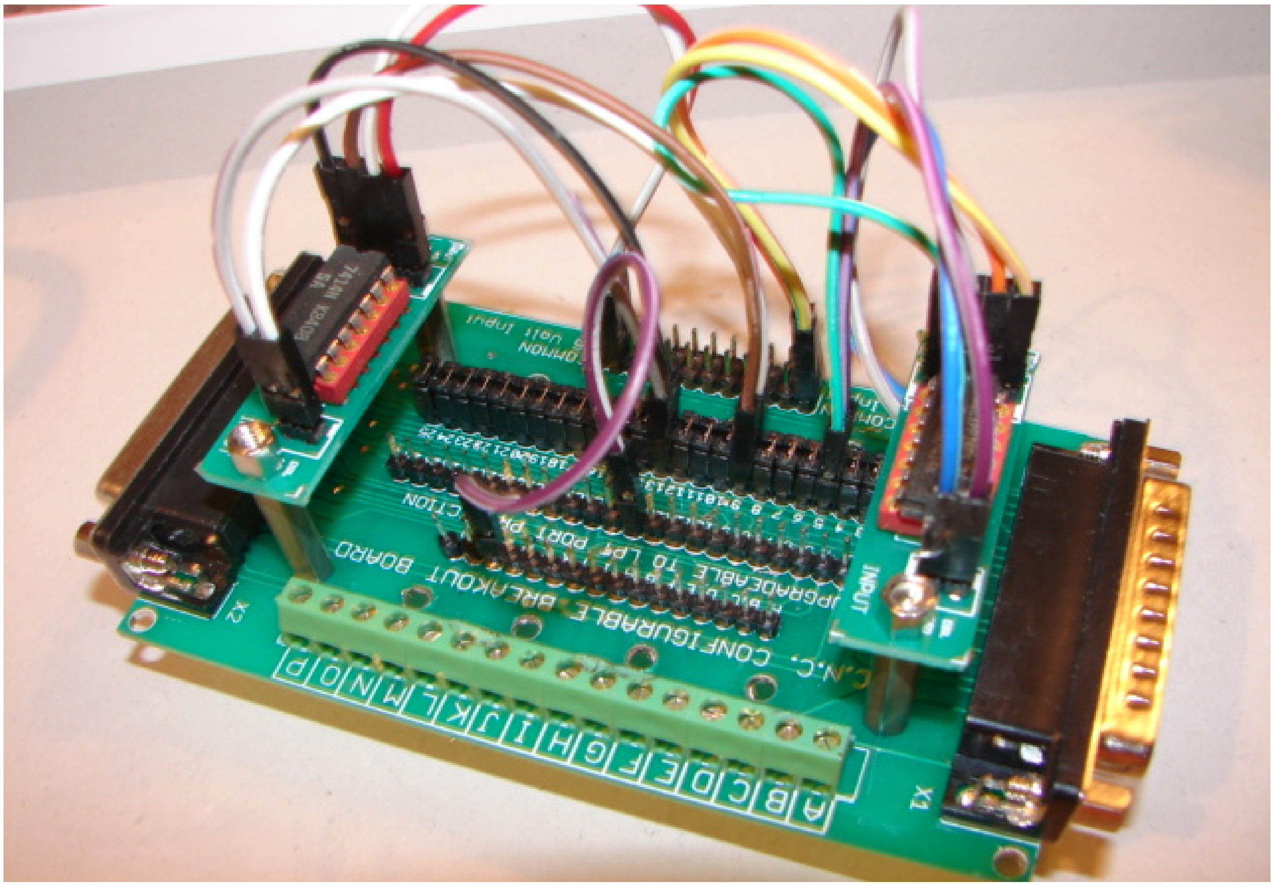
THE CNC SIGNAL CONTROL CENTER

AN I / O BOARD SPECIALLY DESIGNED FOR COMPUTER NUMERIC CONTROL SYSTEMS AND OTHER DB25 CONNECTOR SYSTEM SIGNALS.



IT'S A SIGNAL DIVERTER.

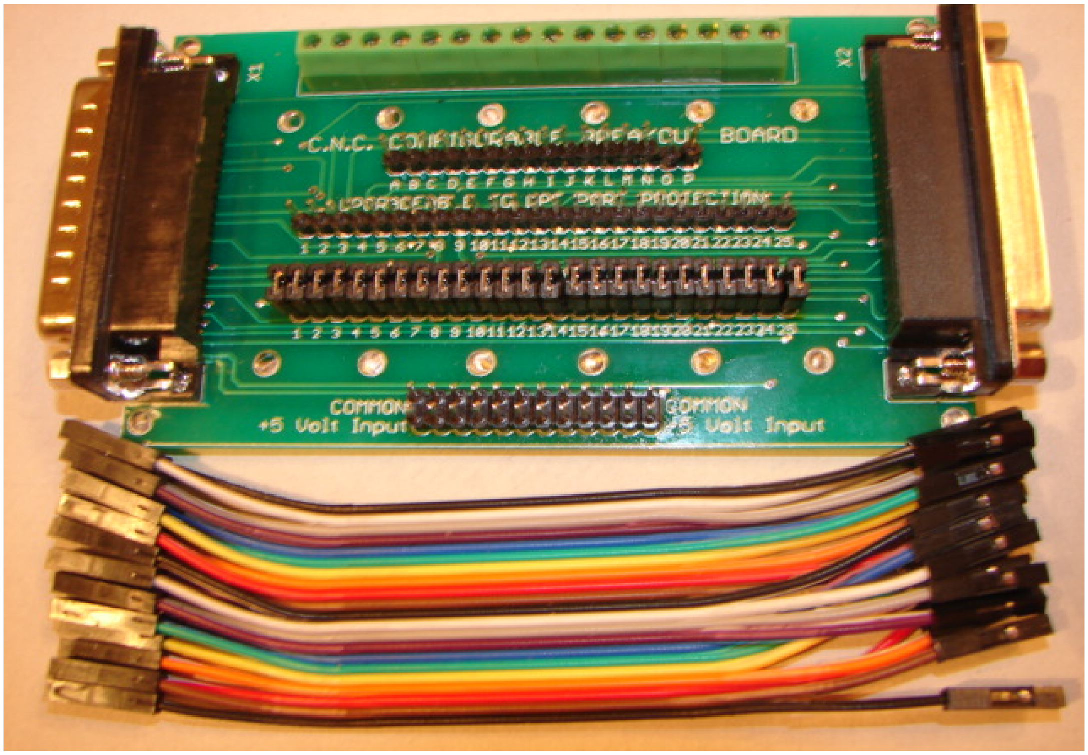
IT'S A SIGNAL TEST POINT.

IT'S A PRINTER PORT PROTECTOR.

IT'S A CONFIGURABLE BREAKOUT BOARD.

IT'S WHAT YOU NEED TO DISTRIBUTE AND HANDLE DB25 SIGNALS.

FIRST OF ALL, LET'S GET ACQUAINTED WITH THE LAYOUT OF THE BOARD



<--------3.

<---------4.

<---------5

<---------6.

1.---> **<---2.**

<---------7.

<---------8.

1. The left side db25 connector is a male db25, it is the input port from your computer.

2. The right side db25 connector is a female db25, it is the output side to your device unless you are using the breakout strip to output to your device. You can use both.

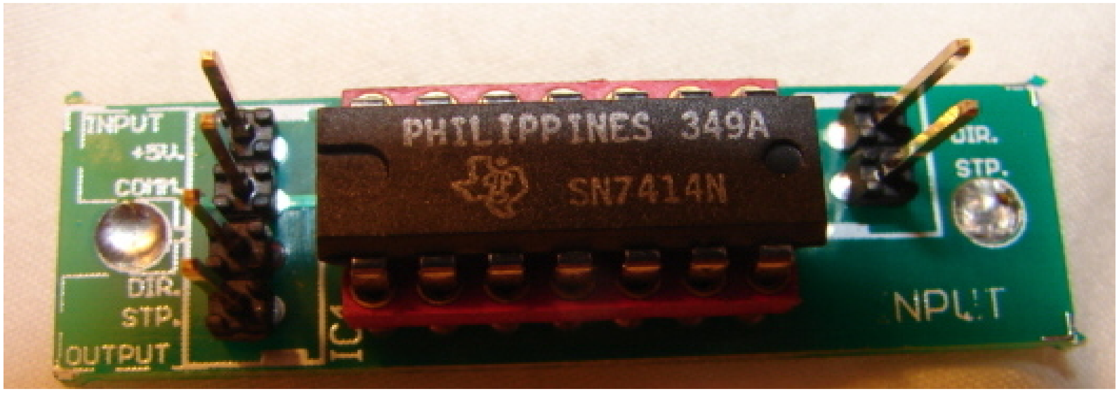
3. The green connectors along the top edge, are screw lugs for connecting input and output wires to the system. The lugs are labeled "A through P", and each lug is directly, **and only** connected to a corresponding "A through P" pin in the row of pins (item 4.) just below the screw lugs.

5. And 6. Row six is called the "jumper row". In the jumper row are 25 pairs of pins, the lower pin of each numbered pair is directly connected to it's corresponding male db25 pin in the left side, "input db25 connector". The upper pin of each numbered pair is directly connected to its corresponding female db25 pin on the right side of the board, "the output db25 connector". The small black jumper cap shorting the lower and upper pins of row six, cause a straight through "pin for pin" path for signals from the input connector to the output connector. Each pin in the **upper** row **only** of the "jumper row", is also directly connected to its corresponding numbered pin in the single row of 25 pins (item row **5.**) just above the "jumper row"

7. The pins of row seven are for distributing 5 volt power to the printer port protection chips (ppp) that can be mounted on this board and integrated with the signals to and from this board. There are 12 pairs of pins. The lower row of pins are all connected with each other as "the 5 v. buss", and are isolated from the upper row pins. The upper row of pins of item 7. are all connected with each other as the "ground buss". A 5 volt external power source and ground must be connected to these power distribution busses for ppp chips, this can be from your cnc power supply, or a wall plug 5v.power pack. (in my ebay CNC store) or from your computer power supply inside of your computer, there are connectors available that plug right in to one of the drive connectors.

8. These are the twenty jumpers that come with the board for making signals go where you want them to go. More are available if you need them through my ebay CNC store.

THE PRINTER PORT PROTECTOR CHIP (ppp).



This assembly is made to mount on the SIGNAL CONTROL CENTER BOARD to protect your computer's printer port from damaging voltages caused by spikes, accidents, burnups, missconnects. This assembly is also made to convert some of the weak signals that come from some printer ports (some computers only put out 3 volts, and it should be 5 volts), so that your driver board that receives the signals gets a strong enough signal to recognize it.

HOW THE ppp WORKS.

The chip is called a hex inverter. It is designed so that a waveform (signal) applied to an input pin is copied and inverted. The copy that is made does not use the same voltage that was from the original signal, but rather the copy is made with the chip's 5 volt power source through a series of diodes in the chip. If a 3 volt waveform is applied, the copy (inverted) will be a 5 volt copy with exactly the same shape only inverted in voltage. If the chip's output pin receives a damaging voltage spike that would damage your printer port, that spike is absolutly blocked from reaching the input side of the chip and subsequently your printer port. Now to double protect, each signal goes through a double hex inversion process, and comes out as a right side up full voltage copy of the original input signal. Each chip can protect two pins of your computer, for example one step, and one direction signal pin can be protected with one ppp chip. All 17 of the used pins in your printer port can be protected with the installation of 9 ppp chips on the SIGNAL CONTROL BOARD. NOTE: Some pins on a printer port are input pins, and some pins are output pins, so the direction of installation of the ppp chip must be considered when protecting input versus output pins. See the documentation on printer ports in this manual.

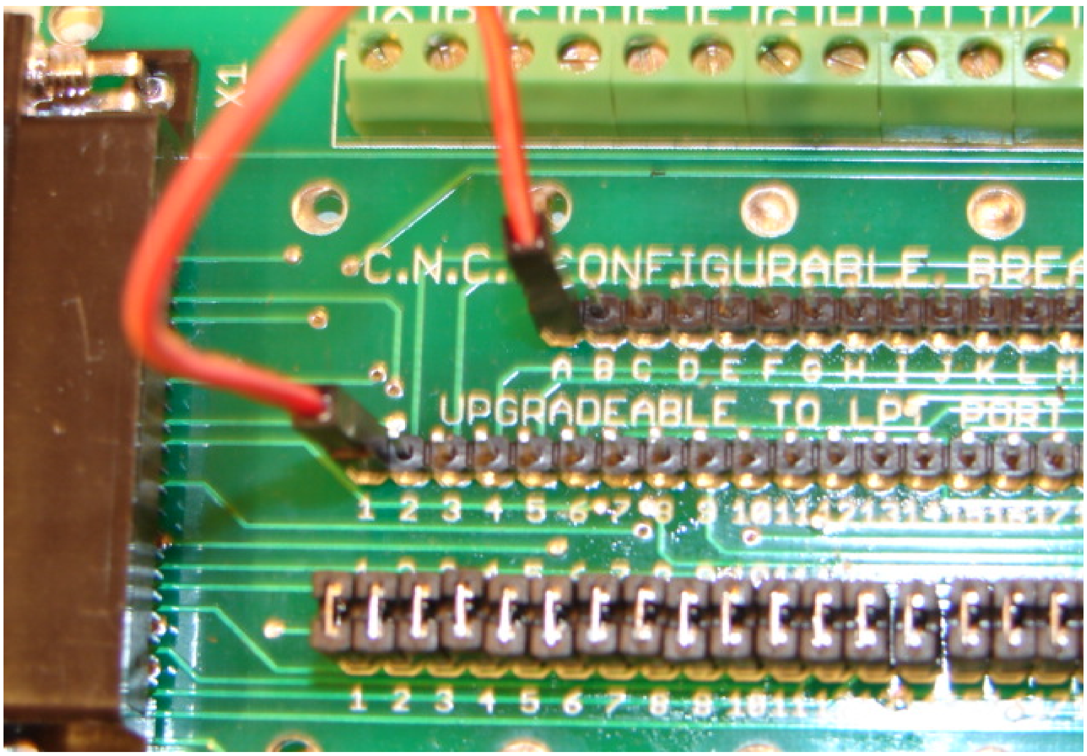
The ppp chips are mounted to the SIGNAL CONTROL BOARD by standoffs through the mounting holes in the board. There are six pairs of standoff holes on the SIGNAL CONTROL BOARD that can mount six ppp chips per layer, and two layers high can hold up to twelve ppp chips, although you should never need to use more than 9 ppp chips to protect all the necessary pins.

WE WILL COVER THE INSTALLATION AND OPERATION OF THE ppp CHIP AFTER WE SHOW YOU HOW TO USE THE SIGNAL CONTROL BOARD.

INSTRUCTIONS ON THE USE AND SET-UP OF THE "SIGNAL CONTROL BOARD"

A. SENDING SIGNALS TO AND FROM THE BREAKOUT SECTION OF THE BOARD.

The green screw lug connectors are what we call the breakout section of the SIGNAL CONTROL BOARD. The green screw lugs can be connected to incoming or outgoing signals on the board with one simple jumper wire connection for each signal. A pin in pin row 3 on the board is wire jumpered to a pin in pin row 4 on the board. The example below shows the pin 1 signal being sent to jumper lug "A" where it can be further sent by wire from the screw lug of "A" to your controller board or application, or lug "A" can be used as a test pin to measure the signal. The printer port sending



<-pin row 4.

<-pin row 5.

<-jumper row

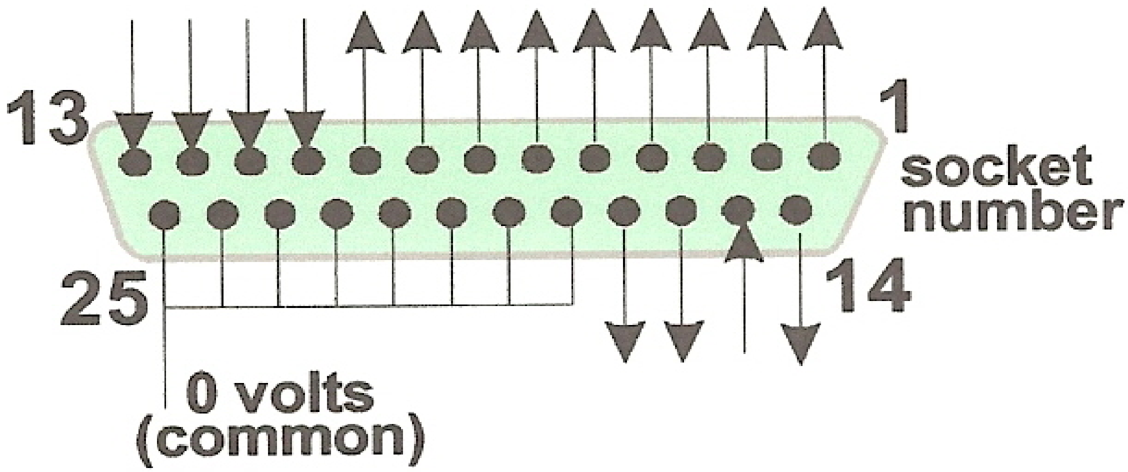
signals to the "Signal Contro Board" can also receive signals from the board on certain pins called input pins. Input pins can accept signals like limit and home position indicators, or an emergency stop signal. Input signals can tell your software that some event has happened, so that the software can take the required action. The pins that are designed to be input pins are: pins 10 through 13, and pin 15. Input voltages higher than 5 volts can damage the printer port, so be very careful, or use printer port protection to send signals to these pins. The point of the last few sentences is to tell you that you can jumper the input pins of your printer port to the screw lugs, to accept home and limit, and emergency stop signals, in the same manner as shown in the pin 1 to lug "A" example above. If you connect a jumper wire from any pin 10 to 13, and pin 15 in **row 5.** to a terminal pin in row **4.,** your printer port will be ready to accept input signals into that screw lug.

THIS CONCLUDES DISCUSSION ON JUMPERING TO THE BREAKOUT SECTION.
EVEN THOUGH THE DISCUSSION WAS LONG, IT IS QUITE SIMPLE, ONE WIRE FROM THE PIN TERMINAL IN ROW 5. TO THE LUG TERMINAL IN ROW 4.

THE NEXT PAGE IS INFORMATION ON PRINTER PORTS FOR REFERENCE

B. THE PRINTER PORT LPT1.

THIS VIEW IS LOOKING IN ON A FEMALE DB25 PRINT PORT.



Arrows pointing **away** from the pins indicate that that pin is an output pin. Pins 1 to 9, 14, 16, 17, and 18. Typically pins 2-9 are used for step and direction signals to a four axis machine. A three axis machine gives you two spares.

Output pins send signals to your driver board.

Typical signals would be; step signals, direction signals; relay turn on signals. The signals from these pins are 5v. Max.

Arrows pointing **into** a pin indicate that that pin is an input pin, pins 10, 11, 12, 13, and 15.

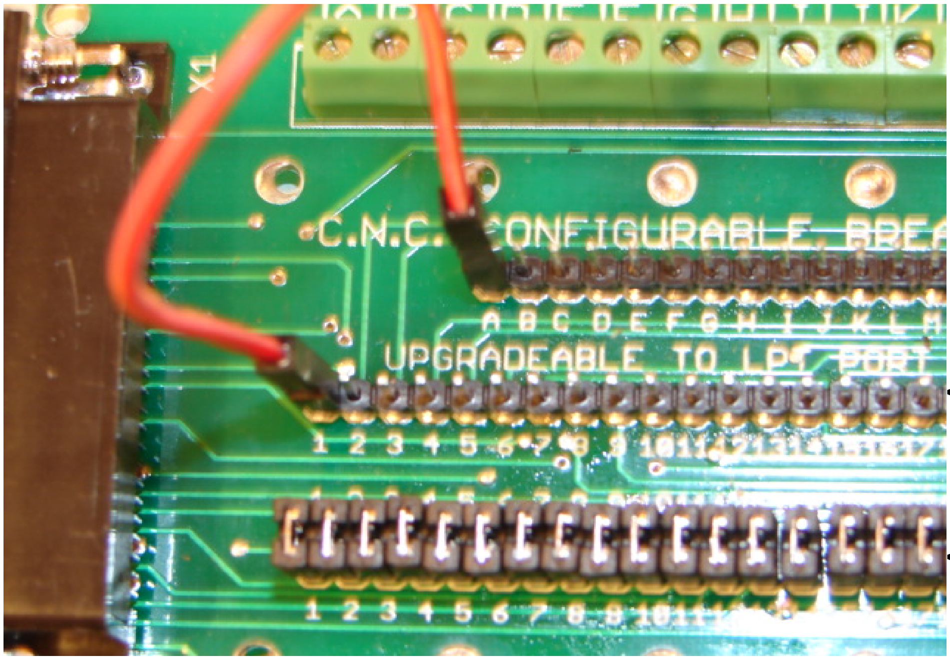
Input pins are used to receive signals to your software of some event such as; a tripped limit switch, a tripped home switch, or an E-stop signal, So your software can react with the proper action.

Pins 18 to 25 are signal ground (0 volts)

CONFIGURING YOUR SIGNAL CONTROL BOARD CAN TAKE A LITTLE TIME, BUT DON'T GET DISCOURAGED, BECAUSE YOU USUALLY ONLY HAVE TO DO IT ONCE, AND IT IS WORTH THE EFFORT IN THE LONG RUN.

C. DIVERTING SIGNALS FROM ANY PIN TO ANY PIN.

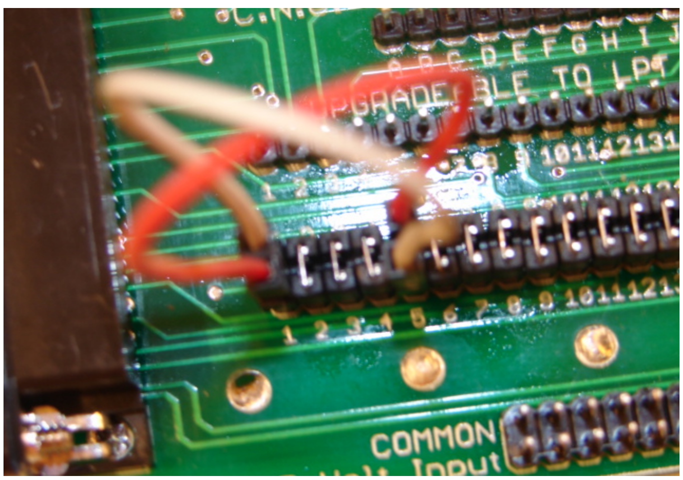
We will now discuss changes to the jumper row of pins on the SIGNAL CONTROL BOARD



<-ROW 5 PINS

<---JUMPER ROW

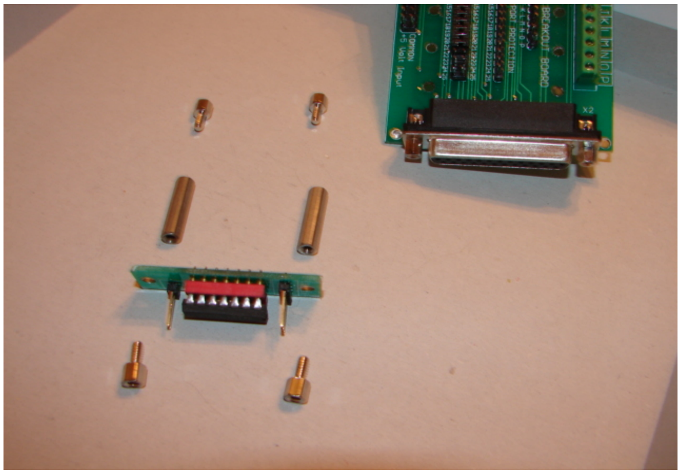
With the small black jumper cap in place, we have pin for pin signals sent from the input db25 to the output db25. If you need to re-configure the input pin to output pin configuration, some jumpers will have to be removed and replaced with jumper wires. Example--If you need to divert the pin one signal coming from the printer port to be sent to pin 5 on the female db25 connector, then you will need to remove the jumper cap from the pin 1 set of the jumper row and you will need to remove the jumper from pin the pin 5 set of the jumper row. Since the lower row of pins comes from the male input db25 on the left, the jumper wire is placed on the lower pin of the jumper row pin one pair. To send that pin one signal to pin 5 output, the other end of the jumper wire is connected to the upper pin of the pin 5 jumper row set (the red jumper wire shown in the picture). If you don't need pin 5, that's all you need to do. If you do need the pin 5, signal from the printer port then you can can re-connect it to the pin 1 output db25 female connector by a jumper like the white wire jumper shown in the picture to the left.

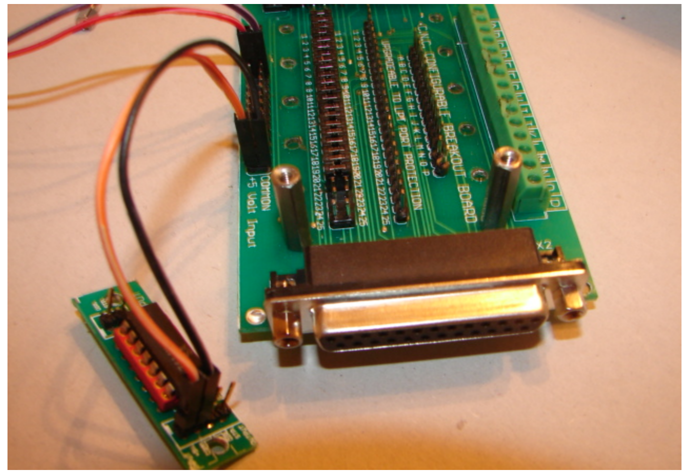


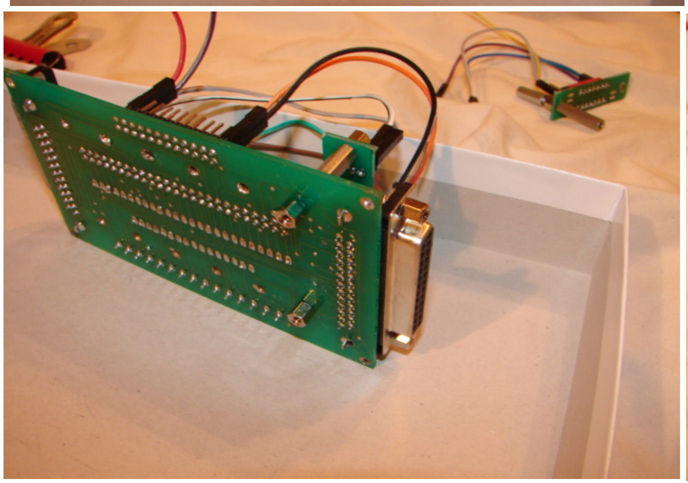
That is the basic concept of diverting signals. The concept is simple, but keep in mind that the **Row 5. Pins** now change their numbers. In this example, the row **5.** Pin 1 is now row **5** pin 5, and the row **5.** Pin 5 is now pin 1 in row **5.** I used pin 5 on purpose to get you to think about the difference between row 5 and pin 5, so once you understand It you will be clear on jumpering. Please re-read this paragraph until you understand why the pin assignments in row 5 change with jumpering, because it has consequences on the Breakout jumpering. If you divert pin-in to pin 5-out then you need to move the breakout jumper for pin 1 to keep the same breakout lug, if you're using it.

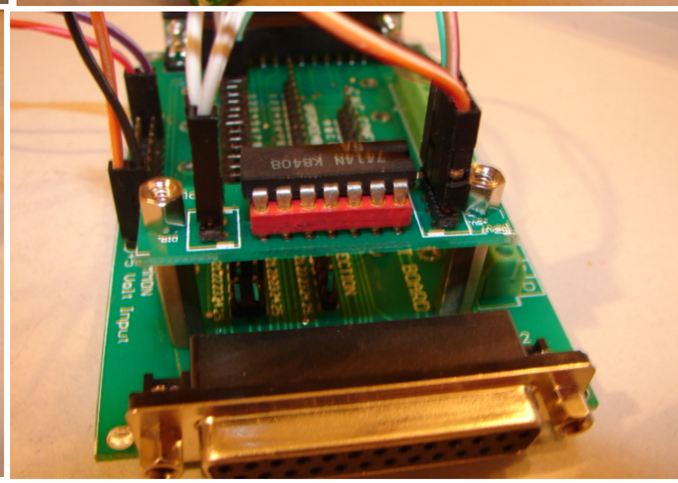
D. SETTING UP ppp CHIPS

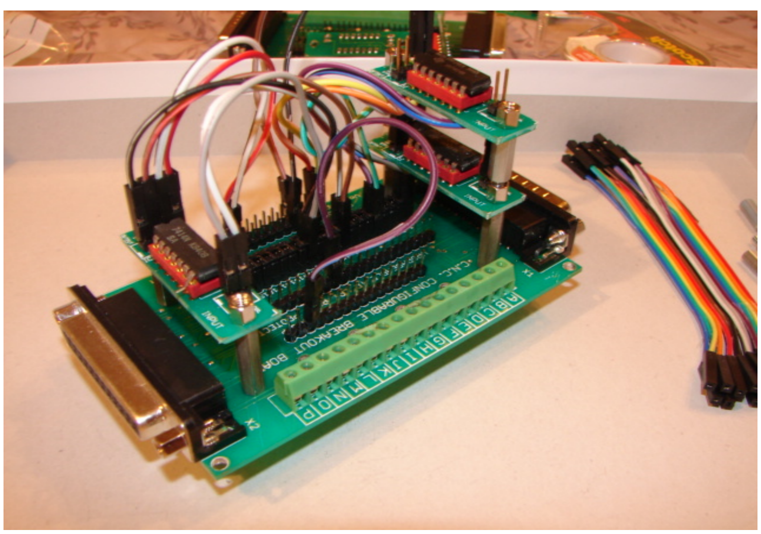
Mounting the chips. Standoffs through the holes mount the chips. Short standoffs up through the bottom, into the tall standoffs, and small standoffs down through the top of the ppp chip board to fasten the ppp to the standoffs.









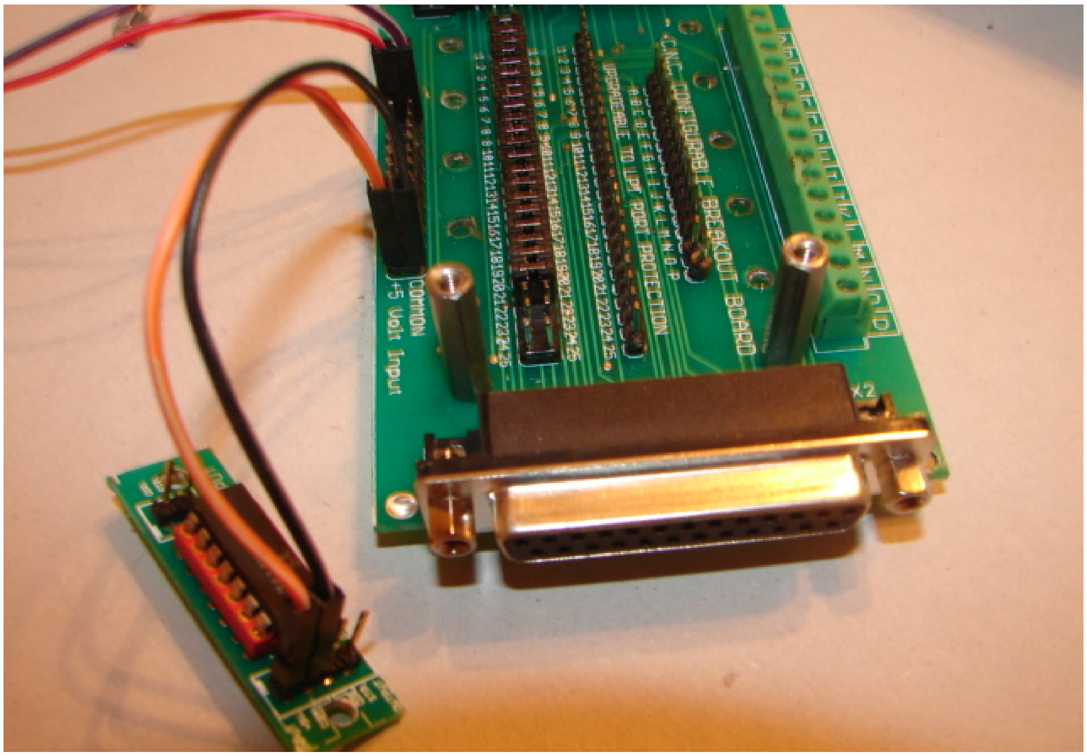


<---Double stacked

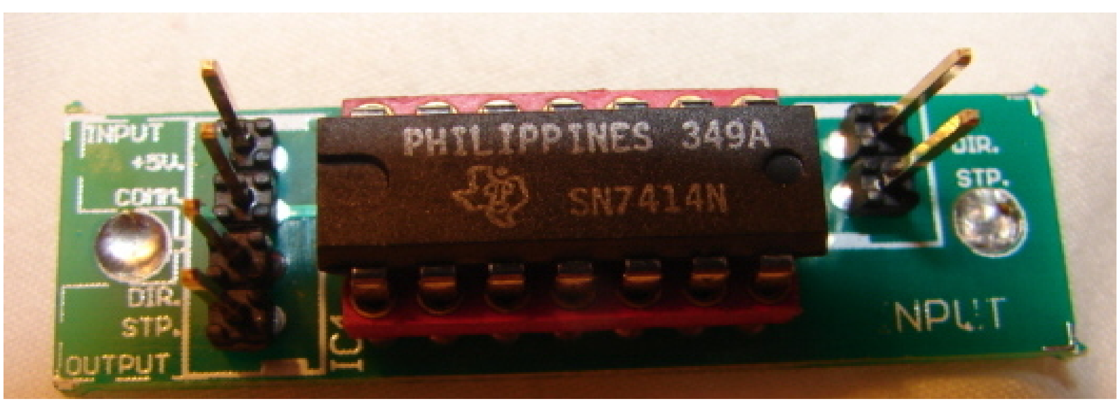
3/4" standoffs screwed into the first floor short standoffs for the second floor of ppp chips as shown.

Wiring the ppp chips

First the 5v. Buss is powered up with a stable 5 volt power source and ground, as shown by the red and black wires in the background on the left side. (ignore the shadows)



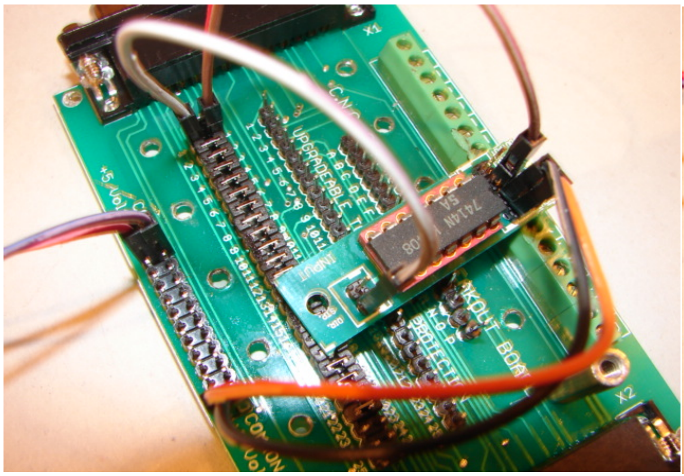
Second the power to the chip is plugged in in from the buss, shown here in the foreground with the orange and black wires in the above picture.

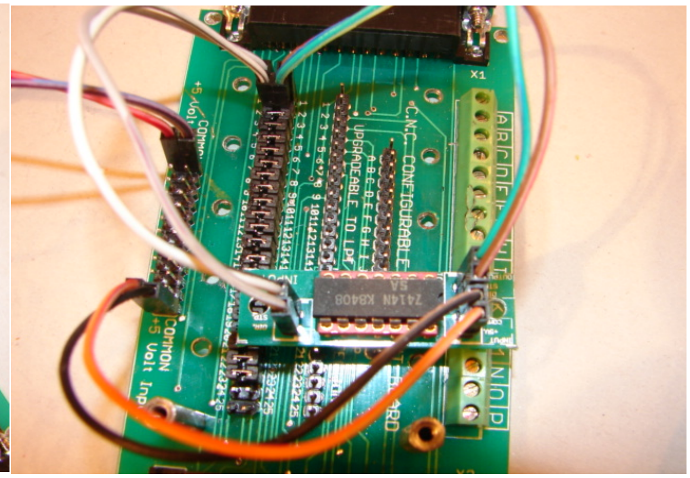


The power input an ground are shown in the above picture on the upper left two pins.
The two signal input pins labeled DIR. And STP. Are on the right. The two signal output pins are shown on the lower left corner of the above picture.

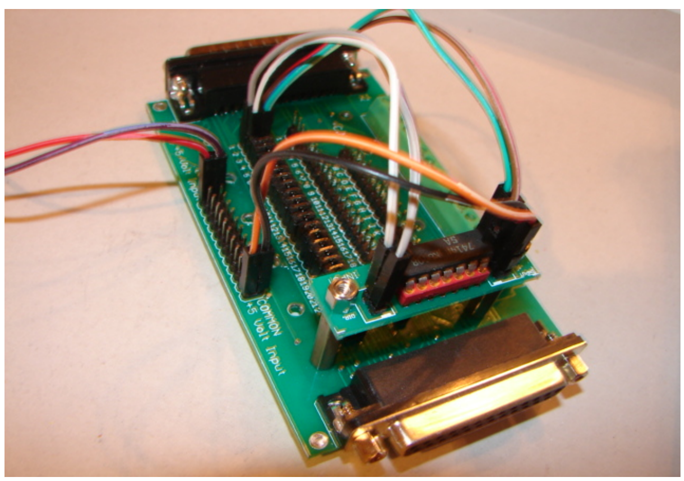
CONNECTING SIGNAL WIRES TO THE ppp CHIP FOR PROTECTING LPT. OUTPUT PINS

After the power is connected, the next step is to connect the signal jumpers from the SIGNAL CONTROL BOARD to the ppp chip. We are going to protect pin 1 of the printer port. First remove the small black jumper cap from the pin 1 set. The picture below shows the input pin of the ppp chip jumpered to the pin 1 "jumper row" input pin from the male db25. The picture shows the output pin of the ppp DIR. Pin connected to the pin 1 output signal on the "jumper row" db25 female output side. This chip is now in place and powered to protect your printer port pin 1 from damaging voltages. Since the chip is capable of protecting two pins, we are going to remove the jumper cap from pin 2, and connect it for protection also. The jumpering for pin 2 is shown in the second picture on the right.



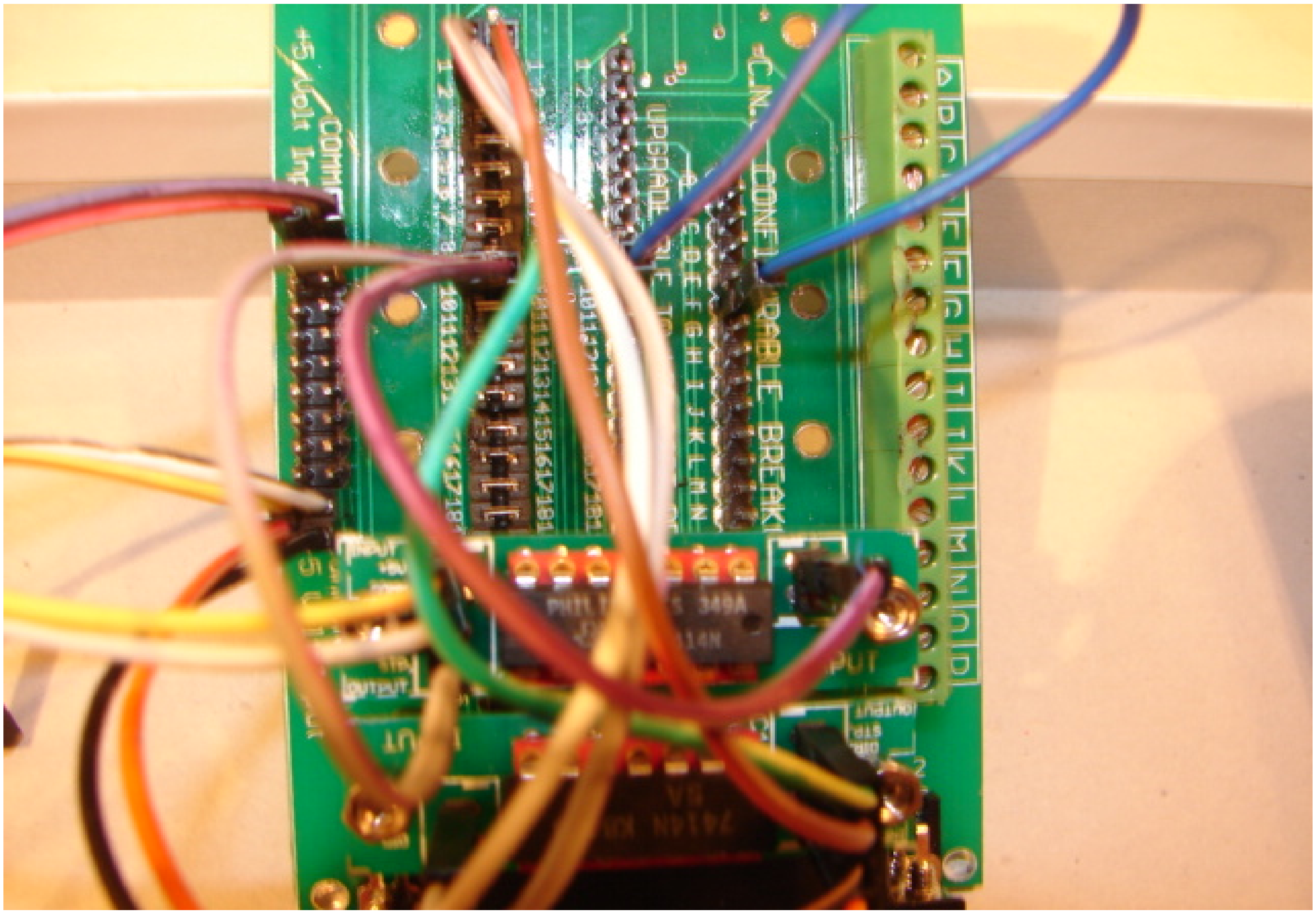


The next step is to mount the ppp chip to the standoffs, only if you are not connecting wires to any of the pins below where you are mounting the chip.



CONNECTING SIGNAL WIRES TO THE ppp CHIP FOR PROTECTING LPT. INPUT PINS.

On input pins of your lpt. The signals go the opposite direction from output pins, they come from your CNC machine (limit, home, and emergency stop) into the print port, therefore the chip direction wire jumpers are reversed from the way output pins are connected. Pins 10 to 13, and pin 15 are input pins. The following shows pin 10 being protected with a ppp chip.



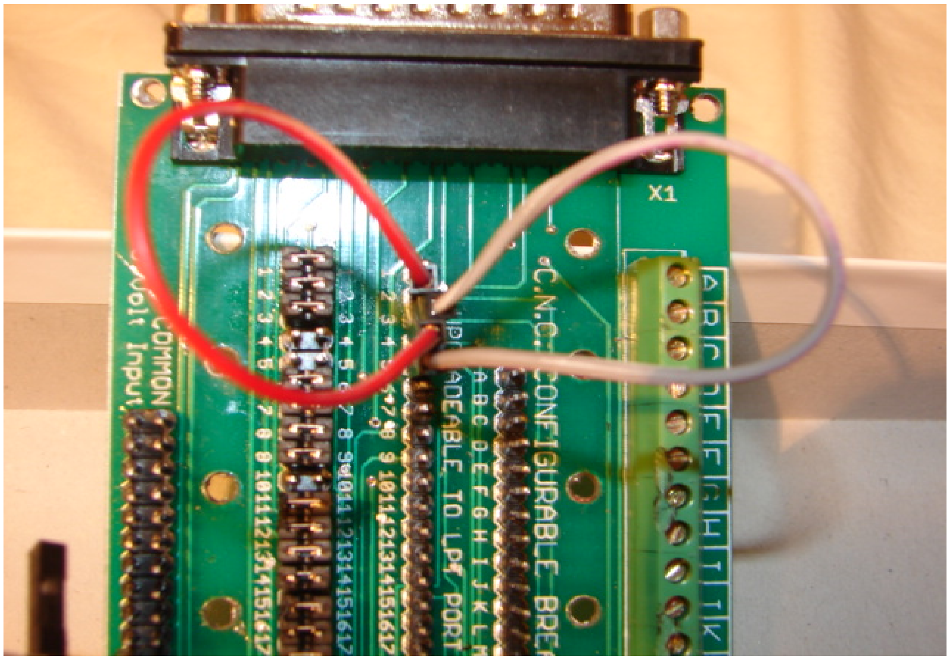
The second chip is mounted to the standoffs, and powered from the power buss by the yellow and white wires on the left side of the chips. Down on the "jumper row" the jumper cap on the pin 10 pair is removed, and the right side pin (output side to the female db25) is connected to the ppp chip DIR. input pin, with the red wire, (the opposite wiring of protecting output pins on the lpt.). The ppp chip DIR. output pin is now connected to the left side "jumper row" pin 10 going back to the printer port through the male db25. This is shown as an orange wire on the left side of the ppp chip (fuzzy)This wiring protects pin 10 of your printer port from damaging voltages.

We also decide that we want to send our home limit signal back to the printer port via the breakout lug "F", so the lug "F" connector pin is jumpered to the pin 10 row 4 input pin. This jumper is the blue wire with pink stripe shown in the above picture.

The ppp chip can protect a second printer pin, so while you are connecting, protect another pin.

RUNNING TWO STEPPER MOTORS IN PARALLEL IN UNISON

Many CNC systems require the running of two axes in UNISON. Parallel running in unison can be achieved in three ways: First and most standard is to have software that will run two separate stepper motor driver boards driven by two separate sets of identical axes step and direction signals. Second, if your stepper motor driver board has a high enough amp rating on a single axis, you can run both motors connected to the same driver board, and get identical running with one set of step and direction signals to the board. Third, you run each motor on its own driver board with one set of step and direction signals split, and fed two each driver board to give unison running. The SIGNAL CONTROL BOARD can connect to all three methods, the first method being the most desireable. The jumpering for the third method is shown in the picture below. In this example, the step and direction signals to the two stepper motor drivers X1 and X2 are **unchangeably** hardware wired internally in your driver board in the following manner: the X1 step signal is connected to pin 2; the X1 direction signal is connected to pin 3; the X2 step signal is connected to pin 4; and the X2 direction signal is hard wired to pin 5. Our desire is to have X1 and X2 run identically in unison. Our goal is to have the step signals of pin 2, feed both pin 2 and pin 4, and to have the direction signal of pin 3, feed both pin 3 and pin 5. This split signal scenario is easily accomplished with the SIGNAL CONTROL BOARD. Remove the jumper caps from pins 4 and 5 in the "jumper row", and install a jumper wire from pin 2 in row 5 to pin 4 in row 5, and another jumper wire from pin 3 in row 5 to pin 5 in row 5. That is the complete jumper wire scenario, now output pins 2 and 4 get the same step signal, and output pins 3 and 5 get the same direction signal. The jumper caps are removed from 4 and 5 to prevent the computer from sending any mixed signals to pins 4 and 5, or to prevent any feedback to the printer port from pin 2 back into pin 4, and likewise from pin 3 back into printer port pin 5.



SENDING A SIGNAL TO THE BREAKOUT WITHOUT PASSING IT THROUGH TO THE FEMALE DB25 OUTPUT PORT.

There may be times when you want a signal to come in from the computer printer port and go to the breakout, but NOT pass through to the female db25 output port, or visa versa send a signal in through the BREAKOUT to the printer port, but not to the db25 output. The picture below shows the signal on pin 8 being sent to breakout, but not passing through to the female db25. The pin 8 jumper row cap is removed, and a jumper from the lower "input" pin 8 is connected to the breakout terminal pin in row **4** that you want the signal to go to, in this example we have connected the pin 8 input signal from the input jumper row to the terminal "A" breakout pin A. In this example the output pin 8 in the jumper row, and the output pin of line 8 in row **5,** are totally isolated from the pin 8 input section.