

MA-3D Assembly Instructions

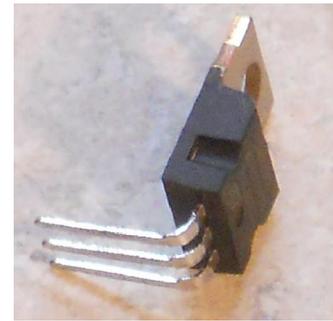
The MA-3D is a 3 phase class D amp suitable for driving a BLWR172S-24-2000 or BLWS231S-24-2000 BLDC motor from Anaheim Automation. The amp is custom designed to work with only these 2 motors; any other motor connected to the output of the amp can permanently damage the amp. The BLWR series has a 4mm shaft and no mounting flange. The BLWS series has a 1/4" shaft and a mounting flange that matches up with a Hurst 59 series motor.

The MA-3D is an amplifier section only and requires the SG-4 sinewave generator to provide the drive signals for each phase. The MA-3D board can also supply the SG-4 with the 12VDC signal needed to power it, so only one wall adapter is needed.

Getting Started

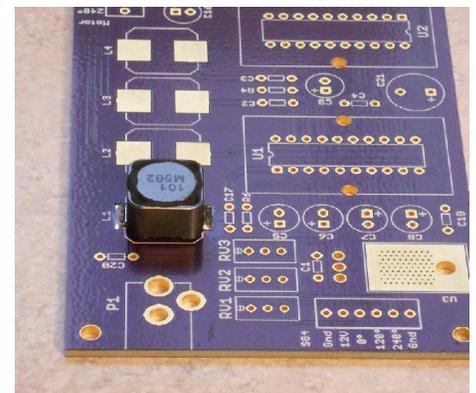
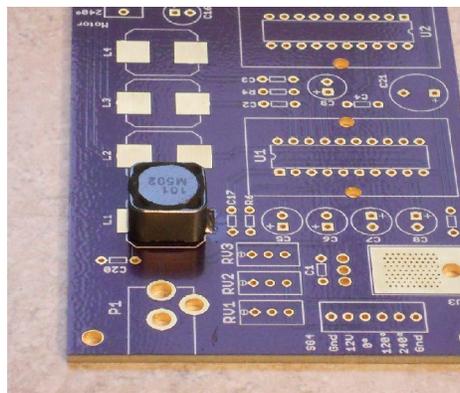
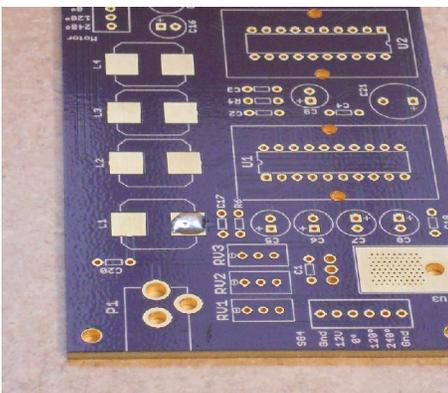
The PCBs from OshPark are cut from a panel of other projects and will have small bridges and/or burrs on the edges. Remove the bridges and lightly sand all four edges of the PCB is 220 grit sandpaper until smooth.

Pre-form all of the resistors by bending the leads down tight against the body of the part. Bend the leads of the 12V regulator at 90° as shown:

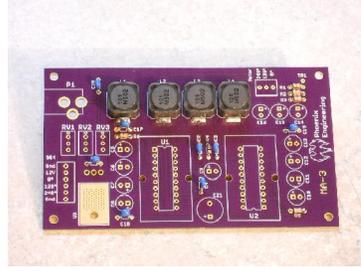


Soldering the components

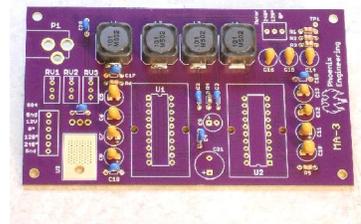
Start by soldering the 4 surface mount inductors onto the PCB. To solder an inductor onto the PCB, start with a puddle of solder on one of the pads. Holding the part in your hand, slide the part up to the dome of solder and reflow the solder with an iron; as the solder melts, slide the part into place and position it so that the part is square with the silk screen. The inductors require a lot of heat to properly solder; most parts will reflow within 1-2 seconds, but the SMT inductors can take 10-12 seconds. Do not solder the other lead yet; ensure the part is square and tight against the PCB. Reflow the one lead to reposition if necessary. When the part is square and tight to the PCB, solder the other lead by heating both the pad and the lead with a soldering iron and touch the solder where they meet. The joint should be smooth and shiny:



Next solder the resistors and all the 0.22uFd caps. Insert the part into the PCB and bend the leads away from each other to hold the part in place when you flip the board over to solder it. Ensure all of the parts are seated tight against the PCB.

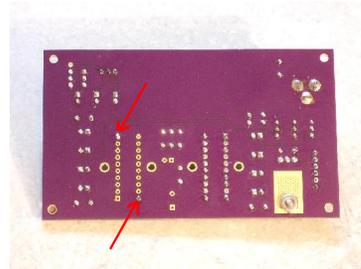


Install the tantalum capacitors next, noting the polarity marking on the PCB, denoted with a “+” on the silk screen (the positive terminal is also square, the minus is round). The tantalum caps are marked on the body of the part with a “+” and the positive lead is usually the longer of the two.

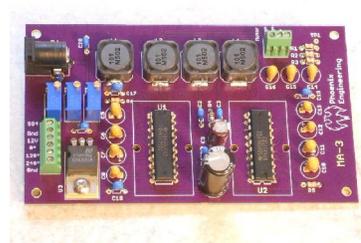


Install the regulator and the pots next. Secure the regulator to the PCB using a 4-40 x 1/4” screw and nut before soldering the leads to prevent damage. When soldering the pots, solder only the center lead first so the part can be rotated and aligned straight with the silk screen. When the part is square solder the other two leads (attempting to rotate the pot after all 3 leads are solder can break the case and damage the part). Solder the power connector using the same method (solder the center pin only, straighten the part if necessary and solder the remaining pins).

Solder the two ICs to the PCB next. The ICs point in **OPPOSITE** directions; the silk screen identifies which way the part should be inserted and pin 1 is square where all others are round. Start by soldering only two pins, one on each opposing corner; ensure the part is tight against the PCB and reflow the 2 pins if necessary to achieve this. When the part is tight to the PCB, solder the remaining pins.



To finish assembling the PCB, install and solder the 2 electrolytic capacitors and the interface connectors. The completed PCB should look like this:



Alignment

Do not connect the motor to the output of the SA-3D until alignment is complete!

Before connecting the SG4 to the amplifier, preset the frequencies to 20Hz/27Hz (33/45 RPM with a BLWS series motor) or 40Hz/54Hz (33/45 RPM with a BLWR series motor). Set both the reduced voltage settings to max (128).

Connect the SG4 to the amp. You will need four 22 AWG wires for the connections 0°, 120°, 240° and Gnd. Connect the 2.1mm cable powering the SG4 to the 12V and Gnd connections on the amp; the center pin is positive and the wire is usually marked for polarity. ***If in doubt, use an Ohmmeter to determine which wire is connected to the center pin (positive), do not guess!***

Connect 15VDC power source to the SA-3D. Confirm the SG4 powers up in StandBy mode; ensure the 33/45 RPM switch is closed (45 RPM mode selected). Enter reduced voltage mode by exiting StandBy mode while holding the Down button. Connect a scope or an AC voltmeter to the 0° output of the amp. Adjust RV1 on the SA-3D PCB until you have 12VPP as read on the scope or 4.2VRMS on the meter. Repeat this step for the 120° output and adjust RV2 for the same reading. Finally, adjust RV3 for the same reading on the 240° output of the PCB.

To balance the outputs, move the scope or the AC voltmeter to TP1 and carefully adjust all 3 pots for ***MINIMUM*** output at TP1. When the levels are the same, the 3 signals should sum to zero (or a very low reading).

While still in 45 RPM mode, adjust the SG4 reduced voltage setting for 11.75VPP (4.1VRMS) if using a BLWR series motor or 11VPP (3.8VRMS) if using a BLWS series motor.

Switch the SG4 to 33 RPM mode and adjust the SG4 reduced voltage setting for 9.5VPP (3.25VRMS) if using a BLWR series motor or 9.25VPP (3.2VRMS) if using a BLWS series motor.

Save the reduced output voltage settings in the SG4 by pressing and holding the Stby button. The SA-3D is now ready to connect to the motor.

If using a BLWR series motor, connect the Black wire to 0°, Red wire to 120° and Green wire to 240°.

If using a BLWS series motor, connect the Black wire to 0°, Red wire to 120° and Yellow wire to 240°.

