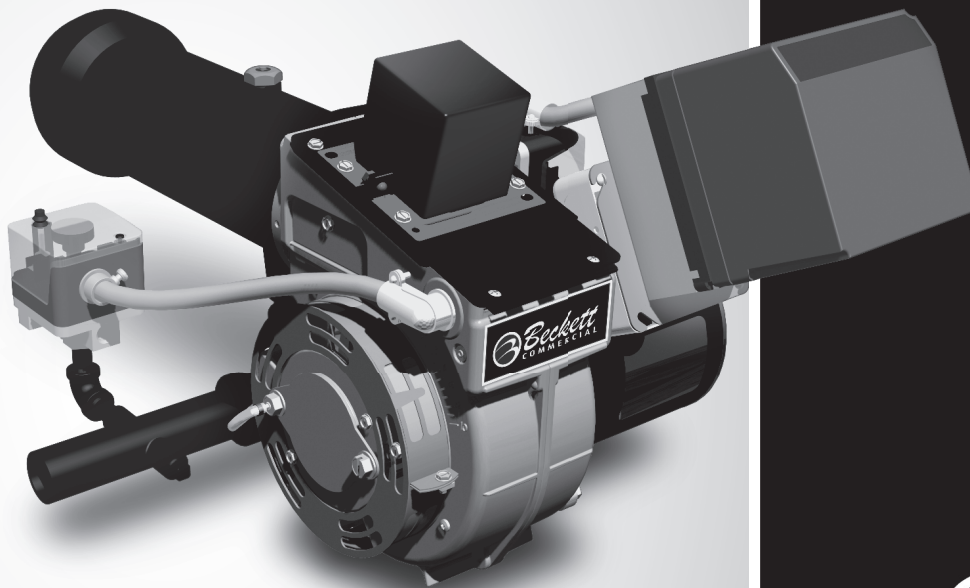


# CG10

## Gas Burner Manual

Operation: On/Off with Low Fire Start  
Rate: 300 to 1200 MBH

*Beckett*<sup>TM</sup>  
COMMERCIAL PRODUCTS



### **WARNING**

### **Fire, Explosion and Asphyxiation Hazards**



***Failure to follow these instructions exactly could lead to fire or explosion and result in death, severe personal injury or property damage.***

1. Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
2. 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 telephone outside the building.
  - Follow the gas supplier's instructions.
  - Call the fire department if you cannot contact your supplier.
3. Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

---

# Contents

<b>General Information .....</b>	<b>3</b>
Hazard Definitions:.....	3
Owner's Responsibility:.....	3
Professional Installer's Responsibility:.....	4
Specifications .....	4
<b>Pre-installation Checklist .....</b>	<b>5</b>
Indoor Installation.....	5
Combustion air supply.....	5
Clearances .....	6
Fuel gas supply .....	6
Flue vent system .....	6
Electrical supply .....	6
Verify burner components .....	6
Verify firing input range .....	6
Verify burner air tube assembly.....	7
<b>Mount the Burner.....</b>	<b>9</b>
<b>Connect Gas Piping .....</b>	<b>9</b>
Gas Trains .....	10
<b>Wire the Burner.....</b>	<b>12</b>
<b>Sequence of Operation .....</b>	<b>13</b>
<b>Prepare the Burner for Start-up .....</b>	<b>13</b>
Start-up checklist.....	14
<b>Start the Burner .....</b>	<b>16</b>
Burner start procedure .....	16
Verify input firing rate .....	16
Check operation and safety controls.....	20
Use test instruments to set combustion: .....	21
Recommended combustion test sequence: .....	21
<b>Maintenance and Service.....</b>	<b>22</b>
Annual maintenance .....	22
Propane Restrictor Description .....	25
Installation .....	25
For the OPERATOR .....	27
<b>Replacement Parts .....</b>	<b>28</b>
<b>Burner Configurations .....</b>	<b>29</b>
<b>Limited Warranty Information .....</b>	<b>32</b>

# General Information

## Hazard Definitions:

**⚠ DANGER** Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

**⚠ WARNING** Indicates a hazardous situation, which, if not avoided, could result in death, or serious injury.

**⚠ CAUTION** Used with the safety alert symbol, indicates a hazardous situation, which, if not avoided, may result in minor or moderate injury.

Within the boundaries of the hazard warning, there will be information presented describing consequences if the warning is not heeded and instructions on how to avoid the hazard.

**NOTICE** Used to address practices not related to personal injury.

## To the Owner:

**Thank you for purchasing a Beckett CG10 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.

**We recommend annual inspection/service of your gas heating system by a qualified service agency.**

## Owner's Responsibility:

**⚠ WARNING** Follow these instructions exactly.



***Failure to follow these instructions, misuse, or incorrect adjustment of the burner could lead to equipment malfunction and result in asphyxiation, explosion or fire.***

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.

## Professional Installer's Responsibility:

### **WARNING**

**Follow these instructions exactly.**



**Failure to follow these instructions could lead to equipment malfunction and result in asphyxiation, explosion or fire.**

- 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.

### **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.

High altitude installations – Accepted industry practice requires no derate of burner capacity up to 2000 feet above sea level. For altitudes higher than 2000 feet, derate the burner capacity 2% for each 1000 feet above the 2000 feet.

50 Hz motors – The burner ratings, air settings and other adjustments are based on 60 hz motors at 3450 rpm. Derate firing capacity 20% when using 50 hz motors. Consult factory for specific application data.

## Specifications

**Table 1 – Burner Specifications**

Input firing range	300 to 1200 MBh
Fuel	Natural gas - 0.6 specific gravity typical
Gas train	Standard: UL listed/CSD-1 Configuration Options: IRI and FM
Manifold pressure	1.0 to 4.6 inches W.C. typical
Firing mode	On/Off or On/Off with Low Fire Start
Flame safeguard	RM7895A Standard (Options available)
Flame detection	Standard: Flame rod rectification Optional: Ultraviolet scanner
Air proving switch	Standard
Gas pressure switches	Standard high and low
Ignition	Direct spark main flame
Motor	Standard: 1/3 HP; 3450 RPM; 120 volt/60 hz, single phase Optional motor: 50 or 60 hz (see notice for 50 hz), 240 volt single phase
Weight	55 lbs.
Dimensions	Refer to <b>Figure 5</b> .

### **NOTICE**

#### **Special Requirements:**

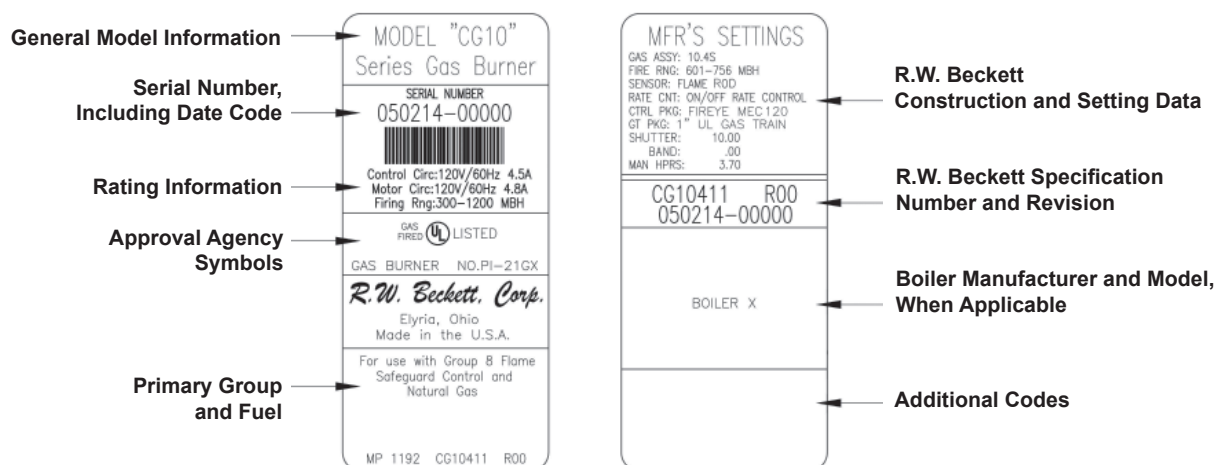
When contacting Beckett for service information — Please record the burner serial number (and have available when calling or writing). You will find the serial number on the silver label located on the left rear of the burner. Refer to **Figure 1**.

#### **Agency Approvals**



Underwriters Laboratories  
Certified by C-UL  
Accepted by N.Y.C.M.E.A.  
Other approvals may be available and must be specified at time of order.

Figure 1. Burner Nameplate



## Pre-installation Checklist

### Combustion air supply



#### **Adequate Combustion and Ventilation Air Supply Required**

*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.*

- The burner cannot properly burn the fuel if it is not supplied with a reliable combustion air source.
- Follow the guidelines in the latest edition of National Fuel Gas Code ANSI Z223.1 (NFPA 54) and CAN1-B149.1 regarding providing adequate air for combustion and ventilation.
- For appliance/burner units in confined spaces, the room must have an air opening near the top of the room, plus one near the floor, each with a free area at least one square inch per 1000 Btu/hr input for all fuel-burning equipment in the room.

### Indoor Installation



#### **Protect against Dust and Moisture**

*Wet or dusty environments could lead to blocked air passages, corrosion damage to components, impaired combustion performance and result in asphyxiation, explosion or fire.*

- 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 more frequent maintenance may be required.

If there is risk of the space being under negative pressure, or of exhaust fans or other devices depleting available air for combustion and ventilation, the appliance/burner should be installed in an isolated room provided with outside combustion air.

## **⚠ WARNING Test For Gas Pipe Leaks**

**Leaking gas could result in asphyxiation, explosion, or fire hazard.**

- The gas supply piping must be absolutely leak-free.
- Pressure test the gas piping with air that is at least three times greater than the gas pressure being used.
- Verify that there are no leaks before proceeding.

## **Clearances**

With the burner installed in the appliance, there must be adequate space in front of and on the sides of the burner to allow access and operation. Verify that the clearance dimensions comply with local codes and with the appliance manufacturer's recommendations.

## **Fuel gas supply**

Verify that the gas supply piping complies with all applicable local codes and the latest edition of the National Fuel Gas Code ANSI Z223.1 (NFPA 54).

Insure that the supply gas pipe size is capable of providing at least the minimum pressure required to the burner gas train inlet at the burner's full capacity rating. Refer to Table 1.

## **Flue vent system**

The flue gas vent system must be in good condition and must comply with National Fuel Gas Code ANSI Z223.1 (NFPA 54) and all other applicable codes having jurisdiction for vent construction, capacity, and sizing.

## **Electrical supply**

Check the nameplate on the burner to verify that the power connections available are correct for the burner. Refer to Figure 1. All power must be supplied through fused disconnect switches and comply with the latest edition of National Electric Code NFPA 70 (Canada CSA C22.1) and all other local or applicable codes.

## **Verify burner components**

- Burner model can be checked from burner carton or rating label on burner.

- Flange mounting arrangement (Includes high-temperature gasket and /or fiber rope for pressure firing).

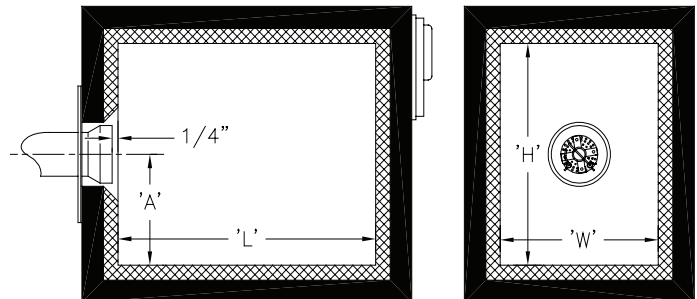
## **Verify firing input range**

Refer to appliance manufacturer's instructions (if available) for the firing input range. Otherwise the maximum recommended firing range for the burner depends on the length and width of the firing chamber and the distance from the burner center to the chamber floor. Verify that the chamber dimensions are at least as large as the minimum values given in **Figure 2**. If the appliance dimensions are smaller, reduce the firing rate accordingly.

## **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.

**Figure 2. Minimum Combustion Chamber Dimensions**



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

## Verify burner air tube assembly

- The information in this section may be disregarded if the burner supplied by the appliance manufacturer is a matched component.
- Maximum firing capacity depends on the furnace pressure. Use the charts shown in **Figure 3** and **Figure 4**, to verify the correct burner configuration for the input rate.
- Refer to **Figure 5** to verify the air tube assembly length and mounting insertion dimensions.

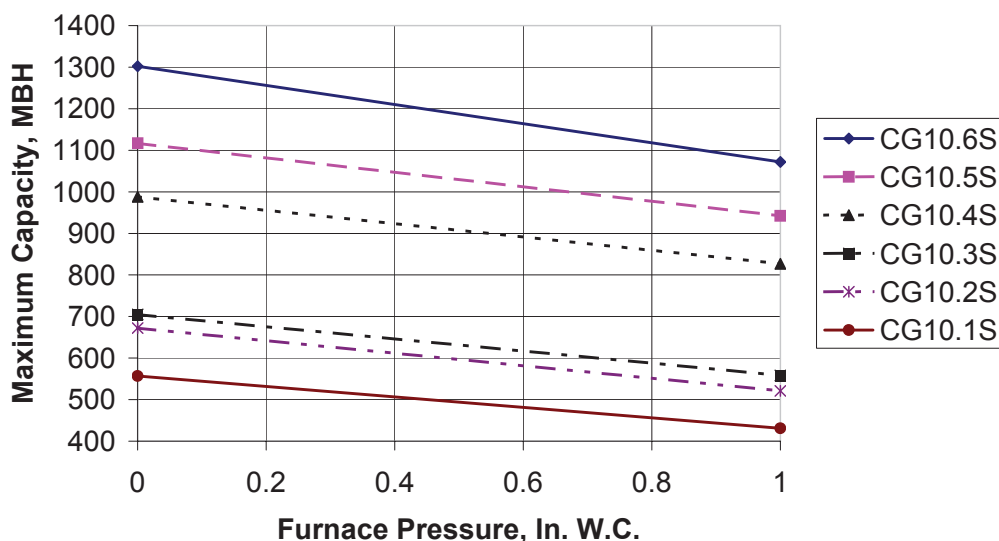
### NOTICE

Flames are shaped by their furnaces and by its flue locations. Increased height and width can decrease the length requirement. When shaping is too severe flames impinge on the walls. Impingement causes CO and carbon deposits and may damage the wall. Maintaining these minimum dimensions should prevent impingement, but smaller furnaces may be acceptable depending upon the results of applications testing. We recommend factory testing of all new burner/furnace combinations by the furnace manufacturer and/or R. W. Beckett Corp.

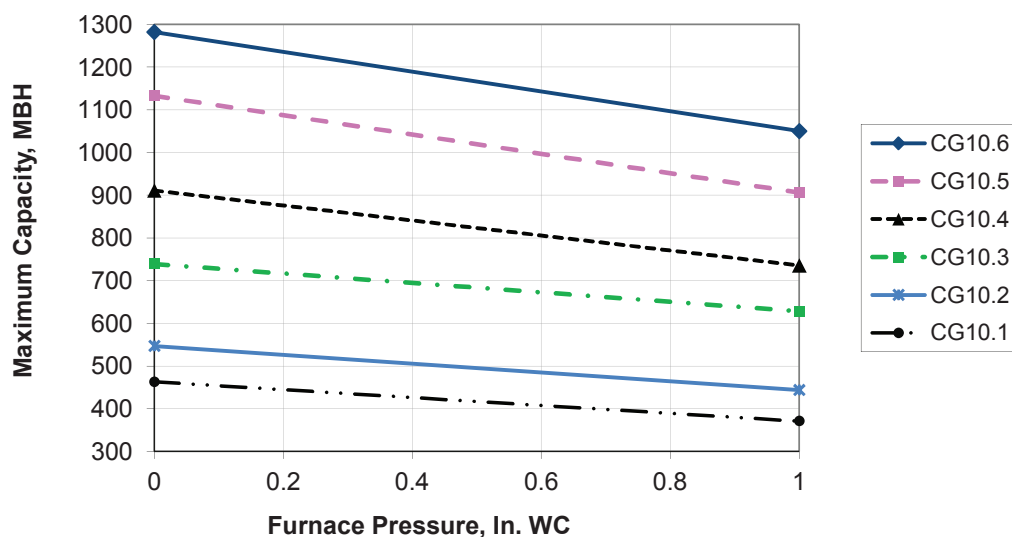
### NOTICE

The volume of the furnace also influences the combustion process. R. W. Beckett Corp. recommends at least 1 cubic foot of furnace volume for each 150,000 BTU/Hr of firing rate.

**Figure 3. Maximum Capacity (at 3% O<sub>2</sub>) vs Furnace Pressure - Step Spud Configuration**



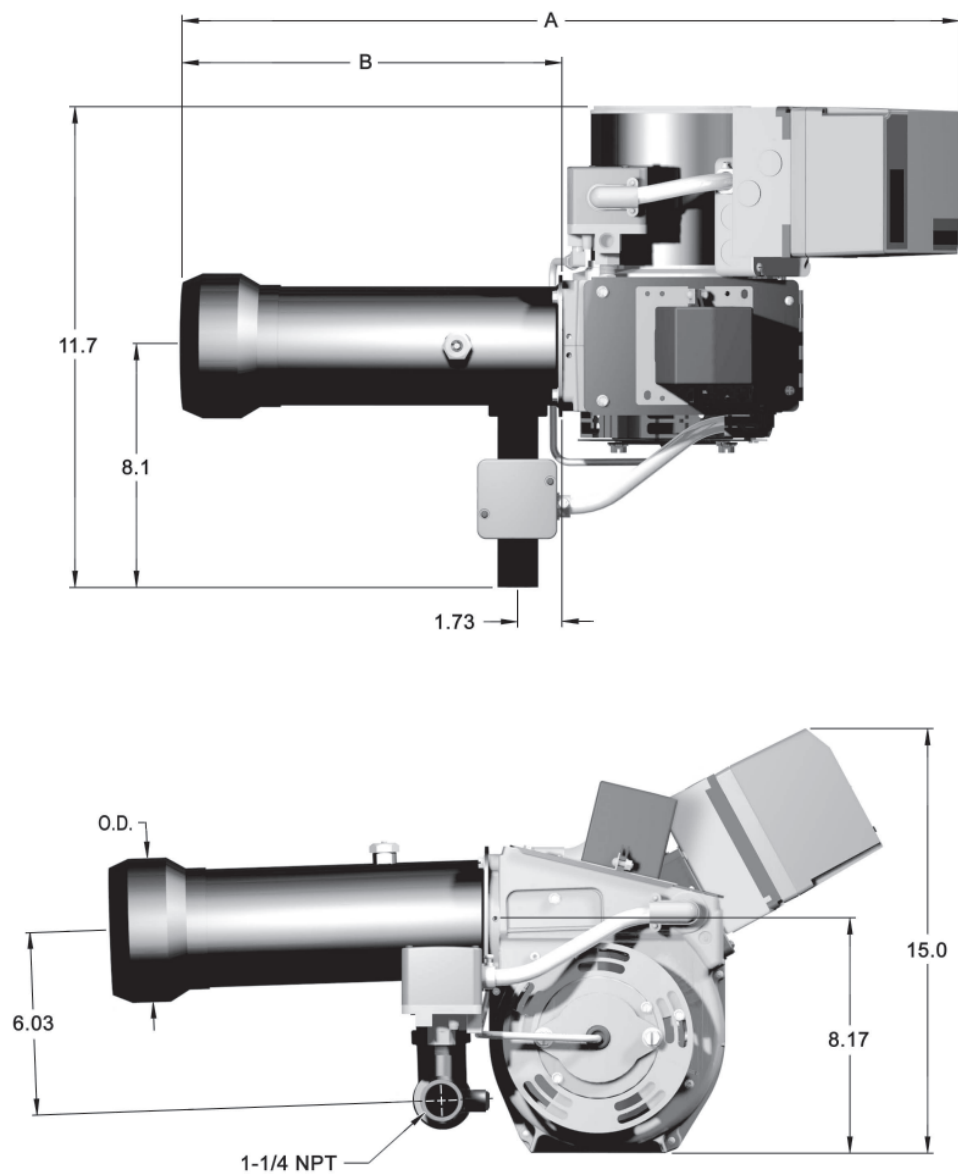
**Figure 4. Maximum Capacity (at 3% O<sub>2</sub>) vs Furnace Pressure - Swirler Head Configuration**





**Figure 5. Burner Dimensions**

Burner Model	Airtube	Dim. A	Dim. B	O.D.
10.1 - 10.3, 10.1S - 10.3S	51927	25.0"	11.7"	4.43"
10.4 - 10.6, 10.4S - 10.6S	51961	25.7"	12.5"	4.61"





## Mount the Burner

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

In the absence of instructions, or for retrofits, make sure that the air tube insertion dimension, measured along the side of the air tube from the welded flange to the end of burner air tube, is correct.



### 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.**

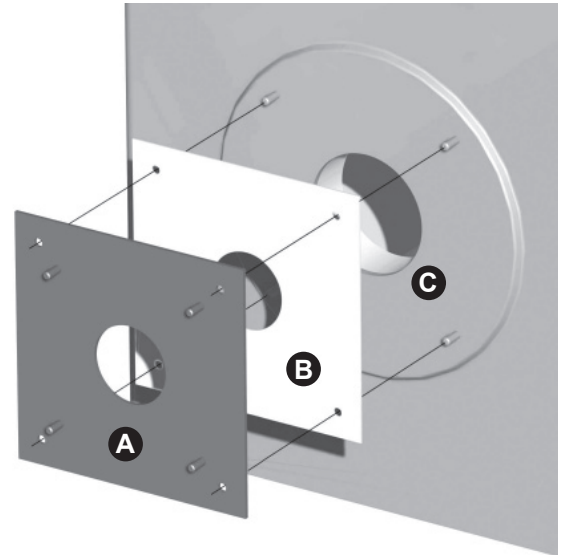
- The end of the air tube must not extend into the combustion chamber unprotected unless it has been factory-tested and specified by the appliance manufacturer.
- The end of the air tube should be set back  $\frac{1}{4}$ " from flush with the refractory inside wall to prevent damage from overheating.
- Refer to the instructions outlined in this section for methods of additional protection.

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. The entry hole diameter in the appliance should be 1" larger than the air tube to facilitate ease of installation and provide adequate protection.

Referring to **Figure 6**, if the front plate opening (C) in the boiler is larger than the burner flange bolt circle, then a custom mounting plate (A) of at least  $\frac{1}{4}$ " thickness must be used with a suitable high-temperature refractory material anchored on the fire-side. A suitable high-temperature gasket (B) must be used for an effective seal.

- Attach the plate and gasket to the boiler and tighten the mounting nuts or bolts securely.
- Verify that the air tube is  $\frac{1}{4}$ " back from flush (see **Figure 2**), and there is nothing blocking the flame zone that could cause flame impingement.

**Figure 6. Custom Mounting Plate**



Key:

- A Burner mounting flange
- B Gasket
- C Appliance mounting plate

## Connect Gas Piping

### 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.

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. Refer to Figure 7 for an illustration of a gas piping layout and refer to Table 1 for pipe sizing.



### Do Not Use Teflon Tape on Gas Piping

**Damage to gas valve cutoff seals and valve bodies could cause gas leaks and result in asphyxiation, explosion or fire.**

- 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.

Figure 7. Typical Gas Piping Layout

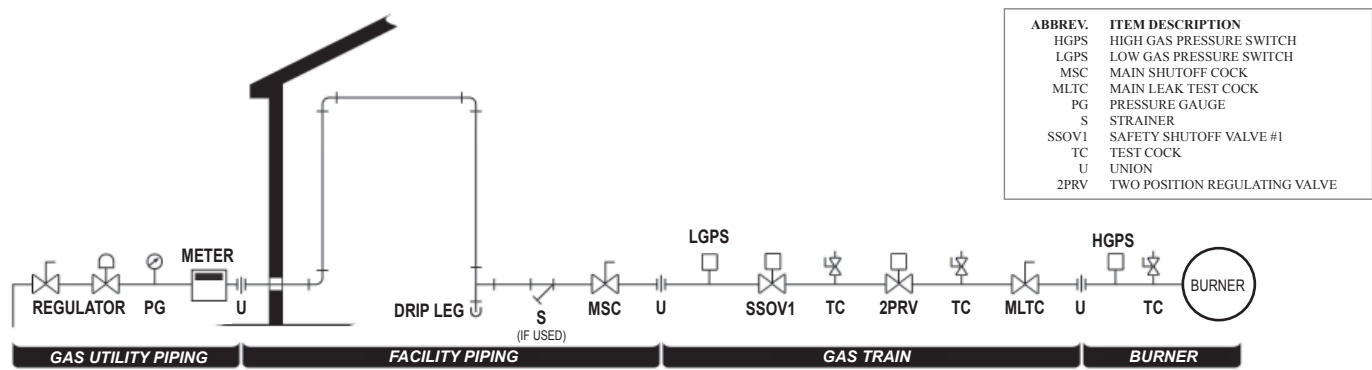


Table 1. Gas supply piping capacity

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

### **WARNING** Install a Drip Leg 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.

### Gas Trains

### **WARNING** Gas Leaks and Explosion Hazards

#### Provide Over-pressure Protection

CSD-1 requires that if gas pressure entering the building exceeds the rating of any gas train component an overpressure protection device must be installed.

**Standard** – An Underwriters Laboratories (UL) listed gas train is standard for the CG10 gas burner. This configuration also meets CSD-1 requirements. See **Figure 8** for typical component layout.

**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 **Figures 12** and **13** are correct for both propane and natural gas. That is also why a gas train adjusted for the burner's natural gas requirements will be correctly adjusted for its propane requirements. R. W. Beckett provides the same pressure regulating safety shutoff valve in the gas train (usually a Honeywell V4944B) for both natural gas and propane. The valve is marked for natural gas due to its primary usage in a pressure range normally used

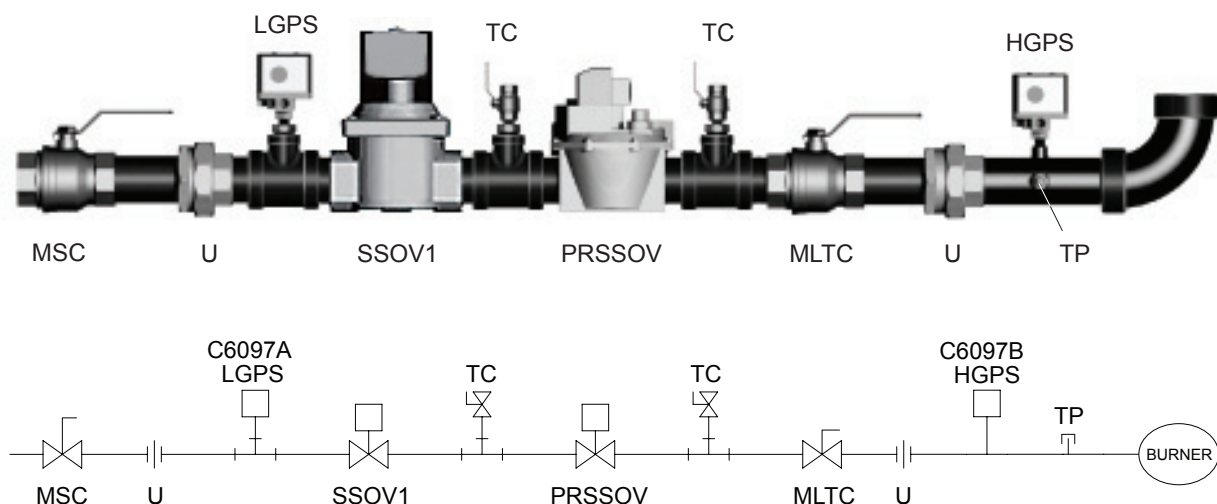
by natural gas appliances. It is safe and effective for propane usage in this design application.

**Optional** – Gas trains for IRI and FM are available and must be specified when ordering a burner.

**Verify** – Verify that the train components are not damaged and all piping and fittings are clean inside and out. The gas train is normally shipped as components and must be assembled and installed at the site.

**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.

**Figure 8. UL gas train configuration**



**ABBREV. ITEM DESCRIPTION**

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
SSOV1	SAFETY SHUTOFF VALVE #1
TC	TEST COCK
TP	TEST PORT
U	UNION

**NOTICE**

When pressure reducing safety shutoff valves are used, the distance from the final shutoff valve (PRSSOV in **Fig. 8**) to the burner manifold must be kept to a minimum for good light-off reliability. R.W. Beckett recommends the following maximum lengths:

Pipe Size	Max. Length
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.

# 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. 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.

## NOTICE

See **Figure 9** for a typical wiring diagram, with the RM7897A flame safeguard control, for reference purposes only. Check the literature that was packaged with the burner for the primary control manufacturer's instructions and the exact wiring diagram for your specific burner.

## CAUTION

### Keep Service Access Covers Securely Installed

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

- 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.**

- Disconnect electrical power before installing or servicing the burner.
- Provide ground wiring to the burner, metal control enclosures and accessories. (This may also be required to aid proper control system operation.)
- Perform all wiring in compliance with the National Electrical Code ANSI/NFPA 70 (Canada CSA C22.1)

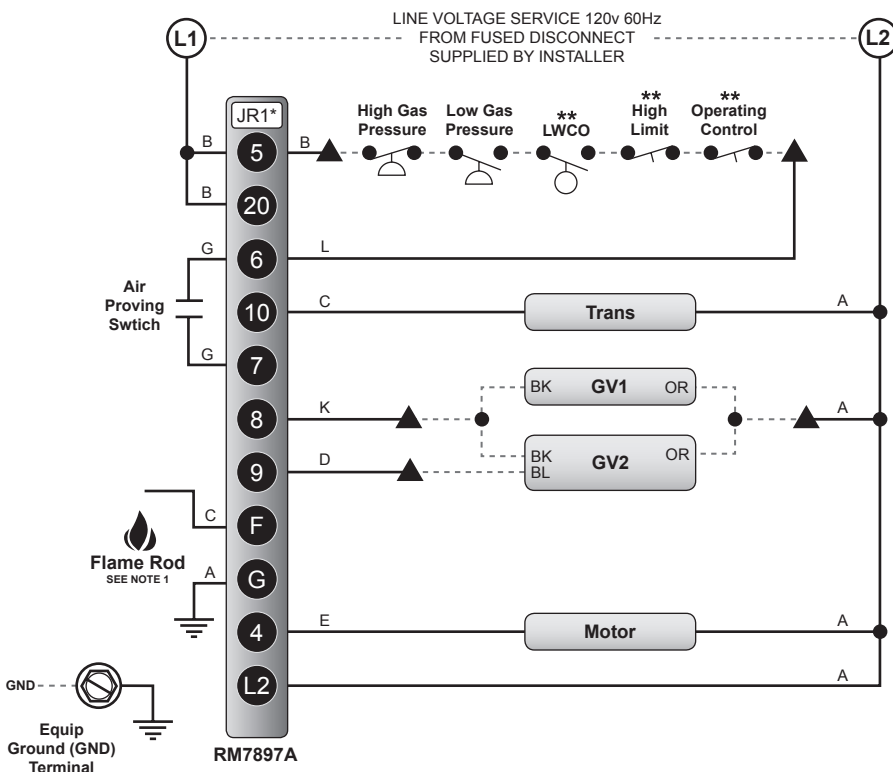
## WARNING

### Do Not Bypass Safety Controls

*Tampering with, or bypassing safety controls could lead to equipment malfunction and result in asphyxiation, explosion or fire.*

- Safety controls are designed and installed to provide protection.
- Do NOT tamper with or bypass any safety control.
- 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.

**Figure 9. Typical wiring using Model RM7897A (for reference only)**



### Legend:

- = Wired by Installer
- \*\* = Provided by Installer
- ▲ = Field Wiring Tie-in

### Key:

- Trans - Ignition Transformer
- GV1 - On/Off Gas Valve
- GV2 - High/Low Valve
- LWCO - Low Water Cut-Off

### Wire Color:

- A - White
- B - Black
- C - Blue
- D - Orange
- E - Brown/Red
- G - Brown
- K - Violet
- L - Black/Red

### Notes:

1. For UV run white wire to G terminal and blue wire to F terminal. For flame rod run wire to F. G is a chassis ground.
2. \* - clip and remove jumper JR1
3. Where a boiler management system cannot supply motor power requirements an isolation relay should be used.

## Sequence of Operation

(Typical for RM7897A flame safeguard primary control)

1. **Initiate** – The primary control enters the INITIATE sequence when the control is first powered on or power returns after an interruption. The initiate sequence is a ten second delay during which the control verifies line voltage stability.
2. **Standby** – The control enters STANDBY until the limits, operating limit control, burner switch, and all microcomputer-monitored circuits are in the correct state.
3. **Load demand** – Operating limit control contacts close on drop in temperature (or pressure) and initiates the start sequence.
4. **Prepurge** – The control will signal the PREPURGE sequence when the airflow interlock and all switches are in the correct state. The Prepurge sequence is the amount of time the blower motor runs prior to the ignition start sequence. Timing for the Prepurge sequence is determined by a card mounted inside the control module (typically 30 seconds).
5. **Trial for ignition (TFI)** – After the Prepurge sequence has timed out, the ignition and main gas valves will be energized. Because the burner has direct spark ignition for the main flame, the flame must be established and detected by the control within 4 seconds or lockout will occur.
6. **Run** – With a flame established and the control continuing to detect a flame, the burner will operate in the RUN mode until the load demand is satisfied or a limit opens.
7. **Load Satisfied** – The fuel valves are closed. After a 15 second post purge, the burner switches to idle until the next call for operation.

### NOTICE

This operation sequence is typical and for reference only. The primary control could vary, depending on the customer specification and code requirements. For the specific operating sequence that applies to your installation, consult the appliance manufacturer's directions, wiring instructions, and control manufacturer's literature supplied with your burner.

## Prepare the Burner for Start-up



### WARNING

### Professional Installation & Service Required



*Incorrect installation and mishandling of start-up could lead to equipment malfunction and result in asphyxiation, explosion or fire.*

- This burner must be installed and prepared for start-up by a qualified service technician who is trained and experienced in commercial gas burner system installation and operation.
- Do not attempt to start the burner unless you are fully qualified.
- Carefully follow the wiring diagrams, control instruction sheets, flame safeguard sequence of operation, test procedures and all appliance manufacturer's directions that pertain to this installation.
- If any of these items are not clear or are unavailable, call Beckett at 1-800-645-2876 for assistance.



### WARNING

### Delayed Ignition, Explosion and Fire Hazards



*This is a direct spark ignition burner and by code requirements must have a primary control with a 4-second flame establishment period. Exceeding 4 seconds could result in delayed ignition, explosions and fire.*

Always verify the primary control has a 4-second flame establishment period by carefully following the control manufacturers' configuration instructions.

Example: Honeywell RM Series requires clipping and removing the JR1 resistor.



## Start-up checklist

Verify the following before attempting to start the burner:

### 1. General

- Carefully read and become familiar with the CG10 Manual, Flame Safeguard Control Instructions, sequence of operation, pertinent wiring diagrams, gas system layout, insurance requirements, other controls and valve literature pertinent to the installation.
- Follow the appliance manufacturer's start-up procedures (when available).
- Inspect the combustion air supply and exhaust venting and verify that they are free of obstructions and installed and sized in accordance with all applicable codes.
- Notify appropriate personnel to schedule start-up (gas utility, owner, operators, subcontractors, etc.).

### 2. Gas Supply Piping

- Insure that the gas piping is properly sized and has been inspected by the gas utility, leak tested at all joints, and purged.
- To protect the gas train and controls, insure that a drip leg or dirt pocket has been properly installed.
- Insure that the fuel gas being supplied is compatible with the burner specification and is available at the correct regulated pressure. (See burner name plate and specification sheets).
- Insure that the vent lines for the diaphragm valves have been run to the outside and properly terminated.
- Use R.W. Beckett recommended maximum pipe lengths for good lightoff (**Figure 8**).

### 3. Electrical

- Insure that all wiring has been completed and complies with the National Electric Code NFPA 70 and local requirements.
- Refer to **Figure 1** and verify that the electrical supply to the burner matches the voltage specification on the label.

### 4. Boiler or Appliance

- Insure that the flue passages and combustion area have been thoroughly cleaned and are in good condition.

- Set the breech damper to the required position for system operation.
- Fill the appliance with water (boilers).
- Check all safety and operating controls for correct application, installation, wiring, and operation.
- Insure that the maximum capacity of the appliance is compatible with the specified burner input firing rate.

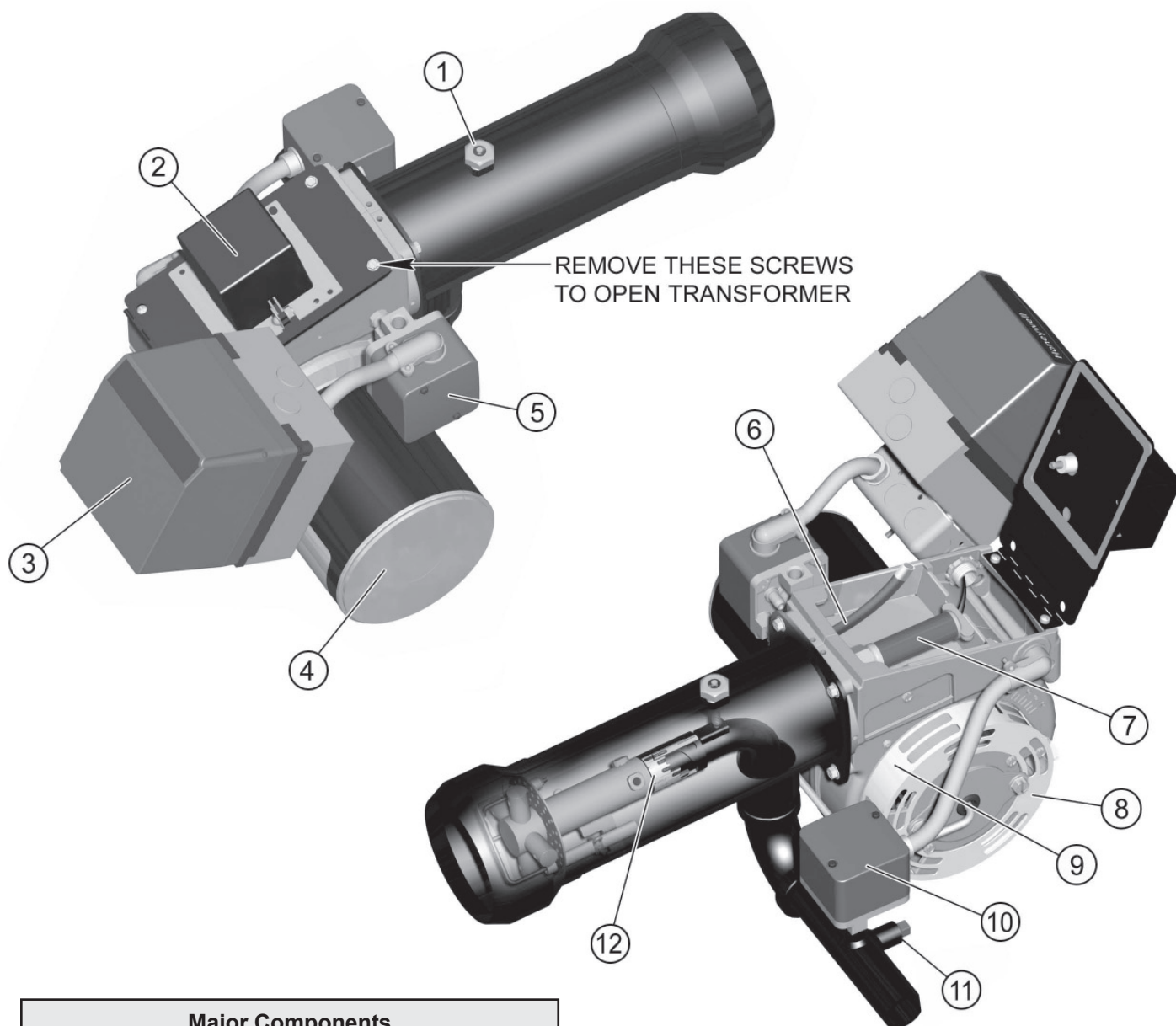
### 5. Burner - See **Figure 10** for familiarization

- Insure that the gas burner model and capacity meet the requirements for the installation.
- Insure that the gas train meets operating specifications, all safety codes and insurance requirements.
- Refer to **Table 2** and **Figure 11** to insure that the burner air shutter and band are positioned for initial start-up preliminary settings.
- Insure that the burner is securely mounted in the appliance with the pressure firing plate and all gaskets in place for pressurized chamber applications.
- For propane-firing burners, insure that the propane restrictor has been correctly selected for your burner model (see **Table 3**) and properly installed (see **Propane Restrictor Installation** instructions).
- Before operating insure that all protective cover plates, enclosures and guards are in place and securely fastened.
- When available, refer to the appliance manufacturer's instructions and install the burner accordingly.

### 6. Test instruments

- The following calibrated test equipment is required to properly install the appliance. Whether these are included in one kit or are individual test components, 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-ammeter for measuring the flame signal. These could be included in one meter or separate meters, but should be calibrated and accurate.
- Calibrated manometers and gauges capable of measuring all pressure ranges in the gas supply and appliance draft. This could typically range from a few psi to 0.01" W. C.

Figure 10. CG10 component familiarization



Major Components	
Item	Description
1	Jacking Screw
2	Ignition Transformer
3	Primary Control
4	Blower Motor
5	Air Flow Proving Switch
6	Electrode Cable*
7	UV Flame Detector (if used)
8	Shutter
9	Air Band
10	High Gas Pressure Switch
11	Manifold Pressure Test Connection
12	Gas Gun Assembly

\*Unplug from transformer when servicing



# Start the Burner

## **WARNING** Professional Installation and Service Required



**Incorrect installation and mishandling of start-up could lead to equipment malfunction and result in asphyxiation, explosion or fire.**

- This burner must be installed and prepared for start-up by a qualified service technician who is trained and experienced in commercial gas burner system installation and operation.
- Do not attempt to start the burner unless you are fully qualified.
- Do not continue with this procedure until all items in the 'Prepare the Burner for Start-up' section have been verified.
- Carefully follow the wiring diagrams, control instruction sheets, flame safeguard sequence of operation, test procedures and all appliance manufacturer's directions that pertain to this installation.
- If any of these items are not clear or are unavailable, call Beckett at 1-800-645-2876 for assistance.

## Burner start procedure

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

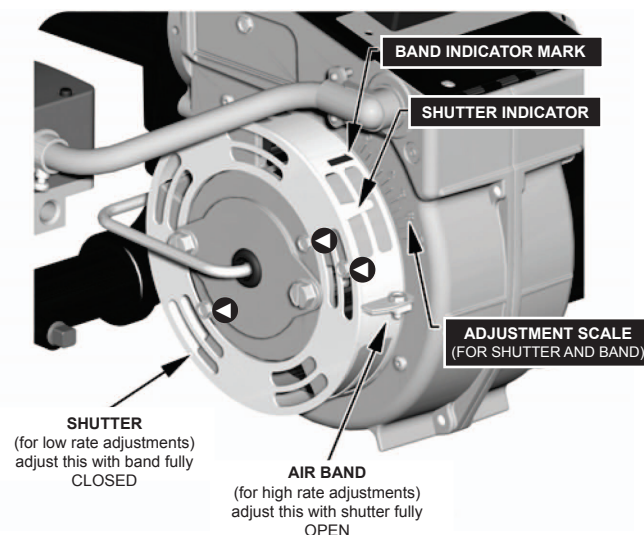
1. With the power and main gas supply to the burner turned off, make sure gas has not accumulated in the boiler or flues.
2. Check the initial air settings (shutter & band) for input firing rate. Check the manufacturer's settings either on the nameplate shown in **Figure 1** or listed in **Table 2**. If adjustment is necessary refer to **Figure 11** and loosen the adjustment screws then twist the shutter and/or air band until the indicators point to the values shown on the nameplate or listed in **Table 2**.
3. With the main gas supply valve closed. Set the limit or controller to call for heat then apply power to start the burner. Reset the high and low gas pressure switches if necessary.
4. In order to check the function of each component (i.e: flame safeguard sequence, airflow proving switch, ignition transformer, gas valves, safety lockout timing, etc.), with the gas supply closed off, monitor a complete burner run sequence. Note that the flame safeguard control will lock out since the fuel supply has been closed off.
5. If component operation sequence and function is correct, reset the flame safeguard and initiate a new cycle. Monitor the start-up cycle and manually open

the main leak test cock as soon as the flame safeguard powers the safety shutoff valves. If the boiler room is quiet you may be able to hear the valve open, if not you can generally place your hand on the valve and feel it open. After you have observed main flame for a brief time, trip any of the switches in the limit string to shut the burner down. 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.

## Verify input firing rate

1. Clock the meter for CFH and calculate the input firing rate. Compare the calculated rate to the specified input for the boiler found on the specification sheets and on the rating plates for the burner and boiler. Do not exceed the specified maximum input for the boiler.
2. Attach a manometer to the manifold test port, clock the meter, and adjust the regulated pressure until the specified input level is achieved. Refer to **Table 2**.
3. Be sure to set the breech or furnace pressure to the correct value, since this will have an effect on the manifold pressure.

**Figure 11. Shutter and Band**



## 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.

**Table 2. 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:** The settings in this chart are for reference only. The actual conditions at the installation may require further adjustment by the fully qualified and experienced start-up technician.

**Notice:** The light-off rate must not be set below the low fire recommendation. Lower rates will lengthen the time it takes for gas to get to the burner head and may cause ignition failures.

## NOTICE

### 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 in Figure 10).

Subtract the furnace pressure from the manifold pressure

Compare the result to the data in Figure 12 or 13 as appropriate for your burner.

## NOTICE

### Clocking a gas meter

Before you clock the meter you must make sure that the burner is operating at a steady rate, and that it is the only thing that is using gas that would flow through the meter.

### Uncorrected flow rate

Locate the dial that moves the fastest and determine how many cubic feet are represented by one revolution of its dial.

Use your watch for timing and observe how many cubic feet are used in one minute.

Multiply by 60

**Example:** The dial is a one cubic foot dial, and goes around 7 ½ times in one minute. That gives 7.5 cubic feet per minute. Multiply by 60 to get 450 cubic feet per hour (CFH) as your uncorrected flow rate.

### Pressure correction

Gas is compressible, the higher the pressure on it, the smaller the number of cubic feet it occupies. To correct for that you will need to know the gas pressure at the meter.

If there's a gauge at the meter, read it while the gas is flowing. (If not, measure the gas pressure in the line downstream of the meter before any valves or regulators, with no gas flowing.)

Convert the gas pressure to PSI if you measure it in any other units. (1 PSI = 27.7 inches water column)

Add 14.7 to the meter pressure, divide their sum by 14.7, and multiply that result times the uncorrected flow rate to obtain the pressure corrected flow rate.

**Example:** The meter in the example above is operating at 14" WC.

$14 / 27.7 = .5$  PSI at the gauge;  $14.7 + .5 = 15.2$ ;  $15.2 / 14.7 = 1.034$  correction factor;

$1.034 \times 450 = 465$  CFH corrected for pressure

### Temperature correction

Gas volume also changes with the temperature of the gas. Most gas meters are temperature compensated, and say so on the face of the index and don't require temperature correction. The temperature we correct to is 60° F. That's close to the temperature of the ground, so usually it's not necessary to correct for temperature from underground lines.

Measure the gas temperature at the meter.

Add 460 to the gas temperature and divide 520 by the result to obtain the correction factor.

Multiply the pressure corrected flow rate times the temperature correction factor.

**Example:** The meter in the example is connected to an above ground line on a hot day and shows 100° F gas temperature.  $460 + 100 = 560$ ;  $520 / 560 = .929$ ;  $465 \times .929 = 432$  CFH corrected for pressure and temperature.

This figure is often called SCFH (for standard cubic feet per hour).

## NOTICE

### BTU's and MBH

The BTU content of natural gas varies from one location to another, and even from day to day at a fixed location. For firing estimates it is usually assumed to be 1000 BTU's per standard cubic foot.

To calculate BTU/Hr firing rates multiply SCFH times 1000.

**Example:**  $432 \text{ SCFH} \times 1000 = 432,000 \text{ BTU/Hr}$ .

MBH stands for thousands of BTU's per hour. Since 1 cubic foot of natural gas contains 1000 BTU, 1 MBH equals 1 SCFH of gas flow.

**Example:**  $432 \text{ SCFH} = 432 \text{ MBH}$

Figure 12. Manifold to Furnace Pressure Drop vs. Rate - Stepped Spud Design

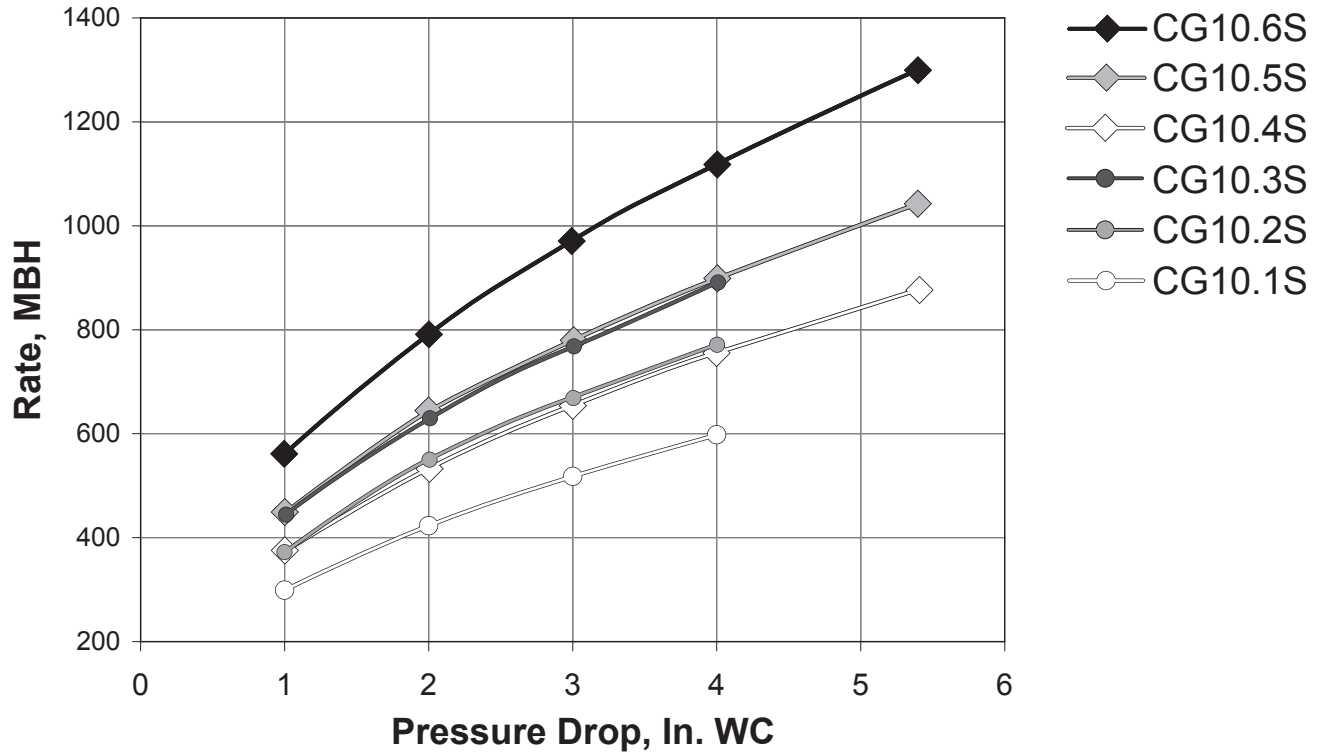
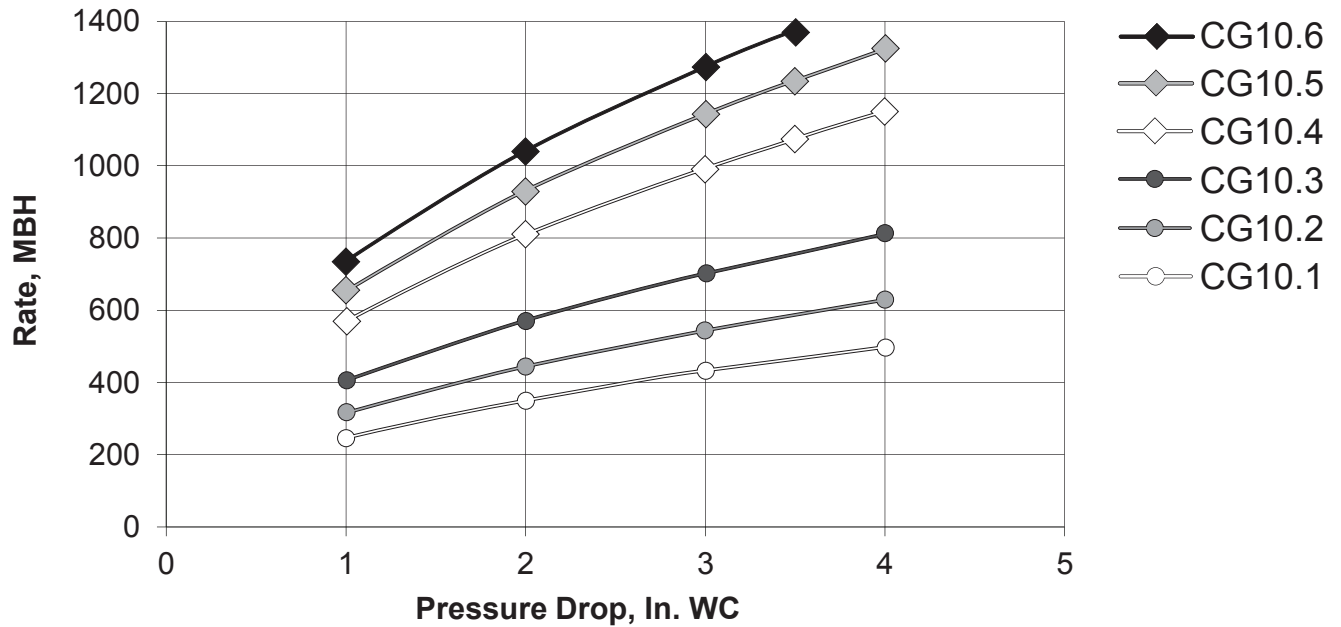


Figure 13. Manifold to Furnace Pressure Drop vs. Rate - Swirl Vane Head Design



## Check operation and safety controls



### WARNING

### Testing by Qualified Technician Required.

*Failure to properly test and verify the correct function of operation and safety controls could lead to equipment malfunction and result in asphyxiation, explosion or fire.*

- The testing of operation and safety controls requires technical training and experience with commercial gas burning systems.
- Carefully follow the manufacturer's instructions supplied with the controls.
- Verify the correct function of all operation 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.
- Refer to **Figure 7** and **Figure 10** for typical test points and component locations.

1. **High limit** – 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.

### NOTICE

Operating controls should be set to minimize the number of firing cycles that the burner runs. High cycling rates increase the possibility of light-off lock outs.

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. **Airflow proving switch** – With the burner firing at its lowest rate, loosen the tubing connection to the airflow proving switch. A loss in air pressure at the tubing should immediately cause the diaphragm in the switch to open and recycle or lockout the safeguard control.
5. **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.
6. **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).
7. **Leak-test valve** – With the burner firing and manometer attached to the leak-test valve port, turn the burner electrical switch off and observe that the gas pressure does not increase after several minutes. This proves total closure of the main gas valve.
8. **Flame safeguard safety lockout** – Simulate a flame failure by turning the main gas supply off. The control should shut the burner off on safety within the safety lockout time.
9. **Flame sensor circuit (flame rod)** – With the burner power switch turned off, refer to the wiring diagram supplied with the control and locate the sensor connection terminals. Place DC voltmeter probes in the flame amplifier test jacks. With the burner firing, the flame signal should be steady and at least 1.25 VDC.
10. **Flame sensor circuit (UV scanner)** – With the burner power switch turned off, refer to the wiring diagram supplied with the control and locate the sensor connection terminals. Place DC voltmeter probes in the flame amplifier test jacks. With the burner firing, the flame signal should be steady and at least 1.25 VDC.

## Use test instruments to set combustion:

### 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.

Verify that all boiler sections, canopy, and access plates or doors are fully equipped with gaskets and sealed against any leakage, which could affect the combustion test results. Before making these tests, operate the burner for several minutes to allow the heating system temperature to stabilize or nearly reach steady-state levels. Record all results in the start-up log for future reference.

- **Draft** – Set the breech or furnace pressure to the level specified by the appliance manufacturer. Typical example: +0.10" W. C.
- **Oxygen** – It is recommended that you measure the oxygen (O<sub>2</sub>) early in the test sequence because high levels of carbon monoxide can be created at very low or even very high O<sub>2</sub> levels. The typical operating range is between 2.5% – 4.5 %. The equivalent carbon dioxide (CO<sub>2</sub>) operating range is 9% – 10.5%.

### NOTICE

High excess air levels reduce the flames UV output and the scanner signal that proves the burner is firing.

- **Carbon monoxide (CO)** – An operating range of 0 -50 PPM is recommended for the CG10 burner. The maximum carbon monoxide (CO) level permitted in the flue gas by the UL 795 Standard is 400 PPM (.04%).
- **Stack Temperature** – The stack temperature should be within the range specified by the appliance manufacturer. It is influenced by input firing rate, flame shape, excess air ratio, and cleanliness of boiler flue passages. This temperature, combined with the ambient temperature, and O<sub>2</sub>% (or CO<sub>2</sub>) is used in calculating the appliance efficiency.

## Recommended combustion test sequence:

1. Adjust the draft or breech pressure to the appliance manufacturer's recommended level.
2. Measure the carbon monoxide level and adjust air settings, if necessary, to regulate it to about 50 PPM for a starting point.
3. Measure the O<sub>2</sub> or CO<sub>2</sub> at the 50 PPM CO level. For this discussion, assume the O<sub>2</sub> is 1.5% (11% CO<sub>2</sub>).
4. 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.
5. Sample the CO level again. It should be in the 0 to 20 PPM range.
6. Check the draft to ensure it still meets specifications. If a major change in draft is required, repeat the above steps.
7. Perform any final adjustments and lock the air settings securely. Run the burner through several cycles to verify prompt ignition and stable burner operation.



# Maintenance and Service

## **WARNING** Annual Professional Service Required



***Tampering with or making incorrect adjustments could lead to equipment malfunction and result in asphyxiation, explosion or fire.***

- 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.
- 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** Turn Off Electric and Gas Supply Before Servicing

***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.

### Annual maintenance

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

#### ○ Burner:

1. Run the burner and perform a complete combustion test using the proper instruments before proceeding. If necessary refer to the section labeled Start the Burner. Record the results for reference.

2. Inspect and clean all dirt accumulation from the gas train, burner exterior, burner air band/shutter, and surrounding area.
3. Remove the blower motor and clean any accumulated matter from the blower wheel and motor end bell.
4. Check wheel for damage and the hub setscrew for tightness. If the blower wheel must be removed from the motor shaft, insure that clearance specifications are maintained.
5. Clean the inside surfaces of the burner housing scroll and especially the air intake area and airflow proving switch suction tube.
6. If the blower motor does not have permanently lubricated bearings, oil the motor. Clear any debris from the air vents on the motor body.
7. Clean the ignition transformer, baseplate, and terminal bushings. Inspect the ignition leads for signs of deterioration and loose terminals.
8. If the burner flame detection is a UV scanner, inspect the mounting and clean the lens according to the component manufacturer's recommendations.
9. Remove the gas gun assembly and clean the entire unit, paying special attention to the air diffuser and spuds.
10. 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 **Figures 14A and 14B**.
11. Inspect the ignition electrode for any damage. Clean all surfaces, set the proper electrode gap, and make sure it is securely fastened.
12. Clean the inside of the air tube and inspect the combustion end for any deterioration. Referring to Figure 2, check the recess dimension from refractory.
13. Inspect gas tube O-ring condition and replace if damaged. Install gas gun assembly back into the burner and use the jacking screw to tighten the gas gun securely in place. (Automotive chassis or bearing grease is suitable for o-ring lubrication.)



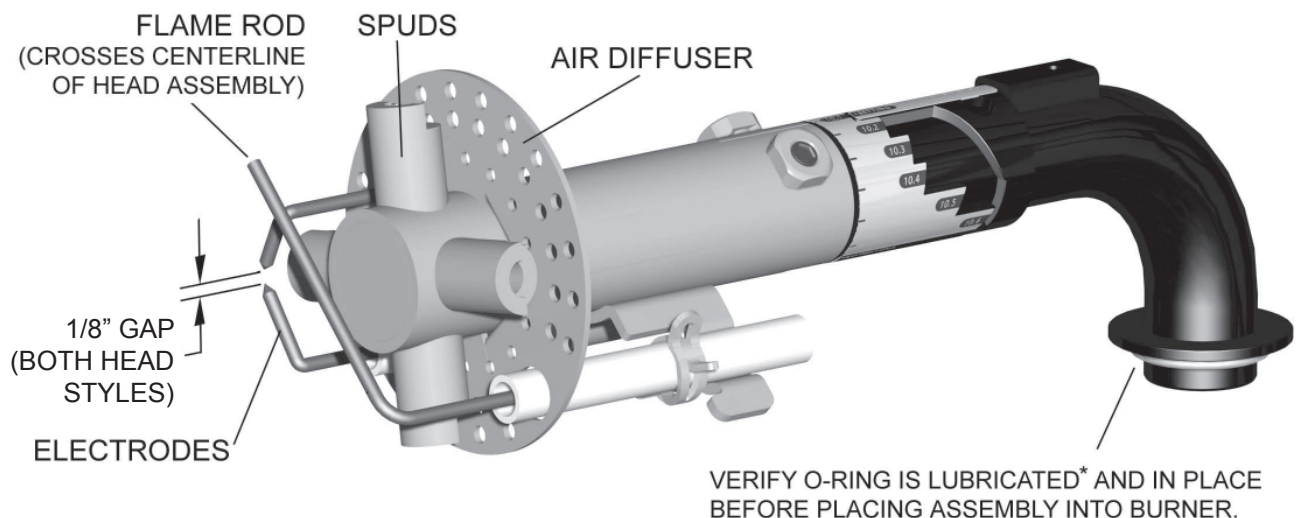
14. Inspect the condition of the appliance mounting plate and burner mounting flange gaskets and replace any damaged materials. See **Figure 6**.
  15. Inspect all burner control wiring and the burner control panel for damaged insulation and loose terminals/connections.
  16. Verify that the source voltage to the burner and control panel is within 10% of the burner rating as listed on the nameplate. (**Figure 1**)
- **Appliance –** (Follow appliance manufacturer's service procedures. The following steps are emphasized because they relate to burner operation)
    1. Check the condition of the combustion chamber refractory, the front-plate insulation, and all gaskets and seals. Repair or replace as necessary
    2. Insure that the flue passages, flue vent pipes, and chimney flues are clean and unobstructed.
    3. Check barometric damper or draft hood for proper operation.
    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:**

Inspect all piping for leakage and proper installation. Perform necessary repairs to comply with all codes.
  - **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 functioning properly, adequately sized, clean, and properly lubricated.
  - **Adjust the burner for proper combustion:**

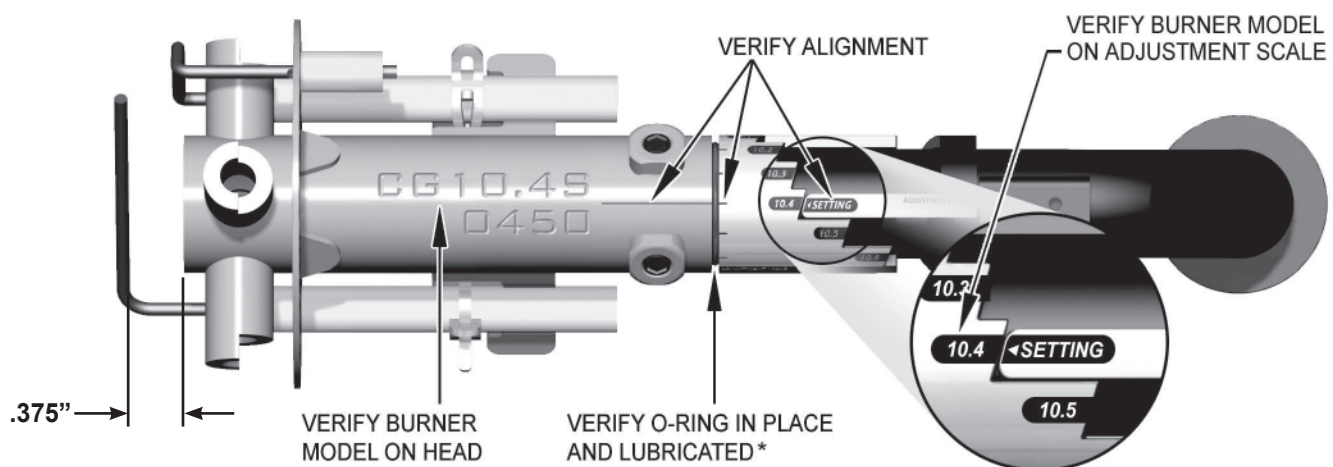
Follow the guidelines under "Start the Burner" to set the combustion levels using test instruments.
  - **Flame safeguard:**

Follow the control manufacturer's instructions and verify that the control is functioning to specifications. See Page 13 for typical sequence of operation and Items 8 through 10 on Page 20 for control system checks.
  - **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.
  - **Ignition Reliability**
    1. Examine ignition electrode insulators for cracks.
    2. Examine ignition wires for worn insulation.
    3. Examine ignition electrodes for wear.
    4. Check ignition transformer functionality.
    5. Verify that the head is centered in the airtube and that the head is not damaged.
    6. Check inlet pressure to the gas train SSOVs.
    7. Verify maximum recommended pipe lengths used in gas trains (**Figure 8**)
    8. Verify low fire light-off rate (**Table 2**)

**Figure 14A – Gas Gun Assembly**



**Figure 14B – Gas Gun Assembly**



\* Automotive chassis or bearing grease is a satisfactory o-ring lubricant.  
- Disassembly of gas gun is not required for cleaning.

**Burner Head Adjustment** - There is an optimum gas orifice size and burner head setting for each firing rate of the CG10 burner. The gas orifice size sets the gas flow velocity; the head setting establishes the airflow velocity. When those velocities are properly matched the burner provides its best performance and stability.

The gas orifice size is built into the burner head. You can verify the correct selection by looking for the burner model number stamped on the top centerline of the stainless steel tube that forms the base of the burner head. It should match the model number on the Beckett burner data label on the blower housing.

The head setting is established by a notched sleeve on the gas tube that can be rotated to positions on a scale marked by the burner's model number. The scale should normally be set to the model number on the Beckett burner data label. (If specific application requirements dictate an alternate head setting it will be noted by a label on the gun assembly.)

For normal service requirements it is not necessary to disassemble the head from the gas tube. If you disassemble the gas gun, make sure that when you re-assemble it:

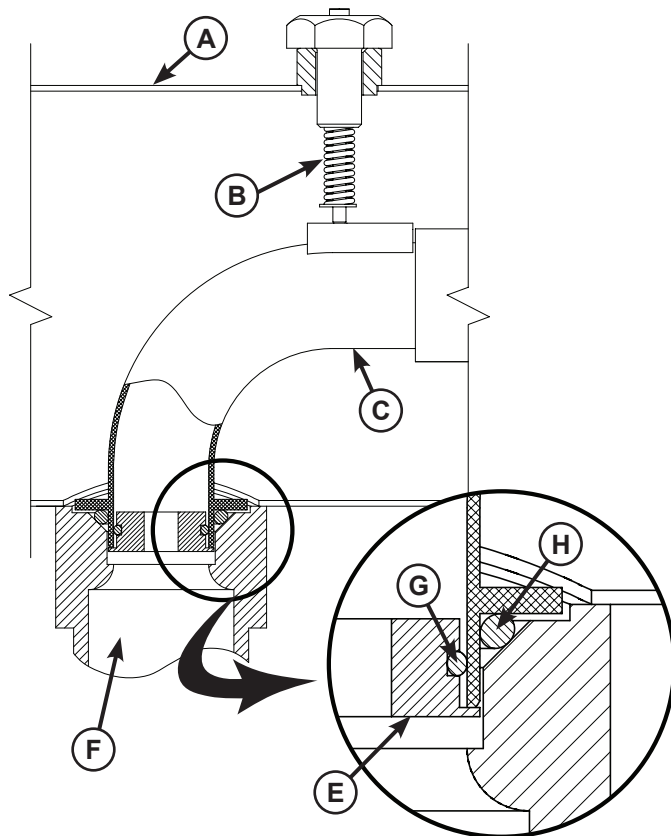
1. The adjustment scale is set to the correct position as indicated by the burner model number or Gun Label.
2. The alignment marks on the head, scale and stop are in alignment.
3. The O-ring between the head and the adjustment scale is in place, is lubricated with grease, and is compressed between the head and scale as the setscrews that retain the head are tightened.

## Propane Restrictor Description

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, adjustments and settings for propane use will be the same as the adjustments and settings for natural gas use as detailed in the burner manual.

**⚠ WARNING** 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.

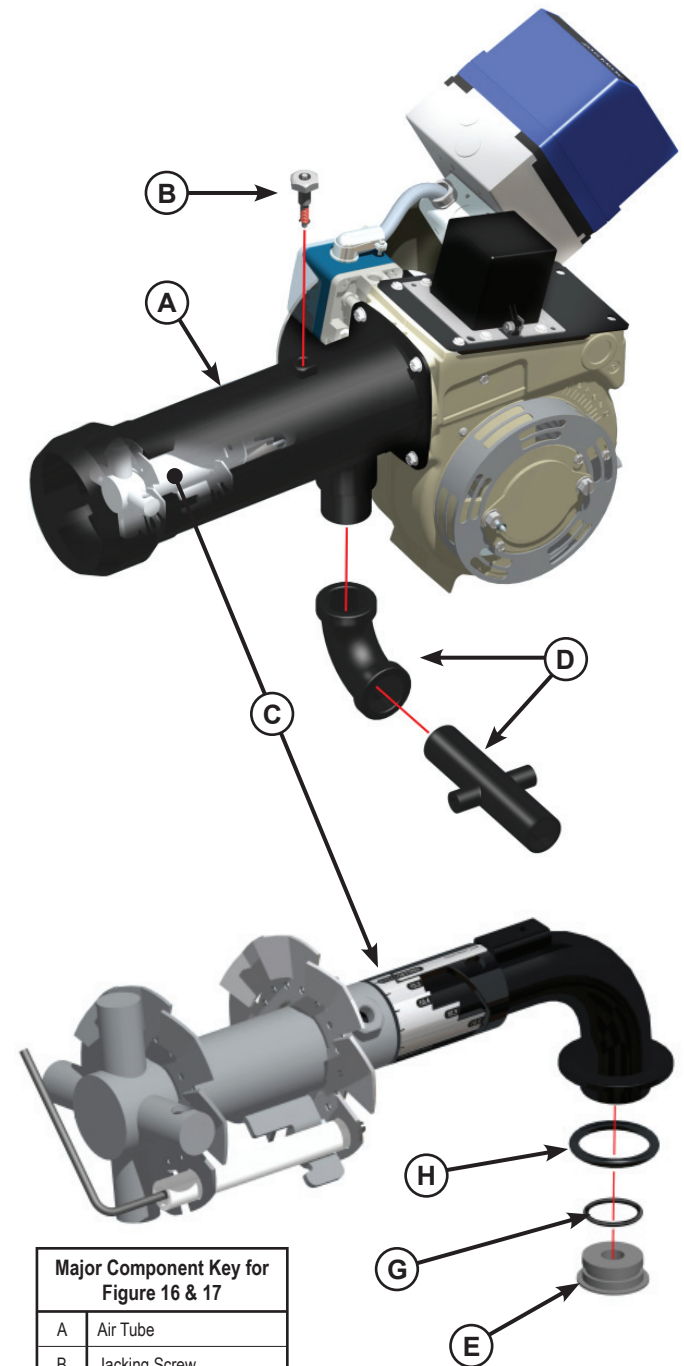
Figure 15 – Propane Conversion Major Components



## 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.

Figure 16 – Component Locations



Major Component Key for Figure 16 & 17	
A	Air Tube
B	Jacking Screw
C	Internal Gas Tube
D	External Gas Manifold
E	Propane Restrictor
F	Union
G	Restrictor O-ring
H	Gas Tube O-ring

**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 3**.

**NOTICE**

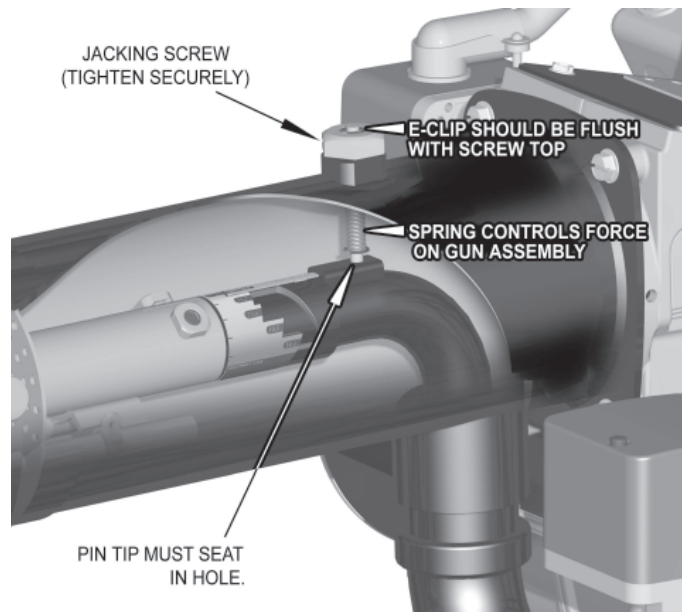
The gun assembly is secured inside the air tube by a spring-loaded jacking screw. It is spring loaded in order to control the force it can impose on the gun assembly. When installing the jacking screw look inside the air tube to verify that the pointed tip of the jacking screw pin is seated into the 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 17**.

Refer to **Figures 15** and **16** when performing the following steps.

1. Remove the jacking screw (**B**) from the air tube/manifold assembly to free the internal gas tube (**C**).
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 16**, 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 15**. 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 adjacent to the rating plate.
9. Complete and attach the supplied Adjustment Data

**NOTICE**

With the gas restrictor installed, as shown in **Figure 15**, all burner air adjustments and gas manifold pressure adjustments for propane will be approximately the same as the natural gas adjustments 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 <http://www.beckettcorp.com/protect/tech.asp>. If further Technical assistance is required, call 800-645-2876, Monday thru Friday, 8AM to 5PM EST.

**Figure 17 – Gas Gun Assembly Installation****Table 3 - Propane Restrictors Replacement Part Numbers**

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

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. The screw can be tightened firmly without putting excessive pressure on the gun assembly that might distort the gun or damage its O-ring seals. 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 hole 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 on the center pin should come flush with the top of the screw.



## For the OPERATOR

### **⚠ WARNING** Inspect Heating System Regularly

***Lack of regular inspections and inadequate maintenance could lead to equipment malfunction and result in asphyxiation, explosion or fire.***

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

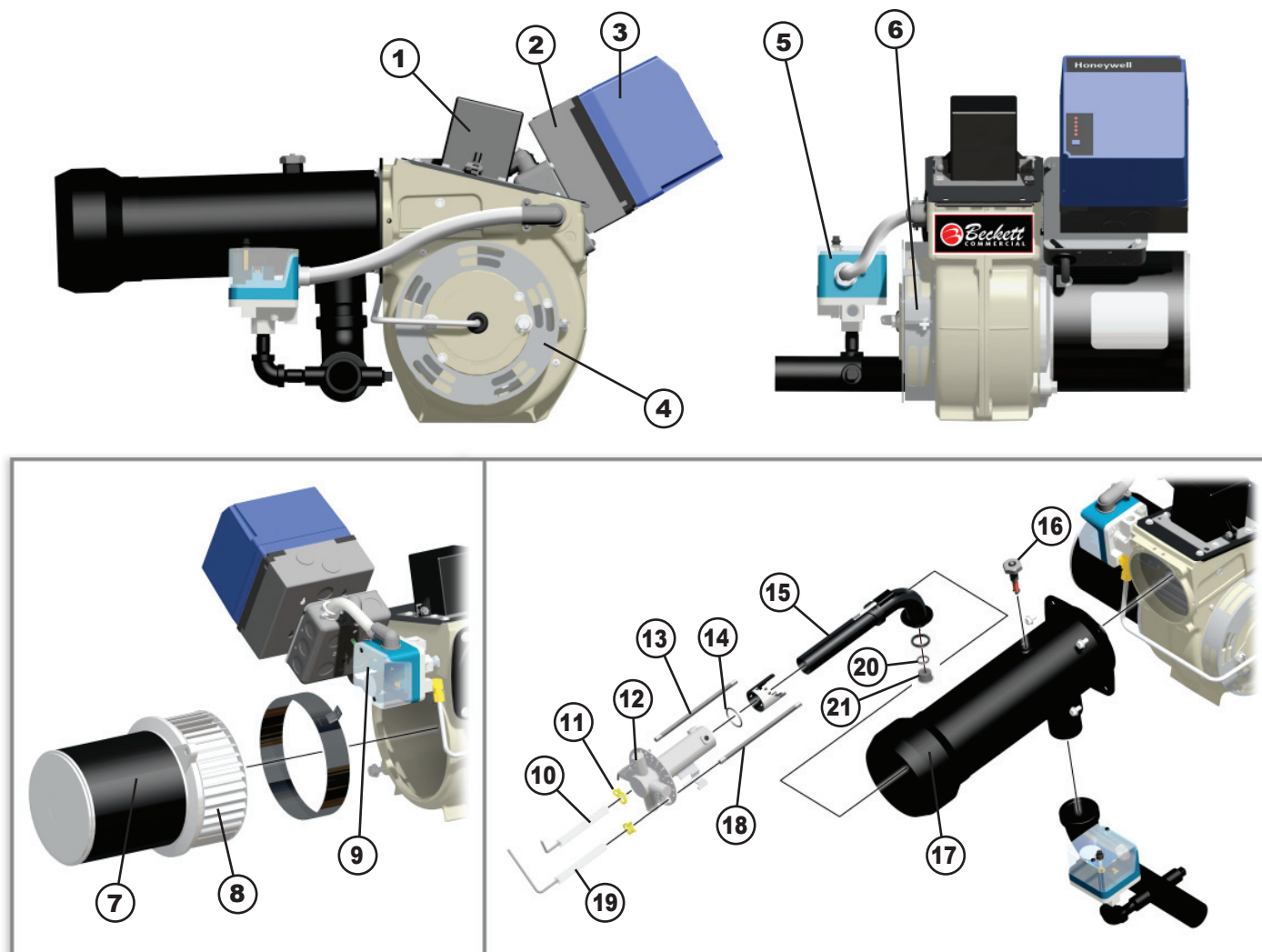
- The following checklist is intended to be used as a minimum reference guide only and does not supersede or replace the heating appliance manufacturer's recommended service and maintenance instructions or any code requirements.
- Consult the installation and service instructions provided by the individual 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.

**Table 4 - Periodic Inspection Sheet**

Test/Inspection	Frequency	Comments
Inspect area surrounding heating plant	Daily	Keep area clean and free of clutter
Inspect gas supply system for leaks	Daily	Use visual and electronic leak detection
Inspect appliance & piping for water leaks	Daily	Keep burner and controls dry at all times
Inspect gauges, indicators, monitors	Daily	Note condition. Replace defective parts
Check temperature and pressure levels	Daily	Compare to manufacturer's specifications
Make visual inspection of flame	Daily	Look for changes in shape, size, and color.
Monitor burner start-up	Daily	Verify prompt ignition and flame stability.
Monitor stack temperature	Daily	Compare to start-up and trend level.
Test low water cutoff and alarm	Daily	Follow control manufacturer's instructions & procedures in ASME Boiler & Pressure Vessel Code, Section VI - Recommended Rules for Care and Operation of Heating Boilers.
Calculate fuel gas input firing rate	Weekly	Compare to appliance manufacturer's Specifications
Check flame safeguard sequence of operation.	Weekly	Follow control manufacturer's instructions
Flame failure response & lockout timing.	Weekly	Follow control manufacturer's instructions
Flame sensor signal level (if meter is hard-wired)	Weekly	Compare to control manufacturer's specifications
Main fuel gas valves	Weekly	Open high limit and verify cutoff operation
Inspect exhaust vent system for blockage	Weekly	Remove any restrictions
Inspect combustion air supply	Monthly	Remove any restrictions
Check high and low gas pressure interlocks	Monthly	Follow control manufacturer's instructions
Check safety valves	As needed	Follow control manufacturer's instructions & procedures in ASME Boiler & Pressure Vessel Code, Section VI - Recommended Rules for Care and Operation of Heating Boilers.

# Replacement Parts

For best performance specify genuine *Beckett* replacement parts.



Item	Description	Part #
1	Ignition Transformer	7503U
2	Control Subbase	See Note 1
3	Primary Control	See Note 1
4	Shutter	3215U
5	High Gas Pressure Switch	2190903U
6	Air Band	3819A
7	Motor - 120v - 220v	21341U 21654U
8	Blower Wheel - CG10 - CG10A or CG10B	21448U 21339U
9	Air Proving Switch	2190901U
10	Electrode Set	Spec. Applic.

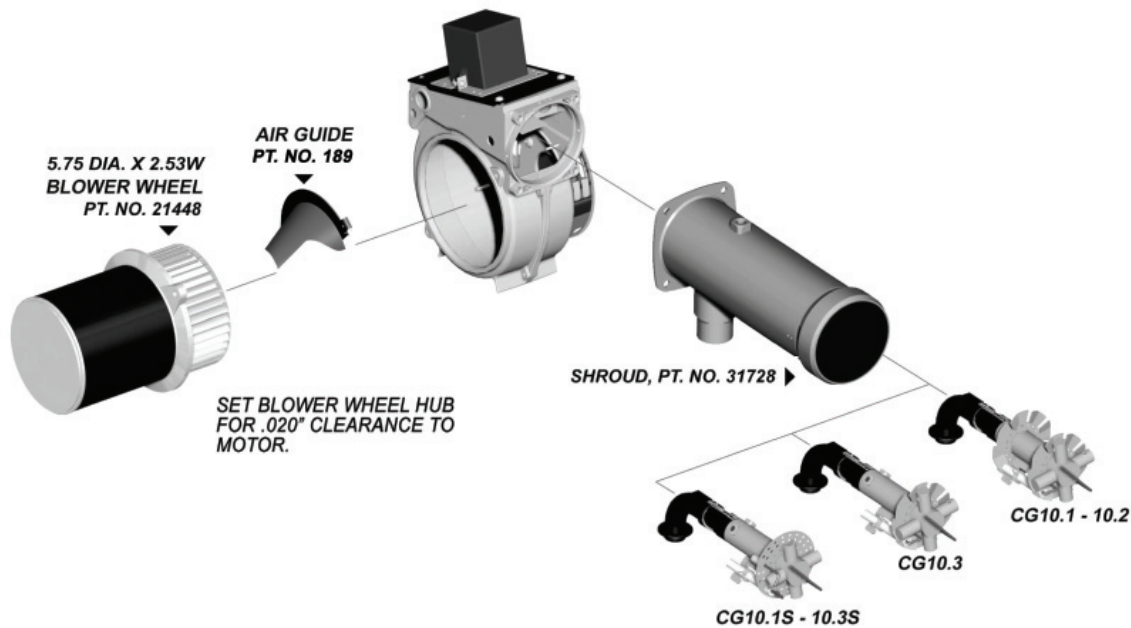
Item	Description	Part #
11	Spring Clamps (4 in pkg.)	3236501U
12	Head	Spec. Applic.
13	Cable, Ignition Electrode	5990130U
14	O-ring set (2 in package)	32264U
15	Gas Tube assembly	5193201U
16	Jacking Screw	5193401U
17	Air Tube	Spec. Applic.
18	Cable, Flame Rod (if used)	5990280U
19	Flame Rod (if used)	2191301U
	UV Scanner (not shown)	7247U
20	Restrictor O-Ring (LP Only)	3226409U
21	Propane Restrictor (LP Only)	See <b>Table 3</b>

**Note 1:** Refer to the UL Label for controller model number.

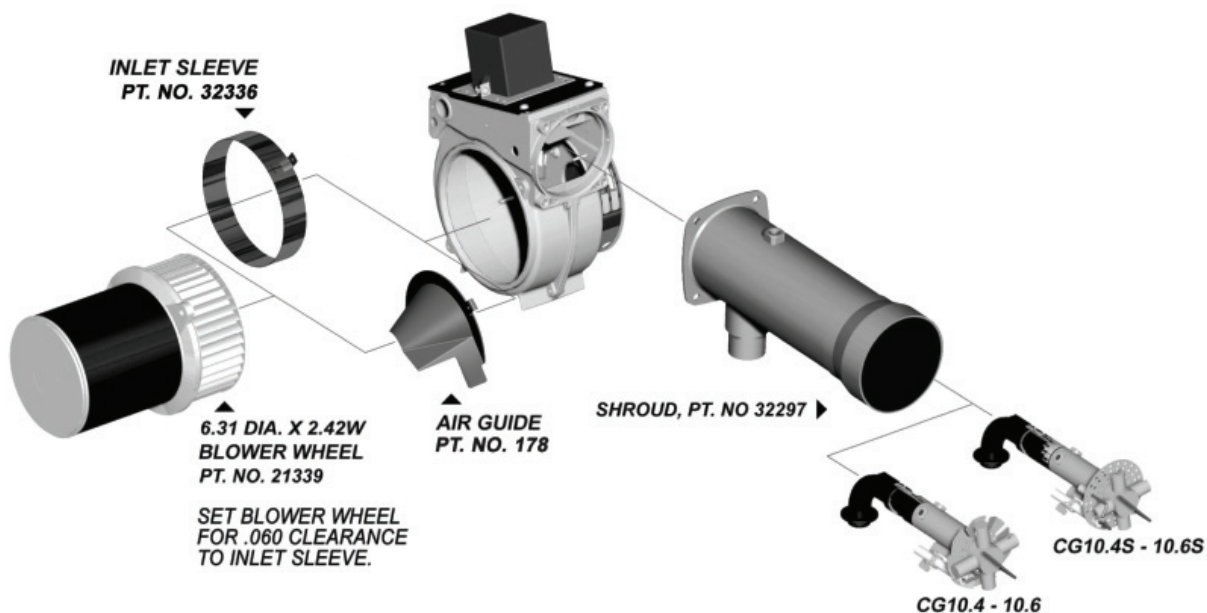
# Burner Configurations

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. Three air tube shrouds shape and stabilize the base of the flame. Twelve gun assemblies provide mixing control and retain the flame. See chart on opposite page.

## Low Rate Burner Configuration; 300 to 800 MBH Applications



## High Rate Burner Configuration; 600 to 1200 MBH Applications





The table below shows proven combinations of the components and the nominal firing rate ranges they serve. These combinations may vary and may be used outside of the nominal listed ranges based on results of specific applications tests conducted for OEM appliance manufacturers.

### Air Platform Configurations

Air Platform	Blower Wheel	Air Inlet
CG10	21448	189 Air Guide
CG10A	21339	32336 Straight Inlet
CG10B	21339	178 Air Guide

### Burner Configurations

	Burner Model	Air Tube Shroud	Gas Gun Assembly	Nominal Capacity, MBH
CG10 Chassis	CG10.1	31728	CG10.1S	300-378
			CG10.1	
	CG10.2	31728	CG10.2S	379-476
			CG10.2	
	CG10.3	31728	CG10.3S	477-600
			CG10.3	
CG10 A or B Chassis	CG10.4	32297	CG10.4S	601-756
			CG10.4	
	CG10.5	32297	CG10.5S	757-952
			CG10.5	
	CG10.6	32297	CG10.6S	953-1200
			CG10.6	

Note: "s" suffix refers to the Step Spud Design



# 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.**

THIS WARRANTY IS LIMITED TO THE PRECISE TERMS SET FORTH ABOVE, AND PROVIDES EXCLUSIVE REMEDIES EXPRESSLY IN LIEU OF ALL OTHER REMEDIES, AND IN PARTICULAR THERE SHALL BE EXCLUDED THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT WILL BECKETT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGE OF ANY NATURE. Beckett neither assumes, nor authorizes any person to assume for Beckett, any other liability or obligation in connection with the sale of this equipment. Beckett's liability and Customer's exclusive remedy is limited to the cost of the product.



**USA:** P.O. Box 1289 • Elyria, Ohio 44036

**Canada:** R.W. Beckett Canada, Ltd. • Unit #3, 430 Laird Road • Guelph, Ontario N1G 3X7  
**[www.beckettcorp.com](http://www.beckettcorp.com)**