

INSTALLATION INSTRUCTIONS

For R7 Series Light Commercial Packaged Gas Electric Units

IMPORTANT: Please read all instructions before converting the furnace. Pay attention to all safety warnings and any other special notes highlighted in the manual. Safety markings are used frequently throughout this manual to designate a degree or level of seriousness and should not be ignored.

WARNING indicates a potentially hazardous situation that if not avoided, could result in personal injury or death.

CAUTION indicates a potentially hazardous situation that if not avoided, may result in minor or moderate injury or property damage.

This conversion kit is only for United States installations to convert a natural gas furnace for high-altitude application. Verify the contents of the conversion kit with that of the parts listed in [Table 1](#) and familiarize yourself with each component.

⚠ WARNING

FIRE OR EXPLOSION HAZARD

- Failure to follow safety warnings exactly could result in serious injury or property damage.
- Installation and service must be performed by a qualified installer, service agency, or the gas supplier.
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Leave the building immediately.
- Immediately call your gas supplier from a neighbors phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

DO NOT DESTROY. PLEASE READ CAREFULLY AND KEEP IN A SAFE PLACE FOR FUTURE REFERENCE.

⚠ WARNING:

This conversion kit is to be installed by a qualified service technician in accordance with these instructions and all codes having jurisdiction. Failure to follow these instructions could result in serious injury, property damage, or death. The qualified service technician performing this work assumes responsibility for this conversion.

⚠ WARNING:

BEFORE YOU PROCEED WITH CONVERSION:
The gas supply must be shut off prior to disconnecting the electrical power. Failure to follow the safety warnings exactly could result in serious injury, death, or property damage.

⚠ WARNING:

- All gas piping must conform with local building codes, or in the absence of local codes, with the most recent edition of the National Fuel Gas Code ANSI Z223.1.
- All electrical wiring must comply with the latest edition of the National Electrical Code ANSI/NFPA 70. Failure to follow these instructions could result in possible damage to equipment, serious personal injury, or death.

Table 1. Conversion Kit Components		
KIT PN: 1011438 100K BTU, 9–10K FEET 166/225K BTU, 6–10K FEET		
DESCRIPTION	QTY	P/N
Gas orifice, #34	5	273348
Gas orifice, #35	5	273349
Gas orifice, #36	5	273350
Gas orifice, #37	5	273351
Pressure switch, 0.58" (green)	1	204327
Pressure switch, 0.75" (red)	1	203933
Pressure switch, 1.00" (brown)	1	201160
Label, LP & high-altitude conversion warning	1	703935
Label, LP & high-altitude conversion info. LC	1	1011987
KIT PN: 1011437 100K BTU, 3–9K FEET 166/225K BTU, 2–6K FEET		
DESCRIPTION	QTY	P/N
Gas orifice, #31	5	273345
Gas orifice, #32	5	273346
Gas orifice, #33	5	273347
Pressure switch, 0.58" (green)*	1	204327
Pressure switch, 0.75" (red)	1	203933
Label, LP & high-altitude conversion warning	1	703935
Label, LP & high-altitude conversion info. LC	1	1011987
*Requires reuse of mounting bracket from replaced switch.		

HIGH-ALTITUDE DERATION

High-altitude application with this unit depends on the installation altitude and the heating value of the gas. At high altitudes, the heating value of natural gas is always lower than the heating value at sea level.

All installations of this equipment must be made in accordance with the National Fuel Gas Code or with local jurisdiction codes. For installations at altitudes of 0– 2,000 feet, the installer does not need to derate the heat exchanger performance. For any installation that exceeds 2,000 feet, follow all instructions in the [Converting Units for Altitudes of 2,001–10,000 Feet](#) section.

IMPORTANT NOTES

- If installing this unit above 2,000 feet, the input rate must be reduced 4% per 1,000 feet of altitude (Example: 12% at 3,000 feet, 16% at 4,000 feet, etc). Always round up to the next highest value of 1,000. So, an installation at 3,120 feet is derated by 16% due to rounding up to 4,000.
- Deration is necessary to compensate for low atmospheric pressure at high altitudes. Generally this will require obtaining the gas heating value from the local gas utility and replacing the burner orifices.
- Do not remove or alter the original rating plate.

How to Shut OFF Fuel Supply to Appliance

1. Set the thermostat to OFF or its lowest temperature setting.
2. Shut OFF the main gas supply to the appliance at the manual valve, outside of the appliance casing.
3. Shut OFF all electrical power to the appliance.
4. Remove the burner access panel louvered door.
5. Move the appliance gas valve lever/knob to the OFF position (see [Figure 1](#)).

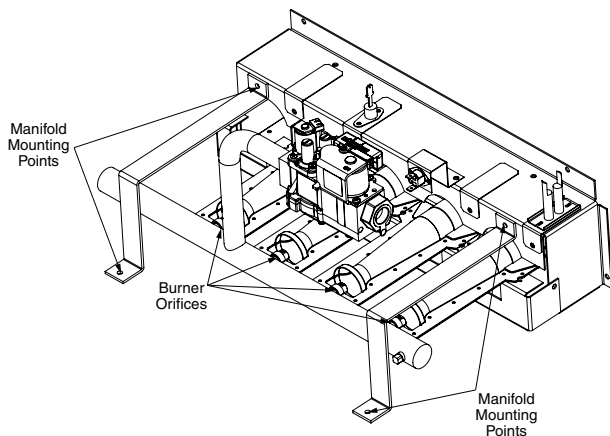


Figure 1. Typical Manifold Assembly

Burner Manifold Assembly Removal

1. Follow the instructions in the [How to Shut OFF Fuel Supply to Appliance](#) section.
2. Remove one screw to allow heat surface cover to slide out.
3. Remove the blue wire from the low stage terminal of the gas valve. Remove the violet wire from the high stage terminal of the gas valve. Remove the brown common wire from gas valve.
4. Remove (if installed) supply gas piping from the gas valve.
5. Remove the four fasteners that secure the gas manifold to the burner box (see [Figure 1](#)). Carefully remove the gas manifold assembly from the burner box. Note that the gas manifold assembly consists of the gas valve, the gas manifold, and the orifices.
6. Identify the gas valve manufacturer listed on the gas valve label.

NOTE: The size of the new orifices that will be installed in the unit will depend upon the elevation of the unit being installed. Please refer to [Table 6](#) for more details.

Converting Units for Altitudes of 2,001–10,000 Feet

1. [Table 2](#) provides a detailed listing of orifices required for converting R7 series units for altitudes up to 10,000 feet. Please check the contents of the conversion kit with that of the parts listing, and familiarize yourself with each component.
2. Examine the rating plate of the unit to determine the model number and rated input (BTUh). Count the number of burners in the burner box. Cross-check all information with [Table 2](#) to determine the appropriate Natural gas orifice size for your application.
3. Install the appropriate gas burner orifices into the gas manifold. Before installing an orifice, check the face or side of the orifice for the drill number to ensure that it is the appropriate size. When installing the new orifices, **DO NOT** use pipe joint compound on the orifice threads. Screw the orifices into the manifold by hand until snug to eliminate cross-threading and then tighten one-half to one turn using a wrench.
4. Follow the instructions in [High-Altitude Deration](#).

Verifying and Adjusting Firing Rate

The firing rate must be verified for each installation to prevent over-firing of the unit.

CAUTION:

Do not re-drill the burner orifices. If the orifice size must be changed, use only new orifices.

IMPORTANT NOTE:

The firing rate must not exceed the rate shown on the unit data label. At altitudes above 2,000 feet, it must not exceed that on the data label less 4% for each 1,000 feet. Follow the steps below to determine the unit firing rate:

- For installations at 2,000 feet and less, the firing rate is the same as shown on the unit rating label.
- For installations above 2,000 feet, calculate the correct firing rate as shown in [Example 1](#).
- [Table 2](#) lists the correct orifice size to use at different altitudes. Refer to [Example 1](#) to determine the unit rating and orifice size.

EXAMPLE 1

Elevation: 3,890 feet
 Type of Gas: Natural Gas
 Unit Model: R7TQ-072C100C

At 4,000 feet, the unit needs to be derated by 4% for each 1,000 feet of elevation. This equates to 16% or less than the sea level rating of 100,000 BTUh.

1. Determine unit input rating:
 $[100k \times (100-16)\%] = 84,000 \text{ BTUh}$. The required heating rate for 3,890 feet is 84,000 BTUh.
2. Determine orifice size:
 Find the gas heat size (refer to [Table 4](#)). Follow across the row and stop at the 4,000 elevation column. For this example, the orifice size displayed is #31. For units equipped with a Honeywell VR9205Q gas valve, install one #31 orifice in every burner and check the firing rate. In this example, the firing rate must not exceed 84,000 BTUh.

- After changing the orifices, it is required that you measure the gas input rate by clocking the gas meter and using the local gas heating value (refer to step 6 and [Example 2](#)).
- Observe the action of the burners. Make sure there is no yellowing, lifting, or flashback of the flame.

⚠ WARNING:

The reduction of input rating necessary for high-altitude installation may only be accomplished with factory supplied orifices. DO NOT attempt to drill out orifices in the field. Improperly drilled orifices may cause fire, explosion, carbon monoxide poisoning, personal injury, or death.

1. Obtain the gas heating value from the gas supplier (HHV).
2. Ensure that the gas supply line is at the correct supply pressure. Verify that the supply pressure is within the allowable unit limits as shown on the unit rating plate.
3. Shut off all other gas fired appliances.
4. Start the unit in heating mode and allow it to run for at least 3 minutes.
5. Using an in-line flow meter, measure the gas flow rate through the supply line to the unit. Convert the reading into cubic feet per hour (refer to [Table 6](#)). Refer to the meter manufacturer's instructions, or the gas supplier for more information. Refer to [Table 6](#) for gas flow rates.
6. Multiply the gas flow rate in cubic feet per hour by the heating value of the gas in BTU per cubic foot to obtain the firing rate in BTUh (refer to [Example 2](#)).

EXAMPLE 2

- Time for 1 revolution of a gas meter with a 5 cubic foot dial = 112 seconds.
- Read 161 cubic feet gas per hour (refer to [Table 6](#)).
- Local heating value of the gas (obtained from gas supplier) = 1,040 BTU per cubic foot.
- Input rate = $1,040 \times 161 = 168,000$ BTUh.

7. Adjustments to the firing rate can be made by adjusting the gas manifold pressure.

The manifold pressure must be set to the appropriate value for your installation. To adjust the manifold pressure, remove the regulator cap and turn the adjusting screw clockwise to increase pressure or counterclockwise to reduce pressure. Replace the regulator cap after adjustments are complete.

Burner Manifold Assembly Reinstallation

1. Carefully reinstall the gas manifold assembly to the burner box with the four fasteners removed earlier.
2. After installing the manifold assembly to the burner box, inspect the alignment of the burners with the heat exchanger tubes. The center of the burners should be aligned with the center of the tubes (see [Figure 2](#)).
3. Reconnect the main gas piping to the gas valve.
4. Reconnect wiring to the gas valve terminals. Blue wire to low stage, violet wire to high stage and brown common wire to the C terminal.

Pressure Gauge Installation

NOTE: For natural gas installations, refer to the unit rating plate to determine the incoming gas maximum and minimum inlet pressures.

IMPORTANT NOTE:

If pressure-testing the gas supply lines at pressures greater than 1/2 psig (14 IN WC), the unit must be disconnected from the gas supply piping system to prevent damage to the gas valve.

Lighting and Adjustment of Appliance

1. Turn ON the gas at the manual valve, outside of the unit.
2. Check all gas connections for leaks using a soap and water solution. If the solution bubbles, there is a gas leak that must be corrected. **DO NOT** use an open flame to check for gas leaks.
3. Turn ON the electrical power to the appliance.
4. Move the gas valve lever/switch/knob to the **ON** position. The lever/knob must be moved to the end of its range of motion to insure the valve is completely open. Use only your hand to push in or turn the gas control valve. Never use tools.
5. Set the room thermostat to a point above room temperature to begin the heating cycle of the unit.
6. Check to ensure that the unit ignites and operates properly. Refer to the installation instructions provided with your unit for the normal operating sequence.
7. After the flame ignites, visually inspect the burner assembly to ensure that the flame is drawn directly into the center of the heat exchanger tube as shown in [Figure 2](#). The end of the flame will be out of sight around the bend of the heat exchanger tube. In a properly-adjusted burner assembly, the flame color should be blue with some light yellow streaks near the outer portions of the flame.

NOTE: Until all of the air is bled out of the gas line, the spark ignitor may not ignite the gas. If the ignition control locks out, turn the thermostat to its lowest setting and wait one minute then turn the thermostat to a point above room temperature. The ignitor will try again to ignite the main burners. This process may have to be repeated several times before the burners will ignite. Once the burners are lit, check all gas connections for leaks again using the soap and water solution. If the solution bubbles, there is a gas leak that must be corrected. **Do not use an open flame to check for gas leaks.**

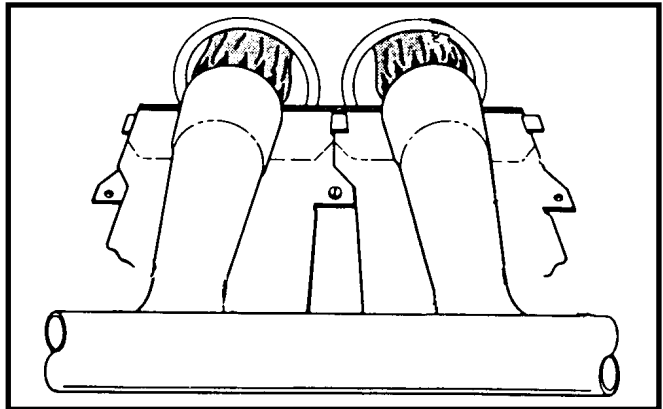


Figure 2. Burner Inspection

NOTE: The following manifold pressure measurement and adjustment procedures apply only to R7TQ units. For R7DA units, refer to the controls manual, form CP-P125-D19-D21-D22-D23 (PN 1024315).

Manifold Pressure Measurement (R7TQ Units)

The manifold pressure can be measured by installing a pressure gauge or U-tube manometer to the outlet end of the gas valve as follows:

1. Shut off gas prior to installing manometer.
2. Using a 3/16-inch Allen wrench, remove the manifold pressure tap plug located on the outlet side of the gas valve. Refer to the appropriate manufacturer's instruction for location.
3. Install a 1/8-inch NPT pipe thread fitting that is compatible with the pressure gauge or U-tube manometer.
4. Install the pressure gauge or U-tube manometer according to the manufacturer's supplied instructions.
5. Set the room thermostat above room temperature to start the furnace.
6. Allow the furnace to operate for 3 minutes and then check the manifold pressure. For natural gas installations, the manifold pressure should be factory-set to 3.3 IN WC or 3.5 IN WC, dependent on the style of gas valve installed (refer to [Table 4](#)). If the manifold pressure is not set to the appropriate pressure, it must be adjusted.

Manifold Pressure Adjustment (R7TQ Units)

NOTE 1: Depending on the gas valve manufacturer, the valve may be factory-set for a 3.3 IN WC or 3.5 IN WC manifold setting. Always inspect the unit rating label to determine the correct factory setting (refer to [Table 4](#)).

NOTE 2: The unit firing rate should be inspected for each installation as described in these instructions. The manifold pressure may be different than the factory setting. If the determination of the actual unit firing rate cannot be made with quality instruments, the manifold pressure should be set to the factory setting, as shown on the unit rating label.

1. If the manifold pressure must be adjusted, remove the protective cap from the top of the High fire gas valve regulator, as shown in the manufacturer's instructions.
2. Turn the adjustment screw clockwise to increase the manifold pressure and counterclockwise to decrease the manifold pressure. Set the manifold pressure to the factory settings, as shown on the unit rating label, or to the correct manifold pressure setting to obtain the correct firing rate.
3. Replace the protective cap over the adjustment screws and tighten.
4. The low fire, firing rate should be 70% of the high fire, firing rate. Per [Example 1](#), the furnace high fire rating of 100,000 BTUh would have a low fire, firing rate of 70,000 BTUh or 0.70 × 100,000 BTUh. **NOTE:** It should not be necessary to adjust the low fire regulator after the High fire setting is accomplished.

Removing the Pressure Gauge U-tube Manometer

After the manifold pressure has been properly adjusted, the pressure gauge or U-tube manometer must be removed from the gas valve.

1. Turn the thermostat to its lowest setting.
2. Shut OFF the main gas supply to the unit at the manual shutoff valve located outside the unit.
3. Shut OFF all electrical supplies to the unit.
4. Remove the manometer adapter from the gas valve and replace it with the 1/8-inch NPT manifold pressure plug removed earlier. Verify that the plug is sealed tightly and not cross-threaded.
5. Turn ON all electrical power to the unit.

COMPLETING THE CONVERSION

1. Replace the unit's heat access panel.
2. Run the appliance through a complete cycle to ensure proper operation.

NOTE: Retain pressure switches within the unit. If the unit fails to start, replace the HIGH fire pressure switch with the next numerically-lower pressure switch.

⚠ CAUTION:

Do not drill orifices out in the field. Use only factory supplied orifices.

Table 2. Natural Gas Orifice Drill Sizes										
mBTU	ORIFICE SIZE FOR INCREASED ELEVATION (FEET)									QTY
	0-2K	3K	4K	5K	6K	7K	8K	9K	10K	
100	#30	#31			#32			#33	#35	2
166	#31		#32		#33	#34	#35	#36	#37	4
200	#31		#32		#33	#34	#35	#36	#37	5
225	0.125	#31	#32		#33	#34	#35	#36	#37	5

NOTE: Refer to instructions for [High-Altitude Deration](#) to determine heat-exchanger capacity at increased elevations.

Table 3. Heat Rise Range for Natural Gas and Propane (LP)							
UNIT SIZE	HEAT SIZE (mBTU)	HIGH FIRE		LOW FIRE		HEAT RISE TEMPERATURE RANGE (°F)	CFM
		HEATING INPUT	HEATING OUTPUT	HEATING INPUT	HEATING OUTPUT		
072	100	100,000	81,000	70,000	56,700	25-55	2550
	166	166,000	134,460	116,200	94,122	30-60	2550
090	166	166,000	134,460	116,200	94,122	30-60	3150
	200	200,000	162,000	140,000	113,400	30-60	3150
	225	225,000	182,250	157,500	127,575	25-55	3150
120	166	166,000	134,460	116,200	94,122	30-60	3450
	200	200,000	162,000	140,000	113,400	30-60	3450
	225	225,000	182,250	157,500	127,575	25-55	3450

NOTE: To calculate cfm based on temperature rise at rated input and efficiency, use the following equations:

$$\text{cfm} = \text{Heating Output (BTUh)} \div [1.08 \times \Delta T (\text{°F})]$$

$$\text{Heating Output (BTUh)} = \text{Heating Input (BTUh)} \times \text{Rated Unit Efficiency (\%)}$$

$$\Delta T (\text{°F}) = \text{Supply Air Temp (°F)} - \text{Return Air Temp (°F)}$$

Table 4. Heating Input for Natural Gas														
HEAT SIZE (mBTU)	NUMBER OF BURNERS	GAS VALVE MANUFACTURER	HEATING INPUT (BTUh)		ORIFICE SIZE FOR INCREASED ELEVATION (FEET)									
			HIGH FIRE	LOW FIRE	0-2K	3K	4K	5K	6K	7K	8K	9K	10K	
100K	2	HONEYWELL VR9205Q	100,000	70,000	#30	#31			#32			#33	#35	
166K	4	HONEYWELL VR9205Q	166,000	116,200	#31		#32			#33	#34	#35	#36	#37
200K	5	HONEYWELL VR8305	200,000	140,000										
225K	5	HONEYWELL VR8305	225,000	157,500	0.125"	#31	#32			#33	#34	#35	#36	#37

Table 5. Black Iron Gas Pipe Capacities								
NOMINAL PIPE DIAMETER (INCHES)	LENGTH OF PIPE RUN (FEET)							
	10	20	30	40	50	60	70	80
	CAPACITY OF BLACK IRON GAS PIPE (CUBIC FEET PER HOUR)*							
1/2	130	90	75	65	55	50	45	40
3/4	280	190	150	130	115	105	95	90
1	520	350	285	245	215	195	180	170
1 1/4	1050	730	590	500	440	400	370	350
1 1/2	1600	1100	890	760	670	610	—	—

NOTE: The cubic feet per hour listed in the table above must be greater than the cubic feet per hour of gas flow required by the furnace. To determine the cubic feet per hour of gas flow required by the furnace, divide the input rate of the furnace by the heating value (from gas supplier) of the gas:

$$\text{Cubic Feet per Hour Required} = \frac{\text{Input to Furnace (BTUh)}}{\text{Heating Value of Gas (BTU/Cubic Feet)}}$$

*For natural gas, specific gravity = 0.60.

Table 6. Gas Flow Rates							
TIME FOR ONE REVOLUTION (SECONDS)	NUMBER OF REVOLUTIONS			TIME FOR ONE REVOLUTION (SECONDS)	NUMBER OF REVOLUTIONS		
	1	5	10		1	5	10
	GAS FLOW (CUBIC FEET)				GAS FLOW (CUBIC FEET)		
10	360	1800	3600	66	55	273	545
12	300	1500	3000	68	53	265	529
14	257	1286	2571	70	51	257	514
16	225	1125	2250	72	50	250	500
18	200	1000	2000	74	49	243	486
20	180	900	1800	76	47	237	474
22	164	818	1636	78	46	231	462
24	150	750	1500	80	45	225	450
26	138	692	1385	82	44	220	439
28	129	643	1286	84	43	214	429
30	120	600	1200	86	42	209	419
32	113	563	1125	88	41	205	409
34	106	529	1059	90	40	200	400
36	100	500	1000	92	39	196	391
38	95	474	947	94	38	191	383
40	90	450	900	96	38	188	375
42	86	429	857	98	37	184	367
44	82	409	818	100	36	180	360
46	78	391	783	102	35	176	353
48	75	375	750	104	35	173	346
50	72	360	720	106	34	170	340
52	69	346	692	108	33	167	333
54	67	333	667	110	33	164	327
56	64	321	643	112	32	161	321
58	62	310	621	114	32	158	316
60	60	300	600	116	31	155	310
62	58	290	581	118	31	153	305
64	56	281	563	120	30	150	300

Installation Location:	
Address:	
City:	State:
Unit Model No.:	
Unit Serial No.:	

Installer Name:	
Phone Number:	
City:	State:

Has the owner's information been reviewed with the customer?	YES	NO
Has the Literature Package been left with the unit?	YES	NO

ATTENTION INSTALLER!

The installer performing this work assumes all responsibility for this conversion. These instructions are primarily intended to assist qualified individuals experienced in the proper installation of these components. Some local codes require licensed installation/service personnel for this type of equipment. Safety should always be the deciding factor when installing this product and using common sense plays an important role as well. Improper installation of the components or failure to follow safety warnings could result in serious injury, death, or property damage. After completing the installation, return these instructions to the equipment owner's package for future reference.

GAS SYSTEM		
Gas Type: Natural Gas Only		
Gas pipe connections leak-tested?	YES	NO
Gas Line Type (Circle One):	BLACK IRON	OTHER
If other, list here:		
Supply Line Size and Length		
Gas Line Pressure (IN WC):		
Is there adequate fresh air supply for combustion and ventilation?	YES	NO
Original Furnace Input Rating (BTUh):		
Installation Altitude (feet):		
Deration Percentage (%):		
Orifice Size Installed:		
New Furnace Input Rating (BTUh):		
Gas Valve Type: (Circle One)	HONEYWELL VR9205Q	HONEYWELL VR8305
During Furnace Operation:		
Gas Heating Value (BTUh/ft ³):		
Gas Flow Rate (ft ³):		
Low fire manifold pressure (IN WC):		
High fire manifold pressure (IN WC):		
Supply Air Temperature (°F):		
Return Air Temperature (°F):		
Temperature Rise (°F):		
CFM (Based on Temp. Rise):		

Specifications and illustrations subject to change without notice or incurring obligations.
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Revision: CP-R7-GC-NG (04-19) PN1012430-B
Supersedes: 1012430-A R7TQ-120 Natural Gas High Altitude Conversion Kit



1012430B