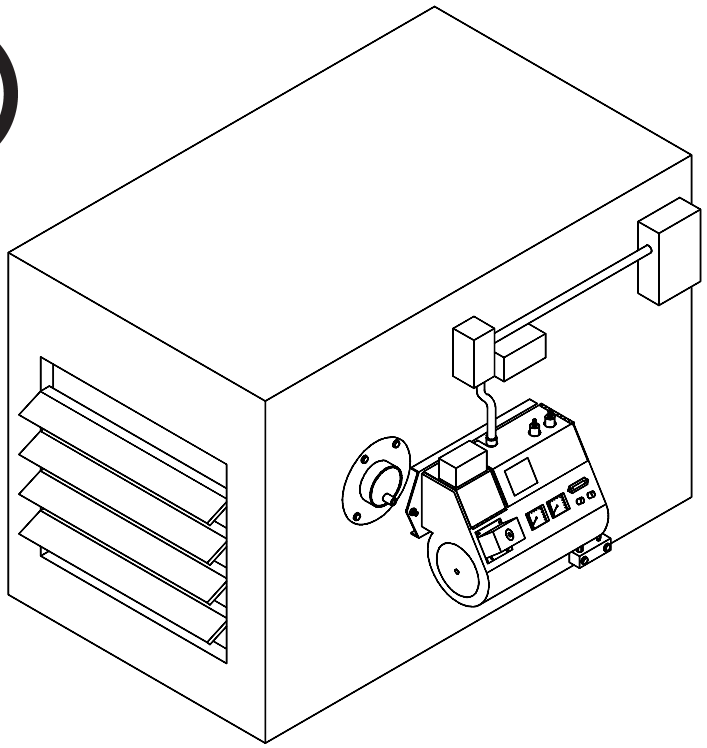
OPERATOR'S MANUAL

CLEAN BURN MODELS: CB-1400, CB-1800, and CB-2800 MULTI-OIL FURNACES

with CB-525-S2 BURNER

U.L. Listed Used Oil Burning Appliance #MH15393 (N)

U.L.-C Listed #CMP217



PUBLICATION DATE: 12/15/01, Rev. 7 **CLEAN BURN PART # 43081**

WARNING: DO NOT assemble, install, operate, or maintain this equipment without first reading and understanding the information provided in this manual. Installation and service must be accomplished by qualified personnel. Failure to follow all safety precautions and procedures as stated in this manual may result in property damage, serious personal injury or death.

IMPORTANT FOR U.S. INSTALLATIONS: All installations must be made in accordance with state and local codes which may differ from the information provided in this manual. Save these instructions for reference.

IMPORTANT FOR CANADIAN INSTALLATIONS: These instructions have been reviewed and accepted by Underwriters' Laboratories of Canada as being appropriate for the installation of the ULC labelled products identified herein. The use of these instructions for the installation of products NOT bearing the ULC label and NOT identified herein may result in an unacceptable or hazardous installation.

IMPORTANT FOR CANADIAN INSTALLATIONS: The installation of this equipment is to be accomplished by qualified personnel and in accordance with the regulation of authorities having jurisdiction and CSA Standard B 139, Installation Code for Oil Burning Equipment.

WARRANTY INFORMATION

Clean Burn, Inc., MANUFACTURER, hereby warrants that MANUFACTURER's products shall be free from defect in material and workmanship under normal use according to the provisions and limitations herein set forth. MANUFACTURER warrants the heat exchanger/combustion chamber, excluding the ceramic flame target, for three (3) years from the date of purchase by the purchaser and *pro rata* thereafter according to the following schedule: (a) If the defect occurs during the fourth year, customer pays 60% of parts, replacement or repair. (b) If the defect occurs during the fifth year, customer pays 65% of parts, replacement or repair. (c) If the defect occurs during the sixth year, customer pays 70% of parts, replacement or repair. (d) If the defect occurs during the seventh year, customer pays 75% of parts, replacement or repair. (e) If the defect occurs during the eighth year, customer pays 80% of parts, replacement or repair. (f) If the defect occurs during the ninth year, customer pays 85% of parts, replacement or repair. (g) If the defect occurs during the tenth year, customer pays 90% of parts, replacement or repair. MANUFACTURER warrants all other Clean Burn products for a period of one (1) year from the date of purchase by the purchaser.

LIMITATIONS:

The obligation of MANUFACTURER for breach of warranty shall be limited to products manufactured by MANUFACTURER (1) that are installed, operated and maintained according to MANUFACTURER's instructions furnished and/or available to the purchaser upon request; (2) that are installed according to all other applicable Federal, State and local codes or regulations; and (3) that the purchaser substantiates were defective in material and workmanship notwithstanding that they were properly installed and correctly maintained as set forth above and were not abused or misused.

The obligation of MANUFACTURER shall be limited to replacing or repairing the defective product, at the option of the MANUFACTURER. MANUFACTURER shall not be responsible for any labor or costs of removal or reinstallation of its products and shall not be liable for transportation costs to and from its plant at Leola, Pennsylvania.

Use of parts for modification or repair of the product or any component part thereof not authorized or manufactured by MANUFACTURER specifically for such product shall void this warranty.

This warranty shall not apply to any damage to or defect in any of MANUFACTURER's products that is directly or indirectly caused by (1) *force majeure*, Act of God or other accident not related to an inherent product defect; or (2) abuse, misuse or neglect of such product, including any damage caused by improper assembly, installation, adjustment, service, maintenance or faulty instruction of the purchaser.

Other than as expressly set forth hereinabove, MANUFACTURER makes no other warranty, express or implied, with respect to any of MANUFACTURER's products, including but not limited to any warranty of merchantability or fitness for a particular purpose.

And in no event shall MANUFACTURER be responsible for any incidental or consequential damages of any nature suffered by purchaser or any other person or entity caused in whole or in part by any defect in any of MANUFACTURER's products. Any person or entity to whom this warranty extends and who claims breach of warranty against MANUFACTURER must bring suit thereon within one year from the date of occurrence of such breach of warranty or be forever barred from any and all legal or other remedies for such breach of warranty.

MANUFACTURER is not responsible for and hereby disclaims any undertaking, representation or warranty made by any dealer, distributor or other person that is inconsistent with or in any way more expansive than the provisions of this limited warranty.

This warranty grants specific legal rights and shall be read in conformity with applicable state law. In some jurisdictions, the applicable law mandates warranty provisions that provide greater legal rights than those provided for herein. In such case, this limited warranty shall be read to include such mandated provisions; and any provision herein that is prohibited or unenforceable in any such jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such prohibition or unenforceability without invalidating the remaining provisions and without affecting the validity or enforceability of such provision in any other jurisdiction(s).

TRADEMARKS

The Clean Burn logo is a trademark of Clean Burn, Inc. All other brand or product names mentioned are the registered trademarks or trademarks of their respective owners.

COPYRIGHT

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

SECTION 1: INTRODUCTION

Guide to this Manual

This manual contains all the information necessary to safely install and operate the Clean Burn Furnace Models CB-1400, CB-1800, and CB-2800. Consult the Table of Contents for a detailed list of topics covered. You'll find this manual's step-by-step procedures easy to follow and understand. Should questions arise, please contact your Clean Burn dealer before starting any of the procedures in this manual.

As you follow the directions in this manual, you'll discover that assembling and operating your new furnace involves five basic activities as outlined here:

- **UNPACKING ..... (Section 2)**
- **ASSEMBLY ..... (Section 3)**
- **INSTALLATION ..... (Section 4)**
- **OPERATION**
  - **Oil Pump Priming ..... (Section 5)**
  - **Starting and Adjusting the Burner ..... (Section 6)**
  - **Resetting the Oil Primary Control ..... (Section 7)**
  - **Adjusting the Draft ..... (Section 8)**
- **MAINTENANCE ..... (Section 9)**

The manual also contains important and detailed technical reference materials which are located at the back of the manual in the Appendixes.

Please read all sections carefully--including the important safety information found in this section--before beginning any installation/operation procedures; doing so ensures your safety and the optimal performance of your Clean Burn furnace.

For Your Safety...

For your safety, Clean Burn documentation contains the following types of safety statements (listed here in order of increasing intensity):

- **NOTE:** A clarification of previous information or additional pertinent information.
- **ATTENTION:** A safety statement indicating that potential equipment damage may occur if instructions are not followed.

CAUTION: A safety statement that reminds of safety practices or directs attention to unsafe practices which could result in personal injury if proper precautions are not taken.

WARNING: A *strong* safety statement indicating that a hazard exists which can result in injury or death if proper precautions are not taken.

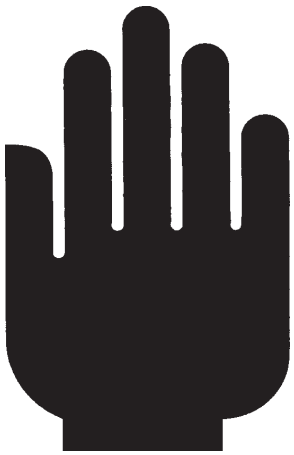
DANGER! *The utmost levels of safety must be observed;* an extreme hazard exists which would result in high probability of death or irreparable serious personal injury if proper precautions are not taken.

In addition to observing the specific precautions listed throughout the manual, **the following general precautions apply and *must be heeded* to ensure proper, safe furnace operation.**

WARNING: Never alter or modify your furnace without prior written consent of Clean Burn, Inc. Unauthorized modifications or alteration can adversely affect the proper, safe operation of your furnace.

WARNING: The burner which is shipped with your Clean Burn furnace is to be used *only* with your furnace according to the instructions provided in this manual. DO NOT use the burner for any other purpose!

WARNING!



STOP

YOUR SAFETY IS AT STAKE! DO NOT INSTALL, OPERATE OR MAINTAIN THIS EQUIPMENT WITHOUT FIRST READING AND UNDERSTANDING THE OPERATOR'S MANUAL!

DO NOT ADD CHLORINATED OILS, SOLVENTS, OR PAINT THINNERS TO YOUR USED OIL! BURNING ANY CHLORINATED SUBSTANCES IS ILLEGAL AND WILL DAMAGE YOUR FURNACE!

WARNING!

THIS BURNER IS TO BE INSTALLED ONLY ON THE PROPER, SPECIFIED, CLEAN BURN PRODUCT

DO NOT USE THE BURNER FOR ANY OTHER PURPOSE

For Your Safety... (continued)

WARNING: ***The Best Operator is a Careful Operator!*** By using common sense, observing general safety rules, and adhering to the precautions specific to the equipment, you, the operator, can promote safe equipment operation. ***Failure to use common sense, observe general safety rules, and adhere to the precautions specific to the equipment may result in equipment damage, fire, explosion, personal injury and/or death.***

WARNING: The installation, operation, and maintenance of this equipment in the U.S. must be accomplished by qualified personnel and in compliance with the specifications in the Clean Burn Operator's Manual and with all national, state, and local codes or authorities having jurisdiction over environmental control, building inspection and fuel, fire and electrical safety and the following standards of the National Fire Protection Association.

NFPA 30	Flammable and Combustible Liquids Code
NFPA 30A	Automotive and Marine Service Station Code
NFPA 31	Standard for the Installation of Oil Burning Equipment
NFPA 211	Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances
NFPA88A	Parking Structures
NFPA 88B	Repair Garages
NFPA 70	National Electrical Code

The NFPA standards may be obtained from:

National Fire Protection Association (NFPA)
1 Batterymarch Park, P.O. Box 9101
Quincy, Massachusetts 02269-9101

Likewise, the installation, operation, and maintenance of this equipment in Canada is to be accomplished by qualified personnel and in compliance with the specifications in the Clean Burn Operator's Manual and in accordance with the regulation of authorities having jurisdiction and CSA Standard B 139, Installation Code for Oil Burning Equipment.

Failure to comply with these standards and requirements may result in equipment damage, fire, explosion, personal injury and/or death.

- This furnace is listed for commercial and/or industrial use only; it is *not* listed for residential use.

- This furnace is listed with Underwriters Laboratory and Underwriters' Laboratories of Canada to burn the following fuels:
    - Used crankcase oil up to 50 SAE
    - Used transmission fluid
    - Used hydraulic oils
    - #2 fuel oil

For Your Safety... (continued)

WARNING: DO NOT add inappropriate or hazardous materials to your used oil, such as:

- Anti-freeze
- Carburetor cleaner
- Paint thinner
- Parts washer solvents
- Gasoline
- Oil additives
- Any other inappropriate/hazardous material

WARNING: Burning chlorinated materials (chlorinated solvents and oils) is *illegal,* will *severely damage* your heat exchanger, immediately *void* your warranty, and adversely affect the proper, safe operation of your furnace. Instruct your personnel to *never* add hazardous materials to your used oil.

DANGER! DO NOT create a fire or explosion hazard by storing or using gasoline or other flammable or explosive liquids or vapors near your furnace.

DANGER! DO NOT operate your furnace if excess oil, oil vapor or fumes have accumulated in or near your furnace. As with any oil burning furnace, improper installation, operation or maintenance may result in a fire or explosion hazard.

- If your safety decals ever become worn, lost or painted over, please call your Clean Burn dealer for free replacements.

- Make sure you comply with all EPA regulations concerning the use of your furnace. EPA regulations require that:
  - Your used oil is generated on-site. You may also accept used oil from "do-it-yourself" oil changers.
  - Hazardous wastes, such as chlorinated solvents, are NOT to be mixed with your used oil.
  - The flue gases are vented to the outdoors with an appropriate stack.
  - Your used oil is recycled as fuel for "heat recovery". DO NOT operate your furnace in warm weather just to burn oil.

  Contact your Clean Burn dealer for current EPA regulations.

- If your furnace ever requires service, call your Clean Burn dealer. DO NOT allow untrained, unauthorized personnel to service your furnace. Make sure that your furnace receives annual preventative maintenance to ensure optimal performance.

SECTION 2: UNPACKING

Before assembling your furnace, you must accomplish the following activities described in this section:

- Removing the Shipping Pallet
- Unpacking and Inspecting All Components
- Warranty Registration

Removing the Shipping Pallet

ATTENTION: Your furnace cabinet is attached to the shipping pallet with two screws to keep the cabinet from shifting during shipment. You must remove the shipping pallet prior to assembly and installation of the furnace. DO NOT use the pallet as a platform for furnace installation!

1. Locate the shipping screws which attach the cabinet to the pallet by looking through the round fan opening on the side of the furnace cabinet.
2. Remove and discard the two screws. Carefully lift the furnace off the shipping pallet with a fork lift, and discard the pallet.

Unpacking and Inspecting All Components

Following is an itemized list of all components you should have received in your Clean Burn furnace shipment. Open all shipping containers and inspect all components according to the list. Immediately notify the freight company and your Clean Burn dealer in case of shipping damage or shortage(s). Keep all components together so you will have them as needed for furnace assembly and installation.

Furnace Component List (CB-1400, CB-1800, and CB-2800)

ONE SKID containing:

- Furnace cabinet

ONE BOX containing:

- Burner

ONE SKID containing:

- Fan assembly ***(Unit Heater Models)*** OR Blower assembly ***(Central Furnace Models)***
- Oil pump
- Canister filter
- Vacuum gauge
- Check valve and check valve screen
- Wall thermostat
- Barometric damper
- Assorted bolts/fittings for assembly/installation of furnace components
- Operator's Manual
- Burner Oil Line and Air Line Components

NOTE: You may have received additional boxes or skids if you ordered optional accessories.

Warranty Registration

For proper warranty registration, Clean Burn requires that you fill out the provided warranty registration card and return it *within 30 days* to:

CLEAN BURN WARRANTY REGISTRATION
Clean Burn, Inc.
34 Zimmerman Road
Leola, Pennsylvania 17540

SECTION 3: FURNACE ASSEMBLY

Understanding Assembly

Assembling your Clean Burn Furnace includes the following steps:

(1) Installing the Observation Port
(2) Determining the Fan/Blower Assembly Configuration
(3) *Unit Heater Models:* Installing the Fan Assembly
(4) *Central Furnace Models:* Installing the Blower Assembly
(5) Installing the Burner
(6) Installing the Connector Block, Oil Line Tubing, and Air Line Tubing

Clean Burn recommends that you review all assembly procedures before proceeding, paying careful attention to safety information statements. ***Please note that some assembly procedures apply only to certain furnace models.*** **Figures 3A, 3B, and 3C** on the following pages provide a general overview of the furnace components and their proper assembly and how the unit should look following proper assembly.

Required Tools and Materials

The following tools and materials are required for furnace assembly and should be gathered before starting any procedures:

- 9/16" open-end wrench
- Medium flat-blade screwdriver
- Medium adjustable wrench

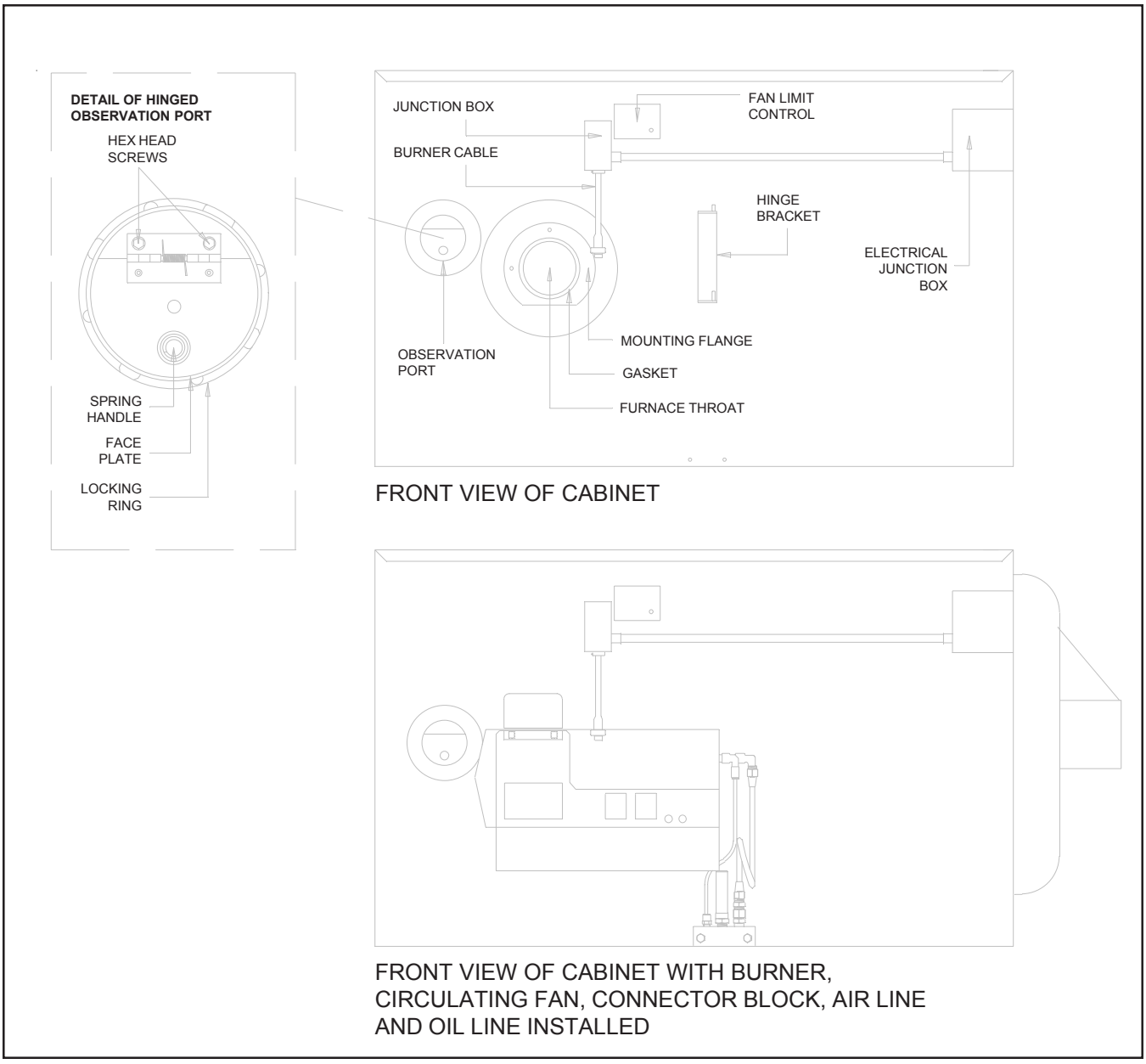


FIGURE 3A - Overview of Furnace Assembly

NOTE: Furnace shown is CB-2800.
Assembly of CB-1400 or CB-1800 is similar.

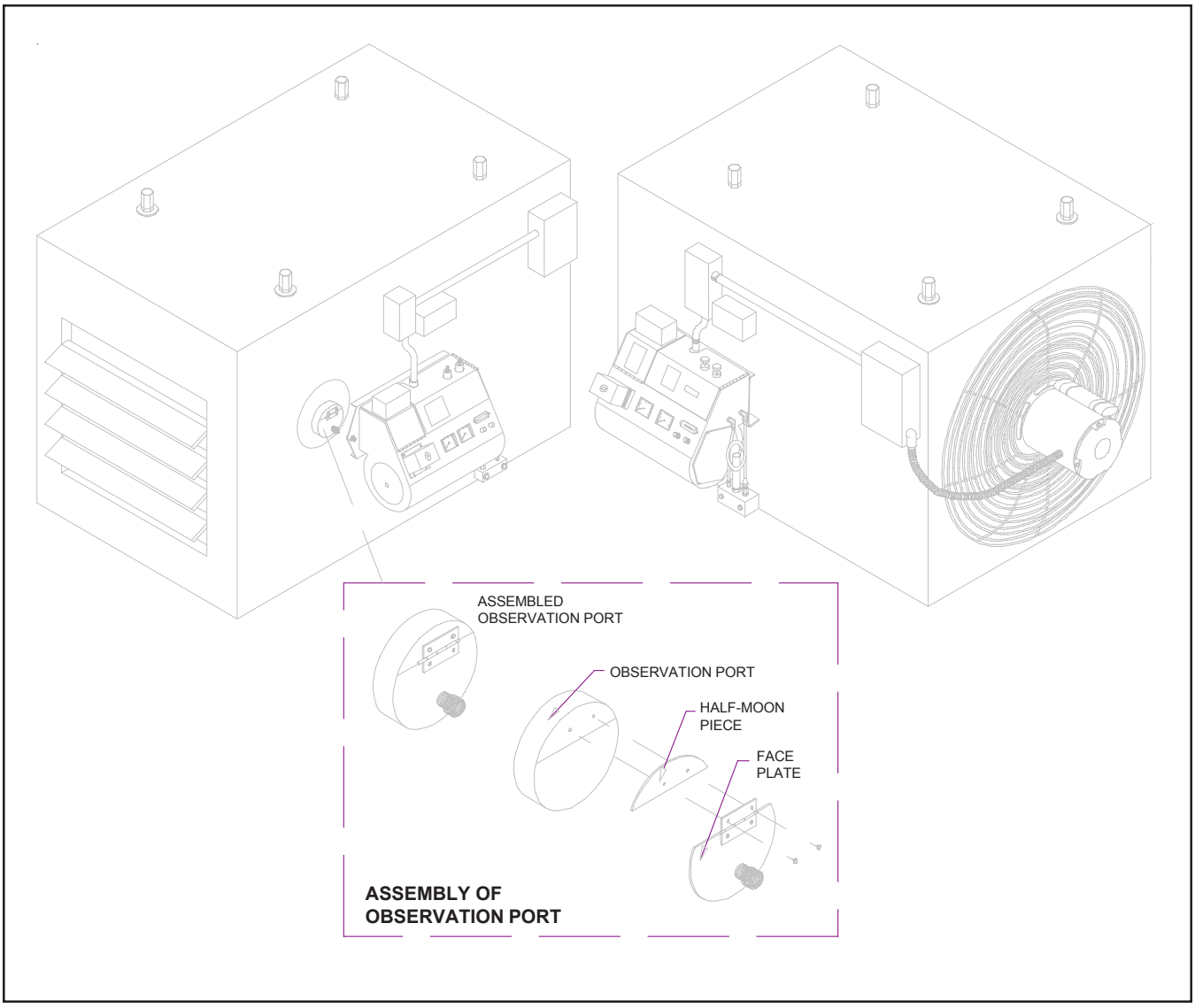


FIGURE 3B - Three-dimensional View - Unit Heater Completely Assembled

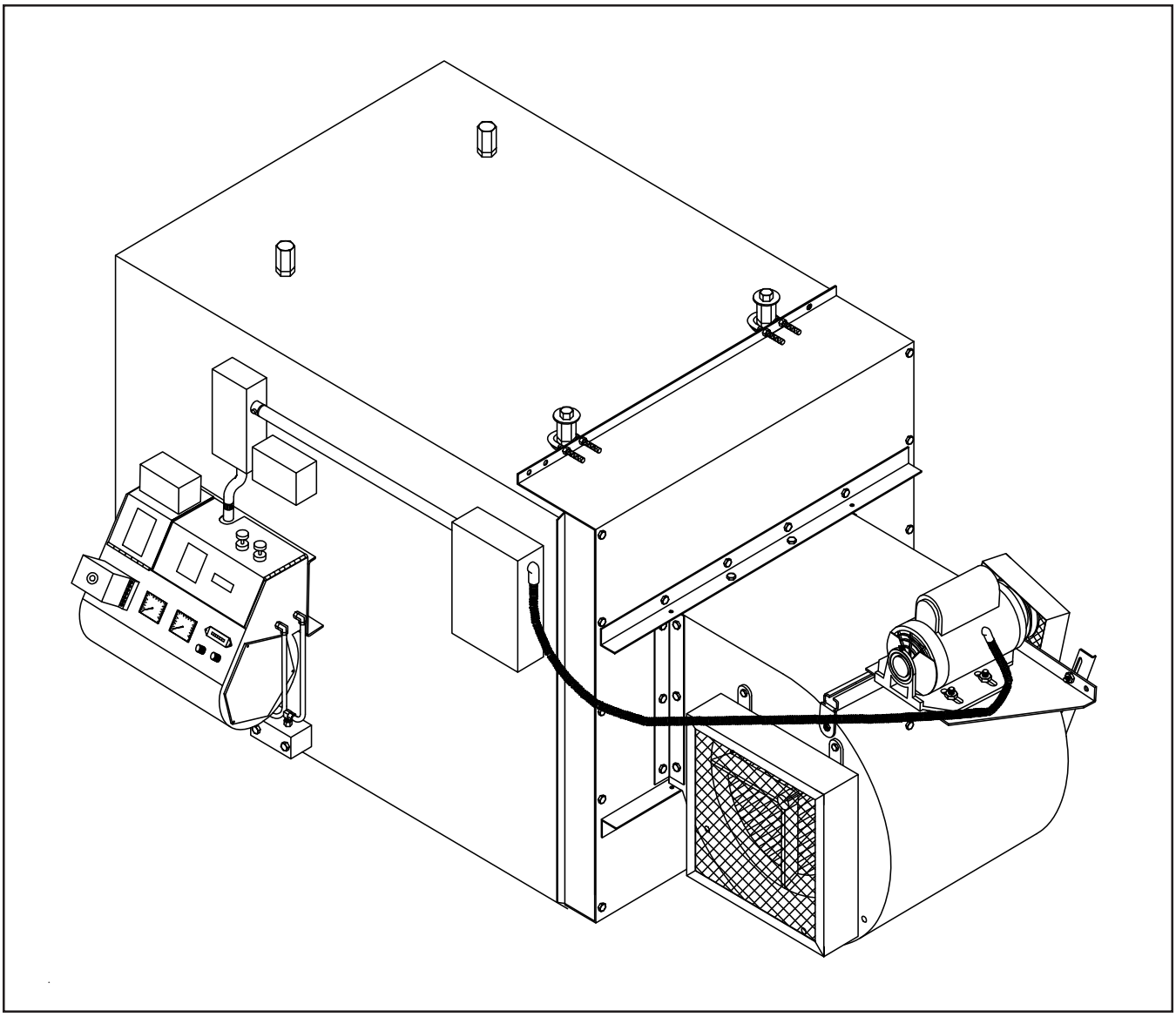


FIGURE 3C - Three-dimensional View - Central Furnace Completely Assembled

Installing the Observation Port

CAUTION: The observation port must be correctly installed according to the following procedure to allow safe observation of the flame during furnace operation. Be sure to follow all safety procedures as outlined in this manual when observing the flame through the port.

1. Refer to Figure 3B.
2. Use a 1/4" nut driver to remove the two (2) self-tapping screws from the half-moon piece.
3. Position the half-moon piece and the faceplate on the observation port, and install the two self-tapping screws.
4. Open the port and make sure the faceplate moves and closes freely. If the faceplate hangs up, loosen the hex-head screws slightly until the faceplate closes correctly.

STOP! READ THIS NOW.

The following information is *critical* to the proper assembly and installation of your Clean Burn furnace; read this section carefully before starting any other procedures.

Determining the Fan/Blower Assembly Configuration

Before proceeding with the assembly of your furnace, it is important to determine the configuration of the fan/blower assembly for your furnace model. There are two configurations to consider:

(1) **Unit Heater**

CB-1400, CB-1800, and CB-2800 with propeller-type fan.
This configuration is for free air application only and may NOT be ducted.

CB-1800 and CB-2800 with blower assembly for free air applications.
You must install the correct blower motor pulley as described in the blower assembly section in this chapter. Refer to the following chart for proper specifications.

(2) **Central Furnace**

CB-1800 and CB-2800 with blower assembly for ducting applications *from .2 to .3* static pressure.*
You must install the correct blower motor pulley as described in the blower assembly section in this chapter. Refer to the following chart for proper specifications.

Air Flow (CFM) and Static Pressure (SP) Specifications for CB-1800 and CB-2800 Central Furnace Models

Static Pressure "H20 in Outlet	**0.20***	**0.30***
CB-1800 Central Furnace CFM	2300	2200
CB-2800 Central Furnace CFM	3300	3100

***ATTENTION:** A qualified electrician must check the blower motor amperage during operation of the furnace to ensure that motor amperage does not exceed 85% of the maximum amperage on the motor label. DO NOT operate the blower motor above 85% of maximum amperage or motor damage may occur.

IMPORTANT NOTE: It is essential that qualified HVAC personnel properly design the ductwork for your furnace and determine the static pressure for your ducting application.

Unit Heater Models: Installing the Fan Assembly

NOTE: The following information on the installation of the fan assembly applies to Unit Heater Models (CB-1400 or CB-1800 or CB-2800) only. If you have a Central Furnace Model, refer to the appropriate information later in this section for installation of the blower assembly.

CAUTION: Ducting any Unit Heater Furnace is *not permitted*. See Section 4 for additional information.

Installing the Fan Assembly (All Unit Heater Models)

1. Refer to Figure 3D.
2. Attach the fan assembly to the furnace cabinet using the six hex-head bolts.
3. Make sure that fan blade is centered in the round opening on the cabinet. Spin the fan blade to check that it spins freely.
4. Remove the cover of the electrical junction box.
5. Attach the fan motor electrical cable to the electrical junction box.
6. Connect the fan motor wires according to the wiring schematic provided in Appendix B at the back of the manual.

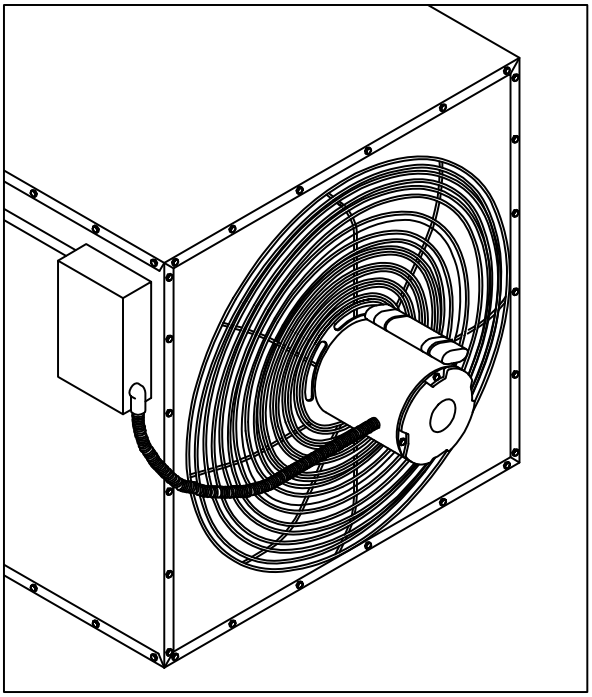


FIGURE 3D - Fan Installed on Furnace Cabinet

Installing the Fan Brace (CB-1800 and CB-2800 only)

NOTE: These instructions apply to Unit Heater Models CB-1800 and CB-2800 only. Unit Heater Model CB-1400 does not require a fan brace.

1. Refer to Figure 3E.
2. Hook the fan brace end with the larger loop over the fan guard strut.
3. Check that the fan brace lines up with the mounting tab on the fan motor.
4. Attach the fan brace to the mounting tab using the bolt and nut provided. Make sure the motor is held firmly in place by the fan brace to prevent fan vibration. DO NOT over-tension the motor.
5. Check that the fan blades spin freely.

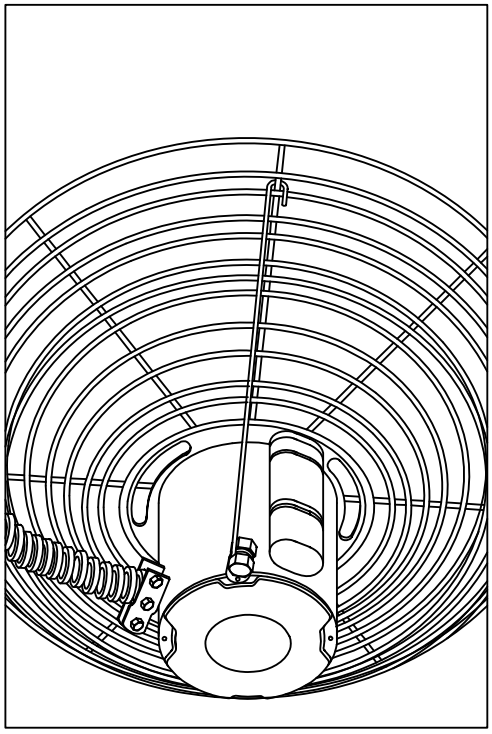


FIGURE 3E - Fan Brace Installed

Central Furnace Models: Installing the Blower Assembly

NOTE: The following information on the installation of the blower assembly applies to Central Furnace Models (CB-1800 or CB-2800) only. If you have a Unit Heater Model (CB-1400 or CB-1800 or CB-2800), refer to the appropriate information earlier in this section for installation of the fan assembly.

NOTE: Ducting Central Furnace Models (CB-1800 or CB-2800) is permitted. Specifications for ducting are provided in Section 4.

Preparing the Furnace Cabinet for Blower Installation

For Model CB-1800 Only:

1. Refer to Figure 3F.
2. Remove the six screws along the left edge of the cabinet so the side lip of the blower mount fits snugly against the cabinet.
3. To remove the bottom screw, grab the screw head with a pair of vise grips and twist it out.

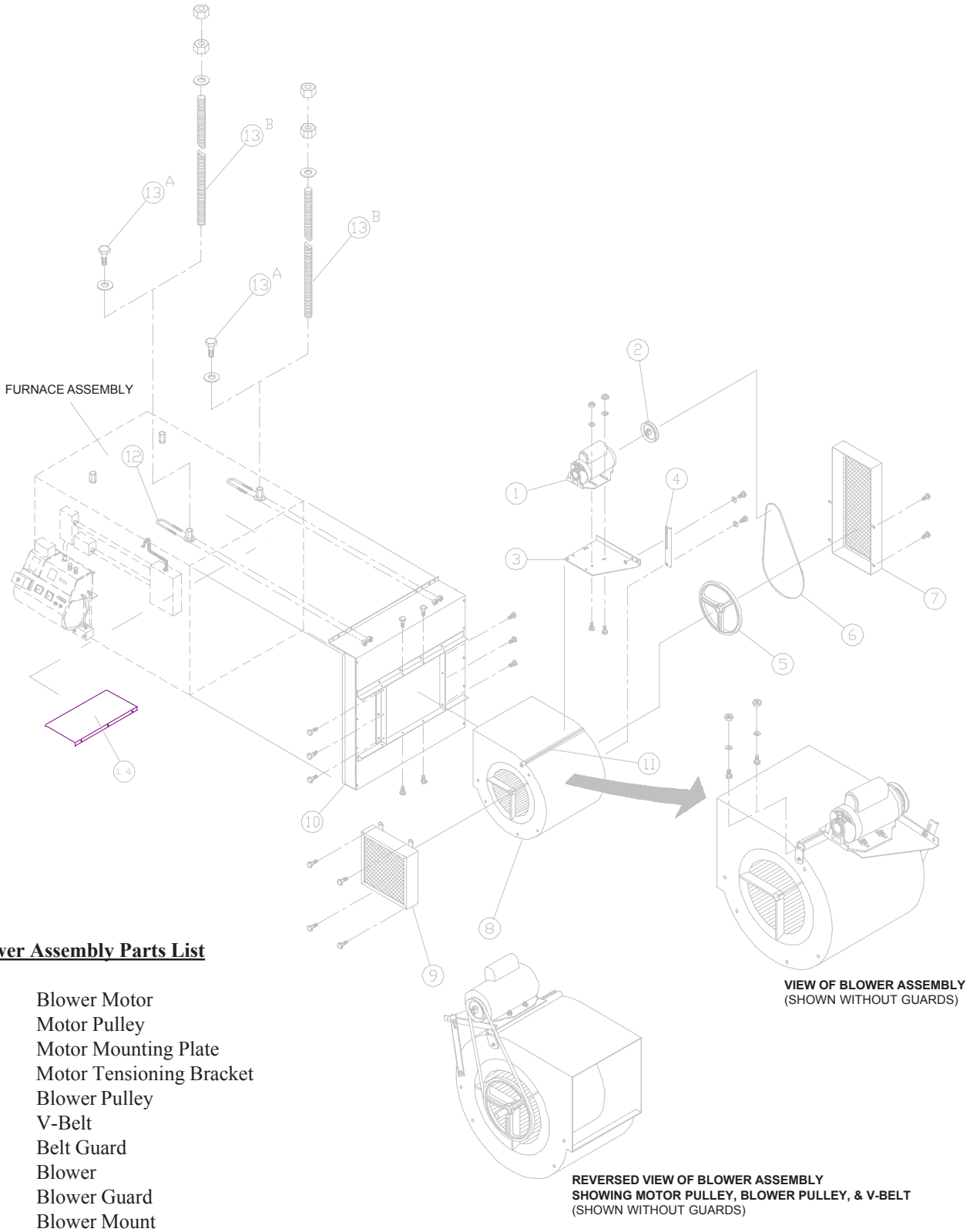
For Model CB-2800 Only:

NOTE: It is important that you install the air flow plate on Model CB-2800 which ensures that the air flow from the blower is properly channeled over the heat exchanger.

1. Refer to Figures 3F and 3G.
2. Slide the air flow plate through the round opening on the fan side of the furnace cabinet.
3. Position the plate on top of the heat exchanger headers between the mounting lugs.
4. Pull the air flow plate snugly against the inside of the sheet metal on the fan side of the furnace cabinet.
5. Use three self-tapping screws to mount the air flow plate in position.
   NOTE: Most furnace cabinets are pre-drilled with three holes in the fan side sheet metal. If these holes are not pre-drilled, mark the position of the lip of the air flow plate and carefully drill three 1/8" holes to allow installation of the plate.
   NOTE: Make sure the self-tapping screws are firmly tightened so that the air flow plate is held tightly in place and cannot vibrate during blower operation.

For Ceiling-hung Furnaces Only:

1. Refer to Figure 3F and Section 4 (Installation), Figures 4A and 4B.
2. Install 5/8" all-thread rods in the four threaded mounting lugs on the top of the furnace cabinet. Be sure to thread the rods into the four lugs on the furnace top until the rods are tight. Lock the all-thread rods in place using double nuts as shown in Figure 3F.



Blower Assembly Parts List

1	Blower Motor
2	Motor Pulley
3	Motor Mounting Plate
4	Motor Tensioning Bracket
5	Blower Pulley
6	V-Belt
7	Belt Guard
8	Blower
9	Blower Guard
10	Blower Mount
11	Top Mounting Bracket
12	U-Bolt
13A	Platform Mounting: two bolts/washers
13B	Ceiling Mounting: four all-thread rods with washers and double locking nuts
14	Air Flow Plate (CB-2800 Central Furnace ONLY)

Figure 3F - Detail of Blower Assembly and Installation of Blower on Furnace Cabinet

Central Furnace Models: Installing the Blower Assembly (continued)

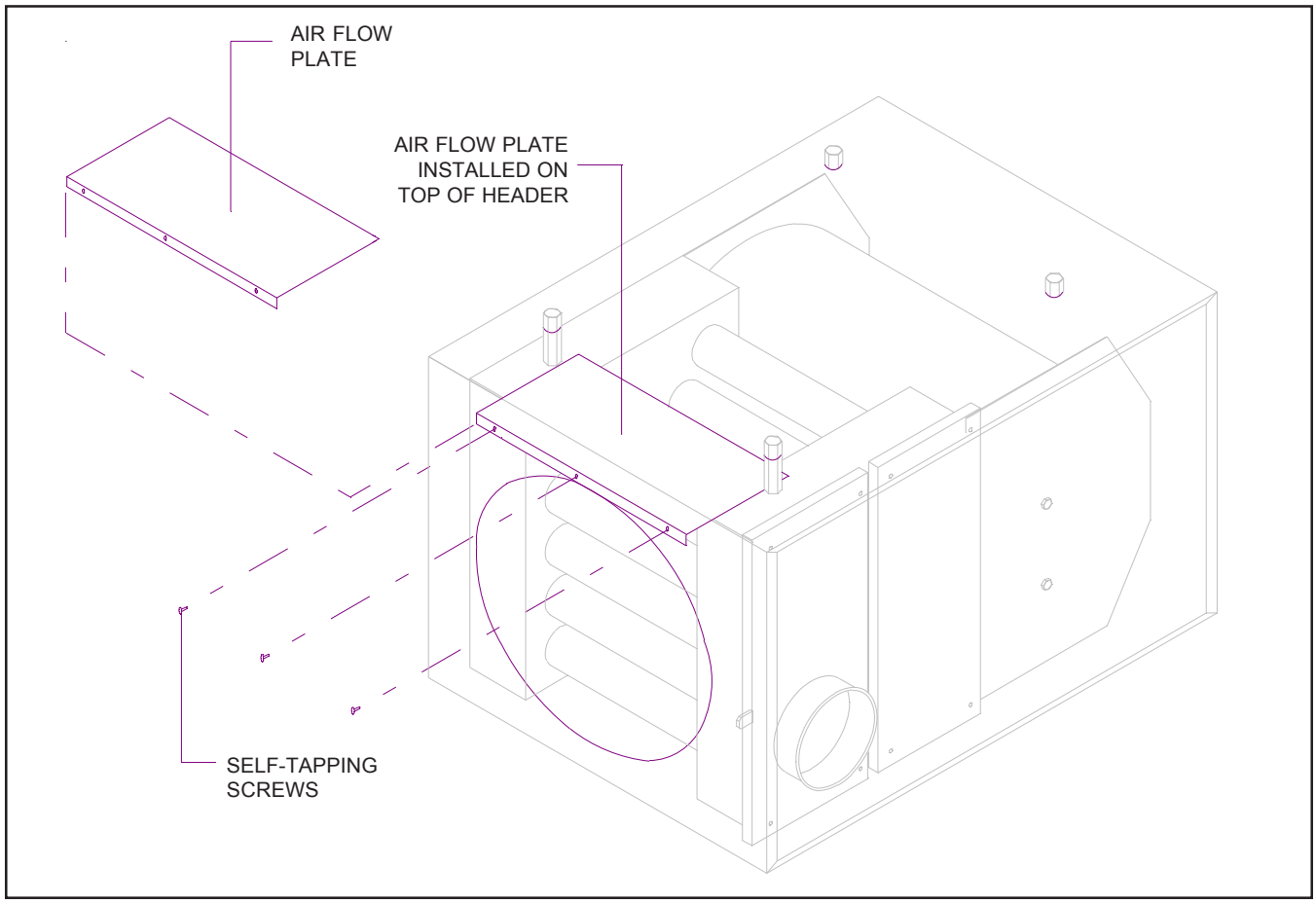


Figure 3G - Detail of Air Flow Plate Installation

Preparing the Furnace Cabinet for Blower Installation (continued)

For Platform-mounted Furnaces Only:

1. Refer to Figure 3F.
2. Install a washer and bolt in the two threaded lugs on the blower side of the furnace. Use the washers and bolts which were supplied with the furnace.

Installing the Blower Mount on the Furnace Cabinet

1. Refer to Figure 3F.
2. **For Model CB-2800 Only:** Make sure the air flow plate has been installed as described earlier in the Preparing the Furnace Cabinet section.
3. Position the blower mount over the fan opening on the furnace cabinet.
4. Install the two U-bolts over the mounting lugs and through the holes in the top lip of the blower mount.
5. Tighten the nuts on the U-bolts until the blower mount fits snugly aginst the side of the furnace cabinet.
6. Use sets of double nuts as shown in Figure 3F, and firmly tighten the nuts to securely lock the blower mount in position.
7. Attach the side lips of the blower mount to the furnace cabinet using the self-tapping screws.

Central Furnace Models: Installing the Blower Assembly (continued)

Installing the Blower on the Blower Mount

CAUTION: Follow the steps in this procedure carefully to ensure that the blower is installed securely on the blower mount.

1. Refer to Figure 3F.
2. Slide the blower into position so that the blower outlet fits inside the mounting bracket on the blower mount.
3. Install the top mounting bracket and firmly attach the blower using self-tapping screws as shown in Figure 3F so the blower is safely supported.

Installing the Motor on the Blower

NOTE: The blower motor is *non-reversible.*

1. Refer to Figures 3F and 3H.
2. Use the self-tapping bolts to install the motor mounting bracket on the blower.
3. Slide the two square-head bolts upside-down in the channel of the motor mounting bracket.
4. Install the motor mounting plate on the mounting bracket using the two bolts in the channel to hold the plate in position. DO NOT install the nuts on the bolts yet. Make sure the plate is flush with the side of the blower.
5. Lift the motor into position on the motor mounting plate using the two bolts in the channel to hold the motor in place. Now install the nuts on the two (2) bolts, and tighten the nuts.
6. Install the additional two (2) bolts and nuts through the lower holes in the motor mounting plate and motor. Tighten the nuts to hold the motor firmly in position.
7. Lift up on the end of the motor mounting plate until the hole in the side of the plate is aligned with the slot in the motor tensioning bracket. Push a bolt through the slot and install a nut to hold the plate in position. DO NOT tighten the nut yet.

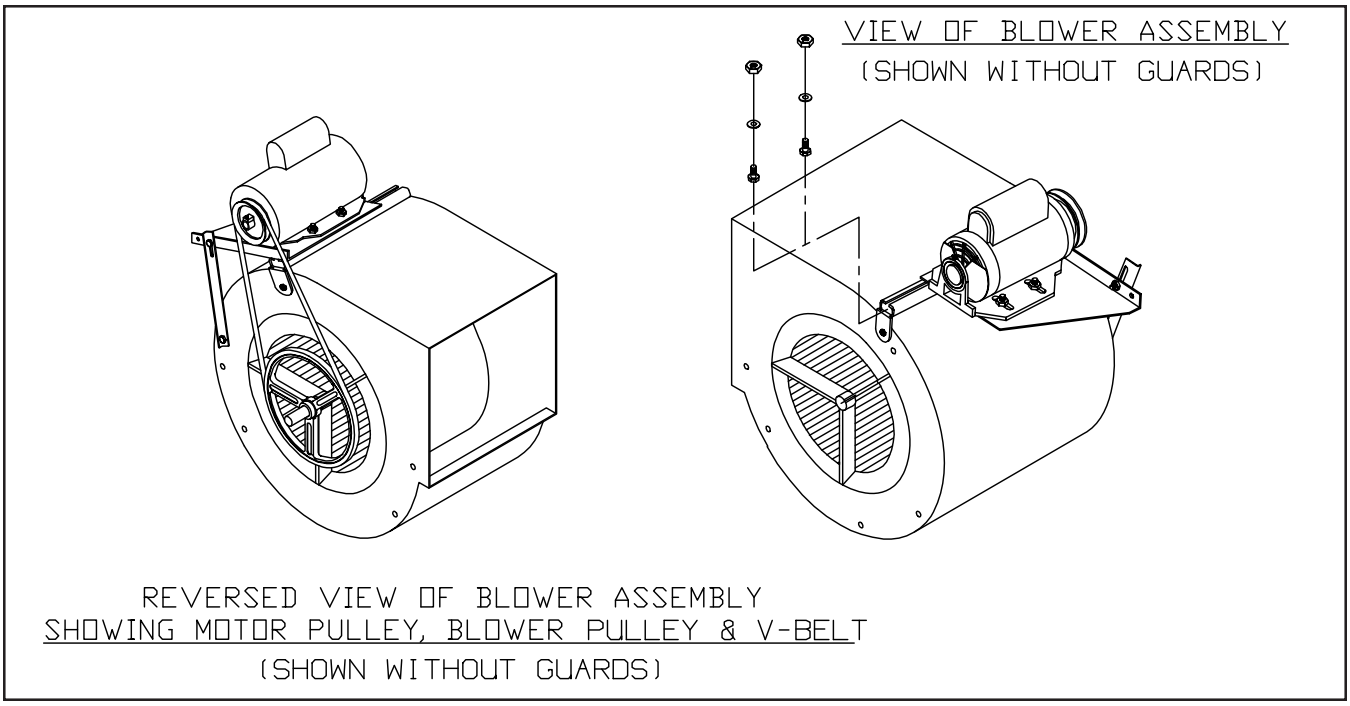


Figure 3H - Assembled View of Blower

Central Furnace Models: Installing the Blower Assembly (continued)

Installing the Motor Pulley

CAUTION: It is essential that the correct motor pulley is installed for your specific ducting application. Make sure that qualified HVAC personnel properly design the ductwork for your furnace and determine the static pressure for your ducting application.

1. Refer to Figures 3F, 3H and the following charts.

CB1800	**Free Air (Unit Heater)**	**.2 to .3 Static Pressure (Central Furnace)**
Motor Pulley Size	3.75" O.D. 5/8" Bore	4.45" O.D. 5/8" Bore
CB2800	**Free Air (Unit Heater)**	**.2 to .3 Static Pressure (Central Furnace)**
Motor Pulley Size	3.55" O.D. 5/8" Bore	3.95" O.D. 5/8" Bore

Air Flow (CFM) and Static Pressure (SP) Specifications for CB-1800 and CB-2800 Central Furnace Models

Static Pressure "H20 in Outlet	**0.20***	**0.30***
CB-1800 Central Furnace CFM	2300	2200
CB-2800 Central Furnace CFM	3300	3100

***CAUTION:** A qualified electrician must check the blower motor amperage during operation of the furnace to ensure that motor amperage does not exceed 85% of the maximum amperage on the motor label. DO NOT operate the blower motor above 85% of maximum amperage or motor damage may occur.

2. Slide the motor pulley into position on the motor shaft.
3. Position the key in the slot on the motor shaft.
4. DO NOT tighten the locking screw in the motor pulley hub until instructed to do so.

Installing the Blower Pulley and V-Belt

1. Refer to Figures 3F and 3H.
2. Slide the blower pulley into position on the blower shaft.
   ATTENTION: Ensure that you align the motor pulley and the blower pulley with a straight edge, or vibration and bearing damage will occur.
3. Tighten the locking screw in the blower pulley hub against the flat on the blower shaft. Also tighten the locking screw in the motor pulley hub.
4. Install the V-belt on the motor pulley and the blower pulley.
5. To tension the V-belt, lift up on the end of the motor mounting plate. Firmly tighten the nut and bolt on the tensioning bracket.
6. Ensure that there is a 3/4" deflection in the tensioned V-belt. DO NOT overtension the V-belt. Repeat step #5 if necessary to achieve the proper tension on the V-belt.

Central Furnace Models: Installing the Blower Assembly (continued)

Installing the Belt Guard and the Blower Guard

1. Refer to Figures 3F and 3H.
2. Install the belt guard and blower guard as shown.

CAUTION: DO NOT operate the furnace without the belt and blower guards in place on the blower assembly.

Installing the Electrical Conduit

WARNING: Ensure that the main power is turned OFF before wiring the blower motor.

1. Install an electrical connector in the electrical access holes on the blower motor and the electrical junction box on the furnace cabinet.
2. Feed the electrical conduit assembly through the connectors.
3. Connect the wires according to Figure 3I.

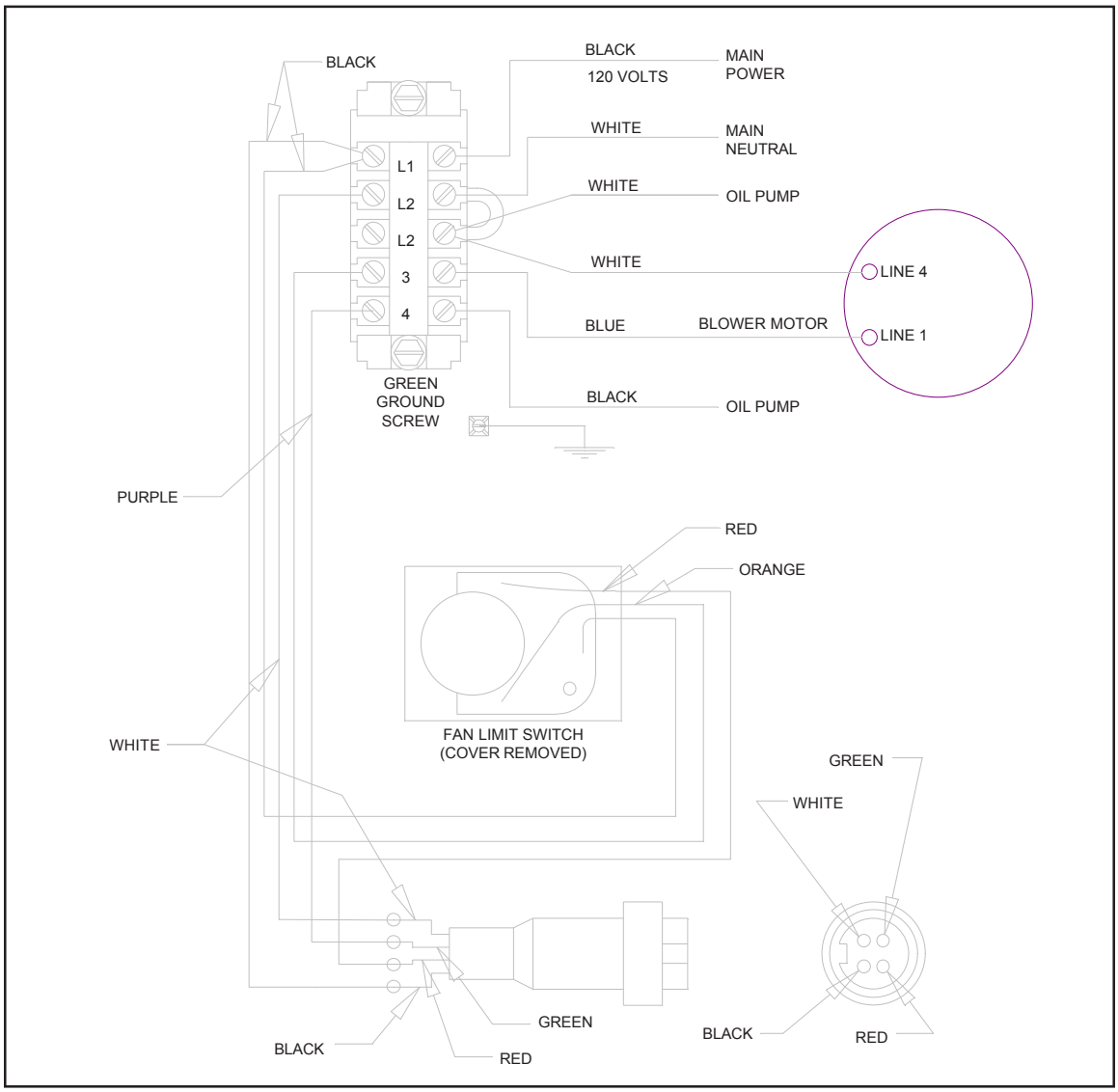


Figure 3I - Wiring Diagram for the Electrical Junction Box on the Furnace Front

Installing the Burner

Checking the Burner Nozzle and Electrodes

NOTE: The burner nozzle is factory installed. All furnace models (CB1400, CB-1800 and CB-2800) use a Delavan 9-5 nozzle. The nozzle size is indicated on the nozzle as shown in Figure 3J. Refer also to **Appendix A** at the back of the manual for additional specifications/instructions on the burner nozzle.

ATTENTION: Check the electrode settings as specified in Figure 3J. The electrode settings must be correct for your burner to operate properly.

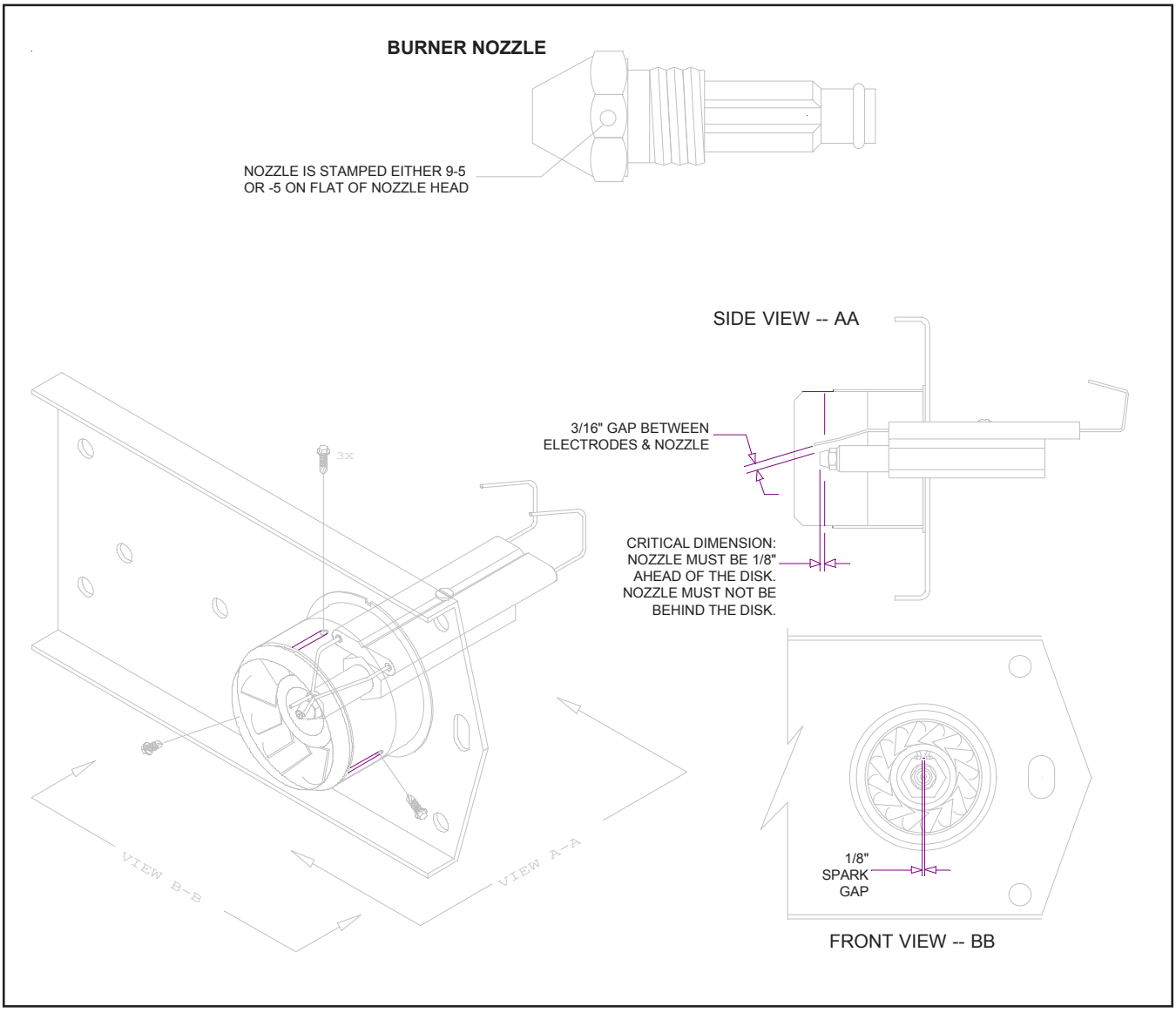


Figure 3J - Burner Nozzle and Electrode Specifications

Installing the Burner (continued)

Mounting the Burner on the Hinge Bracket

ATTENTION: Burner tube components (e.g. electrodes and retention head) are factory set. Handle the burner with extreme care so that burner components are not damaged.

1. Remove the nut from the bolt on the mounting flange of the furnace cabinet, and set it aside for later use.
2. Lift the burner into position so the burner hinge plate is mounted on the hinge bracket on the furnace cabinet.
3. Carefully swing the burner so the retention head enters the throat of the furnace.
4. Check the clearance between the retention head and the furnace throat. *There must be at least 1/8" clearance, so the retention head is not "bumped" as you swing the burner into firing position.*

   NOTE: If the retention head "bumps" the furnace throat, adjust the hinge bracket bolts as follows:
   - While supporting the burner, slightly loosen the two (2) hinge bracket bolts.
   - Carefully re-position the burner so it swings freely into its firing position.
   - With the burner in its firing position, re-tighten the hinge bracket bolts.

Installing the Connector Block, Oil Line Tubing, and Air Line Tubing

Installing the Connector Block on the Furnace Door

For Model CB-1400 Only:

1. Refer to Figure 3K.
2. Install the mounting bracket on the furnace cabinet using the two (2) bolts supplied.
3. Install the connector block on the mounting bracket using the two (2) carriage bolts supplied.
4. Remove and discard the red caps and plugs from the fittings and ports on the connector block. DO NOT allow any dirt/debris to enter these components during furnace assembly.

For Models CB-1800 and CB-2800:

1. Refer to Figure 3L.
2. Use the two (2) bolts to install the aluminum connector block onto the furnace cabinet.
3. Remove and discard the red caps and plugs from the fittings and ports on the connector block. DO NOT allow any dirt/debris to enter these components during furnace assembly.

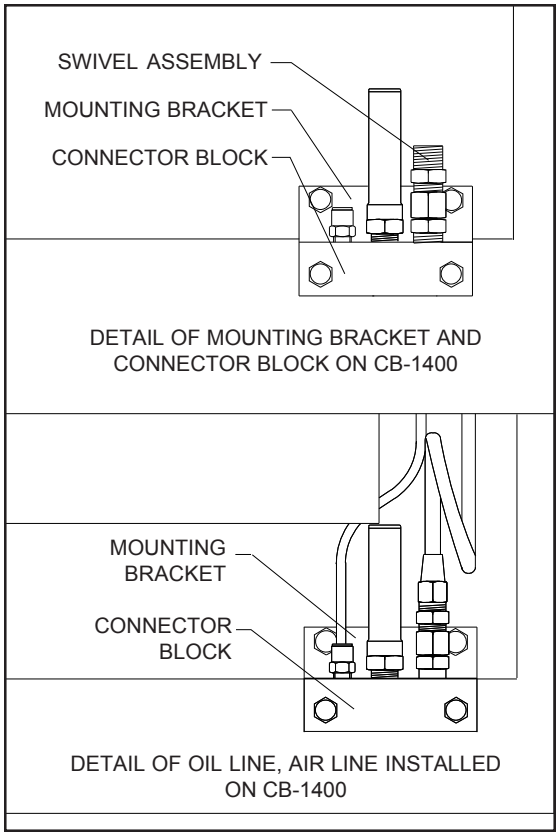


Figure 3K - Installation of Connector Block (CB-1400 only)

Installing the Connector Block on the Furnace Door (continued)

ATTENTION: The connector block includes an accumulator. The accumulator functions like a shock absorber on the oil line to prevent pressure buildup and protect vital burner components. It is important that the connector block is installed as shown so that the accumulator is in a vertical position to prevent sediment from settling in the accumulator. ***Never operate your furnace without the connector block and accumulator properly installed on the furnace, or damage may occur to vital burner components.***

ATTENTION: DO NOT use teflon tape on any fittings. Teflon tape residues will plug vital burner components.

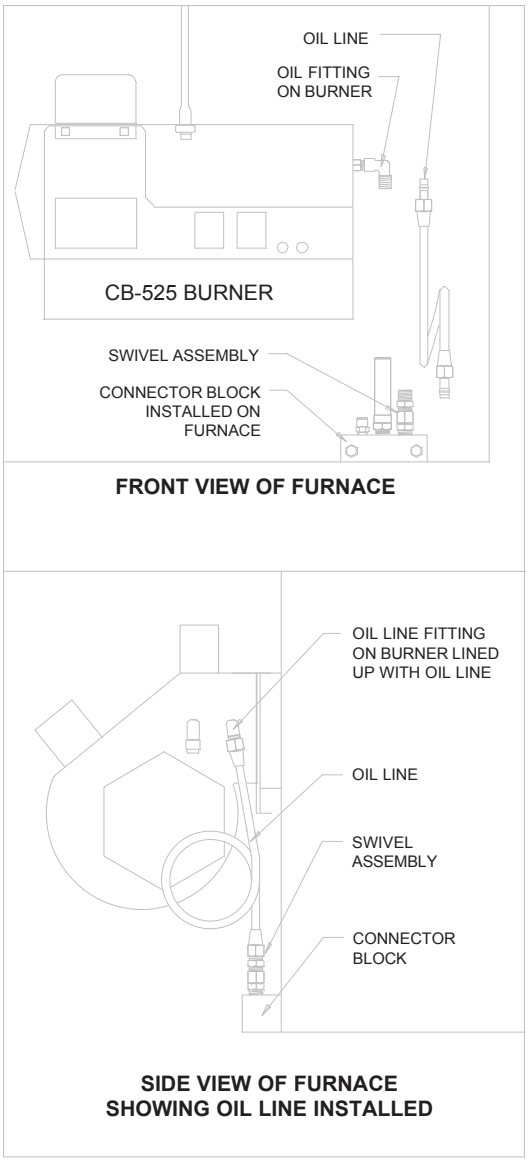


Figure 3L - Installation of Connector Block and Oil Line

Installing the Oil Line Tubing

NOTE: DO NOT disassemble the compression fitting from the swivel fitting. To prevent leaks, the NPT threads of the compression fitting have been sealed with hydraulic sealant during assembly of the fittings at the factory.

1. Remove and discard the red caps from the oil line tubing.
2. Loosely install the oil line tubing into the oil line fitting on the burner.
3. Use a wrench to slightly rotate the oil line fitting on the burner counterclockwise so the tubing lines up with the swivel assembly. Slightly bend the tubing as shown in Figure 3L, if required, to "line up" the oil line.
4. If necessary, use a tubing cutter to cut the tubing to the proper length.
   ATTENTION: Due to adjustment of the burner hinge bracket, the oil line tubing may need to be cut to fit properly. DO NOT lift up on the burner when installing the oil line tubing to compensate for oil line tubing that is too long. This will place the weight of the burner on the swivel fitting and result in leaks at the swivel fitting seal.
5. Make sure that the curl in the oil line is positioned as shown in Figure 3L so that the burner can swing open correctly.
6. Install the oil line tubing and tighten the nuts on the compression fittings. DO NOT overtighten these fittings to avoid damaging the ferrules.

NOTE: You may also check the positioning of the oil line according to Figure 3M on the next page which provides a larger front view of the connector block assembly.

Installing the Connector Block, Oil Line Tubing, and Air Line Tubing (continued)

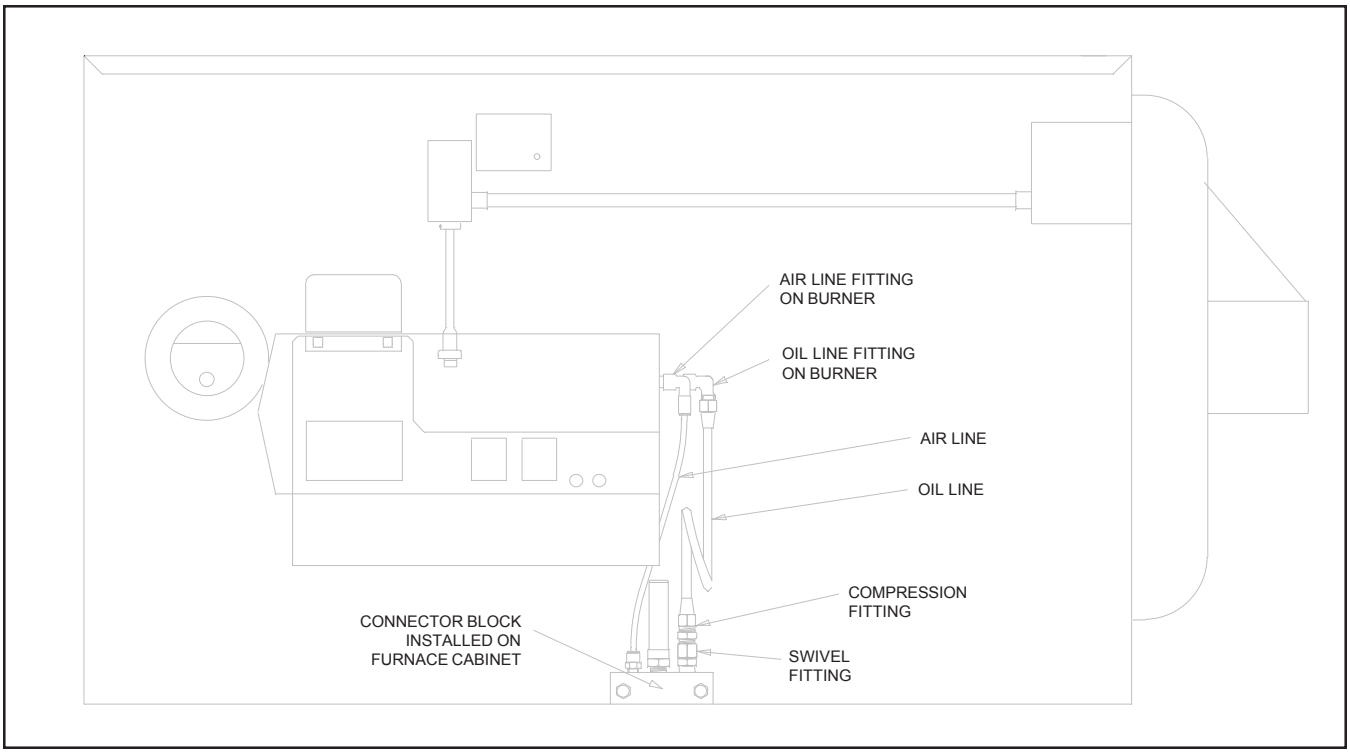


Figure 3M - Installation of Connector Block, Oil Line and Air Line (Front View)

Installing the Air Line Tubing

1. Remove and discard the red caps from the air line tubing.
2. Refer to Figure 3M. Push the air line tubing into the swivel fitting on the connector block until the tubing bottoms out in the fitting.
3. Repeat this procedure to connect the air line tubing to the air line fitting on the side of the burner.

Locking the Burner into Firing Position

1. Swing the burner into firing position.
2. Install and tighten the lock-down nut on the mounting plate bolt to secure the burner in its firing position.
3. Plug the burner electrical cable into the receptacle on the top of the burner housing.
4. Tighten the locking ring to secure the electrical cable.

NOTE: Be sure to properly align the plug when plugging it into the receptacle. See Fig 3N.

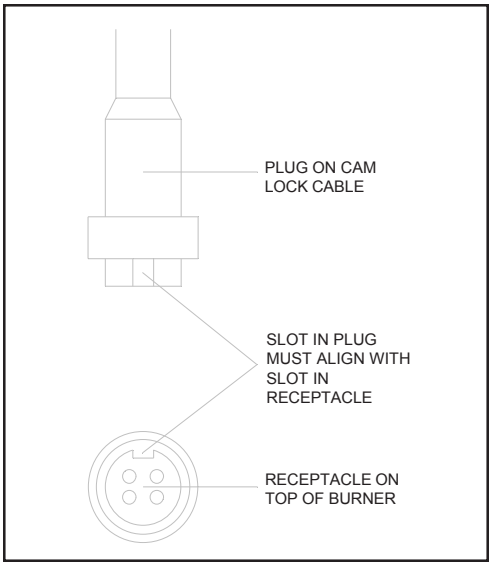


Figure 3N - Detail of Burner Electric Receptacle

NOTE: Your furnace is now assembled and ready for installation. Install the furnace as soon as possible so the burner and/or fan are not "bumped" or damaged. If you must store the furnace for a period of time before installation, make sure it is located in a safe, secure area.

SECTION 4: FURNACE INSTALLATION

Understanding Installation

Installing your Clean Burn furnace is a multi-step process which includes:

(1) Selecting a Location
(2) Mounting the Furnace
(3) Determining the Type of Oil Tank
(4) Installing the Oil Pump
(5) Wiring the Furnace and Pump
(6) Installing the Oil Lines
(7) Installing the Compressed Air Line
(8) Installing the Stack
(9) Installing the Wall Thermostat
(10) Inspecting the Installation

Clean Burn recommends that you review all procedures before beginning installation, paying careful attention to safety information statements. Figures 4A and 4B provide a general overview of typical furnace installations and should be reviewed closely before proceeding.

WARNING: The installation, operation, and maintenance of this equipment in the U.S. must be accomplished by qualified personnel and in compliance with the specifications in the Clean Burn Operator's Manual and with all national, state, and local codes or authorities having jurisdiction over environmental control, building inspection and fuel, fire and electrical safety and the following standards of the National Fire Protection Association.

NFPA 30	Flammable and Combustible Liquids Code
NFPA 30A	Automotive and Marine Service Station Code
NFPA 31	Standard for the Installation of Oil Burning Equipment
NFPA 211	Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances
NFPA88A	Parking Structures
NFPA 88B	Repair Garages
NFPA 70	National Electrical Code

The NFPA standards may be obtained from:

National Fire Protection Association (NFPA)
1 Batterymarch Park, P.O. Box 9101
Quincy, Massachusetts 02269-9101

Likewise, the installation, operation, and maintenance of this equipment in Canada is to be accomplished by qualified personnel and in compliance with the specifications in the Clean Burn Operator's Manual and in accordance with the regulation of authorities having jurisdiction and CSA Standard B 139, Installation Code for Oil Burning Equipment.

Failure to comply with these standards and requirements may result in equipment damage, fire, explosion, personal injury and/or death.

WARNING: Improper installation can adversely affect the proper, safe operation of your furnace. It is critical that your furnace installer reads and follows the instructions provided in this manual.

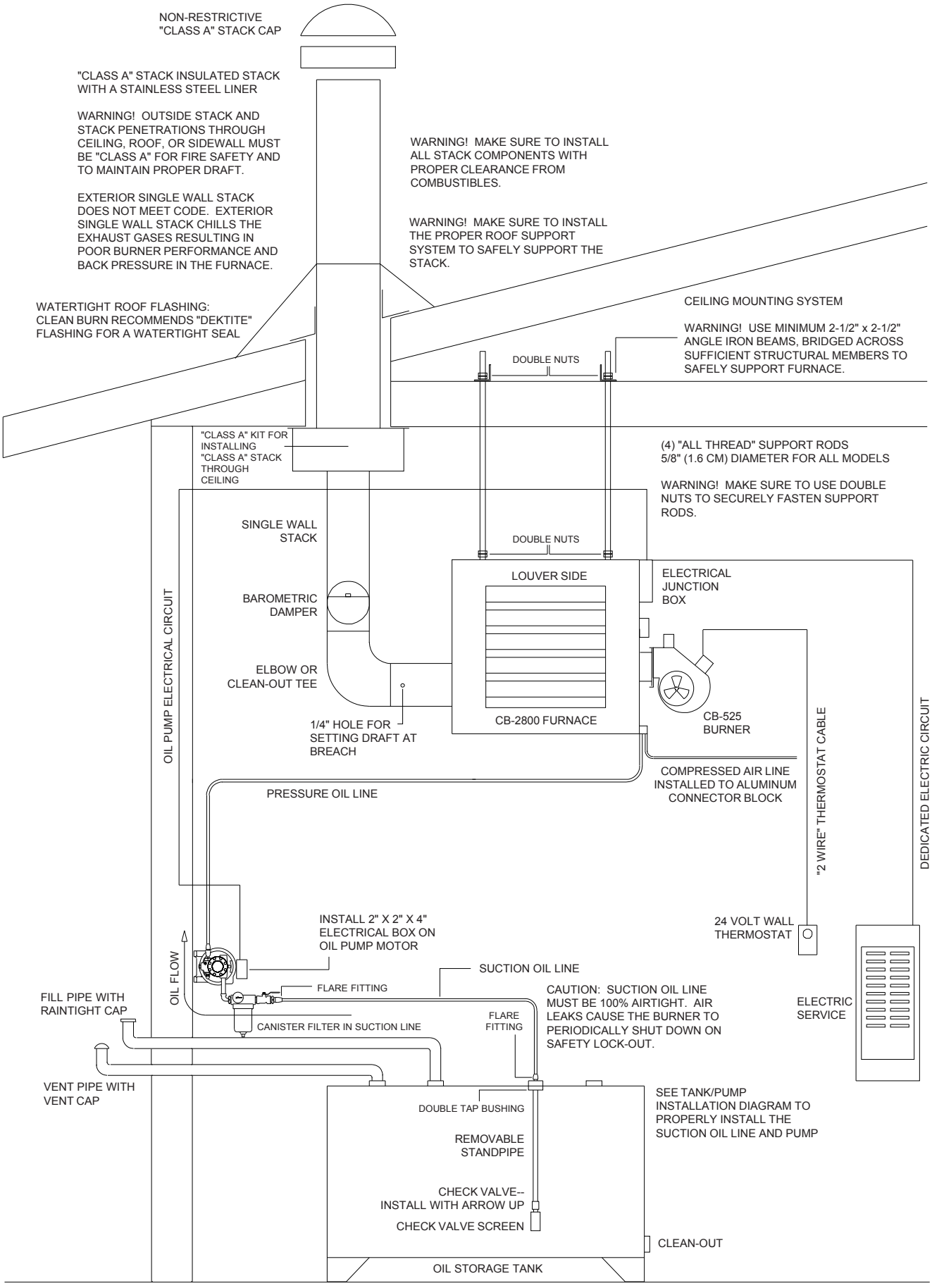


Figure 4A - Typical Furnace Installation

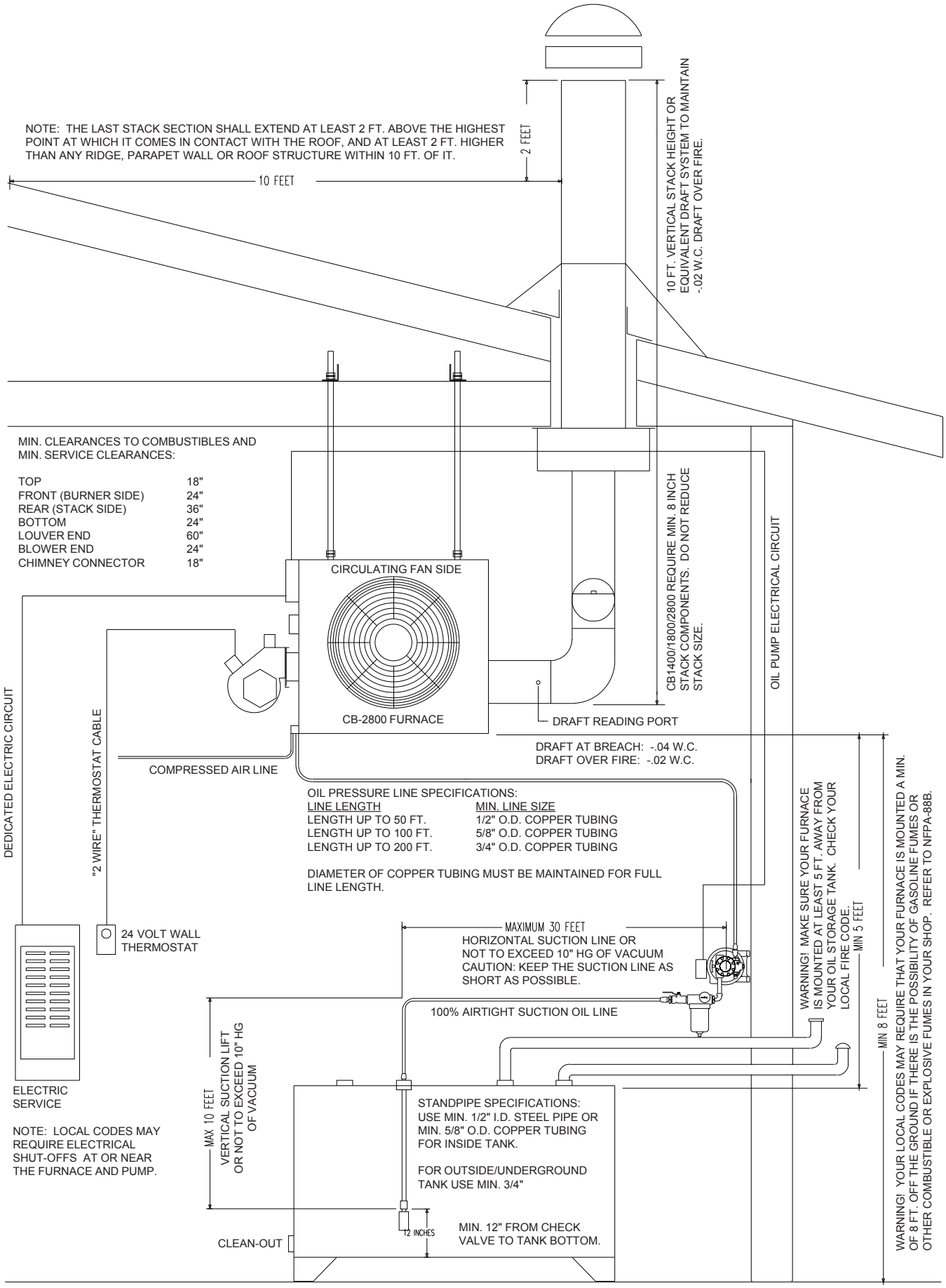


Figure 4B - Typical Furnace Installation - Detailed

Selecting a Location

Guidelines for Selecting a Location

The location you select for your furnace must allow the following:

- Unobstructed, even heat distribution.
- Safe, easy access for servicing.
- Unobstructed passage for shop vehicles and equipment.
- Proper clearances from combustibles. *Verify according to your local safety codes.*
- Adequate combustion air per local codes.
- Proper stack installation.

Adhere to the following *minimum* clearances from combustible surfaces and to provide adequate clearance for servicing:

- TOP ..... 18"
- FRONT (burner side) ..... 24"
- REAR (stack side) ..... 36"
- LOUVER END ..... 60"
- BLOWER/FAN END ..... 24"
- BOTTOM ..... 24"
- CHIMNEY CONNECTOR ..... 18"

WARNING: Your local codes may require that your furnace is mounted a minimum of eight (8) feet off the ground if there is the possibility of gasoline fumes or other combustible or explosive fumes in your shop area. Refer to NFPA-88B.

Determining Air Flow From the Furnace

One important consideration in selecting the proper location for your furnace is *heat distribution*, i.e. how the air (heat) will circulate from your furnace. Depending on the type of furnace you ordered (Unit Heater or Central Furnace), you will use one of two air flow configurations:

- **"Free air" circulation :** this method is the easiest and most economical. In this case, industrial-size ceiling fans may be installed to aid in efficient, even heat distribution. **NOTE:** If the peak of your shop roof/ceiling is 14 feet or higher, Clean Burn recommends the use of industrial-size ceiling fans to gently redistribute the heat from the furnace. A minimum of one Clean Burn 56" Blade Industrial Ceiling Fan (C.B. part# 70003) or equivalent is recommended for each 2000 square feet of heated shop space.

- **Ductwork (*central furnace ONLY*):** this method is more complex and requires careful planning and additional investment for proper installation. *If you plan to duct your furnace, it is essential that qualified HVAC personnel design and install the ductwork system according to the specifications provided in this section.*

Determining Air Flow From the Furnace (continued)

Air Flow (CFM) and Static Pressure (SP) Specifications for CB-1800 and CB-2800 Central Furnace Models

Static Pressure "H20 in Outlet	0.20*	0.30*
CB-1800 Central Furnace CFM	2300	2200
CB-2800 Central Furnace CFM	3300	3100

***ATTENTION:** A qualified electrician must check the blower motor amperage during operation of the furnace to ensure that motor amperage does not exceed 85% of the maximum amperage on the motor label. DO NOT operate the blower motor above 85% of maximum amperage or motor damage may occur.

Mounting the Furnace

After selecting a safe and appropriate location for your furnace, construct the mounting system as required by the location and the following specifications.

Ceiling Mounting

CAUTION: Ensure that your furnace mounting system can safely bear the suspended weight of the furnace and allow safe servicing of furnace components.

1. Refer to Figures 4A and 4B.
2. Follow the instructions as provided in the diagrams.
3. Use a spirit level to make sure the cabinet is level side to side and front to back.

Raised Platform Mounting

CAUTION: Make sure the platform is designed to safely bear the weight of the furnace and allow safe servicing of furnace components. The platform must be constructed of *non-combustible* materials (e.g. steel).

1. Refer to Figure 4C and follow the instructions as provided in the diagram.

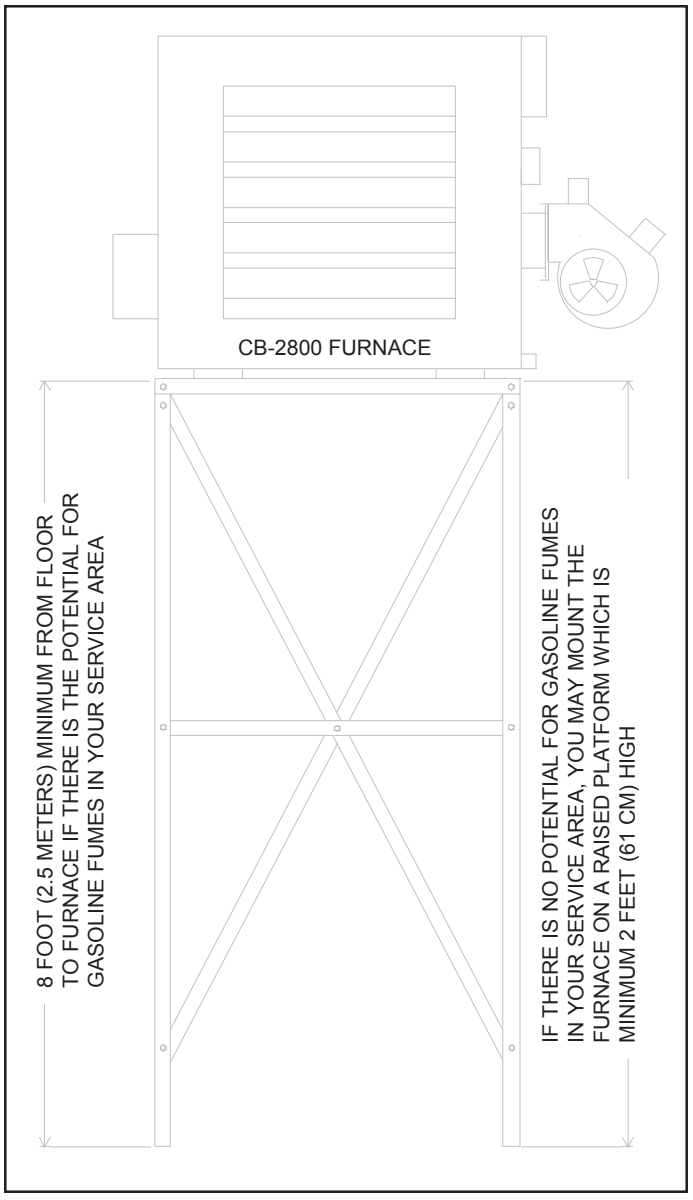


FIGURE 4C - Furnace Installed on Raised Platform

Mounting the Furnace (continued)

Floor Mounting

CAUTION: If you are installing your furnace in an area with a combustible floor, you must construct a *non-combustible* floor as shown in Figure 4D. Refer to NFPA-31 or CSA-B-139.

1. Refer to Figure 4D and follow the instructions as provided in the diagram.

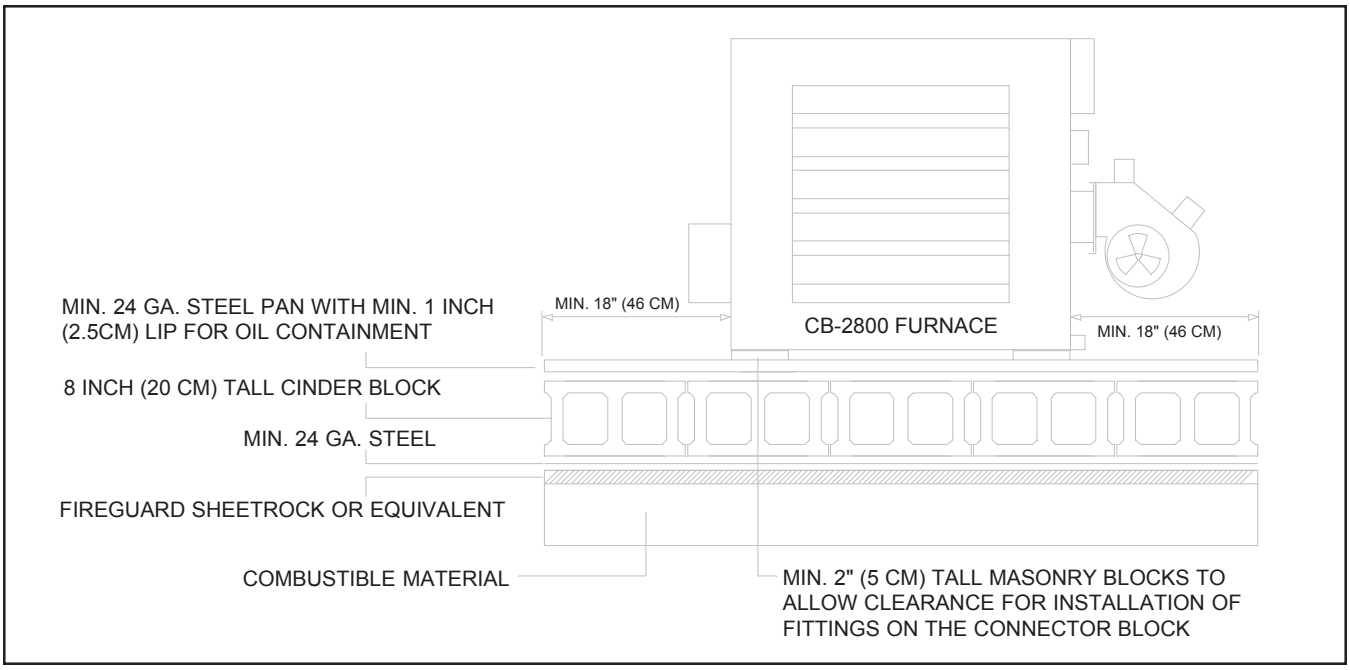


FIGURE 4D - Furnace Installed on Non-Combustible Floor

Determining the Type of Oil Tank

It is very important that you determine which type of oil tank your furnace will be using, as this will determine the correct method for installing your oil pump and oil lines. Oil tanks are classified in three categories as follows:

(1) Inside Above Ground Tank
(2) Outside Above Ground Tank
(3) Underground Tank

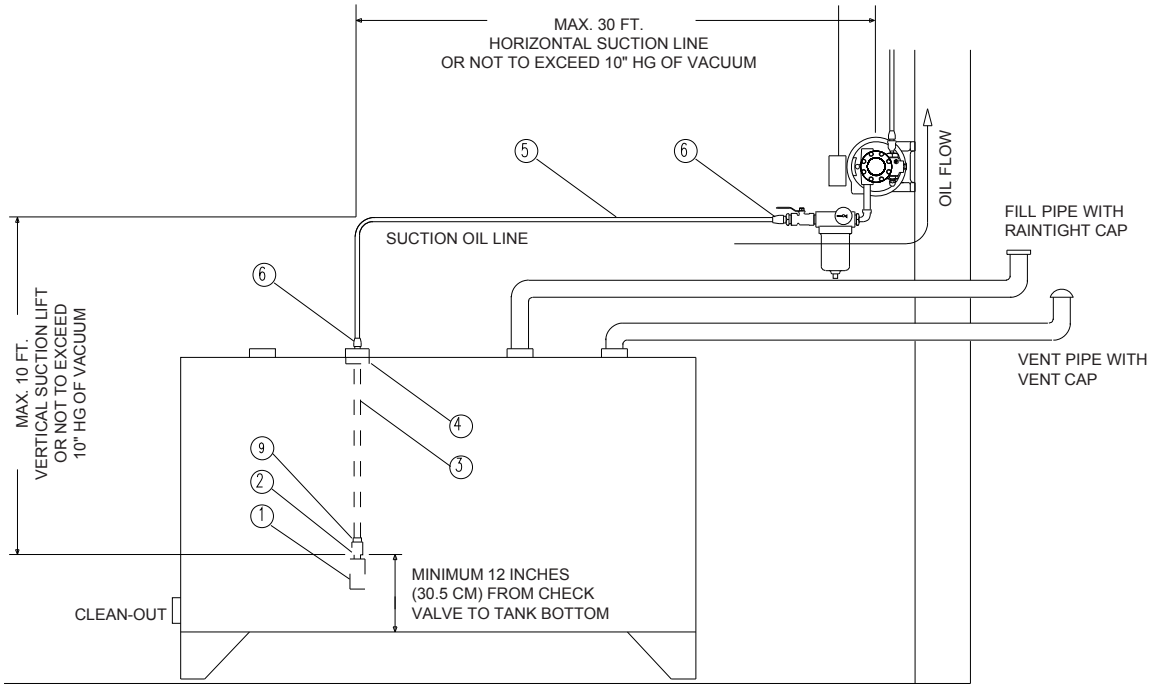
Ensure that your tank installation adheres to the following safety guidelines:

- The tank installation must meet all national and local codes. Consult your Clean Burn dealer and local municipal authorities for more information if necessary.
- Use a minimum 250-gallon tank. DO NOT use a 55-gallon drum as a substitute for an appropriate tank. The tank must be large enough to allow water, sludge, etc. to settle out of the used oil.
- The tank must have a manual shut-off type valve on the side of the tank to allow the water, sludge, etc. to be drained from the bottom of the tank.
- All unused openings in the tank must be plugged or capped off.
- The tank must be vented to the outside of the building using iron or steel pipe and fittings with an approved vent cap.

1. Review the following three figures (4E/4F/4G) which illustrate the different types of oil tank/pump installations, and select the one which matches your site's tank installation.
2. Carefully review the appropriate tank/pump installation details, including the pump installation and specifications for the oil line installation. (Procedures for installing these components can be found in the following sections.)

Determining the Type of Oil Tank (continued)

CAUTION: National and local codes govern the use and installation of inside oil storage tanks. Your tank installation must comply with these codes.



Close-up of pump installation for inside above ground tank

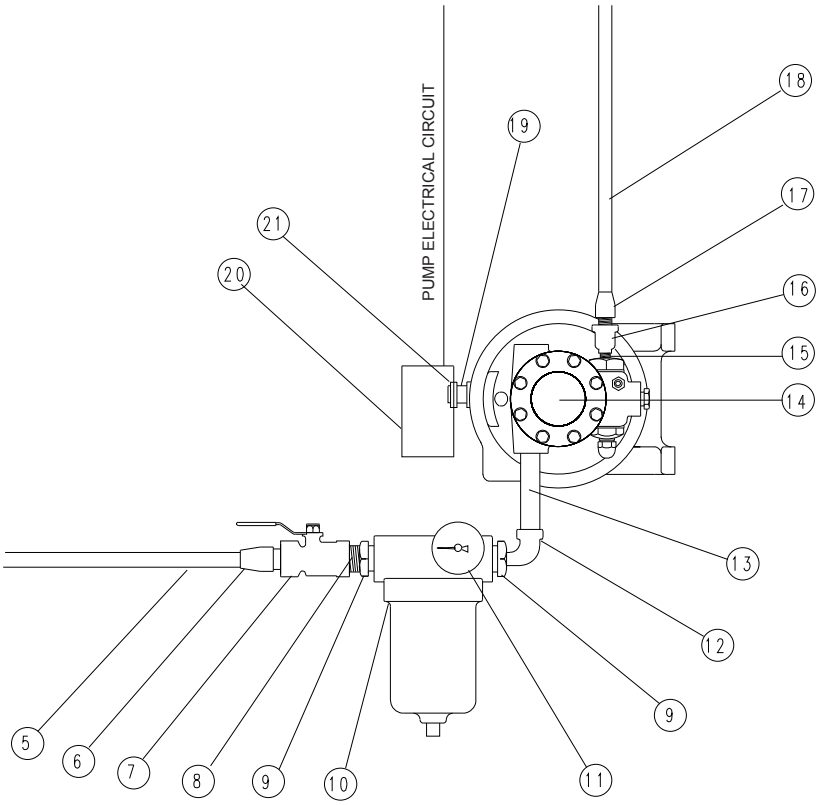


FIGURE 4E - Inside Above Ground Tank Installation

Determining the Type of Oil Tank (continued)

Specifications for Inside Above Ground Tank Installation (Figure 4E)

NOTE: Review the following specifications closely and fill-in as required. Procedures for oil pump and oil line installation can be found in the sections following the tank illustrations/specifications.

Suction Line Specifications (Per Figure 4E)

(1) Horizontal length of suction line (NOT to exceed 30 ft.) _____ ft.
(2) Vertical lift of suction line (NOT to exceed 10 ft.) _____ ft.
(3) Use 5/8" O.D. copper tubing; DO NOT use steel pipe unions.
(4) Use only good flare fittings; DO NOT use compression fittings.
(5) Seal every threaded fitting with Permatex #2 non-hardening gasket sealer or equivalent; DO NOT use teflon tape.
(6) Ensure that the suction line is 100% airtight.

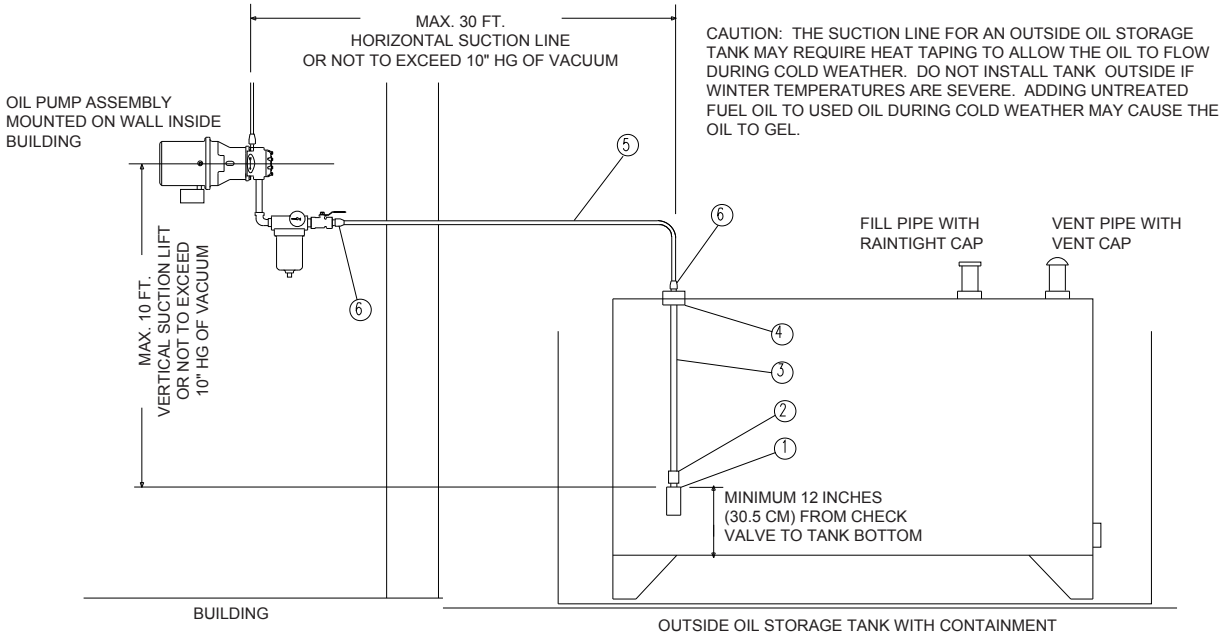
Tank/Pump Installation Component Specifications (Per Figure 4E)

Number	Quantity	Description
(1)	1*	Check valve
(2)	1*	Check valve screen
(3)	1	1/2" I.D. steel pipe (standpipe)
(4)	1	2" x 1/2" tap double tap hex bushing
(5)	_____ ft.	5/8" O.D. copper tubing
(6)	2	Flare fitting (5/8" flare x 1/2" NPT male)
(7)	1	1/2" stainless steel ball valve
(8)	1	1/2" close nipple
(9)	3**	3/4" x 1/2" hex bushing
(10)	1*	Lenz canister filter
(11)	1*	Vacuum gauge
(12)	1	1/2" street elbow
(13)	1	6" x 1/2" pipe nipple
(14)	1*	Oil pump
(15)	1	1/4" close nipple
(16)	1	1/4" x 1/2" bell reducer
(17)	1	___" x 1/4" NPT flare fitting (size correctly for pressure oil line)
(18)	_____ ft.	Pressure oil line (size according to chart in Oil Line Installation section)
(19)	1	1/2" close nipple
(20)	1	4" x 2" x 2" electrical box
(21)	3	Locking rings to attach box to pump motor

* Provided as stock part with furnace.
** Two bushings are provided with furnace.

Determining the Type of Oil Tank (continued)

CAUTION: National and local codes govern the use and installation of outside oil storage tanks. Your tank installation must comply with these codes.



Close-up of pump installation for outside above ground tank

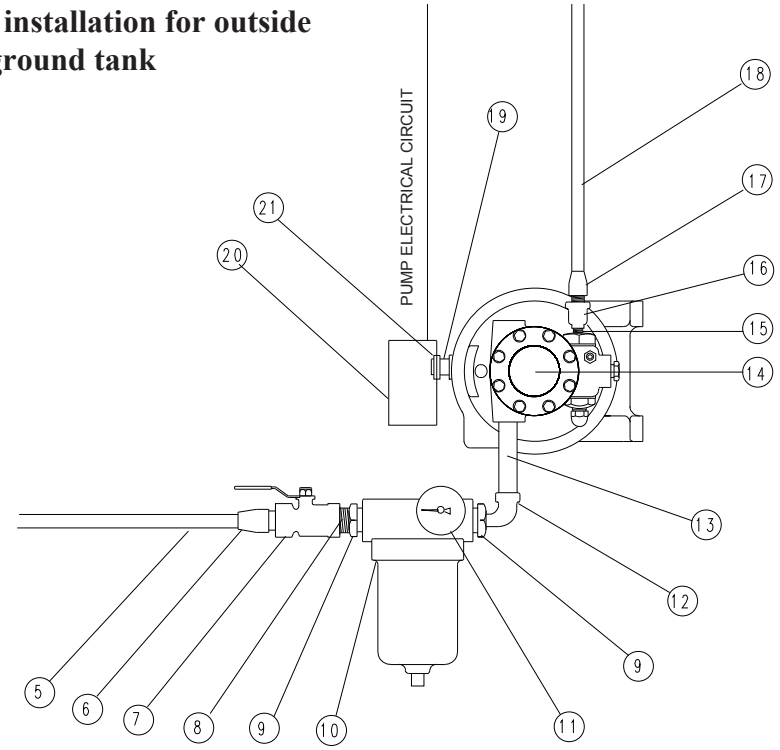


FIGURE 4F - Outside Above Ground Tank Installation

Determining the Type of Oil Tank (continued)

Specifications for Outside Above Ground Tank Installation (Figure 4F)

NOTE: Review the following specifications closely and fill-in as required. Procedures for oil pump and oil line installation can be found in the sections following the tank illustrations/specifications.

Suction Line Specifications (Per Figure 4F)

(1) Horizontal length of suction line (NOT to exceed 30 ft.) _____ ft.
(2) Vertical lift of suction line (NOT to exceed 10 ft.) _____ ft.
(3) Use 3/4" O.D. copper tubing; DO NOT use steel pipe unions.
(4) Use only good flare fittings; DO NOT use compression fittings.
(5) Seal every threaded fitting with Permatex #2 non-hardening gasket sealer or equivalent; DO NOT use teflon tape.
(6) Ensure that the suction line is 100% airtight.

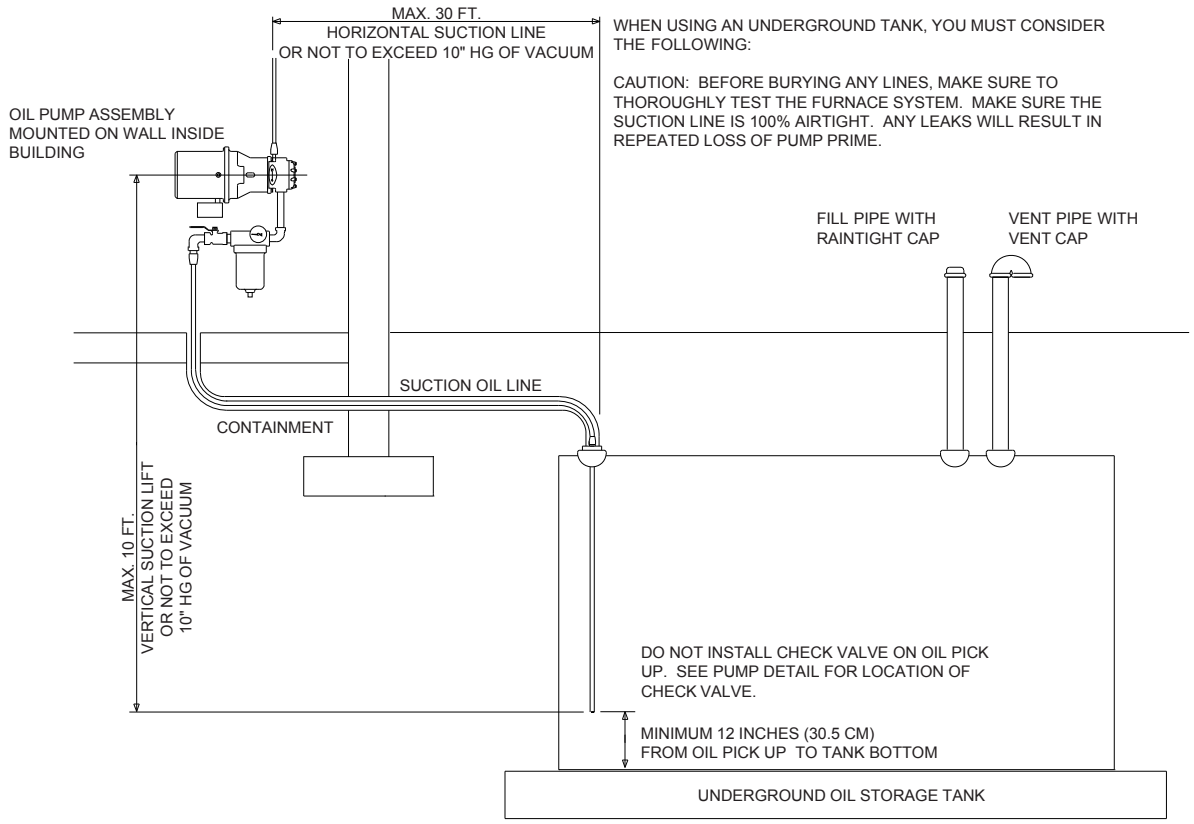
Tank/Pump Installation Component Specifications (Per Figure 4F)

Number	Quantity	Description
(1)	1*	Check valve
(2)	1*	Check valve screen
(3)	1	3/4" I.D. steel pipe (standpipe)
(4)	1	2" x 3/4" tap double tap hex bushing
(5)	_____ ft.	3/4" O.D. copper tubing
(6)	2	Flare fitting (3/4" flare x 3/4" NPT male)
(7)	1	3/4" stainless steel ball valve
(8)	1	3/4" close nipple
(9)	1**	3/4" x 1/2" hex bushing
(10)	1*	Lenz canister filter
(11)	1*	Vacuum gauge
(12)	1	1/2" street elbow
(13)	1	6" x 1/2" pipe nipple
(14)	1*	Oil pump
(15)	1	1/4" close nipple
(16)	1	1/4" x 1/2" bell reducer
(17)	1	___" x 1/4" NPT flare fitting (size correctly for pressure oil line)
(18)	_____ ft.	Pressure oil line (size according to chart in Oil Line Installation section)
(19)	1	1/2" close nipple
(20)	1	4" x 2" x 2" electrical box
(21)	3	Locking rings to attach box to pump motor

* Provided as stock part with furnace.
** Two bushings are provided with furnace.

Determining the Type of Oil Tank (continued)

CAUTION: National and local codes govern the use, installation, and monitoring of underground oil storage tanks. Your tank installation must comply with these codes.



Close-up of pump installation for underground tank

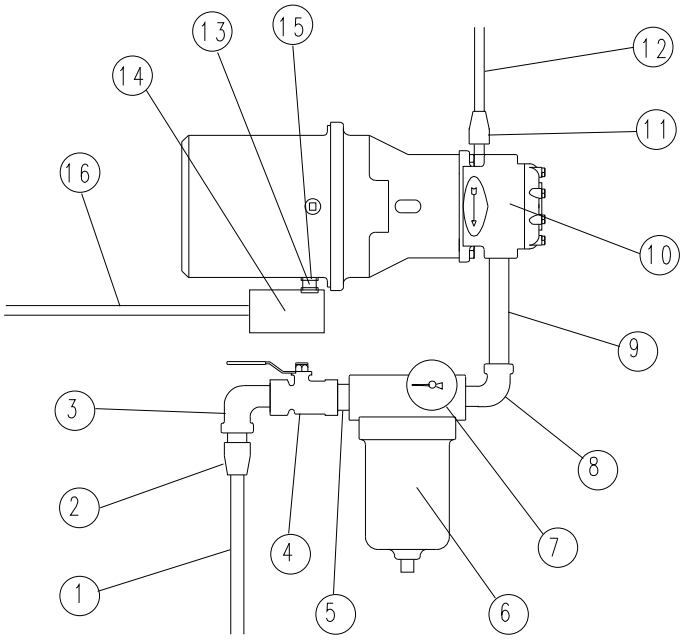


FIGURE 4G - Underground Tank Installation

Determining the Type of Oil Tank (continued)

Specifications for Underground Tank Installation (Figure 4G)

NOTE: Review the following specifications closely and fill-in as required. Procedures for oil pump and oil line installation can be found in the sections following the tank illustrations/specifications.

CAUTION: The underground suction line must be installed in appropriate containment and must comply with all applicable national and local codes.

Suction Line Specifications (Per Figure 4G)

(1) Horizontal length of suction line (NOT to exceed 30 ft.) _____ ft.
(2) Vertical lift of suction line (NOT to exceed 10 ft.) _____ ft.
(3) Use 3/4" O.D. copper tubing; DO NOT use steel pipe unions.
(4) Use only good flare fittings; DO NOT use compression fittings.
(5) Seal every threaded fitting with Permatex #2 non-hardening gasket sealer or equivalent; DO NOT use teflon tape.
(6) Ensure that the suction line is 100% airtight.
(7) DO NOT install the check valve in the tank.

Tank/Pump Installation Component Specifications (Per Figure 4G)

Number	Quantity	Description
(1)	_____ ft.	3/4" O.D. copper tubing
(2)	2	Flare fitting (3/4" flare x 3/4" NPT male)
(3)	1	3/4" street elbow
(4)	1	3/4" stainless steel ball valve
(5)	1	3/4" close nipple
(6)	1*	Lenz canister filter
(7)	1*	Vacuum gauge
(8)	1	3/4" male x 1/2" female street elbow
(9)	1	6" x 1/2" pipe nipple
(10)	1*	Oil pump
(11)	1	___" x 1/4" NPT flare fitting (size correctly for pressure oil line)
(12)	_____ ft.	Pressure oil line (size according to chart in Oil Line Installation section)
(13)	1	1/2" close nipple
(14)	1	4" x 2" x 2" electrical box
(15)	3	Locking rings to attach box to pump motor
(16)	N.A.	Pump electrical circuit

* Provided as stock part with furnace.

Installing the Oil Pump

After determining the type of oil tank your furnace installation will use, you can proceed by installing the oil pump accordingly.

1. Study the specifications for oil pump installation provided in the appropriate tank/pump installation diagram (either Figure 4E, 4F, or 4G).
2. Also refer to the oil pump installation diagram provided in this section (Figure 4H).
3. Adhere to the following guidelines:
    - Install the oil pump in a location where it can be easily primed and serviced. Its location must be protected from water and combustible fumes. DO NOT mount the pump in a basement or on the floor.
    - The oil pump can *push* the oil much further than it can suck the oil. It is therefore very important that the pump be positioned as close to the oil tank as possible.
    - Mount the pump inside the building to protect it from weather/exposure.
    - Position the pump to minimize the height and length of the suction oil line (i.e. the oil line from the pump to the tank). DO NOT exceed the following limits, or your pump will not operate correctly:

      Maximum suction line lift - 10 feet (or not to exceed 10" of vacuum)
      Maximum horizontal run - 30 feet
    - Measure the suction line lift and horizontal run for your installation and write this information on the appropriate tank diagram in the spaces provided (either Figure 4E, 4F, or 4G).
    - The oil pump requires a single oil line. DO NOT install a return line to the tank unless instructed to do so by your Clean Burn dealer.
    - Whenever possible, mount the pump above the highest oil level in the tank, so the pump is suction fed, *not* gravity or pressure fed.

      ATTENTION: If your pump is gravity or pressure fed, DO NOT install check valves, or severe damage to the oil pump seals and oil spillage will occur. Oil pressure at the pump inlet may not exceed 3 psi. Refer to NFPA-31.
4. Install the oil pump according to the instructions and specifications provided in the diagrams.

Installing the Oil Pump (continued)

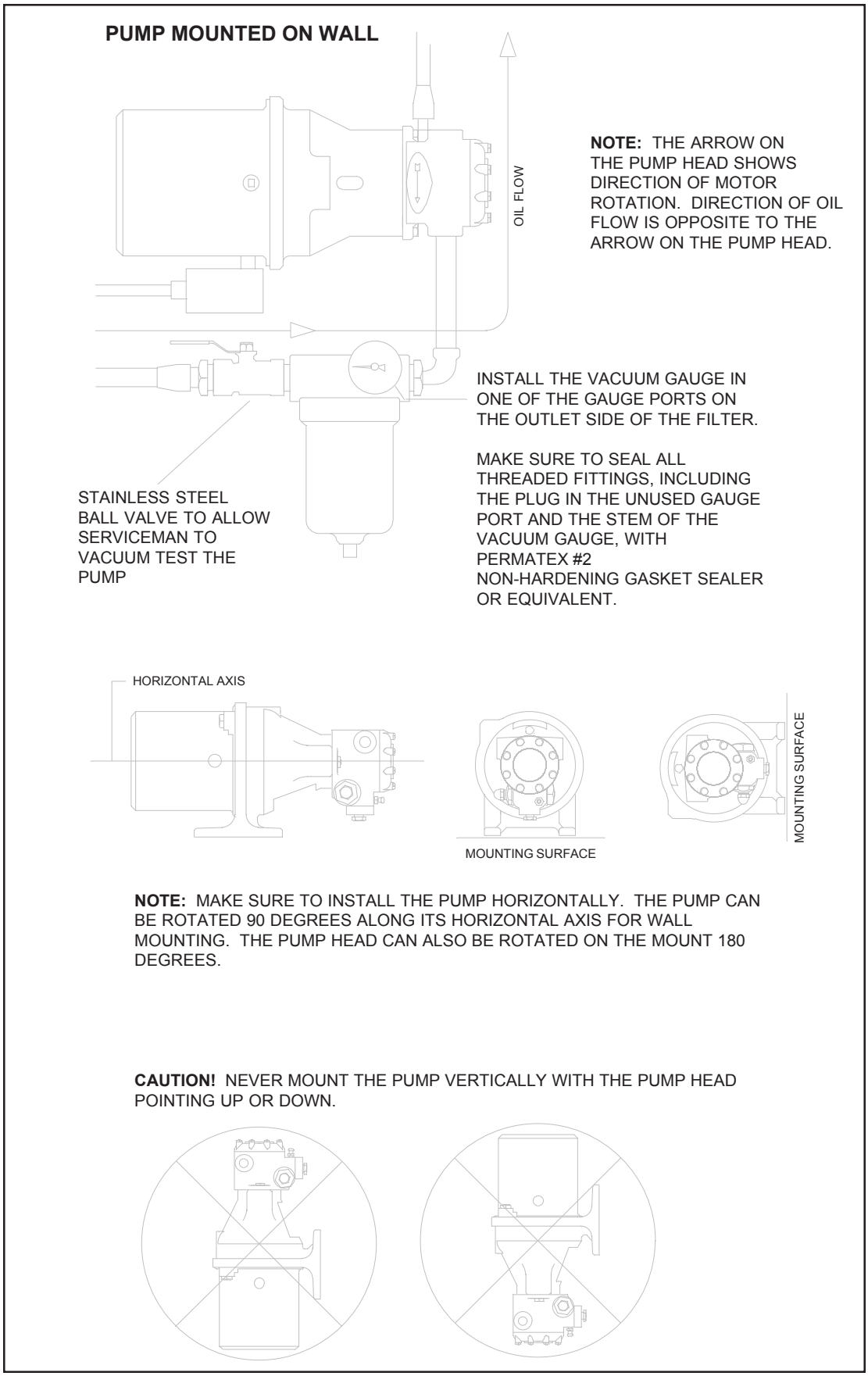


Figure 4H - Detail of Pump Installation for Above Ground Inside/Outside Tank

Wiring the Furnace and Pump

WARNING: To avoid electrical shock, make sure that power to the furnace is turned OFF before connecting any wires. A licensed electrician should install all wiring to your furnace. All wiring must be in accordance with the National Uniform Electrical Code and local codes. Properly size all wires and use electrical conduit for all electrical lines.

Wiring your furnace involves the installation of two lines:

(1) A dedicated electrical line to the furnace
(2) A pump electrical circuit from the furnace to the oil pump

Necessary wiring specifications are provided in this section and in the **Wiring Schematics** located in **Appendix B** at the back of the manual.

Wiring to the Furnace

1. Install a dedicated electrical circuit to the electrical junction box on the furnace.
   CAUTION: DO NOT tie into an existing circuit, or electrical overload may occur.
2. Wire the furnace according to the Wiring Schematic in Appendix B.
3. Check for correct voltage at the furnace, and refer to the following chart.
   ATTENTION: Incorrect voltage will severely damage the blower motor/furnace components. DO NOT operate your furnace on any non-specification power system.

UNIT HEATER

Model	Voltage	Breaker Size*	Circuit	Hertz
CB-1400	110/120	20 amps	Dedicated	60
CB-1800	110/120	20 amps	Dedicated	60
CB-2800	110/120	20 amps	Dedicated	60

***NOTE: Breaker size with optional equipment is 30 amps.** When installing any optional equipment (e.g. air compressor or draft inducer), you must use a 30 amp breaker. Make sure a qualified electrician properly sizes and installs this electrical circuit.

CENTRAL FURNACE

Model	Voltage	Breaker Size	Circuit	Hertz
CB-1800	110/120	30 amps	Dedicated	60
CB-2800	110/120	30 amps	Dedicated	60

4. DO NOT turn on main power until instructed to do so.

Wiring to the Oil Pump

NOTE: DO NOT wire the pump directly into your building's electrical system. The pump must be activated (receive power from) the burner via the pump electrical circuit.

1. Install the pump electrical circuit from the furnace to the oil pump location.
2. Wire the pump circuit according to the Wiring Schematic (Appendix B).

Installing the Oil Lines

Your furnace installation requires two oil lines:

(1) **Suction oil line:** oil line and suction line components from the tank to the pump.

(2) **Pressure oil line:** oil line from the pump to the connector block on the furnace.

Procedures and specifications for the installation of the oil lines follow.

ATTENTION: Be sure to purchase copper tubing which is sized correctly for your installation. Undersizing of oil lines restricts oil flow and results in poor furnace performance. Refer to the tables in this section listing the proper sizing of the suction and pressure oil lines.

Installing the Suction Oil Line

1. Study the specifications on the appropriate Tank/Pump installation diagram (either Figure 4E, 4F, or 4G).
2. Make sure you have purchased all the necessary fittings to complete the installation correctly.
3. Install the fittings and components as shown in the appropriate Tank/Pump installation diagram. Also adhere to the following guidelines:
   - DO NOT exceed line lengths and suction limits of the pump. Keep the suction line and suction lift as short as posssible.
     Maximum suction line lift - 10 feet (or not to exceed 10" of vacuum)
     Maximum horizontal run - 30 feet
   - Use properly sized copper tubing according to the following chart:

Type of Tank	Minimum Size of Copper Tubing*
Inside Tank	5/8" O.D.
Outside Tank	3/4" O.D.
Underground Tank	3/4" O.D.

***NOTE:** Maximum allowable size of tubing is 1" O.D. for all types of tanks.

   - *Ensure that the suction line is 100% airtight.* The pump cannot properly suck oil from the tank if there are any leaks in the suction oil line. Air leaks in the suction line due to improper installation will result in repeated burner shutdown and unnecessary service calls.
   - *Use only good flare fittings.* DO NOT use compression fittings or pipe unions on the suction line. The use of these inappropriate materials on the suction line will result in air leaks and burner shutdown.
   - *Seal each threaded fitting with #2 Permatex non-hardening gasket sealer or equivalent.* DO NOT use teflon tape. Teflon residues will plug vital pump and burner components and will void your warranty.

Installing the Suction Oil Line (continued)

4. Install the canister filter in the suction line according to the specifications on the appropriate Tank/Pump diagram (either Figure 4E, 4F, or 4G).
   NOTE: DO NOT install the canister filter in the pressure oil line. This filter must be installed in the suction oil line to protect the pump head. Ensure that the filter can be easily accessed for cleaning.
5. Install the vacuum gauge in one of the ports of the canister filter. Ensure that all fittings on the canister filter are 100% airtight.

Installing the Pressure Oil Line

1. Study the specifications on the appropriate Tank/Pump installation diagram (either Figure 4E, 4F, or 4G).
2. Make sure you have purchased all the necessary fittings to complete the installation correctly.
3. Install the fittings and components as shown in the appropriate Tank/Pump installation diagram. Also adhere to the following guidelines:
   - Properly size the pressure oil line according to the following chart:

Length of Pressure Line	Minimum Size of Copper Tubing
Length up to 50 feet	1/2" O.D.*
Length up to 100 feet	5/8" O.D.*
Length up to 200 feet	3/4" O.D.*

*Diameter of copper tubing must be maintained for full line length.

   - Local codes may require the installation of "oil thermo cut-off" safety valves. Be sure to check all appropriate codes to ensure compliance.

Installing the Compressed Air Line

NOTE: Your air compressor system must supply air pressure to the furnace with the following requirements:

- 50 psi
- water trap or dryer

If you do not have shop air, an optional air compressor is available. Contact your local Clean Burn dealer for more information.

1. Run a compressed air line from your shop air to the connector block on the furnace. Use minimum 1/4" O.D. copper tubing or equivalent for the compressed air line.
2. Install an easily accessible shut-off valve in the air line so the burner can be serviced without shutting off the shop air in your service area.
3. If necessary, install a pressure regulator (additional to the burner air regulator) in the air line, and set it at 50 psi.
   ATTENTION: DO NOT feed full shop air pressure to the burner or damage to burner components may occur.

Installing the Compressed Air Line (continued)

4. Install a water trap or extractor/dryer in the air line with an automatic drain so compressed air (rather than water) is supplied to the burner.
   NOTE: Water must not be fed to the burner, or the flame will be extinguished and the burner will shut down. Be sure to drain water from your compressor tank on a regular basis to keep water out of the air line.

Installing the Stack

WARNING: Inappropriate stack materials or improper stack design/installation can adversely affect the proper, safe operation of your furnace. Contact your Clean Burn dealer to purchase the proper stack components for your furnace.

Stack designs are generally classified as follows:

(1) "Class A" stack through the ceiling of the building
(2) "Class A" stack through the sidewall and up the side of the building

Figures 4I and 4J illustrate these stack designs. Choose the stack design which is appropriate for your furnace installation and review all specifications provided in the Figure. When designing your stack, adhere to the following specifications:

- Models CB-1400/CB-1800/CB-2800 require minimum 8" I.D. stack components.
- *Ensure that the vertical stack height is at least 10 feet.* If needed, increase the vertical length of the stack or install a draft inducer to obtain -.02" W.C. draft over fire. (Section 8 contains details on adjusting the draft.)
- *Keep the horizontal stack run as short as possible*; slant it upward at a minimum of 1/4" per foot or run.
- *Keep the stack design simple.* Complicated stacks (with long runs and many turns) reduce draft and result in poor burner performance. Your stack may include only one 90 degree turn. All other stack turns must be at 45 degrees or less to ensure optimal draft and burner performance.

NOTE: If you plan to use an existing masonry chimney, the chimney must be inside the building. Exterior masonry chimneys chill the stack gases and result in poor draft and poor burner performance. **ATTENTION: If you have an exhaust fan(s) in your shop, *it is critical that you have adequate make up air (source of fresh air to replace the stale air exhausted by the fan).*** When an exhaust fan is run without adequate make up air, the resultant vacuum in the building will draw combustion products back into the burner. This back draft causes poor burner performance and may damage vital burner components. Refer to Section 8 in this manual for additional information concerning exhaust fans and proper make up air.

Stack components should be installed in the following order:

(1) Inside stack (the stack components from the furnace breach to within 18" of the ceiling, roof, or sidewall of your building)
(2) Barometric damper
(3) "Class A" stack penetration through the ceiling, roof, or sidewall
(4) "Class A" stack on the exterior of the building
(5) "Class A" stack cap

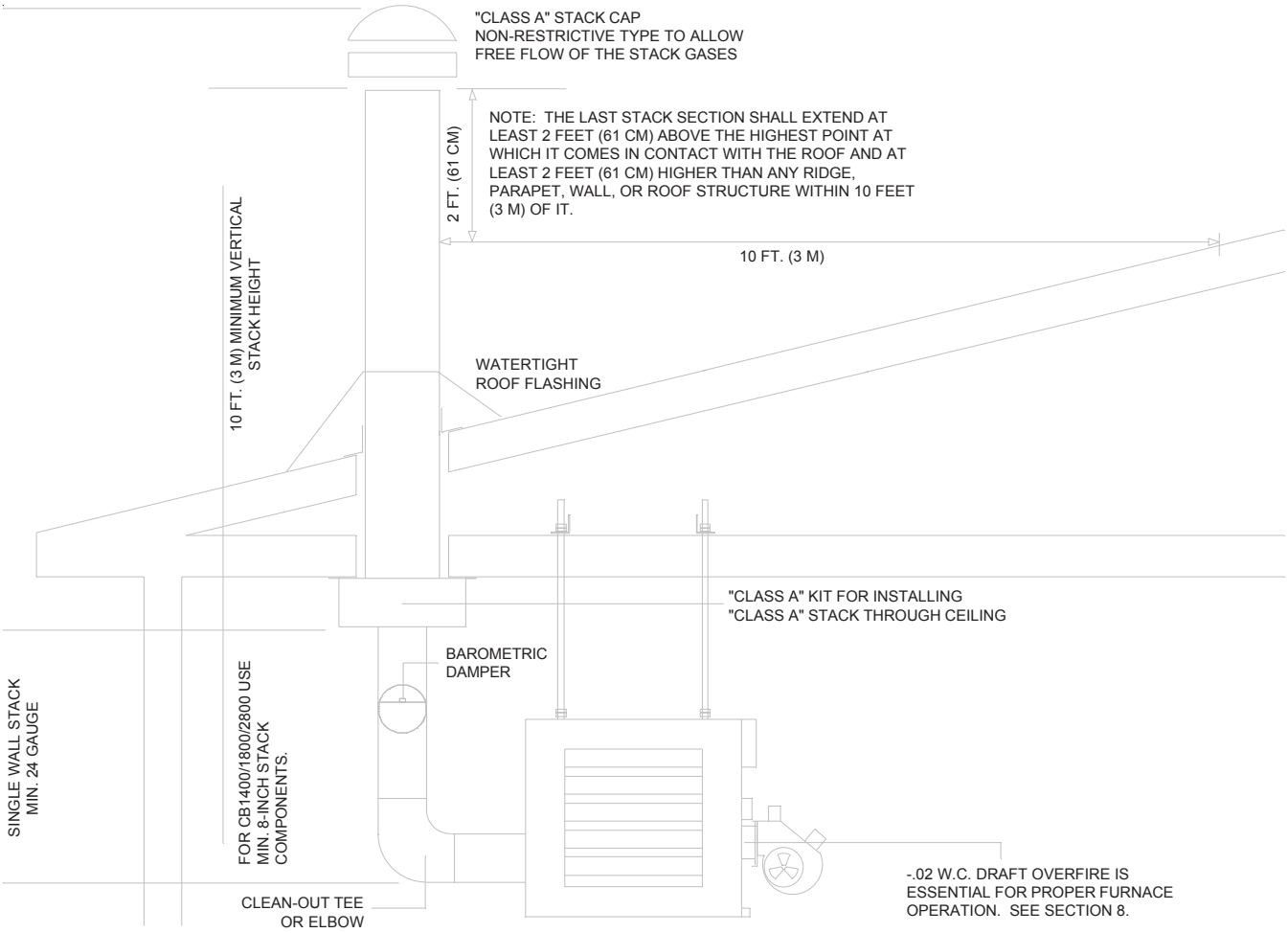


Figure 4I - Installation of "Class A" Stack Through Roof/Ceiling

WARNING! OUTSIDE STACK AND STACK PENETRATIONS THROUGH CEILING, ROOF, OR SIDEWALL MUST BE "CLASS A" FOR FIRE SAFETY AND TO MAINTAIN PROPER DRAFT.

EXTERIOR SINGLE WALL STACK DOES NOT MEET FIRE CODE!

WARNING! MAKE SURE TO INSTALL ALL STACK COMPONENTS WITH PROPER SUPPORT AND CLEARANCES FROM CONBUSTIBLES. FOLLOW STACK MANUFACTURER'S SPECIFICATIONS.

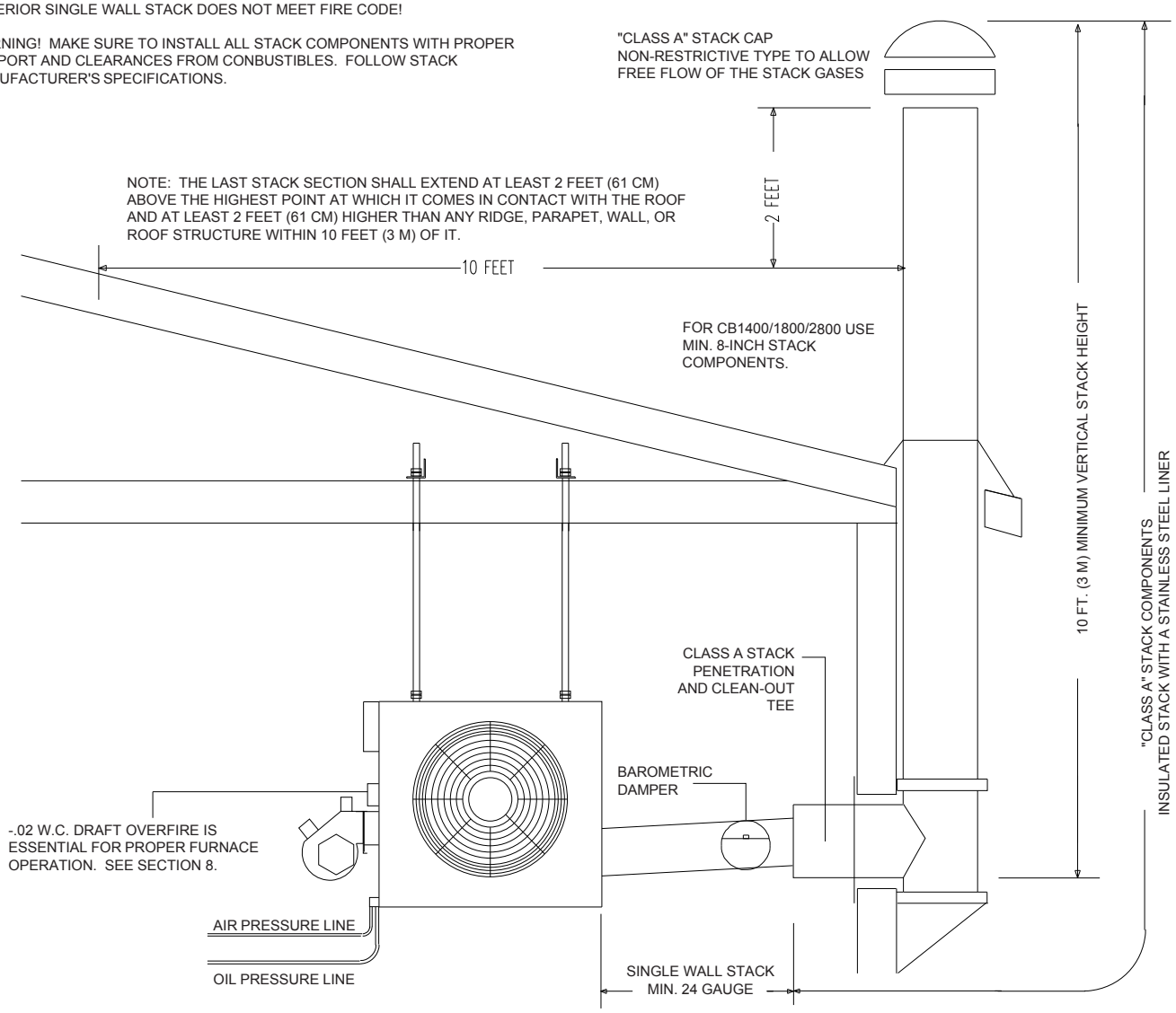


Figure 4J - Installation of "Class A" Stack Through Sidewall

Installing the Interior Stack

WARNING: Single wall stack components may be used *only* for those portions of the stack which are located inside your building and away from any fire/burn hazards. ***All single wall stack components must be located a minimum 18 inches from combustibles.***

1. Install the single wall stack with proper clearances from combustibles. Also ensure that the stack is located a safe distance from all shop personnel.
2. Install an elbow or clean-out tee at the junction of the horizontal and vertical stack components to allow for easy cleaning of the stack.
   ATTENTION: Avoid additional 90-degree turns in the stack. Each additional 90-degree turn slows down stack gases, creates back-pressure, and results in repeated burner shutdown and unnecessary service calls. All other turns in the stack should be at a 45-degree (or smaller) angle.
   NOTE: ***IMPORTANT for Canadian Installations*** - Local codes may require the installation of a clean-out tee.

Installing the Barometric Damper

1. Refer to Figure 4K. Install a single wall tee (min. 24 gauge) on the first straight vertical or horizontal stack section within one to three feet of the furnace breach.
   NOTE: This tee is required to support the barometric damper. You must purchase this tee when you purchase your stack materials (8" single wall tee - CB#71074).
2. Install the barometric damper in the opening of the tee. Use a small spirit level to make sure that it is properly level as shown.
3. Install one self-tapping screw at the BOTTOM of the barometric damper to hold it in place. DO NOT install this screw at the top of the barometric damper, or the flapper of the damper will not operate correctly.

NOTE: Specifications for adjusting the barometric damper for proper draft overfire are provided in **Section 8** of this manual.

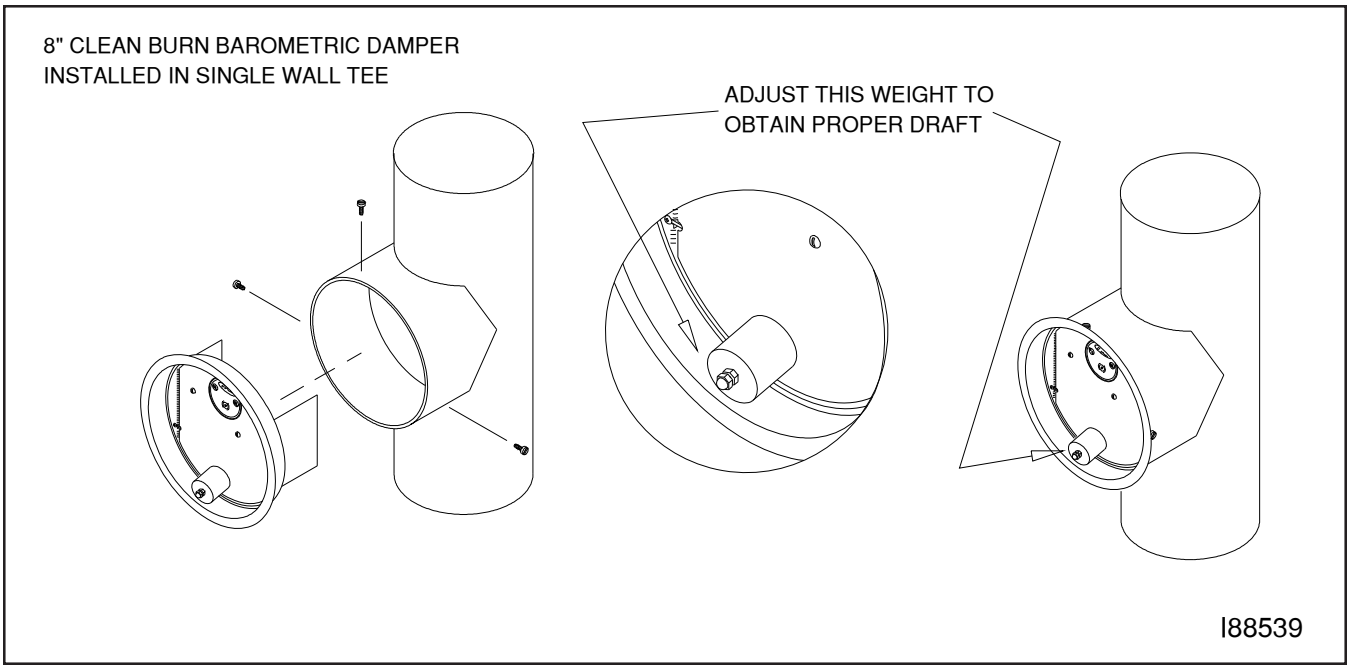


Figure 4K - Installation of Barometric Damper

Installing the Stack Penetration

CAUTION: When running the stack through your ceiling, roof, or sidewall, you must use a proper insulated "Class A" penetration with a stainless steel liner. DO NOT run single-wall stack through your ceilng, roof or sidewall. Single-wall penetrations do not meet safety codes and may create a fire hazard. Provide proper clearances to combustibles per all applicable codes.

1. Refer to Figure 4I/4J as needed.
2. Follow the installation instructions provided by the stack manufacturer.

Installing the Exterior Stack

ATTENTION: All exterior stack pieces must be insulated "Class A" ("all fuel") stack components with a stainless steel liner. DO NOT use "Class B" natural gas stack components. DO NOT use single-wall stack for your exterior stack. Single-wall exterior stack chills the stack gases and results in poor draft and poor burner performance.

1. Refer to Figure 4I or 4J as needed.
2. Follow the installation instructions provided by the stack manufacturer.
3. Install water-tight roof flashing around the penetration of the exterior stack.
   NOTE: Clean Burn recommends the use of "Dektite" roof flashing (or equivalent) which ensures a water-tight seal when installed properly. Contact your local Clean Burn dealer for details.

Installing the Stack Cap

NOTE: Proper installation of a "Class A" stack cap ensures the free flow of stack gases which is essential for optimal burner performance.

1. Refer to Figure 4I or 4J as needed. Your stack cap should be classified as: "Class A" non-restrictive, "fuel-oil type".
2. Install the stack cap according to the manufacturer's instructions.

Installing the Wall Thermostat

ATTENTION: Before installing the round Honeywell thermostat, ***remove the red shipping tab.*** DO NOT turn the dial on the thermostat until the red shipping tab has been removed, or serious damage to the thermostat will occur!

1. Select a location for the thermostat on an interior wall away from the furnace and cold drafts.
2. Run "two wire" (minimum 18 gauge) thermostat cable between the burner and the thermostat.
3. Remove the yellow jumper wire from the "T" terminals of the oil primary control. *Save this jumper wire for use during pump priming.*
4. Connect the thermostat wires to the two "T" terminals on the oil primary control.
5. Follow the manufacturer's instructions to wire the thermostat.

Inspecting the Furnace Installation

Following completion of all installation activities described in this chapter, the furnace should be inspected by qualified personnel before firing. This ensures that your installation meets all applicable national and local codes and allows for any deficiencies to be corrected before furnace startup. *Improper installation may void your warranty.*

SECTION 5: OIL PUMP PRIMING

Understanding Oil Pump Priming

Preparing your Clean Burn furnace for operation begins with priming the oil pump. This activity involves a series of separate procedures as follows:

(1) Preparing the Canister Filter for Pump Priming
(2) Preparing the Pump for Pump Priming
(3) Preparing the Burner for Pump Priming
(4) Activating the Pump
(5) Establishing Proper Oil Flow
(6) Flushing the Oil Lines
(7) Adjusting the Pump Pressure

NOTE: The procedures in this section must be performed in sequence *without interruption* to properly prime the pump.

Required Tools and Materials

The following tools and materials are required for oil pump priming and should be gathered before starting any procedures:

- 3/8" open-end wrench
- Rags
- Two containers (minimum one-gallon)
- Medium straight-blade screwdriver

Preparing the Canister Filter for Pump Priming

ATTENTION: Fill the canister filter with *used oil* so the pump gears are charged with oil during the priming procedure. DO NOT use new motor oil; it will probably not ignite at the burner. DO NOT run the pump with dry gears, or the pump will not prime and damage may occur.

1. Refer to Figure 5A.
2. Remove the four (4) bolts holding the canister bowl in place, then remove the bowl.
3. Check the condition of the filter element and O-ring.
4. Make sure the O-ring is in the groove on the top of the filter element. Push the element into position on the filter body.
5. Fill the canister with used oil to prevent the pump from running dry during priming.
6. Check the condition of the canister O-ring, and re-install the canister. Tighten the four canister bolts evenly to ensure that the canister filter is 100% airtight.

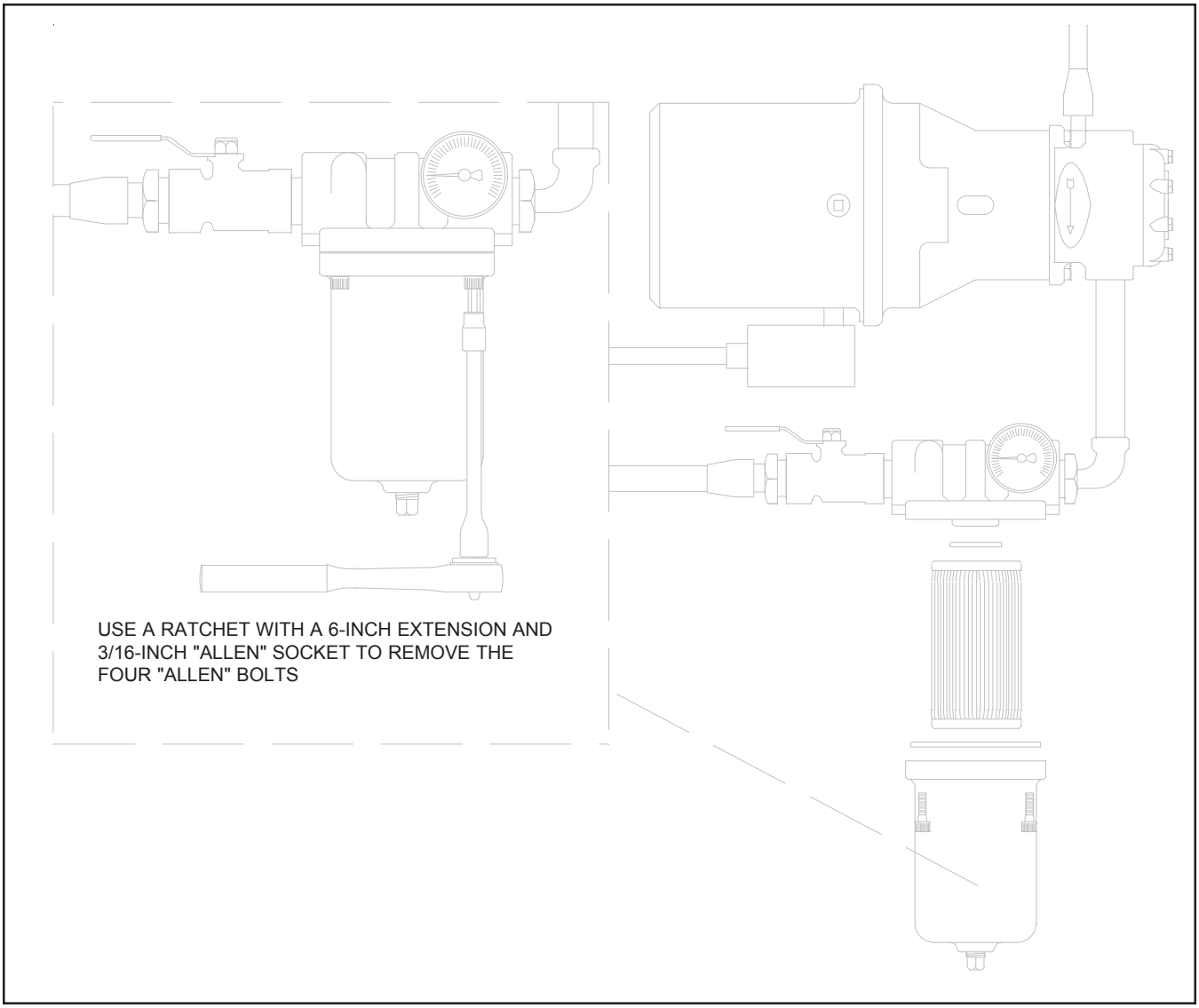


Figure 5A - Oil Canister Detail

Preparing the Pump for Pump Priming

1. Refer to Figure 5B.
2. Use a 3/8" wrench to open the bleeder port on the pump head (two to three full turns) so the bleeder is completely open.
3. Fill a small squeeze bottle with used oil, and squirt a few shots of used oil into the bleeder on the pump. This ensures that the pump gears are charged with oil so the pump can pull an adequate vacuum to prime.
4. Position a one gallon container (minimum) under the bleeder port to catch oil which will flow from the bleeder during pump priming.

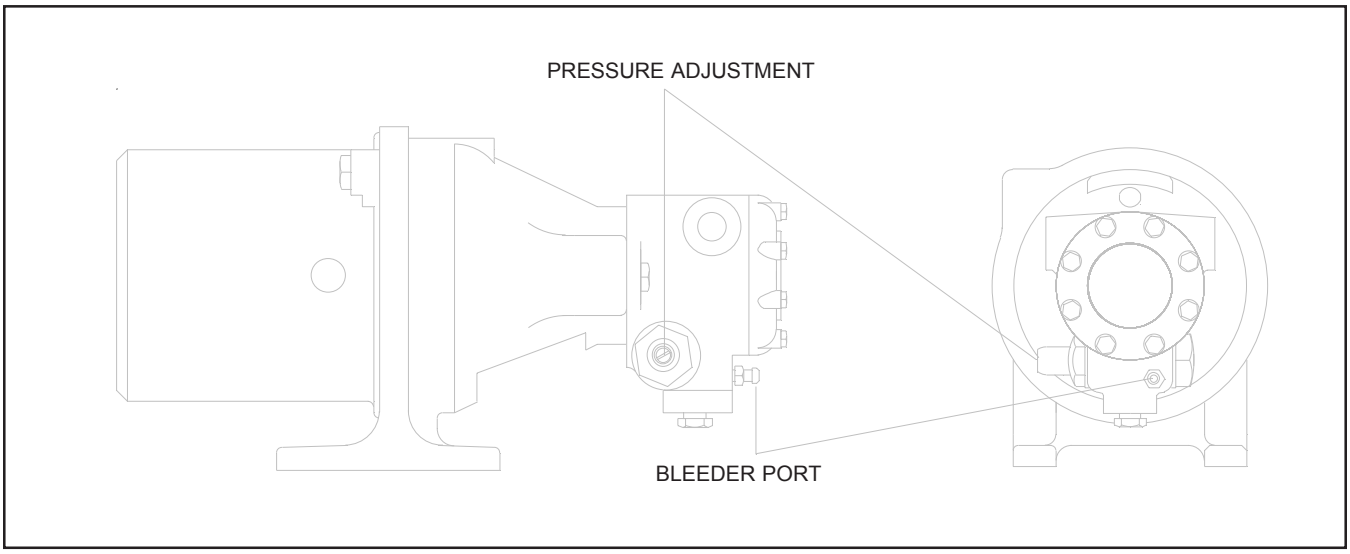


FIGURE 5B - Bleeder Port on Pump Head

Preparing the Burner for Pump Priming

NOTE: It is necessary to allow the burner to warm up at least 15 minutes prior to activating the burner during the pump priming sequence. The proving switch on the preheater block will not allow the burner to start until the block is hot.

1. Turn the switch on the wall thermostat to OFF.
   NOTE: If your thermostat does not have an OFF setting, disconnect one thermostat wire so the burner will not run.
2. Turn the main power to the furnace ON.
3. Refer to Figure 5C.
4. Disconnect the oil line at the connector block on the furnace.
5. Position a one-gallon container (minimum) to catch oil which will flow from the disconnected oil line during pump priming.
   NOTE: It is important to thorougly flush the oil line during pump priming so that no dirt/debris is fed to the burner.
6. Loosen the locking nut on the oil regulator, and turn the knob two to three full turns counter clockwise so the oil regulator is completely shut off.
7. Loosen the locking nut on the air regulator.

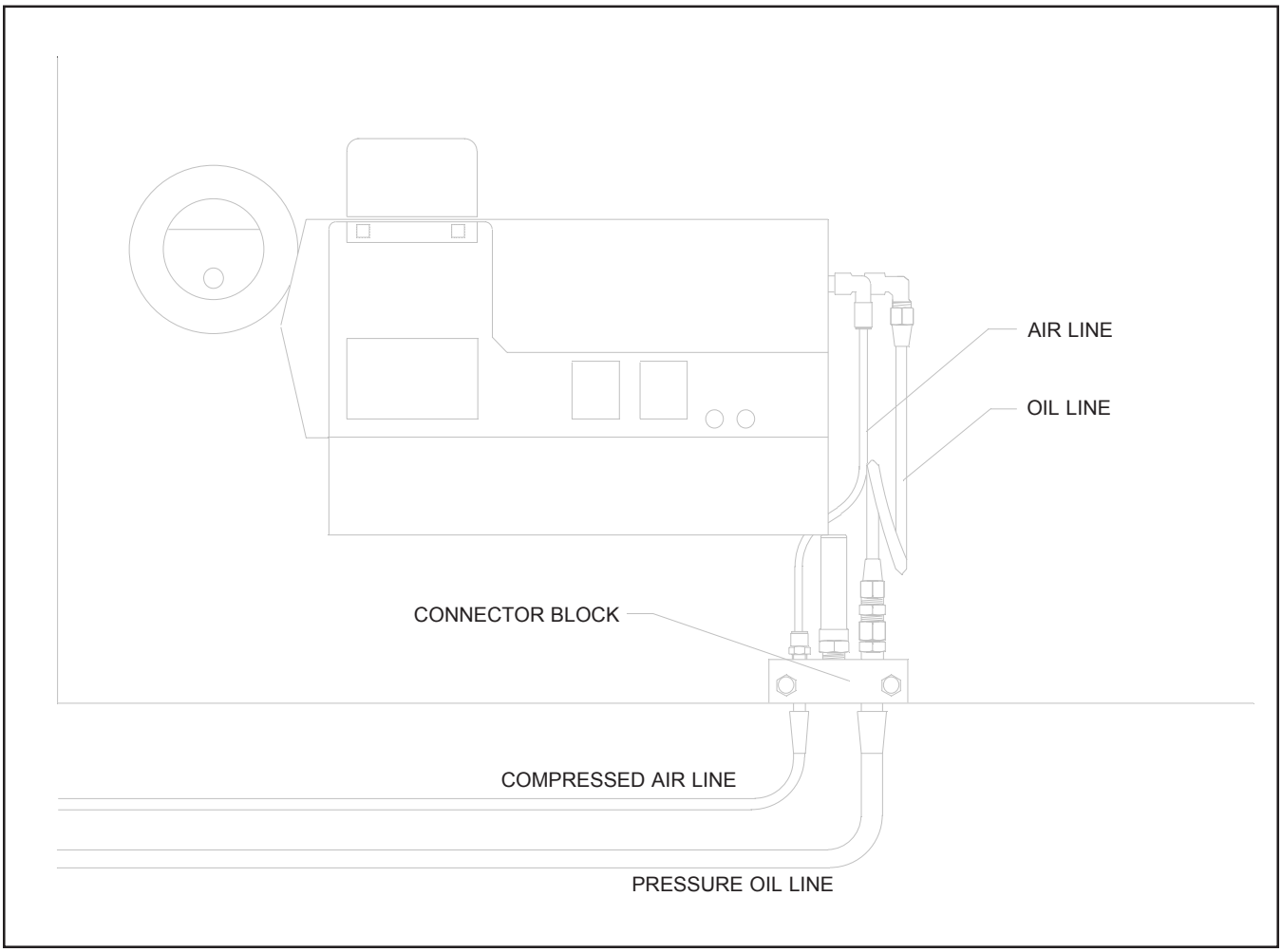


FIGURE 5C - Detail of Burner Connections

Activating the Pump

IMPORTANT NOTE: Activating the pump for pump priming involves running the burner by jumping the "F" terminals of the oil primary control. This procedure (i.e. jumping the "F" terminals) should be used only for this specific purpose--*never for normal operation.* This procedure is accomplished easily by two people: one at the burner and one at the wall thermostat.
ATTENTION: When performing this procedure, never jump from an "F" terminal to a "T" terminal, or severe damage to the primary control will occur.

1. Refer to Figure 5D, Step 1.
2. Locate the yellow jumper wire which you removed and saved during installation of the wall thermostat.
3. Connect the jumper wire to one "F" terminal on the primary control.
4. Refer to Figure 5D, Step 2.
5. Turn the switch on the wall thermostat to HEAT, and adjust the thermostat above room temperature.
6. The burner should start running.
7. Immediately turn the knob on the air regulator clockwise until the air gauge registers 15 psi. You will adjust the air pressure further during burner startup and operation.
   NOTE: No air pressure will register on the air gauge until the burner starts running.
8. The pump should start running.
9. Within ten seconds, jump the "F" terminals by connecting the jumper wire to the other "F" terminal.
   NOTE: If the safety reset on the primary control activates and the burner stops running while performing this procedure, follow the instructions in Section 7 to reset the oil primary control and restart the burner.
10. Run the burner and pump until proper oil flow has been established and the oil lines have been completely flushed out. (See the following procedures for specific instructions.)

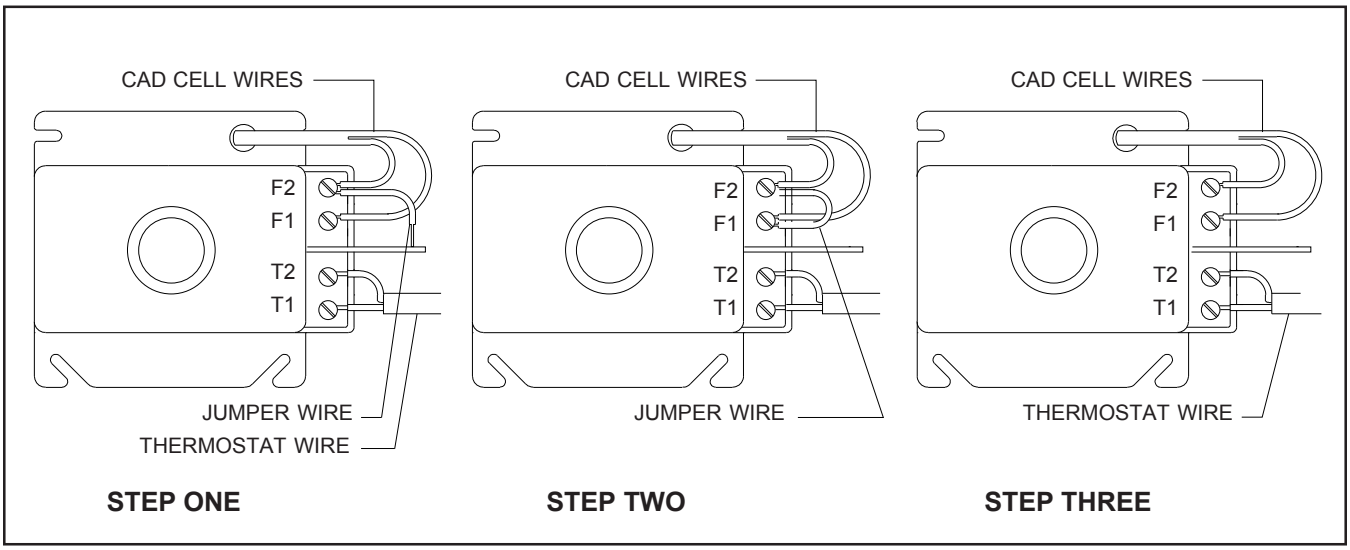


FIGURE 5D - Jumping the Oil Primary Control

ATTENTION: *Never* touch a jumper wire from an "F" terminal to a "T" terminal on the oil primary control. This will severely damage your primary control. Make sure that the plastic barrier strip is in place between the "F" and "T" terminals as shown in Figure 5D.

Establishing Proper Oil Flow at the Pump

1. Within one minute after opening the bleeder port, oil should be sputtering from the port. Make sure the container is positioned to catch the oil flowing from the port.
   ATTENTION: If no oil flows within one minute, shut the pump off and call your Clean Burn dealer. DO NOT run the pump "dry"--doing so may damage the gear set.
2. Observe the oil flow at the bleeder port until a steady stream (no fluctuations or sputtering) is achieved. Bleed approximately one quart of oil from the open port to ensure an airtight suction line.
   NOTE: If the oil stream continues to fluctuate or sputter, there is a leak(s) in the suction line. Any leak(s) in the suction line must be repaired to ensure that the suction line is 100% airtight.
3. Close the port with a 3/8" wrench and tighten completely.

Flushing the Oil Lines

1. Go back to the burner (at the disconnected oil line). Observe a steady oil flow until one gallon has been collected; this ensures that all air and debris have been flushed from the oil line.
2. Turn the power OFF so the burner and pump motors stop running.
3. Re-connect the oil line to the connector block.
4. Remove the jumper wire from the "F" terminals, and make sure the cad cell wires are now connected to the "F" terminals as illustrated in Figure 5D, Step 3. Save the jumper wire for future pump priming.

Adjusting the Pump Pressure

NOTE: It is not necessary to adjust pump pressure for most furnace installations. Adjust the pump pressure *only* if either of the following conditions exist:

- The distance between the pump and the furnace is less than 50 feet.
- You are burning light viscosity oil such as #2 fuel oil. (In this case, you may also need to install a nozzle with a smaller orifice. Contact your Clean Burn dealer before proceeding.)

1. Refer to Figure 5B.
2. Turn the set screw counterclockwise with a small, straight-blade screwdriver until the screw is flush with the nipple. DO NOT back the set screw out more than this!
3. Turn the adjustment screw clockwise one full turn to set the pump pressure at approximately 20 psi.

SECTION 6: STARTING AND ADJUSTING THE BURNER

Understanding Burner Startup and Adjustment

Starting and adjusting the burner involves a series of separate procedures which must be accomplished in sequence without interruption. Review all the procedures before attempting burner startup and adjustment, paying careful attention to safety information statements.

Preparing the Burner for Startup

1. Turn the switch on the wall thermostat OFF.
   NOTE: If your thermostat does not have an OFF setting, disconnect one thermostat wire so the burner will not run.
2. Turn the main power to the furnace ON.
3. Wait at least 15 minutes until the preheater block is thoroughly warmed up. (Feel the back of the burner box to make sure the preheater is sufficiently warm. The proving switch on the preheater block will not allow the burner to start until the block is hot.)
   NOTE: The preheater block will remain warm as long as power is supplied to the burner. If the main power supply is ever turned OFF, you must wait at least 15 minutes until the preheater block is thoroughly warm before starting the burner.
4. Refer to Figure 6A to locate the oil and air regulators. Loosen the locking nuts on the oil and air regulators.
5. Turn the adjustment knobs on the oil and air regulators counterclockwise until 1/2" of the threads on the knobs are exposed. DO NOT back the knobs all the way out.
   NOTE: The air and oil gauges will not show any pressure until the burner starts. Before starting the burner for the first time, it is very important to turn both the air and oil regulators completely OFF as described in this step.

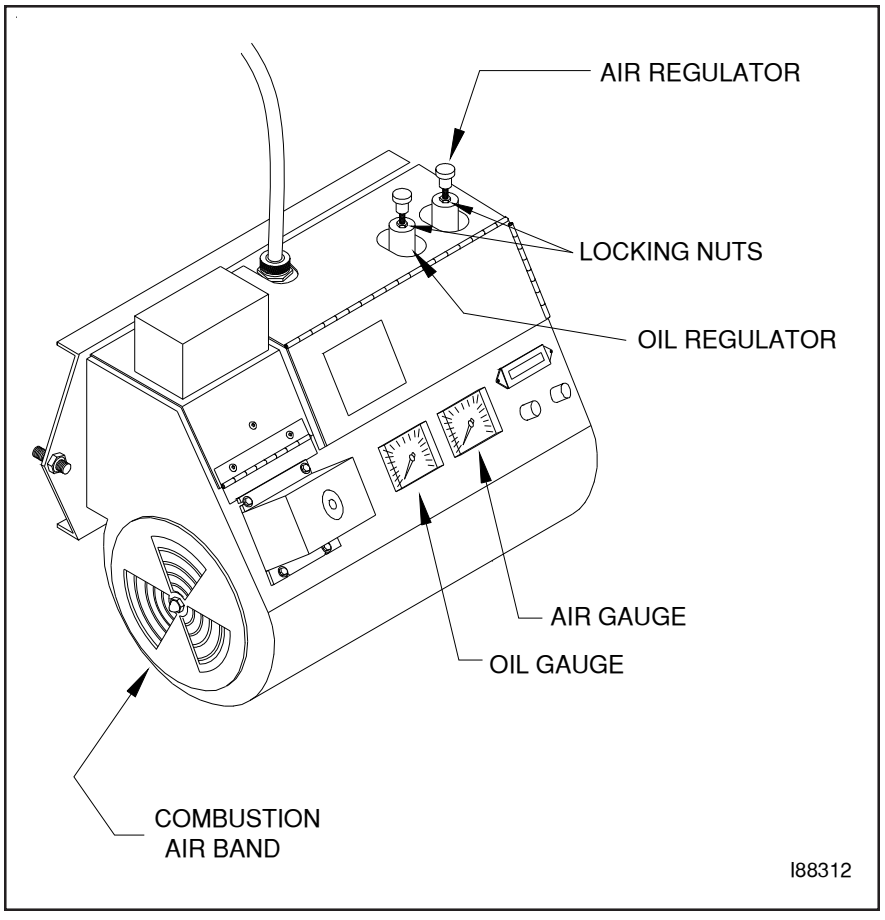


FIGURE 6A - Component Detail of the CB-525-S2 Burner

Preparing the Burner for Startup (continued)

6. **Initial Adjustment of the Combustion Air Band:**

WARNING: The combustion air band must be properly adjusted to ensure that the burner ignites and burns correctly. DO NOT attempt to start the burner with the combustion air band wide open or completely closed. The burner may not ignite correctly. Failure to heed this warning may result in a fire or explosion hazard.

- Refer to Figure 6A to locate the combustion air band.
- Rotate the combustion air band to adjust it to the appropriate initial slot opening as listed in the following **Initial Adjustment Charts**. Use a ruler to accurately set the slot opening at the widest section of the slot.

IMPORTANT NOTE: This initial setting of the combustion air band will allow you to start the burner. You will fine tune the combustion air band further as described later in these instructions.

ATTENTION: The settings shown in the charts below are only *initial* adjustments. ***Final adjustments must be done by inspecting the flame length according to the illustrations provided on the following page.***

Initial Adjustments for CB-1400
Maximum Input = 140,000 BTUH @ 1.0 GPH with CB525-S2 Burner

Oil Type	Oil PSI / Flame Length	Air PSI	Air Band	Nozzle
#2 Fuel Oil*	1.5 & ***check flame length***	12	1/4"	9-5
Used Crankcase Oil	2.0 & ***check flame length***	12	1/4"	9-5
Used ATF	1.5 & ***check flame length***	15	1/4"	9-5
Used Hydraulic Oil	1.5 & ***check flame length***	12	1/4"	9-5

Initial Adjustments for CB-1800
Maximum Input = 185,000 BTUH @ 1.3 GPH with CB525-S2 Burner

Oil Type	Oil PSI / Flame Length	Air PSI	Air Band	Nozzle
#2 Fuel Oil*	2.5 & ***check flame length***	14	3/8"	9-5
Used Crankcase Oil	3.0 & ***check flame length***	14	3/8"	9-5
Used ATF	3.5 & ***check flame length***	14	3/8"	9-5
Used Hydraulic Oil	3.0 & ***check flame length***	14	3/8"	9-5

Initial Adjustments for CB-2800
Maximum Input = 280,000 BTUH @ 2.0 GPH with CB525-S2 Burner

Oil Type	Oil PSI / Flame Length	Air PSI	Air Band	Nozzle
#2 Fuel Oil*	5.5 & ***check flame length***	16	5/8"	9-5
Used Crankcase Oil	6.5 & ***check flame length***	16	5/8"	9-5
Used ATF	5.5 & ***check flame length***	16	5/8"	9-5
Used Hydraulic Oil	5.0 & ***check flame length***	16	5/8"	9-5

*If you are burning light viscosity oils such as #2 fuel oil, it may be necessary to install a smaller nozzle. Call your Clean Burn dealer for more information.

Starting the Burner

1. Turn the switch on the wall thermostat to HEAT and adjust the thermostat setting above room temperature to start the burner.
2. **Adjusting the Air Regulator:**
   As soon as the burner starts running, turn the knob on the air regulator clockwise to achieve proper operating air pressure. Refer to the **Initial Adjustment Charts**.
3. Within ten seconds, turn the knob on the oil regulator clockwise until the oil regulator gauge shows 1 psi and the burner ignites. *Do not exceed 1 psi at this time.* Instructions are provided later in this section for adjusting the oil regulator to the proper flame length.
   NOTE: If the safety reset on the primary control is activated and the burner stops running, see Section 7 for further instructions on restarting your burner.
4. **Adjusting the Oil Regulator:**
   While adjusting the oil regulator, visually inspect the flame length through the observation port. Refer to Figure 6B for an illustration of the desired flame length. The flame should extend no more than one-half of the way down the combustion chamber.

CAUTION
WHEN OPENING INSPECTION PORT

PORT MAY BE HOT
PROTECT HANDS
WEAR SAFETY GOGGLES
KEEP FACE AWAY
OPEN PORT SLOWLY

WARNING: The observation port gets hot as the burner fires. To avoid personal injury, always wear heavy work gloves and safety glasses when opening the port and viewing the flame.

NOTE: The CB525-S2 burner features a unique oil regulator system which regulates the oil after it has been heated to 140 degrees F. At this temperature, the difference in viscosity between various used oils is minimal, and the need for adjusting the oil regulator is significantly reduced. Additionally, this burner allows for fine tuning to accommodate the particular blend of used oils being burned. It is also designed to operate at low ambient temperatures with minimal adjustment.

Correct Maximum Flame Adjustment (Proper Oil and Air Pressure):
- Flame goes half of the way down the combustion chamber.
- Flame does not touch back or walls of combustion chamber.

Incorrect Flame Adjustment (Oil Pressure Too High):
- Flame must not touch back or walls of combustion chamber.

Incorrect Flame Adjustment (Air Pressure Too High):
- Ensure proper air pressure setting.

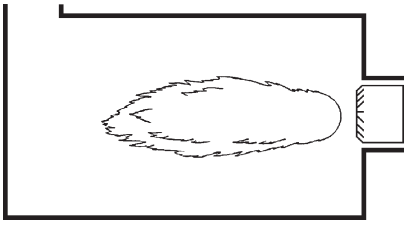


FIGURE 6B - Flame Length Adjustment

Starting the Burner (continued)

5. Check the flame length after the burner has fired for 15 minutes. If necessary, adjust the oil regulator to fine tune the flame.
6. Tighten the locking nuts on the oil regulator and the air regulator.
   NOTE: After initial startup, check the flame length at least weekly and readjust as necessary.
7. **Fine Tuning the Combustion Air Band:**
   NOTE: The initial setting of the combustion air band may require additional adjustment.
   - Refer to Figure 6A to identify the combustion air band location on the burner.
   - Observe the flame. The flame should be yellow-white with sharp tips and no "sparkles."
   - If the flame is orange in color, the oil you are burning requires MORE combustion air. OPEN the air band 1/8" to 1/4", and re-check the flame for the proper characteristics.
   - Re-check the flame after five minutes--you should see a yellow-white flame with sharp tips and no "sparkles."
8. **Checking for a Smokeless Burn:**
   Check for a smokeless burn by observing the stack while the burner is running. If you see any smoke, repeat the previous steps for setting the combustion air band and adjusting the air regulator. After adjusting the combustion air band, re-check the flame length.
   NOTE: Check for a smokeless burn periodically (as you do the flame length). Immediately readjust the burner if you ever see smoke coming from the stack. Smoke indicates improper air/ fuel adjustment.
   NOTE: When using instruments to adjust the burner for a smokeless burn, the following readings should be achieved:
   - Draft over fire should be -.02 inch w.c.
   - Adjust for a smoke spot of a trace to 2
   - Adjust for a CO2 reading of 8 to 10% or an O2 reading of 7 to 9%
   - Cad cell reading below 500 ohms

Checking the Operation of the Fan/Blower Motor

NOTE: It is important to verify that the fan/blower motor operates correctly to ensure that the fan limit control is properly cycling the fan/blower motor as described below. Also refer to Appendix A at the back of the manual for additional information on the fan limit control.

1. Start the burner and adjust it as described previously in this section.
2. The fan/blower motor will not start until the burner has been running for 5 to 15 minutes to heat up the combustion chamber and heat exchanger. At this point, the fan limit control will activate the fan/blower motor.
3. Once the fan/ blower motor has activated, turn the burner off by turning the wall thermostat to OFF.
4. With the burner off, the fan/blower motor should continue to run for 5 to 10 minutes until the combustion chamber is cooled down. The fan limit control will then shut off the fan/blower motor.

WARNING: If the fan/blower motor does not operate as described, immediately shut down your furnace to avoid potential equipment damage and/or fire hazard. Contact your Clean Burn dealer immediately.

SECTION 7: RESETTING THE OIL PRIMARY CONTROL

Understanding the Oil Primary Control

The oil primary control will go into safety lockout and shut the burner off when it detects flame-out during burner operation. The oil primary control will then wait approximately one to two minutes and attempt to re-ignite the burner (recycle mode). If the burner does not re-ignite, the control will shut the burner off on safety. The following procedure explains what should be done when this occurs. *It is very important that you follow these instructions precisely when resetting the safety on the primary control and restarting the burner.*

Using the Reset Button

DANGER! DO NOT push the reset button more than once! DO NOT push the reset button if oil mist is present in the combustion chamber or when the combustion chamber is hot! DO NOT operate your furnace if excess oil, oil vapor or fumes have accumulated in or near your furnace. As with any oil burning furnace, improper operation may result in a fire or explosion hazard.

1. Refer to Figure 7A.
2. Check the combustion chamber for fuel mist by shining a flashlight through the observation port. If you see fog (fuel mist) in the chamber, DO NOT push the reset button.
3. If the combustion chamber is hot, allow the furnace to cool for at least 30 minutes. DO NOT push the reset button.
4. When you are sure all mist has been cleared from the chamber and the combustion chamber is cool, depress the red button on the primary control for a minimum of three (3) seconds, then release. Reset the control ONCE ONLY.
5. If the burner will not restart, call your Clean Burn dealer immediately.

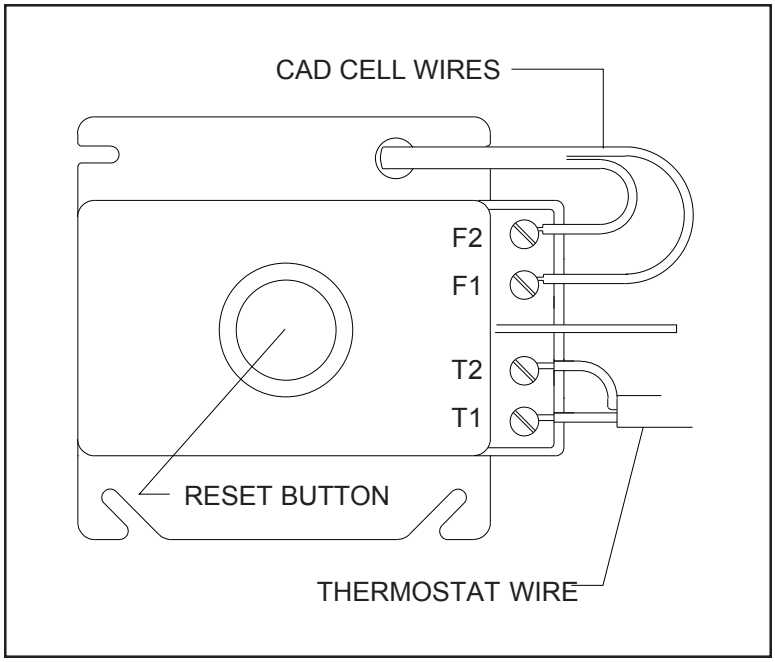


FIGURE 7A - Oil Primary Control

WARNING

DO NOT PUSH RESET BUTTON
(Refer to Owner's Manual First)

ATTENTION: *Never* touch a jumper wire from an "F" terminal to a "T" terminal on the oil primary control. This will severely damage your primary control. Make sure the plastic barrier strip is in place between the "F" and "T" terminals as shown in Figure 7A.

SECTION 8: ADJUSTING THE DRAFT OVER FIRE

Understanding the Importance of Draft

Draft in the furnace is created as the hot combustion gases rise up the stack, creating a negative pressure inside the stack and the furnace. This negative pressure is measured as inches of water column (W.C.) of draft. A proper draft overfire of -.02 w.c. is essential so that all combustion products travel away from the burner, down the combustion chamber, through the furnace flues and up the stack.

Checking for Correct Draft Over Fire

WARNING: Correct draft over fire is *essential* for the proper and safe operation of your furnace.

Your furnace is equipped with an observation/ draft reading port to check draft over fire. *A qualified serviceman with proper equipment must check/adjust your furnace for proper draft.* Contact your Clean Burn dealer for this service.

1. Insert the probe of the draft gauge instrument into the draft reading port in the observation port as shown in Figure 8A.
   NOTE: Follow the directions with the draft gauge to use your specific type of gauge.
2. Note the draft overfire reading on the draft gauge.
   ATTENTION: The draft reading should be in the -.02 to -.04 w.c. range. Poor draft (i.e. -.01 to +.08) results in back pressure in the furnace and poor burner performance. Too much draft (i.e. -.06 to -.12) sucks the heat from the furnace and results in abnormally high stack temperature.

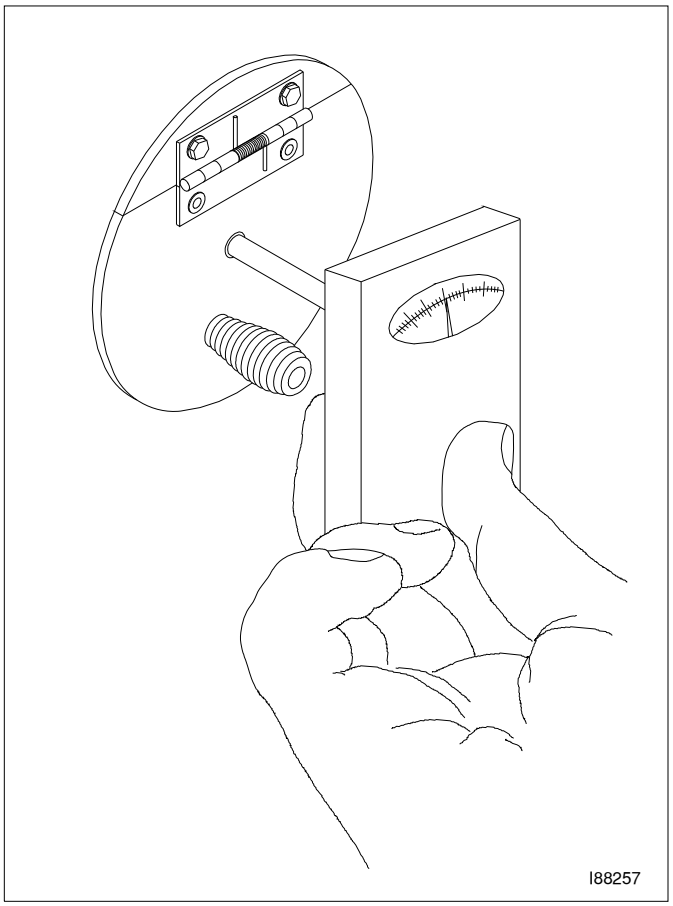


FIGURE 8A - Checking for Proper Draft Over Fire

Adjusting the Barometric Damper

NOTE: If the draft overfire is not in the -.02 to -.04 w.c. range, it is necessary to adjust the barometric damper.

1. Before starting the burner, turn the weight on the flapper COUNTERCLOCKWISE until the flapper remains closed. This will provide maximum draft for the furnace.
2. Follow the directions in Section 6 to start and adjust the burner.
3. With the burner running, check the draft overfire with a draft gauge.
4. As shown in Figure 8B, adjust the weight on the flapper to obtain a consistent -.02 w.c. draft overfire. Turn the weight COUNTERCLOCKWISE to increase draft (i.e. draft increases as the flapper closes). Turn the weight CLOCKWISE to decrease draft (i.e. draft decreases as the flapper opens).
5. Tighten the locking nut to securely hold the weight in position.

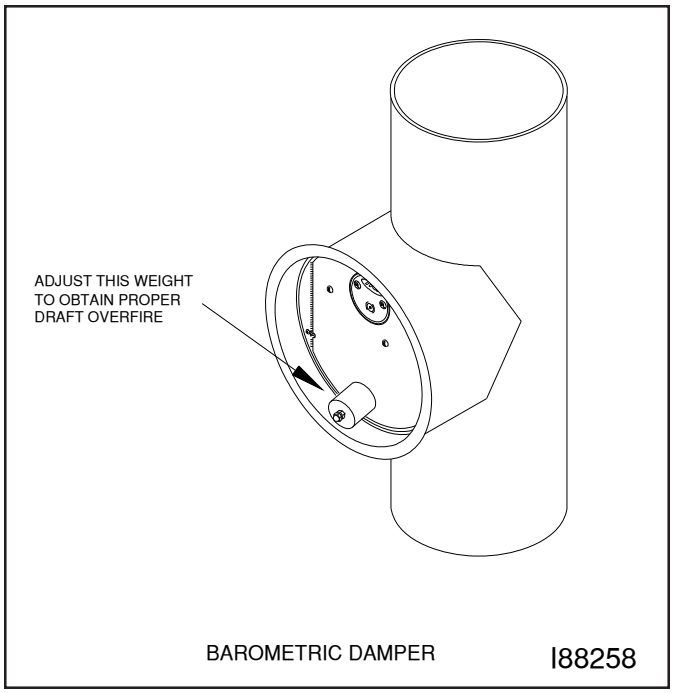


Figure 8B - Adjustment of Barometric Damper

Solving Draft Overfire Problems

WARNING: If you cannot achieve proper draft overfire, do not operate your furnace! Contact your Clean Burn dealer for assistance.

ATTENTION: Backdraft must be resolved or your furnace will not operate correctly!
Under backdraft conditions, draft overfire readings will show positive pressure in the combustion chamber. ***Backdraft*** *means that oil spray, combustion products, and heat are blown back against the burner. Backdraft results in oil-fouled retention heads and electrodes. Severe backdraft will force heat back against the burner and result in heat damage to the cad cell and transformer.*

Backdraft is caused by the following conditions:

- Poor draft caused by improper stack design. (See Section 4.)
- Poor draft caused by improper adjustment of the barometric damper.
- Incorrect combustion air band setting on the burner. (See Section 6.)
- Furnace flues are plugged with ash. (See Section 9.)
- Clean-out gasket on clean-out doors is out of position. (See Section 9.)
- Exhaust fans in your building are sucking gases down the stack.

Understanding the Effect of Exhaust Fans on Draft

Any type of exhaust fan, paint booth, or exhaust system in a building will create negative pressure in the building unless there is a source of make-up air (i.e. fresh air which enters the building and replaces the air removed by the exhaust fans.) Refer to Figure 8C on the following page.

If there is insufficient make-up air, the exhaust fan will suck air and combustion gases down the furnace stack and create backdraft in the furnace. Even if the exhaust fan is on another level of the building or in another room away from the furnace, the exhaust fan will still create backdraft at the furnace.

Checking Draft Overfire to Determine Severity of Backdraft

The following procedure is an accurate method of determining how much backdraft is created by the exhaust fans. Once this is determined, you can select the correct method for resolving the backdraft. Refer to Figure 8C on the following page as needed.

1. Turn off ALL exhaust fans and close ALL doors and windows in the building (any open door or window will allow make-up air to enter the building and will negate the test).
2. Start the furnace and adjust the barometric damper so that the draft overfire is -.02 w.c.
3. Check the draft overfire again. Now have someone start the exhaust fans.
4. Note how much the draft overfire has changed.
   ATTENTION: If the draft overfire changed towards positive, it is mandatory that make-up air is provided to the building or severe damage to the furnace and burner will occur (voiding the warranty). If the draft overfire remained constant at -.02 w.c., there is sufficient make-up air entering the building, and the exhaust fan is not adversely affecting the draft.

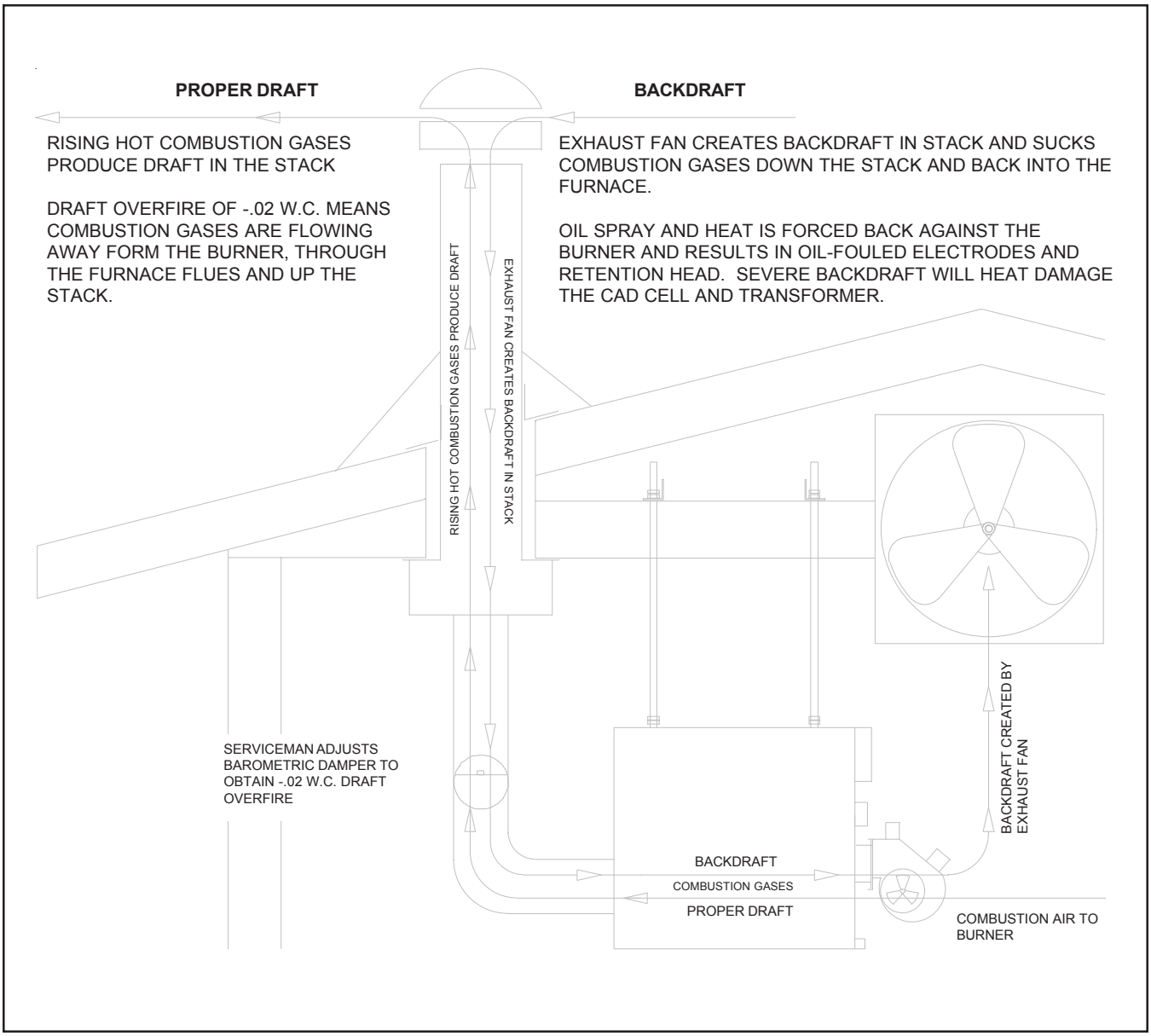


Figure 8C - Proper Draft vs. Backdraft

Installing a Make-up Air Louver

Exhaust Fans and Make-up Air Louvers

When exhaust fans are operated in tight buildings, there is little or no source of fresh air to replace the air removed from the building by the exhaust fan. This results in negative pressure (vacuum) in the building which creates severe backdraft problems at the furnace.

Properly sized make-up air louvers are designed to allow adequate fresh air to enter the building during operation of the exhaust fans. The louvers automatically open under the vacuum created by the exhaust fans. The louvers open just enough to provide the correct CFM of fresh air. The louvers automatically close when the exhaust fans are turned off.

Sizing the Make-up Air Louver

Procedure 1: (a) Determine the CFM rating of the exhaust fan. This information should be stamped on a label on the exhaust fan. Make sure to add up the total CFM if more than one exhaust fan exists in the building.
(b) Select the correct size of make-up air louver to provide the required CFM of fresh air.

If you cannot determine the CFM rating of the exhaust fan, use the following procedure.

Procedure 2: (a) With all exhaust fans running, open one of the large bay doors so that it is just 2 feet open. Position a helper at this door.
(b) Start the furnace and check for proper -.02 w.c. draft overfire.
(c) As you watch the draft gauge, instruct your helper to slowly close the large bay door. When the draft overfire is affected, stop closing the door.
(d) Open the large bay door just enough to allow the draft overfire to return to a proper -.02 w.c. The size of this opening represents the approximate size of the make-up air louver required.
(e) Measure the size of the opening and calculate the square inches. Select a make-up air louver that is at least 10% larger than this opening.

Example of Calculations for Sizing Make-up Air Louver

1. Opening Size 12' (144") x 1' (12") = 12 square feet (1728 (square inches)
2. Add 10% 1728 square inches x 1.1 = 2000 square inches
3. Louver Size Select 48" x 48" louver = 2304 square inches

(Installation instructions are provided on the next page)

Installing the Make-up Air Louver

NOTE: It is very important to follow these instructions carefully to ensure proper performance of the louver.

1. The louver must not be close to the furnace. The fresh air should travel at least 40 to 50 feet before reaching the furnace so the air warms up. The furnace will not heat well if it is receiving cold return air.
2. The louver must be high in the sidewall of the building so the cold fresh air does not blow across the floor level and chill the service personnel.
3. The louver should be installed in the opposite wall from the location of the exhaust fan. This will quickly vent diesel exhaust from the top of the building and reduce the amount of run time for the exhaust fan.

SECTION 9: MAINTENANCE

Understanding Maintenance

Maintaining your Clean Burn furnace is an important activity which includes several periodic maintenance activities and an annual burner tune-up...all are necessary to keep your furnace running in peak condition. *Failure to maintain and/or improper servicing by unqualified personnel may adversely affect the proper, safe operation of your furnace, may reduce the service life of your furnace, and may void your warranty.*

The following chart summarizes all the maintenance activities which should be performed on the furnace at the intervals indicated. Instructions/procedures for these activities are included in this chapter.

Maintenance Activity	**Interval**
Cleaning the canister filter	Before vacuum gauge reads 10" HG of vacuum
Cleaning out ash	At least twice a year; more often with heavy use
Cleaning the check valve/screen	At least once a year
Cleaning water/sludge out of tank	At least once a year
Annual burner tune-up	At least once a year

NOTE: *IMPORTANT!* Record all maintenance activities in the Maintenance Record provided in the Appendixes.

Annual Burner Tune-up

Your Clean Burn furnace requires annual preventative maintenance--similar to an automotive tune-up--to keep it running in peak condition. Contact your local Clean Burn dealer to schedule the annual preventative maintenance which is usually (preferably) performed during warm weather to prepare the furnace for the next heating season. *The burner tune-up should be performed by Clean Burn certified technicians.*

Cleaning the Canister Filter

NOTE: Never operate your furnace with more than 10" HG of vacuum on the suction side of the pump. High vacuum separates air from the oil and results in erratic burner operation.

The following protective gear should be worn when cleaning the filter:

- Rubber gloves
- Safety goggles

1. Close the ball valve adjacent to the filter.
2. Position a container under the filter.
3. Unscrew the four bolts to drain the oil from the canister.
4. Remove the canister bowl.
5. Clean the screen and the bowl in a parts washer.
6. Referring to Figure 9A, examine the filter components as you reassemble them.
7. Check the condition of the O-rings. Replace any that are cracked or worn.
8. Ensure that the canister filter is 100% airtight by firmly tightening the four bolts.
9. Open the ball valve. Refer to Sections 5 and 6 for instructions on priming the pump and starting the burner.

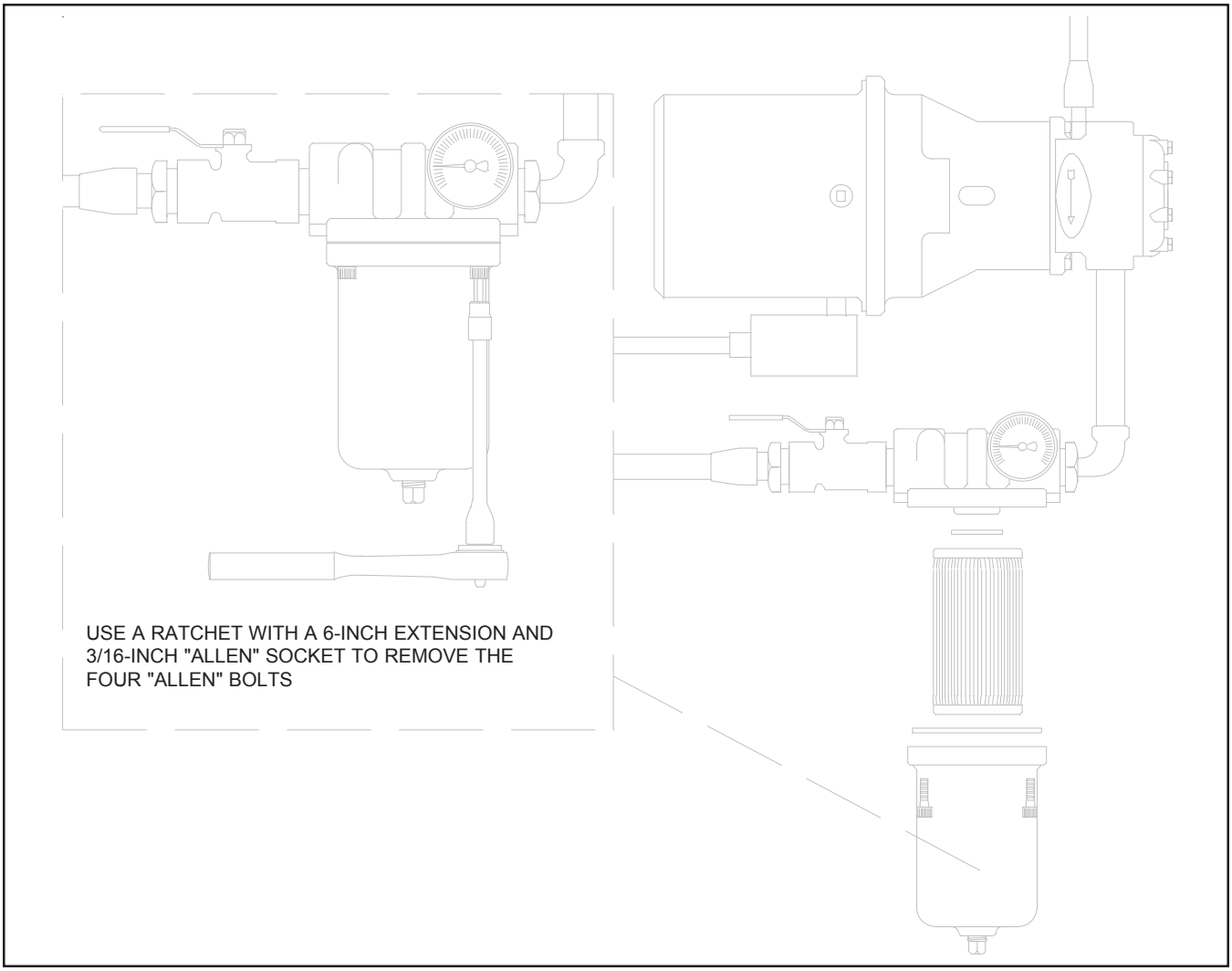


FIGURE 9A - Canister Filter Component Detail

Cleaning Ash from the Furnace

NOTE: The maintenance interval for cleaning ash from the furnace is approximately 700 hours of operation as indicated on the hour meter on the burner. Be sure to clean the ash from your furnace at least twice during the heating season. Your furnace may require more frequent clean out of the ash due to contaminants in the oil or heavy use. As ash accumulates, furnace heat output declines, and the stack temperature rises. 1/8" of ash has the insulating capacity of one inch of fiberglass insulation and reduces heat transfer significantly. Never allow more than 1/4" of ash to accumulate in the combustion chamber, heat exchanger flues, or stack.

CAUTION: Be aware that used oils may contain heavy metallic compounds or foreign materials. When burned, these compounds are deposited within the furnace, necessitating *careful* cleaning. Make sure you use a sturdy ladder or scaffolding for safe access to ceiling-hung furnaces.

NOTE: When cleaning the furnace, static electricity may build up in the shop vac hose. If this occurs, use #12 copper wire wrapped around the hose with the other end connected to the furnace (or other ground source) to eliminate the static.

The following protective gear should be worn when cleaning the ash:

- Respirator for fine particles
- Safety goggles
- Rubber gloves
- Protective clothing

1. Ensure that power has been turned OFF, and all "hot" components have been allowed to cool sufficiently. Allow at least one hour for the ceramic target to cool.
2. Clean out the burner throat:
   a. Disconnect the burner power cable.
   b. Remove the lock-down nut and swing the burner open.
   c. Clean out the burner throat using a small scraper to remove the residues.

   ATTENTION: Keep the burner open (swung out) so that you do not knock or bend burner components when cleaning out the combustion chamber.
3. Clean the ash from the stack components:
   a. Brush accumulated ash from the stack cap.
   b. Lightly tap the stack components to loosen the ash.
   c. Allow ash and dust to settle in the clean-out tee or elbow.
   d. Vacuum ash from the clean-out tee, or disconnect the stack and vacuum ash from the elbow.

Cleaning the Ash (continued)

4. Remove the clean-out door(s) to clean ash from inside the combustion chamber (see Figure 9B):
   a. Disconnect the stack from the furnace breach.
   b. Remove the clean-out panel from the back of the furnace.
   c. Remove the cross brace (Model CB-2800 only).
   d. Remove the clean-out door(s) to expose the heat exchanger flues and the combustion chamber.
   e. Check the color of the ash--it should be light gray or tan.

      ATTENTION: White ash indicates excessive air pressure. Black ash or soot indicates too much oil pressure. If these conditions exist, call your Clean Burn dealer. DO NOT overfire your furnace by turning up the compressed air and/or oil pressure. Overfiring will damage the combustion chamber and heat exchanger and will void your warranty.

   f. Use your shop vac to vacuum ash from the flues.

      NOTE: Avoid "packing" the ash in the back of the tubes by first vacuuming the flues before pushing the flue brush down the flues.

   g. Use a flue brush to thoroughly clean the flues.
   h. Thoroughly vacuum any remaining ash residue from the flues.
   i. Check the flues for rust.

      ATTENTION: The presence of rust in the flues indicates that chlorinated materials are being burned. Burning chlorinated materials will severely damage your heat exchanger and void your warranty. Contact your Clean Burn dealer for instructions to test your oil for chlorine contamination before firing your furnace.

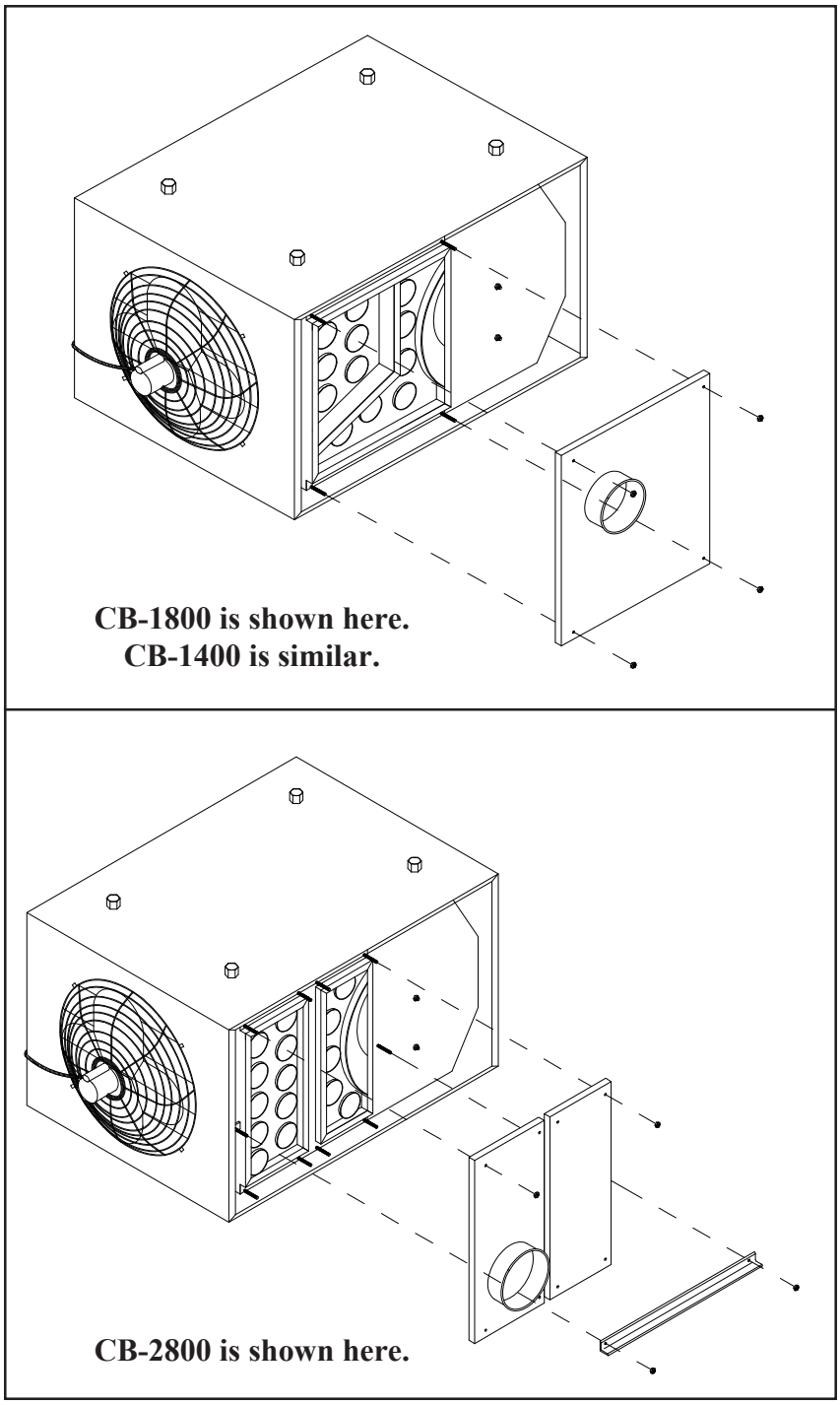


Figure 9B - Accessing the Combustion Chamber for Cleaning

Cleaning the Ash (continued)

j. Inspect the fiberglass rope gasket.
NOTE: Make sure the fiberglass rope gasket is in good condition and the clean-out door(s) seal(s) tightly. If the door(s) does not seal tightly, replace damaged components.

k. Re-install the furnace components: clean-out door(s), cross brace (CB-2800), clean-out panel, and stack.
NOTE: You may need to bleed air from the oil line before starting the burner. See Section 5 for the pertinent instructions.

l. Swing the burner into firing position. Install the lock-down nut and plug in the burner power cable.

Cleaning the Check Valve

This procedure applies to furnace installations with inside and outside tanks. The following protective gear should be worn when cleaning the check valve/screen:

- Rubber gloves
- Safety goggles

1. Refer to Figure 9C. Remove the standpipe from the tank.
2. Remove the check valve and filter. Clean these components in a parts washer.
3. Check the operation of the check valve. The valve must seat so it is airtight to hold pump prime.
4. Re-assemble and re-install the components. Apply Permatex #2 non-hardening gasket sealer or equivalent to the threaded fittings. Firmly tighten all connections so the suction line is 100% airtight.
5. Follow pump priming instructions in Section 5 to re-establish prime.

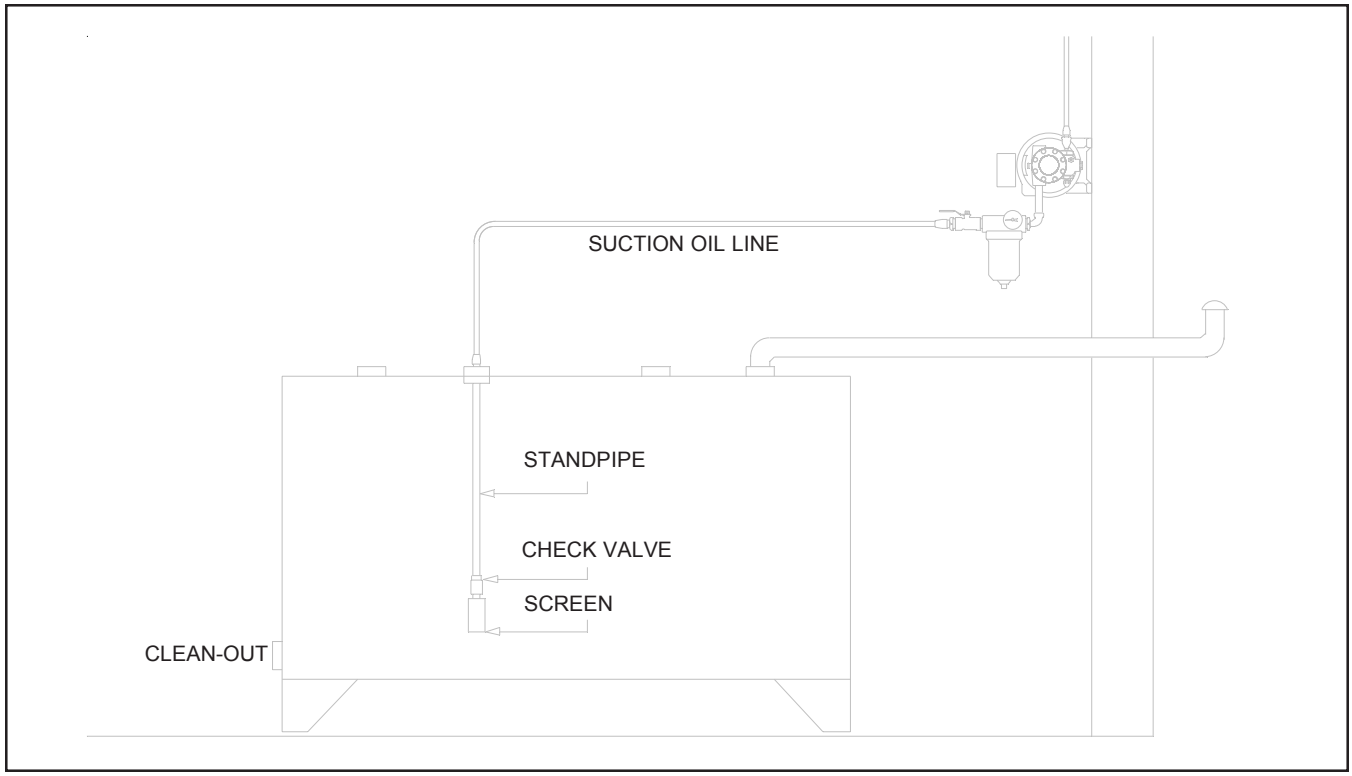


Figure 9C - Check Valve Detail

Cleaning the Tank

DO NOT allow water, sludge, or other debris to accumulate in your oil supply tank to the point that non-combustible or harmful materials are drawn into the pump or burner.

Drain water and sludge from the bottom of your tank at least once a year, and more frequently with water accumulation.

NOTE: If your used oil tank has not been cleaned on a regular basis, a considerable amount of sludge, etc. may have accumulated on the bottom of the tank. Under these circumstances, it is advisable for you to hire your used oil hauler to pump the tank. Make sure the tank is pumped to the bottom to remove all sludge, etc. from the tank (your used oil hauler may charge an additional fee for this type of service). The best time to pump the used oil tank is at the end of the heating season when the tank is low. This allows sufficient time to refill the tank with used oil (generated by your company over the summer months) so that you have adequate fuel for the heating season.

End of Season Maintenance

ATTENTION: Turn main power to your furnace OFF at the end of the heating season. EPA regulations allow your used oil to be burned only for "heat recovery." DO NOT operate your furnace during warm weather just to burn oil, or severe damage to the combustion chamber/heat exchanger may occur.

Contact your local Clean Burn dealer to schedule your annual burner tune-up. Allow only trained, authorized service personnel to service your burner.

APPENDIX A

Detailed Furnace Specifications

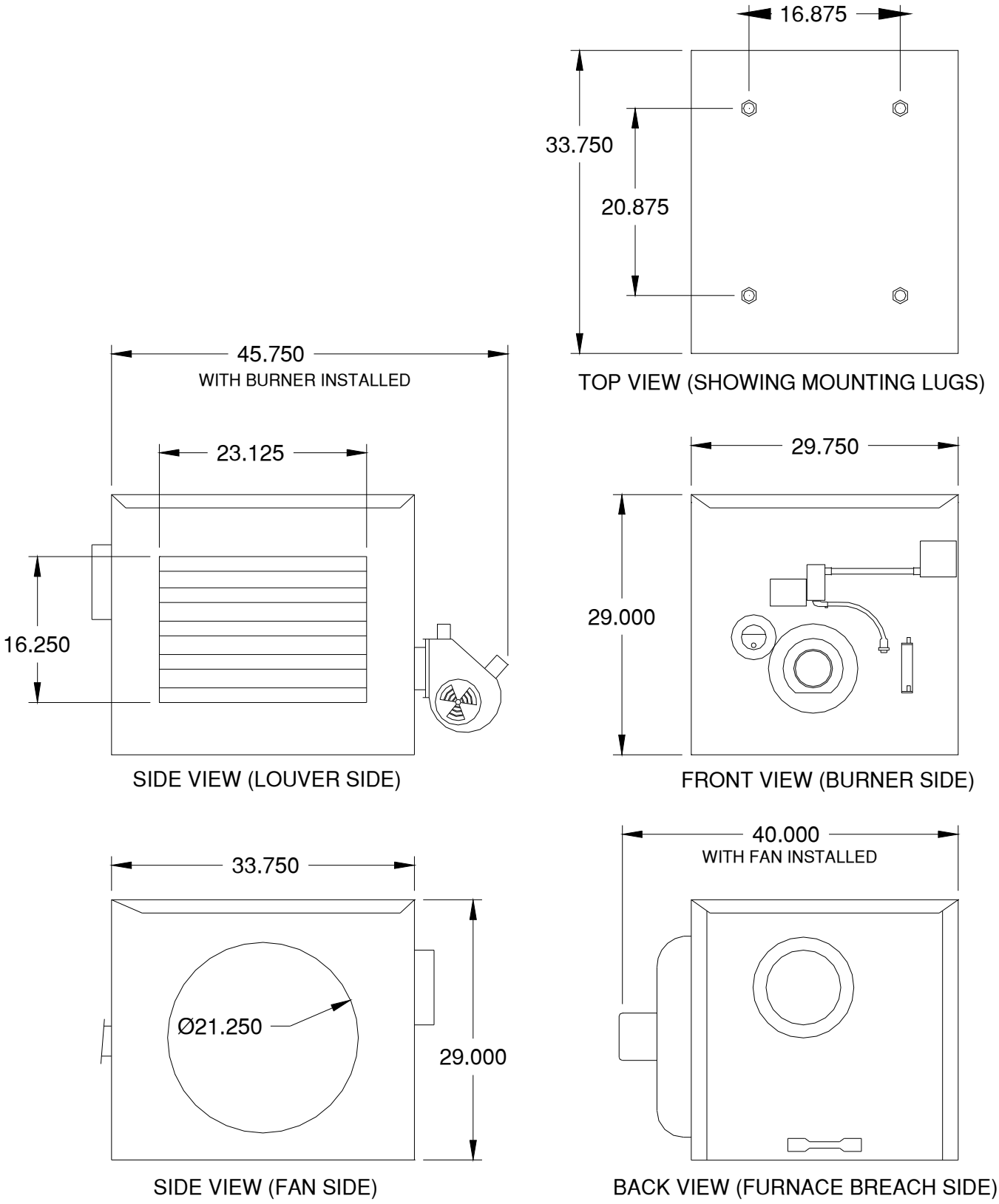
FURNACE SPECIFICATION	CB-1400	CB-1800	CB-2800
BTUH Input	140,000 @ 1.0 GPH	185,000 @ 1.3 GPH	280,000 @ 2.0 GPH
Listed Fuels	#2 Fuel Oil Used Crankcase Oil Used ATF Used Hydraulic Oil	#2 Fuel Oil Used Crankcase Oil Used ATF Used Hydraulic Oil	#2 Fuel Oil Used Crankcase Oil Used ATF Used Hydraulic Oil
Cabinet Dimensions (L x W x H, inches)	33.75 / 29.75 / 29.00	40 / 30 / 28	53 / 36 / 33
Furnace Dimensions with Fan & Burner (L x W x H, inches)	43.75 / 40.75 / 29.00	50 / 42 / 28	63 / 48 / 33
Approximate Weight (lbs.)	320	400	600
Mounting	Ceiling Hung Bench Tank Kit Non-combustible Platform	Ceiling Hung Bench Tank Kit Non-combustible Platform	Ceiling Hung Bench Tank Kit Non-combustible Platform
Electrical Requirements	110/120 Volts, 60 Hz	110/120 Volts, 60 Hz	110/120 Volts, 60 Hz
Circuit Breaker for Unit Heater	20 Amps	20 Amps	20 Amps
Circuit Breaker for Central Furnace	N.A.	30 Amps	30 Amps
Circuit Breaker for Furnaces with Optional Accessories	Refer to specifications included with optional accessories	Refer to specifications included with optional accessories	Refer to specifications included with optional accessories
Wall Thermostat	24 Volt Heat Anticipator Setting: 0.2 Amps	24 Volt Heat Anticipator Setting: 0.2 Amps	24 Volt Heat Anticipator Setting: 0.2 Amps
Oil Pump	Suntec J3NBN A132B	Suntec J3NBN A132B	Suntec J3NBN A132B
Pump Motor	1/6 HP 1725 RPM	1/6 HP 1725 RPM	1/6 HP 1725 RPM
Pump Motor Rotation	CCW shaft end	CCW shaft end	CCW shaft end
Canister Filter	Lenz DH 750-100	Lenz DH 750-100	Lenz DH 750-100
Stack Size	8”	8”	8”
Fan/Blower Motor HP	1/3	1/3	1/2
Fan Blade / Pitch	Three Blade / 21°	Four Blade / 16°	Four Blade / 20°
Fan Limit Control	Honeywell L4064B 8” Probe	Honeywell L4064B 8” Probe	Honeywell L4064B 8” Probe
Fan Limit Settings	Hi-Limit – 200 Fan ON – 120 Fan OFF – 100	Hi-Limit – 200 Fan ON – 140 Fan OFF – 110	Hi-Limit – 200 Fan ON – 140 Fan OFF – 110

Burner Technical Specifications

NOTE: These burner specifications apply to all three furnace models--CB-1400, CB-1800, and CB-2800.

Burner	CB-525-S2
Ignition Transformer	Carlin Transformer 14,000 volts
Nozzle	Delavan 9-5
Burner Motor	1/10 HP 3200 RPM with centrifugal switch
Burner Motor Rotation	CCW shaft end
Compressed Air Requirements	2.0 CFM @ 20 PSI
Oil Primary Control	Carlin Oil Primary
Heater Element in Preheater Block	400 watts
Air Pressure Switch	MPL 808
Setting for Preheater Thermostat	140 degrees F

Furnace Dimensions (CB-1400)

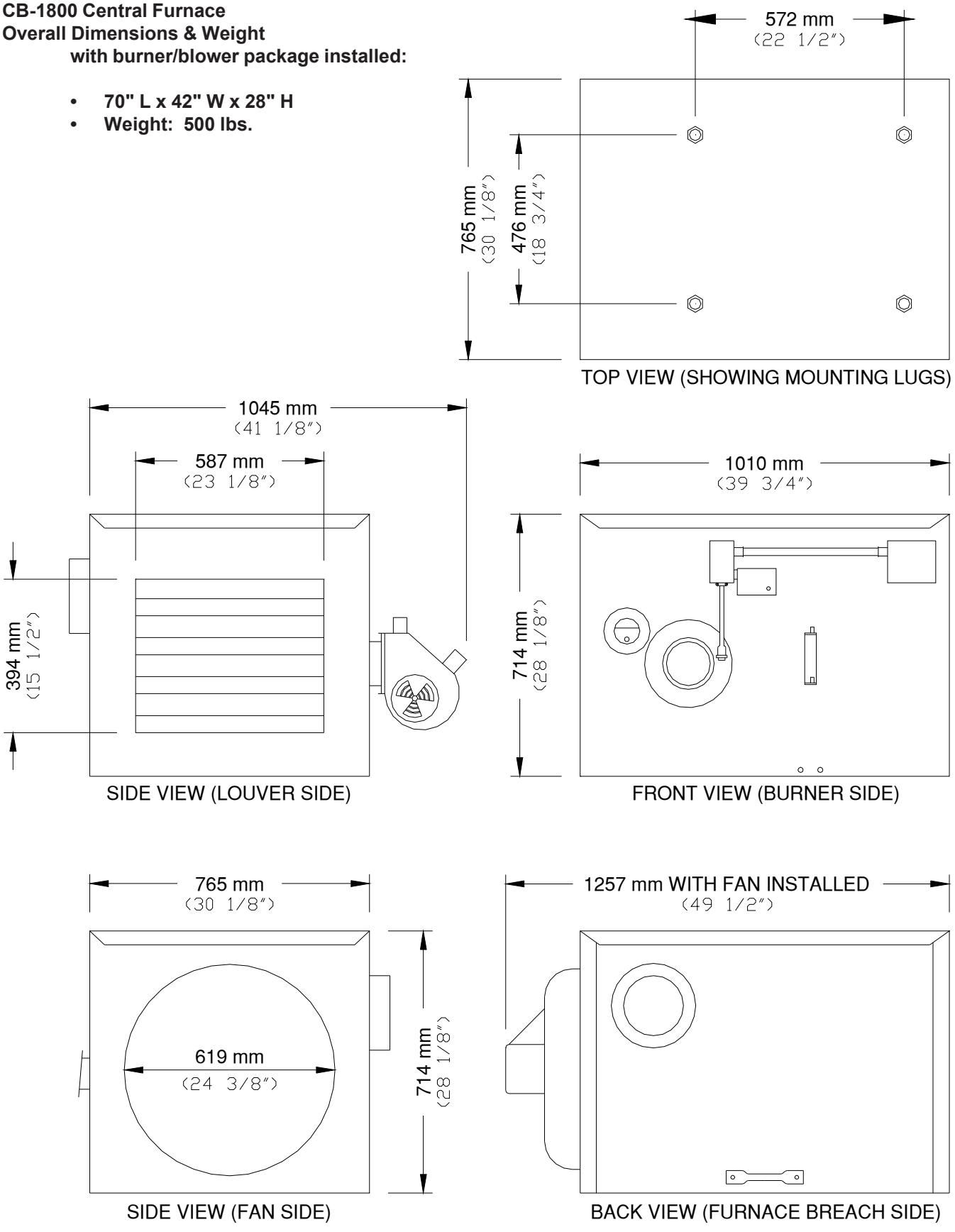


I88545

Furnace Dimensions (CB-1800)

CB-1800 Central Furnace
Overall Dimensions & Weight
with burner/blower package installed:

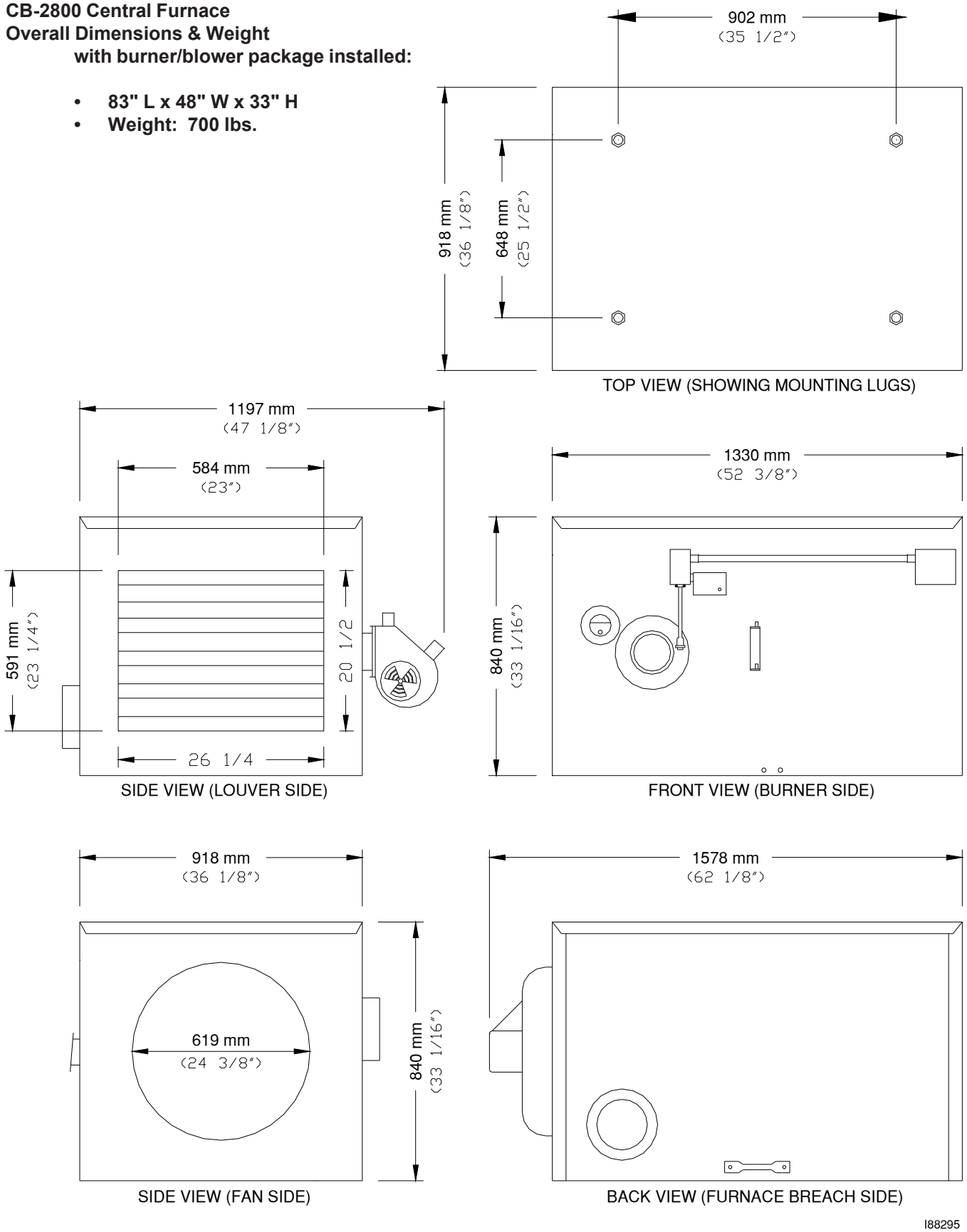
- **70" L x 42" W x 28" H**
- **Weight: 500 lbs.**



Furnace Dimensions (CB-2800)

CB-2800 Central Furnace
Overall Dimensions & Weight
with burner/blower package installed:

- **83" L x 48" W x 33" H**
- **Weight: 700 lbs.**



I88295

Burner Components

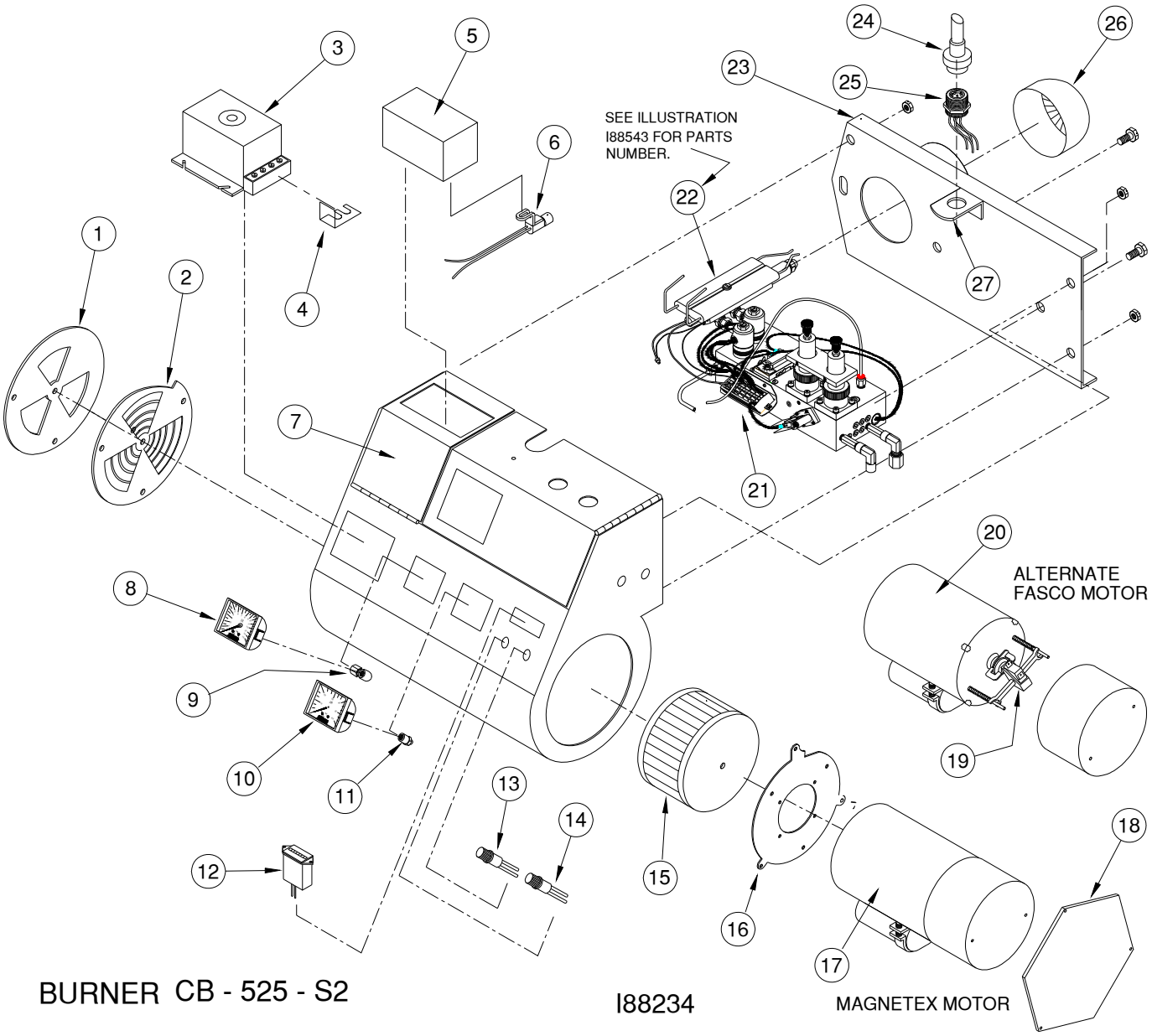


FIGURE A1 - Burner Component Detail

Burner Components (continued)

ITEM #	PART #	QTY	PART DESCRIPTION
1	26103	1	AIR INTAKE OUTER PLATE
2	11359	1	AIR INTAKE INNER PLATE
3	33188	1	CARLIN PRIMARY CONTROL
4	33335	1	ISOLATOR
5	33189	1	CARLIN IGNITER (TRANSFORMER)
6	33116	1	CAD CELL
7	11243	1	TRANSFORMER PLATE
8	32178	1	OIL GAUGE 0-15 PSI
9	32235	1	FEMALE ELBOW (3/16 T x 1/8 NPT)
10	32179	1	AIR GAUGE 0-60 PSI
11	32253	1	FEMALE ELBOW (1/8 TP x 1/8 NPT)
12	33297	1	HOUR METER (60 Hz)
13	33169	1	GREEN LIGHT (POWER)
14	33168	1	AMBER LIGHT (PUMP)
15	31113	1	FAN SQUIRREL CAGE
16	26044	1	MOTOR MOUNT PLATE
17	33175	1	BLOWER MOTOR
18	26053	1	RIGHT SIDE COVER
19	33370	1	CENTRIFUGAL SWITCH ASSEMBLY
20	33175	1	BLOWER MOTOR
21	13148	1	HEATER BLOCK ASSEMBLY
22	SEE NOTE ON DRAWING		NOZZLE ADAPTER ASSEMBLY
23	11334	1	HINGE MOUNTING PLATE
24	33150	1	CONNECTOR PLUG
25	33149	1	CONNECTOR RECEPTACLE
26	11308	1	RETENTION HEAD
27	26052	1	LATCH BRACKET

Burner Components (continued)

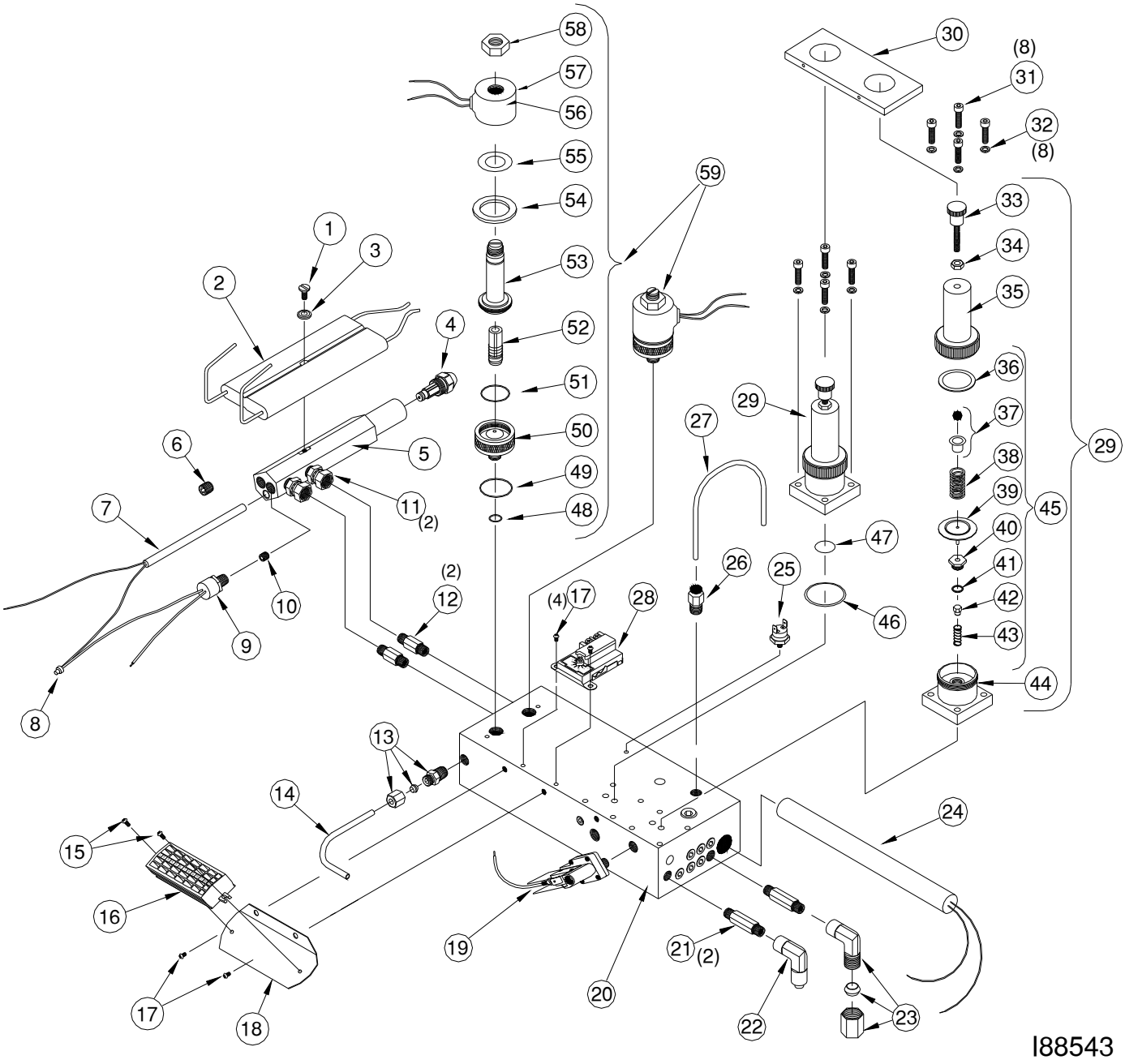


FIGURE A2 - Preheater Block Assembly Component Detail

Burner Components (continued)

ITEM #	PART #	QTY	PART DESCRIPTION
1	34169	1	ELECTRODE SCREW - 10-32 x 3/4
2	33183	1	SINGLE PIECE ELECTRODE
3	34165	1	WASHER
4	32000	1	9 - 5 NOZZLE
5	13150	1	NOZZLE ADAPTOR
6	32007	1	PLUG - 1/8 NPT
7	33298	1	140 WATTS HEATER
8	33381	1	INSULATED CAP CRIMP CONNECTOR
9	33418	1	THERMOSTAT L-130
10	32199	1	PLUG - 1/16 NPT
11	32050	2	SWIVEL FITTING
12	32189	2	HEX NIPPLE - 1/8 NPT x 1-1/2
13	32043	1	MALE CONNECTOR - 3/16T x 1/8 NPT
14	54020	1	3/16 COPPER TUBING (OIL GAUGE LINE)
15	32201	2	MACH. SCREW PHILLIPS HD. 6-32 x 3/8 Z
16	33247	1	TERMINAL BLOCK
17	34036	4	MACH. SCREW PHILLIPS HD. 6-32 x 1/4 Z
18	26059	1	TERMINAL BLOCK BRACKET
19	33057	1	AIR PRESSURE SWITCH
20	26090	1	HEATER BLOCK
21	32190	2	HEX NIPPLE - 1/8 NPT x 2
22	32202	1	FEMALE ELBOW (FOR 1/4" AIR LINE)
23	32201	1	FEMALE ELBOW (FOR 3/8" OIL LINE)
24	33173	1	PRE-HEATER ELEMENT (400 WATTS)
25	33041	1	PROVING SWITCH (NORMALLY OPEN)
26	32325	1	MALE ELBOW 1/8 x 1/8 NPT (FOR AIR GAUGE LINE)
27	54020	1	3/16 COPPER TUBING(OIL GAUGE LINE)
28	33011	1	HEATER BLOCK THERMOSTAT(NORMALLY CLOSED)
29	32359	2	REGULATOR SURFACE MOUNT
30	14090	1	REGULATOR LOCK PLATE
31	34148	8	REGULATOR MOUNTING SCREW
32	34114	8	LOCK WASHER #8 Z
33	34147	2	REGULATOR THREADED STEM
34	34022	2	HEX NU T - 10-32 Z
35	32306	2	BONNET
36	32226	2	DIAPHRAGM RING
37	32364	2	CAP AND BALL ASSEMBLY
38	32227	2	COMPRESSION SPRING
39	32360	2	DIAPHRAGM
40	32361	2	BRASS POPPET SEAT
41	32223	2	POPPET 'O" RING
42	32222	2	POPPET VALVE
43	32221	2	POPPET SPRING
44	32362	2	BASE
45	13142	2	REGULATOR KIT COMPONENTS
46	32308	2	REGULATOR OUTER "O" RING
47	32309	2	REGULATOR INNER "O" RING
48	33311	2	SOLENOID INNER "O" RING
49	33312	2	SOLENOID OUTER "O" RING
50	33313	2	MANIFOLD MOUNT SOLENOID BODY
51	33314	2	BODY "O" RING
52	33315	2	PLUNGER ASSEMBLY
53	33316	2	PLUNGER GUIDE ASSEMBLY
54	33317	2	FLUX PLATE
55	33318	2	WASHER SEAL
56	33319	2	COIL
57	33320	2	COIL HOUSING
58	33321	2	NUT
59	32322	2	AIR/OIL SOLENOID ASSEMBLY

Burner Components (continued)

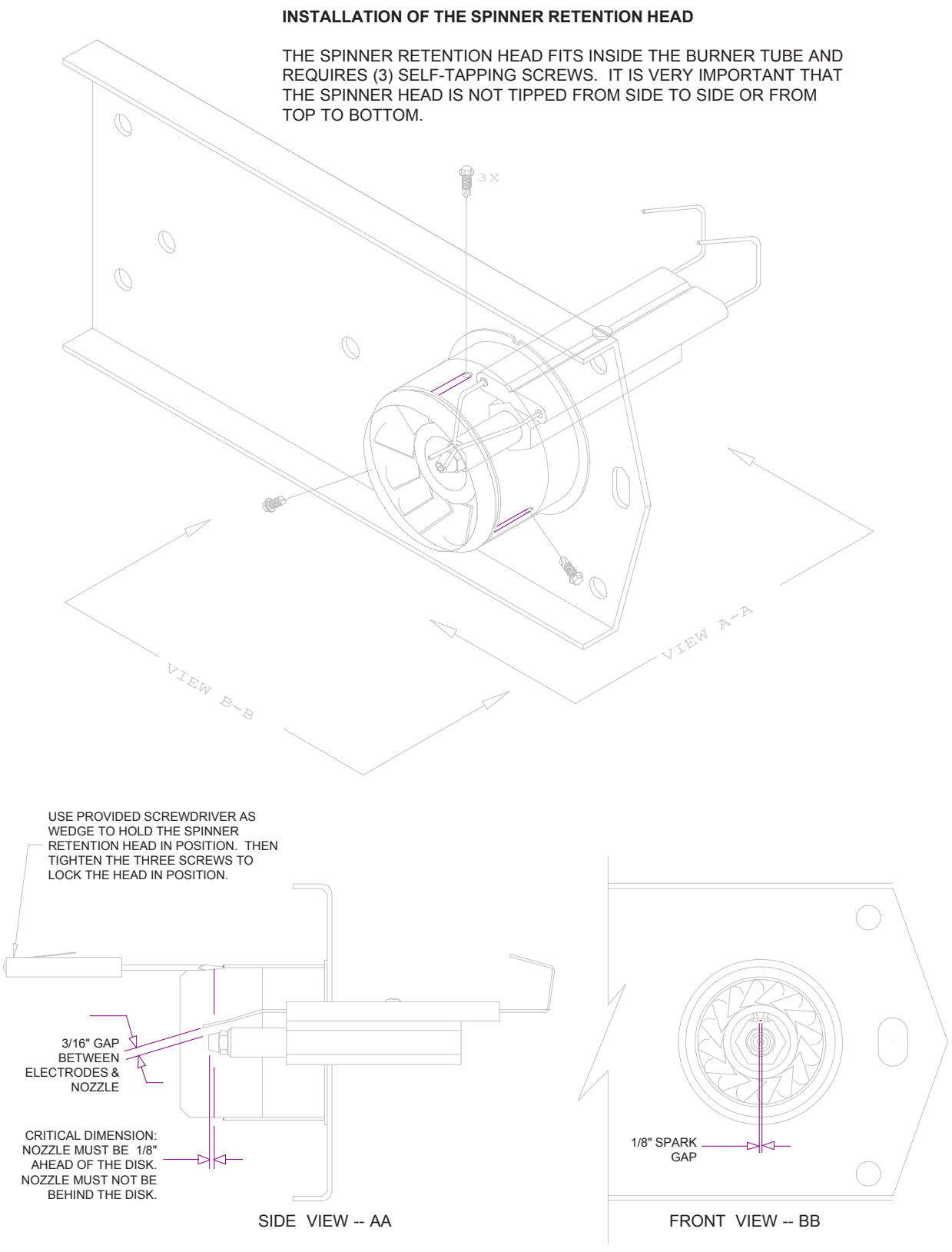
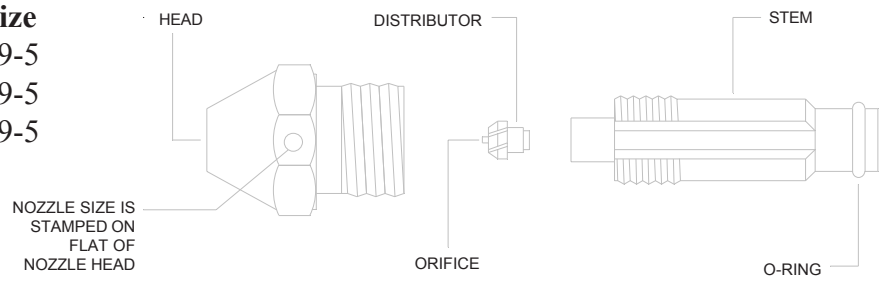


FIGURE A3 - Burner Electrode Specifications with Spinner Retention Head

Burner Components (continued)

Model	Nozzle Size
CB-1400	Delavan 9-5
CB-1800	Delavan 9-5
CB-2800	Delavan 9-5



Removing the Nozzle for Cleaning:

NOTE: Due to swivel fittings on the air and oil lines, it is not necessary to disconnect these lines when swinging the burner open.

1. Remove the lock-down nut on the mounting flange bolt.
2. Disconnect the burner power cable.
3. Carefully swing the burner open to its maintenance position.
4. Remove the nozzle from the nozzle adapter with a 5/8" socket.

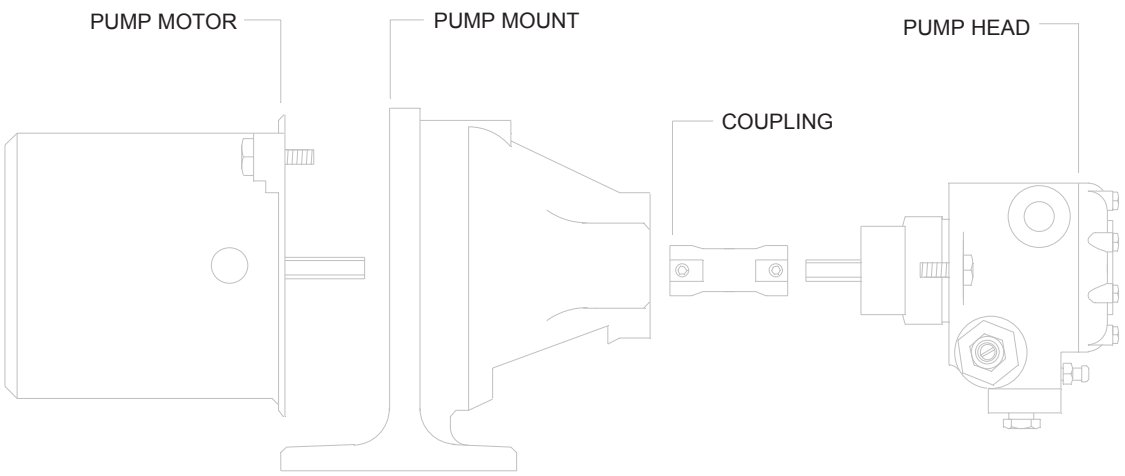
Cleaning the Nozzle:

1. Unscrew the stem from the nozzle head.
2. Spray WD-40 or equivalent through the orifice to thoroughly remove any blockage. **ATTENTION:** DO NOT damage or deform the nozzle orifice; DO NOT use a torch tip cleaner or other inappropriate device to clean the orifice. If the blockage is a "tarry" material or a hard, black material, call your Clean Burn dealer for service.
3. Flush all components with WD-40 to remove oil residues.
4. Reassemble the nozzle components. When tightening the stem, just barely "snug" it down. DO NOT overtighten.
5. Check the O-ring on the nozzle stem. Replace the O-ring if it is in the least bit cut or deformed.
6. Lubricate the O-ring on the nozzle stem with a couple of drops of new motor oil, then re-install the nozzle.
7. Check the electrodes for proper gap and clearances.
8. Re-install the burner and adjust for optimal performance as described in Section 6.

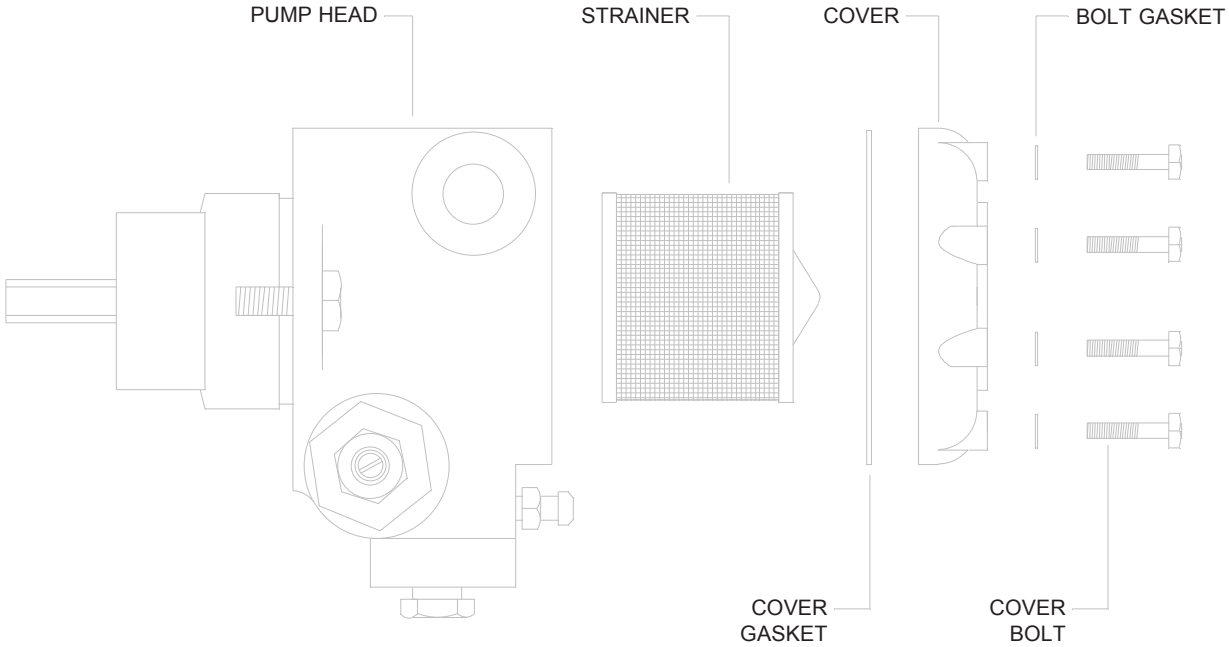
NOTE: If the nozzle plugs within a few days after cleaning, call your Clean Burn Dealer for service.

FIGURE A4 - Cleaning the Nozzle

Oil Pump Components



CAUTION: WHEN REPLACING THE HEAD, MAKE SURE TO TIGHTEN THE LOCK SCREWS ON THE COUPLING LAST (AFTER THE PUMP HEAD BOLTS HAVE BEEN TIGHTENED) SO THE PUMP AND MOTOR BEARINGS ARE NOT COMPRESSED AND DAMAGED.



CAUTION: WHEN CLEANING THE PUMP HEAD STRAINER, INSTALL A NEW GASKET SO THE PUMP HEAD IS AIRTIGHT. IF THE PUMP HEAD STRAINER IS CLOGGED, MAKE SURE TO CLEAN YOUR TANK TO AVOID FURTHER CLOGGING.

FIGURE A5 - Oil Pump Components

Oil Pump Components (continued)

Vacuum Testing the Oil Pump

Vacuum testing the oil pump is a very accurate way to determine the following:

- The condition of the pump -- the ability of the pump to pull a vacuum and suck oil from the tank.
- The condition of the fittings, gaskets and seals from the ball valve to the pump -- these components must all be airtight to avoid suction leaks.

The following procedure provides instructions for vacuum testing the pump and canister filter on systems equipped with a ball valve.

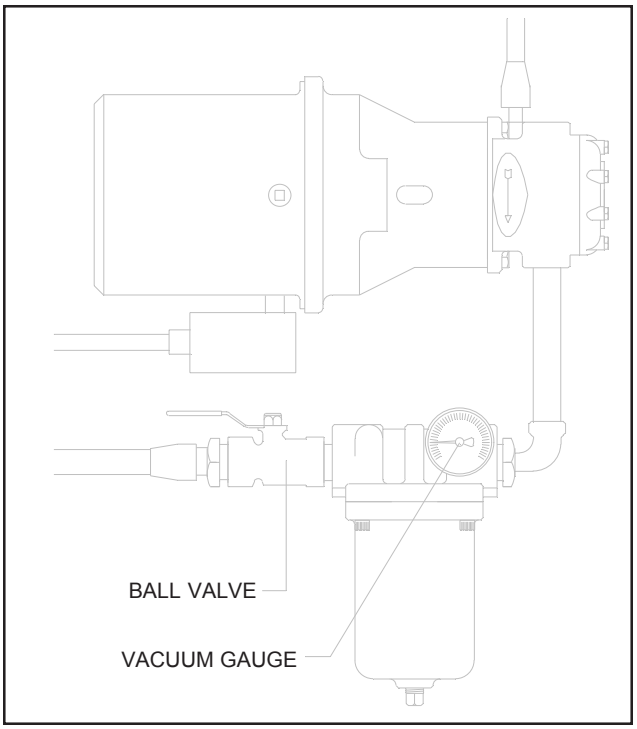


FIGURE A6 - Oil Pump System

IMPORTANT NOTE: For the pump to pull and hold vacuum, it is critical that all fittings are airtight. Check the cover bolts, the 1/4" plug in the return port and the acorn nut (on older style pumps only). If any of these fittings are loose, the pump may not pull a vacuum or may lose the vacuum rapidly. It is also critical that all fittings in the suction line, including fittings on the canister filter, are 100% airtight.

1. Refer to **Section 5: Oil Pump Priming** in this manual. Follow the instructions to prime the oil pump. **NOTE:** The oil pump will not pull a vacuum if the pump is dry. There must be oil in the gears of the pump before the pump can pull a vacuum.
2. With the pump running, open the bleeder two to three full turns, and make sure that oil is flowing from the bleeder. DO NOT close the bleeder yet.
3. Close the ball valve and observe the vacuum gauge. **NOTE:** The ball valve must have a stainless steel ball and should be pressure tested by the manufacturer to ensure that it does not leak. If the ball valve leaks, the vacuum test will not be accurate.
4. The vacuum should increase within 15 seconds to 20 to 25 inches of vacuum. When the vacuum gauge reads 20 to 25 inches of vacuum, first close and tighten the bleeder, then turn the pump off.
   NOTE: If the pump will not pull at least 20 inches of vacuum, there is a very serious suction leak or the pump is damaged.
5. If there are no suction leaks, the system will hold vacuum. **NOTE:** It is acceptable for the vacuum to drop one to five inches within one minute as the seal in the pump seats. The vacuum should then hold steady for 15 minutes.

IMPORTANT: If the vacuum drops *more than one to five inches within the first minute*, there is one or more leaks somewhere between the pump and the ball valve. Do the following:

- Wipe your finger along the cylinder at the shaft of the pump. If there is oil here, the pump seal is damaged. Replace the pump.
- Disassemble and clean all the fittings from the pump to the ball valve. Properly seal all fittings with Permatex #2 non-hardening gasket sealer or equivalent. Check the condition of the o-ring on the canister filter and tighten the four canister filter bolts in a crisscross pattern.
- Repeat the procedure to vacuum test the system to ensure that the system is air tight.

Fan Limit Control

Understanding the Operation of the Fan Limit Control
The fan limit control senses air temperature within the furnace cabinet. This control contains two switches: the limit switch and the fan switch.

Fan Switch: The fan switch is normally open and provides power to the fan (or blower). When the fan limit control senses "Fan On" temperature, the fan switch closes and starts the fan (or blower). When the wall thermostat is satisfied and the burner shuts off, the fan continues to run until the fan limit control senses the "Fan Off" temperature. At this temperature, the fan switch opens and shuts off the fan (or blower).
NOTE: The fan limit control has a white fan switch button. Make sure the white button is pulled OUT for automatic (normal) operation. When the button is pushed in (manual setting), the fan will run continuously.
Limit Switch: The limit switch is normally closed and provides power to the oil primary control on the burner. If the fan limit control senses 200 degrees F, the limit switch opens and shuts off power to the oil primary control and the burner stops running. The fan (or blower) continues to run. Once the fan limit control senses 170 degrees F, the limit switch automatically resets and restarts the burner.
NOTE: It is very important to avoid cycling the burner on hi limit as described above. If the hi limit activates, immediately check and readjust burner settings.
ATTENTION: DO NOT change the fan limit settings from the specified settings, or severe damage to the furnace cabinet may occur.

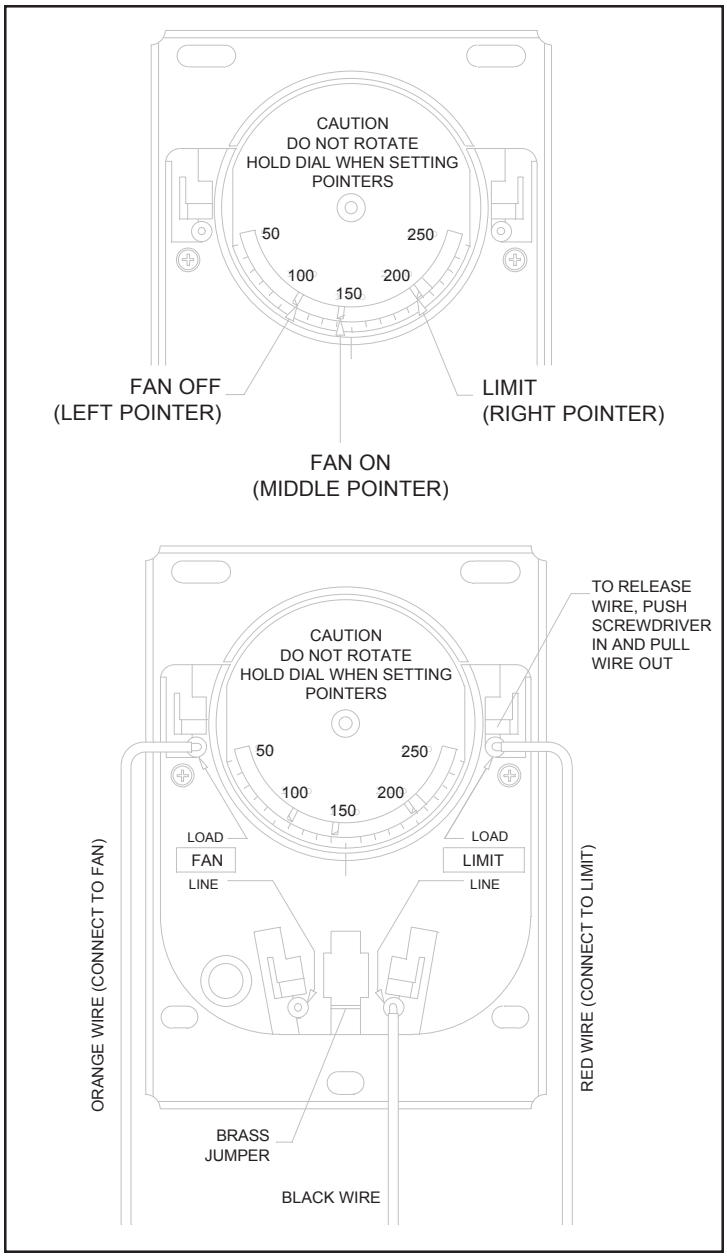


FIGURE A7 - Fan Limit Control Components

To Set Pointers on the Fan Limit Dial

1. Turn OFF main power to the furnace.
2. Remove the fan limit control cover.
3. While holding the dial securely in place with your thumb, move the pointer to the desired setting.

ATTENTION: DO NOT rotate the dial when setting the pointers. This severely damages the control.

Fan Limit Control Settings: CB-1800 / CB-2800

Fan Off: 110
Fan On: 140
Limit: 200

Fan Limit Control Settings: CB-1400

Fan Off: 100
Fan On: 120
Limit: 200

APPENDIX B

Wiring Diagrams

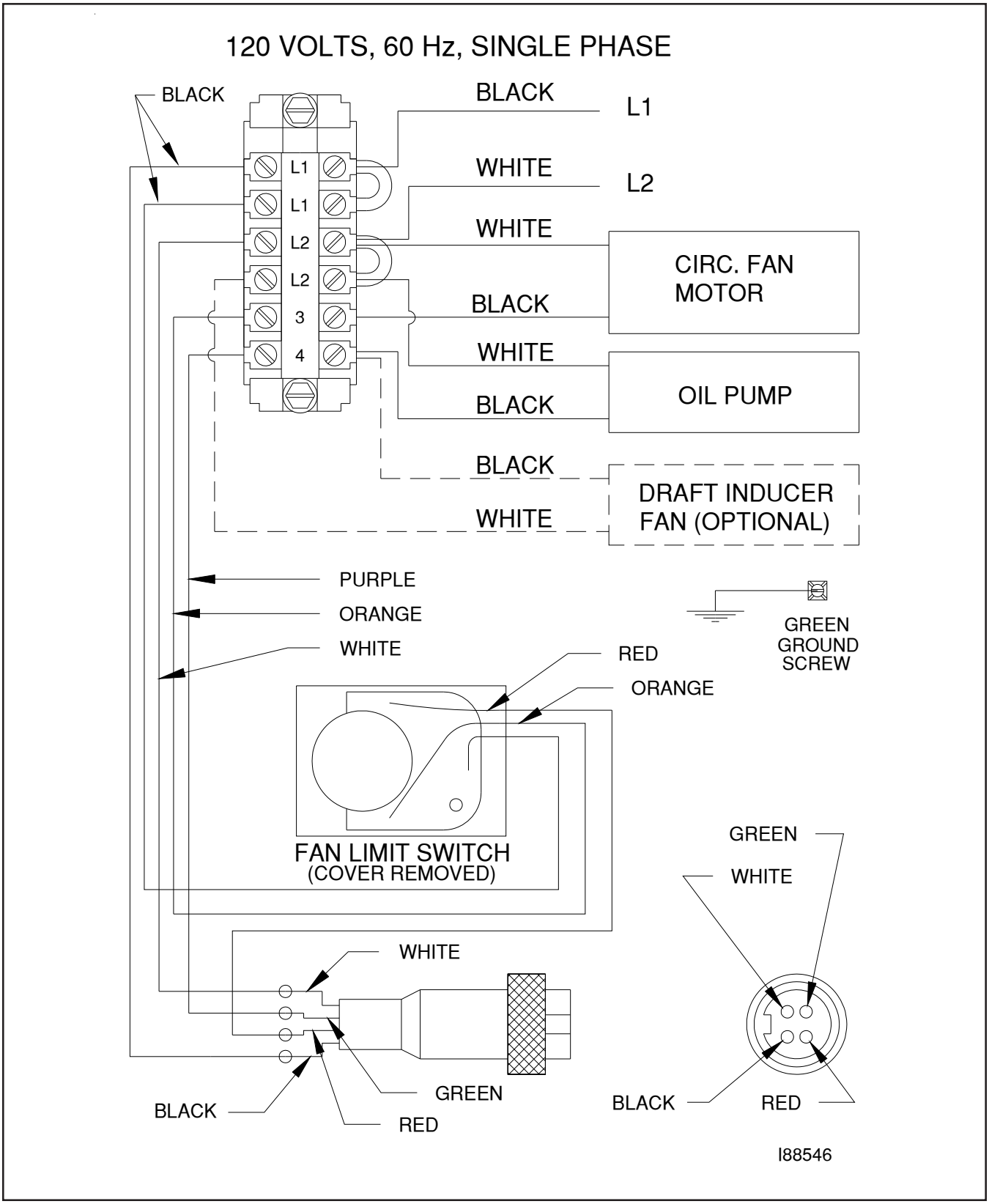


FIGURE B1 - Furnace Wiring Diagram

Wiring Diagrams

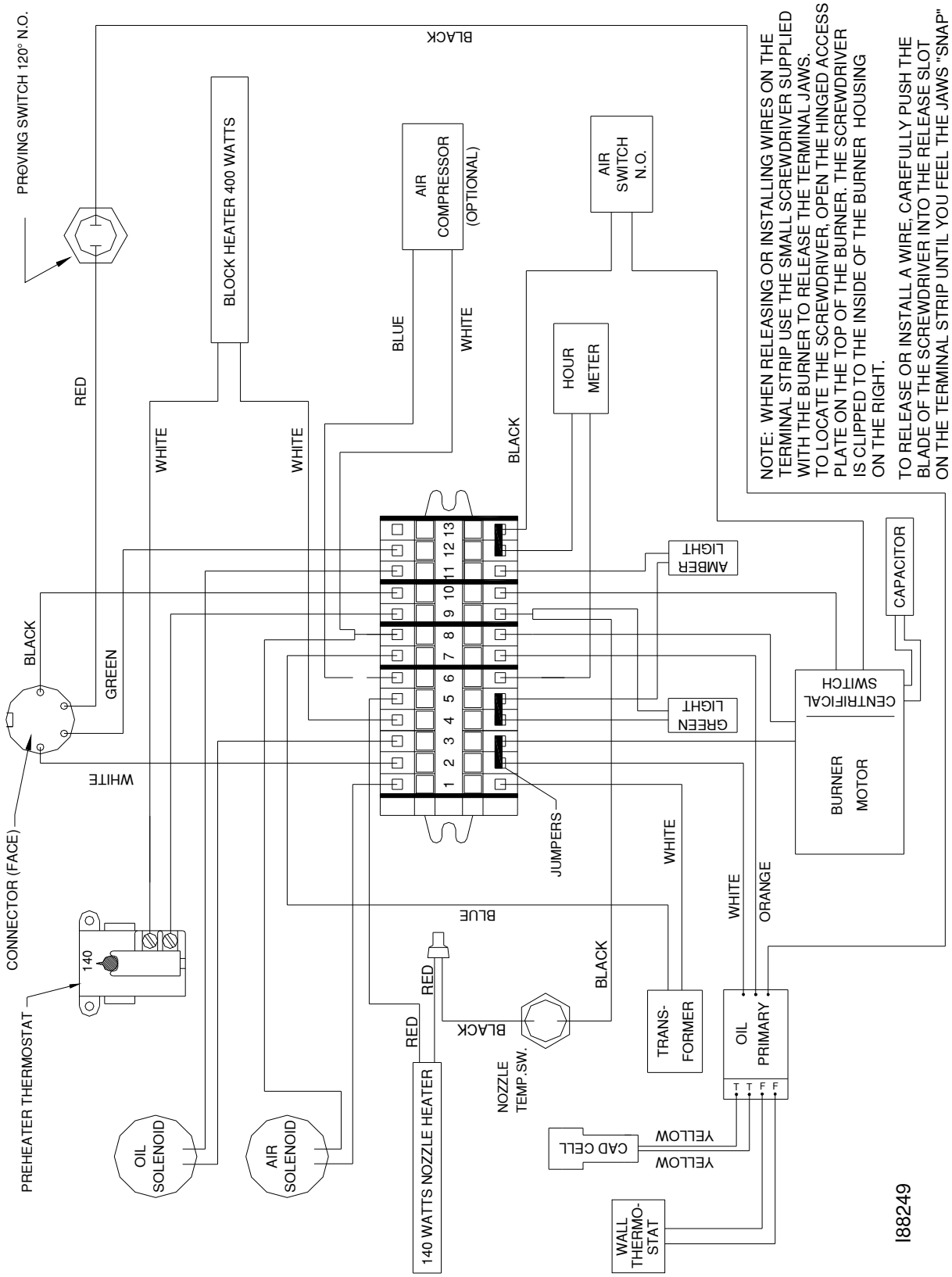
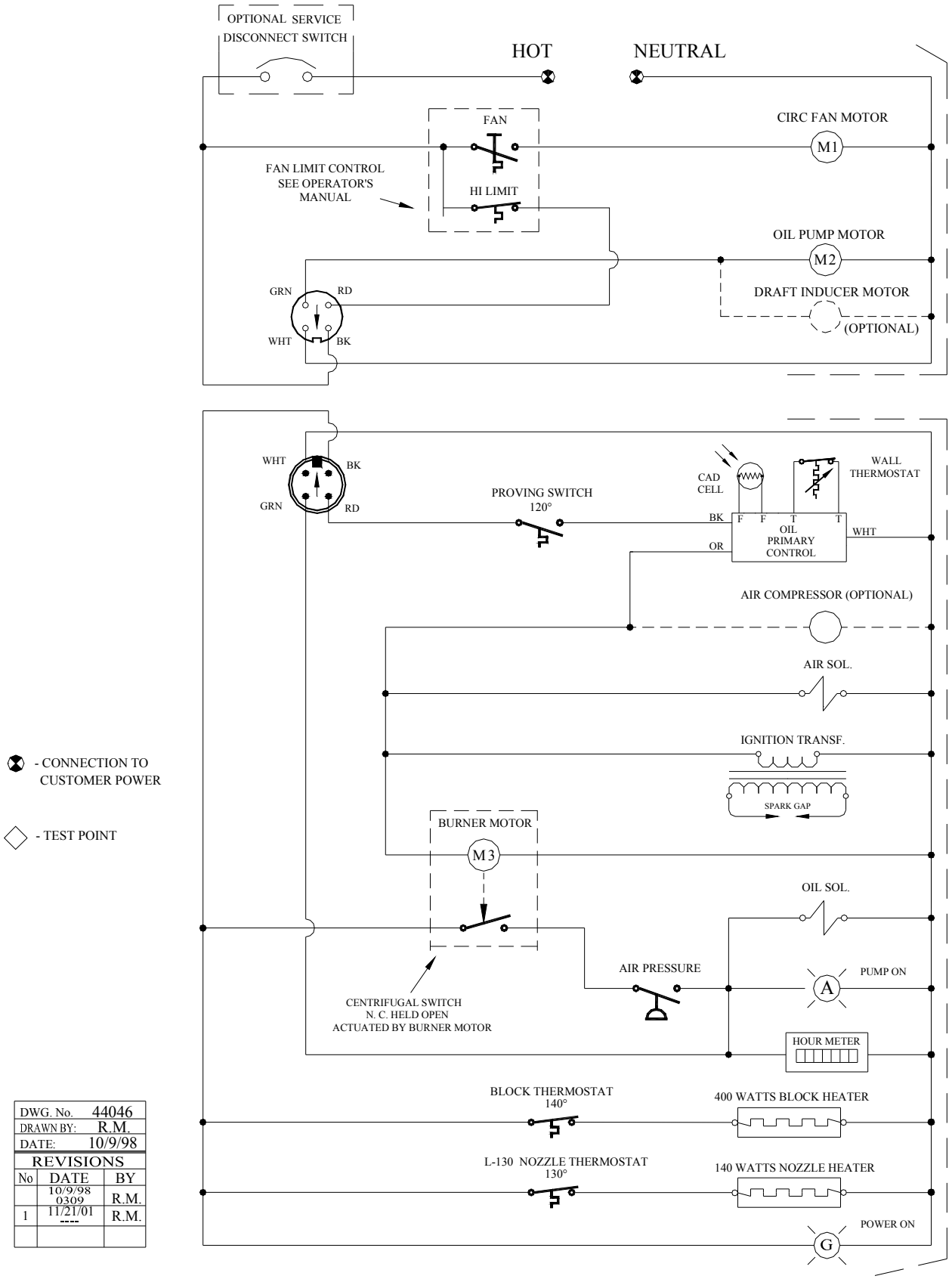


FIGURE B2 - Burner Wiring Diagram

MODELS CB-1400/CB-1800 & CB-2800

DWG. No...44046..



- CONNECTION TO CUSTOMER POWER

- TEST POINT

DWG. No.	44046	
DRAWN BY:	R.M.	
DATE:	10/9/98	
REVISIONS		
No	DATE	BY
	10/9/98 0309	R.M.
1	11/21/01	R.M.

FIGURE B3 - Ladder Schematic for Models CB-1400/1800/2800 (120 Volts / 60 Hz)

APPENDIX B

Wiring Diagrams

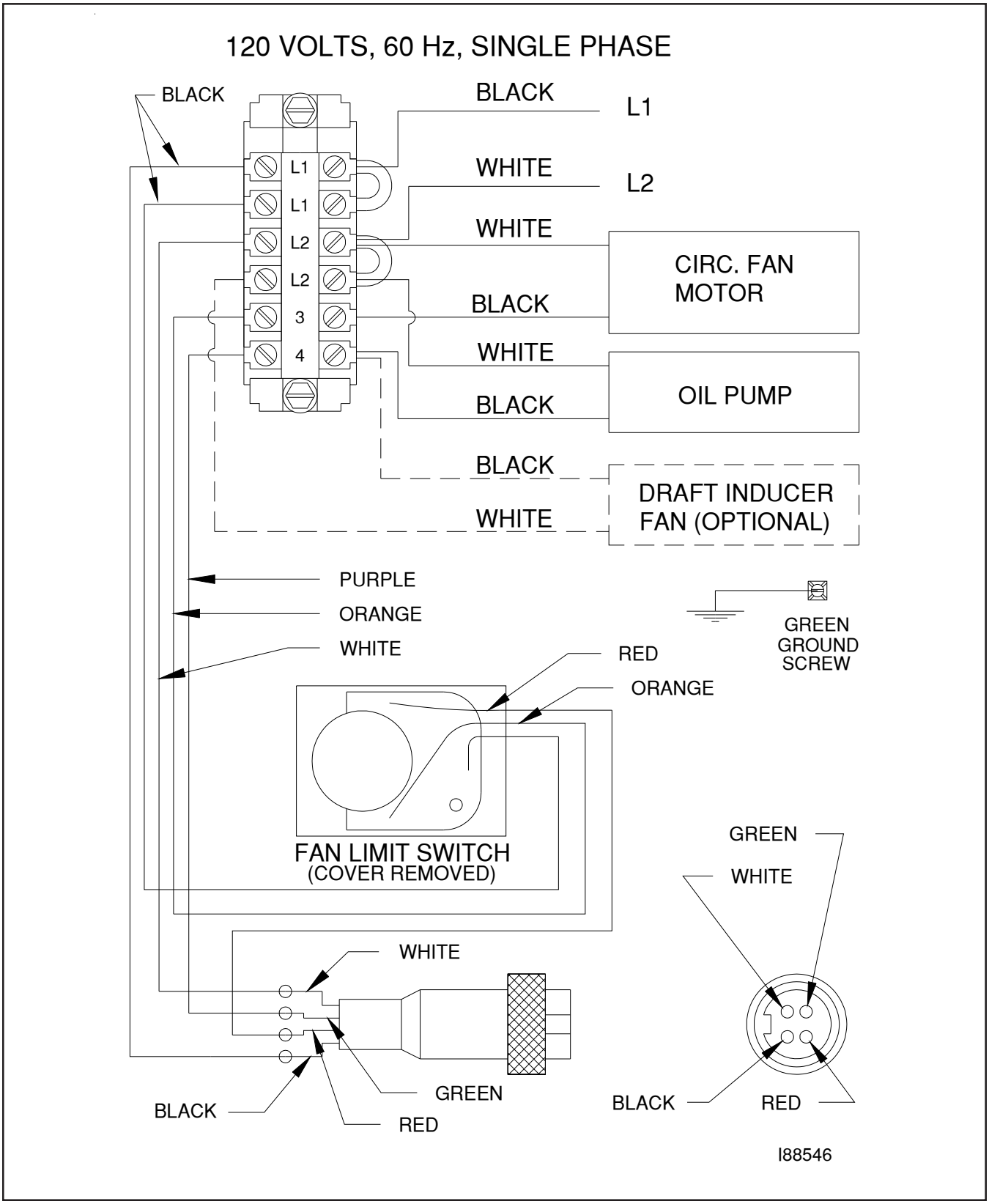


FIGURE B1 - Furnace Wiring Diagram

Wiring Diagrams

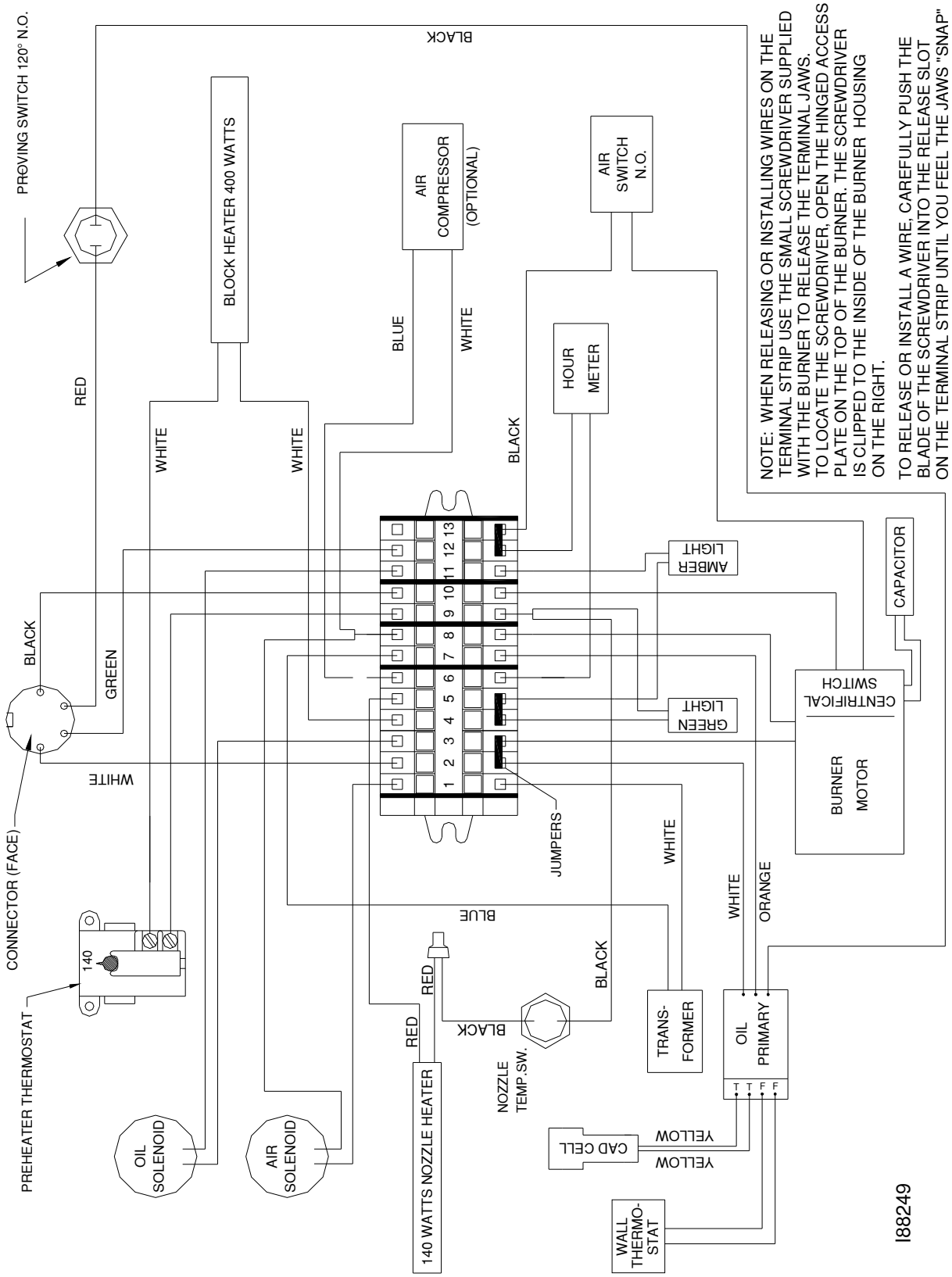
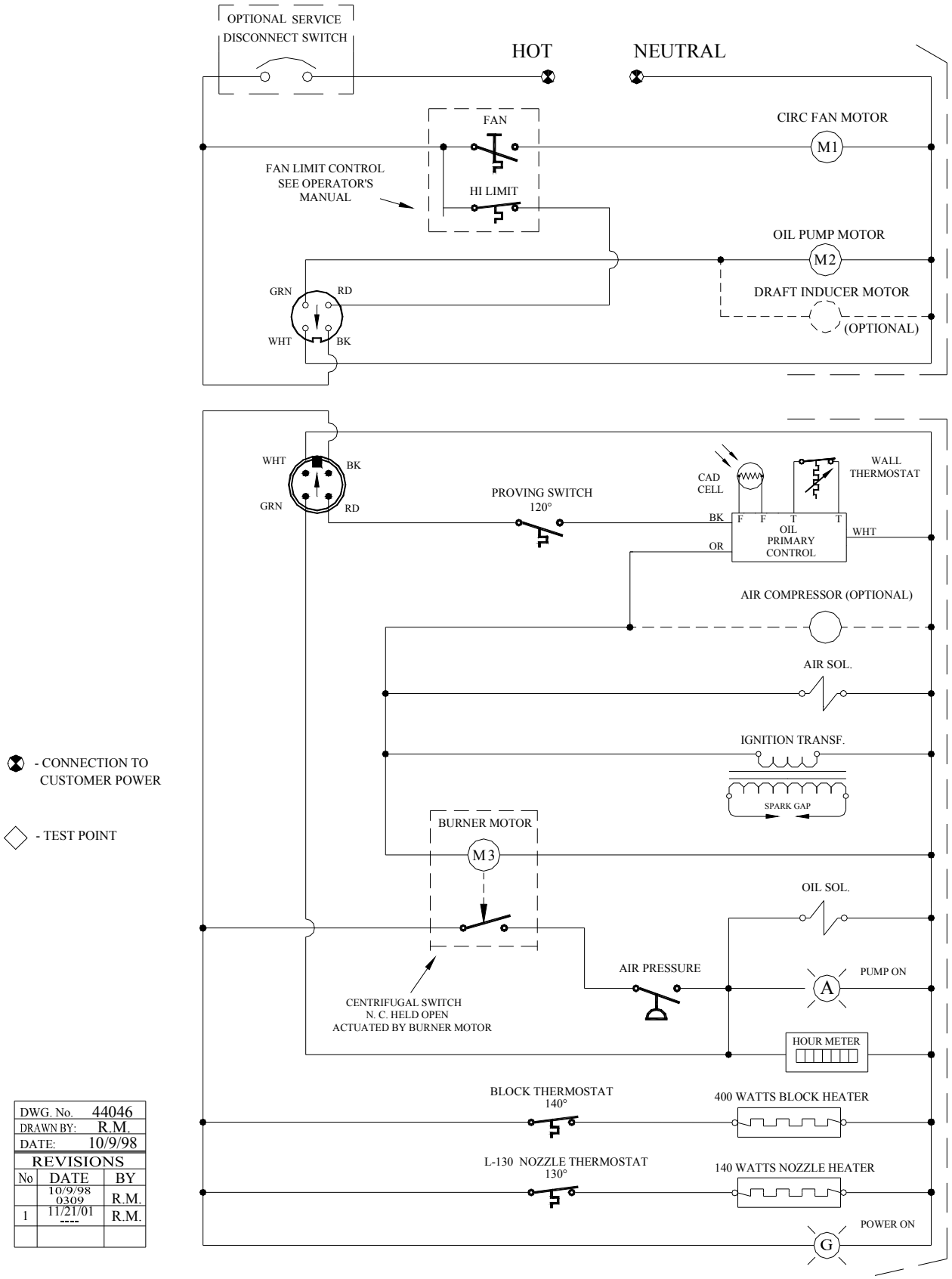


FIGURE B2 - Burner Wiring Diagram

MODELS CB-1400/CB-1800 & CB-2800

DWG. No...44046..



- CONNECTION TO CUSTOMER POWER

- TEST POINT

DWG. No.	44046	
DRAWN BY:	R.M.	
DATE:	10/9/98	
REVISIONS		
No	DATE	BY
	10/9/98 0309	R.M.
1	11/21/01	R.M.

FIGURE B3 - Ladder Schematic for Models CB-1400/1800/2800 (120 Volts / 60 Hz)

APPENDIX C

Furnace Service Record

Furnace Purchased: Date _____ From (name/phone)_____

Furnace Installed: Date _____ By (name/phone)_____

Furnace Inspected: Date _____ By (name/phone)_____

Draft Readings (date / reading)			**Service Record** (date / initials of serviceman)				
Burner	**Stack**		**Canister Filter**	**Chamber & Flues**	**Stack**	**Oil Tank**	**A.P.M.***

*A.P.M. = Annual Preventative Maintenance of Burner (Burner Tune-up)