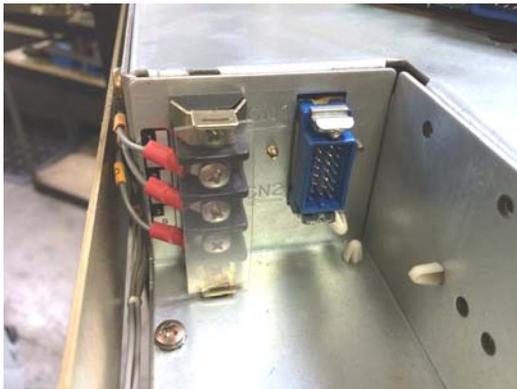


Upgrading a Hardinge Model CHNC II CNC Lathe to use an LCD Display

Revision 2 Feb 22, 2016

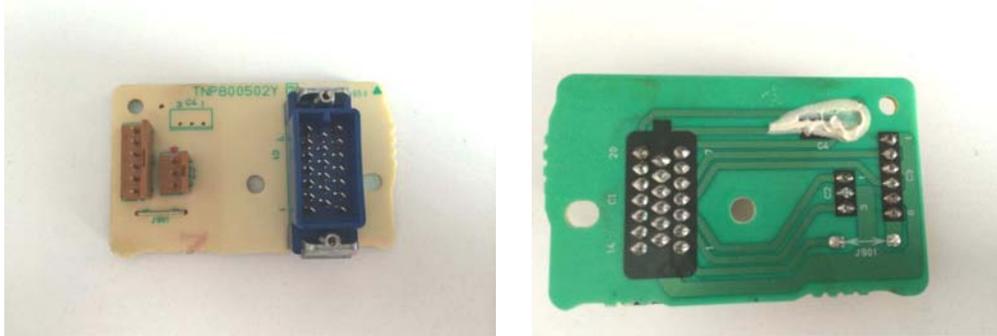
This 1986 vintage Hardinge CNC machine has a **General Numeric GN10 Series** controller, and a **Fanuc A02B-0072-C023 "MDI/CRT Unit"** with a 13" CRT monitor. The old CRT monitor died suddenly, and would throw a loud arc in the CRT enclosure every time the machine was powered on. The operator was still able to manually jog the tooling X/Z positions, indicating that the CPU and most of the electronics of the machine were still working despite no display. Here is how we converted the machine to use a standard LCD computer monitor:

1. Buy an **"XVGA Box"** on E-bay or Amazon for about \$200-\$225. They list these boxes individually for use with various makes/models of CNC machine controllers (but not the Fanuc A02B series). However, it appears that all of the XVGA Boxes are all the same model number and thus should be universal. It does come with a manual, but it doesn't have any information about how or where to tap into the video signals from the CNC machine.
2. Find an LCD computer monitor. It must have a VGA video signal cable input (15-pin D-shaped connector). A 15-inch diagonal, 4:5 aspect ratio (not widescreen) monitor is ideal. These usually have mounting holes on the back, and you should be able to make a simple sheet metal bracket to mount it into the machine later. We found a good used Dell 15" monitor at a pawn shop for \$20. Also get a standard VGA cable.
3. **Turn the machine OFF** and shut off the circuit breaker. Unscrew the control panel assembly and slide the whole thing out of the front of the lathe. We placed it on a cart so that we didn't have to unplug all of the cables. Locate the video signal cable (**blue 20-pin Honda connector**) and the AC power harness (**3-wire terminal block**) that go from the control electronics to the CRT monitor. These are located at the very top back corner of the CRT chassis (the only wires going to it) and look like this:



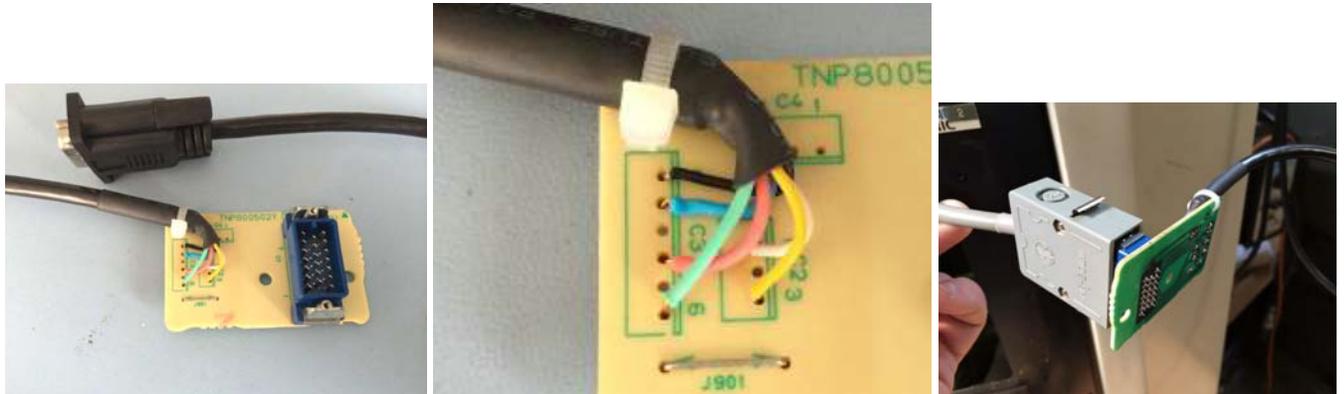
4. Unscrew the three CRT power wires from the terminal block, and cover the three ring terminals with heat-shrink tubing or electrical tape to keep them from shorting to anything later, because they are 220 volts AC.
5. You will need to access the video signal from the machine and route it into the XVGA Box. Theoretically, we could have removed the 20-pin blue Honda connector from the end of the CNC machine's gray video cable and soldered the wires directly to the spare D9 connector that came with the XVGA box. However, it was easier and faster to just wire the unterminated end of the other black D9 cable (that also came with the XVGA) to the small connector board where the video cable plugs into the CRT assembly.
6. You need to remove the lid from the CRT chassis in order to remove this connector board. **CAUTION: Don't touch the cathode ray tube (CRT) or any of the circuit boards or components located inside the CRT chassis, even when powered off! CRTs use deadly voltages and can remain charged for a long time after power is removed.** If you don't know exactly what you are doing, have a qualified electronics or TV technician do the electrical work.

Remove the small video signal connector circuit board from the CRT chassis, then put the lid back on the chassis. Note: Newer CHNC II machines use a board that looks a little different. Our board looked like this:

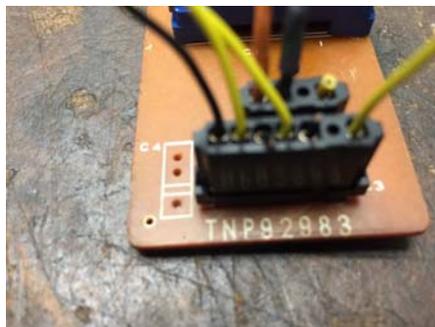


7. The signals you need are on the C3 (6-pin) and C2 (3-pin) connectors on the board. We could have just soldered the wires from the D9 cable to the pins on the two headers, but we decided to remove the headers and solder the wires into the holes for better reliability. **Some of the wires coming out of the unterminated end of the black D9 cable that came with the XVGA Box did not match the colors shown in the XVGA manual, and there were confusing extra wires.** We tested the pins with a continuity meter to figure it out:

D9 Cable Pin	D9 Cable Wire Color	XVGA Box Signal	Soldered to the Interface Board At:
1, 2	Black	Ground	C3, Pin 1
3	Light Red/Pink	Red Interface	C3, Pin 4
4	Light Green	Green Interface	C3, Pin 6
5	Blue	Blue Interface	C3, Pin 2
6, 7	Brown	Not used	Not used, cut off
8	Yellow	(H) Horizontal Frequency Signal	C2, Pin 3 (see note below)
9	White	(V) Vertical Frequency Signal	C2, Pin 1
none	Dark Green	Not connected	Not used, cut off
none	Dark Red	Not connected	Not used, cut off
none	shield	shield	Not used, cut off



Note: We were later contacted by a tech who had a different vintage CHNC II machine with a slightly different looking connector circuit board (shown below). He initially wired his exactly as we had shown above, but the display didn't work. After some hours of head-scratching, he determined that his (H) Horizontal Frequency signal wire had to be moved to C2 pin 2 instead of pin 3, then it worked:



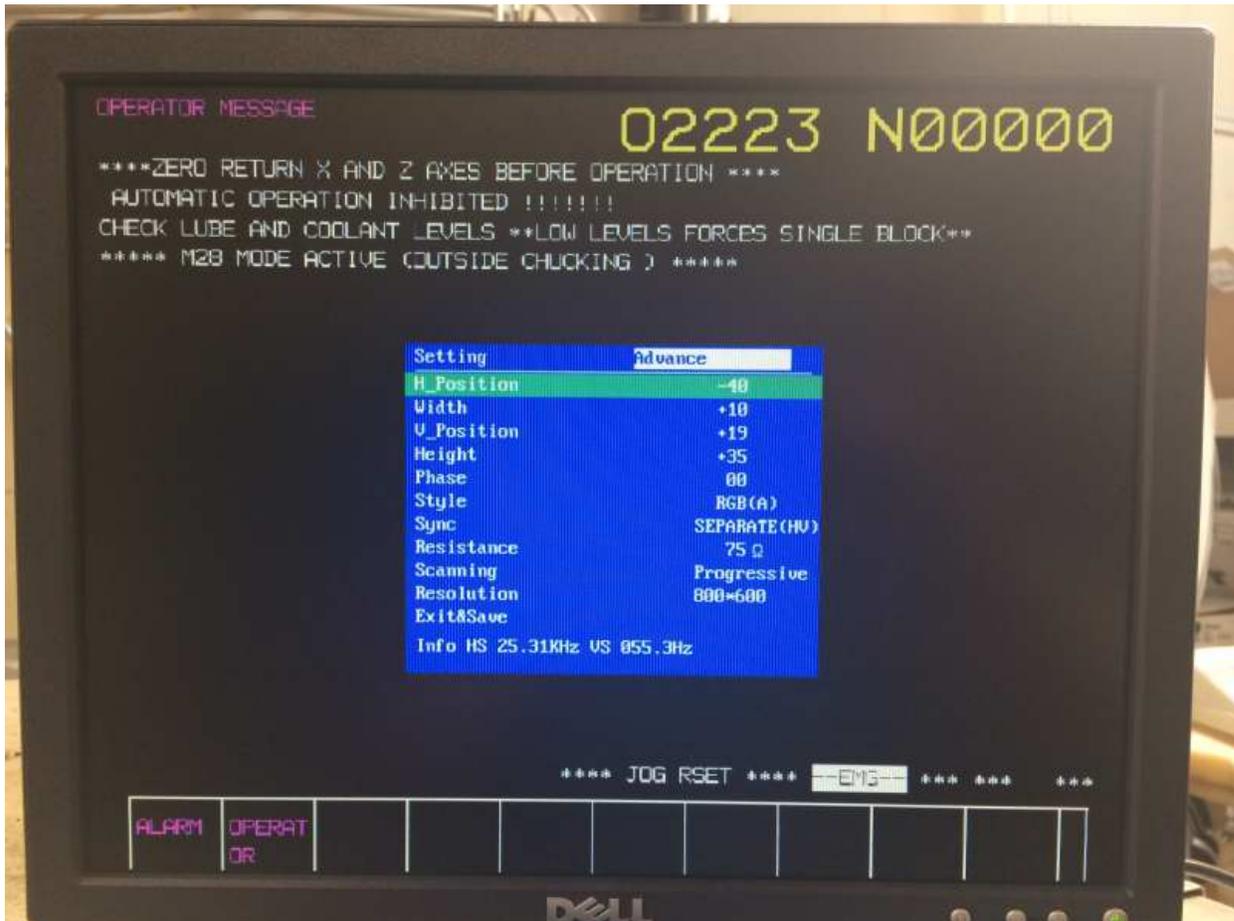
- Plug the black D9 cable into the VIDEO IN connector on the XVGA Box, and plug the gray video cable from the CNC machine into the blue connector on the interface board at other end of your new harness. The harness solder connections will need to be wrapped with shrink tubing or electrical tape, or mounted to avoid shorting.

Connect the VGA cable between the XVGA Box and the LCD monitor. Connect the power cables to the monitor and XVGA Box. We set up our LCD and XVGA Box on top of the machine for testing purposes.

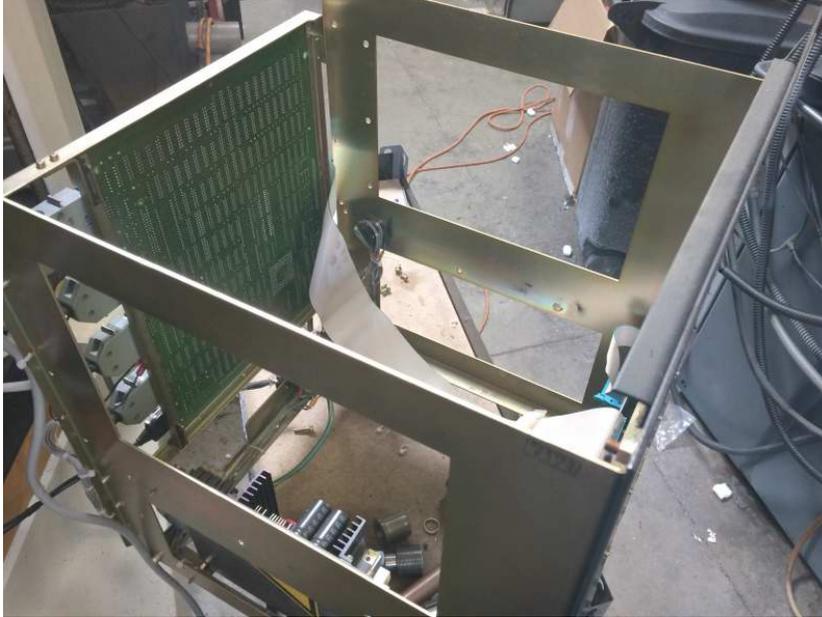


- When you power up the XVGA box, the blue settings menu should show on the LCD display. There are instructions in the XVGA manual for how to change the menu settings with the buttons on the box. The settings shown in the pic below worked for our 15" Display. The STYLE needs to be set to RGB(A). The H POSITION, V POSITION, HEIGHT, and WIDTH settings are used to shrink, stretch, and move the image so that it fits the screen. **Note:** The XVGA Box wouldn't let us exit the blue settings menu until the video signal from the CNC machine was present.

Double check that you removed and insulated the three power wires from the old CRT, then power up the Hardinge machine as usual. If you did everything correctly, the machine display should come up and work. Ours looked like this:



10. After testing the machine, we powered down and removed the old CRT sub-chassis from the Fanuc A02B assembly as shown below. Don't remove any of the circuit boards from the bottom or back of the Fanuc assembly because the machine still needs them all. We fabricated a simple sheet metal bracket to mount the 15" LCD display, the XVGA Box, and the wiring where the old CRT was.
11. We wired the monitor power cord and XVGA power cord to the old CRT power wire terminals, because the power inputs for both were rated for up to 240VAC. This way the whole display system comes up when the machine is powered up.



12. After the display and bezel were mounted, we had to adjust the XVGA Box settings so that the image was correctly sized and positioned behind the original bezel and above the correct soft-keys:

H_Position +28 Width -65 V_Position 00 Height +28

The exact optimal image settings for different brands of monitors will probably be slightly different.

Disclaimer: This information is provided only to indicate what worked for us. Alaric Electromechanics Inc assumes no responsibility for the accuracy of this information, or for any damage, injury, or any other consequences arising from the use of this information. The electronics technician who performed this work is both trained and experienced.