DIY Milking Sex Machine

V0.1.2022.05.06 – Review

Introduction

After building various sex machines for over a decade, I was curious as to the function and feel of milking machines. Seeing these machines often are close to $1,000 and only the most basic functionality, I decided to try and make my own.

The main goals for this machine:

- Have a total cost less than $250
- Provide more power than what is commercially available
- Address the issue of “Pop-Off”, which seems to be a common complaint
- Be able to use existing receivers from Venus, Tremblr, or LoveBotz
- Use solenoids for electronic control of air
- OPTIONAL: Be app-driven and programable for users comfortable with microcontrollers and who want advanced functionality
- Be easily converted into a dual-purpose fuck / milk machine

Please read the entire guide and BOM before purchasing or starting the project. There are some initial choices to make that would be difficult after starting. This guide is meant to provide information, please use extreme caution with electrical components. Do you use yourself during testing – get a banana or something else to make sure of safety.

Caution

- When you manually turn the shaft of a brushed DC motor, the motor is now a generator and electricity will be coming out of the motor. This is less of a hazard to you than other electrical components, but care should be taken regardless.

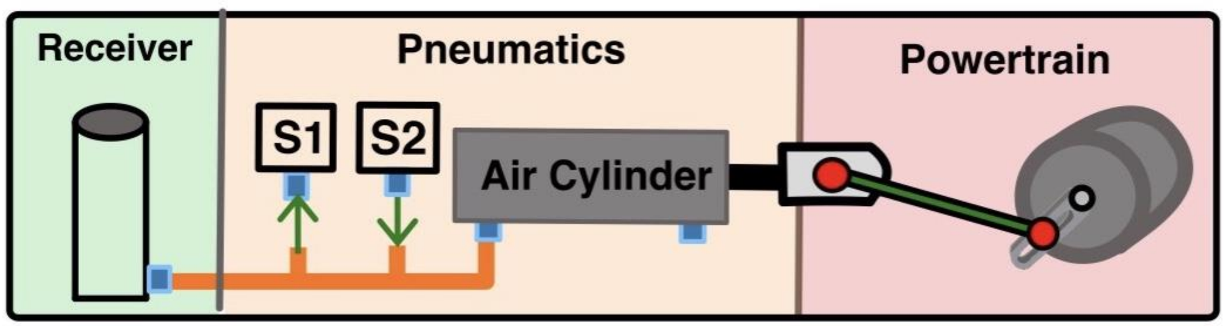
- Many power components use capacitors that store a large amount of charge. When you turn something off, there is still a bunch of stored up power. Be very careful around device you just unplugged, especially higher voltage controllers.

Updates

If you are using the 100w motor and face mounting it per this guide, it really helps to have a spacer between the motor and aluminum. I have a 3d printed one that can also be used as the drilling template. https://www.thingiverse.com/thing:5378599

Design

The machine design is just a simple, reciprocating / thrusting style machine with a fixed air cylinder at the end. In place of thrusting a dildo it pushes and pulls the rod on a dual acting air cylinder. For about $30 this can be made to be a dual-purpose machine, but it adds too much complexity to include in this guide. If there's interest there will be a future guide to show how to turn this into a thrusting style machine.



The motor spins a rocker arm which is attached to one end of a tie rod. The other end of the tie rod is connected to the rod on the cylinder. The front port of the cylinder is left open while the rear port has a push to connect fitting on it. From there pneumatic tubing connects two solenoids (or manual push valves) that each have a one-way check valve. By opening the valve that lets air out, suction is increased and the receiver moves closer to the body. Letting air in gives the receiver a longer stroke while also pushing it away from the body.

The benefit to using electric solenoids is that we can add some extra fun by hooking it up to a $10 microcontroller. Sessions can easily be created that vary speed, stroke length, and even move where the stroke happens – sort of walking the receiver up and down while it strokes.

Supplies

Below is a list of the major components. The Bill of Materials has a complete list of items with some options.

Powertrain
- Motor, controller and power supply
    - 24v, 100w, 4Nm torque, max speed of 220RPM
- Transmission which includes
    - Rocker arm for motor shaft
    - Tie rod / threaded rod with ball joint rod ends

Pneumatics
- Air cylinder
- (2) Solenoids or manual air release valves (for a grease gun)
- Tubing kit

- One-way valves (2)

Stand

- 18” or longer piece of aluminum that is at least 4” wide. This is just where we mount the motor and cylinder. Can be flat, angle, or channel. 1/8” thick works fine and is easier to drill, but ¼” is more stable

Receiver, if making your own

- Polycarbonate tubing
- Rubber end cap
- One way valve
- Liner

Tools

- Drill with bits for drilling aluminum (HSS is fine, no need for Cobalt)
- Calipers

Assembly

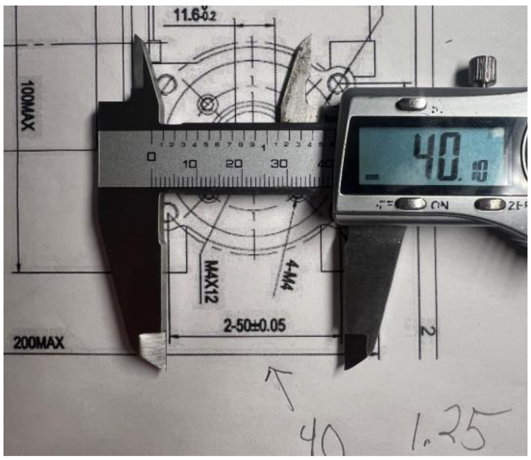
Mounting the motor

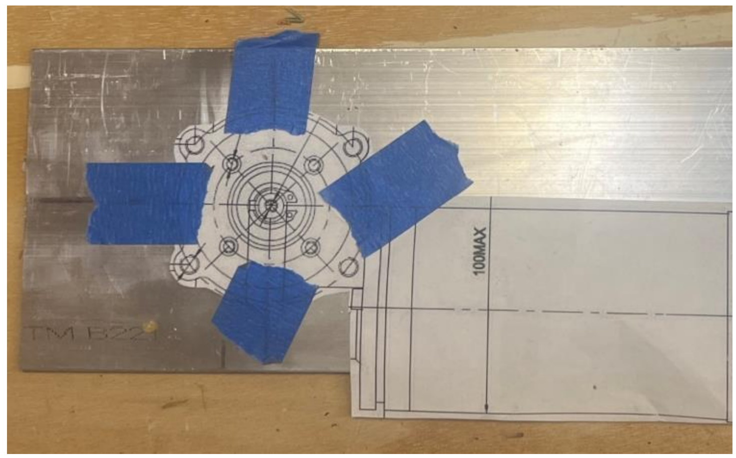
Both the motor and the cylinder’s mount require holes drilled in the aluminum. Regardless of the motor model, the shaft of the motor and the middle of the cylinder mount should be in line with each other and centered on the width of the aluminum. Mark the position for the motor shaft about 3” from the edge and centered on the width.

With the shaft marked, we need to choose how to mount the motor. Since I typically only build milker / thrusting combination machines, I usually put the motor perpendicular to the aluminum. It helps with balance when the motor is positioned down, but you can do whatever you want. Having it be parallel can make it more compact and also hides the wires.

The holes we need to drill for the motor need to be precise. To make this simple, just print out the technical drawing that shows the mounting points at 100% scale. If you don't have the drawings, just contact the vendor and they should be able to email them to you. Most drawings will be at 100% scale already, but just measure the legend with some calipers to verify. As a worst-case scenario, you could try to scan / copy the actual motor.

With the diagram at 100% scale, tape it on the aluminum exactly as you want it mounted. Make sure it is secured well so it doesn't have any room to wrinkle or move.





The diagram shows 50mm between the arrows, but the calipers showed 40. I printed at 125% scale and taped it to the aluminum.

While a drill press will make this much easier, it's not too hard with a hand drill. When the bit first touches the aluminum, the spin will pull the bit off center in the direction of rotation. Multiply this tiny error by the number of holes and it can be a real problem. To minimize this, the first step is to create a dimple with a center punch and hammer so the bit stays in place.

Here are my steps for drilling the holes for the mount points:

1. Start by punching a dimple for the pilot holes with hammer and a center punch. If your bit is walking out of center, make the dimple bigger – it should be big enough that the bit prefers to drill down than walk out.
2. Put a small amount of cutting fluid like Tap Magic on the aluminum to reduce heat and wear on your bits.
3. Set your drill on low speed and start with a 1/16" or 2mm bit. Use very light pressure while holding the drill perpendicular to the aluminum. Any lateral pressure will cause a bit to snap or the hole to be off center. The bits snap easier than you might think.
4. When pilot holes are complete for all, remove the drawing and drill the motor shaft hole to completion first. The shaft is 10mm, so I usually drill out to 11mm or 7/16".
5. Enlarge the pilot hole for the shaft in increments – I usually go 2mm, 4mm, 8mm, 11mm. The steps keep the pressure required and heat to a minimum.

6. Once the motor shaft is complete, line up the motor putting the shaft thru the hole and check to see that the other pilot holes are in place.
7. Repeat for each mounting hole. The mounts are 6mm, so the final bit should be a 5/16" or 8mm. Like the shaft, go up in 2-3 steps.
8. Verify the fit again, using M6 bolts to secure the motor to the aluminum. If everything is good, remove the motor and go on to mounting the cylinder.

If the holes don't line up, the first thing to do is figure out what went wrong so you don't repeat the same mistake. Was the diagram off or your bit walking all over before getting a hold? If there is only one hole off, that's fine. I would just continue to mount the cylinder leaving off one of the motor mounts. After you use the machine for a while, then you can decide to perfect it as needed.

If you need to start over, you can move the mount an inch towards the cylinder or use the other end. There's flexibility in where the cylinder mounts. It can move 1" either closer to or further from the motor with no impact to functionality. See the section for mounting the cylinder, then mark up the aluminum with both the new motor and cylinder mount points to ensure it will work. Extra holes are just an eyesore, it isn't going to impact the structure.

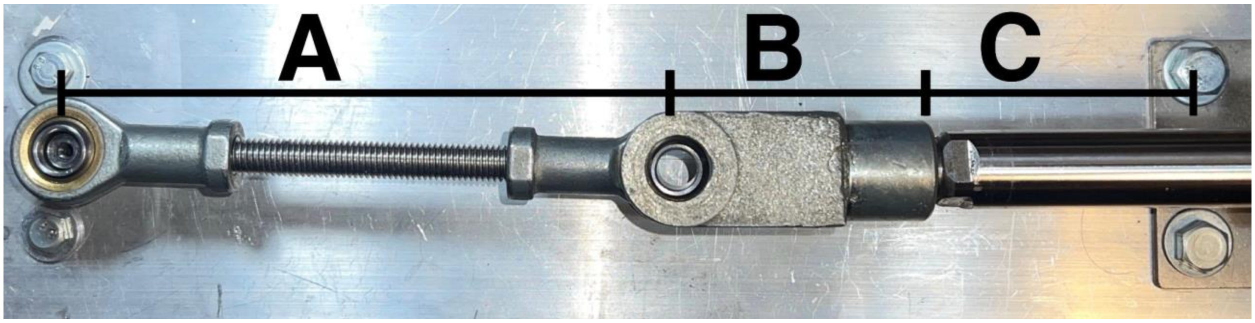
Tips:

- Lubricating or cutting oil will make things easier. It reduces the heat buildup and also keeps some of the tiny shavings from flying out. I use Tap Magic, but even WD40 will help here.
- Wear goggles! I was a bit careless until I started working with metal. Specs of aluminum can fly anywhere.
- Make sure the aluminum is secure and will not shift. Clamp it to your workspace so you have both hands available for drilling.
- You do not need to get any special bits for cutting a small amount of aluminum, however if you think you might do more metal working in the future, M35 cobalt or black oxide will stay sharper longer.

Mounting the cylinder

The cylinder needs to be mounted at a specific distance from the motor to allow the rocker arm to spin without going beyond the limit of the cylinder stroke. The ideal distance between the motor shaft and the cylinder mount can be roughly determined by adding up the length of the tie rod between eye centers, the length the joint added to the cylinder by the joint, and ½ of the cylinder stroke.

It is critical that the rocker arm can rotate completely, pulling and pushing the cylinder rod without hitting the ends of the cylinder's stroke. The best way to ensure this is to have the stroke centered in the cylinder's range. If the machine stroke is set to 50mm and our cylinder has a 150mm stroke, this means we have 100mm of extra space to place the cylinder. The closer the cylinder stroke gets to the machine stroke, the more accurate everything needs to be.



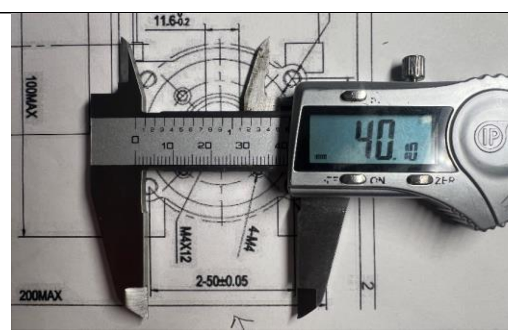
Starting on the left, centered on the motor shaft we add the distance of:

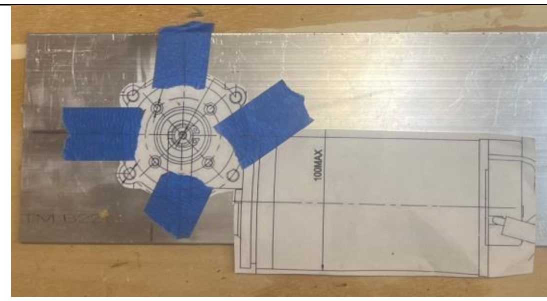
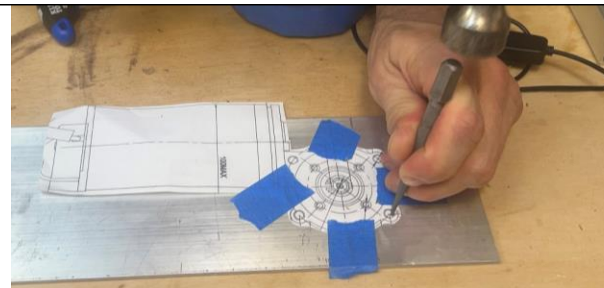
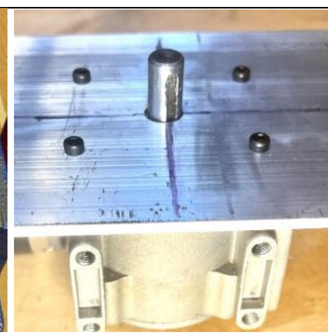
A. The tie rod eye centers (140mm)
B. The length of the Y joint (75mm)
C. Half the stroke of the cylinder (75mm)

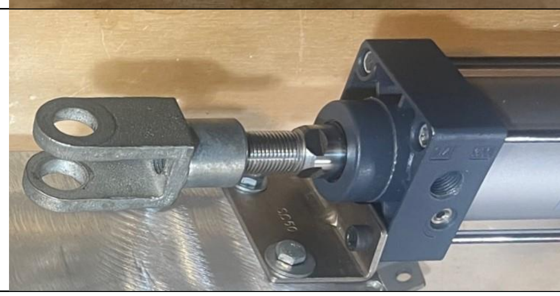
Make a mark 290mm or just under a foot from the motor shaft on the aluminum center. The LB foot flange for SC cylinders has center lines. Put the mount in position and trace out the hole locations on the aluminum. The mount holes for this SC50 foot flange are around 11mm in diameter. M8 screws are more than adequate for this installation. It helps to keep the hole size close to the screw size here. As the cylinder is being pushed and pulled, the extra space can cause some wobble. Follow the same process as the motor – center punch, start with a small bit and work up to 8mm.

With the holes drilled, test out the fit. To mount the cylinder, I find it easier to attach the mount to the cylinder first, then attach that to the aluminum.

Summary

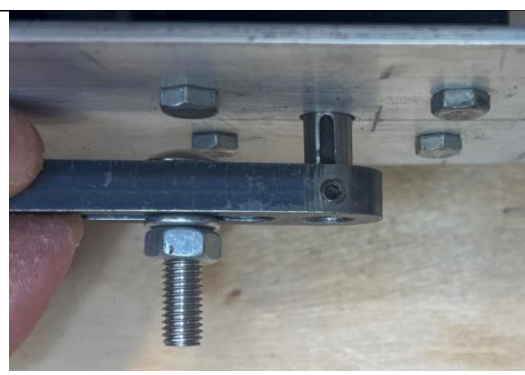
1. Mark the position for the motor shaft about 3" from the edge and centered on the width.	
2. Print out a diagram showing the motor face with shaft and mount holes at 100% scale. Use calipers on the drawing to verify the scale is correct. Here it should be 50mm while I measured 40mm. Printing at 125% scale worked perfectly.	

3. **Choose a motor orientation and securely tape the diagram.**	
4. **Created a dimple in the aluminum with a center punch at the center of each point that needs to be drilled. This will help minimize the amount of walking the bit does at the start.**	
5. **Using a 1/16th or 2mm bit, drill pilot holes for each point**	
6. **Drill the hole for the shaft first by stepping up the hole size until you get to 11mm. When complete, put the shaft through and verify things look ok. Here I just put M3 screws thru the pilots to verify all the holes are lined up.**	 
7. **Finish drilling the remaining mount points and test fit the motor.** Remove the motor to continue to the next step.	

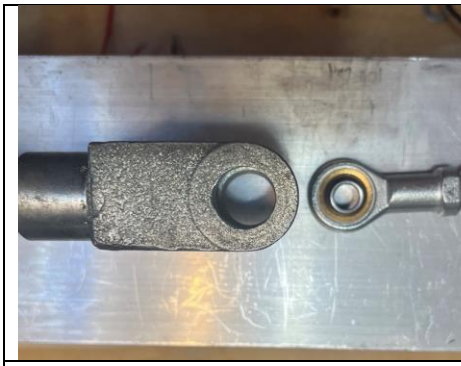
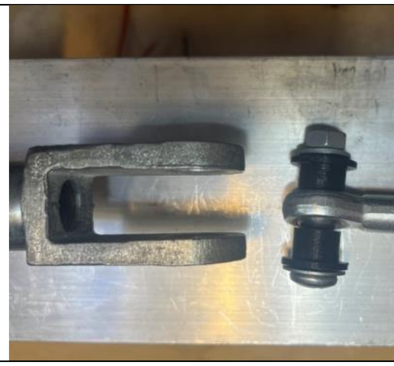
8. Place the cylinder mount the distance calculated above (A + B + C, about 12”) from the motor shaft and trace the mount holes. Repeat the same process as with the motor mounts, ending up with 8mm (5/16”) holes for M8 bolts.	
9. Make sure the rear port is pointing where you want it before attaching the mount to the cylinder.	
10. Use M8 bolts with lock washers and attach the cylinder’s mount to the aluminum.	

Transmission

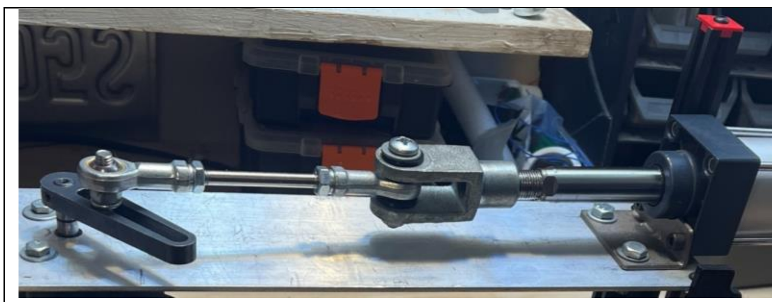
With the motor and cylinder mounted, we can connect the cylinder to the motor. First, set the desired stroke length on the rocker arm. This will need to be adjusted after you test it out, but 50mm is a good place to start. Place the center of the rocker arm bolt 25mm from the center of the shaft hole for the rocker arm. Attach the arm to the motor and tighten the set screws. Keep the arm as far from the motor as possible, which will give it extra height to align with the cylinder. Rotate the arm manually to make sure the arm is properly attached. Attach the clevis to the cylinder. It doesn’t need to go all the way in. This clevis joint can be used to add or remove distance to the motor shaft.

	
The stroke length doesn’t need to be exact. 50mm is a good place to start. The stroke length is 2x the setting on the rocker arm.	Remove the key if present and then align the set screw with the key slot for extra grip.

The complication with this cylinder is that the clevis has a 16mm hole and we have 8mm ends on the tie rod. If nothing is done to fill that gap, the tie rod will hammer around the space in the clevis. There are many ways to fix this. The easiest thing for me was to just print an adapter. PLA is good here – a slight flex is better than brittle strength.


Attach the tie rod to the cylinder with an 8mm bolt, a flat washer, the 8 to 16mm printed adapters, washer and nut.




Attach the other end of the tie rod to the rocker arm in the same way it came. The clevis can be tightened / loosened as needed for length.

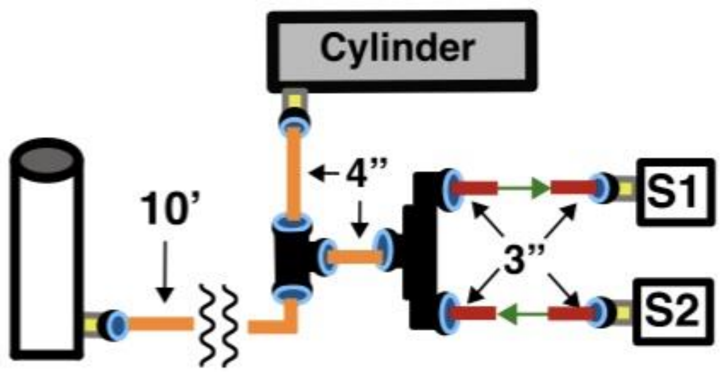
Summary

1. Set the stroke length on the rocker arm – around 50mm is a good place to start. Try to leave the tie rod attached. Just loosed the carriage bolt and slide to the right stroke.
2. If the motor shaft has a key, pull it out with pliers. Put the rocker arm on the shaft with one of the set screws in the key slot if it exists. Tighten the set screws and manually turn the rocker arm to see that its engaged. Make sure the motor is not hooked up to anything, when you turn a brushed motor, it generates electricity.
3. Attach the end of the tie rod to the clevis. To make up the gap between the 8mm tie rod and the 16mm clevis, I use spacers printed in PLA. Take an 8mm screw, a washer, one of the spacers and put it thru the clevis and tie rod. Then continue with another spacer, washer and nut. The photo really helps with this.

Attaching the air components

The layout of the tubing is very flexible. Before you cut any tubing, I suggest making a quick sketch of your desired layout. When I use electric solenoids for letting air in and out, I keep them close to the cylinder and motor to make installation / wiring easier. If you're using manual push valves, you probably want them close to the receiver. They could potentially be integrated into the cylinder, but I've never tried that.

The tubing should connect to the rear port of the cylinder while leaving the front port completely open. The rear port has more volume as it is outside of the cylinder's rod. If the front port has the slightest obstruction, it will cause significant resistance.



The tubing connects together with push to connect fittings. They require a near perfect cut to be airtight. This is difficult with scissors or a utility blade, but trivial for a $5 tube cutter. Use a tube cutter. Where the tubing joins the cylinder, the quick connect will have a pipe thread on one side. PFTE / Teflon tape wrapped around the thread one or two times can make a tighter connection. Excessive tape will cause problems.

Install all threaded parts

1. Attach a threaded push to connect fitting into the rear port of the cylinder.
2. If you're using solenoids, put the threaded push to connect fitting in the front port. The 2-way direction action solenoids in the BOM are not directional. Piloted solenoids can be directional and will not work for this installation as they require constant, positive pressure.
3. If you're using manual valves, attach them into female threaded push to connect fittings. Note that female NPT can be labeled as FNPT.
4. If needed, replace the connection on your receiver with a quick connect or install an appropriate adapter. Usually some sort of male / male barbed adapter works fine.

Complete the one-way valves

1. Using a tube cutter, cut four 3" pieces of tubing. The actual length isn't very important and might be different for your installation.
2. Attach each to the one-way valves. Be very careful not to break off an end of the one-way valves. They are quite fragile. If it's a very tight fit, you can use a bit of heat to loosen up the tubing. Make sure the tubing is as far in as it can go. Don't worry if it isn't perfectly air tight yet.
3. Attach the one-way valves to the push to connect fittings on the solenoids or manual valves.

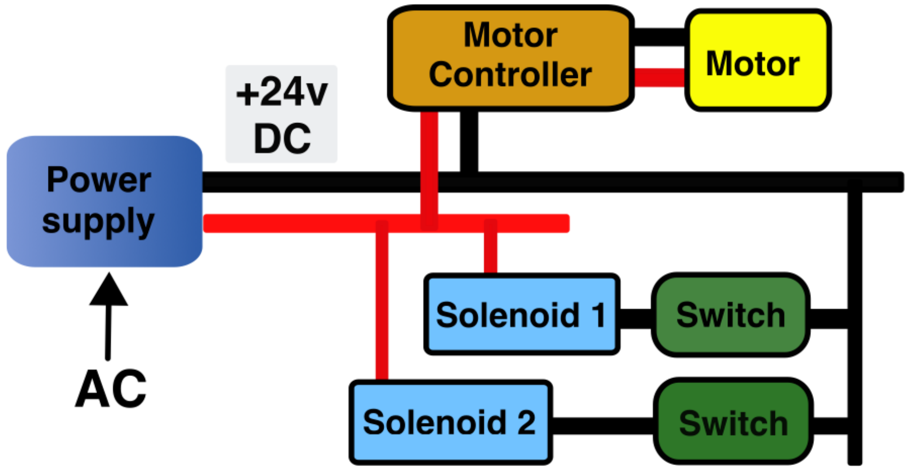
Electric solenoids with 6mm PV tube with the rather fragile, aquarium style one-way valves, mounted on a simple printed part to attach to an aluminum profile frame.	
$2 grease gun bleeder valves conencted into female NPT threaded push to connect with 3/8” PV tube and plastic check valves.	
With a strong polycarbonate receiver, a $5 manifold can act like a handle while holding the one way valves.	

Connect the receiver and cylinder lines

With all the threaded connectors and the one-way valves complete, there are only two tubes to connect. I use about 6” of tube to connect the cylinder to the solenoid branch and 10’ to connect to the receiver. For manual valves I do the opposite so the valves are close to the receiver.

Electrical

Before connecting any of the electrical components, make sure you know which wires are positive, negative, or ground. Color coding is not universal. Parts come from around the world so you might see brown and blue instead of red and black. Hooking up the wrong polarity can cause damage. Make sure the gauge cable can support the required load. If there’s doubt use a lower gauge / thicker cable. 18g should be fine for all the required wiring.



The electrical is going to be specific to your power source and motor controllers. The basics are AC goes into a power supply. The power supply outputs 24V DC. The motor controller takes the DC in and has a DC out to adjust speed. The input to motor controller is sensitive to polarity – positive can't be swapped with negative.

For the most part, brushed DC motors and solenoids don't care about positive or negative – motors just run in the opposite direction with their polarity reversed.

Caution - When you manually turn a brushed DC motor shaft the motor is now a generator and electricity will be coming out of the motor. This is less of a hazard to you than other electrical components, but care should be taken regardless.

Caution – Many power components use capacitors that store a large amount of charge. When you turn something off, there is still a bunch of stored up power. Be very careful around device you just unplugged, especially higher voltage controllers.

Test and finalize

With the wiring complete, it is time to give it a test. Make sure everything works as expected. Adjust the stroke as needed – longer stroke length on the rocker arm means longer strokes on the receiver. Once you have everything where you like it, I strongly suggest adding thread locker to the M8 bolts attaching the cylinder mount and clevis. I use the weakest kind so it is removable, and it holds perfectly. If you don't use thread locker, eventually the machine will unscrew itself while running.

Notes and other things shoved at the end

There is significant resistance when a cylinder first starts after sitting for a bit. You can give it a push by hand if needed, but the 80 and 100w motors haven't had much of a struggle.

The ends of the stroke on most cylinders are padded to prevent the rod from slamming against the walls of the cylinder. There should be an adjustment for the strength of the pad, but you really do NOT want to be running the cylinder in the padded zone. The resistance is huge.

There should be a diode placed on the motor. When an inductive load like a motor stops, it has potential to kick back electricity. This can damage sensitive components, like small microcontrollers. Motor controllers likely are already protected, but if you're adding anything, you really need to put a diode between the terminals on the motor.

Please go back and put thread locker on the M8 nuts for the cylinder mounts and clevis.

Pipe threading is a real pain if you're buying off of Amazon. Do not implicitly trust the listing or the vendor. Read the reviews to see if there are a lot of people complaining about the fit. I have several "NPT" threaded solenoids that are BP.

In the BOM, there is a link to a very inexpensive item that includes the tie rod complete with rod end bearings and the rocker arm with two set screws. There are dozens of vendors selling what appears to be the exact same items on Alibaba / AliExpress, giving you the only choice of shaft size and rocker arm length. However, you need to check to make sure the rod ends are the correct size as well as the rocker arm slot the rod ends connect to. While one vendor uses 10mm rod ends when you select a 10mm shaft size, others might use 8mm rod ends regardless of the shaft size.

Wireless App – separate guide

Building physical user interfaces (buttons, dials, etc.) takes a lot of time and isn't very flexible. Because I build a lot of things that use motors, pumps, solenoids, heaters, and sensors, I designed a very simple box and control system that allows me to app enable anything quickly. It was getting to be way too much work to keep making control boxes for each device. It is entirely programmatic – you can have preset configurations for different types of sessions - start slow, build, stop entirely, change the stroke length, do whatever you want for as long as you want. The code is way beyond the scope of this doc, but here's a brief hardware overview and screenshots.

An ESP32 microcontroller running Blynk controls 4 MOSFET boards. Each MOSFET board supports 30A / 400w and costs around $2. The MOSFETs output to their own DC barrel jack to a single aviation connector. I wire my motor and solenoids to terminate with a male barrel jack so they plug right in.

- App driven, completely programmatic (timers, sessions, min and max settings for safety)
- Controllable over the internet
- Programmatically adjust air to modify the stroke length and position
- Control of heat, eStim, pressure
- Sound or Voice reactive (voice is barely functional)

Appendix and Notes

Advanced

- App driven, completely programmatic (timers, sessions, min and max settings for safety)
- Controllable over the internet
- Programmatically adjust air to modify the stroke length and position
- Heat, eStim, Music, Sound or Voice reactive

NOTE: I have had a tremendous amount of incorrectly labeled pipe threads. Make sure you're putting the right thread in. The most common error is that tapered pipe threads, like NPT, are not tapered. It doesn't matter what thread you use as long as it matches what it's going into. If possible, buy cylinders that come with push to connect adapters.

Improvements

The design here is not optimal. Here is a list of improvements being worked on.

1. Replace SC cylinder with SDA of the same bore and stroke.
    a. This removes about 12" from the total length
    b. The SDA has M10 female threading in the rod – much easier to work with than the M16 male threaded rod in the SC-50.
2. Create a stand or enclosure for the machine.
    a. This guide just mounts all the components to a piece of aluminum.
    b. Noise reduction would be significantly reduced with some rubber spacers between various components.