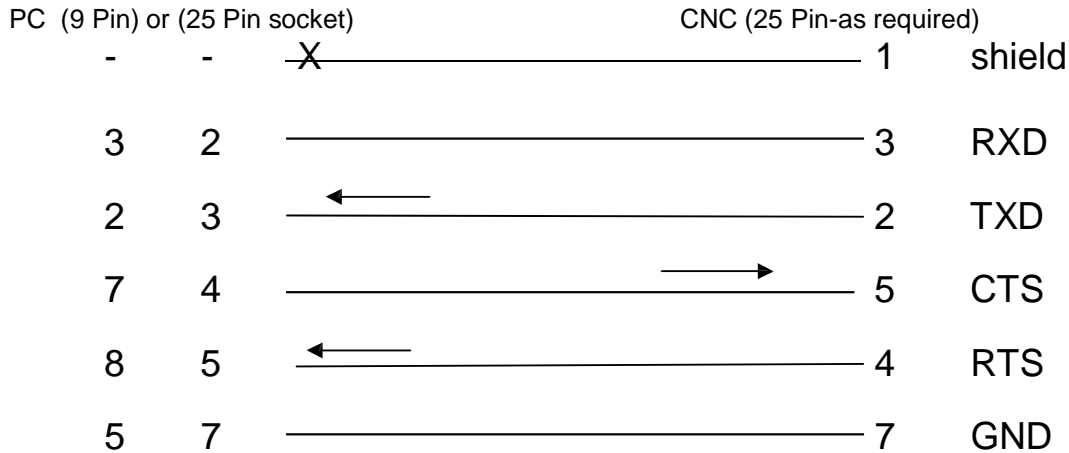# TECHNOTE!

Typical RS-232 wiring from PC to CNC

Please note! "Standard RS-232" straight through wired, pre-made cables will not work unless you add a Null-Modem adapter or buy a Null-modem cable where pin 20 is connected to both pins 6 and 8 on the other end.

The following diagram depicts the cable wiring between a DNC workstation's communications port (either the standard built-in COM1 and COM 2 or Rocketport expansion ports) and *most* CNC's. The numbers given are for standard 25 pin D-subminiature RS-232 connectors. On the PC side of the cable the connector must be a socket. On the CNC side it varies. FANUC and Yasnac's, for example require plugs. Okuma's and Cincinatti's generally require sockets.

This wiring assumes the following for 25 pin D-sub connectors:
At the PC and the CNC pins 2 and 4 are outputs. Pins 3 and 5 are inputs. Pin 7 is logic ground.

PC (9 Pin) or (25 Pin socket)   CNC (25 Pin-as required)

-	-	X————————————————	1	shield
3	2	————————————————	3	RXD
2	3	←————————————————	2	TXD
7	4	————————→————	5	CTS
8	5	←————————————————	4	RTS
5	7	————————————————	7	GND

Many CNC's require a jumper from 6 to 20. Some need no jumpers. Fanuc needs 6, 8 and 20 connected together. It does not hurt install the 6-8-20 jumpers even if not needed.

6
8 (Fanuc only)
20

Connect the shield drain wire to pin 1 at the CNC end of the cable only.

Typical DNC parameter settings

Data rate: 9600 baud (depending upon the capability of the CNC)
Data type: ASCII
Parity: Even
Word Length   7
Stop bits: 1
Handshaking: Both NoWait (if like FANUC and Yasnac CNC's the RTS signal goes on at the beginning of any data transfer, and off at the completion. If not must choose the handshaking depending upon CNC. For example, XON/XOFF wait is normally used with controllers that emulate EIA RS-491 level II, whereas RTS/CTS is used with level 1.)

In almost all cases ASCII, Even and 7 bits should be selected on the DNC side even if the CNC calls for ASCII, No Parity, 8 bits. (Cincinatti's and Citizen's are this way, for example.)

Using an RS-232 tester to troubleshoot your cable connections

The tester that CAD/CAM Integration, Inc. often supplies is a small module with red and green LED indicators for each RS-232 line monitored. A red LED on represents the active state of the signal - nominally +12 volts. A green LED on represents the off state of the signal - nominally -12 volts.

TEST 1 - Check that each RS-232 port is correct. Plug the tester into the DNC computer's or Rocketport COM port in question. Do not attach the cable to the CNC. Have the DNC shop floor application running but no files queued to send or receive. (The parameters must be set as suggested, above, with communication handshaking set to Both NoWait.)
Note! If testing a Comtrol Serial Hub the lights will be off or dim until a job is queued. If you have the CCL feature enabled skip to line 1A. (With CCL, a receive job is always queued waiting for the command file from the CNC.)
         Pins 2, 4 and 20 should be green. If pin 3 is red the port is probably bad. If pin 3 is green but pins 4 and 20 are red then you are probably on the wrong port or a job is queued for sending or receiving via that port.

1A - Now queue up a file to be sent.

         Pin 2 remains green but pins 4 and 20 should change to red. If they do not change then you are probably on the wrong port.

Plug the tester in the RS-232 port of the CNC. Do not attach the cable to the DNC computer.

         Pin 2 should be green. Pins 4 and 20 could be green or red. Pins 3 and 5 should not have any LED on. Other LED's might be on but do not matter.   If pin 2 is red then the port is probably bad.

TEST 2 - **Check the cable**.
Plug the cable into the DNC computer or serial hub. Connect the tester to the free end at the CNC. Do not connect the tester to the CNC.

Pin 3 should be green. Pin 5 should be red. (If the file is still on the job queue in the DNC application.) If you abort the DNC job pin 5 should turn green. If TEST 1 passed but now pin 3 is red and other unexpected LED's are on, the problem might be a bad ground. Check the wire connecting pin 7 on the DNC side to pin 7 on the CNC side.

Note! If testing a Comtrol Serial Hub the lights will be off or dim if no job is queued.
Disconnect the cable at the DNC computer. Plug it in on the CNC side. Plug the tester into the free end of the cable. Do not plug the tester into the DNC computer or serial hub.

Pin 3 should be green. Pin 5 could be red or green. If you are using the cable specified, above, then no other lights should be on. If you are using a store bought cable, other lights might be on but are not used. If TEST 1 passed then it could be a problem with the ground wire on pin 7 to pin 7 as described in the preceding paragraph. Re-check all wiring.

TEST 3 - **All together**.

Plug the cable into the DNC computer's port. On the CNC side, plug the tester into the CNC's RS-232 port and plug the cable from the DNC system into the other side of the tester. Make sure no job is queued up on the DNC computer.

The following assumes the cable specified, above.

Pins 2 and 3 and 5 should be green. Pin 4 should also be green if the CNC is Reset. (On some older CNC's this pin might stay red.) Pins 6, 8 and 20 should all be the same color - generally green if the CNC is Reset. At the DNC computer, queue up a file to be received. Pin 5 on the tester should now turn red. Output (punch) a file from the CNC. Pin 4 should turn red if it was not already red. Pin 2 should now appear as if both the red and green LED's are on while data is transmitted to the DNC system. Pin 3 might occasionally blink red but this is generally too difficult to see. When transmission is complete pin 2 goes back to steady green, and so do pins 4 and 5. 6, 8 and 20 will probably turn to green also.