FOR YOUR SAFETY
If you smell gas:
1. Open windows.
2. DO NOT try to light any appliance.
3. DO NOT use electrical switches.
4. DO NOT use any telephone in your building.
5. Leave the building.
6. Immediately call your local gas supplier after leaving the building. Follow the gas supplier’s instructions.
7. If you cannot reach your gas supplier, call the Fire Department.

Installer
Please take the time to read and understand these instructions prior to any installation. Installer must give a copy of this manual to the owner.

Owner
Keep this manual in a safe place to provide your serviceman with information should it become necessary.
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   Read this section carefully. Improper installation, adjustment, operation or maintenance will result in death, injury or property damage.

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Printed in U.S.A.
**WARNING**

**FIRE OR EXPLOSION HAZARD**

*Will result in death, severe injury or property damage.*

1. Read this manual carefully before installing or servicing this equipment. Improper installation, service or maintenance will result in death, injury or property damage.

2. Check clearances given on the outside of each burner to make sure the product is suitable for your application.

3. Installer must be a trained, experienced service technician or representative.

4. All service must be performed only by a trained service technician or representative.

5. After installation is complete, check product operation as provided in these instructions.

**Combustibles:** Failure to maintain the specified minimum clearances to combustibles could result in a serious fire hazard. Do not locate flammable or combustible materials within this distance. Signs should be posted in storage areas to specify maximum stacking height to maintain required clearances to combustibles. Do not locate in hazardous atmospheres containing flammable vapors or combustible dust. **United States:** Installations in public garages or airplane hangars are permitted when in accordance with ANSI Z83.6 and NFPA-409 and 88 Codes. **Canada:** Installation in public garages is permitted when in accordance with CAN/CGA B.149.1. Installation in airplane hangars is permitted when in accordance with the requirements of the enforcing agency.

**Vehicles:** Minimum clearances must be maintained from vehicles parked below the heater. Ensure that adequate clearance is maintained where vehicle lifts are in operation.

**Gas Connection:** There is an expansion of the radiant pipe with each firing cycle, and this will cause the burner to move with respect to the gas line. This can cause a gas leak resulting in an unsafe condition if the gas connection is not made strictly in accordance with Figure 25 of these instructions.

**Ignition:** This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

**Mechanical Hazard—Suspension:** Use appropriate suspension hardware, beam clamps (rod or perforated strap) and turnbuckles at predetermined locations. The weight and normal movement of the heating system may cause support failure if the following minimum suspension requirements are not met: distance between supports must be 10 ft. (3 m) or less; chain must be general purpose proof coil steel chain, 3/16" or larger in Diameter, with a working load limit of a minimum of 750 lbs. Failure of the supports will cause death, injury or property damage.

**WARNING**

Failure to follow these instructions will result in personal injury or property damage:

Do not use in an atmosphere containing halogenated hydrocarbons or other corrosive chemicals. Some compounds in the air can be drawn into the equipment and can cause an accelerated rate of corrosion of some parts of the heat exchanger. The use of such chemical compounds in or near the enclosure should be avoided where a longer life of the burner, tubing and other parts is desirable.

Caution should be used when running the system near combustible materials such as wood, paper, rubber, etc. Consideration should be given to partitions, storage racks, hoists, building construction, etc. Figure 1 gives minimum acceptable clearances to combustibles.

If the building has a slight negative pressure or contaminants are present in the air, an outside combustion air supply to the heaters is strongly recommended.

**CAUTION**

Failure to follow these instructions will result in damage to the system components:

Do not high pressure test the gas piping with the burners connected. Failure to follow this procedure will exceed the pressure rating of burner gas controls and this will require complete replacement of these parts.

This heater is designed for heating nonresidential indoor spaces. These instructions, the layout drawing, local codes and ordinances, and applicable standards that apply to gas piping, electrical wiring, venting, etc., must be thoroughly understood before proceeding with the installation.

**WARNING**

Improper installation, adjustment, alteration, service or maintenance will result in death, injury or property damage. Read the installation; operation and service manual thoroughly before installing or servicing this equipment. For assistance or additional information, consult a qualified installer, service agency or your gas supplier.

**FOR YOUR SAFETY:**

Do not store or use gasoline or other flammable objects, liquids or vapors in the vicinity of this heater or any other appliance.
Section 2. Introduction

Roberts-Gordon pioneered low-intensity infrared heating systems in 1962 with the introduction of its revolutionary custom-engineered Co-Ray-Vac® system. Now Roberts-Gordon offers over 30 years of infrared expertise in a unitary heating system. The DF-Series is a low-cost, non-condensing, field assembled unitary heating system that is easy to install and requires only minimal maintenance. It is designed to provide years of economical operation and trouble-free service.

The DF-Series burner operates at two separate rates. The majority of the time, the burner fires at the lower of the two rates. However, on extremely cold days, the burner automatically fires at the high rate to achieve the desired temperature rise.

Checking Shipment

Check the shipment against the Bill of Lading for shortages. Also, check for external damage to cartons. Note any shortages, and/or external damage to cartons on the Bill of Lading in the presence of the carrier. The carrier should acknowledge any shortages or damage by initialing this "noted" Bill of Lading. Immediately report any claims for damaged material, or shortages that were not evident at the time of shipment, to the carrier and your Roberts-Gordon Factory Representative.

Installer Responsibility

All heaters and associated gas piping should be installed in accordance with applicable specifications and this installation made only by firms (or individuals) well qualified in this type of work. Consult local building inspectors, Fire Marshals or your local Roberts-Gordon Representative for guidance.

DF heaters are installed on the basis of information given in a layout drawing, which together with the cited codes and regulations, comprise the basic information needed to complete the installation. The installer must furnish all needed material that is not furnished as standard equipment, and it is his responsibility to see that such materials, as well as the installation methods he uses, result in a job that is workmanlike and in compliance with all applicable codes.

Roberts-Gordon Factory Representatives have had training and experience in the application of this equipment and can be called on for suggestions about installation which can save material and money.

Section 3. Planning

The following codes and instructions should be followed when planning the installation of the heater. In addition to these instructions, the warnings in Section 1 must be carefully adhered to since improper installation will result in death, injury or property damage.

National Standards and Applicable Codes

Gas Codes

The type of gas appearing on the nameplate must be the type of gas used. Installation must comply with local codes and recommendations of the local gas company. United States: Refer to National Fuel Gas Code, ANSI Z223.1 - latest revision, (same as NFPA Bulletin 54). Canada: Refer to Can 1-B149.1: Installation Codes for Gas Burning Appliances.

- Clearance between the heater and its vent and adjacent combustible material (which is part of the building or its contents) shall be maintained to conform with the above listed codes.

Aircraft Hangars

Installation in aircraft hangars must be in accordance with the following codes: United States: Refer to Standard for Aircraft Hangars, ANSI/NFPA-409 - latest revision. Canada: Refer to Standard CGA B149-1-M51.

- Heaters in aircraft storage or service areas shall be installed a minimum of 10 ft. above the upper surface of wings or engine enclosures of the highest aircraft which may be housed in the hangar. (This should be measured from the bottom of the heater to the wing or engine enclosure, whichever is highest from the floor).
- In other sections of aircraft hangars, such as shops or office, heaters must not be installed less than eight feet above the floor.
- Heaters installed in aircraft hangars shall be located so as not to be subject to damage by aircraft, cranes, movable scaffolding or other objects.

Public Garages

Installation in garages must be in accordance with the following codes: United States: Standard for Parking Structures NFPA-88A - latest revision or the Standard for Repair Garages, NFPA 88B - latest revision. Canada: Refer to Can 1-B149.1: Installation Codes for Gas Burning Appliances.

- Heaters must not be installed less than eight feet above the floor. Minimum clearances to combustibles must be maintained from vehicles parked below the heater.
- When installed over hoists, minimum clearances to combustibles must be maintained from the uppermost point on the hoist.
The heater must be electrically grounded in accordance with the following codes: **United States**: Refer to National Electrical Code, ANSI/NFPA-70 - latest revision. Wiring must conform to the most current National Electrical Code, local ordinances, and any special diagrams furnished. **Canada**: Refer to Canadian Electrical Code, CSA C22.1 Part 1 - latest revision.

The venting must be installed in accordance with the following codes: **United States**: Refer to NFPA-54/ANSI-Z223.1 - latest revision, National Fuel Gas Code. **Canada**: Refer to Can 1-B149.1: Installation Codes for Gas Burning Appliances.

Partial information with regard to these codes is provided in Section 8 of this installation manual with regard to size and configurations for venting arrangements.

Any portion of vent pipe passing through a combustible wall must be dual insulated and have an approved thimble to conform with above listed codes.

Where there is the possibility of exposure to combustible airborne material or vapor, consult the local Fire Marshall, the fire insurance carrier or other authorities for approval of the proposed installation.
Critical Considerations

⚠️ WARNING

Fire Hazard
Some objects will catch fire or explode when placed close to heater.
Keep all flammable objects, liquids and vapors the required safe distances away from heater.
Failure to follow these instructions will result in death, injury or property damage.

⚠️ ATTENTION

Risque d'incendie
Certains objets placés près du radiateur peuvent s'enflammer ou exploser.
Tenir tous les objets, liquides et vapeurs inflammables à la distance de sécurité requise du radiateur.
Le non-respect de ces consignes peut causer mort, blessures ou dommage matériel.

Installation Procedure

⚠️ WARNING

Several steps are involved in the installation of the heater.
Do not attempt to operate the heater until all steps of the installation have been accomplished.
Failure to follow these instructions will result in death, injury or property damage.

Take maximum advantage of the building upper structure, beams, joists, purlins, etc., from which to suspend the heater. There is no unique sequence for installation of the tubing. On-site observation will usually reveal a logical sequence. Begin the installation at the most critical dimension. This could save time. Watch for swinging doors, overhead cranes, car lifts, etc. Reflectors and tubing can be installed as you move along. Carefully adjust system pitch at each position to level the heater. Pitch down 1/4" per 20' (1 cm per 5 m) away from burner.

Don't:
• Pressure test the gas line using high pressure (greater than 1/2 PSIG) without closing the high-pressure shut-off cocks. Failure to do so will result in damage to the burners.

Do:
• Familiarize yourself with local and national codes.
• Develop a planned procedure which will conserve material and labor on the job.
• Check to see that all material and equipment is on the job before starting installation.
• Allow for thermal expansion of the hot tube.
• Install the gas connector only as shown in instructions. (See Figure 25)
• Have slip joints where required between reflectors to keep them from buckling or coming apart.
• Provide one square inch of free air opening to each 1,000 BTU/hr of heater input but not less than 100 square inches in enclosed spaces. (6.5 cm² per 250 kcal/h). One opening should be within 12 inches (30 cm) of the top and one within 12 inches (30 cm) of the bottom of the enclosure.

The DF-Series is a suspended heater. Therefore, its stability, flexibility, and safety are very important. Before starting installation, be sure the system can meet the following requirements:

• Maintain specified clearances to combustibles, and safe distance from heat-sensitive material, equipment and work stations.

• Provide a suspension with vertical length of chain or swinging rod. Be sure the suspension system is sufficiently flexible to accommodate thermal expansion which occurs as the system heats up (see Figure 16).

• Provide access to burners for servicing, preferably on both sides, above, and behind for burner removal.

• Be sure the heater has a downward pitch of 1/2" per 20' (1 cm per 5 m) away from the burner.

• Provide signs in storage areas to specify maximum stacking height to maintain required clearances to combustibles.

• Plan location of supports. Locate a support near all elbows.

• A minimum of 10 ft. (3 m) on DF-80, and a minimum of 15 ft. (4.5 m) on DF-100/125/150/175/200 is required between the burner and the first elbow.
Section 4. Clearances to Combustibles

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>![Fire Hazard Icon]</td>
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<tr>
<td><strong>Fire Hazard</strong></td>
</tr>
<tr>
<td>Some objects will catch fire or explode when placed close to heater.</td>
</tr>
<tr>
<td>Keep all flammable objects, liquids and vapors the required safe distances away from heater.</td>
</tr>
<tr>
<td>Failure to follow these instructions will result in death, injury or property damage.</td>
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</tbody>
</table>

| ![Burn Hazard Icon] |
| **Burn Hazard** |
| Keep all persons, especially children, away from heater. |
| Do not touch any part of the heater. |
| Heater is very hot. |
| Failure to follow these instructions will result in severe injury. |

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<td><strong>Risque d'incendie</strong></td>
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<tr>
<td>Certains objets placés près du radiateur peuvent s'enflammer ou exploser.</td>
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<tr>
<td>Tenir tous les objets, liquides et vapeurs inflammables à la distance de sécurité requise du radiateur.</td>
</tr>
<tr>
<td>Le non-respect de ces consignes peut causer mort, blessures ou dommage matériel.</td>
</tr>
</tbody>
</table>

| ![Risque de brûlure Icon] |
| **Risque de brûlure** |
| Ne laisser personne, en particulier des enfants, s'approcher du radiateur. |
| Ne toucher aucune partie du radiateur. |
| Le radiateur est brûlant. |
| Le non-respect de ces consignes peut entraîner des blessures graves. |

In all situations, clearances to combustibles must be maintained. Failure to observe clearances to combustibles will result in death, severe injury or property damage. Signs should be posted in storage areas to specify the maximum stacking height to maintain required clearances to combustibles. Minimum clearances must be maintained from vehicles parked below the heater. Caution should be used when running the system near combustible materials such as wood, paper, rubber, etc. Consideration should be given to partitions, storage racks, hoists, building construction, etc. Figure 1 gives minimum acceptable clearances to combustibles.
NOTE: Clearances B, C and D can be reduced by 50% for locations 25 ft. or more downstream of the burner.

### United States

<table>
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### Canada

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### Canada - metric (cm)

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**Figure 1a. Standard Reflector**

**Figure 1b. One Side Reflector**

**Figure 1c. 2 Side Reflectors**

**Figure 1d. 45° Tilt Reflector**

**Figure 1e. U-Tube, Standard**
**NOTE:** Clearances B, C and D can be reduced by 50% for locations 25 ft. or more downstream of the burner.

### United States

<table>
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**Figure 1f. U-Tube, Opposite 45°**

**Figure 1g. U-Tube, Full 45°**

**Figure 1h. 2-Foot Deco Grille**

**Figure 1i. Venting**
Section 5. Standard Parts List

The following section provides information about assembling DF-Series heaters. The heaters must be assembled according to the following illustrations and tables in order to ensure safe and proper operation.

DF-Series burner cartons contain the basic burner unit, a Pipe Nipple and Flex Gas Line for gas connection, and an Outside Air Adapter. Turbulators (when required) are listed in Table 2.

The remaining heater components are shipped in one of two ways:

1) Typically, tubes, reflectors, hangers, etc. are pre-packaged at the factory. Components for heaters of up to 40 ft. (12 m) length are accommodated in one carton that includes a 10 ft. (3 m) transition tube. Longer heaters require two accessory cartons. One carton will include a transition tube. Necessary packages for the various heaters are shown in Table 1 below. Components should be assembled as per Figures 2 through 20.

2) In some cases, DF-Series heaters may be received with the accessory components non-cartoned, or packaged for a specific installation. In those cases, be sure to acquaint yourself with the individual components shown in Figure 2. Also follow carefully the appropriate diagram (Figures 3 through 9 and Figure 19) for the heater you ordered. These indicate the quantity and location of all necessary components.

Figures 10 through 20 show specific assembly details. Refer to Section 8 for venting assembly, Section 9 for gas piping assembly, and Section 10 for field wiring.

Table 1. DF-Series Component Package Guide

<table>
<thead>
<tr>
<th>Model</th>
<th>Tubing Length</th>
<th>Required Accessory Packages</th>
<th>For Assembly see page</th>
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<tbody>
<tr>
<td>DF-80</td>
<td>20' (6 m)</td>
<td>CP20ALUM</td>
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<td></td>
<td>30' (9 m)</td>
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<td>pg 12</td>
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<tr>
<td>DF-100</td>
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<td>pg 12</td>
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<tr>
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<td>40' (12 m)</td>
<td>CP40ALUM</td>
<td>pg 13</td>
</tr>
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<td>30' (9 m)</td>
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<td>40' (12 m)</td>
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<td>pg 13</td>
</tr>
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<td></td>
<td>50' (15 m)</td>
<td>CP30ALUM + EXP20ALUM</td>
<td>pg 14</td>
</tr>
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<td>DF-150</td>
<td>40' (12 m)</td>
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<td>pg 13</td>
</tr>
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<td>50' (15 m)</td>
<td>CP30ALUM + EXP20ALUM</td>
<td>pg 14</td>
</tr>
<tr>
<td></td>
<td>60' (18 m)</td>
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<td>DF-175</td>
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<td>70' (21 m)</td>
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</tr>
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<td>DF-200</td>
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<td>pg 16</td>
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<td></td>
<td>80' (24 m)</td>
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<td>pg 17</td>
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</table>

* The DF-Series heaters have been approved at the optional tubing lengths indicated above. However, Roberts-Gordon recommends installation of the minimum tubing lengths for optimum performance.
### Table 2. Contents of DF-Series Burner Shipping Carton

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<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
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<tr>
<td>02566200</td>
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<td>1</td>
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<tr>
<td>90709801</td>
<td>Gasket (Blower to Burner)</td>
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<td>Installation Manual</td>
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<td>91911700</td>
<td>Outside Air Collar</td>
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<td>94118106</td>
<td>#8 x 3/8 Hex Washer Head</td>
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<td>92311800</td>
<td>Keps Nut</td>
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<td>03051503</td>
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<tr>
<td>03051504</td>
<td>Turbulator 2.5 ft. (76 cm) Section Piece</td>
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<td>2</td>
<td>3</td>
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<tr>
<td>91907302</td>
<td>S-Hook</td>
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<td>2</td>
<td>2</td>
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### Table 3. Contents of Accessory Packages

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<th>Part No.</th>
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<th>Core Packages</th>
<th>Extension Packages</th>
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<td></td>
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<td>Aluminized 20'</td>
<td>30' 40'</td>
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<td>03051100</td>
<td>Transition Tube, Aluminized, 10 ft.</td>
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<tr>
<td>91409408</td>
<td>Tube, HT Aluminized, 10 ft.</td>
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<td>01312700</td>
<td>Standard Coupling Assembly</td>
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<tr>
<td>02750303</td>
<td>Standard 8 ft. Reflector</td>
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<td>02750800</td>
<td>End Cap</td>
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<td>2</td>
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<tr>
<td>03090100</td>
<td>Tube and Reflector Hanger</td>
<td>3</td>
<td>4</td>
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<td>91907302</td>
<td>S-Hook</td>
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<td>03050010</td>
<td>Refl. Support Pkg. (Strap, Wire Form, Screws)</td>
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<td>91107720</td>
<td>U-Clip (20 pcs./pkg.)</td>
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<td>90502700</td>
<td>Vent Adapter</td>
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<td>01318901</td>
<td>Tube Clamp Package</td>
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<th>Package Part Numbers:</th>
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<td>CP20ALUM</td>
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<tr>
<td>EXP30ALUM</td>
</tr>
<tr>
<td>EXP40ALUM</td>
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Section 6. Assembly Overview

The figures in this section provide a general overview of component placement in a DF-Series system. The location of some components such as supports and couplings is crucial to proper installation. Assemble the heater components as shown in Figures 3 through 9.

Optional reflector configurations are shown in Figure 1. Install appropriate suspension hardware, beam clamps, chain or rod at predetermined locations. Adjustment of chain length will provide uniform pitch.

Burner Housing (shown with blower assembly and tube gasket)
Must be installed with the flame observation window facing down. Install separate blower assembly in the position shown. To install the blower, place the blower gasket on the (4) studs located at the top of the burner housing. Place blower assembly over the studs with blower inlet facing to the back of the burner. Secure blower using the (4) Keps nuts provided. Attach blower power cord to the receptacle on the back of the burner housing. Attach outside air collar using the (3) #8 flat washers supplied.

Transition Tube
Supplied in 10 ft. (3 m) lengths. Transition tube is always the first tube after the burner. Attach to burner housing using the (4) split lockwashers, (4) cap screws and tube gasket provided in the burner package.

Tube and Reflector Hanger with Clamp Package
Position this hanger no more than 4" (10 cm) away from the burner assembly. Install tube clamp package as shown. Suspend from 2 S-Hooks.

Heat Exchanger Tube
Supplied in 10 ft. (3 m) lengths. Tube type as indicated.

Reflectors
Alternate overlap as shown on overview. Amount of overlap is indicated. Minimum overlap is 9" (23 cm).

Standard Coupling
Coupling should be oriented with slide bar on top, and all couplings should "point" in the same direction.

Tube and Reflector Hanger
Suspend system from these hangers. Minimum one (1) required per tube. Suspend from S-Hook.

Punch out center section to accommodate tube. Attach with U-Clips provided.

Reflector Support Package
One support is required at every reflector overlap. The support closest to the burner and every other support after should have the screws loosened approx. 1/16" (2 mm) to allow for reflector slippage.

Vent Adapter
Adapter is used to connect the last heat exchanger tube to the vent system. Install adapter with seam on top.

Turbulator
Turbulator must be installed in the last standard section of radiant tube. See Figure 17 for installation details. Turbulator is not required on BH-175 and BH-200 burners.

Figure 2. Assembly Overview
Figure 3. Assembly of 20 ft (6 m) Heat Exchanger System
Figure 4. Assembly of 30 ft (9 m) Heat Exchanger System
Figure 5. Assembly of 40 ft (12 m) Heat Exchanger System
**Figure 6. Assembly of 50 ft (15 m) Heat Exchanger System**

- (4) U-Clips
- (2) Reflector End Caps
- (1) Vent Adapter
- (1) Turbulator (if required)
- (7) Reflectors Overlap approx. 13" (33 cm)*
- S-Hook (Typ.)
- (4) Heat Exchanger Tubes
- (6) Tube and Reflector Hangers
- (4) Stainless Steel Couplings
- (1) Transition Tube
- (1) Tube Clamp Package
- (1) Gasket
- (1) Burner Assembly

* Suggested reflector overlap using the standard quantity of reflectors supplied. Always use a minimum of 9" (23 cm) overlap. U-tube and elbow configurations will affect overlap distance and may require either additional reflectors or cutting reflectors.
Figure 7. Assembly of 60 ft (18 m) Heat Exchanger System
Figure 8: Assembly of 70 ft (21 m) Heat Exchanger System

(1) Vent Adapter
(2) Reflector End Caps
(4) U-Clips
(S) Reflectors
Overlap approx. 14° (36 cm)
(Tight Screws)
(Tight Screws)
(Loose Screws)
(Loose Screws)
(Loose Screws)
(Loose Screws)
(S-Hook (Typ.))
(6) Heat Exchanger Tubes
(8) Tube and Reflector Hangers
(6) Stainless Steel Couplings
(4) U-Clips
(9) Reflector Supports
(1) Tube Clamp Package
(1) Transition Tube
(1) Gasket
(1) Burner Assembly

* Suggested reflector overlap using the standard quantity of reflectors supplied. Always use a minimum of 9° (23 cm) overlap. U-tube and elbow configurations will affect overlap distance and may require either additional reflectors or cutting reflectors.
Figure 3. Assembly of 80 ft (24 m) Heat Exchanger System

(1) Vent Adapter
(2) Reflector End Caps
(4) U-Clips
(12) Reflectors
Overlap approx. 10" (25 cm)*

TIGHT SCREWS
LOOSE SCREWS

S-Hook (Typ.)
(7) Heat Exchanger Tubes
(9) Tube and Reflector Hangers

TIGHT SCREWS
LOOSE SCREWS

(7) Stainless Steel Couplings
(11) Reflector Supports
(4) U-Clips

TIGHT SCREWS
LOOSE SCREWS

(1) Transition Tube
(1) Tube Clamp Package

(1) Gasket
(1) Burner Assembly

* Suggested reflector overlap using the standard quantity of reflectors supplied. Always use a minimum of 9" (23 cm) overlap. U-tube and elbow configurations will affect overlap distance and may require either additional reflectors or cutting reflectors.
Section 7. Component Installation

TUBE COUPLING INSTALLATION

Tube and tube fittings are connected by wrap-around couplings which clamp by means of a tapered, hammer-driven lock member.

![Diagram of Coupling Assembly]

Figure 10. Coupling Assembly

To assemble the coupling, hook the free end of the coupling sleeve into the lanced clip. Place the wide end of the tapered slide bar on the coupling so that it moves toward the lanced clip. Insert the two tube ends into the coupling. Be sure the tube ends are in line and are flush against the stop pins inside the coupling.

Hammer-drive the slide bar until the coupling is secured snugly to the tubes. Overdriving the slide bar will distort the coupling or slide bar lip and will decrease the holding capability of the coupling. Coupling should be tight when the slide bar is ±2" (5 cm) from the end of the coupling. See Figure 10.

![Diagram of Tube Clamp Package]

Figure 11. Tube Clamp Package

![Diagram of Reflector Support Package]

Figure 12. Reflector Support Package

Reflector Support  P/N 03050100
includes Support Strap, Wire Form, and (2) Screws
For slip joint, loosen screws approx. 2 mm (1/16")
ELBOW PACKAGE INSTALLATION

(P/N 02718702) Elbow Package includes: (1) elbow, (1) coupling, (1) end cap, (1) reflector joint piece, and (1) package of U-Clips. Install elbow into radiant tube sequence where plans indicate a 90° bend. Install reflector joint piece using the following procedure:

1. Flatten reflector edge where joint piece matches. Put a mark on the reflector, directly over the tube center. Center the accessory joint piece on the mark and scribe its contour on the reflector. Scribe the location of the mounting holes.

2. Cut away the reflector to clear the tube, leaving about one inch of material inside the scribed contour to attach the accessory joint. With an awl or other pointed tool, punch six 3/32" (2 mm) diameter holes in reflector in the positions shown in Figure 14.

3. Use six #10 sheet metal screws to attach the joint piece. Install a reflector end cap of the open end.

![Figure 13. 90° Elbow Fitting Dimensions](image)

REFLECTOR END CAP INSTALLATION

Reflector end caps must be installed over the open ends of reflectors. Attach the end cap to the reflector using a minimum of four U-clips per end cap.

Before installing the end cap, the center section must be removed. Carefully break the tabs on the bottom flange of the end cap first. Then gently flex the center section until it releases. Be very careful not to distort or otherwise damage the end cap during this procedure.

If the end cap is used at a joint piece to cover a 90° elbow or U-tube, the center section should not be removed.

![Figure 14. Reflector Joint Piece Installation](image)

![Figure 15. Reflector End Cap Installation](image)
TURBULATOR INSTALLATION

For ease of installation, the turbulator should be installed in the tube before hanging the system. Use the following procedure (see Figure 17):

1. Assemble turbulator pieces by "twisting" matching ends together.
2. Insert a long wire (11 ft. minimum) down the length of the tube. Attach the wire to the hole in the tab on the adapter piece.
3. Using the wire, pull the assembled turbulator into the tube from the opposite end. Pull the turbulator through until just the tab comes out. Detach the wire.
4. Bend the tab around the tube. When installed the vent adapter will lock the tab in place.

Figure 16. Typical Suspension Details

Figure 17. Turbulator Baffle Assembly Detail
SIDE EXTENSION REFLECTOR

Optional Side Extension Reflectors may be installed on either side of the unit. Each 8 ft. section of Side Reflector should match a reflector and have identical overlap to adjacent reflectors. Provide slip joints in the same locations as the reflectors. Proceed as follows (see Fig. 18):

1. Attach a reflector side extension support bracket to the tubes where needed. These brackets should be located adjacent to the overlapped joints of the reflectors.

2. Insert lower edge of reflector side extension in extension support bracket.

3. Cut suitable relief notches where the side extension reflector meets tube and reflector hangers and reflector support brackets.

4. Hook the top edge of the side extension reflector over the edge of the reflector.

5. A slip joint must be provided in the perimeter side extension at the location of each slip joint in the reflector. The overlap should be the same as the reflector.

6. Where severe air movement may be encountered, as at a large door, one or two sheet metal screws should be used to attach the side extension reflectors together. Additional reflector supports are also recommended.

7. To Install the Retainer Clips: Lay bracket over the side extension reflector and standard reflector at the selected location. By using the hole in the clip as a template, drill or punch a 3/32" (2 mm) diameter pilot hole in the standard reflector. Secure the retainer clip using #8 x 3/8" sheet metal screws.

Reflector Side Extension Package (P/N 02712700) includes:
(1) Side Extension Reflector, (2) Retainer Clips and (2) Sheet Metal Screws. Order at least (2) Side Extension Reflector Support Brackets (P/N 01329910) for each package.

Figure 16. Installation of Side Extension Reflectors
U-TUBE PACKAGE

DF heaters are approved for optional U-Tube configurations. The U-Tube Package (P/N 030110000) includes: (1) 180° U-Tube, (1) Plain Coupling, (1) Tube and Reflector Hanger, (2) End Caps, (1) U-Tube Support Bracket and (2) 4" (10 cm) U-Bolts with Lockwashers and Hex Nuts.

Shown below is an example DF-100 U-Tube configuration. One of the 10 ft. (3 m) tubes was cut in half to balance the sides. (The layout does not need to be symmetrical.) One (1) additional coupling was needed to complete the installation. The U-Tube may be installed in either a standard horizontal position or in an opposite 45° position as shown below. When designing a U-Tube configuration, the following rules must be adhered to:

1. A minimum of 10 ft. (3 m) on DF-80, and a minimum of 15 ft. (4.5 m) on DF-100/125/150/175/200 is required between the burner and the U-Tube.
2. The correct turbulator must be installed in the last standard section of heater tube.
3. The burner must never be operated in a tilted position.
4. The heater must be properly supported at all locations.

Figure 19. U-Tube Package Assembly Overview (optional)
Figure 20. Installation of 2 ft. (60 cm) Decorative Aluminum Grille (optional)

DEORATIVE GRILLE INSTALLATION

⚠️ WARNING

Cut Hazard
Wear protective gloves when handling aluminum grille.
Edges are sharp.
Failure to follow these instructions will result in injury.

When running the heater over a suspended ceiling, decorative grille must be used directly below the heater. The use of regular ceiling tiles directly below the heater will create an unsafe condition.

The decorative grille option allows the heater to be installed over suspended ceilings. The aluminum grille (P/N 91407000) comes in standard 2 ft. x 4 ft. (60 cm x 120 cm) sections and is installed in place of ceiling tile.

The system is hung in a normal fashion with the tube suspended over the grille at a height between 1.6" and 14.4" (between 4 cm and 36.5 cm). To select the appropriate side extension reflectors, calculate the distance "A" between the radiant tube and the decorative grille. See Table 4 below.

Shields (P/N 01365900) must be placed over ceiling frame members that pass underneath the heater. The side extension reflectors are available in standard 4ft. (120 cm) sections and have notches in the bottom corners to accommodate suspension system. Lay the side extension reflectors along the standard reflectors and cut suitable notches for the tube and reflector hangers where appropriate. It is generally not necessary to cut notches for the reflector support straps. Gloves should be worn when handling the aluminum grilles to protect hands from sharp edges.

Table 4. Side Extensions for Decorative Grille

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<th>Distance &quot;A&quot;</th>
<th>Extension</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Part No.</th>
<th>Width</th>
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<td>5.8&quot; (14.6 cm)</td>
<td>12&quot; (30 cm)</td>
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<tr>
<td>10.1&quot; (25.7 cm)</td>
<td>16&quot; (40 cm)</td>
<td>01370416</td>
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<td></td>
<td></td>
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</tbody>
</table>
Section 8. Venting and Ducting

WARNING
Carbon Monoxide Hazard
Unvented heaters must be interlocked with sufficient building exhaust.
Vented heaters must be vented outdoors.
Unvented and vented heaters must be installed according to the installation manual.
Failure to follow these instructions will result in death or injury.

Heater must be vented in accordance with the proper national and local codes. Partial information relating to these specifications is provided in this section with regard to size and configurations for venting arrangements. United States: refer to ANSI Z223.1 - latest revision. Canada: refer to CAN/CGA-B149.1.

Heater may be vented one of the following ways:

- Unvented (with adequate ventilation)  pg. 25
- Horizontal Venting - Combustible walls  pg. 25
- Horizontal Venting - Noncombustible walls  pg. 25
- Vertical Venting  pg. 26

The method chosen will depend upon a number of factors including: building ventilation, available access points in walls and ceiling, number of burners installed, installation codes, etc. Consult layout drawing for venting method used. Some installations may require the use of an outside combustion air supply. See page 27 for details.

c) If condensation in the vent is a problem, the vent length should be shortened or insulated.
d) For outside air installations, the outside air terminal must not be installed more than one foot above the vent terminal.
e) Secure all joints with minimum (3) #8 x 3/8 sheet metal screws.
f) All vent joints should be sealed using suitable product such as General Electric RTV106 or Permatex Form-a-Gasket red high temperature silicone adhesive sealant.

Vent Length Requirements

- a) Maximum vent length allowed is 45 ft. (13.7 m)
- b) Maximum outside air supply duct allowed is 45 ft. (13.7 m)
- c) Vent length plus outside air supply length plus extension package shall not exceed 65 ft. (19.8 m).
- d) Under length conditions a) through c) above, a total of 2 elbows are allowed for vent and outside air supply together. Subtract 15 ft. (4.6 m) per additional elbow from maximum length allowed if more than 2 elbows are used.

General Venting Requirements

NOTE: Condensate may develop when long vent pipes are used. It is therefore recommended that the flue pipe length should be less than 20 feet (6 m).

Use the following guidelines to help insure an adequate, safe venting arrangement:

a) Exhaust end of heater will accept a four inch vent pipe using the vent adapter (P/N 90502700). Install the vent adapter with the seam on top. This will prevent condensation from leaking out of the adapter.
b) Vent terminal opening must be beyond any combustible overhang.

Figure 21. Unvented Operation
UNVENTED OPERATION

a) Sufficient ventilation must be provided in the amount of 4 cfm per 1000 BTU/hr firing rate (United States); 3 cfm per 1000 BTU/hr firing rate (Canada).

b) Use of optional outside combustion air is not recommended with unvented heaters due to pressure considerations.

c) If exhaust fans are used to supply ventilation air, an interlock switch must be used to prevent the heater from coming on when the fans are off. This may be done using an air pressure switch.

d) For additional information: United States: refer to ANSI Z223.1 - latest revision (NFPA No. 54) and local codes; Canada: CAN/CGA-B149.1 Installation Codes.

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**Figure 22.** Horizontal Venting Configurations

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HORIZONTAL VENTING

a) In combustible or noncombustible walls use insulated vent terminal (P/N 90502100, Tjernlund VH1-4 or equivalent). Follow vent manufacturer’s instructions for proper installation.

b) For noncombustible walls only, use vent terminal (P/N 02537800)

c) 4" O.D. vent pipe is required, 20 ft. (6 m) maximum length is recommended. Up to 45 ft. (13.7 m) maximum may be used if insulated to prevent excess condensation.

d) Vent terminal should be installed at a height sufficient to prevent blockage by snow. Building materials should be protected from degradation by vent gases.

Requirements (Canada)

a) Vent terminal must not be installed less than 3 ft. (1 m) from any building opening.

b) Vent must be at least 6 ft. (2 m) from the combustion air opening of this unit or any other appliance.

c) Vent terminal must be installed at least 3 ft. (1 m) above grade.

Requirements (United States)

a) Vent must exit building not less than seven feet above grade when located adjacent to public walkways.
VERTICAL VENTING

a) In the United States refer to ANSI Z223.1 - latest revision, (NFPA No. 54) for venting guidelines.

b) In Canada refer to CAN/CGA-B149.1 for venting guidelines.

c) Type "B" minimum vent materials must be used outdoors.

d) An insulating thimble may be required to pass through combustible structures.

e) A 4" O.D. vent pipe is required, 20 ft. (6 m) maximum length is recommended. Up to 45 ft. (13.7 m) maximum may be used if insulated to prevent excess condensation.

Figure 23. Vertical Venting Configuration
OUTSIDE COMBUSTION AIR SUPPLY

IMPORTANT: If the building has a slight negative pressure or contaminants such as halogenated hydrocarbons are present in the air, an outside combustion air supply to the heaters is strongly recommended.

The DF heater is approved for installation with an outside air supply system.

For an outside air supply, a 4" O.D. (10 cm O.D.) single wall pipe may be attached to the heater. The duct may be up to 45 ft. (13.7 m) maximum length or 2 ft. (60 cm) minimum length with no more than 2 elbows. See Vent Length Requirements heading on pg. 24 for more detailed guidelines.

The air supply duct may have to be insulated to prevent condensation on the outer surface. The outside air terminal should be securely fastened to the outside wall by drilling four 1/4" (6 mm) diameter holes in the outside flange; wood screws or bolts and expansion sleeves may be used to fasten the terminal.

The DF heater is approved for installation with an outside air supply system. 

For the outside air terminal, use Metalbestos #31267 (RG P/N 60502300), or ACME #104, or equivalent.

PVC pipe, aluminum flex duct, or equivalent may be used instead of single wall pipe for the outside combustion air supply.
Section 9. Gas Piping

A gas supply connection at each burner location must be located and oriented as shown in Figure 25. To check system pressure, put a plugged 1/8" NPT tapping in the gas line at the connection to the burner furthest from the supply. Before connecting the burner to the supply system, verify that all high pressure testing of the gas piping has been completed.

Follow these instructions to ensure a professional gas supply system installation:

- Support all gas piping with suitable pipe hanging materials.
- Use wrought iron or wrought steel pipe and malleable iron fittings. All pipe and fittings should be new and free from defects. Carefully ream the pipe and tubing ends to remove obstructions and burrs.
- Use LP-gas-resistant joint compound on all threads.
- Check the pipe and tubing ends for leaks before placing heating equipment into service. When checking for gas leaks, use a soap and water solution; never use an open flame.

Install the flex gas connector as shown. The flex gas connector accommodates expansion of the heating system and allows for easy installation and service of the burner. A 90° pipe elbow (not supplied) must be installed on the pipe nipple to ensure proper orientation of the flex gas connector.

Read applicable warnings in Section 1 before proceeding with Gas Piping installation. Improper installation may result in death, severe injury or property damage.

Meter and service must be large enough to handle all the burners being installed plus any other connected load. The gas line which feeds the system must be large enough to supply the required gas with a maximum pressure drop of 1/2" w.c.. When gas piping is not included in the layout drawing, the local gas supplier will usually help in planning the gas piping.

The ends of the flex gas connector must be installed parallel. The 2" (5 cm) displacement shown is for the cold condition. This displacement may reduce when the system is fired.
Section 10. Wiring

The DF-Series heater is a dual firing heating unit and must be connected to a low voltage, two-stage thermostat for correct operation. A thermostat connector is provided on the exterior of the burner box. See Figure 26 for wiring the two-stage thermostat to the burner box.

Heaters must be grounded in accordance with applicable codes: **United States**: refer to National Electrical Code ANSI/NFPA 70 - latest revision **Canada**: refer to Canadian Electrical Code CSA C22.1 Part I - latest revision.

---

**Figure 26. Two-Stage Thermostat Wiring**
Figure 27. Internal Wiring - Burner Box

**WARNING**
If any of the original wire as supplied with the heater must be replaced, it must be replaced with wiring material having a temperature rating of at least 105ºC and 600 volts.

**ATTENTION**
Si une partie du câblage d’origine fourni avec le radiateur doit être remplacée, elle doit l’être par du matériel de câblage tolérant une temperature d’au moins 105ºC et 600 volts.

Figure 28. Electrical Connection to the Burner Box
Figure 29. Ladder Diagram

⚠️ WARNING

If any of the original wire as supplied with the heater must be replaced, it must be replaced with wiring material having a temperature rating of at least 105PC and 600 volts.

⚠️ ATTENTION

Si une partie du câblage d'origine fourni avec le radiateur doit être remplacée, elle doit l'être par du matériel de câblage tolérant une température d'au moins 105PC et 600 volts.
Section 11. Operation

If it is desirable to operate the unit at **low fire**, proceed as follows:

1. Remove cover from the thermostat; notice two mercury filled glass tubes inside the unit.

2. Move the temperature control mechanism to raise and lower the temperature setting. Notice how the mercury within the glass tubes moves from right-to-left as the temperature setting is increased, and from left-to-right as the temperature setting is decreased.

3. To operate the unit in the **low fire** mode, slowly move the temperature control mechanism to increase the temperature setting. Observe the motion of the mercury in the top glass tube; as soon as the mercury makes contact with the opposite end of the tube the blower motor will start and the amber indicator light will illuminate upon burner ignition.

If the temperature setting is not done properly, the mercury in the lower glass tube will also move to the left end of the tube, the green indicator light on the burner box will immediately illuminate and the blower motor comes on indicating that the heater will operate in the **high fire** mode.

Sequence of Operation

1. Turn the thermostat up. When the two-stage thermostat calls for heat, the ignition module will energize the blower motor.

2. When the motor approaches nominal running RPM, the air proving switch closes and activates the ignition module.

3. The ignition module then opens the two-stage gas valve for either high or low fire operation and energizes the spark igniter.

4. When the flame is established, the sparking sequence ceases. The burner is either operating at high fire or low fire depending on the temperature differential sensed by the thermostat. If the burner is on **high fire**, the green indicator light will illuminate immediately and the amber indicator light will illuminate upon ignition. If the burner is on **low fire**, the amber indicator light will illuminate upon burner ignition.

The DF-Series heater is a dual firing heating unit and must be connected to a two-stage thermostat (P/N - 90411301) for correct operation. Two-stage thermostats have a built-in temperature differential that controls whether the heater operates on high or low fire.

The example below explains how the two-stage thermostat works with your DF-Series heater.

The two-stage thermostat supplied with the DF-Series heater has a set temperature differential of 2° F. When the thermostat is set at 68° F, the DF-Series heater will run on low fire between temperatures of 65° and 68°F. For example, when the temperature drops to 65°F or lower, the 2°F temperature differential is exceeded and the DF-Series heater will now run on high fire until the temperature increases to 66°F which is now within the 2° temperature differential of 68°F. Upon reaching the 66°F the DF-Series heater will run on low fire until the call for heat is satisfied.

High/Low Firing Instructions

Please note that when the thermostat is turned up, the burner will most likely fire on **high fire**. The high fire condition is indicated by the green indicator light on the burner box that illuminates when the blower motor comes on. The amber indicator light will illuminate upon ignition of the burner unit.
5. If the flame is not established during the ignition sequence, the ignition module closes the gas valve and purge begins. Module will try 2 additional times for ignition (with purge in between). If ignition is not established, the module will lock out.

6. If the flame extinguishes during operation, the ignition module will provide multiple trial sequence described in step 5. If ignition is not re-established, the module will lock out.

7. After lockout, control must be reset by turning down thermostat for five (5) seconds, and then raising it again to desired temperature, or by disconnecting power and then reconnecting.

8. If the burner is operating on high fire, the burner will continue to run until the temperature sensed at the thermostat is within 2°F of the set point. When this condition is met, the thermostat discontinues power to the second solenoid and the burner will run on low fire until the call for heat is satisfied. If the burner initiated operation on low fire, the burner will run until the call for heat is satisfied.

Maintenance

⚠️ WARNING

Disconnect gas and electrical supplies before performing service or maintenance.
Failure to follow these instructions will result in death, injury or property damage.

For best performance, the following maintenance procedures should be performed before each heating season:

1. Be sure gas and electrical supply to heater are off before performing any service or maintenance.

2. Check condition of blower scroll and motor. Dirt and dust may be blown out with compressed air, or a vacuum cleaner may be used.

3. Check condition of burner. Carefully remove any dust or debris from inside the burner box or mixing tube.

4. Inspect the electrode. Replace electrode if there is excessive carbon residue, erosion of electrodes or other defects. Gap should be 0.125".

5. Check the inside of the firing tube with a flashlight. If carbon or scale are present, scrape out the deposits with a wire brush or rod, or metal plate attached to a wooden pole.

6. Check the vent pipe for soot or dirt. After cleaning as necessary, re-attach the vent pipe to the heater.

7. Outside surfaces of heater reflector may be cleaned by wiping with a damp cloth.

8. A qualified service agency should be contacted for service other than routine maintenance.

9. Check vent terminal and fresh air inlet to see that they have not become blocked during the non-heating season. If either pipe is restricted, the air switch won’t close, resulting in a no-heat situation.
Section 12. Troubleshooting

**WARNING**

Disconnect gas and electrical supplies before performing service or maintenance. Failure to follow these instructions will result in death, injury or property damage.

---

No Power (Power supply connected)

1. Check to see that the thermostat is calling for heat.
2. Check fusing in electrical supply to heater.
3. Check for 120V at connection.

Blower Motor Fails to Run

1. Is the blower motor plugged into the burner box outlet?
2. Check for broken motor wire
3. Does blower wheel turn freely? Replace the motor if it is seized.

No Spark

1. Turn off gas and check for spark at the burner.
2. Ignition modules have a built-in pre-purge. Wait 45 seconds and try again.
3. Recycle thermostat or power if no spark appears.
4. Check for loose or broken leads.
5. Replace air switch if faulty.
6. Check electrode gap. Gap should be 0.125".
7. Make sure that the total length of outside air vent and vent pipe has not been exceeded.
8. Check the vent and vent terminal for obstructions.
9. Check the plastic tubing connecting the air switch. A hole in the line will prevent ignition.

No Gas Present

Gas pressure downstream of gas control can be measured by using a manometer and connecting to pressure tap on control.

1. Check to see if manual valve to heater is ON.
2. Check to see if manual valve knob on heater gas control is ON.
3. Supply gas pressure can be checked at 1/8" NPT pressure tapping on heater external manual valve.
4. Check to see if gas control is opening; no manifold pressure indicates valve is closed.

If the valve is closed, either the gas valve or the ignition module is faulty.

---

**WARNING**

Electrical Shock Hazard
Do not disconnect ground leads inside heater.
Do not interchange grounded and ungrounded leads on transformer or ignition module.
Failure to follow these instructions will result in death or electrical shock.

---

Burner Lights and Then Goes Out

Flame current is the current which passes through the flame from the sensor to ground to complete the primary circuit. A minimum flame generated current, usually about 2.0\mu A, is necessary to prevent lockout.

---

**WARNING**

Electrical Shock Hazard
Disconnect electrical power before inserting meter into the circuit.
Replace door before operating.
Failure to follow these instructions will result in death or electrical shock.

---

To measure flame current, disconnect the black sensor wire at the electrode and insert a 0-50\mu A DC meter in the circuit. **TURN OFF ELECTRICAL POWER BEFORE INSERTING METER INTO CIRCUIT.**

Re-attempt ignition sequence and read flame current.

If insufficient flame current is present, inspect electrode and check electrical grounds. Repair as necessary.
START

Turn thermostat down for 10 seconds. Turn thermostat all the way up; does the blower turn on?

Is there power (120V) across terminals 1 & 11 of the DSI ignition module?

Check power source.

If no:

Is there power (120V) across blower motor plug or terminals 2 & 11 of the DSI ignition module?

Replace blower.

If yes:

Unplug blower motor. Does the blower turn freely?

Is there power (24V) across terminals 8 & 9 of the DSI ignition module?

Unplug burner and check igniter and ignition wire. Are they damaged?

Is there spark at the igniter?

Is the igniter gap set at 1/8"?

Is there 24V at the transformer secondary?

Check wiring between the power connection and the transformer.

With the blue and yellow wires still removed, is the voltage at the transformer black and white leads 120V?

Remove the blue and yellow wires from the transformer. Is there 24V at the transformer secondary?

Check wiring between the thermostat and the DSI ignition module.

Unplug burner and check igniter and ignition wire. Are they damaged?

Replace DSI ignition module.

Is the igniter gap set at 1/8"?

Replace igniter and ignition wire as needed.

Place jumper wire across the pressure switch. Is there a spark?

Replace pressure switch.

Are the air hoses to the pressure switch free of kinks and are they secure and leak free?

Are the air hoses to the pressure switch free of kinks and are they secure and leak free?

Repair, replace, or tighten hoses as necessary.

Place a jumper wire across the pressure switch.

Remove obstruction.

Is the vent pipe or the inlet of the burner obstructed?

Carefully reset spark gap to 1/8".

Replace DSI ignition module.

CONTINUED ON NEXT PAGE
Figure 30. DF-Troubleshooting Flow Chart (Continued)
Does burner run on HIGH rate with both lights illuminated? (See Note for selective firing instructions).

Does the burner run on LOW rate with only amber light illuminated? (See Note for selective firing instructions).

Does the burner turn off when the call for heat ends?

Check the thermostat and check the continuity of the ground wire.

Does burner run on HIGH rate with both lights illuminated?

Is there power (24V) at the green light?

Replace the bulb.

Is there power (24V) at the gas valve?

Replace the gas valve.

Is there power (24V) at the thermostat?

Replace the thermostat.

Carefully reduce thermostat setting to operate the burner at the LOW rate until the green light goes out.

Is there power (24V) at the gas valve?

Replace the gas valve.

Replace/correct wires connecting burner box to the thermostat.

Is there power (24V) at the gas valve?

Replace DSI ignition module.

Is there power (24V) at the amber light?

Replace the bulb.

NOTE: If you have problems getting the burner to selectively fire in either the HIGH or LOW mode, refer to Section 11 (Operation) for High/Low Firing Instructions.

TROUBLESHOOTING ENDS. If problems persist, contact your local Roberts-Gordon Representative.
Section 13. Replacement Parts

⚠️ WARNING
Use only genuine Roberts-Gordon replacement parts. Failure to follow these instructions will result in death, injury or property damage.

Figure 31. DF-Series Burner Replacement Parts
Section 14. Engineering Specifications

The total heating system supplied shall be design certified by the American Gas Association and the Canadian Gas Association.

A. Burner and Burner Controls

1. The burner shall be capable of firing at two rates (LOW/HIGH) and shall be fueled by natural gas.

2. Burners shall be supplied to fire at two of the input firing rates as specified:

<table>
<thead>
<tr>
<th>Model</th>
<th>High Rate</th>
<th>Low Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>DF-80</td>
<td>80,000</td>
<td>55,000</td>
</tr>
<tr>
<td>DF-100</td>
<td>100,000</td>
<td>70,000</td>
</tr>
<tr>
<td>DF-125</td>
<td>125,000</td>
<td>85,000</td>
</tr>
<tr>
<td>DF-150</td>
<td>150,000</td>
<td>105,000</td>
</tr>
<tr>
<td>DF-175</td>
<td>175,000</td>
<td>120,000</td>
</tr>
<tr>
<td>DF-200</td>
<td>200,000</td>
<td>130,000</td>
</tr>
</tbody>
</table>

3. Burner shall be equipped with fully automatic direct spark 100% shut-off ignition device. Power supplied to each heater shall be 120V, 60 HZ, single phase. Burners shall be rated for 1.0 Amp.

4. Burner shall be equipped with thermal overload motor protection, balanced air rotor, combustion air proving safety pressure switch, viewing window for flame observation and indicator lights for HIGH and LOW fire operation.

5. When specified, in contaminated environments, the burner shall be capable of supplying outside air to each burner for the support of combustion.

6. All burners shall be ready to accept field-installed flexible conduit for electrical power supply.

7. Burners are controlled by a low voltage (24V), two-stage thermostat.

8. Gas supply to the burners shall be as follows:

- 1/2" NPT (for DF-80, -100, & -125)
- 3/4"NPT (for DF-150, -175 & -200)

Natural Gas: 4.6" W.C. MIN, 14.0" W.C. MAX
5.0" W.C. MIN for DF-175, DF-200

B. Heat Exchanger

1. Radiant tubing shall be 4" diameter, 16 gauge, aluminized steel. Sections shall be joined with stainless steel wrap-around couplings.

2. Reflector to be of aluminum material and designed to direct all radiant output below horizontal centerline of radiant tube. Reflectors shall be certified for 0° or 45° mounting.

3. Reflectors shall have end caps to prevent heat loss due to convection.

4. Steel turbulizers to be used as specified for even heat distribution.

5. Heater to be vented according to manufacturer's instructions.
Section 15. General Specifications

General Specifications for DF-Series heaters are as follows:

![Diagram of DF-Series heater]

<table>
<thead>
<tr>
<th>Model</th>
<th>BTU/HR.</th>
<th>Length &quot;A&quot;</th>
<th>Recommended Min. Mounting Ht.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High Rate</td>
<td>Low Rate</td>
<td>Straight Tube Min.</td>
</tr>
<tr>
<td>DF-80</td>
<td>80,000</td>
<td>55,000</td>
<td>20' (6.1m)</td>
</tr>
<tr>
<td>DF-100</td>
<td>100,000</td>
<td>70,000</td>
<td>30' (9.1m)</td>
</tr>
<tr>
<td>DF-125</td>
<td>125,000</td>
<td>85,000</td>
<td>30' (9.1m)</td>
</tr>
<tr>
<td>DF-150</td>
<td>150,000</td>
<td>105,000</td>
<td>40' (12.2m)</td>
</tr>
<tr>
<td>DF-175</td>
<td>175,000</td>
<td>120,000</td>
<td>50' (15.2m)</td>
</tr>
<tr>
<td>DF-200</td>
<td>200,000</td>
<td>130,000</td>
<td>60' (18.3m)</td>
</tr>
</tbody>
</table>

**Figure 32.** DF-Series Specifications

Gas Pressure at Manifold:
- **Natural Gas:** 3.5" W.C. (High Fire)
  - 2.0" W.C. (Low Fire)
- **1/2" NPT** (for DF-80, -100, & -125)
- **3/4" NPT** (for DF-150, -175 & -200)

**Dimensions:**
- Vent Connection Size: 4" (10 cm)
- Outside Air Connection Size: 4" (10 cm)

Refer to figure above for dimensional information.

**Gas Inlet Pressure:**
- **Natural Gas:** 4.6" W.C. Minimum
  - 5.0" W.C. Minimum for DF-175, DF-200

**Electrical Rating:** (All Models)
- 120V- 60 Hz., 1.0 Amp
Section 16. DF-Series Limited Warranty

WARRANTY COVERAGE:
Roberts-Gordon, Inc. ("Seller") warrants that entire heating systems sold by it (individually a "System") and any replacement parts which it sells relating to any System ("Parts") shall be free from defects in workmanship and material for the time periods described as follows. With respect to a System this warranty shall apply for a period of three years from delivery to the original purchaser ("Buyer"). With respect to Parts, this warranty shall apply for the longer of the original System warranty period or for a period of one year. ("Systems" and "Parts" are hereinafter collectively referred to as "Products".) This warranty extends only to the original purchaser of Products.

Seller manufactures products which are designed only to provide predetermined ranges of heat rises in various enclosures when properly used in systems designed by purchaser or others and installed by others. Seller makes no representation or warranty with respect to the effect upon enclosure, or upon any of the contents of the enclosure, including, without limitation, all plant or animal life, kept or processed in the enclosure subject to the limitations outlined below.

WARNING:
This warranty is void if the products have been damaged due to accident, abuse, mishandling or any other cause whatsoever other than defects in material or workmanship. Specifically, Seller's warranty shall not apply: (a) to damage to Products when used in an atmosphere containing halogenated hydrocarbons or other corrosive chemicals. Some compounds in the air can be ingested into the equipment and can cause an accelerated rate of corrosion of some of the Products. The use of such chemical compounds in or near the enclosure should be avoided where a longer life of the burner, tubing and other parts is desirable; (b) to Products which have been repaired or replaced with other than factory parts, modified in any way, misused or damaged, or which have been installed or used contrary to Seller's written instructions or manuals; or (c) to any damage resulting from improper service or a lack of proper maintenance.

LIMITATIONS OF WARRANTY:
Other than as stated herein or in any other warranty of Seller, there are no other warranties of any kind whatsoever, express or implied, and all other express and all implied warranties of merchantability and/or fitness for any particular purpose are hereby specifically disclaimed.

EXCLUSIVE REMEDY:
The sole and exclusive remedy for any loss, damage or liability, or otherwise, is limited to the obligation of Seller to repair or replace parts, at its factory, of any product owned by original buyer and returned to the Seller's factory within one year after invoice, with transportation charges prepaid, which examination reveals to have been defective. Under no circumstances shall Seller be liable for any loss, damage, cost, expenses, or incidental or consequential damages of any kind, in connection with the sale, installation, use, maintenance, or repair of any Product.

BUYER RESPONSIBLE FOR DATA:
Seller and its representative may furnish Buyer, upon Buyer's request, data relating to the function and use of Products. Seller shall not be liable for loss, damage, cost, expenses or incidental or consequential damages of any kind, sustained directly or indirectly, by any person, or to any property, if Buyer adopts and uses such data in whole or in part.

LIMITATIONS ON AUTHORITY OF REPRESENTATIVES:
No representative of Seller, other than an Executive Officer, has authority to change or extend these provisions. Changes or extension shall be binding only if confirmed in writing by Seller's duly authorized Executive Officer.

Direct any question or warranty claims to the original installer:

Company: ______________________________________
Address: ______________________________________
Phone: ______________________________________

Or to: Warranty Claims
Roberts-Gordon, Inc.
P.O. Box 44
Buffalo, NY 14240-0044

Warranty Claims
Roberts-Gordon Canada, Inc.
241 South Service Road West
Grimsby, Ontario L3M-1Y7