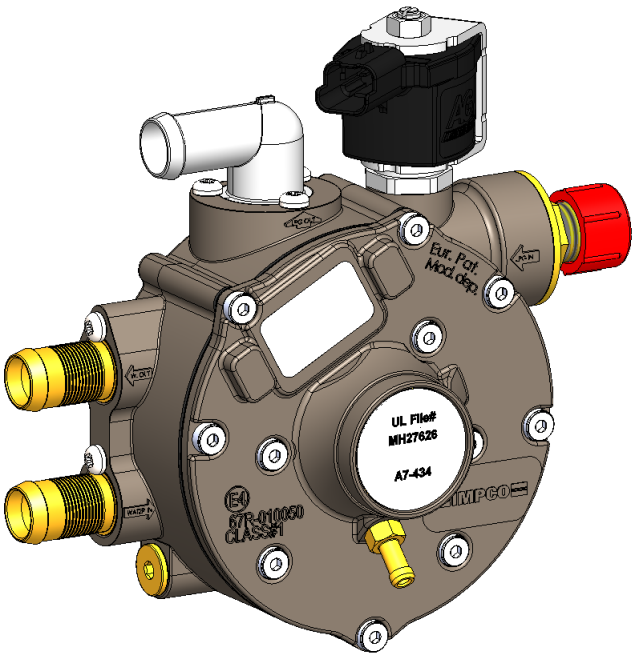
SGI SERIES REGULATOR

REPAIR KIT INSTRUCTIONS

The IMPCO PPI-136 repair kit instructions will provide the technician information to successfully repair the SGI Regulator. These instructions cover the three available service kits described below and in the Overview section.



NOTES:

- Be sure the repair kit part number you are using is correct for the regulator being serviced.
- The Pressure and Leak Test procedure described on page 24 applies to all service kits in this document.

IMPORTANT: Any maintenance, service or repair should be performed by trained and experienced service technicians. Proper tools and equipment should be used to prevent injury to the servicing technician, property, or system components. Service repairs should always be performed in a safe environment and the technician should always wear protective clothing to prevent injury. Always inspect the major casting pieces for damage, corrosion, or cracks before attempting a service repair.

WARNING

Do not use Teflon tape to seal any fuel fittings. Failure to follow this warning may cause the regulator to leak internally, possibly resulting in serious injury and/or property damage and may void any warranty coverage.

REPAIR KIT PART NUMBERS

SAFETY

WARNING:

- **READ THE STATEMENTS BELOW BEFORE INSTALLING ANY ECONTROLS EQUIPMENT.**
- **IMPROPER INSTALLATION OR USE OF THIS PRODUCT MAY CAUSE SERIOUS INJURY, DEATH AND/OR PROPERTY DAMAGE.**

ALL PROCEDURES DESCRIBED IN THIS SECTION SHOULD BE PERFORMED ONLY WHEN THE VEHICLE (IF APPLICABLE) IS IN NEUTRAL ON A LEVEL SURFACE AND THE PARKING BRAKE IS SET.

Natural Gas or LPG Installation in the US:

NFPA 37 Standard for the Installation and USE of Stationary Combustion Engines and Gas Turbines

NFPA 52 Vehicular Natural Gas Fuel Systems Code

NFPA 58 Liquefied Petroleum Gas Code

SERVICE TECHNICIANS AND USERS SHALL CAREFULLY READ AND ABIDE BY THE PROVISIONS SET FORTH IN NATIONAL FIRE PROTECTION ASSOCIATION PAMPHLET (NFPA) #37 FOR STATIONARY COMBUSTION ENGINE STANDARDS, NFPA #52 FOR NATURAL GAS FUEL SYSTEMS OR NFPA 58 FOR STORAGE, HANDLING, TRANSPORTATION AND USE OF LPG.

INSTALLERS: LPG INSTALLATIONS IN THE UNITED STATES MUST BE PERFORMED IN ACCORDANCE WITH FEDERAL, STATE, LOCAL LAWS AND NATIONAL FIRE PROTECTION ASSOCIATION PAMPHLET #58, STANDARD FOR STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GASES, TO THE EXTENT THESE STANDARDS ARE NOT IN VIOLATION OF FEDERAL, STATE AND/OR LOCAL LAW.

COUNTRIES OUTSIDE OF USA: REFER TO THE GOVERNING AGENCIES OVERSEEING CNG AND PROPANE APPLICATIONS.

CNG INSTALLATIONS IN THE UNITED STATES: MUST BE PERFORMED IN ACCORDANCE WITH FEDERAL, STATE, LOCAL LAW AND NATIONAL FIRE PROTECTION ASSOCIATION PAMPHLET #52, COMPRESSED NATURAL GAS (CNG) VEHICULAR FUEL SYSTEMS, TO THE EXTENT THESE STANDARDS ARE NOT IN VIOLATION OF FEDERAL, STATE OR LOCAL LAW.

LPG AND/OR NATURAL GAS INSTALLATIONS ON STATIONARY ENGINES: MUST BE PERFORMED IN ACCORDANCE WITH FEDERAL, STATE, LOCAL LAW AND NATIONAL FIRE PROTECTION ASSOCIATION PAMPHLET #37, STANDARD FOR THE INSTALLATION AND USE OF STATIONARY COMBUSTION ENGINES AND GAS TURBINES, TO THE EXTENT THESE STANDARDS ARE NOT IN VIOLATION WITH FEDERAL, STATE OR LOCAL LAW. FAILURE TO ABIDE BY THE ABOVE WILL VOID ANY ECONTROLS WARRANTY ON THE PRODUCTS AND MAY CAUSE SERIOUS INJURY OR PROPERTY DAMAGE.

SERVICE TECHNICIANS: DUE TO THE INHERENT DANGER OF GASEOUS FUELS, ECONTROLS PRODUCTS MUST NOT BE INSTALLED OR USED BY PERSONS NOT KNOWLEDGEABLE OF THE HAZARDS ASSOCIATED WITH THE USE OF GASEOUS FUELS. ANY MAINTENANCE, SERVICE OR REPAIR SHALL BE PERFORMED BY TRAINED AND EXPERIENCED SERVICE TECHNICIANS.

PROPER TOOLS AND EQUIPMENT: PROPER TOOLS AND EQUIPMENT MUST BE USED TO PREVENT INJURY TO THE SERVICING TECHNICIAN, PROPERTY OR SYSTEM COMPONENTS. SERVICE REPAIRS SHALL ALWAYS BE PERFORMED IN A SAFE ENVIRONMENT AND THE TECHNICIAN MUST ALWAYS WEAR PROTECTIVE CLOTHING TO PREVENT INJURY.

INSPECT PRIOR TO USE: ALWAYS INSPECT THE MAJOR CASTING PIECES FOR DAMAGE, CORROSION OR CRACKS BEFORE ATTEMPTING TO SERVICE AND/OR REPAIR. BE SURE THE REPAIR KIT PART NUMBER YOU ARE USING IS CORRECT FOR THE COMPONENT(S) BEING SERVICED.

NO TEFLON TAPE: DO NOT USE TEFLON TAPE TO SEAL ANY FUEL FITTINGS. FAILURE TO FOLLOW THIS WARNING MAY CAUSE THE REGULATOR TO LEAK INTERNALLY, POSSIBLY RESULTING IN SERIOUS INJURY, DEATH AND/OR PROPERTY DAMAGE AND MAY VOID ANY WARRANTY COVERAGE. SEE SECTION 4 FOR APPROVED SEALANTS.

SAFETY (CONTINUED)

READ BEFORE PERFORMING ANY SERVICE, MAINTENANCE OR REPAIR ON THE FUEL SYSTEM

There are safety regulations and standards that must be followed when installing or servicing gaseous fuel equipment on engines. It is highly recommended you obtain and read the following National Fire Protection Association (NFPA) guidelines:

- NFPA #37-Combustion Engines
- NFPA #52-CNG Vehicular Fuel Systems
- NFPA #54-National Fuel Gas Codes
- NFPA #58-LP Gas Storage
- NFPA #59-LP Gas Utility Plants
- NFPA #59A-LN Gas Storage and Handling

To order these documents, contact the National Fire Protection Agency at (800) 344-3555 or go to www.nfpa.org, expand the Codes and Standards menu, and click on Document List and Code Cycle Information to order online.

There are state standards and regulations enforced by the state fire marshal in most states.

There may be other local standards set by counties, cities and municipalities. Be sure to consult all regulatory agencies to assure adherence to all standards in enforcement.

Safety in the workplace is everyone's responsibility. Regardless of the type work you do, it is important that you pay attention to what you are doing for your safety and the safety of those around you.

The following points are things to keep in mind when working on internal combustion engines and gaseous fuel systems:

- Before working on any fuel system, study the NFPA standard for the fuel in use.
- Before working on any fuel system, read and understand all manufacturers' recommended procedures.
- Before working on any fuel system, make sure you have local code approved safety goggles, face shields, gloves and clothing.
- Before working on any fuel system, make sure there is adequate ventilation.
- Before working on any fuel system, turn OFF the fuel system supply valve and run the engine until it stalls by running out of fuel. If this is not possible, slowly bleed the fuel from all lines before working on the fuel system or engine.
- After working on any fuel system, perform a leak test before starting the engine.

Remember:

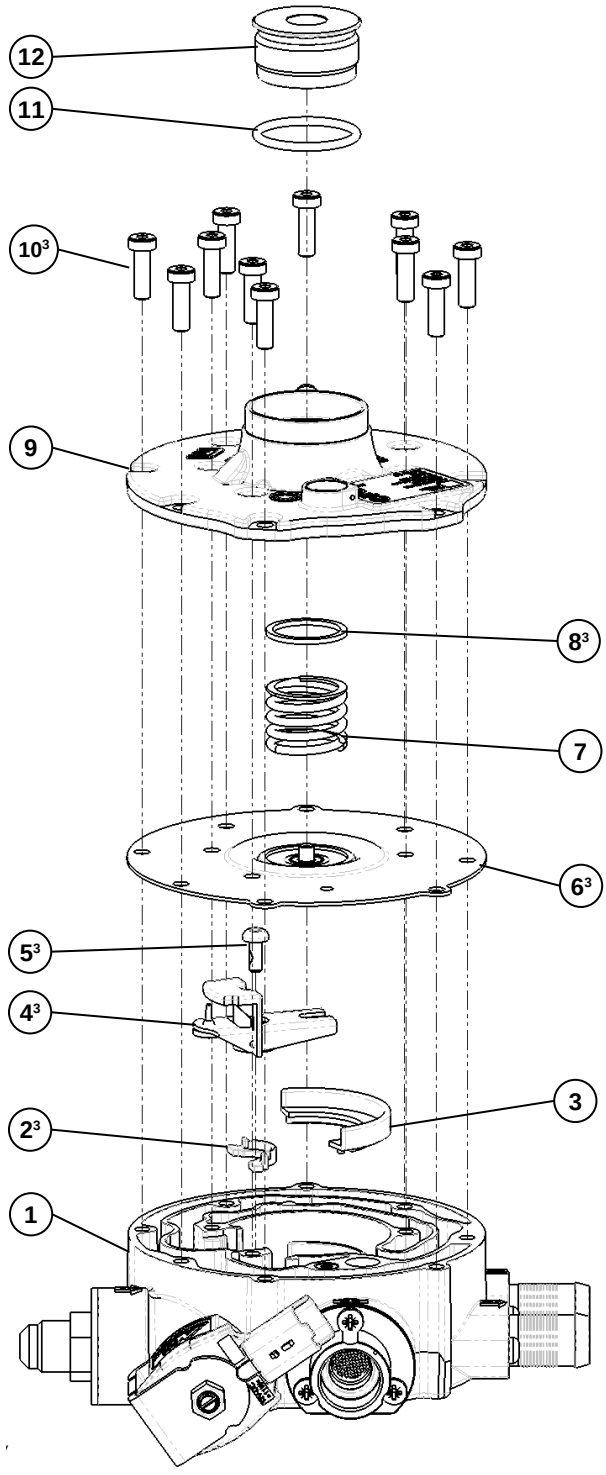
- LPG is heavier than air and will sink to the lowest level. Avoid areas where escaped fuel may collect and all sources of ignition.
- Natural Gas is lighter than air and will rise to the highest point. Avoid areas near overhead heaters and all other sources of ignition.

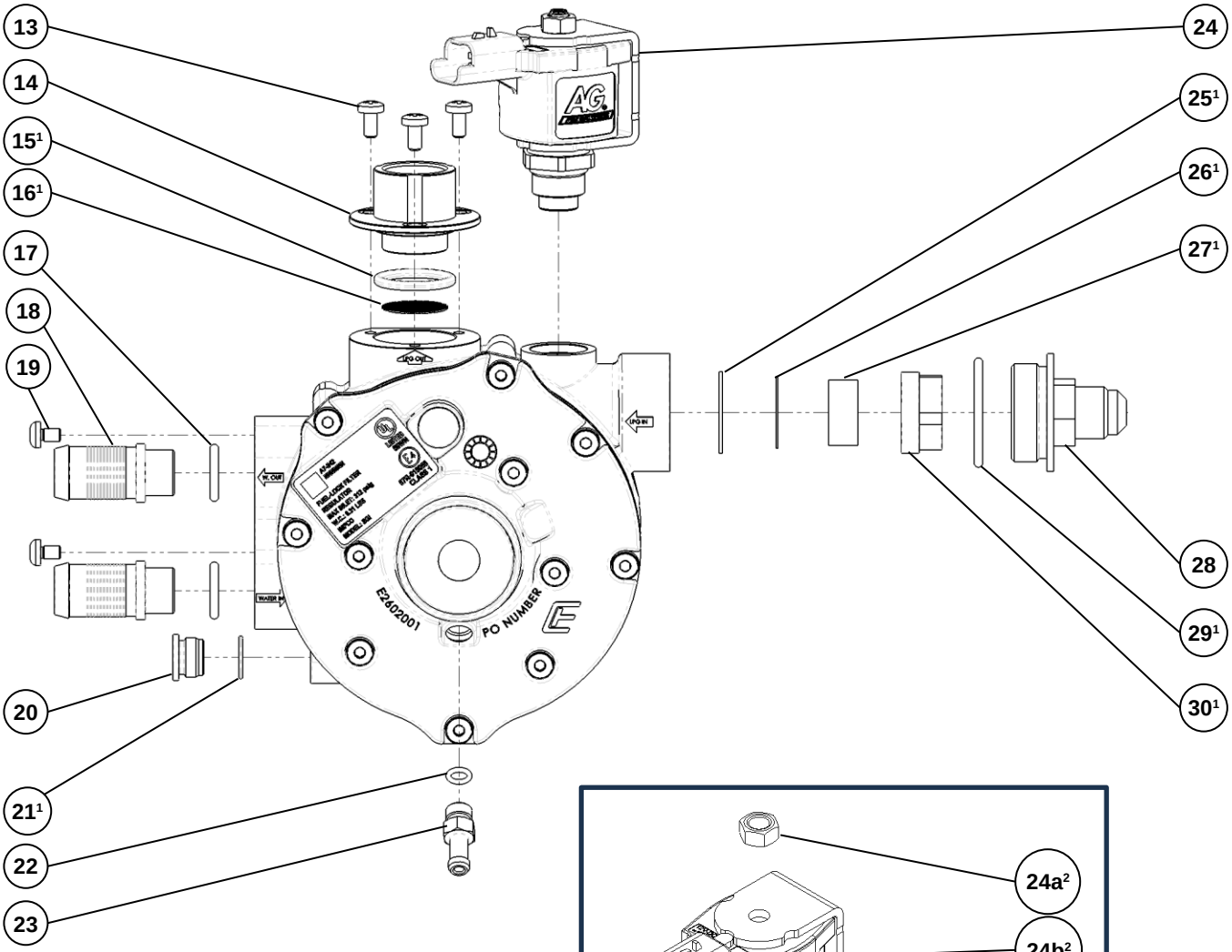
SGI SERIES REGULATOR

COMPONENT PARTS

ITEM	PART #	DESCRIPTION
1	E2602000	BODY, SGI
2	GFA600042B1[3]	GASKET, LOWER BARRIER, SGI
3	GFA600043A0	COVER, SWIRL SGI
4	AL1-59485-001[3]	ASSY, LEVER SGI
5	E2097140410[3]	SCREW, M4X10 SELF TAPPING
6	AD1-59061-002[3]	DIAPHRAGM, ASSY SGI REGULATOR
7	GFA100003A0	SPRING, VAPORIZER SGI
8	GFA600017A0[3]	WASHER, NYLON
9	E2602001	COVER, SGI REGULATOR
10	S1-50237-C025-05016[3]	SCREW, LOW HEAD SOCKET CAP (11)
11	GFA003112A0	O-RING, 3112 NBR 70SH
12	GFA600018A0	SCREW, ADJUSTER, SGI
13	-------	SCREW, M4 (MODEL-SPECIFIC)
14	-------	FITTING, OUTLET (MODEL-SPECIFIC)
15	GFA002030A0[1]	O-RING, METRIC 20X3 NBR 70SH
16	GFA600027A1[1]	FILTER, OUTGAS, SGI
17	GFA012127A0	O-RING, METRIC 12.1X2.7 NBR70SH (2)
18	GFA600019A0	FITTING, SGI, STRAIGHT, 16MM HOSE (2)
19	S1-50237-7041-04016	SCREW, PHILLIPS PAN M4 x 16MM (2)
20	GFA600026A0	PLUG, DRAIN, SGI
21	GFA000108A0[1]	O-RING, 108 NBR 70SH
22	S3-1524-BB-M001	O-RING,NBR 1.5 CS X 5.0 ID METRIC
23	GFA221043A0	FITTING, SGI, STRAIGHT, 6MM HOSE
24	GFA600063C0[2]	LOCK-OFF MODULE, SGI
24a		LOCK-OFF NUT
24b		LOCK-OFF COIL
24c		LOCK-OFF HOUSING
24d		LOCK-OFF PLUNGER
25	GFA600029A1[1]	INLET LPG FILTER GASKET
26	GFA600012A0[1]	SCREEN, POLYESTER SGI
27	GFA600010A0[1]	FILTER, FOAM SGI
28	GFA600062A0	FITTING, SGI, 5/8"-18 UNF-2A
29	GFA003112A01	O-RING, 3112 NBR 70SH
30	GFA600011A01	BODY, FILTER SGI

[1]Included in A7-170 Repair Kit
[2]Included in A7-175 Repair Kit
[3]Included in A7-182 Repair Kit

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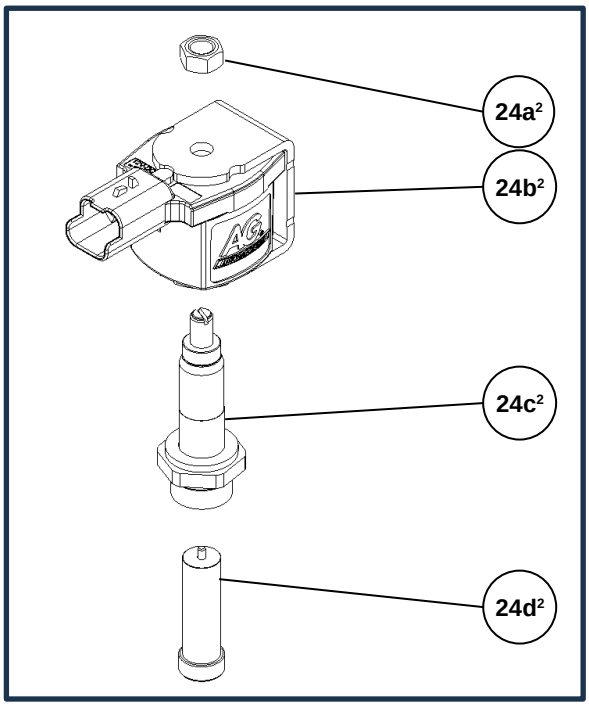
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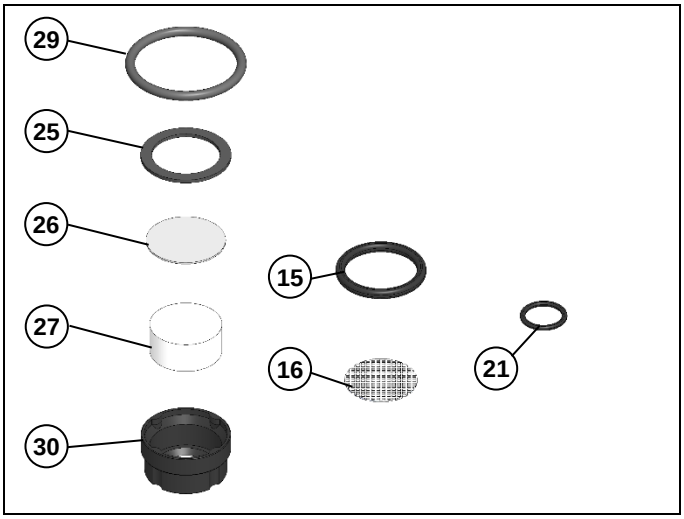
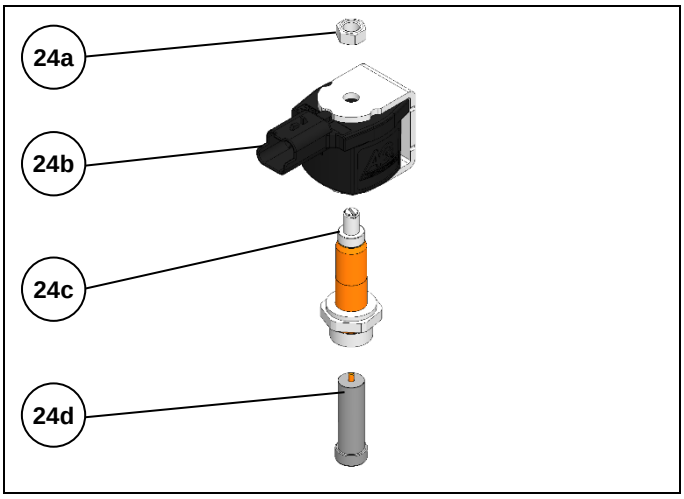
24b[2]
24c[2]
24d[2]

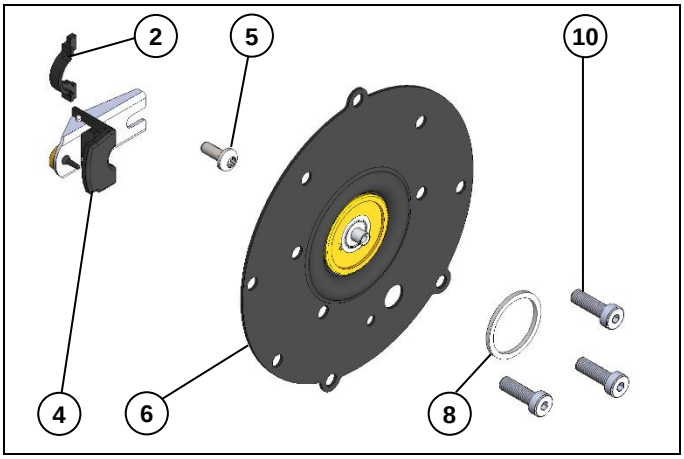
OVERVIEW – AVAILABLE REPAIR KITS



A7-170 Filter Service Kit: Contains filters, seals, gaskets, and related components for servicing fuel inlet , fuel outlet, and drain plug.



A7-175 Lockoff Repair Kit: Contains components for replacing the fuel lockoff valve on the SGI regulator.



A7-182 Regulator Repair Kit: Contains replacement diaphragm and lever assemblies, along with a nylon spring washer and spare cover and lever screws.

OVERVIEW – ADDITIONAL TOOLS NEEDED

In addition to the repair kits above, the following tools and consumables will be needed:

Tool / Consumable	Use
0-15 N*m (44 in-lbf) torque wrench set	Various assembly
19mm deep socket	5/8-18 Fitting removal/assembly
10mm deep socket	Lockoff Nut removal/assembly
OPTIONAL: 10mm wrench	Lockoff Nut removal only
21mm deep socket	Lockoff Housing removal/assembly
OPTIONAL: 21mm wrench	Lockoff Housing removal only
#2 Phillips screwdriver	M4 Screws removal
#2 Phillips bit for torque wrench or screw gun.	M4 Screws assembly
4mm hex screwdriver	Drain Plug removal
4mm hex bit	Drain Plug assembly
O-Ring removal tool or pick	O-Ring removal/assembly
White lithium grease or equivalent	Nylon Washer installation
P-80 Emulsion assembly lubricant	Various assembly
Engine oil	Diaphragm assembly
Application brushes	P-80 Emulsion application
Lint-free swabs	Engine oil application
0-50 psig (425 kPag) pressure gauge, safe to 200psig (1400 kPag) with mating vaporizer outlet fitting.	Pressure & Leak Test
60-200psig shop air with mating vaporizer inlet fitting connector	Pressure & Leak Test
Shop air inlet pressure gauge	Pressure & Leak Test
Solenoid connector, wire & alligator clips	Pressure & Leak Test
Snoop leak detector	Pressure & Leak Test

REBUILD INSTRUCTIONS – A7-170 FILTER SERVICE KIT

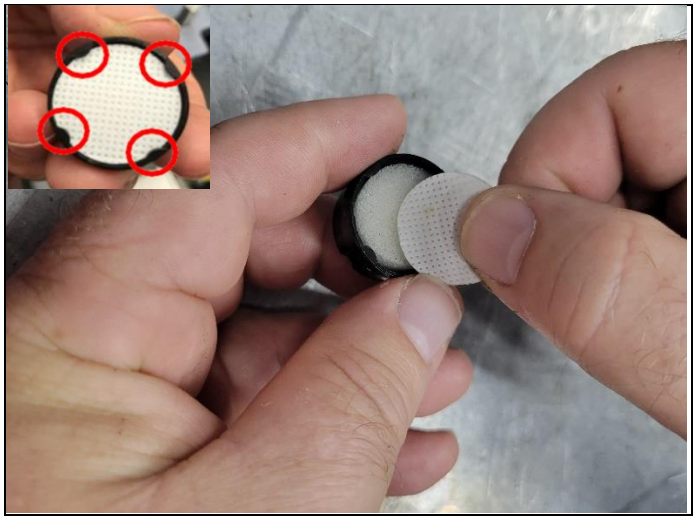
1. Secure regulator in an aluminum jaw vise and use a socket wrench or breaker bar with a 19mm deep socket to loosen and remove the Fitting (Item 28) from the regulator body.

2. Remove the O-Ring (Item 29) from the Fitting and discard. Set aside the Fitting for reuse.

3. Remove and discard the following from the Regulator Body filter bore:

- Filter Body (Item 30)
- Foam Filter (Item 27)
- Filter Screen (Item 26)
- Filter Gasket (Item 25)

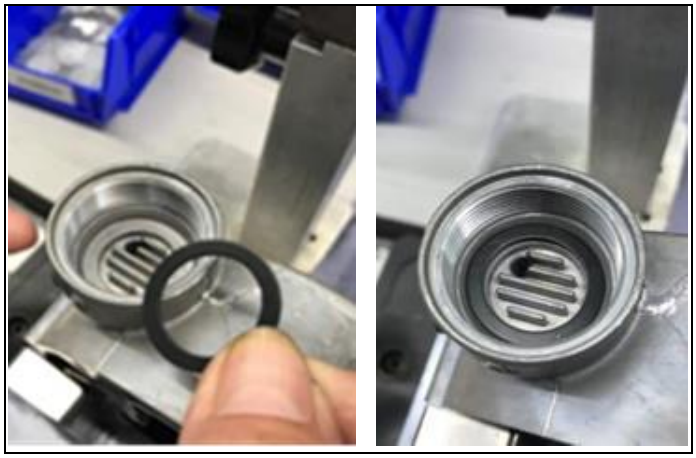
4. Insert replacement Foam Filter (Item 27) into the Filter Body (Item 30).



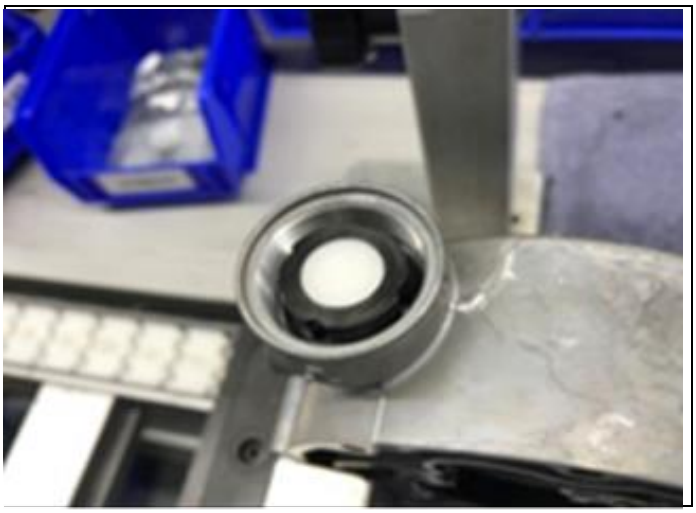
5. Press in the Filter Screen (Item 26) on to the Filter Body as shown.

NOTE:

Ensure that the Filter Screen is installed below the 4 notches on the Filter Body as shown.



6. Insert Filter Gasket (Item 25) into the filter bore as shown.



7. Insert filter assembly in the orientation as shown.

8. Carefully slide the O-Ring (Item 29) onto the Fuel Inlet Fitting (Item 28) as shown.

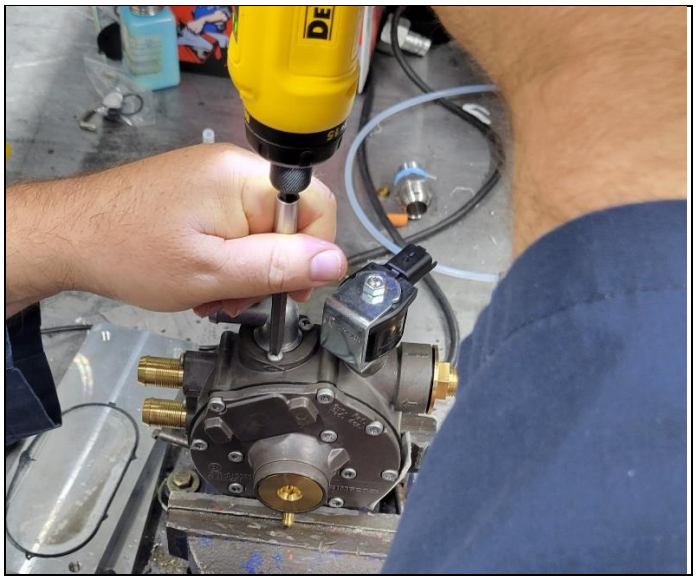
NOTE:

Make sure the O-Ring is not cut or damaged when sliding over the fitting threads.

9. Apply lubricant P-80 onto the O-Ring as shown.

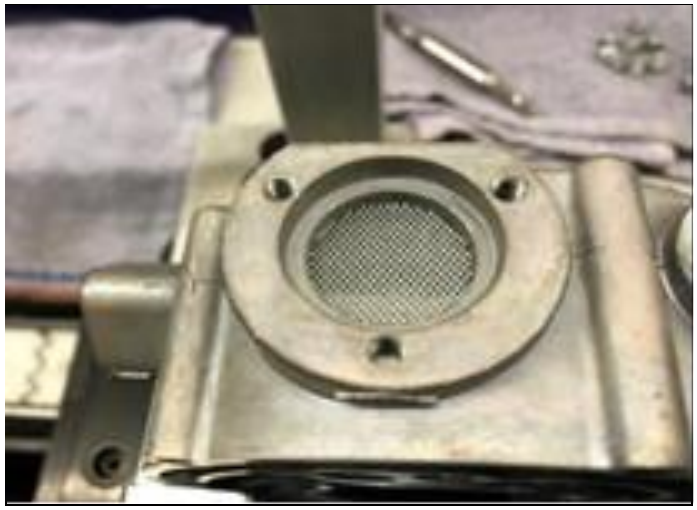
10. Install fitting by hand screwing it to the body as shown.

11. Use a torque wrench with a 19mm deep socket to torque the fitting to 20 ± 4 N*m (14.75 ± 3 foot-pounds).



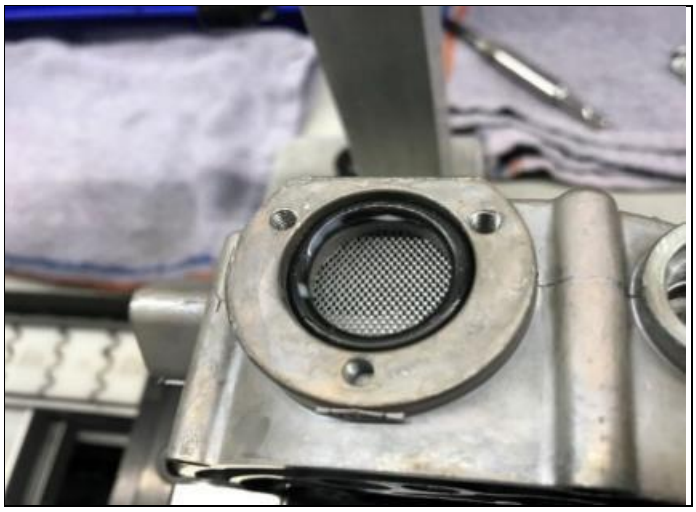
12. Reposition the regulator body in the vise to access the fuel outlet port. Use a #2 Phillips screwdriver to loosen and remove the (3) M4 Screws (Item 13) holding the Outlet Fitting (Item 14) in place. Set aside the M4 Screws and Outlet Fitting for reuse

13. Remove and discard the Outlet O-Ring (Item 15) and Outlet Filter (Item 16).

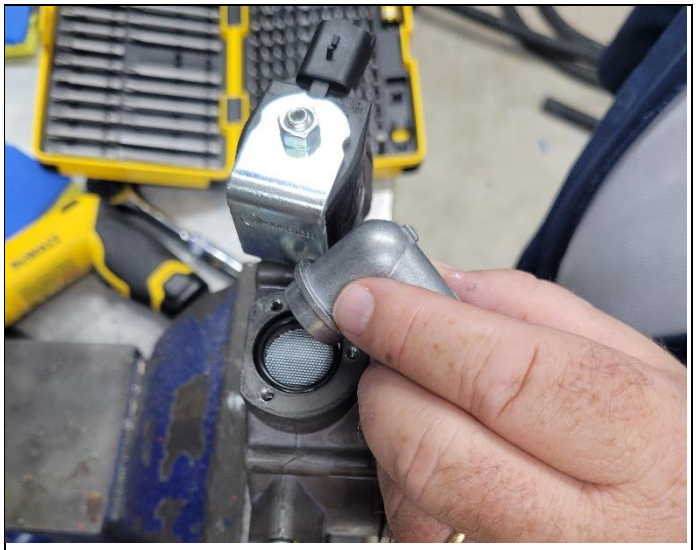


14. Place replacement Outlet Filter (Item 16) in the fuel outlet port as shown.

15. Apply lubricant P-80 onto the replacement Outlet O-Ring (Item 15).



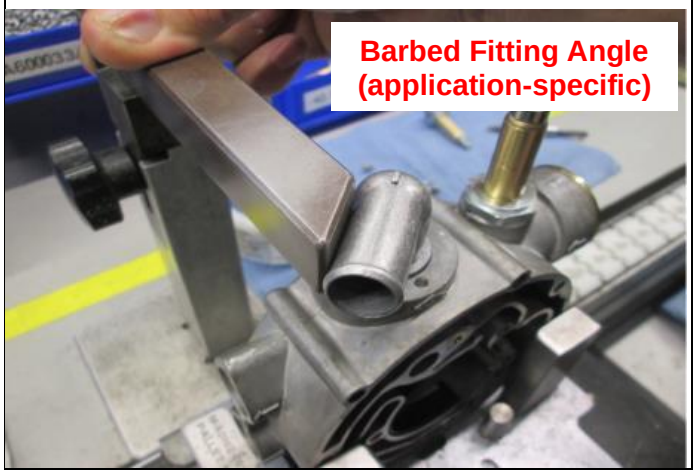
16. Place the replacement Outlet O-Ring into the fuel outlet port as shown.

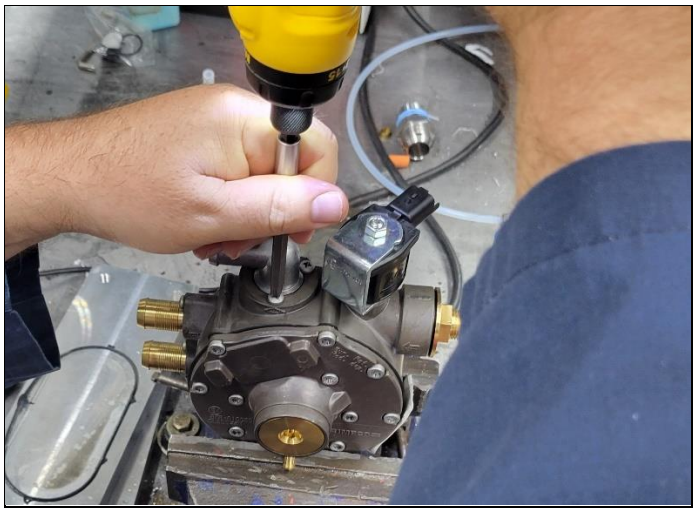


17. Hand-press the Outlet Fitting (Item 14) onto the fuel outlet port as shown.

NOTE:

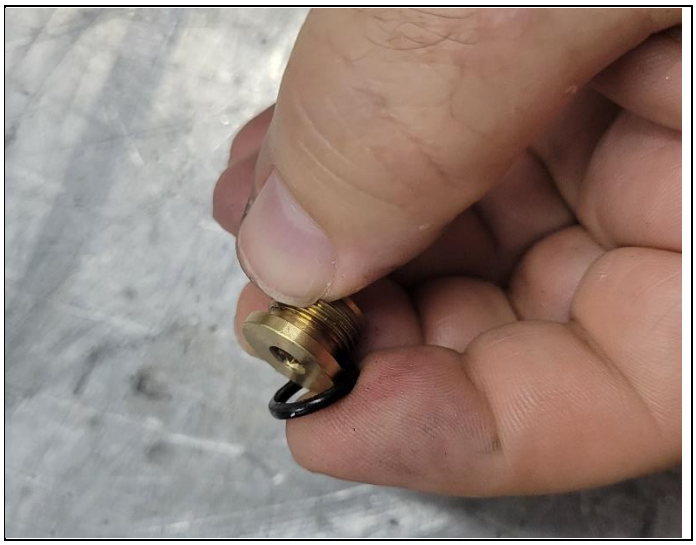
If 90-degree barbed fitting is used, orient the fitting as required by the application.



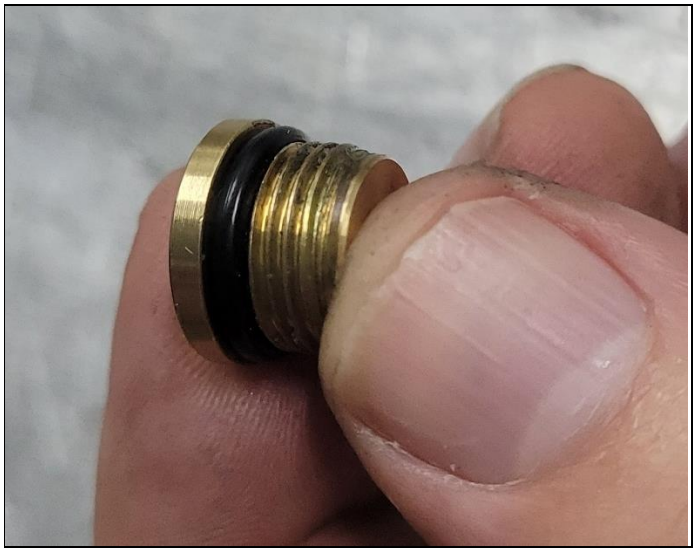


18. Hand start the (3) M4 Screws (Item 13) through the Outlet Fitting and into the threaded body holes, then use a torque wrench or torque gun with a #2 Phillips bit to tighten the screws to 2.5 ± 0.5 N*m (22 ± 4.4 inch-pounds).

19. Rotate the regulator in the vise to access the drain port and use a 4mm hex key to loosen and remove the Drain Plug (Item 20).



20. Remove the Drain Plug O-Ring (Item 21) from the Drain Plug and discard. Set the Drain Plug aside for reuse.



21. Carefully slide the replacement Drain Plug O-Ring (Item 21) onto the Drain Plug as shown.

NOTE:

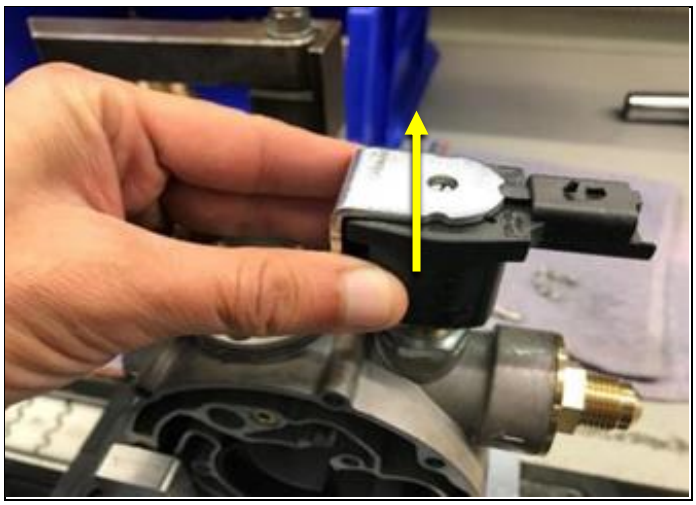
Make sure the O-Ring is not cut or damaged when sliding over the fitting threads.

22. Apply lubricant P-80 onto the Drain Plug O-Ring.

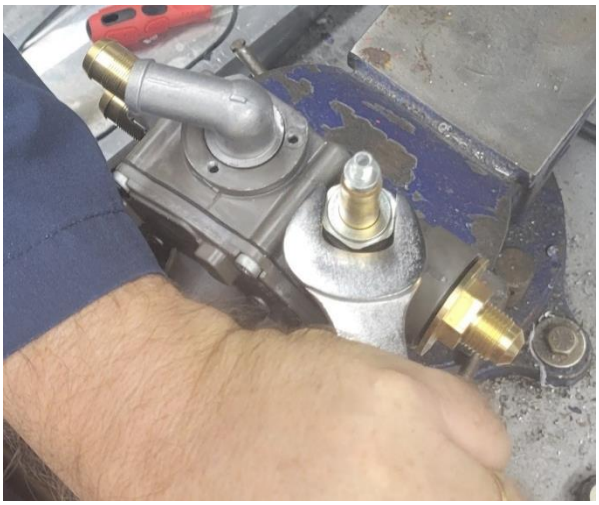
23. Hand-thread the Drain Plug back into the drain port, then use a torque wrench or torque gun with a 4mm bit to tighten the drain plug to 2.5 ± 0.5 N*m (22 ± 4.4 inch-pounds).

REBUILD INSTRUCTIONS – A7-175 LOCKOFF REPAIR KIT

1. Rotate the regulator to access the Lockoff port and use a 10mm wrench or 10mm deep socket to loosen and remove the Lockoff Nut (Item 24a). Discard the nut.



2. Remove and discard the Lockoff Coil (Item 24b).

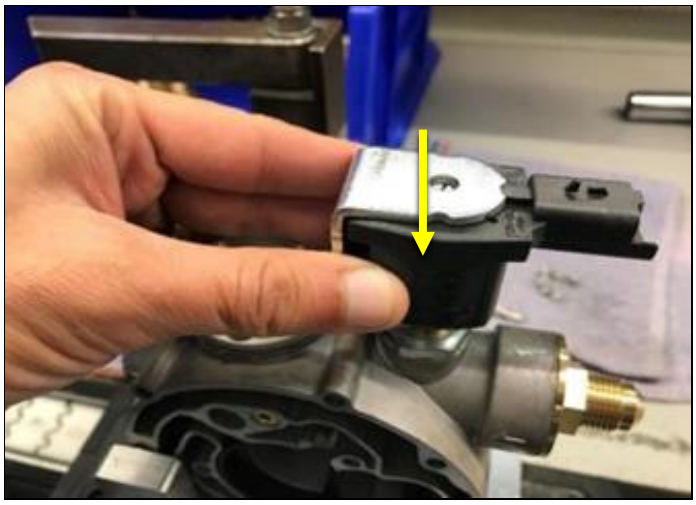


3. Use a 21mm wrench or 21mm deep socket to loosen and remove the Lockoff Housing (Item 24c) with Lockoff Plunger (Item 24d). Discard the Lockoff Housing and Plunger.

4. Insert replacement Lockoff Plunger (Item 24d) into the replacement Lockoff Housing (Item 24c) as shown.

5. Apply lubricant P-80 onto the O-Ring of the replacement Lockoff Housing.

6. Hand screw the Lockoff Housing/Plunger assembly onto the Lockoff port threads of the regulator body, then use a torque wrench with 21mm deep socket to tighten the Lockoff Housing/Plunger assembly to 15 ± 2 N*m (11 ± 1.5 foot-pounds).

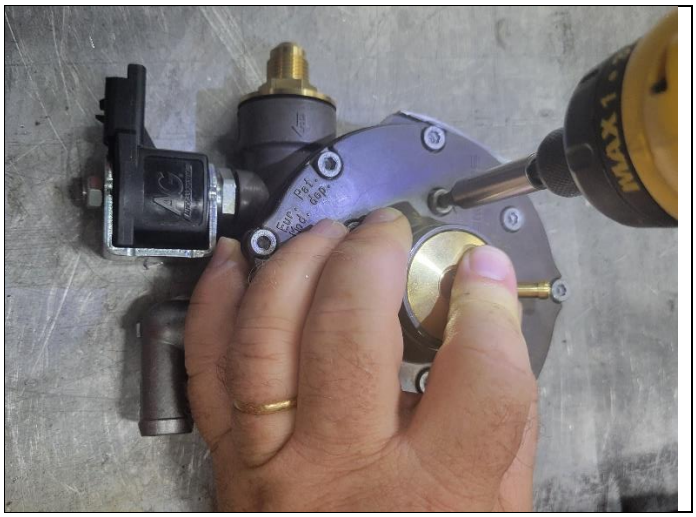


7. Place the replacement Lockoff Coil (Item 24b) on to the module as shown.

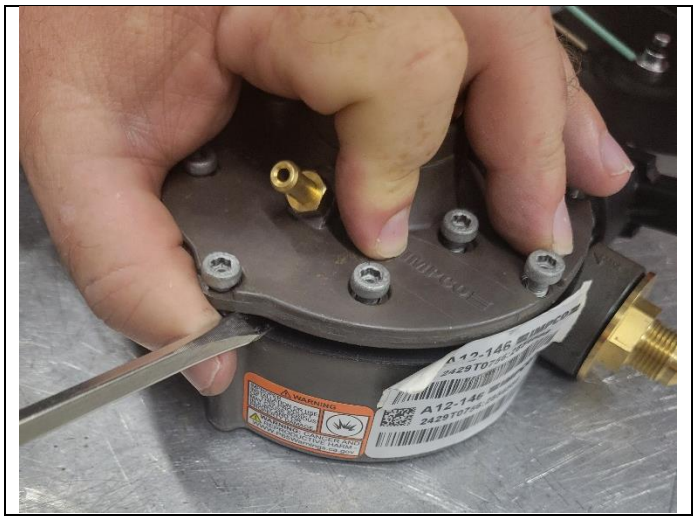
8. Hand screw the replacement Lockoff Nut (Item 24a) as shown.

9. Use a torque wrench with a 10mm socket to tighten the Lockoff Nut to 5.5 ± 0.5 N*m (48.7 ± 4.4 inch-pounds).

REBUILD INSTRUCTIONS – A7-182 REGULATOR REPAIR KIT

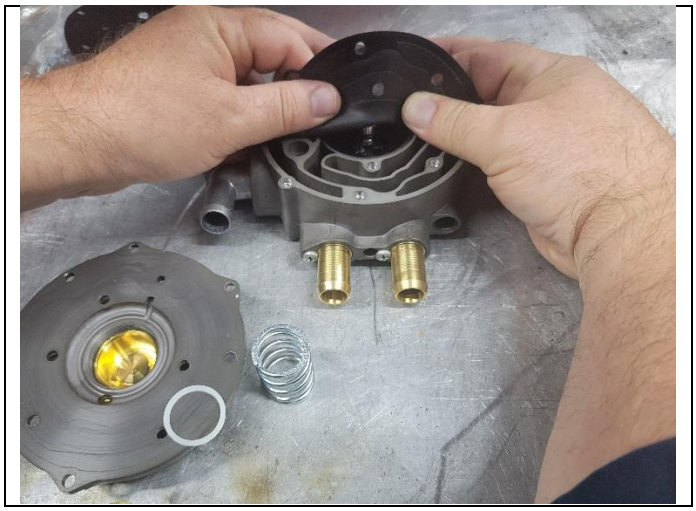


1. Use a 4mm hex key to loosen and remove the 11) cap screws (Item 1) holding the cover (Item 9) to the regulator. Set aside the screws for re-use and identify any screws needing replacement.

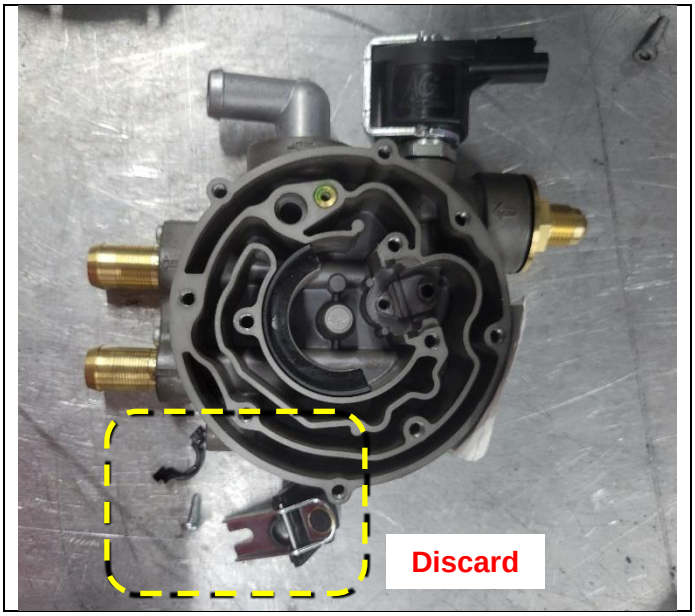


2. Use a thin flat-head screwdriver to CAREFULLY remove the cover (Item 9). Set aside the cover for reuse.

IMPORTANT: When removing the top cover take care not to scratch or damage the top cover or body surfaces that create the diaphragm seal. Any prying should be done carefully at the protruding screw bosses.



3. Carefully pull and slide the Diaphragm Assembly (Item 6) up and away from the lever actuator. Discard the Diaphragm Assembly. Remove and set aside the Vaporizer Spring (Item7). Remove and discard the Nylon Spring Washer (Item 8).



4. Use a #2 Phillips screwdriver to loosen and remove the M4 screw holding the lever assembly. Discard the M4 screw. Remove and discard the Lever Assembly (Item 4) and Lower Barrier Gasket (Item 2)

NOTE:

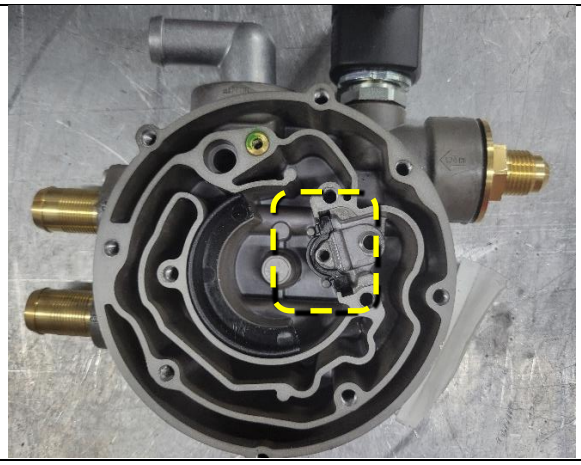
When removing the lever assembly take care not to damage the high-pressure seal seat on the body.

5. NOTES:

When removing the above parts dirt & debris may fall into the vaporizer body. Be sure to clean out all such debris to prevent subsequent fuel or coolant contamination.

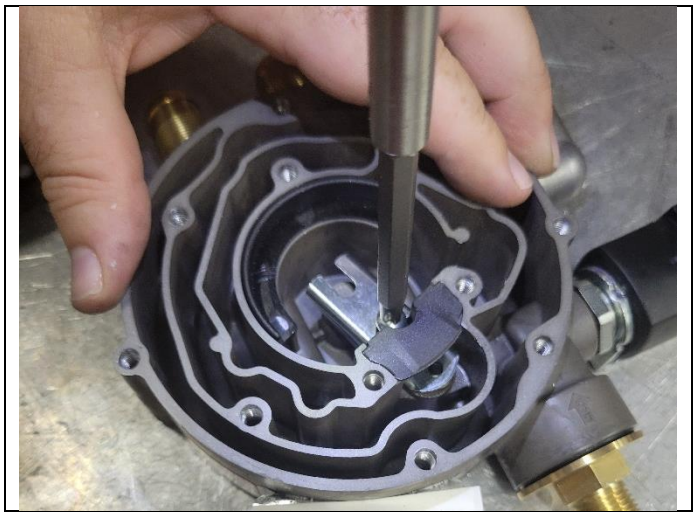
Inspect and clean any debris as well from the PRV orifice and straight fitting.

6. **NOTE:**
If there is corrosion or pitting of the body or top cover (as seen in the photograph below) a proper seal will not be achieved. If this is the case do not continue with the repair. The vaporizer must be replaced. Be sure the MAP port is free from debris or blockage.



7. Place the replacement Lower Barrier Gasket (Item 2) in place as shown. Make sure it is installed with the ridge facing upwards.

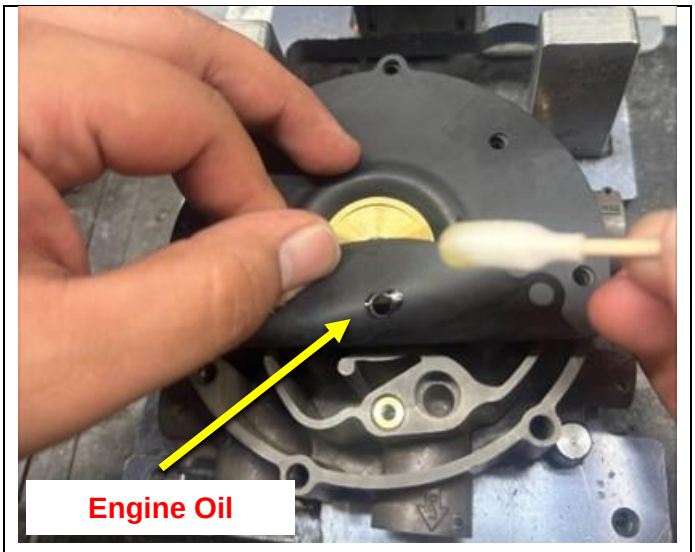
8. Apply P-80 Emulsion rubber lubricant to both sides of the Upper Barrier Gasket of the replacement Lever Assembly (Item 4). Place the Lever Assembly as shown, applying installation pressure on the Upper Barrier Gasket until the top surface is flush with the body sealing ridges.

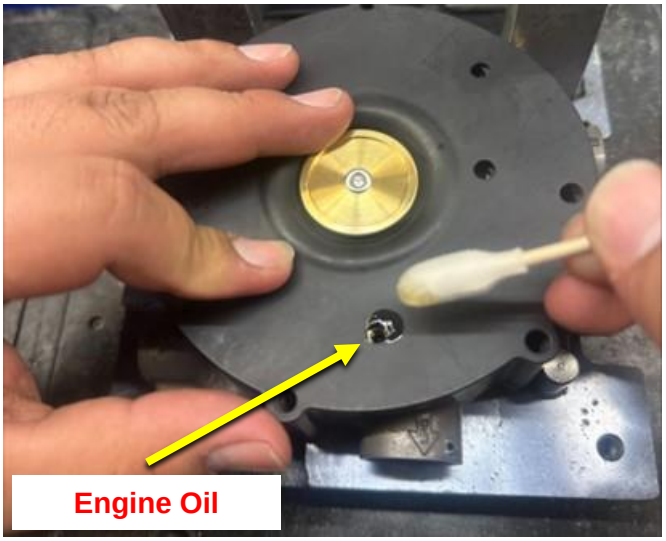


9. Use a #2 Phillips screwdriver to hand-tighten the replacement M4 screw (Item 5) through the Lever Assembly through hole and into the threaded hole in the body. Use a torque wrench or torque screwdriver with a #2 Phillips bit to tighten the M4 screw to 2.5 ± 0.5 N*m (22 ± 4.4 inch-pounds).

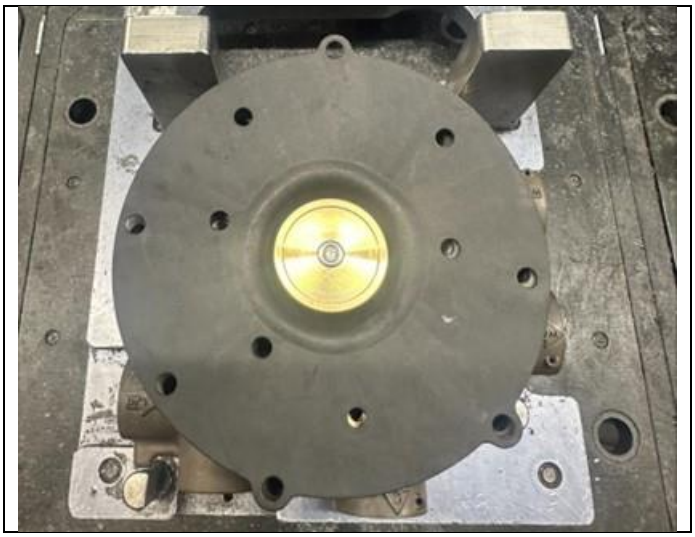
10. Orient the replacement Diaphragm Assembly (Item 6) with the stem facing down and slide the stem groove into the mating slot of the Lever.

IMPORTANT:
The High-Pressure Seal Lever MUST be inserted into the diaphragm stem BELOW the stem O-Ring (Ensure the stem O-Ring is positioned BETWEEN the Lever and the Diaphragm).





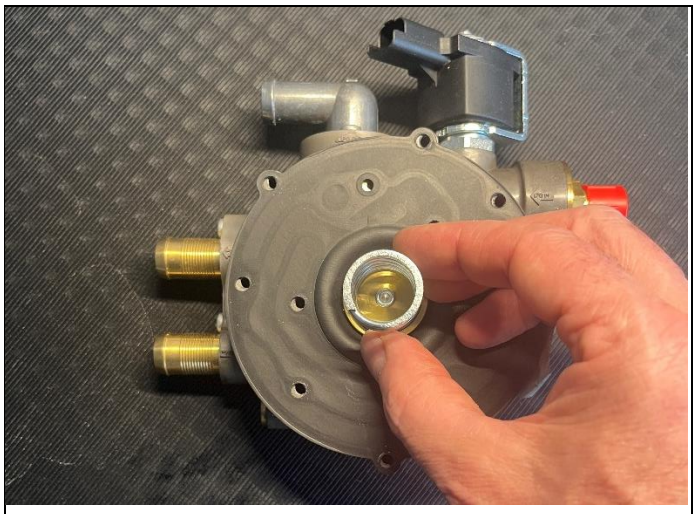
11. Apply engine oil on the diaphragm hole cut out above and below as shown.

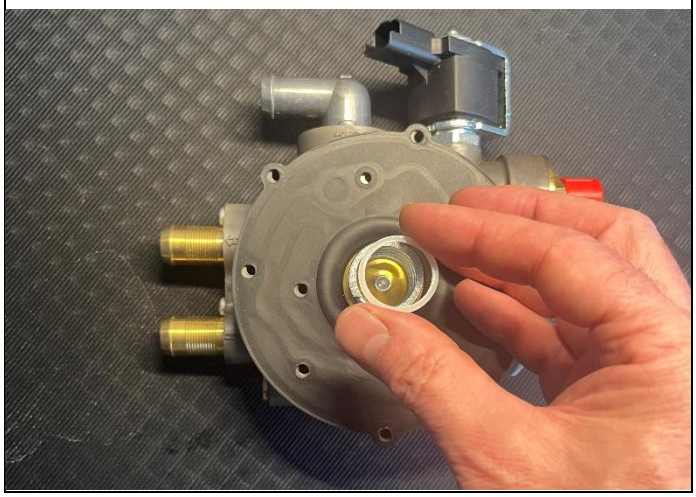


12. Rotate the Diaphragm Assembly as needed to align the outer (3) protruding screw holes with the mating threaded holes in the Regulator Body.

NOTE:

You may need to gently pull the diaphragm towards the center axis to properly align the holes.

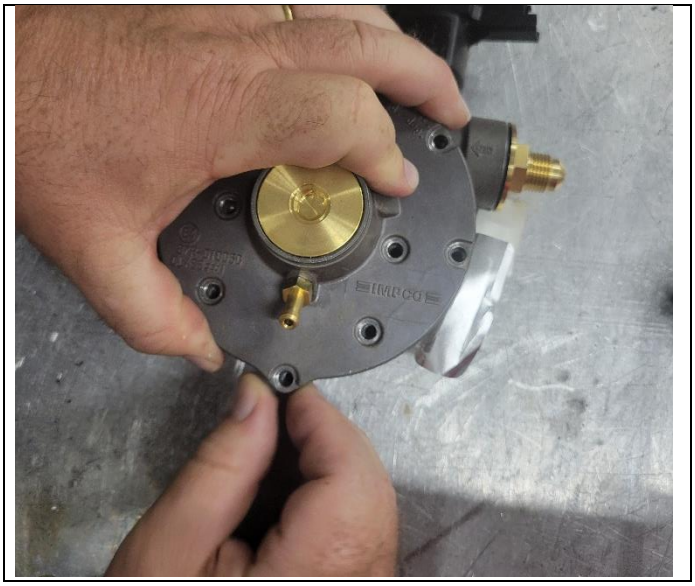




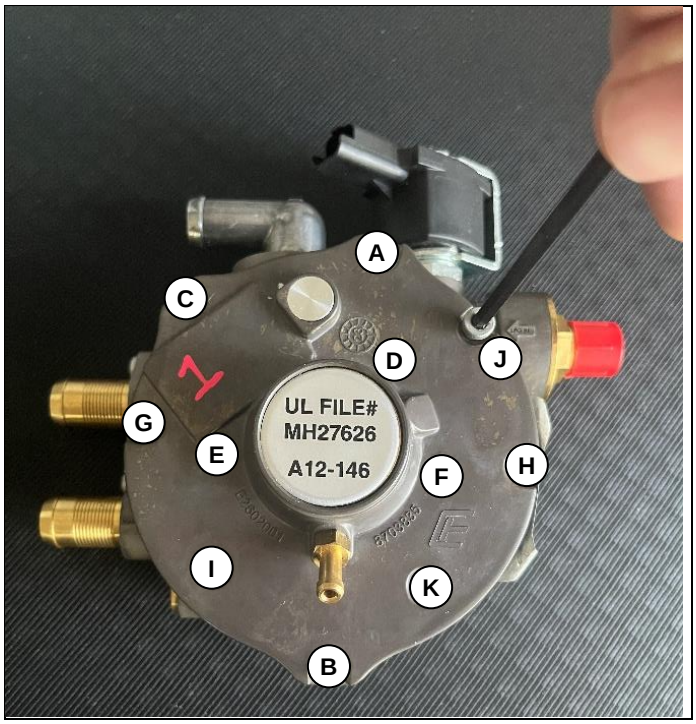
13. Place the Vaporizer Spring (Item 7) on top of the Diaphragm Plate and place the replacement Nylon Spring Washer (Item 8) on top of the spring.

NOTE:

When installing the Nylon Spring Washer, a small amount of white lithium grease may be used to hold the part in place during the assembly of the top cover.



14. Orient the Regulator Cover (Item 9) to align the assembly screw holes with the mating threaded holes of the Regulator Body and Diaphragm Assembly and place the cover over the Vaporizer Spring and Nylon Spring Washer and onto the body.



15. Use a 4mm hex key to hand-install the (11) Cap Screws (Item 10) through the cover holes and into the threaded body holes.

Use a torque wrench with a 4mm bit to torque the top cover screws to 5 N*m (44 inch-lbs), in order as shown in the table “INITIAL” column. Once all 11 screws have been torqued, repeat the tightening pattern turning each screw in a further 1/8 of a turn. Re-torque all 11 screws to 5 N*m in order as shown in the table “FINAL” column after 2 hours of operation.

IMPORTANT:
Insufficient torque will result in leakage of LPG to the environment or into the coolant system of the engine. Over torque may cause thread damage or breakage of top cover screw tangs resulting in leakage of LPG to the environment or into the coolant system of the engine.

SEQUENCE	FASTENER ID	
	INITIAL	FINAL
1	A	D
2	B	E
3	C	F
4	D	J
5	E	H
6	F	K
7	G	I
8	H	G
9	I	A
1	J	B
11	K	C

PRESSURE & LEAK TEST

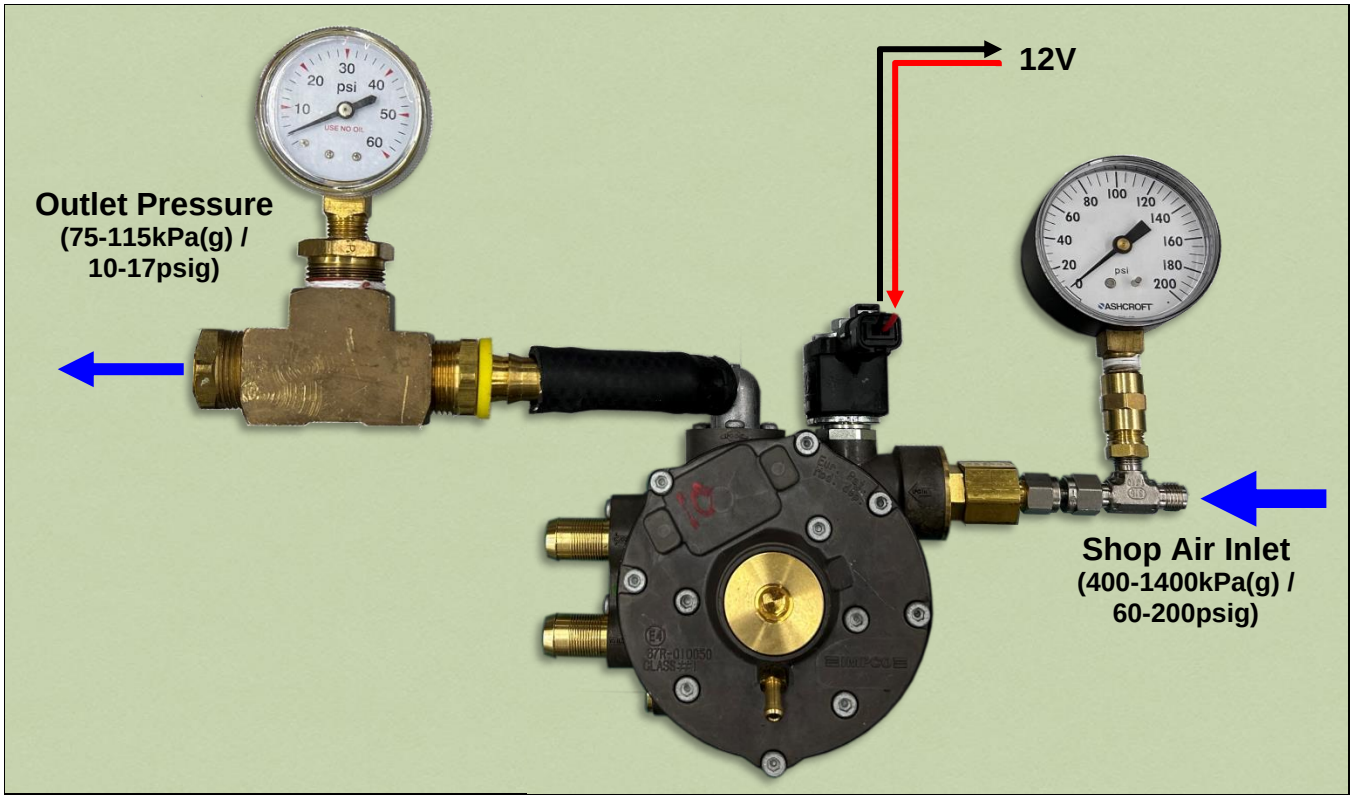
1. After assembly attach the hose & pressure gauge to the outlet port with a gauge capable of reading from 0 to 50 psig (425kPag).

   CAUTION: the gauge must be capable of withstanding 200 psig (1400kPag).

2. Connect a shop air pressure source using the inlet fitting connection. The pressure source must be a minimum of 60 psig to a maximum of 200 psig (400 to 1400kPag).
3. Connect jumper cable to lock off solenoid mating connector. Then make a direct connection to a 12-volt source (battery) using the alligator clips. DO NOT use the vehicle vaporizer connection as the power only remains live for 2 seconds after key on unless the engine is running.
4. Check the pressure reading on the outlet pressure gauge and confirm it is in the acceptable range (see figure below).

CRITICAL:

- Leak testing should not be done until the proper outlet pressure has been confirmed to be present.
- All areas of the diaphragm seal must be checked for leaks with Snoop while the vaporizer is pressurized with air. Leaks to the coolant system MUST also be checked for by filling the coolant passages with water and watching for bubbles or creating a Snoop film over both coolant barbs and watching for leakage.
- Alternatively, insert the entire unit into a bucket of water to check for leaks. Continue to next step only if no leaks are found. If unit leaks do not use, replace with new vaporizer. Be sure there is no leakage out of the MAP barb of the unit.



INSTALLATION CHECK

- If the vaporizer has met all the preceding requirements, it should then be installed on the engine with all the proper connections made. After installation apply fuel by slowly opening the LPG tank valve and turning the ignition key to **ON**.
- Check for leaks with Snoop at all connections and joints.
- Start engine and allow to idle. Using the PC Service Tool, monitor the Fuel Absolute Pressure (FAP) at idle. It should be 75-115kPag, (roughly between 115 and 150 kPaa [17 and 21 psia]). Operate engine until normal coolant temperatures are achieved (75 to 90 degrees C [165 to 195 degrees F]).
- Recheck for leaks with Snoop at all connections and joints.