3 axis 4AUPC Chopper Driver Board Kit

Thank you for purchasing our 3 axis 4AUPC kit. The following information and the step-by-step instructions will assure complete success and satisfaction. Please read through the following before beginning any construction to get familiarized with the process. NOTE: Machinery driven with this device can and will start without warning and may cause injury or even death. The builder of this device assumes sole responsibility for its use! IF YOU DO NOT AGREE WITH THIS RETURN THE KIT FOR FULL REFUND, LESS SHIPPING AND HANDLING FEE, BEFORE STARTING ASSEMBLY.

Specifications:
3 Axis Unipolar Chopper control. Individual OR simultaneous control of 2/4 Phase Stepper Motors. Accepts 5, 6, or 8 wire stepper motors
44 VDC maximum input voltage, 12VDC or 24VDC minimum input voltage depends on fan voltage used.
3.0 Amps Maximum per Phase, 500ma (.5A) minimum. Adjustable throughout this range.
1/2,1/4, 1/8, and 1/16 Microstepping
Step and Direction Control.
Power On Reset.
On board voltage regulation for 5-volt logic with12VDC or 24VDC cooling fan from motor power supply.
On board connections for home and limit switches with 10K pullup resistor provided to each.
Minimum of components to make assembly fast and easy.

Tools Required For Assembly:
15-25 Watt soldering pencil
.032 Rosin core solder
Side cutters
Pliers
Voltmeter

Construction Step by Step:
1. Insert the (3) 8.66K (R1,R2,R3 Gray Blue Blue Red Brown) resistors. Simply bend the leads over to fit the PCB holes and solder in. Trim the leads.

2. (3) 178R resistors (R5,R6,R7 Brown Violet Gray Black Brown) are next. Trim the leads.

3. (2) 249R resistors (R9,R10 Red Yellow White Black Brown) are now installed. Trim the leads.

4. Decide NOW if a 12VDC (12-24VDC input) or 24VDC (24-44VDC input) fan will be used and install (R11 2.15K Red Brown Green Brown Brown for a 12VDC fan **OR** R11 4.53K Yellow Green Orange Brown Brown for a 24VDC fan) Trim the leads. Scratch the appropriate number off the silkscreen of the PCB to identify which fan voltage is used by either removing the "1" or the "4" in front of TB7.

5. Install (1) 750R (R12 Violet Green Black Black Brown) Trim the leads.

6. Install (5) .1uF (C1,C2,C3,C5,C6) Capacitors. These have NO orientation. Trim the leads.

7. Install (6) .2R 3W Current Sense resistors (RS1,RS2,RS3,RS4,RS5,RS6). No orientation is required. Trim the leads.

8. Solder in (4) 10K Resistor Networks (RN1,RN2,RN3,RN5). Orient the dot with the PCB silkscreened dot. Trim the leads.

9. (3) Capacitors 10uF (C7,C8,C9) solder in now. Orient the longest lead into the hole marked "+". The body has "-" marked on it to help identify the proper orientation. Trim the leads.

10. Install (3) Potentiometers (VR1,VR2,VR3) now. Trim the leads.

11. Solder the 2 X 3 (J1,J2,J3) Header Pins in now. (Installing the Jumper/Shunts onto the pins makes holding them in place easier!)   Refer to the PCB Connections drawing for proper orientation.

12. Solder P1 DB25 Male connector in now. Take your time as many pins are close together.

13. The 6 Position Terminal Blocks (TB1,TB2,TB3,TB5) solder in now. Orient the holes for the wires facing "out".

14. Install the 2 Position Terminal Blocks (TB6,TB7) next. Orient the holes facing "out".

15. Install (2) 100uF Capacitors (C11,C12) now. Orient the long lead into the hole marked "+". Again the body is marked with "-" to help with orientation. Trim the leads.

16. The LM317HV (U6), **NOT the LM317**, is next to be soldered in place. Orient the tab towards C12. The PCB silkscreen shows this. Trim the leads.

17. The LM317 (U5) goes in now. Orient the tab towards R12. The PCB silkscreen shows this. Trim the leads.

This completes the basic construction. DO NOT INSTALL U1,U2, and U3 UNTIL THE FOLLOWING TEST IS MADE! To make sure no errors were made, apply more than 12 VDC (If using a 12VDC fan OR 24VDC if using a 24VDC fan BUT less than 44VDC to TB6 labeled + and -. With a voltmeter verify that +5.0VDC to 5.2VDC is present at the via just below the "+" sign on C7,C8, and C9.   The black test lead touches the "-" on TB6 or the pad labeled "GND". If not, review all the above steps and correct them. Failure to insure that +5.0VDC-+5.2VDC is present will BLOW the driver chips!

18. Install (3) 21 pin Driver Chips (U1,U2,U3) only after the above test is successful. They can only go one way. Trim the leads.

19. Clean the PCB with alcohol or a flux remover and inspect all solder connections with a MAGNYFING glass to assure against any solder bridges. These will cause ALMOST ALL failures!

Interfacing With the Printer Port
          This section explains the connections the driver board makes to your computers parallel port. This is where the printer plugs into. The pinouts cannot be changed. These are as follows:

Pin   Function
2   X direction
3   X step
4   Y direction
5   Y step
6   Z direction
7   Z step
8   A direction (not used)
9   A step (not used)
10,11,12,13,15 are pulled up with a 10K resistor and are used for home/limit functions. Consult your software as to the type of switches needed.
14,16,17 are not pulled up and are available as needed.
18-25 Ground

Refer to your software for your specific requirements.

Be sure to use a DB25M to DB25F ALL lines wired straight thru parallel port cable.

Current Adjustment MOST IMPORTANT!
        The stepper motor current **MUST be adjusted before connecting any steppers** to the driver board. Each axis can be adjusted to a different value. Current MUST be 500ma up to 3A per coil. With power applied to TB6 (12VDC min, 44VDC max) use a voltmeter with the black lead connected to the pad labeled "GND" to the left of the DB25 connector and the red lead touching the axis pad to the left of VR1, VR2, and VR3. Clockwise movement increases the voltage, counter clockwise decreases the voltage. The following voltage MUST be set to achieve the correct amperage:
500ma = .103VDC
1A= .17VDC
1.5A= .26VDC
2A= .34VDC
2.5A= .43VDC
3A= .51VDC
For any amperage not shown use the following formula: <u>desired amps times .17 equals Vref</u>.   Below .103VDC will disable the driver chip output. Keep Vref above .103V!

Stepper Motor Hookup
        This driver board will accept 5, 6 and 8 wire stepper motors rated at 500ma to 3A per coil. Over 2A per coil we recommend a heat sink and fan cooling. (4) wire BIPLOAR motors are not usable! The PCB silkscreen identifies which coil connects where. The coil commons connect to the 2 positions labeled "COM". Leads from "A" and "a" coil connect to positions labeled so. Likewise for "B" and "b". Simply reverse "A" for "a" and "a" for "A" connections to reverse the stepper motor direction. Most software allows for direction reversing. "Ballast" resistors are NOT required. Stepper motor leads should be kept as short as possible. 22ga stranded cabling will be fine for most applications.

Microstepping
        The driver board allows (4) different modes of driving your stepper motors. These can be set differently between each axis if desired. As a side note, 1/8 and 1/16 stepping MAY require quite a lot of computer process power! The Microstepping is set as follows:
1/2 step=J2 OFF J3 OFF
1/4 step=J2 ON J3 OFF
1/8 step= J2 OFF J3 ON
1/16 step= J2 ON J3 ON
For reference, the driver chip steps best with a "low to high" transition signal.

Synchronous and Asynchronous Mode
        Jumper J1 controls this function. **Synchronous function is recommended for use with 1/2 step mode only**. REMOVE J1 jumper for Synchronous mode. INSTALL J1 jumper for all other operating modes.
Stepper Power Supply
        The stepper power supply MUST be capable of providing 75% of the TOTAL current draw of the steppers. A 2.5A stepper will draw 5 Amps! For example: 3 steppers rated at 2.5A will draw a total of 15Amps.   Adequate fusing must be used on both the AC and DC side. We suggest a switch be used on the AC and DC side also.

CAUTON: NEVER connect or disconnect the stepper motors with power applied. This will blow the IC's! Steppers will get warm. Also the chopper frequency can be heard in the steppers. This is normal.
        We welcome your comments and suggestions. We can be reached at "mail@hobbycnc.com"

Dave Rigotti Hobby CNC