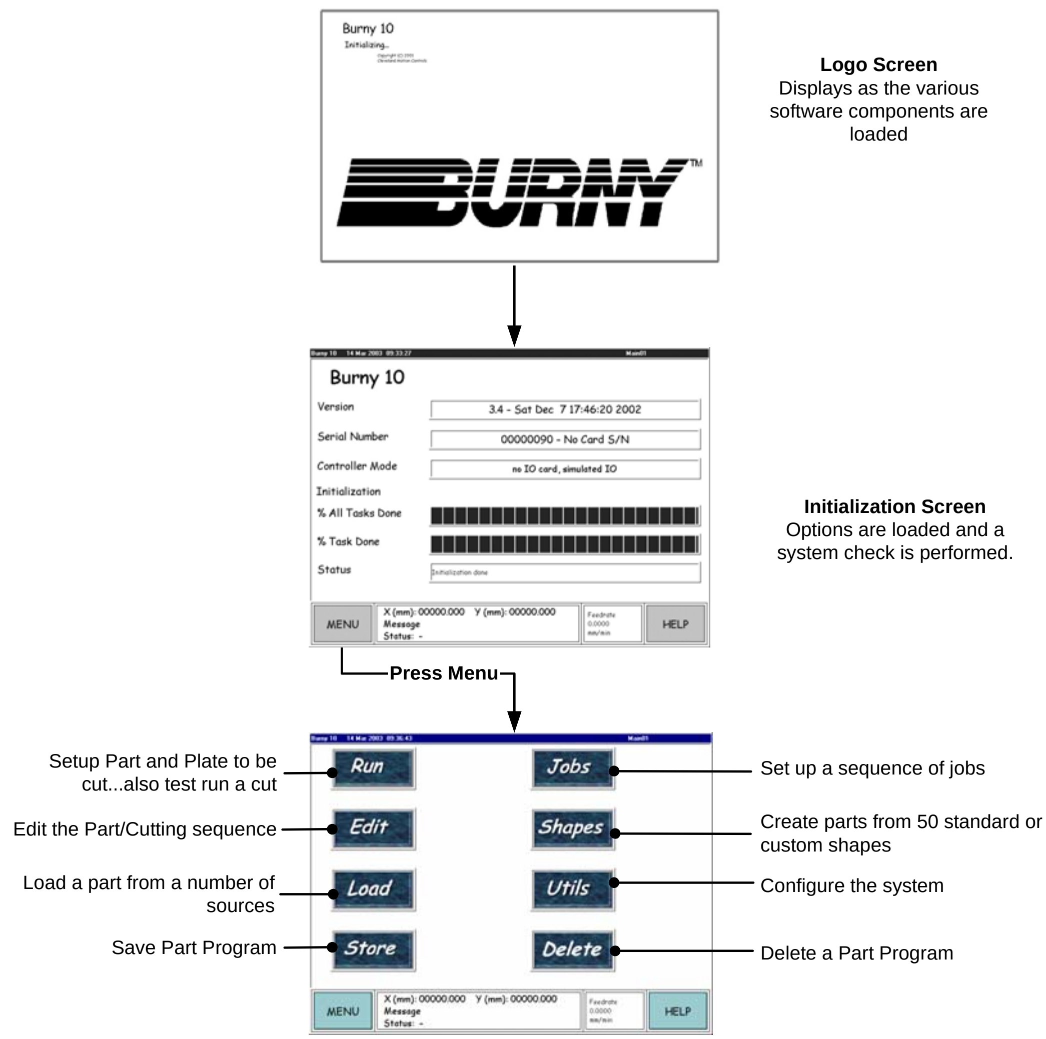
1.3.1 DESCRIPTION

A switch on the back panel of the unit applies power to the unit, usually located at the Upper/Left. See the upper left of Figure 1-5 – Burny 10 LCD Plus Back Panel

During power up, particularly after a power failure, the integrity of the Motion Configuration parameters is examined. Any that are found to be corrupted will be reset with default settings and a message is displayed detailing the error and how to proceed. Depending upon which parameters are at fault, the motion control may be disabled.

Some of the recovery procedures will substitute default motion parameter values for those previously set to operate the control. This enables the operator to get the control functioning. Parameter values can then be checked and corrected. If this has occurred the following message "Default settings set for Motion Configuration" will be shown in the Status window.
Any operation which involves machine motion and is started without parameter correction may cause unexpected motion that could injure personnel or damage the machine. Before starting any such operation, be sure all personnel are clear of the machine and be prepared to activate the E-Stop button at once.

When power-up is complete, the following screens are displayed:



Main Menu (*Main01*)

Figure 1-6 – Power Up Screens (*Main01*)

1.4 SHUT-DOWN

1.4.1 DESCRIPTION

We recommend that the system be shut down in the following way:

a) Press ***Shutdown*** from the **Utility Main Menu Screen (*Util01*)**

b) The **Confirm Shutdown (*UtilYesNo*)** screen is displayed – press ***OK***

c) An orderly shutdown of the CNC controller begins. The "Burny Torch screen" is displayed – the power can now be turned off with the back panel power switch.

When the ***Utility*** mode is accessed, the last active screen will be displayed. To return to the ***Util01*** screen, press ***OK***, ***Cancel***, or ***Return*** until the ***Util01*** screen is displayed.

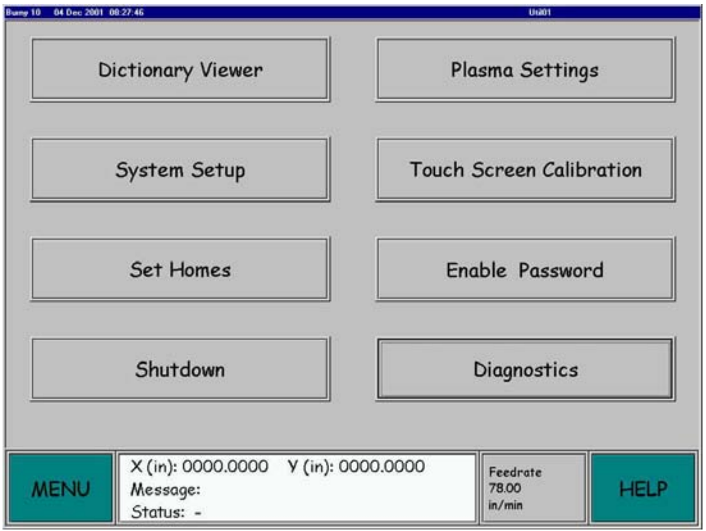


Figure 1-7 – Select Utility Screen (*Util01*)

1.5 CONTROLLING THE BURNY 10 LCD PLUS

Controlling the BURNY is comprised of two main functions: preparing the part program to be cut and the cutting process.

Preparing the part program – the part programs are either uploaded or created using the Shapes mode. The cutting process information is added, i.e. cutting speed, kerf etc. and the job is now ready to be cut.

Cutting the part - started and stopped using the physical controls on the Control Panel.

1.5.1 PART PROGRAMS AND JOB FILES

The files that control the shape to be cut are of two types: Part Program and Job File.

A **Part program** contains the information required to construct a part such as dimensions, geometry information etc.

A **Job** is a file that contains both the Part Program information along with the operating conditions required to produce the part such as cut speed, kerf, geometric orientation, scaling, rotation, plate dimension and location, process type, process timers etc.

The operating conditions can be added to the part program via two screens – the **Run Setup Screen (Run02)** if the part is to be run immediately or the **Job Setup Screen (Job04)** where the operator can specify the feedrates, kerf etc. for a job that will be cut in the future.

1.5.2 Description of Modes

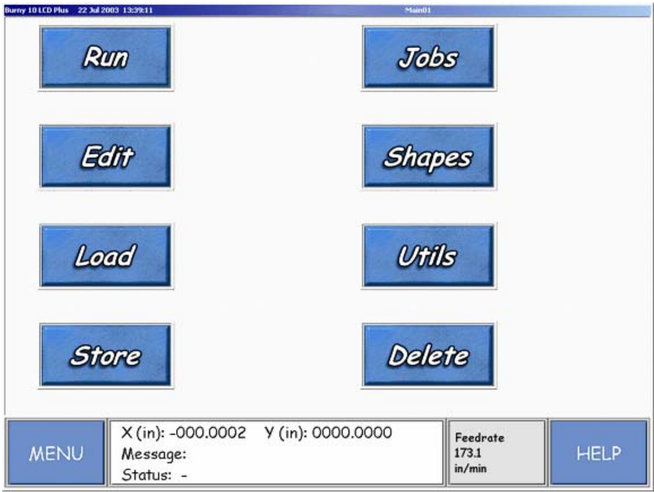


Figure 1-8 – Main Menu Screen (Menu01)

The ***Burny 10 LCD Plus*** operates in 8 major modes that can be selected from the ***Main Menu*** screen. Each mode uses its own set of display screens to interact with the operator. More than one mode can be running in this multi-tasking operating system.

Overview of Mode Operations

The following table lists the 8 modes and the operations available within each mode. The table also lists the sections of the manual where you can find additional mode information.

In this Mode:	These operations can be performed:	Manual section:
Run	Choose part program Set up part program and plate Test Run Cut Part	3
Edit	Edit an existing part program, custom shape, or ASCII file Write new part program	4
Load	Select source device Select folder Select part program Select destination directory Copy file to ***Burny 10 LCD Plus,*** with conversion for part programs	2
Store	Select destination device Select source directory (File Type) Select file Select destination folder (depends on destination device) Select output code conversion (part programs) Copy file to destination	2
Jobs	Place a part program on the Job List by setting it up Examine and modify details of a part program on the Job List Remove a job from the Job List	6
Shapes	Create part program from one of 50 standard generic shapes Create part program from a custom generic shape	5
Utils (Utilities)	Examine the value of Control parameters Change the value of Control parameters Setup the machine by tuning Control parameters	7
Delete	Delete a file from the Part Programs, ASCII, Aux Code, CAD Configuration, or Custom Shapes directory Delete a file from a floppy in the drive	8

1.6 FREQUENTLY USED SCREENS

A number of screens are used frequently throughout the BURNY, including:

- BURNY Toolbar
- Main Menu Screen
- Status Screen
- Feedrate Screen
- Help Screen
- Keyboard Screen
- Number Pad Screen
- Thumbnail and Expanded Graphic Windows

1.6.1 BURNY TOOLBAR

The BURNY Toolbar is located at the bottom of all screens. Press the appropriate area on the toolbar to switch the current display to any of the four screens shown – Main Menu, Help, Status and Feedrate. Press the same area again on the toolbar to return to the previous screen.

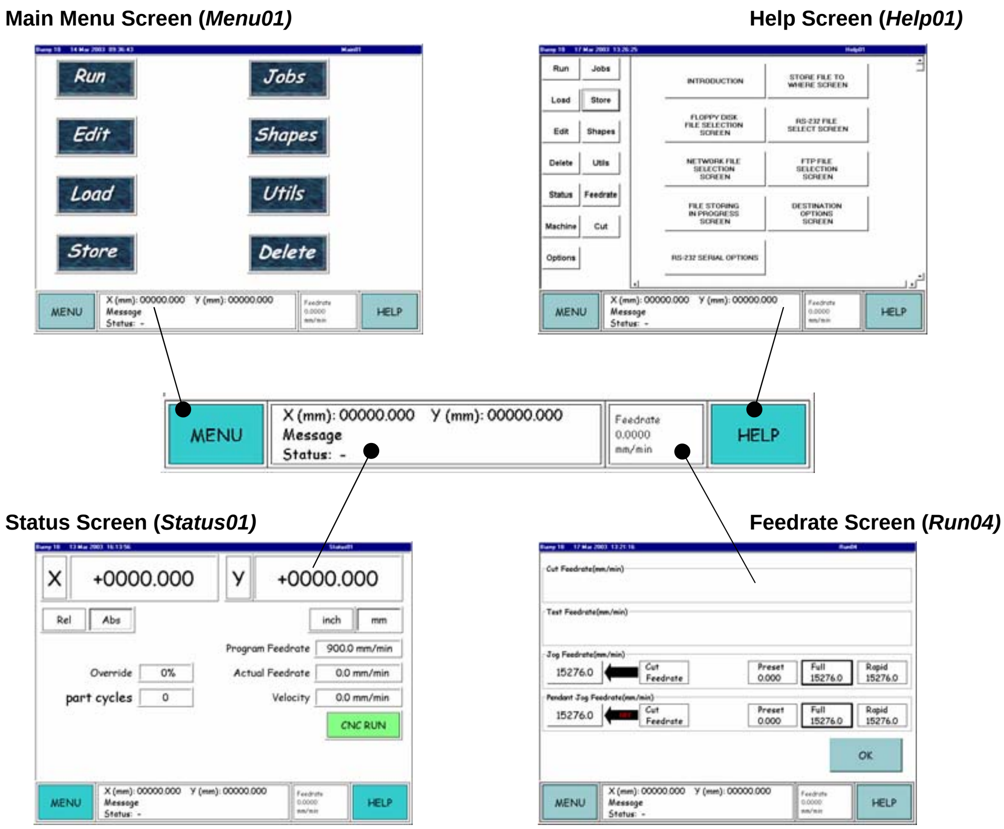


Figure 1-9 – The BURNY Toolbar and Associated Screens.

1.6.2 MENU

Press the ***MENU*** button to display the ***Main Menu*** screen. Select one of the eight modes to display the required screen. Pressing the ***MENU*** twice displays the last screen active under ***Run*** mode.

1.6.3 STATUS WINDOW

The Status window provides a brief summary of the current tool position, information on the status of the part program and on the operating status of the BURNY Control as indicated in Figure 1-10 – Status Window. The background color of the window also changes to indicate the current status.

To view a more detailed overview of the status of the system, press on the Status Window to display the Status Screen. Press the Status window again to return to the previous screen.

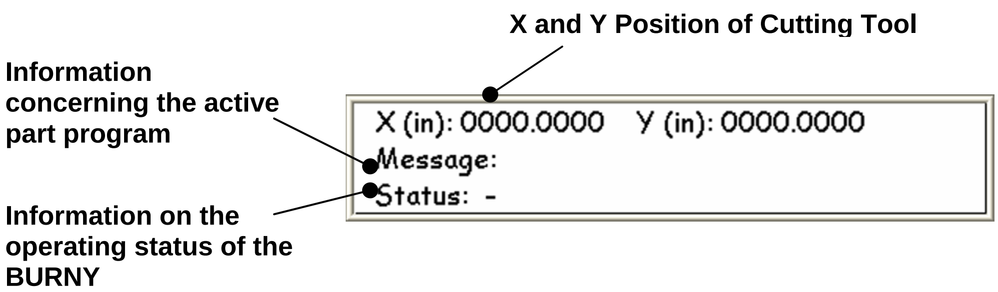


Figure 1-10 – Status Window

The background of the status window displays one of six colors indicating system performance. The colors and their indications are listed in the following table:

COLORS OF STATUS WINDOW

If the status window background color is:	Then:
White	the ***Burny 10 LCD Plus*** application and ***RTSS (Real Time Sub-System)*** controller are operational and ready.
Green	the controller is actively cutting or processing a part program.
Yellow	one of the axes has exceeded its ***Following Error Limit***. If the "OkToRun" Motion Parameter is set to 0, the color changes to yellow when the external Stop signal is active.
Red	the ***RTSS*** controller is either not running, the controller has an error, or an ***E-Stop*** condition exists. In this condition, the ***Burny 10 LCD Plus*** will not function as a controller, not does it have control of the motors. If the "OkToRun" Motion Parameter is set to 1, the color changes to red when the external Stop signal is active.
Blue	the CNC override button on the **Status (*Status01*)** Screen has been selected.
Orange	the system is indicating an Over Temperature Warning.

1.6.4 STATUS SCREEN

DESCRIPTION

The **Status** screen contains:

- the X/Y position
- Feedrates
- cutting program status message
- buttons to change the unit and mode of the displayed feederate and X/Y dimensions
- a toggle button for CNC Run On and Off
- a button for setting-up the PLC or the Command Messaging Option if either is enabled.

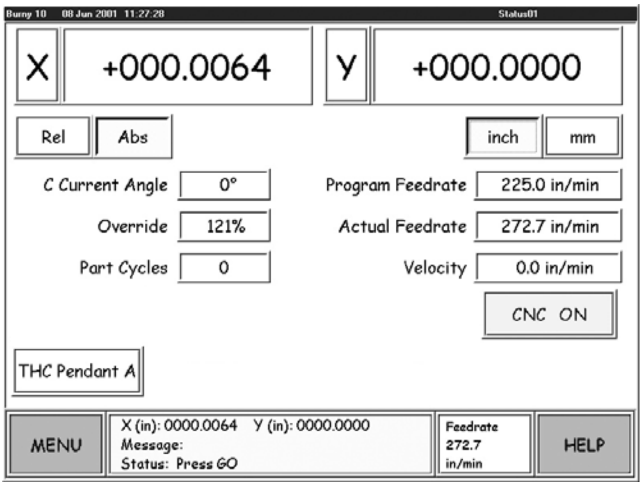


Figure 1-11 – Status Screen (*Status01*)

DETAILS

X & Y BUTTONS

Clears the **X/Y** relative dimension to zero if no part program is running. When pressed, the **X/Y** dimension of the present tool location becomes the zero relative reference for future moves. When ***Go*** is pressed to start a part program in **Relative** dimension mode, the **X** and **Y** dimensions are set to zero.

Pressing the **X/Y** buttons has no effect on ***Absolute*** dimensions.

X & Y DIMENSION WINDOWS

Displays the **X or Y** dimensions in one of two modes: ***Relative*** or ***Absolute***. The dimension numbers in the **Status** window at the bottom of the screen always match the numbers at the top of the **Status** screen and are colored black in ***Absolute*** mode and blue in ***Relative*** mode.

REL/ABS

Toggle the **X** and **Y** dimensions between ***Relative*** and ***Absolute*** mode:

- ***Absolute*** **X** and **Y** dimensions are measured from the ***Absolute Home*** position.
- ***Relative*** **X** and **Y** dimensions are measured from the **X** and **Y** positions where the respective relative dimension was last cleared to zero, either by pressing the **X/Y** buttons or by pressing ***Go*** to start a part program while in ***Relative*** mode.

INCH/MM

Toggle the **X** and **Y** dimensions between inches and millimeters. This change affects all dimensions and speed values throughout the system, except in the *Util10* parameter screens.

OVERRIDE

Displays the current percentage setting of the Speed Pot.

PART CYCLES

The number of parts cut in the part program currently running.

EXTERNAL PLC

When either the PLC or the Command Messaging Option is enabled, the label in this button will be black, meaning it is active. Press this button to display other screens in which the Options can be configured. See the Option Addenda documents for details.

1.6.5 FEEDRATE WINDOW

Pressing the Feedrate button on the toolbar, displays the current speed of the tool along the traverse or cutting path while the part is being cut or during a ***Go To*** move. If the ***Stop*** button is pressed when a job is cutting, the **Run Mode Stop** Screen appears. Pressing the ***Feedrate*** button at this point displays the **Job Setup** screen where elements of the job can be changed. Press the ***Feedrate*** button to return to the stop screen, and press ***Go*** to restart the cutting process with the changes in effect. For additional details on the ***Feedrate*** screen, refer to Section 3, Run Mode**.**

1.6.6 FEEDRATE SCREEN

The **Feedrate Screen (Run04)** displays the cutting, jogging and test run feedrates, accessed by pressing the Feedrate Window on the BURNY Toolbar.

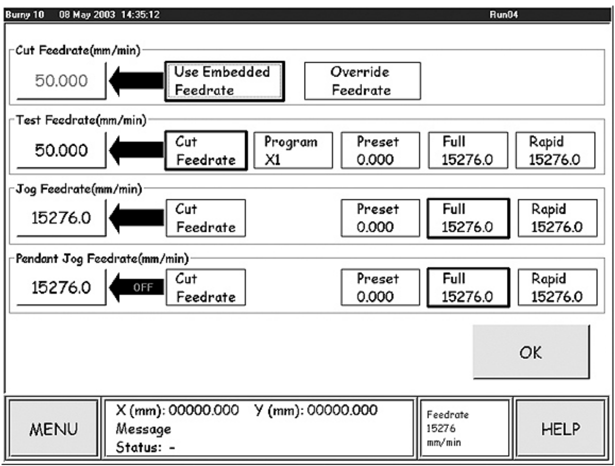


Figure 1-12 – The Feedrate Screen (*Run04*)

DETAILS

Use Embedded Feedrate – the feedrate has been configured during the part setup. Unless overridden it will be the default feedrate for the part. If Embedded has been configured then the Feedrate button on the Job Setup Screen (Run02) will be grayed out. Overriding the Embedded feedrate will cause the Cut Feedrate to be used.

Test Feedrate, Jog Feedrate and Pendant Jog Feedrate – these can be selected from any of up to five choices, to assign a rate press on the button – i.e. in Figure 1-12 – The Feedrate Screen (Run04). Test Feedrate has been set to Cut Feedrate and the Jog and Pendant Jog Feedrates are set to Full.

Cut Feedrate – a feedrate set by the operator or embedded in the part.

Program – the program feedrate is increased by a multiple of 1, 10, 100 or 1000 i.e. X10 = programmed feedrate multiplied by 10. Toggle to scroll through the list.

Preset – Operators preferred feedrate, press the button twice to bring up the number pad to enter the value.

Full – run at full speed of the system with override enabled.

Rapid – a non-cutting move run at full speed of the system with override enabled.

1.6.7 HELP

Pressing the Help button displays the online **Help** page that contains information on all the screens in the current mode. Select the desired screen name, and then use the right-hand scroll bar to move through the section.

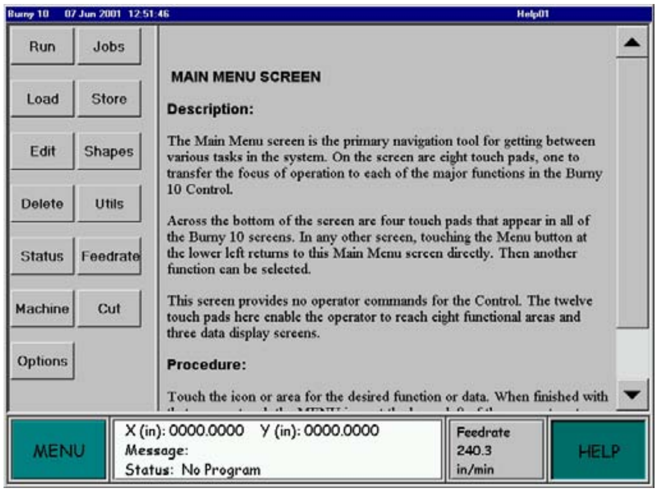


Figure 1-13 – Help Screen

To return to the top of the page or jump to another topic, touch the name of the current mode in the list on the left of the screen.

To access the **Help** pages for another mode, touch its name in the list at the left of the **Help** page. Return to the active screen by touching the ***HELP*** button.

1.6.8 THE KEYBOARD SCREEN

The keyboard screen is used to edit filenames and other alphanumeric information. When the Filename button is pressed on a screen, the Keyboard Screen is displayed.

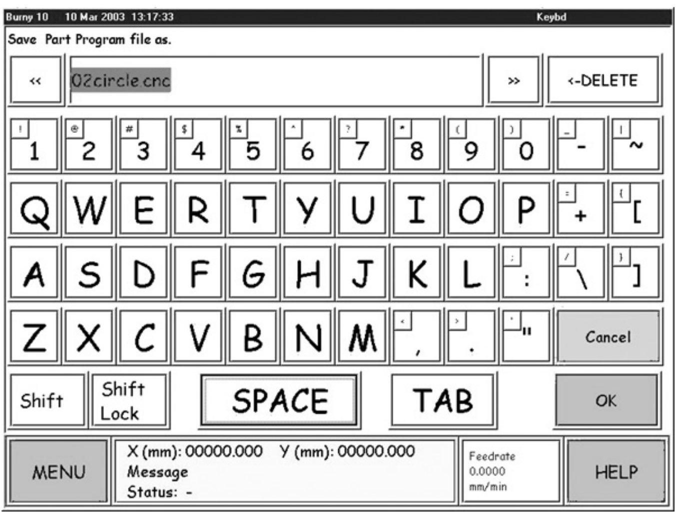
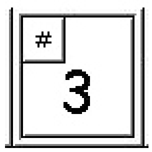


Figure 1-14 – Typical Keyboard Screen (*keybd*)

Do not use the "\" or "/" keys when entering a name.

The existing filename name will initially appear highlighted in red. Use the following table to make changes to the filename:

If you want to:	Then:
Assign a new file name	type the new file name
Edit the existing name	move the cursor press the Right or Left Arrow (<<,>>) buttons. The red highlighting is cleared and the insert cursor appears at the right or left of the filename. Right or Left Arrow keys will now move the cursor one space per press.
Insert a character	move the cursor to the desired position and press the button for the desired character.
Remove a character	move the cursor to the right side of the character and press DELETE.



Some of the keys also have a secondary character - press the shift button plus the button for the secondary character i.e. in this case to obtain the # symbol hold down the shift key and press the 3 key. There are no lower case characters.

Press ***OK*** to retain the changes and return to the previous screen.
Press ***Cancel*** to return to the previous screen without saving any changes.

1.6.9 THE NUMBER KEYPAD

Used to edit numerical values. The Back button deletes the digit at the right end of the item. Any character typed will appear at the same place. The Clear button deletes the entire item in the window. Typing in numbers then replaces it.

The Parameter Name appears at the top of the screen.

Press ***OK*** to save changes and return to the previous screen.

Press ***Cancel*** to return to the previous screen without saving any changes.

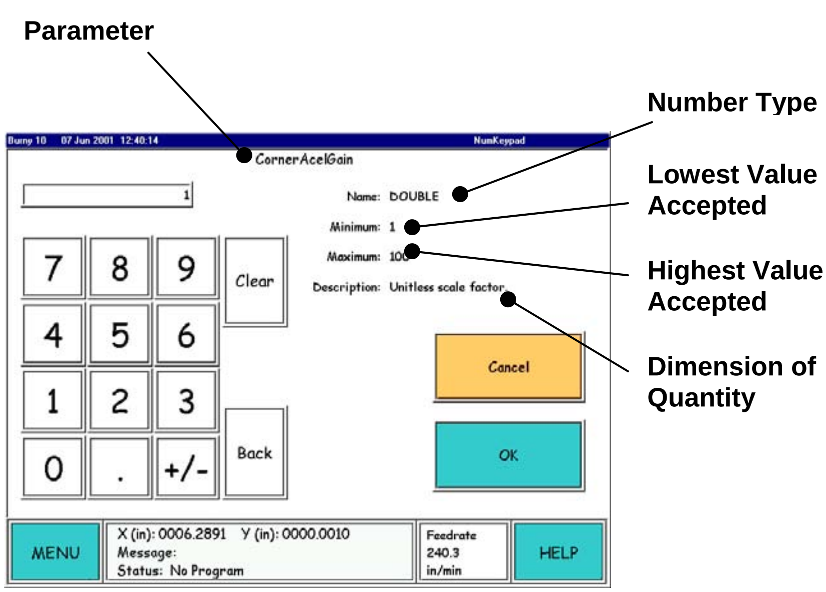


Figure 1-15 – Typical Keyboard Screen (*keybd*)

A label at the top of the keyboard screen describes the parameter for the numerical item displayed in the window. The following table describes the values displayed at the top right-hand side of the screen:

This Value:	Provides you with the following information:
Name	Type of number, such as integer, float, etc.
Minimum	Lowest value accepted
Maximum	Highest value accepted
Description	Repeats the label and adds the dimension of the quantity

1.6.10 THUMBNAIL GRAPHIC

A number of screens include a thumbnail image of the part (refer to Figure 1-2 – The LCD Touch Screen). The thumbnail displays a line that corresponds to the following information:

If the color of the line is	The line is showing the:
Yellow	traversing motion of the tool.
Red	the path to be cut.
Green	procession of the cut, in Run Mode the red line turns to green as cutting proceeds.
Blue	path to be followed by marker.
Orange	areas that may have a problem due to kerf compensation.

A white crosshair shows the tool position. If the tool is moved with the ***Jog Pad***, the crosshair follows its motion.

1.6.11 EXPANDED GRAPHIC WINDOW

In all the modes except ***Jobs***, a thumbnail graphic outline of a part program can be expanded by pressing it. Figure 1-16 – Expanded Part View shows the part program 08flange.cnc (Note this is a negative image). In all modes where the expanded image can be displayed except for the ***Shapes*** mode, several graphic tools help the operator to examine the part in further detail. The graphic tools are explained in the Details portion of this section.

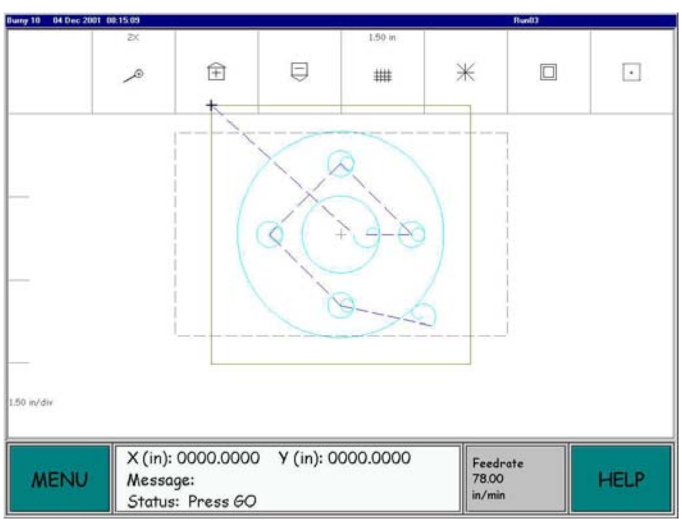


Figure 1-16 – Expanded Part View

DETAILS

Once in the expanded screen, the operator can select any portion of the part outline and magnify it. Press the ***Toggle Frame*** icon at the upper right corner of the screen. A dashed rectangular frame with a crosshair at the center of it is displayed. Touch on the region of the screen that you want to magnify, the rectangle moves to this point with the area magnified.

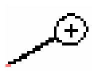
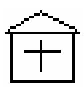
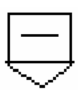
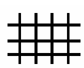
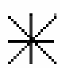
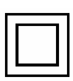
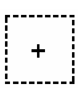
When the ***Zoom*** icon at the upper left is touched, the screen changes to display whatever was in the ***Toggle Frame*** at full screen size. Touch the ***Zoom*** icon again to return to the original expanded display. The same magnified view will appear whether the dashed frame is displayed or not.

The degree of magnification appears above the ***Zoom*** icon as 2X, 4X, etc. Magnification is increased by a factor of two each time the ***Zoom Up*** icon is touched and reduced by a factor of 2 when the ***Zoom Down*** icon is pressed until 2X is reached.

In some of the ***Run*** mode screens, another crosshair appears, brighter than the one at the center of the zoom frame. This one marks the tool position. When the tool crosshair is present, the ***Toggle Zoom Center*** tool also appears. Either crosshair can be made the center of a zoom by using the ***Toggle Zoom*** icon. When the zoom is centered on the tool position, the ***Toggle Zoom Center*** tool has a red overlay.

Before pressing the ***Toggle View*** icon to return to the previous screen, be sure the display is not in a magnified state.

GRAPHIC TOOL ICONS

	**Zoom**	Toggle between the regular and the magnified view. The area displayed in the magnified view is outlined by the white dashed rectangle in the regular view, displayed if enabled by the Toggle Frame icon. The 2X means the magnified view is twice original size.
	**Magnification Increase**	Degree of magnification: 2X, 4X, 8X, 16X, 32X, 64X, 128X. and 256X
	**Magnification Decrease**	Magnification is decreased by a factor of two each time this icon is pressed. Degree magnification reduction: 2X, 4X, 8X, 16X, 32X, 64X, and 128X.
	**Grid Size**	Displays a 5 x 8 grid with the line spacing indicated. The same grid appears in the regular and magnified views with different spacing. Only the scale indication changes.
	**Track Cursor**	Auto Scrolls the displayed view so the cursor is always kept in the visible area.
	**Return to Mode**	Return to Thumbnail
	**Toggle Frame**	Toggle on and off, shows what will appear in the magnified view. The same magnification occurs whether the frame appears or not.

BLANK

Load and Store Modes

(AO-70396 Rev AA)

Section

2

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

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2 LOAD AND STORE MODES

2.1 INTRODUCTION TO LOAD / STORE

The ***Load***/***Store*** mode combines two important functions

- Loading -Copying files into the Control memory from the floppy drive or from a computer via the serial port or network connection
- Storing -Copying files from the Control memory to the floppy drive or to a computer via the serial port or network connection

Actually, these two functions do not simply copy. In the ***Load***/***Store*** mode the ***Control*** does copy all types of files except part programs and CAD drawing files in the .dwg or .dxf format. It treats part program files and CAD drawing files in the .dwg or .dxf format differently. When part program files load into the ***NC*** Program memory of the ***Burny Series 10***, the ***Control*** converts them from the language used to write them into a special internal language called ***IDF*** format. When the ***Burny Series 10*** stores part program files from ***NC*** Program memory to an external device, they convert back to the format chosen at that time. This can be the original format or one of the optional formats.

When CAD drawing files in the .dwg or .dxf format load into the Burny Series 10, they convert to equivalent part programs in the Word Address language and then into the IDF format. If such part programs are stored to an external device, they convert to the Word Address format. See Section 2.12 CAD File Processing.

Before loading or storing a file, the operator must make sure the correct '***PROGRAM TYPE***' has been selected for the file. If the '***PROGRAM TYPE***' is '***NC PROGRAM'***, the file is a part program. For this type of program, the ***Control*** must have additional information on the '***PROGRAM FORMAT'***. The program format is the language used to write the part program.

Once the ***Control*** has this information, it can load the program. It copies the file, say from the floppy drive or via the serial port, then converts it to the ***IDF*** format. The ***Control*** then saves this converted part program file in the ***NC PROGRAM*** section of its memory. The program runs in ***IDF*** format but the program blocks displayed to the operator in the ***Edit Mode*** or in the ***Run Mode*** screens appear in the original language.

When the ***Control*** stores a part program file, it converts the file to the 'program format' (language) chosen at that time. When the ***Control*** stores other types of files, it simply copies them.

The ***Load*** and ***Store*** modes are set up and started as foreground or 'primary' modes but then can be running as background operations. This means that after the ***Load*** or ***Store*** operation is running and transferring a part file, you can switch to ***RUN*** mode and begin running a part program or activate one of the other modes. You then can press ***Load*** or ***Store*** keypad at any time in the ***Main Menu*** screen and return to the same screen to check the status of the current ***Load*** or ***Store*** operation.

The ***Load*** and ***Store*** modes have many similarities.

2.2 LOAD FILE FROM WHERE SCREEN (LOAD01)

Figure 2.1 – Load File From Where? Screen (*Load01*)

2.2.1 DESCRIPTION

The ***Load*** function is used to transfer part programs, configuration files, aux code files, and custom shape files from a remote/peripheral device into the ***Burny*** unit. Except for the part program files, this is a simple copy process.

Part programs contains tags that specify the original language of the file (***Word Address***, ***ESSI***, etc.), code conversion, X/Y swaps, etc. In addition, all part program files are converted to a special internal language called ***IDF***, regardless of their original language.

FLOPPY DISK DRIVE; RS-232 PORT; NETWORK; FTP

Displays the **Load File From (*Load02*)** screen for the source device selected. Press the button labeled with the desired source.

TEACH TRACE

Allows the BURNY system to learn a cutting path.

2.3 LOAD (LOAD02) / STORE (STORE02) SCREENS

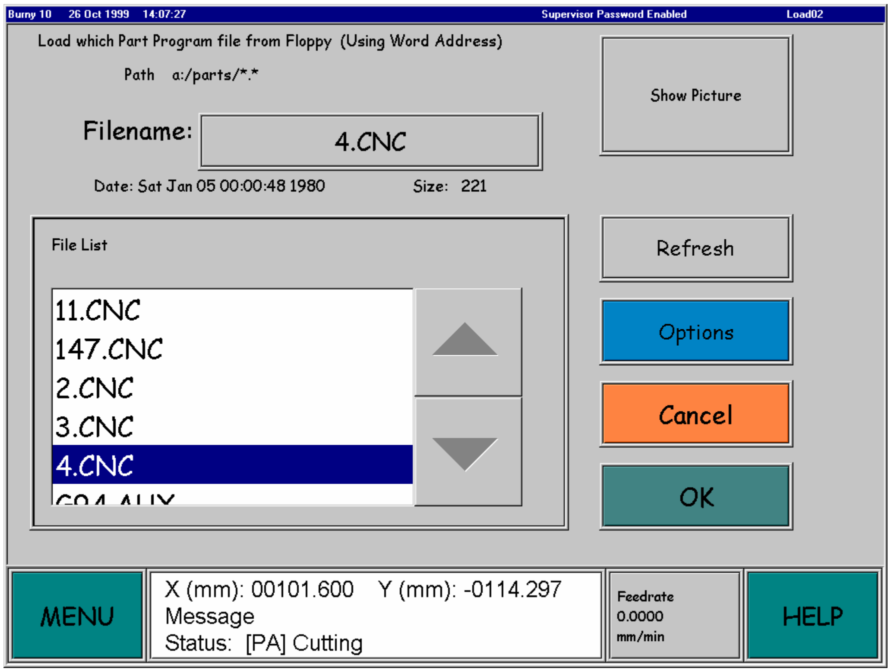

Figure 2.2 – Load Screen (*Load02*) – *Floppy Drive*

2.3.1 DESCRIPTION

The load/store screens are common to all 4 devices…the text at the top of the window indicates the file method chosen along with the current path.

FILE LIST

The file list shows the names of all the files in the directory currently selected The file name under the blue cursor is the one "selected"; it will be loaded/stored by pressing the ***OK*** button

FILENAME

The current filename is displayed – press to display the Keyboard screen (ref section 1.9) and enter the filename accordingly.

When the name is correct, press ***OK*** to return to the **Load/Store** screen. The new file name will appear in the **File Name** window. If that file name is in the list, it will be displayed in the center of the file list window under the cursor. If the file name is not on the list, the file name that would follow it in alphabetical order will be displayed in the center of the **File List** window under the cursor.

THUMBNAIL

Until a part has been selected, **Show Picture** will be displayed in this window. Upon selecting a part the part image will be displayed, and will update as each part is selected. Press the window to display the **Expanded Graphic Window** (ref Section 1.12)

REFRESH

Used to update the file list. For example if parts are being loaded from the floppy drive but the user isn't sure which floppy contains the part file then after each floppy is inserted press the Refresh button to update the filelist to display the files on the new floppy.

OPTIONS

Press to display the **Source-Destination Load*(Load03)*/Store*(Store03)*** screens, where you can change the subdirectory, file type etc.

CANCEL

Return to the **Load/Store** screen and discard all changes made on this screen.

OK

Load/Store the file named in the **Filename** box.

MESSAGES

Two error pop-up messages can appear here

1. DUPLICATE FILE EXISTS. DELETE ORIGINAL? YES NO

- Press ***YES*** to replace the existing file with the one from the floppy.
- Press ***NO*** to cancel the **Load** operation and to retain the pre-existing file.

2. NO SUCH FILE EXISTS ON THE FLOPPY OK

- Press ***OK*** to clear the pop-up message
- Press ***Cancel*** to discard the **Load** operation

2.4 FILE LOADING (LOAD04) / STORING (STORE04) IN PROGRESS SCREEN

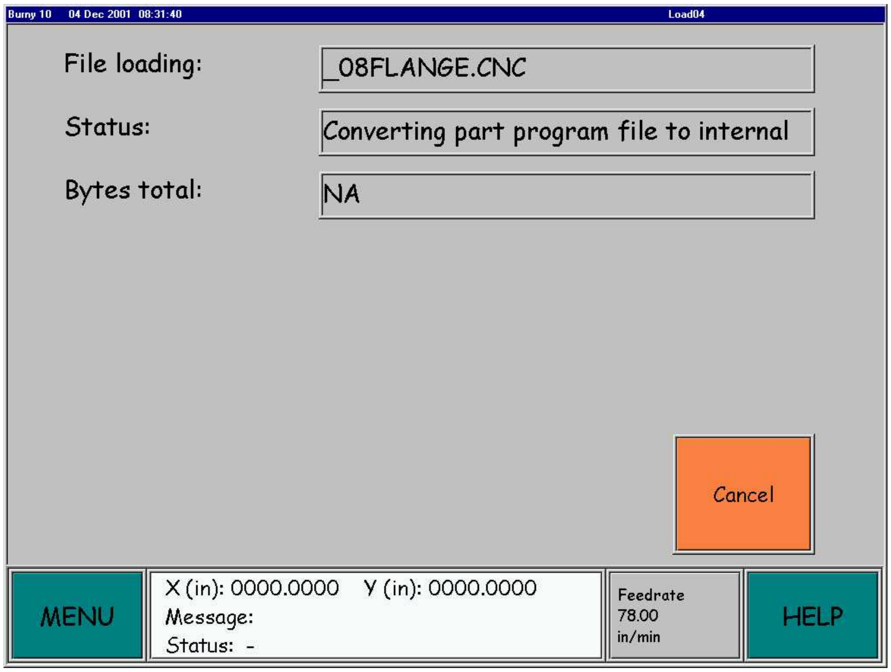

Figure 2.3 – File Loading in Progress Screen (*Load04*)

2.4.1 DESCRIPTION

While the file is loading/storing the **File….In Progress** screen is diplayed, indicating the filename, status of the loading/storing process, number of bytes, and total number of bytes in the file.

Cancel – abort the load/store operation in progress.

When the **Done** status appears, the transfer is complete. The ***Cancel*** keypad changes to ***OK***, press to return to the **File Select** screen.

2.5 DIRECTORY NAVIGATION

With Burny software version 5.X, the Load from Floppy/USB and Load from Network features now include the ability to easily access sub-directories (folders).

Previous software versions required the directory's name to be known prior to accessing the directory's contents. While Directory Navigation doesn't replace this method, it is designed to be much easier to use.

A yellow folder icon now () appears next to each directory name. Touch on or scroll to the desired directory name until it becomes highlighted in blue, then select OK. The contents of that directory will be displayed in the File List window.

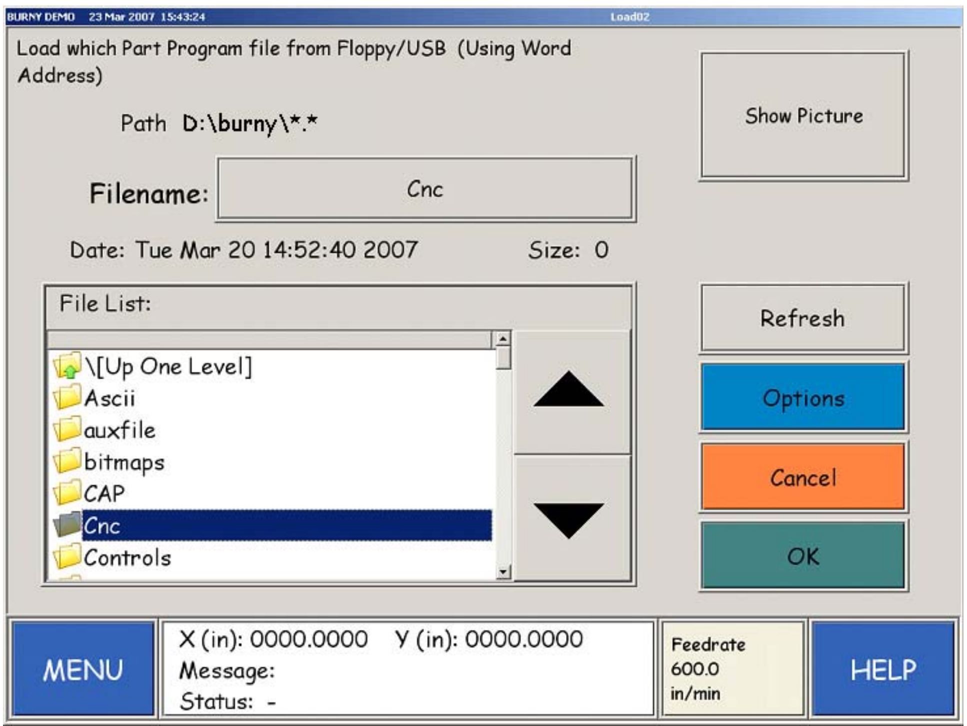

Figure 2.4 – Directory Navigation Icons in Load02 screen

To move "up" in the directory tree, select the "Up One Level" folder icon (), then select OK.

If the security settings for a particular directory don't permit access, the message "Access is denied" will be displayed.

Please note that this feature does not work in Store Mode or with Load from RS-232/FTP.

2.6 SOURCE OPTIONS (LOAD03) / DESTINATION OPTIONS (STORE03) SCREENS

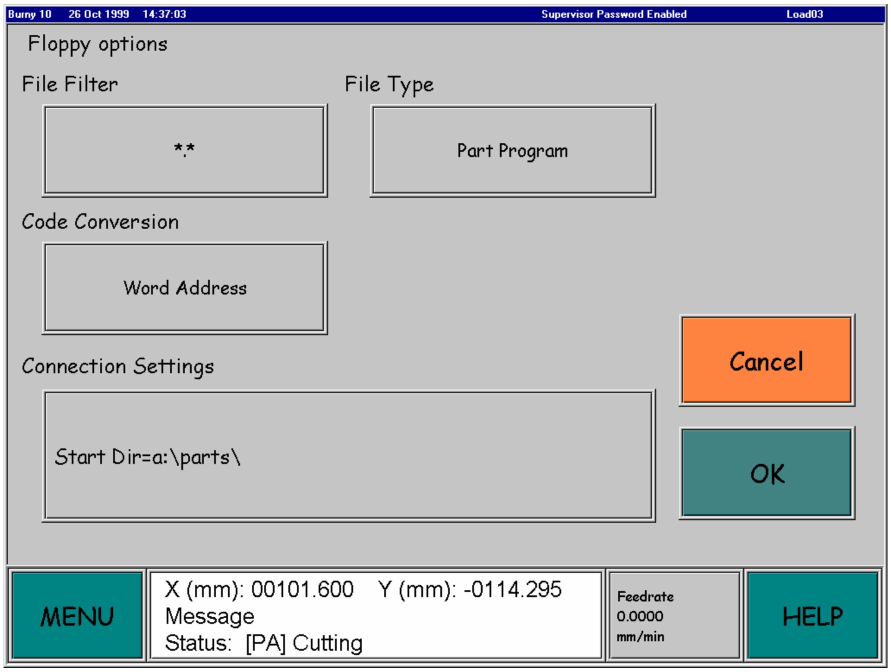

Figure 2.5 – Source Options Screen (*Load03*)

2.6.1 DESCRIPTION

Pressing the ***Options*** button on the **Load02/Store02** screens displays this screen. The **Source/Destination Options** screens have the same general format for all the sources. The title, "***Floppy options***," etc., and the choices in the *Connection settings* window are different and the following variations apply depending upon file type:

- ***Aux Code, Custom Shape, Configuration***, ***& System Backup:*** no conversion window appears.
- ***CAD Import by MTC:*** a *CAD Conversion* window appears, choose the correct *Conversion* file.
- ***Part Program,*** a *Code Conversion* window appears, choose the desired *language* conversion.
- When ***Network*** is the source/destination, a *Subdirectory* window appears in the *Options* screen. Make the desired choice. More subdirectory choices can be created in the *Utility Mode*.

After the choices are made, press the ***OK*** button to make the changes and return to the **File Select** screen.

To discard changes and return to the previous screen, press the ***Cancel*** button.

2.6.2 DETAILS

FILE FILTER

The file filter is a set of characters that filters out files on the list that do not fit a desired pattern and displays those that do.

Touch this button to move to the keyboard. Type an entry of the following format "***XX*.YYY***". Here the ***YYY*** should be the extension common to all the files you want to see on the list. If you want to see all extensions, put just a single asterisk,"***** ", after the period," . ".

Only files with the initial characters "XX" will be displayed. This segment can be more than two or just one, as appropriate. If you want to see all files that have the chosen extension, omit the ***XX*** characters and use just the " * " before the period.

When the File Type is *System Backup*, the file filter is change to "*_*".

FILE TYPE

Five types of files can be loaded into the ***Burny Series 10***:

- Part Program

- Custom Shape
- Aux Code
- Configuration File (Password Required)
- System Backup (Password Required)
- CAD Import by MTC

Touch this button until the desired program type appears. ***Configuration*** and ***System Backup*** can be chosen but cannot be implemented with the ***OK*** touchpad unless a password is enabled.

Custom Shapes, Aux Codes, and ***Configuration Files*** require no conversion to/from ***IDF*** format, if one of these is selected, the ***Code Conversion*** button is removed from the display. Only part programs loading/storing require this option. When CAD Import by MTC is chosen, the CAD conversion window appears.

The ***System Backup*** selection loads/stores the configuration files from/to the device. The configuration files contain the following information:

- Operator preferences, i.e. Units (English, metric), default feedrates, default kerf, standard program format, load/store path, RS-232 Communication port settings, Network settings, and consumable information.
- Motion Configuration files, i.e. BurnyLoadParams.ini
- Aux code files, and
- CAD conversion configuration files.

CODE CONVERSION

During Loading: The system converts all part programs loaded into a common internal format. To select the correct conversion routine, this code conversion entry must match the program to be loaded.

During Storing: The part programs are converted from the ***IDF*** internal format to a selected external format. To select the correct conversion routine, this code conversion entry must match the desired program format to be stored. If the ***As Loaded*** choice is made, when a part program file is stored the same code conversion used to load it into the Burny is used for the storage process.

Press the window to change the code displayed. The ***Word Address*** and ***ESSI*** choices are always available. If the system has been configured to convert other ***.AUX*** formats, those choices will also appear as file names, usually with the extension ".aux." Be sure the window displays the correct choice before ***OK*** is pressed.

CAD CONVERSION

See **Section 2.12 , CAD FILE PROCESSING.**

SUBDIRECTORY

This window appears only when the ***Network*** or FTP source is chosen. See Directory Navigation for more information.

CONNECTION SETTINGS

For each of the four file sources/destinations certain path or parameter settings must be chosen. These options, which are set up in the ***Utility*** mode, appear in this window. For all the sources but ***RS-232***, a touch on this button changes the setting. Toggle through the list until the correct connection is displayed.

For the ***RS-232*** source, touching this button brings up the ***RS-232 Serial Options*** screen. See ***Section 2.9*** for instructions.

For the ***Floppy Disk Drive*** source/destination, the ***Connection Settings*** window reads "Start Dir=a:\…", where the "…" can be blank or can contain more characters describing a path to a subdirectory on the floppy disk.

For the ***RS-232*** destination, touching this button brings up the ***RS-232 Serial Options*** screen. Select from the four options in this screen as required for the connection. See Figure 2.10.

CANCEL

Press to discard any changes made in this screen and return to the **File Selection** screen.

OK

Press to accept the changes made in this screen and return to the **File Selection** screen.

2.7 RS-232 SERIAL OPTIONS SCREEN (LOAD12)

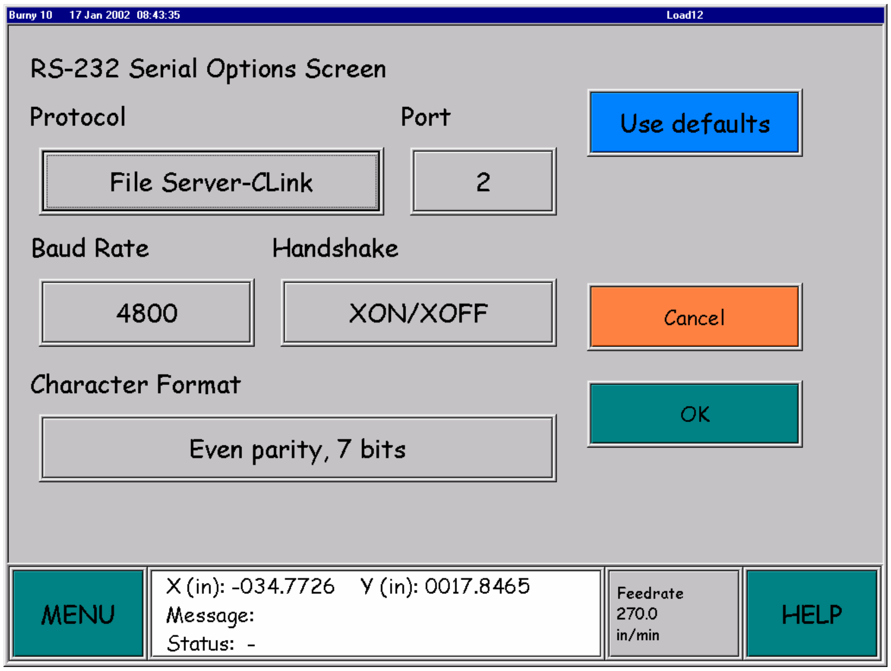

Figure 2.6 - RS-232 Serial Options Screen (*Load12*)

2.7.1 DESCRIPTION

This screen enables the operator to make the four settings required for downloading from a particular RS-232 source. Settings are made here by picking from a limited number of choices. The operator can also change the default settings.

2.7.2 DETAILS

PROTOCOL

This item has three choices ***Std TTY***, ***Std Callup***, and ***File Server***. Pick the one that matches the source.

PORT

This item has three choices ***0, 2*** through ***8***. Port "0" is used to disable using the Communication port for Load and Store operations. Port "1" is reserved and is not available. Ports 3 through 8 require additional hardware.

BAUD RATE

This item has twelve choices ranging from 110 to 115200. Pick the one that matches the source.

HANDSHAKE

This item has three choices. Pick the one that matches the source.

CHARACTER FORMAT

This item has three choices. Pick the one that matches the source.

USE DEFAULTS

When this keypad is touched, all four settings on the screen take the values entered in the ***Communication Setup*** section of the ***Utility Mode***.

CANCEL

Press to discard all changes made in this screen and return to the previous screen.

OK

Press to accept all changes made in this screen and return to the previous screen.

2.8 FILE EXISTS SCREEN (LOADSTOREOK01)

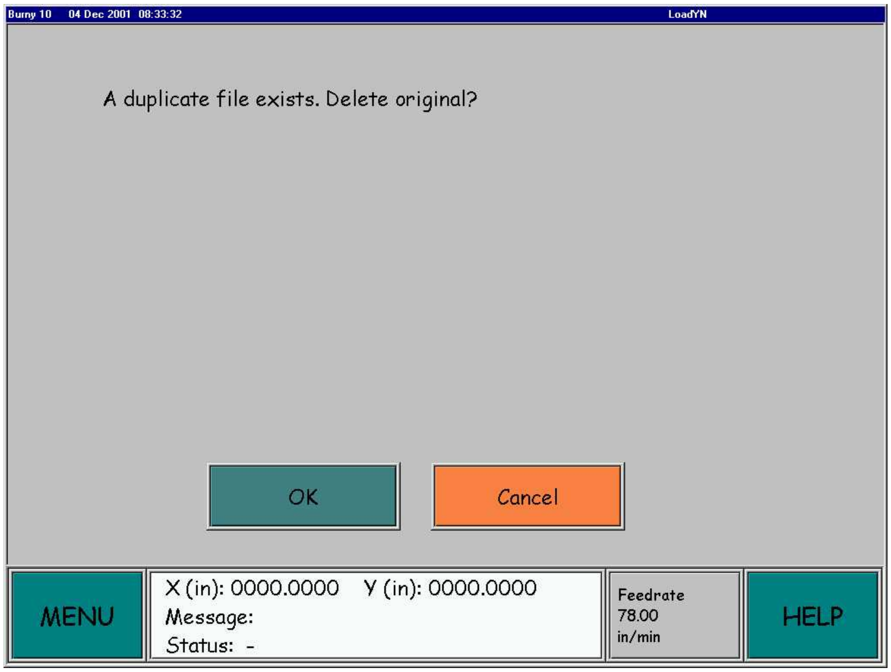

Figure 2.7 – File Exists Screen (*LoadStoreOK01*)

2.8.1 DESCRIPTION

This screen appears when the file name selected for loading already.
Press ***Cancel*** to discard the load command and return to the **file select** screen.
Press ***OK*** to overwrite the existing file.

2.9 PROGRAM NOT SPECIFIED SCREEN (LOADSTOREOK01)

Figure 2.8 – Program Not Specified Screen (*LoadStoreOK01*)

2.9.1 DESCRIPTION

When this screen appears, it means no file was specified for the load operation. Press the ***OK*** button to return to the ***File Select*** screen. Be sure a file name appears in the ***Filename*** window before attempting the load again.

2.10 STORE FILE TO WHERE SCREEN (STORE01)

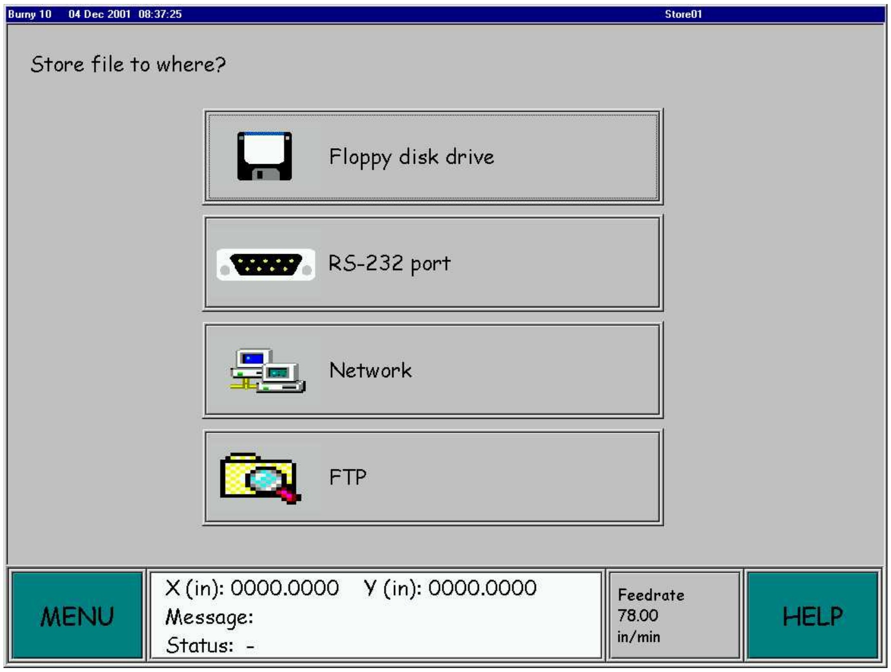

Figure 2.9 – Store File to Where Screen (*Store01*)

2.10.1 DESCRIPTION

The ***Store*** function in the ***Burny Series 10 Control*** transfers files from the ***Burny Series 10*** to a remote or peripheral device. This storing is much more than copying in the case of part program files. The part program file saved in the ***Burny Series 10*** contains tags that specify the original language of the file (***Word Address***, ***ESSI***, etc.), code conversion, X/Y swaps, etc.

One of four destinations can be selected: the integral floppy disk drive, the ***RS-232*** port, the ***Network***, or the ***FTP*** site. The display moves to a different screen for each of these choices where the operator can accept default settings or change them.

2.10.2 PROCEDURE

Touch the button labeled with the desired destination.

2.10.3 FEATURES/DETAILS

FLOPPY DISK DRIVE

Floppy disk drive button - Changes the display to the ***Store which file to floppy*** screen. Make this choice when storing a file to a floppy disk in the on-board floppy drive of the ***Burny Series 10*** Control.

RS-232 PORT

Changes display to the ***Store which file to RS-232*** screen. Make this choice when storing a file from an RS-232 port in the ***Burny Series 10*** Control.

NETWORK

Changes display to the ***Store which file to network*** screen. Make this choice when storing a file to a device on the network connected to the ***Burny Series 10*** Control.

FTP

Changes display to the ***Store which file to ftp*** screen. Make this choice when storing a file to a network computer available to the ***Burny Series 10 Control*** via ***FTP***, File Transfer Protocol.

2.11 RS-232 SERIAL OPTIONS SCREEN (STORE12)

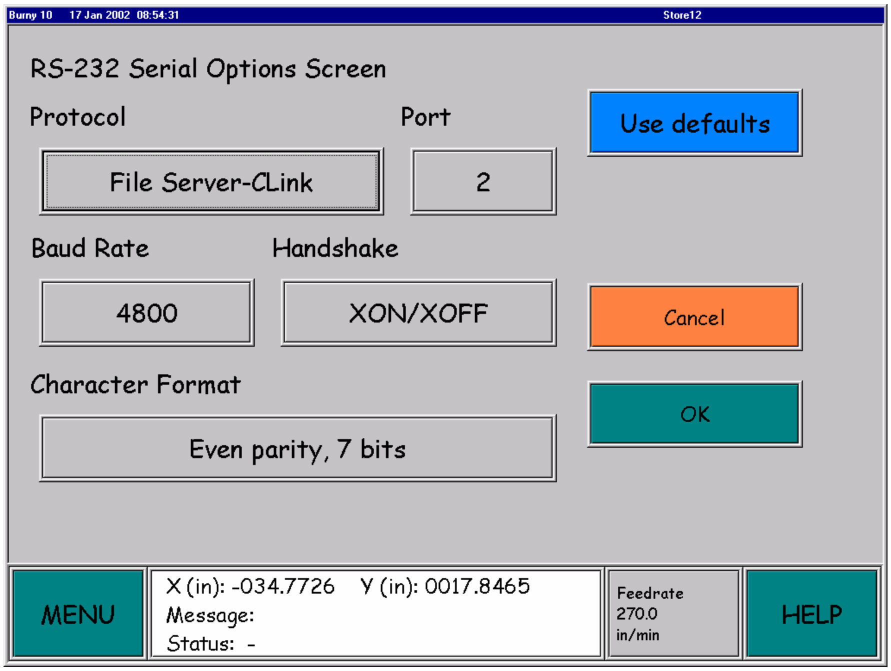

Figure 2.10 - RS-232 Serial Options Screen (*Store12*)

2.11.1 DESCRIPTION

This screen enables the operator to make the various settings required for storing to a particular ***RS-232*** destination. Settings are made here by picking from a limited number of choices.

2.11.2 PROCEDURE

Display this screen by touching the ***Connection Settings*** keypad in the ***RS-232 options, Store03*** screen. Make the required choices, then touch the ***OK*** keypad to accept them and return to the previous screen. To discard the changes made in this screen and return to the previous screen, touch the ***Cancel*** keypad.

2.11.3 DETAILS

PROTOCOL

This item has three choices ***Std TTY***, ***Std Callup***, and ***File Server***. Pick the one that matches the source.

PORT

This item has three choices ***0, 2*** through ***8***. Port "0" is used to disable using the Communication port for Load and Store operations. Port "1" is reserved and is not available. Ports 3 through 8 require additional hardware.

BAUD RATE

This item has twelve choices ranging from 110 to 115200. Pick the one that matches the source.

HANDSHAKE

This item has three choices: ***NONE, XON/XOFF, RTS/CTS***. Pick the one that matches the source.

CHARACTER FORMAT

This item has four choices: Even parity, 7bits; Even parity, 8bits; Odd parity, 7 bits; and Odd Parity, 8 bits. Pick the one that matches the source.

USE DEFAULTS

When this keypad is touched, all four settings on the screen take the values set up in ***Default Serial Settings*** under ***Communications Setup*** in the ***Utility Mode***. If any one of the four values differs from the default settings when ***OK*** is touched and the display returns to the ***Store03*** screen, the ***Connections Settings*** window will have a white background.

CANCEL

Touch this keypad to discard all changes made in this screen and return to the previous screen, ***RS-232 Options*** screen, ***Store03.***

OK

Touch this keypad to accept all changes made in this screen and return to the previous screen, ***RS-232 Options*** screen, ***Store12***.

2.12 CAD FILE PROCESSING

2.12.1 INTRODUCTION

The ***Bury 10*** can load a file generated from a ***Computer Aided Design (CAD)*** software package and process the file so that a part or parts shown in the file can be cut. As the ***CAD*** file is loaded into the ***Burny Series 10***, the file is converted to a ***Word Address*** file and then into an ***Internal Data Format (IDF)*** file, automatically. After loading the ***CAD*** file, the converted file can be used just as any other ***Word Address*** part program is used; it can be ***Run***, ***Edited***, ***Stored*** and ***Deleted***. The store process will not convert the file back to its original ***CAD*** file format, but instead to a ***Word Address*** part program.

Two kinds of ***CAD*** files are supported, ***DXF*** and ***DWG*** files. The extension of the ***CAD*** file determines the conversion process; do not change the extension of the files. If the file was saved as a ***DXF*** formatted file and you change the file extension to ***DWG***, the conversion process will not properly convert the file and the results may be unpredictable. Use the "***Show Picture***" feature as a quick check of the conversion before actually loading the ***CAD*** file.

There are many different variations and techniques that the ***CAD*** operator may utilize when creating the drawing file. The Burny Series 10 can configure the load process to accommodate these variations. These variations are handled by selecting a ***CAD Configuration File*** during the load process. These ***CAD Configuration Files*** can be created and modified in the ***Utility*** mode.

2.12.2 CAD FILES LOAD PROCEDURE

To Load a ***CAD*** file, touch the "***Menu***" button to display the ***Main Menu*** and then touch the "***Load***" button. Select the file source, i.e. ***Floppy***, to show the ***Load File Selection Screen, Load02***. Note that the following screen shows the selected source and ***CAD*** Configuration file in the top line. In this sample, the source is the floppy drive and the ***CAD*** Configuration file is ***"b10mtc.ini."*** This sample screen depicts the screen after "***Show Picture***" was touched in the thumbnail screen.

Touch the ***Options*** button to show the ***Load Options*** screen, ***Load03***. Touch the "***File Type***" button, repeatedly, until "***CAD Import by MTC***" is displayed. The "***CAD Conversion***" button appears. Touch the "***CAD Conversion***" button, repeatedly, until the correct ***CAD Configuration*** file is displayed. Touch the "***OK"*** button to accept this load setup or touch the "***Cancel***" button to discard these settings. Touching the "***OK***" or "***Cancel***" button will return you to the ***Load File Selection Screen, Load02***. You can also change the "***File Filter***" and "***Connection Settings***" as necessary.

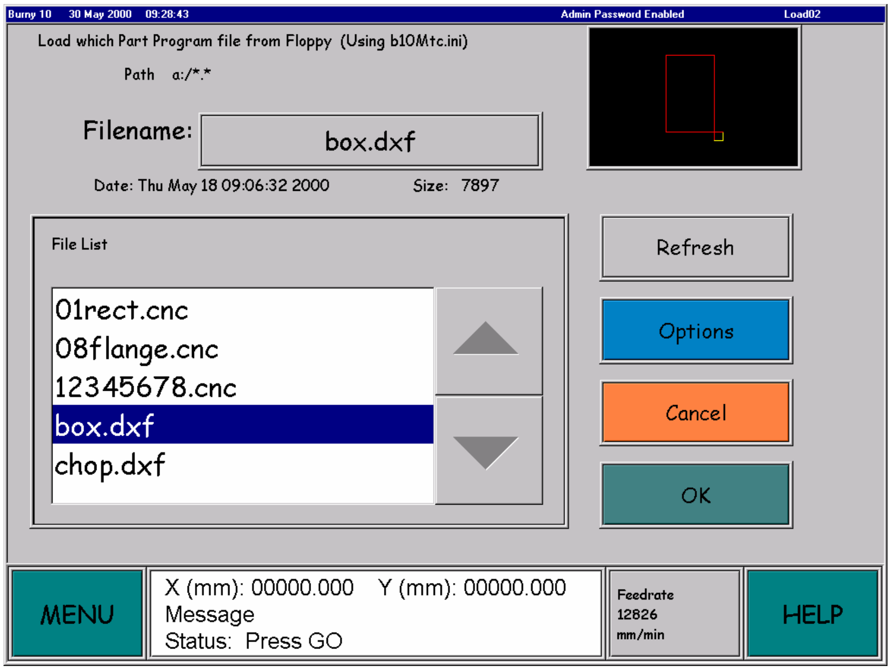

Figure 2.11 – Loading CAD Part Drawings

*If a **CAD Conversion** file does not exist, the "**CAD Conversion**" button will indicate "**None Available**" and the "**OK**" button is disabled. This prevents the operator from attempting an invalid operation. Should this occur contact **Cleveland Motion Controls**.*

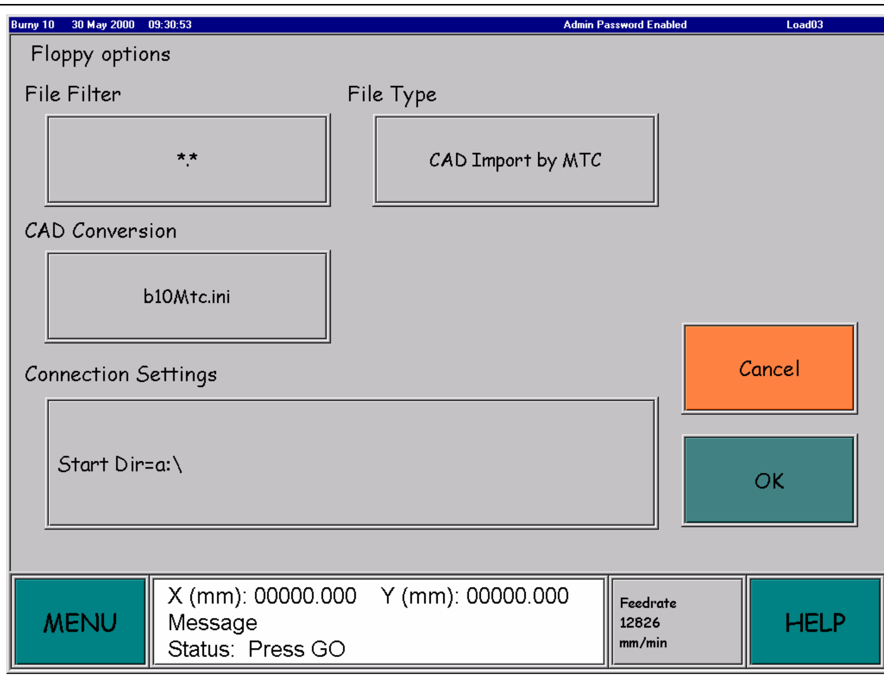

Figure 2.12 – Option Screen For CAD Load

When the ***Load File Selection*** screen is displayed, move the cursor to the desired file name in the list. Touch the ***OK*** button and the load process begins. As the load process is executing, the ***Loading*** screen is displayed. At the completion of the load process, the ***Status*** message will change to ***Done*** if there were no errors during the load process. Touch the ***OK*** button to confirm the successful transfer and processing of the file. This will cause the ***Load File Selection*** screen, ***Load02***, to be displayed and the load process is completed. The part program converted from the ***CAD*** drawing now appears on the part program ***File List*** with the same name and extension, ***dxf*** or ***dwg***, as the original ***CAD*** drawing.

Two kinds of errors are handled. If one kind of error occurred during the processing of the ***CAD*** file, a ***LoadStoreOK01***, screen is displayed with one of the following errors.

2.12.3 CAD PROCESSING ERROR MESSAGES:

Error Message	Description	Solution
"No Data in Source File."	This message will be displayed if the CAD file has no information in it, i.e. a blank file. See below, also.	Ensure the CAD file is correct. This may also occur if the CUT information is on a different DXF layer indicated in the CAD configuration file.
"No Data in Source File."	This message may also be displayed if one of the supporting conversion files is corrupted or missing.	Ensure the CAD file is correct. If the file appears to be correct, contact Cleveland Motion Controls.
Source file could not be opened.	Source CAD file could not be found.	This would occur if you enter the file name incorrectly.
The Conversion Program is NOT Found. Contact CMC	The Burny Series 10 is unable to locate the "program" to perform the conversion/	Contact Cleveland Motion Controls.
The Conversion Function is NOT Found. Contact CMC	The Burny Series 10 is unable to locate the "program" to perform the conversion/	Contact Cleveland Motion Controls.
Errors occurred during CAD conversion. Check configuration file	One or more of the entries in the CAD Configuration file may be causing the conversion to fail.	Ensure the CAD Configuration file entries are the correct type, i.e. String, 0, 1.
"Invalid support file. Contact CMC"	There is a support file named "Burnyswa.cif" that may be missing or is corrupted.	Contact CMC for further instructions.

When a warning or specific kind of ***fatal*** error occurs, a ***Load04*** screen is displayed that contains further information about the conversion of the file. In this example, the file type is wrong; ***CNC*** is not an acceptable extension of the file, it must be ***DXF*** or ***DWG***.

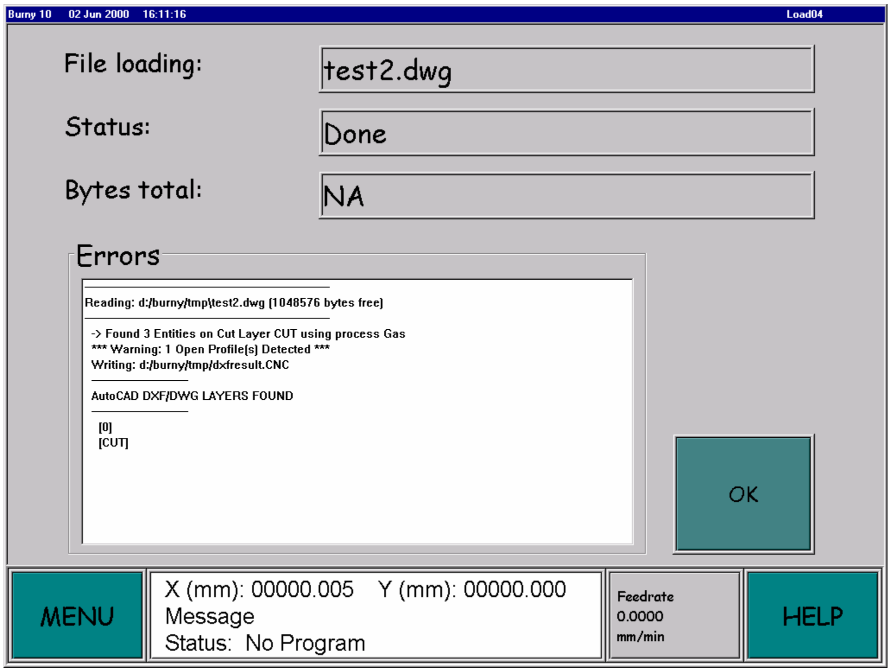

Figure 2.13– Loading Screen After CAD File Load

This display also contains certain information about the CAD file(s) that were last processed. It reports 4 major pieces of information:

1. How many entities were found on each layer specified in the *Cut, Scribe, Punch and Base Layer*.
2. Warnings or errors that have occurred.
3. Location of the CNC file that was just written (only if no errors occurred).
4. All the CAD layers found in the drawing (useful if an *Empty Drawing File! CAD Layers probably do not match* error occurred).

Example:

```
--------------------------------------------------------------------
Reading: mf2.dxf (1048576 bytes free)
--------------------------------------------------------------------
 -> Found 7 Entities on Cut Layer CUT using process Gas
 -> Found 2 Entities on Scribe Layer SCRIBE using process Scribe-G
 -> Found 5 Entities on Point Layer PUNCH using process Punch-G
 Writing: D:\MTC\CNC\mf2.CNC
 ---------------------------
 AutoCAD DXF/DWG LAYERS FOUND
 ---------------------------
  [0]
  [PUNCH]
  [SCRIBE]
  [CUT]
```

2.12.4 WARNINGS

The table contains the most common warnings that could be encountered when processing a CAD file.

Warning	Reason
<# OF OVERLAP ENTITIES> ***OVERLAP ENTITY(S) DETECTED***	This warning occurs when two or more lines/arcs overlap themselves in the CAD drawing. If left unresolved, it could produce a CNC file that has a line/arc cut more than once.
<# *OF OPEN PROFILES*> ***OPEN PROFILE(S) DETECTED***	This warning occurs when one or more CUT profiles on the CAD drawing are not closed. This happens when the profile's start point does not match its end point. Open profiles will not have lead-in/outs added to them.
COULD NOT OPEN FONT FILE	This warning occurs when the file mtcpro.fnt does not exist or is not in the same directory as the DLL. This file allows you to make CUT or SCRIBE TEXT entities on the CAD drawing.

2.12.5 ERRORS

The table contains the most common errors encountered when processing a CAD file.

<table>
<tr><th>Error</th><th>Reason</th></tr>
<tr><td>Empty Drawing File! CAD Layers probably do not match</td><td>This error occurs when the layers, specified as the Cut, Scribe, Punch and Base Layer have no entities in them. All of the cutting, scribing and punching processes must be on individual layers in your CAD drawing in order to extract them correctly. If you use the option Ignore Layers, then you do not have to specify layer names. However, all entities found will then be CUT.</td></tr>
<tr><td>Can't determine file type</td><td>This error occurs when the cadFile is not a valid DXF or DWG file.</td></tr>
<tr><td>Error opening file <cad file name></td><td>This error occurs when the cadFile does not exist or there was a disk access problem (e.g.: permission denied).</td></tr>
<tr><td>Could not open file: standard.dll</td><td>This error occurs when the file standard.dll does not exist or is not in the same directory as the DLL.</td></tr>
<tr><td>Could not find functions in file: standard.dll</td><td>This error occurs when the file standard.dll is invalid or corrupted.</td></tr>
<tr><td>Could not open CIF file: <cif file name></td><td>This error occurs when the controller file does not exist or is not in the same directory as the DLL.</td></tr>
<tr><td>Could not open CNC file: <cnc file name></td><td rowspan="4">These errors occur when the CNC file output location does not exist or there was a disk access problem (e.g.: permission denied).</td></tr>
<tr><td>Could not write to CNC file: <cnc file name></td></tr>
<tr><td>Could not close CNC file: <cnc file name></td></tr>
<tr><td>Could not open token file: <token file name></td></tr>
<tr><td>Could not open file TOKEN.QCE</td><td rowspan="2">These errors occur when the temporary file output location does not exist or there was a disk access problem (e.g.: permission denied</td></tr>
<tr><td>Cannot open file LAYERS.$$$</td></tr>
</table>

RUN MODE

(AO-70356 REV AA)

SECTION

3

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

Table of Contents

3 RUN MODE

3.1 INTRODUCTION

If you haven't done so as of yet, please review the **System Description, Section 1** of the manual.

The ***RUN*** mode screens are used either during the cutting of the part or during a jog and cut operation.The jog and cut operation is used to jog the drives and cut out scrap or a remnant from the workpiece.

Cutting a part uses the following three (3) main screens:

- **Job Select** (*Run01*) to select the part
- **Job Setup** (*Run02*) to set process parameters, plate functions and row/column nesting
- **Job Run** (*Run03*) to cut the part.

Performing the jog and cut operation uses the following three (3) main screens:

- **Job Select** (*Run01*) to select the jog and cut operation using the Jog and Cut button.
- **Job Setup** *(Run02)* to set the jogging parameters
- **Jog and cut Procdure** *(Run08)* to display the steps to perform a jog and cut operation

There are additional screens, i.e. to set parameters and plates, that are also discussed in this section.

The following terms are used throughout this section: ***Part Program, Nest Part Program*** *and* ***Job***

The ***Part Program*** *details the information required to produce an individual part such as centerline dimension, geometry information and, possibly, setup information This information comes from the file processed in the Load mode.*

A ***Nest Part Program*** *is used where a number of parts are being cut from a single piece of plate in one run. The parts are "nested" onto the plate in the form of a grid of rows and columns.* *A* ***Nest Part Program*** *is created using the original* ***Part Program*** *plus Row and Column information including the number of rows, number of columns, spacing, cut priority, starting corner etc..*

A ***Job*** *refers to the* ***Part Program*** *or* ***Nest Part Program*** *AND the process setup information such as cut speed, kerf, geometric orientation (i.e. mirroring), scaling, rotation, number of parts, plate dimension and location, process type, process timers and job status information (i.e. Job Interrupted, Job Done).*

3.2 JOB INFORMATION

As previously mentioned, a **Job** refers to the **Part Program** or **Nest Part Program** combined with the process setup information. The process setup information includes cut speed, kerf, geometric orientation (i.e. mirroring), scaling, rotation, number of parts, plate dimension and location, process type, process timers and job status information (i.e. Job Interrupted, Job Done). A Job is easily identified in the Job Selection screen (Run01) File List by the job status located next to the part program name, i.e. "**08Flange.cnc   Interrupted**".

The job information is "attached" or associated with each **Part Program** when a part is setup to be cut. This means that the controller retains all of the setup information so the next time the **Part Program** is selected, the setup information, i.e. Feedrate, is automatically set to cut the same parts using the same material. This information is retained until the **Part Program** is deleted and/or re-loaded.

3.3 ACCESSING THE RUN MODE

Run Mode is accessed from the ***Run*** button on the Main Menu Screen (Main01). The Main Menu Screen is accessed by pressing the ***Menu*** button located at the bottom of screen.

*Pressing the Menu button twice automatically shows the **Run Mode***

3.4 JOB SELECT SCREEN (RUN01)

3.4.1 DESCRIPTION

This is the first screen in Run Mode. This screen contains:

- Job and Part Program List.
- Expanded Graphic Window.
- **Jog and Cut** button
- ***OK*** Button.

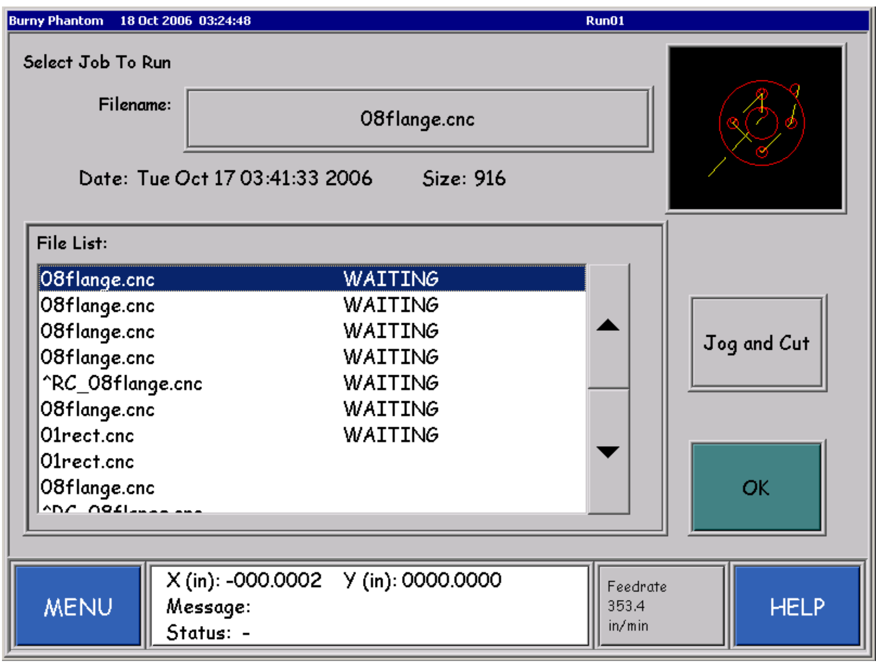

Figure 3.1– Job Select Screen (*Run01*)

To jog and cut a part, press the **Jog and Cut** button

To run the job or part program, select the Job or Part Program and press the **OK** button. The Expanded Graphic Window, Filename, Date and Size fields are available to confirm the correct part is selected.

If the message **"Homing is required before parts can be cut."** is displayed in the File List a homing procedure needs to be carried out before continuing. Ref Section 11.11.

3.4.2 DETAILS

FILE LIST

The File List displays the **Part Programs** and their status, which can be one of the following:

- **WAITING** - A job indicated as "waiting" has all of the setup parameters set except for the plate setting.
- **POWER LOSS** - A job indicated as "Power Loss" has sufficient information to resume from the exact location before the power loss occurred.
- **INTERRUPTED** - A job indicated as "Interrupted" has sufficient information to resume from the exact location at which the job was stopped.
- **DONE** - The job has been completed. There is one job that has the status of "Done", it is the last completed job. When the next job is run the "Done" job will disappear from the File List.

3.5 JOB SETUP SCREEN (RUN02)

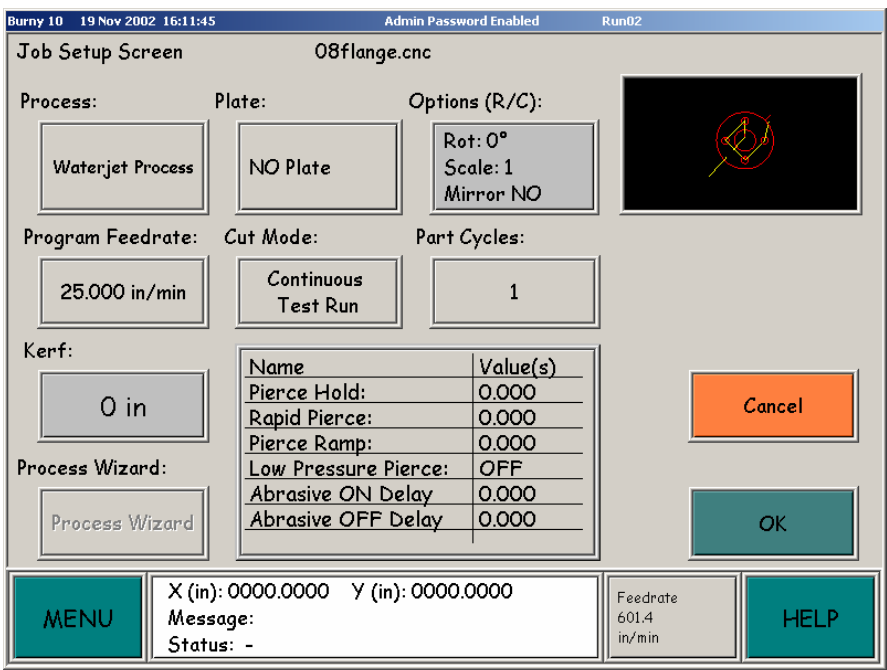

Figure 3.2 – Job Setup Screen (*Run02*)

3.5.1 DESCRIPTION

The Job Setup screen (Run02) is displayed when the ***OK*** button on the Job Select screen (Run01) is selected.

The Job Setup screen allows the operator to set the following parameters.

- **Cut process** – Plasma, Oxy, Waterjet etc.
- Size and alignment of the plate
- **Options (R/C)** – displays the geometric settings
- **Cut/Test Feedrate** – speed of cutting tool during the cut or test.
- **Cut mode** – Continuous Test Run, Automatic, Manual or Single Step Test Run.
- **Number of Part Cycles, or Part Count**
- **Kerf**, optional
- **Process Wizard** - opens 4070 Plasma Consumables where installed
- **Cut Process Timers.**
- **Geometry settings for the part**

The values for each of the parameters are set from one of the following sources.

- The last time the ***Part Program*** was run,
- The data within the ***Part Program***,
- The **Utility General Setup** default settings – refer to Section 7.7.

3.5.2 DETAILS

PROCESS

Used to toggle the cut process between *Oxy Process, Plasma Process* and *Waterjet Process***.** The available processes depend upon the options set in **Util: General Setup** (refer to Section 7.11).

PLATE

Displays the current plate settings:

- "*No Plate*" means that no plate is used for this job, or
- The actual plate dimension and angle is displayed.

The ***Plate*** button allows the operator to change the plate usage, dimension, location, rotation and part location. Refer to Plate Selection Section 3.11 for further details.

OPTIONS (R/C)

Displays the geometric settings, i.e. Rotation, Scaling and Mirroring. This button has a White background if any of the following are true.

- The part rotation angle is NOT 0 degrees,
- The Scale is NOT 1.0,
- The part is mirrored either in the X and/or the Y direction, or
- The part has been setup using the Row and Column feature.

Press to change any of these settings. Refer to the Job Geometry Setup (Run04) Section 3.17 for further details.

CUT/TEST FEEDRATE

Cut/Test

Indicates the current tool movement rate in either Cutting or Test mode. Refer to Cut Mode below for more information.

Feedrate – Embedded

When the button is pressed it's function is indicated by the color of the text:

Black: The button is active and when pressed loads the **Feedrate Screen (*Run04*)** where the federate can be edited. Refer to section 3.6 .

Grayed Out: One or more federates are embedded in the Part Program, the controller is using the values programmed by the person who created the part and it's operating file. The button is disable to prevent inadvertent editing. As the cutting process continues the current the feedrate is displayed. The feedrate cannot be easily altered here.

If the feedrate needs to be altered it can be done on one of two screens:

Feedrate (*Run04*): used to turn off/on the Feedrate for a single part i.e. if the part program was setup for an oxy process but is now being cut using plasma. this can be done via the **Feedrate (Run04)** screen – click on the ***Override Feedrate*** button and enter the values as required. Refer to Section 3.6 for futher information on this screen.

---

*If the button is enabled and the value is changed, the new feedrate value is used for the entire part disregarding **ALL** feedrate changes in the **Part Program**.*

Custom AUX Codes (*Util85 Custom*) (Ref Section 7.19) If a number of parts are to be uploaded with their feedrates being ignored, as opposed to using the Feedrate (*Run04*) screen to manually override each embedded value, the embedded values can be ignored during the upload process. Prior to uploading, on the **Custom AUX Codes** screen select the ***Override Feedrates*** button so that it is highlighted.

Utils ⇒ System Setup ⇒ Custom AUX Codes ⇒ Override Feedrate Button

The above sequence needs to be performed prior to the part being uploaded – the Program Feedrate function cannot be turned off on the fly.

This is a high level operation and is password protected.

CUT MODE

Used to toggle the cut mode between *Continuous Test Run*, *Manual*, *Automatic* and *Single Step Test Run* and the action performed by the controller:

- *Continuous Test Run:* "Traces" the path of the torch without turning on the torch.
- *Automatic:* turns the cutting tool on and off.
- *Manual:* waits for the operator to turn the cutting tool on and off.
- *Single Step Test Run:* executes just one **Part Program** movement instruction each time ***GO*** button is pressed.

The “Test Run” setting indicates the controller's reaction to jogging as follows:

- "*Continuous Test Run*" or "*Single Step Test Run*": jogging the tool moves the position of the part(s) on the plate.
- “*None*” adds a cut or traverse back to the position prior to the jog; this added move is executed in reverse when the ***Go*** button is pressed.

PART CYCLES

Indicates the number of parts that are cut with one torch. Press to alter the desired number of part cycles.

On a multi-torch machine, the number of parts cut is equal to the number of cutting heads times the number of part cycles.

KERF

Kerf is the width of the material lost during the cutting process. To ensure correct cutting of the part the controller adds half the kerf value to the dimensions of the part. The kerf value is displayed on the ***Kerf*** button, press the button to change the value. This button is hidden if the **Part Program** does not have any kerf commands, i.e. Kerf Left or Kerf Right.

The controller automatically updates the **Part Program** applying the kerf settings. The “kerfed” program is then checked to ensure that it is still possible to cut the part without its final shape being compromised as a result of the kerf. If a violation is found, the message "**Warning: kerf conflicts with part**." appears above the Extended Graphic Window and the background of the ***Kerf*** button is orange. Also the Extended Graphic Window displays, in orange, the move instruction that caused the kerf violation.

If kerf values are embedded in the Part Program the value of the first kerf command is shown and the ***Kerf*** button is disabled (grayed out). To override the embedded Kerf values refer to the Job Geometry Setup (Run04) Section 3.17 .

*If the **Kerf** button is enabled and the value is changed, the new kerf value is used for the entire part ignoring **ALL** kerf dimension changes specified in the **Part Program**.*

If a number of parts are to be loaded and each have Kerf settings embedded in them – then rather than having to keep overriding the Kerf settings for each part – the Override Kerf button can be selected on the Standard Program Format or Custon program Format screens. Now all parts will be loaded with the embedded Kerf settings ignored (whether they exist or not). To confirm the state of the override refer to the Job Geometry screen refer to section 3.17 – the “Overrride Kerf” button will be set to *True*. Refer to the Utility Mode Section 7.19 for further details.

EMBEDDED FEEDRATE LAYOUT

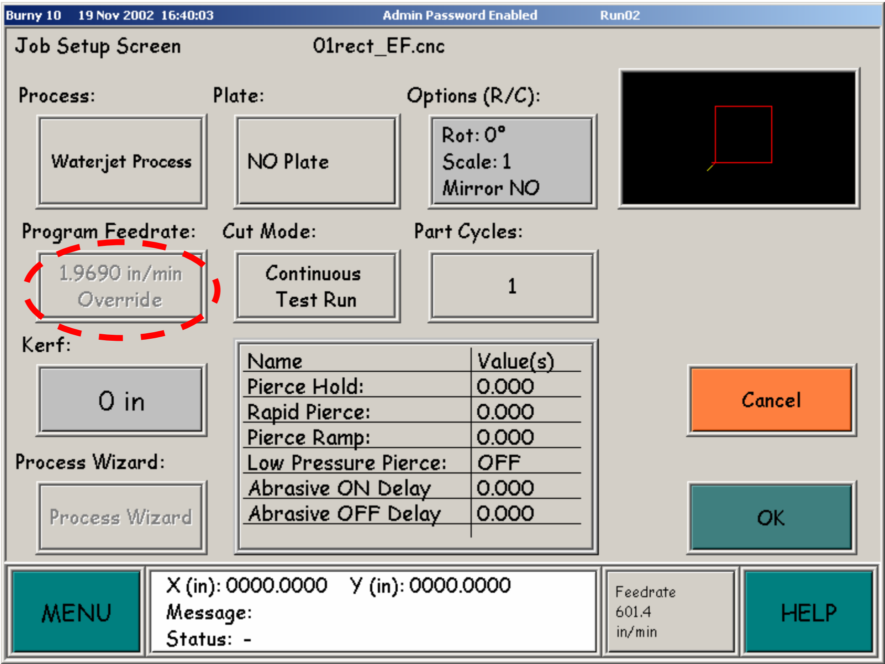

Figure 3.3. - Job Setup (*Run02*) Screen with Embedded Feedrate – Program Feedrate button disabled.

If the part loaded has an embedded feedrate the ***Program Feedrate*** button will be grayed out, displaying the Embedded or Override depending on the jobs setting. The feedrate setting can be altered only in the **Feedrate Screen (Run04)**. Press the ***Feedrate*** Button on the Status Bar to access the Feedrate Screen.

TIMERS SETUP

Lists all the delay timers and their values. The list of the values displayed depends upon the cutting process. Press the button to access the timer settings screen the values can be altered there.

3.6 Feedrate Screen (Run04)

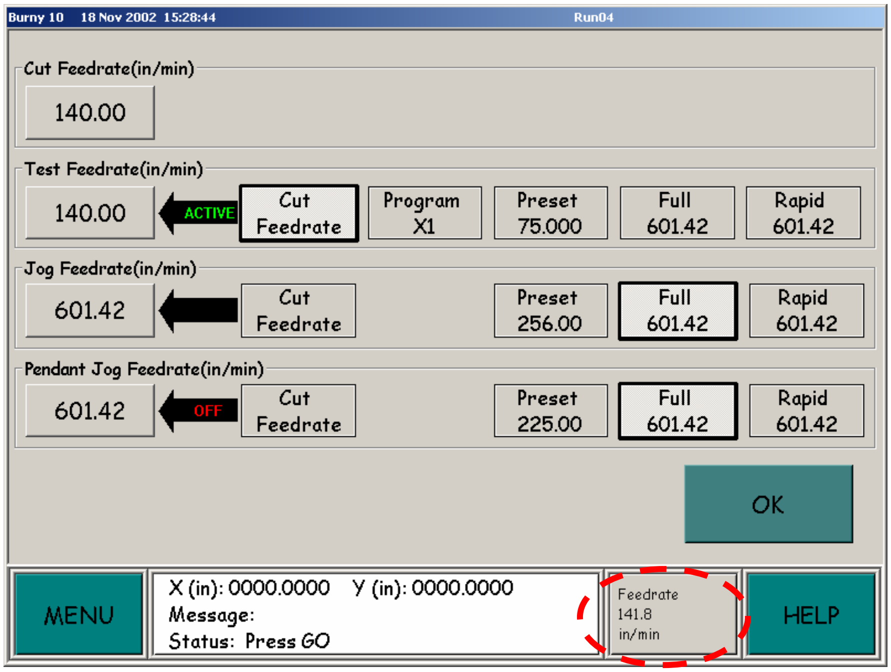

Figure 3.4 - Feedrate screen with part loaded. (*Run04*)

3.6.1 Description

The feedrate screen is accessed using the Feedrate button on the Status Bar. It allows the operator to control a number of velocities involved in the cutting process including:

- Cut Feedrate, Test Feedrate, Jog feedrate and Pendant Jog Feedrate.
- Setting the Test, Jog and Pendant Jog feedrates to the Cut Feedrate.
- Setting Test Feedrate to run as a multiple of Cut Feedrate. This feature is useful when performing a test run where the Cut Feedrates are slow, the test run can be completed in a shorter time than the actual cutting time.
- Preset Value for Test, Jog and Pendant Jog that are operator preset and retained from job to job.
- Running Test, Jog and Pendant Jog feedrates at Full (Max Feedrate, Speed Pod Controlled) and Rapid (Max Feedrate with out Speed Pod Control).
- Local Feedrate override that is retained only for duration of the running job.
- Embedded feedrate override and re-enable. The embedded feedrate can be overridden and then re-enabled.

3.6.2 Details

The feedrate screen is accessed via the Feedrate Button on the Status Bar. To exit out of the feedrate screen either press OK or press the feedrate button a second time.

The entire feedrate screen is based on a two-touch concept. The first press makes the desired selection and the second press allows the operator to change a chosen value if applicable. For example pressing the ***Preset*** button twice will bring up a numberpad where a value can be entered.

*Unlike earlier versions of the Burny 10 system the **feedrate values are applied instantaneously.** Any feedrate choice will be active BEFORE the OK button is pressed.*

When the part is loaded the Green "ACTIVE" sign appears in the arrow alongside the Test Feedrate or Cut Feedrate buttons, depending on which one is currently in operation.

CUT FEEDRATE SET

Available only when the part is loaded and is not running. If the Part Program has no feedrates embedded then only one button is displayed allowing the operator to set a Cut Feedrate value that applies throughout. When an embedded feedrate is loaded 2 buttons are now available: ***Use Embedded Feedrate*** and ***Feedrate Override.*** Selecting one or the other allows the user to switch between those two modes for cut feedrate. "**Use Embedded Feedrate**" sets the cut feedrate to the embedded value for the part, "**Override Feedrate**" uses the Cut Feedrate speed displayed – ignoring the embedded values.

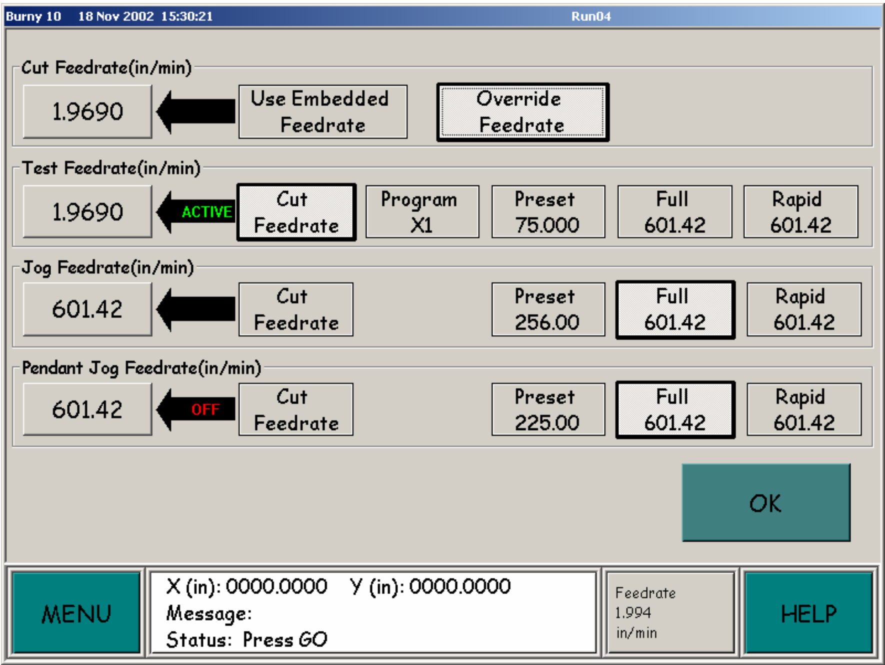

Figure 3.5 - Feedrate Screen (*Run04*) displaying a part with Embedded Feedrate.

TEST FEEDRATE

The left button (below the parameter name) displays the current feedrate. The feedrate value displayed is a function of which of the 5 feedrate buttons was selected:

Cut Feedrate - sets the Test Feedrate to the current Cut Feedrate value. Thus if cut feedrate is based on embedded values, test feedrate will be based on the same values. At the same time if the cut feedrate is set to any fixed value the test feedrate will also be set to that value.

Program xN multiplies the current cut feedrate by multiples of 10, 100 or 1000; press the button to scroll through the multiples.. This feature is useful when performing a test run where the Cut Feedrates are slow, the test run can be completed in a shorter time than the actual cutting. The maximum velocity is limited by the max velocity of the machine.

Preset - the operator's preferred setting for performing the test run. This setting is retained from job to job and can be changed only by operator.

Full - test run a part at full speed with feedrate override (speed pod) enabled.

Rapid - is the same as "Full" Button, but without feedrate override.

JOG/PENDANT JOG BUTTON SET

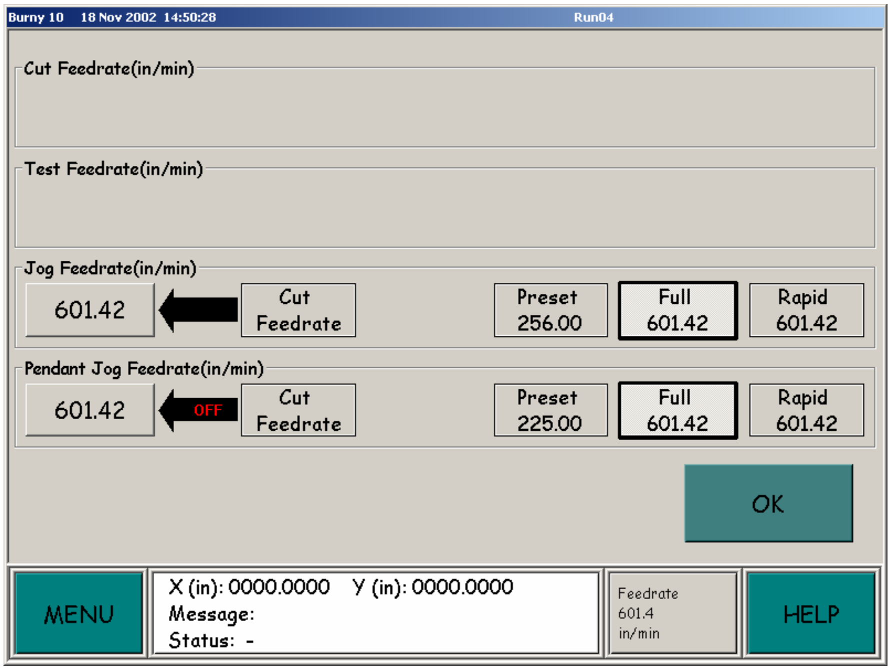

Figure 3.6 - Feedrate Screen without part loaded or with part running.

Jog and Pendant Jog Feedrate set is enabled in any state of the control. Both of them can be set to run at a custom set speed, at Cut Feedrate, at some favorite Preset feedrate, at Full, speed pod controlled feedrate and at Rapid (Max speed, no speed pod control) feedrate.

There is an ON/OFF tag on the Pendant Jog arrow that indicates whether the pendant joystick is turned on.

3.7 TIMER SETUP SCREEN (RUN05)

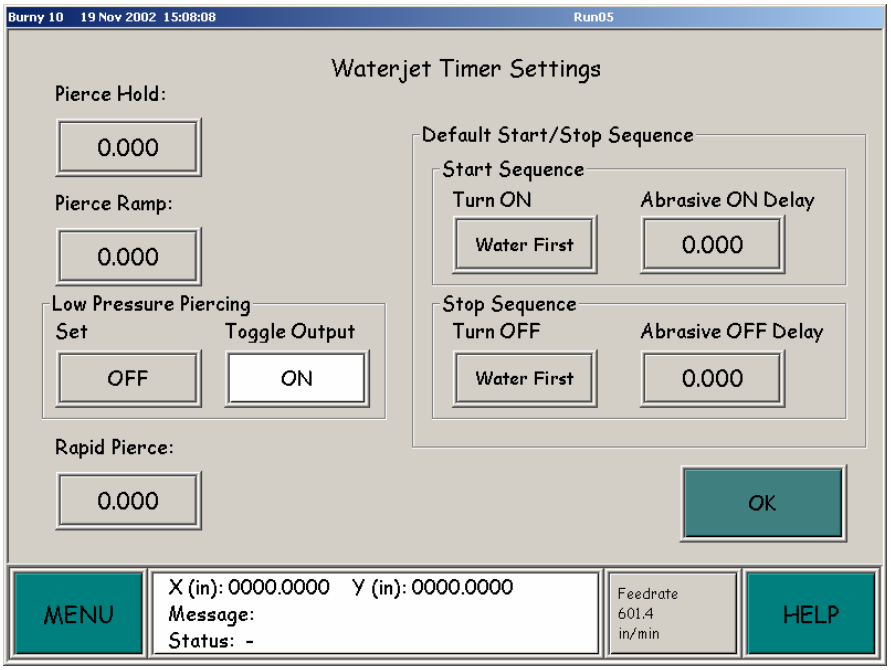

Figure 3.7 – Timer Screen with Waterjet layout (*Run05*).

3.7.1 DESCRIPTION

The Timer setup screen displays all the Timer Delays associated with a cutting process selected at the time of use. The Plasma and Oxy processes have a limited number of settings, while the settings available for the Waterjet is comprehensive. The Timer setup screen is displayed by pressing the ***Cut Process Timers*** button on the **Job Setup Screen (*Run 02*)**

3.7.2 DETAILS

WATERJET

The Waterjet Timer Screen has a number of delays to control every aspect of Waterjet cutting. In addition to Pierce Hold and Pierce Ramp it provides an operator with Low Pressure Pierce and bleed off, Rapid Pierce and Water/Abrasive Cut On/Off sequencing.

Low Pressure Piercing allows operator to command the control to turn the pressure low on the cut on or to toggle the Low Pressure Output and force the low pressure bleed off at the torch's current location.

Rapid Pierce sets the duration of the Rapid Pierce sequence.

Default Start/Stop is executed when there is no embedded information about cut on and off sequence delays embedded in the part program. This sequence also applies to any stops and restarts in the middle of cutting segments. The left button of the Start and the stop sequence defines what is to be acted upon first, for example if Stop sequence lists "Water First" the water will be shut off first in the Cut Off sequence. The right button lists the delay time between the action upon the first cutting component specified in the left button and the second component. If the "Abrasive ON Delay" is set to 2.5 seconds, then during the Cut On sequence the abrasive output would commence 2.5 seconds after the water was turned on.

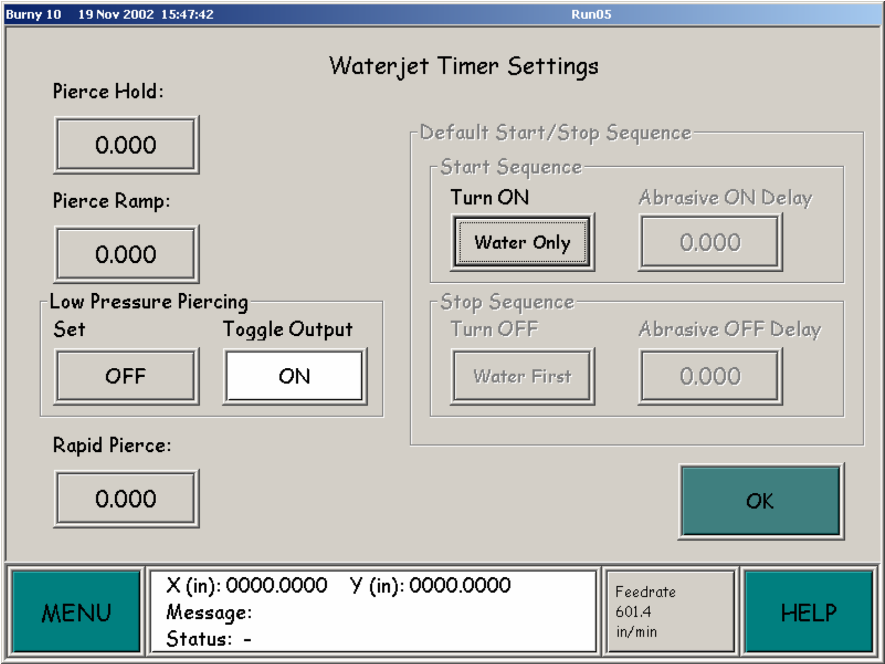

Figure 3.8 – Timer Screen with Water Only (*Run 05*)

If no abrasive is being used the “Water Only” screen is displayed, with the other Default Start/Stop Sequence Buttons being disabled, as they are no longer applicable.

PLASMA

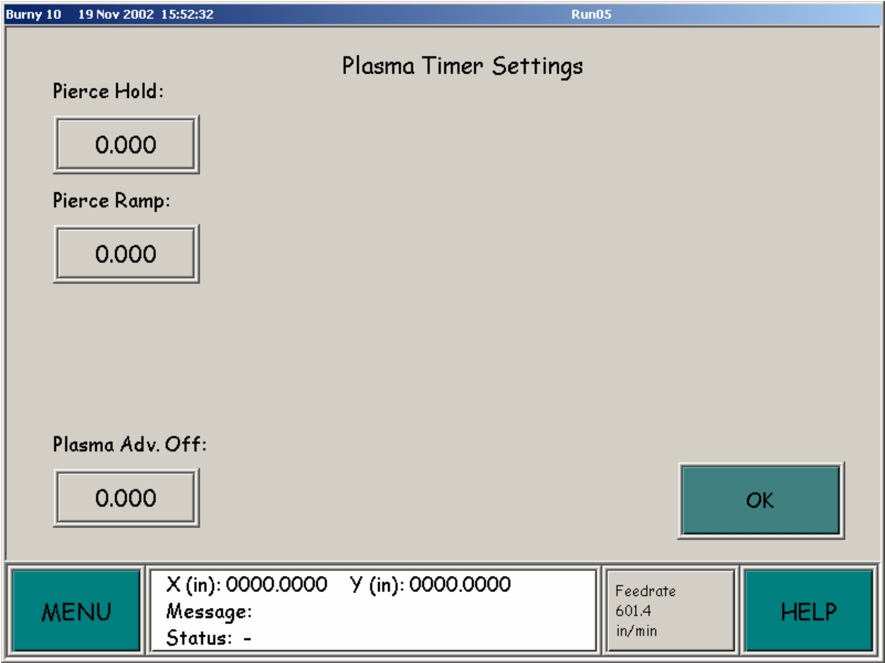

Figure 3.9 – Timer Screen with Plasma Layout (*Run 05*)

This screen displays the Plasma cutting:delays/settings: ***Pierce Hold***, ***Pierce Ramp*** and ***Plasma Advanced Off.*** Press the button to make changes to the setting.

OXY

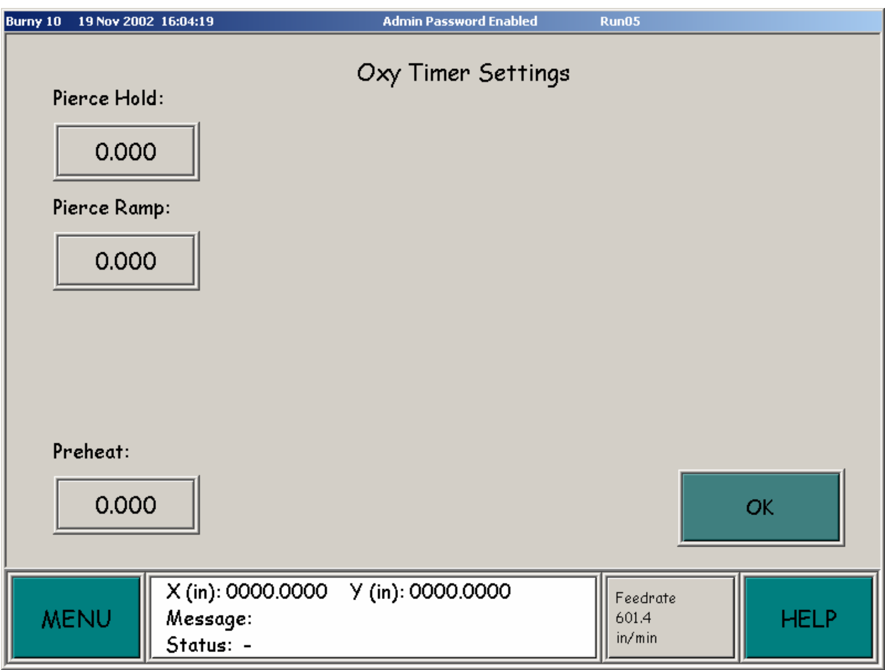

Figure 3.10 – Timer Layout Screen with Oxy Layout (*Run05*)

This screen displays the Oxy cutting:delays/settings: ***Pierce Hold***, ***Pierce Ramp*** and ***Preheat***. Press the button to make changes to the setting.

3.8 JOB PREVIEW SCREEN (RUN03)

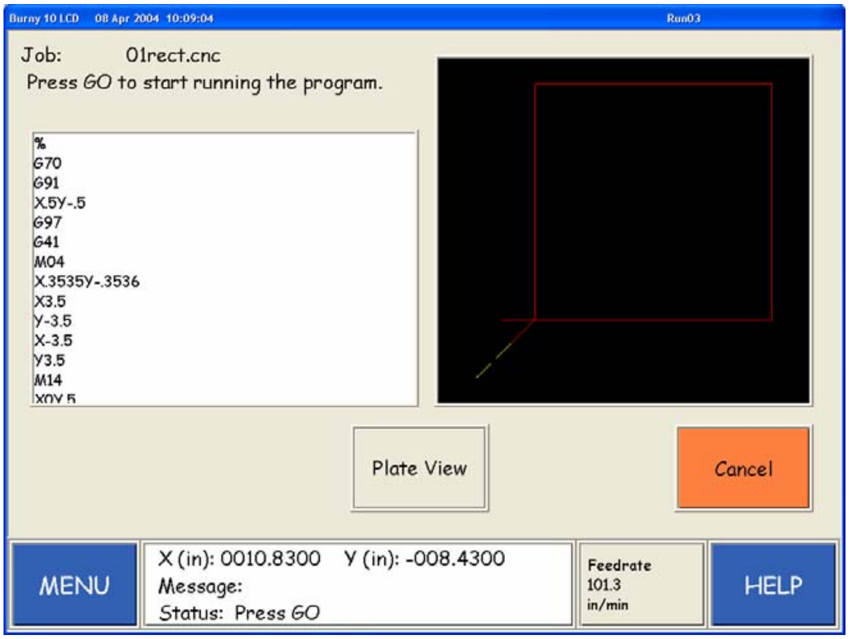

Figure 3.11 – Job Preview Screen (Run03)

3.8.1 DESCRIPTION

The **Job Preview** (Run03) screen is displayed when the **OK** button is pressed on the **Job Setup** screen (Run02).

The Job Preview screen enables you to:

- Examine in detail the shape of the part, including any kerf violations and how the part fits on the plate
- View the Part Program name and six lines of the Part Program code
- Switch between viewing only the part or the part and the plate
- Start cutting the part by pressing the **Go** button
- Resume a "Power Loss" or "Interrupted" job

3.8.2 DETAILS

JOB FIELD

Shows the name of the Part Program about to be cut.

PROGRAM CODE LIST

Displays the code that makes up the program file.

PLATE / PART VIEW BUTTON

Switches the graphic window from **Part View** to **Plate View**. **Plate View** shows the part on the plate.

GO BUTTON

The response of the controller when the **Go** button is pressed depends upon the Cut Mode setting on the **Job Setup** screen. If the Cut Mode is set to:

- **Continuous**: the controller moves the torch along the path for one part. Pressing the **Go** button again, starts moving the torch along the path for the next part and so on. In this mode, jogging the torch moves the part position on the plate.
- **Single Step**: the controller moves the torch for one motion instruction, stops and displays the **Run Stop** screen. Pressing the **Go** button again, moves the torch for the next motion instruction and so on. In this mode, jogging the torch moves the part position on the plate.
- **Automatic or Manual**: the controller starts cutting the part(s), moving the torch along cut and traverse paths and turning on and off torches and markers.

GOTO BUTTON

The **GOTO** button provides choices of moving the torch to specific table positions and positions in the Part Program. Refer to Section 3.19 for further details.

If the part selected has a status of "**POWER LOSS**" or "**INTERRUPTED**", select the "***Return to Path***" choice and press the **Go** button. This moves the torch to last known position before power was lost or when the **Job Interrupt** button was pressed in the Run Stop screen. When the Goto move is complete and the torch is in position, press the **Go** button to continue cutting the part(s).

3.9 RUN "GO" SCREEN (RUN03)

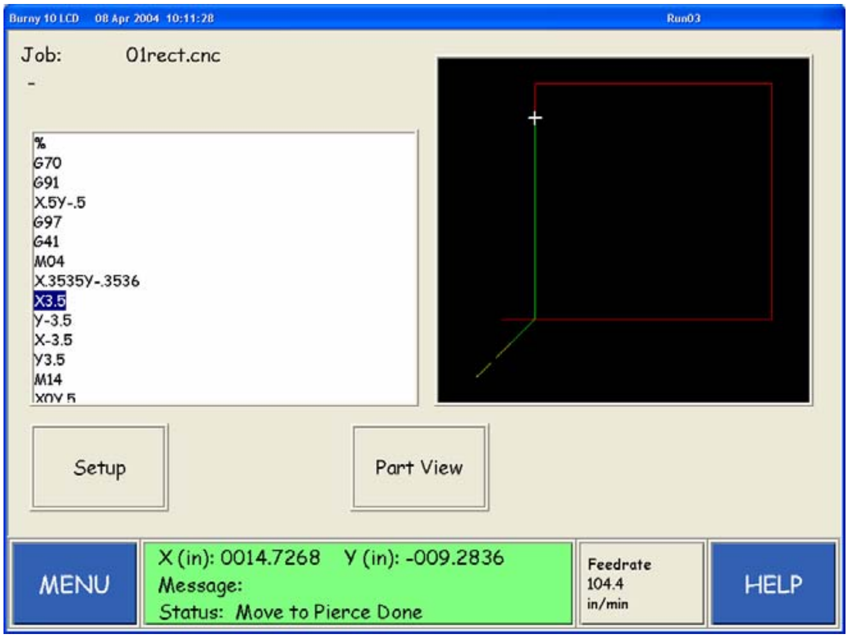

Figure 3.12 – Run "Go" Screen (Run03)

3.9.1 DESCRIPTION

This screen is displayed when the Go button was pressed from the Job Preview or Run Stopped screens.

The Extended Graphic Window shows the current position of the cutting tool indicated by a set of crosshairs moving along the tool path. As the torch cuts, the red outline changes to green.

The Software Limit Warning bar will be displayed if the part to be cut exceeds the Software Limit Parameters. For more information, refer to the Software Limit Warning section 3.20 .

3.9.2 DETAILS

PROGRAM CODE LIST

Displays the Part Program lines. During cutting the cursor highlights the current command being executed.

SETUP

Pressing this button displays the **Job Setup** (Run02) screen where the process parameters can be viewed and altered – the process Wizard can also be accessed if it is enabled.

PLATE / PART VIEW

Switch the graphic window from **Part View** to **Plate View**. **Plate View** shows the part position in relation to the plate.

REVERSE BUTTON

Pressing the Reverse button when this screen is displayed turns the torch off. The torch then reverses direction along the cutting path at the backup velocity defined in the Motion Configuration.

STOP BUTTON

Pressing the **STOP** button turns off the torch and motion is stopped.

GO BUTTON

The **GO** button is used to extend or stop the Preheat timer. This feature is available when the ***Process*** is set to **Oxy** and the ***Cut Mode*** is set to **Automatic**. Press and hold the ***GO*** button to extend the Preheat or press and release the ***Go*** button to stop the Preheat. If **Teachable Preheat** is set in the Motion Configuration, the elapsed preheat time is used for the next cut on sequences.

3.10 RUN "STOP" SCREEN(RUN03)

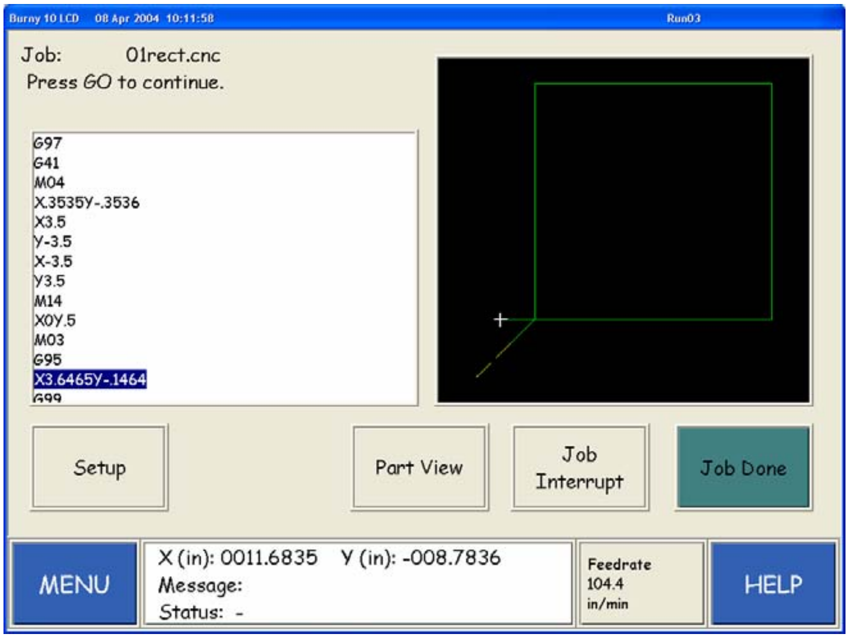

Figure 3.13 – Run "Stop" Screen *(Run03)*

3.10.1 DESCRIPTION

When the program is stopped, the **Run Stop** screen (Run03) is displayed. A program is stopped when:

- The **STOP** button is pressed.
- The appropriate number part cycles have been cut.
- A process or motion error occurs.

When the Run Stop screen is displayed, you can:

- Re-start the process by pressing the **GO** button.
- Jog the machine and then press the **GO** button.
- Press the **Feedrate** button to display the **Job Edit** screen and change certain Job parameters.
- Press the **Job Done** button to indicate that the Job has been completed.
- Capture certain information for resuming and completing the Job at a later time.
- Perform a GOTO Operation.

3.10.2 DETAILS

JOB DONE

Press this button to terminate the job and set the job status to **Done**.

JOB INTERRUPT

If a job has been interrupted, press this button to capture the current job information and change the job status to **Interrupted**. The interrupted job can be resumed and completed later.

SETUP

Press the Setup button to display and alter the process parameters. The process Wizard can also be accessed if it is enabled.

PLATE / PART VIEW

Switches the graphic window between a view of the part and a view of the plate and the part on it.

GO BUTTON

If the process was stopped because the appropriate number of parts were cut, one more part is cut.

The controller responds to the **Go** button differently based on the setting of the **Cut Mode** in Job Setup. If the **Cut Mode** is set to:

- **Continuous**: the controller moves the torch along the path for one part. Pressing the ***Go*** button again, moves the torch along the path for the next part and so on.
- **Single Step**: the controller moves the torch for one motion instruction, stops and displays the Run Stop screen. Pressing the ***Go*** button again, moves the torch for the next motion instruction and so on.
- **Automatic or Manual**: the controller starts cutting the part(s), moving the torch along cut and traverse paths and turning on and off torches and markers.

JOGGING

The Test Mode setting also affects the jogging process. When the Test Mode is set to

- **None**: If you jog "*off path*" there is an additional move "remembered" between the position of the cutting tool when the **Stop** button was pushed, to its current position. When the **Go** button, is pushed, a pierce is performed at the current torch location followed by a cut back to the original cut path. If a traverse was being performed when the **Stop** button was pushed, the "remembered" move is performed as a traverse.
- **Continuous** or **Single Step**: the part is moved relative to the jog distance and the tool continues along the path.

GOTO BUTTON

The **GOTO** button provides choices of moving the torch to specific table positions and positions in the **Part Program**. Refer to Section 3.19 for further details.

3.11 PLATE SELECTION SCREEN (RUNPLT01)

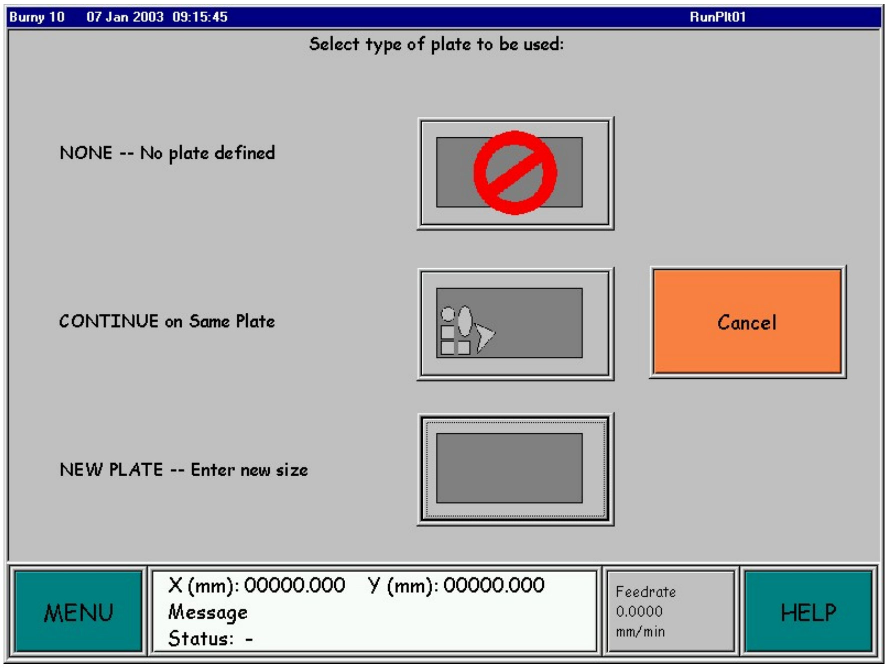

Figure 3.14 – Plate Selection Screen (*RunPlt01*)

3.11.1. DESCRIPTION

The Plate Selection screen (RunPlt01) is displayed when the operator press the ***Plate*** button on the Job Setup screen (Run02). The **Plate Selection** Screen allows the operator to make three different plate selections:

- ***NONE*** -- No plate defined
- ***CONTINUE*** on Same Plate, optional
- ***NEW PLATE*** -- Enter new size

3.11.2. DETAILS

NONE

Indicates that no plate is to be used for the cutting of this part.

CONTINUE

Continue cutting from the same plate. This means that the same plate dimension and physical location on the table are used. This selection is not available if a plate is not defined.

NEW PLATE

Used to enter a new plate size and/or plate location.

3.12 PLATE DIMENSION SCREEN (RUNPLT02)

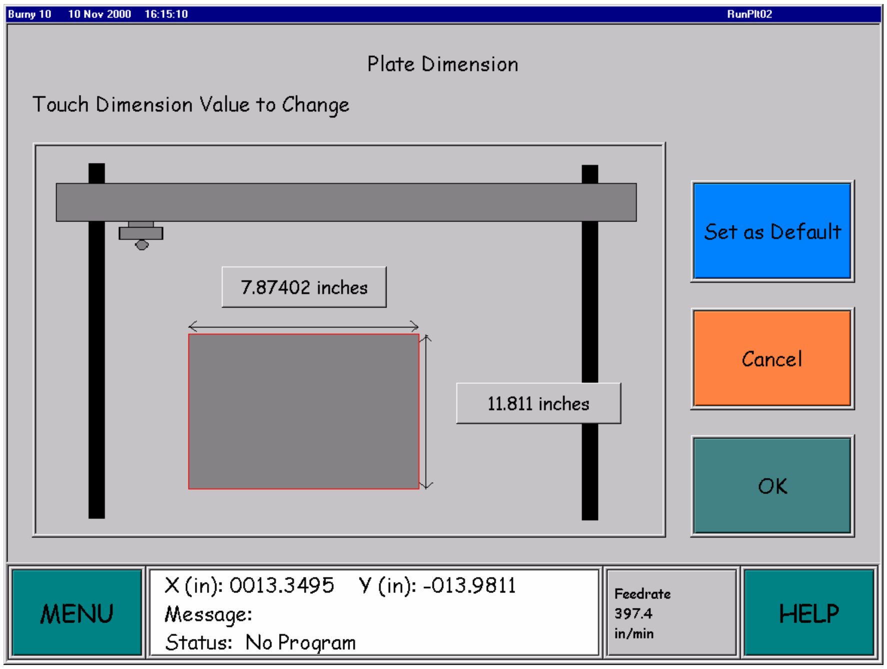

Figure 3.15 – Plate Dimension Screen (*RunPlt02*)

3.12.1 DESCRIPTION

This screen enables the operator to enter new dimensions for the plate. The X dimension is called 'height' and the Y dimension is called 'width'.

3.12.2 DETAILS

PLATE WIDTH

Located above the displayed plate, displays the current value of the plate width. Press the button to change the value.

PLATE HEIGHT BUTTON

Located alongside the displayed plate, displays the current value of the plate height. Press the button to change the value.

SET AS DEFAULT

Press to carry over the width and height values to the next plate used.

3.13 PLATE ALIGNMENT SCREEN (RUNPLT03)

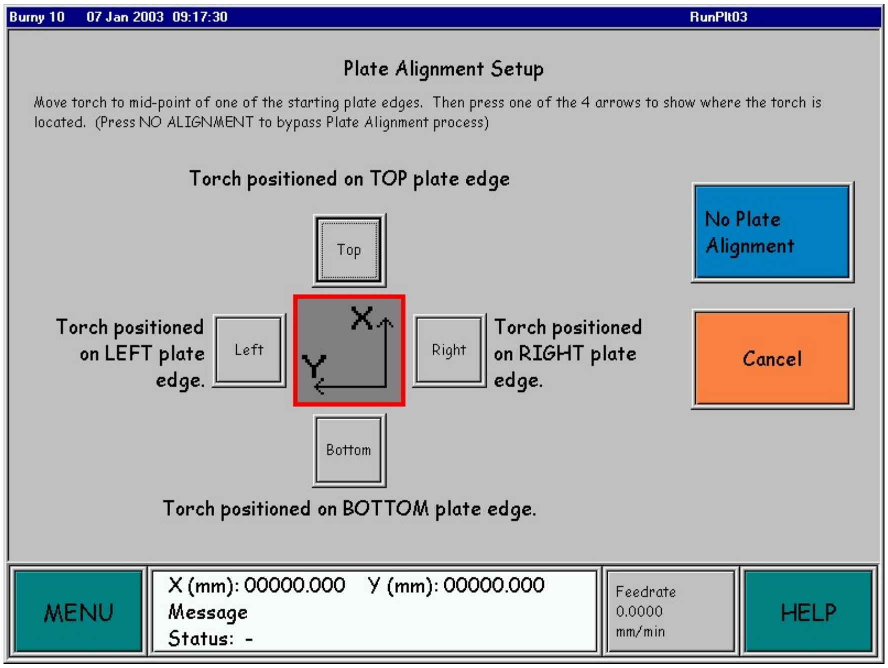

Figure 3.16 – Plate Alignment Screen (*RunPlt03*)

3.13.1 DESCRIPTION

The Plate Alignment Screen (RunPlt03) is the first screen to be displayed when carrying out a plate alignment. This screen instructs the operator to jog the torch to the edge of the plate and press the appropriate button. The subsequent screens provide the rest of the information needed to inform the controller as to the location and orientation of the plate.

This screen also provides a method for the operator to inform the controller that the plate is square to the X and Y axes.

3.13.2 DETAILS

NO PLATE ALIGNMENT

Press to inform the controller that the plate is square to the table. The **No Plate Alignment Setup Screen (RunPltNoAlign)** is loaded – ref Section 3.14

PLATE SIDE

Press the ***Top***, ***Bottom***, ***Left***, or ***Right*** button depending on the location of the torch in relation to the plate's edge. When any of these buttons are pressed, the Plate Alignment Setup screen (RunPlt04) is loaded – ref Section 3.15 .

3.14 NO PLATE ALIGNMENT SETUP SCREEN (RUNPLT10)

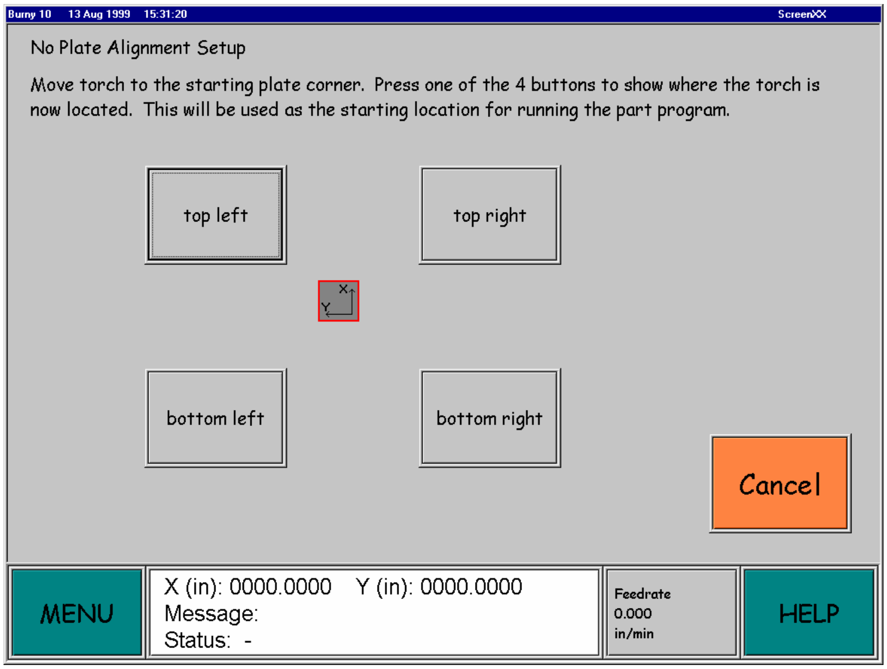

Figure 3.17 – No Plate Alignment Setup Screen *(RunPltNoAlign)*

3.14.1 DESCRIPTION

The No Plate Alignment Setup Screen (RunPltNoAlign) screen allows the operator to select the starting location of the part. Move or jog the torch to the correct corner and press the appropriate corner button. When pressed, the Job Setup (Run02) screen is displayed – ref Section 3.5 .

PLATE CORNER BUTTONS

Press the ***Top Left***, ***Bottom Left***, ***Top Right***, or ***Bottom Right*** button depending on the location of the torch in relation to the corner of the plate.

3.15 PLATE ALIGNMENT SETUP SCREEN CORNER (RUNPLT04)

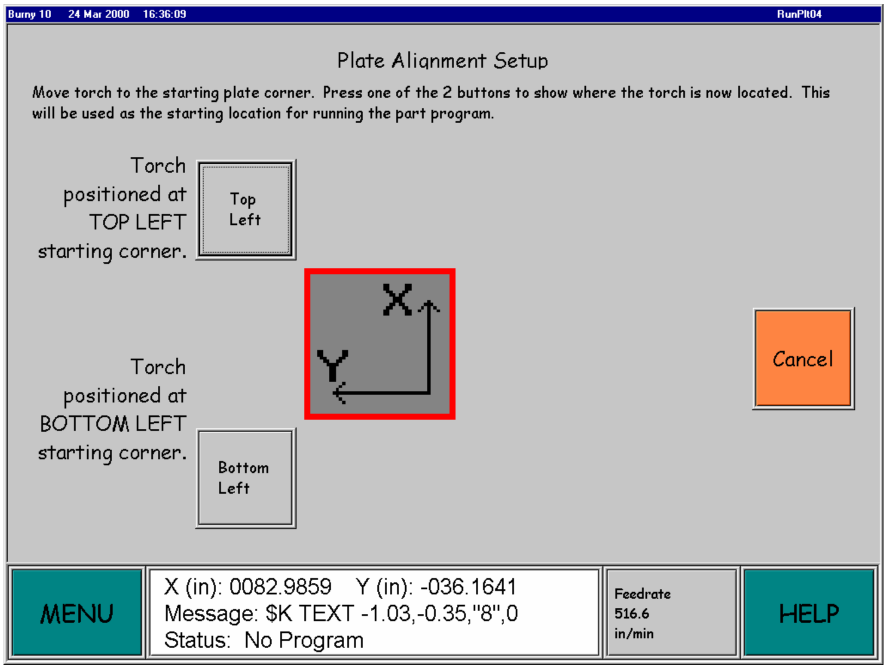

Figure 3.18 – Plate Alignment Setup Screen (*RunPlt04*)

3.15.1 DESCRIPTION

This Plate Alignment Setup Screen (RunPlt04) is the next screen in the alignment and positioning of the plate.

3.15.2 DETAILS

TOP LEFT / BOTTOM LEFT / TOP RIGHT / BOTTOM RIGHT

Two buttons appear on the screen depending upon which side of the plate was selected in the Plate Alignment Screen (RunPlt03) screen.

When one of the buttons is selected, the controller calculates the plate position and angle and then displays the Plate Offset Setup Screen (RunPlt05).

3.16 PLATE OFFSET SETUP SCREEN (RUNPLT05)

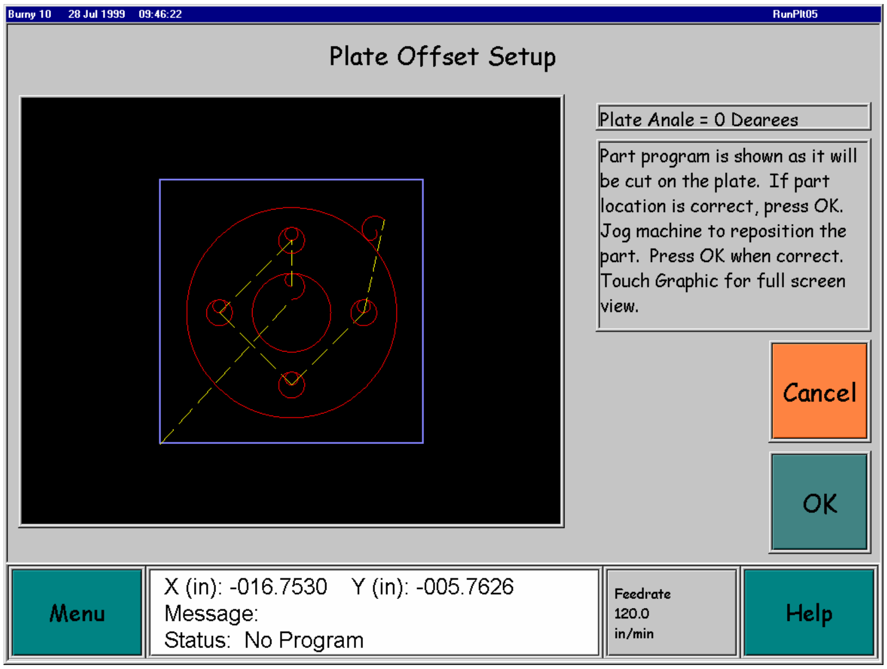

Figure 3.19 – Plate Offset Setup Screen *(RunPlt05)*

3.16.1 DESCRIPTION

The Plate Offset Setup Screen (RunPlt05) enables the operator to examine the location of the part on the plate and reposition the part by jogging the torch to the starting location of the part as necessary.

3.16.2 DETAILS

TEXT

Two text windows display the plate angle and instructions for positioning the part on the plate. Press OK when the cutting tool is in the desired location.

3.17 JOB GEOMETRY SETUP SCREEN (RUN04)

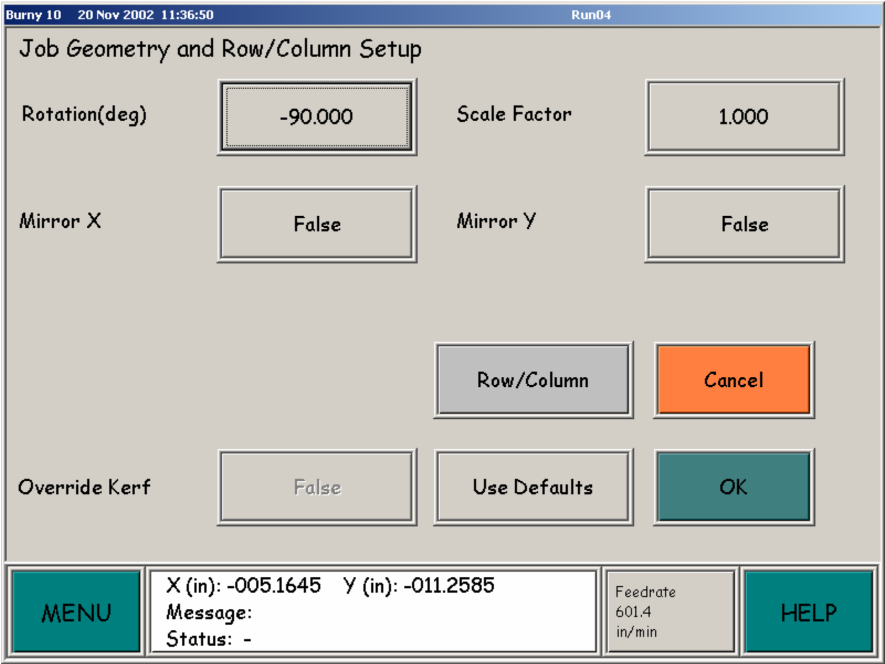

Figure 3.20 – Job Geometry Setup Screen (*Run04*)

3.17.1 DESCRIPTION

The **Job Geometry Setup (Run04)** screen enables the operator to set four geometrical features of the part, and enable an override for feedrate and/or kerf values programmed in the **Part Program**.

3.17.2 DETAILS

ROTATION

Displays the angle that the part is rotation where a positive value rotates the part in a counter-clockwise direction and a negative value rotates the part in a clockwise direction. Press the ***Rotation*** button to change the value.

SCALE FACTOR

Displays the scaling factor. This factor increases or decreases the size of a part. If the ***Scale Factor*** is 2.000, the part is twice the size specific in the **Part Program**. If the ***Scale Factor*** is 0.500, the part is half the size.

MIRROR X

Displays the current setting. When ***Mirror X*** is **True**, the part is cut with all the ***X*** dimensions reversed in sign.

MIRROR Y

Displays the current setting. When ***Mirror Y*** is **True**, the part is cut with all the ***Y*** dimensions reversed in sign.

OVERRIDE KERF

The selected **Part Program** must have an embedded kerf for this button to be enabled. Pressing the button toggles between **False** and **True**. When **False**, the ***Kerf*** button on the **Job Setup** screen is disabled. When **True**, the ***Kerf*** button is enabled.

ROW/COLUMN

The button is white if the currently selected **Part Program** was created using the Row and Column feature. Press ***Row/Column*** button to use the Row and Column feature explained later in this section.

USE DEFAULTS

Used to set the four **Job Geometry** parameters to the default values set in the **Utility Mode**. The default values for the **Override** parameters cannot be changed in the Utility mode but the others can. Usually the default values are:

Rotation	0.000
Mirror X	False
Scale factor	1.000
Mirror Y	False
Override Kerf	False (Always)

3.18 ROW AND COLUMN NEST SCREEN (RUNOPTNEST)

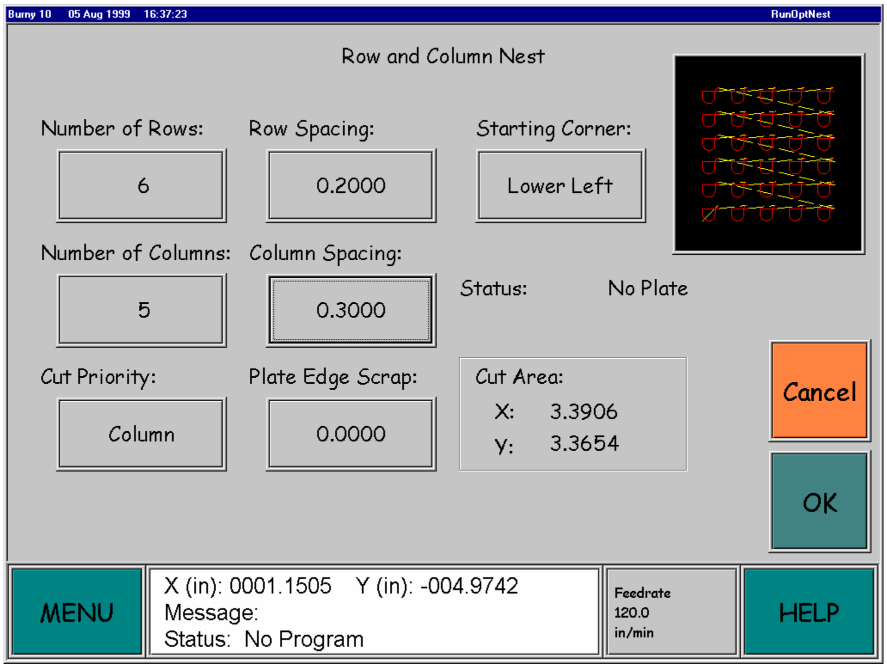

Figure 3.21 – Row and Column Nest Screen (*RunOptNest*)

3.18.1 DESCRIPTION

The Row and Column feature allows the operator create a **Part Program** to cut multiple parts in row and column formation (a grid). While setting the parameters, the Extended Graphic Window and the plate Cut Area are updated automatically. Note that Extended Graphic Window displays the plate if one was defined in the Job Setup screen (Run02).

When the row and column settings are complete, the operator presses ***OK*** to create the **Part Program**. The **Nest Part Program** is now ready to run, just like any other program. Its name is also on the **Part Program File List** so that it can be run again at a later time.

The **Nest Part Program** name is made automatically and has the following format:

^RC_FILENAME.CNC

where FILENAME.CNC is the name of the of the **Part Program**. For example, if the name of the **Part Program** is 08flange.cnc, the **Nest Part Program** is ^RC_08flange.cnc.

3.18.2 DETAILS

NUMBER OF ROWS

Indicates the number of parts in a row, horizontally. Press the button to change this value. The button is disabled if editing a **Nest Part Program** and the ***Cut Priority*** is set to *Column*.

NUMBER OF COLUMNS

Indicates the number of parts in a column, vertically. Press to change the value. The button is disabled if editing a **Nest Part Program** and the ***Cut Priority*** is set to *Row*.

CUT PRIORITY

Indicates the direction in which the parts are to be cut. Press to toggle between "*Row*" and "*Column*". When the ***Cut Priority*** is set to "*Row*", the parts are cut horizontally. When the ***Cut Priority*** is set to "*Column*", the parts are cut vertically.

ROW AND COLUMN SPACING

The nesting process deletes any scrap values programmed from the original **Part Program**. Spacing between parts can be set using the ***Row Spacing*** and ***Column Spacing*** buttons to compensate for kerfing and scrap.

PLATE EDGE SCRAP

Indicates the distance from the parts to the edge of the plate. Press to change this value. This value essentially lengthens the first lead-in allowing easier positioning of the **Nest Part Program**.

STARTING CORNER

Indicates the corner that the **Nest Part Program** starts. Press to toggle between the following selections.

- Upper Left
- Lower Left
- Upper Right
- Lower Right

STATUS

The Status field provides the operator with various information, such as:

- ***OK***, this indicates that the plate, if defined, accommodates the **Nest Part Program.**
- ***No Plate***
- ***Plate Size Exceeded***, indicates that the plate is too small to accommodate the **Nest Part Program.**

PART CYCLES

When creating a new **Nest Part Program** and/or the ***Part Cycles*** is *1* in the Job Setup screen, the part cycles value is the product of the Row times the Columns. When editing a **Nest Part Program** or the ***Part Cycles*** is not 1, this is ***Part Cycles*** value from the Job Setup screen (Run02).

CUT AREA

The Cut Area shows the plate size required to cut the **Nest Part Program**.

3.19 GO TO SCREEN (RUNGOTO01)

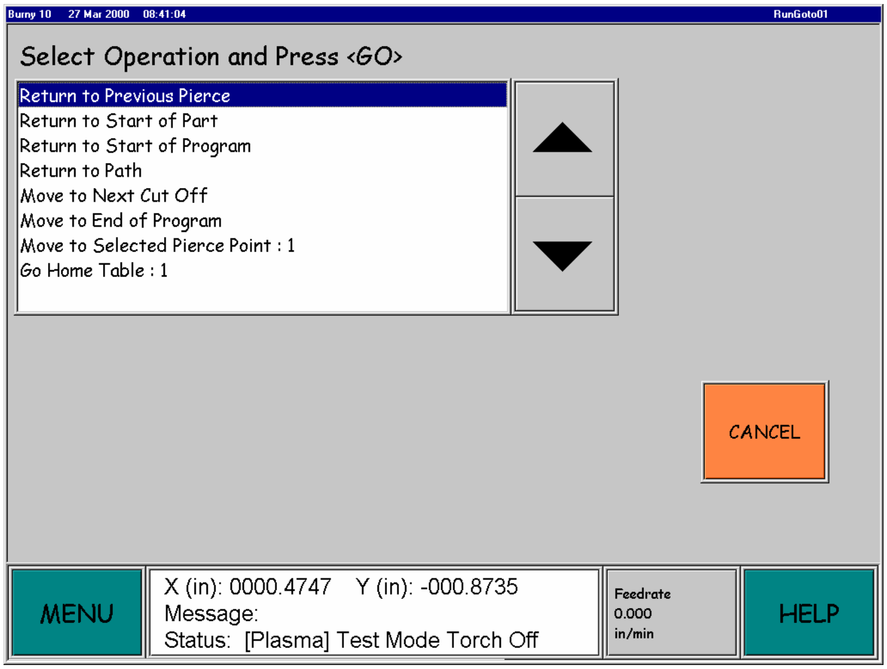

Figure 3.22 – Go To Screen *(RunGoto01)*

3.19.1 DESCRIPTION

The Goto screen can be accessed by pressing the ***Goto*** button on the control panel whenever a job is not being cut. If a Job is not active, only the Go Home Table selection, is shown. Use the Up and Down arrows or press the required operation to select it.

The Goto screen allows the operator to move the tool to several different positions:

- Return to Previous Pierce
- Return to Start of Part
- Return to Start of Program
- Return to Path
- Move to Next cut off
- Move to End of Program
- Move to Selected Pierce Point, displays additional options
- Go Home Table, displays additional options

3.19.2 DETAILS

SELECT OPERATION

Select the desired move from the **Select Operation** list by pressing it or by moving the cursor to it with the ***Up*** and ***Down*** arrows. After the selection and possible sub-selection is made, press the ***GO*** button.

GOTO BUTTON

Repeatedly pressing the ***Goto*** button, cycles through the first 3 Goto operations.

GO BUTTON

Pressing the ***Go*** button executes the selected Goto operation.

"+" AND "-" BUTTONS

The “+” and “-“ buttons become available when the following operations are selected:

- Go to Selected Pierce Point
- Go Home Table

3.19.3 DETAILS FOR SELECTED OPERATIONS ON GO TO SCREEN

INCREMENT JOG

The Increment Jog feature allows the operator to move the torch a specified distance. This feature is available as an additional GOTO Feature. To activate this feature, press the front panel ***Goto*** button and select "Increment Jog". When selected the lower part of the screen displays an X and Y value. These values indicate the distance and direction the torch will move.

There are two methods to incrementally move the torch; using the ***Go*** button and using the Jog controls. When the ***Go*** button is pressed, the torch will move, in both the X and Y directions, the distance identified on the screen.

To use the jog controls, move the jog stick (or press the jog button) in the direction you want the torch to move. The torch moves in that direction the distance indicated on the appropriate button. Note that the sign (+/-) is ignored when using the jog controls. The jog control must be released before an additional movement can occur.

To change either the X or Y values, press the ***"value"*** button and enter a different value.

Note also that this GOTO feature does not automatically dismiss the Goto, allowing the tool to be moved repeatedly over short distances Press the ***Cancel*** button to exit the Goto screen.

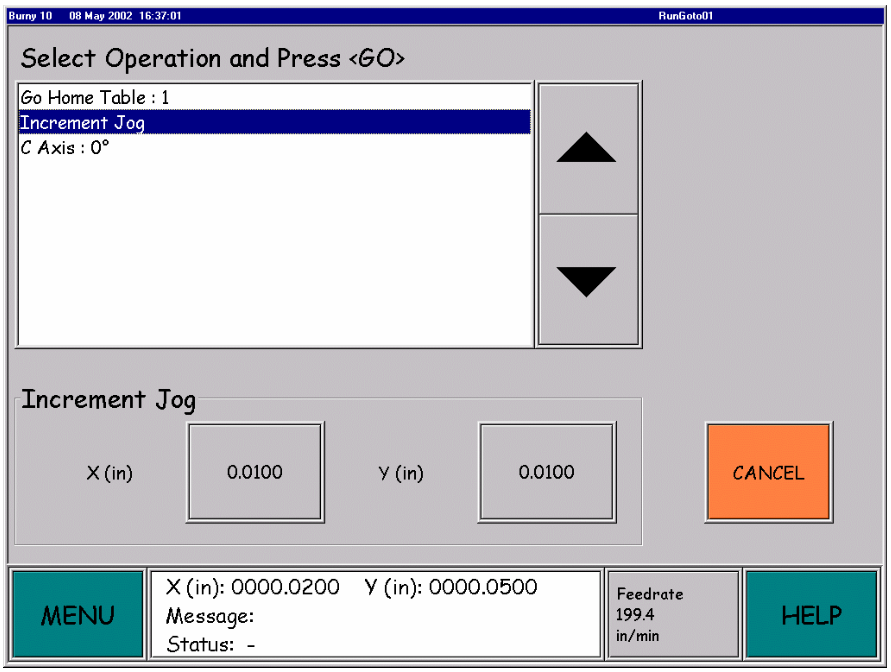

Figure 3.23 – Increment Jog (*RunGoto01)*

GO TO SELECTED PIERCE POINT

Selecting the "**Goto to Selected Pierce Point**" operation displays the "+" and "-" buttons and the "Adjust Pierce Point" text. Use the "+" and "-" buttons to increase and decrease the pierce point number. The pierce point number is relative to the current position. For example: "+1" indicates the next pierce point; "-1" indicates the previous pierce point. The torch moves when the ***Go*** button is pressed.

GO HOME TABLE

When you choose the "**Go Home Table**" operation from the Increment Jog screen and then press the GO button, the system displays the Go Home Table screen where you can use the "+" and "-" buttons to set the home offset position.

There are 18 home positions to choose from.The default home offset position is the last position configured, however if you are using the option for the first time, the default postion is 1. The button to the right of the "+" and "-" buttons displays the value for the configured position . Pressing "**Go**", moves you to the offset position represented by the number .

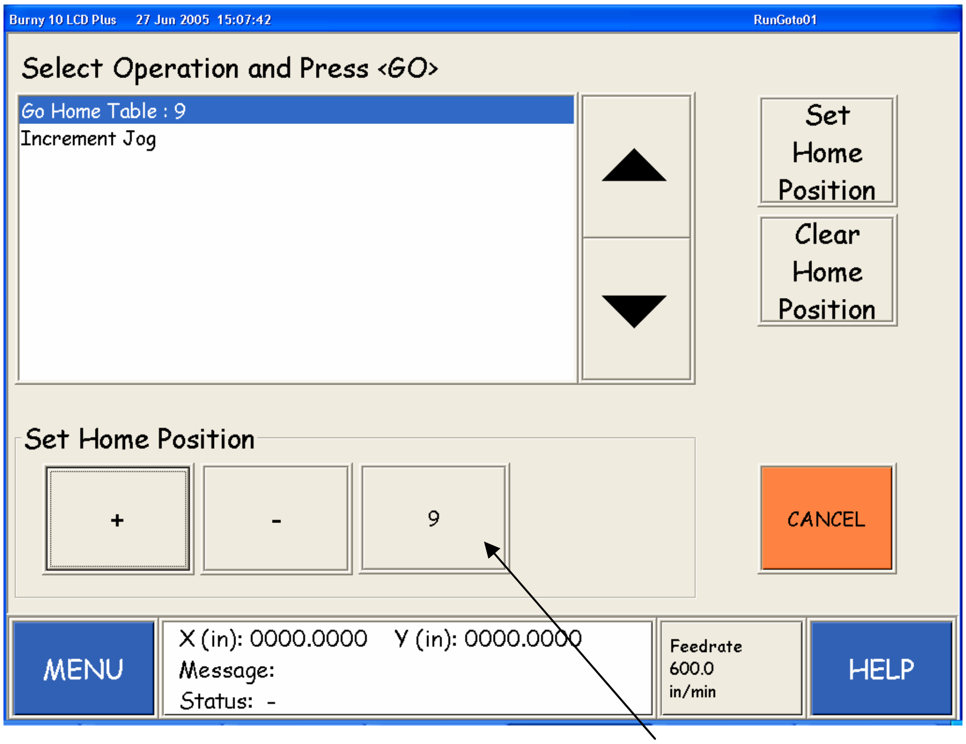

Figure 3.24 – Go Home Table screen

This button displays the value set by using ing + and - buttons. Valid range is 0-18.

The following table provides you with information about the buttons that are available on the screen if the Administrative Password has been enabled:

Button:	Description:
Set Home Position	Changes the displayed current Home Table coordinates to the absolute coordinates. Jog the table to the home offset position and press the "**Set Home Position**" button. The new setting is immediately updated in both the server and the initial configuration file.
Clear Home Position	Sets the value of the Home Table to the absolute coordinates (0,0)

3.20 SOFTWARE LIMIT WARNING (RUN03)

3.20.1 DESCRIPTION

The Software Limit Warning feature informs the operator that the part to be cut exceeds the Software Limit parameters. This feature is performed when the **Run** screen ***(Run03)*** is displayed and the cut mode is set to “Continuous Test Run”. In this mode, the operator can move the part within the table’s cutting area. If the part exceeds a Software Limit in any of the 4 directions, a yellow bar is displayed in the graphic window indicating the side that exceeds the Software Limits. It is possible for all 4 directions to be in violation of the Software Limits, i.e. the part is bigger than the Software Limits.

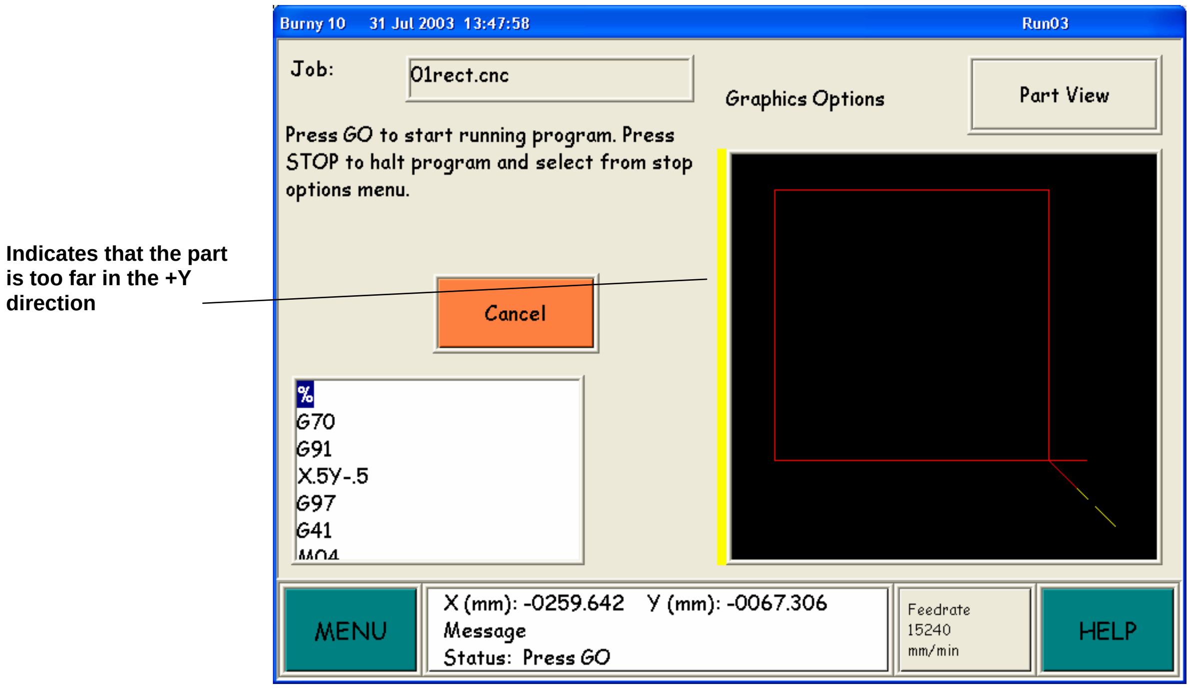

Figure 3.25 – Run03 screen with Software Limit bar

If the operator presses the **GO** button on the front console when a yellow bar is visible in the graphic window, a warning screen is displayed indicating the distance that the part exceeds the Software Limit Parameters.

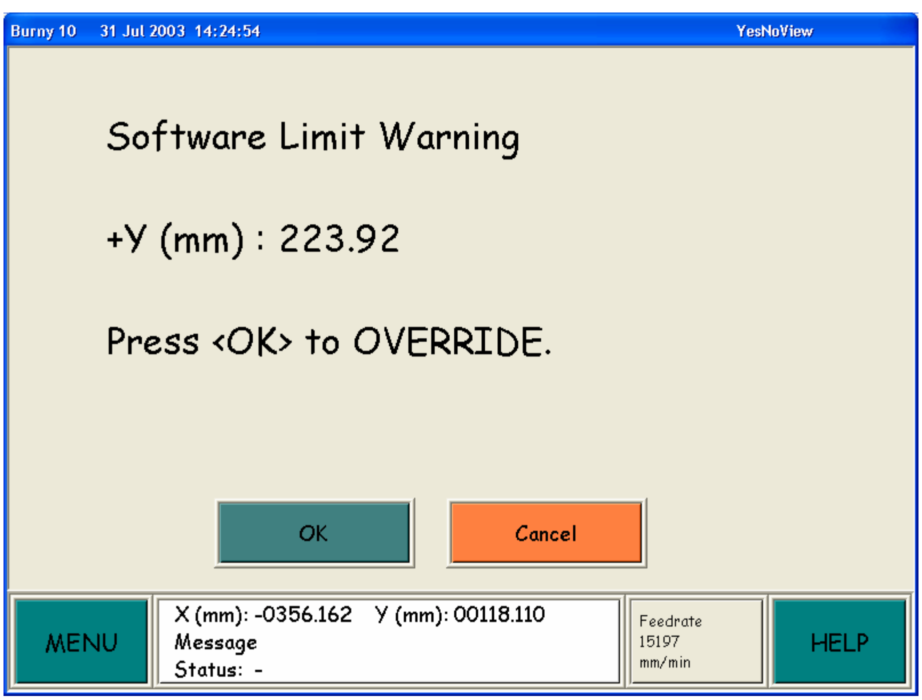

Figure 3.26 – Software Limit Warning screen

3.20.2 DETAILS

On the **Software Limit Warning** screen, the operator can choose **OK** to override or **Cancel**.

Choosing:

- **OK** - accepts the position of the part and the Run screen is redisplayed with an orange bar visible in the graphic window. The orange bar indicates that the part is not located correctly, however when the **GO** button is pressed the part will be cut as much as possible. When the part exceeds the limit, the X-Y display turns yellow again indicating that the part has gone beyond its software limit.
- **Cancel** – returns the operator to the ***Run03*** screen.

3.20.3 THEORY OF OPERATION

When changing from **Job Setup** screen ***(Run02)*** to the **Run** screen ***(Run03)***, a “box” representing the amount of space required to cut the part is calculated. This box is calculated using the scale factor, rotation and mirror settings and includes a compensation factor. This factor is derived from the software limit for each axis and can not be smaller than 0.002 millimeters or larger than 0.010 millimeters.

At appropriate times the location of the calculated box is compared each of the four software limits. If the box exceeds any of the software limits, the operator is notified of this. The “appropriate times” are when the part origin can be moved. This is true when the cut mode is set to “Continuous Test Run” and when the part is first loaded before the **GO** button is pressed regardless of the Cut Mode. During the “dry run”, the evaluation is NOT being performed. However, whenever the part program is NOT executing, i.e. the operator pressed the **Stop** button, the evaluation is being performed.

When the cut mode is set to “Automatic” or “Manual” and the **GO** button has been pushed at least once, the Burny 10 does not allow the part origin to be changed, so this evaluation is not performed. This means that while cutting a part, the operator can press the Stop button, jog the machine, i.e. to change the tool, perform a “Return to Path” GOTO operation and no warnings will be issued or changed.

3.20.4 INSTALLATION AND SET-UP

While no special installation is required for this feature, homing must be performed before the Software Limits are active. The Software Limit Warning feature is available on Versions 3.4.2 and later.

3.20.5 ENABLING AND DISABLING THE SOFTWARE LIMIT WARNING FEATURE

The Motion Parameter, named “**SW Limit Warning**” in **Machine Parameters**, turns this option on and off. When this is set to “True”, the feature is enabled.

3.21 JOB SETUP - JOGCUT SCREEN (RUN02)

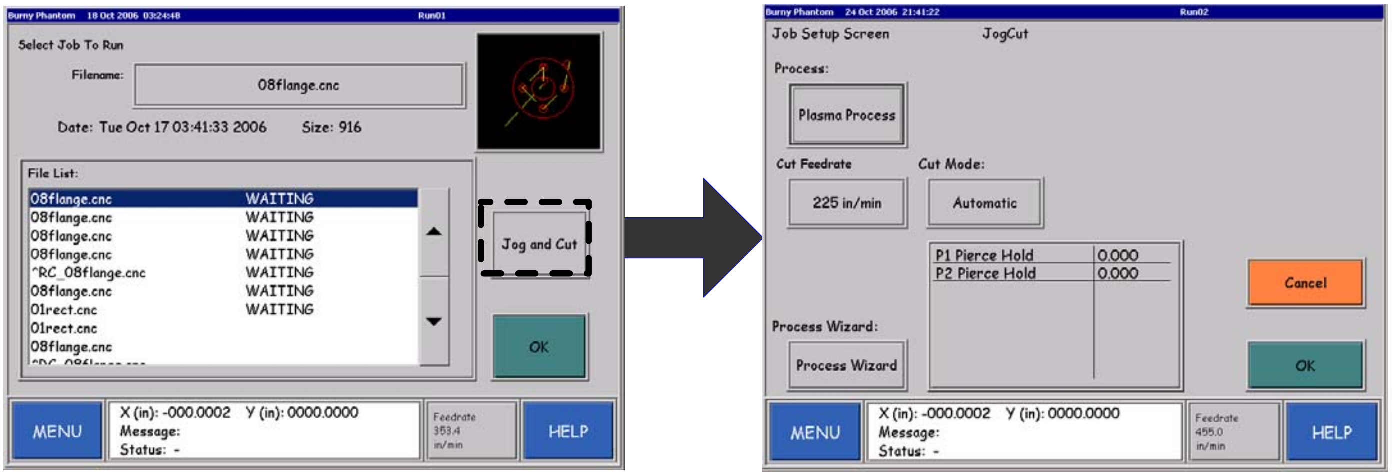

Figure 3-27 Accessing the Job Setup – JogCut Screen (*Run02*)

3.21.1 DESCRIPTION

The **Job Setup – JogCut** screen (Run02) is displayed when the **Jog and Cut** button on the **Job Select** screen (Run01) is selected.

The Job Setup JogCut screen allows you to set the following parameters.

- Cut process – Plasma, Oxy or Waterjet.
- Cut Feedrate – speed of cutting tool during the jog cut.
- Cut mode –Automatic or Manual.
- Process Wizard - opens the Burny Advanced Plasma screen if any advanced plasma option is licensed and enabled
- Cut Process Timers

The values for each of the parameters are set from one of the following sources:

- The last time the Part Program was run
- The Utility General Setup default settings – refer to Section 7.7.

3.21.2 DETAILS

The following buttons are displayed::

PROCESS

Used to toggle between the available cut processes typically, Oxy, Plasma or Waterjet**.** The available processes depend upon the options set in **Util: General Setup** (refer to Section 7.11).

CUT FEEDRATE

Indicates the current tool movement rate in **Cutting** mode. Refer to the **Cut** Mode heading in this section for more information.

When the Feedrate button is pressed the system loads the **NumKeypad Screen** where you can edit the feedrates. Refer to section **3.6**

*If the Feedrate value is changed, the new feedrate value is used for the entire part disregarding **ALL** feedrate changes in the **Part Program**.*

CUT MODE

Used to toggle the cut mode between *Manual* and *Automatic* and the action performed by the controller:

- *Automatic:* turns the cutting tool on and off.
- *Manual:* waits for the operator to turn the cutting tool on and off.

TIMERS SETUP

Lists all the delay timers and their values. The list of the values displayed depends upon the cutting process. Press the **Timer** button to access the timer settings screen, the values can be altered there. Refer to Section 3.7 for more information on the Timer Setup screen screen.

3.22 JOGCUT PROCEDURE SCREEN (RUN08)

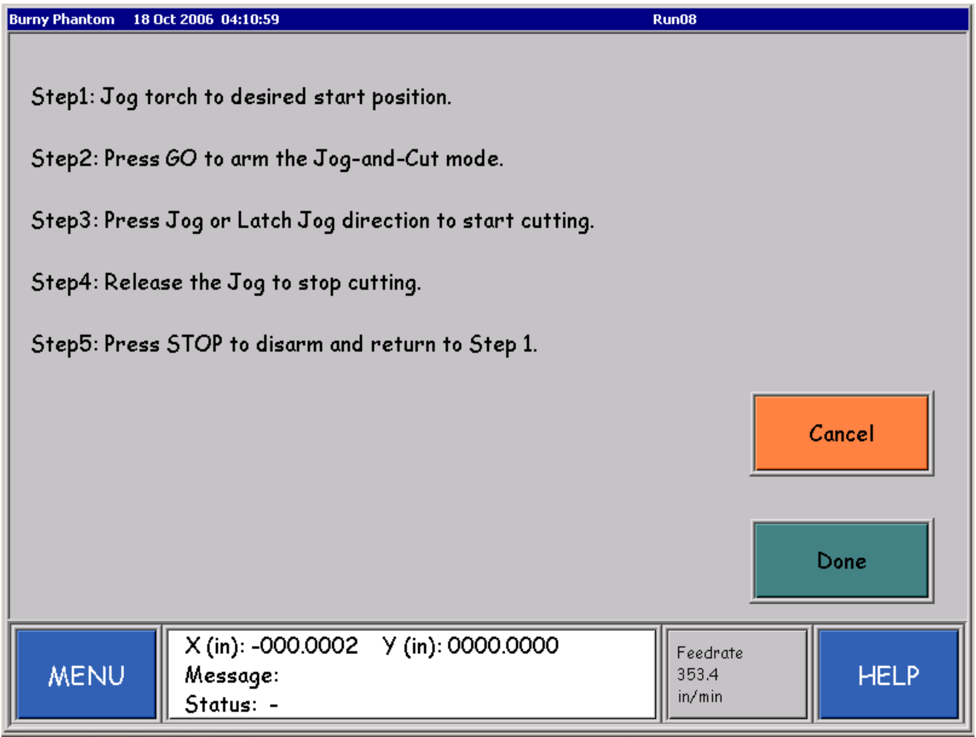

Figure 3.28 JogCut Procedure Screen (*Run08*)

3.22.1 DESCRIPTION

The **JogCut Procedure** screen (Run08) is displayed when the **OK** button on the **Jog Setup-JogCut** screen (Run02) is pressed. This screen lists the steps using the **GO** and **STOP** buttons and **Jog Pad** on the console to perform a Jog and Cut operation. After this procedure is completed, press the **Done** button to return to the **Select Job To Run** screen. For further information on the Jog Pad , refer to Section1.2.5:

EDIT MODE
(AO-70394 REV AA)

SECTION
4

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

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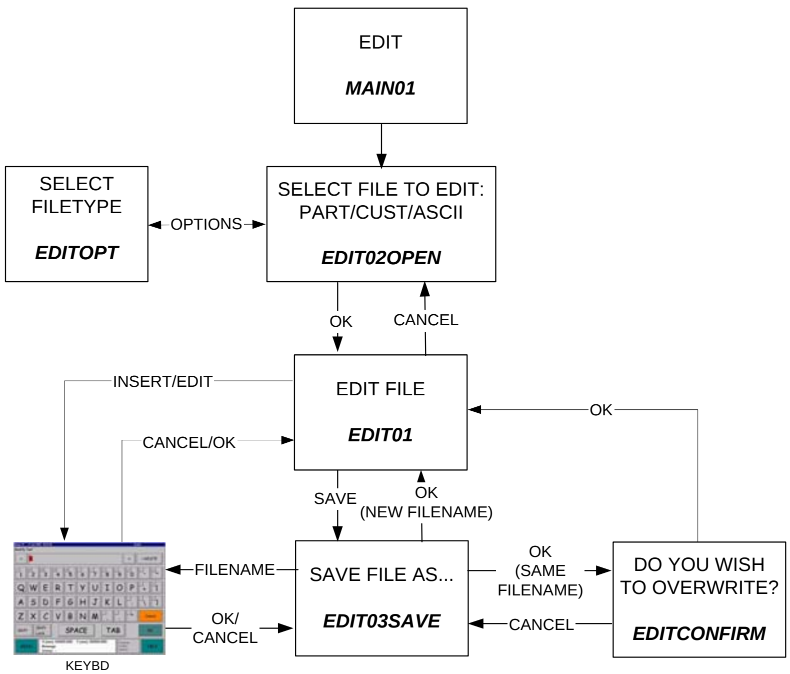
4 EDIT MODE

4.1 INTRODUCTION

The Burny Series 10 Edit mode is based on an ASCII text editor that allows you to edit or create files of the following types:

- **Part Program Files**
- **Custom Shape Files**
- **ASCII files**

Files of these three types can also be deleted and the first two types can be Loaded or Stored. The following diagram shows an overview of the Edit process.



4.1.1 PART PROGRAM FILES

In the Edit mode, the operator can create a new program or edit (change) an existing program in any format, such as Word Address, ESSI, or custom versions of those formats.

When an existing part program file is called up in the Edit mode to be changed, it is in text format. That is, the entire program consists of lines of text, letters, and numbers. The meaning of the codes is explained in the programming section of this manual.

To change the program, simply change the text. In Edit mode you can change a program by deleting, adding, or moving text. You can also start from scratch and write a new program if the desired program language or Aux code file is selected in the General System Defaults screen of the Utilty Mode. Ref Section 7.11.

The Edit mode enables the operator to:

- Select any program file in the Burny Series 10
- Examine the outline of the part
- Examine and change the code listing for the part
- Examine the new shape of the part
- Save the new part to the same file name or to a new one

4.1.2 CUSTOM SHAPE FILES

Custom Shape Files are special "user defined" generic shape programs that perform operations similar to STANDARD SHAPE programs. Ref Section 9.7. These programs are kept in a directory called Custom Shapes.

If the desired custom shape resembles one of the Standard Shapes, use the NT tools available in the Burny Series 10 to copy that Standard Shape .gnr file to a floppy in the Burny Series 10. Edit the file on a PC and load it into the Burny Series 10 Custom Shapes directory. Be sure not to corrupt the Standard Shape file.

4.1.3 ASCII FILES

The ASCII file choice in the Edit mode enables the operator to edit or create simple text files.

4.2 SELECT FILE TO EDIT SCREEN (EDIT02OPEN)

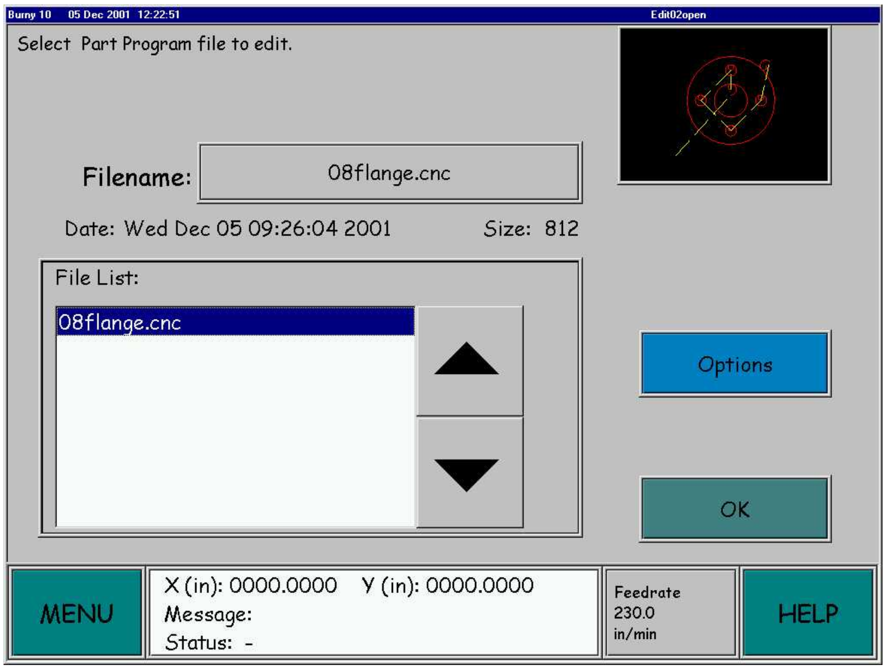


Figure 4.1 – Select File To Edit Screen (*Edit02open*)

4.2.1 DESCRIPTION

The first Edit mode screen, **Select File to Edit** , enables the operator to:

- View the names of all the files of the type selected available in the Control
- Examine a graphic outline of a part in thumbnail or expanded view
- Select the file to edit
- Open a blank file for creating a new file of the type selected

Once the job is selected and ***OK*** is pressed, the display changes to the **Edit File screen (*Edit01*)**. See Figure 4.3.

4.2.2 PROCEDURE

Moving to and from the Edit mode:

If the Edit function is not active, pressing the ***Edit*** icon on the **Main Menu** screen will display this screen-the **Select File to Edit** screen **(*Edit02*)**. This screen can also be reached from other screens in the Edit function by pressing the ***Cancel*** button one or more times. Return to the **Main Menu** screen from the Edit mode at any time by pressing the ***MENU*** icon at the lower left of the screen.

SELECTING THE PROGRAM

The screen prompt at the upper left of the screen tells which of the three file types has been chosen for selection. If this is not the desired choice, press the ***Options*** button to move to the **EditOpt** screen and make the correct selection. If the file type selection is correct, pick the file to edit with one of the following:

- Select the name from the File List

- Move the cursor to the name in the **File List** with the Up or Down Arrow buttons
- Press the Filename button and type in the name of the file.

MOVING TO THE EDIT FILE SCREEN

For Part Program files, a thumbnail graphic showing the outline of the part appears in the upper right of the screen. Examine the graphic view to be sure you have the correct program. For all file types, press ***OK*** to move to the **Edit File** screen. Ref Section 4.4.

4.2.3 DETAILS

FILE LIST

The **File List** shows in alphanumeric order filenames for all files saved in the chosen directory of the Control. This means that file names that begin with a number appear first in numerical order, then file names that begin with letters appear in alphabetical order.
Before a file can be chosen to edit, it must be selected. The selected file is the one highlighted by the cursor in the File list.
Select a file name visible in the list by pressing, select others with the Up or Down Arrow buttons. A file can also be selected by pressing the **Filename** window to bring up the **Keyboard** screen, then typing in the name and pressing **OK**. See "Filename" below.

FILENAME

When the **Select File to Edit** screen first appears, the Filename window contains the same file name highlighted in the File List. If the cursor is moved to another file name, the new file name appears in the Filename window.

To reach a file name quickly in a long list, touch the Filename window to display the keyboard screen. Type in the desired file name or just the first part of it, then press ***OK*** to return to the **Select File to Edit** screen. The cursor will highlight the desired file name, which also appears in the Filename window. If the desired file name is not on the list, the name on the list that would follow it in alphabetical order is highlighted.

UP & DOWN

The Up and Down Arrow buttons move the cursor through the File List.

THUMBNAIL

If Part Program is chosen as the File Type, the Thumbnail graphic window appears, showing in red the outline of the part or parts and the leadin and leadout as they will be cut by the part program whose name is highlighted by the cursor. Traverse motion of the tool shows in dashed yellow.

Press this button to display the graphic at full screen size with tools to zoom and pan on the image.

No thumbnail graphic is shown for the other File Types.

OPTIONS

Press the ***Options*** button to move to the **EditOpt** screen and select the ***File Filter*** and the ***File Type***.

OK

Press the ***OK*** button to choose the selected file for editing and move to the **Edit File** screen, ***Edit01***.

4.3 EDIT OPTIONS SCREEN (EDITOPT)

4.3.1 DESCRIPTION

The **Edit Options** screen enables the operator to select a File Type (directory) that determines what kind of files he can edit or create. Two options are selected here:

- File Filter
- File Type

The File Filter sorts the files so that only a desired group of them will be shown in the file List. Ref Section 2.5.2.

The File Type is one of the three described above in the Introduction to this section:

- Part Program Files
- Custom Shape Files
- ASCII files

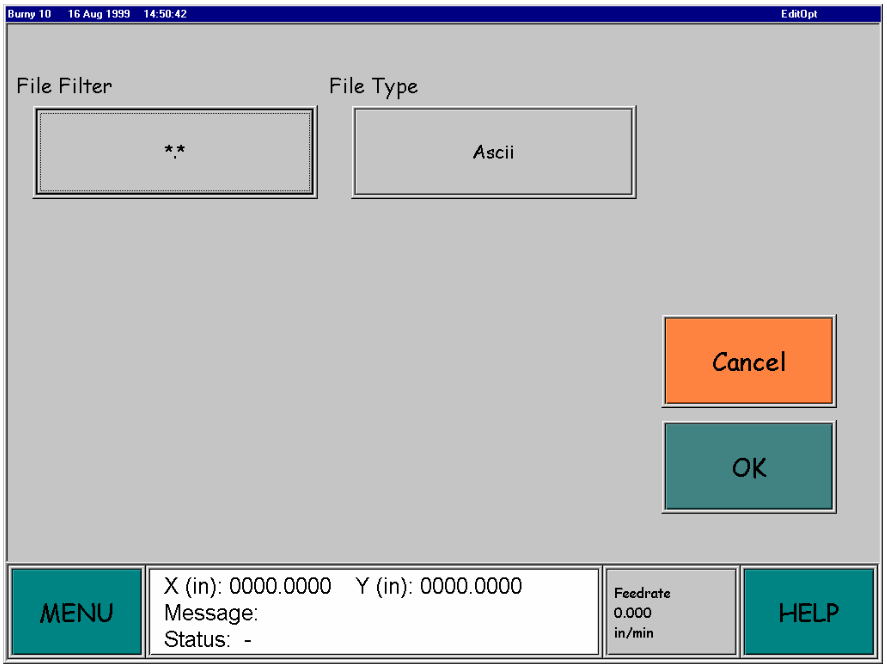


Figure 4.2 – Edit Options Screen (*EditOpt*)

4.3.2 PROCEDURE

Press the **File Filter** window and type the filter into the Keybd screen that appears. Press ***OK*** or ***Cancel*** to return to this screen.

Press the **File Type** window until the desired File type label appears. Press ***OK*** to accept the displayed values and return to the **Select File** screen. Press ***Cancel*** to discard changes made and return to the **Select File** screen.

4.3.3 DETAILS

FILE FILTER

The File Filter typed in is a kind of filename skeleton. Where characters are shown in the filter, the same characters must appear in the filenames that occur on the list. Where the wild card character (*) shows in the filter, any character or group of characters will pass and appear in the filenames displayed on the File List. Any filename displayed must satisfy both requirements. If the File Filter is all wildcards (*), all files in the directory will be shown on the list.

Use a period to separate the filter into two sections if you want to sort the files displayed according to their extension, the characters after the period. Use the first section for a filter for the name and the second for a filter for the extension. For example, the following filter 2*.CNC would cause the file list to display all files in the directory that start with 2 and have the extension CNC. The filter is not case sensitive so that the file 21.cnc would be displayed.

FILE TYPE

The selected File Type is displayed as the label on the File Type button. When the button is pressed, it changes to another of the three choices: ***Part program, Custom Shape***, and ***ASCII.***

CANCEL

Pressing the ***Cancel*** button discards changes made in this screen and returns the display to the **Edit02open** screen.

OK

Pressing the ***OK*** button accepts changes made in this screen and returns the display to the **Edit02open** screen.

4.4 EDIT FILE SCREEN (EDIT01)

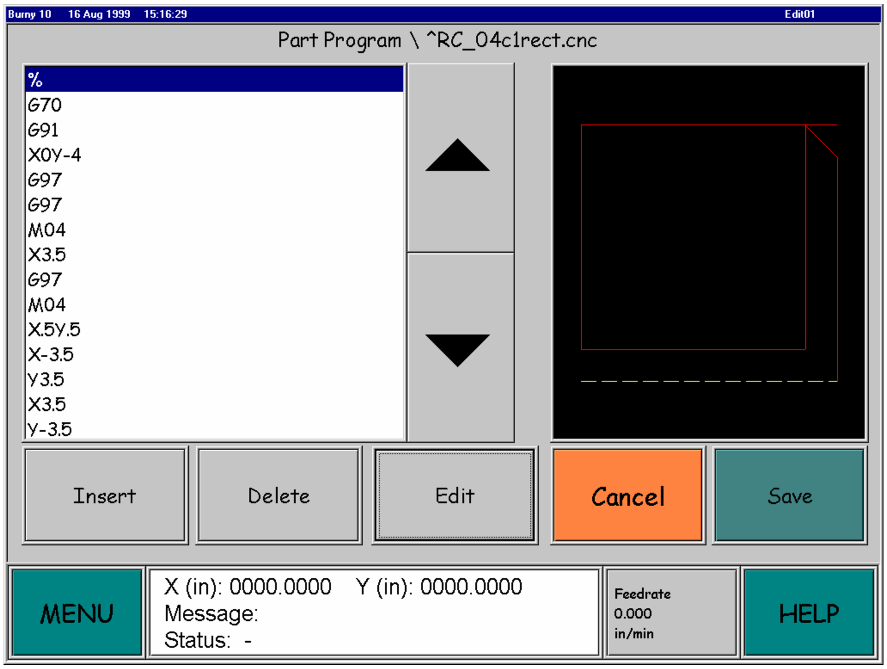


Figure 4.3 – Edit File Screen (*Edit01*)

4.4.1 DESCRIPTION

The **Edit File** screen displays characters contained in the file selected. The operator can delete, change, or add lines to the file.

If a part program has been selected to Edit, a graphic showing the part appears at the upper right of the screen. When the cursor is moved to a line of code that represents a movement of the tool, the corresponding line on the graphic changes color to white.

When a change is made to the part program, the change shows at once in the graphic. After all changes are made, the new part outline can be examined and the new part can be saved to the same file name or to a new one.

An imbedded kerf too large for the part geometry will cause its block in the code and any extraneous lines in the graphic to be colored orange.

4.4.2 PROCEDURE

To delete an entire line of code: Use the ***Up and Down Arrow*** buttons to highlight the line to be deleted. Press the ***Delete*** button.

To change a line of code, select the line with the cursor and press the ***Edit*** button. The **Edit Text keyboard** screen then appears. Use the right and left arrow buttons, the delete buttons and the character buttons to make the desired changes. Then press ***OK***. See Part 1, System Description for details of keyboard operation.

To insert a new line of text characters: Put the cursor on the line of text characters just before the line to be inserted. Press the ***Insert*** button. The **Edit Text** keyboard screen appears with a blank text window. Type in the desired line, then press ***OK*** . Now the **Edit File** screen reappears, showing the new line of text.

To save changes to the selected file, press the **Save** button. The display changes to the **Save File As** screen..

4.4.3 DETAILS

CODE LISTING

The Code Listing shows every line of text characters in the selected file. The line of text characters highlighted by the cursor is the only one to be affected by deleting or changing. An inserted line of text characters will appear directly below it. See Part 9, the Programming section, for a list of part programming codes.

UP/DOWN

Use the Up/Down Arrow buttons to move the cursor through the code listing. A momentary press on the button moves the cursor up or down one line. Holding down the button causes the cursor to scroll.

THUMBNAIL GRAPHIC

When Part Program is selected for the File Type, the thumbnail Graphic appears in the upper right corner of this screen. This graphic screen is larger than the thumbnail screen in the Run mode. The figure shows the complete tool path with cutting in red and traverse in yellow.

As soon as a change is made in the program code that affects the appearance of the part, the change is displayed in the graphic. If the cursor is on a line of code that causes tool motion, the corresponding move will change color to white in the graphic.

INSERT

Press the ***Insert*** button to move to the **Edit** text keyboard screen and type a line of text characters to appear just below the line highlighted by the cursor.

DELETE

Press the ***Delete*** button to erase the line of text characters highlighted by the cursor.

EDIT

Press the ***Edit*** button to move to the **Edit text keyboard** screen and make changes to the selected line of text characters.

The text window in the Edit Text keyboard screen can display a maximum of 52 characters.

CANCEL

Press the ***Cancel*** button to return to the **Select File to Edit** screen, discarding all changes made in the **Edit** screen. This ends the edit session on the selected file. To make any more changes in that file, the edit procedure must be started from the beginning.

SAVE

Press **Save** after changes have been made to the program to move to the **Save File As** screen, ***Edit03***.

4.5 SAVE FILE AS SCREEN (EDIT03SAVE)

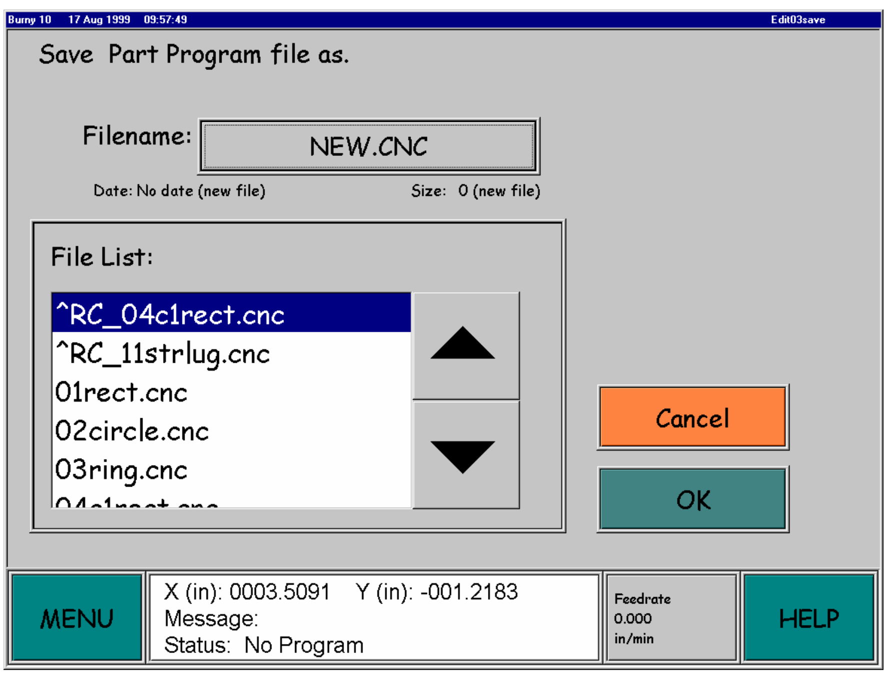


Figure 4.4 – Save File As Screen (*Edit03save*)

4.5.1 Description

The **Save File As, Edit03save**, screen enables the operator to:

- Save the changed file with the same name
- Save the changed file with a different name
- Return to the Edit screen and make more changes before saving

4.5.2 Procedure

To save the changed program with the same name, press ***OK***. The display changes to the **Edit Confirm** screen. The prompt "**Do you wish to overwrite?**" appears at the top of the screen with the name of the file below it. Press ***OK*** to save the changed program with the same name and return to the **Edit File** screen with the new name shown at the top of the screen. Press ***Cancel*** to leave the old file with the same name and return to the **Save File As** screen.

To save the program with a new name, press the ***Filename*** box. The **Save File As** keyboard appears. Enter the new name and press ***OK*** to return to the **Save File As** screen.

To give this name to the edited file, press ***OK***. The display returns to the **Edit File** screen where the new file contents are shown and the new name is displayed. The program is now saved in the Burny10 directory. More changes can be made here and the save process repeated. If no changes are needed, press ***Cancel*** to move to the **Select File to Edit** screen. The Edit session is now complete.

To save the part program to another name that already exists on the Burny Series 10 directory, highlight the name on the **File List** in the **Save File As** screen. Be sure the name appears in the Filename window, then press ***OK***.

This action deletes the file that had that name.

4.5.3 Details

File List

The File List shows in alphanumeric order filenames for all files saved in the control directory for the File Type selected that pass the File Filter test. This means that file names that begin with a number or special character appear first, then file names that begin with letters appear in alphabetical order.

To give an existing name to the changed file, the existing file must be selected. The selected file is the one highlighted by the cursor in the File list window and whose name also appears in the Filename window.

Select a file name visible in the list by pressing; select others with the **Up or Down Arrow** button. A file can also be selected by pressing the Filename window to bring up the Keyboard screen, then typing in the name and pressing ***OK***. See "Filename" below.

Filename

Press the ***Filename*** window to display the keyboard screen. Type in the desired file name, then press ***OK*** to return to the **Save File As** screen. The name typed in appears in the Filename window. If a file by the same name is on the **File List**, the cursor will move to it. If a file by the same name is on the File List and ***OK*** is pressed, that file will be deleted and its name given to the edited file.

Up & Down

The **Up and Down Arrow** buttons move the cursor through the File List.

Thumbnail

The Thumbnail graphic window shows in red the outline of the part or parts and the leadin and leadout as they will be cut by the part program whose name is highlighted by the cursor. Traverse motion of the tool shows in dashed yellow.

Press this window to display the graphic at full screen size with tools to zoom and pan on the image. Ref Sec 1.11.

CANCEL

Pressing the ***Cancel*** button returns the display to the **Edit File** screen, which is in the same state as when Save was touched. The file has not been saved to the program directory of the Burny Series 10 but the changes already made in the Edit mode are still in place in the **Edit File** screen.

More changes can be made by working in the **Edit File** screen. If the changes are to be discarded, press **Cancel** in the **Edit File** screen to return to the **Select File to Edit** screen with the file unchanged.

OK

Press **OK** to save the edited file.

If a new name was entered for the file, the file is saved to the Burny Series 10 directory under whatever name was selected and the display changes to the Edit File screen. Press ***Cancel*** to complete the save process and return to the **Select File to Edit** screen or make more changes in the part program and repeat the save process.

To make more changes, remain in the **Edit File** screen and make them.

SHAPES MODE

(AO-70399 REV AA)

SECTION

5

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

Table of Contents

5 SHAPES MODE

5.1 INTRODUCTION

The **Shapes** mode provides a library of 50 standard generic shapes that the operator can use to make part programs. He does this by giving specific dimensions, number of holes, etc. The operator is asked to decide on one feature at a time, while a graphic of the part at the upper right of the screen highlights the feature.

When all the features have been selected, all of them appear on a list. Any one can be selected for editing. When all are correct, a file name is selected for this new part program and the process can be started again. The new part appears at once on the **Run**, **Edit**, and **Store** file lists.

In addition to **Standard Shapes**, another group of generic shapes called **Custom Shapes** can be accessed in the **Shapes** mode. These **Custom Shapes** can be written on site using information in Section 9.7.

Once selected, custom shapes use the same process as **Standard Shapes** to create a part program. These custom generic shape programs can be edited on site, but **Standard Shapes** cannot.

To make a part program from a standard generic shape, proceed as follows:

Select Standard Shape (or Select Custom Shape) - pick a shape

Customize Dimensions and features - respond to each prompt in turn to enter the dimensions and features

Part Completed - view the Prompts Summary and revisit any to be changed

Save to Part File - Prompt Summary has been accepted; now choose file name for part program

5.2 SELECT STANDARD SHAPE SCREEN (SHAPES01)

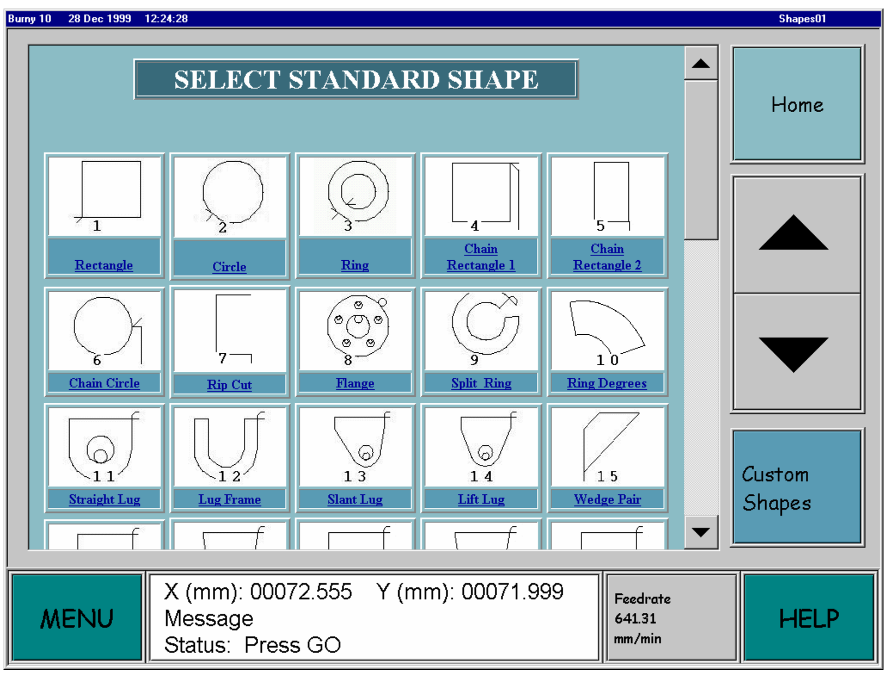


Figure 5.1 – Select Standard Shape Screen (*Shapes01*)

5.2.1 DESCRIPTION

When the ***Shapes*** button is pressed in the **Main Menu** screen, the last screen accessed in the **Shapes** mode will appear. Get to the **Shapes01** screen by following screen prompts and/or using the ***Cancel*** key.

This screen enables the operator to select one of the standard generic shapes for customizing into a part program. The screen shows the number, name, and thumbnail outline of each shape.

5.2.2 PROCEDURE

Select a ***standard shape*** by pressing the icon of the shape in the **Shapes01** screen. The display changes to the **Shapes02** screen where the first dimension or feature will be specified by the operator.

If in doubt about any feature, press the ***Help*** button for a detailed diagram and explanation of that particular shape. Press ***Help*** again to return to the **Shape02** screen.

For dimension features, a numerical keypad appears on the screen showing a current value. Change this value to the correct amount with the keypad, then press ***OK*** to move to the next feature.

For features that have a limited choice, a button will appear for each choice. Press the correct selection, then ***OK*** to move to the next feature.

A list of all the features with the choices made will appear after the last one has been entered. To change the value of a feature, move the cursor to it and press the ***Edit*** button. The display changes to the same screen that was used to set it up before. Make the desired change, then press ***OK***. The display changes back to the screen with the dimension summary. If needed, make another change in the same way.

When the list is correct, press the ***OK*** button to move to the **Save to which file** screen. Select an existing name on the list or press the ***Filename*** window and enter a new name with the keyboard. Press ***OK*** to save the new part program to the parts list and return to the **Select Standard Shape** screen.

5.2.3 FEATURES/DETAILS

SELECT STANDARD SHAPE WINDOW

This window contains thumbnail views of all fifty **standard shapes**. Press the icon of a shape to bring it up in the **Shape02** screen for customizing.

HOME, UP, DOWN

Press the ***Up*** or ***Down*** button to bring the desired shape into view. Press the ***Home*** button to move to the top of the window. The scroll bar to the right of the window can also be used to move up and down the page.

CUSTOM SHAPES

Press the ***Custom Shapes*** button to display the **Select Custom Shape** screen. This screen has the same format as the **Select Standard Shape** screen. It shows thumbnail views for all custom shapes available. Select and customize one of these in the same way as a **Standard shape**.

5.3 SHAPE PROMPTING SCREEN (SHAPES02)

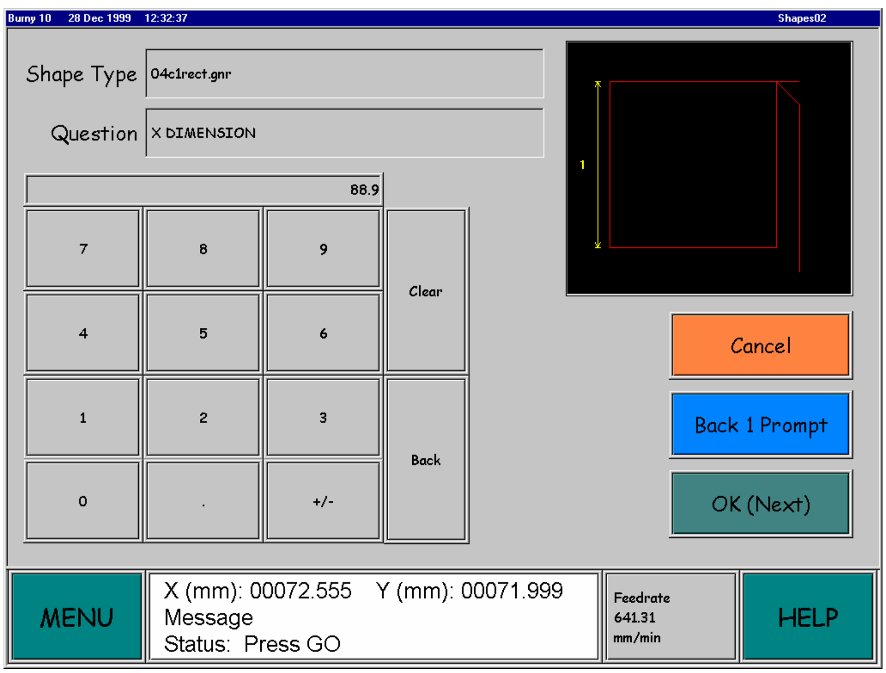


Figure 5.2 – Shape Prompting Screen (*Shapes02*)

5.3.1 DESCRIPTION

The **Shape Prompting** screen (***Shapes02***) provides the means for setting the dimensions and other features of the part program being made from the generic shape. Features are setup in this screen one at a time. The graphic window at the upper right of the screen shows in red the cutting path for the generic shape with the current dimension prompt highlighted in yellow. A numerical keypad, showing a current value, appears on the screen to permit the entry of dimensions. For features that have a limited set of choices, a button will appear for each choice. For each of the features, this screen has buttons to cancel the entire setup, to return to the previous prompt, or to accept the setting and move to the next prompt.

5.3.2 PROCEDURE

Examine the graphic view of the part to be sure it is the correct one. Press the graphic screen to see a full-screen view of the part. Press the screen again to return to the **Shapes02** screen. If in doubt about any feature, press the ***Help*** button for a detailed diagram and explanation of that particular shape. Press ***Help*** again to return to the **Shape02** screen. For dimension features, a numerical keypad appears on the screen showing a current value. Change this value to the correct amount with the keypad, then press ***OK*** to move to the next feature. For features that have a limited number of choices, a button will appear for each choice. At the same time all these choices appear on the graphic. Press the correct selection, then ***OK*** to move to the next feature. To return to a previous prompt to check the value or change it, press the ***Back 1 Prompt*** button until it appears. To cancel the setup of this shape, press the ***Cancel*** button to move to a confirmation screen. To accept the setting for the prompt item and move to the next one, press the ***OK*** button.

5.3.3 FEATURES

SHAPE TYPE WINDOW

The number and name of the selected shape appears in the ***Shape Type*** window at the upper left of the screen.

QUESTION WINDOW

Below the ***Shape Type*** window is the ***Question*** window, which displays the current prompt.

VALUE INPUT

At the center left of the screen a group of touch sensitive buttons will appear to permit the input of the prompt value. When the prompt has a numerical value, a numerical keypad appears. The keypad window shows the existing value. ***Clear*** erases the entire entry; ***Back*** erases the digit at the right. Numbers entered from the pad appear at the right of the window. When the entry is correct, touch ***OK***.

For features that have a limited number of choices, a button will appear for each choice. Press the correct selection, then ***OK*** to move to the next feature.

GRAPHIC WINDOW

At the upper right of the screen a graphic window shows in red the cutting path for the shape. The current prompt is shown in yellow. Press the graphic window to see a full-screen view of the part. Press the screen to return to the **Shapes02** screen.

CANCEL

Pressing the ***Cancel*** button moves the display to a **Cancel Confirmation** screen. An ***OK*** there clears the current setup and returns to the **Shape01** screen. A ***Cancel*** there returns the display to this screen.

BACK 1 PROMPT

Press the ***Back 1 Prompt*** button move back to the previous prompt. Settings made before the move will be retained. In the new prompt screen, the existing setting will appear. To retain it, just press the ***OK*** button. To change it, enter the new value and press the ***OK*** button. After either of these ***OK's***, the display moves to the next prompt.

Any previous prompt can be reached by pressing the ***Back 1 Prompt*** button more than once.

OK

Press the ***OK*** button to accept the value of the present prompt and move to the next one.

5.4 PROMPT SUMMARY SCREEN (SHAPES06)

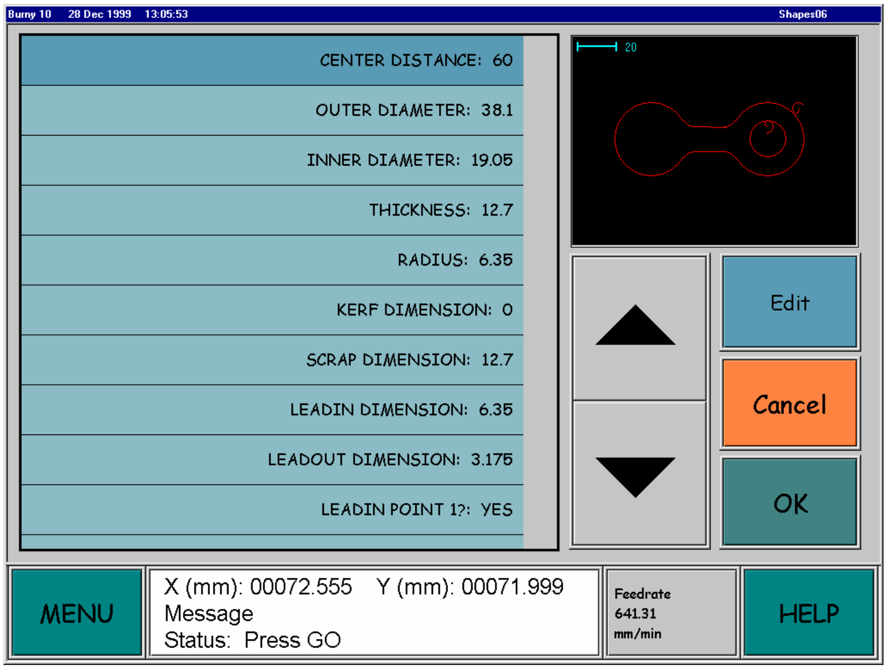


Figure 5.3 – Prompt Summary Screen (*Shapes06*)

5.4.1 DESCRIPTION

The **Prompt Summary** screen appears when all the prompts have been answered and provides:

A summary of all the prompt values

A graphic showing the actual programmed dimensions with a length scale in the upper left of the graphic.

The graphic in **Shape02** always shows the part with default values.

An opportunity to revisit any of the prompts (return to **Shape02**).

A way to abandon the part and return to **Shape01**.

5.4.2 PROCEDURE

This screen provides three main procedures:

Going back to change a prompt

Accepting all the prompts and going on to name the part program

Discarding the new shape and moving to the **Cancel Confirm** screen

CHANGING A PROMPT

Highlight the prompt to be changed with the cursor, then press the ***Edit*** button. The display changes to the **Shape02** screen and the prompt can be set to the new value. Press ***OK*** to return. The effect can be seen in the graphic.

ACCEPTING THE PROMPTS

When all prompts are correct, press the ***OK*** button to move to the **Save to which file** screen. There the part program can be saved to an existing file name or to a new one. Pick ***Cancel*** to move back to the **Prompt Summary** screen and change a prompt or review the shape of the new part.

DISCARDING THE NEW SHAPE

To discard the new shape, press the ***Cancel*** button. The display changes to the **Cancel all dimensions** screen (***Shapes99***). This screen prevents an accidental cancellation.

If you decide not to discard the new part program, press the ***Cancel*** button and return to the **Prompt Summary** screen with the new part program intact..

To discard the new part program, press the ***OK*** button and return to the **Select Standard Shape** screen.

5.4.3 DETAILS

PROMPT LISTING

A window at the left side of this screen lists the names of all the prompts and the values that were just assigned to them. The cursor appears as a darker blue on the top line when the screen first shows on the display. Select a prompt line by pressing it or using the ***Up*** or ***Down*** button.

UP/DOWN

These buttons move the cursor through the Prompt Listing. Press briefly to move one line or hold down to scroll.

GRAPHIC

This window shows the part using the new prompt values. A highlighted line segment in the upper left of the window is labeled with its length to give an idea of the scale of the part. No prompt highlights appear here. Of course they will show in the **Shape02** screen if the ***Edit*** button is pressed. Press the graphic screen to see a full screen blowup of the graphic. Press the screen to return.

EDIT

Press the ***Edit*** button to return to the **Shape02** screen for the highlighted prompt and change it.

CANCEL

Press ***Cancel*** to move to the **Cancel all dimensions** confirmation screen. There press ***OK*** to discard the new part and return to the **Shape01** screen or press ***Cancel*** to return to the **Prompt Summary** screen.

OK

Press ***OK*** to accept all the prompt values and create the new part program. The display changes to the **Save to which file** screen where a name is given to the file

5.5 SAVE TO WHICH FILE SCREEN (SHAPES07)

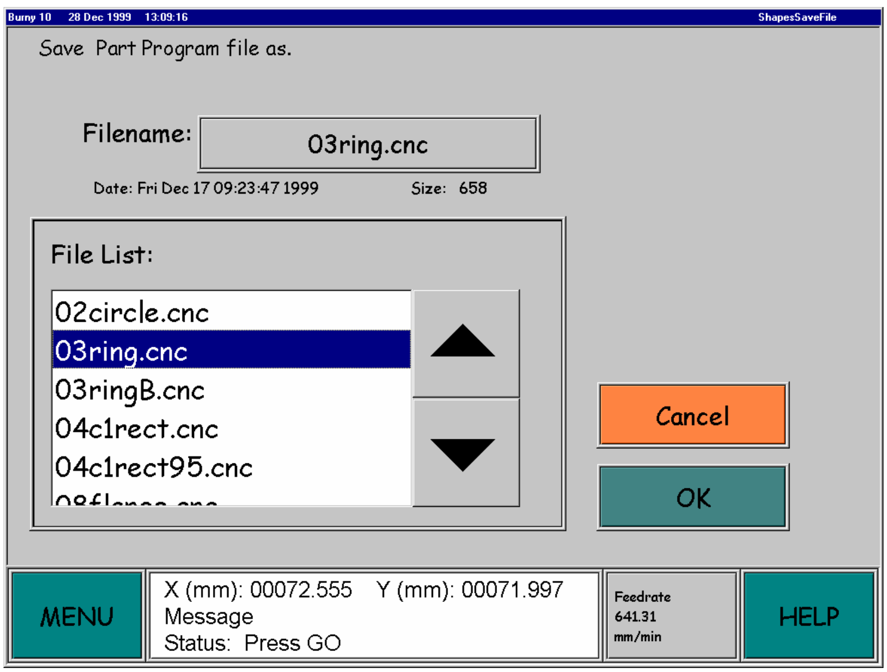


Figure 5.4 – Save To Which File (*SaveShapesFile*) Screen

5.5.1 DESCRIPTION

In this screen a name is given to the newly created part program. Any existing name can be selected from the ***File List*** or a new name can be typed in with the keyboard.

Note that in the ***Filename*** window appears the name of the standard shape used to make this part program with its extension changed from ".gnr" to ".cnc". This is the default name for the part program that is assigned to it if ***OK*** is pressed at this point.

Changes to the program can still be made from this screen by pressing ***Cancel*** to return to the ***Prompt Summary*** screen.

5.5.2 PROCEDURE

To give the new part program an existing file name, select the name on the ***File List*** with the cursor. The same name should be in the ***Filename*** box.

Using this name will erase the existing file and replace it with the new part program

---

To continue, press the ***OK*** button to save the file with the existing name and return to the **Shapes01** screen..

To give the part program a new name, press the ***Filname*** box to bring up the **Keyboard Screen**. Type in the desired name, with an extension of ".CNC". Press the ***OK*** key to get back to the **Save to which file** screen.

Compare the name in the ***Filename*** *window with the file name highlighted on the* ***File List****. If the two are the same, a part program by this name already exists. If* ***OK*** *is pressed at this point, the pre-existing part program will be over written and lost. If you do not wish to do this, press the* ***Filename*** *window to display the keyboard again and change the name of the new part program. Press* OK *to return to the* ***Save to which file*** *screen.*

Then press ***OK*** again to save the file with that name and to return to the **Shapes01** screen.

5.5.3 FEATURES/DETAILS

FILE LIST

The ***File List*** shows file names for part programs in the parts directory. Select a visible file name by pressing; select others with the ***Up*** or ***Down*** button.

To move quickly to a file whose name is not visible, press the ***Filename*** box and enter the first one or two characters of the name on the keyboard. Press ***OK*** to return to the **Save to which file** screen and the desired file name should be close to the cursor.

FILENAME

Press the ***Filename*** Window to display the keyboard. Type in the file name. Press the ***OK*** button to return to the **Save to which file** screen. This window usually shows the same filename that is highlighted by the cursor in the ***File List****.*

When a name that is not on the ***File List*** is entered with the keyboard and ***OK*** is pressed, this new name shows in the ***Filename*** box and does not match the name highlighted by the cursor. If ***OK*** is pressed, the new part program is saved with the name in the ***Filename*** box.

UP & DOWN

Press the ***Up/Down*** buttons to move the cursor to the next file name on the ***File List***; hold down to scroll.

See ***Filename*** above for a quicker way to reach a file name.

CANCEL

Press to return to the **Prompt Summary** screen.

OK

Press the ***OK*** button to save the new part program, giving it the name in the ***Filename*** window and moving the display to the **Shapes01** screen.

5.6 CANCEL ALL DIMENSIONS SCREEN (SHAPES08)

Figure 5.5 – Cancel All Dimensions (*ShapesYesNo*) Screen

5.6.1 DESCRIPTION

The **Cancel all dimensions** screen appears when ***Cancel*** is pressed anywhere in the **Shapes mode** except the **Save to which file** screen. This screen has only two buttons: ***Cancel*** and ***OK***. ***Cancel*** returns the display to the previous screen, saving any changes. ***OK*** discards all the changes and returns the display to the **Shapes01** screen, where customizing another shape can be started.

5.6.2 PROCEDURE

To save changes and return to the previous screen, press the ***Cancel*** button.

To discard work on the new part program and return to the **Shapes01** screen, press the ***OK*** button.

5.6.3 FEATURES/DETAILS

OK

The ***OK*** button discards the work on the new part program and returns the display to the **Shapes01** screen.

CANCEL

The ***Cancel*** button returns the display to the previous screen with all the work done on the new part program undisturbed.

5.7 SELECT CUSTOM SHAPE SCREEN (SHAPES03)

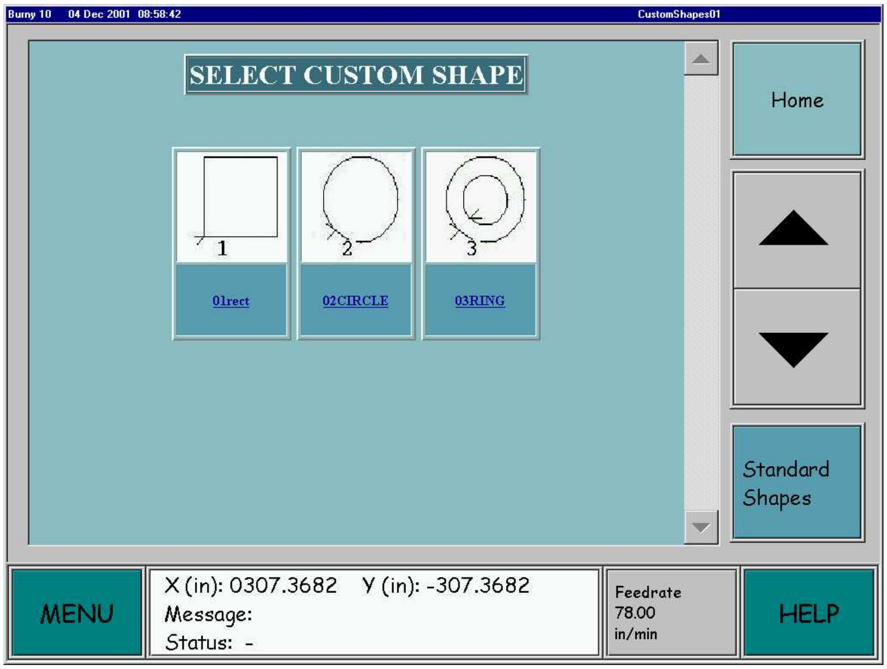


Figure 5.6 – Select Custom Shape (*CustomShapes01*) Screen

5.7.1 DESCRIPTION

The **Select Custom Shape** screen enables the selection of a custom generic shape for making a parts program. Select and customize one of these in the same way as a **Standard Shape**. These are generic shapes that can be produced on site when none of the **Standard Shapes** will produce a needed family of part programs.

Ref Sec 9.7**, Generic Shapes Programming**, for details on custom generic shapes. Note that three custom shapes have been placed here as samples.

5.7.2 PROCEDURE

Move to the **Select Custom Shape** screen by pressing the ***Custom Shapes*** button in the **Select Standard Shape** screen. Press the desired custom shape icon to move to the **Shape02** screen. Customize one of these in the same way as a **Standard Shape**.

5.7.3 DETAILS

SHAPE ICONS

Select and customize one of these shapes in the same way as a **Standard Shape**. These are generic shapes that can be produced on site when none of the **Standard Shapes** will produce a needed family of part programs

HOME, UP, DOWN

Press the ***Up*** or ***Down*** button make the cursor highlight the desired custom shape icon. Press the ***Home*** button to move to the top of the icon page.

STANDARD SHAPES

Press the ***Standard Shapes*** button to return the display to the **Select Standard Shape** screen.

5.8 COMMON DIMENSIONS PROMPTS

The maximum dimensions allowed for shapes are 10,000 in and 254,000 mm. If a larger value is entered and ***OK***'ed, the display changes to the ***Prompt Summary*** screen and must be aborted by pressing the ***Cancel*** button, then ***OK*** in the **Cancel all dimensions** screen. Restart the process and use allowed dimensions.

In addition to the actual dimensions of the part, most of the 50 SHAPE PROGRAMS also prompt for the following:

KERF DIMENSION
SCRAP DIMENSION
LEADIN DIMENSION
LEADOUT DIMENSION

Most of the ***STANDARD SHAPES*** prompt for a ***KERF*** value along with the part dimensions. However in most cases, a ***KERF*** value of 0.00 should be specified so that the ***Burny 10*** "***DIAL IN KERF***" feature can be used when performing ***JOB SETUP*** operations. This allows the same NC part program to be cut with different ***KERF*** values. When a non-zero ***KERF*** value is specified during shape prompting operations, the required ***KERF*** offset distance is permanently added to the NC part dimensions, and the "***DIAL IN KERF***" feature in the ***JOB SETUP*** process is no longer operational. Since the ***KERF*** cannot be adjusted in these part programs, the entire part must be re-programmed in order to change the ***KERF*** value.

On any of the "Chain Cut" parts, such as CHAIN RECTANGLE 2 (#5) and WEDGE PAIR (#15), the KERF value must be defined through the shape prompting process, along with the part dimensions. This is due to the common side cutting and nesting which is done on these parts. Regardless of the KERF entered, the "DIAL IN KERF" will not function on these parts.

Most of the ***STANDARD SHAPES*** also prompt for a ***SCRAP*** dimension. This is the space left between successive rows of parts. Since the "***DIAL IN KERF***" feature does not increase the part-to-part spacing, the value for ***SCRAP*** must allow for enough material to accommodate the anticipated ***KERF*** plus the desired amount of actual material to be left between the rows of parts.

Often the ***SCRAP*** value is also used by the shape process when calculating the traverse move distance from the starting point of the part to the first pierce point. This calculation insures that the X and Y distances from the part to the edge of the plate are the ***SCRAP*** distance, assuming that the resulting NC part program is started from the corner of the plate.

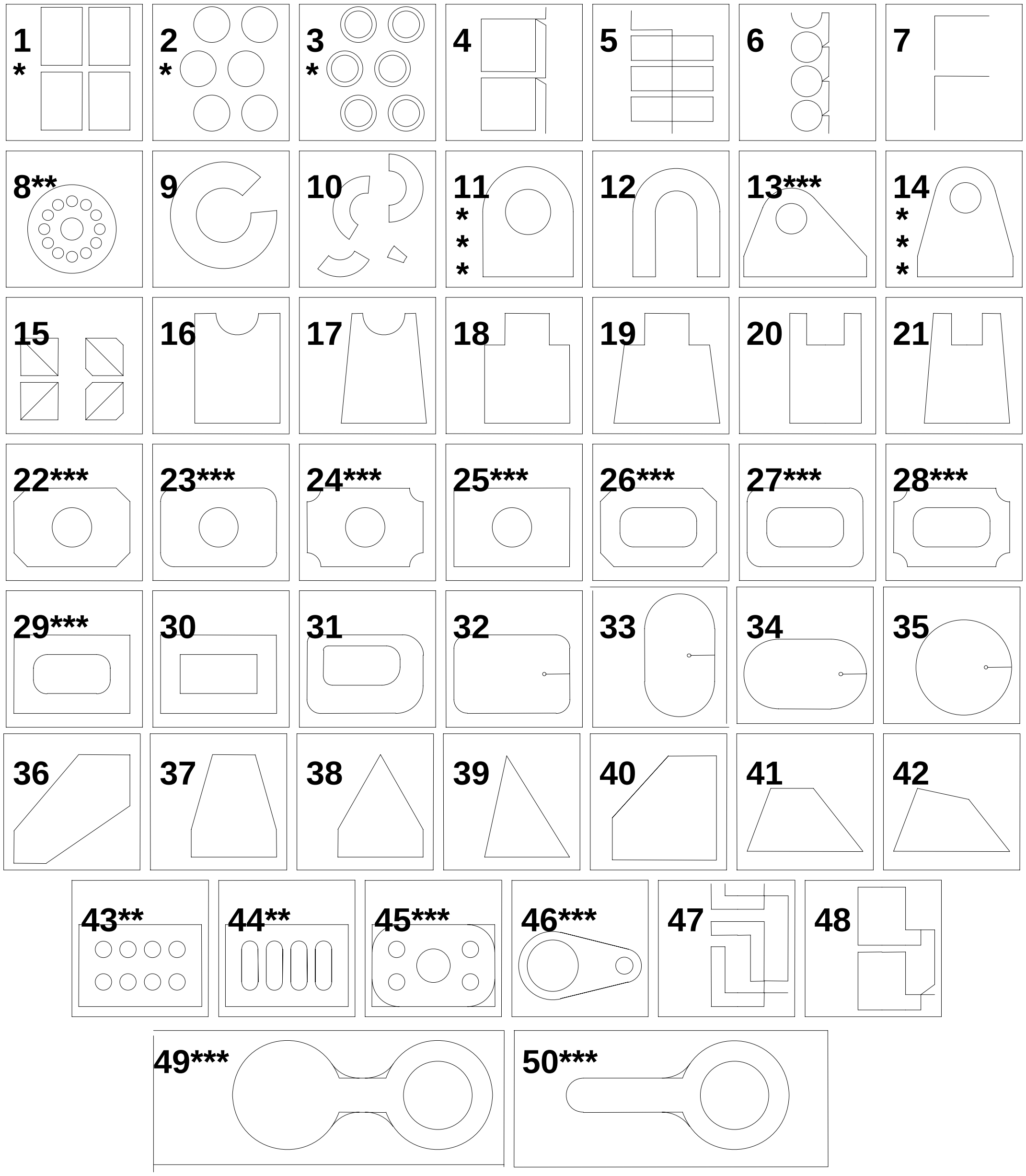
The accuracy of the SCRAP dimension is equal to the accuracy of the part dimensions. Therefore, the SCRAP value can be set fairly small with good results. A typical SCRAP value for OXYGEN FUEL cutting can be anywhere between 0.1 to 0.5 inch (2.5mm to 12mm). Remember that the SCRAP dimension must allow for the anticipated KERF value range if the "DIAL IN KERF" feature is to be used in the JOB SETUP process.

The ***LEADIN*** dimension is the distance from the pierce point to the part. Since the piercing operation is sometimes unpredictable, the ***LEADIN*** dimension should be set so that the plate is pierced and the cut has stabilized before it reaches the actual part. Normal values range from .25 to 1.00 inch (6mm to 25mm).

The ***LEADOUT*** dimension causes the torch to cut away from the part before the cut is turned off. This prevents any damage to the cut part due to the bleed-off characteristics of the torch. In addition, on heavy plate cutting, the ***LEADOUT*** move guarantees that the bottom of the part has been cut completely before the cut is turned off. Normal values are from .5 to 1 inch (12mm to 25mm).

5.9 SHAPE DESCRIPTIONS

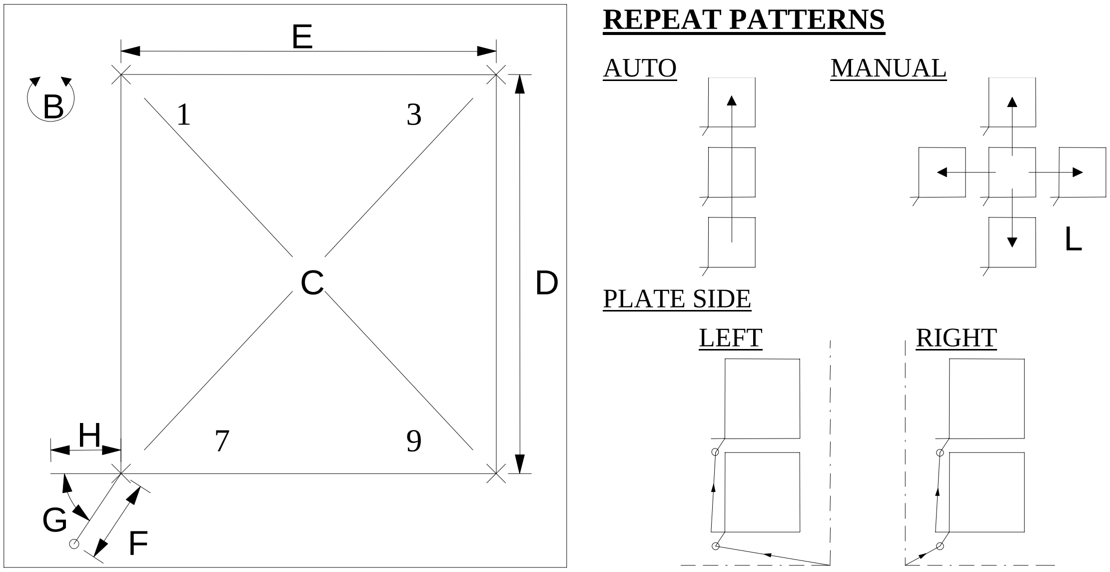
The following pages contain drawings, prompting descriptions and "***RUN PROGRAM***" notes for each of the 50 ***STANDARD SHAPES*** that are currently provided with the ***Burny 10***.



Thumbnail Views of the 50 Standard Shapes

*	SELECTABLE START POSITION, CW/CCW CUTTING, AND SELECTABLE REPEAT MODE AND DIRECTION.
**	ALLOWS SELECTION OF ANY NUMBER OF HOLES.
***	DASHED HOLES ARE OPTIONAL. CORNER RADIUS VALUES MAY BE SET TO 0 FOR SHARP CORNERS.

SHAPE 1: RECTANGLE



A. PLATE CORNER START	:	(YES OR NO)[1]
B. CUT DIRECTION	:	(CLOCKWISE OR COUNTERCLOCKWISE)
C. STARTING POSITION	:	(1 OF 4 CORNERS)[2]
D. X DIMENSION	:	(INCHES OR MILLIMETERS)
E. Y DIMENSION	:	(INCHES OR MILLIMETERS)
F. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
G. LEADIN ANGLE (DEGS)	:	(0 TO 90 DEGREES)[3]
H. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)[4]
I. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
J. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
K. REPEAT MODE	:	(AUTOMATIC OR MANUAL POSITIONING)

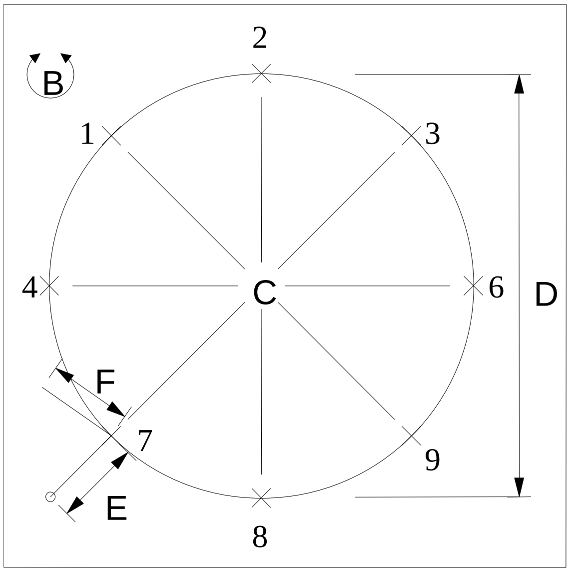
<u>IF MANUAL REPEAT MODE:</u>

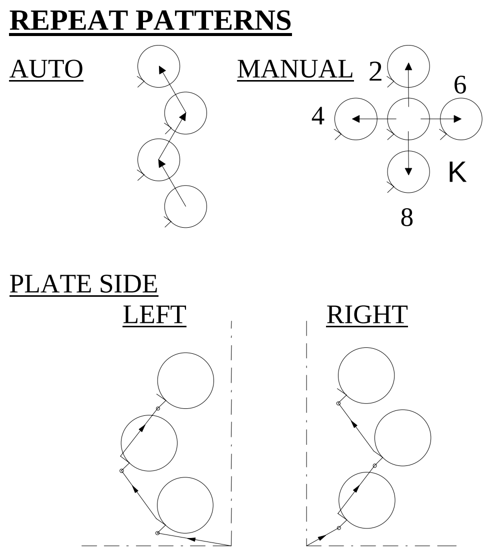
L. REPEAT DIRECTION	:	(1 OF 4 SIDES)[2]

NOTES:

1) When "PLATE CORNER START: NO" is selected, position tool at the STARTING POSITION of the first part, regardless of the REPEAT MODE selected. From this corner, the program moves out to the actual pierce point.
2) The STARTING POSITION and REPEAT DIRECTION parameters can be directly entered with the numeric keypad. Direction arrows are provided for quick reference.
3) When defining the LEADIN ANGLE, 0 degrees is parallel to the Y axis and 90 degrees is parallel to the X axis.
4) The LEADOUT position is determined by the direction of the cut. It is either parallel to the last side cut (as shown) or 45 degrees from the last cut direction.

SHAPE 2: CIRCLE





60-DEGREE ANGLE TO CENTERS

A.	PLATE CORNER START	:	(YES OR NO)[1]
B.	CUT DIRECTION (OD)	:	(CLOCKWISE OR COUNTERCLOCKWISE)
C.	STARTING POSITION	:	(1 OF 8 POINTS)[2]
D.	DIAMETER DIMENSION	:	(INCHES OR MILLIMETERS)
E.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
F.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
G.	LEADOUT TYPE	:	DIFFERENT/SAME AS[3]
H.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
I.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
J.	REPEAT MODE	:	(AUTOMATIC OR MANUAL POSITIONING)[4]

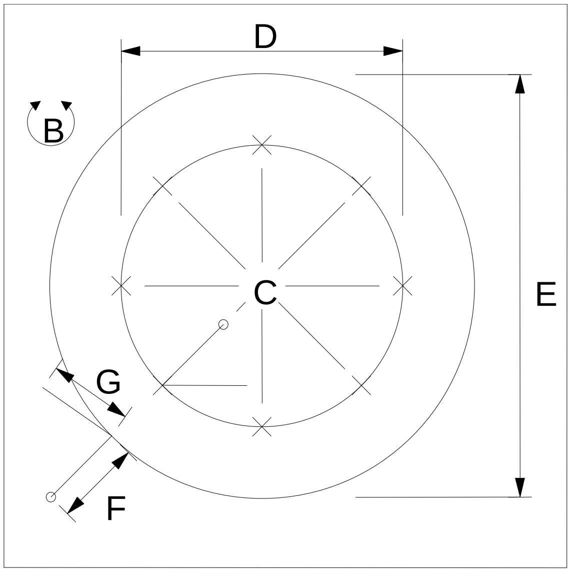
IF MANUAL REPEAT MODE:

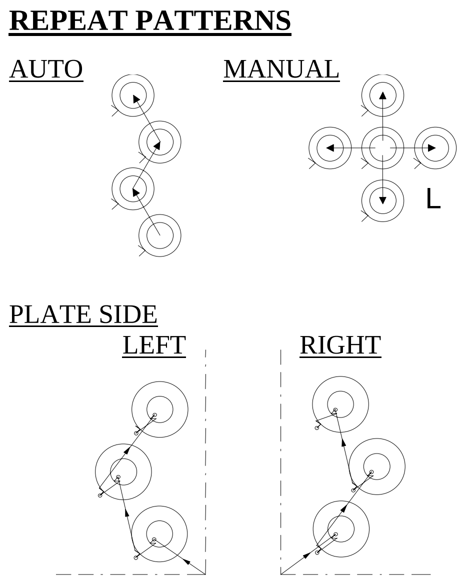
K.	REPEAT DIRECTION	:	(1 OF 4 DIRECTIONS)[2]

NOTES:

1) When "PLATE CORNER START: NO" is selected, position tool at the center of the first part, regardless of the REPEAT MODE selected. From this position, the program moves out to the actual pierce point.
2) The STARTING POSITION and REPEAT DIRECTION parameters can be directly entered with the numeric keypad. Direction arrows are provided for quick reference.
3) When LEADOUT TYPE = DIFFERENT, angled LEADOUTS are cut as shown above (illustrated LEADOUTS assume a clockwise shape). When LEADOUT TYPE = SAME AS, LEADINS and LEADOUTS are cut at the same angle.
4) When performing AUTO REPEAT mode operations, parts are shifted to the left and right at a 60-degree angle to minimize the amount of scrap between parts.

SHAPE 3: RING





A. PLATE CORNER START	:	(YES OR NO)[1]
B. CUT DIRECTION (OD)	:	(CLOCKWISE OR COUNTERCLOCKWISE)[2]
C. STARTING POSITION	:	(1 OF 8 POINTS)[3]
D. INNER DIAMETER SIZE	:	(INCHES OR MILLIMETERS)
E. OUTER DIAMETER SIZE	:	(INCHES OR MILLIMETERS)
F. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
G. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
H. LEADOUT TYPE	:	DIFFERENT/SAME AS[4]
I. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
J. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
K. REPEAT MODE	:	(AUTOMATIC OR MANUAL POSITIONING)[5]

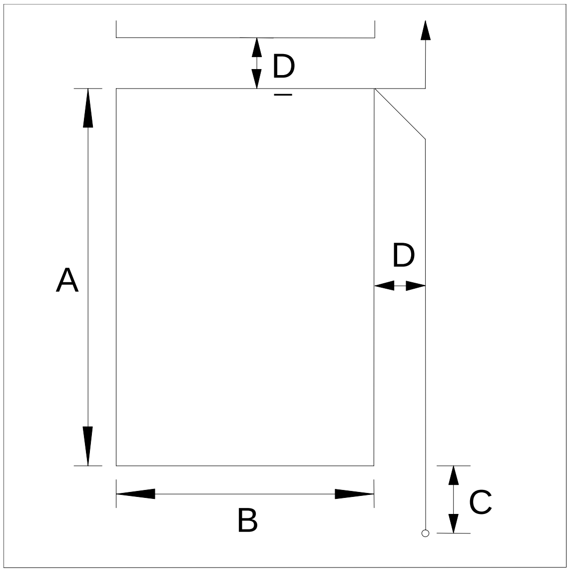
IF MANUAL REPEAT MODE:

L. REPEAT DIRECTION	:	(1 OF 4 DIRECTIONS)[3]

NOTES:

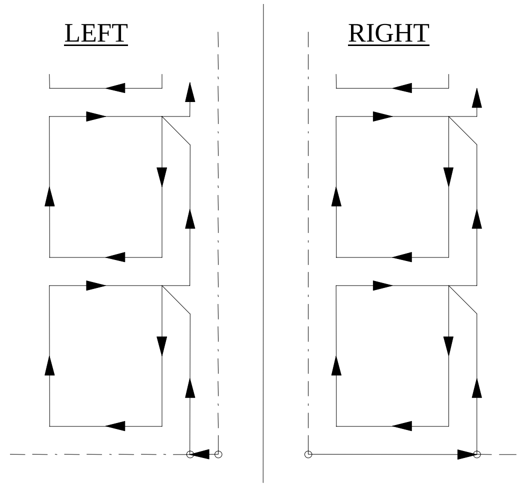
1) When "PLATE CORNER START: NO" is selected, position tool at the center of the first part, regardless of the REPEAT MODE selected. From this position, the program moves out to the actual pierce point.
2) The CUT DIRECTION prompt defines the outer diameter cut direction. The inner direction is always opposite so that the same KERF side (LEFT/RIGHT) can be used for both cuts.
3) The STARTING POSITION and REPEAT DIRECTION parameters can be directly entered with the numeric keypad.
4) When LEADOUT TYPE = DIFFERENT, angled LEADOUTS are cut as shown above (illustrated LEADOUTS assume a clockwise shape). When LEADOUT TYPE = SAME AS, LEADINS and LEADOUTS are cut at the same angle.
5) When performing AUTO REPEAT mode operations, parts are shifted to the left and right at a 60-degree angle.

SHAPE 4: CHAIN RECTANGLE 1



REPEAT PATTERNS

PLATE SIDE[1]

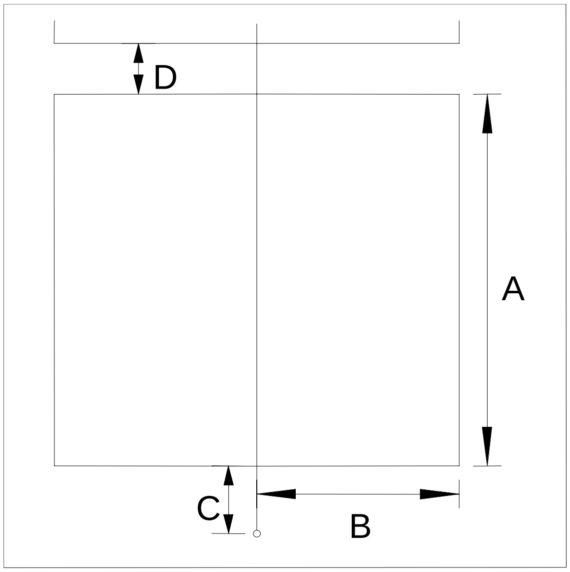


A. X DIMENSION	:	(INCHES OR MILLIMETERS)
B. Y DIMENSION	:	(INCHES OR MILLIMETERS)
C. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
D. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
E. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)[2]

NOTES:

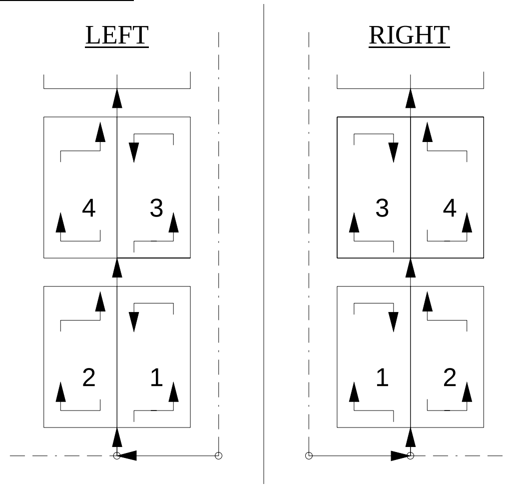
1) All chain cut parts start from the plate corner closest to the operator. The PLATE SIDE is defined through SYSTEM SETUP DATA.
2) A PROGRAM KERF value must be entered here. There is no DIAL-IN KERF at run-time for this shape.

SHAPE 5: CHAIN RECTANGLE 2



REPEAT PATTERNS

PLATE SIDE[1]

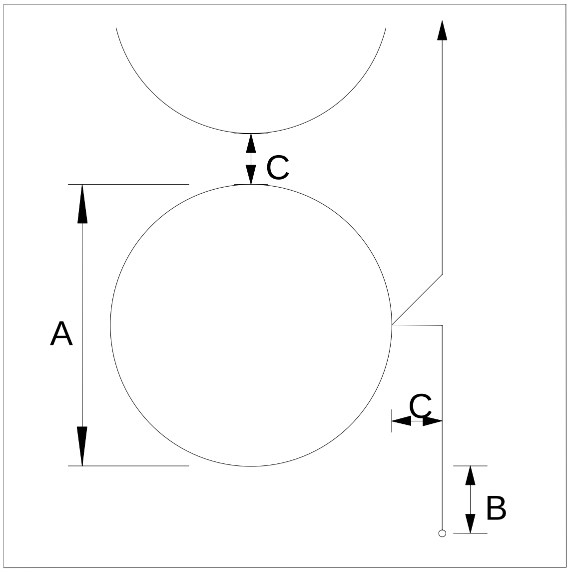


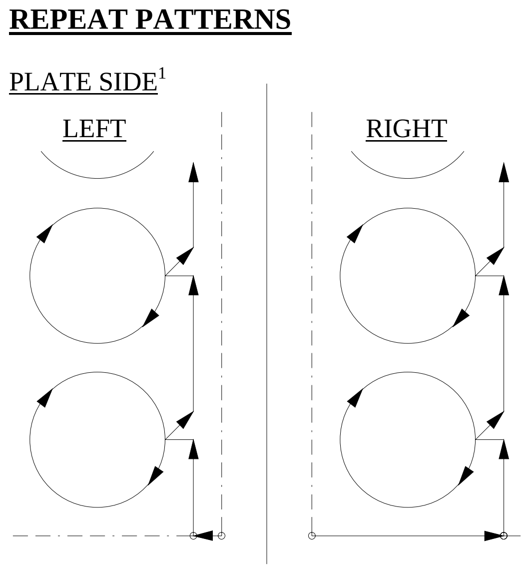
A. X DIMENSION : (INCHES OR MILLIMETERS)
B. Y DIMENSION : (INCHES OR MILLIMETERS)
C. LEADIN DIMENSION : (INCHES OR MILLIMETERS)
D. SCRAP DIMENSION : (DISTANCE BETWEEN PARTS, IN/MM)
E. KERF DIMENSION : (WIDTH OF CUTTING TOOL PATH)[3]

NOTES:

1) All chain cut parts start from the plate corner closest to the operator. The PLATE SIDE is defined through SYSTEM SETUP DATA.
2) The part cutting order also depends on the PLATE SIDE value. The part closest to the corner of the plate is always cut first, as shown under REPEAT PATTERNS.
3) A PROGRAM KERF value must be entered here. There is no DIAL-IN KERF at run-time for this shape.
4) Although the REPEAT PATTERN creates parts in pairs to minimize scrap and reduce cutting time, each part is individually counted when cut.

SHAPE 6: CHAIN CIRCLE



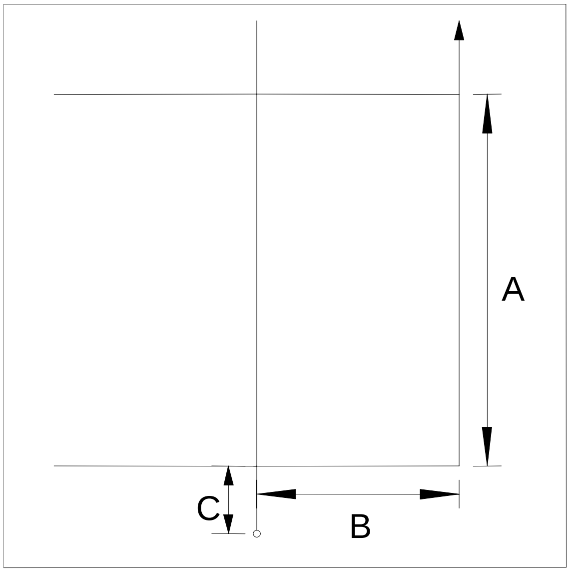


A. DIAMETER PROMPTS	:	(INCHES OR MILLIMETERS)
B. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
C. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
D. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)[2]

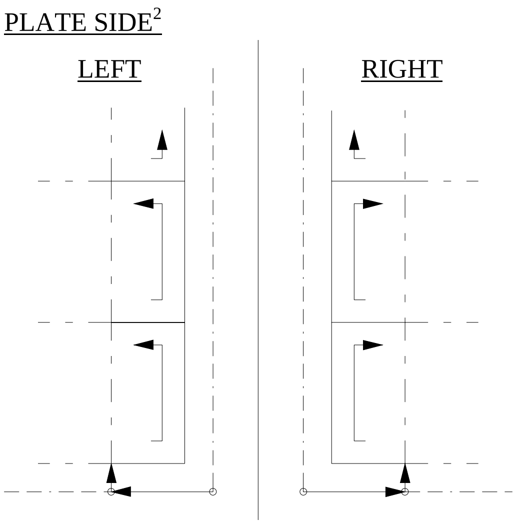
NOTES:

1) All chain cut parts start from the plate corner closest to the operator. The PLATE SIDE is defined through SYSTEM SETUP DATA.
2) A PROGRAM KERF value must be entered here. There is no DIAL-IN KERF at run-time for this shape.

SHAPE 7: RIP CUT



REPEAT PATTERNS

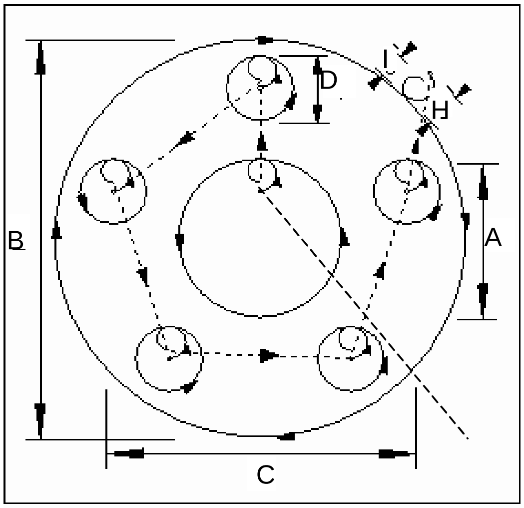


A. X DIMENSION	:	(INCHES OR MILLIMETERS)
B. Y DIMENSION	:	(INCHES OR MILLIMETERS)
C. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
D. SCRAP DIMENSION	:	(DISTANCE FROM EDGE OF PLATE, IN/MM)
E. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)

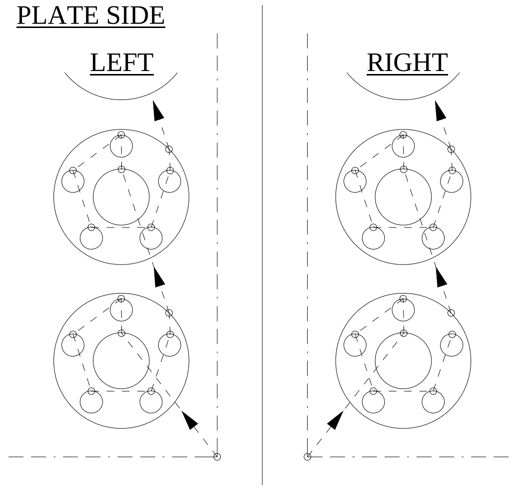
NOTES:

1) This part is designed for use with multiple tools.
2) All RIP CUTS start at the corner of the plate closest to the operator. The PLATE SIDE is defined through SYSTEM SETUP DATA.
3) The cutting sequence also depends on the PLATE SIDE value. After moving away from the corner, a cut is made back towards the corner, as shown above.

SHAPE 8: FLANGE



REPEAT PATTERNS

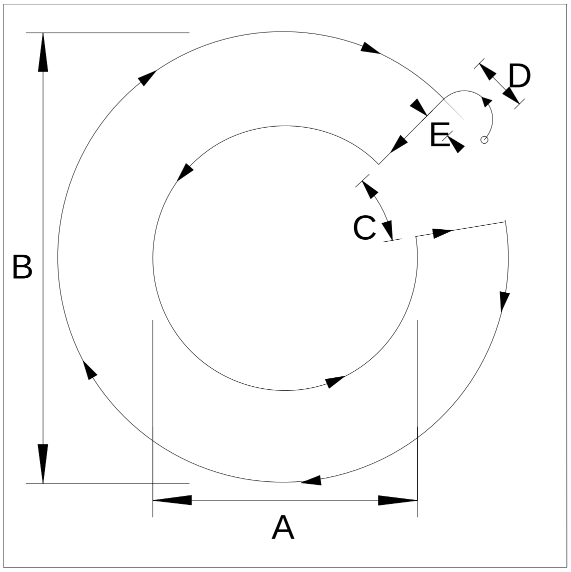


A.	INNER DIAMETER SIZE	:	(INCHES OR MILLIMETERS)[1]
B.	OUTER DIAMETER SIZE	:	(INCHES OR MILLIMETERS)
C.	BOLT CENTER DIAMETER	:	(INCHES OR MILLIMETERS)
D.	BOLT HOLE DIAMETER	:	(INCHES OR MILLIMETERS)
E.	NUMBER OF BOLTS	:	(COUNT, 0 to 99)[2]
F.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
G.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
H.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
I.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
J.	CIRCULAR LEAD-IN	:	(YES/NO)[3]
K.	CIRCULAR LEAD OUT	:	(YES/NO)[3]

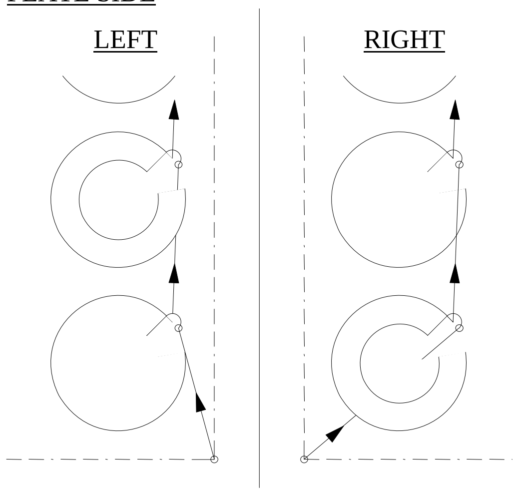
NOTES:

1) If an INNER DIAMETER of 0 is defined, no center hole is cut.
2) If the NUMBER OF BOLTS is defined as 0, no bolt holes are cut.
3) If YES then the lead-in/lead-out will be circular with a dimension H, if NO the lead-in/lead-out will be straight with a dimension H.

SHAPE 9: SPLIT RING



REPEAT PATTERNS

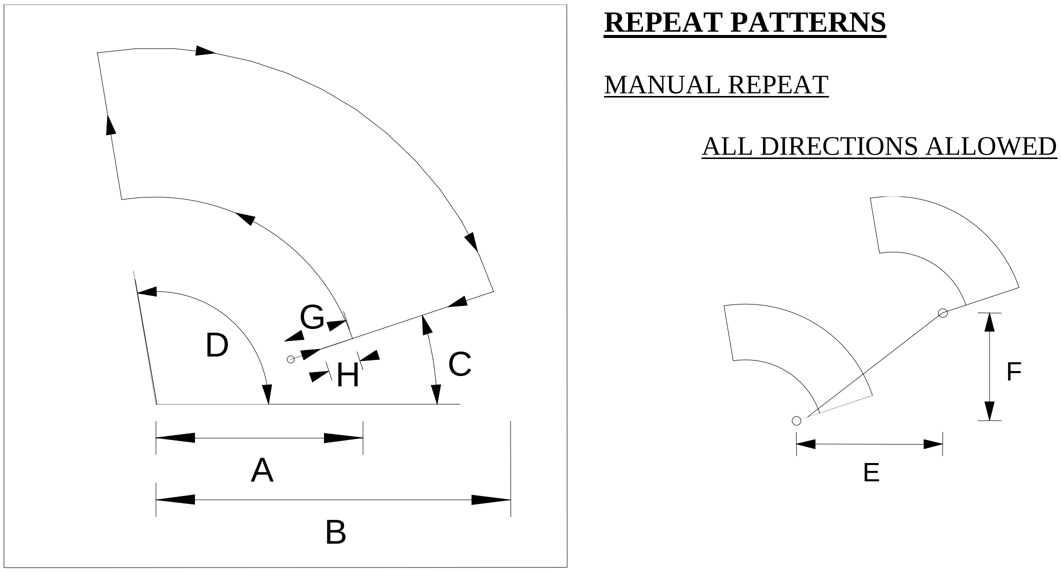


A. INNER DIAMETER SIZE	:	(INCHES OR MILLIMETERS)
B. OUTER DIAMETER SIZE	:	(INCHES OR MILLIMETERS)
C. SPLIT DEGREES	:	(DEGREES)[2,3]
D. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
E. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
F. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
G. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
H. CIRCULAR LEAD-IN	:	(YES/NO)[4]

NOTES:

1) The starting position is always at the 45-degree position as shown.
2) The ending position is determined by the SPLIT DEGREES value.
3) The actual spacing between parts is based on the assumption that SPLIT DEGREES is less than 135 degrees. If not, the scrap between parts may be excessive. Therefore smaller arc segments should be cut using shape 10, RING DEGREES.
4) If YES then the lead-in will be circular with a dimension D, if NO the lead-in will straight with a dimension D.

SHAPE 10: RING DEGREES

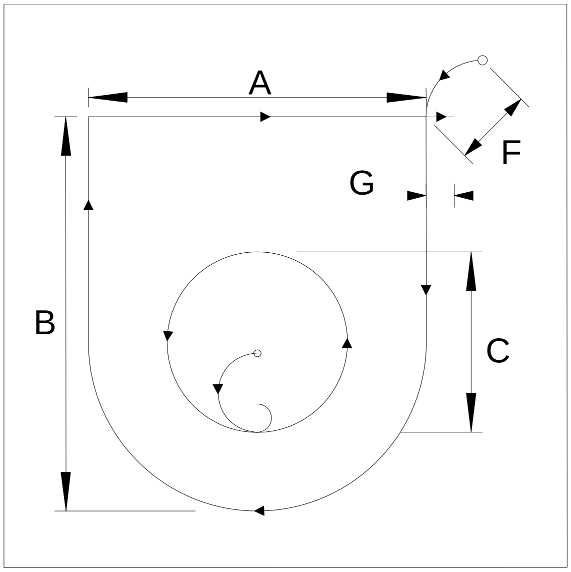


A.	INSIDE RADIUS SIZE	:	(INCHES OR MILLIMETERS)
B.	OUTSIDE RADIUS SIZE	:	(INCHES OR MILLIMETERS)
C.	STARTING DEGREES	:	(DEGREES)[1]
D.	ENDING DEGREES	:	(DEGREES)[1]
E.	CROSS REPEAT DISTANCE	:	(Y DISTANCE TO NEXT PART)[2]
F.	RAIL REPEAT DISTANCE	:	(X DISTANCE TO NEXT PART)[2]
G.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)[3]
H.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
I.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)

NOTES:

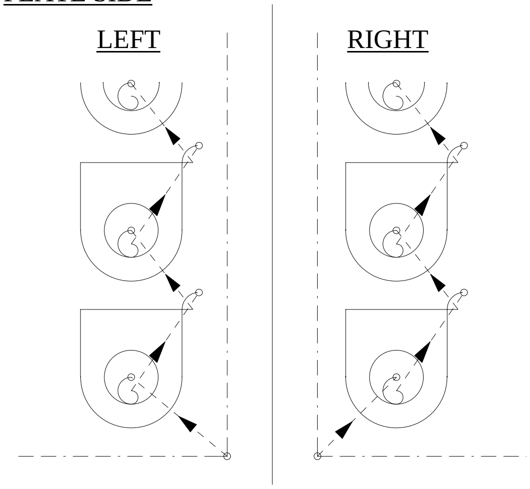
1) The STARTING DEGREES and ENDING DEGREES values represent angular position with respect to the Y axis (0 degrees is parallel to the Y axis and 90 degrees is parallel to the X axis).
2) The REPEAT DISTANCE parameters define the distance from the start of one part to the next. These values must be large enough to provide the necessary SCRAP between parts.
3) When running the resulting NC part program, the machine moves out from the starting corner of the part to the pierce point defined by the LEADIN DIMENSION.

SHAPE 11: STRAIGHT LUG



REPEAT PATTERNS

PLATE SIDE

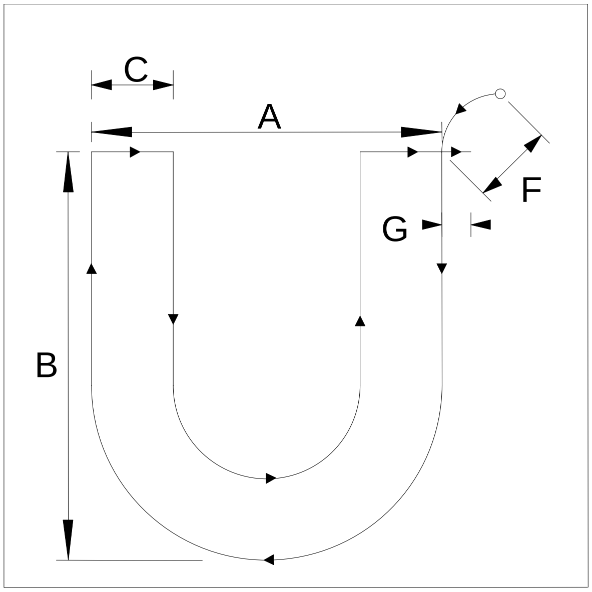


A. WIDTH PROMPT	:	(INCHES OR MILLIMETERS)
B. HEIGHT PROMPT	:	(INCHES OR MILLIMETERS)
C. HOLE DIAMETER	:	(INCHES OR MILLIMETERS)[1]
D. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
E. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
F. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
G. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
H. CIRCULAR LEAD-IN	:	(YES/NO)[2]
I. CIRCULAR LEAD-OUT	:	(YES/NO)[2]

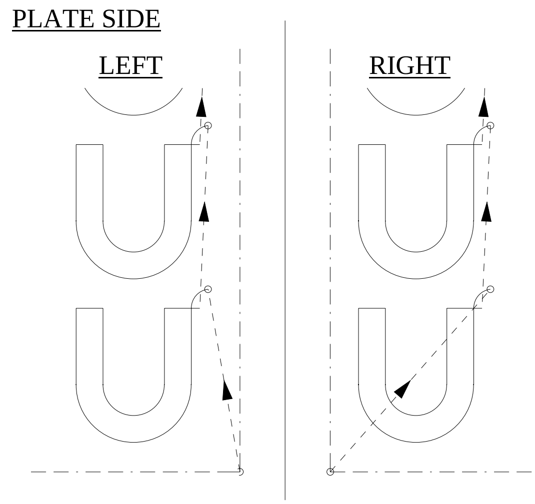
NOTES:

1) If a HOLE DIAMETER of 0 is defined, no center hole is cut.
2) If YES then the lead-in/lead-out will be circular with a dimension F, if NO the lead-in/lead-out will straight with a dimension F.

SHAPE 12: LUG FRAME



REPEAT PATTERNS

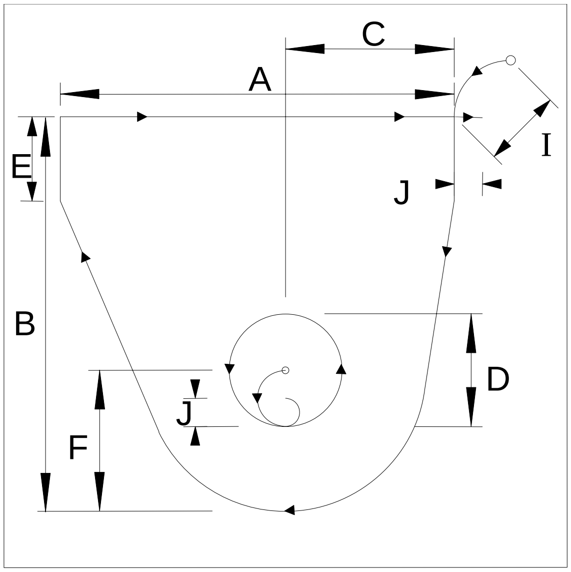


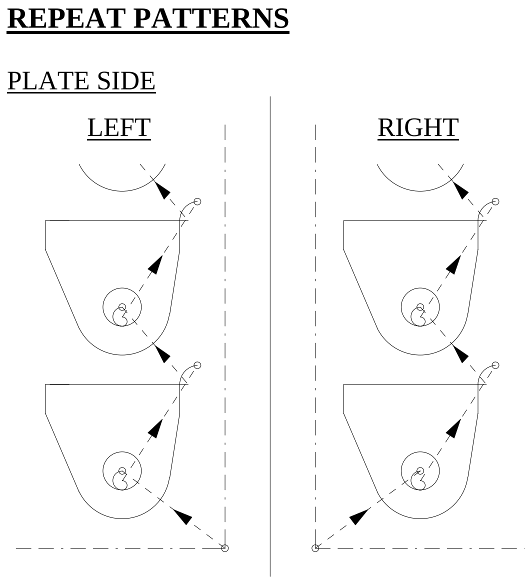
A.	WIDTH PROMPT	:	(INCHES OR MILLIMETERS)
B.	HEIGHT PROMPT	:	(INCHES OR MILLIMETERS)
C.	THICKNESS DIMENSION	:	(INCHES OR MILLIMETERS)
D.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
E.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
F.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
G.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
H.	CIRCULAR LEAD-IN	:	(YES/NO)[1]

NOTES:

1) If YES then the lead-in will be circular with a dimension F, if NO the lead-in will straight with a dimension F.

SHAPE 13: SLANT LUG



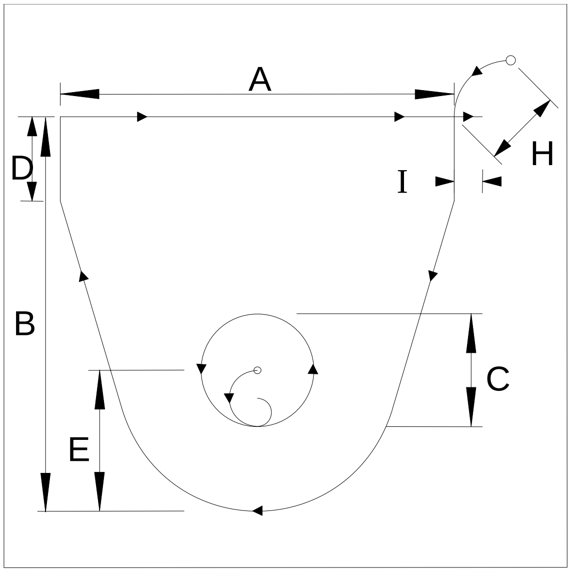


A. WIDTH PROMPTS : (INCHES OR MILLIMETERS)
B. HEIGHT PROMPTS : (INCHES OR MILLIMETERS)
C. BOLT HOLE CENTER : (INCHES OR MILLIMETERS)
D. HOLE DIAMETER : (INCHES OR MILLIMETERS)[1]
E. SHOULDER HEIGHT : (INCHES OR MILLIMETERS)
F. RADIUS PROMPTS : (INCHES OR MILLIMETERS)
G. KERF DIMENSION : (WIDTH OF CUTTING TOOL PATH)
H. SCRAP DIMENSION : (DISTANCE BETWEEN PARTS, IN/MM)
I. LEADIN DIMENSION : (INCHES OR MILLIMETERS)
J. LEADOUT DIMENSION : (INCHES OR MILLIMETERS)
K. CIRCULAR LEAD-IN : (YES/NO)[2]
L. CIRCULAR LEAD-OUT : (YES/NO)[2]

NOTES:

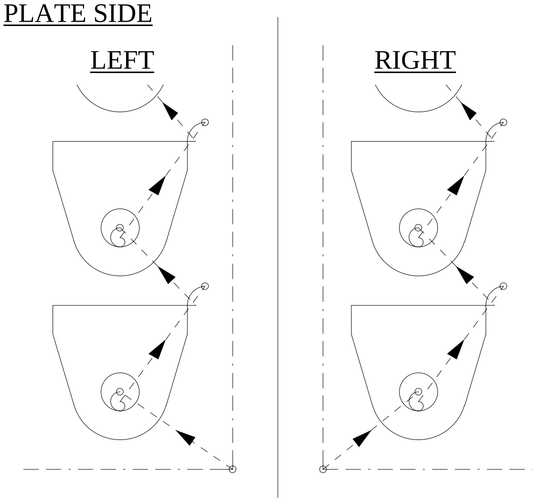
1) If a HOLE DIAMETER of 0 is defined, no center hole is cut.
2) If YES then the lead-in/lead-out will be circular with a dimension I, if NO the lead-in/lead-out will be straight with a dimension I.

SHAPE 14: LIFT LUG



REPEAT PATTERNS

PLATE SIDE

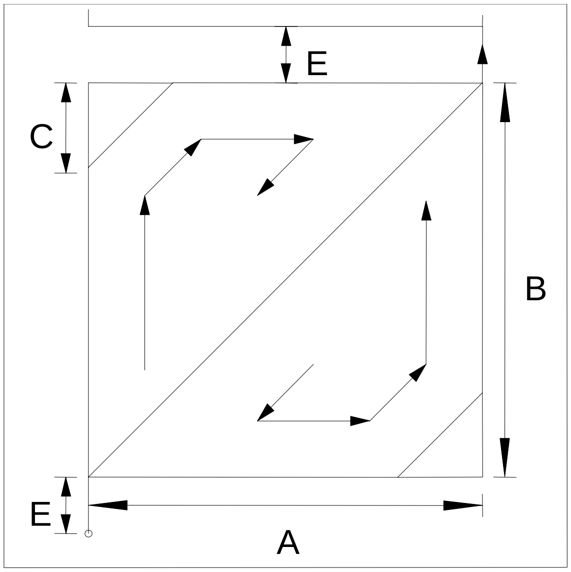


A. WIDTH PROMPT	:	(INCHES OR MILLIMETERS)
B. HEIGHT PROMPT	:	(INCHES OR MILLIMETERS)
C. HOLE DIAMETER	:	(INCHES OR MILLIMETERS)[1]
D. SHOULDER HEIGHT	:	(INCHES OR MILLIMETERS)
E. RADIUS PROMPT	:	(INCHES OR MILLIMETERS)
F. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
G. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
H. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
I. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
J. CIRCULAR LEAD-IN	:	(YES/NO)[2]
K. CIRCULAR LEAD-OUT	:	(YES/NO)[2]

NOTES:

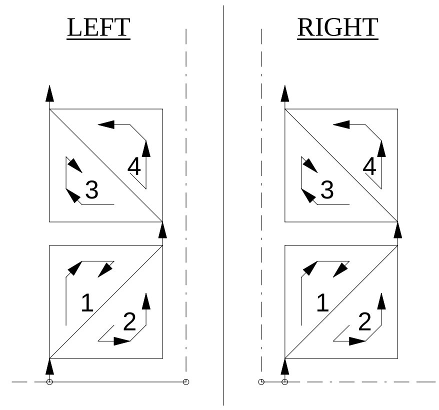
1) If a HOLE DIAMETER of 0 is defined, no center hole is cut.
2) If YES then the lead-in/lead-out will be circular with a dimension H, if NO the lead-in/lead-out will be straight with a dimension H.

SHAPE 15: WEDGE PAIR



REPEAT PATTERNS

PLATE SIDE

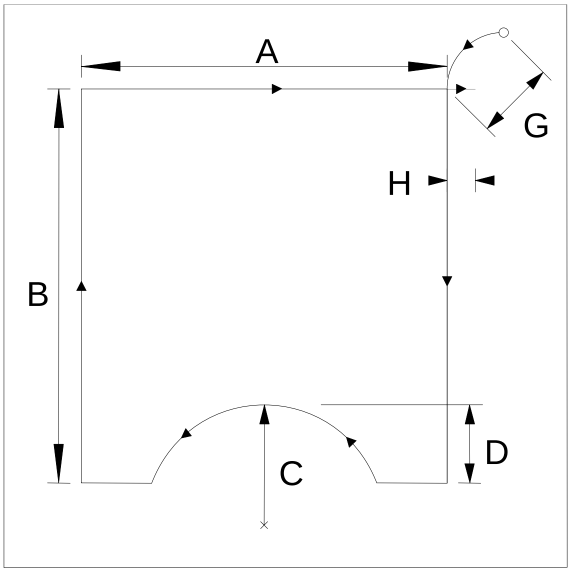


A. WIDTH DIMENSION : (INCHES OR MILLIMETERS)
B. HEIGHT DIMENSION : (INCHES OR MILLIMETERS)
C. BEVEL LENGTH : (INCHES OR MILLIMETERS)[2]
D. KERF DIMENSION : (WIDTH OF CUTTING TOOL PATH)[3]
E. SCRAP DIMENSION : (DISTANCE BETWEEN PARTS, IN/MM)

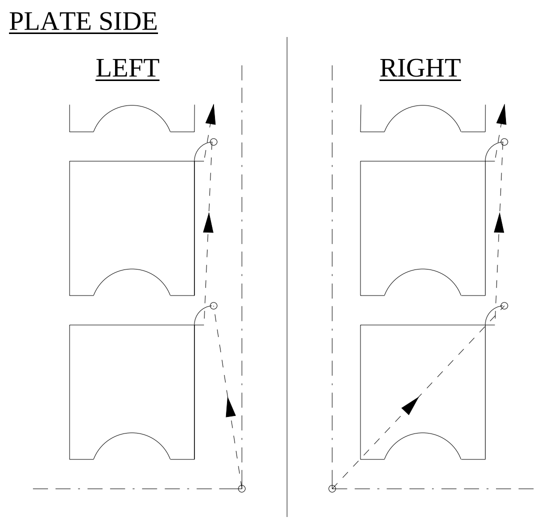
NOTES:

1) This shape creates a special 4-part repeat sequence to minimize the amount of scrap. However, any number of parts may be cut since each of the 4 is counted as a separate part.
2) If a BEVEL LENGTH of 0 is defined, no bevel is cut at the corners. Only sharp, 90-degree corners are cut.
3) A PROGRAM KERF value must be entered here. There is no DIAL-IN KERF at run-time for this shape.

SHAPE 16: STRAIGHT PIPE SUPPORT



REPEAT PATTERNS

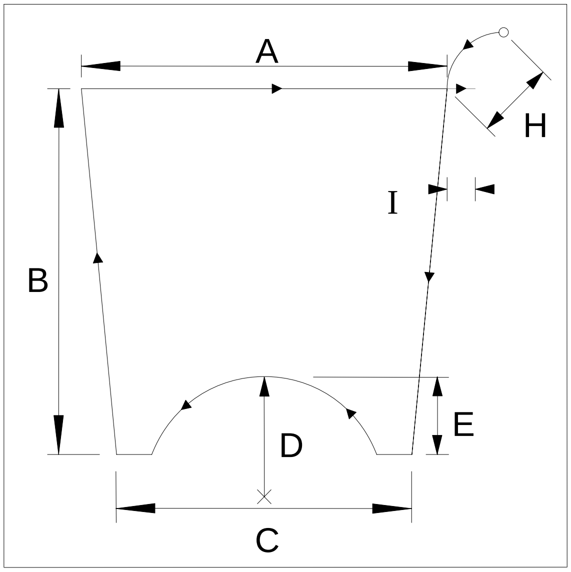


A.	WIDTH DIMENSION	:	(INCHES OR MILLIMETERS)
B.	HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C.	RADIUS DIMENSION	:	(INCHES OR MILLIMETERS)
D.	ARC DEPTH	:	(INCHES OR MILLIMETERS)
E.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
F.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
G.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
H.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
I.	CIRCULAR LEAD-IN?	:	(YES/NO)

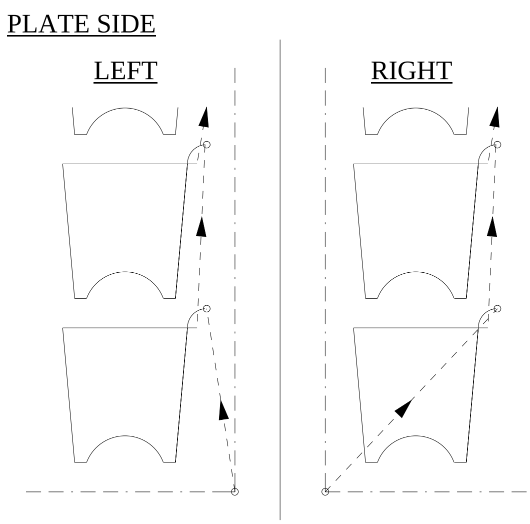
NOTES:

1) If YES then the lead-in will be circular with a dimension G, if NO the lead-in will straight with a dimension G.

SHAPE 17: SLANT PIPE SUPPORT



REPEAT PATTERNS

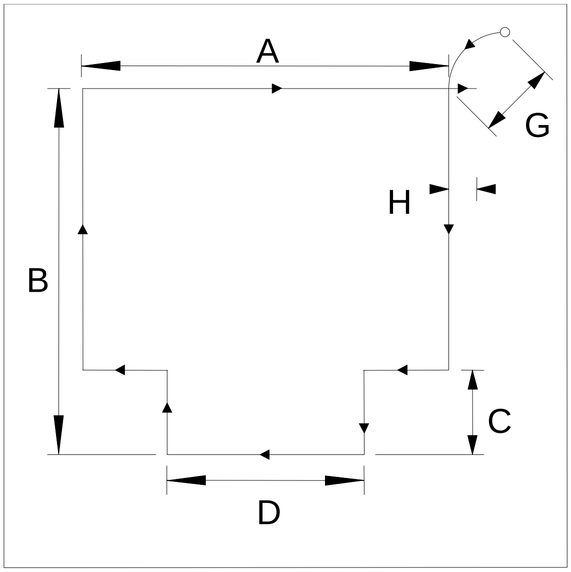


A. BASE WIDTH	:	(INCHES OR MILLIMETERS)[1]
B. HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C. TOP WIDTH	:	(INCHES OR MILLIMETERS)
D. RADIUS DIMENSION	:	(INCHES OR MILLIMETERS)
E. ARC DEPTH	:	(INCHES OR MILLIMETERS)
F. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
G. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
H. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
I. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
J. CIRCULAR LEAD-IN?	:	(YES/NO)

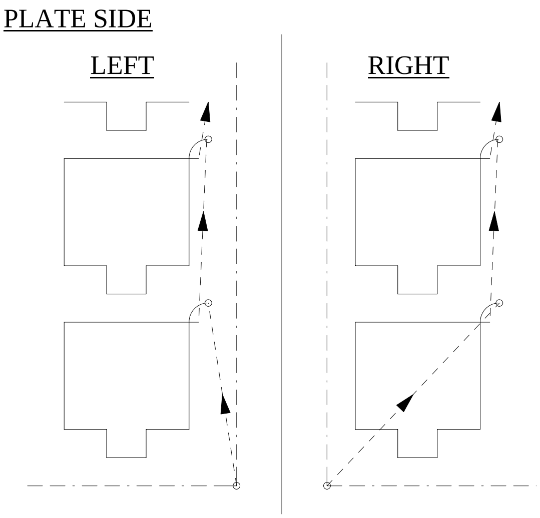
NOTES:

1) Like others, this part is cut with the BASE at the upper position. As a result, the prompts used to label the top and sides assume the part is rotated 180 degrees.
2) If YES then the lead-in will be circular with a dimension H, if NO the lead-in will be straight with a dimension H.

SHAPE 18: VERTICAL PROJECTION



REPEAT PATTERNS

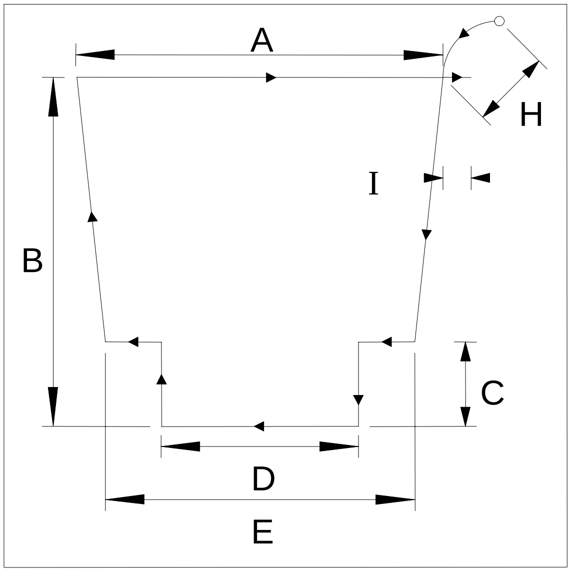


A.	WIDTH DIMENSION	:	(INCHES OR MILLIMETERS)
B.	HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C.	COLLAR HEIGHT	:	(INCHES OR MILLIMETERS)
D.	COLLAR WIDTH	:	(INCHES OR MILLIMETERS)
E.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
F.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
G.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
H.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
I.	CIRCULAR LEAD-IN?	:	(YES/NO)[1]

NOTES:

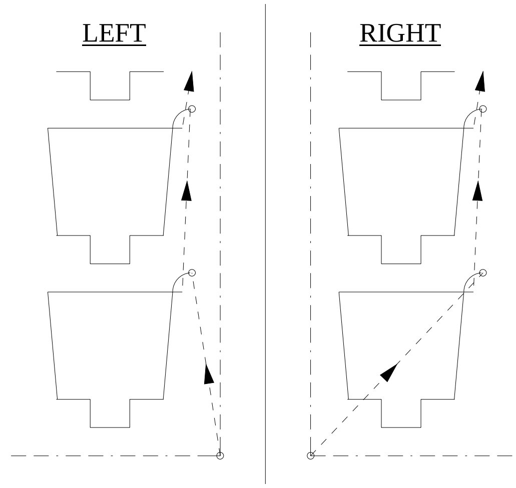
1) If YES then the lead-in will be circular with a dimension G, if NO the lead-in will be straight with a dimension G.

SHAPE 19: SLANT PROJECTION



REPEAT PATTERNS

PLATE SIDE

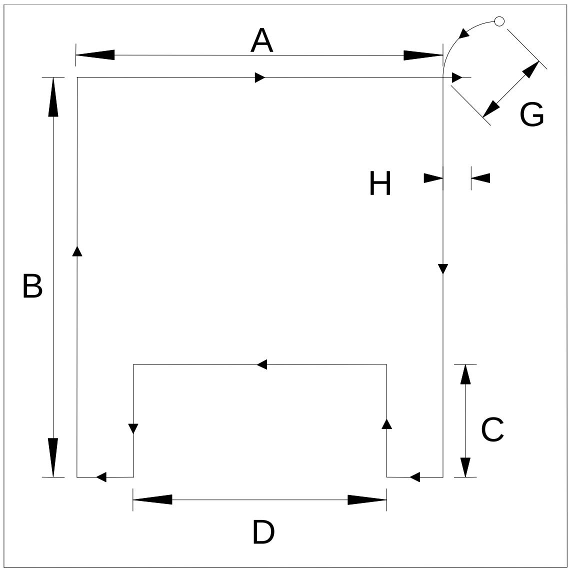


A.	BASE WIDTH	:	(INCHES OR MILLIMETERS)[1]
B.	HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C.	COLLAR HEIGHT	:	(INCHES OR MILLIMETERS)
D.	COLLAR WIDTH	:	(INCHES OR MILLIMETERS)
E.	TOP WIDTH	:	(INCHES OR MILLIMETERS)
F.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
G.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
H.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
I.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
J.	CIRCULAR LEAD-IN?	:	(YES/NO)[2]

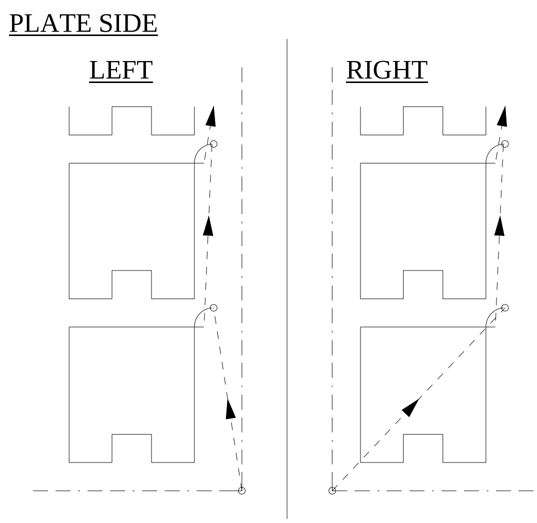
NOTES:

1) Like others, this part is cut with the BASE at the upper position. As a result, the prompts used to label the top and sides assume the part is rotated 180 degrees.
2) If YES then the lead-in will be circular with a dimension H, if NO the lead-in will be straight with a dimension H.

SHAPE 20: VERTICAL SLOT



REPEAT PATTERNS

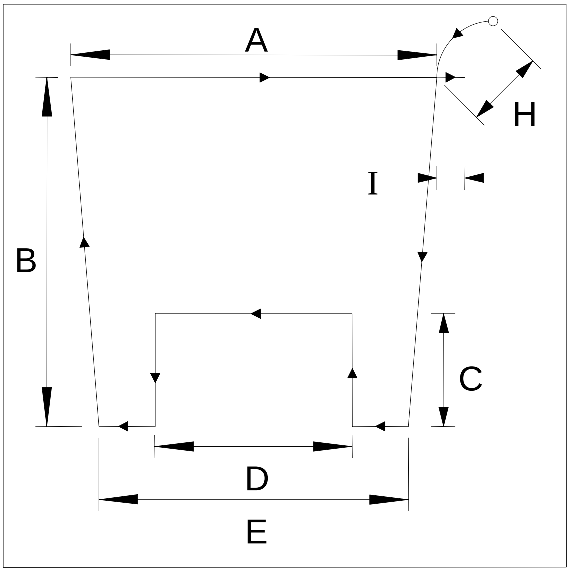


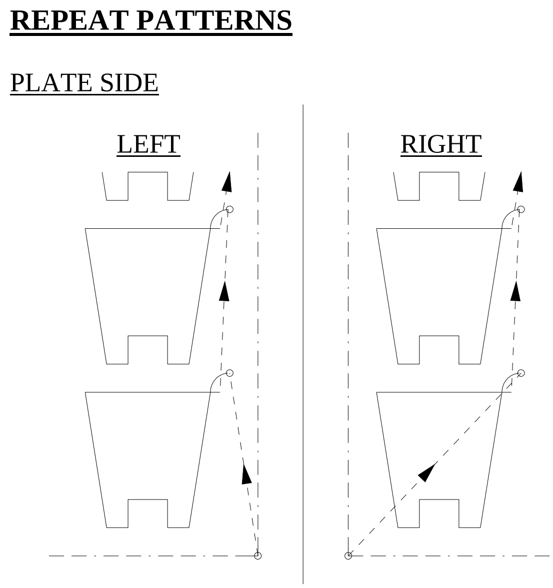
A.	WIDTH DIMENSION	:	(INCHES OR MILLIMETERS)
B.	HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C.	COLLAR HEIGHT	:	(INCHES OR MILLIMETERS)
D.	COLLAR WIDTH	:	(INCHES OR MILLIMETERS)
E.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
F.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
G.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
H.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
I.	CIRCULAR LEAD-IN?	:	(YES/NO)[1]

NOTES:

1) If YES then the lead-in will be circular with a dimension G, if NO the lead-in will be straight with a dimension G.

SHAPE 21: SLANT SLOT



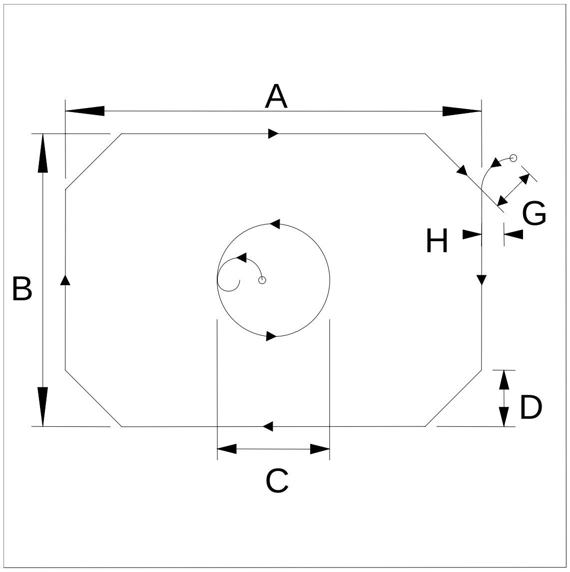


A.	BASE WIDTH	:	(INCHES OR MILLIMETERS)[1]
B.	HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C.	COLLAR HEIGHT	:	(INCHES OR MILLIMETERS)
D.	COLLAR WIDTH	:	(INCHES OR MILLIMETERS)
E.	TOP WIDTH	:	(INCHES OR MILLIMETERS)
F.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
G.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
H.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
I.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
J.	CIRCULAR LEAD-IN?	:	(YES/NO)[2]

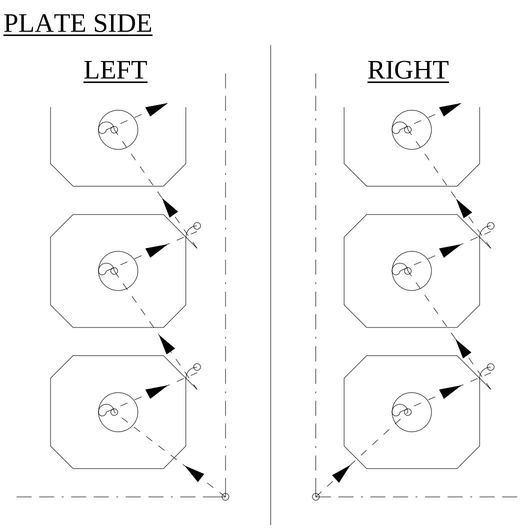
NOTES:

1) Like others, this part is cut with the BASE at the upper position. As a result, the prompts used to label the top and sides assume the part is rotated 180 degrees.
2) If YES then the lead-in will be circular with a dimension H, if NO the lead-in will be straight with a dimension H.

SHAPE 22: OCTAGON



REPEAT PATTERNS

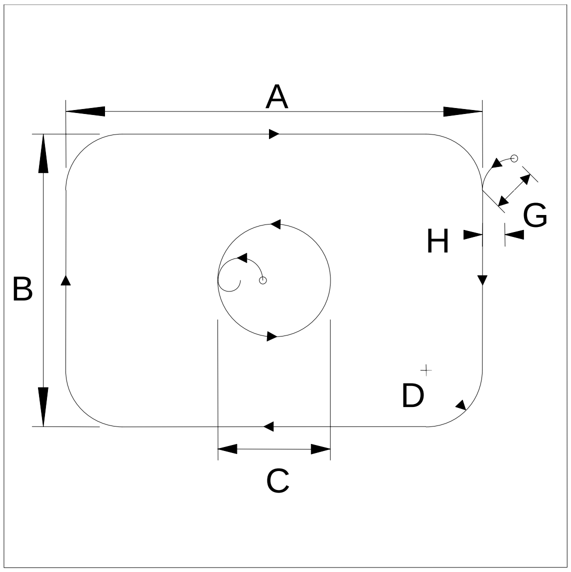


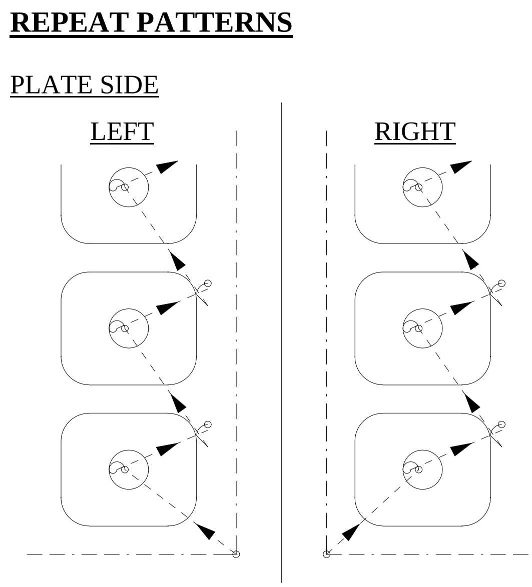
A.	WIDTH DIMENSION	:	(INCHES OR MILLIMETERS)
B.	HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C.	HOLE DIAMETER	:	(INCHES OR MILLIMETERS)[1]
D.	BEVEL LENGTH	:	(INCHES OR MILLIMETERS)[2]
E.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
F.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
G.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
H.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
I.	CIRCULAR LEAD-IN?	:	(YES/NO)
J.	CIRCULAR LEAD-OUT?	:	(YES/NO)

NOTES:

1) If a HOLE DIAMETER of 0 is defined, no center hole is cut.
2) If a BEVEL LENGTH of 0 is defined, no bevel is cut at the corners. Only sharp, 90-degree corners are cut.
3) If YES then the lead-in will be circular with a dimension G, if NO the lead-in will straight with a dimension G.

SHAPE 23: SQUARE, CORNER RADIUS IN



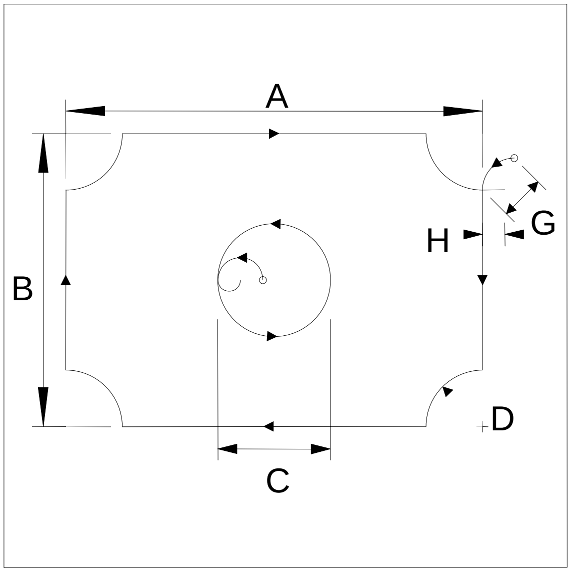


A.	WIDTH DIMENSION	:	(INCHES OR MILLIMETERS)
B.	HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C.	HOLE DIAMETER	:	(INCHES OR MILLIMETERS)[1]
D.	ARC RADIUS	:	(INCHES OR MILLIMETERS)
E.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
F.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
G.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
H.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
I.	CIRCULAR LEAD-IN?	:	(YES/NO)[2]
J.	CIRCULAR LEAD-OUT?	:	(YES/NO)[2]

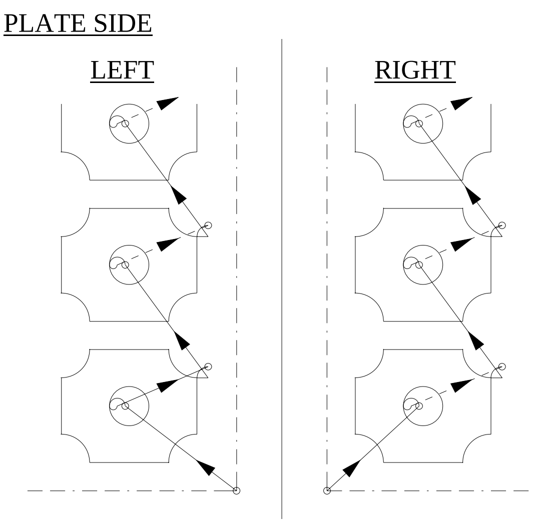
NOTES:

1) If a HOLE DIAMETER of 0 is defined, no center hole is cut.
2) If YES then the lead-in/lead-out will be circular with a dimension G, if NO the lead-in/lead-out will be straight with a dimension G.

SHAPE 24: SQUARE, CORNER RADIUS OUT



REPEAT PATTERNS

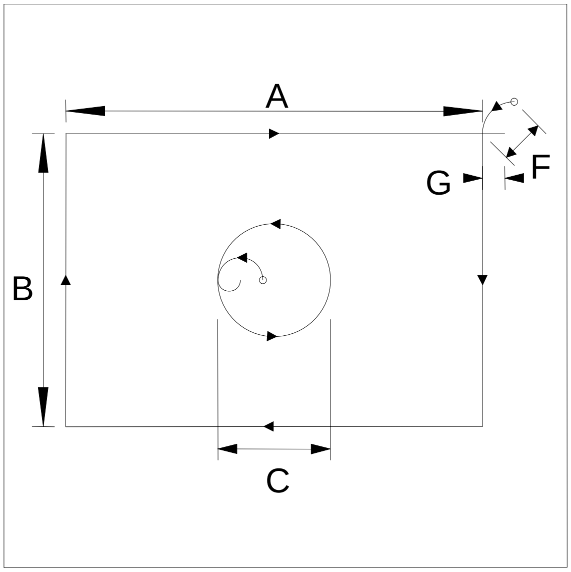


A. WIDTH DIMENSION	:	(INCHES OR MILLIMETERS)
B. HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C. HOLE DIAMETER	:	(INCHES OR MILLIMETERS)[1]
D. ARC RADIUS	:	(INCHES OR MILLIMETERS)
E. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
F. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
G. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
H. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
I. CIRCULAR LEAD-IN?	:	(YES/NO)[2]
J. CIRCULAR LEAD-OUT?	:	(YES/NO)[2]

NOTES:

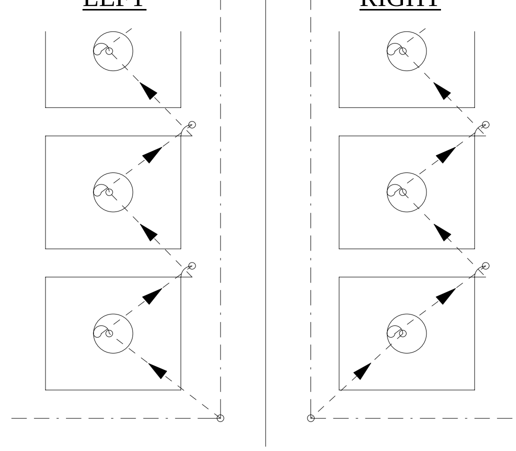
1) If a HOLE DIAMETER of 0 is defined, no center hole is cut.
2) If YES then the lead-in/lead-out will be circular with a dimension G, if NO the lead-in/lead-out will be straight with a dimension G.

SHAPE 25: SQUARE WITH HOLE



REPEAT PATTERNS

PLATE SIDE

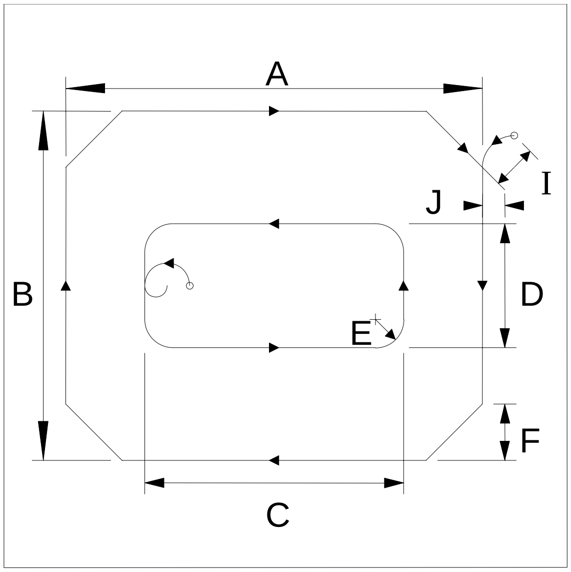


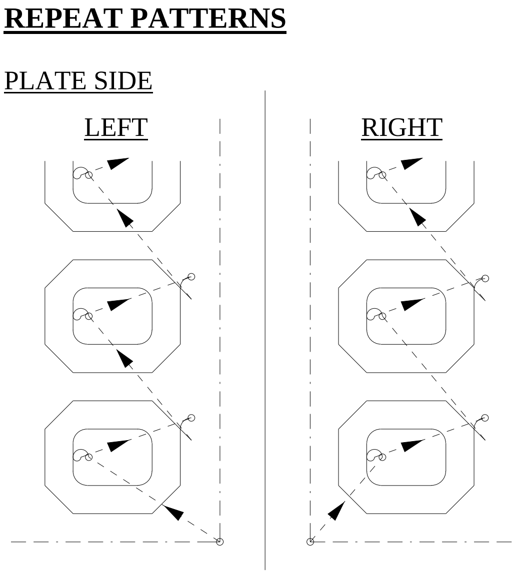
A. WIDTH DIMENSION	:	(INCHES OR MILLIMETERS)
B. HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C. HOLE DIAMETER	:	(INCHES OR MILLIMETERS)[1]
D. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
E. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
F. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
G. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
H. CIRCULAR LEAD-IN?	:	(YES/NO)[2]
I. CIRCULAR LEAD-OUT?	:	(YES/NO)[2]

NOTES:

1) If a HOLE DIAMETER of 0 is defined, no center hole is cut.
2) If YES then the lead-in/lead-out will be circular with a dimension F, if NO the lead-in/lead-out will straight with a dimension F.

SHAPE 26: OCTAGONAL FRAME



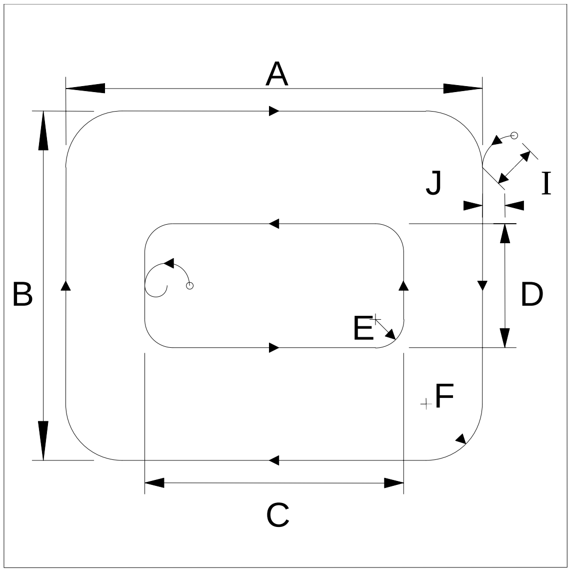


A. OUTSIDE WIDTH	:	(INCHES OR MILLIMETERS)
B. OUTSIDE HEIGHT	:	(INCHES OR MILLIMETERS)
C. INSIDE WIDTH	:	(INCHES OR MILLIMETERS)
D. INSIDE HEIGHT	:	(INCHES OR MILLIMETERS)
E. INSIDE RADIUS	:	(INCHES OR MILLIMETERS)
F. BEVEL LENGTH	:	(INCHES OR MILLIMETERS)[1]
G. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
H. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
I. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
J. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
K. CIRCULAR LEAD-IN	:	(YES/NO)[2]
L. CIRCULAR LEAD-OUT	:	(YES/NO)[2]

NOTES:

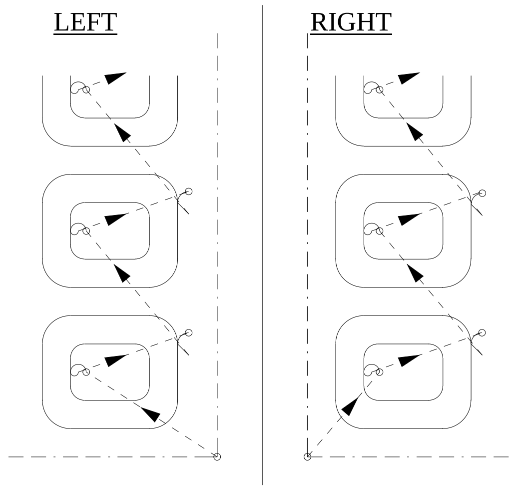
1) If a BEVEL LENGTH of 0 is defined, no bevel is cut at the corners. Only sharp, 90-degree corners are cut.
2) If YES then the lead-in/lead-out will be circular with a dimension I, if NO the lead-in/lead-out will be straight with a dimension I.

SHAPE 27: FRAME, CORNER RADIUS IN



REPEAT PATTERNS

PLATE SIDE

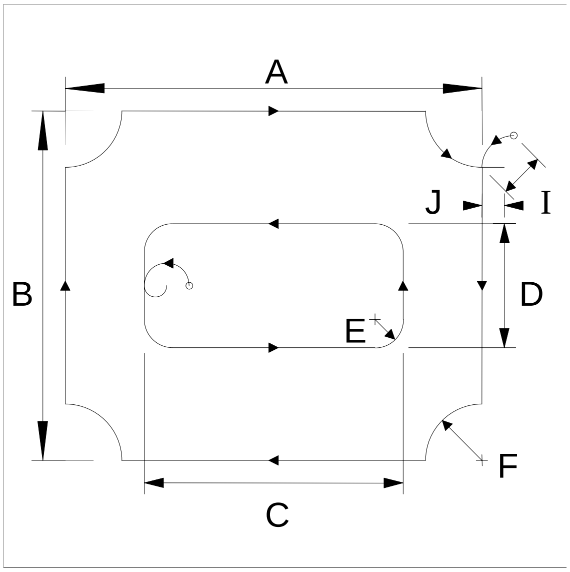


A. OUTSIDE WIDTH	:	(INCHES OR MILLIMETERS)
B. OUTSIDE HEIGHT	:	(INCHES OR MILLIMETERS)
C. INSIDE WIDTH	:	(INCHES OR MILLIMETERS)
D. INSIDE HEIGHT	:	(INCHES OR MILLIMETERS)
E. INSIDE RADIUS	:	(INCHES OR MILLIMETERS)
F. ARC RADIUS	:	(INCHES OR MILLIMETERS)
G. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
H. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
I. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)[1]
J. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)

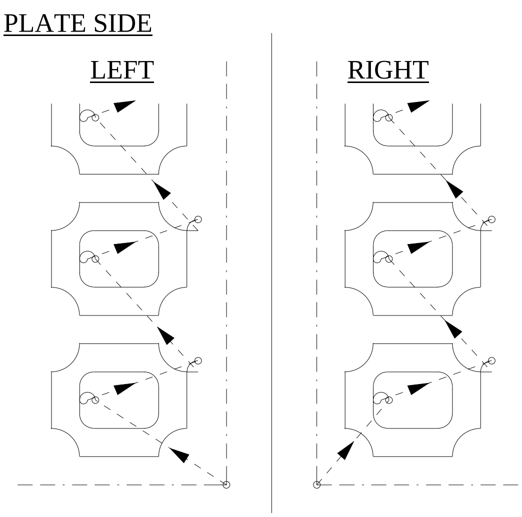
NOTES:

1) If YES then the lead-in will be circular with a dimension I, if NO the lead-in will be straight with a dimension I.

SHAPE 28: FRAME, CORNER RADIUS OUT



REPEAT PATTERNS

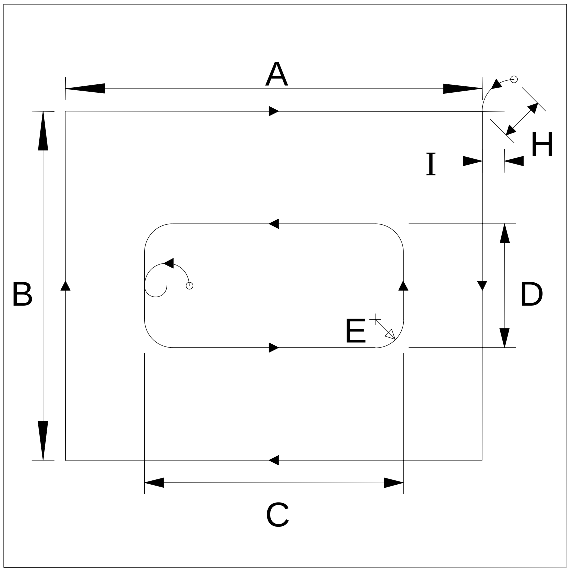


A. OUTSIDE WIDTH	:	(INCHES OR MILLIMETERS)
B. OUTSIDE HEIGHT	:	(INCHES OR MILLIMETERS)
C. INSIDE WIDTH	:	(INCHES OR MILLIMETERS)
D. INSIDE HEIGHT	:	(INCHES OR MILLIMETERS)
E. INSIDE RADIUS	:	(INCHES OR MILLIMETERS)
F. ARC RADIUS	:	(INCHES OR MILLIMETERS)
G. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
H. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
I. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
J. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
K. CIRCULAR LEAD-IN?	:	(YES/NO)[1]
L. CIRCULAR LEAD-OUT?	:	(YES/NO)[1]

NOTES:

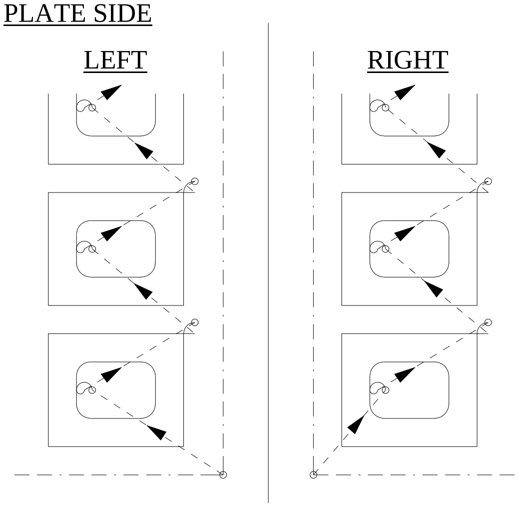
1) If YES then the lead-in/lead-out will be circular with a dimension I, if NO the lead-in/lead-out will be straight with a dimension I.

SHAPE 29: SQUARE FRAME



REPEAT PATTERNS

PLATE SIDE

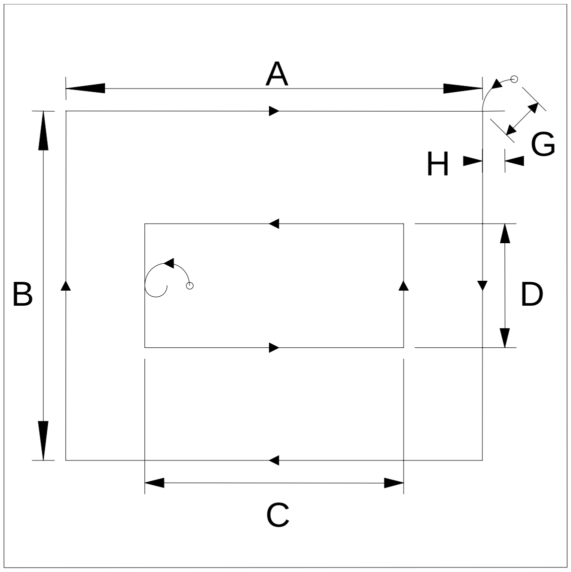


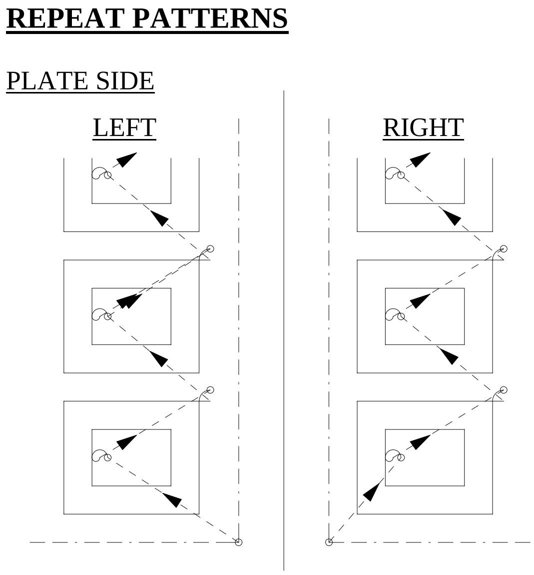
A.	OUTSIDE WIDTH	: (INCHES OR MILLIMETERS)
B.	OUTSIDE HEIGHT	: (INCHES OR MILLIMETERS)
C.	INSIDE WIDTH	: (INCHES OR MILLIMETERS)
D.	INSIDE HEIGHT	: (INCHES OR MILLIMETERS)
E.	INSIDE RADIUS	: (INCHES OR MILLIMETERS)
F.	KERF DIMENSION	: (WIDTH OF CUTTING TOOL PATH)
G.	SCRAP DIMENSION	: (DISTANCE BETWEEN PARTS, IN/MM)
H.	LEADIN DIMENSION	: (INCHES OR MILLIMETERS)
I.	LEADOUT DIMENSION	: (INCHES OR MILLIMETERS)
J.	CIRCULAR LEAD-IN?	: (YES/NO)[1]
K.	CIRCULAR LEAD-OUT?	: (YES/NO)[1]

NOTES:

1) If YES then the lead-in/lead-out will be circular with a dimension H, if NO the lead-in/lead-out will be straight with a dimension H.

SHAPE 30: RECTANGULAR FRAME



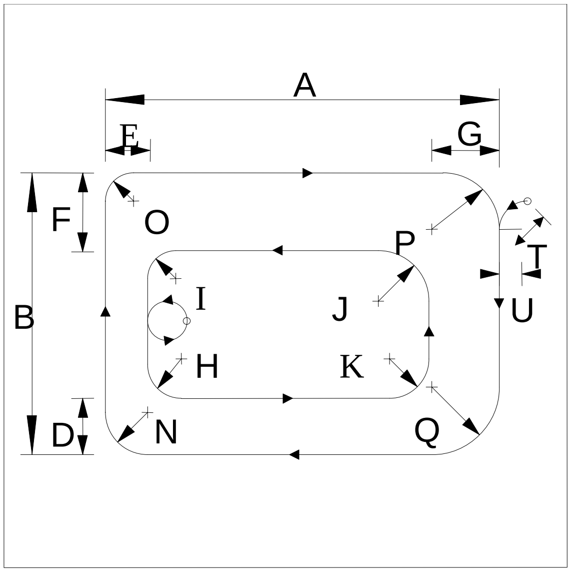


A. OUTSIDE WIDTH	:	(INCHES OR MILLIMETERS)
B. OUTSIDE HEIGHT	:	(INCHES OR MILLIMETERS)
C. INSIDE WIDTH	:	(INCHES OR MILLIMETERS)
D. INSIDE HEIGHT	:	(INCHES OR MILLIMETERS)
E. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
F. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
G. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
H. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
I. CIRCULAR LEAD-IN?	:	(YES/NO)[1]
J. CIRCULAR LEAD-OUT?	:	(YES/NO)[1]

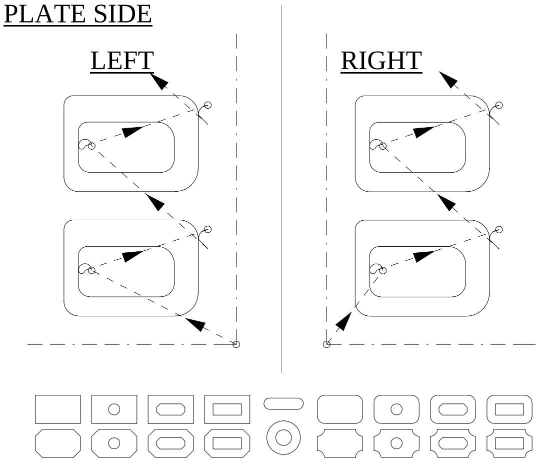
NOTES:

1) If YES then the lead-in/lead-out will be circular with a dimension H, if NO the lead-in/lead-out will be straight with a dimension H.

SHAPE 31: UNIVERSAL FRAME



REPEAT PATTERNS



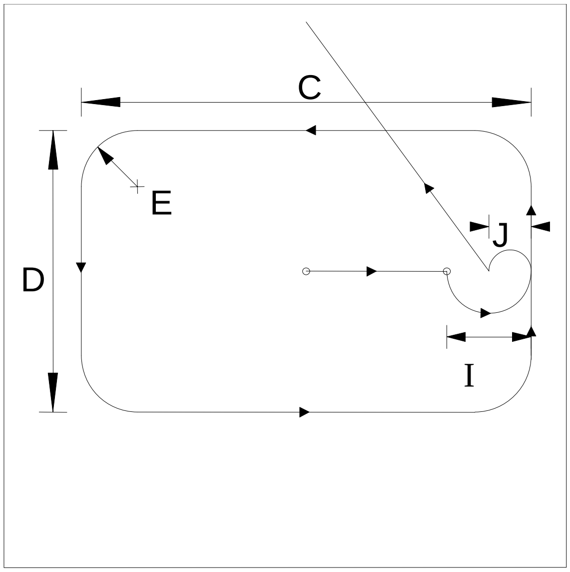
EXAMPLE SHAPES

A. WIDTH DIMENSION	:	(INCHES OR MILLIMETERS)
B. HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C. SYMMETRY	:	(YES OR NO)[1]
D. BOTTOM THICKNESS	:	(INCHES OR MILLIMETERS)
E. LEFT THICKNESS	:	(INCHES OR MILLIMETERS)
F. TOP THICKNESS	:	(INCHES OR MILLIMETERS)
G. RIGHT THICKNESS	:	(INCHES OR MILLIMETERS)
H. B-LEFT INNER RADIUS	:	(INCHES OR MILLIMETERS)
I. T-LEFT INNER RADIUS	:	(INCHES OR MILLIMETERS)
J. T-RIGHT INNER RADIUS	:	(INCHES OR MILLIMETERS)
K. B-RIGHT INNER RADIUS	:	(INCHES OR MILLIMETERS)
L. BEVEL CORNERS	:	(YES OR NO)
M. CONVEX	:	(YES OR NO)[2]
N. B-LEFT OUTER RADIUS	:	(INCHES OR MILLIMETERS)
O. T-LEFT OUTER RADIUS	:	(INCHES OR MILLIMETERS)
P. T-RIGHT OUTER RADIUS	:	(INCHES OR MILLIMETERS)
Q. B-RIGHT OUTER RADIUS	:	(INCHES OR MILLIMETERS)
R. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
S. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
T. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
U. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
V. CIRCULAR LEAD-IN?	:	(YES/NO)[3]
W. CIRCULAR LEAD-OUT:	:	(YES/NO)[3]

NOTES:

1) When "SYMMETRY: YES" is selected, values for "THICKNESS", "INNER RADIUS" and "OUTER RADIUS" are automatically preloaded to define a symmetrical part.
2) The CONVEX prompt line only appears when "BEVEL CORNERS: NO" has been selected.
3) If YES then the lead-in/lead-out will be circular with a dimension T, if NO the lead-in/lead-out will be straight with a dimension T.

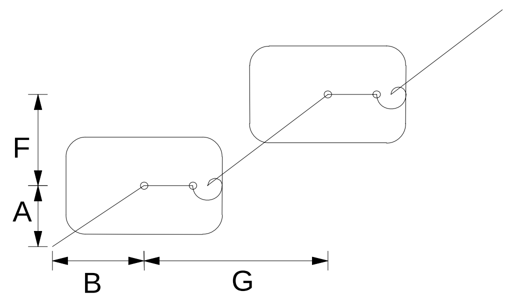
SHAPE 32: RECTANGULAR HOLE



REPEAT PATTERNS

MANUAL REPEAT

ALL DIRECTIONS ALLOWED

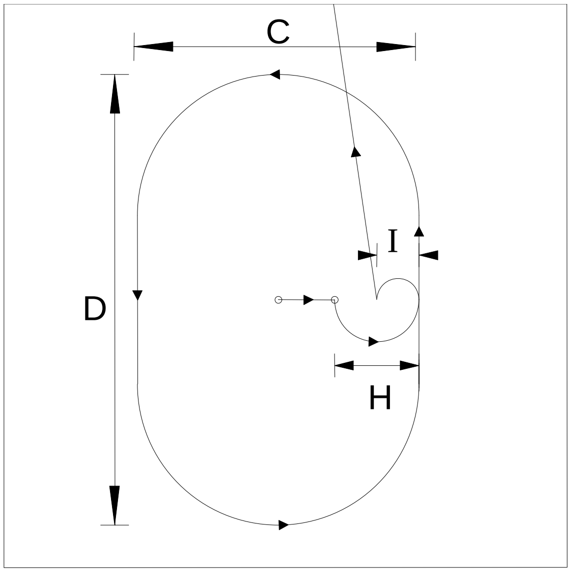


A. X START DISTANCE	:	(RAIL DISTANCE TO HOLE CENTER)[1]
B. Y START DISTANCE	:	(CROSS DISTANCE TO HOLE CENTER)[1]
C. WIDTH DIMENSION	:	(INCHES OR MILLIMETERS)
D. HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
E. CORNER RADIUS	:	(INCHES OR MILLIMETERS)
F. X MOVE DISTANCE	:	(RAIL DISTANCE TO NEXT HOLE)[2]
G. Y MOVE DISTANCE	:	(CROSS DISTANCE TO NEXT HOLE)[2]
H. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
I. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
J. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
K. CIRCULAR LEAD-IN	:	(YES/NO)[3]
L. CIRCULAR LEAD-OUT	:	(YES/NO)[3]

NOTES:

1) The X and Y START DISTANCE values are used to define the distance from the starting position to the center of the first hole. From this center position, the program moves the machine to the pierce point determined by the LEADIN DIMENSION.
2) The X and Y MOVE DISTANCE values are used to define the "center to center" distance between holes. From this center position, the program moves the machine to the pierce point determined by the LEADIN DIMENSION.
3) If YES then the lead-in/lead-out will be circular with a dimension I, if NO the lead-in/lead-out will be straight with a dimension I.

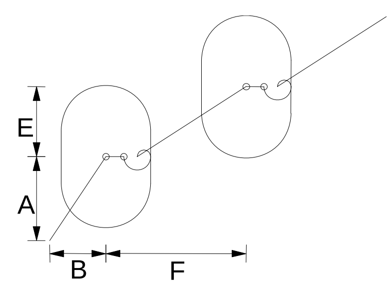
SHAPE 33: VERTICAL HOLE



REPEAT PATTERNS

MANUAL REPEAT

ALL DIRECTIONS ALLOWED

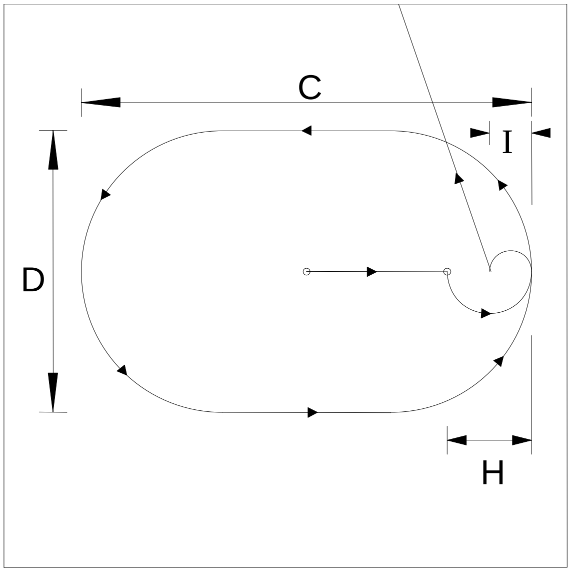


A.	X START DISTANCE	:	(RAIL DISTANCE TO HOLE CENTER)[1]
B.	Y START DISTANCE	:	(CROSS DISTANCE TO HOLE CENTER)[1]
C.	SLOT WIDTH	:	(INCHES OR MILLIMETERS)
D.	SLOT HEIGHT	:	(INCHES OR MILLIMETERS)
E.	X MOVE DISTANCE	:	(RAIL DISTANCE TO NEXT HOLE)[2]
F.	Y MOVE DISTANCE	:	(CROSS DISTANCE TO NEXT HOLE)[2]
G.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
H.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
I.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
J.	CIRCULAR LEAD-IN?	:	(YES/NO)[3]
K.	CIRCULAR LEAD-OUT?	:	(YES/NO)[3]

NOTES:

1) The X and Y START DISTANCE values are used to define the distance from the starting position to the center of the first hole. From this center position, the program moves the machine to the pierce point determined by the LEADIN DIMENSION.
2) The X and Y MOVE DISTANCE values are used to define the "center to center" distance between holes. From this center position, the program moves the machine to the pierce point determined by the LEADIN DIMENSION.
3) If YES then the lead-in/lead-out will be circular with a dimension H, if NO the lead-in/lead-out will be straight with a dimension H.

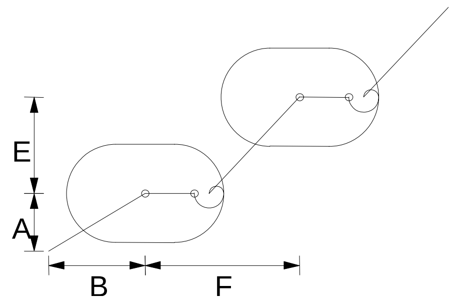
SHAPE 34: HORIZONTAL HOLE



REPEAT PATTERNS

MANUAL REPEAT

ALL DIRECTIONS ALLOWED

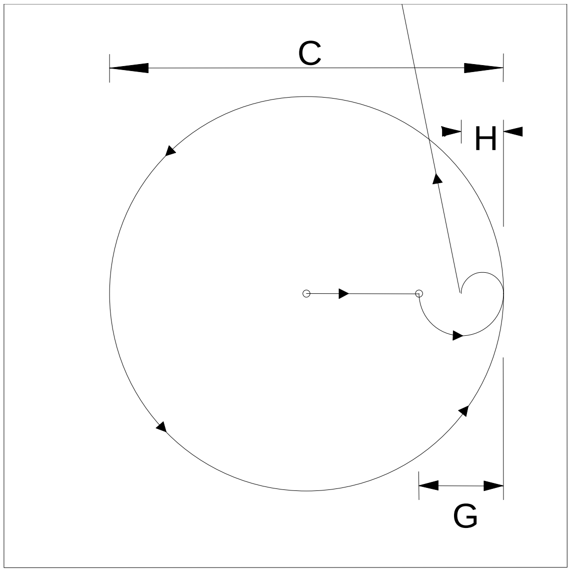


A.	X START DISTANCE	:	(RAIL DISTANCE TO HOLE CENTER)[1]
B.	Y START DISTANCE	:	(CROSS DISTANCE TO HOLE CENTER)[1]
C.	SLOT WIDTH	:	(INCHES OR MILLIMETERS)
D.	SLOT HEIGHT	:	(INCHES OR MILLIMETERS)
E.	X MOVE DISTANCE	:	(RAIL DISTANCE TO NEXT HOLE)[2]
F.	Y MOVE DISTANCE	:	(CROSS DISTANCE TO NEXT HOLE)[2]
G.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
H.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
I.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
J.	CIRCULAR LEAD-IN?	:	(YES/NO)[3]
K.	CIRCULAR LEAD-OUT?	:	(YES/NO)[3]

NOTES:

1) The X and Y START DISTANCE values are used to define the distance from the starting position to the center of the first hole. From this center position, the program moves the machine to the pierce point determined by the LEADIN DIMENSION.
2) The X and Y MOVE DISTANCE values are used to define the "center to center" distance between holes. From this center position, the program moves the machine to the pierce point determined by the LEADIN DIMENSION.
3) If YES then the lead-in/lead-out will be circular with a dimension H, if NO the lead-in/lead-out will be straight with a dimension H.

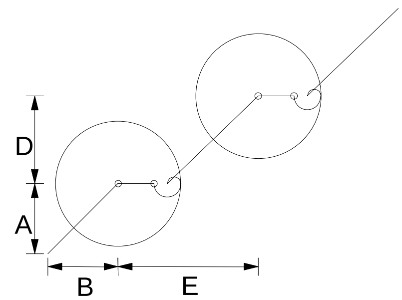
SHAPE 35: CIRCULAR HOLE



REPEAT PATTERNS

MANUAL REPEAT

ALL DIRECTIONS ALLOWED

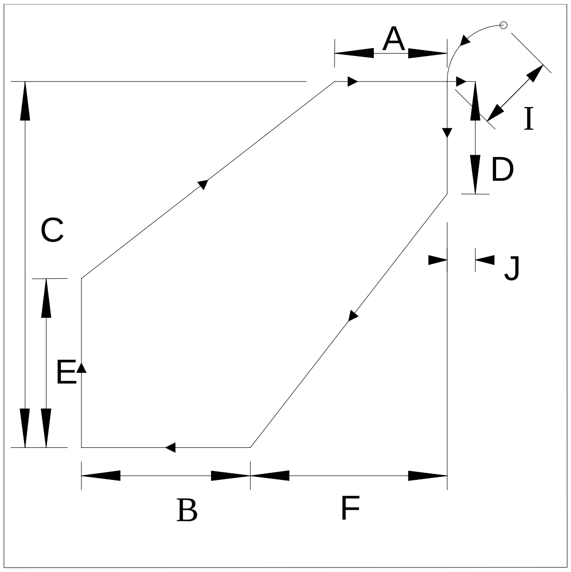


A. X START DISTANCE	:	(RAIL DISTANCE TO HOLE CENTER)[1]
B. Y START DISTANCE	:	(CROSS DISTANCE TO HOLE CENTER)[1]
C. DIAMETER DIMENSION	:	(INCHES OR MILLIMETERS)
D. X MOVE DISTANCE	:	(RAIL DISTANCE TO NEXT HOLE)[2]
E. Y MOVE DISTANCE	:	(CROSS DISTANCE TO NEXT HOLE)[2]
F. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
G. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
H. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
I. CIRCULAR LEAD-IN?	:	(YES/NO)[3]
J. CIRCULAR LEAD-OUT?	:	(YES/NO)[3]

NOTES:

1) The X and Y START DISTANCE values are used to define the distance from the starting position to the center of the first hole. From this center position, the program moves the machine to the pierce point determined by the LEADIN DIMENSION.
2) The X and Y MOVE DISTANCE values are used to define the "center to center" distance between holes. From this center position, the program moves the machine to the pierce point determined by the LEADIN DIMENSION.
3) If YES then the lead-in/lead-out will be circular with a dimension G, if NO the lead-in/lead-out will be straight with a dimension G.

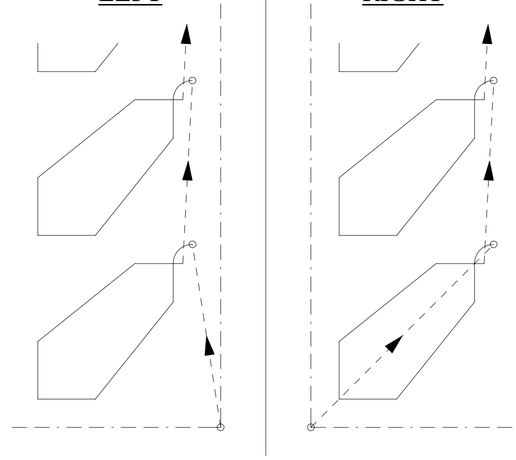
SHAPE 36: BEAM SUPPORT



REPEAT PATTERNS

PLATE SIDE

LEFT RIGHT

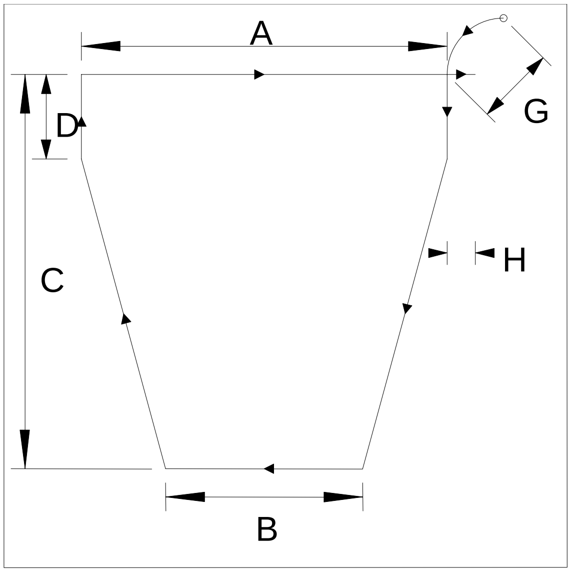


A.	BASE WIDTH	:	(INCHES OR MILLIMETERS)[1]
B.	TOP WIDTH	:	(INCHES OR MILLIMETERS)[1]
C.	HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
D.	LEFT SHOULDER	:	(INCHES OR MILLIMETERS)[1]
E.	RIGHT SHOULDER	:	(INCHES OR MILLIMETERS)[1]
F.	OFFSET	:	(INCHES OR MILLIMETERS)
G.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
H.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
I.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
J.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
K.	CIRCULAR LEAD-IN	:	(YES/NO)[2]

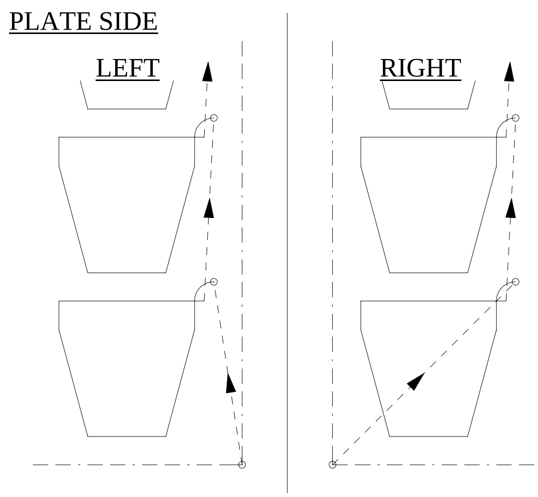
NOTES:

1) Like others, this part is cut with the BASE at the upper position. As a result, the prompts used to label the top and sides assume the part is rotated 180 degrees.
2) If YES then the lead-in will be circular with a dimension I, if NO the lead-in will be straight with a dimension I.

SHAPE 37: TRUSS SUPPORT



REPEAT PATTERNS

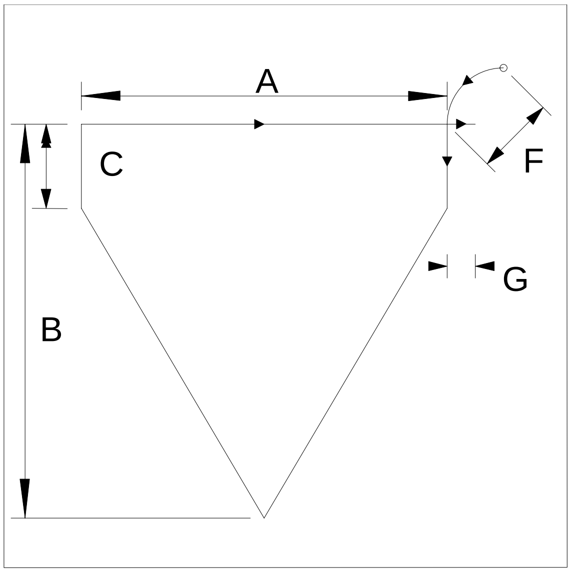


A.	BASEWIDTH	:	(INCHES OR MILLIMETERS)[1]
B.	TOP WIDTH	:	(INCHES OR MILLIMETERS)[1]
C.	HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
D.	SHOULDER HEIGHT	:	(INCHES OR MILLIMETERS)
E.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
F.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
G.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
H.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
I.	CIRCULAR LEAD-IN?	:	(YES/NO)[2]

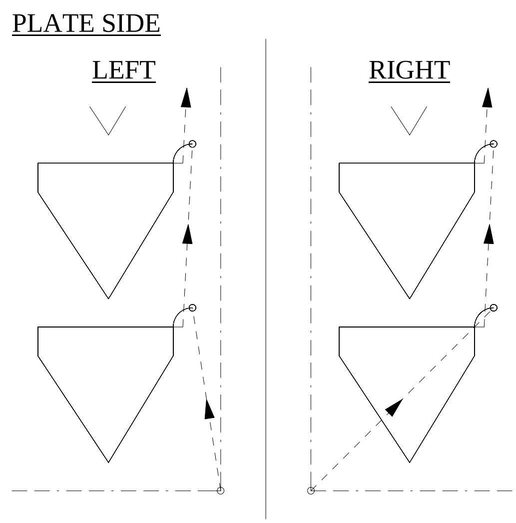
NOTES:

1) Like others, this part is cut with the BASE at the upper position. As a result, the prompts used to label the top and base assume the part is rotated 180 degrees.
2) If YES then the lead-in will be circular with a dimension G, if NO the lead-in will be straight with a dimension G.

SHAPE 38: ANGULAR TRUSS



REPEAT PATTERNS

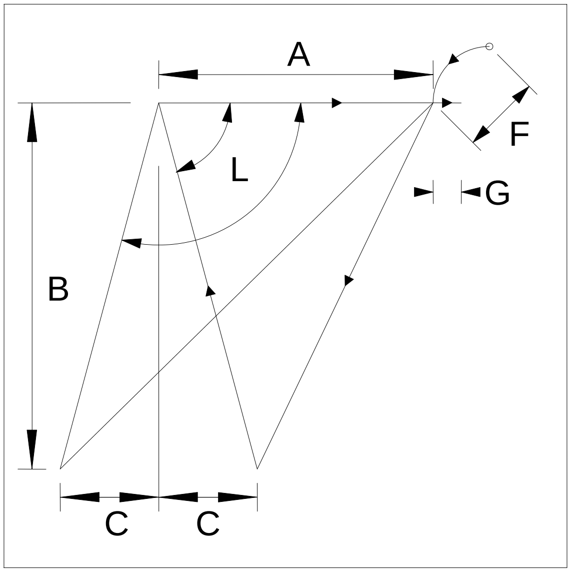


A. BASE WIDTH	:	(INCHES OR MILLIMETERS)[1]
B. HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C. SHOULDER HEIGHT	:	(INCHES OR MILLIMETERS)
D. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
E. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
F. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
G. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
H. CIRCULAR LEAD-IN	:	(YES/NO)[2]

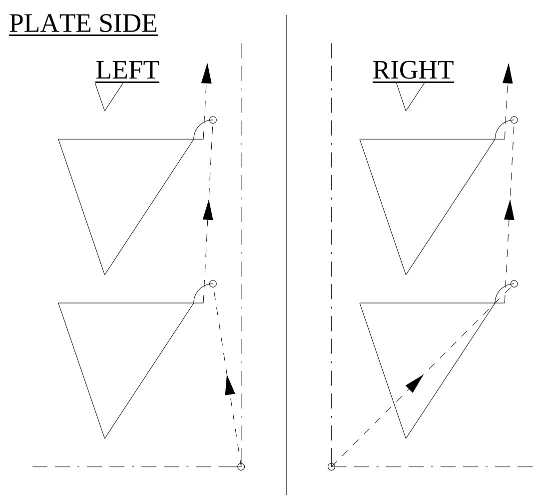
NOTES:

1) Like others, this part is cut with the BASE at the upper position.
2) If YES then the lead-in will be circular with a dimension F, if NO the lead-in will be straight with a dimension F.

SHAPE 39: TRIANGLE



REPEAT PATTERNS

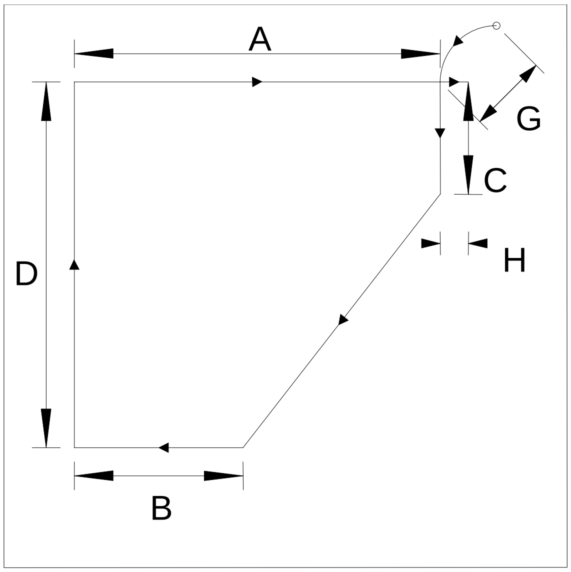


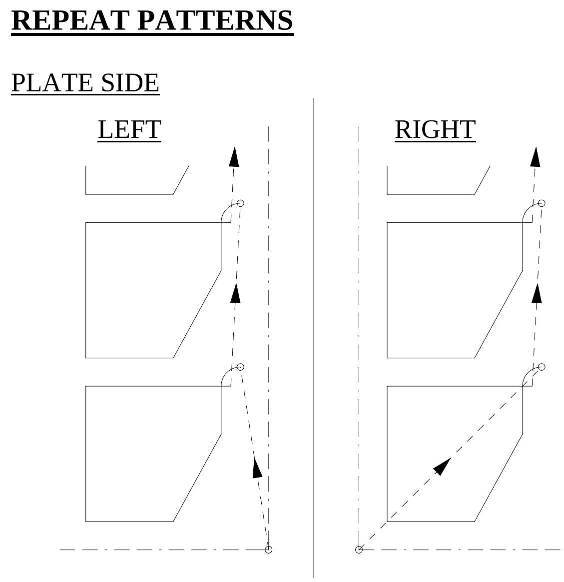
A.	BASE WIDTH	:	(INCHES OR MILLIMETERS)[1]
B.	HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C.	OFFSET	:	(INCHES OR MILLIMETERS)[2]
D.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
E.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
F.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
G.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
H.	CIRCULAR LEAD-IN	:	(YES/NO)[3]

NOTES:

1) Like others, this part is cut with the BASE at the upper position.
2) When OFFSET is greater than 0, angle "L" is greater than 90 degrees and when it is less than 0 (negative), angle "L" is less than 90 degrees.
3) If YES then the lead-in will be circular with a dimension F, if NO the lead-in will be straight with a dimension F.

SHAPE 40: BEVELED RECTANGLE



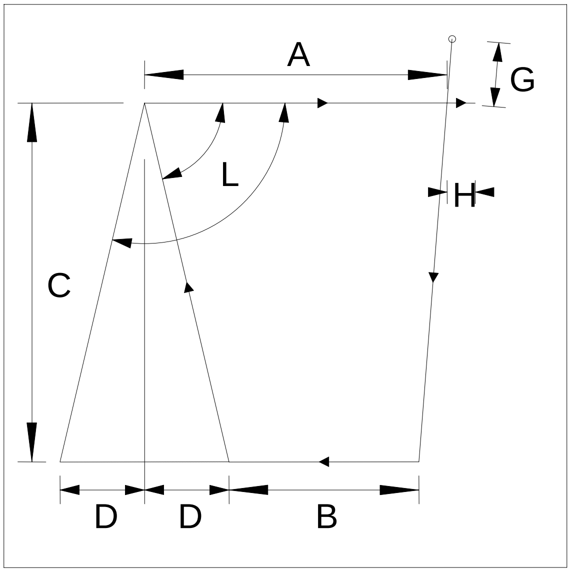


A. BASE WIDTH	:	(INCHES OR MILLIMETERS)[1]
B. TOP WIDTH	:	(INCHES OR MILLIMETERS)[1]
C. LEFT HEIGHT	:	(INCHES OR MILLIMETERS)[1]
D. RIGHT HEIGHT	:	(INCHES OR MILLIMETERS)[1]
E. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
F. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
G. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
H. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)

NOTES:

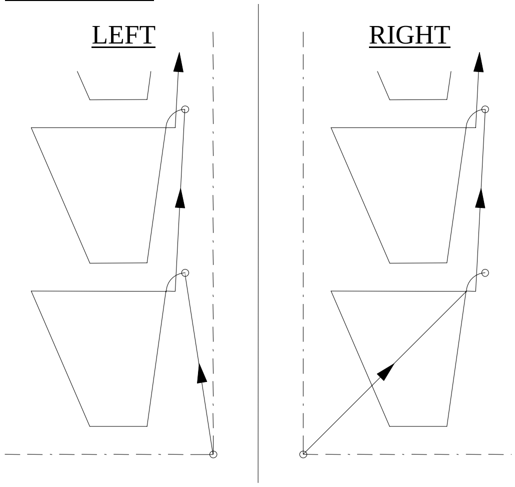
1) Like others, this part is cut with the BASE at the upper position. As a result, the prompts used to label the top and sides assume the part is rotated 180 degrees.

SHAPE 41: TRAPEZOID



REPEAT PATTERNS

PLATE SIDE

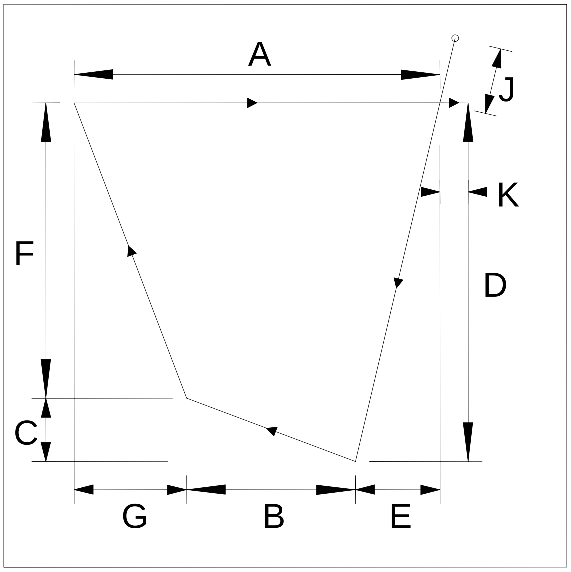


A.	BASE WIDTH	:	(INCHES OR MILLIMETERS)[1]
B.	TOP WIDTH	:	(INCHES OR MILLIMETERS)[1]
C.	HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
D.	OFFSET	:	(INCHES OR MILLIMETERS)[2]
E.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
F.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
G.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
H.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)

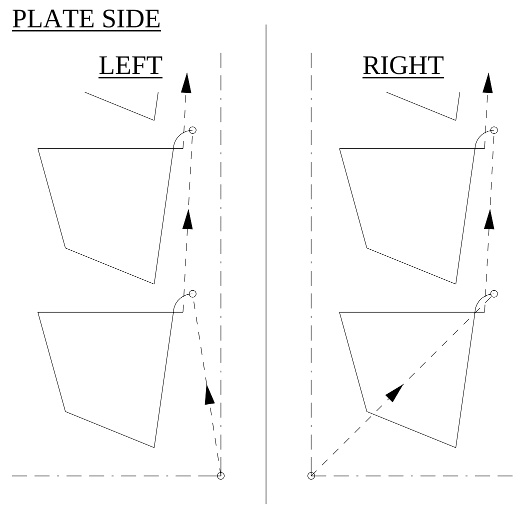
NOTES:

1) Like others, this part is cut with the BASE at the upper position and the TOP at the lower position.
2) When OFFSET is greater than 0, angle "L" is greater than 90 degrees and when it is less than 0 (negative), angle "L" is less than 90 degrees.

SHAPE 42: QUAD SIDE



REPEAT PATTERNS

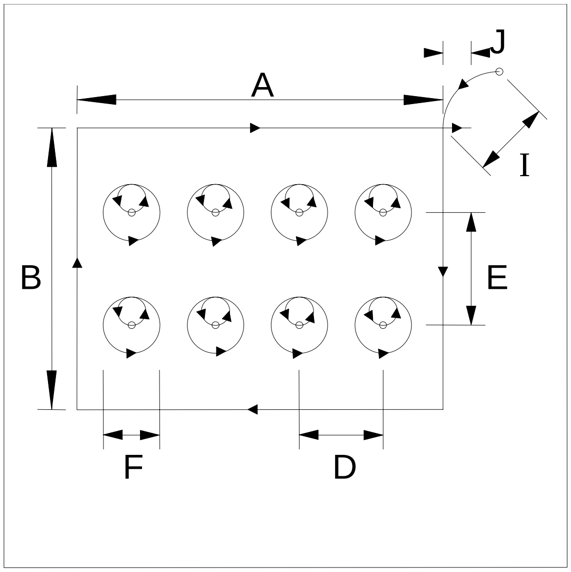


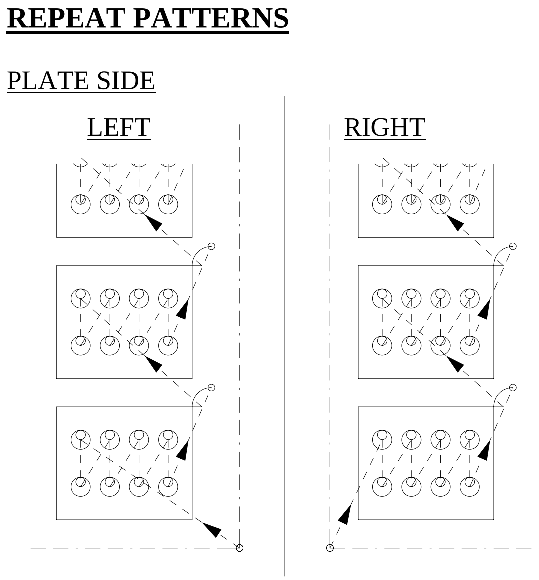
A. BASE WIDTH	:	(INCHES OR MILLIMETERS)[1]
B. TOP WIDTH	:	(INCHES OR MILLIMETERS)[1]
C. TOP OFFSET	:	(INCHES OR MILLIMETERS)[1]
D. LEFT HEIGHT	:	(INCHES OR MILLIMETERS)[1]
E. LEFT OFFSET	:	(INCHES OR MILLIMETERS)[1]
F. RIGHT HEIGHT	:	(INCHES OR MILLIMETERS)[1]
G. RIGHT OFFSET	:	(INCHES OR MILLIMETERS)[1]
H. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
I. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
J. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
K. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)

NOTES:

1) Like others, this part is cut with the BASE at the upper position. As a result, the prompts used to label the top and sides assume the part is rotated 180 degrees.

SHAPE 43: LAP JOINT



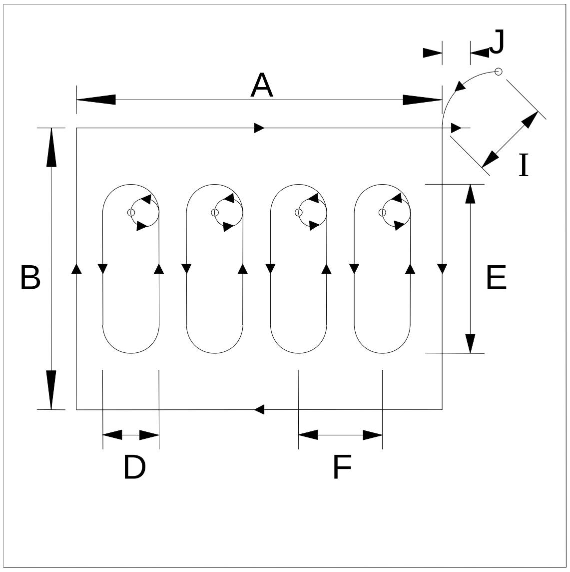


A.	WIDTH DIMENSION	:	(INCHES OR MILLIMETERS)
B.	HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C.	NUMBER OF COLUMNS	:	(COUNT, 0 TO 99)[1]
D.	COLUMN DISTANCE	:	(INCHES OR MILLIMETERS)[1]
E.	BOLT HOLE DISTANCE	:	(INCHES OR MILLIMETERS)[1]
F.	BOLT HOLE DIAMETER	:	(INCHES OR MILLIMETERS)
G.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
H.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
I.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
J.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
K.	CIRCULAR LEAD-IN?	:	(YES/NO)[3]
L	CIRCULAR LEAD-OUT?	:	(YES/NO)[3]

NOTES:

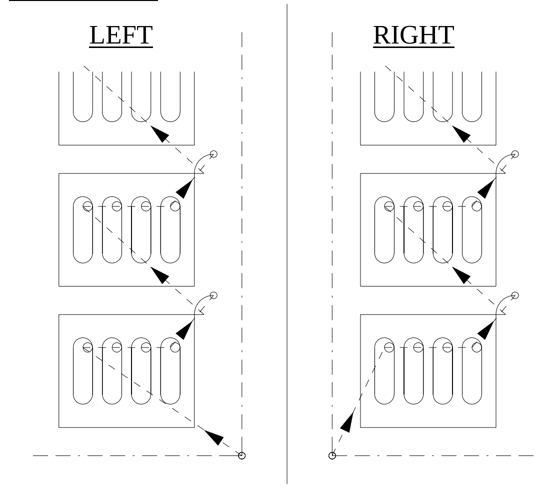
1) The hole pattern defined is automatically centered on the part from top to bottom and left to right.
2) To create a part with a single row of holes, use shape number 44, SLOTTED PLATE, with a SLOT HEIGHT equal to the SLOT WIDTH.
3) If YES then the lead-in/lead-out will be circular with a dimension I, if NO the lead-in/lead-out will be straight with a dimension I.

SHAPE 44: SLOTTED PLATE



REPEAT PATTERNS

PLATE SIDE

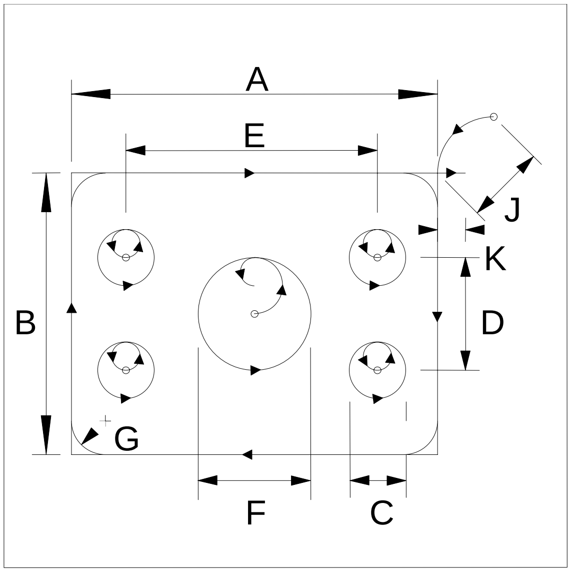


A.	WIDTH DIMENSION	:	(INCHES OR MILLIMETERS)
B.	HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C.	NUMBER OF SLOTS	:	(COUNT, 0 TO 99)[1]
D.	SLOT WIDTH	:	(INCHES OR MILLIMETERS)[1]
E.	SLOT HEIGHT	:	(INCHES OR MILLIMETERS)[1]
F.	SLOT DISTANCE	:	(INCHES OR MILLIMETERS)[1]
G.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
H.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
I.	LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
J.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
K.	CIRCULAR LEAD-IN	:	(YES/NO)[2]
L.	CIRCULAR LEAD-OUT	:	(YES/NO)[2]

NOTES:

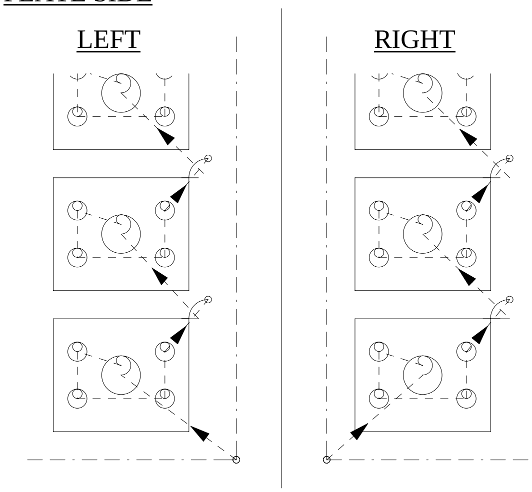
1) The slot pattern defined is automatically centered on the part from top to bottom and left to right.
2) If YES then the lead-in/lead-out will be circular with a dimension I, if NO the lead-in/lead-out will be straight with a dimension I.

SHAPE 45: LAMP BASE



REPEAT PATTERNS

PLATE SIDE

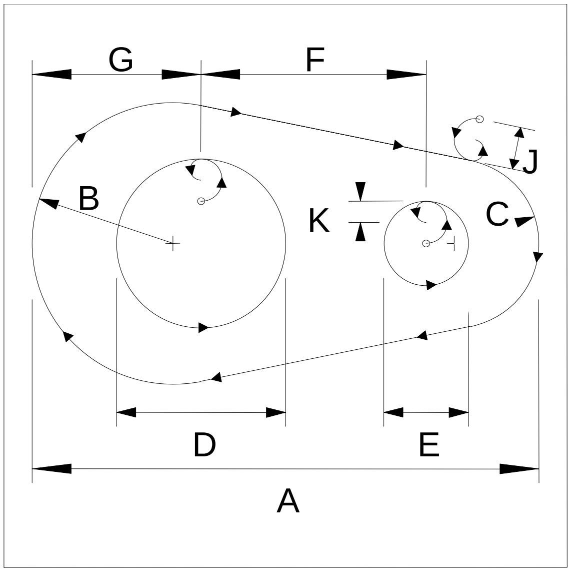


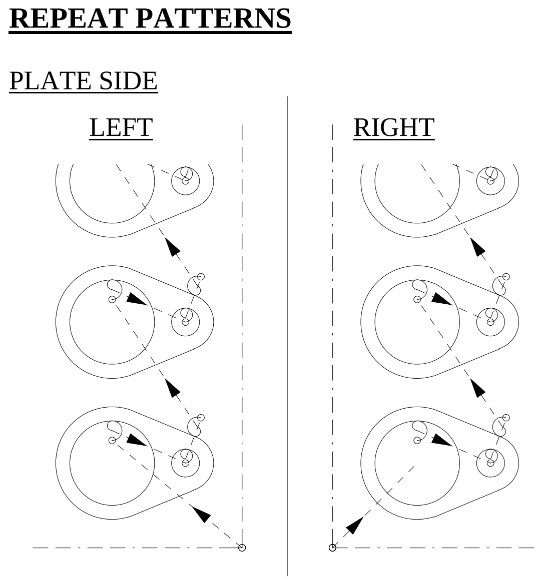
A. WIDTH DIMENSION : (INCHES OR MILLIMETERS)
B. HEIGHT DIMENSION : (INCHES OR MILLIMETERS)
C. BOLT HOLE DIAMETER : (INCHES OR MILLIMETERS)
D. X BOLT HOLE CENTER : (INCHES OR MILLIMETERS)[1]
E. Y BOLT HOLE CENTER : (INCHES OR MILLIMETERS)[1]
F. CENTER HOLE DIAMETER : (INCHES OR MILLIMETERS)[2]
G. CORNER RADIUS : (INCHES OR MILLIMETERS)[3]
H. KERF DIMENSION : (WIDTH OF CUTTING TOOL PATH)
I. SCRAP DIMENSION : (DISTANCE BETWEEN PARTS, IN/MM)
J. LEADIN DIMENSION : (INCHES OR MILLIMETERS)
K. LEADOUT DIMENSION : (INCHES OR MILLIMETERS)
L. CIRCULAR LEAD-IN? : (YES/NO)[4]
M. CIRCULAR LEAD-OUT? : (YES/NO)[4]

NOTES:

1) The hole pattern defined is automatically centered on the part from top to bottom and left to right.
2) If a CENTER HOLE DIAMETER of 0 is defined, no hole is cut.
3) If a CORNER RADIUS of 0 is defined, sharp corners are cut.
4) If YES then the lead-in/lead-out will be circular with a dimension J, if NO the lead-in/lead-out will straight with a dimension J.

SHAPE 46: CAM



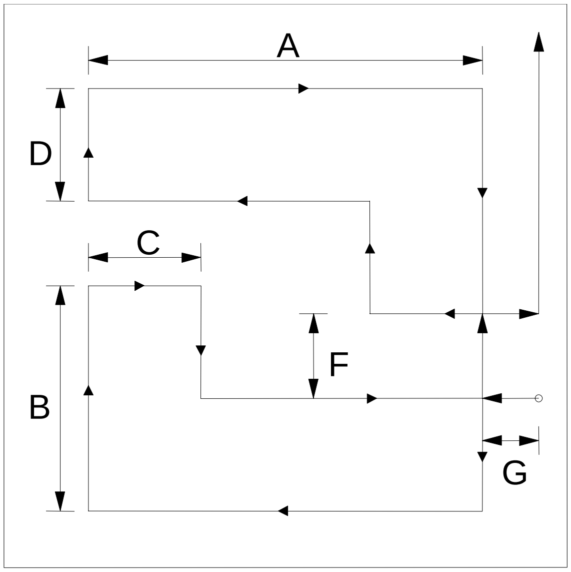


A. WIDTH DIMENSION : (INCHES OR MILLIMETERS)
B. LEFT RADIUS : (INCHES OR MILLIMETERS)
C. RIGHT RADIUS : (INCHES OR MILLIMETERS)
D. LEFT HOLE DIAMETER : (INCHES OR MILLIMETERS)[1]
E. RIGHT HOLE DIAMETER : (INCHES OR MILLIMETERS)[2]
F. CENTER DISTANCE : (INCHES OR MILLIMETERS)
G. LEFT OFFSET : (INCHES OR MILLIMETERS)
H. KERF DIMENSION : (WIDTH OF CUTTING TOOL PATH)
I. SCRAP DIMENSION : (DISTANCE BETWEEN PARTS, IN/MM)
J. LEADIN DIMENSION : (INCHES OR MILLIMETERS)
K. LEADOUT DIMENSION : (INCHES OR MILLIMETERS)
L. CIRCULAR LEAD-IN? : (YES/NO)[3]
M. CIRCULAR LEAD-OUT? : (YES/NO)[3]

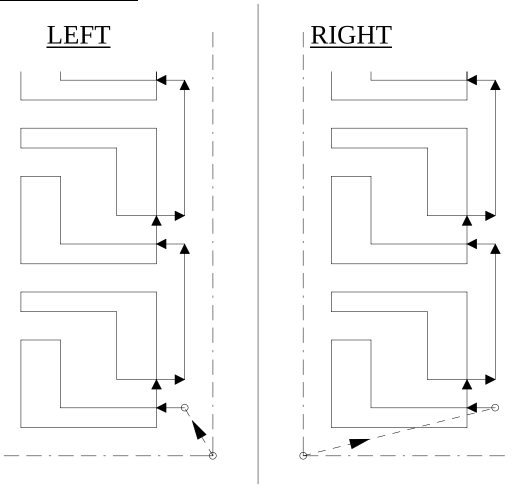
NOTES:

1) If a LEFT HOLE DIAMETER of 0 is defined, no holes are cut in the part.
2) If a RIGHT HOLE DIAMETER of 0 is defined, only the LEFT HOLE is cut.
3) If YES then the lead-in/lead-out will be circular with a dimension J, if NO the lead-in/lead-out will be straight with a dimension J.

SHAPE 47: "L" BRACKET 1



REPEAT PATTERNS

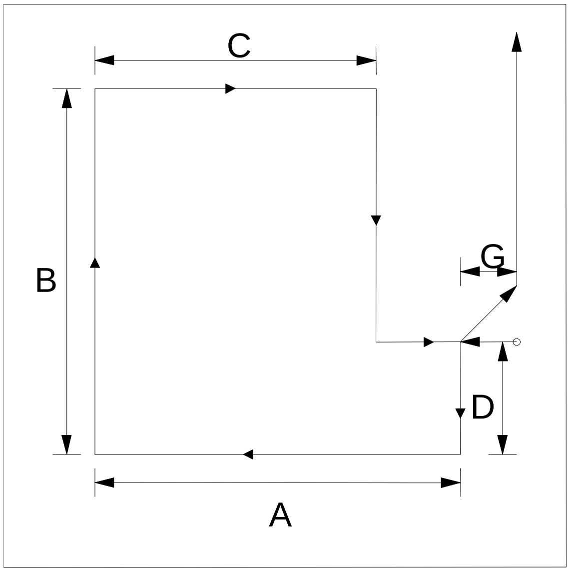


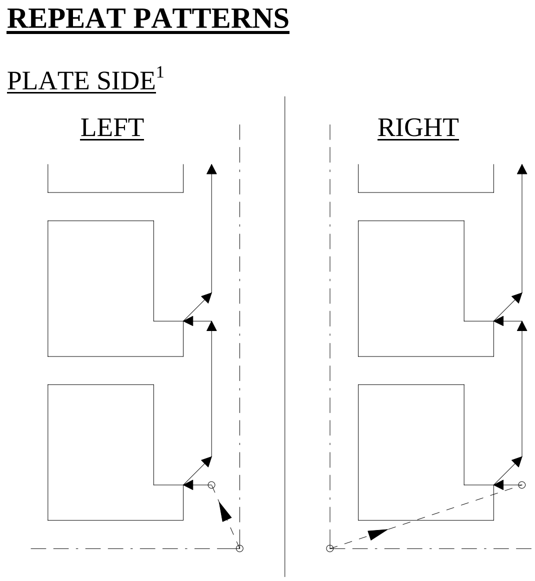
A. WIDTH DIMENSION	:	(INCHES OR MILLIMETERS)
B. HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C. VERTICAL THICKNESS	:	(INCHES OR MILLIMETERS)
D. HORIZONTAL THICKNESS	:	(INCHES OR MILLIMETERS)
E. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
F. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
G. LEAD-IN DIMENSION	:	(INCHES OR MILLIMETERS)

NOTES:

1) All chain cut parts start from the plate corner closest to the operator. The PLATE SIDE is defined through SYSTEM SETUP DATA.
2) Although parts are created in pairs to minimize scrap, each part is individually counted when cut.
3) If part dimensions make it impossible to create part pairs without overlap, use SHAPE 48: "L" BRACKET 2.

SHAPE 48: "L" BRACKET 2



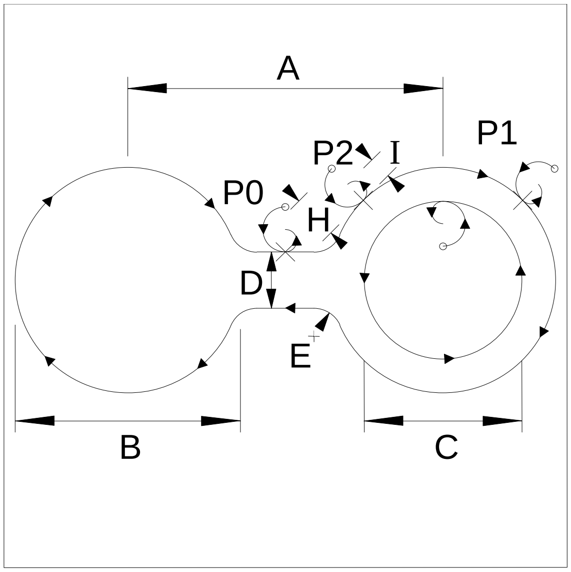


A.	WIDTH DIMENSION	:	(INCHES OR MILLIMETERS)
B.	HEIGHT DIMENSION	:	(INCHES OR MILLIMETERS)
C.	VERTICAL THICKNESS	:	(INCHES OR MILLIMETERS)
D.	HORIZONTAL THICKNESS	:	(INCHES OR MILLIMETERS)
E.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
F.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
G.	LEAD-IN DIMENSION	:	(INCHES OR MILLIMETERS)

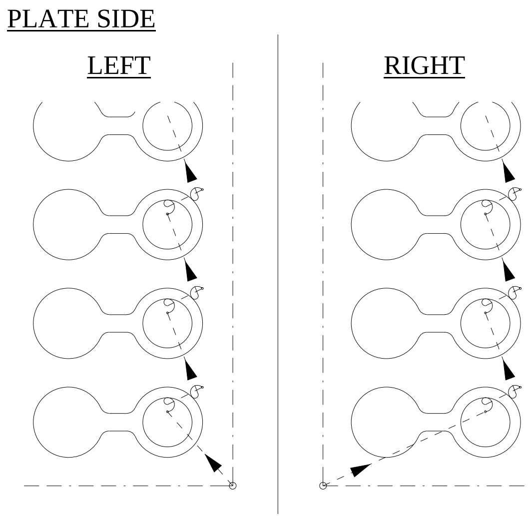
NOTES:

1) All chain cut parts start from the plate corner closest to the operator. The PLATE SIDE is defined through SYSTEM SETUP DATA.
2) If excessive scrap can be eliminated by creating "part pairs," use SHAPE 47: "L" BRACKET 1.

SHAPE 49: BI DAMPER



REPEAT PATTERNS

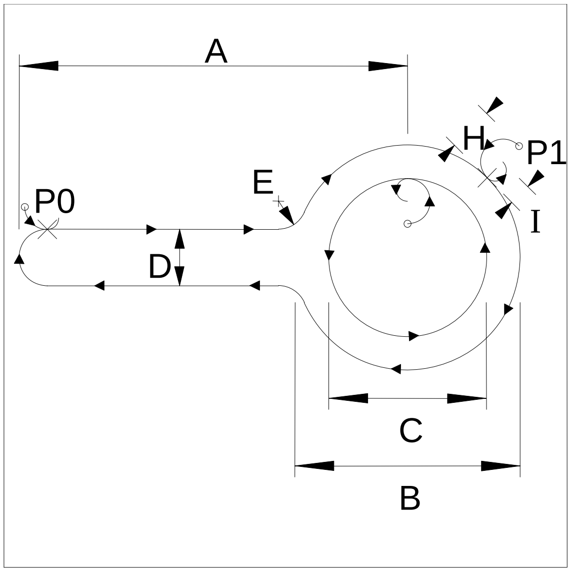


A.	CENTER DISTANCE	:	(INCHES OR MILLIMETERS)
B.	OUTER DIAMETER	:	(INCHES OR MILLIMETERS)
C.	INNER DIAMETER	:	(INCHES OR MILLIMETERS)[1]
D.	THICKNESS DIMENSION	:	(INCHES OR MILLIMETERS)
E.	RADIUS DIMENSION	:	(INCHES OR MILLIMETERS)
F.	KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
G.	SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
H.	LEAD-IN DIMENSION	:	(INCHES OR MILLIMETERS)
I.	LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
J.	LEADIN POINT 1 (P1)	:	(1, 2 OR 3)
K.	CIRCULAR LEAD-IN?	:	(YES/NO)[2]
L.	CIRCULAR LEAD-OUT?	:	(YES/NO)[2]

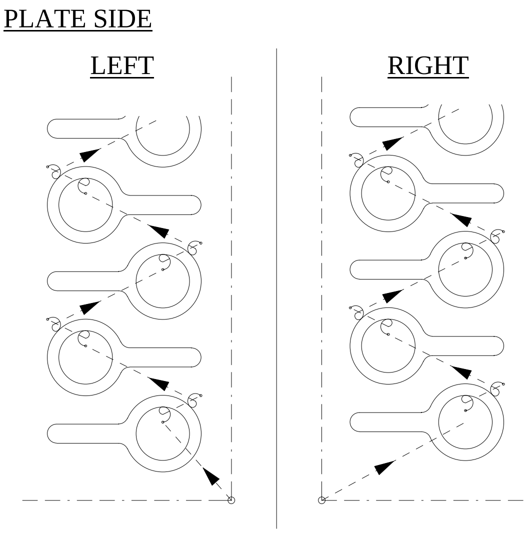
NOTES:

1) If an INNER DIAMETER of 0 is defined, no hole is cut.
2) If YES then the lead-in/lead-out will be circular with a dimension H, if NO the lead-in/lead-out will be straight with a dimension H.

SHAPE 50: DAMPER



REPEAT PATTERNS



A. HANDLE CENTER DIST.	:	(INCHES OR MILLIMETERS)
B. OUTER DIAMETER	:	(INCHES OR MILLIMETERS)
C. INNER DIAMETER	:	(INCHES OR MILLIMETERS)[1]
D. THICKNESS DIMENSION	:	(INCHES OR MILLIMETERS)
E. RADIUS DIMENSION	:	(INCHES OR MILLIMETERS)
F. KERF DIMENSION	:	(WIDTH OF CUTTING TOOL PATH)
G. SCRAP DIMENSION	:	(DISTANCE BETWEEN PARTS, IN/MM)
H. LEADIN DIMENSION	:	(INCHES OR MILLIMETERS)
I. LEADOUT DIMENSION	:	(INCHES OR MILLIMETERS)
J. LEADIN POINT 1 (P1)	:	(1, 2 OR 3)
K. CIRCULAR LEAD-IN?	:	(YES/NO)[2]
L. CIRCULAR LEAD-OUT?	:	(YES/NO)[2]

NOTES:

1) If an INNER DIAMETER of 0 is defined, no hole is cut.
2) If YES then the lead-in/lead-out will be circular with a dimension H, if NO the lead-in/lead-out will be straight with a dimension H.

Jobs Mode

(AO-70395 Rev AA)

Section

6

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

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BLANK

6 JOBS MODE

6.1 INTRODUCTION

The Jobs mode enables the operator to take a part program and turn it into a job by putting it through the Job Setup process. This can be done at any time, even when another job is running. The job then goes on the Job List to be run at a later time. Also on the Job List are jobs that were interrupted or that suffered a power failure.

In this screen, jobs can also be removed from the Job List.

On the **Job Select** screen in the **Run Mode**, the **Job List** appears at the top of the **File List**, marked with status designations in a second column. Below it come the names of all the part programs in the control.

6.2 JOB LIST SCREEN (JOB01)

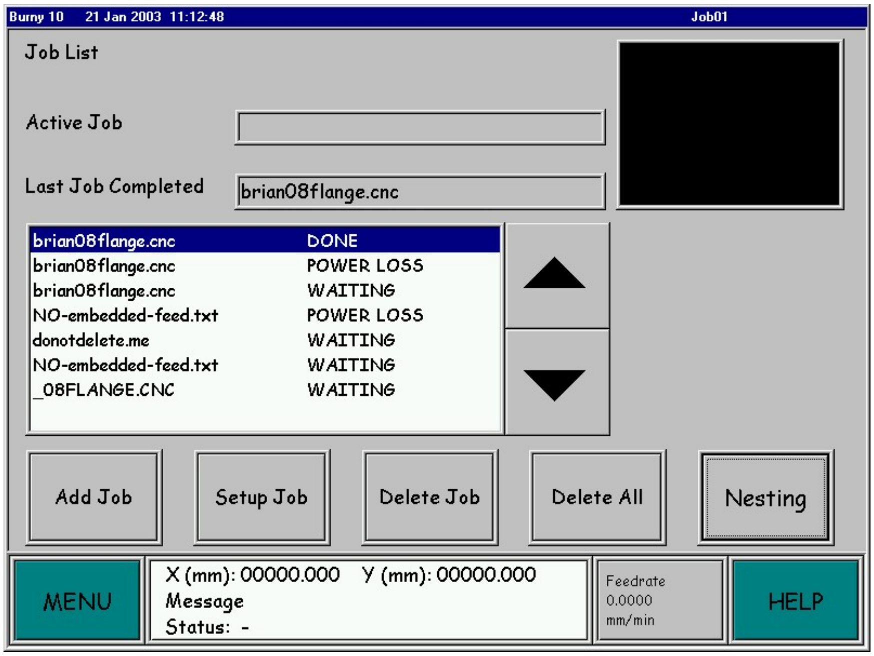


Figure 6.1 – Job List Screen (*Job01*)

6.2.1 DESCRIPTION

Enter the **Jobs** mode by pressing the **Jobs** icon on the **Main Menu** screen.

The **Jobs** mode has five screens of its own. The **Job List** screen, shown below, and four others that are nearly identical to four **Run** mode screens: **Select Job**, **Job Setup**, **Remove this job**?, and **Geometry** (**Options**).

6.2.2 PROCEDURE

To add a job to the **Job List**, press the ***Add Job*** button to change the display to the **Select file to add to job list** screen and select the part program to use.

To setup (change) one of the existing jobs, move the cursor to the desired job and press the ***Setup Job*** button. The display changes to the **Job Setup** screen (***Job04***) where the changes can be made.

To remove a job, select the job with the cursor and press the ***Delete Job*** button. The display now shows the **Remove this job** screen where the deletion of the job file must be confirmed or canceled.

Use the ***Up*** and ***Down*** arrow buttons to move the cursor through the **Job List**.

6.2.3 DETAILS

ACTIVE JOB

When a part program has been selected in the **Run** mode and has been moved to the **Run Preview** screen (***Run03***) or is running, the name of that program appears in this window.

LAST JOB COMPLETED

The file name of the last job that was run and designated as ***DONE*** in the **Run** mode appears in this window. The same name also appears in the **Job List.**

JOB LIST

The **Job List** shows all jobs in the ***BURNY SERIES 10*** memory. This same list appears in the **Run** mode **Select Job To Run** screen at the top of the **File List**.

The selected job is the one highlighted by the cursor in the **Job List**. Select a job file by pressing it in this window or by moving the cursor to it with the ***Up*** and ***Down*** arrow buttons.

UP & DOWN

Use the ***Up*** and ***Down*** arrow buttons to move the cursor through the **Job List** and put it on the file to be selected. If the cursor is not visible, press any one of the file names. A momentary press on the ***Up*** and ***Down*** buttons moves the cursor to the next file. A prolonged press makes the cursor scroll.

THUMBNAIL GRAPHIC

The ***Thumbnail Graphic*** window displays the outline of the selected part program. The tool path shows red for cutting moves and yellow for traverse moves.

This window cannot be expanded and does not show multiple parts but the window in the **Setup** screen has these features.

ADD JOB

Press the ***Add Job*** button to move the display to the **Select file to add to job list** screen (***Job02***). This screen lists all the part programs in the memory of the ***BURNY SERIES 10.*** Select from the **File List**, then press ***OK*** to change the display to the **Job Setup** screen ***(Job04).***

SETUP JOB

Be sure the cursor highlights the file, then press the ***Setup Job*** button. The display changes to the **Job Setup** (***Job04***) screen, nearly identical to the one in the **Run** mode. All the same settings are available here except **Plate,** which must be setup at run time.

When all the settings are made, press ***OK*** to return to the **Job List**. To cancel all settings and return to the **Job List** screen, press the ***Cancel*** button

DELETE JOB

Press the ***Delete Job*** button to remove the selected file from the **Job List**. The **Remove this job?** (***Job03***) screen appears, giving the operator the chance to confirm the removal or to cancel it. This does not affect the part file from which the job was derived.

Any job on the **Job List** can be removed except one that has the ***PAUSED*** status. Only one such job can appear on the **Job List** at a time. This is a currently running job that has been stopped or a job in the **Run Job Preview** screen (***Run03***).

DELETE ALL JOBS

Press the ***Delete All Job*** button to remove all of the entries from the **Job List**. **The Remove all, but active jobs*?*** (***Job03***) screen appears, giving the operator the chance to confirm the removal or to cancel it. This does not affect the part files from which the jobs were derived.

All jobs on the **Job List** can be removed except ones that have the ***PAUSED*** and ***RUNNING*** status. Only one such job can appear on the **Job List** at a time. This is a currently running job that has been stopped or a job in the **Run Job Preview** screen (***Run03***).

NESTING

Loads the job nesting program.

STATUS

Each job listed in the **Job List** has a status value, shown in the second column of the **Job01** screen. The status can have one of six values:

- **DONE**
- **INTERRUPTED**
- **POWER LOSS**
- **PAUSED**
- **WAITING**

- **RUNNING**

Only one file in the list can have the status of ***DONE***: the last part program to run and be designated as ***DONE*** by the operator.

When a job is running, it appears on the **Job List** with the status of ***RUNNING***. An ***INTERRUPTED*** file is one that that was running, then was stopped by the operator. Next the operator pressed the ***Job Interrupt*** button. The display returns to the **Select Job** screen in the **Run** mode and the interrupted job is put on the **Job List**.

If power fails while a job is running, this job appears on the **Job List** after power is back on with the status of ***POWER LOSS***. Home the machine, select the job in **Run** mode, and run it. The cut will continue from where it left off.

When a running job is stopped by the operator, it appears on the **Job List** with the status of ***PAUSED***. It cannot be removed from the **Job List**. As soon as the operator gives the job the status of ***DONE*** or ***INTERRUPTED***, this new status appears beside the file name on the **Job List** and it can be removed.

A job that has been setup and is ready to run appears on the **Job List** and has the status of ***WAITING***.

6.3 SELECT FILE TO ADD TO JOB LIST SCREEN (*JOB02*)

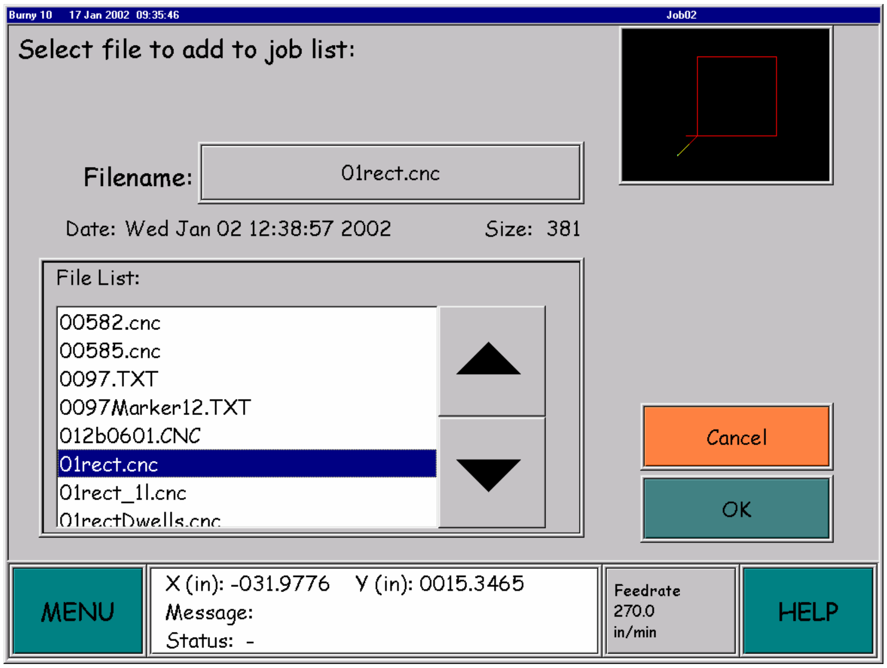


Figure 6.2 – Select File to Add to Job List Screen (*Job02*)

6.3.1 DESCRIPTION

The **Select file to add to job list** screen appears when the ***Add Job*** button is pressed in the **Job List** screen. This screen displays a list of all part programs in the memory of the ***BURNY SERIES 10.*** Any one of these can be selected here and then be setup and saved as a job for running at a later time.

6.3.2 PROCEDURE

Select the part program file by:

- Pressing on the name
- Moving the cursor to the name in the ***File List*** with the ***Up*** or ***Down*** buttons
- Pressing the ***File Name*** field and typing in the name of the file.

Examine the graphic view to be sure you have the correct program. Then press ***OK*** to move to the **Job Setup screen**.

6.3.3 DETAILS

FILENAME

The **filename** window shows the name of the file highlighted by the cursor. This is the "selected" part program file. When this window ispressed, the keyboard appears. Enter the desired name or just the first few characters of it and press ***OK***. The ***Job02*** screen reappears with the cursor highlighting the desired name or the file name most like it.

DETAIL LINE

Below the **Filename** window is the **Detail Line**, showing the last time the file was changed and its size in bytes.

FILE LIST

The **File List** contains the names of all the part programs in the memory of the control. Only five of them are visible at one time. To select one of the visible files, press with your finger. To see file names that are not visible, press the ***Up*** or ***Down*** arrow buttons. To go to a file name that is not in sight, use the ***Filename*** window. See above.

UP/DOWN

The ***Up*** and ***Down*** arrow buttons move the cursor through the **File List**.

OK

Press to accept changes in this screen and return to the previous screen.

CANCEL

Press the ***Cancel*** button to discard changes made in this screen and return to the previous screen.

THUMBNAIL GRAPHIC

Press the ***Thumbnail Graphic*** at the upper right of the screen to expand it to full screen size. Tools appear for panning and zooming on the outline of the part, where yellow lines are traverse and red lines are cut. Ref Section 1.11 & 1.12 of this manual for details.

6.4 REMOVE THIS JOB SCREEN (JOB03)

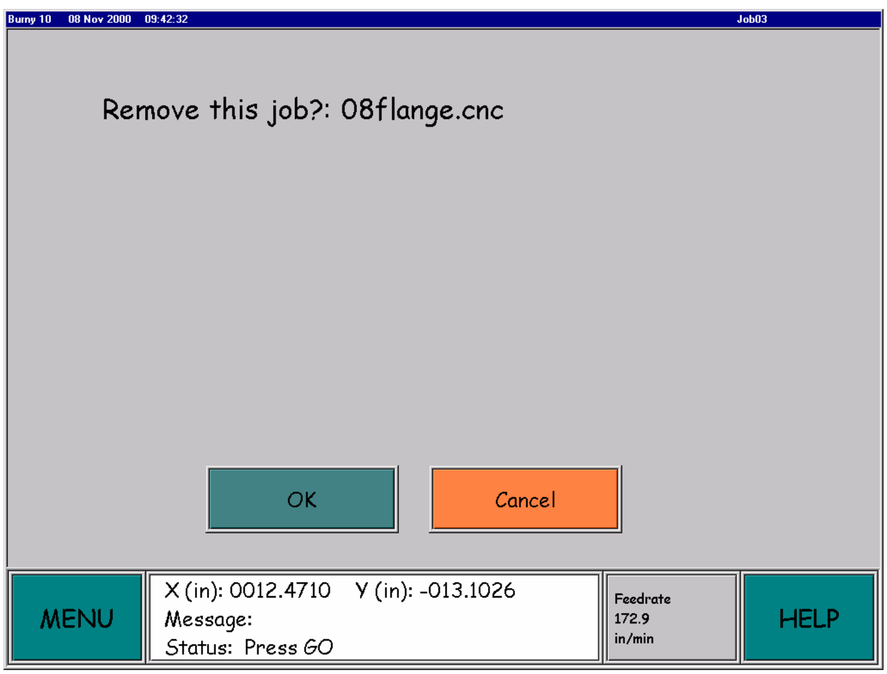


Figure 6.3 – Remove This Job Screen (*Job03*)

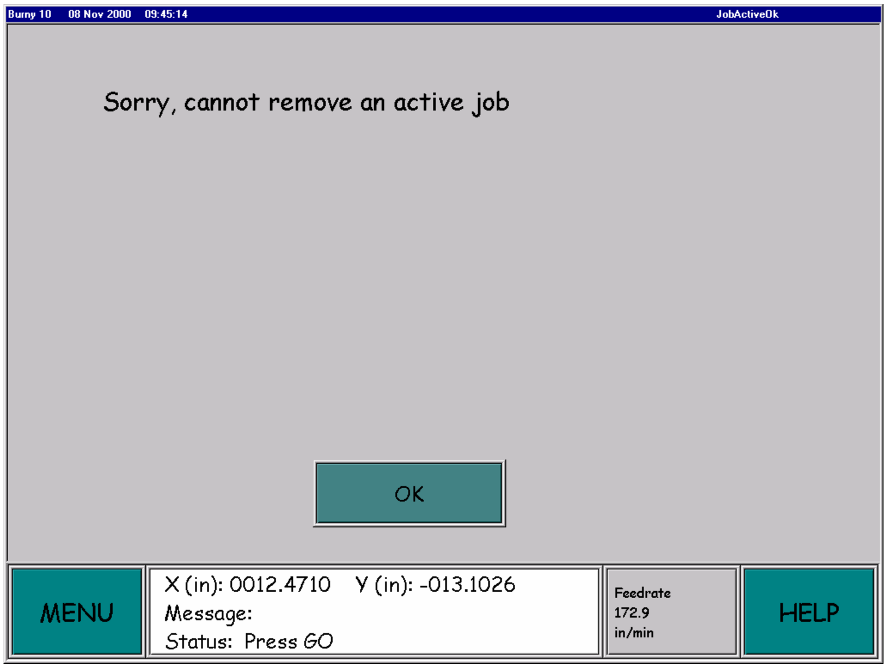


Figure 6.4 – Cannot Remove Active Job Screen (*JobActiveOK*)

6.4.1 DESCRIPTION

The **Remove this job** screen, Figure 6.3, appears after the ***Delete Job*** button has been pressed in the **Job List** (***Job01***) screen. This screen gives the operator a chance to change their mind about deleting a job file.

To complete the removal of the job, press the ***OK*** button. To abandon the removal process and return to the previous screen, press the ***Cancel*** button.

An active job, which is one that has a status of paused or running, cannot be removed. An attempt to do so changes the display to the **Cannot Remove an Active Job** screen, shown above. Press ***OK*** on this screen to return to the **Job List** screen.

6.5 *JOB SETUP SCREEN (JOB04)*

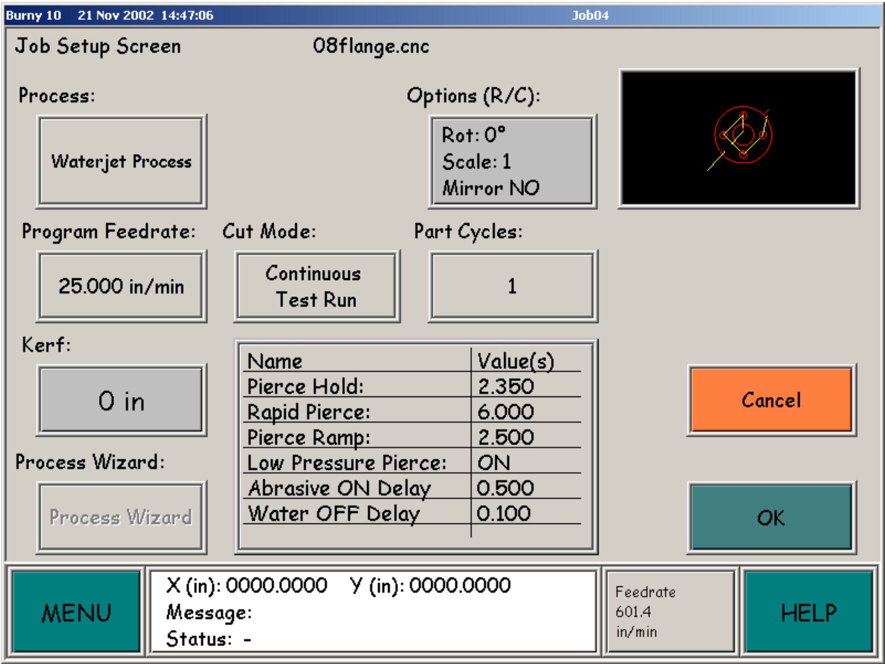


Figure 6.5 – Job Setup Screen (*Job04*)

6.5.1 *DESCRIPTION*

The **Job Setup** screen enables the operator to turn a part program into a "job". This means that several necessary settings not specified in the part program are provided by the operator:

The cutting process to be used *
Program Feedrate *
Cut mode – Continuous Test Run, Automatic, Manual or Single Step Test Run.
The number of Part Cycles *
The width of the kerf *
Preheat time or Plasma Advance Off time *
Pierce Hold time *
Pierce Ramp time *
Geometry settings for the part *
Options (R/C)*

* When features followed in the list above with an asterisk are pressed, the display moves to another screen where the change is made.

6.5.2 *PROCEDURE*

Setup the part program by proceeding as follows for each feature: Press the button for the feature, Enter or select the value or setting, press ***OK*** to accept the new settings.

Limits of the permitted values and a brief description are shown on the number keypad screen that appears for features with numerical values. When all the features are set, press ***OK*** to move to the **Job List** screen, ***Job01***. Return to the **Job Select** screen from this screen at any time, discarding changes, by pressing ***Cancel***.

6.5.3 *DETAILS*

PROCESS

Press the ***Process*** button to cycle the label between ***Oxy Process, Plasma Process*** and ***Waterjet***. Leave the desired label showing.

PROGRAM FEEDRATE

Press this pad to move to a numerical keypad and enter the desired value. Then press ***OK*** to return to the ***Job Setup*** Screen.

If feedrates are specified in the program, the value of the first one will appear in the ***Feedrate*** window. A value entered in the ***Job Setup*** screen will override this program value.

CUT MODE

Press this button to change from ***Manual*** to ***Automatic***.

- ***Continuous Test Run*** - This choice makes a test run of the part at the same ***Feedrate*** as the actual cutting process. It does not stop at cut on/off commands but does respond to programmed ***Feedrate*** changes.
- In ***Automatic*** mode the ***BURNY SERIES 10*** controls turning the cutting tool on and off.
- In ***Manual*** mode, the ***BURNY SERIES 10*** waits for the operator to turn the cutting tool on and off.
- ***Single StepTest Run*** - This choice executes just one program move each time ***GO*** is pressed then waits for the next press of the ***GO*** key.

PART CYCLES

Press this button to move to a numerical keypad and enter the desired number of part cycles. Then press ***OK*** to return to the ***Job Setup*** Screen. The ***Thumbnail*** graphic will show the new number of parts.

In a multi-torch machine, the number of parts cut will equal the number of torches times the number of part cycles.

KERF

Press this button to move to a numerical keypad and enter the desired value.

Kerf is the width of the material lost during the cutting process. The torch offsets by half this amount to preserve the part dimensions.

The ***Kerf*** pad is hidden if the part program does not have any kerf commands, i.e. Kerf Left or Kerf Right.

6.6 TIMER SETTINGS SCREEN (JOB06)

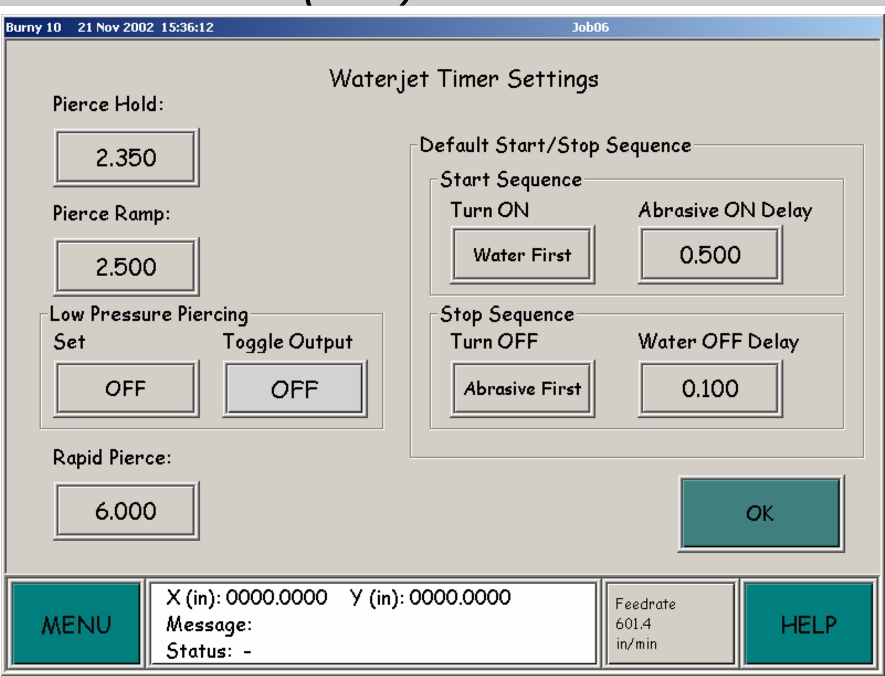


Figure 6.6 - Waterjet Timer Settings Screen (*Job06*)

TIMER SETUP BUTTON /VIEW

The labels on this button are changed by the choice made on the ***Process*** button. After the button is pressed it takes the operator to the Timer Setup View. This view has the following values:

Preheat – in oxy cutting process this delay is applied before the cutting of the part. This particular timer defines the delay that allows the torch to heat up the plate for piercing.

Plasma Adv. Off – in plasma process, this many seconds before the end of the cut, the torch turns off.

Abrasive/Water ON Delay – in waterjet process, the time difference between the moments when water is turned on and when the abrasive is turned on.

Abrasive/Water OFF Delay - in waterjet process, the time difference between the moments when water is turned off and when the abrasive is turned off.

Pierce Hold - The torch remains stationary during this period of time with the cutting oxygen on. At the end of this time, the plate should be pierced. The entered time begins to decrement to zero when the cut switch is turned on. Machine motion does not start until the timer value reaches zero.

Pierce Ramp - The time that it takes to get the torch up to cutting speed with assurance that the plate is still being cut completely through.

Rapid Pierce – The timer that defines how long the waterjet nozzle will remain I circular motion during the program cut on sequence.

Low Pressure Pierce – simply defines whether the low pressure pierce is applied.

THUMBNAIL

Press this window to display the graphic at full screen size with tools to zoom and pan on the image.

The ***Thumbnail*** graphic window shows in red the outline of the part or parts and the lead-in and lead out as they will be cut by the part program whose name is highlighted by the cursor in the ***Job Select*** screen. In the other ***Job*** screens, the ***Thumbnail*** graphic shows the part that has been selected. Traverse motion of the tool shows in dashed yellow.

This graphic window shows the number of parts specified in the ***Part Cycles*** window.

OPTIONS

Press to display the ***Job Geometry Setup*** screen. Make the desired choices of the five features there. Then press ***OK*** to return to the ***Job Setup Screen***.

The choices made always appear on this button. If the default values set up in the ***Utility*** mode are selected, the button background is gray. If one or more of the values differ from the defaults, the background is white to remind the operator.

CANCEL

Press ***Cancel*** to discard all changes and return to the ***Job Selection*** screen.

OK

Press ***OK*** to accept all the choices made on this screen and move to the ***Job Preview*** screen, ***Run03***.

6.7 JOB GEOMETRY SETUP SCREEN (JOB05)

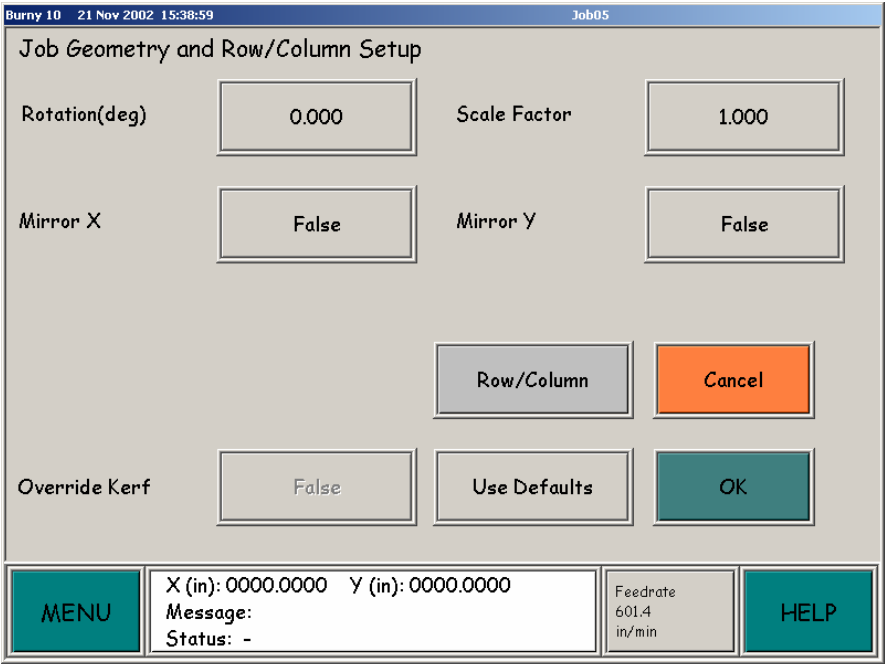


Figure 6.7 – Job Geometry Setup Screen (*Job05*)

6.7.1 DESCRIPTION

The ***Job Geometry Setup (Job05)*** screen enables the operator to set five geometrical features of the part. He can select default values set up in the ***Utility Mode*** or change one or more of them, as required.

Do not have more than one job on the ***Job List*** with the same name.

6.7.2 PROCEDURE

Access this screen by pressing the ***Options*** button in the ***Job Setup*** screen (***Job04***). Press the ***Use Defaults*** button to set all five features to the default values. To change individual values, press their button. For the two numerical values, the ***NumKeypad*** appears. Enter the desired value and press ***OK*** to return to the ***Job04*** screen. For the three Boolean (***True*** or ***False***) features, the opposite value appears on the button when it is pressed.

Beside each ***True***/***False*** button is a statement such as "***Swap X and Y***". When the button label is "***True***", X and Y are swapped. When it is "***False***", they are not swapped.

When finished making changes, press the ***OK*** button to save the changes and return to the ***Job Setup*** screen, ***Job04***. Press ***Cancel*** to discard any changes made and return to the ***Job Setup*** screen, ***Job04***screen.

6.7.3 DETAILS

USE DEFAULTS

This button sets all five features to default values set up in the ***Utility Mode***. Usually these values are ***False*** for the three mirror and swap items, zero degrees for ***Rotation***, and one for ***Scale Factor***.

When all values are set to the defaults, the ***Options*** button in the ***Job Setup*** screen is gray. If one or more values differ from the default, the ***Options*** button is white.

ROTATION

The ***Rotation*** button brings up a ***NumKeypad*** where the value is entered. A positive value rotates the part counterclockwise. The entry can range from -360.000 degrees to 360.000 degrees. When the entry is correct, press ***OK***. To discard any changes and return to the previous screen, press ***Cancel***.

The ***NumKeypad*** displays a minimum and maximum value for the item. Entering a value out of that range and pressing ***OK*** clears the entry and displays a "***NOT in range***" warning. Re-enter a value within range.

SCALE FACTOR

The ***Scale Factor*** value will increase or decrease the size of a part that is cut in relation to the dimensions specified in the program. If the ***Scale Factor*** is 2.000, the part will be twice the size called for in the program. If the ***Scale Factor*** is 0.500, the part will be half the size called for in the program.

The Scale Factor range is 0.010 to 999.990.

MIRROR X

When ***Mirror X*** is ***True***, the part is cut with all the ***X*** dimensions reversed in sign. The same type of cut would result from cutting the part from the bottom of the plate, if this were possible.

MIRROR Y

When ***Mirror Y*** is ***True***, the part is cut with all the ***Y*** dimensions reversed in sign. The same type of cut would result from cutting the part from the bottom of the plate, if this were possible.

SWAP X AND Y

When ***Swap X*** and ***Y*** is ***True***, the tool makes each ***+X*** move called for in the program in the ***+Y*** direction and each ***+Y*** move in the ***+X*** direction. The minus moves are swapped in the same way. The result is the same as a combination of ***Mirror Y*** and ***Rotate +90*** degrees.

USE DEFAULTS

Press the ***Use Defaults*** button to set the five ***Job Geometry*** parameters to the default values set in the ***Utility Mode***. Usually the default values are:

Rotation	0.000	**Scale factor**	1.000
Mirror X	False	**Mirror Y**	False
Swap X and Y	False		

ROW/COLUMN

Press the **Row/Column** button to display the **Row and Column Nest** screen and set up a row and column cutting pattern. See the **Run** section of this manual for an explanation.

6.8 ROW AND COLUMN NEST (RUNOPTNEST)

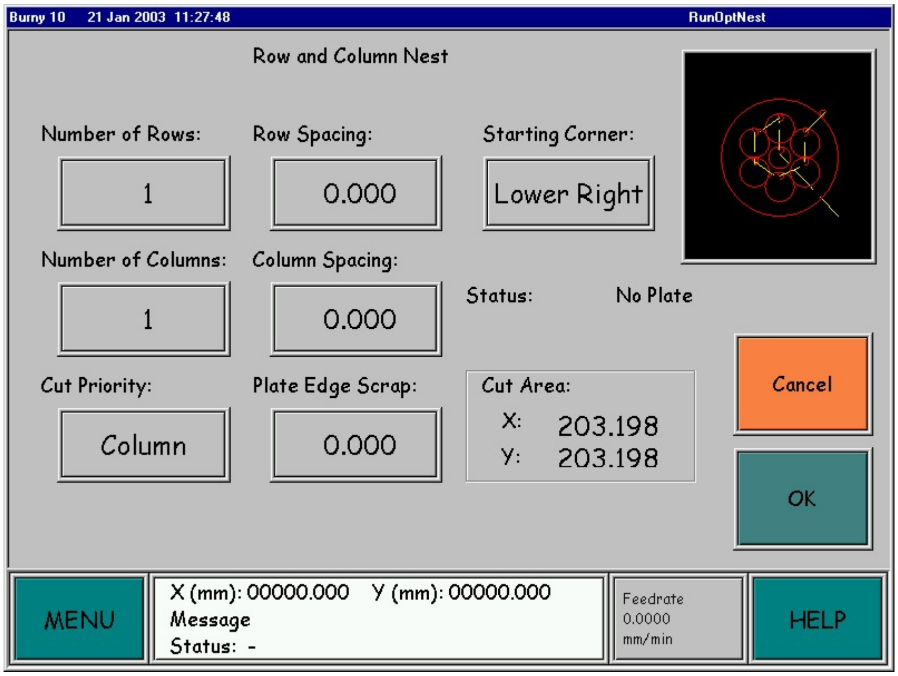


Figure 6.8 - Row and Column Nest (*RunOptNest*)

Used to setup a part program that includes a number of nested parts. Displayed after the ***Row/Column*** button is pressed on the **Job Geometry and Row/Column Setup (*Job05*)** screen.

***ROW AND COLUM NEST*:**

NUMBER OF ROWS

Maximum Number of Parts in a Column – entered via the **NumKeyPad**

ROW SPACING

The distance between each row.

STARTING CORNER

The lead-in position for the cut:

- **Lower Left**
- **Lower Right**
- **Upper Left**
- **Upper Right**

NUMBER OF COLUMNS

Maximum Number of Parts in a Row – entered via the **NumKeyPad**

COLUMN SPACING

The distance between each column.

CUT PRIORITY

Column or Row.

PLATE EDGE SCRAP

Plate Edge Scrap – entered via NumKeyPad

CUT AREA

The total plate area required to cut the nested parts includes the part area(s), kerfs, plate edge scrap and the space between the rows/columns.

CANCEL

Return to the **Job Geometry and Row/Column Setup (*Job05*)** screen without saving any changes.

OK

Save the nested part details and return to the **Job Geometry and Row/Column Setup (*Job05*)** screen.

EXPANDED GRAPHIC WINDOW

Displays the plate and part placement, updating as the data is entered. Refer to the Expanded Graphic Window in Section 1 of the manual for further details of the screen and usage. Press the window for a full screen display of the part(s).

BLANK

UTILITY MODE

(AO-70359 REV AA)

SECTION

7

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

Table of Contents

7 UTILITY MODE

7.1 INTRODUCTION

The **Burny Series 10** uses many system parameters to configure and tune a specific installation. The **Utility** mode displays the value of these parameters at all times and enables an operator who has the password to change these values. All the screens are accessed via two menu screens, **Select Utility Section** (**Util01**) and **Utility Main Menu** (**Util13**). The following functions are available:

Utilility Screen (Util01)	Utility Main Menu (Util13)
Dictionary Viewer	General Setup (System Defaults)
System Setup	Change Password(s)
Set Homes	Default Program Format (Standard)
Shutdown	Custom AUX Codes
Consumable Statistics	Motion Configuration
Touch Screen Calibration	Language
Login	Communication Setup
Diagnostics	Miscellaneous Setup

Enter the **Utility** Mode by pressing the **Utils** button in the **Main Menu** screen. The last active **Utility** screen will appear. Move to the **Select Utility Section (Util01)** screen with the ***OK*** and ***Cancel*** buttons.

Each of the sections will be described in turn, screen by screen.

This section contains instructions for navigating through the **Utility** section and descriptions of the various parameters. **Section 10** of this manual gives additional information and specific details for setting many of these parameters.

Many screens in the **Utility** mode have names (prompts) at the upper left. Some do not, but have been given names in the text that suggests their function. All screens carry an alphanumeric designator at the upper right corner. Most of them start with "***Util***" followed by a two-digit number, such as **Util01**. References to the screens in the text will use the name and designator or just the designator.

7.2 SELECT UTILITY SCREEN (UTIL01)

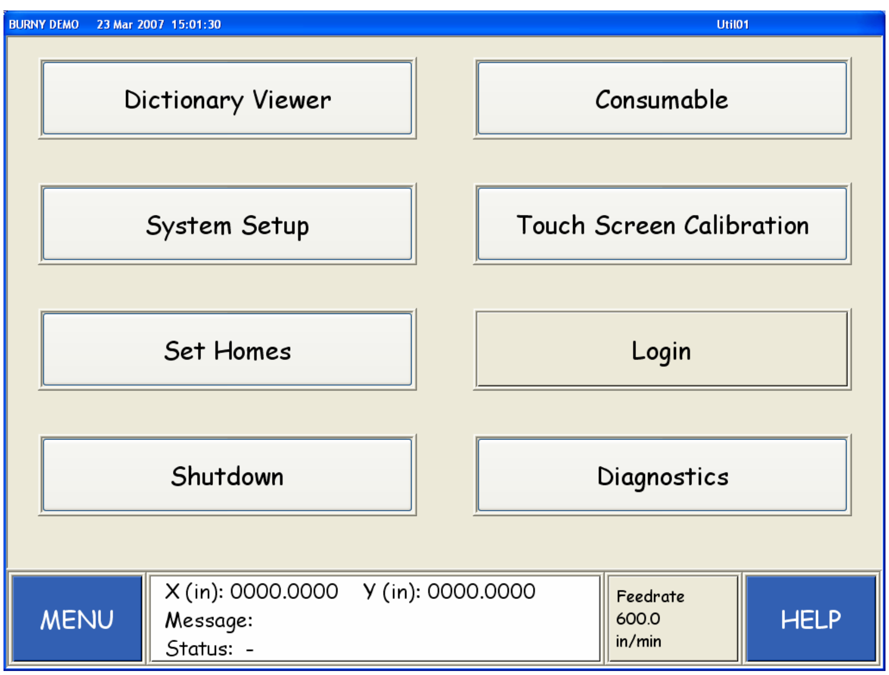


Figure 7.1– Select Utility Screen (*Util01*)

7.2.1 DESCRIPTION

The **Select Utility Section Screen** (**Util01**) displays 8 buttons, one for each functions of the **Utility** mode.

7.2.2 DETAILS

DICTIONARY VIEWER

Displays the **Dictionary Viewer** screen where the current values of all the system parameters can be examined. (Ref. Sec 7.3)

SYSTEM SETUP

Displays the **Utility Main Menu** screen where the remaining ***Utility*** functions can be accessed. (Ref. Sec 7.10)

SET HOMES

Displays the **Machine Squaring** screen where the gantry of a machine with a slave X axis can be can be brought into square.

SHUTDOWN

Select to shutdown the system.

The particular features, software and hardware devices affected during the shutdown process is unique to each installation.

CONSUMABLE

Displays the **Consumable Statistics** screen where the tool usage record can be examined. (Ref Sec. 7.4)

TOUCH SCREEN CALIBRATION

Displays the **Touch Screen Calibration** screen where the **Touch Screen** can be calibrated. (Ref Sec 7.5)

LOGIN / LOGOFF

The system uses two passwords, providing two levels of access and control:

- ***Admin*** password gives access to all functions, including changing the password
- ***Supervisor*** password, to a set of fewer functions.

This button displays the **NumKeypad** screen for entering the ***Admin*** or ***Supervisor*** password or disables the password if one is enabled. (Ref Sec 7.12)

DIAGNOSTICS

This button gives access to the Diagnostic Menu which allows to select "Aux I/O", "I/O Status" and "Cut Logic I/O" diagnostic screens. (Ref Sec 7.9)

7.3 DICTIONARY VIEWER SCREEN (UTIL20)

7.3.1 DESCRIPTION

The ***Dictionary Viewer*** screen provides real-time software information to service personnel. The value of any entry (variable) in any substructure of any of the twelve machine software modules can be examined. The type and current value is given. The total number of such entries is also displayed.

If a parameter is chosen that varies with machine motion, jog the machine and watch the value change in this screen.

No direct changes can be made here, this is a read-only screen.

Press ***OK*** to leave the screen and return to **Util01**.

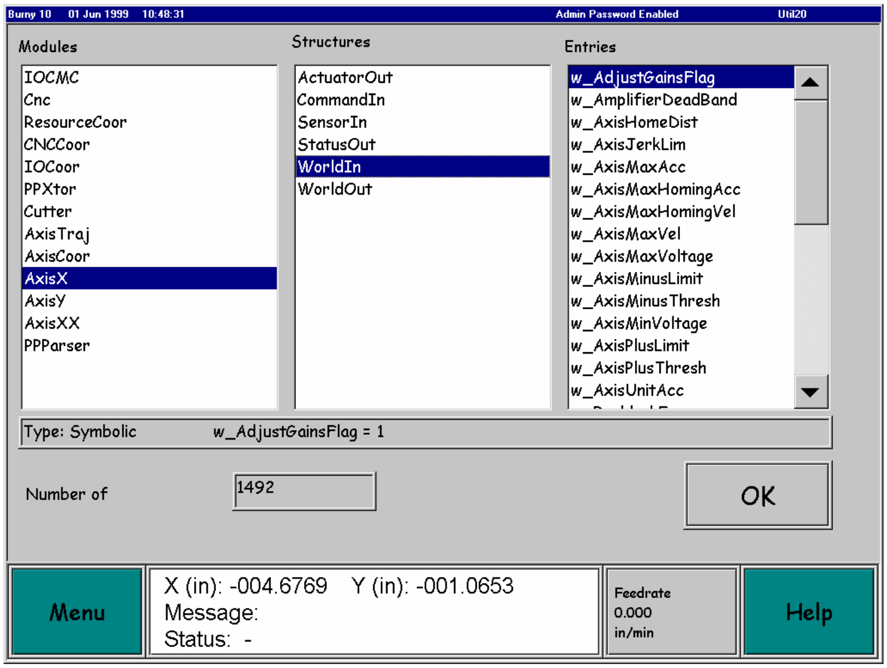


Figure 7.2 – Dictionary Viewer Screen (*Util20*)

Click on the parameter, then select from the sublist.

7.4 CONSUMABLE STATISTICS SCREEN (UTIL40)

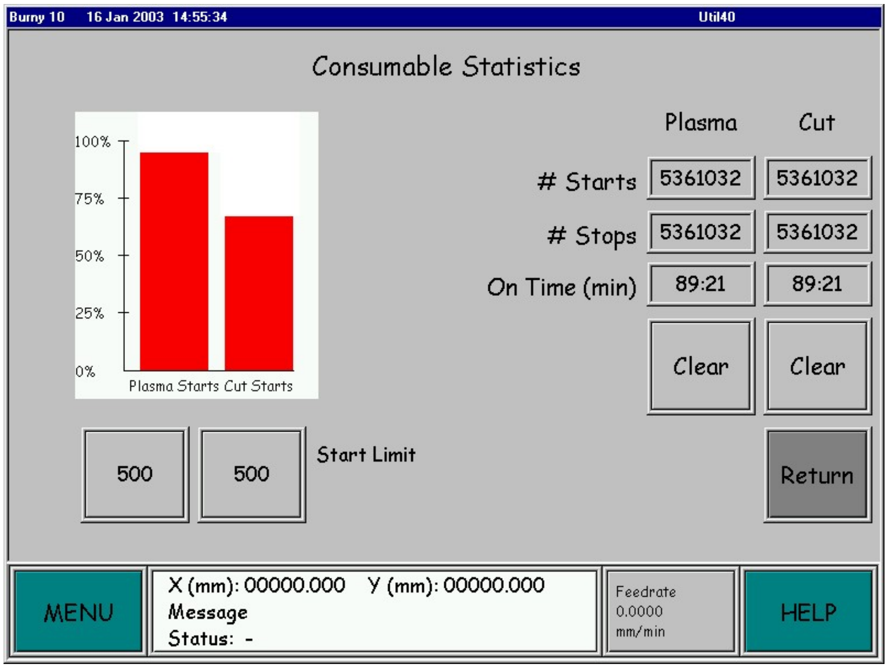


Figure 7.3 – Consumable Statistics Screen (*Util40*)

7.4.1 INTRODUCTION

The rate at which plasma tips are consumed depends upon the number of starts and the burning time. The **Consumable Statistics** screen tracks the amount of the tip life that has been used. When this figure approaches 100%, a warning message appears on screen.

7.4.2 DESCRIPTION

The **Consumable Statistics** screen keeps a count of how many starts and stops a plasma or oxy tip has made and the duration of cutting time. A bar chart displays how close these two figures are to the total life of the tip.

7.4.3 PROCEDURE

CHECK CONSUMABLE

Press the ***Consumable*** button in the **Util01** screen to display the **Consumable Statistics** screen. Examine the screen to check the remaining tip life.

The bar graph will show the bars in different colors as follows:

- BLUE means that the number of starts is less than 95% of the maximum of starts.
- YELLOW means that the number of starts is between 95% and 100% of the maximum number of starts.
- RED means that number of starts is at or has exceeded the maximum number of starts.

Press ***Return*** to return to the **Util01** screen.

RESET SCREEN

When installing a new tip, first enable either password then open this screen. Now the ***Clear*** and ***Start Limit*** buttons are enabled. Press the ***Clear*** button in the **Plasma** column. The # ***Starts***, # ***Stops***, and ***On Time*** figures in the **Plasma** column are reset to zero. The bar chart value is also cleared. The **Oxy** column operates in the same way. When installing a tip with a different life, change the ***Start Limit*** to match. Press ***OK*** to exit the screen. Be sure to disable the password if it is no longer needed.

7.5 TOUCHSCREEN CALIBRATION SCREEN (TOUCH SCREEN)

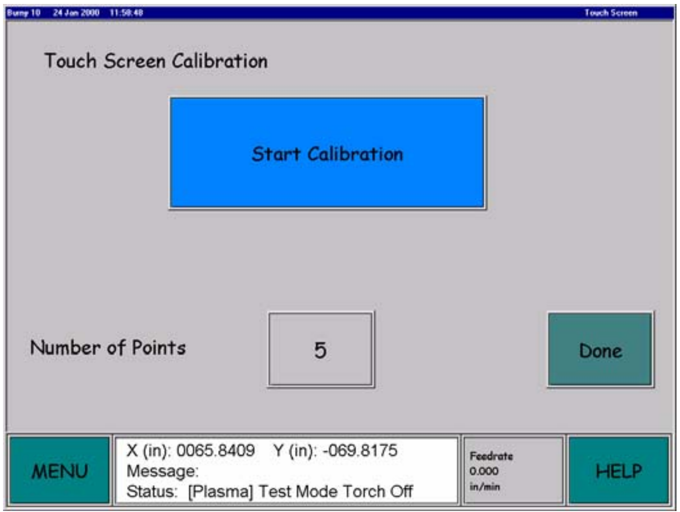


Figure 7.4 – Touch Screen Calibration Screen (*TouchScreen*)

7.5.1 DESCRIPTION

The **Touch Screen Calibration** screen enables the operator to align the ***Touch Screen*** so that the finger touch point and the location activated on the display are aligned.

7.5.2 PERFORMING A SCREEN CALIBRATION

1. Press the **Start Calibration** button on the Touch Screen Calibration screen.

   The **Calibration Control Panel** popup is displayed.

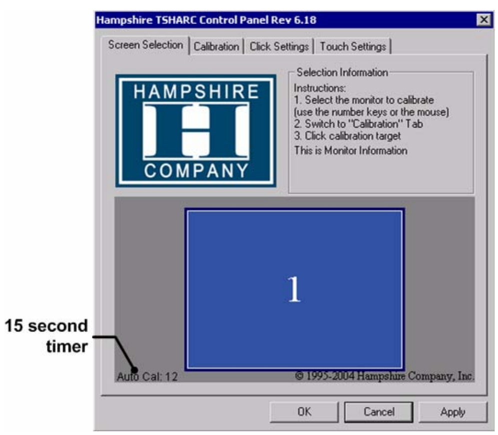


Figure 7.5 Calibration Control Panel Popup

This screen lets the operator align the finger touch point to a number of target locations (default configuration of 4) activated on the display

The **Touch Screen Calibration** screen then displays the message “Wait for calibration targets”.

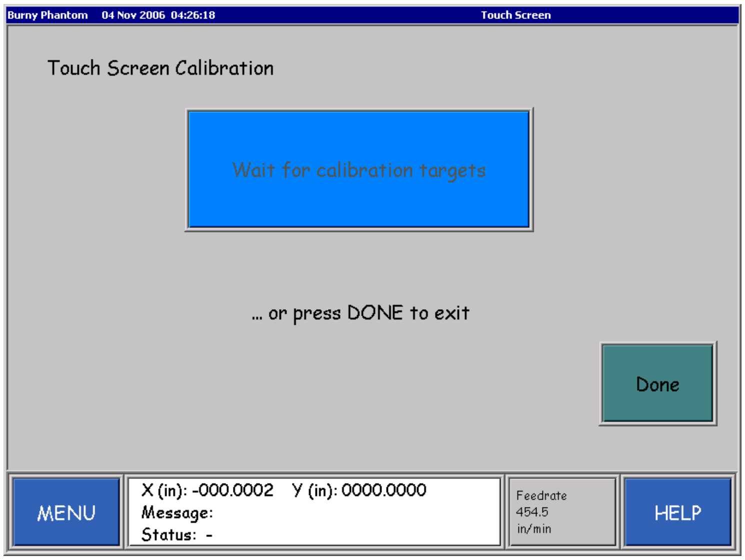


Figure 7.6 Wait for Calibration Targets

After fifteen seconds (see Figure 7-5), a screen displays a calibration target (✚) in the upper left-hand corner.

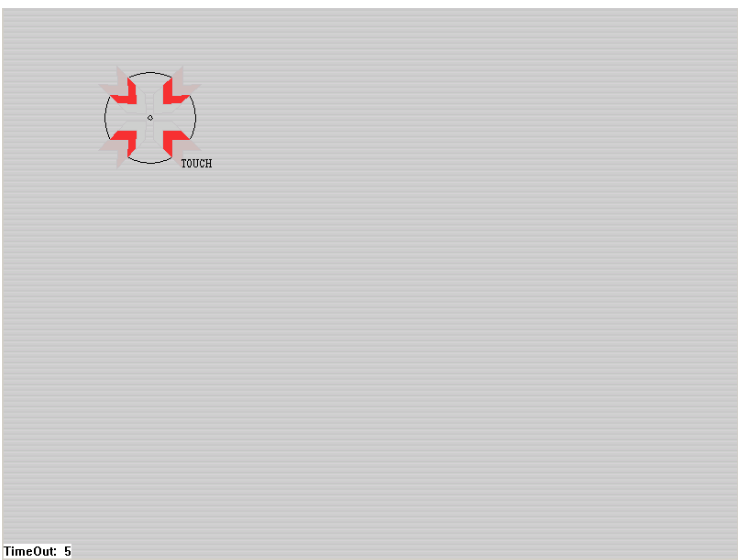


Figure 7.7 Touch, hold and release the target

2. Touch, hold and release the target as instructed to record the touch down position.
3. Continue to touch, hold, and release the target at the four locations on the screen.

After the target has moved to all four locations, the **Touch and Move Target** screen is displayed.

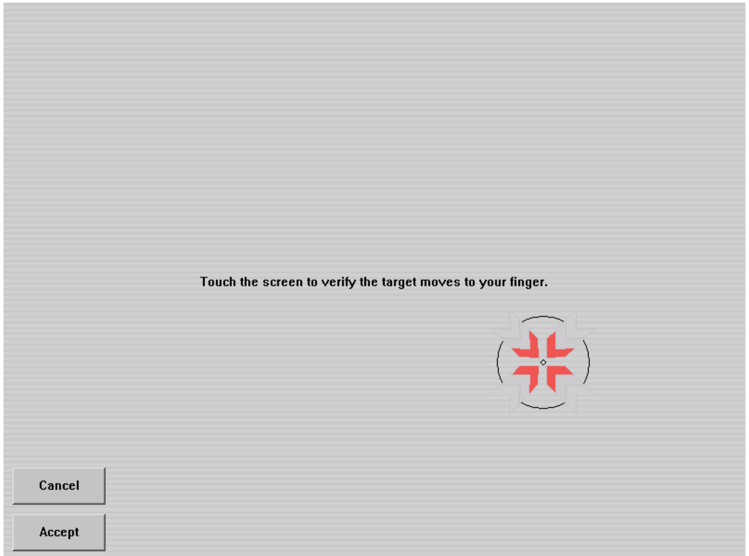


Figure 7.8 Touch and Move Target

4. To verify that the target moves to your finger, touch the target and move it in all directions.
5. When you are satisfied with the target's response, press the **Accept** button.
6. Press the **Done** button on the **Wait for Calibration Targets** screen (Figure 7-6) to end the calibration procedure and return to the **Util01** screen.

7.6 HOMING – AUTOMATIC & MANUAL

7.6.1 OVERVIEW

At certain times the system can lose its absolute home position such as after an intentional power-down or a random power outage. Before cutting parts, the absolute home position should be established by performing a ***Homing*** operation.

Refer to Setup & Calibration for a comprehensive explanation of the homing process.

7.7 LOGIN / LOGOFF

With Burny software version 5.0, the Enable/Disable Admin/Supervisor Password button has been changed to read Login/Logoff. The differences are shown below on the Util01 screen.

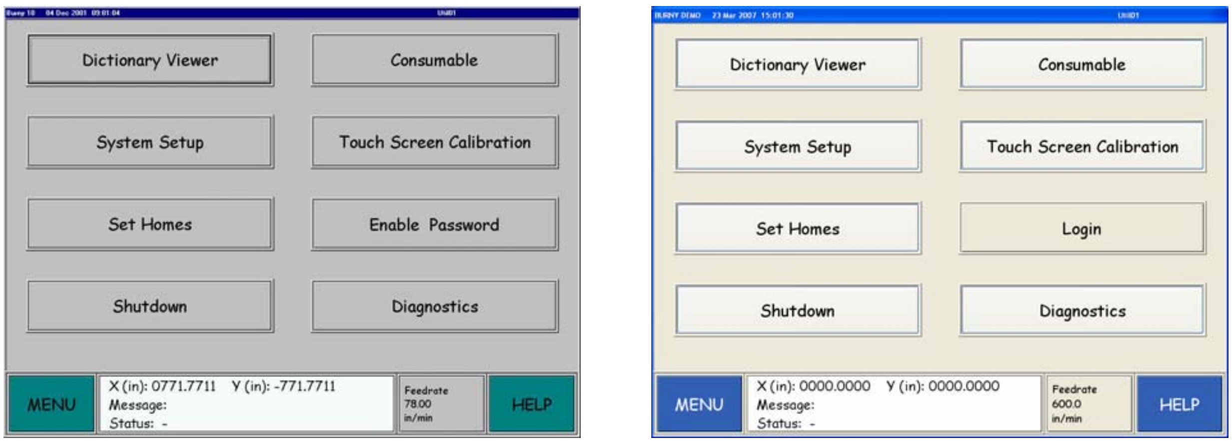


Figure 7.9 Previous Util01 Screen vs. New Util01 Screen

Although this button's label has changed, its function remains the same; to activate the Administrator or Supervisor accounts. These accounts allow access to screens and settings which are not needed for day to day operations.

Passwords for the Administrator and Supervisor accounts are still set through the Change Password(s) button located on the Util13 screen (MENU > Utils > System Setup). This button will be "grayed-out" unless the Administrator account is activated.

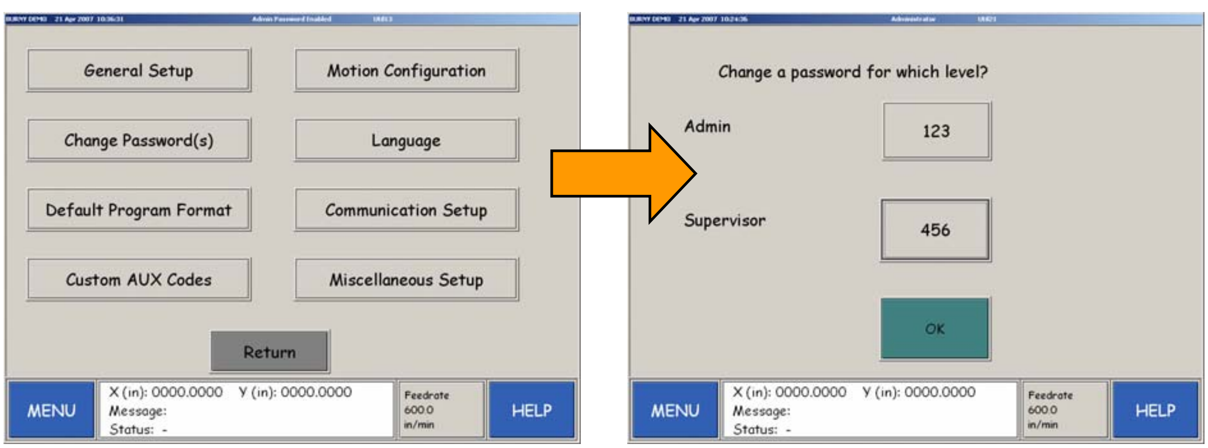


Figure 7.10 Util13 and Util21 Screens

Once successfully logged in, the title bar at the top of the screen will flash either "Admin Password Enabled" or "Supervisor Password Enabled." Also, the Login button label on Util01 will change to either Administrator Logoff or Supervisor Logoff. Press this button once to log off of either account.

7.7.1 LOGIN FOR INDIVIDUAL USER ACCOUNTS

As an extension to the Login/Logoff changes previously described, Burny software version 5.X also allows Individual Users to login/logoff of accounts created by a Burny administrator.

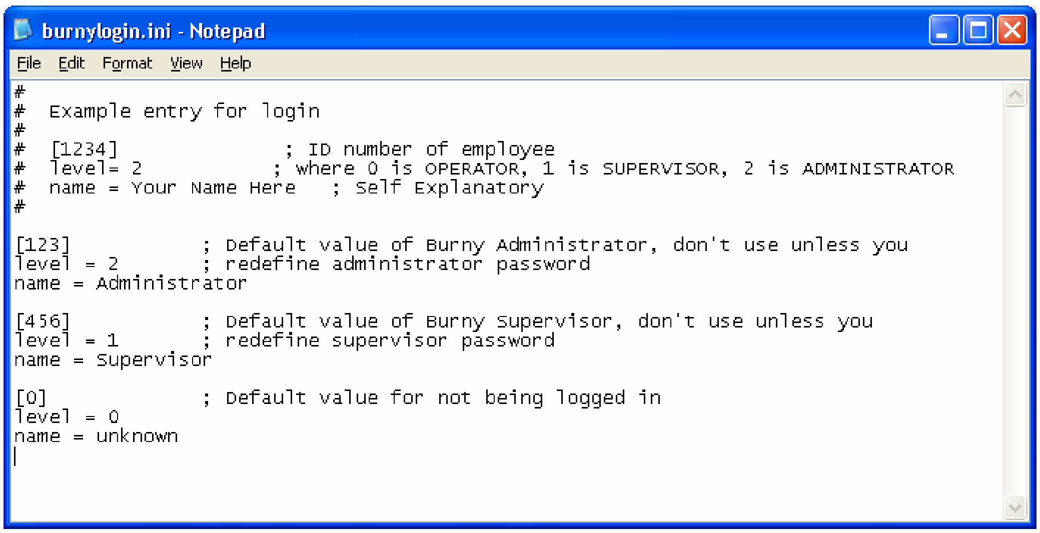
As with earlier software versions, the Burny offers three levels of operation; each of which regulates access to certain settings, parameters and screens. Previously, only one account was available for each level. Now, a virtually unlimited number of accounts can be created for each of the following levels:

- Operator - the default and most restricted level.
- Supervisor - basically the same as administrator.
- Administrator - allows full control of all settings and access to all screens.

Individual User Accounts were developed primarily to be incorporated into third-party job reporting or job tracking software. However, even if this type of software isn't utilized, individual user accounts can still be used. Here is how it works:

Information about the individual user is stored in the burnylogin.ini file. By default, this file is located in the D:\Burny\Systemini\ folder.

The following is an example of the burnylogin.ini file. It can be easily opened and edited using Windows Notepad, which is already installed on the Burny.



burnylogin.ini - Notepad

File Edit Format View Help

```
#
#  Example entry for login
#
#  [1234]              ; ID number of employee
#  level= 2           ; where 0 is OPERATOR, 1 is SUPERVISOR, 2 is ADMINISTRATOR
#  name = Your Name Here   ; Self Explanatory
#

[123]           ; Default value of Burny Administrator, don't use unless you
level = 2       ; redefine administrator password
name = Administrator

[456]           ; Default value of Burny Supervisor, don't use unless you
level = 1       ; redefine supervisor password
name = Supervisor

[0]             ; Default value for not being logged in
level = 0
name = unknown
```

Figure 7.11 Burnylogin.ini File

Each user account must contain the following items as shown in the file above:

1) ID Number. The number in braces is the user's identification number, which is used to login on the ***Util01*** screen. ID Numbers must range between 100 and 999999.

   Values that should ***NOT*** be used as ID Numbers include ones matching the Burny Administrator and Burny Supervisor passwords as set on the ***Util13/Util21*** screens.

2) Level, which can be 0, 1, or 2, regulates access to certain settings and screens.
   - 0 is for the Operator level. It is the most restrictive and is the default level when no one is logged in.
   - 1 is for the Supervisor level, which is basically the same as administrator.
   - 2 is for the Administrator level - full control and full access.

3) Name is the user's name. It is displayed in the title bar at the top of the screen when a user is logged in.

Virtually any number of user accounts may be added to the burnylogin.ini file.

For security purposes, this .ini file can be relocated by changing the following Burny registry entry: HKEY_LOCAL_MACHINE\SOFTWARE\CMC\Burny\SETTINGS\LoginPath

The figure below shows the Registry Editor screen editing the required value.

Important! Using Registry Editor incorrectly can cause serious, system-wide problems that may disable the Burny. Only qualified and authorized personnel should attempt to make this change.

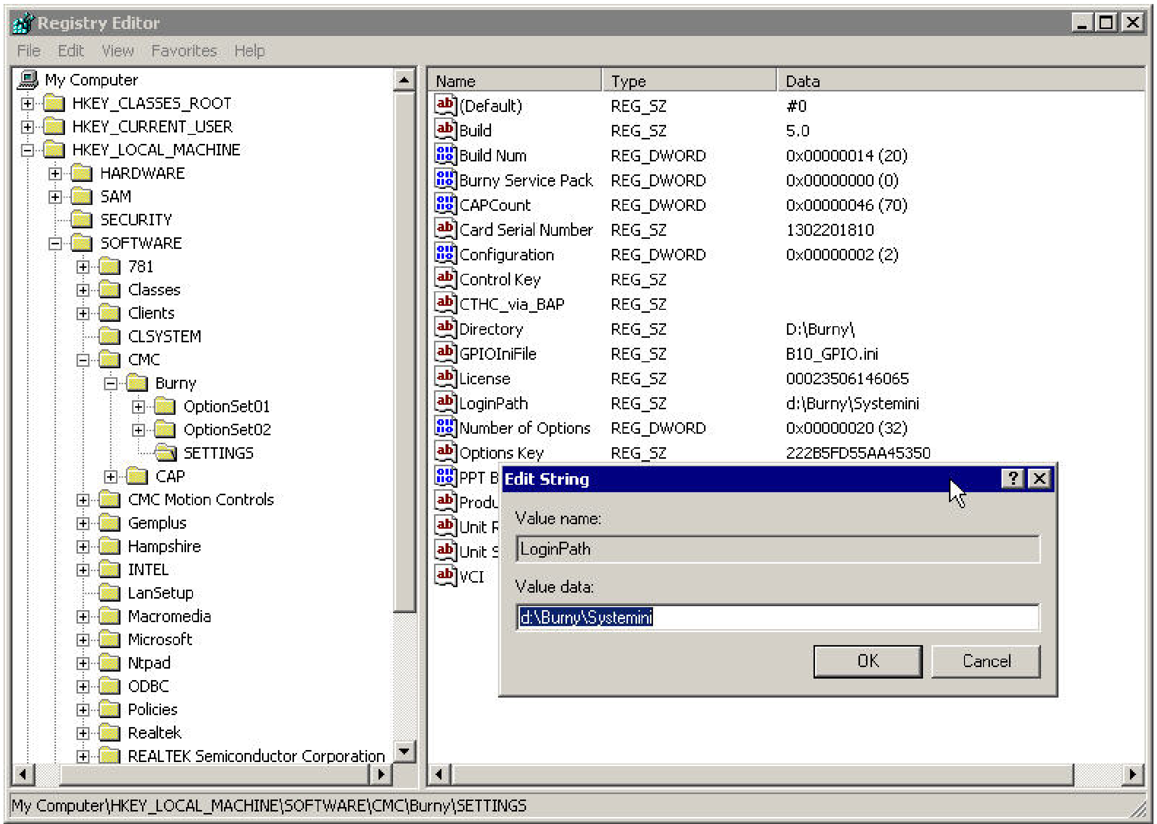


Figure 7.12 Registry Editor Screen

Once the burnylogin.ini file is setup properly, users login to their account on the Util01 screen (MENU > Utils) using the Login button. The users ID Number is entered using the NumKeypad screen, followed by the OK button.

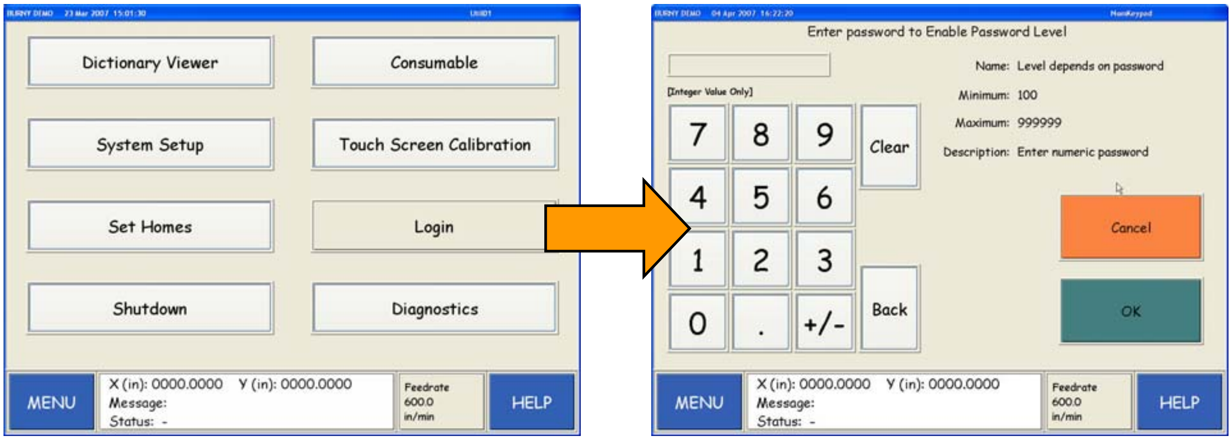


Figure 7.13 Util01 and NumKeypad Screens

To logoff of a user account, return to the Util01 screen (MENU > Utils). The access level assigned to the user (Operator, Supervisor or Administrator) will precede the word Logoff as shown below. Press this button once to logoff.

Figure 7.14 Logoff Button on Util01 Screen

7.8 SHUTDOWN FEATURE (UTIL01)

ACCESS METHOD

The "Shutdown" feature is accessible from the main **Utility Screen (*Util01*)**.

CONFIRMATION QUERY SCREEN

When you press the ***Shutdown*** button from the Utilities Main Menu, the following screen is displayed as a confirmation query. Press the ***OK*** button to continue the shutdown process or ***Cancel*** to go back to the Utilities Main Menu.

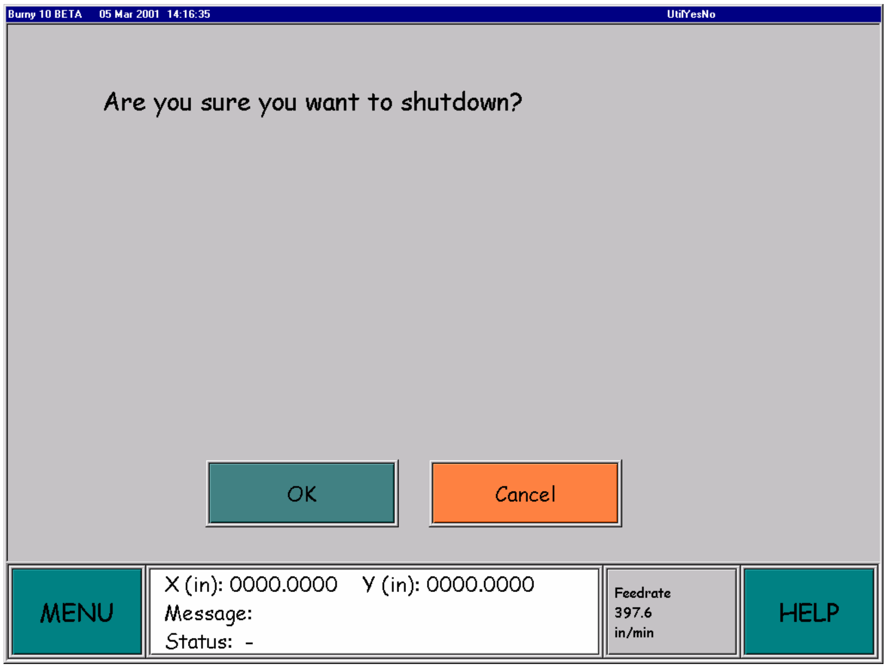


Figure 7.15 – Confirmation Screen (*UtilYesNo*)

When ***OK*** is pressed, the ***Burny Series 10*** will perform a shutdown. This shutdown is complete when the "Restart" small dialog box appears with the "Torch" backdrop. At this time, you may turn off the ***Burny Series 10*** power.

7.9 DIAGNOSTICS

ACCESS METHOD

The Input/Output (I/O) diagnostic screens are accessible from the main Utility Screen (Util01). Pressing this button displays the following menu.

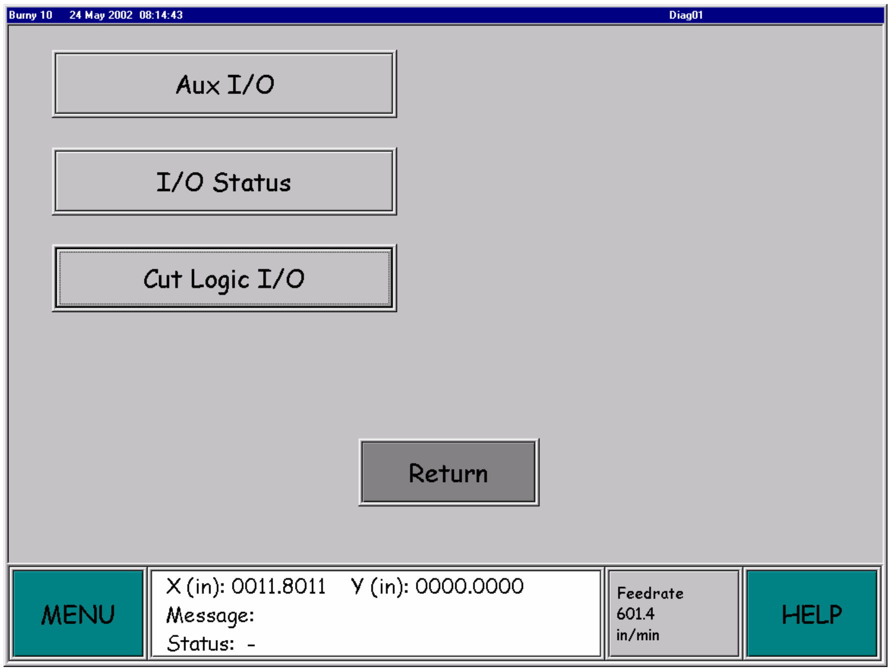


Figure 7.16 - I/O Diagnostics Main Menu (*Diag01*)

AUXILIARY I/O CONTROLS AND STATUS SCREEN

This screen displays the 8 Auxiliary Output and 4 Auxiliary Input status. If the Supervisor password is enabled and there is no active job, the output light bulbs become buttons that control the outputs. The following screen is displayed without a job loaded and no password enabled.

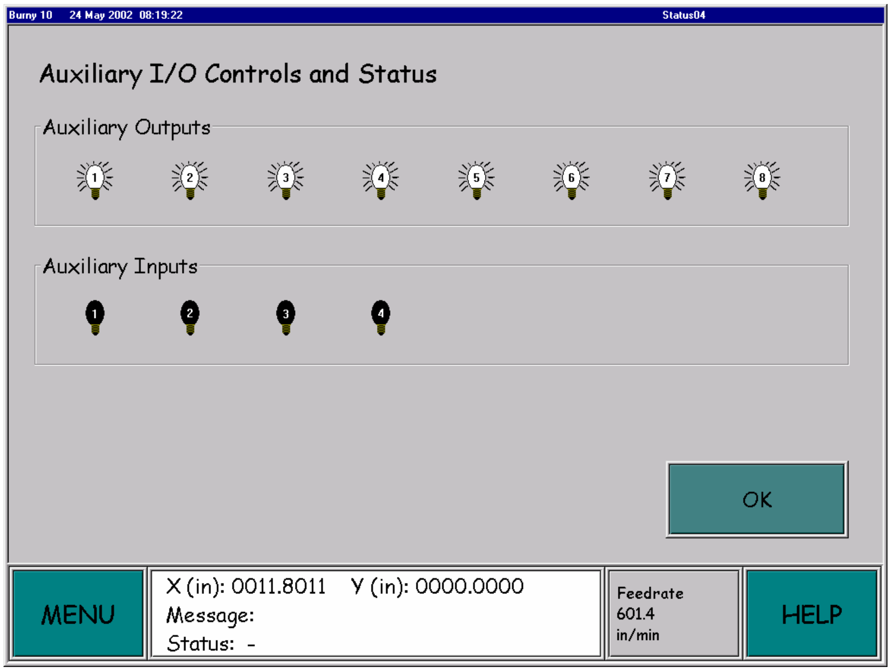


Figure 7.17 - Auxiliary I/O Controls and Status (*Status04*)

RAW I/O SCREEN

This screen is used for diagnostic purposes. It displays the index and encoder input signals, the DAC's, ADC's and unprocessed PCI IO signals.

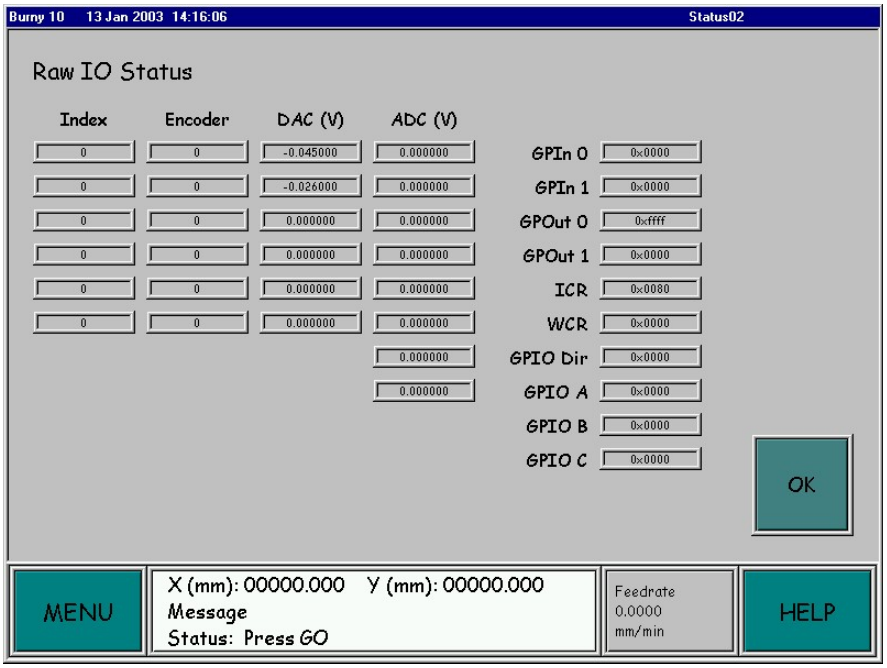


Figure 7.18 - I/O Status Screen (*Status02*)

CUT LOGIC I/O SCREEN

This screen displays the Input and Output signal status associated with the cut logic and other functions. If the Supervisor password is enabled and there is no active job, the output light bulbs become buttons that control the outputs. The following screen is displayed with no job loaded and the password enabled.

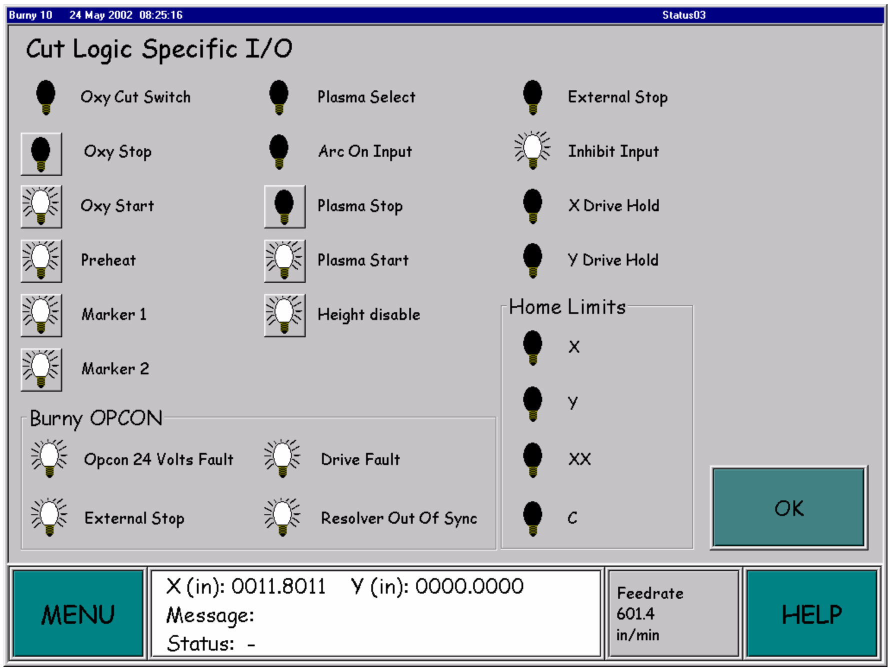


Figure 7.19 - Cut Logic Specific I/O Screen (*Status03*)

7.10 UTILITY MAIN MENU SCREEN (UTIL13)

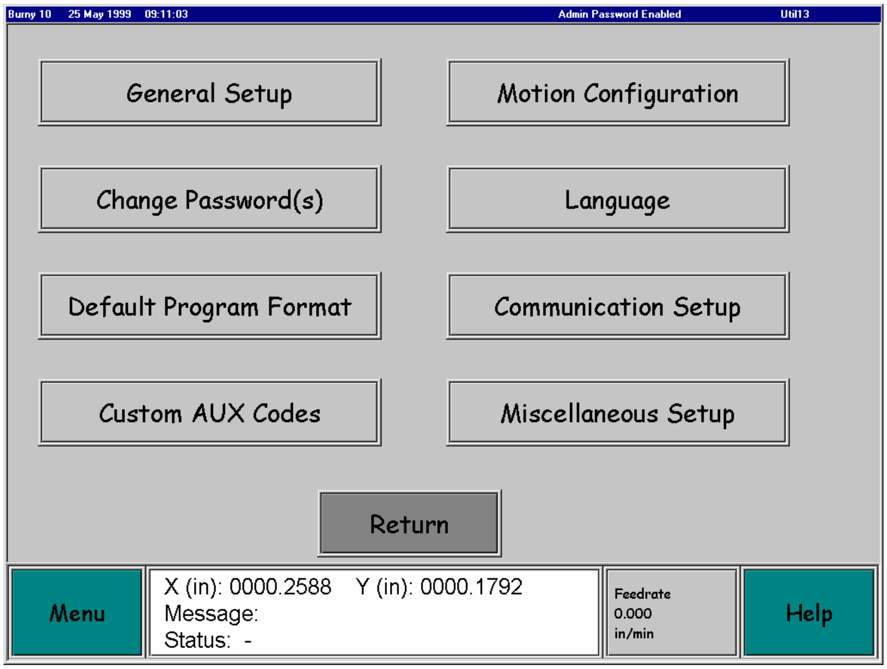


Figure 7.20 – Utility Main Menu Screen (*Util13*)

7.10.1 DESCRIPTION

The **Utility Main Menu** screen holds eight buttons that access various **Utility** functions. This screen is reached via ***System Setup*** on the **Select Utility Section** screen, **Util01**.

7.10.2 PROCEDURE

Press ***System Setup*** in the **Util01** screen to display the Utility Main Menu screen. Select the desired function. Press ***Return*** to display the **Select Utility Section** screen.

The ***Change Password*** button shows its label as dim gray when the ***Admin*** password is not enabled and pressing it has no effect. See **Details** below. All the other buttons will always move the display to another screen. If no password is enabled, values can be examined but not changed.

7.10.3 DETAILS

GENERAL SETUP

Displays the **General System Defaults** screen, **UtilGenSetup,** where the default value of four system parameters can be set if either password is enabled. (Ref Sec 7.11).

CHANGE PASSWORD(S)

Displays the **Change a password for which level** screen, ***Util21,*** where either the ***Admin*** or ***Supervisor*** password can be changed if the ***Admin*** password is enabled. (Ref Sec 7.12).

DEFAULT PROGRAM FORMAT

Displays the **Standard Program Format** screen, **Util85standard,** where the default value of several program parameters can be set if either password is enabled. (Ref Sec 7.13).

CUSTOM AUX CODES

Displays the **Select AUX code file to edit** screen, **Util81,** where the creation or editing of an ***AUX Code File*** begins if either password is enabled. If no password is enabled, existing ***AUX Code Files*** can be examined. (Ref. Sec 7.14)

MOTION CONFIGURATION

Displays one of the 9 **Motion Parameter** screens, **Util10.** Refer to Section 11B for a comprehensive description of this utility.

LANGUAGE

Displays to the **Language Configuration** screen, **Util31,** where the language for the terms on the screen can be changed to one of three selected with no password enabled. (Ref Sec 7.22)

COMMUNICATION SETUP

Displays the **Communication Selection** screen, **Util12,** where one of four types of communication can be chosen for setup. Most current settings here can be examined but not changed unless the ***Admin*** password is enabled. (Ref Sec 7.24)

MISCELLANEOUS SETUP

Displays the **Miscellaneous Select** screen, **Util24,** where the **License** screen, **Util60**, can be selected for display where the **License Key**, can be changed if the ***Admin Password*** is enabled. (Ref Sec 7.29)

RETURN

Returns to the ***Util01*** screen.

7.11 GENERAL SYSTEM DEFAULTS (UTILGENSETUP)

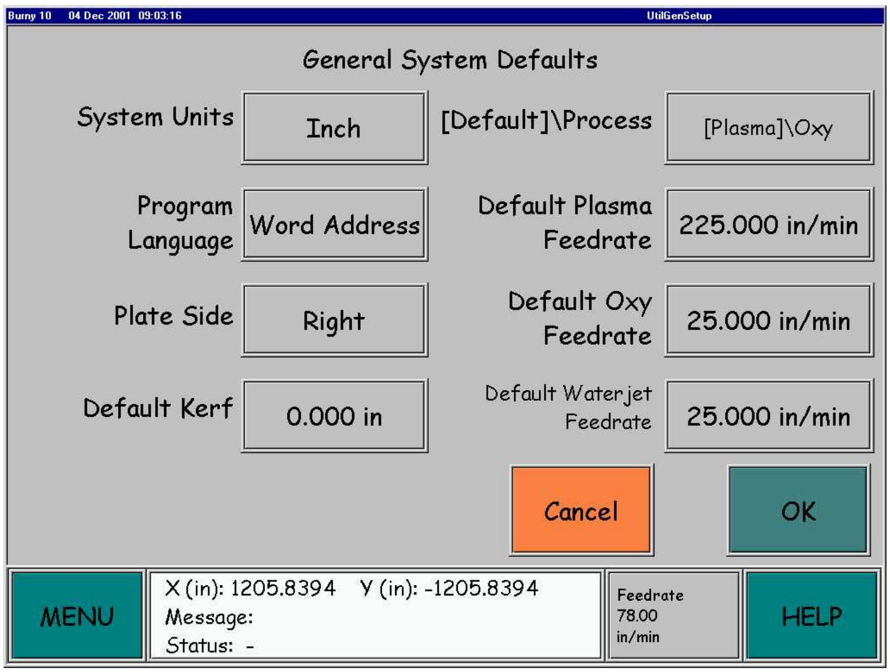


Figure 7.21 – General System Default Screen (*UtilGenSetup*)

7.11.1 DESCRIPTION

The ***General System Defaults*** screen (under ***General Setup***) allows for default setting of the following ***Utility*** items when the ***Admin Password*** is enabled:

System Units	**Default Process**
Program Language	**Default Plasma Feedrate**
Plate Side	**Default Oxy Feedrate**
Default Kerf	**Default Waterjet Feedrate**

When the ***Admin Password*** is not enabled, the buttons are disabled and their labels are grayed out.

7.11.2 PROCEDURE

Be sure the ***Admin Password*** is enabled. Select any button on this screen whose value needs to be changed. For the first four items in the list above, the button toggles the display through a set of values. When the desired value is displayed, move on to the next item.

When a feedrate or kerf button is pressed, the **NumKeypad** appears. Enter the desired value and press ***OK***. When all the labels are correct, press ***OK*** to return to the ***Utility Main Menu*** screen, ***Util13***, and save all the changes or ***Cancel*** to discard all the changes and retain the previous values.

7.11.3 AVAILABLE SETTINGS

System Units – INches and MM Millimetres

Program Language – Word Address, ESSI, Word Address 1, Word Address 2

Plate Side – Right, Left

Default Kerf – distance entered using the numbers.

[**Default]\Process** – configuration of the cutting heads, for systems where two heads are mounted the default head is the one bounded by the [ ] brackets.

[Plasma] \ Oxy

[Oxy] \ Plasma

[Waterjet]

[Waterjet] / Plasma

[Plasma] / Waterjet

Default Plasma Feedrate – enter using the number keypad

Default Oxy Feedrate – enter using the number keypad

Default Waterjet Feedrate – enter using the number keypad

7.12 CHANGE A PASSWORD SCREEN (UTIL21)

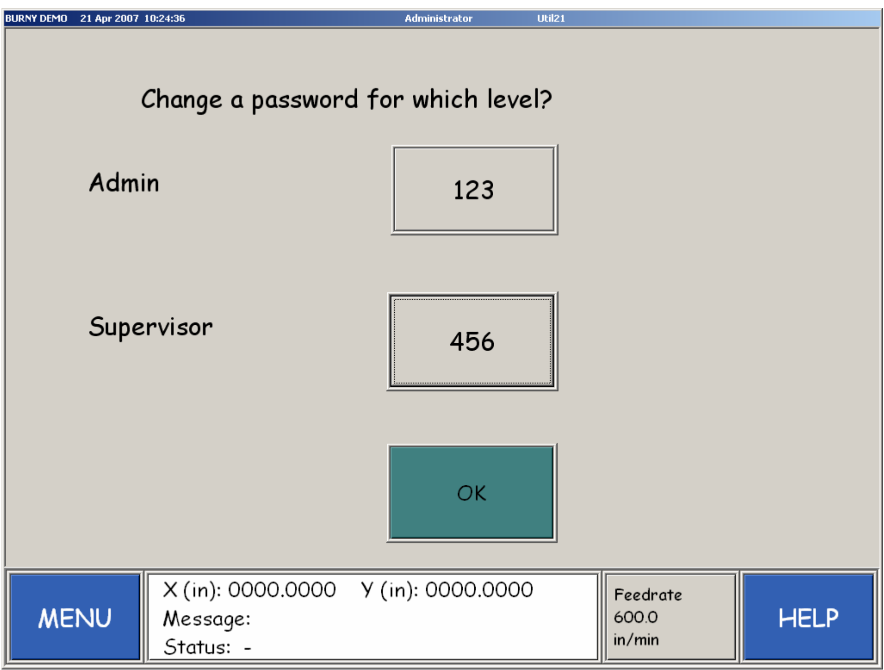


Figure 7.22 – Change Password Screen (*Util21*)

7.12.1 DESCRIPTION

The ***Change a Password (Util21)*** screen appears when the ***Change Password(s)*** button is pressed on the ***Util13*** screen, with the ***Admin*** password enabled. The ***Burny Series 10*** uses two passwords: ***Admin*** and ***Supervisor***.

7.12.2 PROCEDURE

To change either password, press its button. The display changes to the ***Numkeypad***. Enter the desired number and press ***OK***. The ***Change a Password*** screen (***Util21***) reappears with the new number displayed on the selected button. To make a correction, press the button again to move to the ***NumKeypad***, make the correction, and press ***OK*** to return to the ***Util21*** screen.

Once the number is correct in the ***Util21*** screen, make a note of it. Forgetting the ***Supervisor*** password only requires using the ***Admin*** password to open the ***Change a Password*** screen. The ***Supervisor*** password can then be read from the button. If the ***Admin*** password is forgotten, you must call ***Burny Service.***

Press ***OK*** in the ***Util21*** screen to put the new password into effect.

7.12.3 SCREENS REQUIRING THE PASSWORD TO BE ENABLED

The screens below require a password for some or all of their functions to be available:

a) Consumables Statistics Screen – to enable the settings for entering a new tip.

b) General System Defaults Screen – all options are greyed out.

c) Custom AUX Codes – to create new auxiliary code files

7.13 DEFAULT PROGRAM FORMAT, STANDARD (UTIL85STANDARD)

7.13.1 DESCRIPTION

The ***Standard Program Format*** screen shows the program format settings in effect when ***Word Address*** or ***ESSI*** is selected as the ***Code Conversion*** choice in the ***Load*** or ***Store Options*** screen.

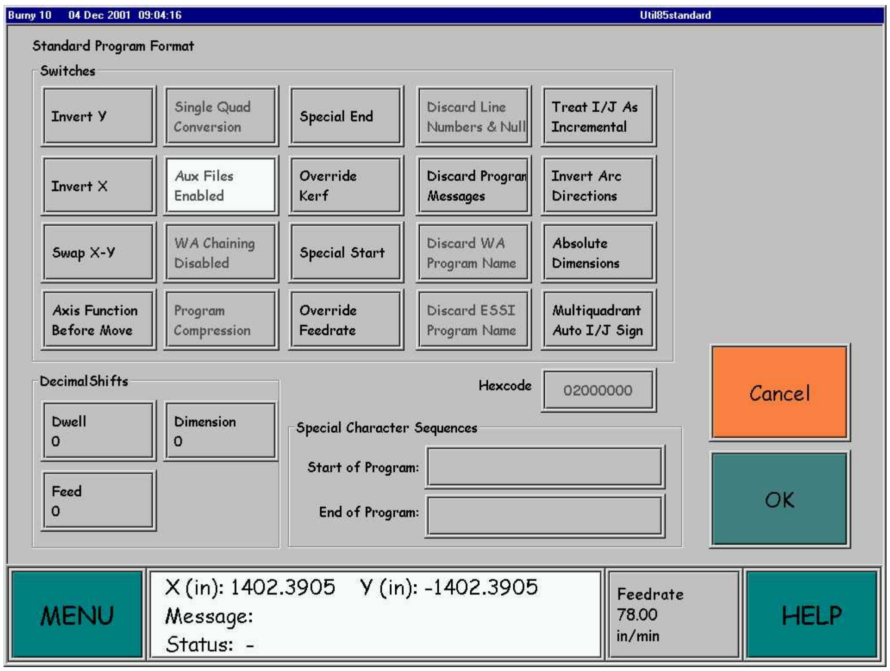


Figure 7.23 – Program Format, Standard (*Util85standard*)

In the array of twenty buttons at the top of the screen, each one is labeled with its function. The active functions are white. The functions with a gray label are not implemented at this time. They have ***NI*** after the title in the ***Detail*** section.

7.13.2 PROCEDURE

In the array of buttons at the top of the screen, turn functions on or off with a press. A function is on when the button is white. If ***Special End*** and/or ***Special Start*** are on, the ***End of Program*** and/or the ***Start of Program*** windows at the lower right must contain a character sequence.

To change one of the three ***Decimal Shifts*** or two ***Special Character Sequences***, press one of their windows. A keyboard screen appears. Make the desired change and press ***OK.***

7.13.3 DETAILS

INVERT Y AND X

This feature causes the sign of the dimension data on the specified axis to be inverted during LOAD / STORE operations and PROGRAM EDIT operations. This makes the internal program match the standard X and Y axis direction used by the control.

When enabled for the X axis but not the Y axis:

+X	=>	-X	and	-X	=>	+X
+Y	=>	+Y	and	-Y	=>	-Y

When enabled for the Y axis but not the X axis:

+X	=>	+X	and	-X	=>	-X
+Y	=>	-Y	and	-Y	=>	+Y

SWAP X - Y

This feature causes the axis definitions during serial device LOAD / STORE operations and PROGRAM EDIT operations to be swapped so that the internal program matches the standard X and Y axis conventions used by the control. When enabled, the following conversions are performed:

+X	=>	+Y
-X	=>	-Y
+Y	=>	+X
-Y	=>	-X

When performing ***LOAD*** operations and both ***AXIS SWAP*** and ***AXIS SIGN INVERT*** are enabled, ***AXIS SWAP*** is performed before the ***AXIS SIGN INVERT*** operation is performed. When performing ***STORE*** operations, ***SIGN INVERT*** is performed first so that the external convention remains unchanged.

For example, when performing a ***LOAD*** operation with ***AXIS SWAP*** and ***X AXIS SIGN INVERT*** enabled but not ***Y AXIS SIGN INVERT*** enabled, the following conversions are performed:

+X	=>	+Y	=>	+Y
-X	=>	-Y	=>	-Y
+Y	=>	+X	=>	-X
-Y	=>	-X	=>	+X

AUX (AXIS) FUNCTION BEFORE MOVE

This feature causes all auxiliary function codes that are contained in a Word Address program block with a dimensional move (X, Y, I, or J value) to be processed *before* the dimensional move. If not enabled, the auxiliary functions for “CUT OFF” “MARKER OFF” and others are processed *after* any dimensional move that may be defined in the same program block. This feature is performed during the ***LOAD*** operations and has no effect on programs already residing in memory.

SINGLE QUADRANT CONVERSION (NI)

When enabled, the single quadrant arc signing conversion process allows the operator to load programs written for old “SINGLE QUADRANT ONLY” controls from other manufacturers, which contain programming errors and end point errors caused by insufficient accuracy.

This process defines I and J dimension signs using logic that assumes all arcs must be less than or equal to 90 degrees. As such, any arc violating this 90-degree limit is automatically converted into a line. This conversion is performed while loading. The resulting program in NC memory can be directly run and/or inspected using the EDIT mode.

AUX FILES ENABLED

When this feature is active, ***Custom Aux Code*** files can be used during ***Load*** and ***Store*** operations.

WORD ADDRESS CHAINING DISABLED (NI)

When set, this bit prevents the WORD ADDRESS process from building ASCII program blocks with multiple auxiliary function codes. Program blocks are then built with one function per ASCII block (as they are saved in internal memory).

PROGRAM COMPRESSION (NI)

When enabled, a program compression feature is enabled that removes data that is not logically necessary in an NC program as it is loaded from the serial port or saved from the program editor. This feature removes all “G00”, “G01”, “G02”, and “G03” function codes from the program, which do not affect the operating mode already defined. Additional “G00” and “G01” function codes can also be removed since the normal “CUT ON” and “CUT OFF” function codes automatically establish “cutting speed” and “high speed” modes as required.

This feature also removes all absolute dimension values, which when internally converted to an incremental movement, result in a value of zero. Unlike older NC controls, which required the programmer to define an X and Y value for every dimension block when in absolute programming mode, the system only requires the program to define the changing field. Undefined field values are not interpreted as zero, but rather the same position as previously defined.

SPECIAL END
When enabled and the ***Special Character Sequence, End Of Program*** parameter value is defined, this special code sequence is enabled for use in program formats.

OVERRIDE KERF
When the ***Override*** Kerf feature is enabled, the loaded part program files receive an ***Override Kerf*** tag. Whenever such files are selected in the ***Run*** mode, the ***Kerf*** button on the ***Job Setup*** screen is enabled, even for files that contain programmed kerf. See the details for the ***Job Setup*** screen in ***Part 3***, ***Run Mode***.

SPECIAL START
When enabled and the ***Special Character Sequence, Start Of Program*** parameter value is defined, this special code sequence is enabled for use in program formats.

OVERRIDE FEEDRATE
When the ***Override Feedrate*** feature is enabled, the loaded part program files receive an ***Override Feedrate*** tag. Whenever such files are selected in the ***Run*** mode, the ***Feedrate*** button on the ***Job Setup*** screen is enabled, even for files that contain programmed feedrate. See the details for the ***Job Setup*** screen in ***Part 3***, ***Run Mode***.

DISCARD LINE NUMBERS AND NULL (NI)
When set, this bit prevents the WORD ADDRESS process from including line numbers in each ASCII block. This allows programs to be stored to serial devices faster and reduces the size of the ASCII program file. With ESSI, this bit causes the 60 null codes that are normally placed between the non-standard program number / name block and the first program data block, to be suppressed.

DISCARD PROGRAM MESSAGES
When set, this bit causes the ***LOAD*** process to discard all program message data and reduce the amount of internal memory required. It prevents the ***STORE*** process from formatting ASCII program message blocks for output, and prevents the ***EDITOR*** from reading and writing message blocks in a program.

DISCARD WA PROGRAM NAME (NI)
When set, this bit prevents the ***STORE*** process from sending program names to serial devices and prevents the ***EDITOR*** from reading program names.

DISCARD ESSI PROGRAM NAME (NI)
When set, this bit prevents the non-standard ***ESSI*** program number and name block from being sent to a serial device or read by the ***EDITOR*** when the ***Standard ESSI*** program format is selected.

TREAT I/J AS INCREMENTAL
This feature allows the operator to define the I and J dimension value format as “INCREMENTAL” even when the X and Y dimension values are programmed in “ABSOLUTE.” When this feature is not enabled, I and J dimensions are assumed to be in the same format as the X and Y dimensions. When this feature is set, I and J dimensions are always processed as incremental values.

INVERT ARC DIRECTIONS
This feature allows the internal arc direction support to perform inverted arc processing operations when performing ***LOAD***, ***STORE*** and ***EDIT*** operations. It is provided primarily to allow programs written in the ***ESSI*** format with non-standard arc direction conventions (+/-) to be used with the control. However all program formats are affected by this feature.

ABSOLUTE DIMENSIONS
This feature allows the operator to change the system default for program dimension type from “INCREMENTAL” to “ABSOLUTE.” If this feature is enabled, all program dimensions are assumed to be in “ABSOLUTE” unless changed by the appropriate auxiliary function code. The dimension type selected here is also used to define the required format when storing an internally created SHAPE program to an external device.

MULTI-QUADRANT AUTO I/J SIGN
This feature allows Word Address programs written for other NC controls to be properly loaded into the NC control. This feature allows arc dimension blocks that define movements in a single quadrant (i.e., arcs less than 90 degrees) and multiple quadrants (arcs up to 360 degrees) to be defined without signs on the I and J values.

The only restrictions are that both the X and Y dimension fields in the block must be provided and must be non-zero, and no signs must exist on either of the I or J dimension values. When these conditions are met, the NC control can calculate which of the four possible points is the correct center point for the arc. However, if these conditions are not satisfied, two or more possible solutions exist so the NC control uses positive I/J dimension values.

7.13.4 DECIMAL SHIFTS

DECIMAL SHIFTS - DWELL

This feature allows the dwell value defined as an “F-word” field in a WORD ADDRESS program to be scaled during LOAD, STORE, EDIT and DISPLAY operations. Each shift left (-) count causes a divide by “10” when converting to internal format. For example, if a shift left count of “3” is defined for the specified program type, “G04F1500” defines a programmed dwell of 1.5 seconds. The operator can define a Dwell Decimal Shift of right 0-7 or left (-) 0-7.

A shift right count causes a multiply by “10” when converting to internal format.

A shift right, or left, of 0 makes the dwell equal to the programmed value.

DECIMAL SHIFTS - FEED

This feature allows the feedrate value defined as an “F-word” field in a WORD ADDRESS program to be scaled during a LOAD operation. Each shift left (-) count represents a divide by “10” when converting to internal format. For example, if a shift left count of “-2” is defined for the specified program type, “F1500” defines a programmed feedrate of 15 (IPM or MMPM depending on the selected dimension type). The operator can define a FEEDRATE DECIMAL SHIFT of left (-) 0-7 or right 0-7.

Each shift right count causes a multiply by “10” when converting to internal format.

A shift right, or left, of 0 causes no change in the feedrate.

Changing the feedrate decimal shift has no effect on a part program that has already been loaded. That is, in order to apply the new feedrate decimal shift, the part program must be reloaded.

DECIMAL SHIFT - DIMENSION

This value allows the dimension values in a WORD ADDRESS program to be scaled as they are read during a serial device LOAD operation. Each shift left (-) count represents a divide by “10” when converting to internal format. For example, if a shift count of “-2” is defined for the specified program type, “X+5000” defines an incremental move of “+50” (inches or millimeters depending on the selected dimension type).

Each shift right count causes a multiply by “10” when converting to internal format.

A shift right, or left, of 0 causes no change in the feedrate.

SPECIAL CHARACTER SEQUENCES - END OF PROGRAM

This parameter allows a user defined character sequence to be used as an additional "END OF PROGRAM WITH REWIND" code termination sequence in WORD ADDRESS and ESSI programs. Enter the special code here, then enable or disable its use by pressing the ***Special End*** button.

When enabled, this sequence does not inhibit the use of the standard "M02" and "M30" function codes. This includes the ESSI termination codes or any other auxiliary codes defined by ***Custom Code Conversion*** lines as "END OF PROGRAM" or "END OF PROGRAM WITH REWIND" codes.

*When encountered in a program during a LOAD operation, the control stores an "**END OF PROGRAM WITH REWIND**" code at the end of the program file in place of the special termination sequence.*

SPECIAL CHARACTER SEQUENCES - START OF PROGRAM:

This parameter allows a user defined character sequence to be used as an additional START OF PROGRAM code sequence in WORD ADDRESS programs. When enabled, this sequence does not inhibit the use of the standard "%" function code. Set the Start of Program to an asterisk, "*" to accept any character as the start of the part program.

HEXCODE

Displays the hexadecimal address of the keys selected.

CANCEL

Cancel returns the display to the ***Utility Main Menu*** screen with any changes to the ***Standard Program Format*** discarded.

OK

OK returns the display to the ***Utility Main Menu*** screen saving any changes to the ***Standard Program Format***.

7.14 CUSTOM AUX CODES

7.14.1 INTRODUCTION

The control's ***Custom Auxiliary Code*** file feature enables the customer who uses special custom auxiliary codes in ***WORD ADDRESS*** or ***ESSI*** part programs to convert them to function codes understood by the ***Burny Series 10***. This feature also permits the inclusion of custom program formats, decimal shifts, and special program start and end sequences.

This part of the ***UTILITY*** mode provides an editor function that enables the operator to:

- Create new auxiliary code files
- Change auxiliary code files stored in memory

One of these ***Auxiliary Code*** files must be selected in ***Load*** or ***Store*** mode when the file to be transferred uses the special codes covered by that file.

When a customer has part programs that contain non-standard codes for certain machine functions, the meaning of these codes must be provided before the programs can be loaded. This section describes how the operator can match all the custom codes and custom program formats for a part program to the functions they stand for. The operator picks from a list of 105 different machine functions and 25 custom program formats. This information is saved in an '***AUX*** code' file.

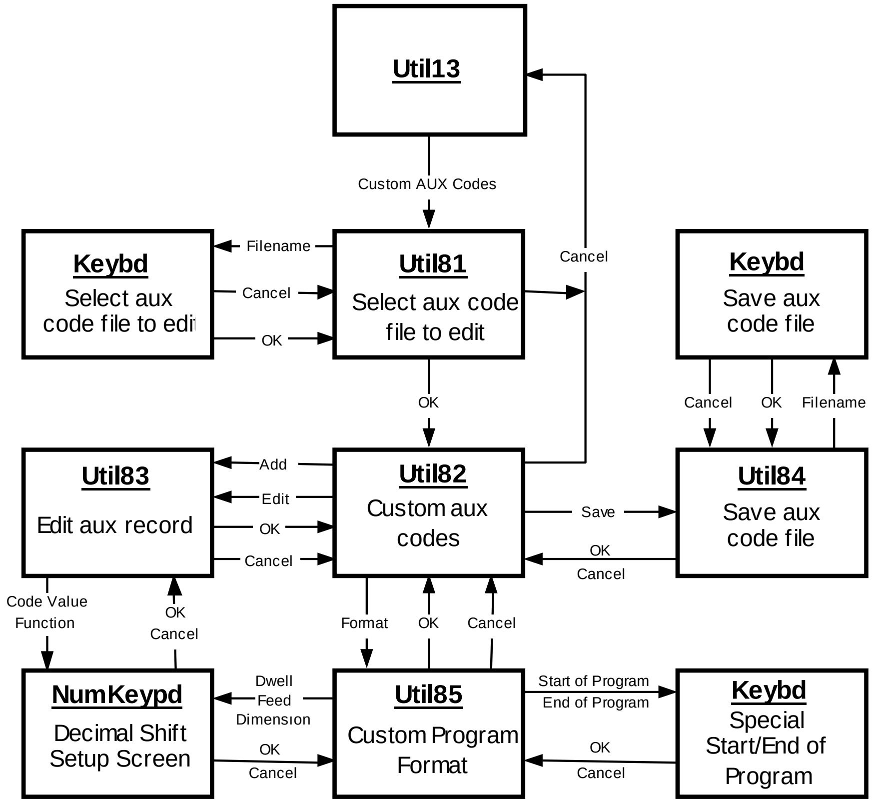


Figure 7.24 - Custom AUX Code Flow diagram

Whenever part programs using custom codes are to be loaded into the ***Burny Series 10*** or stored from it to an external device, the matching aux code file must be used. All current aux code files appear in the ***PROGRAM FORMAT*** field of the ***LOAD OPTIONS*** or ***STORE OPTIONS*** screen. The correct one must be selected before the transfer.

These ***AUX*** code files are needed, not when cutting parts, but when loading or storing part programs which contain custom code. Part programs may have problems if loaded using the wrong ***AUX*** code file.

Command flow for the ***Custom Aux Codes*** operation is shown in the Block Diagram above.

7.15 SELECT AUX CODE FILE TO EDIT SCREEN (UTIL81)

7.15.1 DESCRIPTION

To edit or create AUX Code files, one of the passwords must be enabled. To start the ***CUSTOM AUXILIARY CODES*** feature, press the ***Custom AUX Codes*** button in the ***Util13*** screen, displaying the ***Load which aux code file (Util81)*** screen, shown below.

This screen enables the operator to start editing an existing aux code file or to start creating a new one. An existing file is selected from a list with the cursor or a new filename is entered from a keyboard. Then ***OK*** is pressed to move to an editing screen.

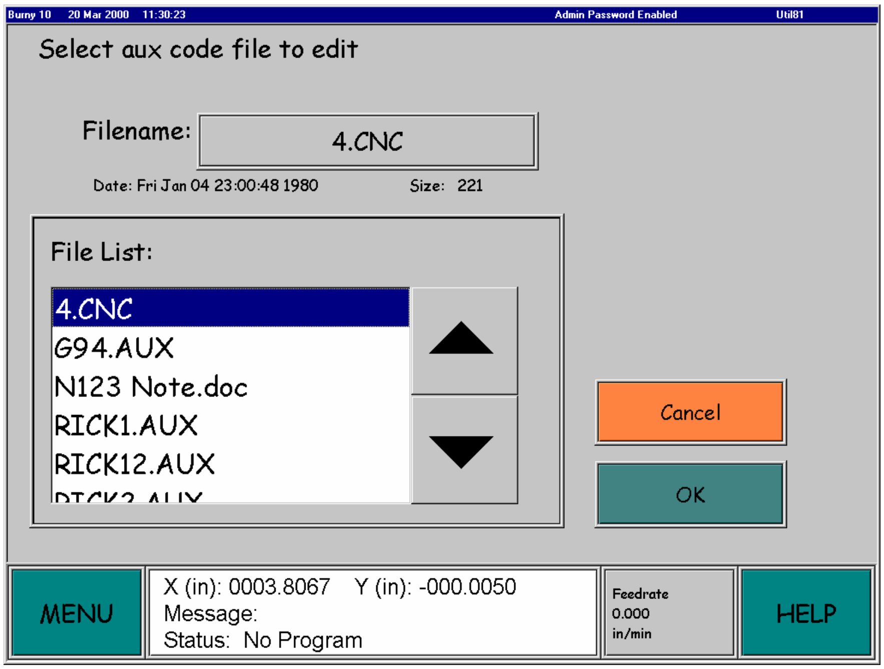


Figure 7.25 – Select AUX Code File To Edit Screen (*Util81*)

7.15.2 PROCEDURE

To edit an existing aux code file, select it on the ***File List*** with the cursor, then press ***OK*** to move to a screen that displays its contents. If the list is long, press the ***Filename*** box to display the keyboard, enter the desired name or the first few letters, and press ***OK***.

The display returns to the previous screen with the file in view, at or near the cursor position. Be sure the cursor is on the desired filename and this name appears in the ***Filename*** box. Press ***OK*** to move to the ***Custom AUX Codes*** screen ***(Util82).***

To create a new aux code file, press the ***Filename*** box. With the keyboard that appears, type in the name of the new file. Then press ***OK*** to return to the previous screen. The new name appears only in the ***Filename*** box. Press ***OK*** to move to the ***Custom AUX Codes*** screen ***(Util82).***

Press the ***Cancel*** button at any time to discard all changes and return to the ***Util13*** screen

7.15.3 DETAILS

FILENAME

Usually this name is the same as the one highlighted in the ***File List*** by the cursor. After a new filename has been created on the ***Keyboard***, that new name will appear here and differs from the name under the cursor. When ***OK*** is pressed, the filename showing in this window will be used in the editing screens.

FILE LIST

This list shows the name of files in the ***auxfile*** directory. Any extension can be used on an ***Aux Code*** file.

UP & DOWN

These buttons move the cursor through the ***File List***. To move quickly to a file, press the ***Filename*** window, type in the first two or three letters of the name, then press ***OK***.

CANCEL

Press this button to discard all changes and return to the ***Util13*** screen.

OK

Press this button to accept the name in the ***Filename*** window and move to the ***Custom Aux Codes*** screen.

7.16 SELECT AUX CODE FILE KEYBOARD SCREEN (KEYBD)

7.16.1 DESCRIPTION

Pressing the ***Filename*** button on the **Select Aux Code (*Util81*)** screen displays the **Select** W**hich AUX Code File** keyboard screen enables the operator to edit an existing filename or to create a new one. It also lets him enter a few initial letters of an existing filename to jump to its position in the ***File List.***

For details on how to use the keyboard refer to **Section 1 - the Keyboard Screen**

7.17 CUSTOM AUX CODES SCREEN (UTIL82)

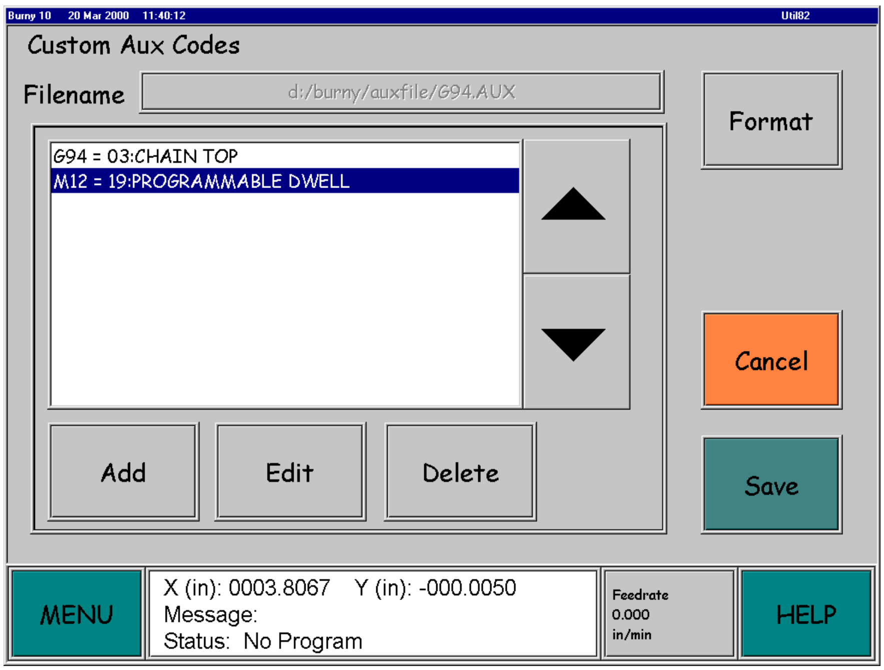


Figure 7.26 – Custom AUX Codes Screen (*Util82*)

7.17.1 DESCRIPTION

A custom aux code file contains two sections:

- A series of code conversion lines, one for each custom code
- A program format that can alter any of twenty-five parameters

Some ***Custom Aux Code*** files may lack one of these sections. No code conversion lines means that if this file is selected in a ***Load*** or ***Store*** operation, all codes will be converted to ***IDF*** using the standard table. When no changes to the program format are made, the ***Custom Aux Code*** file will contain the ***Program Format*** configuration that was the ***Standard Format*** at the time it was saved. See the description of ***Program Format*** under ***System Setup*** in this section of the manual.

Refer to ***Section9: Programming Languages***, for tables showing the standard meanings for ***Word Address*** and ***ESSI*** codes when part programs are loaded into the ***Burny Series 10***. Some part programs use one or more codes on these tables to represent a different function than the one listed. A code not listed in the table could also be used. In either case, an ***Aux Code File*** giving the correct translation for each of these special codes must be selected before the part program is loaded or stored.

Each line in an ***Aux Code*** file has the following format: **Code Side = Function Side**

A ***Custom Aux Code*** to be used in a part program makes up the ***Code*** S***ide***. The ***Function Side*** begins with the ***IDF*** (Internal Data Format) code representing the desired function and ends with a short description.

The contents of ***Aux Code Filename 694.AUX*** appear in the figure above. The first line assigns a function to the code G94. The system does not normally recognize G94 as having any value. This line causes G94 to be converted to ***IDF*** code ***03***, ***CHAIN TOP***.

The second line assigns a function to M12, converting it ***IDF*** code 19, ***PROGRAMMABLE DWELL***.

The ***Program Format*** section of this file will be seen in the ***Custom Program Format screen, Util85custom***. This screen appears when the ***Format*** button is pressed. Refer to Section 7.19 .

7.17.2 PROCEDURE

Two main procedures can be carried out at this point:

- Editing an existing ***Custom Aux Code*** file
- Creating a new ***Custom Aux Code*** file

If a new filename was created in the ***Util81*** screen before entering this screen, you will be creating a new ***Custom Aux Code*** file. Otherwise you will be editing an existing file here.

EDIT AN EXISTING FILE:

- For any code that will return to the standard function, select the line with the cursor, then press Delete.
- For any code that is changing to a different non-standard function, select that line with the cursor, then press Edit. The display changes to the Edit Aux Record screen, Util83. See that screen description for further instructions.
- For any new custom code, press the Add button. The display changes to the Edit Aux Record screen, Util83. See that screen description for further instructions.
- To make changes to the Program Format that is part of this file, press the Format button. The display changes to the Custom Program Format screen, Util85custom. See that screen description for further instructions.

CREATE A NEW FILE:

- For any custom code, press the Add button. The display changes to the Edit Aux Record screen, Util83. See that screen description for further instructions.
- To make changes to the Program Format that is part of this file, press the Format button. The display changes to the Custom Program Format screen, Util85custom. See that screen description for further instructions.

7.17.3 DETAILS

FILENAME

Shows the path and name of the file to edit or create. The filename cannot be changed from this screen.

LIST OF CODE CONVERSION LINES

This list shows up to ten code conversion lines in the file. Each line is like an equation with two elements set equal to each other. On the left or "code" side is the part program code being given a new function. On the right or "function" side is the IDF code for the new function followed by a brief description. Word Address code types will be the letter "M" or "G", followed by a number giving the code value; all ESSI codes have the letter "E" for a type, followed by a number giving the code value.

UP/DOWN

These buttons move the cursor through the code conversion lines.

ADD

This button changes the display to the ***Edit Aux Record*** screen ***Util83***, where a new code conversion line can be created to add to the file. New lines will appear at the bottom of the list.

EDIT

This button changes the display to the ***Edit Aux Record*** screen ***Util83***, where the code side or function side of the conversion line highlighted by the cursor can be changed. This process uses no keyboard for the functions but selects them from a list.

DELETE

This button deletes the code conversion line highlighted by the cursor. If the code has a standard value in the tables, it will return to that value for this ***Custom Aux Code*** file.

FORMAT

This button changes the display to the ***Custom Program Format*** screen Figure 7.28, ***Util85custom***, where the program format section of the ***Custom Aux Code*** file can be examined and changed. This button is white when the program format of the custom aux code file differs from the ***Standard Program Format***.

CANCEL

This button discards any changes made in this screen and returns the display to the ***Util13*** screen. If changes were made in this screen and saved in the ***Util84*** screen, the display comes back to this screen. Then ***Cancel*** from here simply returns the display to the ***Util13*** screen with the changes still in place.

SAVE

This button that changes the display to the ***Save aux code screen, Util84***. In that screen the actual saving is done, either to the same filename or to a new one.

7.18 EDIT AUX RECORD SCREEN (UTIL83)

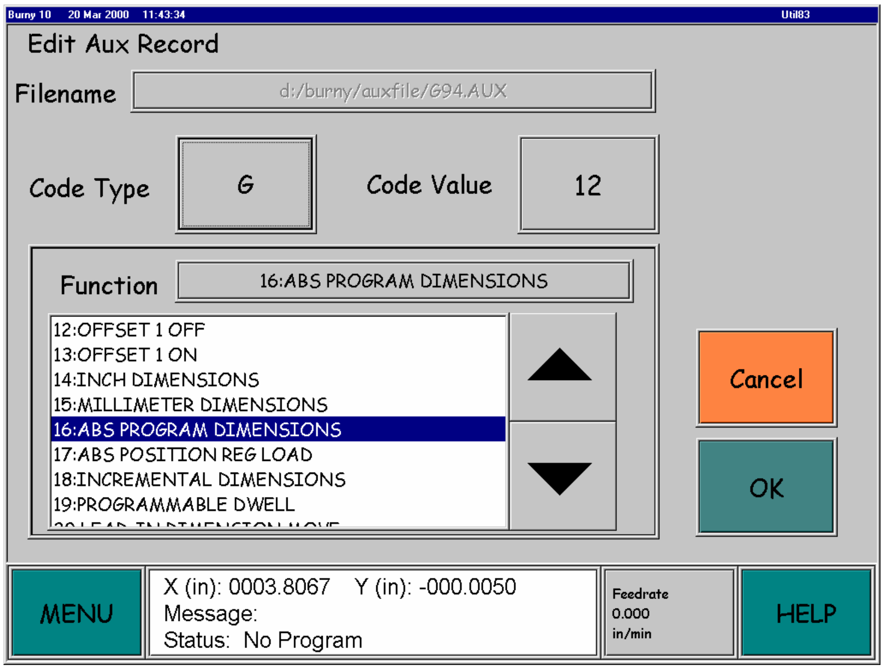


Figure 7.27 – Edit AUX Record Screen (*Util83*)

7.18.1 DESCRIPTION

The ***Edit AUX Record*** screen enables the operator to create an arbitrary ***Word Address*** or ***ESSI*** code that has any one of the 105 functions available on the IDF ***Function*** list. This new function assignment appears as a code conversion line in the ***Custom AUX Codes*** screen when ***OK*** is pressed here.

If the operator pressed ***Edit*** in the ***Custom AUX Codes*** screen to get to this screen, the new code conversion line will replace the line that was highlighted in that screen. If ***Add*** was pressed, the new line appears at the bottom of the list.

7.18.2 PROCEDURE

Press the ***Code Type*** button to cycle through the choices for the first letter of the code: ***M*** and ***G*** for ***Word Address*** and ***E*** for ***ESSI***. When that selection is made, press the ***Code Value*** button to display the ***Numkeypad***. Enter the custom code number and press ***OK*** to return to the ***Edit AUX Record*** screen.

Now select the ***IDF*** function to be assigned to the code. Put the cursor on the desired function by using the ***Up*** and ***Down*** buttons or by pressing the ***Function*** button to display the ***Numkeypad***. Enter the number of the desired function and press ***OK***. The display returns to the ***Edit AUX Record*** screen with the cursor on the chosen function. When the ***Code Type***, ***Code Value***, and ***Function*** are correct, press ***OK*** to return to the ***Custom AUX Codes*** screen, where the new code conversion line will appear.

7.19 PROGRAM FORMAT SCREEN, CUSTOM AUX CODES (UTIL85CUSTOM)

7.19.1 DESCRIPTION

The ***Custom Program Format*** screen shows the program format settings in the ***Custom*** Aux ***Code*** file called out in the ***Filename*** window at the top of the screen. Any active features in the upper array of twenty buttons will be white. The ***Special Character Sequences*** are active if one of their buttons shows any characters. The decimal shifts are active when any of their buttons show a number other than zero.

At present, several functions have not been implemented. These have gray labels. In the ***Details*** section below, such functions are flagged with "NI".

When this ***Custom Aux Code*** file is selected for a ***Load*** or ***Store*** operation, the active program format features will modify the part program as it is converted. Any code conversion lines in this ***Custom Aux Code*** file will also be modifying the part program.

The default or ***standard*** program format found in ***Program Format*** under ***System Setup*** in the ***Utility*** mode can be copied into this screen as a starting point.

In the array of twenty buttons at the top of the screen, each one is labeled with its function. The two marked ***Reserved Function*** will be used later. Several other functions have dim labels. These are explained in the text but have not yet been implemented.

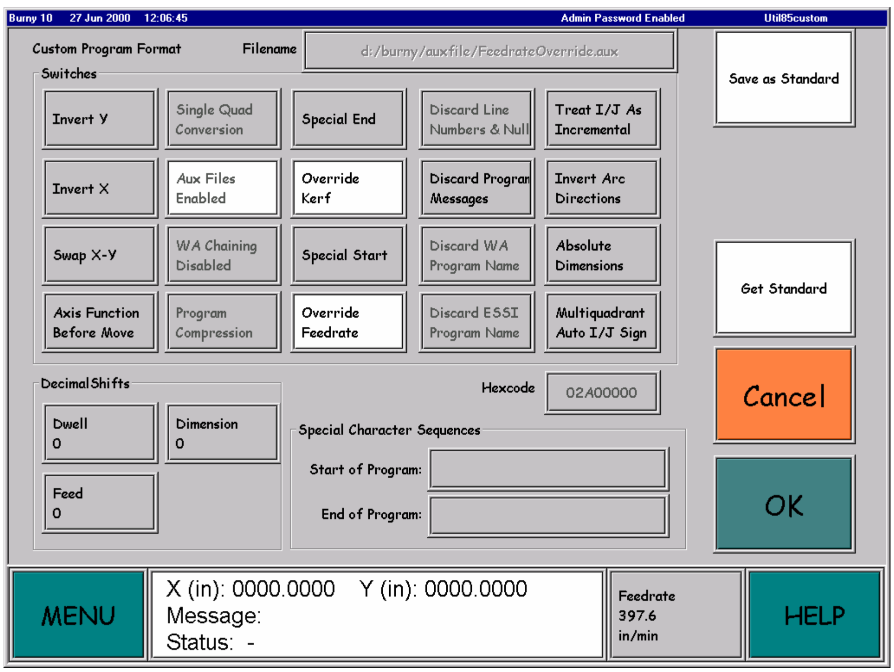


Figure 7.28 – Custom Program Format Screen (*Util85custom*)

7.19.2 PROCEDURE

In the array of buttons at the top of the screen, turn functions on or off with a press. A function is on when the button is white. If ***Special End*** and/or ***Special Start*** are on, the ***End of Program*** and/or the ***Start of Program*** windows at the lower right must contain a character sequence.

To change one of the three ***Decimal Shifts*** or two ***Special Character Sequences***, press one of their windows. A keyboard screen appears. Make the desired change and press ***OK***.

To copy the ***Standard Program Format*** to this screen, press the ***Get Standard*** button. If this button is already gray, this custom screen is a copy of the standard screen.

7.19.3 DETAILS

INVERT Y AND X

This feature causes the sign of the dimension data on the specified axis to be inverted during LOAD / STORE operations and PROGRAM EDIT operations. This makes the internal program match the standard X and Y axis direction used by the control.

When enabled for the X axis but not the Y axis:

+X	=>	-X	and	-X	=>	+X
+Y	=>	+Y	and	-Y	=>	-Y

When enabled for the Y axis but not the X axis:

+X	=>	+X	and	-X	=>	-X
+Y	=>	-Y	and	-Y	=>	+Y

SWAP X - Y

This feature causes the axis definitions during serial device LOAD / STORE operations and PROGRAM EDIT operations to be swapped so that the internal program matches the standard X and Y axis conventions used by the control. When enabled, the following conversions are performed:

+X	=>	+Y
-X	=>	-Y
+Y	=>	+X
-Y	=>	-X

When performing ***LOAD*** operations and both ***AXIS SWAP*** and ***AXIS SIGN INVERT*** are enabled, ***AXIS SWAP*** is performed before the ***AXIS SIGN INVERT*** operation is performed. When performing ***STORE*** operations, SIGN INVERT is performed first so that the external convention remains unchanged.

For example, when performing a LOAD operation with AXIS SWAP and X AXIS SIGN INVERT enabled but not Y AXIS SIGN INVERT enabled, the following conversions are performed:

+X	=>	+Y	=>	+Y
-X	=>	-Y	=>	-Y
+Y	=>	+X	=>	-X
-Y	=>	-X	=>	+X

AXIS FUNCTION BEFORE MOVE

This feature causes all auxiliary function codes that are contained in a Word Address program block with a dimensional move (X, Y, I, or J value) to be processed *before* the dimensional move. If not enabled, the auxiliary functions for "CUT OFF" "MARKER OFF" and others are processed *after* any dimensional move that may be defined in the same program block. This feature is performed during the ***LOAD*** operations and has no effect on programs already residing in memory.

SINGLE QUADRANT CONVERSION (NI)

When enabled, the single quadrant arc signing conversion process allows the operator to load programs written for old "SINGLE QUADRANT ONLY" controls from other manufacturers, which contain programming errors and end point errors caused by insufficient accuracy.

This process defines I and J dimension signs using logic that assumes all arcs must be less than or equal to 90 degrees. As such, any arc violating this 90-degree limit is automatically converted into a line. This conversion is performed while loading. The resulting program in NC memory can be directly run and/or inspected using the EDIT mode.

AUX FILES ENABLED

When this feature is active, ***Custom Aux Code*** files can be used during ***Load*** and ***Store*** operations.

WORD ADDRESS CHAINING DISABLED (NI)

When set, this bit prevents the WORD ADDRESS process from building ASCII program blocks with multiple auxiliary function codes. Program blocks are then built with one function per ASCII block (as they are saved in internal memory).

PROGRAM COMPRESSION (NI)

When enabled, a program compression feature is enabled that removes data that is not logically necessary in an NC program as it is loaded from the serial port or saved from the program editor. This feature removes all "G00", "G01", "G02", and "G03" function codes from the program, which do not affect the operating mode already defined. Additional “G00” and “G01” function codes can also be removed since the normal “CUT ON” and “CUT OFF” function codes automatically establish “cutting speed” and “high speed” modes as required.

This feature also removes all absolute dimension values, which when internally converted to an incremental movement, result in a value of zero. Unlike older NC controls, which required the programmer to define an X and Y value for every dimension block when in absolute programming mode, the ***Burny Series 10*** only requires the program to define the changing field. Undefined field values are not interpreted as zero, but rather the same position as previously defined.

SPECIAL END

When enabled and the ***Special Character Sequence, End Of Program*** parameter value is defined, this special code sequence is enabled for use in program formats.

OVERRIDE KERF

When the ***Override*** Kerf feature is enabled, part program files loaded into the ***Burny Series 10*** receive an ***Override Kerf*** tag. Whenever such files are selected in the ***Run*** mode, the ***Kerf*** button in the ***Job Setup*** screen is enabled, even for files that contain programmed kerf. See the details for the **Job Setup** screen in ***Section* 3**, ***Run Mode***.

SPECIAL START

When enabled and the ***Special Character Sequence, Start Of Program*** parameter value is defined, this special code sequence is enabled for use in program formats.

OVERRIDE FEEDRATE

When the ***Override Feedrate*** feature is enabled, part program files loaded into the ***Burny Series 10*** receive an ***Override Feedrate*** tag. Whenever such files are selected in the ***Run*** mode, the ***Feedrate*** button in the ***Job Setup*** screen is enabled, even for files that contain programmed feedrate. See the details for the ***Job Setup*** screen in ***Section 3***, ***Run Mode***.

DISCARD LINE NUMBERS AND NULL (NI)

When set, this bit prevents the WORD ADDRESS process from including line numbers in each ASCII block. This allows programs to be stored to serial devices faster and reduces the size of the ASCII program file. With ESSI, this bit causes the 60 null codes that are normally placed between the non-standard program number / name block and the first program data block, to be suppressed.

DISCARD PROGRAM MESSAGES

When set, this bit causes the ***LOAD*** process to discard all program message data and reduce the amount of internal memory required. It prevents the ***STORE*** process from formatting ASCII program message blocks for output, and prevents the ***EDITOR*** from reading and writing message blocks in a program.

DISCARD WA PROGRAM NAME (NI)

When set, this bit prevents the ***STORE*** process from sending program names to serial devices and prevents the ***EDITOR*** from reading program names.

DISCARD ESSI PROGRAM NAME (NI)

When set, this bit prevents the non-standard ***ESSI*** program number and name block from being sent to a serial device or read by the ***EDITOR*** when the ***Standard ESSI*** program format is selected.

TREAT I/J AS INCREMENTAL

This feature allows the operator to define the I and J dimension value format as “INCREMENTAL” even when the X and Y dimension values are programmed in “ABSOLUTE.” When this feature is not enabled, the I and J dimensions are assumed to be in the same format as the X and Y dimensions. When this feature is set, I and J dimensions are always processed as incremental values.

INVERT ARC DIRECTIONS

This feature allows the internal arc direction support to perform inverted arc processing operations when performing ***LOAD***, ***STORE*** and ***EDIT*** operations. It is provided primarily to allow programs written in the ***ESSI*** format with non-standard arc direction conventions (+/-) to be used with the control. However, all program formats are affected by this feature.

ABSOLUTE DIMENSION

Allows the operator to change the system default for program dimension type from “***INCREMENTAL***” to “***ABSOLUTE***.” If this feature is enabled, all program dimensions are assumed to be in “***ABSOLUTE***” unless changed by the appropriate auxiliary function code. The dimension type selected here is also used to define the required format when storing an internally created ***SHAPE*** program to an external device.

MULTIQUADRANT AUTO I/J SIGN

This feature allows ***Word Address*** programs written for other ***NC*** controls to be properly loaded into the ***NC*** control. The feature allows arc dimension blocks that define movements in a single quadrant (i.e., arcs less than 90 degrees) and multiple quadrants (arcs up to 360 degrees) to be defined without signs on the ***I*** and ***J*** values.

The only restrictions are that both the ***X*** and ***Y*** dimension fields in the block must be provided and must be non-zero, and no signs must exist on either of the ***I*** or ***J*** dimension values. When these conditions are met, the ***NC*** control can calculate which of the four possible points is the correct center point for the arc. However, if these conditions are not satisfied, two or more possible solutions exist so the ***NC*** control uses positive ***I*** and ***J*** dimension values.

DECIMAL SHIFTS - DWELL

This feature allows the dwell value defined as an “F-word” field in a ***Word Address*** program to be scaled during ***LOAD***, ***STORE***, ***EDIT*** and ***DISPLAY*** operations. Each shift left (-) count causes a divide by “10” when converting to internal format. For example, if a shift left count of “3” is defined for the specified program type, “G04F1500” defines a programmed dwell of 1.5 seconds. The operator can define a Dwell Decimal Shift of right 0-7 or left (-) 0-7.

A shift right count causes a multiply by “10” when converting to internal format.

A shift right, or left, of 0 makes the dwell equal to the programmed value.

DECIMAL SHIFTS - FEED

This feature allows the feedrate value defined as an “F-word” field in a ***Word Address*** program to be scaled during ***LOAD***, ***STORE***, ***EDIT*** and ***DISPLAY*** operations. Each shift left (-) count represents a divide by “10” when converting to internal format. For example, if a shift left count of “-2” is defined for the specified program type, “F1500” defines a programmed feedrate of 15 (IPM or MMPM depending on the selected dimension type). The operator can define a FEEDRATE DECIMAL SHIFT of left (-) 0-7 or right 0-7.

Each shift right count causes a multiply by “10” when converting to internal format.

A shift right, or left, of 0 causes no change in the feedrate.

DECIMAL SHIFT - DIMENSION

This value allows the dimension values in a ***Word Address*** program to be scaled as they are read during a serial device ***LOAD*** operation. Each shift left (-) count represents a divide by “10” when converting to internal format. For example, if a shift count of “-2” is defined for the specified program type, “X+5000” defines an incremental move of “+50” (inches or millimeters depending on the selected dimension type).

Each shift right count causes a multiply by “10” when converting to internal format.

A shift right, or left, of 0 causes no change in the feedrate.

SPECIAL CHARACTER SEQUENCES - END OF PROGRAM

This parameter allows a user defined character sequence to be used as an additional "***END OF PROGRAM WITH REWIND***" code termination sequence in ***Word Address*** and ***ESSI*** programs. Enter the special code here, then enable or disable its use by pressing the ***Special End*** button.

When enabled, this sequence does not inhibit the use of the standard "M02" and "M30" function codes. This includes the ***ESSI*** termination codes or any other auxiliary codes defined by ***Custom Code Conversion*** lines as "***END OF PROGRAM***" or "***END OF PROGRAM WITH REWIND***" codes.

> When encountered in a program during a LOAD operation, the control stores an "**END OF PROGRAM WITH REWIND**" code at the end of the program file in place of the special termination sequence. It then performs the "**END OF PROGRAM WITH REWIND**" operation.

SPECIAL CHARACTER SEQUENCES - START OF PROGRAM:

This parameter allows a user defined character sequence to be used as an additional ***START OF PROGRAM*** code sequence in ***Word Address*** programs. When enabled, this sequence does not inhibit the use of the standard "%" function code. Set the Start of Program to an asterisk, "*" to accept any character as the start of the part program.

7.20 SAVE AUX CODE FILE SCREEN (UTIL84)

7.20.1 DESCRIPTION

Reach this screen from the ***Custom Aux Codes*** screen, ***Util82***, by pressing ***Save***. Here the modified ***Aux Code*** file can be saved to an existing name or a new one.

7.20.2 PROCEDURE

To save the file to an existing filename, select the file on the ***File List***, then press ***OK***. The display changes to the ***Util82*** screen and the file is saved.

To save the file to a new name, press the ***Filename*** button to bring up the ***Save Aux Code File Keyboard***. Enter the filename and extension (any extension can be used), then press ***OK***. The display returns to the ***Util84*** screen with the new name in the ***Filename*** window and the cursor in the ***File List*** on the name of the file that comes after the new filename in alphabetical order.

At this point, press ***OK*** to save the modified ***AUX*** file with the new name and return to the ***Util82*** screen. Make more changes, if needed, and repeat the ***Save*** process or press ***Cancel*** in the ***Util82*** screen to return to the ***Utility Main Menu Screen Util13***.

Note that the file is saved to the ***Control*** memory with the new name when ***Save*** is pressed in the ***Util84*** screen. The display now shows the ***Custom Aux Codes*** screen, ***Util82***, where editing is done. When you press ***Cancel*** in this screen, you are canceling the edit operation not the save.

To halt the save process in the ***Util84*** screen and return to the ***Util82*** screen, press ***Cancel***. The display returns to the ***Util82*** screen with all the changes still in place but the new file has not been saved.

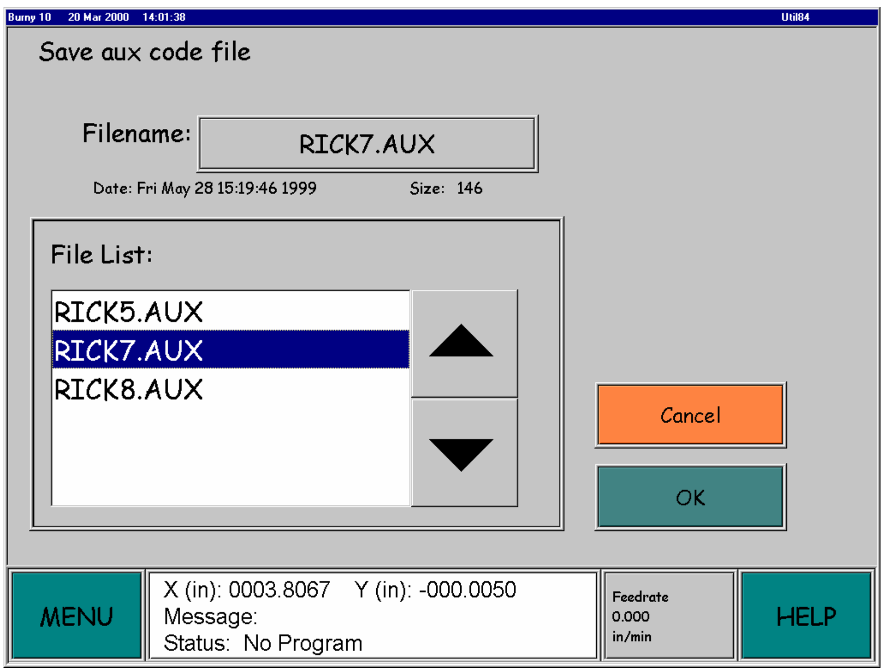


Figure 7.29 – Save AUX Code File Screen (*Util84*)

7.20.3 DETAILS

FILENAME

When pressed the display changes to the keyboard screen. Any name entered here will appear in the ***Filename*** window when ***OK*** is pressed.

FILE LIST

The File List shows the names of all the Aux Code files in the Control memory. When the cursor is moved, the highlighted filename appears in the Filename window.

UP/DOWN

Move the cursor through the File List.

CANCEL

Enables the operator to make more changes to a file before saving it. The ***Cancel*** button stops the ***Save*** process, discarding any new name and returns the display to the ***Util82*** screen. Changes previously made to the file in this screen are preserved.

OK

The ***OK*** button saves the modified ***Aux Code*** file to the ***Control*** memory with the name that appears in the ***Filename*** window. The display changes to the ***Util82*** screen.

7.21 STARTUP AND MOTION CONFIGURATION HANDLING

7.21.1 DESCRIPTION

The Motion Configuration and the Human Machine Interface (HMI) settings are maintained in specific files for use by the system. These files contain information that is vital for the operation of the motion as well as default information for the operator's convenience. The list below shows these filenames and directory locations.

- **ConfigTable.ini** d:\burny\SystemIni
- **HMI.ini** d:\burny\SystemIni
- **BurnyLoadParams.ini** d:\burny\Ini

CONFIGTABLE.INI

This file contains the actual *filename*s of the HMI settings file and the Motion Configuration file. The names are typically HMI.ini and BurnyLoadParams.ini. The following is the typical contents of the **ConfigTable.ini** file.

```
[ConfigFiles]
cmcc=d:/burny/Ini/BurnyLoadParams.ini
general=d:/burny/SystemIni/Hmi.ini
```

BURNYLOADPARAMS.INI

This file contains all of the information that is displayed in the Motion Configuration (Utility 10) screens. This information includes the Homing parameters, Axis tuning parameters, motor setup, i.e. Amp Invert, Tool offsets and more.

HMI.INI

This file contains information relating to the operator usage of the ***Burny Series 10***. Information in this file is set either by the operator, the supervisor and or the system administrator. The following describes the information maintained in the **HMI.ini** file.

- Default part programming language, i.e. Word Address, ESSI, Aux Code.
- English/Metric
- Left/Right plate side
- Language, i.e. English, Dutch
- Default cut process, Plasma or OXY/Fuel
- Default process feedrates.
- Default program format.
- “Floppy” path, i.e. “A:\”
- RS-232 settings
- Network settings, including subdirectories
- FTP settings, including subdirectories
- RAS settings.

7.21.2 PROCEDURE

The startup sequence for the ***Burny Series 10*** uses the three files listed above to check system integrity compromises and attempts to automatically correct problems. It also provides error recovery information. Figure 7.30 is a flowchart of the processing steps and expected message boxes that may appear during startup. Should any errors persist, contact Cleveland Motion Controls.

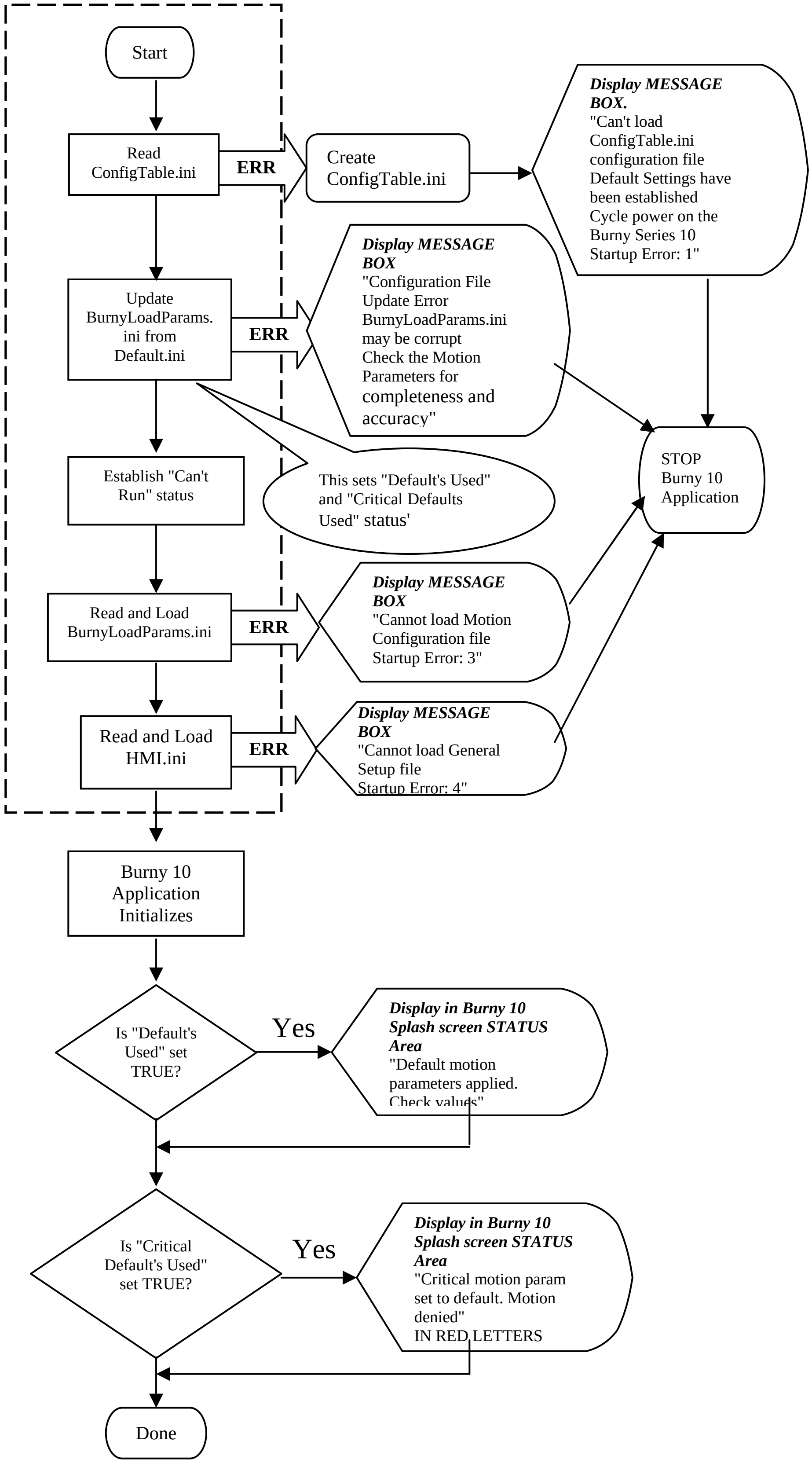


Figure 7.30 – Startup Sequence

7.21.3 ERROR MESSAGES DURING STARTUP

READ CONFIGTABLE.INI

During this step, the **ConfigTable.ini** is accessed to get the two filenames. One file contains the Human Machine Interface data and the other file contains the Motion Configuration data.

If the ConfigTable.ini is missing, a new one is automatically created with the following defaults:

- Human Machine Interface file is named HMI.ini
- Motion Configuration file is named BurnyLoadParams.ini

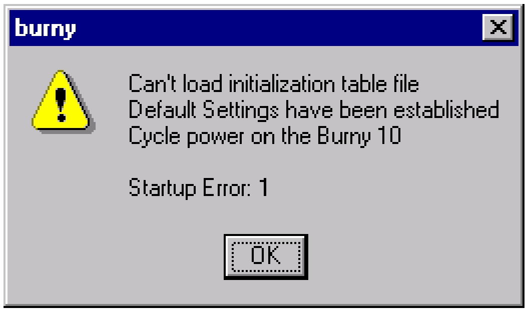


Figure 7.31 – Read ConfigTable.ini Error

When this error occurs, the above message is displayed (Figure 7.31). Press the ***OK*** button and restart the ***Burny Series 10*** controller, i.e. cycle power.

READ HMI.INI

During this step, the information from the Human Machine Interface file is processed.

Figure 7.32 – Read HMI.ini Error

If the HMI.ini file is missing, the following message is displayed (Figure 7.32). The only recovery from this error is to copy a previously saved HMI.ini file in the *d:\burny\SystemIni* directory using Windows-NT Explorer. Then, restart the ***Burny Series 10*** controller, i.e. cycle power.

READ MOTION CONFIGURATION FILE

This step reads and processes the motion configuration data. During this step, the "Automatic Update" feature is utilized. This feature allows a previously saved motion configuration, i.e. from previous ***Burny Series 10*** application program versions, to be updated to current requirements, automatically.

During this step there are two possible message boxes that could appear. The first, Figure 7.33, indicates that the Motion Configuration file could not be accessed. If this box appears, contact Cleveland Motion Controls.

Figure 7.33 – Read Motion Config File Error

The second message box that may appear, Figure 7.34, indicates that something is wrong with the Motion Configuration file. When this message box appears, default settings are used for those motion parameters that could not be recovered. The ***Burny Series 10*** application program is allowed to continue, however, it is advisable to review the motion configuration parameters for accuracy. Alternately, a previously saved Motion Configuration file can be loaded into the ***Burny Series 10***, then "Load from file" in the Motion Configuration screen.

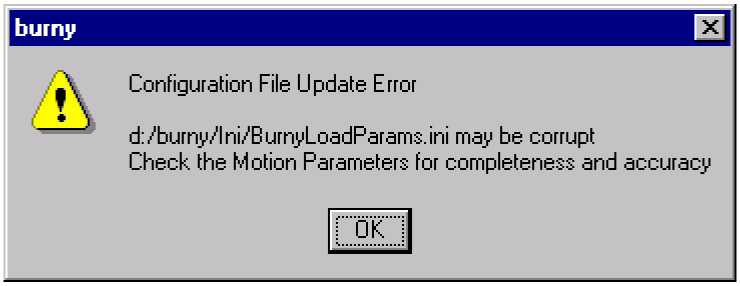


Figure 7.34 – Read Motion Config File Error

The following screen (Figure 7.35) appears if some of the Motion Configuration parameters (i.e. BurnyLoadParams.ini) were "automatically" set to their default values. This usually occurs after a ***Burny Series 10*** update because there are usually new parameters when an update is installed.

When this message appears, at least one non-critical motion parameter has been changed to its default value. Check the parameter settings and make any necessary changes.

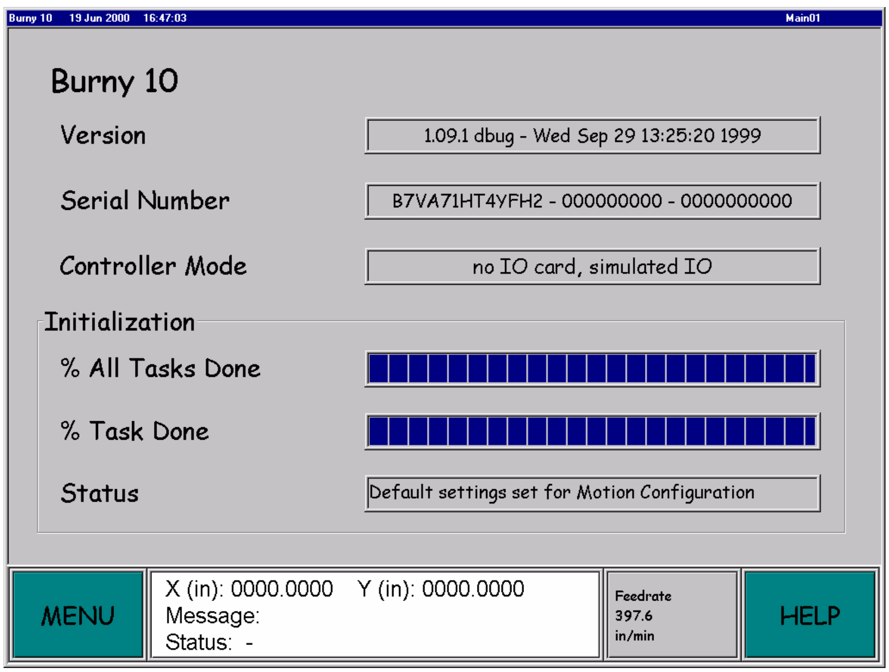


Figure 7.35 – Startup Screen; Non-Critical Motion Param Set To Default (*Menu01*)

When the following message appears (Figure 7.36), at least one critical motion parameter has been set to its default value. When this occurs, the motors cannot be enabled until the operator has evaluated those specific,

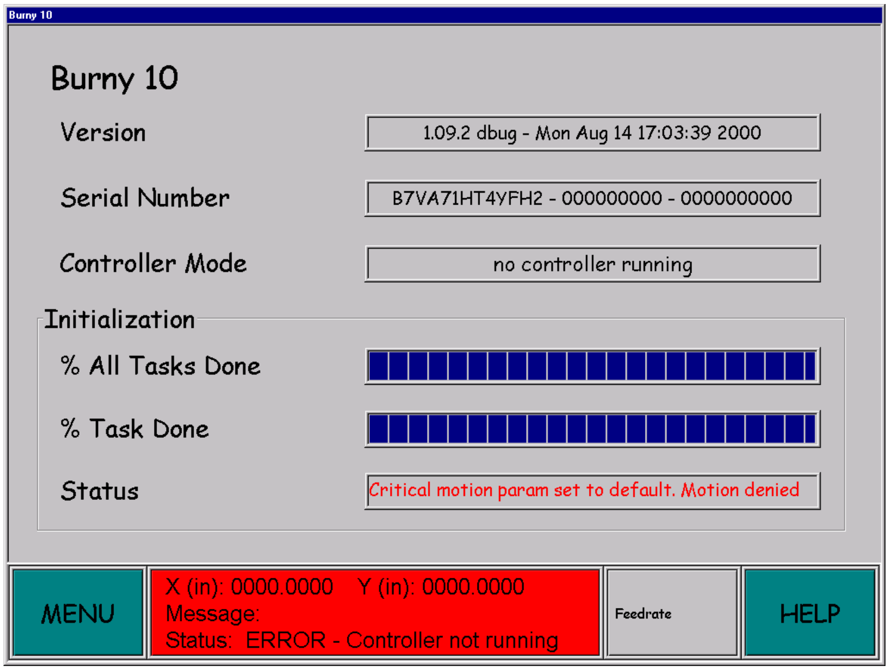


Figure 7.36 – Startup Screen: "Critical Motion Param Set To Default. Motion Denied"

critical parameters. This is accomplished by editing each of the indicated parameters in the Motion Configuration screen. When these parameters have been edited, the motion will be enabled.

The parameters that have been set to their defaults are highlighted in orange. The section name that contains any changed parameters is also highlighted in orange, per Figure 7.37 below.

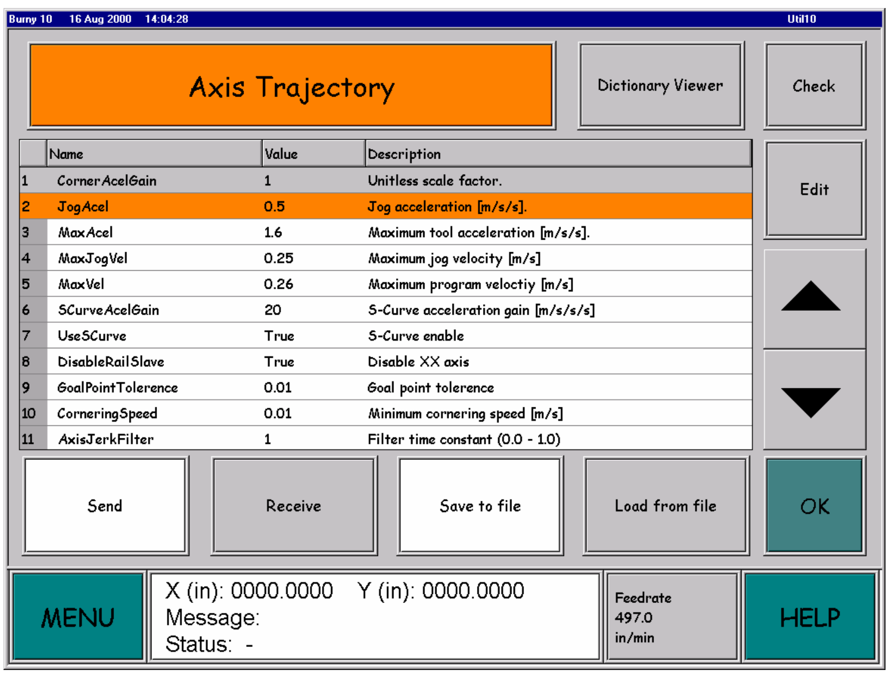


Figure 7.37 – Critical Motion Parameter Screen (*Util10*) with Jog Accel highlighted

To acknowledge this warning, use the Up and Down arrow buttons (▲/▼) to highlight the orange-indicated parameter, press the ***Edit*** button, enter the correct value and press ***OK***. Please note that the default value may be the correct setting, i.e. Encoder direction. In this case, pressing ***OK*** in the edit screen is sufficient.

When at least one parameter has been changed/edited, the ***Send*** and ***Save to file*** buttons change to white. This is a reminder that at least one parameter has to be "sent" to the motion controller and also, that the parameters have to be saved to the motion configuration file.

When the ***Send*** button is pressed, the parameters are sent to the motion controller and all the orange-indicated parameters that were edited are set to a no-warning state. The section name button will change to gray if that section has no highlighted parameters. When all orange-indicated parameters have been edited and sent to the motion controller, the motion controller will be enabled and motion will be allowed.

Press the ***Save to file*** button to save all motion configuration parameters to a file. This can be performed if the ***Save to file*** button is highlighted in white or its normal color, gray.

SAVE TO FILE: ERROR TRAPPING

The Utility10 screen allows for saving the motion configuration data to a file, i.e. BurnyLoadParams.ini file. Error trapping is included when performing this operation. Should any error occur, the error trapping feature keeps track of the first and last error that occur. If only one error occurs, the UtilsError01 screen is displayed as shown in Figure 7.38. If multiple errors are encountered, the first and last error are displayed. If no errors are encountered, this screen is never displayed.

If an error occurs, it is recommended to reload the Motion Configuration file, i.e. BurnyLoadParams.ini, from the ***Burny Series 10's*** initial installation.

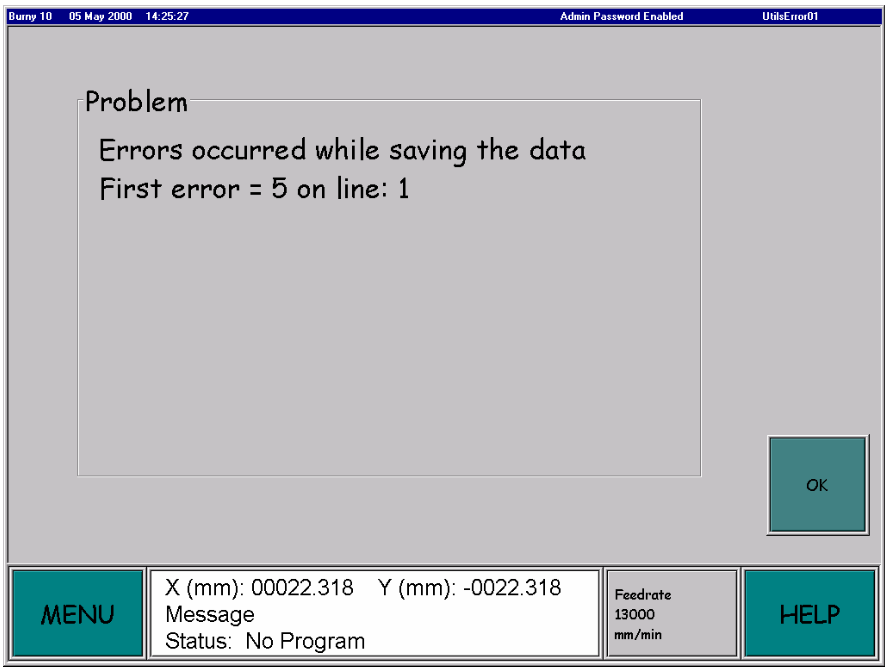


Figure 7.38 – Error Screen (*UtilsError01*)

7.22 LANGUAGE CONFIGURATION SCREEN (UTIL31)

The ***Burny Series 10*** system supports a number of different languages. Three language choices can be configured, one default and two optional. The optional languages can be changed by loading different language files saved in the ***Burny Series 10*** with the extension of ".uni".

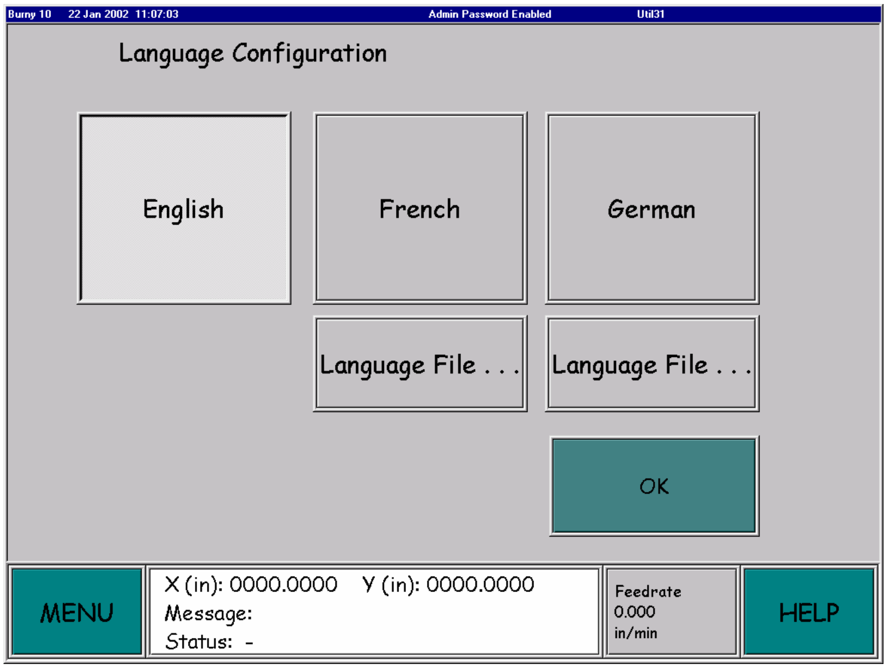


Figure 7.39 – Language Configuration Screen (*Util31*)

7.22.1 DESCRIPTION

Three language choices are available without using the password: ***Default*** and two options. Other languages can be loaded from the ".uni" language files when the ***Admin*** password is entered.

7.22.2 PROCEDURE

SELECT FROM DEFAULT OR OPTIONS

To select from the default and two optional languages, press the desired button. The language used in this screen will change. Press ***OK*** to return to screen ***Util13***. After three or four minutes, the Control should be rebooted to change all screen terms.

CHANGE OPTION

To change one of the optional languages, enable either password. Then return to the ***Util31*** screen.

Now press the ***Language File*** button below the language you wish to change. The display changes to the ***Load which language*** screen. Select the desired file and press ***OK***. See instructions for this screen below.

7.22.3 DETAILS

DEFAULT

This button selects the default language. The default language is set at the factory and cannot be changed in the field.

LANGUAGE BUTTONS

These buttons will have the name of a language for a label. Press one of these to select the indicated language. The background of the selected language button will be light gray.

LANGUAGE FILE

These two buttons display the ***Select Language File*** screen when the ***Admin*** password is enabled. Their labels are dimmed when the password is not enabled.

OK

This button accepts changes made and returns the display to the ***Util13*** screen.

7.23 SELECT LANGUAGE FILE SCREEN (SELECTLANGFILE)

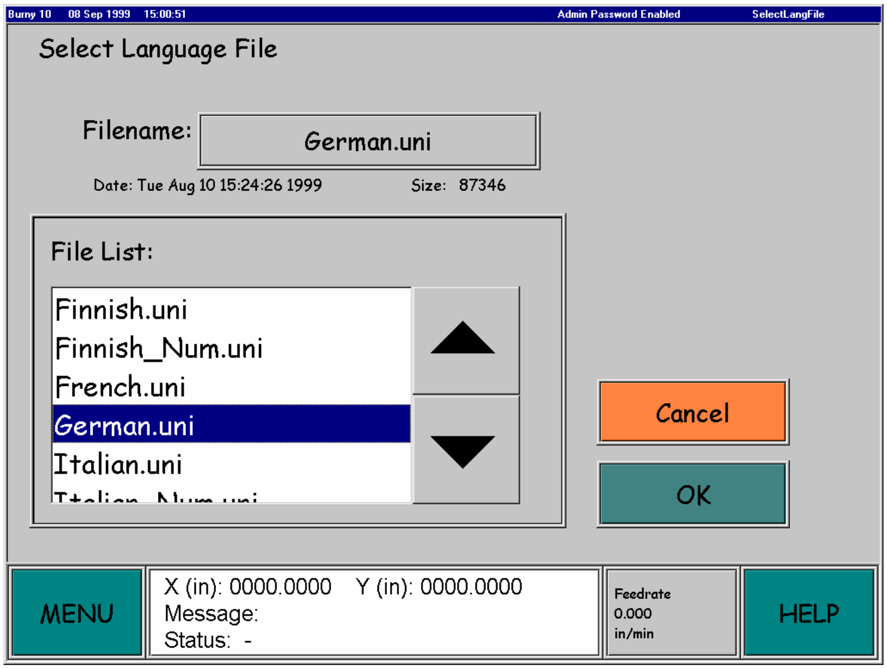


Figure 7.40 – Select Language File Screen (*SelectLangFile*)

7.23.1 DESCRIPTION

The ***Select Language File*** screen enables the operator to load a different language or load the numbers for one of the optional languages.

7.23.2 PROCEDURE

Reach this screen by pressing one of the two ***Language File buttons*** in screen ***Util31*** when the ***Admin*** password is enabled. The ***Filename*** box usually displays the filename highlighted by the cursor in the ***File List***.

To select a different file, press it on the ***File List***. If its name is not showing, use the ***Up***/***Down*** buttons to display it. A language file must end with the extension ".uni". If the list is long, press the ***Filename*** box to display the keyboard, enter the desired name or the first few letters, and press ***OK***.

The display returns to the previous screen with the file in view, at or near the cursor position. Be sure the cursor is on the desired filename and this name appears in the ***Filename*** box. Press ***OK*** to load this language file and return to the ***Util31*** screen.

Press the ***Cancel*** button at any time to discard all changes and return to the ***Util31*** screen.

7.23.3 DETAILS

FILE LIST

This list shows all available language files.

DETAIL LINE

Shows the date and time of creation of the file highlighted by the cursor and its size.

FILENAME BOX

Shows the name of the file highlighted by the cursor in the ***File List*** or the name of a file being searched for.

UP/DOWN KEYS

Move the cursor through the ***File List***.

CANCEL

Discards changes and returns the display to the ***Util31*** screen.

OK

Accepts changes and moves the display to the ***Util31*** screen with the new file loaded and its name displayed.

7.24 COMMUNICATION CHANNEL SELECT SCREEN (UTIL12)

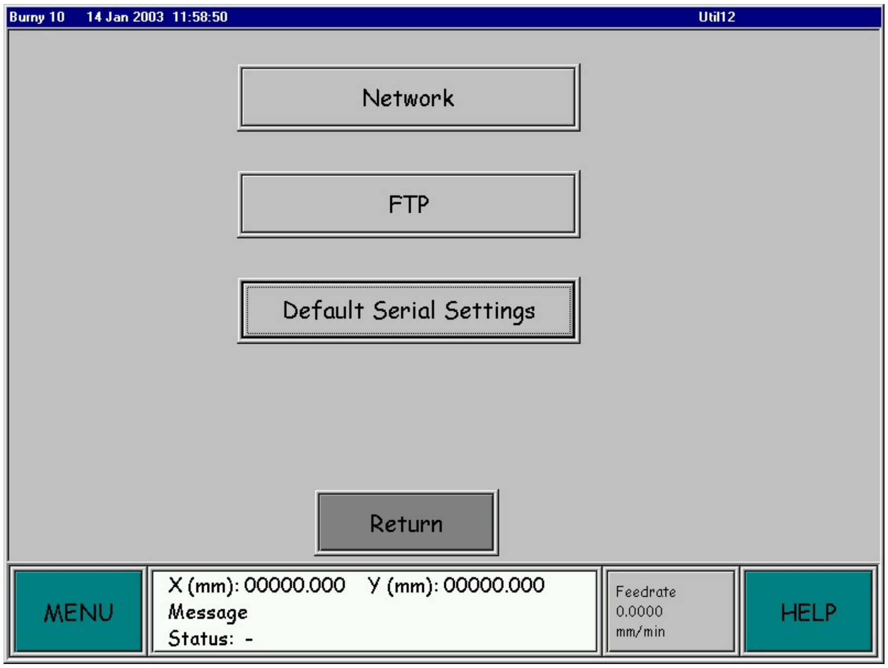


Figure 7.41 – Communication Channel Select Screen (*Util12*)

7.24.1 DESCRIPTION

The ***Communication Channel Select Screen*** permits selection of any of the four communication modes for channel setup. The ***Network*** and ***FTP*** choices provide for setting up four channels each.

7.24.2 PROCEDURE

Press any one of the four communication mode buttons to move to a screen devoted to setting up that mode. See ***Details*** below.

Press the ***Return*** button to move to the ***Util13*** screen.

7.24.3 DETAILS

NETWORK

The ***Network*** button changes the display to the ***Network Site #1*** screen, ***Util23,*** where four parameters can be set for each of four channels if the ***Admin*** password is enabled.

FTP

The ***FTP*** button changes the display to the ***FTP Site #1*** screen, ***Util22,*** where four parameters can be set for each of four channels if the ***Admin*** password is enabled.

DEFAULT SERIAL SETTINGS

The ***Default Serial Settings*** button changes the display to the ***RS-232 Serial Options*** screen, ***UtilCommSetSerial,*** where four parameters can be set for the RS-232 serial channel if the ***Admin*** password is enabled.

RETURN

The ***Return*** button moves the display back to the ***Util12*** screen.

7.25 NETWORK SCREEN (UTIL23)

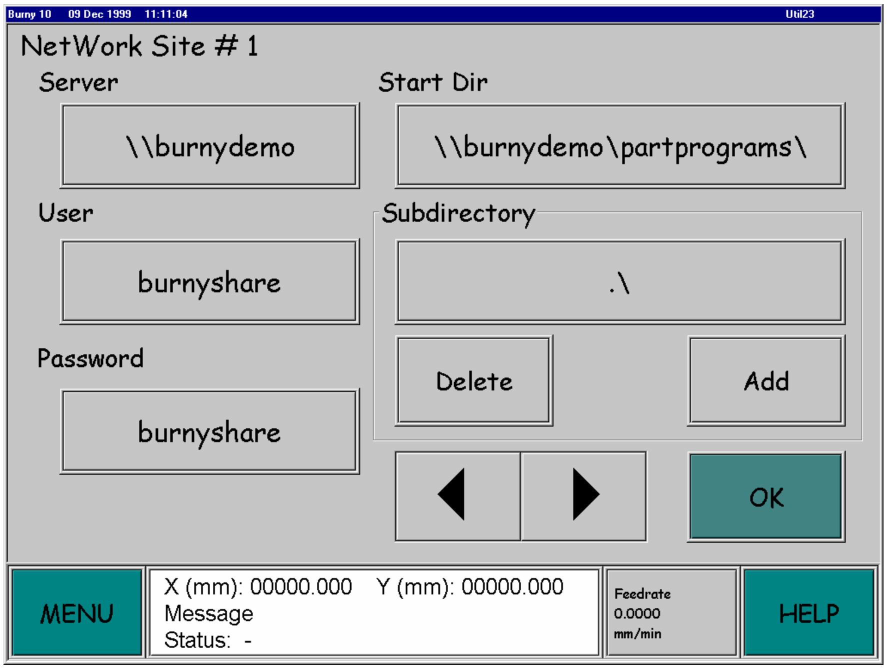


Figure 7.42 – Network Screen (*Util23*)

7.25.1 DESCRIPTION

The ***Network*** Screen permits setting up four different locations for downloading/storing files. The left and right arrows at the bottom of the screen can be clicked to scroll the screens through the 4 different locations – note the screen layout is the same for each location. Enable the ***Admin*** password to make changes here. When the ***Admin*** password is not enabled, the five entries on this screen are legible but dimmed to gray.

It is recommended that all changes be made by ***IS*** personnel.

7.25.2 PROCEDURE

First enable the ***Admin*** password. Then use the left and right arrow keys at the bottom center of the screen to change the display to the site number that needs to be changed.

Press one of the four buttons ***Server***, ***User***, ***Password***, or ***Start Dir*** that must be changed. The display changes to the ***Keyboard***. Make the change and press ***OK***. Repeat this procedure with any other items that need to be changed.

Subdirectories can be added and deleted. To add subdirectory, its name must first be known. The ***Burny Series 10*** cannot display the directory structure of a remote server. Press the Add button to display the Keyboard screen. Enter the name of the subdirectory, followed by a "\". Press OK to accept the subdirectory name and return to the Network screen. Press Cancel to discard changes and return to the Network screen.

When a subdirectory name not present in the site path on the remote server is entered and an attempt is made in Load to access it, an error screen appears stating "Cannot get remote directory listing."

To delete a subdirectory, press the Subdirectory window until its name is displayed and then press the Delete key. No confirmation is required.

When finished, press ***OK*** to return to the ***Util12*** screen.

7.25.3 NETWORKING GUIDELINES

1. **NEVER** make the Burny a member of a domain. The Burny application connects to network shares using the DomainName/UserName method.
2. Add two new user accounts on the server and **DO NOT** use roaming profiles for these accounts.

User 1	**User 2**
Username - burny_user	Username - burny_service
Password - burnyuser	Password - burnyservice

3. Create the appropriate shared folders for the part programs and give **burny_user** and **burny_service** permission to access the shares.
4. It is highly recommended that TCP/IP be used as the primary protocol on the network.
5. Use DHCP whenever possible to obtain an IP address. If the Burny will have a static IP address, the address and subnet mask must be approved by the IT department.
6. To prevent damage to the Burny from electrical noise, do not use the on board Network connection that is built into the motherboard. Instead, use either a fiber optic or wireless network card installed in an empty slot on the motherboard.
7. Configure the Burny network setup using the following ***example*** as a ***guideline***:

Domain Name = cmcusa
User Name = burny_user
Server Name = burnydemo
Share Name = PartPrograms

7.26 FTP SCREEN (UTIL22)

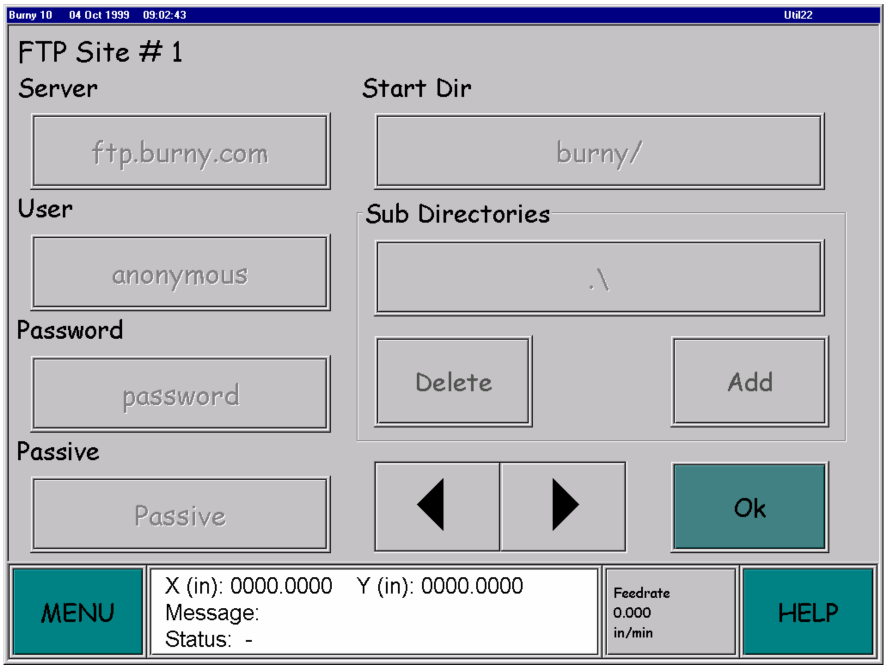


Figure 7.43 - FTP Screen (*Util22*)

7.26.1 DESCRIPTION

The ***FTP*** Screen permits setting up four different sites as sources for downloading files or destinations for storing them. These sites must have the ***FTP*** Server installed. The left and right arrows at the bottom of the screen move the display through four screens with identical layout, one for each site. Enable the ***Admin*** password to make changes here. When the ***Admin*** password is not enabled, the six entries on this screen are legible but dimmed to gray. Consult ***IS*** personnel for specific help.

For a particular site, all the settings will usually remain the same for a long period except the ***Sub Directories***. Part program files may be sorted by types, with each type in a different subdirectory within each ***Start Directory. Subdirectories*** are added or deleted here to form a group for each site from which the operator can select when he is loading or storing a file. Before a ***Load*** or ***Store*** operation, the correct subdirectory must be selected by pressing the ***Sub Directories*** button until its name appears.

If the name of the desired subdirectory does not appear, it must be added to the list that appears on the button. Select ***Add*** to display the keyboard, then type in the name and press ***OK*** to add it to the list or ***Cancel*** to discard any keyboard entry and return to the ***Util22*** screen. A list of the names of subdirectories that may be accessed must be kept on hand. These names cannot be seen with the ***Burny Series 10*** over the network connection.

If a subdirectory will not be used for a while, it can be removed from the list to save time when toggling through the list. Press the ***Sub Directories*** button until the name to be removed appears, then press the ***Delete*** button. This removes the name at once, without confirmation.

7.26.2 PROCEDURE

First enable the ***Admin*** password. Then use the left and right arrow keys at the bottom center of the screen to change the display to the site number that needs to be changed.

Press one of the four upper buttons that must be changed. The display changes to the ***Keyboard***. Make the change and press ***OK***. Repeat this procedure with any other items that need to be changed.

The ***Passive*** button toggles between ***Passive*** and ***No Passive***. Select ***Passive*** when no firewall exists in the access path.

When finished, press ***OK*** to return to the ***Util12*** screen.

7.27 RS-232 SERIAL OPTIONS SCREEN (UTILCOMMSETSERIAL)

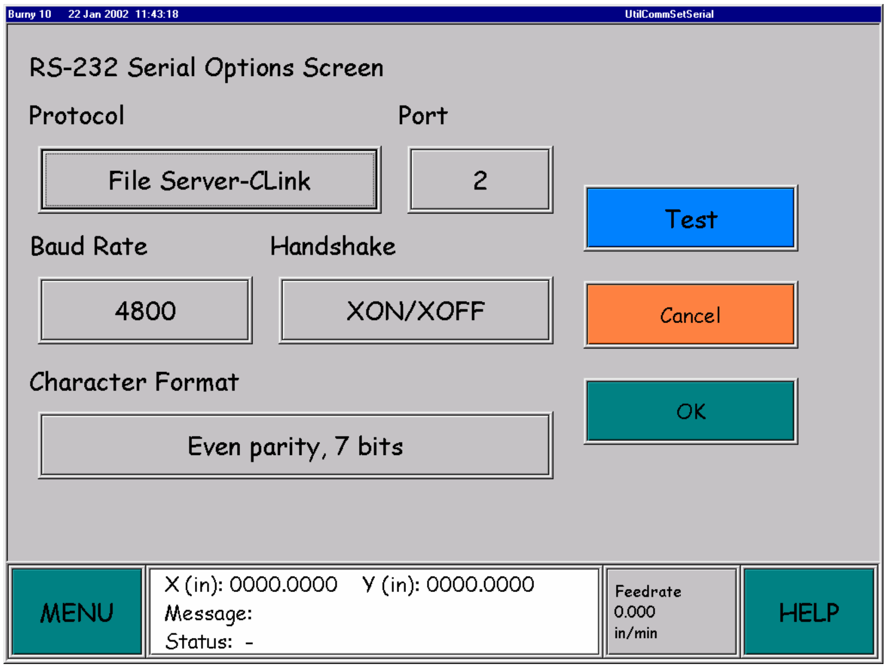


Figure 7.44 - RS-232 Serial Options Screen (*UtilCommSetSerial*)

7.27.1 DESCRIPTION

The ***RS-232 Serial Options Screen*** permits setting the default values of serial communication parameters when the ***Admin*** password is enabled.

These default values should match the settings for the most commonly used external serial device. In the ***Load*** and ***Store*** modes, values actually used for a particular serial transfer can be set to different values than the defaults when necessary.

An RS-232 Loopback Test can also be conducted by pressing the ***Test*** button and following the instructions below under RS-232 Loopback Test.

7.27.2 PROCEDURE

Press the parameter buttons to cycle through the values until the correct one to match the most commonly used external device is displayed.

Button	Values
Protocol	File Server-Clink, Std TTY, Std Callup
Baud Rate	110 to 115200
Hand Shake	XON/XOFF, RTS/CTS, NONE
Charatcer Format	Even Parity 7 bits Even Parity 8 bits Odd Parity 7 bits Odd Parity 8 bits None Parity 7 bits None Parity 8 bits

When all parameters are correct, press ***OK*** to save the values and return to the ***Util12*** screen.

Note that the ***Port*** button has selections of 0, 2, 3, 4, 5, 6, 7 and 8. Port 0 is used to indicate "Not Used".

Press ***Cancel*** to discard any changes made in this screen and return to the ***Util12*** screen.

To run an RS-232 Loopback test, press the ***Test*** button. The RS-232 Loopback Test screen appears. See the next section, RS-232 Loopback Test Screen for instructions.

7.28 RS-232 LOOPBACK TEST SCREEN (UTILRS232TEST)

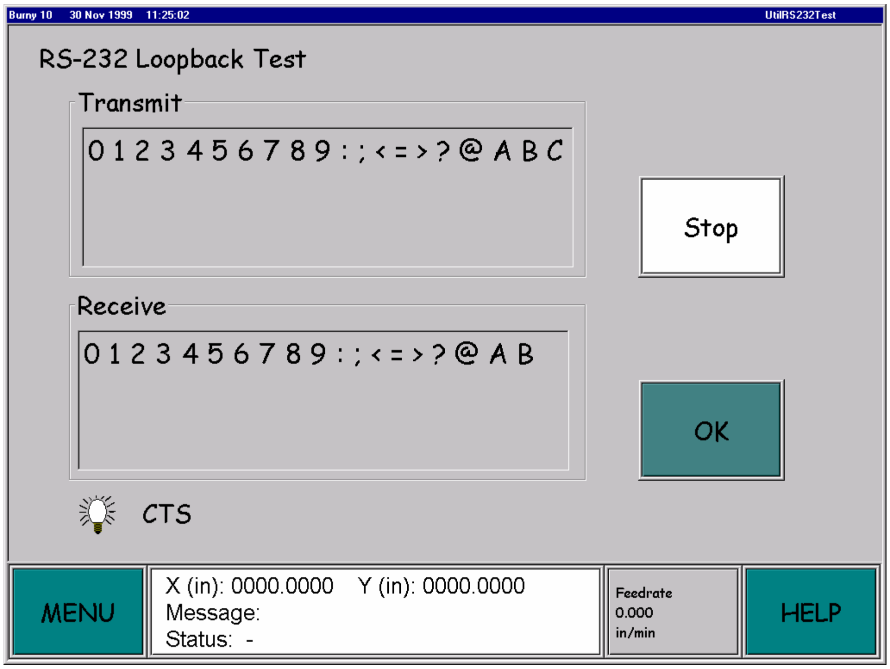


Figure 7.45 - RS-232 Loopback Test Screen (*UtilRS232Test*)

7.28.1 DESCRIPTION

The operator can use this function to verify the RS-232 operation without the Host Computer being available. The test sends a series of easily recognized characters out of the ***Burny Series 10*** serial port and redirects them back into the port. Both character streams are displayed on the screen so that they can be compared.

The receive area of the screen will display the same characters as transmitted, slightly delayed. However, if a received character is not displayable, a string representing the character as numbers is displayed instead. This string takes on the form "[ddd:0xhh]" where "ddd" is the decimal equivalent, and "0xhh" is the hexadecimal equivalent. As an example, the received character of 15 will be displayed as "[15:0x0F]".

7.28.2 PROCEDURE

First, remove the cable, if any, from 36RECP on the ***Burny Series 10*** back panel. Jumper pins 2 to 3and 8 to 9.

Start the test by pressing the blue ***Start*** button. The blue ***Start*** button changes to a white ***Stop*** button, the ***Transmit*** window will start to show the characters being transmitted. The ***Receive*** window will also start to show any characters received. At the same time, the "light bulb" showing ***the Clear-To-Send (CTS)*** status will appear and will reflect the ***CTS*** status. The light bulb should be ***ON***, "white" when ***CTS*** is satisfied.

Examine the two windows to confirm that no characters are missing.

To stop the process, press the white ***Stop*** button. The blue ***Start*** will reappear and the light bulb will disappear. To start the process again, simply press the ***Start*** button. The ***Transmit*** and ***Receive*** windows are cleared and the process starts again.

In the test, characters are transmitted at ten per second regardless of the baud rate setting for better legibility. Otherwise, all changes made in the ***RS-232 Serial Options*** screen will be used in the test. These changes will not be applied to normal ***RS-232*** communication until the ***OK*** button is pressed in the ***RS-232 Serial Options*** screen.

7.28.3 DETAILS

START

Press the blue Start button to begin the test process. The transmitted characters will start at the upper left of the Transmit window and fill the three lines. Then the new characters appear at the lower right and those characters already received will move to the left through all the three lines.

When this button is pressed, the label changes to Stop and the color changes to blue.

STOP

The white ***Stop*** button appears after ***Start*** is pressed. Press it to stop the test. The transmitted and received characters remain displayed in the two windows. The test also stops when the screen display changes. If the ***Status*** screen or the ***Main Menu*** screen is displayed and then the display is returned to the ***RS-232 Loopback Test*** screen, the test will not be running but the characters are displayed. If ***OK*** is pressed to take the display back to ***the RS-232 Serial Options*** Screen and then ***Test*** is pressed to display the ***RS-232 Loopback Test*** screen again, the test is not running and the windows are blank.

Remove the two jumpers and replace the cable, if any, when through testing.

OK

When ***OK*** is pressed, the test stops, the windows are cleared, and the display returns to the RS-232 Serial Options screen.

7.29 MISCELLANEOUS SETUP SCREEN (UTIL24)

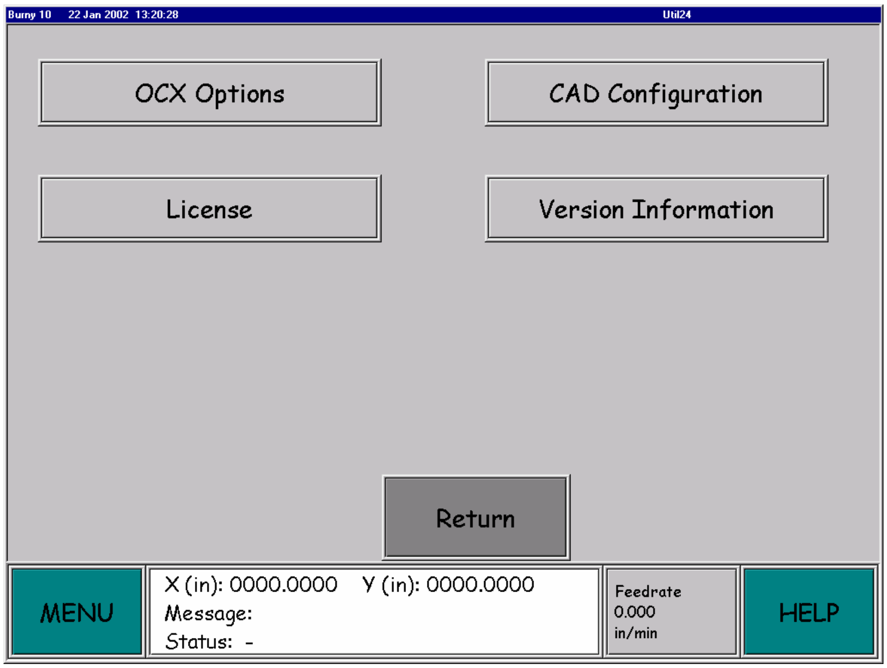


Figure 7.46 – Miscellaneous Setup Screen (*Util24*)

7.29.1 DESCRIPTION

The Miscellaneous Setup screen provides access to the License screen, Util60, the Select CAD Configuration File screen, Util86, the Options screen and the Version Screen, OptionsPage1.

7.29.2 PROCEDURE

Press the ***License*** button to move to the ***License*** screen. Press the ***Options*** button to move to the ***Options*** screen. Press the ***CAD Configuration*** button to move to the ***Select CAD Configuration File*** screen. Press the ***Version Information*** button to move to the ***Version Information*** screen. Press ***Return*** to change the display back to the ***Util13*** screen. See the ***Table of Contents*** for this section to find entries for these three screens.

7.30 LICENSE SCREEN (UTIL60)

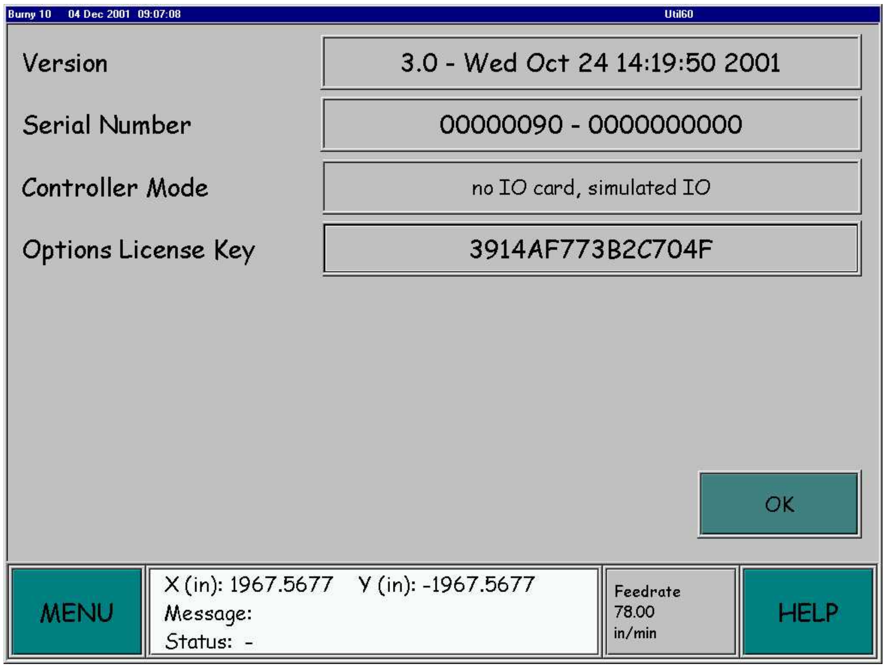


Figure 7.47 – License Screen (*Util60*)

7.30.1 DESCRIPTION

This screen provides six items of information about the software and hardware configuration of the ***Burny Series 10*** and the software version and licensing.

- **Version –** The version and creation date of the installed software.
- **Serial Number –** A machine configuration number in three sections.
  Section One**:** Identification number of the installed hard disk.
  Section Two: Machine ID number on sticker inside the ***Burny Series 10*** case.
  Section Three: Identification number of the PCI IO card.
- **Controller Mode –** A general machine status as reported by a query to the PCI IO card.
- **Licensed Mode –** The hardware configuration and operational pattern as enabled by the License Key.
- **License Key –** A key number that enables the hardware and functions in the ***Burny Series 10*** as purchased.
- **Options License Key –** A key number that makes certain ***Chargeable Option*** programs in the ***Burny Series 10*** available for use.

Be sure not to corrupt the license key or the *Burny Series 10* WILL NOT operate.

7.30.2 PROCEDURE

The ***License*** key and the ***Options License*** key can be changed when the ***Admin Password*** is enabled.

Before making any changes, write down both keys as insurance against problems in the procedure.

Press either of these key buttons to display the ***Keyboard*** screen. Make the required changes. Compare the key entered with the correct value. Note that the name of the key displayed in the ***Keyboard*** text window appears at the upper left of the screen. When the key entered has been verified, press ***OK*** to return to the ***License*** screen with the new key displayed and active.

If the characters of the ***License Key*** are not all correct, the ***Status*** window at the bottom of the ***License*** screen turns red and the status is listed as "***Controller NOT Licensed***". To correct this, press the ***License*** window to display the ***License key Keyboard*** screen and enter the correct key. Then press ***OK***. The ***Status*** window is now clear and the control is functional.

If the characters of the ***Options License Key*** are not all correct, some or all of the available options will not appear in the ***Options*** screen as button text choices. To correct this, enter the correct ***Options License Key***. **This will make the options available but not enabled.** Use the procedure below to enable the desired options.

When the correct keys have been entered, press the ***OK*** key to leave the License screen and return to the ***Miscellaneous Setup*** screen.

7.31 OPTIONS SCREEN (OPTIONS PAGES)

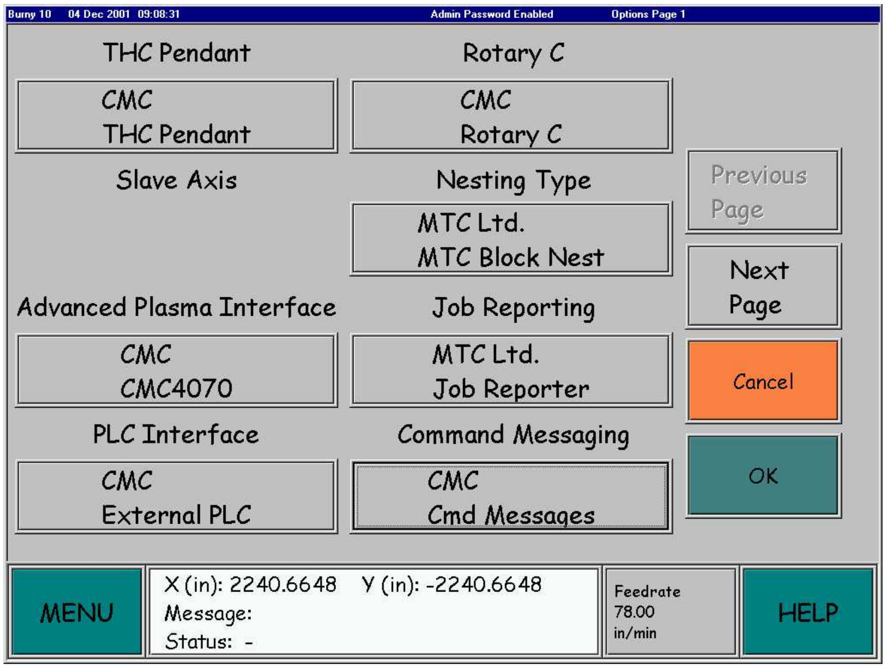


Figure 7.48 – Option Screen (*OptionsPage1*)

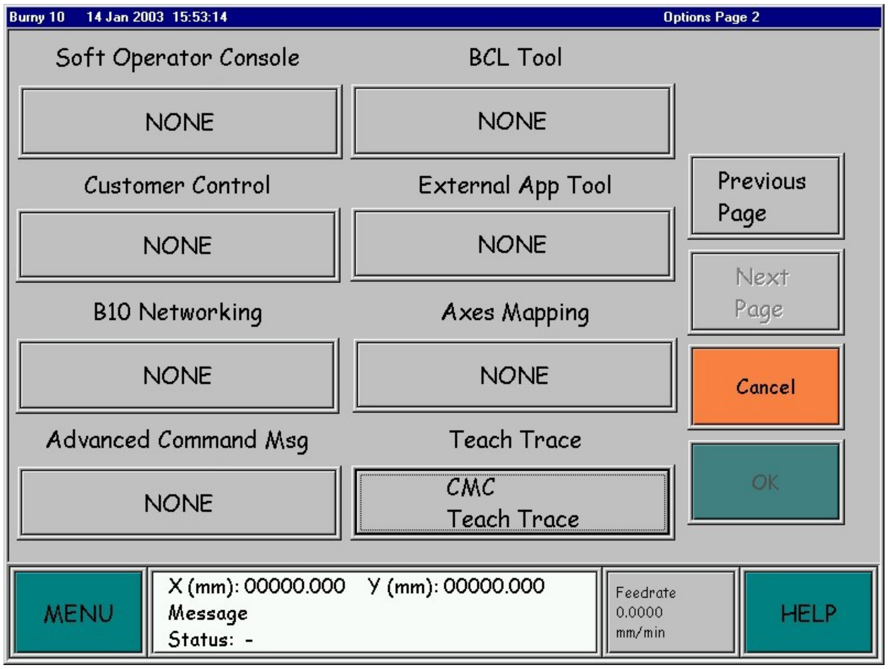


Figure 7.49 - Option Screen 2 (*OptionsPage2*)

7.31.1 INTRODUCTION

The ***Options Page*** enables the use of ***Burny*** & third party programs called ***Chargeable Options*** that operate peripheral equipment or provide additional functions/information. These programs are licensed from ***CMC***.

Such programs may already reside on the ***Burny Series 10*** but haven't been initialised To install a desired function the customer should contact a ***Burny*** sales person to a ***License Key.*** Once the key is entered and the system rebooted the options become available.

More than one vendor may produce a program that performs a similar function – programs that perform similar functions are called "types" One or none of the same type programs can be operational at any time.

7.31.2 DESCRIPTION

Licensed Options require two principal tasks: making the options available and using them.

The process of making options available depends upon whether or not the option program already resides in the ***Burny Series 10***. If so, it can be made available by obtaining a license key from a ***Burny*** sales person and entering that key, a series of alphanumeric characters, into the control. When the control is rebooted, the option is available to use.

If the option program is not in the ***Burny Series 10***, it must be loaded via the network or from a CD/floppy disk. Then the license key must be obtained and loaded as described above. The last step to make the program available is to reboot the control. Now the new program can be accessed among others of its own type.

A series of buttons are displayed labeled ***Option Type*** 1, ***Option Type*** 2, etc, with the name of the software vendor and program description. When a button is pressed, the text changes, either to the text for another option program of the same ***Type*** or to ***None***. Repeated pressing cycles the button text through the information for all the properly licensed options of that type, the label ***None***, and back to the first button text.

Any one of the option programs can be made operational, controlling the function associated with the Type to which it belongs. Right after the control is rebooted, the operational option program for each ***Type*** will have its button text displayed on the ***Type*** buttons.

The option whose button text is displayed on one of the ***Type*** buttons is called the "selected" option of that type. Any one of the option programs can be selected by pressing its Type button until its button text appears. Then pressing ***OK*** makes it the "active" option for that ***Type***. Finally, rebooting the control makes it the "enabled" (operational) option.

7.31.3 GLOSSARY

OPTION LICENSE KEY

An alphanumeric string obtained from ***CMC*** sales that unlocks one or more option programs resident in the ***Burny Series 10*** Control. The key only works on one ***Burny Series 10*** with a specific serial number and only unlocks (makes available) chosen option programs.

OPTION TYPE

Group of **Burny** or third party programs providing similar functions or information that are accessible through the ***Burny Series 10*** application. Only one program of a particular type can be operational at the same time. Each option ***Type*** that has one or more option programs available has a button displayed on the ***Options*** screen.

TYPE BUTTON TEXT

The ***Type*** button text gives the name of a software vendor in the top line and the description of a program in the second line.

ACTIVE OPTION

An option (not currently enabled) whose ***Button Text*** appears in the ***Options*** screen on one of the ***Type*** buttons becomes "active" after ***OK*** is pressed. The active option can be ***None***. Note that more than one option can become active at the same time.

ENABLED

An option that is operational, that currently controls the use of its ***Type*** function or information. The active option becomes the enabled option when the control is rebooted.

7.31.4 PROCEDURE

The ***Options*** screen is displayed when the ***Options*** button in the ***Miscellaneous Setup*** screen (***Util24***) is pressed.

To change the enabled option for a particular ***Type***, make the desired option the selected option, press ***OK*** to accept this choice and move to the ***Options OK*** screen. There a warning message reminds the user that he must reboot the control to enable the selected active option. Reboot the control and the newly selected option will be enabled.

Entering the correct Options License Key makes options available but does not enable them.

Disable an enabled option by enabling another one of the same type. To disable all options of a particular type, enable ***None*** for that type.

7.31.5 DETAILS

OPTION TYPE 1, 2, ETC.

These are the titles for the associated buttons. A ***Type*** is a group of third party programs providing similar but different functions or information that are accessible through the ***Burny Series 10*** application.

SAMPLE 1 – NAME

This first line of the label on a ***Type*** button states the name of the vendor who provided a certain option program that is named in the second line.

SAMPLE 2 – DESCRIPTION.

This second line of the label on a ***Type*** button gives a brief description of the option program associated with this key label.

CANCEL

Select to return to the ***Util24*** screen with no changes made to the options enabled.

OK

Select to make all the selected options, active options and display the ***OptionsOK*** screen.

7.32 OPTIONS OK SCREEN (OPTIONSOK)

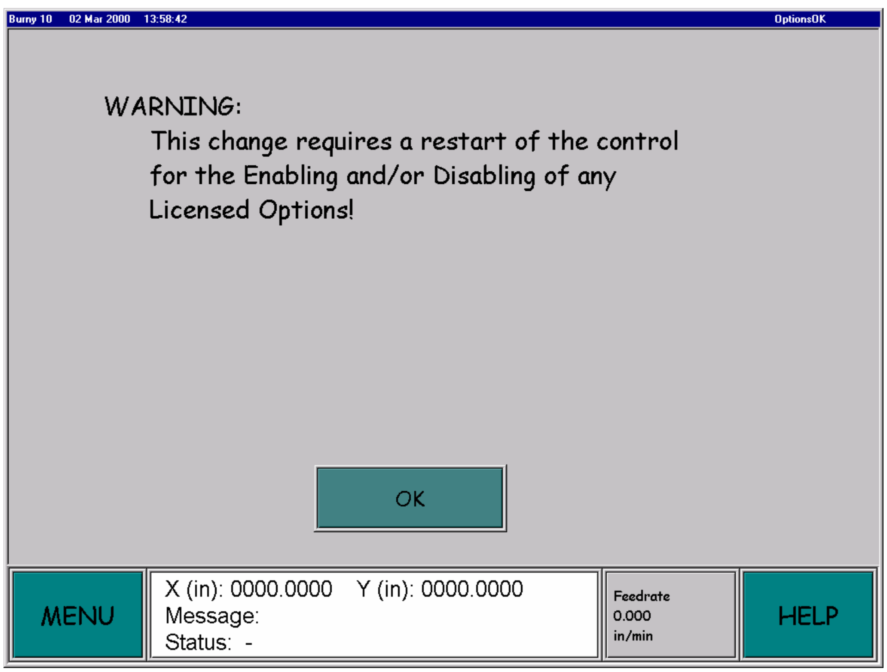


Figure 7.50 – Option OK Screen (*OptionsOK*)

7.32.1 DESCRIPTION

When ***OK*** is pressed in the ***Options*** screen, the ***Options OK*** screen appears. Selected options in the ***Options*** screen now are active options. A Warning message on the screen reminds the user to reboot the control to enable the active options.

7.32.2 PROCEDURE

To enable the active options, reboot the control while this screen is displayed.

To reboot the ***Burny Series 10*** control, activate the ***Emergency Stop*** button. Next use the power switch at the back of the ***Burny Series 10*** to turn power off, then on again.

If the ***Burny Series 10*** is not rebooted at this point but ***OK*** is pressed, the display changes to the ***Miscellaneous Setup*** screen and the same options are enabled as before.

*Any changes that were made in the **Options** screen are still in the active state and will be enabled the next time the **Burny Series 10** is rebooted. To prevent this from happening, re-enter the **Options** screen and change the selected (displayed) choices to the options currently enabled. Then press **OK** to move to the **Options OK** screen. Finally, press **OK** to display the **Miscellaneous Setup** screen. Now rebooting the control will not change the options enabled.*

7.33 CAD CONFIGURATION

7.33.1 INTRODUCTION

The CAD Configuration file contains information used during the CAD to Word Address conversion process. It contains information such as Lead-in type, Lead-out type, Cut Layer and more; a complete list is provided in the tables later in this section.

The CAD Configuration file **Burny_CAD.INI** provides the default settings when a new CAD Configuration file is created. This file is protected from modification or accidental deletion. When the file is selected for modification or viewing, the filename is displayed with [READ ONLY] format indicated, with the Edit and Save buttons being disabled on file editor screen. With the password enabled, the **Burny_CAD.INI** file can be edited and saved with a unique filename.

7.33.2 ACCESSING THE CAD CONFIGURATION FEATURE

The ***Burny Series 10*** enables the supervisor and administrator to create a ***CAD*** configuration file that allows the ***CAD*** files to be processed as the ***CAD*** operator intends. It is suggested that the supervisor coordinate this effort with the ***CAD*** operator to ensure success***. Cleveland Motion Controls*** will assist in creating a ***CAD*** configuration file; contact ***Cleveland Motion Controls*** for more details.

To access the ***CAD Configuration feature***, press the ***Menu*** button and press the ***Utility*** button to view the ***Utilities Main Menu***. If you intend is to create a new ***CAD Configuration*** or modify an existing ***CAD Configuration*** file, press the ***Enable Password*** button and enter the password. If you simply want to view a ***CAD configuration*** file, don't enter a password.

Press the ***Miscellaneous*** button and then press the CAD Configuration button as shown in the

Screen above. This will cause the ***CAD Configuration File Selection*** screen to be displayed.

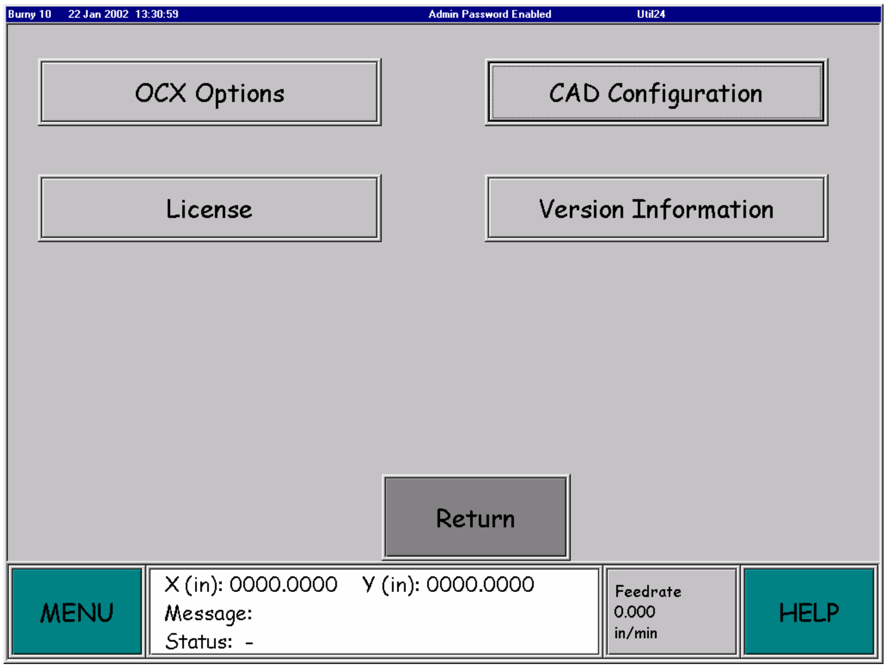


Figure 7.51 – Miscellaneous Setup Screen (*Util24*)

7.33.3 SELECT CAD CONFIGURATION FILE SCREEN (UTIL86)

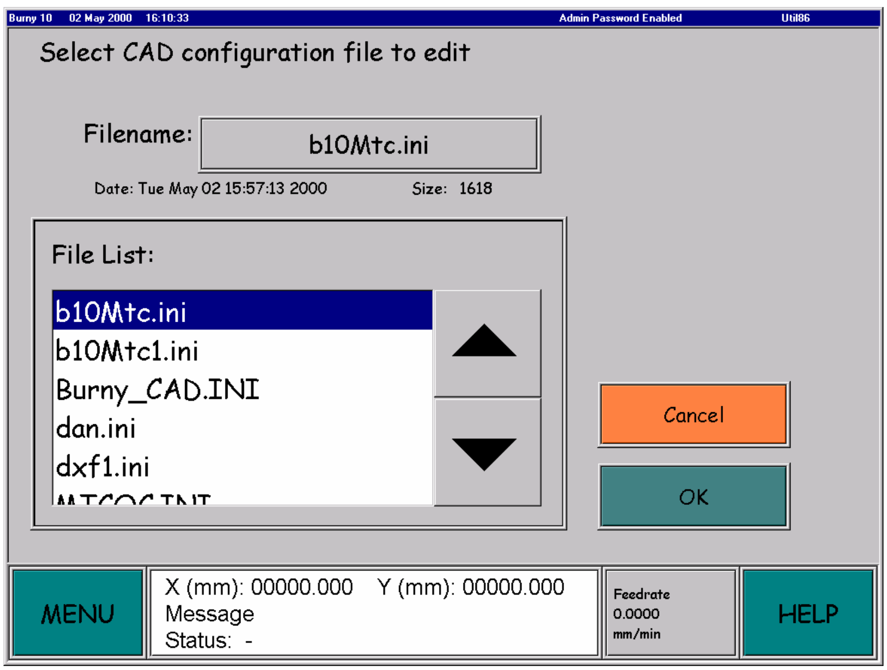


Figure 7.52 – Select CAD Configuration File (*Util86*)

Select a CAD Configuration file to view or modify and press the OK button. This causes the CAD Configuration Editor screen to be displayed.

To create a new ***CAD Configuration*** file, press the ***filename*** box and enter a filename, then press ***OK*** from the ***CAD Configuration File*** selection screen. If the ***CAD Configuration*** file does not exist, a confirmation screen will be displayed asking ***'Do you want to create a new file?"***. Pressing the "***OK***" button will cause a new ***CAD Configuration*** file to be created. Pressing the "***Cancel***" button will show the ***CAD Configuration*** selection screen to be displayed and the 'new' file is not created. When a new ***CAD*** configuration is created, its initial settings are those of the ***Burny_CAD.INI*** file.

7.33.4 CAD CONFIGURATION FILE VIEW/EDIT SCREEN (UTIL25)

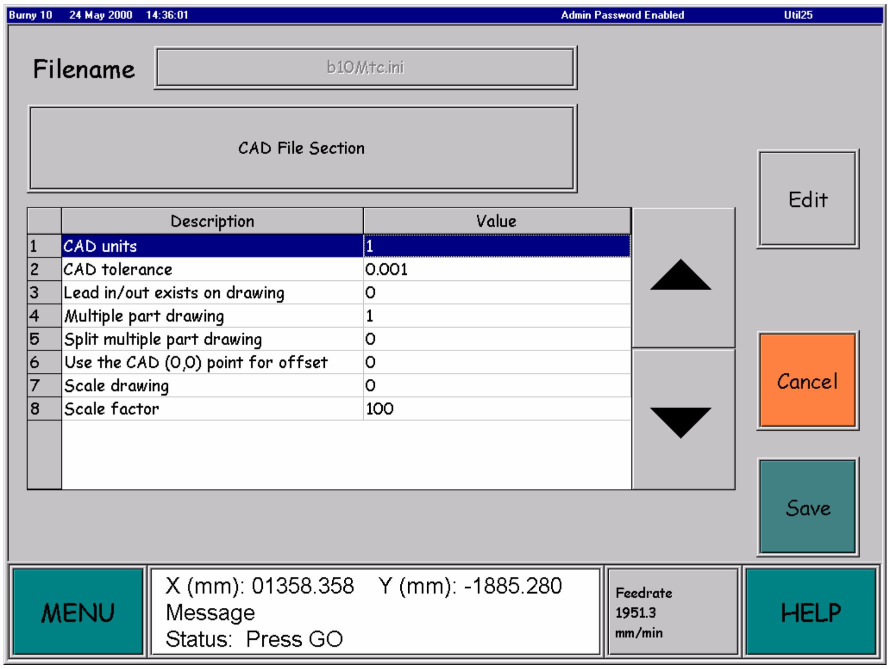


Figure 7.53 - CAD Configuration File View/Edit (*Util25*)

The ***CAD Configuration*** file editor, ***Util25***, allows the supervisor and administrator to change the ***CAD Configuration*** settings. The ***CAD Configuration*** file is divided into "***tables***" and each table has "***entries***". The table and entry explanations and usage are included later in this document in section *CAD Configuration Tables And Entry Description*. Notice that the name of the currently selected ***CAD Configuration*** file is displayed at the top of this screen.

To select a different table, press the large button that displays the table name. This causes the table's entries to be displayed in the list. To select an entry, press the up and down arrow buttons; this causes the highlight "bar" to move within the list. To change the value of an entry, press the "***Edit***" button. This causes the standard ***Burny Series 10*** keyboard to be displayed with the ***Description*** and the current value shown. Change the value and press the "***OK***" button to return to the ***CAD Configuration*** file editor screen. Pressing the "***Cancel***" button will discard the entered value and also return back to the ***CAD Configuration file*** editor screen.

If the password was not entered, the ***CAD Configuration*** file editor screen will have the "***Edit***" and the "***OK***" buttons disabled. These buttons will also be disabled if the ***Burny_CAD.INI*** is being displayed.

The ***CAD Configuration*** file editor screen has two additional buttons, the "***Cancel***" and "***Save***" buttons. Pressing the "***Cancel***" button will discard any changes and return back to the ***CAD*** Configuration file selection screen. Pressing the "***Save***" button will display the ***Save CAD Configuration*** file screen.

The entries, ***"CNC file output location=d:/burny/tmp/ "*** *in the "****CNC File Section****" and "****Controller=BurnySWA****" in the "****Lead In/Out Section****", are not to be changed. If you do, the* ***Burny Series 10*** *application will change them back, automatically.*

7.33.5 SAVE CAD CONFIGURATION SCREEN (UTIL87)

The ***Save CAD Configuration*** screen allows the supervisor and/or administrator to save the changes to either the original file or to a new file. To save the changes to the original file, simply press the "***OK***" button.

This screen also allows the operator to save the changes to a different file or new file. Press the filename box to display the Keyboard screen and enter a new filename. Pressing the "***OK***" button will then save the changes to that new or different ***CAD Configuration*** file. When the "***OK***" button is pressed, the ***CAD Configuration*** file is saved and the ***Miscellaneous Menu*** screen is displayed. If a ***CAD Configuration*** file already exists with that name, a screen will be displayed to confirm your intentions to overwrite the file.

Pressing the "***Cancel***" button returns to the ***CAD Configuration*** file editor screen.

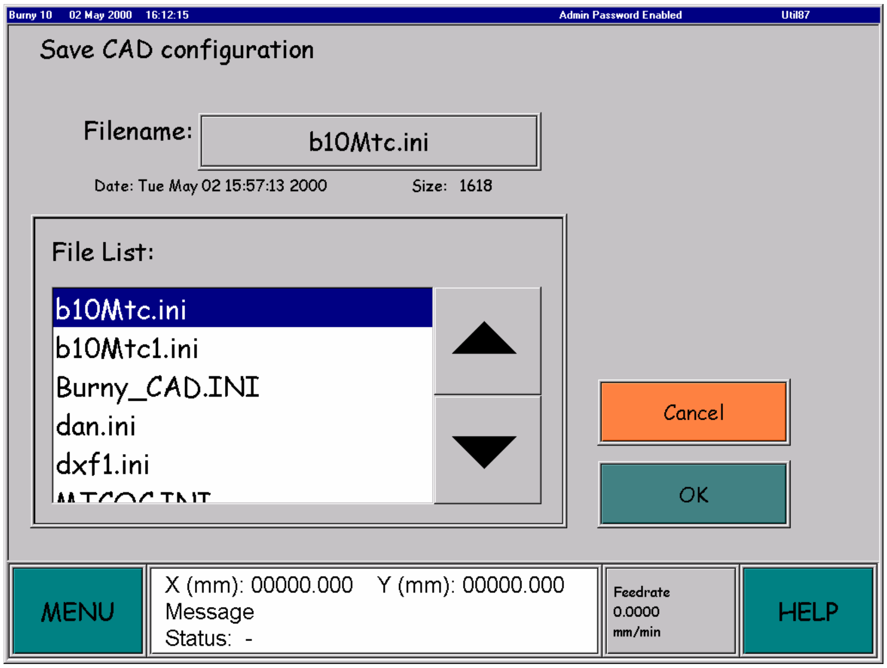


Figure 7.54 – Save CAD Configuration Screen (*Util87*)

7.33.6 CAD CONFIGURATION FILE EDITOR EXCEPTIONS

Sometimes the *CAD Configuration* file editor acts differently than expected. If the *CAD Configuration* file is empty, Figure 7.55 will be displayed. It is advisable to delete this *CAD Configuration* file using the *Delete* feature.

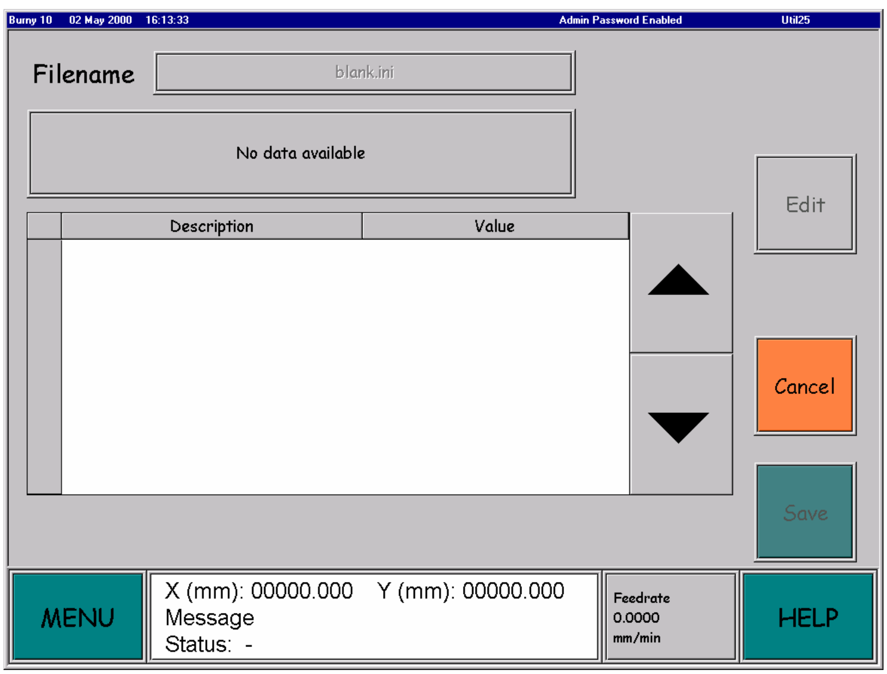


Figure 7.55 – Empty Configuration File (*Util87*)

If a problem occurs when saving the ***CAD Configuration*** file, the following window is displayed. If this occurs, please copy the top line and contact ***Cleveland Motion Controls***. It is advisable to delete this file and create a new ***CAD Configuration*** file.

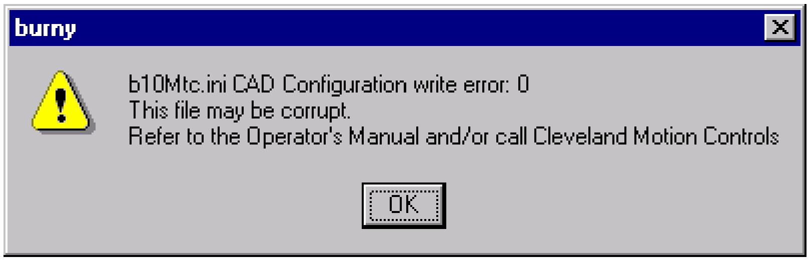


Figure 7.56 – Error Warning Screen

7.33.7 DELETING A CAD CONFIGURATION FILE.

To delete a ***CAD Configuration*** file, press the "***Menu***" button, then the "***Delete***" button. The following ***Delete file from where***?, ***Del01***, screen is shown. Press the ***CAD Configuration Files*** button and select the ***CAD Configuration*** file you wish to delete from the ***Delete which file from CAD Configuration*** (***Del02)*** screen and press the "***OK***" button. A screen will be displayed to confirm your intended actions, press "***OK***" to delete the file

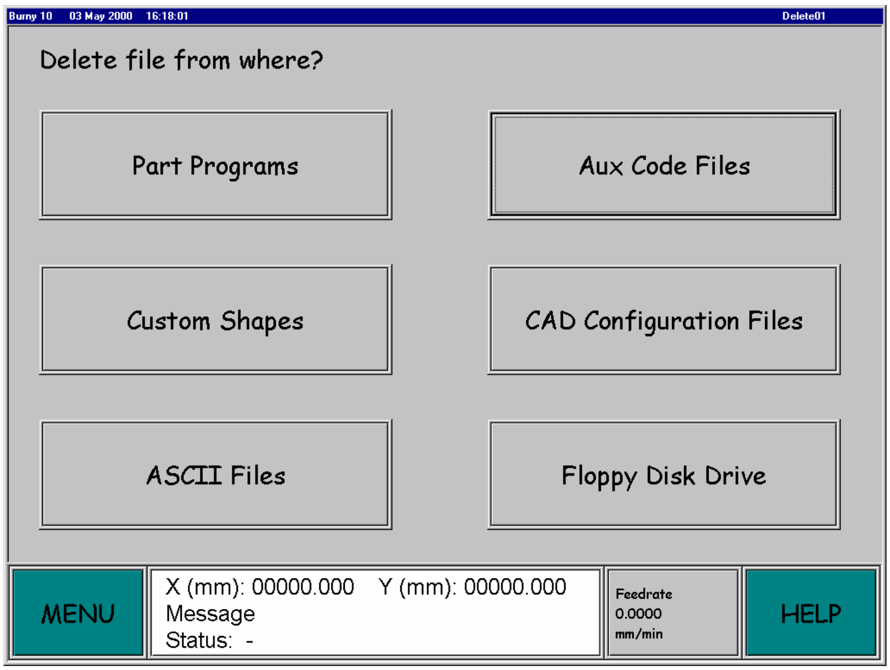


Figure 7.57 – "Delete File From Where?" Screen (*Deleted01*)

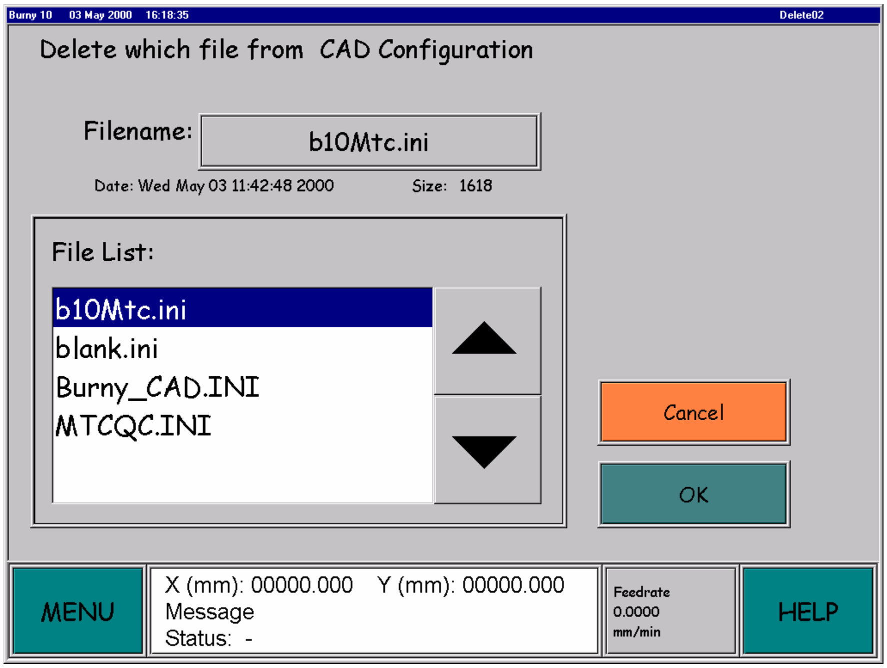


Figure 7.58 – Delete From CAD Configuration Directory (*Deleted02*)

*Any attempt to delete the **Burny_CAD.INI CAD** Configuration file will fail and a screen indicating '**read only'** will be displayed.*

7.33.8 CAD LAYER DEFINITIONS

CUT, SCRIBE AND POINT LAYER

All of your cutting, scribing and punching processes must be on individual layers in your CAD drawing for the CAD Conversion process to extract them. The CAD Conversion process searches the CAD drawing for the layer names specified. When it finds a match, it extracts the information and assigns it to the appropriate process. For example, if the first cut process layer is called CUT and there is a layer in the named DXF file called CUT, the CAD Conversion process takes information from this layer and develops the NC file with the proper cutting codes.

The CAD Conversion process can accommodate three cut process layers, two scribe process layers, and six point process layers. If no other cut layers are used, the base layer can also be used as a cut layer. The plot layer is for display purposes only, allowing entities to be viewed or plotted, but not cut in any way.

BASE LAYER

This is the default CAD layer name or number used if no layers were created on your CAD drawing. Most CAD systems use layer 0 for their base layer. This will be treated as a cut layer.

USE COLOR ATTRIBUTES INSTEAD

Some CAD systems do not allow you to use layers. In this case, you must use colors to identify what layers need to be cut, scribed or punched. When the drawing file is saved in the CAD system, a unique number is used to represent each color in the drawing. This is the number that must be used to represent each CAD layer in the configuration file.

IGNORE LAYERS

If this value is not zero, all the layers in the drawing will be extracted onto cut process 1. It will ignore any layer names used in CUT, SCRIBE and PUNCH. If the value is zero, layers will be treated in the normal way.

7.33.9 PROCESS DEFINITIONS

The following section on processes is provided as reference only. These processes are not functional within the ***Burny Series 10***. All parameter values as listed in the *Lead-In/Out Section - Parameters Table* subsection *Process Parameters* should be kept at their default values so as to eliminate any potential undesirable actions.

The following is used for the 3 Cut Processes, the 2 Scribe processes and the 6 Point processes.

CUT PROCESS

These processes match the three cut processes in the layer set up and determine the type of cutting applied to the part. The cut processes will vary according to the controller being used. Up to 3 cut processes can be assigned.

SCRIBE PROCESS

Select the appropriate scribe process for the cutting application required. For example, the scribe process for gas may be different than plasma. The scribe processes will vary according to the controller being used. Up to 2 scribe processes can be assigned.

POINT PROCESS

Select the appropriate point process for the cutting application required. The scribe processes will vary according to the controller being used. Up to 6 point processes can be assigned.

7.33.10 CAD CONFIGURATION TABLES AND ENTRY DESCRIPTION

This section lists all of the tables and their entries. Each entry includes a description and the expected value.

Table 7.1 CAD Layer Section - Parameters

ID	Parameter	Type	Default Value	Description
1	Cut Layer 1	String	CUT	Value implies that a layer in the CAD filenamed CUT has information to convert as cut.
2	Scribe Layer 1	String	SCRIBE	Value implies this layer has information to convert as scribes or markers.
3	Point Layer 1	String	PUNCH	Value implies this layer has information to convert as punch.
4	Plot Layer 1	String	PLOT	The plot layer is for display purposes only, allowing entities to be viewed or plotted, but not cut in any way.
5	Base Layer	String	0	Can be used as cut layer if no other exists by setting to 1.
6	Use color attributes	String	0	Set to 1 to use color.
7	Ignore Layers	String	0	Set to 1 to ignore layers.

Table 7.2 General Section - Parameters

ID	Parameter	Type	Default Value	Description
1	Report file output location	String	D:\burny\tmp	Do not change. If changed, the Burny Series 10 application will return it to the correct setting.
2	Temporary file output location	String	D:\burny\tmp	Do not change. If changed, the Burny Series 10 application will return it to the correct setting.

Table 7.3 CAD File Section - Parameters

ID	Parameter	Type	Default Value	Description
1	CAD units	Integer	1	1=Inch, 0=millimeters
2	Tolerance	String	0.001	Dimension tolerance This specifies the maximum distance allowed for joining line and arc entities. In other words, if the tolerance is set to .005, it will close .005 inch or smaller gaps, helping to prevent open profiles. In this case, it will consider anything greater than .001 an open profile.

3	Lead in/out exists on drawing	Boolean	0	Set to 0 if the conversion process is to supply lead-ins. When 1, the first move after the "cut on" is considered to be the lead-in.
4	Multiple part drawing	Boolean	0	If there is more than one part on your drawing, set this to 1.
5	Split multiple part drawing	Boolean	0	Set this to 1 if there is more than one part on your drawing and you want to create separate files for each part. (*Multiple part drawing* should also be set to 1)
6	Use the CAD (0,0) point for offset	Boolean	0	Uses the (0,0) of your CAD drawing as the initial point of your N/C file, if set to 1.
7	Scale drawing	Boolean	0	When 0, there is no scaling of the input file. When 1, the Scale factor is applied to the input file dimensions. This allows the user to increase drawings by a given percentage. This feature is especially good for high level graphic drawings.
8	Scale factor	String	100	Specify the percentage by which the drawing should be increased or decreased. If Scale factor is set to 200, the part will be twice the size specified in the CAD drawing. (The above parameter, *Scale drawing*, should be set to 1)

Table 7.4 CNC File Section - Parameters

ID	Parameter	Type	Default Value	Description
1	CNC file output location	String	d:/burny/tmp/	Used to temporarily hold the intermediate work files. This entry should not be changed.
2	CNC file extension	String	CNC	Default resulting file extension. This is ignored.
3	CNC units	Integer	1	0 = millimeter, 1 = inch
4	CNC mode	Integer	1	0 = incremental, 1 = absolute
5	CNC precision	Integer	1	0 = extra, 1 = normal
6	CNC origin	Integer	0	1 = Lower Left, 3 = Upper Left, 0 = Lower Right, 2 = Upper Right
7	Do not return to home point	Boolean	0	If this is set to 1, the torch will not return to the initial starting point after cutting the last part.
8	Punch and scribe all parts first	Boolean	0	If set to 1, all Punching and Scribing will be done before cutting. If you are cutting with underwater plasma, you should select this option. Normally very light metal should not have the punching and/or scribing done first to avoid problems with

				metal movement.
9	Use line numbers in CNC file	Boolean	0	Set this to 1 to use line numbers. This works with Line Number Increment setting below.
10	Eliminate exterior of part	Boolean	0	Set to 1 to eliminate the exterior profile of the part.
11	CNC filename as comment	Boolean	0	Set to 1 to insert the part name into CNC file as a comment.
12	Cut sequence type	Integer	0	Determines the path the torch will take in cutting parts out of the sheet. The cutting sequence can be set to Horizontal, Vertical, Closest To, or None. A vertical cut sequence will have an up and down path. A horizontal cut sequence will have a side to side cut path. A closest to cut sequence will cut the part closest to the origin first and then move on to the next closest and so on. Selecting None will not guarantee any particular cutting order. 0=vertical, 1=horizontal, 2=closest to, 3=none.
13	Arc maximum radius	String	10000.0	Sets an upper limit on arc sizes (in inches). Some controllers can not handle arcs of certain sizes. If this maximum radius size is reached, the arc is converted to line segments.
14	Arc tolerance	String	0.01	The amount of variation allowed between the existing arcs and the lines that would replace them.
15	Use reduction mode	Boolean	0	If set to 1, will try to reduce the number of lines and arcs in a drawing by combining them.
16	Step and repeat part	Boolean	0	For controllers that require codes inserted in the CNC file to allow linear duplication of the part at the cutting machine. This is used with the final position offset (below).
17	Step and repeat direction	Integer	0	This specifies which direction to use when calculating the distance between the parts for duplication of parts. The choices are Right, Left, Above and Below.
18	Step and repeat offset	String	0.5	This determines the distance between parts when duplicating parts using the step-repeat option (if selected above).
19	Line number increment	Integer	1	This sets the default line number increment for the CNC files. Setting the increment to 0 gives no line numbers in the CNC file. Setting the increment to 1 will number the lines 1,2,3. Setting the line increment to 2 will

				number the lines 2,4,6, etc
20	Reverse direction and kerf of part	Boolean	0	Set to 1 to allow the user to change the cutting direction and/or kerf direction from normal convention.
21	Number of sequence zones	Integer	10	This specifies the number and direction of zones or divisions of the plate that are created. For instance, if the cutting sequence is set for horizontal, a setting of 10 zones will divide the plate into 10 equal horizontal strips, sequencing the parts in one strip before proceeding to the next. If the part overlaps 2 or more strips, the location of the lead-in/out determines which zone the part is in.
22	Use 8.3 file format	Boolean	0	This option forces the CNC file to be named using 8.3 file format. This option is used when the controller can not accept long filenames and the CAD filenames are longer than 8 characters. Leave this as 0.

7.33.11 LEAD-IN/OUT SECTION - PARAMETER TABLES

The Lead-In/Out Section table has been divided into three sections for manual clarity. The actual parameter list in this section is not so divided and is structured as one table.

Table 7.5 Straight Lead-In and Lead-Out Parameters

The “Straight in” lead-ins are locations where a continuous straight motion can be made into the cutting path. This is usually a corner on the part. For a straight lead-in, you can define the following properties.

ID	Parameter	Type	Default Value	Description
1	Controller	String	BurnySWA	This contains the M/G Codes. This value should not be changed.
2	Lead in/out units	Integer	1	1= inch and 0=millimeters
3	Straight in type	Integer	1	0=arc, 1=linear, 2=none
4	Straight in scale	String	0.5	This is the size of the lead-in in the units defined on this screen.
5	Straight in angle	String	0.0	Represents the degree of the lead-in angle.
6	Straight in extension	String	0.0	Is a linear addition to the start of the lead-in.
7	Straight out type	Integer	1	This is the type of lead-out 0=arc, 1=linear, 2=none
8	Straight out scale	String	0.5	This is the size of the lead-out in the units defines on this screen.
9	Straight out angle	String	0.0	Represents the degree of the lead-out angle.
10	Straight out extension	String	0.0	Is a linear addition to the end of the lead-out.

Table 7.6 Angled Lead-In and Lead-Out Parameters

The “Angle-in” lead-in must angle into the side of the cutting path. This is the case for many interior profiles. For a angled lead-in, you can define the following properties.

ID	Parameter	Type	Default Value	Description
11	Angle in type	Integer	0	This is the type of lead-in.. Choices are Linear, Arc, or None 0=arc, 1=linear, 2=none
12	Angle in scale	String	0.5	This is the size of the lead-in in the units defined on this screen.
13	Angle in angle	String	90.0	Represents the degree of the lead-in angle.
14	Angle in extension	String	0.0	Is a linear addition to the start of the lead-in.
15	Angle out type	Integer	0	This is the type of lead-out. 0=arc, 1=linear, 2=none
16	Angle out scale	String	0.5	This is the size of the lead-out in the units defined on this screen.
17	Angle out angle	String	45.0	Represents the degree of the lead-out angle.
18	Angle out extension	String	0.0	Is a linear addition to the start of the lead-in.
19	Over/under travel	String	0.0	The amount of travel beyond/before the completion of the profile prior to leading out.

Table 7.7 Process Parameters

Process parameters are currently not required for the Burny Series 10 and the values should be kept at their default values so as to eliminate any potential undesirable actions.

ID	Parameter	Type	Default Value	Description
20	Cut process 1	Integer	0	Non functional within Burny Series 10. Keep value at default.
21	Cut process 2	Integer	0	Non functional within Burny Series 10. Keep value at default.
22	Cut process 3	Integer	0	Non functional within Burny Series 10. Keep value at default.
23	Scribe process 1	Integer	0	Non functional within Burny Series 10. Keep value at default.
24	Scribe process 2	Integer	0	Non functional within Burny Series 10. Keep value at default.
25	Point process 1	Integer	0	Non functional within Burny Series 10. Keep value at default.
26	Point process 2	Integer	0	Non functional within Burny Series 10. Keep value at default.
27	Point process 3	Integer	0	Non functional within Burny Series 10. Keep value at default.
28	Point process 4	Integer	0	Non functional within Burny Series 10. Keep value at default.
29	Point process 5	Integer	0	Non functional within Burny Series 10. Keep value at default.
30	Point process 6	Integer	0	Non functional within Burny Series 10. Keep value at default.

7.34 ERROR TRAPPING FOR MOTION CONFIGURATION FILES (UTILERRORS01)

When Motion Configuration files are saved in the Utility mode, an error trapping feature will print out the first and last errors. If only one error occurs, the print out will appear as shown below. When an error does occur, load the configuration file BurnyLoadParams.ini that was saved when the ***Burny Series 10*** was first installed and set up. If no errors are encountered, this Problem screen is not displayed.

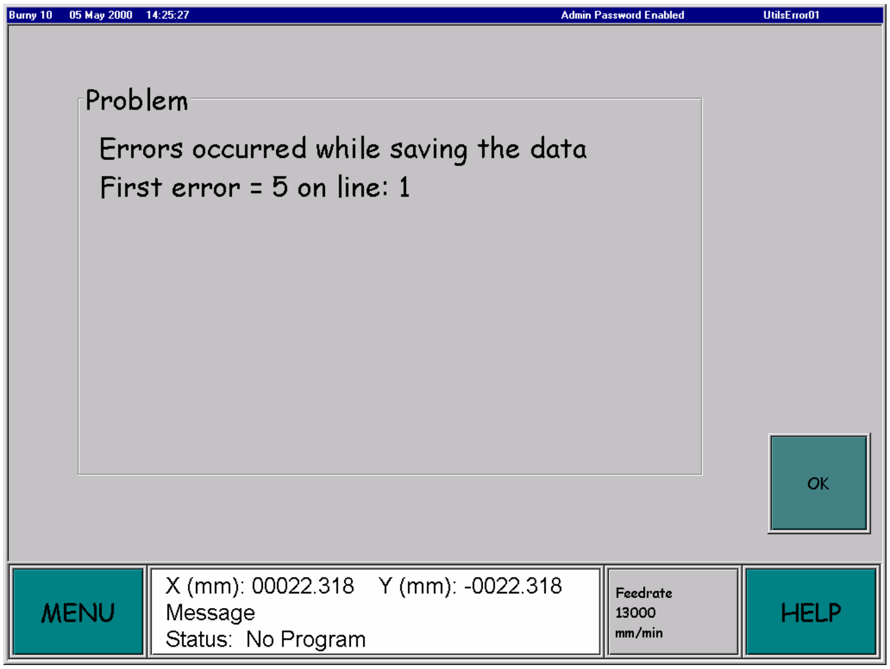


Figure 7.59 – Motion Configuration Error Screen (*UtilsError01*)

7.35 VERSION INFORMATION SCREEN (UTIL_VERSIONS)

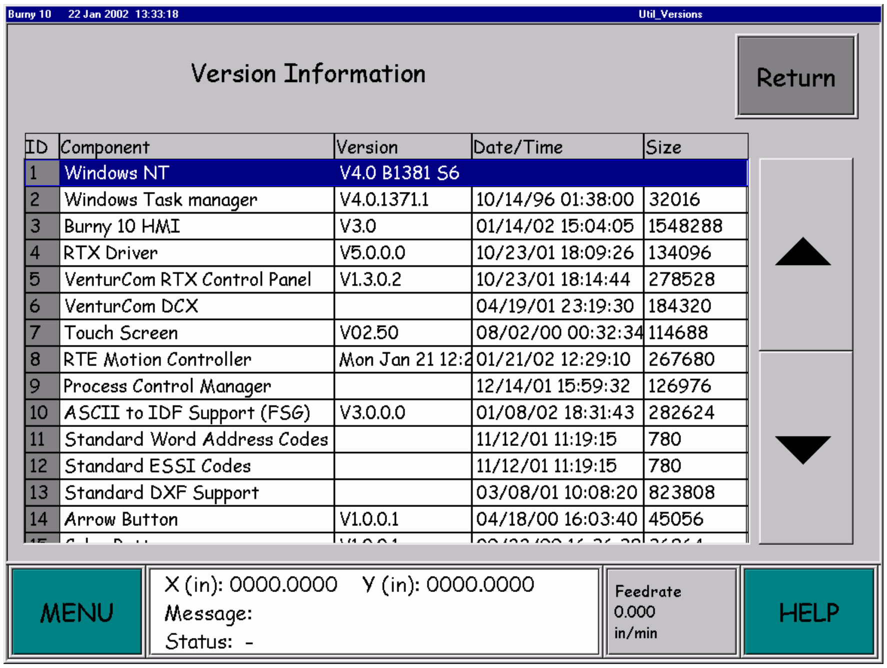


Figure 7.60 – Version Information Screen (*Util_Versions*)

The ***Version Information*** screen displays a list of program ***component*** modules along with the ***Version*** (for most), ***Date***, ***Time***, and ***size*** in bytes. This information helps ***CMC*** service in the solution of any problem that might occur with the control. This screen is accessed by selecting ***Miscellaneous Setup*** in the ***System Setup*** screen, then picking ***Version Information***. Adding new software to the system updates this screen.

The list shown in the figure is only an example and is not a list of correct versions for your system. At present 37 items are displayed. This number will vary according to the software release installed and the options enabled.

7.35.1 DETAILS

UP/DOWN ARROW

Press the ***Up*** or ***Down*** Arrow to scroll through the list.

RETURN

Press the ***Return*** key to display the ***System Setup*** screen.

DELETE MODE
(AO-70393 REV AA)

SECTION
8

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

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8 DELETE MODE

8.1 INTRODUCTION

The ***Delete*** mode enables the operator to delete ***Part program, Custom Shape***, ***ASCII***, ***Aux Code***, or ***CAD Configuration*** files from the ***Burny Series 10 Control*** and files from the root directory of a floppy mounted in the floppy drive of the ***Burny Series 10***. Once a file is deleted, it can only be recovered from an external copy on a floppy disk or a remote computer.

A part program that was the source of any job on the ***Jobs*** list cannot be deleted until the corresponding jobs are removed in the ***Jobs*** mode.

The last step before deletion is to confirm that the file is to be deleted. Be sure the correct file has been selected before pressing ***OK*** to delete it.

8.2 DELETE FILE FROM WHERE SCREEN (DELETE01)

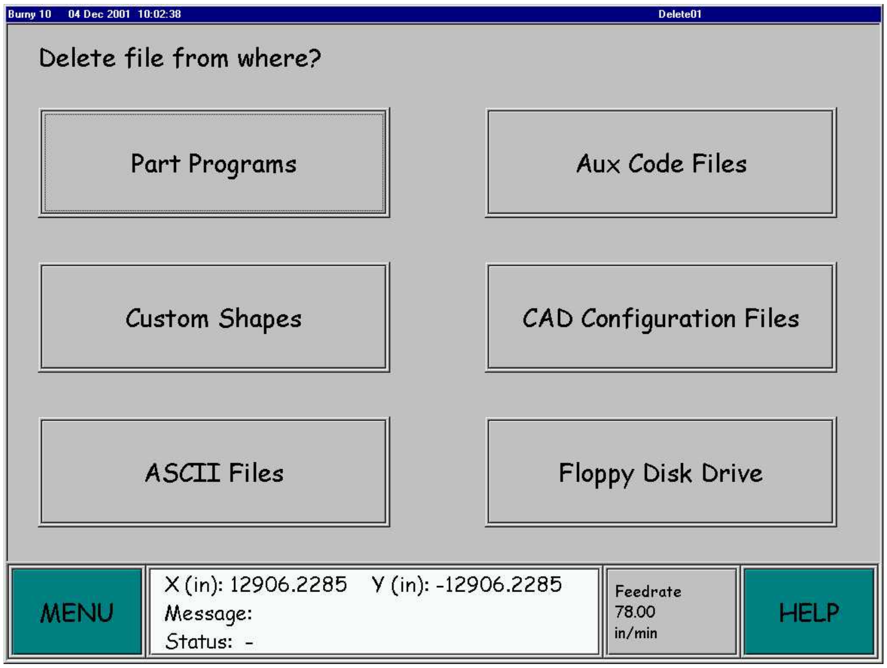

Figure 8.1 – Delete File From Where Screen (*Delete01*)

8.2.1 DESCRIPTION

This screen enables the operator to select the storage area where he wishes to delete a file. The choices are listed below.

8.2.2 PROCEDURE

Select one of the following file storage locations by touching a button on the ***Delete01*** screen:

- NC Part Program Directory
- Custom Shapes Directory
- ASCII File Directory
- Aux Code Directory
- CAD Configuration Directory
- Floppy Disk Drive

The first five names on this list refer to directories in the ***Burny Series 10*** Control. The last is, of course, for a floppy disk mounted in the floppy drive of the ***Burny Series 10*** Control.

When one of these buttons is pressed, the display changes to a file selection screen for that location. See the description of those screens below.

8.2.3 DETAILS

NC PART PROGRAM

Touch this button to move to the ***NC File Select*** screen and select a part program file from the ***NC*** directory for deletion.

CUSTOM SHAPES

Touch this button to move to the ***Custom Shapes File Select*** screen and select a file for deletion from the ***Custom Shapes*** directory.

ASCII

Touch this button to move to the ***ASCII File Select*** screen and select a file for deletion from the ***ASCII*** directory.

AUX CODE

Touch this button to move to the ***Aux Code File Select*** screen and select a file for deletion from the ***Aux Code*** directory.

CAD CONFIGURATION FILES

Touch this button to move to the ***CAD Configuration File Select*** screen and select a file for deletion from the ***CAD Configuration Files*** directory. The ***Burny_CAD.INI*** file is read-only and cannot be deleted.

FLOPPY

Touch this button to move to the ***Floppy File Select*** screen and select a file for deletion from the ***Floppy*** root directory.

8.3 DELETE WHICH FILE FROM NC DIRECTORY SCREEN (DELETE02)

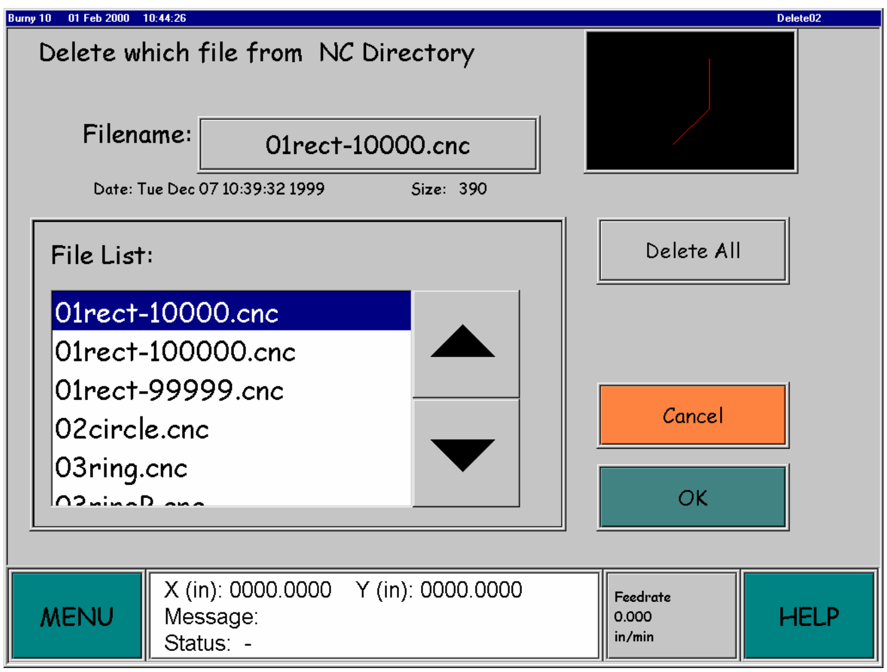

Figure 8.2 – Delete Which File From NC Directory (*Delete02*)

8.3.1 DESCRIPTION

This screen enables the operator to delete any part program file not on the ***Jobs*** list from the ***NC Program*** *(NC comes from Numerical Control)* directory of the ***Burny Series 10 Control***. This includes files in the ***Word Address*** format, ***ESSI*** format, or other languages.

Note that a file appearing here that has setup versions on the ***Jobs*** list cannot be deleted. When all the jobs on the ***Jobs*** list created from the file are removed, the part program file can be deleted.

8.3.2 PROCEDURE

To delete a file from the ***NC*** directory, select the file, and press the ***OK*** button. The display changes to the ***Confirm Delete*** screen, where the deletion is completed or cancelled.

8.3.3 DETAILS

FILE LIST

The ***File List*** shows filenames for part programs in the ***NC*** directory. Select a visible file name by touch. Select others with the ***Up*** or ***Down*** button or an entry in the ***Filename*** window. The selected file is the one highlighted by the cursor.

FILENAME

Touch to display the keyboard and type in a file name. Press the ***OK*** button to return to the ***Delete which file from NC directory*** screen. If the name is in the ***NC*** directory, the ***File List*** will have that filename in view, highlighted by the cursor.

If the file name is not in the ***NC*** directory, the ***File List*** will show the next filename after it in alphabetical order, highlighted with the cursor. The same name will appear in the ***Filename*** window.

UP & DOWN

Touch to select the next file; hold down to scroll.

THUMBNAIL

Touch to display a full screen view of the part and to zoom and pan for more detail.

DELETE ALL

Touch to select all the files in the current directory for deletion and change the display to the ***Confirm Delete*** screen. In the ***NC Directory*** (Part Programs), the ***Delete All*** operation leaves any part program that appears as a job on the ***Job List***. To delete such part program files, delete all the corresponding jobs in ***Jobs*** mode then return here and do the ***Delete All*** operation.

CANCEL

Touch to return to the ***Delete from where?*** screen and cancel the delete operation on the selected file.

OK

Touch to start deleting the file named in the ***Filename*** box by moving to the ***Confirm Delete*** screen.

8.4 DELETE WHICH FILE FROM ASCII DIRECTORY SCREEN

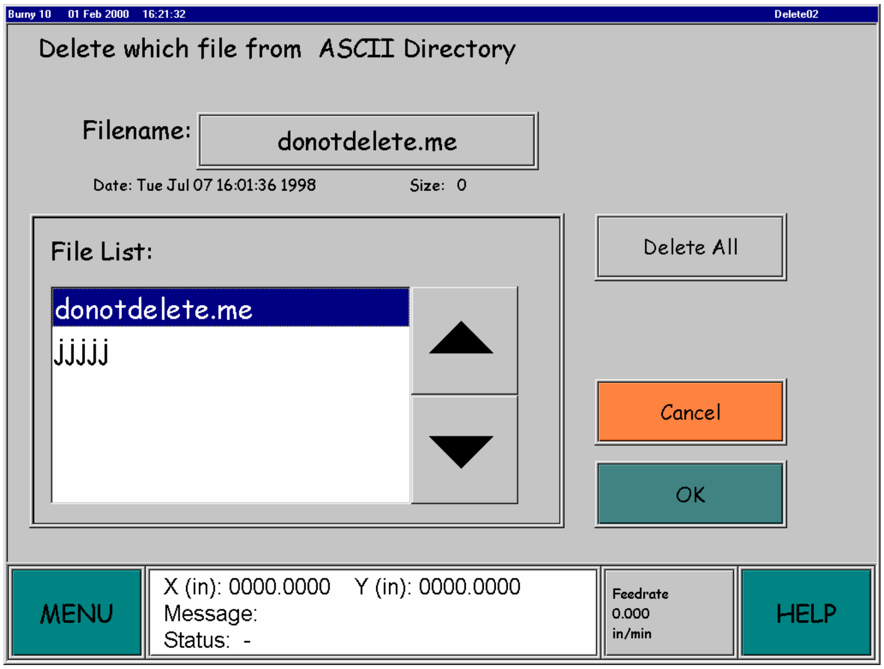

Figure 8.3 – Delete Which File From ASCII Directory Screen (*Delete02*)

8.4.1 DESCRIPTION

This screen enables the operator to delete any file from the ***ASCII*** directory of the ***Burny Series 10 Control***.

8.4.2 PROCEDURE

To delete a file from the ***ASCII*** directory, select the file, and press the ***OK*** button. The display changes to the ***Confirm Delete*** screen, where the deletion can be completed or cancelled.

8.4.3 DETAILS

FILE LIST

The ***File List*** shows filenames for files in the ***ASCII*** directory. Select a visible file name by touch; select others with the ***Up*** or ***Down*** button or an entry in the ***Filename*** window. The selected file is the one highlighted by the cursor.

FILENAME

Touch to display the keyboard and type in a file name. Press the ***OK*** button to return to the ***Delete which file from ASCII directory*** screen. If the name is in the ***ASCII*** directory, the ***File List*** will have that filename in view, highlighted by the cursor.

If the file name is not in the ***ASCII*** directory, the ***File List*** will show the next filename after it in alphabetical order, highlighted with the cursor. The same name will appear in the ***Filename*** window.

UP & DOWN

Touch to select the next file; hold down to scroll.

DELETE ALL

Touch to select all the files in the current directory for deletion and change the display to the ***Confirm Delete*** screen. There the deletion can be confirmed or cancelled.

CANCEL

Touch to return to the ***Delete from where?*** screen and cancel the delete operation on the selected file.

OK

Touch to start deleting the file named in the ***Filename*** box by moving to the ***Confirm Delete*** screen.

8.5 DELETE WHICH FILE FROM CUSTOM SHAPE DIRECTORY SCREEN

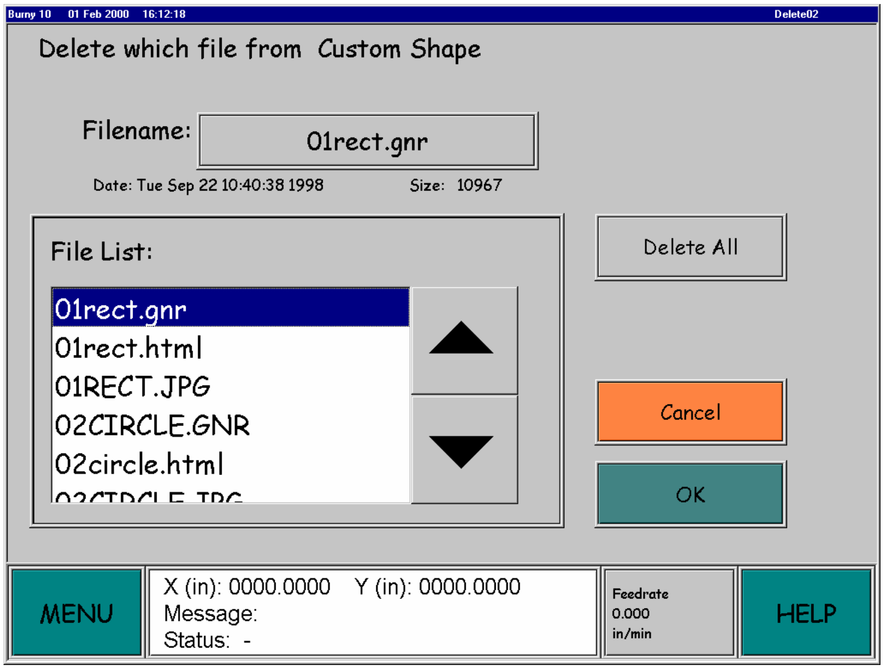

Figure 8.4 – Delete Which File From Custom Shape Directory Screen (*Delete02*)

8.5.1 DESCRIPTION

This screen enables the operator to delete any file from the ***CUSTOM SHAPES*** directory of the ***Burny Series 10 Control***.

8.5.2 PROCEDURE

To delete a file from the ***CUSTOM SHAPES*** directory, select the file, and press the ***OK*** button. The display changes to the ***Confirm Delete*** screen, where the deletion is completed or cancelled.

8.5.3 DETAILS

FILE LIST

The ***File List*** shows ***Filenames*** in the ***CUSTOM SHAPES*** directory. Select a visible file name by touch; select others with the ***Up*** or ***Down*** button or an entry in the ***Filename*** window. The selected file is the one highlighted by the cursor.

FILENAME

Touch to display the keyboard and type in a file name. Press the ***OK*** button to return to the ***Delete which file from SHAPES directory*** screen. If the name is in the ***SHAPES*** directory, the ***File List*** will have that filename in view, highlighted by the cursor.

If the file name is not in the ***SHAPES*** directory, the ***File List*** will show the next filename after it in alphabetical order, highlighted with the cursor. The same name will appear in the ***Filename*** window.

UP & DOWN

Touch to select the next file; hold down to scroll.

DELETE ALL

Touch to select all the files in the current directory for deletion and change the display to the ***Confirm Delete*** screen. There the deletion can be confirmed or cancelled.

CANCEL

Touch to return to the ***Delete from where?*** screen and cancel the delete operation on the selected file.

OK

Touch to start deleting the file named in the ***Filename*** box by moving to the ***Confirm Delete*** screen.

8.6 DELETE WHICH FILE FROM CAD CONFIGURATION SCREEN

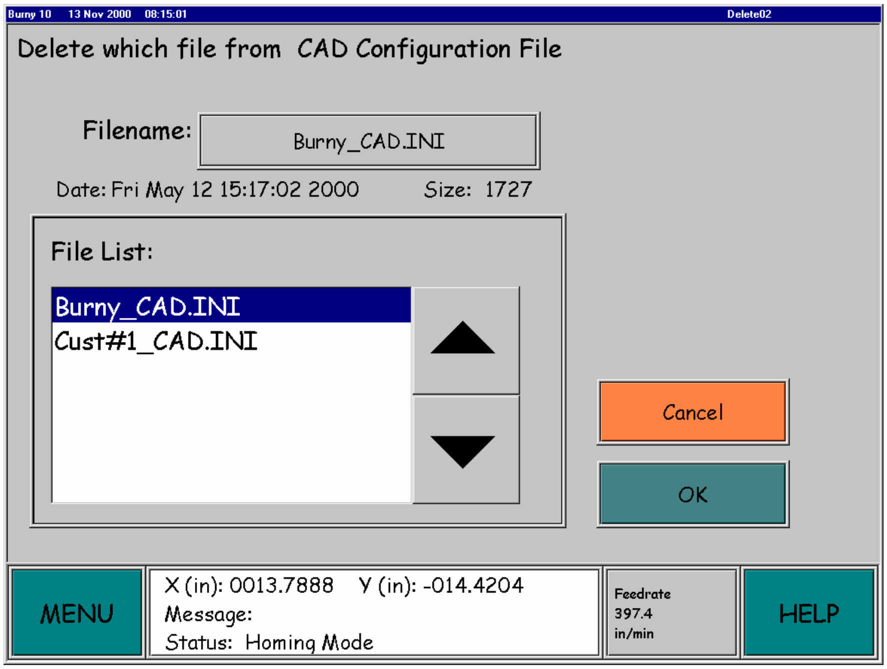

Figure 8.5 – Delete Which File From CAD Configuration Directory Screen (*Delete02*)

8.6.1 DESCRIPTION

This screen enables the operator to delete any file from the ***CAD Configuration*** directory of the ***Burny Series 10 Control*** except BURNY_CAD.INI.

8.6.2 PROCEDURE

To delete a file from the ***CAD Configuration*** directory, select the file, and press the ***OK*** button. The display changes to the ***Confirm Delete*** screen, where the deletion is completed or cancelled.

8.6.3 DETAILS

FILE LIST

The ***File List*** shows ***Filenames*** in the ***CAD Configuration*** directory. Select a visible file name by touch; select others with the ***Up*** or ***Down*** button or an entry in the ***Filename*** window. The selected file is the one highlighted by the cursor.

FILENAME

Touch to display the keyboard and type in a file name. Press the ***OK*** button to return to the ***Delete which file from CAD Configuration directory*** screen. If the name is in the ***CAD Configuration*** directory, the ***File List*** will have that filename in view, highlighted by the cursor.

If the file name is not in the ***CAD Configuration*** directory, the ***File List*** will show the next filename after it in alphabetical order, highlighted with the cursor. The same name will appear in the ***Filename*** window.

UP & DOWN

Touch to select the next file; hold down to scroll.

DELETE ALL

Touch to select all the files in the current directory for deletion and change the display to the ***Confirm Delete*** screen. There the deletion can be confirmed or cancelled.

CANCEL

Touch to return to the ***Delete from where?*** screen and cancel the delete operation on the selected file.

OK

Touch to start deleting the file named in the ***Filename*** box by moving to the ***Confirm Delete*** screen.

8.7 DELETE WHICH FILE FROM FLOPPY SCREEN

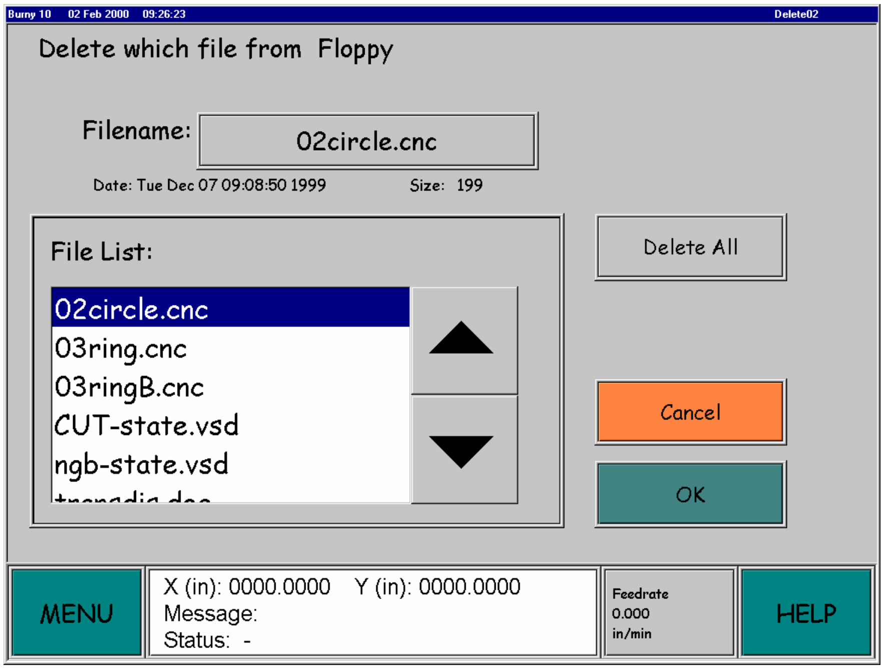

Figure 8.6 – Delete Which File From Floppy Screen (*Delete02*)

8.7.1 DESCRIPTION

This screen enables the operator to delete any file from the root directory of a floppy disk mounted in the floppy drive of the ***Burny Series 10 Control***.

8.7.2 PROCEDURE

Insert a floppy disk into disk drive while the ***Delete from where screen*** is displayed. Then touch the ***Floppy Disk Drive*** touchpad. The ***Delete which file from floppy*** screen appears with the ***File List*** showing the files in the root directory of the floppy disk. To delete a file from the ***FLOPPY***, select the file, and press the ***OK*** button. The display changes to the ***Confirm Delete*** screen, where the deletion is completed or cancelled.

8.7.3 DETAILS

FILE LIST

Displays filenames in the ***FLOPPY DISK*** root directory. Select a visible file name by touch; select others with the ***Up*** or ***Down*** button or an entry in the ***Filename*** window. The selected file is highlighted by the cursor.

FILENAME

Touch to display the keyboard and type in a file name. Press the ***OK*** button to return to the ***Delete which file from FLOPPY directory*** screen. If the name is in the ***FLOPPY*** root directory, the ***File List*** will have that filename in view, highlighted by the cursor.

If the file name is not in the ***FLOPPY*** root directory, the ***File List*** will show the next filename after it in alphabetical order, highlighted with the cursor. The same name will appear in the ***Filename*** window.

UP & DOWN

Touch to select the next file; hold down to scroll.

DELETE ALL

Touch to select all the files in the root directory of the floppy disk for deletion and change the display to the ***Confirm Delete*** screen. There the deletion can be confirmed or cancelled.

CANCEL

Touch to return to the ***Delete from where?*** screen and cancel the delete operation on the selected file.

OK

Touch to start deleting the file named in the ***Filename*** box by moving to the ***Confirm Delete*** screen.

8.8 DELETE WHICH FILE FROM AUX CODE DIRECTORY

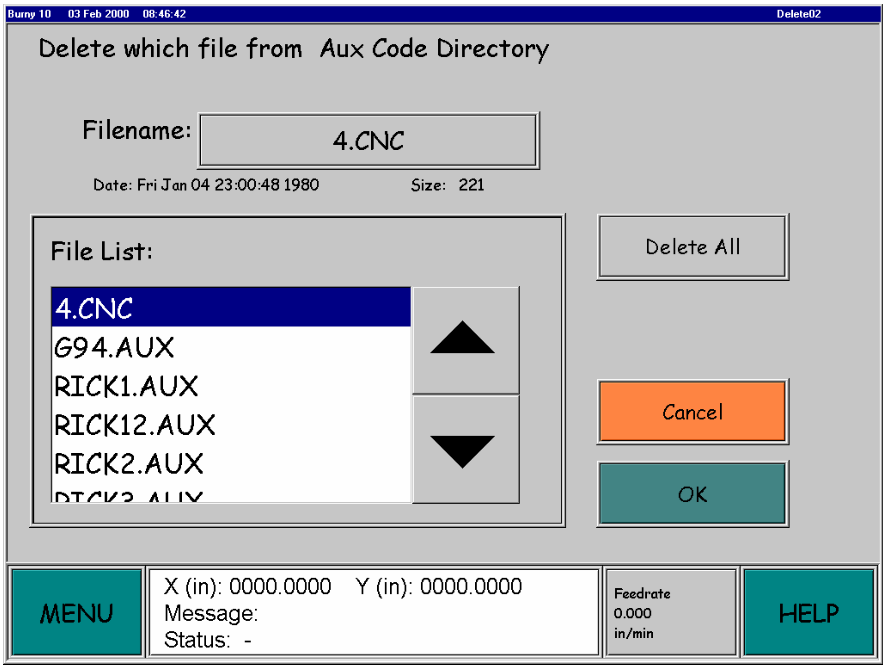

Figure 8.7 – Delete Which File From AUX Code Directory (*Delete02*)

8.8.1 DESCRIPTION

This screen enables the operator to delete any file from the ***AUX CODE*** directory of the ***Burny Series 10 Control***.

8.8.2 PROCEDURE

To delete a file from the ***AUX CODE*** directory, select the file, and press the ***OK*** button. The display changes to the ***Confirm Delete*** screen, where the deletion is completed or cancelled.

8.8.3 DETAILS

FILE LIST

The ***File List*** shows the names of files in the ***CUSTOM SHAPES*** directory. Select a visible file name by touch; select others with the ***Up*** or ***Down*** button or by touching the ***Filename*** window and entering the name with the keyboard screen. The selected file is the one highlighted by the cursor.

FILENAME

Touch to display the keyboard and type in a file name. Press the ***OK*** button to return to the ***Delete which file from SHAPES directory*** screen. If the name is in the ***AUX CODE*** directory, the ***File List*** will have that filename in view, highlighted by the cursor.

If the file name is not in the ***AUX CODE*** directory, the ***File List*** will show the next filename after it in alphabetical order, highlighted with the cursor. The same name will appear in the ***Filename*** window.

UP & DOWN

Touch to select the next file; hold down to scroll.

DELETE ALL

Touch to select all the files in the current directory for deletion and change the display to the ***Confirm Delete*** screen. There the deletion can be confirmed or cancelled.

CANCEL

Touch to return to the ***Delete from where?*** screen and cancel the delete operation on the selected file.

OK

Touch to start deleting the file named in the ***Filename*** box by moving to the ***Confirm Delete*** screen.

8.9 CONFIRM DELETE SCREEN

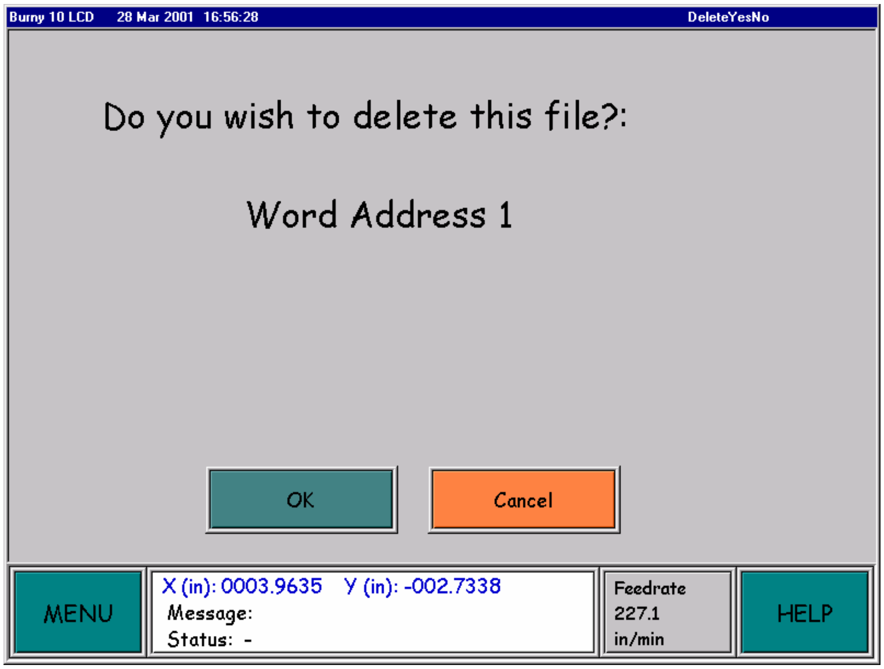

Figure 8.8 – Confirm Delete Screen (*DeleteYesNo*)

8.9.1 DESCRIPTION

After a file has been selected in any of the five file select screens in the *Delete* mode and *OK* is pressed, the *Confirm Delete* screen appears, showing the selected file name. This screen enables the operator to take a second look at the file name and be sure he wants to delete it. Once a file is deleted, it can only be recovered from a source outside the ***Burny Series 10*** Control.

Pick *OK* in this screen to complete the deletion and return to the previous screen. Press the *Cancel* button to prevent the deletion of the file and return to the previous screen.

8.9.2 PROCEDURE

Touch the ***OK*** button to complete the deletion of the selected file and return to the previous screen. Touch the ***Cancel*** button to prevent the deletion of the file and return to the previous screen.

8.9.3 DETAILS

OK

The ***OK*** button completes the deletion of the file and returns to the previous screen.

CANCEL

The ***Cancel*** button prevents deletion of the file and returns to the previous screen.

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Programming Languages

(AO-70397 Rev AA)

Section

9

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

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9 PROGRAMMING LANGUAGES

9.1 INTRODUCTION

One of the advantages of the ***Burny Series 10*** control is its ability to load and process a variety of ***Word Address***, ***ESSI*** and ***GENERIC*** programming formats. The ability to support these formats is accomplished through an assortment of conversion routines that are configured by parameters in ***Utility*** variables. These conversion routines translate programs, as they are loaded to ***NC Program Memory*** into a common internal format. This internal format, called "IDF", is also used to store ***NC*** programs created with any ***Shapes*** program. When storing a ***NC*** program, other conversion routines translate the internal format back to the program format selected. This allows all programs, regardless of how they were originally loaded, to be stored and edited in any of the supported ***NC*** language formats.

This section details program resolution issues, the auxiliary functions that the ***Burny Series 10*** supports, the auxiliary function code conversion process, standard Word Address, ESSI, and GENERIC Programming Languages, and the ***system setup data*** variables associated with those formats.

9.2 PROGRAM RESOLUTION

Programs are loaded into the ***Burny Series 10*** using the following:

ENGLISH system program unit size: .0001 inch

METRIC system program unit size: .0020 millimeter

9.3 PROGRAM DIMENSION RANGES

The ***Burny Series 10*** control supports the following dimensional ranges:

Word Address format:

Inch Dimension Mode: : +/- 99999.9999 (5.4)

Millimeter Dimension Mode : +/- 999999.999 (6.3)

ESSI format (uses implied decimal point):

Inch Dimension Mode : +/- 99999.99 (5.2)

Millimeter Dimension Mode : +/- 999999.9 (6.1)

9.4 AUXILIARY FUNCTIONS

All program formats use the following ***Auxiliary Function Table*** in conversion routines, whether by the use of factory-defined, ***Standard Word Address***, or ***ESSI*** auxiliary function code conversion tables or custom auxiliary function code conversion tables. The ***Auxiliary Functions*** that the ***Burny Series 10*** supports are as follows:

IDF	Auxiliary Function:	Description:
0	No Operation	Function not applicable
1	CW Arc	Defines the arc direction mode for arc data blocks as clockwise. Once used, all subsequent arcs are in the same direction until the opposite code is used. Uses CUT SPEED MODE.
2	CCW Arc	Defines the arc direction mode for arc data blocks as counter-clockwise. Once used, all subsequent arcs are in the same direction until the opposite code is used. Uses CUT SPEED MODE.
3	Chain Top	Used in conjunction with CHAIN BOTTOM to perform a program repeat function. The CHAIN TOP acts as a pointer in the program. When the CHAIN BOTTOM is reached, the program returns to the point in the program where the CHAIN TOP occurred.
4	Chain Bottom & Increment	Used in conjunction with CHAIN TOP to perform a program repeat function. When the CHAIN BOTTOM is reached the internal part count is incremented automatically (no need to program a 56:PART INCREMENT), and the program returns to the point in the program where the CHAIN TOP occurred. If there is no CHAIN TOP, the program returns to the beginning of the program.
5	Cut Off	Turns off the cutting process, after performing any cut off sequencing. Machine moves at high traverse speed to the next pierce location. Used for both oxygen and plasma operations. Affects speed mode and KERF mode.
6	Cut On	Indicates the cutting start sequence for the selected cutting system (oxygen or plasma). While the cut is on, the machine moves at the speed set by the operator's speed dial. Affects speed mode and KERF mode.
7	KERF Off	Modal change. Turns off KERF, but is not required in programs since the KERF is automatically turned off when not cutting.
8	KERF Left	Modal change. Used by the Dial-In-Kerf routine to compensate the cutting path for the amount of material removed by the cutting process. The "left" direction is based on which way the centerline of the torch needs to be offset as it travels along the cutting path.
9	KERF Right	Modal change. Used by the Dial-In-Kerf routine to compensate the cutting path for the amount of material removed by the cutting process. The "right" direction is based on which way the centerline of the torch needs to be offset as it travels along the cutting path.
10	Marker 1 Off	Turns off Marker 1 operations. Machine moves at high traverse to the next marking location. Normally, after the last marking move, the 12:OFFSET 1 OFF function is used to move the cutting torch back to the correct position. Affects speed mode.
11	Marker 1 On	Turns on the Marker 1 relay and starts the marking cycle. Marking speed is selected during setup and installation. Normally, the 13:OFFSET 1 ON function is used before the marking process begins to position the marking device at the correct position. Affects speed mode.
12	Offset 1Off	Cancels the Marker #1 Offset and moves the cutting torch back to the programmed position.
13	Offset 1 On	Moves the machine the distance set up as the X / Y Marker #1 Offset dimension (input during setup and installation). This causes the marker to take the place of the cutting torch so that the part program doesn't have to compensate for the offset between the marker and torch.
14	Inch Dimensions	Sets the unit mode and defines the following values in inch units.
15	MM Dimensions	Sets the unit mode and defines the following values in millimeter units.
16	ABS. Program Dimensions	Modal change. Signals that all subsequent dimensions are in absolute programming format. In Absolute Mode, the moves designated by the X, Y, I and J values are offsets from an absolute reference endpoint that is fixed for the entire part. The internal absolute reference point can be changed in a program by using a HOME OFFFSET auxiliary function. The I and J values can be specified relative to the start of the block (incremental) or as offsets from a fixed reference point like the X and Y values (absolute). This is defined in Program Format
17	ABS. REG. Load	Only used in Absolute Programming mode. When included in a data block containing only X and Y dimensions, it causes the internal absolute registers to be set to the X and Y dimensions from the data block. No machine motion occurs. This function is used for resetting the absolute zero position at various points in a part program to make the X and Y dimension of the subsequent data blocks easier.
18	INCR. Program Dimension	Modal change. Signals that all subsequent dimensions are incremental programming format. In Incremental mode, all moves designated by the X, Y, I, and J values are offsets relative to the tool at the start of the block.
19	Programmable Dwell	Non-modal function. Causes a SYSTEM DWELL. During this time, the machine is held in position and all control outputs remain in the current condition. The DEFAULT DWELL time is established during system setup and installation. This time is used for all PROGRAMMABLE DWELL blocks unless further defined (such as by a Word Address key character F).
20	LEAD-IN DIM. Move	Non-modal function, which may be included along with the arc or line dimensions performing the lead-in to the part. Including this auxiliary function allows the data to be altered to correctly lead into the kerf compensated part.
21	Program Stop	Function causes the machine operation to halt and all cutting functions to be turned off. Pressing the <GO> button resumes program execution.
22	Program End	Function defines the end of a program, but does not rewind the program. If multiple programs are to be loaded, all but the last one should end with this function, since it does not cause a rewind. This is also true if the parts are being loaded through the serial port.
23	Program End with Rewind	Function defines the end of a program, and rewinds the tape or program to the beginning of the program.
24	Program Data Skip On	Enables text mode and defines that the next data should be skipped. It is in effect until a 25 : Program Data Skip Off is encountered.
25	Program Data Skip Off	Disables text mode. Function ends a 25:PGM. DATA SKIP ON function.
26	Marker 2 On	Turns on Marker 2 control relay and starts the marking cycle. Marking speed is selected during setup and installation. Normally, the 28:OFFSET 2 ON function is used before the marking process begins to position the marking device at the correct position. Affects speed mode.
27	Marker 2 Off	Turns off Marker 2 device. Machine moves at a high traverse to the next marking location. Normally, after the last marking move, the 29:OFFSET 2 OFF function is used to move the cutting torch back to the correct position. Affects speed mode.
28	Offset 2 On	Moves the machine the distance set up as the X / Y Marker #2 Offset dimension (input during setup and installation). This causes the marker to take the place of the cutting torch so that the part program doesn't have to compensate for the offset between the marker and torch.
29	Offset 2 Off	Cancels the MARKER 2 OFFSET and moves the cutting torch back to the programmed position.
30	Cut Speed Mode	Function causes the speed to be CUT speed, as determined by the operator's speed dial position. Affects speed mode.
31	High Speed Mode	Function causes a high speed traverse; the speed is determined by SYSTEM SETUP DATA variables. Affects speed mode.
32	Xmit To PLC Before Move & Run	Function allows the machine to continue motion without waiting for verification from the PLC that an auxiliary function was

IDF	Auxiliary Function:	Description:
		processed, so that it does not cause an automatic slowdown.
33	Xmit To PLC After Move & Wait	This function allows the user to define a non-standard execution sequence when function codes are included in the same program block with program dimensions.
34	External Variable Load	External Variable Load updates data registers in the PLC but only when operating in the Burny10/PLC SYSTEM configuration
35	X Home Sw/Index Find	Retain the current position and send the X axis to the home position
36	Y Home Sw/Index Find	Retain the current position and send the Y axis to the home position
37	Return From X Home Dimension	Return the above mentioned "retained" position.
38	Return From Y Home Dimension	Return the above mentioned "retained" position.
39	Data Table #0 Select	
40	Aux Output 1 On	Gen. Purpose Output #1 on DO-90125, Sh. 1, Section 11. When On, the contacts are closed. Enhanced *
41	Aux Output 1 Off	Gen. Purpose Output #1 on DO-90125, Sh. 1, Section 11. When Off, the contacts are open. Enhanced *
42	Aux Output 2 On	Gen. Purpose Output #2 on DO-90125, Sh. 1, Section 11. When On, the contacts are closed. Enhanced *
43	Aux Output 2 Off	Gen. Purpose Output #2 on DO-90125, Sh. 1, Section 11. When Off, the contacts are open. Enhanced *
44	Aux Output 3 On	Gen. Purpose Output #3 on DO-90125, Sh. 1, Section 11. When On, the contacts are closed.
45	Aux Output 3 Off	Gen. Purpose Output #3 on DO-90125, Sh. 1, Section 11. When Off, the contacts are open.
46	Aux Output 4 On	Gen. Purpose Output #4 on DO-90125, Sh. 1, Section 11. When On, the contacts are closed.
47	Aux Output 4 Off	Gen. Purpose Output #4 on DO-90125, Sh. 1, Section 11. When Off, the contacts are open.
48	Aux Input 1 On	These inputs used to complement the serial communications performed between the
49	Aux Input 1 Off	NGB and the PLC.
50	Aux Input 2 On	AUX Input 3 used as Rapid estop input when EnableRapidStop parameter (I/O)
51	Aux Input 2 Off	Config.) is TRUE.
52	Aux Input 3 On	
53	Aux Input 3 Off	
54	Aux Input 4 On	
55	Aux Input 4 Off	
56	Part Increment	Increments the part count in the Status01 screen.
57	Programmed Feedrate (Ipm/Mmpm)	4 byte standard “C” value represented in the resolution. Example: 120 is 120 / 0.0001 = 1200000
58	Home Offset	This function causes a machine position adjustment to the fixed 0,0 home position.
59	Programmed KERF	This function allows the programmer to directly specify the desired kerf value in a program as a signed numeric value. When necessary, the PROGRAMMED KERF auxiliary function can also be used to change the kerf value one or more times in the program as different torches and / or tools are selected for operation. When using PROGRAMMED KERF values, it is important to define the kerf value before the kerf is turned ON (that is, before a KERF ON / CUT ON region of the program is entered). Undesirable results may be obtained if the kerf value is changed with the CUT still ON.
60	Auxiliary State Reset	Function turns off all active torches, markers and auxiliary outputs, disables KERF, selects normal axis conventions, and returns the control to TRAVERSE SPEED mode.
61	No Mirror, No Swap	(Definition for functions 61 through 68.) Modal change. In the Burny Series 10, these auxiliary functions are used during LOAD, STORE, and EDIT operations to alter the axis coordinates, kerf side and arc directions (CW and CCW) as specified by the function code so that the resulting program in memory directly defines the operations to be performed during CUT and graphic imaging operations. This also allows the resulting program to be transferred to other Burny controls not supporting the programmable axis swap / mirror feature. During EDIT and STORE operations, the program is converted back to its original format, provided that the selected program format defines the necessary auxiliary function definitions. For example, if a program is loaded in the ESSI format but edited in the Word Address format where code values for PROGRAMMABLE AXIS SWAP and MIRROR are not defined, the program is displayed in its adjusted coordinate form. However, if the program is edited using the same ESSI format used in the LOAD, the original coordinate format is displayed. NOTE: In the Burny Series 10, “normal axis coordinates” during LOAD, STORE, or EDIT operations are defined by the selected program format and the axis conventions defined in the associated SYSTEM SETUP DATA variables (STANDARD PROGRAM FORMAT and CUSTOM PROGRAM FORMAT). These variables allow the Burny Series 10 to perform an AXIS SWAP and / or MIRROR operation on all of the blocks in a program and therefore, define a non-standard convention as the “normal coordinate” convention. Hence, all PROGRAMMABLE AXIS SWAP and MIRROR functions encountered in the program perform their function based on the “normal coordinate” convention associated with the selected program format. Also note that the AXIS MIRROR and ROTATION operations that can be selected on the RUN SETUP screen are performed in addition to the other coordinate operations defined in the program.
62	Mirror Y, No Swap	See 61:NO MIRROR, NO SWAP.
63	Mirror X/Y, No Swap	See 61:NO MIRROR, NO SWAP.
64	Mirror X, No Swap	See 61:NO MIRROR, NO SWAP.
65	Swap X/Y, Mirror X/Y	See 61:NO MIRROR, NO SWAP.
66	Swap X/Y, Mirror X	See 61:NO MIRROR, NO SWAP.
67	Swap X/Y, No Mirror	See 61:NO MIRROR, NO SWAP.
68	Swap X/Y, Mirror Y	See 61:NO MIRROR, NO SWAP.
69	Auxiliary Torch Master On	Function turns on all active torches when processed in the forward direction.
70	Auxiliary Torch Master Off	Function turns off all active torches when processed in the forward direction.
71	INC Line IN2 MM0	(Definition for aux functions 71 through 82.) These are multiple mode auxiliary functions that define incremental or absolute, line or arc, arc direction, and implied decimal shift operating modes with a single auxiliary function. Any dimension block not containing an I or a J dimension field is assumed to be a line. Similarly, any dimension block containing an I or a J dimension field is assumed to be an arc using the last defined arc direction. Like the normal auxiliary functions for INCREMENTAL, ABSOLUTE, CW ARC, and CCW ARC, which can be used in conjunction with these codes, these functions are modal and remain in effect until changed by another auxiliary function. The major difference provided by these function codes is their ability to change the position of an implied decimal point based on

IDF	Auxiliary Function:	Description:
		the currently defined unit type. Dimension values already containing decimal points are not affected by the selected "implied shift" mode. The "implied decimal shift" functions resolve differences in the program resolutions normally accepted by the Burny Series 10. Typically, inch dimensions are defined using a 5.4 format and millimeter dimensions are defined using a 6.3 format. However, these auxiliary functions define an inch format of 5.2 and a millimeter format of 6.0 when using the normal resolutions and an inch format of 5.3 and a millimeter format of 6.1 when using the "shifted" format codes. To eliminate potential problems, the "forced" decimal shift operations are disabled as soon as one of these auxiliary functions is encountered in a program being loaded. As such, only dimension values before the first "implied decimal shift" function will be adjusted using the "forced shift" feature. Normally, the "forced shift" feature would not be enabled. However, when an ABSOLUTE POSITION REGISTER PRELOAD auxiliary function is placed before the first dimension block, the "forced shift" function may be required to obtain the correct adjustment. When performing STORE and EDIT operations on a program containing these auxiliary functions, all dimension values are reconstructed using decimal points and, when necessary, a trailing zero. This eliminates any confusion when later re-loading or saving the program from the editor.
72	INC CW ARC IN2 MM0	See 71:INC CCW ARC IN2 MM0.
73	INC CCW ARC IN2 MM0	See 71:INC CCW ARC IN2 MM0.
74	INC Line IN3 MM1	See 71:INC CCW ARC IN2 MM0.
75	INC CW ARC IN3 MM1	See 71:INC CCW ARC IN2 MM0.
76	INC CCW ARC IN3 MM1	See 71:INC CCW ARC IN2 MM0.
77	ABS Line IN2 MM0	See 71:INC CCW ARC IN2 MM0.
78	ABS CW ARC IN2 MM0	See 71:INC CCW ARC IN2 MM0.
79	ABS CCW ARC IN2 MM0	See 71:INC CCW ARC IN2 MM0.
80	ABS Line IN3 MM1	See 71:INC CCW ARC IN2 MM0.
81	ABS CW ARC IN3 MM1	See 71:INC CCW ARC IN2 MM0.
82	ABS CCW ARC IN3 MM1	See 71:INC CCW ARC IN2 MM0.
83	X Sign Toggle	Function toggles the X-axis sign: normal to inverted, or inverted to normal.
84	Y Sign Toggle	Function toggles the Y-axis sign: normal to inverted, or inverted to normal.
85	X/Y Swap Toggle	Function toggles the X and Y axes.
86	Offset 3 On	Moves the machine the distance set up as the X / Y Marker #3 Offset dimension (input during setup and installation). This causes the marker to take the place of the cutting torch so that the part program doesn't have to compensate for the offset between the marker and torch.
87	Offset 3 Off	Cancels the Marker #3 Offset and moves the cutting torch back to the programmed position.
88	Offset 4 On	Moves the machine the distance set up as the X / Y Marker #4 Offset dimension (input during setup and installation). This causes the marker to take the place of the cutting torch so that the part program doesn't have to compensate for the offset between the marker and torch.
89	Offset 4 Off	Cancels the Marker #4 Offset and moves the cutting torch back to the programmed position.
90	Offset 5 On	Moves the machine the distance set up as the X / Y Marker #5 Offset dimension (input during setup and installation). This causes the marker to take the place of the cutting torch so that the part program doesn't have to compensate for the offset between the marker and torch.
91	Offset 5 Off	Cancels the Marker #5 Offset and moves the cutting torch back to the programmed position.
92	Offset 6 On	Moves the machine the distance set up as the X / Y Marker #6 Offset dimension (input during setup and installation). This causes the marker to take the place of the cutting torch so that the part program doesn't have to compensate for the offset between the marker and torch.
93	Offset 6 Off	Cancels the Marker #6 Offset and moves the cutting torch back to the programmed position.
94	Offset 7 On	Moves the machine the distance set up as the X / Y Marker #7 Offset dimension (input during setup and installation). This causes the marker to take the place of the cutting torch so that the part program doesn't have to compensate for the offset between the marker and torch.
95	Offset 7 Off	Cancels the Marker #7 Offset and moves the cutting torch back to the programmed position.
96	Offset 8 On	Moves the machine the distance set up as the X / Y Marker #8 Offset dimension (input during setup and installation). This causes the marker to take the place of the cutting torch so that the part program doesn't have to compensate for the offset between the marker and torch.
97	Offset 8 Off	Cancels the Marker #8 Offset and moves the cutting torch back to the programmed position.
98	Height Sensor Disable	Modal change. Allows the programmer to directly define the block position where the height sensor should be disabled.
99	Height Sensor Enable	Modal change. Allows the programmer to directly define the block position where the height sensor should be enabled.
100	Data Table #1 Select	XXX
101	Data Table #2 Select	
102	Data Table #3 Select	
103	Data Table #4 Select	
104	Internal Variable Load	Allows NC programs to directly assign values to internal Burny Series 10 registers. Up to 16383 internal registers can be defined. At this time, however, only two internal Burny Series 10 registers have been assigned (1:PROGRAMMABLE PREHEAT TIME and 2:PROGRAMMABLE PIERCE TIME). This function uses an auxiliary function code followed by a register number field and a value field. Only a positive fixed decimal format can be used with the INTERNAL VARIABLE LOAD auxiliary function at this time. FORMAT CONVENTIONS: When using the INTERNAL VARIABLE LOAD auxiliary function, format and numeric value range checks are performed at two levels. The first validations are performed as the program is loaded into NC program memory. Typically, errors found at this level cause a PROGRAM SYNTAX error condition. The RUN process performs the second level of validation as it decodes and processes the register number and register value. Errors at this level simple cause the running process to ignore the auxiliary function block. In order to avoid format and numeric errors, the following format conventions must be used: 1.) For the "register number" field, only values in the range of 0 to 16383 are accepted by the LOAD process. Values not in this range cause a PROGRAM SYNTAX error. A register number of 0 or any number beyond the supported internal register number range causes the RUN process to ignore the NC program block. 2.) Only the fixed decimal format is supported. The RUN process will ignore any field using the BCD format. 3.) At this time, the fixed decimal format can only specify positive values in the range of 0 to 327.67 for the PROGRAMMABLE PREHEAT TIME and the PROGRAMMABLE PIERCE TIME values. The RUN process will ignore all values beyond this range. OPERATIONAL DETAILS:

IDF	Auxiliary Function:	Description:
		The following related system functions should be considered when using the INTERNAL VARIABLE LOAD function to perform PROGRAMMABLE PREHEAT TIME and PROGRAMMABLE PIERCE TIME operations: 1.) The normal PREHEAT TIME and PIERCE TIME prompting operations on the RUN MODE screen are unaffected by the timer values defined by the INTERNAL VARIABLE LOAD function. That is, these prompts are still used to define the timer values at the start of the program before pressing <GO>. After RUN has started and the <STOP> key has been pressed two times, to change the currently defined values regardless of whether or not these values have been redefined by the program. 2.) Timer values defined by an executing NC part program do not alter the prompting values displayed on the RUN MODE screen. These programmable values only alter the internal timer values used by the RUN process. 3.) When using the <RET> key to return to the last pierce or last start of the part program, the preheat and pierce timer register values are not changed. They retain their current values. Only a RETURN TO HOME (a return to block 1, position 0,0) causes the internal preheat and pierce timer register values to be updated with the last operator-defined values. 4.) When backing up, no INTERNAL VARIABLE LOAD operations are performed. As such, the currently defined values remain unchanged. However, if the first block of the program is re-encountered, the PREHEAT TIME and PIERCE TIME register values are updated with the last values defined by the operator from the RUN MODE screen.
105	Chain Bottom No Increment	Used in conjunction with CHAIN TOP to perform a program repeat function. When the CHAIN BOTTOM is reached the internal part counter is NOT incremented automatically, (need to program a 56:PART INCREMENT), the program returns to the point in the program where the CHAIN TOP occurred. If there is no CHAIN TOP, the program returns to the beginning of the program.
106	AUX OUTPUT 5 ON	Gen. Purpose Output #5 on DO-90125, Sh.1, 31 & 32 RECP. When On, the
107	AUX OUTPUT 5 OFF	contacts are closed. Enhanced *
108 109	AUX OUTPUT 6 ON AUX OUTPUT 6 OFF	Gen. Purpose Output #6 on DO-90125, Sh.1, 31 & 32 RECP. When On, the contacts are closed. Enhanced *
110	AUX OUTPUT 7 ON	Gen. Purpose Output #7 on DO-90125, Sh.1, 31RECP & 32RECP. When On, the
111	AUX OUTPUT 7 OFF	contacts are closed.
112	AUX OUTPUT 8 ON	Gen. Purpose Output #8 on DO-90125, Sh.1, 31RECP & 32RECP. When On, the
113	AUX OUTPUT 8 OFF	contacts are closed.
114	AUX INPUT 5 ON	Future
115	AUX INPUT 5 OFF	
116	AUX INPUT 6 ON	Future
117	AUX INPUT 6 OFF	
118	AUX INPUT 7 ON	Future
119	AUX INPUT 7 OFF	
120	AUX INPUT 8 ON	Future
121	AUX INPUT 8 OFF	
122	Home Table #0 Select	
123	Home Table #1 Select	
124	Home Table #2 Select	
125	Home Table #3 Select	
126	Home Table #4 Select	
127	Punch Marker #1 (One Shot)	
128	Punch Marker #2 (One Shot)	
129	Rotary C Home & Hold	Function will Home and Hold the C Axis.
130	Rotary C Hold	Function will Hold the C Axis.
131	Rotary C Enable	Function will allow the C Axis to follow part contour.
132	Rotary C Swap 180 On	Function will allow the C Axis to follow part contour in the same direction as before, but 180 degrees from were it was.
133	Rotary C Swap 180 Off	Function will allow the C Axis to follow part contour in the same direction as before, but 180 degrees from were it was.
154	Home Table #5 Select	
155	Home Table #6 Select	
156	Home Table #7 Select	
157	Home Table #8 Select	
158	Home Table #9 Select	
159	Home Table #10 Select	
160	Home Table #11 Select	
161	Home Table #12 Select	
162	Home Table #13 Select	
163	Home Table #14 Select	
164	Home Table #15 Select	
165	Home Table #16 Select	
166	Home Table #17 Select	
167	Home Table #18 Select	

* Indicates the “enhanced” outputs are turned on and off by M codes and are turned off when the <Stop> button is pushed.

9.5 WORD ADDRESS PROGRAMMING

9.5.1 WORD ADDRESS DATA BLOCK SPECIFICATION

During the reconstruction process, every effort is made to produce the original format. In some cases, however, standard Burny format conventions are used. For example, Word Address dimension blocks using the custom “RXYXY” arc definition format are always rebuilt using the normal “XYIJ” format.

All Word Address programs contain data blocks that consist of key characters and values. A “key character” is a letter that means something special to the ***Burny Series 10*** control.

The supported key characters are as follows:

% (START OF PROGRAM)

All programs must start with a data block containing this key character, which must be preceded and followed by a line feed.

Format: (LF)%(LF) or %(LF)

Format: (LF)%(CR)(LF) or %(CR)(LF)

N (LINE NUMBER)

Used for documentation purposes only, and does not affect program execution. The ***Burny Series 10*** does not store these values. When the ***Burny Series 10*** loads a program through serial I/O or the floppy, these values are discarded to conserve memory space.

Format: 9

P WORD (PROGRAM NUMBER / NAME)

The P Word (a.k.a. P Block) is an optional key character that allows up to eight characters to be used as a *filename*, and included in a program. If a program is loaded containing this key character, that program number is automatically loaded into NC Program Memory as that *filename*.

Format: P00000000 (Optional Name)

X WORD (X DIMENSION.)

Used for dimensions of lines and arcs. In incremental programming, it is defined as the distance from the start point to the end point of a move along the X-axis. In absolute programming, it is defined as the distance from the zero point to the endpoint of the new move along the X-axis.

Format: +/-5.4 (inches) or +/-6.3 (mm)

Y WORD (Y DIMENSION.)

Used for dimensions of lines and arcs. In incremental programming, it is defined as the distance from the start point to the end point of a move along the Y-axis. In absolute programming, it is defined as the distance from the zero point to the endpoint of the new move along the Y-axis.

Format: +/-5.4 (inches) or +/-6.3 (mm)

I WORD (I DIMENSION.)

Used for arcs, not used on lines. In incremental programming, it is defined as the distance in the X-axis from the start point to the center of an arc. In absolute programming, it is dependent on Program Format, defined in ***SYSTEM SETUP*** data variables.

Format: +/-5.4 (inches) or +/-6.3 (mm)

J WORD (J DIMENSION.)

Used for arcs, not used on lines. In incremental programming, it is defined as the distance in the Y-axis from the start point to the center of an arc. In absolute programming, it is dependent on Program Format**,** defined in ***SYSTEM SETUP*** data variables.

Format: +/-5.4 (inches) or +/-6.3 (mm)

B WORD (BINARY CODED DIGIT (BCD) FIELD.)

This format allows the user to specify data in BCD format with a value range of 0 to 9999. In this format, each digit is represented as a 4-bit value. Thus, the BCD value of 1234 is encoded as the binary value 0001 0010 0011 0100 (hexadecimal 4650).

Format: 4

F WORD (DWELL TIME OR FEED RATE.)

Format: G04F999.9 (seconds, modal dwell time)

When an auxiliary function code (standard Word Address G04) is followed by the **F** key character, the value following the **F** key character is used as the dwell time for this and all subsequent G04 blocks until changed by a new G04 block containing a different **F** time. Otherwise, the default dwell time is established during the setup and installation procedure.

Used by alone, the **F** key character indicates a programmed speed in either IPM or MMPM.

Format: F99999.99 (IPM feedrate, unsigned integer)

Format: F99999.99 (MMPM feedrate, unsigned integer)

G WORD (PREPARATORY FUNCTIONS)

Used to change the operating mode of the cutting machine. Generally, the modes set by **G** codes remain in effect until the end of the program, unless changed or canceled by another **G** code. G Code values are supported from 00 – 4095 by way of the Custom Auxiliary Codes feature in the Utility Mode.

Format: G00

K WORD DIRECT (PROGRAMMABLE KERF VALUE)

Used to identify a directly entered KERF value, as in the following examples:

Format: G240K.12	(Direct KERF value of .12)
Format: G240K9999.9999	(Direct KERF value)
Format: G240K+/-9999.9999	(Direct KERF value showing sign)

M (MISCELLANEOUS FUNCTIONS)

Used to control the non-motion-related operations of the cutting machine. M Code values are supported from 00 – 4095 by way of the Custom Auxiliary Codes feature in the Utility Mode.

Format: M00

T (INDEX NUMBER)

The unsigned integer following this key character signifies a table offset number or an index offset number. Format: 3 (unsigned integer). This allows operations to be performed using a base auxiliary function code and an offset. For example, tool offset operations can be performed using index values. (The following example uses the standard Word Address auxiliary function codes.)

Internal Function	Word Address Code
Offset 1 On	M71 or M71T01
Offset 1 Off	M70 or M70T01
Offset 2 On	M73 or M71T02
Offset 2 Off	M72 or M70T02
Offset 3 On	M275 or M71T03
Offset 3 Off	M274 or M70T03
Offset 4 On	M277 or M71T04
Offset 4 Off	M276 or M70T04
Offset 5 On	M279 or M71T05
Offset 5 Off	M278 or M70T05
Offset 6 On	M281 or M71T06
Offset 6 Off	M280 or M70T06
Offset 7 On	M283 or M71T07
Offset 7 Off	M282 or M70T07
Offset 8 On	M285 or M71T08
Offset 8 Off	M284 or M70T08

( ) (COMMENT BLOCK DELIMITERS)

Used for optional comments in the program, such as user instructions.

9.5.2 OPERATOR PRECEDENCE AND SYNTAX CONSIDERATIONS

OPERATOR PRECEDENCE

If a miscellaneous auxiliary function (**M** code) appears in the same data block as a dimension move, sometimes the auxiliary function is performed before the dimension move and sometimes after the move. See the Auxiliary Function Code Conversion table to determine the precedence.

If two miscellaneous Auxiliary Functions (**M** codes) appear in the same data block, they are processed in the order in which they appear.

If a preparatory Auxiliary Function (**G** code) appears in the same data block as a dimension move, the auxiliary function is always performed before the dimension move.

SYNTAX CONSIDERATIONS

Up to five non-X, Y, I, and J fields may be programmed per data block. The program must be written in upper-case characters. No blanks may be within a numeric field (such as an **F** code). Blanks are permitted between key characters, and before a sign, but not within the numeric field.

An "RXYXY" block is accepted. This format, used in other ***NC*** controls, supplies the radius of the arc in the "R" field, the offset to the center point in the first X/Y pair, and the offset to the arc end point in the second X/Y pair. However, since the ***Burny Series 10*** calculates the radius from the end point and center point data, the radius data is not necessary, and the ***Burny Series 10*** ignores the "R" field. The "RXYXY" conversion is only performed during ***LOAD*** and ***EDIT*** save operations; ***STORE*** and ***DISPLAY*** operations always recreate arc dimension blocks using the standard "XYIJ" format.

This conversion is a standard feature. Whenever the ***Burny Series 10*** encounters a second X or Y value in the same dimension block and it has not already encountered an I or J field, the first X/Y pair is automatically converted into the I/J dimension pair and the scanning process continues. However, if an I or J dimension already exists, the first X/Y values are ignored and the second values are used to define the X/Y pair.

Comment delimiters may be encoded in a variety of ways. The **(** is always the start of the block, and the **)** is always the end of the block, no matter where they appear. For example:

(Start of comment block, which continues multiple lines until **)**
(Or the comment is on one line **)**
(Or the comment may continue **)**
(for several lines, each containing **)**
(the comment block delimiters. **)**

These are all legal. When the program is rebuilt, it is rebuilt as Example 3.

9.5.3 STANDARD WORD ADDRESS M CODE AND G CODE PRECEDENCE

Standard Word Address uses Word Address Chaining on the ***Burny Series 10*** by default. This means that each line can contain more than one Word Address code per ASCII text line.

Example:

```
G02X10Y10M04
```

If the default is disabled then each Word Address Code must be put on a separate line.

Example:

```
G02
X10Y10
M04
```

Hence with Word Address Chaining enabled, the precedence must be established as to which codes are executed before moves and which are executed after moves.

As you can see from the first example above, the ***Burny Series 10*** 06:CUT ON (M04) is executed before the X10Y10 dimension block move and the second example the ***Burny Series 10*** 06:CUT ON is executed after the X10 Y10 Dimension block move.

The table below details which ***Burny Series 10*** functions come before a Word Address Data block and which come after. The chart also denotes what the Standard Word Address code is for the given ***Burny Series 10*** internal function.

9.5.4 WORD ADDRESS M/G CODES AND ESSI CODES CROSS REFERENECE

Word Address	ESSI	Internal Number	Description	Before Move	After Move
		58	HOME OFFSET		
(	03	24	PROGRAM DATA SKIP ON		
)	04	25	PROGRAM DATA SKIP OFF		
Fword	39	57	PROGRAMMED FEEDRATE (IPM/MMPM)		
G00	05	31	HIGH SPEED (RAPID ON)	X	
G01	06	30	CUTTING SPEED (RAPID OFF)	X	
G02	-	1	CLOCKWISE ARC CODE	X	
G03	+	2	COUNTER-CLOCKWISE ARC CODE	X	
G04	41	19	PROGRAMMABLE DWELL	X	
G40	38	7	KERF OFF CODE	X	
G41	29	8	KERF LEFT CODE	X	
G42	30	9	KERF RIGHT CODE	X	
G45	89	20	LEAD-IN FOR KERFED PART	X	
G46	65	39	DATA TABLE #0 SELECT	X	
G70	70	14	INCH UNITS CODE	X	
G71	71	15	METRIC UNITS CODE	X	
G90	82	16	ABSOLUTE PROGRAMMING	X	
G91	81	18	INCREMENTAL PROGRAMMING	X	
G92	92	17	ABSOLUTE REGISTER PRELOAD	X	
G95	95	56	PART INCREMENT	X	
G97	97	3	CHAIN TOP CODE	X	
G98	98	4	CHAIN BOTTOM CODE (w/INCREMENT)	X	
G99	96	105	CHAIN BOTTON (NO INCREMENT)	X	
G201		71	INC LINE IN2 MM0 (LINDE G01)	X	
G202		72	INC CW ARC IN2 MM0 (LINDE G02)	X	
G203		73	INC CCW ARC IN2MM0 (LINDE G03)	X	
G211		74	INC LINE IN3 MM1 (LINDE G11)	X	
G212		75	INC CW ARC IN3 MM1 (LINDE G12)	X	
G213		76	INC CCW ARC IN3MM1 (LINDE G13)	X	
G221		77	ABS LINE IN2 MM0 (LINDE G21)	X	
G222		78	ABS CW ARC IN2 MM0 (LINDE G22)	X	
G223		79	ABS CCW ARC IN2MM0 (LINDE G23)	X	
G231		80	ABS LINE IN3 MM1 (LINDE G31)	X	
G232		81	ABS CW ARC IN3 MM1 (LINDE G32)	X	
G233		82	ABS CCW ARC IN3 MM1(LINDE G33)	X	
G240	40	59	PROGRAMMABLE KERF	X	
G247	266	100	DATA TABLE #1 SELECT		
G248	267	101	DATA TABLE #2 SELECT		
G249	268	102	DATA TABLE #3 SELECT		
G250	269	103	DATA TABLE #4 SELECT		
G276	276	104	INTERNAL VARIABLE LOAD	X	
G277	277	34	EXTERNAL VARIABLE LOAD		
G278	278	35	X HOME SW/INDEX FIND	X	
G279	279	36	Y HOME SW/INDEX FIND	X	
G280	280	37	RETURN FROM X HOME DIMENSION	X	
G281	281	38	RETURN FROM Y HOME DIMENSION	X	
M00	00	21	PROGRAM STOP CODE		X
M02	90	22	PROGRAM END- NO REWIND		X
M03	08	5	CUT OFF CODE		X
M04	07	6	CUT ON CODE	X	
M07	10	10	MARKER #1 OFF CODE		X
M08	09	11	MARKER #1 ON CODE	X	
M09	14	27	MARKER #2 OFF CODE		X
M10	13	26	MARKER #2 ON CODE	X	

Word Address	ESSI	Internal Number	Description	Before Move	After Move
M14	68	98	HEIGHT SENSOR DISABLE		X
M15	67	99	HEIGHT SENSOR ENABLE	X	
M20	08	5	CUT OFF CODE		X
M21	07	6	CUT ON CODE	X	
M30	99/64	23	END OF PROGRAM-REWIND		X
M61	61	127	PUNCH MARKER #1 (ONE SHOT)		
M62	62	128	PUNCH MARKER #2 (ONE SHOT)		
M70	12	12	MARKER OFFSET 1 OFF CODE		X
M71	11	13	MARKER OFFSET 1 ON CODE	X	
M72	16	29	MARKER OFFSET #2 OFF		X
M73	15	28	MARKER OFFSET #2 ON	X	
M79	79	122	HOME TABLE #0 SELECT		
M82Kxx			Add xx.x degrees as offset to the C Axis computed orthogonal angle.	X	
M83Kxx			Move C Axis to absolute angle xx.x degrees. (Use while axis is in Hold.)	X	
M84	84	132	ROTARY C SWAP 180 ON	X	
M85	85	133	ROTARY C SWAP 180 OFF	X	
M86	86	129	ROTARY C HOME & HOLD	X	
M87	87	130	ROTARY C HOLD	X	
M88	88	131	ROTARY C ENABLE	X	
M210	237	83	X AXIS SIGN TOGGLE	X	
M211	238	84	Y AXIS SIGN TOGGLE	X	
M212	239	85	X/Y AXIS SWAP TOGGLE	X	
M221	21	61	NO SWAP, NO MIRROR	X	
M222	22	62	NO SWAP, MIRROR Y	X	
M223	23	63	NO SWAP, MIRROR X AND Y	X	
M224	24	64	NO SWAP, MIRROR X	X	
M225	25	65	AXIS SWAP, MIRROR X AND Y	X	
M226	26	66	AXIS SWAP, MIRROR X	X	
M227	27	67	AXIS SWAP, NO MIRROR	X	
M228	28	68	AXIS SWAP, MIRROR Y	X	
M231	63	60	AUXILIARY STATE RESET		X
M245	245	40	AUX OUTPUT 1 ON [See Note 1 & 2]	X	
M246	246	41	AUX OUTPUT 1 OFF [See Note 1 & 2]		X
M247	247	42	AUX OUTPUT 2 ON [See Note 1 & 2]	X	
M248	248	43	AUX OUTPUT 2 OFF [See Note 1 & 2]		X
M249	249	44	AUX OUTPUT 3 ON	X	
M250	250	45	AUX OUTPUT 3 OFF		X
M251	251	46	AUX OUTPUT 4 ON	X	
M252	252	47	AUX OUTPUT 4 OFF		X
M253	253	48	AUX INPUT 1 ON	X	
M254	254	49	AUX INPUT 1 OFF		X
M255	255	50	AUX INPUT 2 ON	X	
M256	256	51	AUX INPUT 2 OFF		X
M257	257	52	AUX INPUT 3 ON	X	
M258	258	53	AUX INPUT 3 OFF		X
M259	259	54	AUX INPUT 4 ON	X	
M260	260	55	AUX INPUT 4 OFF		X
M261	261	69	AUXILIARY TORCH MASTER ON	X	
M262	262	70	AUXILIARY TORCH MASTER OFF		X
M270	270	123	HOME TABLE #1 SELECT		
M271	271	124	HOME TABLE #2 SELECT		
M272	272	125	HOME TABLE #3 SELECT		
M273	273	126	HOME TABLE #4 SELECT		
M274	283	87	MARKER #3 OFFSET OFF		X

Word Address	ESSI	Internal Number	Description	Before Move	After Move
M275	282	86	MARKER #3 OFFSET ON	X	
M276	285	89	MARKER #4 OFFSET OFF		X
M277	284	88	MARKER #4 OFFSET ON	X	
M278	287	91	MARKER #5 OFFSET OFF		X
M279	286	90	MARKER #5 OFFSET ON	X	
M280	289	93	MARKER #6 OFFSET OFF		X
M281	288	92	MARKER #6 OFFSET ON	X	
M282	291	95	MARKER #7 OFFSET OFF		X
M283	290	94	MARKER #7 OFFSET ON	X	
M284	293	97	MARKER #8 OFFSET OFF		X
M285	292	96	MARKER #8 OFFSET ON	X	
M300	300	106	AUX OUTPUT 5 ON	X	
M301	301	107	AUX OUTPUT 5 OFF		X
M302	302	108	AUX OUTPUT 6 ON	X	
M303	303	109	AUX OUTPUT 6 OFF		X
M304	304	110	AUX OUTPUT 7 ON [See Note 2]	X	
M305	305	111	AUX OUTPUT 7 OFF [See Note 2]		X
M306	306	112	AUX OUTPUT 8 ON [See Note 2]	X	
M307	307	113	AUX OUTPUT 8 OFF [See Note 2]		X
M320	320	114	AUX INPUT 5 ON	X	
M321	321	115	AUX INPUT 5 OFF		X
M322	322	116	AUX INPUT 6 ON	X	
M323	323	117	AUX INPUT 6 OFF		X
M324	324	118	AUX INPUT 7 ON	X	
M325	325	119	AUX INPUT 7 OFF		X
M326	326	120	AUX INPUT 8 ON	X	
M327	327	121	AUX INPUT 8 OFF		X
M400	400	123	HOME TABLE #1 SELECT		
M401	401	124	HOME TABLE #2 SELECT		
M402	402	125	HOME TABLE #3 SELECT		
M403	403	126	HOME TABLE #4 SELECT		
M404	404	154	HOME TABLE #5 SELECT		

Word Address	ESSI	Internal Number	Description	Before Move	After Move
M405	405	155	HOME TABLE #6 SELECT		
M406	406	156	HOME TABLE #7 SELECT		
M407	407	157	HOME TABLE #8 SELECT		
M408	408	158	HOME TABLE #9 SELECT		
M409	409	159	HOME TABLE #10 SELECT		
M410	410	160	HOME TABLE #11 SELECT		
M411	411	161	HOME TABLE #12 SELECT		
M412	412	162	HOME TABLE #13 SELECT		
M413	413	163	HOME TABLE #14 SELECT		
M414	414	164	HOME TABLE #15 SELECT		
M415	415	165	HOME TABLE #16 SELECT		
M416	416	166	HOME TABLE #17 SELECT		
M417	417	167	HOME TABLE #18 SELECT		
M3332	3332	32	XMIT (Transmit) TO PLC BEFORE MOVE & RUN		
M3333	3333	33	XMIT (Transmit) TO PLC AFTER MOVE & WAIT		

NOTE 1: The enhanced outputs ar tuned on and off by M Codes and re turned off when the <STOP> button is pushed.

NOTE 2: ***For Phantom and Phantom ST (with Option I/O Card)***
Physical Aux Output #1 control is mapped to WA part program M Codes for Aux Output #7, so…

for Aux Out #1 ON, use M304 (Aux Out #7 On)
for Aux Out #1 OFF, use M305 (Aux Out #7 OFF)

Physical Aux Output #2 control is mapped to WA part program M Codes for Aux Output #8, so…

for Aux Out #2 ON, use M306 (Aux Out #8 On)
for Aux Out #2 OFF, use M307 (Aux Out #8 OFF)

9.5.5 SYSTEM SETUP DATA FOR WORD ADDRESS PROGRAMMING

INTRODUCTION

System data is set up to accommodate two special aspects of program loading:

- Special start and end of program sequences and Custom auxiliary function codes that are part of the program.
- Enabling or disabling during the Load conversion process certain custom conventions in the program relating to the signs of dimensions, arc characteristics, etc. Also in this class are choices about stripping line number, messages, etc.

In the ***Part 7, Utility***, under ***Custom Aux Codes*** is an explanation for putting these changes in place. The two sections below are included here for convenience to the programmer.

CUSTOM PROGRAM ITEMS

SPECIAL START OF PROGRAM SEQUENCE

This feature can be used if a start sequence is needed and the % character is not desired to delimit the top or start of the program.

SPECIAL END OF PROGRAM SEQUENCE

This feature is used if the program doesn't have a normal end auxiliary function code. This feature allows a user-defined ASCII code sequence to be used as an additional END OF PROGRAM WITH REWIND code termination sequence. When enabled, this sequence does not inhibit the use of standard M02 or M30 function codes or any auxiliary function code defined through the Custom Auxiliary Function Code Conversion Table as END OF PROGRAM or END OF PROGRAM WITH REWIND.

After the user-defined sequence has been entered in a custom aux code file, the following occurs. When encountered in a program during a LOAD operation, the control stores an END OF PROGRAM WITH REWIND code at the end of the program file, in place of the special termination sequence. It then performs the END OF PROGRAM WITH REWIND operation. This prevents multiple program from being loaded and causes a rewind operation to be initiated. To terminate the rewind, the operator must press the <RST> key before the rewind begins or within 3 seconds from the start of the rewind.

CUSTOM AUXILIARY FUNCTION CODE CONVERSION

This feature is used if the ***NC*** programmer needs to assign any external M or G auxiliary function code as any internally supported auxiliary function.

CUSTOM CONVERSION ITEMS

These ***Custom Code Conversion*** items appear on the ***Util85custom*** screen. See ***Part 7 - Utilities***, of this manual. Some of them are not implemented for the software version listed on the title page of this manual. They are marked "NI".

PROGRAM COMPRESSION (NI)

This feature is used if the ***NC*** programmer needs to conserve space in ***NC*** Program Memory. This feature removes data that is not logically necessary in an NC Program as it is loaded from the serial port or floppy or saved from the program editor. When enabled, this feature removes all redundant G00, G01, G02 and G03 auxiliary function codes from the program that do not affect the operating mode already defined. Additional G00 and G01 auxiliary function codes can also be removed since the normal CUT ON and CUT OFF auxiliary function codes automatically establish cutting speed and high speed modes as required.

This feature also removes all absolute dimension values that, when internally converted to an incremental movement, result in a value of zero. Unlike older NC controls that required the programmer to define an X and Y value for every dimension block when in absolute programming mode, the NGB only requires the program to define the changing field. Undefined field values are not interpreted as zero, but rather the same position as previously defined.

WORD ADDRESS LINE NUMBER (NI)

This function is used if the NC programmer needs to speed up the transfer process and / or conserve space. This function prevents the Word Address process from including line numbers in each ASCII block during the reconstruction process, which allows programs to be stored to serial devices or the floppy faster and reduces the size of the ASCII program file.

PROGRAM MESSAGE DISABLE

This function is used if the ***NC*** programmer needs to conserve space in Program Memory. This function causes the LOAD process to discard all program message data and reduce the amount of internal memory required. It prevents the STORE process from formatting ASCII program message blocks for output. It also prevents the text editor from reading and writing message blocks in a program.

PROGRAM NAME DISABLE (NI)

This function is used to prevent the STORE process from sending program names to serial devices or the floppy, and prevents the text editor from reading program names inside the file.

DIMENSION DECIMAL SHIFT

This feature is used if the ***NC*** programmer needs a fixed dimension scaling to add an implied decimal. It allows the dimension values to be scaled as they are read during a serial device or floppy LOAD operation. Each shift count represents a divide by 10 when converting to internal format. For example, if a shift count of 2 is defined for the specified program type, **X+5000** defines an incremental move of +50 (inches or millimeters depending on the selected dimension type).

AUTO I/J SIGNS

This feature is used if the ***NC*** programmer needs to load Word Address programs, written for other ***NC*** controls, into the ***Burny Series 10***. This feature allows arc dimension blocks that define movements in a single quadrant (i.e., arcs less than 90 degrees) and multiple quadrants (arcs up to 360 degrees) to be defined without signs on the I and J values. The only restrictions are that both the X and Y dimension fields in the block must be provided and must be non-zero and no signs must exist on either of the I or J dimension values. When these conditions are met, the ***Burny Series 10*** can calculate which of the four possible points is the correct center point for the arc. However, if these conditions are not met, two or more possible solutions exist, so the ***Burny Series 10*** uses positive I/J dimension values.

The ***Burny Series 10*** control has a second type of single quadrant "arc signing" conversion process, so that programs written for old single-quadrant only controls from other manufacturers that contain programming errors and endpoint error caused by insufficient accuracy can be loaded into the ***Burny Series 10***. Unlike the first ***Burny Series 10*** AUTO I/J process, which is capable of determining I and J dimension signs in both a single and multiple quadrant mode, the SINGLE QUADRANT ONLY arc process defines I and J dimension signs using logic that assumes all arcs must be less than or equal to 90 degrees. As such, any arc violating this 90 degree limit is automatically converted into a line. This conversion is performed only while loading so that the resulting program in ***NC*** Program Memory can be directly run and / or inspected using the test editor or display program utility functions. Only one of these features should be enabled at a time.

AXIS SWAP (SWAP X-Y)

This feature is used for correcting programming differences in X/Y axes definitions. It causes the axes definitions during serial device LOAD / STORE operations and PROGRAM EDIT operations to be swapped so that the internal program matches the standard X and Y axis conventions used by the control. When enabled, the following conversions are performed:

+X	=>	+Y
-X	=>	-Y
+Y	=>	+X
-Y	=>	-X

When performing LOAD operations and both AXIS SWAP and AXIS SIGN INVERT are enabled, AXIS SIGN is performed first. When performing STORE operations, AXIS SWAP is performed first, so that the external convention remains unchanged. For example, when performing a LOAD operation with AXIS SWAP and X AXIS SIGN INVERT enabled, but not Y AXIS SIGN INVERT enabled, the following conversions are performed:

+X	=>	-X	=>	-Y
-X	=>	+X	=>	+Y
+Y	=>	+Y	=>	+X
-Y	=>	-Y	=>	-X

AXIS SIGN INVERT

This feature causes the sign of the dimension data on the specified axis to be inverted during LOAD / STORE operations and PROGRAM EDIT operations so that the internal program matches the standard X and Y axis directions used by the control.

When enabled for the X axis but not the Y axis:

+X	=>	-X	and	-X	=>	+X
+Y	=>	+Y	and	-Y	=>	-Y

When enabled for the Y axis but not the X axis:

+X	=>	+X	and	-X	=>	-X
+Y	=>	-Y	and	-Y	=>	+Y

Auxiliary Code Before Motion

This feature is used if the ***NC*** programmer needs to change operator precedence. It causes all auxiliary function codes that are contained in a program block with a dimension move (X, Y, I, or J value) to be processed BEFORE the dimensional move. This feature is performed during the LOAD operation and has no effect on programs already residing in ***NC*** Program Memory.

FIXED INCREMENTAL I/J

This feature allows the user to define the I and J dimension value format as INCREMENTAL even when the X and Y dimension values are programmed in ABSOLUTE.

DWELL DECIMAL SHIFT

This feature allows the dwell value defined through an **F** key character to be scaled during LOAD, STORE, EDIT and DISPLAY operations. Each shift count represents a divide by 10 when converting to internal format. For example, if a shift count of 3 is defined for the specified program type, **G04F1500** defines a programmed dwell of 1.5 seconds.

INVERT ARC DIRECTION

This feature allows the internal arc direction support to perform inverted arc processing operations when performing LOAD, STORE, and EDIT operations. It is provided primarily to allow programs written in the

ESSI format with non-standard arc direction conventions (+/-) to be used with the control. However, all ESSI and Word Address program formats are affected by this feature.

ABSOLUTE DIMENSION TYPE

This feature allows the user to change the system default for program dimension type from INCREMENTAL to ABSOLUTE. The system default is INCREMENTAL unless the dimension type is changed by the appropriate auxiliary function code. However, if this function is enabled, all program dimensions are assumed to be in ABSOLUTE unless changed by an auxiliary function code. The dimension type selected by this function is also used to define the required format when storing an internally created SHAPE program to a serial device.

FEEDRATE DECIMAL SHIFT

This feature allows the feedrate value defined through an **F** key character to be scaled during LOAD, STORE, EDIT and DISPLAY operations. Each shift count represents a divide by 10 when converting to internal format. For example, if a shift count of 2 is defined for the specified program type, **F1500** defines a programmed feedrate of 15 (IPM or MMPM depending on the selected dimension type).

PROGRAMMED FEEDRATE

Ignore Program Feedrate is one of the ***Machine Parameters*** that can be set in the ***Utility*** mode. See Part 7 - Utilities, of this manual. This feature allows executing ***NC*** programs to directly set the desired cutting speed if the parameter is disabled. If it is enabled, all feedrate values contained in the program are ignored when running, but are retained in the program for possible future use.

The ***Burny Series 10*** processes all **F** key character data that is not in a dwell (G04) program block (or a programmable I/O variable load program block) as a feedrate command. However, programmed feedrate speeds are only used when not in TRAVERSE, HIGH SPEED or RAPID modes. Feed rate changes that are commanded while in these modes are postponed until the next CUT SPEED mode is entered.

When an ***NC*** program is executed, the initial cutting feedrate is defined from the current digital feedrate value. This feedrate remains as the selected feedrate until changed by a program-defined feedrate, or until it is overridden by an operator-defined feedrate. Similarly, as the ***NC*** program continues and encounters additional feedrate commands, each overrides the previously defined cutting speed.

Digital feedrate values specified by the operator override the last defined programmed feedrate value. However, programmed feedrate values have no affect on the last operator-defined feedrate value.

Only programmed feedrate values between .12 IPM and the defined RUN SPEED LIMIT value are allowed. Programmed values greater than the RUN SPEED LIMIT are replaced with this limit value. Programmed feedrate values less than .12 IPM are replaced with the MINIMUM HOLD SPEED value.

The speed dial setting always scales feedrate values used during cutting moves. However, the resulting feedrate value depends upon the actual dial position and the speed dial mode selected. Normally, a full dial setting uses 100% of the programmed feedrate value. However, if the 120% range is selected by a bit in SYSTEM CONFIGURATION #1, the resulting feedrate will be 120% of the programmed rate when at the full dial position, provided this value does not exceed the defined RUN SPEED LIMIT value.

Cutting feedrate values are saved at the “start of part” and “pierce” positions with other position and status data. This allows “return” operations that are performed in ***RUN*** mode to restore the feedrate at the return position to its original value. The cutting feedrate value is always reset to the current digital feedrate value when returning to the HOME position.

Traverse moves are always performed at the TRAVERSE SPEED LIMIT and are not normally affected by the speed dial position. The exception is when the dial is turned to zero and all machine motion is inhibited.

DECIMAL SHIFT

Even though programmed dwell and programmed feedrate use the same **F** key character, separate decimal shift values are defined in the Standard Program Format and Custom Program Format variables so that different shift counts can be assigned. Both allow a maximum shift count of 3. When a program is loaded, the internal data block contains the “shifted” value. When that program is displayed or edited, it contains the “unshifted” value.

With a DWELL SHIFT count of **2** enabled for the program, a program block containing **G04F500** defines a dwell time of 5 seconds.

With a FEEDRATE SHIFT count of **1** enabled for the program, a program block containing **G01F2500** defines a feedrate of 250 IPM (or 250 MMPM if in METRIC mode).

9.6 ESSI PROGRAMMING

9.6.1 BLOCK TYPES

ESSI part programming uses three types of data blocks for the program:

- Line Moves
- Arc Moves
- Auxiliary Functions

LINE AND ARC BLOCK SPECIFICATIONS

Both LINE and ARC BLOCKS are made up of a series of signed (+/-) dimensions. In ESSI programming, the number of signs in a data block determines whether it is an arc or a line. The dimensions for the block do not contain any decimal points. For INCH programming, two decimal places are assumed. For METRIC programming, one decimal place is assumed.

LINE AND ARC BLOCKS

Blocks with two signs, either plus (+) or minus (-), are LINE FUNCTIONS. The first signed value is the X incremental distance and the second signed value is the Y incremental distance. If one of the dimensions is 0, only a + sign need appear in the block.

Line of 1 inch in the X axis and -.5 inches in the Y axis would appear as:

Example: +100-50

Line of -2.5 inches in the Y axis would appear as:

Example: +0-250

Blocks with five signs are ARC FUNCTIONS and are defined as follows

+X+Y+I+J+

The FIRST signed dimension is the incremental (or absolute) distance from the start point to the end point of the arc along the X axis.

+X+Y+I+J+

The SECOND signed dimension is the incremental (or absolute) distance from the start point to the end point of the arc along the Y axis.

+X+Y+I+J+

The THIRD signed dimension is the incremental (or absolute) distance from the start point to the center of the arc along the X axis.

+X+Y+I+J+

The FOURTH signed dimension is the incremental (or absolute) distance from the start point to the center of the arc along the Y axis.

+X+Y+I+J+

The FIFTH sign in the data block determines the direction of the arc.

+ indicates a CCW arc
- indicates a CW arc

9.6.2 SYNTAX CONSIDERATIONS

Decimal points are not allowed, since ESSI uses implied decimal points. A total of seven digits is allowed: Inch units are in 5.2 format and millimeter units are in 6.1 format.

Arc functions (detailed above) are order-dependent.

For example: +++5++

The above line is legal. It says there is no X value, there is no Y value, there is an I value, and there is no J value and the arc is CCW.

The + (plus sign) may be replaced by a - (negative sign).

ESSI supports extended function blocks. This extended block format allows one or more additional data fields to be provided with the function code in the same block. Each additional data field begins with a sign code (usually a **+** sign) to separate it from other data fields.

For example:

Standard auxiliary functions **11** and **12** can be used to perform OFFSET ON and OFFSET OFF operations on the eight tool offsets using a “base function with index” technique. The base function may be the defaults of OFFSET 1 (**11** and **12**) or may be user-defined through the custom auxiliary code conversion process. The index is defined through an extended function (**+**).

IDF Function #	Index	Base + Index	Std ESSI Code
13:OFFSET 1 ON	+1	11+1	11
12:OFFSET 1 OFF	+1	12+1	12
28:OFFSET 2 ON	+2	11+2	15
29:OFFSET 2 OFF	+2	12+2	16
86:OFFSET 3 ON	+3	11+3	282
87:OFFSET 3 OFF	+3	12+3	283
88:OFFSET 4 ON	+4	11+4	284
89:OFFSET 4 OFF	+4	12+4	285
90:OFFSET 5 ON	+5	11+5	286
91:OFFSET 5 OFF	+5	12+5	287
92:OFFSET 6 ON	+6	11+6	288
93:OFFSET 6 OFF	+6	12+6	289
94:OFFSET 7 ON	+7	11+7	290
95:OFFSET 7 OFF	+7	12+7	291
96:OFFSET 8 ON	+8	11+8	292
97:OFFSET 8 OFF	+8	12+8	293

To define different base codes for the ESSI format, assign the desired codes to the OFFSET 1 ON and the OFFSET 1 OFF functions through the Custom Auxiliary Code Conversion Utility.

9.6.3 ESSI AUXILIARY FUNCTION CODE CONVERSIONS

Most of the special program format variations supported by the ***Burny Series 10*** are selected through the Standard Program Format and Custom Program Format data variables in ***SYSTEM SETUP***. These variables allow the ***Burny Series 10*** to customize the conversion routines used when saving program in ***NC Program Memory*** and rebuilding the selected format. As a result, once a program has been placed in memory, changes to these variables will not affect how the part program is run. Therefore, if a program is accidentally loaded from a device with the wrong setup, it must be reloaded after the correct setup has been defined.

Additionally, all programming formats go through an ***Auxiliary Function Code Conversion Process***, whether standard or custom. This section details the auxiliary function code conversion process and ***SYSTEM SETUP*** data variables for standard and custom ESSI formats.

ESSI	Mapped To:
00	21:PROGRAM STOP
03	24:PROGRAM DATA SKIP ON
04	25:PROGRAM DATA SKIP OFF
05	31:HIGH SPEED MODE
06	30:CUT SPEED MODE
07	06:CUT ON
08	05:CUT OFF
09	11:MARKER 1 ON
10	10:MARKER 1 OFF
11	13:OFFSET 1 ON
12	12:OFFSET 1 OFF
13	26:MARKER 2 ON
14	27:MARKER 2 OFF
15	28:OFFSET 2 ON
16	29:OFFSET 2 OFF
21	61:NO MIRROR, NO SWAP
22	62:MIRROR Y, NO SWAP
23	63:MIRROR XY, NO SWAP
24	64:MIRROR X, NO SWAP
25	65:SWAP XY, MIRROR XY
26	66:SWAP XY, MIRROR X
27	67:SWAP XY, NO MIRROR

ESSI	Mapped To:
28	68:SWAP XY, MIRROR Y
29	08:KERF LEFT
30	09:KERF RIGHT
38	07:KERF OFF
39	57:PROGRAMMABLE FEEDRATE
40	59:PROGRAMMED KERF
41	19:PROGRAMMABLE DWELL
61	127:PUNCH MARKER #1 (ONE SHOT)
62	128:PUNCH MARKER #2 (ONE SHOT)
63	60:AUX STATE RESET
64	23:PROGRAM END WITH REWIND
65	39:MULTI SETUP SELECT
67	99:HT. SENSOR ENABLE
68	98:HT. SENSOR DISABLE
70	14:INCH DIMENSIONS
71	15:MILLIMETER DIMENSIONS
79	122:HOME TABLE #0 SELECT
81	18:INCREMENTAL DIMENSIONS
82	16:ABSOLUTE PGM. DIMENSIONS
84	132:ROTARY C SWAP 180 ON
85	133:ROTARY C SWAP 180 OFF
86	129:ROTARY C HOME AND HOLD

ESSI	Mapped To:
87	130:ROTARY C HOLD
88	131:ROTARY C ENABLE
89	20: LEAD-IN DIM. Move
90	22:PROGRAM END
92	17:ABSOLUTE REGISTER PRELOAD
95	56:PART INCREMENT
96	105:CHAIN BOTTOM NO INCREMENT
97	03:CHAIN TOP
98	04:CHAIN BOTTOM WITH INCREMENT
99	23:PROGRAM END W/RWIND
237	83:X SIGN TOGGLE
238	84:Y SIGN TOGGLE
239	85:XY SWAP TOGGLE
245	40:AUX OUTPUT 1 ON
246	41:AUX OUTPUT 1 OFF
247	42:AUX OUTPUT 2 ON
248	43:AUX OUTPUT 2 OFF
249	44:AUX OUTPUT 3 ON
250	45:AUX OUTPUT 3 OFF
251	46:AUX OUTPUT 4 ON
252	47:AUX OUTPUT 4 OFF
253	48:AUX INPUT 1 ON
254	49: AUX INPUT 1 OFF
255	50: AUX INPUT 2 ON
256	51: AUX INPUT 2 OFF
257	52: AUX INPUT 3 ON
258	53: AUX INPUT 3 OFF
259	54: AUX INPUT 4 ON
260	55: AUX INPUT 4 OFF
261	69:AUXILIARY TORCH MASTER ON
262	70:AUXILIARY TORCH MASTER OFF
266	100:DATA TABLE #1 SELECT
267	101: DATA TABLE #2 SELECT
268	102: DATA TABLE #3 SELECT
269	103: DATA TABLE #4 SELECT
270	123:HOME TABLE #1 SELECT
271	124: HOME TABLE #2 SELECT
272	125: HOME TABLE #3 SELECT
273	126: HOME TABLE #4 SELECT
276	104:INTERNAL VARIABLE LOAD
277	34: EXTERNAL VARIABLE LOAD
278	35: X HOME SW/INDEX FIND
279	36: Y HOME SW/INDEX FIND
280	37:RETURN FROM X HOME DIMENSION
281	38: RETURN FROM Y HOME DIMENSION
282	86:OFFSET 3 ON
283	87:OFFSET 3 OFF
284	88:OFFSET 4 ON
285	89:OFFSET 4 OFF

ESSI	Mapped To:
286	90:OFFSET 5 ON
287	91:OFFSET 5 OFF
288	92:OFFSET 6 ON
289	93:OFFSET 6 OFF
290	94:OFFSET 7 ON
291	95:OFFSET 7 OFF
292	96:OFFSET 8 ON
293	97:OFFSET 8 OFF
300	106:AUX OUTPUT 5 ON
301	107:AUX OUTPUT 5 OFF
302	108:AUX OUTPUT 6 ON
303	109:AUX OUTPUT 6 OFF
304	110:AUX OUTPUT 7 ON
305	111:AUX OUTPUT 7 OFF
306	112:AUX OUTPUT 8 ON
307	113:AUX OUTPUT 8 OFF
320	114:AUX INPUT 5 ON
321	115:AUX INPUT 5 OFF
322	116:AUX INPUT 6 ON
323	117:AUX INPUT 6 OFF
324	118:AUX INPUT 7 ON
325	119:AUX INPUT 7 OFF
326	120:AUX INPUT 8 ON
327	121:AUX INPUT 8 OFF
400	123: HOME TABLE #1 SELECT
401	124: HOME TABLE #2 SELECT
402	125: HOME TABLE #3 SELECT
403	126: HOME TABLE #4 SELECT
404	154: HOME TABLE #5 SELECT
405	155: HOME TABLE #6 SELECT
406	156: HOME TABLE #7 SELECT
407	157: HOME TABLE #8 SELECT
408	158: HOME TABLE #9 SELECT
409	159: HOME TABLE #10 SELECT
410	160: HOME TABLE #11 SELECT
411	161: HOME TABLE #12 SELECT
412	162: HOME TABLE #13 SELECT
413	163: HOME TABLE #14 SELECT
414	164: HOME TABLE #15 SELECT
415	165: HOME TABLE #16 SELECT
416	166: HOME TABLE #17 SELECT
417	167: HOME TABLE #18 SELECT
3332	32: XMIT TO PLC BEFORE MOVE & RUN
3333	33: XMIT TO PLC AFTER MOVE & WAIT

9.6.4 SYSTEM SETUP DATA VARIABLES FOR ESSI PROGRAMMING

INTRODUCTION

System data is set up to accommodate two special aspects of program loading:

- Special start and end of program sequences and Custom auxiliary function codes that are part of the program
- Enabling or disabling during the Load conversion process certain custom conventions in the program relating to the signs of dimensions, arc characteristics, etc. Also in this class are choices about stripping line number, messages, etc.

In the ***Part 7***, ***Utility***, under ***Custom Aux Codes*** is an explanation for putting these changes in place. The two sections below are included here for convenience to the programmer.

CUSTOM PROGRAM ITEMS

Special Start Of Program Sequence

This feature can be used if a start sequence is needed and the % character is not desired to delimit the top or start of the program.

End Of Program Sequence

This feature is used if the program doesn't have a normal end auxiliary function code. This feature allows a user-defined ASCII code sequence to be used as an additional END OF PROGRAM WITH REWIND code termination sequence. When enabled, this sequence does not inhibit the use of standard M02 or M30 function codes or any auxiliary function code defined through the Custom Auxiliary Function Code Conversion Table as END OF PROGRAM or END OF PROGRAM WITH REWIND.

After the user-defined sequence has been entered in a custom aux code file, the following occurs. When encountered in a program during a LOAD operation, the control stores an END OF PROGRAM WITH REWIND code at the end of the program file, in place of the special termination sequence. It then performs the END OF PROGRAM WITH REWIND operation. This prevents multiple program from being loaded and causes a rewind operation to be initiated. To terminate the rewind, the operator must press the <RST> key before the rewind begins or within 3 seconds from the start of the rewind.

This function is used to prevent the STORE process from sending program names to serial devices or the floppy, and prevents the text editor from reading program names inside the file. This function prevents the non-standard ESSI program number and name block from being sent to a serial device or read by the TEXT EDITOR when the STANDARD ESSI program format is selected.

CUSTOM AUXILIARY FUNCTION CODE CONVERSION

This feature is used if the ***NC*** programmer needs to assign any external auxiliary function code as any internally supported auxiliary function.

AXIS SWAP

This feature is used for correcting programming differences in X/Y axes definitions. It causes the axes definitions during serial device LOAD / STORE operations and PROGRAM EDIT operations to be swapped so that the internal program matches the standard X and Y axis conventions used by the control. When enabled, the following conversions are performed:

+X	=>	+Y
-X	=>	-Y
+Y	=>	+X
-Y	=>	-X

When performing LOAD operations and both AXIS SWAP and AXIS SIGN INVERT are enabled, AXIS SIGN INVERT is performed first. When performing STORE operations, AXIS SWAP is performed first, so that the external convention remains unchanged. For example, when performing a LOAD operation with AXIS SWAP and X AXIS SIGN INVERT enabled, but not Y AXIS SIGN INVERT enabled, the following conversions are performed:

+X	=>	-X	=>	-Y
-X	=>	+X	=>	+Y
+Y	=>	+Y	=>	+X
-Y	=>	-Y	=>	-X

AXIS SIGN INVERT

This feature causes the sign of the dimension data on the specified axis to be inverted during LOAD / STORE operations and PROGRAM EDIT operations so that the internal program matches the standard X and Y axis directions used by the control.

When enabled for the X axis but not the Y axis:

+X	=>	-X	and	-X	=>	+X
+Y	=>	+Y	and	-Y	=>	-Y

When enabled for the Y axis but not the X axis:

+X	=>	+X	and	-X	=>	-X
+Y	=>	-Y	and	-Y	=>	+Y

FIXED INCREMENTAL I/J

This feature allows the user to define the I and J dimension value format as INCREMENTAL even when the X and Y dimension values are programmed in ABSOLUTE.

INVERT ARC DIRECTION

This feature allows the internal arc direction support to perform inverted arc processing operations when performing LOAD, STORE, and EDIT operations. It is provided primarily to allow programs written in the ESSI format with non-standard arc direction conventions (+/-) to be used with the control. However, this feature affects all ESSI and Word Address program formats.

ABSOLUTE DIMENSION TYPE

This feature allows the user to change the system default for program dimension type from INCREMENTAL to ABSOLUTE. The system default is INCREMENTAL unless the dimension type is changed by the appropriate auxiliary function code. However, if this function is enabled, all program dimensions are assumed to be in ABSOLUTE unless changed by an auxiliary function code. The dimension type selected by this function is also used to define the required format when storing an internally created SHAPE program to a serial device.

PROGRAMMED FEEDRATE

This feature allows executing ***NC*** programs to directly set the desired cutting speed. If it is not enabled, all feedrate values contained in the program are ignored when running, but are retained in the program for possible future use.

In the ESSI programming language, programmed feedrate values are defined using an extended function block format.

For example:

39+1000:

Defines a feedrate of 10.00 IPM (Inches Per Minute) when in inch mode and 100.0 mmPM when in metric (millimeter) mode. Remember that decimal points are not allowed in ESSI, since ESSI uses implied decimal points. A total of seven digits is allowed. Inch units are in 5.2 format and millimeter units are in 6.1 format.

When a ***NC*** program is executed, the initial cutting feedrate is defined from the most recent digital feedrate value. This feedrate remains as the selected feedrate until changed by a program-defined feedrate or until it is overridden by an operator-defined feedrate. Similarly, as the ***NC*** program continues and encounters additional feedrate commands, each overrides the previously defined cutting speed.

Digital feedrate values specified by the operator override the last defined-programmed feedrate value. However, programmed feedrate values have no affect on the last operator-defined feedrate value.

Only programmed feedrate values between .12 IPM and the defined RUN SPEED LIMIT value are allowed. Programmed values greater than the RUN SPEED LIMIT is replaced with this limit value. Programmed feedrate values less than .12 IPM are replaced with the MINIMUM HOLD SPEED value.

The speed dial setting always scales feedrate values used during cutting moves. However, the resulting feedrate value depends upon the actual dial position and the speed dial mode selected. Normally, a full dial setting uses 100% of the programmed feedrate value. However, the 120% range is selected by a bit in SYSTEM CONFIGURATION #1, the resulting feedrate will be 120% of the programmed rate when at the full dial position, provided this value does not exceed the defined RUN SPEED LIMIT value.

Cutting feedrate values are saved at the “start of part” and “pierce” positions with other position and status data. This allows “return” operations that are performed in ***RUN*** mode to restore the feedrate at the return position to its original value. The cutting feedrate value is always reset to the most recent digital feedrate value when returning to the HOME position.

Traverse moves are always performed at the TRAVERSE SPEED LIMIT and are not normally affected by the speed dial position. The exception is when the dial is turned to zero and all machine motion is inhibited.

9.6.5 EMBEDDED CONTROL/COMMANDS

This type of record resembles a Program Message Block in that it is essentially a comment block with special information in it.

Word Address format is "(>50<ID,CODE, DEST, TYPE, DATA)" where:

>50<	Record type identifier.
ID	PS (Plasma System), JS (Job Setup), BP (Burny Parameters) parameters.
CODE	Parameter designator. See the tables below for details.
DEST	For JS and BP use 0.For PS, use 1 for the Hypertherm HD4070.
	For PS to Inner Logic, use the Node Address + 20, so that the DEST value is 21 through 28.
TYPE	0=4-byte integer or 4-byte long, 1=4 byte float.
DATA	Actual Data per for the format indicated by TYPE.

Plasma Setup (PS) Code Definition Table for HyperTherm HD4070

CODE	Description	TYPE	Data
1	Process Number, i.e. Cut Chart	Integer	0-999
2	Unused (Material Type)	Integer	
3	Unused (Thickness)	Float	Inches
4	Unused (Thickness Code)	Integer	Number
5	PreCut 1 Set	Integer	Percent, 0 – 100
6	Cut 1 Set	Integer	Percent, 0 – 100
7	PreShield 1 Set	Integer	Percent, 0 – 100
8	Shield 1 Set	Integer	Percent, 0 – 100
9	PreCut 2 Set	Integer	Percent, 0 – 100
10	Cut 2 Set	Integer	Percent, 0 – 100
11	PreShield 2 Set	Integer	Percent, 0 – 100
12	Shield 2 Set	Integer	Percent, 0 – 100
13	Arc Amperage	Integer	Amps
14	Arc Voltage	Float	Volts, e.g. 90.3
15	Pierce Height	Float	Percent, 50 - 300
16	Cut Height	Float	Inches, e.g. 0.080
17	Pierce Delay	Float	Seconds, 0.0 – 9.0
18	Cut Speed	Float	Inches per Minute
19	Active Torch	Integer	1 or 2 (4070)
20	Corner Current	Integer	Percent, 50 – 100
21	Save Process	Integer	0
22	TorchConfig	Integer	0 – 331
23	Gas Purge	Integer	0
24 – 79	Spare		
80	THC - Pierce Height Factor	Float	Percent, 50 – 300
81	THC - Pierce Delay	Float	Seconds, 0.0 – 9.0
82	THC - IHS Speed	Integer	Unitless, 1 – 10
83	THC - IHS Stall Force	Integer	Unitless, 1 – 10
84	THC - Retract Speed	Integer	Unitless, 1 – 10
85	THC - Retract Height	Float	Inches, e.g. 0.205
86	THC - Nozzle Contact	Integer	0 = off, 1 = on
87	THC - Cut Height	Float	Inches, e.g. 0.075
88	THC - Auto Kerf	Integer	0 = off 1 = on
89	THC - Machine Delay Acceleration	Float	Seconds, 0.0 – 9.0
90-99	THC - Spare		

Plasma Setup (PS) Code Definition Table for Inner Logic:

CODE	DESCRIPTION	TYPE	DATA
100	Load Cut Chart Number	Integer	0 – 32000
101	Material Type *	Integer	0 – 4 (Enumerated)
102	Thickness *	Float	Inches
103	Amperage *	Integer	Enumerated
104	Pierce Height**	Float	0 – 0.999
105	Cut Height**	Float	0 – 0.999
106	Arc Voltage**	Float	50.0 – 200.0
107	Motion Delay	Float	0 – 5.000 Seconds
108	Travel Speed	Integer	0 – 999 IPM
109	Unused (Preflow Gas Type)	Integer	--
110	Preflow Gas PSI	Float	0 – 120.0 psi
111	Plasma Gas Type	Integer	Enumerated
112	Plasma Gas PSI	Float	0 – 120.0 psi
113	Shield Gas Type	Integer	Enumerated
114	Shield Gas PSI	Float	0 – 120.0
115	Process Type	Integer	0 = Cutting 1 = Marking
116	Pierce Time	Float	0 – 9.999 seconds
117	AGI Mode	Integer	0 = Disable (Mode 1) 1 = Enable (Mode 2)
118	Enable Limit	Integer	0 = Disable; 1 = Enable
119	Enable CTP	Integer	0 = Disable; 1 = Enable
120	Enable ACA	Integer	0 = Disable; 1= Enable
121	Partial Raise Height	Float	0 – 0.999 inches
122	Touch Force	Integer	0 – 200
123	Crossover Height	Float	0 – 9.999 inches
124	Retract Delay	Float	0 – 9.999 seconds
125	AVC Delay	Float	0 – 9.999 seconds
126	Proportional Gain	Integer	50 – 750
127	Manual Speed	Integer	0 – 999 IPM
128	Slow Inch Speed	Integer	0 – 99 IPM
129 - 199	Spare		

NOTES for PS with Inner Logic:

* - Material Type, Thickness and Amperage must ALL be set and in that order (Material Type first, Thickness second, Amperage third), after which, all other Inner Logic parameters are reset to default settings for the specified Material/Thickness/Amperage. OR, use the Load Cut Chart number to set up the parameters.

** - Pierce Height, Cut Height and Arc Voltage must ALL be set and in that order (Pierce Height first, Cut Height second, Arc Voltage third). OR, use the Load Cut Chart number to set up the parameters.

Job Setup (JS) Code Definition Table

CODE	Description	TYPE	Data
1	Process	Integer	0=Use Default 1=Oxy 2=Plasma 3=Water 4=Laser
2	Cut Mode	Integer	0=Use Default 1=Automatic 2=Manual
3	Preheat	Float	Seconds (0 - 9999.9)
4	Pierce Hold	Float	Seconds (0 - 9999.9)
5	Plasma Advance Off	Float	Seconds (0 - 9999.9)
6	Pierce Ramp	Float	Seconds (0 - 9999.9)
50	User Parameter #1	Float	-Float to +Float
51	User Parameter #2	Float	-Float to +Float
52	User Parameter #3	Float	-Float to +Float
53	User Parameter #4	Float	-Float to +Float
54	User Parameter #5	Float	-Float to +Float
55	User Parameter #6	Float	-Float to +Float
56	User Parameter #7	Float	-Float to +Float
57	User Parameter #8	Float	-Float to +Float
58	User Parameter #9	Float	-Float to +Float
59	User Parameter #10	Float	-Float to +Float

Burny Parameters (BP) Code Definition Table

CODE	Description	TYPE	Data
1	Minimum Off Time	Float	Seconds (0 - 9999.9)
2	Oxygen Bleed Off Time	Float	Seconds (0 - 9999.9)
3	Plasma Arc On Delay	Float	Seconds (0 - 9999.9)
4	Plasma Arc Off Delay	Float	Seconds (0 - 9999.9)
5	Plasma Start Delay	Float	Seconds (0 - 9999.9)
6	Goal Point Tolerance	Float	0 - 1
7	Cornering Speed	Float	Meters per second (0 - Maximum Table Velocity)
8	Plasma Marker Delay	Float	Seconds (0 - 9999.9)
9	Marker Velocity	Float	Meters per second (0 - Maximum Table Velocity)
10	Default Dwell	Float	Seconds (0 - 9999.9)

9.7 GENERIC SHAPES PROGRAMMING

9.7.1 INTRODUCTION

CUSTOM GENERIC SHAPES are special “user defined” shape programs that perform operations similar to ***STANDARD SHAPE*** programs. ***CUSTOM GENERIC SHAPE*** programs can be created off-line, then loaded into the ***Burny Series 10***. ***CUSTOM GENERIC SHAPES*** are located in a special directory in non-volatile program memory called ***CUSTOM SHAPE MEMORY***. Once loaded into this memory, any number of “***SHAPE***” operations can then be performed using the shape program. This allows an unlimited number of ***NC*** part programs to be created from a single ***CUSTOM GENERIC SHAPE***.

A "***SHAPE***" operation for a custom generic shape is the process of assigning desired values to the various items that the program prompts for when run in the ***Shapes*** mode. All ***CUSTOM GENERIC SHAPES*** loaded in the Burny Series 10 appear as icons on the ***Select Custom Shape*** screen in the ***Shapes*** mode. Touch the icon and the ***CUSTOM GENERIC SHAPE*** program runs***.*** See ***Section 5, Shapes***, in this manual for details.

The ***GENERIC SHAPE*** capability is supported in the ***Burny Series 10*** with a special programming language. This language resembles the ***EIA*** standard ***WORD ADDRESS*** programming language and allows ***WORD ADDRESS*** blocks to be directly used. However, the major advantage of this language over ***WORD ADDRESS*** is in its ability to support prompting operations and perform mathematical and logical operations on variables. Special assignment statements allow these variables to be used in place of actual dimension values. This enables the operator to use ***GENERIC SHAPE*** programs to create not one, but a family of ***NC*** part programs of different dimensions.

When performing a “***SHAPE***” operation, prompting strings contained in the shape program request dimensions and values from the operator for the required custom part. These shape programs always use the prompt strings defined in the ***GENERIC SHAPE*** program.

LOADING A CUSTOM GENERIC SHAPE

A complete ***Custom Generic Shape*** program package consists of three files:

- The ".gnr" Custom Generic Program itself
- A ".jpg" graphic image file 0.75" X 0.75" showing the part
- An ".html" text help file

All these files must be loaded into the ***Burny Series 10*** using the ***Custom Shape File Type*** option.

Only the ".gnr" file is needed to use the program for making parts. The ".jpg" graphic file, if provided, will be displayed in the icon that appears in the ***Select Custom Shape*** screen. This helps the operator to make his selection. The ".html" file, if provided, will be displayed during the ***Shapes*** operation if the ***Help*** keypad is touched. The ".jpg" file and the ".html" file must have names (portion of the filename before the ".") identical to the ".gnr" file

If no ".jpg" file is provided, the upper portion of the icon will display "***Custom Shape Program***". If no ".html" file is provided, touching ***Help*** during the ***Shapes*** operation will display a default ***Custom Shapes*** help file in the language currently chosen in the ***Utility Mode***.

DESCRIPTION

When the ***Custom Generic Shape*** program is run by selecting it in ***Shapes*** mode, the ***Burny Series 10*** reads the program and constructs a graphic image of the part. This image appears at the upper right of the screens during the ***Shapes*** operation. Default values must be included in the program to make sure a feature appears in this image. For instance, the operator may be prompted for the diameter of a hole in the middle of a rectangular plate. If a default value greater than zero was not provided for this variable in the program, the hole will not appear in the thumbnail image until the ***Verify*** screen is reached.

The prompting dimension lines and labels that appear in the ***Standard Generic Shape*** programs can be written into ***Custom Generic Shape*** programs as described in ***Section 9.8***, ***Advanced Generic Programming***.

Programs written in the ***GENERIC SHAPE LANGUAGE*** can be loaded, stored, deleted and edited like any other program in the ***Burny Series 10***. The only difference is that ***GENERIC SHAPE*** programs should be loaded using the ***CUSTOM SHAPE*** program type option. This option causes them to be placed in the ***CUSTOM GENERIC SHAPE*** directory. After loading, the name of the file appears in a new icon on the ***Select Custom Shape*** screen. Touch this icon to perform a shape operation with the new program.

Like ***STANDARD SHAPE*** programs, ***CUSTOM SHAPE*** programs can not be directly "***RUN***". Instead, they must be used in a "***SHAPE***" operation to allow the prompting operations to be performed and the desired part program to be created. The resulting ***NC*** program is then automatically placed in ***NC PROGRAM MEMORY***. From this memory, it can be run, stored, included in a nest and/or edited like any other ***NC*** program.

*The **Burny Series 10** GENERIC language supports the decode of the Burny IV and Burny 5 "A, B and C loops". Burny IV programs with these loops can be loaded into the **Burny Series 10** as GENERIC programs and then can be used like any other GENERIC program to make an **NC** part program. The resulting program can then be RUN on the **Burny Series 10**.*

9.7.2 WORD ADDRESS COMPARED WITH GENERIC

The following table compares the steps necessary to program and cut two (or more) similar parts using WORD ADDRESS and GENERIC SHAPE programming. It illustrates the benefits of using the GENERIC format.

Word Address Language	Generic Shape Language
Obtain drawings for first part to be programmed	Obtain drawings for family of similar parts.
Establish equations necessary to calculate program data for each segment of the part.	Establish equations necessary to calculate program data for each segment of the part
Use these equations to calculate specific X,Y,I,J data for each block of the program.	
Write program in standard word address using specific X,Y,I,J data for each block	Write shape program in generic language using the equations for each data block rather than specific dimensions
Load NC program into Burny NC program memory	Load shape program into Burny generic shape memory.
	Use "SHAPE" operation to create desired NC program. Operator is prompted for part dimensions. Burny generates an NC program with the required X,Y,I and J data for each program block.
Setup and run NC program.	Setup and run NC program.

Up to this point, both methods are about equal as far as the steps required and the time spent. However, consider the next part in the family of similar parts to be cut. This is where the GENERIC SHAPE programming language saves time over WORD ADDRESS.

Word Address Language	Generic Shape Language
Use the same equations as before and calculate the X,Y,I,J data for each data block	No recalculating required program.
Write a new program or edit the previous one for the dimensions of the new part.	No need to write another NC program
Load NC program into *Burny Series 10* NC program memory.	No need to load shape program since shape is already in GENERIC SHAPE MEMORY
	Use "shape" operation to create desired NC program. Operator is prompted for part dimensions Burny generates an NC program with the required X,Y,I and J data for each program block
Setup and run NC program	Setup and run NC program.

This example illustrates the advantages of using the GENERIC SHAPE programming language. Specific dimensions are directly entered into the ***Burny Series 10*** by the operator to create the desired NC part program. Different parts can then be created by simply entering different values. Normal WORD ADDRESS programming requires that a new program be created for each different part to be cut.

9.7.3 LANGUAGE DESCRIPTION

The format and syntax used by this language closely resemble the EIA standard WORD ADDRESS programming language. Standard WORD ADDRESS programming blocks can be directly used in a GENERIC SHAPE program.

Several special block formats are supported in the GENERIC SHAPE LANGUAGE. Prompting function blocks allow a shape to request dimensions and values from the operator for the required ***NC*** part. Mathematical, trigonometric and **logical function** blocks are also supported by the GENERIC SHAPE programming language. Other features of the language allow “dimension variables” to define dimension values, system variables for access of machine specific information and auxiliary code values for the resulting ***NC*** program.

GENERIC SHAPE programs can be created off-line using standard ASCII codes (ref. ANSI X3.4) and loaded into the ***Burny Series 10*** from a serial device or the panel mounted floppy. They can also be created (and modified) using the ***Burny Series 10*** TEXT EDITOR. The only difference when using the editor is that the operator must specify “GENERIC SHAPE” instead of “NC PROGRAM” as the program type.

The starting block of a GENERIC SHAPE program typically contains a “G” instead of the “%” code used in the WORD ADDRESS programming language. However, the ***Burny Series 10*** will also accept GENERIC SHAPE programs starting with a “%” code. Either starting code (% or G) must be followed by an “end of block” code. An “end of block” code can be either a carriage return, a line feed or both. As in WORD ADDRESS programs, GENERIC SHAPE program numbers are assigned in the ***Burny Series 10*** using the “P” command followed by up to 8 digits in the second line of the program. GENERIC SHAPE names and messages are also supported in the ***Burny Series 10*** as shown in the following example.

G<EOB>
(NAME OF GENERIC SHAPE)<EOB>
(SHAPE MESSAGE FOR ***NC*** PROGRAM)<EOB>
M30<EOB>

There are 100 variables that are available for use in defining part equations and for prompting the operator for part dimensions. These variables are specified as D0 through D99. They may be used in any order and may be used more than once within a program.

9.7.4 OPERATOR PROMPTS

Operator prompts cause messages to appear on the screen which query the operator to enter dimensions or values. There are two types of operator prompts. The first allows the user to enter a numeric value. The second allows the user a range of choices shown in a display window.

Numeric prompts use the following format:

NUMERIC ANSWER PROMPTS

D15 “ENTER [X] DIMENSION” 3,2,A ;99.99

│A│ B │ C │ D │

where:

│A│ is the first field in the block. It contains a variable number (D0 to D99) which is assigned the value entered by the operator.

│B│ is the second field in the block, a text section which contains a message enclosed by either single or double quote marks (**’** or **”**). The message between the quote marks is displayed on the screen to prompt the operator for the value to be entered.

│C│ follows the text section and defines the number of digits the operator is allowed to enter for the value. The first number following the ending quote mark indicates the number of whole digits allowed. The second number (separated by a comma) indicates the number of decimal places allowed. An optional comma and “A” character may also be present in this field. If the “,A” characters are not present, then only an unsigned value can be entered. However if the “,A” characters are present, then both positive and negative values can be entered at the prompt. The maximum format is 5 digits to the left of the decimal and 4 digits to the right.

The following table provides several examples of the supported format types:

Format	Positions To Left Of Decimal	Positions To Right Of Decimal
0,1 .X	0	1
0,2 .XX	0	2
1,0 X	1	0
3,1 XXX.X	3	1
4,3 XXXX.XXX	4	3
1,4 X.XXXX	1	4
5,2 XXXXX.XX	5	2

| D | is an optional field which can be used to define default prompt values. The value specified must follow a ";" code. The use of this field is not required for normal operations but will insure that the feature will be displayed in the thumbnail image.

Example:

D23 'OFFSET DIMENSION' 4,2,A; 15.25

This ***GENERIC SHAPE*** programming block generates the following prompt line in the Question field of the Shapes02 screen:

OFFSET DIMENSION

The default dimension, 15.25, appears above the numerical keypad in the ***Shapes02*** screen. This figure is changed to the desired value by touching the keys. Since the ",A" format was specified, negative values may also be entered.

MULTIPLE CHOICE PROMPTS

D15 'ENTER STARTING CUT POSITION' [1 "NW", 3 "NE", 7 "SW", 9 "SE"]*3*

| A | B | C | D |

|**A-B**| are identical in syntax to numeric answer prompts.

|**C**| Enclosed in brackets are the multiple choice answers. The list can be up to nine different possible answers. Each answer has a number between 1 and 9 followed by a short text string. The text strings can be up to 30 characters long. When this prompt is displayed, the letters will appear as key labels. Touching a label assigns the associated number as the value of the variable. If in the above example, "SW" is selected, the value 7 will be stored as the variable "D15". Duplicate numbers are not allowed. Each pair of number and text answer is separated by a comma.

|**D**| Optional default answer. This number must be a legal choice (listed with one of the selections.

9.7.5 ARITHMETIC EQUATIONS

Arithmetic equations contain the assignments and equations necessary to calculate the specific dimensions for the part program.

The first item is the identifier of the variable (D0 to D99) used to store the result of the arithmetic operation. The variable identifier is always followed by an equal sign "=". The equal sign is followed by an equation for the calculation, a variable identifier, or a constant value.

Examples:

```
D0=3
D1=D0
D14=D1+D7
D25=D1
D26=D25+4
D27=5.678
D10=2*D27
```

When using constants, the number of digits in the value must be limited to 9 with a maximum of 4 decimal places. Values with more than 4 decimal places will cause an error message to appear when the ***NC*** program is created. Values having more than 9 total digits will be truncated to the least significant 9 places.

When using the algebraic operators (+,-,/,and *), the operator must be placed between the variables and constants upon which the function is to be performed.

Example:

D2=D3+.25

This equation would add .25 to the value in D3 and place the result in D2. The same variable may appear on both sides of the mathematical assignment function:

Example:

D23=D23+5

If D23 was equal to 10.00 before the operation is performed, D23 will equal 15.00 after the operation.

Example:

D32=D32*D32

The above block will square the value of D32 and place the results back in variable D32.

The following math functions are supported in the GENERIC SHAPE programming language.

Operator	Description
"+"	Addition Operation. Adds two variables, a constant and a variable, or two constants.
"-"	Subtraction Operation. Subtracts two variables, a constant and a variable, or two constants.
"*"	Multiplication Operation. Multiplies two variables, a constant and a variable, or two constants.
"/"	Division Operation. Divides two variables, a constant and a variable, or two constants.

MATH FUNCTIONS

S Sine Function. Calculates the SIN of a value. Value is assumed to be an angle in degrees.

C Cosine Function. Calculates the COS of a value. Value is assumed to be an angle in degrees.

T Tangent Function. Calculates the TAN of a value. Value is assumed to be an angle in degrees.

U Arc Cosine Function. Calculates the ARCCOS of the value. Value must be between +1 and -1 inclusively. Result is an angle in degrees.

V Arc Tangent Function. Calculates the ARCTAN of the value. Result is an angle in degrees.

R Square Root Function. Calculates the Square Root of a value. Value cannot be negative.

I Integer Function. Truncates a decimal value to whole digits only. It does not round up or down value before truncation.

F Fudge Integer Function. Converts a value to the closest integer by rounding up or down.

A Absolute Value Function. Forces the value positive.

N Negate Value Function. Negates the value. (Positive to negative, negative to positive).

When performing algebraic operators (+,-,*,/), operations are performed in a left to right order. Unlike other programming languages that assign a higher operation priority to multiply and divide operations, the ***GENERIC SHAPE*** programming language assigns equal priority to all arithmetic operations and executes them as they appear in the block (left to right order). Operations grouped by parentheses ('(' and ')') will be executed with higher precedence. The precedence has been modified to remain compatible with all B5/B4 ***GENERIC*** programs while still giving the programmer in-line precedence power.

Example 1:

D1=2
D3=5
D9=10
D30=D9*D3-D1*D1

This equation will be evaluated as: ((10*5)-2)*2 = 96 and assign a value of 96 to variable number D30.

Example 2:

```
D1=2
D3=5
D9=10
D30=D9*(D3-D1)*D1
```

This equation will be evaluated as: 10*(5-2)*2 = 10*3*2 = 60 and assign a value of 60 to variable number D30.

The variables to the right of the "=" sign will not have their values altered by any mathematical function. Only the variable to the left of the "=" sign will be altered.

When using the alphabetic MATH function operators (S, C, T, U, etc.) each must precede the variable or constant upon which the function is to be performed.

Example:

```
D2=S35
```

This block calculates the SIN of 35 degrees and places the resulting value of .5735764 in D2. When used with algebraic operators (+,-,*,/) in the same equation, the alphabetic operator functions are ALWAYS evaluated first.

Example:

```
D35=2*V20
```

This block calculates the ARCTAN of 20 (which is 87.137594), multiplies it by 2 and places the resulting value of 174.27519 in D35. Multiple functions with the alphabetic operators (A,I,R,S, etc.) may be performed by stacking the operators before the variable. In this case, the functions will be evaluated starting with the one closest to the variable.

Example:

```
D28=RASD15
```

This equation would perform calculations in the following sequence:

1) Calculate the sine of the variable D15.
2) Calculate the absolute value of the results from step 1.
3) Calculate the square root of the results from step 2.
4) Place the final result in variable D28.

In conventional algebraic terms, the above example would appear as: SQRT(ABS(SIN(D15)))

The ***GENERIC SHAPE*** programming language also supports several pre-defined constants. These constants are values commonly used in calculations and are provided to simplify programming. They are specified using the letter "K" followed by the number of the constant. The following constants are supported.

K0	=	SQRT(2)/2	(.70710)
K1	=	SQRT(2)	(1.41421)
K2	=	SQRT(3)	(1.73205)
K3	=	PI	(3.14159)

Example:

```
D10=D1*K0
```

This block multiplies the value in D1 with the constant value of .70710 (which equals the square root of 2 divided by 2) and places the resulting value in D10.

9.7.6 WORD ADDRESS ASSIGNMENTS

Any WORD ADDRESS variable within a block which has a fixed value may be encoded using standard ***WORD ADDRESS*** programming conventions. ***WORD ADDRESS*** code may be placed anywhere in a ***GENERIC*** program but must be on its own line.

Examples:

```
X5Y-8
G41
(START OF CUT)
M04
G03I3J-8
```

The ***GENERIC SHAPE*** language message text block format allows a ***GENERIC*** register number to be defined in message strings for substitution with the actual register value during the ***NC PROGRAM*** build process. This allows the ***GENERIC*** process to build message strings for display during ***RUN*** with values defined by the contents of ***GENERIC*** registers. The ***GENERIC*** register is declared for substitution by an immediately preceding '@' sign.

Example:

(CUTTING CIRCLE DIA.=@D4)

In this program block, the message generated would depend on the value defined by register D4. If register D4 contained the value 4.5, then the message generated by the ***GENERIC*** process would be:

(CUTTING CIRCLE DIA.=4.5)

This marker is used to differentiate a ***GENERIC*** register from text that accidentally appears to be a register. For example the text "BURNED4" will NOT be converted to "BURNE4.5."

A WORD ADDRESS variable may also be assigned the value contained in one of the GENERIC variables (D0 to D99). This is accomplished by following the WORD ADDRESS variable (X, Y, G, etc.) with an equal sign "=" and then the identifier of the variable that contains the desired value.

Example:

N1G42X=D2Y=D3

In this block, if D2 had a value of 3.5 and D3 had a value of .5, the resulting WORD ADDRESS block would be as follows:

N1G42X3.5Y.5

In "TYPE 3" blocks, a GENERIC variable identifier (D0 to D99) may be preceded by a minus sign. This causes the value from the GENERIC variable to be negated before it is used. However, this operation does not alter the value in the GENERIC variable.

Example:

N2X=-D5Y=D5M04

In this block, if D5 had a value of 7.38, the resulting WORD ADDRESS block would be as follows:
N2X-7.38Y7.38M04

9.7.7 LOGICAL OPERATIONS - IF, ELSE & ENDIF

Logical operations may be performed on data blocks. For example:

```
IF D12=3 THEN
   ONLY DO THIS CODE
ELSE
   OTHERWISE DO ONLY THIS CODE
ENDIF
```

When "D12=3" is true the program blocks between the "THEN" & "ELSE" keywords are executed and the program blocks between the "ELSE" and the "ENDIF" is *not* executed. If the statement is false (D12 does not equal 3) program execution continues after the corresponding "ELSE" keyword. If there is no "ELSE" keyword program execution continues after the "ENDIF" keyword. *All* "IF" keywords must have a corresponding "THEN" & "ENDIF" keywords. The "ELSE" keyword is optional.

9.7.8 COMPARATIVE OPERATORS

"="	Equality operator
"<"	Less than operator
">"	Greater than operator
"<="	Less than or equal to operator
">="	Greater than or equal to operator
"<>"	Not equal to operator
"AND"	Logical AND operator*
"OR"	Logical OR operator*

When using these operators, group the expressions with parentheses as follows:

(D12 = 3 AND D13 = 5)

9.7.9 MACHINE PARAMETER

A machine system variable identifier allows access to inherent machine states. Each machine system parameter has a special meaning. Currently only "PLATESIDE" is accessible as a machine parameter.

PLATESIDE = LEFT/RIGHT

Example of use:

```
IF (PLATESIDE = RIGHT) THEN
        D14 = ND14
        D15 = ND15
ENDIF
```

If the plate is on the right side then both variables "D14" and "D15" will be negated

9.7.10 LABELS

Labels are used to mark positions throughout a program. A LABEL must exist on a line by itself and begin with a colon (":"). A label may be up to 20 characters long and must contain no spaces. Only the first 20 characters of a label are used by the program. The remaining characters are ignored. For Example:

:RIGHT_ANGLE_PLASMA_CUT_RECTANGLE
(Only the underline characters are recognized by the generic interpreter)

:RIGHT ANGLE_PLASMA_CUT_CIRCLE
This label is recognized as being exactly the same as the (..._RECTANGLE) previous label.

Label examples:

:RIGHT_ANGLE_PLASMA_CUT_RECTANGLE
D5=0
:LABEL1
D4=D3+D2
D2=D2+D4
:LABEL2

9.7.11 KEYWORDS

The ***Burny Series 10*** has several keywords. These keywords may not be used as labels in a ***Burny Series 10*** generic program. The keywords are as follow:

AND	CALL	DECLARE	THEN	DEFAULTSON
ELSE	ENDIF	ENDLOOP	ENDSUB	DEFAULTSZERO
GOTO	IF	LEFT	LOOP	ENGLISH
OR	PLATESIDE	RIGHT	VERIFY	METRIC

9.7.12 COMMENTS

The symbol **"//"** is used to insert internal comments into a GENERIC program. Internal comments are not output to the Word Address program. Comments are only used for program documentation. The following is an example of a program comment:

// This is an example of a comment.

9.7.13 GOTO

The "GOTO" statement causes the program execution to continue at the specified label. This is not a conditional jump, the program will ALWAYS go to the label. Care must be taken to avoid unwanted infinite loops (a section of code that will repeat forever). Examine the following example:

GOTO **:LABEL2**
:LABEL1
D4=D3+D2 // These two arithmetic statements will not execute.
D2=D2+D4
:LABEL2 // Program execution will continue here

9.7.14 LOOP

The “LOOP” command provides a limited looping control for the GENERIC language. Since WORD ADDRESS has no support for a limited number of repeats, the GENERIC to WORD ADDRESS converter sequentially repeats the looped code. This saves the GENERIC programmer from manually repeating code. All code between the “LOOP” and “ENDLOOP” statements will be rerun the programmed number of times.

Example “LOOP”:

```
D1 = 2
LOOP(4)
        D1=D1*2
ENDLOOP
```

In this example the loop will be executed 4 times with the contents of D1 increasing with each iteration. The result of this loop is that the D1 will contain the value 32. ((((2*2) * 2) * 2) * 2)

Loops may be nested to any depth. Care must be taken as this can create programs of staggering size.

9.7.15 VERIFY

When the generic program executes the Verify command, the ***Verify*** (***Shapes06***) screen appears, showing all questions and answers that the operator has given. The thumbnail graphic of the part in this screen displays a true representation of the part according to the values entered. Beside the part appears a reference line segment marked with its length, an integral number of the current units: inches or millimeters.

The dimension numbers entered when making a part program from a generic shape will be in the units specified in the **Utility** *mode for* **System Units** *on the* **General System Defaults** *screen (inch or millimeter). This applies when no G70 code (inch dimensions) or G71 code (millimeter dimensions) or equivalent appears in the generic program. If one of these codes does occur in the generic program, default dimensions and dimensions entered will have the unit specified by the code regardless of the system default unit. The numerical value of default prompts does not change when the system default unit changes.*

To change or verify a choice, move the cursor to that item by touching it or using the ***Up***/***Down*** arrows, then touch ***Edit***. The screen for that prompt appears with the dimension line or label showing exactly where the item is and with the value or choice displayed. If the value is satisfactory, touch ***OK*** to return to the ***Verify*** screen; if not, change it then touch ***OK***. When all values on the ***Verify*** screen are correct, touch ***OK*** to accept all the values and move to the ***Save Part Program file as*** screen.

9.7.16 SHAPE PROGRAM EXAMPLES

The following two programming examples are provided to illustrate the GENERIC SHAPE programming language. Some comments are provided on the GENERIC operations being performed. Program messages are used to define messages for display on the screen when later performing “cutting” operations.

Program messages are defined between the “(“ and “)” characters. Comments that follow GENERIC SHAPE programming operations in the same block are provided as notes on the GENERIC operations being performed. These messages are not passed to the resulting ***NC*** program. However, program blocks that contain only a program message and no other data are passed directly to the ***NC*** program being created.

The square bracket characters in these GENERIC SHAPE programming examples are only used to highlight the enclosed text. They do not cause flashing operations as in some previous GENERIC PROGRAMMING implementations.

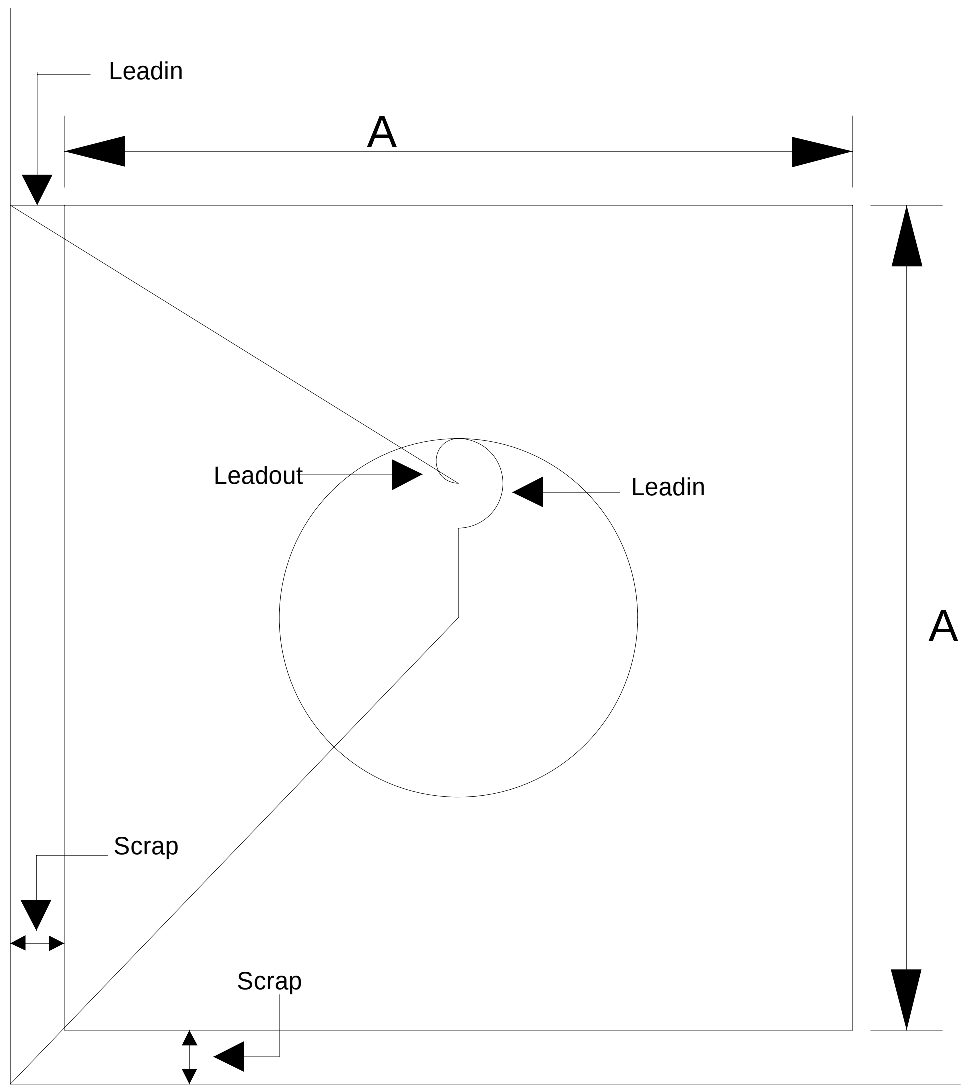
SHAPE EXAMPLE 1
(SEE DRAWING G-0682)

The following ***GENERIC SHAPE*** program creates an ***NC*** program to cut a 10 x 10 inch square part with a variable size hole in the center. The part is referenced from the lower left hand corner of the plate and is a continuous cut part. Lead-in and lead-out moves are circular cuts. Program messages are provided as comments. The number contained in some of these blocks reference one of the three ***GENERIC SHAPE*** programming block types:

- Type 1 - OPERATOR PROMPT BLOCK
- Type 2 - MATH FUNCTION BLOCK
- Type 3 - WORD ADDRESS EQUALITY BLOCK

The letter “S” indicates a sub-set of Type 3 block that contains a ***WORD ADDRESS*** block that is directly transferred to the resulting ***NC*** part program.

```
G
P0982
D1'ENTER [HOLE] DIAMETER:'3,2      //1 PROMPT OPERATOR - HOLE DIA
D2'ENTER [LEADIN] DIM:'1,2         //1 PROMPT OPERATOR - LEADIN
D3'ENTER [LEADOUT] DIM:'1,2        //1 PROMPT OPERATOR - LEADOUT
D4'ENTER SCRAP DIMENSION:'1,2      //1 PROMPT OPERATOR-SCRAPDIM
G70                                        //3 S*    SET FOR INCH DIMENSIONS
G91                                        //3 S*    SET FOR INCREMENTAL MODE
X=D4Y=-D4G03                               //3       MOVE TO PART REF. SET CCW
G97                                        //3 S*    SET REPEAT POINTER
X5Y-5                                      //3 S*    MOVE TO HOLE CENTER
D10=D1/2                           //2     CALCULATE RADIUS  R=1/2 DIA
D11=D10-D2                                 //2       PIERCE POINT=RADIUS-LEADIN
X=D11                                      //3       MOVE TO PIERCE POINT
D12=D2/2                           //2     CALC. RADIUS FOR LEADIN
M04G41                             //3S*   CUT ON - KERF LEFT
G45X=D2I=D12                               //3       CUT LEADIN
I=-D10                                     //3       CUT HOLE
D14=D3/2                           //2     CALC. RAD. FOR LEADOUT
X=-D3I=-D14M03                     //3     CUT CIRC. LEADOUT-CUTOFF
D15=5-D10+D3                               //2       CALC. X DIM TO TOP OF PART
D16=5+D2                                   //2       CALC. LEADIN POS.
X=D15Y=D16                                 //3       MOVE TO TOP LEFT CORNER
M04G42                             //3 S*  CUT ON - KERF RIGHT
G45Y=-D2                                   //3       CUT LEADIN
X-10                                       //3 S*    CUT LEFT SIDE - 10 inches
Y-10                                       //3 S*    CUT BOTTOM - 10 inches
X10                                        //3 S*    CUT RIGHT SIDE - 10 inches
Y10                                        //3 S*    CUT TOP - 10 inches
Y=D3M03                            //3     CUT LEADOUT - CUT OFF
X=D4Y=-D3                                  //3       MOVE TO CORNER OF NEXT PART
G98                                        //3 S*    REPEAT PART
M30                                        //3 S*    PROGRAM STOP/REWIND TAPE
```

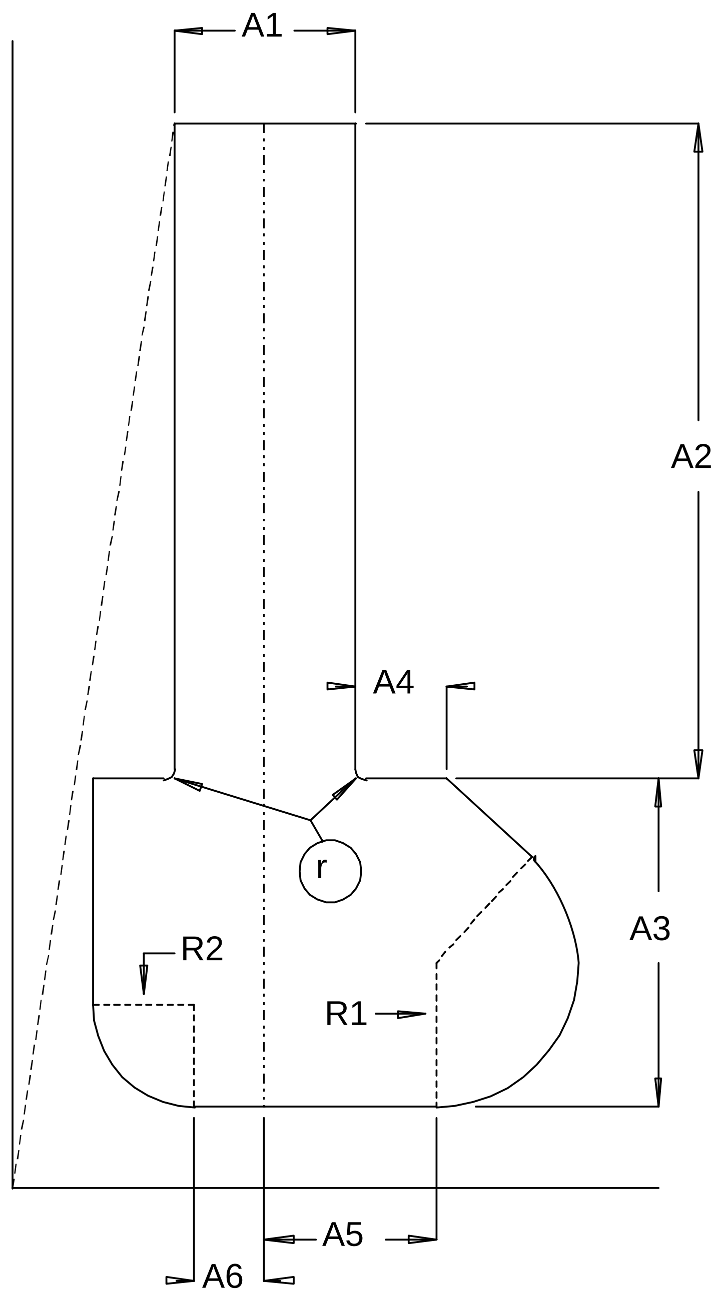


Drawing G-0682

SHAPE EXAMPLE 2
(SEE DRAWINGS G-6162 AND DG-6162)

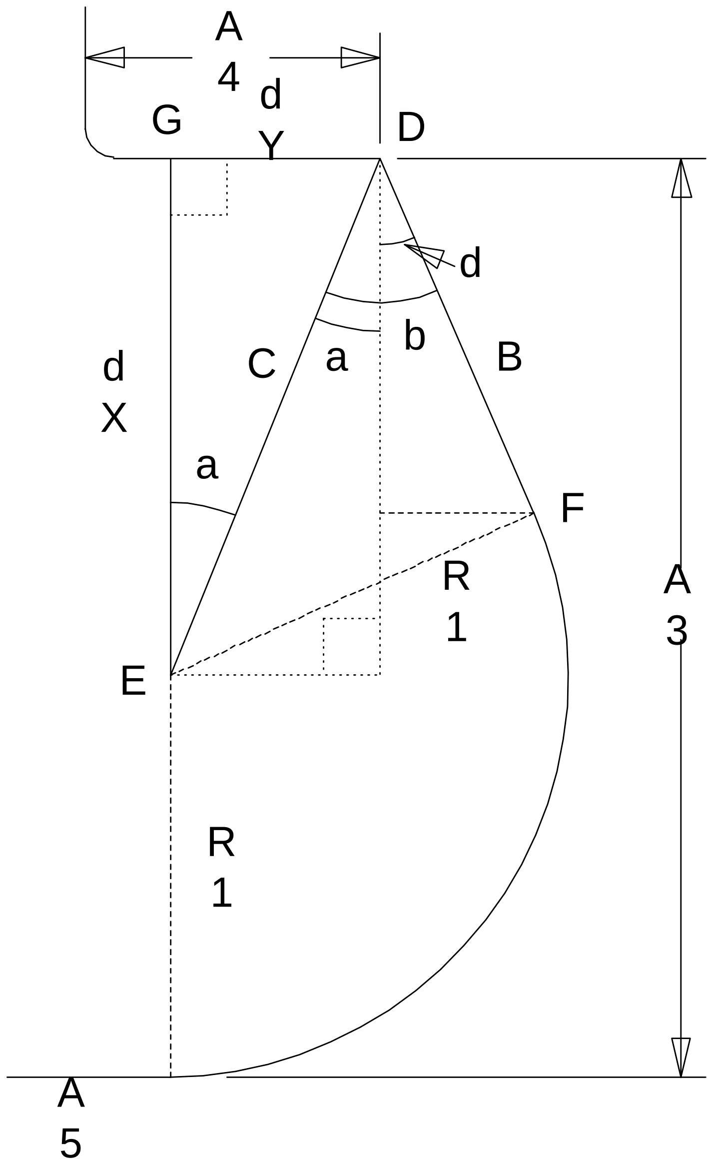
The following ***Burny Series 10*** GENERIC SHAPE program creates an ***NC*** program that cuts a "Goose neck" part using dimension values specified by the operator. Note that this GENERIC SHAPE program contains a shape name in the second block. This name is also used for the resulting ***NC*** program. A program message is also provided in the third block for the resulting ***NC*** program.

```
G
P6162(GOOSE NECK PART)
(NC PART CREATED FROM GENERIC SHAPE 6162)
D1'ENTER [A1 PIN DIAMETER]:'3,2
D2'ENTER [A2 PIN LENGTH]:'3,2
D3'ENTER [A3] HEAD HEIGHT:'3,2
D4'ENTER [A4] FRONT SHOULDER:'3,2
D5'ENTER [A5] CL TO CL FRONT RAD.:'3,2
D6'ENTER [A6] CL TO CL AFT RADIUS:'3,2
D7'ENTER FRONT RADIUS [R1]:'3,2
D8'ENTER AFT RADIUS [R2]:'3,2
D9'ENTER SCRAP DIMENSION:'3,2
D10'ENTER LEADIN DIMENSION:'3,2
D11'ENTER LEADOUT DIMENSION:'3,2
G70                             //SET FOR INCH DIMENSIONS
G91                             //SET FOR INCREMENTAL PROGRAM MODE
D0=D6+D8                        //CALC AFT SHOULDER LENGTH: ADD AFT
D12=.5*D1                       //RADIUS AND A6 DISTANCE TO CL. SUBTRACT
D0=D0-D12                       //1/2 A1 PIN DIA. RESULTS=AFT LENGTH
D12=D9+D2+D3+D10                //CALCULATE X START COORDINATE
D13=D9+D0                       //CALCULATE Y START COORDINATE
X=D12Y=-D13                     //MOVE FROM PLATE CORNER TO START POS
G42M04                  //SET KERF RIGHT; CUT ON
G45X=-D10                       //LEAD IN CUT-SPECIFIED BY G45
D15=D2-.25                      //SUBTRACT .25in RADIUS TO GET A2 LENGTH
X=-D15                          //CUT A2-LEFT SIDE OF PART
G02X-.25Y.25J.25        //SET FOR CW ARC DIRECTION AND .25in ARC
D14=D0-.25                      //SUBTRACT .25in RADIUS TO GET A7 LENGTH
Y=D14                           //CUT CALCULATED AFT SHOULDER
D14=D3-D8                       //SUBTRACT R2 RADIUS FROM A3 - DETERMINE
X=-D14                          //DISTANCE TO START OF ARC R2-CUT LENGTH
G03X=-D8Y=-D8J=-D8              //SET CUT DIRECTION CCW AND CUT ARC R2
D14=D5+D6                       //ADD TO GET TOTAL DISTANCE TO R1 START
Y=-D14                          //CUT A6 AND A5 LENGTHS
D15=D4+D1+D0-D8-D6-D5   //FIND ∆ IN Y FROM R1 TO A4 START
D16=D3-D7                       //FIND CHANGE IN X FROM R1 TO A4 START
D17=D15*D15                     //Y**2=Y2          -+
D18=D16*D16                     //X**2=X2           |
D19=D18+D17                     //X2+Y2=C2          |-  FIND HYP OF CHANGE
D20=D19                 //SAVE C2           |    X AND Y.
D19=RD19                        //C=SQRT C2        -+
D21=D7*D7                       //R1**2=R12 -+ FIND SIDE B OF TRIANGLE
D22=D20-D21                     //C2-R12=B2   |- FDE-ASSUME LINE FD
D22=RD22                        //B=SQRT B2  -+  TANGENT TO ARC R1
D23=AD15/AD16           //ABS CHANGE IN Y/ABS X
D23=VD23                        //ARCTAN OF SIDE Y/X RESULTS = ANG a
D18=D22/D19                     //B/C
D18=UD18                        //ARCCOS OF SIDES B/C RESULTS = ANG b
D24=D15/AD15                    //GET SIGN DETERMINES DIRECTION
D23=D23*D24                     //ANGLE a = ANGLE a * SIGN
D25=90.+D23-D18         //ANGLE d = 90.+ ANGLE a - ANGLE b
D26=SD25*D22                    //SIN ANGLE d *B RESULTS POINT F X COORD.
D27=CD25*D22                    //COS ANGLE d *B RESULTS POINT F Y COORD.
D28=D3-D26                      //CALCULATE IN REF TO ACTUAL X START POS.
D29=D27+D15                     //CALCULATE IN REF TO ACTUAL Y START POS.
X=D28Y=-D29I=D7         //CUT ARC
X=D26Y=D27                      //CUT LENGTH
D26=D4-.25                      /SUBTRACT .25in RADIUS TO GET A4 LENGTH
Y=D26                           //CUT A4 LENGTH
G02X.25Y.25I.25         //CUT ARC .25in RADIUS
D26=D2-.25                      //SUBTRACT .25in RADIUS TO GET A2 LENGTH
X=D26                           //CUT A2 LENGTH
D26=D1+D11                      //ADD LEADOUT VALUE TO PART
Y=D26M03                        //CUT LEADOUT-CUT OFF
M30                             //PROGRAM END/REWIND TAPE
```



Example values:

A1 = Pin Diameter	4.5"	
A2 = Pin Length	17.0"	
A3 = Head Height	8.0"	
A4 = Front Shoulder Length	2.25"	
A5 = Center line of Pin to Center line of Front Radius		4.25"
A6 = Center line of Pin to Center line of Aft Radius		2.50"
R1 = Front Radius	3.50"	
R2 = Aft Radius	2.50"	
R = Radius	0.25"	(Drawing G-6162)



ASL = AFT shoulder length = (A6+R2) - (.5 * A1)
dX = A3 - R1
dY = A4 + A1 +ASL - R2 - A6 - A5

For Triangle 'GDE'   C = SQRT ((dX * dY) + (dY * dY))
For Triangle 'FDE'   B = SQRT ((C * C) - (R1 * R1))

Angle A = ARCTAN (ABS(dY) /ABS(dX)) * (dY/ABS(dY))
Angle B = ARCCOS (B/C)
Angle D = 90 + (Angle A) - (Angle B)

From point D to point F:
X coordinate = SIN(Angle D) * B
Y coordinate = COS(Angle D) * B   (Drawing DG-6162)

9.7.17 SAMPLE BURNY SERIES 10 STANDARD SHAPE CONVERSION

The following is Standard Shape #8 of the current Burny controls program in the new ***Burny Series 10*** format. For an explanation of the ***Line*** and ***Label*** command, see the next section.

```
// 08FLANGE.GNR

// GENERIC PIPE FLANGE WITH BOLTS AND LEADOUTS.  THE PROGRAM
// FIRST CUTS THE PIPE DIAMETER HOLE, THAN IT CUTS THE BOLT
// HOLES FOR THE DESIRED NUMBER OF BOLTS AND FINALLY CUTS
// THE OUTER DIAMETER OF THE FLANGE

// GENERIC CODE FOR STANDARD SHAPE #8 -- FLANGE


G
P0008                                         // PART NUMBER: 0008

DEFAULTSZERO

//D1 "INNER DIAMETER" 4,2; 1.5                // PROMPT FOR INNNER
DIAMETER -> D1
D1 "__266" 4,2; 1.5
($# LINE -1.00,-2.25,0.50,-2.25,1.88,0.0625,1.88,0.0625)
($# LABEL 0.11,-2.68,0)

//D2 "OUTER DIAMETER" 4,2; 4                  // PROMPT FOR OUTER DIAMETER -> D2
D2 "__267" 4,2; 4
($# LINE -2.25,2.25,1.75,2.25,0.0625,1.5,0.0625,1.5)
($# LABEL -0.12,2.63,0)

//D3 "BOLT CENTER DIAMETER" 4,2; 2.75         // PROMPT FOR BOLT CENTER DIAMETER -> D3
D3 "__315" 4,2; 2.75
($# LINE -2.5,1.38,-2.50,-1.37,2.25,0.0625,2.25,0.0625)
($# LABEL -2.75,0.13,0)

//D4 "BOLT HOLE DIAMETER" 4,2; .5             // PROMPT FOR BOLT HOLE DIAMETER -> D4
D4 "__314" 4,2; .5
($# LINE 2.00,0.25,2.00,-0.25,0.0625,0.63,0.0625,0.63)
($# LABEL 2.53,0.14,0)

//D98 "NUMBER OF BOLTS" 2,0; 4                // PROMPT FOR NUMBER OF BOLTS -> D98
D98 "__310" 2,0; 4

//D5 "KERF DIMENSION" 2,4                     // PROMPT FOR KERF -> D5
D5 "__224" 2,4


//D6 "SCRAP DIMENSION" 2,2                    // PROMPT FOR SCRAP -> D6
D6 "__223" 2,2; 0.5

//D7 "LEADIN DIMENSION" 4,2; .5               // PROMPT FOR LEADIN DIMENSION -> D7
D7 "__220" 4,2; .5
($# LINE 1.52,-1.06,1.87,-1.41,0.0625,0.15,0.0625,0.34)
($# LABEL 2.14,-0.88,0)

//D70 "LEADOUT DIMENSION" 4,2; .25            // PROMPT FOR LEADOUT DIMENSION -> D70
D70 "__222" 4,2; .25
($# LINE 1.02,-1.56,1.22,-1.76,0.0625,0.0625,0.0625,0.0625)
($# LABEL 1.14,-1.88,0)

VERIFY                    // VERIFY INPUTS

IF (D98=0) THEN
D8 = 1
D3 = 0
D4 = 0
ELSE
D8 = D98
ENDIF

D11 = D1 - D5                   // ADJUSTED INNER DIAMETER = INNER DIAMETER - KERF

D12 = D2 + D5                   // ADJUSTED OUTER DIAMETER = OUTER DIAMETER + KERF

D14 = D4 - D5                   // ADJUSTED BOLT HOLE DIAMETER = BOLT HOLE DIAMETE - KERF
```

```
D15 = D5 / 2                      // D15 = KERF / 2

D16 = D6 + D5                     // D16 = SCRAP + KERF

D21 = D11 / 2                     // INNER RADIUS = ADJUSTED INNER DIAMETER / 2

D22 = D12 / 2                     // OUTER RADIUS = ADJUSTED OUTER DIAMETER / 2

D23 = D3 / 2                      // BOLT CENTER RADIUS = BOLT CENTER DIAMETER / 2

D24 = D14 / 2                     // BOLT HOLE RADIUS = ADJUSTED BOLT HOLE DIAMETER / 2

D40 = 360 / D8                     // DEGREES PER BOLT = 360 / NUMBER OF   BOLTS

D88 = D8                  // D88 = NUMBER OF BOLTS

D48 = D22 * K0                    // D48 = OUTER RADIUS * 0.707

D47 = D7 * K0                     // D47 = LEADIN * 0.707

D27 = D47 / 2                     // D27 = (LEADIN * 0.707) / 2

D31 = D7                  // INNER LEADIN = LEADIN

IF (D21 < D7) THEN        // IF INNER RADIUS < LEADIN
D31 = D21                         // INNER LEADIN = INNER RADIUS
ENDIF
D71 = D70 * K0                    // PERP LEADOUT = LEADIN * 0.707
D72 = D71 / 2                     // HALF PERP LEADOUT
D73 = D70                         // INNER LEADOUT

IF (D21 < D70) THEN               // IF INNER RADIUS < LEADOUT
D73 = D21                         // CLAMP INNER LEADOUT TO INNER RADIUS
ENDIF

D30 = D22 - D15 + D21 - D31 + D16         // X MOVE = OUTER RADIUS - (KERF / 2) +
 //INNER RADIUS - INNER LEADIN + (SCRAP +     //KERF)
D32 = D22 - D15 + D16                         // Y MOVE = OUTER RADIUS - (KERF / 2) +
                                              //(SCRAP + KERF)

IF (PLATESIDE = RIGHT) THEN                   // IF PLATE SIDE IS RIGHT
D32 = ND32                                    // NEGATE Y MOVE
ENDIF

D81 = D31 / 2                                 // D81 = INNER LEADIN / 2

D74 = D73 / 2                                 // HALF INNER LEADOUT

D78 = D7                          // BOLT HOLE LEADIN = LEADIN

IF (D24 < D7) THEN                 // IF BOLT HOLE RADIUS < LEADIN
D78 = D24                                     // BOLT HOLE LEADIN = BOLT HOLE RADIUS
ENDIF

D85 = D78 / 2                                 // D85 = (ADJUSTED LEADIN) / 2

D75 = D70                                     // BOLT HOLE LEADOUT

IF (D24 < D70) THEN                           // IF BOLT HOLE RADIUS < LEADOUT
D75 = D24                                     // CLAMP BOLT HOLE LEADOUT TO BOLT //HOLE RADIUS
ENDIF

D76 = D75 / 2                                 // HALF BOLT HOLE LEADOUT

D60 = D23 + D24 - D78                         // D60 = BOLT CENTER RADIUS + BOLT HOLE
                                              //RADIUS - BOLT HOLE LEADIN

D90 = ND71 - D48 + D22 + D30 + D15        // X MOVE TO NEXT PART = -PERP
                                              //LEADOUT - (OUTER
// RADIUS * 0.707) + OUTER RADIUS +   //X MOVE + (KERF / 2)

IF (D1 <= 0) THEN                 // IF INNER HOLE IS NOT REQUIRED
D30 = D16 + D22 - D15 + D23 + D24 - D78// X MOVE = (SCRAP + KERF) + OUTER //RADIUS - (KERF / 2)
// + BOLT CENTER RADIUS + BOLT //HOLE RADIUS - BOLT HOLE LEADIN
```

```
D90 = ND71 - D48 + D22 + D15 + D30       // X MOVE TO NEXT PART = -PERP //LEADOUT - (OUTER
// RADIUS * 0.707) + OUTER RADIUS + //X MOVE + (KERF / 2)
ENDIF

X=D30 Y=D32                                          // MOVE TO PIERCE POINT: X=D30, //Y=D31

G97                                                  // CHAIN TOP FUNCTION

IF (D5 = 0) THEN                         // IF KERF = 0 EMPLOY KERF LEFT
G41          //OPTION
ENDIF
IF (D1 > 0) THEN                         // IF THE INNER HOLE NEEDED FOR //PIPE
M04                                                  // TURN CUT ON

D50 = ND21 + D23 + D73 + D24 - D78       // X MOVE TO FIRST BOLT = -(INNER //RADIUS) + BOLT CENTER RADIUS
                                                     // + INNER LEADOUT + BOLT HOLE
                                                     // RADIUS -BOLT HOLE LEADIN

IF (D81 <> 0) THEN                       // CHECK IF LEADIN IS ZERO
G03 X=D31 I=D81                          // CUT LEADIN TO TOP OF CIRCLE
ENDIF       //CCW: X=D31, Y=0, I=D81, J=0

I=-D21                                               // CUT INNER DIAMETER: X=0, Y=0,  //I=-D21, J=0

M14                                                  // DISABLE HEIGHT SENSOR

IF (D73 <> 0) THEN                       // CHECK IF LEADOUT IS ZERO
X=-D73 I=-D74                                        // CUT LEADOUT: X=-D73, Y=0, I=-D74, //J=0
ENDIF

M03                                                  // CUT OFF

X=D50                                                // MOVE TO CUT BOLT HOLES: X=D50,
ENDIF       //Y=0


:FL100

IF (D24 <> 0) THEN                       // CHECK IF BOLT RADIUS IS ZERO
M04                                                  // TURN CUT ON

IF (D85 <> 0) THEN                       // CHECK IF LEADIN IS ZERO
X=D78 I=D85                                          // CUT LEADIN: X=D78, Y=0, I=D85, J=0
ENDIF

I=-D24                                               // CUT BOLT HOLE: X=0, Y=0, I=-D24, J=0

M14                                                  // DISABLE HEIGHT SENSOR

IF (D75 <> 0) THEN                       // CHECK IF LEADOUT IS ZERO
X=-D75 I=-D76                                        // CUT LEADOUT: X=-D75, Y=0, I=-D76, J=0
ENDIF

M03                                                   // CUT OFF
ENDIF                                                // END OF CHECK IF BOLT RADIUS IS ZERO

D60 = ND60                                           // NEGATE D60

D61 = ND61                                           // NEGATE D61

D88 = D88 – 1                                        // DECREMENT NUMBER OF HOLES //REMAINING BY 1

IF (D88 > 0) THEN                        // IF HOLES REMAIN TO BE CUT

D41 = D41 + D40                          // INCREMENT THETA BY DEGREES PER BOLT

D52 = CD41 * D23                         // D52 = COS (THETA) * BOLT CENTER RADIUS

D53 = SD41 * D23                         // D53 = SIN (THETA) * BOLT CENTER RADIUS

D50 = D60 + D24 - (2 * D78) + D75 + D52 // X MOVE = D60 + BOLT HOLE RADIUS
                                                     // - 2 * BOLT LEADIN + BOLT LEADOUT + D52

D51 = D61 + D53                          // Y MOVE = D61 + D53

// UPDATE D60 AS X DISTANCE FROM FIRST PIERCE POINT ON BOLT HOLE
```

```
// TO THE FLANGE CENTER.  SIMILARLY UPDATE D61 AS Y DISTANCE

D60 = D52 + D24 - D78                   // X DISTANCE = D52 + BOLT HOLE RADIUS - //-BOLT HOLE LEADIN

D61 = D53                               // Y DISTANCE = D53

X=D50 Y=D51                             // MOVE TO NEXT HOLE: X=D50, Y=D51

GOTO :FL100

ENDIF

D50=D60 + D48 + D47 + D75 - D78     // X MOVE TO OUTER LEADIN = D60 + (OUTER RADIUS *
                                        // 0.707) + (LEADIN * 0.707) + BOLT LEADOUT
                                        // - BOLT LEADIN

D51 = D61 - D48 - D47                   // Y MOVE TO OUTER LEADIN = D61 - (OUTER //RADIUS * 0.707) -
(LEADIN * 0.707)

X=D50 Y=D51                             // MOVE TO PIERCE POINT: X=D50, Y=D51

M04                                     // TURN CUT ON

IF (D27 <> 0) THEN                  // CHECK IF LEADIN IS ZERO
X=-D47 Y=D47 I=-D27 J=D27           // CUT LEADIN: X=-D47, Y=D47, I=-D27, J=D27
ENDIF

G02 I=-D48 J=D48                    // CUT OUTER DIAMETER CW: X=0, Y=0, I=-D48, J=D48

M14                                     // DISABLE HEIGHT SENSOR

IF (D71 <> 0) THEN                  // CHECK IF LEADOUT IS ZERO
G03 X=D71 Y=-D71 I=D72 J=-D72       // CUT LEADOUT CCW: X=D71, Y=-D71, I=D72,
                                        // J=-D72
ENDIF

M03                                     // CUT OFF

G95                                     // PART INCREMENT

D91 = (D22 + D70) * K0                  // Y MOVE TO NEW PART = (OUTER RADIUS +
                                        // LEADOUT) * 0.707

X=D90 Y=D91                             // MOVE TO NEW PART: X=D90, Y=D91

G99                                     // CHAIN BOTTOM; NO INCREMENT

M30                                     // END PROGRAM AND REWIND
```

9.8 ADVANCED GENERIC PROGRAMMING

Generic programs can be expanded to include interactive dimensions on the screen drawings. These are optional constructs and are not needed in any Generic program. They do provide a clear indication of the prompt on the display to make the shapes easier to create. Any number of these prompt lines may be associated with each question. When a new question is asked, all graphical prompt lines from the previous question are removed and the ones for the current question are displayed on the screen.

There are five display types available:

- Arc
- Dimension Line
- Ray
- Text
- Label

Sample graphical prompt line:

($C RAY 30,60, 45, 10.0)

Each prompt line is defined within a comment block and must start with a dollar sign '**$**'. This identifies the comment as graphical data. The line can be associated with a specific numbered question, in this example the ARC will be displayed with the 3rd question *no matter where in the code this line is.* The prompt line can also be associated with the most recently lexically encountered question. for example:

D2 "INNER DIAMETER SIZE" 3,3;10 //1st QUESTION

D4 "0UTER DIAMETER SIZE" 3,3;16 //2nd QUESTION

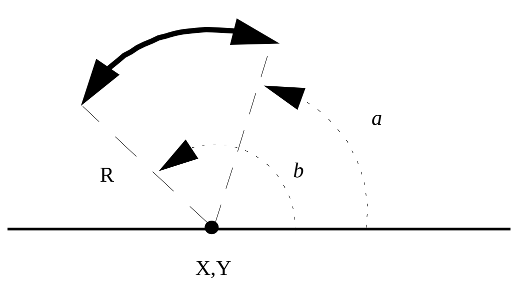
D7 "SPLIT RING DEGREES" 2,3;15 //3rd QUESTION

//Associated with 3rd question ("**C**")

($# ARC 30,60, 45.0,60.0, 10.0)

This ARC prompt data line will be associated with the third question, as though a '**C**' replaced the '**#**' symbol. This allows the programmer to associate the prompt data line without having to count the number of questions for each time. Additionally, if one or more questions are inserted above the question(s) with prompt data lines, they will still remain associated with the proper question. This is not the case if the numbers are hard-coded in, as in the first example. The only disadvantage is that the dimension lines must be immediately following the respective question rather than anywhere in the program. This may be considered undesirable since the prompt data lines do not have any influence on the actual ***NC*** program to be created, but are just to improve the user interface.

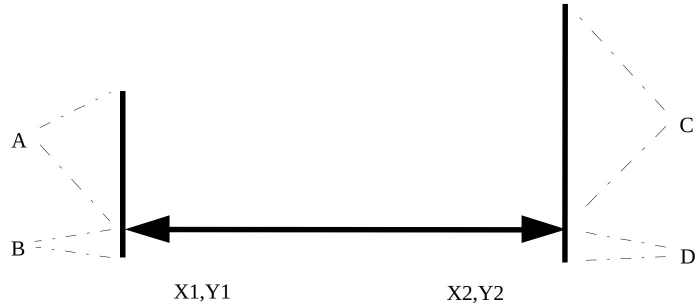
9.8.1 ARC PROMPT LINE



($# ARC X, Y, *a*, *b*, R)

The angles are given in degrees. The Radius, X, & Y positions are given in the same units as the drawing they are appended to.

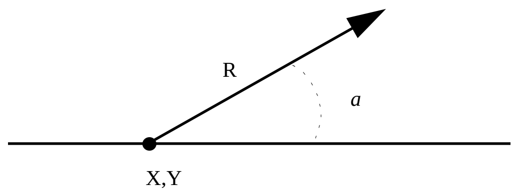
9.8.2 DIMENSION LINE PROMPT



($# LINE X1, Y1, X2, Y2, A,B,C,D)

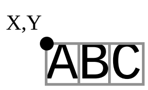
The A-D values specify how long that segment of the reference line will be. The X, Y, A, B, C, & D positions are given in the same units as the drawing they are inserted in.

9.8.3 DIMENSION RAY PROMPT LINE



($# RAY X, Y, *a*, R)

The angle is given in degrees. The Radius, X, & Y positions are given in the same units as the drawing they are appended to.



9.8.4 TEXT PROMPT LINE

($# TEXT “”, X, Y, 1)

Text (in the quotes) up to 16 characters can be printed. It will be printed in the normal style (style 1). A list of supported fonts/styles will be included.

*In some versions of the **Burny Series 10**, normal sized text can only be aligned on an evenly divided 16 bit boundary. Small sized text will be aligned on an 8 bit boundary. Any values that are not on a boundary are left justified onto the nearest boundary.*

9.8.5 LABEL PROMPT LINE

($# LABEL X, Y, 1)

The LABEL prompt line declares the placement for the question number on the screen. The 1 defines which style the letter will be displayed in.

9.9 GENERIC PROGRAMMING ERROR MESSAGES

9.9.1 SHAPES ERROR MESSAGES

The following error messages may be displayed when a GENERIC SHAPE program is processed. These errors are typically caused by incorrectly formatted blocks within the GENERIC SHAPE program. Some of these errors are the result of calculation errors that may be caused by the equations used in the program and/or the values specified by the operator through a prompting operation. For example, “DIVIDE BY ZERO” errors can be caused by incorrect values defined by the operator or programming errors.

When an error is detected, the GENERIC SHAPE process is aborted and an error message is displayed. This message identifies the error type and the line number of the GENERIC SHAPE programming block where the error was detected. Often, the error is caused by an incorrectly formatted program block. These block errors, and others, can be easily corrected using the ***Burny Series 10 Edit Mode***.

9.9.2 DIGIT FORMAT ERROR: LINE XXXX

This message indicates an error in the numeric format digits in a “TYPE 1” OPERATOR PROMPT block. The following are some examples of this type of error:

D1’ENTER X DIMENSION’2.2	(MUST Use comma not period)
D1’ENTER X DIMENSION’2	(2nd DIGIT MISSING)
D1’ENTER X DIMENSION 2,2	(2nd QUOTE MISSING)

9.9.3 AUX. FORMAT ERROR: LINE XXXX

This message indicates an error in the auxiliary format digit following the two numeric format digits in a “TYPE 1” OPERATOR PROMPT block. The following are some examples of this type of error:

D1’ENTER X DIMENSION’2,2,B	(A is the only valid char.)
D1’ENTER X DIMENSION’2,2,	(A is Missing)

9.9.4 VARIABLE DEFINITION ERROR: LINE XXXX

This message indicates an invalid variable definition has been used in the GENERIC SHAPE programming block. This error can occur in any type of block. The following are some examples of this type of error:

D’ENTER X DIMENSION’2,2	(No number following the D)
DM’ENTER X DIMENSION’2,2	(M is not a valid number)

9.9.5 VARIABLE TOO LARGE: LINE XXXX

This message indicates that the number of the variable is out of the acceptable range of 0 to 99. This error can occur in any type of block. The following are some examples of this type of error:

D108’ENTER X DIMENSION’2,2	(D108 TOO LARGE)
D100’ENTER X DIMENSION’2,2	(100 VARIABLES- 0 TO 99)

9.9.6 WADR EQUALITY ERROR: LINE XXXX

This message indicates that the format of an equality statement for a WORD ADDRESS character within the block is invalid. This error can occur in a “TYPE 3” WORD ADDRESS EQUALITY block. The following are some examples of this type of error:

N2X=D1+D2	(NO MATH FUNCTIONS ALLOWED)
N2X=3.5	(SHOULD BE N2X3.5)
N2X=Y	(ONLY EQUATE TO GENERIC VARIABLES)

9.9.7 CONSTANT DEFINITION ERROR: LINE XXXX

This message indicates that the reference to a GENERIC SHAPE programming constant has been incorrectly defined. This error can only occur in a “TYPE 2” MATH FUNCTION block. The following are some examples of this type of error:

D2=D3+K	(NO NUMBER FOLLOWING K)
D2=D3+KA	(DIGIT FOLLOWING K MUST BE A NUMBER)

9.9.8 CONSTANT TOO LARGE: LINE XXXX

This message indicates that the number used to access a GENERIC SHAPE programming constant is out of the acceptable range. This error can only occur in a “TYPE 2” MATH FUNCTION block. The following is an example of this type of error:

```
D2=D3+K6              (CONSTANT VALUE MUST BE 0-3)
```

9.9.9 MATH FUNCTION ERROR: LINE XXXX

This message indicates that an invalid MATH function is contained in the identified GENERIC SHAPE programming block. This error can only occur in a “TYPE 2” MATH FUNCTION block. The following is an example of this type of error:

```
D2=D1+QD2             (Q IS NOT A VALID FUNCTION)
D2=D1+(D3+2)          (Parenthesis not allowed with math functions.)
```

9.9.10 MATH STATEMENT ERROR: LINE XXXX

This message indicates that an invalid combination of MATH functions is present in the GENERIC SHAPE programming block. This error can only occur in a “TYPE 2” MATH FUNCTION block. The following are some examples of this type of error:

```
D2= -D1               (USE NEGATE “N” FUNCTION IN THIS CASE)
D2=D1+2/-4            (NO TWO ALGEBRAIC OPERATORS IN A ROW)
```

9.9.11 DECIMAL NUMBER ERROR: LINE XXXX

This message indicates that a decimal number within the block has too many digits to the right of the decimal point. The maximum is 4 places. This error can only occur in a “TYPE 2” MATH FUNCTION block. The following is an example of this type of error:

```
D2=D1*1.5707963       (MUST TRUNCATE TO 1.5708)
```

9.9.12 DIVIDE BY ZERO ERROR: LINE XXXX

This message indicates that the denominator in a GENERIC SHAPE programming divide operation is zero and the divide cannot be correctly performed. This error can only occur in a “TYPE 2” MATH FUNCTION block. A zero value in the GENERIC variable can be the result of a previous prompting operation or calculation.

9.10 GENERIC EBNF

```
program:               begin _marker  {statement}  end_marker
begin _marker:         <EOB>  G  <EOB>
                       | <EOB>  ‘%’  <EOB>
end_marker:            M30  <EOB>
| programable_eop
                       | <EOF>

programable_eop:       Preset character string to 3 digits long
statement:             inquiry_stmt
                       | assignment_stmt
                       | wa_stmt
                       | message_stmt
                       | if_stmt
                       | label_stmt
                       | call_stmt
                       | goto_stmt
                       | loop_construct_stmt
                       | null_stmt
                       | verify_stmt

inquiry_stmt:          variable  string  integer ‘,’integer  [‘,’A]  [‘;’  decimal ] <EOB>
assignment_stmt:       variable  ‘=‘  expression  <EOB>
wa_stmt:               wa_command  { wa_command } <EOB>
message_stmt:          ‘(‘  text  ‘)’  <EOB>
if_stmt:               IF  ‘(’conditional‘)’ THEN{statement}[ELSE{statement}]
```

ENDIF <EOB>

label_stmt: label <EOB>

call_stmt: **CALL** identifier <EOB>

goto_stmt: **GOTO** label <EOB>

loop_construct_stmt: **LOOP** '**(**' integer|variable'**)**' <EOB>{statement} **ENDLOOP** <EOB>

verify_stmt: **VERIFY** <EOB>

null_stmt: <EOB>

variable: **D** integer

string: '**'**' query_block '**'**' | '**"**' query_block '**"**'

integer: digit { digit }

decimal: { digit } '**.**' integer

expression: unary_op operand [operator expression] | '**(**' expression '**)**'

wa_command: wa_letter signed_number | wa_letter '=' ['-'] variable

text: (character | punctuation) { character | punctuation }

identifier: letter { character }

label: '**:**' letter { letter | '_' }

conditional: unary_op operand [relational_op expression] [**AND** conditional] [**OR** conditional]

signed_integer: ['-' | '+'] integer

query_block: ['_' '_' text '**,**'] text

character: letter | digit | '_'

signed_number: ['-' | '+'] decimal | signed_integer

operand: variable | constant | signed_number

constant: **K** integer

unary_op: { **S** | **C** | **T** | **U** | **V** | **R** | **I** | **F** | **A** | **N** }

operator: '+' | '-' | '*' | '/'

relational_op: '>' | '<' | '<=' | '>=' | '=' | '<>'

wa_letter: **N | P | X | Y | I | J | D | F | G | K | M | T | V**

digit: **0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9**

letter: **A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z**

punctuation: '**!**' | '**@**' | '**#**' | '**$**' | '**%**' | '**^**' | '**&**' | '****' | '**|**' | '**=**' | '**:**' | '**<**' | '**>**' | '**?**' | '**[**' | '**]**' | '**{**' | '**}**' | '**+**' | '**-**' | '*****' | '**/**'

Key:

Bold: Terminals

Italics: Non-terminals

Underlined: Word Address syntax

'|' Logical OR

'[ ]' Optional condition

'{ }' Repeatable zero or more times

'( )' Precedence grouping

BLANK

Burny Series 10

Installation and Maintenance

(AO-70353 Rev AA)

Section

10

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

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10 INSTALLATION AND MAINTENANCE

10.1 PRODUCT SPECIFICATIONS & OPERATING LIMITS

10.1.1 BURNY 10 LCD PLUS

HARDWARE SPECIFICATIONS

- 15 inch 32 bit Color XVGA Touchscreen Display
- 30 Gigabyte Hard Disk, 1.44 Megabyte Floppy Disk Drive
- 2GHz Intel Processor
- 256MB or 512MB RAM memory
- 12 Interface Signal Lines for Cutting and Motion Control, 12 additional I/O Points (Optional)
- Serial Port, RS232/RS422, with Optical Isolation and Baud Rate Selection to 115K
- Optional Internal Modem with Control Lines for an Eight-Control Mutiplexer
- Industrial grade Enclosure that minimizes RFI/EMI Interference
- Two-axis Drive Outputs and Incremental Encoder Inputs, all Optically Isolated (Slave X axis and Rotary C axis are optional.)
- Universal Power Input
- Weight: 32 pounds
- Size: 14.5 inches High, 18.3 inches Wide, 12 inches Deep

PHYSICAL ENVIRONMENT OPERATING LIMITS

Condition:	Operating Limit
Temperature	0 to 50 C
Relative Humidity	5% to 85% (1 g/m3 to 25 g/m3)
Atmospheric pressure	86 kPa to 106 kPa
Climatic Class	3K3

10.1.2 BURNY 10 LCD PLUS OEM

HARDWARE SPECIFICATIONS

- 15 inch 32 bit Color XVGA Touchscreen Display
- 30 Gigabyte Hard Disk, 1.44 Megabyte Floppy Disk Drive
- 2GHz Intel Processor
- 256MB or 512MB RAM memory
- 24 Interface Signal Lines for Cutting and Motion Control
- Serial Port, RS232/RS422, with Optical Isolation and Baud Rate Selection to 115K
- Optional Internal Modem with Control Lines for an Eight-Control Mutiplexer
- Industrial grade Enclosure that minimizes RFI/EMI Interference (optional)
- Two-axis Drive Outputs and Incremental Encoder Inputs, all Optically Isolated (Slave X axis and Rotary C axis are optional.)
- Universal Power Input
- Size: 14.20” High x 18.00” Wide x 7.66” Deep

PHYSICAL ENVIRONMENT OPERATING LIMITS

Condition:	Operating Limit
Temperature	0 to 50 C
Relative Humidity	5% to 85% (1 g/m3 to 25 g/m3)
Atmospheric pressure	86 kPa to 106 kPa
Climatic Class	3K3

10.2 INTRODUCTION

Installing the ***Burny*** consists of the following steps:

- Physical Installation
- Electrical Installation
- System Setup and Configuration
- Checking the Installation
- Functional Testing of the System

When the ***Burny*** is replacing another control, some retrofitting may also have to be done.

Serial communication makes a large part of the electrical installation and has its own coverage in this section.

10.3 INSTALLING THE BURNY

10.3.1 INTRODUCTION

The ***Burny*** must be installed in accordance with the National Electrical Code in the United States, and with IEC 364-4-41 in European Community countries. Additionally, the system must always be installed in accordance with local statute. The ***Burny*** should be installed, adjusted, tested and serviced by qualified personnel familiar with electrical equipment and with the contents of this manual. The ***Burny*** is intended for use only as described in this manual. These instructions have been prepared to ensure compliance with the European Community Electromagnetic Compatibility Directive, and Low Voltage Directive.

Before you begin installing the ***Burny***, be sure that you:

- Backup your existing part programs.
- Read this section of the ***Burny*** Operation and Programming manual completely and keep it available for reference.
- Familiarize yourself with the installation by studying the order of the step outlined in this manual.
- Gather all necessary materials.

10.3.2 PHYSICAL INSTALLATION

The following steps guide you through the physical installation of the ***Burny***:

1. Upon receipt of the unit, unpack all pieces. Retain all packaging until you have verified there is no physical damage to the contents, and the system has been installed.

2. Record the model number and serial number of your units for future reference.

3. Carefully inspect all pieces for shipping damage, loose parts, and exposed un-insulated electrical parts. Contact ***Burny*** immediately if any problems occur.

4. Determine the location where the ***Burny*** will be installed taking into consideration the following cautionary points. Be sure that the ***Burny*** unit is:

   - Installed taking Environmental Operating Specifications for the ***Burny*** into consideration.
   - Free from sources of moisture.
   - Free from undue sources of dust and other particles if possible.
   - Out of high travel areas.
   - Not in zones that are subject to objects accidentally falling, rolling, or sliding.
   - Away from sources of heat.
   - Away from combustible vapors or gases.
   - Located so that cables can be routed safely.
   - Installed so that cables can exit the cabinet.
   - Installed in a location that allows access to the rear panel to permit connection or disconnection of cables and reading of labels on rear panel.
   - Installed where the operator has a clear field of view and acceptable physical environment.

5. The unit must always be mounted on top of a flat surface, using mounting bolts, lock washers, and nuts. Refer to the hole pattern shown in document DO-10348 located in Section 13 of this manual.

   The ***Burny*** is supplied with a plastic plug for the 1.5 inch (38mm) diameter hole in the bottom. The plastic plug should be removed for an installation where cables and wires must pass through the bottom of the cabinet.

10.3.3 ELECTRICAL INSTALLATION

INTRODUCTION

The electrical installation of the ***Burny*** includes the cabling and grounding procedures. Custom signal polarities required by a particular site can be accommodated in the ***Burny*** and typically have been taken care of in the cabling. Consult heading 10.3.4 Machine Interface in this section, if problems occur in this area.

CABLING

Keep the following points in mind when performing the electrical installation of the ***Burny***:

- Cables must be obtained from, designed by, or approved by ***Burny***.
- Cables and leads shall be insulated. The insulation must be rated for the maximum voltage of insulated or uninsulated conductors that the cable does or could contact. If, after installation, there are unused connectors on the rear panel of the unit, they must be covered with a plastic protective cap.
- Metal ground clamps are used at each end of every cable to connect the cable shield to equipment cases. Where the shield is not snug within a clamp, the clamp should be gently crimped. Over-crimping can cause internal damage to the cable. The clamp must make snug contact with the shield around the full circumference of the cable.
- Cable ends connected to the ***Burny*** should have shield clamps connected directly to the ***Burny*** cabinet. Refer to the cable ground to back of cabinet drawing, AO-72105, in Section 13 this manual.
- Cables ends connected to rack mounted encoders (H20 or H25 type) must have the shield clamp connected to the housing of the encoder. See customer instruction drawing AO-72103 in Section 13 of this manual for the rack mounted encoder ground clamp instructions.
- Motor cables are handled as shown on the drawing for motor cable ground clamp installation, AO-72106 in Section 13 of this manual.

GROUNDING

All conductors and connectors must be in accordance with the National Electrical Code in the United States, the IEC in CE installations, and must be in accordance with all local statutes.

Although Earth ground and noise ground are often used interchangeably, they do in fact describe two different and important grounding schemes. The Earth (power) ground uses the Earth as the conductive current return path to the lowest potential point of a power generation system, while the noise ground channels radio frequency (RF) electrical noise to the Earth. Both schemes should be considered prior to installing a ***Burny***.

Since plasma cutting generates significant amounts of RF noise it is critical that all conductors and connections (for encoders, motors, THCs, power supplies and similar devices) are properly shielded and grounded. If not, these devices may act as antennae and pick up RF noise causing the system to malfunction and behave dangerously.

Make sure to ground the ***Burny*** cabinet to the machine frame Earth ground connection with a braided ground strap at least 12 mm in width. A wide flat ground strap provides a better RF ground path than a wire. The strap can be terminated with standard crimp terminals at both ends. The strap should connect to one of the chassis ground screws on the back of the ***Burny*** cabinet. See drawing AO-72102 in Section 13 of this manual.

MOTOR MOUNTED ENCODER CABLE SHIELDS

When motor mounted encoders are used, the ***Burny***-supplied shielding kit must be installed over the junction of the plastic connectors, between the cable and the short lead coming from the encoder. The shielding kit and the instructions are shipped with the cables for the motor-mounted encoders. The connector shield is shown on customer instruction drawing, AO-72107 in Section 13 of this manual.

Be aware that if, for example, a cable was connected to an extension cable, a shielding kit must be installed over the junction to ensure compliance with CE regulations.

TRACERS

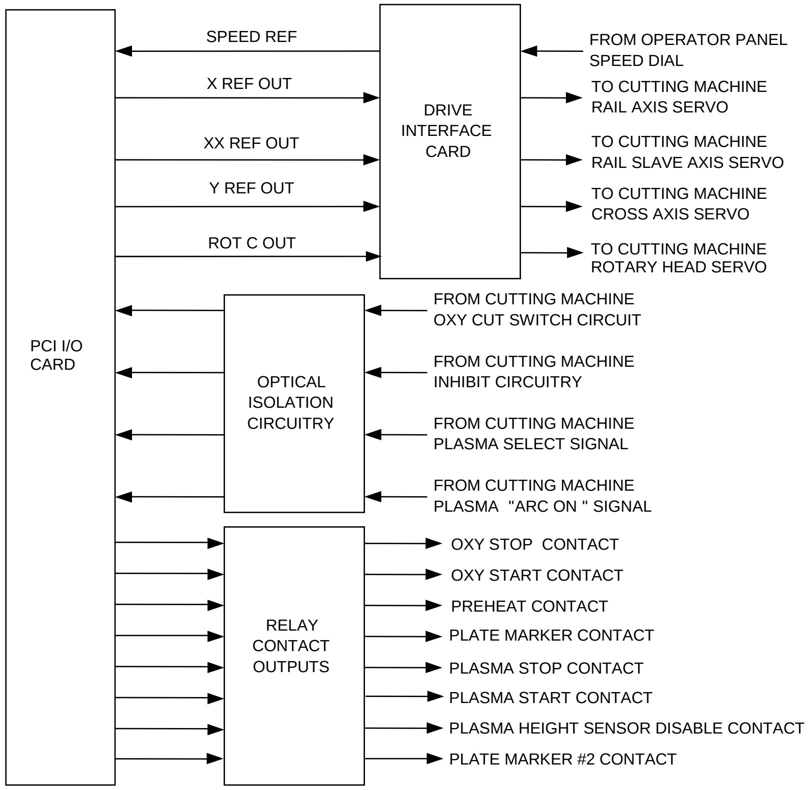
Tracer unit cables are handled as shown on the customer instruction drawing, AO-72108 in Section 13 of this manual.

POWER SUPPLIES

Compliance with the AC line Conducted Emission portion of the EMC Directive of the EC is only possible if the ***Burny*** is equipped with the Burny-supplied line transformer power supply. If the ***Burny*** is powered with the DC supply of the cutting machine drive or tracing system, compliance with the Line Conducted Emission portion of the EC directive is the responsibility of the drive or tracing system manufacturer.

10.3.4 MACHINE INTERFACE

The ***Burny*** requires a connection to certain signals on the cutting machine to allow it to control the various cutting and drive functions. The following is a block diagram showing the ***Burny*** drive and cutting circuitry interface connections.



BURNY SYSTEM INPUT/OUTPUT BLOCK DIAGRAM

DRIVE INTERFACE

All drive interface connections use 30RECP on the ***Burny*** back panel. A CUSTOM DESIGNED INTERFACE CARD can be used to allow many different drive systems to be used with the ***Burny***.

It is impractical to describe the specific drive interface since these will vary on each type of drive system. However, four of the signals are the same for any drive system.

- X REF OUTPUT - this output from the back panel is the drive signal command to the rail master axis servo. It passes through the interface card, if installed, and then out to the machine's rail axis servo drive.
- XX REF OUTPUT - this output from the back panel is the drive signal command to the rail slave axis servo. It passes through the interface card, if installed, and then out to the machine's rail axis servo drive.
- Y REF OUTPUT – this ouput from the back panel is the cross axis servo command output. It passes through the interface card, if installed, and then to the Y cross axis servo drive.
- ROT C OUTPUT – this ouput from the back panel is the rotary C axis servo command output. It passes through the interface card, if installed, and then to the rotary C axis servo drive.

EMERGENCY STOP

The Burny includes a relay contact for connecting to the cutting machine's E-STOP circuit, and a dual purpose input circuit for monitoring the cutting machine's E-STOP or Ready to Run condition. Both of these circuits must be connected as described below for the ***Burny*** to work properly with the cutting machine's E-STOP systems.

For systems using the drop-thru provision of the ***Burny*** to connect to the Op Con products, these connections are made through the drop-thru wiring and do not require additional connections by the installer.

The remainder of this section describes the connections required for a ***Burny*** to a typical cutting machine.

This relay is also connected to the watchdog timer inside the ***Burny***. If the watchdog detects a problem with the software, the relay contact opens to force the machine into an E-STOP condition.

It is extremely important that this relay contact be connected properly to the cutting machine — this contact must cause the proper E-STOP response for the entire cutting machine, servo drives and cutting processes.

READY TO RUN / E-STOP -- INPUT CIRCUITS

The ***Burny*** provides an input capability for monitoring the cutting machine's E-STOP system. This allows the ***Burny*** to determine if the cutting machine is Ready to Run, or is in an E-STOP condition. When the ***Burny*** detects that the machine is in an E-STOP state (NOT Ready to Run), it stops all cutting processes, stops all motion and sets 0 Volts to the D/A outputs. The ***Burny*** also displays a RED status bar with the message "EXTERNAL STOP".

There is a single signal provided for the READY to RUN / E-STOP monitoring function—however it can be connected in two different ways depending on the signal levels available in the cutting machine. It is important to note that you must use ONLY ONE of these two inputs provided—they are not separate functions, but only alternate pinout connections for the same signal.

One of these two input methods must be used to indicate the cutting machine's Ready to Run / E-STOP condition. This allows the ***Burny*** to operate the machine in a safe, reliable manner.

1. READY TO RUN / E-STOP INPUT - DRY CONTACT INPUT

A dry contact (no voltage) input is provided on Pin 20 of 30RECP for most of the standard interface cards, and for the standard ***Burny*** back panel using the ribbon cable interface card connection. Pin 20 has a pull-up resistor to set the input to a high level (5 to 24 Volts depending on interface card). To use this input, a dry relay contact must be connected between Pin 15 (Signal gnd) and Pin 20 of 30RECP – this contact should CLOSE when the machine is READY to RUN. This causes the ***Burny*** to assume the drive is operational and allow normal jogging and cutting functions. When this contact OPENS, the high level on this input signals the ***Burny*** that the cutting machine is not operational, so that the ***Burny*** will sets its outputs to the correct E-STOP condition.

2. READY TO RUN / E-STOP INPUT – POWERED INPUT

This second connection to the Ready to Run / E-STOP signal allows a direct voltage input to be used. The connection is made between pins 31 and 35 of 32RECP. See the input/output tables for specific voltage level specifications.

This input is usually easier to connect since it can be wired directly to the cutting machine's power circuitry. It should be connected in such a way that the input receives power when the machine is "Ready to Run". This tells the Burny to allow normal machine functions. When the machine is in E-STOP, the voltage to this input must be removed, and the Burny will take the appropriate action to respond to the machine's E-STOP condition.

STOP RELAY CONTACT – OUTPUT

For all Burny Models except the Burny 10 LCD Plus OEM:

An isolated relay contact is provided between Pin 25 and Pin 30 of 32RECP on the back panel of the ***Burny***.

The relay is connected to the E-STOP button located on the front of the ***Burny***. The contact will be OPEN when the Burny's E-STOP button is pushed in and must be connected in SERIES with the cutting machine's E-STOP string. It should be connected at a point in the circuit so that when the contact opens, the machine is forced into a safe, E-STOP condition. Keep the following points in mind but DO NOT use in place of the E-STOP button:

- When the E-STOP button on the front of the Burny 10 is released (twist), the relay contact between 32RECP Pins 25 and 30 closes. On most machines, this will complete the E-STOP circuit and allow the machine to be re-started.
- On the Burny 10 LCD, hold the STOP button for 2 seconds to close the relay.

The Stop Relay Contact is rated for 5 amps. If more current is required, it should be used to energize a larger "power relay" which is suitable for switching larger currents.

This relay is also connected to the watchdog timer inside the ***Burny***. If the watchdog detects a problem with the software, the relay contact opens to force the machine into an E-STOP condition.

It is extremely important that this relay contact be connected properly to the cutting machine. The E-STOP button on the front of the ***Burny*** must cause the proper E-STOP response for the entire cutting machine, servo drives and cutting processes.

The Burny 10 LCD Plus OEM uses QC terminals. There is no pinout on 32RECP.

CUTTING INTERFACE

The cutting interface signals are connected to the machines cutting control circuitry so that the ***Burny*** can control the cutting operation. The OXY/FUEL functions are interfaced through 32 receptacle while the PLASMA interface is done through 31 receptacle, both on the back panel. The separate connectors are used to provide maximum isolation between the PLASMA and OXY/FUEL circuitry and help to minimize noise interference from the PLASMA system. The following is a description of the various inputs and relay outputs used for the cutting interface.

The RELAY CONTACT outputs used for the cutting interface are capable of switching loads according to the input/output specifications located at the end of this section.

The SENSING INPUT circuits are all separate 2 wire inputs with no common connection. The standard inputs will respond to voltage inputs according to the input/output specifications located at the end of this section. In most cases, they will respond to much lower levels, so care must be taken that when the input is supposed to be "Off" that there are no low level leakage paths (such as suppression capacitors across switches) which could provide enough current to be sensed as an "On" input.

In the following descriptions, the term "CNC OFF" is used to indicate that the operator has touched the "CNC RUN" keypad on the Status01 screen to disable the ***Burny*** outputs and return to manual machine operation. To monitor the state of the following sensing circuits and relay contacts, press the following button sequence:

Menu > Utils > Diagnostics > Cut Logic I/O

CUT SWITCH

This input is used to sense when the cutting oxygen switch has been turned on so that motion along the cut path can begin. Typically, this signal is connected directly to the cutting oxygen switch or to a signal line which operates at the same time. The cut switch must be sensed in an "OFF" condition before the logic lets the cutting circuit become enabled. Once a cut is finished and the machine has moved to a new pierce location, this signal must go OFF before a new cut will be allowed to start.

When Oxy Cut Switch is sensed "ON", the status "bulb" displayed on the **Cut Logic Specific I/O** screen is "ON".

CUT STOP

This contact must be connected to the oxygen cutting circuit in a way that closing it stops the cutting oxygen and resets any automatic relay sequencing. When running a part, this contact does not open until the "OXY SENSE INPUT" is sensed to be in an "OFF" state. This prevents the enable contact from re-starting the cut. This contact is only supposed to enable the cutting circuit so the oxygen can be started either by the manual cut switch or by the ***Burny*** "OXYGEN START CONTACT". Once the cutting has started, this contact will be maintained in an open position until the part has been completed or the operator presses the "STOP CYCLE" or "BACKUP" BUTTON. At these times, the contact will close, stopping the cutting oxygen.

If the ***Burny*** is set to "CNC OFF", this contact maintains an open position to enable the existing machine cutting circuitry.

When this contact is in the position that stops the Oxygen, the Oxy Stop Status "bulb" displayed on the **Cut Logic Specific I/O** screen is "OFF".

PREHEAT

This contact is connected to the cutting circuit in such a way that it can initiate the HIGH PREHEAT function of the gas controls. This contact operates when AUTO oxy fuel cutting is selected. In "MANUAL" cutting, the contact remains open. This contact closes for the "PREHEAT" time specified by the operator and then opens for the remainder of the cut. If the ***Burny*** is in "CNC OFF", this contact remains open. When this contact is in the position that stops the Oxygen, the Oxy Stop Status "bulb" displayed on the **Cut Logic Specific I/O** screen is "OFF".

CUT START CONTACT

This contact is connected to the cutting circuit and can initiate the cutting oxygen, only if the "OXY STOP CONTACT" is open. It can either directly connect the cutting oxygen circuit, or can provide a signal to the machine's existing auto cut circuitry. This contact will only operate when "AUTO" oxy/fuel cutting is selected. The contact will close after the "PREHEAT" time reaches zero (0) and will remain closed until the part is complete. If "MANUAL" cutting is selected, this contact will remain open, and the cutting oxygen can be started with the machines existing manual cutting controls or the contact will close when "GO" is pressed. If the ***Burny*** is in "CNC OFF", this contact stays open. When this contact is in the position that starts the Oxygen, the Oxy Start Status "bulb" displayed on the **Cut Logic Specific I/O** screen is "ON".

MARKER #1 AND MARKER #2

This contact is connected to the PLATE MARKER #1 CONTROL circuit so that it can close to initiate the PLATE MARKING cycle and open to stop it. After it closes, the machine will hold position for the time set by MARKER DELAY parameter and then begin moving along the marking path. If the ***Burny*** is in "CNC OFF", this contact stays open.

INHIBIT INPUT

This input performs a program "INHIBIT" function. When the input is sensed as being "ON", the ***Burny*** will stop running a part and hold position. All timers and relay outputs will be "FROZEN" in their current state. When the input goes "OFF", normal operation will resume. This input is used when external functions (such as lowering torches, height sensors, etc) require a delay in program execution in order to complete their function. It is not an "E-STOP" input and should not be used in a "FAIL-SAFE" operation. Only program execution will be inhibited, the jog functions will operate regardless of the state of this input.

AC INPUT POWER

The AC INPUT POWER to the ***Burny*** is connected to these pins. The power source should be a non-switched 115/230vac 50/60HZ source capable of supplying 6.3 amps (ACTUAL POWER REQUIREMENT IS LESS).

CHASSIS GROUND

At least one, or both of these pins should be connected to the main chassis ground of the machine. On PLASMA INSTALLATIONS, it is RECOMMENDED THAT AN ADDITIONAL HEAVY WIRE OR STRAP BE CONNECTED BETWEEN THE MACHINE CHASSIS AND ONE OF THE SHIELD GROUNDING SCREWS ON THE BACK PANEL.

PLASMA SELECT

This input is used to select between OXY/FUEL and PLASMA CUTTING and comes from a switch on the Operator Panel. If the input is "OFF", all PLASMA functions are disabled and the OXY/FUEL cutting controls will be active. When this input is "ON", all OXY/FUEL functions are disabled and the following PLASMA functions will operate. This input must be set to the correct state before the part program is run, otherwise the operator prompts will be incorrect (such as requesting a preheat time for a PLASMA CUT).

This input allows the cutting process to be determined independent of the part program. Thus the programming commands do not specify PLASMA or OXY/FUEL, only cut ON or OFF.

When this contact is in the position that selects Plasma, the Plasma Select Status "bulb" displayed on the **Cut Logic Specific I/O** screen is "ON".

ARC ON

This input is used for sensing when the ARC has transferred to the plate and motion along the cut can begin. It operates much the same as the "OXY SENSE INPUT" described earlier in that it must be in an "OFF" state before the PLASMA CIRCUIT will be enabled. Also, motion along the cut begins when the input goes "ON". Since some PLASMA UNITS do not have a "ARC ON" contact output, a timer function is provided which delays motion by a specific time after this input receives the "ON" signal. This PLASMA ON DELAY time is set with Utility Machine Parameter VARIABLE #4 "PLASMA ARC ON DELAY". A second timer is set with Utility Machine Parameter VARIABLE #5 "PLASMA ARC OFF DELAY", which causes a delay after the arc goes out. This allows the machine to continue moving after a part falls out and causes the arc to extinguish.

PLASMA STOP

This contact must be connected to PLASMA STOP CIRCUIT such that when it de-energizes it stops the cut BUT ENERGIZING DOES NOT INITIATE THE CUT. It cannot energize until the "ARC ON" input is sensed as being "OFF". Once it has energized to enable a PLASMA cut, it will remain energized for the entire cut path and then de-energize when it is finished. It will also de-energize if either the "CYCLE STOP" or "BACKUP" buttons are pressed. If the ***Burny*** is set to "CNC OFF", this contact will be maintained in an energized position, thus allowing for normal manual control of the PLASMA circuit. When this contact is in the position that stops the Plasma, the Plasma Stop Status "bulb" displayed on the **Cut Logic Specific I/O** screen is "OFF".

PLASMA START CONTACT

This contact should be connected to the PLASMA control circuitry such that it can close to initiate the PLASMA CUT, but the cut can still be stopped either by the "PLASMA ENABLE CONTACT" opening, or by the operator pressing the STOP button. This contact only operates when "AUTO" PLASMA cutting is selected and will remain closed during the entire PLASMA CUT. If "MANUAL" cutting is selected, this contact will remain open. If the ***Burny*** is in "CNC OFF, this contact stays open. When this contact is closed, the Plasma Start Status "bulb" displayed on the **Cut Logic Specific I/O** screen is "ON".

HEIGHT DISABLE

This contact is connected to the plasma's Height Sensing system such that when activated, the HEIGHT SENSOR is disabled and the torch is "FROZEN" at the existing height. When the contact is released, the height sensor regains control of the torch height. The normal (Non-activate) state of this contact is selectable by "SD#33 PLASMA HEIGHT RELAY" parameter for either normally open or closed operation. Thus it can be set to accommodate the various height sensing systems.

The contact will maintain the "NORMAL" condition as long as the machine is running at the speed set by the operator's speed dial. However, when the speed is slowed for a corner, this contact will switch and maintain the activated condition until the machine has re-accelerated back to the normal cutting speed. This prevents the height sensor from lowering the torch due to the reduced cutting speed in the corner.

If The ***Burny*** is in "CNC OFF", this contact will be maintained in the "NORMAL" condition as set by the system setup data VARIABLE #33, "PLASMA HEIGHT RELAY" parameter.

When this contact is in the position that disables the HEIGHT SENSOR, the Height disable Status "bulb" displayed on the **Cut Logic Specific I/O** screen is "ON".

PLATE MARKER #2 CONTROL CONTACT

This contact is connected to the PLATE MARKER #2 CONTROL circuit so that it can close to initiate the PLATE MARKING cycle and open to stop it. After it closes, the machine holds the position for the time set by "MARKER DELAY TIME" and then begins moving along the marking path. If the ***Burny*** is in "CNC OFF", this contact stays open. When this contact is in the position that enables the PLATE MARKING cycle, the Marker 2 Status "bulb" displayed on the **Cut Logic Specific I/O** screen, is "ON".

10.3.5 DETERMINING CABLE LENGTH

- The cable lengths that are needed depend on the application and the additional options that are ordered with the ***Burny*** control.
- Always allow more cable length that is actually needed. (At least an extra 18 to 24 inches). Note that extremely long cables can act as an antenna for electrical noise.
- DO NOT measure in a straight line from point to point when measuring for cable length. Allow enough cable for proper routing with existing machine cables.
- For plasma cutting applications, keep all ***Burny*** cables routed and separate from the plasma cables by a minimum of two feet. This practice minimizes the possible damage caused by high frequency spikes produced by a plasma system.
- Always determine the location of the ***Burny*** and encoders before measuring for cable lengths.
- Encoder cables are always needed for the ***Burny*** application. To determine the length of the encoders cables, first decide where the encoders will be mounted. Then measure the length from each encoder (X and Y) to the lower back panel of the ***Burny.*** The two lengths normally will be different.
- The cross axis encoder cable is usually longer then the rail axis encoder cable. Because the ***Burny*** and the rail axis encoder are both stationary, the distance from the ***Burny*** to the rail axis encoder is fixed. The cross axis encoder cable length is determined by measuring the distance from the ***Burny*** to the tracing eye or the cross axis drive, where the encoder is mounted. The cable should be long enough to reach both limits of the axis.
- Typically, the ***Burny*** is mounted to the operators station which contains all the signals needed to control the cut solenoids. However, if this is not the case, a power/oxy cable length may be needed for some ***Burny*** applications. This length is determined by measuring between the cutting machines existing operators panel, (where the gas function controls are located) and the back panel of the ***Burny***.
- Typically, the ***Burny*** is mounted to the operators station which contains all the signals needed to control the drives. If a drive cable length is needed on the ***Burny*** applications, the length is determined by measuring between the cutting machines operating station, (where tracing and stripping controls are located) to the back panel of the ***Burny***.

10.4 CHECKING THE INSTALLATION

A check of the installation is recommended to ensure that safety, performance, and time are not lost. For CE installations, you must perform the following specific tests on the completed installation:

- Non-accessibility
- Performance
- Insulation Resistance (greater than 0.5 MOhm measured from AC input to chassis.)

The following items should be checked by qualified personnel. Be sure that:

- All holes in bottom of ***Burny*** cabinet have been sealed against dust and intrusive objects.
- Unused wires have been protected and insulated according to local standards.
- Electrically live parts are protected by enclosures or barriers from external access.
- There are no loose parts, including screws, especially ***Burny*** front panel screws.
- Burny has been informed of any problems with the hardware.
- The operating environment is within Burny operation specifications.
- The Burny is away from sources of moisture.
- The equipment is away from combustible vapors and gasses.
- The equipment is not too close to source of high heat.
- Area dust and particulate level is satisfactory.
- The operator and equipment are away from areas where objects fall, slide, roll etc.
- The operator's view of work and equipment is satisfactory.
- The operator and equipment are located out of a heavy traffic pattern.
- Cables routed so as to avoid damage after the installation.
- Cables not unduly cramped or stretched.
- The rear panel of unit is accessible enough to see and to change cables.
- The operator is not subjected to unsafe or unnecessarily stressful conditions.
- The wire size for AC and DC mains is AWG 18 or larger.
- Each cable is either supplied by, designed by, or approved by Burny.
- The system and all other electrical devices associated with and in the vicinity of the system have been properly grounded.
- Both ends of every cable have a ground clamp attached snugly to the cable shield.
- Every ground clamp is attached to the component in the proper manner.
- The system programs and files are backed up properly.

10.4.1 FUNCTIONAL TESTING OF THE SYSTEM

Functional testing of the ***Burny*** after installation is recommended. Each installed system can have a unique design; therefore a unique test may be required for the installed system. The test should be designed to ensure that:

- The equipment has been properly integrated.
- The ***Burny*** is suitable for and functions correctly in its environment.
- Protective devices and control devices operate as intended.
- The ***Burny*** is compatible with other equipment.
- The ***Burny*** can perform to specifications when interconnected.
- The ***Burny*** has sufficient range in its controls.
- The system programs and files are backed up properly.

10.5 RETROFITS

10.5.1 GENERAL EXPLANATION OF A CNC RETROFIT

A ***Burny*** can be installed on almost any cutting machine with an X-Y coordinate drive system and provides NC control with the capability of switching back to photocell control if it is desired.

Section 13 contains hardware drawings that show how the ***Burny*** should be mounted on a cutting machine. By using the drawings and following the specified rules for correct mounting procedure, it is possible to mount the necessary hardware on almost any cutting machine.

Keep in mind that the mounting drawings only give you the basics of the hardware mounting procedure. The actual mounting method that you use is determined by personal preference and added input from personnel involved in the project.

10.5.2 MOUNTING A GEAR RACK

Keep the following points in mind when mounting a gear rack:

- Take the time to do a good job. Improper mounting of the gear rack can result in problems and the control working to your expectations.
- Always try to mount the gear rack teeth facing sideways or facing down. Mounting the rack with the teeth facing up can cause the rack to accumulate cutting dirt and the teeth to become clogged creating dimensional errors.
- The gear rack should be mounted directly to the machine if possible. If this method does not allow for proper clearance or encoder mesh into the gear rack, another method must be used. One method is to mount the gear rack on a separate angle bracket. By doing this, the gear rack is away from the cutting machine surface to give extra clearance for proper mesh. Washers or spacers can also be used to move the gear rack away from the cutting machine surface for added clearance.
- Be sure that the gear rack covers the entire travel distance of both rail and cross axis. Allow enough rack at all travel limits so that encoder or motor does not go off the end of the gear rack.
- When joining two sections of rack, always use a short piece (about 2 or 3 inches) to obtain proper mesh between six-foot rack sections. Invert the short piece of rack into the two sections that are being joined together, over the joint to obtain proper mesh. DO NOT BUTT TWO SECTIONS AGAINST EACH OTHER. This can cause improper mesh and result in dimensional errors on parts being cut.
- Use whatever means possible to insure that the gear rack is straight both horizontally and vertically. A bowed rack will cause dimensional errors on parts being cut.

10.5.3 MOUNTING AN ENCODER

The purpose for using digital encoders with the ***Burny*** system is to provide a feedback pulse. This tells the ***Burny*** exactly where it is at all times. Incorrect mounting of the encoders can cause the ***Burny*** to get false distance readings and cause the cut part to be the wrong size. Use the following points to ensure that accurate feedback is supplied to the ***Burny***:

- Always install the encoder parallel to the gear rack. The distance from the center of the encoder shaft and distance from the center of the shoulder screw pivot should be the same distance to the gear rack.
- Choose a suitable location for encoder mounting. Try to stay away from mounting the encoder in a vulnerable location such as the end of a rail truck or next to the torches.
- On a bridge type machine with a dual rail axis, always mount the rail encoder on the tracing table side away from the cutting torch side.
- On a cantilever machine, always mount the rail encoder on the center support beam. If possible, mount the rail axis encoder away from the cutting torch side.
- If possible, mount the cross axis encoder to the cross axis drive gearbox. Mounting the encoder to the tracing eye is acceptable, but use this method as a second choice.
- Encoders come with a universal mounting bracket. The mounting bracket configuration can be re-arranged to meet mounting requirements.
- Always leave enough clearance from the top of the encoder housing to any part of the cutting machine. An encoder cable is plugged into the connector on top of the encoder housing. This calls for a 3" clearance from the top of the housing to any part of the cutting machine.

- Encoders are spring loaded with minimum tension into the gear rack. Encoders do not require a great amount of tension to hold them for proper mesh with the gear rack. Just enough tension to keep the encoder firmly meshed and to keep it from popping out of the rack will do. Too much tension will damage the encoder. A conventional tension or compression spring can be used to spring load the encoder into the gear rack.
- After the encoders are mounted, be sure to run the cutting machine to all maximum travel limits. Verify that nothing interferes with either encoder.
- Avoid any sharp impacts to the encoder. Sharp impacts will damage the encoder.

10.6 SYSTEM SETUP AND CONFIGURATION

After the Physical and Electrical installation, parameters in the ***Burny*** must be set and the system must be tuned. For detailed information about Setup and Calibration refer to Section 11B of this manual.

10.7 SERIAL COMMUNICATION

10.7.1 INTRODUCTION

OVERVIEW

Serial Communication is the transfer of data between two devices over a communication link, one character at a time. The ***Burny*** serial communication ports load and store part programs and other data from various types of serial communication devices. The actual type of device is not important, only that it comply with the communication and program specifications. Therefore, remote computers, other controls, and other serial devices can connect to the ***Burny*** for the transfer of data.

COMMUNICATION SPECIFICATIONS

The communication specifications concern the format of the individual character message: how many data bits will be sent and whether parity will be even or odd. The ***Burny*** provides four selectable formats. The specification also covers the Baud Rate: the number of state changes that take place in one second on the serial line. Thirteen different values can be selected for this parameter but the choice must not be too high for the device used.

PROGRAM SPECIFICATIONS

The program specifications (Protocol) refer to the communication program running on the ***Burny*** and the remote device. This program must deal with the individual data packets in the chosen format, to convert them between serial to parallel, and to send and receive encoded procedural messages such as desired part program file name, OK to transmit, and hold up transmission.

HANDSHAKE

You can select a serial communication parameter called Handshake. The available choices establish one of these three: a hardware method of sending procedural messages, a software method, or no messages.

WIRING

Wiring between the serial communication source, destination and voltage states comes from an EIA standard called RS-232C.

SERIAL COMM LINK CHARACTERISTICS

For a communications link to operate properly, the characteristics of the transmitting and receiving devices must match. If they do not, the part program and other data will either not load at all, or will be interpreted incorrectly. For details on how to set them, see the Load/Store Section in this manual under RS232 Options/ Connection Settings. For a description of the default values, see the Utility Section of this manual under RS232 Serial Options.

HANDSHAKE	(RTS/CTS, XON/XOFF, AND NONE)
CHARACTER TYPE	(NUMBER OF DATA BITS, PARITY)
BAUD RATE	(110,300,600,1200,4800,9600,….,115200)
PROTOCOL	(FILE SERVER-CLINK, STD TTY, STD CALLUP)

Also the operator must properly adjust:

FILE TYPE	(WORD ADDRESS, ESSI, AND CUSTOM AUX CODES)

Even though this setting is not part of the serial communication format but is required for the conversion process.

The same factors affect both the receiving and transmitting characteristics of the system. Therefore, once set, they will function in either direction.

DEFAULT VALUES

Settings in the Utility mode determine default values for the Serial Connection Settings options. At bootup, the settings have these default values.

When performing an RS-232 Load or Store operation, touch the following button sequence starting from the Main Menu:

Load/Store > RS-232 Port > Options > Connection Settings > Use Defaults

Pressing the **Use Default** button sets all the values on the screen to the default values setup in the Utility Mode. If the Connection Settings window has a white background, one or more of the Connection Settings is in a non-default state.

10.7.2 SERIAL CONNECTION OPTIONS

RS-232

The ***Burny*** can provide serial communication signals at Serial I/O Port A, RECP35, on the Back Panel in either RS-232 or RS-422. In RS-232 mode, this port can connect directly to a serial port on a host computer. The ***Burny*** has isolation circuitry to protect it from surges on the line but the host computer may not.

RS422

The RS-422 mode permits communication over longer distances (up to one mile) with better noise immunity and higher data throughput. Since not many PCs can accept RS-422 signals directly, Burny stocks an optional RS-422 to RS-232 converter for installation on the host computer when needed.

INTERNAL MODEM

Another interconnection option uses modems, devices that convert the digital RS-232 signal to an analog signal for transmission, then back to RS-232 at the destination. This system works over longer distances than RS-422 and is more resistant to interference.

An optional modem can be installed in the ***Burny*** providing the modem signals at Serial I/O Port B, RECP36, on the Back Panel. From this point, a cable connects to a compatible modem at the host computer. RECP36 also carries signals for use with an optional multiplexer box that can connect up to eight Burny controls to the same host computer.

EXTERNAL MODEM

The final variation in serial connection uses an external modem connected to RECP35 in RS-232 mode. This modem connects to a compatible modem at the host computer, which has its RS-232 output cabled to a serial port input on the host.

10.7.3 CONNECTING TO RS-232C DEVICES

INTRODUCTION

RS-232C is an abbreviation for Recommended Standard 232, Revision C. This standard comes from the engineering department of the Electronic Industries Association (EIA). RS-232C defines the wiring between two serial devices. It also defines the recommended purpose of 25 different wires, which pins they should terminate on and even what voltage levels, current drains and loads are allowed.

Of the 25 pins/wires defined by the standard, only 11 wires are used for asynchronous communications. The others are used for synchronous communication or reserved for future use.

Although there are 11 wires used for asynchronous communication, the ***Burny*** can communicate with as little 3 (TRANSMIT, RECEIVE AND GROUND) using SOFTWARE HANDSHAKING (XON/XOFF) or as few as 5 (TRANSMIT, RECEIVE, Request-To-Send, Clear-To-Send and Signal Common) using HARDWARE HANDSHAKING (RTS/CTS). This means that either a 3 wire or 5 wire cable can connect the ***Burny*** to a host storage device. The host storage device may be a computer, another ***Burny***, or any other type of serial device.

The following list shows various specifications required for the serial communication to function properly. The ***Burny*** has only one serial port, a 9 pin connector, RECP35, located on the back panel.

SIGNAL LEVELS ARE RS232C COMPATIBLE - ONLY THE FOLLOWING SIGNALS ARE USED:

Signal	RECP35	Description
SHIELD	PIN 1	PROTECTIVE GROUND (SHIELD)
RIN	PIN 2	RECEIVED DATA INPUT TO *BURNY*
XOUT	PIN 3	TRANSMITTED DATA OUTPUT FROM *BURNY*
5V	PINS 5,6	PULLUP TO +5 V- MAY BE USED FOR ANY SIGNAL REQUIRING HIGH LEVEL
GND	PIN 7	SIGNAL GND
CTRL-OUT	PIN 8	CONTROL STATUS LINE -OUTPUT FROM *BURNY*
STAT-IN	PIN 9	INPUT STATUS LINE- INPUT TO *BURNY*

The "CTRL-OUT" and "STAT-IN" terminologies are used rather than the more conventional "REQUEST TO SEND" or "CLEAR TO SEND" since these imply specific data-set and data-terminal definitions and do not function identically on all serial devices. By choosing more general names, the correct connection to the remote equipment must be made based on signal function rather than assuming the same named pins are automatically connected.

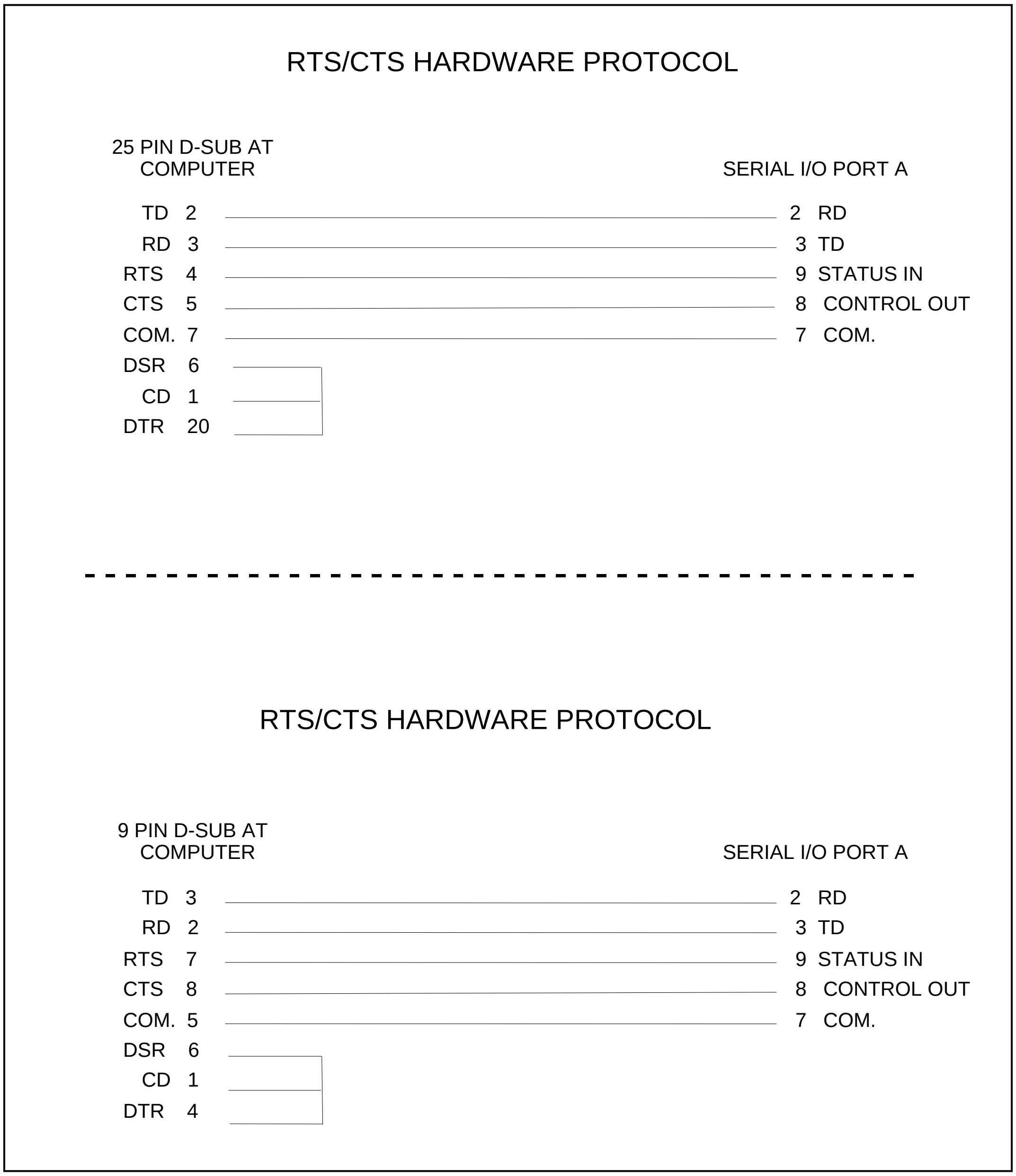
The signal levels from the ***Burny*** are RS-232 compatible and can be connected directly to a remote computer (up to 50 ft). However, this direct connection could cause serious damage to the computer in the event of an electrical failure or short on the cutting machine. In the case of a plasma torch, if the torch shorts out to the machine the entire plasma current (1000 amps or more), would flow through the machine chassis and through any parallel path to ground. If a cable were connected between the ***Burny*** and a remote computer, a large current could flow through the cable to the computer's ground connection.

We therefore DO NOT RECOMMEND A DIRECT CONNECTION FROM THE MACHINE TO THE COMPUTER UNDER ANY CIRCUMSTANCES. Instead, the optional internal ***Burny*** modem and a short haul modem or a pair of short haul; direct connect modems which provide total optical isolation should be used. These devices are available from several sources and are used to transmit data over longer distances than can be done with standard RS-232. They usually allow transmission over twisted pair cables or fiber optic cables of a mile or more. Also, they should provide total electrical isolation between the transmitting and receiving ends. This protects against a ground loop being developed between the machine and the computer and should prevent any damage in most cases.

These modems should be used any time a device is permanently connected to the cutting machine. If a portable device is used where it is brought to the machine and removed before the cutting actually starts, the modems are not necessary. In this case, use the nine pin connector behind the disk drive door.

RS-232 CONNECTIONS FOR HARDWARE HANDSHAKING

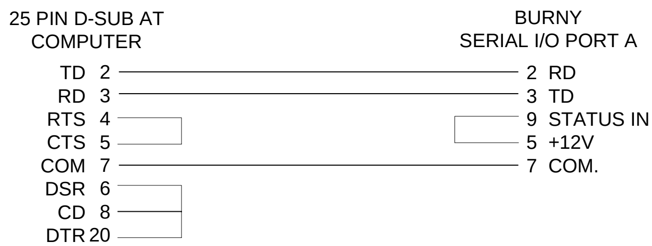
These drawings show the typical connection from a ***Burny*** control to the standard 25-Pin and 9-Pin RS-232 connectors found on most PC compatible computers and peripherals. For HARDWARE HANDSHAKING, 5 wires are required: TRANSMIT DATA, RECEIVE DATA, REQUEST-TO-SEND, CLEAR-TO-SEND, and SIGNAL COMMON.



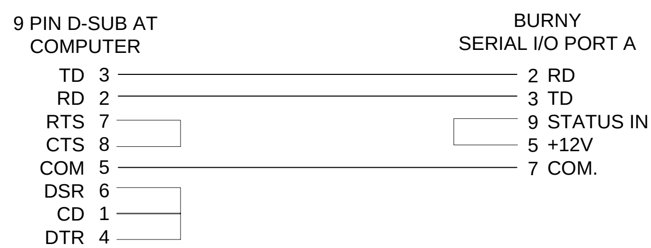
RS-232 CONNECTIONS FOR SOFTWARE HANDSHAKING

These drawings show the typical connection from a ***Burny*** control to the standard 25-Pin and 9-Pin RS-232 connectors found on most PC compatible computers and peripherals. Since SOFTWARE HANDSHAKING uses transmitted characters to control the data flow instead of separate hardware lines, only 3 wires are required: TRANSMITTED DATA, RECEIVED DATA, and SIGNAL COMMON.

XON/XOFF SOFTWARE PROTOCOL



XON/XOFF SOFTWARE PROTOCOL



MODEM CONNECTIONS

The ***Burny*** may be ordered with an optional direct connect short haul modem installed. This modem, in addition to a host powered modem of the same type, provides the protection needed for the ***Burny*** and the host computer. These modems also increase the maximum distance of the communications link.

The ***Burny*** internal modem is mounted on a printed circuit card with some additional circuitry that is used for a multiplexer. This card is installed on the inside back panel of the control. It is mounted over the drive interface card. The modem connection is RECP36 on the Back Panel.

If the modem is not installed by the factory, refer to Modem kit installation instructions.

When the internal modem is installed, both RECP35 and RECP36 will carry signals during a serial communication but RECP35, Serial I/O Port A, will take precedence. That is, when RECP35 is connected to an external serial device, RECP36 has no output.

RECP36 Serial I/O Port B - Modem		
Signal Name	**PIN**	**Description**
SHIELD	1	NO CONNECTION
RX+	2	MODEM RX+
TX+	3	MODEM TX+
	4	** SENSE INPUT #1 (FOR MULTIPLEXER)
	5	** SENSE INPUT #2 (FOR MULTIPLEXER)
	6	** CONTACT OUTPUT #1 (FOR MULTIPLEXER)
	7	** CONTACT OUTPUT #2 (FOR MULTIPLEXER)
TX-	8	MODEM TX-
RX-	9	MODEM RX-

When RECP36 is connected to a multiplexer, the Modem Switching Logic Card monitors the voltage between pins 4 and 5. If it is about 15V AC, the multiplexer is busy and this port cannot transmit. If the voltage is low, pin 6 is connected to pin 7, reserving the multiplexer and transmission can begin.

10.7.4 CONNECTING TO RS-422 DEVICES

INTRODUCTION

The serial port on the ***Burny*** can be configured for either RS-232 or RS-422 operation. RS-232 is more limited in distance and in some cases may be more susceptible to noise since it is a single ended ground referenced signal. RS-422 is a differential signal type signal which permits longer transmission distances (over 1 mile) and better noise immunity.

DETAILS

If the remote computer is equipped with an RS-422 compatible port, the ***Burny*** could be connected directly to it, but this is not recommended. While the RS-422 port on the ***Burny*** is electrically isolated from the internal circuitry, the RS-422 port on the remote computer may not be. Therefore, even though a modem is not required to extend the distance of the transmission, it is recommended that some sort of modem or transient protection device be installed at the host computer to protect it from line induced noise.

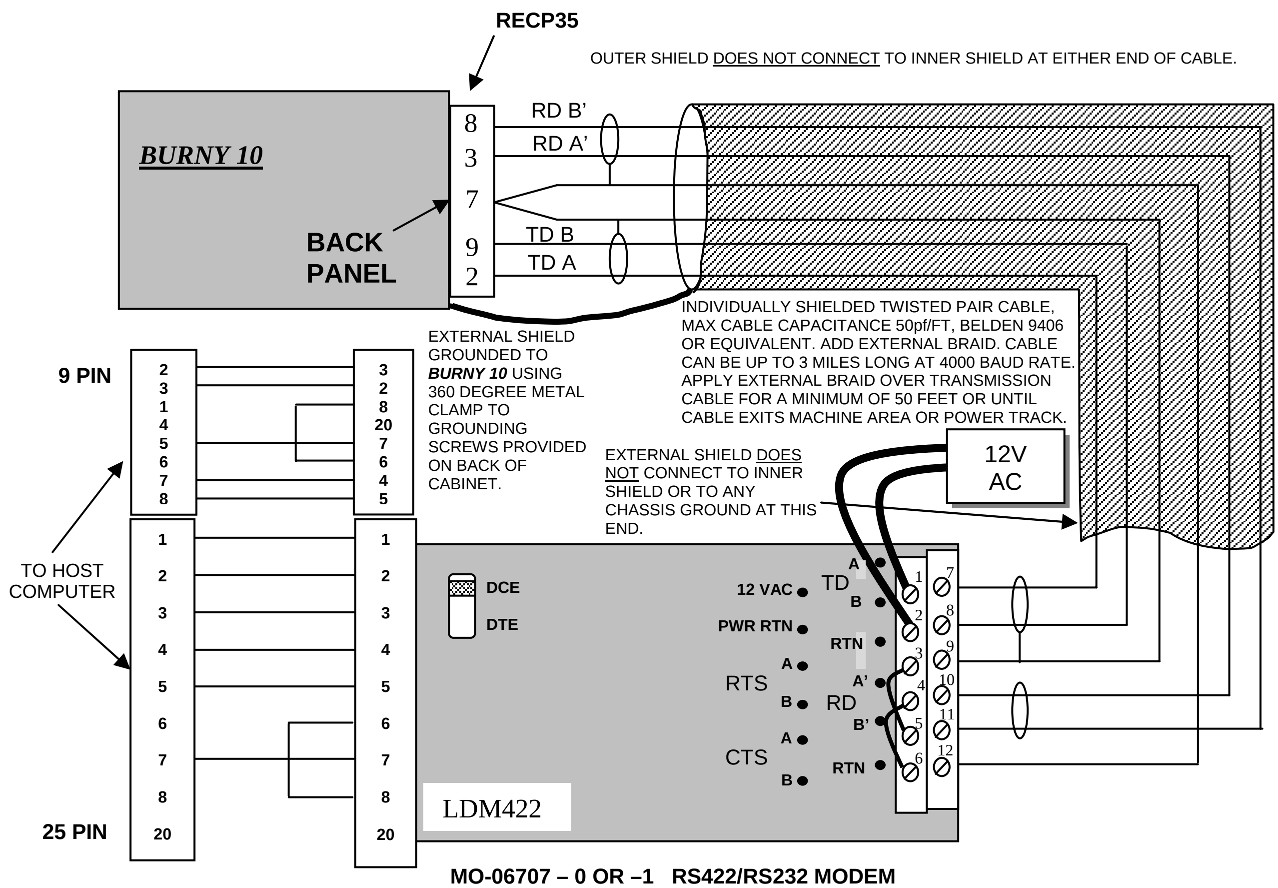
Most computers have only RS-232 level serial ports. This means most computers will require an RS-422 to RS-232 converting modem. This provides two benefits. First, it gives the long distance transmission capability of the RS-422 signals. Second, if the proper type of modem is selected, it will provide complete electrical isolation between the long transmission wire and the computer's sensitive serial port.

The ***Burny*** has such a modem available as an accessory item. Part number MO-06707-0 includes an 115VAC adapter while MO-06707-1 includes a 230VAC 50/60HZ adapter. This modem provides the proper electrical isolation to protect the host computer port.

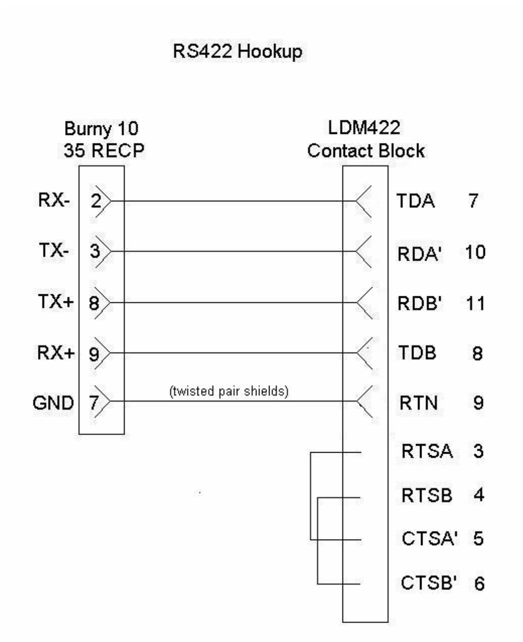
Since the ***Burny*** RS-422 port only supports the TRANSMIT and RECEIVE lines, Hardware (RTS/CTS) handshaking isn't possible. Therefore, the host computer must use SOFTWARE HANDSHAKING (XON - XOFF characters) to control the data flow between the ***Burny*** and the host computer.

SIGNAL LEVELS ARE RS-422 COMPATIBLE. ONLY THE FOLLOWING SIGNALS ARE USED IN THE "RS-422" MODE:

I/O Port A RECP35	Description
PIN 2	RX- RECEIVED DATA INPUT INTO *BURNY*
PIN 3	TX- TRANSMITTED DATA OUTPUT FROM *BURNY*
PIN 5	+5V FOR PULLUP
PIN 6	+5V FOR PULLUP
PIN 7	SIGNAL GROUND (DO NOT CONNECT TO SHIELD)
PIN 8	TX+ TRANSMITTED DATA OUTPUT FROM *BURNY*
PIN 9	RX+ RECEIVED DATA INPUT INTO *BURNY*



Typical RS-422 Modem Connection



10.7.5 SERIAL PROTOCOL DETAILS

CHARACTER FORMATS

The ***Burny*** accepts several different character formats. The most common are:

ASCII (RS-358) - ODD OR EVEN PARITY, 7 DATA BITS, 1 STOP BIT
"EIA" (RS-244) - ODD OR EVEN PARITY, 8 DATA BITS, 1 STOP BIT (FLEXOWRITER)

(The EIA RS-244 specification does not define control codes, hence it does not support the XON/OFF software protocol.). The character format is selected by the operator when the serial I/O operation is selected.

For the remainder of this description, the < > symbols are used to indicate specific characters as follows:

<CR>	- HEX 0D - ASCII CARRIAGE RETURN
<EOB>	- HEX 0A - ASCII END OF BLOCK (ALSO LINE FEED)
<XON>	- HEX 11 - ASCII DC1 (TRANSMITTER ON)
<RON>	- HEX 12 - ASCII DC2 (RECEIVER ON)
<XOFF>	- HEX 13 - ASCII DC3 (TRANSMITTER OFF)
<ROFF>	- HEX 14 - ASCII DC4 (RECEIVER OFF)
<EOF>	- HEX 04 - ASCII EOF (END OF FILE)
<NULL>	- HEX 00 - BLANK TAPE

HEX CODES SHOWN MUST HAVE APPROPRIATE PARITY BIT ADDED TO THE CODE.

The actual program format can be one of several types, as listed in the programming section of this manual.

HANDSHAKING PROTOCOL SPECIFICATIONS

HANDSHAKING is the way in which the data flow between ***Burny*** and the host storage device is regulated and controlled. There are two types of handshaking used by the ***Burny***. The first type is HARDWARE HANDSHAKING. Hardware handshaking uses the STATUS IN and STATUS OUT control lines (RTS and CTS) to control the data flowing through the transmit and receive lines.

The second type is SOFTWARE HANDSHAKING. Software handshaking does not use the RTS and CTS control lines to control data flow between two serial devices. Software Handshaking uses special characters to control the flow of data between two serial devices. They are <XON> for TRANSMITTER ON and <XOFF> for TRANSMITTER OFF.

RTS/CTS HARDWARE PROTOCOL

The "RTS/CTS" protocol uses electrical control signals defined by the RS-232 standard to regulate the transmission of data. The ***Burny*** has 1 input status line and 1 output control line to perform this handshaking. The status input to the ***Burny*** should be connected to a suitable status output signal from the external device. Similarly, the ***Burny*** control output should be connected to a status input line on the remote device.

Traditionally, these two signals have been called "REQUEST TO SEND" (RTS   STATUS OUTPUT) and "CLEAR TO SEND" (CTS - STATUS INPUT). However, the exact definition may vary, thus they are referred to as only the status input and control output lines. In this way, it implies that they should be connected to give the correct function, not necessarily to the pin bearing the same name.

By using this type of handshaking, either the ***Burny*** or the external device can control the data transmission. This compensates for the fact that the data may be transmitted faster than a particular device can process it. If no handshaking is used, data can be lost due to this processing time. With the handshaking, either device can stop the transmission until it is ready to accept more data.

XON/XOFF SOFTWARE PROTOCOL

The "XON/XOFF" protocol uses special ASCII control characters to control the communication process. Since the "EIA" (RS-244) character format does not have equivalent characters for these codes, it cannot be used with software protocol. The following 4 ASCII codes are used:

<XON> -	DC1	-TRANSMITTER ON	HEX 11
<RON> -	DC2	-RECEIVER ON	HEX 12
<XOFF>	-DC3	-TRANSMITTER OFF	HEX 13
<ROFF>	-DC4	-RECEIVER OFF	HEX 14

The <RON> and <ROFF> are used by the transmitter to "Wake Up" the receiving device before the actual data transmission begins. In most cases, these codes are ignored. The "TRANSMITTER ON/OFF" commands are used by the receiving device to turn the "SENDERS" transmitter on or off and thus control the data transmission.

In a typical case, the "SENDER" would transmit an <RON> and then begin sending the data. If the receiver cannot process the data fast enough, it sends an <XOFF> back, causing the data to stop. When the receiver is ready for more data, it sends an <XON> and the transmitter starts sending data again

*When the **Burny** is receiving data from a host computer, it sends an <XOFF> when it needs to stop the data transmission to process the data already received. The remote computer must stop sending data within 3 characters after receiving the <XOFF> code .If it does not stop, it causes an "Overrun Error"st the **Burny** and the download will be aborted.*

Since software <XON>/<XOFF> handshaking uses control codes sent over the same wires as the transmitted data, a 3 wire link (RS-232) is possible: Transmit, Receive and Signal Common. Some types of short haul modems only support this type of link since they only provide for one signal to be transmitted in each direction.

*When software <XON>/<XOFF> handshaking is being used, the Status-input line must be kept at a HIGH level. Tie PIN 5 TO PIN 9 on the 9-pin output connector of the **Burny** when software protocol is selected.*

10.7.6 STANDARD CALLUP PROTOCOL

This is one of the communication protocols which can be used to provide a more automated link between the host computer and the ***Burny***. It requires that the host computer run one of the several available software packages compatible with this protocol, when this protocol is selected, the ***Burny*** transmits a request prompt to the host computer when the operator selects a "LOAD FROM SERIAL DEVICE" operation. The remote computer can interpret this header and send back the corresponding file without operator assistance at the computer. This allows for unattended operation of the computer and makes for a more automatic, more efficient link.

For "LOAD" operations, the ***Burny*** sends the following header when a new program is requested: (program file name 12345678 used for example)

DOWNLOAD PROGRAM:12345678 <CR><EOB>

TYPICAL STANDARD CALLUP LOAD USING RTS/CTS

To perform a typical standard callup load function do the following:

From the Main Menu screen:

1. Press the **Load** button.
2. Select **RS-232** from the Load01 screen.
3. Press the **Options** button.
4. Press the **Connection Settings** button and configure the settings. Then, press **OK**.
5. Press the **OK** button and then press the filename button to configure a name for the part program file.
6. Press **OK**. The ***Burny*** turns-on the control line and then waits for the remote device to signal it's ready to receive data by sensing the status input line. At this point, the ***Burny*** sends 10 <null> characters, delays for 1 second and then sends the following message:

   DOWNLOAD PROGRAM:12345678 <CR><EOB>

   After the message is received, the remote device can then begin transmitting the requested program. If the ***Burny*** needs to halt the transmission, it turns off its control output line, which should cause the remote device to stop sending data. The ***Burny*** turns the control output line back "ON" when data transmission is to resume.

   If the program ends with the PROGRAM END/REWIND CODE, the load process stops.

   When the END OF PROGRAM CODE is received, the ***Burny*** sends a termination message of

"<BEL><BEL><BEL>EOF:###<CR><LF>"

where ### represents a 3 digit status code.

Then, the ***Burny*** turns off it's control output line, finishes loading the program and then stops the download.

The device sending the program can indicate an "END OF FILE" condition by sending an ASCII "control-D" (Hex '04'). This character indicates that the download link should be aborted. The host computer indicates that the requested program does not exist by sending only the "EOF" code. The ***Burny*** detects that only the "EOF" was sent and indicates a "NO PROGRAM FOUND" condition. The "EOF" character does not have to be used for normal downloading.

TYPICAL STANDARD CALLUP LOAD USING "XON/XOFF"

To perform a typical standard callup load using "XON/XOFF"

---

*A Download to the **Burny** using SOFTWARE PROTOCOL requires that the remote device support <XON>/<XOFF> software conventions.*

---

1. Press the **Load** button.
2. Select **RS-232** from the Load01 screen.
3. Press the **Options** button.
4. Press the **Connection Settings** button and configure the settings. Then, press **OK**.
5. Press the **OK** button and then press the filename button to enter a name for the part program file.
6. Press **OK**. The ***Burny*** indicates that transmission can start by sending the following message:

   <XON><RON><10 NULLS><ROFF>

   waits 1 second, then sends another <XON>.

   The ***Burny*** then sends the following message to request the specific program:

   <RON> DOWNLOAD PROGRAM: *Name of Part Program* <CR><EOB>

   The remote device can begin transmission any time after receiving the <XON> character, or it can wait for the "DOWNLOAD PROGRAM:" message to send the requested program. If the ***Burny*** needs to halt the transmission, it sends an <XOFF> character which causes the remote device to stop sending data. The ***Burny*** sends an <XON> character when the transmission can resume.

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*The STATUS INPUT LINE on the **Burny** must be kept at a high level when software protocol is being used. This may be done by connecting the "STATUS IN" to the pull-up line (pin 9 to pin 5).*

When the END OF PROGRAM CODE is received, the ***Burny*** then sends a communication link termination message of:

"<BEL><BEL><BEL>EOF:###<CR><LF>"

where ### represents one of the 3 digit status codes. The ***Burny*** then sends an <XOFF> <ROFF> and then turn off it's OUTPUT STATUS LINE.

10.7.7 COMM LINK 1 PROTOCOL (FILE SERVER)

This protocol is also known "DATA BANK 1" and is used with Burny "File Server-CLink". COMM LINK 1 is a special communications protocol which allows the ***Burny*** to send and receive part cutting programs from a remote computer via commands sent through the RS-232 port. The host computer can be programmed to use this protocol or simply run the File Server program available from Burny to provide a totally automatic link; no operator is required at the host computer.

Currently there are four basic commands that are supported.

<ESC>!FD (FILE DATA COMMAND)
<ESC>!FG (FILE GET COMMAND)
<ESC>!FQ (FILE QUE COMMAND)
<ESC>!QQ (FILE QUIT COMMAND)

COMM LINK 1 utilizes XON/XOFF software handshaking to control the flow of data between the two devices. A character-by-character check for XON or XOFF (>11 and >13) codes is done. The ***Burny*** does not currently support any block type protocols.

FILE DATA: <ESC>!FD

When the ***Burny*** control sends a program to a remote computer, the program data is preceded by a "FILE DATA" command string. The message consists of a sequence of characters incorporating the program file name being sent.

For example, for the ***Burny*** to send program file name 8765 to the remote computer, the following message would be sent first:

<ESC>!FD8765<CR><LF>

where:

<ESC>	is the ASCII escape character
!	is the ASCII exclamation point
FD	is the abbreviated command for "FILE DATA"

8765 is the program name stored in the ***Burny*** control which is sent to the computer. The file name is sent as standard ASCII numeric characters.

<CR>	is the ASCII carriage return character
<LF>	is the ASCII line feed character.

The ***Burny*** pauses for one second and then begins to send program data as follows:

<CR><LF>
%<CR><LF>
P8765<CR><LF>

.. (PROGRAM DATA)<CR><LF>

M30<CR><LF>	
^Z<CR><LF>	signal for end of program data
<ESC>!QQ###<CR><LF>	status code sent by ***Burny***

where:

<ESC>	is the ASCII escape character
!	is the ASCII exclamation point
QQ	is the abbreviated command for "FILE QUIT"
###	is a three digit status code
<CR>	is the ASCII carriage return character
<LF>	is the ASCII line feed character.
^Z	is the ASCII Control-Z character.

FILE GET: <ESC>!FG

The ***Burny*** control requests a program from the storage computer by specifying a program name. The message is a sequence of characters incorporating the desired program file name.

For example, to request program file name 12345, the ***Burny*** sends the following sequence to the computer.

<ESC>!FG12345<CR><LF>

where:

<ESC>	is the ASCII escape character
!	is the ASCII exclamation point
FG	is the abbreviated command for "FILE GET"

12345 is the program file name requested by the ***Burny*** control. The storage computer should send the requested ASCII file preceded by the "FILE DATA" command. The "FILE GET" command is always sent by the requesting device and the "FILE DATA" command always precedes transmission of the actual program.

<CR>	is the ASCII carriage return character
<LF>	is the ASCII line feed character.

*At this time, the remote computer cannot request a program from the **Burny** control. All transfers are initiated at the **Burny** control.*

If the ***Burny*** issues an "FG" request to the remote computer for a program (12345 for example) which does not exist, the remote computer should send the following response:

<ESC>!FD12345<CR><LF><^Z>

where the <^Z> termination character is sent immediately after the FD header indicating the program does not exist. The ***Burny*** then displays "NO PROGRAM HEADER FOUND" error message.

FILE QUEUE: <ESC>!FQ

The "FILE QUEUE" command allows the ***Burny*** to make a request to the storage computer for the next program in its queue. There is no program file name sent with the FILE QUE command. The storage computer must acknowledge the <ESC>!FQ request with <ESC>!FD########<CR><LF>, pause one second then send the program that is next on the queue.

An acknowledgment of <ESC>!FD<CR><LF> with no program file name also works. However the actual file that is sent to the ***Burny*** *MUST CONTAIN A PROGRAM FILE NAME BLOCK, such as "P12345678" for WORD ADDRESS. If no program file name block is included in the program the* ***Burny*** *creates a program file name of "FFFFFFFF" for that file.*

FILE QUIT: <ESC>!QQ

Once a file has been transferred from the storage computer to the ***Burny***, the ***Burny*** sends a <ESC>!QQ### followed by a three digit status code. The status codes are listed at the end of this section.

For example, the ***Burny*** operator requests program file name 12345 from the storage computer.

<ESC>!FG12345<CR><LF>	(Request message sent to storage computer by ***Burny***)
<ESC>!FD12345<CR><LF>	(Storage computer sends acknowledgment to ***Burny***)
PAUSES FOR 1 SECOND	
<CR><LF>	(SENDS <CR><LF> BEFORE "%")
%<CR><LF>	(STORAGE COMPUTER BEGINS TO END ASCII FILE)
PROGRAM DATA SENT BY STORAGE COMPUTER TO ***Burny***	
PROGRAM DATA SENT BY STORAGE COMPUTER TO ***Burny***	
M30<CR><LF>	
^Z<CR><LF>	SIGNAL FOR END OF PROGRAM DATA
<ESC>!QQ0<CR><LF>	PROGRAM COMPLETED NO ERRORS

One digit of '0' is returned on a successful completion with no errors. All other status codes are 3 digits.

10.7.8 STD TTY PROTOCOL

The Std TTY protocol choice in the RS-232 Serial Options Screen sets the ***Burny*** up as a dumb terminal. The Host Computer can use any of the many terminal programs. No handshaking takes place. The operators must coordinate the operation by communication with one another, either directly or over the phone.

10.8 DIAGNOSTICS AND TESTS

The following table lists the diagnostics and tests covered in this manual that will assist you when checking various functions of the ***Burny***.

Subject	Title
Test machine motion without cutting	Section 3 - RUN MODE
Power-up Self Diagnostics	Section 11B - SETUP & CALIBRATION
Encoder operation	Section 7 - UTILITY MODE
Displaying of Variables	Section 7 - UTILITY MODE
Speed problems	Section 11B - SETUP & CALIBRATION
Distance problems	Section 11B - SETUP & CALIBRATION

10.9 REPAIR OF THE BURNY

Service of your ***Burny*** must be performed only by trained, authorized personnel. Keep the following points in mind when troubleshooting:

- If a suspected malfunction is observed, refer to the proper section of this manual to verify that the observed problem is a malfunction.
- All circuit cards must be shipped in special static protective packaging. Any card or part removed from a Burny product should be immediately placed in a static dissipative bag. Warranty replacement, repair, or credit will not be issued on circuit cards returned without the proper anti-static packaging. Contact Burny for specifications or help with any packaging.
- In the case of malfunction of the system, contact Burny service personnel to assist you in isolating the mis-adjustment or malfunctioning component(s) causing the problem. If a component has sustained damage, the involved assembly is usually returned to the factory and a replacement assembly shipped to you.
- Without diagnostic equipment and training, technicians run the risk of damaging more components than were initially damaged extending down-time and repair expense. Always contact Burny Service when damage has occurred in order to prevent further electrical damage.

*To avoid loss of programs, read the section of this manual entitled "**Backup of Programs Stored in Burny Controls**"*

When considering any type of disassembly, please note:

HIGH VOLTAGES ARE PRESENT IN BURNY SYSTEMS THAT CAN INJURE AND KILL.

ONLY QUALIFIED PERSONS SHOULD OPEN OR DISASSEMBLE ANY PART OF THE *BURNY* SYSTEM.

TURN OFF AND RED TAG ALL POWER SOURCES DURING SERVICE.

ENSURE THAT UNAWARE PERSONS DO NOT TURN ON THE POWER DURING SERVICE.

USE A VOLTMETER TO BE CERTAIN THAT ALL POWER SOURCES HAVE BEEN TURNED OFF.

10.9.1 SPARE PARTS

Contact Burny Service to obtain needed replacement parts. Always use replacement parts that are supplied, designed, or approved by Burny. Burny service personnel can give you advice as to which replacement parts are best to have on hand. Refer Section 12, Replacement Parts List for more information.

10.9.2 BACKING UP FILES STORED IN BURNY CONTROL

It is important that you make a backup copy of your Burny files and store them away from the control. There are some instances when the setup information in the ***Burny*** can be lost. For example, a component failure, lightning strike, or even dropping a plate on top of the control may cause a loss of data. There are also cases where a new version of software requires the data to be erased and all programs re-loaded.

To perform a system backup, use the following steps:

1. Enable the Admin password by pressing the **Utils** button from the Main Menu.
2. Return to the Main Menu and press the **Store** button.
3. Choose a destination to store the backup files to from the Store01 screen.
4. Press the **Options** button on the Store02 screen.
5. Press the **File Type** button until System Backup is displayed and then press the **OK** button.
6. Verify and or enter the path and filename for the backup file and then press the **OK** button. The system backups the following:
   - Motion parameters
   - System default parameters
   - Custom AUX code files
   - Custom DXF conversion files
   - 4070 settings
7. After the system performs the backup, press the **OK** button.
8. Use the previous steps to backup additional files by choosing a different file type in step 5.

If programs are already stored on a host computer, make sure there are back-up copies of the computer data since a problem such as a hard disk crash could cause the loss of program information.

TO PREVENT LOSS OF PROGRAM INFORMATION, IT IS THE CUSTOMER'S RESPONSIBILITY TO MAINTAIN BACKUP COPIES OF ALL IMPORTANT PROGRAMS AND TABLES. ALL PROGRAMS MUST BE BACKED-UP BEFORE SERVICE WORK (OR NEW SOFTWARE UPDATE) IS DONE TO THE CONTROL.

BEFORE CALLING BURNY

Before you call Cleveland Motion Controls for assistance, locate your Software Serial Number and Software Version Date Code. To view this information, use the button sequence located below. In case a malfunction prevents access to the License screen (Util60), write the information down and keep it in convenient place.

To access the System Information Screen, press the following button sequence:

Menu > Utils > System Setup > Miscellaneous Setup > License

10.10 ELECTRICAL SPECIFICATIONS (ONLY APPLIES TO: BURNY 10 LCD PLUS)

30 RECP - DRIVE INTERFACE

Specifications when *Burny* configured for: Standard Interface – No Interface card installed.
Pins not listed in this table are not used – do not make any connection to these pins

PIN #(s)	DESCRIPTION	RATINGS
1	General Purpose Input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 µA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
2	General Purpose Input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC @ 50 µA maximum allowed leakage. LOW = 1 VDC maximum @ 16 mA.
4	C Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
5	XX Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
6	Y Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
7	X Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
8	General Purpose Output	Active low open-collector driver output for relay control. Maximum current sink is 100 mA. Voltage source for relay is 24 VDC on pin 14.
9	Analog Ground	0 V
10	+10 VDC output	+10 VDC @ 10 mA maximum Can be used to source power to an external speed potentiometer.
11	General Purpose Output	Active low open-collector driver output for relay control. Maximum current sink is 100 mA. Voltage source for relay is 24 VDC on pin 14.
12	Chassis Ground	0 V
13	*Feature Not Yet Implemented* Output Reserved For X Drive Enable	Active low open-collector driver output for relay control. Maximum current sink is 100 mA. Voltage source for relay is 24 VDC on pin 14.
14	+24 VDC output	+24 VDC @ 100 mA maximum Protected by "TR1" fuse on back panel power board, an automatic resetting fuse. Fuse is reset by removal of power.
15	Signal Common	0 V
16	*Feature Not Yet Implemented* Output Reserved For Y Drive Enable	Active low open-collector driver output for relay control. Maximum current sink is 100 mA. Voltage source for relay is 24 VDC on pin 14.
17	Axis Speed Reference input from external speed potentiometer.	0-10 VDC @ 100 mA maximum
18	*Feature Not Yet Implemented* Output Reserved For XX Drive Enable	Active low open-collector driver output for relay control. Maximum current sink is 100 mA. Voltage source for relay is 24 VDC on pin 14.
19	*Feature Not Yet Implemented* Output Reserved For C Drive Enable	Active low open-collector driver output for relay control. Maximum current sink is 100 mA. Voltage source for relay is 24 VDC on pin 14.

TABLE CONTINUED ON NEXT PAGE…

30 RECP - DRIVE INTERFACE

Specifications when *Burny* configured for: Standard Interface – No Interface card installed.
Pins not listed in this table are not used – do not make any connection to these pins

PIN #(s)	DESCRIPTION	RATINGS
20	External Stop/Run Monitor Input	Active low for RUN by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor for external STOP. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 μA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
21	X Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 μA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
22	Y Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 μA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
23	XX Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 μA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
24	C Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 μA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.

30 RECP - DRIVE INTERFACE

Specifications when the ***Burny** is* configured for: *Burny OPCON* Interface – No Interface card installed.
Pins not listed in this table are not used – do not make any connection to these pins

PIN NUMBER(S)	DESCRIPTION	RATINGS
1, 2, 3	Tied together	30 VDC @ 500 mA, maximum carrying capacity.
4	C Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
5	XX Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
6	Y Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
7	X Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
8	Analog Ground	0 V
9	Analog Ground	0 V

TABLE CONTINUED ON NEXT PAGE…

30 RECP - DRIVE INTERFACE

Specifications when the ***Burny** is* configured for: *Burny OPCON* Interface – No Interface card installed.
Pins not listed in this table are not used – do not make any connection to these pins

PIN NUMBER(S)	DESCRIPTION	RATINGS
10, 11	Drives Ready contacts	Pin 10 is +24 VDC supply out from OPCON when OPCON is not in E-Stop. Pin 11 is Ready Signal input requiring +24 VDC @ 5 mA from pin 10. A relay or switch contact closure signaling that drive is ready is required between these two pins. Open circuit signals a drive not ready condition. Jumper these pins together if not used.
12	Chassis Ground	0 V
13	Signal Common	0 V
14, 16	External E-Stop contacts	Pin 14 is +24 VDC supply out from OPCON. Pin 16 is External E-Stop input requiring +24 VDC @ 150 mA from pin 14. A relay or switch contact closure signaling that no external E-Stops are active is required between these two pins. Open circuit signals an external E-Stop condition. Jumper these pins together if not used.
15	Signal Common	0 V
17, 18	Drive Fault contacts	Pin 17 is +24 VDC looped over from pin 16. Pin 18 is Drive Fault input requiring +24 VDC @ 150 mA from pin 17. A relay or switch contact closure signaling that no drive faults are active is required between these two pins. Open circuit signals a drive fault condition. Jumper these pins together if not used.
19, 20	Drive Out-of-Sync contacts	Pin 19 is +24 VDC looped over from pin 18. Pin 20 is Drive Out-of-Sync Fault input requiring +24 VDC @ 150 mA from pin 19. A relay or switch contact closure signaling that no drive out-of-sync faults are active is required between these two pins. Open circuit signals a drive out-of-sync fault condition. Jumper these pins together if not used.
21	X Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 μA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
22	Y Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 μA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.

TABLE CONTINUED ON NEXT PAGE…

30 RECP - DRIVE INTERFACE

Specifications when the ***Burny** is* configured for: *Burny OPCON* Interface – No Interface card installed.
Pins not listed in this table are not used – do not make any connection to these pins

PIN NUMBER(S)	DESCRIPTION	RATINGS
23	XX Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 µA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
24	C Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 µA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.

30 RECP - DRIVE INTERFACE

Specifications when the ***Burny*** is equipped with: MO-12426 or MO-12703 Replicator™ Interface card

Pins not listed in this table are not used – do not make any connection to these pins

PIN NUMBER(s)	DESCRIPTION	RATINGS
1	Drive enable common connection for pin 2 and pin 3.	25 VDC @ 250 mA, maximum carrying capacity.
2	X Axis Drive Enable	Open-Collector active-low pull-down to pin 1. Transistor sinks current to pin 1 to enable X Axis of external drive. Sink current is 125 mA maximum. Maximum of 25 VDC, measured from pin 1, is allowed when transistor is off.
3	Y Axis Drive Enable	Open-Collector active-low pull-down to pin 1. Transistor sinks current to pin 1 to enable Y Axis of external drive. Sink current is 125 mA maximum. Maximum of 25 VDC, measured from pin 1, is allowed when transistor is off.
4	C Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
5	XX Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
6	Y Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
7	X Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
8	Analog Ground	0 V
9	Analog Ground	0 V
10, 11	Drives Ready contacts	Pin 10 is +24 VDC supply out from OPCON when OPCON is not in E-Stop. Pin 11 is Ready Signal input requiring +24 VDC @ 5 mA from pin 10. A relay or switch contact closure signaling that drive is ready is required between these two pins. Open circuit signals a drive not ready condition. Jumper these pins together if not used.
12	Chassis Ground	0 V
13	Signal Common	0 V

TABLE CONTINUED ON NEXT PAGE…

30 RECP - DRIVE INTERFACE

Specifications when the ***Burny*** is equipped with: MO-12426 or MO-12703 Replicator™ Interface card

Pins not listed in this table are not used – do not make any connection to these pins

PIN NUMBER(s)	DESCRIPTION	RATINGS
14, 16	External E-Stop contacts	Pin 14 is +24 VDC supply out from OPCON. Pin 16 is External E-Stop input requiring +24 VDC @ 150 mA from pin 14. A relay or switch contact closure signaling that no external E-Stops are active is required between these two pins. Open circuit signals an external E-Stop condition. Jumper these pins together if not used.
15	Signal Common	0 V
17, 18	Drive Fault contacts	Pin 17 is +24 VDC looped over from pin 16. Pin 18 is Drive Fault input requiring +24 VDC @ 150 mA from pin 17. A relay or switch contact closure signaling that no drive faults are active is required between these two pins. Open circuit signals a drive fault condition. Jumper these pins together if not used.
19, 20	Drive Out-of-Sync contacts	Pin 19 is +24 VDC looped over from pin 18. Pin 20 is Drive Out-of-Sync Fault input requiring +24 VDC @ 150 mA from pin 19. A relay or switch contact closure signaling that no drive out-of-sync faults are active is required between these two pins. Open circuit signals a drive out-of-sync fault condition. Jumper these pins together if not used.
21	X Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 μA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
22	Y Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 μA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
23	XX Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 μA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
24	C Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 μA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.

30 RECP - DRIVE INTERFACE

Specifications when the ***Burny*** is equipped with: MO-3204-x C&G MST-40,150 (-0) and MST-250 (-1) Tracing system Interface card

Pins not listed in this table are not used – do not make any connection to these pins

PIN NUMBER	DESCRIPTION	RATINGS
5	*Burny* Enable—connect 30RECP-5 to 30RECP-9 to enable the drive outputs from the *Burny*. Open connection to 30RECP-5 to pass external Rail and Cross reference signals from 30RECP-11 and 16 to through the interface card to the servo drives	+VDC when Open 0V @ 1mA when connected to Signal Common
6	Cross Axis Speed Reference output—connects to MST Cross Axis servo drive	+/- 5 VDC @ 2mA maximum for MO-03204-0 +/- 10 VDC @ 2mA maximum for MO-03204-1
7	Rail Axis Speed Reference output—connects to MST Rail Axis servo drive	+/- 5 VDC @ 2mA maximum for MO-03204-0 +/- 10 VDC @ 2mA maximum for MO-03204-1
9	Signal Ground	0V
11	Rail Axis Speed Reference input from MST Tracer—when 30RECP-5 is Open, voltage on this pin is switched to the rail axis speed reference output at 30RECP-7 Also acts as Speed reference input for *Burny* cutting speed control	0-+/-10 VDC @ 1 mA maximum
15	Signal Ground	0V
16	Cross Axis Speed Reference input from MST Tracer—when 30RECP-5 is Open, voltage on this pin is switched to the cross axis speed reference output at 30RECP-6	0-+/-10 VDC @ 1 mA maximum

30 RECP - DRIVE INTERFACE

Specifications when the **Burny** is equipped with:

MO-3205-x Stewart Warner ECT 150 (-0) and ECT-250 (-1) Tracing system Interface Card.

(Any pins not listed in this table are not used – do not make any connection to these pins)

PIN NUMBER	DESCRIPTION	RATINGS
6	Cross Axis Speed reference output to ECT Tracer Cross axis Servo drive	+/-10 VDC @ 2ma maximum
7	Rail Axis Speed reference output to ECT Tracer Rail axis Servo drive	+/-10 VDC @ 2ma maximum
8	-15VDC output to ECT-250 “Catch” signal used to enable servo drives on ECT-250 systems only	-15VDC @ 20ma maximum – MO-3205-1 Only
9	Signal Common	0V
11	Rail axis speed reference from ECT Tracer. When *Burny* is not in control, voltage at this pin is switched to the Rail axis reference output at 30RECP-7	+/-10 VDC @ 0.1 mA Max
15	Signal Common	0V
16	Cross axis speed reference from ECT Tracer. When *Burny* is not in control, voltage at this pin is switched to the Cross axis reference output at 30RECP-6	+/-10 VDC @ 0.1 mA Max
17	Cutting speed reference input from ECT Tracer Speed dial circuit	0 to –10VDC @ 0.1 mA Max

30 RECP - DRIVE INTERFACE

Specifications when the ***Burny*** is equipped with: MO-3206 Stewart Warner HST-1000 Tracing system Interface card

Pins not listed in this table are not used – do not make any connection to these pins

PIN NUMBER(s)	DESCRIPTION	RATINGS
1	Square Wave Speed Reference Sync signal from HST-1000 Tracer	20V P-P @ 0.1 mA Maximum
3,4	Isolated contact connects to HST-1000 tracer to disable the tracer jog functions when *Burny* is in control	Maximum 30V AC/DC @ 0.1 A
6	Cross axis Speed Signal Output to HST-1000 Tracer—	0 to 20V P-P @ 2 mA Max -- Square wave
7	Rail axis Speed Signal Output to HST-1000 Tracer—	0 to 20V P-P @ 2 mA Max -- Square wave
9	Signal Ground	0V
10	Common for Drive enable outputs at 30RECP-11 and 16	0V
11	Sink Output Connects to HST-1000 to enable Rail axis drive when *Burny* is in control—Common is 30RECP-10	Sinks +24VDC @ 0.1A max
15	Signal Ground	0V
16	Sink Output Connects to HST-1000 to enable Cross axis drive when *Burny* is in control —Common is 30RECP-10	Sinks +24VDC @ 0.1A max
17	Cutting speed Reference input	0 to 20 V P-P @ 0.1 mA max

30 RECP - DRIVE INTERFACE

Specifications when *Burny* equipped with: MO-3209 Stewart Warner M33 Type Tracing system Interface card

Pins not listed in this table are not used – do not make any connection to these pins

PIN NUMBER(s)	DESCRIPTION	RATINGS
1	Sine Wave Speed Reference Sync signal from M33 Type Tracer	33VAC @ 1 mA Maximum
5	*Burny* Enable—connect 30RECP-5 to 30RECP-9 to enable the drive outputs from the *Burny*. Open connection to 30RECP-5 to pass external Rail and Cross reference signals from 30RECP-11 and 16 to through the interface card to the servo drives	+VDC when Open 0V @ 1mA when connected to Signal Common
3,4	Isolated contact connects to M33 type tracer to disable the tracer jog functions when *Burny* is in control	Maximum 30VDC, 42VAC @ 0.1 A
6	Cross axis Speed Signal Output to M33 Type Tracer--	8VAC @ 5 mA Max -- Sine wave
7	Rail axis Speed Signal Output to M33 Type Tracer--	8VAC @ 5 mA Max -- Sine wave
9	Analog Ground	0V
17	Cutting speed Reference input	0 to 8VAC @ 0.2 mA max

30 RECP - DRIVE INTERFACE

Specifications when *Burny* equipped with: MO-3210 Hancock Tracker Tracing system Interface card

Pins not listed in this table are not used – do not make any connection to these pins

PIN #	DESCRIPTION	RATINGS
6	Cross Axis Speed reference output to Hancock Tracker Tracing system/drive	+/-10VDC @ 2mA max
7	Rail Axis Speed reference output to Hancock Tracker Tracing system/drive	+/-10VDC @ 2mA max
8	Speed reference input from Hancock Tracker control panel	0 to +15 VDC @ 0.1 mA max
9	Signal Common	0V
11	Rail axis speed reference from Hancock Tracker. When *Burny* is not in control, voltage at this pin is switched to the Rail axis reference output at 30RECP-7	+/-10 VDC @ 0.1 mA Max
15	Signal Common	0V
16	Cross axis speed reference from Hancock Tracker. When *Burny* is not in control, voltage at this pin is switched to the Cross axis reference output at 30RECP-6	+/-10 VDC @ 0.1 mA Max

30 RECP - DRIVE INTERFACE

Specifications when *Burny* equipped with: MO-03387 PCT Tracing system Interface card

Pins not listed in this table are not used – do not make any connection to these pins

PIN #	DESCRIPTION	RATINGS
6	Cross Axis Speed reference output to PCT Tracer Cross axis Servo drive	+/-6.5 VDC @ 2ma maximum
7	Rail Axis Speed reference output to PCT Tracer Rail axis Servo drive	+/-6.5 VDC @ 2ma maximum
9	Signal Common	0V
11	Rail axis speed reference from PCT Tracer. When *Burny* is not in control, voltage at this pin is switched to the Rail axis reference output at 30RECP-7	+/-10 VDC @ 1.5 mA Max
15	Signal Common	0V
16	Cross axis speed reference from PCT Tracer. When *Burny* is not in control, voltage at this pin is switched to the Cross axis reference output at 30RECP-6	+/-10 VDC @ 1.5 mA Max
17	Cutting speed reference input from PCT Tracer Speed dial circuit	0 to +7.8VDC @ 0.02 mA Max

30 RECP - DRIVE INTERFACE

Specifications when *Burny* equipped with MO-03469 Tanaka Tracing system Interface card

(Pins not listed in this table are not used – do not make any connection to these pins)

PIN #	DESCRIPTION	RATINGS
3,4	Isolated Relay contact will be OPEN when *Burny* is in control	30VDC @ 0.1 A Max
5,10	Isolated Relay contact will be closed when *Burny* is in control. Used to Enable the Cross Axis Servo Drive.	30VDC @ 0.1 A Max
6	Cross Axis Speed reference output to TANAKA Tracer Cross axis Servo drive	+/-10 VDC @ 2ma maximum
7	Rail Axis Speed reference output to TANAKA Tracer Rail axis Servo drive	+/-10 VDC @ 2ma maximum
8,13	Isolated Relay contact will be closed when *Burny* is in control. Used to Enable the Rail Axis Servo Drive.	30VDC @ 0.1 A Max
9	Signal Common	0V
11	Rail axis speed reference from TANAKA Tracer. When *Burny* is not in control, voltage at this pin is switched to the Rail axis reference output at 30RECP-7	+/-10 VDC @ 0.05 mA Max
15	Signal Common	0V
16	Cross axis speed reference from TANAKA Tracer. When *Burny* is not in control, voltage at this pin is switched to the Cross axis reference output at 30RECP-6	+/-10 VDC @ 0.05 mA Max
17	Cutting speed reference input from TANAKA Tracer Speed dial circuit	0 to +7.5VDC @ 0.02 mA Max

30 RECP - DRIVE INTERFACE

Specifications when *Burny* equipped with MO-04028 Multi-Drive Interface card

(Pins not listed in this table are not used – do not make any connection to these pins)

PIN #	DESCRIPTION	RATINGS
1,2	Relay contact and 7.2 Volt reference output used to connect to tracer or supply voltage to tracer or cutting machine speed pot. If ***Burny*** in control: Pin 1 is Open (no connection) Pin 2 supplies 7.2 VDC reference If ***Burny*** not in control: Relay contact closed between Pin 1 and Pin 2. No voltage supplied to either pin	7.2V reference supplied 7.2 VDC @ 50 mA maximum Closed relay contact: 30VDC or 42VAC @ .1 A max
3 4 5 10	3 interconnected relay contacts used to connect to tracer or servo drive as required. Relay operation is as follows: If ***Burny*** in control: Contacts Closed: Pin 4 to Pin 10 Pin 5 to Pin 10 If ***Burny*** not in control: Contacts Closed: Pin 3 to Pin 4	30VDC or 42VAC @ .1 A max
6	Cross Axis Speed reference output to Tracer Cross axis Servo drive	+/-10 VDC @ 2 ma maximum
7	Rail Axis Speed reference output to Tracer Rail axis Servo drive	+/-10 VDC @ 2 ma maximum
8,13	Isolated Relay contact is CLOSED when *Burny* is in Control	30VDC or 42VAC @ .1 A max
9	Signal Common	0V
11	Rail axis speed reference from Tracer. When ***Burny*** is not in control, voltage at this pin is switched to the Rail axis reference output at 30RECP-7	+/-10 VDC @ 1.5 mA Max
15	Signal Common	0V
16	Cross axis speed reference from Tracer. When ***Burny*** is not in control, voltage at this pin is switched to the Cross axis reference output at 30RECP-6	+/-10 VDC @ 1.5 mA Max
17	Cutting speed reference input from Tracer Speed dial circuit	0 to +10VDC @ 0.02 mA Max
19	External Jog input. Pin 19 is grounded (connected to Pin 9 signal common) when the external tracer or jog controls are being used to move the machine. While grounded, the external speed reference inputs at pin 11 and 16 are switched to the speed reference outputs at pins 6 and 7.	Open circuit voltage -- +5 VDC When input connected to signal common - sink current = 25 mA max

30 RECP - DRIVE INTERFACE

Specifications when the ***Burny*** is equipped with MO-06213 Westinghouse HL series Interface card

(Pins not listed in this table are not used – do not make any connection to these pins)

PIN #	DESCRIPTION	RATINGS
1,2	Relay contact and 7.2 Volt reference output used to connect to tracer or supply voltage to tracer or cutting machine speed pot. If ***Burny*** in control : Pin 1 is Open (no connection) Pin 2 supplies 7.2 VDC reference If ***Burny*** not in control: Relay contact closed between Pin 1 and Pin 2. No voltage supplied to either pin	7.2V reference supplied 7.2 VDC @ 50 mA maximum Closed relay contact: 30VDC or 42VAC @ .1 A max
3 4 5 10	3 interconnected relay contacts used to connect to tracer or servo drive as required. Relay operation is as follows. If ***Burny*** in control: Contacts Closed: Pin 4 to Pin 10 Pin 5 to Pin 10 If ***Burny*** not in control: Contacts Closed: Pin 3 to Pin 4	30VDC or 42VAC @ .1 A max Jumper J1 can be installed on the card to connect Pin 10 to Signal Common if desired
6	Cross Axis Speed reference output to Tracer Cross axis Servo drive	+/-10 VDC @ 2 ma maximum
7	Rail Axis Speed reference output to Tracer Rail axis Servo drive	+/-10 VDC @ 2 ma maximum
8,13	Isolated Relay contact is CLOSED when ***Burny*** is in Control	30VDC or 42VAC @ .1 A max
9	Signal Common	0V
11	Rail axis speed reference from Tracer. When ***Burny*** is not in control, voltage at this pin is switched to the Rail axis reference output at 30RECP-7	+/-10 VDC @ 1.5 mA Max
15	Signal Common	0V
16	Cross axis speed reference from Tracer. When ***Burny*** is not in control, voltage at this pin is switched to the Cross axis reference output at 30RECP-6	+/-10 VDC @ 1.5 mA Max
17	Cutting speed reference input from Tracer Speed dial circuit	0 to +10VDC @ 0.02 mA Max 0 to 7.2VDC when ***Burny*** is in control
20	External E-STOP Monitor input. An isolated relay contact from the cutting machine should be used to drive this input--- Pin 20 should be connected to signal Common (pin 9) when machine is ready to run. Pin 20 should be OPEN (no connection) when machine is in an E-STOP condition	Open Circuit voltage -- 7 VDC Sink current required when input connected to signal common: 1 mA maximum

30 RECP - DRIVE INTERFACE

Specifications when *Burny* equipped with MO-06214 ServoPak / Multi-drive Interface card

Pins not listed in this table are not used – do not make any connection to these pins

PIN #	DESCRIPTION	RATINGS
1	Rail Axis External Jog input-- Pin 1 is open for normal operation where *Burny* is in Control of the machine. Pin 1 is grounded (Signal Common – Pin 9) to indicate that the external machine or tracer jog control is moving the Rail axis of the machine.	Open Circuit voltage +5 VDC Sink current required when input is connected to signal common: 1.5 mA maximum
2	Cross Axis External Jog input-- Pin 2 is open for normal operation where *Burny* is in Control of the machine. Pin 2 is grounded (Signal Common – Pin 9) to indicate that the external machine or tracer jog control is moving the Cross axis of the machine.	Open Circuit voltage +5 VDC Sink current required when input is connected to signal common: 1.5 mA maximum
3 4 5 10	Relay contact and 7.2 Volt reference output used to connect to tracer or supply voltage to tracer or cutting machine speed pot. If *Burny* in control : Pin 3 is Open (no connection) Pin 4 supplies 7.2 VDC reference Pin 5 supplies 7.2 VDC reference Pin 10 supplies 7.2 VDC reference If *Burny* not in control: Relay contact closed between Pin 3 and Pin 4. No voltage supplied to either pin. Pin 5 is Open—no voltage applied Pin 10 supplies 7.2 VDC reference	7.2V reference supplied 7.2 VDC @ 50 mA maximum Closed relay contact: 30VDC or 42VAC @ .1 A max
6	Cross Axis Speed reference output to Tracer Cross axis Servo drive	+/-10 VDC @ 2 ma maximum
7	Rail Axis Speed reference output to Rail axis Servo drive	+/-10 VDC @ 2 ma maximum
8,13	Isolated Relay contact is CLOSED when *Burny* is in Control	30VDC or 42VAC @ .1 A max
9	Signal Common	0V
11	Rail axis speed reference from Tracer. When *Burny* is not in control, voltage at this pin is switched to the Rail axis reference output at 30RECP-7	+/-10 VDC @ 1.5 mA Max
15	Signal Common	0V
16	Cross axis speed reference from Tracer. When *Burny* is not in control, voltage at this pin is switched to the Cross axis reference output at 30RECP-6	+/-10 VDC @ 1.5 mA Max
17	Cutting speed reference input from Tracer Speed dial circuit	0 to +10VDC @ 0.02 mA Max 0 to 7.2VDC when *Burny* is in control
20	External E-STOP Monitor input. An isolated relay contact from the cutting machine should be used to drive this input--- Pin 20 should be connected to signal Common (pin 9) when machine is ready to run. Pin 20 should be OPEN (no connection) when machine is in an E-STOP condition	Open Circuit voltage -- 7 VDC Sink current required when input connected to signal common: 1 mA maximum

31 RECP - PLASMA FUNCTION INTERFACE

Pins not listed in this table are not used – do not make any connection to these pins

Pin #	Description	Ratings: Burny 10	Ratings: Burny 10 LCD and Burny 10 LCD Plus
2,3,4	Plasma Stop (Enable) Output (Isolated Form-C dry-contact relay) Pin 4 – Normally Open contact Pin 3 – Common contact Pin 2 – Normally Closed contact	230 VAC, 5A maximum **or** 24 VDC, 5A maximum.	115 VAC, 5A maximum **or** 24 VDC, 5A maximum.
5,18	Plasma Select Sense Input (Isolated) Pin 5 – source Pin 18 – return	24-230 VAC, 4-8 mA **or** 24-230 VDC, 5 mA Protected by “FU7” fuse on back panel power board, a 0.125 A fast-acting fuse, on pin 5.	24-115 VAC/DC 5-25mA
6,11	General Purpose Output #3 (Isolated Form-A dry-contact relay)	230 VAC, 5A maximum **or** 24 VDC, 5A maximum.	115 VAC, 5A maximum **or** 24 VDC, 5A maximum. (optional)
7,12	General Purpose Output #6 (Isolated Form-A dry-contact relay)	230 VAC, 5A maximum **or** 24 VDC, 5A maximum.	115 VAC, 5A maximum **or** 24 VDC, 5A maximum. (optional)
8,9	General Purpose Input #3 (Isolated) Pin 8 – source Pin 9 – return	24-230 VAC, 4-8mA or 24-230VDC, 5mA Protected by “FU9” fuse on back panel power board, a 0.125. A fast-acting fuse on pin 8.	24-115 VAC/DC 5-25mA (optional)
10,17	General Purpose Output #4 (Isolated Form-A dry-contact relay)	230 VAC, 5A maximum **or** 24 VDC, 5A maximum.	115 VAC, 5A maximum **or** 24 VDC, 5A maximum. (optional)
13,20,26	Plate Marker #2 Output (Isolated Form-C dry-contact relay) Pin 26 – Normally Open contact Pin 20 – Common contact Pin 13 – Normally Closed contact	230 VAC, 5A maximum **or** 24 VDC, 5A maximum.	115 VAC, 5A maximum **or** 24 VDC, 5A maximum.
15,21,22	Plasma Start Output (Isolated Form-C dry-contact relay) Pin 22 – Normally Open contact Pin 21 – Common contact Pin 15 – Normally Closed contact	230 VAC, 5A maximum **or** 24 VDC, 5A maximum.	115 VAC, 5A maximum **or** 24 VDC, 5A maximum
16,29	Plasma Go (Arc On) Input (Isolated) Pin 16 – source Pin 29 – return	24-230 VAC, 4-8 mA **or** 24-230 VDC, 5 mA Protected by “FU8” fuse on back panel power board, a 0.125 A fast-acting fuse, on pin 16.	24-115 VAC/DC 5-25mA
24,30	General Purpose Output #5 (Isolated Form-A dry-contact relay)	230 VAC, 5A maximum **or** 24 VDC, 5A maximum.	115 VAC, 5A maximum or 24 VDC, 5A maximum. (optional)
25,31	General Purpose Output #7 (Isolated Form-A dry-contact relay)	230 VAC, 5A maximum **or** 24 VDC, 5A maximum.	115 VAC, 5A maximum **or** 24 VDC, 5A maximum. (optional)
27,28	General Purpose Input #4 (Isolated) Pin 27 – source Pin 28 – return	24-230 VAC, 4-8 mA **or** 24-230 VDC, 5 mA Protected by “FU10” fuse on back panel power board, a 0.125 A fast-acting fuse, on pin 27.	24-115 VAC/DC 5-25mA (optional)
32,33	General Purpose Output #8 (Isolated Form-A dry-contact relay)	230 VAC, 5A maximum **or** 24 VDC, 5A maximum.	115 VAC, 5A maximum **or** 24 VDC, 5A maximum. (optional)
35,36,37	Plasma Height Sensor Disable Output (Isolated Form-C dry-contact relay) Pin 37 – Normally Open contact Pin 36 – Common contact Pin 35 – Normally Closed contact	230 VAC, 5A maximum **or** 24 VDC, 5A maximum.	115 VAC, 5A maximum **or** 24 VDC, 5A maximum.

32 RECP - OXYGEN CUTTING INTERFACE AND AC POWER INPUT

Pins not listed in this table are not used – do not make any connection to these pins

PIN #(s)	DESCRIPTION	RATINGS Burny 10	RATINGS Burny 10 LCD and Burny 10 LCD Plus
1	Line HOT Input	115 or 230 VAC, 50/60 Hz, 6.3 A maximum. Protected by “FU1” fuse on back panel power board, a 6.3 A time-delay fuse.	115 or 230 VAC, 50/60 Hz, 4 A maximum. Protected by “FU1” fuse on back panel power board, a 4 A time-delay fuse.
2, 7	General Purpose Input #1 (Isolated) Pin 2 – source Pin 7 – return	24-230 VAC, 4-8 mA or 24-230 VDC, 5 mA Protected by “FU4” fuse on back panel power board, a 0.125 A fast-acting fuse, on pin 2.	24-115 VAC/DC 5-25mA (optional)
3, 4, 8	Oxy Stop Output (Isolated Form-C dry-contact relay) Pin 8 – Normally Open contact Pin 4 – Common contact Pin 3 – Normally Closed contact	230 VAC, 5A maximum or 24 VDC, 5A maximum.	115 VAC, 5A maximum or 24 VDC, 5A maximum.
6,12	General Purpose Output #1 (Isolated Form-A dry-contact relay)	230 VAC, 5A maximum or 24 VDC, 5A maximum.	115 VAC, 5A maximum or 24 VDC, 5A maximum. (optional)
9,14,15	Plate Marker #1 Output (Isolated Form-C dry-contact relay) Pin 9 – Normally Open contact Pin 15 – Common contact Pin 14 – Normally Closed contact	230 VAC, 5A maximum or 24 VDC, 5A maximum.	115 VAC, 5A maximum or 24 VDC, 5A maximum
10, 23	Oxy Cut Switch Sense Input (Isolated) Pin 10 – source Pin 23 – return	24-230 VAC, 4-8 mA or 24-230 VDC, 5 mA Protected by “FU2” fuse on back panel power board, a 0.125 A fast-acting fuse, on pin 10.	24-115 VAC/DC 5-25mA
11, 24	Program Inhibit Input (Isolated) Pin 11 – source Pin 24 – return	24-230 VAC, 4-8 mA or 24-230 VDC, 5 mA Protected by “FU3” fuse on back panel power board, a 0.125 A fast-acting fuse, on pin 11.	24-115 VAC/DC 5-25mA
16, 17	General Purpose Output #2 (Isolated Form-A dry-contact relay)	230 VAC, 5A maximum or 24 VDC, 5A maximum.	115 VAC, 5A maximum or 24 VDC, 5A maximum. (optional)
18, 19	Chassis Ground Input	(16 AWG, 300V, 105 °C wire)	

TABLE CONTINUED ON NEXT PAGE…

32 RECP - OXYGEN CUTTING INTERFACE AND AC POWER INPUT

Pins not listed in this table are not used – do not make any connection to these pins

PIN #(s)	DESCRIPTION	RATINGS Burny 10	RATINGS Burny 10 LCD and Burny 10 LCD Plus
20, 27	General Purpose Input #2 (Isolated) Pin 20 – source Pin 27 – return	24-230 VAC, 4-8 mA or 24-230 VDC, 5 mA Protected by “FU5” fuse on back panel power board, a 0.125 A fast-acting fuse, on pin 20.	24-115 VAC/DC 5-25mA (optional)
21, 22, 28	Preheat Start Output (Isolated Form-C dry-contact relay) Pin 21 – Normally Open contact Pin 22 – Common contact Pin 28 – Normally Closed contact	230 VAC, 5A maximum or 24 VDC, 5A maximum	115 VAC, 5A maximum or 24 VDC, 5A maximum.
25, 30	External Contactor Output (Isolated Form-A dry-contact relay)	230 VAC, 5A maximum or 24 VDC, 5A maximum.	115 VAC, 5A maximum or 24 VDC, 5A maximum.
31, 35	External E-Stop Monitor Input (Isolated) Pin 31 – source Pin 35 – return	24-230 VAC, 4-8 mA or 24-230 VDC, 5 mA Protected by “FU6” fuse on back panel power board, a 0.125 A fast-acting fuse, on pin 31.	24-115 VAC/DC 5-25mA
32, 36, 37	Oxy Start Output (Isolated Form-C dry-contact relay) Pin 32 – Normally Open contact Pin 37 – Common contact Pin 36 – Normally Closed contact	230 VAC, 5A maximum or 24 VDC, 5A maximum.	115 VAC, 5A maximum or 24 VDC, 5A maximum.
34	Line NEUTRAL Input	Neutral connection for pin 1 AC Line input.	

33 RECP and 34 RECP - X encoder input and Y encoder input

Pins not listed in this table are not used – do not make any connection to these pins

PIN #	DESCRIPTION	RATINGS Single-ended encoders "SW1" on back panel ISO Board all open	RATINGS Differential encoders "SW1" on back panel ISO Board all closed
1	Supply Common (to power encoder)	0 V	0 V
2	/I channel input	Not used, do not connect anything to this pin.	Differential driver input paired with pin 6. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
3	/B channel input	Not used, do not connect anything to this pin,	Differential driver input paired with pin 8. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
5	/A channel input	Not used, do not connect anything to this pin,	Differential driver input paired with pin 9. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
6	I channel input	Designed for open-collector type input. HIGH = Pulled to +5 VDC supply with 1.5 kΩ internal resistor. 3 VDC minimum. LOW = Pull down to Supply Common. 1 VDC maximum.	Differential driver input paired with pin 2. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
7	+5 VDC supply output (to power encoder)	+5 VDC @ 500 mA	+5 VDC @ 500 mA
8	B channel input	Designed for open-collector type input. HIGH = Pulled to +5 VDC supply with 1.5 kΩ internal resistor. 3 VDC minimum. LOW = Pull down to Supply Common. 1 VDC maximum.	Differential driver input paired with pin 3. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
9	A channel input	Designed for open-collector type input. HIGH = Pulled to +5 VDC supply with 1.5 kΩ internal resistor. 3 VDC minimum. LOW = Pull down to Supply Common. 1 VDC maximum.	Differential driver input paired with pin 5. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.

35RECP – Serial I/O-RS-232/422

This communication port is isolated (100 V minimum) from the rest of the system.

Pins not listed in this table are not used – do not make any connection to these pins

<table>
<tr><td></td><td colspan="4">Configuration Jumper Designators:
“J1”—B10 or B10 LCD (Reference numbers 100 – 1435)
“J3”—B10 LCD or Burny 10 LCD Plus (Reference numbers 1436 or above)</td></tr>
<tr><td rowspan="2">PIN #</td><td colspan="2">RS-232
Configuration jumper on back panel board set to “A” and software set to RS-232 communication
or
Configuration jumper on back panel board set to “B”.</td><td colspan="2">RS-422
Configuration jumper on back panel board set to “A” and software set to RS-422 communication
or
Configuration jumper on back panel board removed.</td></tr>
<tr><td>DESCRIPTION</td><td>RATINGS</td><td>DESCRIPTION</td><td>RATINGS</td></tr>
<tr><td>2</td><td>Receive Data input (RX)</td><td>Logic LOW = 0.8 V maximum.
Logic HIGH = 2.4 V minimum.
5 kΩ input resistance.
Maximum voltage to pin is |20 VDC reference to pin 7.
Pulled to isolated +5 V with 5.1 kΩ internal resistor.
Logic HIGH on this pin diverts communications over to “36 RECP”.</td><td>Receive Data inverted input (RX-)</td><td>Differential input paired with pin 9.
Minimum differential voltage is 200 mV.
24 kΩ input resistance.
Maximum voltage to pin is |20 VDC reference to pin 7.
Pulled to isolated +5 V with 5.1 kΩ internal resistor.
Logic HIGH on this pin diverts communications over to “36 RECP”.</td></tr>
<tr><td>3</td><td>Transmit Data output (TX)</td><td>Minimum output swing is |5 V into a 3 kΩ load.
Maximum no-load output is |18 V.</td><td>Transmit Date inverted output (TX-)</td><td>Differential output paired with pin 8.
2 V minimum to 6 V maximum output with 50 Ω load.
Short circuit protected.</td></tr>
<tr><td>5, 6</td><td>+5 VDC pull-up
May be used for any signal requiring high level</td><td>Pulled to isolated +5 VDC with 5.1 kΩ internal resistor.
0.4 mA maximum to insure high level.</td><td>+5 VDC pull-up
May be used for any signal requiring high level</td><td>Pulled to isolated +5 V with 5.1 kΩ internal resistor.
0.4 mA maximum to insure high level.</td></tr>
<tr><td>7</td><td>Signal common</td><td>0 V</td><td>Signal common</td><td>0 V</td></tr>
<tr><td>8</td><td>Control Status Line output (RTS)</td><td>Minimum output swing is |5 V into a 3 kΩ load.
Maximum no-load output is |18 V.</td><td>Transmit Date non-inverted output (TX+)</td><td>Differential output paired with pin 8.
2 V minimum to 6 V maximum output with 50 Ω load.
Short circuit protected.</td></tr>
<tr><td>9</td><td>Control Line input (CTS)</td><td>Logic LOW = 0.8 V maximum.
Logic HIGH = 2.4 V minimum.
5 kΩ input resistance.
Maximum voltage to pin is |20 VDC reference to pin 7.</td><td>Receive Data non-inverted input (RX+)</td><td>Differential input paired with pin 2.
Minimum differential voltage is 200 mV.
24 kΩ input resistance.
Maximum voltage to pin is |20 VDC reference to pin 7.</td></tr>
</table>

36 RECP - SERIAL I/O-B MODEM

For communications to LDM-70 Modem by DATAFORTH©

Pins not listed in this table are not used – do not make any connection to these pins

PIN #(s)	DESCRIPTION	RATINGS
2	Receive Data high input (RX+)	This pin is paired with pin 9 to create a current loop sensitive input. Current into pin 2 is a mark and current out of pin 2 is a space. 1000V isolation. 33 Ω input impedance. Exact specifications are proprietary to DATAFORTH©.
3	Transmit Date high output (TX+)	This pin is paired with pin 8 to create a current loop output. Current out of pin 3 is a mark and current into pin 2 is a space. 1000V isolation. Maximum output it ⏐18 VDC. Exact specifications are proprietary to DATAFORTH©.
4, 5	Sense Input from multiplexer	Intended for use with ***BURNY*** Modem Switching Box. Logic LOW = 1 V maximum Logic HIGH = 8 V minimum
6, 7	Contact Output #1 to multiplexer (Isolated Form-A dry-contact relay)	Intended for use with ***BURNY*** Modem Switching Box. 25 VDC, 100 mA
8	Transmit Date low output (TX-)	See pin 3 ratings.
9	Receive Data low input (RX-)	See pin 2 ratings.

37 RECP - Auxiliary Line Power Output

Pins not listed in this table are not used – do not make any connection to these pins

This output not available on the Burny 10 LCD or Burny 10 LCD Plus

PIN #	DESCRIPTION	RATINGS
1	Line HOT output	Voltage will be that supplied for AC Line input on "32 RECP" pin 1 (115 or 230 VAC, 50/60 Hz). 1 A maximum. Protected by "FU1" fuse on back panel power board, a 6.3 A time-delay fuse.
4	Chassis Ground output	(18 AWG, 300V 80 °C wire)
5	Line Neutral	Neutral connection for pin 1 AC Line output.
6	Chassis Ground output	(18 AWG, 300V 80 °C wire)

41RECP and 42RECP (42 RECP is on controls MNT-13000 and later)

"#1 AUX ENCODER INPUT" and "#2 AUX ENCODER INPUT"

Pins not listed in this table are not used – do not make any connection to these pins

PIN #	DESCRIPTION	RATINGS	
		Single-ended encoders "SW2" on back panel ISO Board all open	**Differential encoders** "SW2" on back panel ISO Board all closed
1	Supply Common (to power encoder)	0 V	0 V
2	/I channel input	Not used, do not connect anything to this pin.	Differential driver input paired with pin 6. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
3	/B channel input	Not used, do not connect anything to this pin,	Differential driver input paired with pin 8. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
5	/A channel input	Not used, do not connect anything to this pin,	Differential driver input paired with pin 9. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
6	I channel input	Designed for open-collector type input. HIGH = Pulled to +5 VDC supply with 1.5 kΩ internal resistor. 3 VDC minimum. LOW = Pull down to Supply Common. 1 VDC maximum.	Differential driver input paired with pin 2. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
7	+5 VDC supply output (to power encoder)	+5 VDC @ 500 mA	+5 VDC @ 500 mA
8	B channel input	Designed for open-collector type input. HIGH = Pulled to +5 VDC supply with 1.5 kΩ internal resistor. 3 VDC minimum. LOW = Pull down to Supply Common. 1 VDC maximum.	Differential driver input paired with pin 3. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
9	A channel input	Designed for open-collector type input. HIGH = Pulled to +5 VDC supply with 1.5 kΩ internal resistor. 3 VDC minimum. LOW = Pull down to Supply Common. 1 VDC maximum.	Differential driver input paired with pin 5. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.

43RECP

BLOWER for connection to MO-12230 blower unit only.

Pins not listed in this table are not used – do not make any connection to these pins

Blower receptacle not installed on Burny 10 LCD.

PIN #	115 VAC Line input on "32 RECP" and blower harness wires connected according to back panel power board silkscreen.		230 VAC Line input on "32 RECP" and blower harness wires connected according to back panel power board silkscreen.	
	DESCRIPTION	**RATINGS**	**DESCRIPTION**	**RATINGS**
1	Line HOT output Controlled by thermostat "TH1" on back panel board, which closed as 85 °F (29 °C).	115 VAC, 60 Hz, 1.25 A maximum Protected by "FU11" fuse on back panel power board, a 1.25 A time-delay fuse.	AC line output Controlled by thermostat "TH1" on back panel board, which closed as 85 °F (29 °C).	230 VAC, 50 Hz, 1.25 A maximum Protected by "FU11" fuse on back panel power board, a 1.25 A time-delay fuse.
2	Jumper to pin 3	(18 AWG, 300V, 80 °C wire)	Not used.	Do not connect anything to this pin.
3	Jumper to pin 2	(18 AWG, 300V 80 °C wire)	Jumper to pin 7	(18 AWG, 300V, 80 °C wire)
4	Chassis Ground output	(18 AWG, 300V 80 °C wire)	Chassis Ground output	(18 AWG, 300V, 80 °C wire)
5	Line Neutral	Neutral connection for pin 1 and pin 7 AC Line output.	Line Neutral	Neutral connection for pin 1 AC Line output.
7	Line HOT output Controlled by thermostat "TH1" on back panel board, which closed as 85 °F (29 °C).	115 VAC, 60 Hz, 1.25 A maximum Protected by "FU11" fuse on back panel power board, a 1.25 A time-delay fuse.	Jumper to pin 3	(18 AWG, 300V, 80 °C wire)

10.11 ELECTRICAL SPECIFICATIONS (ONLY APPLIES TO: BURNY 10 LCD PLUS OEM)

30 RECP - DRIVE INTERFACE

Specifications when ***Burny*** configured for: Standard Interface – No Interface card installed.

Pins not listed in this table are not used – do not make any connection to these pins

PIN #	DESCRIPTION	RATINGS for Burny 10 LCD Plus OEM
1	General Purpose Input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 μA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
2	General Purpose Input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC @ 50 μA maximum allowed leakage. LOW = 1 VDC maximum @ 16 mA.
4	C Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
5	XX Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
6	Y Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
7	X Axis Speed Reference output	+/- 10 VDC @ 2mA maximum
8	General Purpose Output	Active low open-collector driver output for relay control. Maximum current sink is 100 mA. Voltage source for relay is 24 VDC on pin 14.
9	Analog Ground	0 V
10	+10 VDC output	+10 VDC @ 10 mA maximum Can be used to source power to an external speed potentiometer.
11	General Purpose Output	Active low open-collector driver output for relay control. Maximum current sink is 100 mA. Voltage source for relay is 24 VDC on pin 14.
12	Chassis Ground	0 V
13	*Feature Not Yet Implemented* Output Reserved For X Drive Enable	Active low open-collector driver output for relay control. Maximum current sink is 100 mA. Voltage source for relay is 24 VDC on pin 14.
14	+24 VDC output	+24 VDC @ 100 mA maximum Protected by “TR1” fuse on back panel power board, an automatic resetting fuse. Fuse is reset by removal of power.
15	Signal Common	0 V
16	*Feature Not Yet Implemented* Output Reserved For Y Drive Enable	Active low open-collector driver output for relay control. Maximum current sink is 100 mA. Voltage source for relay is 24 VDC on pin 14.
17	Axis Speed Reference input from external speed potentiometer.	0-10 VDC @ 100 mA maximum
18	*Feature Not Yet Implemented* Output Reserved For XX Drive Enable	Active low open-collector driver output for relay control. Maximum current sink is 100 mA. Voltage source for relay is 24 VDC on pin 14.

TABLE CONTINUED ON NEXT PAGE…

30 RECP - DRIVE INTERFACE

Specifications when ***Burny*** configured for: Standard Interface – No Interface card installed.

Pins not listed in this table are not used – do not make any connection to these pins

PIN #	DESCRIPTION	RATINGS for Burny 10 LCD Plus OEM
19	*Feature Not Yet Implemented* Output Reserved For C Drive Enable	Active low open-collector driver output for relay control. Maximum current sink is 100 mA. Voltage source for relay is 24 VDC on pin 14.
20	External Stop/Run Monitor Input	Active low for RUN by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor for external STOP. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 µA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
21	X Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 µA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
22	Y Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 µA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
23	XX Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 µA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.
24	C Axis Home Switch input	Active low by pull-down to signal common on pin 15. Internally pulled high to 24 VDC with 1.5 kΩ resistor. Diode protected to only sink current. HIGH = Open circuit at 24 VDC, and 50 µA maximum allowed leakage. LOW = 1 VDC maximum, 16 mA.

31 RECP – PLASMA FUNCTION INTERFACE

NOTE: Transistor Outputs are normally off and are not a Relay Contact

Pins not listed in this table are not used – do not make any connection to these pins

Pin #	Description	Ratings: Burny 10 LCD Plus OEM
1, 20	Plasma Select Sense Input (Isolated) Pin 1: + Pin 20: -	12-24 VAC or VDC, 8-16 mA, respectively
2, 21	Plasma Go (Arc On) Input (Isolated) Pin 2: + Pin 21: -	12-24 VAC or VDC, 8-16 mA, respectively
3, 22	General Purpose Input #3 (Isolated) Pin 3: + Pin 22: -	12-24 VAC or VDC, 8-16 mA, respectively
4, 23	General Purpose Input #4 (Isolated) Pin 4: + Pin 23: -	12-24 VAC or VDC, 8-16 mA, respectively
6, 7	ISO / ESTOP +24V ISO / ESTOP Pin 6: + Pin 7: -	+24 VDC, 500 mA max (combined w/ 31 RECP, 32 RECP) Turns off with E-STOP
9, 28	Plasma Stop (Enable) Output Transistor Output Pin 9: + Pin 28: -	24 VDC, 100 mA max.
10, 29	Plasma Start Output Pin 10: + Pin 29: -	24 VDC, 100 mA max.
11, 30	Plasma Height Sensor Disable Output Pin 11: + Pin 30: -	24 VDC, 100 mA max.
12, 31	Plate Marker #2 Output Pin 12: + Pin 31: -	24 VDC, 100 mA max.
13, 32	General Purpose Output #5 Pin 13: + Pin 32: -	24 VDC, 100 mA max.
14, 33	General Purpose Output #6 Pin 14: + Pin 33: -	24 VDC, 100 mA max.
15, 34	General Purpose Output #7 Pin 15: + Pin 34: -	24 VDC, 100 mA max.
16, 35	General Purpose Output #8 Pin 16: + Pin 35: -	24 VDC, 100 mA max.
17, 36	General Purpose Output #3 Pin 17: + Pin 36: -	24 VDC, 100 mA max.
18, 37	General Purpose Output #4 Pin 18: + Pin 37: -	24 VDC, 100 mA max.
25, 26	ISO Ground	

32 RECP – OXYGEN CUTTING INTERFACE AND AC POWER INPUT

Pins not listed in this table are not used – do not make any connections to these pins.

PIN #(s)	DESCRIPTION	RATINGS: Burny 10 LCD Plus OEM
1, 20	Oxy Cut Switch Sense Input (Isolated) Pin 1: + Pin 20: -	12-24 VAC or VDC, 8-16 mA, respectively
2, 21	Program Inhibit Input (Isolated) Pin 2: + Pin 21: -	12-24 VAC or VDC, 8-16 mA, respectively
3, 22	General Purpose Input #1 (Isolated) Pin 3: + Pin 22: -	12-24 VAC or VDC, 8-16 mA, respectively
4, 23	General Purpose Input #2 (Isolated) Pin 4: + Pin 23: -	12-24 VAC or VDC, 8-16 mA, respectively
5, 24	External E-Stop Monitor Input (Isolated) Pin 5: + Pin 24: -	12-24 VAC or VDC, 8-16 mA, respectively
7, 8	ISO / ESTOP +24V ISO / ESTOP Pin 6: + Pin 7: -	+24 VDC, 500 mA max (combined w/ 31 RECP, 32 RECP) Turns off with E-STOP
10, 29	Oxy Stop Output Transistor Output Pin 10: + Pin 29: -	24 VDC, 100 mA max.
11, 30	Oxy Start Output Pin 11: + Pin 30: -	24 VDC, 100 mA max.
12, 31	Preheat Start Output Pin 12: + Pin 31: -	24 VDC, 100 mA max.
13, 32	Plate Marker #1 Output Pin 13: + Pin 32: -	24 VDC, 100 mA max.
14, 33	General Purpose Output #1 Pin 14: + Pin 33: -	24 VDC, 100 mA max.
15, 34	General Purpose Output #2	24 VDC, 100 mA max.
26, 27	ISO Ground	500 mA max. (combined with 31, 32 RECP)

33 RECP and 34 RECP - X encoder input and Y encoder input,

41 RECP and 42 RECP (42 RECP is on controls MNT-13000 and later)

Pins not listed in this table are not used – do not make any connection to these pins

PIN #	DESCRIPTION	RATINGS Single-ended encoders “SW1” on back panel ISO Board all open	 Differential encoders “SW1” on back panel ISO Board all closed
1	A channel input	Designed for open-collector type input. HIGH = Pulled to +5 VDC supply with 1.5 kΩ internal resistor. 3 VDC minimum. LOW = Pull down to Supply Common. 1 VDC maximum.	Differential driver input paired with pin 5. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
2	A channel shield common		
3	/B channel input	Not used, do not connect anything to this pin,	Differential driver input paired with pin 8. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
4	I channel input	Designed for open-collector type input. HIGH = Pulled to +5 VDC supply with 1.5 kΩ internal resistor. 3 VDC minimum. LOW = Pull down to Supply Common. 1 VDC maximum.	Differential driver input paired with pin 2. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
5	I channel shield common		
9	/A channel input	Not used, do not connect anything to this pin,	Differential driver input paired with pin 9. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
10	B channel input	Designed for open-collector type input. HIGH = Pulled to +5 VDC supply with 1.5 kΩ internal resistor. 3 VDC minimum. LOW = Pull down to Supply Common. 1 VDC maximum.	Differential driver input paired with pin 3. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
11	B channel shield common		
12	/I channel input	Not used, do not connect anything to this pin.	Differential driver input paired with pin 6. 150 Ω internal resistor to ground. Minimum differential: 500 mV. Maximum differential: 5 V.
13	Supply Common (to power encoder)	0 V	0 V
15	+5 VDC supply output (to power encoder)	+5 VDC @ 500 mA	+5 VDC @ 500 mA

35RECP – Serial I/O-RS-232/422

This communication port is isolated (100 V minimum) from the rest of the system.

Pins not listed in this table are not used – do not make any connection to these pins

<table>
<tr><td></td><td colspan="4">Configuration Jumper Designators:
"J1"—B10 or B10 LCD (Reference numbers 100 – 1435)
"J3"—B10 LCD or Burny 10 LCD Plus (Reference numbers 1436 or above)</td></tr>
<tr><td rowspan="2">PIN #</td><td colspan="2">RS-232
Configuration jumper on back panel board set to "A" and software set to RS-232 communication
or
Configuration jumper on back panel board set to "B".</td><td colspan="2">RS-422
Configuration jumper on back panel board set to "A" and software set to RS-422 communication
or
Configuration jumper on back panel board removed.</td></tr>
<tr><td>DESCRIPTION</td><td>RATINGS</td><td>DESCRIPTION</td><td>RATINGS</td></tr>
<tr><td>2</td><td>Receive Data input (RX)</td><td>Logic LOW = 0.8 V maximum.
Logic HIGH = 2.4 V minimum.
5 kΩ input resistance.
Maximum voltage to pin is |20 VDC reference to pin 7.
Pulled to isolated +5 V with 5.1 kΩ internal resistor.
Logic HIGH on this pin diverts communications over to "36 RECP".</td><td>Receive Data inverted input (RX-)</td><td>Differential input paired with pin 9.
Minimum differential voltage is 200 mV.
24 kΩ input resistance.
Maximum voltage to pin is |20 VDC reference to pin 7.
Pulled to isolated +5 V with 5.1 kΩ internal resistor.
Logic HIGH on this pin diverts communications over to "36 RECP".</td></tr>
<tr><td>3</td><td>Transmit Data output (TX)</td><td>Minimum output swing is |5 V into a 3 kΩ load.
Maximum no-load output is |18 V.</td><td>Transmit Date inverted output (TX-)</td><td>Differential output paired with pin 8.
2 V minimum to 6 V maximum output with 50 Ω load.
Short circuit protected.</td></tr>
<tr><td>4</td><td>+5 VDC pull-up
May be used for any signal requiring high level</td><td>Pulled to isolated +5 VDC with 5.1 kΩ internal resistor.
0.4 mA maximum to insure high level.</td><td>+5 VDC pull-up
May be used for any signal requiring high level</td><td>Pulled to isolated +5 V with 5.1 kΩ internal resistor.
0.4 mA maximum to insure high level.</td></tr>
<tr><td>5</td><td>Signal common</td><td>0 V</td><td>Signal common</td><td>0 V</td></tr>
<tr><td>7</td><td>Control Status Line output (RTS)</td><td>Minimum output swing is |5 V into a 3 kΩ load.
Maximum no-load output is |18 V.</td><td>Transmit Date non-inverted output (TX+)</td><td>Differential output paired with pin 8.
2 V minimum to 6 V maximum output with 50 Ω load.
Short circuit protected.</td></tr>
<tr><td>8</td><td>Control Line input (CTS)</td><td>Logic LOW = 0.8 V maximum.
Logic HIGH = 2.4 V minimum.
5 kΩ input resistance.
Maximum voltage to pin is |20 VDC reference to pin 7.</td><td>Receive Data non-inverted input (RX+)</td><td>Differential input paired with pin 2.
Minimum differential voltage is 200 mV.
24 kΩ input resistance.
Maximum voltage to pin is |20 VDC reference to pin 7.</td></tr>
</table>

DC POWER SUPPLY INPUT
Phoenix Part Number 1757077

PIN #	DESCRIPTION
1	+15 VDC
2	-15 VDC
3	+5 VDC
4	COMMON
5	+24 VDC
6	COMMON
7	Encoder +VDC
8	Encoder Common

EXT CONT
(External Contactor) Normally Open Dry Contactor

DESCRIPTION
115 VAC, 5A Max or 24 VDC, 5A Max, QC Terminals

BLANK

SETUP & CALIBRATION GUIDELINES

(AO-70398 REV AA)

SECTION

11A

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

Table of Contents

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11A SETUP & CALIBRATION GUIDELINES

11A.1 INTRODUCTION

This document was written as a companion to the complete Setup & Calibration Procedure (Section 11B). It does not replace the complete procedure and should only be used to enhance the process of setting up and calibrating a ***Burny***.

Individuals using these guidelines should be familiar with Utility Mode (Section 7) as well as cutting machines and their respective components.

These guidelines are applicable to all Burny 10 series and Burny Phantom series products.

11A.2 GUIDELINES

1) Always take precautions to prevent injury or damage.
- Disable or turn off servo drives – press E-Stop
- Disengage drive pinions from the rack to prevent unexpected machine motion.

2) **IMPORTANT!** Disable position control by loading "safe" parameters into the motion controller.
- Load the parameter file "OpenLoopParams.ini" and press SEND.

3) Adjust the following parameters according to the machine requirements:
- "DisableRailSlave" – FALSE for 3 axis/digital sync (option code required), TRUE for 2 axis/resolver sync.
- "OK ToRun Type" – Set to "1" for most applications. "0" requires External Stop to be satisfied before Internal E-Stop can be reset.
- "UseFPSpdPot" – TRUE to use Burny front panel feedrate pot, FALSE to use any other pot.

4) Check motor directions then proper encoder counting and modify InvertPwrAmp and InvertEncoder parameters as needed.
- If possible, leave the "InvertPwrAmp" parameters FALSE to simplify limit switch setup.

REMEMBER! +Y is to the **LEFT!** Directions first, <u>then</u> encoder polarity

5) Select "Save To File", then the Filename "BurnyLoadParams.ini" to preserve your work thus far.

6) Test the travel limit switches for proper operation and correct any problems.

7) Determine and set the proper "TicksPerMeter" values.
- Refer to the complete procedure for 3 possible methods to accomplish this.
- Confirm that the pinions are disengaged before continuing.

8) Adjust the servo drives for required response.
- Eliminate any drifting by adjusting balance, offset or a parameter (depends on the drive type)
- Calibrate the drive speeds to achieve the maximum desired table speed with a maximum speed reference (PwrAmpCmd) from the ***Burny*** of 9 or 9.5 volts.
- Use Dictionary Viewer to see the XX velocity and PwrAmpCmd for each axis.

9) Set MaxVel and MaxJogVel and enable position control.

- Change the MaxVel and MaxJogVel parameters to the meters/sec value that represents the speed the drives were calibrated for in the previous step.
- Change the X and Y PGain parameters to 500.

WARNING! MAKE SURE THE BURNY IS IN E-STOP (RED STATUS BAR) WHILE PRESSING SEND!

- Engage the pinions.

10) Adjust Feed Forward and PID parameters to achieve zero or minimal following error.

- If jog moves are too abrupt, reduce JogAcel for a more gentle response. (0.4 or 0.3)
- Adjust Vff, Aff, PGain and IGain in that order. Refer to the complete procedure for more details. Use the CHECK SCREEN to monitor the results of your adjustments.
- Use the appropriate Velocity Feed Forward chart (in the back of this document) to find the correct value according to how the drives were calibrated. The value for Vff from the charts will only be accurate if the servo speeds were adjusted properly in step 8.

  Example: If the servo is adjusted for 250 IPM with a speed reference (PwrAmpCmd) of 9 volts, Vff will be 85.04.
- Aff will normally be between 0 and 1.
- A maximum PGain value of 3000 is usually sufficient when motor mounted encoders are used. On less mechanically sound rack mounted encoder systems, a PGain value of 500 or less is often required.
- An IGain value between 2 and 10 is usually sufficient when motor mounted encoders are used. On less mechanically sound rack mounted encoder systems, an IGain value of 0 is usually required to prevent oscillations.
- Reduce PGain and IGain values if oscillations occur.

11) Adjust for desired cutting and jogging response.

- Adjust “MaxAcel” and “JogAcel” for desired response. Normally 0.2 to 0.5 is sufficient.
- Refer to the “Cornering Parameters Explained” section of the complete procedure and adjust for desired cornering response and cut quality.

12) Confirm accurate values for TicksPerMeter parameters.

- Becauses the values were determinded while still in Open Loop, a small amount of drive drift may have resulted in slightly inacdcurate values.

13) Set the “FollowingErrorLim” parameters to normal values.

- If tuned properly, 0.002 for FollowingErrorLim and 0.010 for Stop Following Error

14) If required, complete Homing setup.

- Refer to the Homing Parameters Setup section in the complete procedure.

15) Store the System Backup and give a copy to the end user.

- The System Backup is a ZIP file that contains the BurnyLoadParams.ini file and several other important files that are needed if the system software ever has to be re-loaded.

Velocity Feed Forward - v2.2.2 and previous

			Drive Reference Voltage for Max Speed								
			9.5	9.0	8.5	8.0	7.0	6.0	5.0	4.0	3.0
M/m	**IPM**	**m/s**					**Vff Setting**				
1.270	**50**	0.021167	224409	212598	200787	188976	165354	141732	118110	94488	70866
2.540	**100**	0.042333	112205	106299	100394	94488	82677	70866	59055	47244	35433
3.810	**150**	0.063500	74803	70866	66929	62992	55118	47244	39370	31496	23622
5.080	**200**	0.084667	56102	53150	50197	47244	41339	35433	29528	23622	17717
6.350	**250**	0.105833	44882	42520	40157	37795	33071	28346	23622	18898	14173
7.620	**300**	0.127000	37402	35433	33465	31496	27559	23622	19685	15748	11811
8.890	**350**	0.148167	32058	30371	28684	26997	23622	20247	16873	13498	10124
10.160	**400**	0.169333	28051	26575	25098	23622	20669	17717	14764	11811	8858
11.430	**450**	0.190500	24934	23622	22310	20997	18373	15748	13123	10499	7874
12.700	**500**	0.211667	22441	21260	20079	18898	16535	14173	11811	9449	7087
13.970	**550**	0.232833	20401	19327	18253	17180	15032	12885	10737	8590	6442
15.240	**600**	0.254000	18701	17717	16732	15748	13780	11811	9843	7874	5906
16.510	**650**	0.275167	17262	16354	15445	14537	12720	10902	9085	7268	5451
17.780	**700**	0.296333	16029	15186	14342	13498	11811	10124	8436	6749	5062
19.050	**750**	0.317500	14961	14173	13386	12598	11024	9449	7874	6299	4724
20.320	**800**	0.338667	14026	13287	12549	11811	10335	8858	7382	5906	4429
21.590	**850**	0.359833	13201	12506	11811	11116	9727	8337	6948	5558	4169
22.860	**900**	0.381000	12467	11811	11155	10499	9186	7874	6562	5249	3937
24.130	**950**	0.402167	11811	11189	10568	9946	8703	7460	6216	4973	3730
25.400	**1000**	0.423333	11220	10630	10039	9449	8268	7087	5906	4724	3543
26.670	**1050**	0.444500	10686	10124	9561	8999	7874	6749	5624	4499	3375
27.940	**1100**	0.465667	10200	9664	9127	8590	7516	6442	5369	4295	3221
29.210	**1150**	0.486833	9757	9243	8730	8216	7189	6162	5135	4108	3081
30.480	**1200**	0.508000	9350	8858	8366	7874	6890	5906	4921	3937	2953
31.750	**1250**	0.529167	8976	8504	8031	7559	6614	5669	4724	3780	2835
33.020	**1300**	0.550333	8631	8177	7723	7268	6360	5451	4543	3634	2726
34.290	**1350**	0.571500	8311	7874	7437	6999	6124	5249	4374	3500	2625
35.560	**1400**	0.592667	8015	7593	7171	6749	5906	5062	4218	3375	2531
36.830	**1450**	0.613833	7738	7331	6924	6516	5702	4887	4073	3258	2444
38.100	**1500**	0.635000	7480	7087	6693	6299	5512	4724	3937	3150	2362
15.000	**590.5512**	0.250000	19000	18000	17000	16000	14000	12000	10000	8000	6000

Velocity Feed Forward - v3.0 and later

Max Speed Desired			Drive Reference Voltage for Max Speed								
			9.5	**9.0**	**8.5**	**8.0**	**7.0**	**6.0**	**5.0**	**4.0**	**3.0**
M/m	**IPM**	**m/s**					**Vff Setting**				
1.270	**50**	0.021167	448.82	425.20	401.57	377.95	330.71	283.46	236.22	188.98	141.73
2.540	**100**	0.042333	224.41	212.60	200.79	188.98	165.35	141.73	118.11	94.49	70.87
3.810	**150**	0.063500	149.61	141.73	133.86	125.98	110.24	94.49	78.74	62.99	47.24
5.080	**200**	0.084667	112.20	106.30	100.39	94.49	82.68	70.87	59.06	47.24	35.43
6.350	**250**	0.105833	89.76	85.04	80.31	75.59	66.14	56.69	47.24	37.80	28.35
7.620	**300**	0.127000	74.80	70.87	66.93	62.99	55.12	47.24	39.37	31.50	23.62
8.890	**350**	0.148167	64.12	60.74	57.37	53.99	47.24	40.49	33.75	27.00	20.25
10.160	**400**	0.169333	56.10	53.15	50.20	47.24	41.34	35.43	29.53	23.62	17.72
11.430	**450**	0.190500	49.87	47.24	44.62	41.99	36.75	31.50	26.25	21.00	15.75
12.700	**500**	0.211667	44.88	42.52	40.16	37.80	33.07	28.35	23.62	18.90	14.17
13.970	**550**	0.232833	40.80	38.65	36.51	34.36	30.06	25.77	21.47	17.18	12.88
15.240	**600**	0.254000	37.40	35.43	33.46	31.50	27.56	23.62	19.69	15.75	11.81
16.510	**650**	0.275167	34.52	32.71	30.89	29.07	25.44	21.80	18.17	14.54	10.90
17.780	**700**	0.296333	32.06	30.37	28.68	27.00	23.62	20.25	16.87	13.50	10.12
19.050	**750**	0.317500	29.92	28.35	26.77	25.20	22.05	18.90	15.75	12.60	9.45
20.320	**800**	0.338667	28.05	26.57	25.10	23.62	20.67	17.72	14.76	11.81	8.86
21.590	**850**	0.359833	26.40	25.01	23.62	22.23	19.45	16.67	13.90	11.12	8.34
22.860	**900**	0.381000	24.93	23.62	22.31	21.00	18.37	15.75	13.12	10.50	7.87
24.130	**950**	0.402167	23.62	22.38	21.14	19.89	17.41	14.92	12.43	9.95	7.46
25.400	**1000**	0.423333	22.44	21.26	20.08	18.90	16.54	14.17	11.81	9.45	7.09
26.670	**1050**	0.444500	21.37	20.25	19.12	18.00	15.75	13.50	11.25	9.00	6.75
27.940	**1100**	0.465667	20.40	19.33	18.25	17.18	15.03	12.88	10.74	8.59	6.44
29.210	**1150**	0.486833	19.51	18.49	17.46	16.43	14.38	12.32	10.27	8.22	6.16
30.480	**1200**	0.508000	18.70	17.72	16.73	15.75	13.78	11.81	9.84	7.87	5.91
31.750	**1250**	0.529167	17.95	17.01	16.06	15.12	13.23	11.34	9.45	7.56	5.67
33.020	**1300**	0.550333	17.26	16.35	15.45	14.54	12.72	10.90	9.09	7.27	5.45
34.290	**1350**	0.571500	16.62	15.75	14.87	14.00	12.25	10.50	8.75	7.00	5.25
35.560	**1400**	0.592667	16.03	15.19	14.34	13.50	11.81	10.12	8.44	6.75	5.06
36.830	**1450**	0.613833	15.48	14.66	13.85	13.03	11.40	9.77	8.15	6.52	4.89
38.100	**1500**	0.635000	14.96	14.17	13.39	12.60	11.02	9.45	7.87	6.30	4.72
15.000	**590.5512**	0.250000	38.00	36.00	34.00	32.00	28.00	24.00	20.00	16.00	12.00

Velocity Feed Forward - Metric

Version 3.0 and Later

Max Speed Desired			Drive Reference Voltage for Max Speed								
			9.5	9.0	8.5	8.0	7.0	6.0	5.0	4.0	3.0
m/min	in/min	m/sec					Vff Setting				
1.000	**39.37**	0.016667	570.00	540.00	510.00	480.00	420.00	360.00	300.00	240.00	180.00
2.000	**78.74**	0.033333	285.00	270.00	255.00	240.00	210.00	180.00	150.00	120.00	90.00
3.000	**118.11**	0.050000	190.00	180.00	170.00	160.00	140.00	120.00	100.00	80.00	60.00
4.000	**157.48**	0.066667	142.50	135.00	127.50	120.00	105.00	90.00	75.00	60.00	45.00
5.000	**196.85**	0.083333	114.00	108.00	102.00	96.00	84.00	72.00	60.00	48.00	36.00
6.000	**236.22**	0.100000	95.00	90.00	85.00	80.00	70.00	60.00	50.00	40.00	30.00
7.000	**275.59**	0.116667	81.43	77.14	72.86	68.57	60.00	51.43	42.86	34.29	25.71
8.000	**314.96**	0.133333	71.25	67.50	63.75	60.00	52.50	45.00	37.50	30.00	22.50
9.000	**354.33**	0.150000	63.33	60.00	56.67	53.33	46.67	40.00	33.33	26.67	20.00
10.000	**393.70**	0.166667	57.00	54.00	51.00	48.00	42.00	36.00	30.00	24.00	18.00
11.000	**433.07**	0.183333	51.82	49.09	46.36	43.64	38.18	32.73	27.27	21.82	16.36
12.000	**472.44**	0.200000	47.50	45.00	42.50	40.00	35.00	30.00	25.00	20.00	15.00
13.000	**511.81**	0.216667	43.85	41.54	39.23	36.92	32.31	27.69	23.08	18.46	13.85
14.000	**551.18**	0.233333	40.71	38.57	36.43	34.29	30.00	25.71	21.43	17.14	12.86
15.000	**590.55**	0.250000	38.00	36.00	34.00	32.00	28.00	24.00	20.00	16.00	12.00
16.000	**629.92**	0.266667	35.63	33.75	31.88	30.00	26.25	22.50	18.75	15.00	11.25
17.000	**669.29**	0.283333	33.53	31.76	30.00	28.24	24.71	21.18	17.65	14.12	10.59
18.000	**708.66**	0.300000	31.67	30.00	28.33	26.67	23.33	20.00	16.67	13.33	10.00
19.000	**748.03**	0.316667	30.00	28.42	26.84	25.26	22.11	18.95	15.79	12.63	9.47
20.000	**787.40**	0.333333	28.50	27.00	25.50	24.00	21.00	18.00	15.00	12.00	9.00
21.000	**826.77**	0.350000	27.14	25.71	24.29	22.86	20.00	17.14	14.29	11.43	8.57
22.000	**866.14**	0.366667	25.91	24.55	23.18	21.82	19.09	16.36	13.64	10.91	8.18
23.000	**905.51**	0.383333	24.78	23.48	22.17	20.87	18.26	15.65	13.04	10.43	7.83
24.000	**944.88**	0.400000	23.75	22.50	21.25	20.00	17.50	15.00	12.50	10.00	7.50
25.000	**984.25**	0.416667	22.80	21.60	20.40	19.20	16.80	14.40	12.00	9.60	7.20
26.000	**1023.62**	0.433333	21.92	20.77	19.62	18.46	16.15	13.85	11.54	9.23	6.92
27.000	**1062.99**	0.450000	21.11	20.00	18.89	17.78	15.56	13.33	11.11	8.89	6.67
28.000	**1102.36**	0.466667	20.36	19.29	18.21	17.14	15.00	12.86	10.71	8.57	6.43
29.000	**1141.73**	0.483333	19.66	18.62	17.59	16.55	14.48	12.41	10.34	8.28	6.21
30.000	**1181.10**	0.500000	19.00	18.00	17.00	16.00	14.00	12.00	10.00	8.00	6.00
31.000	**1220.47**	0.516667	18.39	17.42	16.45	15.48	13.55	11.61	9.68	7.74	5.81
32.000	**1259.84**	0.533333	17.81	16.88	15.94	15.00	13.13	11.25	9.38	7.50	5.63

BLANK

BURNY 10LCD PLUS & OEM

[WITH SOFTWARE VERSION 5.X]

SETUP & CALIBRATION PROCEDURE

(AO-70357 REV AA)

SECTION

11B

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

Table of Contents

11B SETUP & CALIBRATION PROCEDURE

11B.1 INTRODUCTION

This procedure describes the Burny Series 10 Setup and Calibration. The user of this procedure should be familiar with ***Part 7***, ***Utility Mode***, and with cutting machines themselves.

SCOPE

This procedure applies to 2 and 3 axis Oxy/Fuel, plasma or water jet cutting machines with or without accessories. The procedure is to be performed with all torches and accessories mounted securely.

This procedure applies the Burny 10, Burny 10 LCD, Burny 10 LCD Plus and OEM versions. References to "Burny" implies all models and any information that is specific to a model is indicated as such.

This version of the Setup & Calibration procedure applies to software version 5.X. Earlier versions may have additional setup parameters that require special steps not covered in this document.

REQUIRED EQUIPMENT

All software and programs used in this procedure are included in the Burny.

A Mouse and Keyboard is required for setting some parameters. These can be either USB or PS2 type.

SPECIAL PART PROGRAMS

There are two part programs used in this procedure. They are 99circles.cnc and SquareX.cnc. The part programs can be loaded from within the Burny by loading from floppy and setting the directory to "d:\burny\cnc" with a Word Address format setting. Remember to set the directory back to "a:\" after the parts are loaded.

NOMENCLATURE

The front panel "E" Stop button is different between the Burny 10, the Burny 10 LCD and Burny 10 OEM models. On the Burny 10, the "E" Stop button is a red "mushroom" style button that is pressed to de-activate the "OK to Run" relay and twisted to activate the "OK to Run" relay.

The Burny 10 LCD and OEM models have a front panel membrane STOP button that is used to control "OK to Run" relay. When the STOP button is pressed for two seconds the "OK to Run" relay is de-activated and remains de-activated until the STOP button is released. At which time, the "OK to Run" relay is activated.

This document uses the phrase "Cycle the Stop button" to de-activate and activate the "OK to Run" relay.

11B.2 INSTALLATION

See the installation section of the Burny Series 10 manual for detailed installation instructions. Ensure that the Burny is mounted securely, the cables are connected correctly, the grounding shields are secured at the Burny back-panel per the instructions in the installation manual, and the cutting table is grounded properly for the process being used

11B.3 UTILITY MODE OPERATION

Before the actual tuning process can start, there are features and procedures that must be understood. They are explained in this section of the manual.

UTILITY MODE SCREEN (UTIL01)

To begin the setup of a new machine or to adjust the tuning on an existing machine, touch the ***Utils*** touchpad on the main menu screen. This will bring up the main Utility screen ***(Util01)***.

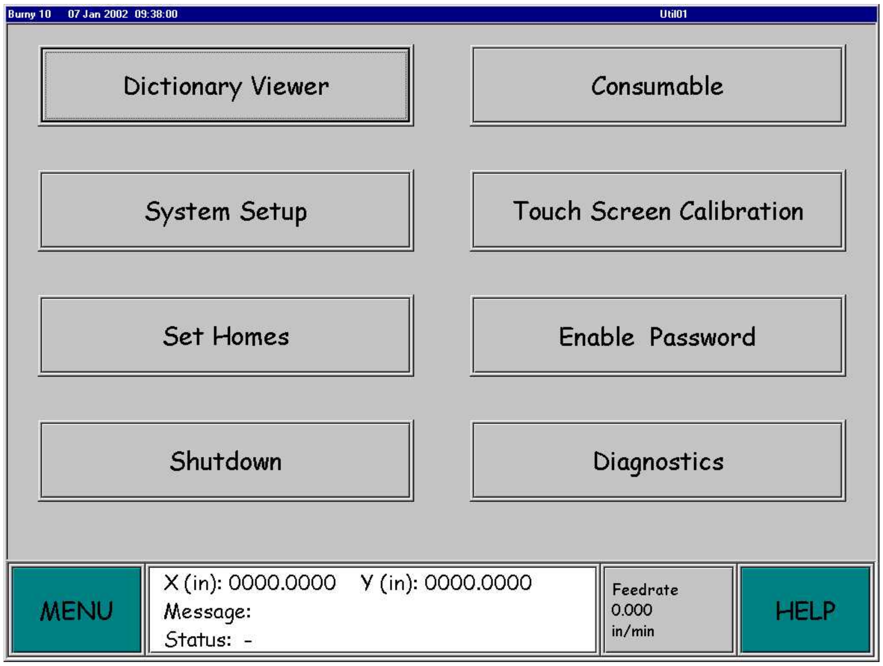

Figure 11.1 - Utility Screen (*Util01)*

This screen provides access to the various utility modes available in the control.

The motor setup and tuning parameters can only be changed when the password is enabled. Touch the ***Enable Password*** button, and enter the password on the numeric keypad. If the password is correct, the ***Util01*** screen re-appears, the touchpad changes to ***Disable Password*** and the phrase "Admin Password Enabled" flashes in the title bar.

When the whole setup is complete, the installer should disable the password to prevent unauthorized changes to the parameter settings.

SYSTEM SETUP SCREEN (UTIL03)

After entering the password, touch the ***System Setup*** touchpad to display the System Setup Screen (***Util13***). All setup parameters and system configuration functions are accessed from this screen.

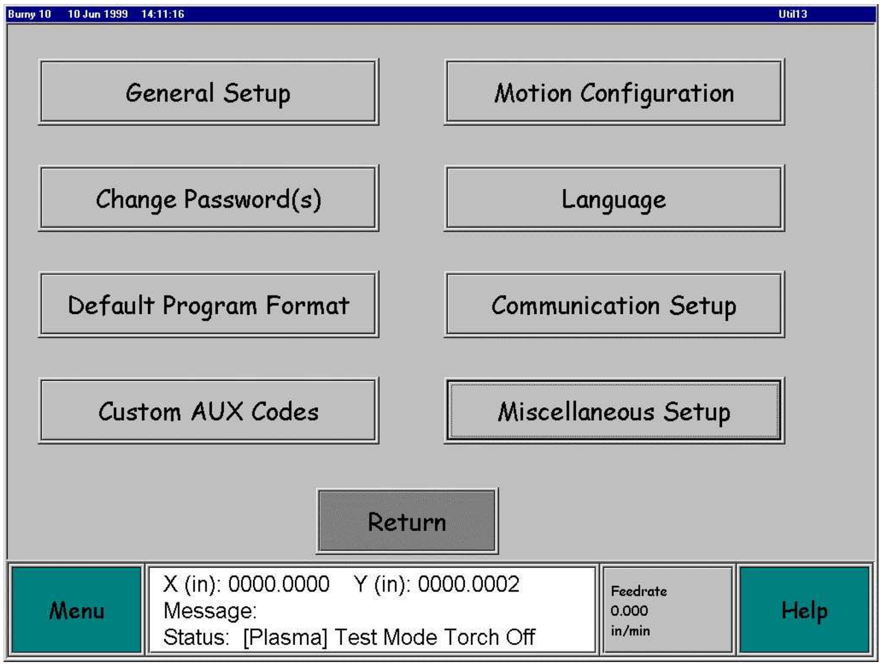

Figure 11.2 - Utility Screen (*Util13*)

The function of each touchpad on this screen is described below. Some of these features are described in the Burny manual.

General Setup – Touch to setup default settings such as System Units (inch/mm), default Program Language (Word Address/ESSI/Word Address 1/Word Address 2/Custom), Plate Side (left/right), Default Process, Default Process feedrates and Default kerf.

Change Password(s) – Used to change the Administrator and Supervisor level passwords. The Administrator password is required to change any of the setup parameter. It can be changed to any number from 100 to 999999. Unless there is a strong reason to change the password, leave it set to the 777 value as it comes from the factory. If the password is changed and the new password is lost or forgotten, consult the factory.

Default Program Format – Sets the standard program format selections to be used by the Burny when loading programs as either Standard Word Address or Standard ESSI. See the Burny manual for details on the various fields on this screen.

Custom AUX Codes – Allows the creation and editing of Custom auxiliary code files that allow for variations in the M and G codes, ESSI codes and Program formats used when loading special programs. See the Burny manual for details on this function.

Motion Configuration -- Contains the parameter tables for setting up the characteristics of the motion control. This function is described in the remainder of this document.

Language -- Used to select the language displayed on the touchpads and text strings in the product.

Communication Setup -- Contains the setup functions for setting the various Network, FTP and Serial Port communication parameters. These features are described later in this document.

Miscellaneous Setup – Contains such things as OCX Option enabling, CAD configuration, software license entry and BCL selection.

CONFIGURATION DATA TABLE SCREENS

Touch the ***Motion Configuration*** touchpad to enter the configuration table screens. (If the password has not been enabled, the values cannot be changed).

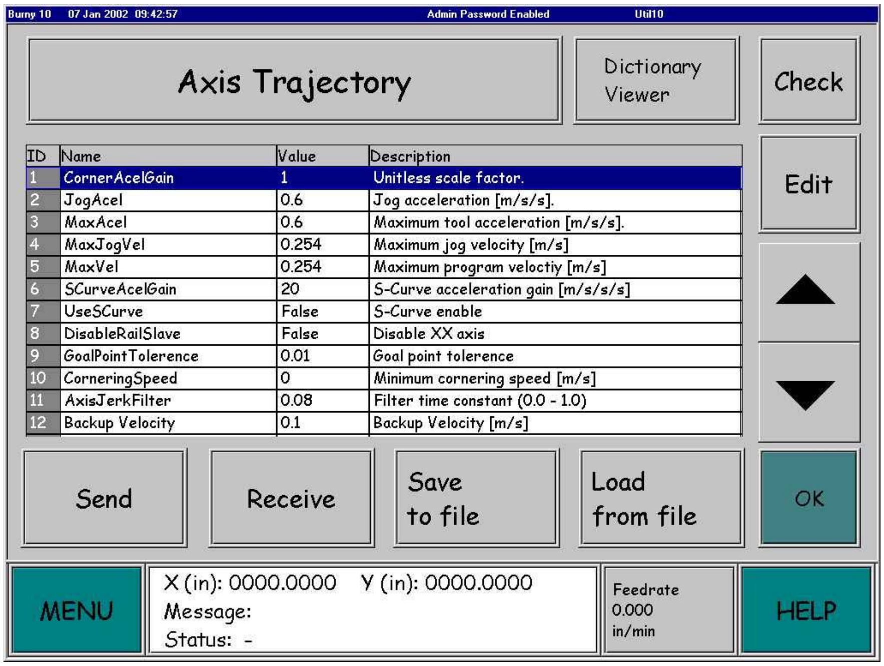

Figure 11.3 - Motion Configuration Screen (*Util10*)

There are 9 parameter tables contained in the "CONFIGURATION" utility function. Parameters are grouped based on their function and common requirement. To access a particular parameter table, touch the long wide touchpad at the top of the screen displaying ***Axis Trajectory***. Each time this touchpad is touched, the next table is displayed. When the end of the tables is reached, the touchpad will restart at the first table. Move forward through the tables by touching the right half of the touchpad and move backward by touching the left half.

The 9 parameter data tables are labeled:

- **Axis Trajectory**
- **Machine Parameters**
- **I/O Configuration**
- **Offset Configuration**
- **Axis X**
- **Axis XX**
- **Axis Y**
- **Homing**
- **Axis C**

There are several conventions used throughout this document to specify parameter locations and to display data used for the tuning process. The first is the method used to indicate the location and name of setup parameters. The parameter is referenced as:

Parameter data table name ⇒ Parameter label

For example, **"*Axis Trajectory*⇒MaxJogVel"** refers to the Maximum Jog Velocity parameter in the ***Axis Trajectory*** table.

The parameter data table screens contain several touchpads to modify, save and recall parameter data.

Send – Touch to transmit the current parameters to the motion controller. The parameters must be sent to actually take affect. This touchpad will appear white if any changed parameters have not been sent to the motion controller.

Receive – Used to read the parameters that are currently active in the controller and display them on the screen. This is useful to confirm the settings of the parameters currently running the machine.

Load from File – Used to load the parameter tables from a data file saved on the hard disk. This will only update the parameters on the screen. You still have to send them to the controller for them to become active.

Save to File – Used to store the parameters currently displayed on the screen to a file on the hard drive. Normally, the SAVE function should be set to store the parameters in the file named **BurnyLoadParams.ini.** This is the file that will be used on power-up to re-call the parameters therefore it must have a copy of the current correct parameters for the control. You can also store the parameters to some other file names to save them for future use, such as different file names for different machine models or speed ranges. This touchpad appears white if the displayed parameters have not been saved to a file on the hard drive.

Edit **—**Displays an entry screen for changing a parameter value. The entry screen is either a number keypad for numeric type parameters, or a ***True***/***False*** keypad for logical selections. Once the value is changed, it must be sent to the controller to take affect.

Check – A graphical display of the following error of each axis. This is helpful to see the affects of different parameter values. See following section for details on the *Check* function.

Dictionary Viewer–Displays over 500 internal variables and parameters. The procedure requires the use of the dictionary viewer in a couple of steps to look at values that are not accessible through normal displays. See the following section for details on the Dictionary Viewer function.

DICTIONARY VIEWER OPERATING INSTRUCTIONS

Touching the ***Dictionary Viewer*** touchpad from either the main screen (Util01) or the configuration table (Util10) displays a screen that shows internal variables and input/output values.

There are 3 columns shown on the screen. You first pick one of the choices from the left most column (Modules), then the middle (Structures), and finally the right hand column (Entries) to identify the exact item you wish to display. This procedure indicates a dictionary item:

|| MODULES CHOICE || STRUCTURES CHOICE || ENTRIES CHOICE ||

For example, to display the Axis position output for the Y-axis, the text would read as

|| Y Axis || WorldOut || w_AxisPosition ||

The screen ***(Util20)*** would appear as follows.

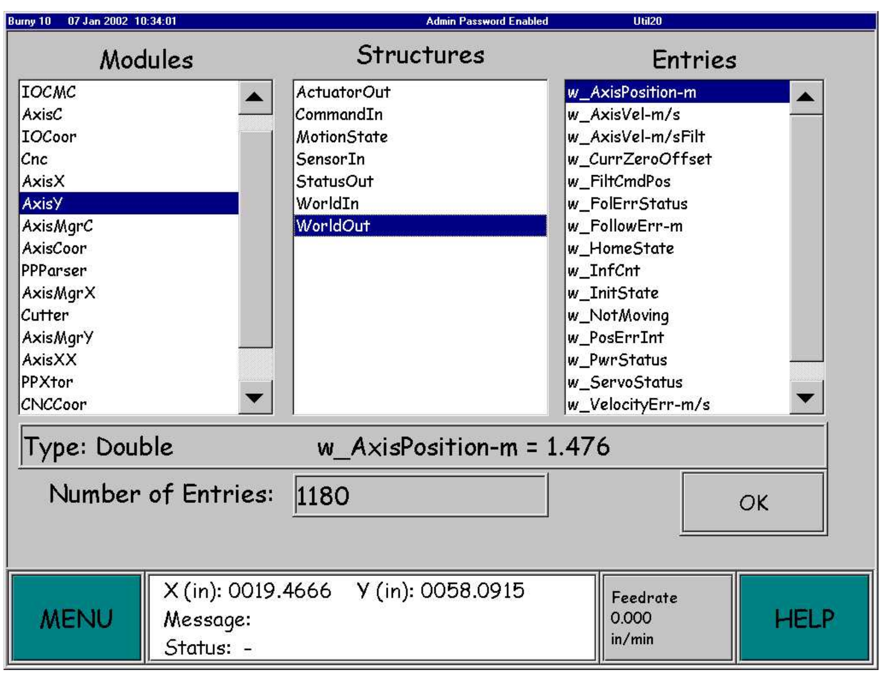

Figure 11.4 - Dictionary Viewer Screen (*Util20*)

In this case, note that the value (1.476) is displayed in meters, while the display in the status window is currently set to inches. The Dictionary viewer displays in international metric units.

To exit the Dictionary Viewer and return to Configuration parameter tables, touch the ***OK*** touchpad on the Viewer.

No direct changes can be made here, this is a read-only screen.

If a parameter is chosen that varies with machine motion, jog the machine and watch the value change in this screen.

REAL TIME FOLLOWING ERROR GRAPHING UTILITY

The Following Error Graphing Utility screen ***(Util32)*** is used to adjust gains and other parameters for optimal performance. The function that does this is accessed via the ***Check*** touchpad on the parameter data table screen ***(Util10)***. When the ***Check*** touchpad is touched, the real time Following Error Graph screen ***(Util32)*** is displayed.

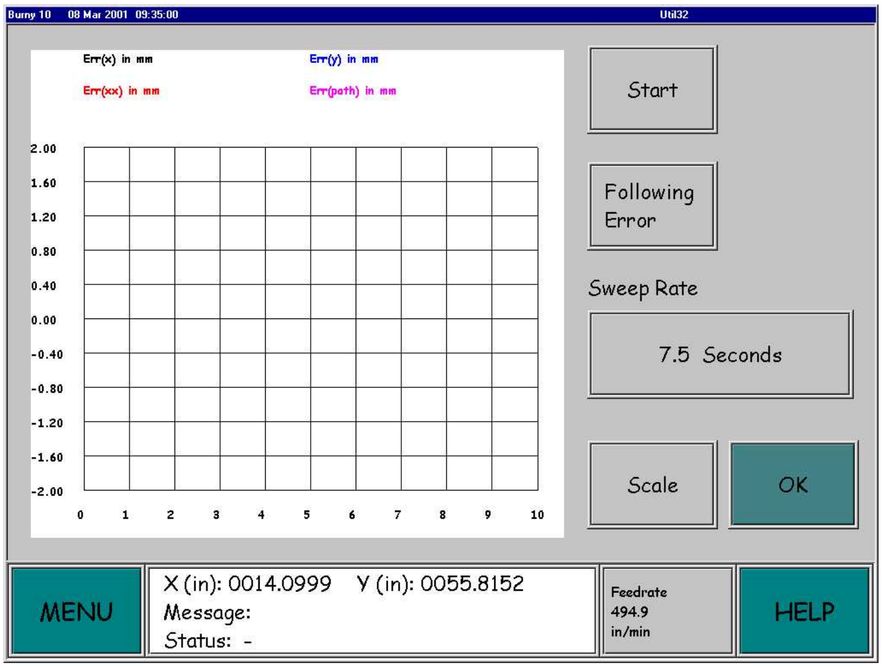

Figure 11.5 – Following Error Graphing Screen (*Util32*)

This screen has several touchpads to control the operation.

Start/Stop – This touchpad controls the graphing action. Touch ***Start*** to begin/continue the real time display, touch ***Stop*** to "freeze" the current display on the screen.

Following Error / DAC Output -- The normal use of this screen for adjusting machine performance requires that this touchpad be set to display "Following Error". This shows the performance of the actual cutting machine in response to the motion commands. Toggling this touchpad to the ***DAC Output*** selection allows the actual voltage output from the D/A converters to be observed.

Sweep Rate – Touch this touchpad to change the speed that the graph is drawn across the screen. The 7.5 seconds setting works well for the drive tuning. It can be changed to improve the resolution of the display if needed.

Scale – Touch this touchpad to enter the full-scale, vertical value in millimeters for the graph being drawn. Making the value larger permits viewing very large position errors. The scale can be reduced to show more detail as the axis tuning improves. The scale value is typically set at 20 mm at the beginning of the tuning procedure and is reduced down as the axis tuning is improved. A value of 2 is typically the lowest value needed during the tuning process.

OK – Touch ***OK*** to exit this screen and return back to the Parameter Table screen

Graph – The graph, which resembles an oscilloscope, shows the Following Error for each axis. Each axis is shown in a different color. The following error is the difference between where an axis (or coordinated position) is supposed to be, and where it actually is. When the tuning is correct, the following error should remain virtually 0 (zero) all the time.

11B.4 OPEN LOOP SETUP PROCEDURE ON A NEW MACHINE

The following is a step-by-step procedure for setting up a Burny on a new cutting machine. The process will first de-tune the control loops so that the machine can be jogged and checked in an open-loop manner. This prevents the axes from running away if an encoder is counting backward or a gain is set wrong. First, the axes are set for their encoder and drive directions. The servo drive is adjusted for its speed performance and drift. Then the various gains and settings are set, one at a time until the entire control loop is functioning as a complete closed loop system.

It is advantageous to disconnect the gears and/or motors from the racks to perform the preliminary motion setup. When instructed to engage the motors, pay attention to travel distances of both axes.

INITIAL SYSTEM SETUP

1. Start with the AC power OFF
2. Ensure the Burny is set correctly for the encoder type. Set the two sets of 8-position DIP switches on the Back Panel according to the directions printed near the switches. All DIP switches should be set to CLOSED or ON for Differential type encoders and set to OPEN or OFF for Single ended encoders. In most cases, the ON-Differential selection will be used. (For the Burny the DIP switches are set on the ISO PC Board).
3. [BURNY 10 ONLY] Set the Fast-On type wire jumpers along the edge of the board for the external blower depending on whether the control will be powered with 115VAC or 230VAC. See the printed instructions on the back panel power board (MO-11995 or MO-12504) for directions.
4. Confirm that the system is interfaced correctly concerning the external stop requirements of the Burny. Refer to the MACHINE INTERFACE addenda in the INSTALLATION AND MAINTENANCE section for details.
5. Push in the STOP button on the control, and disengage all the servo drives from the machine so the motors can be run without causing actual machine motion.
6. Apply AC power to the system, verify that it powers up normally and the main menu screen is displayed.
7. Press the ***Utils*** button from the main menu. Enable the password. Then press the ***System Setup*** button.

OVERALL SYSTEM DEFAULT SETTINGS

8. Touch the ***General Setup*** touchpad. This sets overall default selections for the system
9. Touch the ***System Units*** touchpad to select either inch or millimeter units as the default for the system. The system default units are used for the following:
   - On Power-Up, these units are selected for the axis positions, feedrate displays and other user entry and display screens. These display units can be changed at any time by touching the Status Bar at the bottom of the screen and touching either the INCH or MM touchpad on the main status screen display.
   - The system default selection for inch or millimeter selects the units to be used for all Standard Shape dimensions.
10. Use the Program Language touchpad on the screen to select the default part program type. The usual selections are Word Address, ESSI, Word Address 1 or Word Address 2. It is also possible to select one of the Custom Auxiliary program types if they have been setup in the control. This selection will be used as the default on the Load and Store screen during power-up, and also as the default program format for the Edit function when creating a new part.
11. Use the ***Plate Side*** touchpad to set the plate side setting for the machine. This is the orientation of the plate relative to the operator. If the plate is to the left of the operator, select ***Left***. If the plate is to the right of the operator, select ***Right***. This selection is used by Standard Shapes to set the starting corner and the direction of the repeat move.

12. Use the ***Default Process*** touchpad to set the default cutting process (Plasma, Oxy, or Waterjet) and possible processes. When a part program is selected from Job Selection screen (Run01), the default process will automatically be selected. The possible processes setting provides the operator with only the valid processes available on the cutting table. For instance, a setting of ***[Plasma]/Oxy*** will allow either a Plasma or Oxy/Fuel process to be selected.
13. Use the ***Default Plasma Feedrate***, ***Default Oxy Feedrate*** and ***Default Waterjet Feedrate*** touchpads to set the default feedrate for that process. When a part program is selected from Job Selection screen (Run01), the default feedrate will automatically be selected.
14. If the C Axis Option is enabled, a button is available to select the initial C Axis action of a new part program. The choices are ***C Enabled, C Immediate*** or ***C Home/Held***. Touch the button to set the desired default selection.
15. Use the ***Default Kerf*** value if the same kerf is used for all parts cut. This default kerf value is used as the initial kerf value in Job Setup if there is no embedded kerf in the part program.
16. Touch ***OK*** to exit this screen. The values are saved automatically.

STARTING WITH OPEN LOOP PARAMETERS

17. Press the ***Motion Configuration*** button to enter the tables for configuring the motion control parameters.
18. On a new system installation, the parameter data tables must be initialized to values that will allow the machine to be moved in a controlled "open-loop" manner. To do this, touch the **Load from File** touchpad, and select the file **OpenLoopParams.ini.** Note: There is a long delay while the file is loaded into the controller. This file should be included in all systems. However, if it is missing, see the appendix of this document for the parameters' values for this initial startup. The **OpenLoopParams.ini** file presets the following parameters that make the open loop operation possible:
19. After the file has loaded, touch the ***Send*** touchpad to transmit the new parameters to the motion controller.

SETTING SYSTEM FOR 2-AXIS OR 3-AXIS SYNCHRONIZED X DRIVES

20. The **Axis Trajectory⇒DisableRailSlave** parameter determines if the Burny is controlling the slave motor on a gantry type cutting machine. Gantry type cutting machines usually have 2 motors driving the X-axis; one on each side of the bridge. The purpose of these two motors is to move the bridge of the machine along the X cutting axis while maintaining a square position to the rails. The synchronization of the master and slave sides of the bridge is normally done in one of two ways.

    Setup configuration #1 uses Resolver synchronization where a separate analog circuit monitors the position of the two sides of the machine and outputs an analog signal to the slave motor to keep it aligned to the master side. In this case, the Burny is not controlling the 3rd motor on the machine and is responsible for controlling the only the master X side. The external analog circuit performs the slave side alignment.

    Setup configuration #2 requires that both the master and slave sides of the machine are equipped with encoder feedback. The Burny controls each side as separate, unique axis to maintain their correct, square position to the rail. For this method, the Burny uses its 3rd axis output, Axis XX, to control the slave side of the machine. The Burny now controls both the X and XX motors to keep the machine square as it moves along the rail-cutting axis. For this type of system to work, the same type of drive and encoder system is used on both sides of the machine. The encoder scaling, gear ratio, etc. must be identical between the two sides. This is done to insure that the machine can be maintained exactly square to the rails.

    Set **Axis Trajectory⇒DisableRailSlave** = ***True*** for 2 axis machines. A ***True*** setting indicates that the Burny10 is NOT controlling a second drive system on the X axis. This setting is used for cantilever type machines that have only a single X axis and a single Y axis motor. Set to ***True*** if the machine is a gantry type with two separate master and slave X axis motors and uses some type of Resolver Synchronization to keep the slave motor aligned with the master.

    Set **Axis Trajectory⇒DisableRailSlave** = ***False*** for 3 axis type machines on gantry type machines where there are two X-axis motors (one on each side of the bridge). The Burny directly controls the slave and master motors as separate and unique axes. This requires that both the master and slave X motors on the machine have encoder feedback connected to the Burny so that both sides of the machine are under full position control through the Burny.

Set the **IO Configuration⇒OKToRun Type** to 1. See OKToRun Type description for more information on this parameter.

Set the **IO Configuration⇒UseFPSpdPot** parameter to ***True*** on a Burny 10. On a Burny 10 LCD, set this ***True*** if the feedrate override option has been installed.

CALIBRATE THE FEEDRATE OVERRIDE DIAL

Confirm that the feedrate dial is calibrated correctly. Turn the feedrate dial to its maximum clockwise position then touch the ***Status Bar*** at the bottom of the screen (next to the MENU touchpad where the X and Y position are displayed). The value inside the Override box should read 120%. If it does, continue on to the next paragraph. If not, go to the Dictionary Viewer and select || **IOCMC|| WorldOut || w_ADC1 ||** (or **w_ADC0** for external feedrate pot). With the feedrate dial set to it's maximum clockwise setting, note the value displayed. This should vary between 0 and about 4.1 as the dial is turned. Note the maximum value and enter it for the **IO Configuration⇒SpdPotMax** parameter and touch ***Send*** (two decimal places are sufficient).

21. Cycle the ***Stop*** button and turn on the drives. If any motor immediately runs away, press ***Stop*** and remove power from the drive amplifiers and the motor's tachometer. More than likely, the motor's tachometer is not connected and/or in the proper polarity. There is no parameter that can fix this. **NOTE: If the drives do not start, the *Status Bar* remains RED, or the *Status Bar* is YELLOW with the drives disabled, or the *Status Bar* is WHITE with the drives disabled, external stop interfacing is not correct. Refer to the MACHINE INTERFACE addenda in the INSTALLATION AND MAINTENANCE section for details.**
22. Cycle the ***Stop*** button and turn on the drives again, the motors should remain still, though they may be drifting. Adjust the drift, balance or offset pot in the drive to eliminate as much drift as possible. Some drives may always drift but the drift should be minimized.

REPEAT FOR EACH AXIS

The following procedure uses the Y-axis. Once the steps for the Y axis are completed, repeat the steps for the remaining axes starting at this point.

SETTING DRIVE DIRECTION

23. Set the feedrate dial to the full CCW position - 0%.
24. Use the joystick to jog in the +Y direction (left) and adjust the feedrate dial clockwise until the motor is turning fast enough to observe rotation at the pinion. If the motor "runs away" at this point, the tachometer on the motor must be reversed. When the motor is driving in a controlled manner, note the direction that the machine is moving based on the pinion or drive train rotation. If it is moving in the correct +Y direction, continue with the next step. If it moves in the wrong direction, change the ***True***/***False*** setting of the **Axis Y⇒ InvertPwrAmp.** Touch the ***Send*** touchpad to transmit the changed value to the controller. Jog the axis in the +Y direction again. It should be moving in the correct direction now.

SETTING ENCODER DIRECTION

25. Check the encoder direction.

    Touch the touchpad for ***Dictionary Viewer*** and view **||Y axis||WorldOut||w_AxisPosition||** which is the Y axis position.

26. Jog in the +Y axis and observe the value displayed in the center of the screen is increasing. If it is, continue to the next step. If it's counting down, touch ***OK*** on the Dictionary Viewer and change the ***True***/***False*** setting of the **Axis Y⇒InvertEncoder** parameter. Touch ***Send***. Jog in the +Y direction and the Y axis position value should now be counting in the proper +Y direction.

    In this procedure, the Dictionary viewer was used to check the encoder direction instead of the display in the status bar at the bottom of the screen. This was done so the same procedure could be used for all 3 axes. You can look at the axis position at the bottom of the screen for the X and Y-axis to determine the encoder, but you must use the Dictionary viewer to check the XX axis encoder direction.

27. Jog in the –Y direction and ensure the position is decreasing.
28. Active the "E"-Stop and confirm that the ***Status Bar*** is RED or YELLOW and a message indicating "STOP" is displayed.

SETTING ENCODER DISTANCE "TICKS PER METER"

29. The next parameter to set is the **Axis Y⇒TicksPerMeter** (Y axis in this example)**.** This parameter takes the place of the Distance/Revolution and Counts/Revolution in the older Burny products. A "**TICK"** in the Burny means one of the edges of the encoder signal. Quadrature encoders have 2 channels (A and B) creating 4 rising or falling edges for each cycle or line on the encoder. For example, a 200 line encoder has 800 edges or ticks. Using one of the methods described below, enter the value for the **Axis Y⇒TicksPerMeter** and touch ***Send*** to transmit it to the motion controller.

The Encoder Ticks/meter value can be determined by calculation, or by direct measurement. 3 methods are listed here:

a) Calculating Ticks per Meter Using Burny 2.5, Burny 3 and Burny 5 parameters

Many table manufacturers' have supplied the encoder values in terms of the counts/revolution and distance/revolution for use in the Burny 3 and 5. To convert these values to ticks/meter, perform the following.

If the Distance/revolution is in Inches, use the following conversion:

$$\text{Ticks}\Big/\text{meter} = \frac{\text{Lines per revolution}}{\text{Distance per revolution}} * K * 4$$

where constant K = 39.37 if distance /revolution is inches
= 1000 if distance/revolution is mm

b) Calculating Ticks per Meter Using available data
If you know the number of lines on the encoder, the gear ratio of the gearbox and the size of the pinion gear, use the following calculation.

$$Ticks/meter = \frac{Encoder\ Lines * Gear\ Ratio}{Pinion\ Diameter * \pi} * K * 4$$

Where: π = 3.1415927

K = 39.37 (English) OR 1000 (Millimeters) depending on pinion diameter units.

c) Calculating Ticks per Meter using measurement method (Open Loop)

1. Temporarily engage the pinion for the axis being tested.
    - For Master/Slave systems, engage ONLY the Master side.
2. Adjust drive offsets to eliminate or minimize any drifting that could affect the measurements.
3. Mark the rail with a fine line that can be repeated after the axis is moved.
4. On the STATUS screen, change the display to "Rel" (relative) and reset the X and Y displays to 0 by touching the X and Y at the top of the screen.
5. Jog the axis a particular distance as displayed on the STATUS screen and make a second mark.
    - The displayed distance will usually be very different from the actual distance moved, but this difference will be used in the next step to correct the TicksPerMeter value.
    - If only one side of a Master/Slave system is engaged, jog slowly and carefully. Temporarily change JogAcel to .1 to ensure smooth movements.
6. Measure between the marks and compare the measured dimension with the displayed dimension. Use the following equation to calculate the new value.

$$New\ TicksPerMeter = \frac{Displayed\ Distance}{Measured\ Distance} \times Current\ TicksPerMeter$$

- If the measured dimension is short, TicksPerMeter must be increased. If the measured dimension is long, TicksPerMeter must be decreased.

NOTE FOR DIGITAL SYNC SYSTEMS: Though the TicksPerMeter value for the X axis is automatically used for the XX axis, you can test for proper operation of the XX encoder by doing the following:

- First confirm that the X TicksPerMeter value is accurate.
- Engage the Slave side only and perform the steps above.
- IMPORTANT! You must use Dictionary Viewer Axis XX | WorldOut | w_AxisPosition-m to see the XX position (in meters). The X display on the Status Bar and the Status screen cannot be used because it only represents the X encoder.

ADJUSTING SERVO DRIVE SPEEDS

30. Once the **TicsPerMeter** parameter has been set, the speed of the machine can be measured using the encoder feedback. The speed of the servo drives will be adjusted to their correct performance point when a maximum reference signal is applied. To do this, first determine the maximum travel speed for the machine. This can either be determined by testing the drives during this procedure or based on the drive's manufacturer specification. The speed value is entered into the ***Axis Trajectory*** **⇒MaxVel** parameter however ***do not enter the value at this time*** as it affects the open loop tuning of other axes. After the speed of all axes is determined, this parameter is entered.

    This speed is set in **meters/second**. To convert from inches/minute or mm/minute, the following calculations are used.

    Meters per second = (inches per minute) / (39.37 * 60) = (inches per minute) / 2362.

    Meters per second = (millimeters per minute) / (1000 * 60) = (millimeters per minute) / 60000

    The following chart shows typical conversions from Inches per Minute to Meters to Second and mm/min

Inches per Minute	Meters per second (m/s)	Millimeters per minute (mm/min)
10	0.0042	254
25	0.0106	635
50	0.0211	1270
100	0.0423	2540
150	0.0634	3810
200	0.0846	5080
250	0.1058	6350
350	0.1482	8890
400	0.1693	10160
450	0.1905	11430
500	0.2117	12700
600	0.2540	15240
700	0.2963	17780
800	0.3387	20320
900	0.3810	22860
1000	0.4233	25400

31. Go to the Dictionary Viewer and select || **Axis Y|| ActuatorOut || a_PwrAmpCmd ||**. This shows the command signal being sent to the Y-axis DAC. A value of 10.00 volts is the upper limit of the DAC. Set the speed dial to its maximum clockwise setting and jog the Y-axis. The value should go to 9.5. If it is greater than 9.5 simply reduce the setting of the feedrate pot. If it is less, refer back to 0 calibrate the feedrate pot correctly. 9.5V is the reference voltage needed to adjust the servo speeds in the next step. A maximum of 9.5 instead of 10 volts is used to allow for variance in the AC line and voltage drops in the cables and motors. Under these conditions, the speed reference can go slightly higher than 9.5 volts if needed.

Maximum Reference Voltage Considerations

Most of this procedure assumes the drive system being installed uses a 9.5V maximum reference voltage for controlling the servo drives. There are numerous places where the text states "make sure the voltage goes to 9.5V" or "turn the speed dial to get the full 9.5V reference". This is not the only voltage that can *be used. Some servo drives require less voltage for their maximum speed operation, i.e. 8V or 3V. In these cases, turn down the speed dial until the desired voltage is seen on the dictionary viewer for || Axis Y|| ActuatorOut || a_PwrAmpCmd ||. The actual voltage can be measured using a voltmeter and set the speed pot so that the jog moves used for these tests output the desired maximum voltage. For the remainder of the procedure, when a statement indicates "9.5V max reference", use the appropriate value.*

32. To measure the axis speed, use the Dictionary Viewer, and select || **Axis Y|| WorldOut || w_AxisVel_m/sFilt ||.** This is a filtered display of the actual speed of the Y-axis. Jog the Y-axis at full 9.5V volt reference and adjust the servo drive for the maximum speed that will be expected of the machine during normal operation.

    For example, if a machine is expected to run up to 250 Inches/minute, the servo drives should be adjusted until a value of .1058 meters/sec. is observed.

33. After setting the speed of the drive, re-adjust the DRIFT or BALANCE pot in the drive to remove or minimize drift in the servo drive with no jog commands. Use the Dictionary Viewer **IOCMC || WorldOut || w_Encoder0,1,2,3(X,Y,XX,C)** to observe the motor drift.

DONE WITH 1 AXIS (REPEAT FOR OTHER 1 OR 2 AXES)

34. This completes the steps for the open loop tuning of an individual axis. Return to Section **11.9.7. Setting the Drive Direction** of this procedure and repeat the steps for the remaining axes on the machine. For 2 axis machines (including those using resolver synchronization for the slave axis), you only need to perform these steps on the X and Y axes. For 3 axis dual sided drive machines (where the Burny is directly controlling the XX axis), the procedure must be done for the X, XX and the Y axes.

SETTING SYSTEM SPEEDS

The maximum speed parameters for the table must be entered now. The maximum travel speed and jog speed were set to 0.25 meters/second by the Open Loop file, but they must now be set to the maximum desired speed for the table. Set the following 3 parameters accordingly:

35. **Axis Trajectory⇒MaxVel (Units = meters/second)**

    This is the maximum travel speed of the machine. Set to the same value the drives were just calibrated for.

36. **Axis Trajectory⇒MaxJogVel (Units = meters/second)**

    This parameter sets the maximum speed during Jog moves. Set this the same as MaxVel.

37. **Axis Trajectory⇒BackupVelocity (Units = meters/second)**

    This value is usually set lower than the **Axis Trajectory⇒MaxVel** based upon personal preference for maximum reverse speed. Typically set to about .017 to .026 meters/second (40 to 60 inches/minute)

CLOSING THE CONTROL LOOP

Up to this point, the machine has been operating with the "Open Loop" setup parameters. This was done to make it possible to determine the encoder and drive directions, set drive speeds, etc. With these parameters entered correctly, the next step is to close the control loop so that the Burny uses the encoder feedback to correct the machine's position.

38. Confirm that the motors are currently disengaged from the drives. This is necessary since the next step will cause them to move for possibly a long distance to cancel any accumulated following error.

39. Save the parameters to **BurnyLoadParams.ini** once all axes have been completed. This is the file that is used to reload the parameters on power-up. Touch the ***Save to File*** touchpad and make sure the proper filename (**BurnyLoadParams.ini)** is selected. Touch ***OK*** to save the data and return to the setup screen.

40. Press in the "E"-STOP button on the Burny.

41. Set the Proportional Gain PGAIN parameter to 500 for the X and Y axis:

    AxisX⇒DefaultPGain= 500

    AxisY⇒DefaultPGain= 500

    Cycle the "E"-STOP button and turn the drive system on. The X and Y axes servomotors should remain still. If the motors move, re-check the encoder and drive direction parameters. If either axis oscillates, check for loose drive components. PGain can be reduced to below 500, but this should not be necessary.

VELOCITY AND ACCELERATION FEEDFORWARD GAINS

The Feed Forward gains are the values that cause the machine to move at the proper speed based on a calculated command, not an actual following error of the encoder position. Setting the Velocity and Acceleration Feedforward Gains is a process of adjusting the parameter value and checking the performance using the graphical following error display accessed via the ***Check*** touchpad.

The following is a step-by-step procedure to set the Velocity and Acceleration Feedforward gains (Y axis used for example).

42. Push "E"-STOP to prevent the drives from moving and engage the motors and encoders to the cutting machine. This applies the real load on the servo drives. If the pinions will not engage without moving out of square, jog the slave independently using Manual Homing or you can simply shutdown and restart the control.

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*When jogging the machine, **TAKE CARE NOT TO** hit limit switches or exceed the software travel limits. Since the entire control loop isn't configured yet, the motion when returning from this situation may be violent.*

The following should have already been set during the loading of the Openloop file parameters, to confirm:

43. Confirm that the **AxisY⇒DefaultDGain** Derivative Gain and **AxisY⇒DefaultIGain** Integral gain are set to 0.00

44. Confirm that the **AxisY⇒FollowingErrorLim** is set very large (100 meters) so it doesn't interfere with the tuning.

45. Confirm that the **AxisY⇒DefaultPGain** Proportional Gain is set to 500. This small value used to prevent the axis from drifting.

46. Also confirm that the **AxisX⇒DefaultPGain** Proportional Gain is set to 500. This is being done at this time to prevent the X-axis from drifting while the Y-axis is being tuned.

47. Confirm that the **AxisY⇒DefaultAff** Acceleration Feedforward gain is set to 0.00.

48. Confirm that the **AxisY⇒DefaultVff** Velocity Feedforward gain is set to the default value of 38.

49. Touch ***Send*** to transmit these values to the controller.

50. Cycle the "E"-STOP button and turn on the drive system.

51. Touch the ***Check*** touchpad to go to the Graphing function.

SETTING THE VELOCITY AND ACCELERATION FEEDFORWARD GAINS

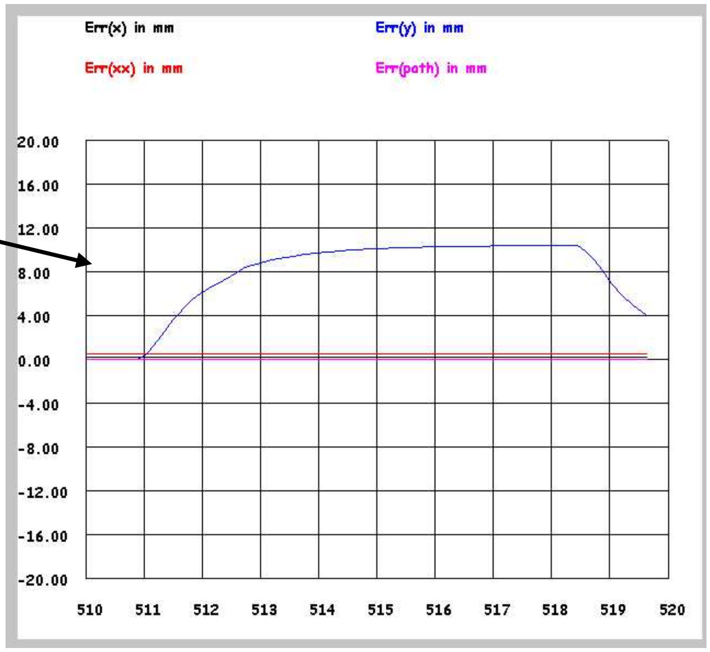
52. Set the speed dial to its full clockwise position. Jog in the +Y direction and note the following error for the Y-axis on the screen. If the display moves off the visible display, change the SCALE to a larger value and repeat the jog move. Note that for this step, the starting level and the steady level of the graph during the jog motion are important. The starting level may not be exactly on the 0 level due to some drift in the servo drive. When the velocity feed forward parameter is adjusted properly, the level during the jog will be the same as the level when the machine is stopped.

    Note that for most machines, there is no need to set the scale value below 2mm. While it is possible to use the CHECK function to look at extremely small errors, it isn't practical for typical cutting machines.

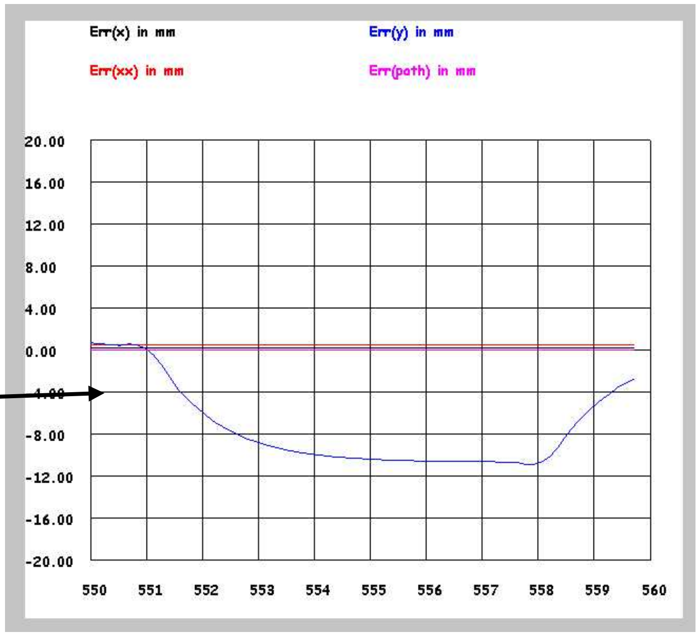
53. The following pictures show the 3 possible cases for the Velocity Feedforward gain. A typical value for this parameter ranges from about 30.0 to 90.0. The velocity feedforward gain is very sensitive so very small changes in the gain will produce very large following error changes.

During a +Y jog, if the following error graph goes positive, it shows that the Velocity Feedforward gain is TOO LOW. Increase the setting for this parameter, press ***Send***, and check the performance again. Remember not to run into any travel limits.

Sweep time set to 7.5 seconds

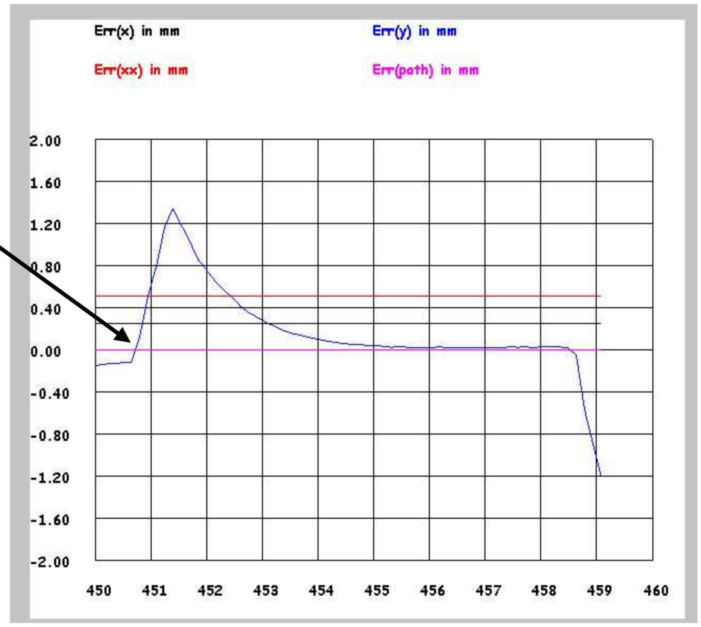


NOTE: When this procedure is used to tune the AxisX Velocity Feedforward, the BLACK trace should be used to make the adjustment. There will also be a RED trace that shows the AxisXX following error, and in most cases, it should track fairly close to the AxisX position. However it is possible for this RED trace to be separated from the BLACK due to variations in the drives.



During a +Y jog, if the following error graph goes Negative (the opposite of the +Y jog direction), it shows that the Velocity Feedforward gain is TOO HIGH. Decrease the setting for this parameter, press ***Send***, and check the performance again. Remember not to run into any travel limits.

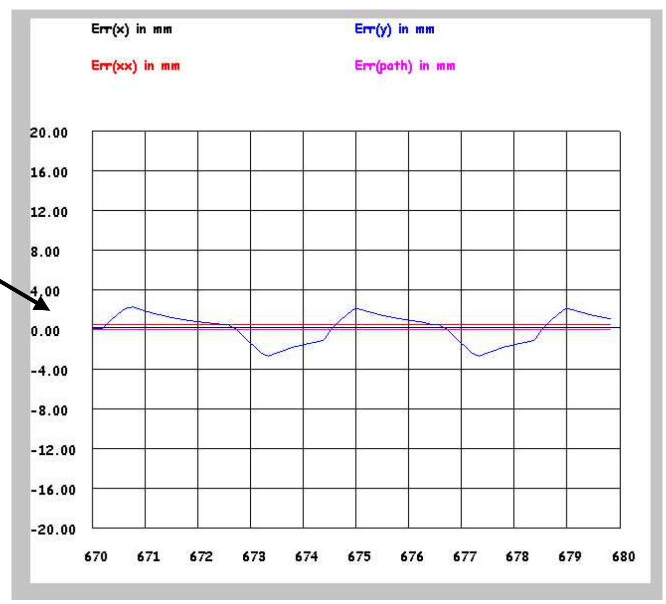
When the Velocity Feedforward is adjusted correctly, there will only be small "bumps" during the acceleration and deceleration during the jog movement. During the constant speed portion of the jog, the error should go back to the zero level. If it does not, be sure that the +Y and –Y jogs go to the same steady state level. Then, use the ZeroVoltOff parameter to adjust for the offset.



54. To change the parameter, touch ***OK*** on the graphing screen to return to the Axis Y parameter table. Touch ***Edit*** and adjust the value for the **AxisY⇒DefaultVff** parameter. Touch ***Send***, then touch ***Check*** and jog the machine again in the +Y direction to see the results of the change. As the parameter gets closer to the correct value, change the Scale to a smaller setting to show smaller errors more clearly. Continue to adjust the value until the graph returns to the same level (or as close as possible. See 3rd picture). The steady state level during the continuous jog returns to the same level that occurs when the machine is at rest.

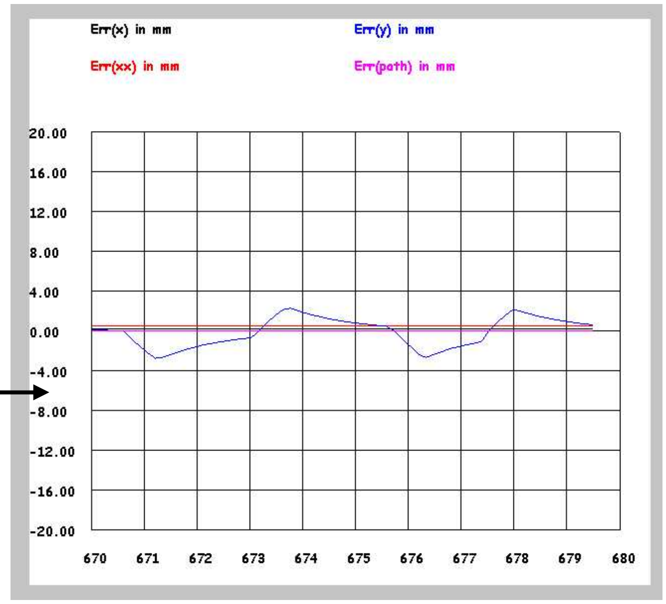
55. Now adjust the **AxisY⇒DefaultAff** Acceleration Feedforward term. This is basically the same process except that now you are trying to eliminate the "bumps" on the graph during the Accel and Decel of the jog moves. See the 3 pictures below for more detail. A typical value for this parameter ranges from 0.0 to 1.0.

During a +Y jog move, if the graph goes positive, it shows that the Acceleration Feedforward parameter is TOO LOW. Increase the setting for this parameter, press ***Send***, and check the performance again. Remember not to hit any travel limits.

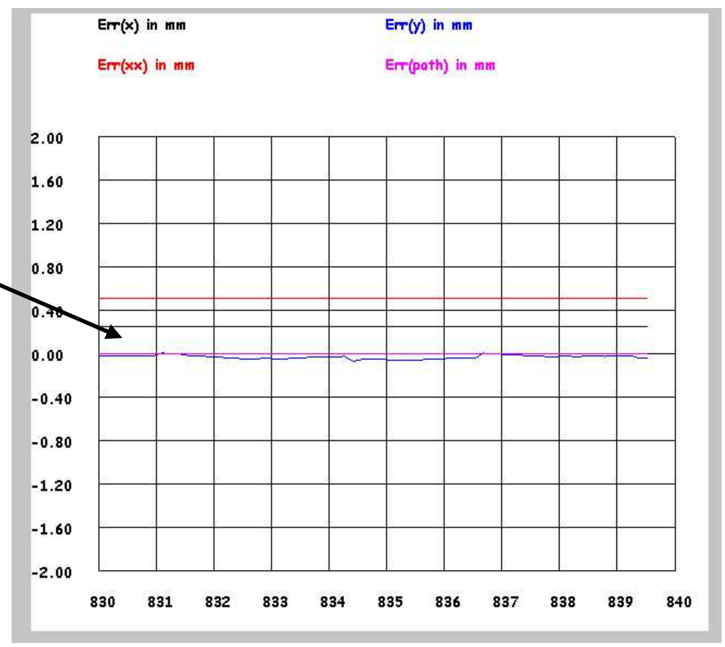


Change the scale as needed during these procedures to get the best picture.

During a +Y jog move, if the graph goes negative (the opposite way from the +Y jog), it shows that the Acceleration Feedforward parameter is TOO HIGH. Decrease the setting for this parameter, press ***Send***, and check the performance again. Remember not to hit any travel limits.



When both the Acceleration and Velocity Feedforward terms are adjusted properly, graph will remain virtually flat during the acceleration and the constant speed portion of the jog move.



PROPORTIONAL, DERIVATIVE AND INTEGRAL GAIN SETUP

The Proportional, Derivative and Integral gains provide the control loop with the parameters to correct for a following error between the desired position of the machine and the actual position of the machine.

Proportional Gain is a pure multiplier. The gain value is multiplied times the following error. The bigger the error, the more signal is output to try to correct for it. Too much proportional gain can cause the machine to oscillate.

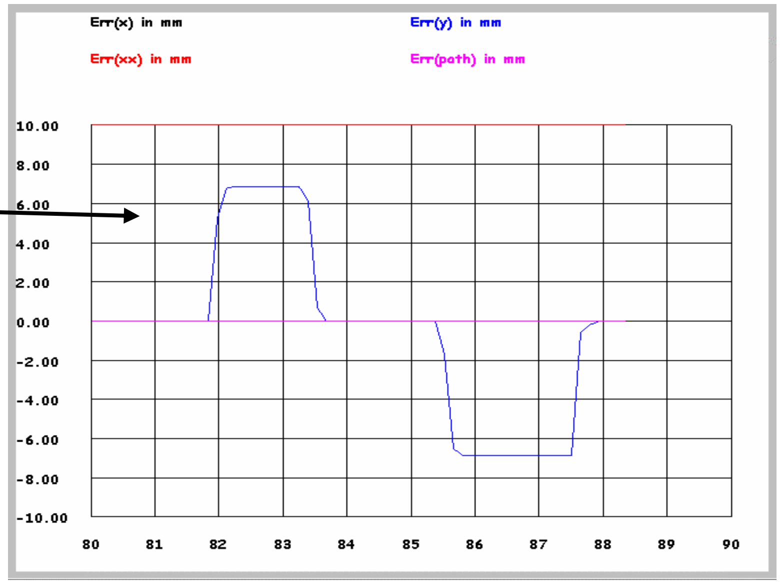
The Derivative Gain is not used in systems 3.0 and higher and is set to 0.

Integral Gain reacts to long duration errors. When there is an error that does not change for a while, the integrator starts ramping up to create an output signal that causes the error to be reduced. Too much integral gain can cause mushy operation and overshooting of corners.

To set the Proportional, Derivative and Integral gains, use the Burny configuration graphing "oscilloscope" and the jog. The concept is to drive the motors as hard (quickly) as possible while maintaining control of the machine. The Y-axis is used here for example.

56. Record the current settings **AxisY⇒DefaultVff** (Velocity Feedforward) and the **AxisY⇒DefaultAff** (Acceleration Feedforward) parameters (write them on a piece of paper. They will be needed later)
57. Set both the **AxisY⇒DefaultVff** and **AxisY⇒DefaultAff** values to 0. This is done to eliminate their affect on the machine motion so the affect of the other gain values can be seen more easily.
58. Set the initial **AxisY⇒DefaultPGain** to 500. This is a fairly low value that should not cause oscillation problems on most machines. Touch the ***Send*** touchpad to transmit these values to the motion controller.
59. Touch ***Check*** to go to the graphing screen. Jog the machine in the +Y and –Y directions and observe the graph. The flat portions show the constant speed jog movement while the edges show the accel/decel times. It may be necessary to change the SCALE value to see the top of the graph. The PGAIN value at this point is still set to 500. The picture should look similar to the following:

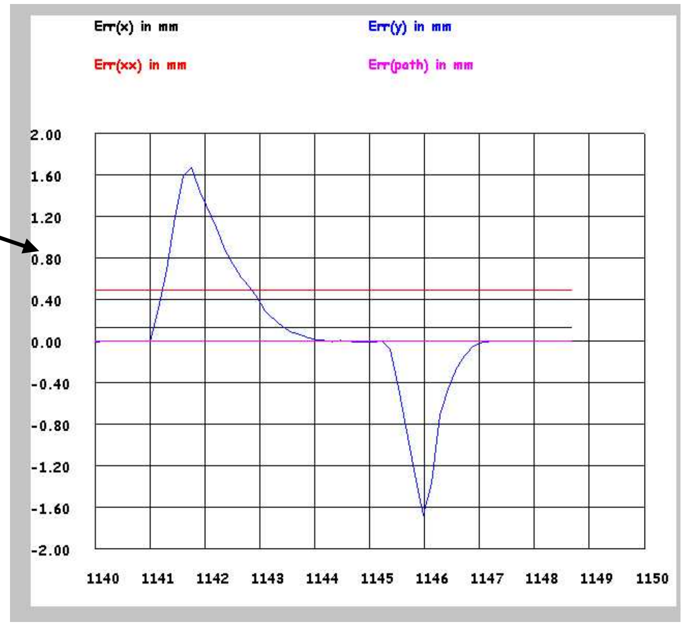
Graph shows large following error at this point since gain values are very low. Note that graph SCALE has been increased to 10 mm to see the entire profile.



60. Press the **OK** button to return to the parameter table screen and increase the **AxisY⇒DefaultPGain** (Proportional Gain) to 1000. Be sure to press **Send** after each parameter change to transmit them to the motion controller.
61. Press **Check** to return to the graph. Jog the machine and observe the following error again. Continue to increase the Proportional gain in increments of 500 to 1000 while observing the top edge of the waveform If it becomes unstable reduce PGain. There is usually no reason t set PGain any higher than 4000. A setting of 2000 is usually all that is required for proper operation. Note: On systems that use rack mounted encoders, it is often necessary to set PGain to 500 or lower to prevent oscillations.
62. Derivative Gain is generally not used and should be set to 0. Oscillation usually occurs when this value is set to 20 or above.
63. Set the **AxisY-DefaultIGain** (Integral gain) to an initial value of 5. Jog and observe the following error on the check screen. Adjust the integral gain until your results are similar to the graph below. A normal setting is usually between 2 and 10. On systems that use rack mounted encoders, a setting of zero is usually required to prevent oscillations.

An Integral gain of 15 produced this graph. Be careful that the gain is not set so high that the graph falls to zero too quickly, but also know that too small of a gain will produce a long lag to zero steady state. The ideal lag to zero steady state error is 2 divisions on a 7.5s scale.

Note: Because Vff is temporarily set to 0, the trace may not fall to exactly 0 steady state error.



64. Restore (enter) the saved **Axis Trajectory⇒DefaultVff** (Velocity Feedforward) and the **Axis Trajectory ⇒DefaultAff** (Acceleration Feedforward) values that were written down before.
65. Touch ***Send*** to transmit the changes to the motion controller
66. Jog the machine in both directions and check its performance. It should be smooth and controlled.
67. Set the Feedforward and PID gains for the X axis by repeating the steps starting at **Section 11.9.15 Feedforward Gains.** Realize that the gain settings for the X axis are used for the XX axis.

ACCELERATION SETTINGS

68. **Axis Trajectory ⇒MaxAcel (units = meters/second/second)**

    The **Axis Trajectory ⇒MaxAcel** parameter controls the acceleration of the machine along the part program path. Setting this value higher will result in a more responsive machine, however a value set too high, can cause the machine to "shudder" or overstress the drive and mechanical systems. If the acceleration is set too low, the machine will be sluggish and, possibly, exhibit poor cut quality, especially in corners and changes in direction.

    A normal setting for this parameter is usually between 0.2 and 0.5.

    There are two procedures to determine the acceleration value. The TEST method is based upon observation and the measurement method provides a way to characterize the machine's actual acceleration capabilities.

    Adjusting Axis Trajectory⇒MaxAcel— Test method

    The TEST method uses a typical part. Repeatedly test-run a part at full speed and adjust the acceleration value until the desired performance is observed. Observe the torch as it accelerates in and out of corners. If the corners appear "mushy", increase the MaxAcel parameter. If there is excessive shaking and bumping at the corners, or if other mechanical problems are noticed during the accelerations, reduce this parameter. Before starting, make sure that **Axis Trajectory⇒UseSCurve** is set to ***True***.

69. **Axis Trajectory⇒JogAcel (units = meters/second/second -- typical value = .5**

    Set this parameter to the desired acceleration for Jog movements. Typically this value is set to .2 to .50 m/s/s.

70. **Testing the TicksPerMeter Values (Closed Loop)**

    A. Mark the rail with a fine line that can be repeated after the axis is moved.
    B. On the STATUS screen, change the display to "Rel" (relative) and reset the X and Y displays to 0 by touching the X and Y at the top of the screen.

C. Jog a particular distance, using Incremental Jog if available, and make a second mark.

D. Measure between the marks and compare the measured dimension with the displayed dimension. Use the following equation to calculate the new value.

$$\textbf{New TicksPerMeter} = \frac{\textbf{Displayed Distance}}{\textbf{Measured Distance}} \times \textbf{Current TicksPerMeter}$$

- If the measured dimension is short, TicksPerMeter must be increased. If the measured dimension is long, TicksPerMeter must be decreased.

E. Repeat the above to test the other axis.

NOTE FOR DIGITAL SYNC SYSTEMS: Though the TicksPerMeter value for the X axis is automatically used for the XX axis, you can test for proper operation of the XX encoder by doing the following:

- First confirm that the X TicksPerMeter value is accurate.
- To avoid abrupt, fast movements while only one pinion is engaged, temporarily reduce JogAcel and MaxAcel to 0.1. You can also temporarily set MaxVel and MaxJogVel to a lower value for slower movements during this testing. (0.1 for about 236 IPM**)**
- Engage the Slave side only and perform the steps above.

CORNERING ADJUSTMENTS

There are parameters that control the cornering performance of the machine. They are S-Curve usage and gain, Axis Jerk Filter, Cornering Speed, Minimum Corner Angle, and Maximum Corner Angle.

To set these parameters, a special test program named **SquareX.cnc** is used. This program may be loaded into the control from the factory. If it is not, use the Editor and create the following part program to cut a 4"square with an X through the middle of it or load it as described in section 0of this document.

```
%
G70
G91
G97
M04
X4
Y4
X-4
Y-4
X4Y4
Y-4
X-4Y4
Y-4
M03
G98
M30
```

This program will be used to observe the performance of the machine on 90 degree and sharper 45-degree changes in direction.

71. **Axis Trajectory⇒ AxisJerkFilt (filter coefficient. Typical range is 0.2 to 1.0)**

    The Axis Jerk Filter should be set to 1.

72. **Axis Trajectory ⇒ UseSCurve (*True*/*False*)**
    Axis Trajectory ⇒ ScurveAcelGain (Filter coefficient. Typical range is 10 to 15)

    UseSCurve is set ***False*** to use the trapezoidal acceleration profile.

73. **Axis Trajectory ⇒ CorneringSpeed (units = meters/second. Typical range is .004 to .015 meters/second)**
    In the Run process, setup SquareX.CNC part to run at a normal feedrate, press the GO button and observe the torch movement and path in the corners. With these parameter values, the machine is making a perfectly square corner, which requires that one axis stops before the other axis begins to move. This

apparent corner dwell can cause poor cut quality on processes such as plasma cutting. The CorneringSpeed parameter is used to reduce the corner dwell by specifying a minimum speed to be used when going around a corner. Setting the Cornering Speed to any value other than 0 causes the machine to make a very small radius on the corner which eliminates the need for the machine to come to a complete stop.

To make this adjustment, Stop the machine, and increase the value of the **Axis Trajectory⇒CorneringSpeed** parameter. Start with a value of .004 meter/second (about 10 inches/minute) and observe the machine performance. The value can be raised as needed to achieve the desired performance in the corners. It may be necessary to cut some sample parts and observe the cut quality in the corners. If it appears that the plasma torch ran too slow through the corner, increase the Cornering Speed parameter. However, as it is set higher, it increases the size of the radius at the corner and the roundness may be undesirable.

Note that the maximum radius created by the CorneringSpeed parameter is limited by the **Axis Trajectory⇒GoalPointTolerance** parameter. This value was set to .005 meters (about .20 inches) earlier and does not usually require further adjustment.

74. **Axis Trajectory⇒MinCornerAngle and Max Corner Angle**
The two parameters, “Min Corner Angle” and “Max Corner Angle”, determine the deceleration factor used for a change in angular direction of two consecutive line or arc segments or program blocks.

If two lines are going in exactly the same direction, the change in angle where they join is 0 so there is no slowdown at the intersection. If two lines form a 90-degree angle, for instance in a square, it is necessary to perform a full slowdown to stop in the corner and then accelerate in the new direction. However, many parts have lines that change direction only a slight amount (1 to 2 degrees), and it is desirable to maintain the cutting speed at these intersections.

If there is a change in direction between two blocks of a program which is LESS than the “Min Corner Angle”, the control will blend from one line to the next without slowing down. In the example where there is a 1-degree change, the speed remains essentially constant through the intersection. If the change in direction between two blocks is greater than the “Max Corner Angle”, the control will perform a normal full deceleration to stop in the corner and then accelerate in the new direction. This is the normal action that would occur on the corner of a square for example.

Angles that fall between the Min Corner Angle and Max Corner Angle values will get a proportional amount of slowdown so that angles close to the Min Corner Angle will have almost no slowdown, while angles close to the Max will be approaching full slowdown.

Typical values are 5 and 90.
Angles less than 5 degrees will have no slowdown.
Angles of 5 to 90 degrees will receive proportionately more slowdown
Angles over 90 degrees will be considered a full corner and will receive full corner slowdown.
Normally, these settings are acceptable for standard cutting applications.

CORNERING PARAMETERS EXPLAINED

When a part is run, the change in direction that occurs when going from one line segment to another is checked. If the direction change is less than the ***MinCornerAngle***, no slowdown will occur at the intersection of the two segments. If the direction change is greater than the ***MaxCornerAngle***, the torch will decelerate to a stop then accelerate in the new direction at a rate based on the setting of the ***MaxAcel*** parameter.

When the angle of the change in direction, when going from one line segment to the next, falls between the setting of the ***MinCornerAngle*** and ***MaxCornerAngle*** parameters, the two line segments will be connected with an arc if the ***CorneringSpeed*** is not set to 0. Setting ***CorneringSpeed*** to 0 allows for stopping in the corners and no arc is created. When set above 0, an arc has to be created in order to go through the corner without dropping below the ***CorneringSpeed***. If the ***CorneringSpeed*** is increased, the size of the arc will increase in order to keep the velocity from falling below the ***CorneringSpeed*** setting. The ***GoalPointTolerance*** parameter sets the maximum radius of the arc that is created. If ***GoalPointTolerance*** is set high, a larger arc can be created and a smoother transition will occur. If ***GoalPointTolerance*** is set low, the radius of the arc is limited and the velocity through the corner will be allowed to fall below the ***CorneringSpeed*** setting.

Some CAD systems output part programs with arcs that consist of many small line segments. Part programs that were created through tracing or scanning usually have the same segmented arcs. To get these segmented arc parts to run smooth without slowing down at every segment junction, start by experimenting with the setting of the ***MinCornerAngle*** parameter. The default setting of 11 will cause most junctions to run without slowing down but if the system is fairly responsive, some roughness may be observed due to the abrupt direction change between segments. A setting of 5 may be good to allow only the slightest direction changes to run without slowing down and the abrupt direction change will be less noticeable. The other junctions, more than 5 degrees, will be smoothed by the arc that is created to join them. If ***CorneringSpeed*** and ***GoalPointTolerance*** are set fairly high, the connecting arcs will have a larger radius and the junctions will run faster and smoother. If the values are set too high, the amount of rounding in the corners that occurs may be unacceptable.

If the ***MaxCornerAngle*** parameter is set fairly low, any direction changes sharper than the setting will only occur after the torch comes to a stop. The default value of 22 is usually acceptable for the slower speeds of Oxy/Fuel cutting. If some rounding in the corners is acceptable, it may be better to set the value higher to keep the torch moving in the corners. A value of 90 or 100 is usually a good value for plasma cutting to accomplish this.

ArcAcelDerate is used to make smaller holes cut slower. Even if the machine characteristics will allow a small radius hole to cut at a fairly fast speed, this is often undesirable when cutting thicker material. This parameter actually modifies the ***MaxAcel*** response based on the radius of the holes. A value of 100 will produce no additional slowdown based on radius. Experiment with a value of 50 and go up or down from there to achieve the desired response.

RAPID STOP ACCELERATION

75. **Axis Trajectory⇒RapidStopAcel**
    This parameter specifies the acceleration at which the machine will come to a stop after Aux Input #3 is activated. This parameter is usually used in conjunction with breakaway torches. Set this value to twice the MaxAcel value for aggressively stopping the machine and set it for MaxAcel in all other cases. For this value to be used, the **IO Configuration⇒Enable Rapid Stop** parameter must be set to TRUE.

FOLLOWING ERROR LIMIT

A “Following Error” occurs when the machine's actual position does not match commanded position. Following errors can occur if the tuning is not correct, or if something has changed in the servo drive performance (bad bearings, loose wires, bad servo card or motor). It can also occur if the machine hits an obstruction or the gears bind. Regardless of the reason, following errors are not desirable. Therefore, there is a specific parameter to watch for following errors and stop the machine if the error gets too large. During the initial tuning, this parameter is set very large so it doesn’t interfere with the tuning process. However, once the tuning is done, this parameter should be set to as small a value as possible. A very small value may cause nuisance stopping due to normal bumps that occur on a cutting machine.

76. **AxisX⇒ FollowingErrorLim (units = meters, typical = .002 to .010)**
    AxisY⇒ FollowingErrorLim (units = meters, typical = .002 to .010)

    Set this value in both the AxisX and AxisY data tables to an acceptable limit that will protect the machine from mechanical damage if the axis gets out of position. Do not set it so small that it causes nuisance tripping of the following error limit due to small variations in the cut path. A typical number would be twice the following error value observed in the ***Check*** screen when jogging, but the number should never be less than 2 mm.

77. **AxisX⇒ Stop Following Error (units = meters, typical = .100)**
    AxisY⇒ Stop Following Error (units = meters, typical = .100)

    This value establishes a safe guard that causes an "E"-Stop to occur if the following error exceeds these values. Set this value in both the AxisX and AxisY data tables to a distance that is greater than the FollowingErrorLim parameter.

BACKLASH COMPENSATION

78. **AxisX ⇒ Backlash (units = meters)**
    AxisY ⇒ Backlash (units = meters)
    AxisXX ⇒ Backlash (units = meters)

    Backlash is defined as the lost motion that occurs when changing direction in most gearboxes and belt drive systems. It occurs on systems where the encoder is located on the motor. If there is any looseness in the gear train, the machine may not move the proper distance and, thus, reduces the accuracy of the machine. The following procedure helps compensate for this.

BACKLASH MEASURING PROCEDURE:

Run the SquareX.CNC program again, but this time set the SCALE factor on the Job Setup screen to 0.025. This will cause the 4" part normally cut by the SquareX.CNC program to run a part which is only .10" on a side. Attach a dial indicator to the axis and measure the total travel of the machine. Compare this value to the total travel shown on the ***Status Bar*** readout. Any difference between these two readings is the backlash, or lost motion in the particular axis. This can be done on one axis at a time.

For example, assume the part is running the .10 x .10 inch pattern, and that the X readout shows that the machine moves from 0.000 to 0.100 each time the GO button is pushed to run another pattern. But the dial indicator only shows a total swing of 0.085" of movement. This indicates that there was .015" of lost motion due to the backlash in the gearbox. Therefore set the AxisX ⇒Backlash parameter to 0.00038 meters to compensate for the backlash.

GENERAL PROCESS PARAMETERS

79. **Machine Parameters⇒ MinOffTime (units = seconds)**
    Set this parameter to cause a dwell to occur after any device is turned off. The same time is used for all tools, whether it is the Cutting Oxygen, Plasma torch or Marking device. This dwell time keeps the machine from moving at the end of a cutting or marking segment so the torch has time to retract before the machine begins the fast traverse movement. On long-life plasma type systems, this dwell prevents the machine from starting the traverse move while the plasma system is still ramping down the arc current. This parameter is normally set to .5 to 2 seconds.

OXYGEN/FUEL CUT PROCESS PARAMETERS

80. **Machine Parameters⇒ BleedOffDelay (units = seconds)**
    This parameter is used for Oxy/Fuel and Waterjet processes.

    Set this parameter to cause a dwell to hold the machine in position at the end of an Oxy/Fuel cut to give time for the cutting oxygen to bleed out of the hoses. If the machine starts moving while cutting oxygen is still flowing, it is possible to nick the part being cut. Note that this timer will ADD onto any time specified for the MinOffDelay described above.

    In Waterjet cutting, this parameter causes a dwell at the end of the "Cut Off" sequence after all cutting medium (water/abrasive) have been turned off.

81. **Machine Parameters⇒ SWSenseTime (units = seconds, typical 0.016 seconds)**
    This parameter is used for Oxy/Fuel and Waterjet processes.

    This parameter determines the length of time that the Oxy/Fuel or Water switch input is stable before the Burny recognizes the input change. Set this parameter to 0.016 to cause a 16-millisecond delay when recognizing an Oxy/Water Switch Sense input change.

82. **Machine Parameters⇒ TeachPreheat (units = *True/False*)**
    During an Oxy/Fuel Preheat cycle, pressing the GO button extends the preheat time. Release the GO button to end the preheat sequence. If this parameter is set to ***True***, the modified preheat time will be remembered and used as the standard preheat time for all subsequent cuts. If this parameter is set to ***False***, the change to the preheat time on one pierce will not affect the preheat time of subsequent sequences. These would continue to preheat for the time originally specified on the job setup.

PLASMA CUT PROCESS PARAMETERS

83. **Machine Parameters⇒ PlasmaArcOnDelay (units = seconds)**
    This defines the time between the Plasma turning on (sensed) and when motion starts. This parameter is normally used with plasma systems that DO NOT have a current sensing output. In this case, the Arc On sense to the control is connected to the Plasma On/Off circuit and the Arc On delay time is used to hold the machine in position for the time needed for the Plasma torch to actually fire.

84. **Machine Parameters⇒ PlasmaArcOffDelay (units = seconds)**
    This defines the time between the Plasma turning off (sensed) and the controller indicating that the plasma arc has been turned off which may stop motion. Set this parameter to 1 to 2 seconds to ignore temporary sputters in the plasma arc or to allow the control to cut such things as expanded metal grating where the arc will continuously cycle on and off.

85. **Machine Parameters⇒ PlasmaStartDelay (units = seconds)**
When a Automatic Plasma cut is started, this timer specifies a delay between the Plasma Stop relay going Off (to enable the plasma) and the Plasma Start relay turning ON (to actually fire the arc). On some machines this is used to allow time for the torch lifter to move down to the plate. This value can be set to 0.00 for most machines, or can be set as desired to give the delay between the plasma torch being enabled and the start contact actually firing the arc.

86. **Machine Parameters⇒ PlasmaArcSenseTime (units = seconds, typical 0.016 seconds)**
This parameter determines the length of time that the plasma sense input is stable before the Burny recognizes the input change. Set this parameter to 0.016 to cause a 16-millisecond delay when recognizing a plasma arc sense input change.

87. **IO Configuration⇒InvertHeightDisable (units = *True*/*False*)**
This parameter inverts the state of the Plasma Height sensor disable contact output from the Burny. Although both the Normally Open and Normally Closed contacts from this relay are provided at the 31RECP connector on the back panel, it is sometimes easier to use the same pin number for the cables connecting to the Burny. Then use this parameter to invert the relay's operation to select the desired state for the contact.

    To set this parameter, cut a part using plasma and monitor the height sensor performance. The sensor should function normally during long constant speed portions of the part. When a corner is reached, the height sensor should be disabled so that the torch doesn't dive into the plate during the slowdown at the corner. After the corner and the machine has resumed the proper cutting speed, the height sensor should return to normal operation.

    If the height sensor operation is correct, no further action is needed. If the height sensor is not freezing in the corners and appears to be inoperative during the constant speed portions of the part, change the ***True*/*False*** setting of this parameter to invert the relay contacts.

88. **IO Configuration⇒PlasmaHeightDist (units = meters, typical = 0.010 meters)**
This distance parameter is used to disable the Plasma Height sensor a fixed distance before the end of cut. This is useful in preventing the plasma torch from diving at the end of the cut as the part or scrap drops away from the plate and where the leadout touches or crosses the lead-in path.

    This parameter also causes height sensor to be disabled at the specified distance before the M14 Plasma Height sensor disable auxiliary code if it is included in the part program (there is also a code for ESSI). This is useful for preventing the height sensor from diving at problem locations in a part program by including an M14 at that location. The height sensor will be disabled at the specified distance before the M14 is executed, and will remain disabled until either the end of cut, or until the M15 Height Sensor Enable code is found.

89. **IO Configuration⇒FeedRateThresh (units = percentage, typical = 95%)**
Set this parameter to 95% for most plasma cutting systems. This is percentage of the cut speed at which the Plasma Height Disable signal is deactivated, thus preventing the plasma torch from diving into the plate, i.e. at corners.

90. **IO Configuration⇒FeedRateThreshHyst (units = percentage, typical = 1%)**
For most plasma systems set to 1%. This is the percentage above the Feedrate Threshhold value, previously mentioned, when the Plasma Height Disable signal is re-activated, i.e. coming out of a corner.

WATERJET CUT PROCESS PARAMETERS

91. **Machine Parameters⇒ BleedOffDelay (units = seconds)**
This parameter is used for Oxy/Fuel and Waterjet processes.

    Set this parameter to cause a dwell to hold the machine in position at the end of the "Cut Off" sequence to give time for the water to bleed out of the hoses. If the machine starts moving while the water is still flowing, it is possible to nick the part being cut. Note that this timer adds any time specified for the MinOffDelay described above.

92. **Machine Parameters⇒ SWSenseTime (units = seconds, typical 0.016 seconds) This parameter is used for Oxy/Fuel and Waterjet processes.**

    This parameter determines the length of time that the Oxy/Fuel or Water switch input is stable before the controller recognizes the input change. Set this parameter to 0.016 to cause a 16-millisecond delay when recognizing an Oxy/Water Switch Sense input change.

93. **Machine Parameters⇒ Rapid Pierce Radius (units = meters)**
    This parameter determines the radius of the circular motion used during the Rapid Piercing.

94. **Machine Parameters⇒ Rapid Pierce Velocity (units = meters/second)**
    This parameter determines the speed of the Rapid Pierce circular motion.

95. **Machine Parameters⇒ Pressure Bleed Down (units = seconds)**
    This parameter determines the length of the delay to allow the pressure to "bleed" down to the low pressure. This time is executed at the start of the Cut Off sequence and is executed only if the Use Low Pressure is set ON in the Job setup parameters.

MARKER PROCESS PARAMETERS

96. **Parameters⇒ MarkerDelay (units = seconds)**
    Set this parameter to cause a delay to occur after a marker is turned on and before the motion begins along the marking path. This delay allows the marking head to lower into position before moving and also to set a fixed time for the marker to create a center punch mark on the plate.

97. **Machine Parameters⇒ MarkerVelocity (units = meters/second)**
    This parameter controls the speed of the machine during Marking operations. Setting this value to 0.00 causes the marker to run at the normal cutting feedrate as specified in the job setup screen, or by a programmed feedrate contained in the part program. Setting this parameter to any speed other than 0.00 causes all marking moves to run at that predetermined feedrate.

98. **Machine Parameters⇒ Punch Mark 1 Delay (units = seconds)**
    This parameter causes the Marker 1 output to activate for the prescribed period of time in response to encountering a "Punch Mark #1" M-Code (M61).

99. **Machine Parameters⇒ Punch Mark 2 Delay (units = seconds)**
    This parameter causes the Marker 2 output to activate for the prescribed period of time in response to encountering a "Punch Mark #2" M-Code (M62).

PROGRAMMABLE OFFSETS

All programmable and table home offset parameters are contained in the **Offset Configuration** data table. This table contains the 8 sets of programmable offset dimensions that are used for such things as tool change operations (Plasma torch to marking device) or other physical offset requirements. In addition there are 4 sets of Table Home offsets to establish fixed table home positions on multiple cutting tables, or park positions. All offsets have a range of +/-100 meters.

The programmable offsets are accessed via part programs that include offset auxiliary codes selected by a T word or ESSI extended function block.

TRAVEL LIMITS

The software limits limit the area where the machine can move on the cutting table, i.e. to avoid hitting a water table, or running into the end of travel in an axis.

The software travel limit is a distance in meters from the 0.000 home position for each axis. The control will not allow the machine to move beyond these limits. There are separate limits for each axis in both the positive and negative directions.

The software limits require that the Homing feature of the Burny be completed to set the 0.00 position for the X and Y-axes. Until a Homing operation is performed (either manual home, or automatic), the software limits are not operational. Once a Homing operation is completed, the software limits are active and prevent the machine from moving outside the specified work area.

Note that there is no specific ON/OFF control for the software limit functions. Once a home position is established, they become active. To disable the software limits, set the limit values very large (+/-100 meters) so that the machine never approaches the limit positions, and so they appear to be deactivated. They can also be set equal to disable the limits.

100. **AxisX ⇒AxisPlusLimit (units = meters)**
AxisY ⇒AxisPlusLimit (units = meters)

Specifies the Software limit position in the X and Y-axis for motion in the positive X and Y-axis respectively. Any motion in the positive direction will be evaluated against these software limit positions, and if the limit value is reached, the machine will decelerate to a stop and not go past the position.

101. **AxisX ⇒AxisMinusLimit (units = meters)**
AxisY ⇒AxisMinusLimit (units = meters)

Specifies the Software limit position in the X and Y-axis for motion in the negative X and Y-axis respectively. Any motion in the positive direction will be evaluated against these software limit positions, and if the limit value is reached, the machine will decelerate to a stop and not go past the position.

FINISHING THE MOTION PORTION SETUP PROCEDURE

After setting all of the parameters based on the procedures outlined above, the following steps should be performed to insure that the data is stored permanently so the control will retain the settings.

102. Touch ***Send*** to make sure all parameter changes has been sent to the motion controller. Retest the motion and cutting performance to make sure the machine is performing properly.

103. Touch ***Save to File***. The list of system initialization files is displayed with the file named **BurnyLoadParams.ini** highlighted. Touch ***OK*** to store the current setting of all the motion parameters to this file. This file is used by the Burny during power-up to set the motion parameters for the system.

104. At this point, it is recommended to create an additional parameter file that is unique to the customer or plant location or calendar date. This may help on future service visits to act as a record of the settings when the machine was installed or last serviced. For example, assume the company name is ACME. Touch the ***Save to File*** touchpad, and when the file list is displayed, touch the filename box at the top of the screen to bring up the QWERTY keypad. Enter the filename **ACME_990615.INI** (assuming the date is June 15, 1999) and touch ***OK*** on both the keypad and on the file list screen. This saves the same parameters that were just stored to the BurnyLoadParams.ini file into the ACME_990615.ini file. On future service calls, this file can be used with the ***Load from File*** touchpad to restore the motion control parameters to their settings on this date.

Several important parameter files unique to your controller are required for your machine to operate correctly. These files can be saved to one backup file using the “System Backup” utility. It is advisable to create this backup file and store it on your company network or at least two different computers at your facility. To save the System Backup file, complete the following steps:

A. Select “Utilities” from the main menu then “Enable Password”. If not previously changed, the password should be 777.
B. Return to the main menu and select the “Store” button.
C. On the next screen, select the “Floppy / USB” button.
D. Select the blue “Options” button.
E. Press the “File Type” button until “System Backup (Password Required)” is displayed.
F. Change “Connection Settings” to E:\ if storing to a USB device. If storing to a floppy disk, it should be A:\.
G. The File List will be empty but the name of the file to be saved will be displayed next to “Path” at the top of the screen. Select “OK” to save the file to the device.
H. The name of the file saved contains the controller unit number and the date it was saved. **Example:** The System Backup file from unit #1952 saved on January 3, 2002 would be **BURNY001952_20020103.zip**.

It is advisable to save a new copy of the System Backup after any parameter changes are made.

105. All ***Burny Phantom*** controls have been fitted with an emergency utility to restore the hard drive back to original settings. This method is effective only if the procedure described in the previous step has been completed in advance. Along with using the back up utility, you must create an emergency disk that can be used to boot the system in case of failure. Please follow document number AO-70185 for further details. This document can be obtained under the D:\burny\support\edisk directory.

11B.5 MOTION TEST

The ROSACE.ISO Part Program has been identified as a good test part to run for motion evaluation. In run, select the ROSACE.ISO part, enter a feedrate about 25% of the maximum feedrate, no kerf, no delays and test run the part. Observe the movement of the torch and the graph for smooth movement and path error. Re-run the same part at a maximum feedrate, observing the torch movement.

11B.6 HOMING PARAMETERS SET-UP PROCEDURE

OVERVIEW

The Burny uses incremental type encoders for its position feedback. These encoders output a series of pulses to indicate the distance and direction that an axis is moving. The Burny observes these pulses to determine the machine's position. When the AC power to the control is turned off (either intentionally or by a Power Failure), this position information is lost. When the AC power is re-applied, the control can remember what the last position was before the power failure, but any movement due to the machine coasting to a stop, or being pushed when the power was off cannot be determined.

Homing is a procedure that re-aligns the Burny's position to the actual position along the rail system of the machine. It doesn't matter if the machine coasts, or is pushed during a power failure. Once the power is re-applied and the homing operation is performed, the Burny knows the exact position of the machine on the rails.

The ability to "home" a machine is necessary to allow for recovery of parts being cut if a power failure occurs. There will always be some amount of lost motion during a power failure (drives coast to a stop, power track pulling on the machine, etc). However, after the power failure, a homing procedure would be performed which would allow the Burny to continue cutting the part in the exact same location on the plate as if the power failure never occurred.

There is 1 manual mode (type 0) and five automatic homing procedures (types 1-5). The manual homing procedure allows the operator to manually move/jog the machine to marks or other alignment positions on the machine and then declares the position as the "home" position. The automatic homing procedures utilize combinations of home switch and encoder index, or a hard stop to establish the home position for the machine.

Each automatic procedure latches a home position through a reproducible sequence of machine moves: closing a switch, opening a switch, detecting an index pulse, or running up against a hard stop. The procedures can be applied independently to the X Axis and the Y Axis. For example, the X Axis home procedure could be Type 1 (index search) and the Y Axis home procedure could be type 5 (hard stop), or any other combination. The procedures perform squaring on a master/slave axis if the **Homing ⇒XXHomeEnabled** parameter is ***True*** and the AxisXX is enabled.

The home position of an axis is established in three steps:

1. Establish the home location: close a switch, open a switch, detect an index, or a hard stop. Check if the X and XX axis for squareness.
2. Latch the present position.
3. Apply offset parameter to set the machine's 0,0 position. This allows the 0,0 position of the machine to be placed somewhere on the work surface instead of at the actual home switch, index or hard stop location.

HOME TYPES OVERVIEW

The following summarize each of the automatic homing procedures. These descriptions are given for the X-axis of the machine since this involves the possible homing of the slave XX axis also. For machines that do not home the XX axis, or for the Y-axis, any references to Axis XX can be ignored and those steps in the table are skipped.

Please note the parameters used in the home type summary and set them to your preference. The parameters include:

Homing⇒SwitchSearchSpeed. This parameter sets the speed when the axis is traveling towards to the home switch and away from the home switch. Typical value is 60 IPM.

Homing⇒IndexSearchSpeed. This parameter is sets the speed when the axis is searching for the home switch. Typical value is 10 IPM.

Homing⇒HomeAccel. This parameters is used as the stopping acceleration when searching for the home switch. It typically is about 50% greater than the MaxAcel parameters.

Homing⇒X-XXHomeDiff. This parameter is the distance between the X and XX axes index pulses (Home Type 1 and 3) or the X and XX home switches (Home Type 2 and 4).

Homing⇒XHomeOffset. This parameter sets the distance between the X-axis established home position and the desired 0.000 position.

Homing⇒YHomeOffset. This parameter sets the distance between the Y-axis established home position and the desired 0.000 position.

TYPE 0 —MANUAL HOMING

Home Type 0 establishes the home position at the current axis position.

Type	Operation	Description
0	No Automatic Home Search	Only Manual home operation allowed for the axis. No automatic functions will be performed

TYPE 1—BACK OFF HOME SWITCH --THEN FIND ENCODER INDEX

This Type 1 Homing process is used on a majority of the cutting machines equipped for homing. Because the motion of the homing process trips a switch and then backs off the switch, it allows a single switch to be used both as the home position switch and as the axis over-travel limit switch to the servo drive. Once the switch trips, there is no additional motion required in the direction of the switch.

The following diagram shows the relationship between the master X Home switch and the slave XX home switch. It is required that the XX Axis switch trips well ahead of the X axis home switch and the XX axis home switch must remain tripped until the entire X Axis home process is completed. The machine continues to move away from the X axis home switch location until the XX Axis home switch is cleared. The positioning of the XX Axis home switch away from the X Axis home switch allows the X Axis home switch to also act as the overall machine X Axis over-travel limit switch.

Type	Operation	Description
1	Automatic Search Allowed • **Switch Search** • **Back off** • **Index Search**	1. Search for the home switch at Switch Search speed. 2. Stop when switch detected and change to slower Index Search speed. 3. Back off home switch and detect when switch clears. 4. When switch clears, begin search for the axis encoder Index. 5. Once index detected, set home 0,0 based on offset parameter. 6. (X-Axis) If XX Home Enabled, continue backing away from X home switch till XX switch is cleared. 7. (X-Axis) When XX switch is cleared, continue backing away till XX encoder index detected. 8. (X-Axis) Once XX encoder index found, adjust XX axis position based on stored X to XX home location difference parameter. 9. Move back to the axis index location.

TYPE 2—BACK OFF HOME SWITCH – NO ENCODER INDEX USED

Homing Type 2 can be used on a majority of the cutting machines equipped for homing but is not as accurate as Homing Type 1. Homing Type 2 drives the axis onto the home switch, then off and establishes that position as the home position.

Because the motion of the homing process trips a switch and then backs off the switch, it allows a single switch to be used both as the home position switch and as the axis over-travel limit switch to the servo drive. Once the switch trips, there is no additional motion required in the direction of the switch.

Type	Operation	Description
2	Automatic Search Allowed • **Switch Search** • **Back off**	1. Search for the home switch at high Switch search speed. 2. Stop when switch detected and change to slower Index Search speed. 3. Back off home switch and detect when switch clears. 4. Set home 0,0 based on offset parameter. 5. (X-Axis) If XX Home Enabled, continue backing away from X home switch till XX switch is cleared. 6. (X-Axis) When XX switch is cleared, adjust XX axis position based on stored X to XX home location difference parameter.

TYPE 3 – MOVE FORWARD ONTO HOME SWITCH—THEN FIND ENCODER INDEX

This Type 3 Homing process is normally used for situations where the home search motion must continue onto the home switch instead of backing away from it as in the Type 1. Because the motion continues onto the switch, the machine over-travel switches cannot be used as the home switch.

The main use of this Type 3 home process is for automatic torch spacing systems. These machines push all the torches against a spring load to compress the torch stations against each other, and then continue onto a home switch. The homing motion continues in the same direction so that the torch stations do not move apart from each other.

Type	Operation	Description
3	Automatic Search Allowed • **Switch Search** • **Continue Forward** • **Index Search**	1. Search for the home switch at high Switch search speed 2. Stop when switch is detected and change to slower Index Search speed 3. Back off home switch and detect when switch clears 4. Reverse direction and move back onto home switch. 5. When switch is detected again, begin search for X encoder Index 6. Once index detected, set home 0,0 based on offset parameter. 7. (X-Axis) If XX Home Enabled, reverse direction and back away from X home switch till XX switch is cleared. 8. (X-Axis) When XX switch is cleared, continue backing away till XX encoder index detected. 9. (X-Axis) Once XX encoder index found, adjust XX axis position based on stored X to XX home location difference parameter.

TYPE 4 – MOVE FORWARD ONTO HOME SWITCH—NO ENCODER INDEX USED

The Type 4 homing procedure is the same as the Type 3 except it does not look for encoder index signals—the trip point of the home switches themselves are used to set the home position.

Type	Operation	Description
4	Automatic Search Allowed • **Switch Search** This type used for automatic torch spacing or other requirements where the motion to the home switch cannot reverse due to some mechanical issue	1. Search for the home switch at high Switch search speed 2. Stop when switch detected and change to slower Index Search speed 3. Back off home switch and detect when switch clears 4. Reverse direction and move back onto home switch. 5. When switch is detected again, set home 0,0 based on offset parameter. 6. (X-Axis) If XX Home Enabled, reverse direction and back away from X home switch till XX switch is cleared. 7. (X-Axis) When XX switch is cleared, adjust XX axis position based on stored X to XX home location

TYPE 5 – RUN UP AGAINST A HARD STOP

The Type 5 homing procedure uses a mechanical stop to set the home position of the machine. This procedure causes the machine to move up against a hard stop, waits for the axis to stop moving, and sets the home position based on the stopped location of the machine. It still has the provision for using a home limit switch input, however, the switch only serves to change from a high speed motion to a lower speed as the machine approaches the hard stop. Frequently this method with the switch is used to lower the homing speed of the machine, and at the same time, to lower the torque capability of the servo drive so that when the machine actually hits the hard stop, no damage occurs from excess torque.

Type	Operation	Description
5	Automatic Search Allowed • **Move to Hard stop** • **Switch determines speed of search**	1. Begin moving toward hard stop location. 2. Machine will move at higher Switch Search Speed if the X home switch is OFF (X-Axis). 3. If home switch is detected as ON, reduce machine speed to the slower Index Search Speed 4. Continue moving till machine runs up against a hard stop, or a drive over travel switch. (X-Axis) The XX axis will continue to move independently if enabled. 5. (X-Axis) When both X and XX have reached the hard stop and motion has ceased, the home location will be set based on the X Home Offset parameter.

HOMING PARAMETERS SETUP

The following steps guide the user through the process of setting the homing parameters.

Any values not listed in the following steps are assumed to be preset as shown in the OPEN LOOP table parameters listed in this document. The OPEN LOOP parameters are loaded at the start of the procedure. Unless instructed to change a specific parameter, it should remain as the original OPEN LOOP setting.

Although it is not listed, after every parameter change, touch the ***Send*** touchpad for the new value to sent to the motion controller and become active. It is recommended that the parameter settings be SAVED TO FILE periodically throughout the procedure so incremental improvements are not lost in case of a power failure. The final setting of the parameter should obviously be saved.

1. **Homing⇒PowerUpSearch**

   The recommended setting for the parameter is ***True***. This requires the operator to perform a Homing operation on the machine before a part program can be run. This insures that the control establishes a home position, and the machine is square before a part program can be cut. Defining the home position before a part program is cut insures that the control can return to the exact same location after a power failure. Set these parameters appropriately.

2. **Homing⇒SwitchSearchSpeed**

   Enter the speed to be used when searching for the home switch. Realize that if the machine is at the other end of the rails, it has to travel all the way to the opposite end to find the home switch. Therefore, this parameter is normally set as fast as possible (up to, but not higher than the ***Axis Trajectory⇒MaxVel*** maximum machine speed). However, some types of Home Switches may not tolerate the amount of distance required to decelerate the machine after the switch trips. If this is the case, it may be necessary to use a lower switch search speed so that the deceleration distance after hitting the switch is reduced. Set these parameters appropriately.

3. **Homing⇒IndexSearchSpeed**

   Enter the speed used by the control for accurate detection of the home switch trips (either ON or OFF) and for detecting the position of the encoder index signal. Recommended values are 5 to 10 Inches per minute (parameter setting .002 to .004 meters/sec). Set these parameters appropriately.

4. **Homing⇒HomeAccel**

   Set this value to the desired axis acceleration during homing operations. Set the Homing Acceleration parameter to 0.00 to use ***Axis Trajectory⇒MaxAccel*** machine acceleration limit for its motion. Most people prefer to make the homing motion smoother by setting this parameter is .30 to .50 m/s/s. Set these parameters appropriately.

5. **Homing⇒X/XXSearchPos**
   Homing⇒YsearchPos

   These two parameters determine the direction the machine moves to reach the home switch/index or hard stop location. A setting of ***True*** will cause the specified axis to move in the Positive +X or +Y direction to reach the home switch while a setting of ***False*** will cause the machine to search in the –X or –Y direction. Set these parameters appropriately.

6. **Homing⇒XswitchInvert**
   Homing⇒YswitchInvert
   Homing⇒XXSwitchInvert

   The ***True***/***False*** setting for these parameters allows either Normally CLOSED (Set ***True***) or Normally OPEN (Set ***False***) switches to be used as the home switch inputs for the control.

   If a particular axis will be using the Type 0 (Manual) or Type 5 process (hard stop), this parameter does not have to be set.

   To determine whether the switches are Normally Closed or Normally Open, position the machine in the center of the cutting area, away from any home switches. Touch the ***MENU*** touchpad, then ***Utils*** and finally SET HOMES to enter the homing operator screen. The states of the 3 axis home switches are shown as light bulbs across the bottom. If a bulb is lighted (white), it indicates the home switch is a Normally Closed type. Set the **SwitchInvert** parameter to ***True***. Similarly, if a bulb appears dark (black), the switch is a Normally Open type and the **SwitchInvert** parameter for that axis should be set to ***False***.

Now Jog the machine onto each of the home switches and observe that the light bulbs toggle states (light to dark or dark to light) as the machine is moved on and off the home switch. If the light bulb does not change states when the switch is activated, there may be a hardware problem with the switch or wiring. Set these parameters appropriately.

7. **Homing⇒X/XXHomeType**
   Homing⇒YHomeType

   Set these parameters to a value from 0 to 5 to select the type of Homing process to be performed for the particular axis. Refer to the Homing Types descriptions at the beginning of this section for details.

8. **Homing⇒XTicksPerIndex**
   Homing⇒YTicksPerIndex

   These parameters are only used for Type 1 or Type 3 Homing processes that use the encoder index pulses.

   Set these parameters to the number of encoder Ticks that occur in 1 revolution of the encoder disk. There is normally 1 index pulse for each revolution of the encoder disk. Encoders are normally rated in "lines" where each "line" on the encoder actually causes 4 counts or "ticks" to be registered by the Burny. As an example, if the encoder is a "250 line" type, there are 1000 ticks for each revolution of the encoder. Enter this value for each axis.

   To observe the operation of the index signal, use the Dictionary Viewer, and select (For Axis X), **IOCMC||WorldOut||w_Latch0,** Y Axis is **w_Latch1** and XX Axis is **w_Latch2**. Jog the machine and note the value. The value updates with the encoder tick count each time the index signal is detected. Sort of like taking a snapshot of the encoder position and the index signal triggers the snapshot.

   In this example, the encoder is a 250 Line encoder. The ***Homing⇒XTicksPerIndex*** parameter should be set to 1000. The **IOCMC||WorldOut||w_Latch0** value counts in increments of 1000. It might appear as: 102568 --- 103568 --- 104568 …etc. The 1000's digit increments each time the index is detected as the axis is jogged. The xxx568 doesn't mean anything special but the number should remain constant. This verifies both the index signal and the TicksPerIndex parameter setting.

   If the previous test shows that the index signal is not being received by the Burny, check the wiring and cables to the encoder at both ends of the cable.

9. **Homing⇒XXHomeEnable**

   Set this parameter to ***True*** for a 3-axis machine (with an XX axis motor). Set this parameter to ***False*** for a 2-axis machine (no XX axis motor), or if you do not want to home the XX axis motor on a 3-axis machine.

10. **Homing⇒XMinIndexTicks**
    Homing⇒XXMinIndexTicks
    Homing⇒YMinIndexTicks

    These parameters define the distance that the controller starts looking for the encoder index pulse after the home switch is OFF. These parameters are used only in home types 1 and 3.

HOME CHECKING

At this point, the homing process can be checked. Touch the ***MENU*** touchpad, then ***Utils*** and finally ***Set Homes***. The dialog box in the upper left part of the screen should say AUTOMATIC HOMING. If not, touch the touchpad on the top right of the screen to change the selection to "Automatic Homing Enabled".

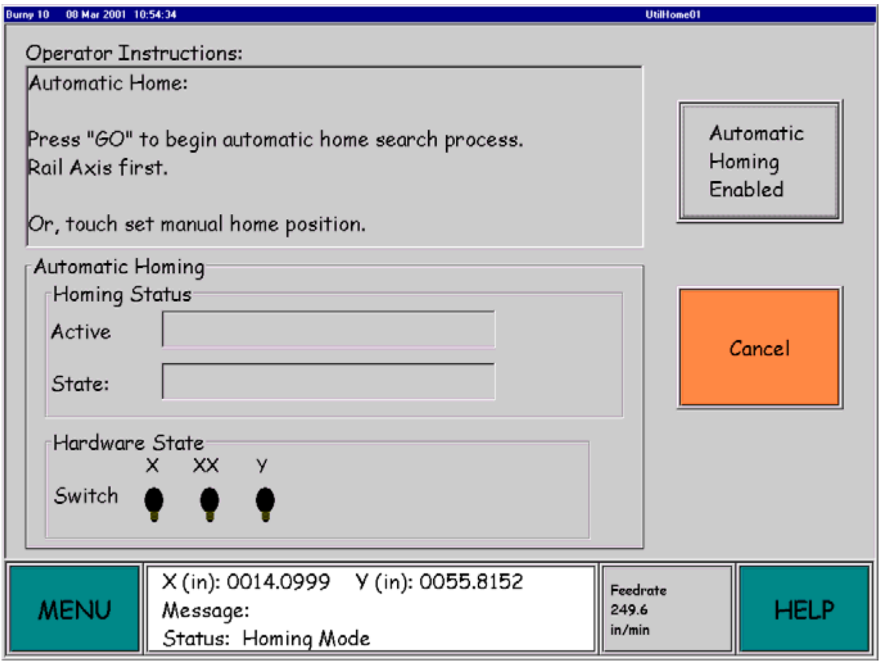


Figure 11.6 – Homing Screen (*UtilHome01*)

Press the GO button and the X axis homing process starts. Upon successful completion of the X axis homing process, the Y-axis homing process is started. At the completion of the Y-axis homing, a ***Done*** touchpad is displayed. When pressed, the controller exits the homing mode and the homing process is complete.

The screen displays operator instructions, the axis that is being homed, the state/status of the homing step and the home switch light bulbs. During the homing process, the “Active” box displays the axis being homed. The “State” box displays the homing step. Should an error occur during the homing process, the “State” box will display the error message.

MANUAL HOMING (TYPE 0) TIPS

This home type can be set to 0 to use manual homing when the <Go> button is pressed. This is useful when establishing the homing parameters for the opposite axis.

Realize that homing does activate the Software Travel Limits.

HOME SWITCH INVERTED TIPS

If the Home Switch Inverted setting is set incorrectly, the first motion is in the wrong direction. This is caused by the controller trying to drive to get off of the home switches.

The XX axis Home Switch is not evaluated until after the X-axis sequence is completed. If the XX-axis Home Switch Invert setting is incorrect, the homing process stops immediately.

HOME TYPE 1 AND 3 TIPS

INCORRECT TICKS PER INDEX SETTING

If the Ticks per Index setting is incorrect, the controller may not encounter the index pulse at the correct time or in the correct number of actual encoder revolutions. Verify that the Ticks Per Index parameter for the problem axis is correctly set. It should be 4 times the number of encoder lines. For example, a 250 line encoder=1000 TicksPerIndex).

Also, verify that the program version for the PROM on the PCI I/O card is labeled as version 1.9 or later. Earlier versions of this PROM had a different encoder index latching system that requires a particular type of encoder to function and does not work with all encoders.

Warning—Index too close to switch – 3% -- If a warning such as this appears on the homing screen when the home process is done, it indicates that the index pulse was detected very close to the location for the home switch. The 3% shows that index is within 3% of the total distance for 1 index cycle. The problem is that the home switches will vary somewhat in their trip points, particularly with temperature. If the index signal occurs very close to the switch, it is possible for the switch to warms up, the trip point may move and miss the index totally. This may cause the home operation to find the next index occurrence and this moves the home position by the distance covered in 1 revolution of the encoder.

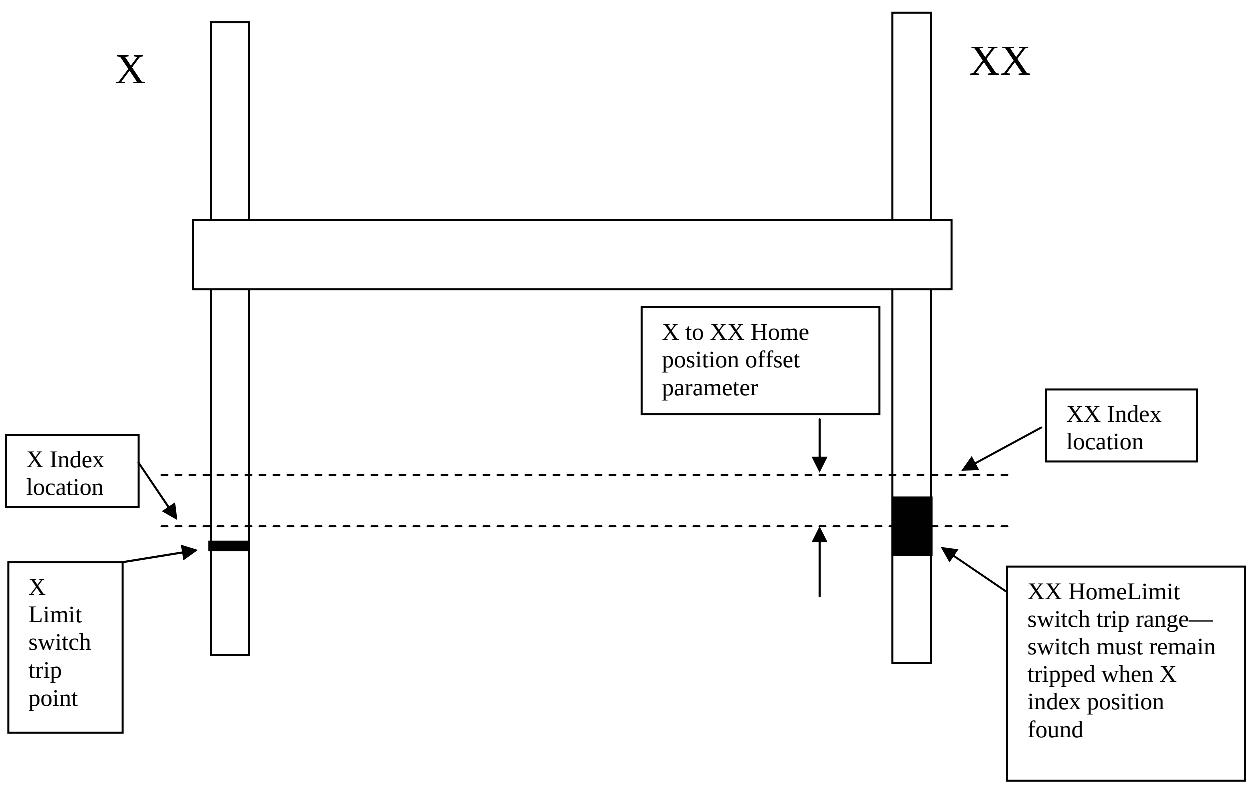
To eliminate this error on rack and pinion drives, disengage the pinion from the rack and move it 1 tooth left or right and re-engage. This will alter the position of the index signal when the home is found and hopefully move it to a more reliable sensing point.

The second way to eliminate this error is to enter a value into the ***Homing⇒XMinIndexTicks*** parameter. This value should be set to about 5% of the total TicksPerIndex value – in this example, it would be set to 50. This will cause any index signal found within the first 50 encoder ticks to be ignored so the home search would always go to the next valid index and avoid the problem with being too close to the limit switch.

AXIS XX HOMING TIPS

Before homing the X/XX axes, the X/XX axes must be square on the rails. This can be checked by cutting a large rectangle and then measuring the diagonals from corner to corner. If the machine is square, the measurements should be the same.

To allow automatic squaring by the Burny, the home switches on the machine must be located as shown in the following drawing. The Axis XX home switch is located at a distance at least two encoder revolutions away from the Axis X home switch. This allows for a possible out-of-square condition of the machine at power up.



The trip mechanism for the Axis XX home switch must be constructed so that the Axis XX switch remains tripped during the motion to and from the Axis X switch location. The picture shows the location of the home switch trip points, and the encoder index locations to be found after the switches on each side. If the type 2 or 4 homing is done, the encoder index data can be ignored since the home location is based on the switch trip points themselves.

Set the following parameters to measure the Difference between the X and XX home switch/index locations.

- Homing⇒ XXHomeEnable = True
- Homing⇒ X-XXSkewLimit = 0
- Homing⇒ X-XXHomeDiff =0

Setting the Skew limit to 0 causes the software to measure the difference between the two home positions and display it as an error. Later the Skew limit will be set to a normal working value.

Start the Automatic Homing process by pressing the <Go> button. The homing process should complete and display an error message of:

SKEW LIMIT EXCEEDED – SKEW= 0.0386

Enter the value displayed on the homing screen (SKEW=0.0386 in this example) into the parameter ***Homing⇒ X-XXHomeDiff.*** Pay attention to the + or – sign of the value. The correct sign must be entered along with the magnitude.

Enter a value for the ***Homing⇒X-XXSkewLimit*** to set the amount of correction that can occur while squaring the machine. A typical value might be 0.010 meters which would allow the control to move the Axis XX up to + or – 0.010 meters in order to square the machine. This value should be set as large as possible without endangering the machine mechanics. This will allow the most mis-alignment between the X and XX axis.

Send the new values to the controller. Retest the homing process. The entire sequence should finish successfully with no errors displayed.

11B.7 C AXIS SETUP AND CALIBRATION

OVERVIEW

The C axis is an optional feature of the Burny that uses the 4th axis of motion control (DAC output and Encoder input) for controlling a rotary head for bevel cutting applications. The C axis software assumes the rotary head is designed for continuous rotation in either direction and has no provisions for monitoring hose windup or other limiting conditions.

The C axis is driven to maintain the rotary head tangent to the cutting direction. As the X and Y-axes are commanded to move, their SIN/COS travel directions are used to create a 0-360 degree position for the C axis. This position is compared to the current C axis position, and an error is output based on a proportional gain parameter to move the C axis into the correct angular position.

The C axis output has many of the same setup parameters as the X and Y, however since it uses position error as it’s only command input, there is only a single proportional gain term.

The C axis requires the same type of incremental quadrature encoder as is used for the X and Y-axis position feedback. This encoder can either be mounted directly to the rotary axis so that 1 revolution of the C axis equals 1 revolution of the encoder, or the encoder can be motor mounted, with many encoder revolutions resulting in 1 revolution of the rotary head.

Since the encoder used is an incremental type, the control does not know the position of the C axis at power-up. Therefore, some type of homing procedure must be used to align the C axis to the machine. The current software supports either a search for a home switch, and then an encoder index (Type 1) or just an encoder index with no switch (Type 6). Read the section of this document on the X/Y homing processes for background information.

ENABLING THE C AXIS OPTION

The C axis output from the Burny is an optional feature that requires a separate software lockout code to enable it’s functioning. This code is entered by touching ***Utils***, ***System Setup***, ***Miscellaneous Setup***, ***License*** touchpads and entering the license code into the box labeled ***Options License***. When the control is re-booted, it will read this option license and enable the appropriate features in the control.

Once the Option License is entered, and the control re-booted, there is a second level of option ON/OFF selection allowed, so that individual options can be turned on and off without affecting the license key. To access this screen, go to ***Utils***, ***System Setup***, ***Miscellaneous Setup*** and finally ***OCX Options***. This leads to a screen with 8 option selection touchpads shown. The C axis will appear as a touchpad under ***Rotary C***. Touching this touchpad will toggle between the selection of ***CMC Rotary C*** and ***NONE***. If the axis is enabled, all normal C axis functions will occur. If the C axis is disabled, all prompts and displays for the C axis will be removed so the operator will not have to deal with them.

C AXIS SETUP AND CALIBRATION

1. Push the ***Stop*** button on the front of the control to insure that the C axis is disabled while the parameters are initially being set.

2. Verify that the C axis encoder is connected to the **RECP42- AUX ENCODER #2** input on the back of the Burny.

3. The following parameters should have been set when the OPEN LOOP parameter file was loaded at the start of this entire tuning procedure. Verify that the following parameters are set as shown:

AxisC ⇒ DefaultPGain	**= 0**	**(Proportional gain set to 0 for startup)**
AxisC ⇒ ZeroVoltOff	**= 0**	**(DAC offset voltage set to 0)**
AxisC⇒ InPositionTol	**= 160**	**(Axis In Position Tolerance)**
AxisC⇒ Stop Following Error	**= 160**	

4. Set the maximum voltage desired from the C axis D/A output into **AxisC⇒AxisMaxVoltage.** Normally this is set to 10 volts to get the largest signal being sent to the servo drive and so increase the signal to noise ratio of the system. Some servo drives cannot tolerate a 10 volt input, therefore this parameter is provided to allow the max output to be set lower.

5. Enter the number of encoder ticks that will occur for exactly one 360 degree rotation of the C axis into the parameter **AxisC⇒CTicksPerRev.** Remember that a 500 line encoder will give 2000 ticks (or counts) per revolution since all 4 edges of the A and B channel are used.

   The encoder for the C axis can either be mounted directly to the axis of rotation, so that 1 revolution of the C axis results in exactly 1 revolution of the encoder. In this case, multiply the number of lines in the encoder by 4 to give the number of TicksPerRev for the C axis.

   The C axis encoder can also be mounted to the drive motor for the C axis, with the actual motion of the C axis head being driven through a gearbox or other mechanical linkage. In this case, multiply the number of lines of the encoder by 4, and then multiply by the gear ratio between the motor and the final C axis rotary head output.

   For example, a 200-line encoder mounted to the back of the motor, and driving the C axis through a 10:1 gearbox would result in:

   (200 x 4) x (10/1) = 8000 ticks per revolution

6. Release the STOP button on the Burny and turn on the machine drive systems including the C axis.

Since all the parameters for the C axis have not been set, it is possible for the C axis to rotate as soon as the STOP button is released. Make sure the area around the C axis is clear of personnel or obstructions when the STOP button is released.

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7. The C axis should not move at this time because the output from the Burny is 0 volts since the PGAIN value is currently set to 0.00. If the C axis servo drive is drifting, adjust the Drift or Balance pot on the C axis servo to cancel the drift motion.

8. Since the C axis is as not been homed at this point, the mechanical alignment of the rotary head will not be correct at this time. Later steps will align the rotary head to the machine axes.

9. Enter a value of 0.1 for the **AxisC⇒DefaultPGain** parameter. This may cause the C axis to move as the proportional gain corrects the position of the axis based on the current parameters, and the encoder position. If at this time the C axis motor starts to run away at increasing velocity, press the STOP button and change the setting of the **AxisC⇒InvertEncoder** parameter.

10. Enter a value of 0.02 for the same **AxisC⇒DefaultPGain** parameter, and observe the C axis motor for oscillation. If the motor is stable, continue to increase the value for the Proportional P Gain in small steps until the C axis motor begins to oscillate. Then reduce the setting for the P Gain till the motor again becomes stable. Setting the P Gain as high as possible, without oscillation gives the best performance for the C axis.

11. Press the GOTO button on the Burny, and select the **C Axis=0** entry from the menu. The default for this GOTO function is for the C axis to go to the 0 degree position. Press the green GO button to accept this selection. The C axis will move to the 0 degree position. It may already be there, in which case, no actual motion occurs.

12. Touch the ***Status Bar*** on the bottom of the screen, and select the main status screen where the X/Y positions are shown at the top. When the C axis is enabled, a box will appear below the X position display that shows:

    C Axis Degrees = XXX.XX

13. Since a GOTO was just done to a setting of 0.00 degrees, this status display should show the C axis currently at an angle of 0.00 degrees (may flicker to 360 occasionally).
14. Press the GOTO button again, and again select the C Axis entry from the list. This time, touch the large [+] touchpad that appeared below the prompting list so that the entry in the list now shows: **C Axis = 45.** Touch it again to get to the display of: **C Axis = 90.**
15. Observe the current position of the rotary head. Press the <Go> button and observe the motion of the rotary head. The head should rotate Counter Clockwise when viewed from above and it should have rotated exactly 90 degrees. The position can be confirmed by looking at the STATUS display. It should display "**C Axis Degrees = 90.00.**

    If this correct 90 degree Counter Clockwise motion was observed, go on to the next step.

    If the STATUS display shows 90 degrees, but the actual motion of the rotary head was more or less than 90 degrees, it indicates a problem with the Encoder Ticks Per Revolution value. Re-check this entry and change it if necessary. When the new value is sent, the C axis will immediately move to the new position.

    If the rotary head moved Clockwise instead of Counter-Clockwise, two parameters must be reversed. Reverse the ***True***/***False*** setting for the **AxisC⇒InvertPwrAmp** parameter and reverse the ***True***/***False*** setting for the **AxisC⇒InvertEncoder** parameter. This value may have been changed earlier, however it must be reversed at this step to maintain control once the power amp is reversed.

    As soon as these parameters are SENT, the axis will move to the new position and should now be at the correct 90 degree Counter-Clockwise location relative to the 0 degree position.

16. Try several angle positions using the GOTO function for the C-Axis and verify that they work correctly. Based on the current 0 degree position of the rotary head, this table shows the positions of the rotary torch that will occur for the various angles listed. Remember that C axis has not been homed at this point so it may not be aligned to the cutting machine axes yet. Verify that it can rotate to the correct angle positions as shown (clock references when viewed from overhead).

0 degrees --	12:00	180 degrees --	6:00
45degrees --	10:30	225 degrees --	4:30
90degrees --	9:00	270 degrees --	3:00
135 degrees --	7:30	315 degrees --	1:30

C AXIS HOMING SETUP

Since the C axis uses incremental encoders, when AC power is removed from the control, all knowledge of the C axis rotary angle is lost. When power is re-applied, a Home Search function must be performed to align the rotary head with the X/Y axes of the machine. The parameters that affect the C axis homing are contained in the **Homing** parameter table along with the X/Y homing values.

17. Set the **Homing⇒CHomeType** parameter to the desired type of home search function. There are only 3 choices:

    CHomeType = 0 A value of 0 for this parameter disables any automatic home search by the Burny control for the C Axis. When power is applied to the control, and after the Burny application has started, the position of the C axis is sampled. That position is established as the 0.00 degree location for the C axis. This value is not normally used for C axis systems unless the C axis servo system performs the homing operation by itself, and can disable the encoder input to the Burny during it's home search.

    CHomeType = 1 The TYPE 1 home for the C Axis functions similar to the same as the TYPE 1 home for the X/Y axes. Refer to the Home Type 1 section of this manual.

    Type 1 performs a dual mode search. It first moves to look for a home switch input, and then reverses off the switch, and searches for the encoder index signal. For the C Axis, this type of home is used for systems where the encoder is mounted to the motor, and there are multiple encoder revolutions for 1 revolution of the rotary head. A home switch must be provided to allow the Burny to know which one of the multiple encoder index signals is the proper home index. In operation, the head will rotate to first find the switch, then reverse off the switch and search for the first encoder index.

CHomeType = 6 The TYPE 6 home selection for the C axis is normally used for systems where the C axis encoder is coupled directly to the axis of rotation for the rotary head. In this configuration, there is 1 revolution of the rotary head equals exactly 1 revolution of the encoder and there is only 1 encoder index signal per revolution. The Type 6 home will cause the head to rotate in the selected direction to find the first encoder index, and set the home 0.00 degree location based on this index.

18. Set the parameter **Homing⇒CSearchPos** to ***True*** to cause the C axis to rotate in a CCW (counter-clockwise) direction to search for the home position, or ***False*** to rotate CW (clockwise) to search for home. This provides a consistent direction for approaching the switch.

19. If a TYPE=1 home is specified, this parameter allows for either a Normally Open or Normally Closed switch to be used. Set **Homing⇒CSwitchInvert** to ***False*** for a Normally OPEN switch. Set the parameter to ***True*** if a Normally Closed switch is used.

20. Initially set the **Homing⇒CHomeOffset** to 0.00 degrees. This parameter adjusts the rotary head home position to align to the machine X/Y axes.

21. Set the **Homing⇒CTicksPerIndex** parameter to the number of encoder ticks that occur for 1 revolution of the encoder. It doesn't matter whether the encoder is coupled directly or through a gearbox. If it is a 200 line encoder, there are 800 ticks per revolution of the encoder, and this parameter should be set to 800. This value is used during the homing operation to detect when the encoder index cannot be found. If the index is not found in two times the "ticks per index" value, the motion will stop and an error message will be displayed.

22. Set the **Homing⇒CMinIndexTicks** to 0000000. This value can be used later if the location for the index pulse is found to be very close to the home switch. If the home switch accuracy could cause the index pulse to be missed, this parameter can be set to skip a certain number of encoder ticks before looking for the index so it will find the next valid index.

23. Set the **Homing⇒CSwitchSearchSpeed** to the desired speed in Degrees/Second to look for the C axis Home switch—this only applies to Home Type =1 where a home switch and index are used. Typical values are 30-90 degrees per second.

24. Set the **Homing⇒CIndexSearchSpeed** to the desired speed in Degrees/Second to be used when searching for the home encoder index signal for either home Type=1 or Type=6 selections. Typical values are 20-50 degrees per second.

25. Set the **Homing⇒CHomeAcceleration** parameter to a starting value of 10000. This acceleration value affects how fast the C axis starts and stops during home search operations. Larger values will cause the C axis to accelerate and decelerate more quickly when searching for the home switch and index while smaller values cause a slower accel/decel characteristic. This parameter is most important for Home Type=1 systems. The rotary axis must move toward the home switch and stop once the switch is detected. If the acceleration value is too low, the axis will coast past the switch and give an error during the homing process. Start with the initial value of 10000 and see how it works during the homing tests.

26. Set the **Homing⇒CHomeRepeatFlag** to ***True***. This parameter provides a way to force the C axis to repeat it's home search process to allow testing and adjustment of the homing parameters. Normally, the C axis will perform its home search process only 1 time on the first part after power is applied to the control. After that, it uses the stored encoder positions to return the C Axis to its home position. However, if this parameter is set to ***True***, and the ***Send*** touchpad is touched, it resets the flag for the C axis home and forces the axis to repeat it's home search.

    Note that this parameter also shows the actual state of the internal C axis home flag. If the ***Receive*** touchpad is touched, this parameter may be changed to ***False*** indicating that the C axis has already completed a home process. So it is important when adjusting the C axis home parameters to make sure this parameter is set to ***True*** before the ***Send*** touchpad is touched to cause the proper repeat of the C axis home search.

    During normal cutting, this parameter has no affect—it can be left either ***True*** or ***False***.

TESTING AND ADJUSTING THE C AXIS HOME

The remaining part of this section give the steps needed to test and adjust the C axis homing function if either the TYPE=1 or TYPE=6 home is selected for the C axis. If TYPE=0 is selected, there is no further setup needed—since the Burny does not perform any homing for the C axis.

The following steps will test the various parts of the C axis home process. There is no special screen or button to cause the C axis home process to occur. It will happen automatically when the first part is run after the power is applied to the unit. So the first step in testing the C axis homing is to create a standard shape rectangle that runs in the +X direction as it's first move—for about 2 or 3 feet to give time to test and adjust the homing parameters. When the machine is cutting in the +X direction, it corresponds to a C axis angle output of 0.00 degrees—therefore this is used to adjust the home 0.00 degree position.

The following table shows the relationship between machine X/Y cutting direction and the C axis angles:

0 degrees --	12:00	-- Machine cutting in +X direction
45degrees --	10:30	-- Machine cutting at 45 degree direction in +X and +Y
90degrees --	9:00	-- Machine cutting in +Y direction
135 degrees --	7:30	-- Machine cutting at 45 degree direction in –X and +Y
180 degrees --	6:00	-- Machine cutting in –X direction
225 degrees --	4:30	-- Machine cutting at 45 degree direction in –X and –Y
270 degrees --	3:00	-- Machine cutting in –Y direction.
315 degrees --	1:30	-- Machine cutting at 45 degree direction in +X and –Y

Using the built in SHAPES function on the control, create a square with the following dimensions. Save it as program 01RECT.CNC

PLATE CORNER START . . .	= **NO**
START CORNER	= **BOTTOM LEFT**
CUT DIRECTION	= **CW**
X DIM.	= **24 inches (6000 mm)**
Y DIM	= **24 inches (6000 mm)**
LEADIN	= **0**
LEADOUT	= **0**
SCRAP	= **0**
KERF.	= **0**
REPEAT	= **Automatic**

Touch the ***MENU*** touchpad then the ***RUN*** touchpad as if you were going to actually cut a part. Select the 01RECT.CNC part you just created and touch ***OK***. On the job setup screen, select the following:

PROCESS	= **Plasma or Oxy as desired**
PLATE	= **NO PLATE**
OPTIONS	= **None—touchpad should be gray**
FEEDRATE	= **20** inches per minute (500 mm/min)
TEST MODE	= **Continuous**
NUMBER OF PARTS	= **1**
KERF	= **0**

Touch ***OK*** to accept these selections and go on to the next screen, and position the cutting machine where the 24x24 inch rectangle can be run for testing. Remember, it starts in the lower left corner. But DO NOT press ***GO*** yet.

Touch the ***MENU*** touchpad and return to the homing parameter table in the setup screens. Verify that the **Homing⇒CHomeRepeatFlag** is set to ***True*** and touch ***Send***. This sets the flag to the controller so that the C axis home search will be done.

Set the speed dial to about 10%, so the machine will move very slowly (10% of 20 inches per minute).

Press GO and observe the C axis – see the appropriate section below for the TYPE=1 or TYPE=6 home for the remaining steps in the setup. To make a change to one of the C axis Homing Parameters, first press the STOP button, and then go to the Utilities screen and make the change to the desired parameter. Before touching ***Send***, verify that the **Homing⇒CHomeRepeatFlag** is set to ***True***, and then touch ***Send***. This will use the new homing parameter, and also require that the home search procedure be repeated. Press GO to re-do the C axis Home search with the new parameter and observe the results.

TYPE 6 C AXIS HOME TESTING

The Type=6 home looks for the first encoder index to set the home position. Since the rectangle being cut starts with a +X cutting motion, the goal is to have the torch aligned to the proper angular position after the homing process to perform this +X cut—this sets the 0.00 degree angle for the C axis. The following table lists some possible results and corrective measures. Again, to make a change to a homing parameter and observe the affect, the STOP button must be pressed, the parameter changed, the CHomeRepeatFlag must be ***True***, and the new data sent with the ***Send*** touchpad. Then press GO to cause the C axis home search to be repeated and observe the results.

Observation (when GO pressed)	Possible cause	Remedy
C axis begins moving (but doesn't go all the way around) and then displays: "ERROR- C HOME INDEX NOT FOUND"	Parameter **Homing⇒CTicksPerIndex** has wrong value	The software will travel for 2x (twice) the number of encoder ticks specified for the **Homing⇒CTicksPerIndex** value. If there are actually 10000 ticks in one revolution of the C axis rotary head, then his parameter must be set to 10000. If it was accidentally set to 2500, the C axis would only move for a total of 5000 ticks (2x2500) and then issue the error message that the home index cannot be found. Enter the proper value for this parameter and re-test
C axis begins moving and rotates two complete rotations, and then displays: "ERROR- C HOME INDEX NOT FOUND"	Index signal from Encoder not functioning-- Burny never received the index signal	Check the wiring from the encoder to the Burny for the index signals (usually marked as Z and /Z on the encoder wiring). These go to pins 2 and 6 of the encoder plug on the back of the Burny.
C axis rotates and finds the index pulse—motion along the cutting path begins, but the torch is not pointed in the correct direction for a +X cutting move	Index signal from encoder doesn't align to the +X direction of the machine	Use the **Homing⇒CHomeOffset** parameter to input an angular offset for the home position relative to where the index pulse was found. If it appears that the torch is pointing at 45 degrees when it should be at 0 degrees for the +X move, enter a value of 45 into the **Homing⇒ChomeOffset** parameter and re-test. Continue adjusting this value and re-testing till the torch aligns exactly to the desired angle for a +X machine cutting motion.
C axis rotates to find the index, then aligns to the proper direction for a +X cut, and the cutting motion starts	None	This is how it's supposed to work.

TYPE 1 C AXIS HOME TESTING

The Type=1 home process first looks for a home switch input, then reverses off the switch and looks for the first encoder index to set the home position. Since the rectangle being cut starts with a +X cutting motion, the goal is to have the torch aligned to the proper angular position after the homing process to perform this +X cut—this sets the 0.00 degree angle for the C axis. The following table lists some possible results and corrective measures. Again, to make a change to a homing parameter and observe the affect, the STOP button must be pressed, the parameter changed, the **Homing⇒CHomeRepeatFlag** must be ***True***, and the new data sent with the ***Send*** touchpad. Then press GO to cause the C axis home search to be repeated and observe the results.4

Observation (when GO pressed)	Possible cause	Remedy
C axis begins rotating in the opposite direction as what was specified for the **Homing⇒CSearchPos** parameter	The software will back-up away from a home switch if the switch is detected as being "ON" when the process starts. So if the switch is detected as always being ON, the software will continue to back away from it, until it goes off.	Touch the ***Status Bar*** and then the ***Cut Logic I/O*** touchpad. Observe the light bulb labeled for the C Home Limit input. For a Normally Open switch, the light should be off (black) when the switch is not tripped, and should go on (white) when the home switch is activated. Normally Closed switches will appear the opposite with the light being off with the switch is tripped, and will turn on when the home switch is not activated. Test the action of the switch manually to confirm it is functioning—if not, check the wiring to the switch and Burny. Finally, check

		the setting for the **Homing⇒CSwitchInvert** parameter—it should be set to ***False*** for Normally OPEN switches that close when activated, and set to ***True*** for Normally CLOSED switches that open when activated. Correct the problem and re-test
C axis begins rotating the proper direction, but doesn't make a complete rotation and displays: ERROR- C HOME SWITCH NOT FOUND.	Parameter **Homing⇒CTicksPerIndex** has wrong value	The software will travel for 2x (twice) the number of encoder ticks specified for the **Homing⇒CTicksPerIndex** value. If there are actually 10000 ticks in one revolution of the C axis rotary head, then his parameter must be set to 10000. If it was accidentally set to 2500, the C axis would only move for a total of 5000 ticks (2x2500) and then issue the error message that the home switch cannot be found. Enter the proper value for this parameter and re-test
C axis begins moving and rotates two complete rotations, and then displays: "ERROR- C HOME SWITCH NOT FOUND"	Signal from C axis home switch not functioning—Burny never received the C axis home switch input	Use the ***Status Bar*** and select ***Cutting I/O*** to display the HOME LIMIT inputs. Observe the C axis home limit switch input and manually activate the switch. The light should change states. If it does not, it indicates a wiring or switch problem. Correct the problem and re-test.
C axis moves toward the home switch, and appears to detect the switch and slows down—but the axis coasts past the switch before it stops and displays: ERROR- C HOME SWITCH OVERRUN.	C axis could not stop in time to remain on the home switch after it was detected.	Either increase the value for the **Homing⇒CHomeAcceleration** parameter or decrease the **Homing⇒CSwitchSearchSpeed.** Increasing the acceleration value causes the axis to stop faster after it detects the switch, and slowing the search speed makes it easier to stop since it isn't going so fast to start with. Try changing these values and re-test.
C axis moves toward the switch, stops and reverses direction off the switch, but then stops immediately—it doesn't appear to search for the encoder index signal.	C axis Index signal trips occurs right after the switch opens.	It is possible, although unlikely that the encoder index signal could be wired properly, and be located exactly at the location where the switch opens—to test this, change the mechanical setup (rotate the encoder, alter the switch trip location) or otherwise shift the position of the home switch a little bit and re-test. If the proper index search now occurs, it shows that the index was located exactly at the switch location. Otherwise, the phasing of the index is wrong as listed above.
C axis finds the home switch, reverses off of it and rotates two complete rotations, and then displays: "ERROR- C HOME INDEX NOT FOUND"	Index signal from Encoder not functioning-- Burny never received the index signal	Check the wiring from the encoder to the Burny for the index signals (usually marked as Z and /Z on the encoder wiring). These go to pins 2 and 6 of the encoder plug on the back of the Burny.
C axis finds the home switch, reverses and then finds the index--motion along the cutting path begins, but the torch is not pointed in the correct direction for a +X cutting move	Index signal from encoder doesn't align to the +X direction of the machine	Use the **Homing⇒CHomeOffset** parameter to input an angular offset for the home position relative to where the index pulse was found. If it appears that the torch is pointing at 45 degrees when it should be at 0 degrees for the +X move, enter a value of 45 into the **Homing⇒CHomeOffset** parameter and re-test. Continue adjusting this value and re-testing till the torch aligns exactly to the desired angle for a +X machine cutting motion.
C axis rotates to find the home switch, reverses and finds the index, then aligns to the proper direction for a +X cut, and the cutting motion starts	None	This is how it's supposed to work.

11B.8 COMMUNICATION SETUP

The communication setup is intended for loading and storing part programs. There are three communication schemes that can be setup: RS-232 Serial port, Network and FTP. (Note that a 4th communication mode of RAS is shown on the screen but is not being used at this time)

RS-232/RS422 SERIAL PORT

SERIAL COMMUNICATION DEFAULT SETTINGS

When the Burny powers up, it reads a set of default settings for the serial port from a file stored on the hard drive. These power-up default values are set by the following:

Enter the ***Utils*** mode, enter the password and touch ***System Setup***.

Touch ***Communication Setup*** and then ***Default Serial Settings.***

Touch each of the 4 touchpads labeled ***Protocol, Baud Rate, Handshake,*** and ***Character Format ,*** to set the proper selection showing in the touchpad display. Touch ***OK*** when all the values are correct. Touch ***Cancel*** to exit the screen without changing the values.

The serial communication link can be tested by selecting the ***Test*** touchpad and installing a loopback plug at one of the Burny ports or at the end of the cable at the host computer.

RS-232/RS-422 SELECTION

The serial port on the back of the Burny (RECP35) can be configured for either RS-232 or RS-422 level communications. This selection can be made in one of two ways. There is a hardware jumper on the ISO CARD on the Back Panel (MO-11996). This jumper can either be set to force the output to RS-232 or RS-422. This jumper is normally shipped installed on position "B" which sets the serial port RECP35 to always be RS-232 to be compatible with other Burny products. Moving this jumper to "**A**" will set the serial port at RECP35 to use RS-422 transmission signals.

If the jumper is removed totally (or set to hang on 1 pin only), then it selects that the RECP35 serial port can be configured through the **I/O Configuration ⇒ UseRS422** parameter. Set this parameter to ***True*** to select the RS-422 mode or ***False*** to select RS-232 mode.

Note that this selection of RS-232 or RS-422 only affects the RECP35 on the back of the unit. If a Modem/Switching card is installed in the unit (MO-12118), the modem signals will be accessed through RECP34 as is normal for other Burny products and is unaffected by the RS-232/422 selection.

NETWORK

The communication setup is intended for loading and storing part programs. The three communication schemes that can be setup are:

- RS-232 Serial port
- Network and
- FTP

For more information about communication setup procedures, refer to the Utilities (Section 7) in this manual.

FTP

There can be up to four FTP connections setup. This setup is accessed via the Utility function, touch ***System Setup***, then ***Communication Setup,*** and then ***FTP.*** The FTP Site screen ***(Util22)*** should be displayed. Determine the following information with assistance from the site's system administrator and enter it here. The Password must be enabled before any information may be entered in these fields.

Server	This is the logical name given to the computer system that will be used as the ftp site. It is typical for this to a name preceded by the word "ftp".
User	This is the name of a valid user on the specified user.
Password	This is the Password for the user.
Start Dir	This is a directory on the server that contains the part programs.
Passive	Set this to Passive.

11B.9 APPENDICES

11B.9.1 OPENLOOPPARAMS.INI FILE DATA

The following data is contained in the OpenLoopParams.ini file that is used for the open loop tuning. If the file is not present on the system being tuned, setting the parameters based on this table will allow the open loop tuning process to work correctly.

Axis Trajectory (*Open loop settings*)

Name	Value	Description
JogAcel	0.5	Jog acceleration [m/s/s].
MaxAcel	1.6	Maximum tool acceleration [m/s/s]
MaxJogVel	0.25	Maximum jog velocity [m/s]
MaxVel	0.25	Maximum program velocity [m/s]
SCurveAcelGain	10	S-Curve acceleration gain [m/s/s/s]
UseSCurve	False	S-Curve enable
DisableRailSlave	True	Disable XX axis
GoalPointTolerence	0.01	Goal point tolerance
CorneringSpeed	0.008	Minimum cornering speed [m/s]
AxisJerkFilter	1	Filter time constant (0.0 - 1.0)
Backup Velocity	0.017	Backup Velocity [m/s]
MinCornerAngle	11	Minimum Corner Angle [deg]
MaxCornerAngle	22	Maximum Corner Angle [deg]
RapidStopAcel	0.5	Maximum Rapid Stop Acceleration [m/s/s]
W_ArcAcelDerate	100	Blended arc acceleration percentage [%]

Machine Parameters (*Open loop settings*)

Name	Value	Description
MinOffTime	0	Minimum off time [s]
BleedOffDelay	3	Bleed off delay [s]
SWSenseTime	0.01	Switch sense time [s]
PlasmaArcOnDelay	0	Plasma arc on delay [s]
PlasmaArcOffDelay	2	Plasma arc off delay [s]
PlasmaStartDelay	0	Plasma start delay [s]
PlasmaArcSenseTime	0.01	Plasma arc on sense time [s]
Marker Velocity	0.02	Marker Velocity [m/s]
MarkerDelay	0	Marker delay [s]
Teach Preheat	False	Enable Teachable Preheat
DefaultDwell	0	Default Dwell [s]
Punch Mark 1 Delay	0	Punch Mark 1 Delay [s]
Punch Mark 2 Delay	0	Punch Mark 2 Delay [s]
Rapid Pierce Radius	0.0032	Radius [m]
Rapid Pierce Velocity	0.01	Speed [m/s]
Pressure Bleed Down	0.5	Low pressure bleed down time [s]
Oxy Raise Timer	0	Oxy Raise Timer [s]
Plasma Raise Timer	0	Plasma Raise Timer [s]

I/O Configuration (*Open loop settings*)		
Name	**Value**	**Description**
InvertHeightDisable	False	Plasma height disable output invert
UseRS422	False	Serial port-- True=RS422, False=RS232
FeedRateThresh	95	Plasma height disable feedrate [%]
FeedRateThreshHyst	2	Plasma height disable hysteresis [%]
SpdPotMin	0	Voltage at minimum [Vdc]
SpdPotMax	4.03	Voltage at maximum [Vdc]
SpdPotMaxPer	120	Maximum speed pot percentage [%]
PlasmaHeightDist	0.01	Plasma height disable distance [m]
UseFPSpdPot	True	Use Front Panel Speed Pot
OKToRun Type	0	OKToRun Configuration Type
Enable RapidStop	False	Use Aux Input 3 as Rapid Stop
Enable C-Axis Lock	False	Use Aux Input 4 as C-Axis Lock
Backpanel MO	0	Board #
Special Op #1	0	Special Operation #1

Axis X, and Axis Y (*Open loop settings*)		
Name	**Value**	**Description**
AxisMinusLimit	-61	Software travel limit [m]
AxisPlusLimit	61	Software travel limit [m]
ZeroVoltOff	0	DAC output offset adjust
DBFactor	0	Deadband scale factor [unitless]
DBThreshold	0	Deadband velocity threshold [m/s]
DefaultAff	0	Acceleration feedforward [V cy cy/m]
DefaultDGain	0	Derivative gain [V cy/m]
DefaultIGain	0	Integral gain [v/m/cy]
DefaultPGain	0	Proportional gain [V/m]
DefaultVff	38	Velocity feedforward [V cy/m]
InvertEncoder	False	Encoder input invert
FollowingErrorLim	100	Following error limit [m]
Stop Following Error	100	Stop Following Error [m]
InvertPwrAmp	False	Drive signal invert
TicksPerMeter	167218	Encoder ticks per meter [counts/m]
Backlash	0	Mechanical Backlash Error [m]

Axis XX (*Open loop settings*)		
Name	**Value**	**Description**
ZeroVoltOff	0	DAC output offset adjust
DBFactor	0	Deadband scale factor [unitless]
DBThreshold	0	Deadband velocity threshold [m/s]
InvertEncoder	False	Encoder input invert
InvertPwrAmp	False	Drive signal invert
Backlash	0	Mechanical Backlash Error [m]
CNC OFF P Gain	0	P Gain to use when in CNC OFF
CNC OFF D Gain	0	D Gain to use when in CNC OFF
CNC OFF I Gain	0	I Gain to use when in CNC OFF

Homing (*Open loop settings*)		
Name	**Value**	**Description**
PowerUpSearch	False	Home Search On Power-Up (True/False)
SwitchSearchSpeed	0.17	Home Switch Search Speed (m/s)
IndexSearchSpeed	0.02	Encoder Index Search Speed (m/s)
HomeAccel	.40	Home Search Accel. (0 uses axes limit) m/s2
X/XXSearchPos	False	X/XX Home Search In Positive Direction
X/XXHomeType	0	X/XX Home Procedure Type (0-5)
XswitchInvert	False	X Home Switch Invert (True/False)
XhomeOffset	0	X Home Position Offset (m)
XticksPerIndex	1000	X Axis Ticks per encoder index
XMinIndexTicks	0	X Axis Minimum Index Search Ticks
XXHomeEnable	False	XX Axis Home Search Enabled (True/False)
X-XXSkewLimit	0.005	X to XX Skew Limit (m)
XXSwitchInvert	False	XX Home Switch Invert (True/False)
X/XXHomeDiff	0	X to XX Home Difference (m)
XXMinIndexTicks	0	XX Axis Minimum Index Search Ticks
YSearchPos	False	Y Search In Positive Direction (True/False)
YHomeType	0	Y Home Procedure Search Type (0-5)
YSwitchInvert	False	Y Home Switch Invert (True/False)
YHomeOffset	0	Y Home Offset (m)
YTicksPerIndex	1000	Y Axis Ticks per encoder index
YMinIndexTicks	0	Y Axis Minimum Index Search Ticks
CSearchPos	False	C Search In Positive Direction (True/False)
CHomeType	0	C Home Procedure Search Type (0,1 or 6)
CHomeOffset	0	C Home Position Offset [deg]
CTicksPerIndex	800	C Axis Ticks per encoder index
CMinIndexTicks	0	C Minimum Index Search Ticks
CSwitchSearchSpeed	90	C Home switch Search speed (deg/s)
CIndexSearchSpeed	90	C Encoder Index Search speed (deg/s)
CHomeAcceleration	100	C Home Acceleration (deg/s/s)
CHomeRepeatFlag	True	Repeat C Axis Home Search
CSwitchInvert	False	C Home Switch Invert (True/False)
Disable Jog Until Home	False	Disable Jog Until Home(True/False)

Axis C (*Open loop settings*)		
Name	**Value**	**Description**
ZeroVoltOff	0	DAC output offset adjust
AxisMaxVoltage	10	Maximum axis voltage [V]
DefaultPGain	0	Proportional gain [V/deg]
InvertEncoder	False	Encoder input invert
InPositionTol	160	Axis In-Position Tolerance [deg]
Stop Following Error	160	Stop Following Error [deg]
InvertPwrAmp	False	Drive signal invert
CTicksPerRev	800	C Encoder Ticks per Revolution [ticks]
Max Velocity	90	Maximum Velocity [deg/s]
Max Acel	1000	Maximum Acceleration [deg/s/s]
AxisMinusLimit	0	Software Rotation Limit [deg]
AxisPlusLimit	0	Software Rotation Limit [deg]

11B.9.2 AXIS TRAJECTORY TABLE PARAMETER LIST

The following are individual descriptions of the parameters contained in the **Axis Trajectory** data table.

JOG ACCELERATION LIMITS

Units: meter/second/second
Typical: 0.5
Access: Axis Trajectory⇒JogAcel

This parameter sets the acceleration when jogging the tool. The tool point is always jogged using trapezoidal velocity profiles. The tool motion will be more responsive when this value is larger. However, a somewhat lower value may make positioning easier for the operator.

ACCELERATION LIMITS (PROGRAM)

Units: meter/second/second
Typical: 0.5
Access: Axis Trajectory⇒MaxAcel

This parameter specifies the maximum acceleration along the tool path during part program execution. This value is used for both trapezoidal and S-curve velocity profiles. The maximum tool acceleration should be as large as possible without causing the machine to jerk severely (S-curve profiles are setup with a separate parameter).

JOG MAXIMUM VELOCITY

Units: meters/second
Typical: 0.2
Access: Axis Trajectory⇒MaxJogVel

This parameter sets the maximum speed for Jog moves. The maximum jog speed occurs at the full CW setting of the speed dial.

MAXIMUM VELOCITY

Units: meters/second
Typical: 0.2
Access: Axis Trajectory⇒MaxVel

Set the Maximum Velocity parameter to the value determined in the Preliminary OPEN LOOP test or to speed specified by the machine manufacturer.

S-CURVE ACCELERATION GAIN

Units: meters/sec/sec/sec
Typical: 10
Access: Axis Trajectory⇒ScurveAcelGain

The parameter specifies the jerk used on S-Curve generated tool paths. A small value will generate very smooth paths, but limit the acceleration of the tool. Larger values will provide a more responsive acceleration profile. As this value gets very large, the velocity profiles will appear to be trapezoidal.

To adjust this parameter, start with the **Axis Trajectory⇒ScurveAcelGain** set to 20, and test run some parts. If the starting and stopping points appear too abrupt, decrease the S-Curve gain and retest. Do not reduce the value any more than necessary since excessively small values will degrade the overall machine performance.

USE S-CURVE

Units: True or False
Typical: False
Access: Axis Trajectory⇒UseSCurve

Set this ***True*** to enable S-Curve generated trajectories.

These parameters enable, and adjust the S-Curve acceleration function in the Burny. Without S-Curve, all accelerations are Trapezoidal. This can sometimes cause some machine oscillation or “shudder” when an axis starts to move or stops. S-Curve Acceleration smoothes out the corners of the trapezoidal profile and provides a more gentle change in speed at the starting and stopping points. Too much S-Curve will limit the maximum acceleration of the machine since it never gets out of a smoothing S-Curve mode.

DISABLE RAIL SLAVE AXIS XX

Units: True or False
Typical: ---
Access: Axis Trajectory⇒DisableRailSlave

Note that this parameter is a DISABLE function. Setting this value to ***True*** will DISABLE the 3rd axis output for the Slave XX rail axis control. Setting this value to ***False*** will allow the XX axis to work as the synchronized slave rail axis to the regular X-axis.

GOAL POINT TOLERANCE

Units: meters
Typical: .01
Access: Axis Trajectory⇒GoalPointTolerance

This parameter is provided to set a maximum radius that can be generated in a corner due to the setting of the **Axis Trajectory⇒CornerSpeed** parameter. Higher corner speed settings will result in a larger corner radius. However, if the radius required exceeds this parameter, the machine speed will be reduced until the radius size has been decreased to the desired value.

CORNERING SPEED

Units: meters / second
Typical: .008
Access: Axis Trajectory⇒CorneringSpeed

This parameter identifies the minimum cornering speed that will be used when going around a corner. If it is set to 0.00 the machine will come to a stop at each corner and the path will go exactly into the corner. This may be desirable for very accurate cutting processes like a water jet. However, thermal cutting processes (oxy/fuel, plasma) generally require that the machine stay in motion as much as possible where stopping can result in loss of cut, or poor cut quality. This parameter allows a minimum speed to be specified for going around a corner. When a corner is found, the machine will only slow down to this Corner Speed setting, and perform a small radius to travel around the corner at the specified speed. The exact radius that will be generated depends on the overall **Axis Trajectory⇒MaxAcel** parameter since machines with better acceleration characteristics can use a smaller radius. The parameter, **Axis Trajectory⇒GoalPointTolerance,** provides a cap on the size of the corner radius.

AXIS JERK FILTER

Units: n/a
Typical: 1.0
Access: Axis Trajectory⇒AxisJerkFilt

With a Jerk Filter value of 1.0, the axis analog outputs can change as much as +/-100% of the axis' maximum DAC value (initialized to 10 VDC) each servo cycle (1 millisecond). With a Jerk Filter value of 0.1, the axis analog outputs can change no more than +/-10% of the axis' maximum DAC value for each servo cycles. Filter values of 0.2 (20%) to 0.4 (40%) should be reasonable in most cases and still provide good servo tracking under most circumstances. Very low values (< 10%) may adversely affect servo dynamics in some situations. Value of 0 should not be used.

BACKUP VELOCITY

Units: meters/second
Typical: 0.017
Access: Axis Trajectory⇒Backup Velocity

This value is usually set lower than the **Axis Trajectory⇒MaxVel** based upon personal preference for maximum reverse speed. Typically set to about 75% of the maximum machine velocity.

MINIMUM CORNER ANGLE

Units: degrees
Typical: 11
Access: Axis Trajectory⇒MinCornerAngle

These next two parameters "Min Corner Angle" and "Max Corner Angle" determine how the software will decelerate for a change in direction in the part program, based on the angle of the change.

If two lines and/or arcs are going in exactly the same direction, the change in angle at the point where they join is 0 so there is no need to slowdown at the intersection. On a square, the first line goes into the corner, and then the second line exits at a 90 degree angle to the first therefore it is necessary to perform a full slowdown to the corner and then re-accelerate back up to speed in the new direction. However, many parts frequently have lines that change direction only a slight amount (1 to 2 degrees), and it is desirable to not slow down excessively at these intersections.

These two parameters set guidelines for how much slowdown should occur at every intersection between two blocks of the part program. If there is a change in direction between two blocks of a program which is LESS than the “Min Corner Angle”, the control will blend from one line to the next without slowing down. So in the example where there was a 1 degree change, the speed would remain essentially constant through the intersection. If the change in direction between two blocks is greater than the “Max Corner Angle”, the control will perform a normal full deceleration to the corner, and then re-accelerate in the new direction. This is the normal action that would occur on the corner of a square for example.

Angles that between the Min and Max values will get a proportional amount of slowdown so that angles close to the Min will have almost no slowdown, while angles close to the Max will be approaching full slowdown.

Typical values are 11 and 22. Angles less than 11 degrees will have no slowdown. Angles of 11 to 22 degrees will receive proportionately more slowdown, and angles over 22 degrees will be considered a full corner and will receive full corner slowdown.

Normally, these settings are acceptable for standard cutting applications.

MAXIMUM CORNER ANGLE

Units: degrees
Typical: 22
Access: Axis Trajectory⇒MaxCornerAngle

See description above for Minimum Corner Angle.

RAPID STOP ACCELERATION

Units: meters/second/second
Typical: .5
Access: Axis Trajectory⇒RapidStopAcel

This feature allows the machine to decel to stop at a preset value that is different from the **Axis Trajectory⇒MaxAcel** parameter. When **I/O Configuration⇒EnableRapidStop** is set to ***True***, Auxiliary input 3 is used as a Rapid Stop input. The machine will decel at a rate set by the **Axis Trajectory⇒RapidStopAcel** parameter. This rate is independent of the **Axis Trajectory⇒MaxAcel** value. Rapid stop will use the **Axis Trajectory⇒RapidStopAcel** value for the rapid stops, but only if the value is greater than the **Axis Trajectory⇒MaxAcel** parameter. **NOTE:** This input was designed for use with plasma torch crash sensors.

ARC ACEL DERATE

Units: %
Typical: 100
Access: Axis Trajectory⇒w_ArcAcelDerate

This parameter limits the acceleration/deceleration used on an arc or circle. Essentially this reduces the velocity through arc’s and circles.

11B.9.3 MACHINE PARAMETERS TABLE LIST

The following are individual descriptions of the parameters contained in the **Machine Parameters** data table.

MINIMUM OFF TIME

Units: seconds
Typical: 0
Access: Machine Parameters⇒MinOffTime

This timer value causes the machine to pause for the specified time after any process is switched OFF. In Plasma and Marker, this timer will run immediately after the Cut Off or Marker Off. In Oxy/Fuel, it will run after the bleed off time.

BLEED OFF TIME

Units: seconds
Typical: 0
Access: Machine Parameters⇒BleedOffDelay

This timer is used to hold the machine in position while the cutting oxygen or water in the hoses is discharged. If the machine were to move while oxygen/water is still flowing, it could nick the part being cut. Note that this dwell time acts in addition to the time specified for the Minimum Off Delay.

When Special Op #1 is set to 1, this parameter is the time to raise the torch at the beginning of the "Cut Off" sequence and when the <Go> button is first pressed to start a part.

SWITCH SENSE TIME

Units: seconds
Typical: .016
Access: Machine Parameters⇒SWSenseTime

This is minimum time for a level to be stable before recognizing a change in the Oxygen/Water Switch input; it acts as a debounce on the input signal.

PLASMA ARC ON DELAY

Units: seconds
Typical: 0
Access: Machine Parameters⇒PlasmaArcOnDelay

This defines the time between the Plasma turning on (sensed) and when motion starts. This parameter is normally used with plasma systems that DO NOT have a current sensing output. In these cases the Arc On sense to the control is connected to the Plasma On/Off circuit—and the Arc On delay time is used to hold the machine in position for approximately the time needed for the Plasma torch to actually fire.

PLASMA ARC OFF DELAY

Units: seconds
Typical: 2
Access: Machine Parameters⇒PlasmaArcOffDelay

This defines the time between the Plasma turning off (sensed) and the controller indicating that the plasma arc has been turned off. This is used to ignore temporary sputters in the plasma arc, or to allow the control to cut such things as expanded metal grating where the arc will continuously cycle on/off. It is recommended that this value always be set to at least 1 or 2 seconds.

PLASMA START DELAY

Units: seconds
Typical: 0
Access: Machine Parameters⇒PlasmaStartDelay

When an Automatic Plasma cut is started, this timer specifies a delay between the Plasma Stop relay going Off (to enable the plasma) and the Plasma Start relay turning ON (to actually fire the arc). On some machines this is used to allow time for the torch lifter to move down to the plate.

PLASMA ARC SENSE TIME

Units: seconds
Typical: .016
Access: Machine Parameters⇒PlasmaArcSenseTime

This is minimum time for a level to be stable before recognizing a change in the Plasma Arc On input; it acts as a debounce on the input signal.

MARKER VELOCITY

Units: meters/second
Typical: .02
Access: Machine Parameters⇒MarkVel

This set is the speed of marker moves. Setting this value to 0.00 will cause the marking to run at the normal cutting feedrate. Setting it to any other value will cause it to run at the specified speed (speed pot must be set to 100%).

MARKER ON DELAY

Units: seconds
Typical: 0
Access: Machine Parameters⇒MarkerDelay

This is the time delay (in seconds) that will occur when a Marker ON command is found—the machine will stop and hold position for this specified time and then continue with the marking portion of the part program.

TEACHABLE PREHEAT

Units: true / false
Typical: false
Access: Machine Parameters⇒TeachPreheat

During an Oxy/Fuel Preheat cycle, the time can be extended or shortened by pressing the GO button, and releasing it to end the preheat. If this parameter is set to ***True***, the new modified preheat time will be remembered and used as the standard preheat time for all subsequent cuts. If this parameter is set to ***False***, the change to the preheat on one pierce will not affect the preheat time for the rest of the part—they would continue to preheat for the time originally specified on the job setup.

DEFAULT DWELL

Units: seconds
Typical: 0
Access: Machine Parameters⇒DefaultDwell

This parameter defines the system default time used when a “DWELL” auxiliary code is encountered in a part program without a dwell time assigned in the same block. However, once a dwell time is assigned by the program, it becomes the default time until changed by another dwell function block.

PUNCH MARK 1 DELAY

Units: seconds
Typical: 0
Access: Machine Parameters⇒Punch Mark 1 Delay

This parameter sets the time spent while executing a “Punch Mark 1” M-Code, M61.

PUNCH MARK 2 DELAY

Units: seconds
Typical: 0
Access: Machine Parameters⇒Punch Mark 2 Delay

This parameter sets the time spent while executing a “Punch Mark 2” M-Code, M62.

RAPID PIERCE RADIUS

Units: meters
Typical: 0.0032
Access: Machine Parameters⇒Rapid Pierce Radius

This parameter sets the radius of the circular water piercing motion.

RAPID PIERCE VELOCITY

Units: meters/second
Typical: 0.01
Access: Machine Parameters⇒Rapid Pierce Velocity

This parameter sets the speed of the circular water piercing motion. Note that this speed is not affected by the feedrate override pot setting.

PRESSURE BLEED DOWN

Units: seconds
Typical: 0
Access: Machine Parameters⇒Pressure Bleed Down

This parameter sets the time to allow the water pressure to bleed down from the high pressure to the low pressure. This occurs in water jet processes when a Cut Off part program command is encountered.

OXY RAISE TIMER

Units: seconds
Typical: 0
Access: Machine Parameters⇒Oxy Raise Timer

This parameter is used when Special Op #1 is set 1. This parameter sets the time to raise the torch during the pierce sequence after the Oxy Input is sense as ON.

PLASMA RAISE TIMER

Units: seconds
Typical: 0
Access: Machine Parameters⇒Plasma Raise Timer

This parameter is used when Special Op #1 is set 1. This parameter sets the time to raise the torch at the beginning of the Cut Off sequence.

11B.9.4 I/O CONFIGURATION TABLE PARAMETER LIST

The following are individual descriptions of the parameters contained in the **I/O Configuration** data table.

INVERT PLASMA HEIGHT DISABLE

Units: True or False.
Typical: False
Access: IO Configuration⇒InvertHeightDisable

This inverts the Plasma Height Disable Relay output signal operation. This allows the same pin wiring to be used to the connectors and still work with height sensing systems that require either Normally Closed, or Normally Open contacts.

RS-232/RS-422 SELECTION

Units: True / False
Typical: False
Access: Machine Parameters⇒UseRS422

The serial port on the back of the Burny (RECP35) can be configured for either RS-232 or RS-422 level communications. This selection can be made in one of two ways. There is a hardware jumper on the Back Panel Card that can be set to force the output to RS-232 or RS-422. This jumper is normally shipped installed on position "B" which sets the serial port RECP35 to always be RS-232 to be compatible with other Burny products. Moving this jumper to "**A**" will set the serial port at RECP35 to use RS-422 transmission signals.

If the jumper is removed totally (or set to hang on 1 pin only), then it selects that the RECP35 serial port can be configured through the **I/O Configuration ⇒ UseRS422** parameter. Set this parameter to ***True*** to select the RS-422 mode or ***False*** to select RS-232 mode.

Note that this selection of RS-232 or RS-422 only affects the RECP35 on the back of the unit. If a Modem/Switching card is installed in the unit (MO-12118), the modem signals will be accessed through RECP34 as is normal for other Burny products and is unaffected by the RS-232/422 selection.

PLASMA FEEDRATE THRESHOLD

Units: Percentage
Typical: 95
Access: IO Configuration⇒FeedRateThresh

This describes the percentage of the feedrate when the Plasma Height Sensor signal will be active.

PLASMA HEIGHT DISABLE THRESHOLD HYSTERESIS

Units: Percentage
Typical: 1
Access: IO Configuration⇒FeedRateThreshHyst

This describes the percentage above the Plasma Feedrate Threshold percentage when the Plasma Height Sensor signal will be de-activated.

SPEED POT MINIMUM

Units: voltage
Typical: 0.0V
Access: IO Configuration⇒SpdPotMin

This is the voltage when the speed pot is at the minimum or fully counter clock-wise. It can compensate for the small offset voltage that sometimes occurs at the bottom of a pot so the display reads 0 at the CCW position.

Note, to view the Speed Pot Minimum and Maximum voltage, touch the ***MENU, Utils, Diagnostics*** and then the touchpad labeled ***I/O STATUS.*** The value displayed in the second box under the ADC (V) column is the voltage from the front panel speed dial. Set the dial full CCW to find the minimum voltage, then full CW for the Maximum and enter these values into the parameters.

SPEED POT MAXIMUM VOLTAGE

Units: voltage
Typical: 3.9 - 4.1V
Access: IO Configuration⇒SpdPotMax

This is the voltage from the feedrate pot when set at its maximum full clock-wise position. Set to 4.03 volts for normal Burny systems

SPEED POT MAX PERCENTAGE

Units: percentage
Typical: 120
Access: IO Configuration⇒SpdPotMaxPer

This is the percentage when the speed pot is at its maximum voltage or full clock-wise. Set to 120 for normal Burny systems.

PLASMA HEIGHT DISTANCE

Units: meters
Typical: 0.005 (default)
Access: IO Configuration⇒PlasmaHeightDist

This describes the distance from the cut off when the Plasma Height Sensor signal will be active.

USE FRONT PANEL SPEED POT

Units: True/False
Typical: True
Access: IO Configuration⇒UseFPSpdPot

Setting this parameter to ***True*** uses the front panel mounted speed pot for the 0-120% speed override input to the Burny. This is the normal setting for systems equipped with the built in speed pot.

For special systems without a built in speed pot, an external analog input can be used for the 0-120% adjustment. In this case, setting this parameter to ***False*** causes the external signal to be used instead of the front panel speed pot.

OKTORUN TYPE

Units: None
Typical: 1
Access: IO Configuration⇒OKToRun Type

This parameter changes the way an External Stop input is interpreted by the control. The possible types for this parameter are defined below.

Type 0: When a stop input occurs, the external contactor is turned off. In addition, all I/O is returned to the off state. The ***Status Bar*** on the control indicates that the machine is in stop and it is colored red.

Type 1: When a stop input occurs, all I/O is returned to the off state and the DAC references are driven to zero. The external contactor remains on and the drive is still powered. The ***Status Bar*** on the control indicates that the machine is in stop and it is colored yellow. This type is the normal setting for most controls.

ENABLE RAPID STOP

Units: True/False
Typical: False
Access: IO Configuration⇒EnableRapidStop

Used to enable or disable the **Rapid Stop** function. See the **Axis Trajectory⇒RapidStopAcel** parameter description above in the **Axis Trajectory** parameter list.

ENABLE C-AXIS LOCK

Units: True/False
Typical: False
Access: IO Configuration⇒EnableC-AxisLock

Locking of the C-Axis can be enabled or disabled.

BACKPANEL MO

Units: Number
Typical: 0
Access: IO Configuration⇒ BackPanel MO

This parameter identifies the Back Panel configuration by setting this value to the CMC “MO” Number. This is required if using a newer back panel, i.e. MO number is greater than 12960, and an older PCI Board. The newer PCI Boards can detect the style of back panel assemblies.

SPECIAL OP #1

Units: Number
Typical: 0
Access: IO Configuration⇒ Special Op #1

This parameters enables special operations to be performed. If this parameter is set to 1, the Oxy and Plasma Cut On and Cut Off sequences change to raise the torch. This special sequencing is used for capacitive-type lifters. More information is included later in this document.

11B.9.5 OFFSET CONFIGURATION TABLE PARAMETER LIST

The following are individual descriptions of the parameters contained in the **Offset Configuration** data table.

X/Y OFFSETS #1 THRU #8

Units: meters
Typical: --
Access: Offset Configuration⇒#1 X Offset, #1 Y Offset , #2 X Offset

There are 8 pairs of X/Y offsets at the top of this data table. Each offset pair (#1 X Offset / #1 Y Offset) specifies the offset movement to be performed when the appropriate offset command is contained in the part program. An Offset ON command causes the machine to move in the direction specified for these parameters, while an Offset OFF command causes the machine to move in the opposite directions. See the Word Address or ESSI programming section of the operator's manual for details on the program codes used to cause these offset movements.

X/Y HOME OFFSETS #1 THRU #4

Units: meters
Typical: --
Access: Offset Configuration ⇒ Home Offset 1-X, Home Offset 1-Y, Home Offset 2-X

The 4 pairs of home offsets at the end of this data table specify absolute X/Y locations within the machines operating area. This allows the operator, or a part program to command the machine to move to a specific home location, or to a parking location for loading or unloading material. The dimensions specified in these parameters are absolute offsets from the Home 0,0 location.

11B.9.6 AXISX AND AXISY TABLE PARAMETER LISTS

The following are individual descriptions of the parameters contained in the **AxisX and AxisY** data tables. The parameters are common between the X and Y tables. There is a separate description following this section for the AxisXX parameters which are adjusted separately from the AxisX. Any parameters not listed in the AxisXX table will use the AxisX data values.

AXIS TRAVEL LIMITS—MINUS DIRECTION

Units: meters
Typical: none-- (set to a large value to disable the limit functions)
Access: AxisX ⇒ AxisMinusLimit
AxisY ⇒ AxisMinusLimit

This describes the maximum travel distance allowable by the controller in the minus direction from the home 0 position for the specified axis. Note that the XX slave axis will use the same value as used for Axis X.

AXIS TRAVEL LIMITS—PLUS DIRECTION

Units: meters
Typical: none-- (set to a large value to disable the limit functions.)
Access: AxisX ⇒ AxisPlusLimit
AxisY ⇒ AxisPlusLimit

This describes the maximum travel distance allowable by the controller in the plus direction from the home 0 position for the specified axis. Note that the XX slave axis will use the same value as used for Axis X.

DAC ZERO VOLT OFFSET ADJUST

Units: volts
Typical: 0 – This value should be set to 0 for all normal applications
Access: AxisX ⇒ ZeroVoltOff
AxisY ⇒ZeroVoltOff

This parameter allows the DAC output for each axis to be zeroed -- or to compensate for a drift or offset in the servo system. However, since servo offset is normally temperature dependent, it's impossible to adjust for it with a fixed parameter. Therefore, in most cases, this parameter should be left at 0.00, and the drive adjusted for minimal drift during the open loop tuning. After that, the closed loop position control will cancel any drift automatically.

DEADBAND FACTOR

Units: percent
Typical: 0
Access: AxisX ⇒ DBFactor
AxisY ⇒ DBFactor

This is an additive factor to the proportional gain. When the speed is lower than the DBThreshold factor, the proportional gain is multiplied by this factor. This increases the response of the drive at these very low speeds to try to compensate for the deadband area of the servo. There is no specific setup for this parameter. In normal circumstances, this value should be set to 0.

DEADBAND THRESHOLD

Units: meters / second
Typical: 0
Access: AxisX ⇒ DBThreshold
AxisY ⇒ DBThreshold

This defines the speed limit for the deadband Factor. When the speed is lower than this value, the deadband factor is active. Deadband is a characteristic where the servo drive will not respond to low control signals. Even though a signal is being sent to the drive, it doesn't move. There is no specific setup procedure for these parameters at this time. Unless there is a problem, it is recommended that these parameters be set to 0.00.

ACCELERATION FEEDFORWARD GAIN

Units: Volt cycle / meter
Typical: 0.1 to 1.0
Access: AxisX ⇒ DefaultAff
AxisY ⇒ DefaultAff

This parameter sets the Acceleration Feed Forward gain for the control loop. This parameter is very important in reducing or eliminating following error during the program execution by commanding the proper acceleration response. See the procedure in this document for adjusting this parameter. Note that the XX slave axis will use the same value as used for Axis X.

DERIVATIVE GAIN

Units: Volt cycle/meter
Typical: 0
Access: AxisX ⇒ DefaultDgain
AxisY ⇒ DefaultDgain

Sets the Derivative term in the PID loop error correction software. This parameter acts to boost the error correction of the control when an error just starts occur instead of waiting for a the following error to build to a large enough error to cause machine motion due to the Proportional term only. This value should be set as high as possible without causing oscillation in the machine. Note that the XX slave axis will use the same value as used for Axis X. Oscillations often occur when this value has a setting of 20 or greater.

INTEGRAL GAIN

Units: Volt / cycle / meter
Typical: 5 to 50
Access: AxisX ⇒ DefaultIgain
AxisY ⇒ DefaultIgain

Sets the integral term in the PID loop error correction software. Note that the XX slave axis will use the same value as used for Axis X.

PROPORTIONAL GAIN

Units: Volts/meter
Typical: 200 to 6000
Access: AxisX ⇒ DefaultPGain
AxisY ⇒ DefaultPGain

Sets the Proportional term in the PID loop error correction software. This parameter sets a gain value that multiplies any position error by this value and outputs the resulting value to the DAC as a correction. This value should be set as high as possible without causing oscillation in the machine. Note that the XX slave axis will use the same value as used for Axis X.

VELOCITY FEEDFORWARD

Units: Volts cycles / meter
Typical: 10.0 to 100.0
Access: AxisX ⇒ DefaultVff
AxisY ⇒ DefaultVff

This value sets the Velocity Feed Forward gain for the control loop. This parameter is most important in reducing or eliminating following error by commanding the machine to move at the proper speed. See the procedure in this document for adjusting this parameter. Note that the XX slave axis will use the same value as used for Axis X.

INVERT ENCODER SIGN

Units: True or False
Typical: False
Access: AxisX ⇒ InvertEncoder
AxisY ⇒ InvertEncoder

Used to configure the encoder counting direction to the actual machine movement—change the ***True***/***False*** setting to reverse the direction of the encoder counting.

FOLLOWING ERROR LIMIT

Units: meters
Typical: 0.010
Access: AxisX ⇒ FollowingErrorLim
AxisY ⇒ FollowingErrorLim

Set this value to an acceptable limit that is slightly higher than the normal error displayed on the graphing ***Check*** screen used during the tuning process. If the highest observed following error was .50 mm for example, a good rule of thumb would be to allow at least 10 to 20 times this value for the following error limit parameter—at least 10mm. Remember this parameter like all the others is in METERS-- therefore set it to .010 meters for the desired 10 mm effect. Note that AxisXX uses the same value specified for Axis X.

STOP FOLLOWING ERROR

Units: meters
Typical: 0.020 to 0.100
Access: AxisX ⇒ Stop Following Error
AxisY ⇒ Stop Following Error

Set this value to an acceptable limit that is slightly higher than the FollowingErrorLim parameter. This parameter should be set to a limit that keeps the machine from breaking if exceeded. If exceeded, the machine will go into a stop condition.

INVERT POWER AMPLIFIER SIGN

Units: True or False
Typical: False
Access: AxisX ⇒ InvertPwrAmp
AxisY ⇒ InvertPwrAmp

This parameter controls the polarity (positive or negative) for the DAC analog output voltage that is sent from the Burny to the servo drives. For example, when the Burny is jogged in the +Y direction, some servo amplifiers will require a positive voltage to give the proper machine movement, while others will require a negative voltage to cause the machine to move in the correct +Y direction.

ENCODER TICKS PER METER

Units: Ticks/meter
Typical: 15000 through 800,000
Access: AxisX ⇒ TicksPerMeter
AxisY ⇒ TicksPerMeter

Sets the scaling factor for converting the encoder pulses for each axis to actual meters of distance traveled.

One encoder "Tick" is created for each edge of the encoder signals—since there are 2 channels on the quadrature encoders used by the Burny, there are 4 edges created for each "line" on the encoder disc. So an encoder rated as a 200 line encoder will give 800 ticks per revolution. Set this parameter to how many "ticks" will occur in exactly 1 meter (39.37 inches) of travel. Note that AxisXX uses the same value specified for AxisX.

BACKLASH COMPENSATION

Units: meters
Typical: 0
Access: AxisX ⇒ BacklashError
AxisY ⇒ BacklashError

This parameter compensates for backlash in the drive system. It is assumed that the encoder is mounted on the back of the motor, and that the backlash is occurring between the motor output, and the final pinion or axis drive mechanism. Backlash is also referred to as “lost motion” usually due to looseness in the gearing or other mechanical causes. Normally, this parameter is set by first measuring the backlash in each axis (program a small square and check the actual machine movement versus the commanded dimensions). Then set the backlash parameter for each axis to the amount of lost motion measured during the test.

11B.9.7 AXISXX TABLE PARAMETER LISTS

Since AxisXX is supposed to track AxisX in order to keep the machine square on the rails, most of the motion parameters for AxisXX are copied from AxisX and cannot be adjusted separately. There are however several parameters relating to encoder and drive directions and servo drive performance that require settings that are possibly different than AxisX. These parameters are listed in the AxisXX parameter table:

DAC ZERO VOLT OFFSET ADJUST

Units: volts
Typical: 0 – This value should be set to 0 for all normal applications
Access: AxisXX ⇒ ZeroVoltOff

This parameter allows the DAC output for each axis to compensate for a drift or offset in the servo system. However, since servo offset is normally temperature dependent, it’s impossible to adjust for it with a fixed parameter. In most cases, this parameter should be left at 0.00, and the drive adjusted for minimal drift during the open loop tuning. After that, the closed loop position control will cancel any drift automatically

DEADBAND FACTOR

Units: meters / second
Typical: 0
Access: AxisXX ⇒ DBFactor

This is an additive factor to the proportional gain. When the speed is lower than the DBThreshold factor, the proportional gain is multiplied by this factor. This increases the response of the drive at these very low speeds to try to compensate for the deadband area of the servo. There is no specific setup for this parameter. In normal circumstances, this value should be set to 0.

DEADBAND THRESHOLD

Units: meters / second
Typical: 0
Access: AxisXX ⇒ DBThreshold

This defines the speed limit for the deadband Factor. When the speed is lower than this value, the deadband factor is active. Deadband is a characteristic where the servo drive will not respond to low control signals even though a signal is being sent to the drive, it doesn’t move. There is no specific setup procedure for these parameters at this time. Unless there is a problem, it is recommended that these parameters be set to 0.00.

INVERT ENCODER SIGN

Units: True or False
Typical: False
Access: AxisXX ⇒ InvertEncoder

Used to configure the encoder counting direction to the actual machine movement. Change the ***True*/*False*** setting to reverse the direction of the encoder counting.

INVERT POWER AMPLIFIER SIGN

Units: True or False
Typical: False
Access: AxisXX ⇒ InvertPwrAmp

This parameter controls the polarity (positive or negative) for the DAC analog output voltage that is sent from the Burny to the servo drives. For example, when the Burny is jogged in the +Y direction, some servo amplifiers will require a positive voltage to give the proper machine movement, while others will require a negative voltage to cause the machine to move in the correct +Y direction.

BACKLASH COMPENSATION

Units: meters
Typical: 0
Access: AxisXX ⇒ BacklashError

This parameter compensates for backlash in the drive system. It is assumed that the encoder is mounted on the back of the motor, and that the backlash is occurring between the motor output, and the final pinion or axis drive mechanism. Backlash is also referred to as "lost motion" usually due to looseness in the gearing or other mechanical causes. Normally, this parameter is set by first measuring the backlash in each axis (program a small square and check the actual machine movement versus the commanded dimensions). Then set the backlash parameter for each axis to the amount of lost motion measured during the test.

CNC OFF PROPORTIONAL GAIN

Units:
Typical: 0
Access: AxisXX ⇒ CNC OFF P Gain

The **CNC OFF Proportional Gain**, **Derivative Gain** and **Integral Gain** values only affect the slave axis.

The three gain values become active when the ***CNC RUN*** touchpad is in the ***OFF*** state and the following conditions are true:

- There is no Jogging activity
- CNC OFF Proportional Gain" is set to a value greater then 0. If the CNC Off Proportional Gain is set to "0", the "CNC OFF Derivative Gain and CNC OFF Integral Gain value are ignored. The standard PID values are then applied to the slave axis.

These parameters are primarily used when a tracing system is attached to the Burny control system.

Proportional Gain is a pure multiplier. The gain value is multiplied times the following error. The bigger the error, the more signal is output to try to correct for it. Too much proportional gain can cause the machine to oscillate.

CNC OFF DERIVATIVE GAIN

Units:
Typical: 0
Access: AxisXX ⇒ CNC OFF D Gain

Derivative Gain reacts to changes in the following error. This provides an extra little "kick" when it sees an error instead of waiting for it to build up to a larger value. Too much derivative gain can cause the machine to oscillate. This parameter is normally not used and is left at 0.

CNC OFF INTEGRAL GAIN

Units:
Typical: 0
Access: AxisXX ⇒ CNC OFF I Gain

Integral Gain reacts to long duration errors. When there is an error that doesn't change for a while, the integrator starts ramping up to create an output signal that causes the error to be reduced. Too much integral gain can cause mushy operation and overshooting of corners. Integral Gain is normally not used and is left at 0.

11B.9.8 HOMING TABLE PARAMETER LISTS

The following are individual descriptions of the parameters contained in the **Homing** data table. These parameters are used by the control to determine the type, speed, direction and other characteristics for the home operations to be performed for each axis. Note that the homing parameters for all 4 axis's are contained in this single table to make it easier to set them as a group—Axis X, Axis XX, Axis Y and Axis C.

POWER UP HOME SEARCH

Units: True/False
Typical:
Access: Homing ⇒ PowerUpSearch

If this parameter is set to ***True***, it will require the operator to perform a Homing operation on the machine before a part program can be run. This insures that the control knows establishes the home 0,0 position, and the machine is square before a part program can be cut. Defining the home 0,0 position before a part program is cut insures that the control can return to the exact same location after a power failure to recover the job that was being cut when the power went off.

HOME SWITCH SEARCH SPEED

Units: meter/second
Typical: .042 m/s
Access: Homing ⇒ SwitchSearchSpeed

Sets the speed for the machine to move toward the home limit switch. This speed can be set fairly high since it is only used for a coarse detection of the home switch. Once the switch is detected, the control will decelerate to a stop, reverse off the switch, and then move back onto the switch at the slower **Index Search Speed** described in the following parameter.

HOME INDEX SEARCH SPEED

Units: meter/second
Typical: .002
Access: Homing ⇒ IndexSearchSpeed

Sets the speed for the machine to use for accurate detection of the home switch and the encoder index location. During a homing operation, the machine will first move toward a switch at the higher speed set by the **Home Switch Search Speed** parameter. Once the switch is detected, all subsequent homing movements will be performed at this slower **Index Search Speed.** This slower speed is used to provide more accurate detection of home switch trip points and to insure accurate detection of the encoder index location.

HOME SEARCH ACCELERATION

Units: meters/second/second
Typical: 0
Access: Homing ⇒ HomeAccel

Setting the parameter to 0 will use the standard **Axis Trajectory⇒Max Accel** acceleration rate for homing operations—this is the normal setting for this parameter. If special cases require, this parameter can be set to it's own acceleration rate which will be used for the homing motion of the machine.

X/XX HOME SEARCH POSITIVE

Units: True/False
Typical:
Access: Homing ⇒ X/XXSearchPos

If this parameter is set to ***True***, it causes the X (and the XX) axis to move in the +X direction to look for the home location. Setting this value to ***False*** causes the home search to be done in the –X direction

X/XX HOME TYPE

Units: (0-5)
Typical:
Access: Homing ⇒ X/XXHomeType

This parameter controls what type of home search will be done for the X (and XX if enabled) axes. See the Homing Setup section of this manual for more details on each type. The choices are:

Type	Operation	Description
0	No Automatic Home Search	Only Manual home operation allowed for X axis. No automatic functions will be performed
1	Automatic Search Allowed • **Switch Search** • **Back off** • **Index Search**	10. Search for X home switch at high Switch search speed 11. Stop when switch detected and change to slower Index Search speed 12. Back off X home switch and detect when switch clears 13. When switch clears, begin search for X encoder Index 14. Once index detected, set home 0,0 based on offset parameter. 15. If XX Home Enabled, continue backing away from X home switch till XX switch is cleared. 16. When XX switch is cleared, continue backing away till XX encoder index detected. 17. Once XX encoder index found, adjust XX axis position based on stored X to XX home location difference parameter. 18. Move back to X index location.
2	Automatic Search Allowed • **Switch Search** • **Back off**	7. Search for X home switch at high Switch search speed. 8. Stop when switch detected and change to slower Index Search speed 9. Back off X home switch and detect when switch clears 10. Set home 0,0 based on offset parameter. 11. If XX Home Enabled, continue backing away from X home switch till XX switch is cleared. 12. When XX switch is cleared, adjust XX axis position based on stored X to XX home location difference parameter.
3	Automatic Search Allowed • **Switch Search** • **Continue Forward** • **Index Search**	10. Search for X home switch at high Switch search speed 11. Stop when switch detected and change to slower Index Search speed 12. Back off X home switch and detect when switch clears 13. Reverse direction and move back onto X home switch. 14. When switch is detected again, begin search for X encoder Index 15. Once index detected, set home 0,0 based on offset parameter. 16. If XX Home Enabled, reverse direction and back away from X home switch till XX switch is cleared. 17. When XX switch is cleared, continue backing away till XX encoder index detected. 18. Once XX encoder index found, adjust XX axis position based on stored X to XX home location difference parameter.
4	Automatic Search Allowed • **Switch Search** This type used for automatic torch spacing or other requirements where the motion to the home switch cannot reverse due to some mechanical issue	8. Search for X home switch at high Switch search speed 9. Stop when switch detected and change to slower Index Search speed 10. Back off X home switch and detect when switch clears 11. Reverse direction and move back onto X home switch. 12. When switch is detected again, set home 0,0 based on offset parameter. 13. If XX Home Enabled, reverse direction and back away from X home switch till XX switch is cleared. 14. When XX switch is cleared, adjust XX axis position based on stored X to XX home location
5	Automatic Search Allowed • **Move to Hard stop** • **Switch determines speed of search**	6. Begin moving toward hard stop location. 7. Machine will move at higher Switch Search Speed if the X home switch is OFF. 8. If X home switch is detected as ON, reduce machine speed to the slower Index Search Speed 9. Continue moving till machine runs up against a hard stop, or a drive over travel switch. The XX axis will continue to move independently if enabled. 10. When both X and XX have reached the hard stop and motion has ceased, the home location will be set based on the X Home Offset parameter.

X HOME SWITCH INVERT

Units: True/False
Typical:
Access: Homing ⇒ XSwitchInvert

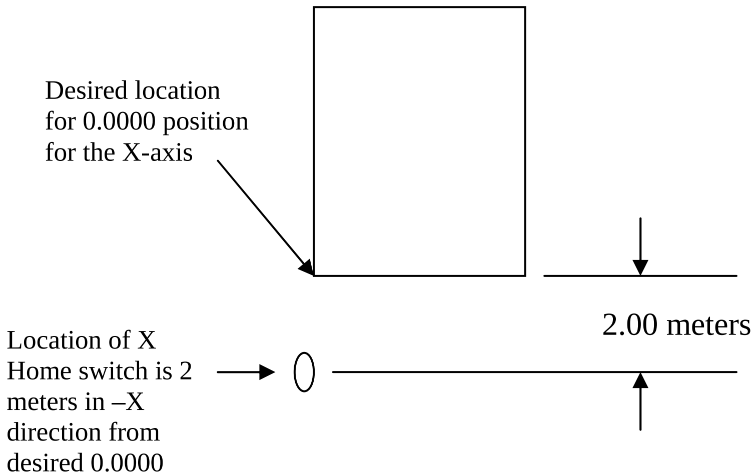
This parameter allows for either Normally Open or Normally closed switch types to be used for the X-axis homing operation. A ***False*** setting for this parameter would be used for a Normally Open switch. This type of switch is open or OFF when the machine is away from the switch and is closed or ON when the machine reaches the home switch location. Setting this parameter to ***True*** inverts this logic, so that a Normally Closed switch could be used.

Switch operation can be observed by touching the ***MENU***, ***Utils***, ***Diagnostic*** then ***Cut Logic I/O***. This displays the normal I/O in the system as either Black (OFF) or White (ON) light bulbs. A Normally open Home switch would show as a Black light bulb while the machine is away from the switch, and would turn White when the home switch was actuated.

X HOME OFFSET

Units: meters
Typical: 0
Access: Homing ⇒ XhomeOffset

This parameter allows the 0.000 position for the X-axis to be located away from the actual home switch location. This is useful for cases where the home switch is located far away from the actual cutting area of the machine.



Example: The location for the X home switch is located 2 meters in the –X direction from the desired location for the 0.0000 position of the X-axis. This parameter would be set to –2.0000 meters so that when the X home switch/index was found, the X-axis would be set to –2.000 meters. Thus the 0.0000 position of the X-axis would be 2 meters away from the home switch and located on the cutting surface as desired.

X TICKS PER INDEX

Units: Ticks
Typical:
Access: Homing ⇒ XTicksPerIndex

Specifies the number of encoder Ticks that occur between index pulses for Homing operations Type 1 or Type 3. This value is used to detect situations where the index pulse falls too close to the switch location for accurate detection. This value is also used to determine a maximum search distance for the encoder index signal. The control will search for the index for a total of 2.5 times this specified ticks value before declaring an error for the index not being detected.

X MINIMUM INDEX SEARCH TICKS

Units: Ticks
Typical: 0
Access: Homing ⇒ XminIndexTicks

When a Type 1 or Type 3 home is performed, the homing process looks for both a home switch, and then for the encoder index signal. By using the encoder index, the home position is accurate to 1 encoder tick count.

It is typical for switches used for these homing operations to have variations in their trip point so that the location where the index search actually starts can vary from one home operation to the next. If the encoder index occurs very close to the switch location, the signal can sometimes be missed due to the variance in the switch trip location. To eliminate this problem, set this value to 5% of the Ticks per Encoder revolution.

AXIS XX HOME ENABLE

Units: True/False
Typical:
Access: Homing ⇒ XXHomeEnable

This parameter determines whether the separate process of finding the Axis XX home switch is performed (***True***) or not (***False***).

If set to ***False***, the homing process will find the home position for the X axis based on the type selected, but will not alter the alignment between the X and XX axis so the squareness of the machine is not affected.

If set to ***True***, the homing process will first find the X axis home position (based on Type selected) and will then continue on to find the XX home switch (and index) then the squareness of the machine will be adjusted based on the X to XX Home difference parameter.

X TO XX SKEW LIMIT

Units: meters
Typical: .010
Access: Homing ⇒ X-XXSkewLimit

This value is used during the homing process to limit the about of movement that can occur when the machine is squared as a result of homing the XX axis. The home process first finds the location for the X and XX individual home positions (either a switch, or a switch with encoder index). The difference between these two positions is compared to the ***Homing⇒X-XXHomeDiff*** parameter. If the actual difference is not the same as the stored value, the XX axis must be moved to place the machine into it's proper square position to the rails. Before this alignment motion begins, the amount of the movement is compared to the Skew Limit parameter. If the motion to square the machine is less than the Skew Limit, the XX axis will be moved to align the machine. If the motion to square the machine is excessive (greater than the Skew Limit), the machine is not moved, an error message and the homing process is stopped.

XX HOME SWITCH INVERT

Units: True/False
Typical:
Access: Homing ⇒ XXSwitchInvert

This parameter allows for either Normally Open or Normally closed switch types to be used for the XX Axis homing operation. A ***False*** setting for this parameter would be used for a Normally Open switch. This type of switch is open or OFF when the machine is away from the switch and is closed or ON when the machine reaches the home switch location. Similarly, a ***True*** setting for this parameter would invert this logic, so that a Normally Closed switch which opens at the home location could be used.

Switch operation can be observed by touching the ***MENU***, ***Utils***, ***Diagnostic*** then ***Cut Logic I/O***. This displays the normal I/O in the system as either Black (OFF) or White (ON) light bulbs. A Normally open Home switch shows as a Black light bulb while the machine is away from the switch, and turns White when the home switch is actuated.

X TO XX HOME DIFFERENCE

Units: meters
Typical: .010
Access: Homing ⇒ X-XXHomeDiff

When the Axis XX homing is enabled to square the machine, this parameter is used to account for the fact that the X and XX home switches are not located at the same position along the rail. Since these two switches are not aligned, this parameter is the difference between the measured positions for the X and the XX home switches (with or without encoder index).

To set this parameter, the machine should first be aligned square to the rails and several test parts cut and measured to make sure the machine is square.

Then set this ***Homing⇒X-XXHomeDiff*** and the ***Homing⇒X-XXSkewLimit*** parameters to 0.00 for the initial testing. Run the home search routine and observe the error message displayed at the end of the XX home search process. It should indicate an "Excess Skew Error-- +/-x.xxx meters." The value displayed shows the measured distance from the X to the XX home switch that was detected by the software. Since the machine was measured to be square before this home process was run, the displayed dimension is the value to be entered in this parameter**.**

See the Skew Limit description above for additional reference to this parameter.

XX MINIMUM INDEX SEARCH TICKS

Units: Ticks
Typical: 0
Access: Homing ⇒ XXMinIndexTicks

When a Type 1 or Type 3 home is performed, the homing process looks for both a home switch, and then for the encoder index signal. By using the encoder index, the home position is accurate to 1 encoder tick count.

It is typical for switches used for these homing operations to have variations in their trip point so that the location where the index search actually starts can vary from one home operation to the next. If the encoder index occurs very close to the switch location, the signal can sometimes be missed due to the variance in the switch trip location. To eliminate this problem, set this value to 5% of the Ticks per Encoder revolution.

Y HOME SEARCH POSITIVE

Units: True/False
Typical:
Access: Homing ⇒ YSearchPos

If this parameter is set to ***True***, it causes the Y-axis to move in the +Y direction to look for the home location. Setting this value to ***False*** causes the home search to be done in the –Y direction

Y HOME TYPE

Units: (0-5)
Typical:
Access: Homing ⇒ YHomeType

This parameter controls what type of home search will be done for the Y-axis. See the Homing Setup section of this manual for more details on each type. The choices are:

Type	Operation	Description
0	No Automatic Home Search	Only Manual home operation allowed for Y axis. No automatic functions will be performed
1	Automatic Search Allowed • **Switch Search** • **Back off** • **Index Search**	1. Search for Y home switch at high Switch search speed 2. Stop when switch detected and change to slower Index Search speed 3. Back off Y home switch and detect when switch clears 4. When switch clears, begin search for Y encoder Index 5. Once index detected, set home 0,0 based on offset parameter.
2	Automatic Search Allowed • **Switch Search** • **Back off**	1. Search for Y home switch at high Switch search speed. 2. Stop when switch detected and change to slower Index Search speed 3. Back off Y home switch and detect when switch clears 4. Set home 0,0 based on offset parameter.
3	Automatic Search Allowed • **Switch Search** • **Continue Forward** • **Index Search**	1. Search for Y home switch at high Switch search speed 2. Stop when switch detected and change to slower Index Search speed 3. Back off Y home switch and detect when switch clears 4. Reverse direction and move back onto Y home switch. 5. When switch is detected again, begin search for Y encoder Index 6. Once index detected, set home 0,0 based on offset parameter.
4	Automatic Search Allowed • **Switch Search** This type used for automatic torch spacing or other requirements where the motion to the home switch cannot reverse due to some mechanical issue	1. Search for Y home switch at high Switch search speed 2. Stop when switch detected and change to slower Index Search speed 3. Back off Y home switch—detect when switch clears 4. Reverse direction and move back onto Y home switch. 5. When switch is detected again, set home 0,0 based on offset parameter.
5	Automatic Search Allowed • **Move to Hard stop** • **Switch determines speed of search**	11. Begin moving toward hard stop location. 12. Machine will move at higher Switch Search Speed if the Y home switch is OFF. 13. If Y home switch is detected as ON, reduce machine speed to the slower Index Search Speed 14. Continue moving till machine runs up against a hard stop, or a drive over-travel switch. 15. When the Y-axis has reached the hard stop and motion has ceased, the home location will be set based on the Y Home Offset parameter.

Y HOME SWITCH INVERT

Units: True/False
Typical:
Access: Homing ⇒ YSwitchInvert

This parameter allows for either Normally Open or Normally closed switch types to be used for the Y-axis homing operation. A ***False*** setting for this parameter would be used for a Normally Open switch. This type of switch is open or OFF when the machine is away from the switch and closed or ON when the machine reaches the home switch location. Similarly, a ***True*** setting for this parameter would invert this logic, so that a Normally Closed switch could be used.

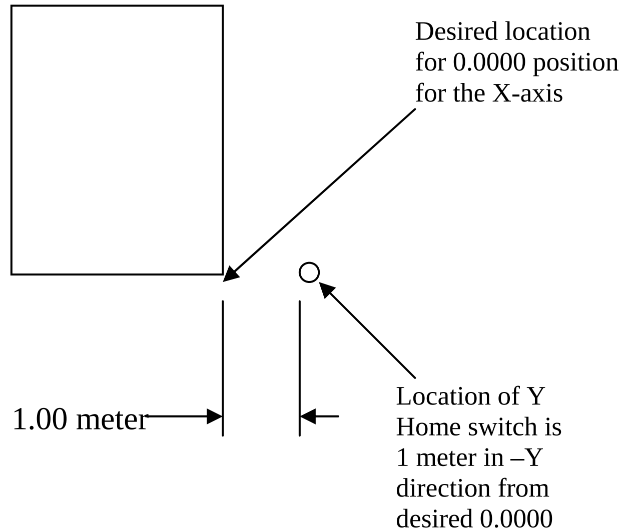
Switch operation can be observed by touching the ***MENU***, ***Utils***, ***Diagnostic*** then ***Cut Logic I/O***. This displays the normal I/O in the system as either Black (OFF) or White (ON) light bulbs. A Normally open Home switch shows as a Black light bulb while the machine is away from the switch, and turns White when the home switch is actuated.

Y HOME OFFSET

Units: meters
Typical: 0
Access: Homing ⇒ YhomeOffset

This parameter allows the 0.000 position for the Y-axis to be located away from the actual home switch location. This is useful for cases where the home switch is located far away from the actual cutting area of the machine.

Example: The location for the Y home switch is located 1 meters in the –Y direction from the desired location for the 0.0000 position of the Y axis. This parameter would be set to –1.0000 meter so that when the Y home switch/index was found, the Y-axis would be set to –1.000 meter. Thus the 0.0000 position of the Y-axis would be 1 meter away from the home switch and located on the cutting surface as desired.



Y TICKS PER INDEX

Units: Ticks
Typical:
Access: Homing ⇒ YTicksPerIndex

Specifies the number of encoder Ticks that occur between index pulses for Homing operations Type 1 or Type 3. This value is used to detect situations where the index pulse falls too close to the switch location for accurate detection. This value is also used to determine a maximum search distance for the encoder index signal. The controller searches for the index for a total of 2.5 times this specified ticks value before declaring an error for the index not being detected.

Y Minimum Index Search Ticks

Units: Ticks
Typical: 0
Access: Homing ⇒ YMinIndexTicks

When a Type 1 or Type 3 home is performed, the homing process looks for both a home switch, and then for the encoder index signal. By using the encoder index, the home position is accurate to 1 encoder tick count.

It is typical for switches used for these homing operations to have variations in their trip point so that the location where the index search actually starts can vary from one home operation to the next. If the encoder index occurs very close to the switch location, the signal can sometimes be missed due to the variance in the switch trip location. To eliminate this problem, set this value to 5% of the Ticks per Encoder revolution.

C Home Search Positive

Units: True/False
Typical:
Access: Homing ⇒ CSearchPos

If this parameter is set to ***True***, it causes the C axis to move in the + direction (Angle display increases +1, +2, +3…) to look for the home location. Setting this value to ***False*** causes the home search to be done in the – direction

C Home Type

Units: (0,1 or 6)
Typical:
Access: Homing ⇒ CHomeType

This parameter controls the type of homing done for the C axis—the C axis must be homed before any cutting operations can be performed. The three choices for C axis homing are:

Type	Operation	Description
0	Disable C axis Homing	Used for testing, or for special cases where the C axis is Homed by external means. The position of the C axis at Power-Up will be used as the home 0.00 angle location.
1	Automatic Search Allowed • **Switch Search** • **Back off** • **Index Search**	1. Search for C home switch at high C Switch search speed 2. Stop when switch detected and change to slower C Index Search speed 3. Back off C home switch and detect when switch clears 4. When switch clears, begin search for C encoder Index 5. Once index detected, set 0.00 angle position based on C axis Offset parameter.
6	Automatic Search Allowed • **Index Search** • **No Switch used**	1. Rotate in direction specified for C axis Home Search until Encoder Index signal is detected. 2. Once Index is found, set C axis 0.00 Angle position based on C Axis Offset parameter.

C Home Switch Invert

Units: True/False
Typical:
Access: Homing ⇒ CSwitchInvert

This parameter allows for either Normally Open or Normally closed switch types to be used for the Y-axis homing operation. A ***False*** setting for this parameter would be used for a Normally Open switch. This type of switch is open or OFF when the machine is away from the switch and closed or ON when the machine reaches the home switch location. Similarly, a ***True*** setting for this parameter would invert this logic, so that a Normally Closed switch could be used.

Switch operation can be observed by touching the ***MENU***, ***Utils***, ***Diagnostic*** then ***Cut Logic I/O***. This displays the normal I/O in the system as either Black (OFF) or White (ON) light bulbs. A Normally open Home switch shows as a Black light bulb while the machine is away from the switch, and turns White when the home switch is actuated.

C HOME OFFSET

Units: degrees
Typical: 0
Access: Homing ⇒ CHomeOffset

This parameter allows the 0.000 Angle position for the C axis to be located away from the actual home switch or index location. This allows the C axis encoder (and optional home switch) to be placed without regard to the actual angular alignment of the rotary head to its 0.00 position.

For example: When the C axis encoder is mounted, the index pulse might occur 15 degrees away from the desired location for the 0.00 Angle position of the C axis. Older C axis systems would require that the encoder was rotated so that the index pulse was mechanically moved to the desired 0.00 angle position. This parameter allows the mechanics of the system to be built without regard for the 0.00 placement—then at setup time, the amount of offset can be measured and entered into this parameter to place the torch at it's correct 0.00 angle location.

C TICKS PER INDEX

Units: Ticks
Typical:
Access: Homing ⇒ CTicksPerIndex

Specifies the number of encoder Ticks that occur between index pulses for Homing operations Type 1. This value is used to detect situations where the index pulse falls too close to the switch location for accurate detection. This value is also used to determine a maximum search distance for the encoder index signal. The controller searches for the index for a total of 2.5 times this specified ticks value before declaring an error for the index not being detected.

C MINIMUM INDEX SEARCH TICKS

Units: Ticks
Typical: 0
Access: Homing ⇒ CMinIndexTicks

When a Type 1 home is performed, the homing process looks for both a home switch, and then for the encoder index signal. By using the encoder index, the home position is accurate to 1 encoder tick count.

It is typical for switches used for these homing operations to have variations in their trip point so that the location where the index search actually starts can vary from one home operation to the next. If the encoder index occurs very close to the switch location, the signal can sometimes be missed due to the variance in the switch trip location. To eliminate this problem, set this value to 5% of the Ticks per Encoder revolution.

C HOME SWITCH SEARCH SPEED

Units: degrees/second
Typical: 30deg/s
Access: Homing ⇒ CSwitchSearchSpeed

Sets the speed used by the Rotary C axis to search for the C axis Home switch if a Type 1 Home is selected. This speed can be set fairly high since it is only used for a coarse detection of the home switch. Once the switch is detected, the control will decelerate to a stop, reverse off the switch, and then move back onto the switch at the slower **C Index Search Speed** described in the following parameter.

C INDEX SEARCH SPEED

Units: degrees/second
Typical: 1deg/s
Access: Homing ⇒ CIndexSearchSpeed

Sets the speed for the machine to use for accurate detection of the home switch and the encoder index location for the C axis. During a homing operation, the machine will first move toward a switch at the higher speed set by the **C Home Switch Search Speed** parameter. Once the switch is detected, all subsequent homing movements will be performed at this slower **C Index Search Speed.** This slower speed is used to provide more accurate detection of home switch trip points and to insure accurate detection of the encoder index location.

C HOME ACCELERATION

Units: degree/s/s
Typical:
Access: Homing⇒ CHomeAcceleration

The **Homing⇒CHomeAcceleration** parameter controls the acceleration of the "C" axis. Setting this value higher will result in a more responsive machine, however if it is too high, it can cause the machine to "shudder" or overstress the drive and mechanical systems. If it is set too low, the rotary torch will appear sluggish and give poor cut quality especially in corners and changes in direction

C HOME REPEAT FLAG

Units: True/False
Typical: True
Access: Homing ⇒ CHomeRepeatFlag

This parameter provides a way to force the C axis to repeat it's homing process during the tuning operations on the machine.

Since the C axis uses incremental encoders, it must be homed after the power is applied to the control to align the mechanics to the machine for the correct 0 degree location. Normally, this homing operation occurs before the first part is cut (this occurs automatically). After this first time, the established home position is used for all subsequent moves to home for the C axis. However, during tuning, it is sometimes necessary to repeat the home search operation on the C axis to determine if the parameters for the C axis homing are set correctly. Setting this parameter to ***True*** and touching ***Send*** will reset the flag for the C axis home, so that the next time the GO button is pressed, the C axis repeats the homing operation. This parameter does not permanently set the C axis to repeat the homing operation. It causes a 1-time home operation to be performed each time a ***True*** is sent to the controller. For normal cutting operations, it doesn't matter what this parameter is set to.

DISABLE JOG UNTIL HOME

The DisableJogUntilHome parameter, when set to True will disable the Jogging of the CNC control. When this parameter is set to TRUE, then 5 seconds after the power up sequence has completed, the Burny will jump to the Homing screen. **Machines must have limit switches to use this feature**. Once a homing operation has been **successfully** completed, jogging operations are enabled.

11B.9.9 AXIS C TABLE PARAMETER LISTS

The following parameters are used to adjust the performance of the C (rotary torch) axis.

DAC ZERO VOLT OFFSET ADJUST

Units: volts
Typical: 0 – This value should be set to 0 for all normal applications
Access: AxisC ⇒ ZeroVoltOff

This parameter allows the DAC output to compensate for a drift or offset in the servo system. Servo offset is normally temperature dependent so it is impossible to adjust for it with a fixed parameter. In most cases, this parameter should be left at 0.00 and the drive should be adjusted for minimal drift during the open loop tuning.

MAXIMUM VOLTAGE

Units: volts
Typical: 10
Access: AxisC ⇒ AxisMaxVoltage

This parameter sets the limit for the voltage output from the D/A converter for the C axis. Normally this parameter is set to 10 volts and the servo drive is adjusted for the desired maximum rotation speed. Some servo drives have a lower maximum voltage. Set this parameter to that maximum input voltage of the servo drive.

PROPORTIONAL GAIN

Units: Volts/deg
Typical: 1 to 200
Access: AxisC ⇒ DefaultPGain

Sets the Proportional term in the PID loop error correction software. This parameter sets a gain value that multiplies any position error by this value and outputs the resulting value to the DAC as a correction. This value should be set as high as possible without causing oscillation in the machine.

INVERT ENCODER SIGN

Units: True or False
Typical: False
Access: AxisC ⇒ InvertEncoder

Used to configure the encoder counting direction to the actual machine movement. Change the ***True*/*False*** setting to reverse the direction of the encoder counting.

IN POSITION TOLERANCE

Units: degrees
Typical: 1
Access: AxisC ⇒ InPositionTol

This parameter defines the maximum error allowed between the expected position and the actual position, i.e. Following Error. Set this value to 160 degrees.

STOP FOLLOWING ERROR

Units: deg
Typical: unknown
Access: AxisC ⇒ Stop Following Error

Set this value to an acceptable limit that is slightly higher than the FollowingErrorLim parameter. This parameter should be set to a limit that keeps the machine from breaking if exceeded. If exceeded, the machine will go into a stop condition.

INVERT POWER AMPLIFIER SIGN

Units: True or False
Typical: False
Access: AxisC ⇒ InvertPwrAmp

This parameter controls the polarity (positive or negative) for the DAC analog output voltage that is sent from the controller to the servo drives.

ENCODER TICKS PER REVOLUTION

Units: Ticks/rev
Typical: unknown
Access: AxisC ⇒ CTicksPerRev

Set this parameter to the number of encoder "ticks" which occur in exactly 360 degrees of rotation of the C axis. Note on systems using a gearbox between the feedback encoder and the output, there may be multiple rotations of the encoder for 1 revolution of the output C axis. Remember a 500-line encoder results in 2000 encoder ticks

MAX VELOCITY

Units: deg/sec
Typical: unknown
Access: AxisC⇒MaxVel

Set the Maximum Velocity of rotation in degrees.

MAX ACEL

Units: deg/sec/sec
Typical: unknown
Access: AxisC⇒MaxAcel

Set the Maximum Acceleration of rotation in degrees.

AXISPLUSLIMIT

Units: degrees
Typical: unknown
Access: AxisC⇒AxisPlusLimit

AxisPlusLimit must be at least 480 degrees.

If the AxisPlusLimit and the AxisMinusLimit are not the same, then they are used to enforce rotational limits. When rotational limits are active, the GoTo Screen: C Axis supports -360 to +360 in 45 degree increments and will unwind to the target position. During cutting, if the rotational limit is reached, program execution stops and the status bar turns white. If the AxisPlusLimit and AxisMinusLimit are the same value, then no rotational or windup limit is enforced. In this case, the GoTo Screen: C Axis will only show 0 to +360 in 45 degree increments.

AXISMINUSLIMIT

Units: degrees
Typical: unknown
Access: AxisC⇒AxisMinusLimit

AxisMinusLimit must be at least -480 degrees. The minus sign (-) is required.

If the AxisPlusLimit and the AxisMinusLimit are not the same, then they are used to enforce rotational limits. When rotational limits are active, the GoTo Screen: C Axis supports -360 to +360 in 45 degree increments and will unwind to the target position. During cutting, if the rotational limit is reached, program execution stops and the status bar turns white. If the AxisPlusLimit and AxisMinusLimit are the same value, then no rotational or windup limit is enforced. In this case, the GoTo Screen: C Axis will only show 0 to +360 in 45 degree increments.

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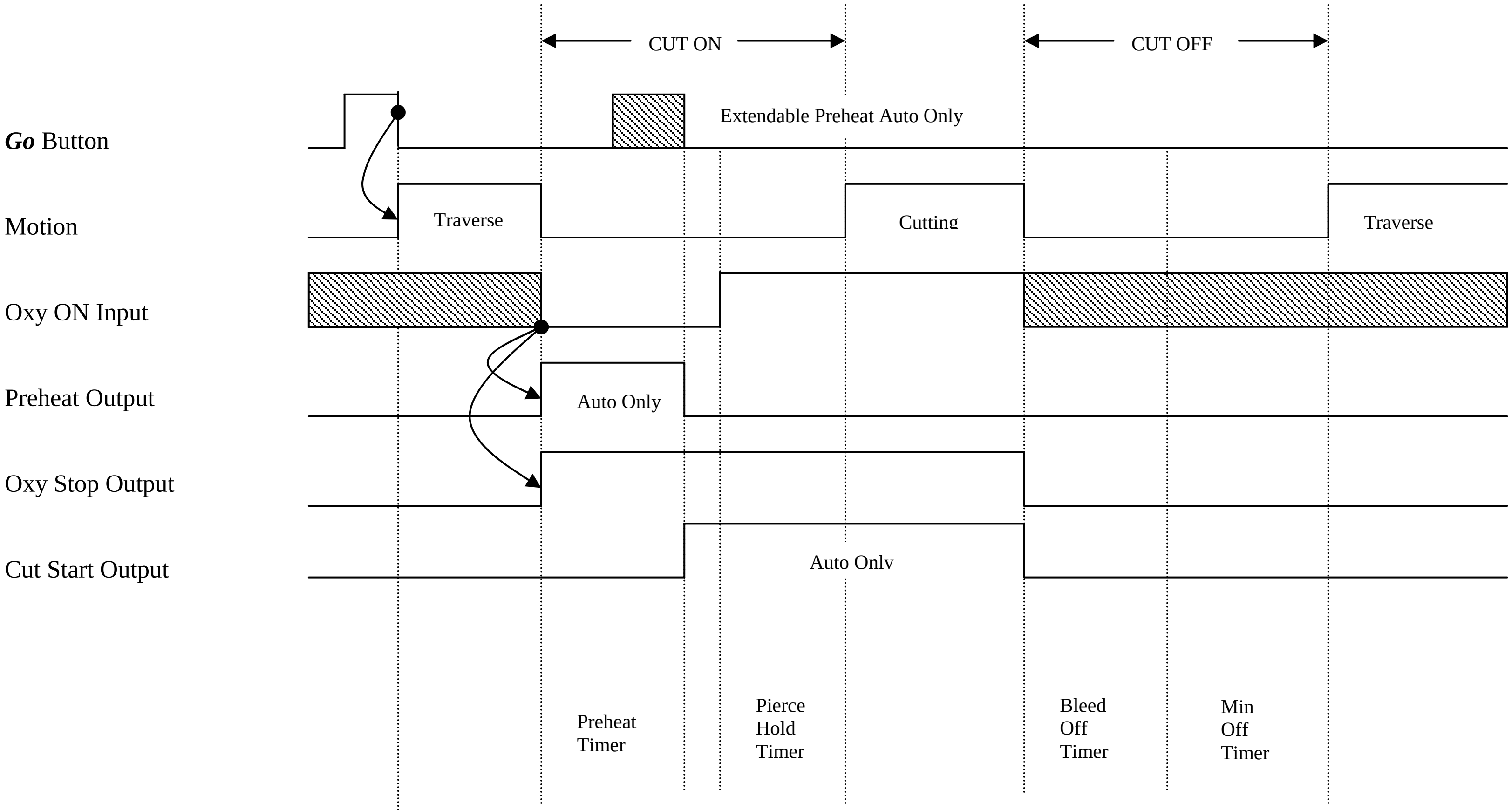
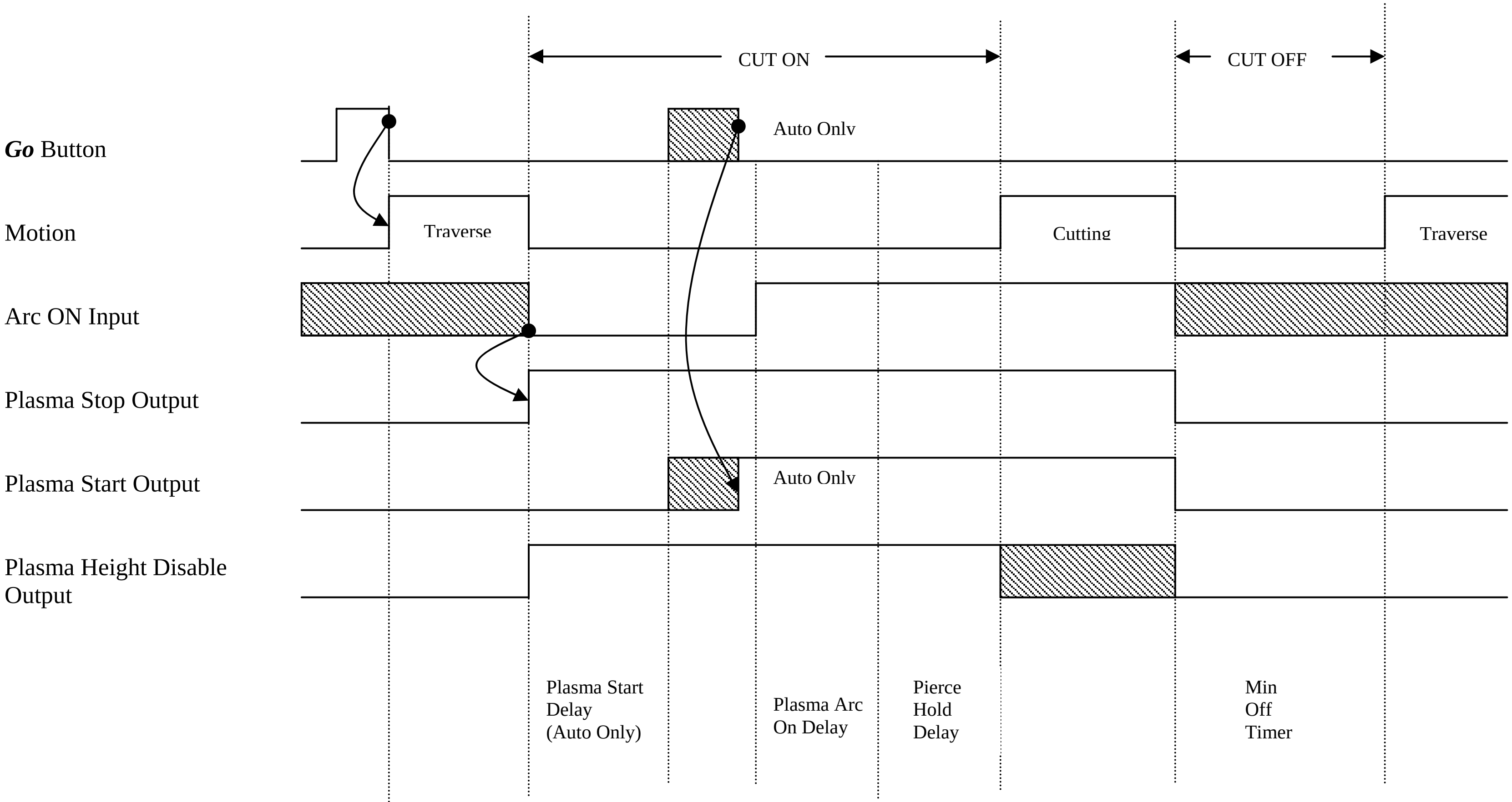
11B.10 STANDARD OXY/FUEL CUTTING DIAGRAM

This section shows the Cut On and Cut Off sequences for Oxy cutting in both Automatic and Manual Modes.



11B.11 STANDARD PLASMA CUTTING DIAGRAM

This section shows the Cut On and Cut Off sequences for Plasma cutting in both Automatic and Manual Modes.



11B.12 SPECIAL OPERATION #1

This operation provides signals to raise and lower torch lifters in both Oxy/Fuel and Plasma cutting. Basically, the torch is raised when the ***Go*** button is pushed to start cutting a part and at the end of each cut. Additionally, the torch is raised when the ***Stop*** button is pushed. The time the torch is the Bleed Off timer for Oxy and the Plasma Raise Timer for Plasma.

This function works with a torch lifter that accepts automatic/manual mode and torch up control signals. It is advantageous for the lifters to supply “torch down” signals. If these signals are not available, tie the “torch down” inputs active.

A timing chart is included later in this document that shows the Input/Output signals and timer sequencing for both the Oxy/Fuel and Plasma cut logic.

SETTING FOR SPECIAL OPERATION #1

The following parameters are used for Special Operation #1.

IO CONFIGURATION ⇒ SPECIAL OPERATION #1

Set IO Configuration ⇒ Special Operation #1 to 1 to enable the feature. To disable this feature set to 0.

MACHINE PARAMETERS ⇒ OXY RAISE TIMER

This time, in seconds, indicates the length of time to raise the Oxy torch from the plate to the correct for the pierce height.

MACHINE PARAMETERS ⇒ BLEED OFF DELAY

This time, in seconds, indicates the length of time that the Oxy torch will raise and vent at the end of cut and after the ***Go*** button is pressed to start cutting. This timer is not new, however, the torch raise feature utilizes this timer.

MACHINE PARAMETERS ⇒ PLASMA RAISE TIMER

This time, in seconds, indicates the length of time to raise the plasma torch at the end of the cut and after the ***Go*** button is pressed to start cutting.

MACHINE PARAMETERS ⇒ PLASMA START DELAY

This time, in seconds, indicates the length of time to raise the plasma torch at the beginning of the Cut On sequence to allow torch lifters to travel toward the plate.

MACHINE PARAMETERS ⇒ MIN OFF TIME

This time, in seconds, indicates the length of dwell time at the end of a Cut Off sequence.

JOB SETUP ⇒ PREHEAT TIMER

This time, in seconds, indicates the length of time that the preheat time is on.

JOB SETUP ⇒ PIERCE HOLD TIMER

This time, in seconds, indicates the length of pierce hold time.

I/O DESIGNATION USED FOR SPECIAL OPERATION #1

The following Oxy/Fuel and Plasma I/O signals are used for the Special Operation #1 feature.

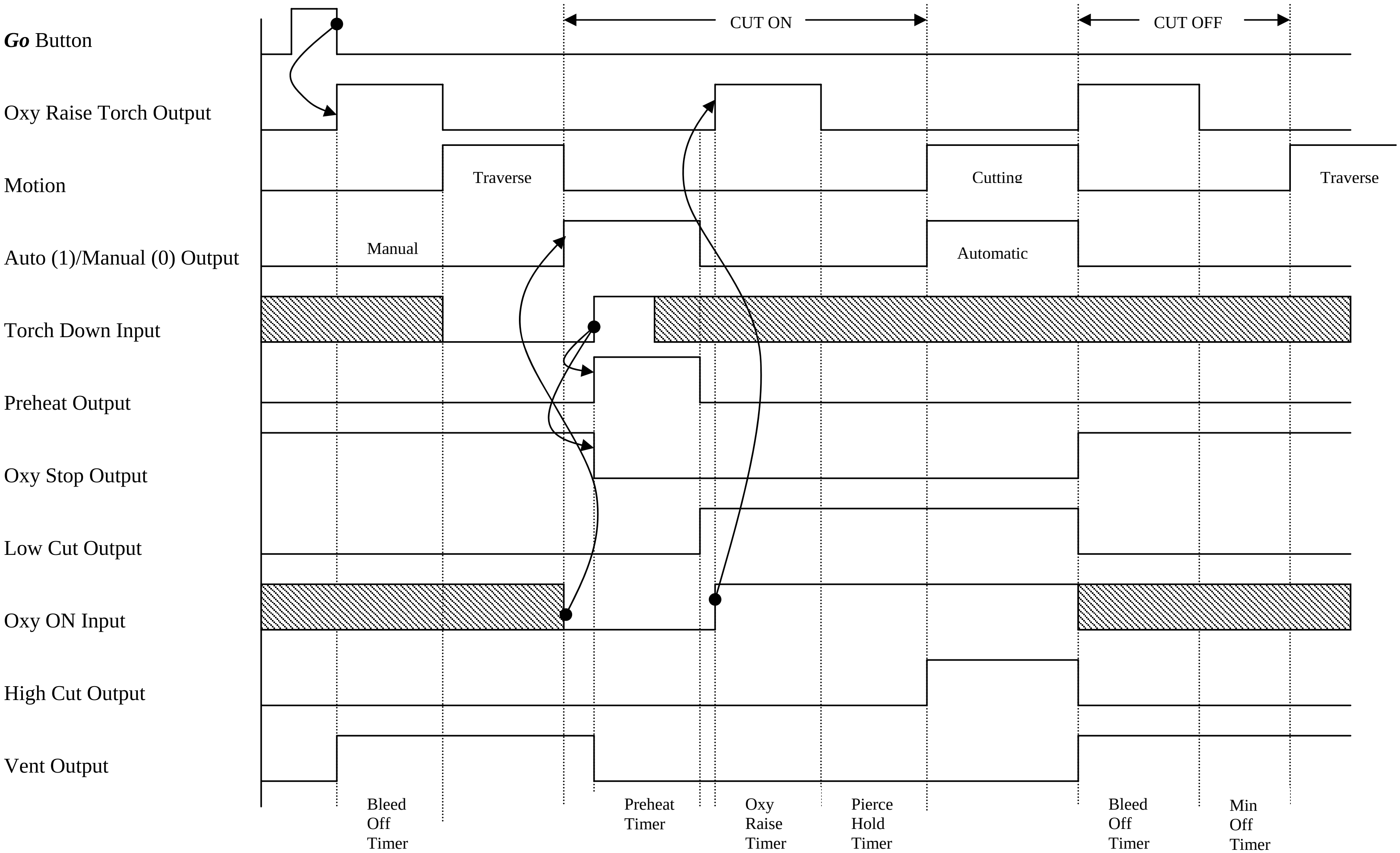
OXY/FUEL I/O SIGNALS

Description	Connection for Standard Back Panel	Connection for OEM Back Panel Card MO-12839	Comments
Oxy Raise Torch Output	31RECP 32, 33	31RECP 16(+), 35(-)	General Purpose Output #8
Oxy Torch Auto/Man Mode Output	31RECP 25, 31	31RECP 15(+), 34(-)	General Purpose Output #7 Automatic = ON, Manual = OFF
Oxy Torch Down Input	32RECP 2, 7	32RECP 3, 22	Aux Input #1 = ON = Torch is down. This input may be permanently force ON.
High Cut Output	31RECP 7, 12	31RECP 14(+), 33(-)	General Purpose Output #6
Vent Output	31RECP 24, 30	31RECP 13(+), 32(-)	General Purpose Output #5
Oxy Cut On Input	32RECP 10, 23	32RECP 1,20	
Preheat Output	32RECP 21, 22	32RECP 12(+), 31(-)	
Oxy Enable Output	32RECP 4, 8	32RECP 10(+), 29(-)	
Oxy Start (ON) Output Low Cut Output	32RECP 32, 37	32RECP 11(+), 30(-)	

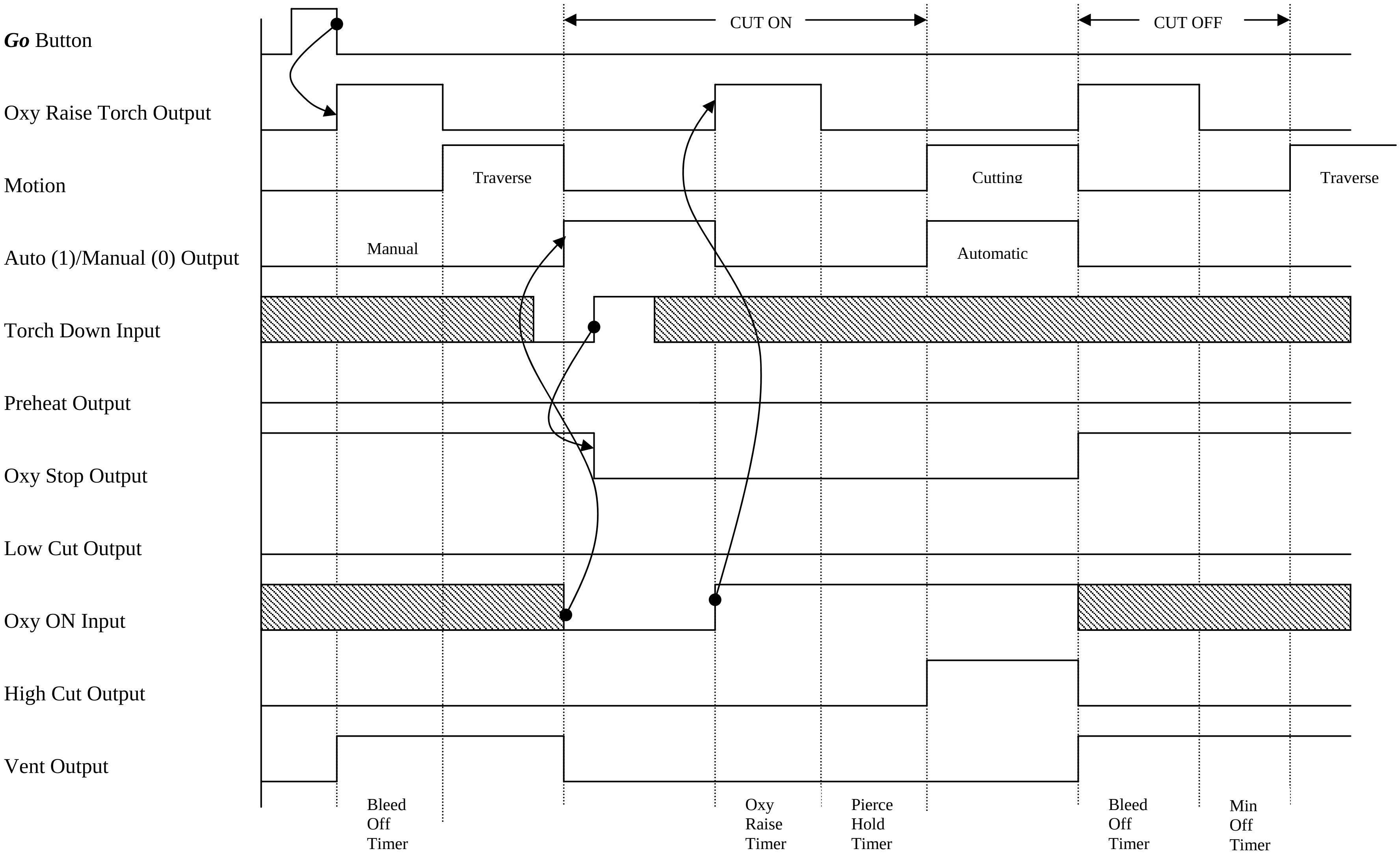
PLASMA I/O SIGNALS

Description	Connection for Standard Back Panel	Connection for OEM Back Panel Card MO-12839	Comments
Plasma Raise Torch Output	31RECP 6, 11	31RECP 17(+), 36(-)	General Purpose Output #3
Plasma Torch Auto/Man Mode Output	31RECP 10, 17	31RECP 18(+), 37(-)	General Purpose Output #4 Automatic = ON, Manual = OFF
Plasma Torch Down Input	32RECP 20, 27	32RECP 4, 23	Aux Input #2 = ON = Torch is down. This input may be permanently force ON.
Plasma Enable Output	31RECP 3, 4	31RECP 9(=), 28(-)	
Plasma Start Output	31RECP 21, 22	31RECP 10(+), 29 (-)	
Plasma Arc On Input	31RECP 16, 29	31RECP 2, 21	
Plasma Select Input	31RECP 5, 18	31RECP 1, 20	
Height Sensor Disable Output	31RECP 36, 37	31RECP 11(+), 30(-)	

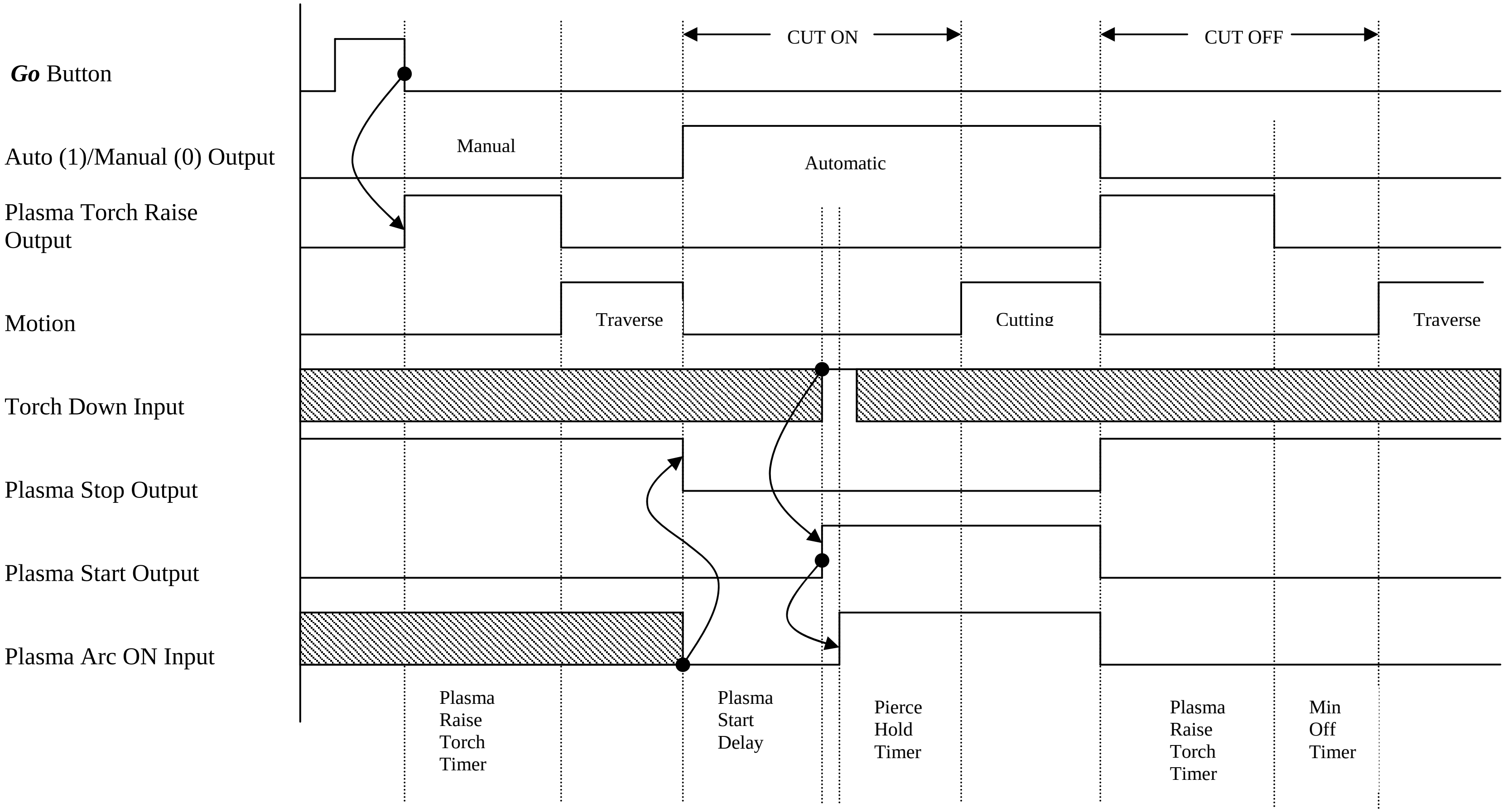
SPECIAL OPERATION #1 OXY/FUEL AUTOMATIC MODE CUTTING TIMING CHART



SPECIAL OPERATION #1 OXY/FUEL MANUAL MODE CUTTING TIMING CHART



SPECIAL OPERATION #1 PLASMA CUTTING TIMING CHART



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11B.13 WATER JET CUTTING INTRODUCTION

This section describes the water jet cut logic used in the Burny Series 10 controllers. The water jet cut logic handles different water jet cut process sequences including the use of water, abrasive, low pressure and “rapid” piercing. The process supports turning on and off the water and abrasive in different orders with appropriate timers/delays to assist in the piercing process as well as prevention of tip clogging.

Low pressure piercing is supported such that the control sequence will turn on the low pressure at the appropriate time as well as turning it off during the cutting process. There is capability to manually turn the low pressure on and off.

Rapid piercing refers to a circular motion that is executed during the piercing process. There are parameters to define the radius of the circular motion, the speed and the duration of the “rapid” pierce.

The cut logic supports Automatic and Manual modes. In Manual mode, the part program is responsible for turning on and off the water, abrasive and low pressure outputs via the part program or other means. In Manual mode, there are provisions to define stopping and starting sequences so the operator can us the ***Stop*** and ***Go*** buttons to stop and continue cutting.

Automatic mode allows the entire cut process to be controlled by the Burny. This includes controlling the low pressure, water and abrasive turning on and off. There are a variety of machine setup and job setup parameters that provide customization of the sequencing.

Timing diagrams that depict the On and Off sequences are included later in this section.

INPUTS AND OUTPUTS

Following is a list of outputs that are used during the waterjet process and their connection points. Refer to appropriate manual for physical connector and pin designations.

Description	Connection Point	Comments
Cut On Output	Oxy Start	Water ON and OFF control.
Cut Stop Output	Oxy Stop	Inhibits the water and abrasive from turning on.
Abrasive Output	Preheat	Abrasive ON and OFF control.
Low Pressure Output	Marker 1	Low pressure ON and OFF control.
Cut On Sense	Oxy Sense In	Water ON status.
Plasma Select Input	Plasma Select	Plasma process selected (ON), otherwise Waterjet or Oxy.

MACHINE PARAMETERS

The machine parameters pertaining to waterjet are setup in the Utilities Motion Parameters.

Description	Location	Comments
Rapid Pierce Radius	Machine Parameters	This is the radius of the “circular” motion during Rapid Piercing.
Rapid Pierce Velocity	Machine Parameters	This sets the velocity of the Rapid Piercing motion.
Pressure Bleed Down	Machine Parameters	This timer is executed during an automatic cut off sequence if low pressure piercing is being used.

JOB SETUP PARAMETERS

This section describes the parameters that are available for a specific waterjet job.

Description	Location	Comments
Process	Run02 / Job04	Selects the cut process. The selections can two of Plasma, Oxy/Fuel or Waterjet.
Cut Mode	Run02 / Job04	Selects the cut mode. The selections are Manual, Automatic, Single Step Test Run, and Continuous Test Run.
Pierce Hold	Run05 / Job06	Pierce Hold time in seconds.
Pierce Ramp	Run05 / Job06	Pierce Ramp time in seconds.

Low Pressure Piercing	Run05 / Job06	Set ON if low pressure piercing is desired. Set OFF otherwise.
Low Pressure control	Run05 / Job06	This touchpad turns the Low Pressure output ON and OFF.
Rapid Pierce	Run05 / Job06	The time in seconds that the Rapid pierce circular motion executes.
Start Sequence turn ON first	Run05 / Job06	This identifies the first cut medium turned ON in response to the ***Go*** button in Manual mode or a Cut On M-Code in Automatic mode. The selections are Water Only, Water First, and Abrasive First.
Start Sequence ON Delay	Run05 / Job06	The amount of time between turning ON the first and second cut medium.
Stop Sequence turn OFF first	Run05 / Job06	This identifies the first cut medium to turn OFF in response to the ***Stop*** button in Manual mode or a Cut Off M-Code in Automatic mode. The selections are Water First and Abrasive First.
Stop Sequence OFF delay	Run05 / Job06	The amount of time between turning OFF the first and second cut medium.

WATER JET MANUAL MODE

When in water jet, manual mode, the operator or the Part Program controls the water, low pressure and abrasive outputs. The controller responds to Part Program M-Codes as follows.

Word Address	ESSI	Description	Action
M03	08	Cut Off.	1. This turns OFF the Cut Stop output and the Cut Start Output. 2. Executes the Bleed Off delay, if any. 3. Executes the Min Off delay, if any.
M04	07	Cut On.	This causes the controller to 1. Wait for the Cut Sense Input to be off. 2. Turns ON the Cut Stop, turns ON the Cut Start. 3. Waits for the Cut Sense input to be ON.
M245	245	Aux Output #1 ON	This turns ON the Abrasive output, which is assigned to the “Preheat” output.
M246	246	Aux Output #1 OFF	This turns OFF the Abrasive output, which is assigned to the “Preheat” output.
M249	249	Aux Output #3 ON	This turns ON the Low Pressure output, which is assigned to the “Marker 1” output.
M250	250	Aux Output #3 OFF	This turns OFF the Low Pressure output, which is assigned to the “Marker 1” output.

START AND STOP SEQUENCES

The controller assists in the safe stopping and re-starting of the cut process. The operator can setup up “Stop” sequences that turn off the water or abrasive first, perform a delay then turn off the other cutting medium. The operator can also set up the “Start” sequence to turn on water or abrasive, perform a delay then turn on the other cutting medium.

With these sequences set, the operator can press the ***Stop*** button which when pressed executes the “Stop” sequence. When the subsequent ***Go*** button is pressed to continue cutting, the “Start” sequence is performed.

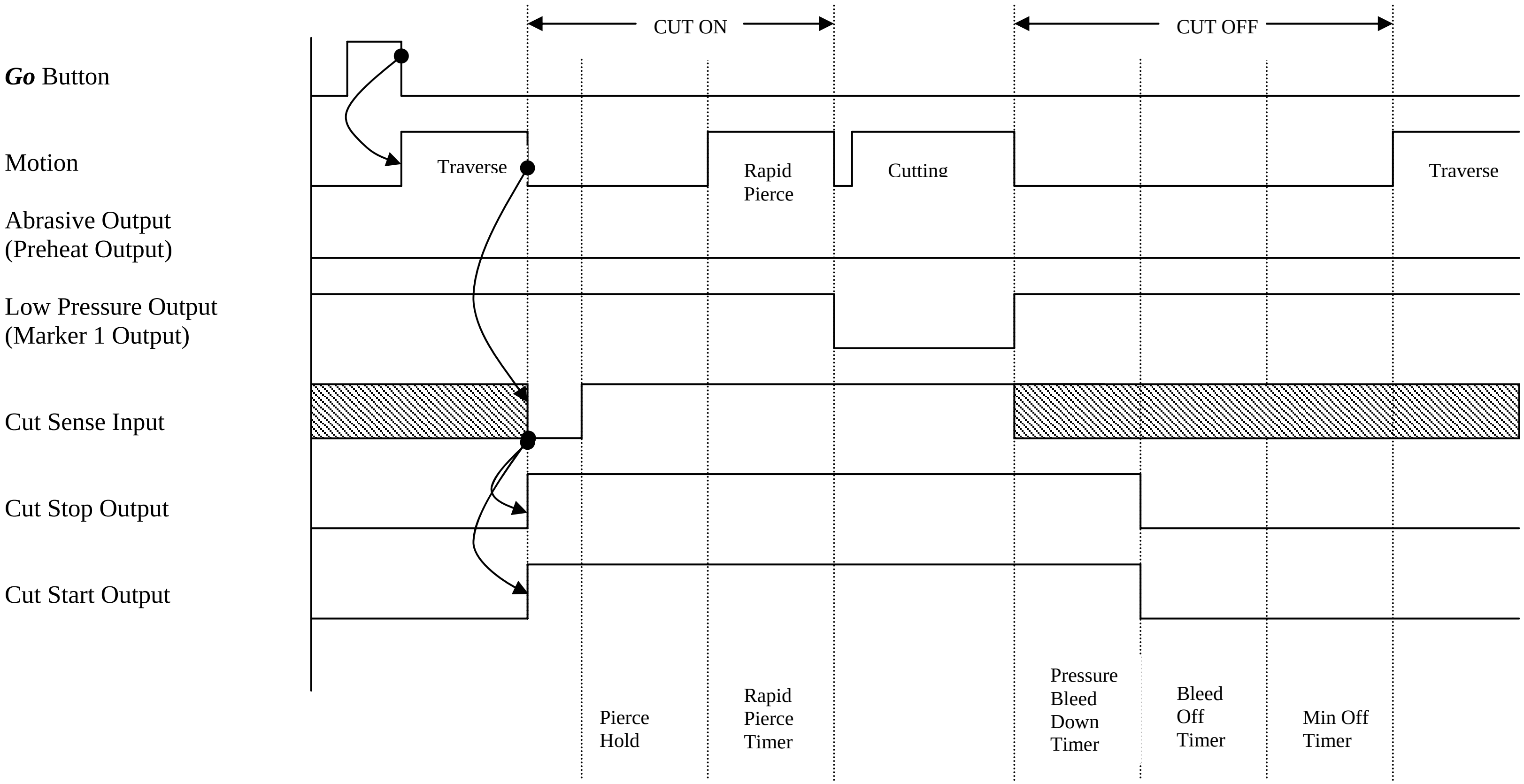
TIMING DIAGRAMS

The following timing diagrams depict typical sequences including input, output and timers/delays. The diagrams depict sequences when all related timers/delays have non-zero values. If any or all of these timers/delays are set to 0, the input signals are still evaluated and the output signals are still controlled, however, the time/delay is not performed.

WATER JET AUTOMATIC MODE CUTTING TIMING CHART

Low Pressure	**ON**
Start Sequence	**Water Only**
Stop Sequence	**N/A**

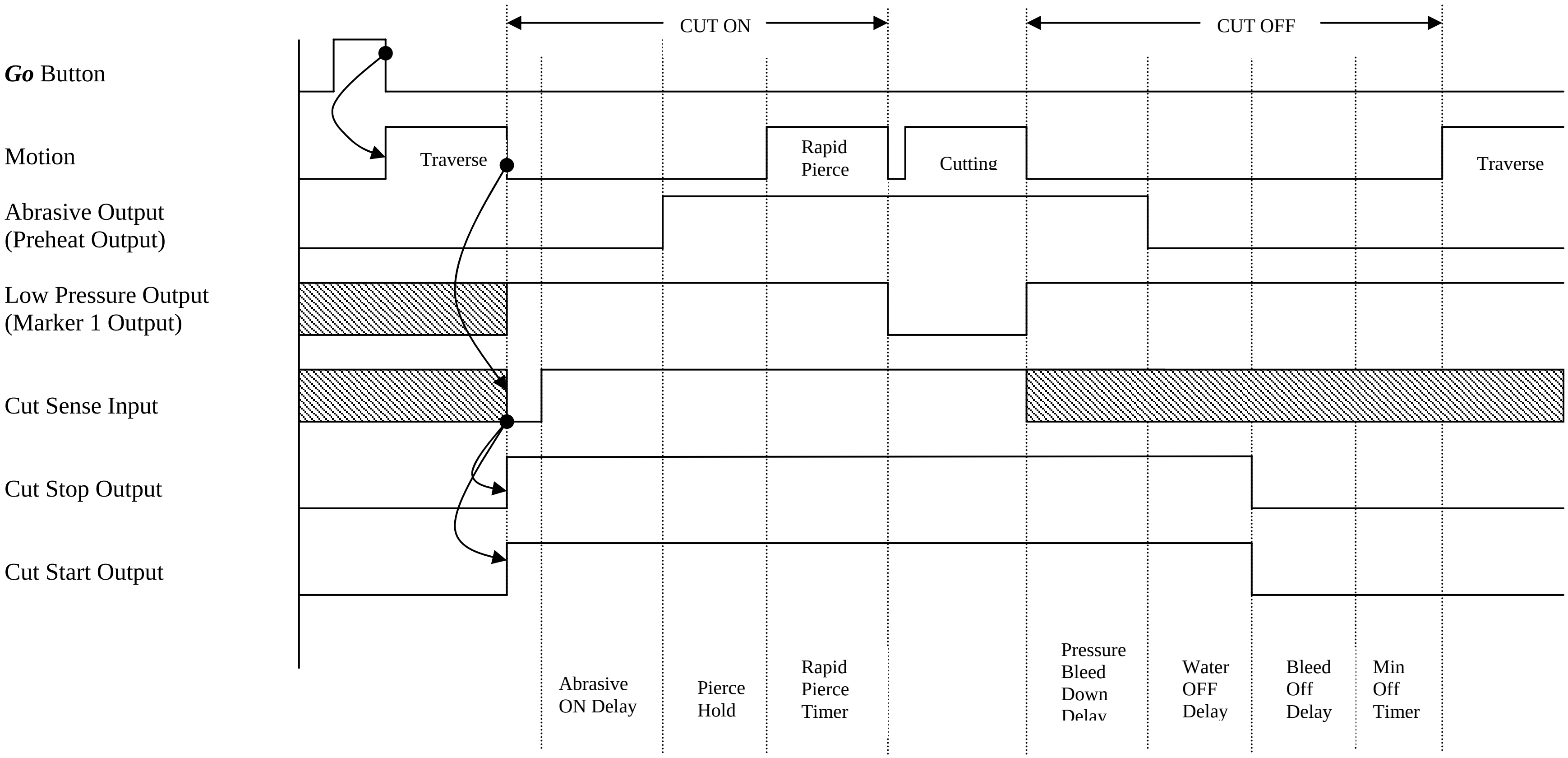
This diagram shows the Pierce Hold, Rapid Pierce, Pressure Bleed Down, Bleed Off, and Minimum Off timers as being non-zero values.



WATER JET AUTOMATIC MODE CUTTING TIMING CHART

Low Pressure	**ON**
Start Sequence	**Water First**
Stop Sequence	**Abrasive First**

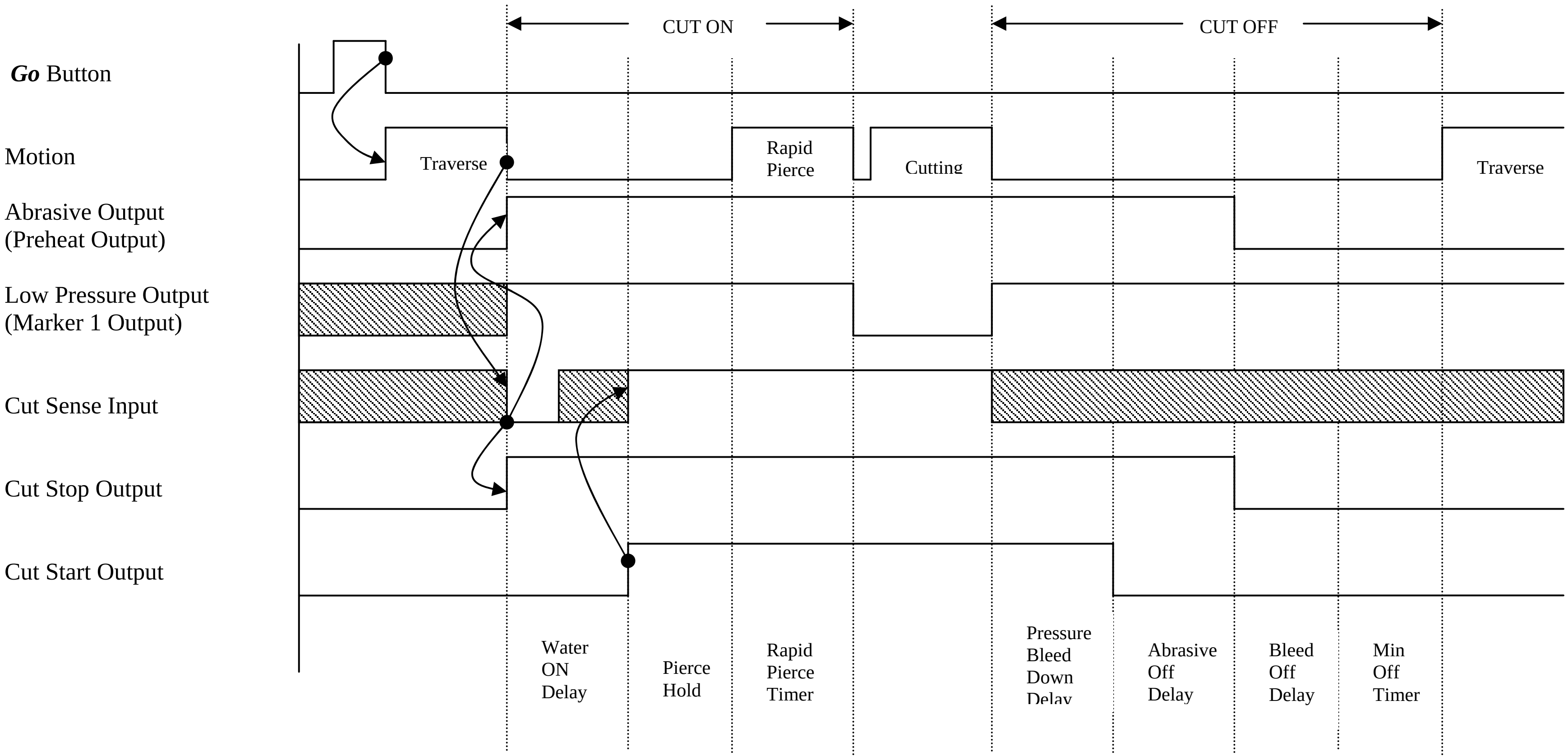
This diagram shows the Pierce Hold, Rapid Pierce, Pressure Bleed Down, Bleed Off, Minimum Off, Abrasive ON Delay and Water OFF Delay timers as being non-zero values.



WATER JET AUTOMATIC MODE CUTTING TIMING CHART

Low Pressure	**ON**
Start Sequence	**Abrasive First**
Stop Sequence	**Water First**

This diagram shows the Pierce Hold timer, Rapid Pierce, Pressure Bleed Down, Bleed Off, Minimum Off, Water ON Delay and Abrasive OFF Delay timers as being non-zero values.



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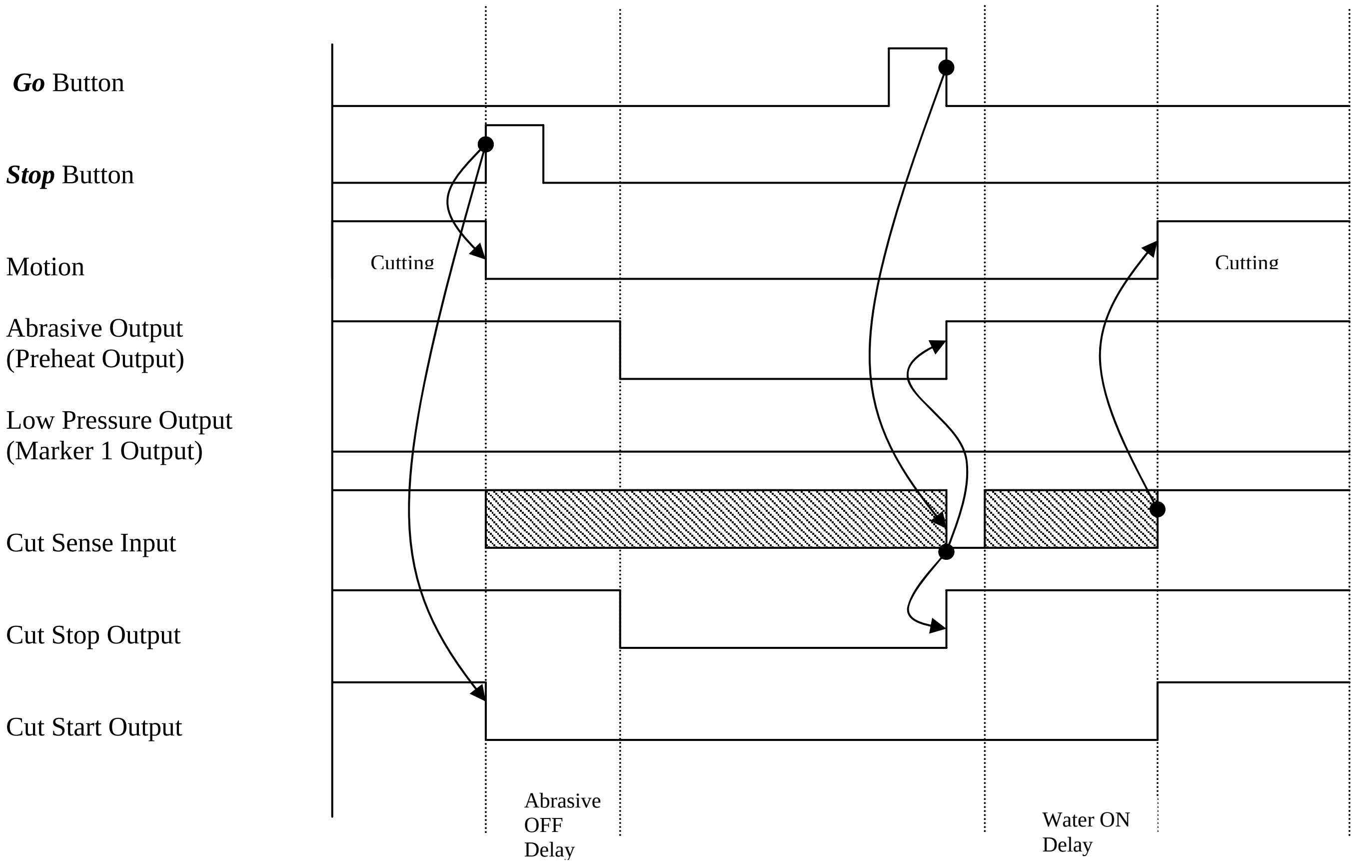
WATER JET STOPPING/RESTARTING TIMING CHART

The following diagram depicts the sequence that occurs when the <Stop> button is pressed and the sequence when the <Go> button is pressed after the stop sequence is performed. This sequence applies in both Automatic and Manual Modes. In both modes the “Stop” sequence is performed only if both the water and abrasive outputs have been turned on.

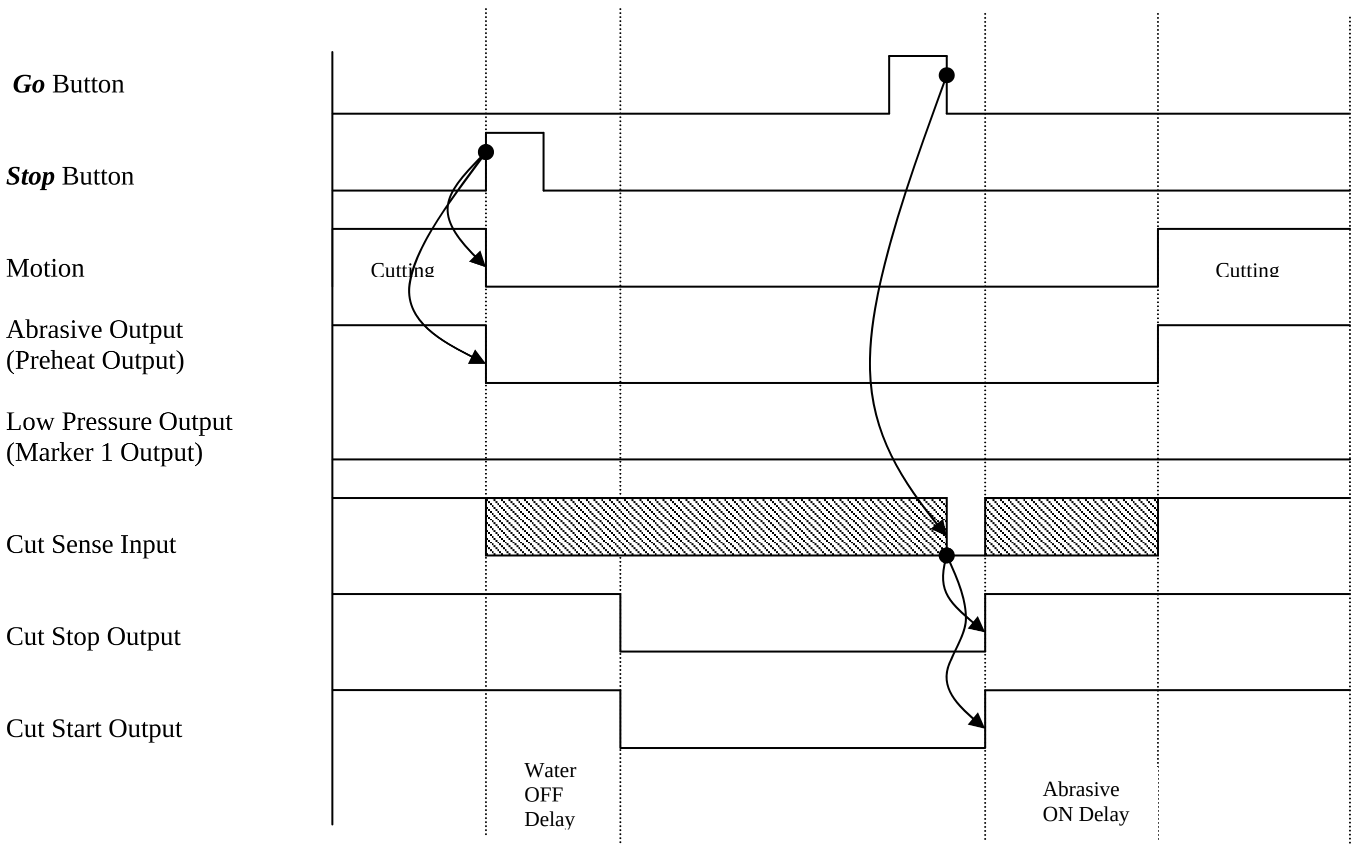
Low Pressure	**ON/OFF**	**This diagram shows the Water ON Delay and Abrasive OFF Delay timers as being non-zero values.**
Start Sequence	**Abrasive First**	
Stop Sequence	**Water First**	



WATER JET STOPPING/RESTARTING TIMING CHART

The following diagram depicts the sequence that occurs when the <Stop> button is pressed and the sequence when the <Go> button is pressed after the stop sequence is performed. This sequence applies in both Automatic and Manual Modes. In both modes the “Stop” sequence is performed only if both the water and abrasive outputs have been turned on.

Low Pressure	**ON/OFF**	**This diagram shows the Water ON Delay and Abrasive OFF Delay timers as being non-zero values.**
Start Sequence	**Water First**	
Stop Sequence	**Abrasive First**	



11B.14 MOTION TROUBLESHOOTING

1. Disengage the pinions from the rack.

2. Change FollowingErrorLim and Stop Following Error to 100 on both axes.

3. If rack mounted encoders are used, skip to step 5. Otherwise, continue to step 4.

4. Jog again and observe Amp Output on the check screen.
   - A 10V reference with the motor not turning indicates a motor, drive or cable problem. See these specific troubleshooting items listed below.
   - A 10V reference with the motor running fast may indicate a problem with encoder feedback. See these specific troubleshooting items listed below.
   - A 10V reference near or at full speed indicates a speed scaling problem. Confirm that the drives run at full speed with no more than 9.5V.
   - An oscillating motor may indicate a motor tachometer problem.

5. Temporarily put both axis in "Partial OpenLoop" by setting the following parameters:
   - DefaultAff 0
   - DefaultDGain 0
   - DefaultIGain 0
   - DefaultPGain 0
   - DefaultVff Do not change
   - FollowingErrorLim 100 (already done in step 2)
   - Stop Following Error 100 (already done in step 2)

Jog in all directions and check for drive drift, correct rotation and proper speeds.

ENCODER TROUBLESHOOTING

- Does the X, Y and XX position display change? (use the I/O Status screen to observe the XX encoder pulses or Dictionary Viewer to see the XX Axis Position)
- Is the encoder turning? Check for loose set screws, belts etc. Check for a faulty encoder cable. Confirm proper setting of back panel encoder DIP switches.
- Use scope or meter to check for proper encoder signals

MOTOR / DRIVE TROUBLESHOOTING

- Check for any fault indicators on drive
- Check continuity of armature/tach cable and confirm no shorts to earth ground
- Check motor brushes
- Confirm that tach voltage is present when the motor is rotating

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Replacement Parts
(AO-70355 Rev AA)

Section
12

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

12 REPLACEMENT PARTS

Part Number	Description
MO-14082	Burny 10 LCD Plus Front Panel Assembly
MO-13022	Burny PCI I/O Card, Gen II, Four Axis
MO-13008	Burny 10 LCD Gen II Standard Back Panel Assembly
MO-12960	Burny 10 LCD Gen II Back Panel Card
MO-13018	Burny 10 LCD Gen II Auxiliary I/O Kit
MO-14128	Burny 10 LCD Plus Fan Assembly, with anti-vibration
MO-13260	Burny 10 LCD Plus, Switch Interface card and kit for remote pendant applications
MO-13230	Speed Pot Option Kit
MO-14471	Pre-Programmed SATA Hard Drive for B10 LCD PLUS 5.X Platform **Specify Unit Reference Number with Sales Order.
MO-13229	Burny 10 LCD Plus Membrane Switch Panel/5-Wire Touch Screen Kit
MO-13217	PS/2 and USB Option Kit
X44-33089	LCD Inverter Power Supply
X44-34413	Display, 15” TFT, 250NIT, Active, LVDS
C44-37416	Inverter/LVDS Data Cable
X44-32639	Power Supply, ATX 12V, 250W 115/230VAC
X44-29385	Floppy Disk Drive, 3.5”
X44-32199	Power Supply, +5, +24, +15, -15VDC **Order X10-00067, X12-00002, X12-00029, X19-34001, and X29-30775 with power supply.
X44-37441	CPU, Intel Pentium M 1.8GHZ ROHS Compliant
MO-14472	Kit, Motherboard, Burny 10 LCD PLUS, KONTRON, 886LCD-M/FLEX, Replacement
X44-37787	DDR Ram, PC2700, 1GB

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DRAWING INDEX

(AO-70352 REV AA)

SECTION

13

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

13 DRAWING INDEX

Drawing #	Part #	Description
AO-72102		Customer Instructions, ground strap installation
AO-72103		Customer Instructions, Encoder cable ground installation
AO-72104		Customer Instructions, Servopak motor/tach ground
AO-72105		Customer Instructions, Cable to Cabinet ground installation
AO-72106		Customer Instructions, Motor cable ground installation
AO-72107		Customer Instructions, Encoder connector Shield installation
AO-72108		Customer Instructions, Tracer connector Shield installation
AO-73389	MO-12347	B10 AC power connector kit. When used with Burny Operators' Console, power must go to 32 Recp pins directly from a 115 / 230 VAC source. You cannot connect to the Burny Op Con power terminal block as is done with the Burny 3 and Burny 5.
CO-10349	MO-12247-0XX	Cable B10 to Servopak 3-axis using B10 digital sync
CO-10391	MO-12513-0XX	Cable B10 with Burny Operators' Console to Servopak 2-axis or 3-axis with resolver sync" Servopak 2-axis or 3-axis with resolver sync
CO-10392	MO-12514-0XX	Cable B10 with Burny Operators' Console to Servopak 3-axis using B10 digital sync
CO-21749	MO-12512-0XX	Cable B10 power / oxy interface (Not used with Burny Operators' Console)
CO-21657	MO-12249-0XX	Cable B10 plasma interface (Not used with Burny Operators' Console)
DO-21685	MO-12342-0XX	Cable B10 to Servopak 2-axis or 3-axis with resolver sync" resolver sync
DO-21810 DO-10465 DO-10464	MO-12799	Burny 10 LCD to Burny Operator's Console connection kit
DO-10665		Assembly Drawing, Burny 10 LCD Plus Front Panel
DO-10666		Assembly Drawing, Burny 10 LCD Plus Cabinet
DO-10680		Assembly Drawing, Burny 10 OEM Plus Front to Back Panel
DO-90321		Burny 10 LCD Plus Mounting Pattern
DO-90322		Burny 10 LCD Plus Front Panel Mounting Pattern
DO-90392		Burny 10 LCD Plus 5.X System Diagram
DO-31181		Burny 10 OEM Wiring Diagram Back Panel

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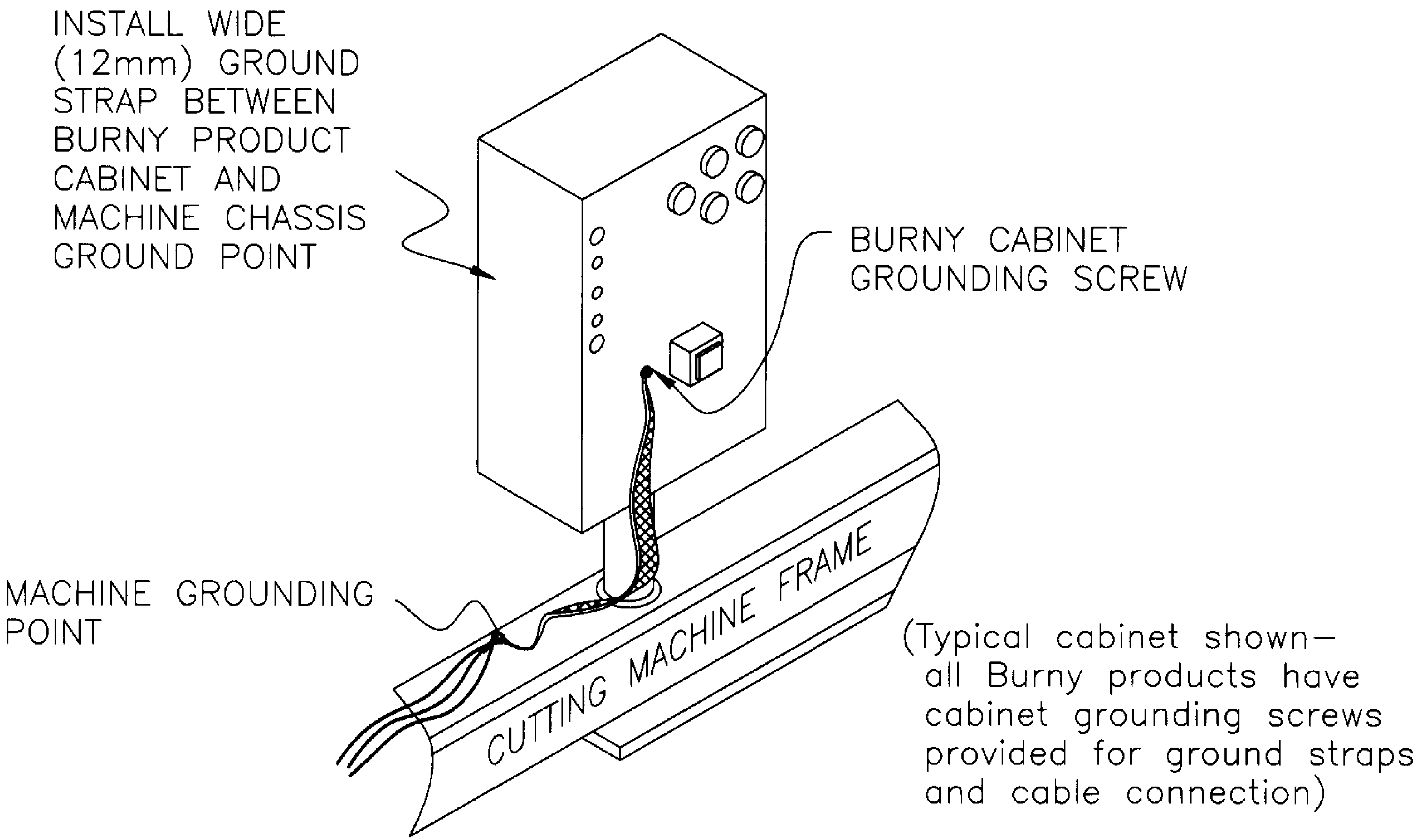

SYM	REVISION	ECO	BY	DATE
F				
E				
D				
C				
B				
A	RELEASED		KJB	12-95

TOLERANCES
(EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

CUSTOMER INSTRUCTION
GROUND STRAP INSTALLATION

CAD DWG NO. : DXXX-XXXXX_X.DWG		SIZE	DRAWING NUMBER	REV
DRAWN BY KJB	APPROVED BY KJB	A	AO-72102	A
DATE 12/12/95	DATE 12/95	SHEET 1 OF 1		

MATERIAL	FINISH	SCALE	REF
NOTE	NOTE	1 : 1	

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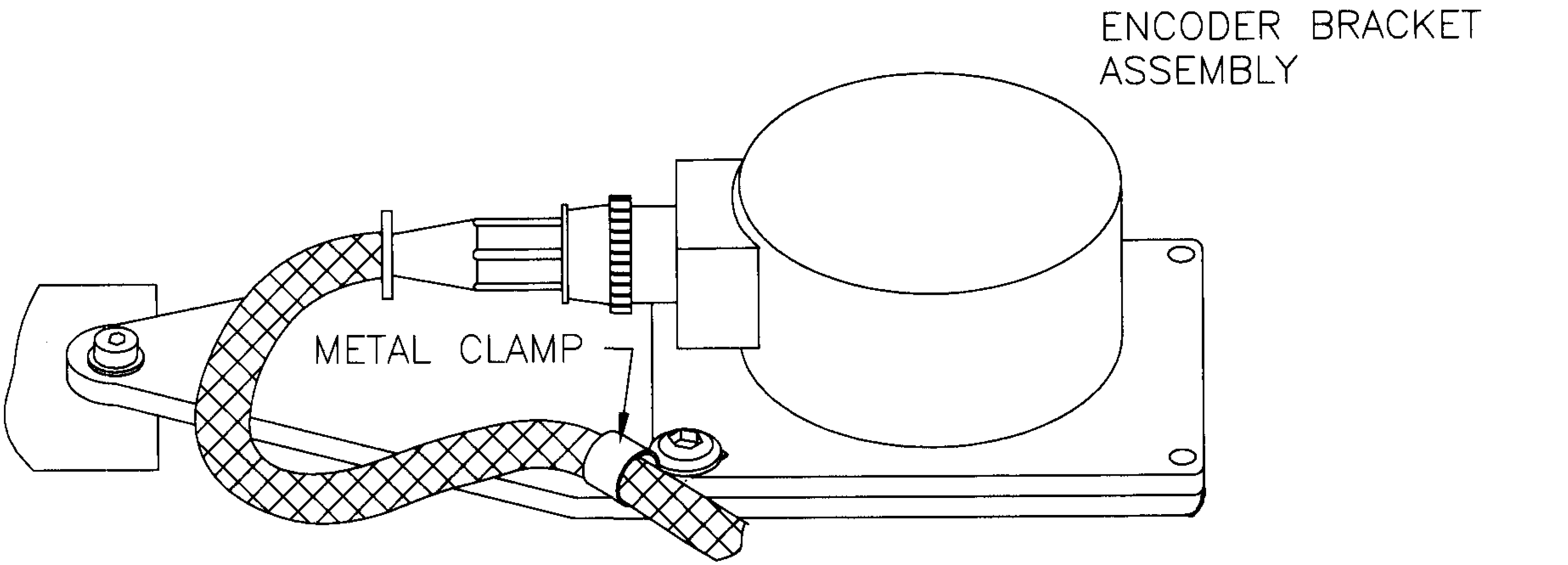


GROUND EXTERNAL CABLE SHIELD TO ENCODER BASE
USING EXISTING HARDWARE AND 360° METAL CLAMP

METAL CLAMPS PROVIDED WITH
ALL BURNY CABLE ASSEMBLIES

SYM	REVISION	ECO	BY	DATE
F				
E				
D				
C				
B				
A	RELEASED		KJB	12-95

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

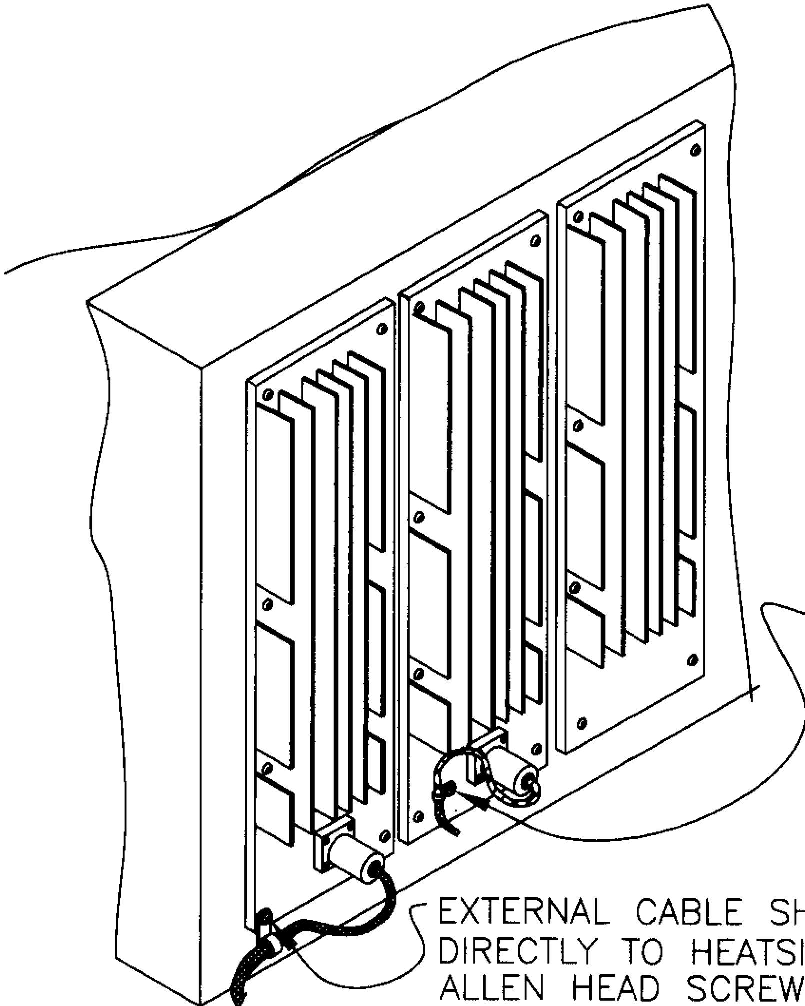
Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

RACK MOUNTED ENCODER CABLE GROUND CLAMP INSTRUCTIONS

MATERIAL	FINISH	SCALE	REF
NOTE	NOTE	1 : 1	

CAD DWG NO.	DRAWN BY	APPROVED BY	DATE	DATE	SIZE	DRAWING NUMBER	REV
DXXX-XXXXX_X.DWG	KJB	KJB	12/95	12-95	A	A0-72103	A

SHEET 1 OF 1



TYPICAL BACKPANEL ON BURNY 2.8
OR SERVOPAK 150.

NEW HEATSINK HAS CABLE
GROUNDING SCREW PROVIDED – IF
PRESENT,THIS SCREW SHOULD BE
USED TO CONNECT EXTERNAL BRAID
TO HEATSINK

EXTERNAL CABLE SHIELD GROUNDED
DIRECTLY TO HEATSINK BY EXISTING
ALLEN HEAD SCREW WITH 360° METAL
CABLE CLAMP– ADD FLAT WASHER IF
NECESSARY

METAL CLAMPS PROVIDED WITH
ALL BURNY CABLE ASSEMBLIES.

SYM	REVISION	ECO	BY	DATE
F				
E				
D				
C				
B				
A	RELEASED		KJB	12-95

TOLERANCES
(EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

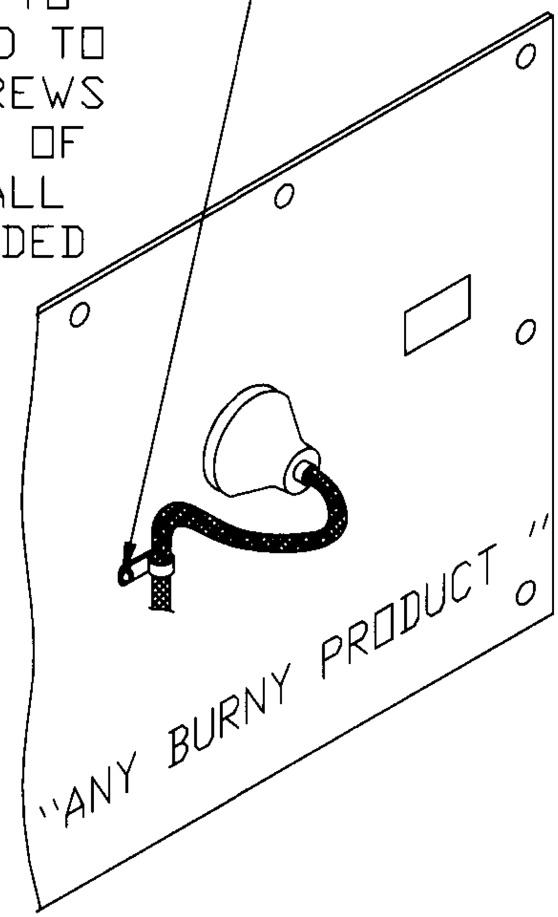
ServoPak MOTOR/TACH. GROUND

MATERIAL	FINISH	SCALE	REF
NOTE	NOTE	1 : 1	

CAD DWG NO. : DXXX-XXXXX_X.DWG		SIZE	DRAWING NUMBER	REV
DRAWN BY KJB	APPROVED BY KJB	A	AO-72104	A
DATE 12-95	DATE 12-95	SHEET 1 OF 1		

USE 360° METAL CLAMP TO GROUND EXTERNAL BRAID TO CABINET GROUNDING SCREWS PROVIDED ON THE BACK OF ALL BURNY PRODUCTS. ALL CABLES MUST BE GROUNDED IN THIS FASHION

METAL CLAMPS PROVIDED WITH ALL BURNY CABLE ASSEMBLIES



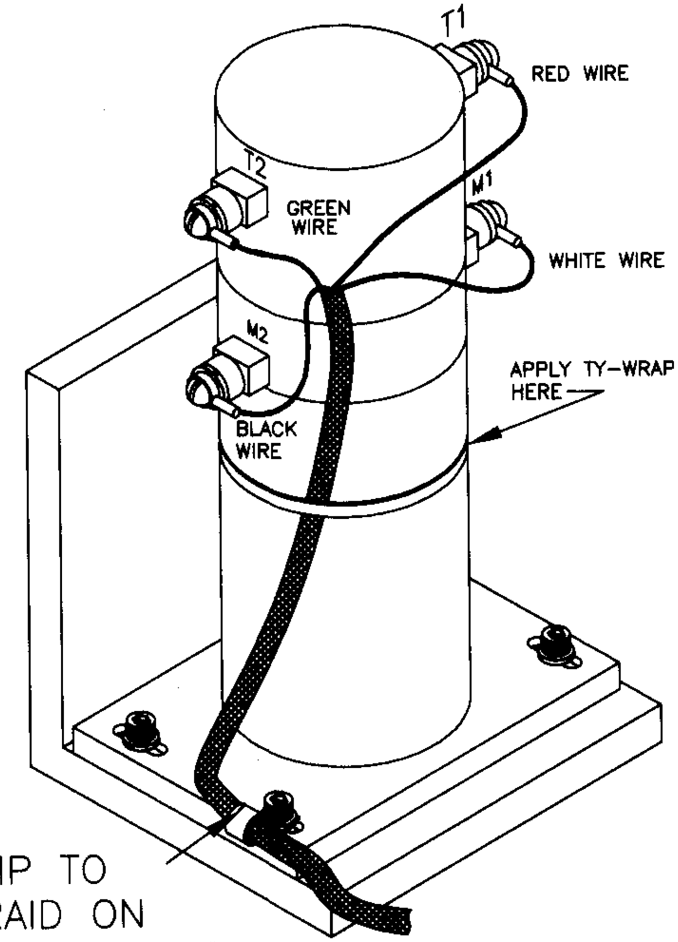
SYM	REVISION	ECO	BY	DATE
F				
E				
D				
C				
B				
A	RELEASED		KJB	12-95

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

CABLE GROUND TO BACK OF CABINET

CAD DWG NO. : DXXX-XXXXX_X.DWG	SIZE: A	DRAWING NUMBER: AO-72105	REV: A
DRAWN BY: KJB	APPROVED BY: KJB		
DATE: 12-95	DATE: 12-95	SHEET 1 OF 1	
MATERIAL: NOTE	FINISH: NOTE	SCALE: 1 : 1	REF:



USE 360° METAL CLAMP TO GROUND EXTERNAL BRAID ON MOTOR/TACH. CABLE TO ONE OF THE SCREWS ON THE MOTOR MOUNTING PLATE AS SHOWN

METAL CLAMPS PROVIDED WITH ALL BURNY CABLE ASSEMBLIES

SYM	REVISION	ECO	BY	DATE
F				
E				
D				
C				
B				
A	RELEASED		JB	12-95

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

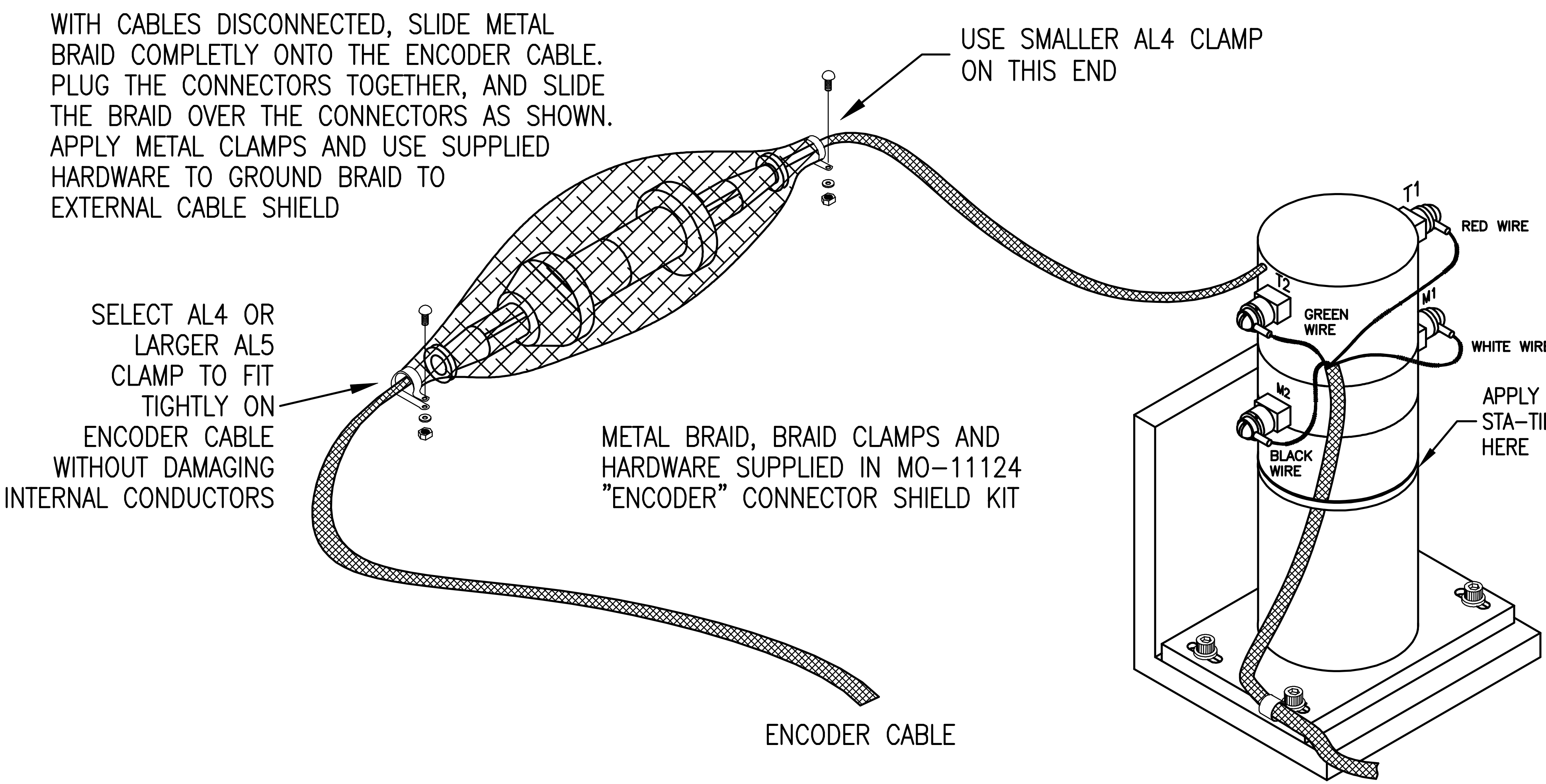
Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

MATERIAL	FINISH	SCALE	REF
NOTE	NOTE	1 : 1	

MOTOR CABLE GROUND CLAMP INSTALLATION (2630)

CAD DWG NO. : DXXX-XXXXX_X.DWG

DRAWN BY	APPROVED BY	SIZE	DRAWING NUMBER	REV
KJB	KJB	A	AO-72106	A
DATE 12-95	DATE 12-95	SHEET 1 OF 1		



SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA	NOTE AL4 OR AL5 CLAMP	CLE2758	RDM	03/04
AA	AS RELEASED	KJB	KJB	12/95

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

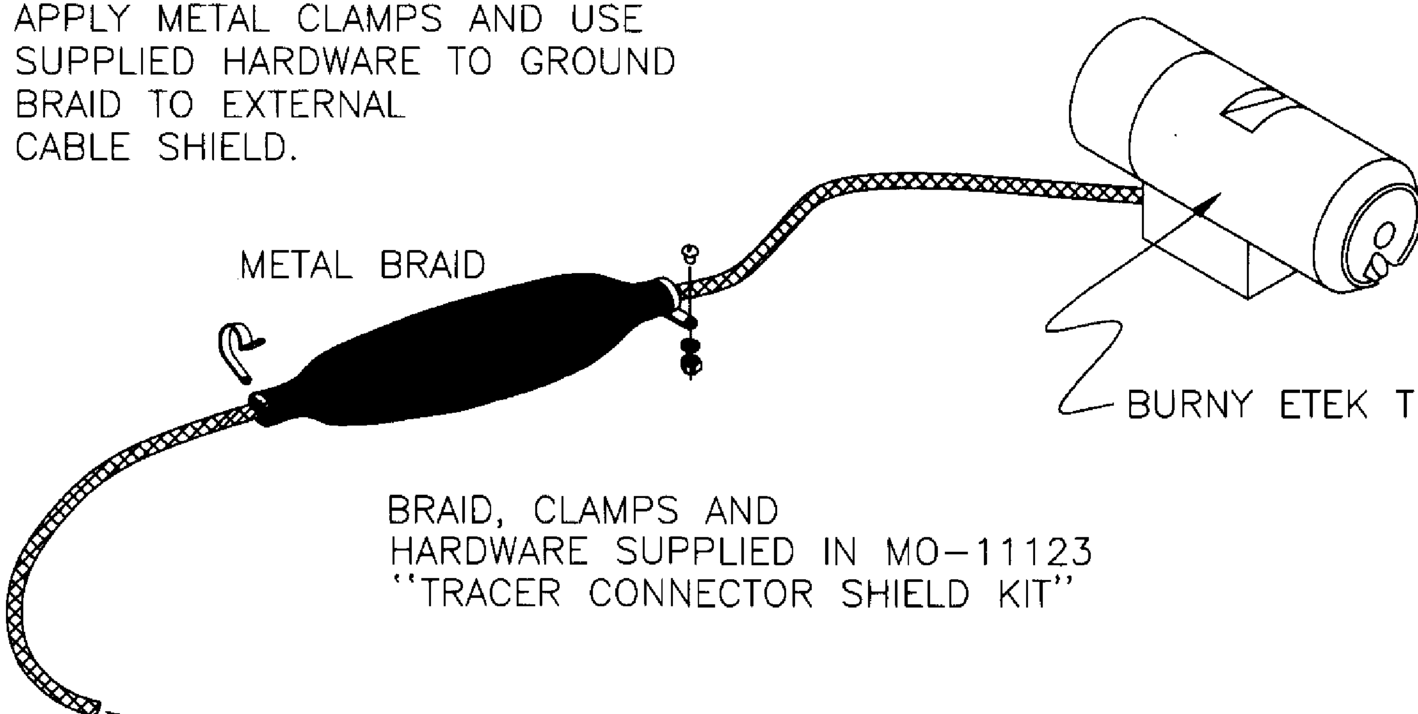
MATERIAL	FINISH	SCALE	REF

CUSTOMER INSTRUCTIONS ENCODER CONNECTOR SHIELD INSTALLATION

CAD DWG NO. : AO-72107BA.DWG

DRAWN BY	APPROVED BY	SIZE	DRAWING NUMBER	REV
KJB	KJB	A	AO-72107	BA
DATE 12-95	DATE 12-95	SHEET 1 OF 1		

WITH CABLES DISCONNECTED,SLIDE METAL
BRAID COMPLETLY ONTO THE TRACER CABLE.
PLUG THE CONNECTORS TOGETHER,AND
SLIDE THE BRAID OVER THE CONNECTORS
AS SHOWN.
APPLY METAL CLAMPS AND USE
SUPPLIED HARDWARE TO GROUND
BRAID TO EXTERNAL
CABLE SHIELD.



SYM	REVISION	ECO	BY	DATE
F				
E				
D				
C				
B				
A	REV. KIT No.& CHG.No.	11478	KJB	12-95

TOLERANCES
(EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

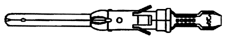
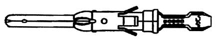
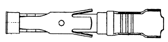
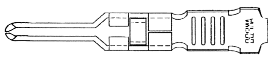
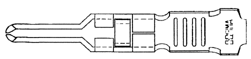
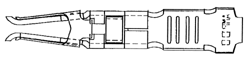
CUSTOMER INSTRUCTION
TRACER CONNECTOR SHIELD

MATERIAL	FINISH	SCALE	REF
NOTE	NOTE	1 : 1	

CAD DWG NO.	DRAWN BY	DATE	APPROVED BY	DATE	SIZE	DRAWING NUMBER	REV	SHEET
DXXX-XXXXX_X.DWG	KJB	12-95	KJB	12-95	A	A0-72108	A	1 OF 1

Customer Instructions for Connector Kits

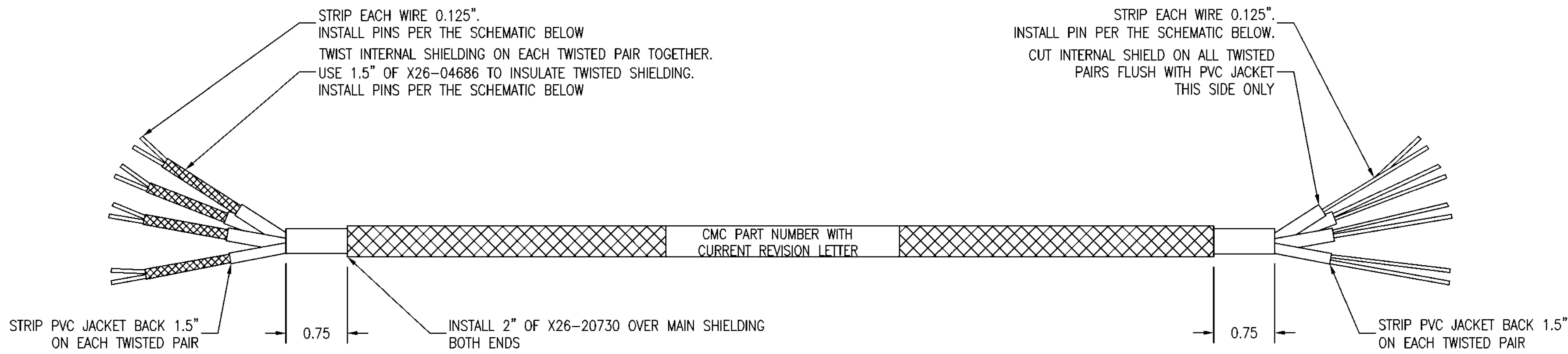
1. This connector kit could contain the following pins. Each pin is listed with its specifications.

Pin Diagram	CMC Part No.	AMP Part No.	Wire Size Range		Insulation Size Range		Hand Crimper	Pin Extractor	Description
			AWG	mm^2	inches	mm			
	X43-29687-1	164164-2	18-16	.8-1.4	.078-.098	1.98-2.49	90067-5	305183-R	Male 10A long pin
	X43-05672-1	66589-1	18-16	.8-1.4	.080-.100	2.03-2.54	90067-5	305183-R	Male 10A short pin
	X43-09105-1	66101-2	18-16	.8-1.4	.080-.100	2.03-2.54	90067-5	305183-R	Female 10A short pin
	X43-26274-1	66428-3	30-26	.05-.15	.040-.060	1.02-2.03			
	X43-29688-1	66262-2	16-12	1.25-3.0	.135-.160	3.43-4.06	90382-2	91019-3	Male 35A long pin
	X43-16790-1	66259-2	10-8	5-6	.190-.220	4.83-5.59	90382-2	91019-3	Male 35A short pin
	X43-24017-1	66261-2	14-12	2-3	.135-.160	3.43-4.06			
	X43-16791-1	66741-6	10-8	5-6	.190-.220	4.83-5.59	90382-2	91019-3	Female 35A short pin
	X43-24018-1	66740-6	14-12	2-3	.135-.160	3.43-4.06			

2. The longer pins are used to terminate the protective conductor circuit (chassis ground), which is usually a green and yellow striped wire. Do not use the longer pins for any lead termination other than chassis ground. The use of this pin creates a make-first break-last connection and is required for European Compliance.

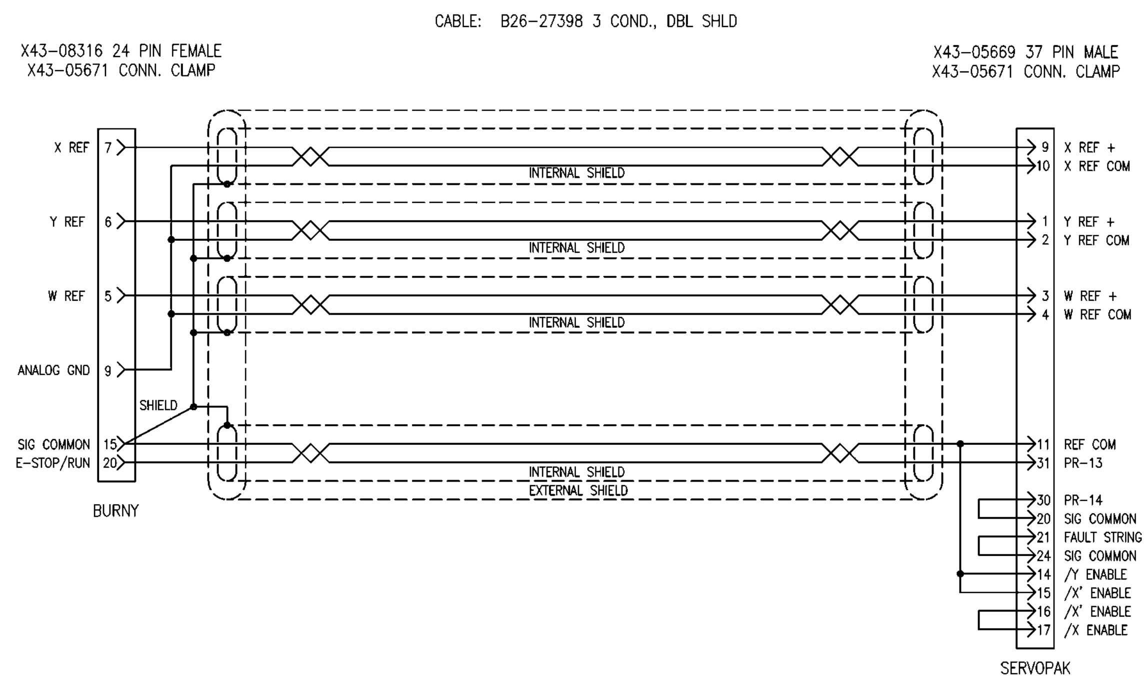
3. Contact AMP for more information on the availability of the crimping tools specified above.

AMP U.S.A.	AMP Japan	AMP Europe
Regional Center Harrisburg, PA U.S.A. Phone: 717-986-0100 Fax: 717-986-7575	**Regional Center** Kawasaki, Kanagawa 213 Japan Phone: 81-44-813-8502 Fax: 81-44-813-8500	**Regional Center** Stoke Poges, SL2 4JL England Phone: 44-753-676-800 Fax: 44-753-676-801



NOTES:

- FOR ALL 22AWG WIRES ON THIS SIDE USE FEMALE PINS, X43-10032-2 (3).
- FOR PIN 9 AND 15 USE FEMALE PINS, X43-09105-2 (2).
- FOR ALL 18AWG WIRES ON THIS SIDE USE FEMALE PINS, X43-09105-2 (1).



NOTES:

- FOR ALL 22AWG WIRES ON THIS SIDE USE MALE PINS, X43-10031-2 (13).
- FOR PINS 11 AND 14 USE MALE PINS, X43-05672-2 (2).
- FOR ALL 18AWG WIRES ON THIS SIDE USE MALE PINS, X43-05672-2 (1).

SYM	REVISION	ECO	BY	DATE
F				
E				
D				
C				
B				
A	RELEASE	----	MMO	01/99

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR ± 0.5°
DO NOT SCALE DRAWING

CMC Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

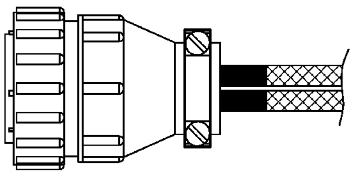
ASSEMBLY,
NT TO SERVOPAK HARNESS

MATERIAL	FINISH	SCALE	REF	DATE	DATE
			MO-12247-TAB	12-21-98	01-05-99

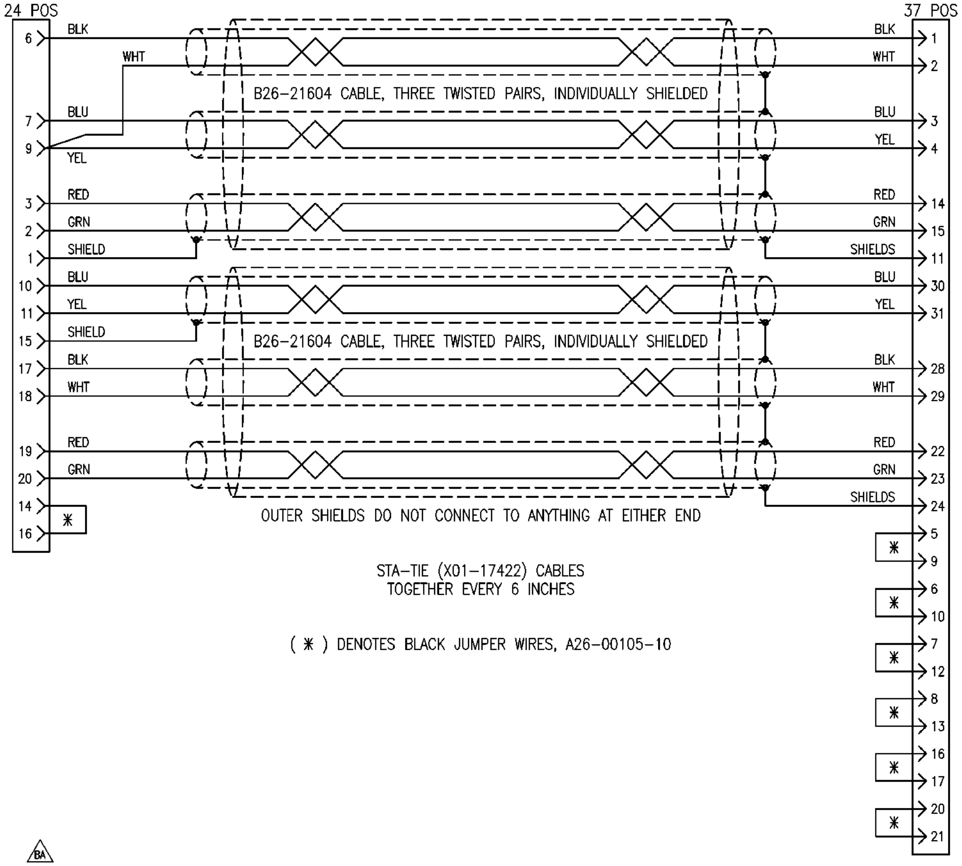
CAD DWG NO. : CO-10349A.DWG
DRAWN BY MMO
APPROVED BY MMO
SIZE C
DRAWING NUMBER CO-10349
REV A
SHEET 1 OF 1

BLANK

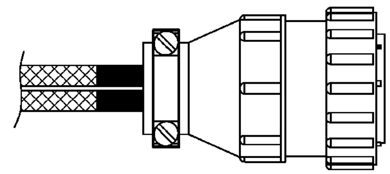
X43-32088 (QTY 1) PLUG WITH WIRE SEAL
X43-05671 (QTY 1) CLAMP
X43-09105-2 (QTY 1) FEMALE PINS FOR POS. 9
X43-10032-2 (QTY 14) FEMALE PINS FOR ALL OTHER WIRES



USE PUNCTURING PIN (X43-32110) TO AID INSERTION OF SOCKET PINS AND TO PREVENT WIRE SEAL DAMAGE.



X43-05669 (QTY 1) PLUG WITH WIRE SEAL
X43-05671 (QTY 1) CLAMP
X43-05672-2 (QTY 2) MALE PINS, FOR SHIELDS
X43-10031-2 (QTY 24) MALE PINS FOR ALL OTHER WIRES
X09-08344 FOAM TAPE (QTY 0.5 FT)



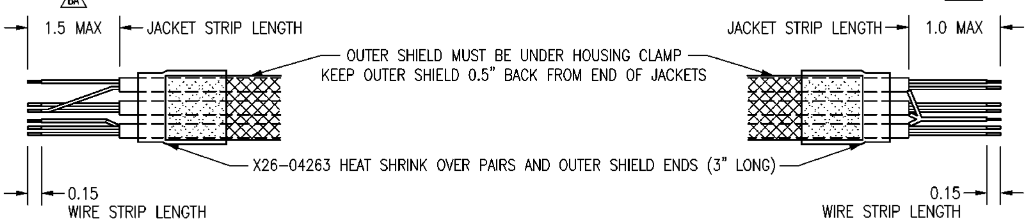
STA-TIE (X01-17422) CABLES TOGETHER EVERY 6 INCHES

(*) DENOTES BLACK JUMPER WIRES, A26-00105-10

TOP CABLE (B26-21604), THIS END: WHITE & YELLOW WIRES TO BE CRIMPED TOGETHER IN ONE TERMINAL AND INSERTED INTO POSITION 9.

INNER SHIELD FROM GREEN & RED PAIR PULLED TOGETHER, PUT INTO X26-07689 HEAT SHRINK, CRIMPED INTO ONE TERMINAL & INSERTED INTO POSITION 1.

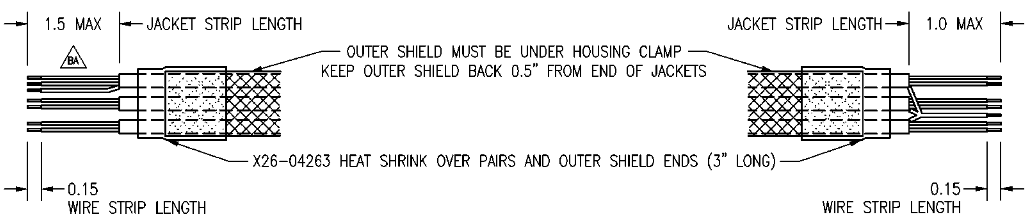
INNER SHIELD FROM OTHER PAIRS TRIMMED FLUSH WITH JACKET.



TOP CABLE (B26-21604), THIS END: INNER SHIELDS TO BE PULLED TOGETHER, PUT INTO X26-06922 HEAT SHRINK, CRIMPED INTO ONE TERMINAL AND INSERTED INTO POSITION 11.

BOTTOM CABLE (B26-21604), THIS END: INNER SHIELD FROM YELLOW & BLUE PAIR PULLED TOGETHER, PUT INTO X26-07689 HEAT SHRINK, CRIMPED INTO ONE TERMINAL & INSERTED INTO POSITION 15.

INNER SHIELDS OF ALL OTHER PAIRS TO BE TRIMMED FLUSH WITH JACKET.



BOTTOM CABLE (B26-21604), THIS END: INNER SHIELDS TO BE PULLED TOGETHER, PUT INTO X26-06922 HEAT SHRINK, CRIMPED INTO ONE TERMINAL AND INSERTED INTO POSITION 24.

NOTE:
CABLE CLAMPS MUST BE TIGHTENED SECURELY ONTO THE THREADED CONNECTOR. USE MATING RECEPTACLE TO HOLD CONNECTOR WHEN TIGHTENING. USE CHANNEL – LOCK PLIERS (JAWS COVERED WITH TAPE TO PREVENT MARRING) TO TIGHTEN CABLE CLAMPS.

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA	STRIP LENGTH WAS 1.0	CLE1807	KAP	02/01
AA	AS RELEASED	SSH	KAP	2/00

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR ± 0.5°
DO NOT SCALE DRAWING

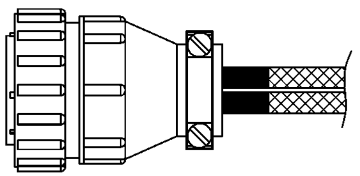
CMC Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

ASSEMBLY/SCHEMATIC, DRIVE CABLE B10 & OP CON TO SERVOPAK WITH DRIVE READY, 2-AXIS OR 3-AXIS WITH RESOLVER

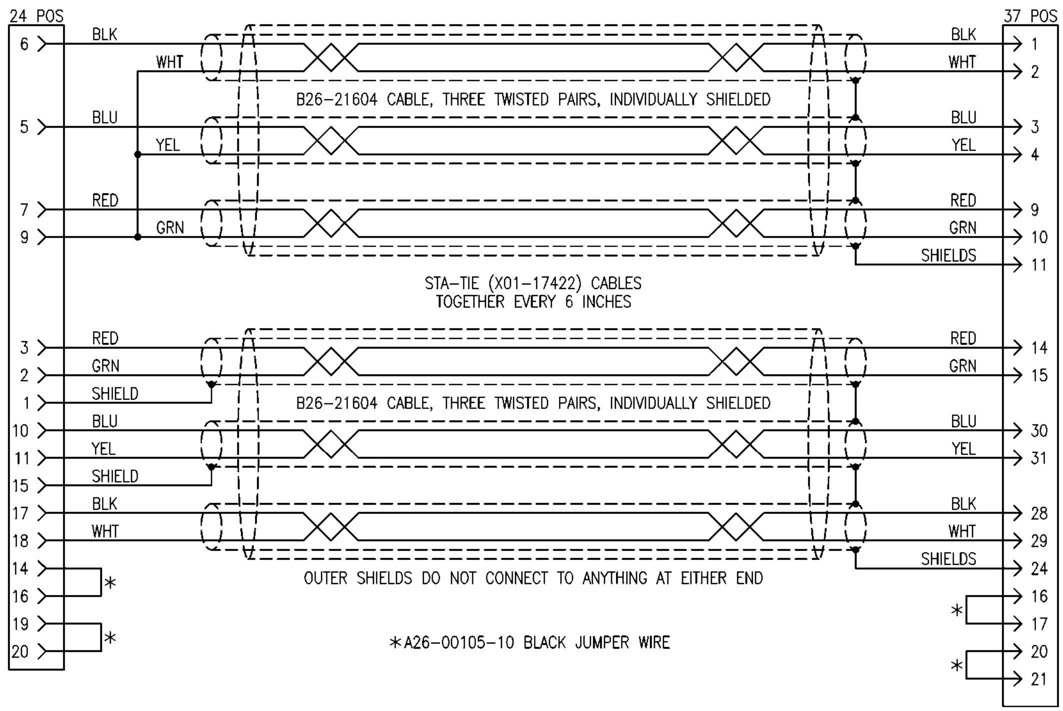
CAD DWG NO. : CO-10391BA.DWG	SIZE	DRAWING NUMBER	REV
DRAWN BY SS HULING / APPROVED BY SS HULING	C	CO-10391	BA

MATERIAL	FINISH	SCALE	REF	DATE	DATE	
		NONE	MO-12514-TAB	09 DEC 99	02 FEB 00	SHEET 1 OF 1

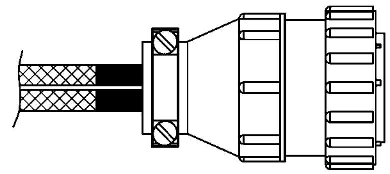
X43-32088 PLUG WITH WIRE SEAL (QTY 1)
X43-05671 CLAMP (QTY 1)
X43-09105-2 PIN (QTY 1) FOR POS. 9
X43-10032-2 PINS (QTY 15) FOR ALL OTHER WIRES



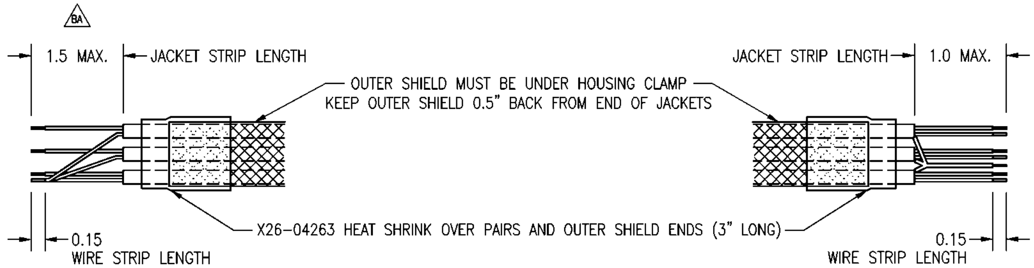
USE PUNCTURING PIN (X43-32110) TO AID INSERTION OF SOCKET PINS AND TO PREVENT WIRE SEAL DAMAGE.



X43-05669 PLUG (QTY 1)
X43-05671 CLAMP (QTY 1)
X43-05672-2 PINS (QTY 2) FOR SHIELDS
X43-10031-2 PINS (QTY 16) FOR ALL OTHER WIRES
X09-08344 FOAM TAPE (QTY 0.5 FT)

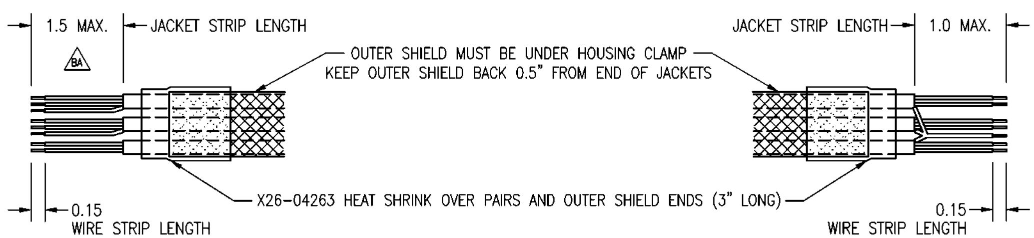


TOP CABLE, THIS END:
WHITE, YELLOW AND GREEN WIRES TO BE CRIMPED TOGETHER IN ONE TERMINAL AND INSERTED INTO POSITION 9.
INNER SHIELDS OF ALL PAIRS TO BE TRIMMED FLUSH WITH JACKET.



TOP CABLE, THIS END:
INNER SHIELDS TO BE PULLED TOGETHER, PUT INTO X26-06922 HEAT SHRINK, CRIMPED INTO ONE TERMINAL AND INSERTED INTO POSITION 11.

BOTTOM CABLE, THIS END:
INNER SHIELD FROM RED AND GREEN PAIR PULLED TOGETHER, PUT INTO X26-07689 HEAT SHRINK, CRIMPED INTO ONE TERMINAL AND INSERTED INTO POSITION 1.
INNER SHIELD FROM BLUE AND YELLOW PAIR PULLED TOGETHER, PUT INTO X26-07689 HEAT SHRINK, CRIMPED INTO ONE TERMINAL AND INSERTED INTO POSITION 15.
INNER SHIELD FROM BLACK AND WHITE PAIR TRIMMED FLUSH WITH JACKET.



BOTTOM CABLE, THIS END:
INNER SHIELDS OF ALL PAIRS TO BE PULLED TOGETHER, PUT INTO X26-06922 HEAT SHRINK, CRIMPED INTO ONE TERMINAL AND INSERTED INTO POSITION 24.

NOTE:
CABLE CLAMPS MUST BE TIGHTENED SECURELY ONTO THE THREADED CONNECTOR. USE MATING RECEPTACLE TO HOLD CONNECTOR WHEN TIGHTENING. USE CHANNEL-LOCK PLIERS (JAWS COVERED WITH TAPE TO PREVENT MARRING) TO TIGHTEN CABLE CLAMPS.

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA	STRIP LENGTH WAS 1.0	CLE1806	KAP	02/01
AA	AS RELEASED	SSH	KAP	2/00

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR ± 0.5°
DO NOT SCALE DRAWING

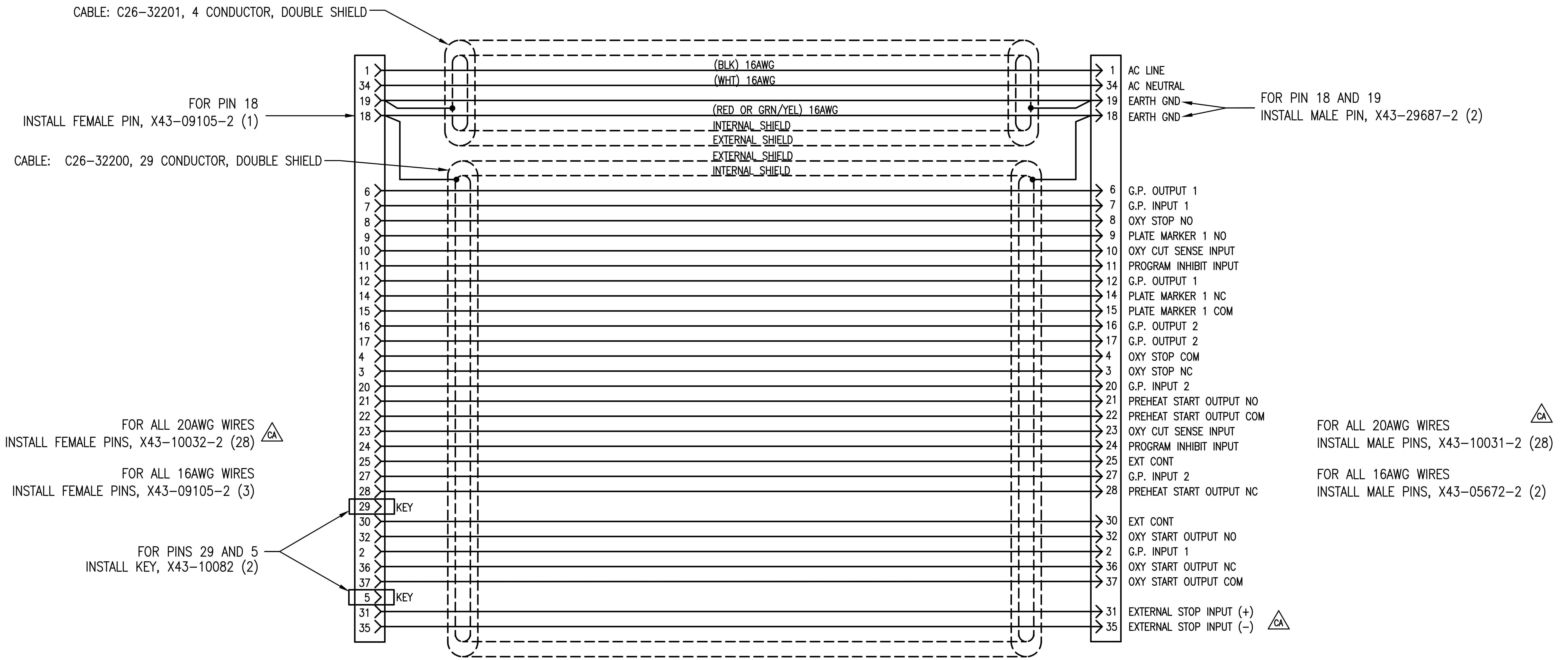
CMC Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

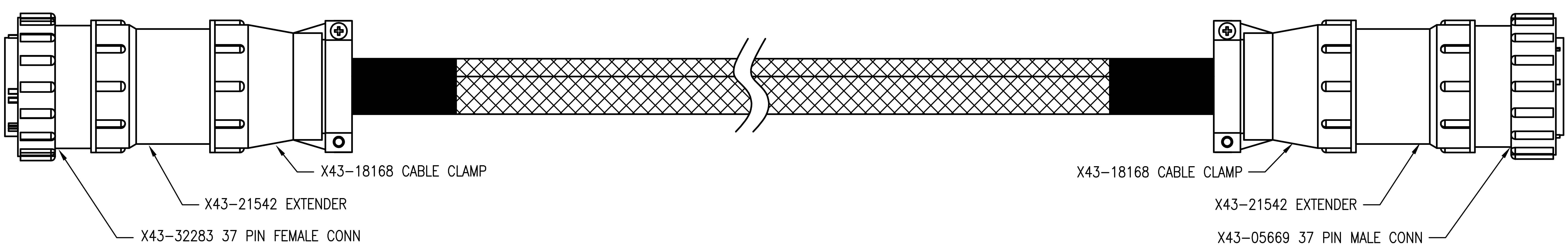
ASSEMBLY/SCHEMATIC, DRIVE CABLE BURNY 10 & OP CON TO SERVOPAK WITH DRIVE READY, FOR 3-AXIS DIGITAL SYNC

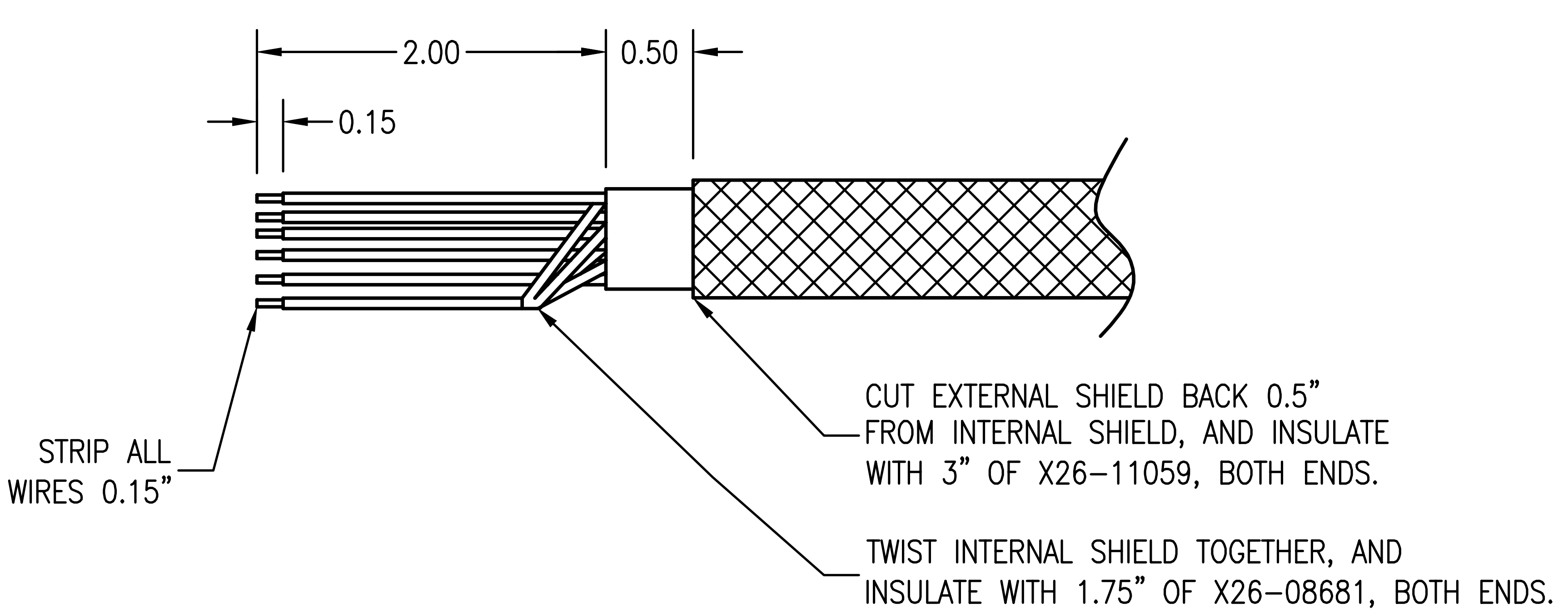
MATERIAL	FINISH	SCALE	REF	DRAWN BY	APPROVED BY	SIZE	DRAWING NUMBER	REV
		NONE	MO-12513-TAB	SS HULING	SS HULING	C	CO-10392	BA
				DATE 08 DEC 99	DATE 31 JAN 00		SHEET 1 OF 1	

CAD DWG NO.: CO-10392BA.DWG

BLANK







NOTES:

1.) WIRE COLORS ARE NOT CRITICAL UNLESS SPECIFIED ABOVE.

BA 2.) CUT THREE EXTRA WIRES FLUSH WITH PVC JACKET ON BOTH ENDS.

3.) LABEL CABLE WITH CMC PART NUMBER AND CURRENT REVISION LEVEL.

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA	ADD EXT STOP WIRES, CAR30033	CLE2809	KAP	05/04
BA	CORRECT ERRORS	CLE1839	KAP	03/01
AA	AS RELEASED	RDR	KAP	02/00

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

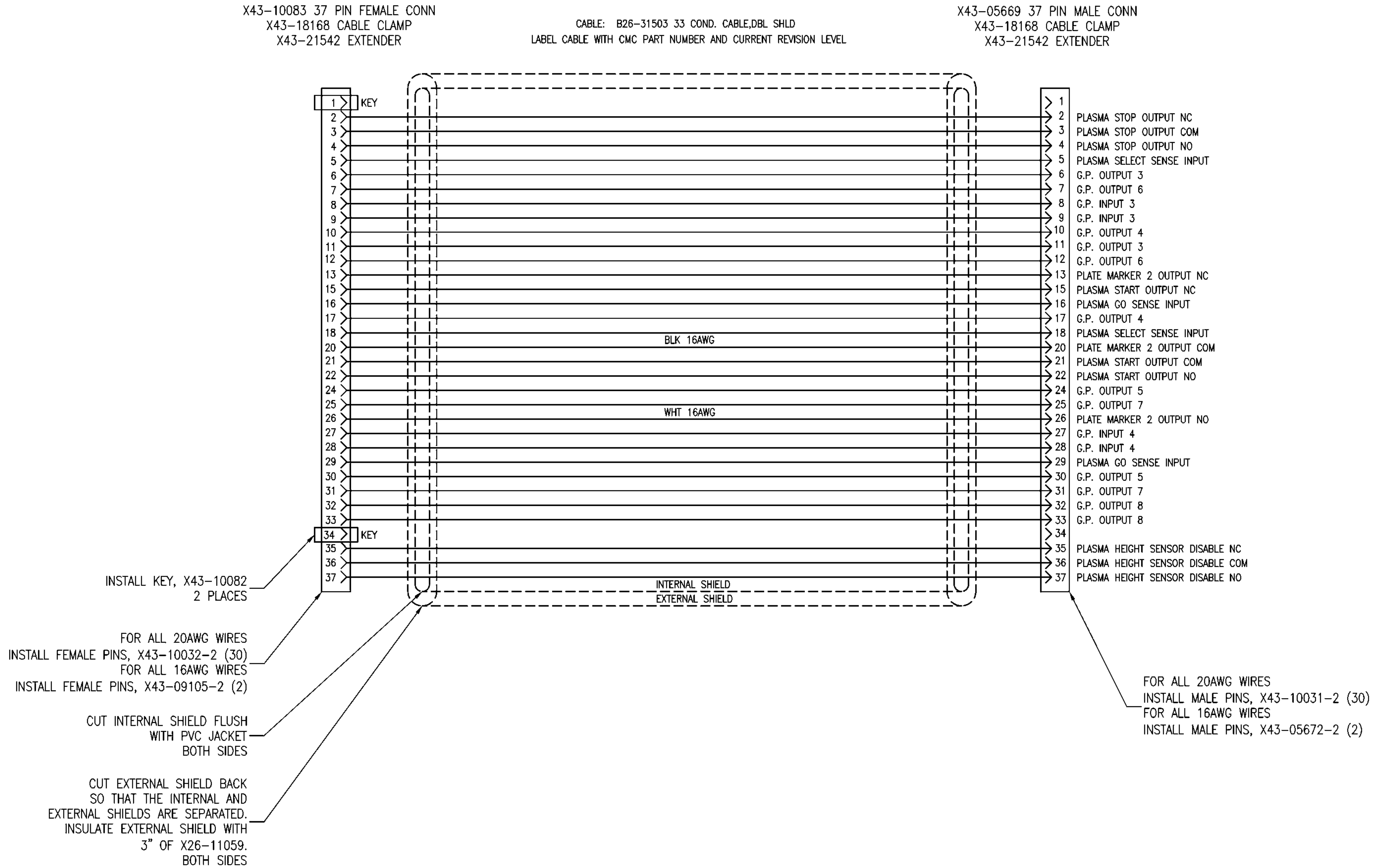
MATERIAL	FINISH	SCALE	REF
		NONE	

SCHEMATIC,
BURNY 10 POWER/OXY HARNESS, CE

CAD DWG NO. : CO-21749CA.DWG		SIZE	DRAWING NUMBER	REV
DRAWN BY RDR	APPROVED BY RDR	C	CO-21749	CA
DATE 12-17-99	DATE 02-17-00	SHEET 1 OF 1		

NOTES:

1.) CUT THE 16AWG GRN/YEL FLUSH WITH THE PVC JACKET.
2.) NOTE SPECIFIC LOCATIONS FOR BLACK AND WHITE 16AWG WIRES.
3.) USE X09-08344 TO SEAL EACH CONNECTOR.



SYM	REVISION	ECO	BY	DATE
F				
E				
D				
C				
B				
A	RELEASE	----	MMO	01/99

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR ± 0.5°
DO NOT SCALE DRAWING

CMC Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

SCHEMATIC,
NT PLASMA CABLE ASSEMBLY

MATERIAL	FINISH	SCALE	REF	CAD DWG NO.	DRAWN BY	DATE	APPROVED BY	DATE	SIZE	DRAWING NUMBER	REV
			MO-12249-TAB	CO-21657A.DWG	MMO	12-15-98	MMO	01-05-99	C	CO-21657	A

SHEET 1 OF 1

NOTES:

- FOR ALL 22AWG WIRES ON THIS SIDE USE FEMALE PINS, X43-10032-2 (3).
- FOR PIN 9 AND 15 USE FEMALE PINS, X43-09105-2 (2).

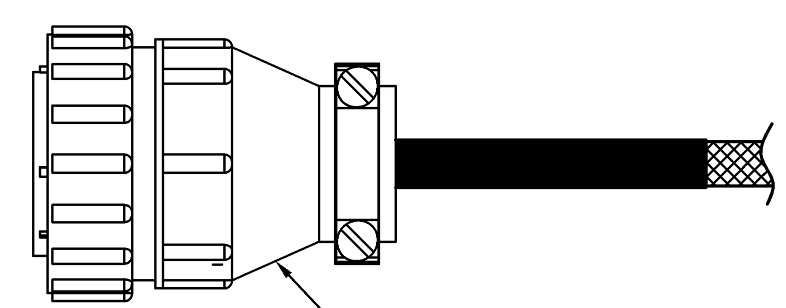
X43-08316 24 PIN FEMALE
X43-05671 CONN. CLAMP

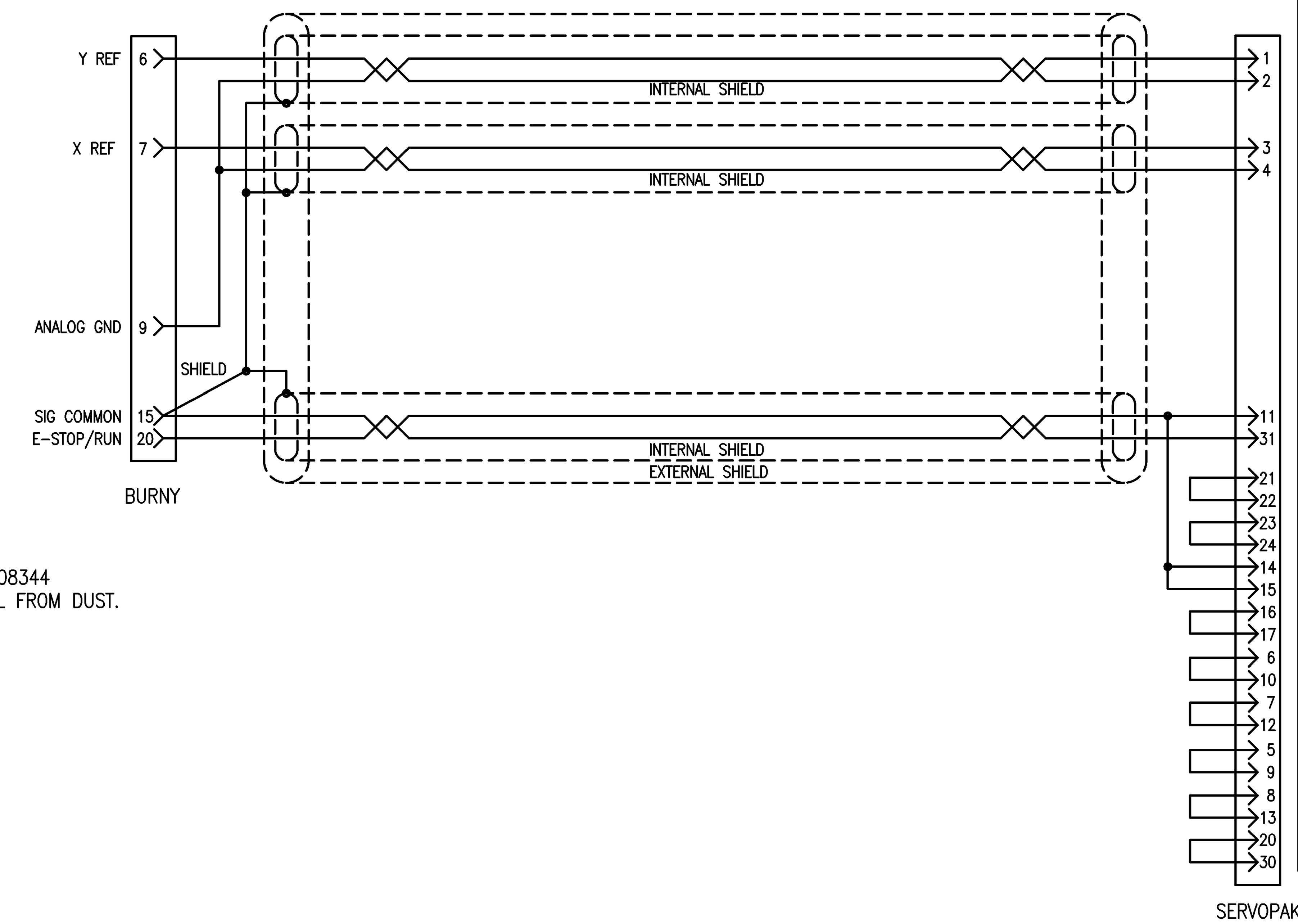
CABLE: B26-21604 6 COND., DBL SHLD
LABEL CABLE WITH CMC PART NUMBER AND CURRENT REVISION LETTER

X43-05669 37 PIN MALE
X43-05671 CONN. CLAMP

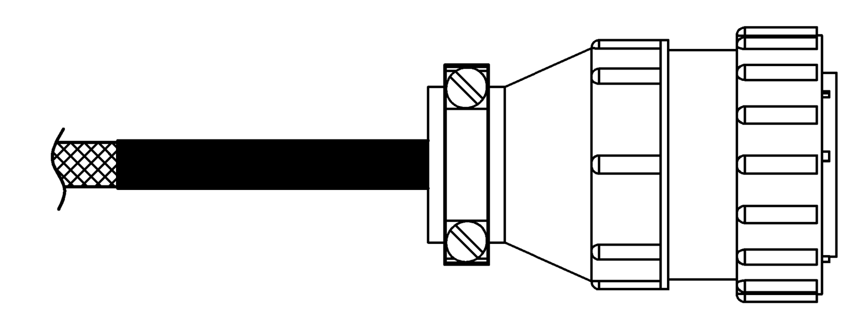
NOTES:

- FOR ALL 22AWG WIRES ON THIS SIDE USE MALE PINS, X43-10031-2 (22).
- FOR PINS 11 AND 14 USE MALE PINS, X43-05672-2 (2).

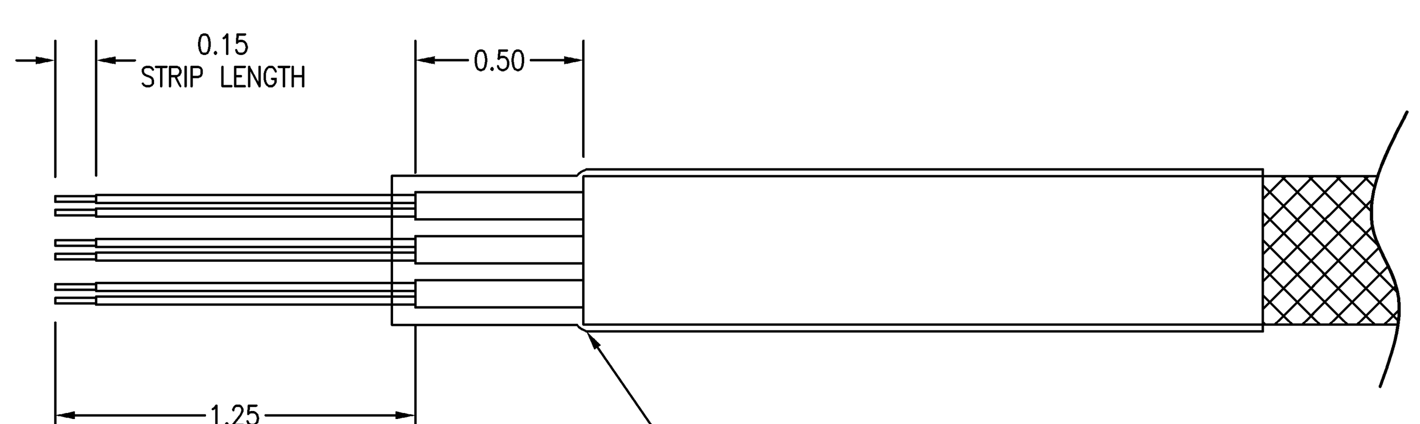




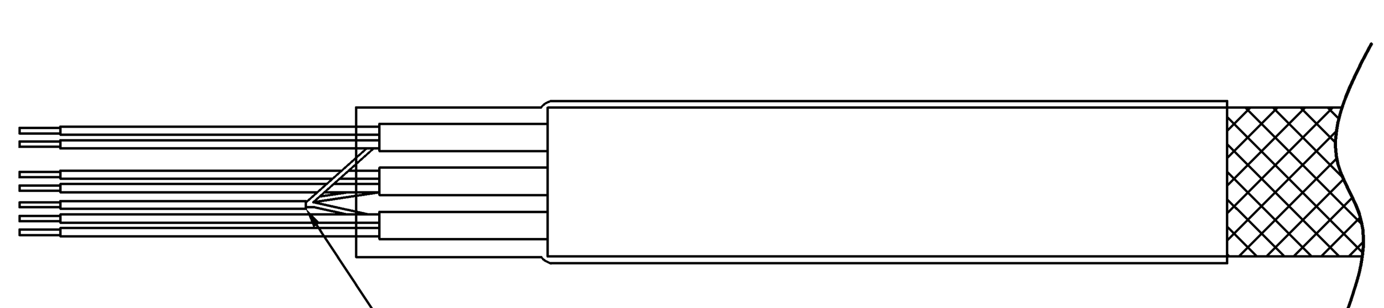
PIN	SERVOPAK 150		ALL OTHER SERVOPAKS	
	2 AXIS	3 AXIS RESOLVER SYNC	2 AXIS	3 AXIS RESOLVER SYNC
1	Y REF +	Y REF +	Y REF +	Y REF +
2	Y REF COM	Y REF COM	Y REF COM	Y REF COM
3	X REF +	W REF +	JUMPERED TO 5	W REF +
4	X REF COM	W REF COM	REF COM	W REF COM
11	REF COM	REF COM	REF COM	REF COM
31	PR-13	PR-13	CLUTCH/ESTOP CR3	CLUTCH/ESTOP CR3
21	FAULT STRING	FAULT STRING		
22	JUMPERED TO 23	OUT OF SYNC RELAY	SYNC OK CR2	SYNC OK CR2
23	JUMPERED TO 22	OUT OF SYNC RELAY	SYNC OK CR2	SYNC OK CR2
24	SIG COM	SIG COM	REF COM	REF COM
14	/Y ENABLE	/Y ENABLE	/Y ENABLE	/Y ENABLE
15	/X ENABLE	/X ENABLE	JUMPERED TO 16	/W ENABLE
16	----	/W ENABLE	JUMPERED TO 15	/W ENABLE
17	----	/X ENABLE	/X ENABLE	/X ENABLE
6	----	W REF COM	REF COM	REF COM
10	----	X REF COM	X REF COM	X REF COM
7	X ERROR + REF	X ERROR + REF	----	----
12	----	SYNC ERROR OUTPUT	----	----
5	----	W REF	JUMPERED TO 3	W REF
9	----	X REF	X REF	X REF
8	X ERROR - REF	X ERROR - REF	REF COM	REF COM
13	SIG COM	SIG COM	REF COM	REF COM
20	SIG COM	SIG COM	REF COM	REF COM
30	PR-14	PR-14	CLUTCH/ESTOP CR3	CLUTCH/ESTOP CR3



INSTALL 6" OF FOAM X09-08344 INSIDE CONNECTOR TO SEAL FROM DUST. (BOTH ENDS)

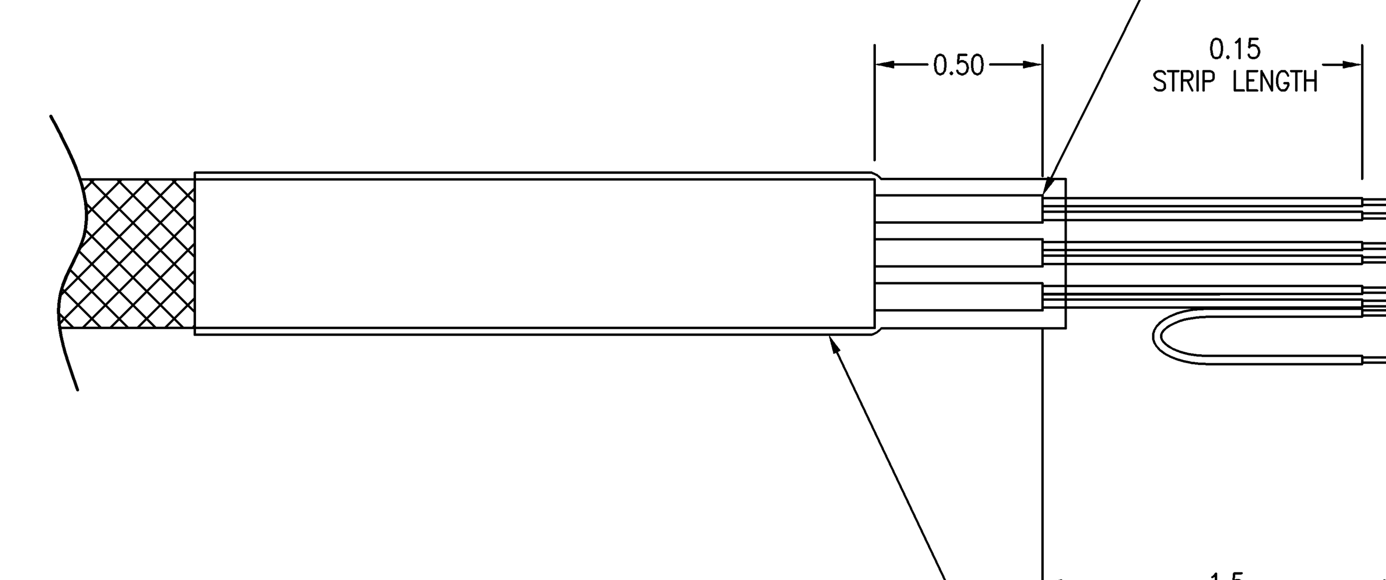


INSTALL 3" OF X26-04263 OVER OUTER SHIELDING.
NOTE: OUTER SHIELD SHOULD BE 0.5" BACK FROM END OF JACKET AS SHOWN.



TWIST ALL INTERNAL SHIELDS AND INSTALL 1.1" OF X26-06922.

CUT INTERNAL SHIELDS FLUSH WITH JACKET.



3" JUMPER
INSTALL PER SCHEMATIC (10)

INSTALL 3" OF X26-04263 OVER OUTER SHIELDING.
NOTE: OUTER SHIELD SHOULD BE 0.5" BACK FROM END OF JACKET AS SHOWN.

SYM	REVISION	ECO	BY	DATE
F				
E				
D				
C				
B				
A	RELEASE	----	MMO	04/99

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

MATERIAL | FINISH | SCALE | REF MO-12342-TAB

CABLE, B10/SERVOPAK
2 AXIS/3 AXIS RESOLVER SYNC

CAD DWG NO. : DO-21685A.DWG
DRAWN BY MMO | APPROVED BY MMO
DATE 04/05/99 | DATE 04/13/99
SIZE D | DRAWING NUMBER DO-21685 | REV A
SHEET 1 OF 1

NOTE:

1.) INSTALL JUMPERS IN CORRECT LOCATION FOR 115VAC OR 230VAC INCOMING OP CON AC LINE.

2.) BURNY 10LCD AC LINE IS SUPPLIED SEPARATE FROM THE OP CON AND IS AUTO SWITCHING. CONNECT EARTH GROUND TO PIN 18, OR PIN 19 OR BOTH. CONNECTOR KIT IS MO-12347.

3.) WIRE HARNESS PLUGS ONTO STATION RECP4 TO CAUSE STATION RELAYS TO FOLLOW "GAS ON" SWITCH. WIRE HARNESS PLUGS ONTO GAS RECP4 TO CAUSE STATION RELAYS TO FOLLOW CUTTING OXYGEN.

4.) 4 STATION BACK PANEL ASSEMBLY MO-07608.
6 STATION BACK PANEL ASSEMBLY MO-07609.
8 STATION BACK PANEL ASSEMBLY MO-06717.
12 STATION BACK PANEL ASSEMBLY MO-07811.
4 STATION/OXY BACK PANEL ASSEMBLY MO-08475.
6 STATION/OXY BACK PANEL ASSEMBLY MO-08476.
8 STATION/OXY BACK PANEL ASSEMBLY MO-08477.

5.) 12 SPDT LIFTER BACK PANEL ASSEMBLY MO-07864.
4 DPDT LIFTER BACK PANEL ASSEMBLY MO-07606.
6 DPDT LIFTER BACK PANEL ASSEMBLY MO-07607.
8 DPDT LIFTER BACK PANEL ASSEMBLY MO-06714.

6.) 4 LIFTER SWITCH PANEL MO-07612.
6 LIFTER SWITCH PANEL MO-07613.
8 LIFTER SWITCH PANEL MO-06715.
4 LIFTER/STATION SWITCH PANEL MO-07604.
6 LIFTER/STATION SWITCH PANEL MO-07605.
8 LIFTER/STATION SWITCH PANEL MO-06711.
9-12 LIFTER/STATION SWITCH PANEL MO-09927.

7.) REFER TO THE BURNY 10LCD SYSTEM SCHEMATIC FOR THE REMAINDER OF THE BURNY 10LCD SYSTEM.

8.) THIS SCHEMATIC SHOWS WIRING FOR TYPICAL OP CON OPTION PANELS. OTHER OPTION PANELS ARE AVAILABLE.

9.) FOR 2-AXIS OR 3-AXIS WITH RESOLVER SYNC: MO-12514-XXX;
FOR 3-AXIS WITH DIGITAL SYNC: MO-12513-XXX;
30RECP SHOWS SIMPLIFIED FAULT STRING SIGNALS. REFER TO INTERFACE CARD SCHEMATIC, 2PL, FOR EXT FAULT CONNECTIONS AND FULL PINOUT.

10.) SET INTERFACE CARD JUMPERS AS FOLLOWS:
J1-A, J2-A, J3-A, J4-A, J6-OTHER, J7-A

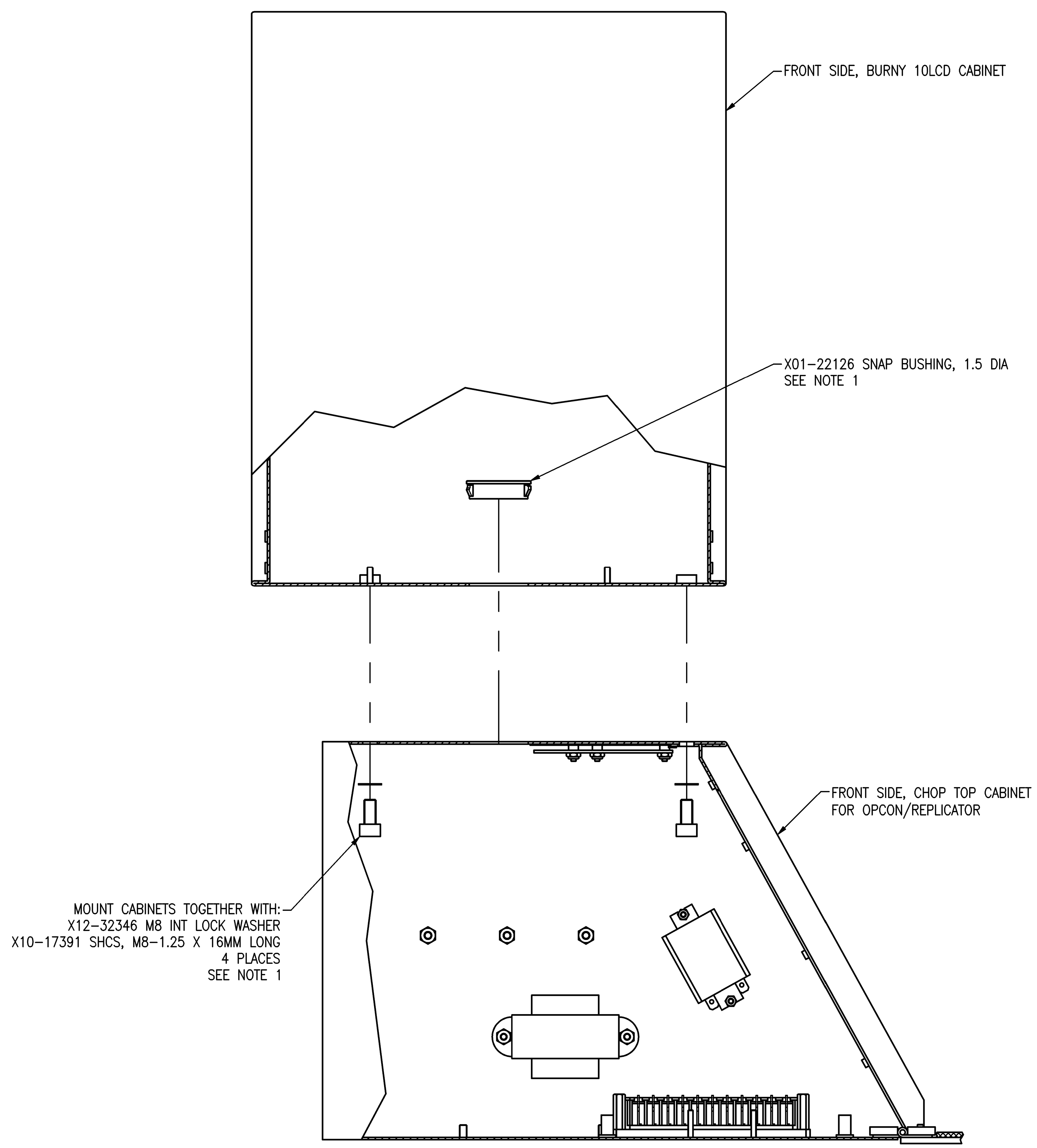
SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA	CORRECTIONS PER DCR170	CLE3284	GMC	12/05
AA	AS RELEASED	SSH	KAP	05/01

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR ± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

SCHEMATIC,
BURNY OPERATOR CONSOLE
WITH BURNY 10 LCD

CAD DWG NO.: DO-21810BA.DWG	SIZE	DRAWING NUMBER	REV
DRAWN BY SS HULING / DATE 25 APR 01	APPROVED BY SSH / DATE 30 APR 01	D	DO-21810	BA
MATERIAL	FINISH	SCALE NONE	REF MO-12799	SHEET 1 OF 1



NOTE:

1.) REMOVE EXISTING HOLE PLUGS WHERE APPLICABLE.

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA				
AA	AS RELEASED	SSH	KAP	05/01

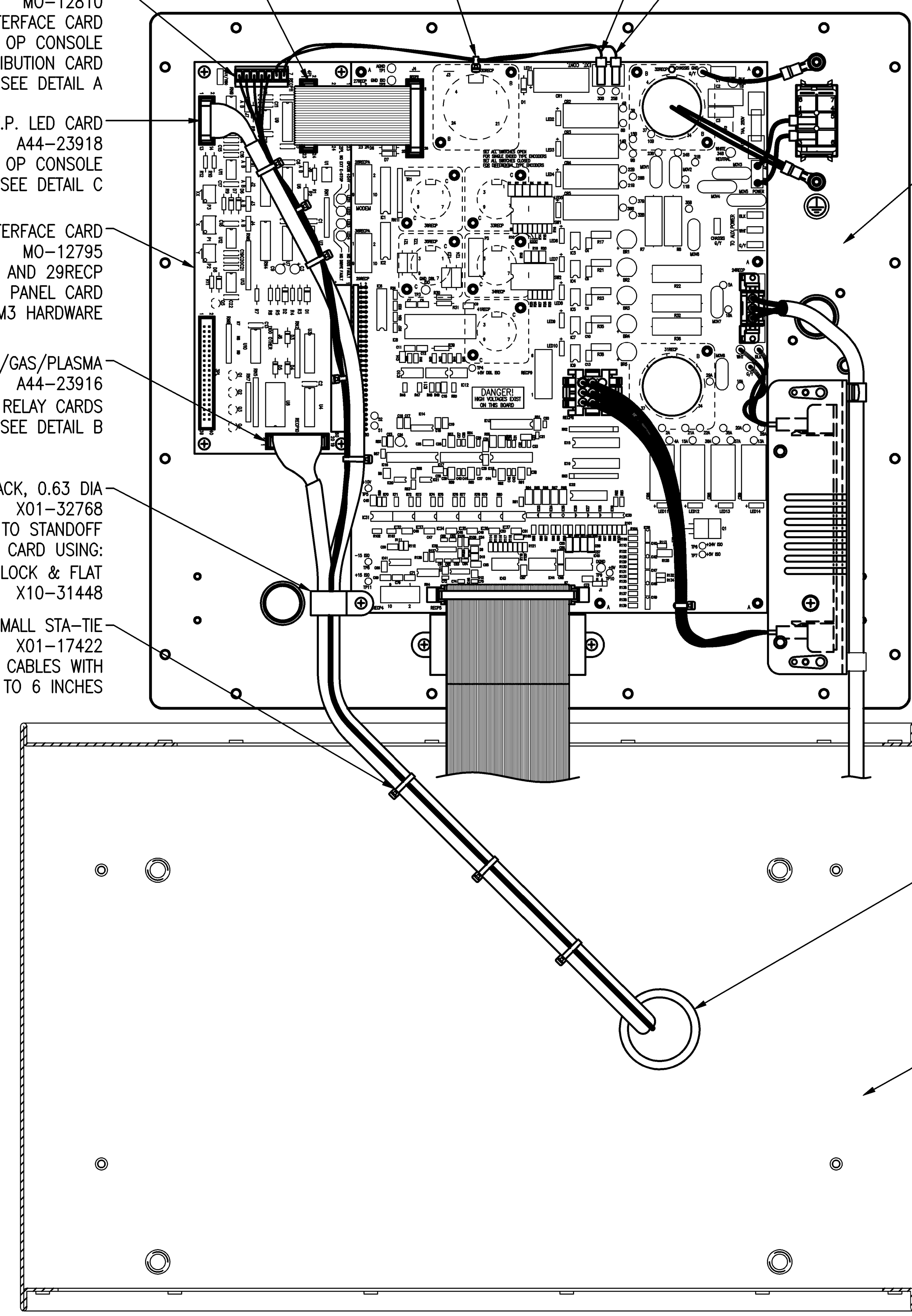
TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

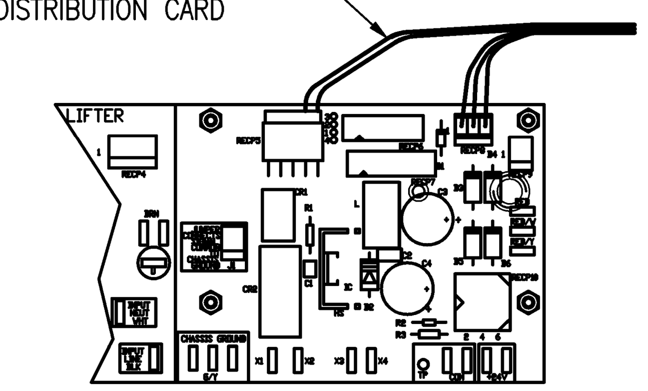
MATERIAL | FINISH | SCALE NONE | REF

ASSEMBLY, CABINETS
CHOP TOP TO BURNY 10 LCD

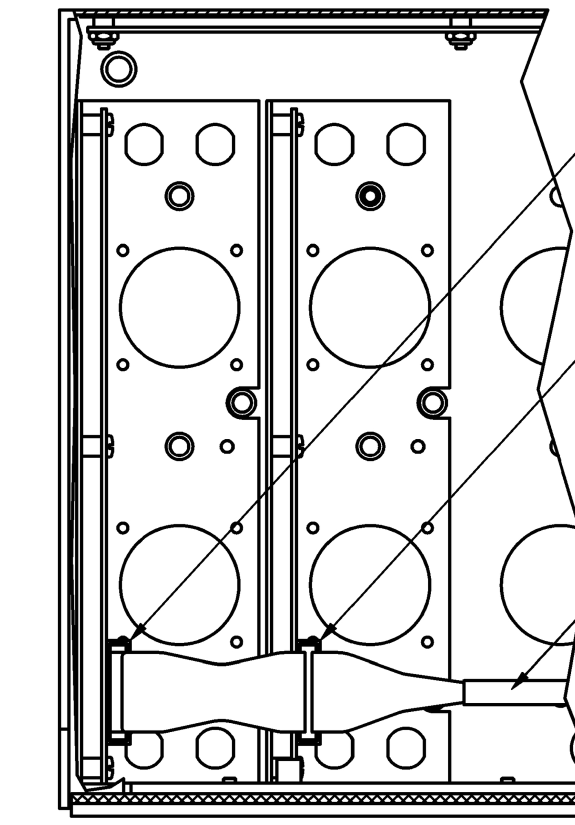
CAD DWG NO. : DO-10465AA.DWG
DRAWN BY SS HULING | APPROVED BY SSH
DATE 26 MAR 01 | DATE 30 APR 01
SIZE D | DRAWING NUMBER DO-10465 | REV AA
SHEET 1 OF 1



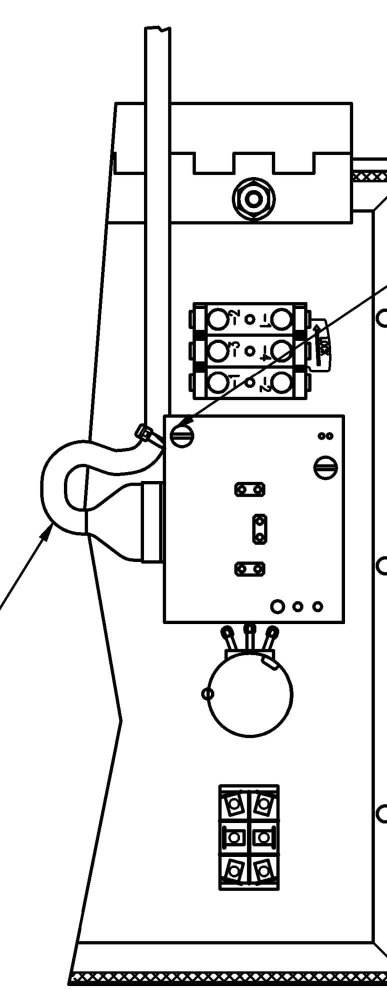
FRONT OF BURNY 10LCD



DETAIL A
POWER DISTRIBUTION CARD LOCATED
ON INSIDE TOP OF OP CONSOLE ENCLOSURE



DETAIL B
INSIDE VIEW OF OP CONSOLE ENCLOSURE
PLASMA AND GAS RELAY CARD OPTIONS



DETAIL C
INSIDE VIEW OF OP CONSOLE FRONT PANEL

2.) ASSEMBLE CABINETS ACCORDING TO CMC DRAWING DO–10465
BEFORE INSTALLING PARTS SHOWN ON THIS PAGE.

1.) BURNY 10 LCD TO BE FULLY ASSEMBLED
BEFORE INSTALLING PARTS SHOWN
ON THIS PAGE.

NOTE:

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA				
AA	AS RELEASED	SSH	KAP	05/01

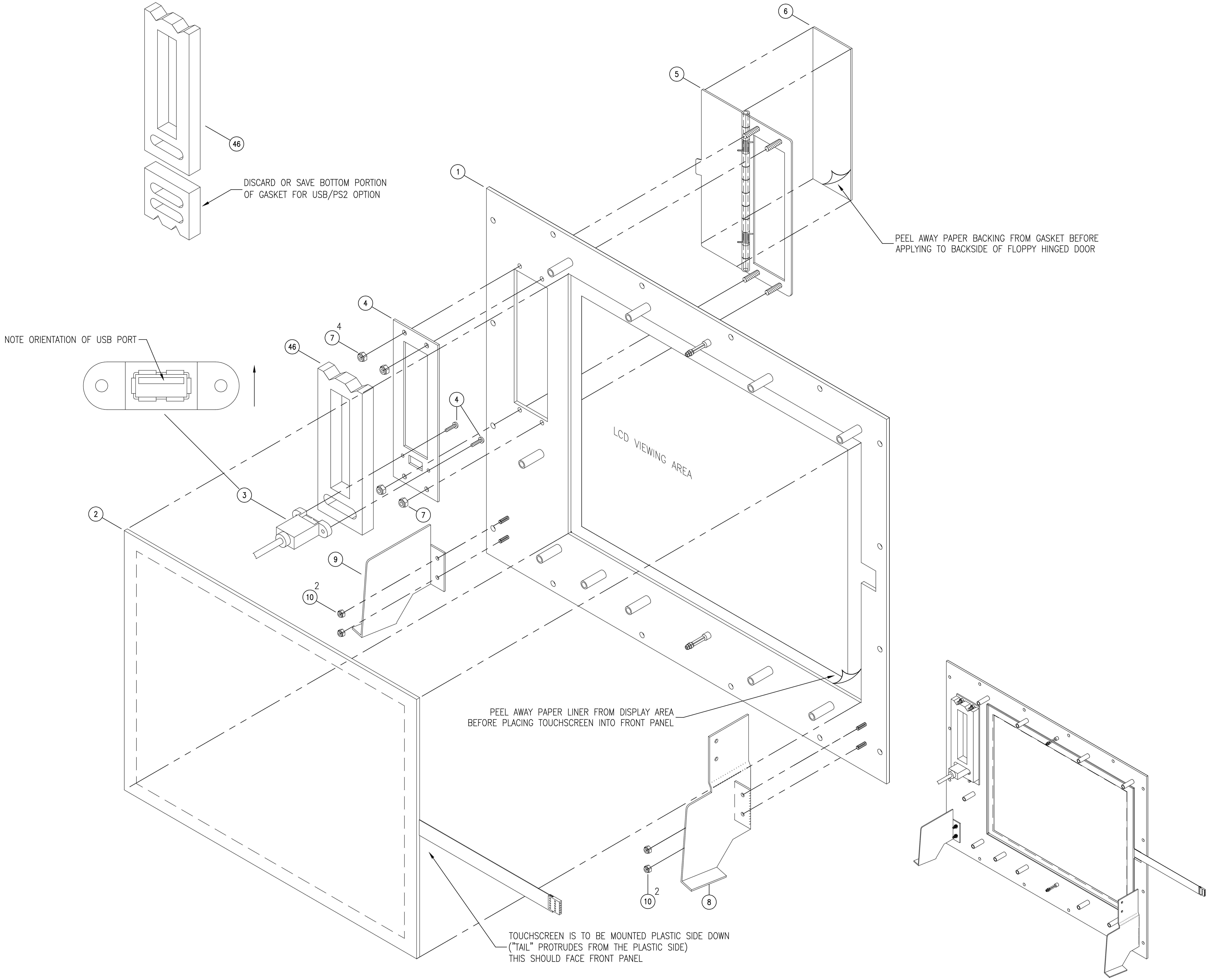
TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

MATERIAL	FINISH	SCALE	REF
		NONE	MO–12799

ASSEMBLY,
BURNY 10 LCD TO OPERATOR CONSOLE

CAD DWG NO. : DO–10464AA.DWG		SIZE	DRAWING NUMBER	REV
DRAWN BY SS HULING	APPROVED BY SSH	D	DO–10464	AA
DATE 18 APR 01	DATE 30 APR 01	SHEET 1 OF 1		



	SYM	CMC PART NUMBER	DESCRIPTION	QTY
	1	D04-33604-01	MEMBRANE SWITCH PANEL, BURNY 10 LCD PLUS	1
	2	X04-33609	15" TOUCHSCREEN, BURNY 10 LCD PLUS	1
	3	X44-33610	USB-A TO USB-A EXTENSION CABLE (MOUNT PER DETAIL SHOWN W/ SCREWS PROVIDED)	1
	4	C05-33689	BACKPLATE, FLOPPY DRIVE RETAINER W/USB MOUNTING	1
	5	D05-33690	FLOPPY DRIVE DOOR, HINGED SPRING TO CLOSE	1
	6	B09-33791	GASKET, FLOPPY DOOR DRIVE	1
	7	X11-31416	NUT, M4 x 0.7 NYLOCK, ZINC PLATED	8
	8	C05-33606-01	BRACKET, PANEL RENTENTION, LEFT	1
	9	C05-33606-02	BRACKET, PANEL RENTENTION, RIGHT	1
	10	X11-31328	NUT, M3 x 0.5 NYLOCK, ZINC PLATED	4
M	11	D05-34269	CHASSIS, P4 MICRO ATX MOTHERBOARD	1
	12	MO-13428	LAPTOP HARD DRIVE ASSEMBLY	1
	13	REMOVED	- - -	- -
	14	REMOVED	- - -	- -
	15	REMOVED	- - -	- -
	16	X10-33000	SCREW, M3 x 0.5 x 8MM PHMS w/INTERLOCK & WASHER WITH NYLON PATCH	22
	17	X44-33089	LCD INVERTER ASSEMBLY	1
M	18	X44-34413	LCD 15" DISPLAY	1
M	19	C44-34380	CABLE, INVERTER / LVDS DATA FOR B10 LCD PLUS	1
	20	REMOVED	- - -	2
	21	REMOVED	- - -	2
	22	X12-33778	M2 FLAT WASHER, STAINLESS STEEL	2
	23	REMOVED	- - -	6
	24	REMOVED	- - -	6
M	25	X44-34414	MOTHERBOARD, KONTRON 845 MICRO ATX	1
	26	X44-32639	POWER SUPPLY, ATX 250W, 115/230VAC INPUT	1
	27	X10-32998	FASTENER, 6-32 x 1/4 TAPTITE w/NYLON PATCH	6
	28	X01-31324	CLIP, CABLE, ADHESIVE BACK	1
	29	X44-29385	FLOPPY DISK DRIVE, 3.5"	1
	30	MO-13022	BURNY PCI I/O CARD, GEN II	1
CA	31	X44-34415	VIDEO CARD, AGP TO DVI	1
	32	B05-32693	BRACKET, PCI I/O CARD RETENTION	1
	33	X44-33603	CPU, INTEL CELERON, 478 PIN	1
M	34	X44-34111	RAM, 512MB, DDR PC2100 64x64	1
	35	X10-32999	SCREW, M5 x 0.8 x 10MM W/INTER, WASHER, NYLON PATCH	10
	36	D05-33879	BRACKET, FAN MOUNTING	1
	37	MO-13337	FAN ASSEMBLY, 137CFM WITH MOLEX PLUG	1
	38	X01-31721	FAN GUARD, 5" SQUARE PATTERN	1
	39	X10-32705	SCREW, PHMS, M4 x 0.7 x 50MM	4
	40	X01-16285	CLIP, WIRE, EXTRUDED WIDE (USE FOR HARD DRIVE\FLOPPY DRIVE RIBBON CABLES)	2
	41	A44-32688	RIBBON CABLE FOR COM PORT 1	1
	41A	OEM RIBBON CABLE	OEM RIBBON CABLE FOR COM PORT 1	1
	42	X10-00007	SCREW, 4-40 x 3/16 PAN HEAD	2
	43	X12-27705	M3 SPLIT LOCK	2
	44	X10-31012	SCREW, M3-0.5 x 8MM	2
	45	X01-33125	GROMMET EDGING (USE AS NEEDED)	TBD
	46	A01-34068	GASKET, FLOPPY DISK/USB	1
BA	47	B05-34696	HARD DRIVE MOUNTING PLATE	1
BA	48	X01-34707	GROMMET	4
BA	49	X10- 34709	SHOULDER SCREW	4
BA	50	X12-09295	FLAT WASHER	4

FOR THE PURPOSE OF CLARITY
SOME PARTS HAVE NOT BEEN
DRAWN WITH COMPLETE DETAIL

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA	X44-34414 WAS X44-33597 PER DCR150	CLE3371	GMC	12/05
BA	ADDED H.D. MOUNTING PLATE/SHT2	CLE3153	CMC	04/05
AA	AS RELEASED	KAP	KAP	12/04

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

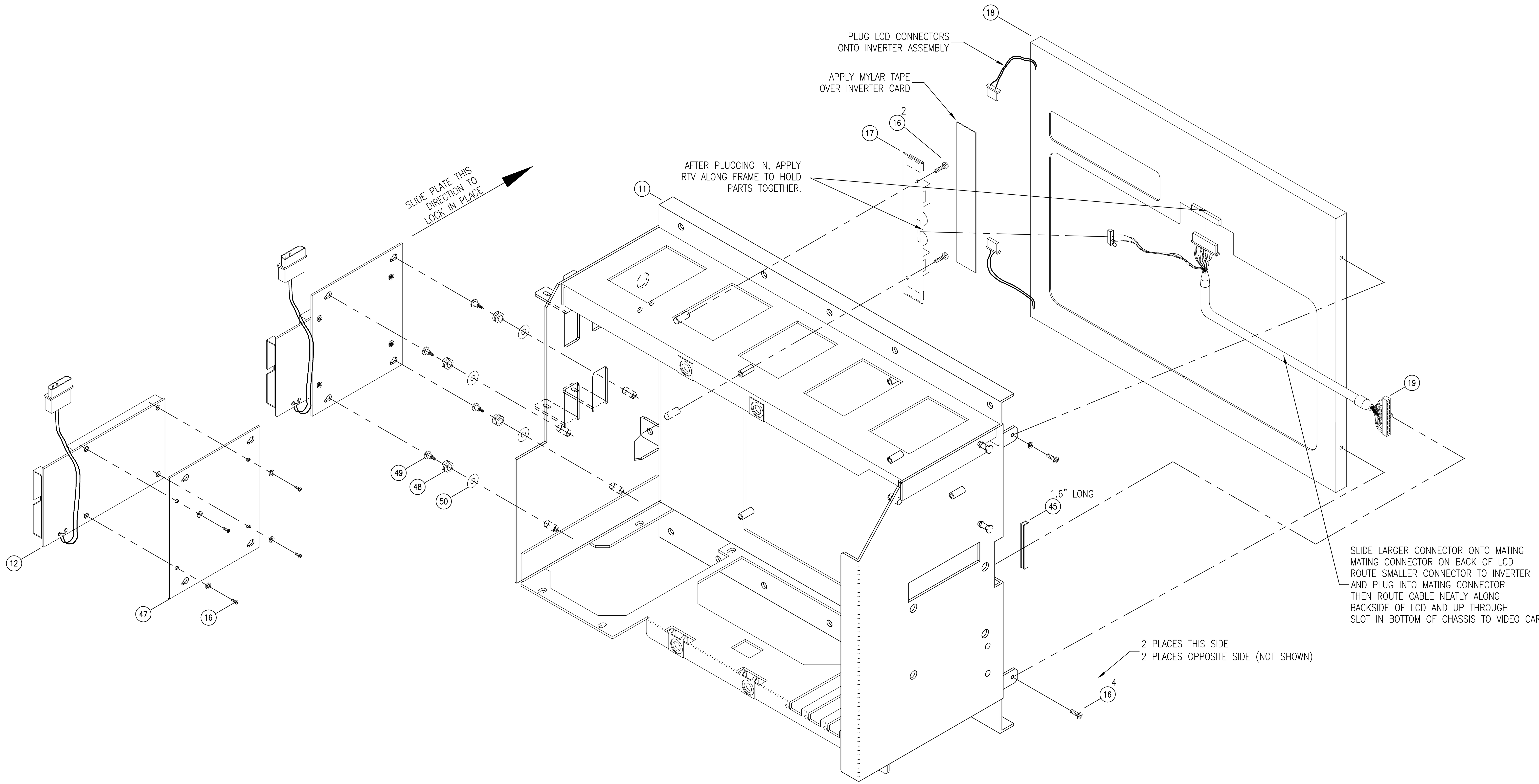
MATERIAL	FINISH	SCALE	REF	DATE	DATE
		1 : 2	MO-13638	01 DEC 04	01 DEC 04

ASSEMBLY,
BURNY 10 LCD PLUS
FRONT PANEL

CAD DWG NO. :DO-10665CA.DWG

DRAWN BY	APPROVED BY	SIZE	DRAWING NUMBER	REV
KAP	KAP	D	DO-10665	CA

SHEET 1 OF 6



HARD DRIVE ASSEMBLY SHOULD BE MOUNTED AFTER MOTHERBOARD
HAS BEEN MOUNTED INTO THE CHASSIS AS SHOWN ON SHEET 3
HARD DRIVE MOUNTING SHOWN HERE FOR CLARITY ONLY

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA				
AA				

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

ASSEMBLY,
BURNY 10 LCD PLUS
FRONT PANEL

MATERIAL	FINISH	SCALE	REF	CAD DWG NO.	DRAWN BY	DATE	APPROVED BY	DATE	SIZE	DRAWING NUMBER	REV	SHEET
		1 : 2	MO–13638	:DO–10665CA.DWG	KAP	01 DEC 04	KAP	01 DEC 04	D	DO–10665	CA	2 OF 6

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA				
AA				

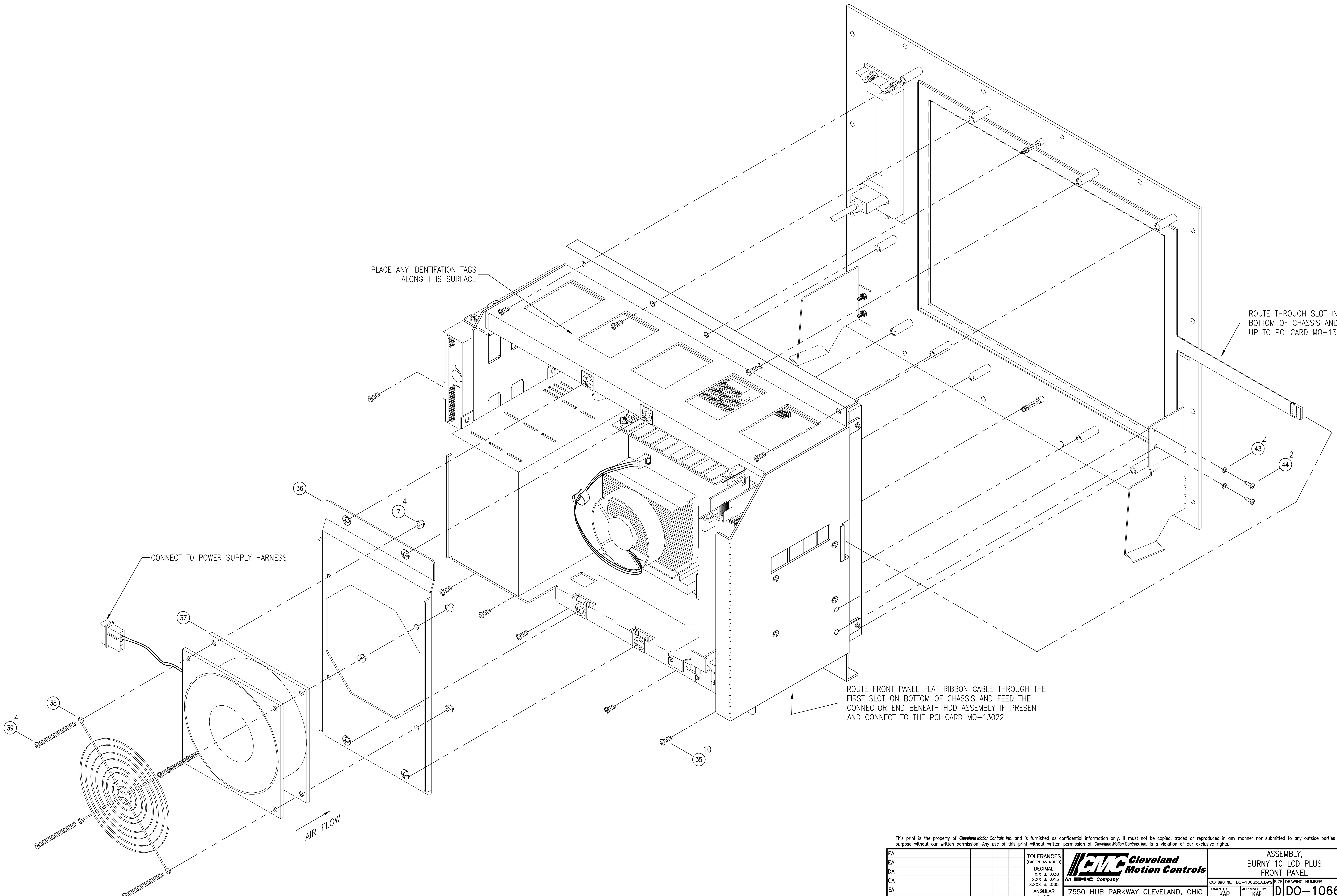
TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

MATERIAL	FINISH	SCALE	REF
		1 : 2	MO–13638

ASSEMBLY,
BURNY 10 LCD PLUS
FRONT PANEL

CAD DWG NO. :DO–10665CA.DWG		SIZE	DRAWING NUMBER	REV
DRAWN BY KAP	APPROVED BY KAP	D	DO–10665	CA
DATE 01 DEC 04	DATE 01 DEC 04	SHEET 3 OF 6		



SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA				
AA				

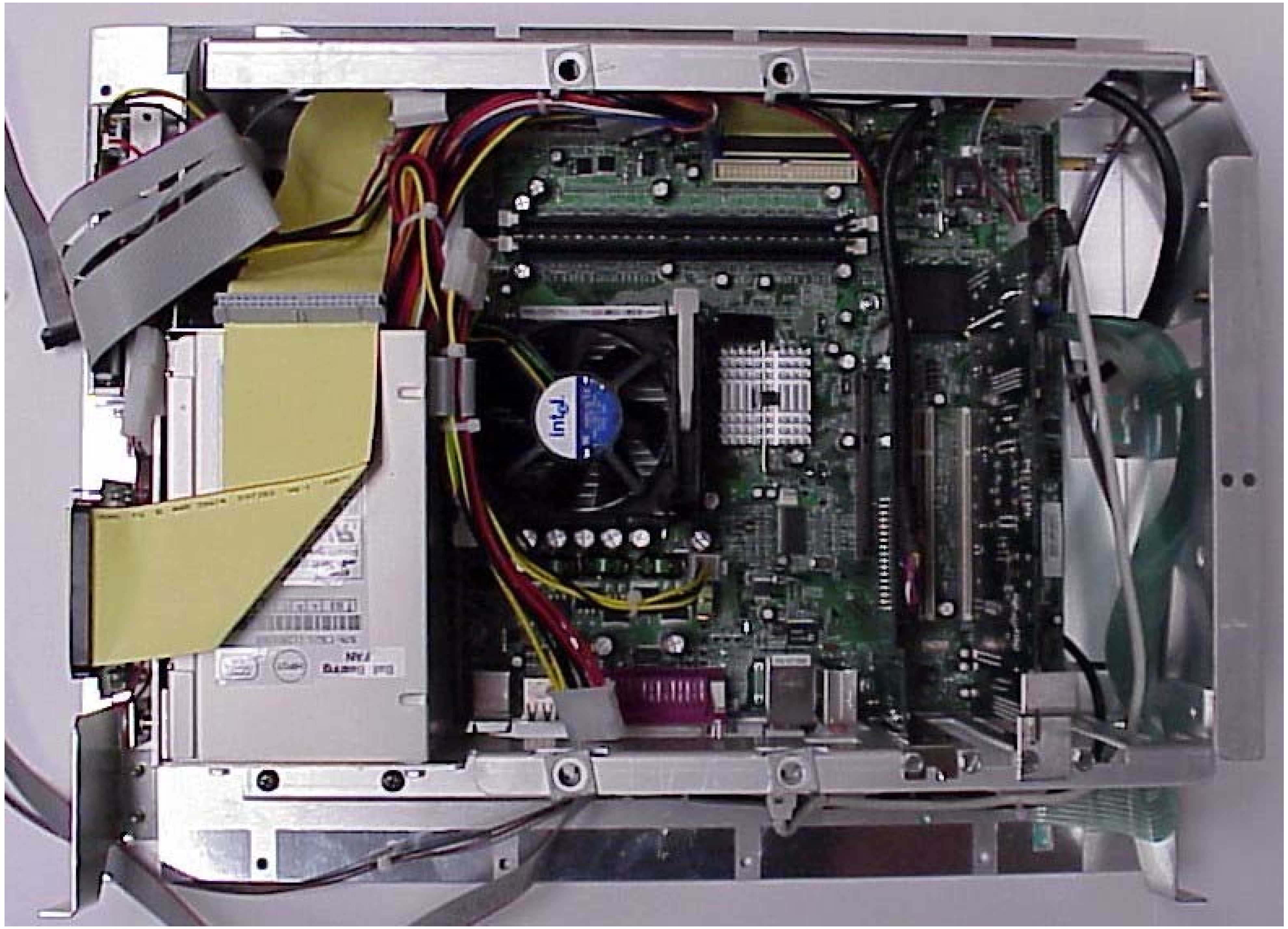
TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

ASSEMBLY,
BURNY 10 LCD PLUS
FRONT PANEL

MATERIAL	FINISH	SCALE	REF	DRAWN BY	APPROVED BY	SIZE	DRAWING NUMBER	REV
		1 : 2	MO-13638	KAP	KAP	D	DO-10665	CA
				DATE 01 DEC 04	DATE 01 DEC 04		SHEET 4 OF 6	

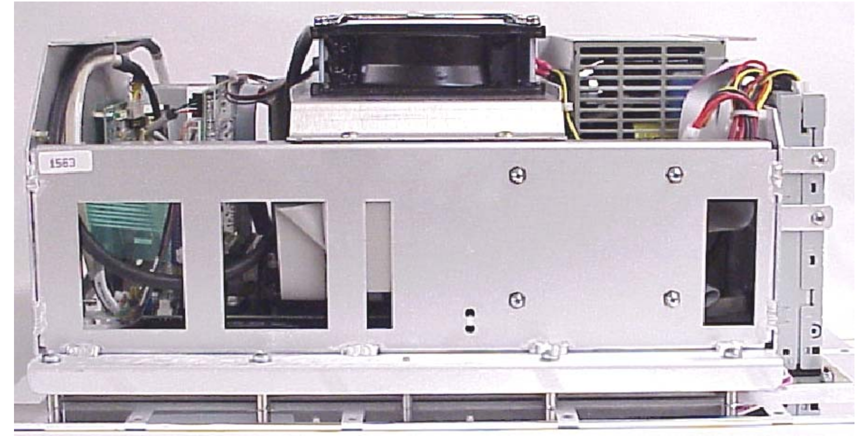
CAD DWG NO. :DO-10665CA.DWG



ALL CABLING AND HARNESSING SHOULD BE
ROUTED NEATLY AS POSSIBLE THROUGHOUT
THE ASSEMBLY (AS PICTURED))

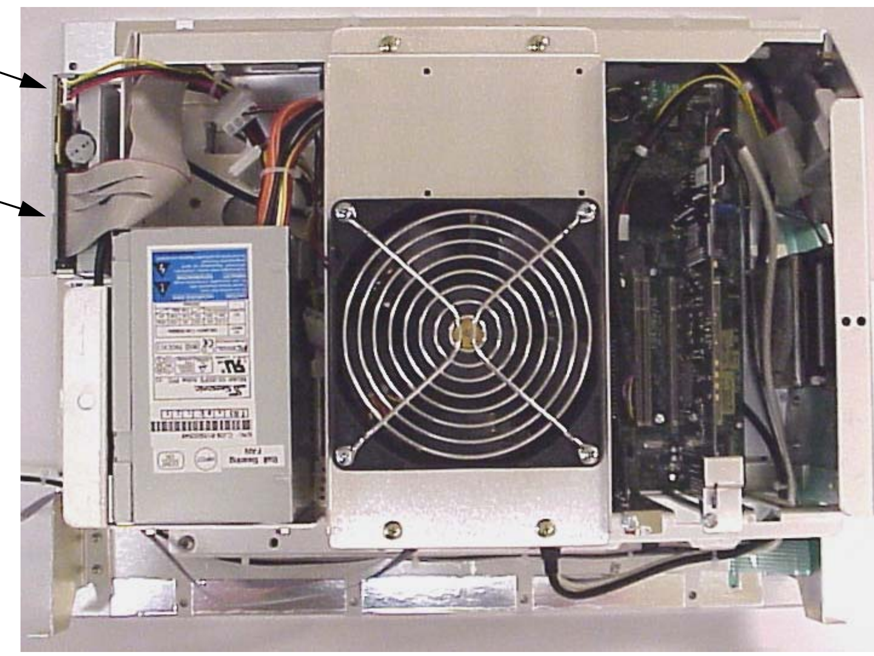
Cleveland Motion Controls — An IMC Company	Dwg No.	DO-10665	Rev CA
	Dwg Size	D	Sheet 5 of 6

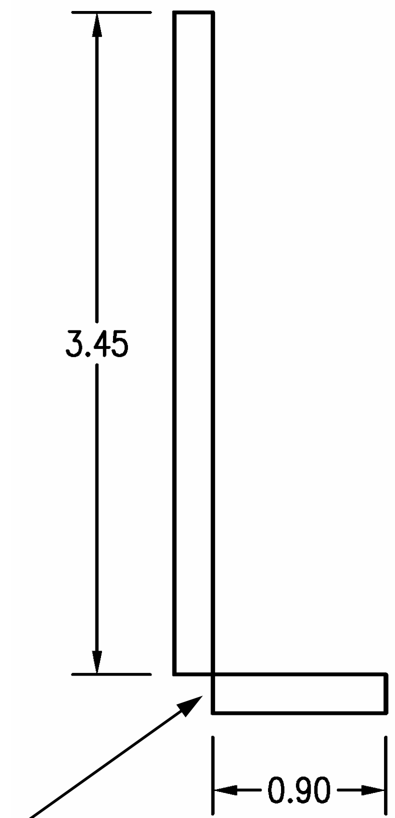
BLANK



4 PIN CONNECTOR
FROM POWER SUPPLY

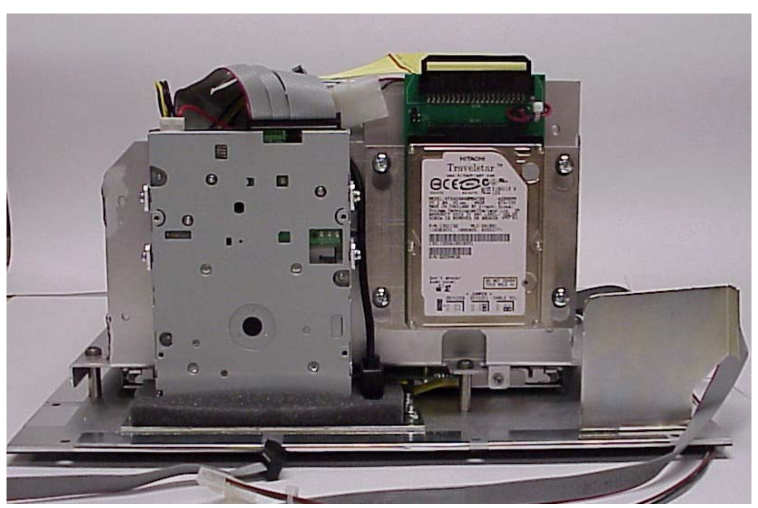
RIBBON CABLE FROM
MOTHERBOARD

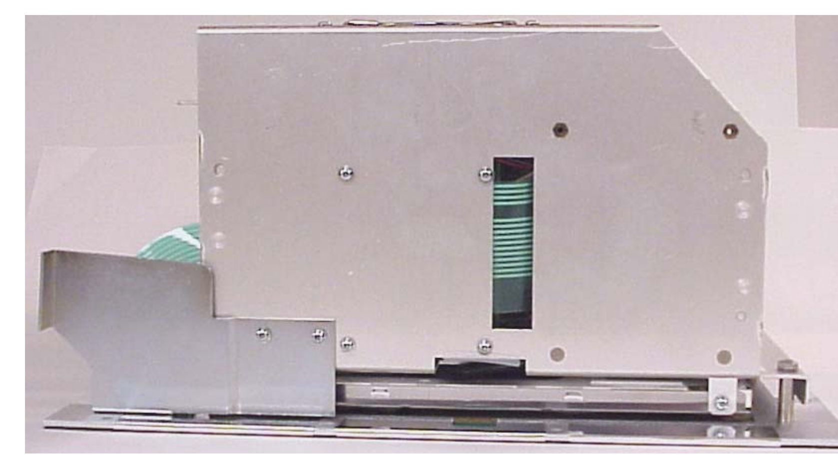




TOTAL LENGTH 4.35"

45





WHITE USB CABLE (B44-33147)
TO MO-13022 PCI I/O CARD

2

42 41

OR 41A

BLACK USB CABLE (X44-33610) TO
BACKPLATE OF FRONT PANEL

Cleveland Motion Controls, An IMC Company	Dwg No.	DO-10665	Rev CA
	Dwg Size D		Sheet 6 of 6

ENCLOSURE SHOWN AS CUTAWAY VIEW WITH
TOP REMOVED TO SEE WIRES AND CABLE CLAMPS

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA	ADD CABLE DETAIL - CAR40025	CLE2958	KAP	10/04
AA	AS RELEASED	MMO	KAP	09/04

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

CMC Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

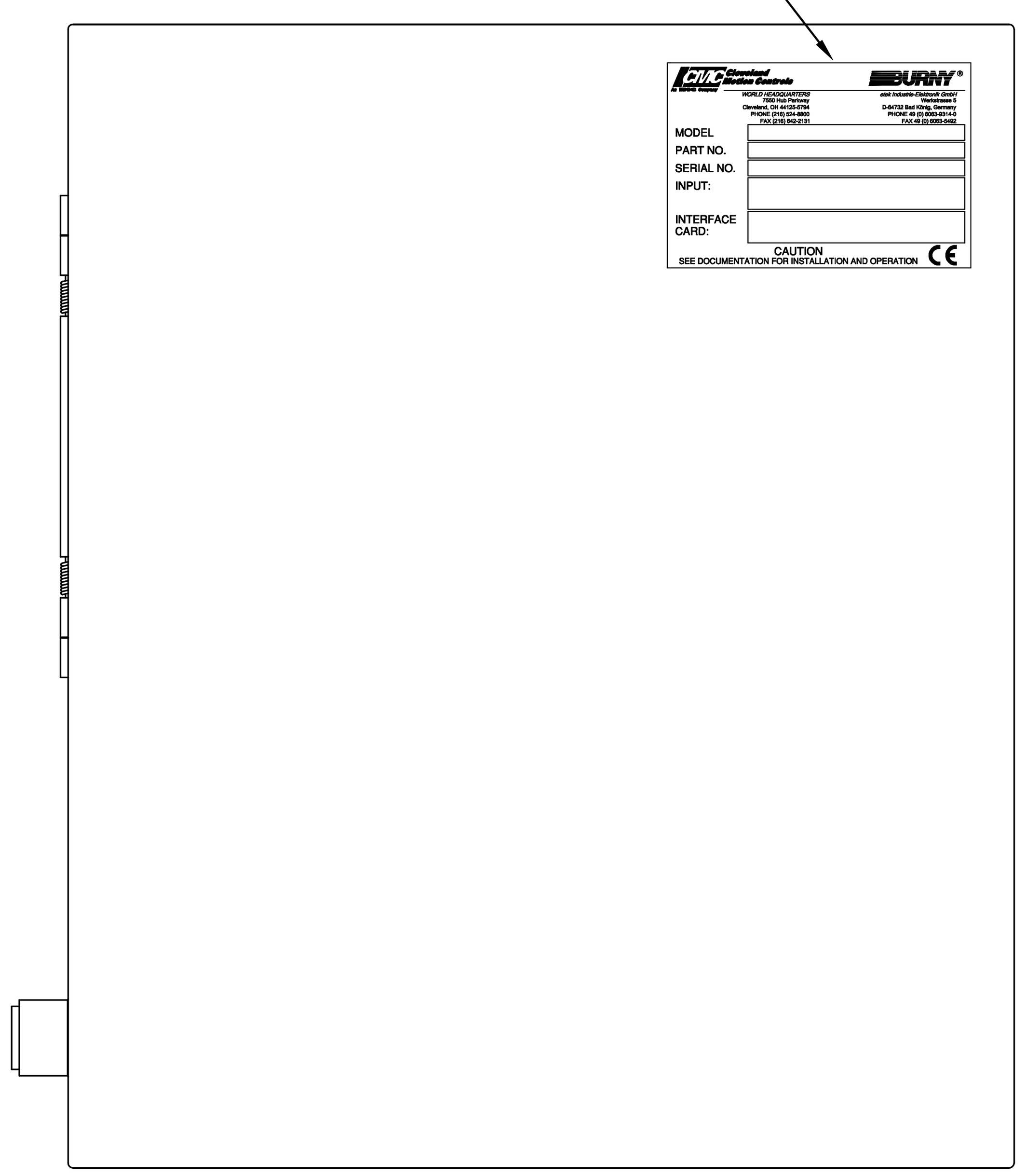
MATERIAL	FINISH	SCALE	REF
		NONE	MNT-13669

ASSEMBLY, FINAL
BURNY 10 LCD PLUS WITH LVDS

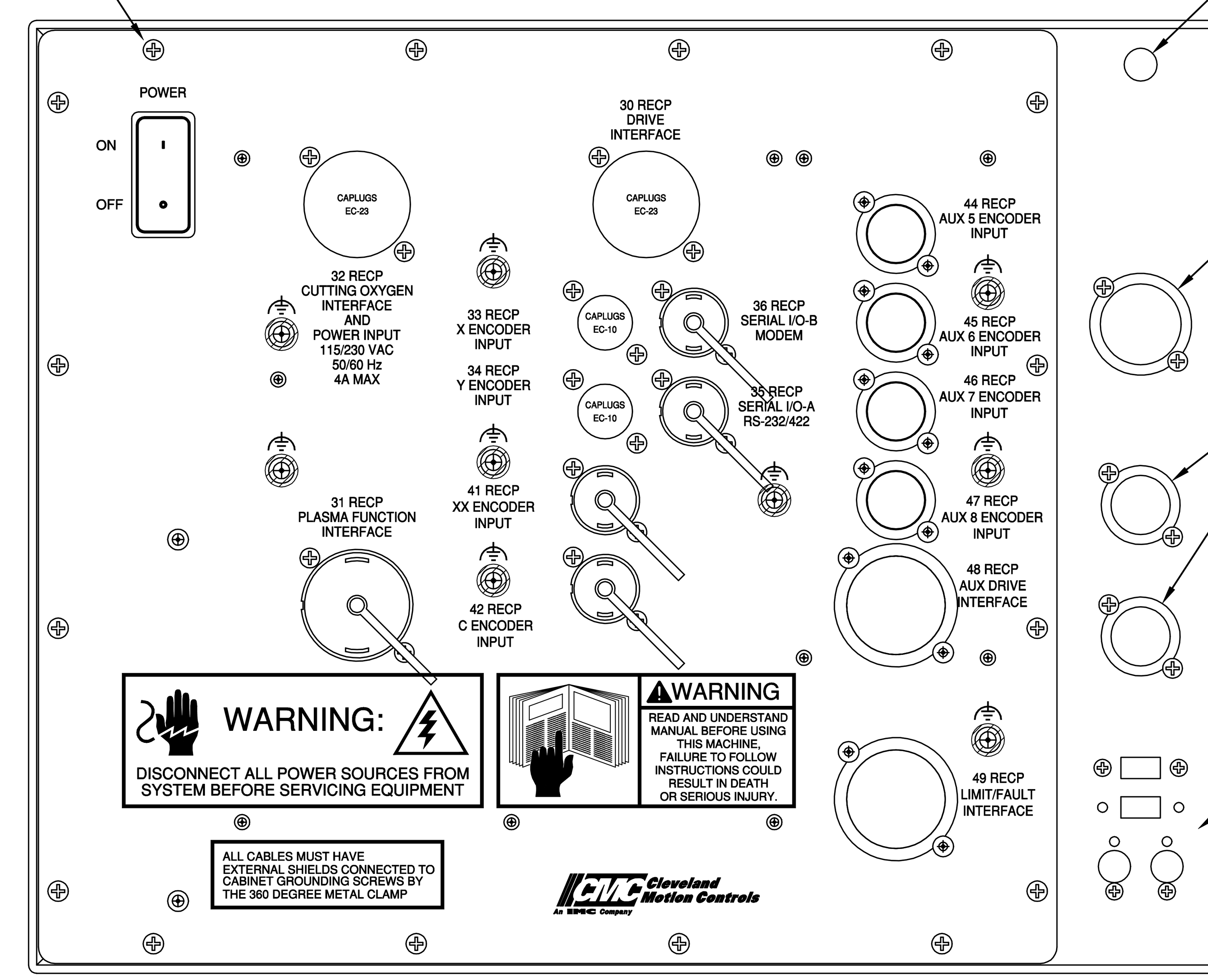
CAD DWG NO.	DRAWN BY	DATE	APPROVED BY	DATE	SIZE	DRAWING NUMBER	REV
DO-10666BA01.DWG	KAP	17 SEP 04	MMO	28 SEP 04	D	DO-10666	BA

SHEET 1 OF 3

A01-30768 PRODUCT LABEL
FIRMLY ADHERE TO ENCLOSURE
@ 1/2" FROM TOP AND BACK
BE SURE TO KEEP LABEL
PARALLEL TO ALL SIDES



X10-31447 SCREW, M4 x 10MM WITH SPLIT LOCK WASHER PHMS
16 PLACES



IF NO OPTIONS ARE INSTALLED BY THE FACTORY
INSTALL THE FOLLOWING PARTS BELOW

X01-22170 PLUG BUTTON, 1/2" DIA, BLK
1 PLACE

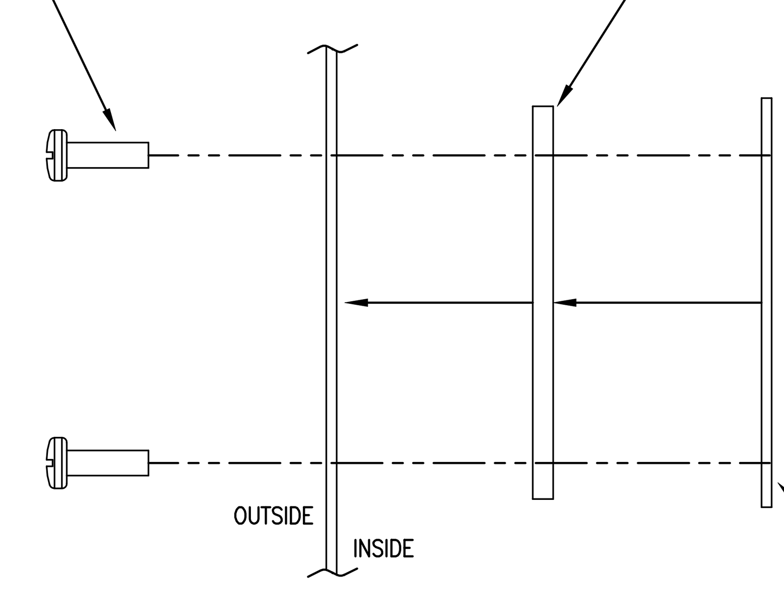
X01-21997 HOLE PLUG, 1 1/8"
1 PLACE
MOUNT WITH:
X10-23676 (2) 8-32 x 1/2 PHMS

X01-13152 HOLE PLUG, 7/8" DIA
2 PLACES
MOUNT WITH:
X10-23676 (2 EA.) 8-32 x 1/2 PHMS

SEE DETAIL BELOW FOR MOUNTING
BACKPLATE COVER & GASKET

X10-23676 SCREW, 8-32 X 1/2, TYPE F, BLK
4 PLACES

A09-33730 GASKET
REMOVE PAPER BACKING TO EXPOSE PSA
AND APPLY TO BACKPLATE COVER (A05-33732)



A05-33732 BACKPLATE COVER

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA				
AA				

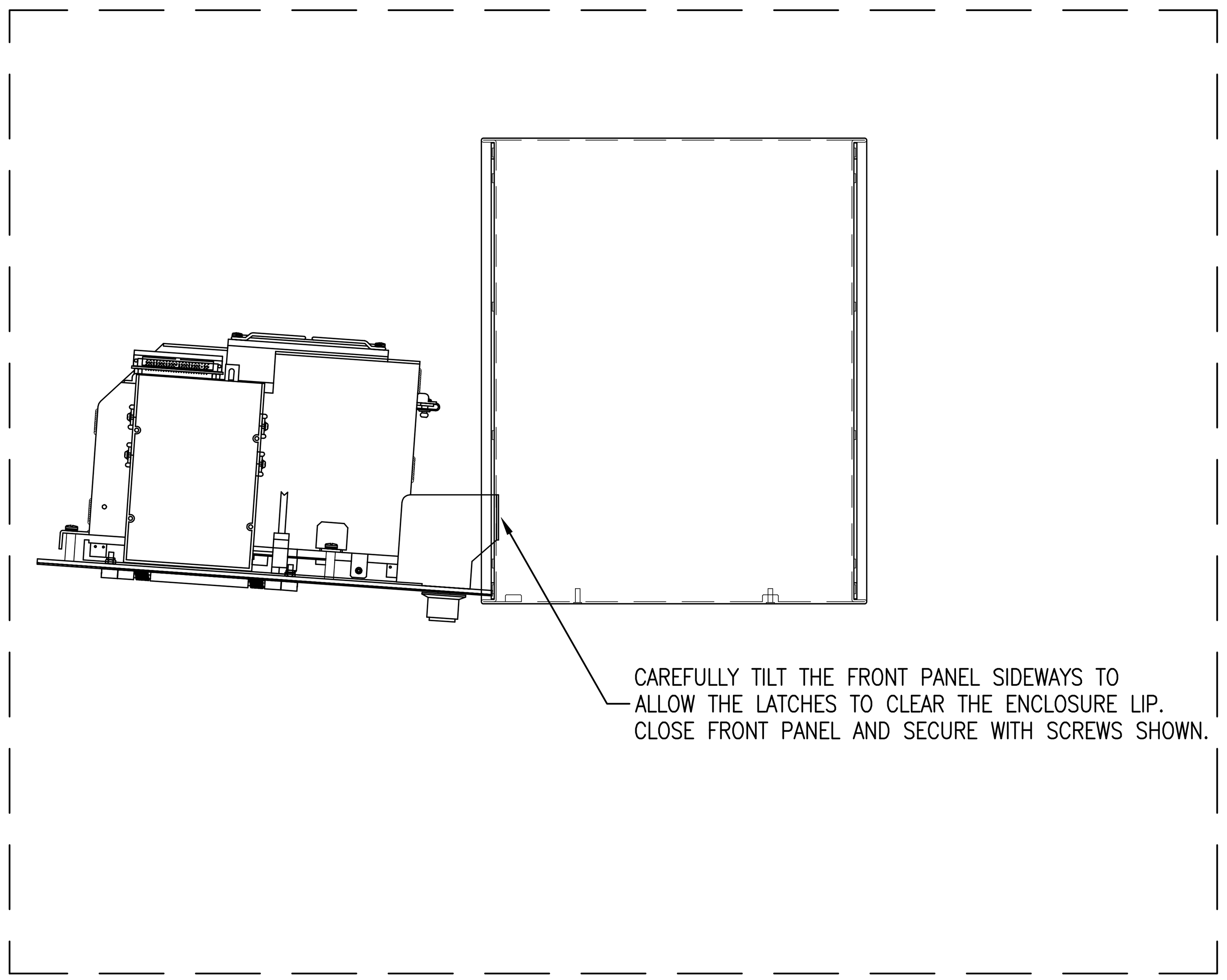
TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

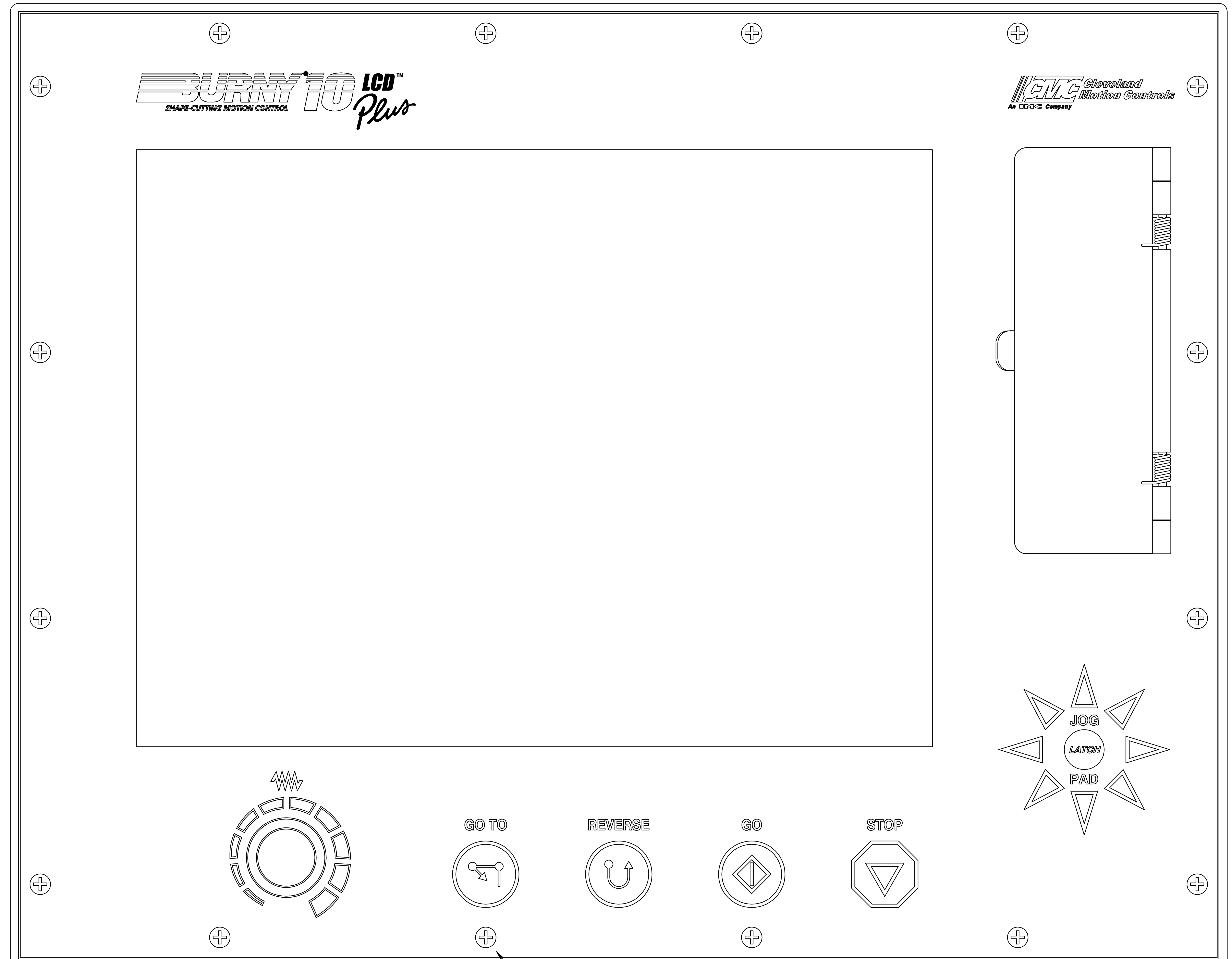
MATERIAL	FINISH	SCALE NONE	REF MNT-13669

ASSEMBLY, FINAL
BURNY 10 LCD PLUS WITH LVDS

CAD DWG NO. :DO-10666BA02.DWG		SIZE	DRAWING NUMBER	REV
DRAWN BY KAP	APPROVED BY MMO	D	DO-10666	BA
DATE 17 SEP 04	DATE 28 SEP 04	SHEET 2 OF 3		



CAREFULLY TILT THE FRONT PANEL SIDEWAYS TO
ALLOW THE LATCHES TO CLEAR THE ENCLOSURE LIP.
CLOSE FRONT PANEL AND SECURE WITH SCREWS SHOWN.



X10-33898 SCREW, M4 x 12MM FHMS
16 PLACES

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA				
AA				

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

CMC Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

ASSEMBLY, FINAL
BURNY 10 LCD PLUS WITH LVDS

MATERIAL	FINISH	SCALE	REF	DATE	DATE
		NONE	MNT-13669	17 SEP 04	28 SEP 04

CAD DWG NO. :DO-10666BA03.DWG
DRAWN BY: KAP
APPROVED BY: MMO
SIZE: D
DRAWING NUMBER: DO-10666
REV: BA
SHEET 3 OF 3

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA	ADD CABLE DETAIL – CAR40025	CLE2958	KAP	10/04
AA	AS RELEASED	MMO	KAP	09/04

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

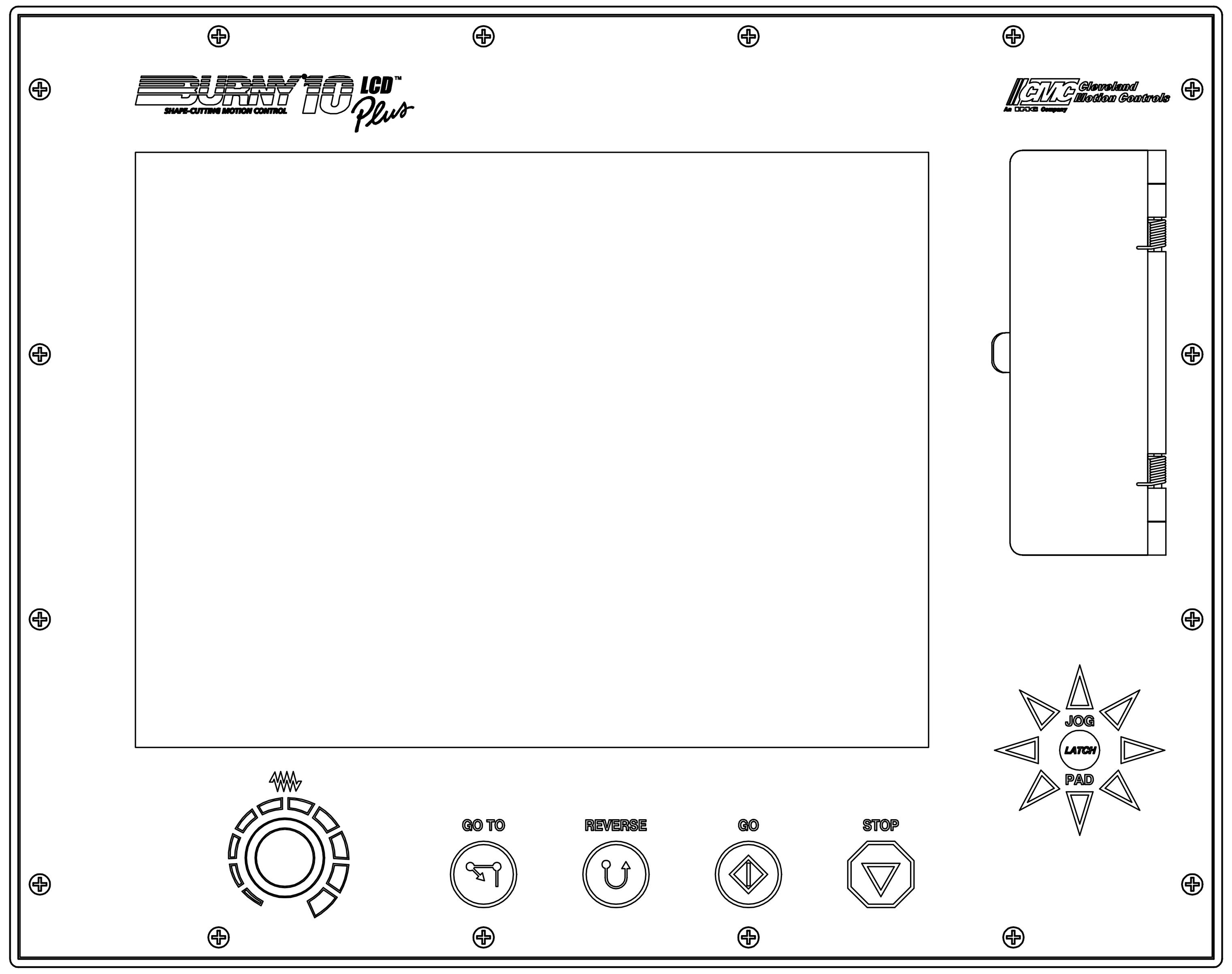
Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

ASSEMBLY, FINAL
BURNY 10 LCD PLUS WITH LVDS
OEM VERSION

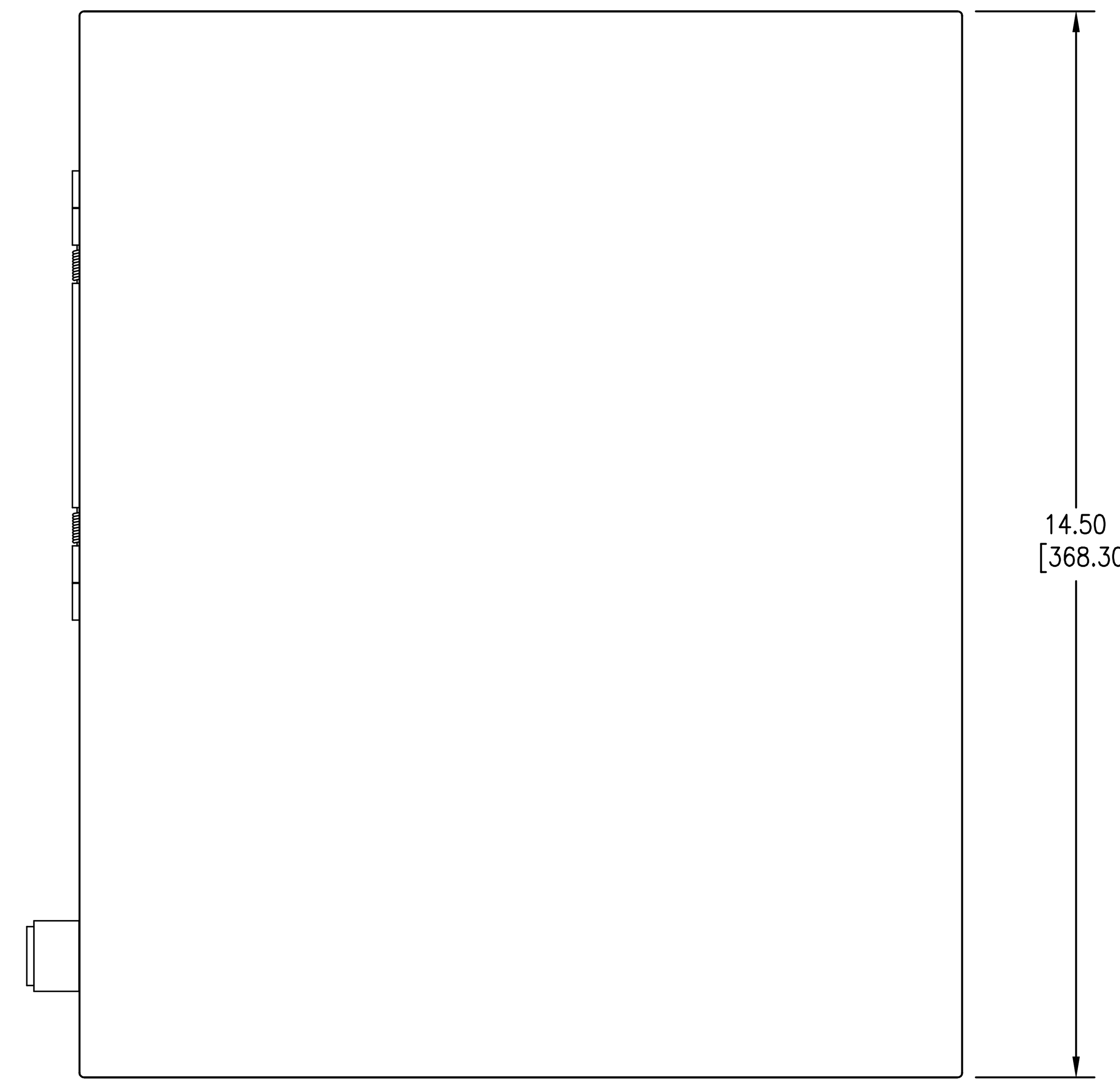
MATERIAL	FINISH	SCALE	REF	DATE	DATE
		NONE	MNT-13667	21 SEP 04	28 SEP 04

CAD DWG NO. :DO-10680BA.DWG
DRAWN BY KAP
APPROVED BY MMO
SIZE D
DRAWING NUMBER DO-10680
REV BA
SHEET 1 OF 1

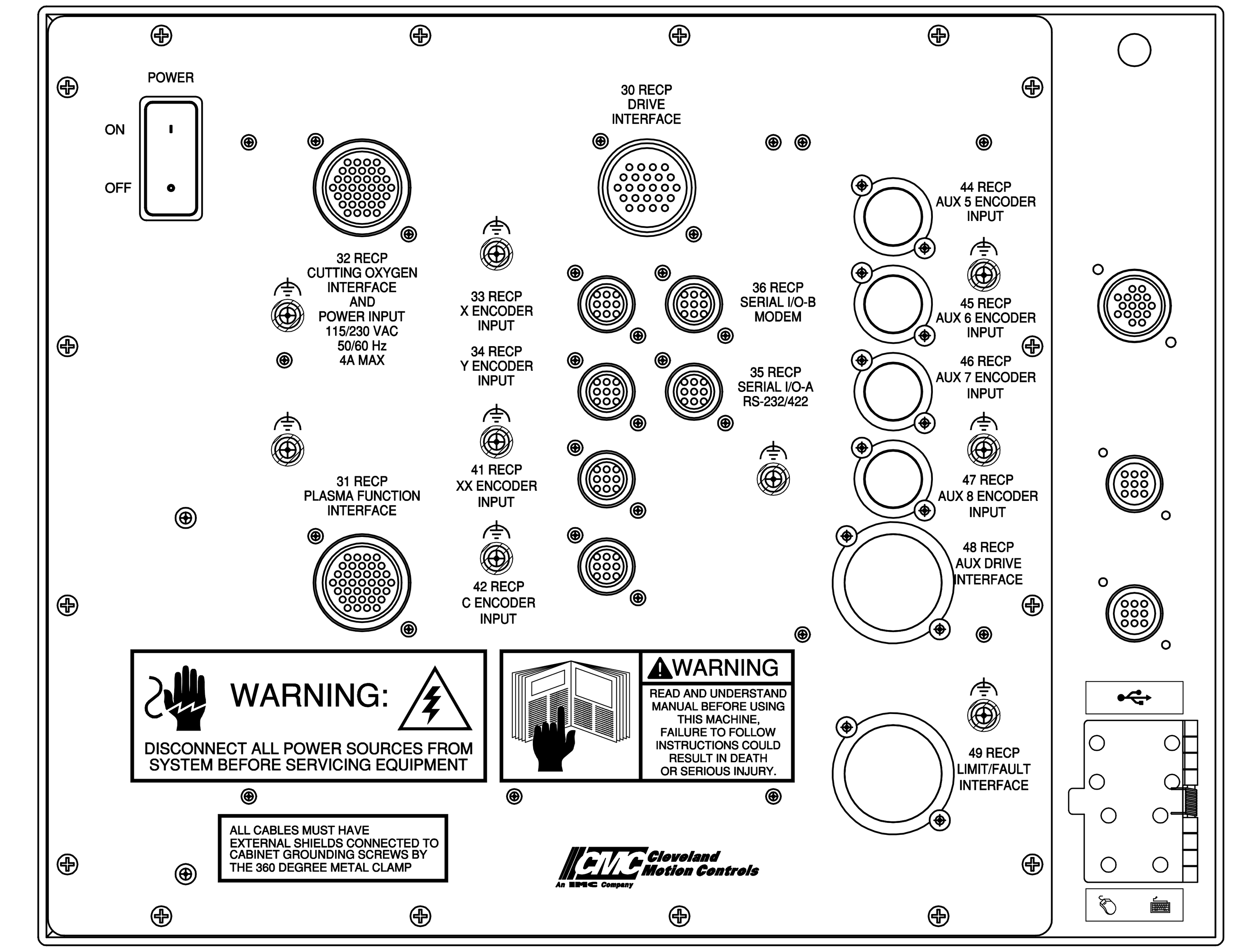
FRONT VIEW



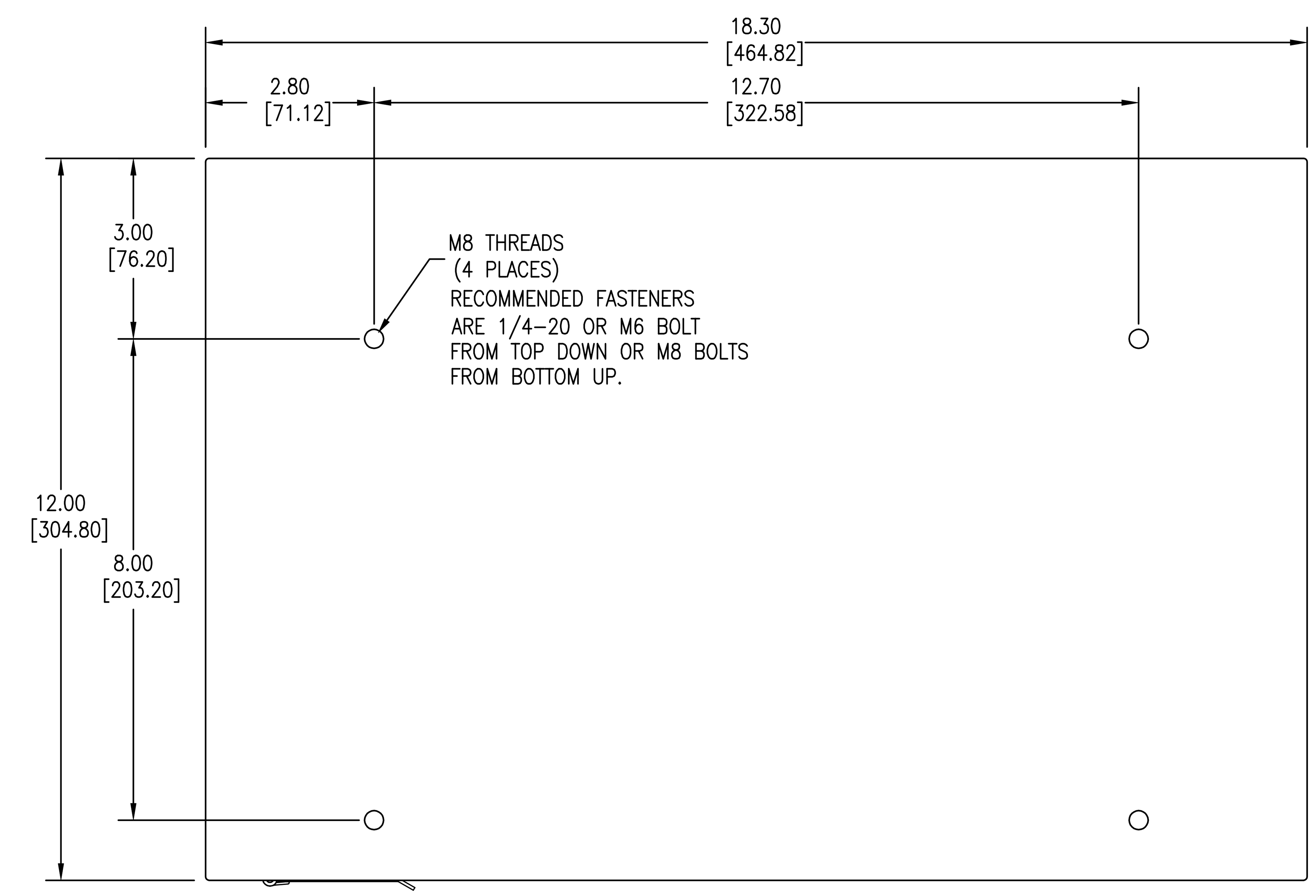
SIDE VIEW



REAR VIEW



BOTTOM VIEW



FOR THE PURPOSE OF CLARITY
NOT ALL PARTS ARE SHOWN

DIMENSIONS IN BRACKETS [x.xxx] ARE MILLIMETER AND ARE FOR REFERENCE

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA				
AA	AS RELEASED	MMO	KAP	06/04

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

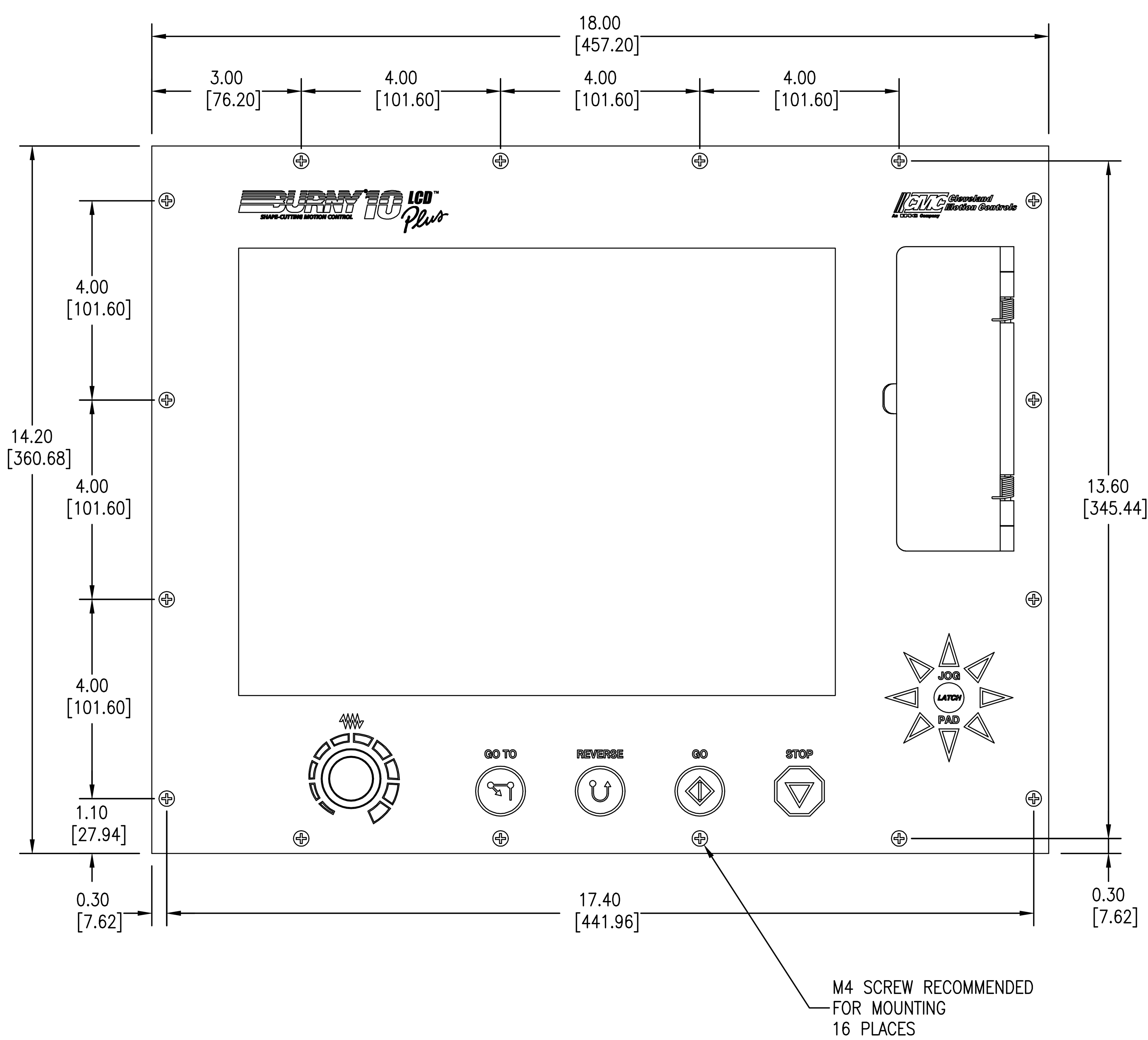
Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

MATERIAL	FINISH	SCALE	REF
		1 : 2	B10 PLUS

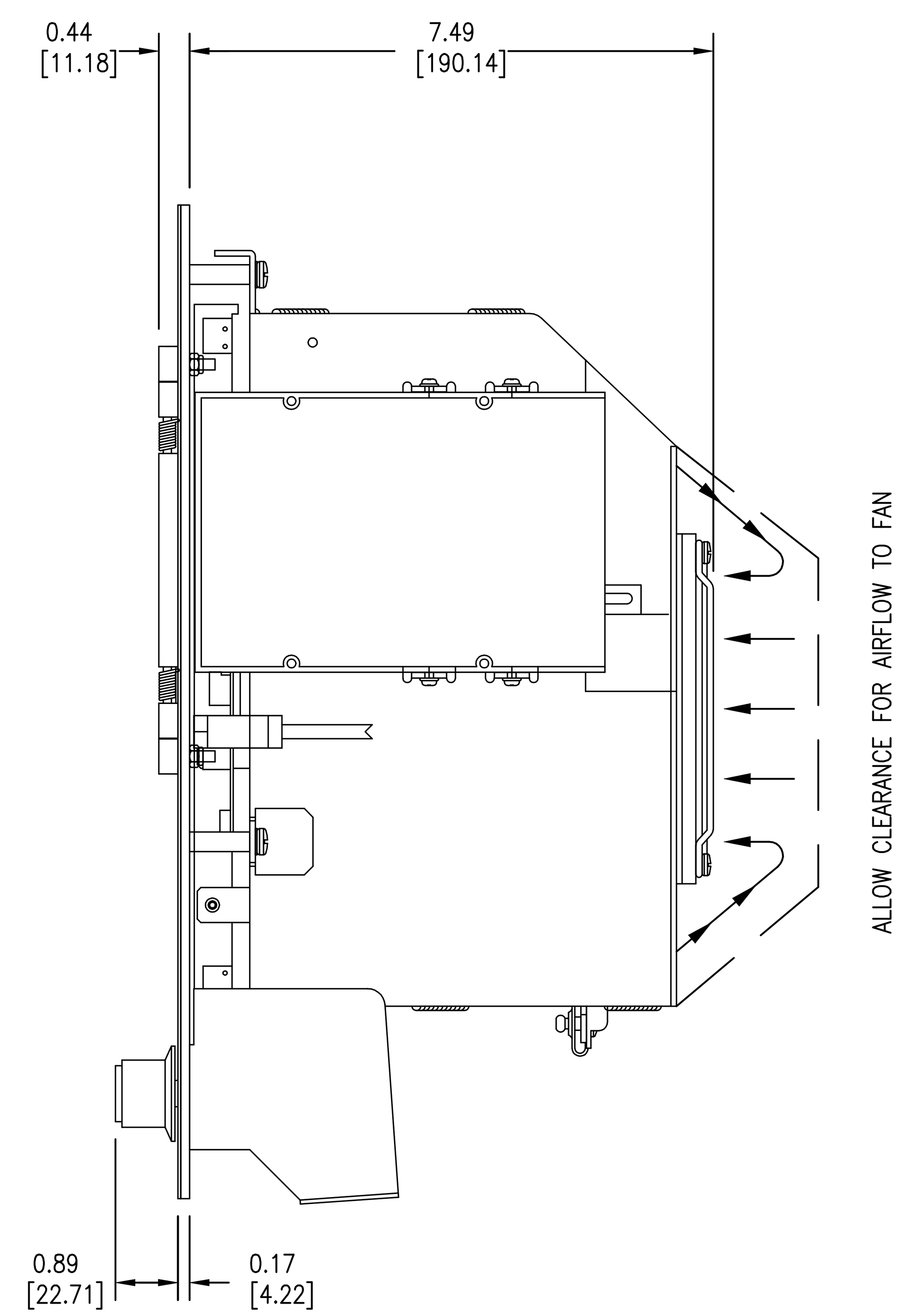
MOUNTING PATTERN,
BURNY 10 LCD PLUS

CAD DWG NO. : DO-90321AA.DWG		SIZE	DRAWING NUMBER	REV
DRAWN BY KAP	APPROVED BY MMO	D	DO-90321	AA
DATE 09 JUN 04	DATE 09 JUN 04	SHEET 1 OF 1		

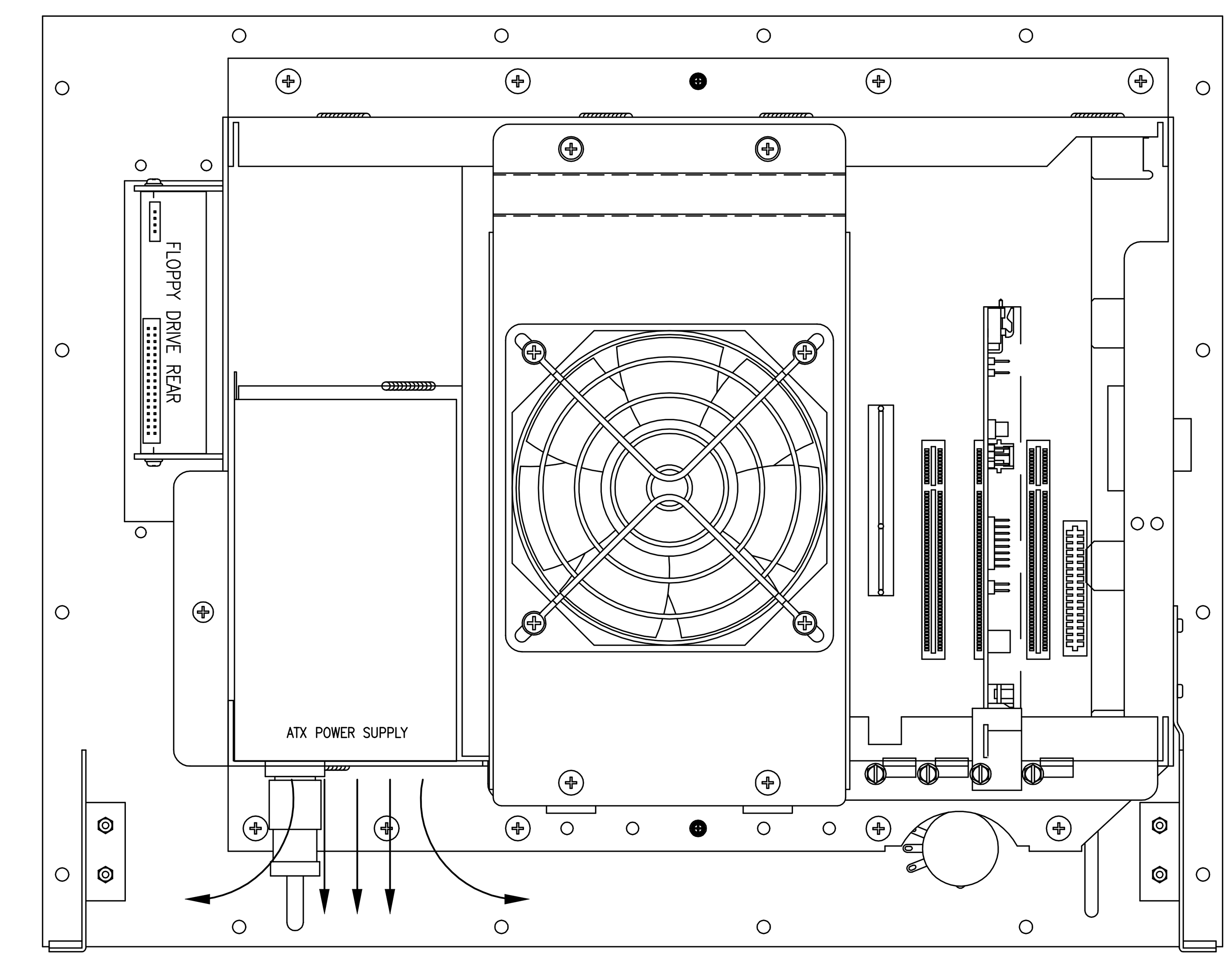
FRONT VIEW



SIDE VIEW



REAR VIEW



NOTE: ALLOW CLEARANCE FOR AIRFLOW
FROM POWER SUPPLY FAN.

FOR THE PURPOSE OF CLARITY
NOT ALL PARTS ARE SHOWN

DIMENSIONS IN BRACKETS [x.xxx] ARE MILLIMETER AND ARE FOR REFERENCE

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA				
AA	AS RELEASED	MMO	KAP	06/04

TOLERANCES
(EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

MATERIAL	FINISH	SCALE	REF
		1 : 2	B10 PLUS

MOUNTING PATTERN,
BURNY 10 LCD PLUS
FRONT PANEL ASSEMBLY

CAD DWG NO. : DO-90322AA.DWG		SIZE	DRAWING NUMBER	REV
DRAWN BY KAP	APPROVED BY MMO	D	DO-90322	AA
DATE 09 JUN 04	DATE 09 JUN 04	SHEET 1 OF 1		

BURNY – SYSTEM DIAGRAM

"30 RECP DRIVE INTERFACE" (24 PIN CPC)

PIN	STANDARD PINOUT (NO INTERFACE CARD)
1	/GENERAL PURPOSE INPUT
2	/GENERAL PURPOSE INPUT
3	UNUSED
4	C REF OUT
5	XX REF OUT
6	Y REF OUT
7	X REF OUT
8	/GENERAL PURPOSE OUTPUT
9	ANALOG GROUND
10	10 V REF OUT
11	/GENERAL PURPOSE OUTPUT
12	CHASSIS GROUND
13	RESERVED
14	+24 V, 100 mA OUTPUT
15	SIGNAL COMMON
16	RESERVED
17	A/D INPUT 1
18	RESERVED
19	RESERVED
20	E-STOP/RUN INPUT
21	/X HOME SWITCH
22	/Y HOME SWITCH
23	/XX HOME SWITCH
24	/C HOME SWITCH

29RECP PIN	SIGNAL NAME
1	XX REF OUT
2	UNUSED
3	UNUSED
4	UNUSED
5	GND ISO
6	UNUSED
7	GND ISO
8	UNUSED
9	GND ISO
10	UNUSED
11	GND ISO
12	UNUSED
13,14,15	+5 V ISO
16	X REF OUT
17,18	+15 V OUT
19	UNUSED
20	AGND
21	Y REF OUT
22	AGND
23	UNUSED
24	-15 V ISO
25	A/D REF
26	-15 V ISO
27	1 FOR INT REF
28	1 FOR OVERRIDE, 0 FOR NC RUN
29	HOME SW SELECT
30	SPARE OUT 1
31	SPARE OUT 2
32	WATCHDOG
33	/HEIGHT SENSE DISABLE
34	/MARKER NO 2
35	/PLASMA START
36	/PLASMA STOP
37	/OXY START
38	/HIGH PREHEAT
39	/MARKER NO 1
40	/OXY STOP
41	X DRIVE HOLD
42	Y DRIVE HOLD
43	X HOME SWITCH
44	Y HOME SWITCH
45	/PLASMA SELECT
46	/INHIBIT ON
47	/OXY CUT ON
48	/PLASMA ARC ON
49	/XX HOME SWITCH
50	ESTOP/RUN
53,54	-15 V ISO
55,56	+15 V ISO
57,58	+5 V ISO
59,60	GND ISO

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA				
AA	AS RELEASED / MADE FROM DO-90324BA	STB	KAP	06/07

TOLERANCES (EXCEPT AS NOTED)
DECIMAL X.X ± .030 X.XX ± .015 X.XXX ± .005
ANGULAR ± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

SYSTEM DIAGRAM, BURNY 10 LCD PLUS 5.X PLATFORM STANDARD

CAD DWG NO. : DO-90392AA.DWG	SIZE	DRAWING NUMBER	REV
DRAWN BY STB/KAP; APPROVED BY STB	D	DO-90392	AA

MATERIAL	FINISH	SCALE	REF	DATE	DATE
		NONE	MNT-14221	06-11-07	06-11-07

SHEET 1 OF 4

PL3-REMOTE PENDANT	
PIN	SIGNAL NAME
1	FRONT PNL ENABLE/DISABLE
2	+24VDC
3	PENDANT ENABLED
4	JOG -Y
5	JOG -X
6	JOG +Y
7	JOG +X
8	LATCH JOG
9	GO
10	BACKUP
11	RAPID
12	STOP
13,14	GROUND ISO
15, 16	+24VDC ISO

PL7-FRONT PANEL SWITCHES	
PIN	SIGNAL NAME
1	+24VDC STOP SOURCE
2	STOP
3	+24VDC BUTTON SOURCE
4	BACKUP
5	LAMP 2
6	LAMP 1
7	GO
8	GOTO
9	+X
10	+X-Y
11	-Y
12	-X-Y
13	LATCH JOG
14	-X
15	+Y-X
16	+Y
17	+Y+X
18	RAPID
19	EXTRA
20	LCD GROUND
21	+ LCD MENU CONTROL
22	MENU
23	- LCD MENU CONTROL

RS-232	RS-422/485
RX	RX- (A')
CTS	RX+ (B')
GND	GND
TX	TX- (A)
RTS	TX+ (B)
+V PULLUP	+V PULLUP
+V PULLUP	+V PULLUP

TOLERANCES (EXCEPT AS NOTED) DECIMAL X.X ± .030 X.XX ± .015 X.XXX ± .005 ANGULAR ± 0.5° DO NOT SCALE DRAWING

Cleveland Motion Controls — An IMC Company — 7550 HUB PARKWAY CLEVELAND, OHIO

SYSTEM DIAGRAM, BURNY 10 LCD PLUS 5.X PLATFORM STANDARD

CAD DWG NO.: DO-90392AA.DWG | SIZE D | DRAWING NUMBER DO-90392 | REV AA

DRAWN BY STB/KAP | APPROVED BY STB | SCALE NONE | REF MNT-14221 | DATE 06-11-07 | DATE 06-11-07

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA				
AA				

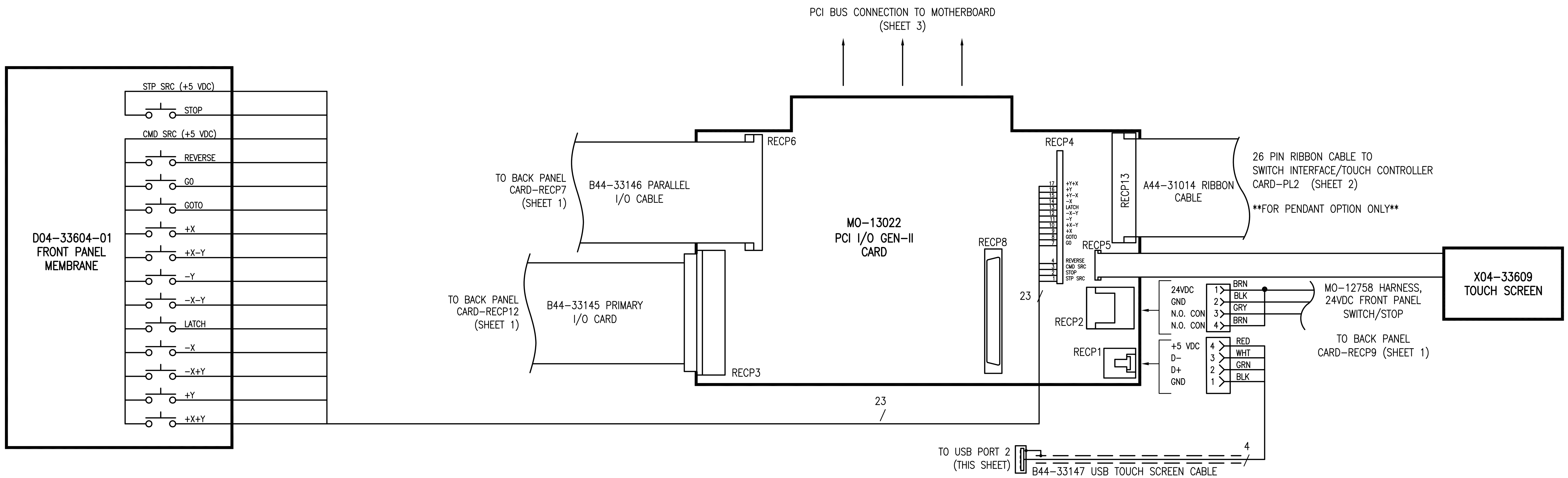
TOLERANCES (EXCEPT AS NOTED)
DECIMAL X.X ± .030 X.XX ± .015 X.XXX ± .005
ANGULAR ± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

SYSTEM DIAGRAM, BURNY 10 LCD PLUS 5.X PLATFORM STANDARD

CAD DWG NO.	SIZE	DRAWING NUMBER	REV
DO-90392AA.DWG	D	DO–90392	AA

MATERIAL	FINISH	SCALE	REF	DRAWN BY	APPROVED BY	
		NONE	MNT–14221	STB/KAP 06–11–07	STB 06–11–07	SHEET 3 OF 4



SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA				
AA				

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR
± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

SYSTEM DIAGRAM,
BURNY 10 LCD PLUS 5.X PLATFORM
STANDARD

MATERIAL	FINISH	SCALE	REF	DRAWN BY	APPROVED BY
		NONE	MNT-14221	STB/KAP	STB
				DATE 06-11-07	DATE 06-11-07

CAD DWG NO. : DO-90392AA.DWG
SIZE D
DRAWING NUMBER DO-90392
REV AA
SHEET 4 OF 4

BLANK

4.) ALL METAL D-SUB HOUSINGS MAKE CONNECTION TO CHASSIS GROUND THROUGH MOUNTING STANDOFFS
3.) ALL MOUNTING STANDOFFS MUST MAKE GOOD CONNECTIONS TO CHASSIS GROUND.
2.) OUTPUT OFF IS PLASMA STOP, OUTPUT ON IS PLASMA ENABLE.
1.) OUTPUT OFF IS OXY STOP, OUTPUT ON IS OXY ENABLE.
BA NOTES:

SYM	REVISION	ECO	BY	DATE
FA				
EA				
DA				
CA				
BA	ADD NOTES/CAR #20093	CLE2239	KAP	05/02
AA	RELEASE	MMO	KAP	09/01

TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR ± 0.5°
DO NOT SCALE DRAWING

Cleveland Motion Controls
An IMC Company
7550 HUB PARKWAY CLEVELAND, OHIO

WIRING DIAGRAM, BACK PANEL
BURNY 10 OEM

CAD DWG NO. : DO-31181BA01.DWG		SIZE	DRAWING NUMBER	REV
DRAWN BY MMO	APPROVED BY MMO	D	DO-31181	BA
DATE 09-06-01	DATE 09-18-01		SHEET 1 OF 2	

MATERIAL	FINISH	SCALE	REF
		NONE	MNT-12843


DRIVE INTERFACE
30RECP
25 PIN MALE D-SUB
TYPICAL CONNECTION
+24VDC
/G.P. INPUT 1 (X DRIVE HOLD) 16mA
/G.P. INPUT 2 (Y DRIVE HOLD) 16mA
E-STOP/RUN INPUT 16mA
/X HOME SWITCH 16mA
/Y HOME SWITCH 16mA
/XX HOME SWITCH 16mA
/C HOME SWITCH 16mA
/G.P. OUTPUT (INT REF) 100mA MAX
/G.P. OUTPUT (/NC RUN) 100mA MAX
/G.P. OUTPUT 100mA MAX
C REFERENCE ±10VDC
XX REFERENCE ±10VDC
Y REFERENCE ±10VDC
X REFERENCE ±10VDC
+10VDC REF OUT
+24VDC ISO 100mA MAX
A/D INPUT 1 (FEEDRATE) 0-10VDC
ANALOG COMMON
SIGNAL COMMON
CHASSIS GROUND
CR
ENCODERS
33, 34, 41, 42RECP
15 PIN MALE D-SUB
A
/A
SHIELD COMMON
B
/B
I
/I
ENCODER COMMON
ENCODER +VDC
DC POWER SUPPLY INPUT
TB-8 PHOENIX MATES WITH
PHOENIX P/N 1757077
+15VDC
-15VDC
+5VDC
COMMON
+24VDC
SERIAL I/O A
35RECP
9 PIN MALE D-SUB
RS232
RS422
RX
RX-
CTS
RX+
+V PULL UP
GROUND
TX
TX-
RTS
TX+
EXTERNAL CONTACTOR
X ENCODER
Y ENCODER
XX ENCODER
C ENCODER
EXT CONT
ISO SUPPLY INPUT
FROM FP
SERIAL I/O-A
OXY INTERFACE
PLASMA INTERFACE
DRIVE INTERFACE
RS-232 FROM PC
FROM ATX SUPPLY
J1
A=AUTO
B=RS232
NONE=RS422
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TOLERANCES (EXCEPT AS NOTED)
DECIMAL
X.X ± .030
X.XX ± .015
X.XXX ± .005
ANGULAR ± 0.5°
Cleveland Motion Controls
7550 HUB PARKWAY CLEVELAND, OHIO
WIRING DIAGRAM, BACK PANEL
BURNY 10 OEM
DRAWN BY MMO
APPROVED BY MMO
DATE 09-06-01
DATE 09-18-01
D
DO-31181
BA
SHEET 2 OF 2

CMC Pendant Control Option

(AO-70382 Rev AA)

Option

PC

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

Table Of Contents

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1 CMC PENDANT CONTROL OPTION

1.1 INTRODUCTION

The CMC Pendant Control Option allows from one to four independent Hypertherm Command THC systems to be setup and controlled directly through the ***Burny***. One Command THC system is required for each torch. Multi-drop for a single Command THC is not supported.

The CMC Pendant Control Option / Command THC system may be used independently or in conjunction with Hypertherm's HPR130 and/or HPR260 Power Supplies.

This option is called CMC Pendant Control because it provides convenient access to the functionality found in the Command THC's optional Operators Pendant.

The CMC Pendant Control Option has been integrated into the Process Wizard (Burny Advanced Plasma) interface beginning with Software Version 4.0.4/4.3 BSP1. Please make sure you know which version of software your Burny uses before proceeding with this documentation.

Hypertherm's Command THC is a torch height control/initial height sensing (THC/IHS) systems that uses the plasma arc voltage to control the physical stand-off (distance) between the torch and the work piece during plasma arc cutting. The IHS operates by ohmic contact sensing or by a limited force stall detection method. Details of the system can be found in the Hypertherm manual 802780.

1.2 PHYSICAL CONNECTION

The physical hookup between the ***Burny*** and the Hypertherm System is through an RS422 serial connection detailed in Figure 1. For general information about how the ***Burny*** handles serial communications, refer to ***Section 10: Installation and Maintenance***.

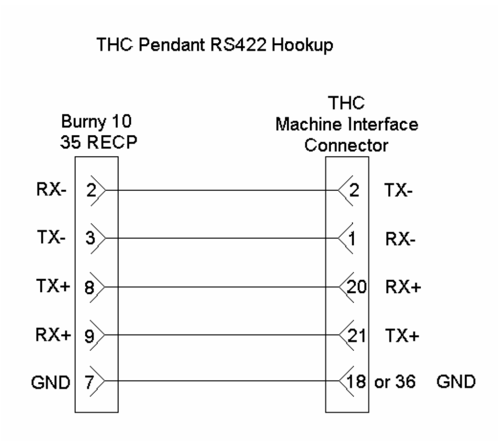


Figure 1- RS422 Connection Diagram

1.3 FOR SOFTWARE VERSIONS 4.0.4/4.3 BSP1 AND NEWER

1.3.1 SOFTWARE VERSION NOTIFICATION

Starting with the release of Software Version 4.0.4/4.3 BSP1, the CMC Pendant Option is now accessed through the Burny Process Wizard (or Burny Advanced Plasma), which appears on either the ***Run02*** or ***Run0***3 screens. This is a change from the previous software versions where this access was made through the ***Status Screen*** (Status01). See section 1.4 for details on older software versions.

1.3.2 LICENSING AND ENABLING THIS OPTION

The following steps should be performed by the administrator or service engineer for your system. Obtain a valid CMC Pendant Control Option license key from Cleveland Motion Controls before beginning this procedure:

1) Enter the license key by following this sequence:
   Press MENU » Press UTIL » Press Enable Password » Enter the admin password » Press OK » Press System Setup » Press Miscellaneous Setup » Press License » Press the "Options License Key" button » Enter a valid license key » Press OK » Press OK.
2) Enable the Option…continuing from Step 2, follow this sequence:
   Press OCX Options » Press the NONE button under "Voltage Height Control" until it reads "CMC Pendant Control" » Press OK » At the Warning: Reboot Screen, press OK.
3) Reboot the Burny…continuing from Step 3, follow this sequence:
   Press Return » Press Return » Press Shutdown » Press OK » When prompted, turn off the Burny power switch » Wait 60 seconds » Turn on the Burny power switch.

After the Burny starts, the option is ready to be setup and configured.

1.3.3 ACCESSING THIS OPTION

Once the option is licensed and enabled, it is accessed through the "*Process Wizard*" button, which is located on both the ***Run02*** and ***Run03*** screens as shown below – this is also know as the Burny Advanced Plasma interface.

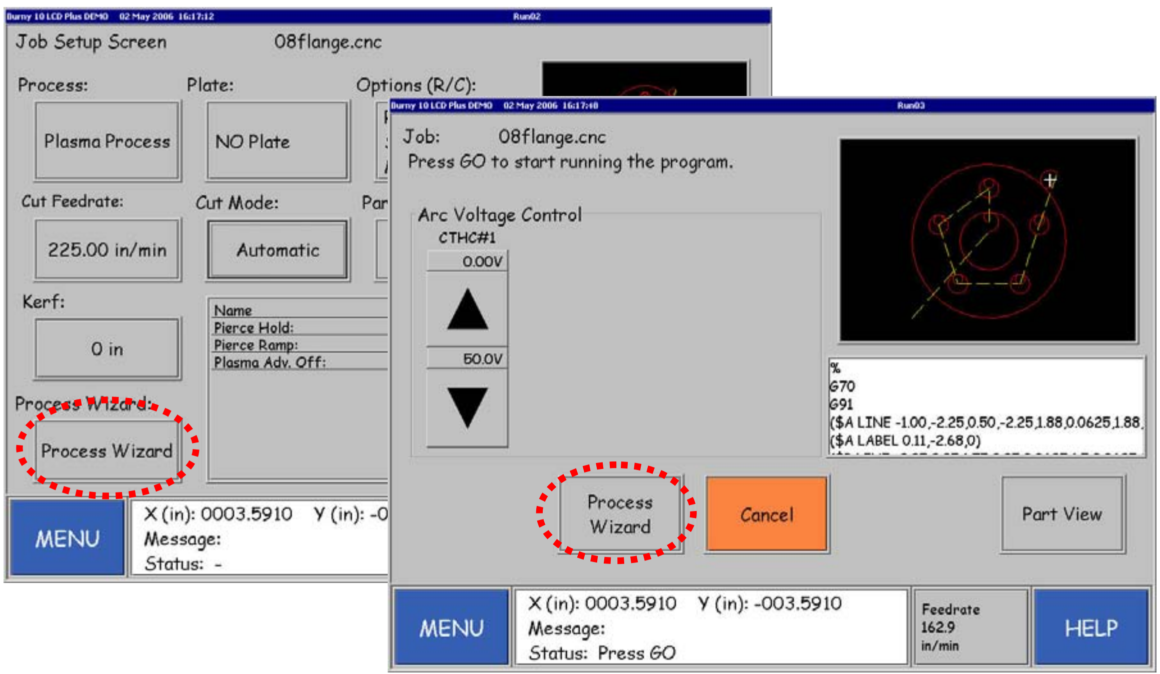


Figure 2 – Access points for the Process Wizard (Burny Advanced Plasma)

1.3.4 INITIAL SETUP

1) Make the physical connections between the Burny and Command THC System and apply power to the unit.

2) Assign a COM port for the Command THC system by touching the **Process Wizard** button on the ***Run02*** screen, followed by the **Status** button and finally the A**dd/Remove PS** button.

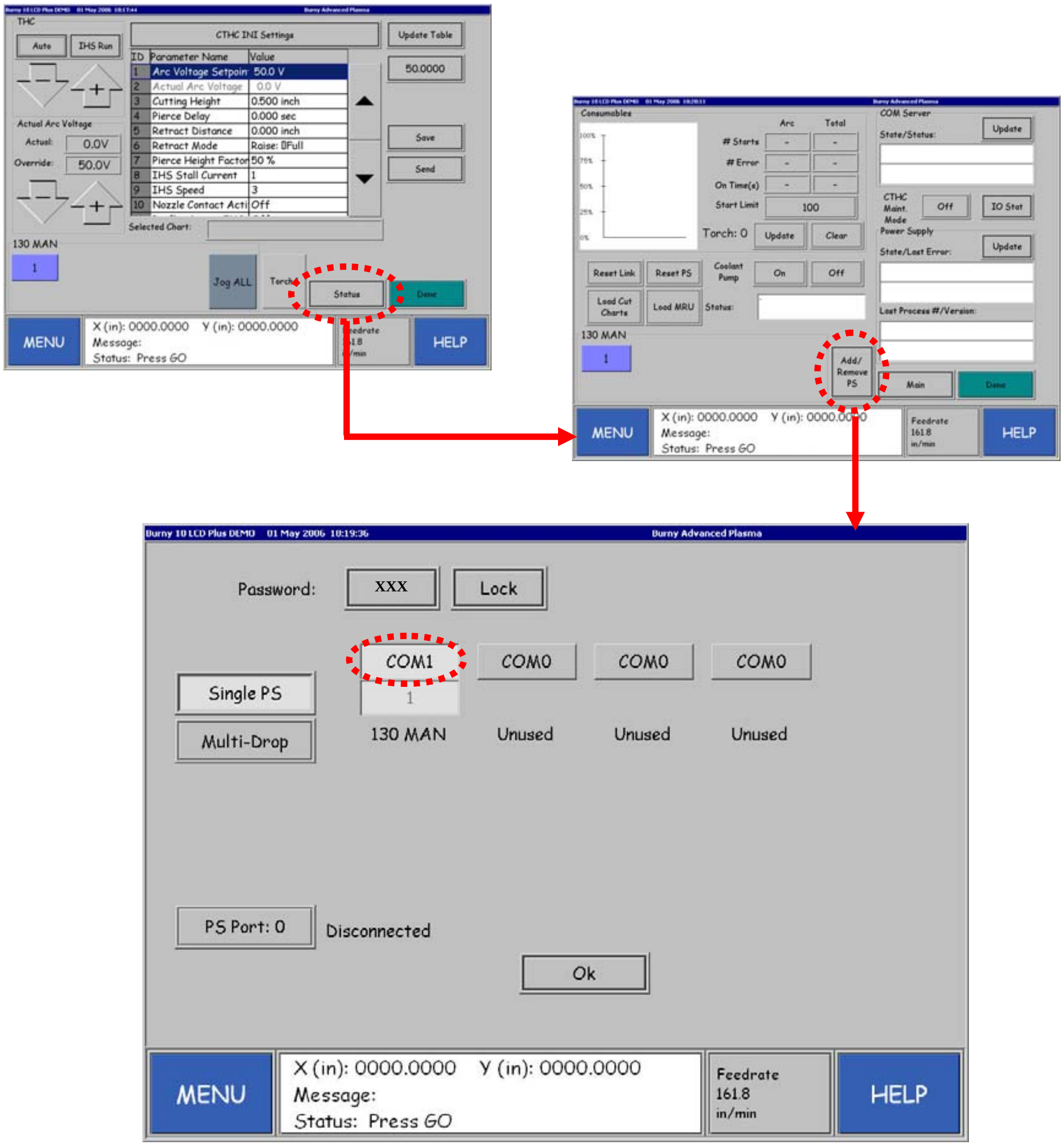


Figure 3 – Sequence for Assigning COM ports

3) Touch the Password "**0**" button and enter the Burny Admin Password.

4) Touch the **COM0** button above the proper power supply until the desired COM port is selected. Choices are from COM0, which means disabled, up to COM8.

5) Touch the **Lock** button to prevent accidental changes.

6) Choose **OK** to apply the changes and return the ***Advanced Plasma Main Screen***.

7) Reboot the Burny to make the selected COM port(s) available.

1.3.5 ADVANCED PLASMA MAIN SCREEN COMPONENTS

Press on this side of the **Parameter Table** button to scroll *backwards* through the available Parameter

Press on this side of the **Parameter Table** button to scroll *forward* through the Parameter Tables.

THC Control Buttons

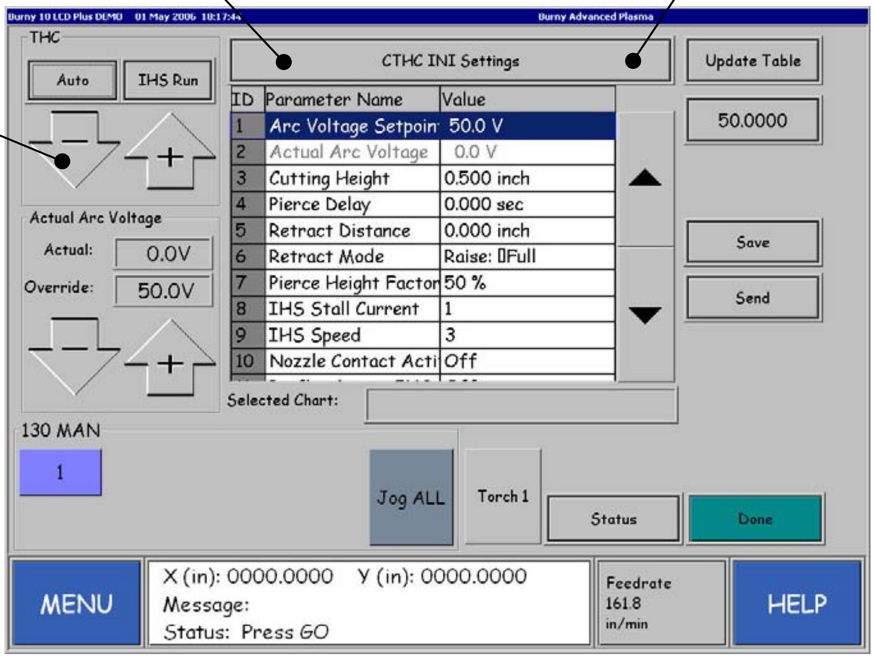


Figure 4 – Advanced Plasma Main Screen

For purposes of clarity, only buttons associated with this option are shown in the table below. For more information about other buttons, refer the appropriate Burny documentation for the power supply being used.

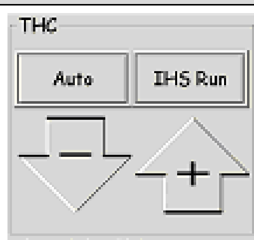
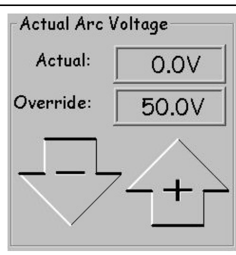
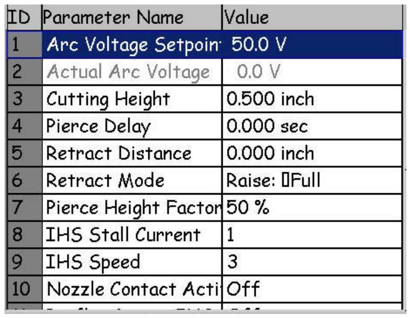
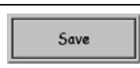
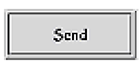
This area or button:	Provides you with the following operations:
	**Auto/Manual button** - Pressing this button toggles the Command THC system between Auto and Manual mode. In Auto mode, the arrow buttons move the torch up and down until a start signal is applied to the Command THC then, automatic operation takes control. In Manual mode, all of the automatic functions are disabled and the torch position must be controlled using the up and down arrow buttons. **IHS Run/On button** - (Initial Height Sense) Pressing this button toggles between **IHS Run** and **IHS On**. When set to **IHS Run**, the IHS is ready for normal operation. When set to **IHS ON**, the torch moves down to detect the plate and then rises to the configured pierce height.
	The **Actual** field displays the plasma arc voltage while a cut is being made. If you want to change the arc voltage to achieve a desired cut quality, use the arrow keys to temporarily and incrementally override the arc voltage set point. Keep in mind, that in order to maintain optimal cut quality, the arc voltage may need to be increased as the electrode wears. When a power supply is selected, pressing the **Up arrow** button (+) increases the arc voltage, thereby increasing the cutting height of the torch. Pressing the **Down arrow** button (-) decreases the arc voltage, thereby lowering the cutting height of the torch.

Table Continued On The Next Page…

This area or button:	Provides you with the following operations:
 	Parameter Table Button - pressing this button cycles through the available tables for the active Command THC and Power Supply, if installed.
	Parameter Table Window - this window displays the Parameter Table items associated with the selection shown on the **Parameter** Table button. Adjustable Parameter items are shown in bold type. To change a value, do the following: 1. Highlight the parameter item by pressing on it or use the scroll bars. 2. The select button will change to show the current value. Press it to edit the value You can not adjust the values for items that are grayed out. For a complete list of parameters, see Hypertherm's Command THC documentation.
	Pressing this button uploads the current values of the active THC or Power Supply, if installed, into the Parameter table.
 *or* 	Use this button to edit the highlighted parameter contained in the parameter window.
	Saves changes made in the parameter tables, which are stored in the Burny. Use the Send button to upload the table to the Command THC.
	Pressing this button transmits (uploads) all the parameter table values to the Command THC unit. Before sending the parameters, a screen is displayed allowing the operator to choose which Command THC unit to send the table values.
	Pressing this button displays the ***Status Screen***.
	Returns to the previous ***Run Screen***.

CHANGING PARAMETERS

These are the steps required to change a parameter value and then make it available to the Command THC system.

1) Select the desired parameter by touching it or by using the scroll bars to highlight it.
2) Touch the ***Select*** button or the button containing the parameter value to be changed.
3) The subsequent screen will allow you to change the value by choosing from a list or entering a new value. Press ***OK*** to accept the change. Change as many parameter values as necessary.
4) Press the ***Save*** button to write the value(s) into the CTHC INI Settings table.
5) Touch the ***Send*** button to upload the parameter table to the Command THC system. Note: the entire table is uploaded.

The new parameters are now ready to be used by the Command THC system.

1.3.6 ADVANCED PLASMA STATUS SCREEN

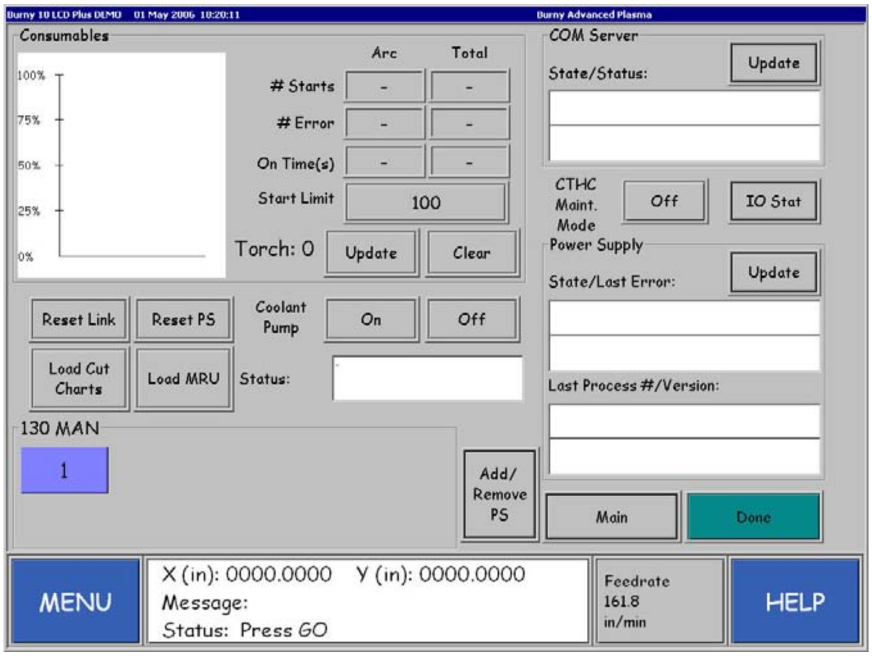


Figure 5 – Advanced Plasma Status Screen

For purposes of clarity, only buttons associated with this option are shown in the table below. For more information about other buttons, refer the appropriate Burny documentation associated with the brand of power supply being used.

This button:	Provides you with the following operations:
	This button toggles the Maintenance Mode either ON or OFF. Setting this to ON moves the lifter to the home position (full up), which allows the operator to perform maintenance tasks to the torch or consumables. Setting the mode of OFF resumes normal operation and the lifter moves to the configured pierce height.
	This button is used to access the largest screen shown if Figure 3, which allows the operator to setup COM ports for connecting the Burny to the Command THC system.

1.3.7 TROUBLESHOOTING

Before Contacting Burny…

If the Command THC is in Maintenance Mode and the Burny's power is cycled, the UP / DOWN buttons may not function as expected. This is because the Command THC cannot be queried by the Burny during power-up, so it is assumed not to be in Maintenance Mode.

To reset this rare condition, touch the Maintenance Mode button ONCE and restart the Burny.

1.4 FOR SOFTWARE VERSIONS PRIOR TO 4.0.4/4.3 BSP1

1.4.1 INTRODUCTION

The following instructions are provided as reference only for units with software versions prior to 4.0.4/4.3 BSP1

The CMC Pendant Control Option enables a ***Burny Series 10*** user to setup from one to four independent Hypertherm Torch Height Control/Initial Height Sensing (THC/IHS) systems. One system is required for each torch that is controlled. A system uses the plasma arc voltage to control the physical standoff distance between the torch and the work piece during plasma arc cutting. The IHS operates by ohmic contact sensing or by a limited force stall detection method. Details of the system can be found in the Hypertherm manual 802780.

This ***Burny Series 10*** option is called Pendant Control because the Hypertherm system can be controlled through its THC Control unit with a hand held keyboard. The Pendant Control Option brings the same setup functions to the screen of the ***Burny Series 10*** through an RS422 interface to the THC Control units.

See ***Part 7***, ***Utility***, of this manual for general information on options and how to install them.

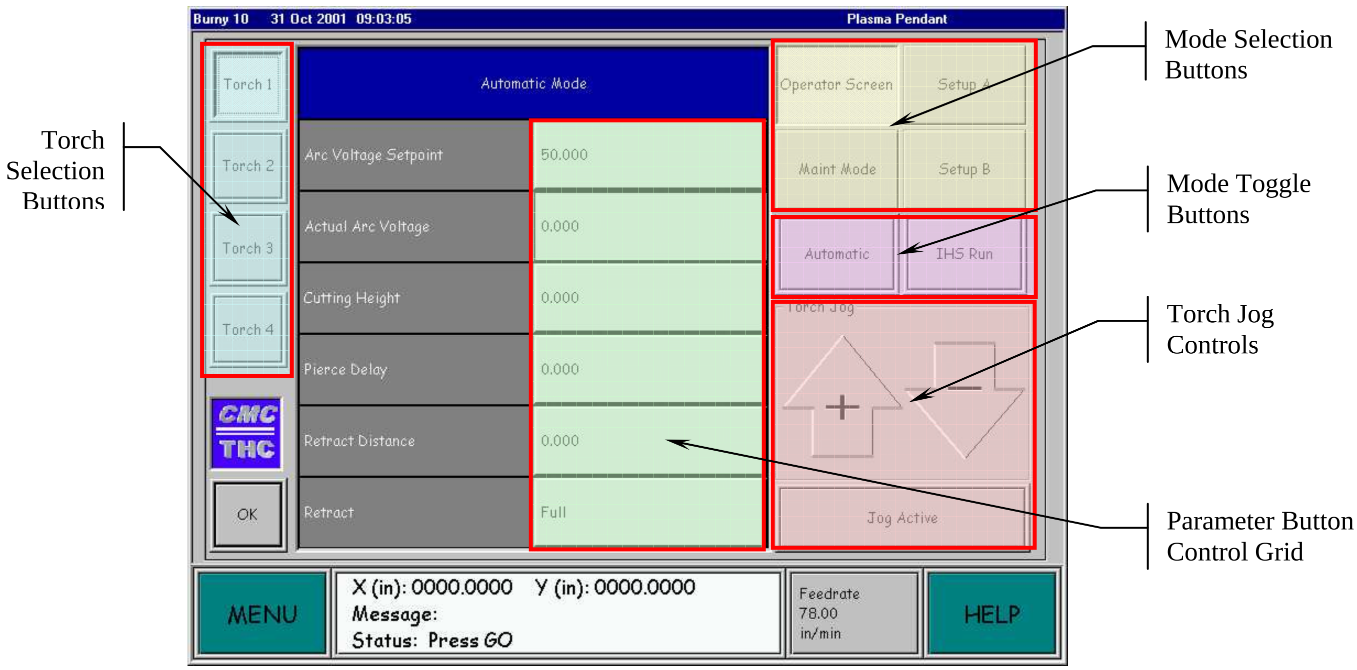


Figure 6 – Pedant User Interface Screen (PlasmaPendant)

The Pendant User Interface screen is shown in Figure 6. The area with two columns labeled Automatic Mode in the figure is called the control grid. The parameters displayed here apply to the torch whose Torch Selection Button is highlighted in the left column of the screen as shown in . This torch is called the “active” torch, and only one can be active at a time.

An “enabled” torch is one connected through a Hypertherm THC/IHS system to the ***Burny Series 10***, powered up, and enabled in the Pendant Setup Screen. Up to four torches can be “enabled”. A torch must be enabled before it can be selected as active.

Touching an item in the control grid brings up a keypad that allows the operator to enter values for a parameter or changes the display to a different screen.

1.4.2 TORCH SELECTION BUTTONS

The Setup process is performed on the torch and corresponding system selected with the four Torch Selection buttons in the upper left of the screen. This torch is called the “active” torch. A torch must be enabled before it can be selected. See Pendant Setup Screen in Section 0. The Actual Arc Voltage and the parameter values displayed in the Parameter Control Grid shown in correspond to those stored in the selected system.

1.4.3 MODE SELECTION BUTTONS

Selecting the Operator Screen button will force the active torch into automatic or manual mode, depending on the state of the Automatic/Manual Toggle Button. In Automatic mode, torch height is controlled by the Hypertherm system to maintain the Arc Voltage Setpoint.

1.4.4 MAINTENANCE MODE BUTTON

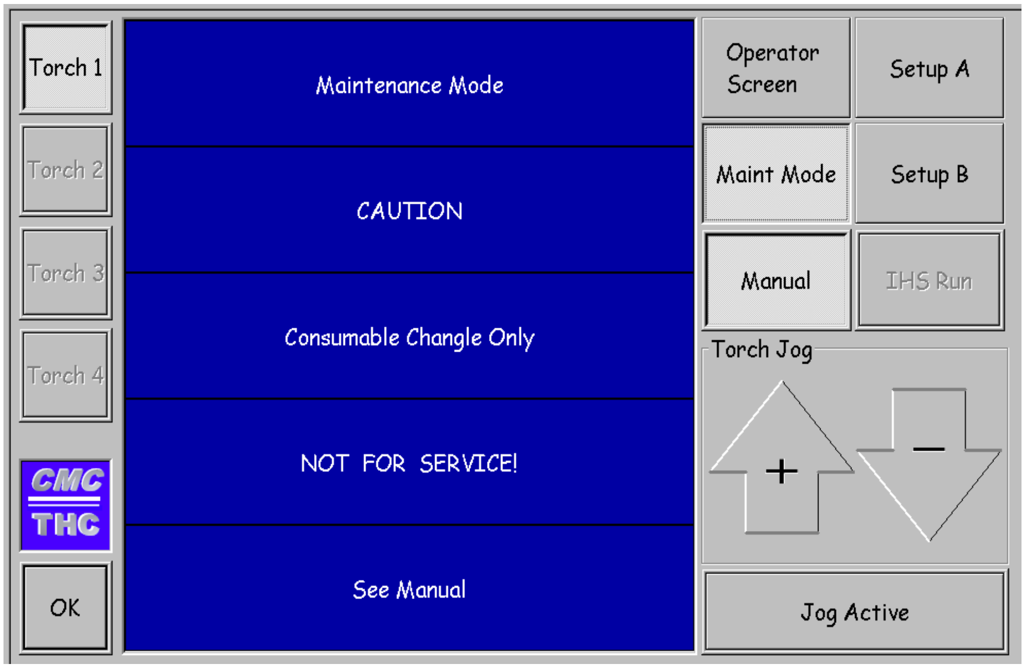


Figure 7 – Maintenance Mode Screen

When the Maint Mode button is touched, the Control Grid area of the screen changes as shown in . The torch system is forced into maintenance mode, causing the torch to retract to full up and the brake to lock. Exit this mode by touching one of the other mode buttons: Operator Screen, Setup A, or Setup B.

The Setup A and Setup B modes display additional setup parameters in the button grid. See Section 1.4.4 .

AUTOMATIC/MANUAL TOGGLE BUTTON

Toggle the Automatic/Manual button to set the Operator Screen mode. In Automatic mode, the voltage is held constant by the torch height control system. In Manual mode, the operator adjusts the voltage by jogging the torch height.

IHS RUN/TEST BUTTON

In Operator Screen, Setup A, or Setup B mode, toggling the IHS button from IHS Run to IHS Test will cause the torch control to begin an Initial Height Sensing sequence. When the button is in IHS Test mode, all other control buttons are disabled. When the test finishes, deselect the IHS Test mode.

TORCH JOG BUTTONS

The Torch Jog arrows are enabled when in Operator Screen mode and the Automatic/Manual toggle button is in the Manual position. Touch either arrow once to start up or down motion of the torch. Touch the arrow again to stop the motion.

When the Jog Active/Jog All button reads Jog Active, only the active torch will be moved by the jog commands. When Jog All is selected, all enabled torches will receive jog commands.

SETTING PARAMETER VALUES

Touching any of the button fields in the control grid will bring up a keypad that allows the operator to enter Boolean or numeric values. The prompt indicates the active torch, the parameter name, and the current units: Volts, Seconds, Percent, inch, or mm and the allowed range.

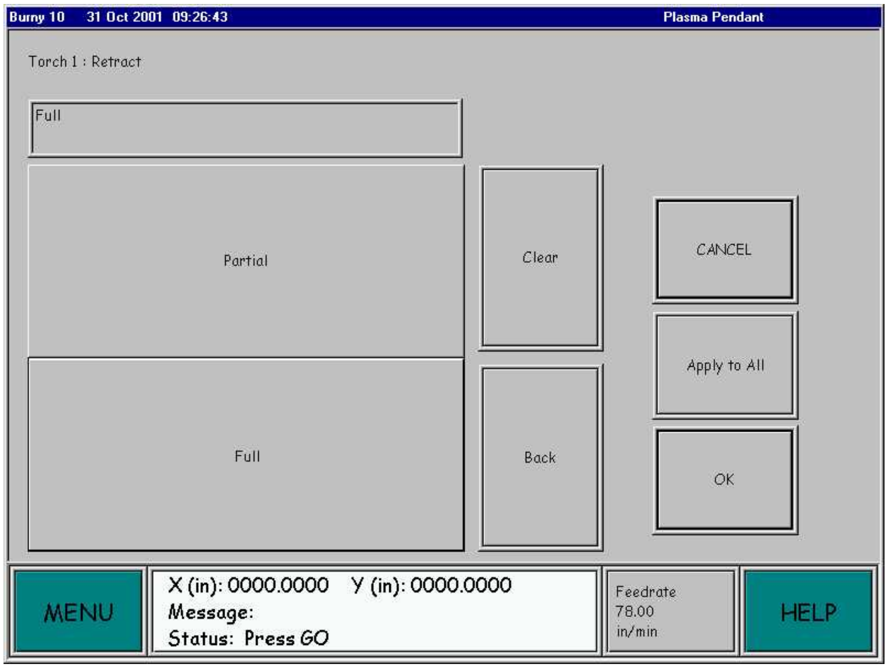


Figure 8 – Boolean Keypad

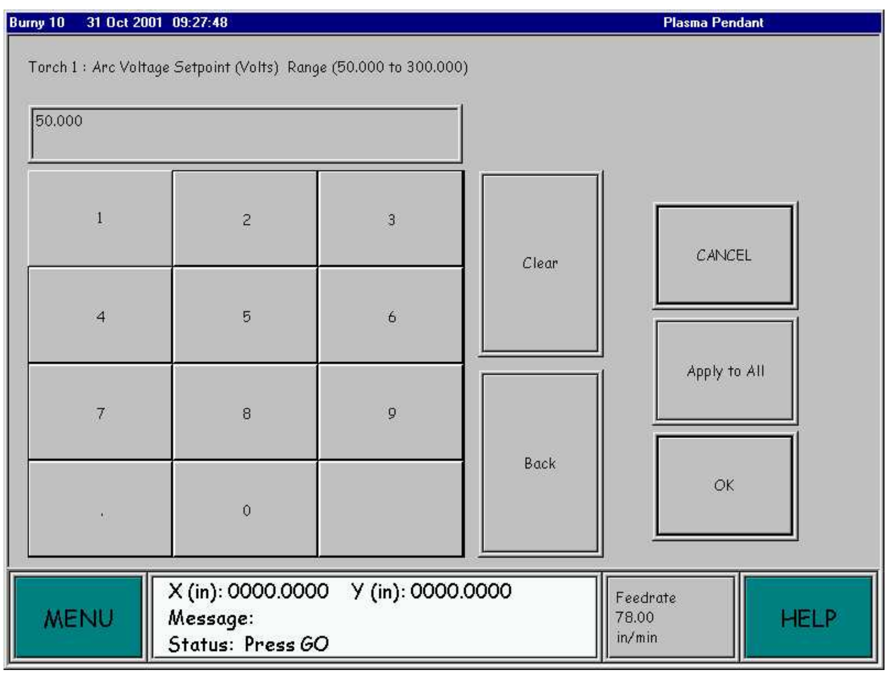


Figure 9 – Numeric Keypad

CANCEL BUTTON

The Cancel button will discard any changes made and return the user to the previous screen.

Apply to All Button

Apply to All will cause the new value to transmit to all enabled torches and the display returns to the previous screen. If the transmission is not acknowledged by all the enabled Torch Height Controllers, the display will change to the error screen shown in Figure 10.

OK BUTTON

OK will cause the new value to transmit to the currently selected torch. If the transmission is not acknowledged by the Torch Height Controller, the display will change to the error screen shown below.

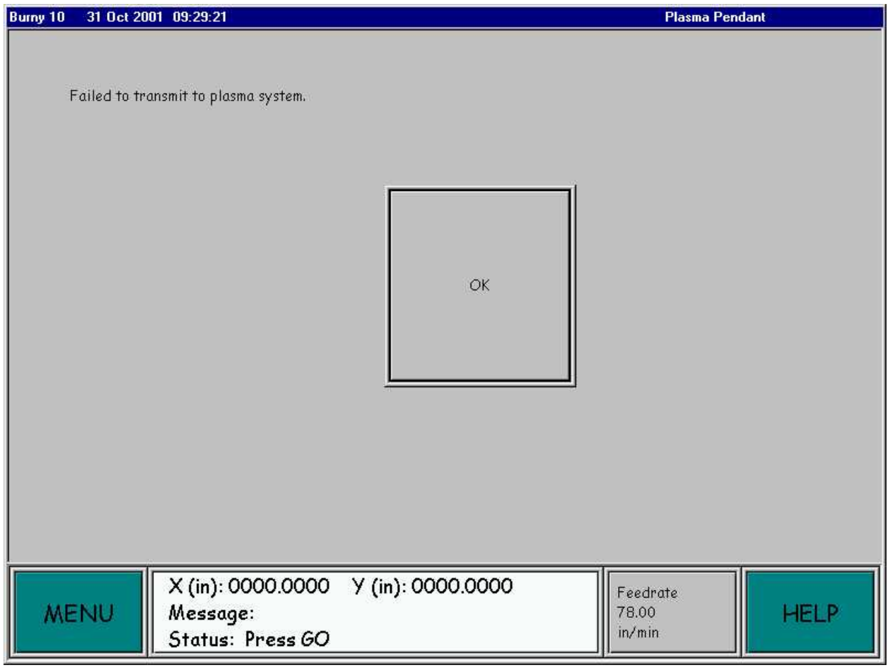


Figure 10 – TRANSMIT ERROR SCREEN

1.4.5 SETUP SCREENS

INTRODUCTION

Three Setup Screens are used with the Pendant Option: Setup A, Setup B, and Pendant Setup. Screens Setup A and Setup B appear when their buttons are touched on the User Interface screen. The Setup B screen contains a button for displaying the Pendant Setup screen.

SETUP A SCREEN

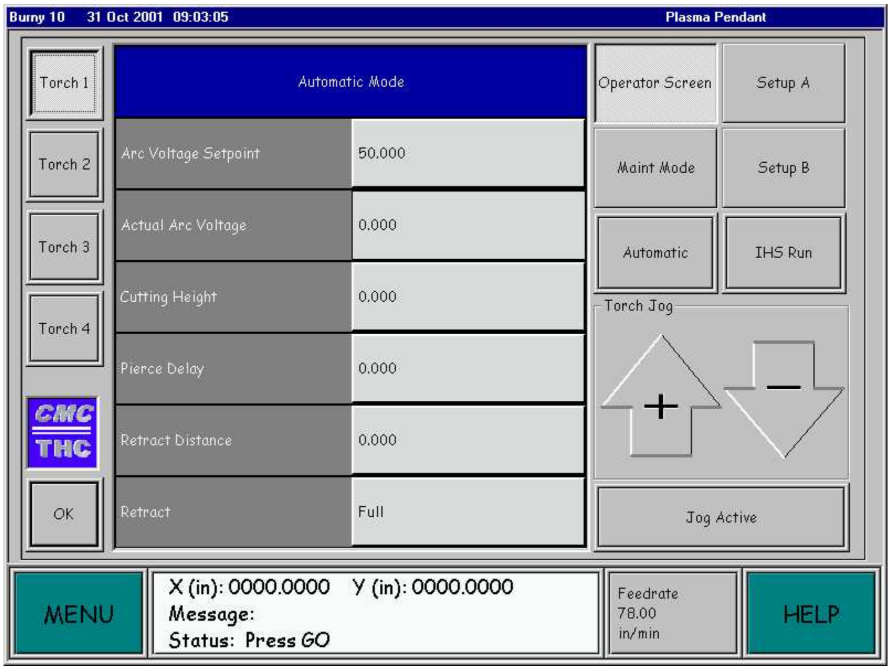


Figure 11 – SETUP A SCREEN

Setup A allows the user to change the Pierce Height Factor, IHS Stall Current, IHS Speed, Nozzle Contact Active, and Preflow During IHS parameters. Refer to the Hypertherm Instruction Manual 802780 for an explanation of these parameters.

SETUP B SCREEN

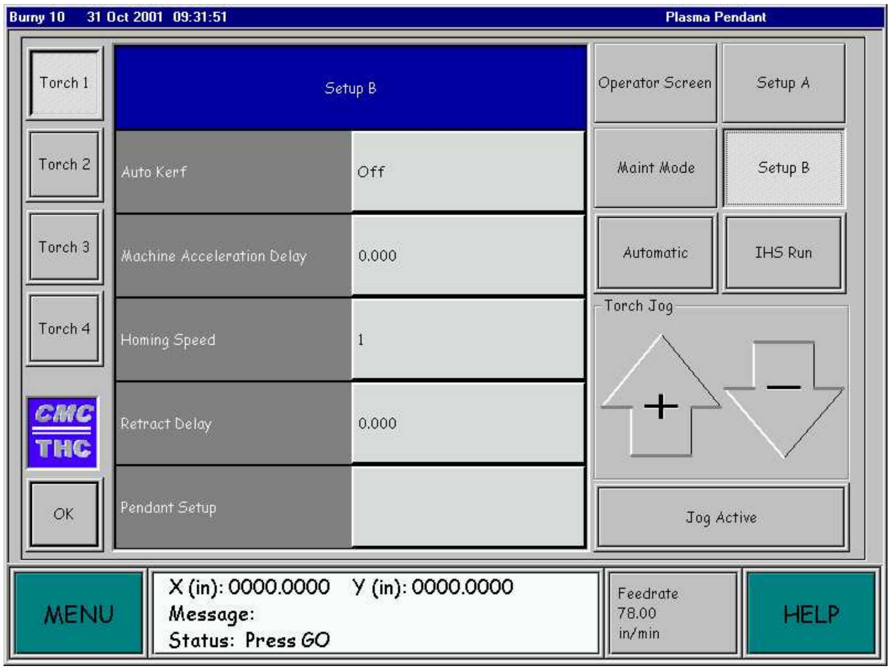


Figure 12 – SETUP B SCREEN

Setup B allows the user to set the Auto Kerf, Machine Acceleration Delay, and Homing Speed. It also allows the user to set up the Pendant Control. Refer to the Hypertherm Instruction Manual 802780 for an explanation of these parameters.

PENDANT SETUP SCREEN

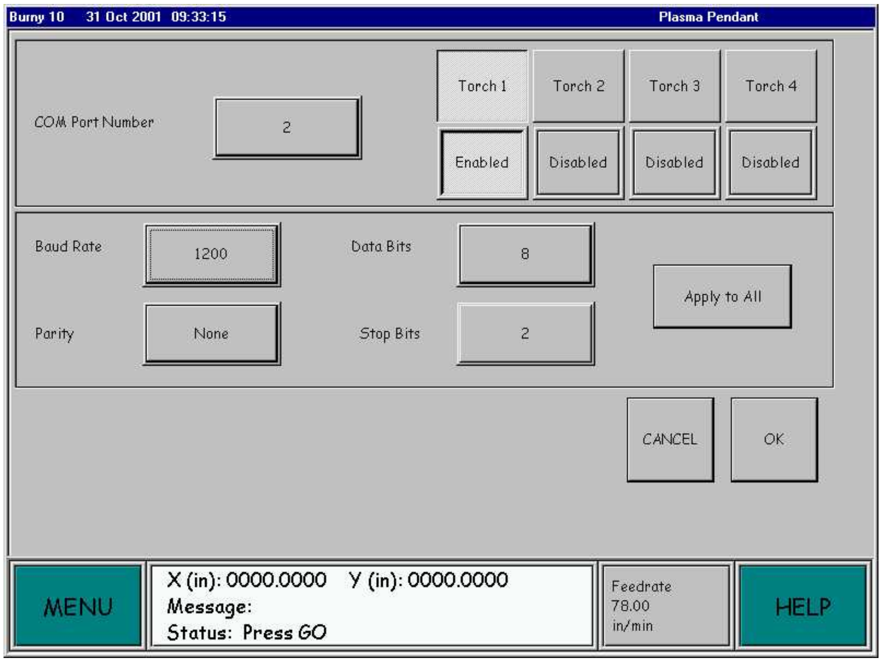


Figure 13 – PENDANT SETUP SCREEN

To configure the serial port settings for a torch, it must first be enabled. Do this by touching the Enable/Disable button below the desired Torch button. Then highlight the Torch 1, Torch 2, Torch 3, or Torch 4 button.

If communications to any of the torch controllers fails, the CMC Pendant Control will report an error.

When Enabled and selected, the torch can be configured and jogged. Selecting Disabled removes the torch from setup.

The setting buttons on the screen: baud, parity, data bits, stop bits, and COM port number scroll through a sequence of values with each touch. Touching Apply to All will cause the Pendant Control to apply the baud, parity, data and stop bits settings to all enabled torches AFTER selecting OK.

Selecting OK will cause the Pendant Control to poll every enabled torch. If communications fail the error screen shown in Figure 14 will be displayed. Touch OK in the Error screen to return to the Pendant Setup screen.

Selecting Cancel will return the user to Setup B and restore all the previous settings.

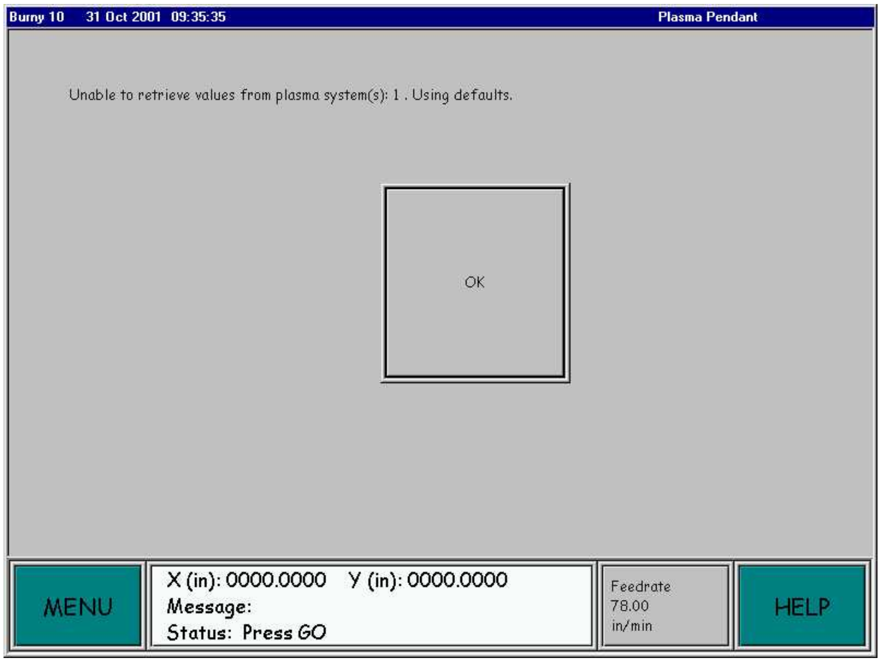


Figure 14 – COMMUNICATION ERROR SCREEN

Command Messaging Option

(AO-70383 Rev AA)

Option

CM

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

Table Of Contents

BLANK

1 COMMAND MESSAGING OPTION

1.1 INTRODUCTION

The COMMAND MESSAGING feature allows the ***BURNY SERIES 10*** to send ASCII messages as command strings to an external device as they are encountered in a running NC part program. At this time only serial (RS-232) connectivity is supported, on COM3 through COM6, and on COM2 with some limitations (see "setup/configuration" for details).

The COMMAND MESSAGING feature can be enabled by entering the correct Options License Key in the License screen, Util60. This Options License Key, which is obtained from CMC, is unique for every control. For additional information, see the License Screen section of ***Section 7*** in this manual.

The COMMAND MESSAGING feature supports several different data transmission schemes:

- One allows COMMAND MESSAGING strings to be unconditionally transmitted without any acknowledgement required by the external device. An optional time delay is available in this mode to wait for the device to complete its operation.
- Another scheme requires COMMAND MESSAGING strings to be acknowledged before the ***BURNY*** can continue with the next NC program block. This approach also allows the receiving device to respond with a <NAK> to request a retransmission of the data for verification purposes.
- A third transmission scheme encloses the NC program COMMAND MESSAGING text in a special "data packet". The format of this packet includes a starting code, an ending code and a checksum value to provide some level of error detection.

1.2 NC PROGRAMMING OF COMMAND MESSAGES

COMMAND MESSAGES are defined in an NC program using a special program message format. A COMMAND MESSAGE will be displayed in the normal message field of the Status window as it is transmitted to the external device.

Printable and non-printing ASCII codes can be defined in the program message. To accommodate non-printing ASCII, the COMMAND MESSAGING feature performs a special substitution on certain character pairs. This allows the programmer to define and send any binary code in the range of 0 to 255 to an external device. See the section “SPECIAL TEST SEQUENCES FOR CONTROL” for details of how these special character pairs are used.

The COMMAND MESSAGING option allows the programmer to define control strings and messages for transmission as special program messages. A program message that is specially formatted to be a command message consists of (a) COMMAND MESSAGE OPERATION followed by (b) the COMMAND MESSAGE TEXT.

The OPERATION always with the ">" character and ends with the "<" character. Between these delimiters is (a) an operation value in the range of 20 through 29, (b) optional "format" field and (c) optional "timeout" field.

Summarizing, these are the general forms of a command message:

>20<COMMAND MESSAGE TEXT

>20>format<COMMAND MESSAGE TEXT

>20>format>timeout<COMMAND MESSAGE TEXT

If >30< is placed before the COMMAND MESSAGE TEXT instead of >20<, the message is sent over an optional network in TCP/IP protocol to the destination device.

In the general forms above, there are ">" characters embedded between the ">" and "<" delimiters. These merely delimit the "operation" from the "format" and "timeout" fields, to illustrate the general form. They are NOT the actual delimiters you would use between the fields. Instead the embedded ">" of the general form is replaced by one of the following supported delimiters:{comma, plus-sign, minus-sign and space}.

Below is example usage of these delimiters. Note that "format" and "timeout" are unsigned values that are not affected by a leading "+" or "-" character.

>20,3,0<COMMAND MESSAGE TEXT

>20+1+5<COMMAND MESSAGE TEXT

>20-2-2<COMMAND MESSAGE TEXT

>20 0 10<COMMAND MESSAGE TEXT

The operation values are as follows:"20" performs the COMMAND MESSAGE transmit while performing a "RUN HOLD" operation. This operation insures that the COMMAND MESSAGE is completely transferred to the external device before the ***BURNY*** executes the next program block. Any time delay specified is also allowed to complete before the run process is allowed continue.

"21" causes the ***BURNY*** to just setup the COMMAND MESSAGE for transmission and then continue with the execution of the next NC program block. This allows the COMMAND MESSAGE to be transferred while executing additional program blocks. However, only 4 messages can be setup for transfer while continuing to run. If more are attempted, the ***BURNY*** automatically performs a "RUN HOLD" operation until all of the messages that were previously setup have been transferred.

"22" performs the same operation as the "20" operation code but also waits for the external device to respond with an acknowledge code (ACK, hexadecimal 06). This operation also allows the external device to request a retransmission of the COMMAND MESSAGE by sending a negative acknowledge code (NAK, hexadecimal 15).

The character code following the ">20" determines which of the general formats is being used. One format allows only the COMMAND text string to follow. Others allow the characteristics of the transfer to be adjusted for each COMMAND MESSAGE defined in the program. The optional "format" value allows the programmer to identify whether or not an automatic carriage return and line feed should be appended to the COMMAND MESSAGE that follows or whether some other supported feature should be used. The optional "timeout" value allows the programmer to specify the delay required before continuing (when no acknowledge is to be performed) or the maximum wait time before terminating with an error (when waiting for the external device to respond).

The "timeout" value is specified as a 3.2 format value where a value of "10" defines a time of 10.00 seconds.

The "format" value field is defined by adding the numeric values for the desired characteristics. These values are defined as follows:

0=> No special assignments.
1=> Append a carriage return (<CR>, hexadecimal 0D) and a line feed (<LF>, hexadecimal 0A) code to the end of the COMMAND MESSAGE string.
16=> Append an "EXCLUSIVE OR" check byte (<BCC>) to the end of the COMMAND MESSAGE.
32=> Enclose the COMMAND MESSAGE with the characters <STX> (hexadecimal 02) and <ETX> (hexadecimal 03). The <ETX> follows the COMMAND MESSAGE and optional <CR><LF> appended codes but precedes the check byte.

When a value of "49" is placed in the "format" field of the COMMAND MESSAGE program message, all of the currently supported characteristics are selected. Values other than 0, 1, 16, 17, 32, 33, 48 and 49 should not be used since these may enable undesirable features in future software releases.

As an example, assume that the following COMMAND MESSAGE program message is placed in an NC program written in WORD ADDRESS:

(>20,49,5<PART:12345)

The resulting command string sent to the external device will have the following format:

<STX>PART:12345<CR><LF><ETX><BCC>

where each of the codes between the < > characters represent a single 8-bit binary code.

FOR FUTURE VERSION: If the <SOH>/<EOT> option has also been selected, then the command string sent to the device will be similar. In this case the same string as before will be preceded by the ASCII <SOH> character and appended with the ASCII <EOT> character, as follows:

<SOH><STX>PART:12345<CR><LF><ETX><BCC><EOT>

As with other ESSI program messages, COMMAND MESSAGE control strings are preceded with a "SKIP DATA ON" function block ("03") and followed by a "SKIP DATA OFF" function block ("04"). In WORD ADDRESS, COMMAND MESSAGE program messages are enclosed within the characters "(" and ")" as follows:

In ESSI:

03
>20<Command message text
>20<More command message text
04

In WORD ADDRESS:

(>20<Command message text)
(>20<More command message text)

LENGTH OF COMMAND MESSAGE TEXT: Program message fields in the ***BURNY SERIES 10*** have a maximum length of 245 characters including the necessary parenthesis or END-OF-BLOCK character codes. The minimum length of the COMMAND MESSAGE OPERATION is six (4) (">20<"). Thus the maximum length of the COMMAND MESSAGE TEXT is 239 characters (245 - 4 - 2).

LENGTH OF TRANSMITTED MESSAGE: The maximum length of the transmitted message is the same as the command message text. However, when the special two-character sequences are used (see the section " SPECIAL TEXT SEQUENCES FOR CONTROL"), each sequence occupies 2 characters in text, but transmits only one. That is, the effect is that the maximum length of the transmitted message is further reduced when the special 2-character sequences are used.

When a COMMAND MESSAGE sequence is executed in an NC program, the ***BURNY*** displays a status of "RUN-MESSAGE TRANSMIT" as it sends the message. If a time delay is then required or the message must be acknowledged by the external device, the status changes to "WAIT-MESSAGE DELAY" as the ***BURNY*** holds position. If the message communication process is successful, the running process continues normally. However if an error is detected and/or the message retry count has been exceeded, the running process displays a status "RUN-**MESSAGE ERROR**", and retransmits the message to the external device. When performing operations that require an acknowledgement from the remote device, a status of "RUN-MESSAGE VERIFY" is displayed until the ASCII <ACK> character is received. When in this mode, reception of an ASCII <NAK> character causes the ***BURNY*** to retransmit the COMMAND MESSAGE for verification by the external device.

When reversing, COMMAND MESSAGE strings are sent to the remote device (in reverse order, as each is re-encountered in the part program). There is no provision to inhibit the transmissions while reversing.

1.3 SETTING UP SERIAL COMMUNICATIONS

The Status screen, shown in Figure 1, gives access to the screens that enable the operator to set up the communication channel to be used for the transmission of Command Messages.

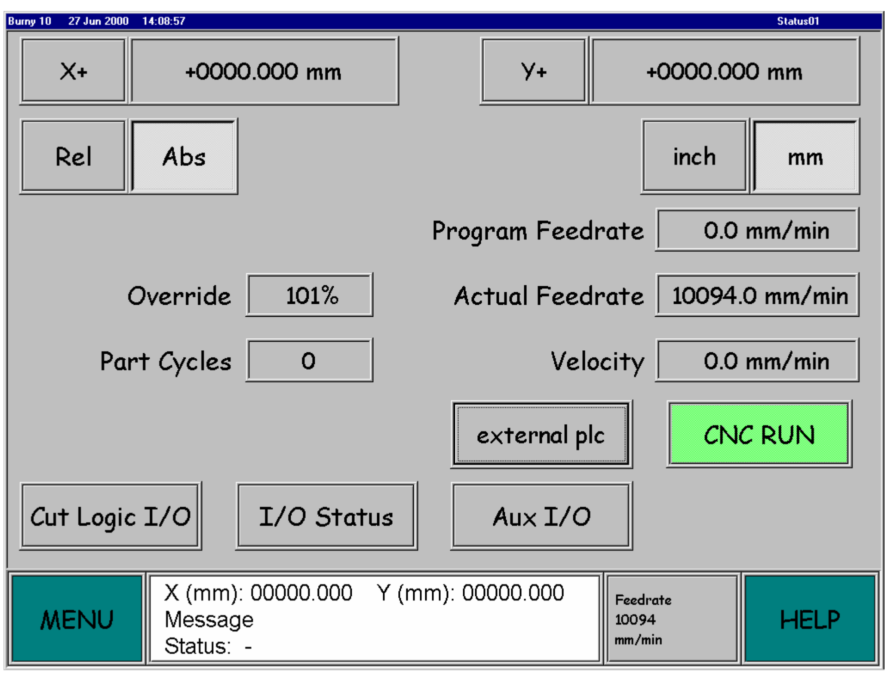


Figure 1– STATUS SCREEN

Access to the ***Options Main Screen*** requires that the "***Supervisory***" access level has been enabled via the password; if that access has not been enabled, the button will appear "grayed out" and is disabled. (The button will not appear at all unless either the ***Command Messaging Option*** or ***PLC Option*** has been enabled in the ***Utility*** mode).

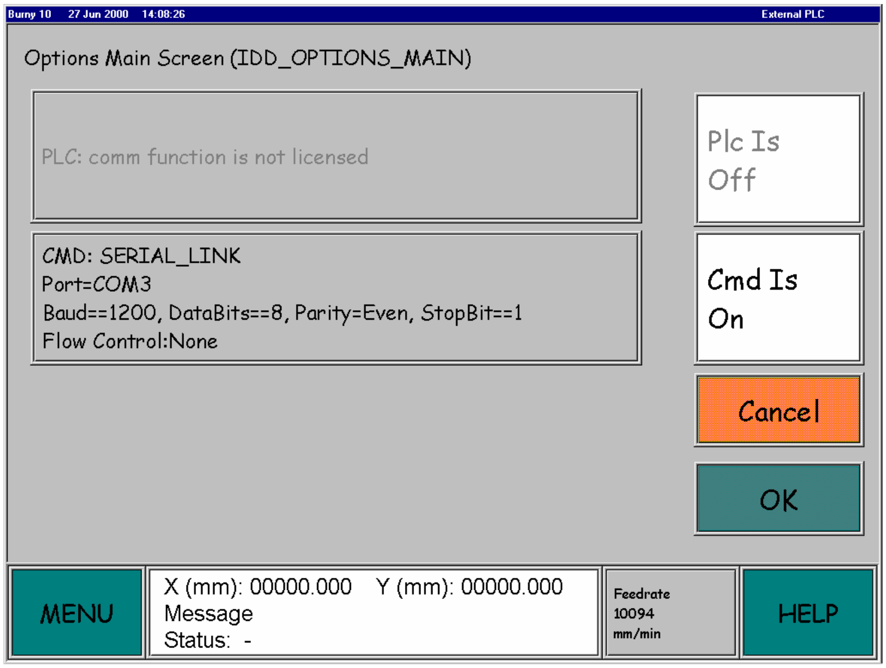


Figure 2 – OPTIONS MAIN SCREEN, Cmd On

When either the Command Messaging Option or the PLC Option has been enabled in the Utility mode, the External PLC keypad appears on the Status screen. Touch this keypad to display the Options Main Screen.

The ***Options Main Screen*** pictured in Figure 2 shows in the "***CMD communications*** " button (the large lower button) that the ***Command Messaging Option*** has been enabled in ***Utility*** mode. It also shows that the ***Command Messaging Option*** has been configured for serial communications on ***COM3***, and displays the serial communication parameters that have been selected for the port. It also shows, in the "***Cmd On***" button, that the option is currently "turned on".

To illustrate difference in this screen, the "***PLC communications*** " button (the large upper button) shows that the ***PLC Option*** has not enabled in ***Utility*** mode.)

Command Messaging can be "turned off" from this screen simply by pressing the "***Cmd On***" button (the button will then display "***Cmd Off***"). Likewise it can be "turned on" again by pressing the same button. When changing from "***Cmd On***" to "***Cmd Off***" or vice versa, the change will take effect on the next job that is run (i.e., it will not affect a job that has already been configured to run). Any part program advanced from the ***Job Setup*** screen to the ***Job Preview*** screen will be affected by the latest status of the ***Cmd On/Cmd Off*** keypad. The following screen illustrates the screen when it has been turned off.

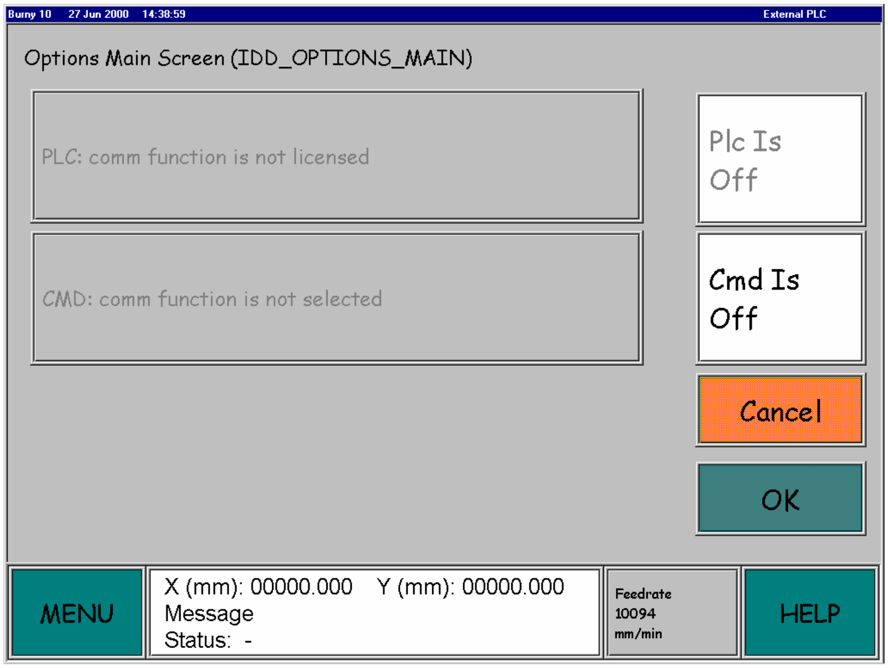


Figure 3 – OPTIONS MAIN SCREEN, Cmd Off

If the selections shown on the ***Options Main Screen*** are correct, touch the ***OK*** pad to return to the ***Status*** screen. To change the communications settings, touch the "***CMD communications***" button to display the ***Configuration Main Screen*** and make changes.

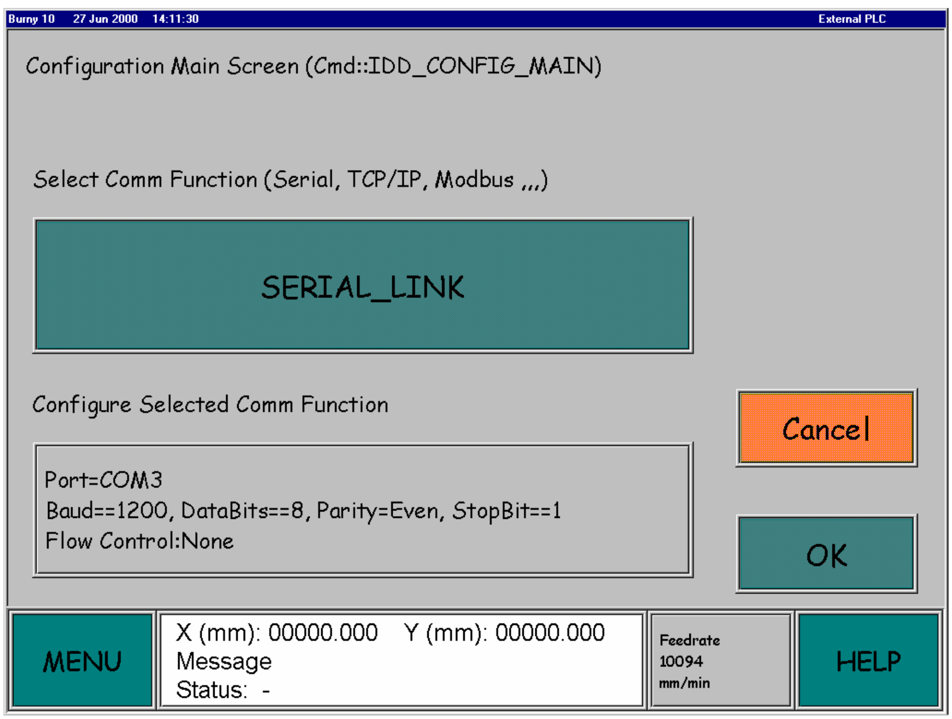


Figure 4 – CONFIGURATION MAIN SCREEN

In the ***Configuration Main Screen***, the upper window (labeled "***Select Comm Function***") shows the current protocol, and the lower window gives the details of its configuration. Touch the upper window to change the protocol. If a particular protocol is not implemented in your version of option, the lower window will say "***Not Implemented***".

To change the configuration of the ***Serial Link*** protocol, touch the lower window to display the ***Command Function*** screen.

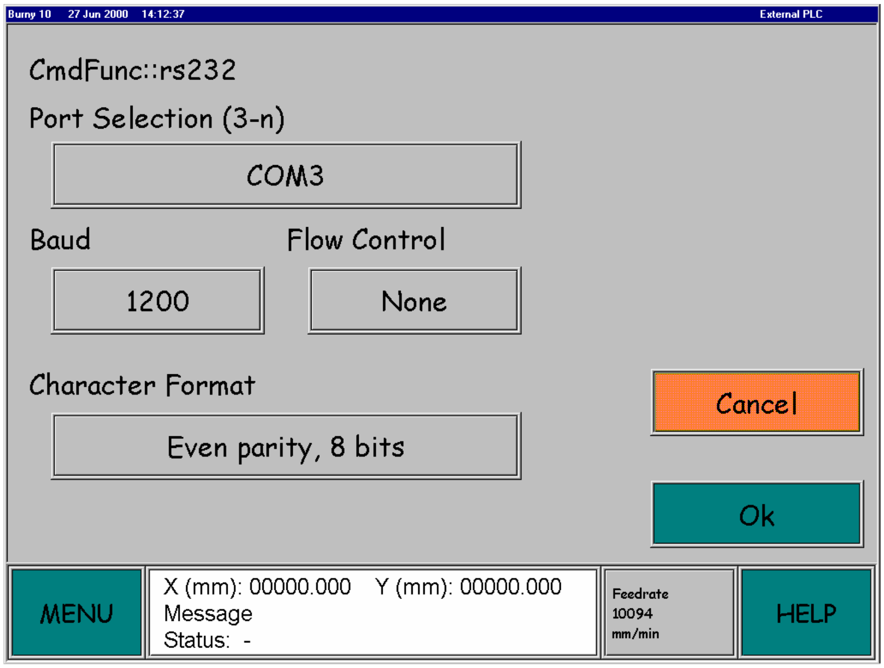


Figure 5 – COMMAND FUNCTION SCREEN

Touch one of the four parameter-windows in the ***Command Function*** screen to toggle through the value choices. When the desired values are displayed, touch ***OK***; the settings are now configured and will take effect when the next job is configured to run. Touch ***OK*** until the ***Status*** screen appears. Touch the ***Status*** window at the bottom of the screen to return to your original screen.

SPECIAL NOTE ABOUT COM2: The ***Command Function*** screen indicates "***Port Selection (3-n)***", hinting that use of ***COM2*** is not encouraged, but is permitted with some limitations. When ***COM2*** is selected for command messaging, it must "share" the port with the ***LOAD*** and ***STORE*** operations. Thus it is not possible to begin a serial ***LOAD*** or ***STORE*** operation while a job is configured to run with command messaging. Likewise, while a serial ***LOAD*** or ***STORE*** operation is in progress, it is not possible to configure a job to run with command messaging.

1.4 SPECIAL TEXT SEQUENCES FOR CONTROL

Only printable ASCII character codes can be retained in a program message. To permit transmission of non-printing codes to an external device, the ***Command Messaging*** option provides special two-character sequences of printable characters that represent non-printing codes. These two-character sequences are retained in the program message and displayed in the ***Status Window***, but are converted into a single 8-bit code when transmitted.

There are three types of sequences, and each performs a different operation on the 2nd character of the sequence, to produce a single modified character for transmission.

- The "&*" two-character sequence clears the 0x40 bit from the 2nd character code value.
- The "!*" sequence clears the 0x40 bit and sets the 0x80 bit set in the 2nd character.
- The "$*" sequence sets the 0xC0 bit in the 2nd character.

For example, to transmit the single character with value 0x01, use the 2-character sequence "&A" (this converts the "A" value of 0x41 to 0x01 by clearing the 0x40 bit). To transmit 0x81, use "!A", or to transmit 0xC1 use "$A".

These examples and others are found in the tabulation that follows, which show the resulting hexadecimal 8-bit code for each two-character printable-ASCII sequence. To transmit ASCII control codes (less than hexadecimal 20):

"&@"	>00	.•	"&H"	>08	•	"&P"	>10	•	"&X"	>18
"&A"	>01	.•	"&I"	>09	•	"&Q"	>11	•	"&Y"	>19
"&B"	>02	.•	"&J"	>0A	•	"&R"	>12	•	"&Z"	>1A
"&C"	>03	.•	"&K"	>0B	•	"&S"	>13	•	"&["	>1B
"&D"	>04	.•	"&L"	>0C	•	"&T"	>14	•	"&\"	>1C
"&E"	>05	.•	"&M"	>0D	•	"&U"	>15	•	"&]"	>1D
"&F"	>06	.•	"&N"	>0E	•	"&V"	>16	•	"&^"	>1E
"&G"	>07	.•	"&O"	>0F	•	"&W"	>17	•	"&_"	>1F

To transmit other 8 bit character codes (higher than hexadecimal 80):

"!@"	>80	•	"!H"	>88	•	"!P"	>90	•	"!X"	>98
"!A"	>81	•	"!I"	>89	•	"!Q"	>91	•	"!Y"	>99
"!B"	>82	•	"!J"	>8A	•	"!R"	>92	•	"!Z"	>9A
"!C"	>83	•	"!K"	>8B	•	"!S"	>93	•	"!["	>9B
"!D"	>84	•	"!L"	>8C	•	"!T"	>94	•	"!\"	>9C
"!E"	>85	•	"!M"	>8D	•	"!U"	>95	•	"!]"	>9D
"!F"	>86	•	"!N"	>8E	•	"!V"	>96	•	"!^"	>9E
"!G"	>87	•	"!O"	>8F	•	"!W"	>97	•	"!_"	>9F
"!`"	>A0	•	"!h"	>A8	•	"!p"	>B0	•	"!x"	>B8
"!a"	>A1	•	"!i"	>A9	•	"!q"	>B1	•	"!y"	>B9
"!b"	>A2	•	"!j"	>AA	•	"!r"	>B2	•	"!z"	>BA
"!c"	>A3	•	"!k"	>AB	•	"!s"	>B3	•	"!;"	>BB
"!d"	>A4	•	"!l"	>AC	•	"!t"	>B4	•	"!<"	>BC
"!e"	>A5	•	"!m"	>AD	•	"!u"	>B5	•	"!="	>BD
"!f"	>A6	•	"!n"	>AE	•	"!v"	>B6	•	"!>"	>BE
"!g"	>A7	•	"!o"	>AF	•	"!w"	>B7	•	"!?"	>BF
"$@"	>C0	•	"$H"	>C8	•	"$P"	>D0	•	"$X"	>D8
"$A"	>C1	•	"$I"	>C9	•	"$Q"	>D1	•	"$Y"	>D9
"$B"	>C2	•	"$J"	>CA	•	"$R"	>D2	•	"$Z"	>DA
"$C"	>C3	•	"$K"	>CB	•	"$S"	>D3	•	"$["	>DB
"$D"	>C4	•	"$L"	>CC	•	"$T"	>D4	•	"$\"	>DC
"$E"	>C5	•	"$M"	>CD	•	"$U"	>D5	•	"$]"	>DD
"$F"	>C6	•	"$N"	>CE	•	"$V"	>D6	•	"$^"	>DE
"$G"	>C7	•	"$O"	>CF	•	"$W"	>D7	•	"$_"	>DF
"$`"	>E0	•	"$h"	>E8	•	"$p"	>F0	•	"$x"	>F8
"$a"	>E1	•	"$i"	>E9	•	"$q"	>F1	•	"$y"	>F9
"$b"	>E2	•	"$j"	>EA	•	"$r"	>F2	•	"$z"	>FA
"$c"	>E3	•	"$k"	>EB	•	"$s"	>F3	•	"$;"	>FB
"$d"	>E4	•	"$l"	>EC	•	"$t"	>F4	•	"$<"	>FC
"$e"	>E5	•	"$m"	>ED	•	"$u"	>F5	•	"$="	>FD
"$f"	>E6	•	"$n"	>EE	•	"$v"	>F6	•	"$>"	>FE
"$g"	>E7	•	"$o"	>EF	•	"$w"	>F7	•	"$?"	>FF

Special Considerations In Non-Printing ASCII Codes:

OVERRIDE: Since the three code sequences "&*", "!*" and "$*" are used to signal the special code definition, they must be specified twice in order to define a single "&", "!" or "$" code for transmission and override the special character code process. For example, to transmit the character "&", use "&&" in the NC program.

OTHER SPECIAL SEQUENCES THAT ARE NOT TABULATED: The table does not show 2-character sequences that result in a printable code, but they do exist. There are situations in which you will need to use a 2-character sequence instead of the equivalent printable-code.

For example, the sequence "&k" in the ***NC*** program creates the transmission code value of 0x2B, which is the ***ASCII*** code for "+". You would use this in ***ESSI*** programming. This is because the "+" character has another special meaning in an ***ESSI*** program. In order to transmit a "+" character in a command message, you must use the "&k" sequence in the command message text.

There are several other printable characters that have special meaning in ***Word Address*** and ***ESSI*** programs. Each of these has a corresponding 2-character sequence for transmitting it in a command message. For easy reference, some special sequences are listed below, with their resulting transmission code:

"&`"	0x20 = space	(at end of ESSI message)
"&h"	0x28 = "("	(to transmit "(" from WORD ADDRESS program)
"&i"	0x29 = ")"	(to transmit ")" from WORD ADDRESS program)
"&?"	0x7F = DEL	(non printable DELETE code)
"&k"	0x2B = "+"	(to transmit "+" from ESSI program)

Advanced Command Messaging Option

(AO-70380 Rev AA)

Option

ACM

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

TABLE OF CONTENTS

IMPORTANT USER INFORMATION

Throughout this manual we use two icons to make you aware of important safety considerations and/or helpful information:

IMPORTANT

The information shown in IMPORTANT boxes is about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. IMPORTANT boxes help you: identify a hazard, avoid a hazard, and recognize the consequences.

TIP

Information contained in TIP boxes highlights useful information that is important for successful application and understanding of the product.

TRADEMARKS

Hypertherm is a registered trademark of Hypertherm, Inc.

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BLANK

1 ADVANCED COMMAND MESSAGING OPTION

1.1 INTRODUCTION

Advanced Command Messaging (ACM) is the mechanism used to transfer data in part programs to external devices. Currently, the following are supported:

- Burny parameters
- Job Setup parameters
- Hypertherm 4070, HPR130/260 power supply
- InnerLogic FineLine power supplies and INOVA controls

1.2 ADVANCED COMMAND MESSAGING SYNTAX

The ACM program block must contain all 5 parameters (Id, Code, Dest, Type and Data):

Word Address Syntax is defined by the following format: **`(>50<ID, CODE, DEST, TYPE, DATA)`**

Where:

`>50<`	Record type identifier.
`ID`	Parameter ID: PS (Plasma System), JS (Job Setup), BP (Burny Parameters), TH (Torch Height Control).
`CODE`	Parameter Code designator. (Refer to Section 1.4).
`DEST`	Destination: use 0 for JS and BP Codes, use 1-255 for PS and TH Codes (Refer to Sections 1.2.1 and 1.2.2).
`TYPE`	Type of data to follow: 0=4-byte integer or 4-byte long, 1=4 byte float.
`DATA`	Actual Data value, per the format indicated by **`TYPE`**.

1.2.1 DEST PARAMETER FOR: HYPERTHERM 4070 AND HPR130/260

The **`DEST`** (destination) field is determined by the serial link mode. For a single power supply (4070, HPR130 or HPR 260) connected to a Burny serial port, the **`DEST`** should always be set to 1.

To connect more than one power supply on the serial link with the Burny, the **`DEST`** field represents the bit mask of the power supplies that are to receive the advanced command message. In this multi-drop case, the **`DEST`** can be values from 1 to 255 (Decimal) as shown below:

1→ID0	2→ID1	4→ID2	8→ID3
16→ID4	32→ID5	64→ID6	128→ID7

For example, if three 4070 supplies are on the multi-drop link, and the power supplies use ID0, ID1, and ID2, then the possible **`DEST`** values are:

`DEST` Value (decimal):	Target Power Supply(s):
1	ID0 only.
2	ID1 only.
3 (= 1 + 2)	ID0 and ID1 only.
4	ID2 only.
5 (=1 + 4)	ID0 and ID2 only.
6 (=2 + 4)	ID1 and ID2 only.
7 (= 1 + 2 + 4)	ID0 and ID1 and ID2. (Refer to the TIP below).

TIP

*If all PS Codes specified a **`DEST`** value of 255, then the command would always be sent to every power supply on a multi-drop link, as 255 covers all possible link ID's.*

1.2.2 DEST PARAMETER FOR: INNERLOGIC FINELINE POWER SUPPLIES AND INOVA CONSOLES

The **DEST** field is used to specify the target Nodes for advanced command messages. If it is a PS Code, then the mask selects the power supply(s) to receive the message. For TH Codes, the mask selects the INOVA consoles to receive the message.

The **DEST** field represents the bit mask of the devices to receive the advanced command message. The **DEST** can be values from 1 to 255 (Decimal) as shown below:

1 → ID1	2 → ID2	4 → ID3	8 → ID4
16 → ID5	32→ ID6	64 → ID7	128 → ID8

For example, if three FineLine supplies (or INOVA consoles) are on the multi-drop link, and the power supplies use ID0, ID1, and ID2, then the possible **DEST** values are:

DEST Value (decimal):	Target Power Supply(s):
1	ID1 only.
2	ID2 only.
3 (= 1 + 2)	ID1 and ID2 only.
4	ID3 only.
5 (=1 + 4)	ID1 and ID3 only.
6 (=2 + 4)	ID2 and ID3 only.
7 (= 1 + 2 + 4)	ID1 and ID2 and ID3. (Refer to the TIP below).

TIPS

*1) **DEST** = 7. The advanced command message is "broadcast" to all of the power supplies as a single message, since all of the power supplies on the multi-drop link are specified.*

*2) If all PS Codes specified a **DEST** value of 255, then the command would always be sent to every power supply on a multi-drop link, as 255 covers all possible link ID's.*

1.3 SAMPLE ADVANCED COMMAND MESSAGES FROM PART PROGRAMS

You can use Advanced Command Messages to send an "AGC Cut Chart" to a Hypertherm HPR power supply with Auto Gas Console (AGC) or an AutoMix Console. Be sure that:

- ALL of the commands in the sample program are issued in your part program.
- The final command of your part program MUST BE the SET_ALL_PARMATERS command.

IMPORTANT

Power Supplies with Auto Gas and Auto Mix consoles use the "SET_ALL_xxx" commands with multiple parameters. To support these functions through advanced command messages, the part programs MUST contain all of the SET command Codes, followed by the appropriate SEND Code. If any of the SET command Codes are omitted, the SEND may fail and may not be attempted.

1.3.1 SAMPLE #1: CUTTING WITH HPR130/260 (260 AMP MILD STEEL, 1 ¼" THICKNESS)

```
(Set the Current Setpoint for 260 Amps: )
(>50<PS,40,1,0,260)
(Set the Corner Current to 100 percent: )
(>50<PS,41,1,0,100)
(Set the Plasma Gas Type to O2: )
(>50<PS,42,1,0,1)
(Set the Shield Gas Type to Air: )
(>50<PS,43,1,0,5)
(Set the Plasma Cut Flow PSI: )
(>50<PS,44,1,0,84)
(Set the Plasma Pre Flow PSI: )
(>50<PS,45,1,0,22)
(Set the Shield Cut Flow PSI: )
(>50<PS,46,1,0,58)
(Set the Shield Pre Flow PSI: )
(>50<PS,47,1,0,58)
(Set the N2 Mix Setpoint: )
(>50<PS,48,1,0,0)
(Set the Gas2 Mix Setpoint: )
(>50<PS,49,1,0,0)
(* Now post the actual Set_all_parameters to the power supply: )
(>50<PS,50,1,0,0)
```

1.3.2 SAMPLE #2: MARKING WITH HPR AGC AND AUTOMIX CONSOLES

```
(Set the Current Setpoint for 18 Amps: )
(>50<PS,40,1,0,18)
(Set the Corner Current to 100 percent: )
(>50<PS,41,1,0,100)
(Set the Plasma Gas Type to N2: )
(>50<PS,42,1,0,6)
(Set the Shield Gas Type to N2: )
(>50<PS,43,1,0,6)
(Set the Plasma Cut Flow PSI: )
(>50<PS,44,1,0,10)
(Set the Plasma Pre Flow PSI: )
(>50<PS,45,1,0,10)
(Set the Shield Cut Flow PSI: )
(>50<PS,46,1,0,10)
(Set the Shield Pre Flow PSI: )
(>50<PS,47,1,0,10)
(Set the N2 Mix Setpoint: )
(>50<PS,48,1,0,0)
(Set the Gas2 Mix Setpoint: )
(>50<PS,49,1,0,0)
(* Now post the actual Set_all_parameters to the power supply: )
(>50<PS,50,1,0,0)
```

1.3.3 SAMPLE #3: HYPERTHERM 4070 POWER SUPPLIES

```
%
G70
G91
(ADV. CMD MSG )

(JOB SETUP)

(OXY PROCESS)
(>50<JS,1,0,0,1)

(AUTOMATIC CUT MODE)
(>50<JS,2,0,0,1)

(PREHEAT 6s)
(>50<JS,3,0,1,6.0000)

(Pierce Hold 8s)
(>50<JS,4,0,1,8.0000)

(Pierce Ramp 1.2s)
(>50<JS,6,0,1,1.2000)

(Power Supply)

(Set Cut Chart 100)
(>50<PS,1,1,0,100)

(Precut 1 = 11ppi)
(>50<PS,5,1,0,11)

(PreShield 1 12ppi)
(>50<PS,7,1,0,12)
(PreCut 2 13ppi)
(>50<PS,9,1,0,13)

(PreShield 2 64 ppi)
(>50<PS,11,1,0,64)

(Arc Amperage 31Amps)
(>50<PS,13,1,0,31)

(ArcVoltage 125 V)
(>50<PS,14,1,1,125.0000)

(Pierce Height 160%)
(>50<PS,15,1,1,160.0000)

(Cut Height 0.030 in)
(>50<PS,16,1,0,0)

(Pierce Delay 3s)
(>50<PS,17,1,1,3.0000)

(Cut Speed 225 ?!)
(>50<PS,18,1,1,225.0000)

(Active Torch 1)
(>50<PS,19,1,0,1)

(Corner Current 90%)
(>50<PS,20,1,0,90)

(Save Process)
(>50<PS,21,1,0,0)

(Gas Purge)
(>50<PS,23,1,0,0)
```

(and the rest of the program)

```
X.5Y-.5
G97
G41
M04
X.3535Y-.3536
X3.5
Y-3.5
X-3.5
Y3.5
M14
X0Y.5
M03
X3.6465Y-.1464
M04
X.3535Y-.3536
X3.5
Y-3.5
X-3.5
Y3.5
M14
X0Y.5
M03
G95
X3.6465Y-.1464
G99
M30
```

1.4 ADVANCED COMMAND MESSAGING CODE TABLES

1.4.1 JOB SETUP (JS) CODES

JS Code	Description	Type	Data Range & Units
1	**Process**	Integer	0=Use Default 1=Oxy 2=Plasma 3=Water 4=Laser
2	**Cut Mode**	Integer	0=Use Default 1=Automatic 2=Manual
3	**Preheat**	Float	0 – 9999.9 Seconds
4	**Pierce Hold**	Float	0 – 9999.9 Seconds
5	**Plasma Advance Off**	Float	0 – 9999.9 Seconds
6	**Pierce Ramp**	Float	0 – 9999.9 Seconds
50	**User Parameter #1**	Float	-Float to +Float
51	**User Parameter #2**	Float	-Float to +Float
52	**User Parameter #3**	Float	-Float to +Float
53	**User Parameter #4**	Float	-Float to +Float
54	**User Parameter #5**	Float	-Float to +Float
55	**User Parameter #6**	Float	-Float to +Float
56	**User Parameter #7**	Float	-Float to +Float
57	**User Parameter #8**	Float	-Float to +Float
58	**User Parameter #9**	Float	-Float to +Float
59	**User Parameter #10**	Float	-Float to +Float

1.4.2 BURNY PARAMETERS (BP) CODES

BP Code	Description	Type	Data Range & Units
1	**Minimum Off Time**	Float	0 – 9999.9 Seconds
2	**Oxygen Bleed Off Time**	Float	0 – 9999.9 Seconds
3	**Plasma Arc On Delay**	Float	0 – 9999.9 Seconds
4	**Plasma Arc Off Delay**	Float	0 – 9999.9 Seconds
5	**Plasma Start Delay**	Float	0 – 9999.9 Seconds
6	**Goal Point Tolerance**	Float	Meters (0 – 1.000)
7	**Cornering Speed**	Float	0 – Maximum TableVelocity Meters/Second
8	**Plasma Marker Delay**	Float	0 – 9999.9 Seconds
9	**Marker Velocity**	Float	0 – Maximum TableVelocity Meters/Second
10	**Default Dwell**	Float	0 – 9999.9 Seconds
11	**MaxAcceleration**	Float	0 - 100.00 Meters/Sec/Sec
12	**MinCornerAngle**	Float	0 –179.0 Degrees
13	**MaxCornerAngle**	Float	0 –179.0 Degrees
14	**ArcAccelDerate**	Float	0 – 100.0 Percent
15	**Marker 1 Punch Delay**	Float	0 – 100.0 Seconds
16	**Marker 2 Punch Delay**	Float	0 – 100.0 Seconds
17	**Y-Axis Accel Feed Forward (AFF)**	Float	0 – 10000000.00
18	**Y-Axis TicksPerMeter**	Float	0 – 10000000.00

Continued on next page…

BP Code	Description	Type	Data Range & Units
19	**Y-Axis VelocityFeedForward(VFF)**	Float	0 – 10000000.00
20	**X-Axis Accel Feed Forward (AFF)**	Float	0 – 10000000.00
21	**X-Axis TicksPerMeter**	Float	0 – 10000000.00
22	**X-Axis VelocityFeedForward(VFF)**	Float	0 – 10000000.00
25	**Max Jog Velocity**	Float	0 – 10.0 Meters/Second
26	**Max Velocity**	Float	0 – 10.0 Meters/Second
27	**Y-Axis Default D-Gain**	Float	0 – 10000000.0
28	**Y-Axis Default P-Gain**	Float	0 – 10000000.0
29	**X-Axis Default D-Gain**	Float	0 – 10000000.0
30	**X-Axis Default P-Gain**	Float	0 – 10000000.0
31	**Home Search Speed**	Float	0 – 10.0 Meters/Second
32	**Index Search Speed**	Float	0 – 10.0 Meters/Second
33	**X-Axis Zero Offset**	Float	-100.0 to +100.0
34	**Y-Axis Zero Offset**	Float	-100.0 to +100.0
35	**C-Axis Default P-Gain**	Float	0 – 10000000.0
36	**C-Axis TicksPerMeter**	Float	0 – 10000000.0
37	**C-Axis Max Velocity**	Float	0 – 10000.00 Degrees/Second
38	**C-Axis Acceleration**	Float	0 – 10000000.0 Deg/Sec/Sec
39	**C-Axis Home Offset**	Float	0 – 360.0 Degrees
40	**C-Axis Ticks per Index**	Integer	0 – 10000000
41	**C-Axis Min Index Ticks**	Integer	0 – 10000000
42	**Jog Unit Acceleration**	Float	0 – 100.0 Meters/Second/Second
43	**Y-Axis Default I-Gain**	Float	0 – 10000000.0
44	**X-Axis Default I-Gain**	Float	0 – 10000000.0
45	**C-Axis Minus Limit**	Float	-36,000.0 to +36,000.0 Degrees
46	**C-Axis Plus Limit**	Float	-36,000.0 to +36,000.0 Degrees

1.4.3 PLASMA SETUP (PS) CODES FOR HYPERTHERM POWER SUPPLIES

PS Code	Description	Type	Data Range & Units	4070	HPR130, HPR260 Manual	HPR130, HPR260 AutoGas and AutoMix
1	**Process Number, i.e. Cut Chart**	Integer	0 – 999	Yes	No	No
2	**Unused (Material Type)**	Integer		-	-	-
3	**Unused (Thickness)**	Float	Inches	-	-	-
4	**Unused (Thickness Code)**	Integer	Number	-	-	-
5	**PreCut 1 Set**	Integer	0 – 100 Percent	Yes	No	No
6	**Cut 1 Set**	Integer	0 – 100 Percent	Yes	No	No
7	**PreShield 1 Set**	Integer	0 – 100 Percent	Yes	No	No
8	**Shield 1 Set**	Integer	0 – 100 Percent	Yes	No	No
9	**PreCut 2 Set**	Integer	0 – 100 Percent	Yes	No	No
10	**Cut 2 Set**	Integer	0 – 100 Percent	Yes	No	No
11	**PreShield 2 Set**	Integer	0 – 100 Percent	Yes	No	No
12	**Shield 2 Set**	Integer	0 – 100 Percent	Yes	No	No
13	**Arc Amperage**	Integer	Amps	Yes	Yes	Yes

Continued on next page…

PS Code	*Description*	*Type*	*Data Range & Units*	*4070*	*HPR130, HPR260 Manual*	*HPR130, HPR260 AutoGas and AutoMix*
14	**Arc Voltage**	Float	Volts, e.g. 90.3	Yes	No	No
15	**Pierce Height**	Float	50 - 300 Percent	Yes	No	No
16	**Cut Height**	Float	Inches, e.g. 0.080	Yes	No	No
17	**Pierce Delay**	Float	0.0 – 9.0 Seconds	Yes	No	No
18	**Cut Speed**	Float	Inches per Minute	Yes	No	No
19	**Active Torch**	Integer	1 or 2	Yes	No	No
20	**Corner Current**	Integer	50 – 100 Percent	Yes	Yes	Yes
21	**Save (Custom) Process**	Integer	0	Yes	No	No
22	**(Set) TorchConfig**	Integer	0 – 331	Yes	No	No
23	**Gas Purge**	Integer	0	Yes	No	No
24–32	**(Reserved)**	-	-	-	-	-
33	**SET Plasma Cutflow**	Integer	0 – 99 PSI	No	No	Yes
34	**SET Plasma Preflow**	Integer	0 – 99 PSI	No	No	Yes
35	**SET Shield Cutflow**	Integer	0 – 99 PSI	No	No	Yes
36	**SET Shield Preflow**	Integer	0 – 99 PSI	No	No	Yes
37	**SET N2 Mix Setpoint**	Integer	0 – 100 PSI	No	No	Yes
38	**SET Gas2 Mix Setpoint**	Integer	0 – 100 PSI	No	No	Yes
39	**SEND SET_ALL_GAS_FLOWS** [Note 2] **(sends values in Codes 33 – 38)**	Integer	0	No	No	Yes
40	**SET Current Setpoint**	Integer	5 – 260 Amps	No	No	Yes
41	**SET Corner Current Percent**	Integer	50 - 100 Percent	No	No	Yes
42	**SET Plasma Gas Type**	Integer	Table VI (0–12) [Note 1]	No	No	Yes
43	**SET Shield Gas Type**	Integer	Table VI (0–12) [Note 1]	No	No	Yes
44	**SET Plasma Cutflow**	Integer	0 – 99 PSI	No	No	Yes
45	**SET Plasma Preflow**	Integer	0 – 99 PSI	No	No	Yes
46	**SET Shield Cutflow**	Integer	0 – 99 PSI	No	No	Yes
47	**SET Shield Preflow**	Integer	0 – 99 PSI	No	No	Yes
48	**SET N2 Mix Setpoint**	Integer	0 – 100 PSI	No	No	Yes
49	**SET Gas2 Mix Setpoint**	Integer	0 – 100 PSI	No	No	Yes
50	**SEND SET_ALL_PARAMETERS** [Note 2] **(sends values in Codes 40-49)**	Integer	0	No	No	Yes
51	**Reserved**	Integer	0	-	-	-
52	**SET Plasma Gas Type**	Integer	Table VI (0–12) [Note 1]	No	No	Yes
53	**SET Shield Gas Type**	Integer	Table VI (0–12) [Note 1]	No	No	Yes
54	**SEND SET_INLET_GASES** [Note 2] **(sends values in Codes 52-53)**	Integer	0	No	No	Yes
55–79	**Reserved**	-	-	-	-	-
80	**THC - Pierce Height Factor**	Float	50 – 300 Percent	Yes	No	No
81	**THC - Pierce Delay**	Float	0.0 – 9.0 Seconds	Yes	No	No
82	**THC - IHS Speed**	Integer	Unitless, 1 – 10 (1=slow; 10=fast)	Yes	No	No
83	**THC - IHS Stall Force**	Integer	Unitless, 1 – 10	Yes	No	No
84	**THC - Retract Speed**	Integer	Unitless, 1 – 10	Yes	No	No
85	**THC - Retract Height**	Float	Inches, e.g. 0.205	Yes	No	No
86	**THC - Nozzle Contact**	Integer	0 = off, 1 = on	Yes	No	No
87	**THC - Cut Height**	Float	Inches, e.g. 0.075	Yes	No	No
88	**THC - Auto Kerf**	Integer	0 = off 1 = on	Yes	No	No

Continued on next page…

PS Code	Description	Type	Data Range & Units	4070	HPR130, HPR260 Manual	HPR130, HPR260 AutoGas and AutoMix
89	**THC - Machine Delay Acceleration**	Float	0.0 – 9.0 Seconds	Yes	No	No
90	**THC Manual Mode**	Integer	0	Yes	No	No
91	**THC Auto Mode**	Integer	0	Yes	No	No
92–99	**Reserved**	-	-	-	-	-

Note 1:
Refer to the Hypertherm documentation for the latest GAS TABLE (Table VI). As of April 2006, the table was as follows:

enum GAS {
- NO_GAS = 0,
- O2 = 1, // oxygen
- CH4 = 2, // methane
- H35 = 3, // argon-hydrogen
- H5 = 4,
- AIR = 5,
- N2 = 6, // nitrogen
- CO2 = 7,
- N95 = 8,
- H35Mix = 9,
- H5Mix = 10
- N95Mix = 11,
- CH4Mix = 12

};

Note 2:
Power Supplies with Auto Gas and Auto Mix consoles use the "SET_ALL_xxx" commands with multiple parameters. To support these functions through advanced command messages, the part programs MUST contain all of the SET command Codes, followed by the appropriate SEND Code. If any of the SET command codes are omitted, the SEND may fail and may not be attempted

For example, to use the SET_INLET_GASES command successfully, the part program must include the two SET Codes (PS Codes 52 and 53 from the table above), followed by the SEND (Code 54). So the part program might look like this:

`(>50<PS, 52, 1, 1, 1)` ←Set the Plasma Gas Type to O2 (oxygen).

`(>50<PS, 53, 1, 1, 6)` ←Set the Shield Gas Type to N2 (nitrogen).

`(>50<PS, 54, 1, 1, 0)` ←Now use the SEND Code to post the SET_INLET_GASES command to the power supply, using the gas types of the two prior SET codes.

1.4.4 PLASMA SETUP (PS) CODES FOR INNERLOGIC FINELINE POWER SUPPLIES

PS Code	*Command Description*	*Type*	*Data Range & Units*
1	**Set Material Type** [Note 1]	Integer	0-4 (Enumerated) [Note 2]
2	**Set Thickness** [Note 1]	Float	Inches, e.g. 0.125
3	**Set Cut Current (Amperage)** [Note 1]	Integer	Enumerated [Note 2]
4	**Set Motion Delay**	Float	0 – 5.0 Seconds
5	**Set Preflow Gas PSI**	Float	0 – 120.0 PSI
6	**Set Plasma Gas Type**	Integer	Enumerated [Note 2]
7	**Set Plasma Gas PSI**	Float	0 – 120.0 PSI
8	**Set Shield Gas Type**	Integer	Enumerated [Note 2]
9	**Set Shield Gas PSI**	Float	0 – 60.0 PSI
10	**Set Process**	Integer	0=Cutting; 1=Marking
11-49	**Reserved**	--	--

Note 1:
These values are required to be set, and in the order shown (material first, thickness second, cut current third).

Note 2:

Refer to InnerLogic documentation for the latest information. As of May 2006:

```
enum Material Types {
        0 = Mild Steel Hot
        1 = Stainless Steel
        2 = Aluminum
        3 = Other Material
        4 = Mild Steel Cold
 };

enum Cut Current {
        0 = 15 Amps
        1 = 30 Amps
        2 = 50 Amps
        3 = 70 Amps
        4 = 100 Amps
        5 = 150 Amps
        6 = 200 Amps
        7 = 8 Amp Marking
        8 = 9 Amp Marking
        9 = 10 Amp Marking
        10 = 200 Amps
        11 = 275 Amps
        };

enum Plasma_Gases {
        0 = O2
        1 = N2
        2 = Air
        4 = H17
        };
```

1.4.5 TORCH HEIGHT CONTROL (TH) CODES FOR INNERLOGIC INOVA SYSTEM

TH Code	*Command*	*Data Type*	*Data Range & Units*
50	**Set Pierce Height** [Note 1]	Float	0 – 0.999 Inches
51	**Set Cut Height** [Note 1]	Float	0 – 0.999 Inches
52	**Set Arc Volts** [Note 1]	Float	50.0 – 250.0 Volts
53	**Confirm Arc Volts** [Note 1]	Float	50.0 – 250.0 Volts
54	**Set for Full Raise**	Integer	0
55	**Set for Partial Raise**	Integer	0
56	**Disable AGI**	Integer	0
57	**Enable AGI**	Integer	0
58	**Enable Limit**	Integer	0
59	**Disable Limit**	Integer	0
60	**Enable CTP**	Integer	0
61	**Disable CTP**	Integer	0
62	**Enable ACA**	Integer	0
63	**Disable ACA**	Integer	0
64	**Set Cut Height Delay**	Float	0 – 9.99 Seconds
65	**Set Partial Raise Height**	Float	0 – 9.999 Inches
66	**Set IHS Touch Force**	Integer	0 – 200 default = 20
67	**Set Crossover Height**	Float	0 – 9.999 Inches
68	**Set Retract Delay**	Float	0 – 9.999 Seconds (9.999 = Auto Mode, the preferred setting)
69	**Set AVC Delay**	Float	0 – 9.999 Seconds (9.999 = AVC Disable)
70	**Set Proportional Gain**	Integer	50 – 750 default = 250
71	**Set Manual Speed**	Integer	0 – 999 Speed in IPM, default = 100
72	**Set IHS Speed**	Integer	0 – 99 Speed in IPM default = 40
73-99	**Reserved**	--	--

Note 1:
These values are required to initialize the Inova Torch Height Control, and must be sent in the order shown (Pierce Height first, Cut Height second, Arc Volts third, Confirm Arc Volts fourth). Also note that the Arc Volts command requires the Confirm Arc Volts be sent immediately after it, with the same value.

BLANK

HYPERTHERM ADVANCED PLASMA OPTION

AO- 70386 REV AA

OPTION

AP

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

Table of Contents

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1 HYPERTHERM ADVANCED PLASMA OPTION

1.1 OVERVIEW

The Hypertherm Advanced Plasma option for Burny 10 series and Phantom controllers provides you with direct control of the following Hypertherm (HT) systems using the Burny interface software:

- HyDefinition 4070 (HD4070) plasma cutting system
- HyPerformance 4070 (HPR4070) plasma cutting system
- HyPerformance HPR130 power supply
- HyPerformance HPR260 power supply
- CommandTHC system (if installed on 4070)

1.2 CABLING

Burny controllers connect to Hypertherm Power supplies and Hypertherm CommandTHC system through the 35RECP Serial I/O-A RS232/422 port located on the back panel. The Burny can connect to the following:

- Up to eight (8) HD4070 power supplies with or without CommandTHC system
- Up to four (4) HPR130 or HPR260 systems
- Up to eight (8) HPR4070 power supplies with or without CommandTHC systems

When multiple power supplies are used, they must be daisy chained together (using the same pinouts), linked on a single COM port and use the multi-drop option. The Burny controller does NOT support multiple power supplies via multiple COM ports.

Table A - Connections for Burny Controllers with standard backpanel to Power Supplies

Burny with standard backpanel 35RECP Serial I/O -A RS-232/422	HD4070 HPR4070	HPR 130 HPR 260
Pin 2 (Rx- signal)	Pin 1 (Tx- signal)	Pin 2 (Tx- signal)
Pin 9 (Rx+ signal)	Pin 20 (Tx+ signal)	Pin 21 (Tx+ signal)
Pin 3 (Tx- signal)	Pin 2 (Rx- signal)	Pin 1 (Rx- signal)
Pin 8 (Tx+ signal)	Pin 21 (Rx+ signal)	Pin 20 (Rx+ signal)
Pin 7 (Gnd)	Pin 15 or 16 or 34 (Gnd)	Pin 3 (Gnd)

Table B - Connections for Burny Controllers with OEM backpanel to Power Supplies

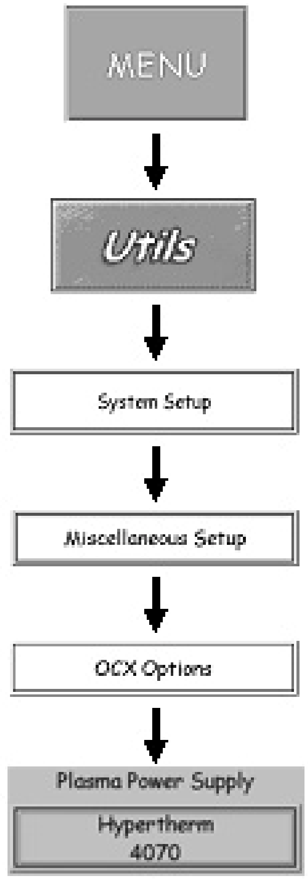
Burny with OEM backpanel 35RECP	HD4070 HPR4070	HPR 130 HPR 260
Pin 2 (Rx- signal)	Pin 1 (Tx- signal)	Pin 2 (Tx- signal)
Pin 8 (Rx+ signal)	Pin 21 (Tx+ signal)	Pin 21 (Tx+ signal)
Pin 3 (Tx- signal)	Pin 1 (Rx- signal)	Pin 1 (Rx- signal)
Pin 7 (Tx+ signal)	Pin 20 (Rx+ signal)	Pin 20 (Rx+ signal)
Pin 5 (Gnd)	Pin 15 or 16 or 34 (Gnd)	Pin 3 (Gnd)

Hypertherm HD4070 power supplies have specific hardware and firmware revision requirements for multi-drop support. Contact Hypertherm, Inc. to verify compatibility.

1.3 SET UP AND ENABLING

To set up and enable the Hypertherm Advanced Plasma option, complete the following steps:

1. Obtain and enter a valid Options License Key from Cleveland Motion Controls. This step is typically completed by the administrator or service engineer for your system. For instructions on entering the Options License Key, refer to the technical manual that was shipped with your Burny Series 10 or Phantom control.
2. Enter the Admin. password.
3. Enable the Advanced Plasma option by pressing the following sequence of buttons on the Burny touchscreen:



4. Press the **OK** button.
5. At the reboot screen press the **OK** button.
   Reboot the system by returning to the Util01 screen and pressing the **Shutdown** button.
6. Configure communications with the power supply. Access the Run02 or Run 03 screen and then, press the **Process Wizard** button.

   The system displays the Advanced Plasma option Main screen (Figure 3).
7. Press the **Status** button. The Advanced Plasma option Status Screen is displayed.
8. Press the **Add/Remove PS** button. The Power Supply Add/Remove screen is displayed.

9. Press the "**0**" password button and enter the Admin. Password.

   The system displays the Password/Power supply Burny Advanced Plasma screen. Refer to Figure 1.

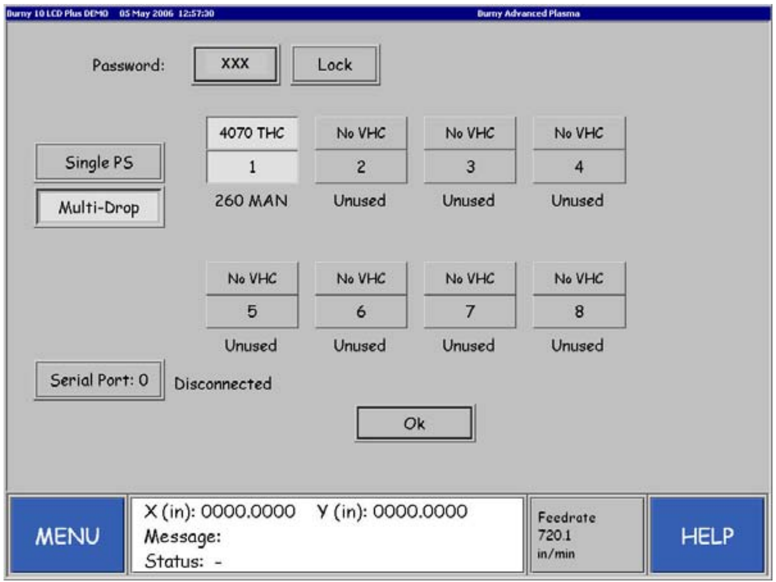


Figure 1 - Advanced Plasma Password/Power supply screen

10. Press on the **Single PS** button to connect to a single power supply or, press on the **Multi-Drop** button to connect to multiple power supplies. For multiple power supplies, press on the **Node** buttons for each power supply ID present.
11. Press on the **Serial Port** button to cycle through the eight (8) available Serial communication ports.

    Select **Serial Port 0** to disable communication between the Burny controller and the power supply source(s). Disabling of the Serial communication port may be necessary if other options require the use of the same serial port or, to run a loopback test on the port.

    To avoid the issue of conflicting port settings, be sure that the serial port number that you choose in this step is *different from* the default port number configured for the Burny controller. To verify the serial port configured for the Burny controller, use the following steps:

    a. Navigate to the Burny Main01 screen and then, press on the **Utils** button.
    b. Press the **System Setup** button.
    c. Press on the **Communication Setup** button
    d. Press on the **Default Serial Settings** button. The Serial Options Screen is displayed where you can view the Port setting for the Burny Controller.
    e. Press the **MENU** button and then return to the Advanced Plasma option **Add/Remove Power Supply** screen.
12. Verify that the power supplies are powered, finished initializing and connected to the configured Serial communication port.
13. Press on the **Lock** button. This action returns the **Password** button to the default status of "0" and disables further configuration of the Power supply and Serial Port settings.
14. Press the **OK** button. The system returns to the Advanced Plasma option Status screen.
15. Shut down and then, reboot the Burny controller so that the Burny Advanced Plasma option processes are synchronized.

    The Advanced Plasma option is now configured and ready for use in a cutting procedure.

1.4 ACCESSING

To access the **Hyperthermerm Advanced Plasma** option:

1. Complete the Setup and Enabling steps outlined in section 1.3 of this manual.
2. Press the **Process Wizard** button from the Run02 screen, or the Run03 screen.

Press on the **Process Wizard** button to access the Advanced Plasma Main Screen

Figure 2 - Process Wizard button on Run 02 screen

The Advanced Plasma option has two principal screens that you use to configure and monitor the Hypertherm Power Supplies and CommandTHC system. They are the:

- **Main Screen** - for more details refer to Section 1.5
- **Status Screen** - for more details refer to Section 1.6

1.5 MAIN SCREEN

Press on this side of the **Parameter Table** button to scroll *backwards* through the available Parameter Tables. Note that each power source has a unique set of Parameter Tables associated with it.

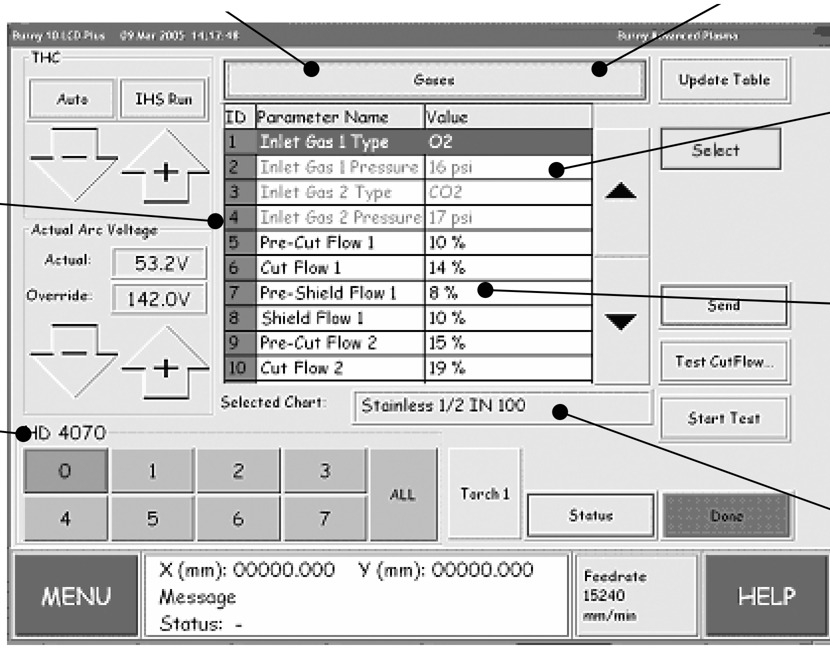
Press on this side of the **Parameter Table** button to scroll *forward* through the Parameter Tables.

Parameter Table window

Parameters shown grayed-out cannot be modified unless you create a Custom Cut chart. Refer to Section 1.8 in this document.

You can modify the Values for Parameters that are shown in bold text. Press on the **Parameter Name** and then, press the **Select** button.

Shows type of active power supply



This button displays the name of the selected Cut Chart.

Figure 3 - Advanced Plasma Option Main Screen

Table C - Detailed Information about the Burny Advanced Plasma Main Screen

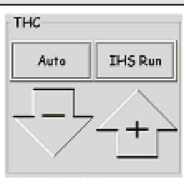
This area/button of the Main Screen:	Provides you with the following operations:
	**Auto/Manual button** - Pressing this button toggles the CommandTHC system (if installed) between Auto and Manual mode. This option is only available on the Hypertherm 4070 power supplies. In Auto mode, the arrow buttons move the torch up and down for the selected power supply (refer to Section 1.7 in this document) until a start signal is applied to the CommandTHC then, automatic operation takes control. After an arc transfer signal is received from the power supply, the arrow buttons can be used to alter the programmed arc voltage. In Manual mode, all of the automatic functions are disabled and the torch position must be controlled using the up and down arrow buttons. **IHS Run/On button** - (Initial Height Sense) Pressing this button toggles between **IHS Run** and **On**. When set to **Run**, the IHS is ready for normal operation. When set to **IHS ON**, the torch to detects the plate and then rises to the configured pierce height.  The THC should be in IHS Run before the process is sent to the 4070 supply. If the THC IHS is ON (in IHS Test mode), DO NOT send the process to the 4070 power supply. If the process is sent while in IHS Test mode, cycle power to the 4070 supply and then resend the process while in IHS Run mode.

Table continued on next page…

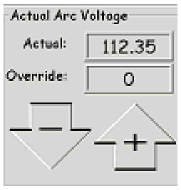
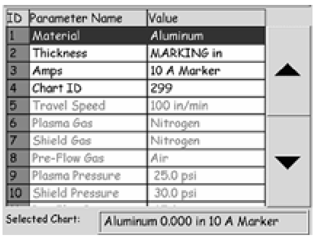
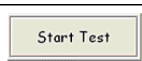
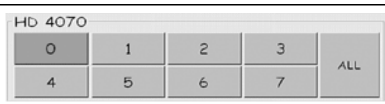
This area/button of the Main screen:	Description:
	The **Actual** field displays the plasma arc voltage while a cut is being made. If you want to change the arc voltage to achieve a desired cut quality, use the arrow keys to temporarily and incrementally override the arc voltage set point. Keep in mind, that in order to maintain optimal cut quality, the arc voltage may need to be increased as the electrode wears. When a power supply is selected, pressing the **Up arrow** button (+) increases the arc voltage, thereby increasing the cutting height of the torch. Pressing the **Down arrow** button (-) decreases the arc voltage, thereby lowering the cutting height of the torch.
	**Parameter Table** button - pressing this button cycles through the Tables available for the currently active power supply. For more information about Parameter Tables refer to Section 1.5.1
	Parameter Table window - this window displays the Parameter Table items associated with the selection shown on the **Parameter** Table button. Adjustable Parameter items are shown in bold type. To change a value, do the following: 1. Highlight the parameter item by pressing on it or use the scroll bars. 2. The select button will change to show the current value. Press it again to edit the value You can not adjust the values for items that are grayed out. The Chart Id parameter is used to: ▪ select a custom cut chart in the HD4070 and HPR4070 cutting systems ▪ select the gas type for the HPR 130 and 260 power supplies For more information on Parameter Tables, refer to Section 1.5.1 in this document. For more information on Creating a Custom Cut chart, refer to Section 1.8 in this document.
	Pressing this button uploads the current values of the active (selected) power supply into the Parameter table.
	Lets you navigate the: ▪ process cut charts for the 4070 power supplies ▪ AGC Gas charts for the HPR130 and 260 power supplies as well as the 130 and 260 AutoMix power supplies. To use the **Select** button to navigate, do the following: 1. Select the Material, Thickness or Amps item. 2. Press the **Select** button. The system displays a list to choose from.
	If you have altered the default parameters but have not yet sent the changes to the active power supply, pressing this button restores the actual power supply settings to the screen.
	This button is used when you are creating a custom Cut Chart. For detailed information about creating a custom Cut Chart, refer to Section 1.8 in this document.
	Pressing this button transmits the parameter table values to the power supply. Note that all of the values in the table are sent to the power supply.

Table continued on next page…

<table>
<tr><th>This area/button of the Main screen:</th><th>Description:</th></tr>
<tr><td>
</td><td>
4070 power supplies - this button is only available when Gases are displayed on the Parameter Table button.
HPR 130 and 260 power supplies - this button is only available when the Parameter Table button is displaying the parameters for Current AGC Gases.
Pressing the Test… button cycles through the available gas leak/flow tests. The table below lists the power supplies and the tests that are available for them:
<table>
<tr><th>Power Supply</th><th>4070</th><th>130 or 260 AGC and AutoMix</th><th>Manual 130 or 260</th></tr>
<tr><td>Available tests</td><td>Gas Pre Flow
Gas Cut Flow</td><td>Gas Pre Flow
Gas Cut Flow
Inlet Leak
System Leak
Burkert</td><td>Gas Pre Flow
Gas Cut Flow
Inlet Leak
System Leak</td></tr>
</table>
All of the tests take approximately 40 seconds to complete.
Gas Pre Flow Test - turns on pre-flow gases to determine if they are flowing correctly.
Gas Cut Flow Test - turns on cutting gases to determine if they are flowing correctly.
Inlet Leak Test - determines if inlet solenoids are allowing gas to pass through the valve even when they are closed.
System Leak Test - determines if there are leaks to the atmosphere within the system.
Burkert Test - checks for an expected Pulse Width Modulation (PWM) value for a set pressure.
</td></tr>
<tr><td>
</td><td>Pressing this button begins the test specified using the Test… button. Once the test has begun, this button displays the time in seconds before the test is complete. Pressing this button when a test is running stops the test.</td></tr>
<tr><td>
</td><td>This button is active when the parameters for a Custom Cut chart are displayed. Pressing this button deletes the custom cut chart.</td></tr>
<tr><td>
</td><td>Pressing this button displays the main Status screen for the power supply.</td></tr>
<tr><td>
</td><td>Returns you to the Burny Run screen.</td></tr>
<tr><td>
</td><td>
Lets you select the active power supply/torch height control node.
Select a single power supply node by pressing one of the numbered node buttons.
When in a normal state the power supply Node buttons are displayed blue in color. If a power supply experiences a fatal status condition, the associated Node button turns red in color. Use the status screen to view detailed status information for each power supply.
ALL button - use only to Jog all 4070 THC's up or down.
</td></tr>
<tr><td>
</td><td>
Lets you specify the active torch when two (2) torches are connected to a 4070 power supply.
First, select the appropriate Node button for the power supply and then, activate the desired torch using this button.
This button also lets you choose the active torch for the CommandTHC.
Only one torch can be active at a time.
</td></tr>
</table>

1.5.1 PARAMETER TABLES

The following table lists the Parameter Tables associated with each of the compatible power supplies. To access the Parameter tables, activate a power supply and then, press on the Parameter Table button. (Refer to Figure 3).

Table D - Available Parameter Tables

<table>
<tr><th>If this Power Supply is Active:</th><th colspan="4">The Parameter Table Button toggles through the following Table Headings:</th></tr>
<tr><td>HD4070 or HPR4070</td><td colspan="2">THC (if installed)
You can configure the following:
Pierce Height Factor
Pierce Delay
IHS Speed - Initial Height Speed
IHS Stall Force
Retract Speed
Retract Distance
Nozzle Contact Action
Cutting Height
Auto Kerf
Machine Acceleration
Corner Current</td><td>Process
You can configure the following parameters::
Material
Thickness
Amperage
Cut Chart ID</td><td>Gases
You can configure the following parameters:
Pre-cut flow
Cut Flow 1
Pre-Shield Flow 1
Shield Flow 1
Pre-cut Flow 2
Cut Flow 2
Pre-Shield Flow 2
Shield Flow 2</td></tr>
<tr><td>130 AGC or 260 AGC
130 AMIX or 260 AMIX</td><td>AGC Cut Chart
You can configure the following parameters:
Material
Thickness
Amperage
Cut Chart ID</td><td>AGC Gases
Displays current setpoints of the gases for the power supply.</td><td>AGC Status
Displays the operational parameters of the power supply.</td><td>Current AGC Gases
Reads the actual gas pressures and gas types. These parameters are updated while the flow/ leak tests are performed.</td></tr>
<tr><td>130 MAN or 260 MAN</td><td colspan="4">Current Gases
Reads the actual gas pressures and automatically updates the values while the leak/flow tests are performed.</td></tr>
</table>

1.6 STATUS SCREEN

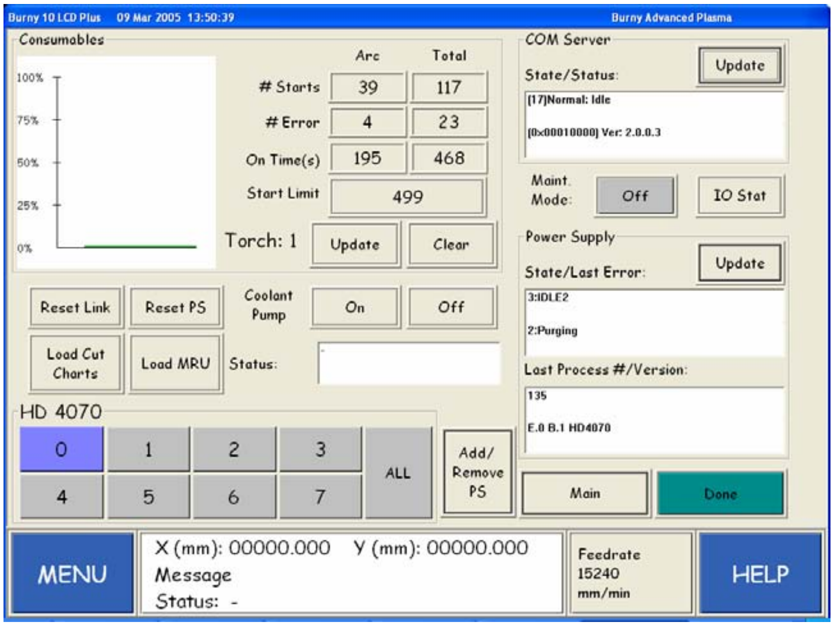


Figure 4 - Advanced Plasma option Status Screen

Table E - Detailed Information about the Advanced Plasma option Status Screen

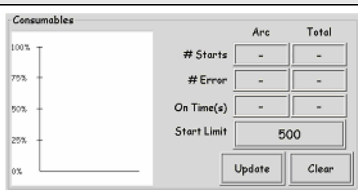
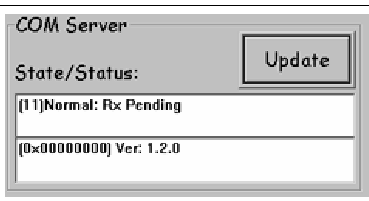
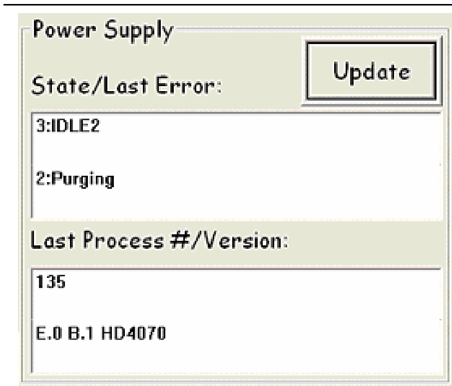
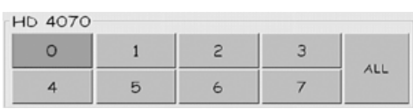
<table>
<tr><th>This area/button on the Status Screen:</th><th>Description::</th></tr>
<tr><td></td><td>
The bar graph corresponds to the percentage value of the ratio between the value shown in Consumable # Starts field and the value configured using the Start Limit button.
<table>
<tr><th>If the color of the bar graph is:</th><th>Then, the number of starts is:</th></tr>
<tr><td>Green</td><td>less than 95% of the configured start limit</td></tr>
<tr><td>Yellow</td><td>between 95% and 100% of the start limit</td></tr>
<tr><td>Red</td><td>equal to or has exceeded the start limit</td></tr>
</table>
Consumable statistics are only available for 4070 systems with torch height control.
Starts - The value displayed in this field corresponds to the total number of times that the plasma arc was fired.
Errors - The value displayed in this field corresponds to the number of faults that occurred during plasma ramp up/down operation.
Start Limit - Press on this button to display a key pad where you can set the maximum number of starts for the consumable. This value can range from 1 to 500.
Update - Immediately updates the consumable information.
Clear - When you change a consumable, press this button to reset the number of starts and number errors fields to zero.
</td></tr>
<tr><td></td><td>
The Burny COM server processes the commands and requests and then, sends the information to the selected power supply.
Update - queries the state, communication status and version number of the Burny server.
</td></tr>
<tr><td></td><td>
Maint. Mode button - only for 4070 power supplies. Setting this Mode to ON lets you perform torch and consumable maintenance tasks by disabling the torch height controls displayed in the Burny controller. Setting the Mode to OFF resumes normal operation.
IO Stat button - reads the status of the I/O ports and displays them in the State/Status window.
</td></tr>
</table>

Table continued on next page…

<table>
<tr><th>This area/button on the Status Screen:</th><th>Description::</th></tr>
<tr><td>
</td><td>resets the serial link from the Burny COM port server to the power supply(s).</td></tr>
<tr><td>
</td><td>issues a "Reset" command to the power supply; this is only accepted by the system if the power supply is in an error condition. Not all errors are cleared by pressing this button and certain situations require that you recycle power to the power supply.</td></tr>
<tr><td>
</td><td>uploads cut charts from active power supply. This button is only available for use with 4070 powers supplies.</td></tr>
<tr><td>
</td><td>Loads the Most Recently Used (MRU) process. Typically, the last process used. The last process ID is shown in the Power Supply Status window. This button is only available for use with 4070 power supplies</td></tr>
<tr><td>
</td><td>Lets you manually turn the coolant pump ON or OFF. The pump is set to ON to load coolant. The availability to turn the coolant pump off is subject to the coolant temperature. The state of the pump is displayed in the status window after either command.

The HPR 130 and 260 power supplies do not support the manual pump OFF command.</td></tr>
<tr><td>
</td><td>Verify that the power supply you want to monitor is active and then, press the Update button to display the power supply state, error messages and version number.
For specific information about displayed error messages, refer to the power supply documentation.</td></tr>
<tr><td>
</td><td>Returns you to the Burny Advanced Plasma option Main screen.</td></tr>
<tr><td>
</td><td>Returns you to the Burny Advanced Plasma option Main screen.</td></tr>
<tr><td>
</td><td>Lets you select the active power supply/torch height control node.
Select a single power supply node by pressing one of the numbered node buttons.
When in a normal state the power supply Node buttons are displayed blue in color. If a power supply experiences a fatal status condition, the associated Node button turns red in color. Use the status screen to view detailed status information for each power supply.
ALL button - use only to Jog all 4070 THC's up or down.</td></tr>
<tr><td>
</td><td>Add/Remove Power Supply button - Displays the Add and Remove Power supply screen. For more information about adding power supplies, refer to Section 1.7 in this document.</td></tr>
</table>

1.7 ADDING AND REMOVING POWER SUPPLIES

For the Burny to recognize and communicate with the Hypertherm power supplies and the CommandTHC system, you must perform a power supply configuration process. This is a one-time setup process and does not have to be repeated unless there is a change in the available Hypertherm power source(s) or CommandTHC system(s).

1. Press on the **Process Wizard** button from the Burny **Run02** screen. The system displays the Advanced Plasma option **Main** screen.

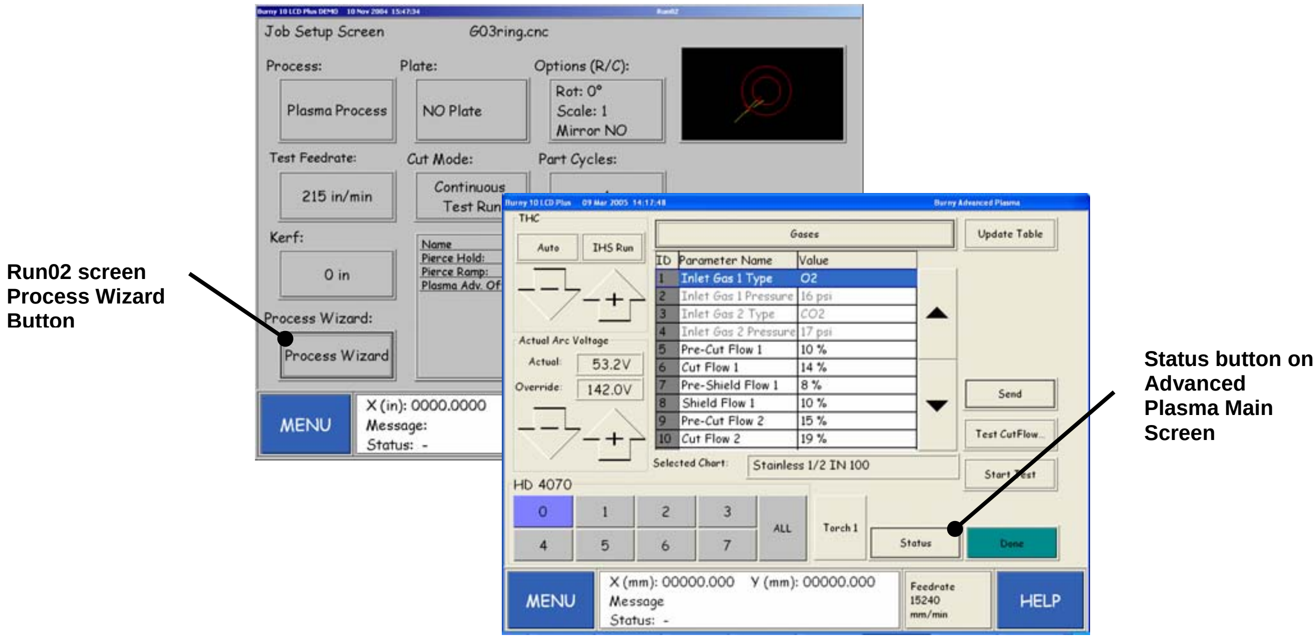


Figure 5 - Run02 and Advanced Plasma Main Screen

2. Press on the **Status** button. The Advanced Plasma option **Status** screen is displayed.
3. Press on the **Add/Remove PS** (Power Supply) button. The system displays the Password/Power supply Burny Advanced Plasma screen.
4. Press on the “**0**” button then, enter the Admin password using the displayed number keypad. Press **OK**.

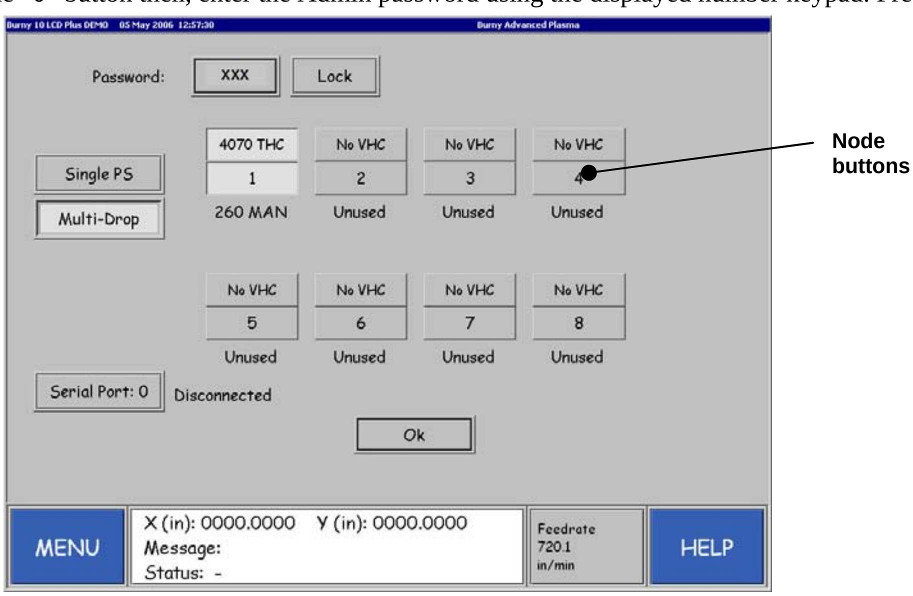


Figure 6 - Burny Advanced Plasma Password/Power supply screen

5. Press on the **Single PS** button to connect to a single power supply or, press on the **Multi-Drop** button to connect to multiple power supplies. For multiple power supplies, press on the **Node** buttons for each power supply ID present.
6. Press on the **Serial Port** button to cycle through the eight (8) available Serial communication ports.

   Select **Serial Port 0** to disable communication between the Burny controller and the power supply source(s). Disabling of the Serial communication port may be necessary if other options require the use of the same serial port or, to run a loopback test on the port.
7. Verify that the power supplies are powered, finished initializing and connected to the configured Serial communication port.
8. Press on the **Lock** button. This action returns the **Password** button to the default status of “0” and disables further configuration of the Power supply and Serial Port settings.
9. Press the **OK** button. The system returns to the Advanced Plasma option Status screen.
10. Shut down and then, reboot the Burny controller so that the Advanced Plasma option processes are synchronized.

1.8 CREATING A CUSTOM CUT CHART

You can create a custom (process) cut chart using one of the default Cut Charts as a template for the following power supplies:

- HPR4070
- HyDefinition4070
- HPR130
- HPR260
- 130 AMIX
- 260 AMIX

To create a custom cut chart, use the following steps:

1. With the Main Advanced Plasma screen displayed, press on a 4070 **Node** button to make the power supply active.
2. Press on the **Parameter Table** button to display the **4070 Cut Chart** table.
3. Define the values for Material Type, Thickness and Amperage (shown in bold). Use the following steps:
   a. Press on the Parameter Name in the **Parameter** window.
   b. Press the **Select** button. The system displays the **Select Item** window.
   c. Press on an item then, press the **OK** button.
4. Press the **Create** button. The system displays the **Create Custom Cut Chart** screen.

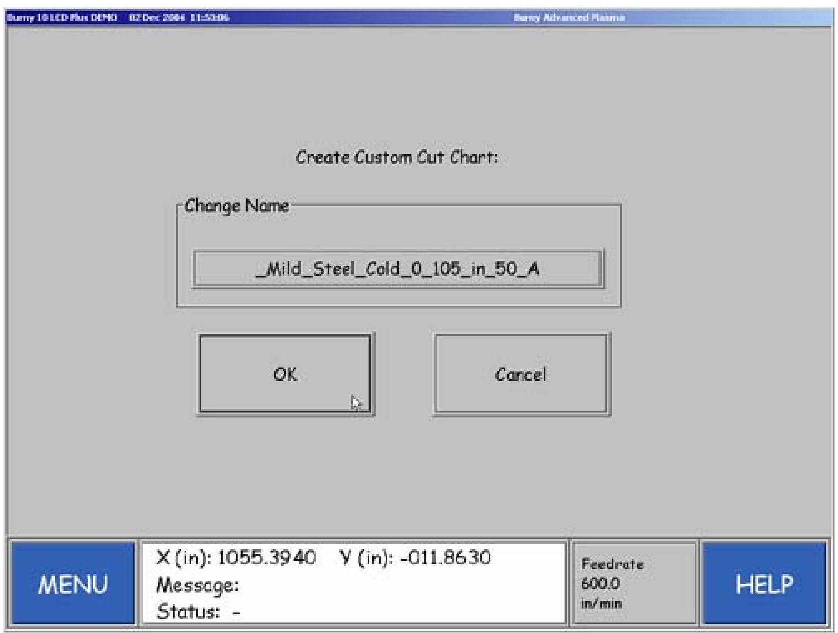


Figure 7 - Create Custom Cut Chart screen

5. Press on the **Change Name** button to display the keyboard screen where you can type in a new name. Press the **OK** button. The system displays the Advanced Plasma option **Main** screen with the configurable parameter names and values shown in bold text.
6. Configure the necessary parameters for your custom cut chart then, press the **Send** button. The system displays the Advanced Plasma option **Select Power Supply** screen.
7. Select the power supplies where you want to send the custom cut chart (0-7 or All) and then, press the **Send** button. The system returns you to the Advanced Plasma option Main screen.

1.9 VIEWING PART NUMBERS OF THE CONSUMABLES

Before making a cut, check to be sure that the correct consumables are installed on the torch. To view the part numbers and picture (if available) for the correct torch consumable, use the following steps:

1. Press on a **Node** button to select a power supply.
2. Press on the **Parameter Table** button until the Cut Chart table is displayed.
3. Use the **Scroll arrow** button to select a consumable in the parameter window then, press the **View** button. The system displays a photo (if available) and part number for the consumable.
4. Press the **Cancel** button. The system returns to return to the Advanced Plasma option **Main** screen.

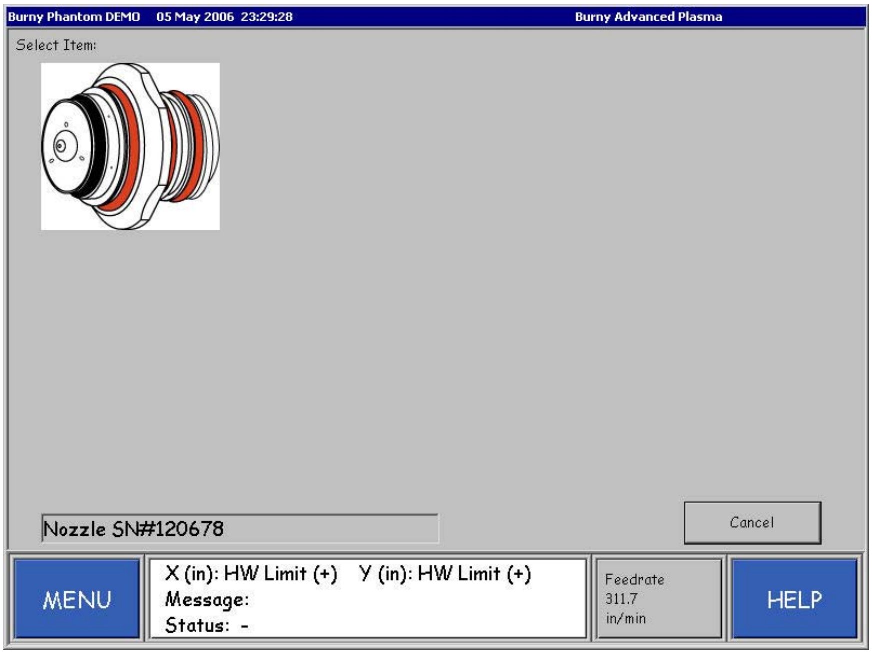


Figure 8 – View Consumables Screen

Trademark Information: HyDefinition is a registered trademark of Hypertherm Inc.

1.10 TROUBLESHOOTING

1. Confirm that the Hypertherm options is properly licensed and enabled in the "OCX Options" screen. If not, set the option, click "Ok" and restart the unit.

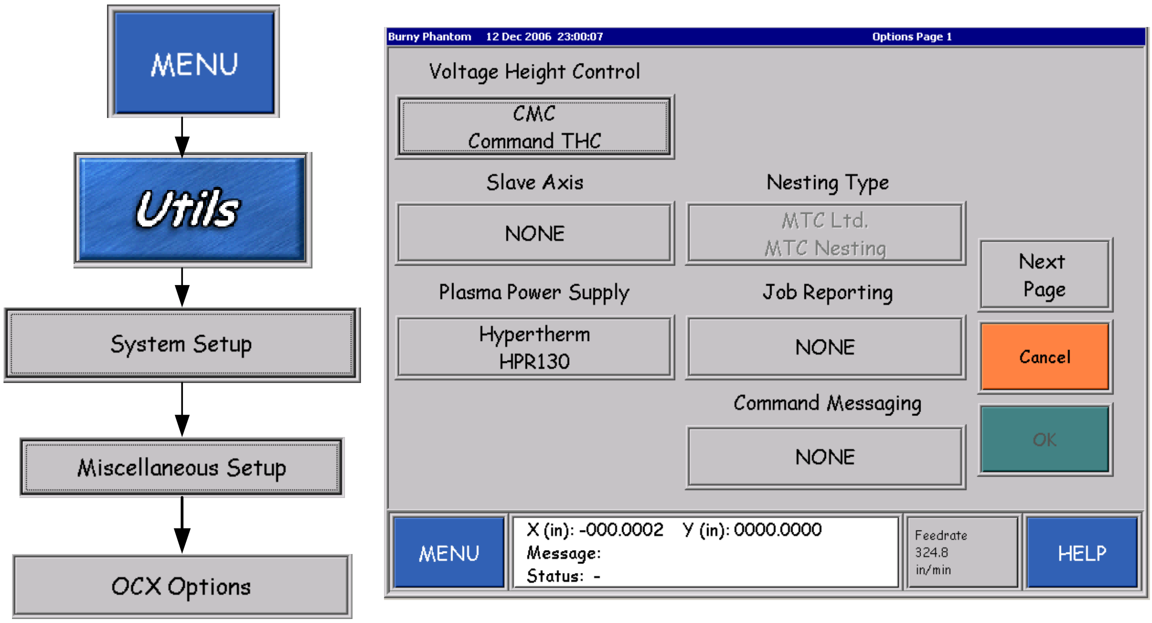


Figure 9 OCX Options Screen

2. Make sure that the **UseRS422** parameter on the **I/O Configuration** page of the Motion Parameters is set to True.

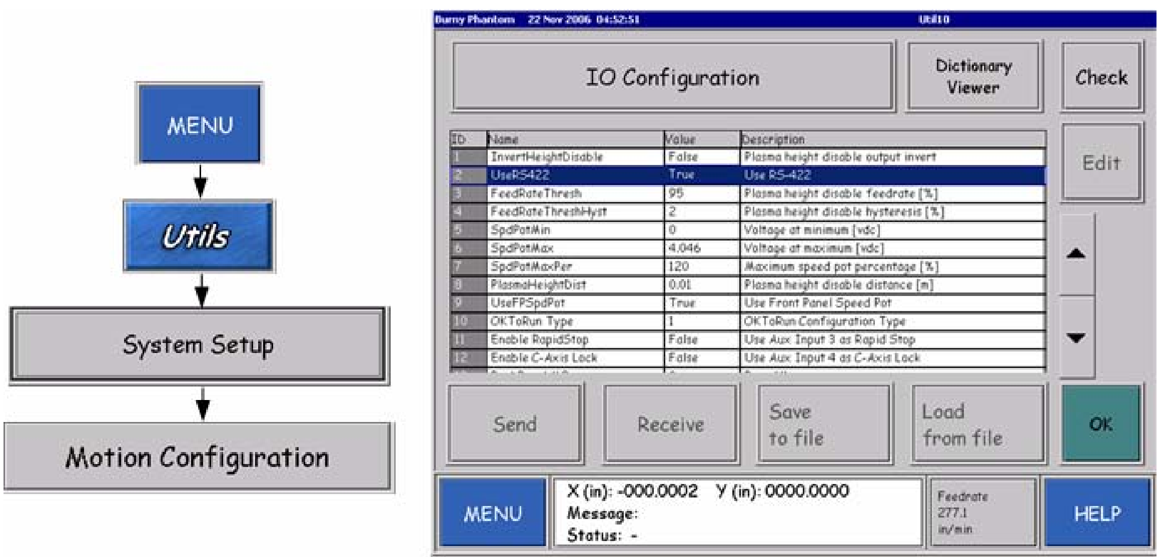


Figure 10 I/O Configuration Page of Motion Configuration Screen

3. If Comm 1 is used for Hypertherm communication, set the default serial settings port to 0 or to which ever port is being used for downloading parts.

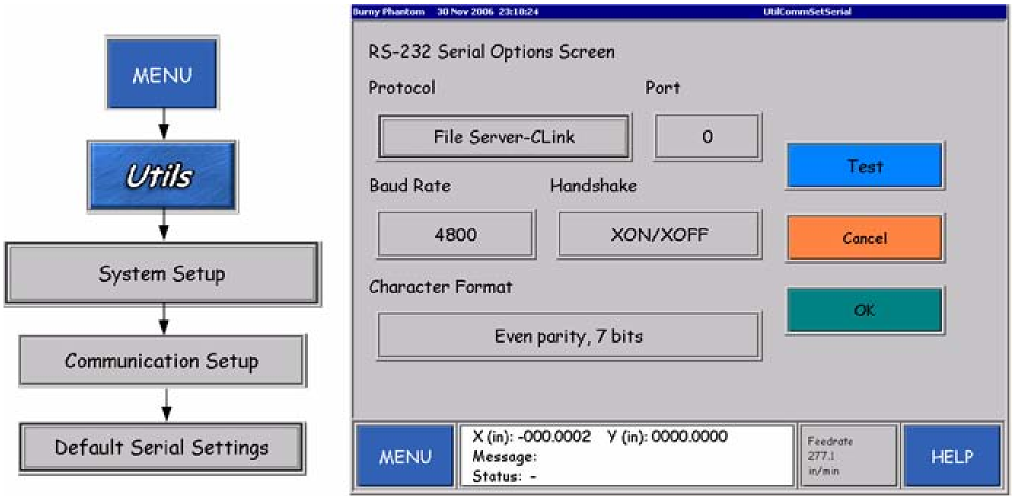


Figure 11 RS-232 Serial Options Screen

4. Open the Process Wizard from the RUN02 Screen and in the **Add / Remove PS** screen, confirm proper power supplies are configured at the right node address and comm. Port. **Note**: nodes 1-8 correspond with Inner Logic node addresses 0-7.

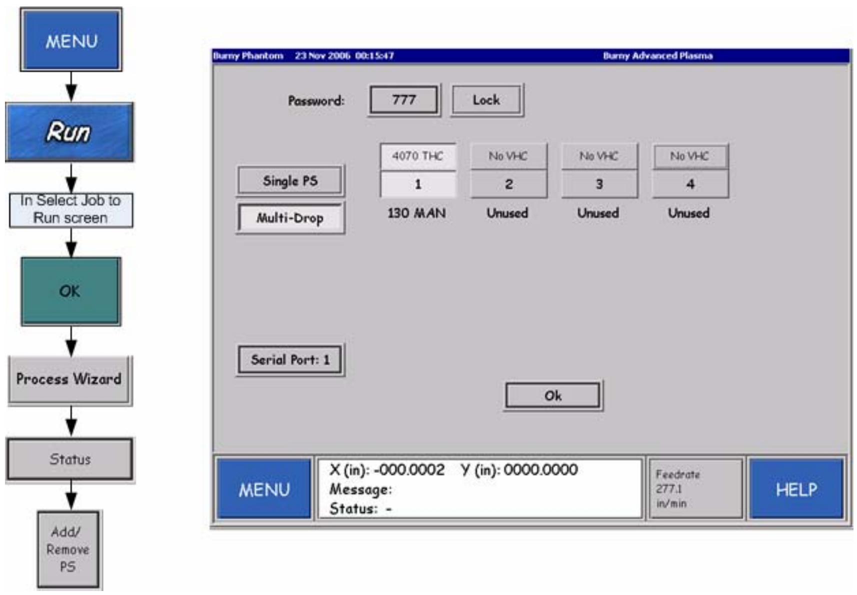


Figure 12 Add/Remove PS Screen

5. While in **Add / Remove PS** screen, enter the "Admin" password. Click the **Serial Port** button, until the desired COM port number used on the Burny is displayed. If "Connection Failed" is displayed for this COM port, there is a conflict with another application attempting to open the same port. The competing application needs to be located and prevented from access to this port. For the purposes of example, assume the Hypertherm link is to operate on COM1.
6. If the COM port is opened successfully in the last step, click "OK" while in **Add / Remove PS.**
7. Go to Menu **Utils** and shut down the unit.

8. For Burny 10 LCD or Burny LCD Plus with a multidrop line, add two 120 Ohm and one 2.4K Ohms resistors to the cable connecting Burny RECP 35 according to the following drawing,

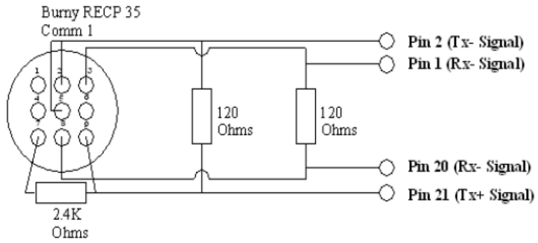


Figure 13 Adding Resistors to Cable Connecting Burny RECP 35

9. Before powering up the unit, open the front panel, and locate and check the jumpers for communications.
   - **For the Burny 10 LCD or Burny 10 LCD Plus,** locate Comm1 (J3) jumper on the standard encoder and Comm board.

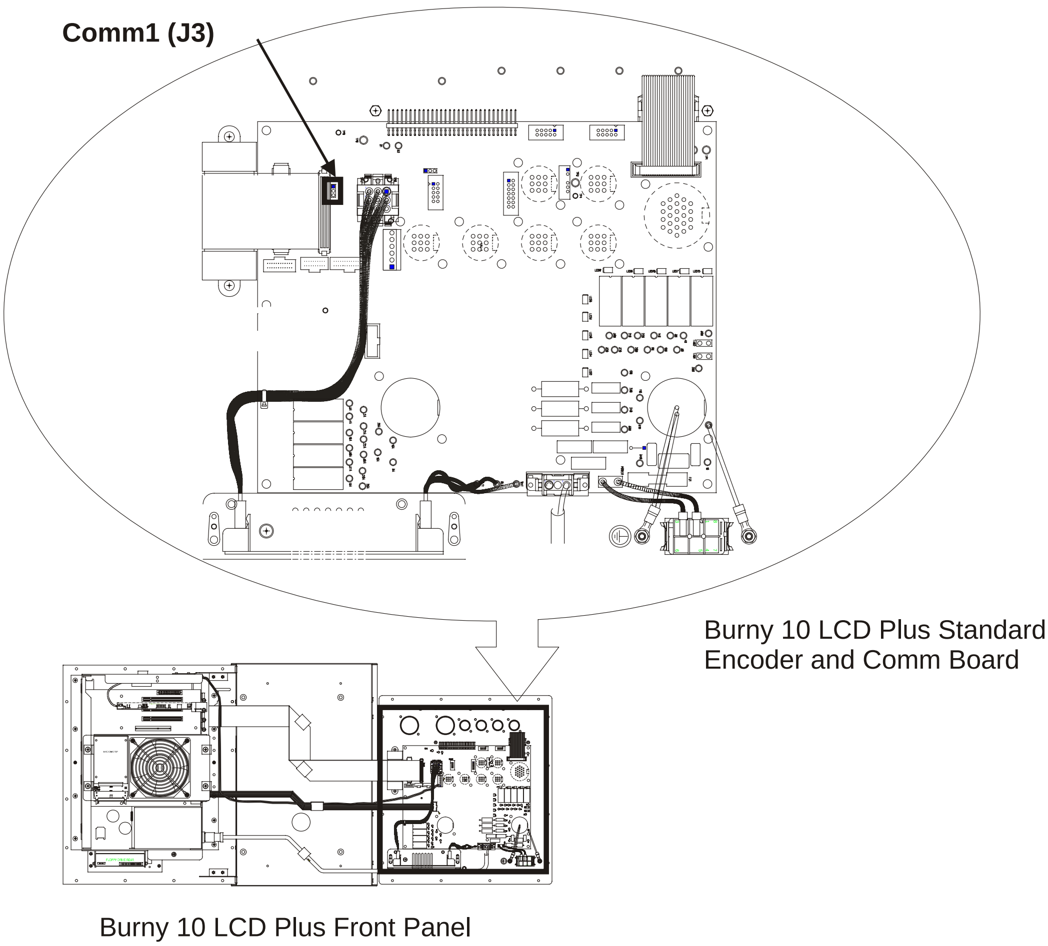


Figure 14 Location of Comm1 (J3) Jumpers on Burny 10 LCD Standard Encoder and Comm Board

- **For the Burny 10 LCD Plus OEM,** locate the Comm1 (J3) jumper on the OEM Encoder and Comm board.

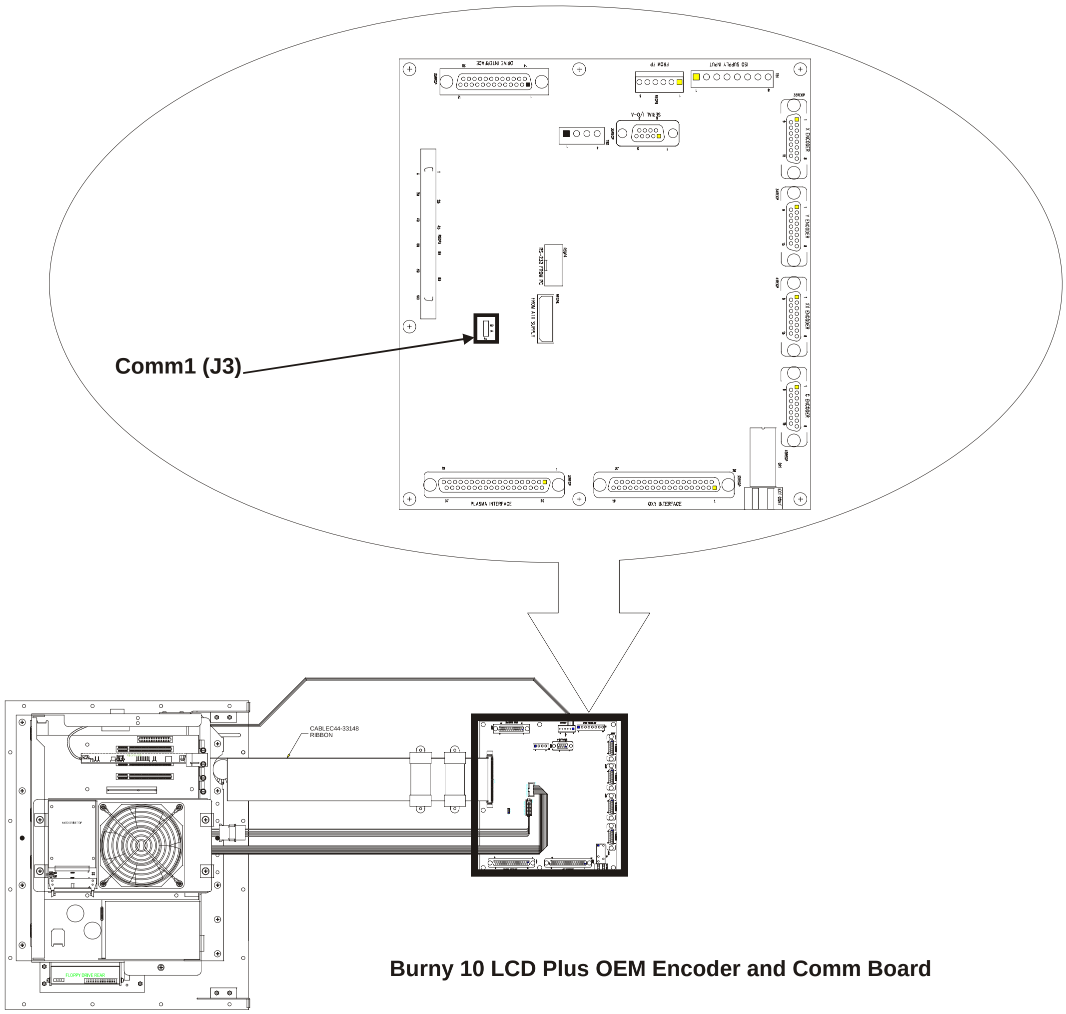


Figure 15 Location of Comm1 (J3) Jumpers on Burny 10 LCD OEM Encoder and Comm Board

- **For the Burny 10 LCD Plus with Comm-2 Option,** locate the Comm2 Option (J1-J4) jumpers on the Comm-2 option board.

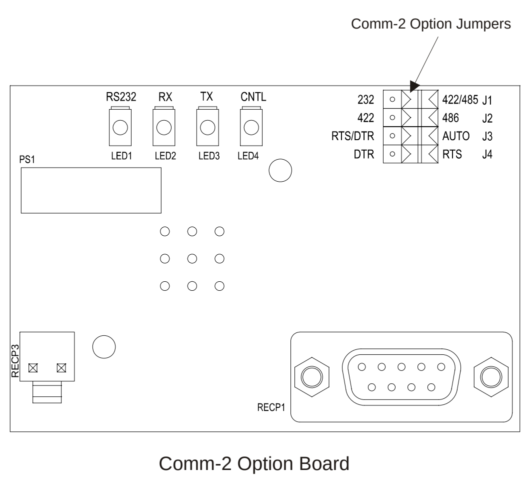


Figure 16 Location of Comm-2 Option Jumpers

- **For the Burny Phantom or Phantom ST,** locate the Comm1 (J1-J4), Comm2 (J5-J8) jumpers on the encoder and comm. port card of the back panel of the control. These jumpers are located at the lower left-hand side of the circuit card just above the two large ribbon cable connectors.

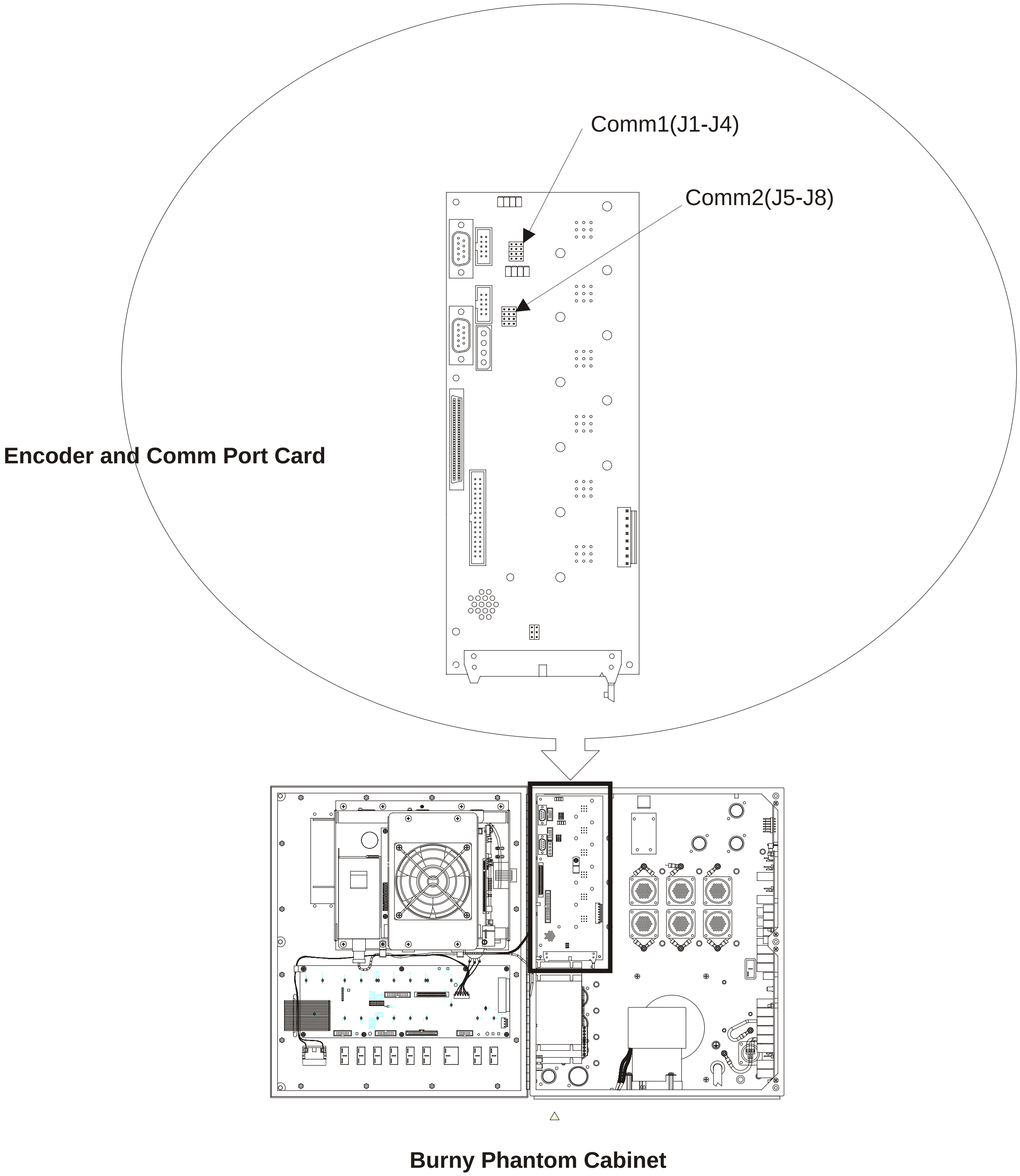


Figure 17 Location of Comm1 (J1-J4) and Comm2 (J5-J8) Jumpers on Phantom Encoder and Comm Port Card

Use the following table to make sure that the jumper settings are correct for your unit and line (single or multidrop).

Table F Comm Jumper Settings

Unit	Single Line	Multidrop Line
Burny 10 LCD Burny 10 LCD Plus (Standard or OEM)	J3 There should be no jumpers. No jumpers means none/RS422.	J3 There should be no jumpers. No jumpers means none/RS422s
Burny 10LCD Plus with Com-2 option	**J1** 232 **422/485** **J2** **422** 485 **J3** **RTS/DTR** Auto **J4** DTR **RTS**	**J1** 232 **422/485** **J2** 422 **485** **J3** **RTS/DTR** Auto **J4** DTR **RTS**
Phantom Phantom ST	**J1 or J5** RS232 **RS422/485** **J2 or J6** **RS422** RS485 **J3 or J7** **RTS/DTR** Auto **J4 or J8** DTR **RTS**	**J1 or J5** RS232 **RS422/485** **J2 or J6** RS422 **RS485** **J3 or J7** **RTS/DTR** Auto **J4 or J8** DTR **RTS**

10. To check the communication from the Burny, jumper 35 RECP pins 2 and 3 and 8 and 9 and click the **Test** button to run the Burny "RS232 Loopback Test" on the **RS232 Serial Options Screen.**

    Note: If you have changed the port setting previously, set the VHC port to zero. Then set the default serial port to the desired port to test. Restart the control to reset the port changes.

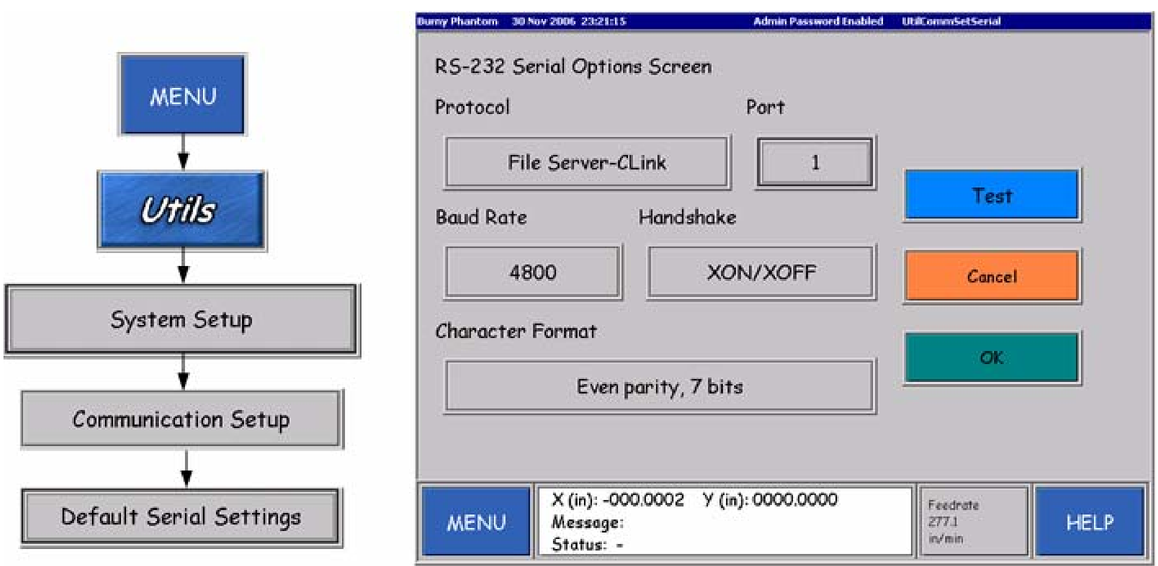


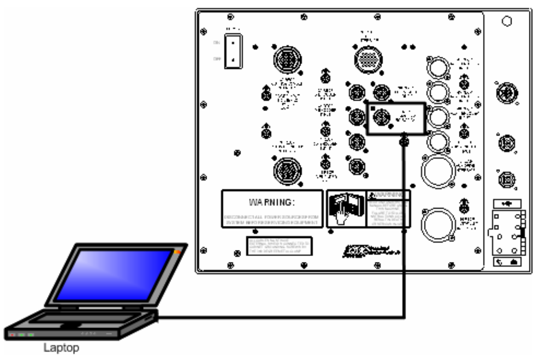
Figure 18 Testing Port 1 Communication

11. Use the Hypertherm emulator to check communication to and from the Burny unit.
    - For the Burny 10 LCD or 10 LCD Plus, connect the RS232 cable from a PC to the COM1 (35RECP) on the standard or OEM back panel and run the emulator program EMUL_IL_VIEWER.EXE from the PC. Refer to Table G for the pinout of this cabling.

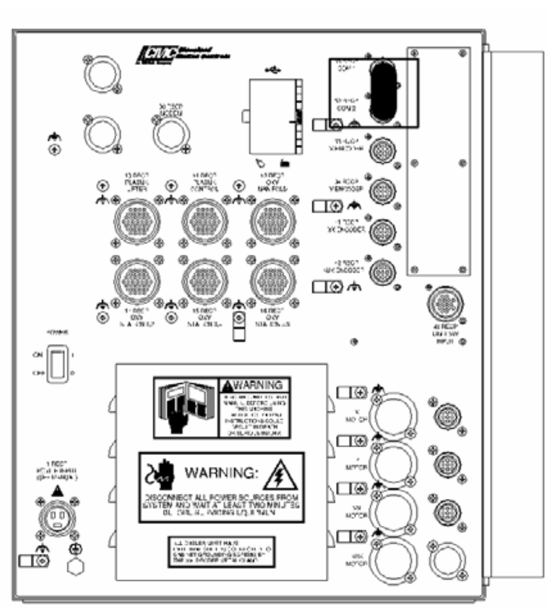
Table G Pinout For PC to Burny Cabling

PC Side Pin #'s		Burny Side Pin #'s
2	-->	3
3	-->	2
5	-->	7
7	-->	9
8	-->	8

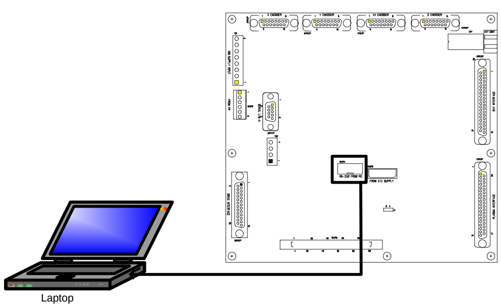
    - For the Phantom or Phantom ST, connect a loopback cable from COM1 (35RECP) to the COM2 (50RECP) and run the emulator program EMUL_IL_VIEWER.EXE located in "D:\Burny\Support\Emul of the Burny unit.



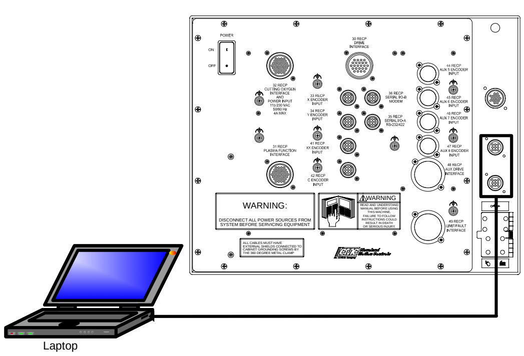
RS232/RS485 cabling from PC to Burny LCD or Burny LCD Plus Standard Back Panel



Loopback Cable from RECP 35 to RECP 50 on Phantom and Phantom ST Back Panel



RS232/RS485 cabling from PC to Burny LCD Plus OEM Back Panel



RS232/RS485 cabling from PC to Burny LCD Plus Standard Back Pane with factory installed Com-2 Option

Figure 19 PC to Burny and Loopback Connections

12. On the GUI for HD4070 Emulator screen, set "Comm Port" to the value "2" to indicate the use of COM2 port by the emulator, and click "Connect".

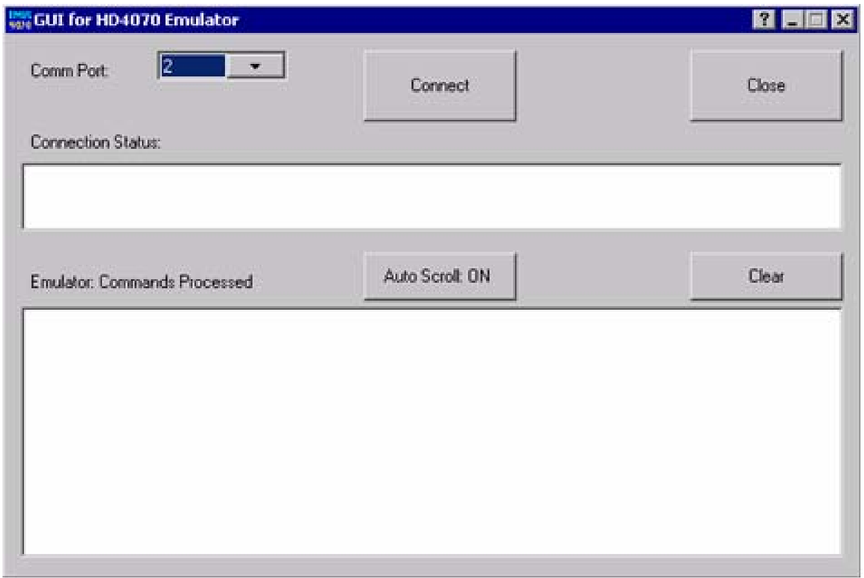


Figure 20 HD4070 Emulator Viewer Screen

13. In Burny, navigate to the **Advanced Plasma Status** screen. Click the COM Server **Update** button. A normal message should indicate "(10) Normal: Idle" state.

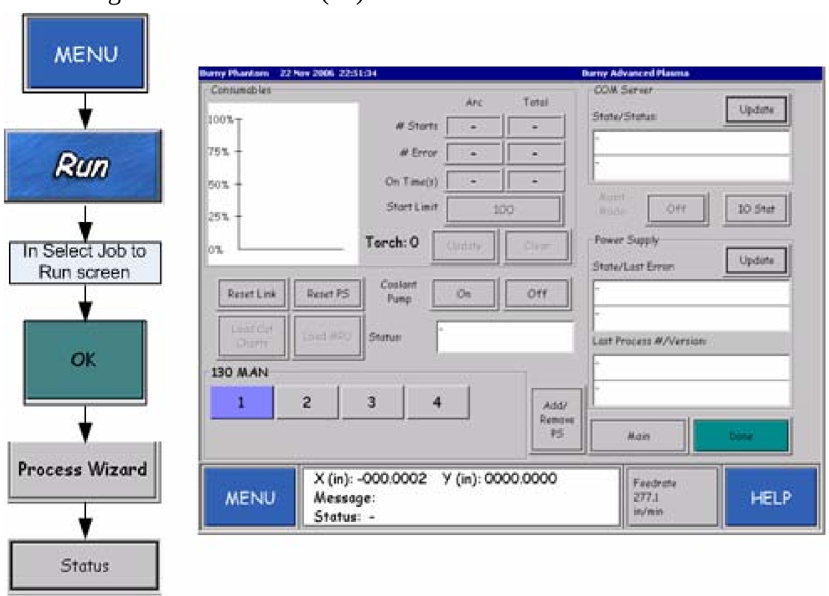


Figure 21 Advanced Plasma Status Screen

14. Click the first node button while still in the **Status** screen (for example assume this is "1"). Click the Power Supply **Update**" button. If the communication is successful, the bottom of "State/Last Error" should read the software and cut chart version (for example "Software 11 Charts 14"). If the data returned is "Get Status Failed", then RS232 communication is not properly connected.

15. If communication is working, the status window on the Emulator will reflect this.

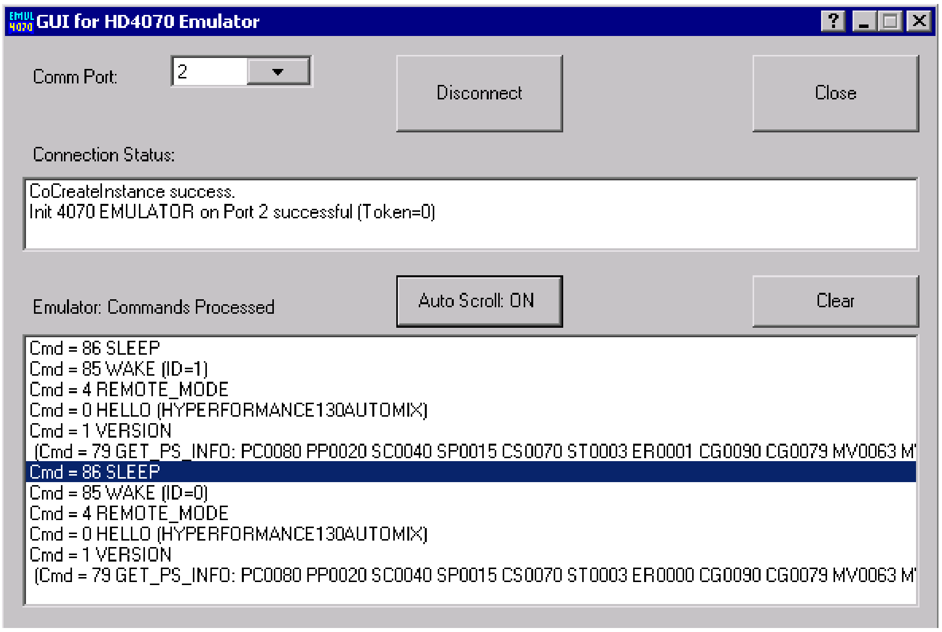


Figure 22 Emulator Status Window after Communication is Established

16. If all tests to this point have failed, then the problem most likely resides in the Burny unit. Call Burny service for assistance.
17. If the testing to this point was successful, then the problem is either in the RS232/RS485 cabling to the Hypertherm devices or in the configuration of the Hypertherm device itself.
    - For pinouts for RS232/RS485 cabling to Hypertherm power supplies, refer to Section 1.2. of the Hypertherm Advanced Plasma Option (AO-70322).
    - For configuration settings for the Hypertherm devices, refer to Hypertherm installation manual.

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KALIBURN ADVANCED PLASMA OPTION

(AO- 70387 REV AA)

OPTION

AP

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

Table of Contents

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1 KALIBURN ADVANCED PLASMA

1.1 OVERVIEW

The Kaliburn Advanced Plasma Option lets you directly control **Kaliburn® FineLine 100PC, 150PC, 200PC, 260PC,** and **Kaliburn® Spirit 275a, 200a, 150a** power supplies through the Burny. (***NOTE: References in this manual to "Kaliburn power supply" refers only to those units listed previously.***) This option also lets you communicate with the Inova Torch Height control if installed on your system, and automatically sets the correct pierce height, cutting height, and arc voltage.

You can access and use the pre-configured cut charts or, create a custom cut chart that satisfies your cutting needs. After you select the type of cut you would like to make and configure the material type and thickness, you can view pictures of the required torch parts along with their part numbers.

Incorporating the support for multi-drop links, the Burny can communicate and control up to eight (8) power supplies linked on a single COM port through a single RS-422 serial communication port. The Burny does NOT support control of multiple power supplies that are connected using multiple COM ports.

1.2 CABLING

Burny controllers connect to Kaliburn Power supplies and Inova Height Control systems through the 35RECP Serial I/O-A RS232/422 port located on the back panel. The Burny can connect to:

- Up to eight (8) Kaliburn Power supplies
- Up to eight (8) Inova Height Control systems
- Up to eight (8) Kaliburn Power supplies with Inova systems

Table A - Connections for Burny controllers to Inova Control Console

Burny controllers **(Burny 10 standard Backpanel, Burny 10LCD, Phantom, PhantomST)** **35RECP Serial I/O -A RS-232/422**	**Inova Control Console** **P6 RS-422 IN Port**
Pin 8 (Tx+ signal)	Pin 1 (Rx+ signal)
Pin 3 (Tx- signal)	Pin 2 (Rx- signal)
Pin 9 (Rx+ signal)	Pin 3 (Tx+ signal)
Pin 2 (Rx- signal)	Pin 4 (Tx- signal)
Pin 7 (Gnd)	Pin 5 (Gnd)

Table B - Connections for Burny controllers with OEM backpanel to Inova Control Console

Burny with OEM Backpanel **35RECP**	**Inova Control Console** **P6 RS-422 IN Port**
2 (Rx- signal)	Pin 1 (Rx+ signal)
8 (Rx+ signal)	Pin 2 (Rx- signal)
3 (Tx- signal)	Pin 3 (Tx+ signal)
7 (Tx+ signal)	Pin 4 (Tx- signal)
5 (Gnd)	Pin 5 (Gnd)

If you are using multiple Inova Height Control systems, the Inova P7 RS-422 OUT port connects to the next system through the Inova P6 RS-422 IN port. For more detailed information, refer to manual that accompanied your Inova Height control.

When using an Inova torch height control system with a Kaliburn power supply, the power supply's communication node feature must be disabled. To do this on the power supply, scroll down to the Set Communication Node selection on the maintenance screen and press ENT., then press F3 until "disabled" is displayed in the node number selection box.

1.3 Licensing and Enabling

The following steps should be performed by the administrator or service engineer for your system:

1. Obtain a valid Kaliburn Advanced Plasma Option license key from Cleveland Motion Controls.
2. Enter the license key by following this sequence:
   Press **MENU** » Press **UTIL** » Press **Enable Password** » Enter the admin password » Press **OK** » Press **System Setup** » Press **Miscellaneous Setup** » Press **License** » Press the “Options License Key” button » Enter a valid license key » Press **OK** » Press **OK**.
3. Enable the Kaliburn Advanced Plasma Option. Continuing from Step 2, follow this sequence:
   Press **OCX Options** » Press the **NONE** button under “Plasma Power Supply” until it reads “KL Advanced Plasma” » Press **OK** » At the *Warning: Reboot Screen*, press **OK**.
4. Reboot the Burny. Continuing from Step 3, follow this sequence:
   Press **Return** » Press **Return** » Press **Shutdown** » Press **OK** » When prompted, turn off the Burny power switch » Wait 30 seconds » Turn on the Burny power switch.
5. After the Burny starts, configure communications with the power supply. See Section 1.8 Adding and Removing Power Supplies, for more information.

1.4 How to Access

To access the Advanced Plasma Option, press the **Process Wizard** button from the *Run02 Screen*, or the *Run03 Screen*. Refer to Figure 1.

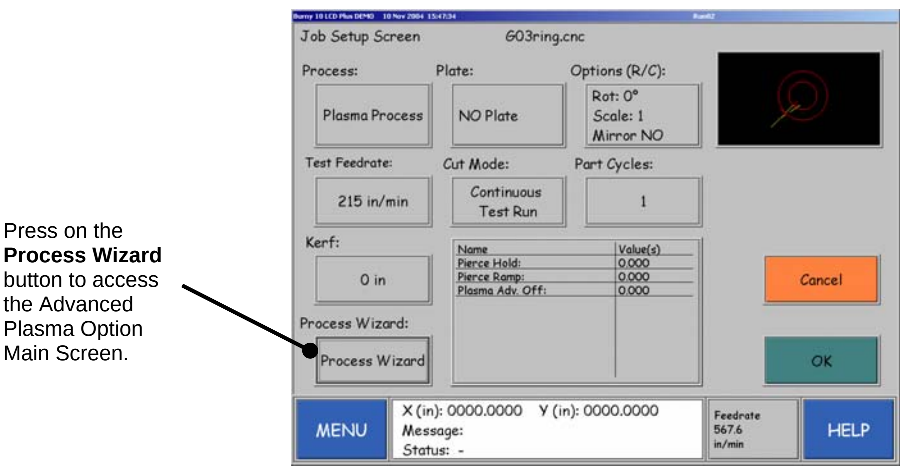


Figure 1 - Process Wizard button on Run02 Screen

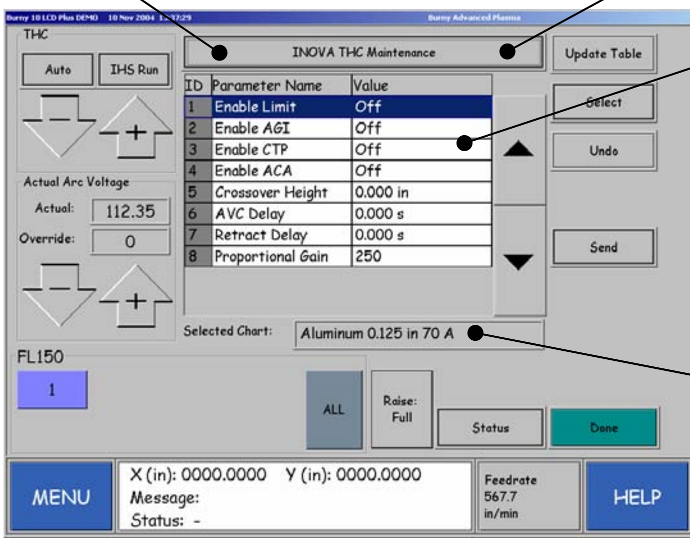
The Advanced Plasma Option has two principal screens that you use to configure and monitor the Kaliburn Power Supplies and Inova Torch Height Control. The two screens are:

- *Advanced Plasma Option Main Screen* - for more details refer to Section 1.5 .
- *Advanced Plasma Option Status Screen* - for more details refer to Section 1.7 .

1.5 MAIN SCREEN

Press on this side of the **Parameter Table** button to scroll backwards through the THC, THC Maintenance, Cut Chart, and Current tables.

Press on this side of the **Parameter Table** button to scroll forward through the THC, THC Maintenance, Cut Chart, and Current tables.



You can modify the Values for Parameters that are shown in bold text. Press on the **Parameter Name** and then, press the **Select** button.

Parameters shown grayed-out cannot be modified unless you create a Custom Cut chart.

This area displays the name of the selected Cut Chart.

Figure 2 - Advanced Plasma Option Main Screen

Table C - Detailed Information about the Burny & Power Supply Status Screen

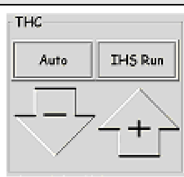
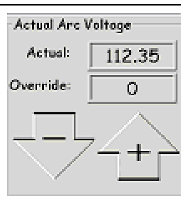
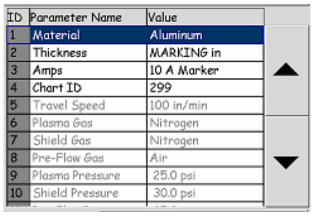
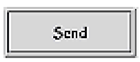
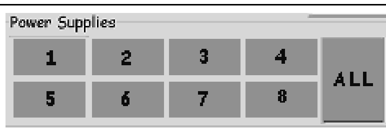
This Area of the Main Screen:	Provides you with the following operations:
	**Auto/Manual button** - Pressing this button toggles the Inova torch height control system between Auto and Manual mode. In Auto mode, the arrow buttons move the torch up and down for the selected power supply (refer to Section 1.8 in this document) until a start signal is applied to the Inova then, automatic operation takes control. After an arc transfer signal is received from the power supply, the arrow buttons can be used to alter the programmed arc voltage. In Manual mode, all of the automatic functions are disabled and the torch position must be controlled by the up and down arrow buttons. **IHS Run/On button** - (Initial Height Sense) Pressing this button toggles between **IHS Run** and **On**. When set to **Run**, the IHS is ready for normal operation. When set to **IHS ON**, the torch to detects the plate and then rises to the configured pierce height.
	The **Actual** field displays the plasma arc voltage while a cut is being made. If you want to change the arc voltage to achieve a desired cut quality, use the arrow keys to temporarily and incrementally override the arc voltage set point. Keep in mind, that in order to maintain optimal cut quality, the arc voltage may need to be increased as the electrode wears. When a power supply is selected, pressing the **Up arrow** button (+) increases the arc voltage, thereby increasing the cutting height of the torch. Pressing the **Down arrow** button (-) decreases the arc voltage, thereby lowering the cutting height of the torch.
	Pressing this button, toggles between the following Parameter tables: • Cut Charts (default) • Current Settings • Inova THC • THC Maintenance Each setting has an associated set of parameters that are displayed in the Parameter Name portion of the window. For more information about the Parameter Tables refer to Section 1.6

Table Continued on next page…

This Area of the Main Screen:	Provides you with the following operations:
	Adjust the Material Type, Thickness and Amps parameters when you are setting-up to make a cut. The remaining parameters are set to the default values. Adjustable Parameters are shown in bold type. To change a value, do the following: 1. Highlight the parameter by pressing on it or use the scroll bars. 2. Press the **Select** button. You can not adjust the values for parameters that are grayed out. The Chart Id parameter is used for creating a custom cut chart. For more information on Creating a Custom Cut chart, refer to Section 1.9
	Pressing this button reads the current settings from the power supply and displays them in the parameter table.
	Press this button after you select a configurable parameter from the Parameter window to display a screen that lets you select from a list of values.
	If you have altered a Numeric Value parameters but have not yet sent the changes to the power supply, pressing this button restores the default value.
	This button is used when you are creating a custom Cut Chart. For detailed information about creating a custom Cut Chart, refer to Section 1.9 in this document.
	Pressing this button sends any parameter value changes to the power supply.
	This button is visible when a custom cut chart has been created. Pressing this button deletes the custom cut chart.
	Pressing this button displays the main *Status Screen* for the power supply.
	Pressing this button returns to the *Burny Run Screen*. ***IMPORTANT:*** After changing parameter values, make sure to press the Send button. Pressing Done does not send new parameter values to the power supply.
	Lets you select the active power supply/torch height control node. • You can select a single power supply node by pressing one of the numbered node buttons or, • All of the power supply nodes by pressing the **ALL** button When in a normal state the power supply **Node** buttons are displayed blue in color. If a power supply experiences a fatal status condition, the associated **Node** button turns red in color. Use the status screen to view detailed status information for each power supply.
	When set to **Raise Full** the selected torch is completely raised when the cut is complete. When set to **Partial** the system to uses the value configured in the Partial Raise Height parameter located on the THC table.

1.6 PARAMETER TABLES

The following table lists the available Parameter Tables and the settings available. To access the Parameter tables, press on the Parameter Table button. (Refer to Figure 2).

Table D - Available Parameter Tables

When the Parameter Table button displays:	The following Parameters can be Configured:
INOVA THC Settings	**Arc Voltage** - value range is between 50 and 250 volts in .1 volt increments. **Pierce Height** - 0 to .999 inches (25.3 mm) **Partial Raise Height** **Cutting Height** - 0 to .999 inches (25.3mm) **Manual Speed** - 20 to 999 inches per minute (508 to 25374 mm/min) **IHS Speed** **IHS Torch Force** - 0 to 200 (default is 20) Pierce Time **Crossover Height** - Enter the value manually or, capture the value currently used for the THC. **Teach Crossover Height** - Capture the current height value to use as the crossover setting.
INOVA THC MAINTENANCE	**Enable Limit** - On or, Off (default) **Enable AGI** - On or, Off (default) **Enable CTP** - On or, Off (default) **Enable ACA** - On (default) or Off **AVE Delay** - enter a value between 0.0000 and 9.9990 seconds. **Retract Delay** - enter a value between 0.0000 and 9.9990 seconds. **Proportional Gain -** enter a value between the range of 50 and 750
Cut Charts	Browse and select standard cut charts or create a custom cut chart. Refer to the Kaliburn Power Supply documentation for standard cut chart information.
Current Settings	Reads and displays the current settings contained in the Kaliburn Power Supply and displays the consumable information.
Inova INI File	Edit and save the height control settings to the .INI file. You also use this screen to send the settings saved in the .INI file to the Inova Height control(s) after it is powered down.

1.7 STATUS SCREEN

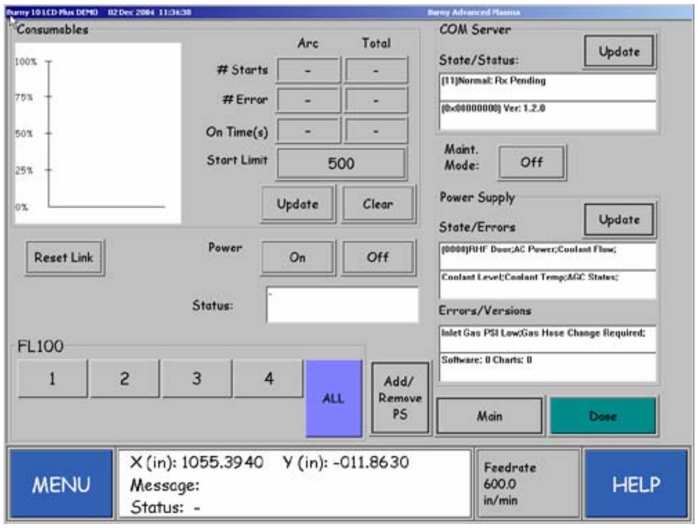


Figure 3 – Advanced Plasma Option Status Screen

Table E - Detailed Information about the Advanced Plasma Option Status Screen

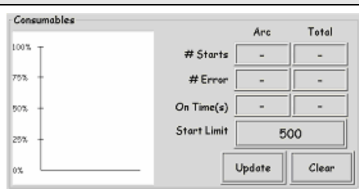
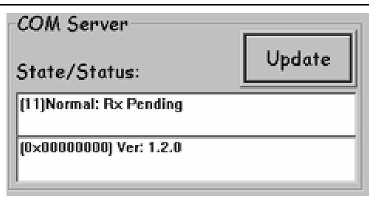
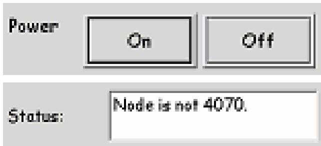
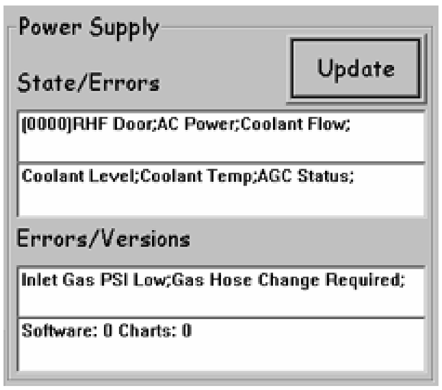
<table>
<tr><th>This area on the Status Screen:</th><th>Provides you with the following operations:</th></tr>
<tr><td></td><td>The bar graph corresponds to the percentage value of the ratio between the value shown in # Starts field and the value configured using the Start Limit button.
<table>
<tr><th>If the color of the bar graph is:</th><th>Then, the number of starts is:</th></tr>
<tr><td>Green</td><td>less than 95% of the configured start limit</td></tr>
<tr><td>Yellow</td><td>between 95% and 100% of the start limit</td></tr>
<tr><td>Red</td><td>equal to or has exceeded the start limit</td></tr>
</table>
Starts - The value displayed in this field corresponds to the total number of times that the plasma arc was fired.
Errors - The value displayed in this field corresponds to the number of faults that occurred during plasma ramp up/down operation.
Start Limit - Press on this button to display a key pad where you can set the maximum number of starts for the consumable. This value can range from 1 to 500.
Update - Immediately updates the consumable information.
Clear - When you change a consumable, press this button to reset the number of starts and number errors fields to zero.</td></tr>
<tr><td></td><td>The Burny COM server processes the commands and requests and then, sends the information to the selected Kaliburn power supply.
Update - queries the state, communication status and version number of the Burny server.</td></tr>
<tr><td></td><td>Maint. Mode button - Toggles the power supply maintenance mode OFF and ON. Setting this mode to ON, transmits a power off message to the power supply. The torch height controls displayed in the Burny are no longer available until you turn the Maintenance Mode OFF.</td></tr>
<tr><td></td><td>Pressing this button resets the communication link between the Burny control and the Kaliburn power supply.</td></tr>
</table>

Table Continued on next page…

<table>
<tr><th>This area on the Status Screen:</th><th>Provides you with the following operations:</th></tr>
<tr><td>
</td><td>Pressing the Power On button sends a sequence request to the selected Kaliburn power supply to complete a power ON check. Wait approximately ten seconds after you press the button then, press the Update (State/Errors) Power supply button. The messages in the Power Supply window are updated.

Critical errors that occur are reflected in the Lights on front of power supply. For more information consult the technical manual that accompanied the Kaliburn Power Supply.

Pressing the Power Off button sends a sequence request to the Kaliburn Power supply to power-down and turn-off the coolant pump. The Inova Torch height controls are NOT disabled.</td></tr>
<tr><td>
</td><td>Verify that the power supply you want to monitor is selected and then, press the Update button to display the power supply state, error messages and version number. The following table lists possible error messages and version information:
<table>
<tr><th>Error Message:</th><th>Description:</th></tr>
<tr><td>Get Status Failed</td><td>The Burny is not able to communicate with the power supply.</td></tr>
<tr><td>RHF Door</td><td>Indicates that the Remote High Frequency (RHF) console is not closed properly. The status indicator light corresponding to the RHF door on the front panel of the power supply is lit when the RHF console door is closed securely. The status indicator light is off when the RHF console door is open.</td></tr>
<tr><td>Automatic Gas Console</td><td>Indicates that the automatic gas console (AGC) is not operational. The status indicator light on the power supply is lit when the automatic gas console is operational. The status indicator is off when there is a problem with the gas system.</td></tr>
<tr><td>Coolant Flow</td><td>Indicates that the coolant flow through the system is not satisfactory. The status indicator light on the power supply is Illuminated when the coolant flow through the system is satisfactory. The status indicator light is off when the coolant flow through the system is restricted.</td></tr>
<tr><td>Coolant Level</td><td>Indicates that the coolant level inside the reservoir is not satisfactory. The status indicator light on the power supply is illuminated when the coolant level inside the reservoir is satisfactory. The status indicator light is off when coolant must be added to the system.</td></tr>
<tr><td>Coolant Temperature</td><td>Indicates that the temperature of the torch coolant is too high. If the status indicator light of the power supply is lit when the torch coolant temperature is satisfactory. The status indicator light is off when the coolant is too hot. If the torch coolant indicator is off, leave the unit energized until the status indicator illuminates.</td></tr>
<tr><td>AC Power</td><td>Indicates that there is a problem with the power.</td></tr>
<tr><td>Inlet Gas PSI Low</td><td>Indicates that the Inlet Gas pressure is too low to perform a cutting operation.</td></tr>
<tr><td>Gas Hose Change Required</td><td>This is a critical error and the selected power supply will not function.</td></tr>
<tr><td>Firmware and Cut Charts</td><td>Provides you with version information about the firmware, software and cut charts installed on the system.</td></tr>
</table></td></tr>
<tr><td>
</td><td>Returns you to the Advanced Plasma Option Main Screen.</td></tr>
<tr><td>
</td><td>Returns you to the Advanced Plasma Option Main Screen.</td></tr>
<tr><td>
</td><td>Select one power supply at a time and use the following functions:
monitor the status of the power supply, COM Server and torch consumables, set the start limit for the torch.
reset the communication link between the power supply and the Burny control.</td></tr>
<tr><td>
</td><td>Displays the Add/Remove Power Supply Screen. For more information about adding power supplies, refer to Section 1.8 in this document.</td></tr>
</table>

1.8 ADDING AND REMOVING POWER SUPPLIES

For the Burny to recognize and communicate with the Kaliburn power supplies and Inova Torch Height Control system, you must perform a power supply configuration process. This is a one-time setup process and does not have to be repeated unless there is a change in the available Kaliburn power source(s) or Inova Torch Height control(s).

1. Press on the **Process Wizard** button from the *Burny Run02 Screen*. The system displays the *Advanced Plasma Option Main Screen*.

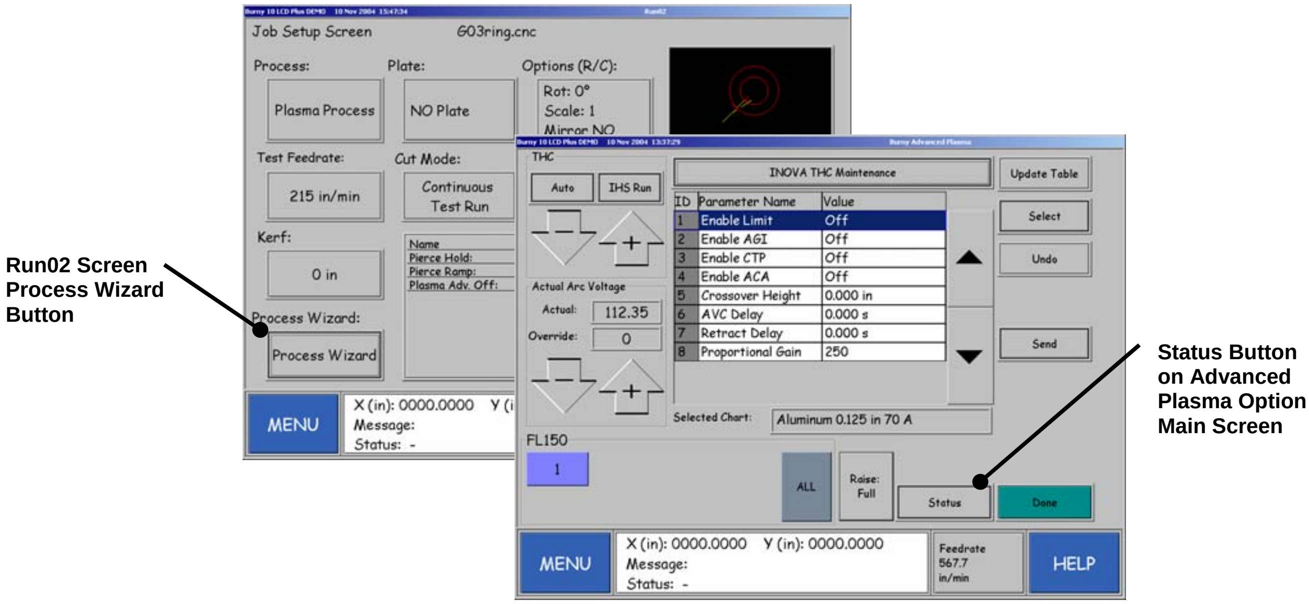


Figure 4 - Run02 and Advance Plasma Main Screen

2. Press on the **Status** button. The *Advanced Plasma Option Status Screen* is displayed.
3. Press on the **Add/Remove PS** (Power Supply) button.
4. Press on the "**0**" button then, enter the Admin password using the displayed number keypad. Press **OK**. Refer to Figure 5.
5. Press on the **Serial Port** button until the serial port number connecting the Kaliburn system to the Burny is displayed. To avoid the issue of conflicting port settings, be sure that the serial port number that you choose in this step is *different from* the default port number configured for the Burny controller. To verify the serial port configured for the Burny controller, use the following steps:
   a. Navigate to the *Burny Main01 Screen* and then, press on the **Utils** button.
   b. Press the **System Setup** button.
   c. Press on the **Communication Setup** button
   d. Press on the **Default Serial Settings** button. The *Serial Options Screen* is displayed where you can view the Port setting for the Burny Controller.
   e. Press the **MENU** button and then return to the *Add/Remove Power Supply Screen*.

6. Press on the **Node number** button to toggle through the available Kaliburn power supply choices. Refer to Figure 5.

Procedure continued on next page…

7. If you are using an Inova Torch Height control with a power supply, press on the **Torch Height Control (THC) selection** button located above the **Power supply** button until THC is displayed on the button. The choices are Inova THC (pressed) and NO THC (unpressed). See Section 1.2 for important information on connecting the THC, power supply and the Burny.

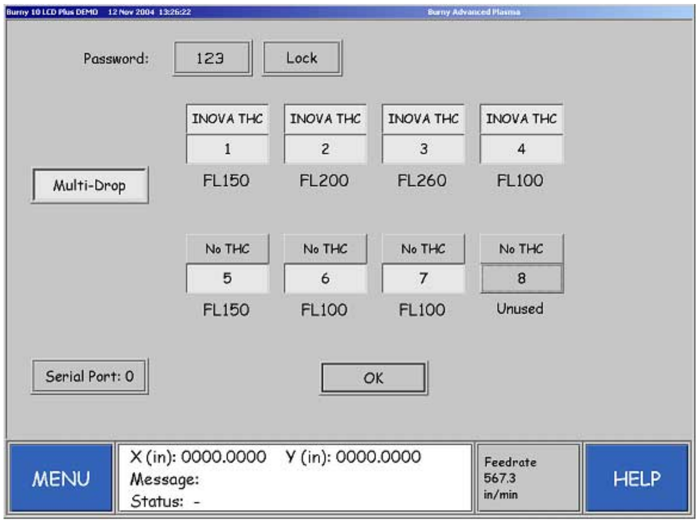


Figure 5 - Configured Add/Remove Power Supply and Torch Height Control Screen

8. Press on the **Lock** button to return the Password button to the default status of "0" and disable further configuration of the Power supply, Inova Torch Height Control and Serial Port communications.
9. Press **OK**. The system returns to the *Advanced Plasma Option Screen*.
10. Shut down and then restart the Burny controller so that the Advanced Plasma Option processes are synchronized.

After you restart the Burny controller, the *Run03 Screen* displays up to four (4) arc voltage control buttons representing the Inova Torch Height Control(s) you configured. The value displayed above the **Up Arrow** button is the actual voltage of the plasma torch. The value displayed between the **Up Arrow** and **Down Arrow** buttons is the value defined in cut chart table for the part being processed. Refer to Figure 6.

If you have more than four (4) Inova Torch Height controls on your system, press on the **Process Wizard** button to access the *Main Screen* and use the node buttons to select the desired Torch Height control and adjust the arc voltage.

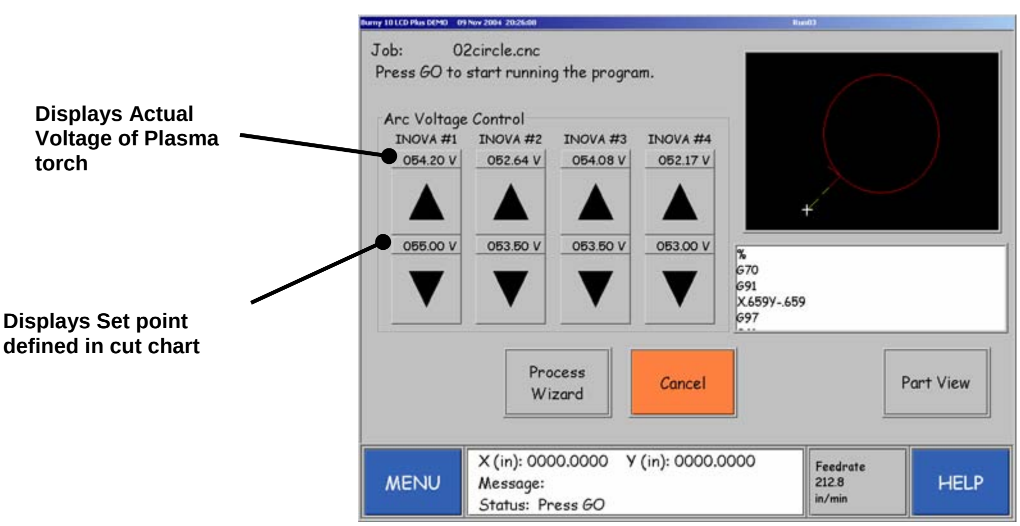


Figure 6 - Run03 Screen with Inova Arc Voltage Controls

1.9 CREATING A CUSTOM CUT CHART

You create a custom cut chart using one of the Kaliburn Cut Charts as a template. To create a custom cut chart, use the following steps:

1. Press on the **Parameter Table** button to display the **Kaliburn Cut Chart** table.
2. Define the values for Material Type, Thickness and Amperage (shown in bold). Use the following steps:
   a. Press on the Parameter Name in the **Parameter** window.
   b. Press the **Select** button. The system displays the **Select Item** window.
   c. Press on an item then, press the **OK** button.
3. On the *Advanced Plasma Option Main Screen* press the **Create** button. The system displays the *Create Custom Cut Chart Screen*.

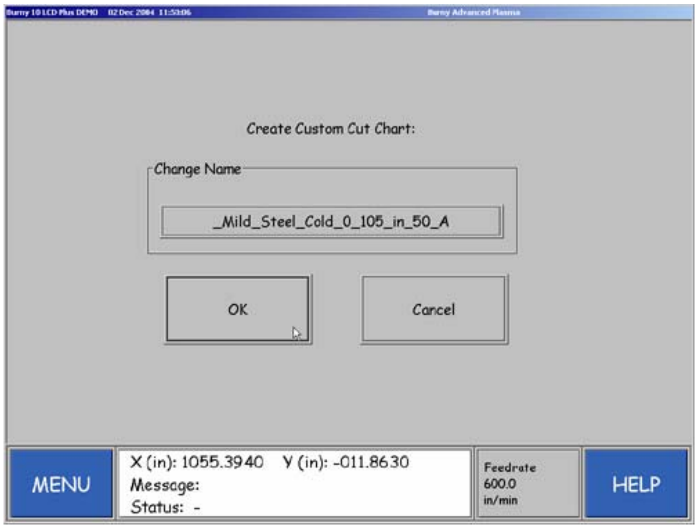


Figure 7 - Create Custom Cut Chart Screen

4. Press on the **Change Name** button to display the *Keyboard Screen* where you can type in a new name. Press the **OK** button. The system displays the *Advanced Plasma Option Main Screen* with the configurable parameter names and values shown in bold text.
5. Configure the necessary parameters for your custom cut chart then, press the **Send** button. The system displays the *Advanced Plasma Option Select Power Supply Screen*.
6. Select the power supplies where you want to send the custom cut chart (0-7 or All) and then, press the **Send** button. The system returns you to the *Advanced Plasma Option Main Screen*.

1.10 VIEWING PICTURES AND PART NUMBERS OF THE CONSUMABLES

Before making a cut, check to be sure that the correct consumables are installed on the torch. To view a picture of the correct consumable for the associated cut chart, use the following steps:

1. Press on a **Node** button to select an active Power supply.
2. Press on the **Parameter Table** button until the Kaliburn Cut Chart table is displayed.

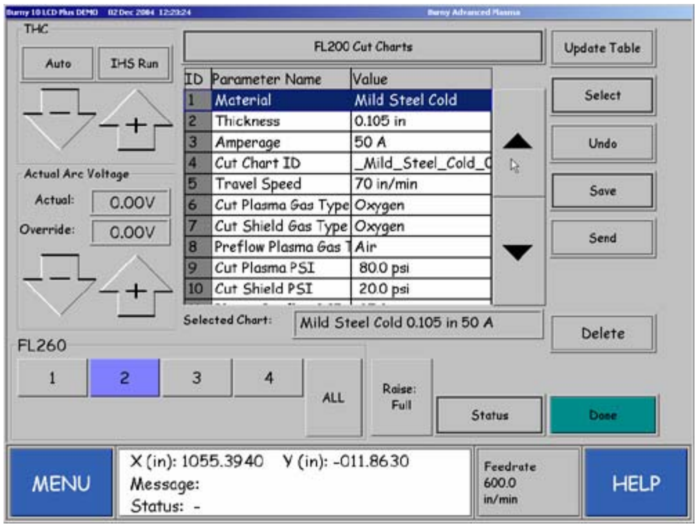


Figure 8 - Kaliburn Cut Chart Table

3. Use the **Scroll arrow** button to select a consumable in the parameter window then, press the **View** button. The system displays a photo and part number for the consumable.
4. Press the **Cancel** button. The system returns to return to the *Advanced Plasma Option Main Screen*.

Trademark Information: Kaliburn, Spirit and FineLine are trademarks of Kaliburn.

1.11 TROUBLESHOOTING

1. Confirm that the Kaliburn Advanced Plasma option is properly licensed and enabled in the "OCX Options" screen. If not, set the option, click "Ok" and restart the unit.

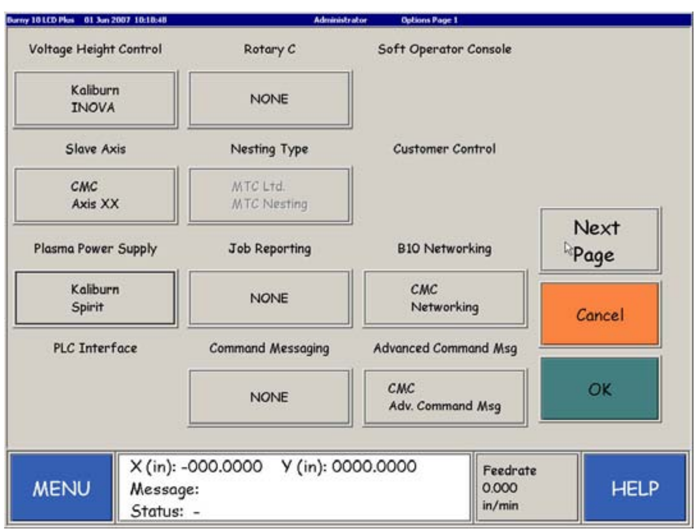


Figure 9 OCX Options Screen

2. Make sure that the **UseRS422** parameter on the **I/O Configuration** page of the Motion Parameters is set to True.

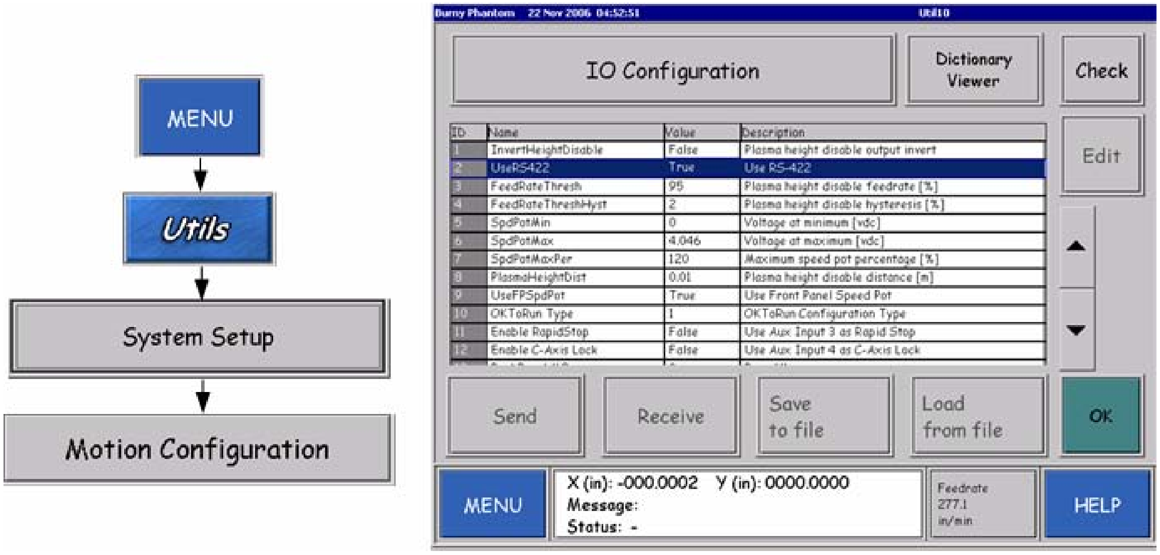


Figure 10 I/O Configuration Page of Motion Parameters Screen

3. If Comm 1 is used for Kaliburn / Inova communication, set the default serial settings port to 0 or to which ever port is being used for downloading parts.

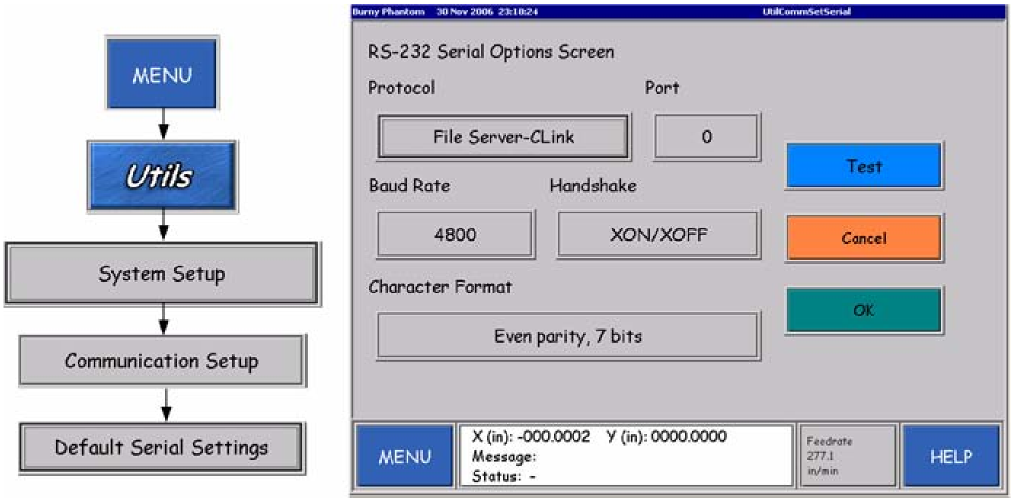


Figure 11 RS-232 Serial Options Screen

4. Open the Process Wizard from the RUN02 Screen and in the **Add / Remove PS** screen, confirm proper power supplies are configured at the right node address. And comm. Port. Note: nodes 1-8 correspond with Kaliburn node addresses 0-7.

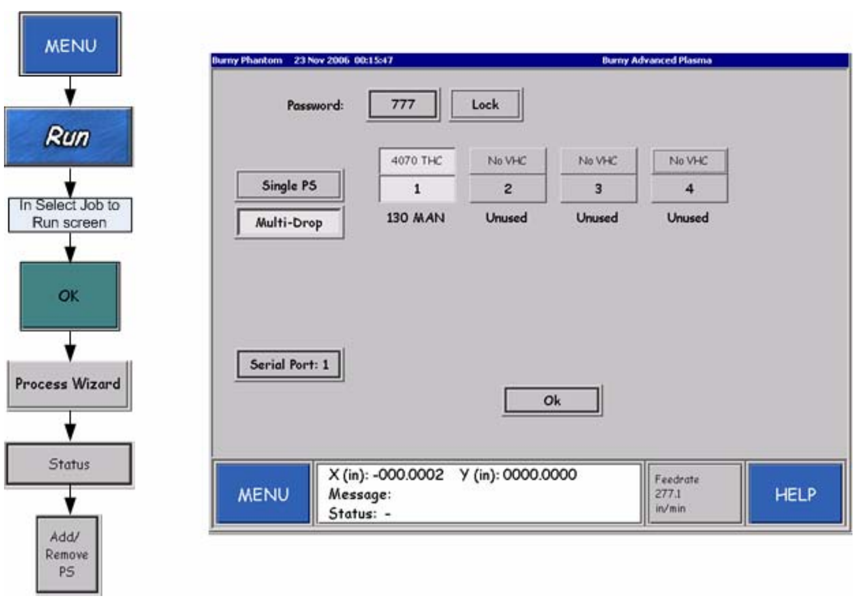


Figure 12 Add/Remove PS Screen

5. While in **Add / Remove PS** screen, enter the admin password. Click the "**PS Port**" button, until the desired COM port number used on the Burny is displayed. If "Connection Failed" is displayed for this COM port, there is a conflict with another application attempting to open the same port. The competing application needs to be located and prevented from access to this port. For the purposes of example, assume the Kaliburn link is to operate on COM1.
6. If the COM port is opened successfully in the last step, click "OK" while in **Add / Remove PS.**
7. Go to Menu **Utils** and shut down the unit.

8. Before powering up the unit, open the front panel, and locate and check the jumpers for communications.
   - **For the Burny 10 LCD or Burny 10 LCD Plus,** locate Comm1 (J3) jumper on the standard encoder and Comm board.

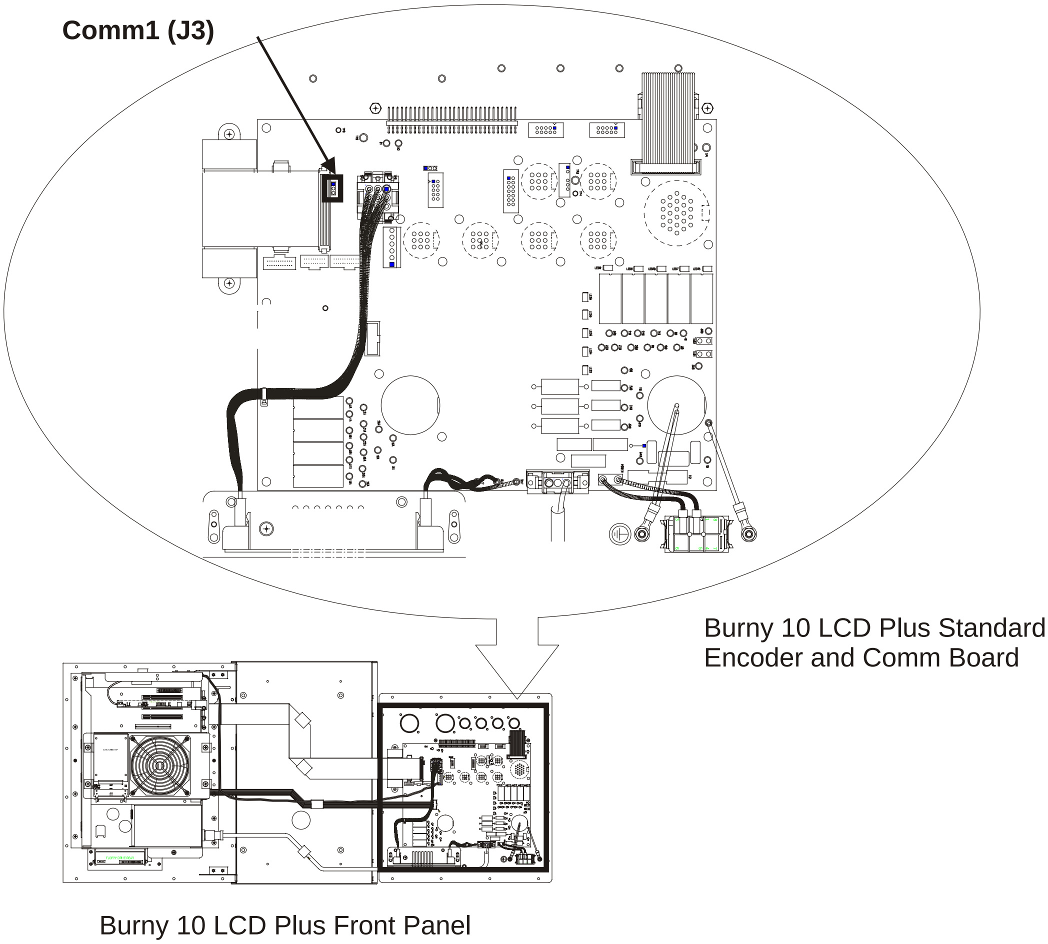


Figure 13 Location of Comm1 (J3) on Burny 10 LCD Plus Standard Encoder and Comm Board

- **For the Burny 10 LCD Plus OEM**, locate the Comm1 (J3) jumper on the OEM Encoder and Comm board..

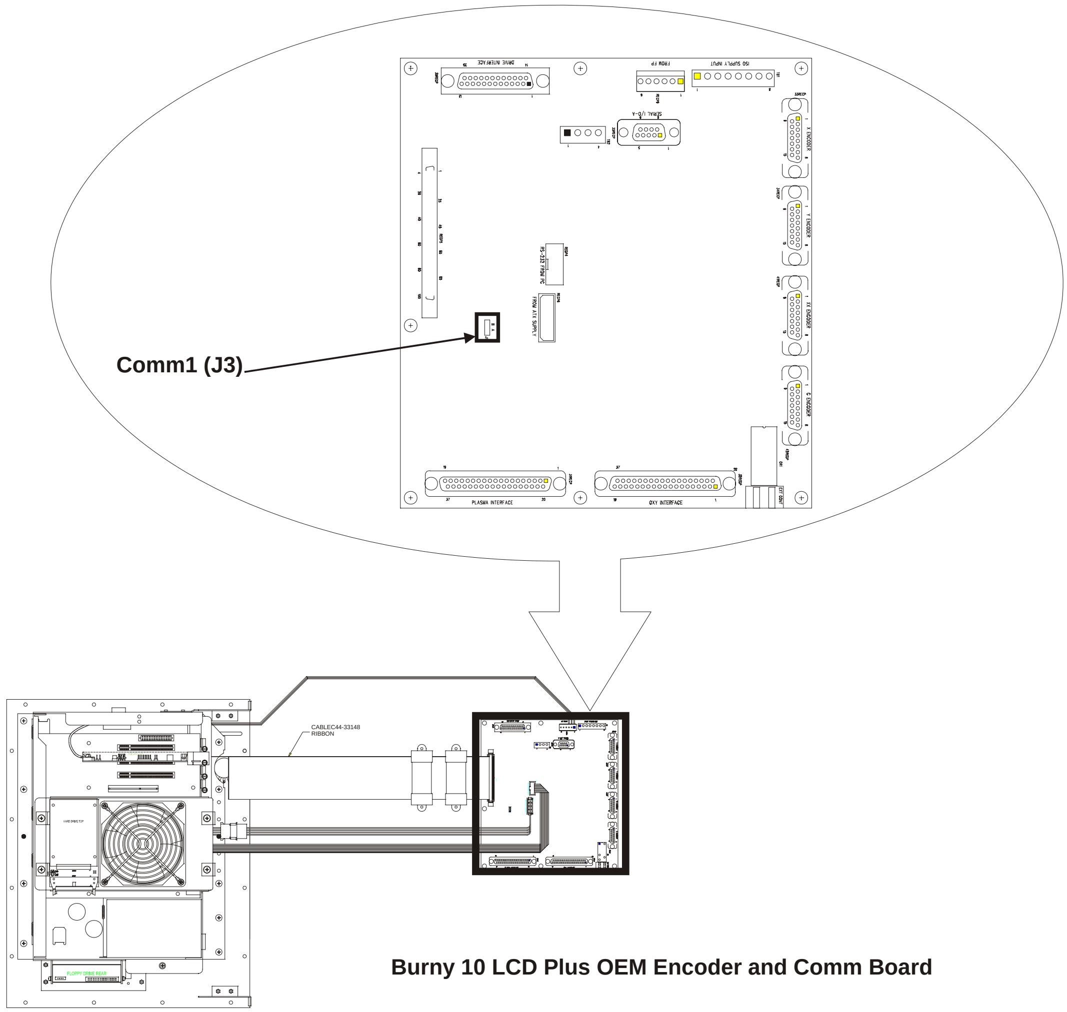
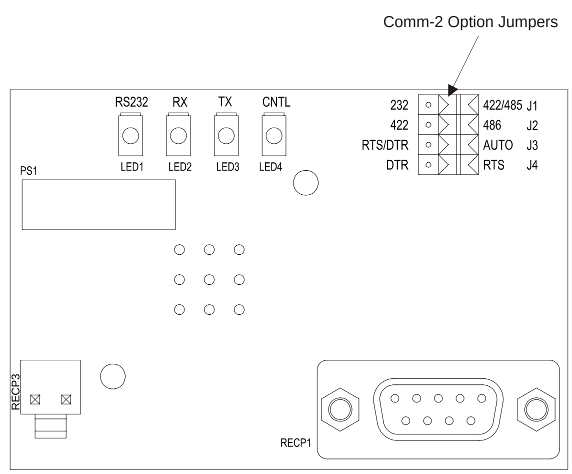


Figure 14 Location of Comm1 (J3) Jumpers on Burny 10 LCD OEM Encoder and Comm Board

- **For the Burny 10 LCD Plus with Comm-2 Option,** locate the Comm2 Option (J1-J4) jumpers on the Comm-2 option board.



Comm-2 Option Board

Figure 15 Location of Comm-2 Option Jumpers

- **For the Burny Phantom or Phantom ST,** locate the Comm1 (J1-J4), Comm2 (J5-J8) jumpers on the encoder and comm. port card of the back panel of the control. These jumpers are located at the lower left-hand side of the circuit card just above the two large ribbon cable connectors.

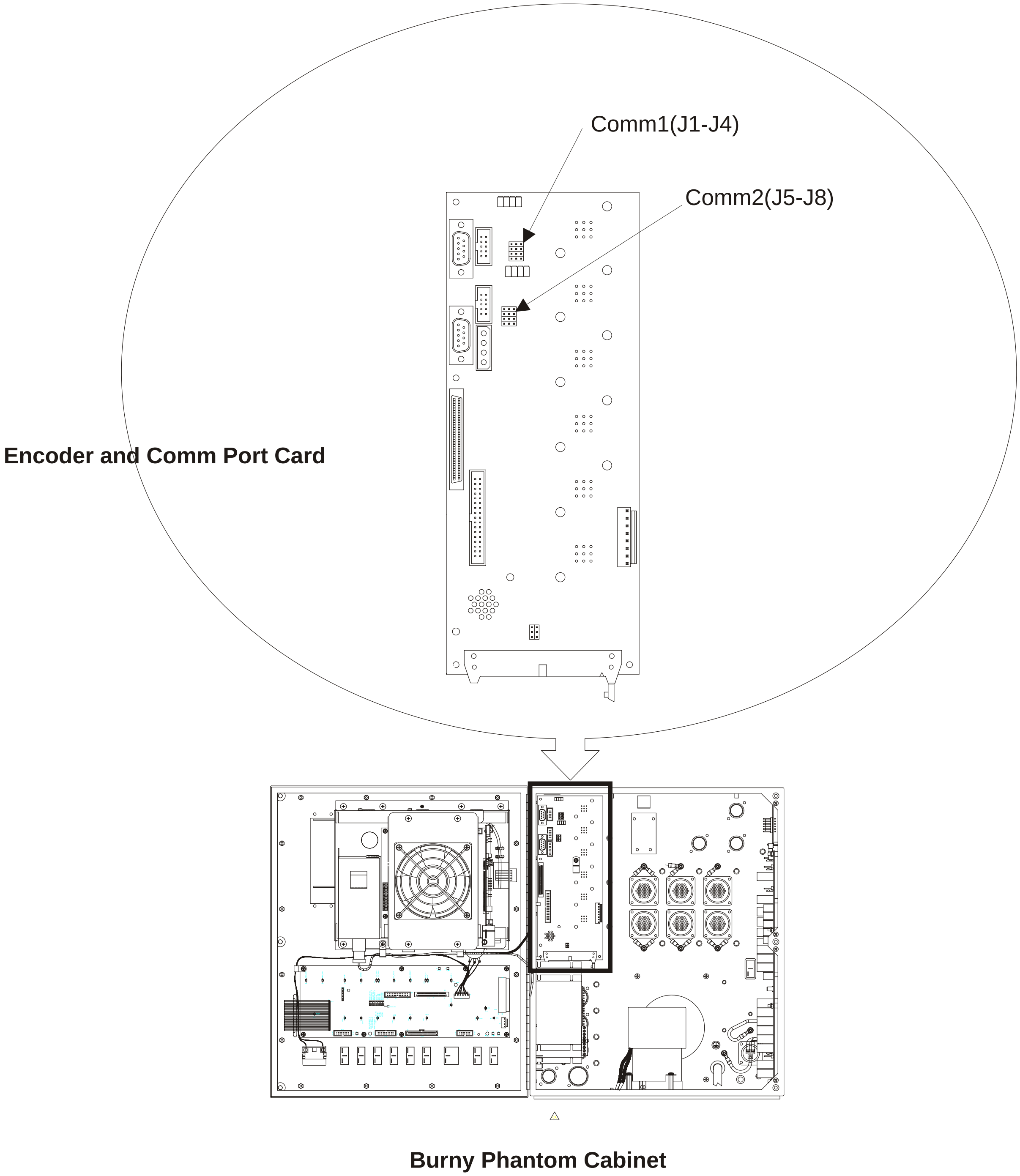


Figure 16 Location of Comm1 (J1-J4) and Comm2 (J5-J8) Jumpers on Phantom Encoder and Comm Port Card

Use the following table to make sure that the jumper settings are correct for your unit and line (single or multidrop).

Table F Comm Jumper Settings

Unit	Single Line	Multidrop Line
Burny 10 LCD	J3 There should be no jumpers. No jumpers means none/RS422.	N/A
Burny 10 LCD Plus (Standard or OEM)		
Burny 10LCD Plus with Com-2 option	J1 232 422/485 J2 422 485 J3 RTS/DTR Auto J4 DTR RTS	J1 232 422/485 J2 422 485 J3 RTS/DTR Auto J4 DTR RTS
Phantom or Phantom ST	J1 or J5 RS232 RS422/485 J2 or J6 RS422 RS485 J3 or J7 RTS/DTR Auto J4 or J8 DTR RTS	J1 or J5 RS232 RS422/485 J2 or J6 RS422 RS485 J3 or J7 RTS/DTR Auto J4 or J8 DTR RTS

9. To check the communication from the Burny, jumper 35 RECP pins 2 and 3 and 8 and 9 and click the **Test** button to run the Burny “RS232 Loopback Test” on the **RS232 Serial Options Screen.**

   Note: If you have changed the port setting previously, set the VHC port to zero. Then set the default serial port to the desired port to test. Restart the control to reset the port changes.

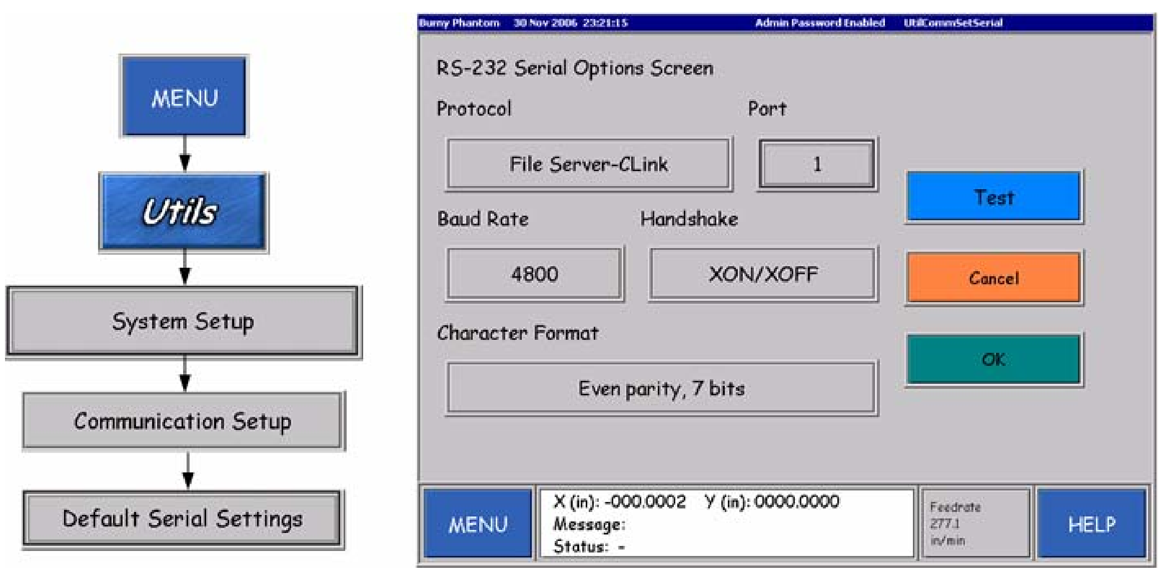


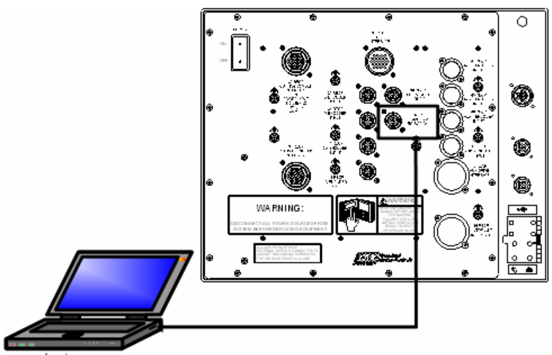
Figure 17 Testing Port 1 Communication

10. Use the Kaliburn emulator to check communication to and from the Burny unit.
    - For the Burny 10 LCD or 10 LCD Plus, connect the RS232 cable from the PC to the COM1 (35RECP) on the back panel and run the emulator program EMUL_IL_VIEWER.EXE from the PC. Refer to Table G for a pinout for this cabling.

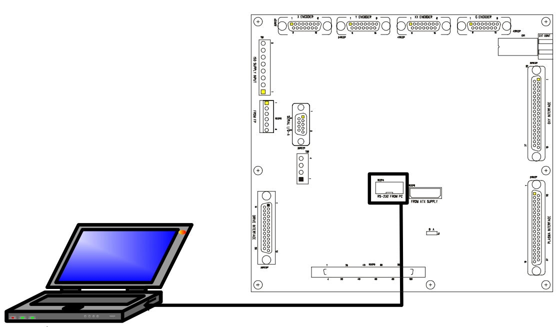
Table G Pinout For PC to Burny Cabling

PC Side Pin #'s		Burny Side Pin #'s
2	-->	3
3	-->	2
5	-->	7
7	-->	9
8	-->	8

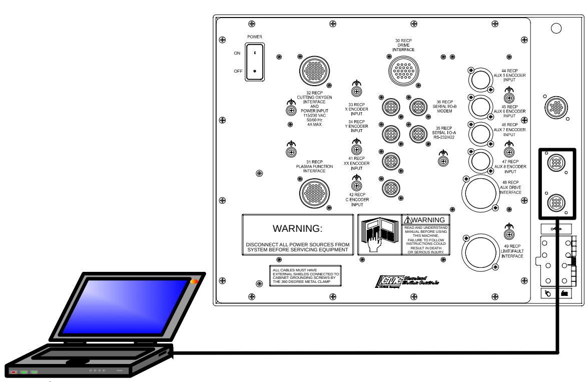
    - For the Phantom or Phantom ST, connect a loopback cable from COM1 (35RECP) to the COM2 (50RECP) and run the emulator program EMUL_IL_VIEWER.EXE located in "D:\Burny\Support\Emul of the Burny unit



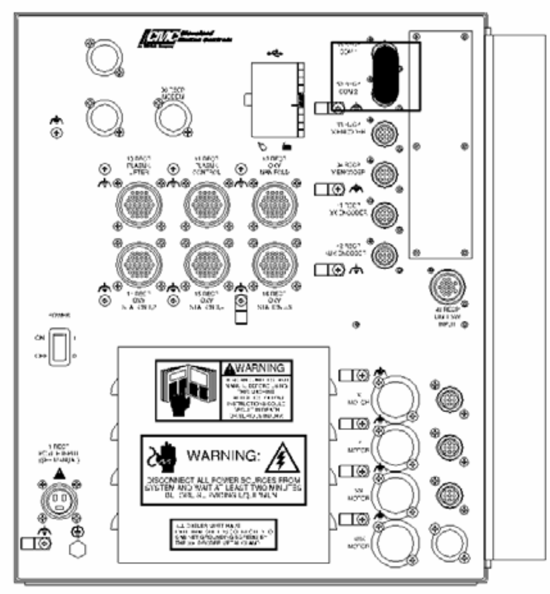
RS232/RS485 cabling from PC to Burny LCD or Burny LCD Plus



RS232/RS485 cabling from PC to Burny LCD Plus OEM Back Panel



RS232/RS485 cabling from PC to Burny LCD Plus Standard Back Pane with factory installed Com-2 Option



Loopback Cable from RECP 35 to RECP 50 on Phantom and Phantom ST Back Panel

Figure 18 PC to Burny and Loopback Connections

11. On the **Emul_IL_Viewer** screen, set “Comm Port” to the value “2” to indicate the use of COM2 port by the emulator, and click “Connect”.

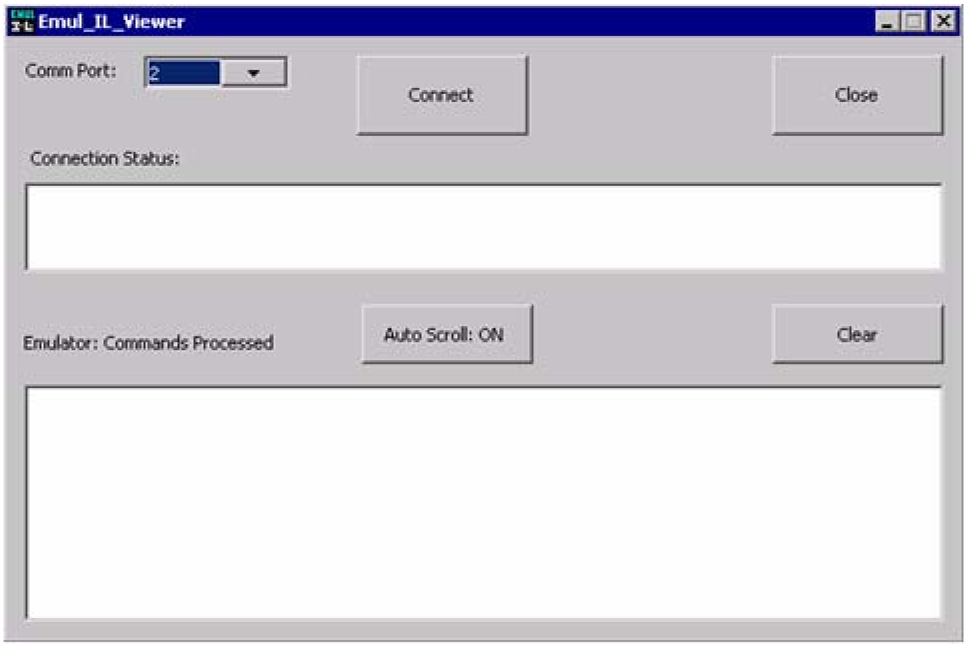


Figure 19 Emul_IL_Viewer Screen

12. In Burny, navigate to the **Advanced Plasma Status** screen. Click the “COM Server Update” button. A normal message should indicate “(10) Normal: Idle” state.

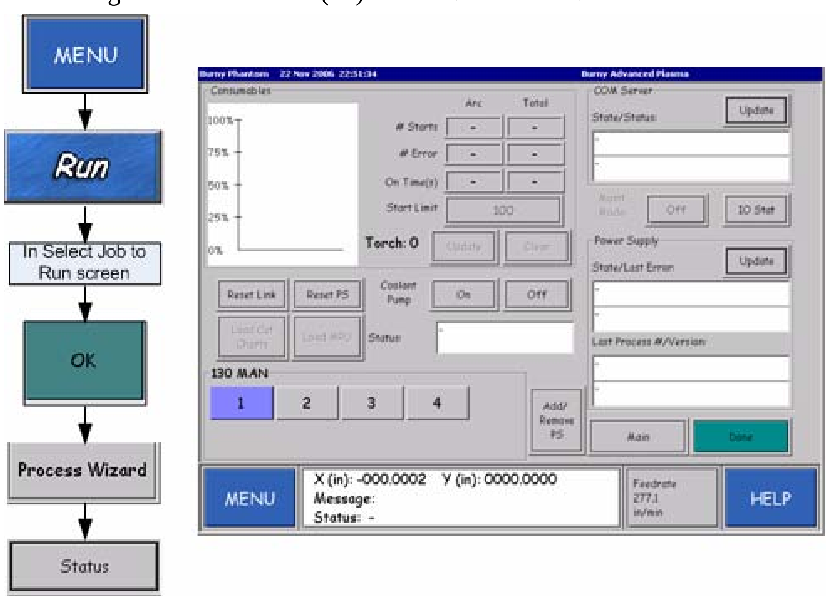


Figure 20 Advanced Plasma Status Screen

13. Click the first node button while still in the **Status** screen (for example assume this is “1”). Click the Power Supply **Update** button. If the communication is successful, the bottom of “State/Last Error” should read the software and cut chart version (for example “Software 11 Charts 14”). If the data returned is “Get Status Failed”, then RS232 communication is not properly connected.

14. If communication is working, the status window on the Emulator will reflect this.

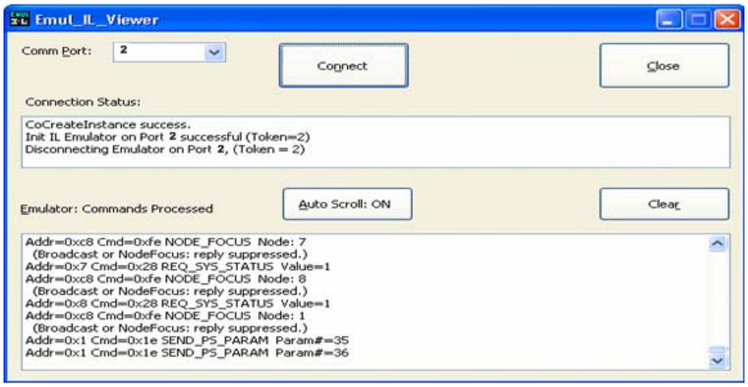


Figure 21 Emulator Status Window after Communication is Established

15. If all tests to this point have failed, then the problem most likely resides in the Burny unit. Call Burny for assistance.
16. If the testing to this point was successful, then the problem is either in the RS232/RS485 cabling to the Kaliburn devices or in the configuration of the Kaliburn device itself.
    - For pinouts for RS232/RS485 cabling to the Inova Control Console, refer to Section 1.2 .
    - For configuration settings for the Kaliburn devices, refer to Kaliburn installation manual.

Kjellberg Advanced Plasma Option

(AO- 70388 Rev AA)

Option

AP

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

Table of Contents

BLANK

1 KJELLBERG ADVANCED PLASMA OPTION

1.1 OVERVIEW

This Advanced Plasma Option lets you directly control Kjellberg Power Supplies (with or without THC) through the Burny. You can access and use the pre-configured cut charts from the power supply manufacturer, or create custom cut charts that satisfy your specific cutting needs.

After selecting the type of cut, material and thickness, you can view pictures of the required torch parts along with their corresponding part numbers. This visual check gives you the ability to verify that the proper consumables are installed prior to cutting.

1.2 CABLING

The Burny connects to the power supply(s) through the 35RECP Serial I/O-A RS232/422 port located on the standard Burny backpanel. The Burny can connect up to four (4) Kjellberg power supplies. For more information on connecting the power supply and gas console (PGC1) with the Burny (CNC), see Kjellberg's documentation.

Table A –Standard Burny Backpanel, RS-232

Burny with Standard Backpanel 35RECP	Kjellberg Power Supply RS-232
Pin 2 (Rx)	Pin 2 (Rx)
Pin 3 (Tx)	Pin 3 (Tx)
Pin 7 (Gnd)	Pin 5 (Gnd)
Pin 8 (RTS)	Pin 7 (RTS)
Pin 9 (CTS)	Pin 8 (CTS)

Table B –Burny OEM Backpanel, RS-232

Burny with OEM Backpanel 35RECP	Kjellberg Power Supply RS-232
Pin 2 (Rx)	Pin 2 (Rx)
Pin 3 (Tx)	Pin 3 (Tx)
Pin 5 (Gnd)	Pin 5 (Gnd)
Pin 8 (Tx)	Pin 7 (RTS)
Pin 9 (Rx)	Pin 8 (CTS)

1.3 LICENSING AND ENABLING

The following steps should be performed by the administrator or service engineer for your system:

1. Obtain a valid Kjellberg Advanced Plasma Option license key (and optional THC license) from Cleveland Motion Controls.
2. Enter the license key by following this sequence:
   Press **MENU** » Press **UTIL** » Press **Enable Password** » Enter the admin password » Press **OK** »
   Press **System Setup** » Press **Miscellaneous Setup** » Press **License** » Press the "Options License Key" button » Enter a valid license key » Press **OK** » Press **OK**.
3. Enable the Advanced Plasma Option. Continuing from Step 2, follow this sequence:
   Press **OCX Options** » Press the **NONE** button under "Plasma Power Supply" until it reads "Kjellberg 160i w/PGC1" (if an optional THC is needed, press the **NONE** button under "Voltage Height Control" until it displays the appropriate brand) » Press **OK** » At the *Warning: Reboot Screen*, press **OK**.
4. Reboot the Burny. Continuing from Step 3, follow this sequence:
   Press **Return** » Press **Return** » Press **Shutdown** » Press **OK** » When prompted, turn off the Burny power switch » Wait 60 seconds » Turn on the Burny power switch.
5. After the Burny starts, configure communications with the power supply. See Section 1.7 , Adding and Removing Power Supply, for more information.

1.4 ACCESSING THE ADVANCED PLASMA OPTION

To access the Advanced Plasma Option, press the **Process Wizard** button from the *Run02* or *Run03 Screen*. See Figure 1.

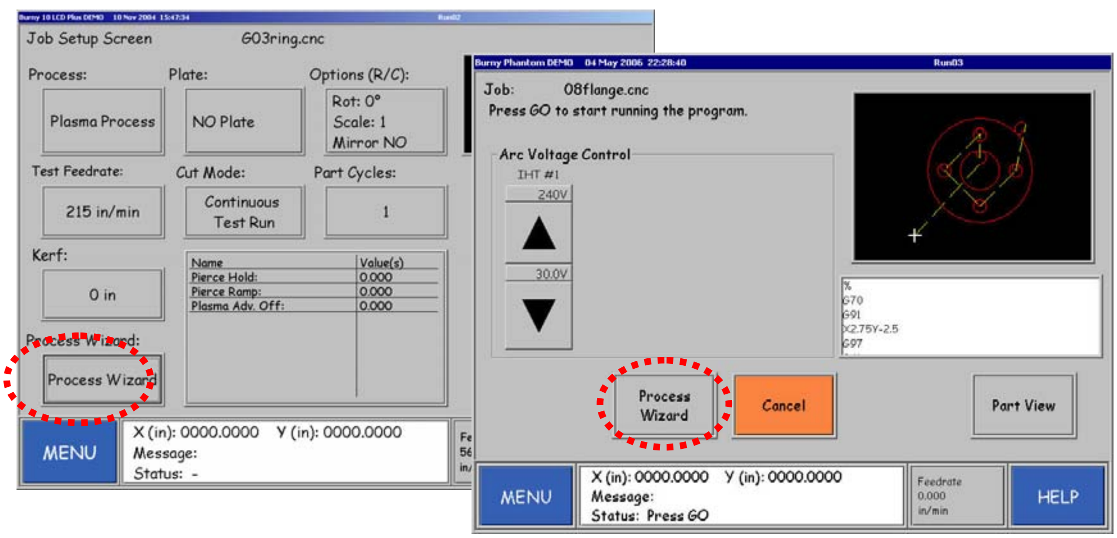


Figure 1 - Process Wizard button on Run02 and Run03 Screens

The Advanced Plasma Option has two principal screens to configure and monitor the Kjellberg Power Supply(s) and optional THC systems:

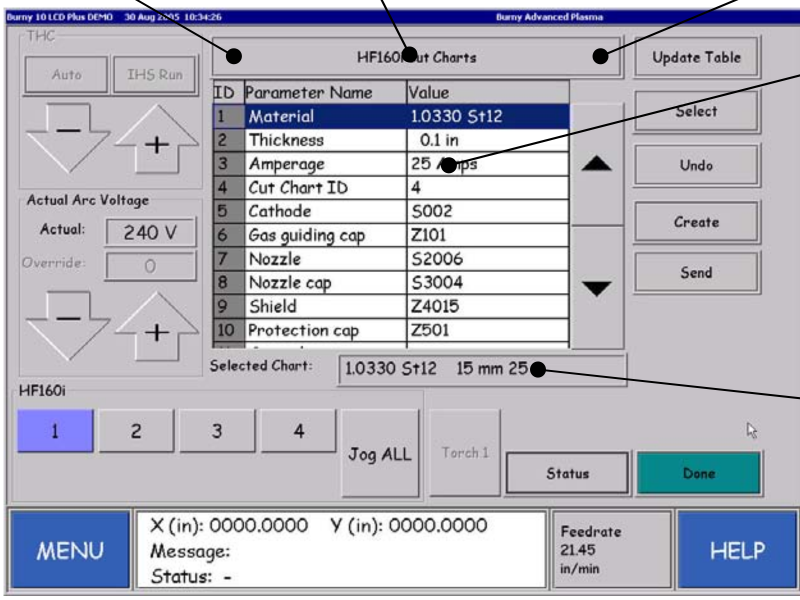
- *Advanced Plasma Option Main Screen* - for more details refer to Section **Error! Reference source not found.**.
- *Advanced Plasma Option Status Screen* - for more details refer to Section **Error! Reference source not found.**.

1.5 MAIN SCREEN

Press on this side of the Parameter Table button to scroll backwards through the list of available tables.

Press on this side of the Parameter Table button to scroll forward through the list of available tables.

Parameter Table



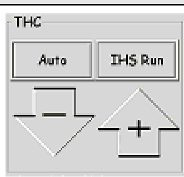
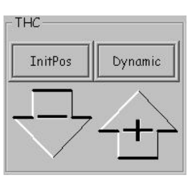
You can modify the Values for Parameters that are shown in bold text. Press on the **Parameter Name** and then, press the **Select** button.

Parameters shown grayed-out cannot be modified unless you create a Custom Cut chart. Refer to Section

This area displays the name of the selected Cut Chart.

Figure 2 – Advanced Plasma Option Main Screen

Table C – Main Screen, Detailed Information

This Area of the Main Screen:	Provides the following operations:
 *Typical THC*	This button is only available if a Torch Height Control (THC) System option is licensed and enabled. As described below, the values of the buttons in this area depend upon the brand of THC licensed. **Typical THC** **Auto/Manual button** – Pressing this button toggles the torch height control system, if installed, between Auto and Manual mode. In Auto mode, the arrow buttons move the torch up and down for the selected power supply until a start signal is applied to the THC. then automatic operation takes control. After an arc transfer signal is received from the power supply, the arrow buttons can be used to alter the programmed arc voltage. In Manual mode, all of the automatic functions are disabled and the torch position must be controlled by the up and down arrow buttons. **IHS Run/On button** - (Initial Height Sense) Pressing this button toggles between **IHS Run** and **On**. When set to **Run**, the IHS is ready for normal operation. When set to **IHS ON**, the torch to detects the plate and then rises to the configured pierce height.
 *IHT PCS 2100*	**IHT Automation's PCS 2100 THC** **InitPos button** – This button controls the Retract Mode parameter. One of three values must be selected before using the THC. **InitPosEver** – Completes procedure of initial position finding every time a new cut is initiated. **InitPosNever** – Initial position finding is never done, or OFF. **InitPosNo** – Initial position finding procedure is set by "No. of Cut" parameter. **Dynamic button** – Allows the operator to toggle between: Slow, Medium, or Fast to control the speed of the THC's vertical movement. One of these three options must be selected prior to using the THC.

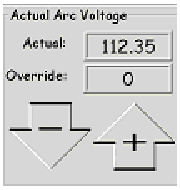
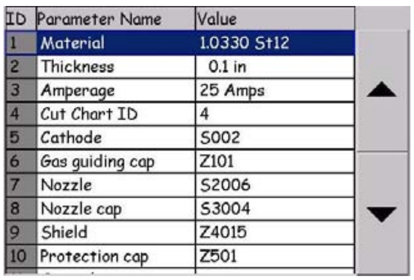
This Area of the Main Screen:	Provides the following operations:
	Table Continued on the Next Page…
	The Actual field displays the plasma arc voltage while a cut is being made. If you want to change the arc voltage to achieve a desired cut quality, use the arrow keys to temporarily and incrementally override the arc voltage set point. Keep in mind, that in order to maintain optimal cut quality, the arc voltage may need to be increased as the electrode wears. When a power supply is selected, pressing the **Up arrow** button (+) increases the arc voltage, thereby increasing the cutting height of the torch. Pressing the **Down arrow** button (-) decreases the arc voltage, thereby lowering the cutting height of the torch.
	Pressing this button toggles between the following parameter tables: • HF160i Current Settings • HF160i Cut Charts • PGC Current Settings Pressing on the left half of the button toggles backward through the list, while pressing the right half toggles forward through the list. If a torch height control system is installed and the option is licensed and enabled, additional parameter tables for that device will be listed here.
	This area displays all the data available from the power supply and torch height control system, if installed. To change a parameter value, do the following: 1. Highlight the parameter by pressing on it or by using the scroll bars. 2. Press the **Select** or **Numeric Value** button. 3. Change the value and then press **OK**. 4. Press the **Send** button to upload the change to the power supply. 5. Choose the proper power supply node, then press **OK**. ***NOTE***: You cannot adjust the values for parameters that are grayed out.
	Pressing this button reads the current settings from the power supply or THC and displays them in the parameter table.
 or  or 	Depending upon the parameter value type, one of three buttons will be displayed: Pressing **Select** allows you to select from a list of values. Pressing **Numeric Value** allows you to enter any value within a given range. Pressing **View** allows you to see the picture and part number of a consumable.
	If you have altered a Numeric Value parameters but have not yet sent the changes to the power supply, pressing this button restores the default value.
	This button is used to create a custom cut chart. For detailed information refer to Section 1.8 in this document.
	Pressing this button sends any parameter value changes to the power supply or THC.
	This button is visible when a custom cut chart has been created. Pressing this button deletes the custom cut chart.
	Pressing this button displays the *Advanced Plasma Option Status Screen*. If multiple power supplies are used, choose the proper node to view the status of that power supply.
	Pressing this button returns to the *Burny Run Screen*. ***IMPORTANT:*** After changing parameter values, make sure to press the Send button. Pressing Done does not send new parameter values to the power supply or THC.

Table Continued on the Next Page…

This Area of the Main Screen:	Provides the following operations:
	Lets you select the active power supply node and view the associated parameter tables. When in a normal state, the active power supply node is displayed blue in color. If a power supply experiences a fatal status condition, the associated node button turns red in color. Use the *Advanced Plasma Option Status Screen* to view detailed status information for each power supply.
	This button replaces the "Torch Number" button if the IHT Option is licensed and enabled. It lifts the torch to one of the following positions at the end of a cut. This selection must be made before using the THC. **Retract Pos Preset 1** = 20mm / 0.8 inches above "Transition Position" **Retract Pos Preset 2** = 50mm / 2 inches above "Transition Position" **Retract Pos Up** = Upper Torch Position **Retract Pos Down** = 0mm / 0 inches above "Transition Position"

1.6 STATUS SCREEN

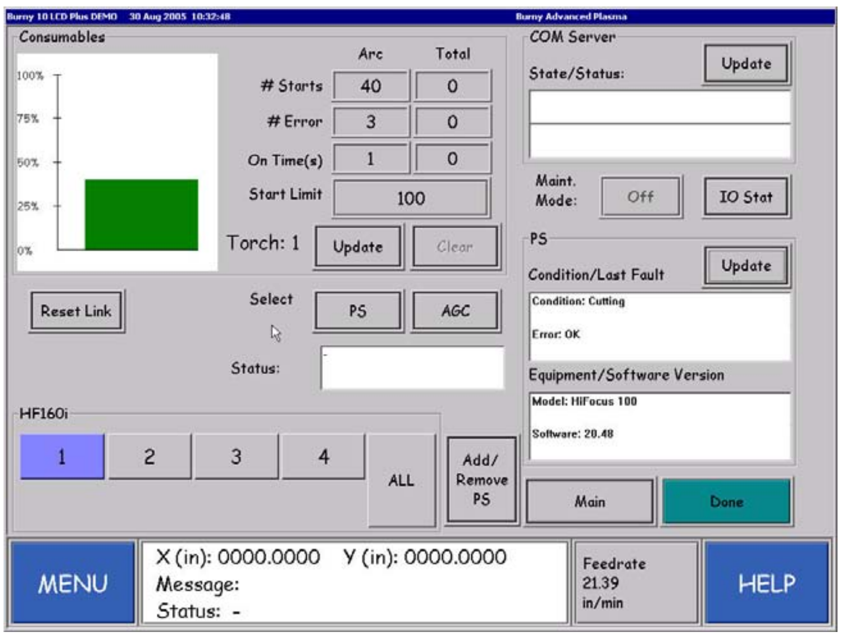
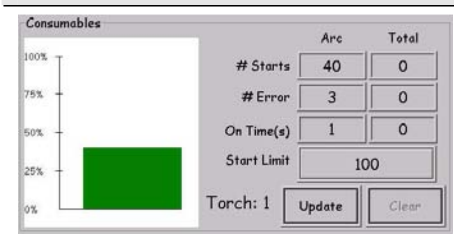
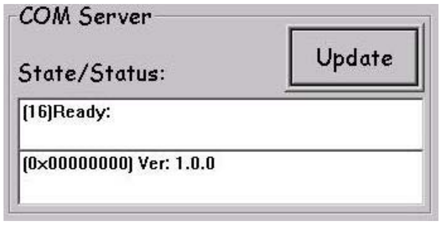


Figure 3 – Advanced Plasma Option Status Screen

Table D - Detailed Information, Status Screen

This area on the Status Screen:	Provides the following operations:
	The bar graph corresponds to the percentage value of the ratio between the value shown in the **# Starts** field and the value configured using the **Start Limit** button. <table><tr><th>If the graph color is:</th><th>Then, the number of starts is:</th></tr><tr><td>Green</td><td>less than 95% of the configured start limit</td></tr><tr><td>Yellow</td><td>between 95% and 100% of the start limit</td></tr><tr><td>Red</td><td>equal to or has exceeded the start limit</td></tr></table>**# Starts** - The value displayed in this field corresponds to the total number of times that the plasma arc was fired. **# Errors** - The value displayed in this field corresponds to the number of faults that occurred during plasma ramp up/down operation. **Start Limit** - Press on this button to display a key pad where you can set the maximum number of starts for the consumable. This value can range from 1 to 500. **Update** - Immediately updates the consumable information. **Clear** - When you change a consumable, press this button to reset the number of starts and number errors fields to zero.

<table>
<tr><th>This area on the Status Screen:</th><th>Provides the following operations:</th></tr>
<tr><td>
</td><td>The Burny COM server processes the commands and requests and then sends the information to the selected power supply, gas console, or THC.

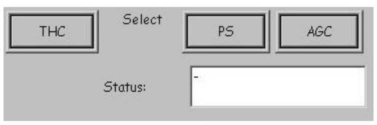
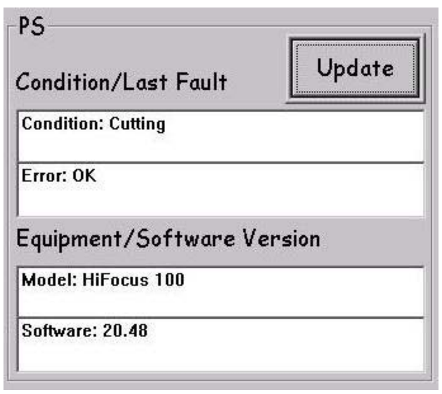
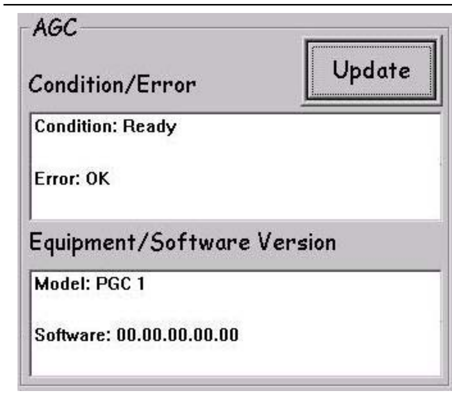
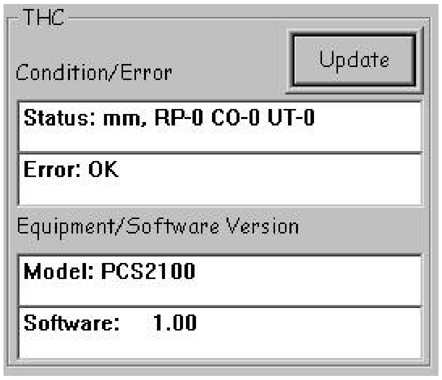
Update button - queries the state, communication status and version number of the Burny COM server.</td></tr>
<tr><td>
</td><td>IO Stat reads the status of the I/O ports and displays them in the State/Status window.</td></tr>
<tr><td>
</td><td>Pressing this button resets the serial link between the Burny and the power supply(s).</td></tr>
<tr><td>
</td><td>Selecting PS (Power Supply), AGC (Automatic Gas Console) or THC (Torch Height Control) determines which unit will provide status information.</td></tr>
<tr><td>
</td><td>Select the PS (Power Supply) button and then press the Update button. This will display the unit's condition, error messages, model number and software version.
<table>
<tr><th>Error Message:</th><th>Description:</th></tr>
<tr><td>OK</td><td>Power Supply is ready to cut</td></tr>
<tr><td>Gas/Water/Temp</td><td>Gas missing, coolant missing, high temperature</td></tr>
<tr><td>Power Source</td><td>Current relay pilot arc or current relay main arc activated, voltage appears without ON signal, the current from a module is bigger than 90 A in the cutting operation</td></tr>
<tr><td>Torch Error</td><td>Current flow during gas preflow, torch short circuit</td></tr>
<tr><td>Pilot Time</td><td>Pilot arc time exceeded</td></tr>
<tr><td>Ignition Time</td><td>HV ignition time exceeded or no ignition</td></tr>
<tr><td>Main Arc Interruption</td><td>Arc interruption during cutting (main source)</td></tr>
<tr><td>Torch Distance Too Small</td><td>Arc voltage too low, distance to work piece too small</td></tr>
<tr><td>Gas Test Time Too Long</td><td>Max time exceeded, stop gas test and start again if required</td></tr>
<tr><td>Pilot Arc Interruption</td><td>Arc interruption during ignition (pilot power source)</td></tr>
<tr><td>Door Error</td><td>Check the power supply access door</td></tr>
</table>
NOTE: combinations of the above errors will result in a numeric code displayed in hexadecimal format. Consult the Kjellberg documentation to obtain details on meaning of the code.</td></tr>
<tr><td>
</td><td>Select the AGC (Automatic Gas Console) button and then press the Update button. This will display the unit's condition, error messages, model number and software version.
<table>
<tr><th>Error Message:</th><th>Description:</th></tr>
<tr><td>OK</td><td>Gas Control is ready to Cut</td></tr>
<tr><td>CAN Error</td><td>There is a CAN error</td></tr>
<tr><td>PG1</td><td>PG1 input pressure < 6 or 8.5 bar</td></tr>
<tr><td>PG2:</td><td>PG2 input pressure < 8.5 bar</td></tr>
<tr><td>PG3</td><td>PG3 input pressure < 8.5 bar</td></tr>
<tr><td>WG1</td><td>WG1 input pressure < 8.5 bar</td></tr>
<tr><td>WG2</td><td>WG2 input pressure < 8.5 bar</td></tr>
<tr><td>Control Gas Error</td><td>control gas input pressure < 8.5 bar</td></tr>
<tr><td>CNC Invalid</td><td>The CNC has transferred an invalid data set</td></tr>
<tr><td>Data Leak Detected</td><td>There are pressure losses in the gas hoses. This error is only for information</td></tr>
</table>
NOTE: combinations of the above errors will result in a numeric code displayed in hexadecimal format. Consult the Kjellberg documentation to obtain details on meaning of the code.</td></tr>
</table>

Table Continued on the Next Page…

This area on the Status Screen:	Provides the following operations:
	*The following applies to IHT Automation's PCS 2100 THC.* Select the **THC** (Torch Height Control) button and then press the **Update** button. This will display the unit's condition, error message, model number and software version. The *Status* line is used primarily for troubleshooting by Burny engineers. Below is a list of possible *Error* messages and their corresponding integers. "Fault Weight Comp" = 1 "Fault Clearance" = 2 "Fault Arc Voltage" = 4 "Collision" = 8 Combinations of errors are displayed in hexadecimal format. Therefore, an error message of 0x03 would mean a combination of Fault Weight Comp (1) + Fault Clearance (2) = 3. Additionally, error 0x0A (A stands for 10) would mean Fault Clearance (2) + Collision (8) = 10.
	Returns to the *Advanced Plasma Option Main Screen*.
	Returns to the *Burny Run Screen*.
	Select one power supply node at a time or use the **All** button to: • monitor the status of the power supply, COM Server and torch consumables, set the start limit for the torch. • reset the communication link between the power supply and the Burny control.
	Displays the *Add / Remove Power Supply Screen*. For more information about adding or removing power supplies, refer to Section 1.7 in this document. This button is also used to add or remove THC systems.
	*The following applies to IHT Automation's PCS 2100 THC.* Pushing this button gives control back to the THC unit, which is automatically disabled while the Burny is in control.

1.7 ADDING AND REMOVING POWER SUPPLY(S) OR THC(S)

For the Burny to recognize and communicate with the Kjellberg power supply(s) and optional THC, you must perform a power supply configuration process. This is a one-time setup process and does not have to be repeated unless there is a change in the available power supply(s).

1. Press the **Process Wizard** button on the *Run02 Screen* to display the *Advanced Plasma Option Main Screen*.
2. Press the **Status** button to display the *Advanced Plasma Option Status Screen*.
3. Press the **Add/Remove PS** (Power Supply) button.
4. Press the **Password** "**0**" button then, enter the Admin Password using the number keypad. Press **OK**
5. Press the **PS Port** button until the proper serial port number connecting the Kjellberg power supply to the Burny is displayed. To avoid the issue of conflicting port settings, be sure that the serial port number that you choose in this step is *different from* the default port number configured for the Burny controller. To verify the serial port configured for the Burny controller, use the following steps:
    a. Press the **MENU** button
    b. Press the **Utils** button.
    c. Press the **System Setup** button.
    d. Press the **Communication Setup** button
    e. Press on the **Default Serial Settings** button. The *Serial Options Screen* is displayed where you can view the Port setting for the Burny Controller.
    f. Press the **MENU** button and then the **RUN** button to return to the *Add/Remove PS Screen*.
6. To add a power supply, press the **Node number** button (1 through 4) to toggle through the available Kjellberg power supplies. To remove a power supply, press the Node number until the label reads "Unused".

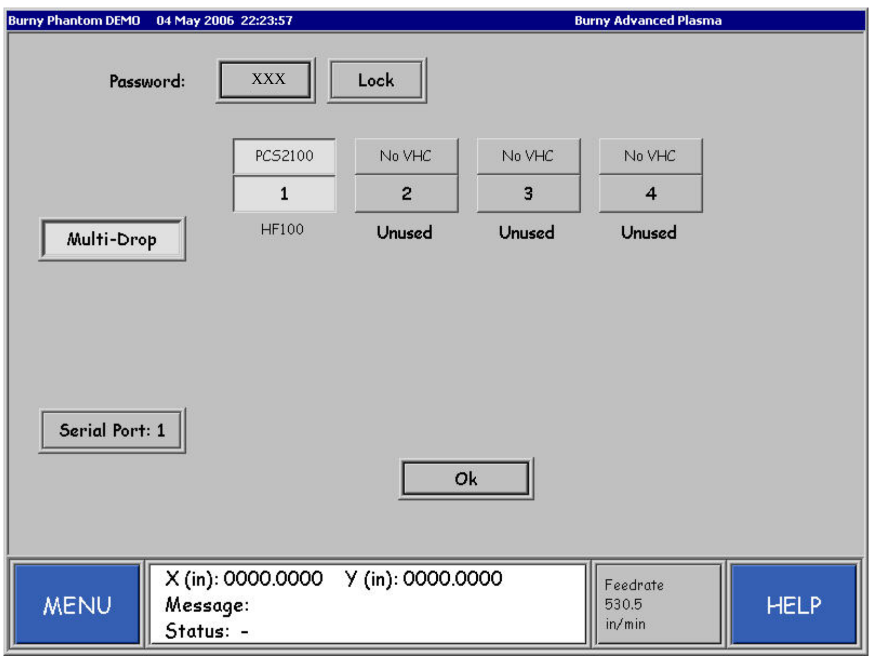


Figure 4 - Add/Remove Power Supply Screen

7. If a torch height control system is installed and the option is licensed and enabled, press the button above the power supply node to activate the appropriate VHC. Press the VHC Port button to select the proper port for serial communications.
8. Press on the **Lock** button to return the **Password** button to the default status of "0" and disable further configuration of the Power Supply and Serial Port communications.
9. Press **OK**. The Burny returns to the *Advanced Plasma Option Status Screen*.
10. Reboot the Burny by following this sequence:
    Press **MENU** » Press **UTIL** » Press **Shutdown** » Press **OK** » When prompted, turn off the Burny power switch » Wait 30 seconds » Turn on the Burny power switch.
11. After the Burny starts it is ready for normal use.

1.8 CREATING CUSTOM CUT CHARTS

You create a custom cut chart using one of the standard Kjellberg Cut Charts as a template. To create a custom cut chart, use the following steps:

1. Press on the **Parameter Table** button to display the "HF160i Cut Charts" table.
2. Define the values for Material Type, Thickness and Amperage. Use the following steps:
    a. Press on the Parameter Name in the **Parameter** window.
    b. Press the **Select** button. The system displays the **Select Item** window.
    c. Press on an item then, press the **OK** button.
3. On the *Advanced Plasma Option Main Screen* press the **Create** button. The system displays the **Create Custom Cut Chart** Screen.

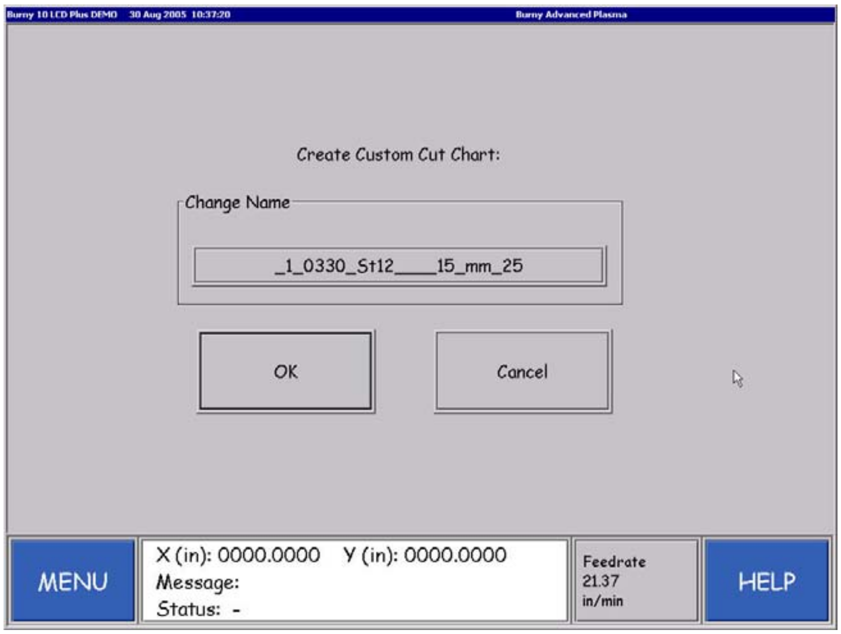


Figure 5 - Create Custom Cut Chart Screen

4. Press on the **Change Name** button to display the keyboard screen where you can type in a new name. Press the **OK** button. The system displays the *Advanced Plasma Option Main Screen* with the configurable parameter names and values shown in bold text.
5. Configure the necessary parameters for your custom cut chart then, press the **Send** button. The system displays the *Advanced Plasma Option Select Power Supply Screen*.
6. Select the power supplies where you want to send the custom cut chart (1-4 or All) and then, press the **Send** button. The system returns you to the *Advanced Plasma Option Main Screen*.

1.9 VIEWING CONSUMABLES

Before making a cut, check to be sure that the correct consumables are installed on the torch. To view a picture of the correct consumable for the associated cut chart, use the following steps:

1. Press on a **Node** button to select an active Power supply.
2. Press on the **Parameter Table** button until the "HF160i Cut Charts" table is displayed.
3. Use the **Scroll arrow** button to select a consumable in the parameter window then, press the **View** button. The system displays a photo and part number for the consumable. Refer to Figure 6.

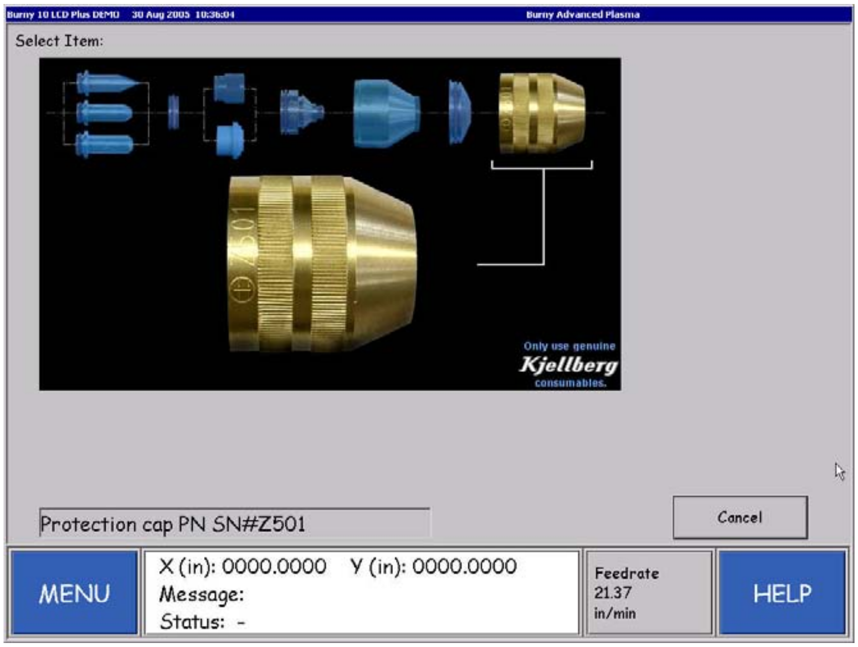


Figure 6 – Consumable Photo and Part number

4. Press the **Cancel** button. The system returns to return to the *Advanced Plasma Option Main Screen*.

1.10 TROUBLESHOOTING

1. Confirm that the Kjellberg Power supply options is properly licensed and enabled in the “OCX Options” screen. If not, set the option, click “Ok” and restart the unit.

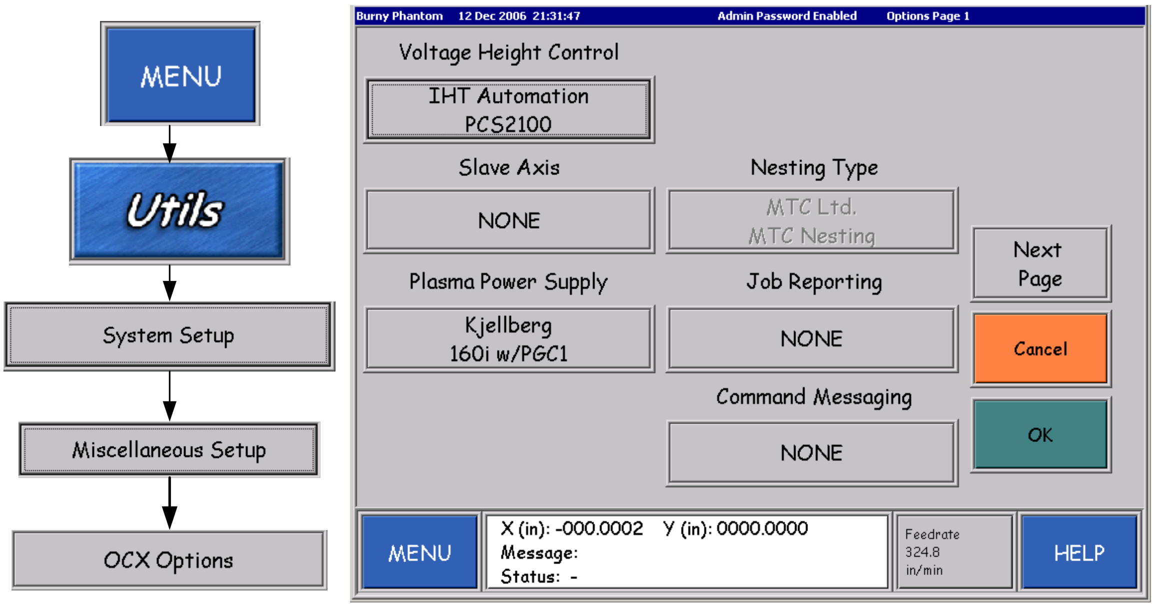


Figure 7 OCX Options Screen

2. Make sure that the **UseRS422** parameter on the **I/O Configuration** page of the Motion Parameters is set to True.

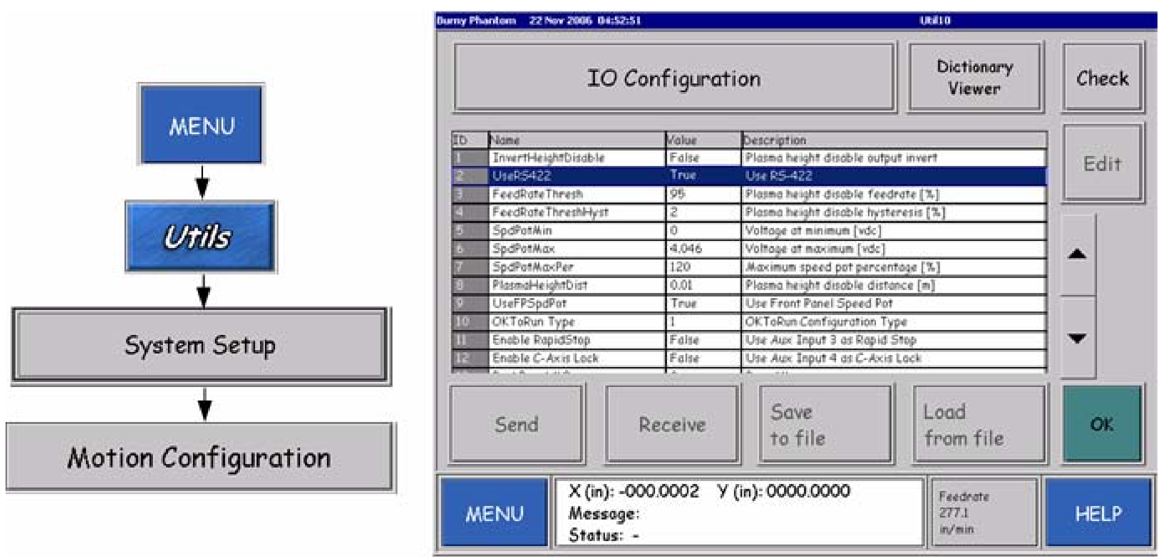


Figure 8 I/O Configuration Page of Motion Configuration Screen

3. If Comm 1 is used for Kjellberg communication, set the default serial settings port to 0 or to which ever port is being used for downloading parts.

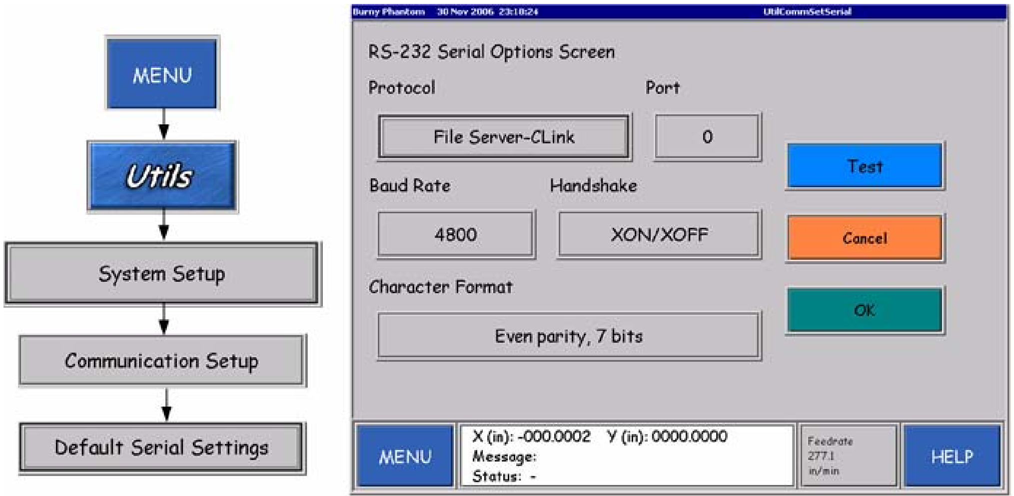


Figure 9 RS-232 Serial Options Screen

4. Open the Process Wizard from the RUN02 Screen and in the **Add / Remove PS** screen, confirm proper power supplies are configured at the right node address. Note: nodes 1-8 correspond with Kjellberg node addresses 0-7.

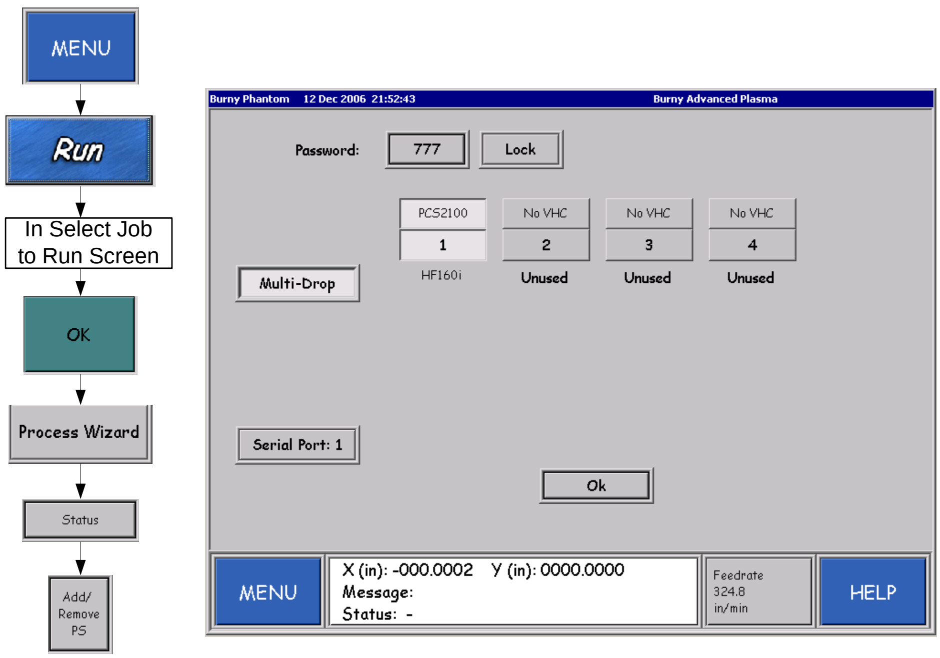


Figure 10 Add/Remove PS Screen

5. While in **Add / Remove PS** screen, enter the admin password. Click the "**PS Port**" button, until the desired COM port number used on the Burny is displayed. If "Connection Failed" is displayed for this COM port, there is a conflict with another application attempting to open the same port. The competing application needs to be located and prevented from access to this port. For the purposes of example, assume the Kjellberg link is to operate on COM1.
6. If the COM port is opened successfully in the last step, click "OK" while in **Add / Remove PS.**
7. Go to Menu **Utils** and shut down the unit.

8. Before powering up the unit, open the front panel, and locate and check the jumpers for communications.
   - **For the Burny 10 LCD or Burny 10 LCD Plus,** locate Comm1 (J3) jumper on the standard encoder and Comm board.
   -

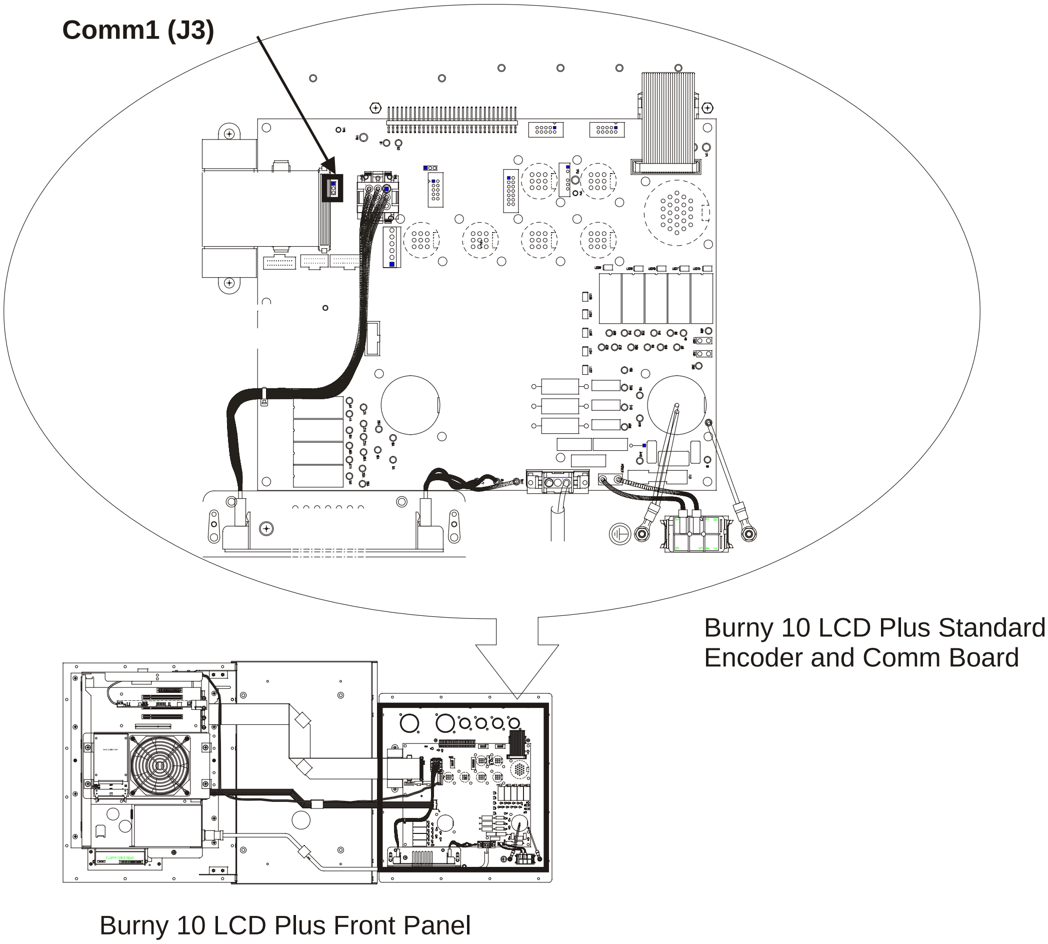
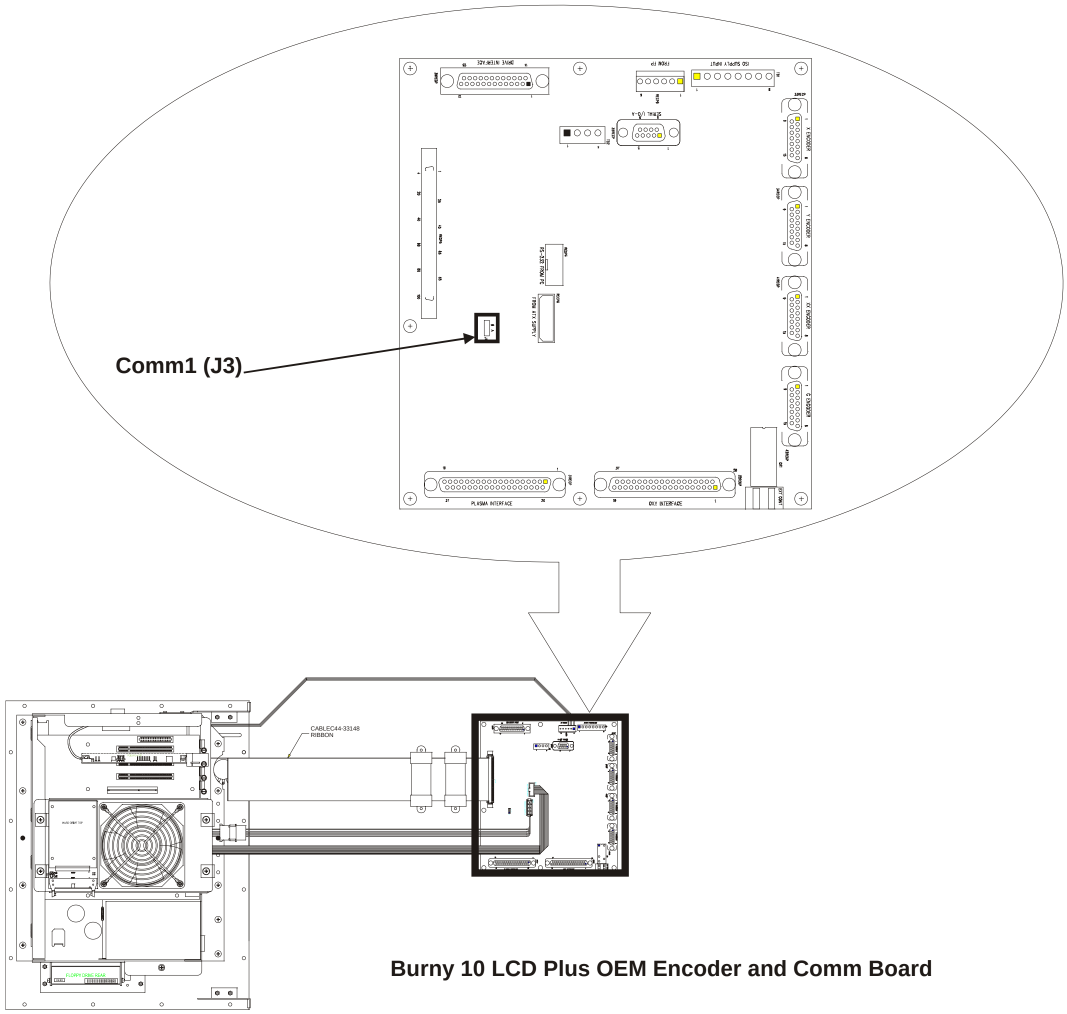


Figure 11 Location of Comm1 (J3) on Burny 10 LCD Plus Standard Encoder and Comm Board

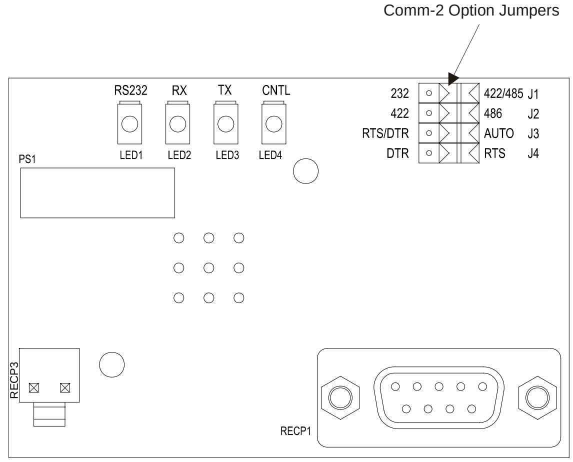
- **For the Burny 10 LCD Plus OEM,** locate the Comm1 (J3) jumper on the OEM Encoder and Comm board**.**



Burny 10 LCD Plus OEM Encoder and Comm Board

Figure 12 Location of Comm1 (J3) Jumpers on Burny 10 LCD OEM Encoder and Comm Board

- **For the Burny 10 LCD Plus with Comm-2 Option,** locate the Comm2 Option (J1-J4) jumpers on the Comm-2 option board.



Comm-2 Option Board

Figure 13 Location of Comm-2 Option Jumpers

- For the Burny Phantom or Phantom ST, locate the Comm1 (J1-J4), Comm2 (J5-J8) jumpers on the encoder and comm. port card of the back panel of the control. These jumpers are located at the lower left-hand side of the circuit card just above the two large ribbon cable connectors.

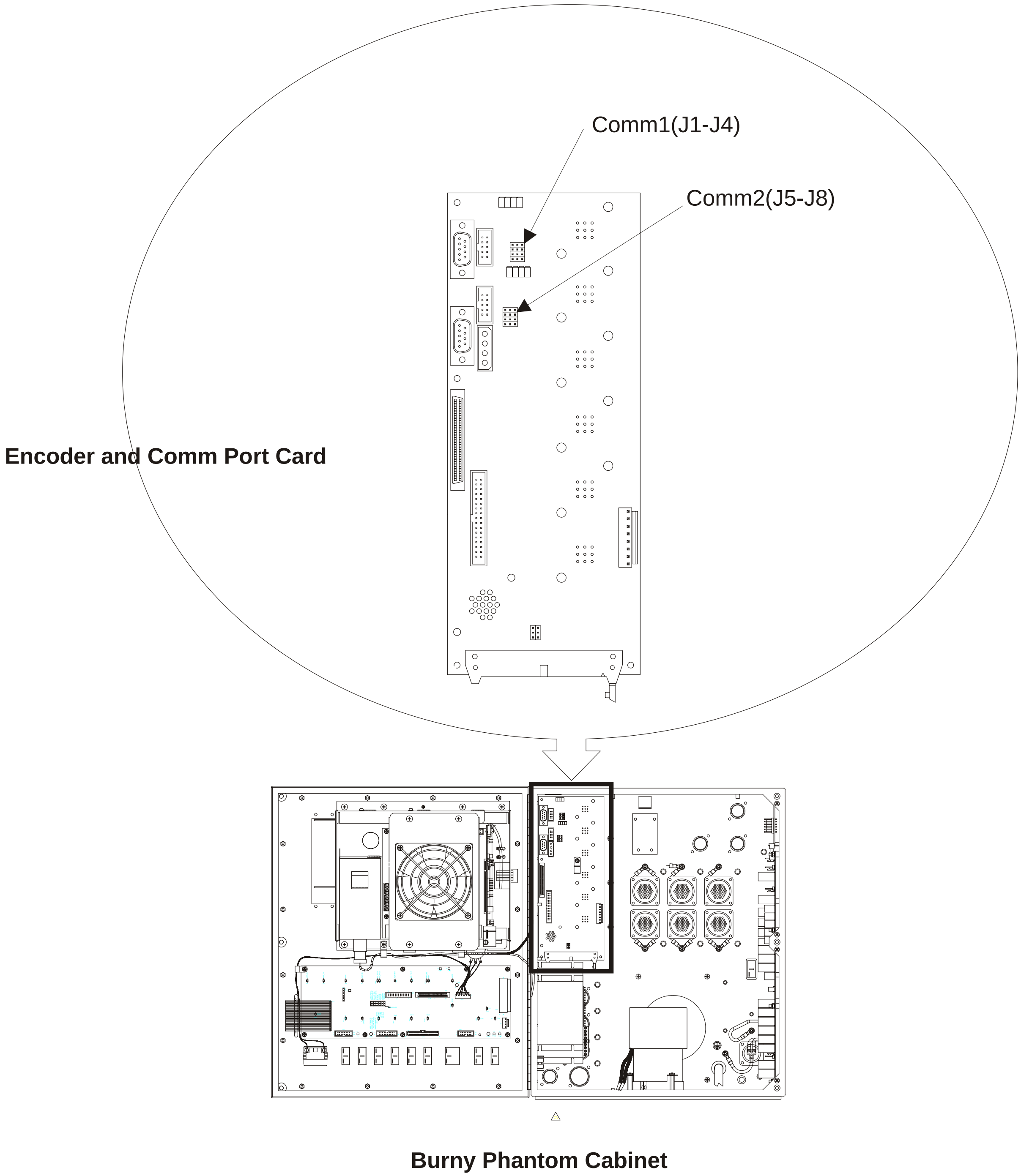


Figure 14 Location of Comm1 (J1-J4) and Comm2 (J5-J8) Jumpers on Phantom Encoder and Comm Port Card

Use the following table to make sure that the jumper settings are correct for your unit and line (single or multidrop).

Table E Comm Jumper Settings

Unit	Single Line	Multidrop Line
Burny 10 LCD Burny 10 LCD Plus (Standard or OEM	J3 There should be no jumpers. No jumpers means none/RS422.	N/A
Burny 10LCD Plus with Com-2 option	**J1** 232 **422/485** **J2** **422** 485 **J3** **RTS/DTR** Auto **J4** DTR **RTS**	**J1** 232 **422/485** **J2** 422 **485** **J3** **RTS/DTR** Auto **J4** DTR **RTS**
Phantom or Phantom ST	**J1 or J5** RS232 **RS422/485** **J2 or J6** **RS422** RS485 **J3 or J7** **RTS/DTR** Auto **J4 or J8** DTR **RTS**	**J1 or J5** RS232 **RS422/485** **J2 or J6** RS422 **RS485** **J3 or J7** **RTS/DTR** Auto **J4 or J8** DTR **RTS**

9. To check the communication from the Burny, jumper 35 RECP pins 2 and 3 and 8 and 9 and click the **Test** button to run the Burny "RS232 Loopback Test" on the **RS232 Serial Options Screen.**

   Note: If you have changed the port setting previously, set the VHC port to zero. Then set the default serial port to the desired port to test. Restart the control to reset the port changes.

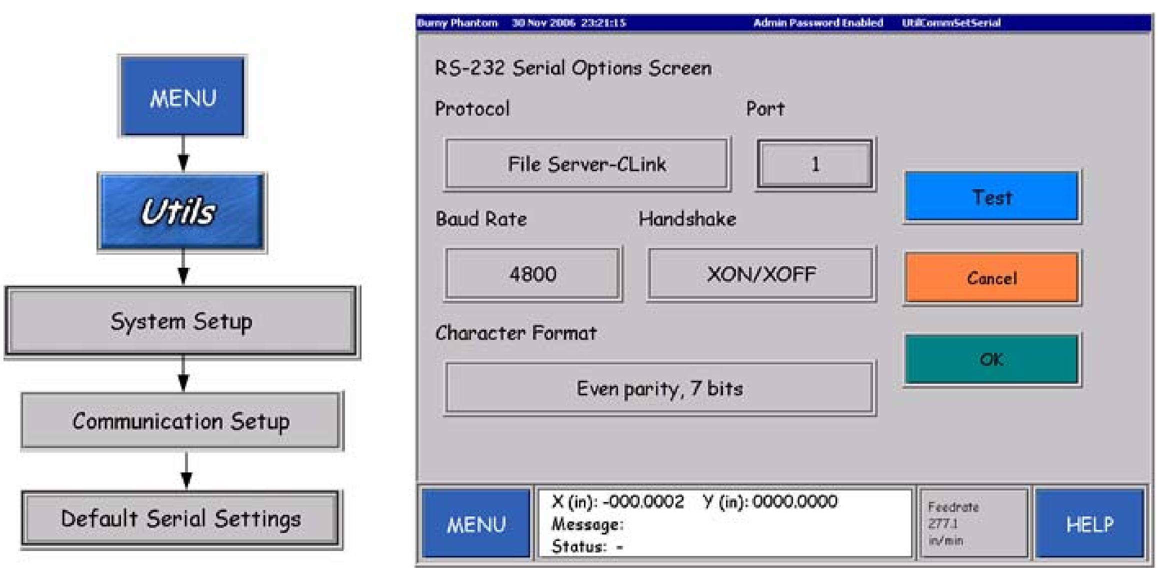


Figure 15 Testing Port 1 Communication

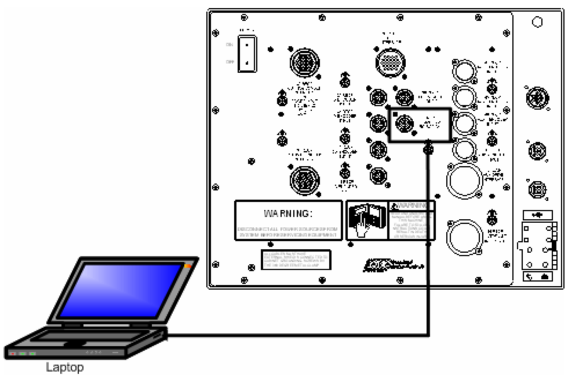
10. Use the Kjellberg emulator to check communication to and from the Burny unit.

- For the Burny 10 LCD or 10 LCD Plus, connect the RS232 cable from the PC to the COM1 (35RECP) on the back panel and run the emulator program EMUL_IL_VIEWER.EXE from the PC. Refer to Table F for a pinout of this cabling.

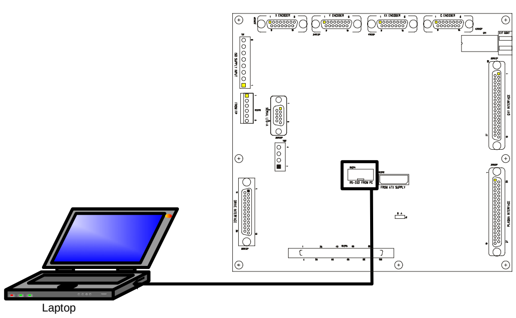
Table F Pinout For PC to Burny Cabling

PC Side Pin #'s		Burny Side Pin #'s
2	-->	3
3	-->	2
5	-->	7
7	-->	9
8	-->	8

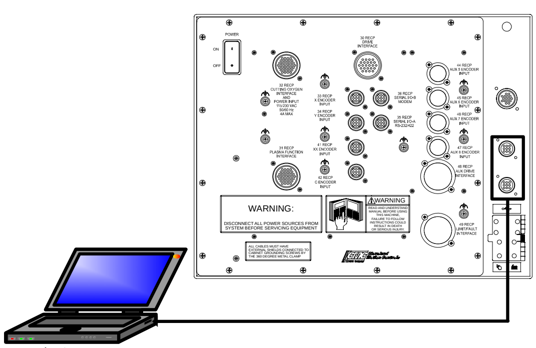
- For the Phantom or Phantom ST, connect a loopback cable from COM1 (35RECP) to the COM2 (50RECP) and run the emulator program EMUL_IL_VIEWER.EXE located in "D:\Burny\Support\Emul of the Burny unit



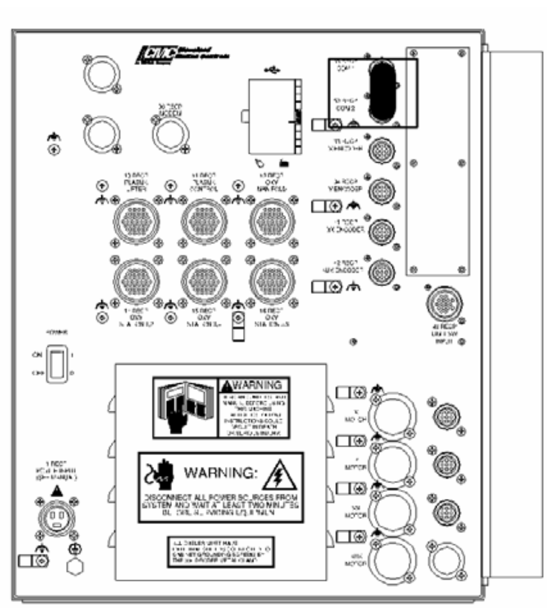
RS232/RS485 cabling from PC to Burny LCD or Burny LCD PluS



RS232/RS485 cabling from PC to Burny LCD Plus OEM Back Panel



RS232/RS485 cabling from PC to Burny LCD Plus Standard Back Pane with factory installed Com-2 Option



Loopback Cable from RECP 35 to RECP 50 on Phantom and Phantom ST Back Panel

Figure 16 PC to Burny and Loopback Connections

11. On the GUI for Emulator_KJ_Viewer screen, set “Comm Port” to the value “2” to indicate the use of COM2 port by the emulator, and click “Connect”.

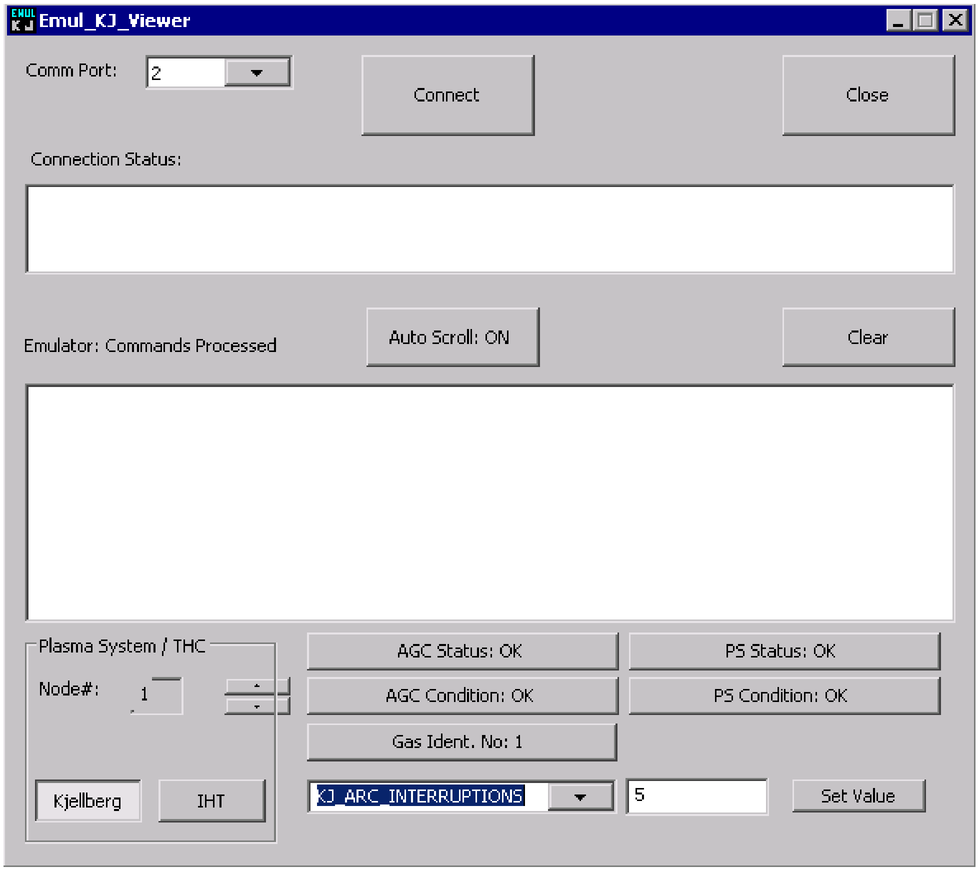


Figure 17 Emulator_KJ_Viewer Screen

12. In Burny, navigate to the **Advanced Plasma Status** screen. Click the “COM Server Update” button. A normal message should indicate “(10) Normal: Idle” state.

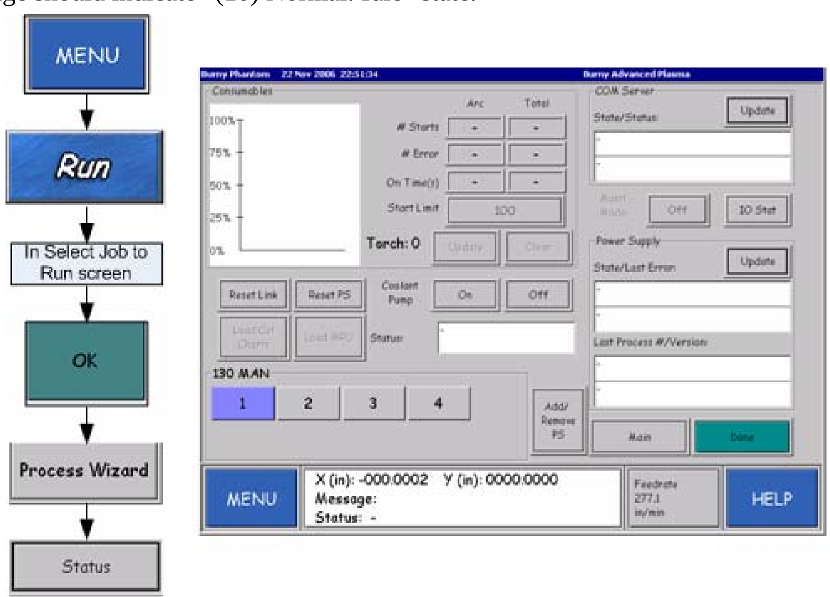


Figure 18 Advanced Plasma Status Screen

13. Click the first node button while still in the **Status** screen (for example assume this is “1”). Click the Power Supply **Update** button. If the communication is successful, the bottom of “State/Last Error” should read the software and cut chart version (for example “Software 11 Charts 14”). If the data returned is “Get Status Failed”, then RS232 communication is not properly connected.
14. If communication is working, the status window on the emulator will reflect this.

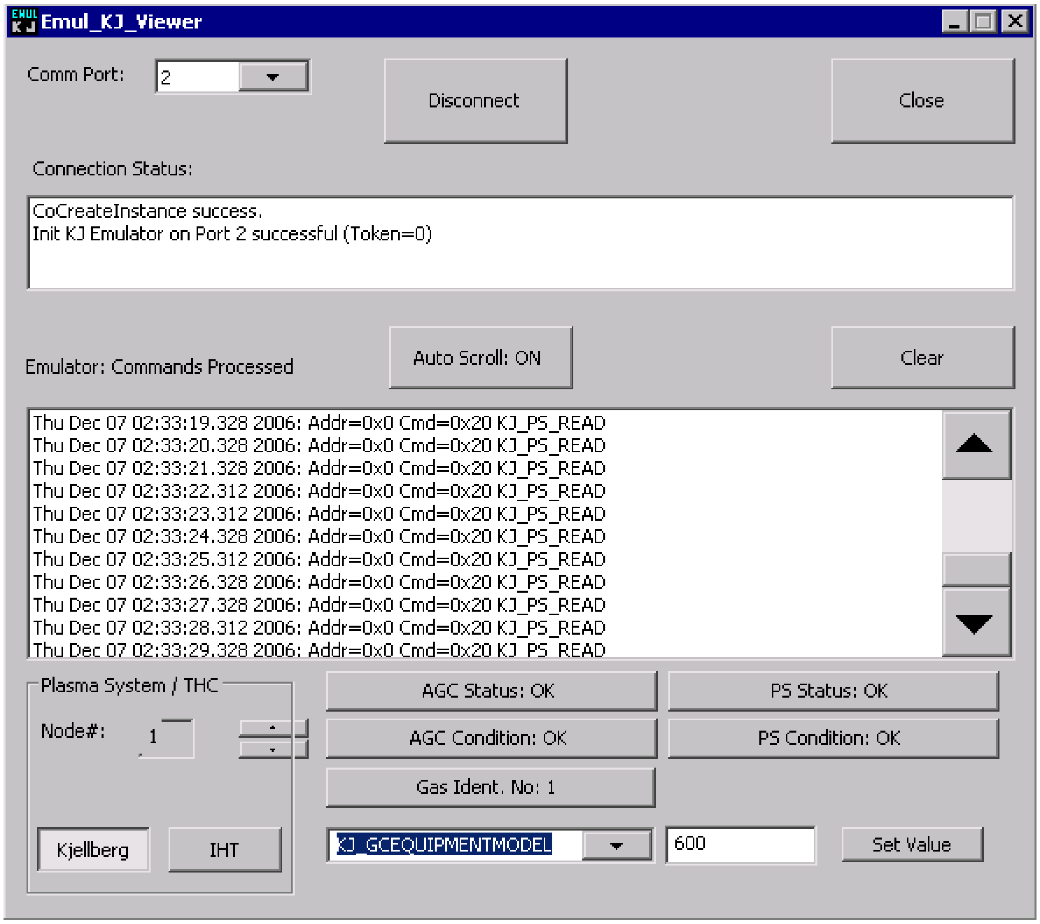


Figure 19 Emulator Status Window after Communication is Established

15. If all tests to this point have failed, then the problem most likely resides in the Burny unit. Call Burny for assistance.
16. If the testing to this point was successful, then the problem is either in the RS232/RS485 cabling to the Kjellberg devices or in the configuration of the Kjellberg device itself.

   - For pinouts for RS232/RS485 cabling to the power supply, refer to Section 1.2. of the Kjellberg Advanced Plasma Option (AO-70324)

   - For configuration settings for the Kjellberg power supply, refer to Kjellberg instruction manual.

BLANK

External Application Option

(AO-70385 Rev AA)

Option

EA

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

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1 EXTERNAL APPLICATION OPTION

1.1 INTRODUCTION

The “External Application” option allows another Windows application to run with the Burny 10 application. The Ext App also provides a “Drop to Background” button on the status screen. This button allows the operator to switch from the Burny application to the Alternate application with out using a keyboard. When configured correctly the second application looks like it is running inside of the Burny 10 application. Typical applications that could take advantage of this new feature are Nesting and drawing packages such as MTC TurboNest, as shown below.

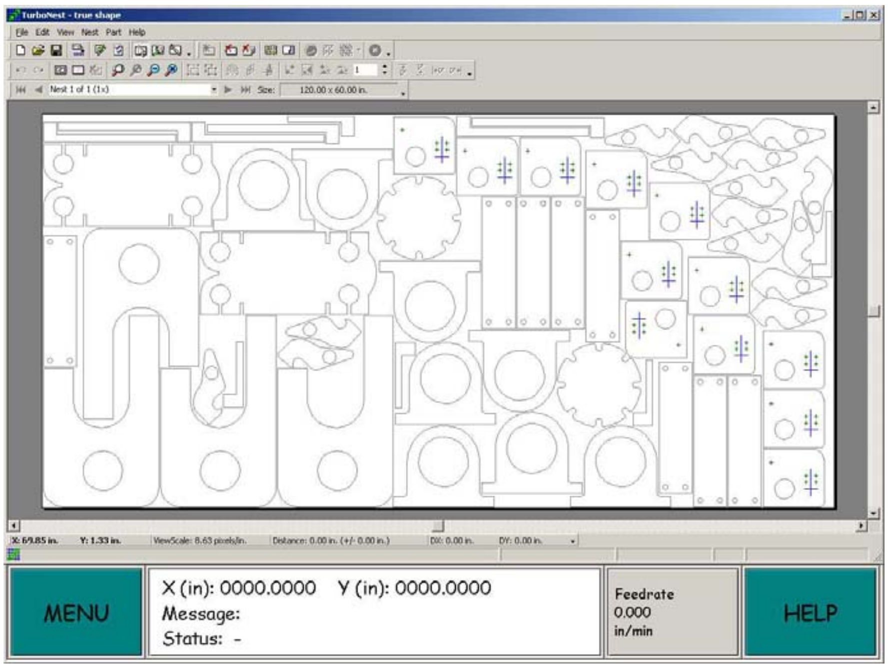

Figure 1. MTC TurboNest running within the Burny 10 window.

There are a multitude of issues that can arise from running any other kind of software on the control simultaneously with the Burny application. Problems can arise if a third party software application takes control over the CPU for a lengthy period of time. The Burny 10 application must have control of the machine. If the Burny application believes that it has lost control of the motion, the system watchdog timers will time out and cause a stop condition. ***This stop condition can occur at any time****.*

1.2 ENABLING

The External Application option, **X44-32426-14**, must be enabled with a software option key. Please contact Burny Customer Service to obtain this key.

1.3 USAGE

In order for the option to work correctly the third party application should be setup according to the guidelines listed below:

Add a batch file to the **d:\burny** directory called **ExtApp.bat**. This batch file should execute the external application you require. For instance, if the External Application were the Windows NT file explorer, the command in the ExtApp.bat file would be **c:\winnt\explorer.exe**.

The application should be run in a window that is positioned and sized in such a way that it fits over the Burny application, but does not cover the toolbar. Figure 2 shows how to size the window. The Burny toolbar must be shown at all times for this feature to work properly.

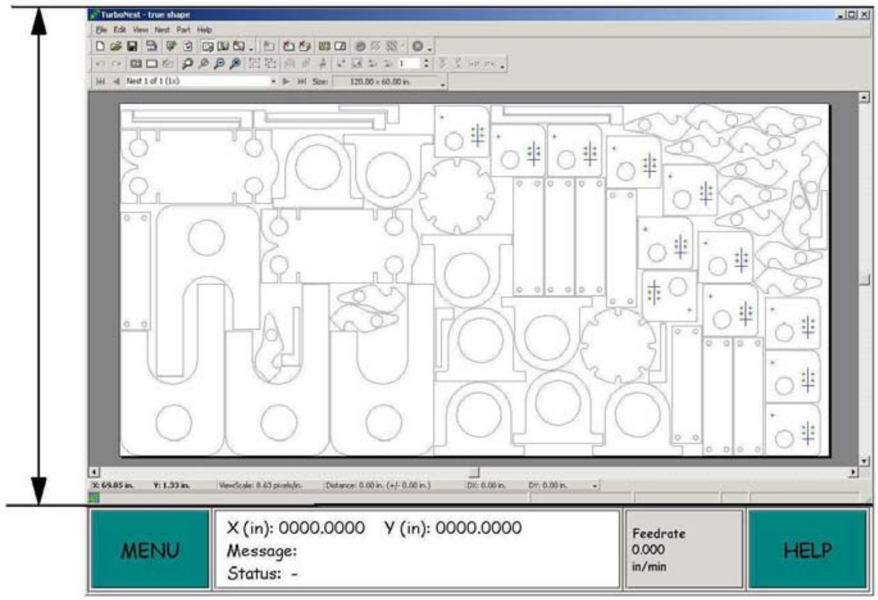

Figure 2. Application window resized to display the Burny toolbar.

To get the Burny application to flip to the background application screen press the ***Status Bar*** to get to the status screen and then press ***Drop to Background*** button.

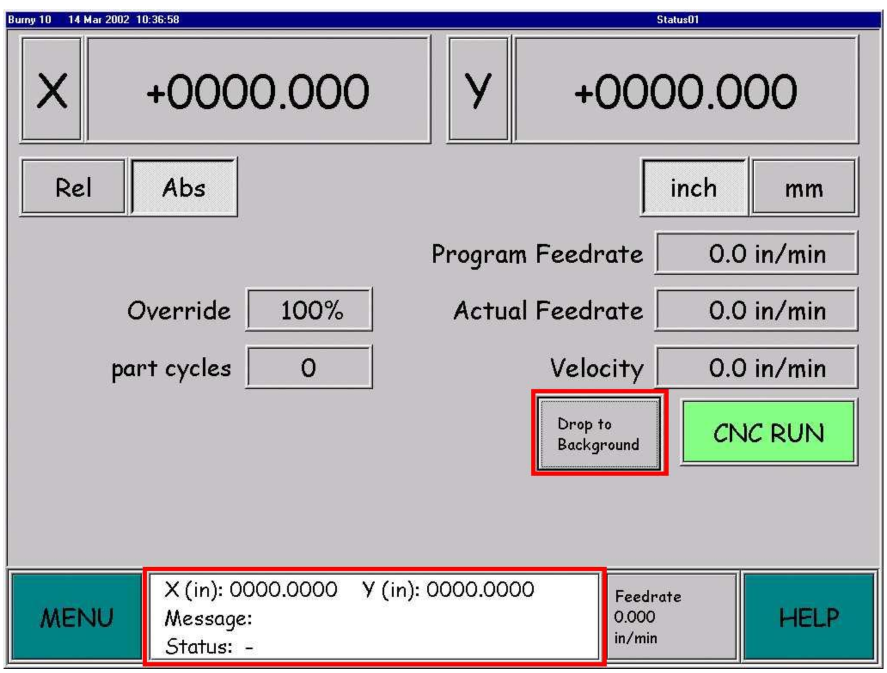

Figure 3. The Status Window (Status01) with the "Drop to Background" and the Status Bar indicated

To return to the Burny applications press anywhere on the ***status bar*** or press ***GOTO*** button on the external Burny 10 panel.

Emergency Disk Restore Option

(AO-70384 Rev AA)

Option

EDR

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

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1 EMERGENCY DISK RESTORE

1.1 INTRODUCTION

The Emergency Disk Restore (E-Disk) Option is the best way to get a corrupted Burny hard drive running again. This procedure will work in most cases with the only exception being a mechanical failure of the hard drive.

Creating an E-Disk when the Burny is first installed is the best way to avoid lost time when a problem occurs.

Before attempting this procedure, contact Cleveland Motion Controls to obtain a valid registration password. Two formatted 1.44 MB floppy disks are also required; one for the E-Disk and one for important INI files.

NOTE: This procedure is for restoring the hard disk image as it was shipped from the factory.

1.2 OBTAIN THE NECESSARY FILES

1.2.1 IF THE BURNY'S DISK DRIVES ARE NOT ACCESSIBLE:

Contact Cleveland Motion Controls to obtain the required file by email or website download. Execute this self-extracting compressed file and save its contents to your PC hard drive. Two files will be extracted; these instructions in PDF format and a file named Edisk.exe. Insert a formatted 1.44 MB floppy disk into your PC's floppy drive.

1.2.2 IF THE BURNY'S DISK DRIVES ARE ACCESSIBLE:

On the Burny control, navigate to D:\burny\Support\Edisk and locate the Edisk.exe file. Insert a formatted 1.44 MB floppy disk into the Burny's floppy drive.

1.3 CREATING AN E-DISK

After inserting a formatted 1.44 MB floppy disk in the previous step, execute the Edisk.exe file. The screen below will appear.

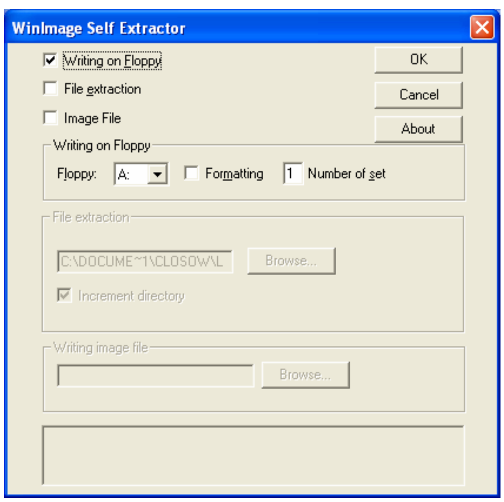

Figure 1

Click OK to create the E-Disk. If your floppy disk is not empty, a screen prompt will give you the option to erase the disk. Wait until the WinImage program indicates that it is finished before removing the disk from the floppy drive.

It's a good idea to save the Edisk.exe file to a safe place such as a PC hard drive or network location for future reference. Long-term storage on floppy disk isn't always reliable.

1.4 BACKUP IMPORTANT FILES

Before restoring the hard drive, you must backup your INI files. These files are unique to your machine setup and should, therefore, be backed up after the system is initially installed and ***NOT*** after a problem with the machine occurs. In some cases, the Burny may not be accessible when a problem occurs so the operator should be prepared for this in advance.

To backup the Burny INI files:

From the Main Menu, press Util. Enable the administrator's password by pressing the Enable Password button. Enter the correct password and press OK.

From the Main Menu, press Store. Press Floppy Disk. Insert a formatted 1.44 MB floppy disk. Press Options. Select System Backup as the File Type. Press OK. Press OK to backup the files.

This process gathers several files into a single compressed file, which should be stored in a safe place such as a PC hard drive or network location for future reference. Long-term storage on floppy disk isn't always reliable.

1.5 RESTORE THE HARD DRIVE TO FACTORY DEFAULT

To start the hard drive restoration, insert the E-Disk floppy into the Burny's floppy drive and reboot the control. The Burny will boot into a restore mode. If the floppy does not boot, the BIOS may be set to boot from the hard drive first. To change this, enter the BIOS by pressing the DELETE key on boot. Find the first boot device in the BIOS. Set the first boot device to Floppy and the second boot device to HDD-0. Be sure to set this back when the restore is complete.

The restoration is started when you see the script pictured below. It will take some time to load the application.

When Figure 2 appears, Type- **Restore** and press **Enter** to start the recovery process.

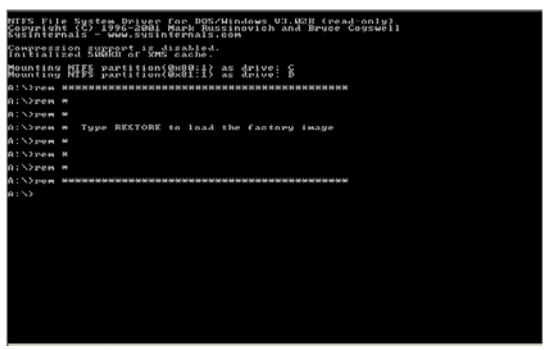

Figure 2

Once A:\> appears, remove the floppy disk and reboot the Burny.

1.6 RESTORE IMPORTANT FILES

To restore the Burny INI files:

From the Main Menu, press Util. Enable the administrator's password by pressing the Enable Password button. Enter the correct password and press OK.

From the Main Menu, press Load. Press Floppy Disk. Insert the Burny INI floppy disk previously created. Press Options. Select System Backup as the File Type. Press OK. Press OK to restore the files.

Once this process is complete the Burny will reboot automatically.

TurboNest,
Burny Edition
(AO-70392 Rev AA)

Option
TN

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

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1 TURBONEST, BURNY EDITION

TurboNest, Burny Edition is a nesting system designed for 2-axis profile cutting applications such as Plasma, Oxy-fuel, Laser, Waterjet and Routers. By combining the advanced interactive nesting and automated CAD import features of **TurboNest** with automatic nesting options, you can build a nesting system specific to your needs.

TurboNest, Burny Edition comes standard with ***True Shape Profile Nesting***, which provides nesting speed and efficiency for the automatic **nesting** of parts with varying shape and quantity.

Burny systems using Software Version 3.4 and greater have the ***TurboNest*** program along with the ***Digitized Remnant*** feature preloaded. The feature is initially enabled in demo mode to allow the user to gain an understanding of the software - the demo mode allows the operator to digitize a remnant and then nest parts on the control. However parts cannot be saved as part programs for cutting. If the user wants to use the program for nesting parts and producing part programs then it must be enabled.

1.1 ENABLING THE TURBONEST PROGRAM

The program is enabled on the TurboNest About screen – load as follows:

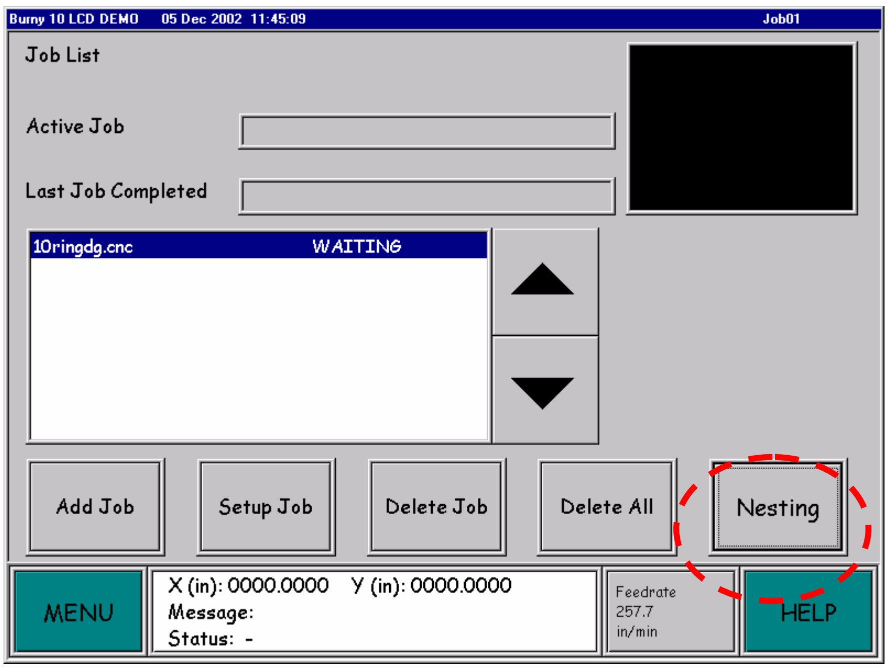


Figure 1 - Job list Screen (Job01) – Nesting button l.r.

a) Press the ***Nesting*** Button on the Job01 screen.

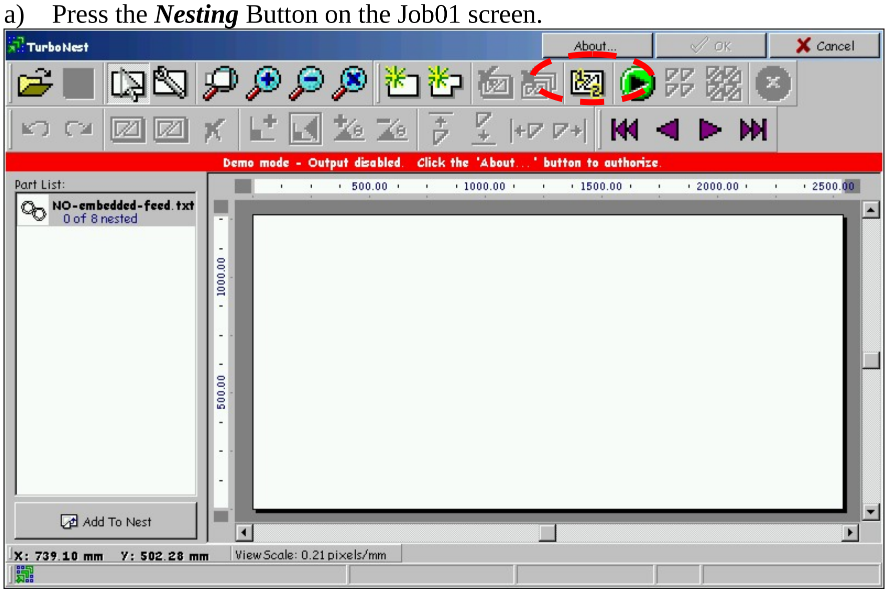


Figure 2 – The TurboNest Screen

b) The TurboNest program will be displayed as above (Fig 2).

c) Press the "***ABOUT"*** button located on the header bar, top right, to display the About screen.

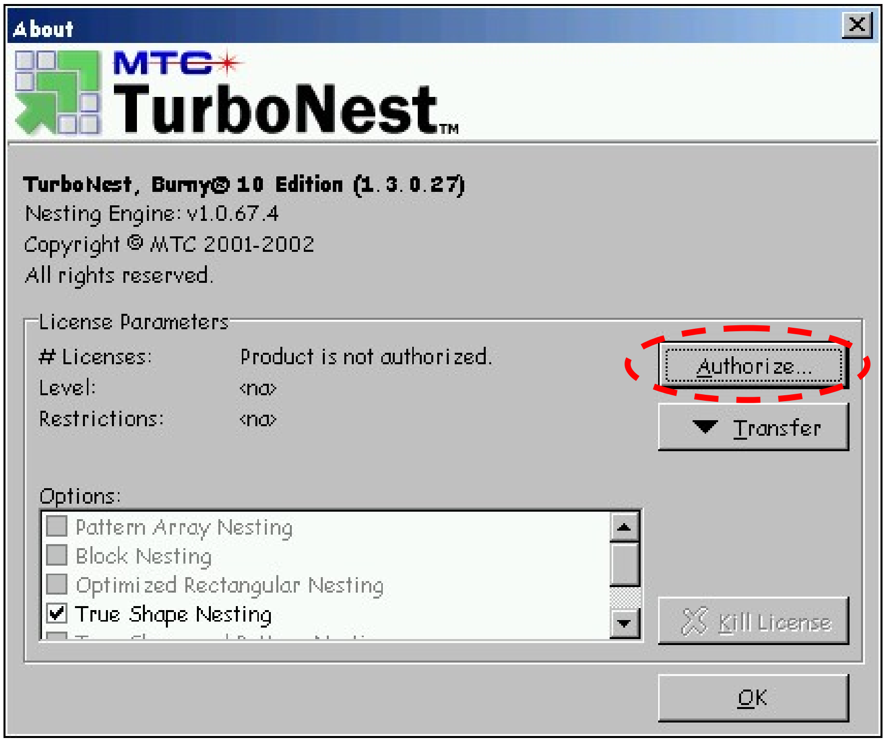


Figure 3 - TurboNest About Screen

d) Press the ***"AUTHORIZE/UPDATE BUTTON".*** The authorization screen will appear

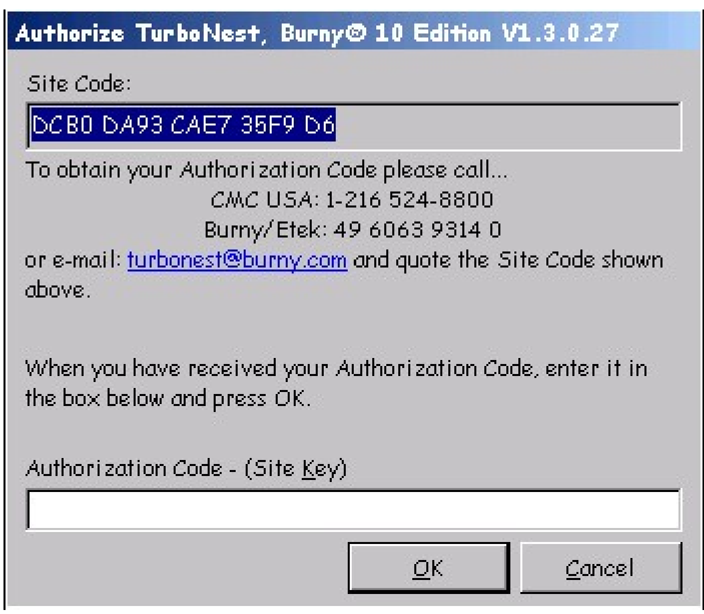


Figure 4 - TurboNest Authorization Screen

e) A site code is displayed - write this number down and call one of the numbers listed on the screen to obtain your authorization code or send an e-mail to turbonest@burny.com including your site number. Enter the Authorization code to enable the TurboNest Digitizing Remnant feature

1.2 BURNY 10 TURBONEST BASICS

Burny 10 TurboNest provides several ways to accomplish most tasks like starting a new job, deleting the selected parts, or using the array function. Most functions are available through the menus and toolbars and in some cases by using a right-click pop-up menu.

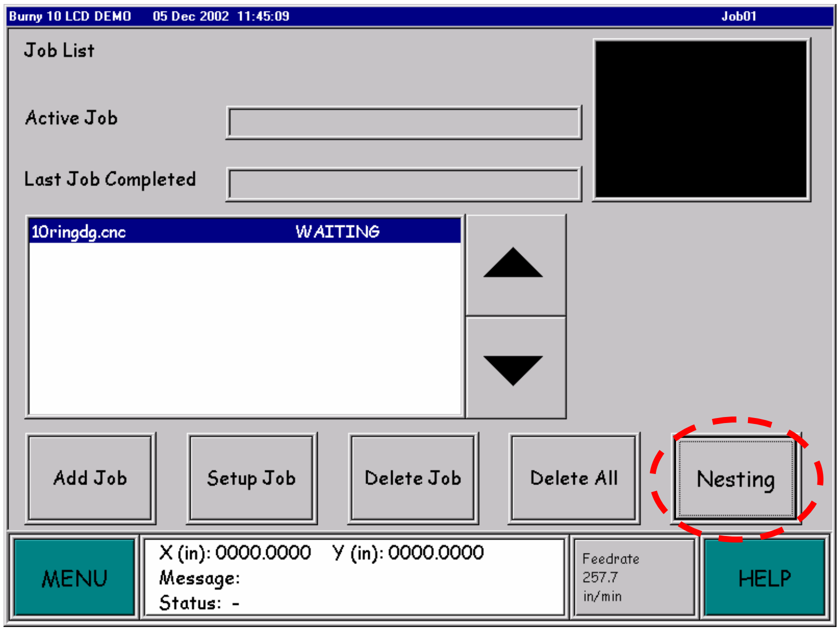


Figure 5 - Job Setup Screen (Job01) with the Nesting Button highlighted

1.3 AUTOMATIC NESTING

Automatic Nesting is the simplest Nesting Method to use. Press the Automatic/Interactive button to toggle so that Automatic is displayed.

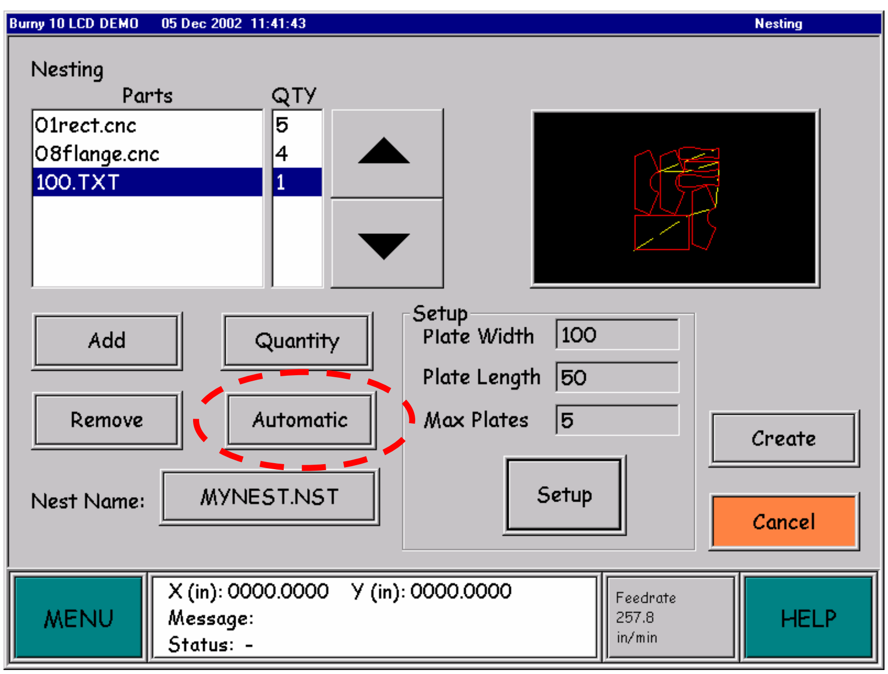


Figure 6 - Nesting Screen with Automatic Selected

a) Press the "**Nest Name"** button and enter a name using the keyboard screen.

b) Press the **"ADD"** button to add files to be nested.

c) Press the **"Quantity"** button to change the quantity of individual parts.

d) **"Remove"** deletes parts from the list.

e) Press the "**SETUP"** button to set the size of the plate and the part separation distance.

f) Press the **"Create"** button to make the nest

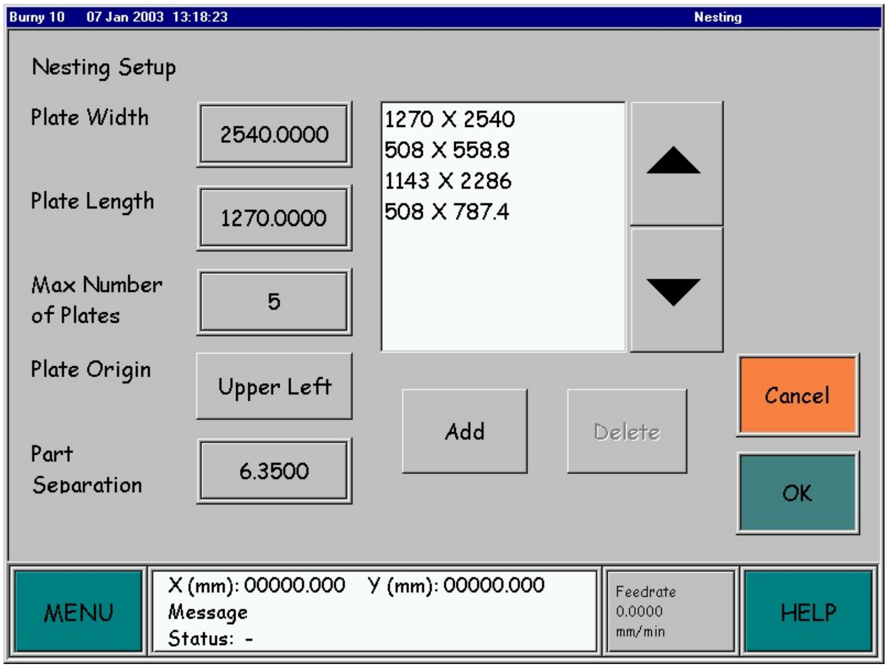


Figure 7 - Plate Setup Screen for Nesting

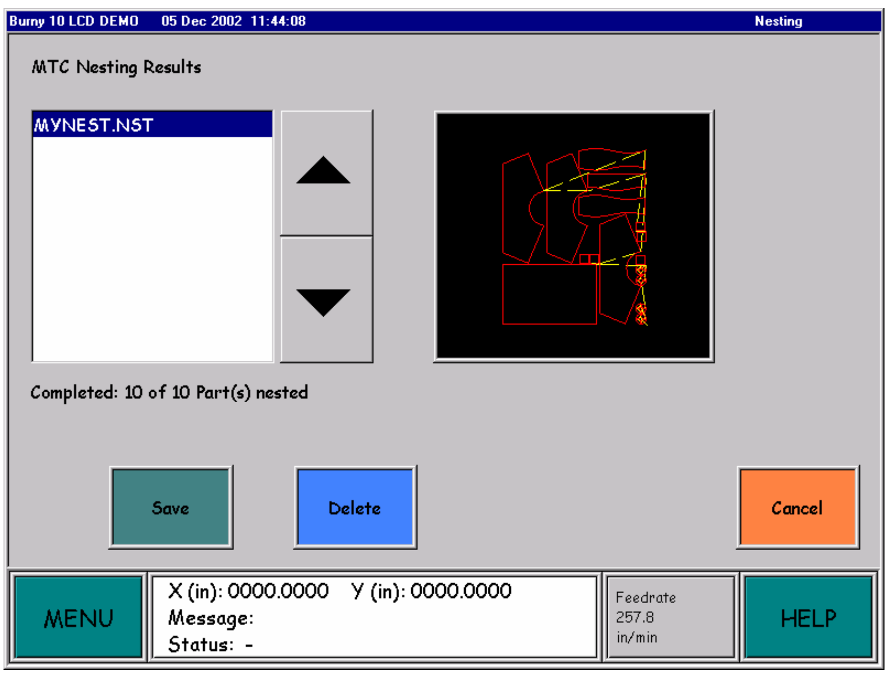


Figure 8 - Nesting Screen showing the parts nested on the plate along with the lead-ins

After the create button is press the Burny will take a few seconds to create a True Profile nest.

1.4 INTERACTIVE NESTING

Interactive Nesting allows placement of parts on the plate and positioning them where desired. To access the TurboNest program toggle the Automatic/Interactive button on the Nesting Screen (ref Figure 6) to ***Interactive***.When the ***Create*** button is pressed the TurboNest program will load.

SELECTING AND UNSELECTING A PART

Only parts that appear on the plate can be selected. To select a part that has been nested, click on it with the left mouse button. To prevent choosing the wrong part, click within the interior of the desired part. This is especially helpful if the desired part is nested inside or interlocked with another part.

Once selected, the parts (or parts) are drawn in the selected part color and the nesting handles appear at the corners and sides of the part region. Use of the nesting handles will be described later in this section.

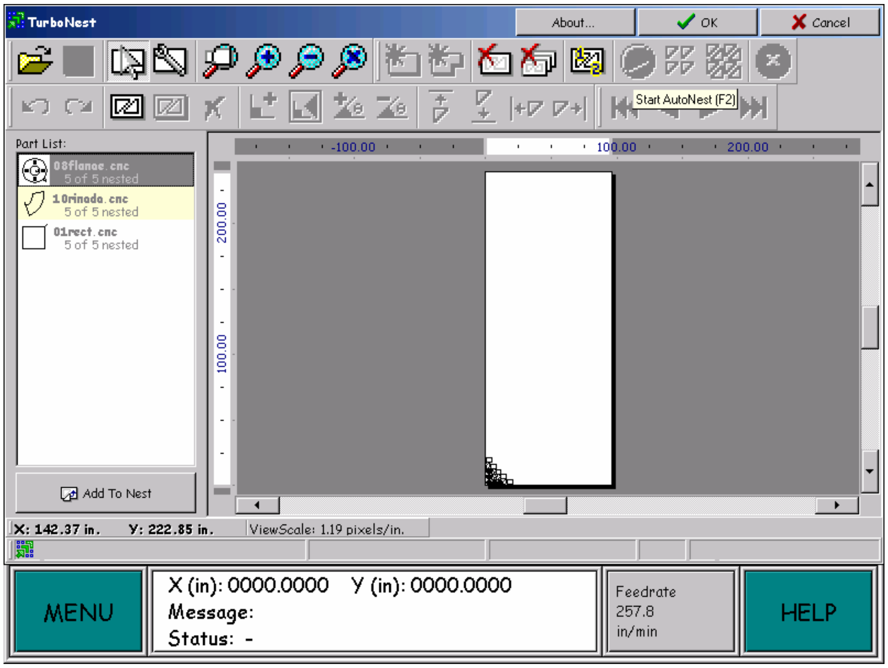


Figure 9 - TurboNest screen with a plate being displayed

To unselect a part, click anywhere outside of the part region. Clicking outside the plate is preferred, as it eliminates the possibility of picking another part by mistake. A selected part can be unselected by choosing another part. A selected part can also be unselected by pressing the ***Enter*** button.

SELECTING AND UNSELECTING A GROUP OF PARTS

Group of parts can be selected using the ***Shift*** button. Select the first part, hold down the shift key and then click on the other parts required. If incorrectly selected – hold the ***shift*** key down click on it again to deselect.

To add a part to the selected group, hold down the shift key and select the second part with the left mouse button, continuing this process until all of the desired parts appear in the selected state. To remove a part from the group, shift select that part.

AREA SELECT

You can also select one or more parts by dragging a rectangular window using the **Right** mouse key. To do this, position the mouse cursor at one corner of the desired area, hold the right mouse button down and move the mouse to the opposite corner of the area and release the mouse button.

If you select the area by moving from the left to the right, all parts entirely contained the selection area will become selected. If you select from right to left, all parts contained or whose region intersects the selection area will become selected.

If you hold the shift key down while using area select, the parts in the selection area will be added to the selected group.

SELECTING OR UNSELECTING ALL PARTS

To select all parts on the current nest, choose the ***Select All*** icon. To unselect all parts, choose the ***Unselect All icon***.

ZOOMING IN AND OUT

Zooming in allows you to examine smaller areas of your nest by magnifying them to fill the desktop area of ***Burny 10 TurboNest***. Zooming out means to return to a previous level of magnification.

AREA ZOOM
To zoom in on a selected (rectangular) area of the plate, click on the ***Area Zoom*** icon on your toolbar.

ZOOM TO SELECTED
To zoom in on a selected part or group of parts, click on the ***Zoom Selected*** icon on your toolbar.

DYNAMIC ZOOM
Dynamic zooming allows you to easily zoom in and out at any desired location on your nest. Just position the mouse cursor at the center of the area and press the ***Page Up*** or ***Page Down*** keys. Each time you press the page up or down keys you will zoom in or out more. Dynamic zooming is very useful when you are in a mode like Move Leads.

ZOOM OUT
To zoom out (return to the previous magnification level), click on the ***Zoom Out*** icon on your toolbar.

NO ZOOM
To return to a view of the entire plate, click on the ***No Zoom*** icon on your toolbar.

1.4.1 WORKING WITH SELECTED PARTS
During interactive nesting, all operations affect the selected parts. These parts are referred to as the selected group. The group is surrounded by eight "handles", one at each corner and side. A part must be selected before any operation can be performed on it.

MOVING (DRAGGING)
To move the selected group, click inside a part in the selected group and hold down the left mouse button. The handles disappear, and the selected parts are redrawn in specified moving color. Only exterior profiles of these parts are visible while they are being moved. This is a dragging state. Still holding down the left mouse button, drag the group with the mouse until it is in the desired location.

Releasing the left mouse button returns the selected group to a normal selected state in the new location.

MOVING (USING SLIDE)
If you click and hold the mouse button down on one of the side bump handles you can slide it horizontally or vertically without changing its position in the other direction. For example, if you slide the part using the left bump handle, the part can only be moved horizontally, not vertically.

MOVING (USING NUDGE)
The selected group can also be moved a pre-defined distance by using the shift key with arrow keys or the bump handles. To move up by the nudge distance, hold down the shift key and press the UP ARROW key (or click on the top-center bump handle), to move left, press the LEFT ARROW key, and so on. The selected group will move the amount given by the Nudge Distance setting in the Manual Nesting tab of the Preferences screen.

BUMPING
In Burny 10 TurboNest, bumping means to move a part in a desired direction until it is the specified separation from other parts or the plate edge.

To bump, click on the desired side handle of the selected part or group. For example, to bump left, select the handle on the left side of the selected group. You can also bump by using the arrow keys or the bump icons on the toolbar. The selected group will move left until it is a part separation away from another part or the plate edge. Parts that are completely off the plate will not bump. If the leading edge of a part (i.e., the left edge if bumping left) is already in conflict, it will not bump.

DELETE
To delete the selected group press the ***Delete*** key or the ***Delete Selected*** icon.

DELETE NEST
To delete the current nest, select the ***Delete Nest*** Icon.

DELETE ALL NESTS
To delete all nests, select the ***Delete All Nests*** Icon. When this is done, all parts are free to be nested again.

ARRAYING

To array, place the selected part or group in the desired start location and select the **Array** Icon. The number of parts to place in the X and Y directions, and the part offset (X & Y spacing) are calculated. The number in the Y direction is maximized to cover the plate height. The part offset is calculated to place parts as close together as possible based on the part separation in your settings.

PATTERN ARRAY

Pattern Array is an optional feature of Burny 10 TurboNest. To Pattern Array, place the selected part or group in the desired start location and select the ***Pattern Array*** icon. Burny 10 TurboNest will then calculate an optimal arrangement of that part or group to maximize the number of copies that can be nested.

ROTATING PARTS OR PART GROUPS

All rotations occur in relation to the center point of the selected part or group.

- **Rotating by Increment** - To rotate the selected part or group by a set increment, click on either the Incremental Rotation Icon, or the upper left handle. This can also be done by pressing the PLUS ("+") or MINUS ("-") keys on the keyboard. The selected group will rotate by the specified increment. If the "+" Incremental Rotation Icon, the upper left handle or the PLUS key are used, the selected group rotates counter-clockwise. If the "-"Incremental Rotation Icon or the MINUS key is used, the selected group rotates clockwise. If your mouse has a "wheel", you can also use it to rotate the selected groups.
- **Rotating to Next 90** - To rotate the selected part/group to the next 90 degree increment greater than its current angle, starting from its initial angle, select the Rotate To Next 90 Icon, Press "Q" on the keyboard, or select the lower left handle. The current angle of the selected part/group is the total rotation from its initial angle. If the selected part/group consists of one part, the initial angle of that part is used. If the part/group consists of multiple parts, the initial angle is set to zero each time a part is added or removed from the group.
- **Longest Straight Side –** Clicking the Long Side Rotate Icon, pressing "**S**" on the keyboard, or clicking the lower right "handle" will determine the selected part's longest straight side and proceed to rotate that side to next closest counter-clockwise horizontal or vertical position. For example, the hypotenuse of a right triangle will rotate to 90°, 180°, 270° or 360°.
- **Free Rotate** - To "free" rotate the selected group, select the upper right handle and hold down the left mouse button. The handles disappear, and the selected parts are redrawn in the moving color. Only exterior profiles of the parts are visible. This is a dragging state. Still holding down the left mouse button, move the mouse. The part rotates with the mouse. To rotate quickly, stay closer to the center of the part or group. To rotate slowly, move farther away from the center. Releasing the left mouse button returns the selected group to a normal selected state.

1.4.2 CUT SEQUENCE

When you nest parts in Burny 10 TurboNest, either manually or automatically, the program generates a cutting sequence for those parts for you based on your current settings. After your nesting is complete, you can interactively change the cut sequence if desired. Click on the ***Cut Sequence*** Icon in your toolbar; Burny 10TurboNest will display the Cut Sequence Toolbar. This tool bar has special tools to help you change the cut sequence. Normally this toolbar appears as a floating toolbar on your workspace area, but like all other toolbars, it can be "docked". The current cut sequence for each part on your nest will be displayed. You can now use the mouse to select parts and toggle them between sequenced and unsequenced mode by simply clicking on them. When a part is unsequenced, a sequence number is not displayed near the start point of the exterior profile.

MODIFYING THE CUT SEQUENCE

To change the sequence of a few parts on the nest, click on each of those parts to unsequence them, and then click on those parts again to sequence them in the new order.

To move a part or group of parts forward in the cut sequence, select (and therefore unsequence) those parts in the desired order. Then Click the ***Insert Unsequenced Parts Before*** icon on the Cut Sequence Toolbar, and then click on the sequenced part that you want to insert that part (or parts) before. The sequence numbers of all parts will be adjusted to show the new order.

To move a part or group of parts to the end of the cut sequence, select (and therefore unsequence) those parts in the desired order. Then Click the ***Append Unsequenced Parts to End*** icon and those parts will be shifted to the end of the cutting sequence.

SET CUT SEQUENCE

To explicitly set the cut sequence for all of the parts in the nest, you should first click on the ***Clear Cut Sequence*** icon to unsequence all of the parts. You can also click on the ***Clear Cut Sequence From*** icon to clear the sequence for all parts starting with the part you click on next. Then simply click on the parts in the new order to sequence them.

EXIT CUT SEQUENCE MODE

To exit from Cut Sequence mode, click on the ***Close*** button on the Cut Sequence toolbar. Burny 10 TurboNest will automatically sequence any remaining unsequenced parts for you.

1.5 USING AUTONEST

To begin AutoNesting, click on the ***Start Autonest*** icon on your toolbar. The text "Automatic Nesting" will be displayed in the right-most panel of the Status bar at the bottom of your screen. Burny 10 TurboNest will automatically use the highest nesting level available to the user while nesting. All toolbar icons will become disabled with the exception of the Stop AutoNest button. Some AutoNesting methods take more time than others, if you wish to interrupt the nesting process, click on the Stop AutoNest icon or press the Esc key.

BLOCK NESTING

The Burny 10 TurboNest Block nesting method nests parts by nesting the rectangles that represent the boundaries of each part. Block nesting does not interlock parts or place parts in the interior cutouts of other parts. Block nesting is a significant tool for nesting the right type of parts (rectangular with small or no internal cutouts). Block nesting results can often be enhanced by pre-clustering parts into basically rectangular shapes. Additional parts can always be placed in the open spaces manually.

PATTERN ARRAY NESTING

The Pattern Array feature is not accessed from AutoNesting, but rather is a special array operation that is accessed by clicking on the **Pattern Array** icon on the tool bar, or right-click popup menu.

With Pattern Array nesting, Burny 10 TurboNest automatically determines the spacing and orientation of the selected part(s) to maximize the number of that part that can be placed in the available plate area. Pattern Array nesting develops this pattern by looking at a region of the plate starting at the location of the currently selected part and then the plate area, moving away from nesting defaults Plate Initialization Point.

There are three different settings for Pattern Array nesting: basic, intermediate and advanced. This setting controls how many different options that Burny 10 TurboNest evaluates while determining the best pattern. The basic setting uses the fewest options and is fastest, while advanced uses the most options and takes more time.

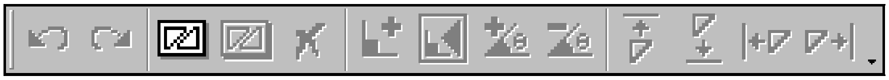
TRUE SHAPE NESTING

The Burny 10 TurboNest True Shape nesting method nests parts by looking at their actual shape and is also often called Profile nesting. True Shape Nesting will interlock parts as well as place parts in the cutouts inside of parts and in the void areas between parts. During True Shape Nesting, Burny 10 TurboNest evaluates how the part being nested “fits” at different positions and orientations and selects the best one. There are two options for True Shape Nesting, True Shape 1 and 2. In general, True Shape 2 will try more possible orientations and will take longer to nest your parts than True Shape 1. However, True Shape 2 does not always produce the highest utilizations for all situations. You can easily try both methods and choose the one that gives you the best result.

1.6 TOOLBARS REFERENCE

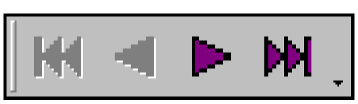
This section details the toolbars and functions

EDIT



Undo Move	While a part or group of parts is selected, click on this icon to “undo” the previous movement or change in orientation. If there are no moves that can be undone, the icon will be grayed out and the hint will be “Can’t Undo”.
Redo Move	While a part or group of parts is selected, click on this icon to “redo” the previous movement or change in orientation. If there are no moves that can be redone, the icon will be grayed out and the hint will be “Can’t Redo”.
Select All	Selects all parts on the current nest
Unselect All	Unselects (nests) all selected parts
Delete Selected	Deletes all selected parts
Rotate to Next 90	This rotates the selected part or group of parts to the next 90 degrees from its initial angle.
Rotate Long Side	This will determine the selected part’s longest straight side and proceed to rotate that side to the next closes counter-clockwise horizontal or vertical position.
Incremental Angle	Rotates the part or group of parts counter-clockwise by the increment angle.
Decrement Angle	Rotates the part or group of parts clockwise by the decrement angle.
Bump Up	Bumps the part(s) up on the plate to the specified separation from other parts or the plate edge.
Bump Down	Bumps the part(s) down on the plate to the specified separation from other parts or the plate edge.
Bump Left	Bumps the part(s) left on the plate to the specified separation from other parts or the plate edge.
Bump Right	Bumps the part(s) right on the plate to the specified separation from other parts or the plate edge.

NAVIGATION

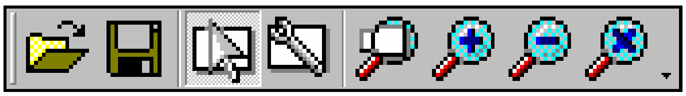


First	Allows the user to go to the first nested plate.
Previous	Allows the user to go to the previously nested plate.
Next	Allows the user to go to the next nested plate.
Last	Allows the user to go to the last nested plate.

LOCATION

X:	The X value of the current mouse position.
Y:	The Y value of the current mouse position.
View Scale:	Displays the current view scale factor in pixels per inch or pixels per mm.

STANDARD

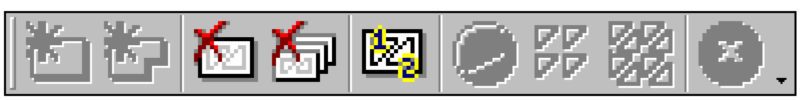


Open Job	Opens a previously saved job
Save Job	Saves the current job with the current job name
Select Mode	This mode allows nested parts to be selected or unselected so that they can be moved, rotated, deleted, etc.
Area Zoom	Used to zoom in on a selected, rectangular region of the nest.
Zoom Selected	Used to zoom in on the region of the selected parts on the plate.
Zoom Out	Reverts to the previous zoom level.
No Zoom	Returns to a view of the entire plate.

STATUS BAR

This portion of the ***Burny 10 TurboNest*** window displays what function is presently being performed. For example, if you are modifying the cut sequence, the prompts in the status bar will change assisting in the process.

NEST



New Nest	Displays the New Nest dialog window, used to add a new, empty plate on which to nest parts.
Delete Nest	Deletes the current nest.
Delete All Nests	Deletes all nests in the job
Cut Sequence	Used to view or change the cut sequence for the current nest.
Start Autonesting	Displays the Autonest dialog window used to specify the options used by Burny 10 TurboNest to automatically nest your parts.
Array	Determines the spacing and number of the selected part or group that can be placed in a rectangular grid arrangement and then automatically arrays the parts.
Pattern Array	Uses advanced techniques to calculate an optimal pattern of the selected part or group, including spacing and orientation and then automatically arrays the parts.
Stop Autonesting	Stops the autonesting process.

1.6.1 DIGITIZING A PLATE REMNANT

The Burny 10 also has the ability to digitize a piece of plate. To Begin the process of digitizing a plate, ***Press*** the "***New Digitized Remnant"*** icon on the toolbar.

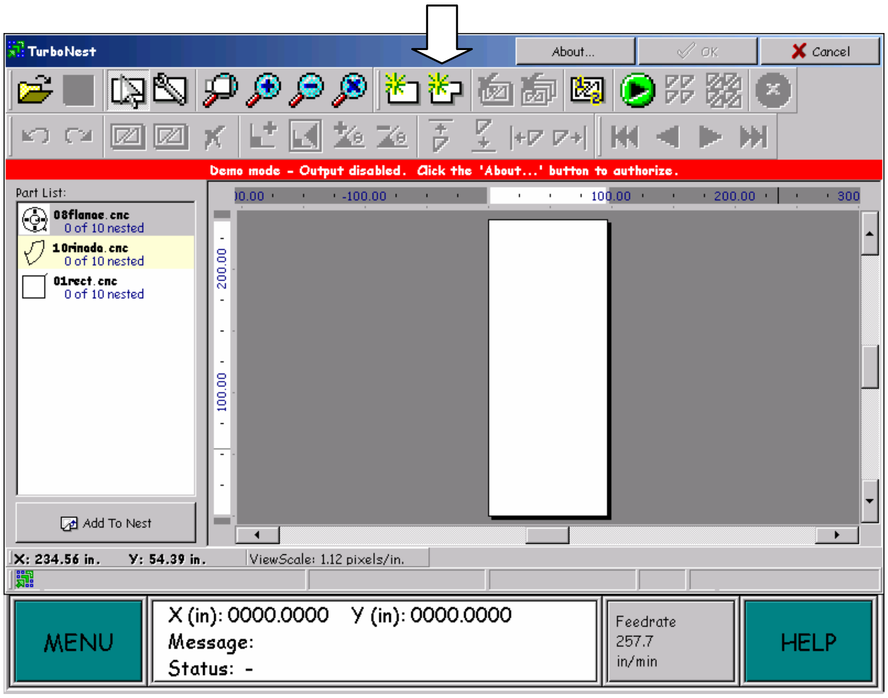


Figure 10 - The TurboNest screen with the Digitized Remnant button indicated

After the ***New Digitized Remnant"*** screen is displayed, move a torch to the edge of the remnant to be digitized and press ***"Add Point".*** Keep moving the torch around the plate and Pressing "Add Point".

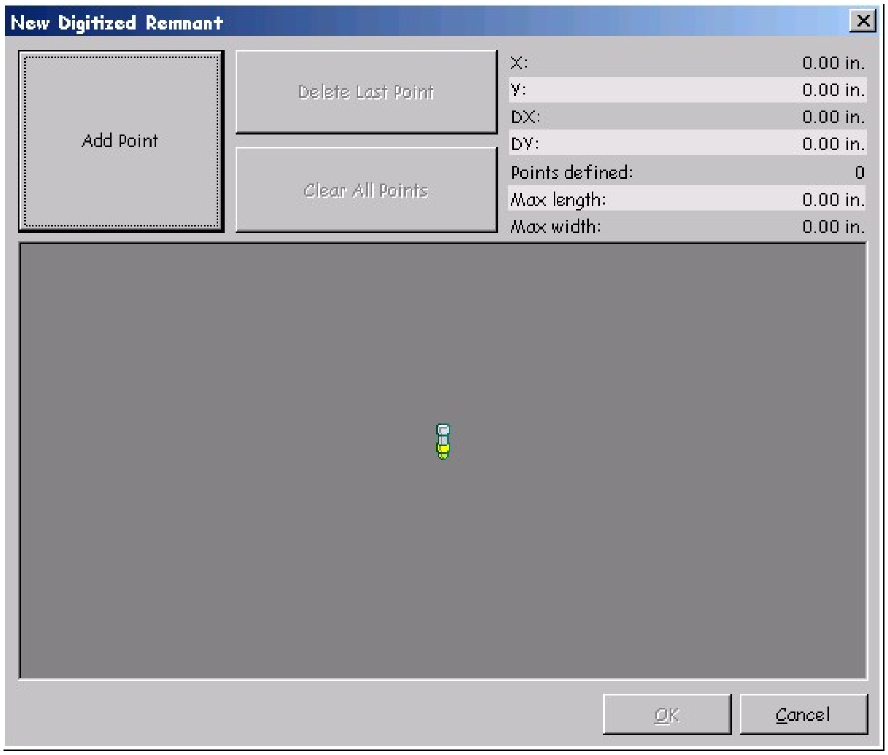


Figure 11 - The TurboNest Digitized Remnant Screen

As more points are added the graphics will begin to display a likeness of the remnant. When the last point is Added, Press "**OK"** to exit the remnant digitizing process. At this point, the graphics should display the remnant that was just digitized.

DO NOT MOVE THE MACHINE

Press the Green "***Start AutoNest"*** icon or press "***F2***" if a keyboard is connected. The parts will nest on the newly created remnant.

Save the nest and exit to the Run Screen. It is important to not that the machine must not be moved after the nest is complete. The machine is located where the new nest will start.

The final step is to go to "***Run***" and cut the part.

AXES COMPENSATION OPTION

(AO-70381 REV AA)

OPTION

AC

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

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1 AXES COMPENSATION OPTION

1.1 SCOPE

This document identifies the implementation of the Axes Compensation, a.k.a. "Axis Mapping" in the Burny 10 product line. This document identifies the theory of operation, mapping files, and axes compensation value acquisition.

1.2 LICENSING AND ENABLING

The following steps should be performed by the administrator or service engineer for your system:

1. Obtain a valid Axes Mapping Option license key from Cleveland Motion Controls.
2. Enter the license key by following this sequence:
   Press **MENU** » Press **UTIL** » Press **Enable Password** » Enter the admin password » Press **OK** » Press **System Setup** » Press **Miscellaneous Setup** » Press **License** » Press the "Options License Key" button » Enter a valid license key » Press **OK** » Press **OK**.
3. Enable the Axes Mapping Option. Continuing from Step 2, follow this sequence:
   Press **OCX Options** » Press **Next Page** » Press the button under "Axes Mapping" until it reads "CMC Axes Mapping"» Press **OK** » At the *Warning: Reboot Screen*, press **OK**.
4. Reboot the Burny. Continuing from Step 3, follow this sequence:
   Press **Return** » Press **Return** » Press **Shutdown** » Press **OK** » When prompted, turn off the Burny power switch » Wait 30 seconds » Turn on the Burny power switch.

1.3 MACHINE ACCURACY MAPPING INTRODUCTION

The Burny 10 product line compensates for inaccuracy in ball screws or machine drive racks to achieve better accuracy than would be possible with just the mechanical systems. This process is generally referred to as "mapping". Readings from a measurement device, such as a laser interfrometer, are analyzed and a correction factor applied to compensate for deviations of "expected" versus "actual" axis position.

One method to acquire the correction data is through the use of a laser interferometer. Using a series of mirrors and prisms the exact position of the torch on each axis is measured. The mapping process consists of the Burny control moving the cutting tool a specific distance and then the laser measures the actual distance moved. A data table is built showing the deviation between the "expected" moved distance and the "actual" moved distance. The system uses these tables to compensate for the deviations during the torch/axis movement, modifying the encoder feedback data used by the position loop.

The cutting table must have repeatable homing capabilities since the position corrections are based upon the absolute position of the axis on the table. Compensation is NOT applied until homing has been performed.

1.4 BASIC MOTION CORRECTION FUNCTIONALITY

Two types of positional errors are considered, Linear and Curvature. The Linear compensation eliminates positional errors for each axis and Curvature compensation eliminates positional errors caused the by the position of the opposing axis.

1.4.1 LINEAR COMPENSATION

Linear errors occur on each of the machine axes (X, XX and Y) due to inaccuracies in the machine drive rack, errors in the joints between adjacent rack sections, or tolerance errors in ball screw or other drive mechanisms. The most prominent positional system uses encoder feedback from the drive motor itself. Any error in the accuracy of the mechanical transmission system results in a error in the part being cut. If an axis was supposed to move 1.00 inches, but the mechanics caused an actual movement of 1.01 inches, the extra .01 inch is not known to the controller since it only sees that the motor has turned the proper amount. To eliminate this error, a linear compensation is applied for each axis.

1.4.2 CURVATURE COMPENSATION

Curvature errors involve the interaction between the two orthogonal axes on the machine. The curvature error is the error caused in one axis's position based on the mechanical straightness of the opposites axis mechanical system. To eliminate this positional error, each axis is compensated for the position of the opposing axis. That is to say, X is compensated based upon the Y axis position. The same applies for the XX and Y axes.

1.5 COMPENSATION DATA ACQUISITION USING A LASER INTERFEROMETER

This section suggests the use of a Laser Interferometer to acquire the compensation data.

*During the acquisition of the data, the **Home Offset** values should be set to **0.000**.*

1.5.1 LINEAR DATA ACQUISITION

Figure 3 shows the typical setup for measuring the linear error using a laser. The controller is programmed to run a part program repeating a specific movement along the axis with a delay at each position, where the laser the laser measures the actual position. The control moves the entire length of the axis, reverses direction and stops at the same points from the opposite direction. This gives the position errors in both directions and can determine backlash in the gear train or mechanical errors in the gear or ball screw.

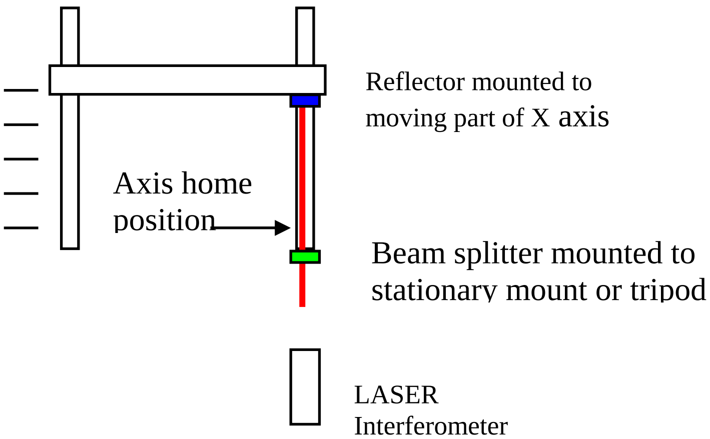

Figure 3 - Measurement of Linear Error in the X direction using a Laser

The same process is used to acquire the linear compensation for the XX and Y axes. The data is then put into the Axes Compensation Data file and presented to the Burny 10 controller. See the Axes Compensation File section for further details.

1.5.2 CURVATURE DATA ACQUISITION

Figure 4 shows the typical setup of the Laser Interferometer for a curvature compensation measurement. In this example the curvature of the X (Rail) axis of the machine is being measured. The Curvature measuring optical Beam Splitter is attached to the Y axis torch station and produces two beams. One is relative to the motion along the X axis only, and one is affected by motion in either the X or Y axis. The difference between these two beams is detected and yields a measurement of Y axis error. Since the Y axis was not moved by the controller during these tests, any movement detected in the Y axis was due to curvature in the X axis mechanical system.

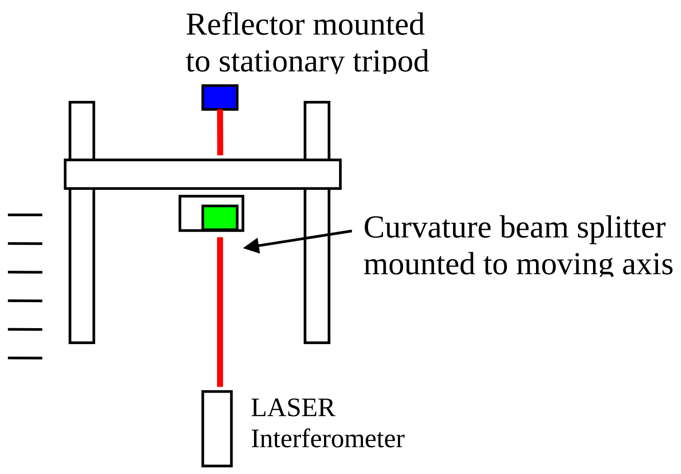

Figure 4 - Measurement of Linear Error in the X direction using a Laser

The same technique is used to acquire the X error due to Y axis movement. The data is then put into the Axis Compensation Data file and presented to the Burny 10 controller. See the Axes Compensation File section below for further details.

1.6 AXES COMPENSATION FILE

The Axes Compensation File is a flat-ASCII file, named **AxesComp.dat,** and contains the linear and curvature compensation data. This file is expected to be in the D:\BURNY\SYSTEMINI directory on the Burny 10 controller.

The file contains 5 sets of data; 3 linear and 2 curvature sets. The format of the file is as follows.

```
; Data acquired on 4/17/02
X            ; X axis linear data header
0, 0         ; needs this line
.1, 0.001
.2, 0.002
.3, 0.003
.4, 0.004
.5, 0.005
XX           ; XX axis linear data header
0, 0         ; needs this line
.1, -0.001
.2, -0.002
.3, -0.003
.4, -0.004
.5, -0.005
Y            ; Y axis linear data header
0, 0         ; needs this line
-.1, 0.005
-.2, 0.004
-.3, 0.003
-.4, 0.002
-.5, 0.001
XY           ; Change in Y axis based upon X axis curvature data
header
0, 0         ; needs this line
.1, 0.0001
.2, 0.0002
.3, 0.0003
.4, 0.0004
.5, 0.0005
```

```
YX          ; Change in X based upon Y axis curvature data header
0, 0        ; needs this line
.1, 0.0005
.2, 0.0004
.3, 0.0003
.4, 0.0002
.5, 0.0001
END
```

Each of the five sets of data has the same format. The "expected position" in meters followed by the "positional error" in meters.

Following is a list of constraints and considerations.

- The values must be separated by commas.
- An empty table is acceptable.
- A missing table is acceptable.
- Comments are acceptable on the same line following the data or section header.
- Comments on a separate line are acceptable. However, a comment on a separate line with in the data set indicates the end of that data set.

1.7 REVERSE COMPENSATION

For units using v4.0.4 / v4.3 software (and later), this option now supports a separate and optional compensation table for the Reverse direction. This table follows the same format as the Forward table. If only the Forward table exists (in D:\Burny\SystemIni\AxesComp.dat), then it is used in both directions. However, if the Reverse table data also exists (in D:\Burny\SystemIni\AxesCompRev.dat), then this data will be used in the Reverse direction.

Backlash can be included in the Reverse compensation data. If it is, the Burny motion parameters for each axis should then be set to 0.0 (zero). When a change of direction occurs, the instantaneous difference in the Forward and Reverse table compensation values is applied using backlash style correction. However, if the backlash is large, or the motor is dithering position when stopped instead of holding a steady position, then the backlash can be entered in each axis and can be left out to the compensation table data. The compensation is interpolated between mapped positions and is constantly applied. The backlash compensation is only applied when the part program motion causes an axis to reverse its direction.

SERCOS Digital Drives Option

(AO-70390 Rev AA)

Option

SDD

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

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1 THEORY OF OPERATION

1.1 OPTION IMPLEMENTATION

The SERCOS feature is implemented as an option and can be located by selecting the following sequence:

Utilities ⇒ System Setup ⇒ Misc. Setup ⇒ OCX Options ⇒ Option Page 3

Refer to the Section 7, Utility Mode for option licensing and enabling details.

1.2 START-UP

During start-up, the Burny 10LCD Plus "looks" for the Automata SERCOS PCI board and establishes communication with the installed drives. The Burny searches for the installed and enabled options, i.e. Rotary C and Slave X axis, and determines if the options, the number of drives and the drives' identification numbers comply. For more information on Drive identification numbers, refer to the Drive Identification table later in this document

After communication has been established, parameters are read from, and written to, the drives. The drives are queried for their units and scaling factors so that the Burny can communicate position in the same units as the drives. This allows the drives to be set-up by the installer in familiar distance units, i.e. Inches or Meters. For more information on drive parameters, refer to the Drive Parameter table in this document.

1.3 NORMAL OPERATION

When the start-up is complete, the Burny 10LCD Plus and the drives are capable of performing all normal functions. During normal operation, the Burny continuously receives position parameters from the drives/motors and sends position parameters back to the drives/motors every 2 milliseconds. Every two milliseconds, the Burny performs motion planning but does NOT perform PID or feedforward calculations, as this functionality is performed by the drives and motors.

1.4 HOMING

There are two homing operations available for X (XX) and Y axes with SERCOS enabled drives/motors:

- Home type 0 (manual homing)
- Home type 2

If any other Home Type is selected, the operation will immediately respond with a "Step Failed" message. For the optional Rotary C axis, Home Types 0 and 1 are supported. If C Axis rotational limits (windup) are used, then S-0-0076 bit 7 should be set to 0 = absolute format. If no rotational limits will be used, then S-0-0076 bit 7 should be 1 = Modulo format. Refer to Section 11B, Setup and Calibration Procedure, in this manual for more information on Homing.

1.5 ERROR HANDLING

During normal operation, the drives/motors are checked for errors and the Burny will enter an E-Stopped condition if any errors occur. When the front panel ***Stop*** button is cycled, the Burny determines if any drives/motors are in a fault condition and will issue a command to clear the errors in the drives/motors. This may allow the drives to be enabled and may cause the Burny to re-enter the Stop condition. Cycle the ***Stop*** button again to enable the drives.

2 INSTALLATION OVERVIEW

2.1 OVERVIEW

The ***SE***rial ***R***eal-time ***CO***mmunication ***S***ystem (SERCOS) feature is based upon the IEC-61491 Standard and uses digital drive technology to provide a different method to control motors. Essentially, the analog drive signals are replaced with digital drive signals. The analog drives, motors, cabling and associated hardware are replaced with digital drives (i.e. Indramat ECO drives from Bosch-Rexroth), corresponding motors, a PCI board in the Burny and fiber optic cables.

To install the SERCOS option, you must:

- Install of the SERCOS Interface PCI board into the Burny and identify it to the system as an RTX device
- Install the drives and motors
- Set-up drive parameters

2.2 REQUIREMENTS

To implement the SERCOS option you will need the following items:

- Burny 10 LCD Plus controller
- Fiber optic cabling
- SERCOS Interface PCI board
- SERCOS compatible drives or motors
- Optional limit switches
- Optional home switches

2.3 APPROVED EQUIPMENT LIST

We have approved the following items for use with the SERCOS option:

- Automata SERCOS PCI Board available from Burny
- Bosch/Rexroth Indramat ECO drives and motors with SMT firmware
- Bosch/Rexroth Indramat IndraDrives (firmware Rev 4 and higher) with Basic control section.
- Kollmorgen S300 drives (with SERCOS interface option card installed), Rev 1.31 or higher.

3 INSTALLING THE SERCOS PCI BOARD

1. Turn-off power to the Burny 10LCD Plus.
2. Open the front panel on the Burny.
3. Check to be sure that that the Motorola/Intel jumper is removed on the SERCOS PCI board.
4. Install the SERCOS PCI board into a PCI Slot. We recommend slot 1, which is closest to center of the motherboard.
5. Connect the two fiber optic cables to the connectors on the SERCOS Interface PCI Board.

For troubleshooting and future reference, mark the cables so that you know which one is plugged into the Transmit and Receive connectors.

6. Close and secure the front panel.

3.1 INSTALLING ON EARLY MODEL B10 LCD PLUS UNITS

In this section, we show you how to identify the SERCOS PCI Board to the system as an RTX supported device. You will need a keyboard and a mouse plugged into the Burny.

Based on the Burny 10 LCD Plus model number, different installation steps are necessary. For units with a model number MNT-13658 and greater (i.e. MNT-13668, MNT-13669), go to heading 3.2 . For all other models, continue with Step 1 below.

STEP 1 - SET THE IRQ IN THE BIOS.

1. Power-up the Burny and enter the BIOS setup by pressing the “Delete” button on the keyboard during the BIOS startup.
2. Locate the PCI configuration for the slot that contains the PCI card and change the IRQ address from “Auto” to “9”.
3. Exit and Save the BIOS configuration then, let the boot-up sequence continue and disable the auto-login feature by pressing and holding the Shift key until the log-in dialog box appears.

STEP 2 - CONFIGURE THE RTX INF FILE FOR THE SERCOS PCI BOARD.

1. Power-up the Burny and override the automatic login.
2. Login as burny_service. If the “New hardware wizard” starts up, select cancel to exit.
3. From the Windows Start menu, select **Control Panel ⇒ RTX Properties**.
4. Click on the Plug and Play tab.
5. Deselect “Show Filtered List”.
6. In the Windows directory tree, locate the SERCOS PCI board listed as the “Network Controller”. Note: There may be another network controller if you have one installed or if one resides on the motherboard. To verify that you have the correct “Network Controller”, right-click on the controller and select Properties from the menu. Check to see that the:
   - Device ID is set to 9050
   - Vendor ID is set to 10
7. Right-click on “Network Controller” and select “Add RTX INF support” from the menu.
8. Click “OK” on the dialog box.
9. If the RTX Properties window does not close, press the “OK” button to dismiss it.

STEP 3 - REMOVE THE SERCOS PCI BOARD AS A WINDOWS DEVICE.

1. From the Windows Start menu, open the Control Panel and then click on the System icon.
2. Select the “Hardware” tab.
3. Select “Device Manager” from the dialog box.
4. Locate the SERCOS PCI board shown as “Network Controller” in the Windows directory tree.
5. Right-click on the SERCOS PCI board “Network Controller” and select uninstall from the menu. Answer any remaining windows to remove the device.

STEP 4 - DISABLE THE USB DRIVER.

You may encounter a driver conflict between the SERCOS PCI Board interrupt and one of the USB drivers. To identify the conflict and disable the driver, do the following:

1. Open the Windows-XP “Device Manager”.
2. Locate the “Universal Serial Bus controllers” folder and click the plus sign to expand the driver list.
3. Find the USB driver that is using interrupt IRQ 9 and disable it by right-clicking and selecting “Disable” from the menu.
4. Cycle power on the unit and override the automatic log-in by holding down the Shift key.
5. Log-in as burny_service.

STEP 5 - COMPLETE THE INSTALLATION OF THE SERCOS PCI BOARD AS AN RTX SUPPORTED DEVICE.

When the log-in is completed, the “New Hardware Found Wizard” displays. Press “Next” and then “OK” in the dialog boxes to complete the installation of the SERCOS PCI board as an RTX supported device.

STEP 6 - VERIFY INSTALLATION OF THE SERCOS PCI BOARD

1. From the Windows Start menu, select Control Panel ⇒ RTX Properties. Select the “Plug and Play” tab and locate the “Network Controller” on the RTX directory tree.
2. Right-click on the “Network Controller” and select “Properties” from the menu.
3. Verify that the Properties dialog box shows the following information:

Device Type:	RTX
Device ID:	9050
Vendor ID:	10
Location:	PCI bus 0/1/2,, devid, function 0
Slot Number:	0/1/2,…
IRQ	9
Disposition:	Device Exclusive
Status:	RTX PnP Device is setup properly

3.2 INSTALLING ON LATE MODEL B10 LCD PLUS UNITS

Based on the Burny 10 LCD Plus model number, different installation steps are necessary. For units with a model number MNT-13658 and greater (i.e. MNT-13668, MNT-13669), go to Step 1 below. For all other models, go back to heading 3.1 .

STEP 1 – SET THE IRQ IN THE BIOS.

1. Power-up the Burny and enter the BIOS setup by pressing the "Delete" button on the keyboard during the BIOS startup.
2. Locate the PCI configuration for the slot that contains the PCI card and change the IRQ address from "Auto" to "5".
3. Exit and Save the BIOS configuration then, let the boot-up sequence continue and disable the auto-login feature by pressing and holding the Shift key until the log-in dialog box appears.

STEP 2 - CONFIGURE THE RTX INF FILE FOR THE SERCOS PCI BOARD.

1. Power-up the Burny and override the automatic login.
2. Login as burny_service. If the "New hardware wizard" starts up, select cancel to exit.
3. From the Windows Start menu, select Control Panel ⇒ RTX Properties.
4. Click on the Plug and Play tab.
5. Deselect "Show Filtered List".
6. In the Windows directory tree, locate the SERCOS PCI board listed as the "Network Controller". Note: There may be another network controller if you have one installed or if one resides on the motherboard. To verify that you have the correct "Network Controller", right-click on the controller and select Properties from the menu. Check to see that the:
7. Device ID is set to 9050
8. Vendor ID is set to 10
9. Right-click on "Network Controller" and select "Add RTX INF support" from the menu.
10. Click "OK" on the dialog box.
11. If the RTX Properties window does not close, press the "OK" button to dismiss it.

STEP 3 - REMOVE THE SERCOS PCI BOARD AS A WINDOWS DEVICE.

1. From the Windows Start menu, open the Control Panel and then click on the System icon.
2. Select the "Hardware" tab.
3. Select "Device Manager" from the dialog box.
4. Locate the SERCOS PCI board shown as "Network Controller" in the Windows directory tree.
5. Right-click on the SERCOS PCI board "Network Controller" and select uninstall from the menu. Answer any remaining windows to remove the device.

STEP 4 - COMPLETE THE INSTALLATION OF THE SERCOS PCI BOARD AS AN RTX SUPPORTED DEVICE.

Reboot the Burny and logon as burny_service by holding the shift key during boot.

When the log-in is completed, the SERCOS PCI board should automatically be installed. Continue with the next step.

STEP 5 - VERIFY INSTALLATION OF THE SERCOS PCI BOARD

1. From the Windows Start menu, select Control Panel ⇒ RTX Properties. Select the “Plug and Play” tab and locate the “Network Controller” on the RTX directory tree.
2. Right-click on the “Network Controller” and select “Properties” from the menu.
3. Verify that the Properties dialog box shows the following information:

Device Type:	RTX
Device ID:	9050
Vendor ID:	10
Location:	PCI bus 0/1/2,, devid, function 0
Slot Number:	0/1/2,…
IRQ	5
Disposition:	Device Exclusive
Status:	RTX PnP Device is setup properly

4 INSTALLING DRIVES AND MOTORS

1. Install the drive(s) and motor(s). For more specific information about motor and mounting connections, refer to the manufacturer’s installation manual.
2. Connect the fiber optic cables to the appropriate connectors on the drive.

5 SETTING-UP DRIVE PARAMETERS

5.1 DRIVE IDENTIFICATION NUMBERS

Use the following table to set the drive’s SERCOS ID numbers. Refer to the manufacturer’s documentation to set the drive ID (address).

Axis Designation	Drive ID number	
X (Master)	1	Required
Y	2	Required
XX (Slave X)	3	Optional
C	4	Optional

5.2 FIBER OPTIC BAUD RATE

Ensure that the SERCOS Communication Baud Rate is set to 4 M-baud. Refer to the manufacturer’s documentation to set the baud rate.

5.3 DRIVES/MOTORS PARAMETERS

Use the manufacturer's software tool, i.e. Indramat DriveTop for ECODrive03, Indramat IndraWorks-D for IndraDrive, or DriveGUI version 1.30 Build 0051 or higher for Kollmorgan S300, and the following table to set the drive parameters.

5.3.1 INDRAMAT ECODRIVE AND INDRADRIVE:

Description	SERCOS ID	Value	Comments
Minimum AT transmit starting time (T1min)	S-0-0003	--	Leave as factory default.
Transmit/receive transition time (TATMT)	S-0-0004	--	Leave as factory default.
Minimum feedback acquisition time(T4min)	S-0-0005	--	Leave as factory default.
Receive to receive recovery time (TMTSG)	S-0-0088	--	Leave as factory default.
Command value transmit time (TMTSG)	S-0-0090	--	Leave as factory default.
Slave arrangement (SLKN)	S-0-0096	--	Leave as factory default.
Primary Mode of Operation	S-0-0032	0x0003	Position control with encoder 1 with lag.
Position Polarities	S-0-0055	0x0000	Positive. Please note that the "Invert Encoder" parameter in the Burny is used for motor direction.
Position data scaling type	S-0-0076		Bit 2-0 = 001 Linear, 010 = Rotary, Set to Linear for X, Y, XX; Set to Rotary for C Axis. Bit 3 = 0, Preferred scaling Bit 4 = 0, Meter, 1= inch Bit 5 = 0, Reserved Bit 6 = 1 Referenced "to the load" Bit 7 = 0, Absolute. Use for X and Y linear, and for Rotary C if rotational limits are used. Bit 7 = 1, Modulo. Use for Rotary C if NO rotational limits are used. Bit 8 – 15 = 0, Reserved
Linear position data scaling factor	S-0-0077	--	Leave as factory default.
Linear position data scaling exponent	S-0-0078	--	Leave as factory default.
Rotational position resolution	S-0-0079	--	Leave as factory default.
Position feedback 1 type	S-0-0277	0x40 or 0x00	Bit 0 = Rotary (0), Linear(1) Bit 1 = 0 Bit 3 = 0 Non inverted. Bit 6 = Incremental (0) or Absolute (1) Bit 7 = Absolute encoder active (0)
Allocation of real-time status Bit 1	S-0-0305	400 Decimal "S-0-0400"	Set to provide Home Switch status in motor status information. Required for Home Type 2.
Allocation of real-time status Bit 2	S-0-0307	32991 "P-223"	Set to provide the E-Stop input status, if applicable.
Travel Limit Parameter	P-0-0090	0x07	Bit 0 = Active high (0), Active Low (1) Bit 1 = Travel Limit Active (1) Bit 2 = Handled as error (0), Handle as warning (1).

5.3.2 KOLLMORGEN S300 DRIVE:

Description	SERCOS ID	Value	Comments
Minimum AT transmit starting time (T1min)	S-0-0003	--	Leave as factory default.
Transmit/receive transition time (TATMT)	S-0-0004	--	Leave as factory default.
Minimum feedback acquisition time(T4min)	S-0-0005	--	Leave as factory default.
Receive to receive recovery time (TMTSG)	S-0-0088	--	Leave as factory default.
Command value transmit time (TMTSG)	S-0-0090	--	Leave as factory default.
Slave arrangement (SLKN)	S-0-0096	--	Leave as factory default.
Primary Mode of Operation	S-0-0032	0x0003	Position control with encoder 1 with lag.
Position Polarities	S-0-0055	0x0000	Positive. Please note that the "Invert Encoder" parameter in the Burny is used for motor direction.

Position data scaling type	S-0-0076		Bit 2-0 = 001 Linear, 010 = Rotary, Set to Linear for X, Y, XX. Set to Rotary for C Axis. Bit 3 = 0, Preferred scaling Bit 4 = 0, Meter units Bit 5 = 0, Reserved Bit 6 = 1 Referenced "to the load" Bit 7 = 0, Absolute. Use for X, XX and Y linear, and for Rotary C axis if rotational limits are used. Bit 7 = 1, Modulo. Use for Rotary C axis if NO rotational limits are used. Bit 8 – 15 = 0, Reserved
Linear position data scaling factor	S-0-0077	1	Scaling factor of 1
Linear position data scaling exponent	S-0-0078	-7 (0xFFF9)	Exponent of 10-7
Rotational position resolution	S-0-0079	--	Leave as factory default.
Position feedback 1 type	S-0-0277	0x40 or 0x00	Bit 0 = Rotary (0), Linear(1) Bit 1 = 0 Bit 3 = 0 Non inverted. Bit 6 = Incremental (0) or Absolute (1) Bit 7 = Absolute encoder active (0)
Allocation of real-time status Bit 1	S-0-0305	400 Decimal "S-0-0400"	Set to provide Home Switch status in motor status information. Required for Home Type 2. Burny configures this IDN during startup.
Allocation of real-time status Bit 2	S-0-0307	--	Unused.

The following table lists the parameters set by the Burny during the initialization, startup phase or homing.

Description	**SERCOS ID**
AT Transmission starting time (T1)	S-0-0006
Feedback acquisition starting time (T4)	S-0-0007
Command valid time (T3)	S-0-0008
MDT Transmit starting time (T2)	S-0-0089
NC Cycle time (Tncyc)	S-0-0001
SERCOS Cycle time (Tscyc)	S-0-0002
Length of master data telegram	S-0-0010
Telegram type parameter	S-0-0015
Beginning address in master data telegram	S-0-0009
Custom amplifier telegram configuration list for Current Position (S-0-0051) and, for Indramat:: Limit Switch Status (P-0-0222) and following error (S-0-0189). For Kollmorgen, Current Position (S-0-0051), and Digital Input 3 (IDNP 3032) as Positive Travel Limit and Digital Input 4 (IDNP 3033) as Negative Travel Limit.	S-0-0016
Configuration list of the master data telegram for positional drive command (S-0-0047)	S-0-0024
Reference distance 1	S-0-0052
Clear Error (Command)	S-0-0099
C100 Communication phase 3 transition check (Command)	S-0-0127
C200 Communication phase 4 transition check (Command)	S-0-0128
C600 Drive controlled homing procedure command	S-0-0148
Homing parameter	S-0-0147
C300 Set Absolute measurement (Indramat absolute encoder only.)	P-0-0012
Digital Input 1 Configuration, set to Mode=12, use as Home Switch (Kollmorgen only.)	IDNP 3000 (35,768)
Digital Input 3 Configuration, set to Mode=2, use as Positive Travel Limit switch (Kollmorgen only.)	IDNP 3002 (35,770)
Digital Input 4 Configuration, set to Mode=3, use as Positive Travel Limit switch (Kollmorgen only).	IDNP 3003 (35,771)

5.4 MOTION PARAMETERS

The Burny 10LCD Plus uses the parameters as described in Section 11B, Setup and Calibration Procedure, with the exception of those listed in the following table.

Description	Location	Value
Proportional Gain	Axis[X,Y,XX,C] ⇒ w_DefaultPGain	Set to 0. *
Integral Gain	Axis[X,Y,XX,C] ⇒ w_DefaultIGain	Set to 0. *
Derivative Gain	Axis[X,Y,XX,C] ⇒ w_DefaultDGain	Set to 0. *
Acceleration Feedforward	Axis[X,Y,XX,C] ⇒ w_DefaultAff	Set to 0. *
Velocity Feedforward	Axis[X,Y,XX,C] ⇒ w_DefaultVff	Set to 0. *
Encoder ticks per meter	Axis[X,Y,XX,C] ⇒ w_TicksPerMeter	Set to 0. *
Absolute Encoders	Axis[X,Y,XX,C] ⇒ Absolute Encoders	False or True.
Following error limit	Axis[X,Y,XX,C] ⇒ w_FollowingErrorLim	Set Note 1.
Invert Power Amp	Axis[X,Y,XX,C] ⇒ w_InvertPwrAmp	Set to false.
Zero-volt offset	Axis[X,Y,XX,C] ⇒ w_ZeroOffset	Set to 0. *
Fatal following error	Axis[X,Y,XX,C] ⇒ w_EstopFollowingErrorLim	Set Note 1.

* Or leave as factory default.

Note 1: Set this value to about 5 millimeters (50 for Fatal Following Error) greater than the following error as viewed on the Oscilloscope screen. Refer to Section 11B, Setup and Calibration Procedure.

6 USING ABSOLUTE ENCODERS (INDRAMAT ONLY)

During the initialization of the drives, the drive is queried for its encoder type (S-0-0277). If the encoder is an absolute type, the Burny will consider that axis to be homed automatically and makes the Software Limits active. If not, the system has to be homed each time the Burny is powered-up.

The Data Dictionary item, Axis[X | Y | C] ⇒ WorldIn ⇒ Absolute Encoder, indicates TRUE if absolute encoders are recognized from the drive, else this value is FALSE.

7 USING HOME SWITCHES

Home switches can be used for Home Type 2. They can either be connected to the Burny 10 back panel directly or to the drive. Refer to the respective manual for connection points.

When using the Home Switches connected to the drive itself, it is required to set S-0-0305 to 400 (decimal) in order to have the Home Switch Status available during the home procedure.

Indramat Drives: It is possible to use the home switch as a limit switch. Connect/Jumper the home switch input to the appropriate limit switch input (ECO X3-2/3). See “Using Limit Switches”.

8 USING LIMIT SWITCHES

8.1 WITH INDRAMAT DRIVES

The Burny is setup to recognize travel limit switches. It is important to wire the limit switches for the correct operation when jogging off the switch.

During initialization, the Indramat drive is queried for its Travel Limit Switch configuration (P-0090) and will adjust the evaluation of the switch’s inputs appropriately. This includes active and inversion settings.

Ensure that the drive’s direction parameter is set to positive (ECO S-0-0055 = 0).

If the Invert Encoder parameter is false, connect the limit switch at the positive travel limit side to the “positive” limit switch input (ECO drive X3-3) and the limit switch at the negative travel limit side to the “negative” limit switch input (ECO drive X3-2).

If the Invert Encoder parameter is true, connect the limit switch at the positive travel limit side to the “negative” limit switch input (ECO drive X3-2) and the limit switch at the negative travel limit side to the “positive” limit switch input (ECO drive X3-2).

It is possible to use the limit switch as home switches. Connect/jumper the appropriate limit switch input to the “reference” input (ECO X3-1). See “Using Home Switches”. Be aware that the home switch input is active high.

8.2 WITH KOLLMORGEN DRIVES

The Burny is setup to recognize travel limit switches. It is important to wire the limit switches for the correct operation when jogging off the switch.

Use DriveGUI to set up each S300 drive as follows: Set the Mode for Digital Input 3 to be 30, and set the Command to Echo. Likewise, set the Mode for Digital Input 4 to be 30, and set it for Command Echo. In this way, the Burny will enunciate and handle the Travel Limit inputs, instead of having the drive handle them. The travel limits are active low.

For X and Y axes connect the positive Travel Limit to the PStop input (DigIn 3) and the negative limit to the NStop input (DigIn 4). If a Slave (XX) axis is present, jumper the Master (X) axis limit switches to the XX drive, remembering to cross them over if the XX axis spins in the opposite direction of the X axis. If X and XX rotate in opposite directions, then connect the X Axis Positive Travel limit to the NStop input on the XX drive, and connect the Negative Travel limit of X to the PStop input of the XX drive.

9 USING EXTERNAL STOP SWITCHES

9.1 WITH INDRAMAT DRIVES

The Burny recognizes an "External E-Stop" condition when the input is connected directly to the drives. Ensure the Real Time Status 2 is set appropriately (ECO S-0-0307 = 32991). Connect an active low (0V = active) signal to the drive's E-Stop input (ECO X3-6). When the signal goes low, the Burny stops all motion and changes the status bar to yellow. When the signal goes high (No E-Stop condition), the motors become active and status bar changes back to while.

Be aware that when the input signal is satisfied, that the drive/motors may be active immediately.

9.2 WITH KOLLMORGEN DRIVES

The Burny recognizes an "External E-Stop" condition when the input is connected directly to the drives. Connect an active low (0V = active) signal to the drive's Digital Input 2. When the signal goes low, the Burny stops all motion and changes the status bar to yellow. When the signal goes high (No E-Stop condition), the motors become active and status bar changes back to while.

Be aware that when the input signal is satisfied, that the drive/motors may be active immediately.

10 TROUBLESHOOTING

10.1 DIAGNOSTIC SCREEN

When the SERCOS option is licensed and enabled, the Burny Utility-Diagnostic section will have a “SERCOS” button. When pressed, the status and current communication phase for 4 motors are displayed. The drive status word (S-0-0135) has the following bit pattern and is valid only when the communication phase is 4 for all active drives/motors.

Bit Location	Drive Status Word Description (S-0-0315)
Bits 0-2	Control Information for service channel.
Bit 5	Bit change command
Bits 6 & 7	Real time status bits. Bit 6 is Home switch when configured. (via S-0-0305) Bit 7 is the External E-Stop when configured. (via S-0-0307, Indramat only.)
Bits 8 & 9	Type of operation, should be 0 for primary mode
Bit 11	Bit change for Class 3 diagnostics
Bit 12	Bit change for Class 2 diagnostics
Bit 13	Drive lock error, error in Class 1 diagnostics
Bits 14 & 15	00 = Drive not ready 01 = Ready to switch on power 10 = Control and power supplies ready for operation, torque free 11 = In operation and under torque.

The status when in (E)-Stop is 0x8001 or 0x8000. When the Indramat drives are powered and in normal operation, the status is 0xc801 or 0xc800. For Kollmorgen drives, the normal operation status is 0xC000 or 0xC001.

10.2 DISTORTION LED’S.

If there is difficulty starting and initializing the drives/motors, the Burny will repeatedly go into (E)-Stop condition. This can occur due to communication failure between the Burny and the drives. There are red “distortion LED” on each drive as well as on the SERCOS board in the Burny. If any of these red LED’s are illuminated, the SERCOS fiber optic ring is not complete. This may be caused by improper wiring of the fiber optic cables (i.e. transmit is connected to transmit) or the fiber optic cables are bad, broken or loose.

If there are problems and the red LED’s are not illuminated, be sure that the baud rate settings on the drives are set to 4 Mbaud.

The green LED on the SECOS board is controlled by the Burny motion engine. If everything is functioning properly (the SERCOS ring is complete, the SERCOS board's interrupt is properly configured and the Burny application is running), the green LED will flash 2 to 3 times per second. If the green LED is ON solid or OFF solid, then the SERCOS board’s interrupt is not properly configured.

10.3 STATUS CODES

The Data Dictionary contains two entries to assist in troubleshooting the SERCOS option.

10.3.1 SERCOS ENABLED

IOCMC ⇒ StatusOut ⇒ SercosEnabled is TRUE when the option is licensed and enabled, otherwise it's FALSE.

10.3.2 SERCOS RTE STATUS

CNCCoor ⇒ WorldOut ⇒ SercosErrNum has the following values and meanings:

Value	Description
0	SERCOS Completed initialized and OK.
-1	SERCOS not enabled
1 thru 10	Initialization of internal procedures and functions
11	Failed to switch to Phase 0 during initialization.
12	Failed to switch to Phase 1 during initialization.
13	Failed to switch to Phase 2 during initialization.
14	Failed to read and/or write some setup parameter
15	Failed the S-0-0127 Command (C100 Communication phase 3 transition check)
16	Failed to switch to Phase 3 during initialization.
17, 18	Failed the S-0-0128 Command (C200 Communication phase 4 transition check)
19	Failed on clearing errors (S-0-0099)
20	Failed to switch to Phase 4 during initialization.

10.4 DRIVE LED CODES

In most cases, the manufacturer of the drive/motor manufacturer has diagnostic information available about the drive. Indramat drives for example, displays a two-character LED on the drive. For more information about the codes, refer to the drive manufacturer's manual.

The following table lists the most common codes when using Indramat ECO drives:

LED Code	Description	Possible solution(s)
C406	Failure to switch to operational mode	There is a parameter that is incorrectly set. Connect "DriveTop" and switch between parameter mode and operational mode. "DriveTop" will then display the incorrectly set parameter. Make the necessary changes to the errant parameters.
F237	Excessive position command difference	This is caused when the Burny commands a position that is too great according to the parameters in the drive. This may be caused by an acceleration that is too high. Reduce the Max Acel parameter.
F226	Undervoltage in power section	There is no 230V or 460 V power supplied to the drive. Apply the main power to the drive.
E834	E-Stop active	Apply power to the E-Stop input on the drive.
E843	Positive Limit Switch active	Jog off the travel limit switch
E844	Negative Limit Switch active	Jog off the travel limit switch
bb	Ready for operation	Parameters are OK and the drive is ready to have main power applied.
Ab	Drive is ready	Drive has main power and is ready to be enabled.
AF	Drive is active	Drive can be used.
P0	Phase number	Indicates the drive is ready to communicate with the host (Burny) controller.

For IndraDrive and Kollmorgan S300 errors, please refer to their manufacturer's documentation.

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Rotary C Axis Option
(AO-70389 Rev AA)

Option
RCA

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

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1 ROTARY C AXIS OPTION

1.1 INTRODUCTION

The ***Rotary C Axis Option*** provides a means to bevel cut one or both edges of the part at the same time the basic ***X/Y*** shape is being cut. An active bevel torch must be rotated so that it cuts perpendicular to the direction of travel. The primary torch that cuts square to the plate also rotates but its center is aligned with the axis of rotation. Torches used with this option must have no limit on rotation.

The direction of the bevel torches in the ***X/Y*** plane is called the ***rotary axis***. When a part is being cut, this rotary axis stays perpendicular to the programmed cutting path. It does not change when path corrections are made or when the torch is jogged to restart and pierce in scrap material. Before the first cut is started, the torches are rotated to the correct position for the first cut.

The operator turns the ***Rotary C Axis*** function on and off in the ***Job Setup Screen*** (*Run02*). When the function is off, the torches rotate to their ***Home*** position. A marker operation, etc. can then be run correctly. The ***Home*** position is usually taken as the position of the torches when cutting in the ***+X*** direction on the right side of a plate. The torch rotary position appears on the ***Status Screen***. It has a value of 0 to 360 degrees.

The ***C Axis*** uses an encoder for homing and position reference. A full turn of the ***C Axis*** makes one full turn on the encoder. The ***C Axis*** is homed by finding the index mark on the encoder, then adding a ***C Axis Offset*** parameter that moves the torches to the ***+X Home*** position.

1.2 LICENSING AND ENABLING THE OPTION

The following steps should be performed by the administrator or service engineer for your system. Obtain a valid Rotary C Axis Option license key from Cleveland Motion Controls before beginning this procedure:

1) Enter the license key by following this sequence:
   Press MENU » Press UTIL » Press Enable Password » Enter the admin password » Press OK » Press System Setup » Press Miscellaneous Setup » Press License » Press the “Options License Key” button » Enter a valid license key » Press OK » Press OK.
2) Enable the C Axis Option. Continuing from Step 2, follow this sequence:
   Press OCX Options » Press the NONE button under “Rotary C” until it reads “CMC Rotary C” » Press OK » At the Warning: Reboot Screen, press OK.
3) Reboot the Burny. Continuing from Step 3, follow this sequence:
   Press Return » Press Return » Press Shutdown » Press OK » When prompted, turn off the Burny power switch » Wait 60-90 seconds » Turn on the Burny power switch.
4) After the Burny starts the option is ready to use.

1.2.1 DEFAULT VALUES

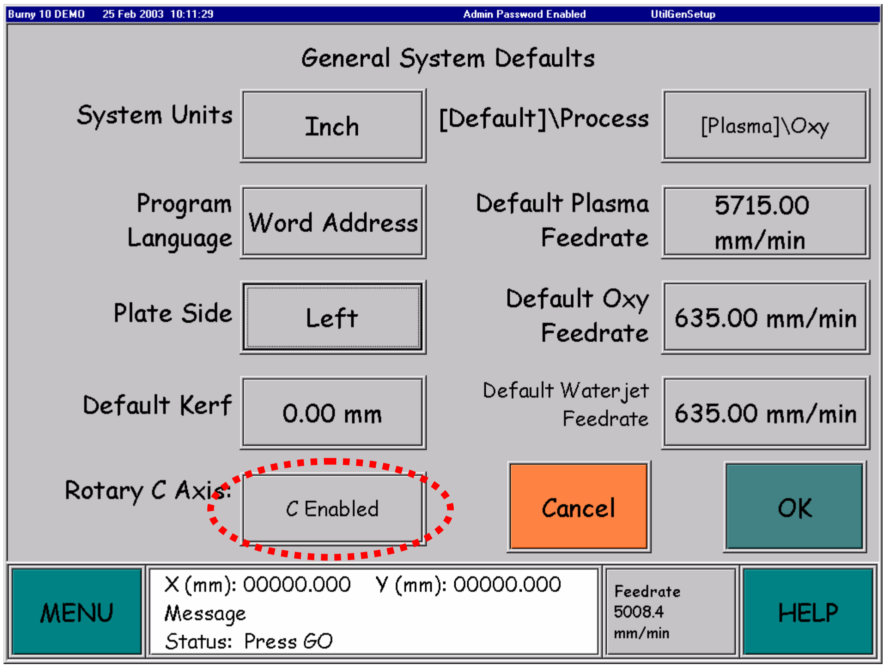

Figure 1 – General System Defaults Screen

The ***General System Defaults Screen*** (*UtilGenSetup*), shown in Figure 1, allows various default values to be set which are used by the ***Burny*** during power-up. The factory default setting for the Rotary C Axis Option *is* "*C Home / Held*". Other choices are "*C Enabled*" and "*C Immediate*". The value chosen here is the initial value displayed on the ***Job Setup Screen*** (Run02).

To access the ***General System Defaults Screen***, choose: Menu » Utils » System Setup » General Setup. The ***Burny's*** admin password must be enabled to make any changes.

1.3 JOB SETUP SCREEN (RUN02)

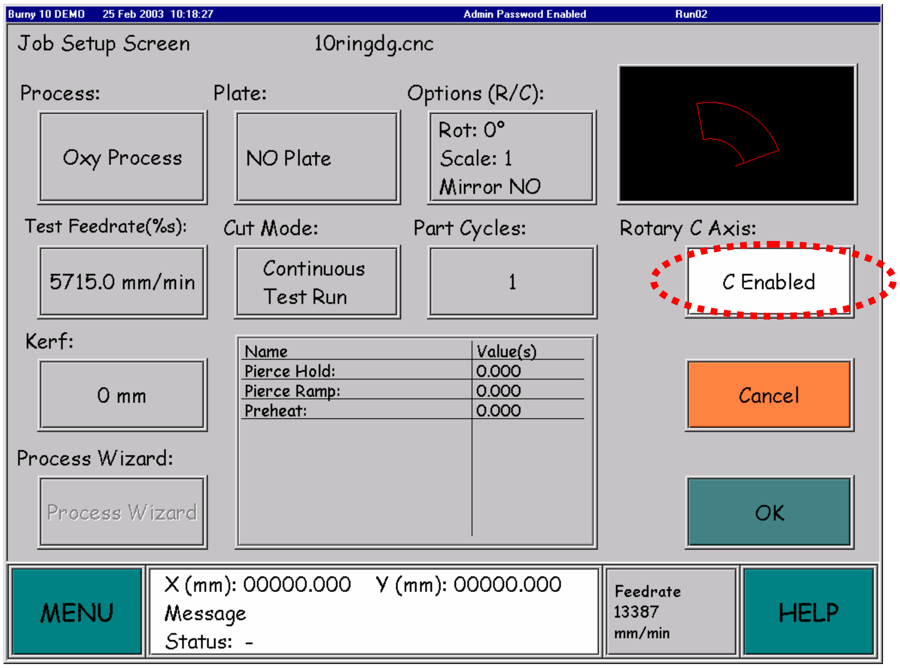

Figure 2 – Job Setup Screen (Run02)

The ***Job Setup Screen*** (Run02) is shown in Figure 2. If the ***Rotary C Axis Option*** is licensed and enabled, the "Rotary C Axis" button (circled in Figure 2) becomes available.

The operator can choose from three different states, depending upon the job's requirements:

> ***C Home/Held***: In this state, the button has a grey background and all auxiliary codes for controlling Rotary C functions are ignored. Some parameters are overridden with Aux codes in the part program but the ***C Home/Held*** state will ignore all Aux codes in the part program.
>
> ***C Enabled:*** In this state, the button has a white background and the Rotary C Axis follows all embedded M-Codes. For a part program with no C Axis oriented M-Codes, the C Axis will be perpendicular to the cut path (except during traverse).
>
> ***C Immediate***: In this state, the button has a white background and the Rotary C Axis follows any X/Y moves. In this state, the Enable and Disable M-Codes act immediately.

1.4 CURRENT C AXIS POSITION

The ***Status01*** screen, shown in Figure 3, displays the current angle of the C Axis in the "***C Current Angle***" box. To Access the ***Status01*** screen, simple touch the ***Status Window*** located on the ***Burny Toolbar***.

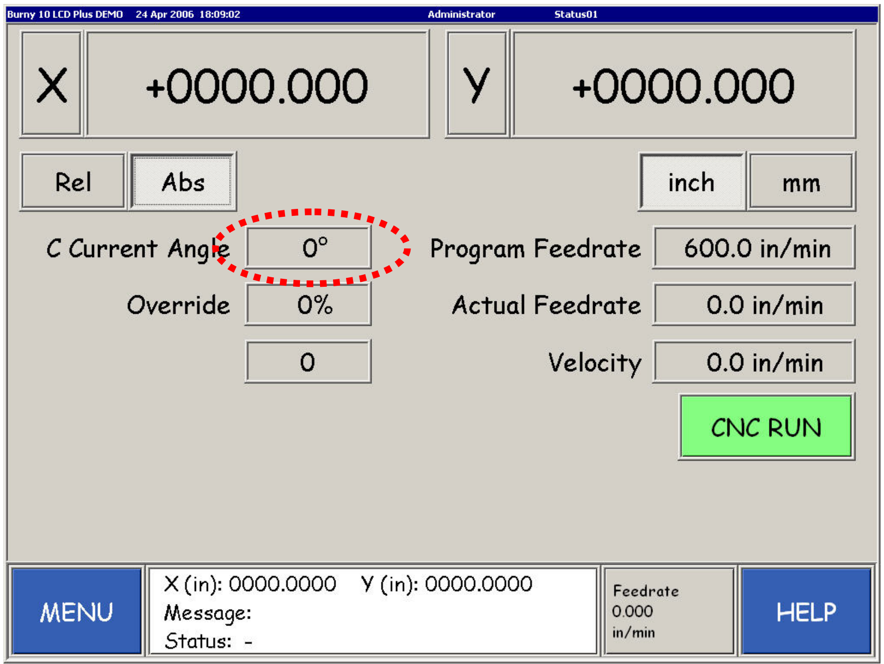

Figure 3 – Status Screen (Status01)

1.5 MOTION CONFIGURATION TABLE

The parameters used to setup and optimize the C Axis Option are located in the Motion Configuration Table shown in Figure 4. To access this screen (Util10), choose: MENU » Utils » System Configuration » Motion Configuration. Finally, touch the area circled below until it reads Axis C.

A brief description of each parameter follows. For more detailed information on these parameters, please consult Part 11B of this manual, Setup and Calibration.

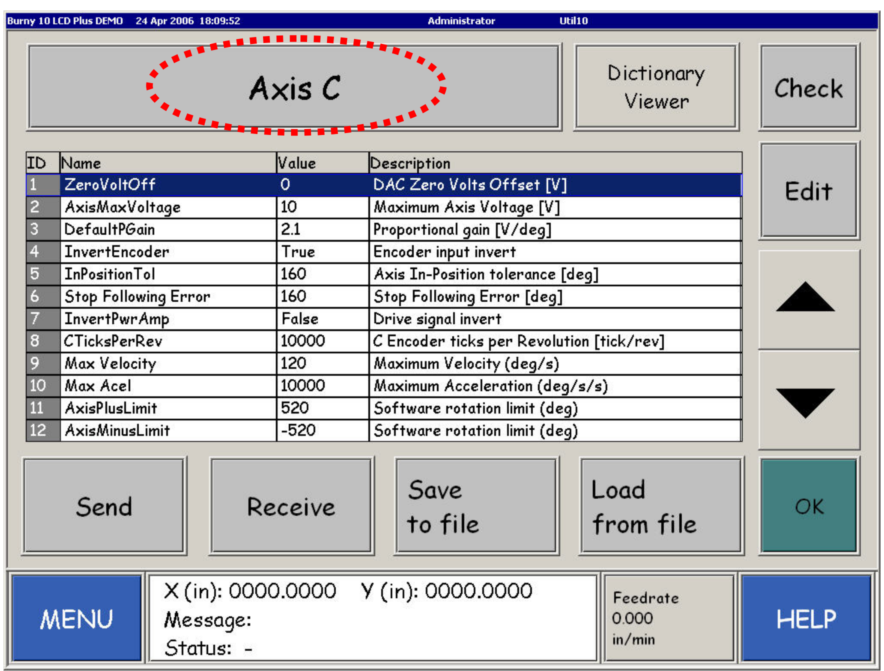

Figure 4 – Motion Configuration Screen for C Axis

DAC ZERO VOLT OFFSET ADJUST

This parameter allows the DAC output to compensate for a drift or offset in the servo system. Servo offset is normally temperature dependent so it is impossible to adjust for it with a fixed parameter. In most cases, this parameter should be left at 0.00 and the drive should be adjusted for minimal drift during the open loop tuning.

MAXIMUM VOLTAGE

This parameter sets the limit for the voltage output from the D/A converter for the C axis. Normally this parameter is set to 10 volts and the servo drive is adjusted for the desired maximum rotation speed. Some servo drives have a lower maximum voltage. Set this parameter to that maximum input voltage of the servo drive.

PROPORTIONAL GAIN

Sets the Proportional term in the PID loop error correction software. This parameter sets a gain value that multiplies any position error by this value and outputs the resulting value to the DAC as a correction. This value should be set as high as possible without causing oscillation in the machine.

INVERT ENCODER SIGN

Used to configure the encoder counting direction to the actual machine movement. Change the ***True***/***False*** setting to reverse the direction of the encoder counting.

IN POSITION TOLERANCE

This parameter defines the maximum error allowed between the expected position and the actual position, i.e. Following Error. Set this value to 160 degrees.

STOP FOLLOWING ERROR

Set this value to an acceptable limit that is slightly higher than the FollowingErrorLim parameter. This parameter should be set to a limit that keeps the machine from breaking if exceeded. If exceeded, the machine will go into a stop condition.

INVERT POWER AMPLIFIER SIGN

This parameter controls the polarity (positive or negative) for the DAC analog output voltage that is sent from the controller to the servo drives.

ENCODER TICKS PER REVOLUTION

Set this parameter to the number of encoder “ticks” which occur in exactly 360 degrees of rotation of the C axis. Note on systems using a gearbox between the feedback encoder and the output, there may be multiple rotations of the encoder for 1 revolution of the output C axis. Remember a 500-line encoder results in 2000 encoder ticks

MAX VELOCITY

Set the Maximum Velocity of rotation in degrees.

MAX ACEL

Set the Maximum Acceleration of rotation in degrees.

AXISPLUSLIMIT

AxisPlusLimit must be at least 480 degrees.

If the AxisPlusLimit and the AxisMinusLimit are not the same, then they are used to enforce rotational limits. When rotational limits are active, the ***GoTo Screen***: C Axis supports -360 to +360 in 45 degree increments and will unwind to the target position. During cutting, if the rotational limit is reached, program execution stops and the status bar turns white.

If the AxisPlusLimit and AxisMinusLimit are the same value, then no rotational or windup limit is enforced. In this case, the ***GoTo Screen***: C Axis will only show 0 to +360 in 45 degree increments.

AXISMINUSLIMIT

AxisMinusLimit must be at least -480 degrees. The minus sign (-) is required.

If the AxisPlusLimit and the AxisMinusLimit are not the same, then they are used to enforce rotational limits. When rotational limits are active, the ***GoTo Screen***: C Axis supports -360 to +360 in 45 degree increments and will unwind to the target position. During cutting, if the rotational limit is reached, program execution stops and the status bar turns white.

If the AxisPlusLimit and AxisMinusLimit are the same value, then no rotational or windup limit is enforced. In this case, the ***GoTo Screen***: C Axis will only show 0 to +360 in 45 degree increments.

1.6 HOMING CONFIGURATION TABLE

Each axis of the ***Burny Series 10*** uses homing parameters set up in the ***Homing*** table of the ***Motion Configuration*** screens. See Figure 5. The ***Rotary C Axis*** can use one of three types of ***Homing***. The ***CHomeType*** parameter can be set to 0, 1, or 6. See the explanation of these types below.

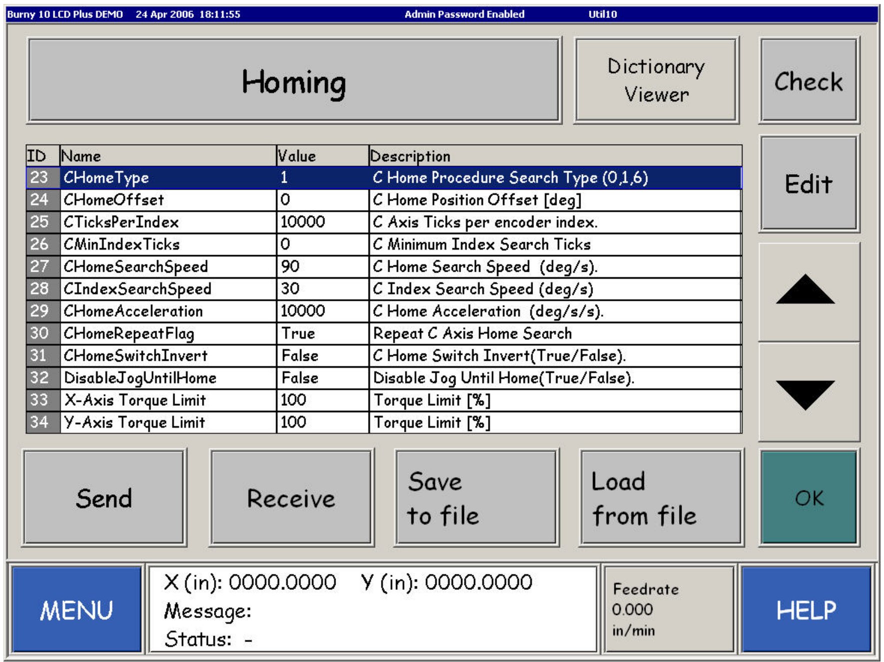

Figure 5 – Axis C Motion Configuration Screen

1.6.1 C HOME TYPE 0 – (POWER UP HOME LOCATION)

C Axis Home Type 0 saves the existing angle of the ***C Axis*** as the ***Home*** position when the ***Burny Series 10*** starts/boots. The "***CHomeRepeatFlag***" parameter will have no effect on resetting the ***C*** Axis home location.

1.6.2 C HOME TYPE 1 – (PHYSICAL LIMIT SWITCH)

C Axis Home Type 1 uses a physical (external) limit switch, called the ***C Axis Home Switch,*** which is sought during preparation for first pierce point. It will also look for this switch when a part program uses the ***C Axis Home & Hold AUX*** code function. There is a search limit of 720°. If the limit is reached without finding the ***C Axis Home Switch,*** the controller will hold the motion of X, Y, & C.

1.6.3 C HOME TYPE 6 – (AUTOMATIC HOME LOCATION)

C Axis Home Type 6 will rotate the ***C Axis*** until the encoder index marker is found (plus offset if any ***CHomeOffset***), during preparation for the first pierce of each part program or the first pierce after power up. The index pulse plus offset, if any, is sought when the part program specifies the ***Home & Hold AUX*** code function.

1.6.4 C AXIS HOME RESET

The ***C Axis*** can be forced to repeat the home sequence by using the ***Motion Configuration Homing Table***. The "***CHomeRepeatFlag***" parameter can be set to true and sent to the controller. The next time <***GO***> is pressed the ***C Axis*** will search for the ***Physical*** switch or the ***Encoder Index Pulse*** marker.

1.7 PROGRAMMED ON/OFF (AUX CODES)

The listings below apply to ***Word Address*** and/or ***ESSI*** programs as noted in each description. In ***Word Address***, use the ***M*** without brackets and the numerical portion. In ***ESSI*** programs, use only the numerical part.

1.7.1 [M]88 - C AXIS ENABLED

ASCII programmable AUX code for enabling the Rotary C axis

The [M]88 Word Address / ESSI code when used in a part program will allow the torch on the C Axis to stay perpendicular to the X & Y part contour.

1.7.2 [M]87 – C AXIS HOLD

ASCII programmable AUX code for disabling the Rotary C axis

The [M]87 Word Address / ESSI code, when programmed in a part program, will prevent the Rotary C Axis from moving or stop existing rotation while the X & Y axes are moving.

1.7.3 [M]86 – C AXIS HOME & HOLD

ASCII programmable AUX code for sending the Rotary C axis to a known position and then disabling the Rotary C Axis

The [M]86 Word Address / ESSI code, when programmed in a part program, will home the C axis and prevent C axis rotation while the X & Y axes are moving.

1.7.4 [M]85 – C AXIS NON-INVERT

ASCII programmable AUX code for returning the C Axis to a non-inverted (standard) position

The [M]85 Word Address / ESSI code, when programmed in a part program, will return the C Axis to standard orientation, when enabled.

1.7.5 [M]84 - C AXIS INVERT

ASCII programmable AUX code for inverting the C Axis position by adding a 180° offset

The [M]84 Word Address / ESSI code, when programmed in a part program, will cause the C Axis to operate at an orientation of 180º from standard when enabled.

1.7.6 M83KXX.X – MOVE/UNWIND THE C AXIS TO XX.X DEGREES

This Word Address command will move (and unwind, if rotational limits are in effect) the C Axis to the specified absolute position, and hold it there as long as desired. The Kxx.x angle is interpreted as a signed floating point number representing degrees. If a value (Kxx.x) is not provided, an angle of zero (K0.0) degrees is assigned.

Example:

M87	(Hold the C Axis at its current position, so the M83 can control the angle instead of using the computed orthogonal angle.)
M83K-37.5	(Move and unwind the C Axis to the absolute position of -37.5 degrees.)

If no rotational limits exist, then the M83K-37.5 command would cause the C Axis to take the shortest path to a position of 322.5 degrees.

Note: The M83Kxx.x command is processing even if M87 (C Axis Hold) is active. This is a result of needing to be in M87 hold mode to prevent the computed orthogonal angle from being used. Therefore, only one M87 is needed, followed by as many M83Kxx.x commands as necessary.

1.7.7 M82KXX.X – ADD OFFSET XX.X DEGREES TO THE COMPUTED ORTHOGONAL POSITION

This Word Address command allows an offset to be added to the computed orthogonal position of the C Axis. The offset amount is a signed, absolute angle from -360 to +360 degrees. If a value (Kxx.x) is not provided, an offset of zero (K0.0) degrees is assigned.

Notes:

1. Unloading a part program resets the orthogonal offset to 0 (zero).
2. The ***Status Screen*** shows the C Axis position rounded to the nearest degree.
3. An offset of +/-180 degrees is equivalent to the M85/M84 invert commands.

1.8 STATUS BAR MESSAGES

When the motion controller encounters a condition that requires operator intervention, the controller will hold motion and display a message in the status bar. These messages give the user information to resolve any issue and retry by pressing ***<GO>***.

1.8.1 ROTARY C MESSAGES FROM MOTION CONTROLLER

104 ERROR: C home-switch overrun	Message: *<Rotary C Home Switch not found>*
113 ERROR: C home-switch not found	Message: *<none>*
114 ERROR: C home-index not found	Message: *<none>*
119 Waiting for C Axis	Message: *<Controller is waiting for C Axis to move into position>*

1.8.2 AXIS LIMIT MESSAGES FROM THE MOTION CONTROLLER

101 ProgStop: Lost Arc	Message: *<Plasma arc lost during program execution>*
102 ProgStop: Following Error	Message: *<Following error exceeded during program execution>*
103 ProgStop: Soft Limit	Message: *<Soft limits exceeded during program execution>*
118 SW Limit	Message: *<Used on tool bar>*

Additional Isolated COM Ports Option

(AO- 70379 Rev AA)

Option

COM

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

Table of Contents

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1 ADDITIONAL ISOLATED COM PORTS OPTION

1.1 OVERVIEW

This option allows the Burny to use additional isolated COM ports above and beyond the standard offering.

It is important to use isolated COM ports when connecting any serial device to the Burny. This protects the Burny from potentially harmful electrical noise.

1.2 AVAILABLE CONFIGURATIONS

The tables below describe the kits needed to achieve the desired number of isolated COM ports. In some cases, the maximum number of isolated COM ports shown may require drilling holes in the Burny cabinet.

Table A - For Units Running Software v4.X or Earlier.

Kit Number *(Number of Isolated COM Ports Per Kit)*	**Burny Model Type**	**Number of Non-Isolated COM Ports**	**Number of Isolated COM Ports**	
			Standard	*Maximum*
MO-13608-1 *(1 port per kit)*	Burny 10	1	1	2 (one kit)
	Burny 10 LCD	1	1	2 (one kit)
	Burny 10 LCD Plus & OEM	2	1	2 (one kit)
MO-13608-2 *(2 ports per kit)*	Burny 10	1	1	5* (two kits)
	Burny 10 LCD	1	1	5* (two kits)
	Burny 10 LCD Plus & OEM	2	2	6* (two kits)
MO-13687 *(1 port per kit)*	Burny 10	1	1	1**
	Burny 10 LCD	1	1	1**
	Burny 10 LCD Plus & OEM	2	1	2 (one kit)
MO-13600 *(1 port per kit)*	Burny Phantom, 2 Axes *(with EPIA VIA motherboard)*	2	1	2 (one kit)
	Burny Phantom, 2 Axes *(with ITOX motherboard)*	3	1	3 (two kits)
MO-13600 *(1 port per kit)*	Burny Phantom, 3 Axes *(with EPIA VIA motherboard)*	2	2	2**
	Burny Phantom, 3 Axes *(with ITOX motherboard)*	3	2	3 (one kit)
MO-13600 *(1 port per kit)*	Burny Phantom ST, 2 or 3 Axes *(with EPIA VIA motherboard)*	2	1	2 (one kit)
	Burny Phantom ST, 2 or 3 Axes *(with ITOX motherboard)*	3	1	3 (two kits)

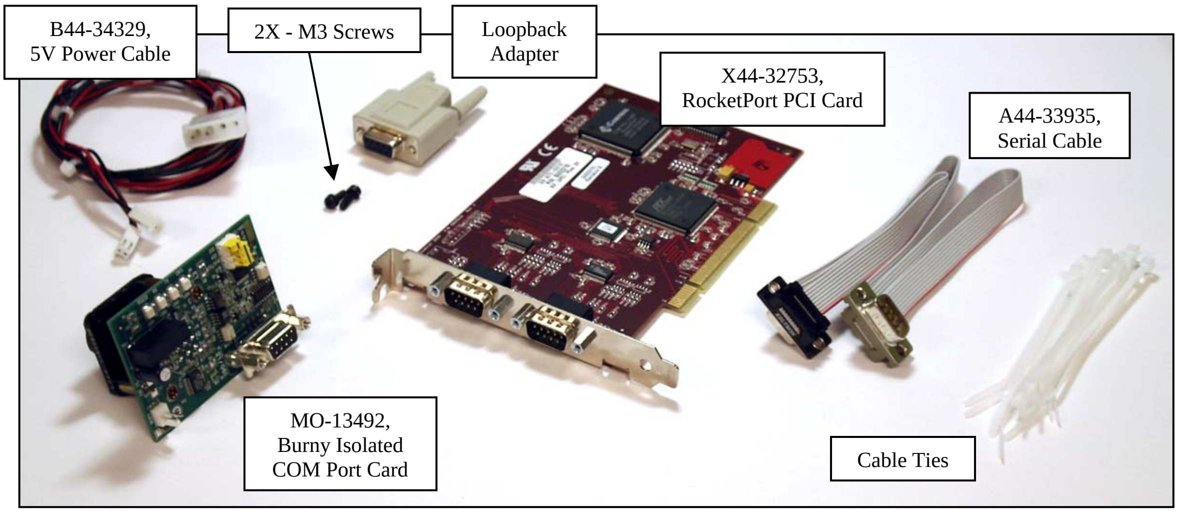
** To achieve the maximum number of isolated COM ports shown, additional holes may need to be drilled into the Burny cabinet. See Section 1.6 for more details.*

*** Additional isolated COM ports are not available for this product and kit combination.*

1.3 KIT DESCRIPTIONS

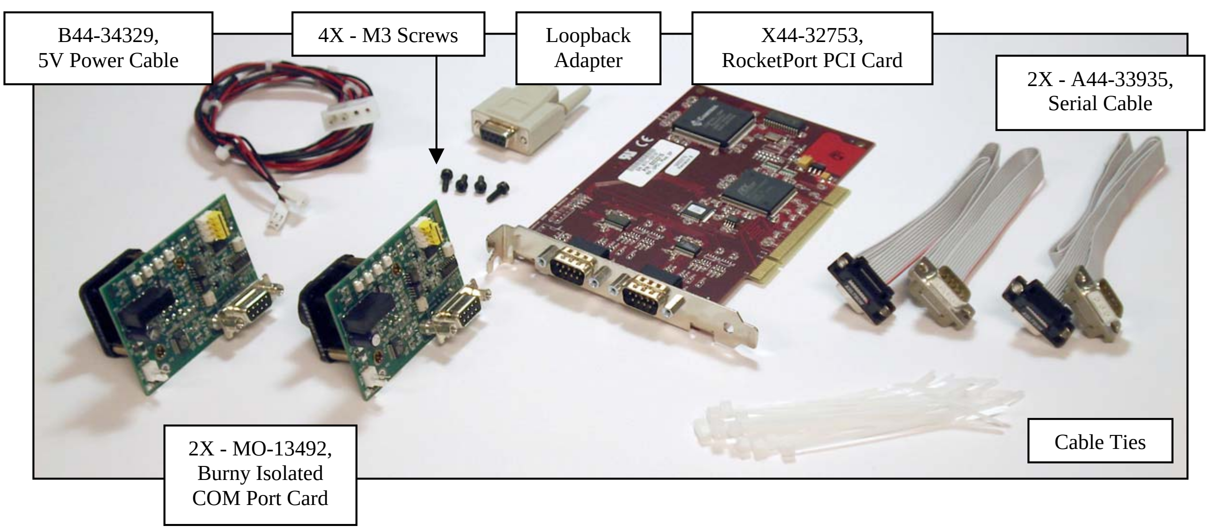
KIT NUMBER: MO-13608-1, SINGLE PORT ROCKETPORT

This kit requires an available PCI slot and is designed for the Burny 10, Burny 10 LCD, Burny 10 OEM or Burny 10 LCD Plus. It contains the following parts:



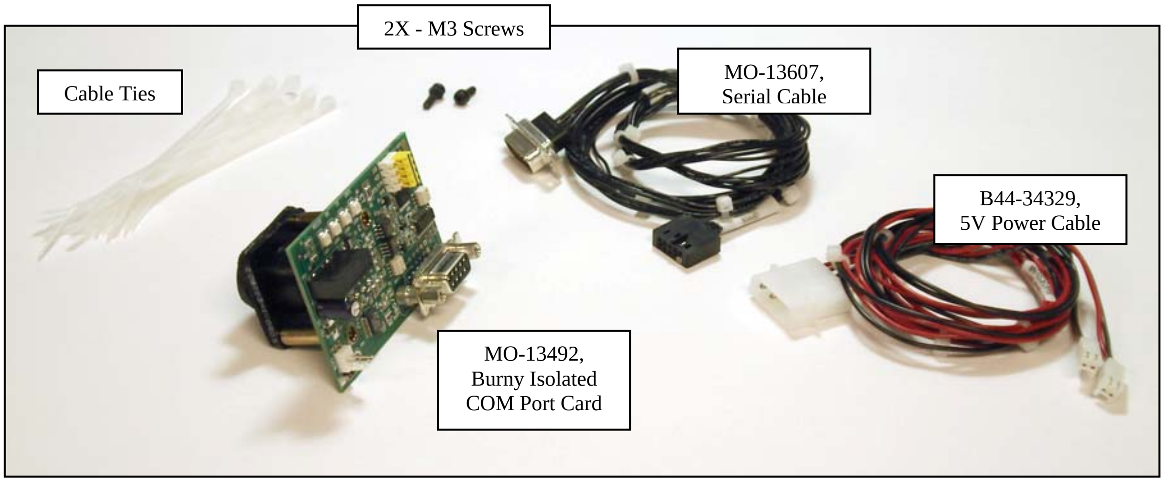
KIT NUMBER: MO-13608-2, DUAL PORT ROCKETPORT

This kit requires an available PCI slot and is designed for the Burny 10, Burny 10 LCD, Burny 10 OEM or Burny 10 LCD Plus. It contains the following parts:



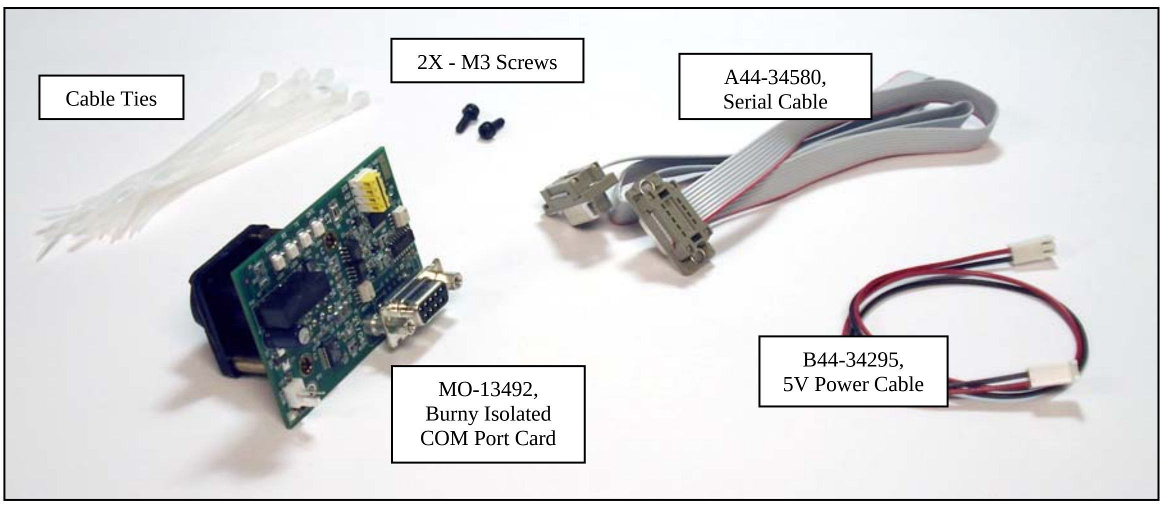
KIT NUMBER: MO-13687, HEADER MOUNT

This kit is used with the Burny 10 OEM or Burny 10 LCD Plus and contains the following parts:



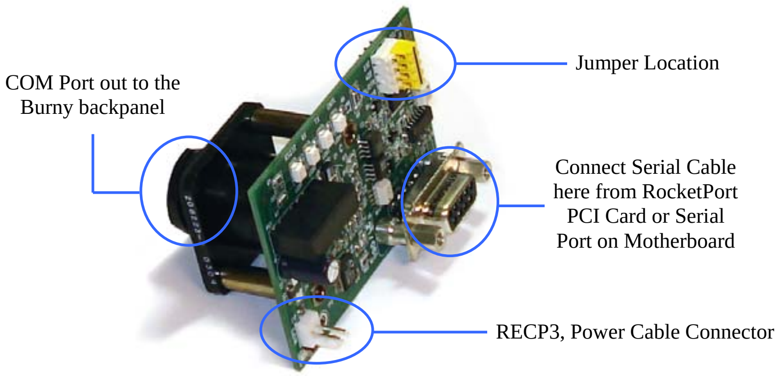
KIT NUMBER: MO-13600, PHANTOM SERIES

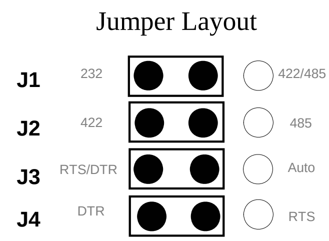
This kit is used with the Burny Phantom and Phantom ST. It contains the following parts:

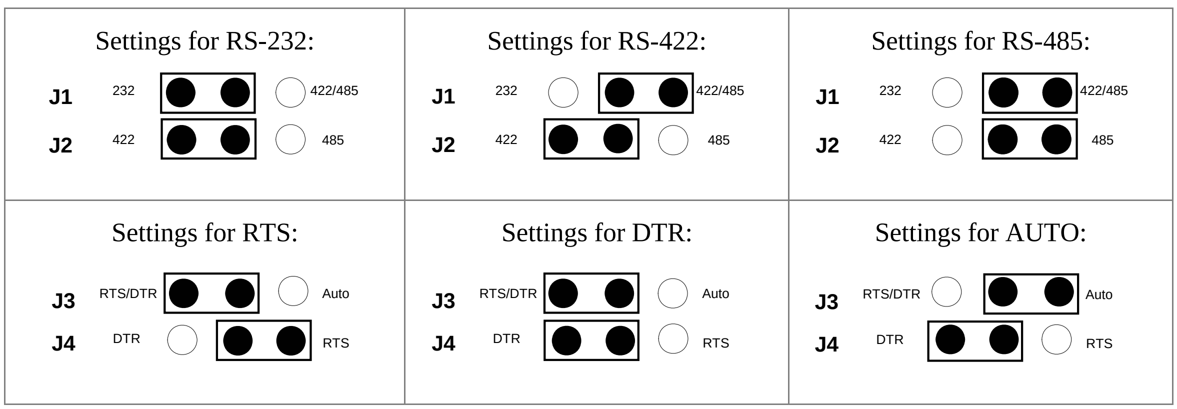


1.4 BURNY ISOLATED COM PORT CARD

The Burny Isolated COM Port Card contains four jumpers which are used in combination to select the characteristics of the COM port. Jumpers J1 and J2 set the protocol while jumpers J3 and J4 set the flow control.







1.5 INSTALLATION PROCEDURES

Before handling or installing circuit boards, make sure to wear an anti-static wristband to avoid seriously damaging the part.

KIT NUMBER: MO-13608-1, SINGLE PORT ROCKETPORT

1) Determine if your kit contains all the necessary parts as shown previously. Wear an anti-static wristband while removing circuit boards from their packaging and while handling at all times.
2) Before working on the Burny make sure to properly power down the unit. From the Burny Main Menu choose Utils > Shutdown. Turn off the Power Switch when prompted.
3) Locate an available opening on the Burny backpanel. Remove the two screws from the black hole plug and discard. Remove the black hole plug and discard.
4) Configure the Burny Isolated COM Port Card (MO-13492) jumpers to meet your requirements.
5) Open the Burny cabinet and install the Burny Isolated COM Port Card using the two M3 screws that came with the kit.
6) Locate an available PCI slot on the motherboard. Make sure to wear an anti-static wristband and install the RocketPort PCI card (X44-32753).
7) Connect the female end of the Serial Cable (A44-33935) to a serial port on the RocketPort PCI card.
8) Connect the male end of the Serial Cable to the Burny Isolated COM Port Card.
9) Connect the Power Supply Cable (B44-34329) to any available connector in the power supply harness.
10) Connect the other end of the Power Supply Cable to RECP3 on the Burny Isolated COM Port Card.
11) Close the Burny cabinet and power up the unit.
12) Test the installation per Section 1.7 .

KIT NUMBER: MO-13608-2, DUAL PORT ROCKETPORT

1) Determine if your kit contains all the necessary parts as shown previously. Wear an anti-static wristband while removing circuit boards from their packaging and while handling at all times.
2) Before working on the Burny make sure to properly power down the unit. From the Burny Main Menu choose Utils > Shutdown. Turn off the Power Switch when prompted.
3) Locate two available openings on the Burny backpanel. Remove all the screws from each of the black hole plugs and discard. Remove both black hole plugs and discard. If no openings are available, the Burny cabinet will need to be modified accordingly. See Section 1.6 for more details.
4) Configure the Burny Isolated COM Port Card (MO-13492) jumpers to meet your requirements.
5) Open the Burny cabinet and install each of the Burny Isolated COM Port Cards using the M3 screws that came with the kit.
6) Locate an available PCI slot on the motherboard. Make sure to wear an anti-static wristband and install the RocketPort PCI card (X44-32753).
7) Connect the female end of the Serial Cable (A44-33935) to a serial port on the RocketPort PCI card.
8) Connect the male end of the Serial Cable to the Burny Isolated COM Port Card.
9) Connect the Power Supply Cable (B44-34329) to any available connector in the power supply harness.
10) Connect the other ends of the Power Supply Cable to RECP3 on each of the Burny Isolated COM Port Cards.
11) Close the Burny cabinet and power up the unit.
12) Test the installation per Section 1.7 .

KIT NUMBER: MO-13687, HEADER MOUNT

1) Determine if you have all the necessary parts as shown previously. Wear an anti-static wristband while removing circuit boards from their packaging and while handling at all times.
2) Before working on the Burny make sure to properly power down the unit. From the Burny Main Menu choose Utils > Shutdown. Turn off the Power Switch when prompted.
3) Locate an available opening on the Burny backpanel. Remove the two screws from the black hole plug and discard. Remove the black hole plug and discard. If no openings are available, the Burny cabinet will need to be modified accordingly. See Section 1.6 for more details.
4) Configure the Burny Isolated COM Port Card (MO-13492) jumpers to meet your requirements.
5) Install the Burny Isolated COM Port Card using the two M3 screws that came with the kit.
6) Connect the female end of the Serial Cable (MO-13607) to the COM2 header on the motherboard.
7) Connect the male end of the Serial Cable to the Burny Isolated COM Port Card.
8) Connect the Power Supply Cable (B44-34329) to any available connector in the power supply harness.
9) Connect the other end of the Power Supply Cable to RECP3 on the Burny Isolated COM Port Card.
10) Close the Burny cabinet and power up the unit.
11) Test the installation per Section 1.7 .

KIT NUMBER: MO-13600, PHANTOM SERIES

1) Determine if you have all the necessary parts as shown previously. Wear an anti-static wristband while removing circuit boards from their packaging and while handling at all times.
2) Before working on the Burny make sure to properly power down the unit. From the Burny Main Menu choose Utils > Shutdown. Turn off the Power Switch when prompted.
3) Locate an available opening on the Burny backpanel. Remove the two screws from the black hole plug and discard. Remove the black hole plug and discard.
4) Configure the Burny Isolated COM Port Card (MO-13492) jumpers to meet your requirements.
5) Install the Burny Isolated COM Port Card using the two M3 screws that came with the kit.
6) Connect the female end of the Serial Cable (A44-34580) to an available serial port on the motherboard.
7) Route the Serial Cable along with the existing wires that connect the motherboard to the backpanel. Use cable ties where needed.
8) Connect the male end of the Serial Cable to the appropriate connection on the Burny Isolated COM Port Card.
9) Connect the Power Supply Cable (B44-34295) to any available connector in the power supply harness.
10) Connect the other end of the Power Supply Cable to RECP3 on the Burny Isolated COM Port Card.
11) Close the Burny cabinet and power up the unit.
12) Test the installation per Section 1.7 .

1.6 INSTALLATION PATTERN

As noted in Table A, some configurations may require drilling the Burny cabinet to allow for the installation of the Burny Isolated COM Port Card.

The orientation of the two NO.25 (0.1495) holes governs the final orientation of the Burny Isolated COM Port Card. Make sure to check the final fit of this card on the inside the Burny cabinet before drilling these mounting holes.

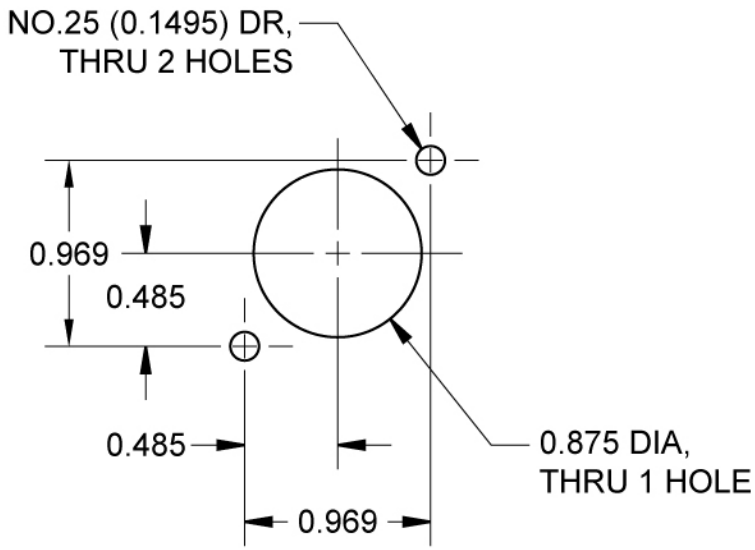
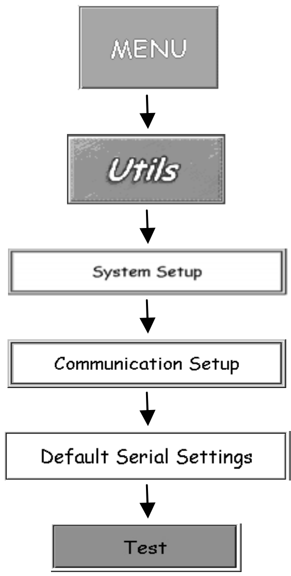


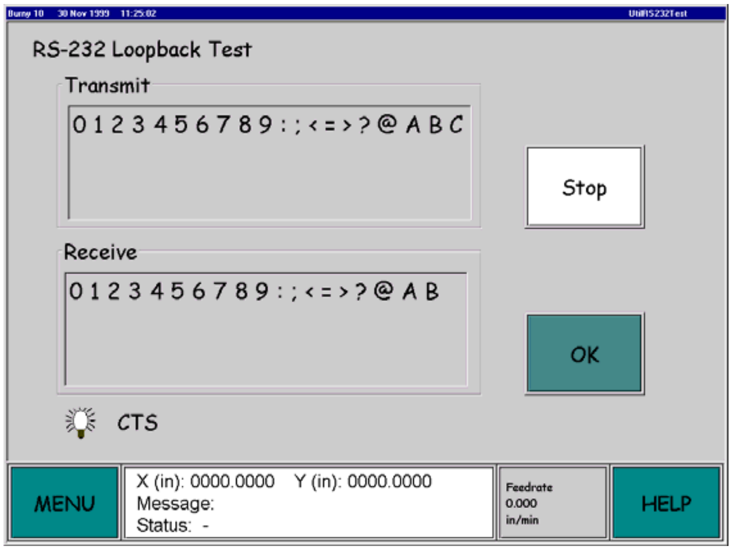
Figure 1 – Installation Pattern
(NOT TO SCALE)

1.7 TESTING THE INSTALLATION

Use the **RS-232 Serial Options** screen to set the default values for the Burny COM port(s). Use the "Test" function to verify serial operation.

The test sends a series of easily recognized characters out of the Burny serial port and redirects them back into the port. Both character streams are displayed on the screen so that they can be compared.





The receive area of the screen displays the same characters as the ones transmitted though slightly delayed. If a received character is able to be displayed, a string representing the character as numbers is shown in the form "[ddd:0xhh]". The "ddd" is the decimal equivalent of the character, and "0xhh" is the hexadecimal equivalent of the character. For example, the received character of 15 will be displayed as "[15:0x0F]".

To run this test:

1. Remove the cable, if any, from 35RECP (Port 1) or 50RECP (Port 2) on the Burny backpanel.
2. Place jumper pin at 2 to 3 and 8 to 9 on the port being tested.
   For better legibility, Loopback test characters are transmitted at ten per second regardless of the baud rate setting. Otherwise, all configuration made in the **RS-232 Serial Options** screen are used in the test. These changes will not be applied to normal RS-232 communication until the **OK** button is pressed in the **RS-232 Serial Options** screen.
3. Press the **Start** button.
   The **Transmit** window shows the characters being transmitted and the **Receive** window shows any characters received. The light bulb icon is displayed and shows **the Clear-To-Send (CTS)** status. When the light bulb icon is "white", CTS is satisfied.
4. Examine the contents of the Transmit and Receive windows to confirm that characters are not missing.
5. Press the **Stop** button to stop the test.
   Starting the process again after the **Stop** button is pressed, clears the **Receive** and **Transmit** windows and the process begins again. The Loopback test is also stopped if the screen display is changed. Pressing the **Status** button or the **Main Menu** button stops the RS-232 Loopback test but does not discard the characters.
6. Press the **OK** button to stop the test, clear the windows and return to the **RS-232 Serial Options** screen.
7. Remove the two jumpers and replace the cable, if any, when through testing.

Teach Trace Option

(AO-70391 Rev AA)

Option

TT

Revision History

Rev	ECO#	Author	Date	Description of Change
AA	--	CAD	06/04/2007	As Released

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1 TEACH TRACE

1.1 INTRODUCTION

The Burny Series 10 Teach Trace feature provides a method to acquire path from a tracer and store results as a part program. This feature is available through the **Load (*Load01*)** Screen when the Teach Trace option is licensed and enabled.

The feature allows the operator to run a tracer and have the Burny Series 10 store the path and CUT ON/OFF information. It also optimizes the incoming data and stores paths as a series of arcs and line segments.

This feature also allows the operator to change the tolerance factor to reduce the number of line/arc segments, possibly allowing smoother motion and reducing the part program file size.

1.2 OPERATIONAL OVERVIEW

The Teach Trace feature is an option that needs to be enabled via

Utility ⇒ System Setup ⇒ Miscellaneous Setup ⇒ OCX Options.

Contact CMC Customer Service if you wish to enable this option.

1.2.1 LOAD (LOAD01) SCREEN

When the Teach Trace feature is licensed and enabled, the **Load (*Load01*)** screen will show the ***Teach Trace*** button as indicated in Figure 1.

Figure 1 - Load (*Load01*) screen with Teach Trace enabled

1.2.2 TEACH SCREEN (TEACH01)

The Teach Trace first and main screen is shown in Figure 2. To begin the Teach Trace process, the “CNC” button (located on the **Status (Status01)** screen ref section 1.8) must be switched to the “CNC OFF” position. When Teach01 is accessed in "CNC ON" mode, the ***Start Teach Trace*** and ***OK*** buttons are disabled. When the Burny is switched to the “CNC OFF” mode, the ***Start Teach Trace*** button becomes enabled.

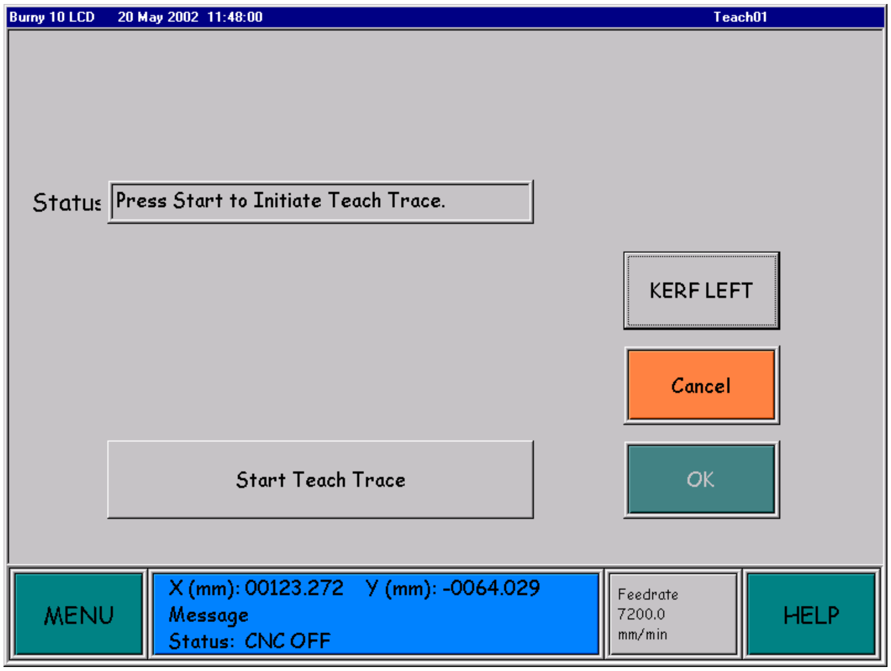

Figure 2 - Main Teach Trace screen (*Teach01*)

To teach/trace, the torch is positioned at a point where the teaching process will begin. This position is usually at a corner of the plate or some reference position. When the ***Start Teach Trace*** button is pressed, the teaching process begins and the trace position is stored as the beginning of part program. From this point, every machine movement is recorded by the Burny. The [STOP] and [GO] buttons function as “CUT ON” and “CUT OFF” buttons on the operator console.

The sequence for a trace of a part is the following:

1. Jog to the plate corner or reference position.
2. Press the ***Start Teach Trace*** button.
3. Jog to the initial “CUT ON” point.
4. Set the desired kerf side, by pressing the ***Kerf*** button. This button toggles between “Kerf Left” and Kerf Right”
5. Press the [GO] button on the Burny 10 front panel. This inserts a “CUT ON” code in the part program.
6. Start the tracer.
7. Allow the tracer to trace to the desired “CUT OFF” point and stop it.
8. Press the [STOP] button on the Burny 10 front panel. This inserts a “CUT ON” code in the part program.
9. Jog the machine to the next pierce point.
10. Repeat steps 4 through 9 for all cut paths, or,
11. Jog the machine desired ending position.
12. Press the ***OK*** button to complete the teaching process.

Pressing ***Cancel*** aborts the process and returns the Burny to the **Load01** Screen. The ***OK*** button is pressed only when the teach process has been completed. When the ***OK*** button is pressed, the Burny displays the **Teach02** screen.

1.2.3 DATA FITTING SCREEN (TEACH02).

The Teach Trace Data Fitting screen displays the status of the process of processing the data, Figure 3. The Burny then displays the resulting cut paths in red and traverses in yellow drawn on top of real data in blue. This is shown in Figure 4.

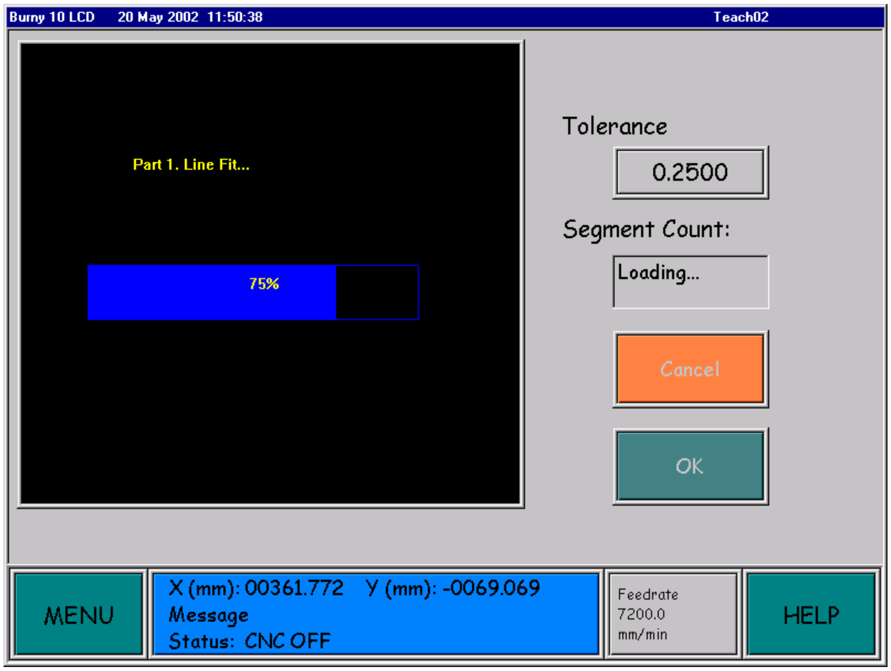

Figure 3 - Data Fitting (*Teach02*)

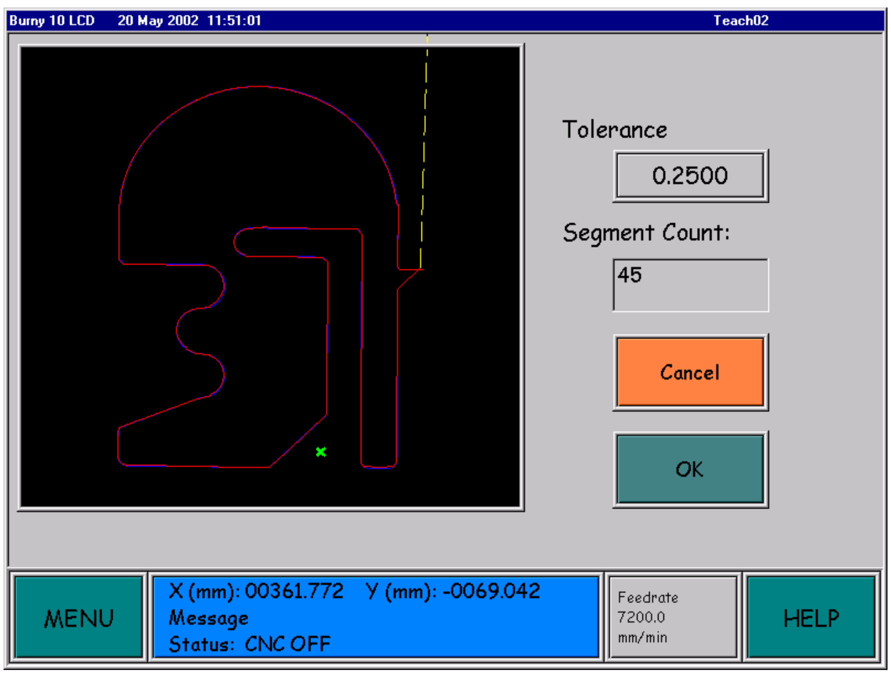

Figure 4 - Data Fitting (*Teach02*)

If the number of segments, traverses and cut paths are satisfactory, press the ***OK*** button. When the ***OK*** button is pressed, the **Teach03** screen is displayed. If the results are unsatisfactory, the tolerance value can be changed to lower the segment count or raise the trace precision. The Tolerance Factor range is between 0.125mm and 1mm. When the Tolerance Factor is changed the Burny (re)processes the data automatically.

NOTE: The data fit will only be as good as the trace data itself, thus it is better to trace at slow speeds to gather more data points.

1.2.4 TEACH TRACE STORE SCREEN (TEACH03)

This screen allows the operator to name and save the teach taught data as a part program. The **Teach Trace Store (*Teach03*)** screen displays the list of existing part programs.

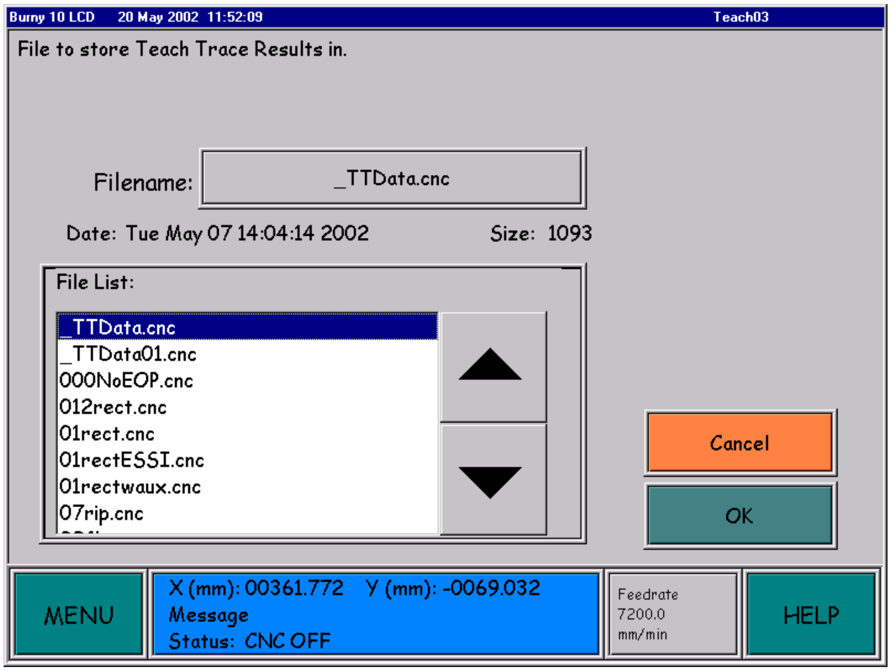

Figure 5 – Teach Trace Store (*Teach03*)

Press the ***FileName*** button to enter the name of the newly taught part program. Press ***OK*** to save the part program and exit the teach process.