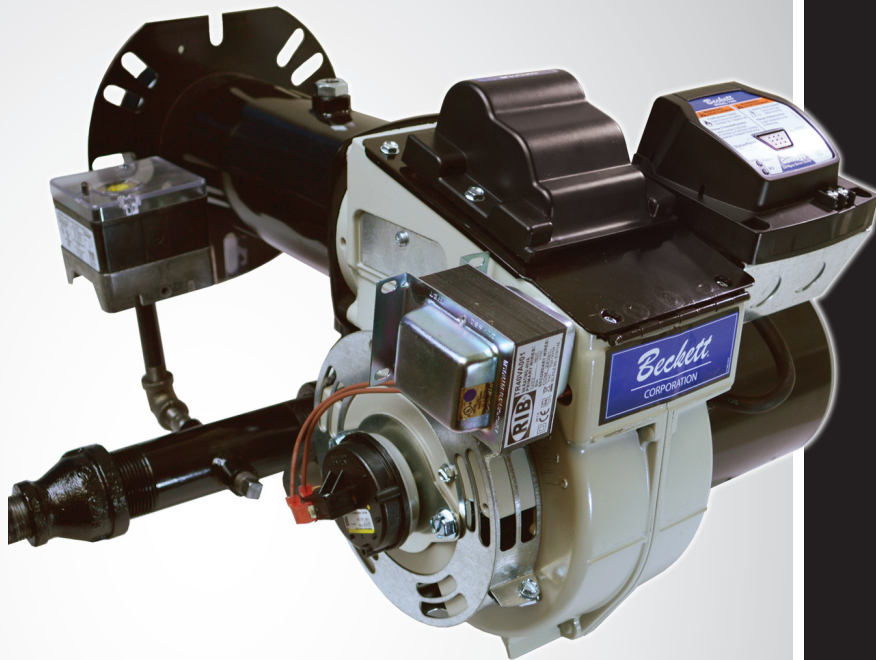


# CG10-24

with GeniSys 7590 Control

## Gas Burner Manual

Operation On/Off & On/Off Low Fire Start  
Available Rates: 300 - 1200 MBH



*Beckett*  
CORPORATION



### **WARNING** Fire or Explosion Hazard



*Can cause severe injury, death or property damage*

*If the information in these instructions is not followed exactly, a fire or explosion may result causing personal injury, death or property damage.*

- **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.
  - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
  - If you cannot reach your gas supplier, call the fire department.
  - Installation and service must be performed by a qualified installer, service agency or the gas supplier.

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## Before Calling Beckett . . .

Before contacting us about your burner, you must have a completely filled out copy of the **Contractor Start-Up Form** (Located inside of last page). This information is crucial for troubleshooting and obtaining the correct replacement part.

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**Thank you for purchasing a Beckett CG10 gas burner** for use with your heating appliance. Please pay attention to the Safety Warnings contained within this instruction manual. Keep this manual for your records and provide it to your qualified service agency for use in professionally setting up and maintaining your burner.

Your CG10 burner will provide years of efficient operation if it is professionally installed and maintained by a qualified service technician. If at any time the burner does not appear to be operating properly, **immediately contact your qualified service agency** for consultation.

**Gas equipment and their vent systems must be inspected annually by a qualified service agency to assure safe and reliable operation.**


## General Information


### To the Owner:

This equipment must be installed, adjusted and started by a qualified service agency that is licensed and experienced with all applicable codes and ordinances and responsible for the installation and commissioning of the equipment.

## Hazard Definitions:

 <b>DANGER</b>	Indicates a hazardous situation that, if not avoided, <b>will</b> result in <b>death or serious injury</b> .
 <b>WARNING</b>	Indicates a hazardous situation that, if not avoided, <b>could</b> result in <b>death or serious injury</b> .
 <b>CAUTION</b>	Indicates a hazardous situation that, if not avoided, <b>could</b> result in <b>minor or moderate injury</b> .
 <b>NOTICE</b>	Used to address practices not related to physical injury.
 <b>SAFETY INSTRUCTIONS</b>	Safety instructions signs indicate specific safety-related instructions or procedures.

 **WARNING** **Burn Hazard, Hot Surface**

 *Burner flange and air tube are hot when burner is in operation. Do not service this area during or immediately after operation. Allow area to cool.*

## Owner's Responsibility:

### **WARNING**

### **Explosion, Fire, and Asphyxiation Hazard**



*Failure to follow these instructions, misuse, or incorrect adjustment of the burner could lead to equipment malfunction.*

Contact a professional, qualified service agency for the installation, adjustment and service of your gas burning system. Thereafter, have your equipment adjusted and inspected at least annually to ensure reliable operation. This work requires technical training, trade experience, licensing or certification in some states and the proper use of special combustion test instruments.

Please carefully read and comply with the following instructions:

- See the front cover for 'What to do if you smell gas'.
- Never store or use gasoline or other flammable liquids or vapors near this burner or appliance.
- Never attempt to burn garbage or refuse in this appliance.
- Never attempt to light the burner/appliance by throwing burning material into the appliance.
- Never attempt to burn any fuel not specified and approved for use in this burner.
- Never restrict the air inlet openings to the burner or the combustion air ventilation openings in the room.

### **CAUTION**

### **Frozen Plumbing and Water Damage Hazard**

*If the residence is unattended in severely cold weather, burner primary control safety lockout, heating system component failures, power outages or other electrical system failures could result in frozen plumbing and water damage in a matter of hours. For protection, take preventive actions such as having a security system installed that operates during power outages, senses low temperature and initiates an effective action. Consult with your heating contractor or a home security agency.*

### **NOTICE**

Contact a professional, qualified service agency to replace any component that has been exposed to water.

### Professional Installer's Responsibility:

**WARNING**

#### Explosion, Fire, and Asphyxiation Hazard

**Professional Service Required.**

- Please read all instructions before proceeding. Follow all instructions completely.
- This equipment must be installed, adjusted and started by a qualified service agency that is licensed and experienced with all applicable codes and ordinances and responsible for the installation and commissioning of the equipment.
- The installation must comply with all local codes and ordinances having jurisdiction and the latest edition of the National Fuel Gas Code ANSI Z223.1 (NFPA 54) and CAN1-B149.1 in Canada.
- Burner must be used within the limits of **Table 1**.

**WARNING**

#### Fire Hazard: Overheating

Should over-heating occur:

- Shut off the manual gas control to the appliance.
- DO NOT shut off power to the equipment, allow the blower and pumps to continue running.

**NOTICE**

#### Special Requirements:

When contacting Beckett for service information — Please have the burner serial number and contractor start-up form available when calling or writing. You will find the serial number on the label located on the left rear of the burner.

**NOTICE**

Concealed damage – If you discover damage to the burner or controls during unpacking, notify the carrier at once and file the appropriate claim forms. Do not install a burner or control that has been damaged.

**LISTED**

This burner is UL listed for use in the US or Canada per ANSI/UL 295 & CSA/CGA 3.4. For use with natural gas or propane.

If any of these instructions are not clear, Call Beckett at **1-800-645-2876** for assistance.

### Specifications

**Table 1 – Burner Specifications**

Input Firing Rate Available*	300 - 1200 MBH
Firing Mode	On-Off or On/Off with Low Fire Start
Fuel	Natural gas - 0.64 specific gravity LP gas - 1.53 specific gravity
Required Gas Supply Pressure (to gas train)	6" WC minimum (std) 4.5" WC minimum (special)
Input Voltage **	120 Vac + 10% / -15%; 60 Hz
Input Current	5.3 Amp
Gas Train	24V Valves High/Low gas pressure switch
Life Cycle	Gas valves are rated for 100-000 cycles (regarding valve seat leakage).
Application Type	Indoor, Stationary. See notice below for outdoor use.
Burner Control	Programmable Pre-purge
Flame Detection	Flame Rectification
Igniter	Electronic - Direct Spark
Motor	Thermally Protected - Manual Reset
Combustion Air Proving	Differential Pressure Switch
Weight	40 lbs.
Mounting Orientation	Up to 90° from upright with motor shaft horizontal
Dimensions	11.9" x 16.0" x 20.5"
Acceptable Ambient Temperature Range	-4°F to +104°F
Acceptable Ambient Humidity	5% - 95% RH non-condensing

\* For altitudes higher than 2,000 feet, derate the burner capacity 4% for each 1,000 feet above sea level.

\*\* This burner is not approved for use in 50 Hz applications.

**NOTICE**

**FOR OUTDOOR USAGE** it is the responsibility of the OEM equipment manufacturer to protect the burner system and components from exposure to water in the end-use application.

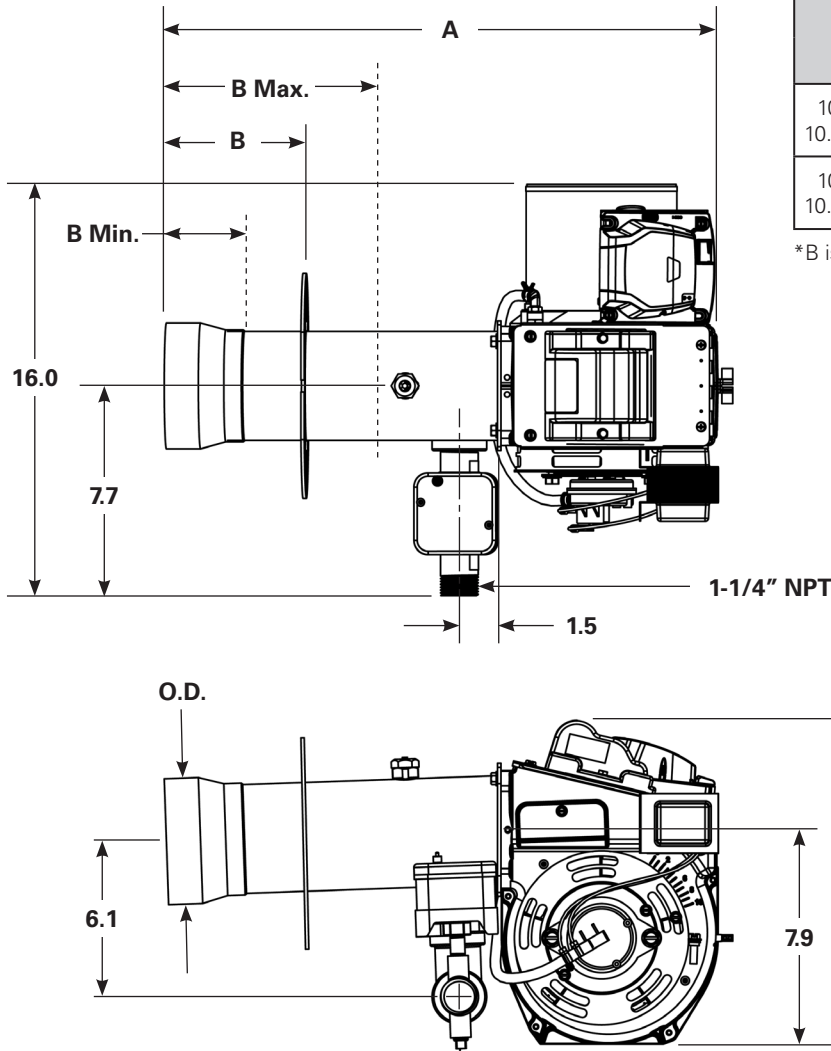
**Table 2 – Available Models**

Model No.	Input Firing Rate (MBH)
CG10.1	300-378
CG10.2	379-476
CG10.3	477-600
CG10.4	601-756
CG10.5	757-952
CG10.6	953-1,200
CG10.1S	300-378
CG10.2S	379-476
CG10.3S	477-600
CG10.4S	601-756
CG10.5S	757-952
CG10.6S	953-1,200

4



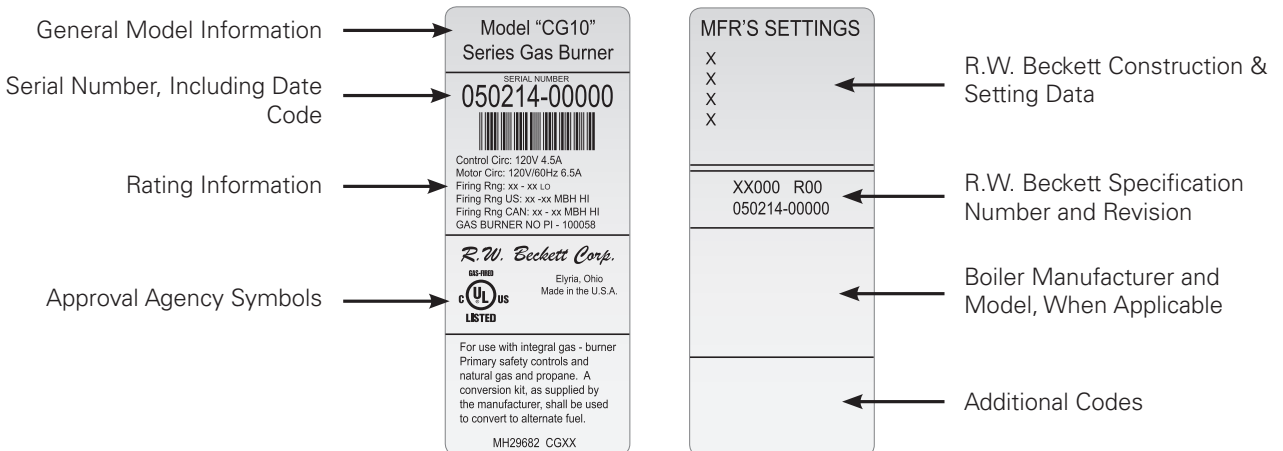
**Figure 1 – Burner Dimensions**



Burner Model	Dim. A	Dim. B*		O.D.
		Min.	Max.	
10.1 - 10.3 10.1S - 10.3S	19.8"	1.88"	7.00"	4.43"
10.4 - 10.6 10.4S - 10.6S	20.6"	3.00"	7.63"	4.61"

\*B is factory set (welded) depending on application.

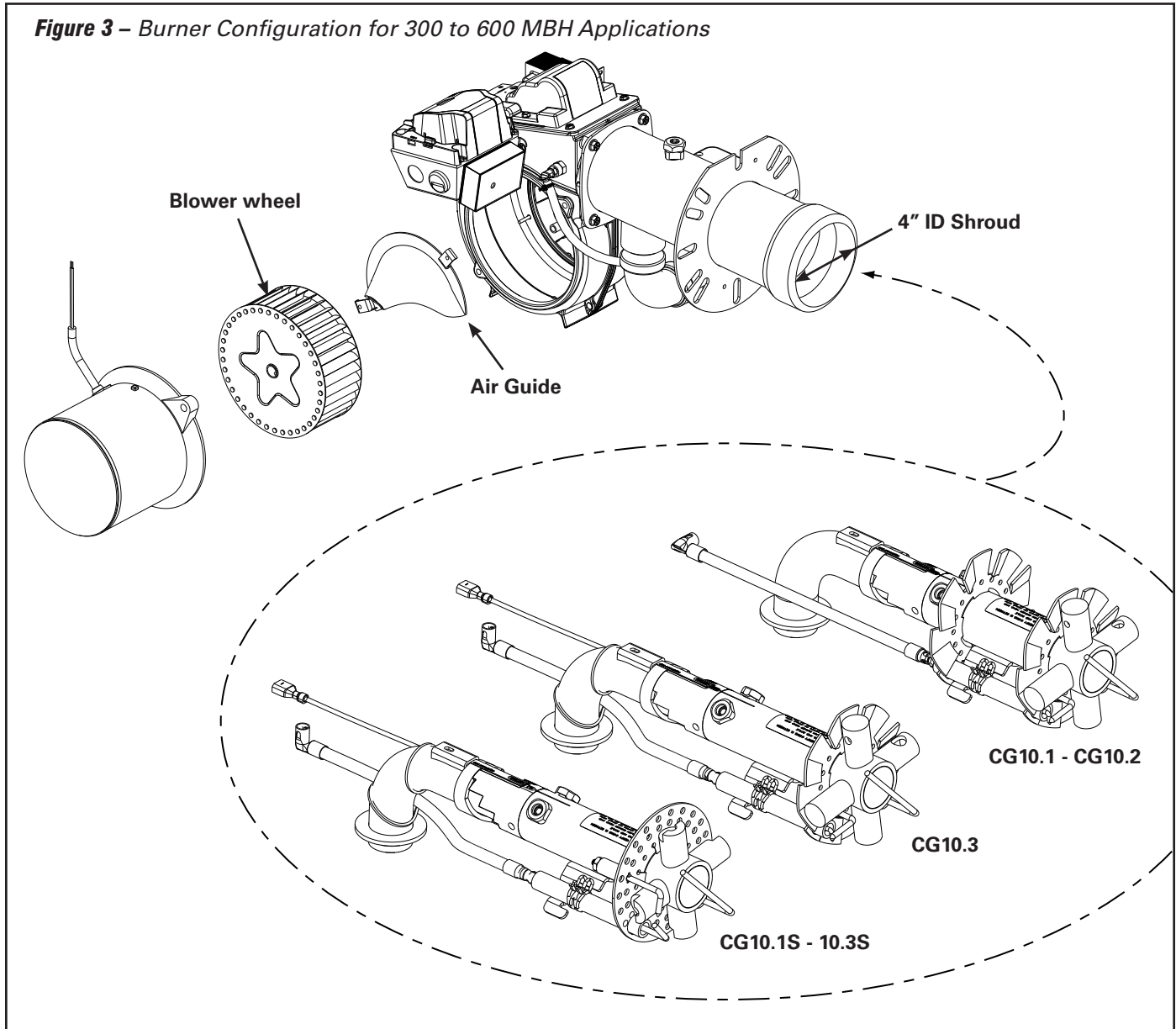
**Figure 2 – Burner Nameplate**



# Burner Configurations

The CG10 burner is offered in configurations that allow it to be customized to the capacity and furnace size needs of many different appliances. Two blower wheel sizes provide airflow capacity through the range. An air guide provides static pressure augmentation at low rates and an inlet sleeve maximizes flow capacity at high rates. Two air tube shrouds shape and stabilize the base of the flame. Two burner head styles are available for each firing range to provide mixing control and retain the flame. See **Table 3** and **Table 4**.

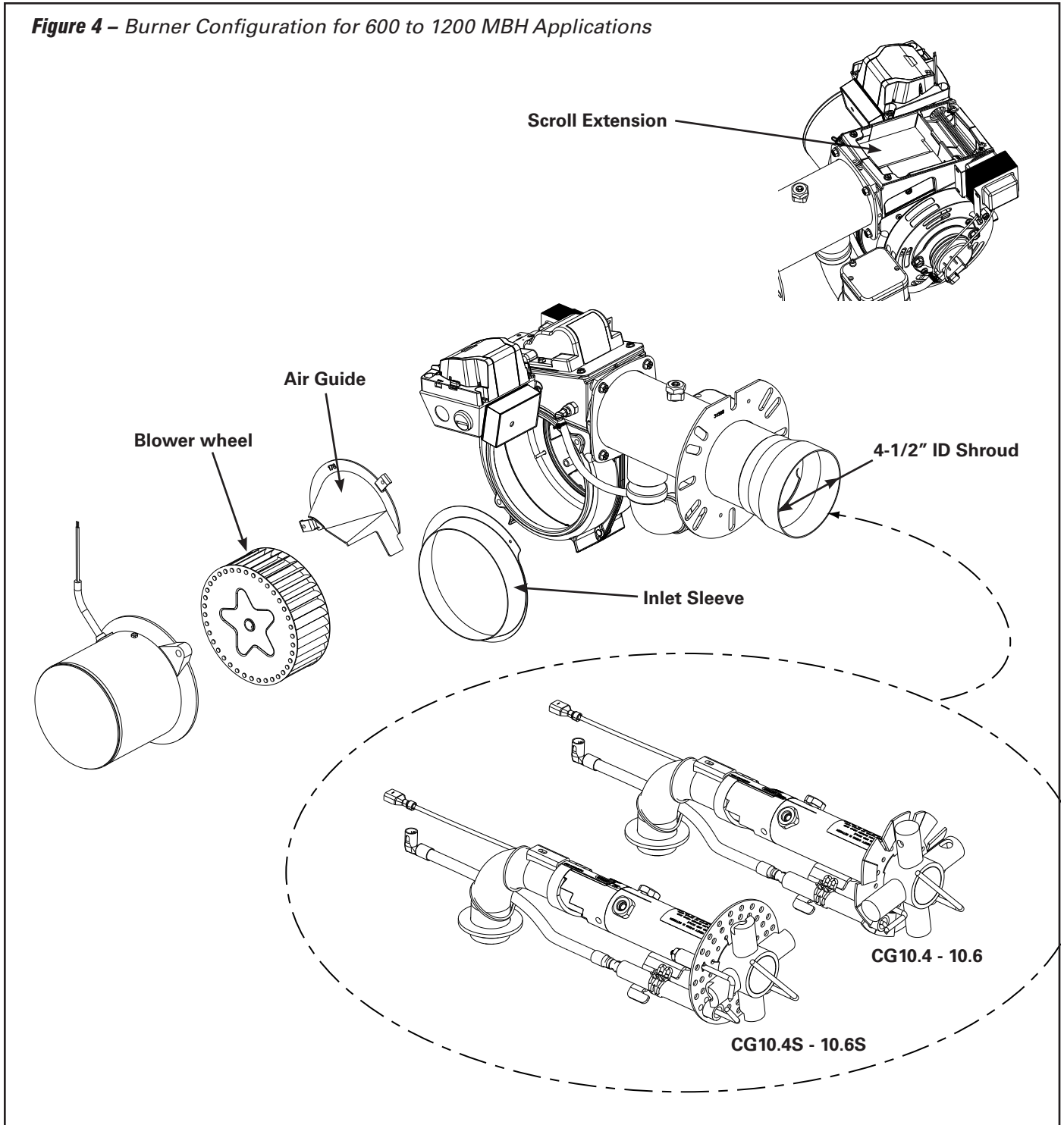
**Figure 3 – Burner Configuration for 300 to 600 MBH Applications**



**Table 3 – Low Rate Burner Configuration**

Chassis	Firing Rate (MBH)	Burner Head	Blower Wheel	Air Inlet	Scroll Extension
CG10	300-378	10.1	5.75" dia. x 2.53" w, Part No. 21448	Air Guide, Part No. 189	None
		10.1S			
	379-476	10.2			
		10.2S			
	477-600	10.3			
		10.3S			

**Figure 4 – Burner Configuration for 600 to 1200 MBH Applications**



**Table 4 – High Rate Burner Configuration**

Chassis	Firing Rate (MBH)	Burner Head	Blower Wheel	Air Inlet	Scroll Extension
CG10B	601-756	10.4	6.31" dia. x 2.42" w, Part No. 21339	Air Guide, Part No. 178	Installed
		10.4S			
	757-952	10.5			
		10.5S			
CG10A	953-1,200	10.6	Inlet Sleeve, Part No. 32336		
		10.6S			

Figure 5 – Gas Gun Assembly - Component Familiarization

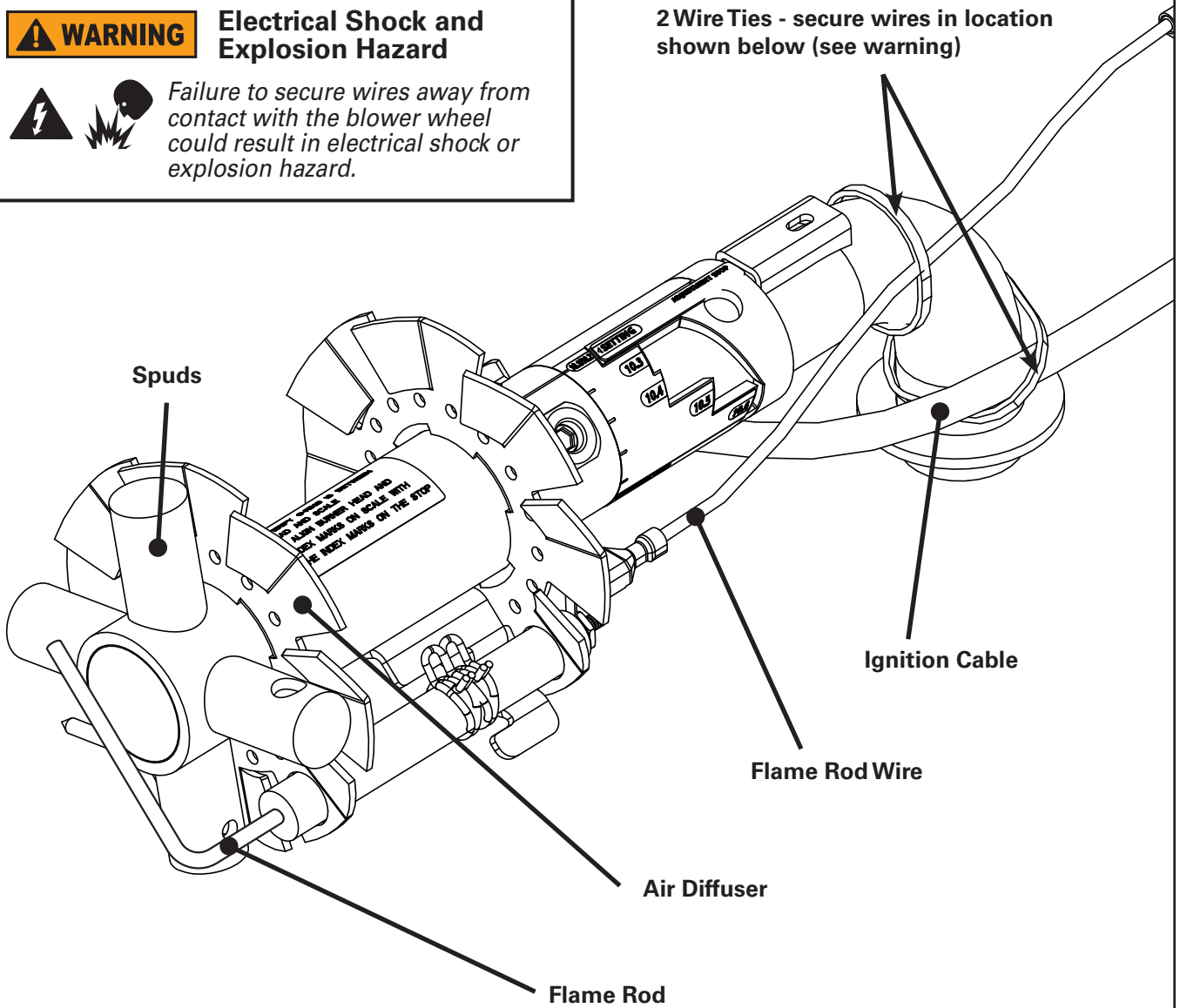
**WARNING**

**Electrical Shock and Explosion Hazard**



Failure to secure wires away from contact with the blower wheel could result in electrical shock or explosion hazard.

2 Wire Ties - secure wires in location shown below (see warning)



# Inspect/Prepare Installation Site

## Indoor Installation

### **WARNING**

#### Explosion, Fire, and Asphyxiation Hazard



*Wet or dusty environments could lead to blocked air passages, corrosion damage to components, impaired combustion performance.*

- This burner is designed for clean, dry installations.
- Electrical controls are not protected against rain or sprayed liquids.
- Keep the installation clear of dust, dirt, corrosive vapors, and moisture.
- Protective covers and frequent maintenance may be required.

### **WARNING**

#### Fire, Smoke and Asphyxiation Hazard



- Carefully inspect the chimney, chimney liner & exhaust vent system.
- Make sure it is properly sized and in good working condition.
- Follow the instructions supplied by the appliance manufacturer.
- If a draft regulator is required, it must be a double-acting type, agency recognized for use with gas vent systems.
- The chimney installation and vent sizing must strictly comply with all applicable codes, authorities having jurisdiction and the latest revision of the National Fuel Gas Code (ANSI Z223.1, or NFPA54) or CAN/CGA B/49 Canada. Remove any vent damper device.
- Regulation by these authorities take precedence over the general instructions provided in this installation manual.

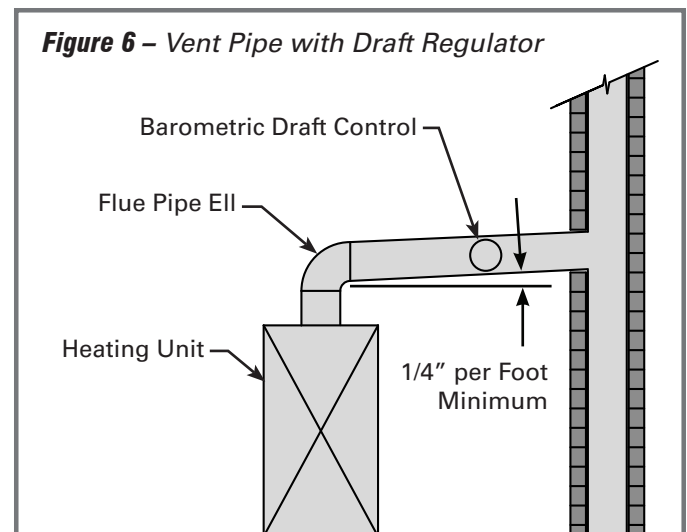
Examine the installation site for conditions that could adversely affect the health and safety of installation personnel and the user of the appliance or proper operation of the burner and appliance, and correct any defects found.

- The area around the appliance should be unobstructed and dry.
- Wiring must be in good condition and meet state & local code requirements.
- If the burner is replacing an existing oil burner, old piping and the tank must be secured or removed to prevent leakage or unintended deliveries of oil.
- Local jurisdictions may require removal of oil tanks. See NFPA-30 flammable and combustible liquids code for approved procedures.

## Inspect Chimney and Vent System

1. Any accumulation of soot or debris in chimney offsets must be removed
2. Any obstructions such as a protruding joint or a piece of broken tile wedged in the chimney must be removed.
3. No other appliance connection should be made to the same flue pipe.
4. The flue pipe must have an upward pitch toward the chimney of at least 1/4" per foot of length. It should fit tightly and should not project into the chimney, see **Figure 6**.

**Figure 6 – Vent Pipe with Draft Regulator**





5. Any leakage between chimney tiles, around clean-out doors, or around the vent pipe should be sealed.
6. A barometric draft control is required, it shall be a double-acting type, agency recognized for use with gas vent systems.
7. The design and sizing of the appliance's vent system shall comply with the requirements of NFPA 54 Chapters 12 and 13.
8. A chimney flue shall extend at least 3 feet above the highest point at which the chimney comes in contact with the roof, and not less than 2 feet above the highest roof surface or structure within 10 feet horizontally of the chimney. Refer to **Figure 7**.

**NOTICE**

Some local codes and gas utilities require the installation of a thermal flue Safety switch on the double-acting draft control, or draft hood.

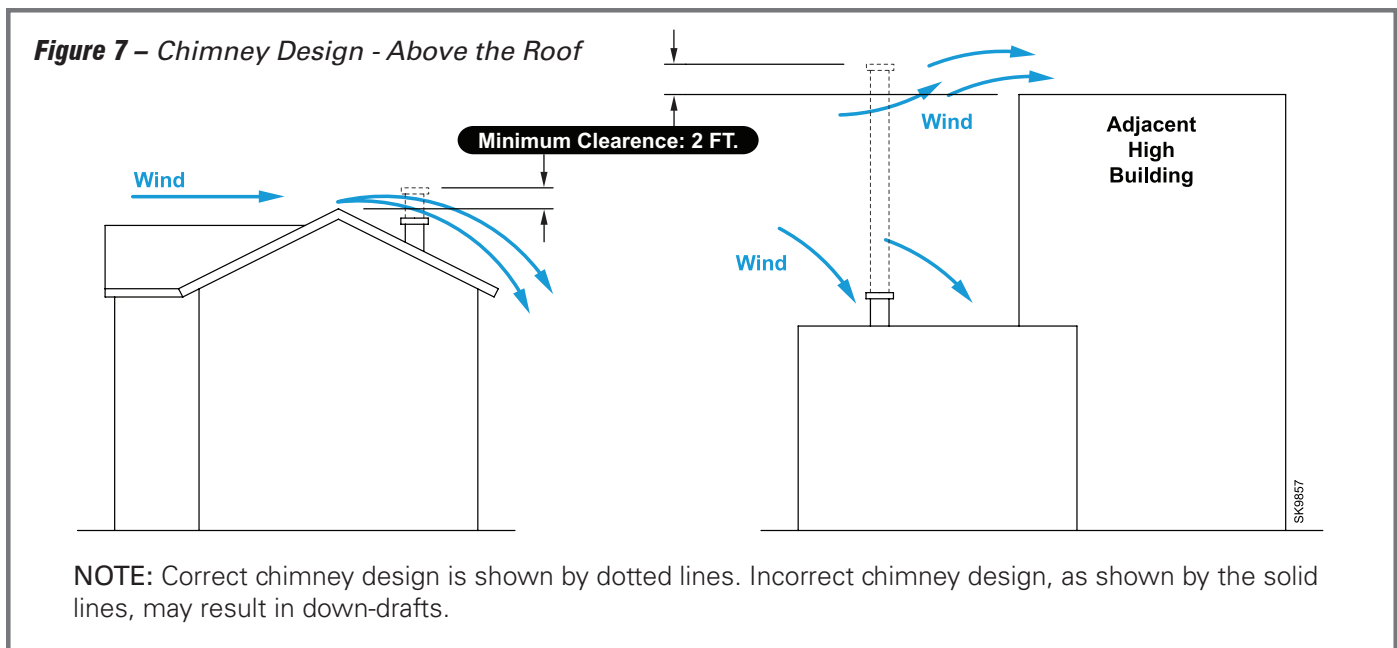
The thermal safety switch senses flue gas spillage caused by blocked flue exhaust, prolonged down-draft, or insufficient draft. The safety is wired in series with the burner control circuit and shuts the burner off, when the spillage of hot flue gases is detected.

Chimney Liners

The new designs of furnaces and boilers are more efficient. One result of increased efficiency is lower flue gas temperatures. As flue gases rise in the chimney, they cool and condense when they reach the dew point. The condensation mixes with sulphur in the flue gases creating sulfuric acid. The acid attacks the chimney mortar, brick and clay liners causing corrosion, deterioration, leaks, or blockage of the chimney. Eventually the blockage could prevent exhausting the flue gases. Instead, the flue gases vent out the barometric damper into the living space.

Therefore it is strongly recommended that an approved insulated stainless steel chimney liner be installed. The installing contractor is solely responsible for installation of the proper vent system.

- o For those installations not requiring a chimney, such as through-the-wall vented appliances, follow the instructions given by the appliance and power venter (if used) manufacturers.



## Combustion Air Supply

### NOTICE

Some local codes and gas utilities require the installation of a CO detector, this is strongly recommended in all applications. Consult with your heating contractor or a home security agency.

### WARNING

#### Carbon Monoxide Hazard

*Do not block combustion air inlet. Failure to provide adequate air supply could seriously affect the burner performance and result in damage to the equipment and emission of poisonous carbon monoxide gas.*

## Buildings with Adequate Air Infiltration

In many cases, a burner operating in an unconfined space of a conventional frame, brick or stone building will receive adequate air supply from leakage in the building itself. But if the burner is located in a confined space such as a furnace or boiler room, that space must have one permanent opening toward the top of the space and one near the bottom of the space.

Each opening must have a free area of not less than one sq. in. per 1,000 BTU per hour of the highest input rating listed for the appliance (refer to NFPA 54 & 58).

Remember to take the total input of all air-using appliances into consideration when figuring the openings. The openings must connect with the inside of the building, which should have adequate infiltration from the outside.

### As an example:

If a gas burner was firing at 350,000 BTU/Hr, in an enclosed room in a building each opening in the enclosure should be 350 sq. in. ( $350,000/1,000 \times 1 \text{ sq. in.} = 350 \text{ sq. in.}$ ) A 350 sq. in. opening would typically be 12"x30" or 19"x19"

## Buildings with Less Than Adequate Air Infiltration

If the burner is located in a tightly constructed building where there is inadequate outside air infiltration, outside combustion air must be supplied by some other means.

One method to accomplish this is through a permanent opening(s) in an exterior wall. The opening, or openings, must have a total free area of not less than one sq. in. per 5,000 BTU per hour. All appliances must be taken into consideration. Refer to NFPA 54 & 58.

## Clearances to Burner and Appliance

- Provide space around burner and appliance for easy service and maintenance.
- Check minimum clearances against those shown by the appliance manufacturer and by applicable building codes.
- The recommended clearance around the burner itself is 12" minimum for service access.

## Fuel Gas Supply

### NOTICE

Gas supply piping must be structurally supported independent of the burner. The burner manifold and gas valve are not designed to support piping loads.

### WARNING

#### Explosion, Fire, and Gas Leak Hazard



*Provide Over-pressure Protection*

The National Fuel Gas Code, ANSI Z223.1 (NFPA 54) and ASME CSD-1 require that if gas pressure entering the building exceeds the rating of any gas train component an overpressure protection device must be installed.

### WARNING

#### Explosion and Fire Hazard

*Never use an open flame for leak testing supply piping or equipment.*

*Never use Oxygen for leak testing or purging of fuel supply piping.*

A typical gas piping layout is shown in **Figure 8** on page 12.

The gas supply system must be sized to deliver at least the minimum required pressure to the gas train inlet.

Contact your local gas utility for verification of gas pressures, allowable pressure drops, and any local piping code requirements.

If using current facility piping already in place, verify the following:

- Piping design meets all applicable codes.
- Piping and components are inspected and in good working condition.
- Piping is sized correctly to supply required gas pressure to the burner and any other gas appliances in the facility.
- Any new branches in the supply piping must be pressure tested as outlined in ANSI Z223.1 / NFPA 54.

For new facility piping, follow the pipe sizing methods and tables for pipe sizing as outlined in ANSI Z223.1 / NFPA 54.

**NOTICE** All gas piping installation must comply with the latest edition of the National Fuel Gas Code ANSI Z223.1 (NFPA 54) and other applicable local codes.

**WARNING** **Explosion, Fire, and Gas Leak Hazard**

- Do not disassemble gas valve.
- Valve must be installed with the gas flow in the same direction as the arrow.

**WARNING** **Explosion, Fire, and Gas Leak Hazard**

*Do not use Teflon tape on gas piping. Damage to gas valve cutoff seals and valve bodies could cause gas leaks.*

- Pieces of tape can be cut loose during installation and lodge in gas valves causing cutoff seal problems.
- Teflon tape ‘lubricates’ pipe threads, allowing iron pipes to penetrate too deeply into aluminum valve bodies causing distortion and leakage.
- Use only pipe sealant compounds that are resistant to the gas being used.

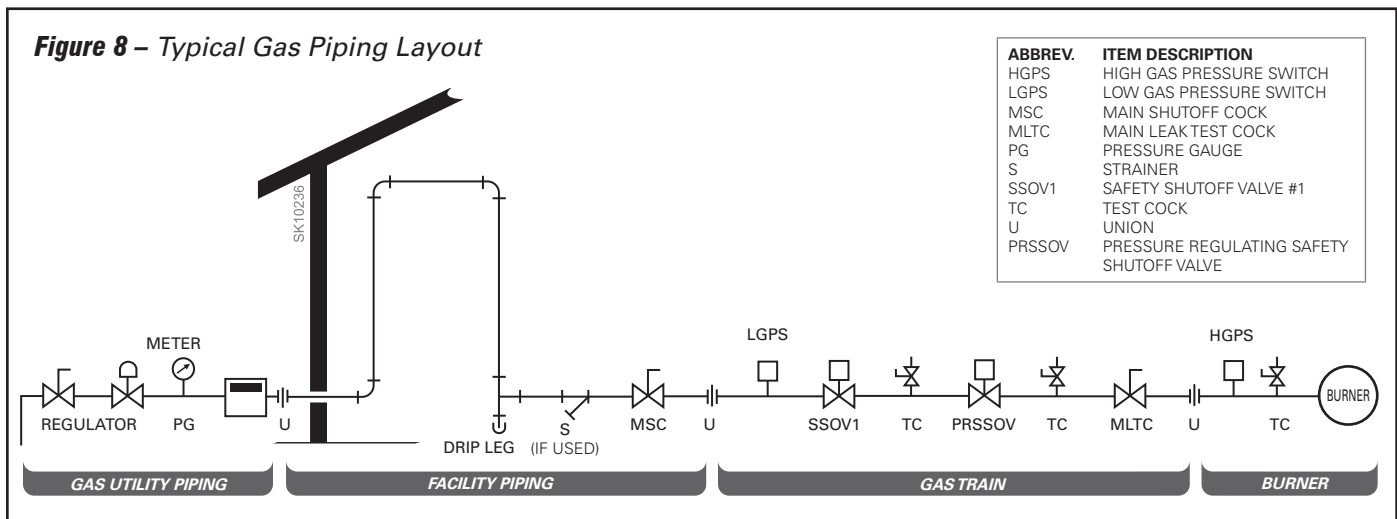
**WARNING** **Explosion, Fire, and Gas Leak Hazard**

*A Drip Leg is required in gas supply piping. Foreign matter could lodge in gas valve cutoff seals, resulting in gas leak-through, explosion or fire.*

Install a full-size drip leg or dirt pocket in the piping directly ahead of the main shutoff valve to capture foreign matter.

New facility piping must be pressure tested in accordance with ANSI Z223.1 / NFPA 54.

A leak test must be performed on supply piping immediately after gas is turned back on. Any leaks must be fixed before continuing with the installation.



**Table 5 – Gas Supply Piping Capacity**

Schedule 40 metallic pipe with 0.50 psi or less inlet pressure and 0.30" W.C. pressure drop								
Maximum capacity in cubic feet of gas per hour (CFH). Natural gas with 0.60 specific gravity. Pipe size (inches) IPS								
Pipe Length (ft.)	0.75"	1.0"	1.25"	1.5"	2.0"	2.5"	3.0"	4.0"
10	278	520	1050	1600	3050	4800	8500	17500
20	190	350	730	1100	2100	3300	5900	12000
30	152	285	590	800	1650	2700	4700	9700
40	130	245	500	760	1450	2300	4100	8300
50	115	215	440	670	1270	2000	3600	7400
60	105	195	400	610	1150	1850	3250	6800
70	96	180	370	560	1050	1700	3000	6200
80	90	170	350	530	990	1600	2800	5800
90	84	160	320	490	930	1500	2600	5400
100	79	150	305	460	870	1400	2500	5100
125	72	130	275	410	780	1250	2200	4500
150	64	120	250	380	710	1130	2000	4100
175	59	110	225	350	650	1050	1850	3800
200	55	100	210	320	610	980	1700	3500

For other inlet pressures and pressure drops, see NFPA 54 for Natural Gas piping or NFPA58 for LP Gas Piping.

## Prepare the Appliance

### **WARNING Breathing Hazard**

#### *Ceramic fiber or Fiberglass insulation*



Ceramic fiber materials, such as chamber liners, may contain carcinogenic particles (crystalline silica) 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 crystalline silica. Actual job requirements for 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 eyes immediately
- Breathing - fresh air

### **WARNING Asbestos Hazard**



*NEVER attempt to retrofit an appliance containing asbestos. Contact a professional to remove the asbestos prior to installation. If unsure call a qualified contractor to verify if asbestos is present.*

### **WARNING Carbon Monoxide Hazard**

Burner mounting gasket must be used to seal against leakage from the appliance. Do not use a damaged mounting gasket. Verify that all boiler sections, canopy, and access plates or doors are fully equipped with gaskets and sealed against any leakage.

## Mount the Burner

The burner specified for packaged equipment will have a flange to match the appliance bolt pattern and welded for the required insertion. Follow the appliance manufacturer's instructions for mounting.

### **CAUTION Carbon Monoxide Hazard**

*Protect the Air Tube from Overheating. Overheating could cause damage to the air tube and other combustion components leading to equipment malfunction and impaired combustion performance.*

- The end of the air tube must not extend into the combustion chamber unprotected unless it has been factory-tested and specified by the appliance manufacturer.
- The end of the air tube should be set back ¼" from flush with the refractory inside wall to prevent damage from overheating.
- Refer to the instructions outlined in this section for methods of additional protection.

### **WARNING Explosion, Fire, and Asphyxiation Hazard.**

*Adjustable flange shall not be used with portable equipment.*

For retrofit applications and to ensure correct installation, verify the following:

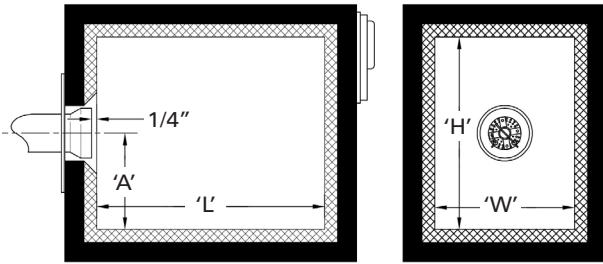
- Verify the end of the burner air tube will be set back 1/4" from the interior surface of the combustion chamber when the burner is mounted to the appliance. See **Figure 9**.
- If this dimension cannot be achieved, protect the end of the air tube by installing a suitable ceramic refractory material such as a refractory mill board capable of withstanding at least 2300°F.
- Verify the burner flame size is suitable for the appliance combustion chamber. See **Figure 9** for minimum combustion chamber dimensions at the stated firing rate ranges.

### **NOTICE**

Dimensions shown are for cast iron sectional boilers with uptakes between sections. For minimum dimensions of other furnace types consult R.W. Beckett Corporation.

- Verify the supplied gasket is in place on the burner air tube flange and then mount the burner to the appliance using appliance or field supplied hardware.



**Figure 9 – Minimum Combustion Chamber Dims.**

Minimum Combustion Chamber Dimensions (inches)				
Input Firing Rate in MBH	Length 'L'	Width 'W'	Height 'H'	Burner Head Centerline to floor 'A'
300-400	18	12	12	6
400-600	22	14	14	7
600-900	26	16	16	8
900-1200	30	18	18	9

## Connect Gas Train Piping

The CG10 gas burner comes supplied with standard gas train components that meet Underwriters Laboratory (UL) and CSD-1 requirements for gas trains. The gas train is normally shipped as components and must be assembled and installed at the site.

The gas train is used for both natural gas and propane; for converting burner, see Propane Conversion instructions on page 17.

Verify that the gas train components are not damaged and all piping and fittings are clean inside and out.

See **Figure 10**, **Figure 11** and **Figure 12** starting on page 16 for typical component layout.

**Vent lines** – Install vent lines to any gas valve component that requires atmospheric air pressure to balance a diaphragm. Vent lines must be run to the outdoors, with the termination point away from fresh air intakes and windows. The terminal opening must be fitted with a wire mesh screen to block insects and other contaminants from entering the vent and must be mounted in such a position that water, ice, dirt, or any other foreign matter cannot infiltrate and block the vent piping. Make sure the final assembly is anchored securely.

### **WARNING**

#### **Explosion, Fire, and Asphyxiation Hazard.**

*Do not use Teflon tape on gas piping. Damage to gas valve cutoff seals and valve bodies could cause gas leaks.*

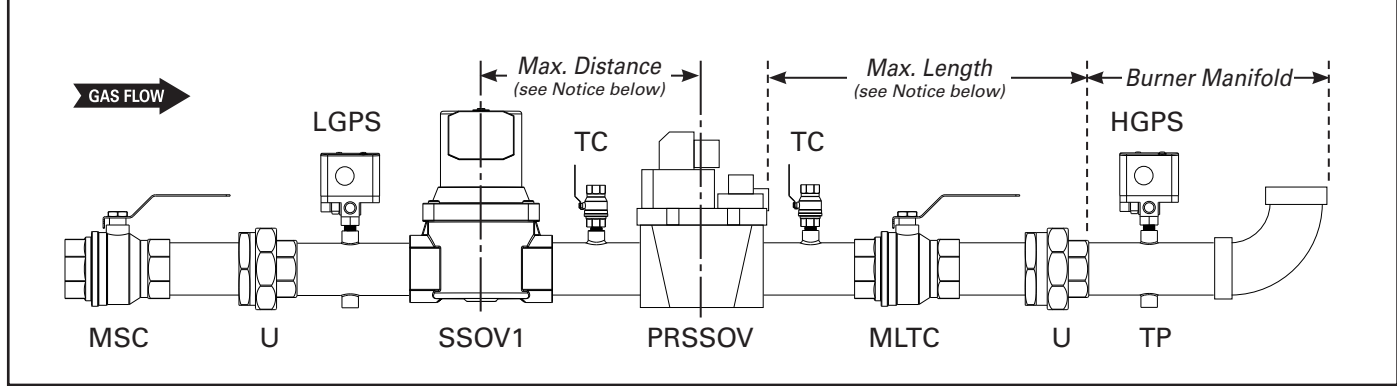
- Pieces of tape can be cut loose during installation and lodge in gas valves causing cutoff seal problems.
- Teflon tape 'lubricates' pipe threads, allowing iron pipes to penetrate too deeply into aluminum valve bodies causing distortion and leakage.
- Use only pipe sealant compounds that are resistant to the gas being used.

### **WARNING**

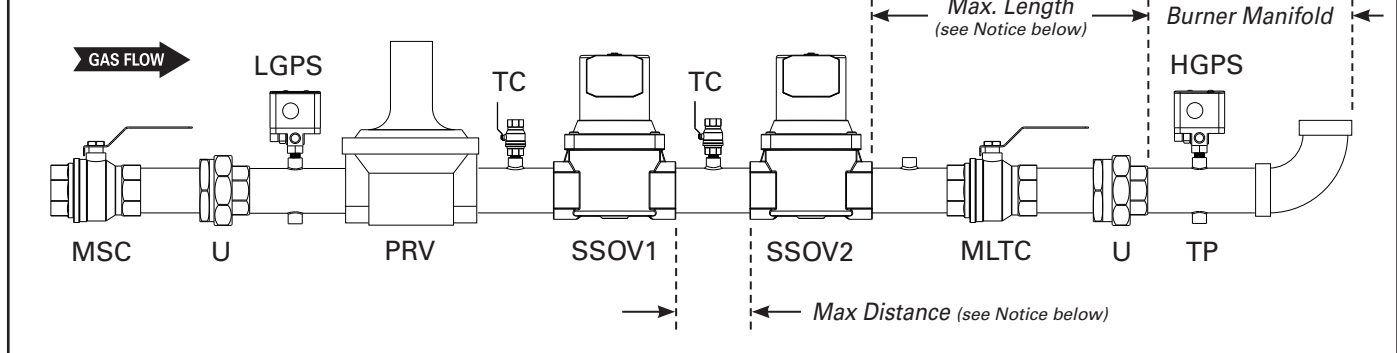
#### **Explosion, Fire, and Asphyxiation Hazard.**

*The orientation of the gas valves may have an effect on operation and safety. Gas valves shall be mounted in accordance with their manufacturer's instructions.*

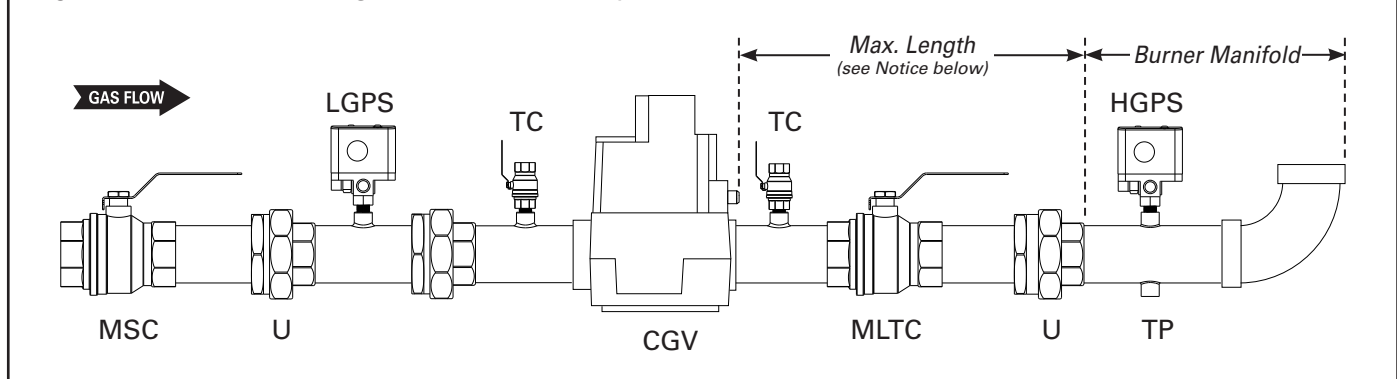
**Figure 10 – Gas train configuration for On/Off with Low Fire Start**



**Figure 11 – Gas train configuration for On/Off operation**



**Figure 12 – Gas train configuration for On/Off operation under 399 MBH**



**NOTICE**

When pressure reducing safety shutoff valves are used, the distance from the final shutoff valve (PRSSOV) to the burner manifold must be kept to a minimum for good light-off reliability. R.W. Beckett recommends the following maximum lengths. When two shut-off valves are used, the distance between valves should not exceed the max. length specified below:

Pipe Size	Max. Length
3/4"	12"
1"	12"
1-1/4"	15"
1-1/2"	18"
2"	24"

If a Normally Open Vent Valve (not shown) is used, the distance between the SSOVs must be kept to a minimum using the shortest practical nipples.

**Key (Figure 10 thru Figure 12)**

Abbrev.	Item Description
CGV	Combination Gas Valve
HGPS	High Gas Pressure Switch
LGPS	Low Gas Pressure Switch
MSC	Main Shutoff Cock
MLTC	Main Leak Test Cock
PRSSOV	Pressure Regulating Safety Shutoff Valve
PRV	Regulator
SSOV1	Safety Shutoff Valve #1
SSOV2	Safety Shutoff Valve #2
TC	Test Cock
TP	Test Port
U	Union

# Propane Conversion



## WARNING Explosion, Fire, and Asphyxiation Hazard



This conversion kit shall be installed by a qualified service agency in accordance with the manufacturer's instructions and all applicable codes and requirements of the authority having jurisdiction. (In Canada, in accordance with the requirements of the CAN/CGA-B149 Installation Code.) If the information in these instructions is not followed exactly, a fire, explosion, or production of carbon monoxide may result causing property damage, personal injury or loss of life. The qualified service agency is responsible for the proper installation of this kit. The installation is not proper and complete until the operation of the converted appliance is checked, as specified in the manufacturer's instructions supplied with the kit.

The Beckett Propane Restrictor Conversion Kit allows for the conversion of CG10 burners for use with propane gas. With the proper installation of the restrictor and attached O-ring, initial adjustments and settings for propane will be the same as the initial adjustments and settings for natural gas.

Propane (LP) – When the correct propane restrictor is added to a burner's gas pipe assembly it changes the burner's gas pressure drop so that the propane pressure drop is equal to the natural gas pressure drop of the same BTU firing rate. That is why the Manifold to Furnace Pressure Drop curves of **Figure 19** and **Figure 20** on page 26 are correct for both propane and natural gas. That is also why the initial burner settings, **Table 8** on page 25, are appropriate for natural gas; or propane with the correct orifice. R. W. Beckett provides the same pressure regulating safety shutoff valve in the gas train for both natural gas and propane. The valve is marked for natural gas due to its primary usage in a pressure range normally used by natural gas appliances. It is safe and effective for propane usage in this design application.

## Propane Restrictor Installation

Note that Steps 1 and 2 on the following page refer to fully assembled burners. Skip to Step 3 when converting a burner without the air tube assembly installed.

Refer to **Figure 13** and **Figure 14** on page 18 when performing the following steps.

1. Remove the jacking screw (B) from the air tube/manifold assembly to free the internal gas tube (C).

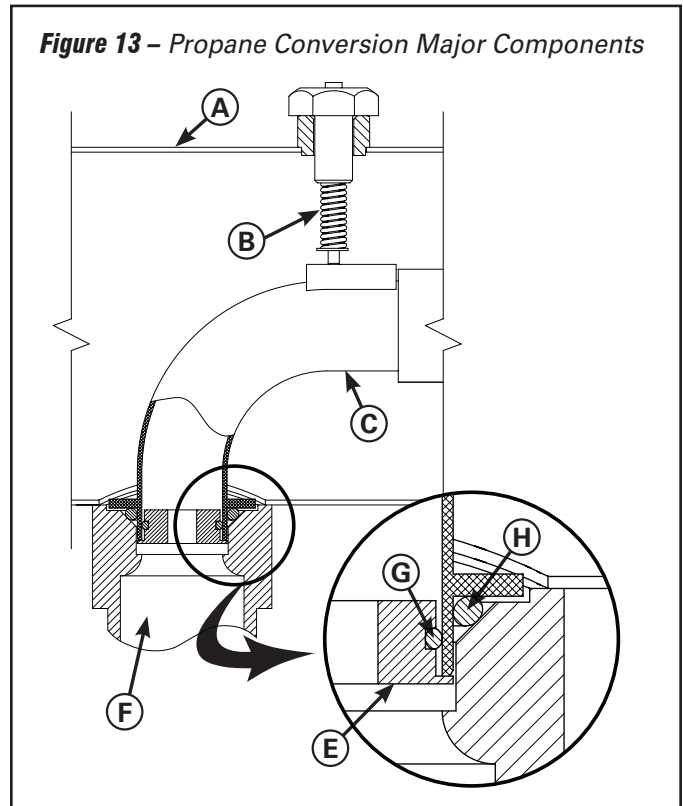
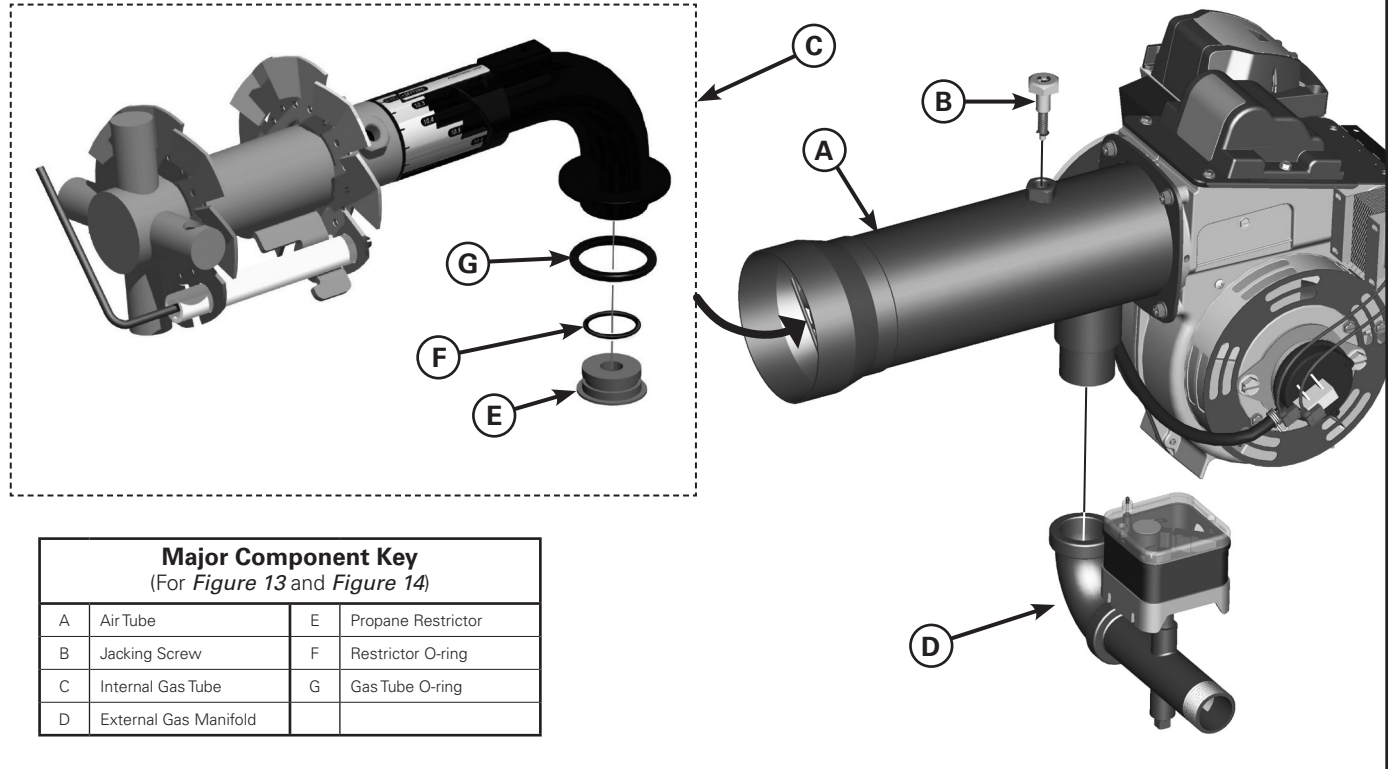


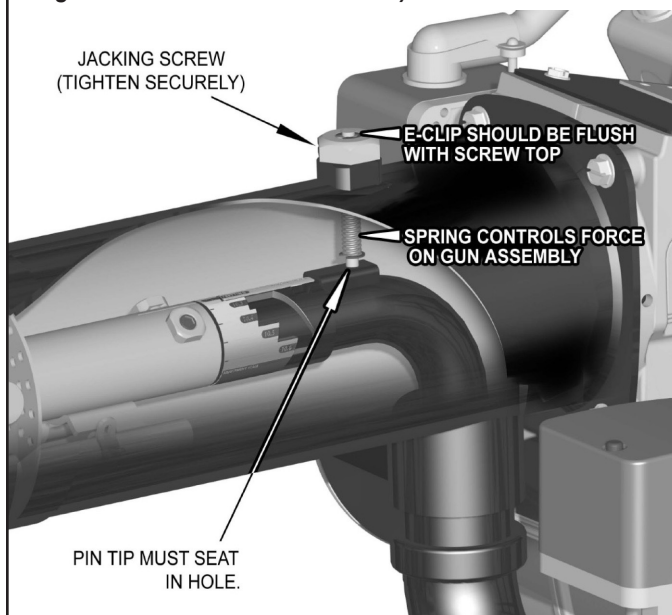
Figure 13 – Propane Conversion Major Components

2. Gently rock the internal gas tube (C) to loosen the tube from the union (F).
3. Inspect the O-rings and insure that they are properly lubricated. (A silicon O-ring lubricant is recommended, but automotive chassis or bearing grease is an acceptable substitute.)
4. Referring to **Figure 13**, place the restrictor (E) with pre-attached, pre-lubricated O-ring (G) into the internal gas tube (C). Use your hand to press the restrictor into the tube. The O-ring will hold the restrictor in place.
5. Insure that the O-ring (H), attached to the outside diameter of internal gas tube, is properly lubricated and seated against the flange on the internal gas tube.
6. Install the internal gas tube (C) back into the air tube (A) housing, refer to **Figure 14**. Fit the end of the tube into the union (F) on the air tube.
7. Re-install the jacking screw (B). (Refer to the above notice for installation details.)
8. Fill out and place the supplied Conversion Data Plate (Part No. 61712) adjacent to the rating plate.
9. Complete and attach the supplied Adjustment Data Tag (Part No. 61711).

**Figure 14 – Component Locations**



**Figure 15 – Gas Gun Assembly Installation**



**Table 6 – Propane Restrictors Replacement Part Nos.**

Burner Model	Restrictor Kit	Restrictor Inside Diameter	O-Ring Part Number
CG10.1	3246700U	0.401	3226409U
CG10.2	3246701U	0.432	3226409U
CG10.3, CG10.2S	3246702U	0.470	3226409U
CG10.1S	3246703U	0.418	3226409U
CG10.3S, CG10.6S	3246705U	0.510	3226409U
CG10.4S	3246706U	0.459	3226409U
CG10.5S	3246707U	0.482	3226409U
CG10.4	3246723U	0.547	3226409U
CG10.5	3246724U	0.578	3226409U
CG10.6	3246725U	0.594	3226409U

**NOTICE**

Use authorized replacement parts only. Restrictors are precision-machined parts and O-rings are rated for fuel contact. Do not attempt to replicate or modify any parts. Refer to **Table 6**.

**NOTICE**

The gun assembly is secured inside the air tube by a spring-loaded jacking screw. It is spring loaded in order to control the force it can impose on the gun assembly. When installing the jacking screw look inside the air tube to verify that the pointed tip of the jacking screw pin is seated into the small slot on the locating pad on top of the gun. There is also an external verification of correct assembly: when the screw is fully tightened, the e-clip on the top of the center pin should come flush with the top of the screw. Refer to **Figure 15**.

**NOTICE**

With the gas restrictor installed, as shown in **Figure 13**, all burner initial settings (or adjustments and gas manifold pressure) for propane will be the same as the natural gas initial settings shown in the burner manual, or printed on the "Mfr's Settings" label on the burner housing. For a copy of the current burner manual go to [www.beckettcorp.com/product/cg10-gas-burner](http://www.beckettcorp.com/product/cg10-gas-burner). If further technical assistance is required, call 800-645-2876, Monday thru Friday, 8AM to 5PM EST.

## Wire the Burner

Install the burner and all wiring in accordance with the National Electric Code ANSI/NFPA 70 (Canada CSA C22.1) and all applicable codes and requirements. High and Low gas pressure switches must be installed and wired in accordance with manufacturer's instructions. Wire the burner in compliance with all instructions and diagrams provided by the appliance manufacturer. Verify operation of all controls in accordance with the appliance manufacturer's guidelines.

See **Figure 17** and **Figure 18** for typical wiring diagrams for the CG10-24.

**NOTICE**

Maximum fuse size for the 120 Vac 60 Hz electrical power supply to the burner is 20 Amps.

**WARNING**

### Explosion, Fire, Scald, and Asphyxiation Hazard



*All heating appliances must have HIGH LIMIT protection to interrupt electrical power and shutdown the burner if operating or safety controls fail and cause a runaway condition.*

- Follow the appliance manufacturer's wiring diagrams and note all required safety controls.
- Typical safety controls include high temperature or pressure limits, low water cutoffs, pressure relief valves and blocked flue sensing switches.
- Do not tamper with, or bypass, safety controls. Verify all limit and safety controls are installed and functioning correctly, as specified by the manufacturer, applicable safety standards, codes and all authorities having jurisdiction.
- If a safety control is not functioning properly, shut off all main electrical power and gas supply to the burner and call a qualified service agency immediately.

**CAUTION**

### Keep Service Access Covers Securely Installed


*All covers must be securely in place to prevent electrical shock, protect against injury from moving parts and prevent damage from external elements.*

All covers or service access plates must be in place at all times except during maintenance and service.

This applies to all controls, panels, enclosures, switches, and guards or any component with a cover as part of its design.




**WARNING Electrical Shock Hazard**

 *Electrical shock can cause severe personal injury or death.*


- Line voltage neutral shall not be used as a substitute for ground.
- Disconnect electrical power before installing or servicing the burner.
- Provide ground wiring to the burner, metal control enclosures and accessories. A good ground is required to maintain a good flame sensing.
- Use a ground fault interrupt if grounding of the burner can be compromised.

**WARNING Fire or Explosion Hazard**

 *Can cause severe injury, death, or property damage.*

- The control can malfunction if it gets wet, leading to accumulation of gas.
- Never install where water can flood, drip or condense on the control.
- Never use a control that has been wet - replace it.

**WARNING Explosion, Fire and Asphyxiation Hazard**

 *Do not tamper with, or bypass, safety controls. If a safety control is not functioning properly, shut off all main electrical power and gas supply to the burner and call a qualified service agency immediately.*

**NOTICE Electromagnetic Interference**

Operation of this burner in a residential area may cause interference, in which case the user will be required to correct the interference.

Figure 16 – 7590 Control

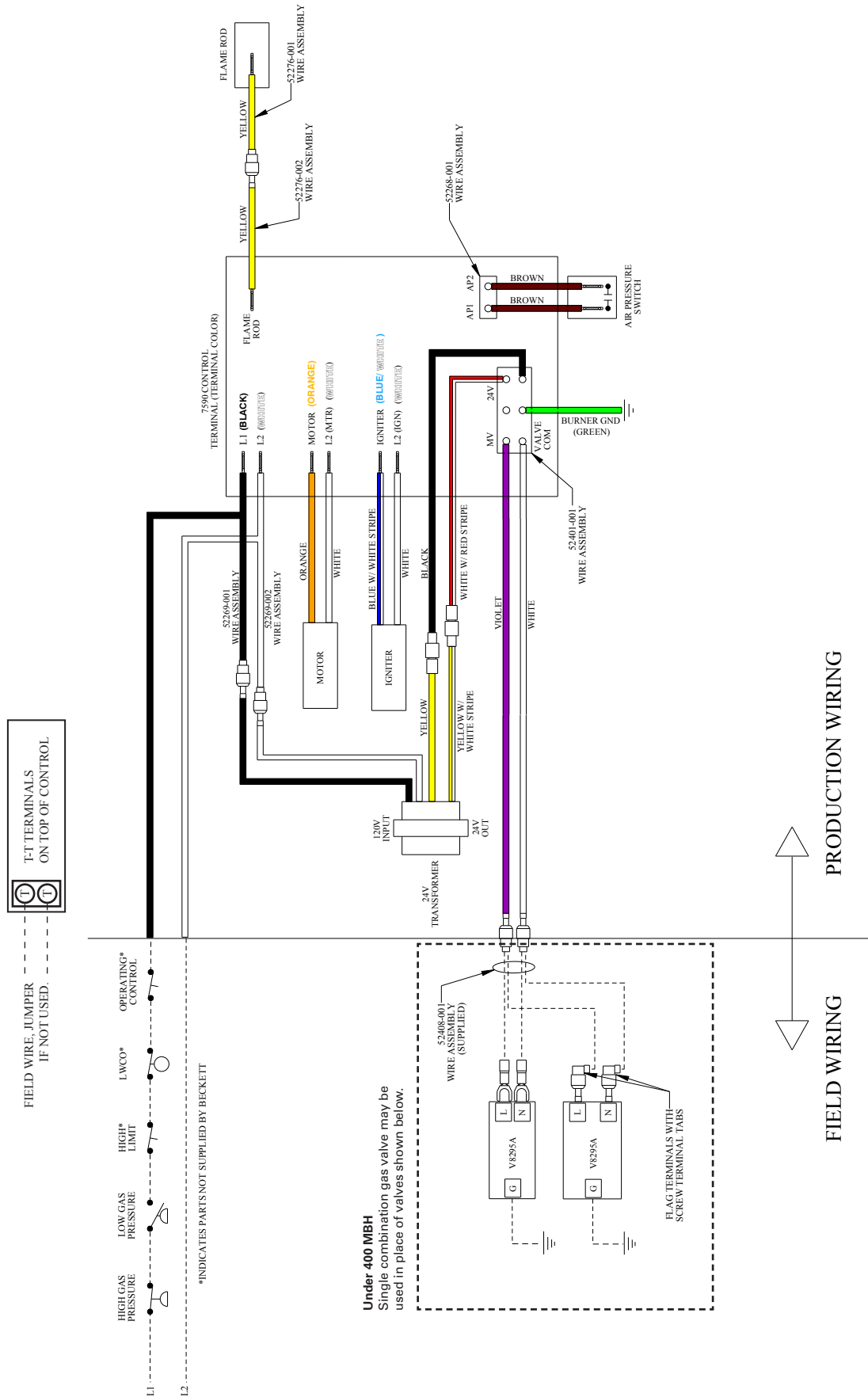


**Optional Component:**

**Alarm Module:**  
For adding isolated low voltage alarm contacts to the base control. See Alarm Module Instructions for specifications.

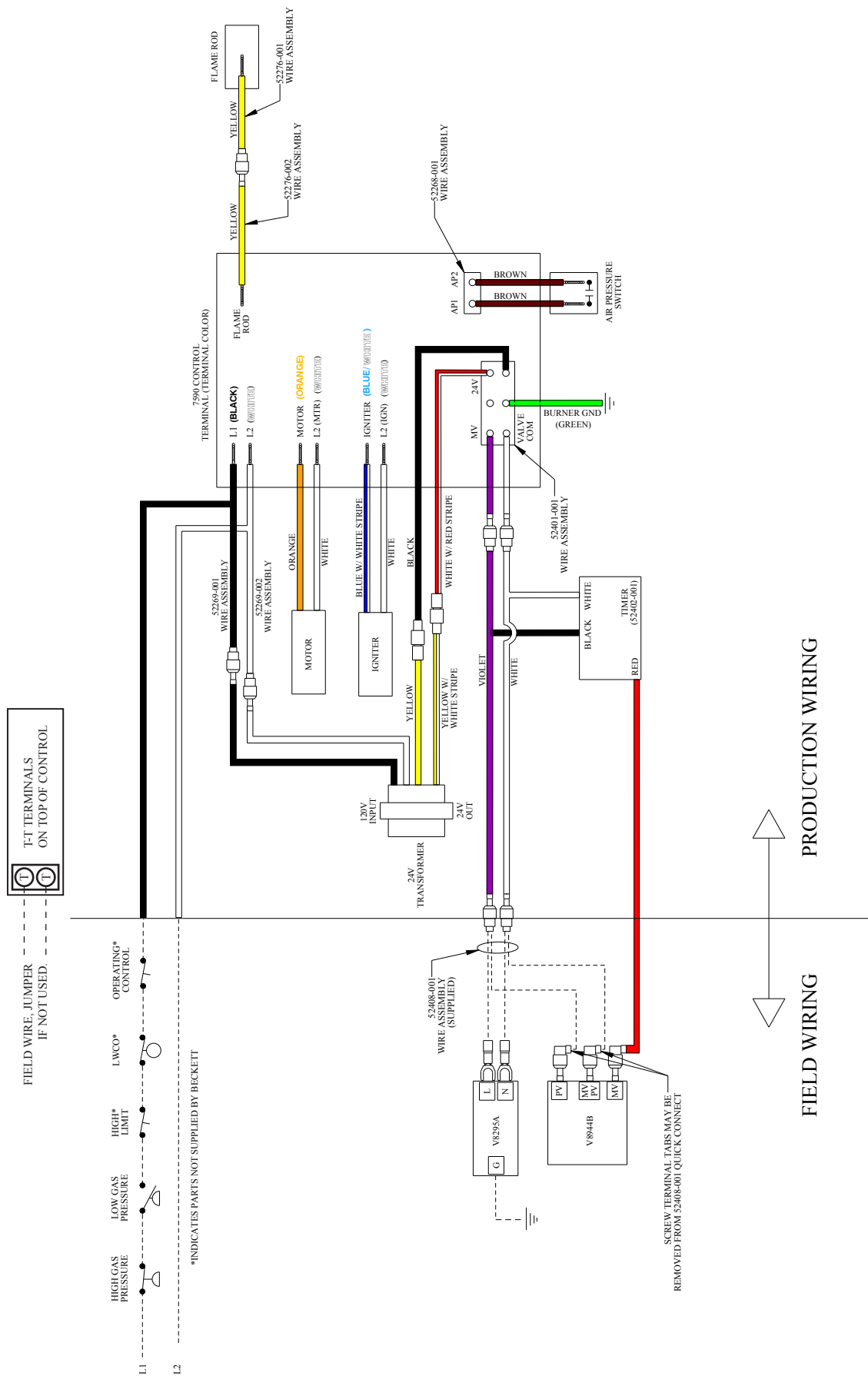


Figure 17 – Typical Wiring Schematic, On/Off Operation



- Notes:**
- o L1 power shall be run through the limits for high gas, low gas, LWCO, high limit, and operating control.
  - o Solid lines (——) = factor wiring
  - o Dashed lines (----) = field wiring

Figure 18 – Typical Wiring Schematic, On/Off Operation with timer



- Notes:**
- L1 power shall be run through the limits for high gas, low gas, LWCO, high limit, and operating control.
  - Solid lines (——) = factor wiring
  - Dashed lines (----) = field wiring

# Sequence of Operation

**NOTICE** This operation sequence is typical for operation with a 7590 control. This is the only control approved for use on the CG10-24.

Do not start the burner yet.

(Reference **Table 7**)

- Call for heat, Status LED is turned on.
  - Control performs safe-start check
  - If safe-start fails, control locks out.
  - If safe-start passes, control checks for presence of flame.
  - If flame is present, control will enter hold state until flame is no longer present. Flame LED and Status LED will flash until flame is no longer present.
  - If flame is not present, control will check status of air proving switch. If switch is closed, (indicating the pressure switch is stuck) control will enter lockout.
  
- If the air proving switch is open, the motor will start. Once the air proving switch closes, pre-purge will begin (lasting typically 60 seconds). Pre-purge or ignition timings will not start until the air proving switch closes.
  - The air proving switch must close to prove combustion air is present. If switch fails to close during the specified period, the control will enter lockout.

- When pre-purge is completed, the control turns on the igniter and the gas valve. MV LED will turn on.
  - Spark continues until end of ignition timing or until flame is proved.
  
- Once flame is proved, The Flame LED is turned on and the spark is turned off. The gas valve and MV LED remain energized.
  - If flame is not proved, the control will lockout or enter the inter-trial waiting period. Status LED will flash rapidly for lockout or slowly for inter-trial waiting.
  - If multiple trial logic is used, the control will complete the trials for ignition
  - When flame is proved the control will continue in run mode until the end of the call for heat.
  
- When the call for heat is ended, the gas valve, MV LED, Flame LED, Status LED and motor turn off.

Additional information on control operation is available in the GeniSys 7590 Control Manual (61981-001).

**NOTICE** For Low Fire Start the operation sequence is the same for the 7590C control, the difference is the timer wired into the valve circuit will enable Low Fire Start.

**Table 7 – Operating Sequence**

	<b>SEQUENCE</b>					
	<b>Call for Heat</b>	<b>Motor Start</b>	<b>Pre-purge</b>	<b>Ignition</b>	<b>Run</b>	<b>End Call for Heat</b>
LEDs	 Status LED turns on	 Status LED ON	 Status LED Flashes	 Status, MV LEDs On	 Status, MV, Flame LEDs On	 LEDs Off
Timers & Timings			Pre-purge Timer 1 - 240 Seconds	Ignition Trial Timer 4 - 15 Seconds		
Flame Check	On	On	On	On	On	
Motor/Blower		Blower Starts	On	On	On	Off
Air Switch Check	On	Air Switch Closes	On	On	On	
Igniter				On	Off	Off
Gas Valve				On	On	Off

## Burner Start-up

**⚠ WARNING** **Explosion, Fire, and Asphyxiation Hazard**

*Professional Installation & Service Required. Incorrect installation and set up could lead to equipment malfunction.*

**⚠ WARNING** **Asphyxiation Hazard**

*It is recommended that you measure the oxygen (O<sub>2</sub>) early in the test sequence because high levels of carbon monoxide (CO) can be created at very low or very high O<sub>2</sub> levels. The typical operating range is between 3%-5% O<sub>2</sub>.*

This burner must be installed and prepared for start-up by a qualified service technician who is trained and experienced in gas burner system installation and operation.

Do not attempt to start the burner unless you are fully qualified.

Do not continue with this procedure without the proper test instruments.

Carefully follow the wiring diagrams, control instruction sheets, control sequence of operation, test procedures and all appliance manufacturer's directions that pertain to this installation.

### Test Instruments

The following calibrated test equipment is required to properly install the appliance. They should be calibrated and in good working order.

- A combustion analyzer capable of measuring oxygen (or carbon dioxide), carbon monoxide, stack temperature, ambient temperature, and appliance efficiency.
- Electrical multi-meter capable of measuring voltage, ohms, amps, and DC micro-amps for measuring the flame signal.
- Calibrated manometers and pressure gauges capable of measuring all pressure ranges in the gas supply and appliance draft. This could typically range from a few PSI to 0.1" W.C.

### Burner Start Procedure

**(Before proceeding, turn off and lock out electrical power and close the main shut off cock to shut off gas to the burner.)**

1. With the power and main gas supply to the burner turned off, make sure gas has not accumulated in the boiler or flues.

2. Check the initial air settings (shutter & band) for input firing rate. See **Table 8** on page 25 for initial air settings.
3. With the main shutoff cock closed. Set the limit or controller to call for heat then apply power to start the burner.
4. **Verify Burner Safety Control Function** – In order to check the function of each component (i.e.: 7590 sequence, airflow proving switch, ignition transformer, gas valves, safety lockout timing, etc.), with the main shutoff cock closed, monitor a complete burner run sequence. Note that the 7590C control will enter a 5 minute waiting time after failing the trial for ignition since the fuel supply has been closed off. Reset the control by pressing and holding the reset button while the control is powered.
5. **Verify Flame Sensor Function** – If 7590 operation sequence and function is correct, turn off power and remove sensor wire from bottom of 7590 control. Turn on power and fuel and initiate Call for Heat. Verify that burner fires up and the gas valve closes. After control locks out, flame shall go off.
6. Turn power off and reattach sensor wire. Turn power back on and reset the control using reset button. Initiate Call for Heat.
7. After you have observed main flame for a brief time, press the reset button on the control for 1 second to shut down and re-start the burner. Monitor the flame and safety shutoff valves to assure that shutdown is controlled by the valves and that they operate properly. With this test passed, you may safely initiate automatic start-ups on subsequent cycles.
8. While the burner is firing, examine the vent system for evidence of leaks, obstructions, and for correct function of the barometric draft control. Leak test all gas piping from the burner to the utility supply piping. If leaks are found, correct them immediately.
9. **Low gas pressure switch** – With the burner firing and a manometer attached to a test port near the low pressure switch, gradually close the main leak test cock to shut off the gas supply. Note the pressure at which the low gas pressure switch opens and shuts the burner off. Manually reset the switch. The low gas pressure switch should be set at half of the normal supply pressure in the line.
10. **High gas pressure switch** – With the burner firing and a manometer attached to the test port nearest the high pressure switch, gradually increase the gas pressure until the high pressure switch opens and shuts the burner off. Note the pressure and manually reset the switch. The high gas pressure switch should be set at one and one half times the high fire manifold pressure (see nameplate data in **Figure 1** or set switch as determined by testing).



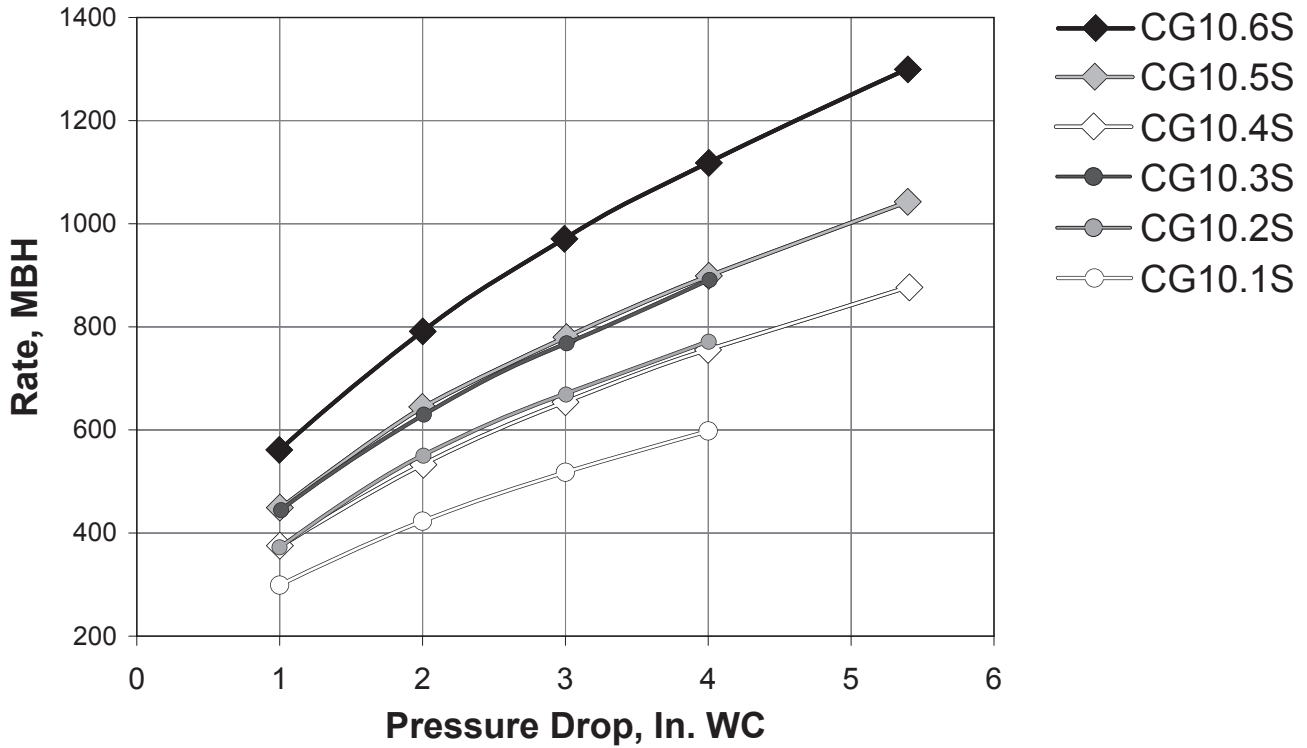
**Table 8 – Initial Burner Settings**

Furnace Pressure		0" W. C.				.25" W. C.				.50" W. C.				1.00" W. C.			
Firing Rate MBH	Burner Model	Running Manifold Gas Pressure, In. WC	Low Fire Start Gas Pressure, In. WC	Shutter Setting	Band Setting	Running Manifold Gas Pressure, In. WC	Low Fire Start Gas Pressure, In. WC	Shutter Setting	Band Setting	Running Manifold Gas Pressure, In. WC	Low Fire Start Gas Pressure, In. WC	Shutter Setting	Band Setting	Running Manifold Gas Pressure, In. WC	Low Fire Start Gas Pressure, In. WC	Shutter Setting	Band Setting
<b>Stepped Spud Head Configuration</b>																	
300	CG10.1S	1.0	0.5	3	0	1.3	0.6	3	0	1.5	0.8	4	0	2.0	1.0	6	0
350	CG10.1S	1.4	0.7	4	0	1.6	0.8	4	0	1.9	0.9	5	0	2.4	1.2	7	0
400	CG10.2S	1.1	0.5	4	0	1.3	0.7	4	0	1.6	0.8	5	0	2.1	1.0	6	0
450	CG10.2S	1.4	0.7	5	0	1.7	0.8	6	0	1.9	1.0	7	0	2.4	1.2	9	0
500	CG10.3S	1.2	0.6	6	0	1.5	0.7	7	0	1.7	0.9	8	0	2.2	1.1	10	1
550	CG10.3S	1.3	0.7	8	0	1.6	0.8	9	0	1.8	0.9	10	0	2.3	1.2	-	-
600	CG10.4S	2.5	1.3	5	0	2.8	1.4	6	0	3.0	1.5	7	0	3.5	1.8	9	0
700	CG10.4S	3.4	1.7	7	0	3.6	1.8	9	0	3.9	1.9	10	0	4.4	2.2	10	3
800	CG10.5S	3.1	1.6	10	0	3.4	1.7	10	1	3.6	1.8	10	1	4.1	2.1	10	3
900	CG10.5S	4.0	2.0	10	3	4.2	2.1	10	4	4.5	2.2	10	4	5.0	2.5	10	6
1000	CG10.6S	3.2	1.6	10	0	3.4	1.7	10	2	3.7	1.8	10	3	4.2	2.1	10	6
1100	CG10.6S	3.9	1.9	10	2	4.1	2.1	10	4	4.4	2.2	10	5	4.9	2.4	10	10
1200	CG10.6S	4.6	2.3	10	6	4.9	2.4	10	8	5.1	2.6	10	10	-	-	-	-
<b>Spinner Head Configuration</b>																	
300	CG10.1	1.5	0.8	3	0	1.8	0.9	3	0	2.0	1.0	4	0	2.5	1.3	5	0
350	CG10.1	2.0	1.0	5	0	2.3	1.1	6	0	2.5	1.3	8	0	3.0	1.5	10	1
400	CG10.2	1.6	0.8	4	0	1.8	0.9	4	0	2.1	1.0	5	0	2.6	1.3	6	0
450	CG10.2	2.0	1.0	4	0	2.2	1.1	4	0	2.5	1.2	5	0	3.0	1.5	8	0
500	CG10.3	1.5	0.8	5	0	1.8	0.9	5	0	2.0	1.0	6	0	2.5	1.3	8	0
550	CG10.3	1.9	0.9	7	0	2.1	1.1	8	0	2.4	1.2	9	0	2.9	1.4	10	1
600	CG10.4	1.1	0.6	6	0	1.4	0.7	7	0	1.6	0.8	8	0	2.1	1.1	10	0
700	CG10.4	1.5	0.8	9	0	1.8	0.9	10	0	2.0	1.0	10	1	2.5	1.3	10	4
800	CG10.5	1.5	0.7	9	0	1.7	0.9	10	1	2.0	1.0	10	3	2.5	1.2	10	6
900	CG10.5	1.9	0.9	10	1	2.1	1.1	10	3	2.4	1.2	10	4	2.9	1.4	10	9
1000	CG10.6	1.8	0.9	10	2	2.1	1.0	10	4	2.3	1.2	10	5	2.8	1.4	10	9
1100	CG10.6	2.2	1.1	10	4	2.5	1.2	10	6	2.7	1.4	10	7	-	-	-	-
1200	CG10.6	2.7	1.3	10	6	2.9	1.5	10	8	3.2	1.6	10	10	-	-	-	-

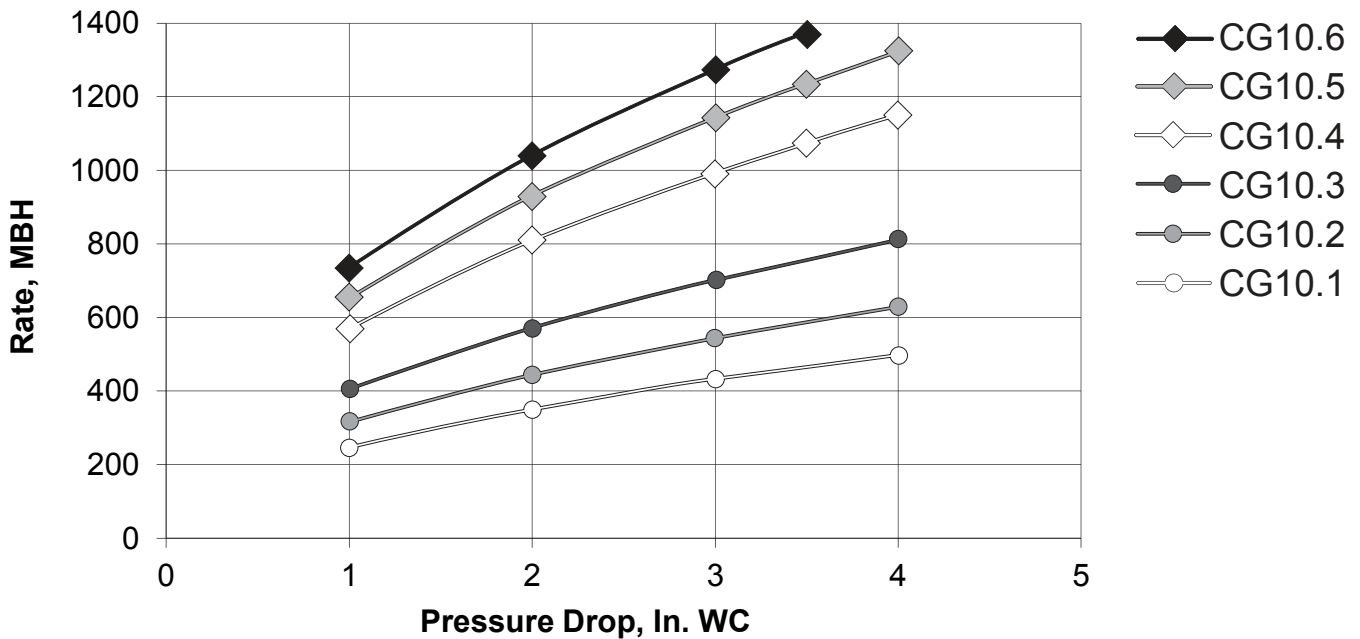
**NOTICE**

Initial burner settings do not account for variation in fuel gas BTU content or variation in field installation setups or conditions. Combustion test equipment must be used by a qualified service agency for proper setup.

**Figure 19** – Manifold to Furnace Pressure Drop vs. Rate - Stepped Spud Design



**Figure 20** – Manifold to Furnace Pressure Drop vs. Rate - Swirl Vane Head Design



## Verify the Burner Firing Rate

**The primary method** for verifying the burner's firing rate is to assure that the burner is operating with the correct manifold pressure and the correct setup for either natural gas or propane.

1. Turn off electrical power to the burner and close the main shutoff cock supplying gas to the burner.
2. Remove the plug from the outlet pressure tap on the burner manifold end of the gas valve and install a hose barb fitting and manometer.
3. Turn on system power and gas supply and initiate a call for heat to light the burner.
4. Verify the valves regulating pressure. Let the burner continue to run and adjust the gas valve pressure regulator in the following steps to obtain the correct manifold pressure.
5. Manifold Pressure is to be used to set the burners firing rate. See **Table 8** on page 25.
6. Remove the regulator cover screw from the regulator adjustment tower and turn the regulator adjust screw clockwise to increase pressure or counterclockwise to decrease pressure. Set the regulator to produce the correct water column reading in the manometer. Check the appliance breech or draft setting and adjust if necessary as it can affect the setting. Replace the regulator cover screw.
7. Turn off the burner and turn off all electrical power to the system.
8. Remove the manometer hose and barb fitting from the gas valve outlet pressure tap.
9. Replace the outlet pressure tap plug and tighten (clockwise 40 – 60 in.-lbs.).
10. Turn on system power and start the burner.
11. Check for leaks at the gas valve outlet pressure tap plug using a leak detection solution or soapsuds. Bubbles forming indicate a leak. SHUT OFF GAS AND FIX ALL LEAKS IMMEDIATELY.

**If the burner is firing natural gas** it may be possible to verify the firing rate by "clocking" the gas meter:

1. Locate the gas meter and examine its display to be sure that you can determine a 1 cubic foot usage of gas and that the meter is temperature compensated.
2. Contact the gas utility to find the **heating value** of the gas. It can vary from about 950 BTU/Ft<sup>3</sup> to about 1,100 BTU/Ft<sup>3</sup>.
3. Examine the gas piping to know of any other gas appliances connected to it. Turn them off so that only this burner is using gas from the meter.
4. Start the burner and use a stopwatch to measure the number of **timed seconds** it takes for the burner to fire 1 cubic foot of gas.
5. Calculate the firing rate in BTU/Hr. using the following equation:

$$\text{Firing rate BTU/Hr.} = \text{Heating value (BTU/Ft}^3\text{)} \times 3,600 \div \text{Timed seconds}$$

For example, if the heating value is 1,050 BTU/Ft<sup>3</sup> and you timed 1 cubic foot of gas at 42 seconds then firing rate BTU/Hr = 1050 x 3,600 ÷ 42 which calculates to 90,000 BTU/Hr.

**If the burner is firing LP gas**, a meter is usually not available. Contact your LP supplier for recommendations.

## Estimating Rate

Manifold to Furnace Pressure information can be used to estimate the burner's firing rate when it is not possible to clock a meter for the rate.

To estimate the burner's firing rate:

- Measure the furnace pressure over fire.
- Measure the manifold pressure (at the manifold pressure test connection).
- Subtract the furnace pressure from the manifold pressure.
- Compare the result to the data in **Figure 19** and **Figure 20** on page 26 as appropriate for your burner.

## Validate Safety Control Operation



### WARNING

#### Explosion, Fire, and Asphyxiation Hazard



*Testing by Qualified Technician Required. Failure to properly test and verify the correct function of operation and safety controls could lead to equipment malfunction.*

The testing of operating and safety controls requires technical training and experience with power gas burners and appliances.

Carefully follow the manufacturer's instructions supplied with the appliance and the controls.

Verify the correct function of all operating and safety controls used in the installation.

If instructions are not available, use the following recommended procedures and record all results in a start-up log.

1. **High limit/ Pressure Control** – To check the High Limit, raise the temperature or pressure of the operating control to a higher level and lower the limit to a setting less than the operating control. Run the burner until the high limit opens and shuts the burner off. Adjust the controls back to the desired settings.
2. **Operating control** – Run the burner until the operating control shuts it off. If necessary, make adjustments to ensure the control cycles the burner in the desired temperature or pressure range.
3. **Low water cutoff (LWCO)** – With the burner firing, open the blow down valve on the low water cutoff, if applicable. As the water level drops, the LWCO switch contacts open and shut the burner off. When the water level rises, the LWCO contacts close and restart the burner. Monitor the LWCO switch operation in relation to the water level in the sight-glass for synchronization.
4. **Verify Flame Sensor Function** – If 7590 operation sequence and function is correct, turn off power and remove sensor wire from bottom of 7590 control. Turn on power and fuel and initiate Call for Heat. Verify that burner fires up and the gas valve closes. After control locks out, flame shall go off.

## Combustion Air Adjustment Procedure



### WARNING

#### CO Leakage, Asphyxiation

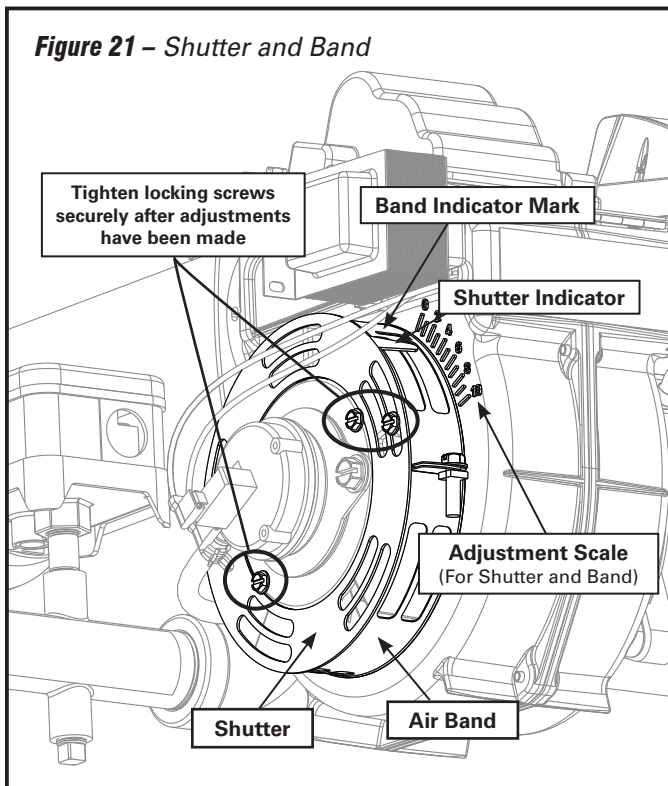
*Failure to maintain proper stack temperature could result in flue gas condensing and cause chimney damage.*

### NOTICE

Always use calibrated test instruments to set combustion levels. Verify that test instruments are calibrated and in good working condition. If not already provided, drill test access holes in the flue pipe near the breech (or upstream of the boiler breech damper, if applicable) and in the front mounting plate area for firebox pressure. Be careful not to damage any water-backed surface.

1. Initiate a call for heat.
2. Adjust the draft, over-fire, or breech pressure to the appliance manufacturer's recommended level after flame has stabilized.
3. Measure the carbon monoxide level and adjust air settings. An operating range of 0 - 50 PPM is recommended for the CG10 burner.
4. Before making these tests, operate the burner to allow the heating system temperature to stabilize or nearly reach steady-state levels.
5. Measure the O<sub>2</sub> or CO<sub>2</sub> at the 50 PPM CO level. It is recommended that you measure the oxygen (O<sub>2</sub>) early in the test sequence because high levels of carbon monoxide (CO) can be created at very low or very high O<sub>2</sub> levels. The typical operating range is between 3%-5%.
6. Open the air adjustment until the O<sub>2</sub> level is increased by at least 1% or to 3% O<sub>2</sub> (whichever is higher). This should reduce the CO level and provide a margin of reserve air to accommodate variable conditions.
7. Sample the CO level again. It should be in the 0 to 50 PPM range.
8. Check the draft to ensure it still meets specifications. If a major change in draft is required, repeat the above steps.

9. Verify stack temperature meets appliance manufacturer's recommendations. Generally a 325°F stack temperature is high enough to avoid corrosive condensation in the vent system, however a large cross section flow area chimney or a very tall chimney may require a high temperature. See ANSI Z223.1/NFPA 54 for design requirements.
10. Perform any final adjustments and lock the air setting securely. Run the burner through several cycles to verify prompt ignition and stable burner operation. (see **Figure 21**).
11. Record the combustion performance readings, burner settings and appliance data on the start-up form in the back of this manual. If the burner is firing LP gas you must also record set-up information on the propane conversion label and attach it to the appliance.

**NOTICE**

The shutter and band both control the amount of flow area available for air inlet to the burner. The greater their combined flow area, the higher the firing rate. The primary differences between the two are their ease of adjustment and their total airflow area. The shutter turns more easily and has a smaller net flow area. As a result we have found the shutter to be better suited for low rate adjustments, and the band better suited for high rate adjustments. We recommend that at low rates the band be left completely closed until the shutter has been fully opened, and that for higher rates the shutter is left completely open as the band is opened.

**Maintenance and Service****WARNING****Explosion, Fire, and Asphyxiation Hazard**

*Annual Professional Service Required. Tampering with or making incorrect adjustments could lead to equipment malfunction.*

Do not tamper with the burner or controls or make any adjustments unless you are a trained and qualified service technician.

To ensure continued reliable operation, a qualified service technician must service this burner annually.

**NOTICE**

More frequent service intervals may be required in dusty or adverse environments.

Operation and adjustment of the burner requires technical training and skillful use of combustion test instruments and other test equipment.

**WARNING****Electrical Shock and Explosion Hazard**

*Failure to turn off electric and gas supply could result in electrical shock, gas leakage, explosion, or fire hazards.*

Turn main gas valves and electric power off before performing any maintenance.

If a maintenance procedure requires electrical power, use extreme caution.

**WARNING****Fire Hazard**

*Removing the igniter from the factory-installed baseplate could cause serious death or injury.*

Do not remove igniter from factory installed baseplate.

**NOTICE**

Label all wires prior to disconnecting when servicing controls. Wiring errors can cause improper and dangerous operation.

**Verify proper operation after servicing.**

**WARNING****Explosion, Fire, Asphyxiation Hazard**

Use authorized replacement parts only. Do not attempt to replicate or modify any parts.

## Required Annual Maintenance



**WARNING**

### Explosion, Fire, and Asphyxiation Hazard



*Inspect Heating System Regularly. Lack of regular inspections and inadequate maintenance could lead to equipment malfunction.*

(Always follow the appliance manufacturer's recommended service instructions, when available.)

- The following checklist is intended to be used as a minimum reference guide only and does not supersede or replace the heating appliance manufacturer's recommended service and maintenance instructions or any code requirements.
- Consult the installation and service instructions provided by the individual control or component manufacturer and carefully follow their directions.
- Maintenance and testing may be required more frequently due to dusty or severe operating conditions.
- If unusual or questionable performance is observed, shut the system down and contact your qualified service agency immediately.

***(The following should be performed by a qualified service technician only.)***

○ Inspect and Clean the Burner

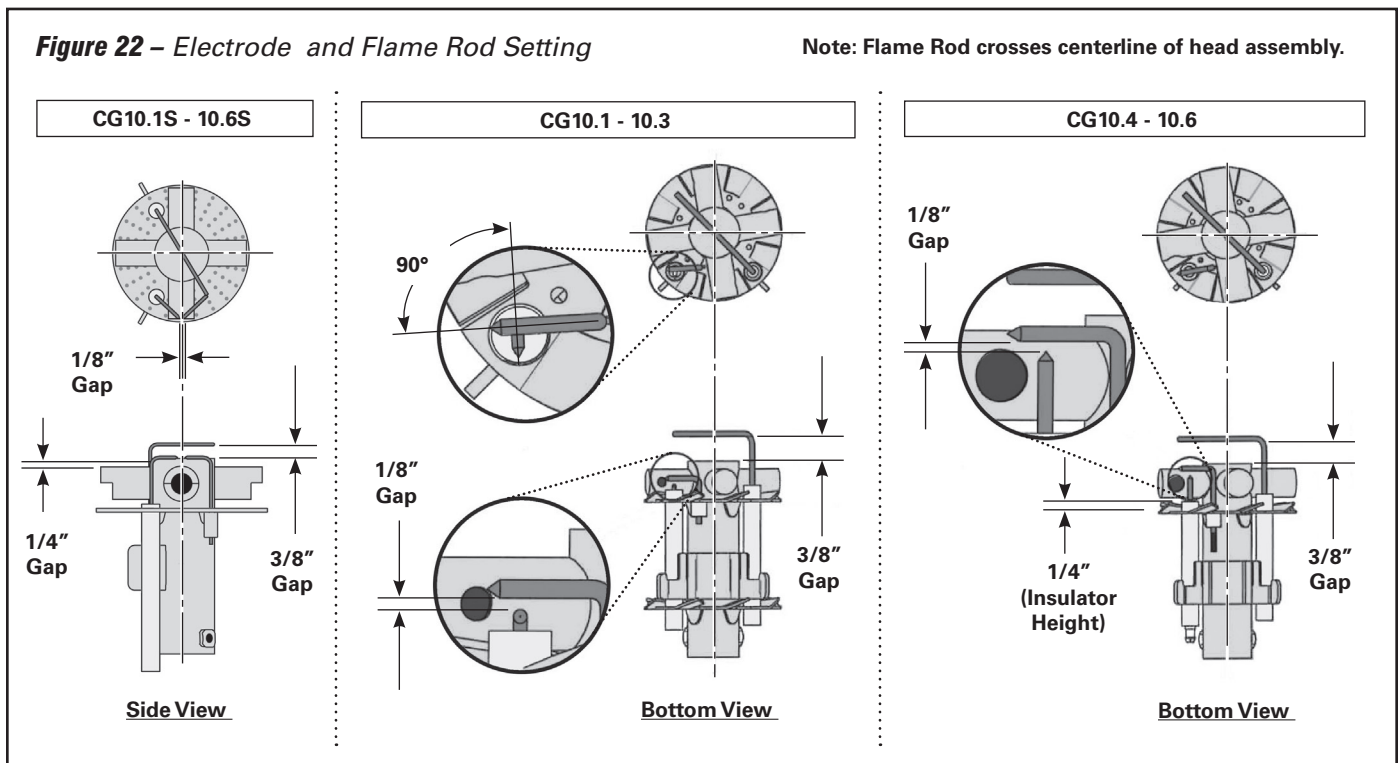
1. Inspect and clean all dirt accumulation from the gas train, burner exterior, burner air band/shutter, and surrounding area.
2. Remove the blower motor and clean any accumulated matter from the blower wheel and motor end bell.
3. Check wheel for damage and the hub setscrew for tightness.
4. Clean the inside surfaces of the burner housing scroll and especially the air intake area and airflow proving switch suction tube.
5. Clear any debris from the air vents on the motor body.
6. Clean the ignition transformer, baseplate, and terminal bushing. Inspect the ignition lead for signs of deterioration and loose terminals.
7. Remove the gas gun assembly and clean the entire unit, paying special attention to the air diffuser.

8. Inspect the flame rod for oxidation or distortion. Clean all surfaces, set the probe position, and insure that the flame rod is securely fastened. Refer to **Figure 22** on page 31.
  9. Inspect the ignition electrode for any damage. Clean all surfaces, set the proper electrode gap, and make sure it is securely fastened. See **Figure 22**.
  10. Clean the inside of the air tube and inspect the combustion end for any deterioration. Check the recess dimension from refractory.
  11. Inspect gas tube O-ring condition and replace if damaged. Install gas gun assembly back into the burner and tighten the gas gun securely in place. (Automotive chassis or bearing grease is suitable for O-ring lubrication.)
  12. Inspect the condition of the appliance mounting plate and burner mounting flange gaskets and replace any damaged materials.
  13. Inspect all burner control wiring and the burner control for damaged insulation and loose terminals/connections.
  14. Verify that the source voltage to the burner and control panel is within 10% of the burner rating as listed on the burner nameplate.
- **Appliance** – (Follow appliance manufacturer's service procedures. The following steps are emphasized because they relate to burner operation)
1. Insure that the flue passages, flue vent pipes, and chimney flues are clean and unobstructed.
  2. Check barometric damper or draft hood for proper operation.
  3. Check the condition of the combustion chamber refractory, the front-plate insulation, and all gaskets and seals. Repair or replace as necessary.
  4. Inspect boiler sections and system load piping for possible leaks. Make all necessary repairs.
  5. Check all operating and safety controls on the boiler for proper installation and operation.
  6. Perform all maintenance and tests according to the burner control manufacturer's instructions (limits, controllers, low water cutoff, relief valves, feed valves, etc.).

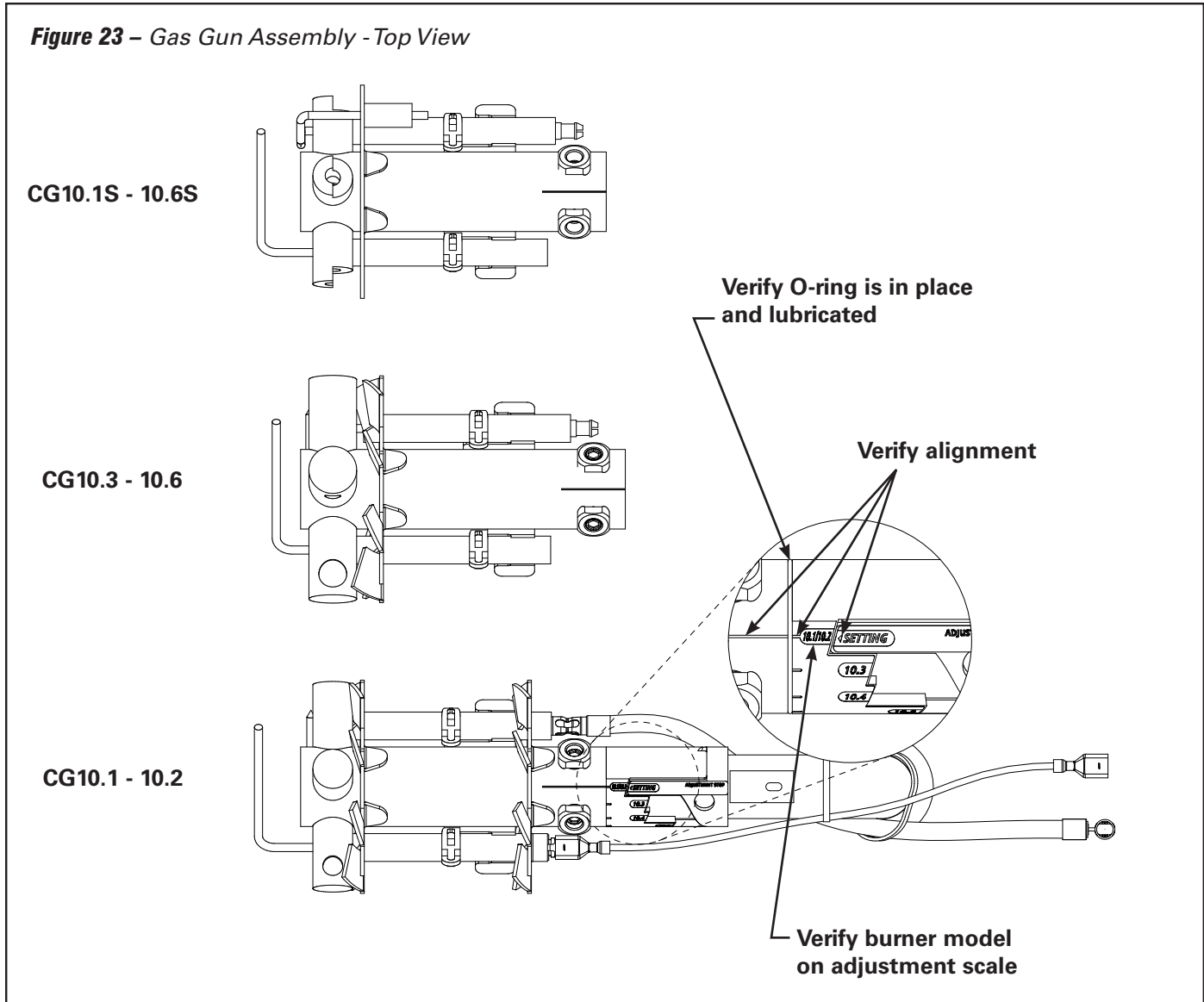


- **Gas supply piping:**
  1. Inspect all piping for leakage and proper installation.
  2. Perform necessary repairs to comply with all codes.
  3. Check inlet pressure to the gas valve.
- **Installation area:**
  1. Insure that there are no combustible materials, flammable liquids or vapors in the vicinity of the heating appliance.
  2. Verify that the combustion air supply is adequate.
- **Adjust the burner for proper combustion:**
  1. Run the burner and perform a complete combustion test using the proper instruments. If necessary refer to section titled "Burner Start-up" on page 24. Record the results for reference.
  2. Visually inspect the flame. Look for changes in shape, size, and color.
- **7590 GeniSys Primary Control:**

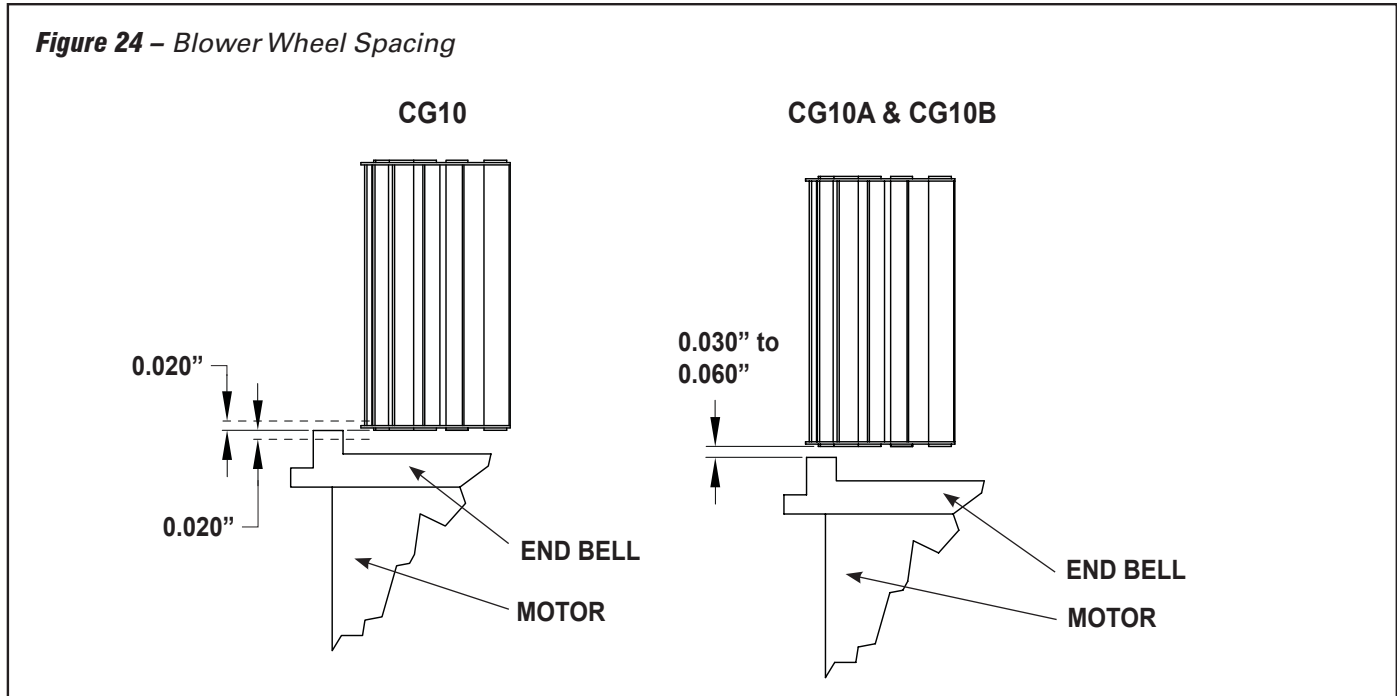
Follow the instructions in Beckett GeniSys Model 7590 manual (available at [www.beckettcorp.com](http://www.beckettcorp.com) or by calling 1-800-645-2876). Verify that the control is functioning to specifications. See "Check for Normal Operation" section.
- **Manual shutdown for long periods:**
  1. Close all gas valves in the gas supply piping system.
  2. Turn off all electrical power to the burner.
  3. Protect the burner and controls from moisture and dirt.



**Figure 23 – Gas Gun Assembly - Top View**

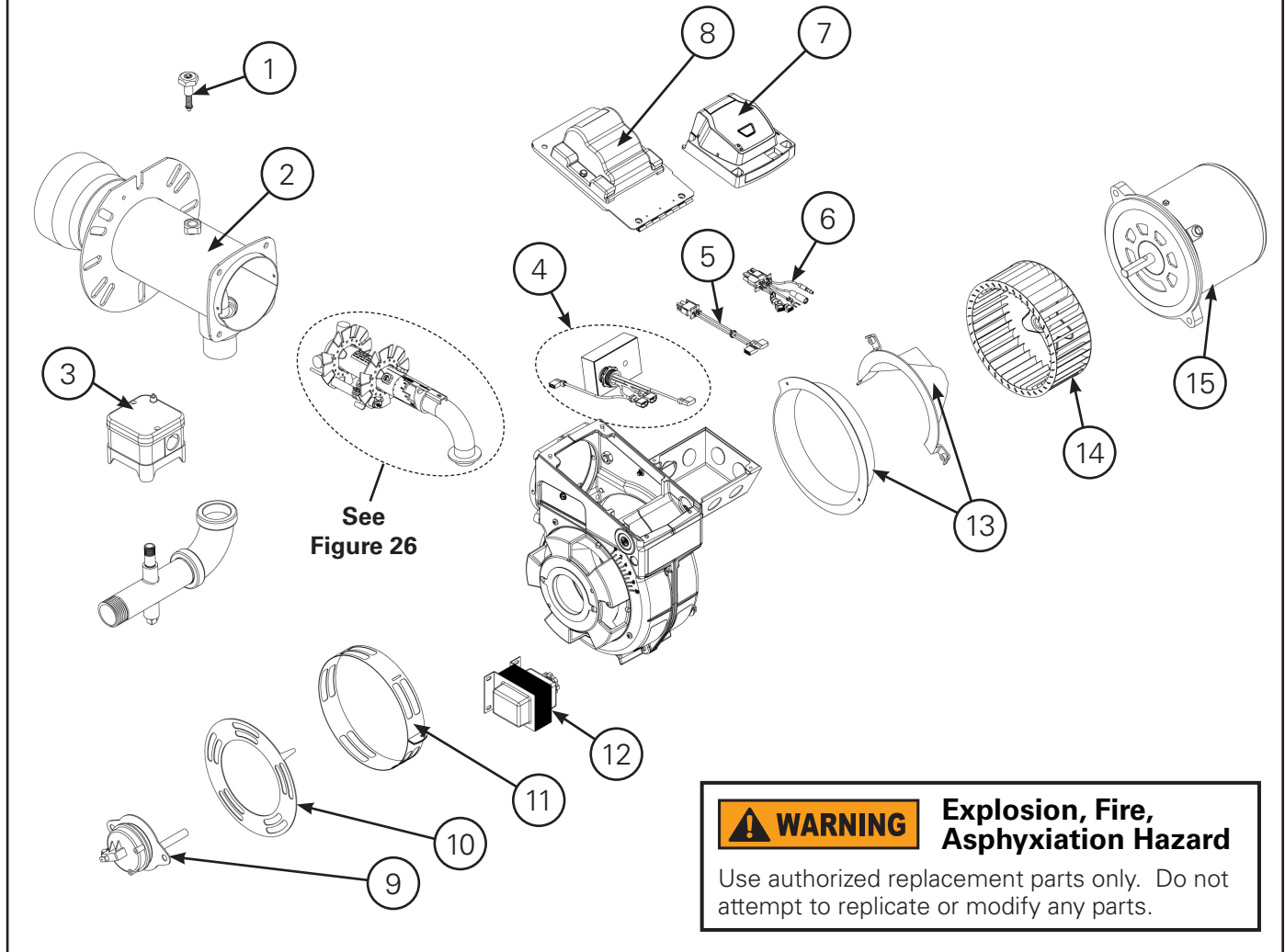


**Figure 24 – Blower Wheel Spacing**



# Replacement Parts

**Figure 25 – CG10-24 Gas Burner Replacement Parts**



**WARNING** Explosion, Fire, Asphyxiation Hazard  
 Use authorized replacement parts only. Do not attempt to replicate or modify any parts.

Item	Description	Beckett Part No.
1	Jacking Screw	5193401U
2	Air Tube	See Note 1
3	Low Gas Pressure Switch	52259-001U
	High Gas Pressure Switch	52259-002U
4	Valve Timer	52402001U
5	Wire Assembly - Air Proving Switch	52268001U
6	Wire Assembly - 6 pin	52401001U
7	Primary Control	7590C0001U
8	Ignition Transformer	7474002U
9	Air Proving Switch Assy	52264002U
10	Shutter	3215U
11	Air Band	5151503
12	24V Transformer	52310002U
13	Air Guide (300-600 MBH)	189U
	Air Guide (600-1,000 MBH)	178U
	Inlet Sleeve	32336U

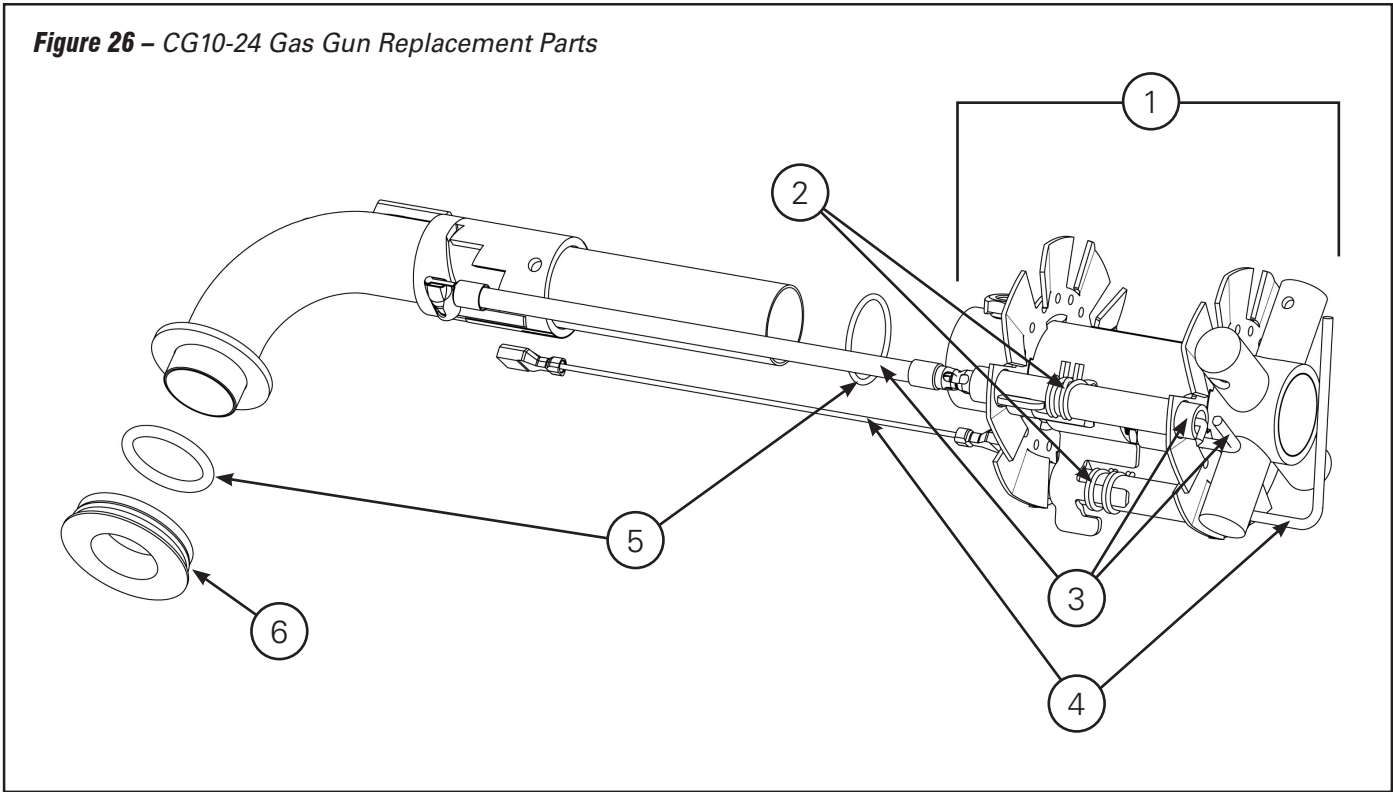
Item	Description	Beckett Part No.	
14	Blower Wheel	CG10 (300-600 MBH)	21448U
		CG10A or B (600-1,200 MBH)	21339U
15	Motor 120v	21341U	

**Note 1:** Appliance must be specified to order an airtube with welded mounting flange.

**Gas Valve Replacement Parts (not shown)**

Description	Beckett Part No.
Solenoid Gas Valve 24V, 1" NPT	2193410U
Solenoid Gas Valve 24V, 3/4" NPT	2193411U
2 Stage Gas Safety Valve 24V, 1" NPT	32990001U
Regulator Maxitrol 3/4" NPT	2192901CU
Regulator Maxitrol 1" NPT	2192902DU

**Figure 26 – CG10-24 Gas Gun Replacement Parts**



Item	Description	Beckett Part No.	
1	Head with Electrode	10.1	101U
		10.1S	101SU
		10.2	102U
		10.2S	102SU
		10.3	103U
		10.3S	103SU
		10.4	104U
		10.4S	104SU
		10.5	105U
		10.5S	105SU
		10.6	106U
10.6S	106SU		
2	Spring Clamps (4-pack)	3236501U	
3	Electrode Set with Cable	10.4 - 10.6	22225U
		10.1 - 10.3	2191201U
		10.1S-10.6S	2191205U
4	Flame Rod with Cable	2191305U	
5	O-ring Set (2-piece)	3226401U	
6	Propane Restrictor (LP Only)	See <b>Table 6</b> on page 18	

# Contractor Start-Up Form

Installation Name: \_\_\_\_\_ Installation Date: \_\_\_\_\_

Installation Address: \_\_\_\_\_

Start-Up Company's Name \_\_\_\_\_ Phone: \_\_\_\_\_

Name of Technician \_\_\_\_\_

## ■ Appliance *(Below information can be obtained from appliance name plate)*

Manufacturer: \_\_\_\_\_

Type (circle one): [ **Boiler / Furnace / Other** ] Model #: \_\_\_\_\_ Serial #: \_\_\_\_\_

Input MBH: \_\_\_\_\_ Original Appliance Designed for (circle one): [ **Oil / Natural Gas / Propane** ]

Output MBH: \_\_\_\_\_

Limits	Limit Model No. (Indicate n/a if not required by the appliance manuf.)	Operation Verified
Temperature		<b>YES / NO</b>
Pressure		<b>YES / NO</b>
LWCO		<b>YES / NO</b>
Other Limits		<b>YES / NO / n/a</b>

## ■ Burner

Fuel: [ **Natural Gas / Propane** ] Model #: \_\_\_\_\_ Serial #: \_\_\_\_\_

Combustion Head: \_\_\_\_\_ Propane Orifice Size(if installed): \_\_\_\_\_ Air Shutter Setting: \_\_\_\_\_

Air Band Setting: \_\_\_\_\_

## ■ Chimney/Smoke Pipe

Chimney Type: [ **Masonry / Metal Vent / Direct Vent** ] Location (circle one): [ **Inside / Outside** ]

Chimney Height: \_\_\_\_\_ Flue Pipe Size: \_\_\_\_\_ Flue Pipe Length: \_\_\_\_\_ Number of Elbows: \_\_\_\_\_ Confirm Double Acting Draft Regulator Installed: [ **Yes / No** ]

Thermal Safety Switch Installed [ **Yes / No** ] Voltage: [ **120V / 24V** ]

## ■ Gas Supply Piping

Pipe Diameter: \_\_\_\_\_ Length of Pipe from Burner to Meter: \_\_\_\_\_ Number of Elbows: \_\_\_\_\_

Gas Pressure to Burner Gas Valve While Burner is Operating \_\_\_\_\_ Inches W.C.

## ■ Combustion Readings

O<sub>2</sub>: \_\_\_\_\_ % CO: \_\_\_\_\_ PPM CO<sub>2</sub>: \_\_\_\_\_ % Stack Temperature (325°F MIN.): \_\_\_\_\_ °F

Manifold Gas Pressure: \_\_\_\_\_ (Inches W.C.) Draft at Breech \_\_\_\_\_ W.C. Clocked Meter Input \_\_\_\_\_ MBH

# Limited Warranty Information

The R. W. BECKETT CORPORATION ("Beckett") warrants to persons who purchase its "Products" from Beckett for resale, or for incorporation into a product for resale ("Customers"), that its equipment is free from defects in material and workmanship. To qualify for warranty benefits, products must be installed by a qualified service agency in full compliance with all codes and authorities having jurisdiction, and used within the tolerances of Beckett's defined product specifications.

To review the complete warranty policy and duration of coverage for a specific product, or obtain a written copy of warranty form 61545, please choose one of the following options:

1. Visit our website at: [www.beckettcorp.com/warranty](http://www.beckettcorp.com/warranty)
2. Email your request to: [rwb-customer-service@beckettcorp.com](mailto:rwb-customer-service@beckettcorp.com)
3. Write to: R. W. Beckett Corporation, P. O. Box 1289, Elyria, OH 44036

**NOTE: Beckett is not responsible for any labor cost for removal and replacement of equipment.**

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