

# Operator's Manual

## Indirect-Fired Air Heaters

### HI 400 HD D

### HI 400 HD G



**Copyright notice**

© Copyright 2010 by Wacker Neuson Corporation.

All rights, including copying and distribution rights, are reserved.

This publication may be photocopied by the original purchaser of the machine. Any other type of reproduction is prohibited without express written permission from Wacker Neuson Corporation.

Any type of reproduction or distribution not authorized by Wacker Neuson Corporation represents an infringement of valid copyrights. Violators will be prosecuted.

---

**Trademarks**

All trademarks referenced in this manual are the property of their respective owners.

---

**Manufacturer**

Wacker Neuson Corporation

N92W15000 Anthony Avenue

Menomonee Falls, WI 53051 U.S.A.

Tel: (262) 255-0500 · Fax: (262) 255-0550 · Tel: (800) 770-0957

[www.wackerneuson.com](http://www.wackerneuson.com)

---

**Original instructions**

This Operator's Manual presents the original instructions. The original language of this Operator's Manual is American English.

---

## Foreword



This heater is designed and approved for use as a construction heater in accordance with Standard ANSI Z83.7–CSGA 2.14. CHECK WITH YOUR LOCAL FIRE SAFETY AUTHORITY IF YOU HAVE QUESTIONS ABOUT APPLICATIONS.

Other standards govern the use of fuel gases and heat producing products in specific applications. Your local authority can advise you about these.

**THE INSTALLATION OF THE UNIT SHALL BE IN ACCORDANCE WITH THE REGULATIONS OF THE AUTHORITIES HAVING JURISDICTION.**

**WARNING**

Risk of personal injury or machine damage from improper use.

- ▶ Before using the machine, read and understand all instructions and follow them carefully.
- ▶ The manufacturer is not responsible for damages to goods or persons due to improper use of this machine.

**WARNING**

Failure to comply with the precautions and instructions provided with this machine can result in death, serious injury, and property loss or damage from fire, explosion, burns, asphyxiation, carbon monoxide poisoning, and/or electric shock.

- ▶ Before using the machine, read and understand all precautions and instructions that have been provided. Follow them carefully.
- ▶ Only persons who can understand and follow the precautions and instructions should use or service this machine.
- ▶ Contact the manufacturer if you need assistance with operating the machine or need replacement manuals or labels.

**WARNING**

Work site fire, burn, inhalation, and explosion hazards.

- ▶ Keep solid combustibles, such as building materials, paper, or cardboard at a safe distance away from the machine as recommended by the instructions.
- ▶ Never use this machine in spaces which do or may contain volatile or airborne combustibles, or products such as gasoline, solvents, paint thinner, dust particles, or unknown chemicals.

**WARNING**

Not for use in homes or recreational vehicles. Installing this machine in a home or RV may result in fire, explosion, property damage, personal injury, or death.

- ▶ Operate the machine only for applications specified in *Machine Description and Intended Use*.

## Foreword

### Machines covered by this manual

This manual covers machines with the following item numbers:

Machine	Item Number
HI 400HD D	0620868
HI 400HD G	0620701

### Machine documentation

- Keep a copy of the Operator's Manual with the machine at all times.
- Use the separate Parts Book supplied with the machine to order replacement parts.
- If you are missing any of these documents, please contact Wacker Neuson Corporation to order a replacement or visit [www.wackerneuson.com](http://www.wackerneuson.com).
- When ordering parts or requesting service information, be prepared to provide the machine model number, item number, revision number, and serial number.

### Expectations for information in this manual

- This manual provides information and procedures to safely operate and maintain the above Wacker Neuson model(s). For your own safety and to reduce the risk of injury, carefully read, understand, and observe all instructions described in this manual.
- Wacker Neuson Corporation expressly reserves the right to make technical modifications, even without notice, which improve the performance or safety standards of its machines.
- The information contained in this manual is based on machines manufactured up until the time of publication. Wacker Neuson Corporation reserves the right to change any portion of this information without notice.

### Manufacturer's approval

This manual contains references to *approved* parts, attachments, and modifications. The following definitions apply:

- **Approved parts or attachments** are those either manufactured or provided by Wacker Neuson.
- **Approved modifications** are those performed by an authorized Wacker Neuson service center according to written instructions published by Wacker Neuson.
- **Unapproved parts, attachments, and modifications** are those that do not meet the approved criteria.

Unapproved parts, attachments, or modifications may have the following consequences:

- Serious injury hazards to the operator and persons in the work area
- Permanent damage to the machine which will not be covered under warranty

Contact your Wacker Neuson dealer immediately if you have questions about approved or unapproved parts, attachments, or modifications.

<b>Foreword</b>	<b>3</b>
<b>1 Safety Information</b>	<b>7</b>
1.1 Signal Words Used in this Manual .....	7
1.2 Machine Description and Intended Use .....	8
1.3 Operating Safety .....	9
1.4 Safety Guidelines for Gas-Fired Machines .....	10
1.5 Safety Guidelines for Operating Combustion Burners .....	11
1.6 Service Safety .....	12
<b>2 Labels</b>	<b>14</b>
2.1 Label Locations .....	14
2.2 Label Meanings .....	15
<b>3 Lifting and Transporting</b>	<b>18</b>
3.1 Lifting and Transporting .....	18
<b>4 Operation</b>	<b>19</b>
4.1 Preparing the Machine for First Use .....	19
4.2 Installing the Axle and Wheels .....	19
4.3 Installing the Front Duct Adapter .....	20
4.4 Installing the Rear Duct Adapter (optional) .....	21
4.5 Control / Component Locations .....	22
4.6 Adjusting the Handle Height .....	23
4.7 Positioning the Machine .....	24
4.8 Control Panel—Oil Burner (D Models) .....	26
4.9 Recommended Fuels and Fuel Blending Guide (D models) .....	27
4.10 Inspecting the Fuel Hose .....	27
4.11 Control Panel—Gas Burner (G Models) .....	28
4.12 Gas Installation and Setup (G models) .....	29
4.13 Connecting the Gas Line (G models) .....	30
4.14 Setting the Gas Selector Valve (G models) .....	31
4.15 Suggested Venting .....	32
4.16 Installing the Heater Duct .....	34
4.17 Installing the Remote Thermostat or Receptacle Cap .....	35
4.18 Connecting Power to the Machine (Preheating) .....	36
4.19 Starting the Machine in Extremely Cold Weather .....	37
4.20 Before Starting .....	38

4.21	Starting the Machine (D models) .....	39
4.22	Starting the Machine (G models) .....	40
4.23	Stopping .....	41
4.24	Burner Fault .....	41
4.25	Installing and Using the Remote Thermostat .....	42
<b>5</b>	<b>Accessories</b>	<b>43</b>
5.1	Available Accessories .....	43
<b>6</b>	<b>Burner Setup</b>	<b>44</b>
6.1	Removing the Access Panel .....	44
6.2	Removing and Installing the Burner .....	45
6.3	Inspecting the Oil Burner Electrodes (D models) .....	48
6.4	Checking/Changing the Burner Nozzle (D models) .....	49
6.5	Adjusting the Burner Air Damper Setting .....	50
6.6	Adjusting the Fuel Pressure (D models) .....	51
<b>7</b>	<b>Maintenance</b>	<b>53</b>
7.1	Periodic Maintenance Schedule .....	53
7.2	Changing the Fuel Heater Filter (D models) .....	54
7.3	Inspecting and Cleaning the Cadmium (CAD) Cell .....	55
7.4	Cleaning the Fan Blades and Motor .....	56
7.5	Cleaning the Interior Shell .....	57
7.6	Inspecting the Flame Head .....	58
7.7	Inspecting the Electrical Connections .....	59
7.8	General Cleaning Guidelines .....	59
<b>8</b>	<b>Technical Data</b>	<b>62</b>
8.1	Machine .....	62
<b>9</b>	<b>Schematics</b>	<b>63</b>
9.1	HI 400HD D—Oil Burning .....	63
9.2	Components—Oil Burning .....	64
9.3	HI 400HD G—Gas Burning .....	65
9.4	Components—Gas Burning .....	66

## 1 Safety Information

### 1.1 Signal Words Used in this Manual

This manual contains DANGER, WARNING, CAUTION, *NOTICE*, and NOTE signal words which must be followed to reduce the possibility of personal injury, damage to the equipment, or improper service.



This is the safety alert symbol. It is used to alert you to potential personal hazards.  
► Obey all safety messages that follow this symbol.



#### **DANGER**

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

- To avoid death or serious injury from this type of hazard, obey all safety messages that follow this signal word.



#### **WARNING**

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

- To avoid possible death or serious injury from this type of hazard, obey all safety messages that follow this signal word.



#### **CAUTION!**

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

- To avoid possible minor or moderate injury from this type of hazard, obey all safety messages that follow this signal word.

**NOTICE:** Used without the safety alert symbol, NOTICE indicates a situation which, if not avoided, could result in property damage.

**Note:** A Note contains additional information important to a procedure.

## 1.2 Machine Description and Intended Use

**Machine description** The HI Heater is an indirect-fired air heater. Depending on the model, the machine operates either on diesel fuel (oil) or natural gas / liquid propane (LP). The machine consists of the following components:

- Stainless steel combustion chamber and heat exchanger
- Blower
- Two-stage burner (oil model)
- High-temperature shut-down device
- Fuel tank (oil model)
- Gas selector valve (gas model)

Fuel is consumed in a closed combustion chamber. Room air or outside air (depending on the application) is pulled into the machine where it is heated. This clean, dry, hot air is then blown into the space to be heated by the blower. Access to the blower assembly is protected by a guard fitted on the air inlet.

**Intended use** The HI Heater is intended to provide heat on outdoor or indoor construction sites (if properly vented) and in other rugged applications.

This machine has been designed and built strictly for the intended use described above. Using the machine for any other purpose could permanently damage the machine or seriously injure the operator or other persons on the work site. Machine damage caused by misuse is not covered under warranty.

Do not use this machine indoors without proper exhaust venting designed for indoor use which meets all applicable regulations.

This machine has been designed and built in accordance with the latest global safety standards. It has been carefully engineered to eliminate hazards as far as practicable and to increase operator safety through protective guards and labeling. However, some risks may remain even after protective measures have been taken. They are called residual risks. On this machine, they may include exposure to:

- exhaust emissions
- hot surfaces such as exhaust vents and fuel heater
- fuel and fuel fumes when refueling
- high voltages and arc flash

To protect yourself and others, make sure you thoroughly read and understand the safety information presented in this manual before operating the machine.

**Optional accessories** Wacker Neuson Corporation offers many optional accessories for the machine. These accessories include the following:

- Remote thermostat
- Duct adapters (various sizes, available as kits, or individual ducts at 25 ft. lengths).
- Exhaust vents and elbows

Contact your Wacker Neuson dealer for more information.



### 1.3 Operating Safety

**Operator training**

Before operating the machine:

- Read and understand the operating instructions contained in all manuals delivered with the machine.
- Familiarize yourself with the location and proper use of all controls and safety devices.
- Contact Wacker Neuson Corporation for additional training if necessary.

When operating this machine:

- Do not allow improperly trained people to operate the machine. People operating the machine must be familiar with the potential risks and hazards associated with it.

**Machine condition**

Only operate the machine when:

- All safety devices and guards are in place and in working order.
- All controls operate correctly.
- The machine is set up correctly according to the instructions in the Operator's Manual.
- The machine is clean.
- The machine's labels are legible.

When operating the machine:

- Do not modify or defeat the safety devices.
- Do not use worn electrical cords.
- Do not use faulty fuel supplies.

**Guidelines for operator**

When operating the machine:

- Remain aware of the machine's moving parts. Keep hands, feet, and loose clothing away from the machine's moving parts.
- Wear protective clothing appropriate to the job site when operating the machine.
- Wear safety glasses.

When operating the machine:

- Do not operate a machine in need of repair.
- Do not smoke near the machine.

**Personal Protective Equipment (PPE)**

Wear the following Personal Protective Equipment (PPE) while operating this machine:

- Close-fitting work clothes that do not hinder movement
- Safety glasses with side shields
- Hearing protection
- Safety-toed footwear

**Work space**

Follow the guidelines below when placing the machine in the workspace.

- Position the machine on a firm, noncombustible, level surface.

- Keep the area immediately surrounding and underneath the machine clean, neat, and free of debris and combustible materials.
- Keep the area above the machine clear of debris that could fall on the machine.
- Keep unauthorized personnel, children, and animals away from the machine.
- Do not connect ductwork between the exhaust outlet port and the supply air inlet port.
- Do not position the electrical cords under the machine or over the top of the machine.

## While operating the machine

- Inspect the machine before startup, and monitor it regularly during operation.
- Never exceed the maximum heat output of the machine.
- Never operate the machine in areas that contain flammable objects, fuels, or products that produce flammable vapors.

## After use

- Disconnect power from the machine.
- Store the machine properly when it is not being used.

## 1.4 Safety Guidelines for Gas-Fired Machines



### WARNING

Gas leaks can cause explosions or fire. Follow the steps below if you smell gas.

- ▶ Open windows.
- ▶ Do not touch electrical switches.
- ▶ Extinguish open flames.
- ▶ Immediately call your gas supplier.



### WARNING

Risk of explosion, fire, property damage, asphyxiation, death, or carbon monoxide poisoning.

- ▶ Read and follow the instructions below regarding proper gas supply and preparation of the machine.

Proper gas supply must be provided to the inlet of the machine. Refer to the rating plate for the correct gas supply pressure.

- Gas pressure above the maximum specified on the rating plate can cause fire or explosions, leading to serious injury, death, or property loss.
- Gas pressure below the minimum specified on the rating plate may cause improper combustion, leading to asphyxiation or carbon monoxide poisoning.

Before operating the machine, read and follow all instructions in the *Operation* chapter. Important points to note are:

- Position the machine correctly before each use.
- Provide proper venting for both indoor and outdoor use.
- Do not operate the machine with exterior panels removed.
- Disconnect all electrical power from the machine before opening doors or removing panels.

## 1.5 Safety Guidelines for Operating Combustion Burners

When using the machine:

- Clean up any spilled fuel immediately.
- Replace the fuel tank cap after refueling the machine.
- Refill the fuel tank in a well-ventilated area.
- Make sure you have proper certification or licensing required by the locality, state, or province in which the machine is being installed to work with natural gas or Liquid Petroleum (LP).

When using the machine:



---

**DANGER**

Exhaust gas from the burner (and generator, if equipped) contains carbon monoxide, a deadly poison. Exposure to carbon monoxide can kill you in minutes.

- ▶ Never run the machine indoors or in an enclosed area unless the machine is vented properly according to local and national codes.
- 

- Do not fill or drain the fuel tank near an open flame, while smoking, or while the machine is running.
- Do not smoke when refueling the machine.

## 1.6 Service Safety

### Personal Protective Equipment (PPE)

Wear the following Personal Protective Equipment (PPE) while servicing or maintaining this machine:

- Close-fitting work clothes that do not hinder movement
- Safety glasses with side shields
- Hearing protection
- Safety-toed footwear

In addition, before servicing or maintaining the machine:

- Tie back long hair.
- Remove all jewelry (including rings).

### Licensing/training/

- Only qualified personnel who possess the proper certification or license required by the locality, state, or province in which the machine is being installed are allowed to make connections to natural gas or LP.
- Only trained personnel should troubleshoot or repair electrical problems occurring with the machine.

### Cleaning

When cleaning and servicing the machine:

- Keep the area around the burner free of debris such as leaves, paper, cartons, etc.
- Keep the machine clean and labels legible.

When cleaning the machine:

- Do not clean the machine while it is running.
- Never use gasoline or other types of fuels or flammable solvents to clean parts. Fumes from fuels and solvents can become explosive.

### Maintenance guidelines

When maintaining the machine:

- Keep the fuel lines in good condition and properly connected.
- Allow the burner to cool before maintaining the machine.
- Re-install the safety devices and guards after repairs and maintenance.
- Keep all electrical cords away from heat, oil, vibrating surfaces, and sharp edges.
- Inspect all electrical cords before each use and replace damaged cords.

### Replacing parts and labels

When maintaining the machine:

When replacement parts are required for this machine, use only Wacker Neuson replacement parts or those parts equivalent to the original in all types of specifications, such as physical dimensions, type, strength, and material.

- Replace worn or damaged components.
- Replace all missing and hard-to-read labels.
- Replace or repair electrical components with components that are identical in rating and performance as the original component.

**Accessories,  
safety devices  
and  
modifications**

When using the machine:

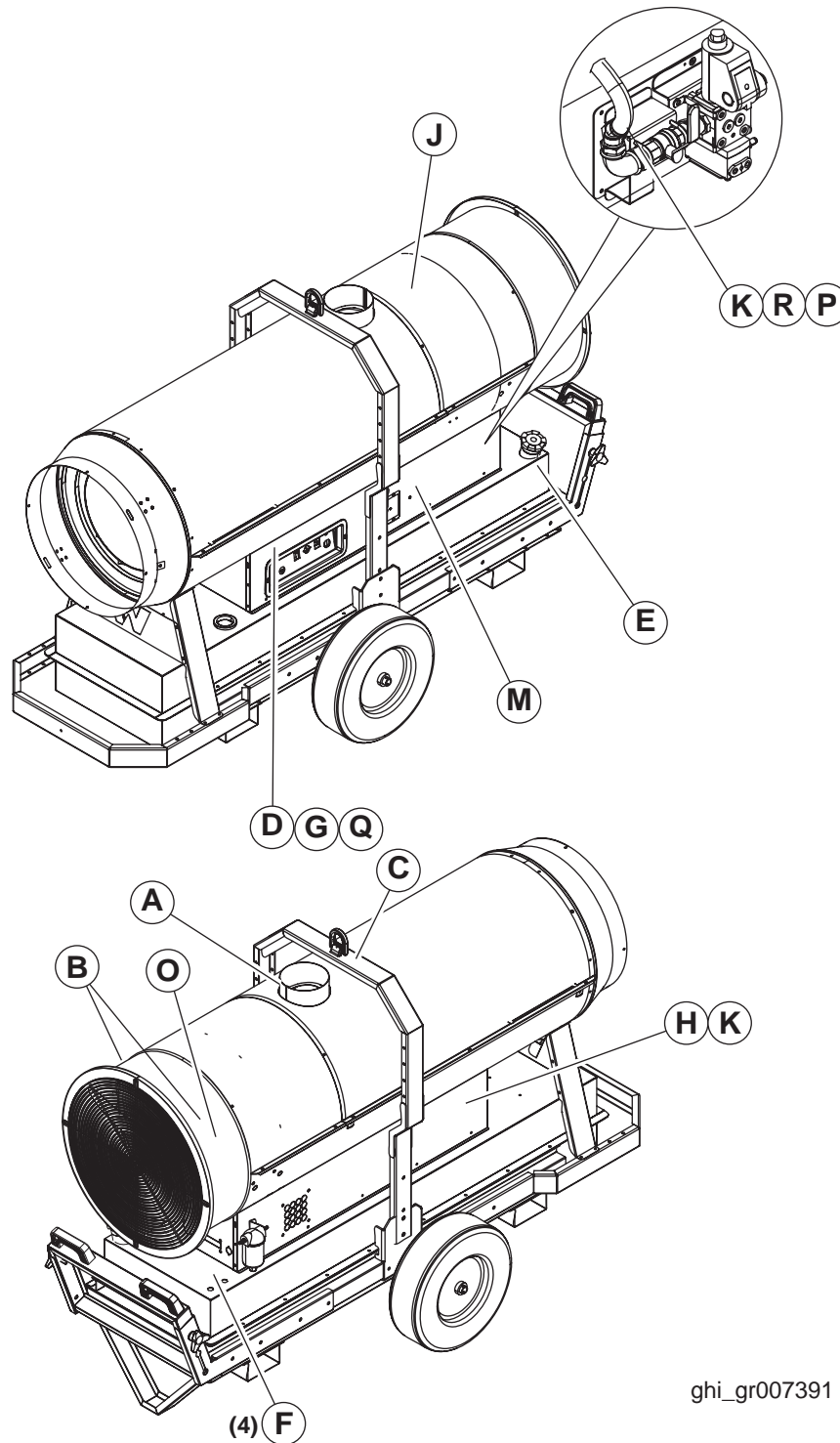
- Use only accessories/attachments that are recommended by Wacker Neuson Corporation.

When using the machine:

- Never operate the machine if any safety devices or guards are missing or inoperative.
  - Do not defeat safety devices.
  - Do not modify the machine without the express written approval of the manufacturer.
-



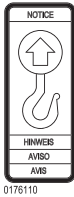



## 2 Labels



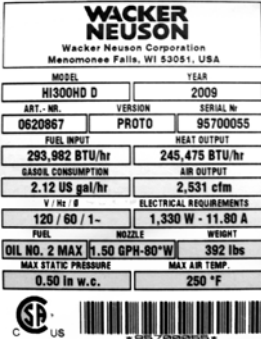
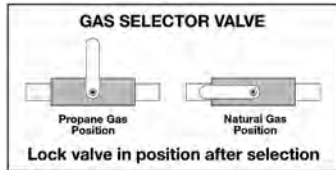

### 2.1 Label Locations





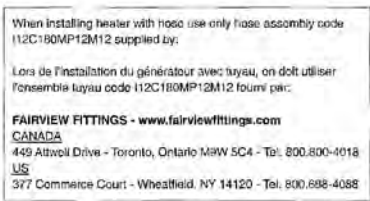
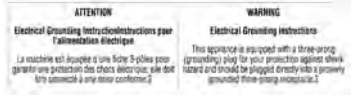
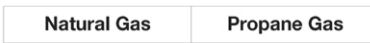
ghi\_gr007391

## 2.2 Label Meanings

A		WARNING! Hot surface!
B		WARNING Entanglement hazard. Rotating machinery. Do not reach inside machine when engine is running.
C		NOTICE Lifting point.
D		WARNING! Electric shock hazard. Disconnect power before servicing. Read Operator's Manual.
E		CAUTION This machine uses diesel fuel.
F		Tie-down point.

G	 <p>183237</p>	<p><b>DANGER</b></p> <p>Using a heater indoors can kill you in minutes. Heater exhaust contains carbon monoxide. This is a poison you cannot see or smell. During indoor operation, vent exhaust gas outdoors. Refer to Operator's Manual.</p>
H	<p><b>CAUTION:</b> Hot while in operation. Do not touch. Keep children, clothing, and combustibles away.</p> <p><b>ATTENTION:</b> Chaud si en fonction. Ne toucher pas. Tenir loin les enfants, les vêtements, et les combustibles.</p>	<p><b>CAUTION</b></p> <p>Hot while in operation. Do not touch. Keep children, clothing, and combustibles away.</p>
J		<p>Safety instruction label for diesel fuelled heaters</p>
K		<p>A nameplate listing the model number, item number, revision number, and serial number is attached to each unit. Please record the information found on this plate so it will be available should the nameplate become lost or damaged. When ordering parts or requesting service information, you will always be asked to specify the model number, item number, revision number, and serial number of the unit.</p> <p>May not be on your machine.</p>
L		<p>Gas selector valve</p> <p>Propane Gas Position Natural Gas Position</p> <p>Lock valve in position after selection.</p>
M		<p>Heater rating plate</p>



<p>N</p>		<p><b>WARNING</b> Licensed gas technician required.</p> <p>Natural gas / liquid propane burner setup and installation, fuel supply connection, test firing, and burner adjustment <b>MUST</b> be performed by a <b>LICENSED</b> professional gas technician and must conform to the requirements of all relevant local, state, provincial, and Federal authorities.</p> <p>Failure to heed this warning may result in an explosion and/or fire causing property damage, personal injury, or death.</p>
<p>O</p>		<p>General usage warnings</p>
<p>P</p>		<p>Hose assembly specification</p>
<p>Q</p>		<p>Electrical grounding instructions</p>
<p>R</p>		<p>Gas type label</p>

## 3 Lifting and Transporting

### 3.1 Lifting and Transporting

- Requirements**
- Transport vehicle capable of carrying 1000 lbs (454 kg)
  - Crane or lift capable of carrying 1000 lbs (454 kg)

---

**Background**     **NOTICE:** These machines are NOT designed to be towed with any vehicle.

---



**WARNING**

Crushing hazard.

- ▶ Only qualified riggers should attempt aerial lifting of this machine.
- 

- Guidelines**
- Follow the guidelines below when lifting and transporting this machine.
- Remove all venting from the machine prior to lifting/transporting.
  - Cover all openings on the machine to avoid infiltration from road debris and dust.
  - When using an aerial lifting rig, use the designated lifting point on top of the machine.
  - Use the designated fork pockets when transporting the machine with a fork lift.
  - Use the manual transport handle when relocating the machine within the job site.
  - When tying down the machine, route tie-down straps or chains through the lower frame only.

**NOTICE:** Do not route tie-down straps or chains over the top of the machine. Doing so will damage the machine. Use only the designated tie-down locations.

## 4 Operation

### 4.1 Preparing the Machine for First Use

#### Preparing for first use

To prepare your machine for first use:

1. Make sure all loose packaging materials have been removed from the machine.
2. Check the machine and its components for damage. If there is visible damage, do not operate the machine! Contact your Wacker Neuson dealer immediately for assistance.
3. Take inventory of all items included with the machine and verify that all loose components and fasteners are accounted for.
4. Attach component parts not already attached.
5. Add fluids as needed and applicable, including fuel, engine oil, and battery acid.
6. Move the machine to its operating location.

### 4.2 Installing the Axle and Wheels

#### Overview

The axle and wheels are shipped loose with the machine and must be installed by the customer.

#### Procedure

Follow the procedure below to install the axle and wheels.

1. Lift the machine using appropriate lifting gear.

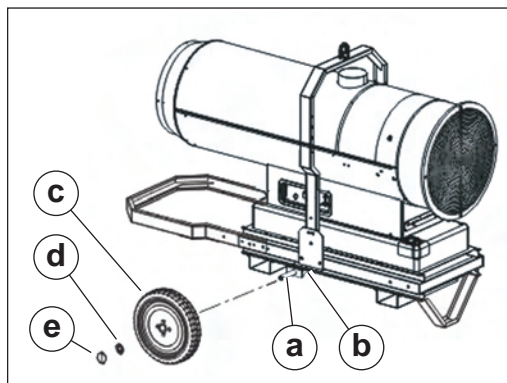


#### WARNING

Crushing hazard.

- Refer to chapter *Lifting the Machine* for instructions on proper lifting techniques.

2. Slide the axle **(a)** into the tube **(b)** beneath the trailer.



wc\_gr007904

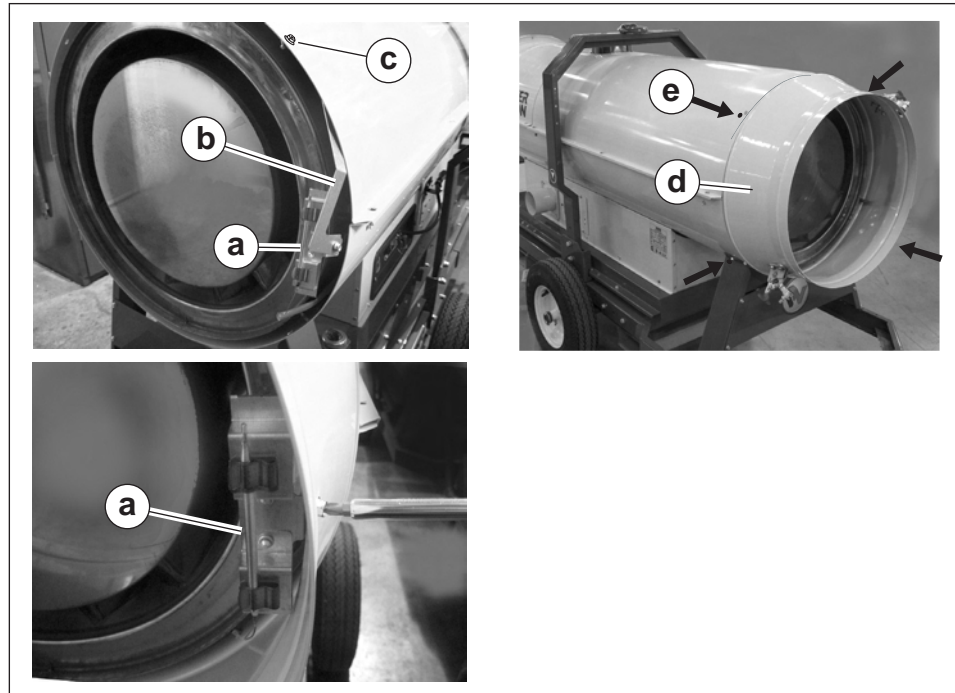
3. Place a wheel **(c)** and flat washer **(d)** on each end of the axle as shown.
4. Insert hitch pins **(e)** into the holes at each end of the axle to secure the wheels.

### 4.3 Installing the Front Duct Adapter

**Overview** The front duct adapter provided with your machine is shipped loose and must be installed before operating the machine. The thermostat probe must also be installed on the inside of the duct adapter during this procedure.

**Procedure** Follow the procedure below to install the front duct adapter and thermostat probe.

1. The thermostat probe **(a)** is temporarily mounted on a disposable bracket **(b)** inside the machine shell. Remove and set aside the mounting screw **(c)** to disconnect the bracket from the machine shell.



wc\_gr007766

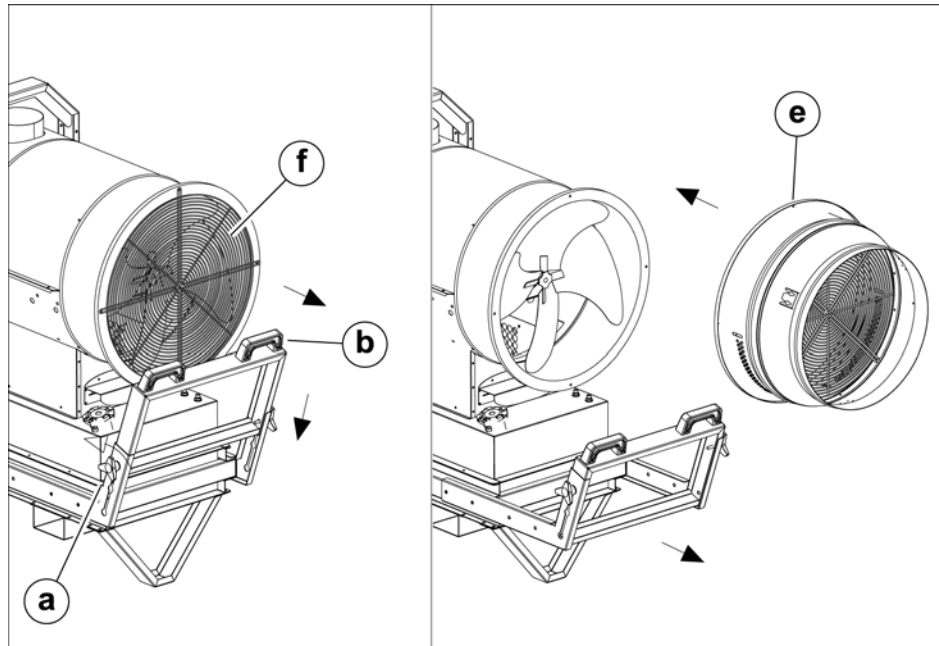
2. Remove the screw fastening the thermostat probe to the disposable bracket, and discard the bracket. Temporarily rest the thermostat probe inside the machine shell.
- Note:** Do not discard the screw. It will be used to mount the thermostat probe.
3. Slide the edge of the duct adapter **(d)** beneath the edges of the upper and lower machine shell.
  4. Align the four threaded mounting holes **(e)** on the duct adapter with the corresponding holes on the machine shell.
  5. Use the screws (provided) to fasten the duct adapter to the machine shell.
  6. Align the thermostat probe inside the duct adapter as shown. Fasten the thermostat probe in place using the reserved bracket screw.

## 4.4 Installing the Rear Duct Adapter (optional)

**Overview** The optional rear duct adapter is shipped loose and must be installed before operating the machine.

**Procedure** Follow the procedure below to install the rear duct adapter.

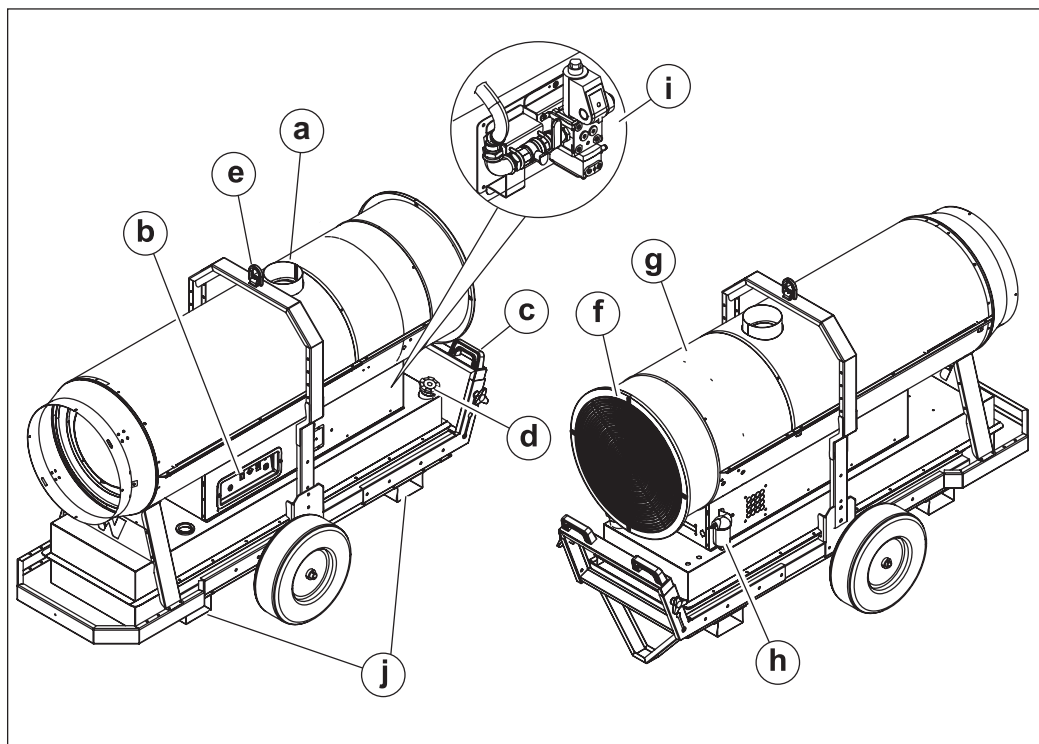
1. Loosen, but do not remove, the two adjusting knobs **(a)** on the handle.



wc\_gr008037

2. Grasp the handgrips **(b)** and slide the handle down to the lowest detent position in the handle slots.
3. Pull the handle away from the fan guard **(f)**.
4. Remove the fan guard. There are four screws that secure the fan guard.
5. Align the four threaded mounting holes **(e)** on the duct adapter with the corresponding holes on the machine shell.
6. Use the fan guard screws to fasten the duct adapter to the machine shell.
7. Slide the handle back to its original position and tighten the adjusting knobs.

## 4.5 Control / Component Locations



wc\_gr007232

## Machine components

Ref	Description	Ref	Description
a	Exhaust flue	f	Air inlet and fan guard
b	Control panel	g	Access panel
c	Manual transport handle	h	Fuel filter (D units)
d	Fuel fill location (D units only)	i	Gas train (G units only)
e	Lift brackets	j	Fork pockets

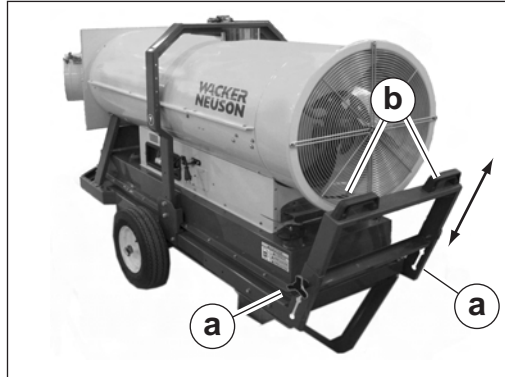
## 4.6 Adjusting the Handle Height

**Overview** Your machine is equipped with a manual transport handle. The handle height can be adjusted to suit the operator's preference.

---

**Procedure** Follow the procedure below to adjust the handle height.

1. Loosen, but do not remove, the two adjusting knobs **(a)** on the handle.



wc\_gr007767

2. Grasp the handgrips **(b)** and slide the handle up or down to one of the three detent positions in the handle slots.
3. When the handle is in the desired position, tighten the two adjusting knobs.

## 4.7 Positioning the Machine

**DANGER**

Exhaust gas from the burner contains carbon monoxide, a deadly poison. Exposure to carbon monoxide can kill you in minutes.

- ▶ Never run the machine indoors or in an enclosed area unless the machine is vented properly according to local and national codes.

**Guidelines**

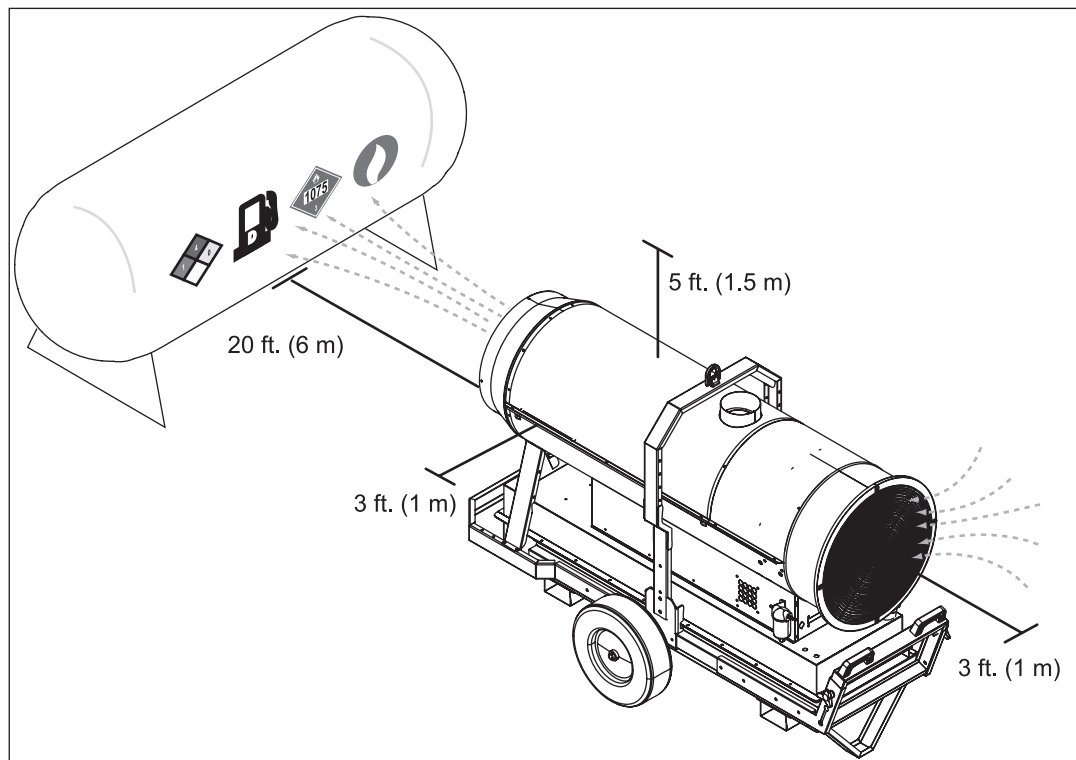
Observe the following guidelines when positioning the machine for operation.

- Installer must be familiar with all applicable laws, codes, regulations, or other restrictions regarding installation of Indirect-fired (IDF) heaters.
- Machine must be on flat, firm surface.
- Installation must adhere to proximity restrictions.
- Install wedge blocks under the wheels to prevent movement.

**Proximity restrictions**

The machine must be located a safe distance from any other structures, vehicles, materials or other combustible surfaces. The following proximity restrictions apply for all machine installations.

- 20 ft. (6 m) to air outlet
- 3 ft. (1 m) to air inlet and sides
- 5 ft. (1.5 m) to top
- 20 ft (6 m) from outlet to external fuel container



wc\_gr007234

**Note:** Graphic is representative only. Your machine may vary.

Electrical and Grounding Requirements



**WARNING**

Fire hazard and electric shock hazards. The use of an inappropriate power supply, or undersized extension cords, can lead to fire and electric shock. Fire and electric shock can cause severe injury.

- ▶ Before use, ensure that the machine is properly connected to an appropriate power source and grounded per the requirements provided below.
- ▶ Do not use undersized extension cords.

**Electrical requirements**

- Ensure that the machine is connected to a reliable, consistent source of electric power.
- The electric power source must be grounded per the requirements below and connected to a freely accessible circuit breaker.
- Ensure that extension cords (if used) are properly sized for the installation. Do not use worn, bare, or frayed cords!

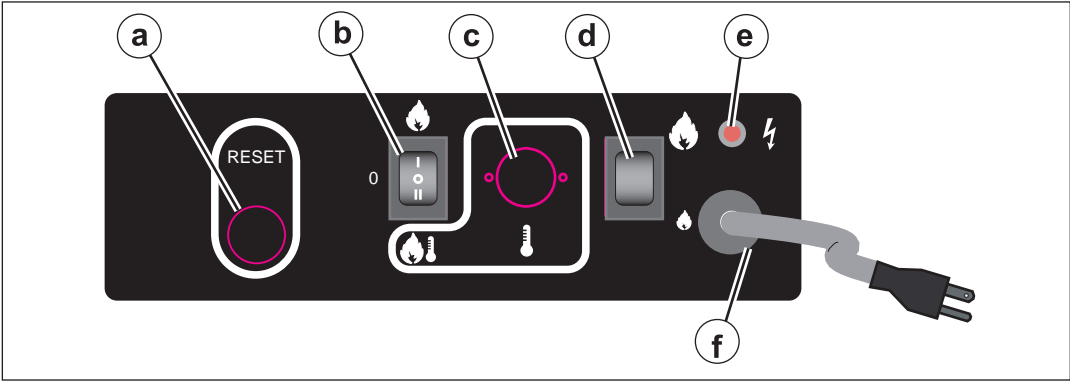
Restrictions for extension cords:

- Use only 3-wire type extension cords with heavy-duty plugs.
- The maximum length of extension cord usage per circuit is 30 m (100 ft).
- Use 12-gauge extension cords for lengths up to 15 m (50 ft).
- Use 10-gauge extension cords for lengths up to 30 m (100 ft).

**Grounding requirements**

- Electrical grounding must comply with the National Electric Code ANSI/NFPA 70 or the CSA C22.1 Canadian Electrical Code, Part 1.

4.8 Control Panel—Oil Burner (D Models)









wc\_gr007254

Control panel components

Ref	Description	Ref	Description
a	Burner fault lamp and reset button (dual function)	d	Firing mode switch (High-fire or low-fire)
b	Mode switch (on-off-on) See topic <i>Starting the Machine</i>	e	Power indicator
c	Remote thermostat receptacle	f	Power cord

Symbols and meanings

Symbol	Meaning/function	Symbol	Meaning/function
RESET	Push the button to reset the machine when a burner fault occurs.		On (Continuous heat mode) See topic <i>Starting the Machine</i>
	On (Remote thermostat mode) See topic <i>Starting the Machine</i>		Remote thermostat connection point
	Low-fire mode See topic <i>Recommended Fuels</i>		High-fire mode See topic <i>Recommended Fuels</i>
	Power indicator	—	—

## 4.9 Recommended Fuels and Fuel Blending Guide (D models)

**Overview** Low ambient temperatures cause diesel fuels to gel. Gelled fuels will cause burner ignition failure and/or burner fuel pump damage. Always use the proper fuel for the conditions.

Fuel Blend Guide		
Lowest expected ambient temperature °F (°C)	Generator powered	Shore powered
Below 5 (-15)	50-50 blend of #2 diesel and #1 diesel, plus additives OR 50-50 blend #2 diesel and K1 kerosene, plus additives	100% #1 diesel plus additives OR 100% K1 kerosene, plus additives
5 to 25 (-15 to -4)	70-30 blend of #2 diesel and #1 diesel, plus additives OR 70-30 blend of #2 diesel and K1 kerosene, plus additives	
Above 25 (-4)	Winter-blend diesel	

**Note:** The burner on this machine was calibrated by test-firing for correct operation at Wacker Neuson Corporation located 180 m (600 ft.) above sea level using #2 diesel fuel combined with an anti-gelling additive.

## 4.10 Inspecting the Fuel Hose

**When** Visually inspect the fuel hose assembly each time before operating the heater.



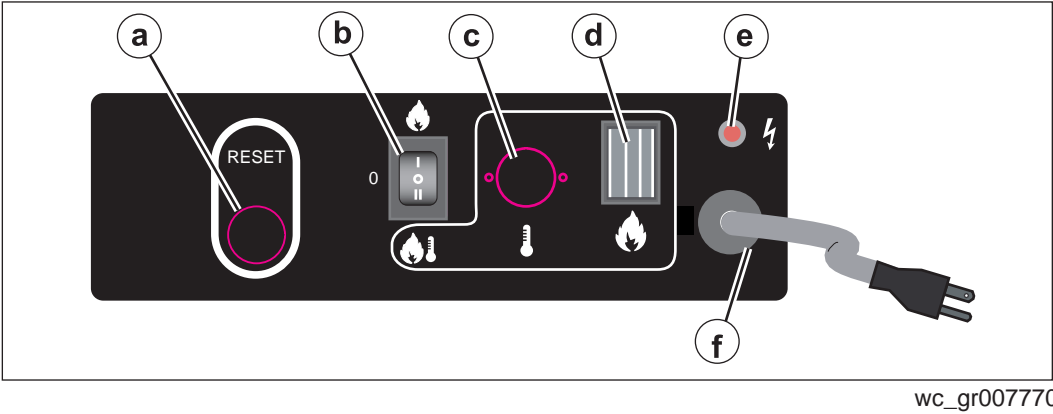
### WARNING

Fire and explosion hazards. A damaged hose may leak flammable fuel.

► Do not operate the heater if the hose has excessive abrasions, wear, or cuts.

**Replacement hose** Replace a damaged hose assembly with an equivalent as specified on the machine label.





4.11 Control Panel—Gas Burner (G Models)



Control panel components

Ref	Description	Ref	Description
a	Burner fault lamp and reset button (dual function)	d	Burner indicator
b	Mode switch (on-off-on) See topic <i>Starting the Machine</i>	e	Power indicator
c	Remote thermostat receptacle	f	Power cord

Symbols and meanings

Symbol	Meaning/function	Symbol	Meaning/function
RESET	Push the button to reset the machine when a burner fault occurs.		On (Continuous heat mode) See topic <i>Starting the Machine</i>
	On (Remote thermostat mode) See topic <i>Starting the Machine</i>		Remote thermostat connection point
	Power indicator	—	—

## 4.12 Gas Installation and Setup (G models)

**WARNING**

Extreme explosion and fire hazards.

- ▶ Only a licensed, professional gas technician shall perform installation, fuel supply connection, setup, adjustment, and testing of gas lines.
- ▶ Never use open flames to detect gas leaks.

**Natural gas installation requirements**

Natural gas installation must conform with local codes. In the absence of local codes, the installation must conform with the National Fuel Gas Code ANSI Z223.1/NFPA 54 and the Natural Gas and Propane Installation Code, CSA B149.1.

**Propane installation requirements**

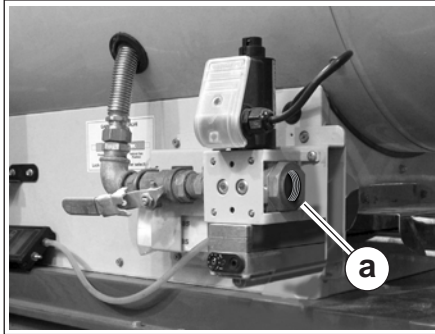
Follow the instructions below if equipping the machine for liquid propane (LP) gas.

- The installation must conform with local codes. In the absence of local codes, the installation must conform with the Standard for the Storage and Handling of Liquefied Petroleum Gases, ANSI/NFPA 58 and the Natural Gas and Propane Installation Code, CSA B149.1.
- Heated air from the machine shall not be directed toward any propane gas container within 6 m (20 feet)
- Size and capacity of gas cylinders shall be properly dimensioned according to the gas flow in *Technical Data*.
- The cylinder supply system shall be arranged to provide for vapor withdrawal from the operating cylinder.
- After connecting the machine to the gas cylinder, open the supply tap and check the supply pipe and fittings for gas leaks. Only use foam soap or an approved leak detector.
- The gas shall be turned off at the propane supply cylinder(s) when the machine is not in use.
- When the machine is to be stored indoors, the connection between the propane supply cylinder(s) and the machine must be disconnected. Cylinder(s) must be removed from the heater and stored in accordance with Standard for the Storage and Handling of Liquefied Petroleum Gases, ANSI/NFPA 58 and CSA B149.1, Natural Gas and Propane Installation Code.

### 4.13 Connecting the Gas Line (G models)

**Overview**

The HI 400HD-G heater includes a 3/4" NPT inlet **(a)** on the gas safety valve / pressure regulator body. The gas supply line connects to the inlet.



wc\_gr007559

**WARNING**

Extreme fire and explosion hazard!

- ▶ Only a licensed, professional gas technician shall perform installation, fuel supply connection, setup, adjustment, and testing of gas lines.
- ▶ All connections and settings must conform to relevant local, state, provincial, and federal requirements.

**Gas pressures**

The table below lists the minimum and maximum gas supply pressures.

Fuel	Minimum supply pressure	Maximum supply pressure
Natural gas	7" w.c.	10" w.c.
Liquid propane (LP)	8" w.c.	13" w.c.

**Regulating LP gas pressure**

The installation of a secondary pressure regulator is strongly recommended when using LP gas. A secondary pressure regulator ensures a steady flow of LP to the burner. A regulator is especially valuable when the gas supply pressure is inconsistent.

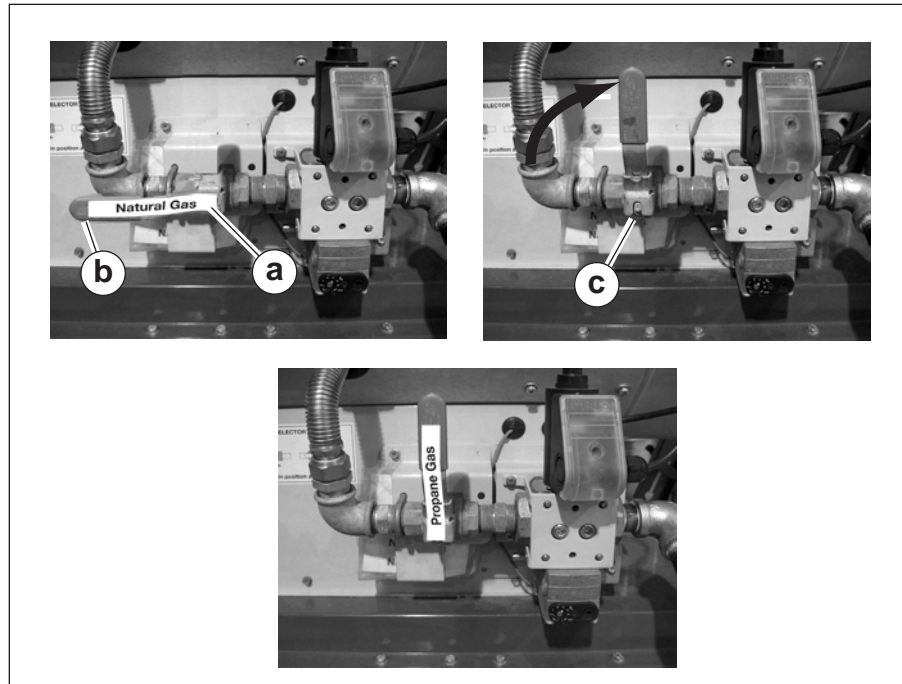
**Note:** Gas piping, pressure regulators, and fittings are not included with this heater and must be provided by the customer.

## 4.14 Setting the Gas Selector Valve (G models)

**Overview** Your machine is configured at the factory to operate on natural gas. The gas selector valve on the gas train allows you to convert the machine from natural gas to LP as job site conditions require.

**Procedure** To change the type of gas, follow the procedure below.

1. Remove the gas type label **(a)** from the handle on the gas selector valve **(b)**.



ghi\_gr007393

2. Loosen the screw **(c)** beneath the label.
3. Turn the handle to the desired position.
4. Tighten the screw.
5. Apply a new gas type label to the handle. (Extra labels are provided with the machine.)

## 4.15 Suggested Venting

**DANGER**

Asphyxiation hazard.

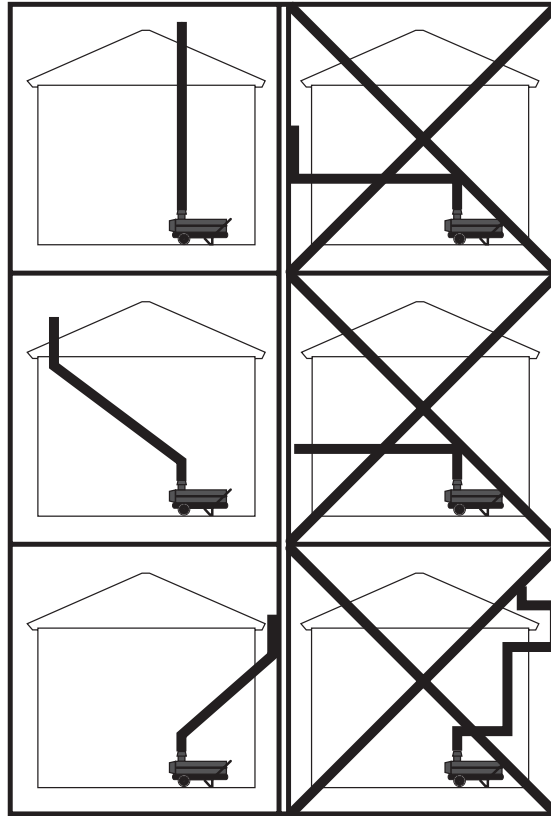
Exhaust gas from the burner contains carbon monoxide, a deadly poison. Exposure to carbon monoxide can kill you in minutes.

- ▶ Never run the machine indoors or in an enclosed area unless the machine is vented properly according to local and national codes.

When installing vents:

- Do not use B-vent exhaust pipes to vent an oil burning machine. Contact Wacker Neuson Product Support for recommended alternatives.
- Adhere to all local and national codes.
- Adhere to all fire prevention regulations.
- Consult all appropriate governing bodies or local contractor for venting and fresh air requirements. Make sure that the room or building to be heated has sufficient ventilation to ensure that the machine has enough air to function properly.
- Position the machine in a manner that avoids excessive vent bends (elbows), and long horizontal runs.
- Keep air inlets and outlets free from obstruction. Ensure that there are no bulky objects or sheets/covers near or on the machine.
- Route the venting pipes in a manner that avoids flammable materials.
- Route the venting pipes in a manner that avoids contact with people.
- When the machine is connected to a flue pipe, the flue pipe shall terminate in a vertical section at least two feet long. Sufficient draft shall be created to assure safe and proper operation of the machine.





wc\_gr007265

**Note:** The above venting diagram shows suggested venting layouts only. Consult all appropriate governing bodies or local contractor for venting and fresh air requirements.

## 4.16 Installing the Heater Duct

**Overview** Optional ducts can be connected to the air outlet. This allows warm air to be evenly distributed throughout the heating area.

**NOTICE:** When using ducts, observe the static air pressure limits specified in *Technical Data*.

- Requirements**
- Machine shut down and cooled
  - Machine properly positioned



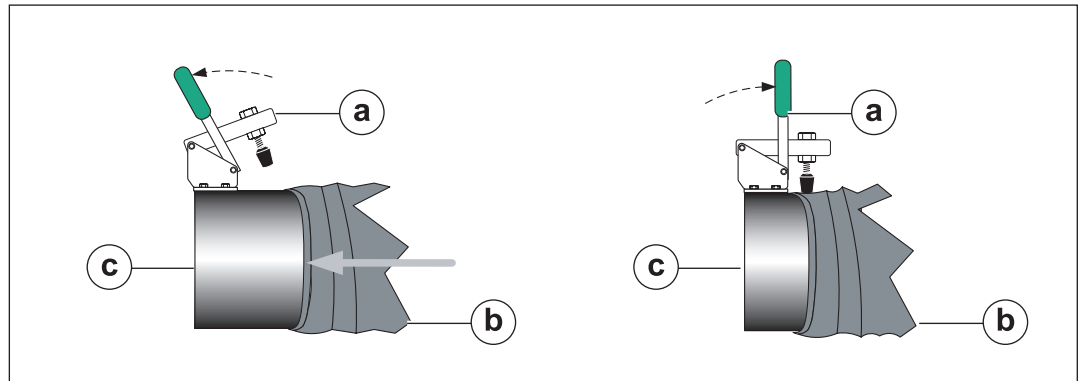
**CAUTION**

Hot surface hazard. The machine surfaces may be hot.

- Allow the machine to cool for a minimum of ten minutes before touching it.

**Procedure** To install the ducts, carry out the following procedure.

1. Open the clamps **(a)**.
2. Slide the duct **(b)** onto the duct adapter **(c)**.
3. Close the clamp to secure the duct in place.

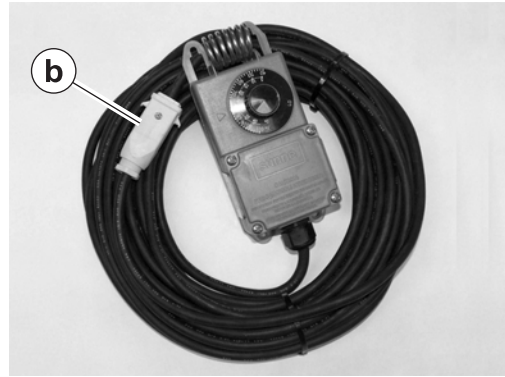
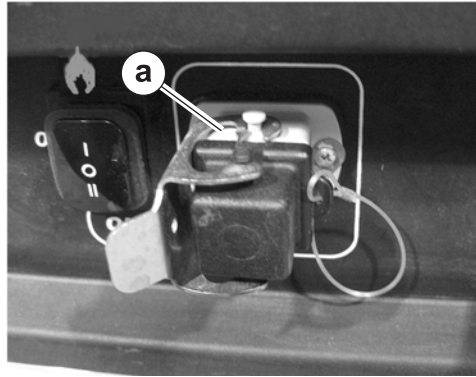


ghi\_gr005850

## 4.17 Installing the Remote Thermostat or Receptacle Cap

- Requirements**
- Remote thermostat, **or**
  - Thermostat receptacle cap

**Background** The control panel includes a receptacle for an optional remote thermostat **(b)**. The receptacle is protected by an attached cap **(a)** when not in use.



ghi\_gr007065

**NOTICE:** To avoid damaging or contaminating the receptacle, make sure the cover is securely locked in place when a remote thermostat is not installed.

To install the remote thermostat, remove the cap, insert the plug into the receptacle and lock the plug in place.

**Operational notes**

- When the mode switch is set to the upper (continuous heat) position, the heater will operate without a remote thermostat.
- When the mode switch is set to the lower (remote thermostat) position, the heater will not operate unless a remote thermostat is plugged into the receptacle and the signal is read by the control board.

## 4.18 Connecting Power to the Machine (Preheating)

- Requirements**
- Power source (115VAC)
  - Machine properly positioned
  - Operation mode switch in the OFF (0) position



---

**WARNING**

Fire hazard and electric shock hazard. The use of under-sized extension cords can lead to fire and electric shock. Fire and electric shock can cause severe injury.

- Do not use under-sized extension cords.
- 

**Extension  
cords**

Restrictions for extension cords:

- Use only 3-wire type extension cords with heavy-duty plugs.
  - The maximum length of extension cord usage per circuit is 30 m (100 ft).
  - Use 12-gauge extension cords for lengths up to 15 m (50 ft).
  - Use 10-gauge extension cords for lengths up to 30 m (100 ft).
- 

**CAUTION**

Burn hazard. The self-regulating fuel heater, located inside the fuel filter canister, will initiate when power is connected to the machine. The surface of the fuel filter canister may become very hot.

- Use caution when working with the fuel filter canister.
- 

**Procedure**

Perform the procedure below to connect power to the machine.

1. Verify that the operation mode switch is in the OFF (0) position.
2. Connect the main power cord to a properly-rated power source.

**Note:** *If the ambient temperature is below freezing, wait 10–30 minutes before proceeding.*

---

**Result**

Power has now been connected. The machine is ready for pre-starting checks.

## 4.19 Starting the Machine in Extremely Cold Weather

**Background** In temperatures below 32°F (0°C), it may be necessary to preheat the fuel inside the fuel filter canister. The fuel filter canister is equipped with a low-wattage heating element specially designed for this purpose.

Your machine is also equipped with a thermostatically controlled nozzle heater as described below.



---

**WARNING**

Burn hazard. The external surface of the fuel filter may be hot.

- Wear safety gloves when handling the fuel filter.
- 

**Note:** *Excess heating may increase the need for maintenance. See topics “Replacing the Fuel Filter” and “Replacing the Burner Nozzle”.*

**Preheating the fuel**

To preheat the fuel, carry out the following procedure.

1. Connect power to the machine. See topic *Connecting Power to the Machine*.
2. Wait 20-30 minutes—longer for colder temperatures.
3. Start the machine. See topic *Starting the Machine*.

**Note:** *In extreme wind, the machine may need to be temporarily blocked from the wind in order to start.*

**Troubleshooting**

4. If the burner does not start on the first attempt, allow the power-on sequence to cycle again.
  5. If, after the second power-on sequence completes, the machine will not fire, move the power switch to the OFF position.
  6. Wait another 20-30 minutes and attempt to start the machine again.
- 

**Nozzle heater**

The burner may not fire immediately on startup if the nozzle is cold. An additional heater warms the nozzle to the required operating temperature.

**Note:** *After you select the ON (heat) mode, the nozzle preheating sequence may cause a delay of up to 6 minutes before the burner fires.*

## 4.20 Before Starting

- Requirements**
- Machine properly positioned
  - Power connected to the machine

### Checks

Before starting the machine, check the following items:

Item	Task
Fuel sight gauge (if equipped)	Check that the fuel tank is full (if applicable).
Fuel tank cap	Check that the fuel tank cap (if applicable) is secure.
Gas supply (if equipped)	Check that the gas supply lines (if applicable) have been properly installed. Check that all valves are in the proper operating position.
Operation mode switch	Check that the operation mode switch is in the OFF position.
Main control panel	Check that proper power supplies have been connected at the main control panel. See topic <i>Connecting Power to the Machine</i> .
Remote thermostat (if installed)	Check that the remote thermostat has been correctly installed. See topic <i>Installing the Remote Thermostat or Thermostat Receptacle Plug</i> .
Ducts and duct adapters	Check that all ducts and duct adapters have been properly installed. See topic <i>Installing the Heater Duct</i> .

### Result

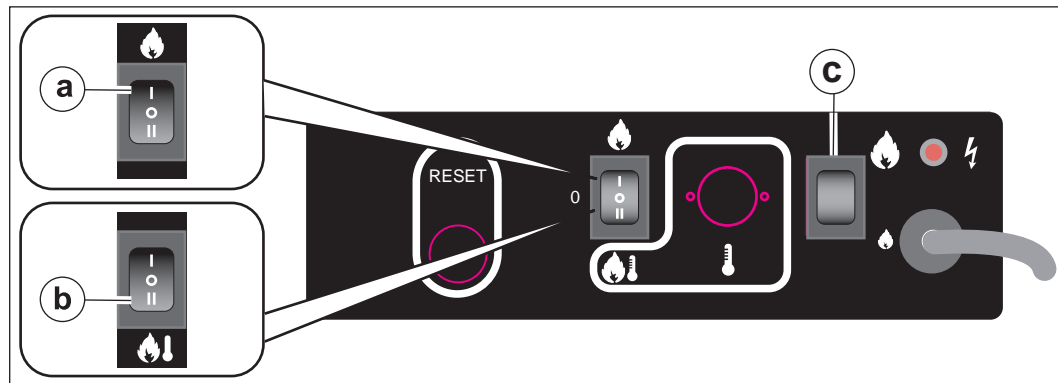
The machine is ready to turn on.

## 4.21 Starting the Machine (D models)

- Requirements**
- Machine properly positioned
  - Power connected
  - Pre-starting checks completed

**Procedure** To start the machine, follow the procedure below.

1. Select an operation mode.
  - a. Continuous heat mode (I)
  - b. thermostat mode (II)



wc\_gr007276

2. Select a firing mode (c).
  - a. If the need for heat is low, choose the LOW fire mode. Low fire mode allows the heater to run at a lower fuel pressure with a lower burner firing rate. Less heat is generated and the machine runs more economically as a result.
  - b. If the need for heat is high, choose the HIGH fire mode. High fire mode allows the machine to operate at full capacity, generating maximum heat.

**Operational sequence**

The following sequence of events will occur.

1. The burner blower will start.

**Nozzle heater**

**Note:** The burner may not fire immediately on startup if the nozzle is cold. An additional heater warms the nozzle to the required operating temperature. After you select the ON (heat) mode, the nozzle preheating sequence may cause a delay of up to 6 minutes before the burner fires.

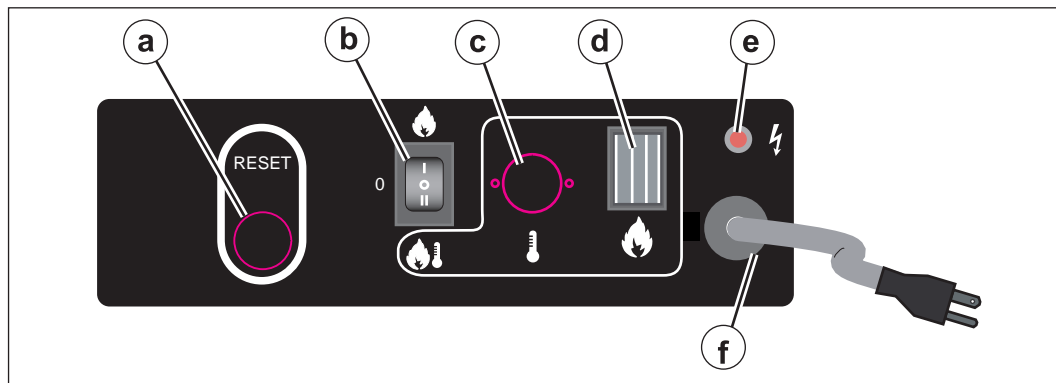
2. The burner will start firing.
  - In applications in which the thermostat receptacle plug is being used, the burner will fire continuously.
  - In applications in which the remote thermostat is being used, the burner will fire until the air temperature of the application area reaches the target temperature set by the remote thermostat. At that time, the burner will shut off, but the blower will continue to operate. When the air temperature of the application area falls below the target temperature set by the remote thermostat, the burner will refire. The process continues as long as there is fuel for the burner.
3. The main blower will start.

## 4.22 Starting the Machine (G models)

- Requirements**
- Machine properly positioned
  - Power connected
  - Pre-starting checks completed

**Procedure** To start the machine, follow the procedure below.

1. Select an operation mode **(b)**.
  - a. Continuous heat mode (I)
  - b. thermostat mode (II)



wc\_gr007770

**Operational sequence**

The following sequence of events will occur.

1. The blue light on the gas regulator will illuminate, indicating that gas is flowing.
2. The burner blower will start.
3. The burner will start firing.
  - In applications in which the thermostat receptacle plug is being used, the burner will fire continuously.
  - In applications in which the remote thermostat is being used, the burner will fire until the air temperature of the application area reaches the target temperature set by the remote thermostat. At that time, the burner will shut off, but the blower will continue to operate. When the air temperature of the application area falls below the target temperature set by the remote thermostat, the burner will refire. The process continues as long as there is fuel for the burner.
4. The main blower will begin blowing warm air when the combustion chamber is hot.



## 4.23 Stopping

**Procedure** Follow the procedure below to stop the machine.

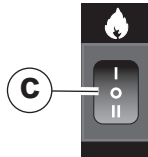


### WARNING

Electric shock hazard. Electric power is still active at the blower even when the machine is turned OFF.

- Remove all electric power to the machine before servicing the machine.

1. Turn the operation mode switch to the OFF (0) position **(c)**.



### Shutdown sequence

The following sequence of events will occur after turning the machine off.

1. The burner will shut down.
2. The blower will stop when the machine is sufficiently cool.

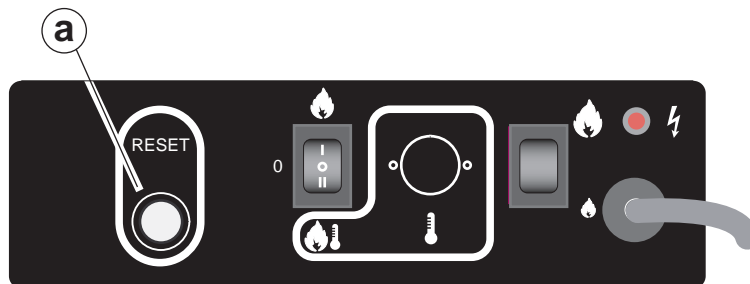
## 4.24 Burner Fault

The burner fault lamp / reset button **(a)** is illuminated while the machine is operating. The lamp is green during normal operation.

### Burner fault

A burner fault occurs if the burner does not fire upon startup. The lamp will turn red. The lamp will also turn red if the burner goes out while the machine is operating.

- To clear a burner fault, press and hold the burner fault lamp / reset button for 2–3 seconds until the lamp goes out.
- Re-start the machine.
- If the burner fault re-occurs, see *Basic Troubleshooting*.



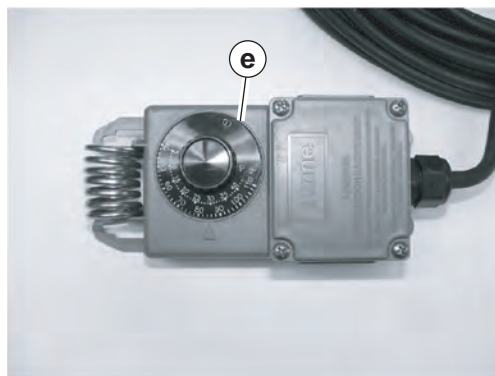
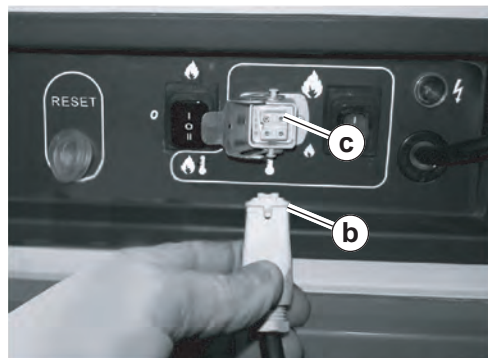
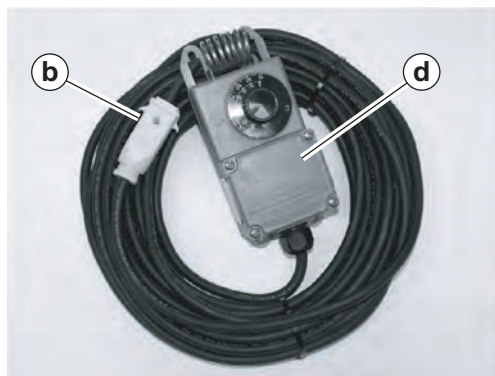
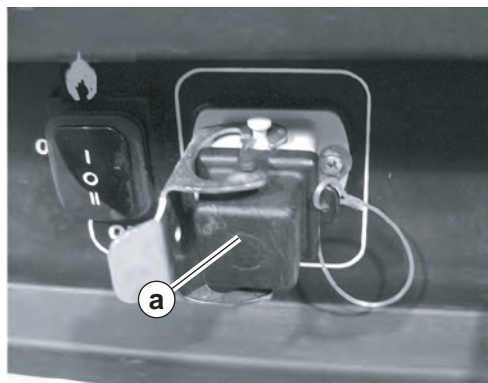
wc\_gr007620

## 4.25 Installing and Using the Remote Thermostat

- Requirements**
- Remote thermostat
  - Pre-starting checks complete

**Procedure** Follow the procedure below to install and use the remote thermostat.

1. Remove the thermostat receptacle plug **(a)** from the control panel receptacle.
2. Connect the remote thermostat **(b)** to the control panel receptacle **(c)**.
3. Set the sensor end **(d)** within the area to be heated.
4. Adjust the target temperature with the dial **(e)**.



wcghi\_gr007373

**Result** The machine will now be controlled by the remote thermostat.

## 5 Accessories

### 5.1 Available Accessories

**Introduction** Wacker Neuson Corporation offers many optional accessories for this machine. These accessories are described below. Contact your local Wacker Neuson dealer or visit [www.wackerneuson.com](http://www.wackerneuson.com) for ordering information.

**Note:** Depending on the specific machine model, your heater is equipped with one of three available outlet adapters. All three outlet adapters are compatible with your machine and can be purchased and installed as needed.

Item	Description/Purpose
Remote thermostat	Allows the user to remotely control the target temperature
Exhaust pipe	An insulated exhaust pipe that offers a method of directing exhaust away from the application area
Inlet and outlet covers	Vinyl covers that protect the interior of the machine from the elements during transport or storage
Duct adapters—various sizes	Various sizes of detachable inlet and outlet adapters
Flexible ducts—various sizes	Vinyl ducts that offer a method of directing inlet and outlet air
Exhaust support bracket	Bracket to support exhaust vents
Exhaust vent rain cap	Metal cap to protect exhaust pipes from the elements

## 6 Burner Setup

### 6.1 Removing the Access Panel

- Requirements**
- Machine shut down and cooled
  - Machine properly positioned



**CAUTION**

Hot surface hazard. The machine surfaces may be hot.

- Allow the machine to cool for a minimum of ten minutes before touching it.

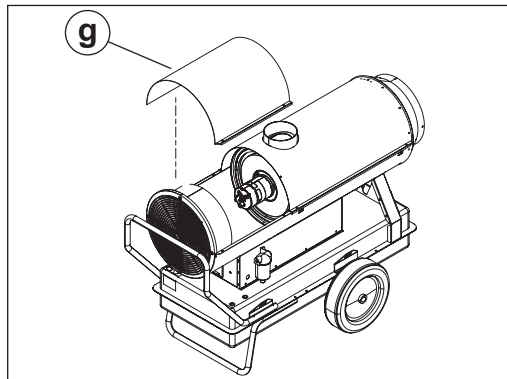
**Overview**

Your machine is equipped with a removable access panel. The access panel must be removed in order to maintain and repair certain machine components such as the burner, electric motor, and fuel pump.

**Procedure**

Follow the procedure below to remove the access panel.

1. Shut down the machine and allow it to cool.
2. Disconnect the power cord from the power source.
3. Remove the four screws that fasten the access panel **(g)**.



wc\_gr007394

4. Remove the access panel and set it aside.
5. Perform the required maintenance.
6. When maintenance is complete, reinstall the access panel and fasten it with the screws.

## 6.2 Removing and Installing the Burner

**Note:** Although an oil burning machine (D model) is shown in the photos below, the procedure for removing the burner assembly on a gas burning machine (G model) is similar.

- Requirements**
- Machine shut down and cooled
  - Machine properly positioned



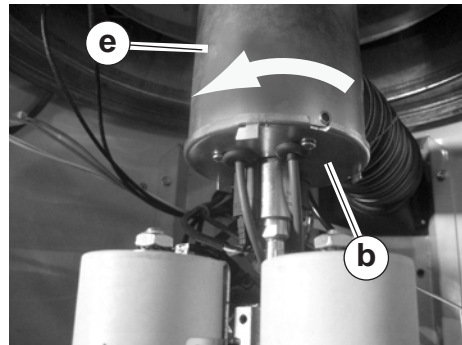
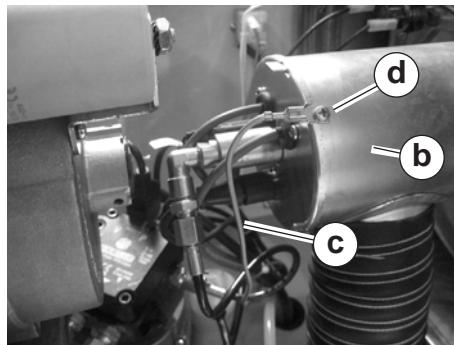
### CAUTION

Hot surface hazard. The machine surfaces may be hot.

- Allow the machine to cool for a minimum of ten minutes before touching it.

**Procedure** Before performing any maintenance on the burner assembly, it must be removed from the machine. To remove or install the burner assembly perform the following procedure.

- Removal**
1. Shut down the machine and allow it to cool.
  2. Disconnect the power cord from the power source.
  3. Remove the access panel. See topic *Removing the Access Panel*.



wc\_gr007773

4. Remove the screw **(d)** to disconnect the ground wire **(c)** from the burner assembly **(b)**.
5. Rotate the burner assembly counter-clockwise and remove it from the flame head and air tube assembly **(e)**.
6. Perform the required maintenance.

**Note:** Refer to the maintenance procedures in this manual.

7. Reinstall the burner assembly. Refer to the steps below to install the burner assembly.

- Installation**
1. Place the burner assembly into the flame head and air tube assembly.
  2. Rotate the burner assembly clockwise to lock it into place.
  3. Install the ground wire using the screw **(d)**.
  4. Reinstall the access panel.
- Setting Up the Burner

## Factory settings

Machine	Nozzle size	Fuel pressure		Burner pressure in WC		Air damper setting
		psi	bar	NG	LP	
HI 400 HD D	2.00 (80W) gph	Stage I: 160 Stage II: 217	Stage I: 11 Stage II: 15	—		1.5
HI 400 HD G	3 x 2.8 mm (12 X 0.11 in.)	—	—	6.40 (1600 Pa)	6.52 (1630 Pa)	3

## Background

The burner consists of several different components and subsystems. Each of these components or subsystems must be operating correctly for the burner to function properly.

## Tools required

The following tools are required to adjust the burner:

- High-quality combustion analyzer
- Smoke spot tester
- Fuel pressure test gauge
- General hand tools

## Mandates

- Adjustments made shall be done so that the machine conforms to the requirements of local, state, and federal codes and authorities.
- Adjustments shall be made at the job site.

## When

Adjust the burner:

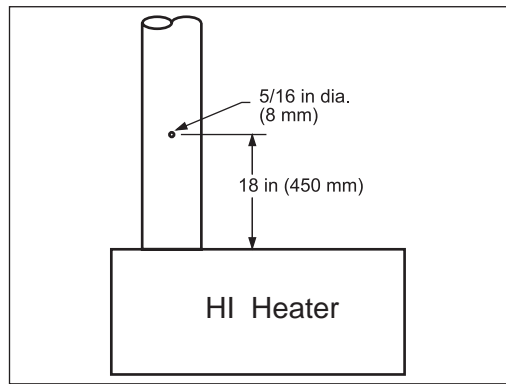
- Before operating the machine at elevations 305 m (1,000 ft) above or below the location of where the last adjustments were made
- Before starting at a new job site
- After any burner maintenance or repair has been performed
- If burner performance is in question

## Procedure

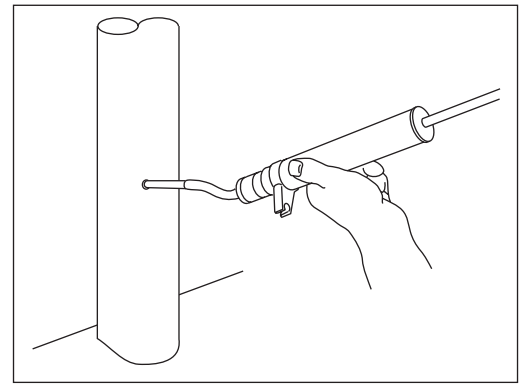
Follow the procedure below to set up the burner.

1. Shut down the machine.
2. Set the burner electrodes.  
(See topic *Checking and Adjusting the Oil Burner Electrodes*.)
3. Check the burner nozzle.  
(See topic *Checking/Changing the Burner Nozzle*.)
4. Check and adjust the burner air damper if necessary.  
(See topic *Adjusting the Burner Air Damper Setting*.)
5. Start the machine and the burner.
6. On D models only, check/set the fuel pressure.  
(See topic *Adjusting the Fuel Pressure*.)
7. Conduct a smoke spot test. Follow the smoke spot tester manufacturer's instructions and the general guidelines below.

*This procedure continues on the next page.*

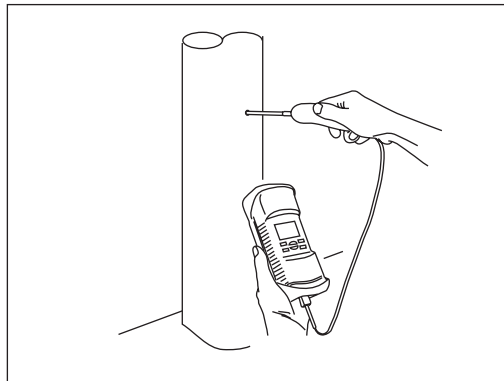


ghi\_gr007395



ghi\_gr006969

- Use the access hole in the exhaust stack.
  - Several samples should be taken as the heater warms.
  - The final sample should be taken just before the heater reaches 71°C (160°F).
8. Analyze the combustion. Follow the combustion analyzer manufacturer's instructions and the general guidelines below.



ghi\_gr006970

- Use the access hole in the exhaust stack.
  - Take several samples as the heater warms.
  - Take the final sample just before the heater reaches 71°C (160°F).
9. Re-adjust the air band, if necessary, until the smoke spot test and combustion analysis are within the following parameters:
- O<sub>2</sub> content: 3–5%
  - Smoke spot: less than 1

## Result

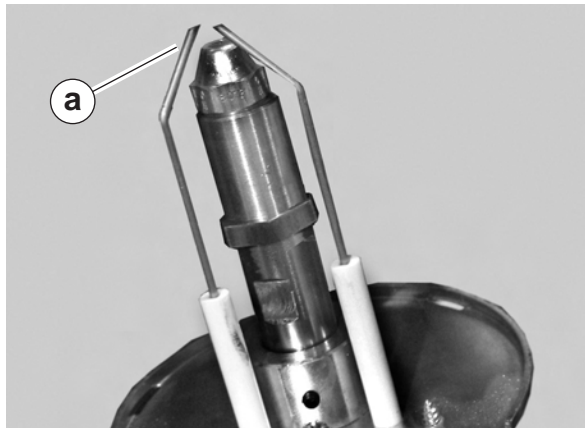
The burner has now been set.

## 6.3 Inspecting the Oil Burner Electrodes (D models)

- Requirements**
- Machine shut down
  - Power disconnected
  - Burner cool

**When to inspect** Inspect the electrodes on your machine every two weeks or after every 50 hours of operation. The condition of the electrodes will drastically affect your machine's ability to fire efficiently.

**Procedure** Remove the burner assembly and inspect the condition of the electrode tips **(a)**. Refer to the table below to determine the condition of the electrode tips.



wc\_gr007619

Condition	Task
	None; ok as-is
	None; ok as-is
	Replace

The electrodes should be replaced if they are worn or damaged. Contact your Wacker Neuson dealer for replacement electrodes.



## 6.4 Checking/Changing the Burner Nozzle (D models)

- Prerequisites**
- Machine shut down and cool to the touch
  - Machine properly positioned



**CAUTION**

Hot surface hazard. The machine surfaces may be hot.

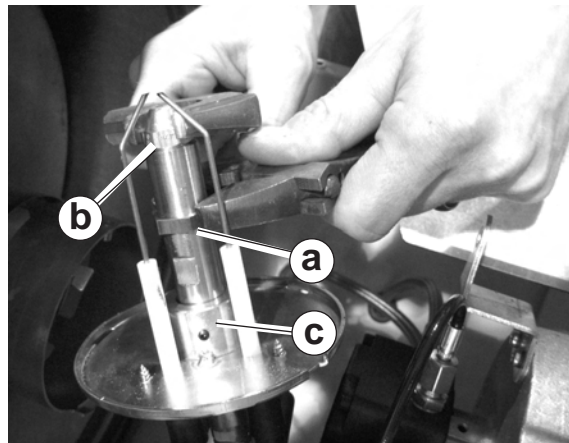
- Allow the machine to cool for a minimum of ten minutes before touching it.

**When** Replace the burner nozzle annually, or if it is damaged.

To replace the burner nozzle, carry out the following procedure.

- Removing the nozzle**
1. Remove the burner. See topic *Removing and Installing the Burner Assembly*.
  2. Place an adjustable wrench on the large fitting **(a)** on the nozzle base **(c)**.
  3. Place another adjustable wrench on the nozzle **(b)**.
  4. Rotate the nozzle counter-clockwise and remove it from the assembly.

- Installing the nozzle**
5. Install the new nozzle **(b)** onto the nozzle base **(c)**.
  6. Tighten the nozzle **(b)** using an adjustable wrench. Rotate the wrench clockwise.
  7. Reinstall the burner assembly. See topic *Removing and Installing the Burner Assembly*.



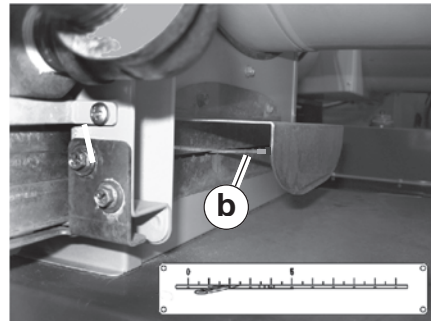
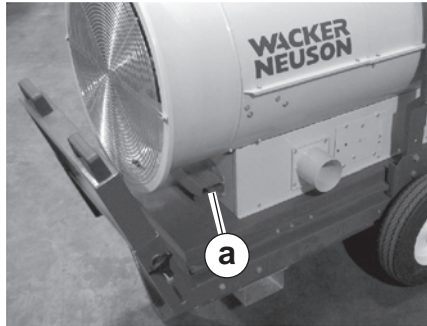
ghi\_gr007408

## 6.5 Adjusting the Burner Air Damper Setting

- Requirements**
- Machine shut down
  - Power disconnected

**Procedure** Perform the procedure below to check and adjust the burner air damper setting.

1. Shut down the machine and allow it to cool.
2. Disconnect the power cord from the power source.
3. The burner air damper **(a)** is located beneath the fan guard.



ghi\_gr007396

4. To adjust the burner air damper, move the lever **(b)** left or right to align with the desired graduation (marking). See *Technical Data*.

**Result** The burner air damper has now been adjusted.

## 6.6 Adjusting the Fuel Pressure (D models)

- Requirements**
- Machine shut down and cool to the touch
  - Power disconnected
  - Fuel pressure gauge
  - Flat-bladed screwdriver

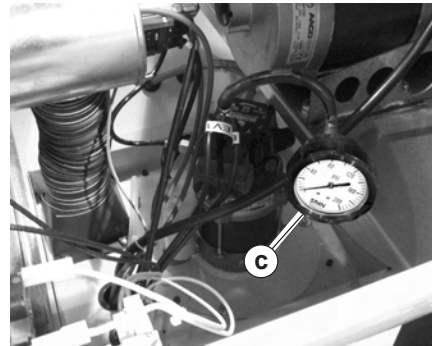
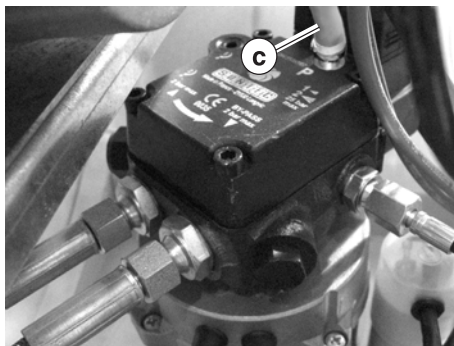
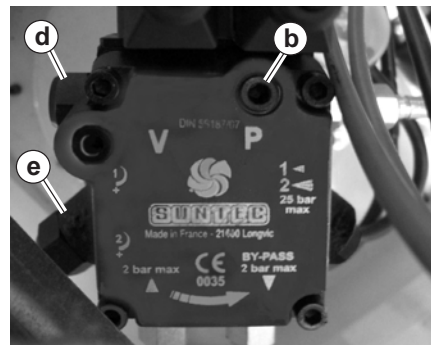
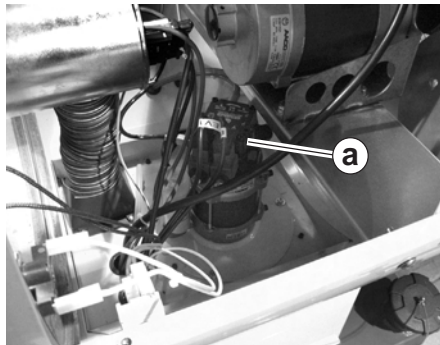
**Background** The information below will show you how to check the fuel pressure on your machine. Incorrect fuel pressure will result in too much fuel, or too little fuel, to be supplied to the burner. This will cause the machine to smoke during operation.

**Note:** *The fuel pressure differs when the burner is operating in Stage 1 (low fire mode) and Stage 2 (high fire mode). Therefore, both pressures must be checked.*

**When to check** Check the fuel pressure if the machine emits smoke during operation.

**Procedure** To check and/or adjust the fuel pressure, carry out the following procedure.

1. Remove the access panel and locate the pump **(a)**. See topic *Removing the Access Panel*.
2. Remove the threaded plug from the pressure test port **(b)** using a hex key wrench. Set the plug in a safe location to be re-installed later.



wc\_gr007902

### Checking low pressure

3. Install a pressure gauge with adapter **(c)** in the pressure test port.
4. Set the mode switch to low fire mode (I).
5. Start the machine. See topic *Starting the Machine*.
6. With the machine running, verify the low fuel pressure setting. For the correct setting, refer to the *Technical Data* charts in this manual.

### Checking high pressure

7. Set the mode switch to high fire mode (II). Wait approximately 30 seconds to allow the burner to switch from Stage I to Stage II.
8. Verify the high pressure fuel pressure setting. For the correct setting, refer to the *Technical Data* charts in this manual.
9. Stop the machine. See section *Stopping the Machine*.

### Adjusting fuel pressure

10. Adjust the fuel pressure if necessary. The pump has two adjustment screws; one for low fuel pressure **(d)** and one for high fuel pressure **(e)**. Adjust the fuel pressure and repeat steps 5–8 to re-check the settings.

**Note:** *Do not adjust the fuel pressure to a setting outside the safe operational parameters.*

11. Remove the pressure gauge from the pressure test port.
12. Re-install the threaded plug into the pressure test port.
13. Replace the access panel and re-install the screws that secure the panel.

## 7 Maintenance

### 7.1 Periodic Maintenance Schedule

Task	Interval* (hours of service)			
	Daily ---	2 Weeks (50)	6 Months (1000)	Yearly (1200)
Inspect the heater.	■			■
Inspect the hose assembly.	■			
Check fuel level and pressure.	■			
Clean the machine.	■			
Clean the fuel filter.		■		
Clean the fan and the interior shell.		■		
Clean and check/adjust burner electrode settings.		■		
Inspect electrical components.			■	
Inspect the blower motor and belts. Replace the belt if necessary.			■	
Replace the burner nozzle.				■
Replace the fuel heater filter.				■
Maintain the heater weldment.				■
Inspect and test the burner.	As needed or upon changing job sites; see chapter <i>Burner Setup</i> .			
Inspect burner electrodes; replace if necessary.	As needed or upon changing job sites; see chapter <i>Burner Setup</i> .			
* Use whichever comes first, calendar time or service hours.				

## 7.2 Changing the Fuel Heater Filter (D models)

- Prerequisites**
- Machine shut down
  - Burner cool



**CAUTION** Hot surface hazard.

The external surface of the fuel filter canister may be hot.

- ▶ Allow the machine to cool before servicing.



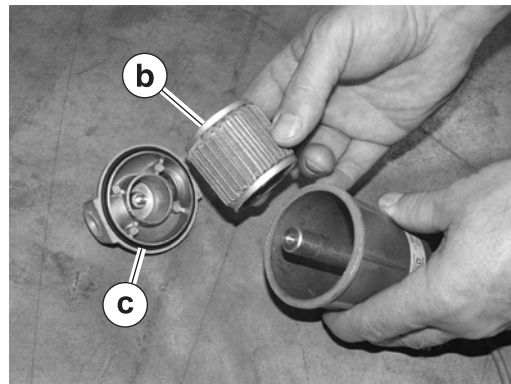
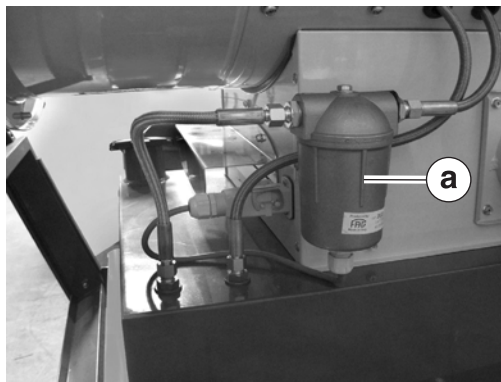
**WARNING** Hot fluids.

The fuel inside the fuel filter canister may be hot.

- ▶ Wear safety glasses.

**Procedure** Follow the procedure below to change the fuel heater filter.

1. Shut down the machine and allow it to cool.
2. Remove the screw that secures the cover to the housing (a).



wc ar007774

3. Remove the filter (b).
4. Inspect the O-ring (c). Replace it if it is cracked, damaged, or deformed.
5. Install the new filter.
6. Reinstall the cover.

**Result** The procedure to replace the fuel heater filter is now complete.

### 7.3 Inspecting and Cleaning the Cadmium (CAD) Cell

- Prerequisites**
- Machine shut down and cool to the touch
  - Machine properly positioned



**CAUTION**

Hot surface hazard. The machine surfaces may be hot.

- Allow the machine to cool for a minimum of ten minutes before touching it.

**When**

Inspect and clean the CAD cell as needed, or while performing other scheduled maintenance procedures.

To inspect and clean the CAD cell, carry out the following procedure.

1. Remove the access panel. See topic *Removing the Access Panel*.
2. Twist and pull out the plastic protective holder **(1)** off the base of the burner assembly. The CAD cell **(2)** is inside this plastic holder.



ghi\_gr007370

3. Inspect the CAD cell for cleanliness. Be sure the cell is free of debris or soot.
4. Clean the CAD cell if necessary.

**NOTICE:** Do NOT use solvents or liquids to clean the CAD cell. Use a soft dry cloth to clean the CAD cell.

5. Reinstall the plastic protective holder onto the base of the burner assembly.



## 7.4 Cleaning the Fan Blades and Motor

- Prerequisites**
- Machine shut down and cool to the touch
  - Power source disconnected

**WARNING**

Electric shock hazard. Electric power is still active at the blower even when the machine is turned OFF.

- Remove all electric power to the machine before performing this procedure.

**CAUTION**

Hot surface hazard. The machine surfaces may be hot.

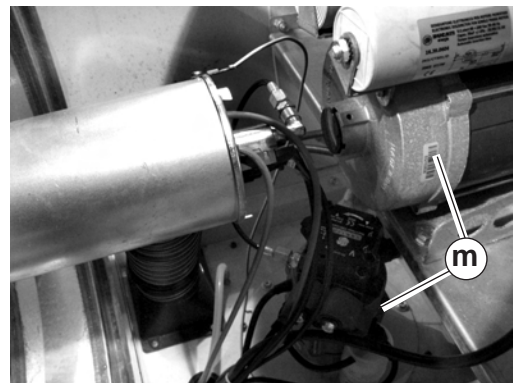
- Allow the machine to cool for a minimum of ten minutes before touching it.

**When**

Clean the fan blades and motors prior to the first seasonal use, every 1200 hours or annually, or as needed.

To clean the fan blades and motors, carry out the following procedure.

1. Remove the fan guard **(f)**. There are four screws that secure the fan guard.



ghi\_gr007398

2. Remove the the access panel **(g)**. See topic *Removing the Access Panel*.
3. Inspect and, if necessary, clean the motors **(m)** using compressed air.
4. Clean the fan blades using a stiff brush.
5. Reinstall the internal access panel.
6. Reinstall the fan guard.



## 7.5 Cleaning the Interior Shell

- Prerequisites**
- Machine shut down and cool to the touch
  - Power source disconnected



**CAUTION**

Hot surface hazard. The machine surfaces may be hot.

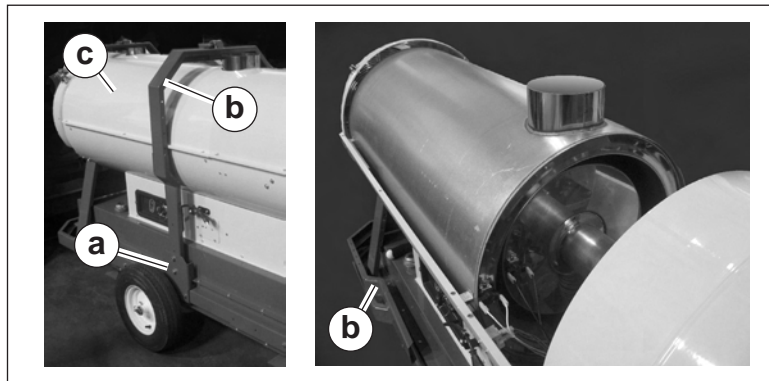
- Allow the machine to cool for a minimum of ten minutes before touching it.

**When**

Clean the interior shell prior to the first seasonal use, every 1200 hours or annually, or as needed.

To clean the interior shell, carry out the following procedure.

1. Remove the fan guard. See topic *Cleaning the Fan Blades and Motor*.
2. Remove the access panel. See topic *Removing the Access Panel*.
3. Unscrew and remove the four lift bracket screws **(a)**. Carefully raise and maneuver the lift bracket **(b)** away from the machine shell cover **(c)**, resting it on the rear frame as shown.



wc\_gr007776

4. Remove the six mounting screws and lift the machine shell cover off the machine.
5. Inspect and clean the interior shell using compressed air.
6. Re-install the machine shell cover.
7. Re-install the lift bracket.
8. Re-install the access cover.
9. Re-install the fan guard.

## 7.6 Inspecting the Flame Head

- Prerequisites**
- Machine shut down and cool to the touch
  - Machine properly positioned



**CAUTION**

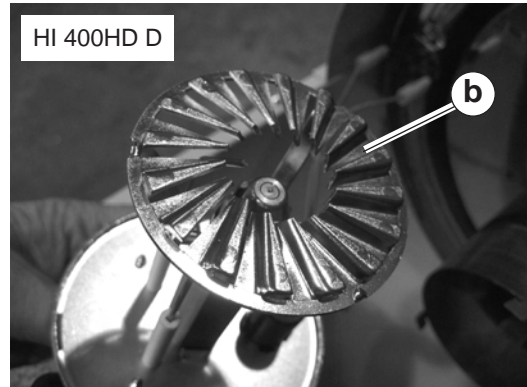
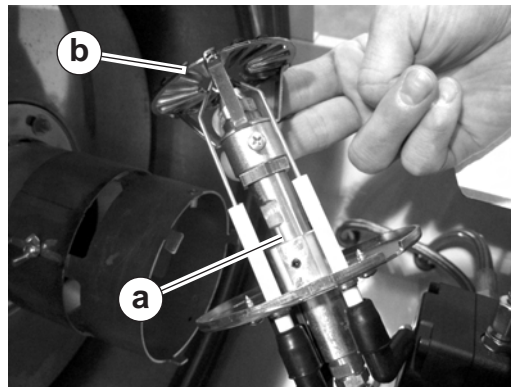
Hot surface hazard. The machine surfaces may be hot.

- Allow the machine to cool for a minimum of ten minutes before touching it.

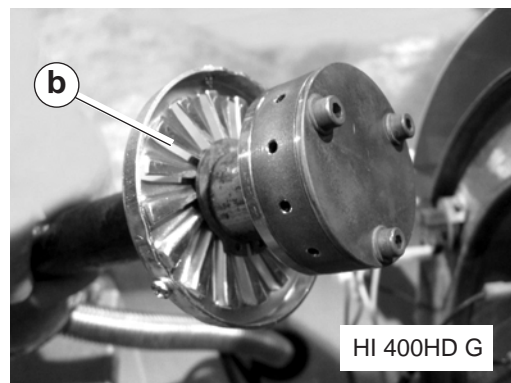
**When** Inspect the flame head prior to the first seasonal use, during regular maintenance, and as needed.

**Procedure** To inspect the flame head **(b)**, carry out the following procedure.

1. Remove the access panel. See topic *Removing the Access Panel*.
2. Remove the burner assembly **(a)**. See topic *Removing and Installing the Burner Assembly*.



ghi\_gr007412



3. The flame head is attached to the burner assembly. Inspect the flame head for the following:
  - Wear. Replace if necessary.
  - Cleanliness. Clean the flame head if necessary.
  - Thermal stress. Replace if necessary.
4. Re-install the burner assembly. See topic *Removing and Installing the Burner Assembly*.

## 7.7 Inspecting the Electrical Connections

After disconnecting the power cord, check all electrical connections for the following:

- Proper connections. Be sure that all connections are complete and tight.
- Corrosion. Clean or replace if necessary.
- Damaged wires/connectors. Replace if necessary.
- Proper ground.

## 7.8 General Cleaning Guidelines

- Prerequisites**
- Machine shut down
  - Machine cool

**General cleaning**

Clean the following areas to ensure proper operation.

Item	Method/task
Burner	Remove all dirt and debris. Ensure air intake area is unobstructed.
Hoses, connectors, and couplings	Wipe clean with cloth.
Trailer (if equipped)	Clean with compressed air: 50 PSI maximum.
Covers/machine exterior	Wipe clean with cloth.
Air inlets/ouputs	Remove all dirt and debris. Ensure air intake area is unobstructed.

## List of Abbreviations

Amp	ampere (unit of electrical current)
asl	above sea level
BTU	British Thermal Unit
°C	Celsius (metric unit of temperature)
°F	Fahrenheit (unit of temperature)
ft <sup>2</sup>	square foot/square feet (measurement of area)
ft.lbs.	foot pounds (unit of torque)
gph	gallons per hour (unit of liquid flow)
GFI	Ground Fault Interrupt(er) (protection device)
Hz	Hertz (unit of frequency)
ID	inner diameter
in.	inch
kg	kilogram
kilo-cal	kilo-calorie (1000 calories) (metric unit of heat energy)
kPa	kilo-Pascals (metric unit of pressure)
kW	kilo-Watt (unit of electrical power)
lb.	pound
m	meter
mm	millimeter (1/1000 of a meter)
psig	pounds per square inch gauge (unit of pressure)
VAC	Volts, Alternating Current
VDC	Volts, Direct Current
VFD	Variable Frequency Drive
HTF	Heat Transfer Fluid

## 8 Basic Troubleshooting

**Note:** The following symptoms and remedies are some of the more common issues that have arisen during the history of these machines. These do not represent all the possibilities. If you need advanced troubleshooting assistance, please contact Wacker Neuson Product Support.

Symptom	Possible Causes	Remedy
The burner does not start	<ul style="list-style-type: none"> <li>The remote thermostat or thermostat plug is not inserted correctly.</li> <li>Faulty cable or power supply</li> <li>The over temperature limit has tripped</li> <li>The burner is in lock-out mode.</li> </ul>	<ul style="list-style-type: none"> <li>Insert the remote thermostat or thermostat plug.</li> <li>Check cable and power supply</li> <li>Press the reset button.</li> </ul>
The burner starts, the flame does not ignite, the unit locks out	<ul style="list-style-type: none"> <li>No fuel</li> <li>Worn burner nozzle</li> <li>Faulty electrodes</li> <li>Cad cell detecting external light.</li> <li>Cad cell defective</li> <li>Burner control defective</li> </ul>	<ul style="list-style-type: none"> <li>Fill fuel tank</li> <li>Replace burner nozzle</li> <li>Replace electrodes</li> <li>Check the Cad cell enclosure</li> </ul>
The burner starts, flame ignites, but the unit locks out	<ul style="list-style-type: none"> <li>Incorrect fuel pressure</li> <li>Worn burner nozzle</li> <li>Incorrect air lock setting</li> <li>Cad cell defective</li> <li>Burner control defective</li> </ul>	<ul style="list-style-type: none"> <li>Increase fuel pressure</li> <li>Replace burner nozzle</li> <li>Re-adjust air lock setting</li> </ul>
The burner ignites but the performance is poor	<ul style="list-style-type: none"> <li>Worn burner nozzle</li> <li>Clogged fuel filter</li> <li>Air leaks in the fuel lines</li> <li>Insufficient oil pressure</li> </ul>	<ul style="list-style-type: none"> <li>Replace burner nozzle</li> <li>Replace the fuel filter</li> <li>Inspect the lines for leaks; replace if necessary</li> </ul>
Black smoke from vent pipe	<ul style="list-style-type: none"> <li>Insufficient combustion air</li> <li>Insufficient ventilation air</li> </ul>	<ul style="list-style-type: none"> <li>Remove any obstructions from the air inlet and outlet areas.</li> </ul>
The machine stops due to pressure switch fault	<ul style="list-style-type: none"> <li>Overheat condition</li> <li>Faulty pressure switch</li> <li>Incorrect nozzle</li> <li>Wrong fuel pressure</li> </ul>	<ul style="list-style-type: none"> <li>Contact Wacker Neuson Product Support</li> </ul>

**Note:**

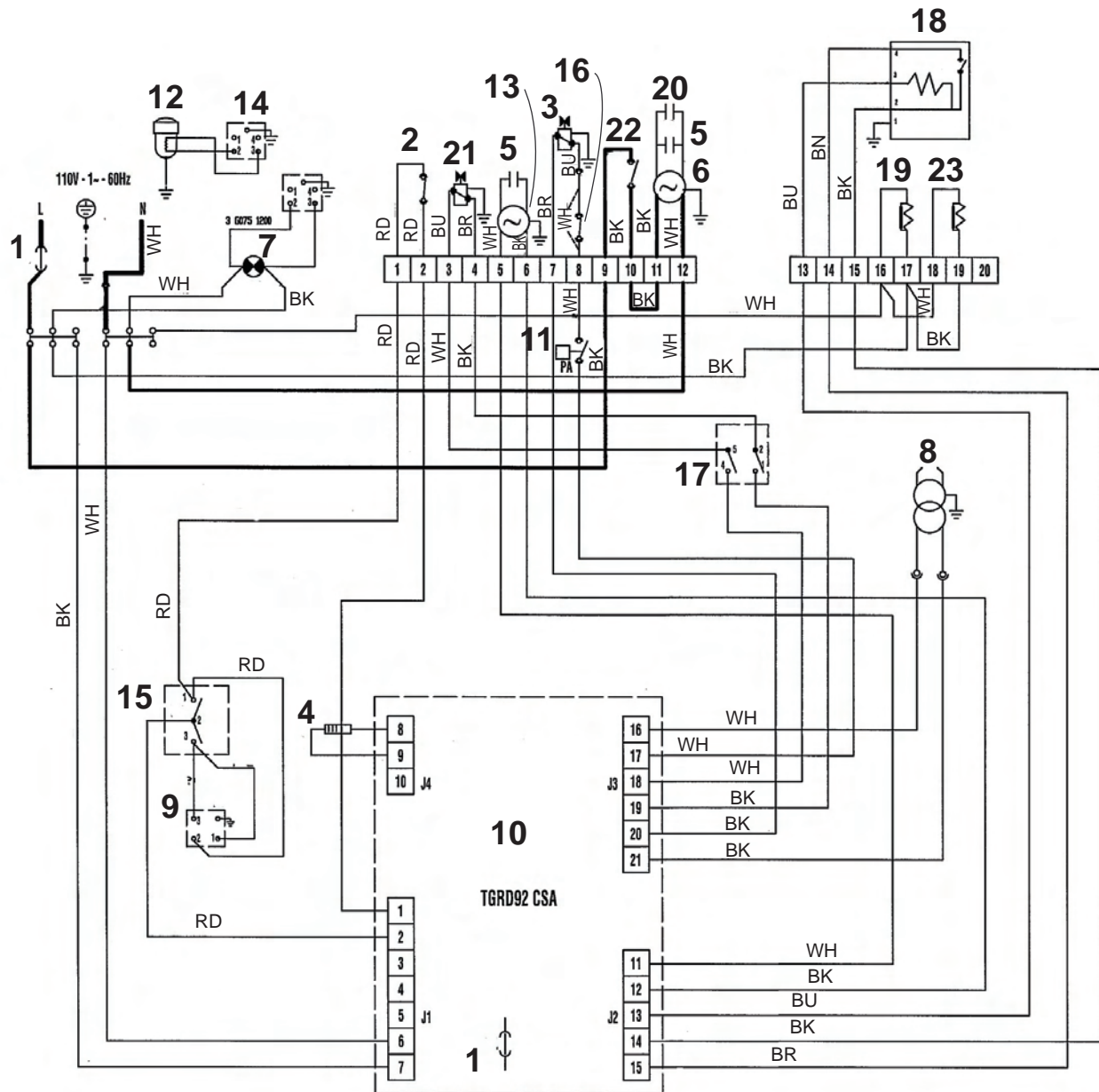
## 9 Technical Data

### 9.1 Machine

Model		HI 400HD D	HI 400HD G
	Units		
Heat input	BTU/hr	412,682	354,610
Heat output	BTU/hr	341,288	293,617
Air flow	cfm	3760	3821
Fuel consumption	L (gal)/hr	11.2 (2.97)	—
Fuel consumption	m <sup>3</sup> /hr cfm	—	10.1 (5.93) 3.8 (2.23)
—Natural gas			
—Liquid propane (LP)			
Fuel nozzle size	L/hr (gph)	7.6 (2.0) (80W)	—
Fuel nozzle size	mm (in.)	—	3 x 2.8 (12 x 0.11)
Efficiency	%	82.7	82.8
Noise level at 1 m	dB (A)	76	74
Power requirement	VAC/Hz	120/60	120/60
Electrical current	Ampere	15	15
Weight (no fuel)	kg (lb)	206.8 (456)	225.4 (497)
Height	mm (in.)	1308 (51.5)	1105 (43.5)
Length	mm (in.)	2134 (84)	2134 (84)
Width	mm (in.)	838 (33)	838 (33)
Flue diameter	mm (in.)	152.4 (6)	152.4 (6)
Fuel tank capacity	L (gal)	216.1 (57.1)	—
Fuel pressure	psi (bar)	Stage I: 160 (11) Stage II: 217 (15)	—
Fuel supply pressure	WC (Pa)	—	Min 7, Max 10 Min 8, Max 13
—Natural gas			
—Liquid propane (LP)			
Burner pressure	WC (Pa)	—	6.40 (1600) 6.52 (1630)
—Natural gas			
—Liquid propane (LP)			
Air damper setting	number	1.5	3
Static air pressure limit	WC (Pa)	0.60 (150)	

## 10 Schematics

## 10.1 HI 400HD D—Oil Burning



wc\_gr007399

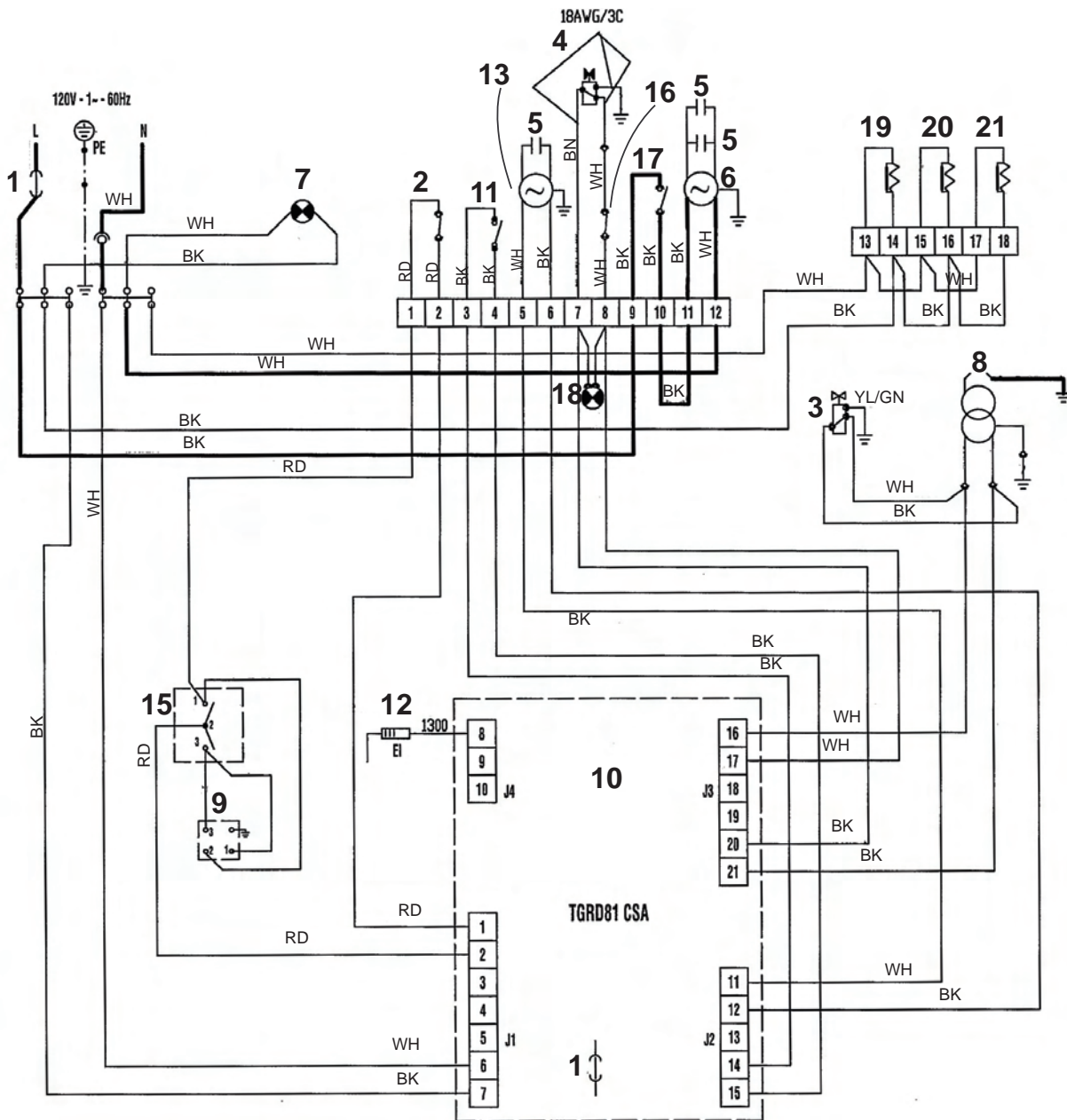
## 10.2 Components—Oil Burning

No.	Description	No.	Description
1	Fuse	13	Burner motor
2	Overheat thermostat	14	Pre-heated filter plug
3	Solenoid valve	15	Summer/ winter switch
4	CAD cell	16	Overheat safety thermostat
5	Capacitor	17	Low fire / high fire power switch
6	Fan motor	18	Preheated nozzle
7	Electric pilot lamp	19	Control board heater
8	Transformer H.V.	20	Starter capacitor
9	Room thermostat plug	21	Solenoid valve
10	Control box	22	Fan thermostat
11	Air pressure switch	23	Pressure switch heater
12	Heated fuel filter	—	—

Wire Colors							
BK	Black	RD	Red	YL	Yellow	OR	Orange
GN	Green	TN	Tan	BR	Brown	PU	Purple
BU	Blue	VIO	Violet	CL	Clear	SH	Shield
PK	Pink	WH	White	GY	Gray	LB	Lt. blue



## 10.3 HI 400HD G—Gas Burning



wc\_gr007400

## 10.4 Components—Gas Burning

No.	Description	No.	Description
1	Fuse	12	Ionization probe
2	Burner thermostat	13	Burner motor
3	Solenoid valve	15	Summer/ winter switch
4	Gas train	16	Overheat safety thermostat
5	Capacitor	17	Fan thermostat
6	Fan motor	18	Flame lamp
7	Electric pilot lamp	19	Control board heater
8	Transformer H.V.	20	Pressure switch heater
9	Room thermostat plug	21	Gas valve heater
10	Control box	22	PTC resistor
11	Air pressure switch	—	—

Wire Colors							
BK	Black	RD	Red	YL	Yellow	OR	Orange
GN	Green	TN	Tan	BR	Brown	PU	Purple
BU	Blue	VIO	Violet	CL	Clear	SH	Shield
PK	Pink	WH	White	GY	Gray	LB	Lt. blue



