

# The 8200 CNC Control

The 8200 CNC control is an open architecture PC based control system. The functions of the control are divided between two main portions. The CNC portion is located behind the operator's panel. This portion operates the front panel, runs the CNC software, and processes all of the motion control commands. The interface panel is located inside the electrical cabinet. It is responsible for communications between the CNC and the "outside world". The control and the interface are connected by a fiber optic cable that carries the communications between the two.

## 8200 CNC Control Components

Below is an overview of the cards found in a typical 8200 control. Diagrams of the cards follow the descriptions.

### CNC Control

#### Single Board Computer

The 8200 CNC is built around a single board computer, or SBC. The SBC board contains the processor, video control, I/O interface for floppies and other devices, memory simms, and a network controller. The SBC board also contains a PC/104 slot that allows for connection to other boards in the control. The power for the card comes from a power supply plugged directly into it. The PC/104 expansion slot will provide power to any other cards connected there.

Machine software, parameters, and part programs are stored on a flash ram storage card. The capacity of the flash ram card is 1 gigabyte. The flash ram card is inserted into a socket on the back side of the SBC board, parallel to the board itself. If the card is moved to another control all machine software, parameters, and programs will go with it.

IC-204 is the part number for a replacement flash card. It is typically supplied with machine software and the latest parameters available at the factory (typically from when the machine was built).

#### The NCB2 board

The NCB2 board is responsible for all motion control calculation in the 8200 control. It processes the axes moves and responds to the encoder feed back..

There are three main components on the card:

- A processor chip is mounted on the card to calculate the axes moves and respond to feed back.
- An Xilinx CPLD (complex programmable logic device) is mounted to the back side of the card and provides the bulk of the circuitry logic. This chip replaces many electronic components used on the previous version of the NCB card. This chip is programmed at the factory through the CN2 port on the board.

- A third chip that contains the NCB firmware that runs the board. This chip is flash programmable and can be programmed in the field to update the NCB firmware, if necessary.

8200 firmware is different than firmware for 7200 and Cent 7 controls. To accommodate this difference controls with the 8200 hardware package are set up to re-flash the NCB firmware on boot, negating the need for separate cards for 7200 and 8200 controls. This is part of the software package on the compact flash card.

The NCB firmware and NCB PLD software versions can be displayed on the control under [F10] Utilities-[F8] Info-[F9] Misc.

### **Keypad Encoder Card**

The 8200 keypad encoder board processes the keyboard and switch input signals from the control and sends them to the SBC.

There are three main components to this board:

- A Keypad firmware chip that holds the keypad software. This software controls the interpretation of the keyboard matrix and the switch inputs.
- An Xilinx CPLD (complex programmable logic device) is mounted to the card and provides the bulk of the circuitry logic. This chip replaces many electronic components used on the previous versions of the keypad card.
- 2 ULN2803A lamp driver chips in sockets are used to power the 12vdc front panel lamps used in the switches of a discrete key front panel.

The Keypad firmware version can be displayed on the control under [F10]Utilities-[F8]Info. The Keypad firmware version (listed as Front Panel) should be 5.xx for the molded 8200 CNC panels.

### **Sourcing Interface Assembly**

This assembly acts as the translator between the NCB card and the outside world. This board brings the signals from the plugs to the motion control. It receives the signals from the various input switches, encoders, and drive devices. It contains the outputs and analog signals to fire relays, solenoids and command other external devices. This interface IO provides or is triggered by +24 VDC signals.

This assembly will always be accompanied by a safety relay to complete the machine enable circuit.

The Assembly contains two boards with separate power inputs and grounds. The first board is powered by +5VDC. There are several main components of this board:

- A processor chip on the board is used to manage the fiber optic communication between the interface board and the NCB card.

- Two Xilinx CPLDs (complex programmable logic devices) are mounted to the card and provides the bulk of the circuitry logic. These chips are programmed at the factory.
- A large eeprom on the board contains the Interface board firmware. Its function is to run the interface board devices. The software is burnt onto it at the factory.
- Connectors for 5 axes of motion control. Each axis contains two styles of connector. One for a D-sub type connector used by Yaskawa or Mitsubishi axes drive cables, and another generic connector for use with any other type of drive or device.
- Connectors for spindle, hand wheel, and thermal compensation inputs.
- The watchdog relay. The watchdog relay is the o.k. signal for the motion control. If everything in the interface and NCB portion of the motion control is working correctly this relay is energized. A surface mount LED on the board indicates that the watchdog relay is on. It is labeled on the plastic cover of the interface assembly. The relay will come on only after the CNC software has booted up. If a failure occurs in the NCB, the interface, or the connection between them, the watchdog coil will de-energize and the machine will emergency stop. In addition, a set of normally closed contacts on the watchdog relay will put the analog signals to ground so that no command signals may be sent to the axis or spindle.
- Various LED status indicators.
- A DAC (digital to analog converter) chip produces the analog command signals for the axes and the spindle drive.
- An Offset and a Gain adjustment on the front edge of the card adjust the magnitude and balance of the analog signals. All analog signals are affected by this adjustment.

The second board is powered by +24VDC and contains all of the connections and components for the inputs and outputs. The physical connections to outside devices are made through I/O modules that are connected to the J1 through J4 connectors via ribbon cables.

Both boards have fuses near the DC power connectors.

The Interface logic board has a 2 amp fuse ( part # FU-133) protecting the 5VDC circuit on the board.

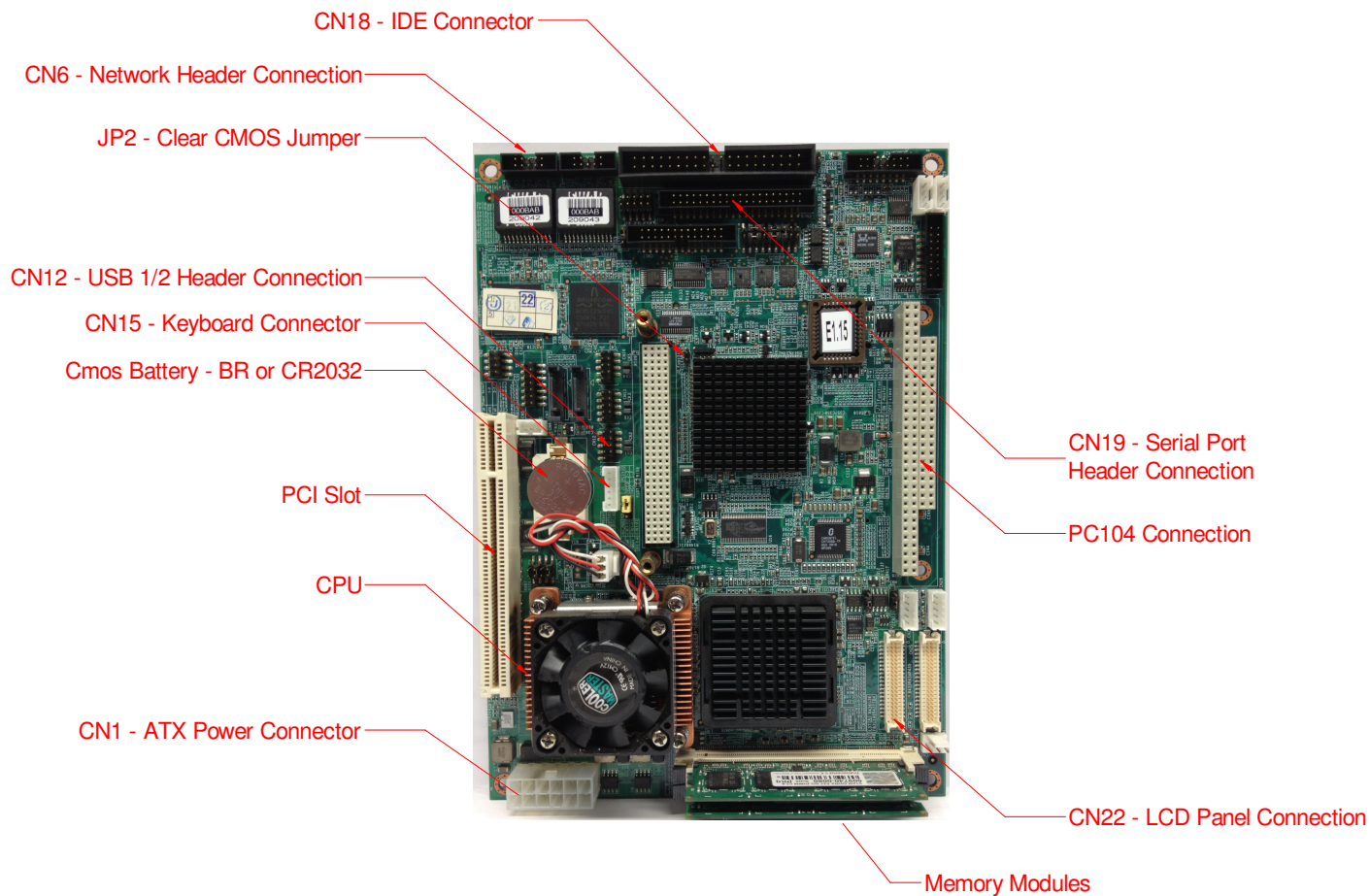
The Interface IO board has 2 fuses:

- A 5 amp fuse ( part # FU-134) in position F1 protects the 24VDC line that provides power to the IO board.
- A 2 amp fuse ( part # FU-133) in position F2 protects a line into the logic board so that it may provide 24VDC through the axis connectors.

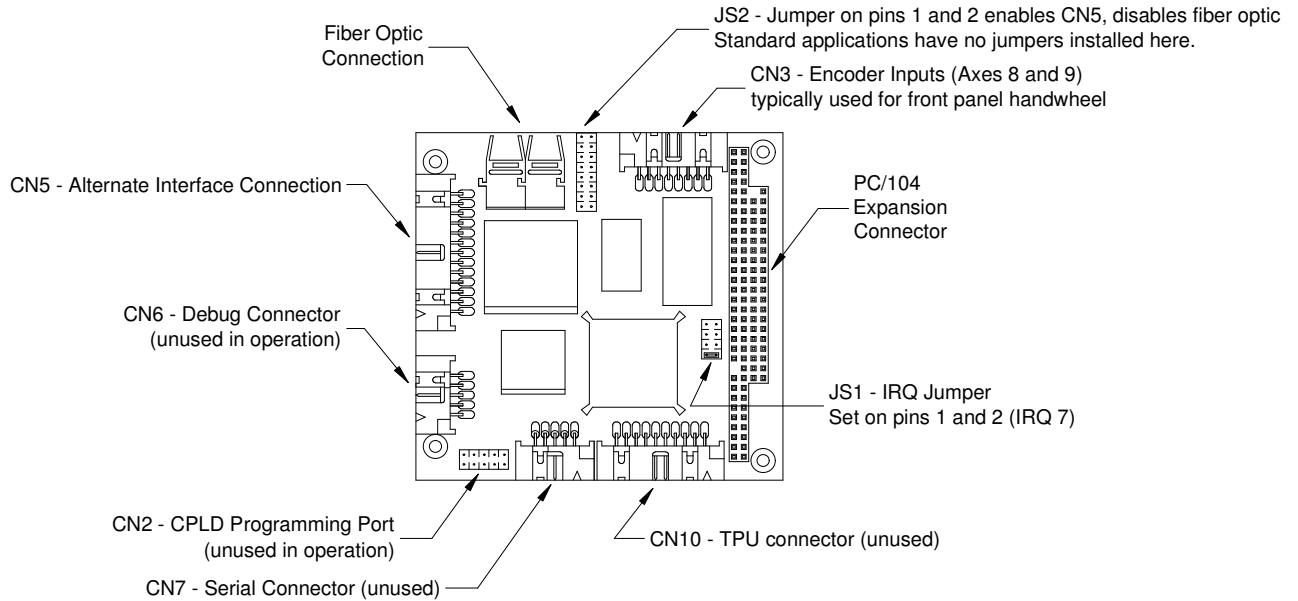
Any failure of the interface assembly is cause to check these three fuses.

# Selected Board Illustrations

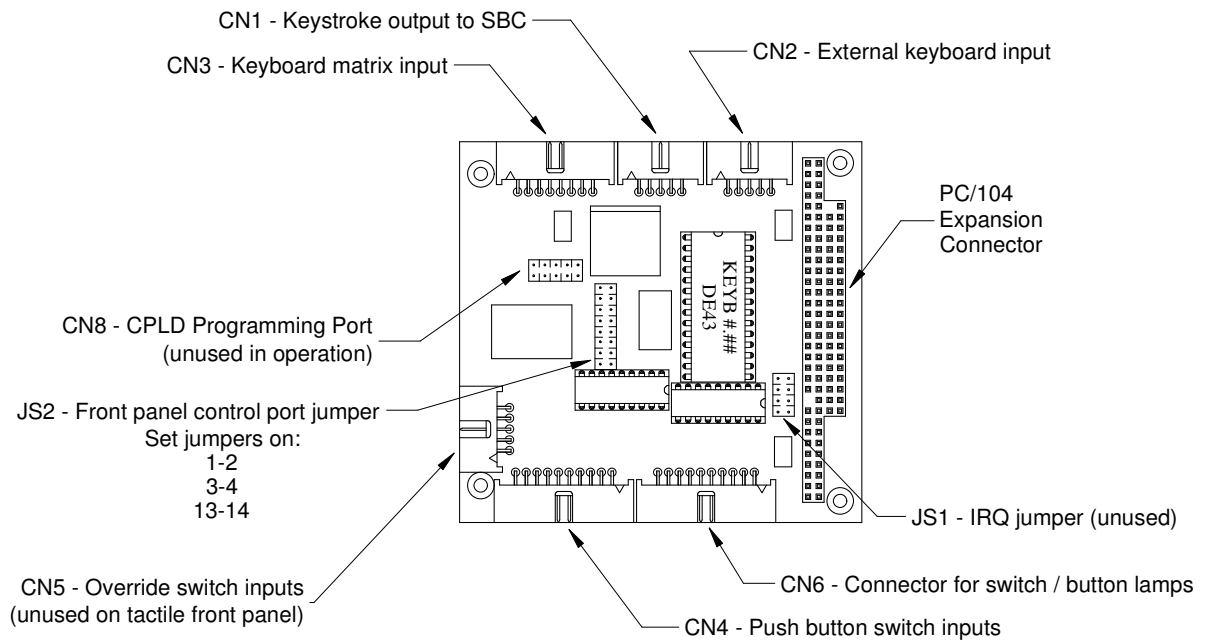
## PCM-9584 Single Board Computer



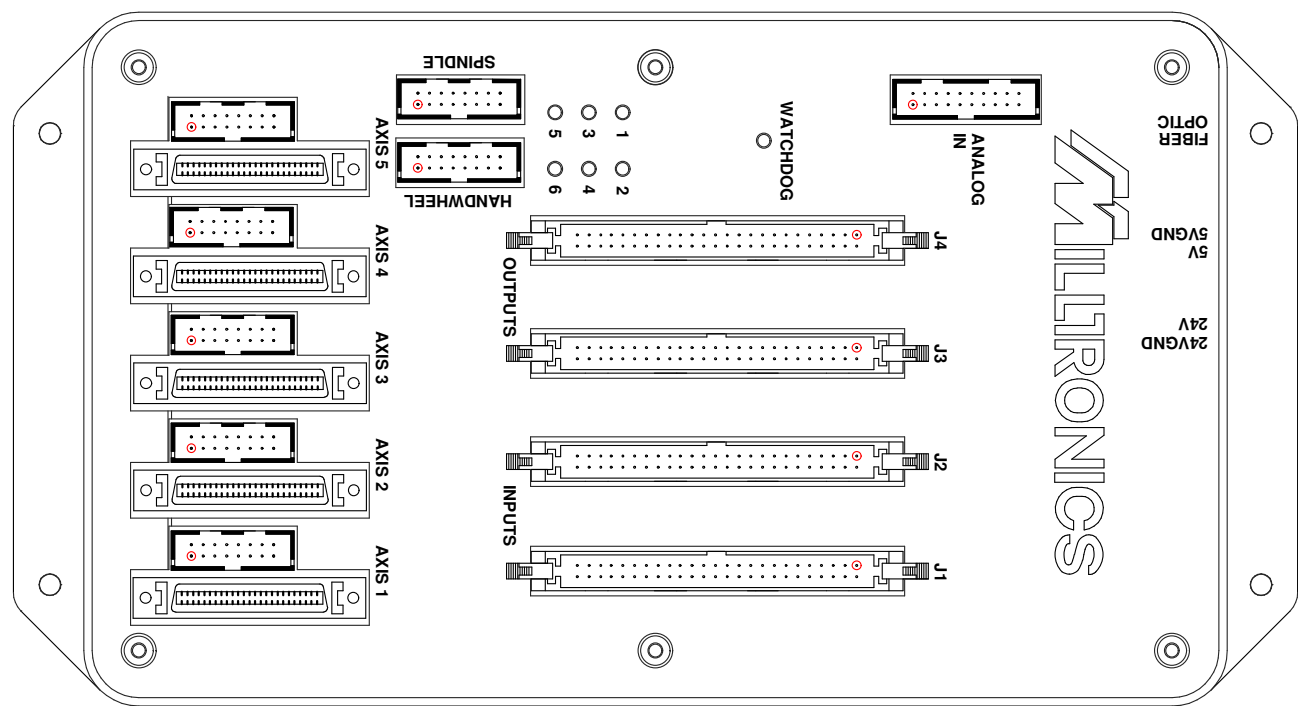
## NCB Card (BD-100)



## Keypad Encoder Card (BD-101)

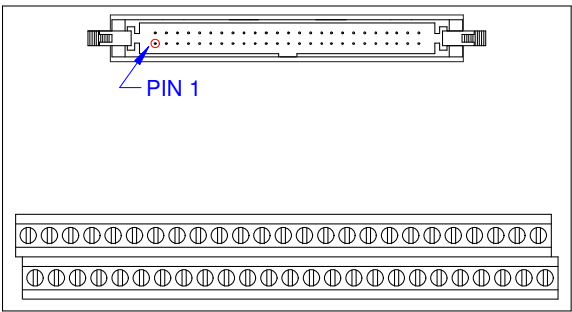


Active High or “Sourcing” Interface Panel Assembly (7534)



○ = PIN 1

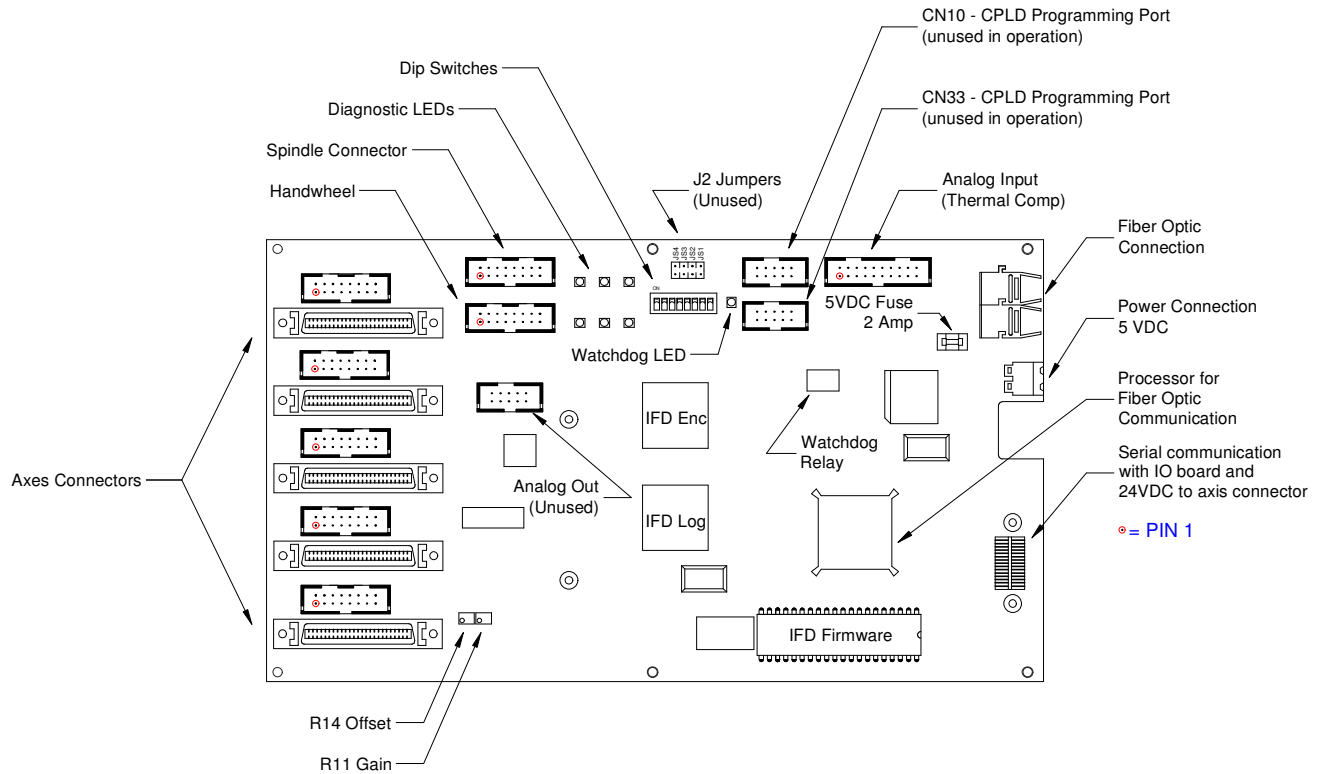
Active High or “Sourcing” Input/Output Module (PR-38)



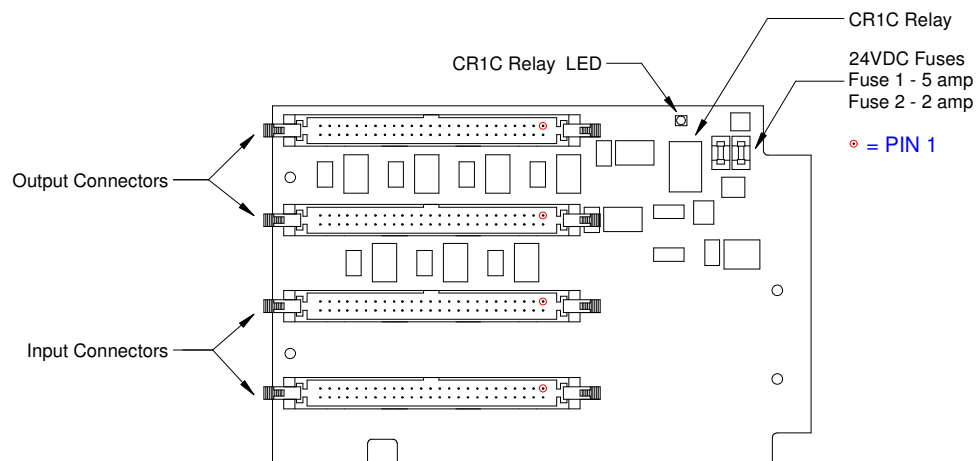
|   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 |
|   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1 | 3 | 5 | 7 | 9  | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 | 41 | 43 | 45 | 47 | 49 |
|   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

## Active High or “Sourcing” Interface Boards

### Logic Board (BD-143)



### IO Board (BD-144)



# The 8200B Control

The 8200 control hardware has been replaced in 2014 with the 8200B. The 8200B is an externally sourced hardware solution that replaces most of the traditional Centurion 7, 7200, and 8200 hardware with a single package designed to increase durability and reliability.



The 8200B control uses a sealed keypad design to prevent contamination of the key switches. All hardware is in a sealed unit on the back of the panel.

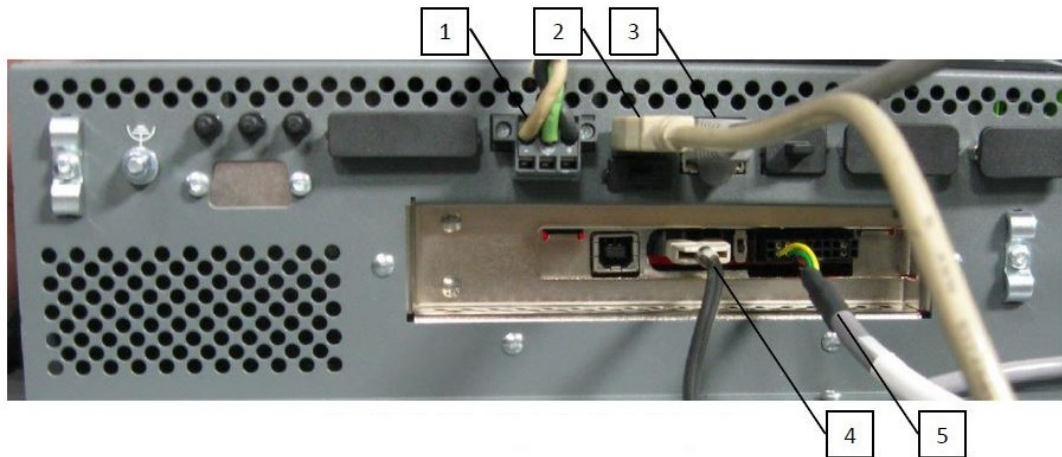


Connections on the 8200B control are made at the bottom of the CPU case.



Connections include:

- 1) 24VDC input power
- 2) USB connections
- 3) Networking port (Eth0, nearest to the USB ports)
- 4) Fiber optic connection to the Interface
- 5) Connection for the front panel hand wheel.



The side panel (left side when looking from the front) includes:

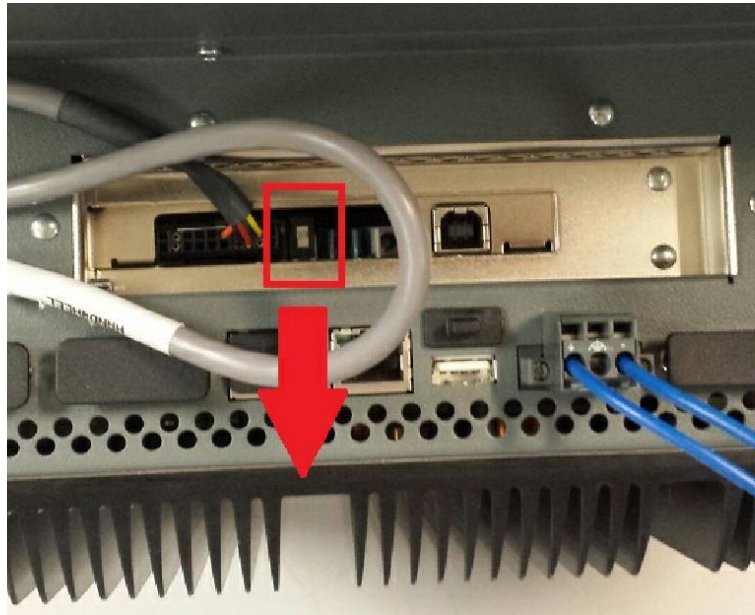
- 1) A socket for the compact flash memory device (CF1).
- 2) PS2 keyboard connector (used in retrofit applications only).
- 3) A battery socket holding the CR 2477N cmos battery.
- 4) Various Status LEDs.



The side panel is removable to access the internal card slot of the control.



The 8200B CPU has a single PCI slot into which is placed the NCB card. The NCB card has a switch used during programming of the card that should be switched towards the heat sink on the back of the CPU enclosure. It is possible the control may not boot at times if this switch is placed in the incorrect position.



The Emergency Stop and Enable buttons have spade type lugs on the back to connect the FPP cable. This cable connects these switches into the safety relay circuit.



At this time the 8200B front panel unit is NOT considered a field serviceable item. If the CNC unit has been determined to have a problem it must be replaced or returned for repair.

# Basic Control Operation

Some operational knowledge of the control is required to be able to service the machine. The following section provides some short explanations of some basic machine functions. Further information can be found in the 8200 Series CNC Control Operations Manual.

## Homing the machine

- Press [F1] Home, then press the Cycle Start button.
  - Mill: The Z axis will home to completion first followed by all other axes.
  - Lathe: The X axis (cross slide) will home first followed by all other axes.

## Moving the Machine in Hand Wheel

- Press [F3] Hand-Whl.
- Select the axis to move with the [F1] through [F3] keys.
- Turn the hand wheel to move the machine.
- Change speed of motion with the feed rate override knob.

## Executing a Command in MDI

- Press [F5] MDI.
- Enter the desired command or commands.
- Press [F5] Run, then press the Cycle Start button.

## Running a Program

- Press [F4] Run-Prog.
- Press [F7] Menu.
- Use the [F9] and [F10] arrow keys to select the program desired and press [F1] Select.
  - Program to be run will appear at the bottom of the status window.
  - Do not try to run files with .cnv file extension. These are conversational format files.
- Press [F1] Start, then press the Cycle Start button.

## Loading a program

- Insert a USB stick with the program into the port on the machine.
- Press [F8] Program.
- Press [F5] FileUtil
- Use the [F8] key to toggle back and forth between the SOURCE and DESTINATION windows.
  - The program will move from the source to the destination.
- High light the DESTINATION window with the [F8] key.
- Use the [F9] and [F10] to scroll to <Parts> in the top window. Press [F1] Select.
- High light the SOURCE window with the [F8] key.
- Use the [F9] and [F10] to scroll to <USB> in the top window. Press [F1] Select.
- Use the [F9] and [F10] to scroll to the desired program in the bottom window. Press [F1] Select.
  - Multiple programs can be selected by continued scrolling and pressing {f1}.
- Press [F3] Copy. Program(s) will be transferred from the source to the destination.

Enabled

Opt Stop

CutterComp Off  
ActiveTool 0  
NextTool 2  
Length 00.0000  
Diameter 00.0000  
WorkCoord (G540) 1  
Clearance 00.0000  
FeedRate 050.0 ipm  
(100%) 000.0 ipm  
Spindle 0000 rpm  
(100%) 0000 rpm Off  
0%  
Cycle None  
Dwell 000.0  
Coolant  
Part# 0006  
Time 10:20:50 AM  
parts\1234

|   | Current  | Target   | Machine  |
|---|----------|----------|----------|
| X | +00.0000 | +00.0000 | +00.0000 |
| Y | +00.0000 | +00.0000 | +00.0000 |
| Z | +00.0000 | +00.0000 | +00.0000 |

Main-Program-FileUtils

SOURCE

DESTINATION

<Parts>

<USB>

<Floppy>

<Network>

<RAM>

<ROM>

<Parts>

<USB>

<Floppy>

<Network>

<RAM>

<ROM>

<USB>

<Parts>

| THREAD            | 1k   | 03.27.13 |
|-------------------|------|----------|
| THREAD.CNV        | 443b | 03.27.13 |
| TURNING W ARC     | 812b | 03.26.13 |
| TURNING W ARC.CNV | 798b | 03.26.13 |

1234

1234.CNV

ABCD.CNV

QQQQ

QQQQ.CNV

FilePath: E:/  
FileName: TURNING W ARC  
FileSize: 812  
FileDate: 03.26.13-13:19:04  
(Conversational Program  
Version parts\TURNING W  
ARC)  
G20

|        |           |      |        |        |      |     |    |    |     |         |      |
|--------|-----------|------|--------|--------|------|-----|----|----|-----|---------|------|
| F1     | F2        | F3   | F4     | F5     | F6   | F7  | F8 | F9 | F10 | F11     | Esc  |
| Select | SelectAll | Copy | Rename | Delete | Flip | Top | ↔  | ↑  | ↓   | Refresh | Exit |

## Saving a Program

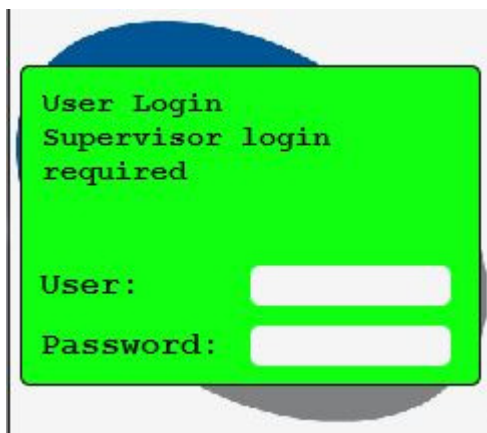
- Saving a program is the same process as loading a program, with the SOURCE being <Parts> and the DESTINATION being <USB>.
- To quickly reverse the SOURCE and DESTINATION use the [F6] Flip key.

## Writing a New Program

- Press [F8] Program.
- Press [F1] TextEdit to begin a new g-code program.  
or  
Press [F2] ConvEdit to begin a new conversational program.
- Press [F2] New. Enter the desired name of the program and press Enter.
- Begin writing the program.

## Accessing Machine Parameters

- Press [F7] Paramtrs.
- Press [F1] Set Up.



- In the User field type “PROTO3”. Press Enter.
- In the Password field type “3”. Press Enter.
- Machine parameters should be open.



# Control Outputs and Inputs

The 8200 CNC achieves most of the interfacing to connected devices through the outputs and inputs of the control. An output provides a signal to a device such as a relay or solenoid, servo drive, indexer or other device. An input is triggered by an external signal provided by a proximity switch, limit switch, or other device, and is used to signal the control that a certain event is taking place or a condition met. Often a failure of the machine to perform a task, such as completing a tool change or turning on the spindle, can be traced to a failure of the input / output of the given function. It then becomes important to be able to verify the outputs and inputs associated with the machine operation.

## Sourcing Logic

The state of the input and output signals depend upon which interface panel is used with the CNC. All current products use the Active High or “Sourcing” interface panel. This panel uses +24vdc logic; the outputs provide +24vdc at 250mA and the inputs are triggered by +24vdc. The outputs are protected against shorts or over amperage.

The inputs and outputs on a “Sourcing” interface are identified on a schematic by the IO module that they are connected to, J1 through J4. J1 and J2 are inputs, while J3 and J4 are outputs. The sourcing interface has 72 inputs and 72 outputs, using pins 1 through 36 on each module for the connections.

## Sourcing Output Hardware

Sourcing output chips are soldered directly to the IO board in the interface assembly. They are protected against over amperage or direct shorts, so are not easily damaged. If they are damaged the IO board must be replaced.

Outputs can be checked to see if they are providing the correct signal provided they are hooked to a device. If the output is not connected to a device the voltage measurement will not be correct.

A voltage measurement of an output should show:

0 VDC when the output is off (open “radio button”)  
+24 VDC when the output is on (filled “radio button”)

## Sourcing Input Hardware

The input chips on the 8200 CNC control are optically isolated and are triggered by a signal to the corresponding pin. Triggering an input will cause its entry to show a status change in the diagnostic page. Each input is brought into the control through the corresponding pin on the axis input plug (for instance J1-23 will be found in the J1 input connector, terminal number 23).

There is no way to set an input through the control. To test an input it must be connected to a voltage source.

On a “Sourcing” interface the input needs to be pulled up to +24vdc. This can be done by connecting a wire from the appropriate J1 or J2 terminal to terminal block 12 (+24vdc) on the terminal strip on the electrical panel. The input should show a status change when connected to 24vdc. If it does not there is a problem in the control that may require board replacement or factory repair. The input chips are not in sockets and are not easily replaceable, however they are seldom damaged.

## Displaying I/O Status

The status of the outputs and inputs of the control can be viewed by entering the diagnostic display of the control when the parameters are open. This can be done from the main menu by entering [F6] Display, [F7] Diagnostic. **The setup parameters must be open for the diagnostic option to be viewed under display.**

The inputs and outputs will be listed by their STO/CLO number (see “Setting and Clearing Outputs Manually” later in this section) in two columns, one for inputs and one for outputs. The inputs and outputs are divided between the IO modules as follows:

- J1: Inputs 1-36
- J2: Inputs 37-72
- J3: Outputs 1-36
- J4: Outputs 37-72

The diagnostic screen will show an empty “radio button”, a “0” character, and the word “off” next to an input or output that is not active. These items will all change if the input or output is activated, i.e. the “radio button” will activate, the character will change from “0” to “1”, and the “off” will become “on”.

| I/O Status |                 |                              |    |                |                                        |
|------------|-----------------|------------------------------|----|----------------|----------------------------------------|
| #          | Input Signals   | State                        | #  | Output Signals | State                                  |
| 1          | Estopped        | <input type="radio"/> 0: Off | 1  | Excess Error   | <input checked="" type="radio"/> 1: On |
| 2          | Input 2         | <input type="radio"/> 0: Off | 2  | Mist Coolant   | <input type="radio"/> 0: Off           |
| 3          | Input 3         | <input type="radio"/> 0: Off | 3  | Flood Coolant  | <input type="radio"/> 0: Off           |
| 4          | Up To Speed     | <input type="radio"/> 0: Off | 4  | Spindle CW     | <input type="radio"/> 0: Off           |
| 5          | Tool Change     | <input type="radio"/> 0: Off | 5  | Spindle CCW    | <input type="radio"/> 0: Off           |
| 6          | Lube Fault      | <input type="radio"/> 0: Off | 6  | Spindle Stop   | <input type="radio"/> 0: Off           |
| 7          | Wait Channel    | <input type="radio"/> 0: Off | 7  | Spindle Allow  | <input type="radio"/> 0: Off           |
| 8          | Zero Speed      | <input type="radio"/> 0: Off | 8  | Tool Change    | <input type="radio"/> 0: Off           |
| 9          | Drive Fault     | <input type="radio"/> 0: Off | 9  | Allow Reset    | <input type="radio"/> 0: Off           |
| 10         | Spindle Reverse | <input type="radio"/> 0: Off | 10 | Delayed Reset  | <input type="radio"/> 0: Off           |
| 11         | Digitizing      | <input type="radio"/> 0: Off | 11 | Delayed E-Stop | <input type="radio"/> 0: Off           |
| 12         | X Home Switch   | <input type="radio"/> 0: Off | 12 | Rotary Clamp   | <input type="radio"/> 0: Off           |
| 13         | M20 waiting     | <input type="radio"/> 0: Off | 13 | M20 output     | <input type="radio"/> 0: Off           |
| 14         | M21 waiting     | <input type="radio"/> 0: Off | 14 | M21 output     | <input type="radio"/> 0: Off           |
| 15         | M22 waiting     | <input type="radio"/> 0: Off | 15 | M22 output     | <input type="radio"/> 0: Off           |
| 16         | M23 waiting     | <input type="radio"/> 0: Off | 16 | M23 output     | <input type="radio"/> 0: Off           |
| 17         | M24 waiting     | <input type="radio"/> 0: Off | 17 | M24 output     | <input type="radio"/> 0: Off           |

## Customized I/O Display

Custom I/O screens can be built so that diagnostics can be displayed while the machine is running. This allows certain I/O to be monitored while the machine is in action. Custom I/O screens are created in the [F6] Display – [F7] Diagnostic screen.

To create a custom I/O display:

Once in the diagnostic screen press the [F2] Build soft key. Keys will appear at [F4] Add and [F5] Reset.



Use the [F7] through [F10] arrow keys to navigate the diagnostic screen to select which inputs and outputs to add to the screen.

Press the [F4] Add soft key to add an input or output to the custom screen. Up to 10 inputs and 10 outputs can be added to the custom screen.

If an input or output needs to be removed from the custom list place the cursor on it in the main list and press [F4] Remove (will change from ADD if input/output has been previously selected).

To clear the custom list and start fresh, press the [F5] Reset soft key.



The screenshot displays the CNC diagnostic interface. At the top, there are two status indicators: "Enabled" and "Opt Stop". The main area is divided into several sections:

- Machine Parameters:** A list of parameters on the left, including CutterComp, ActiveTool, NextTool, Length, Diameter, WorkCoord, Clearance, FeedRate, Spindle, Cycle, Dwell, Coolant, Part#, Time, and parts\DRILL.
- Current, Distance, Actual:** A table showing the current position, distance to go, and actual position for X, Y, and Z axes.
- Main-Display-Diagnostics:** A section containing a "Custom I/O" table and an "I/O Status" table.

| Current    | Distance | Actual   |
|------------|----------|----------|
| X +00.0000 | +00.0000 | +00.0000 |
| Y +00.0000 | +00.0000 | +00.0000 |
| Z +04.0000 | +00.0000 | +04.0000 |

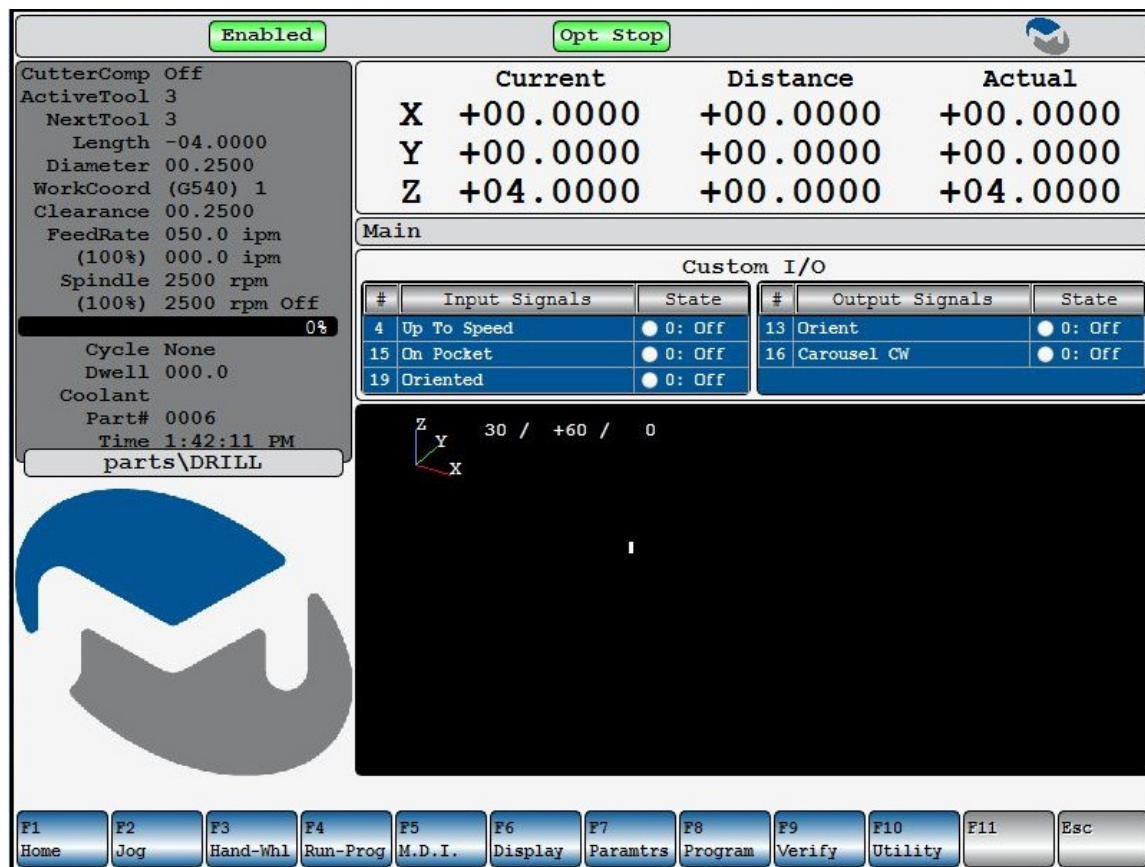
| #  | Input Signals | State    | #  | Output Signals | State    |
|----|---------------|----------|----|----------------|----------|
| 4  | Up To Speed   | ● 0: Off | 13 | Orient         | ● 0: Off |
| 15 | On Pocket     | ● 0: Off | 16 | Carousel CW    | ● 0: Off |
| 19 | Oriented      | ● 0: Off |    |                |          |

| #  | Input Signals    | State    | #  | Output Signals | State    |
|----|------------------|----------|----|----------------|----------|
| 9  | Drive Fault      | ● 0: Off | 12 | Rotary Clamp   | ● 0: Off |
| 10 | 15k Spndl Lube   | ● 0: Off | 13 | Orient         | ○ 0: Off |
| 11 | Digitizing       | ● 0: Off | 14 | Pot Down       | ● 0: Off |
| 12 | Home Switch      | ● 0: Off | 15 | Drawbar        | ● 0: Off |
| 13 | Air Pressure     | ● 0: Off | 16 | Carousel CW    | ● 0: Off |
| 14 | Carousel at Home | ● 0: Off | 17 | Carousel CCW   | ● 0: Off |
| 15 | On Pocket        | ● 0: Off | 18 | Output 18      | ● 0: Off |
| 16 | Pot is Down      | ● 0: Off | 19 | Output 19      | ● 0: Off |
| 17 | Pot is Up        | ● 0: Off | 20 | NotParked/Fdhd | ● 0: Off |
| 18 | Remote C-Start   | ● 0: Off | 21 | Low Range      | ● 0: Off |
| 19 | Oriented         | ● 0: Off | 22 | Output 22      | ● 0: Off |

At the bottom, there is a row of function keys: F1 Cust I/O, F2 Build, F3, F4 Remove, F5 Reset, F6, F7 (left arrow), F8 (right arrow), F9 (up arrow), F10 (down arrow), F11, and Esc Exit.

To display the custom screen at the main menu select the [F1] Cust I/O soft key. It will appear green when active. The display can be turned off by pressing the [F1] key again. The contents of the display will be kept and can be turned back on later if required. The contents will be saved until altered by the user, reset by the user, or the machine parameters are overwritten.



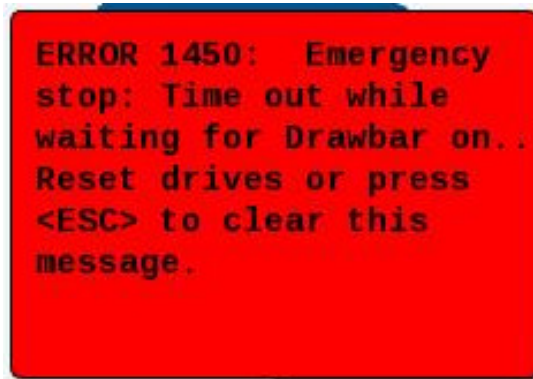
## Static I/O Display

The software also has an option for static diagnostics. The static diagnostic page captures the status of the inputs and outputs at the time of the last control E-stop, providing a snapshot of the control I/O at the time of failure. The static diagnostic page can be viewed by going into the [F10] Utilities, [F8] Info, [F7] Saved IO menu.

## 1450 Emergency Stop due to Missed Signal

Centurion 8200 CNC software also has provisions in the software for time out messages that will advise the operator if the machine has emergency stopped waiting for a specific input signal. This allows the control to indicate to the user which signal may be missing without having to examine the diagnostic pages. A typical timeout will take approximately 15 seconds from a non-receipt of signal to an emergency stop condition.

The red message box will display “Time out waiting for \_\_\_\_\_” in addition to the usual emergency stop information. This will indicate the lost signal. Sometimes this is not the first message displayed, so the escape key must be pressed once to clear the first message box and bring up the next one to view the time out message.



## Setting and Clearing Outputs Manually

Outputs are usually activated during the course of an M code function on the machine, but can also be set individually through the STO and CLO commands. This can be done in a program, as in the case of a custom M-code, or through the MDI mode. The command STO 6 will cause the 6th output to activate and the associated diagnostic to change. CLO 6 will turn the output off and cause its status indicator to revert back. The machine's logic files may block some outputs from being set.

The chart below lists the physical location of the output connection, followed by the STO/CLO number used to activate or deactivate it.

| Sinking Interface<br>Pin # | Sourcing Pin # | STO #     | Sinking Interface<br>Pin # | Sourcing Pin # | STO #     |
|----------------------------|----------------|-----------|----------------------------|----------------|-----------|
| Axis 1 – Out 1             | J3-1           | <b>1</b>  | Axis 4 – Out 1             | J4-1           | <b>37</b> |
| Axis 1 – Out 2             | J3-2           | <b>2</b>  | Axis 4 – Out 2             | J4-2           | <b>38</b> |
| Axis 1 – Out 3             | J3-3           | <b>3</b>  | Axis 4 – Out 3             | J4-3           | <b>39</b> |
| Axis 1 – Out 4             | J3-4           | <b>4</b>  | Axis 4 – Out 4             | J4-4           | <b>40</b> |
| Axis 1 – Out 5             | J3-5           | <b>5</b>  | Axis 4 – Out 5             | J4-5           | <b>41</b> |
| Axis 1 – Out 6             | J3-6           | <b>6</b>  | Axis 4 – Out 6             | J4-6           | <b>42</b> |
| Axis 1 – Out 7             | J3-7           | <b>7</b>  | Axis 4 – Out 7             | J4-7           | <b>43</b> |
| Axis 1 – Out 8             | J3-8           | <b>8</b>  | Axis 4 – Out 8             | J4-8           | <b>44</b> |
| Axis 1 – Out 9             | J3-9           | <b>9</b>  | Axis 4 – Out 9             | J4-9           | <b>45</b> |
| Axis 1 – Out 10            | J3-10          | <b>10</b> | Axis 4 – Out 10            | J4-10          | <b>46</b> |
| Axis 1 – Out 11            | J3-11          | <b>11</b> | Axis 4 – Out 11            | J4-11          | <b>47</b> |
| Axis 1 – Out 12            | J3-12          | <b>12</b> | Axis 4 – Out 12            | J4-12          | <b>48</b> |
| Axis 2 – Out 1             | J3-13          | <b>13</b> | Axis 5 – Out 1             | J4-13          | <b>49</b> |
| Axis 2 – Out 2             | J3-14          | <b>14</b> | Axis 5 – Out 2             | J4-14          | <b>50</b> |
| Axis 2 – Out 3             | J3-15          | <b>15</b> | Axis 5 – Out 3             | J4-15          | <b>51</b> |
| Axis 2 – Out 4             | J3-16          | <b>16</b> | Axis 5 – Out 4             | J4-16          | <b>52</b> |
| Axis 2 – Out 5             | J3-17          | <b>17</b> | Axis 5 – Out 5             | J4-17          | <b>53</b> |
| Axis 2 – Out 6             | J3-18          | <b>18</b> | Axis 5 – Out 6             | J4-18          | <b>54</b> |
| Axis 2 – Out 7             | J3-19          | <b>19</b> | Axis 5 – Out 7             | J4-19          | <b>55</b> |
| Axis 2 – Out 8             | J3-20          | <b>20</b> | Axis 5 – Out 8             | J4-20          | <b>56</b> |
| Axis 2 – Out 9             | J3-21          | <b>21</b> | Axis 5 – Out 9             | J4-21          | <b>57</b> |
| Axis 2 – Out 10            | J3-22          | <b>22</b> | Axis 5 – Out 10            | J4-22          | <b>58</b> |
| Axis 2 – Out 11            | J3-23          | <b>23</b> | Axis 5 – Out 11            | J4-23          | <b>59</b> |
| Axis 2 – Out 12            | J3-24          | <b>24</b> | Axis 5 – Out 12            | J4-24          | <b>60</b> |
| Axis 3 – Out 1             | J3-25          | <b>25</b> | Axis 6 – Out 1             | J4-25          | <b>61</b> |
| Axis 3 – Out 2             | J3-26          | <b>26</b> | Axis 6 – Out 2             | J4-26          | <b>62</b> |
| Axis 3 – Out 3             | J3-27          | <b>27</b> | Axis 6 – Out 3             | J4-27          | <b>63</b> |
| Axis 3 – Out 4             | J3-28          | <b>28</b> | Axis 6 – Out 4             | J4-28          | <b>64</b> |
| Axis 3 – Out 5             | J3-29          | <b>29</b> |                            | J4-29          | <b>65</b> |
| Axis 3 – Out 6             | J3-30          | <b>30</b> |                            | J4-30          | <b>66</b> |
| Axis 3 – Out 7             | J3-31          | <b>31</b> |                            | J4-31          | <b>67</b> |
| Axis 3 – Out 8             | J3-32          | <b>32</b> |                            | J4-32          | <b>68</b> |
| Axis 3 – Out 9             | J3-33          | <b>33</b> |                            | J4-33          | <b>69</b> |
| Axis 3 – Out 10            | J3-34          | <b>34</b> |                            | J4-34          | <b>70</b> |
| Axis 3 – Out 11            | J3-35          | <b>35</b> |                            | J4-35          | <b>71</b> |
| Axis 3 – Out 12            | J3-36          | <b>36</b> |                            | J4-36          | <b>72</b> |

## Feedback Channels

The 8200 CNC control is capable of 5 axes of simultaneous motion control. The (up to 5) axes of machine motion are connected to the “Live” motion connectors. These connections provide both command signal in the form of a 0-10VDC analog and inputs for A, B, and Marker signals from an encoder. They also provide 5 and 24 VDC and a drive enable signal.

There are four additional connections that receive encoder feedback and provide 5 VDC only. These connections are used for devices that will be included in a position loop with one of the existing axes. These devices include pulse generators, spindle encoders, and quill scales.

Devices in the second group will be assigned to a feedback channel through the machine parameters. The assignment is based upon where they are plugged in. They may make use of a “live” feedback channel if none of the others are available. The channels are identified as follows:

| Location        | Connector | Axis # |
|-----------------|-----------|--------|
| Interface Panel | Axis 1    | 1      |
| Interface Panel | Axis 2    | 2      |
| Interface Panel | Axis 3    | 3      |
| Interface Panel | Axis 4    | 4      |
| Interface Panel | Axis 5    | 5      |
| Interface Panel | Spindle   | 6      |
| Interface Panel | Handwheel | 7      |
| NCB card        | CN3       | 8      |
| NCB card        | CN3       | 9      |

# Keypad Diagnostics

8200 CNC controls have a diagnostic screen to indicate whether the push buttons on the front panel are being read by the keypad encoder card. To access these diagnostics from the main menu enter [F10] Utility, [F7] Panel. The screen will show the push button name, followed by a “0” character. The character will change to a “1” when the appropriate button is pressed. There will also be a status display next to the activity bit that will show the expected function of the switch light; on, off, or blink.

## Override Switch Functions and Settings

The feed rate and spindle over ride switches are rotary switches. These switches send a binary signal that will indicate to the keypad encoder card the position that the switch is in. The keypad encoder then converts this into a keyboard signal and passes it to the control.

The Override parameters in the software (Parameters-Setup-OverRide) determine the percentage value at each position for feed and spindle override.

They also determine the amount of machine movement during front panel hand wheel operation. The table shows the axis movement distance represented in encoder pulses that will result from each pulse (represented by a physical “click”) of the hand wheel.

Remote hand wheels have separate over ride settings in the POWER section of the setup parameters.

The machine software has entries for 22 switch positions to accommodate the feedrate override switch (the spindle override only has 16 positions).

EnabledOpt Stop

CutterComp Off  
ActiveTool 5  
NextTool 5  
Length -06.0000  
Diameter 00.0000  
WorkCoord (G540) 1  
Clearance 00.0000  
FeedRate 050.0 ipm  
(100%) 000.0 ipm  
Spindle 7200 rpm  
(100%) 7200 rpm Off  
0%  
Cycle None  
Dwell 000.0  
Coolant  
Part# 0006  
Time 1:40:36 PM  
arts\2761 374 SIDE 2.n

|   | Current  | Target   | Distance |
|---|----------|----------|----------|
| X | +00.0000 | +00.0000 | +00.0000 |
| Y | +00.0000 | +00.0000 | +00.0000 |
| Z | +06.0000 | +06.0000 | +00.0000 |

Main-Parameters-Setup-OverRides

OverRides

|              | Feed Rate | Hand Wheel | Spindle  |
|--------------|-----------|------------|----------|
| OverRide: 1  | 00.0000   | 00.0000    | 00.0000  |
| OverRide: 2  | 10.0000   | 01.0000    | 10.0000  |
| OverRide: 3  | 20.0000   | 04.0000    | 20.0000  |
| OverRide: 4  | 30.0000   | 08.0000    | 30.0000  |
| OverRide: 5  | 40.0000   | 16.0000    | 40.0000  |
| OverRide: 6  | 50.0000   | 20.0000    | 50.0000  |
| OverRide: 7  | 60.0000   | 30.0000    | 60.0000  |
| OverRide: 8  | 70.0000   | 40.0000    | 70.0000  |
| OverRide: 9  | 80.0000   | 50.0000    | 80.0000  |
| OverRide: 10 | 90.0000   | 60.0000    | 90.0000  |
|              | 100.0000  | 70.0000    | 100.0000 |

Initial Value: 10.0000

F1F2F3F4F5F6SearchF7F8F9F10F11EscExit

# Parameter Files

## The Ram Directory

A Centurion control's "parameters" actually consist of many files beyond the setup parameters contained in the Pfile.dat. These files are all located inside of a directory called "ram" on the C: drive. When parameters are saved it copies all of these files onto a floppy disk inside of another "ram" directory. When parameters are loaded the machine copies all of the files contained in a "ram" directory on a USB stick are copied to the ram directory on the machine.

This is a listing of many of the files that may be seen in the ram directory:

|               |                                                                                                                                                                                                                                                                                                                                                                |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| pfile_f.dat:  | Contains the "float" parameters for machine setup.                                                                                                                                                                                                                                                                                                             |
| pfile_i.dat:  | Contains the "integer" parameters for machine setup.                                                                                                                                                                                                                                                                                                           |
| pfile_s.dat:  | Contains the "string" parameters for machine setup.                                                                                                                                                                                                                                                                                                            |
| pfile_e.dat:  | Added in version 1.36. Contains parameters 8000-9999.                                                                                                                                                                                                                                                                                                          |
| pfile.txt:    | A operator readable text file of the parameter values created any time parameters are saved. A list of these parameters should appear in the "Red Book" of machine information documentation on the USB stick.                                                                                                                                                 |
| bpfile_X.dat: | A backup of each of the machine setup parameters files. Used by the machine as a restore file in case of parameter corruption.                                                                                                                                                                                                                                 |
| BSCREW# :     | The axis ball screw compensation files. BSCREW1 is for X, BSCREW2 is for Y, Ect..                                                                                                                                                                                                                                                                              |
| mck#.ko:      | These are logic files that deal with the function of the M-codes and IO.<br><br>mck1.ko deals mainly with spindle control and coolant commands.<br><br>mck2.ko deals mainly with the tool changer and spindle gear shifting.<br><br>mck3.ko deals mainly with spare M-codes.<br><br>Mck4.ko deals mainly with special functions. It may not always be present. |
| INPUT.XXX:    | A text file that provides the labels for the inputs in the diagnostic display. Must be of the correct foreign extension to function. Not necessary for machine operation.                                                                                                                                                                                      |

OUTPUT.XXX: A text file that provides the labels for the outputs in the diagnostic display. Must be of the correct foreign extension to function. Not necessary for machine operation.

MCODES.XXX: A text file that provides the labels for the M-codes in the MDI page. Must be of the correct foreign extension to function. Not necessary for machine operation.

GCODES.XXX: A text file that provides the labels for the G-codes in the MDI page. Must be of the correct foreign extension to function. Not necessary for machine operation.

hwinfo.txt: A text file showing the versions of software the machine contained for keyboard, CNC, firmware, and the mck files when the machine left Milltronics. Not necessary for machine operation.

O901\*: A custom G-code program

O902\*: A custom M-code program

O903\*: A custom M-code program

O93\*\*: A probing macro program

O97\*\*: A probing macro program

O98\*\*: A probing macro program

TOOLSET.XXX: A program file that serves as the tool setting macro accessed through the run menu.

Q\*\*\*\*: A file used to store and reload a specific group of parameters.

dhcpcd.eth0: Linux file used for networking.

Inpv4.eth0: Linux file used for networking.

Error.log: Captures information about any abnormal exit from the CNC.

Evlogexit.txt: keystroke log saved when the CNC exits for any reason.

Evlogmonitor.txt: keystroke log saved if the CNC stops communicating. Indicative of a “hang up”.

Evlogsave.txt: keystroke log saved when Params / Setup / KeySave is executed

infoA:

infoB:

infoC:                These files relate to they pay timer and must be in the control to operate.

System\_version.txt:   Software version file created when Util / Info / Save is executed.

USAGE:                File records instances of administrator logins - going into params or console window

USAGE.BKP:           Backup of the usage file created when usage becomes too large. Usage will then be cleared and started fresh.

USEROUT:             Used to record the outputs to be displayed in the custom I/O screen. Created when a custom I/O screen is created.

USERIN:               Used to record the inputs to be displayed in the custom I/O screen. Created when a custom I/O screen is created.

In addition to these files there may also be a macro to operate the tool changer.

Files with .DAT or .ENG will be English language files. Other extensions could be other languages. See programming and operation manual for extensions of various languages.

## **MCK Files**

The mck#.ko files configure the inputs and outputs and provide the sequencing for the various M-codes used on the machine. Because of differences in machine design and features, different machines require different mck files to operate correctly. If the files are lost the control will not be able to process M-codes. The files can be restored by loading the backup parameters.

## The pfile\_#.dat Files

The pfile\_#.dat files are the files that contain the setup parameters of the machine. There are a total of 4 pfiles: pfile\_e.dat, pfile\_f.dat, pfile\_i.dat, and pfile\_s.dat that make up the complete set of machine parameters. The 4 files store different types of parameters and all 4 must be present to operate the control in software 1.36 and newer (previous versions did not have the pfile\_e.dat).

These files are not text files and cannot be viewed by themselves. The setup parameters can be viewed within the machine by entering the setup parameter section.

To enter the setup parameters enter the parameter menu on the control and press:

[F1] Setup

This will prompt the user for the access code. Type “**PROTO3**” for the access code and press enter.

The user will now be asked for the access level. Type “**3**” for access level and press enter.

The setup parameters will now be open and the operator will see several parameter section choices that can be made. The main sections are:

[F1] Power: Contains information about the default modes of the machine and the tool changer. Any change in this section will require the machine to be powered down and back up again to take effect.

[F2] Axis: Contains information about the axis movement of the machine. Most of these parameters must have the machine re-homed to take effect.

[F3] Miscellaneous: Contains the spindle ranges and other software defaults.

[F4] OverRide: Contains the values that control the feed rate and spindle over ride knobs.

[F5] BallComp: Allows viewing, editing, and enabling of the ball screw compensation.

[F6] Prefer: Allows change of control passwords.

[F7] Network: Contains the settings for the network connection.

[F8] Thermal: Information related to the optional thermal comp sensors.

[F9] EncComp: Information related to the optional scale measured thermal compensation (TT40 only)

Any of these parameters can be changed by scrolling the cursor to it using the arrow keys at F7 through F10.

Any parameter that requires the machine to have power cycled to take effect will also require that the operator escape back to the main menu before E-stopping the machine and powering it down. If the control is not set back to the main menu before power down the change may not remain in the parameter file.

## **Saving and Loading Parameters**

Because the Centurion control software can be subject to corruption in the software due to various causes it is always advisable to have a backup copy of the machine parameters on a USB. This is easily done on the 8200 CNC control.

### **To save the machine parameters:**

- With a USB stick mounted and the control at the main menu press:  
[F7] Params  
[F9] Save  
[F1] Yes (to overwrite)
- The parameters will be saved on the USB drive in a directory called “ram”.

### **To Load Parameters:**

Any parameter files to be loaded into the machine must be on a USB stick inside of a folder named “ram”. The folder must be located in the root directory (not inside of any other folder) of the USB stick

- With the USB stick mounted and the control at the main menu press:  
[F7] Params  
[F10] Load  
[F1] Yes (to overwrite machine parameters)
- The parameters will be loaded into the machine.
- Escape back to the main menu, emergency stop the machine, and power down for at least 30 seconds before powering the machine back up.
- To load an individual file it is easiest to put the file on a USB stick in a folder called ram, then just load the file as you would a parameter backup.

**The parameter backups that are provided by the factory are typically inside of a ram folder that is inside of another folder on the USB stick provided. This ram folder must be put on the root directory of the USB stick or copied to the root of another USB stick before they can be loaded.**

## How to Change the User Image

The image in the lower left corner of the screen can be changed to suit the user's needs / tastes. The control looks first in the /ram directory for a file named user\_image.jpg. If it does not find one, it uses the Milltronics logo. To customize the user image, put any .jpg image in the /ram directory, renamed as **user\_image.jpg** (the name must be lower case). The control automatically scales the image to fit it into the user info window.

This file can be placed on a USB stick inside of a folder named **ram** and loaded as parameters would.

The File Utilities screen may also be used to load the file into ram, however the ram directory does not appear as a one of the available directory choices under File Utilities until logging in as supervisor with "PROTO3" and "3".

After a new user\_image.jpg file has been inserted in the /ram directory, cycle machine power to display the new image.

## How to Determine the CNC Software Version

The current version of software in the machine can be determined by looking in [F10] Utility – [F8] Info.

The first line will show the CNC version installed in the machine. It will appear in the following format: "MILLTRONICS CNC VERSION 1.##.r####".

The front panel firmware version, The NCB firmware version, and the versions of the MCK files (listed as tasks) can be viewed here as well.

# Software Upgrades

8200 Software is updated on a continuous basis. The core software is the same for both mills and lathes. Upgrades are sought either to fix a problem in a previous version of software or to add features to an older machine. If there are any questions on the compatibility of a software upgrade to a particular machine contact the factory before the upgrade is attempted.

## Installing a Software Update

Before getting started, make sure the update file provided by Milltronics is at the root of the USB drive. The update file will be named `updatecnc.tar.bz2`.

- 1) E-stop the machine
- 2) Turn off the machine power.
- 3) Insert the USB drive into the USB port on the side of the pendant box
- 4) Turn the machine power back on (make sure at least 20 seconds have elapsed since power was turned off before powering on).
- 5) Press any key, EXCEPT FOR ENTER, when the “Grub Menu” screen appears during the boot cycle. The menu will show:

8000  
8000 System Update
- 6) Arrow to “8000 System Update”. Use the arrow keys on a keyboard connected to the machine OR use the letter V key on the keypad.
- 7) Press the “Enter” key. Disregard what scrolls across the screen until it stops
- 8) The control will now ask you if you would like to update your system.

It needs to show **“updatecnc.tar.bz2”**
- 9) Press Y, then press Enter.
- 10) Ignore all errors and warnings
- 11) Control will boot itself to the CNC software.
- 12) Verify the update by going into: [F10] Utility, [F8] Info. The new software version should be displayed.

## • CMOS Setting

The CMOS of the control, sometimes referred to as the Bios settings, is the memory on the motherboard where the configuration of the motherboard itself is set. It is here that the hardware devices such as floppy and hard disk drives are indicated. The BIOS also keeps the date and time, boot sequence, and many other settings. The addition of new hardware, or a battery failure on the motherboard will require entry and setting of the CMOS.

### **CMOS Setup for SBC 9584 board in the 8200 CNC Control**

To access and make changes to the CMOS an external keyboard must be plugged into the machine. The proper keys will not be available without it.

#### **To enter the CMOS:**

Turn on the machine power and immediately begin pressing the DELETE key on the external keyboard. Do not hold the key down as it will cause a Keyboard error.

#### **ADVANCED BIOS FEATURES**

First Boot Device = Hard Disk

Second Boot Device = USB-FDD

Third Boot Device = Disabled

#### **ADVANCED CHIPSET FEATURES**

Video BIOS Cacheable = Enabled

Memory Hole at 15M-16M = Enabled

#### **INTEGRATED PERIPHERALS**

Onboard Device <Enter>

USB2.0 Controller = Disable

Azalia/AC97 Audio Select = All Disabled

Super IO Device <Enter>

Onboard Parallel Port = Disabled

Onboard Serial Port3 = 2E8

Onboard Serial Port4 = 2F8

#### **POWER MANAGEMENT SETUP**

PCI Express PM Function <Enter>    PCI Express PME = Disabled

Video Off in suspend = No

Soft-Off by PWR-BTN = Delay 4 sec

Wake-up by PCI Card = Disabled

Power On by Ring = Disabled

#### **PnP/PCI CONFIGURATIONS**

Resources Controlled By = Manual

IRQ Resources <Enter>

IRQ7 Assigned to Reserved

## How to set the Onscreen Time and Date (PCM9584 Mother Board)

The current time is displayed onscreen at the bottom of the machine status box. Time and date is also recorded during program creation and is displayed in the information box in the lower left corner of the screen during program selection. This time and date are taken from the motherboard clock. Any corrections of time must be done in the cmos settings of the motherboard.

To change the onscreen time:

- 1) Connect an external USB keyboard to the control
- 2) Power the machine on and start tapping the **delete** key as control powers up.
- 3) Control will display a blue screen with the title “Phoenix – AwardBIOS CMOS Setup Utility”. Standard CMOS Features will be highlighted in red.
- 4) Hit the enter key to open the Standard CMOS Features.
- 5) Use arrow keys to highlight the month, day, or year.
- 6) Use the page up and page down keys to change the highlighted item.
- 7) Use arrow keys to highlight the hour, minute or second.
- 8) Enter correct number for the highlighted item, or use the page up and page down keys to change.
- 9) Press the escape key to exit the Standard CMOS Features.
- 10) Press the F10 “Save and Exit” key.
- 11) Press the Y key when the message appears “SAVE to CMOS and EXIT (Y/N)?”, then press Enter
- 12) The control will now reboot to the main CNC operation screen.

## Pay Codes

The 8200 control has a pay timer imbedded into the system to insure payment for the machine is made. If a machine is not permanently enabled (i.e. paid for) it will display the time remaining for operation when the software first boots. If the pay timer expires before being extended or permanently enabled it will display a green message “PAYMENT REQUIRED. CNC OPERATION IS CRIPPLED”. All front panel button lights will flash and the override percentages on the screen will read 0. If this occurs during program operation the axes and spindle should stop as overrides will both be at 0%

Pay timer codes are e-mailed to the dealer via e-mail upon Milltronics’ receipt of payment. The particular person who receives this varies by organization. A form is sent along with the sales order confirmation requesting a designated recipient of this code.

**Changing of an NCB card or the compact flash card requires a new pay code be issued.**  
The card must be installed before the code can be generated.

To get a pay code:

- 1) Get the 8 digit Control Identifier (or Identifier) from the **F10 Utilities – F8 Info** page.
- 2) Get the 8 digit Servo Revision from the **F10 Utilities – F8 Info – F9 Misc** page.
- 3) E-mail those two numbers and the machine serial number to [paytimer@milltronics.net](mailto:paytimer@milltronics.net) to receive the new pay code.

Enter the new pay code under **F10 Utilities – F10 Gokey – F1 Code**.

The code will come in two parts of 8 digits each. Part B of a permanent code will all be the same character.

## Linux Command Prompt

A Linux command prompt window can be accessed from the control through the [F10] Utility Menu.

- 1) Press the [F1] Console key
- 2) At the “User” prompt type **SU**. Press Enter.
- 3) At the “Password” prompt type **CENT8**. Press Enter.

The Linux command window will appear.

To close the window type **EXIT** and press Enter.

## Setting up Custom Codes on the 8200 Control

Often it is desirable or necessary to create a user defined M-code or G-Code for the machine to use. A custom code is one that is linked to a program such that when the M-code or G-code is commanded, the program will be run. The procedure to set up a custom code follows.

- 1) From the main menu, enter the setup parameters and go to the Power group.
- 2) Page down to the custom M and G code section. Select the custom code slot that is to be used and set it to the M or G Code number desired (if an M77 is being created, set the custom M-code to 77). Escape back to the main menu.

The screenshot displays the 'Main-Parameters-SetUp-Power' screen. On the left, a list of parameters is shown, including 'CutterComp Off', 'ActiveTool 2', 'NextTool 2', 'Length 00.0000', 'Diameter 00.0000', 'WorkCoord (G540) 1', 'Clearance 00.0000', 'FeedRate 050.0 ipm (100%) 000.0 ipm', 'Spindle 0000 rpm (100%) 0000 rpm Off', 'Cycle None', 'Dwell 000.0', 'Coolant', 'Part# 0006', and 'Time 5:18:34 PM'. The 'Opt Stop' button is highlighted in green. The main area shows a table with columns 'Current', 'Target', and 'Distance' for X, Y, and Z axes, all set to +00.0000. Below this, the 'Power' section contains a list of custom codes (G09015 to G09025 and M09020 to M09025) with their corresponding 'Values'. The value for 'Custom Mcode 09025' is set to 77. The 'Initial Value: 0' is indicated at the bottom right. The bottom of the screen features a row of function keys (F1-F11) and navigation arrows.

| Current    | Target   | Distance |
|------------|----------|----------|
| X +00.0000 | +00.0000 | +00.0000 |
| Y +00.0000 | +00.0000 | +00.0000 |
| Z +00.0000 | +00.0000 | +00.0000 |

| Custom Code        | Values |
|--------------------|--------|
| Custom Gcode 09015 | 0      |
| Custom Gcode 09016 | 0      |
| Custom Gcode 09017 | 0      |
| Custom Gcode 09018 | 0      |
| Custom Gcode 09019 | 0      |
| Custom Mcode 09020 | 0      |
| Custom Mcode 09021 | 0      |
| Custom Mcode 09022 | 0      |
| Custom Mcode 09023 | 0      |
| Custom Mcode 09024 | 0      |
| Custom Mcode 09025 | 77     |

Initial Value: 0

- 3) Write a program with the number of the custom M-code slot that was selected. If custom M-code O9020 was set, the program written must be named O9020. Write or save the program into the RAM folder of the CNC.
- 4) M-codes will be active on an 8200 control without having to cycle power on the machine.

Note: If an M-code number of an existing M-code is used, the custom code will replace the original. If the original code is called at the end of the custom code the original will be executed after the custom events are run. A custom M-code cannot call another custom M-code.

Custom M-codes programs must be in the RAM directory on the 8200 control or they will not be recognized. They will be saved with the other parameters and are safe from being erased in this location.

All M-codes are resolved when trying to execute an M-code through MDI or a program. If there is a problem with any custom code the error “322: Error in program Oxxxx or custom M code program not found” will be displayed when trying to execute ANY M-code.

### **Sample Custom M-Code**

Example: To make a lamp come on when an M30 is commanded.

- 1) Start a new text program in the ram directory named o9031. In the program write:

```
STO 50  
M30
```

- 2) Store the program.
- 3) Then set the Parameter Custom M code 9031 to 30. (see below)
- 4) After this has been done reboot the machine to load the program into main memory.

When the M30 command is commanded, 9031 gets run. The STO50 command will trigger J4-14, which could turn on a relay wired to it. This in turn could power a light. The original M30 will then be executed and the command is complete.

## **Wait Channel**

Input J1-7 (Axis 1-input 7) is the wait channel. It is wired to terminal block 79.

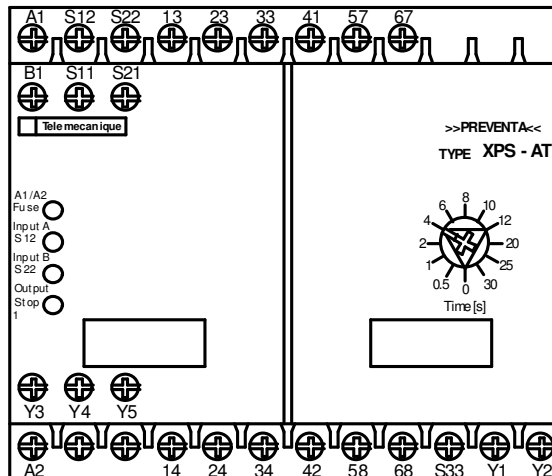
If an M32 is commanded in a program the control will look at this input. If the input is activated the machine will stop at this point and wait for the input to lose the signal before continuing the program. If the signal is not there at the time the M32 is issued the control will continue as if it did not receive the code at all. The signal must only be broken for an instant to allow the control to pass beyond this block of the program.

A popular use for the wait command is if the machine tool has an indexer installed. The indexer code will usually include a check of the wait channel. The indexer itself will have a channel wired to the wait channel that will signal while the indexer is turning. When the indexer move is completed it will break the signal and allow the program to continue.

# The 8200CNC “Sourcing” Enable Circuit

Featuring the Telemecanique Preventa XPS-AT Safety relay

In 2006 Milltronics changed from a “Sinking” interface panel which used 0VDC inputs and outputs to a “Sourcing” interface which uses 24VDC inputs and outputs. The machine enable or “reset” circuit was changed at this time to make use of the Telemecanique Preventa XPS-AT Safety Relay. The following information describes this Safety Relay and its use in a typical Milltronics machine.



## Safety Relay Terminal Designations

**A1** - 24 volts DC power

**A2** – DC ground

**Y3,Y4,Y5** – Jumper to indicate the nature of the reset signal. Y3 and Y5 are tied together in a Milltronics machine indicating that the Safety Relay will reset on the trailing edge of the reset pulse. This means that reset occurs upon button release, not when it is first pressed.

**S11 to S12** – Input Circuit A

**S21 to S22** – Input circuit B

Input circuits that indicate the machine status outside of the Safety Relay is OK. Circuits must be unbroken to allow the machine to reset. A break in either circuit will signal the Safety Relay to stop the machine. If the relay is faulted both circuits must be broken (an e-stop button pressed) before they can be restored.

**B1 to S11** – These terminals are jumped to indicate the presence of two separate input circuits (A and B). When this jumper is in place the two circuits are operated at different voltages (one at 24vdc and the other at 0vdc). This allows the Safety Relay to detect shorts between the two circuits or to ground.

**S33 to Y2** – A momentary connection between these two terminals initiates the reset of the Safety Relay. The connection can be broken down into two parts:

S33 to Y1 – The reset pulse. This includes a contact in the reset button and a relay contact in the interface panel tied to the “ALLOW RESET” signal (J3-9). There should be continuity between these two terminals when the reset button is pressed.

Y1 to Y2 – Pre-existing conditions. These are normally closed contacts on any number of relays activated by the Safety Relay that should be OFF before the machine is allowed to reset. In most Milltronics machines this includes the relays that provide power to the axes and spindle controllers. Other relay contacts could be present as well (see specific machine print for details).

The Y1 terminal does not have an internal connection to the Safety Relay and is used only as a convenient terminal to separate the wiring between the reset pulse and NC contact circuits.

**41 to 42** – This is an NC contact that is used to alert the CNC that the Safety Relay is in a stopped condition. This signal is connected to the E-stop input (J1-1) of the CNC.

**13 to 14**

**23 to 24**

**33 to 34** – These normally open contacts close when the Safety Relay is enabled. They open immediately when the relay is stopped.

**57 to 58**

**67 to 68** - These normally open contacts close when the Safety Relay is enabled. They open a delayed time after the relay is stopped. The duration of the delay (in seconds) is set by the dial on the front of the Safety Relay.

## **Safety Relay Conditions at Start**

The following conditions should exist on the Safety Relay once the CNC control has booted up and the emergency stop buttons are released. The machine will not be prepared to reset if these conditions are not met.

Power on A1 and A2. Indicated by top light “A1/A2 Fuse” being lit.

Continuity in the circuit between S11 and S12 terminals indicated by “Input A” light being on

Continuity in the circuit between S21 and S22 terminals indicated by “Input B” light being on

Stop 1 time delay circuits are open indicated by the “Output Stop 1” light being off.

Any problems in the initial startup of the relay could be due to any of the following causes.

### **If the “A1/A2 Fuse” light is not on:**

- The relay is not getting 24vdc to the A1 terminal.
- It is not connected to DC ground at terminal A2.
- The Safety Relay is defective.

**If the “Input A” and “Input B” lights are both out:**

- One of the e-stop buttons is depressed.
- An external device with an emergency stop button on it is not connected, i.e. remote hand wheel or chip conveyor.

**If the “Input B” light is on, but the “Input A” light is not. There is a break between S11 and S12 caused by:**

- The Watchdog relay in the interface panel not being on (check interface).
- The CR1A “Software E-Stop” relay being on or contacts stuck open (check output J3-1 or the CR1A relay).
- A break in E-stop wiring between S11 and S12. Check for continuity thru the circuit.

**The “Input A” light is on, but the “Input B” light is not. There is a break between S21 and S22 caused by:**

- A break in E-stop wiring between S21 and S22. Check for continuity thru the circuit.
- On initial applications where CR1A contacts and watchdog contacts were wired between terminal B1 and S11 on the Safety Relay (Disregard if there is a jumper directly from B1 to S11)
  - Watchdog relay in the interface panel not being on (check interface)
  - CR1A “Software E-Stop” relay being on or contacts stuck open (check output J3-1)

**If the “Output Stop 1” light is on:**

- The machine is already reset.
- The relay is in the time delay period after e-stop.
- The relay is defective.

## **Resetting the Machine**

### **How to enable the machine:**

- 1) Release all of the emergency stop switches on the machine. A1/A2 Fuse, Input A, and Input B lights should now all be lit.
- 2) Wait approximately 5 seconds.
- 3) Press and RELEASE the ENABLE button on the machine. Machine should enable after the release of the enable button.

### **How to enable the machine after a software emergency stop (drive fault, excess error, air pressure alarm):**

- 1) Clear the cause of the machine fault.
- 2) Press any one of the emergency stop buttons (to clear both A and B emergency stop channels).
- 3) Release all of the emergency stop switches on the machine. A1/A2 Fuse, Input A, and Input B lights should now all be lit.
- 4) Wait approximately 5 seconds.
- 5) Press and RELEASE the ENABLE button on the machine. Machine should enable after the release of the enable button.

## **The Enable Sequence Explained**

When the machine is powered on the A1/A2 Fuse light should come on. The Input B light will come on as well.

As the interface panel initializes and the watchdog relay turns on, the Input A light will come on.

The relay should now be in its starting condition and prepared to be enabled. If it is not see the above section “Safety Relay conditions at start” to determine why.

To enable the machine, press the enable button. A signal is sent from terminal S33 on the Safety Relay through a “reset allow” relay contact in the interface assembly, then through an NO contact on the reset button itself to terminal Y1 on the Safety Relay. This signal then travels from The Y1 terminal through various NC contacts (see appropriate machine schematic for details) to the Y2 terminal. The button is then released, stopping the signal. It is this “trailing edge” when the signal stops that is an indication that the Safety Relay is to enable. If the relay is enabled the fourth light “Output Stop 1” should come on.

## Things to check if the Safety Relay does not enable:

**Make sure that the lights show that the relay is in the starting condition.**

**Check that the signal is traveling between S33 and Y1.**

- The “Allow reset” contact may not be closing in the interface when the reset button is pressed. Check in the diagnostic screen for J3-9 to be turning ON when the reset button is pressed. If it does not the CNC does not want the machine to reset. Things that inhibit the “Allow Reset”:
  - J1-1 “E-stopped” is OFF. This input is triggered through the NC contact at terminals 41 and 42 of the Safety Relay. If the machine does not know it is e-stopped, then it will not try to reset. **If the machine is equipped with the XPS-ATE safety relay the J1-1 will be wired through contacts on a relay “RR” instead.** Make sure the RR relay is seated in its socket.
  - Spindle drive fault.
  - Watchdog failure in the interface assembly (Input A light should not be lit).
- Check that there is continuity through the allow reset contact between J3-45 and J3-46 on the interface terminals when reset is pressed. If the diagnostic dot changes color, but there is no continuity between the two terminals, the interface panel may be bad.
- Check that there is continuity through the reset button contacts when reset is pressed. If there is no continuity through it when pressed then the button or wiring may be bad.

**Check that the signal is traveling between Y1 and Y2.**

Prior to the Safety Relay being enabled the relay contacts should be closed between Y1 and Y2. Check for continuity between Y1 and Y2 terminals. If there is no continuity a relay or contact may be stuck open.

**Check if there is always continuity between S33 and Y2**

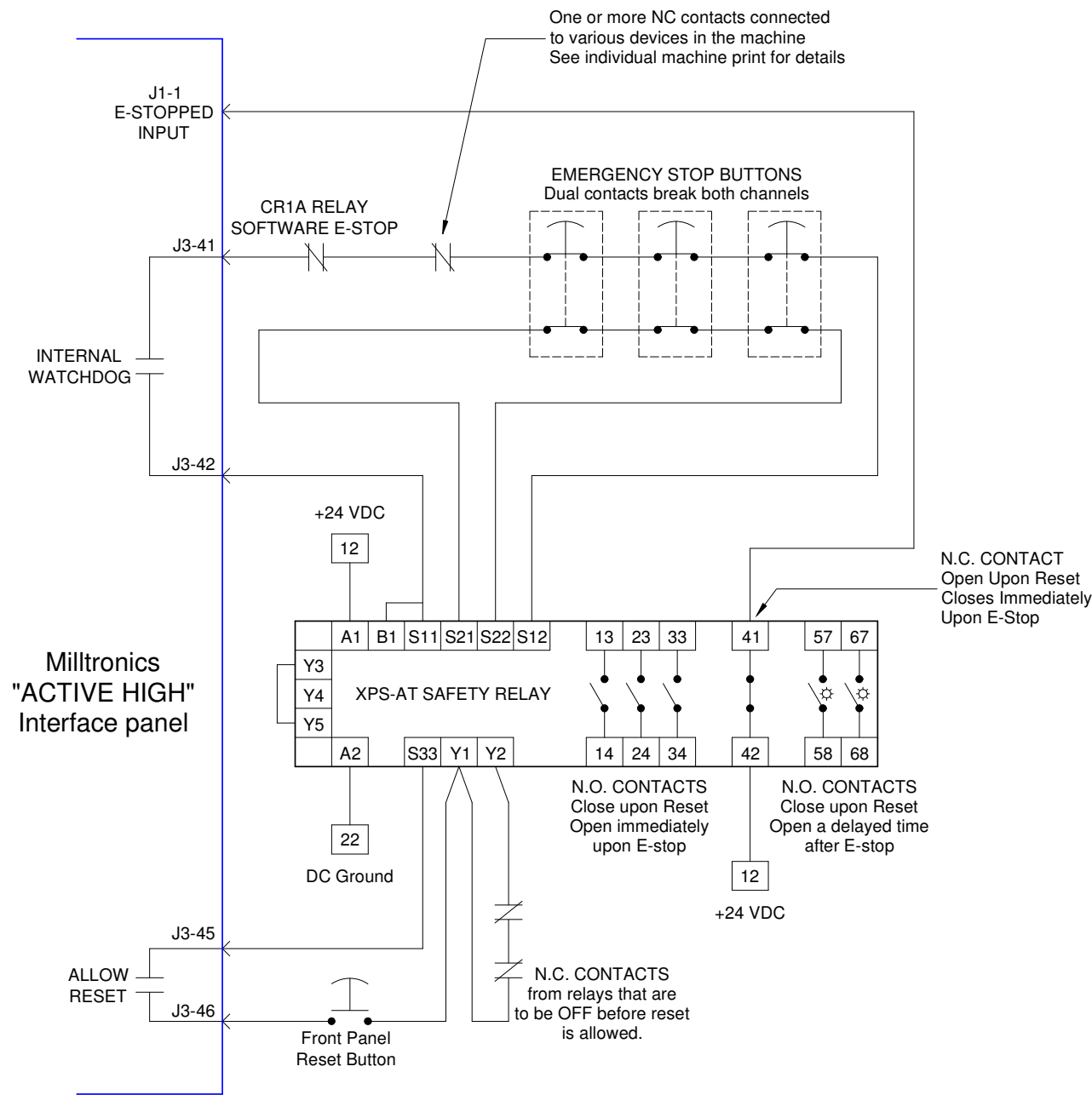
This would require a multi-level failure, however if the cycle start was stuck on there could be continuity between S33 and Y2 all of the time. In that case there would be no “trailing edge” signal when the button was released and the Safety Relay will not enable.

**The Safety Relay is bad.** The safety relay is highly reliable and its failure is unlikely. If relay failure is suspected, recheck the above conditions prior to replacing it.

If the Safety Relay energizes for a second, but drops out immediately then one of the “Drive OK” signals may be missing which would indicate a drive fault. Check for A 449 alarm on the control or look for fault indications on the axis drives.

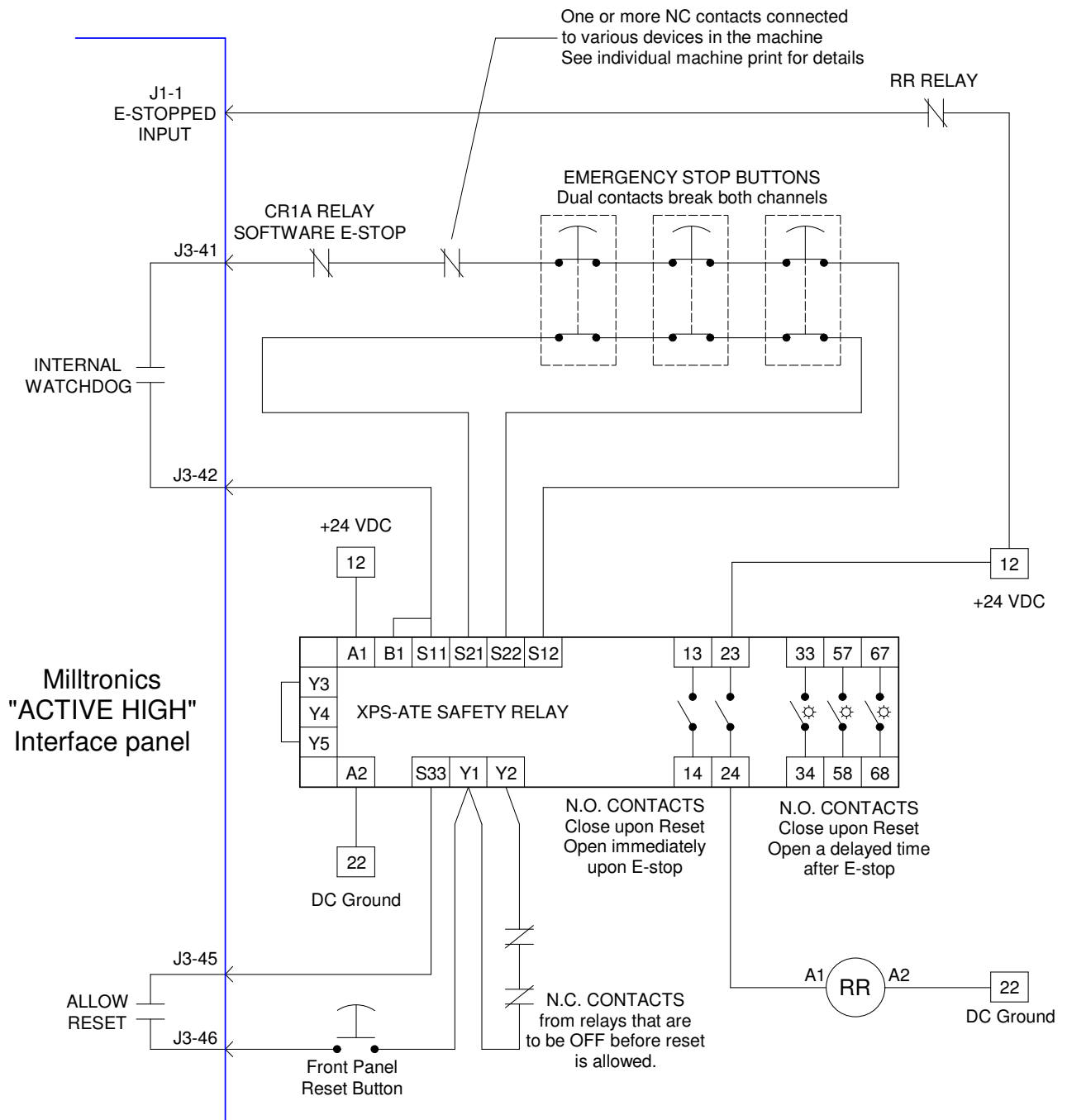
Sourcing Machine Reset Basic Diagram: XPS-AT Relay

Milltronics CNC  
Safety Relay Circuit  
Basic Diagram



## Sourcing Machine Reset Basic Diagram: XPS-ATE Relay

### Milltronics CNC XPS-ATE Safety Relay Circuit Basic Diagram



# The Milltronics “Sourcing” Enabled Circuit

## Featuring the Phoenix Contact PSR-ESD-30 Safety Relay

In 2014 Milltronics began using the Phoenix Contact PSR-ESD-30 safety relay. It replaced the previous safety relay manufactured by Telemechanique. The functionality is very similar with some differences in the operation of the LEDS and the wiring of the enable button. The following information describes this Safety Relay and its use in a typical Milltronics machine.

### Safety Relay Terminal Designations

**A1** - 24 volts DC power

**A2** – DC ground

**S11 to S12** – Input Circuit A

**S21 to S22** – Input circuit B

Input circuits that indicate the machine status outside of the Safety Relay is OK. Circuits must be unbroken to allow the machine to reset. A break in either circuit will signal the Safety Relay to stop the machine. If the relay is faulted both circuits must be broken (an e-stop button pressed) before they can be restored.

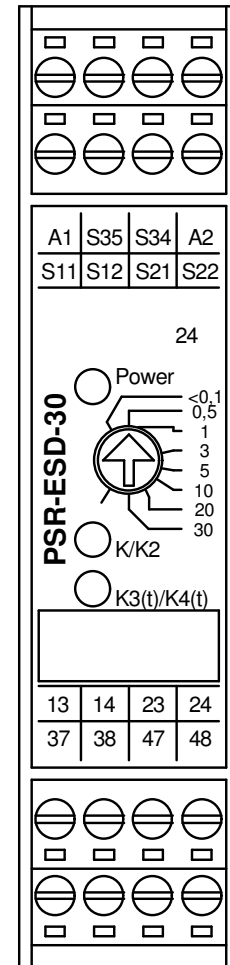
**S34**– A momentary 24vdc pulse to this terminal initiates the reset of the Safety Relay. The connection is broken down into two parts on the electrical panel:

**Terminal Block 94 to Terminal Block 93** – The reset pulse. This includes a contact in the reset button and a relay contact in the interface panel tied to the “ALLOW RESET” signal (J3-9). There should be continuity between these two terminals when the reset button is pressed.

**Terminal Block 93 to Relay Terminal S34** – Pre-existing conditions. These are normally closed contacts on any number of relays activated by the Safety Relay that should be OFF before the machine is allowed to reset. In most Milltronics machines this includes the relays that provide power to the axes and spindle controllers. Other relay contacts could be present as well (see specific machine print for details).

**13 to 14**

**23 to 24** – These normally open contacts close when the Safety Relay is enabled. They open immediately when the relay is stopped.



### **37 to 38**

**47 to 48** - These normally open contacts close when the Safety Relay is enabled. They open a delayed time after the relay is stopped. The duration of the delay (in seconds) is set by the dial on the front of the Safety Relay.

## **Safety Relay Conditions at Start**

The following conditions should exist on the Safety Relay once the CNC control has booted up and the emergency stop buttons are released. The machine will not be prepared to reset if these conditions are not met.

- Power on A1 and A2. Indicated by top LED “Power” being lit.
- Continuity in the circuit between S11 and S12 terminals.
- Continuity in the circuit between S21 and S22 terminals.
- The K/K2 and K3(t)/K4(t) lights should be OFF.

Any problems in the initial startup of the relay could be due to any of the following causes.

### **If the “Power” light is not on:**

- The relay is not getting 24vdc to the A1 terminal (CB RR is open?).
- It is not connected to DC ground at terminal A2.
- The Safety Relay is defective.

### **If ANY LEDs are flashing on the safety relay (on power up):**

There is a problem with the wiring to the relay OR the timer dial has been adjusted while power is on. Shut off machine power for 30 seconds, then turn back on to see if problem corrects itself. If not the wiring to the relay must be inspected.

## **Enabling the Machine**

### **How to enable the machine:**

- 1) Release all of the emergency stop switches on the machine.
- 2) Wait approximately 5 seconds.
- 3) Press and RELEASE the enable button on the machine.
- 4) Machine should enable after the release of the button. All 3 LEDs on the safety relay should be on.

### **How to enable the machine after a software emergency stop (drive fault, excess error, air pressure alarm):**

- 1) Clear the cause of the machine fault.
- 2) Press any one of the emergency stop buttons (to clear both S11 and S21 emergency stop channels).
- 3) Release all of the emergency stop switches on the machine.
- 4) Wait approximately 5 seconds.
- 5) Press and RELEASE the enable button on the machine.

Machine should enable after the release of the button. All 3 LEDS on the safety relay should be on.

### **The Reset Sequence Explained**

When the machine is powered on the “Power” light should come on.

As the interface panel initializes and the watchdog relay turns on. When all Emergency Stop buttons are released the S11-S12 and S21-S22 circuits should be complete.

The relay should now be in its starting condition and prepared to be enabled. If it is not see the above section “Safety Relay conditions at start” to determine why.

To enable the machine, press the Enable button. 24 VDC will travel from terminal block 94 through a “reset allow” relay contact in the interface assembly, then through an NO contact on the reset button itself to terminal block 93. This signal then travels from terminal 93 through various NC contacts (see appropriate machine schematic for details) to the S34 terminal on the safety relay. The button is then released, stopping the signal. It is this “trailing edge” when the signal stops that is an indication that the Safety Relay is to enable.

If the relay is enabled all three LEDs should come on.

### **Things to check if the Safety Relay does not enable:**

#### **Make sure that the lights show that the relay is in the starting condition.**

If the **Power LED is flashing** either the S11-S12 circuit or the S21-S22 circuit is open. Flashing of the LED can occur when the software e-stop is activated and the enable button is pressed. Check for faults of the axes or spindle drive, air pressure alarm, or other control initiated emergency stop.

**Check that the signal is traveling between Terminal Block 94 and Terminal Block 93.**

- The “Allow reset” contact may not be closing in the interface when the reset button is pressed. Check in the diagnostic screen for J3-9 to be turning ON when the reset button is pressed. If it does not the CNC does not want the machine to reset. Things that inhibit the “Allow Reset”:
  - J1-1 “E-stopped” is OFF. This input is triggered through the NC contact at terminals 41 and 42 of the Safety Relay. If the machine does not know it is e-stopped, then it will not try to reset.
  - Spindle drive fault.
  - Watchdog failure in the interface assembly (Check Watchdog LED on interface).
- Check that there is continuity through the allow reset contact between J3-45 and J3-46 on the interface terminals when reset is pressed. If the diagnostic dot changes color, but there is no continuity between the two terminals, the interface panel may be bad.
- Check that there is continuity through the reset button contacts when reset is pressed. If there is no continuity through it when pressed then the button or wiring may be bad.

**Check that the signal is traveling between Terminal Block 93 and Safety Relay Terminal S34.**

Prior to the Safety Relay being enabled the relay contacts should be closed between these terminals. Check for continuity between them. If there is no continuity a relay or contact may be stuck open.

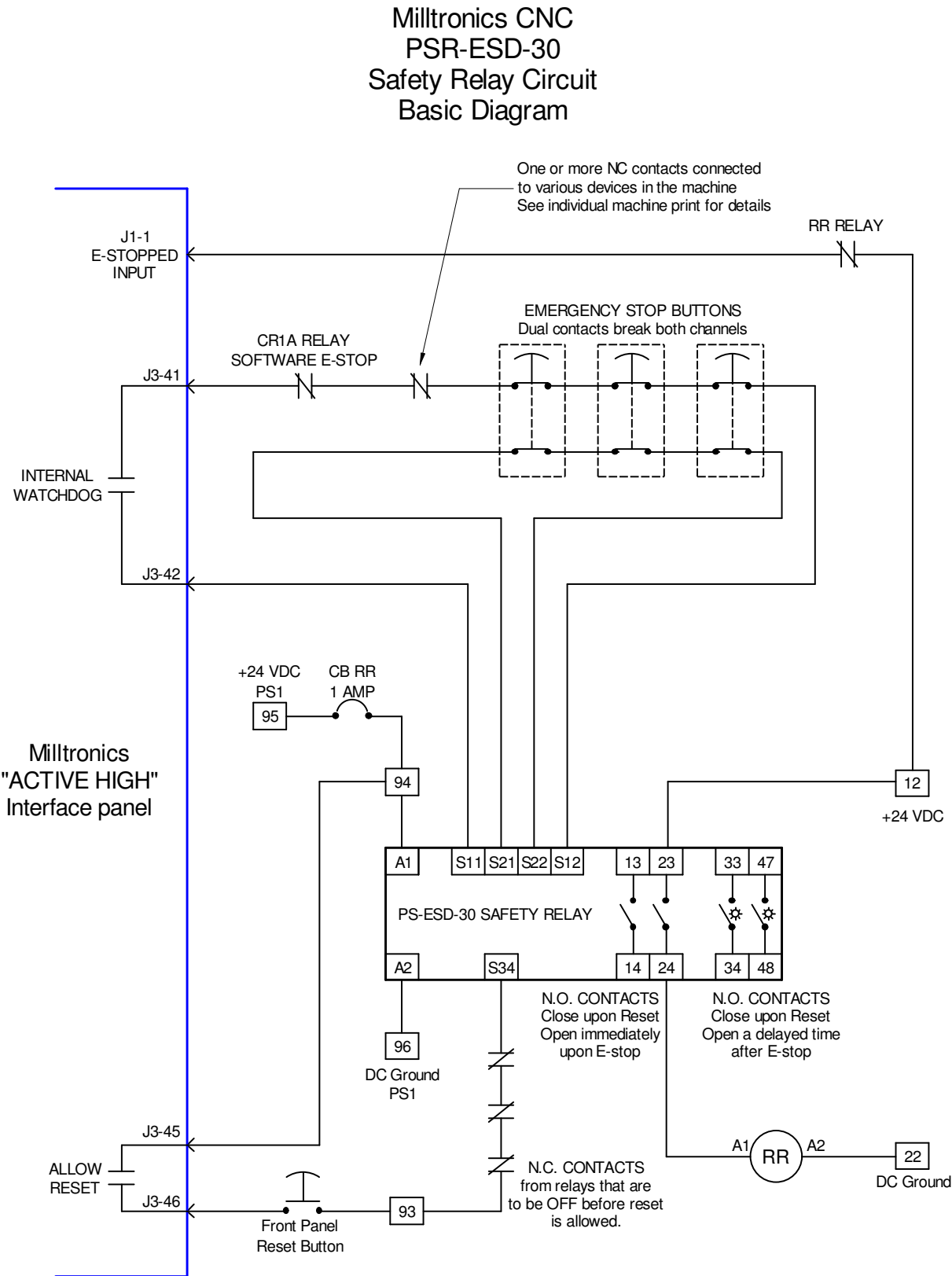
**Check if there is always continuity between Terminal Block 94 and Safety Relay Terminal S34.**

This would require a multi-level failure, however if the cycle start was stuck on there could be continuity between Terminal Block 94 and Safety Relay Terminal S34 all of the time. In that case there would be no “trailing edge” signal when the button was released and the Safety Relay will not enable.

**The Safety Relay is bad.** The safety relay is highly reliable and its failure is unlikely. If relay failure is suspected, recheck the above conditions prior to replacing it.

If the Safety Relay energizes for a second, but drops out immediately then one of the “Drive OK” signals may be missing which would indicate a drive fault. Check for A 449 alarm on the control or look for fault indications on the axis drives.

Sourcing Machine Reset Basic Diagram: PSR-ESD-30 Relay



# Troubleshooting the Enable Circuit with a Volt Meter

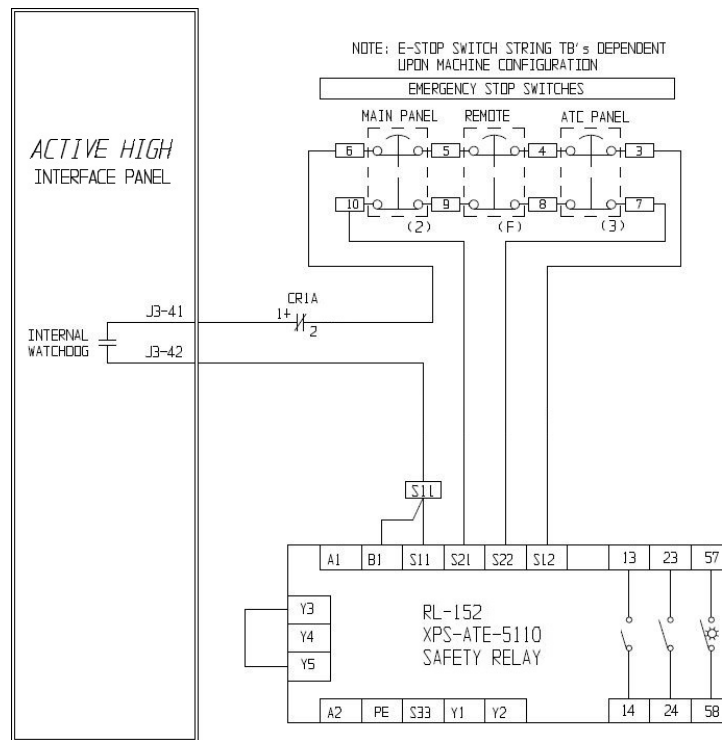
The most common failure mode of the safety relay is a break in the S11/S12 circuit as it contains contacts from all of the components included in the e-stop chain (typically only the second contacts of emergency stop buttons are found in the S21/S22 circuit). A break in the safety relay circuit in the S11/S12 input circuit will cause the relay to drop into a fault state or fail to enable. Finding the point at which the circuit is broken is the key to determining the problem.

DC voltage is supplied from terminal S11 on the safety relay through the circuit to S12. A volt meter can be used to test through each successive point in the input circuit to find where the voltage is lost.

The voltage will be approximately **24 VDC** on the **RED** Telemechanique Preventa relay

The voltage will be approximately **16.7 VDC** on the **YELLOW** Pheonix Contact relay.

The circuit below can be tested in order from terminal S11 on the safety relay.



- S11 on safety relay to ground.
- J3-42 on the interface breakout module to ground.
- J3-41 on the interface breakout module to ground.
- Terminal 1+ on CR1A solid state relay to ground.
- Terminal 2 on CR1A solid state relay to ground.
- Terminal strip 6 to ground.
- Terminal strip 5 to ground.
- Terminal strip 4 to ground.
- Terminal strip 3 to ground.
- S12 on safety relay to ground.

Examine the results of the tests to find the break in the circuit:

|                                                   |        |
|---------------------------------------------------|--------|
| S11 on safety relay to ground:                    | 24 VDC |
| J3-42 on the interface breakout module to ground: | 24 VDC |
| J3-41 on the interface breakout module to ground: | 24 VDC |
| Terminal 1+ on CR1A solid state relay to ground:  | 24 VDC |
| Terminal 2 on CR1A solid state relay to ground:   | 24 VDC |
| Terminal strip 6 to ground:                       | 24 VDC |
| Terminal strip 5 to ground:                       | 0 VDC  |
| Terminal strip 4 to ground:                       | 0 VDC  |
| Terminal strip 3 to ground:                       | 0 VDC  |
| S12 on safety relay to ground:                    | 0 VDC  |

The test shows a loss of voltage between terminals 6 and 5 in the terminal strip which would indicate a problem with the Main Panel emergency stop button.

If there is voltage present at S11 to ground and S12 to ground there is no break in the circuit.

Components included in the S11/S12 input circuit will vary by machine. Consult the specific electrical print for the machine in question to determine what points need to be tested.

## Networking Setup for the 8200 Control

Access the network setup screen by pressing [F7] Paramtrs - [F1] Setup. A green "Supervisor Login" screen appears in the User Info area in the lower left part of the screen. Enter "PROTO3" in the User field. Then enter "3" for password. The setup parameter choices will appear. Press [F7] Network for the network setup page. The screen will look like this:

|   | Current  | Target   | Distance |
|---|----------|----------|----------|
| X | +10.0000 | +10.0000 | +00.0000 |
| Y | +10.0000 | +10.0000 | +00.0000 |
| Z | +14.5650 | +14.5650 | +00.0000 |

| Network Settings     |                |
|----------------------|----------------|
| SERVER INFORMATION:  |                |
| SERVER:              | 10.110.40.99   |
| SHARE NAME:          | ENGINE         |
| USER NAME:           | PETERSTL       |
| PASSWORD:            | *****          |
| MACHINE INFORMATION: |                |
| DEVICE:              | eth0           |
| TYPE:                | Static         |
| MACHINE IP:          | 10.110.100.220 |
| GATEWAY:             | 10.110.10.1    |
| SUBNET MASK:         | 255.0.0.0      |

By default, the CNC sees letters entered at the front panel as upper case. To get a lower case letter, hold down <Shift> then <Space> then press the letter. Release <Shift> and <Space>, then repeat the sequence for the next lower case letter. Using an external keyboard, to get lower case letters, hold down <Shift> then press the letter.

**SERVER:** This is the IP address of the host computer where the network share is located, for example "10.100.40.99". The share may be on the network server, but it doesn't have to be. The IP address is available from the server itself. On the server, from the Start menu, choose Run. Type "cmd" and <Enter>, which produces a DOS-style command prompt. At the prompt type "ipconfig" and <Enter>. The resulting list includes the IP address of the server. If the server is a "DNS" server then the server name can be used rather than the address.

**SHARE NAME:** The name of the directory on the server where part programs are stored, designated for sharing with network clients (the CNC8000 is a network client). For example "CNC Parts". The Share Name is case sensitive.

**USER NAME:** User name of any authorized network user. For example "JVENTURA". The User Name is case sensitive. Even if the shop network does not have user names and passwords, the 8200 network setup interface still requires a user name. Make something up.

**PASSWORD** User's password. For example "TheBody123". The password is case sensitive. If a shop network does not have user names and passwords, no password entry is required.

\*\*\*\*\* MACHINE INFORMATION \*\*\*\*\*

**DEVICE:** Toggle choices are "eth0", "eth1", and "--". Use "eth0".

**TYPE:** Toggle choices are "Static", "Dynamic", and "None".

Dynamic: Activates DHCP. The machine requests a temporary IP address from the network DHCP server and no further information is needed. No other network entries will be displayed.

Static: A specific static IP address is assigned to the machine. This method is used by many shops and requires further information.

**MACHINE IP:** The static IP assigned to the network port. For example, "10.110.100.218". The IP address of the network port may be verified on the 8200 side at the Linux console. At the console prompt execute the command "ip addr" to see data associated with each of network ports.

**GATEWAY:** Ask the shop network person. An example would be "10.110.10.1". The default gateway is also available from the shop network server. On the server, from the Start menu, choose Run. Type "cmd" and <Enter>, which produces a DOS-style command prompt. At the prompt type "ipconfig" and <Enter>. The resulting list includes the default gateway.

It is also okay simply to use the machine's own static IP address as the gateway address. The 8200 network setup page will be satisfied with that value and the machine will not have a path out to the Internet, which is probably good.

**SUBNET MASK:** Ask the shop network person. An example would be "255.255.0.0". The subnet mask is also available from the shop network server. On the server, from the Start menu, choose Run. Type "cmd" and <Enter>, which produces a DOS-style command prompt. At the prompt type "ipconfig" and <Enter>. The resulting list includes the subnet mask.

After filling in fields in the network setup page, **press F1 (Save)** to save them. Escape back up to the main screen. Cycle the power on the machine to allow the CNC8000 to see the network settings.

## **Additional 8200 Networking Information**

### **Ping**

A successful ping means your hardware connection is good. Pinging is an important first step, but it doesn't necessarily mean you will be able to see the files you want to see.

For example, on the engineering machine, setting the server address as 10.110.100.1 and setting DHCP, the network assigns an IP address to the machine. The machine pings successfully with other computers on the network. It does not see the Engine drive.

Setting the server address as 10.110.40.99 and setting DHCP, the network assigns the same IP address to the machine (!). The machine pings successfully with other computers on the network, and it does see the Engine drive.

Ping is executed from the command line. To get to a command line, open a console window by doing Util -> Console. The control prompts for a username and password. For highest privilege, username is "SU" and password is "CENT8". Sometimes when exploring at the system level it is better to plug in a keyboard and exit the cnc entirely by doing Ctrl-Alt-Backspace. Then ping as follows:

`ping -c 3 xxx.xxx.xxx.xxx` for example `ping -c 3 10.110.70.40`

### **Network Setup**

Type: The customer may not know if his shop machines are networked dynamically (using DHCP) or statically. If the customer does not know, then a workaround is to go to any other computer on that same network to see how it is set up. To investigate how a computer is set up on the network, sit down at that computer and go to Start -> Control Panel -> Network Connections. If there is more than one network connection listed, identify the active one and double-click on it. Then click Properties and scroll down to Internet Protocol (TCP/IP) and highlight it. Then click Properties. If the radio button labeled "Obtain an IP address automatically" is filled in, then the network supports DHCP. If the radio button labeled "Use the following IP address" is filled in, then the shop uses static IP addresses.

Gateway: This is the path from the machine out to the Internet. A value for Gateway is obtainable from the host computer, but it is okay, and perhaps better, to use the same value in Gateway as in static IP. The 8200 network setup page will be satisfied with that value and the machine will not have a path out to the Internet, which is probably good.

Subnet Mask: Obtained from the host computer.