

Stepper Metering Pump Assembly Instructions

Parts list to purchase

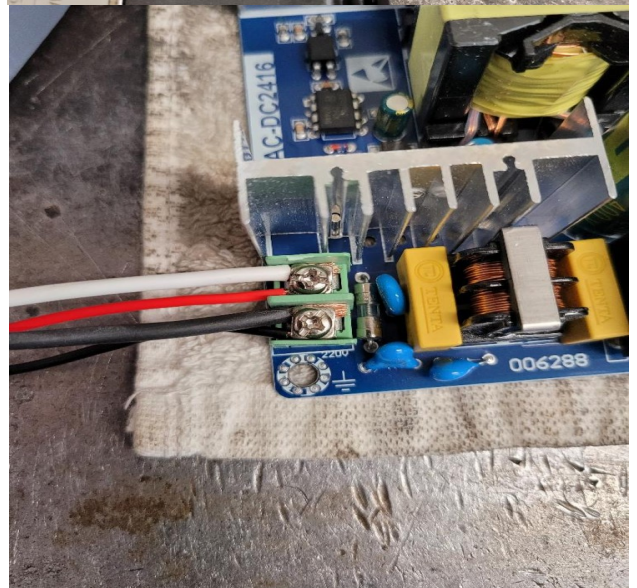
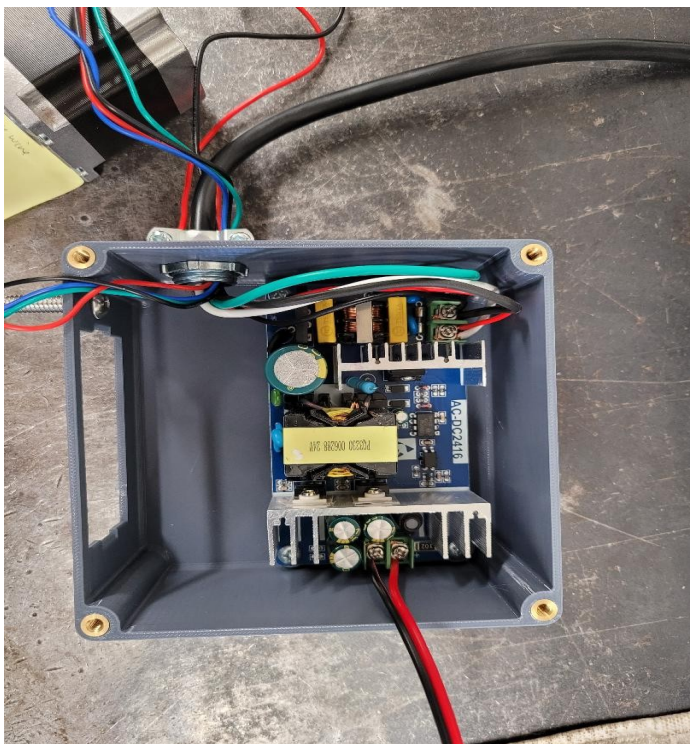
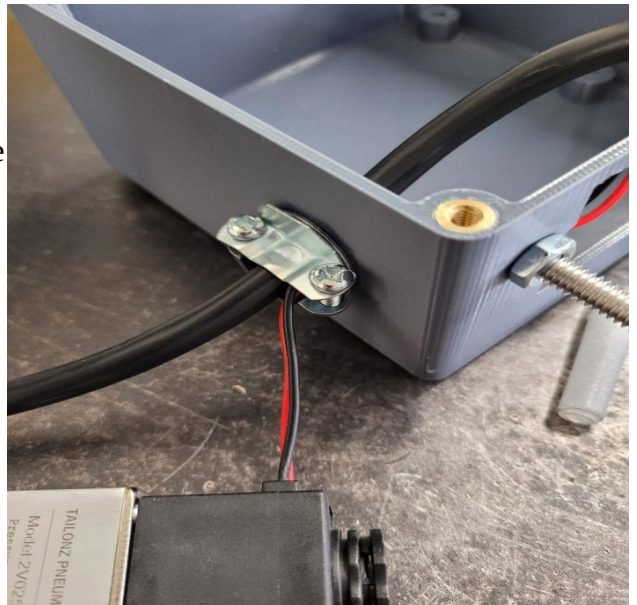
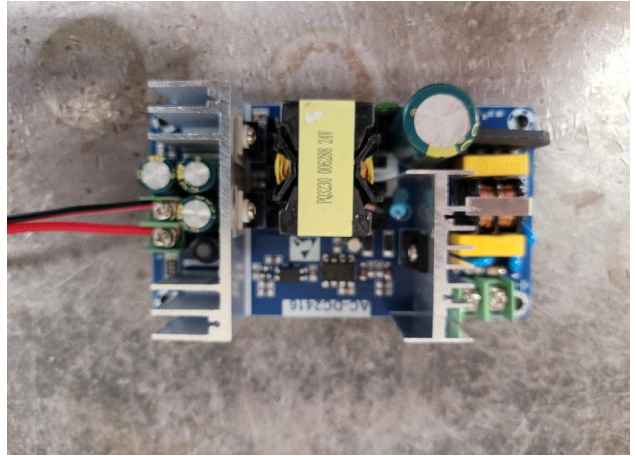
24v power supply (amazon B089SPKHYD)
stepper motor (amazon B00PNEPF5I)
stepper controller (amazon B0B1HNS9L2)
30mm fan (amazon B08R9JZY2Q)
power cord (amazon B075BCD1LP)
Solenoid valve (amazon B07QNK2M2M)
inlet and outlet fittings

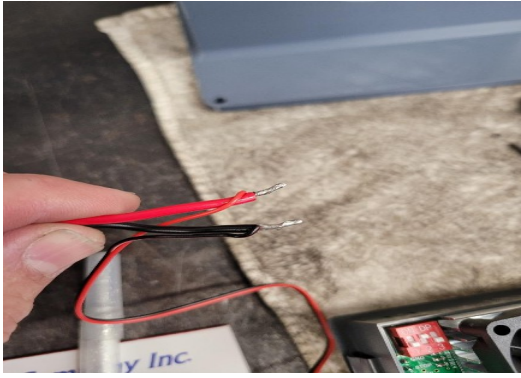
1. Strip wire ends of blk/red low voltage wire about 1/4". Insert one end into the power supply board, watch polarity here and tighten screws.

2. Cut power cord in Half. Strip the black insulation on the male side back about 5". Strip the individual wires back about 1/4" Insert this end of the male side thru the cord restraint into the box, pull at least a foot of wire thru the restraint to make it easier to work on. Crimp the spade terminal onto the ground wire. Pull the solenoid wires thru the restraint into the box also. The female end will be used on the burner.

3. Install the black wires from the solenoid and power cord in the line terminal on the power supply board. Install the white power cord wire and the red solenoid wire into the neutral terminal of the power supply board.

4. Install the power supply board into the electrical box with the supplied coarse thread screws. Put the ground spade terminal under the screw near the terminals.





5. Cut the connector off of the fan and strip the wires back about 1/4". Install the fan onto the heat sink of the motor controller using the supplied 4-40 screws. The threads just go down between the fins. Don't over tighten these as there is not much aluminum engaging the threads.

6. Run the fan wire thru the front opening of the box. Solder the fan wires to the power supply wires to make them easier to insert into the screw terminals of

the motor controller.

7. Run stepper motor wires thru the cord restraint on the box and out thru the front opening.

8. Install stepper motor wires into controller terminals. A+=BLK, A-=GR, B-=RED, B+=BLUE. Connect 24v power supply and fan wires to motor controller. Watch the polarity here.

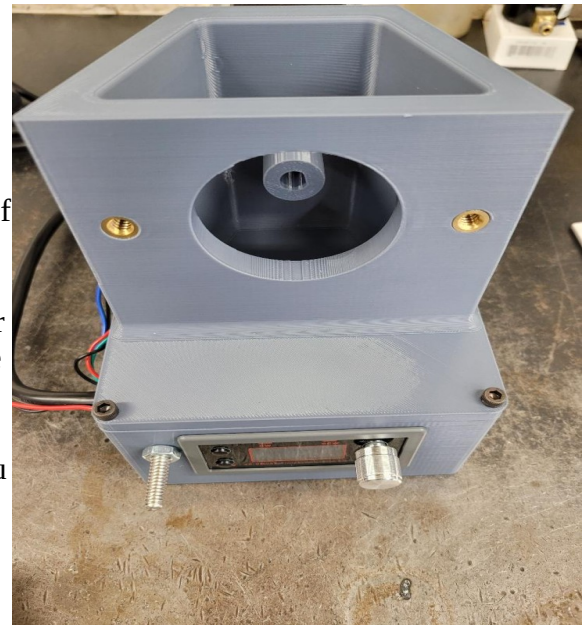
9. Install motor controller into the electrical box. Then install latch tab and thumb screw but do not tighten at this time.

10. Bolt stepper motor to the housing using the supplied 8-32 socket head screws.

11. Bolt the motor/pump mount back onto the electrical box. Put the motor coupling onto the motor.

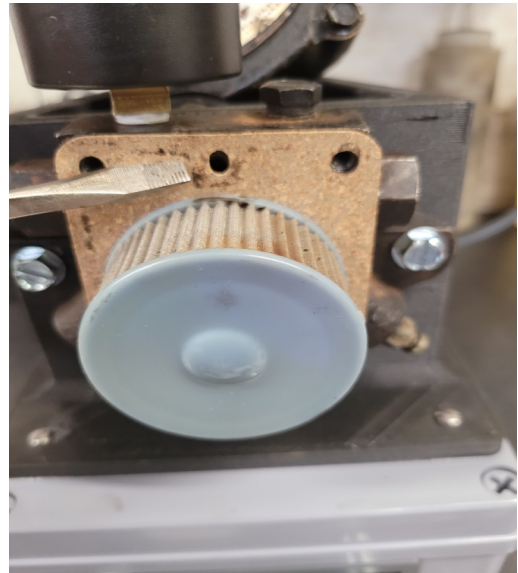
12. Push excess motor wires into the box, pull excess solenoid wires out of the box and tighten cord restraint.

13. Plug the unit in to power it up and change a parameter. Push the silver knob in until F01 P01 appears. Push the knob once and it should flash the P01, rotate the knob one click clockwise and make it P02. Push and hold the knob until it exits the parameters. You can push the CW button and the motor should rotate. You can change the speed with the knob while you are pushing the button.



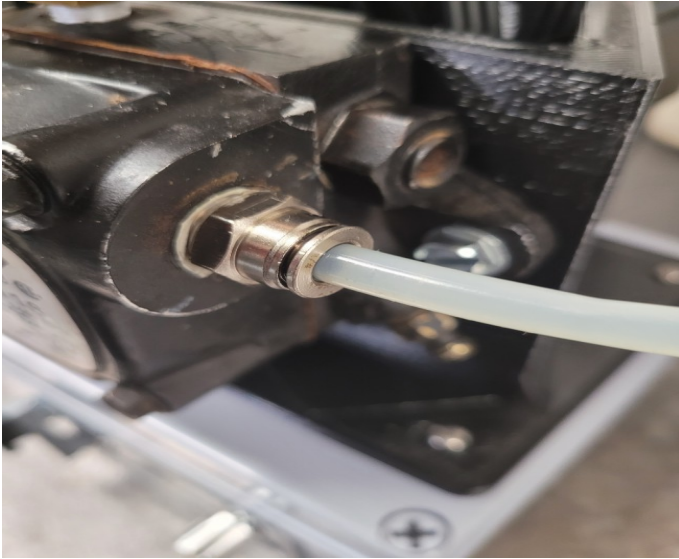
Pump modification for positive displacement use:

1. Remove 4 screws and remove strainer housing being careful so as not to damage gasket. (If you have an A2EA-6520 pump, you can remove the solenoid coil off the top as it will no longer function or be necessary.)
2. Clean the strainer housing, strainer and gasket mating surface using brake cleaner and a razor blade.
3. The shaft must spin freely using fingers, if it does not, try spinning it with a drill to loosen up. If it is still not free, you may need to completely disassemble pump to clean the gear set. At this time, make sure the shaft seal looks dry. If it shows any sign of leakage/wetness, now is the time to replace it.
4. Re assemble gasket first (align hole at the top), then strainer, then strainer housing with 4 bolts and tighten to seal gasket.
5. Install 1/16 npt plug in return/bypass port on bottom of pump (no sealant or tape). Reinstall plug with sealant and tighten.



6. Remove spring and plunger from the pressure adjusting port, (right port in pic) re install only the adjuster port nut to seal the port and tighten. The slotted adjusting screw must stay in place to seal this port. This allows low pressure output based on rpm.





7. Install inlet fitting of choice to match fuel supply line from tank. Push to connect fittings like the one pictured are not recommended. They may work ok if the tubing is in perfect condition and the fitting is new. But, they may leak under a vacuum created by the suction of the pump gears. You may also wish to install a filter/strainer to keep the worst of the junk out of the pump strainer.

8. Install solenoid and pump outlet fitting of choice that matches fuel line supply to connect fuel line to burner. You can remove the solenoid coil and wires from the solenoid body to make it easier to thread on the fittings. You can also install a gauge on the gauge port (A2VA-7116 pump) or into the outlet tee (A2EA-6520 pump). The solenoid is directional. The notch side is the inlet, the body is also printed with the direction. If you are mounting the metering pump higher than the burner, you should install the solenoid on the burner itself.



9. Install pump on metering pump/motor mount. Use the original 1/4-20 hex head screws that mounted the pump on the burner. Use a screwdriver to tighten, not a wrench so you don't pull the threads out of the plastic mount.

10. Re install solenoid coil and wires onto solenoid. (so solenoid opens when the pump unit gets power) The solenoid keeps the oil from dripping out of the nozzle during burner off time. Bolt the pump pump/motor mount to the top of the electrical box.

11. We recommend feeding the pump inlet thru 1/2" line not 3/8" line. ESPECIALLY if the line will be longer than 8-10 feet. Otherwise the shaft seal will leak under vacuum and you will get air bubbles in the oil line to the burner.

12. The pump comes with a 3 prong cord to facilitate powering up and bleeding the system. You will have to run the pump for a few minutes, starting and stopping a few times to bleed all the air out of the strainer chamber of the pump and the lines. Make sure you get good oil flow out of the line with no air bubbles before connecting to the oil inlet of burner. You do not have to use the bleeder port, only the outlet line to the burner. You can increase the speed of the pump to make bleeding a little faster.

13. The power for the pump unit must come from the valve terminal on the primary safety. If your safety does not have a specific valve terminal, **it must be wired to come on with the air solenoid.**

14. In usage, the pump should only spin clockwise. The button latch tab on the front will only reach the CW button for this purpose. After bleeding, you can tighten the tab to keep the CW button pressed down permanently. Any time the pump unit is powered up, it should start spinning the pump in the CW direction and feeding oil.

15. The nozzle will have some dripping when the burner shuts off and when the preheater warms up the next time. This is inevitable because the preheater does not drain when the burner shuts down. This was one of the benefits of a siphon system. The burner mounting flange will have to be adjusted so the tube tilts into the chamber. This keeps the dripping from running back the blast tube to the burner housing or out the fuel line hole in the blast tube. We recommend using a Beckett adjustable burner flange with the flat part pointing upward. With the burner and flange installed on the furnace/boiler, lift the burner housing upwards as much as you can and tighten the set screw on the mounting flange to set the burner at that angle.

Tuning the burner

1. Oil Flow rate is completely variable by changing the motor rpm with the knob.
2. You should only need a .3gph or .5gph nozzle to go from .5gph (70k BTU) up to 3.5gph (500k BTU).
3. Be **VERY** careful with the pump speed adjustment, as you can completely destroy the combustion chamber and possibly even melt thru the back wall and cause a fire burning down the entire building. (that would be bad)
4. You are shooting for 350-500* F. exhaust temperature measured with a real thermometer, NOT AN INFRARED THERMOMETER.
5. Air pressure should be 15psi to fully atomize the oil. Opposite of siphon feeding, more air pressure shortens the flame.
6. If you have a pressure gauge on the oil, understand that the actual pressure number is arbitrary and will change with temperature and oil viscosity. The pump is a metering pump and moves a precise amount of oil regardless of what type or thickness of oil.

Oil flow rate of standard pumps (A2VA-7116, A2EA-6520)

100 rpm	.65 gph	(91k BTU)
150 rpm	.95 gph	(133k BTU)
200 rpm	1.27gph	(178k BTU)
250 rpm	1.59 gph	(223k BTU)
300 rpm	1.91 gph	(267k BTU)
350 rpm	2.22 gph	(311k BTU)
400 rpm	2.54 gph	(356k BTU)
450 rpm	2.86 gph	(400k BTU)
500 rpm	3.20 gph	(448k BTU)

Trouble shooting oil delivery

1. No power on controller
 - test for 110vac on power supply board
 - if 110v is present, test for 24vdc out to controllers
 - if controller has 24v and it is not lit up, controller is bad, if no 24v present, power supply is bad
2. If controller is powered but motor is not turning
 - make sure CW button is pressed by latch tab
 - make sure an rpm is specified on the display
3. If motor is turning but no oil is delivered
 - Make sure pump has oil supply and it is primed.
 - Clean pump strainer and or external filter if one is installed
 - make sure nozzle is not plugged
 - check inlet line connections, any un-tight fitting can leak air under vacuum.