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3 axis HobbyCNC EZ Rev0 Chopper Driver Board Kit

Thank you for purchasing our 3 axis HobbyCNC EZ 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. 4 wire types are not usable.
- 36 VDC maximum input voltage, 12VDC minimum input voltage.
- 3.0 Amps Maximum per Phase, **.**6A minimum. Individually adjustable throughout this range.
- 1/1, 1/2, 1/4, 1/8, and 1/16 Micro stepping.
- Step and Direction Control.
- Built In Protection Circuit to help against blown chips on stepper motor short or open connections while in motion.
- On board voltage regulation for 5-volt logic with 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
- 1/32" Rosin core solder
- Side cutters
- Pliers
- Voltmeter

Construction Step by Step:

1. Insert the (3) 10K (R1,R2,R3 Brown Black Black Red Brown) resistors. Simply bend the leads over to fit the PCB holes (typically .400") and solder in. We ALWAYS use an Ohmmeter to verify values before soldering in place. It just takes a second or two but can save hours troubleshooting.

2. (2) 249R resistors (R4,R5 Red Yellow White Black Brown) are now installed. Trim the leads.

3. Install (1) 4.53K (R6 Yellow Green Orange Brown Brown) resistor. Trim the leads.

4. Install (1) 750R (R7 Violet Green Black Black Brown) resistor. Trim the leads.

5. Install (5) .1uF (C1,C2,C3,C4,C5) Capacitors. These have NO orientation. Trim the leads.

6. Solder in (4) 10K Resistor Networks (RN1,RN2,RN3,RN4). **Orient** the dot with the PCB silkscreened dot. Trim the leads.

7. Double check RN1,RN2,RN3, and RN4 orientation.

8. (3) Capacitors 10uF 50V (C6,C7,C8) solder in now. **Orient** the longest lead into the hole marked "+". The body has "-" marked on it to help identify the proper orientation.

9. Install (3) Potentiometers (VR1,VR2,VR3) now. They snap in place. Solder and then trim the leads.

10. Solder the 2 X 3 (J1,J2,J3) Header Pins in now. (Installing the Jumper/Shunts onto the longer pins makes holding them in place easier!)   Refer to the PCB Connections drawing for proper orientation. Only 2 jumper shunts maximum are required for each 2 X 3 pin header to satisfy all stepping modes.

11. Solder (P1) DB25 Male connector in now. Take your time as many pins are close together. We also solder the mounting lugs for an even more robust mounting.

12. The 6 Position Terminal Blocks (TB1,TB2,TB3,TB4) solder in now. **Orient** the holes for the wires facing "out". These may require a little extra heat to flow the solder as a lot of copper is present.

13. Install the 2 Position Terminal Blocks (TB5,TB6) next. **Orient** the holes facing the "plus and minus" signs. These may require a little extra heat to flow the solder as a lot of copper is present.

14. The LM317HV (U5), **NOT the LM317**, is next to be soldered in place. **Orient** the tab towards the broad white stripe. The PCB silkscreen shows this as a wide white band. Trim the leads.

15. The LM317 (U4) goes in now. **Orient** the tab towards the broad white stripe. The PCB silkscreen shows this as a wide white band. Trim the leads.

16. Install (2) 680uF Capacitors (C9,C10) now. **Orient** the long lead into the hole marked "+". Again the body is marked with "-" to help with orientation. Trim the leads.

17. 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!

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 at least 12VDC BUT less than 36VDC to TB5 labeled + and -. With a voltmeter verify that +5.0VDC to 5.2VDC is present at the pad labeled +5VDC. The black test lead touches the "-" on TB5. 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! **(U4, R5, and R7 control the +5VDC voltage. These are the first items to check if the test fails!)** Go no further until +5VDC is achieved with this test.

18. Install (3) 23 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 again with alcohol or a flux remover and again inspect all solder connections with a MAGNYFING glass to assure against any solder bridges.

50-0004

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 different from previous HobbyCNC driver boards!** They are as follows:

Pin	Function	Pin	Function
2	X step	5	Y direction
3	X direction	6	Z step
4	Y step	7	Z direction

- 10,11,12,13, and 15 are pulled up with a 10K resistor (RN4) and are used for home/limit functions. Consult your software as to the type of switches needed. (N.O. or N.C. types) Limit switches are usually wired in a series as N.C. and the home switches are wired individually for that axis.

- 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 **should be adjusted before connecting any steppers** to the driver board. This will prevent "overamping" them if the initial setting is too high. Each axis can be adjusted to a different value. Current MUST be 600ma up to 3A per coil. With power applied to TB5 (12VDC min, 36VDC max) use a voltmeter with the black lead connected to TB6 terminal "minus" 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:

- 600ma = .080VDC (eight hundredths of a volt)
- 1A= .14VDC (fourteen hundredths of a volt)
- 1.5A= .21VDC (twenty-one hundredths of a volt)
- 2A= .28VDC (twenty-eight hundredths of a volt)
- 2.5A= .35VDC (thirty-five hundredths of a volt)
- 3A= .42VDC (forty-two hundredths of a volt)

For any amperage not shown use the following formula: desired amps times .14 equals Vref. We recommend fan (24VDC) cooling and heat sink at 2A or more. The wiring diagram has a suggested heat sink from 1/8" aluminum flat stock.

Stepper Motor Hookup

This driver board will accept 5, 6 and 8 wire stepper motors rated at 600ma 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. Never connect or disconnect any wiring with ANY voltage present as this will ensure blown driver chips! Measure for under .1VDC at TB5 before making any connections or

disconnections. Be very careful when tightening the terminal screws so as NOT to twist the terminal block. This MAY cause the soldered pins to fracture causing intermittent operation.

Microstepping
The driver board allows (5) 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:

- 1/1 step=J1 ON J2 ON J3 OFF
- 1/2 step=J1 ON J2 OFF J3 OFF
- 1/4 step=J1 OFF J2 ON J3 ON
- 1/8 step= J1 OFF J2 ON J3 OFF
- 1/16 step= J1 OFF J2 OFF J3 ON

We recommend using 1/2 or 1/4 step. This produces almost full power and usually avoids any resonance issues. The finer the micro step the less power you'll have. Don't use microstepping to increase the "precision" of your machine.

For reference, the driver chip steps best with a "low to high" transition.

Synchronous and Asynchronous Mode
Asynchronous function is active for all stepping modes. This cannot be changed nor does it need to be.

Stepper Power Supply
The stepper power supply MUST be capable of providing 50% 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.

Stepper Fault Protection
We recommend never to connect or disconnect the stepper motors with power applied.

 Wait a few minutes for the capacitors to completely discharge before removing any stepper wires.

The driver chips have a built in feature (PAT PEND) to help prevent blowing the chip if a stepper motors wiring becomes open or shorted. This feature is available only during stepping. Use extreme caution when connecting or disconnecting ANY wires to and from the driver board. If the driver does enter fault protect mode, then cycling the power off and on again will reset the chip. Wait a full minute before turning back on. Find the fault and correct it.

Steppers will get warm. Also the chopper frequency can be heard in the steppers. This is normal.

We welcome your comments and suggestions. Be sure to check our FAQ page hobbycnc.com/faq first. **All** customer support is handled thru our Yahoo support group. A link was provided at the time of your order.

Please join and share the experience!

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HEAT SINK 1/8 X 2 X 4/12 ALUM
LOCATE HOLES FROM CHIPS TAP #4-40

USE HEAT SINK COMPOUND
ISOLATION NOT REQUIRED

$\frac{1}{4}$"

$\frac{1}{2}$"

8 WIRE STEPPER

6 WIRE STEPPER

5 WIRE STEPPER

NEVER CONNECT/DISCONNECT STEPPERS WITH VOLTAGE STILL PRESENT

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J1 OFF ON OFF ON OFF ON
J2 ON OFF ON OFF ON OFF
J3 OFF ON OFF ON OFF ON
1/1 1/2 1/4 1/8 1/16

2 = x STEP 5 = Y STEP
3 = x DIR 6 = z STEP
4 = Y STEP 7 = z DIR

36 VDC MAX

V_{ref} = AMPS * .14

.6-3AMP MAX PER COIL

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HobbyCNC EZ REV 0

+5 VDC

2 4 VDC FAN .18A MAX

TOUCH VOLTMETER BLACK LEAD HERE FOR ALL MEASUREMENTS

TOUCH VOLTMETER RED LEAD HERE TO CHECK FOR +5VDC BEFORE INSTALLING THE DRIVER CHIPS

TOUCH VOLTMETER RED LEAD HERE WHEN SETTING Vref AXIS VOLTAGE. TYP FOR EACH AXIS

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