INSTALLATION INSTRUCTIONS

Original Issue Date: **3/03**
Model: **30–60RZG (GM 4.3/5.0/5.7 L Engines)**
Market: **Industrial Generator Sets (FAA)**
Subject: **LP Liquid Withdrawal Conversion Kits GM28616-KP1 and GM28616-KP2**

Introduction

Model	Engine	Kit
30–45 kW	4.3 L GM	GM28616-KP1
50/60 kW	5.0/5.7 L GM	GM28616-KP2

Use the following instructions to convert an LP vapor fuel system to an LP liquid withdrawal fuel system. See Figure 1.

Installation of the LP liquid withdrawal conversion kit must comply with these installation instructions. Failure to install the fuel vaporizer following these installation instructions may result in poor generator set performance and affect the generator set warranty.

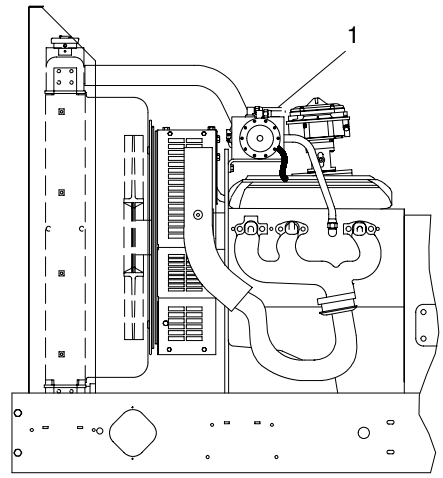
With the LP liquid withdrawal fuel system, LP fuel in liquid form is directed under pressure from the tank to a vaporizer. The vaporizer converts the fuel from a liquid to a gaseous state and then the LP vapor is drawn off to the fuel mixer (carburetor). The system also includes a fuel valve which shuts off the fuel flow when the engine is stopped.

The electrical wiring must comply with all national and local codes.

The kit procedure requires the following customer-supplied items:

- Oxygen Sensor Service Kit GM29285
- Service Bulletin 634 Fuel Mixture Adjustment using Oxygen Sensor Service Kit GM29285
- Two #6 spade connectors, 18–22 ga. (X-285-1)
- One 1/4 in. fully insulated, push-on male connector, 18-22 ga. (X-431-29)
- One 1/4 in. fully insulated, push-on female connector, 18-22 ga. (X-431-25)
- 18 ga. wire min., as needed (two leads required; identify as N and 70 or use color code identification)
- Additional plumbing components to complete the water line system, as needed
- Additional plumbing components to complete the fuel system, as needed
- Brackets and hardware for mounting the fuel vaporizer

Read the entire installation procedure and compare the kit parts with the parts list at the end of this publication before beginning installation. Perform the steps in the order shown.



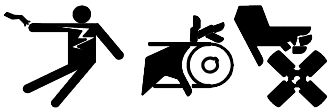
1. LP liquid withdrawal fuel inlet

Figure 1 LP Liquid Withdrawal System

Safety Precautions

Observe the following safety precautions while installing the kit.

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or connected equipment, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

⚠ WARNING

Fire.
Can cause severe injury or death.

Do not smoke or permit flames or sparks near fuels or the fuel system.

⚠ WARNING

Explosive fuel vapors.
Can cause severe injury or death.

Use extreme care when handling, storing, and using fuels.

The fuel system. Explosive fuel vapors can cause severe injury or death. Vaporized fuels are highly explosive. Use extreme care when handling and storing fuels. Store fuels in a well-ventilated area away from spark-producing equipment and out of the reach of children. Never add fuel to the tank while the engine is running because spilled fuel may ignite on contact with hot parts or from sparks. Do not smoke or permit flames or sparks to occur near sources of spilled fuel or fuel vapors. Keep the fuel lines and connections tight and in good condition. Do not replace flexible fuel lines with rigid lines. Use flexible sections to avoid fuel line breakage caused by vibration. Do not operate the generator set in the presence of fuel leaks, fuel accumulation, or sparks. Repair fuel systems before resuming generator set operation.

Explosive fuel vapors can cause severe injury or death. Take additional precautions when using the following fuels:

Propane (LP)—Adequate ventilation is mandatory. Because propane is heavier than air, install propane gas detectors low in a room. Inspect the detectors per the manufacturer's instructions.

Natural Gas—Adequate ventilation is mandatory. Because natural gas rises, install natural gas detectors high in a room. Inspect the detectors per the manufacturer's instructions.

Gas fuel leaks. Explosive fuel vapors can cause severe injury or death. Fuel leakage can cause an explosion. Check the LP vapor gas or natural gas fuel system for leakage by using a soap and water solution with the fuel system test pressurized to 6-8 ounces per square inch (10-14 inches water column). Do not use a soap solution containing either ammonia or chlorine because both prevent bubble formation. A successful test depends on the ability of the solution to bubble.

LP liquid withdrawal fuel leaks. Explosive fuel vapors can cause severe injury or death. Fuel leakage can cause an explosion. Check the LP liquid withdrawal gas fuel system for leakage by using a soap and water solution with the fuel system test pressurized to at least 90 psi (621 kPa). Do not use a soap solution containing either ammonia or chlorine because both prevent bubble formation. A successful test depends on the ability of the solution to bubble.

Installation Procedure

1. Removing the generator set from service.

1.1 Place the generator set master switch in the OFF position.

1.2 Deenergize the battery charger, if equipped.

1.3 Deenergize the block heater, if equipped.

1.4 Disconnect the generator set engine starting battery(ies), negative (–) lead first.

1.5 Close all fuel supply valves.

2. Removing the existing fuel system components.

2.1 With the engine and radiator cool, drain the coolant into a suitable container.

Note: The drain valve is located on the radiator bottom and/or on the side of the engine crankcase.

2.2 Remove the air cleaner assembly components. The air cleaner components will not be reused.

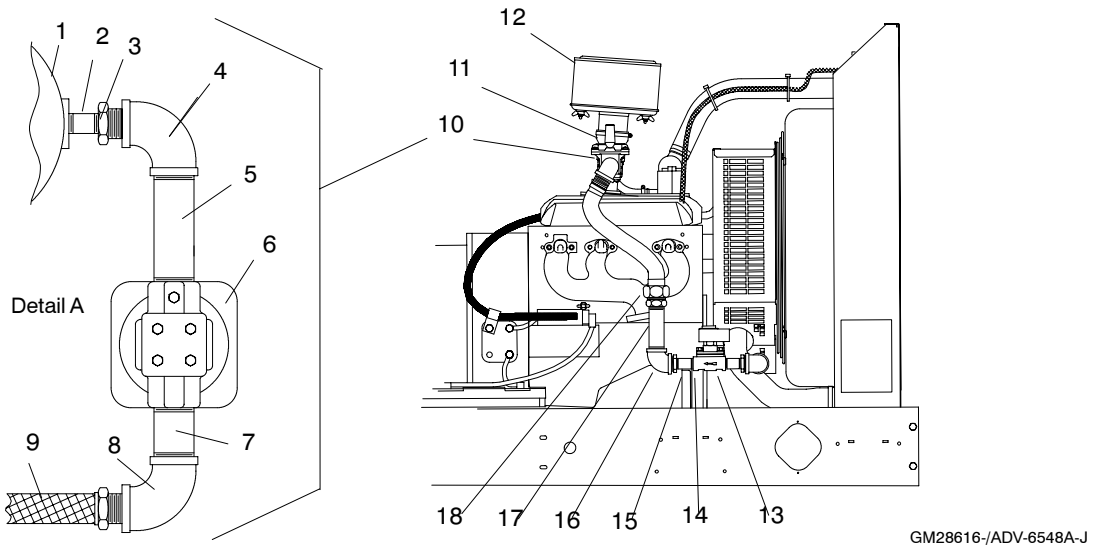
2.3 Remove the fuel mixer from the engine intake manifold. The fuel mixer will not be reused. Save the mounting hardware for installing the new fuel mixer.

2.4 Disconnect the fuel supply line connected to the gas valve assembly.

2.5 Disconnect and remove the flexible fuel line located between the gas valve assembly and the pressure regulator assembly.

2.6 Disconnect the leads connected to the gas valve assembly.

2.7 Remove the existing fuel system components shown in Figure 2.



1. Fuel mixer
2. Pipe nipple
3. Reducer bushing
4. Pipe elbow
5. Pipe nipple
6. Pressure regulator
7. Pipe nipple
8. Pipe elbow
9. Flexible fuel line
10. See Detail A
11. Fuel mixer
12. Air cleaner
13. Gas valve assembly
14. Reducer bushing
15. Support bracket and pipe
16. Pipe elbow
17. Pipe nipple
18. Pipe union

Figure 2 Existing LP Gas Fuel System

3. Installing the fuel system components on the vaporizer.

Note: Apply pipe sealant to the male threads of all components before installation.

3.1 Install the new fuel mixer (GM29850 with kit GM28616-KP1 or GM16165 with kit GM28616-KP2) including gaskets to the engine intake manifold using the existing hardware.

3.2 Apply pipe sealant to the threads on one end of pipe nipple (X-206-9) and install in the fuel mixer.

3.3 Apply pipe sealant to the threads on the other end of pipe nipple (X-206-9) and install pipe elbow (X-215-2). Position the pipe elbow as shown in Figure 3.

3.4 Apply pipe sealant to the threads on one end of the 152 mm (6 in.) pipe nipple (X-206-15) and thread the pipe nipple in the pipe elbow installed in the previous step.

3.5 Apply pipe sealant to the male threads of reducer bushing (X-202-1) and install the reducer bushing in the vaporizer outlet (326075). See Figure 3.

3.6 Apply pipe sealant to the threads of the other end of the 152 mm (6 in.) pipe nipple installed in step 3.4 and thread the vaporizer and reducer bushing assembly on the pipe nipple. Position the vaporizer as shown in Figure 3.

3.7 Apply pipe sealant to the threads of one end of the 3/8 x 1.0 in. pipe nipples (X-204-9) and install the pipe nipples in the vaporizer water inlet and outlet. See Figure 3.

3.8 Apply pipe sealant to the threads on the other end of the pipe nipples installed in step 3.7 and thread pipe elbows (X-215-9) on the pipe nipples. Position the pipe elbows as shown in Figure 3.

3.9 Apply pipe sealant to the threads of hose connectors (X-582-2) and install the hose connectors in the ends of the pipe elbows installed in step 3.8.

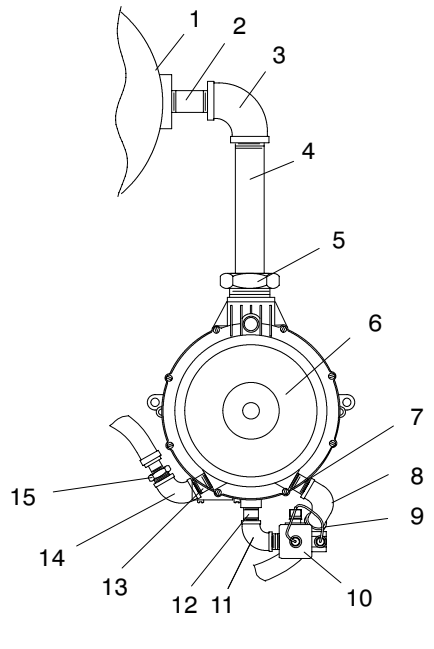
3.10 Apply pipe sealant to the threads of one end of the 1/4 x 0.9 in. pipe nipple (X-220-5) and install the pipe nipple in the vaporizer inlet. See Figure 3.

3.11 Apply pipe sealant to the threads of the other end of the pipe nipple installed in step 3.10 and thread the pipe elbow (X-215-5) on the pipe nipple. Position the pipe elbow as shown in Figure 3.

3.12 Apply pipe sealant to the male threads of the fuel solenoid (256976) and thread the fuel solenoid in the pipe elbow installed in step 3.11. Position the fuel solenoid as shown in Figure 3.

3.13 Mount the vaporizer assembly within the limits of the rubber hoses. The customer must provide all mounting hardware.

3.14 Install the new air cleaner assembly (A-326315 with kit GM28616-KP1 or A-326051 with kit GM28616-KP2) to the fuel mixer.



1. Fuel mixer
2. Pipe nipple (X-206-9)
3. Pipe elbow (X-215-2)
4. Pipe nipple, 152 mm (6 in.) (X-206-15)
5. Reducer bushing (X-202-1)
6. Vaporizer (326075)
7. Pipe nipple (X-204-9)
8. Pipe elbow (X-215-9)
9. Hose connector (X-582-2)
10. Fuel solenoid (256976)
11. Pipe elbow (X-215-5)
12. Pipe, 23 mm (0.9 in.) (X-220-5)
13. Pipe nipple (X-204-9)
14. Pipe elbow (X-215-9)
15. Hose connector (X-582-2)

Figure 3 LP Liquid Fuel System, Top View

4. Connecting the engine water lines to the vaporizer.

4.1 Remove the existing pipe plug on the engine for connection B. Location of connection B varies for the 30–45 kW and 50/60 kW models. See Figure 4. The pipe plug will not be reused.

4.2 Remove the existing rubber plug and hose clamp on the engine for connection C. See Figure 4. The rubber plug and hose clamp will not be reused.

4.3 Apply pipe sealant to the threads of street elbow (X-211-3) and install in the connection B location on the engine. Location of connection B varies for the 30–45 kW and 50/60 kW models. Position the pipe elbow as shown in Figure 4.

4.4 Apply pipe sealant to threads of hose connector (X-582-1) and install in the street elbow on the engine for connection B.

4.5 Slide two hose clamps (X-426-12) on rubber hose (X-577-40) and connect between connection B on the engine and connection B on the vaporizer. Position and tighten a hose clamp at each end.

4.6 Slide two hose clamps (X-426-12) on rubber hose (X-577-40) and connect between connection C on the engine and connection C on the vaporizer. Position and tighten a hose clamp at each end.

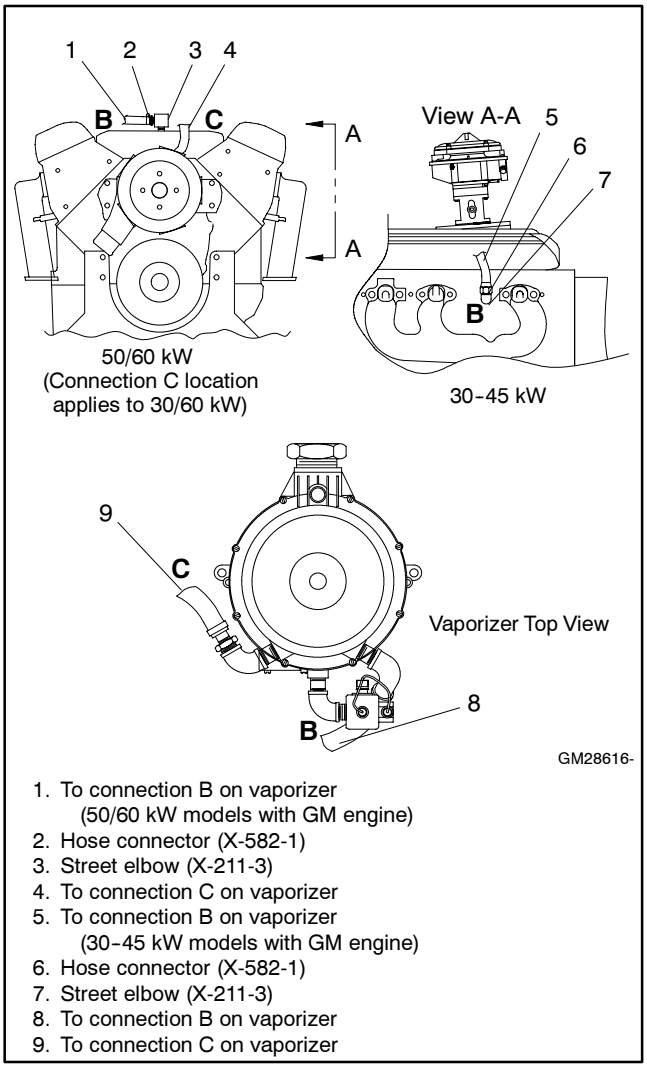
5. Connecting the fuel solenoid to the wiring harness and fuel supply.

5.1 Fabricate an electrical harness connecting the vaporizer to the existing engine wiring harness using the following customer-supplied components:

- Two #6 spade connectors, 18–22 ga. (X-285-1)
- One 1/4 in. fully insulated, push-on male connector, 18-22 ga. (X-431-29)
- One 1/4 in. fully insulated, push-on female connector, 18-22 ga. (X-431-25)
- 18 ga. wire (min.), as needed (two leads required; identify as N and 70 or use color code identification)

Note: Lead N is engine ground/battery negative (–) and lead 70 is engine run/battery positive (+).

5.2 Connect the new harness to the existing engine wiring harness connectors previously attached to the LP gas valve.



1. To connection B on vaporizer (50/60 kW models with GM engine)
2. Hose connector (X-582-1)
3. Street elbow (X-211-3)
4. To connection C on vaporizer
5. To connection B on vaporizer (30–45 kW models with GM engine)
6. Hose connector (X-582-1)
7. Street elbow (X-211-3)
8. To connection B on vaporizer
9. To connection C on vaporizer

Figure 4 Vaporizer Water Line Connections

5.3 Connect lead 70 to the fuel solenoid positive terminal.

5.4 Connect lead N to the fuel solenoid negative terminal. See Figure 5.

5.5 Connect the (customer-supplied) fuel supply line to the fuel solenoid.

5.6 Turn on the fuel supply to the generator set and test the connections for leaks. Turn off the fuel supply and correct leaks, if required. Turn on the fuel supply.

LP liquid withdrawal fuel leaks. Explosive fuel vapors can cause severe injury or death. Fuel leakage can cause an explosion. Check the LP liquid withdrawal gas fuel system for leakage by using a soap and water solution with the fuel system test pressurized to at least 90 psi (621 kPa). Do not use a soap solution containing either ammonia or chlorine because both prevent bubble formation. A successful test depends on the ability of the solution to bubble.

6. Restoring the generator set to service.

6.1 Refill the cooling system using the procedure and coolant recommendation given in the engine operation manual and/or generator set operation manual. See the respective spec sheet for coolant capacity.

Reuse the existing drained coolant if deemed acceptable. Otherwise, mix clean distilled water and coolant according to the engine manufacturer's recommendation in the engine operation manual.

Dispose of all waste materials, (engine oil, fuel, coolant, etc.) in an environmentally safe manner. Contact local authority for procedures.

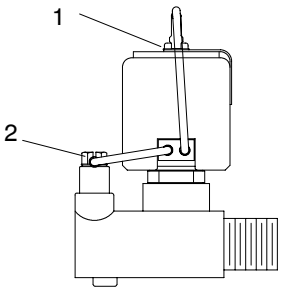
6.2 Check that the generator set master switch is in the OFF position.

6.3 Reconnect the generator set engine starting battery, negative (–) lead last.

6.4 Reenergize the battery charger, if equipped.

6.5 Reenergize the block heater, if equipped.

7. Adjust the fuel mixture using Service Bulletin 634.



1. Positive connection
2. Negative connection

Figure 5 Fuel Solenoid Electrical Connections

Parts List

LP Liquid Withdrawal Kit

Kit: GM28616-KP1		
Qty.	**Description**	**Part Number**
1	Bushing, reducer, 3/4 NPT x 1 NPT	X-202-1
2	Nipple, pipe, 3/8 NPT x 1.0 in.	X-204-9
1	Nipple, pipe, 3/4 NPT x 1.4 in.	X-206-9
1	Nipple, pipe, 3/4 NPT x 6.0 in.	X-206-15
1	Elbow, street, 90 deg. 1/2 NPT	X-211-3
1	Elbow, pipe, 3/4 NPT	X-215-2
1	Elbow, pipe, 1/4 NPT	X-215-5
2	Elbow, pipe, 3/8 NPT	X-215-9
1	Nipple, pipe, 1/4 NPT x 7/8 in.	X-220-5
4	Clamp, hose	X-426-12
2	Hose, rubber 5/8 ID	X-577-40
1	Connector, hose 1/2 NPT	X-582-1
2	Connector, hose 3/8 NPT	X-582-2
1	Solenoid, fuel	256976
1	Vaporizer, LP fuel	326075
1	Mixer, fuel (includes gaskets)	GM29850
1	Cleaner assembly, air	A-326315
Kit: GM28616-KP2		
Qty.	**Description**	**Part Number**
1	Bushing, reducer, 3/4 NPT x 1 NPT	X-202-1
2	Nipple, pipe, 3/8 NPT x 1.0 in.	X-204-9
1	Nipple, pipe, 3/4 NPT x 1.4 in.	X-206-9
1	Nipple, pipe, 3/4 NPT x 6.0 in.	X-206-15
1	Elbow, street, 90 deg. 1/2 NPT	X-211-3
1	Elbow, pipe, 3/4 NPT	X-215-2
1	Elbow, pipe, 1/4 NPT	X-215-5
2	Elbow, pipe, 3/8 NPT	X-215-9
1	Nipple, pipe, 1/4 NPT x 7/8 in.	X-220-5
4	Clamp, hose	X-426-12
2	Hose, rubber 5/8 ID	X-577-40
1	Connector, hose 1/2 NPT	X-582-1
2	Connector, hose 3/8 NPT	X-582-2
1	Solenoid, fuel	256976
1	Vaporizer, LP fuel	326075
1	Mixer, fuel (includes gaskets)	GM16165
1	Cleaner assembly, air	A-326051