



CNC3X Installation Manual

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This manual produced on 2/3/2010.

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1 Disclaimer of Liability and Limitation of Warranty

Where the CNC box is supplied as a component and not as part of a complete control system it is assumed that the purchaser has sufficient electrical and electronic knowledge to handle the component competently.

It is further assumed that the purchaser has sufficient knowledge of safe working practices and the relevant Health & Safety regulations which apply to working with electrical and electronic systems to work safely with the component.

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2 Introduction to the CNC3X box



The CNC3X box has been designed to control CNC lathes, milling machines, PCB drills, routers, etc. In fact any machine which has 1, 2, 3 or 4 stepper motor driven axes. The stepper motors can also, optionally, be controlled in a closed-loop mode with the addition of standard quadrature encoders in either strip or rotary form.

The CNC3X box has a built in power supply which can output 30 volts DC @ 20 Amps.

A machine fitted with a CNC3X can be operated in stand-alone mode (without requiring a host computer) using a standard VGA monitor and PS2 keyboard.

The CNC3X box can be fitted with 2, 3 or 4 STEPHP1 stepper motor drive cards. The CNC3X can also be supplied with 3rd party pseudo-stepper DC servo drive cards.

2.1 Front panel controls



The front panel controls are (from left to right) the axis jog buttons for the X and Y axis (arranged in a cross around the green 'Enter'/BTN1 button), the Z axis jog buttons, 3 status LEDs, the electronic hand-wheel, the emergency stop button and the power switch.

When in manual mode the jog buttons can be used to rapidly position an axis and then the hand-wheel can be used to control the precise position. The hand-wheel automatically switches to operate the last axis that was moved with one of the jog-buttons. The electronic hand-wheel is rotated clockwise to move the axis in the positive direction and counter-clockwise to move the axis in the negative direction.

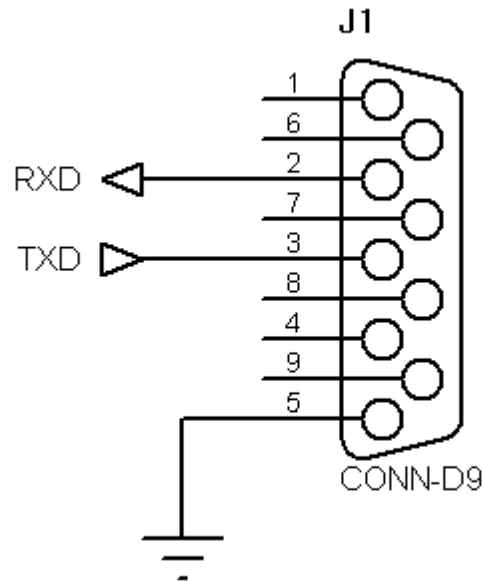
2.2 Rear Panel Connections

The rear panel contains the plugs for: the mains supply, [the computer](#), [an AC/DC spindle motor](#) (or any 10 Amp load), 12-volt relay drives, the [stepper motors](#) and the [feed-back/encoder/limit-switch](#) plug.

AC Mains Inlet

The AC mains connector is a standard 'kettle' type plug (an IEC plug). The socket includes a 2 Amp fuse - do not use a higher rated fuse... it will reduce the level of protection!

2.2.1 RS232 Serial Interface



Pin	Signal
2	Receive Data (RCD)
3	Transmit Data (TXD)
7	Ready-To-Send (RTS)
8	Clear-To-Send (CTS)
5	Ground

The serial port is configured as a standard PC AT 9-pin port. A standard PC-AT to PC-AT serial cable (a cross-over cable) can be used.

The default protocols are 115,200 baud, 8 data bits, no parity and 1 stop bit.

The board will use XON/XOFF flow controls by default.

2.2.2 Spindle Motor control plug

Pin	Signal
1	Emergency stop
2	Emergency stop
3	Spindle speed control +
4	Spindle speed control reference
5	Spindle speed control -
6	Coolant relay
7	Coolant relay
8	Spindle relay
9	Spindle relay

The emergency stop circuit can be connected through any safety switches, cover switches, etc. Provided it is unbroken the spindle, coolant and programmes can be run. If the emergency stop circuit is broken then the spindle and coolant are forced off and any programme running will be stopped... the machine can still be moved in manual mode. **The plug supplied has a link shorting pins 1 and 2. Do NOT connect the stop circuit to any active components!**

The spindle speed control circuit is designed to emulate a potentiometer control and can be used with most 3rd party spindle motor control cards. It is optically isolated from the rest of the control electronics so spindle speed control cards with different voltage levels or floating grounds can be used.

The spindle and coolant relays are both 10A/250V.

2.2.3 Stepper motor plug

Pin	Signal
1	X Motor A phase +
2	X Motor A phase -
3	X Motor B phase +
4	X Motor B phase -
5	Y Motor A phase +
6	Y Motor A phase -
7	Y Motor B phase +
8	Y Motor B phase -
9	Z Motor A phase +
10	Z Motor A phase -
11	Z Motor B phase +
12	Z Motor B phase -
13	U Motor A phase +
14	U Motor A phase -
15	U Motor B phase +
16	U Motor B phase -

N.B. As delivered the stepper motor outputs are configured for 2 Amps/phase and for half-stepping with power-save enabled. To change these settings please refer to the manual for the stepper motor drive card (STEPHP1).

*****WARNING** Never connect or disconnect a motor when the control box is powered up. Always turn off the control box and allow 2-3 minutes for the power-supply capacitors to discharge before connecting or disconnecting motors. Failing to observe this precaution could permanently damage your control box!***

2.2.4 Feed-back/Encoder/Limit-switch plug

The pin-out for 25-pin D-connector is below - please note that D-connectors are numbered across the top row and then the bottom row...

DB25 pin	Function
1	+5V
14	X encoder channel A
2	X encoder channel B
15	0V/GND
3	X limit +
16	X limit -
4	FB1 - single slot encoder for threading
17	U encoder channel A
5	U encoder channel B
18	+5V
6	Y encoder channel A
19	Y encoder channel B
7	0V/GND
20	Y limit + (also FB1 on CNC1)
8	Y limit - (also FB2 on CNC1)
21	FB2 - multi-slot encoder for threading
9	V encoder channel A
22	V encoder channel B
10	+5V
23	Z encoder channel A
11	Z encoder channel B
24	0V/GND
12	Z limit +
25	Z limit -
13	+12V

Cells highlighted in grey are not connected (N/C) in a CNC1 box

The power requirement of any encoder used should not exceed 100 milli-amps.

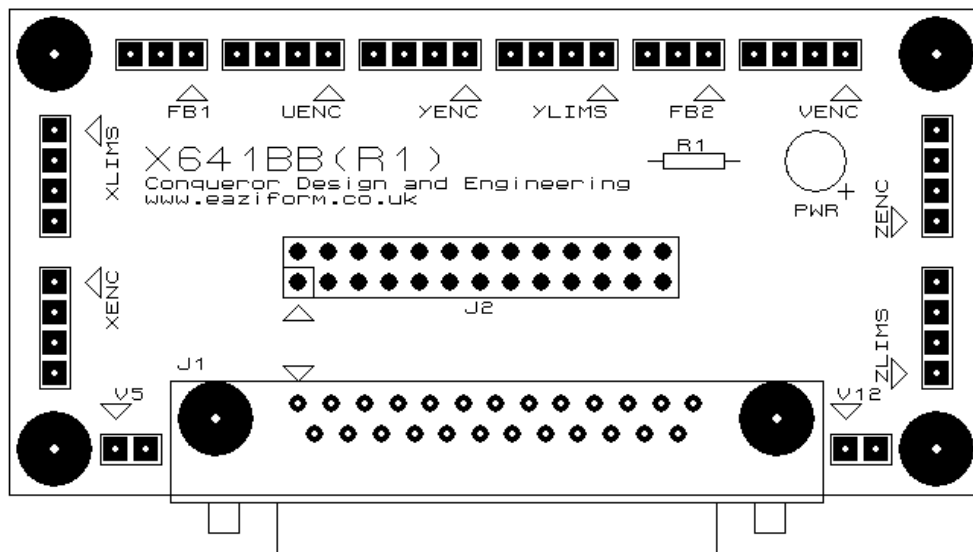
To connect a limit switch it should be connected between the limit switch input and the ground connection for the same section. For instance to connect an X-LIMIT+ switch the switch would be connected across pins 3 and 15.

Threading sensors (FB1 and FB2) should be connected to the Y+ and Y- limits on a CNC1 box - the power supply for the encoders can be drawn from pins 1 and 7. A CNC1 box does

not have connections for the feedback encoders.

N.B. With a CNC2X it is possible to use encoders which require a higher voltage than 5 volts by using the 12-volt supply from the plug and inserting a diode into the A and B lines. For details please contact technical support.

2.2.4.1 X641BB break-out board



There is an optional X641BB break-out board.

The break-out board can be used with the X-series cards using a 26-pin ribbon cable or with CNC control boxes using a 25-pin extension cable.



X641BB connector pin-outs

In all cases the marked pin is pin #1.

XENC, YENC, ZENC and UENC connector

Pin	Signal
1	+5 volts
2	A signal
3	B signal
4	GND

XLIMS, YLIMS and ZLIMS connector

Pin	Signal
1	+ Limit switch
2	GND
3	- Limit switch
4	GND

(To connect a limit switch connect it across 1 & 2 or 3 & 4)

FB1 and FB2 connector

Pin	Signal
1	+5 volts
2	Encoder signal
3	GND

2.3 Spare and replacement plugs

A replacement/spare plug for the stepper motors, feed-back/limit-switch connector, relay connector and spindle/Emergency-Stop connector can be obtained from RS Components (<http://www.rswww.com>) or Farnell Electronics (<http://www.farnell.co.uk>).

Stepper motor plug is... "Connector, circular, CPC, cable plug, 16 way, 17 shell"

Feed-back/limit switch plug is... 25-pin male D-connector (plug)... various types are suitable.

Relay connector is... 9-pin male D-connector (plug)... various types are suitable.

RS Components code # 372-254, "Connector, circular, CPC, cable plug, 9 way, 13 shell".

Farnell Electronics code # 3195545, "RECEPTACLE, STD SLD CPC1 9 WAY".

3 Operation

For the specifics of operating the CNC box please refer to the EaziCNC software manual and to the X-card manual.

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