# DPS T3/T4 Hybrid Turbonator®

# Installation Instructions

# * IMPORTANT *

- **DO NOT CLOCK OR LOOSEN ACTUATOR, IT HAS BEEN CLOCKED AND PRE-CALIBRATED FOR YOUR SPECIFIC APPLICATION. DOING SO MAY MAKE YOUR VEHICLE RUN POORLY, AND CAN VOID WARRANTY!**
- **IF RE-CLOCKING THE HYBRID ACTUATOR, AVOID PLACING IT ABOVE THE EXHAUST MANIFOLD AND VGT TURBINE HOUSING, AS EXCESSIVE HEAT MAY CAUSE DAMAGE. IF NECESSARY, ENSURE THE ACTUATOR IS HEAVILY SHIELDED FROM HEAT.**
- **DO NOT PLACE THE PNEUMATIC SOLENOID OR AIR REGULATOR ABOVE THE TURBO OR EXHAUST MANIFOLD, AS RISING HEAT CAN DAMAGE THE SOLENOID ASSEMBLY.**
- **ALL FITTINGS AND PLUGS LOCATED ON THE HYBRID ACTUATOR NEED TO BE AIRTIGHT. IF LEAKS ARE PRESENT HOT EXHAUST GAS CAN FLOW THROUGH THE SYSTEM AND DAMAGE THE HYBRID ACTUATOR.**
- **THIS SYSTEM REQUIRES THE USE OF AN ON-BOARD AIR COMPRESSOR.**
- **NEVER ENGAGE DPS EXHAUST BRAKE SWITCH WHILE USING CRUISE CONTROL.**

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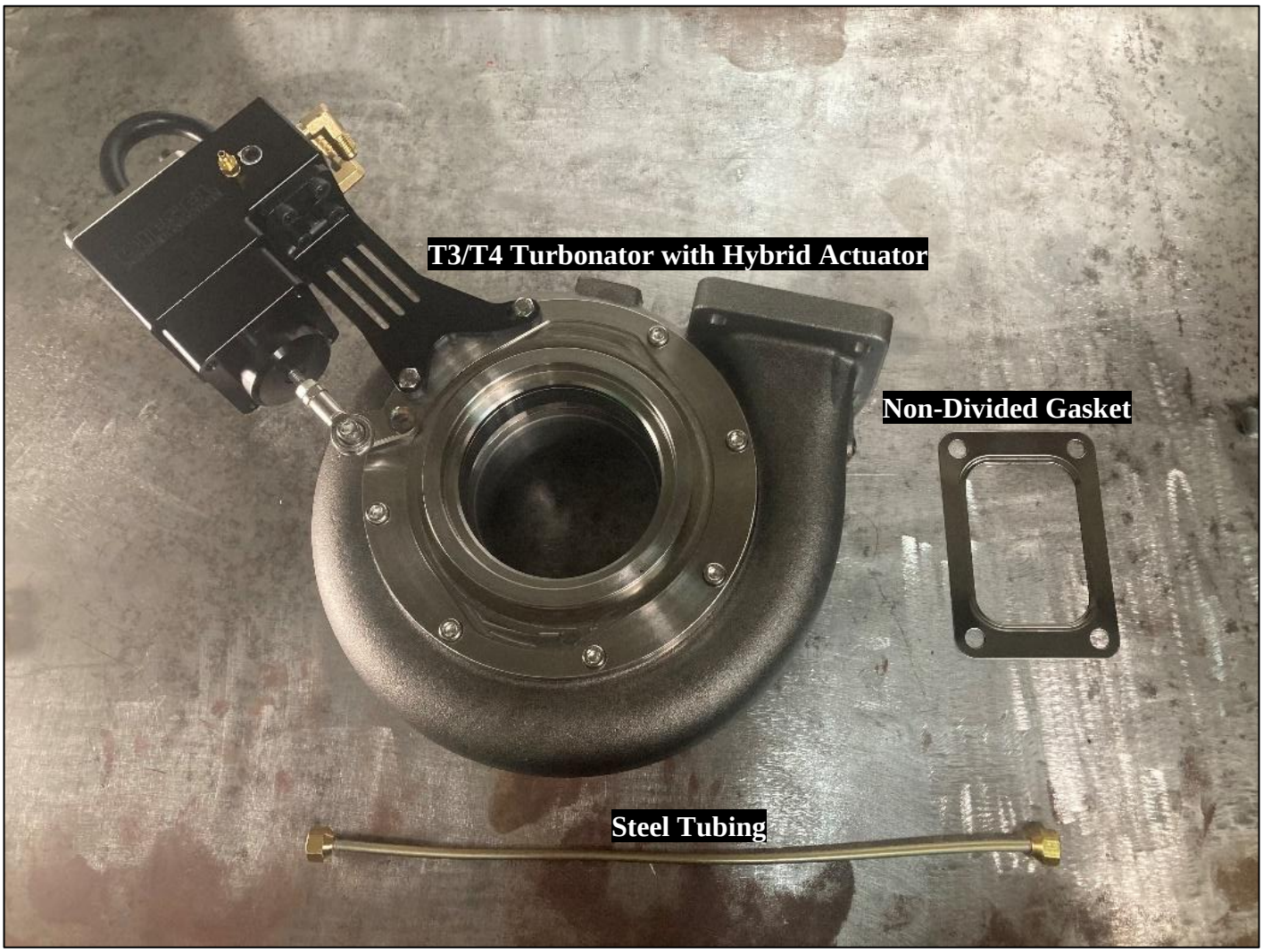
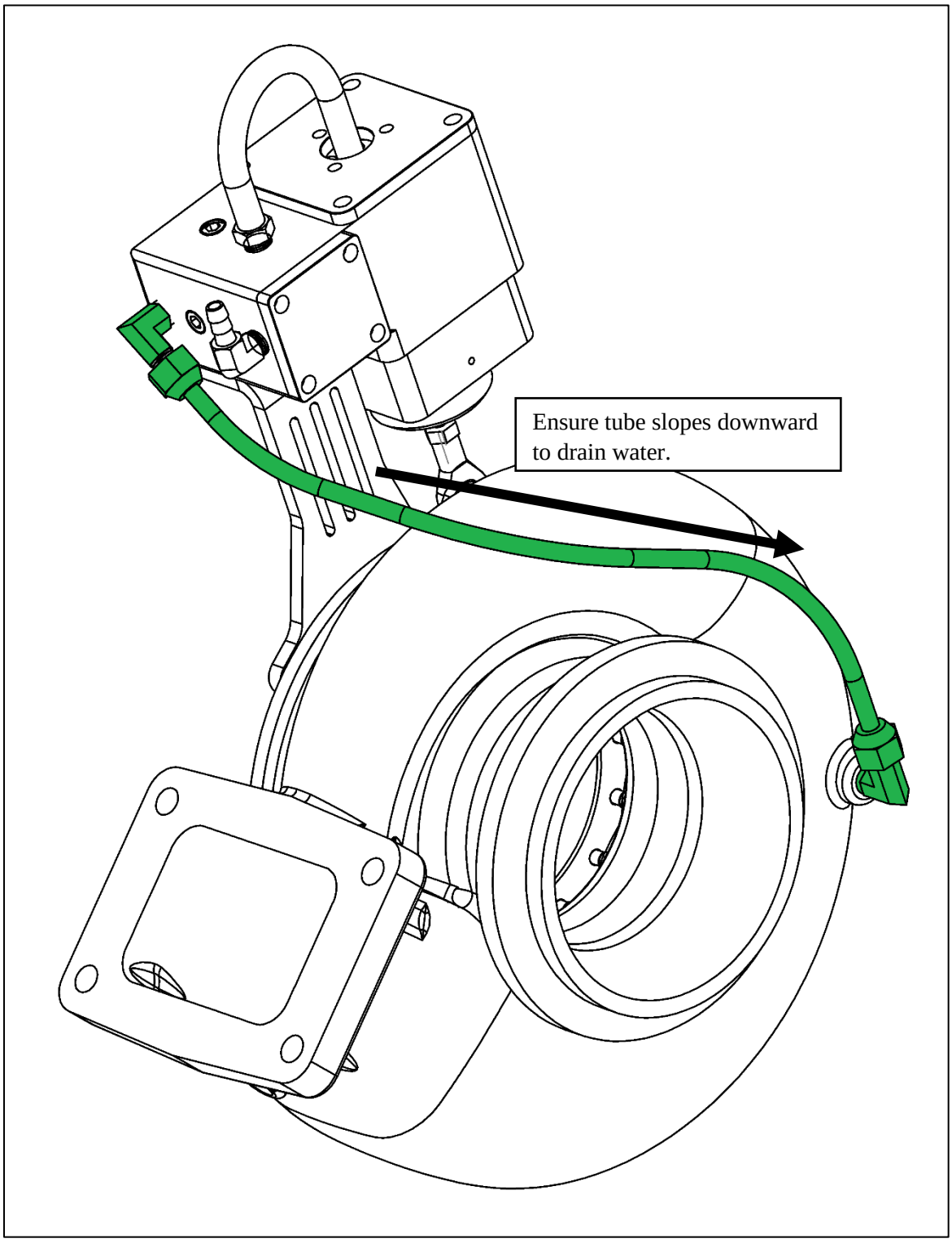
# T3/T4 Turbonator Installation Instructions

Included with your hybrid actuator kit is a non-divided gasket, steel tubing, and Turbonator VGT Housing




**Step 1:** Attach your new Turbonator housing to your exhaust manifold. Be sure to place the provided gasket between the turbo flange and the manifold flange.

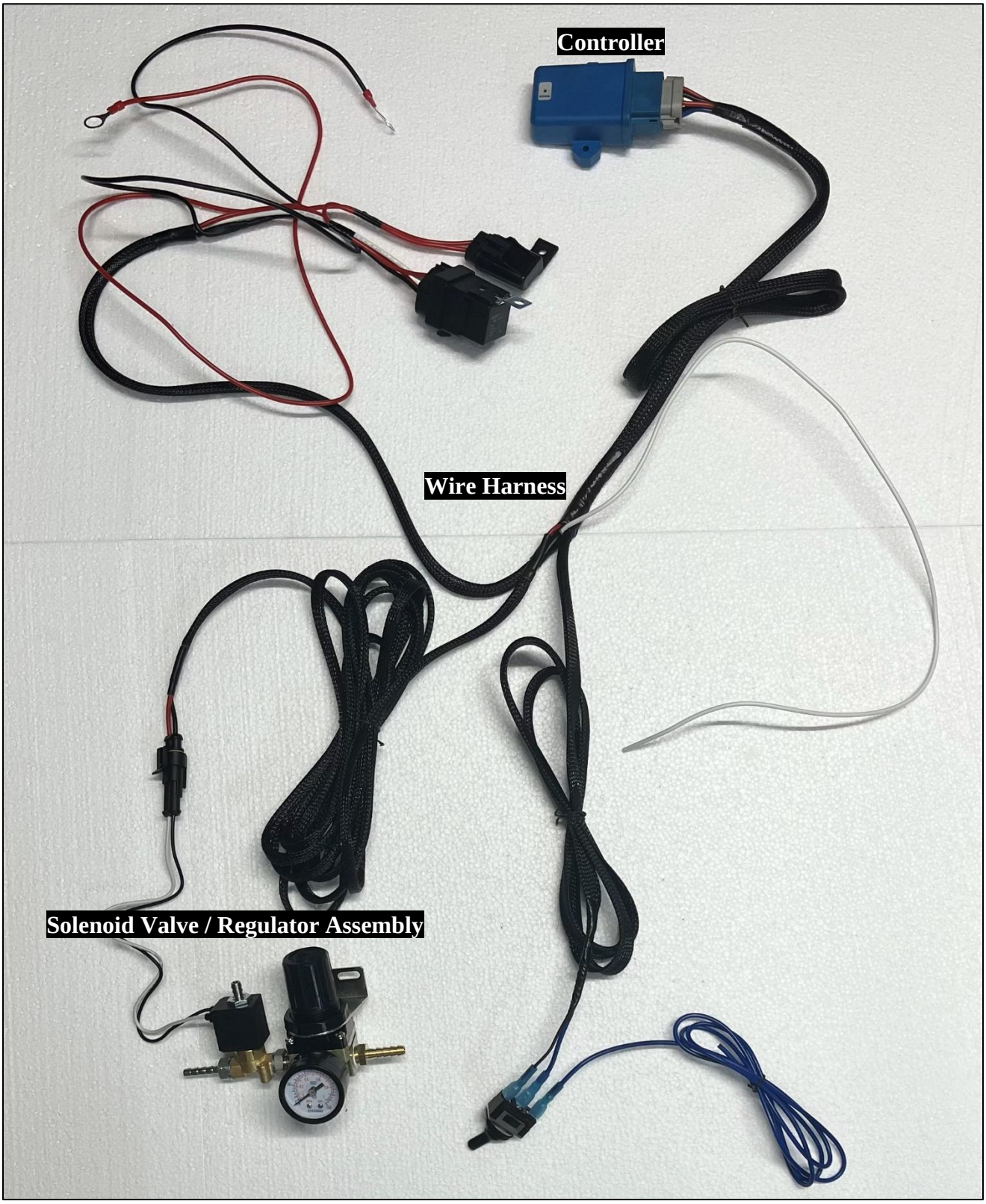
**Step 2:** Route the steel tubing from the hybrid actuator to the Turbonator housing. Ensure the steel tube runs down from the actuator fitting to the turbine housing fitting. Condensation can accumulate in the tube, and it must drain away from the actuator. If this condensation accumulates in the actuator the actuator can be permanently damaged. Refer to the image bellow.



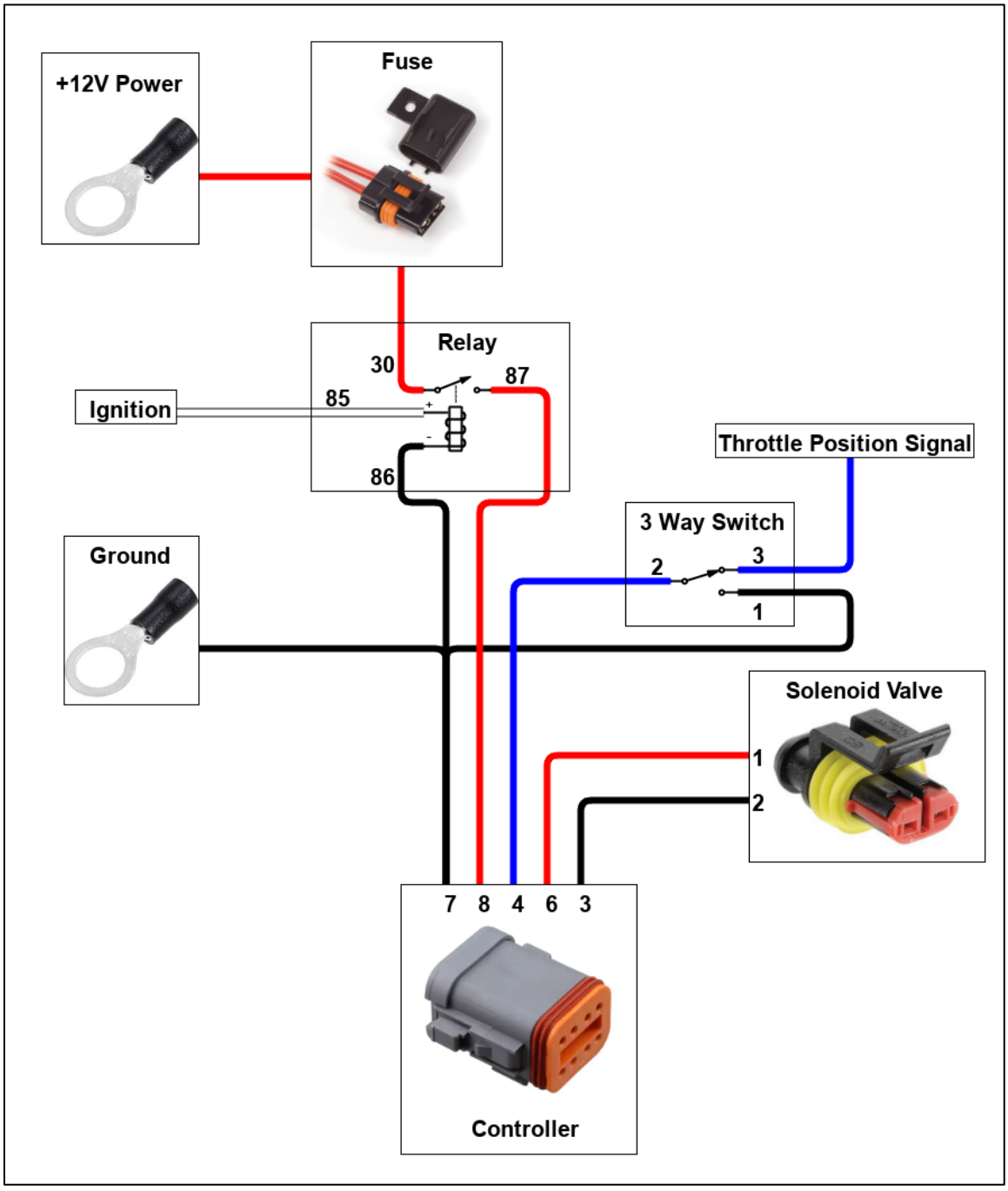

**Step 3:** If you have separated the turbo or purchased just the exhaust housing separately, attach the turbo center cartridge to the previously installed Turbonator housing.

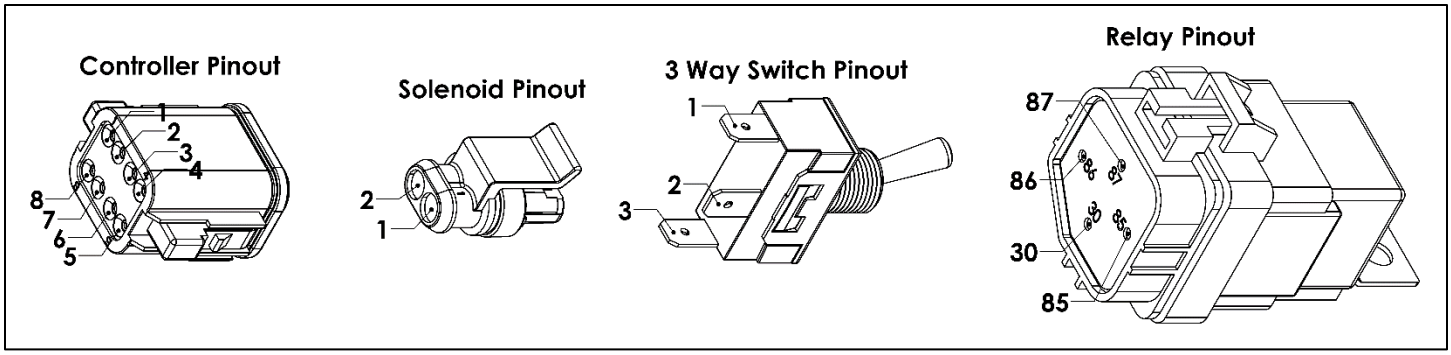
# Hybrid Exhaust Brake Electronic Instructions

Included with your T3/T4 hybrid actuator kit is a controller, wiring harness, and pneumatic solenoid valve / regulator assembly.



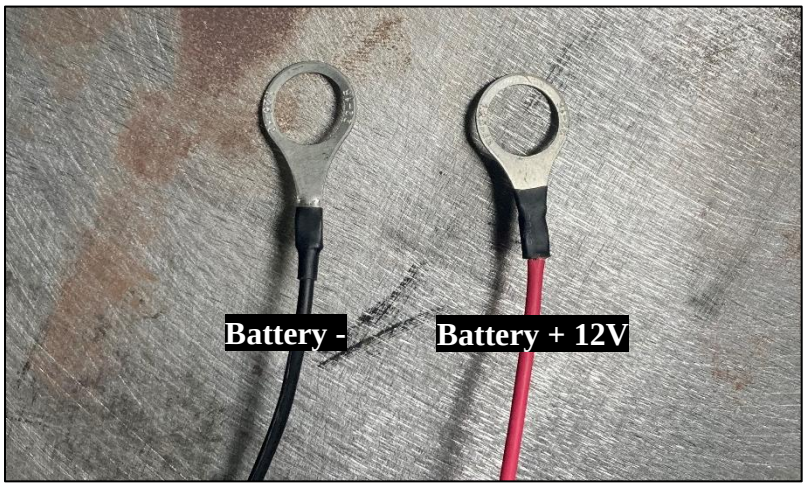
# Hybrid Exhaust Brake Harness Schematic



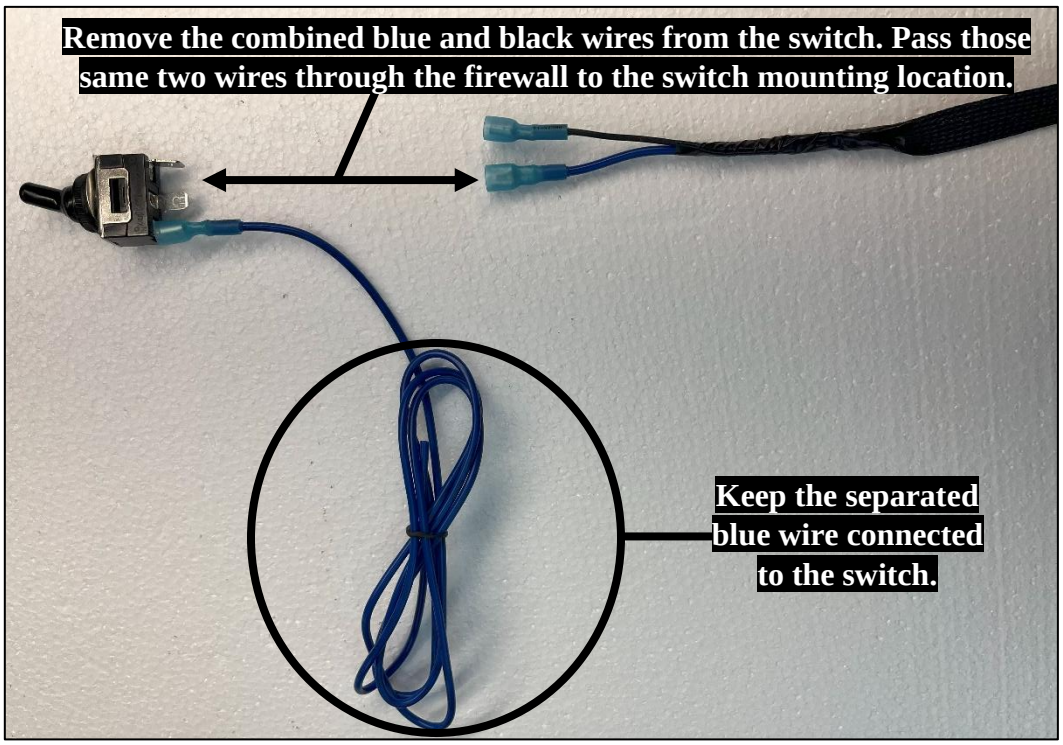
**Step 4:** Connect the exhaust braking controller to the wiring harness.


**Step 5:** Attach battery power: BLACK ring to negative and RED to positive terminals of the 12V battery.

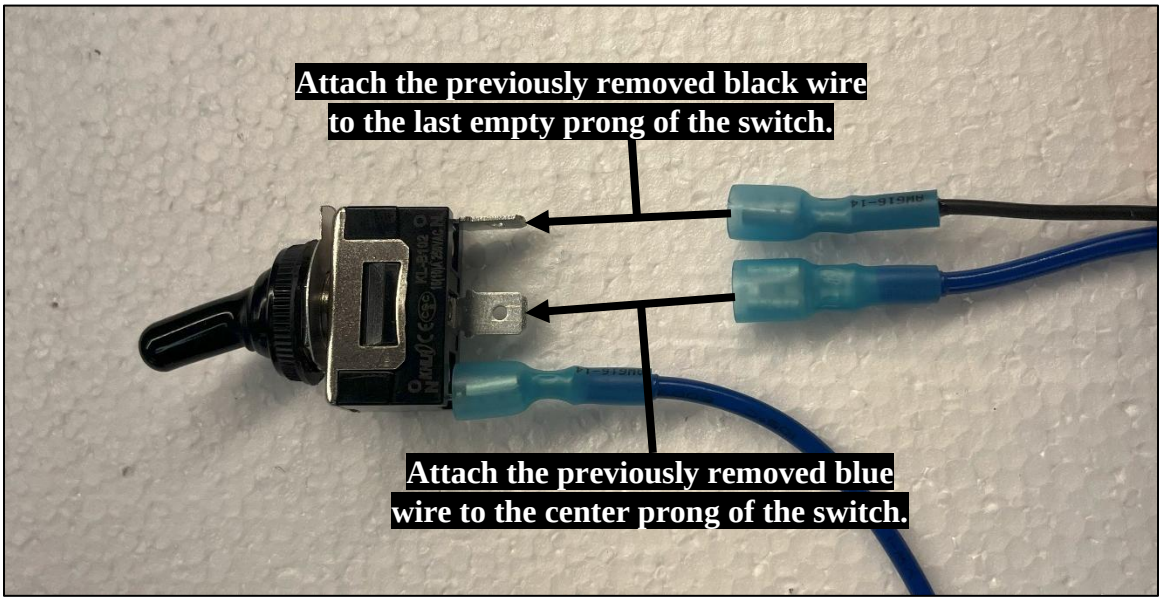



**Step 6:** Attach the white Ignition/Accessory Power Wire to an ignition-controlled wire. This will allow the controller to turn on and off with the ignition switch (usually in your fuse panel). This will prevent the controller from draining battery power while the truck is turned off.

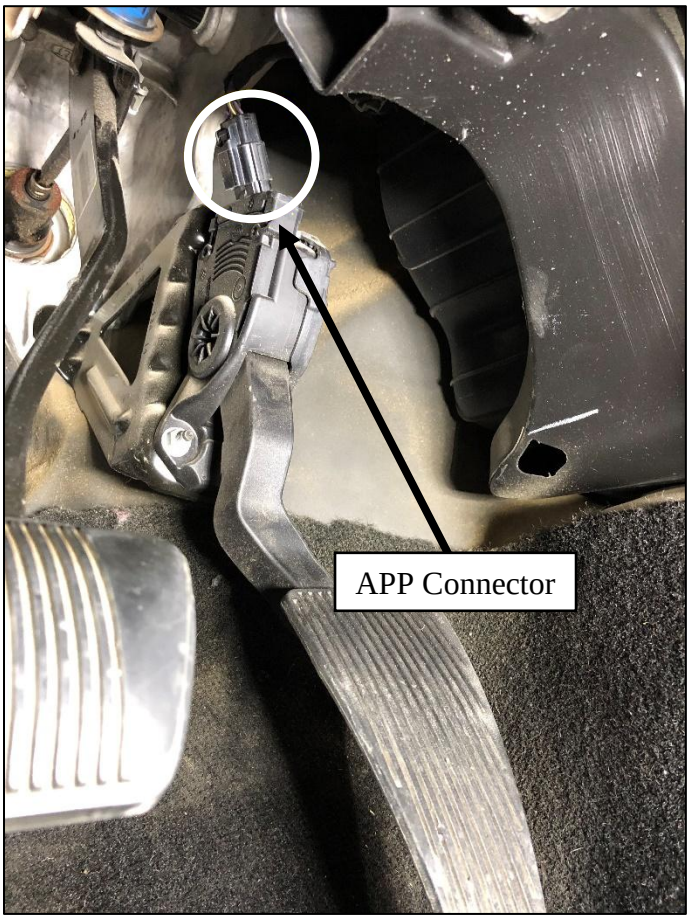
**Step 7:** Remove the combined blue and black wires that are connected to the wire harness from the 3-prong exhaust brake on/off switch. Keep the separated blue wire connected to the switch. Pass the combined blue and black wires through the firewall of your truck to a location where you would like to mount the switch.




**Step 8:** Once the wires have been passed through the firewall reconnect them to the 3-prong exhaust brake on/off switch. Attach the blue wire to the center prong and the black wire to the last empty prong. Mount the exhaust brake on/off switch in the cab of the truck. Mount it for easy access so you can engage and disengage exhaust braking while driving. Use a 1/2" drill bit to drill the hole for the exhaust brake on/off switch then fasten the switch to the mounting location. Ensure the switch is in the off position. **WARNING: Use the switch provided with your wiring harness! This switch controls the throttle position signal voltage to the controller, and it is critical that this signal remains clean for the controller to function correctly! Using any other switch, especially any LED powered switches will disrupt the throttle position signal. This will cause the controller to not function properly and result in a faulty exhaust brake!**



**Step 9:** Locate the factory Accelerator Pedal Position (APP) sensor. Unplug the factory APP connector by pressing the release button. Carefully peel back the protective sheathing to expose about 1 ½ inches of wires. Be careful to not cut into the insulation on the individual wires. On the factory APP plug, locate the sensor signal wire (see table below for wire identification). The exhaust braking controller uses the throttle position to activate exhaust braking when you are not throttling and deactivate exhaust braking when the throttle is engaged. The voltage along the wire needs to change from approximately 0.4 volts at idle, and 4.5 volts when the pedal goes from idle to fully depressed. (**Note:** If you specified in your order to not use throttle position control and opted to engage the exhaust braking with just the switch. You will neglect steps 9 – 11 and tie the blue throttle position cable directly to a 12V.)

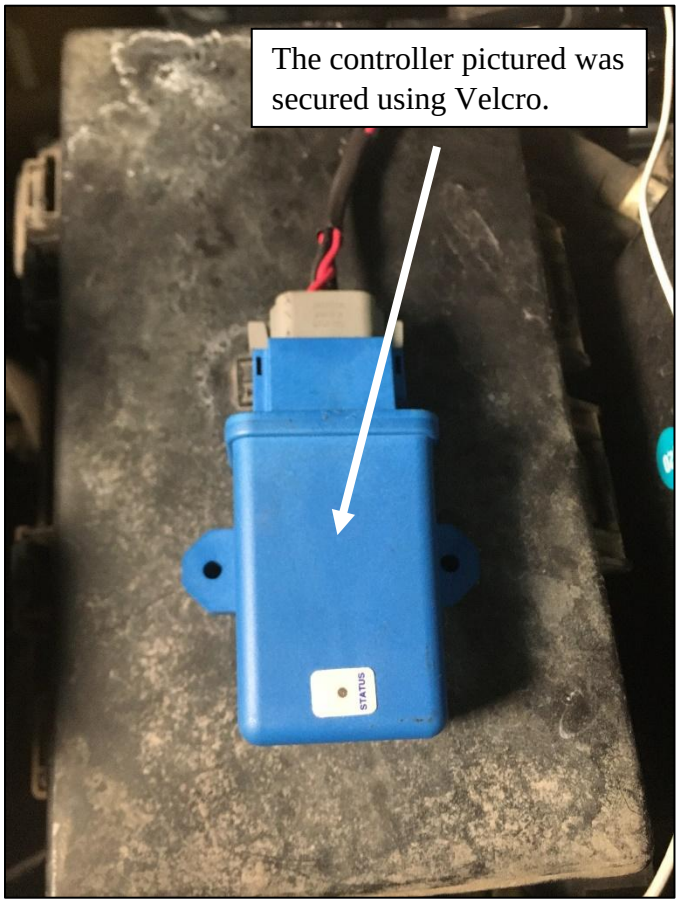



| APP Signal Wire Identification Table for Dodge Cummins | |
|---|---|
| 1996-1997 | Dark blue wire |
| 1998 | Orange wire with dark blue stripe |
| 1999-2002 | Light blue wire with black stripe |
| 2003 | Yellow wire |
| 2004-2007 | Brown wire with white stripe |
| 2007.5 – 2009 | Brown wire with white stripe |
| 2010 – 2012 | Brown wire with light green stripe |
| 2013 – 2014 | Brown wire with light green stripe |
| 2015 – 2018 | Brown wire with white stripe |

**Step 10:** Thread the provided wiretap to the throttle position wire located in the last step. Ensure the pointed tip of the wiretap pierces the wire to create a secure electrical connection.

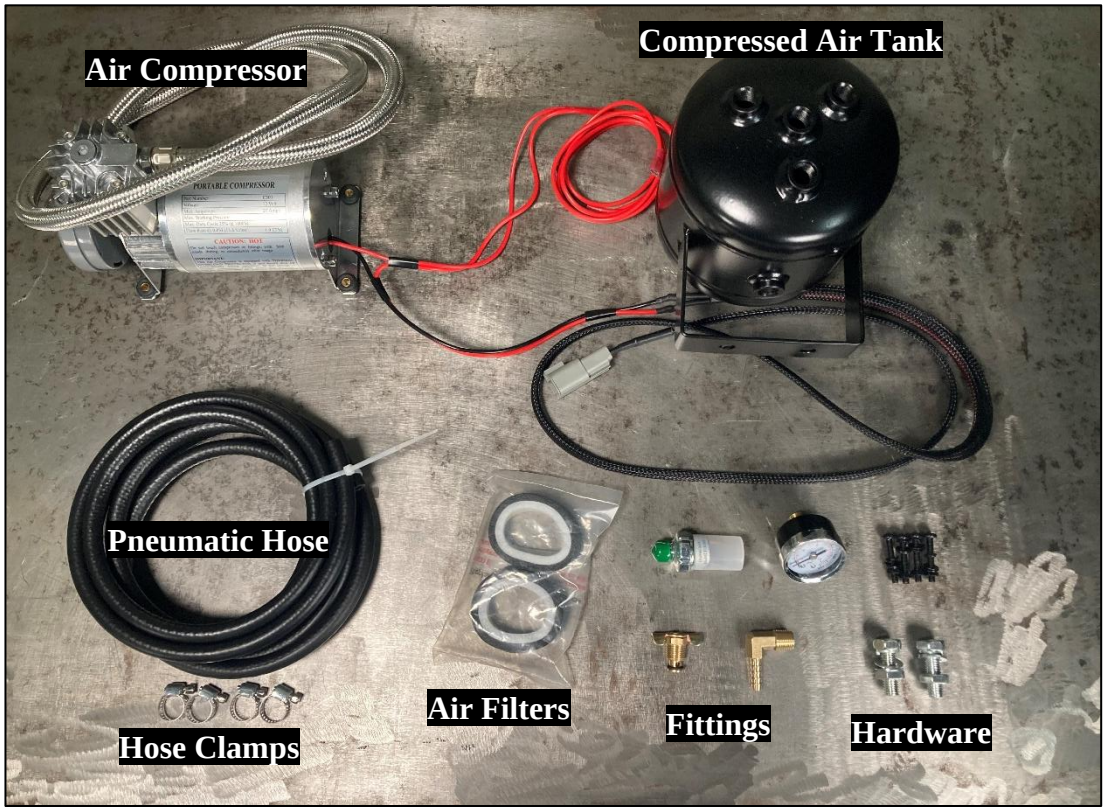
**Step 11:** Pull the stripped end of the blue throttle position cable connected to the switch toward the tapped wire from the last step. Remove the cap from the wiretap and push the blue wire through the cap. Then place the stripped portion of the blue wire into the top of the wiretap. Finally screw the wiretap cap back on, ensuring the blue wire does not get pulled out in the process. Once you are done pull on the blue wire to ensure it does not separate from the wiretap.

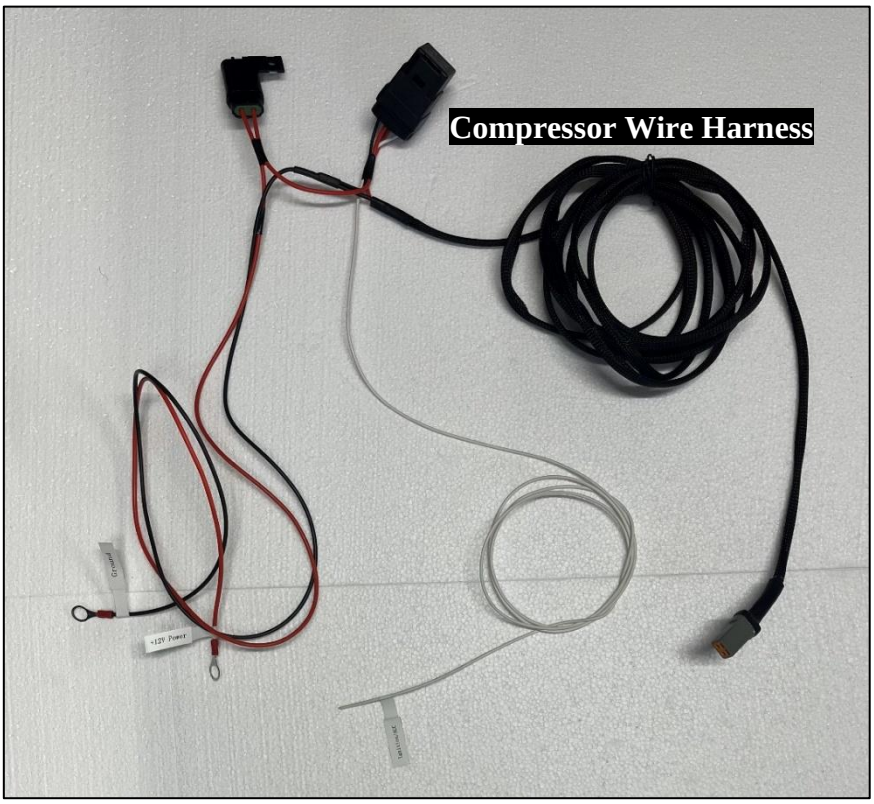
**Step 12:** Securely mount the controller under the hood of your truck and use zip ties to secure loose wires.



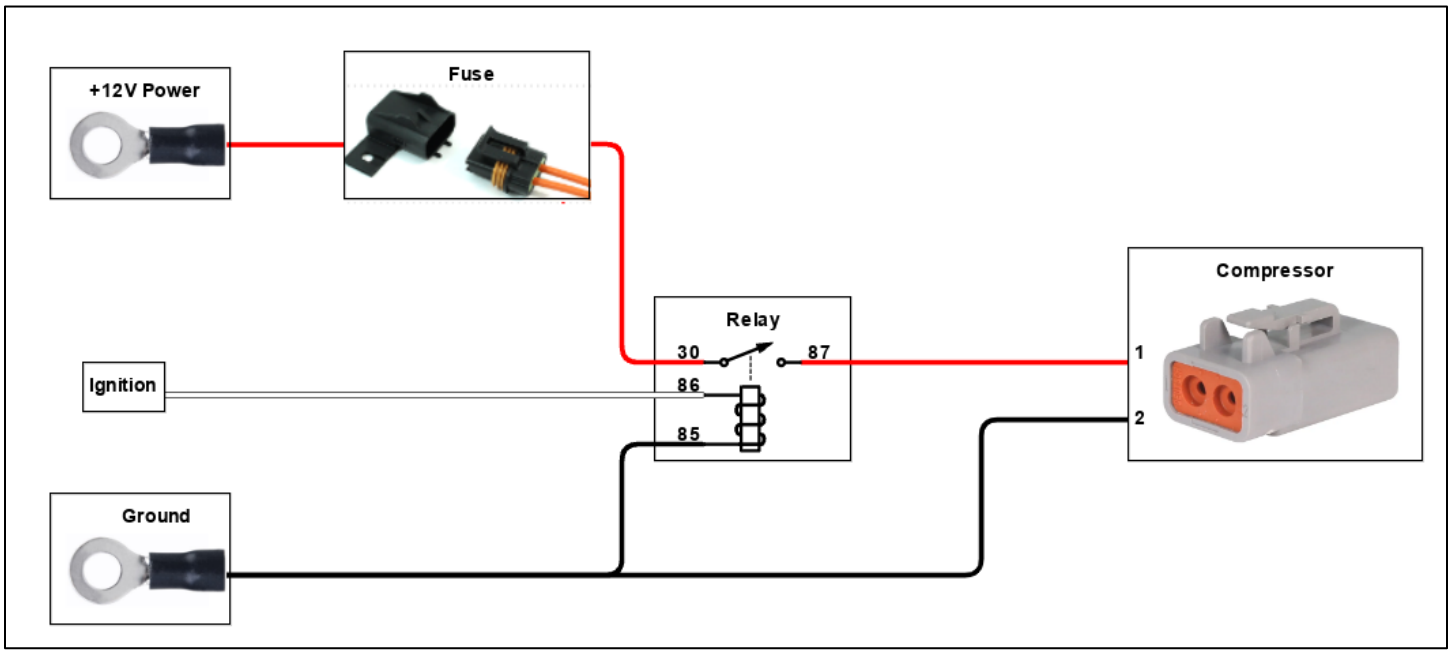
# Pneumatic Instructions

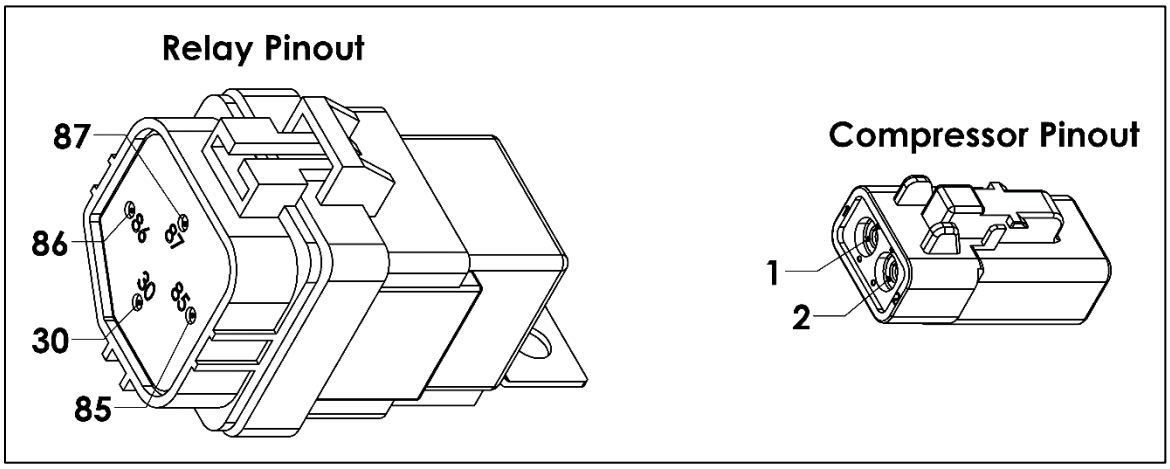
Included with your hybrid actuator kit is an air compressor, compressor wire harness, compressor filter, compressed air tank, 2 five-foot lengths of pneumatic hose, 4 hose clamps, fittings, and mounting hardware.



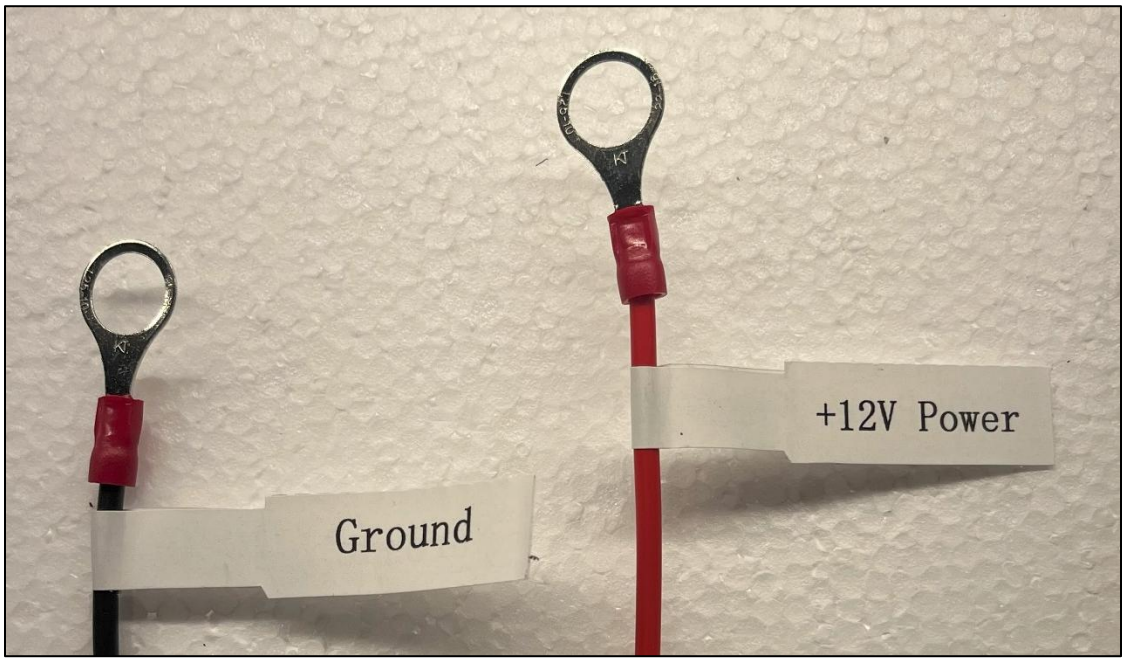



# Compressor Harness Schematic

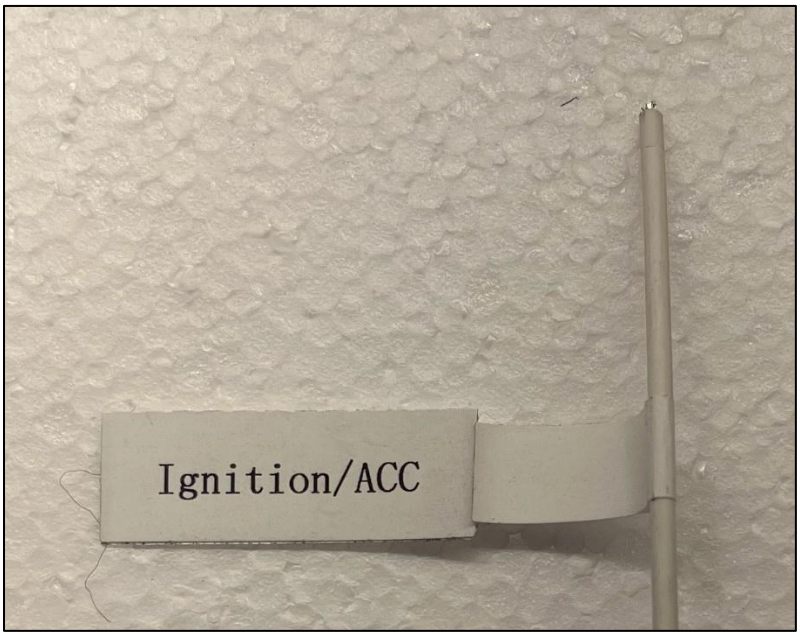


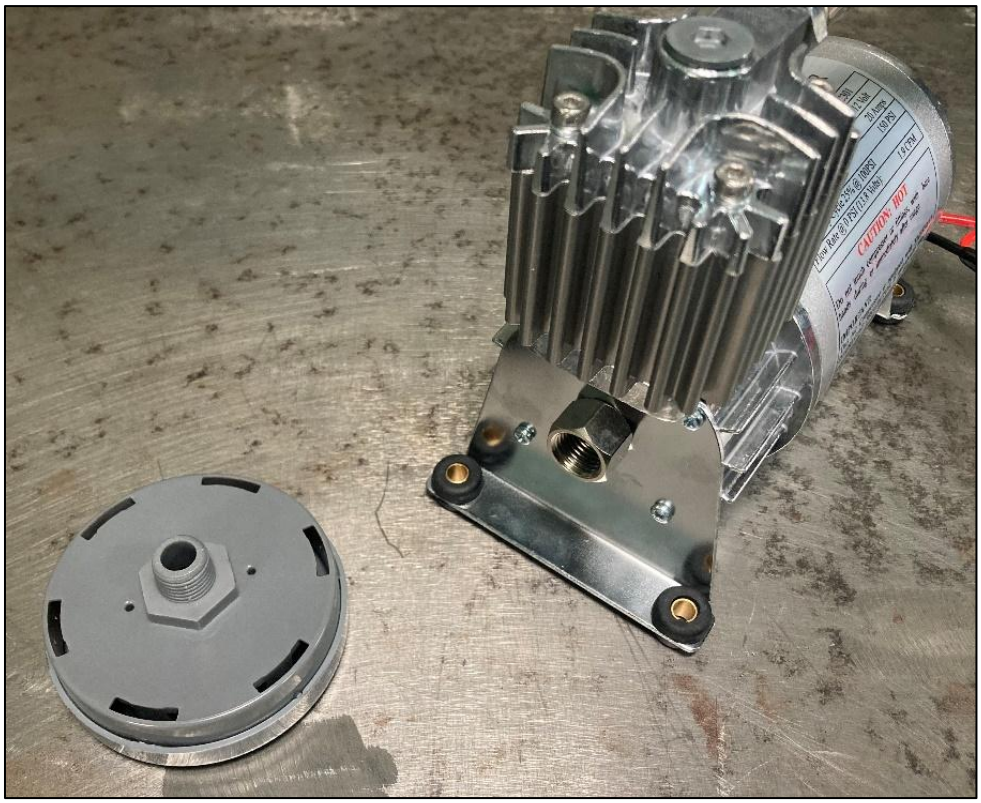
**Step 13:** Attach the compressor harness to the battery power: BLACK ring to negative and RED to positive terminals of the 12V battery.



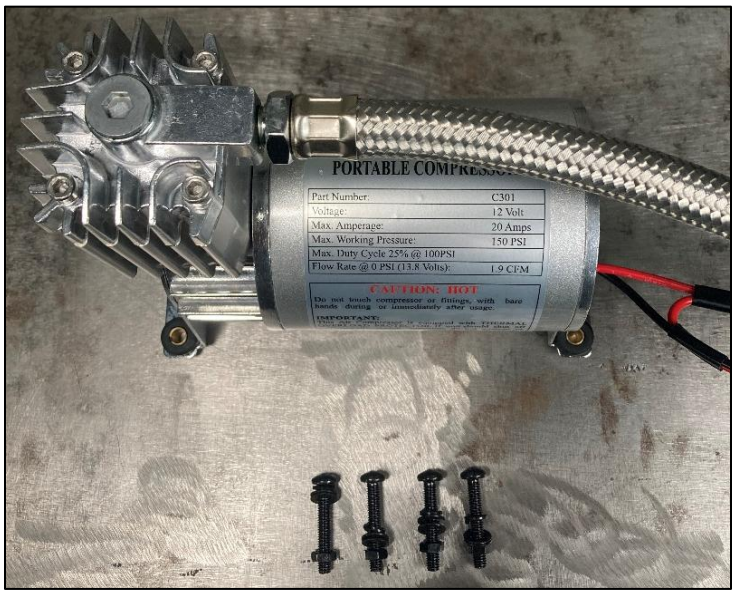

**Step 14:** Attach the compressor harness white Ignition/Accessory Power Wire to an ignition-controlled wire. This will allow the compressor to turn on and off with the ignition switch (usually in your fuse panel). This will prevent the compressor from draining battery power while the truck is turned off.

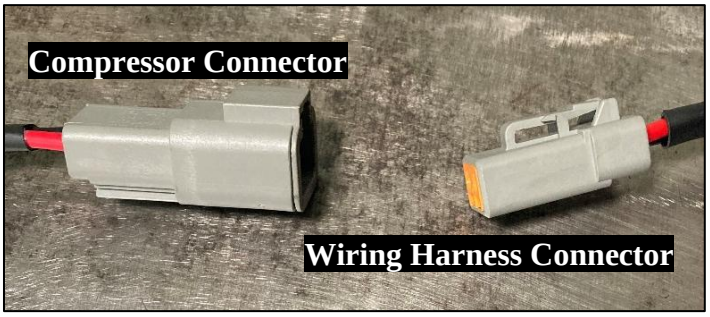


**Step 15:** Attach the air filter housing to the front of the air compressor. Included with your kit are two additional air filters for future use.



**Step 16:** Mount the air compressor on the driver's side frame of the truck away from the heat of the engine. Before bolting the air compressor to the frame and with the truck turned off ensure that the wire harness compressor connector can reach the intended location of the compressor. Once you have verified that the harness can reach drill and bolt the compressor to the frame using the provided M5-0.8 x -30mm screws.

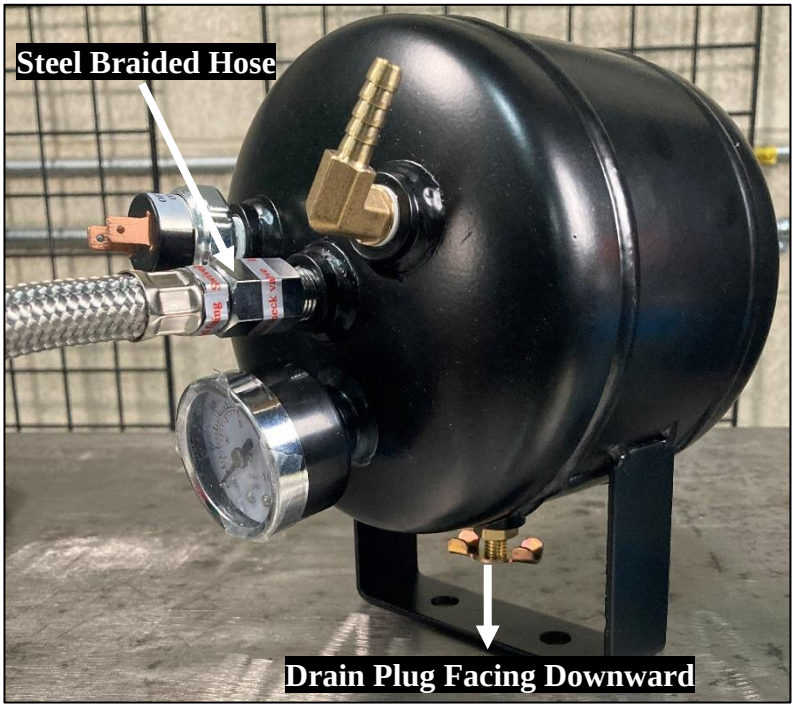


**Step 17:** Attach the air tank drain plug into the threaded hole located behind the tank mounting bracket. This plug will allow you to drain water that may accumulate in the tank over time. Place sealant on this fitting to prevent air leaks. Once the fitting is installed ensure that the plug is closed so it won't leak once the compressor is turned on.

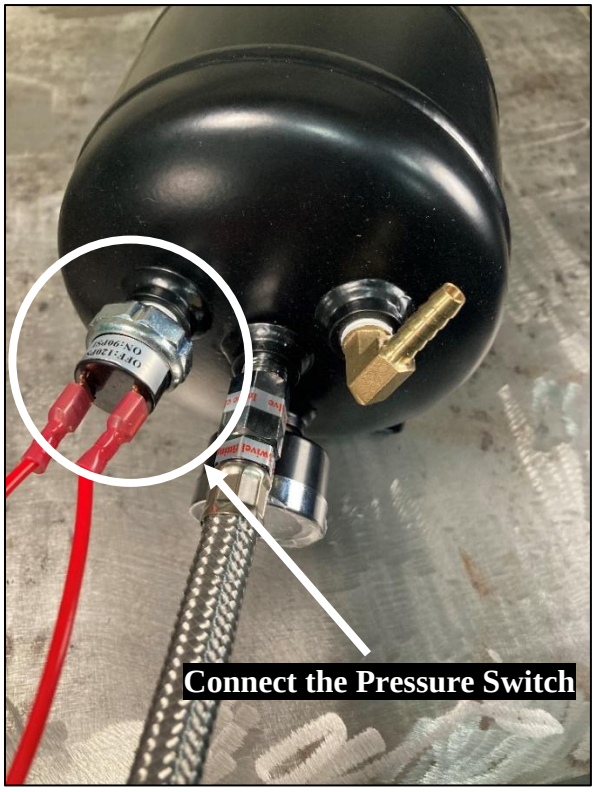

**Step 18:** Attach the barbed elbow fitting, pressure switch, and pressure gauge to the air tank. Place sealant on each of these fittings to prevent air leaks. One hole will remain open, and the compressor will be connected to that port in the next step.


**Step 19:** Mount the compressed air tank on the driver's side frame close to the previously mounted compressor. The compressor has a 4-foot steel braided hose that needs to reach the tank to supply the air. Also, the tank should be mounted such that the drain plug faces the ground to facilitate easy draining of water. Once you have found an adequate location thread the steel braided hose into the empty port of the tank. Put sealant on the steel braided hose fitting to prevent air leaks. Drill/mount the tank to the frame using the provided M10-1.5 x 30mm bolts.



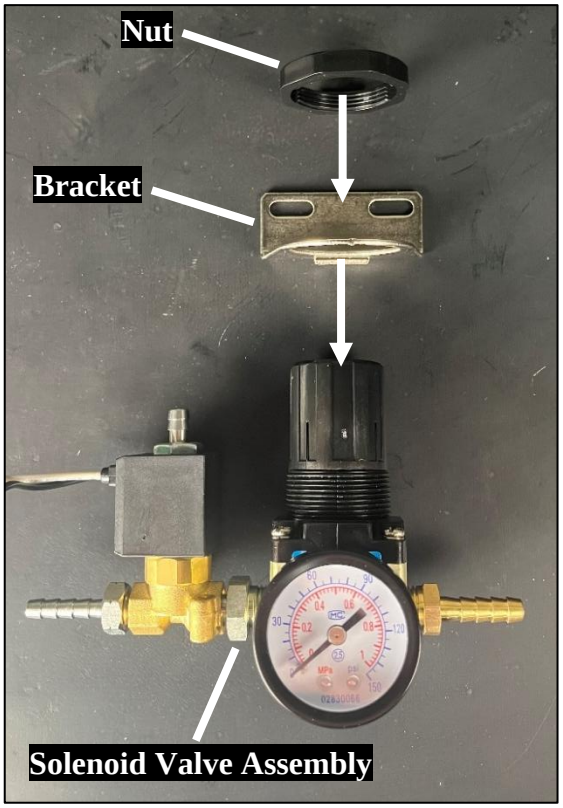


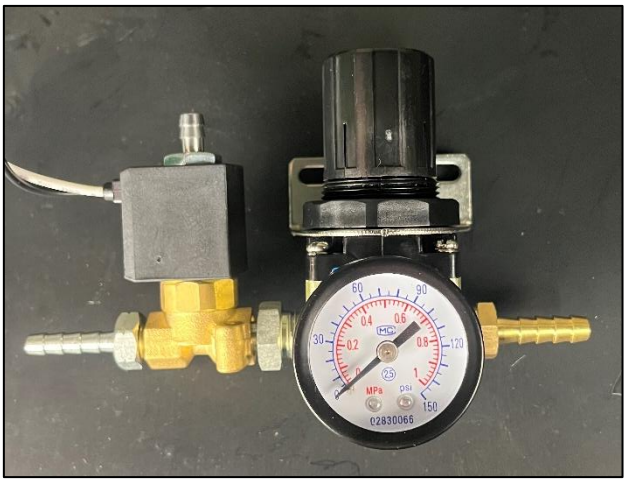
**Step 20:** Once the tank is mounted connect the two red wires with the insulated spade connectors located on the compressor to the pressure switch located on the air tank.



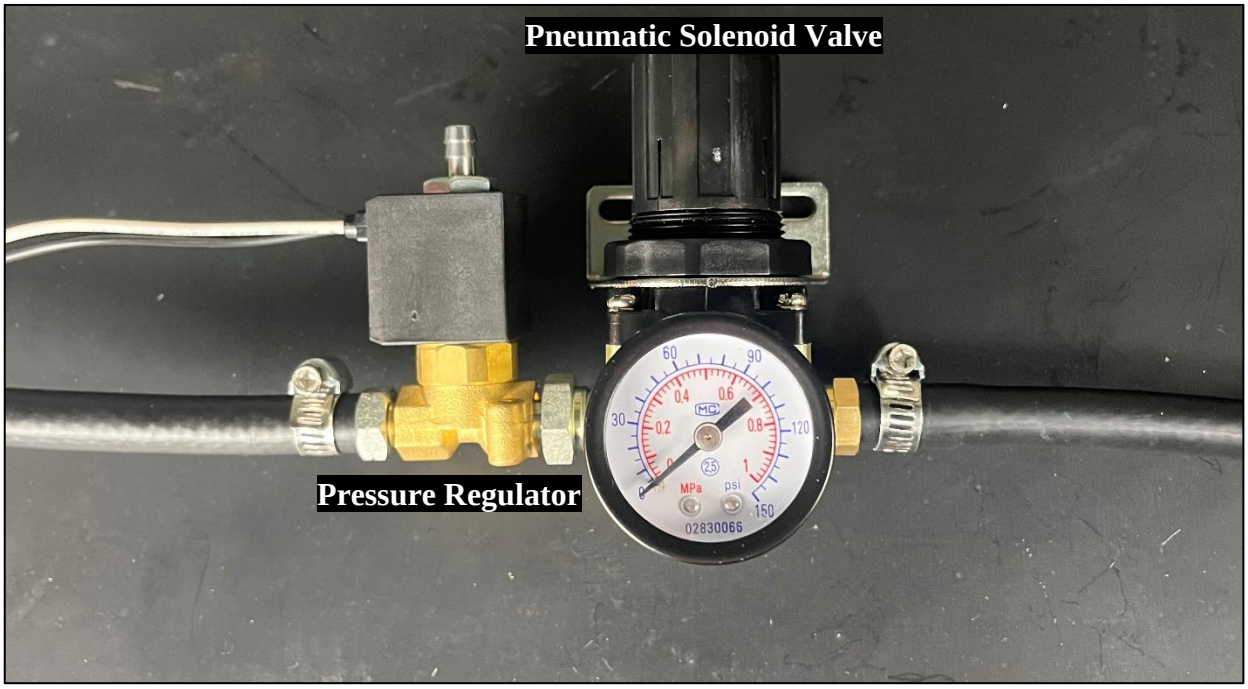
**Step 21:** Mount the solenoid valve / regulator assembly bracket on a rigid surface using the provided #10 self-drilling screws. Be sure to place the bracket between your air tank and Turbonator VGT. Ensure the assembly is not close to the Turbonator housing or exhaust manifold. Excess heat can ruin the solenoid valve.


**Step 22:** Attach the solenoid valve / regulator assembly to the previously installed bracket. Use the nut that is threaded to the knob of the regulator to fasten the assembly to the bracket.

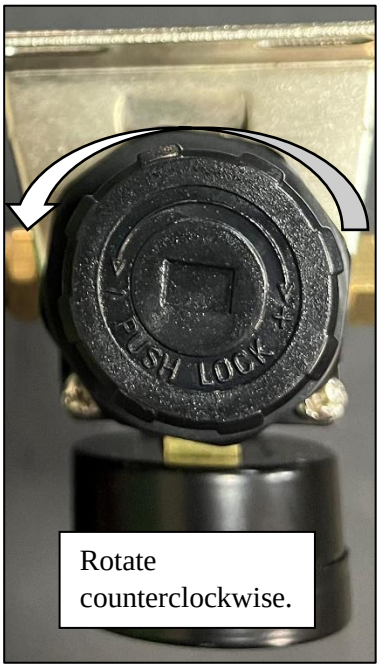


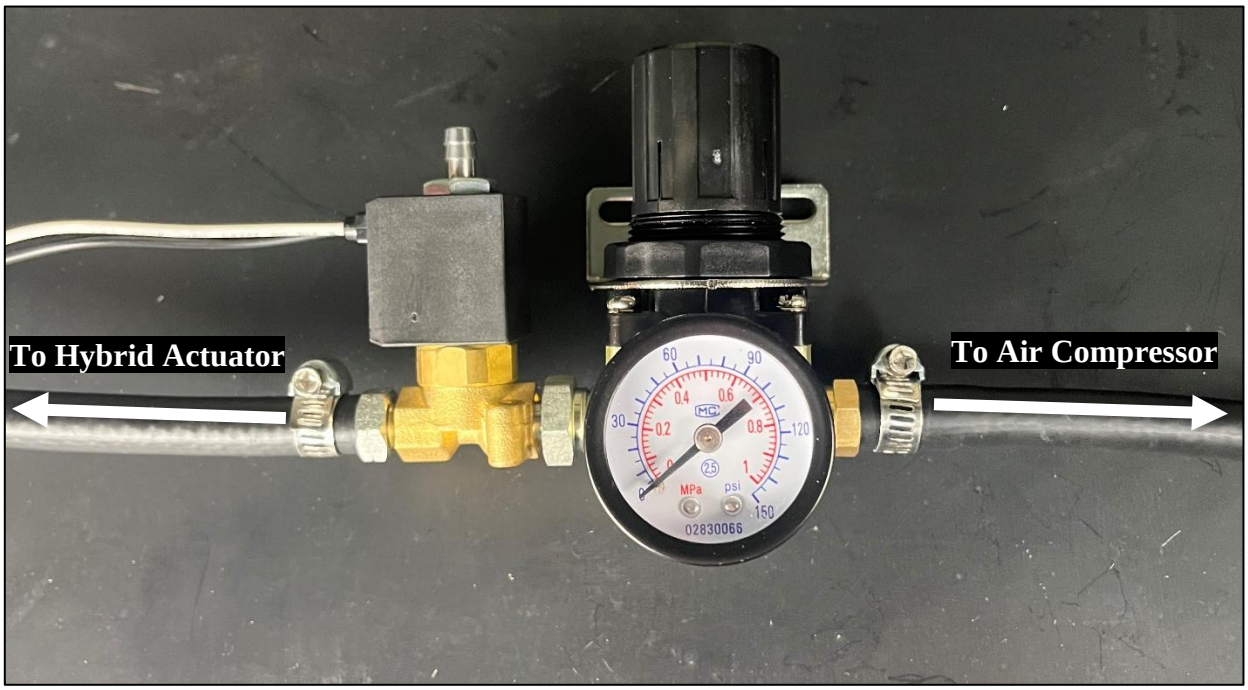
**Step 23:** Connect the first five-foot length of hose to the barbed fitting on the pressure regulator then connect the second five-foot length of hose to the barbed fitting on the pneumatic solenoid valve. Use two of the clamps to tighten the hoses to their fittings.




**Step 24:** Unlock the regulator by pulling up on the knob. Turn the knob counterclockwise until it stops rotating and lock the regulator by pushing down on the knob. This will help to set the regulator in later steps.

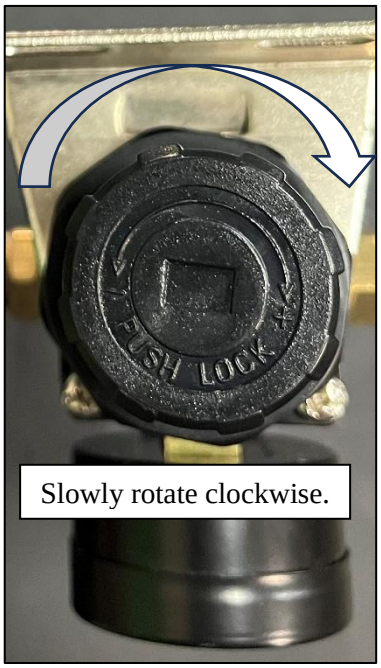



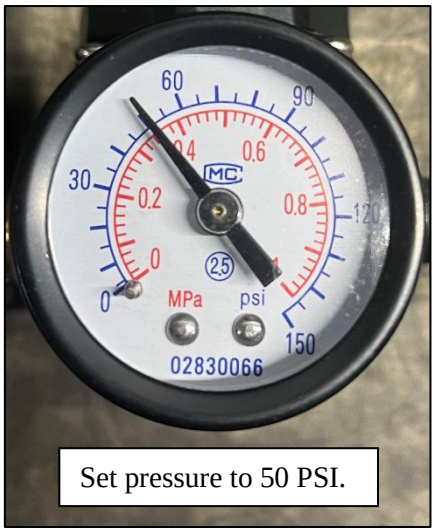

**Step 25:** Connect the hose coming from the **pneumatic solenoid valve** to the barbed elbow fitting located on the **hybrid actuator**. Then connect the hose coming from the **pressure regulator** to the barbed fitting located on your previously installed **air tank**. Use the remaining clamps to tighten the hose to your compressor and the hybrid actuator.

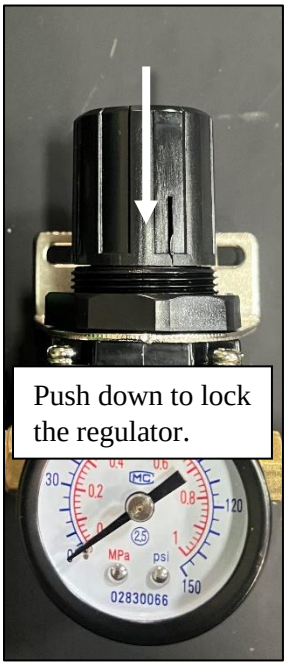



**Step 26: Double check that all hoses and wires are secured properly as instructed in the previous steps.** Now when you turn on your truck the air compressor will start filling the tank. It should take 2 minutes to fill the tank to the max pressure of 120 PSI. Once the tank reaches this pressure the compressor will turn off automatically. Once the tank is full the compressor will only turn on once the pressure in the tank drops below 90 PSI. At this point turn on your truck and let the compressor fill the tank, watch the gauge, and ensure the compressor stops at 120 PSI.

**Step 27:** With the truck still on and the tank full unlock the regulator by pulling up on the knob. Turn the regulator knob clockwise slowly until the gauge reads 50 PSI. If the regulator is set to below 40 PSI, the exhaust brake will not actuate properly. If the regulator is set to above 60 PSI, the actuator can be damaged. Once the regulated pressure is set, lock the regulator by pushing down on the knob.

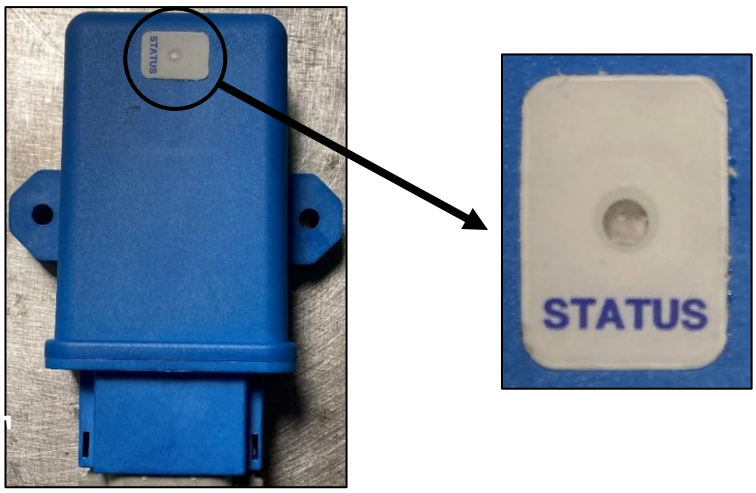




**Step 28:** Ensure that all hoses and wires are positioned away from any snag points or hot surfaces such as the exhaust manifold or turbine housing. Direct exposure to hot surfaces could cause a leak in the hose. Use zip ties to secure loose hose and wire.

# Testing Exhaust Braking

**Step 29:** Ensure the exhaust brake switch is **OFF**. Also, when the truck key is **OFF** ensure that the controller status window LED is not blinking.




**Step 30:** Turn the truck **ON** and ensure the controller status window LED is blinking.

**Step 31:** While the truck is **ON**, turn the exhaust brake switch **ON** and ensure the actuator gets pulled back away from the turbine housing.

When you turn the switch **ON** this part of the actuator should move in the direction of the arrow while the remaining assembly stays stationary.

**Step 32:** With the truck **ON**, turn the exhaust brake switch **OFF** and ensure the actuator moves back to its initial position.

When you turn the switch **OFF** this part of the actuator should move in the direction of the arrow returning the actuator to its operating position while the remaining assembly stays stationary.


**Step 33:** Test drive the truck first with the exhaust braking turned **OFF**. This will allow you to test the drivability of the Turbonator VGT with the 3-stage pneumatic actuator.

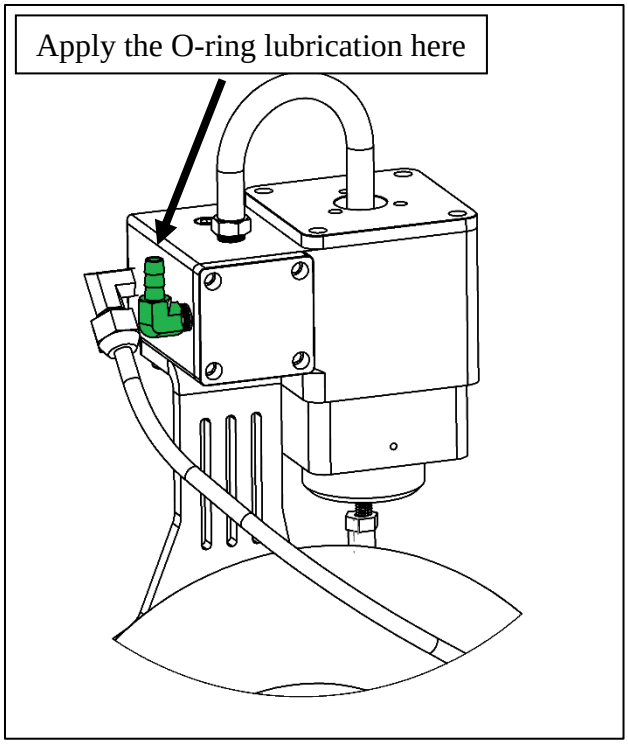
**Step 34:** Test the exhaust braking capabilities of the Turbonator VGT with hybrid actuator. While driving, turn the exhaust braking switch **ON**, pull your foot off the throttle all the way and you should feel the exhaust braking engage. With the exhaust brake switch still **ON** engage the throttle and you should feel the exhaust brake disengage and drive normally. When you turn **OFF** the exhaust brake switch you can throttle on and off without the actuator engaging the exhaust brake. **IMPORTANT: NEVER USE CRUISE CONTROL WITH THE DPS BRAKE SWITH TURNED ON.**

**Step 35:** After the test drive check that the pressure regulator is still set for 50 PSI. If it has changed simply adjust the regulator to achieve the correct operating pressure.

**Step 36:** After the test drive and while the engine is still hot, ensure all bolts are tightly fastened by hot torquing all bolts again. Also, ensure all wires and hoses are secure and positioned away from any hot surfaces.

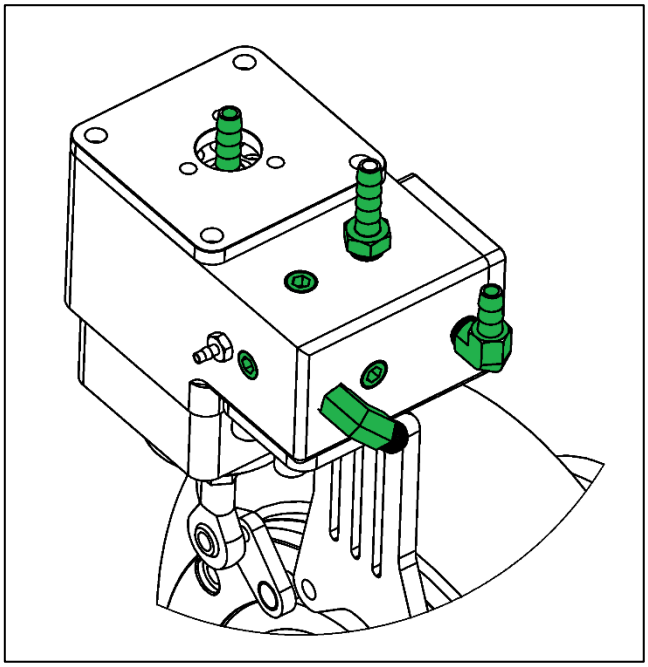
# Hybrid Actuator Maintenance

- **Every 3 months** loosen the hose that connects the hybrid actuator to the pneumatic solenoid valve. Apply 5 – 10 drops of oil into the barbed hose fitting located on the hybrid actuator. Reconnect the hose and actuate the exhaust brake a few times to allow the oil to lubricate the internal O-ring seals.

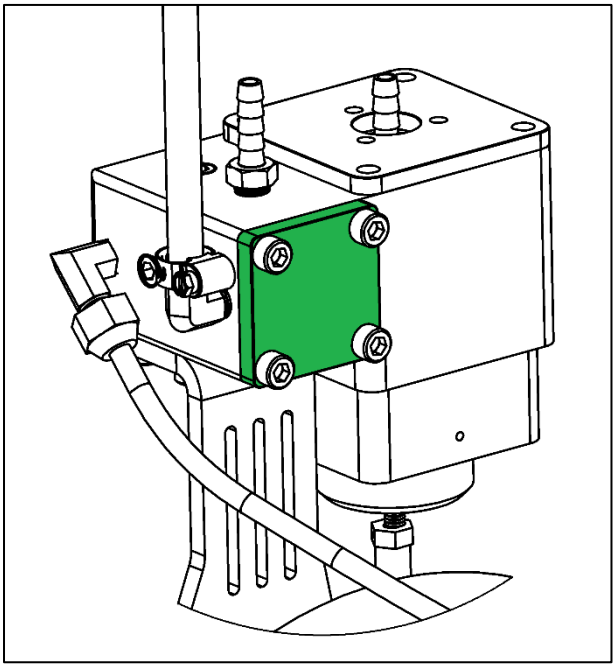



- All fittings and plugs pictured in the below image must be airtight. The fittings and plugs have been sent from Diesel Power Source with sealant. Periodically check to ensure no exhaust leaks occur at these fittings. If an exhaust leak is detected remove the leaky fitting and apply sealant to the fitting. A leak can draw hot exhaust gasses through the system causing the hybrid actuator to be damaged.

The fittings and plugs pictured in green need to be sealed.



- Never remove the top cap pictured in the below image. There is a static seal located under the cap which could leak if the cap is removed and then reattached.

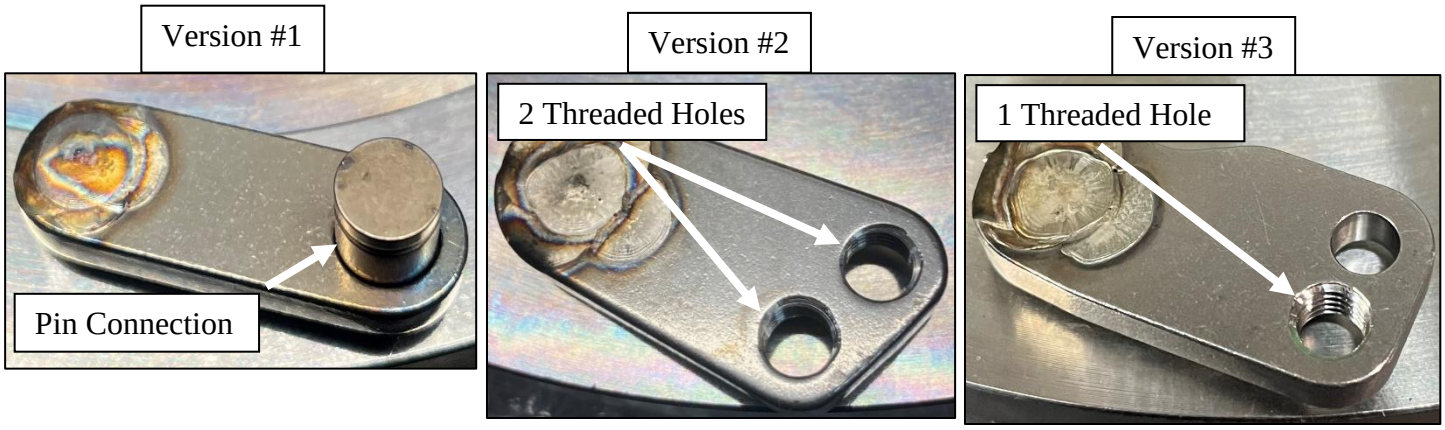


- If one of the internal seals is assumed to be leaking, never disassemble the hybrid actuator to repair yourself. Contact Diesel Power Source to get the seal fixed by our team.

# Hybrid Actuator Calibration

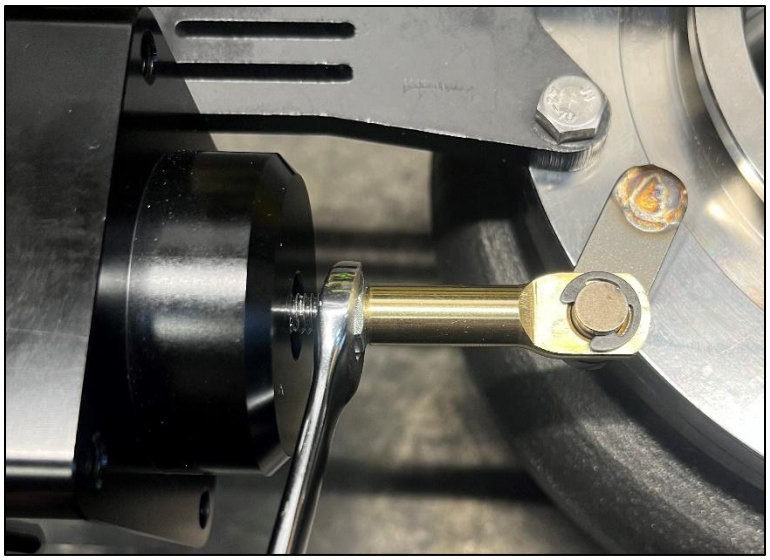
**Your Hybrid actuator is pre-calibrated for your specific application based on testing done by Diesel Power Source. The following instructions show how to calibrate the actuator.**

**STEP #1:** Identify which actuating arm is attached to your Turbonator housing. If you have Version #1 refer to the *"Actuating Arm Version #1 Calibration"* section below. If you have either Version #2 or Version #3 refer to the *"Actuating Arm Version #2 & Version #3 Calibration"* section below.

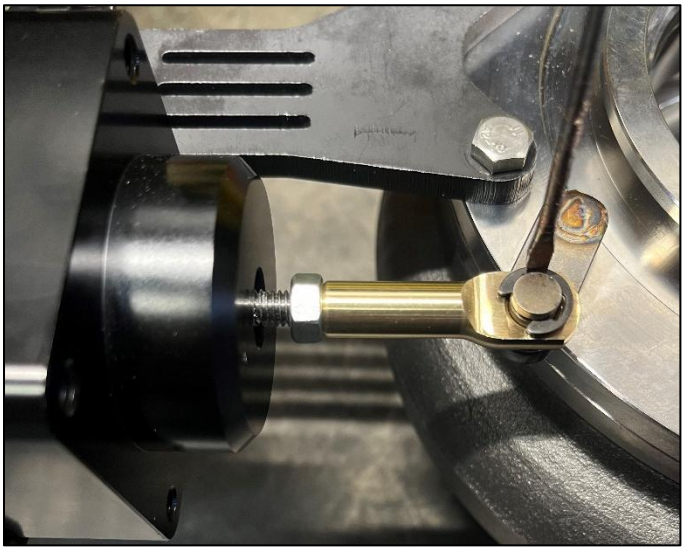


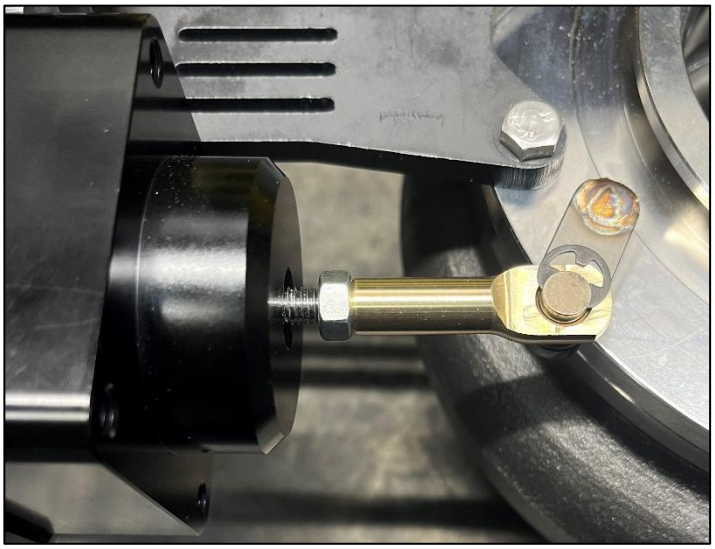

## Actuating Arm Version #1 Calibration:

- Loosen the locknut from the linkage using a 10mm wrench.

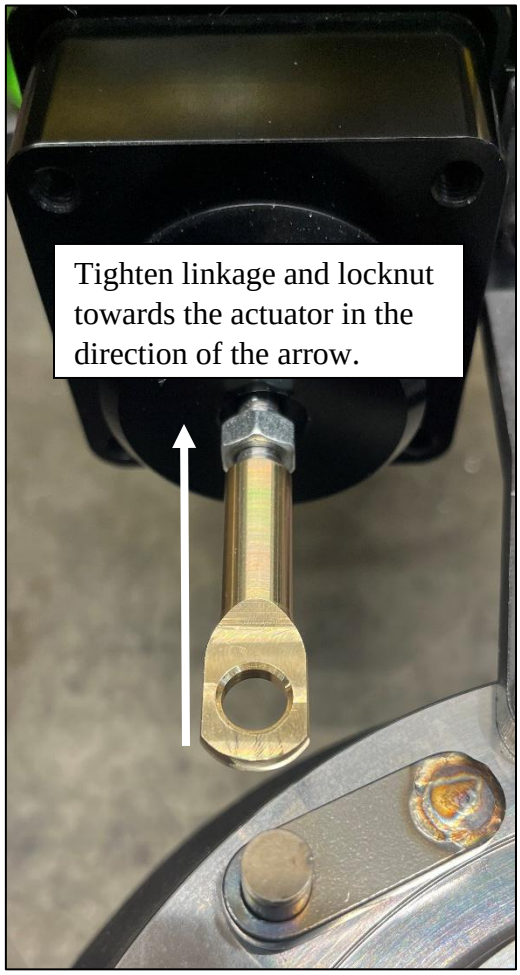


- Remove the E-clip securing the linkage to the actuating arm pin. Use a small flat head screwdriver to pry the E-clip out of the groove. **DO NOT LOSE THE E-CLIP DURING THIS PROCESS!!!**

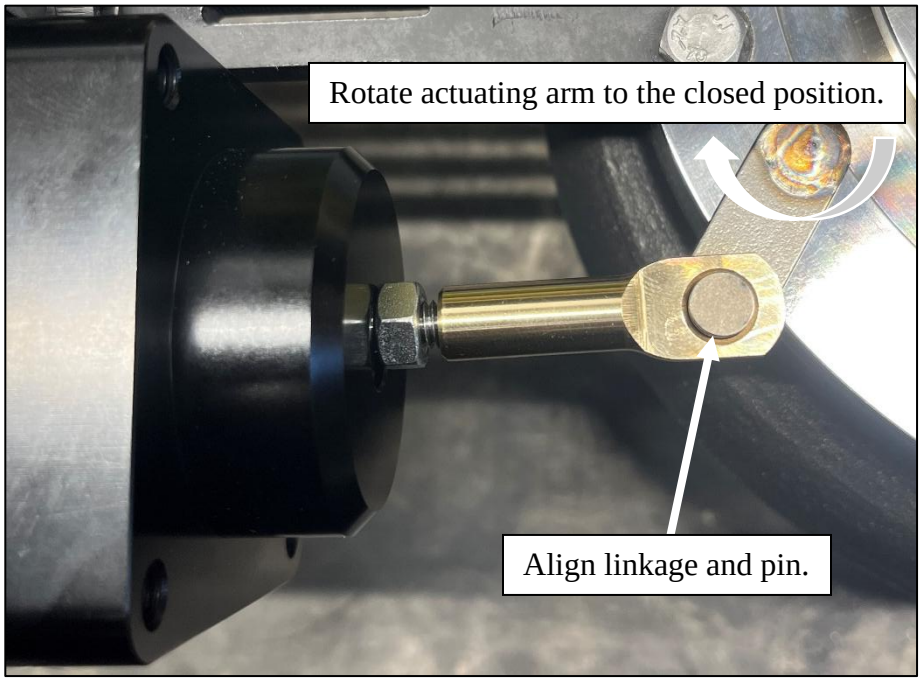




- Tighten the actuator linkage and locknut all the way towards the actuator.

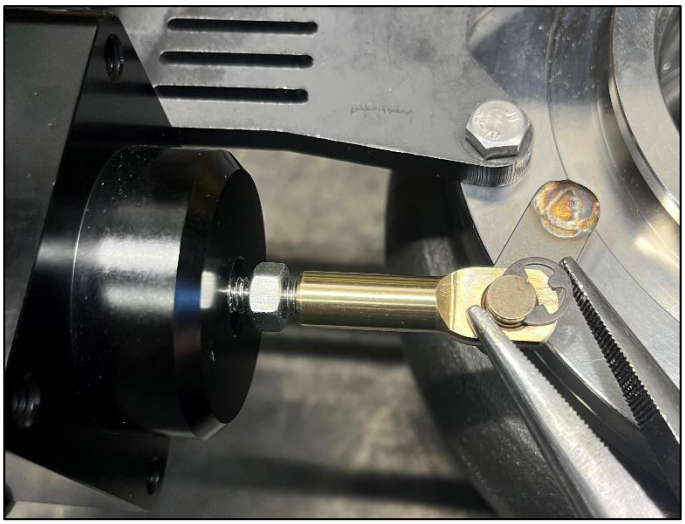


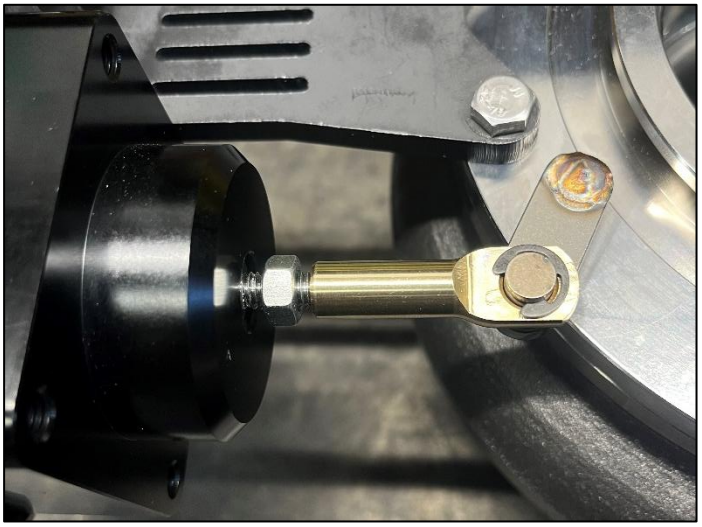
- Rotate the Turbonator VGT actuating arm all the way to its closed position in the clockwise direction. While the actuating arm is in the closed position align the linkage with the pin. This is the zero position where all the vanes in your Turbonator VGT housing are closed.



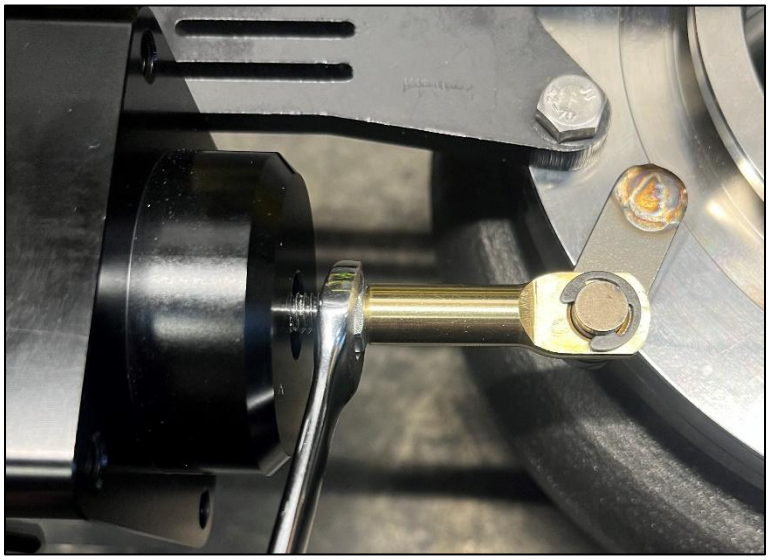

- Remove the linkage from the pin and loosen the linkage **2 full turns** away from the actuator. This will set the starting positions of your Turbonator VGT housing.

- Align the linkage with the actuating arm pin in the new location and secure the E-clip to the actuating arm pin using a pair of pliers to snap it into the groove located on the pin.





- Tighten the locknut against the linkage using a 10mm wrench.



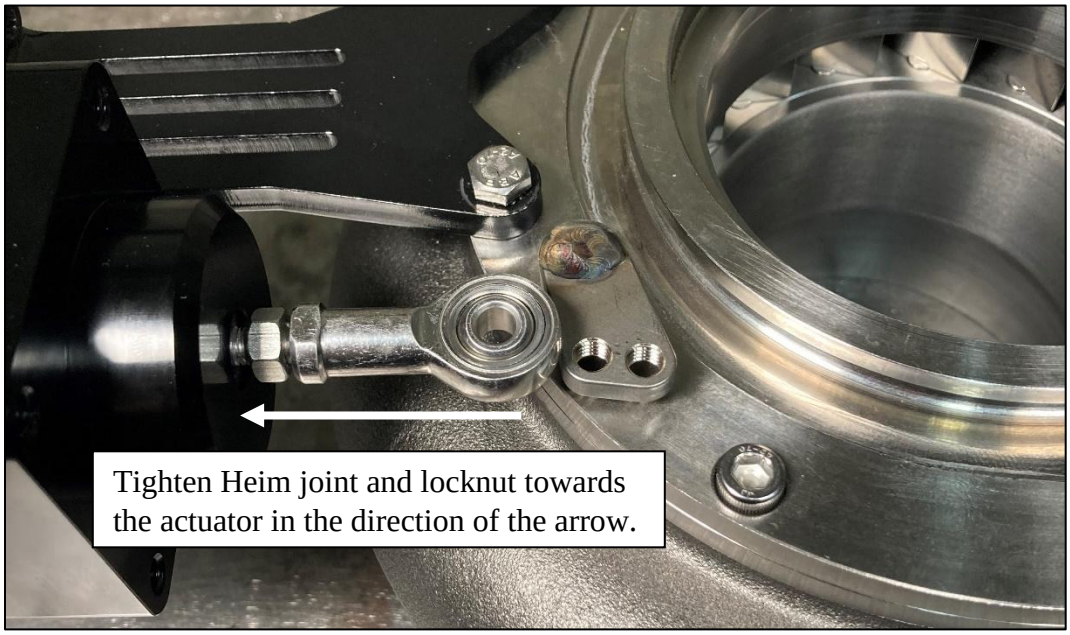
- Take the truck on a test drive to determine the performance of the calibration. The calibration can be adjusted by loosening the linkage away from the actuator. If the turbo isn't spooling fast enough, the linkage needs to be loosened away from the actuator. We recommend loosening the linkage a half turn at a time and test drive between each adjustment until the best spool up is achieved. A small change can make a big difference. You should never loosen the linkage more than 4 full turns after you have done the initial 2 full turn calibration in the previous steps.

# Actuating Arm Version #2 & Version #3 Calibration:

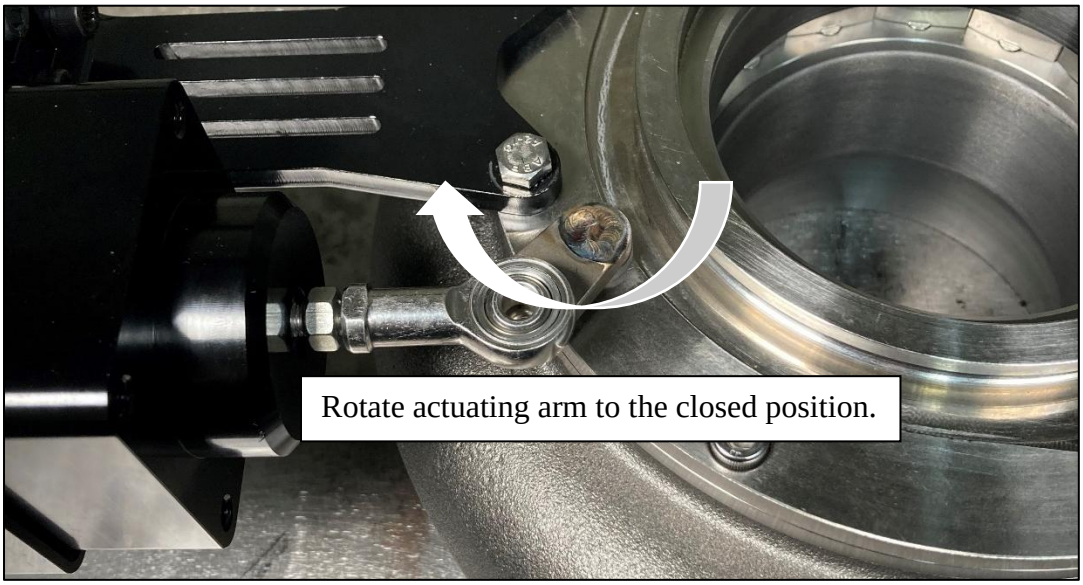
- Using a 10mm and 11mm wrench, loosen the lock nut that is fastened to the Heim joint.

- Remove the M6-1 x 14mm socket head cap screw by using a 11/16 wrench and a 5mm Allen key.

- Tighten the actuator Heim joint and jam nut all the way towards the actuator.

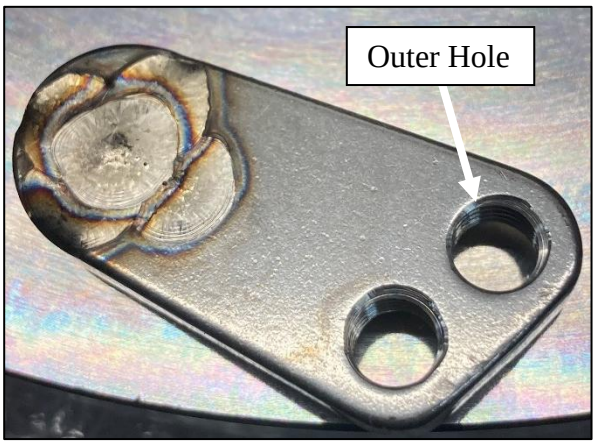


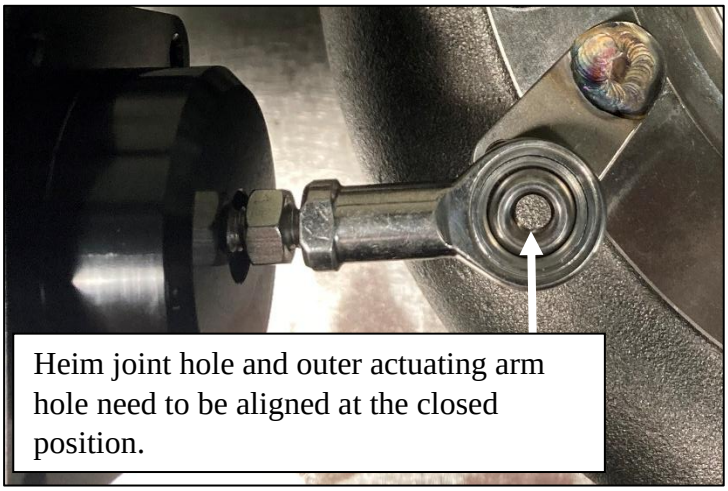

- Pull the Turbonator VGT actuating arm all the way to its closed position in the clockwise direction.



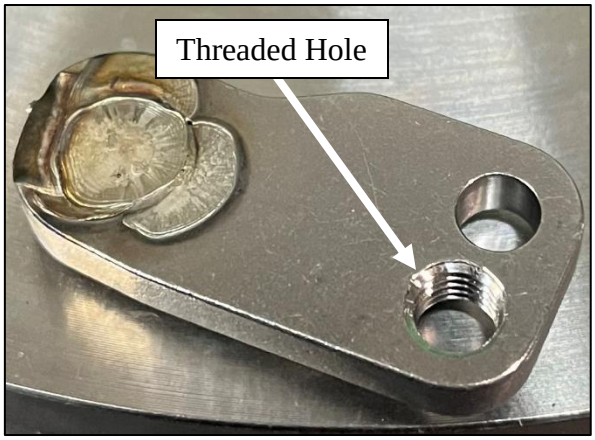
- With the actuating arm in the closed position. If you have version #2 of the actuating arm loosen the Heim joint until the joint hole aligns with the outer hole of the actuating arm. If you have version #3 of the actuating arm loosen the Heim joint until the joint hole aligns with the threaded hole located on the actuating arm. (NOTE: There is only 1 threaded hole on version #3 of the actuating arm.)

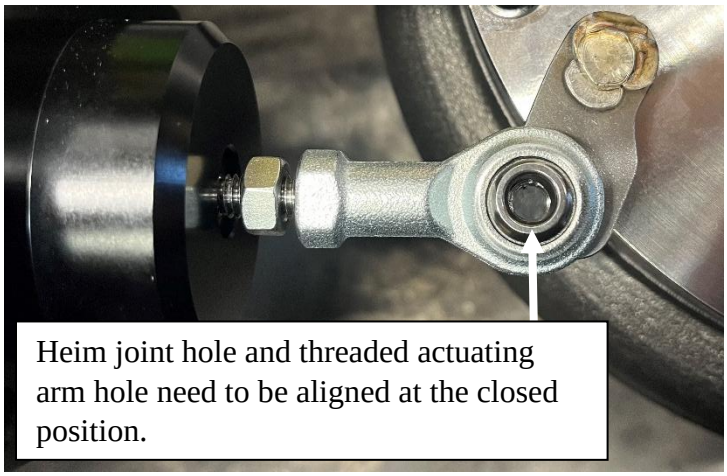
Actuating Arm Version #2



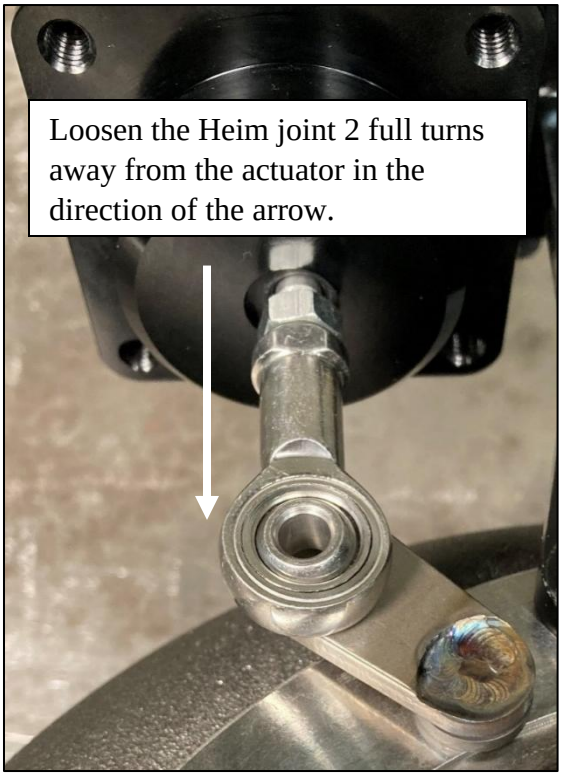




Actuating Arm Version #3



- Now move the actuating arm away from the Heim joint and loosen the Heim joint **2 full turns** away from the actuator. This will set the starting position of your Turbonator VGT housing. Realign the Heim joint hole with the previously aligned actuating arm hole from the last step.




- Thread the M6-1 x 14mm socket head cap screw into the aligned holes. Once finger tightened use a 11/16 wrench and a 5mm Allen key to tighten the cap screw and linkage arm assembly.

- Using a 10mm and 11mm wrench, tighten the lock nut to the Heim joint. Do not twist the Heim joint in the process.

- Take the truck on a test drive to determine the performance of the calibration. The calibration can be adjusted by loosening the Heim joint away from the actuator. If the turbo isn't spooling fast enough, the Heim joint needs to be loosened away from the actuator. We recommend loosening the Heim joint a half turn at a time and test drive between each adjustment until the best spool up is achieved. A small change can make a big difference. You should never loosen the Heim joint more than 4 full turns after you have done the initial 2 full turn calibration in the previous steps.