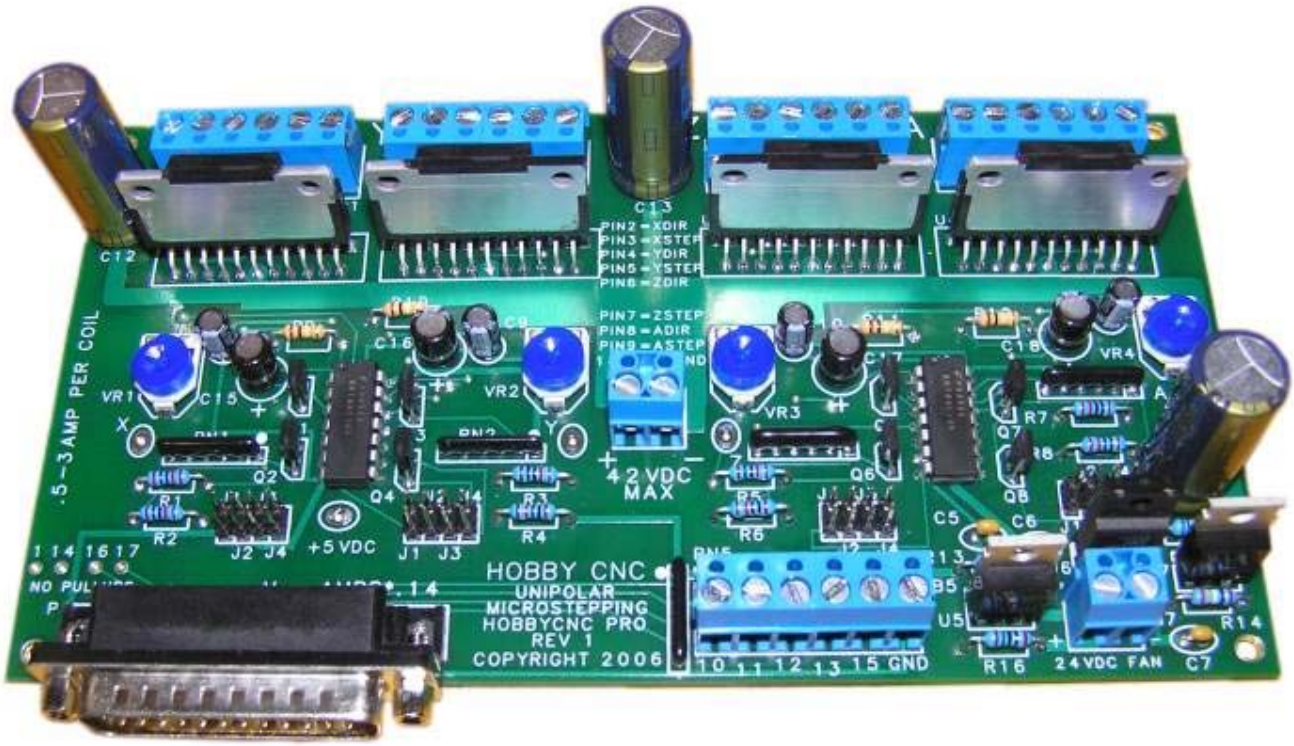
HobbyCNC
PRO Chopper Driver Board



The HobbyCNC PRO Chopper Driver board is one of the more popular stepper controller boards for the hobby CNC market. Good for use on routers, lathes, mills, PCB drillers, engravers — the possibilities are endless.

I recently had the opportunity to build up one of the boards from the kit they offer for a friend who lacked the skills to solder up the system. Assembly was straight forward and a novice builder should be able to complete the board assembly in less than 90 minutes.

The instructions which come with the unit are very simplistic, but they do give you the basic information to complete the assembly of a board. It is important to follow the instructions carefully as there are a couple of parts and positions on the board which can easily be confused if you do not watch what you are doing.

As you follow through the guide, you will be instructed to insert the necessary components in to the board. After inserting them, you can confirm the positions by matching up our pictorial display and also as a final confirmation the instructions received with your kit. In each step, once you are sure you have positioned the components to the their correct locations, you can proceed to solder the components into place.

Presented on the following pages are the step-by-step process we took to build up the board — and yes, it worked perfectly the first time we powered it up on a three-axis system.

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The 4-axis kit arrives in a relatively small package, with the static sensitive components safely tucked away in an anti-static pouch.

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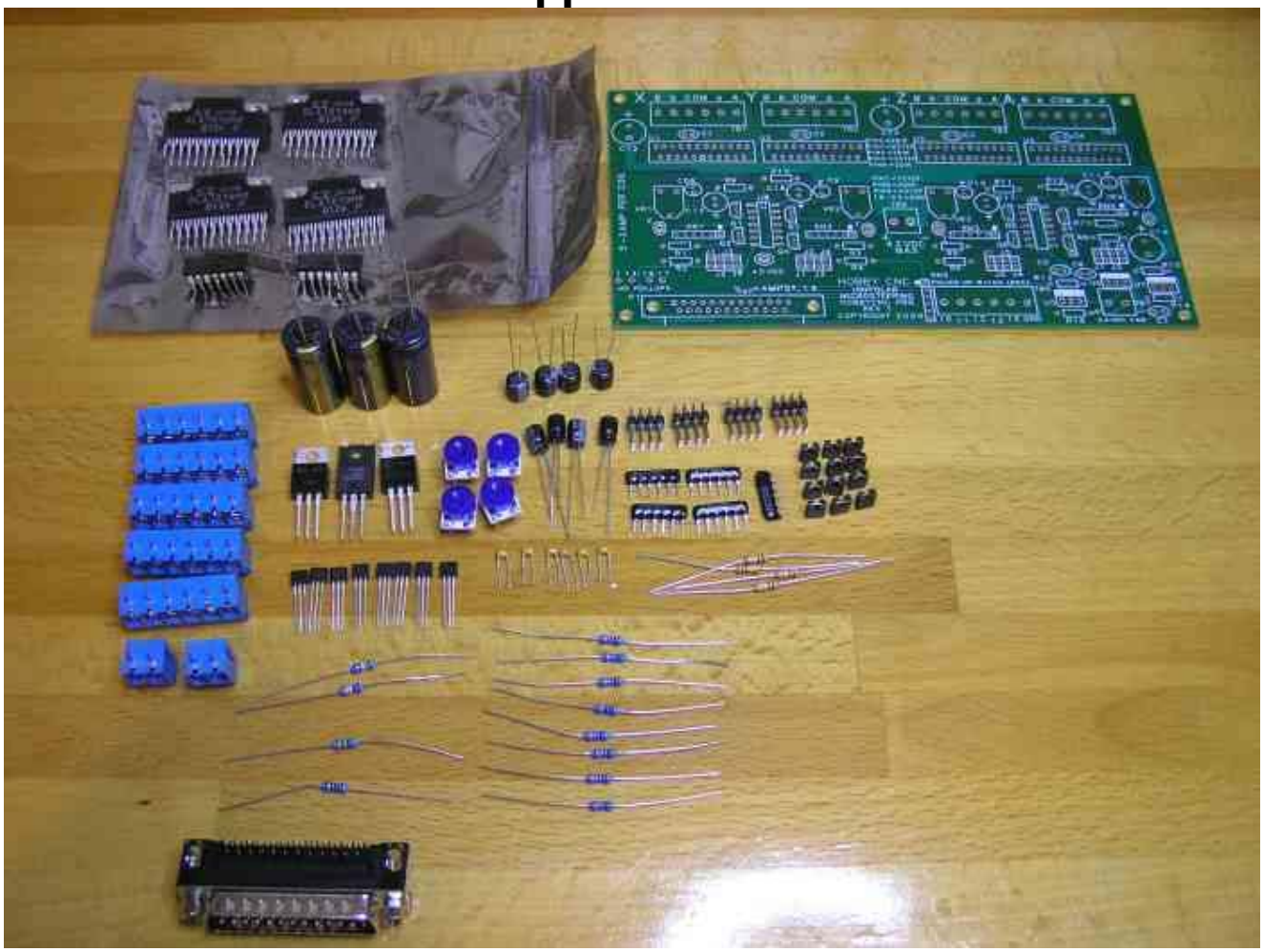
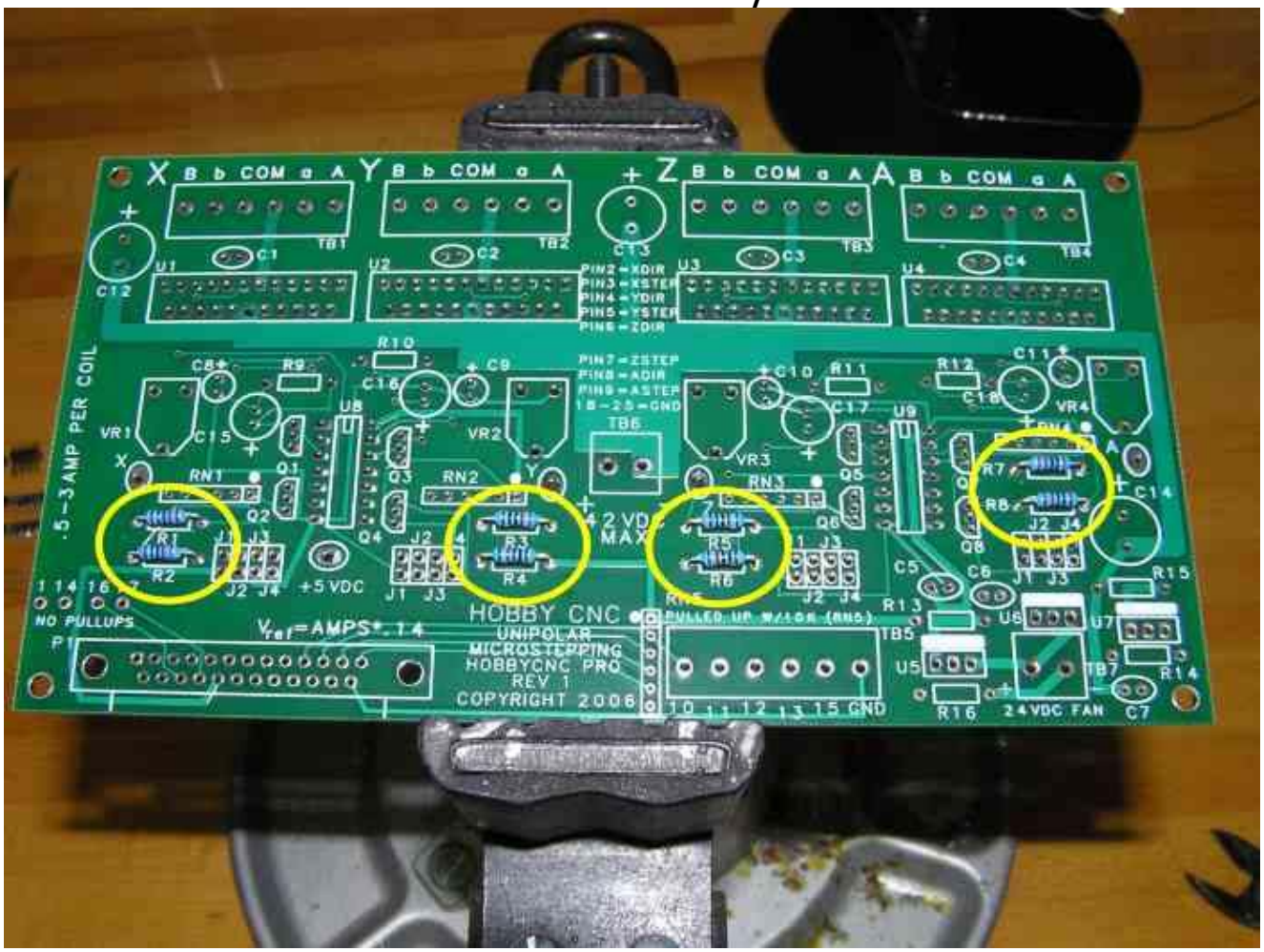


Your first job is to carefully remove all the parts from the package and sort them out. In our kit, we were missing a single .1uF capacitor. Good thing we have a well-stocked parts kit.

HobbyCNC PRO Chopper Driver Board

Construction Step 1



This is where we begin, and you should follow the guide included with the board. The first step is for the installation of eight 10K ohm (Brown-Black-Black-Red-Brown) resistors at location R1, R2, R3, R4, R5, R6, R7 and R8.

Throughout the assembly guide, we will highlight the components with a large circular yellow indicators.

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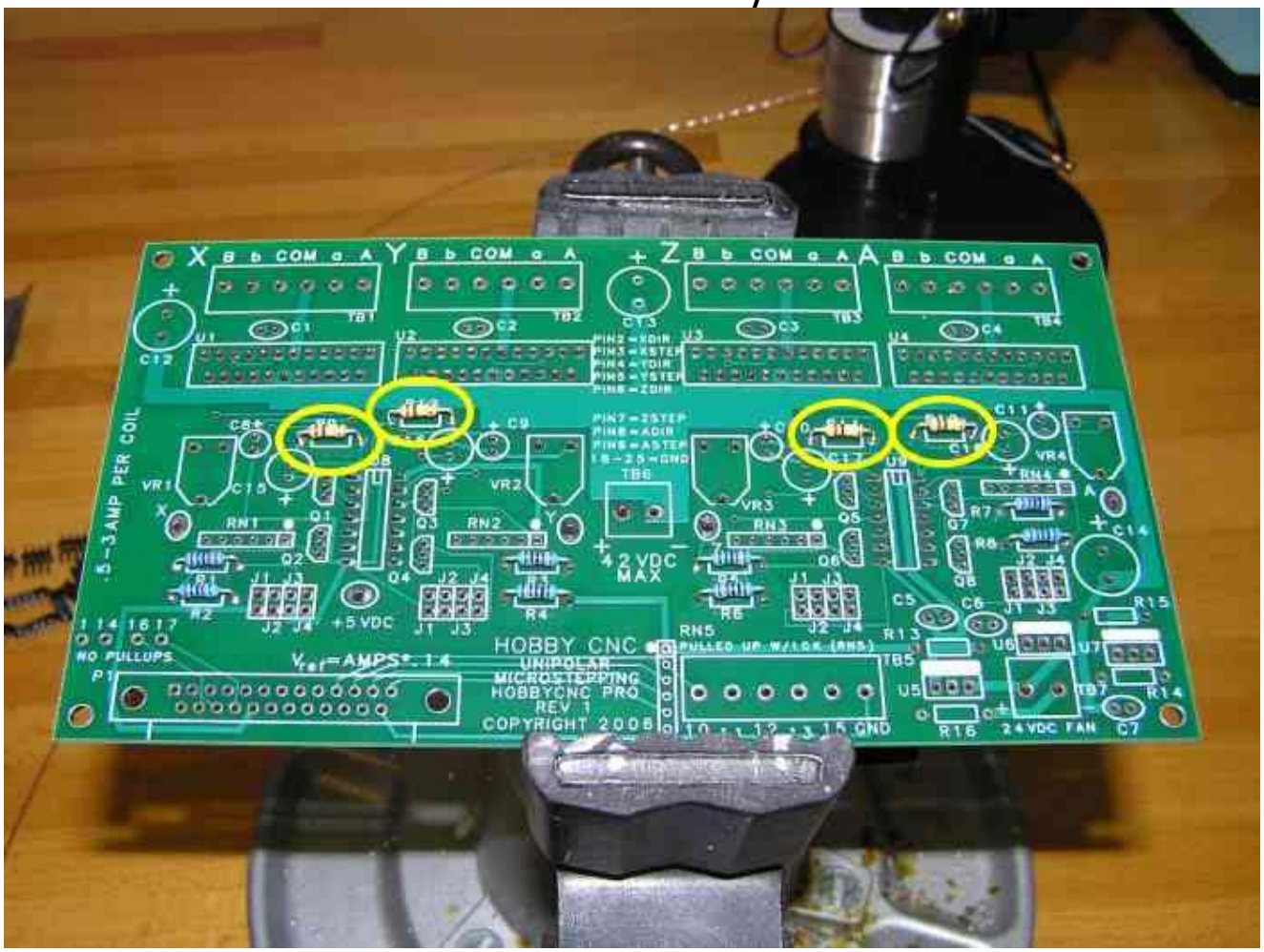
Construction Step 2



Now we move on to the installation of four 100K ohm (Brown-Black-Yellow-Gold) resistors at locations R9, R10, R11 and R12.

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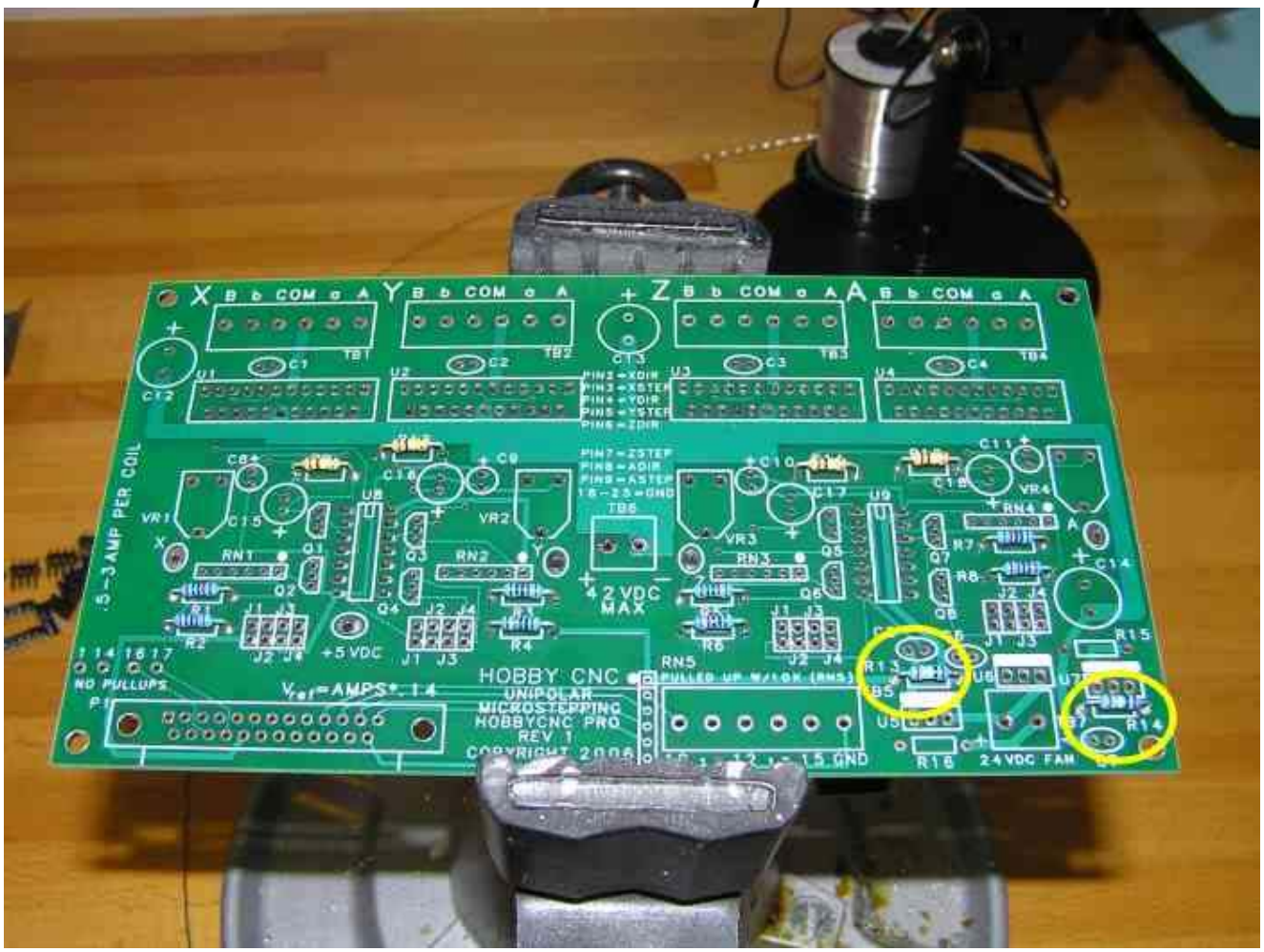
Construction Step 3



Now install two 249 ohm (Red-Yellow-White-Black-Brown) resistors at positions R13 and R14.

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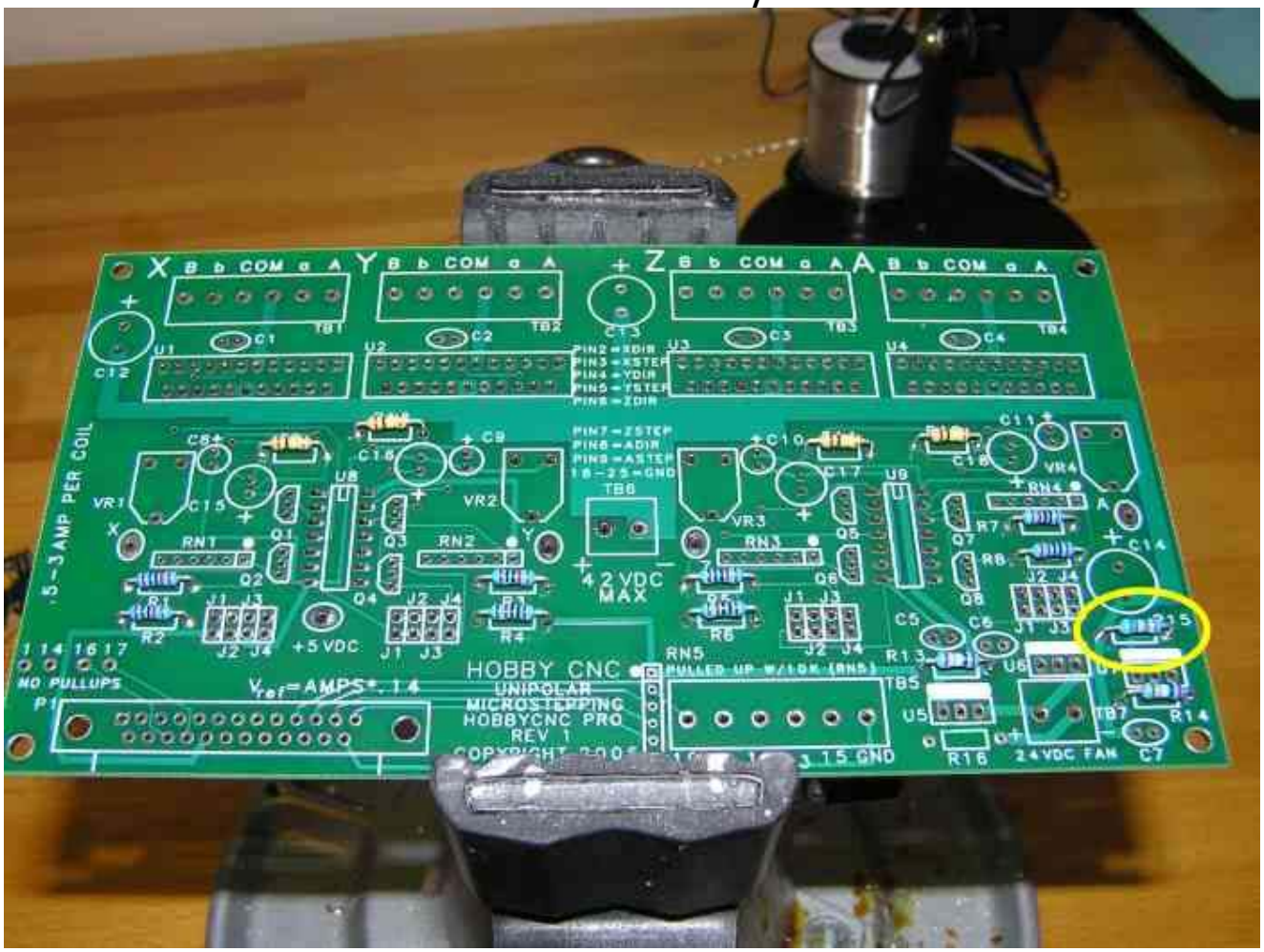
Construction Step 4



Now install one 6.04K ohm (Blue-Black-Yellow-Brown-Brown) resistor at position R15.

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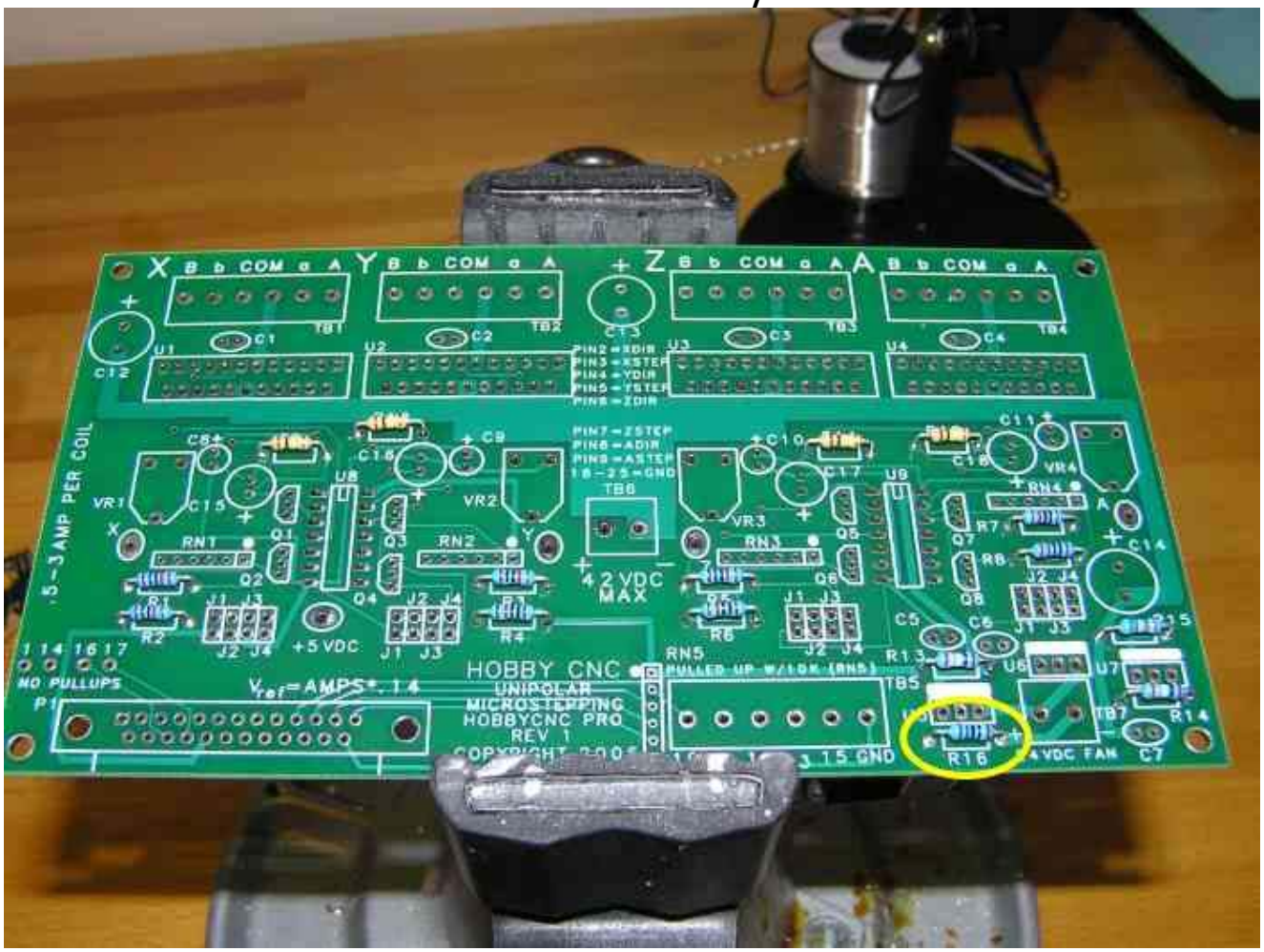
Construction Step 5



Now install one 750 ohm (Violet-Green-Black-Black-Brown) resistor at position R16.

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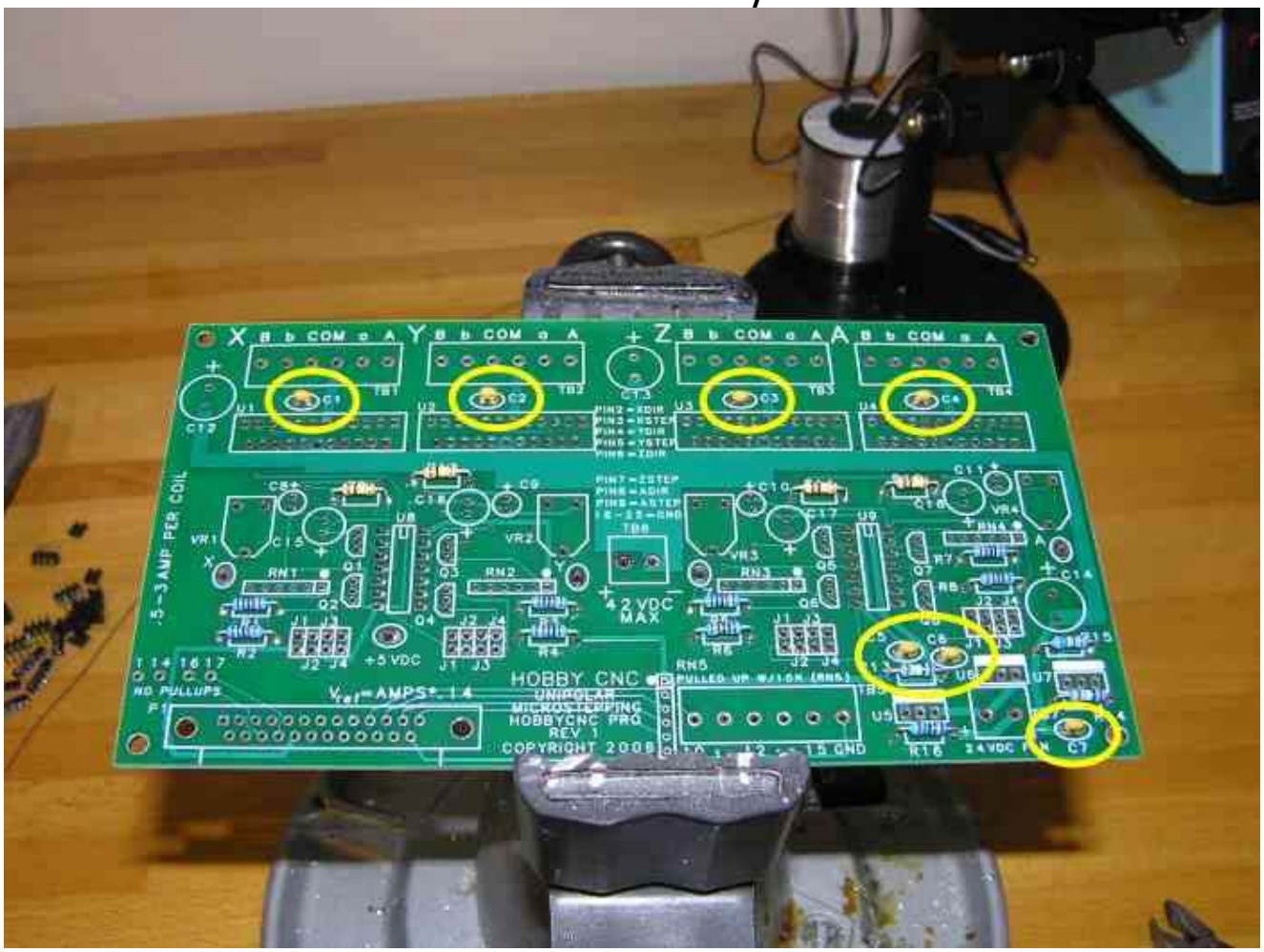
Construction Step 6



Now we move on to the installation of seven .1uF capacitors at locations C1, C2, C3, C4, C5, C6 and C7. Like resistors, these capacitors have no polarity or orientation – they too can be installed in any direction.

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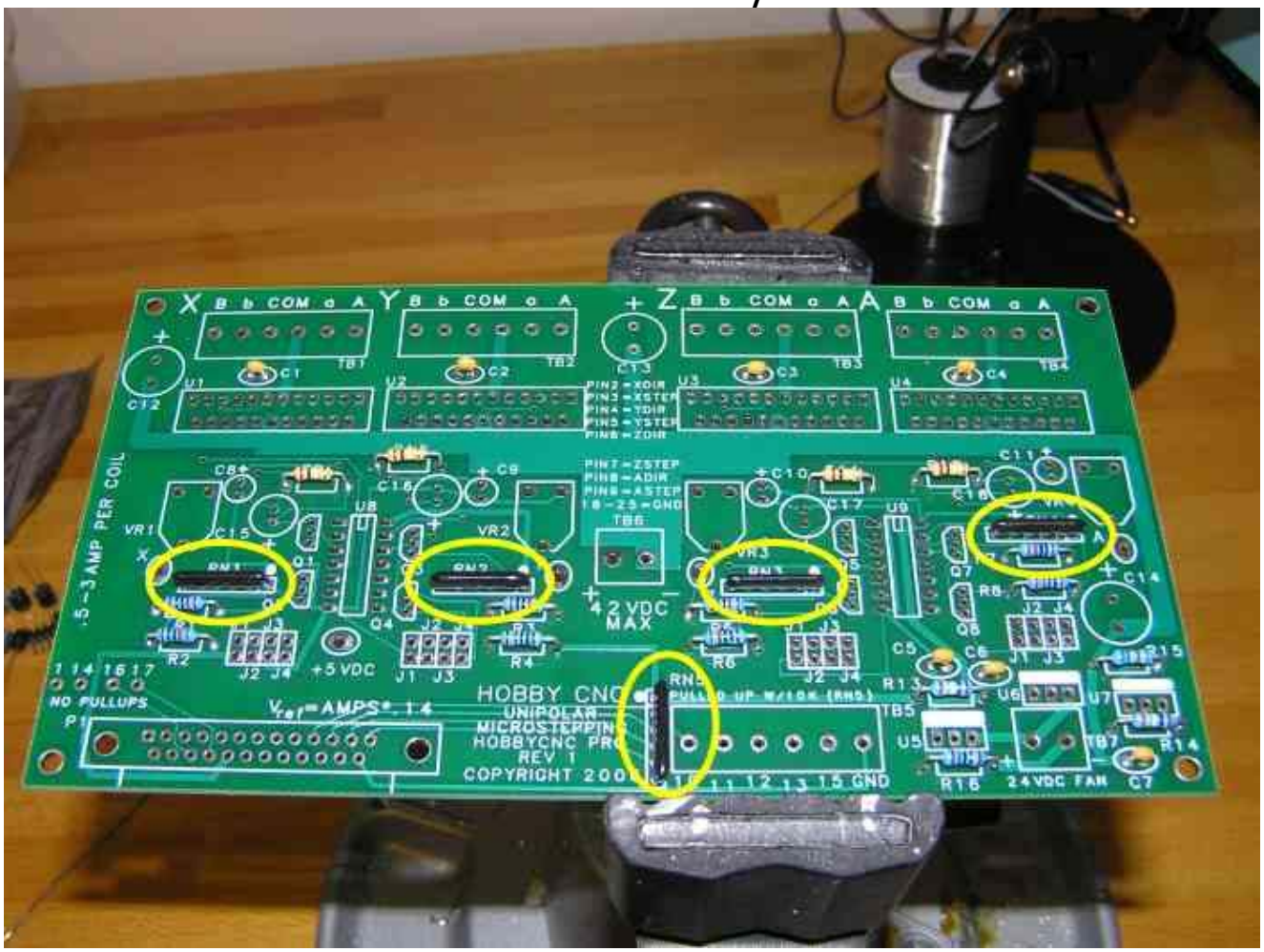
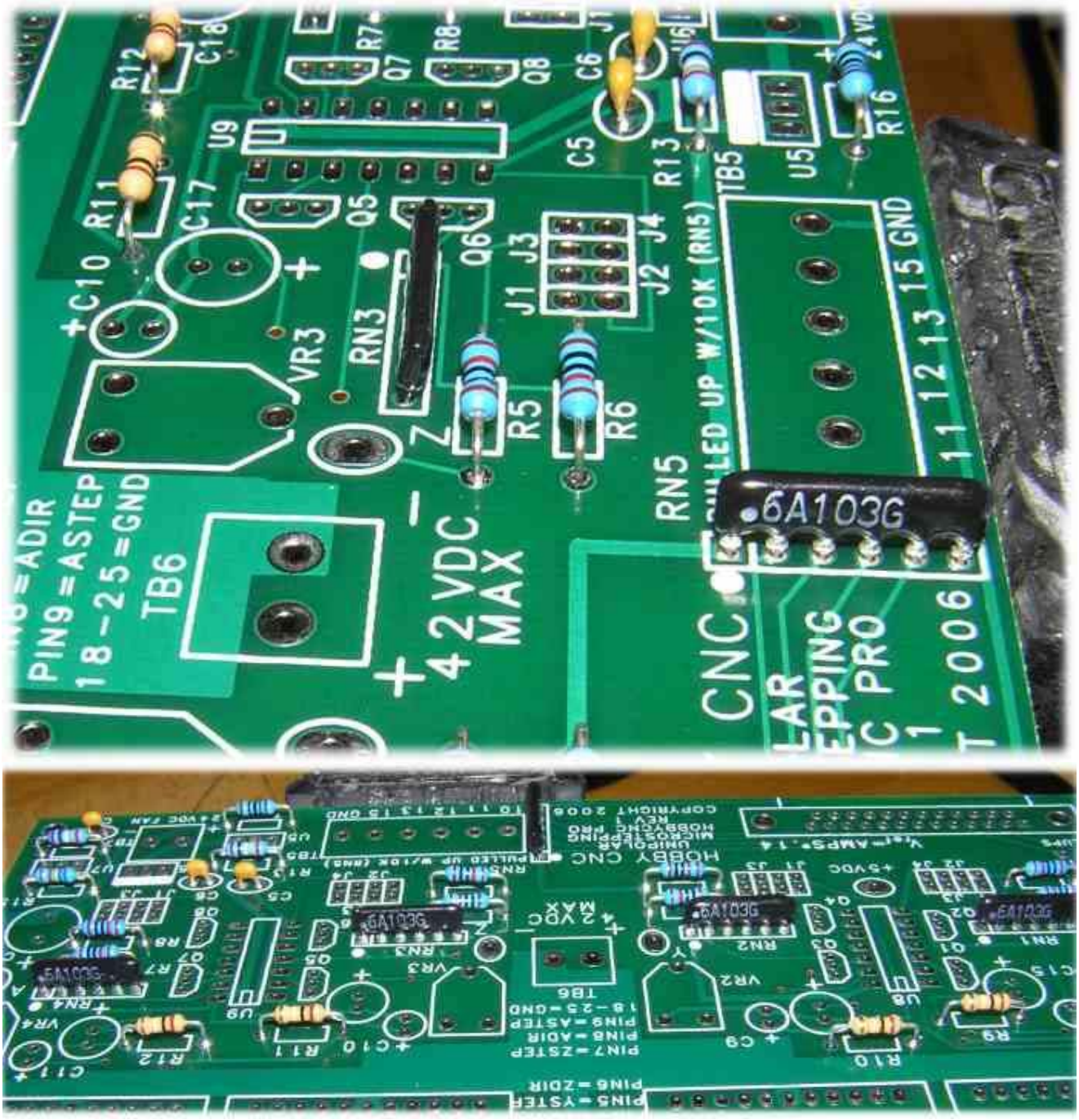
Construction Step 7



The next step involves the installation of five 10K ohm Resistor Networks at positions RN1, RN2, RN3, RN4 and RN5. Resistor Networks **must** be installed in the correction direction. You should match up the dot on the resistor network with the corresponding dot on the PC board.



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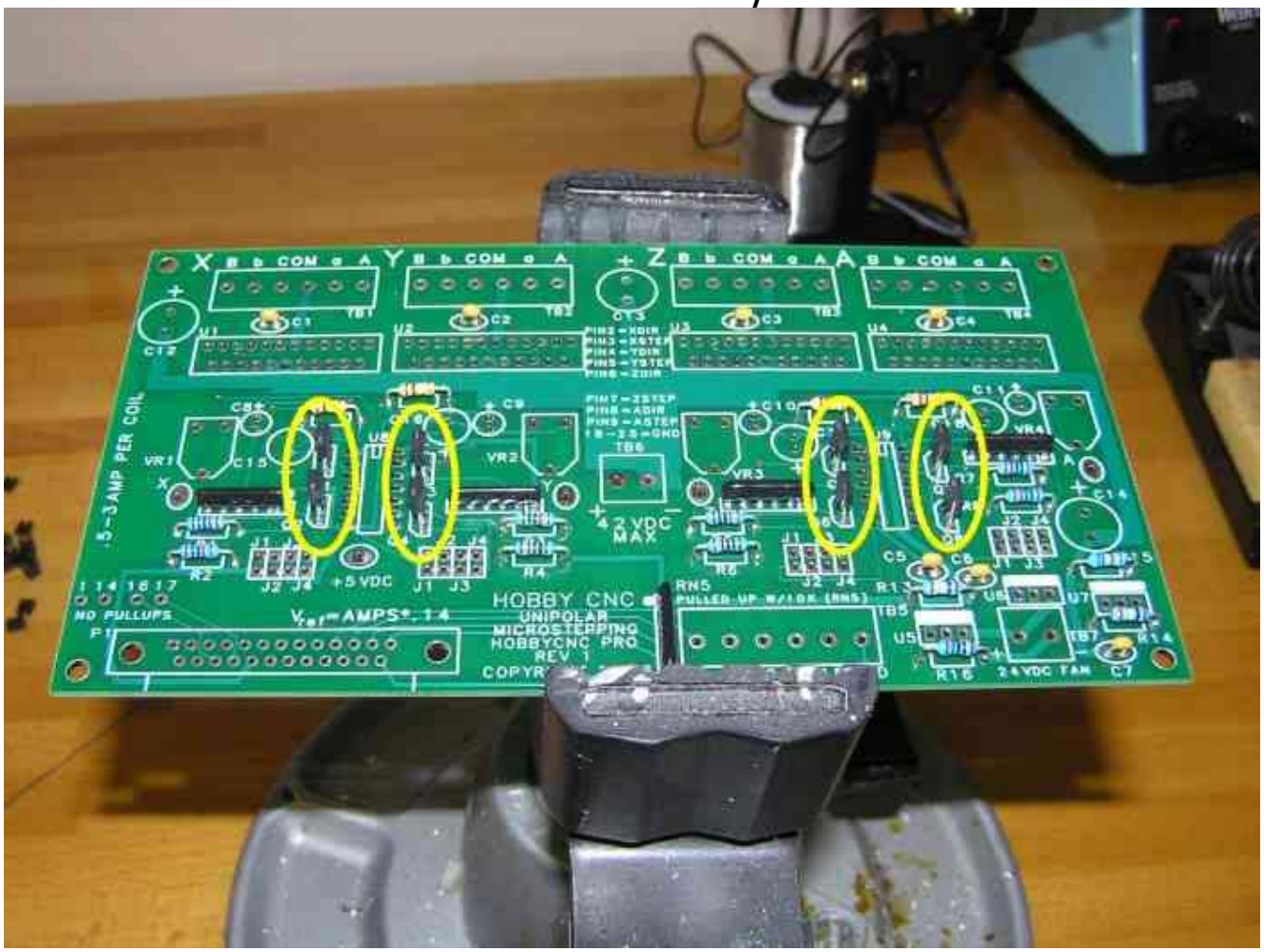
Construction Step 8



Now it is time to install the Mosfets. Eight of these three-legged devices are installed at positions Q1, Q2, Q3, Q4, Q5, Q6, Q7 and Q8. Care again must be observed when installing these as their orientation must be correct. You will notice that one side of the Mosfet has a round edge, this round edge must match the rounding of silk screen on the PC board. Double and triple check to ensure these are all orientated correctly.

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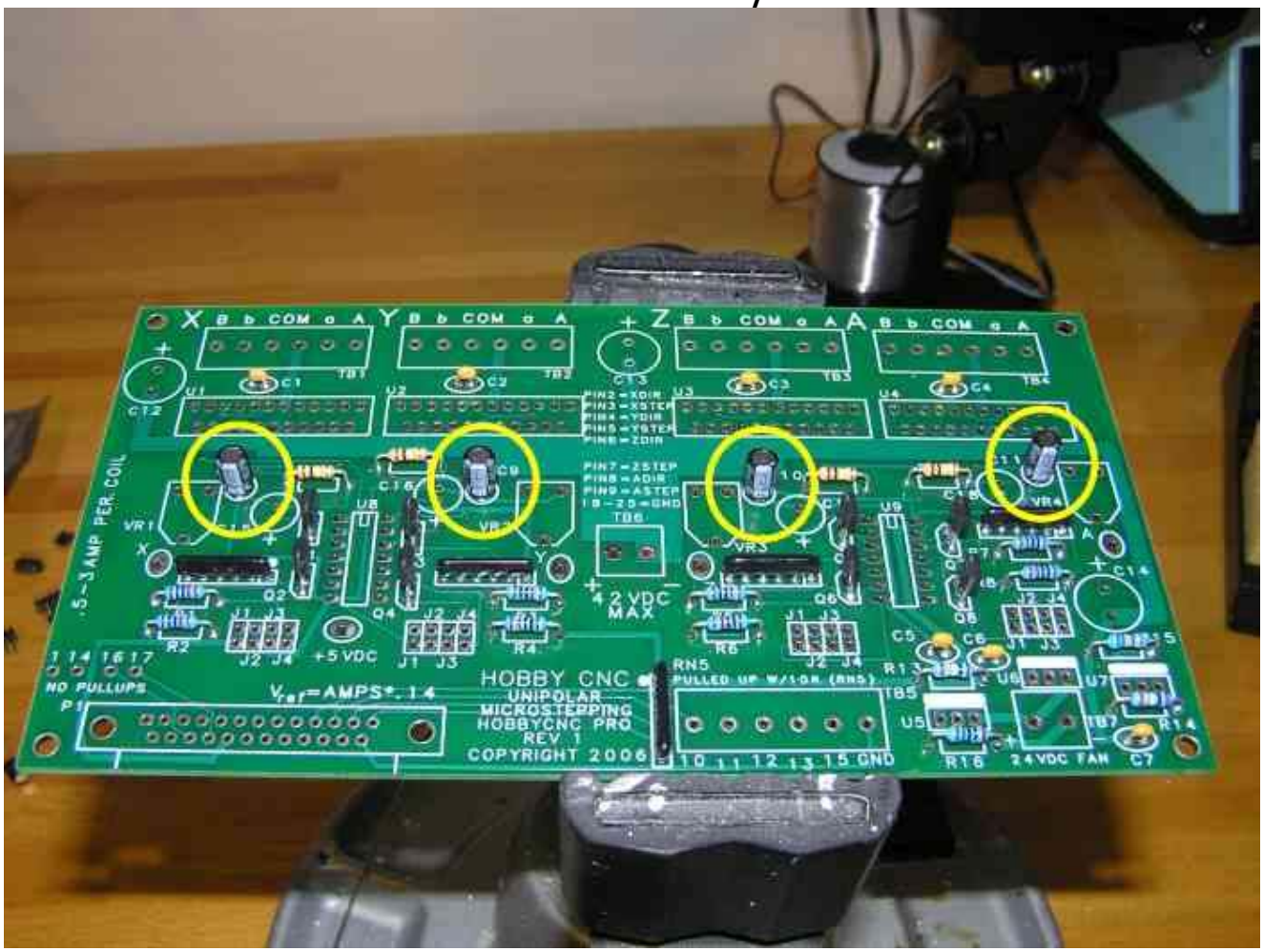
Construction Step 9



We now move on to four 10uF 50v electrolytic capacitors located at positions C8, C9, C10 and C11. These capacitors are polarized, which requires them to be orientated correctly when installed on to the board. The longest lead of the capacitor is the positive, which should be inserted in to the hole on the PCB labeled with the "+". The body of the capacitor has a "—" marked on it to assist you in identifying the proper orientation. **Do not confuse with positions C15-C18**.

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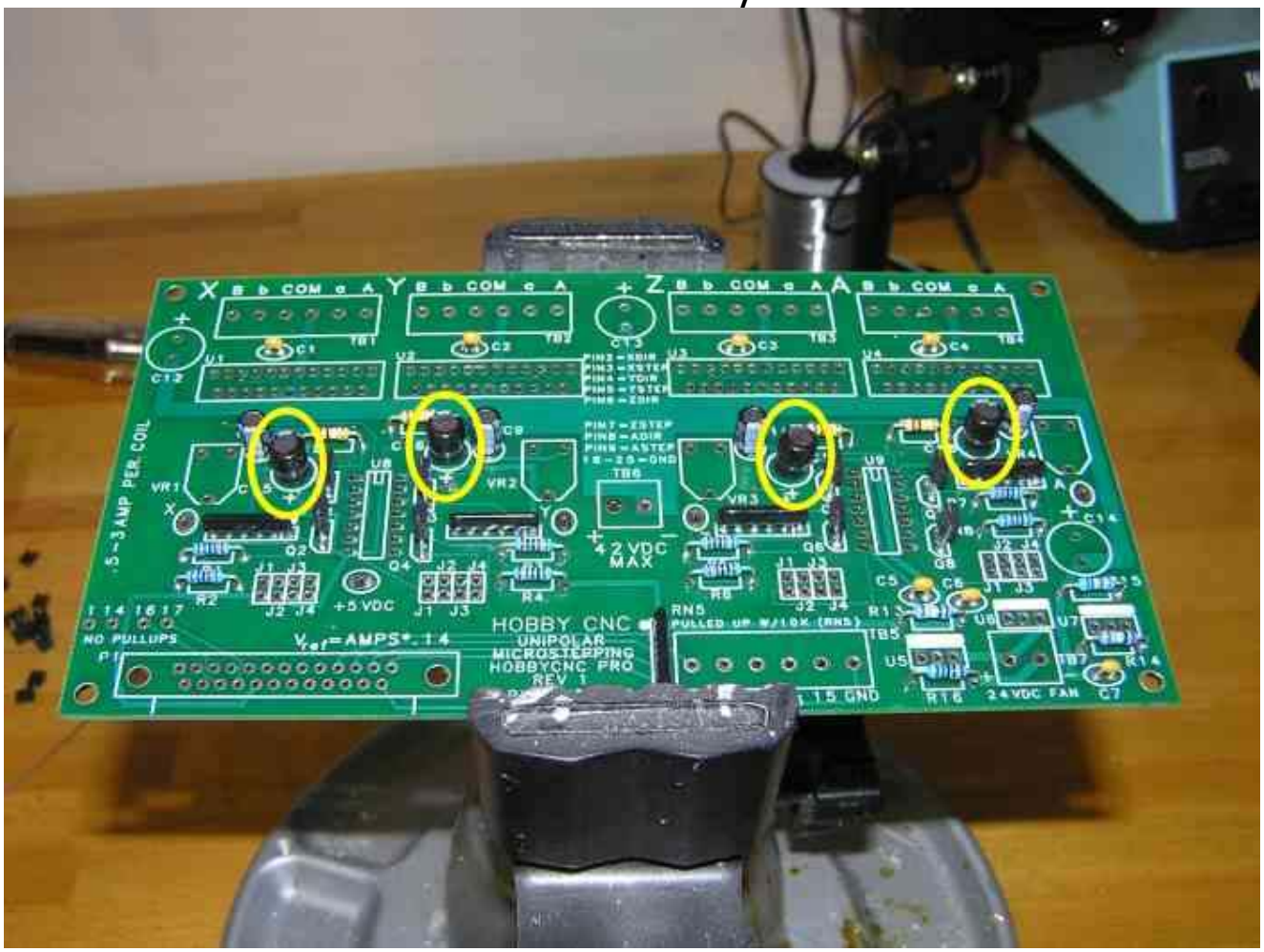
Construction Step 10



We now move on to four 100uF 16v electrolytic capacitors located at positions C15, C16, C17 and C18. These capacitors are polarized, which requires them to be orientated correctly when installed on to the board. The longest lead of the capacitor is the positive, which should be inserted in to the hole on the PCB labeled with the "+". The body of the capacitor has a "—" marked on it to assist you in identifying the proper orientation.

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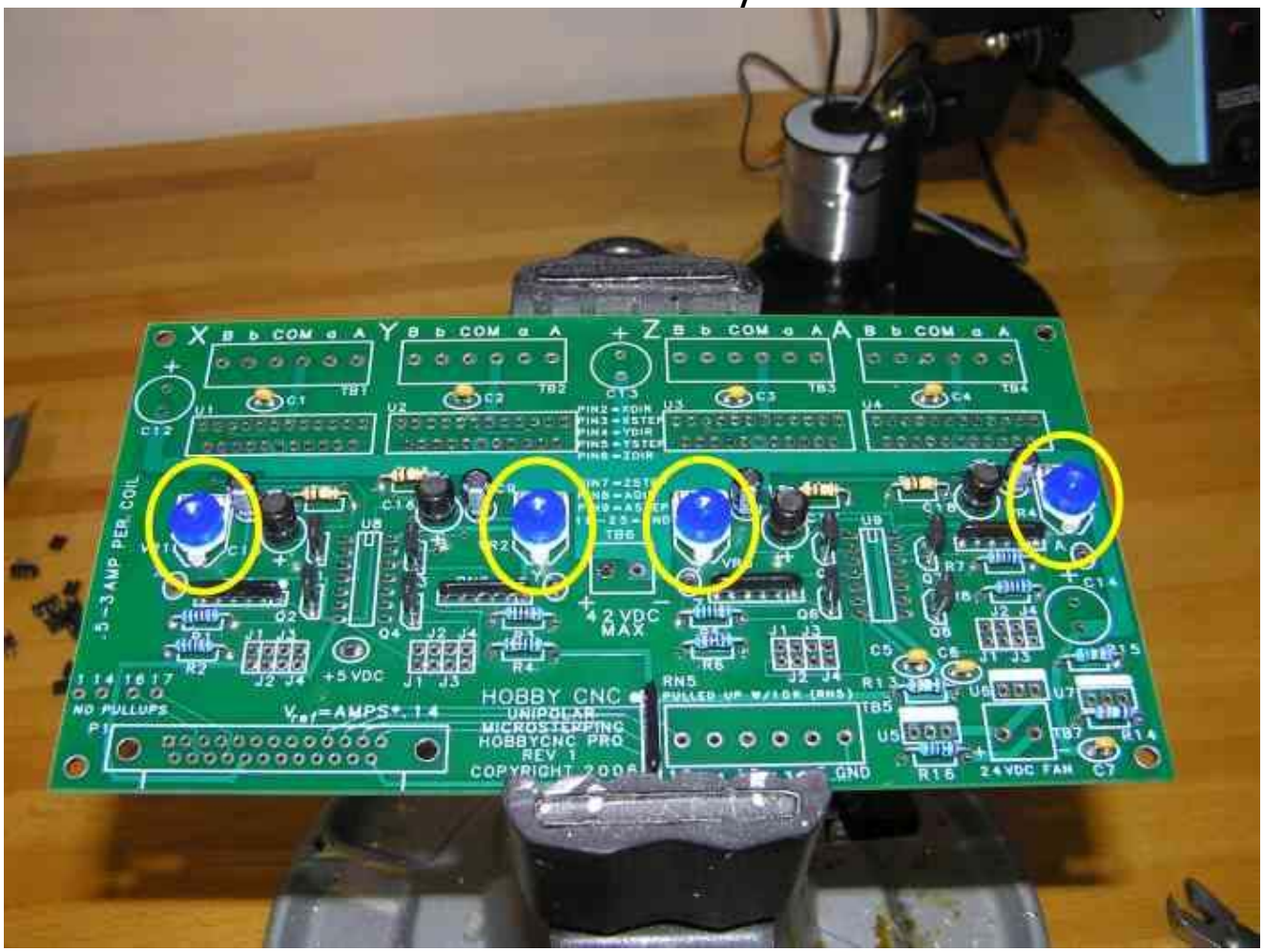
Construction Step 11



Now we advance to install four variable resistors (potentiometers) at positions VR1, VR2, VR3 and VR4.

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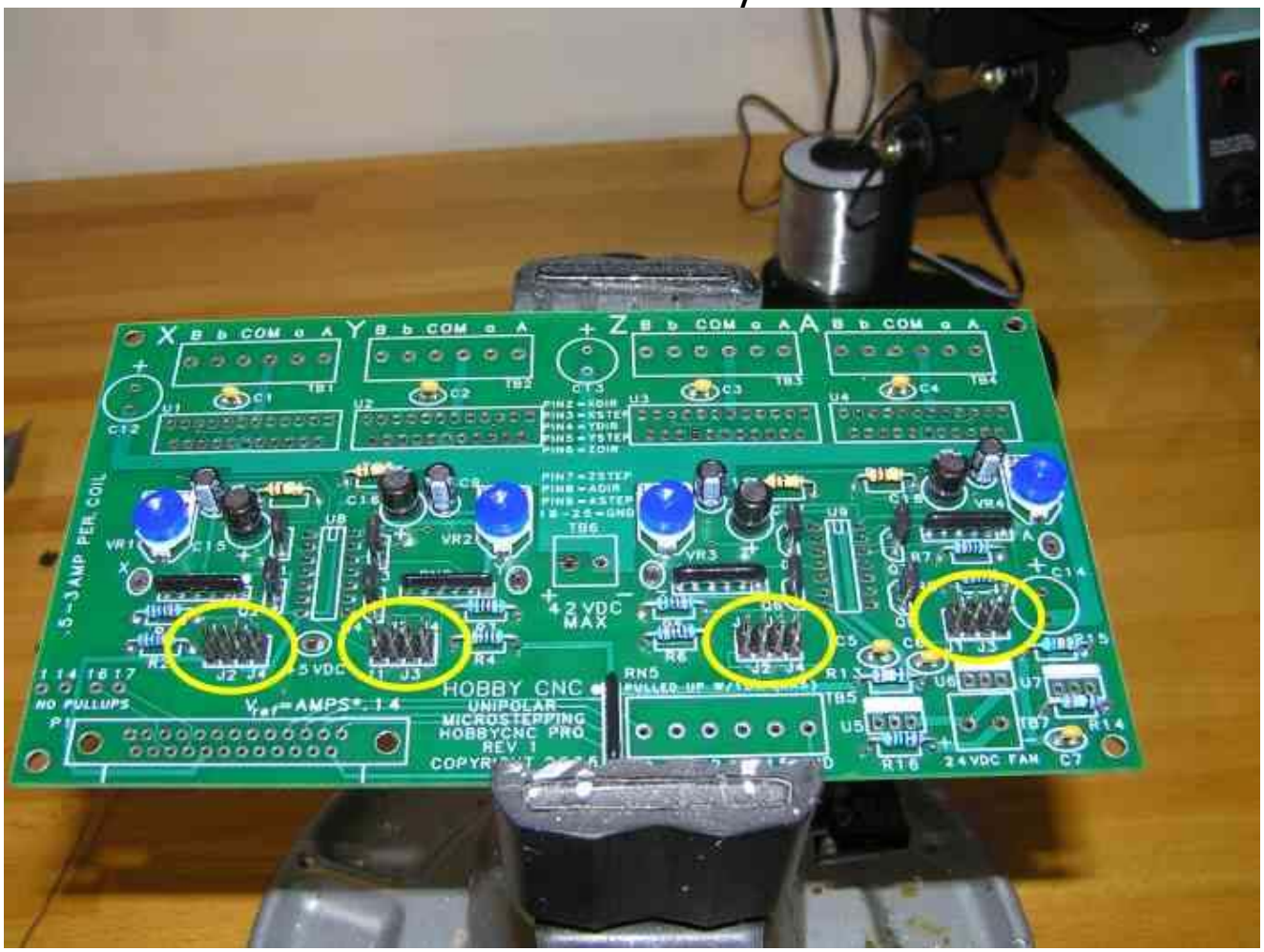
Construction Step 12



We can now install the header pins at J1, J2, J3 and J4. You can install the jumpers on the header pins prior to installing on the board to allow you to hold on to the pins as you solder them in. Once installed, you should refer to the PCB Connections drawing included with the board which describes the various setting options in more detail.

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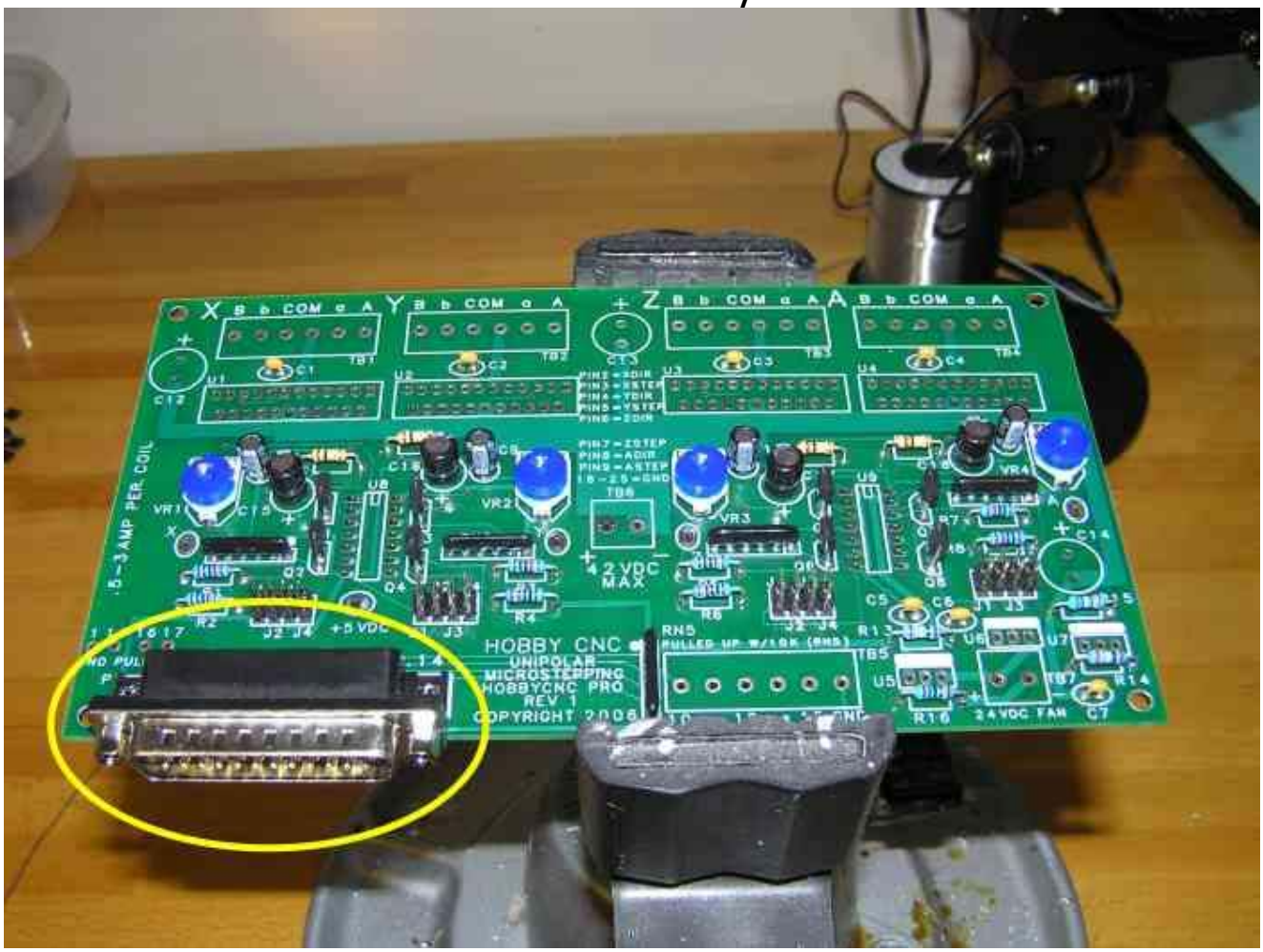
Construction Step 13



The largest connector on the board is now ready for installation. The DB25 male connector can be installed at P1. Take your time fitting this on to the board as you do not want to damage any of the pins.

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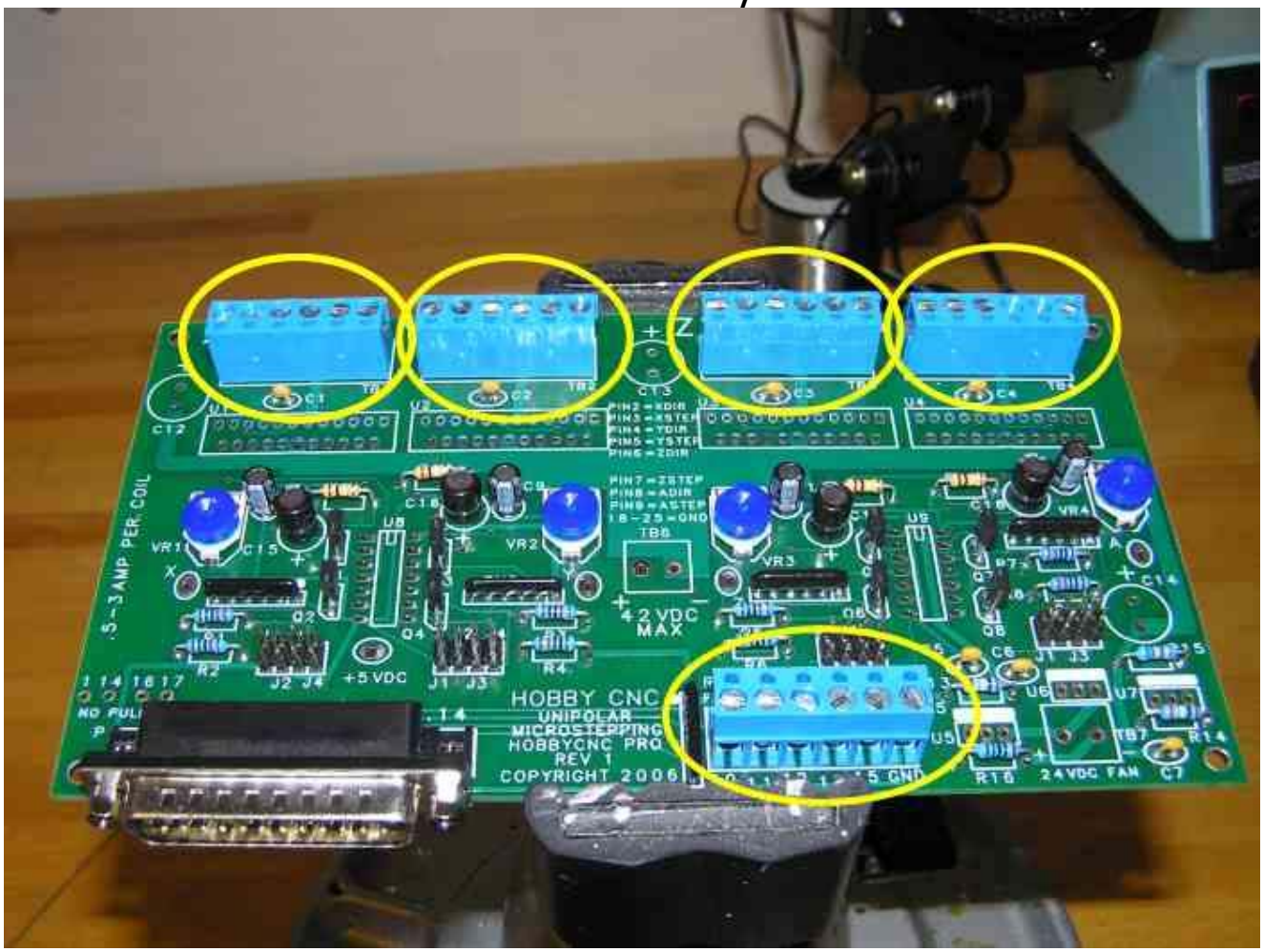
Construction Step 14



Now install the five large six-position Terminal Blocks at TB1, TB2, TB3, TB4, and TB5. These should be positioned with the holes facing the outside edge of the PC board.

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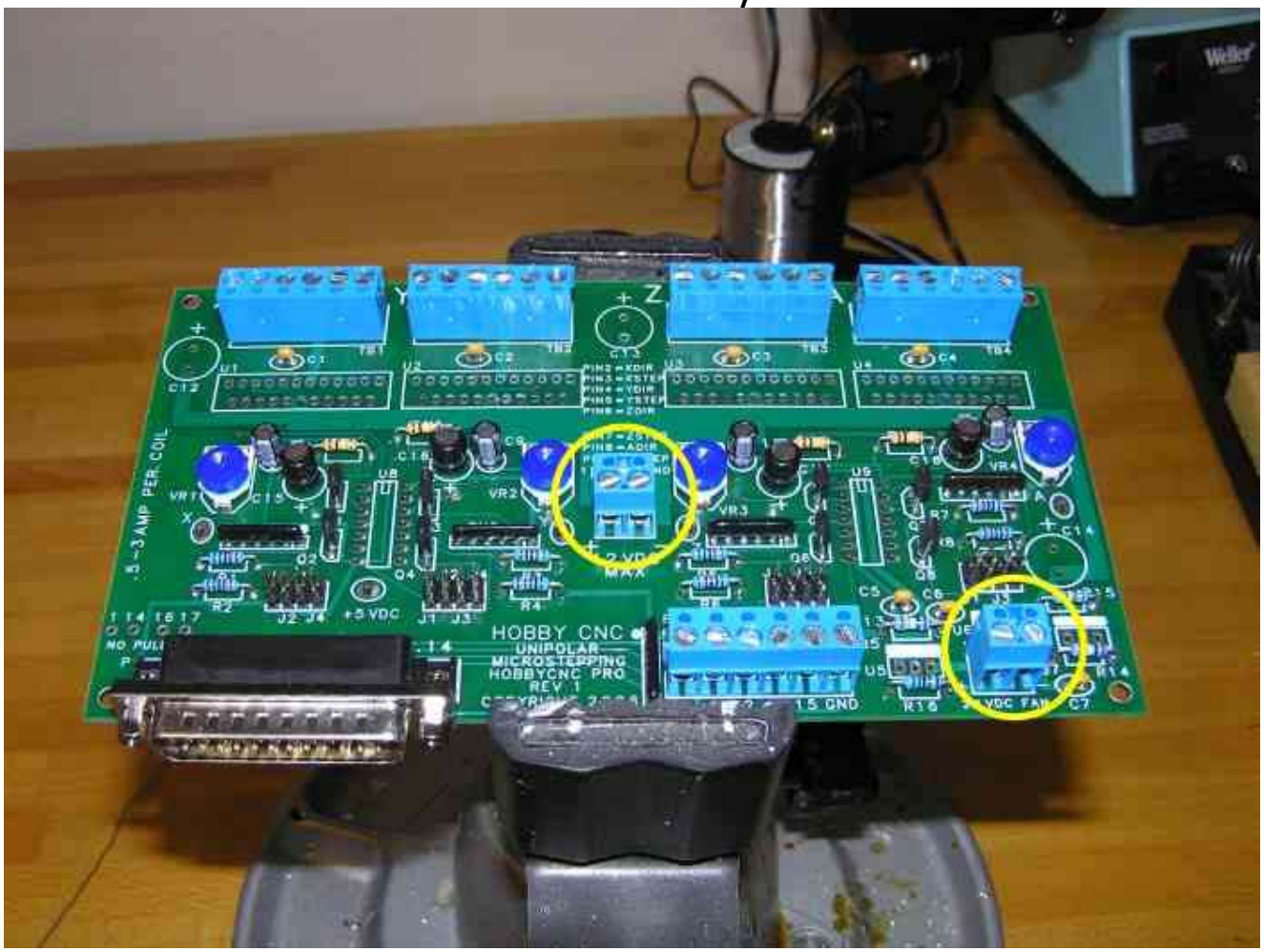
Construction Step 15



Now install the two smaller two-position Terminal Blocks at TB6, and TB7. Again, these should be positioned with the holes facing the outside edge of the PC board.

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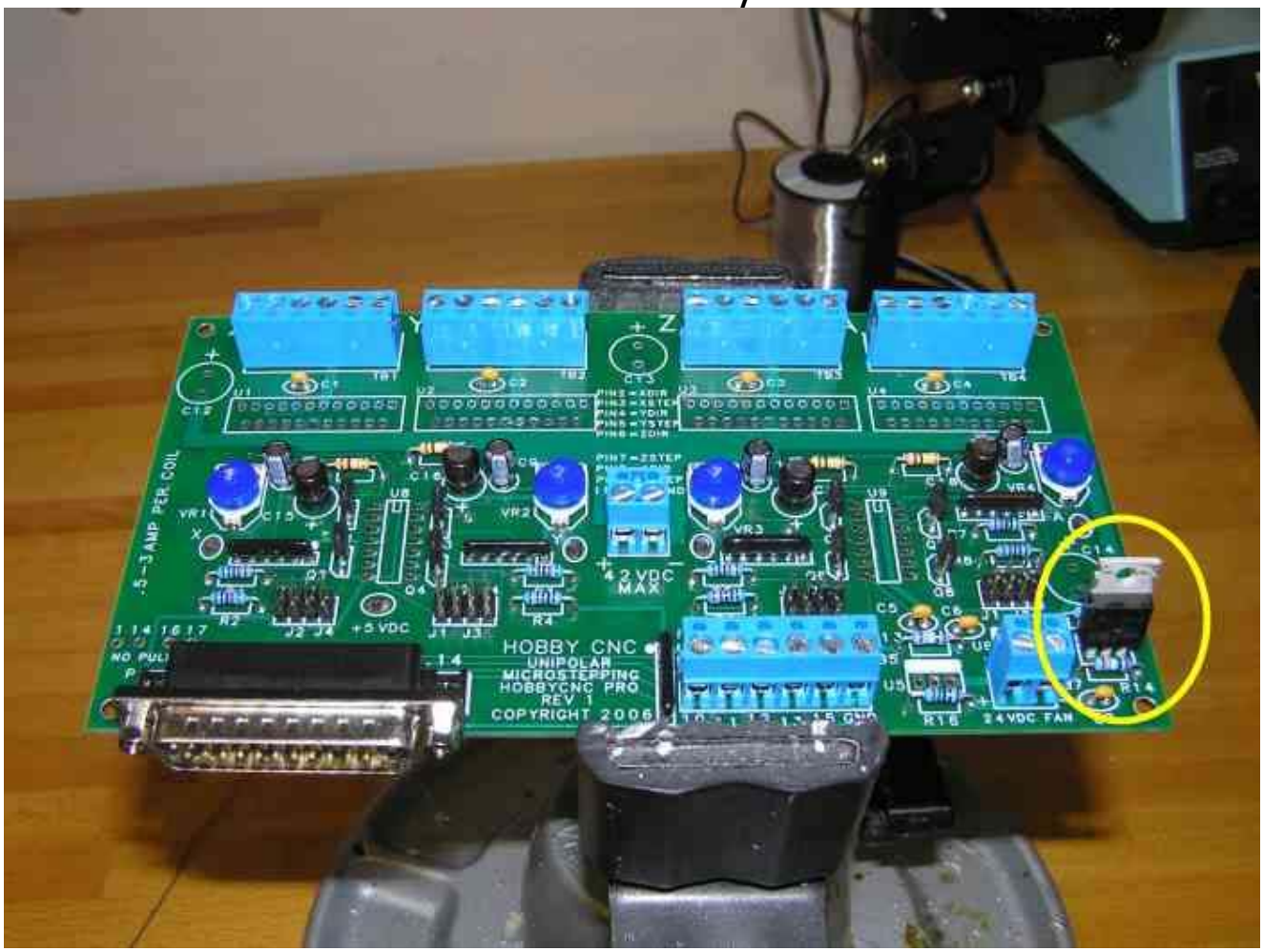
Construction Step 16



Now we can install the first of three voltage regulators. The first regulator is the LM317HV which goes at position U7. Make sure you install the LM317HV and **NOT the LM317**, which will be installed in a later step. The tab on the back of the regulator should be towards R15. The silkscreen on the board shows the tab as a wide white band.

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Construction Step 17

Now install the second of three voltage regulators. This regulator is the LM317 which goes at position U5. The tab on the back of the regulator should be towards R13. The silkscreen on the board shows the tab as a wide white band.

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Construction Step 18

The final regulator, 7824, can now be installation at position U6. The tab on the back of the regulator should be towards C6. The silkscreen on the board shows the tab as a wide white band.

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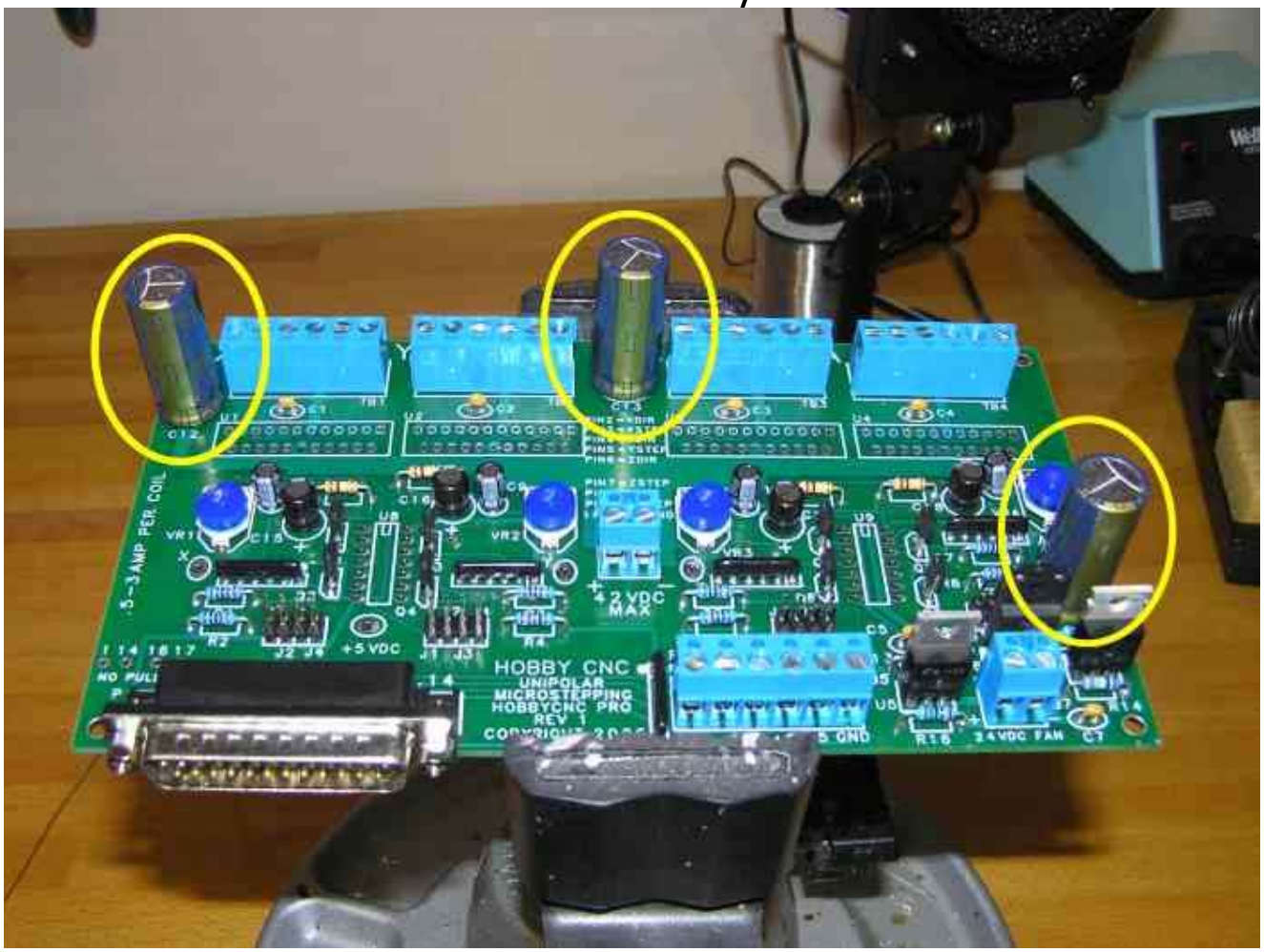
Construction Step 19



Now we are ready to install the last of the filter capacitors. These three 680uF capacitors go at positions C12, C13 and C14. These capacitors are polarized, which requires them to be orientated correctly when installed on to the board. The longest lead of the capacitor is the positive, which should be inserted in to the hole on the PCB labeled with the "+". The body of the capacitor has a "—" marked on it to assist you in identifying the proper orientation.

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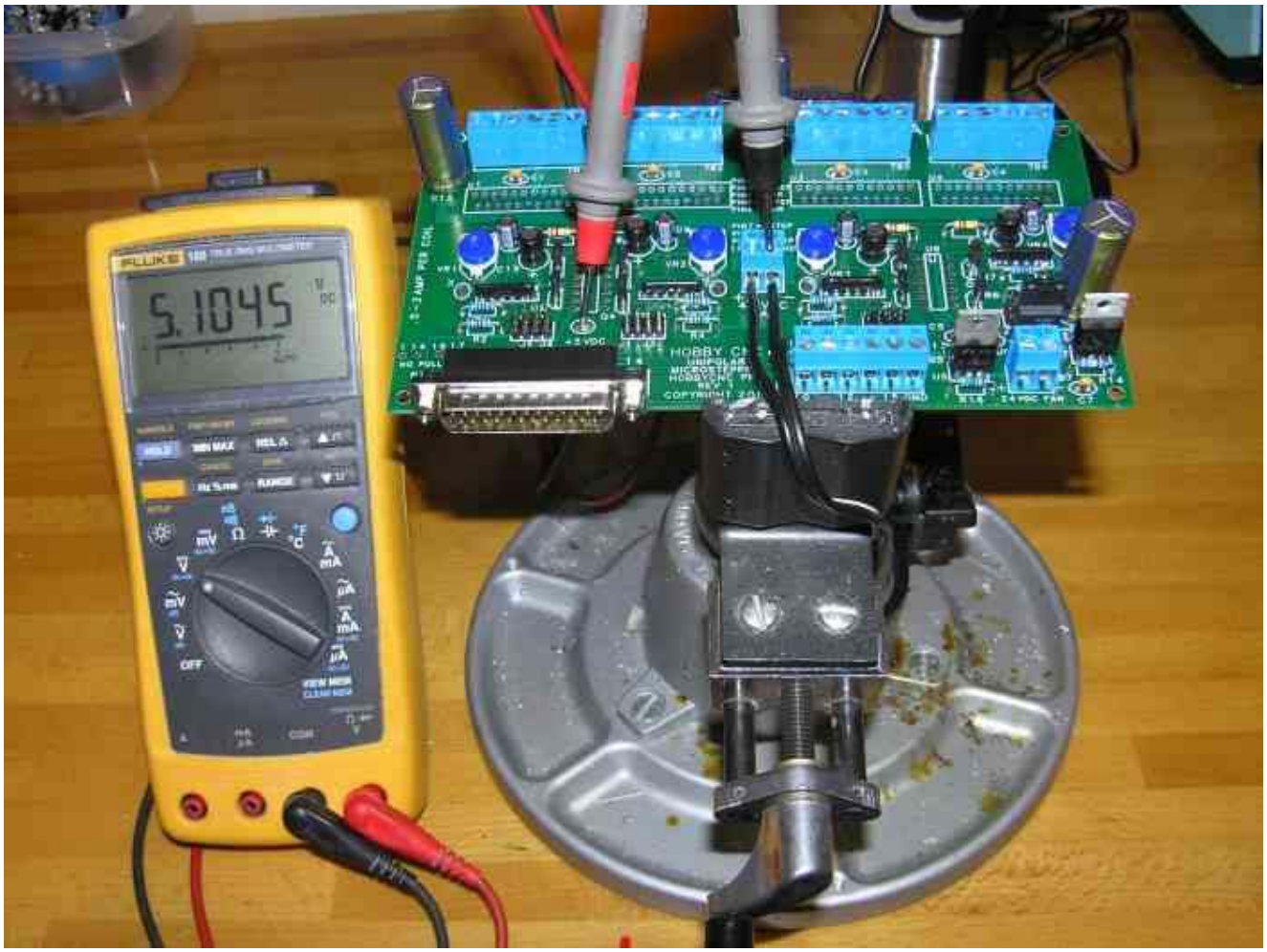
Construction Step – Testing

You have now completed the basic construction of the board. Before moving on to finish the installation, we need to perform some basic tests to ensure you did not make any errors.

Do Not Install U1, U2, U3, U4, U8 and U9 until you have completed the following testing!

We need to apply power to the board at position TB6. You must supply a minimum of 12v DC, but less than 42v DC. Apply to the TB6 position at the ports labeled "**+**" and "**–**". Do not reverse the polarity when applying the power or certain destruction of various components on the board is very possible!

After applying 12v to 42v DC at TB6, you should verify the voltage across TB6 with a volt meter. The black lead of your meter should go to the " –" terminal and the red lead to the "+". In our test case, we have 18.548v being applied to the board.



Now we need to verify that the 5v regulator circuit is functioning as intended. The 5v circuit provides power to all the semiconductors on the board, so it is important we have the correct voltage here before installing any of the driver chips.

Leaving your Black volt meter probe on the " –" terminal of TB6, apply the red probe to the pad labeled "+5 VDC". The voltage here should be measured between 5.0v DC to 5.2v DC. If the voltage does not match this range, you need to go back and review your installation. Failure to ensure that you have 5.0v DC to 5.2v DC is present can very easily cause permanent damage (blow) the driver chips. If you have problems with the +5v reading, take a close look at the components at U5, R14 and R16.

In our test, we are at 5.1045v DC, which is exactly where it should be.

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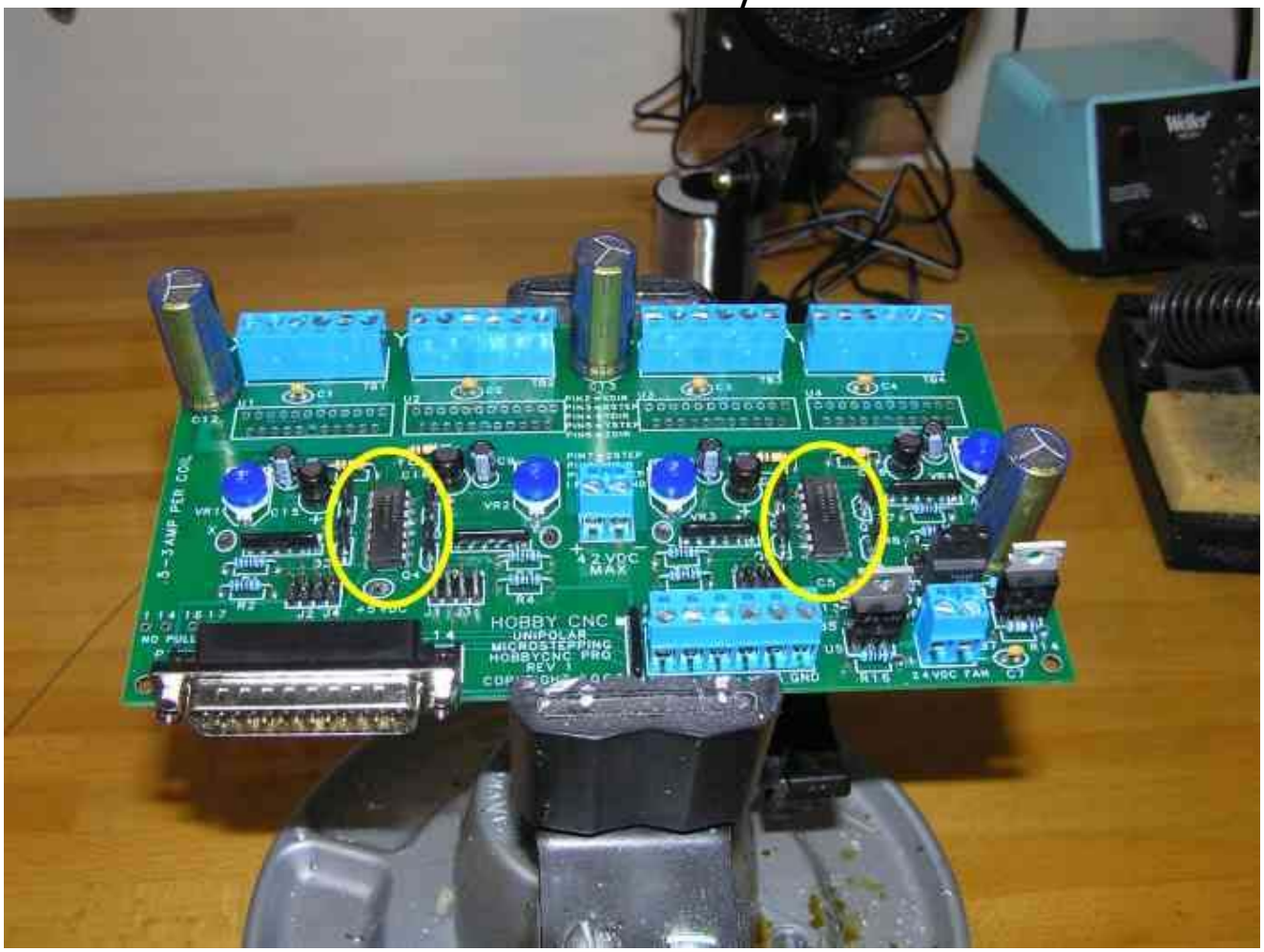
Construction Step 20



This is where we begin to install the first driver related components. Install two MM74HC14N chips at positions U8 and U9. Be sure to match the pin-1 notch on the chip with the pin-1 notch shown on the PCB silkscreen.

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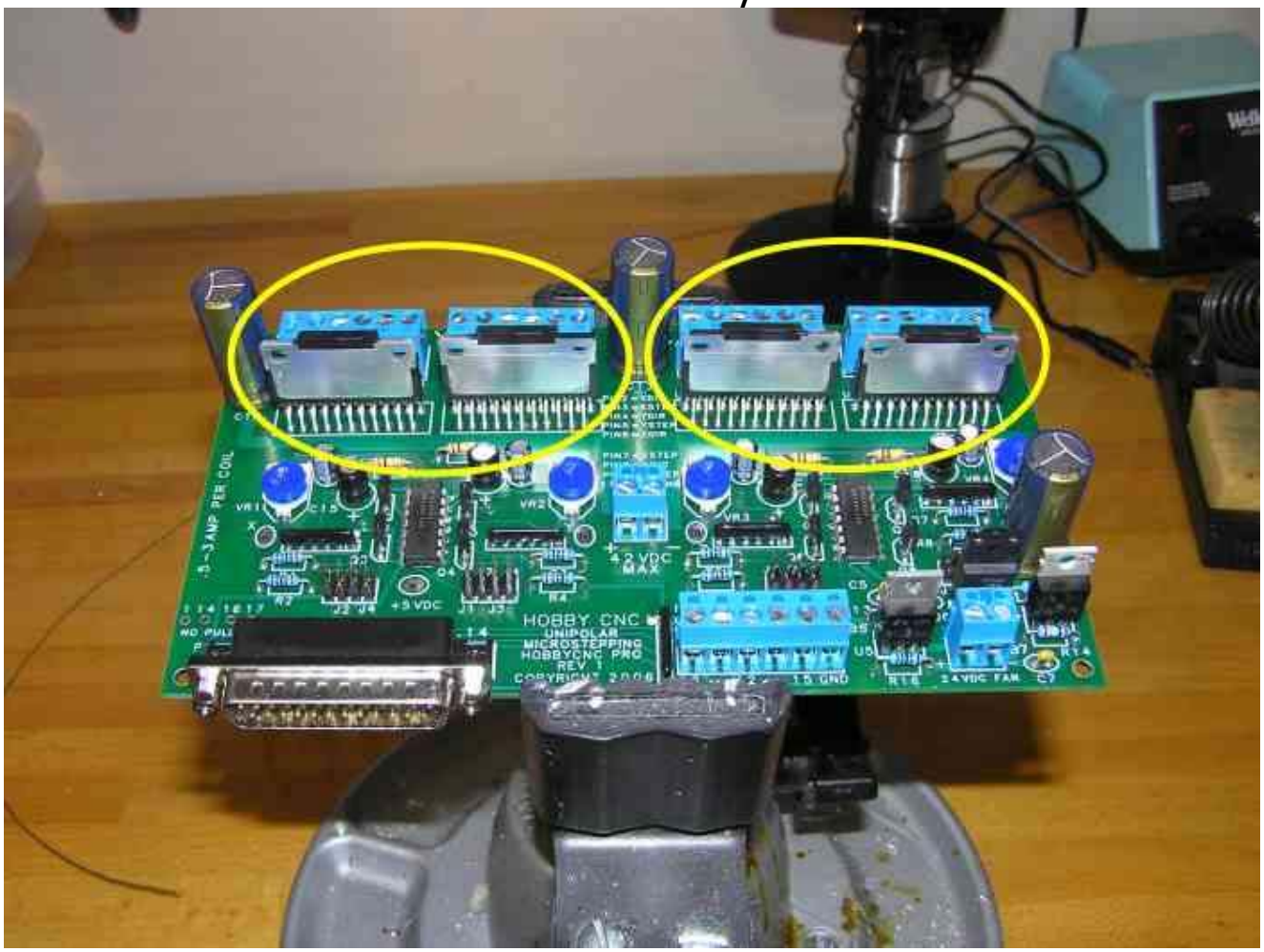
Construction Step 21



Now we move on to the last components, the driver chips. The four drivers go at positions U1, U2, U3 and U4. With the pin layout on the chips, they can only be installed to the board in one direction. Carefully install each chip ensuring that each pin is inserted correctly into the PCB.

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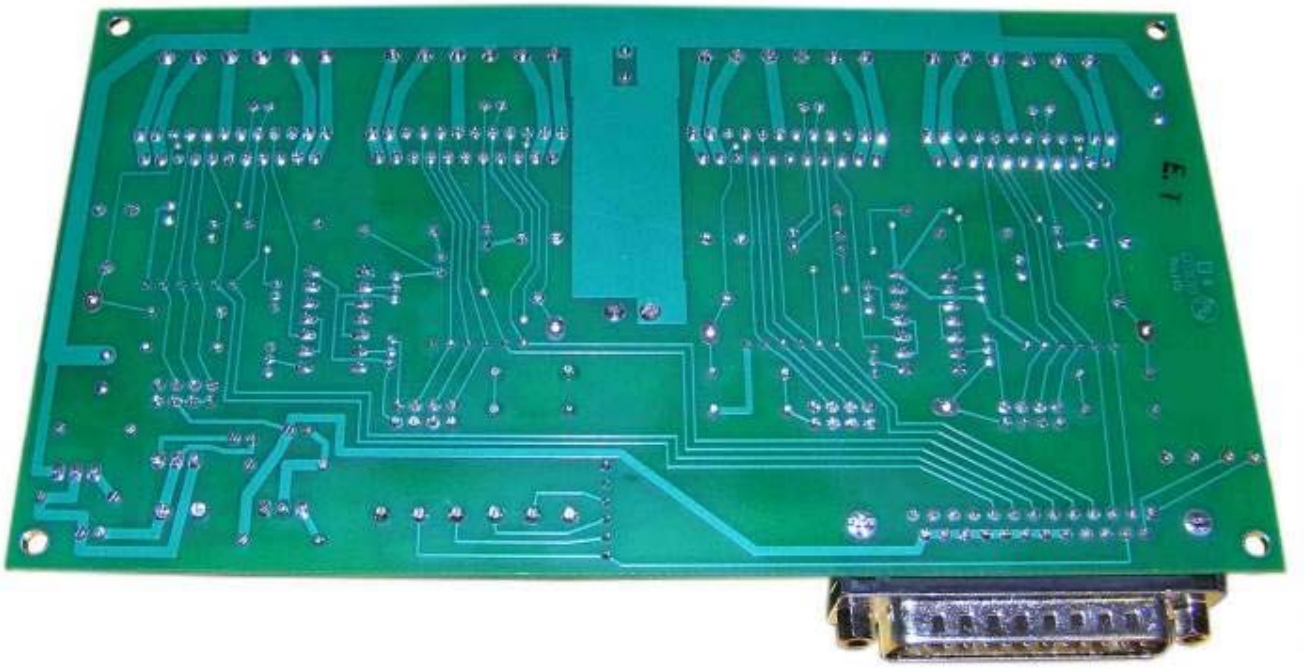
Construction Step 22



The final step is one of the most important. Clean the PC board with an alcohol or flux remover, or if you used a solder with a water soluble flux, warm water. Carefully inspect all solder connections with a magnifying glass looking for solder bridges or cold solder joints. This step will eliminate almost all possibilities of initial board failures.

The solder we prefer to use is a Water Soluble Core Solder from Kester. The residues are rinsed off with standard tap water and leave a perfectly clean board. The model of solder is Kester part number 24-6337-6403.

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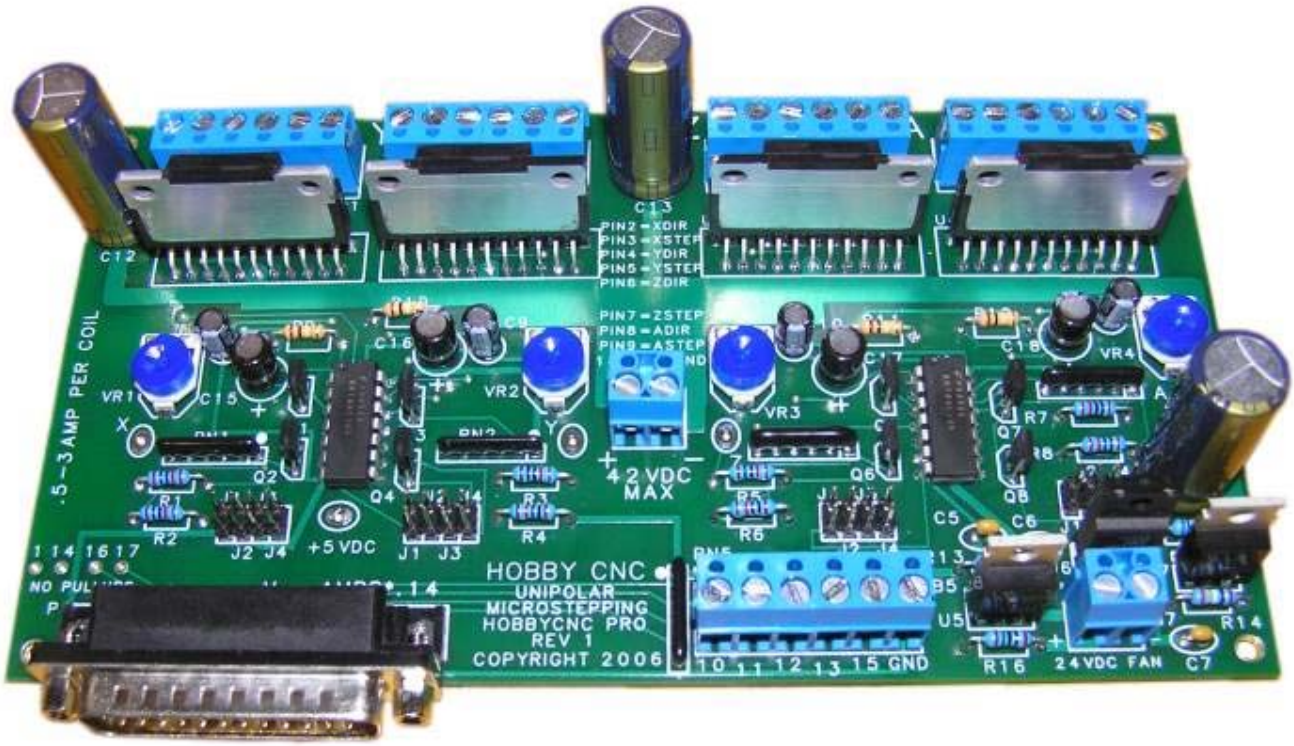
Construction Summary



You are now finished with the construction of the PC board. Spending the time to assemble your board with care will result in years of reliable service.

If you do not feel comfortable building up the board yourself, there are various people out there who can professionally assemble and test your board for you at very competitive rates. There are also people who can offer to you fully assembled and tested systems complete with Power Supplies and Stepper Motors if you prefer. Feel free to contact us if you require additional information on how to contact these people.

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