

## Your Reliable Guide for Power Solutions

To fulfill our commitment to be the leading supplier in the power generation industry, the Total Energy Systems, LLC. team ensures they are always up-to-date with the current power industry standards as well as industry trends. As a service, our **Information Sheets** are circulated on a regular basis to existing and potential power customers to maintain their awareness of changes and developments in standards, codes and technology within the power industry.

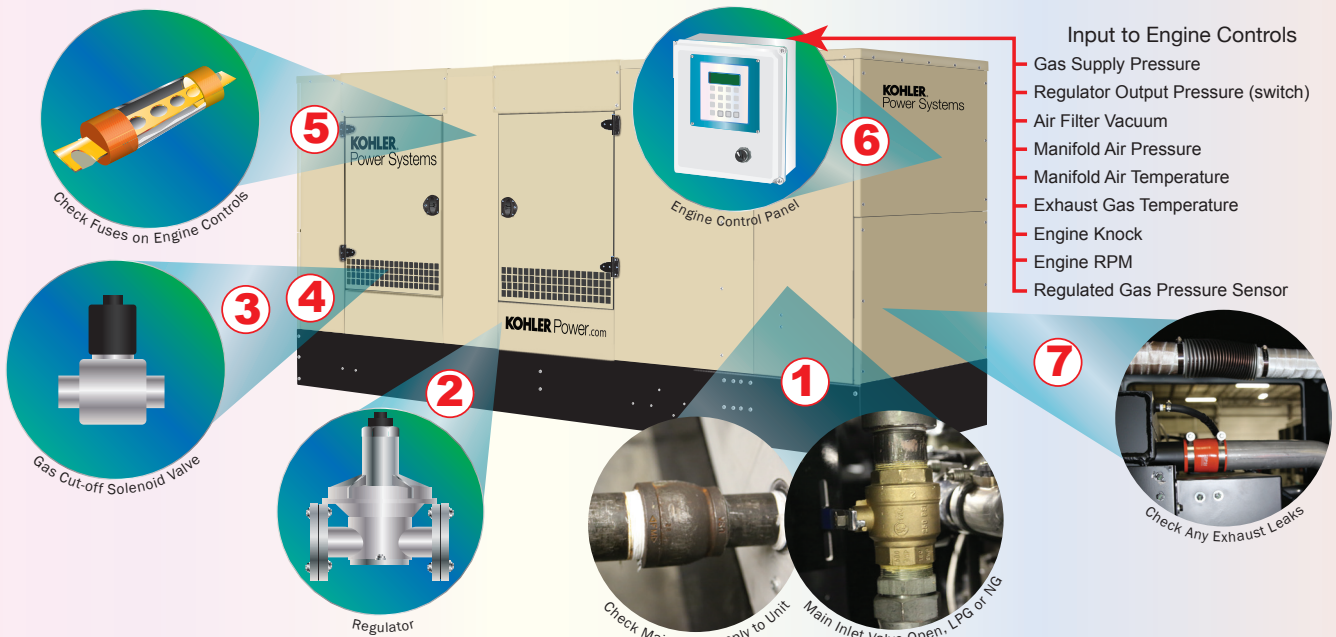
### Troubleshooting Gaseous Generator Systems

#### 1.0 Introduction:

Many standby and prime power generator systems are powered by gaseous fueled spark ignition engines. Gaseous fuels are used to power the engine with the fuel of choice predominately natural gas, or liquid petroleum gas (LPG). Gaseous fueled sets, as for diesel sets, should be regularly serviced by a technician trained and certified to work on gaseous powered engines and generator systems. Your authorized generator distributor's trained technician is very experienced in troubleshooting a gaseous generator systems and determining a reason for failure.

*This Information Sheet discusses typical technician troubleshooting issues related to gas when a generator set fails to start:*

#### Key Items a Service Technician Checks When Troubleshooting a Gaseous Generator



STEP	CERTIFIED TECHNICIAN TROUBLESHOOTING STEPS TO TAKE ON GASEOUS GENERATOR SYSTEMS
1	Check if the main inlet valve is open, if NG or LPG fueled, and recommended PSI from source to engine inlet
2	Determine if the generator is fitted with a pressure regulator and required inlet and outlet PSI
2A	For units without a regulator connect manometer to fuel shut-off valve inlet (Adjust if required)
2B	Units with a regulator, read gauge if fitted or connect pressure gauge to access ports to read inlet and outlet PSI
3	Check gas connections between fuel cut-off solenoid valve, regulator, and engine
4	Check gas pressure to shut-off solenoid, voltage feed to solenoid, and operation of solenoid
5	If pressure is within limits, and all connections are correct, check fuses in engine fuse panel
6	After checking all gas connections and pressures, and the unit will not start proceed to check engine control panel
7	Should the unit not pull full load check the exhaust and inter-cooler connections

## 2.0 Key Differences between Gaseous and Diesel Fuels:

Diesel fuel is a liquid that is ignited by compressed air when the injector injects diesel into the engine cylinder providing the energy to push the piston down. In gaseous fueled engines a spark ignites the gas fed into the engine as a gas vapor air fuel mixture. The mechanics of a spark ignition engine and compression ignition engine are very different and present unique areas of troubleshooting. Your trained technician is very familiar with these differences.

## 3.0 Key Areas to Trouble Shoot on a Gaseous Generator:

A regular planned maintenance program will minimize any unscheduled failures, but when a failure does occur the technician will follow the 80/20 rule, whereby 20% of the possible reasons for failure make up 80% of all failures.

Should your generator fail to start, your service technician will investigate in order the following: *(See diagram on front page.)*

- **Type of Gas Engine** - What gas fuel is being used.
- **Pressure Regulator** - Is the engine fitted with a pressure regulator, most commonly it is.
- **Gas Flow** - After batteries, fuel delivery is the most common reason for failure to start.
- **Fueling to Engine** - Fuel valve operation.
- **Electrical Connections** - After fueling electrical connections are checked.
- **Controls** - Is the controller fully operational.
- **Exhaust Connections** - In a gaseous closed loop system any leaks will effect performance.

## 4.0 Type of Gas Engine and Main Gas Connection:

It would appear an obvious check, but most units are fitted with a manual gas on/off valve on the inlet side of the main gas supply, this valve should be checked to ensure it is in the open position.

First the technician will determine if the fuel into the engine is Natural Gas (NG) or LPG. In some units the inlet gas pressure source is controlled without a regulator. To check gas pressure on a unit without a pressure regulator, the technician hooks up a gauge to the valve on the fuel cut-off solenoid.

## 5.0 Inlet Pressure to Regulator:

On many units a pressure regulator adjusts the inlet pressure of the connected incoming gas line to the required inlet pressure into the engine combustion system as recommended by the manufacturer.

For a unit equipped with a regulator, the inlet pressure gauge is read or a test gauge is connected to the valve on the regulator. In both cases the service technician will use the inlet connected gas pressure as recommended by the manufacturer for NG or LPG, which is given as "inches of water."

## 6.0 Gas Flow:

Gas flow into the engine must enter at the correct PSI and be unrestricted. Any leaks are not only hazardous but can also drop pressure to levels where the engine cannot maintain load. The technician tests the following gas flow.

- **Connection to Gas Supply** - NG and LPG connections should be securely connected to the generator.
- **Pressure to Via Fuel Cut-off Solenoid** - Final gas feed to the engine is frequently through a gas cut-off solenoid, the inlet outlet pressures can be read via hook up valves on the solenoid.
- **Pressure Regulator** - Depending on the gas supply and type of engine, a gaseous generator could have one or more pressure regulators. Either by checking gauges on the engine, or hooking a test gauge to the inlet and outlet side of the regulator, the technician will ensure all pressures are within the required limits, there are no leaks, and the connections are tight.
- **Correcting Regulator Pressure** - The pressure regulator can be adjusted to provide the required outlet pressure.

## 7.0 Fueling to Engine:

If all measurements indicate the gas inlet and outlet pressures are correct and the unit still will not start the technician will check if the engine gas fuel cut-off solenoid valve is functioning correctly. The voltage across the solenoid valve is checked with a multi-meter. If the correct voltage is read the technician will check the operation of the valve.

## 8.0 Electrical Connections:

Should the engine still not start, even though the gas pressure is correct and fuel valves are operational, the next stage is for the technician to check the fuses in the engine fuse box located on the side of the engine. Any blown fuses should be replaced after checking the circuit they control, and the technician will try and start the engine again.


## 9.0 Controls:

Having checked gas pressure, fuel flow, electrical connections, and any fuses, and the unit still does not start the technician will check the generator controls. The control panel will indicate if failure is due to items such as battery, oil pressure, etc.

Many closed loop gaseous generators sets will have a control panel that allows the technician to hook up to software on their note book to determine if there is any controller issue within the system that is preventing start.

## 10.0 Exhaust Connections:

In some cases the generator set starts, but is not able to carry it's rated load. On a gaseous generator the inability for the set to perform per its given rating can be loose or leaking exhaust connects. The ignition system of a closed loop generator set is controlled by several sensors to measure items such as oxygen. The technician will check for any leaks or loose connections in the exhaust system to verify if this is the cause of poor performance.

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