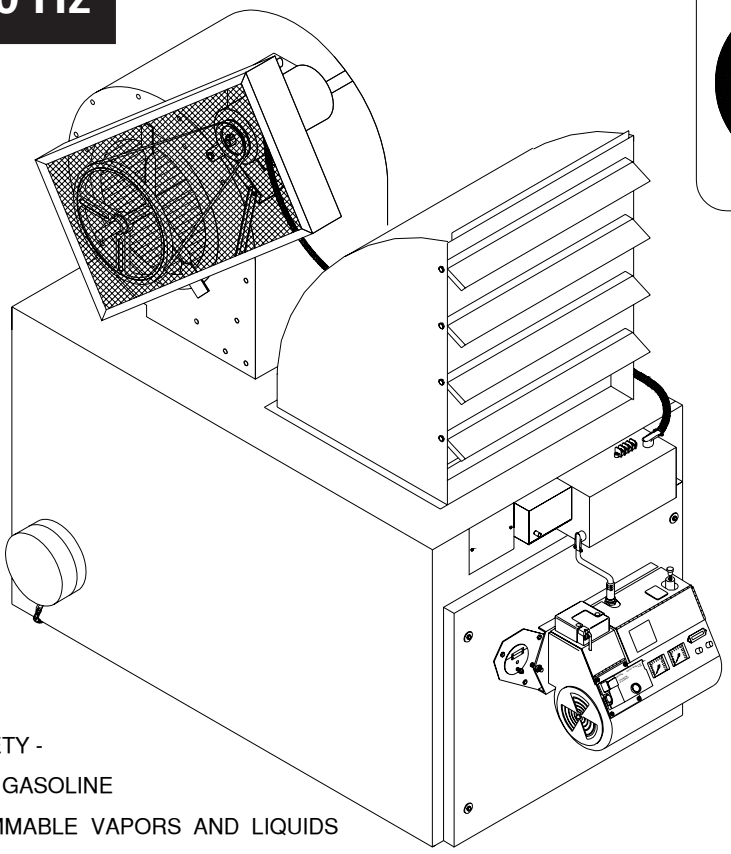
OPERATOR'S MANUAL

CLEAN BURN MULTI-OIL FURNACE MODELS:
CB-3500 and CB-5000 with CB-500 Series BURNER

230 V / 50 Hz



FOR YOUR SAFETY -
DO NOT STORE GASOLINE
OR OTHER FLAMMABLE VAPORS AND LIQUIDS
IN THE VICINITY OF THIS OR ANY APPLIANCE!!

I88911

PUBLICATION DATE: 2/15/07, Rev. 10 **CLEAN BURN PART #43143**

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.

CLEAN BURN, INC. • 34 Zimmerman Road • Leola, PA 17540 • U.S.A.

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SECTION 1: INTRODUCTION

Guide to this Manual

This manual contains all the information necessary to safely install and operate the Clean Burn, CE-certified, 230 V / 50 Hz Furnace Models CB-3500 and CB-5000. 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 six basic activities as outlined here:

- **UNPACKING ..... (Section 2)**
- **ASSEMBLY ..... (Section 3)**
- **INSTALLATION ..... (Section 4)**
- **OPERATION**
  - **Metering 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 following safety information--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.**

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 appliance, improper installation, operation or maintenance may result in a fire or explosion hazard.

WARNING: Ensure that your furnace is properly installed, adjusted, operated and maintained. Improper installation, adjustment, operation, or maintenance can adversely affect the proper, safe operation of your furnace and may cause serious personal injury/death.

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, and adversely affect the proper, safe operation of your furnace. Instruct your personnel to *never* add hazardous materials to your used oil.

For Your Safety... (continued)

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: Electrical installation of the furnace is to be performed only by qualified personnel (i.e. licensed electrician/engineer). Improper electrical installation can adversely affect the proper, safe operation of the furnace and may cause serious personal injury/death.

WARNING: Install the furnace in an area away from the main shop traffic. ***It is essential for personal safety that only manufacturer-trained, qualified personnel have access to operate and maintain the furnace. Only OFTEC or Manufacturer-trained and registered technicians should install, commission, and service the equipment.***

WARNING: To prevent damage to the furnace and to ensure personal safety, lifting, mounting, and hanging of the furnace must be performed in accordance with safe handling procedures.

WARNING: DO NOT operate your furnace when the ambient temperature is above 35° C (95° F).

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 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.

WARNING: This equipment is for commercial and/or industrial use only; it is NOT for residential use.

WARNING: Call your Clean Burn dealer for service. DO NOT allow untrained, unauthorized personnel to service your furnace. Make sure that your furnace receives periodic maintenance to ensure optimal performance.

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

For Your Safety... (continued)

Guidelines for Furnace Usage

- This furnace is designed to burn the following fuels:
    - Used crankcase oil up to 50 SAE
    - Used transmission fluid
    - Used hydraulic oils
    - #2, #4, and #5 fuel oils

  NOTE: Used oils may contain other substances, including gasoline, that may hinder performance.

- Make sure you comply with all environmental regulations concerning the use of your furnace. These 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 boiler in warm weather just to burn oil.

  Contact your Clean Burn dealer for current environmental regulations.

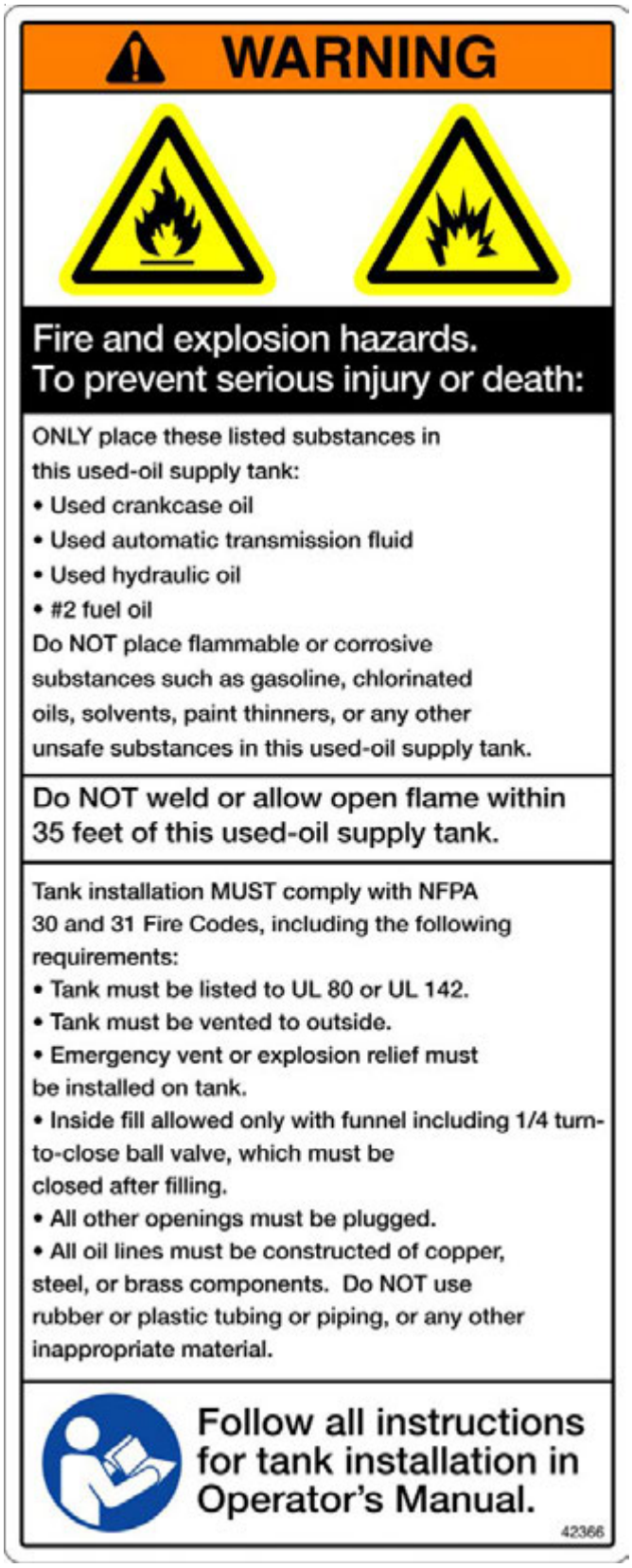
- If your furnace ever requires service, call your Clean Burn dealer. DO NOT allow untrained, unauthorized personnel to service your furnace. Make sure that your furnace receives annual preventative maintenance to ensure optimal performance.

For Your Safety... (continued)

Guidelines for Used Oil Tanks

For the safe storage of used oil and the safety of persons in the vicinity of the used oil supply tank, ensure that your tank installation adheres to the following safety guidelines:

- **The tank installation must meet all national and local codes.** Consult your local municipal authorities for more information as necessary.
- **Review and adhere to the safety guidelines for used oil supply tanks as stated in the WARNING shown.**
- Ensure that the tank for your furnace installation complies with all code and safety requirements as stated here. If the tank does not comply, DO NOT use it.
- If you do not have a copy of the tank safety label pictured at right, please contact your Clean Burn dealer for the label, which is to be affixed directly on your used oil supply tank.



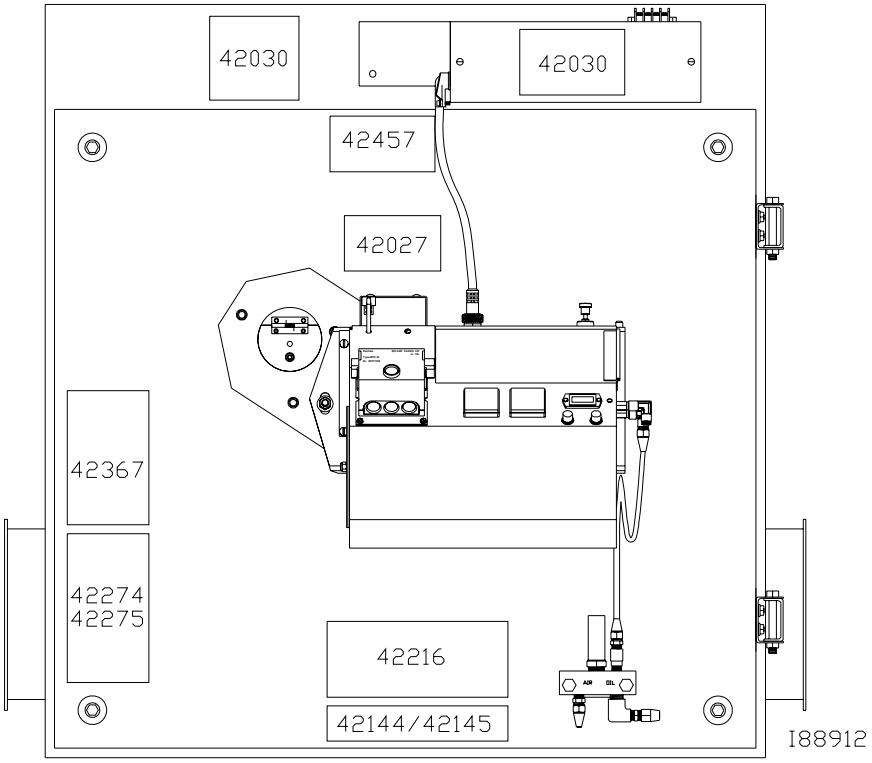
For Your Safety... (continued)

Safety Labels

Following are the locations and descriptions of all labels on your CB-3500 or CB-5000 furnace. The following illustrations show the location of ALL labels on your furnace. Please note that some labels denote model number, model description, etc. while others contain important safety messages.

Each **Safety Label** contains an important safety message starting with a key word as discussed earlier in this section (e.g. ATTENTION, CAUTION, WARNING, DANGER). For your safety and the safe operation of your furnace, review all labels and heed all safety messages as printed on the labels.

If any labels on your Clean Burn furnace ever become worn, lost or painted over, please call your Clean Burn dealer for free replacements.

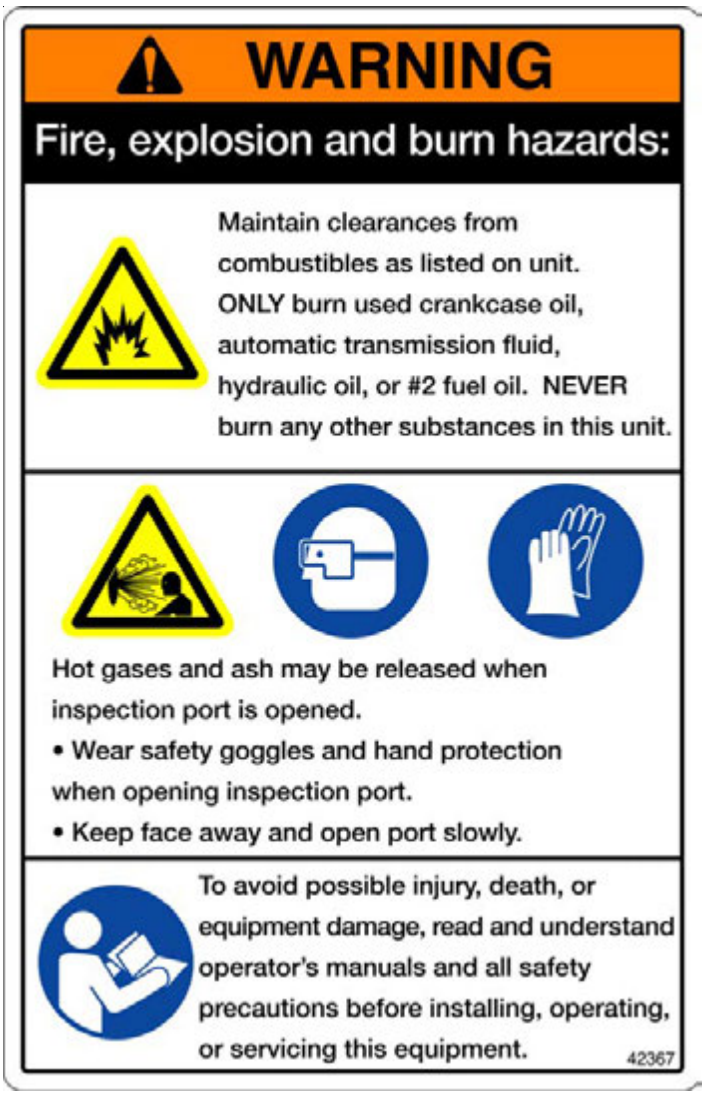


CB-3500/CB-5000 Furnace Cabinet Labels

Label Part #	Description
42030	Furnace Electrical Shock Hazard Warning Label *(several locations)*
42457	Made in USA Label
42027	Furnace Burn Hazard/Hazardous Voltage Warning Label
42367	Furnace Safety Warning Label (Multiple Messages - Fire/Shock/Burn Hazards)
42274	Data Label - CB-3500 CE
42275	Data Label - CB-5000 CE
42216	Clean Burn Logo Label
42144	Model CB-3500 Label
42145	Model CB-5000 Label
42068	Furnace Blower/Fan Entanglement Hazard Warning Label *(not shown - positioned near blower)*

For Your Safety... (continued)

CB-3500/CB-5000 Furnace Cabinet *Safety* Labels



For Your Safety... (continued)

CB-3500 / CB-5000 Furnace Cabinet *Safety* Labels (continued)

CLEAN BURN, INC.
LEOLA, PENNSYLVANIA (USA)

LABEL SERIAL NO.

MULT-OIL BURNING UNIT HEATER
WHEN USED WITH THE FOLLOWING
LISTED FUELS

89/392/EEC 72/23/EEC 89/336/EEC

MODEL NO. CB 3500

INPUT RATING W/NO. 2 FUEL OIL — BTU/HR 350,000 — (KW) 103

LISTED FUELS	INPUT -GPH-	INPUT -LTR/H-	ATOM AIR PRESS -PSIG-	ATOM AIR PRESS -BAR-	OIL PRESS -PSIG-	OIL PRESS -BAR-
NO 2 OIL	2.5	9.5	16.0	1.1	6.0	0.41
USED OILS INCLUDE:						
CRANKCASE OIL	2.5	9.5	16.0	1.1	6.5	0.45
HYDRAULIC OIL	2.5	9.5	16.0	1.1	6.0	0.41
ATF	2.5	9.5	16.0	1.1	6.0	0.41

MAX. DISCHARGE AIR TEMPERATURE 210°F (98°C) — FLUE DRAFT IN. W.C. -0.06 (-1.5 mm)

CLEARANCE TO COMBUSTIBLE SURFACES: INCHES / (cm)

ABOVE BLOWER	2 (5)	CHIMNEY	18 (46)	SIDES	24 (61)
BURNER SIDE	60 (152)	REAR	18 (46)	BOTTOM	24 (61)

	POWER	VOLTS	AMPS	HZ
BLOWER MOTOR HP.	2	230	8.5	50
OIL PUMP MOTOR HP.	1/6	230	1.3	50
BURNER MOTOR HP.	1/10	230	0.45	50
BURNER HEATER WATTS	450	230	1.7	50
DRAFT IND. (OPT) HP	1/50	230	0.5	50
AIR COMPRESS. (OPT) HP.	1/3	230	1.8	50
TOTAL CIRCUIT AMPS			12	
MAXIMUM FUSE SIZE			20	

THE MAINTENANCE INTERVAL FOR CLEANING ASH FROM THE FURNACE IS APPROXIMATELY 700 HOURS. THE ASH LEFT FROM THE BURNING OF USED OIL MAY CONTAIN METALLIC COMPOUNDS OR FOREIGN MATERIALS. THE ASH MUST BE DISPOSED OF PROPERLY.

BURNER REQUIRES A MINIMUM AIR SOURCE OF:
2 S.C.F.M. (57 L/MIN.) AT 25 P.S.I. (1.72 BAR).
THIS APPLIANCE IS NOT TO BE USED WITH AIR FILTERS AND
SHALL INCORPORATE NO PROVISIONS FOR MOUNTING AIR FILTERS.
INSTALL AND USE ONLY IN ACCORDANCE WITH THE
MANUFACTURER'S INSTALLATION AND OPERATING INSTRUCTIONS.
FOR COMMERCIAL OR INDUSTRIAL USE ONLY.

AUTHORITIES HAVING JURISDICTION SHOULD
BE CONSULTED PRIOR TO INSTALLATION.

42274

CLEAN BURN, INC.
LEOLA, PENNSYLVANIA (USA)

LABEL SERIAL NO.

MULT-OIL BURNING UNIT HEATER
WHEN USED WITH THE FOLLOWING
LISTED FUELS

89/392/EEC 72/23/EEC 89/336/EEC

MODEL NO. CB 5000

INPUT RATING W/NO. 2 FUEL OIL — BTU/HR 500,000 — (KW) 147

LISTED FUELS	INPUT -GPH-	INPUT -LTR/H-	ATOM AIR PRESS -PSIG-	ATOM AIR PRESS -BAR-	OIL PRESS -PSIG-	OIL PRESS -BAR-
NO 2 OIL	3.6	13.5	18.0	1.2	2.5	0.17
USED OILS INCLUDE:						
CRANKCASE OIL	3.6	13.5	16.0	1.1	3.0	0.21
HYDRAULIC OIL	3.6	13.5	16.0	1.1	3.0	0.21
ATF	3.6	13.5	18.0	1.2	3.0	0.21

MAX. DISCHARGE AIR TEMPERATURE 210°F (98°C) — FLUE DRAFT IN. W.C. -0.06 (-1.5 mm)

CLEARANCE TO COMBUSTIBLE SURFACES: INCHES / (cm)

ABOVE BLOWER	2 (5)	CHIMNEY	18 (46)	SIDES	24 (61)
BURNER SIDE	60 (152)	REAR	18 (46)	BOTTOM	24 (61)

	POWER	VOLTS	AMPS	HZ
BLOWER MOTOR HP.	2	230	9.0	50
OIL PUMP MOTOR HP.	1/6	230	1.3	50
BURNER MOTOR HP.	1/10	230	0.45	50
BURNER HEATER WATTS	450	230	1.7	50
DRAFT INDUCER (HP)	1/4	230	1.3	50
TOTAL CIRCUIT AMPS			15	
MAXIMUM FUSE SIZE			20	

THE MAINTENANCE INTERVAL FOR CLEANING ASH FROM THE FURNACE IS APPROXIMATELY 700 HOURS. THE ASH LEFT FROM THE BURNING OF USED OIL MAY CONTAIN METALLIC COMPOUNDS OR FOREIGN MATERIALS. THE ASH MUST BE DISPOSED OF PROPERLY.

BURNER REQUIRES A MINIMUM AIR SOURCE OF:
2 S.C.F.M. (57 L/MIN.) AT 25 P.S.I. (1.72 BAR).
THIS APPLIANCE IS NOT TO BE USED WITH AIR FILTERS AND
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AUTHORITIES HAVING JURISDICTION SHOULD
BE CONSULTED PRIOR TO INSTALLATION.

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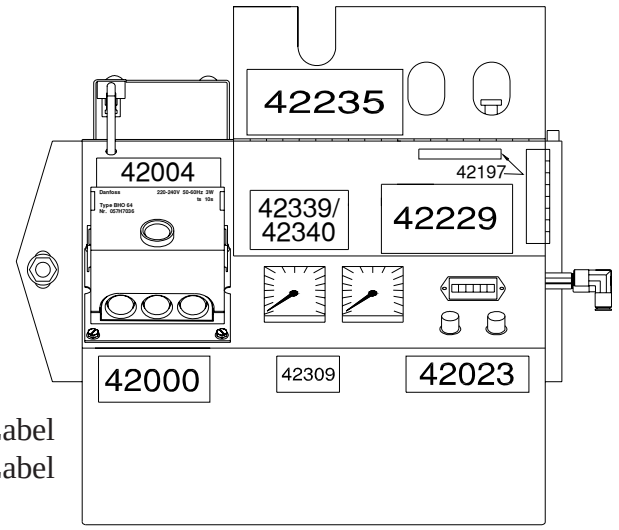
For Your Safety... (continued)

CB-3500 / CB-5000 Burner Labels

Label Part #	Description
42005	Sold and Serviced By Label
42004	Burner Safety Warning Label (High Voltage/Moving Parts Hazards)
42000	Burner Safety Warning Label (Fire/Explosion Hazard - Reset Button)
42235	Burner Safety Warning Label (Fire/Explosion Hazard - Burner Installation and Service)
42339	CB-500-CE Burner Model/Serial Number Label
42340	CB-551-CE Burner Model/Serial Number Label
42197	Patent Pending Label
42229	Logo/Burner Description Label
42023	Burner Power Label



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CB-3500/CB-5000 Burner*Safety* Labels

SECTION 2: UNPACKING

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

- Removing the Shipping Crate
- Unpacking and Inspecting All Components

Removing the Shipping Crate

1. Carefully remove the top boards of the shipping crate. Then remove the front, back, and side panels.
2. Carefully lift the furnace off the shipping pallet with a fork lift.

ATTENTION: DO NOT attempt to slide the furnace cabinet out of the shipping crate--you may damage the furnace cabinet.

NOTE: DO NOT remove the squirrel cage blower from the furnace cabinet. (The blower is installed in final position for Model CB-3500; it will require additional installation for Model CB-5000.)

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

ONE SKID containing:

- Furnace cabinet

  Components packed on top of furnace cabinet:
  - Burner
  - 2 HP Blower motor
  - Blower
  - Air discharge

  Components packed inside furnace cabinet:
  - Ceramic target
  - Blower assembly components
  - Oil pump
  - Canister filter
  - Vacuum gauge
  - Check valve / check valve screen
  - Wall thermostat
  - Barometric damper
  - Draft inducer (CB-5000 only)
  - Connector block
  - Assorted bolts/fittings, Assembly parts, Mounting components

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

Unpacking Items Packed Inside the Furnace

To unpack the items packed inside the furnace cabinet (in the combustion chamber), you will need to open the combustion chamber door.

1. Remove the four nuts and washers which hold the combustion chamber door closed. Set the nuts and washers aside in a safe place for later re-installation after the target has been installed (Section 3).
2. Carefully swing the clean out door open. Remove and inspect the components packed inside.
3. Leave the door unfastened (open) for assembly/installation procedures to be accomplished in the next section.

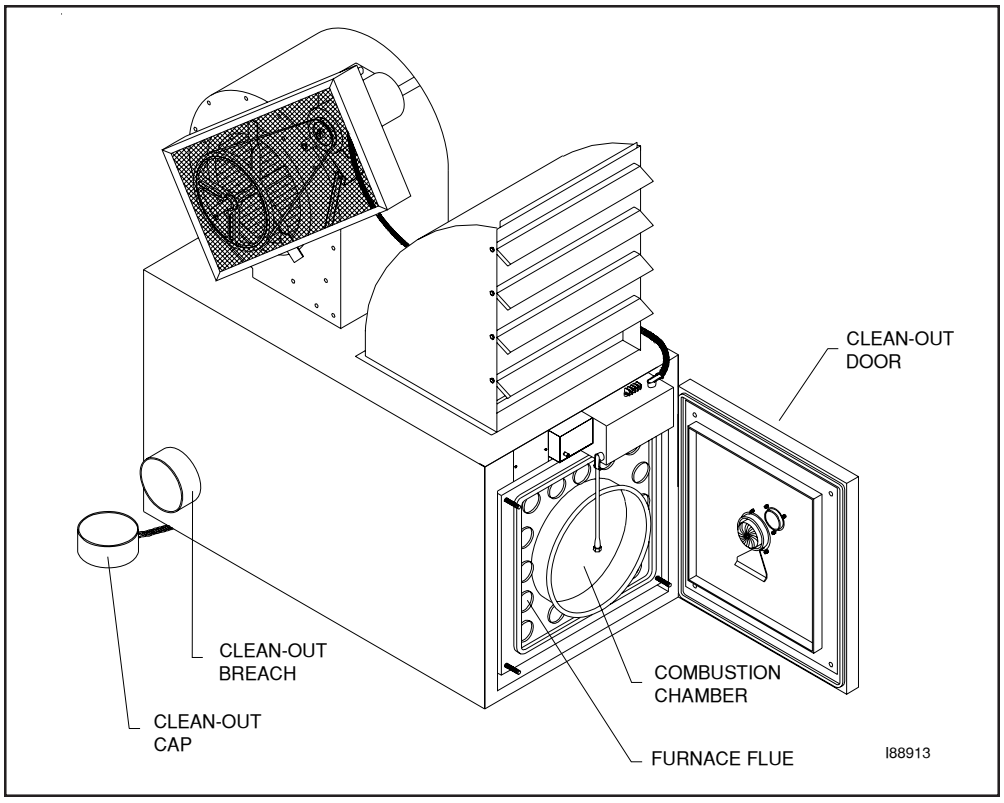


Figure 2A - Accessing the Combustion Chamber

SECTION 3: FURNACE ASSEMBLY

Understanding Assembly

Assembling your Clean Burn Furnace is a six-step process which includes:

(1) Installing the Blower Components
(2) Installing the Hot Air Discharge Components
(3) Installing the Ceramic Target
(4) Installing the Burner
(5) Installing the Connector Block, Oil Line Tubing, and Air Line Tubing
(6) Installing the Mounting and Stabilizer Brackets

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 and 3B** 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 are required for furnace assembly and should be gathered before starting any procedures:

- Variable-speed electric drill
- 1/4" hex-nut driver attachment for electric drill
- Set of open-end wrenches (3/8" - 5/8")
- 6" adjustable wrench
- Medium straight-blade screwdriver

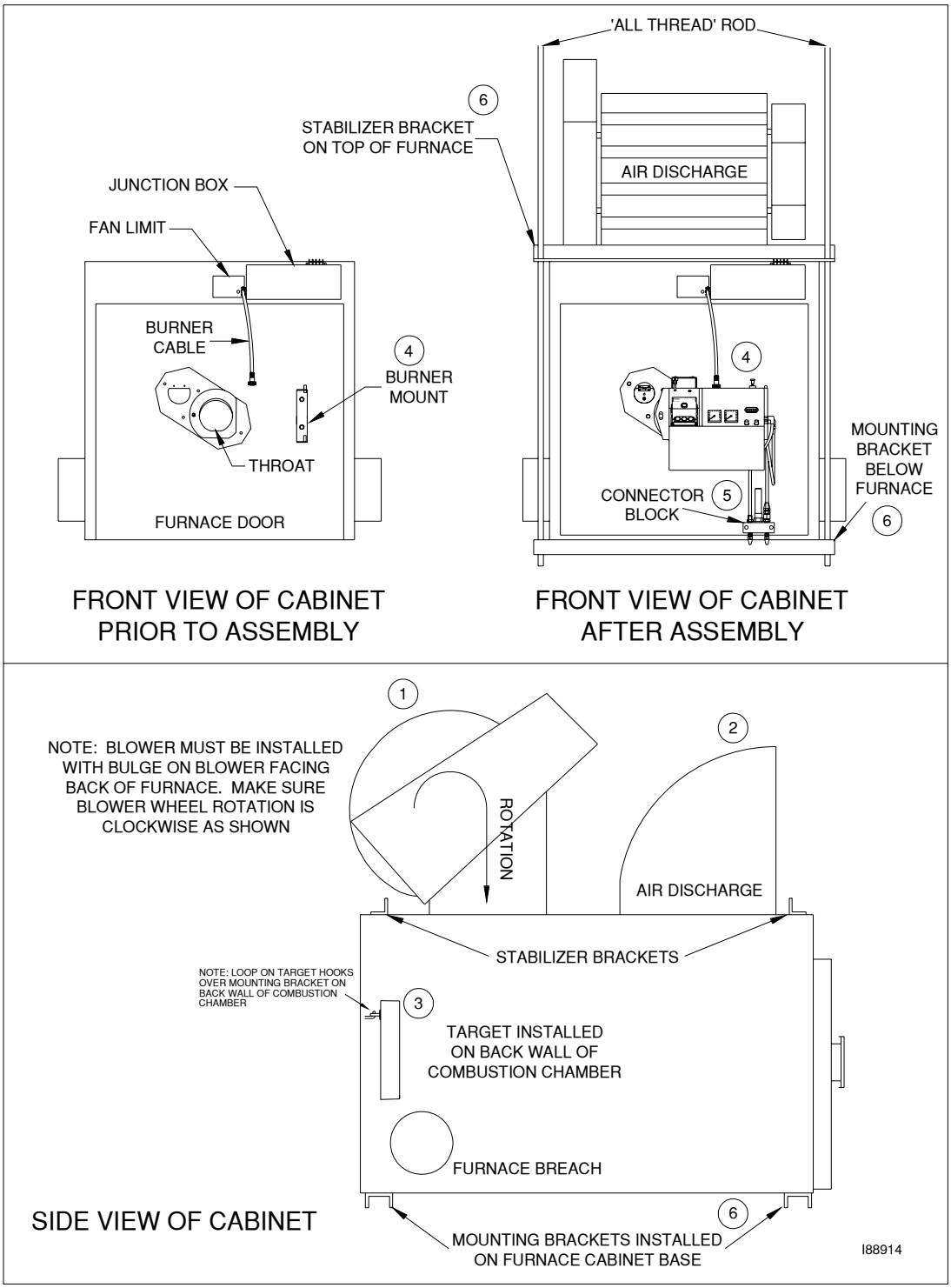


Figure 3A - Overview of Furnace Assembly

Complete assembly of the CB-3500/CB-5000 furnace according to the following list of activities as illustrated above:

(1) Installing the Blower Assembly
(2) Installing the Hot Air Discharge Components
(3) Installing the Target
(4) Installing the Burner
(5) Installing the Connector Block, Oil Line Tubing, and Air Line Tubing
(6) Installing the Mounting and Stabilizer Brackets

NOTE: *Corresponding procedures provided in order in this section.*

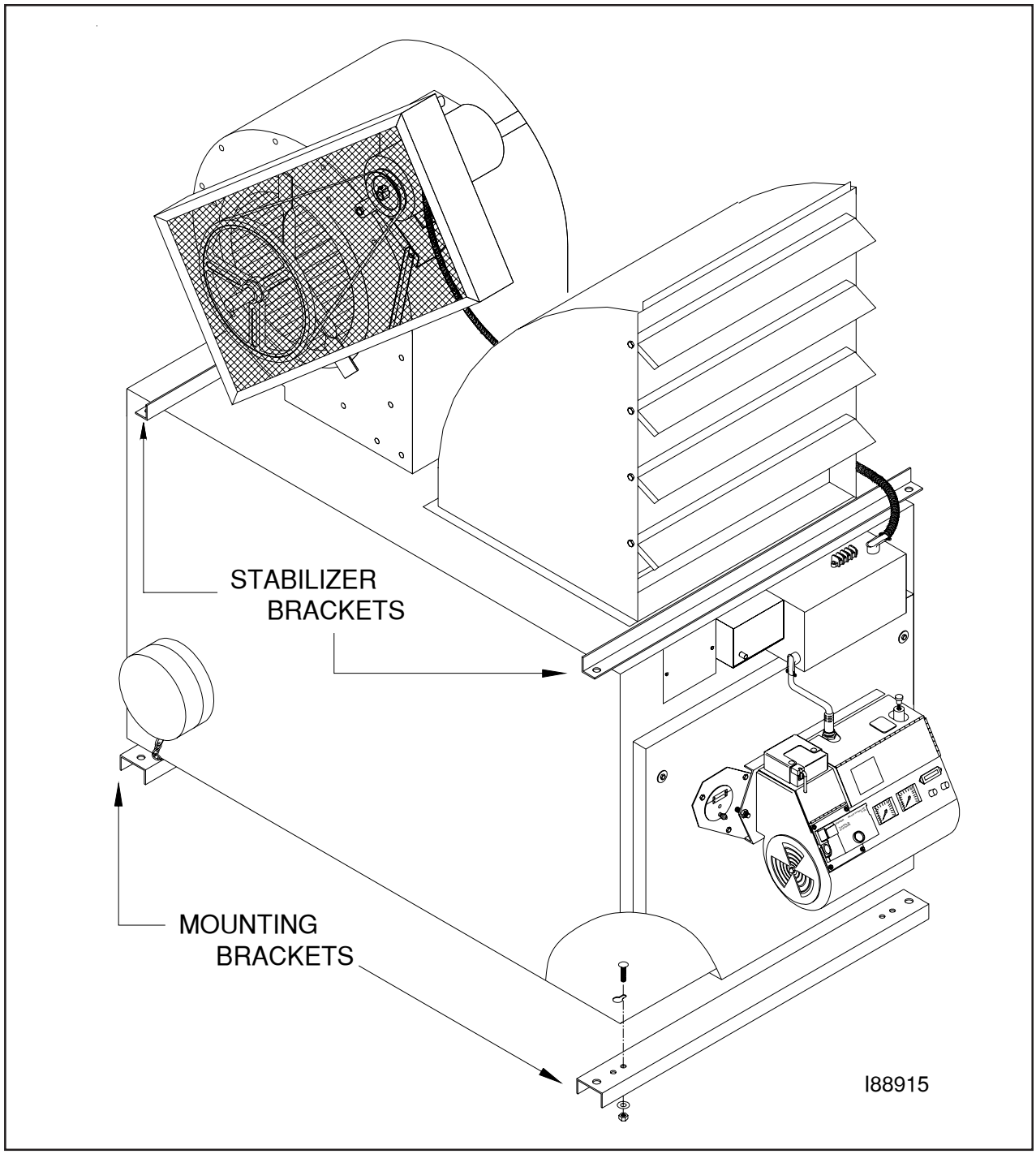


Figure 3B - Three-dimensional View - Furnace Completely Assembled with Louver Assembled for Unit Heater Application

NOTE: This figure shows the mounting/stabilizer brackets in place for a ceiling mounted installation. If your furnace will be floor or platform mounted, the brackets are not needed.

WARNING: Keep hands and fingers clear of the motor pulley or serious personal injury may occur.

Installing the Blower Components

NOTE: The blower is installed in final position on the CB-3500 cabinet. The blower for the CB-5000 requires additional installation as described in the following procedure.

Installing the Blower *(Model CB-5000 ONLY)*

NOTE: For proper air flow through the furnace, the blower must be positioned so the bulge on the blower faces toward the rear of the furnace as illustrated in Figures 3A, 3B, and 3D.

1. Remove the hex-head screws, which hold the blower in the shipping position.
2. Carefully slide the blower rearward on the cabinet into position against the blower inlet lip.
3. Use self-tapping screws to install the angle support at the back of the blower to complete the blower inlet lip.
4. Install at least three (3) self-tapping screws to each side of the blower inlet to safely support the blower.

Installing the Motor on the Blower

1. Refer to Figures 3C and 3D.
2. Use self-tapping bolts to install the motor mounting bracket on the blower according to the dimensions provided in Figure 3C.
3. Slide the two (2) 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. Use a self-tapping bolt to install the motor tensioning bracket on the blower according to the dimensions provided in Figure 3C.
6. 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 loosely just to hold the plate in position. DO NOT tighten the nut yet.
7. Lift the motor into position on the motor mounting plate using the two bolts in the channel to hold the motor in place. Now loosely install the nuts on the two (2) bolts.
8. Slide the motor into position so the face of the motor is flush with the side of the blower. Now tighten the nuts.
9. 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.

Wiring the Blower Motor

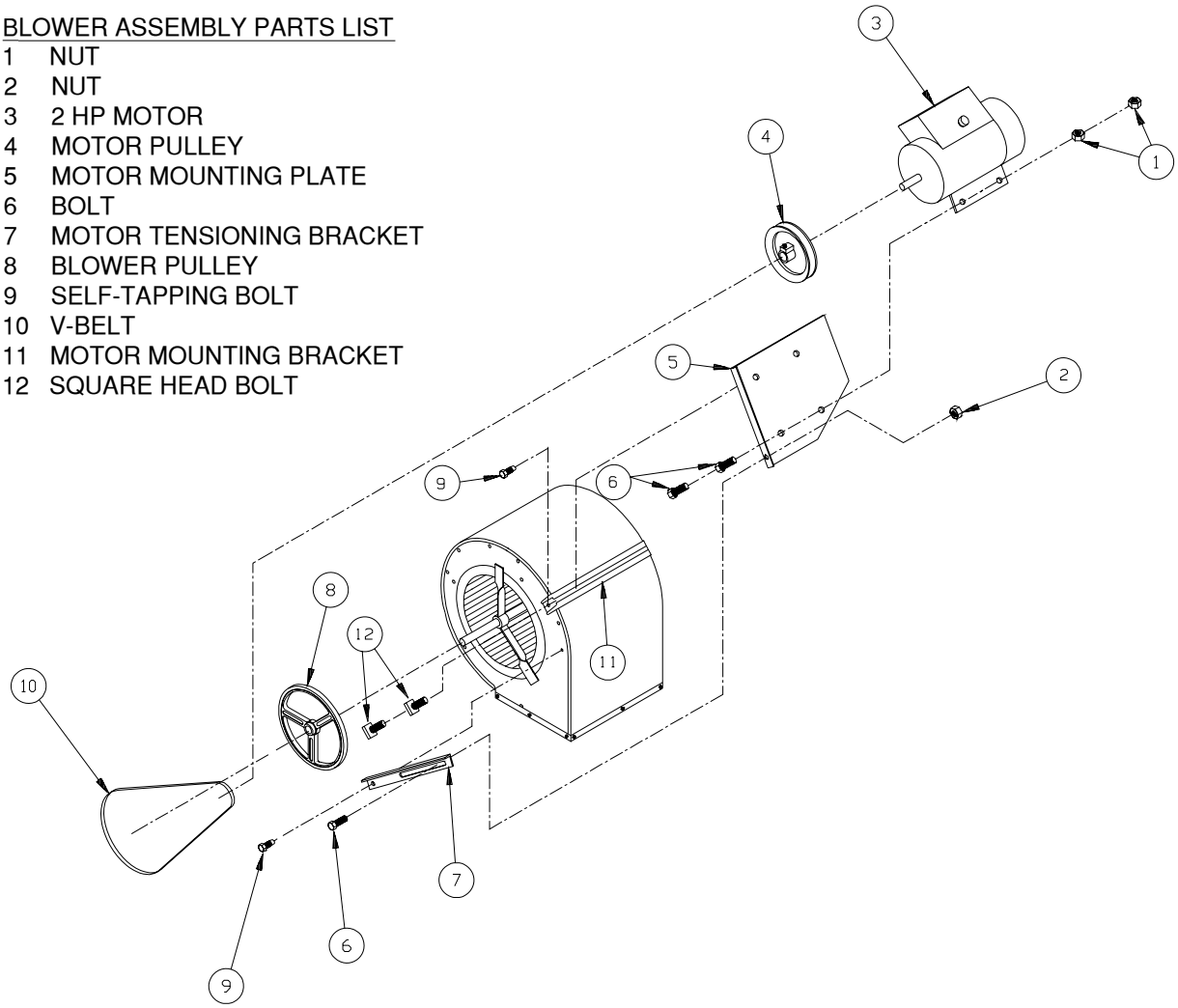
WARNING: To avoid electrical shock, make sure the main power to the furnace is turned OFF before wiring the blower motor.

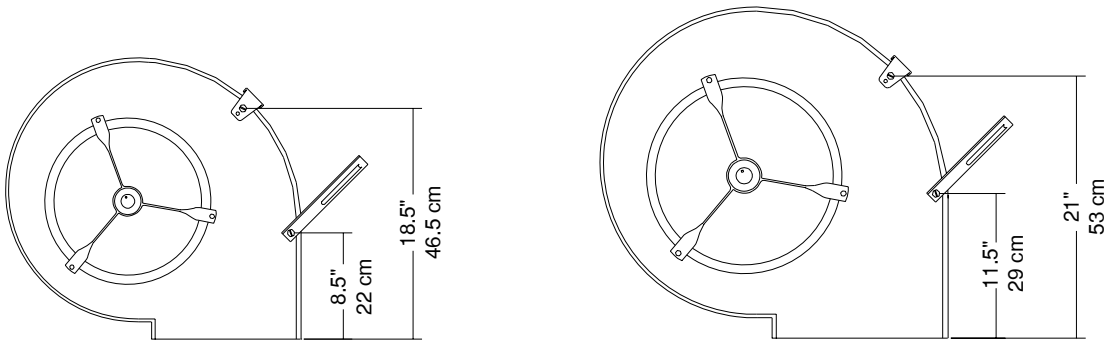
1. Refer to the Furnace Wiring Diagram provided in Appendix B at the back of this manual.
2. Install the electrical cable between the electrical junction box on the front of the furnace and the electrical access on the blower motor.
3. Connect the wires in the junction box according to the Furnace Wiring Diagram (Appendix B).

NOTE: *The blower motor is rated for 220/240 volts, single phase. Make sure the proper electrical circuit to the furnace has been provided by a qualified electrician as shown in the Furnace Wiring Diagram.*

BLOWER ASSEMBLY PARTS LIST

1 NUT
2 NUT
3 2 HP MOTOR
4 MOTOR PULLEY
5 MOTOR MOUNTING PLATE
6 BOLT
7 MOTOR TENSIONING BRACKET
8 BLOWER PULLEY
9 SELF-TAPPING BOLT
10 V-BELT
11 MOTOR MOUNTING BRACKET
12 SQUARE HEAD BOLT





CB-3500 BLOWER

CB-5000 BLOWER

DETAIL OF BRACKET INSTALLATION

NOTE: The brackets must be installed at the correct position on the side of the blower as shown here. Note the measurements provided which should aid your positioning of the brackets.

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Figure 3C - Expanded View of Blower Assembly

Installing the Blower Components (continued)

Installing the Motor Pulley, Blower Pulley, and V-Belt

1. Refer to Figures 3C and 3D.
2. Slide the pulleys into position on the motor and blower shafts. ***ATTENTION:*** *Make sure that the face of the motor is flush with the side of the blower. Then position the motor pulley 3 cm (1-1/8") out from the face of the motor. Failure to properly position the motor and the motor pulley may cause damage to the motor or blower bearings.* Now tighten the locking screw in the motor pulley hub.
3. Position the key in the slot on the motor shaft. ***ATTENTION:*** *Use a straight edge to make sure the blower pulley is aligned with the motor pulley, or vibration and bearing damage may occur.*
4. Install the double set of locking screws on the blower pulley. (Install the smaller locking screw and tighten it firmly; then install the second locking screw and tighten it firmly.) *It is important to install both locking screws to prevent the locking screws from working loose.*
5. Install the V-belt on the motor pulley and the blower pulley.
6. 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.
7. Check that there is a 2 cm (3/4") deflection in the tensioned V-belt. DO NOT overtension the V-belt. Repeat step #6 if necessary to achieve the proper tension on the V-belt.

NOTE: If you ever need to remove the blower wheel, you must remove both locking screws.

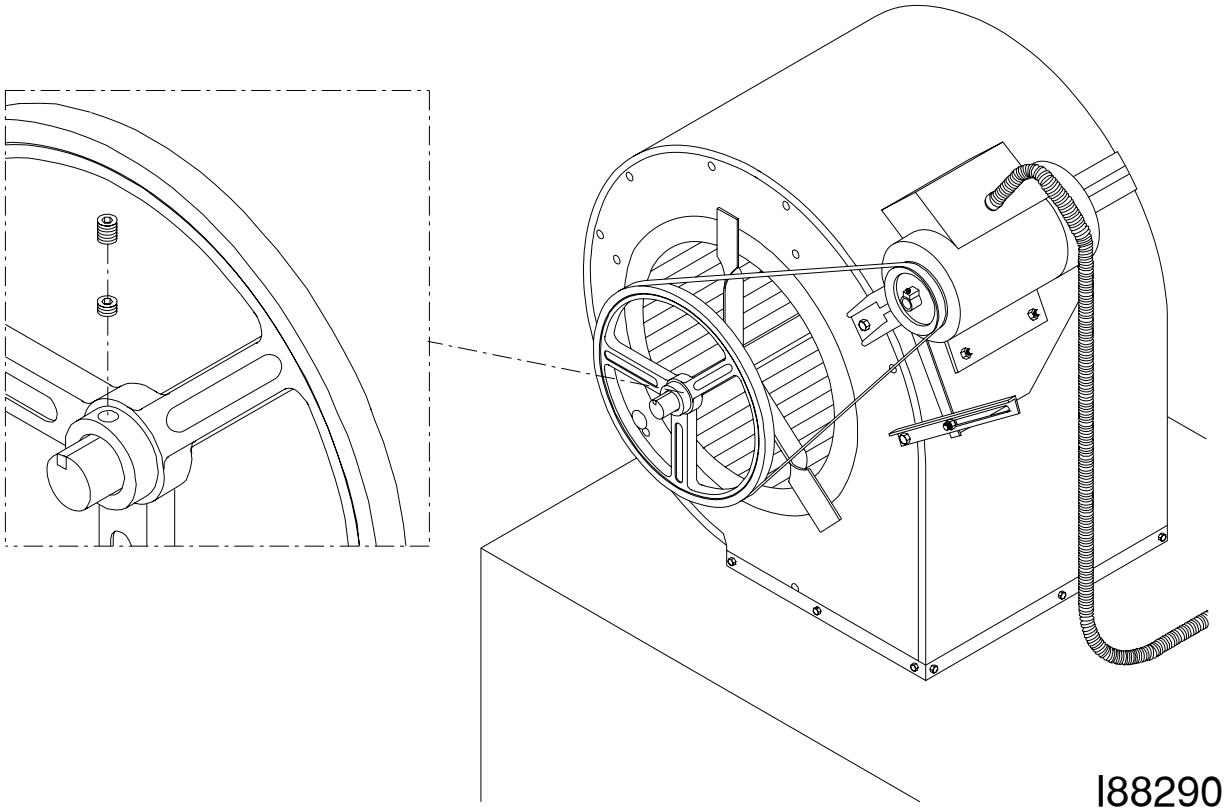


Figure 3D - Blower Assembly Installed on Furnace Cabinet

Installing the Belt Guard and the Blower Guard

WARNING: To prevent serious personal injury, DO NOT operate the furnace without the belt and blower guards in place.

1. Refer to Figure 3E.
2. Install the belt guard and blower guard as shown.

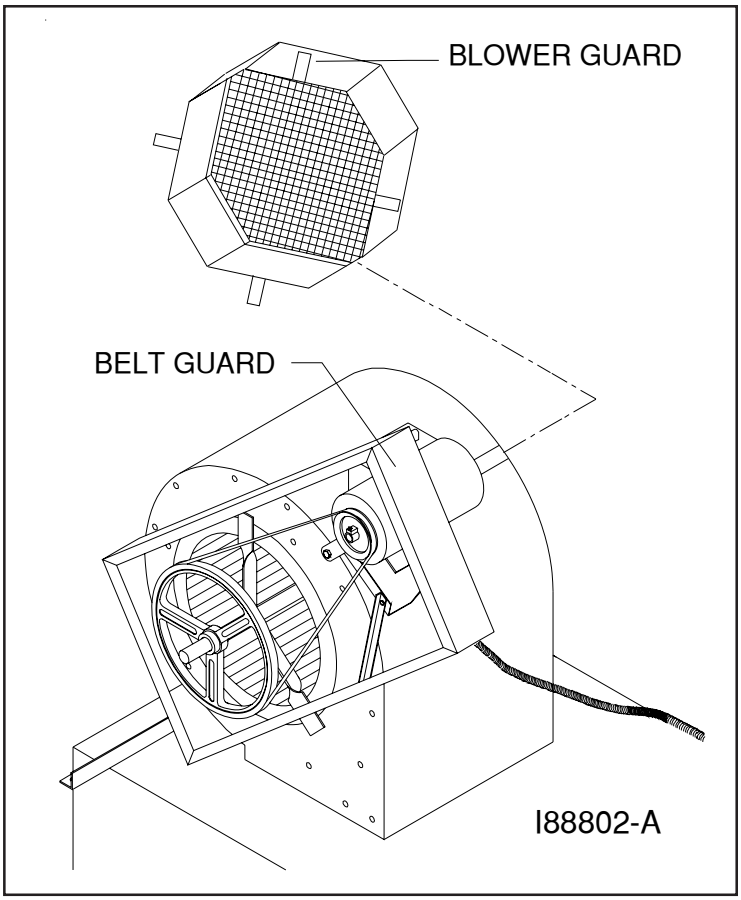


Figure 3E - Installing the Belt and Blower Guards

Installing the Hot Air Discharge Components

Determining the Air Discharge Configuration

The CB-3500 and CB-5000 furnaces may be configured for use as EITHER a Unit Heater or a Central Furnace as described below.

(1) **Unit Heater**

Furnace with blower for FREE AIR applications.
HOT AIR DISCHARGE: Louver assembly (components supplied)
NOTE: If the peak of your shop roof/ceiling is 4.3 m (14') or higher, install industrial-size ceiling fans to aid in efficient, even heat distribution. A minimum of one 1.4 m (56") Blade Industrial Ceiling Fan or equivalent is recommended for each 186 m^2 (2000 ft^2)of shop space.

Be sure to adhere to the specified clearances as stated in Section 4 of this manual.

(2) **Central Furnace**

Furnace with blower for DUCTING applications *from 0.06 kPa (0.25" WC) to 0.10 kPa (0.40" WC)* static pressure.*
HOT AIR DISCHARGE: Ductwork (Refer to the following chart for the proper air discharge/ducting specifications; installation to be accomplished by HVAC professionals ONLY.)

Be sure to adhere to the specified clearances as stated in Section 4 of this manual.

Air Flow - Cubic Meters per Minute (CMM) or Cubic Feet per Minute (CFM) and Static Pressure (SP) Specifications

PARAMETER	UNIT HEATER	CENTRAL FURNACE		
	Louver Assembly (orifice plate installed)	Ductwork (orifice plate removed)		Opening Size (for ductwork)
Static Pressure kPa in Outlet (Inches WC in Outlet)	Free Air*	0.06 kPa* (0.25)	0.10 kPa* (0.40)	N/A
CB-3500 CMM (CB-3500 CFM)	119 (4200)	113 (4000)	110 (3900)	51cm x 51cm (20" x 20")
CB-5000 CMM (CB-5000 CFM)	156 (5500)	147 (5200)	144 (5100)	61cm x 61cm (24" x 24")

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.

UNIT HEATER APPLICATIONS: Installing the Air Discharge Louver Assembly

The body of the air discharge louver assembly is shipped assembled and is packed on top of the furnace cabinet. The louvers, nuts and bolts, which must be assembled separately, are packed inside the combustion chamber.

It is very important to install the air discharge to direct the flow of the hot air from the furnace as desired for your application. As you will note from Figure 3F, the air discharge may be installed facing forward (as shown) or rotated 90° to the left or right. Additionally, the louvers may be installed horizontally or vertically to direct the flow of the heated air.

1. Position the body of the air discharge as desired over the hot air outlet on the furnace (i.e. facing forward, right, or left).
   ATTENTION: KEEP THE ORIFICE PLATE IN PLACE (as shown in Figure 3F) when installing the louver assembly. The orifice plate is *necessary* for proper air flow from the furnace.
2. Use the 12 self-tapping screws to securely attach the body of the louver assembly to the furnace cabinet.
3. Install the louvers in the desired position (i.e. horizontally or vertically) using the bolts and locking nuts provided.
   ATTENTION: DO NOT restrict the flow of hot air from the furnace by closing the louvers, or damage to the furnace and/or blower motor may occur.

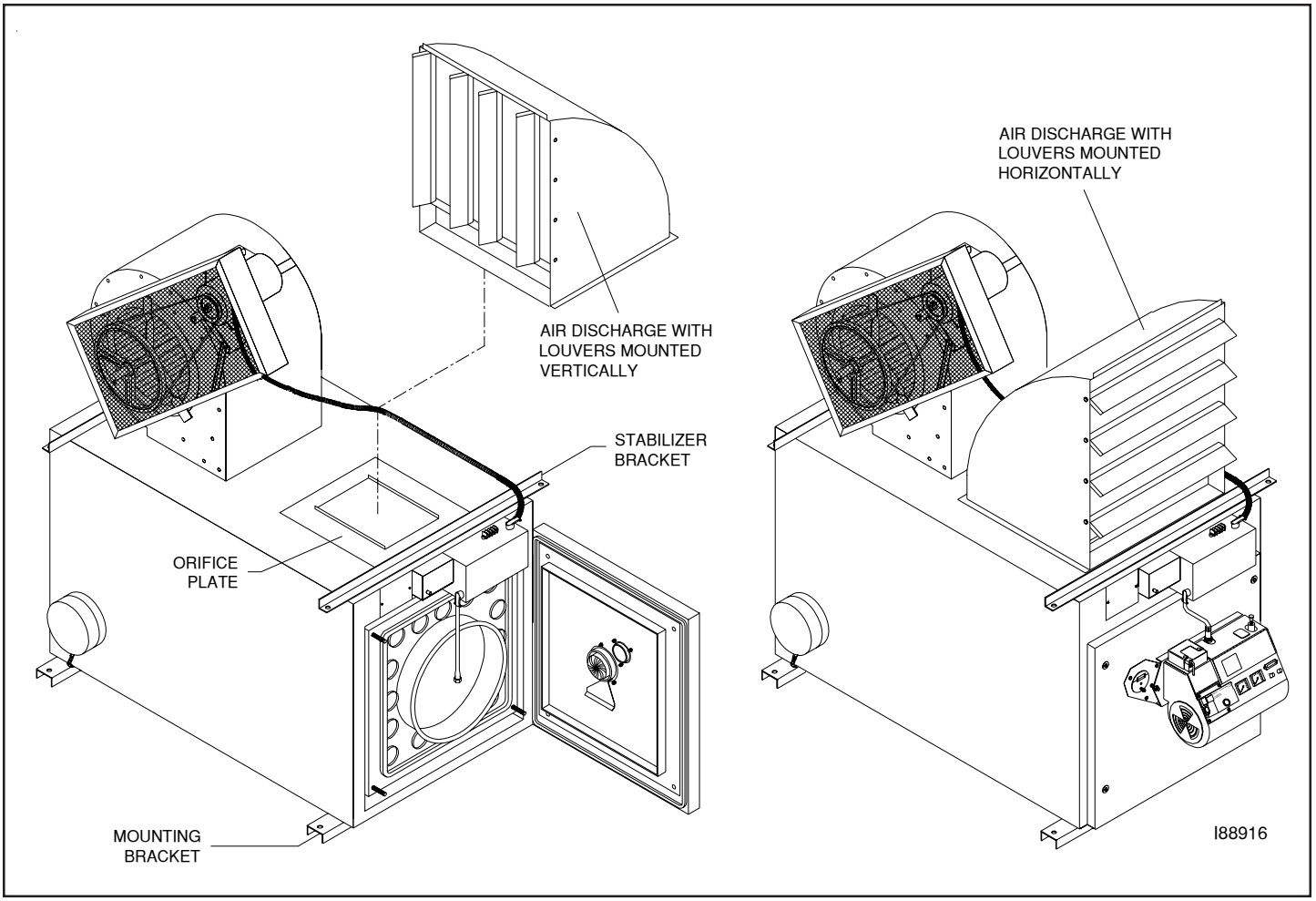


Figure 3F - Installation of the Hot Air Discharge Louver Assembly

CENTRAL FURNACE APPLICATIONS: Installing Ductwork

If you plan to install ductwork on your furnace, ***it is mandatory that qualified HVAC personnel design and install the ductwork system to the Air Flow and SP specifications provided in this manual.*** Establish correct duct size according to the following specifications and use radial bends or turning vanes to allow for proper air flow.

Sizing the Ductwork:

- **For Model CB-3500,** the outlet on the air discharge is 51 cm x 51 cm (20" x 20"). *The main duct on a CB-3500 must initially maintain an outlet size of 51 cm x 51 cm (20" x 20").*
- **For Model CB-5000,** the outlet on the air discharge is 61 cm x 61 cm (24" x 24"). *The main duct on a CB-5000 must initially maintain an outlet size of 61 cm x 61 cm (24" x 24").*

Additionally, to ensure proper air flow from the furnace and to prevent damage to related furnace components, adhere to the following guidelines for installing ductwork with your CB-3500 or CB-5000 central furnace application.

Installation Guidelines for Ductwork:

- It is essential that qualified HVAC personnel properly design the ductwork for your furnace and determine the static pressure for your ducting application;
  ATTENTION: Failure to adhere to the static pressure and Air Flow specifications provided in this manual may result in damage to the blower motor.
- The ductwork should be installed directly over the opening in the top of the furnace cabinet (i.e. where the louver assembly would be installed for free air applications.)
- **THE ORIFICE PLATE MUST BE REMOVED for all ductwork applications.**
- *Existing ductwork* at your installation site may NOT be appropriate or meet the specifications for your furnace installation.

Installing the Ceramic Target

Installing the Ceramic Target on the Combustion Chamber

ATTENTION: DO NOT fire your furnace without the flame target in place, or combustion chamber damage will occur. The target is high-temperature ceramic--handle it carefully to avoid damage.

1. Refer to Figure 3A at the beginning of this section to review the proper positioning of the target.
2. Swing open the clean-out door on the furnace front to gain access to the combustion chamber.
3. Use a long rod to support the ceramic target as you guide it into position on the back of the combustion chamber. The eye bolt on the back of the target fits over the hook on the target mounting bracket which is located on the back of the combustion chamber.

Closing the Furnace Door

1. After the ceramic target has been installed, close the furnace clean-out door.
2. Tighten the four (4) lock-down nuts in a criss-cross pattern until all are snug.

Installing the Burner

Checking the Burner Nozzle and Electrodes

NOTE: The burner nozzle is factory installed. Model CB-3500 uses a Delavan 9-5 nozzle. Model CB-5000 uses a Delavan 9-11 nozzle. The nozzle size is indicated on the nozzle head as shown in Figure 3G. Refer also to **Appendix A** at the back of the manual for additional specifications/instructions on the burner nozzle.

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

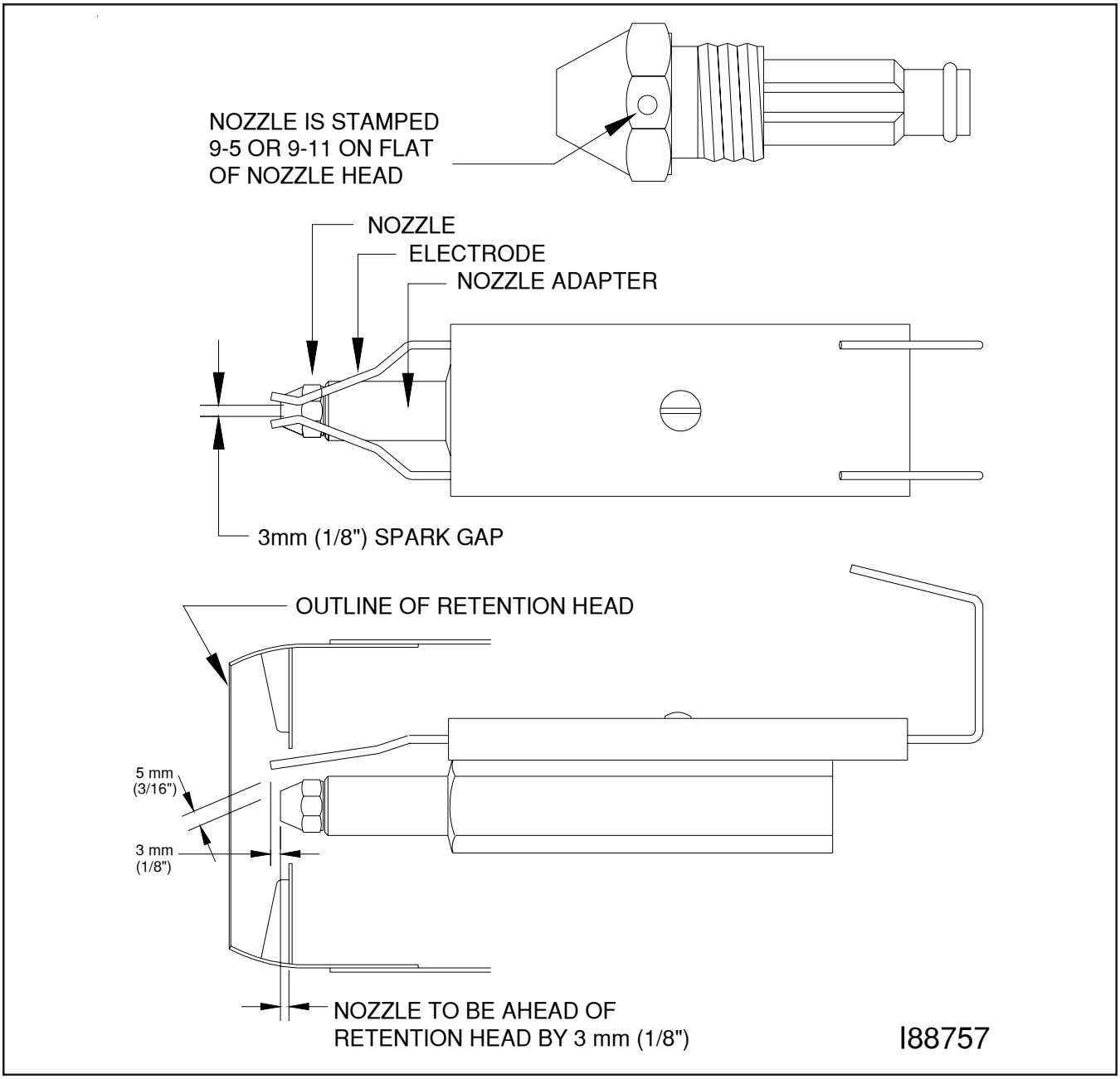


Figure 3G - Burner Nozzle and Electrode Specifications

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 mounting flange of the furnace cabinet, and set it aside for later use.
2. Lift the burner into position so that it 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 3 mm (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

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

Installing the Connector Block on the Furnace Door

1. Refer to Figure 3H.
2. Use the two (2) bolts to install the aluminum connector block onto the furnace door.
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.

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.***

Installing the Oil Line Tubing

ATTENTION: 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 3H, 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.

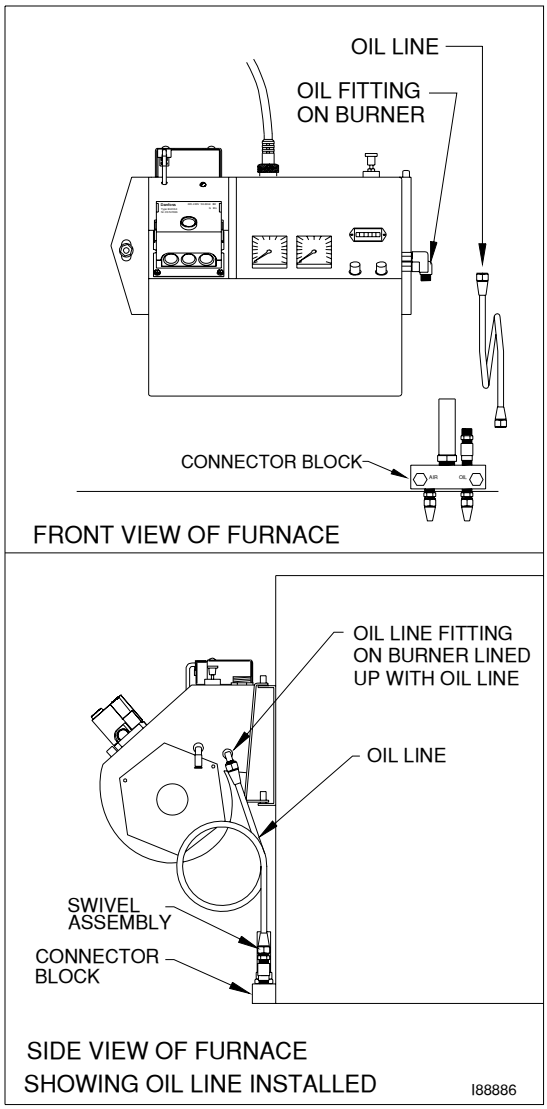


Figure 3H - Installation of Connector Block and Oil Line

(procedure continued on next page)

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

Installing the Oil Line Tubing (continued)

5. Make sure that the curl in the oil line is positioned as shown in Figure 3H 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 3I, which provides a larger front view of the connector block assembly.

Installing the Air Line Tubing

1. Remove and discard the red caps from the air line tubing.
2. Refer to Figure 3I. Push the air line tubing into the 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.

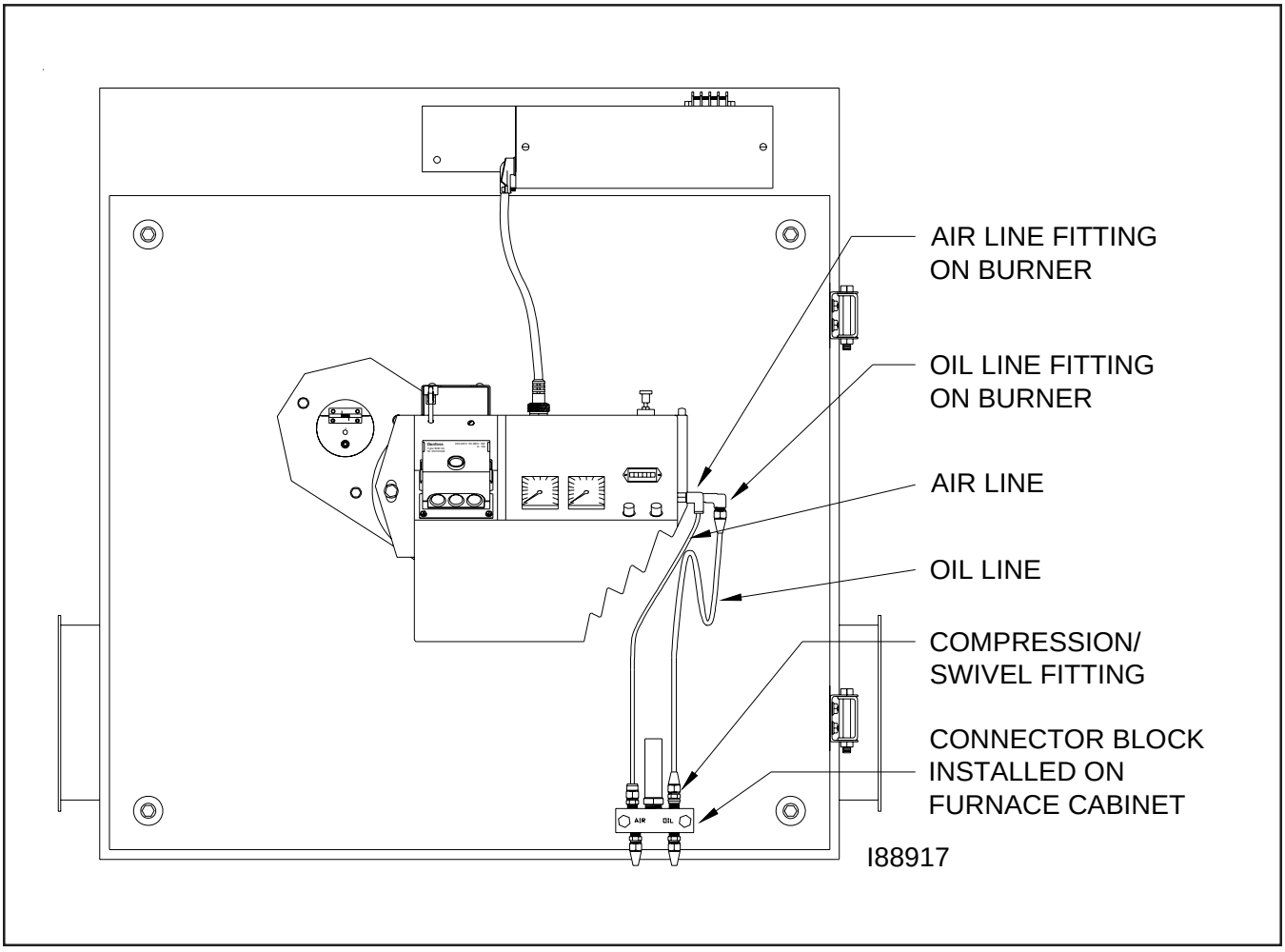


Figure 3I - Installation of Connector Block, Oil Line, and Air Line (Front View)

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 3J.

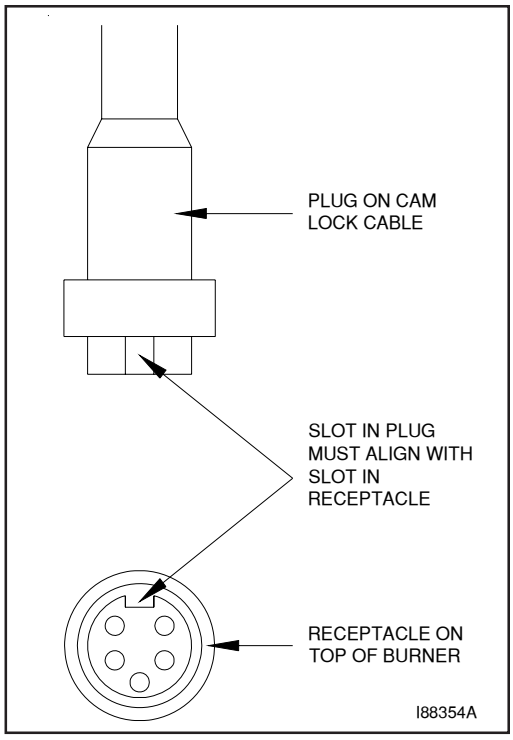


Figure 3J - Detail of Burner Electric Receptacle

Installing the Mounting and Stabilizer Brackets

Installing the Brackets on the Furnace Cabinet *(For Ceiling Mounting Only)*

NOTE: If you are **ceiling mounting** your furnace, it is critical that the mounting and stabilizer brackets be installed as described below.

The **mounting brackets** must be attached to the furnace base to allow ceiling installation of the furnace using "all-thread" rods. **See Figures 3A/3B.**

The weight of the furnace must be supported by the mounting brackets. The **stabilizer brackets** are installed on the top of the furnace to properly align the "all-thread" rods. *The stabilizer brackets will not support the furnace.*

1. Refer to Figures 3A and 3B.
2. Install both mounting brackets 2.5 cm (1") channel on the base of the furnace using the four (4) bolts supplied.
3. Install the two (2) stabilizer brackets on the top of the furnace using self-tapping screws.

NOTE: Your furnace is now assembled and ready for installation. Install the furnace as soon as possible so the burner and/or blower 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) Oil Tank Installation Specifications (review)
(4) Installing the Metering 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** provides a general overview of a typical furnace installation and should be reviewed closely before proceeding.

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. Access to the furnace must be restricted; only trained, qualified personnel should be permitted to perform installation and operation procedures.

WARNING: To prevent damage to the furnace and to ensure personal safety, lifting, mounting, and hanging of the furnace must be performed in accordance with safe handling procedures.

Important Safety Guidelines for Safe Installation

General installation of the appliance shall be in accordance with the manufacturer's literature, in addition to complying with the following:

BS5410 Code of Practice for Oil Firing

1997: Installation up to 45 KW output capacity for space heating and hot water supply purposes.
1998: Installation of 44 KW and above capacity for space heating, hot water and steam supply purposes.
1978: Installation for furnaces, kilns, ovens and other industrial purposes.

The Building Regulations:

England and Wales: Approved Document J: Heat Producing Appliances (1991).
Scotland: Technical standards for compliance with the Building Standard (Scotland) Regulations 1990, Part F: Heat Producing Installations and Storage of Liquid and Gaseous Fuels.
Northern Ireland: The Building Regulations (Northern Ireland) 1990. Technical Booklet L - Heat Producing Appliances, July 1991.
Republic of Ireland: The Building Regulations of Ireland 1997, Part J: Heat Producing Appliances.
Isle of Man, Jersey and Guernsey: The Building Bylaws - BS 7671: 1992 IEE Wiring Regulations 16th Edition.

Important Safety Guidelines for Safe Installation (continued)

The Environmental Protection Act 1990, Part 1: Processes prescribed for air pollution control by local enforcing authorities PG1/1 (95).
Secretary of State's Guidance: Waste Oil Burners, less than 0.4 MW net rated thermal input. November 1995 (Appendix A of OFTEC OFSA 103).
OFTEC Guidelines: Document OFG100 for externally serviced oil fired appliances.

Important Notes to the Electrician

WARNING: Electrical installation of the furnace is to be performed only by qualified personnel (i.e. licensed electrician/engineer). Improper electrical installation can adversely affect the proper, safe operation of the furnace and may cause serious personal injury/death.

WARNING: Before completing any furnace wiring, refer to the wiring diagrams in Appendix B at the back of the manual. Carefully review the wiring assignments and colors, noting that the Clean Burn wire colors may not be "standard" or familiar.

WARNING: High earth leakage current / earth connection is essential and must be established before connecting the main power supply.

WARNING: Low voltage terminals are only protected by basic insulation--caution is required.

CAUTION: Use only approved wire conduit and connectors when wiring the Clean Burn furnace. An emergency stop device (i.e. "panic button") must be installed at ground level in the mains cable to the furnace to ensure the safety of furnace operators and service personnel. The external disconnect device must employ a contact separation of 3mm in all poles; the external breaker must be an approved type.

CAUTION: The main cable must be introduced into the control box using conduit connectors which provide adequate strain relief. The main cable installation must be accomplished using suitably rated and approved wiring (BASEC or HAR) or appropriate current-carrying capacity. The wires should have a minimum rating of 90 degrees C.

NOTE: According to Clause 4A of 61000-3-11 (International Electrical Standard), the user must determine, in consultation with the supply authority, that the furnace is connected only to a supply with an impedance of $3.773 \times 10^{-3} + 2.358 \times 10^{-3}$ or less.

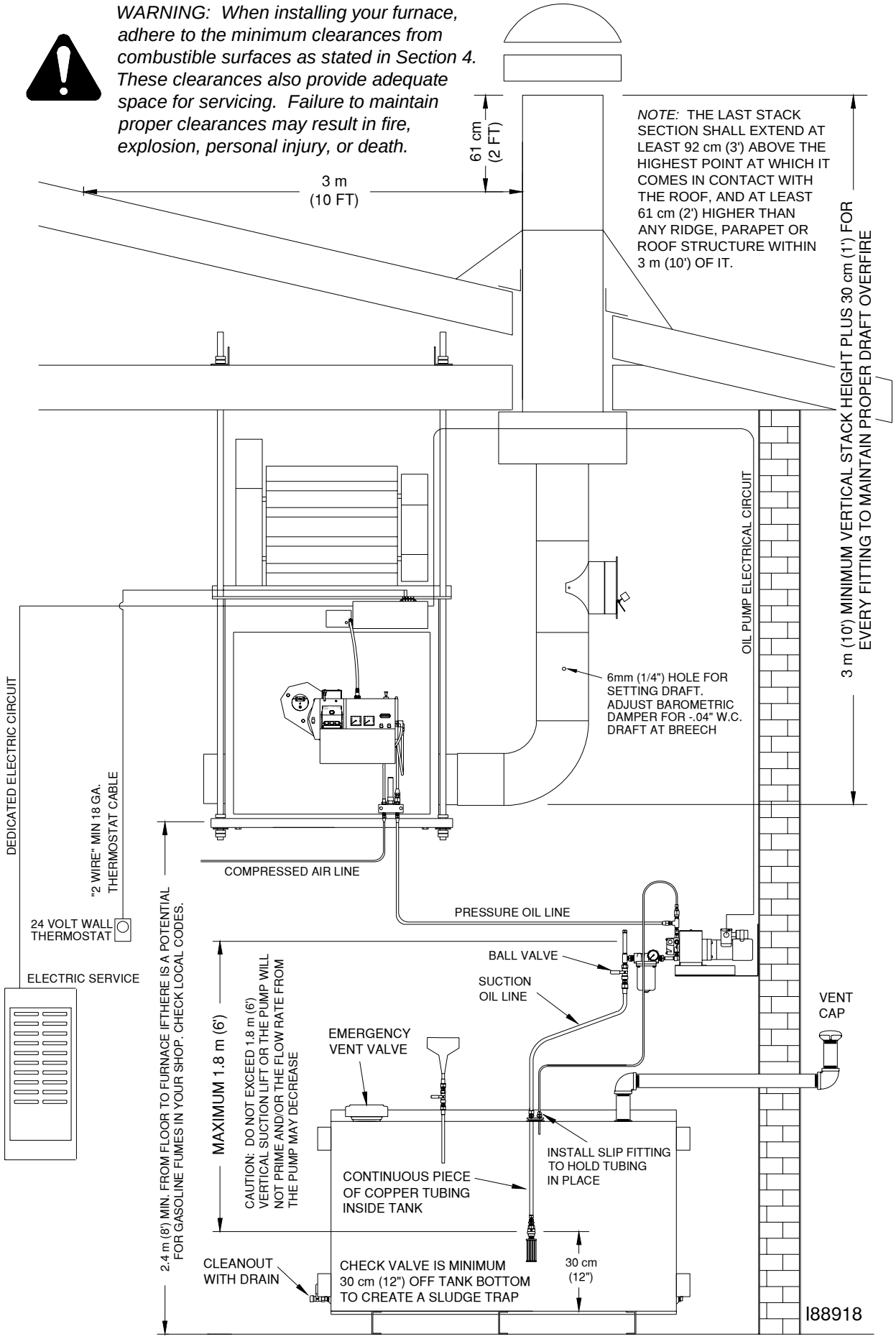


Figure 4A - Typical CB-3500 / CB-5000 Furnace Installation

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.

WARNING: Adhere to the following *minimum* clearances from combustible surfaces and to provide adequate clearance for servicing (also refer to **Figure 4B** for visual reference); failure to maintain proper clearances may result in fire, explosion, personal injury or death.

CLEARANCES FOR CB-3500/CB-5000 INSTALLATIONS

- TOP (above blower) ..... 5 cm (2")
- FRONT (burner) ..... 152 cm (60")
- SIDES ..... 61 cm (24")
- CHIMNEY CONNECTOR ..... 46 cm (18")
- REAR ..... 46 cm (18")
- BOTTOM ..... 61 cm (24")
- WARM AIR DUCTS within 3ft.** ..... 15 cm (6")

***Where applicable*

WARNING: Local codes may require that your furnace is mounted a minimum of 2.4 m (8') off the ground if there is the possibility of gasoline fumes or other combustible or explosive fumes in your shop area.

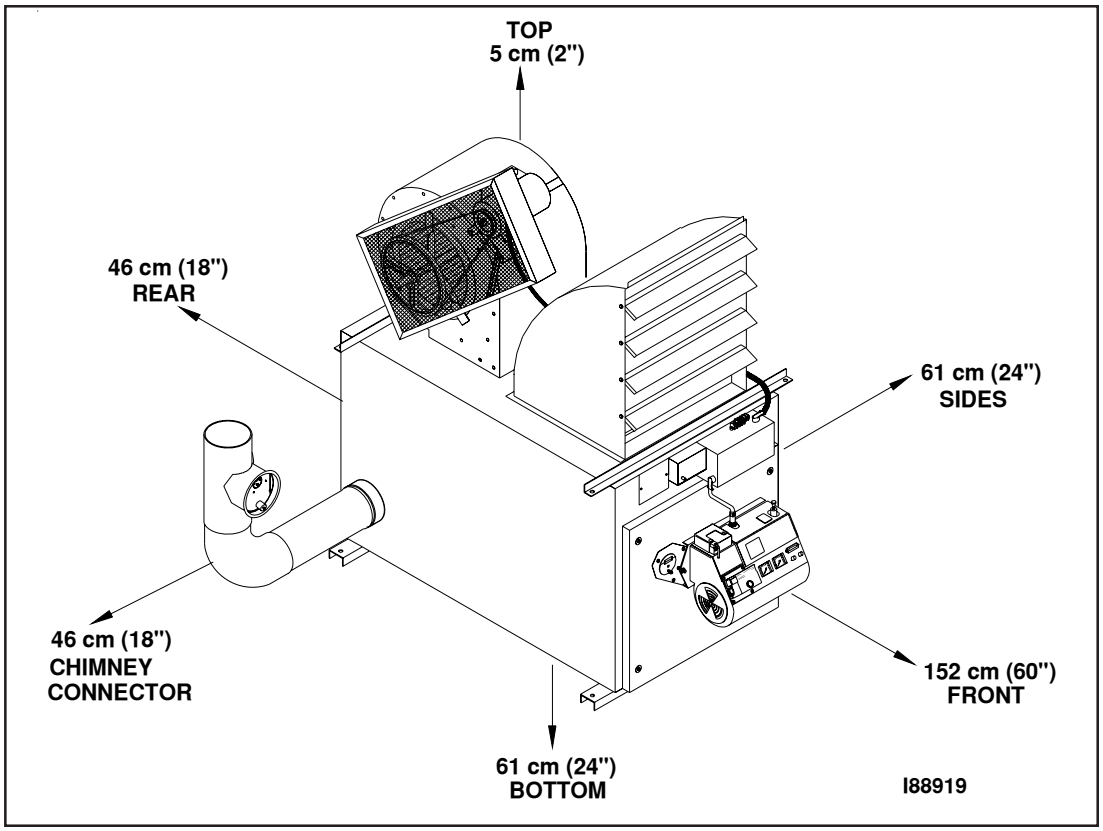


Figure 4B - Clearances from Combustibles

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

WARNING: To prevent serious personal injury, ensure that your furnace mounting system can safely bear the suspended weight of the furnace and allow safe servicing of furnace components. Use minimum 64 mm x 64 mm x 6 mm (2-1/2" x 2-1/2" x 1/4") angle iron beams bridged across sufficient structural members to safely support the furnace.

1. Refer to Figure 4C.
2. Follow the instructions as provided in the diagram.
3. Use a level to make sure the cabinet is level side to side and front to back.

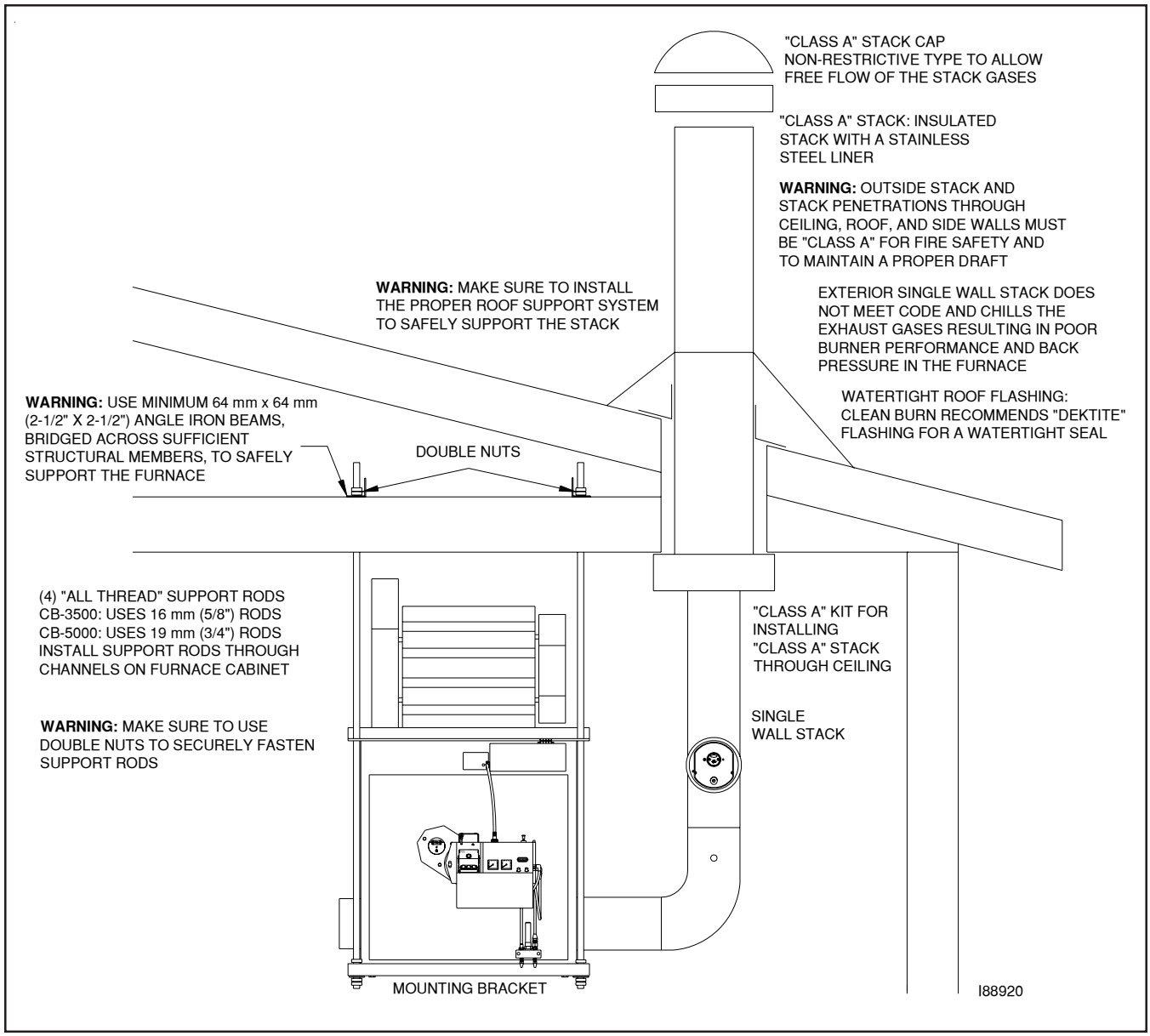


Figure 4C - Ceiling Mounting Installation Overview

Mounting the Furnace (continued)

Raised Platform Mounting

WARNING: To prevent serious personal injury, 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) and must be securely anchored to an adjacent wall.

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

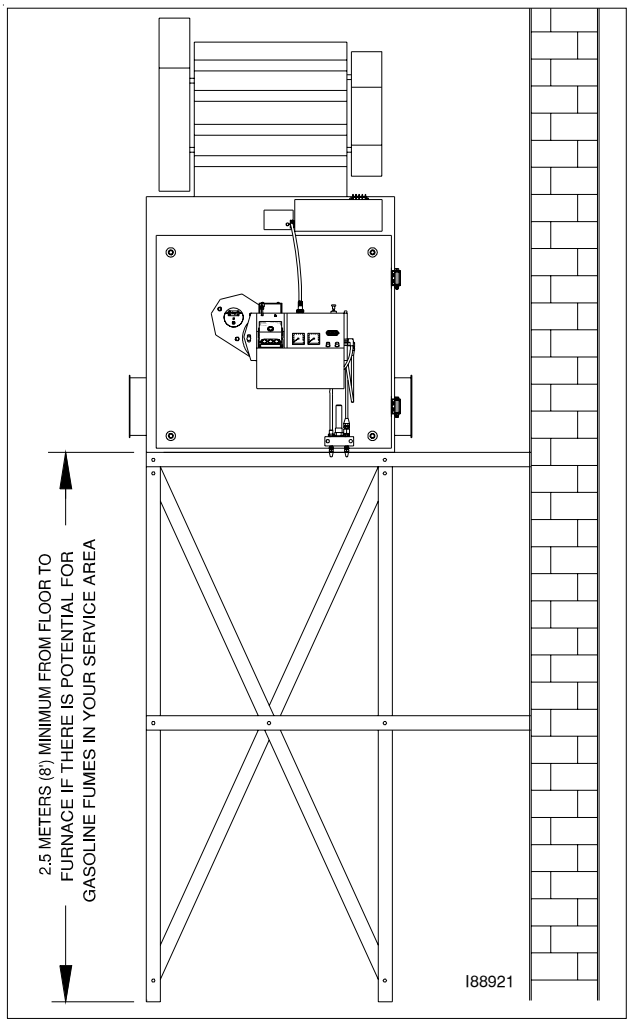


Figure 4D - Furnace Installed on Raised Platform

Floor Mounting

WARNING: To prevent serious personal injury, make sure the floor can safely bear the weight of the furnace.

CAUTION: If you are installing your furnace in an area with a combustible floor (e.g. over the top of a parts room or on a mezzanine), you must construct a *non-combustible* floor as shown in Figure 4E.

Constructing A Non-Combustible Floor

1. Determine the size of floor you will need to construct:
   - Measure the width and length of the cabinet of the furnace.
   - Add 30 cm (12") minimum to ***all*** sides of the cabinet to achieve the total measurement for the non-combustible floor.

   EXAMPLE: The CB-3500 measures 147 cm (58") long x 89 cm (35") wide.
   147 cm + 30 cm + 30 cm = 207 cm (82") long
   89 cm + 30 cm + 30 cm = 149 cm (59") wide

2. Refer to Figure 4E. Install two (2) pieces of 16 mm (5/8") sheet rock on top of the combustible material (wooden floor, wooden beams, etc.) The sheet rock must be cut to the size of the total non-combustible floor area.
3. Place a sheet of 24-gauge (minimum) galvanized sheet metal on top of the sheet rock; the sheet metal must cover the sheet rock completely.
4. Place 10 cm (4") thick (minimum) hollow masonry block, end to end, on top of the 24-gauge sheet metal to make a solid foundation. Be sure to add center cross blocking to safely and adequately support the furnace.

Constructing A Non-Combustible Floor (continued)

5. Place a 24-gauge sheet metal pan with a 2.5 cm (1") containment lip on top of the masonry blocks. This will provide containment of any oil that may be spilled while working on the furnace.
6. Position the furnace on top of the sheet metal pan; make sure you maintain the extra 30 cm (12") minimum clearance on all sides of the cabinet.
7. Ensure that the installation adheres to all clearances from combustibles as stated at the beginning of Section 4 in this manual.
8. After positioning the furnace cabinet on the sheet metal pan, install 5 cm (2") tall (minimum) cinder blocks (4) under each corner of the furnace to elevate the cabinet off the sheet metal pan to allow clearance for installation of fittings on the connector block.

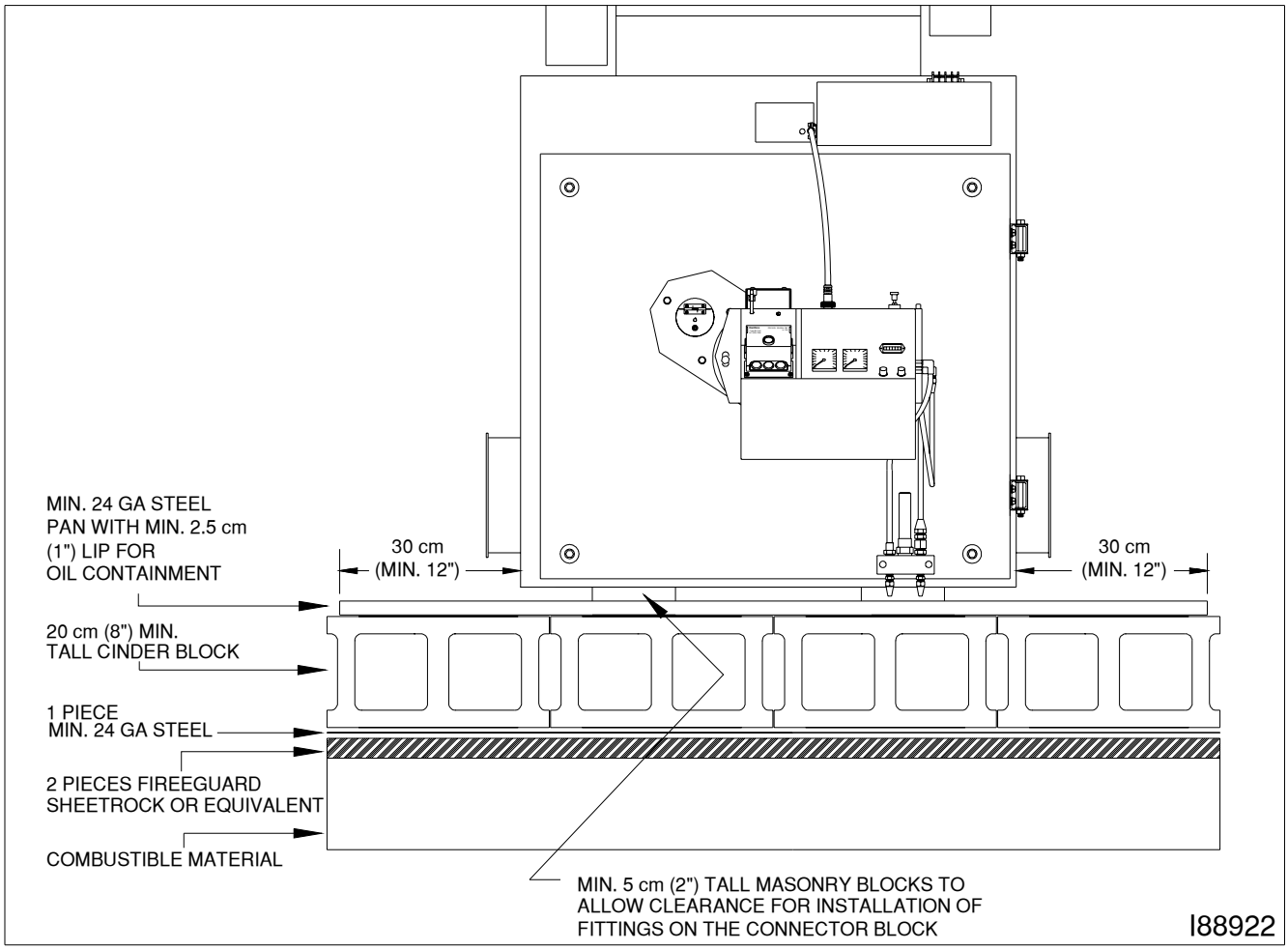


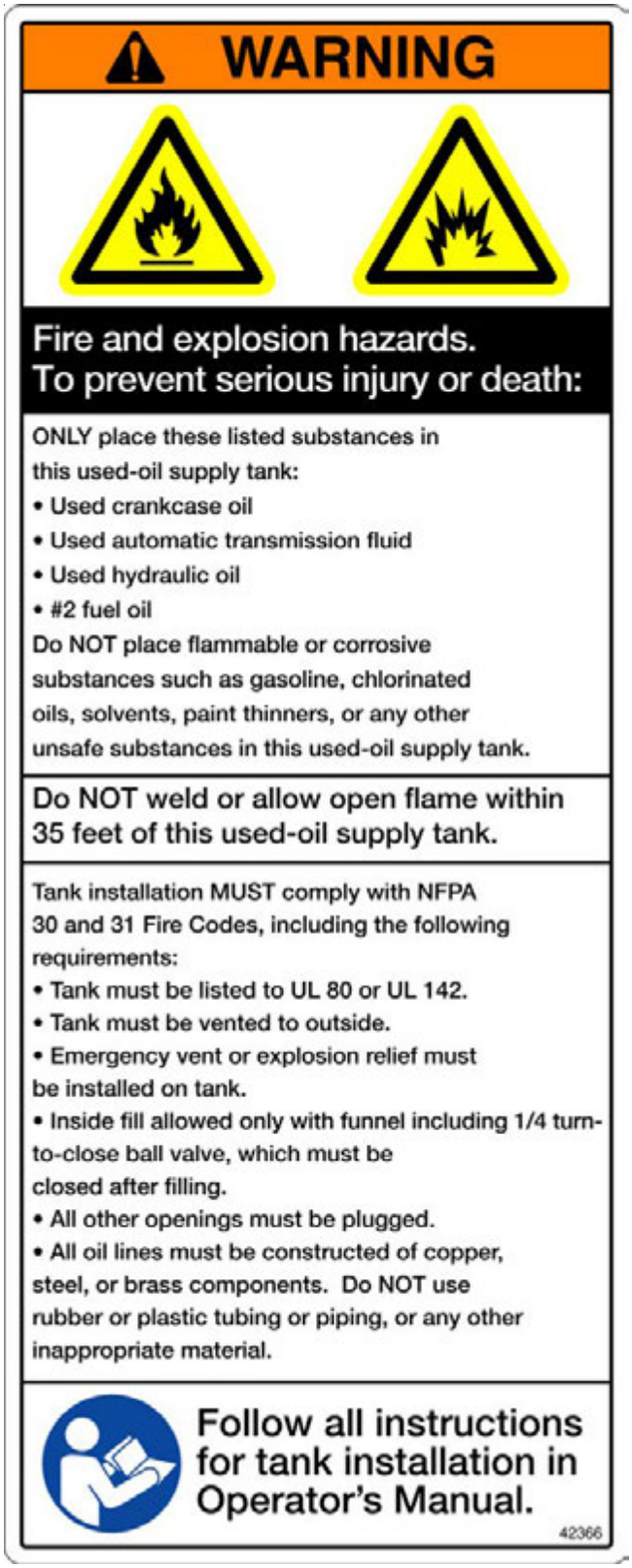
Figure 4E - Furnace Installed on Non-Combustible Floor

Oil Tank Installation Specifications

Ensure that your tank installation adheres to the following safety guidelines as stated here and in **Section 1** of this manual.

The tank safety label (shown at right) also summarizes these important specifications for tank installation and usage. If you do not have a copy of this label, please contact your Clean Burn dealer for a copy, which is to be affixed directly to your used oil supply tank.

- **The tank installation must meet all national and local codes.** Consult your local municipal authorities for more information as necessary.
- Use a minimum **1000 Liter tank**. DO NOT use drums 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.
- For optimal system functioning, Clean Burn Recommends inside tank installations as shown in Figures 4A, 4F, and 4J.
- The tank must be **vented to the outside** of the building using iron or steel pipe and fittings with an approved vent cap.
- Carefully review the oil tank and pump installation details as shown in Figures 4A, 4F, and 4J including the metering pump installation and specifications for the oil line installation. (Procedures for installing these components can be found in the following pages.)
- Ensure that the oil supply tank is **properly maintained**; refer to Section 9 in this manual for related procedures.



ATTENTION: For outside tank installations and/or tanks larger than 1890 Liters (500 gallons), contact the Clean Burn Service Department for installation recommendations and specifications.

Oil Tank Installation Specifications (continued)

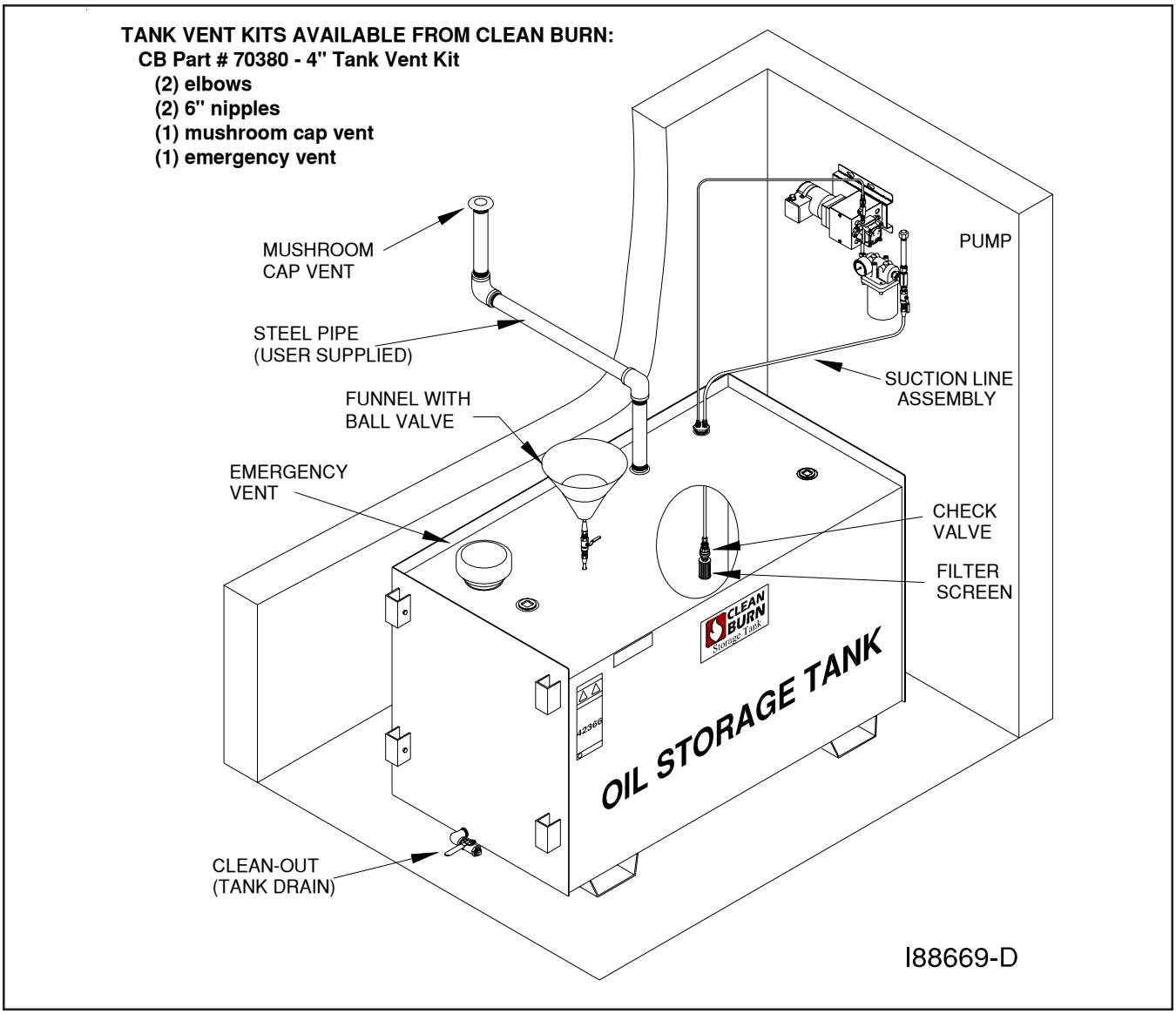


Figure 4F - Typical Metering Pump Installation with Inside Tank

Installing the Tank Vent and Emergency Vent

Codes require that you install a tank vent (to the outside) and an emergency vent for your tank as shown in Figure 4F. **Tank Vent Kits** are available from Clean Burn; contact your local Clean Burn dealer to order. Be sure to check your local codes for any additional tank installation requirements, and adhere to the following installation guidelines:

- Install a length of minimum 5 cm (2") steel pipe (user-supplied) terminating outside with a proper vent cap as shown in Figure 4F. Consult local codes for information and requirements concerning the proper venting of oil storage tanks.
- Install an emergency vent as shown in Figure 4F. Contact your tank manufacturer for information concerning the proper emergency vent for your tank.

Installing the Metering Pump

Preparing for Installation

Before starting installation of the metering pump, review Figures 4G, 4H, and 4I to become familiar with the metering pump components. You will also need to accomplish the following activities:

- Verify that you have the proper metering pump for your furnace (note the specific gear motor part numbers shown in Figure 4H).
- Gather all required tools and materials as needed for installation; as indicated in the following procedures, some materials (e.g. fittings, tubing) are to be user-supplied.
- *Standard mounting* is vertical mounting on a wall; **this pump installation is recommended.** *Alternate mounting* is horizontal mounting on a bracket. Be sure to carefully follow the appropriate procedures/diagrams for pump mounting.
- For optimal metering pump functioning, ***ensure that the pump is mounted at a distance not more than 122 cm (4 feet) from the oil tank.***

Standard Mounting: Vertical Positioning

1. Refer to Figures 4G, 4H, and 4I. Note that the metering pump is shipped with the pump head already positioned for vertical wall mounting.
2. Use the appropriate type of bolts and washers (user-supplied) to securely mount the metering pump to the appropriate wall in your building ***at a distance not more than 122 cm (4') from the tank.***

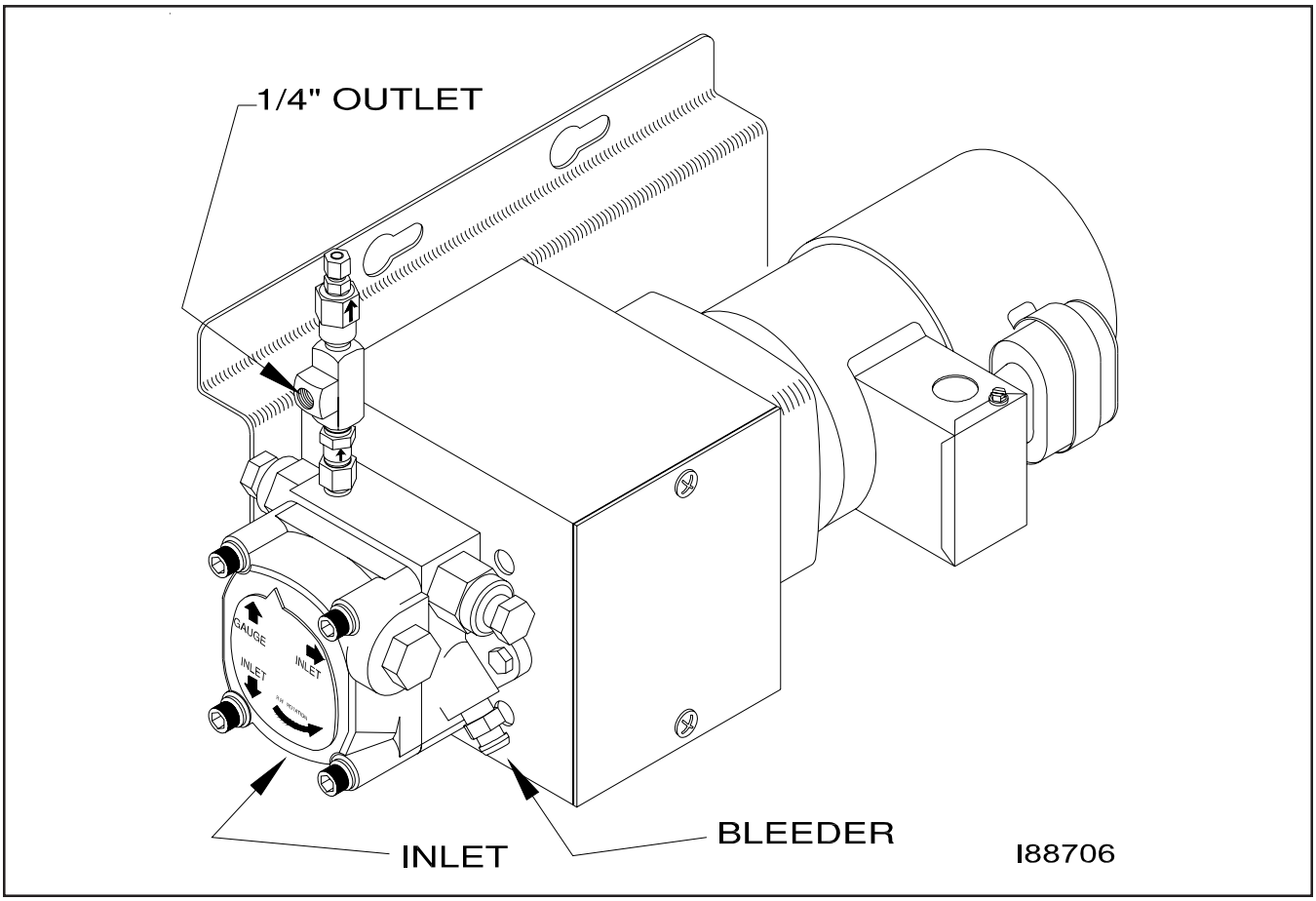
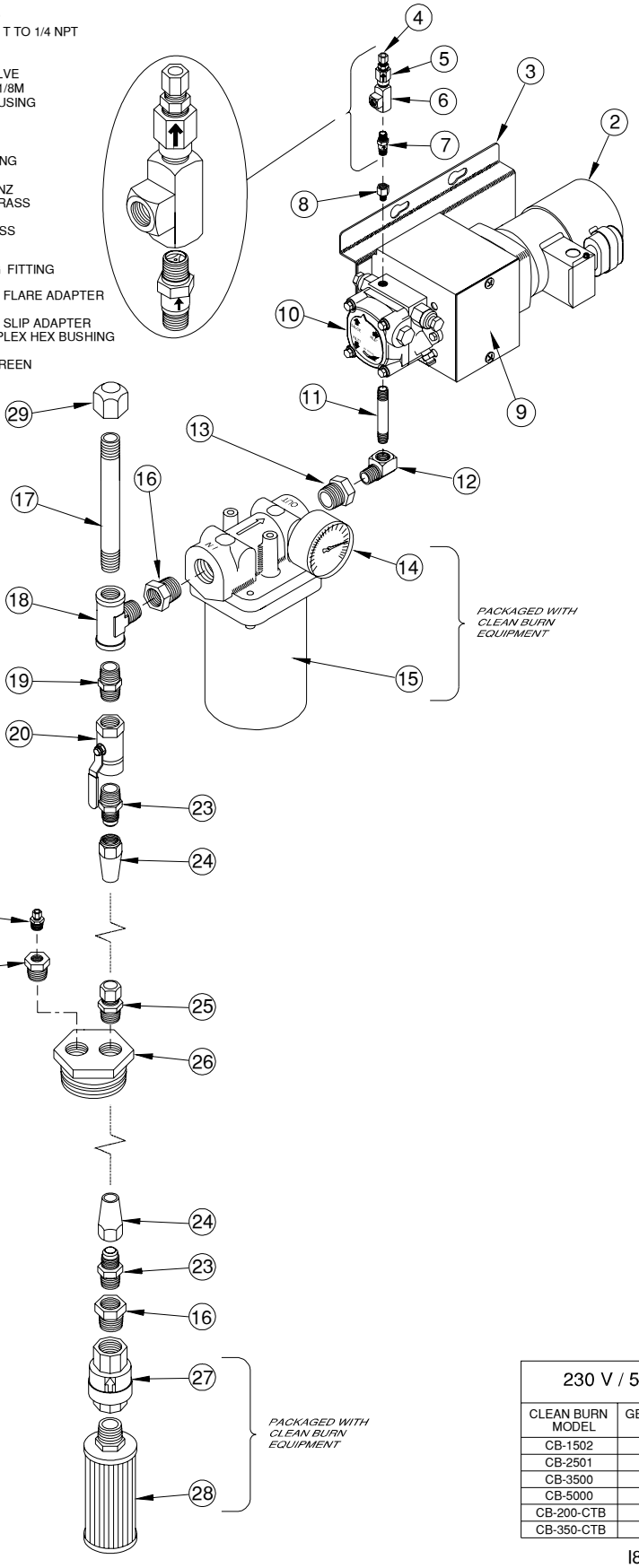


Figure 4G - Standard (Recommended) Vertical Mounting of the Metering Pump

#	PART #	DESCRIPTION
2	see chart	GEARMOTOR
3	11322	MOUNT - METER PUMP
4	32062	MALE CONNECTOR 1/4 T TO 1/4 NPT
5	32293	RELIEF VALVE
6	32425	1/4 NPT BRASS TEE
7	32424	LOW FLOW CHECK VALVE
8	32335	ADAPTOR PIPE 1/4F X 1/8M
9	21119	LID - METER PUMP HOUSING
10	32327	METER PUMP
11	32467	1/4" X 3" NIPPLE
12	32210	1/4" STREET ELBOW
13	32336	1/4 X 3/4 BRASS BUSHING
14	32123	VACUUM GAUGE
15	32127	CANISTER FILTER- LENZ
16	32430	1/2" x 3/4" BUSHING, BRASS
17	32246	1/2" X 5" NIPPLE
18	32429	1/2" STREET TEE, BRASS
19	32137	1/2" HEX NIPPLE
20	32142	1/2" BALL VALVE
21	32062	1/4" NPT x 1/4" TUBING FITTING
22	32443	1/4" x 1/2" BUSHING
23	32141	1/2" NPT x 1/2" TUBING FLARE ADAPTER
24	32140	1/2" LONG NUT
25	32139	1/2" NPT x 1/2" TUBING SLIP ADAPTER
26	32442	2" x 1/2" x 1/2" NPT DUPLEX HEX BUSHING
27	32021	3/4" CHECK VALVE
28	32061	3/4" CHECK VALVE SCREEN
29	32445	1/2" PIPE CAP



230 V / 50 Hz	
CLEAN BURN MODEL	GEARMOTOR PART #
CB-1502	33425
CB-2501	33426
CB-3500	33427
CB-5000	33428
CB-200-CTB	33530
CB-350-CTB	33436

I88728-D

Figure 4H - Metering Pump Component Detail

Installing the Metering Pump (continued)

Alternate Mounting: Horizontal Positioning

ATTENTION: If the metering pump is to be mounted horizontally or on a bracket as shown in Figure 4I, the pump head must be rotated counterclockwise so that it is aligned in a horizontal position. ***The gauge arrow on the pump head must point up, or the pump will not prime.***

1. Refer to Figures 4H and 4I.
2. Remove the two pump mounting bolts. The coupling is keyed and does not have set screws.
3. Rotate the pump head 180 degrees to the horizontal position as shown in Figure 4I.
4. Re-install and tighten the two pump mounting bolts.
5. Use the appropriate type of bolts and washers (user-supplied) to securely mount the metering pump to the mounting bracket, which is to be installed on the appropriate wall in your building ***at a distance not more than 122 cm (4 feet) from the oil tank.***

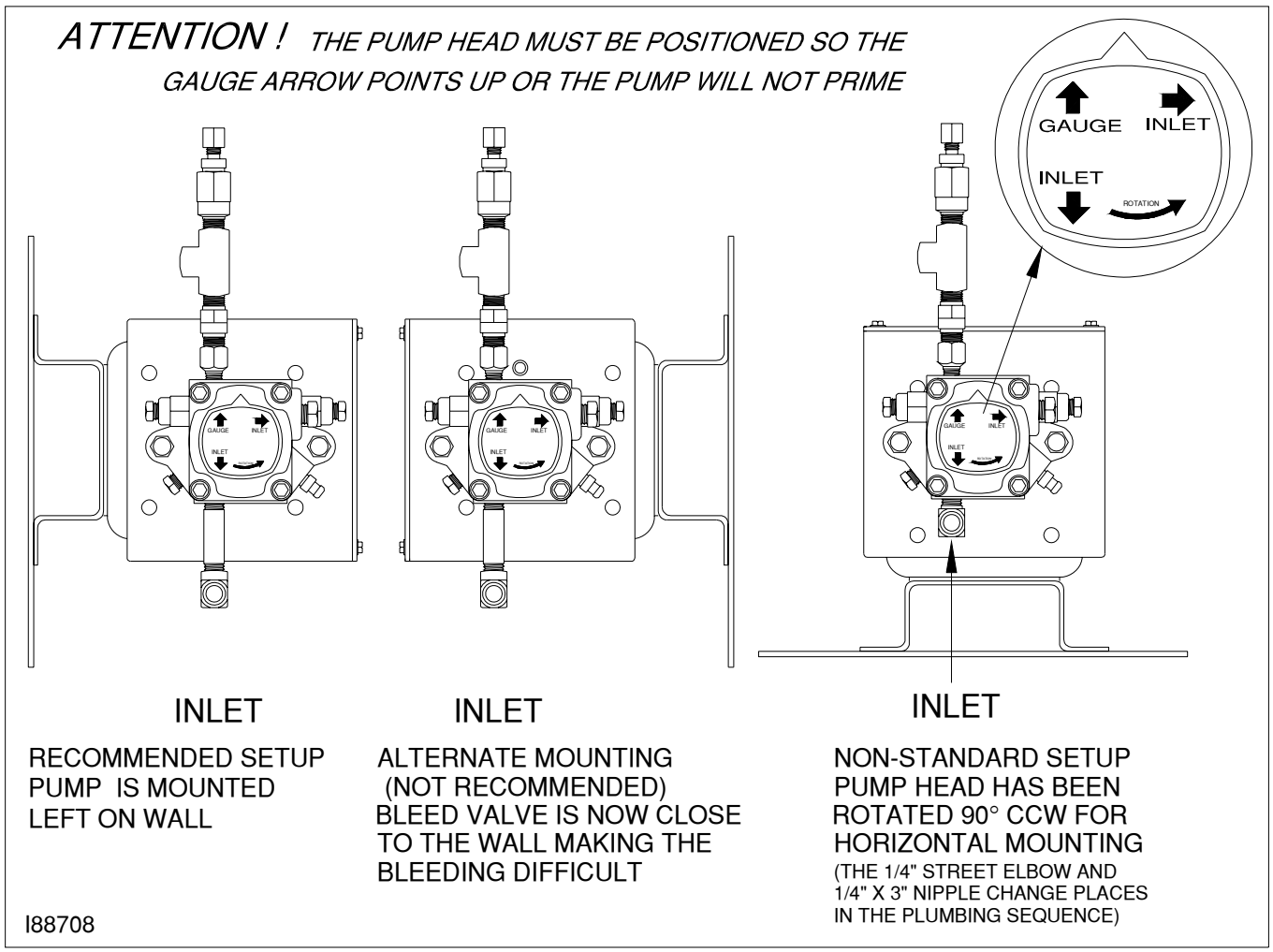


Figure 4I - Proper Positioning of Metering Pump Head

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 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 metering 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 and adhere to the following specifications for wire type:

Model	Wire Specification/Type
Model 3500	10 gauge, 4-wire / copper wire ONLY
Model 5000	10-gauge, 4-wire / copper wire ONLY

WARNING: DO NOT tie into an *existing* circuit, or electrical overload may occur.

2. Wire the furnace according to the Wiring Schematic, Figure B1, in Appendix B. ***Ensure that the ground wire is attached to the GREEN ground screw on the furnace junction box.***
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.

Model	Voltage	Breaker Size*	Circuit	Hertz
CB-3500	230	30 amps*	Dedicated	50
CB-5000	230	30 amps*	Dedicated	50

   ***NOTE:** When installing any optional equipment (e.g. air compressor or draft inducer), you do not need to "upgrade" the breaker size. **The breaker size listed above should be sufficient.** Make sure a qualified electrician properly sizes and installs this electrical circuit. **10-gauge copper wire is required for a 30 amp breaker.**

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

Wiring to the Metering Pump

WARNING: 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. DO NOT wire the pump directly to a wall outlet so that it runs continuously; this will seriously damage your metering pump and/or furnace and may result in a fire or explosion hazard.

1. Install the pump electrical circuit from the furnace to the metering pump location.
2. Wire the pump circuit according to the **Metering Pump Wiring Schematic** in Appendix B at the back of this manual.

Installing the Suction Oil Line Components

ATTENTION: It is critical that you adhere to the following specifications for suction oil line installation *(oil line from the tank to the pump)*. If these specifications are not met, the metering pump will not function correctly and the burner will shut down on reset. The majority of service problems with the metering pump are caused by leaks at fittings in the suction oil line; these problems are eliminated by ensuring a 100% airtight suction oil line which slants up to the pump.

- All suction oil line components must be installed as shown in Figures 4H and 4J. **Suction line size is 13 mm (1/2") diameter.** Proper installation allows the suction oil line to be filled with used oil during initial priming.

- The suction oil line may NOT exceed **183 cm (6') TOTAL vertical lift AND 122 cm (4') TOTAL horizontal lift** *(which equals 6.0" hg maximum operating vacuum)*. To determine if your suction oil line will meet this specification for maximum operating vacuum, base the calculation for your installation on the following equivalents:
  30 cm vertical (1') = 0.75" hg (vacuum)
  122 cm horizontal (4') = 0.75" hg (vacuum)
  NOTE: ALSO ADD 0.75" hg to the final sum to account for every oil filter, shut-off valve, and check valve on the suction side of the pump assembly.
  Sample calculation: 183 cm (6') vertical x (0.75" hg/30 cm) = 4.50" hg AND
  122 cm (4') horizontal = 0.75" hg
  4.50" hg + 0.75" hg + 0.75" hg = 6.00" hg vacuum

- The metering pump must be installed with a **check valve and screen** at the end of the suction oil line, or the pump will not maintain its prime.

- Use **Permatex #2 non-hardening gasket sealer** on every threaded fitting. DO NOT use teflon tape or teflon pipe dope compounds; the teflon can flake off and cause damage to the pump head.

- **The suction oil line must be 100% airtight for proper system functioning.** Use only high-quality flare fittings for the copper tubing. DO NOT use compression fittings. DO NOT use any steel pipe unions. DO NOT use sweat copper pipe. These types of fittings cause air leaks in the suction oil line and will require re-installation.

- **The suction oil line must slant up to the pump;** any high spots will trap air and will not allow the pump to prime.

1. **Assemble the suction oil line fittings *(from the metering pump to the canister filter)*:**
   a. Refer to Figure 4H for a detailed look at the metering pump components and fittings.
   b. Remove the plug from the 1/4" inlet port of the pump.
   c. Install the 1/4" x 3" brass nipple into the 1/4" inlet port on the pump.
   d. Install the 1/4" brass street elbow onto the 3" brass nipple; turn the fitting onto the nipple until it is tight and faces away from the pump mounting plate.
   e. Prepare the canister filter for installation:
      - Install the 3/4" x 1/4" brass hex bushing into the outlet port of the canister filter. *Check the direction of the arrow for the proper flow.*

Installing the Suction Oil Line Components (continued)

(1.) (e.) Prepare the canister filter for installation *(continued):*

- Install the 3/4" x 1/2" brass bushing into the inlet port of the canister filter.
- Remove the plug from one of the 1/8" gauge ports in the canister filter and install the vacuum gauge. Seal the threads of the gauge with Permatex #2 non-hardening gasket sealer.
- Install the 1/2" threaded pipe adapter into one side of the 1/2" ball valve.
- Install the 1/2" MPT x 1/2" flare adapter into the other side of the ball valve.
- Install this assembly into one side of the 1/2" brass tee.
- Install the assembled 1/2" tee into the 3/4" x 1/2" brass bushing, which is installed in the inlet port of the canister filter. Make sure that the 1/2" flare adapter is pointing down.
- Install the canister filter assembly onto the 1/4" brass street elbow as shown in Figure 4H. The canister filter must be installed with the arrow pointing towards the pump (direction of oil flow).
- Install the 1/2" x 5" brass nipple into the top side of the 1/2" brass tee assembly.
- Loosely install the 1/2" brass cap onto this nipple; DO NOT tighten the cap at this time.

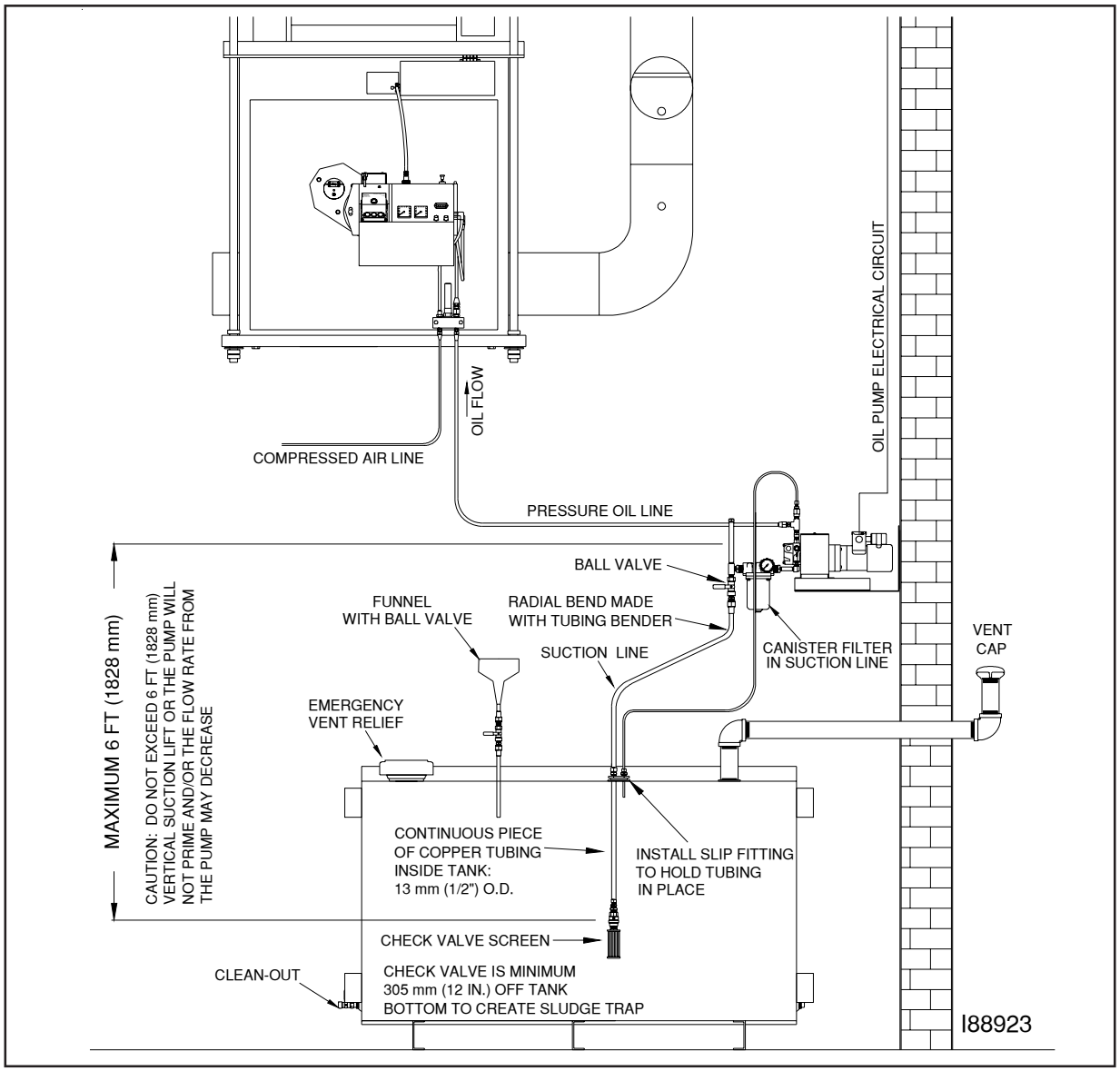


Figure 4J - Oil Line Installation Overview

2. **Install the suction oil line *(from the the tank to the canister filter)*:**
   a. Refer to Figures 4H and 4J. Prepare a piece of 1/2" O.D. copper tubing (user-supplied) which will function as the pick-up line from the tank to the canister filter. This copper tubing must have the following specifications:
      - The tube must be one continuous piece of 1/2" O.D. copper tubing with no kinks or fittings.
      - The tube is to slant up from the tank to the pump with no loops or high points to trap air.

   c. Locate the 2" MPT x 1/2" FPT x 1/2" FPT duplex, slip-thru hex bushing (which will eventually be installed into one of the 2" openings on the tank). *Note that the fitting is marked "S" for suction and "R" for return.*
   d. Install the 1/2" MPT x 1/2" slip fitting into the "S" side of the 2" duplex slip-thru hex bushing.
   e. Install the 1/4" MPT x 1/4" compression fitting into the 1/2" x 1/4" brass bushing.
   f. Install the 1/2" x 1/4" brass bushing into the "R" side of the 2" duplex slip-thru hex bushing.
   g. Measure the height of the oil tank (from the bottom of the tank, NOT the floor) to the 2" opening that you are going to use for the supply oil line. Deduct 12" (305mm) from this measurement and transfer this new measurement onto the 1/2" O.D. copper tubing.
   h. Remove the locking nut and ferrel sleeve connector from the 1/2" slip fitting, and slide them over the copper tubing.
   i. Slide the 1/2" O.D. copper tubing through the 1/2" slip fitting, which is installed in the "S" side of the 2" hex bushing.
   j. Install the screen into one side of the 3/4" check valve (making sure the arrow is pointing away from the screen assembly).
   k. Install the 3/4" x 1/2" brass bushing into the 3/4" check valve.
   l. Install the 1/2" MPT x 1/2" flare adapter into the 3/4" x 1/2" brass bushing.
   m. Slide the 1/2" flare nut over the end of the 1/2" copper tubing, and flare the end of the tubing. **NOTE:** Use a high-quality flaring tool (such as a Ridgid Flaring Tool) to ensure that all flares are made properly (i.e. so they will be 100% airtight).
   n. Install the flared oil line and nut onto the assembled check valve/screen and tighten.
   o. Pick up the assembled oil line, and carefully guide the end of the tubing with the check valve through the 2" tank opening.
   p. Apply Permatex #2 non-hardening gasket sealer (or equivalent) to the threads of the 2" duplex slip-thru tank bushing, and tighten this fitting into the tank.
   q. Pull the 1/2" copper tubing back up through the slip fitting until you see the mark that you put on the tubing earlier. Holding the tubing with one hand, push the ferrel sleeve connector and locking nut down the tubing, then tighten onto the 1/2" slip fitting. The oil line is now installed in the correct position off of the bottom of the tank.
   r. Carefully bend the oil line up to the canister filter; use a spring bender over the oil line while bending the tubing to prevent kinks in the oil line. Allowing for the flare nut, cut off the excess tubing.
   s. Install the 1/2" flare nut onto the tubing, and flare the end of the tubing.
   t. Install the end of the tubing with the flare nut onto the 1/2" flare adapter (on the ball valve assembly at the canister filter).
   u. Install a vent from the tank to the outside of the building according to code. The tank must be properly vented to allow air to enter the tank as oil is pumped out and to safely vent fumes to the outside. See Figures 4J.
   v. Install plugs in all other tank openings as required by code.
   w. Inspect the installation. For proper suction oil line operation, make sure all components are installed and positioned as specified in this manual.

Installing the Pressure Relief and Low-Flow Check Valve

ATTENTION: It is critical that you adhere to the following specifications for pressure relief and low-flow check valve installation; if these specifications are not met, the metering pump will not function correctly and the burner will shut down on reset.

The metering pump requires the installation of a pressure relief and low-flow check valve as shown in Figures 4H, 4J, and 4K.

- The **pressure relief** will open and relieve pressure on the line if there is a restriction in the pressure oil line, clogged nozzle, etc.
- The **low-flow check valve** is a vital component which maintains pressure in the oil pressure line.

Be sure to use Permatex #2 non-hardening gasket sealer to seal every threaded fitting. DO NOT use teflon tape or teflon pipe dope compounds.

1. Refer to Figure 4K.
2. Remove the plug from the gauge port on top of the metering pump head.
3. Install the pressure relief valve assembly in a **vertical position** in the gauge port. Note that the directional arrows on the relief valve must be positioned so that the arrows point away from the pump head (i.e. in the direction of the oil flow).
4. Install 1/4" O.D. copper tubing (user-supplied) from the pressure relief back to the oil tank. Refer to Figure 4J as needed.

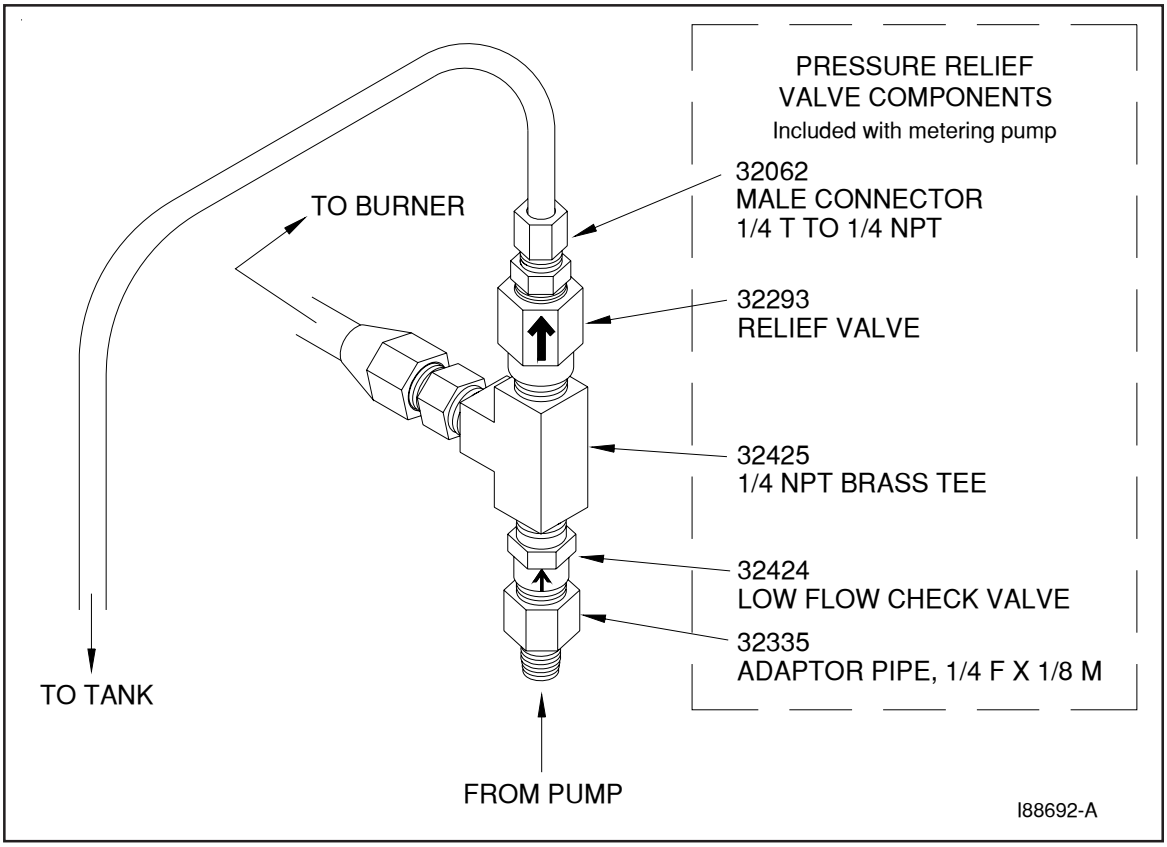


Figure 4K - Pressure Relief Valve Assembly Detail

Installing the Pressure Oil Line Components

ATTENTION: It is critical that you adhere to the following specifications for pressure oil line installation (oil line from the pump to the furnace); if these specifications are not met, the metering pump will not function correctly and the burner will shut down on reset.

- The parameters for pressure oil line installation are:

Length of Pressure Line	**Line Size**
Up to 30 m (100')	10 mm (3/8") O.D. copper tubing

- **The pressure oil line must slant up to the burner** with no loops or high points to trap air.

- Local codes may require the installation of an in-line **"Fire-O-Matic" safety valve**. Be sure to check all appropriate codes to ensure compliance.

1. Refer to Figures 4H, 4J, and 4K.
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 related illustrations. Be sure to use Permatex #2 non-hardening gasket sealer to seal every threaded fitting. DO NOT use teflon tape or teflon pipe dope compounds.

Installing the Compressed Air Line

NOTE: Your air compressor system must supply air pressure to the furnace with the following requirements: **1.7 bar (25 psi)** and **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 -- for Model CB-3500 use minimum 6 mm (1/4") O.D. copper tubing or equivalent; for Model CB-5000, use 10 mm (3/8") O.D. copper tubing or equivalent.
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 3.5 bar (50 psi).
   ATTENTION: DO NOT feed full shop air pressure to the burner or damage to burner components may occur.
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.
   ATTENTION: 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 (refer to **Figure 4L**)
(2) "Class A" stack through the sidewall and up the side of the building (refer to **Figure 4M**)

Stack Design and Specifications

ATTENTION: ***The stack design must be single and dedicated for each unit (furnace) according to the following specifications.*** A single stack serving more than one unit MUST be engineered/certified for that specific installation. Failure to adhere to this rule may result in less than optimal system performance.

Figures 4L and 4M illustrate recommended stack designs. Choose the stack design which is appropriate for your furnace installation and review all specifications provided in the corresponding drawing. When designing your stack, adhere to the following specifications:

- Model CB-3500 requires **minimum 20 cm (8") I.D. stack components.**
  Model CB-5000 requires **minimum 25 cm (10") I.D. stack components.**
- *Ensure that the vertical stack height is* ***at least 3 m (10') PLUS 45 cm (1.5') for every fitting*** *(e.g. 45 degree, 90 degree, or T) in the stack run.* 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 6 mm (1/4") per 30 cm (1') of 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 *lined* and *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.

Stack components should be installed in the following order:

(1) Inside stack *(from furnace breach to within 45 cm (18") of ceiling, roof, or sidewall of 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
(6) Draft Inducer *(standard component for Model CB-5000; optional accessory for Model CB-3500)*

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.

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 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: Local codes may require the installation of a clean-out tee.

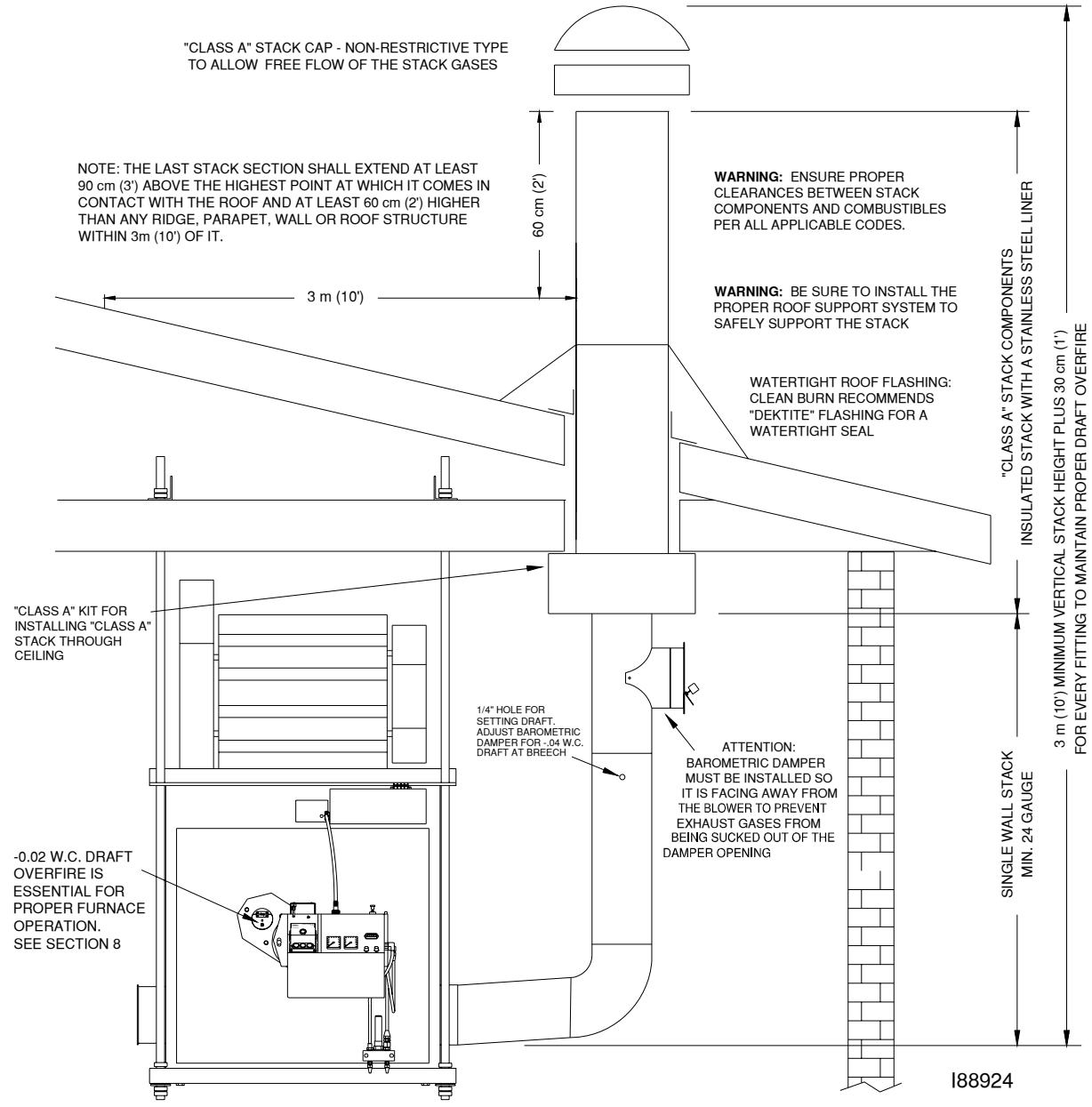


Figure 4L - Installation of "Class A" Stack Through Roof/Ceiling

Installing the Stack (continued)

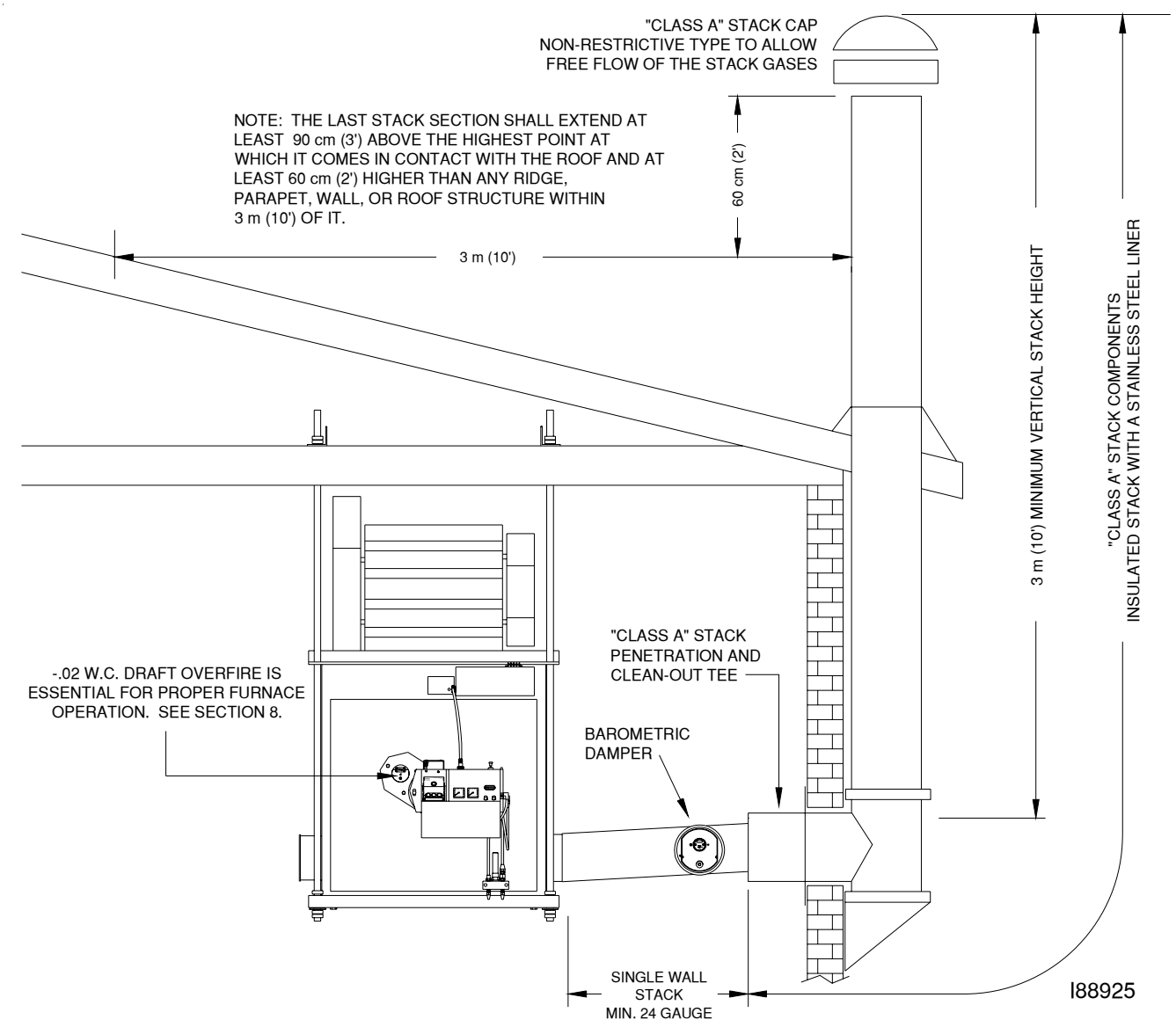
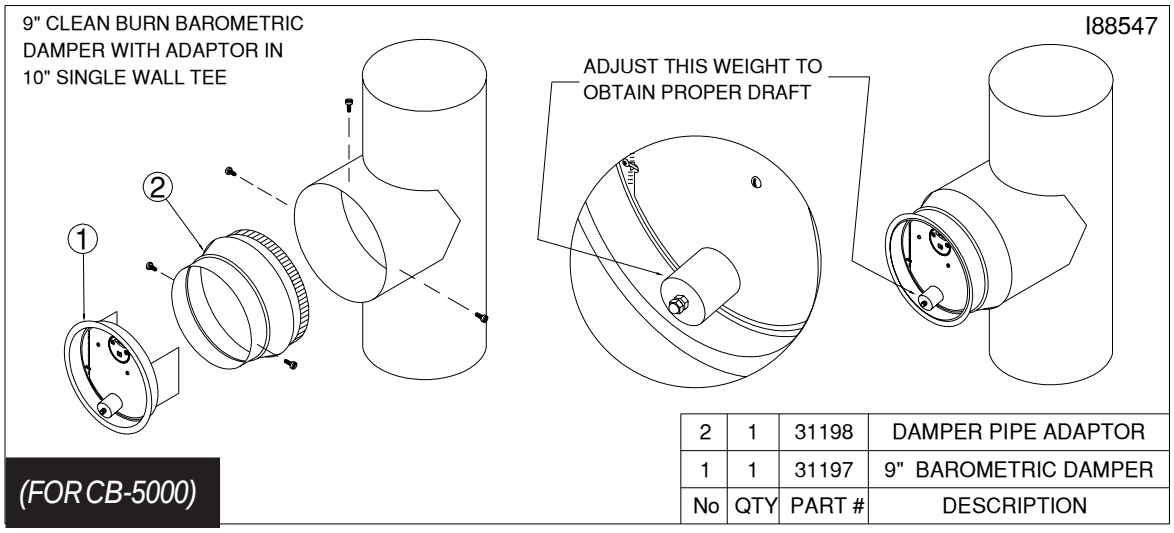


Figure 4M - Installation of "Class A" Stack Through Sidewall

Installing the Barometric Damper

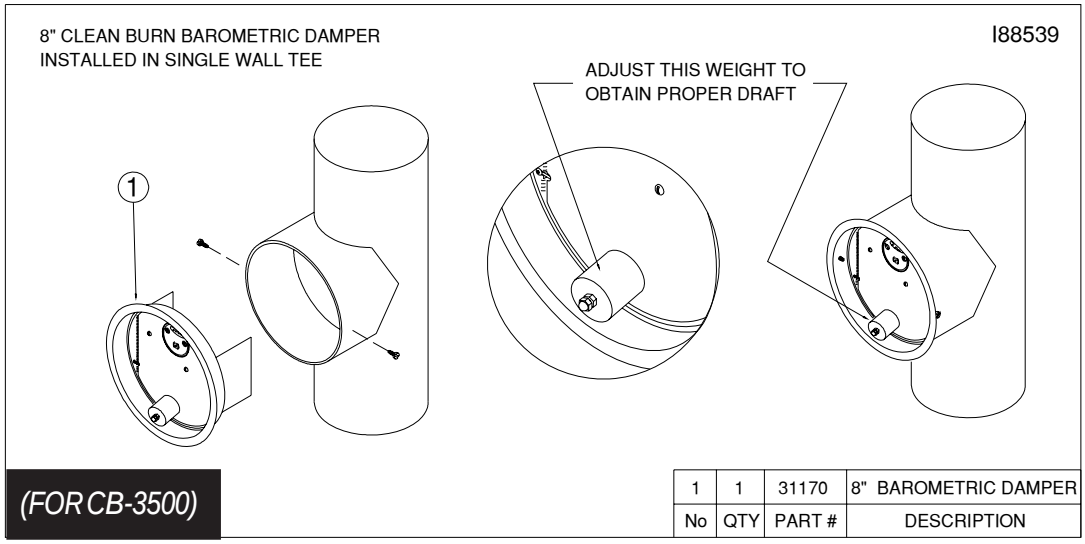
1. Refer to the stack installation drawing, Figure 4L. Install a single wall tee (min. 24 gauge) after the 90° elbow in the straight vertical stack section within 90 cm to 152 cm (3' to 5') of the furnace breach. For horizontal stack runs (as shown in Figure 4M), install the tee after the first straight section of pipe. **NOTE: The tee is required to support the barometric damper.** You must purchase this tee when you purchase your stack materials (8" single wall tee - CB#70174 for CB-3500; 10" single wall tee - CB#70180 for CB-5000).
2. **For CB-5000 ONLY:** Install the 9"-to-10" pipe adapter in the opening of the tee as shown in Figure 4N.
3. Install the barometric damper in the opening of the tee (or pipe adapter for CB-5000 furnaces). Use a small spirit level to make sure that it is properly level.
4. Install two self-tapping screws (i.e. one on each side of the barometric damper) to hold the damper in place as shown in Figures 4N and 4O . DO NOT install a screw at the bottom 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.



No	QTY	PART #	DESCRIPTION
2	1	31198	DAMPER PIPE ADAPTOR
1	1	31197	9" BAROMETRIC DAMPER

Figure 4N - Installation of 9" Barometric Damper for Model CB-5000 Furnaces



No	QTY	PART #	DESCRIPTION
1	1	31170	8" BAROMETRIC DAMPER

Figure 4O - Installation of 8" Barometric Damper for Model CB-3500 Furnaces

Installing the Stack Penetration

WARNING: When running the stack through your ceiling, roof, or sidewall, you must use **Class A double-wall insulated all-fuel stack components** with a stainless steel liner. DO NOT run single-wall stack through your ceiling, roof or sidewall. NEVER locate a stack joint inside walls or in a joist spacer. Ensure proper clearances from combustibles per all applicable codes.

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

Installing the Exterior Stack

ATTENTION: All exterior stack pieces must be Class A double-wall insulated all-fuel stack components with a stainless steel liner.

- DO NOT use Class B or BW Vent/double-wall stack components (for gas fired appliances only).
- DO NOT use Type L Vent/double-wall stack components (for approved fuel oil appliances only).
- DO NOT use black stack pipe (for solid fuel burning appliances only).
- 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 4L/4M 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 4L/4M as needed. Your stack cap should be classified as: "Class A" non-restrictive, all-fuel type.
2. Install the stack cap according to the manufacturer's instructions.

Installing the Draft Inducer

ATTENTION: The draft inducer, Field brand model DI-3, is standard equipment for CB-5000 furnaces and must be installed to ensure proper draft. The Field brand model DI-2 is available as optional equipment for the CB-3500 furnace. The Field brand draft inducers have been tested for use on Clean Burn furnaces. DO NOT use other models or brands of draft inducers.

Understanding the Importance of the Draft Inducer

The draft inducer is designed to aid in the removal of the natural draft created by the appliance to vent the combustion gases to the outside of the building. As the paddle wheel turns, a negative pressure is maintained within the stack so that the combustion gases can leave the furnace and travel out of the stack. (See Figure 4P.) ***Proper sizing, installation, and adjustment of the draft inducer are critical for optimal draft inducer operation.***

Installing the Draft Inducer (continued)

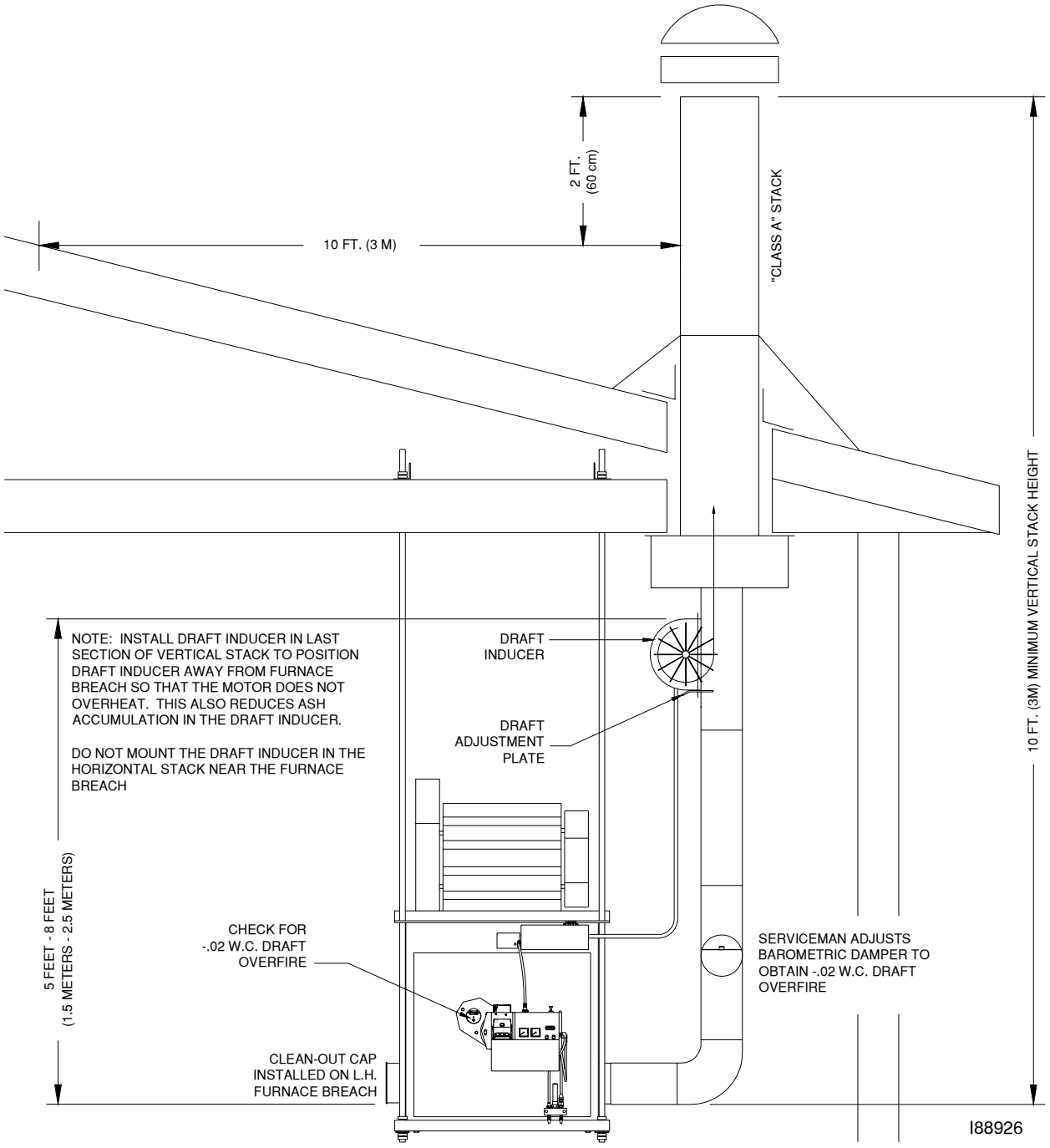


Figure 4P - Installation of the Draft Inducer

Installing the Draft Inducer (continued)

Installing the Draft Inducer

WARNING: Turn OFF the main power to the furnace before proceeding with the installation of the draft inducer.

ATTENTION: It is very important to install the draft inducer on a vertical section of stack to isolate the inducer from excessive heat and ash buildup. Never install the draft inducer on a horizontal section of stack close to the furnace breach where heat and ash will damage the inducer motor.

1. Refer to Figure 4P. Follow the instructions included with the draft inducer to mount the draft inducer on the section of single-wall vertical stack.
2. Position the draft plate all the way out so that it does not reduce the draft produced by the draft inducer. You will adjust the draft plate later as part of **Adjusting the Draft Overfire (Section 8)**.

Wiring the Draft Inducer for Normal Operation*

*(No exhaust fans in the building)

1. Wire the draft inducer according to the **Furnace Wiring Diagram** provided in **Appendix B** at the back of this manual.

Installing the Wall Thermostat

1. Select a location for the thermostat on an interior wall away from any hot or cold drafts.
2. Remove the top cover from the thermostat by pushing gently on the latch on the right side of the case. *(Hold the thermostat base in one hand, and grasp the cover with the other hand; push in on the latch with your thumb, and pull the cover away from the base.)*
   ATTENTION: DO NOT use a screwdriver to pry the cover off the base, or damage may occur.
3. Remove the black plastic tab located in the battery compartment.
4. Refer to the **Furnace Wiring Diagram** in **Appendix B** at the back of this manual. Run two wire, 18-gauge (minimum) thermostat cable from the terminals on the back of the thermostat base to the terminal block located on top of the electrical junction box (on top of the furnace cabinet).
   ATTENTION: NEVER jump between terminals of the thermostat wire without removing one of the wires. Failure to remove one of the wires will burn out the heat anticipator on the thermostat and will cause the thermostat to fail.
5. Mount the thermostat base 152 cm to 168 cm (60" to 66") from the floor using the hardware provided.
6. Re-assemble the thermostat cover onto the base. *(Align the hinges on the side of the cover with the slots on the base, and swing the cover into place.)*

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 safety codes and allows for any deficiencies to be corrected before furnace startup. *Improper installation may damage the equipment.*

SECTION 5: METERING PUMP PRIMING

Understanding Metering Pump Priming

Preparing your Clean Burn furnace for operation begins with priming the metering pump. The procedures in this section must be performed in sequence *without interruption* to properly prime the pump.

ATTENTION: Please note that in order to use the metering pump with the CB-500 Series burner (and to accomplish pump priming), ***the oil regulator assembly must first be removed from the preheater block assembly.*** The following procedure provides the necessary instructions.

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 3.8 liters (1 gallon)
- Medium straight-blade screwdriver

Preparing the Burner for Use with the Metering Pump

WARNING: To avoid electrical shock hazards, turn off all power to the furnace, and unplug the burner before proceeding.

1. Figure 5A shows an exterior view of the burner components. In this procedure, you will be removing the oil regulator from the preheater block assembly to prepare the burner for use with the metering pump.
2. Remove the self-tapping screw and swing open the double-hinged lid to expose the heater block assembly.
3. Use a 1/8" Allen wrench to loosen the two locking bolts on the locking bar.
4. Remove the locking bar.
5. Refer to Figure 5B. Use a 5/32" Allen wrench to remove the four (4) bolts and washers holding the surface-mounted oil regulator in place, then carefully remove the oil regulator.
   NOTE: Keep the oil regulator assembly in a safe place in case a standard J-type oil transfer pump is installed at a later date. (You would then need to re-install the oil regulator assembly.)
6. Clean the top of the heater block to remove used oil, etc. DO NOT allow any debris to fall into the oil passageways which have been exposed by the removal of the oil regulator.
7. Install the square cap with the o-ring using the four (4) bolts and washers. Tighten the four bolts firmly in a crisscross pattern to ensure that there are no leaks.

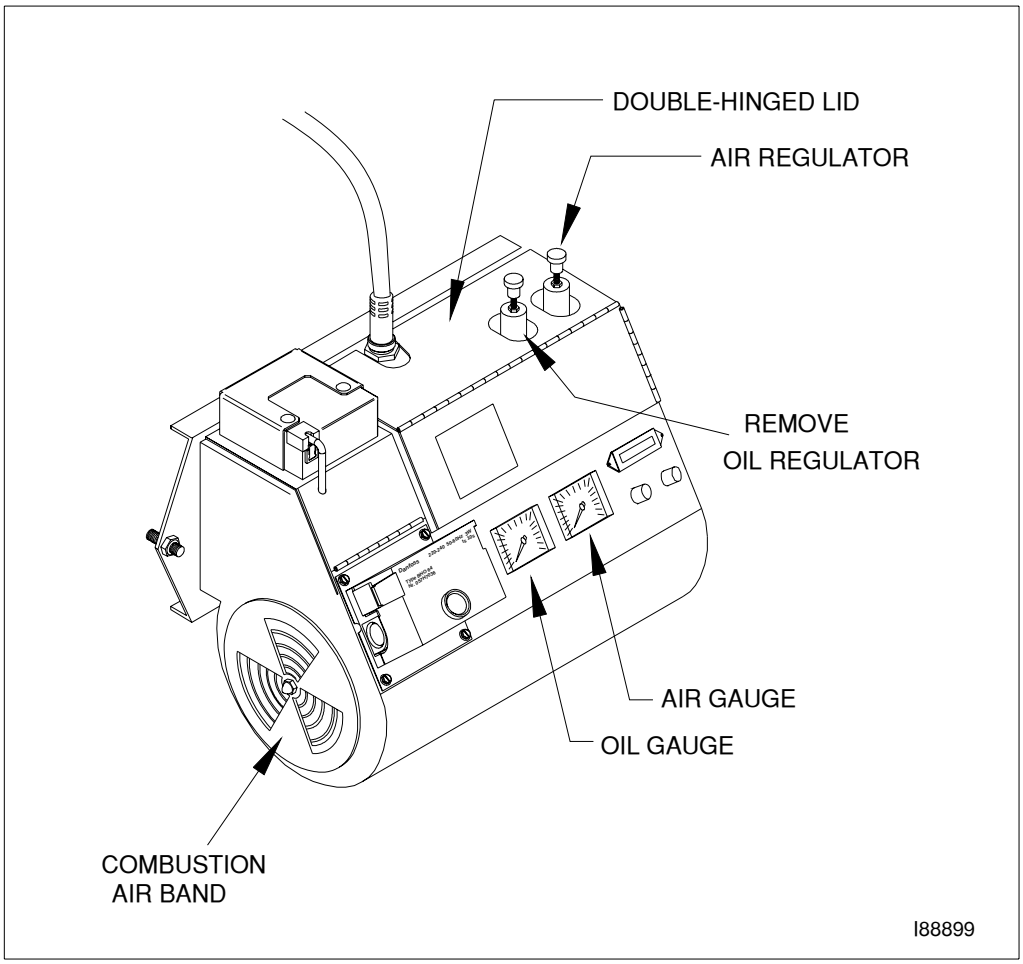


Figure 5A - Detail of Burner Components

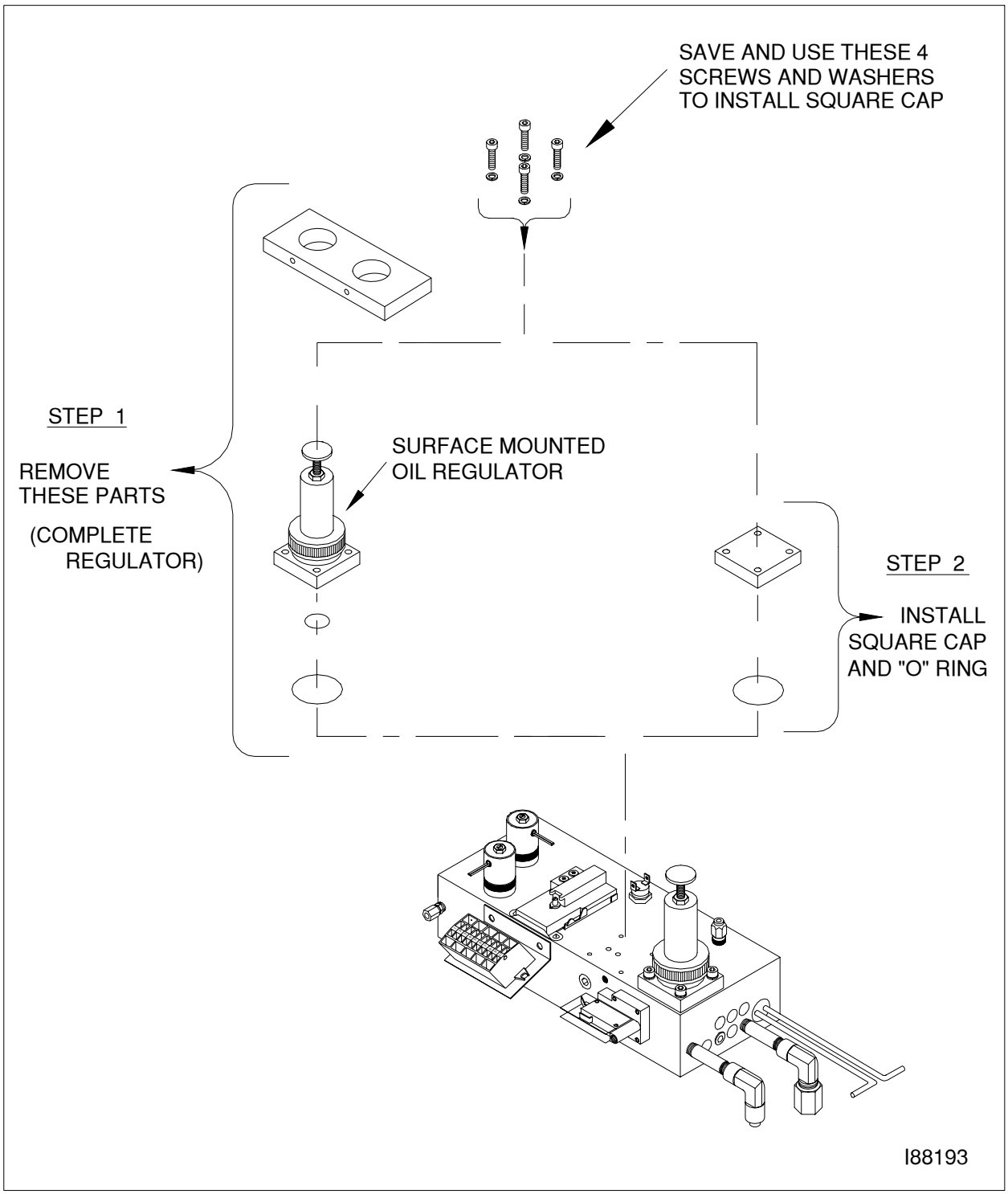


Figure 5B - Detail of Heater Block with Surface-Mounted Oil Regulator

Priming the Metering Pump

ATTENTION: ***The priming process must be done precisely as described in this procedure to ensure that all air is thoroughly bled from the system.*** Failure to bleed all air from the system will result in repeated burner shutdowns on reset.

1. Refer to Figure 5C.
2. Remove the 5/8" plug from the side of the pump head, and set it aside.
3. Remove the 1/2" brass cap from the 1/2" brass nipple. Place a funnel in the opening. Slowly pour used oil into the funnel until oil comes out of the side of the pump head; this will fill the oil line, canister filter, and pump head with oil.
   ATTENTION: NEVER run the pump head dry (i.e. without oil in the pump head); doing so will severely damage the pump.
4. Apply Permatex #2 non-hardening gasket sealer to the threads of the plug (removed from the pump head). Re-install the plug and tighten.
5. Apply Permatex #2 non-hardening gasket sealer to the threads of the 1/2" brass nipple. Re-install the 1/2" brass cap on the brass nipple and tighten.
6. Open the bleeder on the pump two to three (2-3) full turns, and position a container to catch oil which will flow from the bleeder during pump priming.

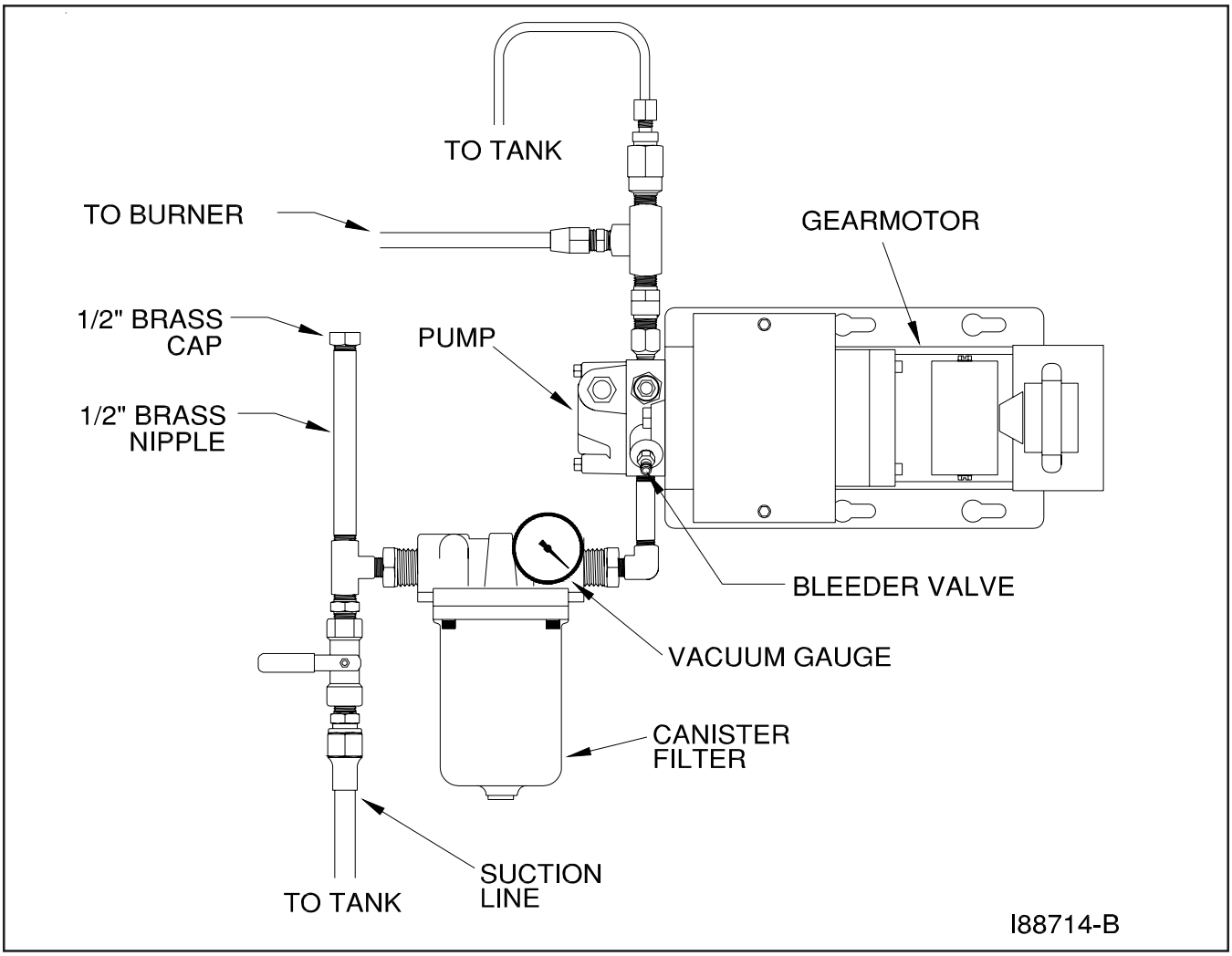


Figure 5C - Priming the Metering Pump

Priming the Metering Pump (continued)

7. **Activating the Pump**

NOTE: The CB-3500 and CB-5000 furnaces feature a priming switch which is mounted on the left-hand side of the electrical junction box on the front of the furnace cabinet. The priming switch has two positions:

- **PRIME (switch is in the UP position / orange indicator light is ON):** this is used only for pump priming. When the switch is in the UP position, the pump circuit is activated for priming. The pump will continue to run as long as the switch is in this position. The oil primary control circuit is de-activated so the burner cannot run while the switch is in the UP position.
- **BURNER (switch is in the DOWN position):** this is used for normal burner operation. When the switch is in the DOWN position, the burner controls the operation of the pump. The pump will only run while the burner is running.

a. Refer to Figure 5D to locate the priming switch.
b. Turn the priming switch to the UP position. The pump should immediately start running.
c. Run the oil pump until proper oil flow has been established and the oil lines have been completely flushed out. (The following steps provide specific instructions.)

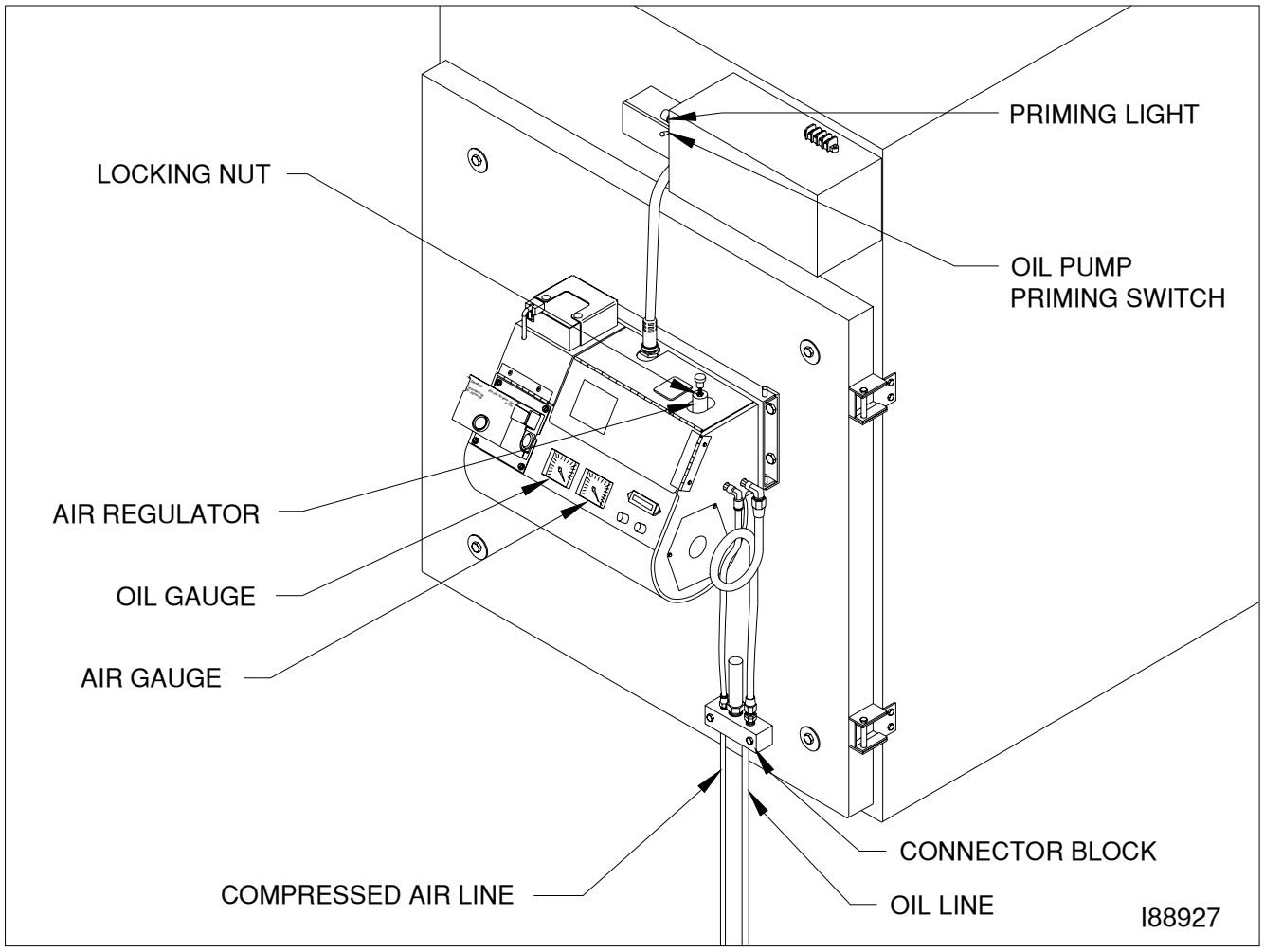


Figure 5D - Detail of Burner Connections/Components

Priming the Metering Pump (continued)

8. Run the pump until a solid stream of oil flows from the pump bleeder. This will bleed all air out of the suction line, oil filter and pump head.
   ATTENTION: For the metering pump to operate correctly, it is very important that the system is entirely full of oil and all air is bled out. The burner will shut down if there is any air in the system.
9. Close and tighten the bleeder on the pump.
10. Turn the priming switch to the DOWN position so that the pump stops running.
11. Disconnect the pressure oil line from the burner and position a container to catch oil which will flow from the pressure oil line during pump priming.
12. Turn the priming switch to the UP position. The pump should start running immediately .
13. Run the oil pump until the proper flow of oil has been established, and the oil line has been completely flushed out.
14. Turn the priming switch to the DOWN position so that the pump stops running.
15. Re-connect the oil line to the connector block.

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.

ATTENTION: For the pump to pull and hold vacuum, it is critical that all fittings are airtight. 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. Follow the instructions to prime the pump (previous procedure).
   NOTE: The 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. Refer to Figure 5C. 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 15 inches of vacuum. When the vacuum gauge reads 15 inches of vacuum, first close and tighten the bleeder, then turn the pump off.
   NOTE: If the pump will not pull at least 15 inches of vacuum, there is a very serious suction leak, or the pump is damaged.

Vacuum Testing the Oil Pump (continued)

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.

ATTENTION: 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.

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.

ATTENTION: ***Please verify that the oil regulator has been removed from the burner as shown in Figure 6A. If the oil regulator has not been removed, please refer to Section 5 for the necessary instructions -- Preparing the Burner for Use with the Metering Pump.*** The metering pump will *automatically* supply the correct fuel flow to the burner.

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 air regulator. Loosen the locking nut on the air regulator.
5. Turn the adjustment knob on the air regulator counterclockwise until 1/2" of the threads on the knob are exposed. DO NOT back the knob all the way out.
   NOTE: The air gauge will not show any pressure until the burner starts. Before starting the burner for the first time, it is very important to turn the air regulator completely OFF as described.

(continued on next page)

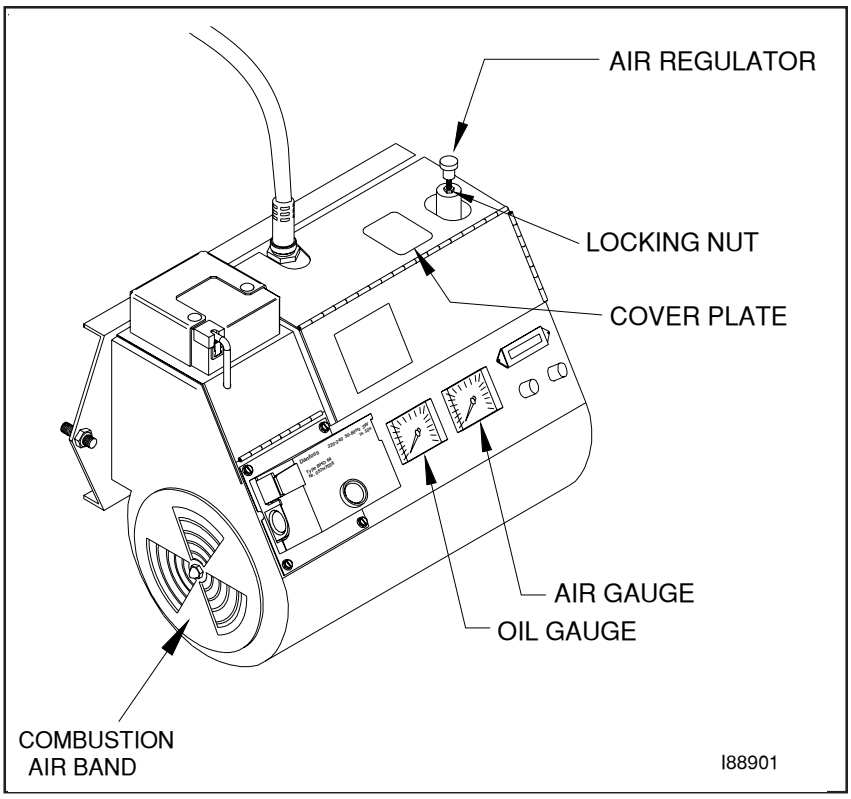


Figure 6A - Component Detail of the CB-500 CE Burner for the CB-3500 Furnace

Preparing the Burner for Startup (continued)

6. **Initial Adjustment of the Combustion Air Band for CB-3500 Furnaces:**

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. Failure to heed this warning may result in fire or explosion hazard.

- Refer to **Figure 6A** to locate the combustion air band. Note that the burner has an adjustable combustion air band.
- Rotate the combustion air band to adjust it to the appropriate slot opening as listed in the **Initial Adjustment Charts** on the next page. Use a ruler to accurately set the slot opening at the widest section of the slot.

7. **Initial Adjustment of the Air Intake for CB-5000 Furnaces:**

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

- Refer to **Figure 6B** to locate the air intake. Note that the burner has an adjustable air intake with a locking tab.
- Rotate the locking tab DOWN and OPEN the air intake by rotating the disk (CCW) to the appropriate slot opening as listed in the following **Initial Adjustment Charts** on the next page.
- Rotate the locking tab UP to lock the air intake in place.

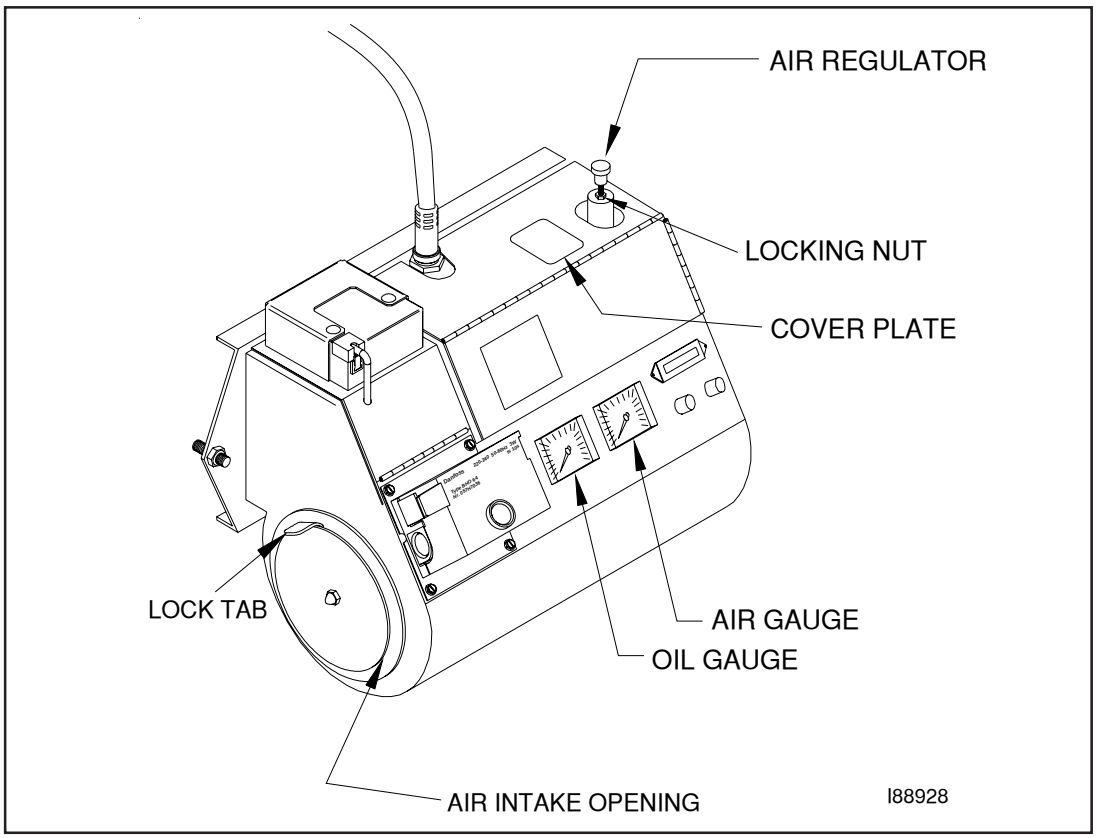


Figure 6B - Component Detail of the CB-550-CE Burner for CB-5000 Furnaces

Preparing the Burner for Startup (continued)

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.***

NOTE: ***The oil pressure is automatically adjusted by the metering pump.***

Initial Adjustments for CB-3500

NOTE: Only Gearmotor part # 33427 may be used with the CB-3500 (230 V / 50 Hz)

Maximum Input = 103 KW (350,000 BTUH) @ 9.5 LPH (2.5 GPH) *per* CB-500 Series Burner

Oil Type	Oil Pressure/Flame Length	Air Bar	(PSI)	Air Band	Nozzle
#2 Fuel Oil*	***check flame length***	0.8-1.1	(12-16)	20 mm (3/4")	9-5
Used Crankcase Oil	***check flame length***	0.8-1.1	(12-16)	20 mm (3/4")	9-5
Used ATF	***check flame length***	0.8-1.1	(12-16)	20 mm (3/4")	9-5
Used Hydraulic Oil	***check flame length***	0.8-1.1	(12-16)	20 mm (3/4")	9-5
#4 and #5 Fuel Oils	***check flame length***	0.8-1.1	(12-16)	20 mm (3/4")	9-5

Initial Adjustments for CB-5000

NOTE: Only Gearmotor part # 33428 may be used with the CB-5000 (230 V / 50 Hz)

Maximum Input = 147 KW (500,000 BTUH) @ 13.5 LPH (3.6 GPH) *per* CB-500 Series Burner

Oil Type	Oil Pressure/Flame Length	Air Bar	(PSI)	Air Band	Nozzle
#2 Fuel Oil*	***check flame length***	0.8-1.1	(12-16)	6 mm (1/4")	9-11
Used Crankcase Oil	***check flame length***	0.8-1.1	(12-16)	6 mm (1/4")	9-11
Used ATF	***check flame length***	0.8-1.1	(12-16)	6 mm (1/4")	9-11
Used Hydraulic Oil	***check flame length***	0.8-1.1	(12-16)	6 mm (1/4")	9-11
#4 and #5 Fuel Oils	***check flame length***	0.8-1.1	(12-16)	6 mm (1/4")	9-11

*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. Adjust the thermostat setting above room temperature to start the burner.
   NOTE: If the burner refuses to start, review the ***Preparing the Burner for Startup*** procedure. If, after repeating this procedure, the burner still refuses to start, check the following system components for proper functioning:
   - Verify that the red wire as shown in the **Burner Wiring Diagram** (Appendix B) is energized to230VAC.
   - Verify that the prime switch (on the control box) is set to RUN (i.e. DOWN position).
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**.
   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.

*(**Starting the Burner** procedure continues on the next page)*

Starting the Burner (continued)

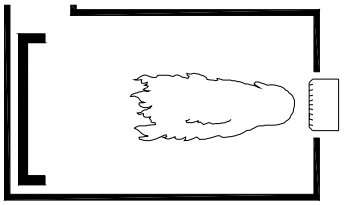
3. **Observing the Flame Length:**
Visually inspect the flame length through the observation port. Refer to Figure 6C for an illustration of the desired flame length. The flame should extend no more than one-half of the way down the combustion chamber.

CAUTION
WHEN OPENING INSPECTION PORT

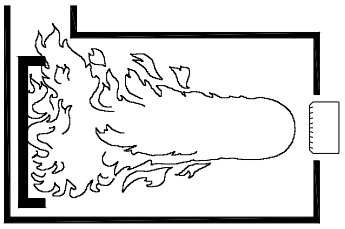
PORT MAY BE HOT
PROTECT HANDS
WEAR SAFETY GOGGLES
KEEP FACE AWAY
OPEN PORT SLOWLY

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.

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



Incorrect Flame Adjustment
(Not Enough Combustion Air):
- Flame must not touch back or walls of combustion chamber.
- Increase combustion air by opening the air band on the side of the burner.



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

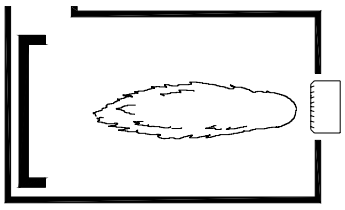


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Figure 6C - Flame Length Adjustment

4. Check the flame length after the burner has fired for 15 minutes.
5. Tighten the locking nuts on the air regulator.

Starting the Burner (continued)

6. **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 or the flame length is too long, the oil you are burning requires MORE combustion air. OPEN the air band 3 mm to 6mm (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", and the flame should extend half of the way down the combustion chamber.

7. **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 or air intake 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 12% or an O2 reading of 4 to 8%
- Cad cell reading of 200 to 500 ohms

Checking the Operation of the Blower Motor

NOTE: It is important to verify that the blower motor operates correctly to ensure that the fan limit control is properly cycling the 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 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 blower motor.
3. Once the blower motor has activated, turn the burner off by turning the wall thermostat to OFF.
4. With the burner off, the 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 blower motor.

CAUTION: If the blower motor does not operate as described, immediately shut down your furnace and contact your Clean Burn dealer.

SECTION 7: RESETTING THE FURNACE AND BURNER

Understanding Furnace/Burner Shutdowns

When troubleshooting furnace/burner shutdown situations, Clean Burn recommends the following sequence of actions:

- Follow the procedure for Resetting the Oil Primary Control provided in this section.
- Review the material on the following page about the safety switches to determine if the furnace is shut down on high limit.
- If the burner still will not restart, contact your Clean Burn Distributor for immediate service.

Understanding the Oil Primary Control

The oil primary control will shut the oil pump and oil solenoid off when it detects flame-out during burner operation. The oil primary control will then wait approximately 15 seconds (while the burner motor, air solenoid, and transformer are energized) 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 lock-out. 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.*

Resetting the Oil Primary Control

DANGER! DO NOT reset the oil primary control 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 the unit. As with any oil burning appliance, improper operation may result in a fire or explosion hazard.

1. Refer to Figure 7A.
2. Allow 5 to 10 minutes for all fuel mist to exhaust from the combustion chamber.
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 that all fuel mist has cleared and the furnace has cooled, push in and hold the reset button for three seconds, then release. This will reset the control at any time during its operation.
5. If the burner will not restart, call your Clean Burn dealer immediately.

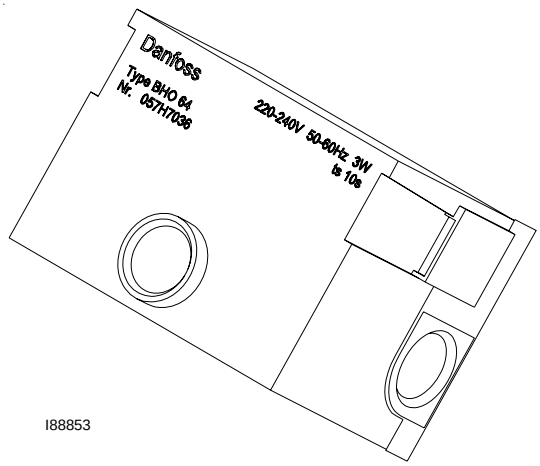


Figure 7A - Danfoss Oil Primary Control

Understanding the Fan Switches and Hi-Limits on the CB-3500/CB-5000 Furnaces

The CB-3500 and CB-5000 furnaces feature *redundant* fan switches and *redundant* limit switches. The two fan switches enable efficient working of the fan/blower for both unit heater and central furnace applications. The two limit switches serve to protect the furnace from damage due to overheating. Review the following specifics on each of the switches/controls to understand their operation; refer to the **Furnace Wiring Diagrams** in **Appendix B** at the back of this manual to review the installation of these switches.

The Blower/Fan Switch

The CB-3500/CB-5000 furnaces feature an F-180 blower/fan switch (normally open) which is surface-mounted at the front of the combustion chamber as shown in Figure 7B. The blower/fan switch senses the temperature of the combustion chamber as the burner is firing. When the combustion chamber reaches the proper temperature, the switch closes and sends power to the blower motor relay to turn ON the blower. When the wall thermostat is satisfied and the burner shuts off, the blower/fan continues to run until the switch senses that the combustion chamber has cooled down. The switch then opens and shuts off the blower/fan.

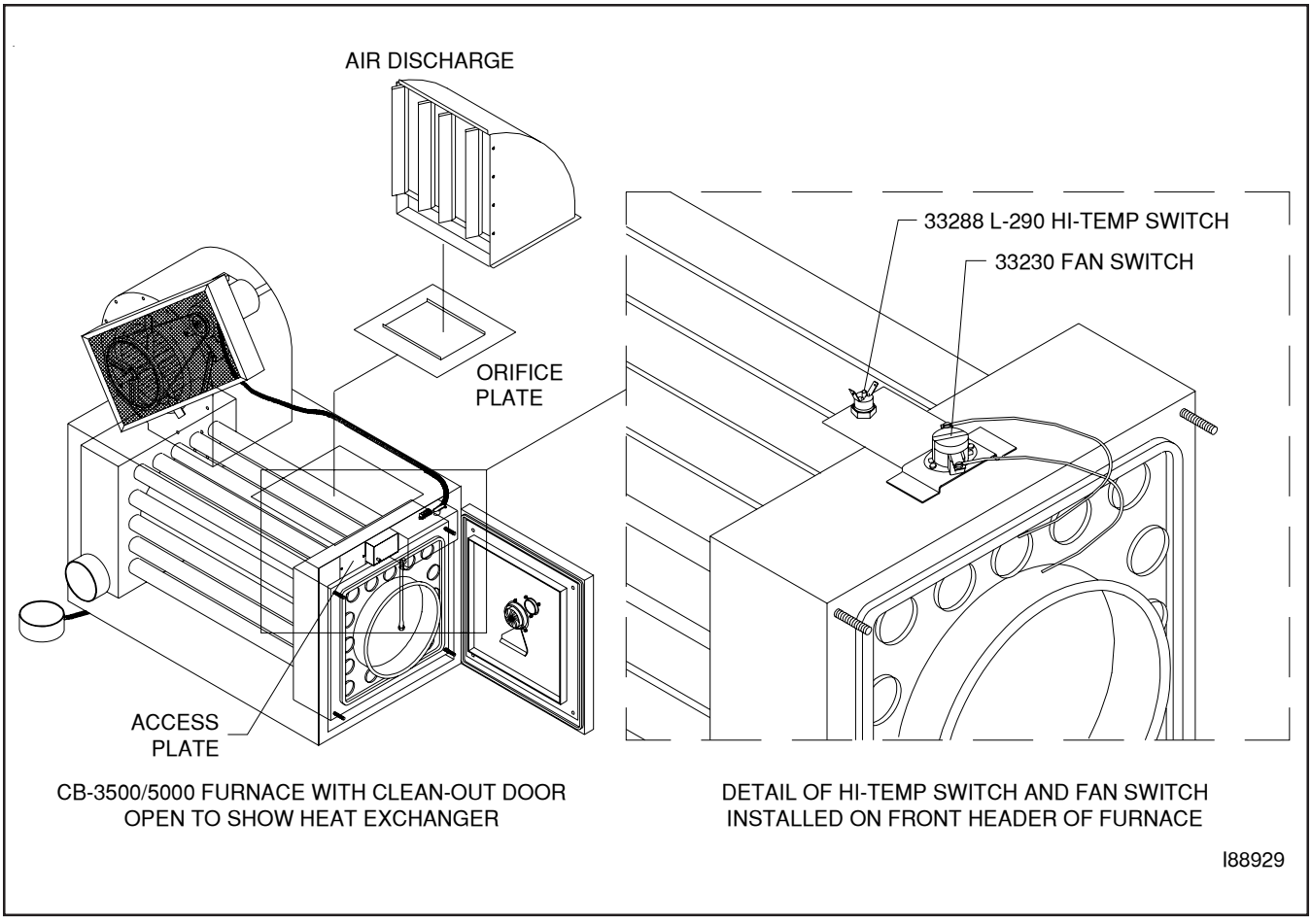


Figure 7B - Locating the F-180 Fan Switch amd the L-290 Hi-Temp Limit Switch

The Fan Limit Control

Understanding the Operation of the Fan Limit Control

The fan limit control, which is a probe style control, senses air temperature within the furnace cabinet. This control contains two switches: the fan switch and the limit switch. This control is especially important for the functioning of the fan with ducted applications.

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 93 °C (200 °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 77 °C (170 °F), the limit switch automatically resets and restarts the burner.
ATTENTION: 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.

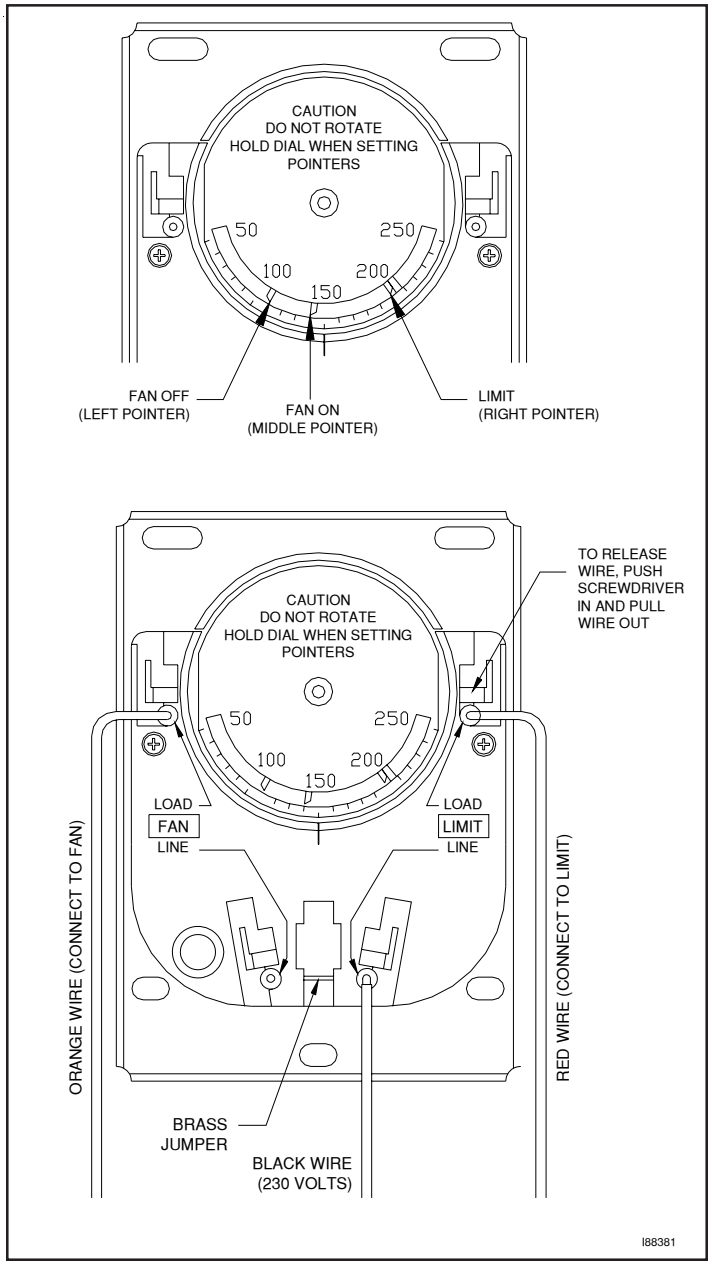


Figure 7C - Fan Limit Control Components

Setting the Pointers on the Fan Limit Control 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;*** doing so will severely damage the control.

Fan Limit Control Settings: CB-3500/CB-5000

Fan Off:	38 °C (100 °F)
Fan On:	49 °C (120 °F)
Limit:	99 °C (210 °F)

The Auxiliary Hi-Temp Limit Switch

The CB-3500 and CB-5000 furnaces are equipped with an auxiliary L-290 high temperature limit switch which is mounted on a bracket at the front of the combustion chamber as shown in Figure 7B. This switch senses the build-up of heat within the combustion chamber beyond the fan limit control setting and is designed to protect the furnace from damage due to overheating.

Understanding the Function of the Auxiliary L-290 *Auto-Reset* Hi-Temp Limit Switch

If the temperature of the combustion chamber has exceeded the range of the fan limit control, the auxiliary L-290 auto-reset hi-temp limit switch opens and shuts off power to the primary control on the burner, and the burner shuts down. After the combustion chamber has sufficiently cooled, the L-290 switch will *automatically* reset, and allow the burner to re-start.

The L-290 hi-temp limit switch will open and shut down the burner if any of the following conditions exists:

- **If the fan/blower has stopped running for any reason during furnace operation,** the heat in the furnace may cause the L-290 hi-temp limit switch to open. Ensure that the fan/blower is functioning properly.
- **The fan limit control is not functioning properly.** If the fan limit control has malfunctioned, the L-290 could cycle on/off repeatedly. If this occurs, contact your Clean Burn Distributor immediately for service.
- **The furnace is overfiring.** Review the directions in Section 6 in the Operator's Manual to properly adjust the burner.
- **Improper ductwork is installed on the furnace *(applicable only if your furnace is operating as a central furnace).*** Ductwork must be installed by qualified HVAC personnel according to industry standards and the specifications provided in Section 3 of the Operator's Manual.

ATTENTION: *It is very important to determine the reason for the opening of the L-290 switch and take steps to correct the cause; failure to do so may result in serious overheating and damage to the heat exchanger of the furnace.* ***Additionally, if the burner is rapidly cycling on/off, contact your Clean Burn Distributor immediately;*** *failure to address this situation may result in serious damage to the furnace.*

SECTION 8: ADJUSTING THE DRAFT OVERFIRE

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 to -.04 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 Overfire

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

Your furnace is equipped with an observation/ draft reading port to check draft overfire. *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 overfire (i.e. *greater than* -.04) sucks the heat from the furnace and results in abnormally high stack temperature.

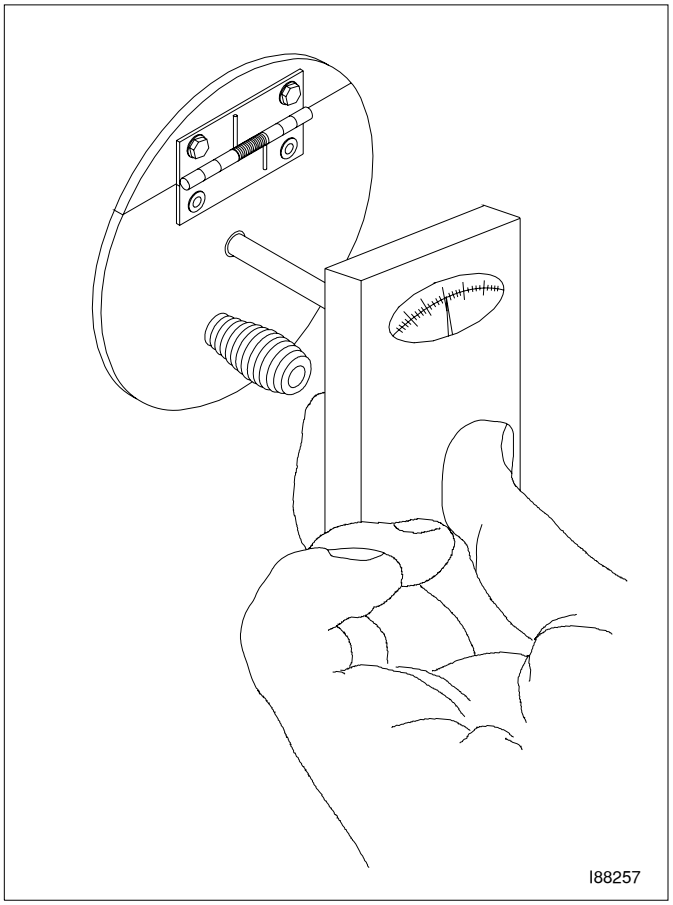


Figure 8A - Checking for Proper Draft Overfire

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.

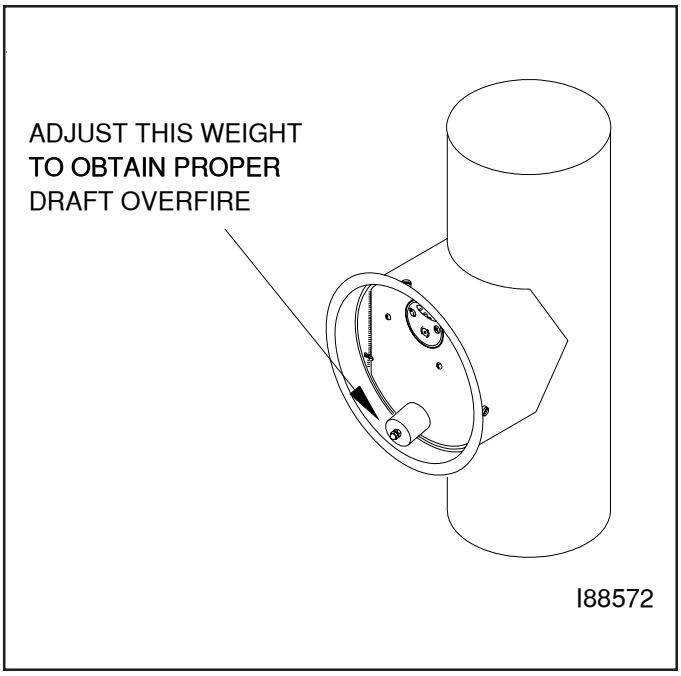


Figure 8B - Adjustment of Barometric Damper

Adjusting Draft Overfire on Furnaces with Draft Inducers
(CB-5000 Standard; CB-3500 Optional)

NOTE: The draft inducer is purposely sized to create a generous draft. When adjusting the barometric damper, you will find that the flapper is open most of the time. This allows the draft inducer to suck cool air through the damper to protect the inducer motor from heat damage.

1. Use a draft gauge to check draft overfire.
2. Adjust the barometric damper to obtain -0.02 w.c. draft overfire. If you still have too much draft, adjust the draft plate on the draft inducer. Move the plate in 6 mm (1/4") to reduce the draft. Recheck the draft reading.

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.)
- 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. 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.

Special Note to Service Personnel

To arrive at proper draft measurements be sure that all fans within the building are running while adjusting the draft to final levels!

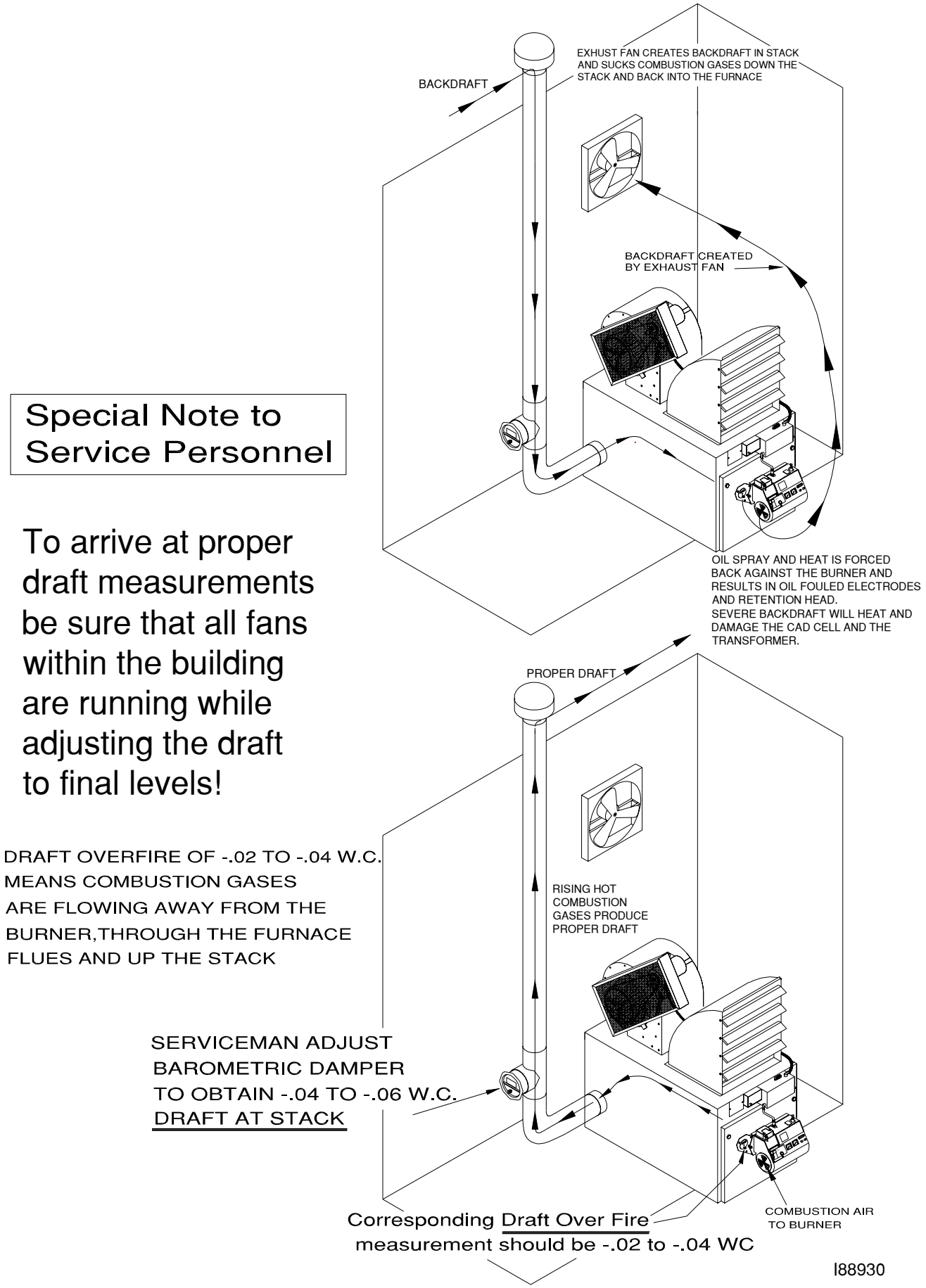


Figure 8C - Proper Draft vs. Backdraft

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 amount of fresh air. The louvers automatically close when the exhaust fans are turned off.

Sizing the Make-up Air Louver

IMPORTANT NOTE: When using louvers and grills, and the actual free area of the louver or grill is not known, it is understood that wooden louvers/grills will have a free area of 25%, while metal louvers/grills will have a free area of 75%. ("Free area" translates into the actual space allowing air to flow through.)

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) Count the total number of exhaust fans in the building.
(b) Close all of the doors and windows in the building *except* for one overhead garage door.
(c) Start the furnace and allow it to run for 15 minutes to bring it up to temperature.
(d) Set the draft-over-fire for -.02" to -.04" W.C.
(e) Turn ON all of the exhaust fans in the building.
(f) Now close the opened overhead garage door *slowly*, just until the draft gauge moves down into a positive (+) draft reading; as soon as it reaches this point, STOP the door at that position.
(g) Slowly open the door back up, just until the draft reading comes back up to the -.02" to -.04 W.C.
(h) Measure the size of the door opening.

Example of Calculations for Sizing Make-up Air Louver

Measured door opening: 366 cm (144") wide x 30 cm (12") high

- Convert to cm^2 (ft^2) - in this case it equals 10,980 cm^2 (1728 in^2)
- Multiply by 1.1 correction factor (10,980 cm^2 x 1.1 = 12,078 cm^2)
  (1728 in^2 x 1.1 = 1901 in^2)
- Multiply by free area factor (12,078 cm^2 x 1.25 = 15,098 cm^2
  (1901 in^2 x 1.25 = 2367 in^2)
- Refer to sizing chart on the following page - required grill size would be:
  (1) 137cm x 137cm (54in. x 54 in.) grill

Installing a Make-up Air Louver (continued)

CALCULATED OPENING SIZE		REQUIRED LOUVER / GRILL SIZE	
cm^2	in^2	cm	in
0 – 528	0 – 82	25 x 25	10 x 10
529 – 836	83 – 130	30 x 30	12 x 12
837 – 1,445	131 – 224	41 x 41	16 x 16
1,446 – 1,923	225 – 299	46 x 46	18 x 18
1,924 – 2,390	300 – 370	51 x 51	20 x 20
2,391 – 3,166	371 – 490	61 x 61	24 x 24
3,167 – 4,769	491 – 739	76 x 76	30 x 30
4,770 – 7,150	740 – 1109	91 x 91	36 x 36
7,151 – 9,182	1,110 – 1,424	107 x 107	42 x 42
9,183 – 12,355	1,425 – 1,915	122 x 122	48 x 48
12,356 – 15,499	1,916 – 2,400	137 x 137	54 x 54
15,500 – 19,650	2,401 – 3,045	152 x 152	60 x 60

Installing the Make-up Air Louver

All louvers and grills, regardless of the material from which they are made, must be FIXED in the OPEN position OR be interlocked with the appliance so that they will open automatically during the operation of the appliance. The interlock must be placed on the driven member.

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 12 to 15 meters (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

Servicing your Clean Burn furnace in a timely manner is very important to keep your furnace running in peak condition. Just as an automobile requires periodic maintenance such as oil changes, engine tune-ups, etc. your Clean Burn furnace also requires regularly scheduled service.

WARNING: *Failure to maintain and/or improper servicing by unqualified personnel may adversely affect the proper, safe operation of your furnace, and may reduce the service life of your furnace.*

The following chart summarizes all the service intervals which are required to maintain your furnace. Service instructions/procedures for these activities are included in this chapter.

Maintenance Activity	**Interval**
Periodic Burner Inspection	Monthly
Cleaning the canister filter	***Before*** vacuum gauge reads 10" HG of vacuum
Servicing the metering pump	At least once a year
Cleaning the check valve/screen	At least once a year
Cleaning water/sludge out of tank	At least once a year
Cleaning out ash	Approx. 700 hours as indicated on the burner hour meter*
Annual burner tune-up	At least once a year

***It is very important to clean ash from the furnace on schedule.** Normal use of the furnace requires clean-out at least twice during the heating season. Heavy, around-the-clock usage requires more frequent clean-out. For instance, *one month* of continual running of the furnace is *720 hours* (24 hours x 30 days = 720 hours).

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

Periodic Burner Inspection

Following initial start up of the burner, you should inspect the operation of the burner periodically--ideally on a monthly basis. Doing so ensures that the system is functioning efficiently and safely.

Follow these guidelines for inspecting the operation of the burner:

- Visually inspect the flame length through the observation port; the flame should extend no more than one-half of the way down the combustion chamber.
  - -If the flame is diminishing or displays wide variations, clean the canister filter and check valve/screen (procedures provided in this section).
  - -If the flame is firing too strongly (i.e. flame touches back and/or side walls of the combustion chamber), check the air pressure setting (see following guideline).

CAUTION
WHEN OPENING INSPECTION PORT

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

- Check the air pressure by observing the air gauge; proper air pressure settings are provided in Section 6. DO NOT overfire the burner; doing so on a continual basis will damage the furnace.
- Check the combustion air band setting for the proper opening and clean away any dust/debris as necessary. Note that the air band should NEVER be set fully open or closed.
- Check the draft over fire reading as specified in Section 8.

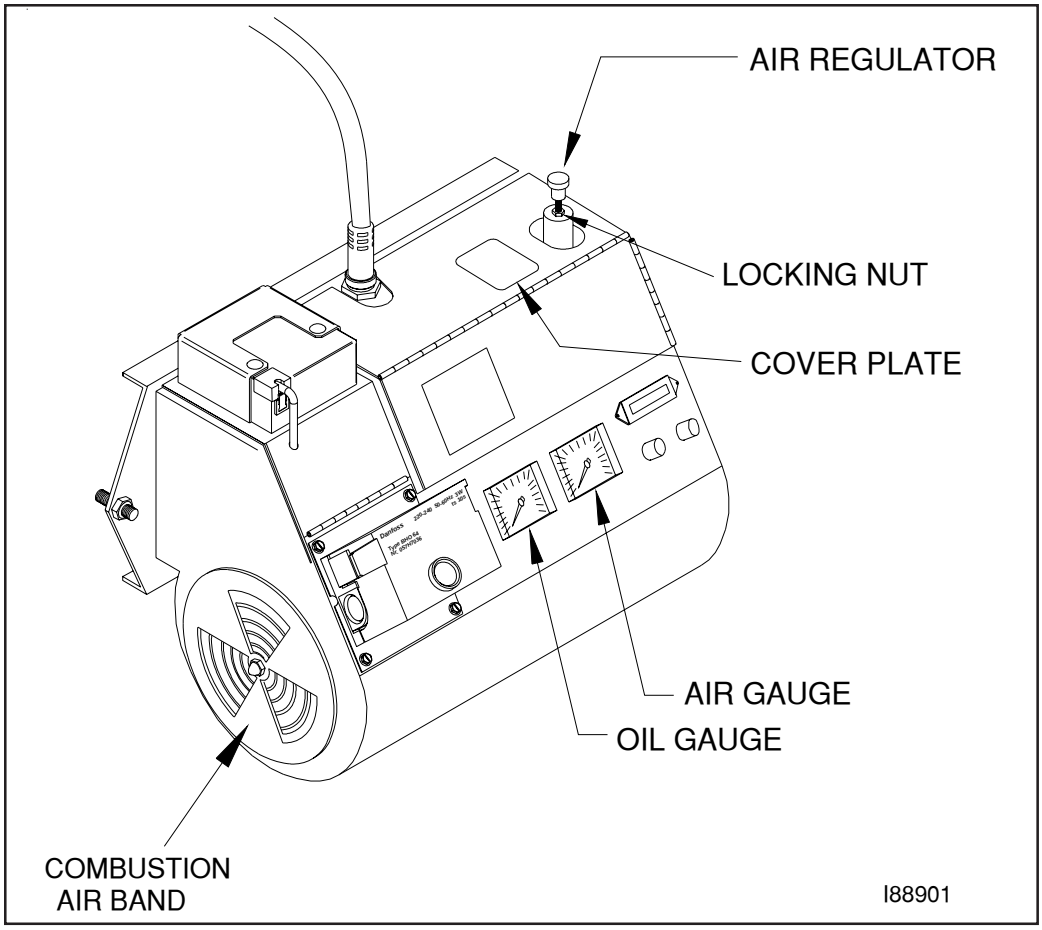


Figure 9A - Component Detail of the CB-525-S2 Burner (CB-550-S2 is similar)

Cleaning the Canister Filter

ATTENTION: 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 9B, 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.

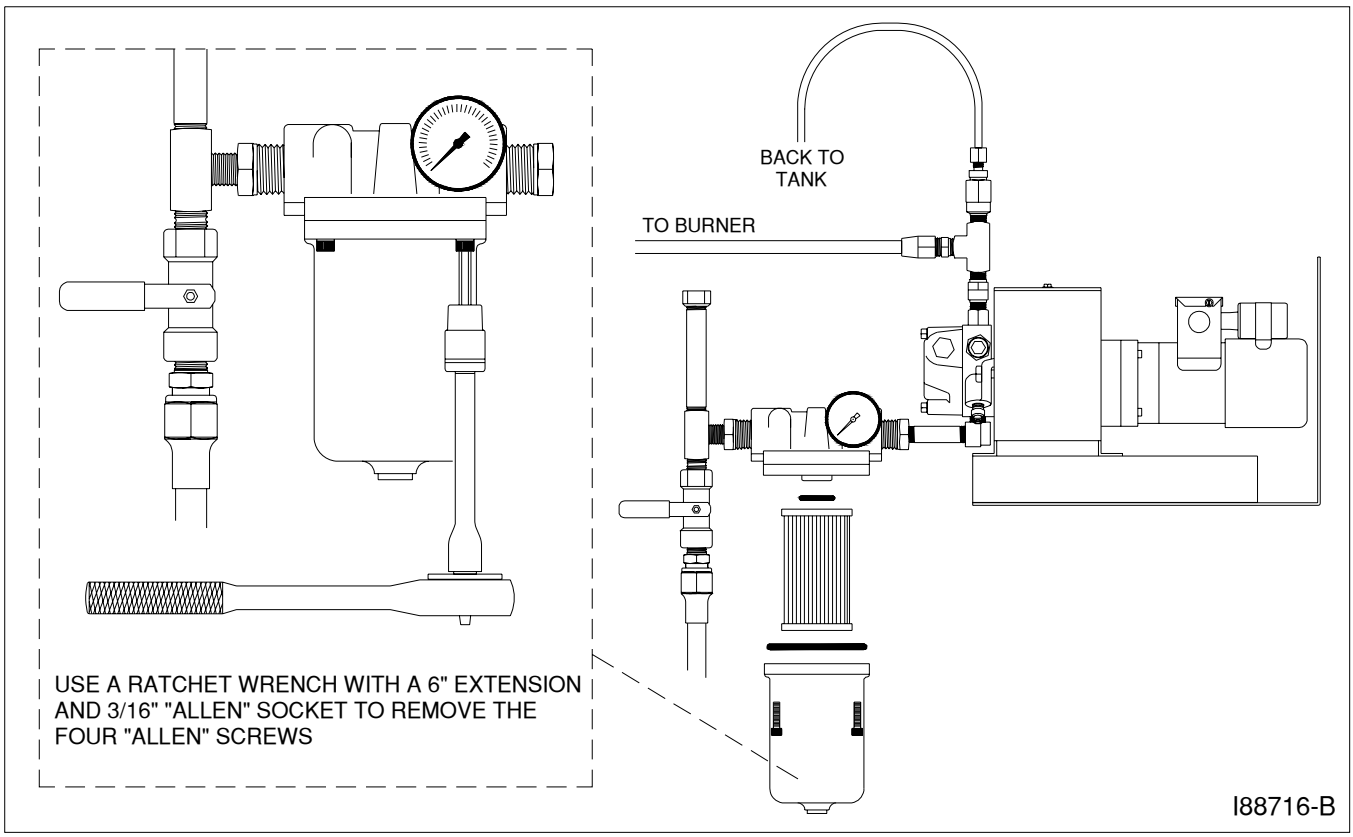


Figure 9B - Canister Filter Component Detail

Servicing the Metering Pump

1. Refer to Figure 9C.
2. Remove the pump head cover (part 1).
3. Remove the screen (part 2) and wash it.
4. Remove and discard the used gasket (part 3).
5. Install a new gasket (Clean Burn Part #32422).
6. Replace the screen and pump head cover.

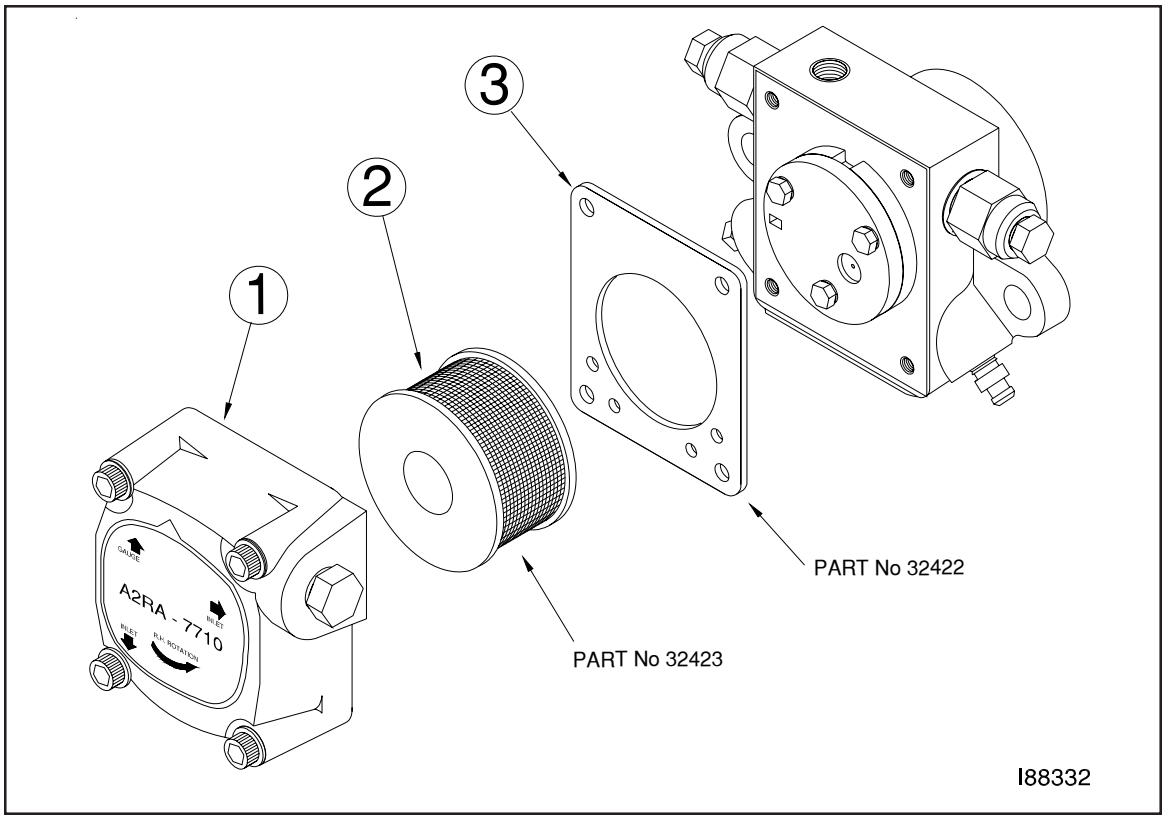


Figure 9C - Servicing the Metering Pump

Cleaning the Check Valve / Screen

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 9D. Remove the one-piece suction oil line 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.

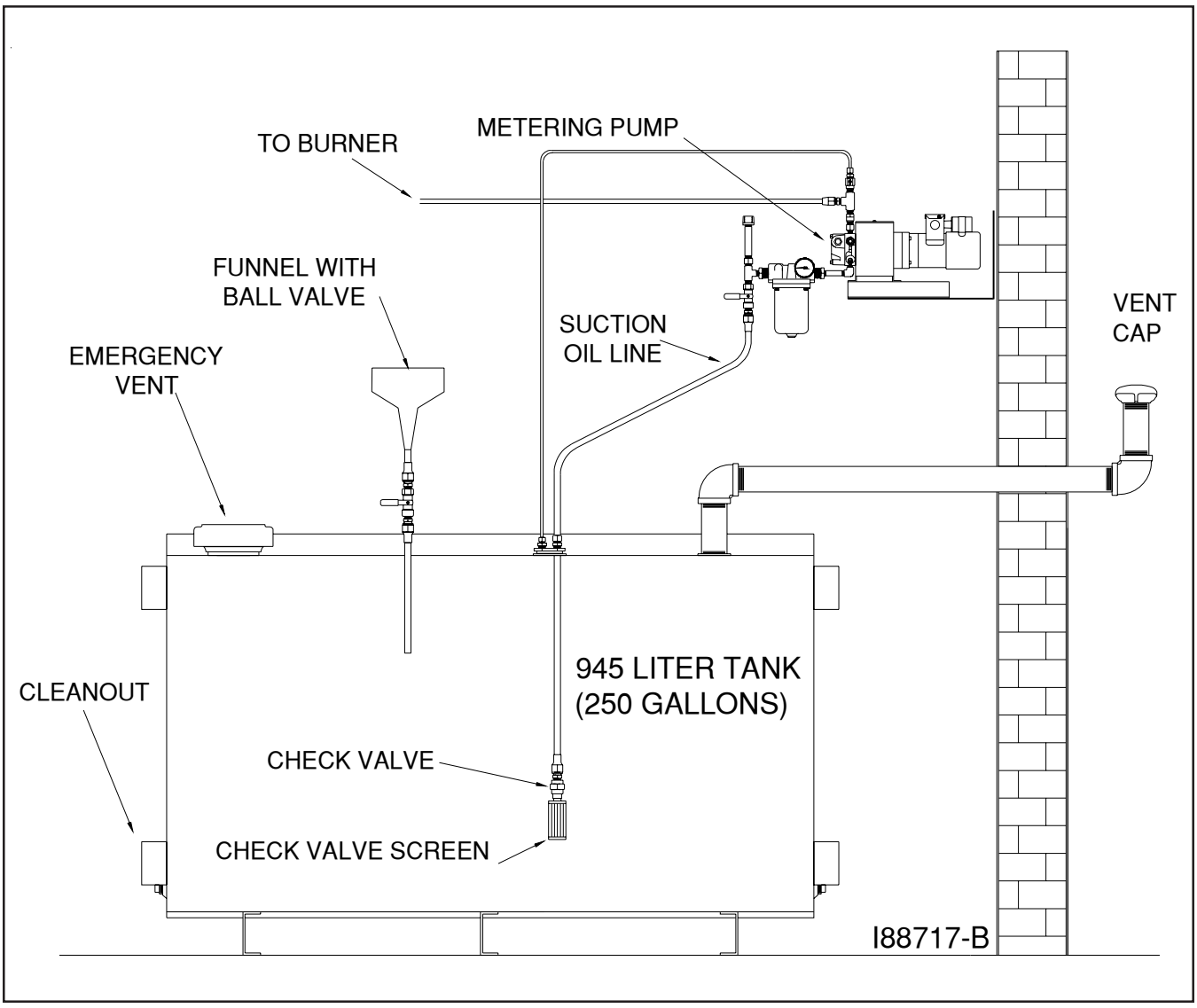


Figure 9D - Check Valve Detail

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.

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 (refer to the servicing intervals at the beginning of this chapter). ***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. 3 mm (1/8") of ash has the insulating capacity of 2.5 cm (1') of fiberglass insulation and reduces heat transfer significantly. ***Never allow more than 6 mm (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. The following protective gear should be worn when cleaning the ash:

- Respirator for fine particles (a dust mask is not acceptable)
- Rubber gloves • Safety goggles • Protective clothing

CAUTION: Make sure you use a sturdy ladder or scaffolding for safe access to ceiling-hung furnaces. 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.

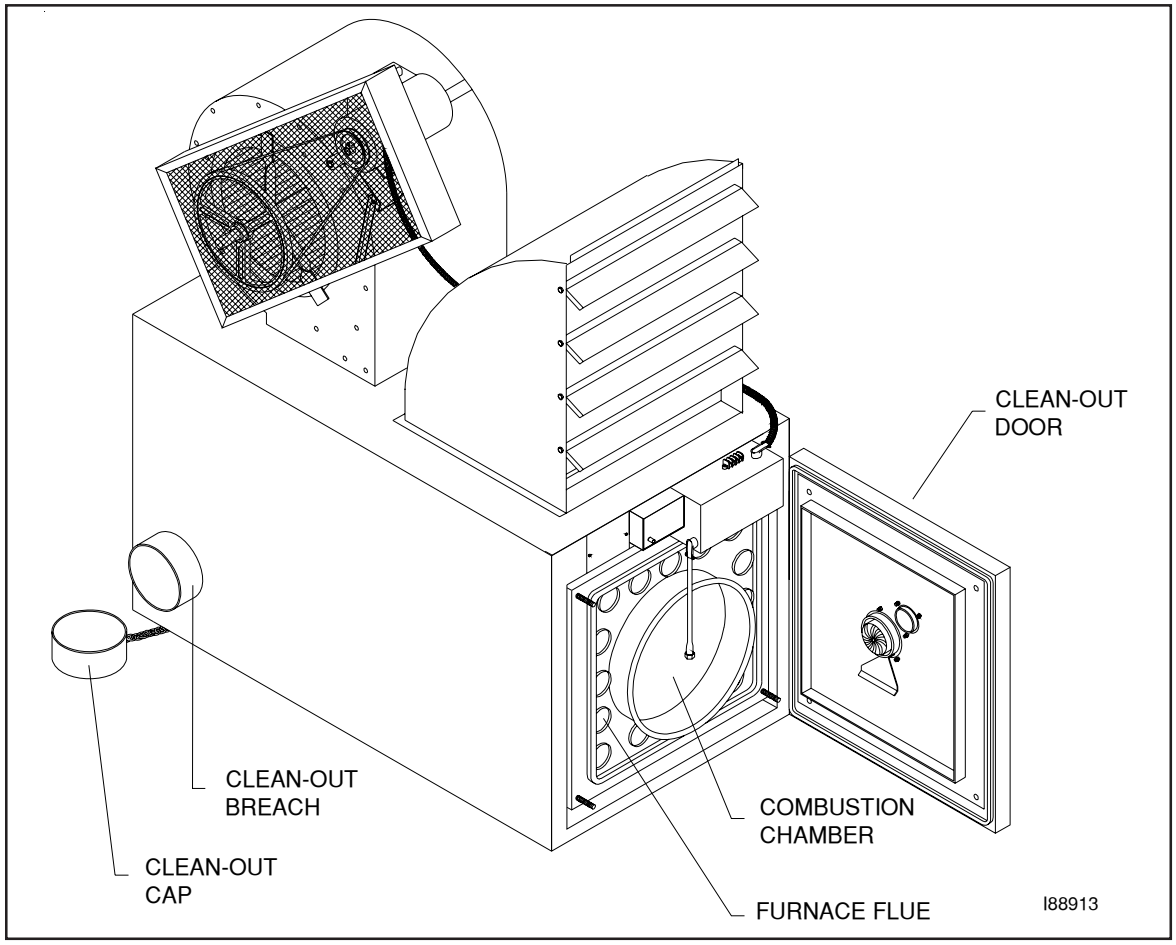


Figure 9E - Accessing the Combustion Chamber for Cleaning

Cleaning the Ash (continued)

1. Ensure that power has been turned OFF, and all "hot" components have been allowed to cool sufficiently. Carefully remove the target with a long handle or pipe. Lightly vacuum the target.
2. 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 elbow on the stack.
      NOTE: It is not necessary to remove the stack to clean it. You will vacuum ash from the stack elbow as you clean out the back of the furnace as described below.
   d. Remove the clean-out cap from the unused furnace breach.
   e. Thoroughly vacuum out the back of the furnace, including the stack elbow, through the clean-out breach. A long wand on the hose of your shop vac is helpful in reaching all the way through the back of the furnace to the stack elbow.
3. Clean the ash from the combustion chamber (see Figure 9E):
   a. Bleed down pressure on the air and oil lines by slightly loosening the fittings at the bottom of the connector block.
      NOTE: Turn off the shut-off on the air pressure line.
   b. With air and oil pressure completely bled off, disconnect the air and oil pressure lines from the bottom of the connector block.
      NOTE: Cover the lines to keep dirt from entering the air / oil supply
   c. Remove the lock-down nuts on the clean-out door.
   d. Carefully swing open the clean-out door 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 lack of combustion air. If these conditions exist, call your Clean Burn dealer. DO NOT overfire your furnace by turning up the compressed air. Overfiring will damage the combustion chamber and heat exchanger.
   f. Vacuum the ash from the combustion chamber and the flues.
      ATTENTION: When cleaning the combustion chamber, ensure that you do not gouge or damage the refractory material on the inside of the clean-out door.
      NOTE: Avoid "packing" the ash in the tubes by first vacuuming the flues before pushing the flue brush down the flues. DO NOT bump or bend burner components while cleaning the combustion chamber.
   g. Use a flue brush to thoroughly clean the flues.
   h. Thoroughly vacuum any remaining ash residue from the flues. Make sure the back (at the breach) is still clean.
   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. Contact your Clean Burn dealer for instructions to test your oil for chlorine contamination before firing your furnace.
   j. Inspect the inside of the clean-out door. Make sure the refractory material on the inside of the clean-out door is in good condition and the clean-out door seals tightly when closed. If the door does not seal tightly, replace any damaged components.

Cleaning the Ash (continued)

k. Re-install the furnace components: Swing the clean-out door shut; install and tighten the lock-down nuts so that the door seals properly. Re-install the air and oil lines on the bottom of the connector block.
NOTE: You may need to bleed air from the oil line before starting the burner. See Section 5 for the pertinent instructions.

Annual Burner Tune-up

Your Clean Burn furnace requires annual periodic maintenance. The burner requires an annual tune-up --similar to an automotive tune-up--to keep it running in peak condition. *The burner tune-up should be performed by a qualified Clean Burn service technician who has the necessary parts and expertise.*

Contact your local Clean Burn dealer to schedule the annual periodic maintenance which is usually (preferably) performed during warm weather to prepare the furnace for the next heating season. Various levels of service are provided to fit your particular need.

End of Season Maintenance

ATTENTION: Turn main power to your furnace OFF at the end of the heating season. This will prevent the oil from being "cooked" in the pre-heater block when it is not in use. Failure to do so may result in carbon build up in the burner preheater block which will block oil flow.

ATTENTION: 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.

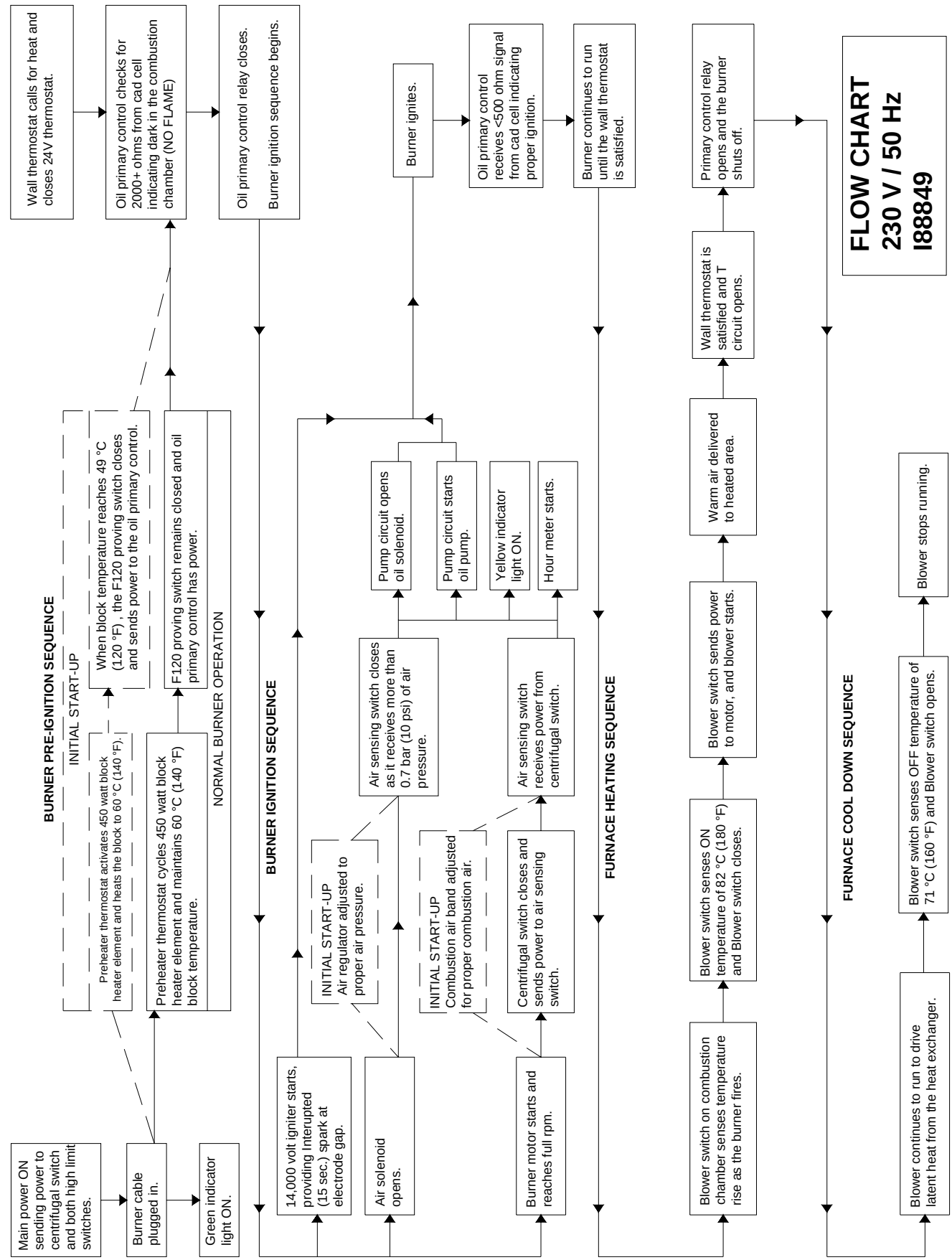
Contact your local Clean Burn dealer to schedule your annual burner tune-up. Allow only trained, authorized service personnel to service your burner.

SECTION 10: TROUBLESHOOTING

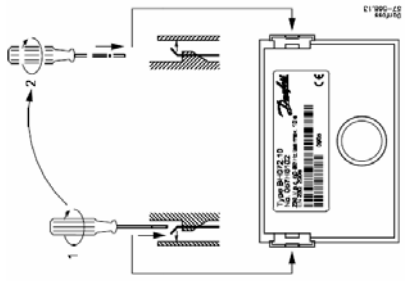
The following charts and tables are provided for reference in troubleshooting any difficulties encountered in furnace operation and adjustment.

- The **Flow Chart** outlines the proper sequence of events in furnace operation -- use this chart to help diagnose where a problem may be occurring.

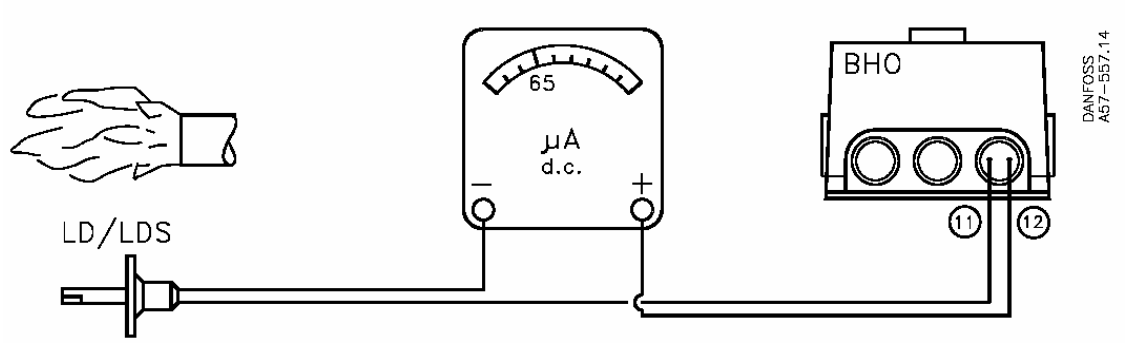
- More specific troubleshooting information is provided in the **Troubleshooting Tables** following the flow charts. Each table lists a **Problem**, **Possible Cause**, and **Possible Action(s)** to fix the problem.


FLOW CHART
230 V / 50 Hz
I88849
BURNER PRE-IGNITION SEQUENCE
INITIAL START-UP
Preheater thermostat activates 450 watt block heater element and heats the block to 60 °C (140 °F).
When block temperature reaches 49 °C (120 °F) , the F120 proving switch closes and sends power to the oil primary control.
Preheater thermostat cycles 450 watt block heater element and maintains 60 °C (140 °F) block temperature.
F120 proving switch remains closed and oil primary control has power.
NORMAL BURNER OPERATION
BURNER IGNITION SEQUENCE
FURNACE HEATING SEQUENCE
FURNACE COOL DOWN SEQUENCE
Main power ON sending power to centrifugal switch and both high limit switches.
Burner cable plugged in.
Green indicator light ON.
Wall thermostat calls for heat and closes 24V thermostat.
Oil primary control checks for 2000+ ohms from cad cell indicating dark in the combustion chamber (NO FLAME)
Oil primary control relay closes.
Burner ignition sequence begins.
14,000 volt igniter starts, providing Interupted (15 sec.) spark at electrode gap.
INITIAL START-UP
Air regulator adjusted to proper air pressure.
Air solenoid opens.
INITIAL START-UP
Combustion air band adjusted for proper combustion air.
Burner motor starts and reaches full rpm.
Centrifugal switch closes and sends power to air sensing switch.
Air sensing switch closes as it receives more than 0.7 bar (10 psi) of air pressure.
Air sensing switch receives power from centrifugal switch.
Pump circuit opens oil solenoid.
Pump circuit starts oil pump.
Yellow indicator light ON.
Hour meter starts.
Burner ignites.
Oil primary control receives <500 ohm signal from cad cell indicating proper ignition.
Burner continues to run until the wall thermostat is satisfied.
Blower switch on combustion chamber senses temperature rise as the burner fires.
Blower switch senses ON temperature of 82 °C (180 °F) and Blower switch closes.
Blower switch sends power to motor, and blower starts.
Warm air delivered to heated area.
Wall thermostat is satisfied and T circuit opens.
Primary control relay opens and the burner shuts off.
Blower continues to run to drive latent heat from the heat exchanger.
Blower switch senses OFF temperature of 71 °C (160 °F) and Blower switch opens.
Blower stops running.

PROBLEM	POSSIBLE CAUSE	POSSIBLE ACTION(S)
Burner won't run at all *and* Green power light is NOT ON.	1. Circuit breaker/main switch open. 2. Fuse/breaker blown. 3. Burner cable is damaged or not plugged in properly.	1. Close circuit breaker/switch. 2. Electrician should check out electrical system. 3. Check burner cable.
Burner won't run at all *and* Green power light is ON.	1. Oil primary control has shut down on safety reset. 2. Wall thermostat is not operating. 3. Heater block is not heating up. 4. F-120 proving switch has not closed. 5. Check the condition of the Oil primary control. 6. Oil primary control is damaged. 7. The L290 or L-290 limit switches have opened.	1. Follow the directions in Section 7 to reset the oil primary control. 2. Check the wall thermostat and thermostat cable. 3. Feel the back of the burner; it should be 60 °C (140 °F). If the heater block is NOT HOT: (a) Wait 15 minutes for the heater block to heat up and re-check the back of the burner, and (b) Check the block heater thermostat and block heater element. Refer to the wiring diagram and ladder schematic in Appendix B. 4. If the block is HOT: (a) Check the red wire at the F-120 proving switch for power. If there is NO power at the red wire, refer to the wiring diagram and ladder schematic in Appendix B to troubleshoot the circuit that provides power to the proving switch. (b) If there is power at the red wire at the proving switch, check for power at the black wire. If there is NO power at the black wire, replace the F-120 proving switch. 5. (a) Check the physical condition of the top primary control cover and the lower base to make sure there was no heat damage. (b) Disconnect the top cover of the primary control and check the base wiring. Follow the burner wiring label. 6. Replace oil primary control: (a) Check voltage – it must be 230 volts. 7. Test the switch for power. Note that power should be indicated on both sides of the switch. See section 7.



PROBLEM	POSSIBLE CAUSE	POSSIBLE ACTION(S)
Burner ignites, but will not stay running *and* Burner shuts off on reset within 15 seconds.	1. There is a fuel delivery problem. 2. The cad cell is dirty. 3. Cad cell wires are loose. 4. Cad cell / cad cell wires are damaged. 5. The primary control is not receiving the proper µA signal from the cad cell.	1. Follow the procedures listed in the next problem. 2. Clean and check the condition of the cad cell and cad cell wires. 3. Check that the blue and black wires are connected properly into the primary base (terminals 11 and 12) 4. Replace the cad cell and cad cell wires. If the cad cell is heat damaged: (a) Clean your furnace, including the combustion chamber, flues and stack. Refer to instructions in Section 9. (b) Check for backdraft caused by exhaust fans in your building. Follow instructions in Section 8. 5. The photo current is measured with a direct current ammeter in series with the photo unit (+ pole on terminal 12). With a flame, cad cell current must be between 50 µA and 210 µA at 240V. With no flame, the measured photo current must be maximum 5 µA at 230V.



Burner ignites and runs properly, but the burner shuts off on reset periodically (e.g. the burner goes off on reset during the night and requires resetting in the morning).	1. There is air in the suction oil line due to leaks at the fittings 2. There is air trapped in a high point in the pressure oil line.	1. Follow the procedures in Section 5 to vacuum test the pump. Re-install and properly seal the suction line fittings to eliminate air leaks. 2. Follow instructions in Section 4 to bleed the air out of the pressure oil line.

PROBLEM	POSSIBLE CAUSE	POSSIBLE ACTION(S)
Burner ignites *and* Burner shuts off on reset sometime later during the day or night.	1. There is air in the fuel supply.	1. Prime the pump. If the pump will not prime or there is air in the oil stream from the pump bleeder, follow the steps in the next problem ("Pump will not prime.")
	2. The primary control is not receiving the proper μA signal from the cad cell.	2. Check for proper μA signal. Follow the procedures in the previous problem (top, page 10-4)
	3. There is insufficient air pressure.	3. Follow the instructions in Section 5 to adjust the air regulator for proper air pressure. DO NOT turn the air compressor off while the furnace is operating. If you turn the air compressor off at night, turn the wall thermostat to OFF so the burner will not run.
	4. The heater block is cold.	4. DO NOT shut off power to the furnace overnight, or the heater block will cool down, and the burner will not re-start the next morning. To turn the furnace "off" overnight, turn the wall thermostat to OFF. The heater block will stay hot.
	5. The electrodes are fouled.	5. If oil residues have built up on the electrodes and retention head, follow the instructions in Section 8 to check for proper draft overfire. Clean the electrodes and retention head.

PROBLEM	POSSIBLE CAUSE	POSSIBLE ACTION(S)
Pump will not prime *and* Pump motor is running.	1. There is a leak(s) in the suction line.	1. Follow the specifications in Section 4 to make sure the suction line is installed properly and that all fittings are 100% airtight.
	2. The pump is not installed so it will fill with oil during the priming process.	2. Make sure the pump head is filled with oil prior to starting the pump. See Section 5.
	3. The pump gears are dry.	3. Follow the procedure in Section 5 to fill the oil line and prime the pump.
	4. The pump seal is damaged.	4. With the pump not running, wipe your finger along the bottom of the cylinder at the pump shaft. If there is oil at the pump shaft, the seal is damaged. Replace the pump, or replace the seal. NOTE: Some oils will expand as they warm up. Because there is a check valve in the suction line, the expanding oil may build up pressure and damage the oil seal. Install a mini-accumulator in the 1/8" port of the canister filter to prevent the pressure build-up.
	5. The ball valve is closed.	5. Open the ball valve on the suction line.
	6. The canister filter is dirty.	6. Refer to Section 9 to clean the canister filter.
	7. The check valve is dirty.	7. Refer to Section 9 to clean the check valve.
	8. The pump is damaged or worn out.	8. Replace the pump.

PROBLEM	POSSIBLE CAUSE	POSSIBLE ACTION(S)
Pump will not prime *and* Pump motor is NOT running.	1. There is NO power on the pump circuit from the burner.	1. Start the burner and adjust the air pressure regulator to 15 PSI. (a) If the amber "pump" light on the burner comes ON, the pump circuit on the burner has activated properly. Refer to the wiring diagram and ladder schematic in Appendix B to troubleshoot the pump circuit from the burner to the pump. (b) If the amber "pump" light on the burner does NOT come ON, there is a problem with pump circuit in the burner. With the burner running, check for power at the brown wire on the air pressure switch. If there is NO power at the brown wire, replace the burner motor. If there is power at the brown wire, replace the air sensing switch.
	2. The pump motor has shut off on thermal overload.	2. (a) The pump motor is too hot—the internal thermal protection switch shut the motor off. Wait for the motor to cool down; the thermal switch will automatically reset. Check voltage and amperage draw of the pump motor. Call your dealer if the problem persists. (b) The coupling is not adjusted properly, keeping the shafts of the motor and pump from turning freely. Re-position the coupling so that both shafts turn freely. (c) The shaft on the motor or oil pump will not turn freely. If you can't turn the shafts, replace the faulty part(s).
Blower motor runs all the time.	1. Blower motor circuit is wired incorrectly.	1. Refer to wiring diagram and ladder schematic in Appendix B to troubleshoot the blower motor circuit.
Blower motor will not run.	1. The blower motor is not wired correctly.	1. Check the blower motor wiring. Refer to the wiring diagram and ladder schematic in Appendix B. Follow the directions in Section 6 to test for proper fan operation. If the fan does not operate, shut OFF power to the furnace and call your Clean Burn dealer for service.
	2. The Blower / Fan switch is defective.	2. Replace the Blower / Fan switch.
	3. The blower motor has overheated and shut down on thermal reset.	3. Reset the red button on the motor thermal reset. Check voltage and amperage draw of the blower motor. Call your dealer if the problem persists.

APPENDIX A

Detailed Furnace Specifications

Furnace Technical Specifications

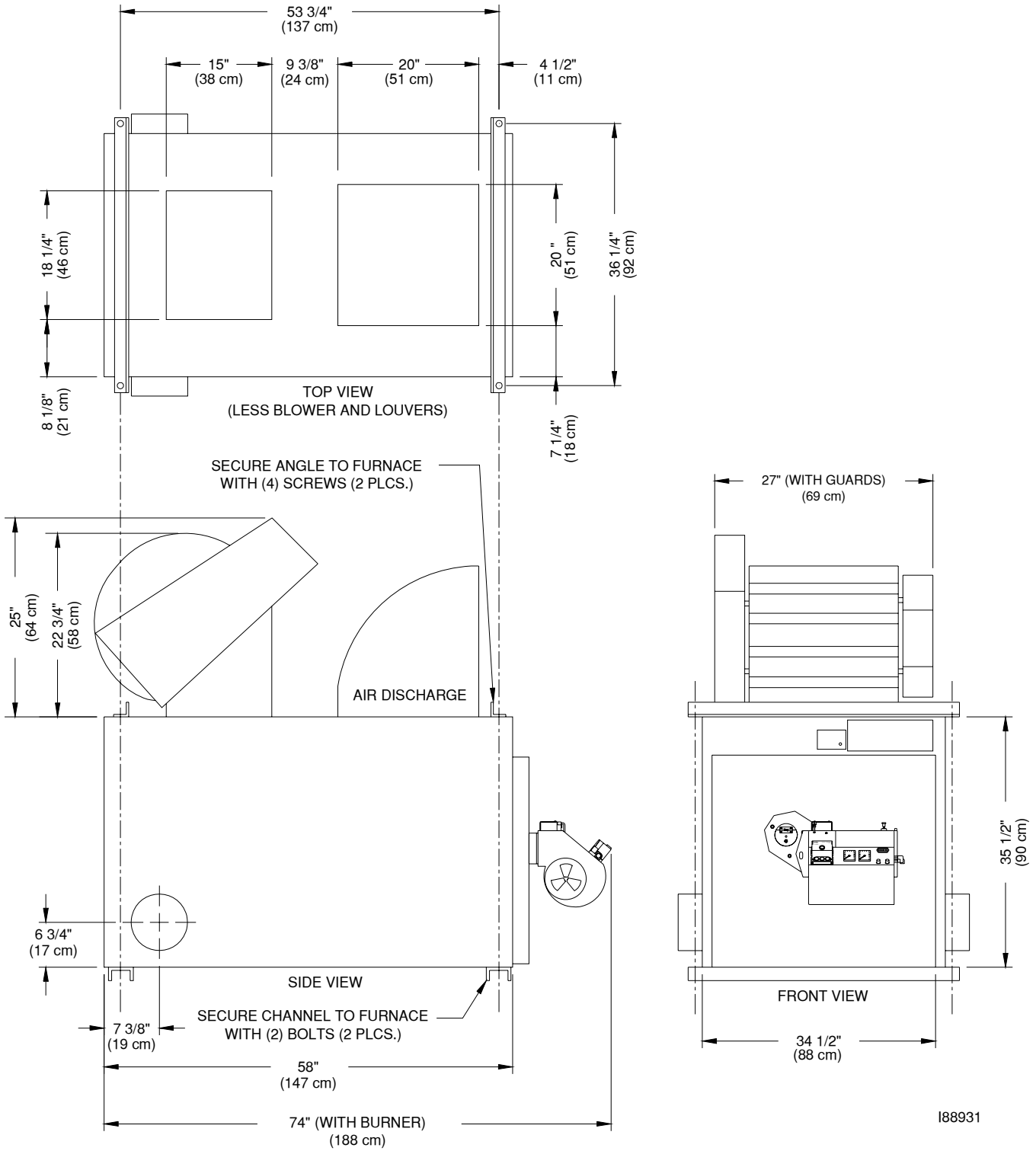
Furnace Model	CB-3500	CB-5000
Maximum Input	103 KW (350,000 BTUH) At 9.5 LPH (2.5 GPH)	147 KW (500,000 BTUH) At 13.5 LPH (3.6 GPH)
Listed Fuels	#2, #4, #5 fuel oils Used crankcase oil Used ATF Used hydraulic oil	#2, #4, #5 fuel oils Used crankcase oil Used ATF Used hydraulic oil
Cabinet Dimensions	L X W X H 147cm X 88cm X 90cm (58" X 34 ½" X 35 ½")	L X W X H 155cm X 97cm X 100cm (61" X 38 ¼" X 39 ½")
Furnace Dimensions with Blower and Burner	L X W X H 188cm X 88cm X 154cm (74" X 34 ½" X 60 ½")	L X W X H 198cm X 97cm X 184cm (78" X 38 ¼" X 72 ½")
Approximate Weight	380 Kg (836 lbs.)	470 Kg (1036 lbs.)
Mounting	- ceiling hung - non-combustible platform	- ceiling hung - non-combustible platform
Electrical Requirements	230 Volts / 50 Hz	230 Volts / 50 Hz
Maximum Fuse Size	20 Amps	25 Amps
Wall Thermostat	24 Volts	24 Volts
Oil Pump	Suntec A2RA-7710	Suntec A2RA-7710
Pump Motor	1/20 HP	1/20 HP
Pump Motor Rotation	CCW shaft end	CCW shaft end
Canister Filter	Lenz DH-750-100	Lenz DH-750-100
Stack Size	20 cm (8")	25 cm (10")
Blower Motor HP	2 HP	2 HP
Blower Motor Relay	30 Amp double pole	30 Amp double pole
Pump and D-I Relay	20 Amp single pole	20 Amp single pole
Blower / Fan Switch	F180	F180
Fan Limit Control	Honeywell L4064B	Honeywell L4064B
Fan Limit Settings	Hi Limit – 99 ^{o}C (210^{o}F) Fan On – 49 ^{o}C (120 ^{o}F) Fan Off – 38 ^{o}C (100 ^{o}F)	Hi Limit – 99 ^{o}C (210^{o}F) Fan On – 49 ^{o}C (120 ^{o}F) Fan Off – 38 ^{o}C (100 ^{o}F)
Hi-Temp Limit Switch	L290 (auto reset)	L290 (auto reset)

Burner Technical Specifications

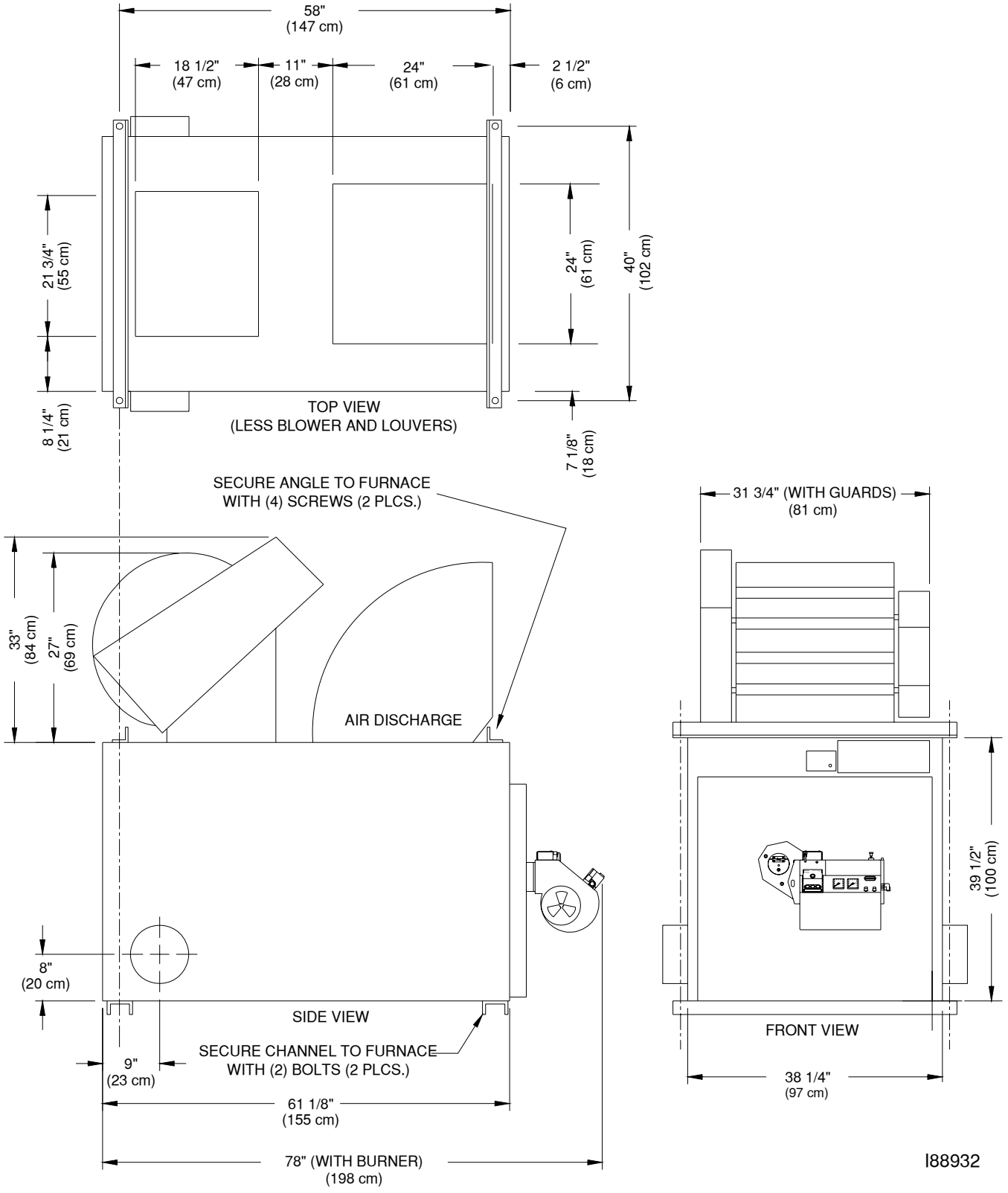
NOTE: These burner specifications apply to both furnace models, CB-3500 and CB-5000, except where differences are noted within the table.

Burner	CB-500-CE-5W Series
Ignition Transformer	Danfoss (14,000 Volts)
Nozzle	Delavan 9-5 (CB-3500) Delavan 9-11 (CB-5000)
Burner Motor	1/10 HP 2800 RPM With Centrifugal Switch
Burner Motor Rotation	CCW Shaft End
Compressed Air Requirements	CB-3500 - 0.06 CMM @ 1.7 Bar (2.0 SCFM @ 25 psi) CB-5000 - 0.07 CMM @ 1.7 Bar (2.5 SCFM @ 25 psi)
Oil Primary Control	Danfoss
Heater Element in Preheater Block	450 Watts
Air Pressure Switch	MPL 808
Setting for Preheater Thermostat	60^{o}C (140^{o}F)

Furnace Dimensions (CB-3500)



Furnace Dimensions (CB-5000)



Burner Components

CB-3500 with CB-500-CE
CB-5000 with CB-550-CE

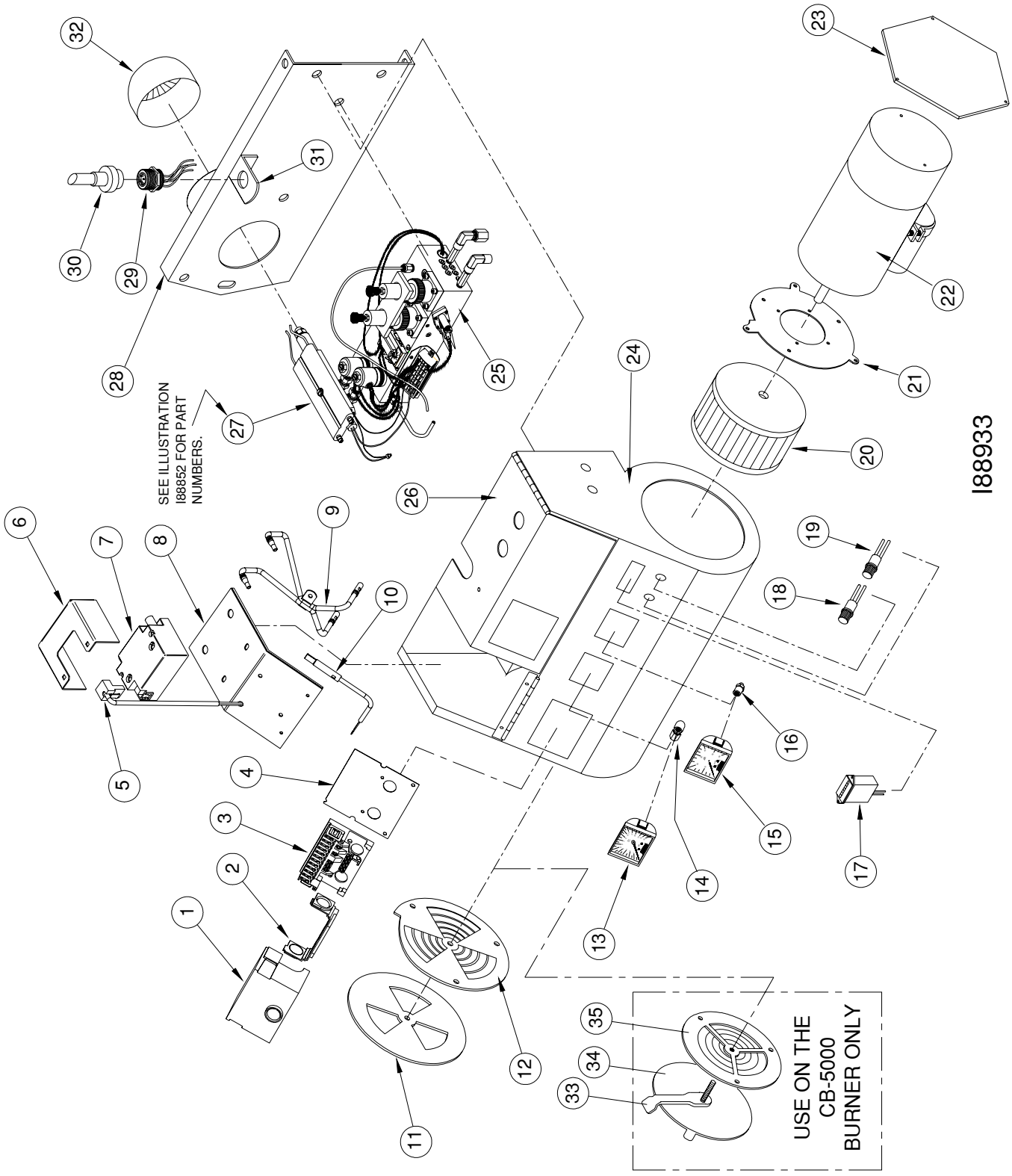


Figure A1 - Burner Component Detail

Burner Components (continued)

Item#	C.B. Part#	Component Description
1	33521	BURNER CONTROL, BHO 64
2	33523	FRONT PLATE FOR BHO 64
3	33522	BASE FOR BHO 64
4	26122	PLATE, DANFOSS PRIMARY
5	33526	PRIMARY CABLE WITH PLUG
6	26121	COVER, DANFOSS IGNITER
7	33524	DANFOSS IGNITER, TYPE EBI 230V
8	26120	PLATE, DANFOSS IGNITER
9	33528	SPARK-PLUG CABLE
10	33525	PHOTO UNIT LD
11	26095	AIR INTAKE OUTER PLATE
12	11359	AIR INTAKE INNER PLATE
13	32178	OIL GAUGE 0-15 PSI
14	32235	FEMALE ELBOW (3/16 T x 1/8 NPT)
15	32179	AIR GAUGE 0-60 PSI
16	32253	FEMALE ELBOW (1/8 TP x 1/8 NPT)
17	33161	HOUR METER (50 Hz)
18	33166	GREEN LIGHT (POWER) 230V
19	33338	AMBER LIGHT (PUMP) 230 V
20	31113	FAN SQUIRREL CAGE
21	26044	MOTOR MOUNT PLATE
22	33337	BLOWER MOTOR (230 V)
23	26053	RIGHT SIDE COVER
24	11335	HOUSING (INCLUDES ITEM 26)
25	13156	HEATER BLOCK ASSEMBLY
26	11265	COVER-HINGED
27	SEE NOTE	NOZZLE ADAPTER ASSEMBLY
28	11334	HINGE MOUNTING PLATE
29	11285	CONNECTOR RECEPTACLE
30	33534	CONNECTOR PLUG
31	26052	LATCH BRACKET
32	11308	RETENTION HEAD - CB-3500
	11427	RETENTION HEAD - CB-5000
33	26106	LOCKING LEVER
34	11410	OUTER DRAFT PLATE
35	26104	INNER DRAFT PLATE ASSEMBLY

Burner Components (continued)

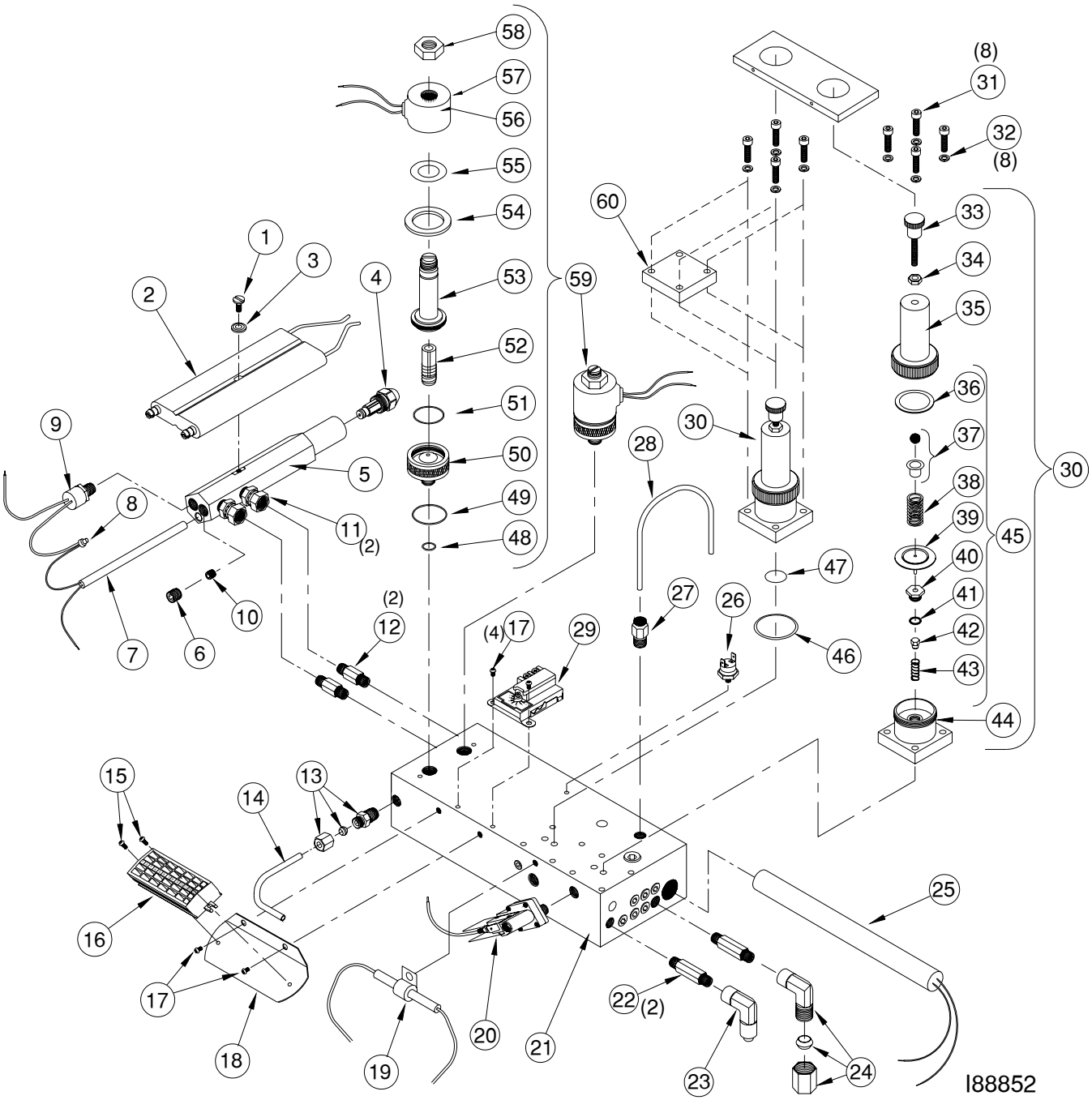


Figure A3 - Preheater Block Assembly Component Detail

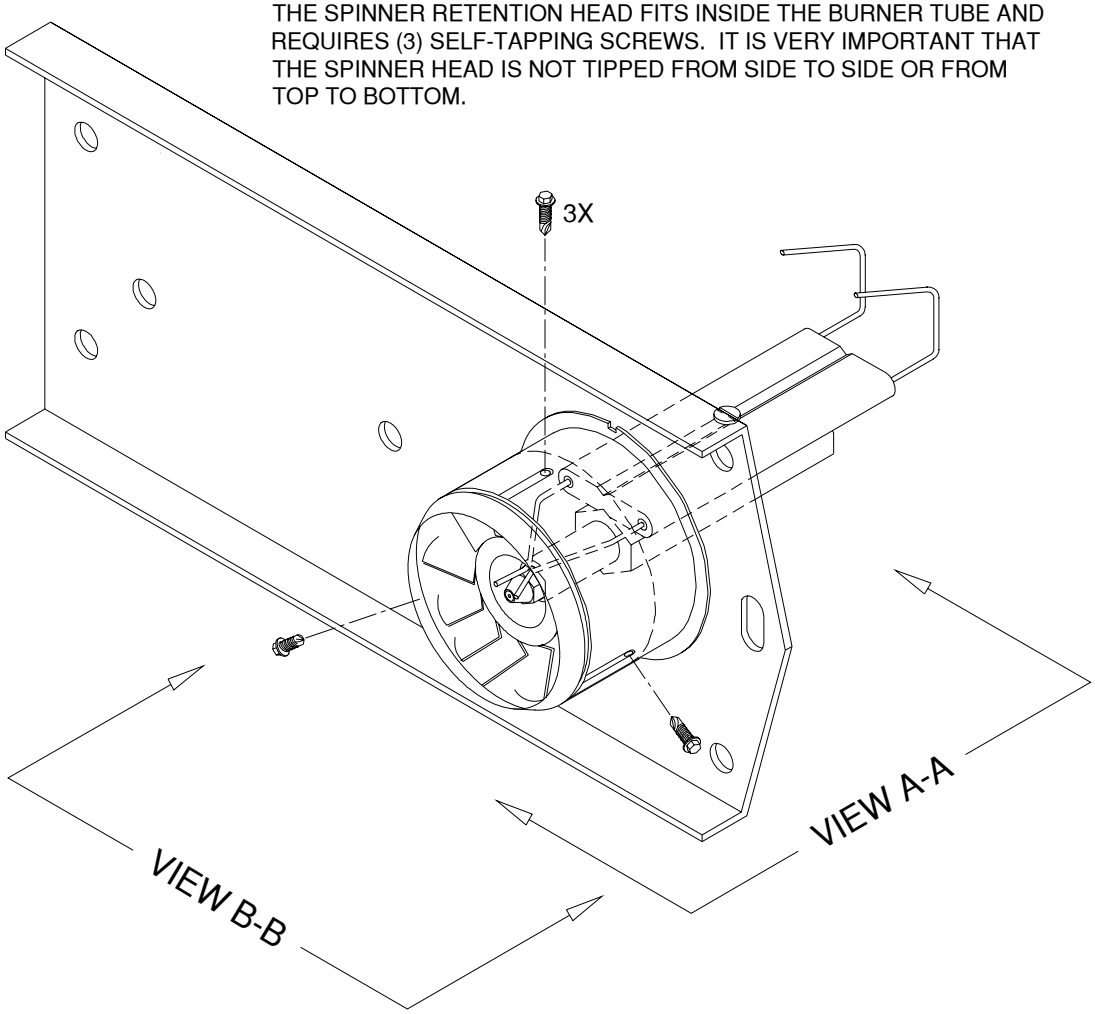
Burner Components (continued)

Item#	C.B. Part#	Qty.	Component Description
1	34169	1	ELECTRODE SCREW - 10-32 x 3/4
2	33527	1	PLUG IN ELECTRODE
3	34165	1	WASHER
4	32000	1	9 - 5 NOZZLE - CB-3500
	32002	1	9-11 NOZZLE - CB-5000
5	13150	1	NOZZLE ADAPTOR
6	32007	1	PLUG - 1/8 NPT
7	33375	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	33278	1	THERMAL CUT-OFF
20	33057	1	AIR PRESSURE SWITCH
21	26090	1	HEATER BLOCK
22	32190	2	HEX NIPPLE - 1/8 NPT x 2
23	32202	1	FEMALE ELBOW (FOR 1/4" AIR LINE)
24	32201	1	FEMALE ELBOW (FOR 3/8" OIL LINE)
25	33289	1	PRE-HEATER ELEMENT (450 WATTS)
26	33378	1	PROVING SWITCH (NORMALLY OPEN)
27	32325	1	MALE ELBOW 1/8 x 1/8 NPT (FOR AIR GAUGE LINE)
28	54020	1	3/16 COPPER TUBING(OIL GAUGE LINE)
29	33011	1	HEATER BLOCK THERMOSTAT(NORMALLY CLOSED)
30	32359	2	REGULATOR SURFACE MOUNT
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	DIAPHRAM RING
37	32364	2	CAP AND BALL ASSEMBLY
38	32227	2	COMPRESSION SPRING
39	32360	2	DIAPHRAM
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	33384	2	COIL (230 V)
57	33320	2	COIL HOUSING
58	33321	2	NUT
59	33371	2	AIR/OIL SOLENOID ASSEMBLY (230 V)
60	26107	1	REG. SQUARE CAP

Burner Components (continued)

INSTALLATION OF THE SPINNER RETENTION HEAD

THE SPINNER RETENTION HEAD FITS INSIDE THE BURNER TUBE AND REQUIRES (3) SELF-TAPPING SCREWS. IT IS VERY IMPORTANT THAT THE SPINNER HEAD IS NOT TIPPED FROM SIDE TO SIDE OR FROM TOP TO BOTTOM.



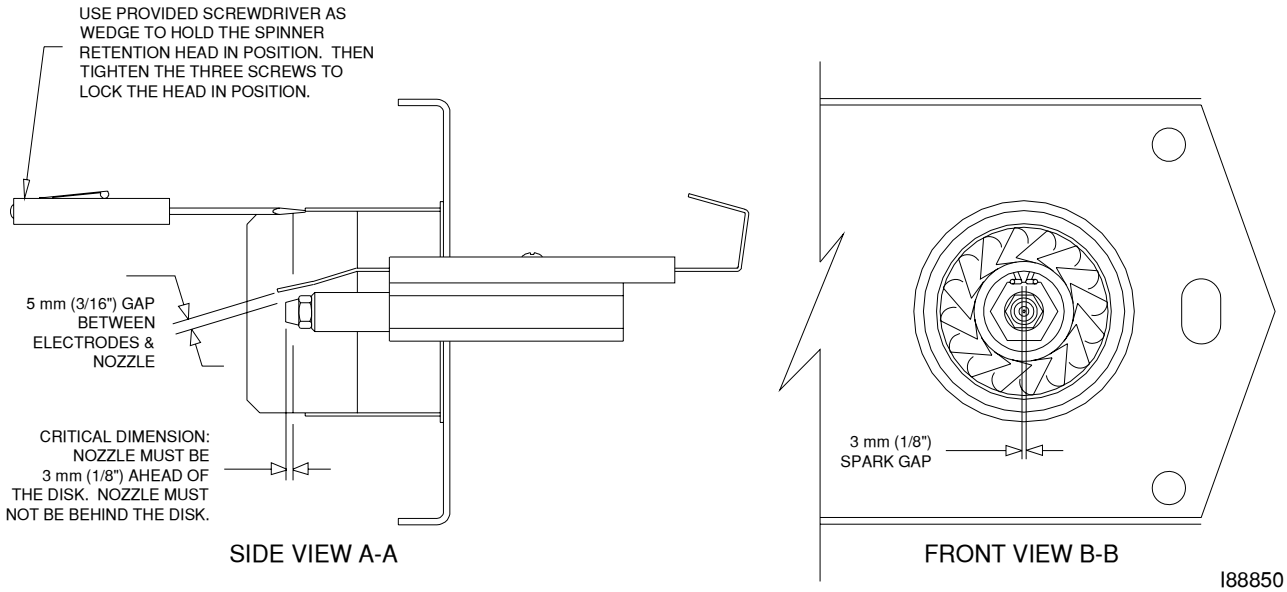
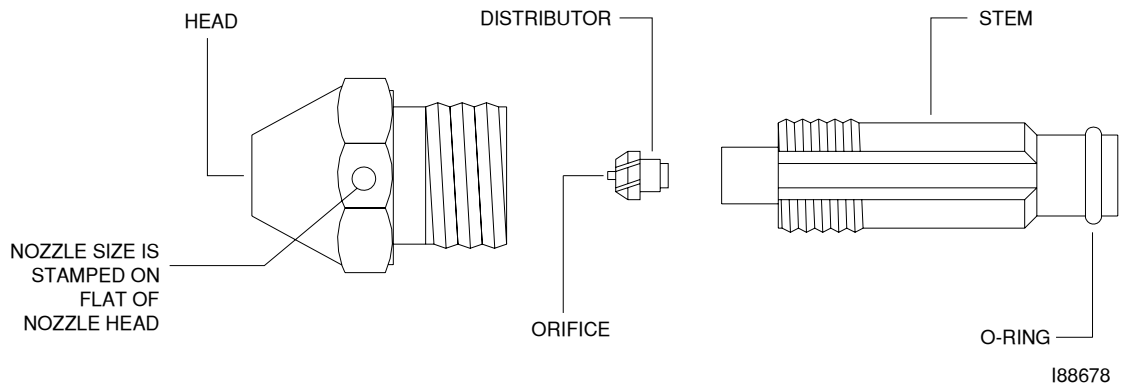


Figure A4 - Burner Electrode Specifications with Spinner Retention Head

Burner Components (continued)



Model	Nozzle Size
CB-3500	Delavan 9-5
CB-5000	Delavan 9-11

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.

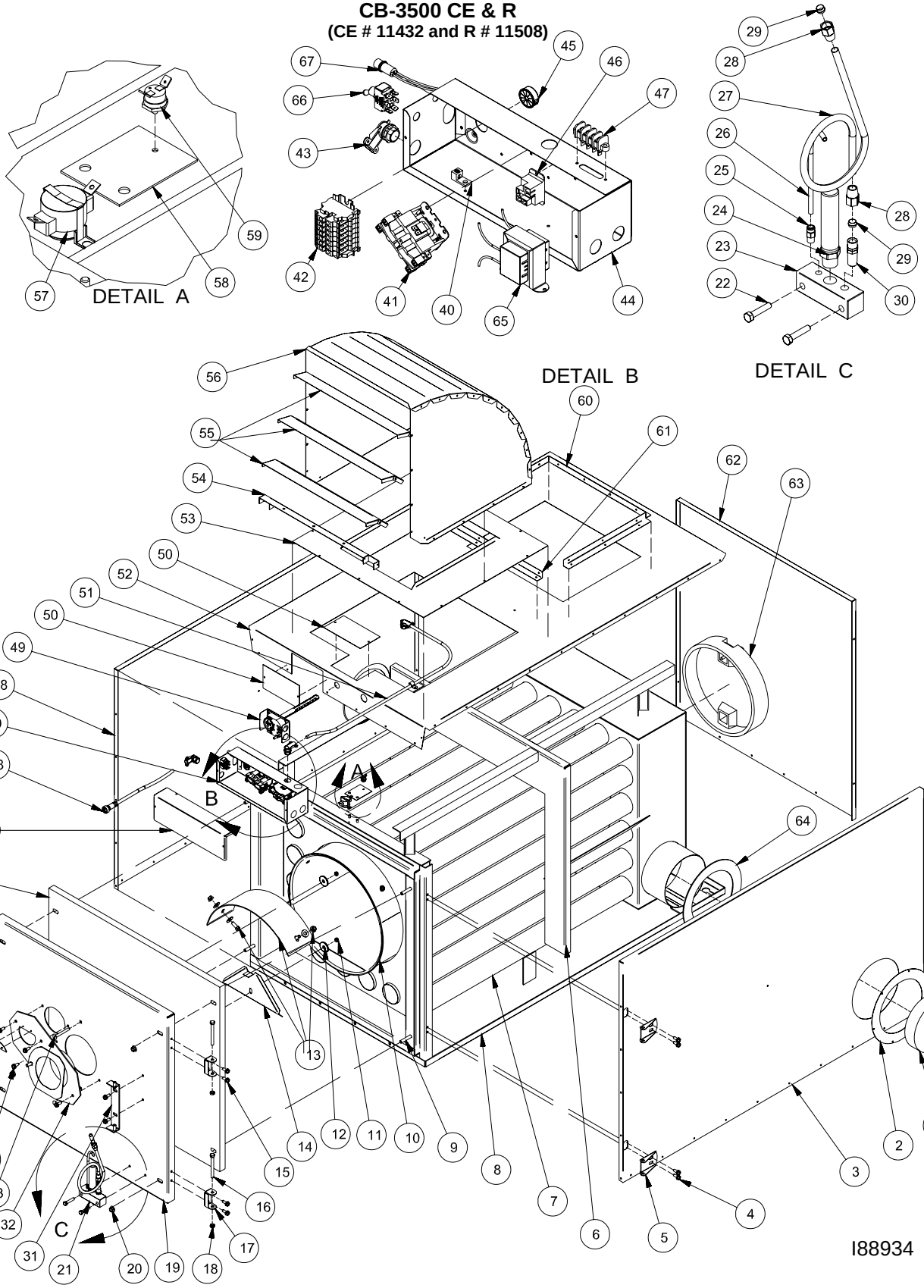
Cleaning the Nozzle:

1. Unscrew the stem from the nozzle head.
2. Spray WD-40 or equivalent through the orifice to thoroughly remove any blockage. **CAUTION:** 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 A5 - Cleaning the Nozzle

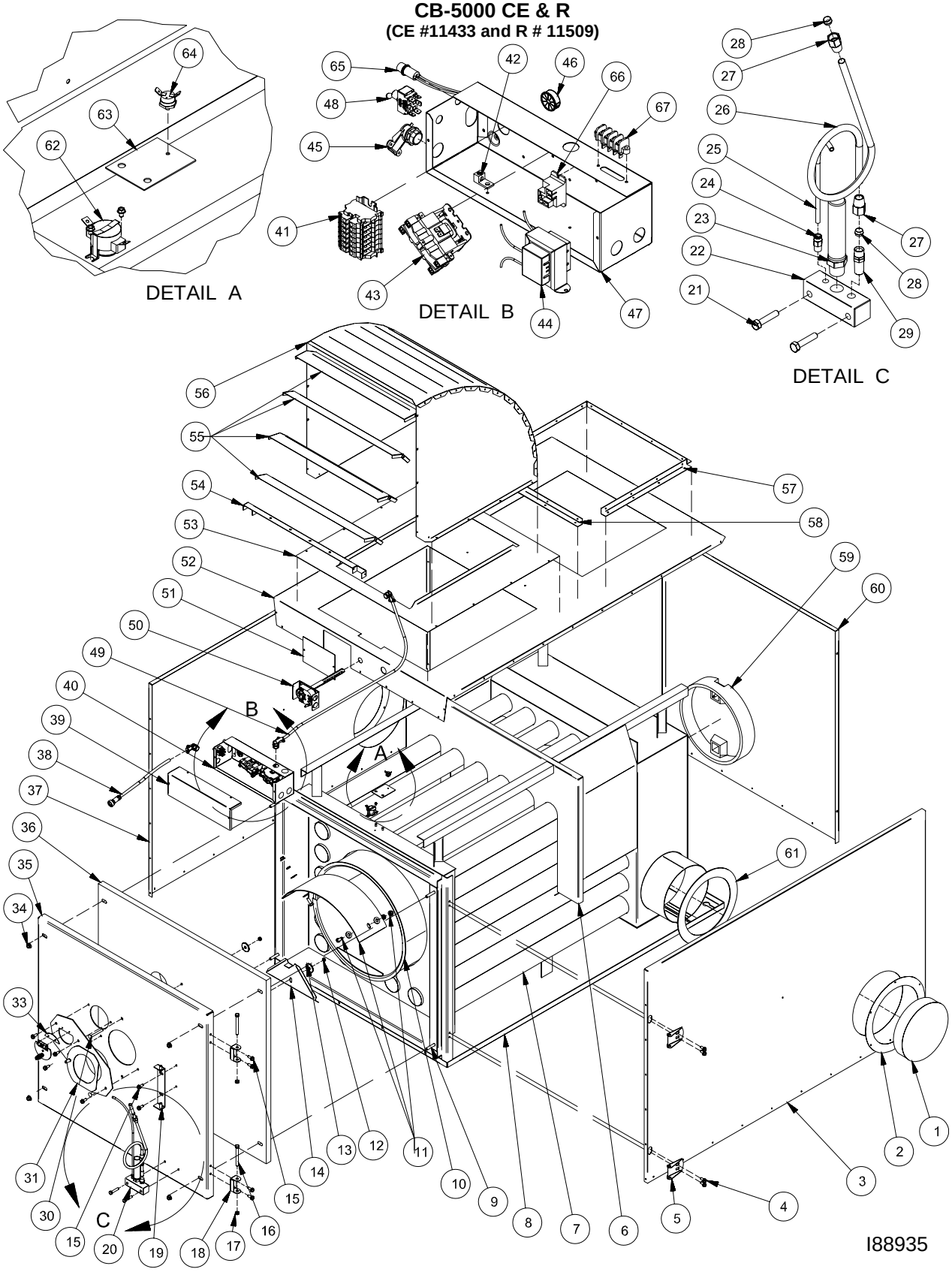
CABINET
CB-3500 CE & R
(CE # 11432 and R # 11508)



CB-3500 Furnace Components

Item #	Part #	Description	Item #	Part #	Description
1	31091	DUCT CAP ROUND 8"	46	33544	RELAY-COIL 24VAC 30A
2	21010	STACK PIPE FLASH RING	47	33331	TERMINAL BLOCK 4 POST
3	24077	SIDE - RIGHT	48	24080	SIDE - LEFT
4	34028	5/16-18 X 3/4 SERR HEX FLANG	49	33245	FAN LIMIT SWITCH
5	21057	HINGE BRACKET	50	24119	COVER
6	24069	DIVIDER	51	14173	MOTOR HARNESS, CB3501
7	21102	FLUE TUBE CB3500/CB5000	52	24079	TOP
8	24068	BASE	53	24108	ORIFICE
9	34126	3/8-16 X 2 HHCS GR-5	54	24114	3500 DISCHARGE - ANGLE BOTTOM
10	24116	FIRE DRUM	55	24092	LOUVER
11	34121	5/16-18 TOP LOCK NUT S.S.	56	14160	DIFFUSER OUTLET 3500 A
12	21039	.438 X 1.5 X .135 FLAT WASHER	57	33230	FAN SWITCH - SURFACE MOUNT 180
13	70418	COMB CHAMBER BAND KIT - 3500	58	25115	PLATE
	24182	REINFORCEMENT BAND - 3500	59	33288	AUXIL HI LIMIT-AUTO RESET 290
	34397	3/8 X 1 HHCS - SS	60	24082	BLOWER ANGLE
	34398	3/8 SERRATED FLANGE NUT - SS	61	24083	BLOWER CLOSING ANGLE
	34399	3/8 SPLIT LOCK WASHER - SS	62	24078	BACK
14	11213	DOOR APRON	63	11154	TARGET (REFRAC) DISC ASSY
15	34118	5/16-18 X 3/4 HEX WASHER HEAD	64	24100	RING
16	34119	3/8-16 X 3 HHCS GR-2 ZINC	65	33340	TRANSFORMER 24-240V
17	21056	HINGE BRACKET	66	33286	SWITCH DPDT ON-ON
18	34095	3/8-16 STOVER L/N GR-B CAD/WAX	67	33338	AMBER LIGHT 220V
19	24075	OUTSIDE DOOR			
20	34009	3/8-16 HEX SERR FLANGE NUT PLT			
21	14102	CB-3500 HOOK-UP A			
22	34051	5/16-18 X 1 1/2 HHCS GR-2 ZINC			
23	21101	CONNECTOR BLOCK			
24	32311	ACCUMULATOR			
25	32039	ADAPT 1/4 OD X 1/8 P			
26	13017	AIR LINE ASSEMBLY			
27	13128	OIL LINE A			
28	32304	NUT - LONG			
29	32303	SLEEVE			
30	32245	SWIVEL 1/4NPTM,1/4NPTF			
31	11033	HINGE BRACKET W A			
32	11143	BURNER MOUNT W A			
33	34120	5/16-18 X 2 3/4 CARR BOLT S.S.			
34	11325	INSPECTION DOOR A			
35	21076	PORT CAP			
36	24103	DOOR INSULATION			
37	21114	LID			
38	33150	CONNECTOR PLUG			
39	12294	JUNCTION BOX INTERNATL 5 WIRE A.			
40	33145	SCREW LUG			
41	33210	CONT 230V 50HZ 2POLE			
42	33486	TERMINAL BLOCK ASSY.			
43	33273	CONNECTOR 90 DEG. SNAP-TITE			
44	21173	BOX - JUNCTION			
45	33299	PLASTIC WIRE PROT			

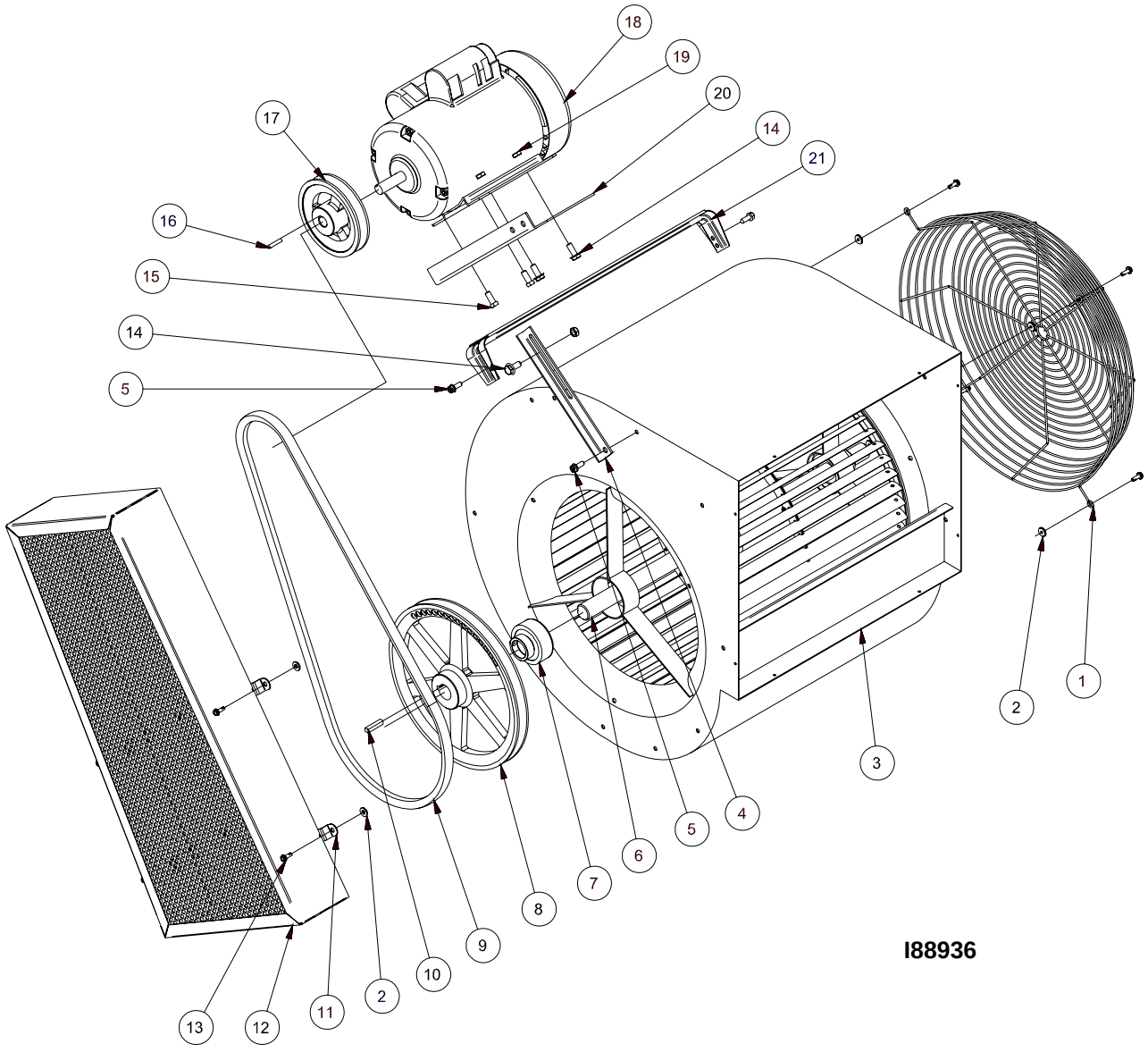
CABINET
CB-5000 CE & R
(CE #11433 and R # 11509)



CB-5000 Furnace Components

Item #	Part #	Description
1	31092	DUCT CAP ROUND 10" - 28 GA.
2	25032	STACK PIPE FLASH RING DH
3	25085	SIDE - RIGHT
4	34028	5/16-18 X 3/4 SERR HEX FLANG
5	21057	HINGE BRACKET
6	25110	DIVIDER
7	21102	FLUE TUBE CB3500/CB5000
8	25078	BASE
9	34126	3/8-16 X 2 HHCS GR-5
10	25107	FIRE DRUM
11	70419	COMB CHAMBER BAND KIT - 5000
	25130	REINFORCEMENT BAND - 5000
	34397	3/8 X 1 HHCS - SS
	34398	3/8 SERRATED FLANGE NUT - SS
	34399	3/8 SPLIT LOCK WASHER - SS
12	34121	5/16-18 TOP LOCK NUT S.S.
13	21039	.438 X 1.5 X .135 FLAT WASHER
14	11213	DOOR APRON
15	34118	5/16-18 X 3/4 HEX WASHER HEAD
16	34119	3/8-16 X 3 HHCS GR-2 ZINC
17	34095	3/8-16 STOVER L/N GR-B CAD/WAX
18	21056	HINGE BRACKET
19	11033	HINGE BRACKET W A
20	14103	CB-5000 HOOK-UP A
21	34051	5/16-18 X 1 1/2 HHCS GR-2 ZINC
22	21101	CONNECTOR BLOCK
23	32311	ACCUMULATOR
24	32039	ADAPT 1/4 OD X 1/8 P
25	13017	AIR LINE ASSEMBLY
26	13129	OIL LINE A
27	32304	NUT - LONG
28	32303	SLEEVE
29	32245	SWIVEL 1/4NPTM,1/4NPTF
30	34120	5/16-18 X 2 3/4 CARR BOLT S.S.
31	11143	BURNER MOUNT W A
32	11325	INSPECTION DOOR A
33	21076	PORT CAP
34	34009	3/8-16 HEX SERR FLANGE NUT PLT
35	25083	OUTSIDE DOOR
36	25119	DOOR INSULATION
37	25088	SIDE - LEFT
38	33150	CONNECTOR PLUG
39	21114	LID
40	12229	JUNCTION BOX INTERNATL A
41	33486	TERMINAL BLK ASSY.
42	33145	SCREW LUG
43	33210	CONT 230V 50HZ 2POLE
44	33340	TRANSFORMER 24-240V
45	33273	CONNECTOR 90 DEG. SNAP-TITE
46	33299	PLASTIC WIRE PROT
47	21173	BOX - JUNCTION INTL 5 WIRE
48	33286	DPDT ON-ON
49	12215	MOTOR HARNESS (CB5001)
50	33245	FAN LIMIT SWITCH
51	25114	COVER
52	25087	TOP
53	25070	ORIFICE PLATE
54	21107	5000 DISCHARGE - ANGLE BOTTOM
55	24034	LOUVER
56	14161	DIFFUSER OUTLET 5000 A
57	25067	BLOWER FLANGE
58	25068	BLOWER CLOSING ANGLE
59	11154	TARGET (REFRAC) DISC ASSY
60	25086	BACK
61	25100	RING
62	33230	FAN SWITCH - SURFACE MOUNT 180
63	25115	PLATE
64	33288	AUXIL HI LIMIT-AUTO RESET 290
65	33338	AMBER LIGHT 220V
66	33544	RELAY-COIL 24V 30A
67	33331	TERMINAL BLOCK 4 POST

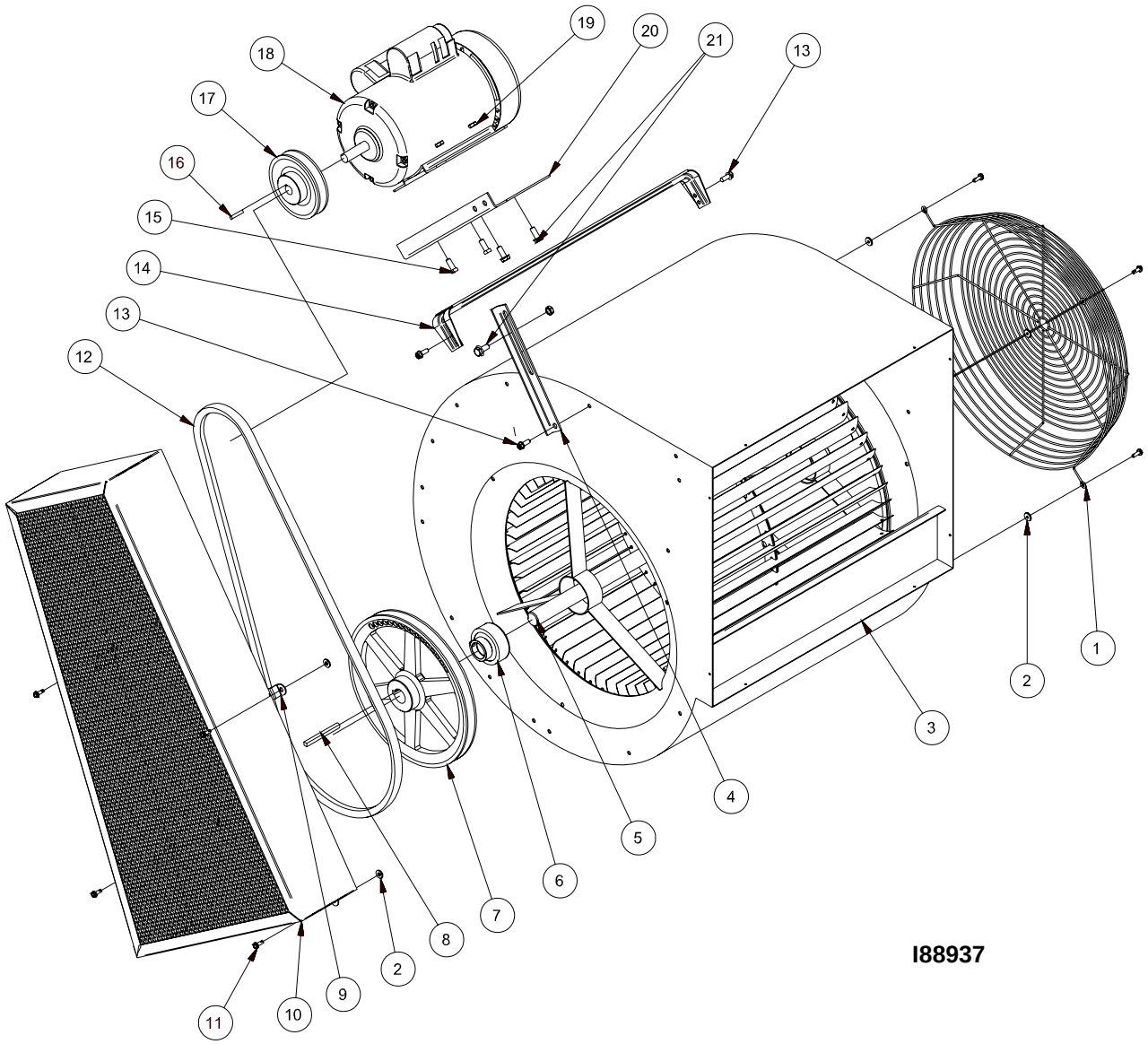
BLOWER ASSEMBLY
CB-3500 CE & R
(CE # 11436 and R # 11514)



CB-3500 Blower Components

Item #	Part #	Description
1	31228	BLOWER WIRE GUARD 3500/5000
2	34165	#12 X 9/16 BONDED NEOPRENE
3	31084	BLOWER
4	25046	ANGLE FRONT
5	34159	1/4 X 3/4 SLOTTED IND HEX
6	31194	1" SHAFT W/KEYWAY (15")
7	31192	REPLACEMENT BEARING PACKAGE
8	31072	BLOWER PULLEY; 10.75" OD
9	31180	BELT V B58 (CB-3500I-2 HP MTR)
10	210131	KEY 1/4 X 1 1/4
11	21112	TAB
12	11125	BELT GUARD ASSY
13	34116	10 X 5/8 HEX WASHER HEAD TEK Z
14	34328	5/16-18 X 3/4 HEX HEAD FLANGE
15	34290	5/16-18 X 3/4 SQUARE HEAD
16	210129	KEY SQ. 3/16 X 1
17	31178	BK-60 PULLEY 5/8" BORE
18	33373	BLOWER MOTOR 2HP (230V/50HZ)
19	34072	5/16-18 STOVER TOP LOCK NUT
20	24087	MOTOR MOUNT
21	31187	MOTOR MOUNT BRACKET
	11436	ACCESS GRP CB-3500 CE
	11514	ACCESSORY GROUP CB-3500-R-MP

BLOWER ASSEMBLY
CB-5000 CE & R
(CE # 11437 and R # 11515)



I88937

CB-5000 Blower Components

Item #	Part #	Description
1	31228	BLOWER WIRE GUARD 3500/5000
2	34165	#12 X 9/16 BONDED NEOPRENE
3	31056	BLOWER
4	25046	ANGLE FRONT
5	31195	1" SHAFT W/KEYWAY (18")
6	31192	REPLACEMENT BEARING PACKAGE
7	31072	BLOWER PULLEY; 10.75" OD
8	210304	1/4 SQ X 3" KEY
9	21112	TAB
10	11238	BELT GUARD WA
11	34116	10 X 5/8 HEX WASHER HEAD TEK Z
12	31088	V BELT B-64
13	34159	1/4 X 3/4 SLOTTED IND HEX
14	31188	MOTOR MOUNT BRACKET
15	34290	5/16-18 X 3/4 SQUARE HEAD
16	210129	KEY SQ. 3/16 X 1
17	31179	BK-57 PULLEY 5/8" BORE
18	33373	BLOWER MOTOR 2HP (230V/50HZ)
19	34072	5/16-18 STOVER TOP LOCK NUT
20	24087	MOTOR MOUNT
21	34328	5/16-18 X 3/4 HEX HEAD FLANGE
	11437	ACCESS GRP CB-5000 CE
	11515	ACCESSORY GROUP CB-5000-R-MP

APPENDIX B

Wiring Dia

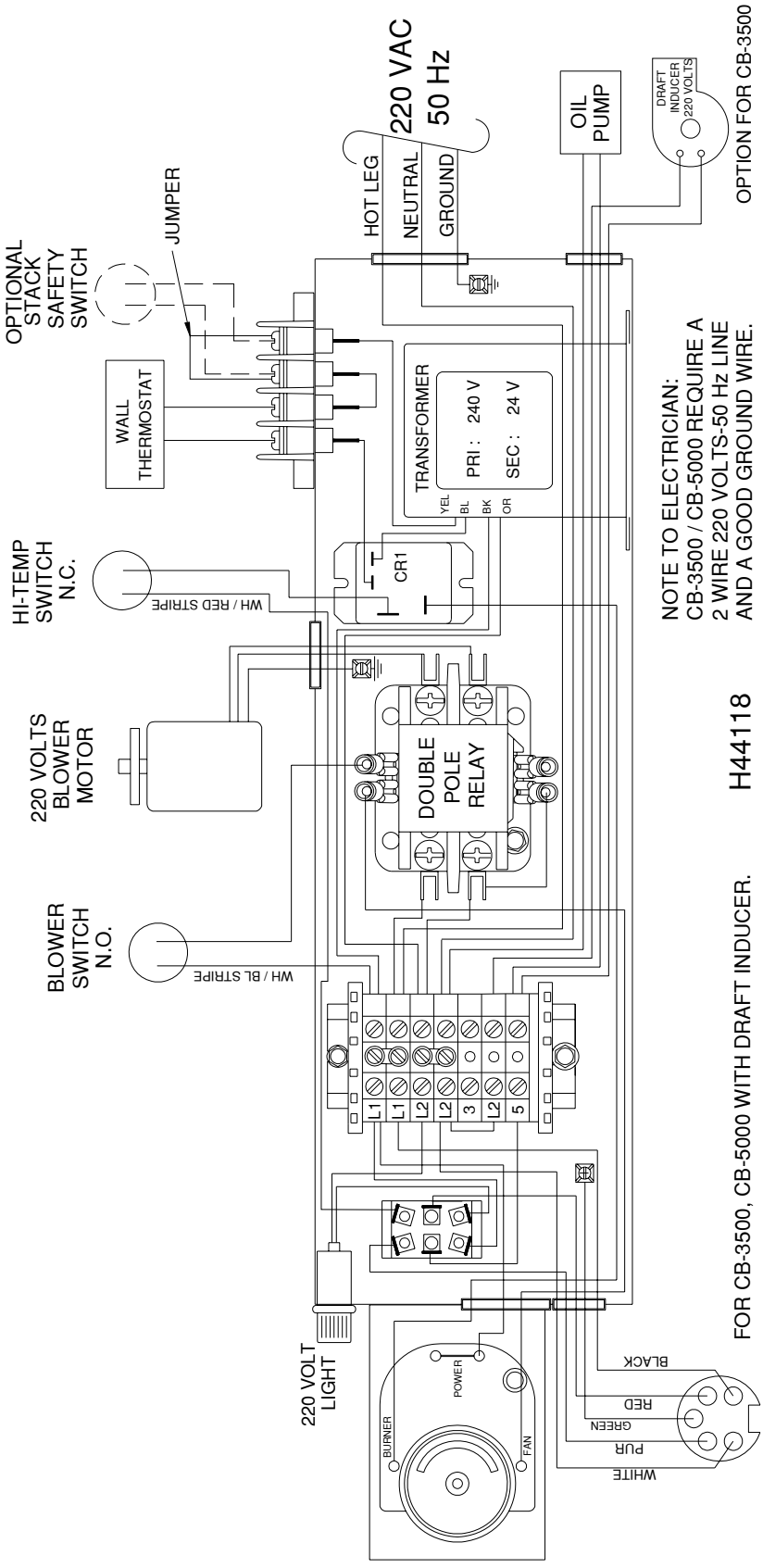


Figure B1 - CB-3500/CB-5000 Furnace Wiring Diagram
(*with Draft Inducer - *standard for CB-5000; optional with CB-3500)

Wiring Diagrams

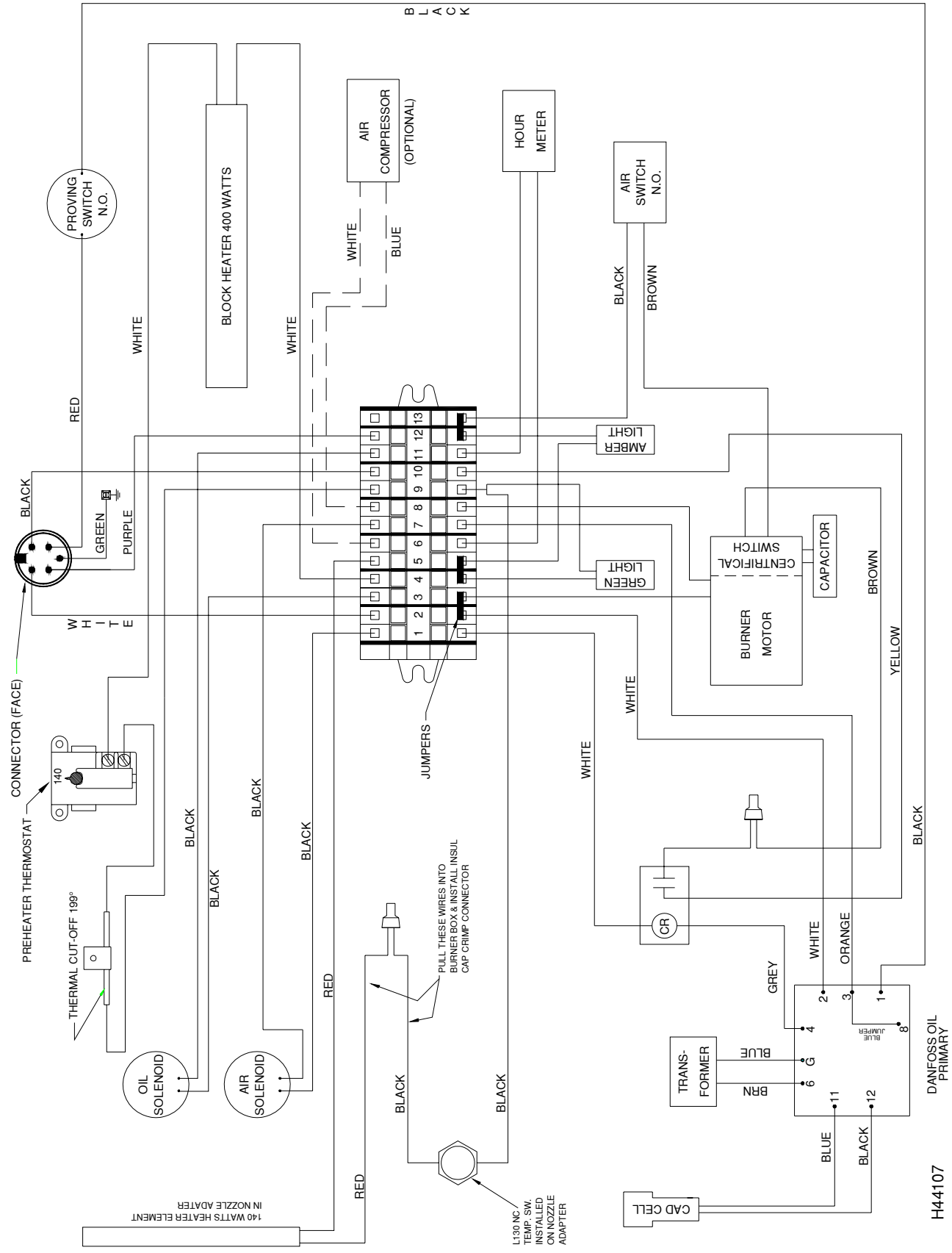
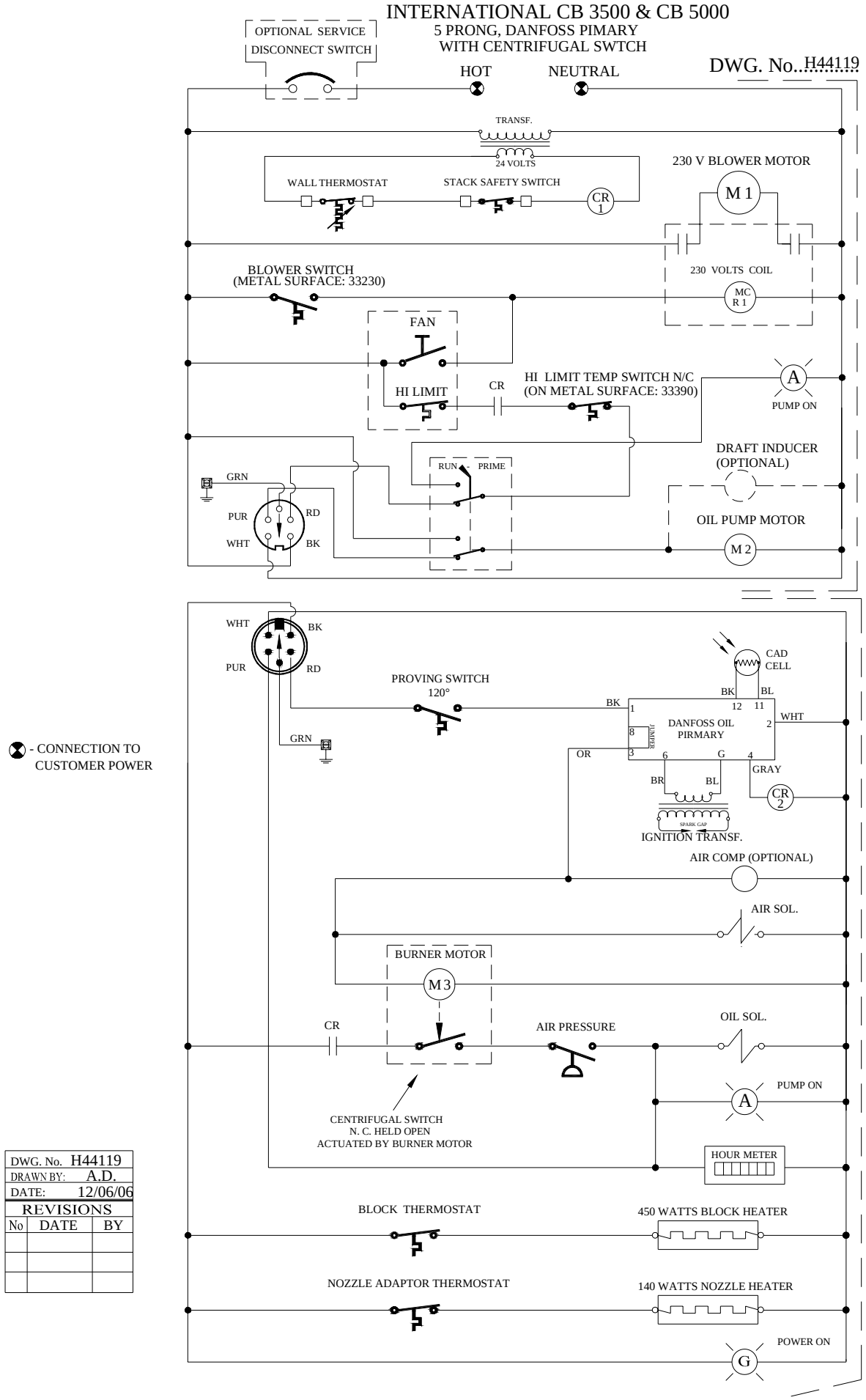


Figure B2 - CB-3500/CB-5000 with CB-500 Series Burner



DWG. No.	H44119
DRAWN BY:	A.D.
DATE:	12/06/06

REVISIONS		
No	DATE	BY

Figure B3 - Ladder Schematic for Models CB-3500 / CB-5000 (230 Volts / 50 Hz)

Wiring Diagrams (continued)

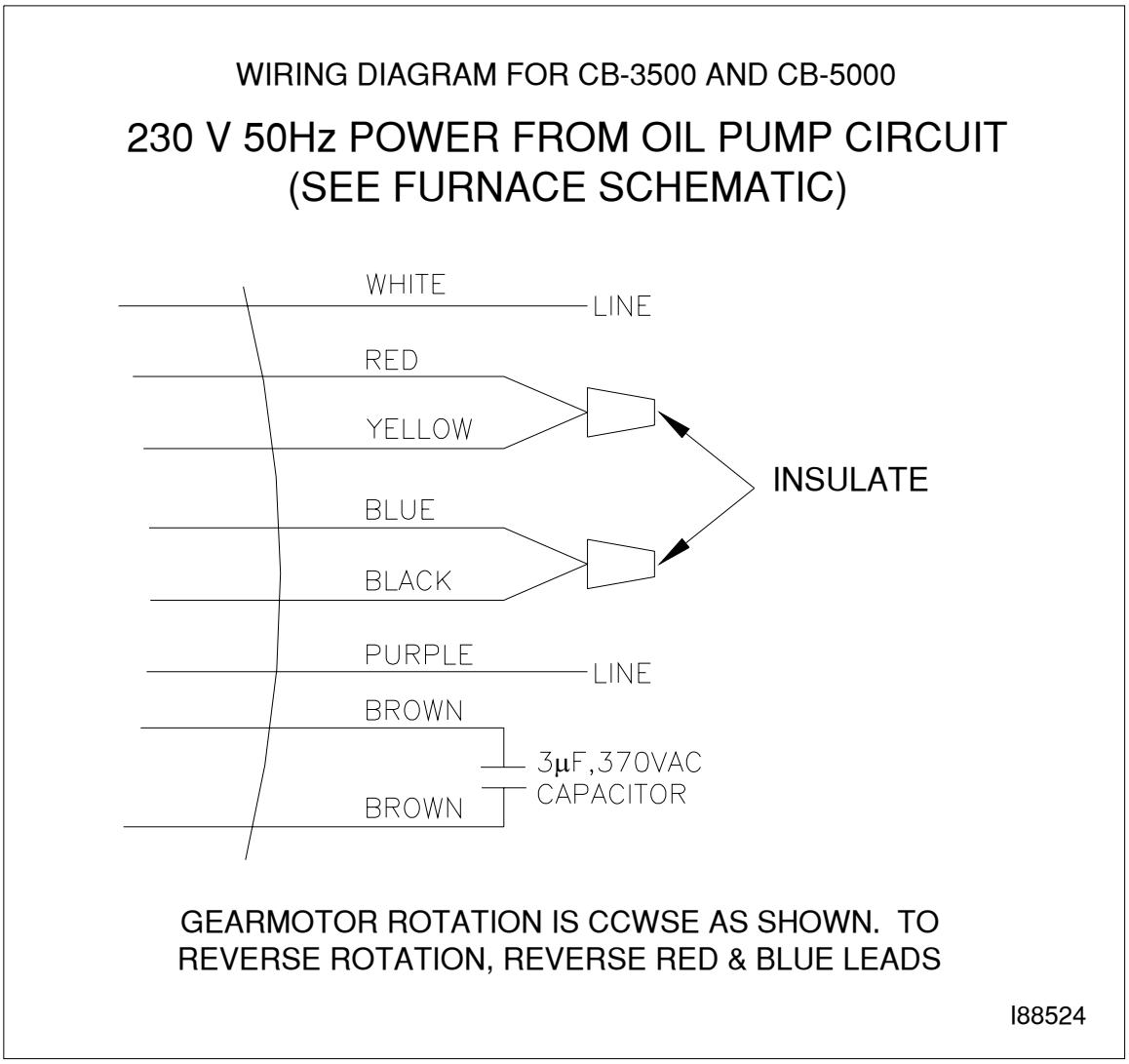


Figure B4 - Metering Pump Wiring Schematic

APPENDIX C

Additional Installation Requirements

The following activities must also be accomplished for furnace installations in the United Kingdom:

- Installing a cover over the oil/air regulators on the burner
- Installing a fire valve above the burner

Instructions and/or drawings for these activities are provided in this Appendix.

Installing a Cover over the Oil/Air Regulators

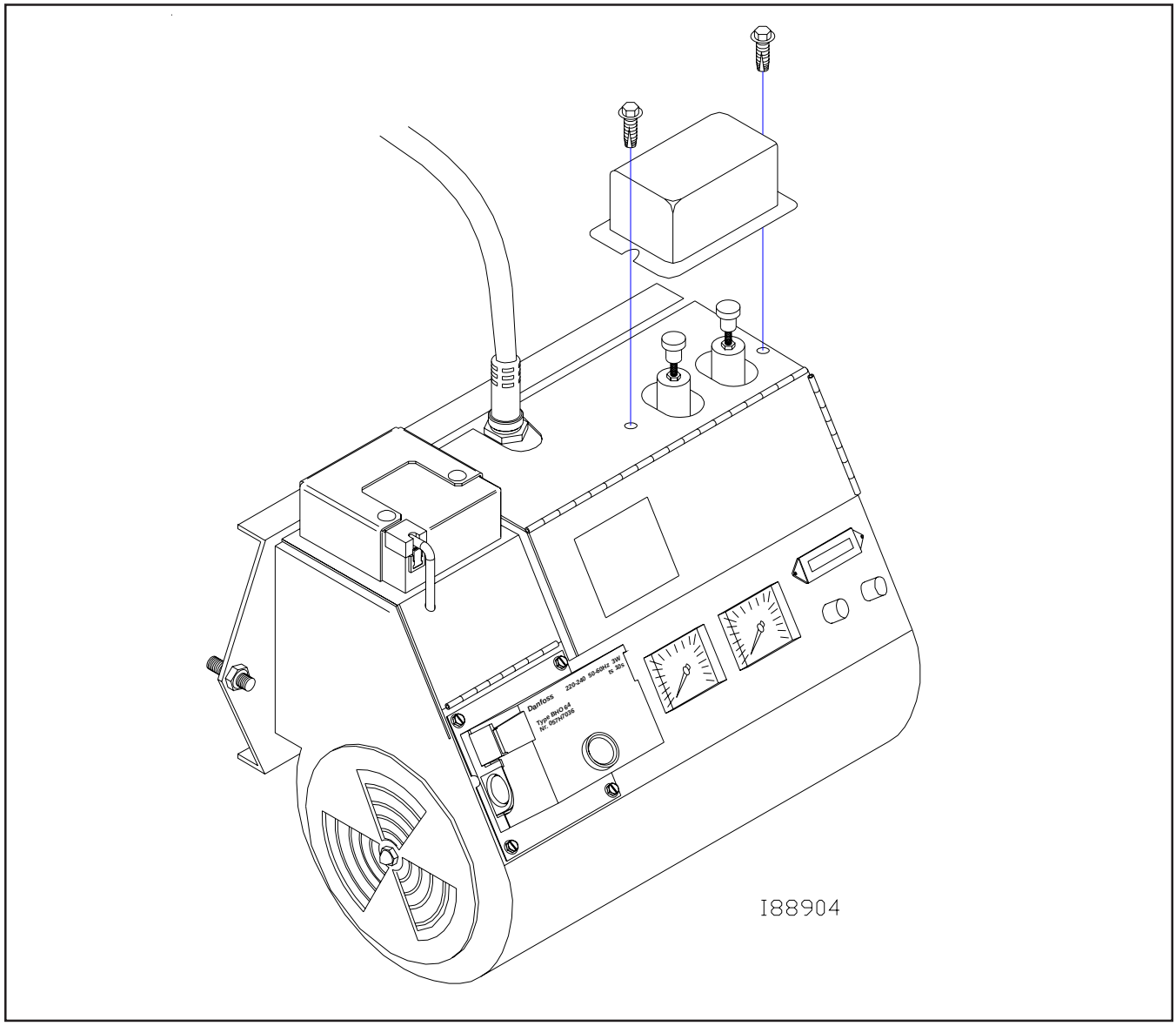


Figure C1 - Installing a Cover over the Oil/Air Regulators on the Burner

Installing a Fire Valve

Install a fire valve element in a position above the burner as shown in Figure C2 to provide adequate protection in accordance with BS 5410 Parts 1 and 2.

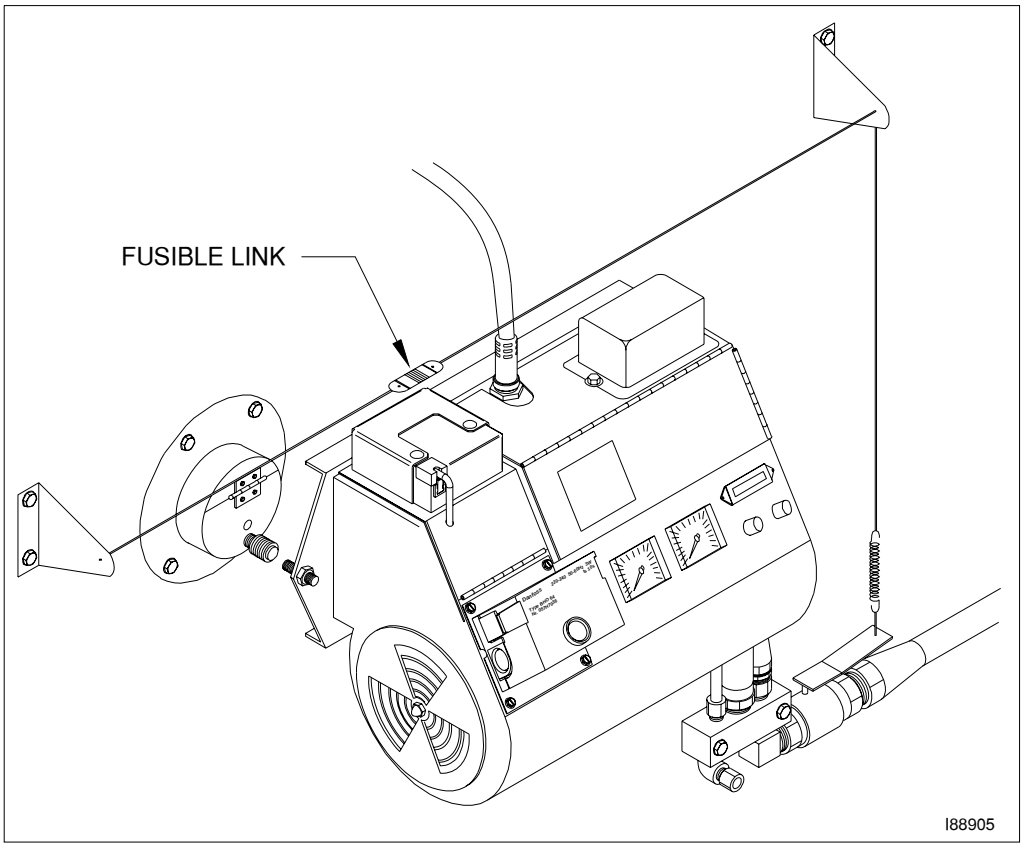


Figure C2 - Installation of a Fire Valve

APPENDIX D

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)