Instructions for High Altitude Installations Above 4500 FT.

WARNING

If installing Boiler sizes 080 OR 180, do not attempt to convert 080 for use with LP at altitudes above 2000 ft (610 m). Also, do not attempt to convert 180 for use with LP gas at altitudes above 7800 ft (2377 m). Attempts to do so may result in unreliable operation, property damage, personal injury, or loss of life due to carbon monoxide (CO) poisoning.

These instructions apply only to altitudes from **4501 to 10200 ft. (1350 to 3109 m).**
These instructions contain specific information to set up your Boiler to ensure proper operation.

WARNING

LP Conversions - Boiler setup from factory is configured for use with natural gas installed from 4501 to 10200 ft (1350 to 3109 m) above sea level only. For conversion to LP at altitudes from 4501 to 10200 ft (1350 to 3109 m), follow the "High Altitude Start-Up Instructions for LP" section in this supplement. This conversion shall be performed by a qualified service agency in accordance with the manufacturer's instructions and all applicable codes and requirements of the authority having jurisdiction. If the information in these instructions is not followed exactly, a fire, explosion, or production of carbon monoxide may result causing property damage, personal injury, or loss of life. Installation is not proper and complete until the operation of the converted appliance is checked as specified in the manufacturer's instructions supplied.

DANGER

These instructions include a procedure for adjusting the air-fuel mixture on this Boiler. This procedure requires a combustion analyzer to measure the CO_2 (or Oxygen) and Carbon Monoxide (CO) levels in flue gas. Adjusting the air-fuel mixture without a proper combustion analyzer could result in unreliable Boiler operation, personal injury, or death due to carbon monoxide poisoning.

WARNING

Asphyxiation Hazard. The outlet pressure for the gas valve has been factory set and requires no field adjustment. This setting is satisfactory for both natural gas and LP. Attempting to adjust the outlet pressure may result in damage to the gas valve and cause property damage, personal injury, or loss of life due to carbon monoxide (CO) poisoning.

WARNING

Failure to set up Boiler in accordance with these instructions could result in production of high amounts of Carbon Monoxide which could result in death, serious injury, and/or reduced component life.

High Altitude Start-up Instructions for Natural Gas

1. Install Boiler in accordance with the Installation, Operating and Service Instructions manual supplied with the Boiler. Follow all instructions in Section XI (Start-up and Checkout) up through Step 14. Skip Step 10.
2. Verify the gas inlet pressure is between the ranges shown in Table 4 with all gas appliances (including the Boiler) both on and off.
3. Perform a combustion test. Boilers are equipped with a screw cap in the vent adapter. Be sure to replace this cap when combustion testing is complete. Check CO_2 (or O_2) and CO at both high and low fire. The Boiler may be temporarily locked into high or low fire as follows:
   a. From the home screen, press and hold both the LH and RH buttons for 3s. The screen will change to Diagnostic Mode and show the flame signal (Figure 12.7 in the Installation, Operating and Service Instructions manual).
   b. Press the RH ("Next") button 5 times to advance to the high fire ("HF") screen.
   c. To set the Boiler in low fire from the high fire screen, press the LH button 6 more times.
   d. To return to automatic firing control from either the HF or LF screens, press the LH ("Done") button. The Boiler will return to automatic modulation from either screen after 15 minutes if no buttons are pressed.
   e. At both high and low fire, CO readings should be less than 200PPM air-free. Acceptable CO_2 and O_2 ranges are shown in Table 3.
      Adjust the throttle at high fire if flue gases are not in range:
      - To reduce the CO_2 (increase the O_2), turn throttle clockwise.
      - To increase the CO_2 (reduce the O_2), turn throttle counter-clockwise.

   Make adjustments in increments of 1/8 to 1/4 turn and allow Boiler at least a minute to respond to each adjustment before making another. The CO level will be at its lowest somewhere in the CO_2 range shown in Table 3. Consult factory if it is not possible to reduce CO level below 200PPM air free within the range of CO_2 shown for the fuel and altitude at which the Boiler is being used. Final readings should be taken with all doors and covers in place.
4. Follow all instructions in Section XI (Start-up and Checkout) from Steps 17 to 20.
5. Apply the "High Altitude Installation Label for Canadian Installations" adjacent to the Rating Plate Label, if applicable. This label is provided in the Instructions Packet supplied with the Boiler.

High Altitude Start-up Instructions for LP

1. Install Boiler in accordance with the Installation, Operating and Service Instructions manual supplied with the Boiler. Follow all instructions in Section XI (Start-up and Checkout) up through Step 9.
2. Set the throttle to its preliminary setting for LP. To do this:
   a. Turn the throttle (Figure 1) clockwise until it stops (several full turns).
   b. Turn the throttle counter-clockwise the exact number of turns shown in Table 2.
3. Follow all instructions in Section XI (Start-up and Checkout) from Steps 11 through 14.

   Note: If the Boiler does not light on the first try for ignition, allow the Boiler to make at least four more attempts to light. If the Boiler still does not light, turn the throttle counterclockwise in 1/8 increments, allowing the Boiler to make at least four tries for ignition at each setting, until the Boiler lights.
4. Verify the gas inlet pressure is between the ranges shown in Table 4 with all gas appliances (including the converted Boiler) both on and off.
5. Perform a combustion test. Boilers are equipped with a screw cap in the vent adapter. Be sure to replace this cap when combustion testing is complete. Check CO_2 (or O_2) and CO at both high and low fire. The Boiler may be temporarily locked into high or low fire as follows:
   a. From the home screen, press and hold both the LH and RH buttons for 3 seconds. The screen will change to Diagnostic Mode and show the flame signal (Figure 12.7 in the Installation, Operating and Service Instructions manual).
   b. Press the RH ("Next") button 5 times to advance to the high fire ("HF") screen.
   c. To set the Boiler in low fire from the high fire screen, press the LH button 6 more times.
   d. To return to automatic firing control from either the HF or LF screens, press the LH ("Done") button. The Boiler will return to automatic modulation from either screen after 15 minutes if no buttons are pressed.

e. Allow Boiler to operate for approximately 5 minutes before taking combustion readings. At both high and low fire, CO readings should be less than 200PPM air-free. Acceptable CO_2 and O_2 ranges are shown in Table 3. Adjust the throttle at high fire if flue gases are not in range:

- To reduce the CO_2 (increase the O_2), turn throttle clockwise.
- To increase the CO_2 (reduce the O_2), turn throttle counter-clockwise.

Make adjustments in increments of 1/8 to 1/4 turn and allow Boiler at least a minute to respond to each adjustment before making another. The CO level will be at its lowest somewhere in the CO_2 range shown in Table 3. Consult factory if it is not possible to reduce CO level below 200PPM air free within the range of CO_2 shown for the fuel and altitude at which the Boiler is being used. Final readings should be taken with all doors and covers in place.

6. Cycle Boiler at least five times at the final throttle setting to ensure burner ignites without delay and without noise.
7. Follow all instructions in Section XI (Start-up and Check-out) from Steps 17 to 20.
8. A sheet of yellow labels is provided in the Instructions Packet supplied with the boiler for boilers converted from natural to LP gas. Select the model from this sheet of labels and apply them as follows:
   a. Apply the "Rating Plate Label" adjacent to the rating plate.
   b. Apply the "Gas Valve Label" to a conspicuous area on the gas valve.
   c. Apply the "Boiler Conversion Label" to a conspicuous surface on, or adjacent to, the outer boiler jacket. Fill in the date of the conversion and the name and address of the company making the conversion with a permanent marker.
9. Apply the "High Altitude Installation Label for Canadian Installations" adjacent to the Rating Plate Label, if applicable. This label is provided in the Instructions Packet supplied with the boiler.

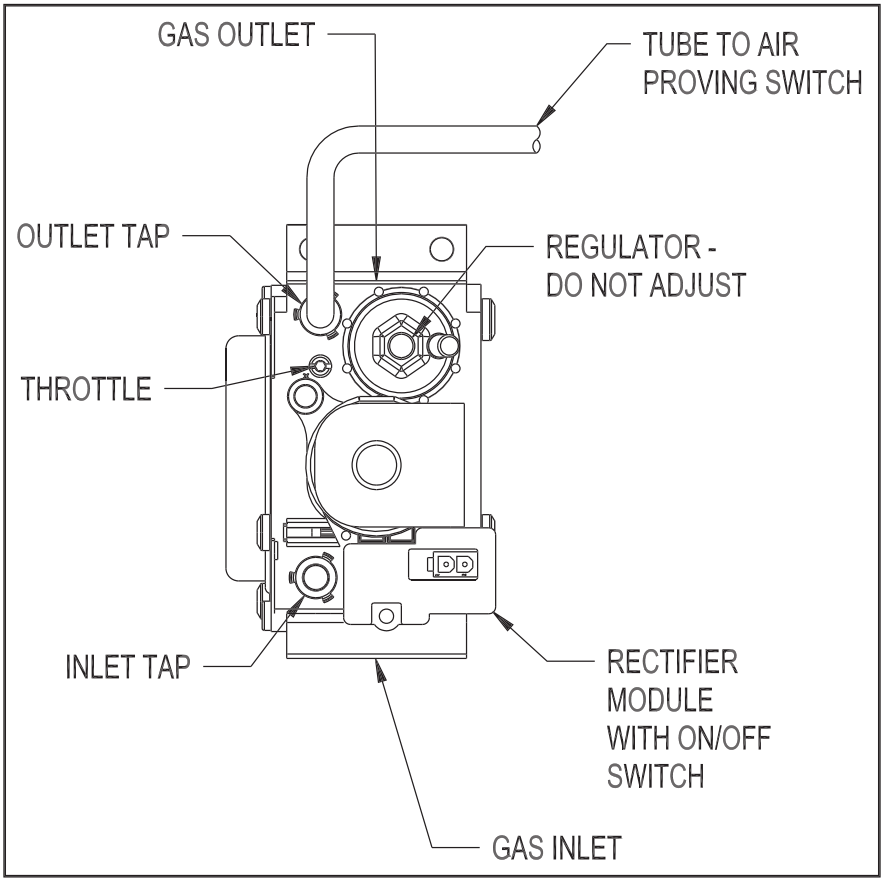

Figure 1a: Gas Valve Detail (80MBH Thru 120MBH)

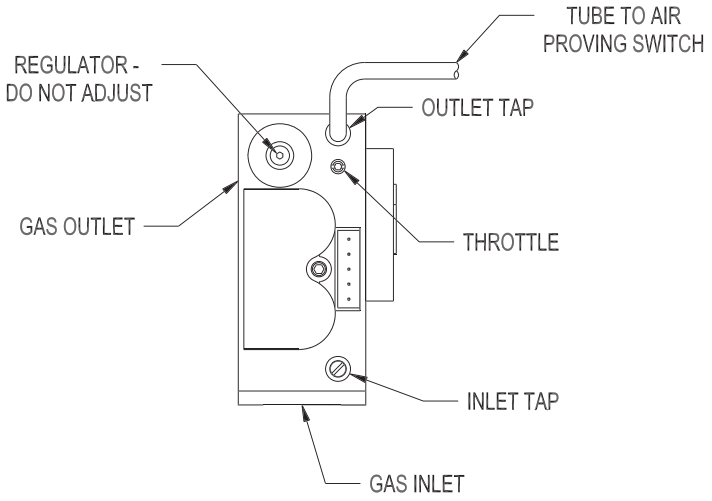

Figure 1b: Gas Valve Detail (150MBH, 180MBH)

Table 2: Starting Number of Throttle Turns For Conversion To LP Gas

Boiler Size	# Counterclockwise Turns (From Fully Closed)
080	
100	3
120	4
150	5-3/4
180	6-1/2

WARNING

Throttle adjustments shown in Table 2 are approximate. The final throttle setting must be found using a combustions analyzer. Leaving the Boiler in operation with a CO level in excess of 200PPM air-free could result in injury or death from carbon monoxide poisoning. Leaving the Boiler in operation with a CO_2 level outside of the range shown in Table 3 could also result in injury or death from carbon monoxide poisoning, even if the Boiler is operating at an air-free CO level below 200PPM during this adjustment procedure.

If the throttle is very far out of adjustment on the "rich" (counter-clockwise) side, the Boiler burner may be running at 0% excess air or even with a air deficiency. Operating the Boiler in this condition may cause property damage, personal injury or loss of life. Under these conditions, most combustion analyzers used in the field will show 0% O_2 and a very high (over 1000PPM) CO. Combustion readings will also appear to be unresponsive to throttle adjustment. If the Boiler appears to be operating under this condition, turn the throttle screw clockwise until the flame lengthens significantly and is mostly blue. Then, slowly turn the throttle counter-clockwise, using a combustion analyzer to achieve the required CO_2 as described in these instructions.

Table 3: Boiler Altitude Adjustments 4501 - 10200 Ft. (1350 - 3109 m)

Boiler Size	Fuel	Acceptable Combustion Readings			Approximate Derate per 1000 Ft.	
		Measured % CO_2	Measured % O_2	Max CO (PM Air-Free)	4501 - 7800 ft. * (1350 - 2377 m)	7801 - 10200 ft. ** (2377 - 3109 m)
80	NG	8.7-9.1	4.9-5.6	200	0.0%	3.1%
	LP					
100	NG	8.5-9.3	4.5-6.0	200	0.0%	3.1%
	LP	9.9-10.2	5.4-5.8	200	0.9%	3.1%
120	NG	8.8-9.3	4.5-5.4	200	0.0%	3.1%
	LP	9.9-10.2	5.4-5.9	200	0.5%	3.1%
150	NG	8.6-9.3	4.5-5.8	200	0.4%	3.1%
	LP	9.8-10.3	5.2-6.0	200	1.2%	3.1%
180	NG	8.5-9.1	4.9-6.0	200	1.9%	3.1%
	LP	9.9-10.2	5.4-5.8	200	2.4%	

* Derate is referenced from sea level.

** Derate is referenced from 7800 ft.
Example:

1) 150 Boiler Size using natural gas installed at 6000 ft.
   Total derate = (0.4% x 6.0) = 2.4%
2) 150 Boiler Size using natural gas installed at 8800 ft.
   Total derate = (0.4% x 7.8) + (3.1% x 1.0) = 6.22%

Table 4: Acceptable Gas Inlet Pressure Range

Fuel	Inlet Pressure (in w.c.) 4501 - 10200 Ft.
Nat. Gas	4.0-14.0
LP	11.0-14.0

Table 5: High Altitude Specific Parameters

Boiler Size	080	100	120	150	180
PIM High Altitude Repair Kit Part Number	107394-01	107394-02	107394-03	107394-04	107394-05
Altitude	4501 - 10200 Ft.				
Maximum Heat Rate (RPM)	6200	7500	7050	7300	7200
Minimum Heat Rate (RPM)	1800	2000	1800	2000	1900
Absolute Maximum Heat Rate (RPM)	7720	7680	7132	7300	7385
Minimum Light-off Rate (RPM)	3500	3500	3500	3500	3500
Maximum Light-off Rate (RPM)	4000	4000	4000	4000	4000