

## Ratings

<b>Input:</b>	150,000 to 399,000 Btuh
<b>Fuels:</b>	Natural gas or propane gas
Max. supply pressure	14 inches w.c.
Min. supply pressure	5 inches w.c.
Manifold pressure	3.5 inches w.c.
<b>Electrical:</b>	Power 120V/60 Hz/1-Phase
Motor	1/6 or 1/4 HP, 3450 RPM
Current	Approx. 2.5 or 4.4 amps
<b>Ignition:</b>	Carlin Model 41800 solid state ignitor
<b>Control:</b>	Carlin Model 60200FR microprocessor control
<b>Agencies:</b>	UL Listed

**WARNING**

**Installer/servicer** — Except where specifically stated otherwise, this manual must be used only by a **qualified service technician**. (In the state of Massachusetts, this product must be installed by a licensed Plumber or Gas Fitter.) Failure to comply with this or other requirements in this manual could result in severe personal injury, death or substantial property damage.

**WARNING**

**User** — Refer only to **User's Information** booklet for information regarding operation of this burner. The burner **Instruction Manual** is intended only for your service technician. The burner and heat exchanger must be inspected and started at least annually by your service technician.

## Instruction Manual

## Contents

PLEASE read this first	2
Codes and standards	2
201GAS burner at-a-glance	3
Prepare site • prepare burner • mount burner	4
Install gas piping	9
Wire burner	10
Check system • start-up burner/appliance	11
Perform checkout procedures • fill out certificate	16
Maintenance and service procedures	18
Troubleshooting	19
Dimensions and mounting information	21
Replacement parts	22

## PLEASE read this first . . .

### Special attention flags

Please pay particular attention to the following when you see them throughout this manual.

**DANGER** Notifies you of hazards that **WILL** cause severe personal injury, death or substantial property damage.

**WARNING** Notifies you of hazards that **CAN** cause severe personal injury, death or substantial property damage.

**CAUTION** Notifies you of hazards that **WILL or CAN** cause minor personal injury or property damage.

**NOTICE** Notifies you of special instructions on installation, operation or maintenance that are important, but are not normally related to injury or property damage hazards.

### General information

#### Burner applications

Follow all instructions in this manual and the appliance manual. Where appliance instructions differ from this manual, follow the appliance instructions. Read the label attached to the burner air tube to verify the burner is correct for the appliance being used. See page 7 for procedures.

#### Damage or shortage claims

The consignee of the shipment must file damage or shortage claims immediately against the transportation company.

#### When calling or writing about the burner . . .

Please provide us with the UL serial number and burner model number to assist us in locating information. Enter this information on the Installation Certificate in this manual. The certificate information can be helpful when troubleshooting or obtaining replacement parts.

#### Fill out burner adjustment label

Fill out the burner adjustment label, located on the housing above the rating label after completing installation and burner setup.

**WARNING** Should overheating occur: (1) shut off the manual gas control to the appliance, (2) do not shut off the control switch to the pump or blower.

**NOTICE** FROZEN PIPES/WATER DAMAGE: This is not a freeze protection device. Suitable freeze protection monitoring or other precautions are recommended to protect against ruptured pipes/water damage caused by fuel outage, safety related fault conditions, or equipment failures.

### Codes and standards

**NOTICE** The installer/servicer is solely responsible for compliance with all applicable codes and standards.

#### Burner listings

Carlin 201GAS burners are tested and approved under standards ANSI Z21.17-latest edition and CSA 2.7-M86.

**WARNING**

Follow the guidelines below to avoid potential severe personal injury, death or substantial property damage.

#### Installer/service technician . . .

- Read all instructions before proceeding. Perform all procedures, and in the order given to avoid potential of severe personal injury, death or substantial property damage.
- Before leaving the site after start-up or service, review the **User's information** manual with the user. Make the user aware of all potential hazards and perform the training outlined below.

#### Train the user . . .

- To properly operate the burner/appliance per this manual and the appliance instructions and the **User's information manual**.
- To keep this manual at or near the burner/appliance for ready access by the user and service technician.
- To contact the service technician, gas supplier or fire department should the user smell gas.
- To keep the appliance space **free of flammable liquids or vapors and other combustible materials**.
- Do not use laundry products, paints, varnishes or other chemicals in the room occupied by the burner/appliance.
- To contact the service technician at least annually for start-up and burner/appliance service.

#### When servicing the burner . . .

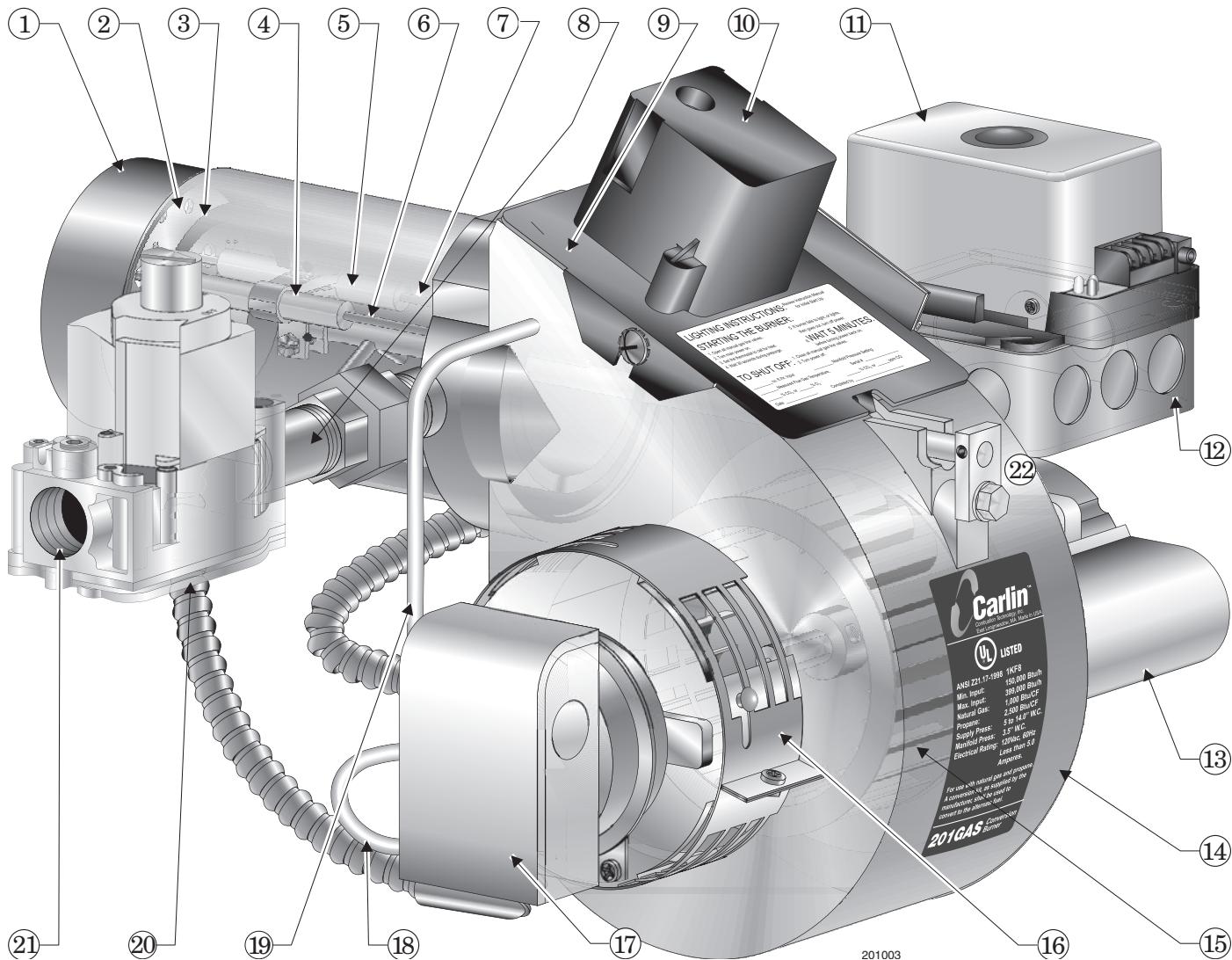
- **Disconnect electrical supply** to burner before attempting to service to avoid electrical shock or possible injury from moving parts.
- Burner and appliance components can be extremely hot. **Allow all parts to cool** before attempting to handle or service to avoid potential of severe burns.

#### Codes

Burner/appliance installations must comply with all applicable local codes and, where applicable, with the Installation of Domestic Gas Conversion Burners, ANSI Z21.8, the National Fuel Gas Code, ANSI Z223.1/NFPA 54-latest edition, and the National Electrical code, ANSI/NFPA 70-latest edition for U. S. installations or B149.1/B149.2 Installation Code, and CSA C22.1/CSA C22.2 Canadian Electrical Code for Canadian installations.

Where appliance instructions differ from this manual, follow the appliance instructions.

## 201GAS burner at-a-glance



- 1 Air tube (flange omitted for clarity), with powder coat paint finish
- 2 Diffuser plate (hole or slot pattern)
- 3 Gas manifold (concentric cylinders swaged and welded at ends)
  - Gas manifold delivers gas to gas openings on inner wall of manifold near the diffuser plate.
- 4 Ignitor electrode insulator
- 5 Flame rod insulator
- 6 Ignitor electrode
- 7 Flame rod electrode
- 8 Gas orifice nipple — see pages 7 and 8 for orifice sizing requirements
- 9 Hinged cover plate (for access to blower wheel & electrodes)
- 10 Ignitor (Carlin Model 41800 solid state electronic ignitor — 9,000 volts, continuous duty rated)
- 11 Primary control — Carlin Model 60200FR microprocessor-based interrupted ignition flame supervisory control (flame rectification)
- 12 Burner junction box
- 13 Motor (with permanently-lubricated bearings and thermal overload protection)
- 14 Blower housing (cast aluminum), with powder coat paint finish
- 15 Blower wheel
- 16 Air band — Only a single adjustment required for setting combustion air; see page 7 for starting setting based on input
- 17 Airflow proving switch — Prevents burner from firing if air is not moving
- 18 Airflow proving switch sensing line (aluminum) — blower inlet
- 19 Airflow proving switch sensing line (aluminum) — blower outlet
- 20 Combination gas valve (with integral gas pressure regulation — set for 3½" w.c. outlet pressure)
- 21 Gas supply entrance — ¾" NPT; 5" w.c. min; 14" w.c. max
- 22 Flame rod/ignition electrode assembly yoke

## 1. Prepare site • prepare burner • mount burner

### Prepare installation site

#### Inspect, repair and/or replace vent system

**WARNING**

Do not install this burner unless you have verified the entire vent system and the appliance are in good condition and comply with all applicable codes. And

The vent and chimney must be sized and constructed in accordance with the National Fuel Gas Code, NFPA 54/ANSI Z223.1, or B149.1/B149.2 Installation Code for Canadian installations. Appliances equipped with a gas conversion burner are treated as fan-assisted appliances.

The vent system must not be pressurized unless the vent piping and vent system are designed accordingly. The vent must provide draft at all times (negative pressure in vent).

Do not install or use an existing manual damper in the vent connector or vent.

Do not connect the appliance vent connector to a chimney or vent serving a fireplace, incinerator or solid-fuel-burning apparatus.

In a cold climate, do not vent into a masonry chimney that has one or more sides exposed to the outside. Install a listed stainless steel liner to vent the flue products.

A defective vent system could result in severe personal injury, death or substantial property damage.

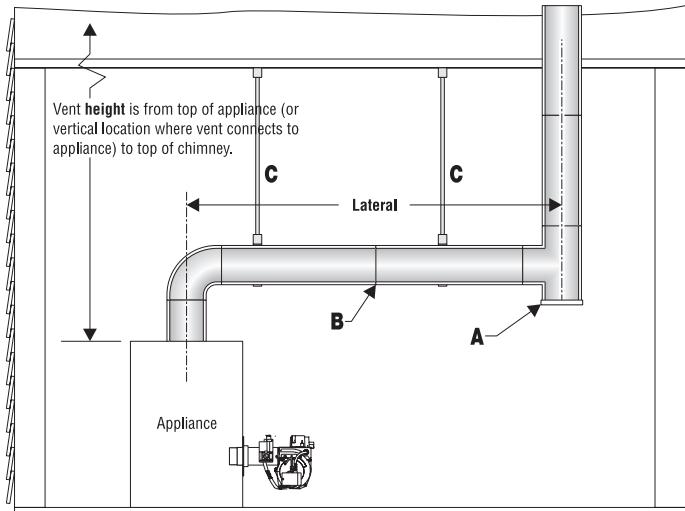
#### Vent/chimney sizing

- Follow all local codes when sizing the vent and chimney.
- Refer to the appliance manufacturer's manual, when available, for venting recommendations.

#### Prepare vent/chimney

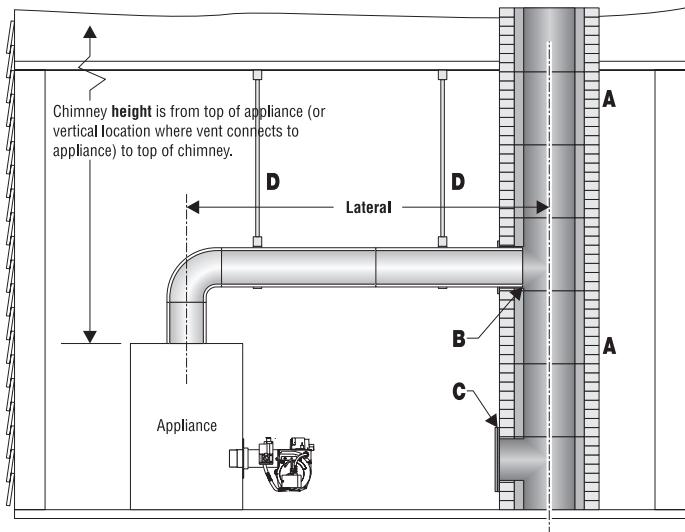
- Secure all metal vent joints with screws, following the vent manufacturer's instructions. Seal all joints in the vent system and chimney. Repair masonry chimney lining and repair all mortar joints as needed.
- Install a double-acting barometric draft regulator in the vent piping. (The damper must be located in the same space as the appliance.) Install a manual reset spill switch per manufacturer's instructions. Wire the switch into the appliance limit circuit to shut off the appliance/burner if sustained downdraft should occur. Refer to the appliance manufacturer's instruction manual for recommendations regarding the need for a barometric draft regulator.
- Provide support for the vent piping. Do not rest the weight of any of the vent piping on the appliance flue outlet.

**Figure 1** Vent and vent connector installation



#### Metal vent application

- Connect to vertical with tee, if possible, to provide inspection/cleanout opening in vent.
- Seal all joints and access openings tightly to prevent draft loss.
- Support vent pipe so no weight of vent connector rests on appliance.



#### Masonry chimney application

- Tile-lined interior masonry chimney only; with all tile and joints in good condition.
- Vent pipe should be almost flush, but *not extending into*, inside surface of liner.
- Seal all access openings tightly to prevent draft loss.
- Support vent pipe so no weight of vent connector rests on appliance.

20102

Where appliance instructions differ from this manual, follow the appliance instructions.

## 1. Prepare site • prepare burner • mount burner (continued)

### Prepare installation site

#### Verify combustion/ventilation air openings (Figure 2)

##### WARNING

Installing the burner/appliance in a space that does not provide enough air for combustion and ventilation can result in severe personal injury, death or substantial property damage. Follow all applicable codes and guidelines below to ensure space has sufficient air openings.

#### Large spaces

For appliances located in basements, ventilated crawl spaces or other large areas, no additional air openings should be necessary. Exception: If the building construction is unusually tight (see National Fuel Gas Code, NFPA 54/ANSI Z223.1, or B149.1/B149.2 Installation Code for Canadian installations for definition), you will need to provide air openings into the building if appliance air comes from inside. Provide one opening within 12 inches of the ceiling, and one opening within 12 inches of the floor. Size each opening to provide free area (after deduction for louvers) of 1 square inch per 1,000 Btuh input of all fuel-burning appliances in the building.

#### Confined spaces — air from inside building

If air openings connect to areas inside the building, provide two openings, one within 12 inches of the ceiling, the other within 12 inches of the floor. Each opening must have a free area (after deduction for louvers) of 1 square inch per 1,000 Btuh of all appliances in the space. If the building construction is unusually tight (see National Fuel Gas Code, NFPA 54/ANSI Z223.1, or B149.1/B149.2 Installation Code for Canadian installations for definition), you will need to provide air openings into the building. Provide two openings sized and located as for the openings into the boiler space.

#### Confined spaces — air from outside

If air openings connect directly to outside, provide two openings, one within 12 inches of the ceiling, the other within 12 inches of the floor. Each opening must have a free area (after louver deduction) of:

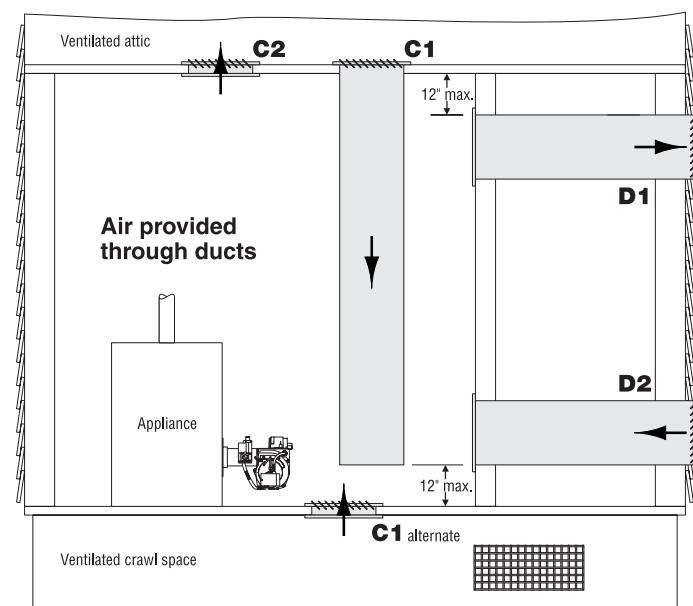
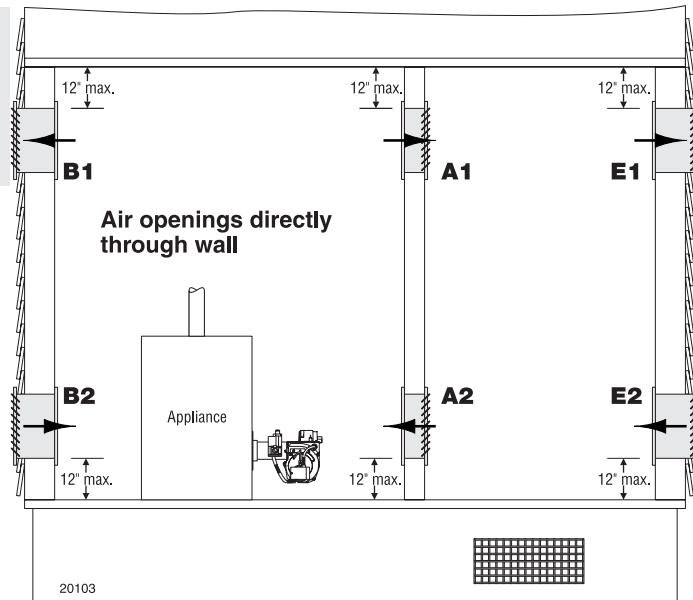
- If directly through side wall: 1 square inch for each 4,000 Btuh of all appliances in the space.
- If through vertical ducts: 1 square inch for each 4,000 Btuh of all appliances in the space.
- If through horizontal ducts: 1 square inch for each 2,000 Btuh of all appliances in the space.

You will also have to apply this option if the appliance space may contain corrosive contaminants, such as laundry products, paints, varnishes or other chemicals.

##### WARNING

Make sure the space provides enough ventilation to prevent overheating of the appliance, burner and controls. If there is risk of overheating, you must install ventilation air openings sized large enough to provide air for cooling the equipment. Failure to provide ventilation can result in severe personal injury, death or substantial property damage.

**Figure 2 Locating & sizing air openings**



#### Minimum grille free area per 1,000 Btuh input of all appliances in space

<b>A1 &amp; 2</b> Two openings through interior wall	<b>1 sq. in.</b>
<b>B1 &amp; 2</b> Two openings through outside wall	<b>0.25 sq. in.</b>
<b>C1 &amp; 2</b> Two vertical ducts (to attic and crawl space)	<b>0.25 sq. in.</b>
<b>D1 &amp; 2</b> Two horizontal ducts from outside	<b>0.50 sq. in.</b>
<b>E1 &amp; 2</b> If building construction is unusually tight, provide two air openings as shown if appliance air comes from inside.	<b>1 sq. in.</b>

**Example** A space contains two fuel-burning appliances. The combined input is 120,000 Btuh. Air comes in through horizontal ducts from outside. This is case **D**. So multiply 0.50 sq. in. times 120 to get 60 sq. in. free area per opening. If louvers reduce free area to 70%, then divide minimum free area by 0.7 for actual grille area, or  $60 \div 0.7 = 85.7$  sq. in.

## 1. Prepare site • prepare burner

### Prepare installation site

#### Verify combustion/ventilation air openings (continued)

**WARNING**

When sizing air openings for combustion and ventilation, include air required for exhaust fans and other appliances, such as clothes dryers, that require air for operation.

Check appliance manual and applicable codes for required sizing of combustion and ventilation air openings.

- Verify that openings are unobstructed.
- Verify that appliance space and air source spaces are free of:
  - Gasoline or other flammable liquids or vapors.
  - Combustible materials.
  - Air contaminants, such as laundry products, paint, thinner, varnish, etc.
- Confirm with user that the area will be kept free of these materials at all times.

### Prepare the appliance

**WARNING**

**Burner input:** Install a gas burner sized for the normal input rating of the appliance. Do not install a burner with a higher firing rate than the appliance rating. Do not install a burner with a firing rate more than 10% lower than the appliance rating. The appliance and vent system could be damaged due to condensation.

**Clean the appliance:** Clean the appliance thoroughly and seal all joints. Test all electrical components and verify the relief valve works (boilers only).

Verify combustion chamber dimensions comply with the minimum dimensions shown in Figure 3, page 7. Install or replace chamber liner if required by the appliance manufacturer. The burner must not extend into the combustion chamber. The end of the burner air tube must be within  $\frac{1}{4}$ " of the inside face of the chamber. If the space around the burner air tube is more than  $\frac{1}{4}$ ", wrap the burner air tube with minimum 2300 °F – rated ceramic fiber blanket to seal off the gap.

Repair or replace damaged appliance components. Inspect the appliance thoroughly. Follow appliance manufacturer's guidelines for repair or replacement of any component found defective.

When cleaning the appliance or working with ceramic fiber refractories or fiberglass insulation, see **WARNING** on this page.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

### Verify clearances

- Verify that the burner/appliance will maintain all clearances to combustible walls or floor and all clearances required for service/maintenance as required in the appliance manual and applicable codes.

## • mount burner (continued)

### Ceramic fiber or Fiberglass insulation

**WARNING**

Ceramic fiber materials, such as chamber liners, may contain carcinogenic particles (chrystobalites) after exposure to heat. Airborne particles from fiberglass or ceramic fiber components have been listed as potentially carcinogenic by the State of California. Take the following precautions when removing, replacing and handling these items.

**Avoid breathing dust and avoid contact with skin or eyes.** Wear long-sleeved, loose-fitting clothing, gloves and eye protection. Use a NIOSH N95 certified respirator. This respirator meets requirements for protection from chrystobalites. Actual job requirements or NIOSH regulations may require other or additional protection. For information, refer to the NIOSH website, <http://www.cdc.gov/niosh/homepage.html>.

**Ceramic fiber removal:** To prevent airborne dust, thoroughly wet ceramic fiber with water before handling. Place ceramic fiber materials in a plastic bag and seal to dispose.

**Avoid blowing, tearing, sawing or spraying** fiberglass or ceramic fiber materials. If such operations are necessary, wear extra protection to prevent breathing dust.

**Wash work clothes separately from other laundry.** Rinse clothes washer thoroughly afterwards to prevent contamination of other clothing.

#### NIOSH First aid procedures:

Eye exposure — irrigate immediately

Breathing — fresh air.

### Prepare appliance for burner mounting

**WARNING**

The universal flange supplied with 201GAS burners is intended only for firing chambers with negative overfire pressure. For pressurized firing, you must obtain a burner with a welded flange, designed for use with the appliance. You can also use the optional forced draft flange. Failure to comply could result in severe personal injury, death or substantial property damage.

See page 21 for required dimensions and bolt locations.

Where appliance instructions differ from this manual, follow the appliance instructions.

## 1. Prepare site • prepare burner • mount burner (continued)

### Prepare burner and components

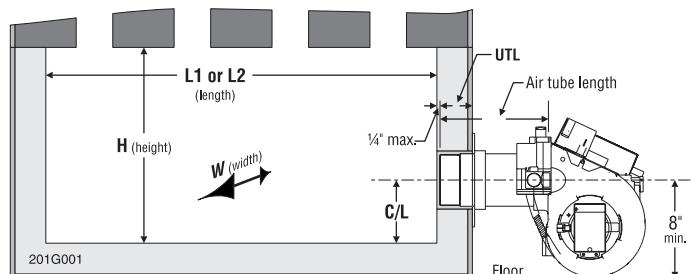
#### WARNING

Do not install or operate the burner if any component is damaged or if burner does not comply with the specifications of Table 1 and other guidelines in this manual.

#### Air tube insertion length (UTL)

- Usable air tube length (UTL) is the distance from mounting flange to end of air tube. Verify that the end of the air tube will be flush with, or no more than  $\frac{1}{4}$  inch short of, the inside of the appliance combustion chamber front wall when the burner is mounted. See Figure 3 and Table 1 below, for further information.

**Figure 3** Combustion chamber dimensions (see Table 1)



**Table 1** Burner specifications for 201GAS burners

Input Note 1	Burner orifice drill size			Approximate air band setting Notes 1 & 2			Diffuser	Minimum chamber dimensions Inches (Notes 3, 4, 5) (VC = min. diam. of vertical cylinder chamber)						UTL Air tube insertion length	
	Btuh	Natural gas	Propane gas	%	Slots	Air shutter		C/L	L1	L2	W	H	VC		
150,000	9/32	7/32	15	2	Yes	C	4	11	14	8	10	9½		Burners with <b>welded flange</b> have fixed usable tube length (UTL). Verify length is correct for the application. Burners with <b>adjustable flange</b> : Usable tube length (UTL) varies with air tube length:	
175,000	5/16	1/4	30	2	Yes	C	4	12	16	8	10	10			
200,000	11/32	9/32	60	2	Yes	C	4½	14	17	8	11	12			
225,000	11/32	9/32	8	2	No	B	4½	15	18	9	11	13			
250,000	3/8	5/16	25	2	No	B	4½	16	19	9	11	14			
275,000	13/32	5/16	40	2	No	B	4½	17	21	10	11	15			
300,000	13/32	5/16	15	4	No	A	5	17	21	12	12	15			
350,000	15/32	11/32	35	4	No	A	5½	17	21	12	12	15			
399,000	9/16	7/16	80	4	No	A	6	20	24	14	13	17			
Note 1	High altitude applications: The maximum burner input at sea level is 399,000 Btuh. Reduce this capacity by 4% per 1,000 feet above sea level. Example — max. capacity at 5,000 feet is 319,000 Btuh (20% reduction). Pressurized firing: Maximum burner input decreases with increasing overfire pressure. Assume a reduction in maximum burner input of approximately 5% at 0.1 inches w.c. and 10% at 0.2 inches w.c. You will have to increase the air band opening to compensate for the increased pressure. Follow the procedures given in this manual to check combustion with instruments to determine the correct air band setting. Do not fire into a chamber with pressure higher than 0.2 inches w.c. and never fire at a higher pressure than recommended by the appliance manufacturer.														
Note 2	Use this as the starting setting only. Adjust air band setting, if necessary, after performing combustion testing (see page 13).														
Note 3	Some tested appliances may operate satisfactorily with dimensions less than the above.														
Note 4	Horizontal cylindrical chambers — diameter must be no less than column "W" above Horizontal stainless steel cylindrical chambers — diameter at least 1 to 4 inches larger than column "W" above.														
Note 5	A corbel may help heat transfer in a larger boiler or furnace, provided it is recommended by the appliance manufacturer.														

## 1. Prepare site • prepare burner • mount burner (continued)

### Inspect/redrill gas orifice when required

- Turn off power to the burner/appliance before proceeding.
- Close main manual gas valve in gas line to burner. Then disconnect the ground joint union to allow rotating burner combination gas valve.

**WARNING**

You must disconnect power to burner and close main manual gas valve before proceeding. Failure to do so could result in severe personal injury, death or substantial property damage.

- Remove wire junction box cover on gas valve by removing the single screw attaching the box to the valve body. Then pull the two insulated spade connectors off of the gas valve terminals.
- Remove the combination gas valve (item 21, page 3) and the orifice nipple (item 8, page 3). Remove the orifice nipple from the gas valve.
- Read the correct orifice drill size from Table 1, page 7. Then check actual orifice size using that size twist drill bit.
- If gas orifice is smaller than required, redrill the orifice to the correct size, if necessary.
- If gas orifice is larger than required, obtain a replacement orifice nipple from Carlin. If necessary, drill the orifice hole in the replacement orifice nipple to the correct size.

**WARNING**

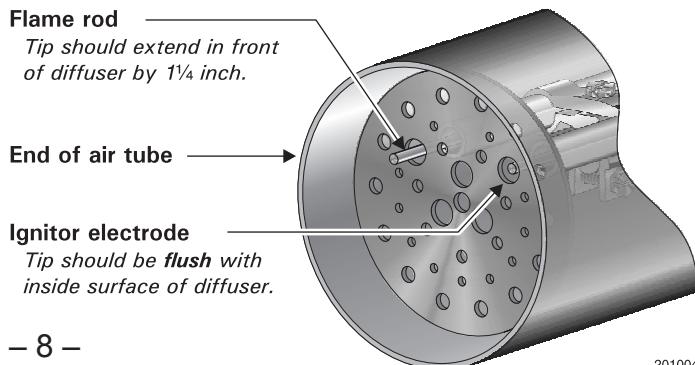
Drill the orifice carefully, avoiding drill wobble. Wobble will cause the orifice to be over-sized. The orifice nipple should be secured in a vise, if possible, to ensure it is steady during the drilling process.

- Write the orifice size on the orifice nipple label.
- Replace the gas valve and piping, using only pipe dope listed for use with liquefied petroleum gases. Make sure the arrow on the orifice nipple label points in the direction of gas flow.

### Flame rod and ignitor electrode

- Inspect the burner from air tube end. Flame rod should extend through the diffuser plate as shown in Figure 5. Ignitor electrode should be flush with inner face of diffuser plate as shown.

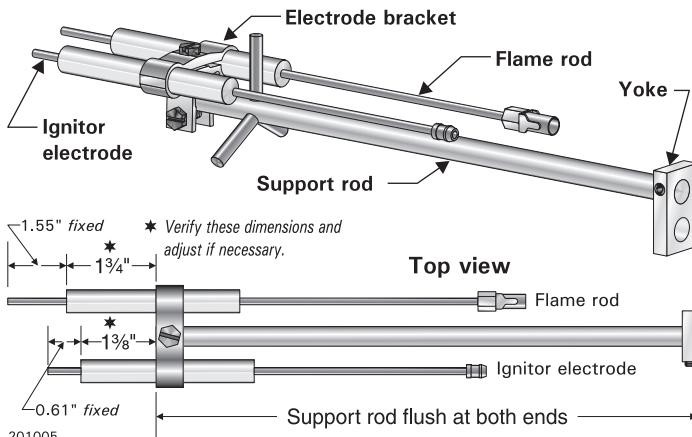
**Figure 5** Flame rod and ignitor electrode placement



### Install gas valve on burner

- Read WARNING's on page 9 before installing gas valve.
- Apply a small amount of pipe dope (suitable for propane gas) to gas valve outlet connection and to threads of gas line union and nipple. Assemble pipe nipple to gas valve and one half of union. Assemble other half of union to burner gas connection nipple. Join the union.

**Figure 6** Flame rod/ignitor electrode assembly


**WARNING**

To avoid damage to gas valve, do not hold valve with a pipe wrench or overtighten. Use only a crescent wrench or other means. Failure to comply could result in severe personal injury, death or substantial property damage.

- Feed wires into air pressure switch housing and secure conduit fitting with lock nut.
- Connect white wire from valve to white wire from burner with wire nut. Attach black wire quick-connect terminal to switch terminal connector (violet wire from burner is attached to other switch terminal).

### Inspect components and wiring

- Visually inspect all burner components and wiring.
- Verify that wiring is intact and leads are securely connected.
- Verify that all burner components are in good condition.

### Mount burner in appliance

- Verify appliance burner front plate dimensions per page 21.
- Slide gasket supplied with burner over end of air tube.
- Insert burner into appliance opening and bolt in place.

Where appliance instructions differ from this manual, follow the appliance instructions.

## 2. Install gas piping from meter to combination gas valve

### Code compliance

The burner/appliance installation must comply with codes listed on page 2 and any other locally applicable codes.

Piping from meter to burner

**WARNING**

Connect from the gas supply to the burner combination gas valve inlet using new, clean black iron pipe and malleable iron fittings only. Do not use copper, brass, cast iron or galvanized pipe or fittings.

Provide support for gas piping. Do not rest weight of piping on burner gas valve.

Apply pipe dope sparingly at all joints. Use only pipe dope listed for use with propane gas. Do not use pipe sealing tape.

Do not hold gas valve with pipe wrench. Use crescent wrench or other smooth-jawed device. Do not overtighten.

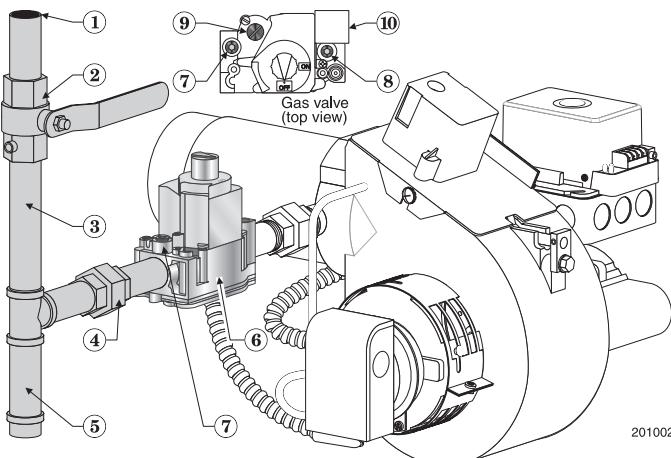
Failure to comply with above could result in severe personal injury, death or substantial property damage.

1. If possible, install a new gas line directly from the gas meter. If you are using an existing gas line, verify it is clean and in good condition, and verify it is large enough to handle the load of all connected appliances.
2. When branching from a common gas line, do not tap off from the bottom of horizontal sections — only from the side or top.
3. Install a main manual shutoff valve, sediment trap and ground joint union near the burner combination gas valve connection as shown in Figure 7.

**WARNING**

In the state of Massachusetts, when lever-type gas shutoffs are used, they must be T-handle type only.

**Figure 7** Connecting gas supply piping to burner



1 Pipe to meter or branch	6 Burner combination gas valve
2 Main manual gas shutoff valve	7 Upstream pressure tap, 1/8"
3 Use clean, burr-free black iron pipe and malleable iron fittings	8 Outlet pressure tap, 1/8"
4 Ground joint union	9 Gas regulator access screw
5 Sediment leg	10 Gas valve wire junction box

4. If the burner is installed inside an appliance jacket, install the main manual gas valve and sediment trap external to the jacket.
5. Size piping (or verify size) using Table 2. You will find additional information on gas line sizing in the National Fuel Gas Code, NFPA 54/ANSI Z223.1, or B149.1/B149.2 Installation Code for Canadian installations.

### Gas supply pressure — natural or propane

- Maximum supply pressure: 14 inches w.c.
- Minimum supply pressure: 5 inches w.c.

**WARNING**

Do not expose the combination gas valve to gas pressure in excess of 14 inches water column. Higher pressure could damage the valve seat, resulting in potentially hazardous condition. When pressure testing piping at higher pressures, disconnect burner from gas line before testing.

If the gas supply pressure can exceed 14 inches water column at any time, you must install a lockup type gas pressure regulator in the gas supply piping, ahead of the main manual gas valve installed at the burner.

### Test and purge gas line

Read WARNING above.

Pressure test and purge the line. Pressure testing should be done by the gas supplier or utility, following all applicable codes.

**Table 2** Capacities of black iron pipe, cubic feet gas/hour

Pipe size (inches)	Capacities in cubic feet per hour for pipe carrying natural gas or propane				
	Total length of gas piping, from meter to burner connection (feet)				
	20	40	60	80	100
1/2	92	63	50	43	38
5/8	190	130	105	90	79
1	350	245	195	170	150
1 1/4	730	500	400	350	305

Natural gas @ .60 specific gravity, pressure drop 0.3 in. w.c. (note 1)					
1/2	92	63	50	43	38
5/8	190	130	105	90	79
1	350	245	195	170	150
1 1/4	730	500	400	350	305

Natural gas @ .60 specific gravity, pressure drop 0.5 in. w.c. (note 1)					
1/2	120	82	66	57	50
5/8	250	170	138	118	103
1	465	320	260	220	195
1 1/4	950	660	530	460	400

Propane gas @ 1.55 specific gravity, pressure drop 0.3 in. w.c.					
1/2	57	39	31	27	24
5/8	118	81	65	56	49
1	217	152	121	105	93

Propane gas @ 1.55 specific gravity, pressure drop 0.5 in. w.c.					
1/2	74	51	41	35	31
5/8	155	105	86	73	64
1	288	198	161	136	121

Note 1	For natural gas with specific gravity other than 0.60, consult National Fuel Gas Code, NFPA 54/ANSI Z223.1, or Canadian B149.1/B149.2 for correction factor.
--------	--

### 3. Wire burner

#### Code compliance

The burner/appliance installation must comply with codes listed on page 2 and any other locally applicable codes.

#### General wiring requirements

**WARNING**

**Read and follow the guidelines below.** Failure to comply could result in severe personal injury, death or substantial property damage.

**Electrical shock hazard** — Disconnect electrical supply to the burner before attempting to service.

**Electrically ground burner** — The burner must be grounded in accordance with local codes or, in the absence of local codes, with the National Electrical Code, ANSI/NFPA 70 (or CSA C22.1/CSA C22.2 Canadian Electrical Code for Canadian installs.)

**Label all wires** before removing for servicing. Wiring errors could result in unsafe appliance/burner operation.

**NOTICE**

Read appliance manufacturer's instructions completely before wiring burner.

The 60200FR control requires a constant 120 VAC power source from the appliance as well as power from the appliance limit circuit. See Figure 8. **Check polarity carefully. If hot and neutral wires are reversed at appliance power source, the control will lockout on flame failure.**

If replacing any of the wire supplied with the burner, use minimum #18 AWG 125°C or better.

#### Approximate amp draw of 201GAS burners

	1/6 HP motor	1/4 HP motor
During ignition	3.0 AMPS	4.9 AMPS
Steady operation	2.5 AMPS	4.4 AMPS

#### Verify power supply

1. The burner requires a 120 VAC/60 Hz/single-phase power supply, with at least a 10-amp fuse. The current draw will be (when equipped with typical motor and Carlin 41800 electronic ignitor) approximately:
2. The 120 VAC power connections to the black and red/white wires of the 60200FR must be the same polarity **from the same power source**. DO NOT attempt to supply separate power sources. Check the power from the appliance with a voltmeter. Verify that the supply to the black and red/white wires are from the 120 VAC HOT side and that the power is no less than 102 VAC nor more than 132 VAC.

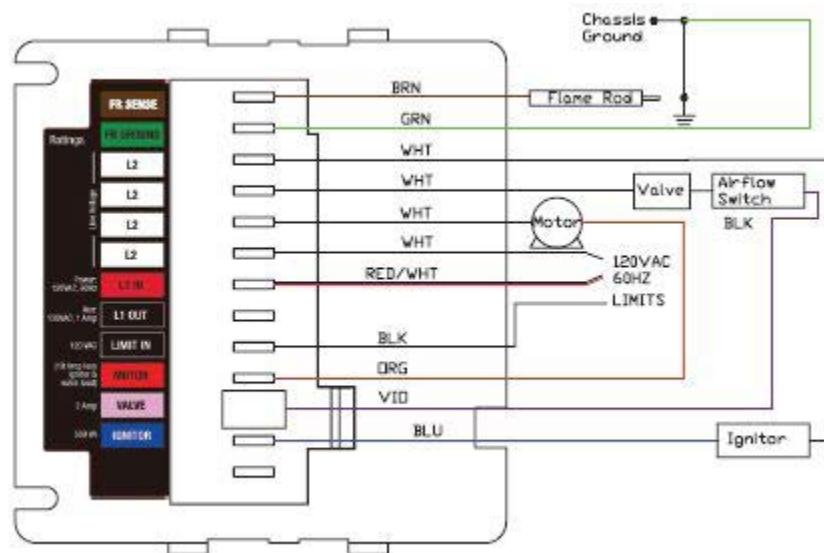
#### Checking burner flame signal

The 60200FR uses flame rectification to detect the flame. Because the grounded metal surface area near the flame rod is much larger than the surface of the flame rod, current flows through the flame more easily in one direction than the other. This causes an AC voltage applied to the flame rod to result in a DC current. (Note that, if the flame rod should touch a grounded metal part, the current would be AC, not DC, and the control would sense flame failure.)

The minimum flame signal needed to satisfy the 60200FR sensing circuit is 0.8 microamps. The control will register flame failure at any lower signal.

**Figure 8** Wiring diagram — 201GAS burner with 60200FR primary control

**EZGas**  
**120V**



Where appliance instructions differ from this manual, follow the appliance instructions.

## 4. Check system • start-up burner/appliance

### Inspect/check system

Before starting the burner and appliance, verify the system has been installed as directed by this manual and the appliance instructions.

#### Check gas piping for leaks

**WARNING**

Disconnect the burner from the gas supply line if gas line test pressure will exceed 14 inches w.c. Exposing the burner combination gas valve to pressure higher than 14 inches w.c. can damage the valve seat, resulting in potentially unsafe operation.

You can usually test the gas piping by allowing the line to fill with gas to main regulator outlet pressure.

1. Shut off gas flow to all equipment connected to the meter.
2. If test pressure will be less than 14 inches w.c., turn the burner combination gas valve knob to OFF. If test pressure will be higher than 14 inches, remove the burner from the gas line by shutting off the main manual gas valve installed near the burner (per Figure 7, page 9) and disconnecting the ground joint union. See warning above.
3. Watch the gas meter dial. For a one half cubic foot per revolution dial, there should be no movement of the dial for at least 5 minutes. For larger volumes per revolution, increase this time proportionately.
4. If you detect a gas leak, locate the leak with a soap suds mixture and repair it. Then test the system for leaks again.

**WARNING**

Do not test for leaks with an open flame. And do not use oxygen as a test gas. Either of these could cause an explosion, resulting in severe personal injury, death or substantial property damage.

#### Bleed gas line

Purge all air from the gas line. Purge to outside of the building, NEVER into the appliance or burner.

#### Leak test near-burner gas piping

If piping near burner has not already been pressure tested, open main manual gas valve on supply to burner and smell around area for any signs of gas. Apply a soap suds mixture to all gas piping joints near burner and check for any leaks. If any leaks appear, repair before proceeding and retest.

#### Set burner air band

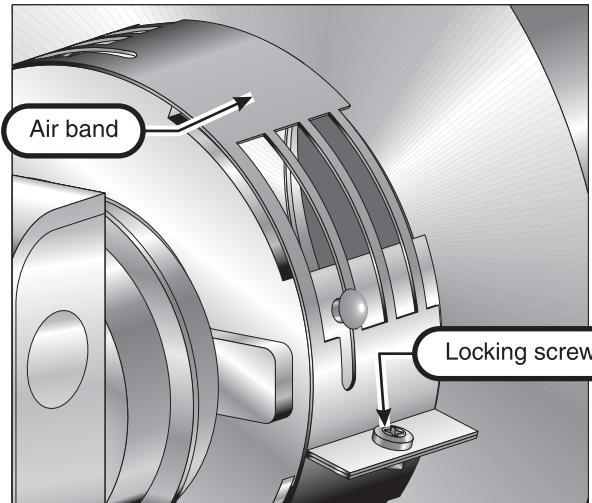
See Figure 9. Loosen air band locking screw. Then rotate band until it is open to the setting given in Table 1, page 7. Tighten air band locking screw.

The Table 1 setting will probably be satisfactory without change. If the combustion test indicates a need for more or less air, however, you will have to adjust the band accordingly.

#### Check burner and primary control

Inspect burner thoroughly. Verify that hinged cover gasket is closed and screw is tight. Verify all wiring is in place and all components are secure and in position.

**Figure 9** Air band adjustment



201007

**WARNING**

Do not start the burner if you smell gas or if there may be gas present in the appliance combustion chamber, appliance or the vent system. An explosion could occur, causing severe personal injury, death or substantial property damage.

**WARNING**

During initial start-up, you must be constantly alert for emergency conditions such as fuel leaks, electrical malfunctions, etc. Familiarize yourself with the location of manual shutoff valves and switches so you can quickly use them if needed.

**WARNING**

If the burner fails to ignite, NEVER attempt to manually bypass the normal sequence of the control, which provides purging of the combustion chamber.

#### Inspect/check system

Before starting the burner and appliance, verify the system has been installed as directed by this manual and the appliance instructions.

#### Verify flame failure Lockout of 60200FR control

1. Install a hose barb fitting in the combination gas valve outlet pressure tap and connect with a hose to a U-tube manometer.
2. Close the main manual gas valve and turn the combination gas valve knob to ON.
3. Turn on power to appliance and set appliance limit(s) to call for heat.
4. Burner motor will start. The 60200FR will run for its prepurge timing, then start the ignitor. Approximately one second later, the combination gas valve will open. (The manometer should show almost no pressure, because the main manual gas valve is closed.)
5. After the Trial for Ignition Period, the 60200FR will lockout and turn on the red LED. The ignitor will shut off and the gas valve will close. Turn off power and set controls to stop call for heat.
6. If Lockout does not occur, replace the 60200FR control.

## 4. Check System • Start-up Burner/Appliance (continued)

### Programming and Setup – 60200FR

#### Definitions:

**Call for Heat (C.F.H.):** TT on + Limit In on + BV on + CO on

**Pre-Purge:** Time period the motor is on prior to T.F.I.

**Trial for Ignition: (T.F.I.):** Burner Flame Establishing period

**Post-Purge:** Time period the motor is on after a Call for Heat has been satisfied

**Post-Purge Interrupt:** If selected is Time at which the 120 second Post-purge will be interrupted if a C.F.H. occurs during the Post-purge.

**Allowed Recycles:** Number of Recycles allowed during a single C.F.H. prior to lockout due to flame loss.

**TT Used:** Select “NO” when not using TT, select “YES” when using TT

**Baseline Reset:** Resets the baseline statistics used by the fault history

**Factory Default:** Resets ALL settings to the “Factory Defaults”

Pre-Purge*	T.F.I.*	Post-Purge*	Post-Purge Interrupt*	Allowed Recycles	TT Used	Reset Baseline	Factory Default
		120					
		60					
90		30					
30		15		3			
10	6	10	60	1	Yes	Yes	Yes
0	4	0	Never	None <sup>†</sup>	No	No	No

Shaded box = default settings

\*In seconds

<sup>†</sup>MA code (“N” models) are non-recycling and will lock out on flame failure

**WARNING** Do not start the burner if the combustion chamber contains gas.

### Button Functions – 60200FR

#### Reset

1. Return to Standby from other operating states. Press for 1/2 second
2. Reset control from Lockout. Press for 1 second
3. Reset control from Latch-up. Press for 30 second

#### Display Control

##### ESC / ▲

Display previous Operating State from Operating screen.

Exit Log or Setup screen to Operating screen with 3 second press.

Scroll through recent fault in Log screen.

Scroll to previous parameter in Setup screen.

Reject parameter change from Setup screen. Displays UNCHANGED on line 2 then after 2 sec, displays parameter with unchanged value.

##### DN / ▼

Display Time on line 2 of Operating screen.

Scroll down when in Log or Setup screen.

##### UP / ▲

Display Flame Rod – µAmps on line 2 of Operating screen.

Scroll up when in Log or Setup screen.

##### ENTR / ▶

Display status/fault messages on line 2 from Operating screen.

Move to less recent fault in Log screen.

Move to next parameter in Setup screen.

Accept parameter change from Setup screen. Displays ENTERED on line 2 then after 2 sec, displays parameter with changed value.

##### UP / ▲ & ENTR / ▶ for 3 seconds

Enter Setup screen.

##### DN / ▼ & ENTR / ▶ for 3 seconds

Enter Fault History screen.

##### DN / ▼ & UP / ▲ for 3 seconds

Enter Diagnostic screen to display Load Current sensed and Line voltage.

Where appliance instructions differ from this manual, follow the appliance instructions.

## 4. Check system • start-up burner/appliance (continued)

### Screen Information

The first line on the LCD screen shows the controls Firmware version at power up then will show the operating state. The screen turns off after 30 minutes and will turn on if the control goes to lockout or if any button is pushed.

**Power On:** Open all manual gas valves. Close the line switch.

The screen displays the firmware version for 5 seconds

“Version”	• Display program version info for 5 seconds
“Startup”	• 3 sec of self-tests to verify internal operation, including a flame rod calibration (when the circuit looks at the flame rod signal at standby and uses this value to compare to when the control knows that the flame should be present). Once the tests pass, the control goes to “Standby”
“Standby”	• Normal state, wait for a CFH. • If fault message “BV Switch Open” or “CO Switch Open” is displayed, control will remain in standby even if there is a call for heat

**Call for Heat (CFH):** Set the Thermostat (TT) to Call for Heat, The BV, CO and Limit In must be closed to initiate a call for heat

“Pre-Purge”	• Turn on the burner motor • Motor on, Ignitor & Valve off
“Pre-Ignition”	• Ignitor turns on to establish spark prior to the gas valve(s) opening • Motor on, ignitor on, valve off
“Trial for Ignition”	• Motor on, Ignitor on, Valve(s) on • The ignitor turns off at the end of the TFI time and the flame rod must sense flame. Lockout if no flame detected
“Flame Proven”	• Maintain the burner on until the CFH is satisfied • Motor on, Ignitor off, Valve(s) on
“Post-Purge”	• Enter from Flame Proven when the CFH is satisfied. • TT or HV-Limit open. • Or if flame is lost during flame proven • Motor on, Ignitor off, Valve(s) off
“Recycle”	• Occurs on flame loss in flame proven • Motor off, Ignitor off, Valve(s) off for 60 sec. or lockout if the recycle limit has been reached (see setup)
“Lockout”	• Motor off, Ignitor off, Valve off, Alarm on • No flame detected at the end of TFI • Flame is detected during Pre-purge, Pre-ignition or Post-purge • CO input not detected during Pre-purge, Pre-ignition, TFI or Post-purge • BV input not detected after 30 second delay during Pre-purge, Pre-ignition, TFI or Post-purge • Motor, ignitor or valve relay weld detected • If the control is miswired causing voltage to be detected on the outputs terminals, motor, ignitor or valve, when not expected • Recycle limit count has been reached

When a lockout occurs, the screen turns on, the fault icon flashes and a fault message is displayed. The screen will cycle every 4 seconds between 2 displays, one giving the fault message and one giving the amount of time in the lockout state. For example, if the cause was loss of the CO input the fault icon would flash and the message would read “CO detected.” After 4 seconds, the time in the lockout state “secs or mins” will be displayed. This cycle will continue until the fault is resolved.

Fault Message	Possible causes	Fault Message	Possible causes
NO FLAME	No flame detected. Cause unknown.	FLAME IN PREPURGE	Flame detected in prepurge
RECYCLE LIMIT	Exceeded “Recycles” setpoint limit	NO MOTOR POWER	Motor has no power (no 120volts present when there should be)
MOTOR POWERED	Motor relay welded or miswired	NO IGNITOR POWER	Ignitor has no power (no 120volts present when there should be)
IGNITOR POWERED	Ignitor relay welded or miswired	NO VALVE POWER	Valve has no power (no 120volts present when there should be)
VALVE POWERED	Valve relay welded or miswired	FLAME IN PREIGN	Flame detected in preignition
CO SWITCH OPEN	CO switch detected open indicating CO detected	FLAME DETECTED	Flame detected in postpurge or recycle
BV SWITCH OPEN	BV switch detected open after 30 second delay indicating a blocked vent		

To Reset from Lockout, press and hold the reset button for 1 second

“Latchup” If the control locks out 3 times during a single call for heat, latch-up occurs. The control may be reset from latchup by holding the reset button down for 30 seconds, unless in permanent latchup.

A permanent latchup occurs when a relay weld is detected and cannot be corrected. When this occurs, the display will read “Latchup Replace Control”.

#### WARNING

Should overheating or an emergency occur, immediately:

- Shut off main manual gas valve.
- Shut off control switch to burner.

Under some circumstances power should remain on for circulating blowers or other equipment. Determine proper response before attempting start-up.

#### WARNING

If burner fails ignition on several attempts, close gas valve and use burner blower to purge appliance before restart.

Do not start the burner if the combustion chamber contains residual gas. Allow gas to disperse.

## 4. Check System • Start-up Burner/Appliance (continued)

### Operating and Fault History – 60200FR

#### The 60200FR stores operating history

The first line contains the parameter listed below.

The second line contains the Value and Units if appropriate.

Lines starting with "Total" are not reset by Baseline Reset.

All other lines are reset using "Reset Baseline" setpoint.

#### "Fault Cycles"

- Number of fault cycles in log (50 max, then oldest is discarded)

#### "Total Cycles"

- Total Number of CFH cycles since control was put into service

#### "Total Run Time" (Motor on)

- Total Motor on time since control was put into service

#### "Total Burn Time" (Valve on)

- Total Valve on time since control was put into service

#### "Total On time"

- Total time since control was put into service

#### The 60200FR stores information from the last 50 fault cycles in a fault log with 1 being the latest fault

##### Fault Message

- The message that accompanied this fault
- If it was a Lockout message, the cycle is faulted

##### End State

- The last operating state before returning to Standby
- If not Post Purge or Flame Proven, the cycle is faulted

##### Flame Rod $\mu$ A

- The FR current on entry to Lockout or Standby
- If the FR current is outside its limits, the cycle is faulted

##### Line Volts

- Running average of detected Line Volts at end of CFH cycle
- If  $<102$  or  $>132$ , cycle is faulted

##### Motor Current

- “ - ” if current has not been determined yet
- “Ok” if current is known and above limit
- “Low” if current is known and below limit

Low current causes the cycle to be faulted

##### Ignitor Current

- “ - ” if current has not been determined yet
- “Ok” if current is known and above limit
- “Low” if current is known and below limit

Low current causes the cycle to be faulted

#### "Baseline time"

- Elapsed time since baseline was reset

#### "Max Line Volts"

- Highest line volts recorded since baseline reset

#### "Min Line Volts"

- Lowest line volts recorded since baseline reset

#### "Recycles"

- Total Recycles since baseline reset

#### "Run Time" (Motor on)

- Total Motor on time since baseline reset

#### "Burn Time" (Valve on)

- Total Valve on time since baseline reset

#### "CFH Cycles"

- Number of CFH cycles since baseline was reset

##### Valve Current

- “ - ” if current has not been determined yet
- “Ok” if current is known and above limit
- “Low” if current is known and below limit

Low current causes the cycle to be faulted

##### Recycle

- “Yes” if a recycle occurred in CFH cycle
- A recycle causes the cycle to be faulted
- “No”

##### Run time

- Time motor output is on during this cycle

##### Burn time

- Time valve output is on during this cycle

##### CFH Cycle, enter at this row on column change

- The CFH cycle during which this fault occurred
- “1” if first cycle after baseline was reset

Where appliance instructions differ from this manual, follow the appliance instructions.

## 4. Check System • Start-up Burner/Appliance (continued)

### Status Icons – 60200FR

#### Line 1 Inputs

##### “POWER”

- On if 120 VAC power detected
- Flash if Voltage is over 132 VAC or less than 102 VAC

##### “HV-LIM”: High Voltage Limit string input

- On if an input detected on the High Voltage Limit input terminals

##### “BV”: Blocked Vent, Low Voltage Limit string input

- On if BV input detected on the Low Voltage Limit input terminals

##### “T-T”: Thermostat input

- On if the T-T current is above the TT closed threshold
- Turn on if T-T used “NO” is selected

##### “FLAME”: Detected using Flame Rod

- On if DC uAmps in flame rod is at or above the flame detect threshold >0.8 $\mu$ A

#### Line 2 Outputs

##### “FAULT”

- Fault detected, alarm output on. Always flashes when activated

##### “MOTOR”

- On with Motor output
- Flash if running and Low current detected
- Flash if suspected motor fault

##### “IGNITOR”

- On with Igniter output
- Flash if running and Low current detected
- Flash if suspected Igniter fault

##### “VALVE”

- On with Valve output
- Flash if running and Low current detected
- Flash if suspected Valve fault

### Service & Troubleshooting – 60200FR

#### Burner (control) will not come on

##### No power to control

- Check line voltage to the control (at least 102 VAC).
- Check all electrical connections.

##### Control is in lockout

- Press the reset button for 1 second.

##### Other no start problems

- Line voltage <90 VAC. Check line voltage. >132VAC
- Motor relay welded. If valve/ignitor has no voltage, and line voltage OK, the issue is a welded motor relay. Replace the control.
- Reversed 120 VAC polarity – make sure hot and neutral lines are not reversed on incoming lines.
- Check T-T, BV, CO and HV limit inputs.

#### Repeated flame failures

##### Check for:

- Excessive airflow or draft causing flame to leave burner head – check for proper air band setting and draft.
- Excessive back pressure causing flame to be erratic – check appliance and flue for sooting/plugging.
- Defective flame rod assembly.

#### Control locks out at end of TFI

##### Check for:

- No gas to burner – check gas supply. Verify gas pressure is no higher than allowed for gas valve (usually 1/2 psig or 14" water column).
- Shorted electrodes (shorted to burner head or diffuser) – inspect for cracked porcelain and replace as needed.
- Poor spark – check electrode spacing and condition per burner manual. Replace or realign if necessary.
- Airflow too high – check air band setting.
- Ignitor module defective – replace if no spark.
- Check wiring connections.
- Flame rod shorted to ground or defective.

#### FROZEN PIPES/WATER DAMAGE

*This is not a freeze protection device.* Suitable freeze protection monitoring or other precautions are recommended to protect against ruptured pipes/water damage caused by fuel outage, safety related fault conditions or equipment failure.

## 5. Perform checkout procedures • fill out certificate

### Installer/servicer

#### Please check off and fill in certificate

**WARNING**

Should overheating or an emergency occur, immediately:

- Shut off main manual gas valve.
- Shut off control switch to burner.

Under some circumstances power should remain on for circulating blowers or other equipment. Determine proper response before attempting start-up. If appliance fails ignition on several attempts, close gas valve and use burner blower to purge appliance before restart.

#### Preparation before checkout

- Burner/appliance installed per appliance instruction manual?
- Burner components verified against Table 1, page 7?
- Burner/appliance installed per all applicable codes?
- Installation site has adequate ventilation openings and vent system?
- Gas supply line in good condition and sized correctly?
- All gas line joints sealed with pipe dope listed for use with liquefied petroleum gases?
- Gas supply pressure to combination gas valve checked?
- Regulator installed if pressure can exceed 14 inches w.c.?
- Air purged from gas line?
- Gas piping checked for leaks?
- Wiring installed per burner manual and appliance instructions?
- Burner inspected and primary control flame failure lockout checked?
- Start-up sequence performed (page 13)?

#### Make final burner adjustments

##### Check for leaks in gas piping

- Smell around burner to make sure there is no gas leak in near-burner piping. Verify integrity of gas line joints between combination gas valve and burner gas inlet tapping using soap suds mixture.

##### Check/adjust gas valve outlet pressure

- With burner running, check manometer reading for combination gas valve outlet pressure. Adjust valve regulator if necessary so the reading is 3.5 inches w.c. for either natural gas or propane gas.

#### Make final burner adjustments (continued)

##### Inspect flame

- Look at flame through appliance observation port. The flame should be a soft blue with well-defined orange and yellow tips for natural gas, or well-defined yellow tips for propane gas. (If you make air or gas pressure changes later, inspect the flame again.)

##### Check the firing rate

- Natural gas only — Turn off all other gas appliances connected to the gas meter. Use a stopwatch to time the number of seconds for a flow of one cubic foot of gas (two revolutions for a one half cubic foot per revolution dial, for example). You will also need to know the gas heat content in Btu per cubic foot. Determine the actual input from: INPUT =  $(3600 \times \text{Btu per cubic foot}) \div (\text{number of seconds for one cubic foot})$ , for firing rate in Btuh. For example, for 1050 Btu per cubic foot natural gas, with meter timed at 15.1 seconds for one cubic foot of gas: INPUT example =  $(3600 \times 1050) \div (15.1) = 250,500 \text{ Btuh}$ . Firing rate should be within  $\pm 5\%$  of rated input for the appliance. Adjust the combination gas valve pressure regulator if necessary to obtain the correct firing rate. Valve outlet pressure must not be lower than 3.2 inches w.c. nor higher than 3.8 inches w.c.
- For propane gas, contact your propane supply for procedure to verify firing rate.

##### Check combustion using instruments

**WARNING**

Do not attempt to confirm combustion simply by inspecting the flame visually. You must use combustion test instruments. Failure to properly verify/adjust combustion could allow unsafe operation of the burner, resulting in severe personal injury, death or substantial property damage.

Fuel	CO <sub>2</sub>		O <sub>2</sub>	
	Minimum	Maximum	Maximum	Minimum
Natural Gas	8.5%	10.0%	6.2%	3.5%
Propane Gas	9.5%	11.2%	6.0%	3.5%

- Insert test probe into appliance vent outlet to sample flue products. The results should show CO<sub>2</sub> or O<sub>2</sub> as follows:

- If the combustion results are outside the range above, and the firing rate of the burner is within 5% of rated input, open or close the air band until the CO<sub>2</sub> (or O<sub>2</sub>) are acceptable.

**WARNING**

After CO<sub>2</sub> (O<sub>2</sub>) tests are completed satisfactorily, measure flue products for carbon monoxide (CO) concentration. The CO must not exceed 50 ppm adjust to "air free", or other if specified by local codes.

- Check pressure overfire in appliance. Refer to appliance manual for recommended reading and barometric damper instructions for proper setting of damper.

Where appliance instructions differ from this manual, follow the appliance instructions.

## 5. Perform checkout procedures

### Verify burner/appliance operation

#### Check burner/appliance/controls operation

- Test operating and limit controls on appliance as specified in appliance instruction manual.
- Check operation of the 60200FR primary control by forcing Latch-up (three consecutive lockouts during the same call for heat) by closing the main manual gas cock and cycling the burner. Press the reset button to reset when the control locks out on flame failure. Do this two times and the control should enter Latch-up. See page 13 to reset control.
- Check operation of airflow switch.
  - Cycle the burner off with the appliance controls. Then turn off power to the appliance. Remove the two sensing lines from the airflow switch by loosening the plastic sealing nuts and pulling the aluminum sensing tubes out of the sockets.
  - With the sensing lines removed, turn on power to the appliance and set the controls to call for heat. Watch the manometer on the combination gas valve outlet pressure tap. After the control performs its pre-purge, it will try to turn on the gas valve. The gas valve should not open with the airflow sensor lines removed. Set the controls to stop the call for heat and turn off power to the appliance. If the airflow switch operates correctly (gas valve doesn't open), continue with normal operation. If switch fails to operate correctly, replace the switch and retest.

**WARNING**

NEVER attempt to adjust the air pressure switch setting. This could allow unsafe operation of the burner, resulting in potential of severe personal injury, death or substantial property damage.

#### Verify burner operation

- Start and stop the burner several times, allowing the primary control to sequence through normal operation. Verify correct operation of burner and control throughout.

#### • fill out certificate (continued)

### Verify burner/appliance operation

#### Verify vent system operation

- Verify vent is operating correctly and flue products are properly exhausted from building.
- Check operation of barometric damper and spill switch.
- If the building contains any exhaust fans or conditions that could affect vent performance, check burner/appliance/vent operation with exhaust fans (or other conditions) operating.

#### Prepare burner for normal operation

- Cycle burner off with appliance controls. Then turn off power to the appliance.
- Close the main manual gas valve.
- Remove the U-tube manometer line from the combination gas valve outlet pressure tap hose barb. Remove hose barb and replace 1/8" NPT pipe plug in tapping.
- Verify all components and wires are in place and burner is ready for operation.

#### Train the user

- Train the user to operate the burner and appliance under normal conditions. Explain procedure to shut down burner/appliance when required.
- Review the user information manual (and the appliance instructions) with the user.
- Verify the user is aware of all procedures specified in the manual.
- Verify user will not store or use combustible liquids or materials or contaminants in the vicinity of the burner/appliance.

## 6. Maintenance and service procedures

### Annual start-up & service

**WARNING**

This burner should be started and serviced at least annually by a qualified service technician. Failure to properly maintain and service the burner could result in severe personal injury, death or substantial property damage.

**WARNING**

Turn off power to appliance and close main manual gas valve when servicing burner. See **WARNINGS** on page 2 and elsewhere in this manual regarding correct procedures. Failure to comply could result in severe personal injury, death or substantial property damage.

### Annual start-up and service procedures

- Discuss burner/appliance operation with user to determine any problems that may have occurred during the previous season and to verify user is aware of proper operation and care of the burner/appliance.
- Turn off power to appliance and close main manual gas valve.
- Remove burner from appliance and inspect diffuser plate, ignitor electrode and flame rod (see Figures 5 and 6, page 8).
- Remove ignitor electrode/flame rod assembly to clean and adjust if necessary.

To remove assembly:

1. Remove the connector wires from the flame rod and ignitor electrode.
2. Remove the bolt securing the yoke to the housing.
3. Pull the electrode/flame rod assembly straight back and out.
4. Clean the assembly if necessary. Replace any part that is damaged.
5. Check the dimensions of the assembly against those shown in Figure 6, page 8. Adjust if necessary.
6. Replace the electrode/flame rod assembly in the air tube.
7. Tighten the retaining bolt to secure the yoke in place.

**NOTICE**

If the inside surface of the air tube and/or diffuser plate needs to be cleaned, clean with a vacuum cleaner with brush attachment while the electrode/flame rod assembly is out of the burner.

Verify that hinged cover gasket is closed and screw is tight.

Close the housing cover plate and secure in place.

Check the burner flange gasket. It must be in good condition. Replace gasket on burner flange and mount burner in appliance, securing to mounting studs.

Perform the complete checkout procedures of pages 11 through 17, including system inspection and checks.

### Maintenance/service procedures

#### Cleaning blower wheel

1. The blower wheel accumulates dust and debris from normal operation. You will need to clean the wheel blades periodically to prevent reduction in airflow. To clean blades, remove the two bolts securing the motor to blower housing.
2. Slide the motor out and rotate to remove and access blower wheel.
3. Use a brush and vacuum to clean each blade and the blower housing interior.
4. Replace motor/wheel in blower housing and secure with the two bolts.
5. Push wire slack back into junction box.

3. Loosen the Allen screw securing the blower to the motor shaft and remove the wheel.

4. When assembling the replacement assembly, slide the wheel onto the motor shaft and use feeler gauges to set a space of 1/8 inch between the blower wheel and the motor face.
5. Replace the motor/wheel assembly in the housing, wire the motor leads and secure the motor with the two bolts.

#### Motor maintenance

The motor is constructed with permanently-lubricated bearings, and requires no oiling. Should you replace the original motor with another type of motor, occasional oiling may be required, depending on motor design and manufacturer's recommendations.

**WARNING**

Any time you replace a component or disassemble any part of the burner for service/maintenance, perform a complete operational test after reassembly to verify the burner operates correctly. Failure to verify operation could result in severe personal injury, death or substantial property damage.

#### Replacing blower motor or wheel

1. If either the blower wheel or motor must be replaced, remove the two bolts securing the motor to housing.
2. Disconnect the motor wires in the burner junction box.

Where appliance instructions differ from this manual, follow the appliance instructions.

## 7. Troubleshooting

Problem	Possible cause	Corrective action
<b>WARNING</b>		These procedures must only be performed by a qualified service technician. Use care when performing tests on electrically or mechanically live parts. Disconnect power to burner/appliance and close main manual gas valve when removing components for service. Failure to comply could result in severe personal injury, death or substantial property damage.
Burner motor will not start	120 VAC power circuits	Check voltage and polarity at entrance to appliance and burner. Check fuse or breaker protecting circuit. Check appliance limit circuit — are controls calling for heat? Check electrical connections.
	Primary control is in Lockout	Red LED will be on. Press the reset button for 1 second. If red LED comes back on in a couple of seconds, there could be voltage present to the gas valve or the motor relay contacts could be stuck in the closed position. The Safety Monitoring Circuit causes lockout if this occurs. If there is no voltage present at the gas valve (using a voltmeter), replace the control. If there is voltage at the gas valve, check all wiring for accuracy. Replace the control if the 60200FR gas valve wire shows 120 VAC when disconnected from the burner wiring.
	Primary control is in Latch-up	Red and amber LED's will both be on. See page 12 for procedure to handle this condition. When resetting control from Latch-up, be sure to investigate what caused the repeated failures. Correct the condition.
	Incorrect wiring	Check wiring against appliance and burner wiring diagrams. Verify all connections are secure.
	Defective motor	Remove motor leads from junction box and apply power directly. If motor fails to operate, then replace.
	Defective primary control	If control receives power to both the black and red/white wires, but doesn't start the motor, the control may be defective. Replace control.
Repeated flame failures — burner won't light	Airflow too high	Check air band setting against Table 1, page 7. Reposition to correct setting if necessary.
	Gas orifice wrong	Check gas orifice size. See pages 7 and 8 for procedure.
	Wrong manifold pressure	Check combination gas valve outlet pressure — should be between 3.2 and 3.8 inches w.c. unless specified.
	No gas supply to combination gas valve	Check main manual gas valve — might be closed. Attach manometer to combination gas valve supply pressure tapping and check pressure. If no pressure, trace gas line to find why no gas is available.
	Gas valve not opening	Check gas supply pressure to combination gas valve. Pressure in excess of 14 inches w.c. will cause valve to lockup. Check voltage to gas valve. Is gas valve receiving 120 VAC? If gas valve is receiving 120 VAC and not opening, and gas supply pressure is below 14 inches w.c., replace gas valve.
	Airflow switch	Check electrical connections and sensing connections to airflow switch. If blower operates, check across switch to see if it makes. If switch is correctly connected, but won't close, replace airflow switch. To verify switch is receiving signal, connect a manometer across the sensing lines.
	Primary control defective	Check voltage to gas valve during TFI. If no voltage to valve, replace control.

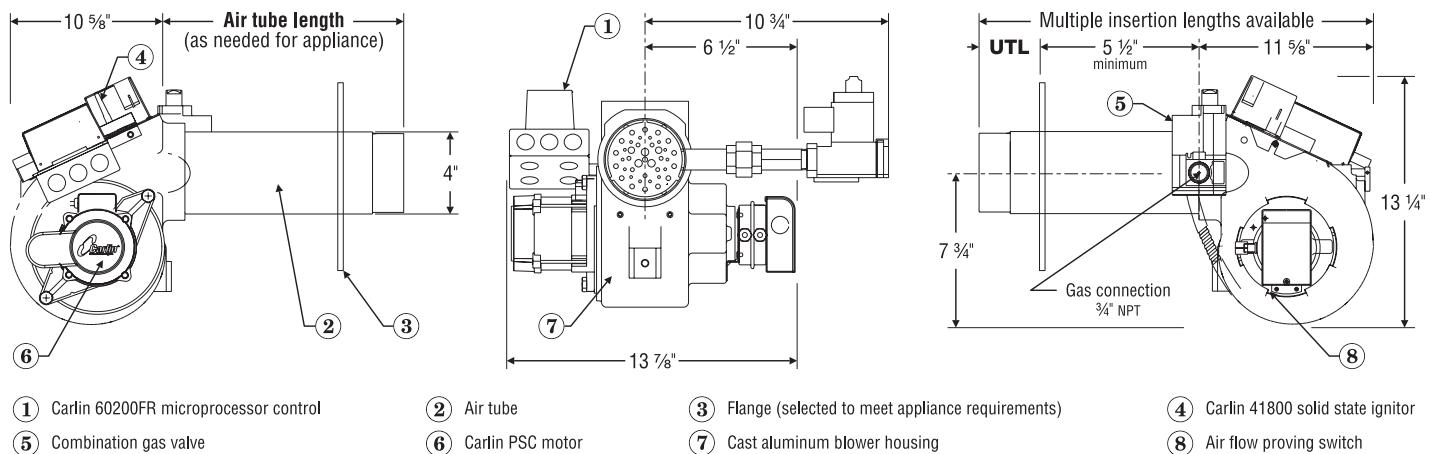
## 7. Troubleshooting (continued)

Problem	Possible cause	Corrective action
<b>WARNING</b>		These procedures must only be performed by a qualified service technician. Use care when performing tests on electrically or mechanically live parts. Disconnect power to burner/appliance and close main manual gas valve when removing components for service. Failure to comply could result in severe personal injury, death or substantial property damage.
Burner lights, but locks out after TFI	Insufficient flame signal	Flame signal at test jack on 60200FR must be at least 0.8 microamps. Check following if signal is lower. Flame rod may be touching ground, insulator may be broken, or contamination may cause path to ground. Inspect and clean if necessary. See Figures 5 and 6, page 8 for more information. Check flame rod position in burner per Figures 5 and 6, page 8. Adjust if necessary. Flame rod must be correctly positioned for best flame signal.
Ignition — no spark or poor spark	Check wire connections to ignitor electrode. Check position of ignitor electrode per Figures 5 and 6, page 8. Adjust if needed. Check primary voltage to ignitor. If ignitor receives 120 VAC and doesn't generate spark, replace ignitor.	
Airflow	Check air band setting against Table 1, page 7.	
Wrong orifice size	Verify orifice size per Table 1, page 7. See pages 7 and 8 for procedure.	
Manifold pressure	Check combination gas valve outlet pressure — should be between 3.2 and 3.8 inches w.c. unless specified.	
Inadequate gas supply	Check line pressure at combination gas valve supply pressure tapping. Gas pressure must be at least 5 inches w.c. If other appliances are on same line or regulator and burner pressure drops when they are on, line is undersized. Contact your gas supplier. If gas pressure is always low, check supply regulator setting and adjust if necessary. Gas pressure must not exceed 14 inches w.c.	
Improper draft	Over-fire draft should not be higher than specified in the appliance manufacturer's instructions. Follow the appliance manual instructions to troubleshoot excess overfire pressure or poor draft problems if necessary.	
Flame rod grounded	Check flame rod and insulator. If flame rod is grounded in any way, the control will lockout after the trial for ignition.	
120 VAC polarity	Check polarity of power supply. If hot and neutral wires are reversed, flame rod circuit cannot sense flame correctly. Control will lockout after the trial for ignition.	
Flame rod wire	Check to make sure connections are tight on both ends. Make sure 90° Rajah boot is connected to stud in 60200FR control.	

Where appliance instructions differ from this manual, follow the appliance instructions.

## 8. Dimension and mounting information

**Figure 10 Dimensional data**



(1) Carlin 60200FR microprocessor control

(5) Combination gas valve

(2) Air tube

(6) Carlin PSC motor

(3) Flange (selected to meet appliance requirements)

(7) Cast aluminum blower housing

(4) Carlin 41800 solid state ignitor

(8) Air flow proving switch

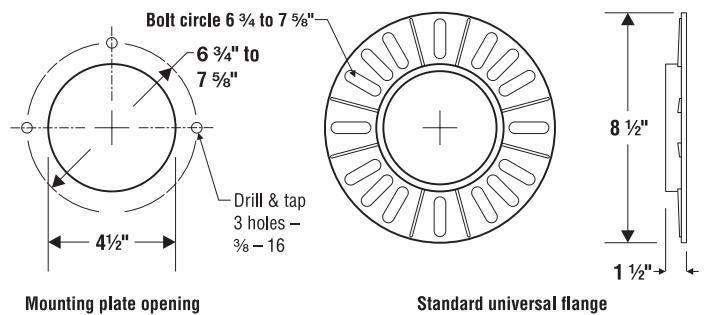
### Mounting burner to appliance

**WARNING**

The universal flange supplied with 201GAS burners is intended only for firing chambers with negative overfire pressure. For pressurized firing, you must obtain a burner with a welded flange, designed for use with the appliance. You can also use the optional Forced draft flange. Failure to comply could result in severe personal injury, death or substantial property damage.

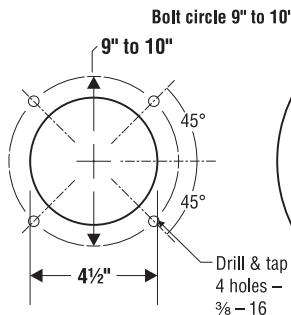
Prepare the burner opening on the front of the appliance as shown in Figure 11 if not already supplied. See page 7 to determine the location of the flange on the burner air tube. Tighten the flange locking screws firmly.

**Figure 11 Flange mounting information**



Mounting plate opening

Standard universal flange



Mounting plate opening

Optional forced draft flange

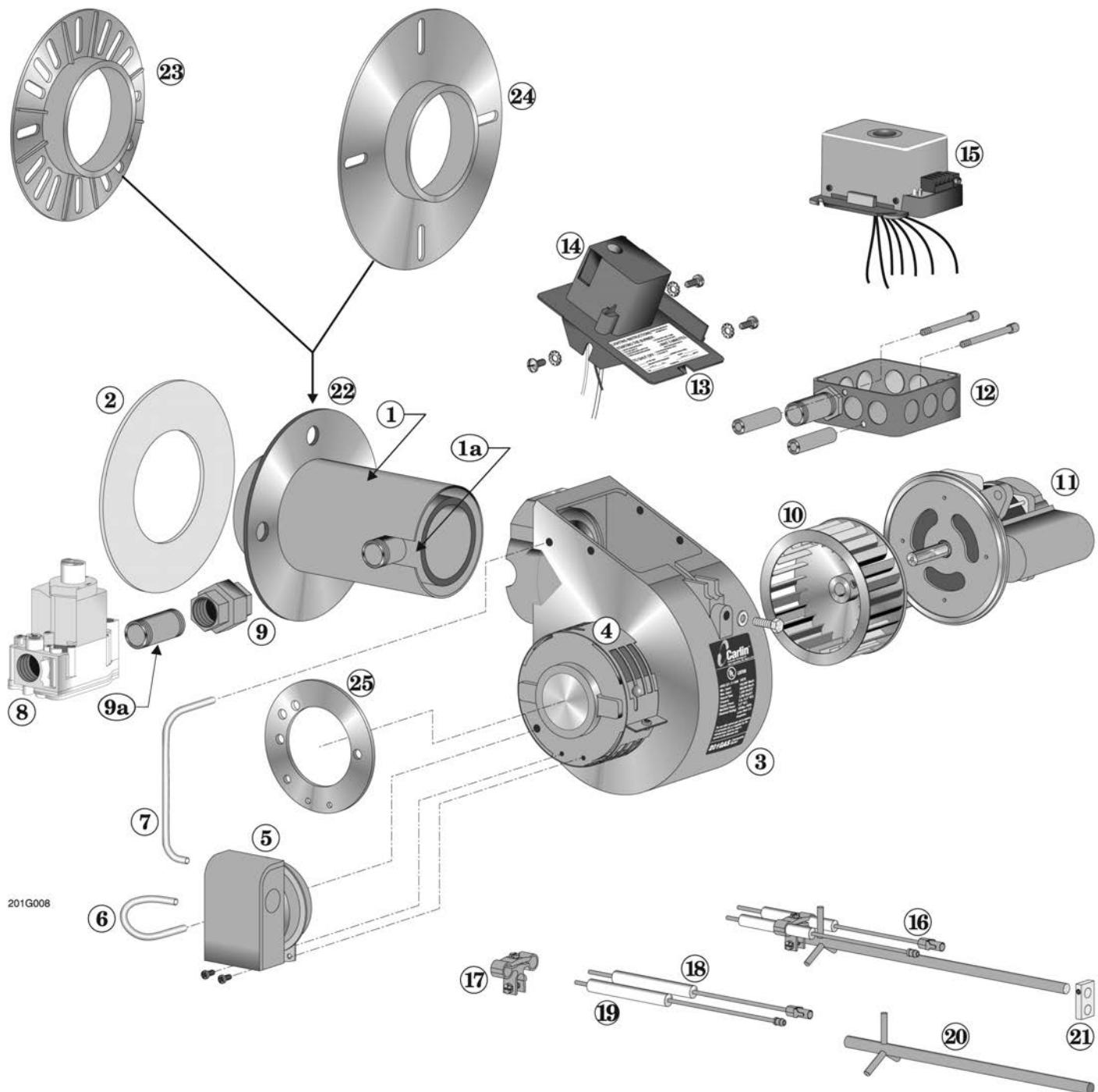
201G011

## 9. Replacement parts

Item number	Description	Part number
1 1a	Air tube with gas manifold & diffuser (specify overall length of air tube) Gas manifold (specify air tube length, diffuser and firing rate)	Contact factory Contact factory
2	Gasket, mounting flange	40287
3	Blower housing (burners with A or B diffuser) Blower housing (burners with C diffuser)	98529 Contact factory
4	Air band (four-slot) Air band (two-slot)	47001 98542
5	Airflow switch and mounting plate assembly	98521
6	Blower inlet sensing line	98557
7	Blower outlet sensing line	98558
8	Gas valve	98523
9 9a	Gas line union, 3/4" Gas orifice nipple, 3/4" NPT both ends x 4"	Starter hole orifice Drilled to size
10	Blower wheel	28563
11	Motor, 1/6 HP (140-WATT PSC)	98611
12	Junction box, 4" x 4", with grommet, lock washer, conduit nipple (to burner housing), and bracket (not shown)	Contact factory
13	Hinged cover plate for Carlin ignitor	98534
14	Ignitor, Carlin electronic Model 41800	4180002
15	Primary control, Carlin 60200FR microprocessor flame rod control	6020002FR
16	Ignitor electrode/flame rod assembly, complete (depends on air tube length)	Contact factory
17	Electrode holding base with hardware (depends on air tube length)	23135S
18	Flame rod (depends on air tube length)	Contact factory
19	Ignitor electrode (depends on air tube length)	
20	Ignitor electrode/flame rod support rod (depends on air tube length)	Not available separately
21	Ignitor electrode/flame rod locator bracket	
22	Welded flange (when supplied)	Included with air tube
23	Standard universal flange (supplied with burners without welded flange)	59642BLU
24	Optional forced draft flange	59444BLU
25	End cover plate (only on burners with C diffusers)	98331

Where appliance instructions differ from this manual, follow the appliance instructions.

## 9. Replacement parts (continued)



**NOTICE**

Burner is shown with welded flange, supplied only on burners ordered for specific appliance applications. Other burners are supplied with the universal flange (item 23) or optional forced draft flange (item 24). See page 21 for details.

**Installation/service certificate****Installation data**

Burner model		Serial number		Measured firing rate, Btu/h	Gas orifice drill size	Inlet gas pressure, IWC
O <sub>2</sub> %	CO <sub>2</sub> %	CO PPM	Flame Signal	Fuel (natural or propane)	Were all controls tested?	

Comments about installation/start-up:

Installer's name:	Company name:	Company address:	Phone:
-------------------	---------------	------------------	--------

**Service history**

Date	Technician	Company/address	Describe work performed