

The Centurion Control

The centurion 6 control, as was the Centurion 1 and 5 before it, is a PC based control system. This means that the control structure is based on off-the-shelf components similar to those found in most desktop applications. The main processor is an Intel chip (currently 133Mhz Pentium). The video driver and the I/O card (if needed) are also those that would be found in a standard desktop computer. The job of making the PC work as a CNC control is the task of some special cards and the software that runs in the machine.

Centurion “6 ½”

The current Centurion control is sometimes referred to as a Centurion 6.5. This control differs from the previous controls in that a standard P.C. motherboard is no longer used. This has been replaced with a passive back plane and an SBC card.

“SBC” stands for single board computer. The SBC contains the processor, memory simms, Input/output, video, and network all on one card. In addition, the card will typically include a “Disk on Chip”. This is a solid state chip that acts exactly like a hard drive. The machine software, network drivers, and part storage are all contained on the chip. The storage capacity depends upon which model of the chip is on the card. The standard chip will hold 8 meg. This card can be powered by plugging the card cage power supply directly into the card or by plugging it into a powered back plane board. This is how it is done in the Centurion control.

The back plane board itself has no independent function. Its purpose is to provide both a power source and a route for communication for the other cards that are plugged into it. The back plane board contains 6 ISA sockets for plugging in cards, a connection for the power supply to feed it, a series of screw terminals to get power off of the board if desired, and four indicator LEDs to show the presence of the four voltages on the back plane board.

The rest of the components of a Centurion 6.5 are similar to the earlier Centurion 6. Differences will be noted below.

Control Components

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

Centurion 6/6T/6.5 Control

NC Blaster Board (NCB): The NCB card is the CNC brain of the control. This card processes the axis moves for the control and responds to the encoder feedback. It is the NCB card that closes the loop for the motion control. It is capable of supporting up to five axis of motion control simultaneously. This board houses the NCB firmware, the software that runs the motion control (see diagram).

There are additional components on this board if it is used in a Centurion 6 control instead of a 6.5. The Simdisk II, SRAM chips, and software daughter board are not used and may not be present in a Centurion 6.5 system.

The Simdisk II chip (see diagram) enables the two other banks of chips to act as logical drives. The SRAM bank of chips acts as part storage and parameter storage. It is a read/write drive. The other bank located on the software daughter board provides the location that the machine software and operating system is stored on. These chips are read only.

In addition, there is another chip that must be changed when the card is used in a Centurion 6.5 system, due to a conflict with the SBC card. This chip is labeled U33 and 1290 on a Centurion 6 system. **This chip should be labeled U33A and/or 125F when used with the SBC board in a 6.5 control.**

Software Daughter board: A Centurion 6.5 system will not have this board. This board holds the chips that are the Rom memory of the control. This is where the machine software resides. There are two types: The original rom board contained six to eight socketed chips. A software change required changing of the chips. The flash daughter board has six permanently soldered chips. These software on these chips can be changed via floppy disks, thus no changing of the chips should ever be required.

Interface Daughter (IFD) Board: This board 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 sends out the analog signals, contains the gain settings, and sets the inputs and the outputs.

Interface Panel: The interface panel contains the plugs that the external devices connect to and transmits the signaling going into and out of the IFD. The plugs that are on the panel are dependent on the machine type and/or drive configuration. The interface panel also includes several sets of jumpers that route the inputs and outputs, and allow the control to be configured to replace a wide variety of previous applications. The jumper settings of a given control are denoted by the letter suffix on the **card cage serial number**. Interface jumper definitions and settings appear in the appendix of this section.

Video card (ISA/PCI): Provides the video signal to the front panel monitor. May have one of two types of socket connections depending on available sockets on the mother board (All newer controls have the PCI buss connection). A Centurion 6.5 system will not have this board.

Network card: Option may be in the control to allow it to be included in a computer network.

Centurion 1/5/5T Control

Simdisk: Short for Simulated Disk. Contains the Rom and Ram drives of the CNC. The Rom and Ram are not actually drives, but memory space on chips that the control utilizes as logical drives. The Simdisk card is treated as two logical drives.

An SBC card may be used to replace a bad mother board if a control is repaired at the factory. If this is done the chip (U12) labeled GU12C must be replaced with GU12D if the Simdisk is to remain in the control.

Acroloops: Do the same job as the NCB and the interface combined. Each card does the motion processing and interface functions for each axis individually. In addition the inputs and outputs are housed on the acroloops as well. Each card has a single software chip on it to control its operation. The software version should be the same on each card. The cards have an axis address jumper centrally located on each of them that indicates the axis that it is to control.

Control Acroloop vs. Regular:

The control acroloop coordinates the actions of all of the acroloops, as well as providing the spindle control and the hand wheel input. Very old systems had a controller separate from the axis acroloops (acro software versions 1.XX). Most systems (Acro software versions 2.XX) will have the controller combined with the X axis Acroloop card on mills, or the Z axis on lathes. The control acroloop has an additional software chip that manages the control functions. It will have a different version number than the regular acroloop software chip.

Fast Acroloops:

The fast Acroloop card was used in the high speed option for Centurion 5 controls. The fast Acroloop is modified from the basic Acroloop with several small but important differences.

- Fast Acroloop software in place of standard software acroloop chips on each card. The chips at location U19 and U30 (controller only) will be labeled “DALLAS - Speed It Up”.
- A green wire soldered from the bottom of each DALLAS chip to a nearby point on the board.
- Fast Acroloop firmware.

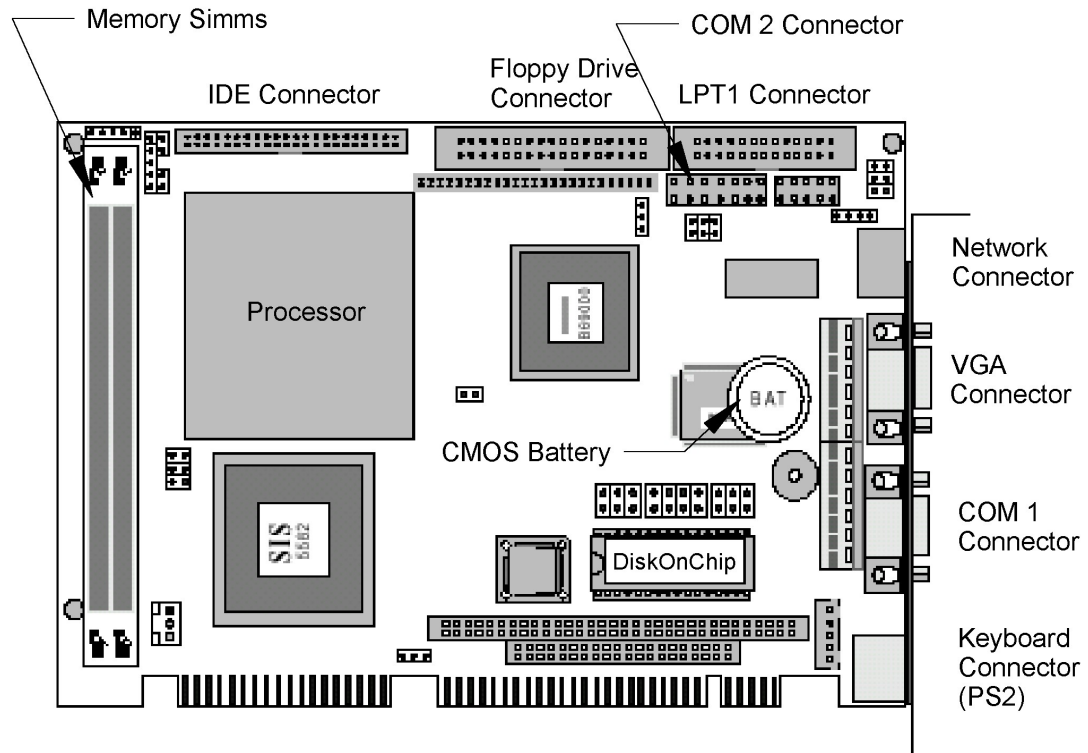
I/O card: This card is found in almost all 486 and older systems and provides the interface between the motherboard and the hard drive, floppy drive, and serial ports. Newer motherboards and SBC boards have these connections directly on them.

Video card (ISA/PCI): Provides the video signal to the front panel monitor. This card will not be present if the motherboard is replaced with an SBC board.

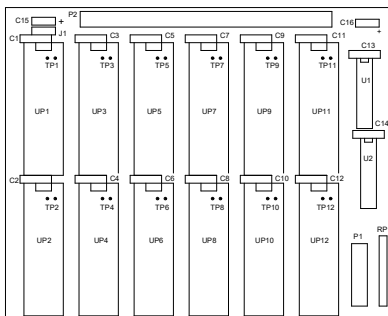
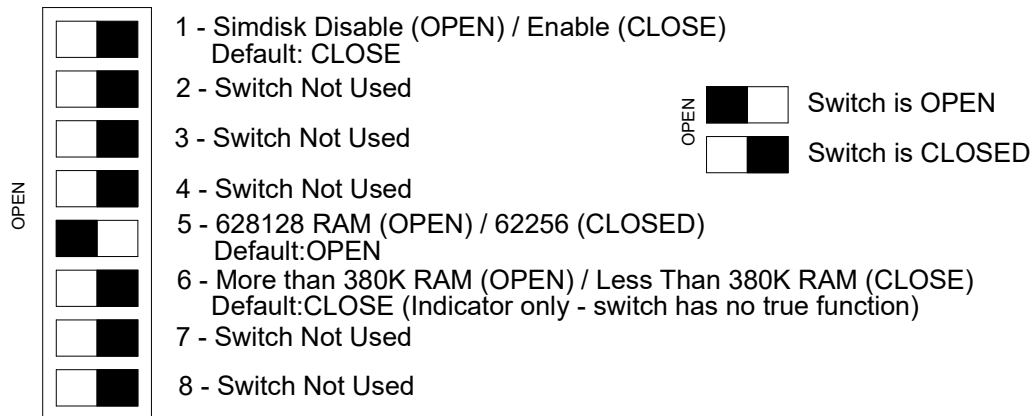
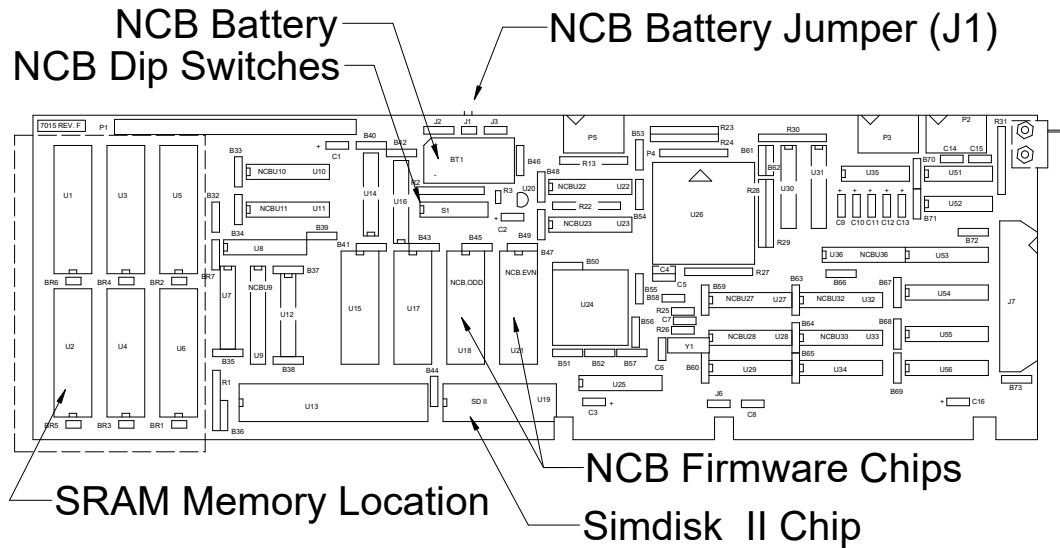
Network card: Option may be included to allow the control to be networked to a shared directory.

Selected Board Illustrations

SBC Board – Centurion 6.5

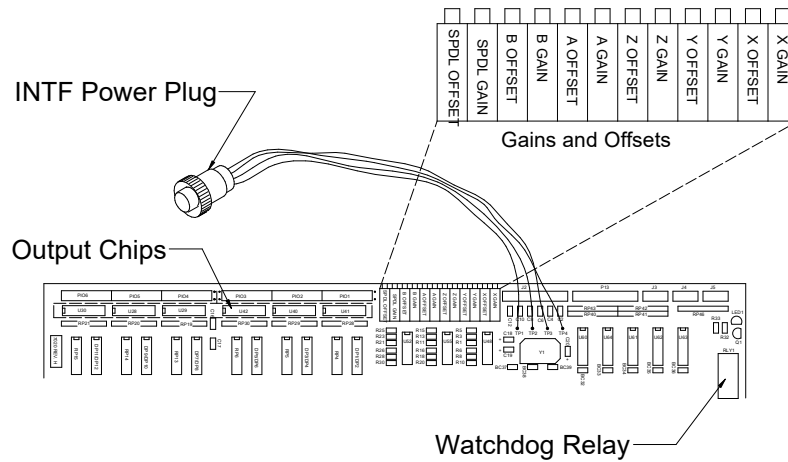


NCB CARD and SOFTWARE DAUGHTER BOARD-Centurion 6/6.5

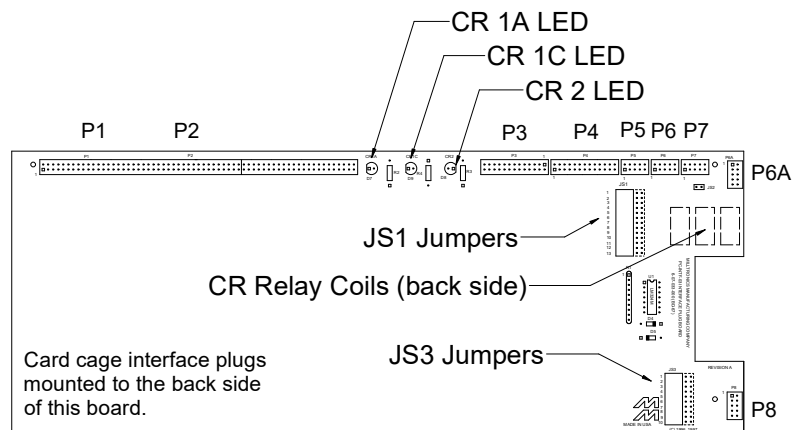
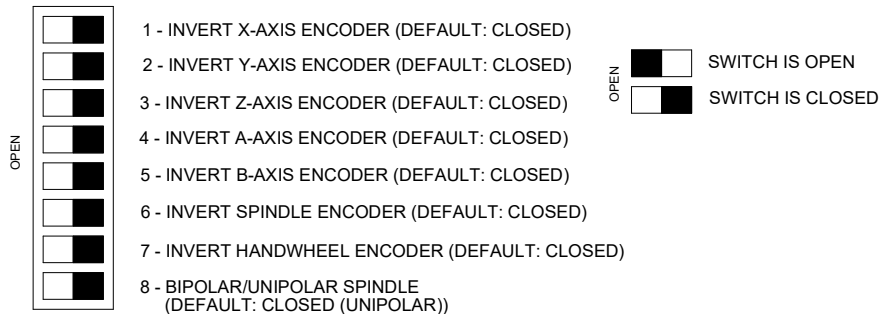


Software Daughter Board

INTERFACE PANEL and IFD BOARD-Centurion 6/6.5



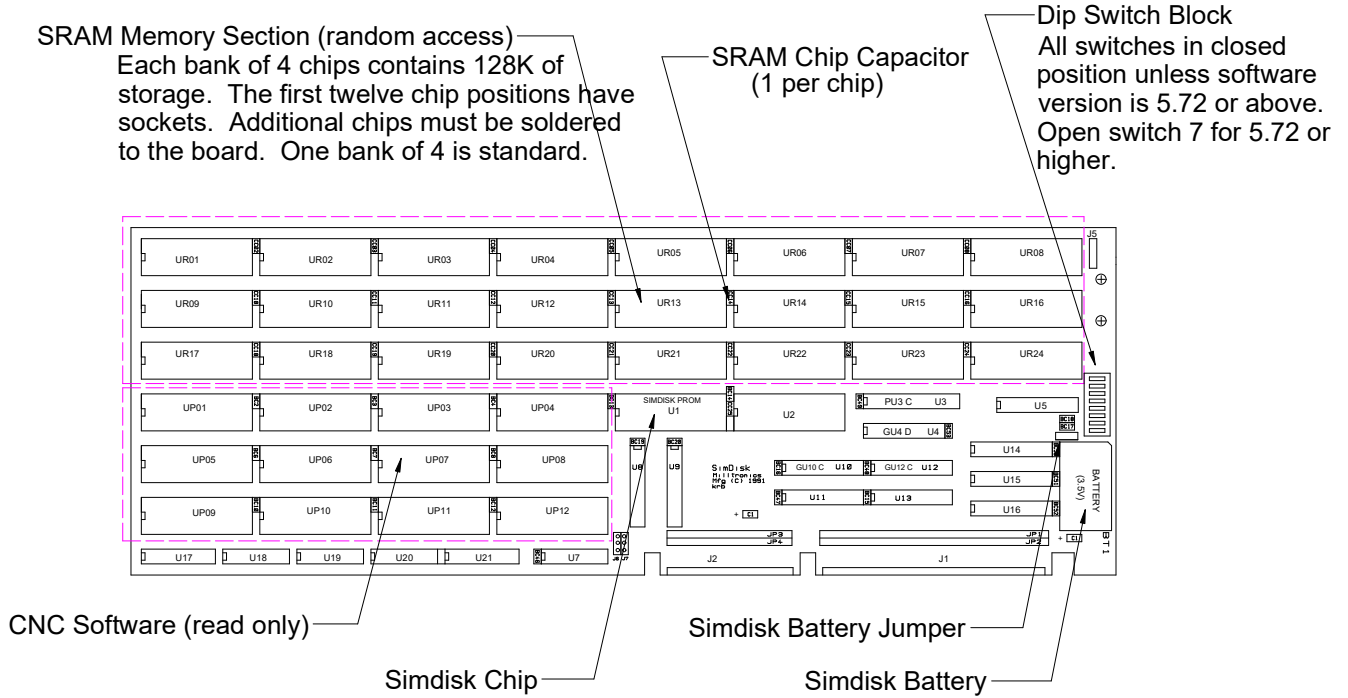
DEFAULT SETTING FOR DIP SWITCH S1



- P1/P2 - Input/Output
- P3 - Analog Outputs
- P4 - Axis Encoder Connection 1-4
- P5 - Axis Encoder Connection 5
- P6 - Spindle Encoder (In/Out of Interface Daughter Board)
- P6A - Spindle Encoder In
- P7 - Handwheel encoder, Watchdog, Spindle Load Meter
- P8 - Hand Wheel Encoder In

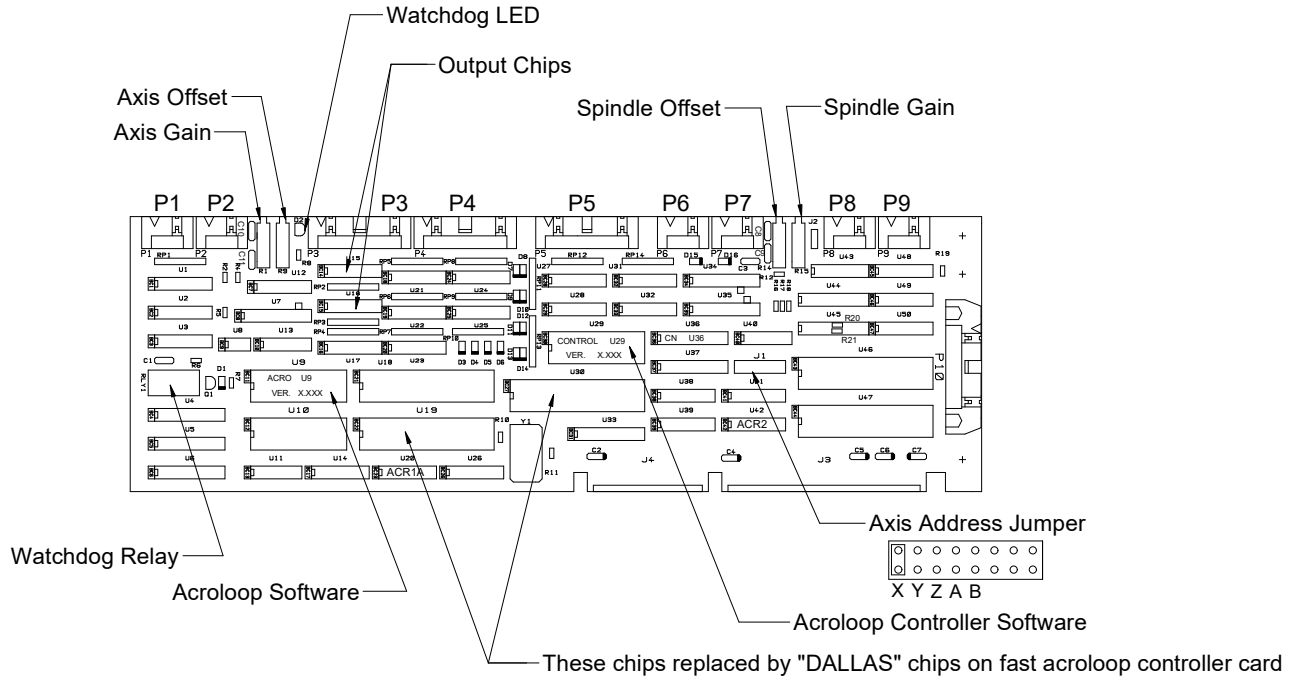
Information on interface jumper settings can be found in the appendix of this section.

SIMDISK CARD-Centurion 5/1

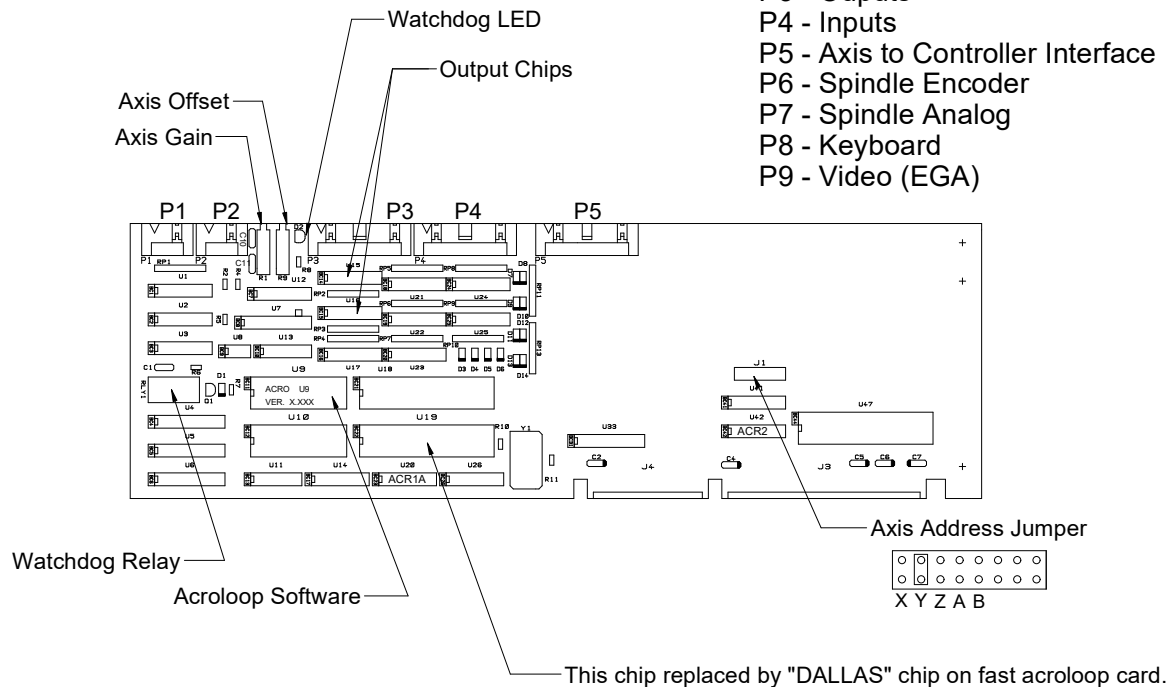


ACROLOOP CARDS-Centurion 5/1

Controller Acroloop Card



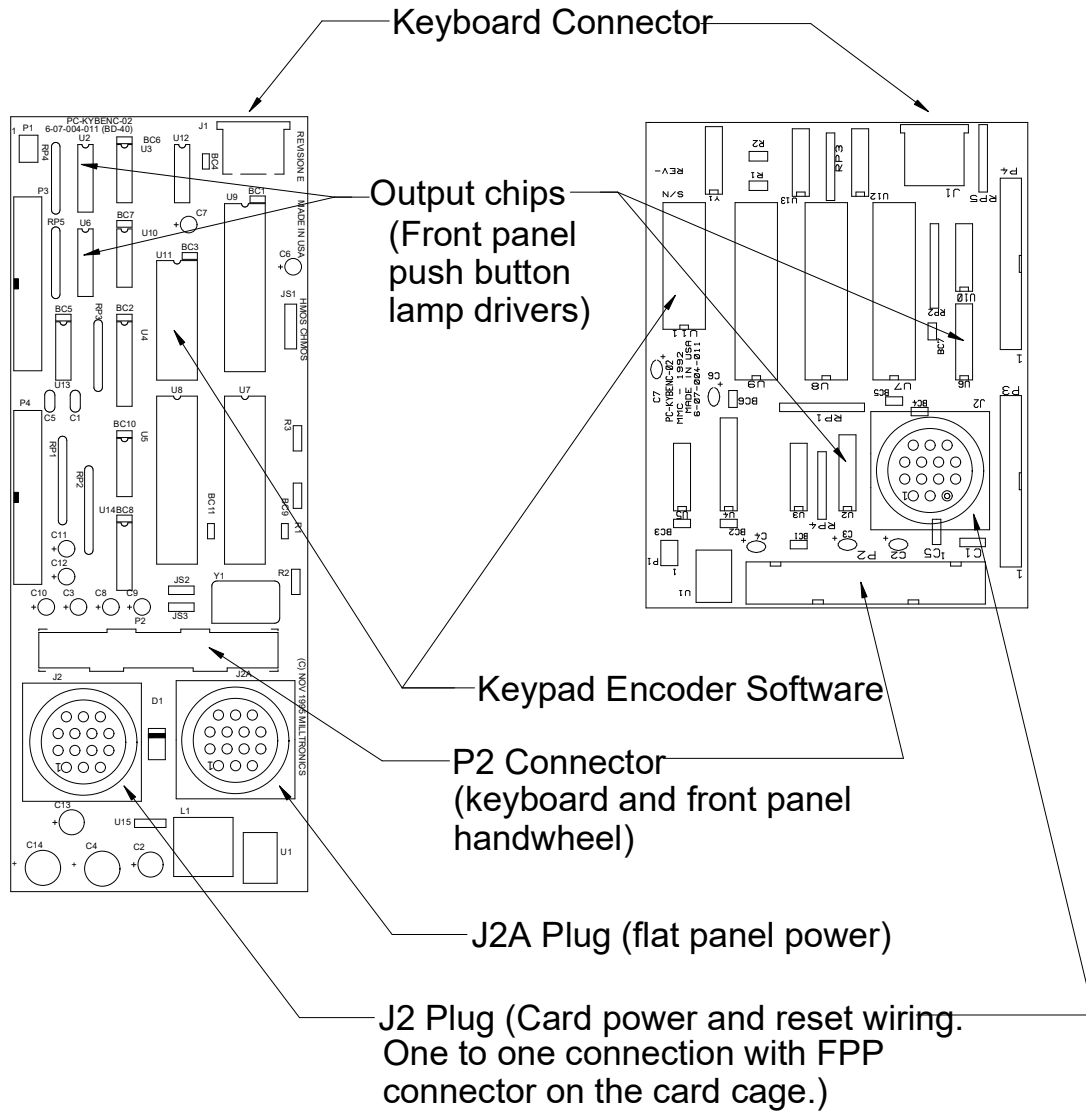
Standard Acroloop Card



KEYPAD ENCODER CARDS

Serial Keyboard 7325
(Version 2.XX Software)

Previous Version 7315
(Version 1.xx Software)



Front Panel Interface

The front panel is the user interface of the control. It consists of an alphanumeric keyboard, a switch board that holds the front panel switches, an F key keypad, a pulse generator, a monitor for video display, and the keypad encoder card.

Front Panel Displays

There are two possible types of monitors that may be mounted on the front panel. In the past the standard display was a CRT. The CRT was a standard EGA or VGA computer monitor mounted in an industrial frame. The final model used was a 14" color monitor. They require a video signal and 110vac power.

The current product line features a liquid crystal display. The LCD is a flat screen similar to those used in laptop computers. The LCD requires a VGA signal and +12vdc to operate. It derives its power from the J2A plug on the keypad encoder card.

There are two varieties of LCD. The passive matrix is the base line model. It is available in black and white, or color. The active matrix is the option screen for the front panel, but will probably be found in the majority of machines. It will always be color. It is much sharper, brighter, and easier to view at an angle than the passive matrix screen.

Both screens convert the analog video signal to digital and display it on the LCD screen. The display itself has no brightness to it, but requires back lighting to be seen. This is achieved through the use of miniature fluorescent bulbs that are installed in the edge of the display panel. The lights are powered from a small board that converts the 12 VDC into a high voltage A.C. signal. A screen with no video signal or a bad analog/digital converter may show a white screen due to the backlighting. A black screen may indicate that the display is working, but the backlighting is out. This could be due to failed bulbs or a malfunctioning backlight board. Check a black screen with a flashlight to insure that there is no video displayed on the panel before replacing other components.

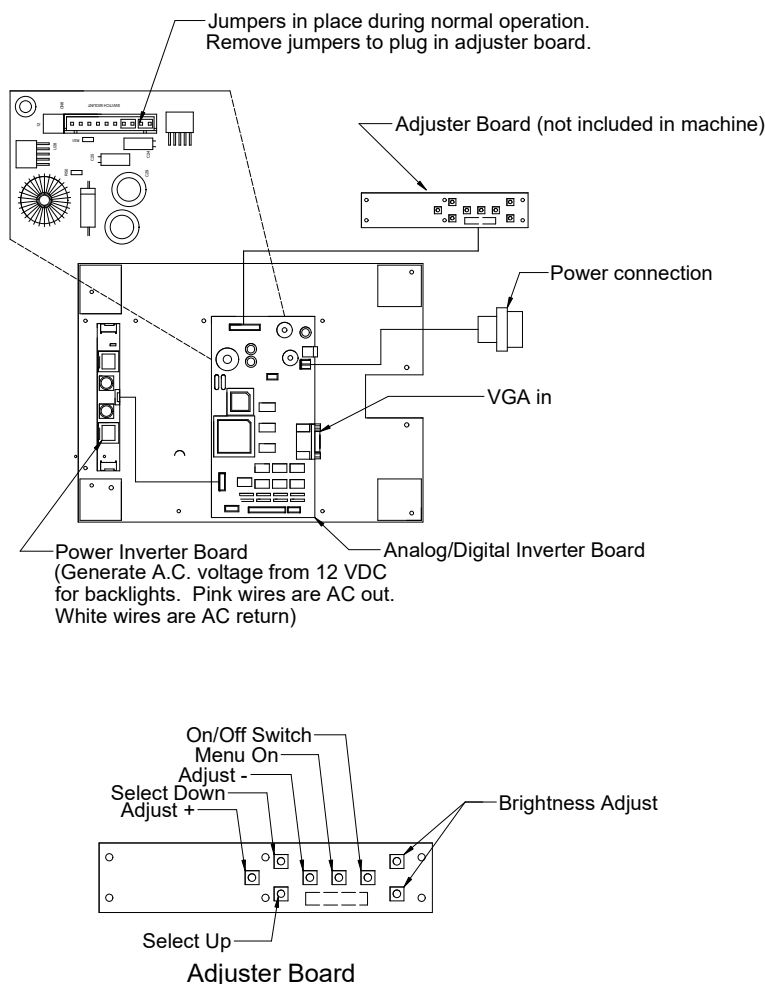
Since the video signal is VGA, a desktop monitor can be used to test if there is a video signal to the front panel. Unplug the video cable from the front panel screen and plug it into the desktop monitor. Current and newer products have a male plug on the end of the video cable due to the analog/digital converter board having a female plug on it. A male to male adaptor (adapter will have two female ends) will be required to complete the connection. Plug the monitor into the wall. If the desktop monitor acts just as the front panel display did, then the problem is cable or video controller related. The monitor can then be plugged directly into the control to confirm or eliminate the cable as the problem's source.

Adjustments to the picture of an LCD screen is done with a separate plug in board. The image is adjusted during installation, then the board is removed. The adjusters can be obtained from the factory if adjustments in the field are required. The passive and active screens use different adjustment boards.

Adjusting an Active LCD Display

The active LCD is typically preset, and can be installed without adjustments. There may, however be a need for adjustments during certain replacements or component repairs.

The active display adjuster board must be hooked up before the machine is powered up. Remove the front panel from the control box and either have an assistant hold the panel while adjusting the image or try to suspend the front panel from the control box while allowing easy access to the back of the panel. Locate the socket that the adjuster plugs into. It should be near the top of the board. There will be two jumpers on the first four pins in the socket. Remove the jumpers and plug the adjuster board cable into the socket. It is keyed and will only plug in one way.



Turn the machine on. When the machine starts to power up, turn the screen on with the on/off button on the adjuster board. Hold the button for several seconds to power up. The screen should power on and display an image.

Brightness can be adjusted up or down with the brightness + and - buttons. This will set the intensity of the back lights. Set brightness as desired. The brighter the screen is adjusted the shorter the life of the backlights.

The menu button accesses adjustments other than brightness. Select down will choose the item on the menu to change (select up is not supported by this analog/digital board). The + and – buttons will adjust the magnitude of the attribute in question. The attributes available are:

CONT (contrast) – Sets the screen contrast. Use with brightness to achieve a clear, sharp, viewable picture. Typically set to the third or fourth mark from the left

PHSE (phasing) – If light and dark vertical bands appear on the screen they can be adjusted away with phasing. Typically set either all of the way left or at the second mark from the right.

SIZE – Adjusts horizontal size only.

VERT (vertical) – Adjusts vertical position.

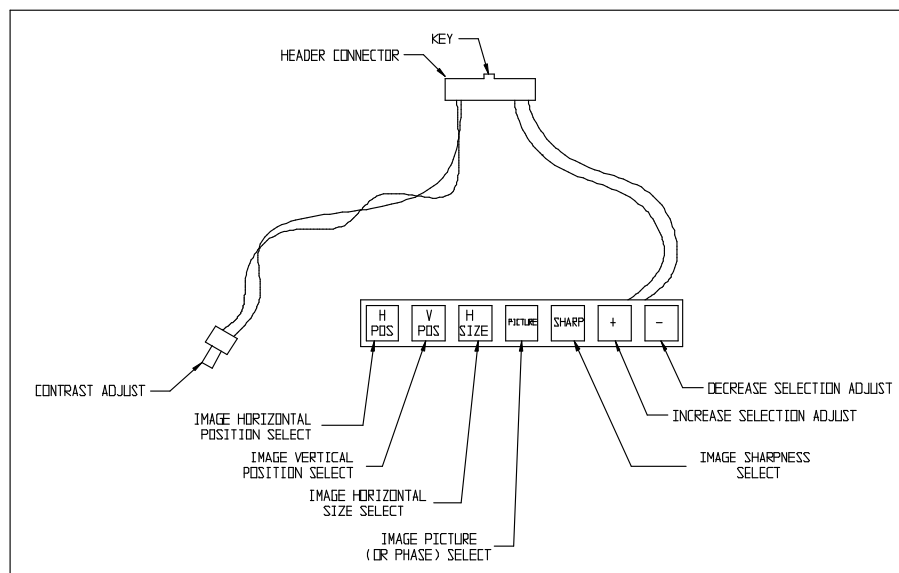
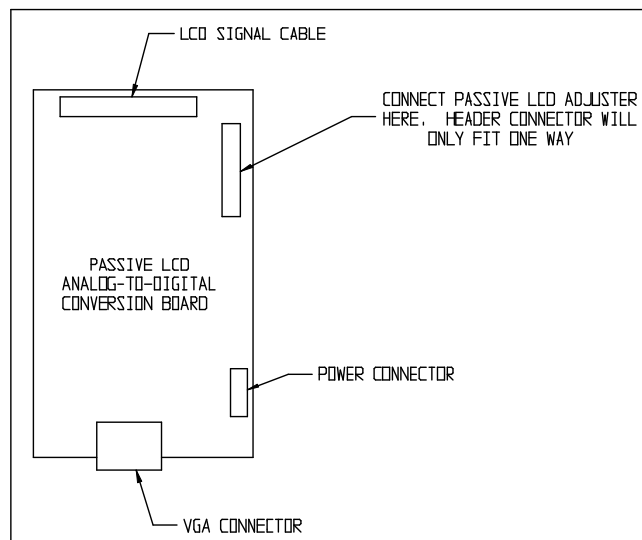
HORI (horizontal) – Adjusts horizontal position.

When the adjustments are complete the menu button can be pressed again. This will make the menu shut off. Hold the on/off button for several seconds to shut the LCD display off. Power down the machine and reinstall the jumpers in the socket. Adjustment is complete.

Adjusting a Color Passive LCD Display

Due to the nature of the passive LCD's analog/digital conversion board, the display must be reset after final installation in a machine, field replacements, and retrofits.

The machine must be plugged in and running with the Centurion 6 CNC displayed. Remove the front panel from the control box and either have an assistant hold the panel while adjusting the image or try to suspend the front panel from the control box while allowing easy access to the back of the panel. Remove the LCD chassis back cover and plug in the LCD adjusting tool into the analog-to-digital conversion board as shown. The connector is keyed and will fit only one way onto the header.



For best results, the observer should face the front panel directly and the center of the display area should be at eye-level. To change the display properties, press and release the function key on the adjusting tool and then change the selection using the + or – keys.

Adjusting tool functions:

HPOS – Use to center the image horizontally in the display area

VPOS – Use to center the image vertically in the display area

HSIZE – Use to change the width of the image

PICTURE – Use to set the correct phasing of the image. Incorrect phasing is evident by “noise” in the image. Also look for speckles or a glitter effect in the darker areas of the image, particularly in the CNC’s soft keys or the red error banner. (Hit E-stop).

PICTURE will also lighten or darken the image as well. Adjust PICTURE up and down until the best image is obtained.

SHARP – Use to adjust the image focus. While setting SHARP, observe the small text in the CNC display for best results.

+ and - keys – use to change selected function. For fast adjustments, press and hold the key. For fine tuning, press and release the key repeatedly.

CONTRAST control – Use to set picture contrast. Over adjustment will result in a white “washed out” image and turning the contrast too low will give a negative picture or a blank, dark screen.

Keypad Encoder Card

The main component of the front panel is the keypad encoder card. The keypad encoder card translates the front panel switch inputs, override knobs, and keypad inputs into keyboard signals. It also is responsible for driving the front panel switch lights using the same ULN 2002 driver chips that acroloop cards use for outputs. The keypad card has an AT style keyboard plug on it that allows the user to plug a computer keyboard into it. On newer machines this plug is brought to the outside of the machine via a cable. Not all older machines have this cable, but the socket is still on the card and can be used.

Because the switch functions are translated into keyboard commands it is possible to run the machine directly from an external keyboard. The keyboard commands are as follows:

FP switch commands- ALT +	Feed rate over ride- ALT+	Spindle over ride ALT +
F1 = STOP	A = 0%	1 = 0%
F2 = E STOP	S = 10%	2 = 10%
F3 = CW	D = 20%	3 = 20%
F4 = FEED HOLD	F = 30%	4 = 30%
F5 = CCW	G = 40%	5 = 40%
F6 = CYCLE START	H = 50%	6 = 50%
F7 = MIST	J = 60%	7 = 60%
F8 = TOOL RESET	K = 70%	8 = 70%
F9 = FLOOD	Z = 80%	Q = 80%
F10 = RESET	X = 90%	W = 90%
	C = 100%	E = 100%
	V = 110%	R = 110%
	B = 120%	T = 120%
	N = 130%	Y = 130%
	M = 140%	U = 140%
	< = 150%	I = 150%

Override Switch Functions

The feed rate and Spindle over ride switches are four channel rotary switches. These switches send a binary signal that will indicate to the keypad encoder card the position (1-15) 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 determine the percentage value at that position.

The switch signals can be found in the P1 connector on the back of the front panel switch mounting board. The pin numbers are:

Feed Rate override

- 1 LSB
- 2
- 3
- 4 MSB
- 5 Common

Spindle override

- 9 LSB (Least significant bit)
- 10
- 11
- 12 MSB (Most significant bit)
- 13 Common

By checking continuity between the common lead and the different switch channels it is possible to determine if the switch is working properly. The combination of outputs at each switch position should match the table below:

Switch Pos	Spindle %	Feed Rate %	Binary Code
1	0	0	0000
2	10	10	0001
3	20	20	0010
4	30	30	0011
5	40	40	0100
6	50	50	0101
7	60	60	0110
8	70	70	0111
9	80	80	1000
10	90	90	1001
11	100	100	1010
12	110	110	1011
13	120	120	1100
14	135	130	1101
15	175	140	1110

By noting what percentage is being obtained at each position it is possible to determine which channel is faulty. A determination can then be made as to whether it is a switch, cable, or board problem.

Control Outputs and Inputs

The Centurion controls achieve most of their interfacing to connected devices through the outputs and inputs of the control. An output provides ground to a 24vdc device such as a relay or solenoid, servo drive, indexer or other device. An input is triggered by a ground signal provided by a prox 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.

The status of the outputs and inputs of the control can be viewed by entering the diagnostic display of the control. This can be done from the main menu by entering [F6] Display, [F4] Diagnostic. Centurion 1 and 6 SLS software will require the setup parameters to be open for the diagnostic option to be viewed under display. Newer 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] Diagnostic menu.

Newer software also has provisions in the software for time out messages that will advise the operator if the machine has hung up waiting for a specific input signal. This allows the control to tell the user which signal may be missing without having to examine the diagnostic pages. A timeout will take approximately 15 seconds from a non-receipt of signal to an emergency stop condition. The red message box will display, in addition to the usual emergency stop information, "Time out waiting for _____". 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.

The inputs and outputs of the control are grouped by axis and each group can be accessed through the function keys F1 through F4. The I/O pages are identified by axis to give them some identification, not because they necessarily have anything to do with the operation of a given axis. They are also grouped as they are because the Centurion 1 and 5 controls have their outputs and inputs located on the axis acroloop cards and their grouping indicates which acroloop card they are located on.

A listing of the inputs and outputs and their functions can be found in the signal connector listings in the appendix of this section.

Outputs

Socketed chips inside the card cage provide the Centurion control's outputs. In the Centurion 6 control the output chips are arranged in six ULN 2802 driver chips on the interface daughter board. The outputs are distributed on the chips as such:

U-41	X Out 1-8	U-41 is closest to the gain adjustment pots
U-40	X Out 9-12, Y Out 1-4	
U-42	Y Out 5-12	
U-29	Z out 1-8	
U-28	Z Out 9-12, A Out 1-4	
U-30	A Out 5-12	U-30 is closest to the end of the card

In the Centurion 5 and 1 controls these chips are ULN 2002 driver chips. There is a pair of these chips on each of the acroloop cards in the control. Chip U-15 contains outputs 1-7. Chip U-16 contains outputs 8-12.

Each output is brought out of the control through the corresponding pin on the axis output plug (for instance X out 7 will be found in the X output plug, pin number 7). Outputs provide a ground when they are active, and will display a "1" next to the corresponding entry in the diagnostic page. They are capable of sinking .3 amps of current at 24 VDC. When an output is not active it should be in a high voltage state. A voltage measurement of an output should show:

+24 VDC when the output is off ("0" on the diagnostic page)
0 VDC (approximately) when the output is on ("1" on the diagnostic page)

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 SET and CLR commands. This can be done in a program, as in the case of a custom M-code, or through the MDI mode. The command SET X6 will cause the X output 6 to go to a low voltage state and the associated diagnostic to go to a "1". CLR X6 will turn the output off and cause it to go back to +24 VDC. If the output does not go to approximately 0 VDC when the diagnostic shows a "1", there may be a problem with the corresponding chip and it may have to be replaced.

In some cases the SET and CLR commands are not appropriate. For instance, the forth axis inputs and outputs cannot be set with them. In these instances the STO and CLO commands can be used. They work very much like SET and CLR, but instead of giving the axis designation with the output the command it requires the absolute output number. The absolute output numbers start with X Out 1 - 12 being outputs 1 -12. Y Out 1 would have an absolute number of 13 and the values would climb to Y out 12 being output 24. The command STO 30 would activate Z Out 6. The diagnostic reaction and voltage measurement should change accordingly.

STO/CLO numbers

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

Inputs

The input chips on the Centurion controls reside on the same cards as the outputs. The input chips are optically isolated and are triggered by a ground to the corresponding pin. Grounding an input will cause its entry to show a “1” in the diagnostic page. It will show a “0” when it is not. Each input is brought into the control through the corresponding pin on the axis input plug (for instance Y in 7 will be found in the Y input plug, pin number 7).

There is no way to set an input through the control. To test an input it must be brought to ground voltage. The easiest way to accomplish this is to obtain a wire with a pin crimped on the end of it. Remove the pin from the suspected input and replace it with the pinned wire. Touch the other end of the wire to terminal block 22 (D.C. ground) or to bare metal on the electrical panel. When the input is grounded its entry in the diagnostic display should be a “1”. If it is not there is a problem in the control that may require board replacement or factory repair. The input chips are not socketed and therefor not easily replaceable. In a Centurion 5 or 1 control the acroloop cards may be swapped to help diagnose the problem.

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 either the B: drive or C: drive if it is a disk on chip system. 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 floppy disk into the B:\ram on the machine.

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

Active.dat:	Contains the number of the current active program, as well as the current edit program.
Path.dat:	Contains the DOS paths to the various components of the machine software.
Pfile.dat:	Contains the machine setup parameters. A list of these parameters should appear in the "Red Book" of machine information shipped with each machine.
Bscrew1:	The X axis ball screw compensation file.
Bscrew2:	The Y axis ball screw compensation file.
Bscrew3:	The Z axis ball screw compensation file.
Ncb1.hex:	This is a file found in a Centurion 6 control that deals with the function of the M-codes. Ncb1 deals mainly with spindle control and coolant commands.
Ncb2.hex:	This is a file found in a Centurion 6 control that deals with the function of the M-codes. Ncb2 deals mainly with the tool changer and spindle gear shifting.
Ncb3.hex:	This is a file found in a Centurion 6 control that deals with the function of the M-codes. Ncb3 deals mainly with spare M-codes.
Ncb4.hex:	This is a file found in a Centurion 6 control that deals with the function of the M-codes. Ncb4 deals mainly with special functions. It may not always be present.
Acro1.hex:	A Centurion 5 or 1 file. It performs the same task as Ncb1.hex.

Acro2.hex:	A Centurion 5 or 1 file. It performs the same task as Ncb2.hex.
Acro3.hex:	A Centurion 5 or 1 file. It performs the same task as Ncb3.hex.
Inp(3):	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.
Out(3):	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(3):	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(3):	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.
Soft.ver:	A text file showing the versions of software the machine contained for keyboard, CNC, firmware, and the NCB files when the machine left Milltronics. Not necessary for machine operation.
Pfile.ref:	A reference file of the pfile as it was when the control was built. Not necessary for machine operation.
O901*:	A custom G-code program
O902*:	A custom M-code program
Special.dat	A program file that serves as the tool setting macro accessed through the run menu.

Saving and Loading Parameters

Because the Centurion control 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 floppy disk. This is easily done on most Centurion controls. To save the machine parameters:

Centurion 5 (vers. 129.41 and above) and 6 CNC

With a floppy disk in the drive and the control at the main menu press:

[F7] Params

[F6] Save

The parameters will be saved on a floppy drive in a directory called "ram".

Centurion 1 and 6 SLS

With a floppy disk in the drive and the control at the main menu press:

[F10] Utilities

[F3] Files

[F2] Save

This will bring up a menu of the programs in the control.

[F8] down arrow key to move the pointer until it points at "Parameters"

[F2] Set

[F1] Start

The parameters will be saved on a floppy drive in a directory called "ram".

To load parameters back into the machine:

Centurion 5 (vers. 129.41 and above) and 6 CNC

With the parameter disk in the drive and the control at the main menu press:

[F7] Params

[F7] Load

The parameters will be loaded into the ram directory. Escape to the main menu and E-stop the machine. Power the machine down for approximately 30 seconds and power back up for the parameters to take effect.

Centurion 1 and 6 SLS

With the parameter disk in the drive and the control at the main menu press:

[F10] Utilities

[F3] Files

[F1] Load

This will bring up a menu of the programs in the control.

[F8] down arrow key to move the pointer until it points at "Parameters"

[F2] Set

[F1] Start

The parameters will be loaded into the ram directory. Escape to the main menu and E-stop the machine. Power the machine down for approximately 30 seconds and power back up for the parameters to take effect.

Saving Parameters on Centurion 5 Versions Earlier than 129.41

Centurion 5 software versions previous to version 129.41 will not save all of the parameter files to the floppy when using the procedure above. Only the pfile.dat and path.dat files will be copied to the floppy disk. These older versions of software require that the entire contents of the B:\RAM directory be copied to the floppy through DOS. This is the only way to insure that all of the ram files are saved. Reloading the parameters into the control will also have to be done in DOS.

Machines of this software vintage were provided with a floppy disk that held the files not included on the parameter disk. This disk was placed into the machine previous to power on, and loaded the files automatically.

The PFILE.DAT File

The Pfile.dat file is the file that contains the setup parameters of the machine. This file is not a text file and cannot be viewed by itself. 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

[F1] Level

This will prompt the user for the access code. Type PROTO3 for the access code (776863 for Centurion1) and press enter. The user will now be asked for the access level.

Type 3 for access level.

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

[F2] Precision

[F3] Power

[F4] Axis

[F5] Miscellaneous

[F6] Over rides

[F7] Ball screw tables

[F9] Dos

The parameters are arranged in these sections depending upon what they are related to. A full list of these parameters appear at the end of this section.

Power parameters include info 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. Axis parameters include information about the axis movement of the machine. Most of these parameters must have the machine re-homed to take effect. The miscellaneous group contains the spindle ranges and other software defaults. The over ride section contains the values that control the feed rate and spindle over ride knobs. The ball screw tables section controls the ball screw compensation. The DOS key will make the CNC software shut down and the DOS prompt come up on the screen. The Machine must be E-stopped before going into DOS. The machine must be shut down and powered up again to restore it to operation.

Any of these parameters can be changed by simply scrolling the cursor to it and using the [F1] edit key. Any parameter that requires the machine to have its power cycled will 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.

The Path.dat File

The Path.dat file is a text file that determines where the different resident elements of the machine software are located. There are six different areas of concern.

They are:

Rom: Location of the CNC software and other main parts of the software

Ram: Location of the machine parameter files

Parts: Machine storage location of parts programs

Display: Location that the tool path graphic file will be held when it is generated. (The screen display in graph mode).

Floppy: Drive location of floppy disk drive or other load from / store to device. Parameters will always be saved to this path.

Remote Files: This path was added to later Centurion 6 software. To provide a separate load from/ store to path while still allowing parameters to be stored to the floppy path.

The Path.dat file can be viewed by entering [F10] Utilities, [F8] Info, [F5] Paths.

Newer Centurion 6 software has the ability to enable a drive switching key during the files-load and files-save functions. This key allows the user to change the drives that are being loaded from/stored to as they go. This will alter the current parts and floppy or remote storage paths in the control. It will not change the path.dat file. The default paths can be reset in the control by either cycling power on the machine, or by viewing the path.dat file as stated in the above paragraph.

The Path.dat file can be edited like a text program file or changed through the CNC shell. Changing through the shell can be done by entering the shell (see SRAM setup procedure) and selecting F5 “set paths”. The current paths will then be displayed and the option to change each will be offered. If a particular path does not need changing, the enter key can be pressed. Typing in a new path and pressing enter will change it.

Cent 6/5/5T/1 paths without hard drive (This was the standard system):

Rom	A:\ROM\
Ram	B:\RAM\
Parts	B:\PARTS\
Display	D:\
Floppy	C:\

Cent 6 paths with hard drive (Hard drive for parts storage and/or networking):

Rom	A:\ROM\
Ram	B:\RAM\
Parts	C:\PARTS\
Display	E:\
Floppy	D:\ if standard floppy
	F:\ if LS120 Superdrive or Zip

Centurion 6.5 control with the Disk on Chip (current standard):

Rom	C:\ROM\
Ram	C:\RAM\
Parts	C:\PARTS\
Display	D:\
Floppy	A:\
Remote Files	A:\ if floppy only
	E:\ if LS120 Superdrive or Zip

Centurion 6.5 control with the Disk on Chip and hard drive:

Rom	C:\ROM\
Ram	C:\RAM\
Parts	D:\PARTS\
Display	E:\
Floppy	A:\
Remote Files	A:\ if floppy only
	F:\ if LS120 Superdrive or Zip

Cent 5/5T/1 paths with hard drive (Hard drive for parts storage and/or networking):

Rom	A:\ROM\
Ram	B:\RAM\
Parts	D:\PARTS\
Display	E:\
Floppy	C:\

Software versions 5.1XX and 3.1XX may use the Cent 6 hard drive paths. If the above paths do not seem functional, try the Cent 6 settings.

You may run into an old **Cent 5, 5T or 1 system** that is “**Hard Drive Only**”. If this is the case the paths may look like this:

Rom	C:\CNC\ROM\
Ram	C:\CNC\RAM\
Parts	C:\CNC\PARTS\
Display	D:\ or C:\
Floppy	A:\

The addition of a network to any of these systems may have an effect on the path.dat file.

NCB/ACRO Hex Files

The NCB or ACRO.Hex 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 ACRO/NCB files to operate correctly. The ACRO files are used on Centurion 1,5 and 5T controls. The NCB files are used on the Centurion 6, 6SLS and 6T controls. 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, or if unavailable, by loading them with the NCB/ACRO update disk.

Using the NCB/ACRO update disk

Before using the update disk it is necessary to find out some information about the machine. The main pieces of information are: What type of control the machine has, which type of electrical panel the machine has, the type of axis drives that the machine has, the type of spindle drive, The type of spindle orient (if a mill with a tool changer), and the tool changer type.

The control will have to be one of four choices: Centurion 1, 5, 6, or lathe.

There are two types of electrical panels, A.C. or D.C. The type of panel can be found by checking the NCB/ACRO files already in the machine through [F10] Utilities – [F8] Info. Alternatively, you can check the solenoids and the relays in the cabinet. If many of the solenoids are 110VAC and there are contactors or relays labeled “MC” (the flood pump relay is labeled MC-2) the machine is an AC panel. If the solenoids and relays are 24VDC and there are contactors or relays labeled “K” (the flood pump is K8) it is a DC panel.

The main distinction in the axis drives is if the machine has Yaskawa drives or not. The Yaskawa drives are recognizable by their shape. Each drive is a tan box with “Servopack” written on it. If the machine has any other type of servo drive, the Yaskawa drives question will be answered no.

The spindle drive type is another piece of information necessary. The first question is if it is a CSM spindle drive or not. If the spindle drive is a large black box that says Custom Servo Motors on it, it is a CSM. If it is a CSM, the next question is to determine if it is a three or a four gear CSM. The MPA-80-231 part number denotes four gear CSM spindle drives. If the CSM drive has any other part number, it is a three gear. If the spindle drive is not a CSM, answer non-CSM

The answer to the previous question may prompt the user to indicate whether the machine has electronic or mechanical orient. Mechanical orient will include a pneumatic cylinder in the head with a roller bearing on the end. Electronic orient is standard in current Milltronics products.

The final question we need to answer is the tool changer type. This is probably the easiest question to answer because the user only needs to count the number of pockets on the tool changer itself.

After all the information has been collected, power the machine down. Put the NCB/ACRO disk into the floppy drive and power up. The disk should automatically load and start asking the questions. Questions may change or new questions may appear depending on the answers to previous questions. After answering all the questions, the necessary files will be copied into the machine from the disk. Power the machine down, remove the disk and power back up. Check all machine functions.

When the machine is operating correctly, save the new files along with the machine parameters to a floppy disk.

Reformatting SRAM

(This section describes formatting system memory on Centurion controls that use SRAM memory. This procedure does not apply to any control with Disk on Chip memory.)

Corruption can occur in the machine parameters or other components of the software. If this happens, the ram drive of the machine can be cleared and rebuilt if a backup parameter disk is available. If you are having any one of following problems setting up the SRAM may be a good idea.

- Control won't boot up.
- Parameter file corrupted (Pfile.dat)
- Erratic or unpredictable behavior of machine

Setting up the SRAM accomplishes several things. First, the entire content of the memory is erased. Second, default directories, files, and parameters are created. Basically setting up the SRAM drive allows us to "clean the slate".

The consequence of setting up the SRAM drive is that the machine setup parameters, as well as all part programs stored in the SRAM will be lost. Parameters as well as programs can be reloaded later via the floppy disk if backups are available. One thing to keep in mind, if a program or the parameters are indeed corrupted and saved to disk, reloading these after the SRAM setup will only reintroduce the problem. Therefore if you have any reason to question the integrity of these files it would be best to reenter programs and parameters by hand.

Make sure that all programs are backed up and a good machine parameters disk is available (every Milltronics machine is shipped with a parameter disk, although a newer one may have been made) before beginning the procedure.

Note: if you are working with an older Centurion I control an auxiliary keyboard must be connected before the SRAM can be successfully setup (the setup program will want you to respond to some questions with the letter Y or N). Any IBM AT style keyboard will work. A keyboard jack is provided for this purpose and is located within the front panel directly behind the numeric keyboard, the top cover of the front panel must be removed to allow access to this jack.

1. Power control down and wait approximately 30 seconds. Turn the machine back on.
2. Enter the system shell. This is done by waiting for the following screen and pressing any key when prompted. Be quick! The control only allows you a few seconds to hit a key and will display a countdown during which the time is right.

```
Centurion_ System Shell Version _._  
Copyright 1991 by Milltronics Mfg.  
SRAM(B:) freespace=_____  
Press any key to enter shell  
0987654321
```

The text to the left will be displayed in the top left of the screen shortly after powering up. The numbers at the bottom of the screen serve as a count down, any key must be pressed while they are counting down to successfully enter system shell

3. If you have completed step three successfully you are now in the “System Shell” if the control has continued to power up as usual repeat steps 1 to 3
4. Press F1, this will display the shell function menu
5. Select “Setup SRAM Drive” from function menu. The setup program will now ask us the following questions one at a time; answer each question as shown below unless otherwise directed by Milltronics.

- | | |
|-------------------------------|------------|
| • Format the SRAM drive | Answer Yes |
| • Create Directories | Answer Yes |
| • Use backed up SRAM on flash | Answer No |
| • Default parameter file | Answer Yes |
| • Default path file | Answer Yes |
| • Blank ball screw files | Answer No |
| • Begin SRAM setup | Answer Yes |

(“Use backed up SRAM on flash” will only appear on Centurion 6 flash software systems. If it is answered yes then the machine will use parameters that are stored in the flash. The rest of the questions will not be asked. The parameters do not always get stored in the flash, so it is usually better to answer no and use parameters from the backup disk. If correct parameters are established they may be backed up to the flash for future use. The option to do this is in the shell menu.)

6. At this point you are now asked to “Insert a diskette into drive B and strike enter when ready”. There is no disk necessary for this procedure; simply strike the enter key.
7. The formatting of the SRAM drive should now be underway, this should take only a minute or two. When the formatting is complete you will be asked if you want to format another, there is no need to format another; answer No (press enter to accept).
8. Formatting of the SRAM drive is now complete. The screen should display an A:\ prompt. Press the ESC key to boot the software.
9. Before the machine can be run its parameters must first be loaded. Either reload the parameters via the floppy disk or manually enter them by hand.
10. Escape back to the main menu. E-stop the machine and cycle power (wait 30 seconds between off/on as before).

The SRAM reformat should be complete. Check tool change height and observe machine operation for a short time to insure that the parameters on the backup disk that was used are current.

Software Upgrades

Software for mills and lathes is updated on a continuous basis. Upgrades are sought either to fix a problem in a previous version of software or to add features to an older machine. The process and difficulty level of a software upgrade is dependent upon the age of the machine and the type of software in it. If there are any questions on compatibility of a software upgrade contact the factory before the upgrade is attempted

If a Centurion 6 control is to be updated, the type of software must be determined first. The types available are EPROM, Flash, and DOC. The type of software can be determined by checking the software version in [F10] Util- [F8] info.

A Centurion 6 control with flash software will have the word "Flash" follow the version number in the info screen. This software is upgradeable with a four floppy disk set. Disk on Chip software will have "Disk on Chip" following the software version. This software is upgradeable with a single floppy disk. Anything else should be EPROM software and requires a software chip change to upgrade.

Installing a Flash Software Update

1. Power the machine down
2. Insert the diskette labeled "Flash Boot Disk" into the disk drive on the machine.
3. Power the machine up
4. If your system does NOT have a hard drive press "D" when the "Press N to disable" message is displayed, otherwise let the control continue.
5. Insert disk 1 when prompted to do so, then press any key.
6. You will be given the opportunity to create backup disks. If you choose to do this it requires 3 additional blank diskettes, be careful not to mix backup disks with the new disk 1,2, & 3.
7. Follow instructions for the remaining disks (insert when prompted).
8. Remove any disk from the disk drive.
9. Power the machine down then wait 30 seconds. Power the machine up again.
10. Check for any new parameters and adjust as required, then create a new parameter disk

A new parameter disk should be created so the original disk may be preserved for future reference. Label a blank diskette, put it into the disk drive then press PARAMS-SAVE.

Installing an EPROM Software Update

A Centurion 6 with older EPROM software will have the chips placed on the software daughter board on the NCB card. This daughter board should be replaced with a flash software daughter board and software upgraded per the previous procedure.

Installing a Disk on Chip Software Update

1. Power the machine down
2. Insert the diskette labeled "SBC/DOC Software Update" into the disk drive on the machine.
3. Power the machine up. The software will load automatically
4. When software loading is complete the machine software will boot as normal. Do not run the machine. Power the machine down.
5. Remove the disk from the disk drive and power the machine up.
6. Check for any new parameters and adjust as required.
7. Create a new parameter disk

A new parameter disk should be created so the original disk may be preserved for future reference. Label a blank diskette, put it into the disk drive then press PARAMS-SAVE.

Updating Firm Ware Chips

There are several firmware chips in the control and front panel that should be replaced when doing a software upgrade. These chips include the NCB firmware (2 chips on the NCB card), The front panel chip (on the keypad encoder card), and possibly the Simdisk II Chip (on the NCB card also). Locations of these chips can be found on the board illustrations earlier in this section.

The versions of most of these chips can be found by entering [F10] utilities, [F8] Info. The front panel version will be listed as front panel present. The NCB firmware version will be listed as controller card. The version will be printed as v02xx 000. This is commonly referred to as version 2.xx. The Simdisk II chip version must be obtained from the label of the chip itself, although the chip may require changing only if the CNC software version currently in the control is 6.107 or older.

These chips are set in sockets and are relatively easy to replace. Once replaced the machine can be powered up. No other action needs to be taken. Front panel and firmware should always be replaced with current versions when updating software. If the chips are current versions there is no need to replace them.

Firmware Versions current as of May, 2001

Simdisk II	1.03
NCB	2.10
Keyboard (front panel)	2.20 for 7325 board w/ version B keyboards (almost all) 2.19 for 7325 board w/ version A keyboards 1.17 for 7315 and older boards

Note: Version 1.XX keyboard software cannot be replaced with version 2.XX software or vice-versa.

Note2: Version A or B keyboards are determined by looking for the board number on the back of the alpha numeric keypad board. Version A keyboards were only used for a short time and there are few in the field.

Converting from SLS to CNC Software

With the advent of flash software it has become more popular than ever to switch an SLS software machine over to CNC software. This is easy to accomplish, although it does require some changes to the ram files. Note that the mechanical hand wheels of many SLS machines will be lost in the change to CNC.

Before flashing or loading the new software some parameter changes should be made.

1. Change Foreign Extension from SLS to DAT
Save a copy of the parameters.

2. Load the parameter disk into the computer or into the machine and edit the file names
Rename Inp3.sls to Inp.dat
Rename Out3.sls to Out.dat
Rename Mcodes3.sls to Mcodes.dat
Note: If the machine is French or German you have to rename Inp3.grm to Inp.grm, Out3.grm to Out.grm and Mcodes3.grm to Mcodes.grm (or .FRN)
3. There are some files you can delete if the machine will use English extensions:
Mcodes3.frn
Mcodes3.grn
Inp3.frn
Inp.grm
Out3.frn
Out3.grm
Init.bat
4. Flash the CNC software into the control.
5. Load the new parameter disk that was created.
6. There may be more parameters to change. Two of them to check are:
Slow Jog Velocity to 50.
Multiple Block Display to YES
7. Save new parameters back up disk.

Note: If the foreign extension parameter was not changed from SLS to DAT before the old software was replaced the new software will not boot correctly. To overcome this problem use the following procedure:

Stop the control at the shell just as would be done to reformat the SRAM.

Instead of choosing a menu option type:

B: <enter>.

CD\RAM <enter>

A:\CNC\CNC N DAT <enter>

This should allow the control to boot up and then the foreign extension parameter can be changed. Reboot the control normally.

Updating Software on a Centurion 1 or 5 Control

Software updates can be performed on Centurion 1 and 5 controls as well. Software upgrades on the Centurion 1 and 5 controls are not to be taken lightly, however, as the range of versions of the control and machine models make software compatibility a problem. Some of these issues are addressed in the trouble-shooting guide. If there are any questions the factory should be consulted before an upgrade is attempted.

The software on Centurion 1 and 5 controls is burned onto EPROM chips. To change software requires the user to change these chips. There are 12 CNC software chips located on the Simdisk card. In addition, there is also firmware to be considered; one chip on each of the acroloop motion control cards, one extra on the acroloop controller, and one for the keyboard encoder card. See the board illustrations earlier in this section for exact locations of these chips.

The current versions of all of the software should be determined before changing anything in the control. Do this by entering [F10] utilities, [F8] Info. The software versions should be listed.

CNC – Centurion # version _____
Keyboard – Front panel version _____
Controller Card Version _____ (1st four digits of number)
X axis Acroloop Version _____ (1st four digits of number)
Y axis Acroloop Version _____ (1st four digits of number)
Z axis Acroloop Version _____ (1st four digits of number)

Firmware Versions current as of May, 2001

Keyboard (front panel)	1.17
Controller Card Version	2.40
Acroloop version	2.54
Fast Controller version	2.41
Fast Acroloop version	2.55

If any of the version numbers match the current version or the version found on the chips you have received, do not replace those chips. Firmware (acroloop and keyboard) should always be updated to the most current version.

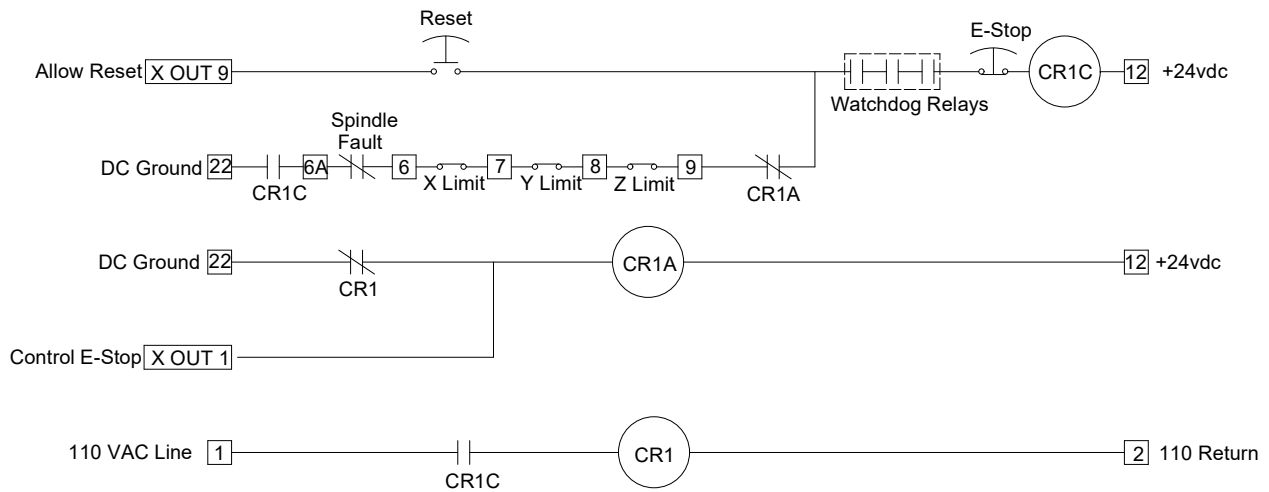
1. Start the update by saving the current machine parameters.
2. Power the machine down.
3. Remove the cover from the card cage. Removing the card cage from the machine may be preferred if all software chips are to be replaced.
4. Remove the necessary boards one at a time and change the chips. If removing the acroloop cards make careful note of the position of the ribbon cables connecting

the cards and the red stripe on the ribbon. Carefully remove the old chips one at a time with a small screwdriver or chip puller. Note the orientation of the chip and the dent in the end of it. Also note the chip address on the chip label. Each chip has a specific place on its respective board and must be placed correctly. Press the new chips into their sockets. New chips may require the pins to be bent in slightly to fit into the socket easier.

5. If the software is being changed from a version previous to CNC 5.72 to that version or later, switch dip switch 7 on the Simdisk board to the open position.
6. If the front panel chip needs to be replaced the front panel will have to be removed and the chip placed on the front panel keyboard encoder card.
7. Replace all cards and covers and reinstall the card cage if removed.
8. Power the machine up and reload the parameters saved previously. Check for any new parameters in the software update.
9. Cycle power on the machine for the parameters to take effect.

Save a new parameters setup disk.

Centurion 5 Reset Explained



1. The front panel reset switch is pressed, sending a keyboard signal to the control
2. In the diagnostics screen ([F6] Display, [F4] Diag) the x output #9 will go to a “1”, providing a momentary internal ground.

If X Out 9 does not turn to a “1” there are several possible problems:

- There may be an axis drive fault inhibiting the reset signal. This would be signified by a “1” at X INPUT 9.
- There must be a ground at X INPUT 1 “E-Stopped” for the machine to be able to set the X Out 9. If X In 1 is not a “1”, it is missing that ground. The +24vdc line may be low or shorted and its voltage should be checked.
- The reset switch itself may be malfunctioning. Plug in an external keyboard and press the F10 key while holding down the Alt key. This will simulate the keyboard signal that the reset switch sends when depressed. If the machine resets this way the switch needs to be replaced.

3. The internal ground at X Out 9 energizes the coil of CR 1C through contacts on the control watchdog relays and the normally closed contact of the E-Stop button.

If CR 1C is not energized at this time there are again several possibilities:

- The watchdog relays are not activated. Check the watchdog LEDs located on each acroloop card. If any are unlit that acroloop card is malfunctioning and the control may have to be sent in for repair.
- The E-Stop switch contact is malfunctioning such that it is open all of the time.
- The CR 1C relay has failed. Replace with another coil (CR 7 mist works well).

4. When the CR 1C relay energizes, the relay latches to ground through its own contacts, through the over travel limits, through the spindle fault contacts, and through a set of normally closed contacts on the CR 1A relay. (The CR 1A is wired through normally closed contacts on CR 1, and will shut off when CR 1 comes on). The reset switch is then released leaving the CR 1C on.

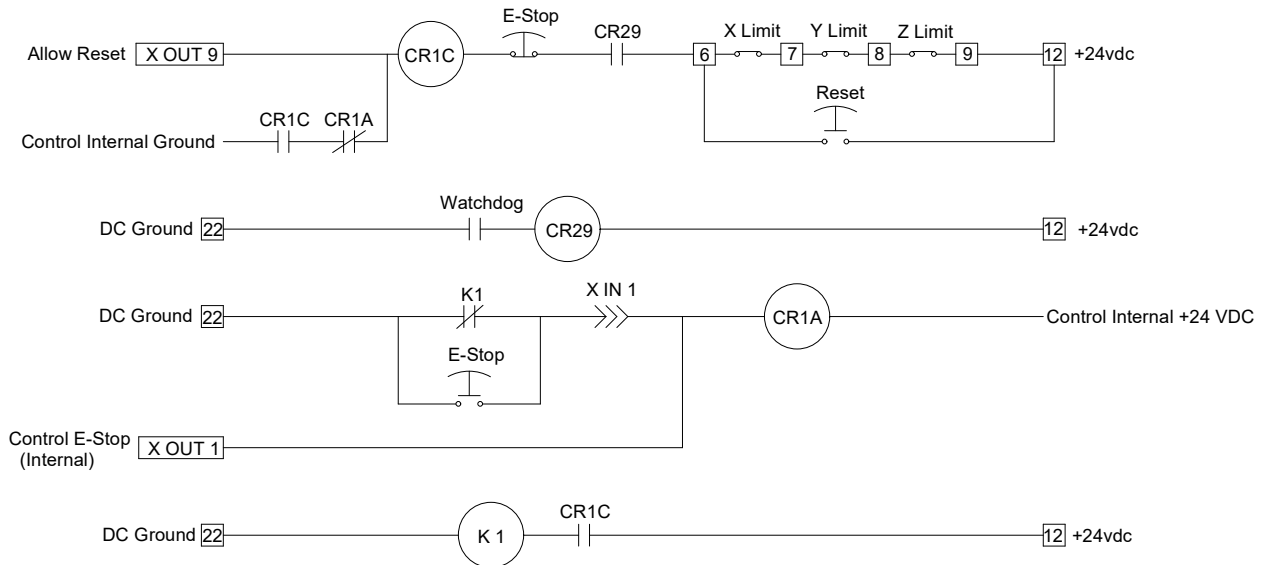
If CR 1C will not remain latched there are several possible problems:

- The machine is sitting on a limit switch or a limit wire is broke. Hold down the reset switch and jog the machine to the center of travel. Release the reset and observe if the machine stays in reset. If a break in the limits is suspected they may be jumped past by placing a jumper wire from terminal block 6 to block 9. If the machine stays reset the problem axis can be isolated by jumpering from terminal blocks 6 to 7 (X axis), blocks 7 to 8 (Y axis), and blocks 8 to 9 (Z axis).
- The spindle drive may be faulted. A jumper from terminal blocks 6 to 6A will bypass this. If the machine remains reset with this jumper check the spindle drive for fault information.
- There may be problems with the contacts on CR 1A or CR 1C. Try replacing one or the other relay.

DO NOT OPERATE MACHINE WITH ANY JUMPERS IN PLACE. Jumpers are for trouble shooting purposes only.

5. With CR 1C latched the CR 1 machine reset relay should then come on all machine devices will be energized.

Centurion 6 Reset Explained



1. The front panel reset switch is pressed, sending a keyboard signal to the control
2. In the diagnostics screen ([F6] Display, [F4] Diag the X output #9 will go to a “1”, providing a momentary internal ground.

If X Out 9 does not turn to a “1” there are several possible problems:

- There may be a drive fault inhibiting the reset signal. This would be signified by a “1” at X INPUT 9 if it is the spindle drive. An axis drive fault will show up in the A or “4” diagnostic group. A inputs 1 through 5 could possibly be drive indicators, depending upon the number of axis. If the machine is equipped with D.C. drives, these will be drive faults and a “1” indication will mean that a drive is faulted. If the machine has A.C. Yaskawa drives these will be drive O.K. indicators and a fault will be shown by a “0” (“1” means drive o.k.)
- There must be a ground at X INPUT 1 “E-Stopped” for the machine to be able to set the X Out 9. If X In 1 is not a “1”, it is missing that ground. The +24vdc line may be low or shorted and its voltage should be checked. The ground comes through normally closed contacts on the K1 machine reset relay. There may be a problem with it.
- The reset switch itself may be malfunctioning. Plug in an external keyboard and press the F10 key while holding down the Alt key. This will simulate the keyboard signal that the reset switch sends when depressed. If the machine resets this way the switch needs to be replaced.

3. The internal ground at X Out 9 energizes the coil of CR 1C through contacts on the CR 29 relay, the normally closed contacts of the E-Stop button and through the over travel limits or the normally open contacts of the reset button.

If CR 1C is not energized at this time there are again several possibilities:

- The CR 29 relay is not activated. Check the LED next to the CR 29 relay located on a quad relay card (the relay itself should be labeled). If the LED is unlit there may be a problem in the control. The CR 29 relay is powered through the control watchdog relay. Check LED 1 on the control's interface panel. If it is unlit there is a malfunction in the control and it may have to be sent in for repair.
- The E-Stop switch contact is malfunctioning such that it is open all of the time.
- The CR 1C relay has failed.
- There may be a problem in the jumper settings if the interface panel has just been replaced.

4. When the CR 1C relay energizes, the relay latches to ground through the over travel limits, through its own contacts, and through a set of normally closed contacts on the CR 1A relay. (The CR 1A is wired through normally closed contacts on K 1, and will shut off when K 1 comes on. It is also wired to the normally open E-Stop contacts and will come on when E-stop is latched or held in.) The reset switch is then released leaving the CR 1C on.

If CR 1C will not remain latched there are several possible problems:

- The machine is sitting on a limit switch or a limit wire is broke. Hold down the reset switch and jog the machine to the center of travel. Release the reset and observe if the machine stays in reset. If a break in the limits is suspected they may be jumped across by placing a jumper wire from terminal block 6 to block 9. If the machine stays reset the problem axis can be isolated by jumping across terminal blocks 6 to 7 (X axis), blocks 7 to 8 (Y axis), and blocks 8 to 9 (Z axis).
- The E-stop button may still be latched or the normally open contacts may be stuck shut leaving the CR 1A relay energized.
- The K 1 relay contacts may be stuck shut or K1 is not coming on, causing the same condition as above.
- There may be problems with the contacts on CR 1A or CR 1C.

DO NOT OPERATE MACHINE WITH ANY JUMPERS IN PLACE. Jumpers are for trouble shooting purposes only.

5. With CR 1C latched the K 1 machine reset relay should then come on and all machine devices will be energized.

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.

Samples of CMOS settings appear in the appendix of this section.

Entering the CMOS

Before attempting to enter the CMOS you may need to disconnect the Com 2 connector from the motherboard inside of the control. If this plug is not removed the control will believe it has a serial mouse attached (a mouse pointer will appear on the screen) and when the user enters the CMOS the keyboard will be inactive. This will not be required on controls with an SBC board.

To enter the CMOS of the machine attach a keyboard to the keyboard jack on the side of the front panel. An external keyboard is required to enter setup, as the machine keyboard does not have a delete key. Power the machine up. Enter setup by pressing “DEL” when the “Press delete to enter setup” message appears. If this opportunity is missed the control must be rebooted to begin again.

Depending on the BIOS the motherboard has the screen will either have a menu in the center of the screen or, it will have a group of windows on it. If there is an “ENTER CURRENT PASSWORD” message on the screen it will be necessary to enter the serial number of the card cage. For example, if the serial number is 1234-A it will be necessary to enter 1234A.

Some motherboard CMOS are a menu with many options listed. Navigation is usually done through the arrow keys. The bottom of the screen will give the information on which keys will accomplish which tasks. Another type is a windows interface that requires the user to “Tab” from one field to the next to enter the desired section of the CMOS. The arrow keys will then select a task in that section. The enter key will open the highlighted setting for editing purposes and will store the value entered there.

The escape key will prompt the user to exit the CMOS. If the enter key is pressed at this time the CMOS should be exited and the control should reboot.

Hard Drive Installation

A hard drive can be added to many controls. It provides increased parts storage capability. It is also a must if a non-DOC control is to be networked or hooked to any type of large storage device such as an LS120 or a Zip drive, and does not have a Disk on Chip. This is due to the need for a place to store the driver software for these devices.

Disk on chip systems can have a hard drive installed, but this is typically avoided in favor of a larger size Disk on Chip. Adding a hard drive to one of these systems will require a special IDE ribbon connector, as the IDE socket on the SBC card is not of the standard size.

Some old Centurion 5 and 1 systems also contained the CNC software on the hard drive as well, although it is not advisable to do this as it makes controls less reliable.

It is also important to note that on Centurion 1 and 5 controls the hard drive must be partitioned to 33 meg to work with the Simdisk because the operating system on these controls will not recognize anything larger. The hard drive also must have a parts directory on it so that it may be recognized as parts storage.

To install a hard drive on the machine:

1. Save the machine parameters and programs onto a floppy disk.
2. Enter the machine setup parameters, power section, and make sure the SERIAL KEYBOARD parameter is set to NO. Escape back to the main menu and power down the machine.
3. Remove the card cage from the machine and mount the new or replacement hard drive. The new hard drive should be installed on the side of the card cage near the keyboard jack on the motherboard.
4. Hook up the power to the hard drive using one of the spare connectors from the card cage power supply. It should only go in one way.
5. Hook up the data cable to the hard drive. The red stripe on the cable should be inserted into the connector facing the hard drive's power socket. The other end of the data connector should go into either the I/O card or directly into the motherboard, depending on which type of motherboard is in the control. If the control has an I/O card, the cable should be attached to the connector marked "IDE." It is the longest connector on the board. Be sure to orient the cable the same way as the other cables on the card, i.e. Pin one on the connector to the red stripe on the cable. If the control does not have an I/O card, install the cable to the motherboard in the "PRIMARY IDE" connector. Again, noting the orientation of the cable
6. Reinstall the Card Cage into the machine and reattach all connections.

7. Enter the CMOS of the machine per the procedure previously stated. Check to see if the control has a Com 2 cable that may need to be removed from the motherboard.
8. Auto detect the hard drive.
 - 8A. If you have a simple menu, arrow down to “AUTO DETECT HARD DISK” and press enter. After approximately 30 seconds, there should be a window with a set of choices. Press “Y” to accept the settings. Now there should be an “AUTO DETECTING DRIVE D” message on the screen. Press “ESC” then “Y” to select no drive D. Escape back to the main menu and press F10 to save settings. Confirm the CMOS settings and the control should reboot.
 - 8B. If there is a windows type interface, press, “TAB.” “IDE SETUP” should now be highlighted. Press “ENTER” after a short delay, an “ACCEPT SETTINGS Y/N?” window should appear on the screen. Under drive C: there should be a hard drive listed. Under drive D: there should be a “not detected” message.

If, after auto-detection, there is no drive selected. Recheck all connections in the card cage and reattempt to auto-detect the hard disk.
9. If the hard drive is simply a replacement the Path.dat file should be correct and the control should be operating as before. If the hard drive is a new install the Path.dat file will need to be adjusted for the CNC software to recognize the hard drive as a valid path. See the section on the Path.dat file for information on how to change the paths.

Setting up custom codes on the Centurion Control

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

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

Runtime: 000:00:00		MAIN-PARMS-SETUP-POWER		Active: 00001	
Current Next					
X	+00.0000	X	+00.0000		
Y	+00.0000	Y	+00.0000		
Z	+00.0000	Z	+00.0000		
*** Custom M and G code Tables ***					
Custom Gcode	09010.....000	Comp	: Cancelled	*	
Custom Gcode	09011.....000	Tool	: 00(00)		
Custom Gcode	09012.....000	Length	: 00.0000		
Custom Gcode	09013.....000	Radius	: 00.0000		
Custom Gcode	09014.....000	Plane	: XY (G54)		
Custom Gcode	09015.....000	Clearance	: 00.1000		
Custom Gcode	09016.....000	Interp	: Linear (Feed)		
Custom Gcode	09017.....000	Feed	: 010.0 ipm		
Custom Gcode	09018.....000	(100%)	: 010.0 ipm		
Custom Gcode	09019.....000	Units	: Abs/English		
Custom Mcode	09020.....000	Cycle	: Cancelled		
Custom Mcode	09021.....000	Dwell	: 0000.00 sec		
Custom Mcode	09022.....000	Spindle	: 0000 rpm		
Custom Mcode	09023.....000	(100%)	: 0000 rpm (OFF)		
▶ Custom Mcode	09024.....000	Coolant	: Off		

F1 EDIT

F7 ↑

F8 ↓

F9 PGUP

F10 PGDN

ESC ESC

3. Write a program with the number of the custom M-code slot that was selected. If custom M-code O9020 was set, then the program written must be named O9020. Save the program.
4. Escape to the main menu, E-stop, and power down the machine. Wait approximately 30 seconds and power up.
5. When the machine is powered back up the M-code should be active.

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 can be placed either in the parts storage or the B:/ram. If they are placed in ram they can be saved with the other parameters and are safe from being erased.

Sample Custom M-Code

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

1. Start a new text program o9024. In the program write:

```
SET Z8  
M30
```

2. Store the program.
3. Then set the Parameter Custom M code 9024 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, 9024 gets run. The SET Z8 command will trigger Z output 8, 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

X input 7 is the wait channel. If an M32 is commanded in a program the control will look at X in 7. If X in 7 is grounded, it will show a “1” in diagnostics display, the machine will stop at this point and wait for the input to lose the ground signal before continuing the program. If the ground 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 ground must only be broken for an instant to allow the control to pass beyond this block of the program.

This input will be wired to terminal block 79 on a D.C. panel.

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.

RS 232 Communication

Another method of bringing information in from the outside world to the control's memory, other than the floppy drive, is the RS232 port. Centurion CNC controls use a standard RS232 interface just as that found on today's desktop personal computers.

The pinout of the 25 pin "D" style connector on the control box is as follows:

- Pin 2 Receive data
- Pin 3 Transmit data
- Pin 7 Signal Ground
- Pin 1 Frame Ground – (tied to cable shield on one computer end only)

Operation notes.

- The Milltronics end requires no jumpers such as 5,6,8, & 20. Only pins 2,3, & 7 are used.
- Hardware handshaking signals are NOT used.
- Software handshaking (Xon & Xoff) is used to control the data flow. This handshaking mode is employed by default and cannot be disabled.
- The required parameters for baud rate, data bits, stop bits, and parity are found under PARAMS-CTRL in the CNC menus. Before attempting any communication ensure that the devices on both ends are set up the same way as one another.
- When transferring data always prepare the receiving end first, then initiate the sender.
- Always make sure the type of file being received is the same type as that being sent. When transferring files from a CAD/CAM system the file type will always be TEXT.
- To receive a file, go into UTIL-RS232-RECV, select the type of the file TEXT or FCAM. Type the name or number of the new file being created, then press enter. The file name of the file being sent is not transferred with the data so the name must be specified when RECEIVE FILE is initiated.
- To send a file go into UTIL-RS232-SEND, select the type of file TEXT or CONV, & MENU. Then from the menu, select the file with the cursor arrow, hit enter, then F1 to begin.

RS232 Cables

There are two different cable configurations used for RS232 communications. The two drawings below show how these cables should be made for proper communication to the machine. The machine end of both cables requires a male 25-pin plug. The computer end of the cable is determined by the type of port used.

In making a 25 pin to 25-pin cable, connect pin 1 of the computer end only to the shield of the cable. Pin 2 on the computer end should connect to pin 3 of the machine end. Pin 3 of the computer end should connect to pin 2 of the machine end. Pin 7 of the computer end should connect to pin 7 on the machine end as a ground.

In making a 9 pin to 25-pin cable, as before pin 1 on the 9-pin computer end should be connected to the cable shield. Pin 2 on the computer end should connect to pin 2 on the machine end. Pin 3 on the computer end should connect to pin 3 on the machine end. And pin 5 on the computer end should connect to pin 7 on the machine end as signal ground.

