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85669 Gas Valve MBC-SE 2500 24VAC

Applicable Appliance Models

- FTG 2000-2400

Kit Contents

- 85669 – Gas Valve

Tools Required

- Phillips Screwdriver
- 6 mm Allen wrench
- 3 mm Allen wrench
- 2.5 mm Allen wrench
- Flat Screwdriver
- Combustion Analyzer

Figure 1 Gas Valve



The installation of this gas valve must be performed by a qualified gas technician in accordance with these instructions. Installing this valve without the proper background and training is hazardous and may result in property damage serious injury or death.

Replacement Instructions

- 1) Shut off the power and gas supply to the boiler.
- 2) Remove the gas valve harness and feedback tube from the gas valve (feedback tube is connected to a Push-in fitting installed on the valve (see Figure 2); press in on the plastic to release the tube).
- 3) Unbolt the inlet and outlet flanges from the gas valve (6 mm Allen wrench) and remove the gas valve from the boiler.
- 4) Transfer the Low Gas Pressure Switch from the old gas valve to the new valve; remove the plug from the new valve before installing the switch (see Figure 3). Use care to ensure that the O-ring gasket does not fall out.



O-ring – Failure to properly re-install the gas line adapter O-ring will result in gas leakage which may cause property damage, serious injury, or death.

- 5) Transfer the Push-in fitting for the feedback tube from the old gas valve to new valve (see Figure 2).
- 6) Reinstall the new valve in the reverse order, taking care to properly align the O-ring seals, and perform the **Combustion Calibration Procedure** detailed on the following pages.



Feedback Tube – Reconnect the tubing from the air-inlet to the gas valve feedback port (Figure 2). Failure to properly reconnect the feedback tube will negate the boiler's blocked vent safety shutoff mechanism, and could lead to incorrect combustion resulting in property damage, serious injury or death.

Figure 2 – Feedback Tube Connection on Valve

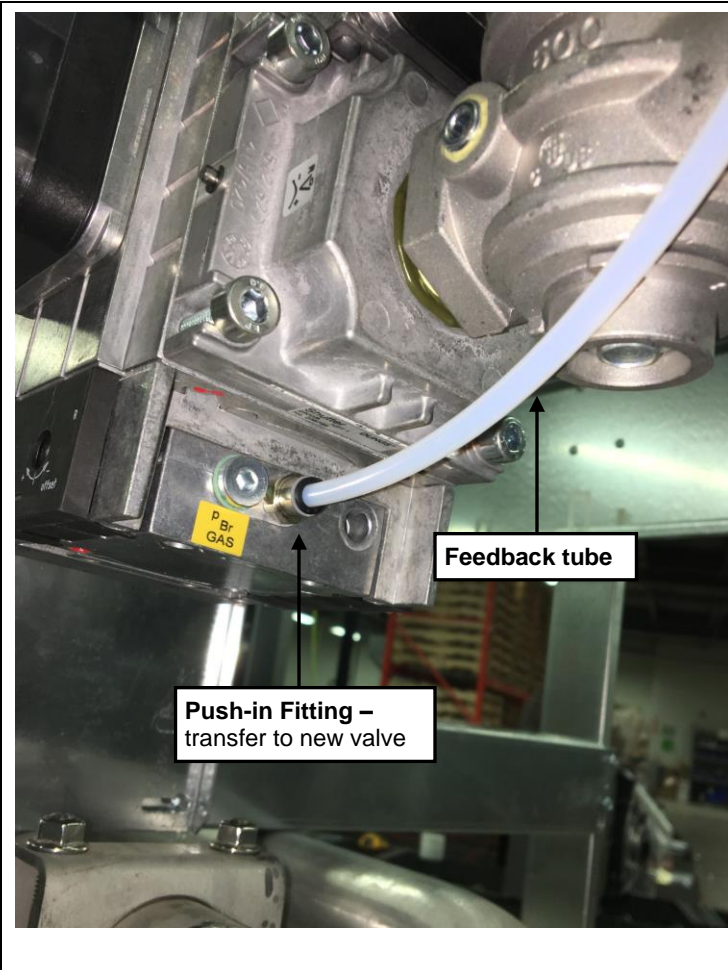
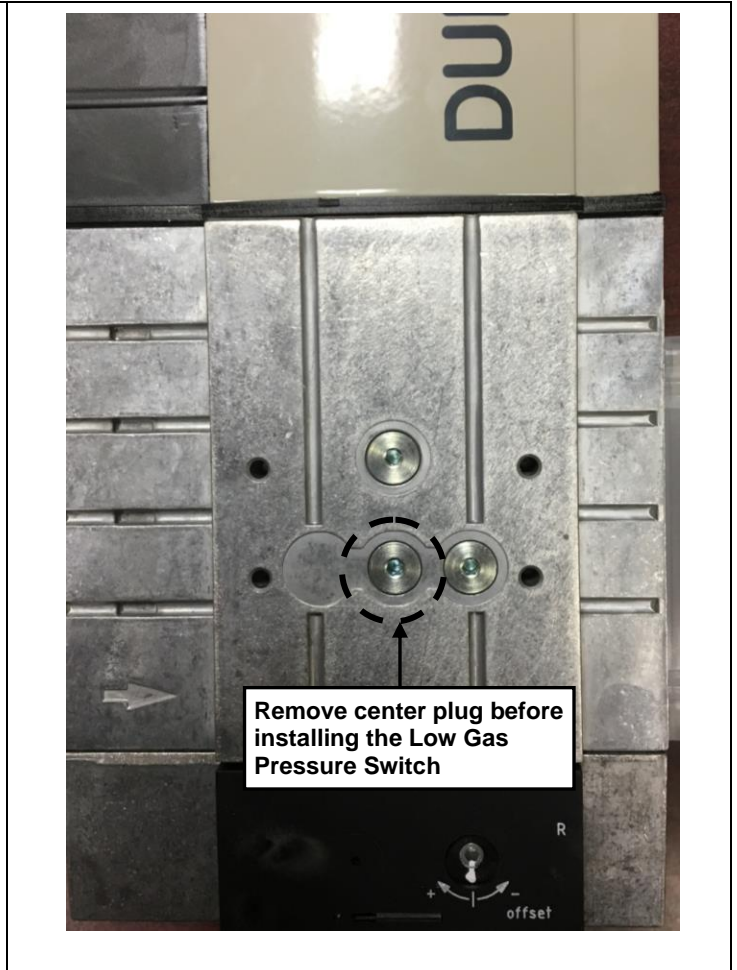


Figure 3 – Low Gas Pressure Switch Port



Combustion Calibration Procedure

To calibrate burner combustion, perform the following procedure using a calibrated combustion analyzer capable of measuring CO₂ and CO from a Natural Gas or Propane burning appliance:

1. **Set analyzer** to the appropriate fuel (Natural Gas or Propane).
2. **Gas Line Pressure Test** – monitor gas line pressure throughout all combustion tests and verify it is maintained within tolerance. See *Gas Line Pressure Test* below.
3. **Set Throttle Screw** – operate burner to the maximum modulation rate (see Table 2); set combustion according to Table 1 using the Throttle Screw; allow time for the analyzer readings to stabilize between adjustments – record CO₂ value. See *Throttle Screw Adjustment* below.
4. **Set Offset Screw** – operate burner to the minimum modulation rate (see Table 2); using the Offset Screw, set the CO₂ to 0.5-1.0% lower than the value obtained during the maximum modulation rate test (e.g. if CO₂ at Max = 9.0%, then CO₂ at Min must = 8.0-8.5%). Perform the Gas Valve Offset Check/Adjustment procedure detailed in Figure 5. See *Offset Screw Adjustment* below.



Combustion Calibration is mandatory upon installation and during each annual service. Failure to perform the Combustion Calibration in accordance with these instructions may result in incorrect combustion leading to burner damage or excessive Carbon Monoxide concentrations causing property damage, personal injury or death.



Carbon Monoxide - Never leave the unit operating while producing Carbon Monoxide (CO) concentrations in excess of 175 ppm. Failure to follow this warning may result in serious injury or death.

Throttle Screw Adjustment

The gas valve Throttle Screw (see Figure 4) is used to calibrate the CO₂ concentration with the burner operating at or near the maximum modulation rate (see Table 2). Turning the Throttle Screw in (clockwise) decreases the CO₂ concentration. Turning the Throttle Screw out (counterclockwise) increases the CO₂ concentration. Typical adjustment required is 0 – 1/8 of a turn in or out from the factory setting.

NOTE:

Calibration of the Throttle Screw should only be performed with the burner operating at or near the maximum modulation rate (see Table 2).



Adjustments to the **Throttle Screw** may only be made by a qualified gas technician using a calibrated combustion analyzer capable of measuring CO₂ and CO. Adjustments may only be performed if the gas line pressure is maintained above minimum levels throughout the duration of the test (see Table 1). Failure to follow these instructions may result in serious injury or death.

Offset Screw Adjustment

The gas valve Offset Screw (see Figures 4 & 5) is used to calibrate the CO₂ offset at minimum modulation vs. maximum modulation. Making the offset more positive (+) increases the CO₂ concentration at minimum modulation rate; making the offset more negative (-) decreases the CO₂ concentration at minimum modulation rate.

NOTE:

Calibration of the Offset Screw must only be performed with the burner operating at the minimum modulation rate (see Table 2).

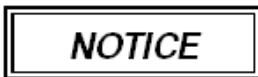


Adjustments to the **Offset Screw** may only be made by a qualified gas technician using a calibrated combustion analyzer capable of measuring CO₂ and CO, and only with the burner at the minimum modulation rate (see Table 2). Attempting to set the Offset Screw while the burner is operating at a modulation rate other than the minimum will result in incorrect combustion and may lead to burner damage or excessive CO.

Gas Line Pressure Test

The boiler gas valve is equipped with a line pressure test port; see Figure 4. Use the following procedure to measure the gas line pressure to the boiler to ensure it falls within the range given in Table 1:

1. Turn the supply of gas to the boiler off.
2. Open the bleed screw of the line pressure test port approximately 1-1/2 turns. This port is directly connected to the gas line feeding the boiler. See Figure 4.
3. Force tubing over the housing of the line pressure test port; install the other end of the tubing to an appropriate line pressure test gauge or manometer. Ensure both ends of the tubing make a tight connection.
4. Open the supply of gas to the boiler and check for gas leaks.
5. Observe the line pressure under static conditions and compare it to Table 1. The pressure will be greatest under static conditions.
6. With all other gas appliances in the application running, operate the burner to the maximum firing rate (See Table 2) and compare the observed line pressure with Table 1. The pressure will be lowest during the maximum flow of gas.
7. Adjust the gas line pressure to ensure the parameters in Table 1 are attained under all conditions. If possible adjust the line pressure to the "Nominal/Desired" value listed in Table 1, while the unit is operating at the maximum modulation rate, see Table 2.
8. Continue observing the gas line pressure until the completion of the combustion analyses, in case adjustments need to be made.
9. Complete pressure testing, and then return the bleed screw of the Line Pressure Test Port to the closed position. Turn gas on and check for leaks.



The line pressure is a function of the gas supply and is affected solely by field provided parameters such as line size and regulator settings. Under no circumstances can the boiler gas valve influence or be used to adjust the gas line pressure.



Failure to close the bleed screw of the Line Pressure Test Port will cause a severe leakage of gas, resulting in a fire or explosion causing property damage, serious injury or death.

Table 1 Line Pressure and Combustion Parameters

Gas	Line Pressure (inches w.c.)			Offset Pressure (inches w.c. / [Pa]) ²	CO ₂ (%) ¹		Max. CO (ppm)
	Nominal/Desired	Min.	Max.		Min.	Max.	
Natural	7	4	10.5	-0.01 to 0 / [-3 to -1]	8.5	9.5	175
Propane	11	8	13	-0.04 to -0.03 / [-10 to -8]	9.8	10.8	175

Notes:

¹ Combustion values listed are for burner operation at maximum modulation rate; when tested at minimum modulation rate the CO₂ must be 0.5-1.0% lower than CO₂ at maximum modulation rate.

² The Offset Pressure must be checked, and if necessary adjusted, in accordance with the procedure detailed in Figure 5.

Table 2 Minimum and Maximum Modulation Rates

Model	Min. Modulation Rate (RPM)	Max. Modulation Rate (RPM)
FTG 2000	1050	7100
FTG 2200	1050	7200
FTG 2400	1050	8000

Notes:

¹ Use *Diagnostic Test*, accessed from the *Diagnostic* menu of the display, to force max. and min. modulation rates; see Appendix A – Controller and Touchscreen Display Instructions, Section 5 DIAGNOSTICS PAGE.

Figure 4 Gas Valve Assembly

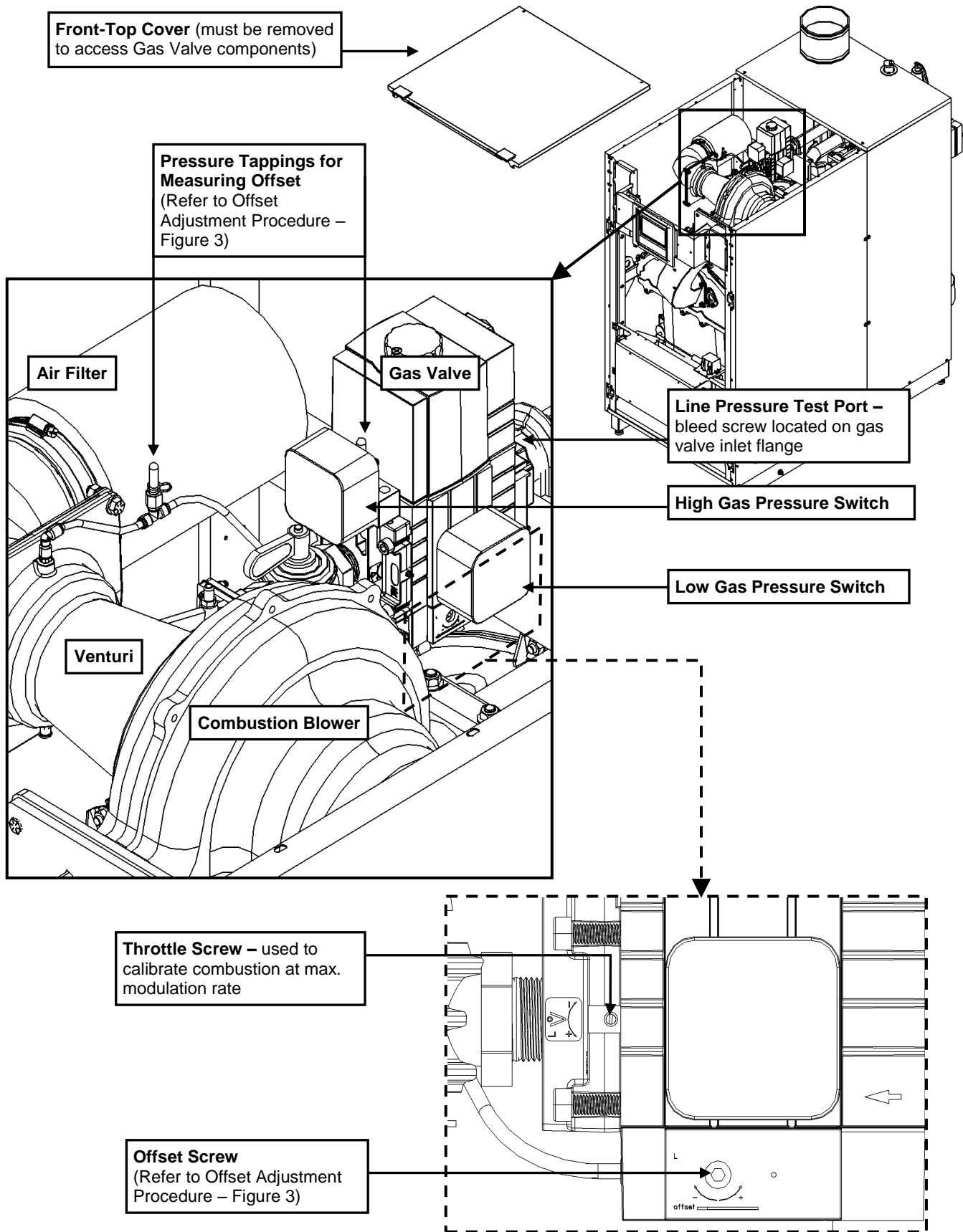
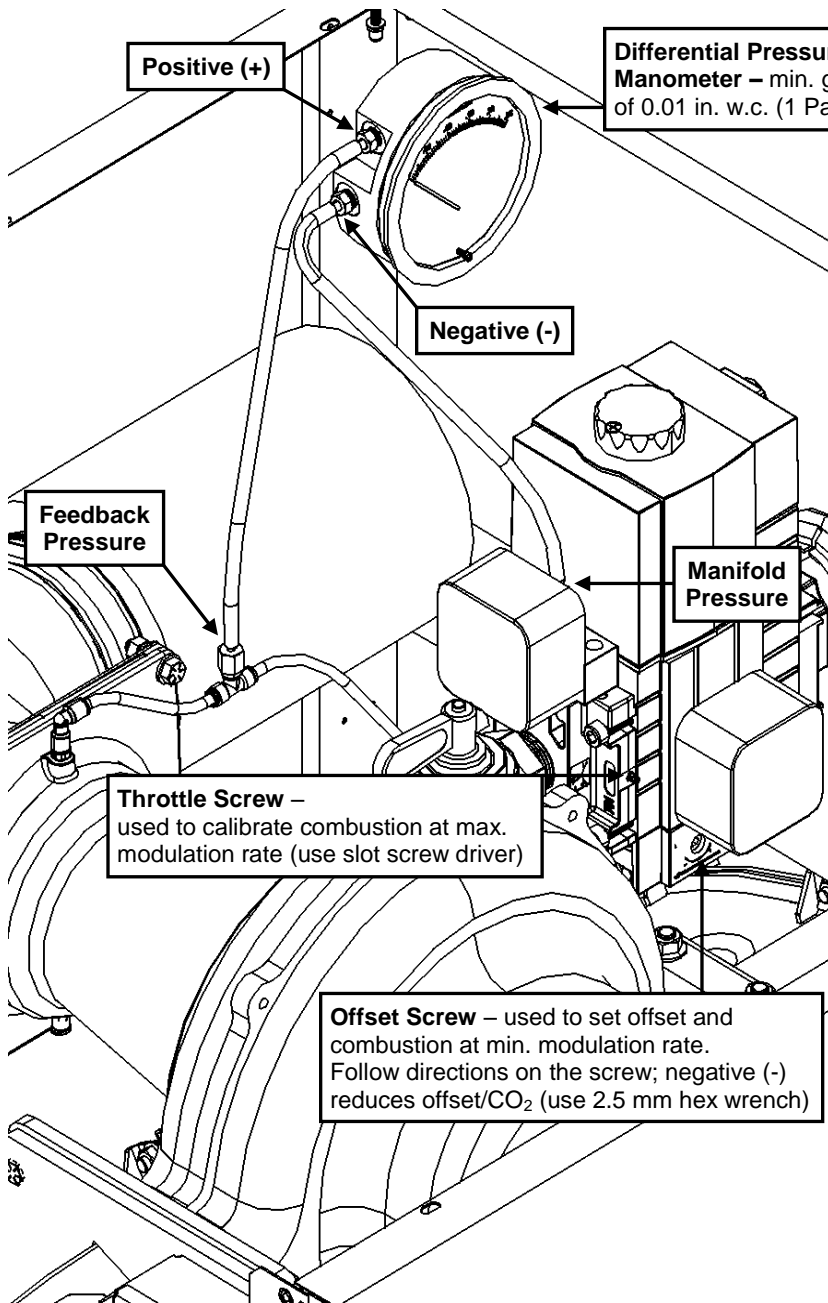


Figure 5 Gas Valve Offset Check/Adjustment



Offset Adjustment Procedure:

- 1) **Differential Pressure Manometer** – obtain a meter capable of measuring differential pressure (“+” and “-” ports) with a minimum graduation of 0.01 inches w.c. (or 1 Pa).
- 2) **Installation** – with the burner off, remove the caps from the pressure tappings. Connect the Feedback Pressure Tapping to the Positive (+) port of the manometer; connect the Manifold Pressure Tapping to the Negative (-) port of the manometer. Verify that the manometer is reading zero – zero the meter if necessary.
- 3) **Set Throttle Screw** – operate burner to maximum modulation rate (see Table 2), ensuring gas line pressure is maintained above 4 inches w.c.; set combustion according to Table 2-1 using the Throttle Screw – record CO₂ value.
- 4) **Set Offset Screw** – operate burner to minimum modulation rate (see Table 2); set offset pressure according to Table 1 using the Offset Adjustment Screw.

NOTE: Since the Manifold Pressure Tapping is connected to the Negative (-) port of the manometer, a negative Offset Pressure will read positive (e.g. to achieve an offset pressure of -0.03, manometer will read +0.03).

- 5) **Verify Combustion** – with the burner remaining in operation at the minimum modulation rate, measure combustion and compare to readings obtained during maximum modulation – CO₂ must be 0.5 to 1.0% lower at minimum modulation. If readings are out of tolerance – CONTACT NTI FOR ASSISTANCE.
- 6) **Complete Test** – shutdown the burner, remove the manometer tubing and reinstall the factory caps on Offset Pressure Tappings.

NOTICE

The Gas Valve Offset Pressure is factory set for Natural Gas; units converted to Propane must have the offset pressure field adjusted. Offset pressure must be checked during each annual service for all applications.

WARNING

Improperly adjusted Gas Valve Offset Pressure will result in incorrect combustion leading to burner damage or excessive Carbon Monoxide concentrations causing property damage, personal injury or death.