

Temp-O-Matic Oil Furnaces

THB High Boy

TLB Low Boy

Furnace Manual

**KEEP THESE INSTRUCTIONS
WITH FURNACE FOR FUTURE
REFERENCE.**



Contents	Page
Read this first!.....	2
Prepare furnace location.....	3
Prepare furnace and place in position	6
Connect supply and return ducts	7
Venting.....	10
Connect fuel oil piping	11
Wire furnace and burner	11
Start-up	14
Checkout procedure	15
Troubleshooting	16
Service and maintenance	17
Components and replacement parts.....	20
Dimensions and ratings	26
Owner's information.....	31

Hazard definitions

DANGER Hazards that **will cause severe** personal injury, death or substantial property damage.

WARNING Hazards that **can cause severe** personal injury, death or substantial property damage.

CAUTION Hazards that **will or can cause minor** personal injury or property damage.

NOTICE Special instructions on installation, operation or maintenance that are important but not related to personal injury or property damage.

WARNING **INSTALLER** – Read all instructions before installing. **Read page 2 first.** Follow all instructions in proper order to prevent personal injury or death.

- Consider ducting, fuel supply, venting and installation when determining furnace location.
- Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

WARNING Do not store or use gasoline or other flammable liquids or vapors near this furnace or any other appliance.

CAUTION Ventilate house while operating furnace for the first time. Odors may be emitted for a brief period.

WARNING Do not alter this furnace in any way. The manufacturer will not be liable for any damage resulting from changes made in the field to the furnace or its components or from improper installation. Failure to comply could result in severe personal injury, death or substantial property damage.

WARNING **USER** – Please read the following. Failure to comply could result in severe personal injury, death or substantial property damage.

- **This manual is for use only by your qualified heating installer / service technician.**
- Please see the **Owner's information** only, on back page of this manual.
- Have the furnace serviced by a qualified service technician, at least annually.

WARNING This manual must only be used by a qualified heating installer / service technician. Furnace and burner must be installed and serviced only by a qualified heating installer / service technician. Failure to comply could result in severe personal injury, death or substantial property damage.

NOTICE When calling or writing about the furnace – Please have furnace model number and serial number from the rating label. You may list the serial number and model number in the space provided on the "Installation and service certificate" found on page 17.

READ THIS FIRST!

WARNING Failure to adhere to the guidelines below can result in severe personal injury, death or substantial property damage.

Service and maintenance –

To avoid electric shock, disconnect electrical supply before performing maintenance.

To avoid severe burns, allow furnace to cool before performing maintenance.

Perform service and maintenance as described in this manual and the burner manual.

Do not attempt to make adjustments to the blower or motor while the furnace is in operation. Disconnect power to the furnace and be sure all parts have stopped moving before attempting adjustments or maintenance.

The burner must be set up and adjusted using combustion test instruments. Visual examination of the flame alone cannot determine combustion performance.

Operation -

Do not use the furnace as a construction heater.

Do not operate any furnace if the heat exchanger is damaged, corroded or pitted. Toxic flue products could enter the air stream.

Do not jumper, attempt to by-pass or override any limit control.

Do not block flow of combustion or ventilation air to furnace. Do not block or obstruct the air openings in the furnace casing.

Do not store or use combustible materials, gasoline, or other flammable liquids or vapors in the furnace area.

Do not operate the furnace if the furnace area will be exposed to air contaminants as described on page 5.

Should overheating occur, do not turn off or disconnect electrical supply to furnace. Instead, shut off the oil supply at a location external to the appliance, if possible.

Do not use this furnace if any part has been under water. Immediately call a qualified service technician to inspect the furnace and to replace any part to the furnace, control system or burner that has been under water.

Do not operate furnace if temperature rise through heat exchanger exceeds 85° F.

Inspect, clean and replace (if necessary) return air filter regularly.

Do not obstruct return air grills or supply air outlets.

Supply only #2 fuel oil to the burner. Never attempt to use gasoline, a mixture of gasoline and oil, waste fuel, refuse or any other substance in the burner of furnace.

Installation -

Do not block flow of combustion or ventilation air to furnace. Do not block or obstruct the air openings in the furnace casing.

Connect furnace only to a functional vent system in good condition. Place the furnace to allow proper venting, with the shortest possible venting and minimum number of elbows.

Always connect and seal a return air duct to the furnace unless the furnace is located in a large space, such as an unpartitioned basement, Route the return air duct to an adjacent room if no return air manifold is used.

Install furnace maintaining minimum clearances for service and separation from combustible surfaces described in this manual. If furnace is installed on a combustible floor, you must use the combustible floor base or provide the minimum clearance from the furnace to the floor as given in this manual.

Install, start-up, service and maintain burner per instructions in this manual and the burner manual.

Verify burner is properly inserted through the combustion chamber opening.

Furnace must be installed so that burner and control system components are protected from dripping, spraying water or rain during operation or service.

If installing an air conditioning evaporator coil, install the coil downstream of, or in parallel with, the furnace to prevent condensation on the furnace heat exchanger. If the coil is in parallel, provide means to prevent flow of chilled air into the furnace, including an interlock to prevent simultaneous operation of heating and air conditioning.

NOTICE Apply the following suggestions to prevent unsatisfactory operation of the furnace.

Installation –

Be sure to level the furnace, using a spirit level on the front and one side. If the furnace is not level, oil can drip into the combustion chamber after burner cycling, causing fouling of the heat exchanger and the burner head.

Make sure the legs are in contact with the floor to distribute the load and prevent the possibility of undue noise or vibration.

Avoid locating return grills in rooms that may contain undesirable odors.

Never locate a return air grill closer than approximately 20 feet from the furnace.

Locate the furnace near the center of the supply and return duct systems.

Always check the size of the ducts on a replacement installation, particularly if adding air conditioning.

1 Prepare furnace location

Pre-installation checklist

Verify code compliance

- Local, state, provincial, and national codes, laws, regulations and ordinances
- NFPA-31, Installation of Oil-Burning Equipment
- National Electrical Code
- All local codes and/or regulations take precedence over the instructions in this manual and should be followed accordingly.

NOTICE THB & TLB furnaces, their burners and controls met safe lighting and other performance criteria when furnace underwent tests specified in Underwriters Laboratories Standard UL727.

Check location and furnace specifications

- Furnace heating capacity
 - Space is large enough to provide required clearances
- Verify the installation will meet the requirements of this manual :
- Clearances (page 3)
 - Combustion/ventilation air openings (page 4)
 - Supply air duct (page 7)
 - Return air duct (page 7)
 - Vent system (page 10)
 - Fuel oil piping (page 11 plus burner manual)
 - Electrical connection (page 11)

Clearances

Minimum clearance to combustible materials

Install the furnace, ductwork and vent such that no combustible surface is closer than listed in Table 1.

NOTICE Flue pipe clearances must take precedence over jacket clearances (listed below).

Service accessibility clearances

Provide no less than the minimum clearances given in Table 1 to ensure the furnace can be properly operated, serviced and maintained.

Always apply whichever clearance is **LARGER** – combustible construction or service accessibility.

Flooring and foundation

Flooring

THB & TLB furnaces are approved for installation on combustible flooring, but must never be installed on carpeting.

WARNING Do not install furnace on carpeting even if foundation is used. Fire can result, causing severe personal injury, death or substantial property damage.

Foundation

Provide a solid brick or minimum 2-inch concrete foundation pad if any of the following is true :

- The floor can become flooded.
- The furnace mounting area is not level.

Residential garage installations

Take the following special precautions when installing the furnace in a residential garage. If the furnace is located in a residential garage :

- Mount the furnace a minimum of 18 inches above the floor of the garage.
- Locate or protect the furnaces so it cannot be damaged by a moving vehicle.

Table 1 Minimum clearances

Minimum clearances from furnace, ductwork and vent				
Service accessibility clearances are recommended minimum dimensions to allow access to furnace components (motor, blower, filters, etc.).	THB Furnaces		TLB Furnaces	
	To combustible construction	For service accessibility	To combustible construction	For service accessibility
Top of plenum to ceiling	1"		1"	
Above warm air duct within 6 feet of furnace	1"		1"	
Front of furnace	18" (alcove)	18"	18" (alcove)	18"
Flue pipe (or barometric d. c.) to any surface	18" (note 1)	18"	18" (note 1)	18"
Rear of furnace	0"		0"	
Side of furnace	0"		0"	
Warm air plenum to wall	1"		1"	
Combustible floor	0"		0"	

Note 1: Single wall metal vent (or barometric draft control) can be no closer than 18 inches to any combustible surface. Apply requirements of NFPA 31 and local codes to reduce clearance using double-wall vent pipe and/or protective insulation between the flue pipe or barometric draft control and combustible surfaces. Minimum clearance when using T type L double-wall vent pipe is 6".

1 Prepare furnace location (continued)

Air for combustion and ventilation

WARNING Adequate combustion and ventilation air ensures proper combustion and reduces risk of severe personal injury or death from possible flue gas leakage and carbon monoxide emissions.

WARNING Do not install exhaust fan in furnace room.

Consider building construction

Older buildings with single-pane windows, minimal weather-stripping and no vapor barrier often provide enough natural infiltration and ventilation without dedicated openings.

New construction or remodeled buildings are most often built tighter. Windows and doors are weather-stripped, vapor barriers are used and openings in walls are caulked. As a result, such tight construction is unlikely to allow proper natural air infiltration and ventilation.

For buildings with tight construction, provide openings directly to outside or to a ventilated crawl space or attic. Size the openings to the same specifications as for the furnace location per the following paragraphs.

Follow state, provincial or local codes when sizing adequate combustion and ventilation air openings. In absence of codes, use the following guidelines when furnace is in a confined room (defined by NFPA 31 as less than 7200 cubic feet per 1 GPH input of all appliances in area. A room 8 ft. high x 30.0 ft. x 30.0 ft. is 7200 cu. ft.).

Provide two permanent openings :

Openings locations

One within 12 inches of ceiling, one within 12 inches of floor. Minimum height or length dimension of each rectangular opening should be at least 3 inches.

When inside air is used :

Each opening must freely connect with areas having adequate infiltration from outside. Each opening should be at least 140 sq. in. per 1 GPH input (1 sq. in. per 1000 BTU input) of all fuel-burning appliances plus requirements for any equipment that can pull air from room (including clothes dryer and fireplace).

When outside air is used

Connect each opening directly, by ducts to the outdoors, or to crawl or attic space that freely connects with outdoors. Size per below :

- Through outside wall or vertical ducts – at least 35 sq. in. per 1 GPH input (1sq. in. per 4000 BTU input) of all fuel burning appliances plus requirements for any equipment that can pull air from room (including clothes dryer and fireplace).
- Through horizontal ducts – at least 70 sq. in. per 1 GPH furnace input (1 sq. in. per 2000 BTU input) of all fuel-burning appliances plus requirements for any equipment that can pull air from room (including clothes dryer and fireplace).
- Where ducts are used, they should have the same cross-sectional area as free area of openings to which they connect. Compensate for louver, grille or screen blockage when calculating free air openings. Refer to their manufacturer's instructions for details. If unknown, use:
 - Wood louvers, which provide 20-25 % free air.
 - Metal louvers or grilles, which provide 60-75 % free air.

Lock louvers in open position or interlock with equipment to prove open before furnace operation.

Basement installations

When the furnace is located in an unconfined space, such as an unpartitioned basement, adequate air should normally be available without additional opening. An unconfined space is defined as one having no less than 50 cubic feet room volume per 1,000 BTU input of all appliances in the space.

If the house is of tight construction, provide air openings to the basement directly from outside or from a ventilated attic. Size the openings as described above under "When outside air is used".

Closet installations – special NOTICE

Openings in closet doors

Provide TWO openings – one within 6 inches of top of closet door, the other within 6 inches of the bottom of closet door.

EACH opening must be at least 24 inches wide by 12 inches high.

WARNING Advise homeowner that the openings to the closet must never be obstructed or blocked in any way. Failure to provide adequate air for combustion and ventilation could result in severe personal injury, death or substantial property damage.

1 Prepare furnace location (continued)

Air contamination

Please review the following information on potential combustion air contamination problems.

See Table 2 for products and areas which may cause contaminated combustion air.

WARNING To prevent potential of severe personal injury or death, check for products or areas listed below before installing furnace. If any of these contaminants are found :

- Remove contaminants permanently.
- OR-**
- Isolate furnace and provide outside combustion air. See national, provincial or local codes for further information.

Table 2 Corrosive contaminants and likely locations

Products to avoid
Spray cans containing chloro/fluorocarbons
Permanent wave solutions
Chlorinated waxes/cleaners
Chlorine-based swimming pool chemicals
Calcium chloride used for thawing
Sodium chloride used for water softening
Refrigerant leaks
Paint varnish removers
Hydrochloric acid/muriatic acid
Cements and glues
Antistatic fabric softeners used in clothes dryers
Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms
Adhesives used to fasten building products and other similar products
Areas likely to have contaminants
Dry cleaning/laundry areas and establishments
Swimming pools
Metal fabrication plants
Beauty shops
Refrigeration repair shops
Photo processing plants
Auto body shops
Plastic manufacturing plants
Furniture refinishing areas and establishments
New building construction
Remodeling areas
Garages with workshops

2 Prepare furnace and place in position

Inspect & prepare furnace

Remove furnace from carton

Remove the furnace from its shipping carton and inspect thoroughly. Remove access panels to inspect the furnace interior.

NOTICE Immediately file a claim with the transportation company if you discover concealed damage.

WARNING Do not install or attempt to operate the furnace if the heat exchanger, burner or controls have been damaged. Immediately contact your furnace supplier. Operating a damaged furnace could result in severe personal injury, death or substantial property damage.

Prepare furnace (THB models)

THB furnaces require cutting the return air opening into one side of the furnace. Carefully cut the opening on the correct side of the furnace, using the four knockouts on the side as guide.

Prepare burner

Remove the burner from its shipping carton and inspect thoroughly. Read the burner manual and follow instructions for preparing and installing the burner.

Install the correct nozzle for the required firing rate, using the burner manual and the information on section 12 of this manual. Follow the burner manual's instructions for nozzle installation. Verify the correct setting of electrodes after nozzle and burner oil tube assembly are in place.

Openings in walls, floor & ceiling

General

Ensure that the finished door opening to the furnace room is large enough to install and remove the furnace, water heater or any other appliances in the room.

Before placing furnace in a closet or small room, cut all openings required in floor, ceiling or walls for ducts and vent. This will simplify the work and prevent construction dust from entering the furnace heat exchanger.

WARNING Verify that all clearances to combustible construction and as needed for service accessibility will be met. The vent must be no closer than 18 inches to any combustible surface unless using type L double-wall vent pipe or constructed per the requirements of NFPA31. Provide ventilated thimble per all applicable codes where vent pipe passes through wall or ceiling. Failure to comply could result in severe personal injury, death or substantial property damage.

Duct locations and sizing

Verify the size of the supply and return duct system is sufficient for the application. The pressure drop through the duct system must not exceed 0.25 inches water column. The total drop through the duct system and air conditioning condensing coil (if used) must not exceed 0.5 inches water column.

See suggested duct sizing in this manual. For more detailed sizing information, refer to ACCA Manual D.

Openings ... (continued)

Return air duct

You must install a return air duct, sealed to the furnace, even if no return manifold is used. The only exception is when the furnace is located in a large unpartitioned room, such as a basement. (A room whose volume is at least 50 cubic feet per 1,000 BTU/h input of all appliances in the room is considered large). For large rooms, return air may be taken directly at the furnace, without a return air duct. No return air register should be within 20 feet of the furnace.

Cut the required opening for the return air duct in the wall (or floor or ceiling) of the room before placing the furnace.

Install filter

Install return air filter of the size listed on section 12.

NOTICE Verify that the filter will be easily accessible for removal after the furnace is in place.

When installing on **combustible flooring**, provide supply plenum size and floor opening as given in Table 3.

Install furnace and burner

Place furnace

Place the furnace in the desired location. Measure clearances and verify per page 3 of this manual.

Level the furnace using a spirit level on the front and one side.

Inspect combustion chamber

Inspect the combustion chamber. Verify it is in good condition and correctly in position inside the heat exchanger. The burner opening in the chamber must align with the burner heat exchanger opening.

WARNING The combustion chamber is constructed of ceramic fiber materials. See the WARNING information on page 20 of this manual. Comply with these instructions when handling any ceramic fiber or fiberglass materials. Failure to adhere to these guidelines could result in severe personal injury or death.

Insert burner

Following the burner manual instructions, install the burner and its gasket in the burner opening. Make sure the burner passes through the opening in the combustion chamber and does not protrude more than ¼ inch into the chamber.

Secure the burner in place with the three nuts and washers provided. Wire and pipe fuel to the burner per burner manual and this manual.

3 Connect supply and return ducts

Duct sizing

Determine air flow CFM

The temperature rise through the furnace must not exceed 85° F and should be at least 55° F for comfort. When calculating air flow, assume a temperature rise of 70° F.

The sensible heat temperature change for cooling would be approximately 27-30° F. Actual temperature change will be approximately 18-21° F due to humidity of the air.

To calculate the sensible heat temperature change (ΔT), you can use the formula :

$$\Delta T = \text{BTU/h} / (1.1 \times \text{CFM}) \quad \text{Eq. 3-1}$$

To calculate air flow when you know temperature change (ΔT), you can use :

$$\text{CFM} = \text{BTU/h} / (1.1 \times \Delta T) \quad \text{Eq. 3-2}$$

You can estimate air flow using the following rules of thumb :

Heating : **14 CFM per 1,000 BTU/h** output Eq. 3-3

Cooling : **400 CFM per ton** air conditioning Eq. 3-4

Determine the required air flow based on whichever is larger – heating mode or air conditioning mode.

Examples :

What would the temperature rise be for a 100,000 BTU/h output furnace with an air flow rate of 1200 cfm?

Use Equation 3-1 since you know CFM and BTU/h :

$$\Delta T = 100,000 / (1.1 \times 1200) = 76^\circ \text{F}$$

- The temperature rise would be 76° F.
- If the air enters the furnace at 70° F, it would leave the furnace at 70° F + 76° F = 146° F.

What would the air flow be to obtain a 70° F rise through a 120,000 BTU/h output furnace?

Use equation 3-2 since you know ΔT and BTU/h :

$$\text{CFM} = 120,000 / (1.1 \times 70) = 1,558 \text{ CFM}$$

- The air flow would have to be 1,558 CFM to obtain a temperature rise of 70° F.

Estimate the required air flow for a 75,000 BTU/h output furnace installed with a 2-ton air conditioning evaporator coil.

Heating mode air flow (use Equation 3-3) :

$$\text{CFM} = 75 \times 14 = 1,050 \text{ cfm}$$

Cooling mode air flow (use Equation 3-4) :

$$\text{CFM} = 2 \times 400 = 800 \text{ cfm}$$

- The larger number is 1,050 cfm (heating), so the duct system should be sized for 1,050 cfm.
- The supply duct would need to be 16" round or a rectangular equivalent such as 8" x 25" or 12" x 16", using Table 4, page 8.

Estimate the required air flow for the same furnace installed with a 4-ton air conditioning evaporator coil.

Heating mode air flow is still 1,050 cfm.

Cooling mode air flow (use Equation 3-4) :

$$\text{CFM} = 4 \times 400 = 1,600 \text{ cfm}$$

- The larger number is 1,600 cfm (cooling), so the duct system should be sized for 1,600 cfm.
- The supply duct would need to be 18" round or a rectangular equivalent such as 8" x 36" or 12" x 21", using Table 4, page 8.

CAUTION Always check the size of existing ducts, particularly if you are adding air conditioning. The air pressure loss through the cooling evaporator coil reduces available air flow. If the ducts are too small as well, the system may not work satisfactorily on either heating or cooling.

Determine duct dimensions

Table 4, page 8, and Table 5, page 9, provide typical round and rectangular duct sizes for rectangular and flat oval galvanized ducts. Do not apply these tables to size ductwork if the total equivalent length of the duct exceeds approximately 100 feet. For longer systems or for ductboard, fiberglass-lined or flexible duct sizing, use the ACCA Manual D or the ACCA duct sizing slide rule. These tables are based on pressure loss of approximately 0.10 inch water column per 100 feet equivalent length of duct.

Use Table 3 below to size or check sizing of takeoffs to supply registers or return grills.

Verify the size and type of registers, diffusers and grills from the manufacturer's ratings. Do not exceed the recommended flow rate. The pressure drop allowance for each should not exceed approximately 0.05 inch water column.

Install a return air filter, sized per specifications on section 12.

Use only a return air filter mounted to the furnace. Do not add additional filters unless the duct system is carefully sized to allow for the additional pressure drop.

Table 3 Suggested maximum flow to takeoffs

TAKE-OFF SIZE (Inches)	CFM	
	SUPPLY	RETURN
Sheet metal or ductboard		
5 Round	60	45
6 Round	100	75
7 Round	140	110
8 Round	210	160
3 ¼ x 8 Stack	70	55
3 ¼ x 10 Stack	100	75
3 ¼ x 14 Stack	140	110
2 ¼ x 12 Stack	70	55
2 ¼ x 14 Stack	90	70
Flexible duct (keep bends to minimum)		
6 Round	55	40
8 Round	120	90
10 Round	200	160
12 Round	320	250
14 Round	480	375
16 Round	660	530
18 Round	880	680
20 Round	1200	900

3 Connect supply and return ducts (continued)

Duct sizing (continued)

Table 4 Typical duct sizing for systems not over 100 feet equivalent length – round or rectangular galvanized

Typical duct sizing																		
(For approximately 0.10 inch w.c. in a typical residential installation of galvanized metal duct)																		
CFM	Round duct diameter (inches)	Rectangular duct equivalent sizes																
		Minimum width (inches) for duct heights (inches) of :																
		4 x	5 x	6 x	7 x	8 x	9 x	10 x	12 x	14 x	16 x	18 x	20 x	22 x	24 x	26 x	28 x	30 x
45	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	5	6	5	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-
100	6	8	6	5	5	4	4	-	-	-	-	-	-	-	-	-	-	-
150	7	12	9	7	6	5	5	5	4	4	-	-	-	-	-	-	-	-
200	8	14	11	9	8	7	6	6	5	4	4	-	-	-	-	-	-	-
250	9	18	13	10	9	8	7	6	6	5	5	4	4	-	-	-	-	-
300	9	20	15	12	10	9	8	7	6	6	5	5	4	4	-	-	-	-
400	10	26	19	15	13	11	10	9	8	7	6	6	5	5	5	4	4	-
500	12	32	23	18	15	13	12	11	9	8	7	6	6	6	5	5	5	5
600	12	38	28	22	18	15	13	12	10	9	8	7	7	6	6	6	5	5
700	12	46	32	25	20	17	15	14	11	10	9	8	7	7	7	6	6	6
800	14	52	36	28	23	19	17	15	13	11	10	9	8	8	7	7	6	6
900	14	58	41	31	25	21	19	17	14	12	11	10	9	8	8	7	7	7
1000	16	64	45	34	28	23	20	18	15	13	11	10	9	9	8	8	7	7
1100	16	72	49	38	30	25	22	19	16	14	12	11	10	9	9	8	8	7
1200	16	-	54	41	33	27	24	21	17	15	13	12	11	10	9	9	8	8
1300	16	-	58	44	35	29	25	22	18	16	14	12	11	10	10	9	9	8
1400	18	-	63	47	38	31	27	24	19	16	14	13	12	11	10	10	9	9
1500	18	-	68	51	40	34	29	25	20	17	15	14	12	12	11	10	10	9
1600	18	-	72	54	43	36	30	27	21	18	16	14	13	12	11	11	10	9
1700	18	-	-	58	45	38	32	28	23	19	17	15	14	13	12	11	10	10
1800	18	-	-	61	48	40	34	29	24	20	17	16	14	13	12	11	11	10
1900	20	-	-	64	51	42	35	31	25	21	18	16	15	14	13	12	11	11
2000	20	-	-	68	53	44	37	32	26	22	19	17	15	14	13	12	12	11
2200	20	-	-	-	59	48	41	35	28	23	20	18	16	15	14	13	12	12
2400	22	-	-	-	64	52	44	38	30	25	22	19	17	16	15	14	13	12
2600	22	-	-	-	69	56	47	41	32	27	23	21	19	17	16	15	14	13
2800	22	-	-	-	-	61	51	44	34	29	25	22	20	18	17	15	15	14
3000	22	-	-	-	-	65	54	47	37	30	26	23	21	19	17	16	15	14
3500	24	-	-	-	-	-	63	54	42	34	29	26	23	21	19	18	17	16
4000	26	-	-	-	-	-	72	61	47	39	33	29	26	23	21	20	19	18

WARNING Do not apply this table for duct systems over approximately 100 equivalent feet length. For longer systems or systems using other duct materials, refer to ACCA Manual D. Incorrectly sizing duct systems can result in unsafe or uncomfortable operation.

3 Connect supply and return ducts (continued)

Duct sizing (continued)

Table 5 Typical duct sizing for systems not over 100 feet equivalent length – round or flat oval galvanized

Typical duct sizing														
(For approximately 0.10 inch w.c. in a typical residential installation of galvanized metal duct)														
CFM	Round duct diameter (inches)	Flat oval duct equivalent sizes												
		Minimum width (inches) for duct heights (inches) of :												
		3 x	4 x	5 x	6 x	7 x	8 x	9 x	10 x	12 x	14 x	16 x	18 x	20 x
45	4	6	5	-	-	-	-	-	-	-	-	-	-	-
65	5	8	6	-	-	-	-	-	-	-	-	-	-	-
100	6	11	8	7	-	-	-	-	-	-	-	-	-	-
150	7	16	11	9	8	-	-	-	-	-	-	-	-	-
200	8	21	15	11	10	8	-	-	-	-	-	-	-	-
250	9	26	18	14	11	10	9	-	-	-	-	-	-	-
300	9	30	20	16	13	11	10	-	-	-	-	-	-	-
400	10	40	26	20	16	14	12	11	-	-	-	-	-	-
500	12	49	32	24	19	16	14	13	12	-	-	-	-	-
600	12	59	38	28	22	19	16	15	13	-	-	-	-	-
700	12	69	44	32	25	21	18	16	15	13	-	-	-	-
800	14	-	50	36	29	24	20	18	16	14	-	-	-	-
900	14	-	56	41	32	26	22	20	18	15	-	-	-	-
1000	16	-	63	45	35	29	24	22	19	17	15	-	-	-
1100	16	-	69	49	38	31	26	23	21	18	16	-	-	-
1200	16	-	75	53	41	33	28	25	22	19	17	-	-	-
1300	16	-	-	58	44	36	30	26	24	20	18	-	-	-
1400	18	-	-	62	47	38	32	28	25	21	18	17	-	-
1500	18	-	-	66	50	41	34	30	26	22	19	18	-	-
1600	18	-	-	71	54	43	36	31	28	23	20	18	-	-
1700	18	-	-	-	57	46	38	33	29	24	21	19	-	-
1800	18	-	-	-	60	48	40	35	31	25	22	20	-	-
1900	20	-	-	-	63	50	42	36	32	26	23	21	19	-
2000	20	-	-	-	67	53	44	38	33	27	24	21	20	-
2200	20	-	-	-	73	58	48	41	36	29	25	23	21	-
2400	22	-	-	-	-	63	52	44	39	32	27	24	22	21
2600	22	-	-	-	-	68	56	48	42	34	29	25	23	22
2800	22	-	-	-	-	-	60	51	44	36	30	27	24	23
3000	22	-	-	-	-	-	64	54	47	38	32	28	26	24
3500	24	-	-	-	-	-	-	63	54	43	36	32	28	26
4000	26	-	-	-	-	-	-	71	61	48	40	35	31	29

WARNING Do not apply this table for duct systems over approximately 100 equivalent feet length. For longer systems or systems using other duct materials, refer to ACCA Manual D. Incorrectly sizing duct systems can result in unsafe or uncomfortable operation.

4 Venting

General venting requirements

WARNING Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

DANGER Inspect existing chimney before installing furnace. Clean chimney thoroughly. Replace or repair chimney if visual inspection indicates chimney may be unsuitable for use. Insufficient draft can cause flue gas leakage and carbon monoxide emissions. Failure to clean or replace perforated pipe or tile lining and/or patch mortar and joints can cause severe personal injury or death.

- THB and TLB furnaces are designed to operate with an over-fire draft of $-0.01''$ to $-0.02''$ w.c. Proper draft for these oil furnaces may be achieved using either a conventional chimney (natural draft) or a power vent (sidewall) system that has been properly designed for use with oil equipment. Power vent manufacturer's instructions must be followed.
- Use vent material approved by local codes for oil-fired burners. In their absence, refer to :
 - NFPA 31, Installation of Oil-Burning Equipment.
 - NFPA211, Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances.
 - In Canada, refer to CSA B139, Installation Code for Oil-Burning Equipment.
 - NFPA-211 requires chimney to be lined before connected to furnace.
- To prevent downdrafts, extend chimney at least 3 feet above highest point where it passes through roof and 2 feet higher than any portion of building within 10 feet. Increase chimney cross-sectional area and height at least 4% per 1,000 feet above sea level.
- Provide minimum clearances from vent (flue) pipe to combustible material :
 - Single-wall vent – 18 inches minimum
 - Type "L" double-wall vent – 6 inches minimum
- Provide a chimney no smaller than that listed in Table 6.

NOTICE Oversized chimneys, outside masonry chimneys and/or derated inputs can result in condensation in chimney.

Connect venting

WARNING Long horizontal vent runs, excessive number of tees and elbows, or other obstructions restricting combustion gas flow can result in the possibility of condensation, flue gas leakage and carbon monoxide emissions, which can lead to severe personal injury or death.

The horizontal vent must slope upwards, away from the furnace, a minimum of $\frac{1}{4}$ inch per foot.

Connect full-sized venting when possible. See Table 6.

Connection must be made above bottom of chimney to avoid blockage. Vent pipe must not enter chimney far enough to cause obstruction. Use thimble or slip joint where vent pipe enters chimney to allow removal for cleaning.

When burner and furnace are properly installed, draft overfire will be approximately $-0.01''$ to $-0.02''$ w.c. Install barometric

Connect venting (continued)

control in vent, per control manufacturer's instructions, when excess draft needs to be relieved or to comply with applicable codes and regulations. Use draft gauge to adjust proper opening.

An induced draft fan for the chimney may be necessary if :

- Excessive resistance to flow of combustion gases can be expected.
- Cross-sectional area of chimney is smaller than minimum recommended.
- Chimney height is less than recommended.
- When using induced draft fan seal all vent joints and interlock burner with fan operation.

Table 6 Minimum chimney/vent size

Furnace Model number	Minimum vent diameter	Minimum chimney size		Minimum Chimney height
		Rectangular (minimum inside dimensions)	Round	
THB/TLB-105	6 "	6 " x 6 "	6 "	15'

Vent dampers

WARNING Do not install a thermal-type vent damper on this furnace. Failure to comply could result in severe personal injury, death or substantial property damage.

NOTICE If vent damper is required, use only a motorized vent damper, installed and wired to the furnace following the vent damper manufacturer's instructions.

Barometric draft control

Install barometric control in vent, per control manufacturer's instructions, when excess draft needs to be relieved or to comply with applicable codes and regulations. Use draft gauge to adjust proper opening.

Install barometric draft control in vent pipe at least one foot from the furnace vent connection, preferably in the highest part of the vent pipe before the vent enters the chimney. If headroom doesn't provide enough clearance to locate the control at least one foot from the vent connection, install an elbow at the furnace and mount the control in a horizontal pipe at least one foot from the elbow. Install an elbow after the control to turn vertically.

The barometric draft control must be located in the same room as the furnace to operate correctly.

Ensure the barometric draft control is accessible. Adjust the damper to obtain the correct overfire draft, as described in this manual and the burner manual.

5 Connect fuel oil piping

General oil piping requirements

- Location and installation of oil tanks, oil piping and burners must follow :
 - NFPA 31, Standard for the Installation of Oil-Burning Equipment.
 - In Canada, CSA B139, Installation of Oil-Burning Equipment.
 - Local codes and regulations.
 - Information provided with burner and fuel pump.
- If any part of fuel oil tank is above level of burner, an anti-siphon device must be used to prevent flow of oil in case of oil line break.
- Support oil lines as required by codes.
- Make tank connections with swing joints or copper tubing to prevent breaking in case the tank settles. Make swing joints so they will tighten as tank settles. Non-hardening pipe joint compounds should be used on all threads.

WARNING Do not use Teflon tape as an oil pipe sealant. It can cause valves to fail, creating hazards. Use only flare fittings. Do not use compression fittings. Failure to comply could result in severe personal injury, death or substantial property damage from oil leakage and/or fire hazard.

- Underground pipe must be run in a casing to prevent oil leaking into ground or under floor. Check local codes for information.

Oil piping connection at burner

- Connect oil line to burner using a flare fitting.

WARNING Use of any connection other than a flare fitting at the oil connection to the burner could result in a fuel oil leak, with the potential for severe personal injury, death or substantial property damage.

- See local codes for appropriate arrangement and piping of filter, control valves, etc. connecting to oil tank.
- Refer to burner manual for oil system requirements. Verify that suction lift does not exceed stated limit. Where lift exceeds limit for a one-pipe system, use a two-pipe system as directed in burner manual.

6 Wire furnace & burner

WARNING Electric shock hazard. Can cause severe personal injury or death if power source, including service switch on furnace, is not disconnected before installing or servicing

Wire burner

The burner harness is factory-wired to the furnace at the factory. Plug the burner harness into the mating burner connector to wire the burner. Refer to the wiring diagram on pages 12 and 13 for further information.

Install and wire thermostat

Locate the room thermostat on an interior wall in the natural circulating path of room air. Do not locate thermostat so it is exposed to cold air infiltration, drafts from windows or doors, air currents from supply or return air registers, behind obstructions, on a shelf, in a closet, or in a corner.

Ensure the thermostat won't be exposed to heat from nearby fireplace, radio, television, lamp or rays from the sun. Do not mount thermostat on a wall over a supply or return duct, chimney or vent.

Wire thermostat to furnace and set thermostat anticipator as shown on wiring diagram, pages 12 and 13.

Connect power wiring

All wiring must conform to :

- National Electrical Code, ANSI/NFPA 70, latest edition and any additional national, state or local codes.
- In Canada, CSA C22.1 Canadian Electrical Code Part One and any local codes.
- Wiring must be N.E.C. Class 1. If original wire as supplied with furnace must be replaced, type 105° C wire or equivalent must be used. Supply wiring to furnace must be sized for the load required (see section 12)
- Provide electrical ground at furnace as required by codes.

Connect 120 VAC/60 Hertz, single phase separate electrical line from the main house panel to the power leads in the external burner junction box as shown on wiring diagram, pages 12 and 13. Provide a fused disconnect in the power wiring, following all local codes.

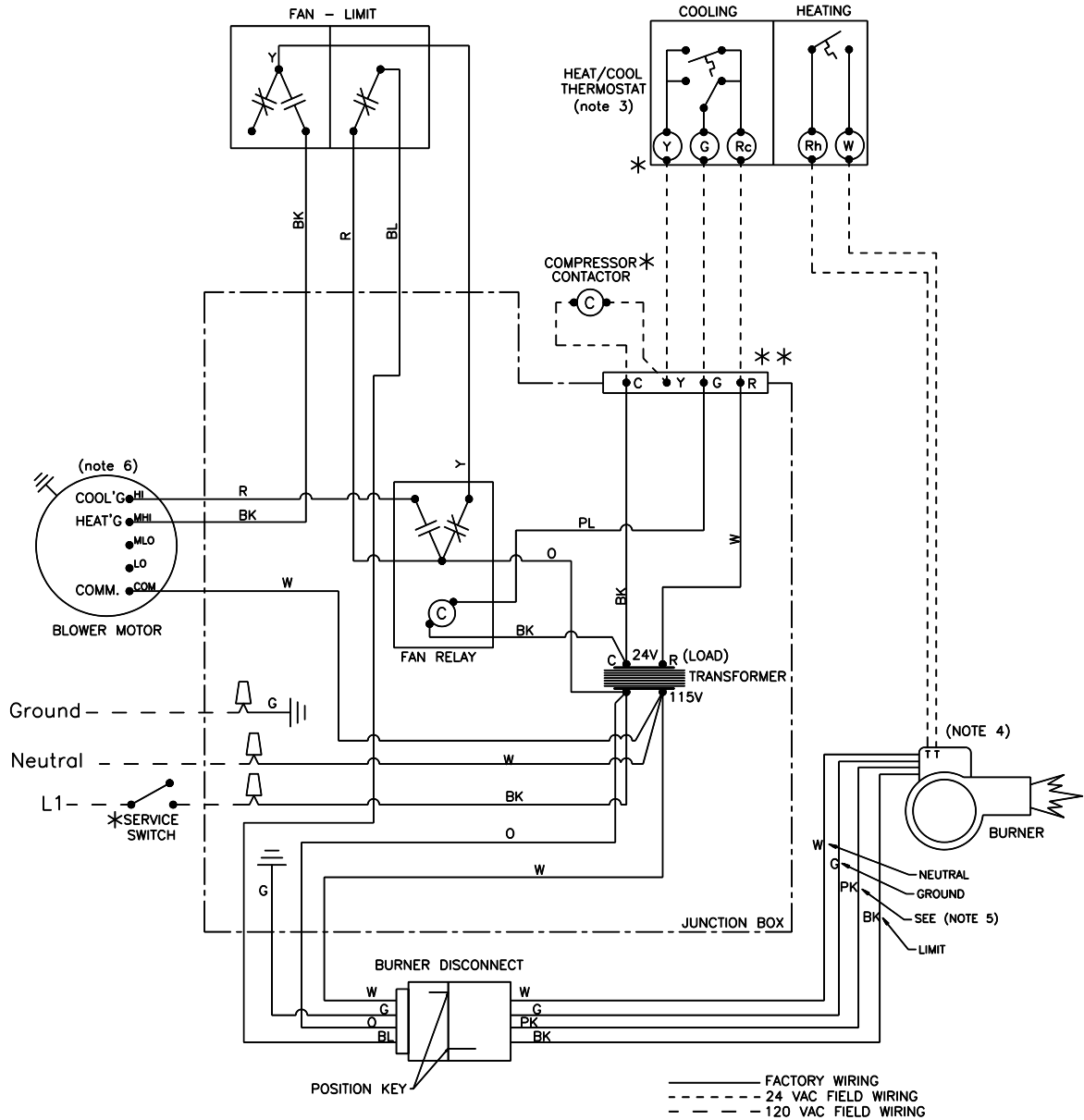
Ensure the wire size and type are adequate for the electrical load (see section 12 and furnace nameplate for value).

Limit control

The furnace is equipped with a fan switch/limit control. This control limits the air leaving the heat exchanger to 200° F or less. The fan switch continues fan operation until the air drops to a preset temperature. For most installations, set the blower ON setting at 110° F and blower OFF setting at 90° F. If a longer cool down period is desired, lower the OFF setting.

6 Wire furnace & burner (continued)

SCHEMATIC WIRING DIAGRAM
DIRECT DRIVE
TLB-105-DD-F-S2, TLB-105-DD-R-S2 & THB-105-DD-S2



NOTES:

1. All wiring must be installed in accordance with:
 - A) U.S.A. – N.E.C. And any other national, state, or local code requirements.
 - B) Canada – C.S.A. C22.1.C.E.E. Part 1 and any other national, provincial, or local code requirements.
2. If any of the original wire as supplied with the appliance must be replaced, use minimum 105°C wire or equivalent.
3. Thermostat anticipator setting – 0.20 amp.

4. Refer to control component instructions packed with the furnace burner for application information.
5. Pink wire is continuous electric power used only with nozzle line heater (Carlin EZ), control with post purge option or burner with electric damper if required. Leave wire capped and unattached if not used.
6. Refer to technical specification for blower speed adjustment.
7. Capacitor 5 MF.

* Items not provided
 ** Low voltage terminal strip

Figure 1 Wiring – THB & TLB furnaces with direct-drive blowers

DNS-0889 Rev. C

6 Wire furnace & burner (continued)

LADDER WIRING DIAGRAM DIRECT DRIVE
(All contacts shown without power applied)

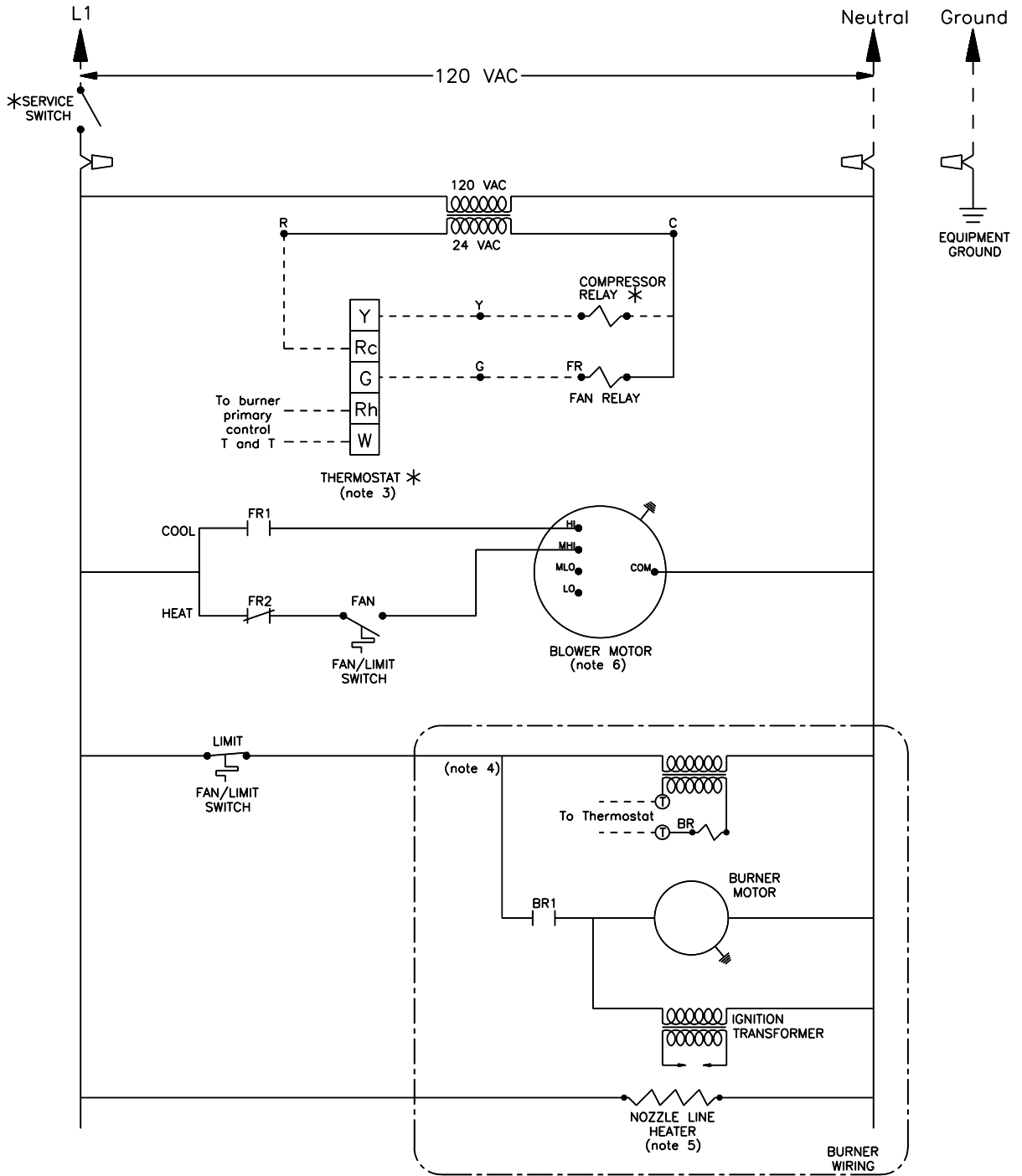


Figure 2 Wiring – THB & TLB furnaces with direct-drive blowers

DNS-0890 Rev. B

7 Start up

DANGER

Follow information below to prevent severe personal injury, death or substantial property damage :

- Do not use gasoline, crankcase drainings or any oil containing gasoline. See burner manual for proper fuel oil.
- Do not attempt to start burner when excess oil has accumulated, when unit is full of vapor or when combustion chamber is very hot.
- Do not start burner unless collector box, venting and burner mounting plate are secured in place.
- Never burn garbage or paper in the furnace.
- Never leave combustible material around it.

To start furnace

1. Factory burner adjustment and settings may not be suitable for specific job conditions. Refer to burner manual for burner start up, adjustment and checkout procedures.
2. Set room thermostat to call for heat.
3. Start burner as described in burner manual.
4. The furnace blower will delay for a short time after burner starts, until the limit/fan switch senses air temperature above the fan ON setting.
5. Set room thermostat to its lowest setting. Burner should turn off.
6. Furnace blower will continue to run until the limit/fan switch senses air temperature below the fan OFF setting.
7. Set the room thermostat to call for heat again. Allow furnace to heat to design temperature. Then adjust burner for correct combustion, using combustion test equipment. Adjust burner for:
 Draft : -0.01 to -0.02 inches water column draft in furnace combustion chamber.
 CO₂ : between 10 % and 11½ %, with 0 smoke.

To start furnace (continued)

WARNING

Make final burner adjustments using combustion test equipment to assure proper operation.

8. Check furnace and duct system for proper operation and conditions.
9. Inspect vent system for proper operation.
10. To set limit/fan switch :
 The blower operates until the air temperature drops below the fan OFF setting. If the air at the supply registers is too warm at blower start up or shutdown, lower the fan OFF and ON settings on the limit/fan switch.
 To check operation of the limit switch, slide a piece of cardboard into the furnace filter slot. After a few minutes of operation (not more than 5 minutes), the burner should shut off (limit switch open). The blower will operate until the furnace cools down. Remove cardboard when finished.
11. Complete testing of the burner cad cell control using the instructions in the burner manual.

To shut down furnace

1. Set the room thermostat to its lowest setting.
2. Turn off the disconnect switch in the 120-VAC power line to the furnace.
3. If the burner will be shut down for an extended time, tightly close all oil valves.
4. Refer to burner manual for any additional instructions.

8 Checkout procedure

Furnace selection

- 1. Heat loss BTU/h at °F outdoor design temperature.
- 2. Furnace model..... output BTU/h.
- 3. Burner model nozzle : gph ° type.....
- 4. Burner pump pressure psig.

Furnace installation

- 5. Furnace leveled and all legs in contact with floor?
- 6. Return and supply ducts securely attached to furnace?
- 7. Fuel filter and fuel lines installed per burner manual and inspected?
- 8. Furnace and burner wired per wiring diagram?
- 9. 120 VAC wiring : type..... size AWG.

8 Checkout procedure (continued)

Vent and combustion air

- 10. Existing chimney/vent system inspected and in good condition?
- 11. New vent piping installed, sealed and in good condition?
- 12. Vent sizing checked against furnace manual and codes?

Ductwork

- 13. Duct sizing checked against furnace manual and/or ACCA Manual D?
- 14. Supply and return registers checked for size based on air flow?
- 15. Balancing dampers installed as needed?
- 16. Ductwork sealed and insulated as needed?

Furnace operation

- 17. Clean air filter in place?
- 18. Temperature rise through furnace checked (not to exceed 85° F) and blower speed adjusted if necessary?
- 19. Thermostat heat anticipator set per wiring diagram?
- 20. Burner started and tested per burner manual?
- 21. Proper draft and burner flame? Final adjustment made with combustion test equipment?

Furnace operation (continued)

- 22. Air purged from oil piping? Piping checked for leaks?
- 23. Burner sealed to furnace and nuts tight? Burner harness securely plugged in?

WARNING Obtain gas-tight seal at burner flange, cleanout plates and/or flue collector box to prevent possible flue gas leakage and carbon monoxide emissions, leading to severe personal injury or death.

- 24. Limit control tested per "To start up" in this manual?
- 25. Furnace cycled with thermostat? Raise to highest setting and verify furnace goes through normal start up cycle. Lower to lowest setting and verify furnace goes off.
- 26. Observed several operating cycles for proper operation?
- 27. Set room thermostat (s) to desired room temperature?

After installation

- 28. Completed "Installation and service certificate" below?
- 29. Reviewed Owner's information in this manual with owner or maintenance person and instructed person to keep for future reference?
- 30. Replaced all instructions provided with furnace for future reference?

Installation and service certificate

Furnace model _____ Series _____

Serial number _____ Date installed _____

- Installation instructions have been followed.
- Checkout sequence has been performed.
- Above information is certified to be correct.
- Information received and left with owner/maintenance person.

Installer _____ (company) _____ (address) _____ (phone)

_____ (installer's signature)

9 Troubleshooting

Before beginning these troubleshooting procedures, ALWAYS :	
<ul style="list-style-type: none"> • Check 120 volt supply to furnace. If there is no supply voltage, check fuses and service switch. CAUTION : When testing electrical equipment, always follow standard electrical safety procedures. 	<ul style="list-style-type: none"> • To successfully service the oil furnace, you must have these instruments : <ul style="list-style-type: none"> • smoke tester • carbon-dioxide (CO₂) or oxygen (O₂) analyzer • draft gauge (scale should read from -.01" w.c. to -.25" w.c.) • volt/OHM/milliamper multimeter • pressure gauge capable of reading 0-150 lb/sq. inch (for oil only) • Be familiar with these instruments as well as the burner manufacturers recommended settings.
<ul style="list-style-type: none"> • Make sure thermostat is calling for burner operation. 	
<ul style="list-style-type: none"> • Check oil supply and make sure all valves are open. 	

Symptom – Burner	Possible corrections :	
Burner motor does not start.	<ul style="list-style-type: none"> • Check fuses and make sure service switch is on. 	<ul style="list-style-type: none"> • Check for voltage from primary relay to burner motor. Make sure the primary relay has not locked out on safety.
	<ul style="list-style-type: none"> • Check for line voltage into furnace junction box. 	<ul style="list-style-type: none"> • Make sure the thermostat is calling for heat and that the wiring to the thermostat is correct.
Burner short cycles or locks out on primary relay safety.	<ul style="list-style-type: none"> • If the primary relay control is not popping out the reset button measure the milliamperage at the thermostat and set the heat-anticipator accordingly. Also check wiring from the thermostat to the burner. 	<ul style="list-style-type: none"> • Check the alignment of the cad cell to assure it is aimed at the fire.
	<ul style="list-style-type: none"> • Check nozzle and electrode position. (Reference burner manufacturers instructions). 	<ul style="list-style-type: none"> • Check ignition transformer output
Unable to achieve clean combustion by setting air adjustments.	<ul style="list-style-type: none"> • Check tube insertion and alignment. 	<ul style="list-style-type: none"> • Check nozzle and electrode position (Reference burner manufacturers instructions).
	<ul style="list-style-type: none"> • Replace nozzle. 	<ul style="list-style-type: none"> • Check pump pressure (varies with manufacturer and application; see burner manual).
	<ul style="list-style-type: none"> • Check overfire draft. 	
To check CAD cell operation, use the following procedure :	<ol style="list-style-type: none"> 1. Remove CAD cell leadwires from the f-f terminals on the primary safety control, then start burner. Shortly after burner starts, place a temporary jumper between terminals f-f. Connect ohmmeter across CAD cell leadwires-resistance should be under 1,600 ohms. 	<ol style="list-style-type: none"> 3. With burner off, check dark cell resistance across CAD cell leadwires. Resistance should be greater than 20,000 ohms. If cell resistances are different from above, recheck wiring and location of cell, etc. If necessary, replace plug-in portion of cell.
	<ol style="list-style-type: none"> 2. Stop burner and remove temporary jumper. 	

Symptom – Furnace blower	Possible corrections :	
Furnace blower will not start.	<ul style="list-style-type: none"> • Check wiring from Fan and Limit control. See if blower motor will run when it is switched on manually at the thermostat sub-base (if sub-base is installed). 	<ul style="list-style-type: none"> • Check for 120V to the blower motor. If present, replace motor.
Blower cycles on and off after the burner has shut down.	<ul style="list-style-type: none"> • Adjust fan "off" setting at 90° and adjust fan "on" setting at 110°. 	
Blower short cycles on limit control.	<ul style="list-style-type: none"> • Return ducts may be undersized. 	

10 Service and maintenance

WARNING Follow the “Service and maintenance” procedures given throughout this manual and in component literature shipped with the furnace. Failure to perform the service and maintenance could result in damage to the furnace or system. Failure to follow the directions in this manual and component literature could result in severe personal injury, death or substantial property damage.

WARNING The furnace should be inspected and started annually, at the beginning of the heating season, only by a qualified service technician. In addition, the maintenance and care of the furnace designated in the table below, and explained on the following pages must be performed to assure maximum furnace efficiency and reliability. Failure to service and maintain the furnace and system could result in equipment failure.

WARNING This furnace contains fiberglass and ceramic fiber materials. These materials require special attention. Please refer to the WARNING and guidelines given on page 18. Failure to comply could result in severe personal injury, death or substantial property damage.

Service technician annual maintenance/start up (see following pages and burner manual for instructions)	
Service and maintenance	Annual start up
<p style="text-align: center;">Furnace and air system</p> <p><input type="checkbox"/> Consult with homeowner to see if there were any problems with furnace or system during the prior heating season (or cooling season)</p> <p><input type="checkbox"/> Clean, inspect, and lubricate blower motor and wheel</p> <p><input type="checkbox"/> Check condition of electrical wiring and tightness of terminals and connectors</p> <p><input type="checkbox"/> Clean and inspect heat exchanger and combustion chamber</p> <p><input type="checkbox"/> Clean and inspect system accessories</p> <p style="text-align: center;">Vent system</p> <p><input type="checkbox"/> Clean and inspect flue pipe, chimney/vent, and draft regulator</p> <p style="text-align: center;">Fuel oil system</p> <p><input type="checkbox"/> Check oil tank and piping for leaks</p> <p><input type="checkbox"/> Replace oil filter</p> <p style="text-align: center;">Oil burner</p> <p><input type="checkbox"/> Clean and inspect oil burner assembly</p> <p><input type="checkbox"/> Bleed system of air (single-pipe system)</p> <p><input type="checkbox"/> Check oil pump pressures</p> <p><input type="checkbox"/> Check combustion air ducts, grilles, etc. (if applicable)</p>	<p style="text-align: center;">Check operation</p> <p><input type="checkbox"/> Check sequence of operation</p> <p><input type="checkbox"/> Check flame characteristics</p> <p><input type="checkbox"/> Perform combustion checks/tests per burner manual and furnace manual</p> <p><input type="checkbox"/> Check temperature rise</p> <p><input type="checkbox"/> Check thermostat heat anticipator setting</p> <p><input type="checkbox"/> Check safety controls (high-temperature limit switch, flame cutoff time, etc.)</p>

Handling ceramic fiber and fiberglass materials

HANDLING OR REMOVAL OR COMBUSTION CHAMBER

WARNING

The combustion chamber in this product contains ceramic fiber materials. Ceramic fiber can be converted to cristobalite in very high high temperature applications. The International Agency for Research on Cancer (IARC) has concluded, "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1)".

- Avoid breathing dust and contact with skin and eyes.
 - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH web site at <http://www.cdc.gov/niosh/homepage.html>. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this web site.
 - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Apply enough water to the combustion chamber lining to prevent airborne dust.
- Remove combustion chamber lining from the furnace and place it in a plastic bag for disposal.
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

NIOSH stated First Aid.

- Eye : Irrigate immediately
- Breathing : Fresh air.

HANDLING OR REMOVAL OF FIBERGLASS WOOL – OR – INSTALLATION OF FIBERGLASS WOOL OR COMBUSTION CHAMBER :

WARNING

This product contains fiberglass jacket insulation and ceramic fiber materials in combustion chamber. Airbone fibers from these materials have been listed by the State of California as a possible cause of cancer through inhalation.

- Avoid breathing dust and contact with skin and eyes.
 - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for fiberglass wool at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH web site at <http://www.cdc.gov/niosh/homepage.html>. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this web site.
 - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Operations such as sawing, blowing, tear out, and spraying may generate airborne fiber concentration requiring additional protection.
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

NIOSH stated First Aid.

- Eye : Irrigate immediately
- Breathing : Fresh air.

10 Service and maintenance (continued)

Service/maintenance procedures

To lubricate and inspect blower motor

CAUTION DO NOT over –oil motors. Adding too much oil can damage the motor bearings, resulting in blower motor failure.

Belt-drive motor – Oil annually using 3 drops of S.A.E. #10 oil (or other if specified by motor manufacturer). Blower bearings are permanently lubricated and do not require oiling. Verify that the blower, motor pulleys and belt are in good condition. Replace if necessary.

Direct-drive motor – Oil annually using 2 drops of S.A.E. #10 oil (or other if specified by motor manufacturer). Oiling is normally not required until beginning of third year of operation.

Clean blower wheel – Vacuum dust from blower wheel blades and surrounding area.

To clean heat exchanger

WARNING The heat exchanger must be cleaned and inspected at least once each year. Operating the furnace with a fouled or leaking heat exchanger could result in severe personal injury, death or substantial property damage.

WARNING The combustion chamber contains ceramic fiber materials. Wear a NIOSH-approved respirator while cleaning the furnace and follow WARNING on page 18 for proper handling.

1. Remove the burner and mounting plate.
2. Inspect the heat exchanger using a mirror inserted through the burner opening.
3. Using a brush on a flexible handle, loosen the soot on the inside of the heat exchanger.
4. Remove the soot with a vacuum. Be careful not to damage the combustion chamber while cleaning the heat exchanger.
5. Remove the heat exchanger cleanout covers of flue collector box. Using a brush on a flexible handle, loosen the soot from the heat exchanger surfaces. Remove as much soot as possible using a vacuum.
6. Replace cleanout covers.
7. Inspect combustion chamber and replace with a new one if chamber is damaged in any way.
8. Re-install burner and mounting plate.

WARNING Obtain gas-tight seal at burner flange and cleanout plates to prevent possible flue gas leakage and carbon monoxide emissions, leading to severe personal injury or death.

Inspect vent system

Thoroughly inspect the entire vent system at least annually, including horizontal vent pipe and chimney or vertical vent. Ensure vent system is repaired or replaced if necessary before placing furnace in operation.

Oiled-bearing burner motors

The burner may need to be lubricated if motor is equipped with oiling cups. Refer to burner manual for specific instructions. If instructed, apply a few drops only of S.A.E. 20 detergent oil (never use household oils). Do not attempt to “fill up” the oil cup. Over-oiling can damage the motor.

Annual start up

DANGER Follow information below to prevent severe personal injury, death or substantial property damage :

- Do not use gasoline, crankcase drainings or any oil containing gasoline. See burner manual for proper fuel oil.
- Do not attempt to start burner when excess oil has accumulated, when unit is full or vapor or when combustion chamber is very hot.
- Do not start burner unless collector box, vent and burner mounting door are secured in place.
- Never burn garbage or paper in the furnace.
- Never leave combustible material around it.

To start furnace

1. Factory burner adjustment and settings may not be suitable for specific job conditions. Refer to burner manual for burner start up, adjustment and checkout procedures.
2. Set room thermostat to call for heat.
3. Refer to burner manual for start up.
4. The furnace blower will delay for a short after burner starts, until the limit/fan switch senses air temperature above the fan ON setting.
5. Set room thermostat to its lowest setting. Burner should turn off.
6. Furnace blower will continue to run until the limit/fan switch senses air temperature below the fan OFF setting.
7. Set the room thermostat to call for heat again. Allow furnace to heat to design temperature. Then adjust burner for correct combustion, using combustion test equipment. Adjust burner for:
Draft : -0.01 to -0.02 inches water column draft in furnace combustion chamber.
CO₂ : between 10 % and 11 ½ %, with 0 smoke.

WARNING Make final burner adjustments using combustion test equipment to assure proper operation.

8. Check furnace and duct system for proper operation and conditions.
9. Inspect vent system for proper operation.
10. To set limit/fan switch :

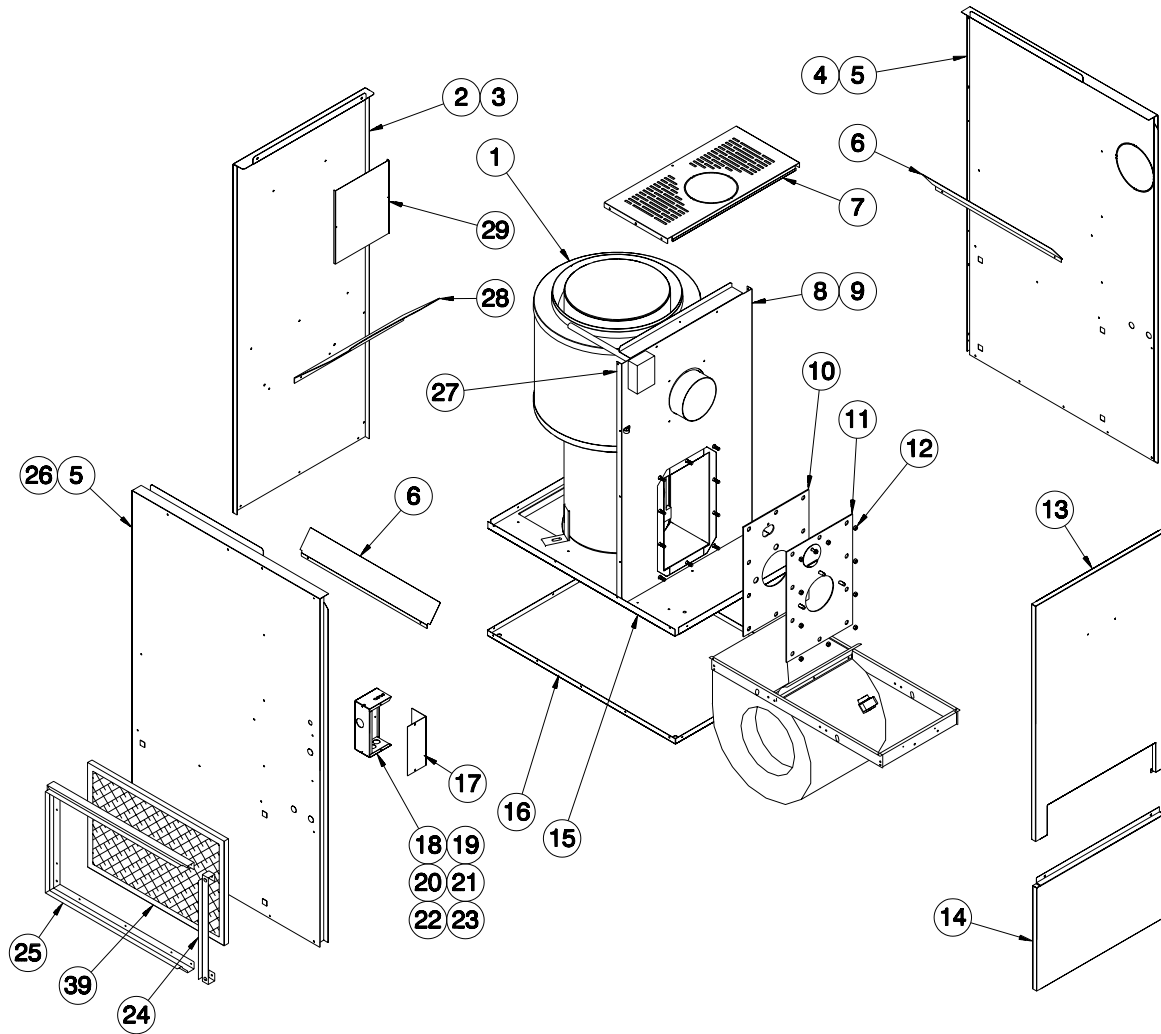
The blower operates until the air temperature drops below the fan OFF setting. If the air at the supply registers is too warm at blower start up or shutdown or shutdown, lower the fan OFF and ON settings on the limit/fan switch.

To check operation of the limit switch, slide a piece of cardboard into the furnace filter slot. After a few minutes of operation (not more than 5 minutes), the burner should shut off (limit switch open). The blower will operate until the furnace cools down. Remove cardboard when finished.

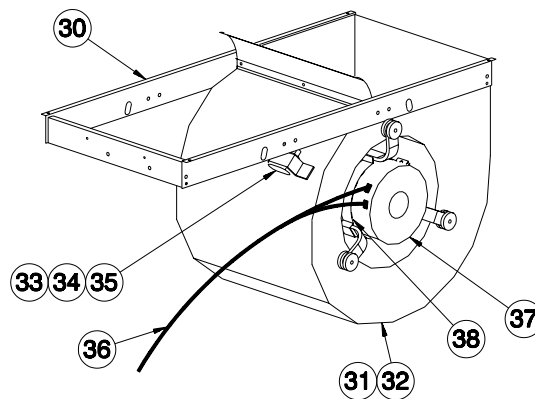
11. Complete testing of the burner cad cell control using the instructions in the burner manual.

11 Components and replacement parts

Figure 3 Model THB furnaces – Component locations



Direct-Drive



11 Components and replacement parts (continued)

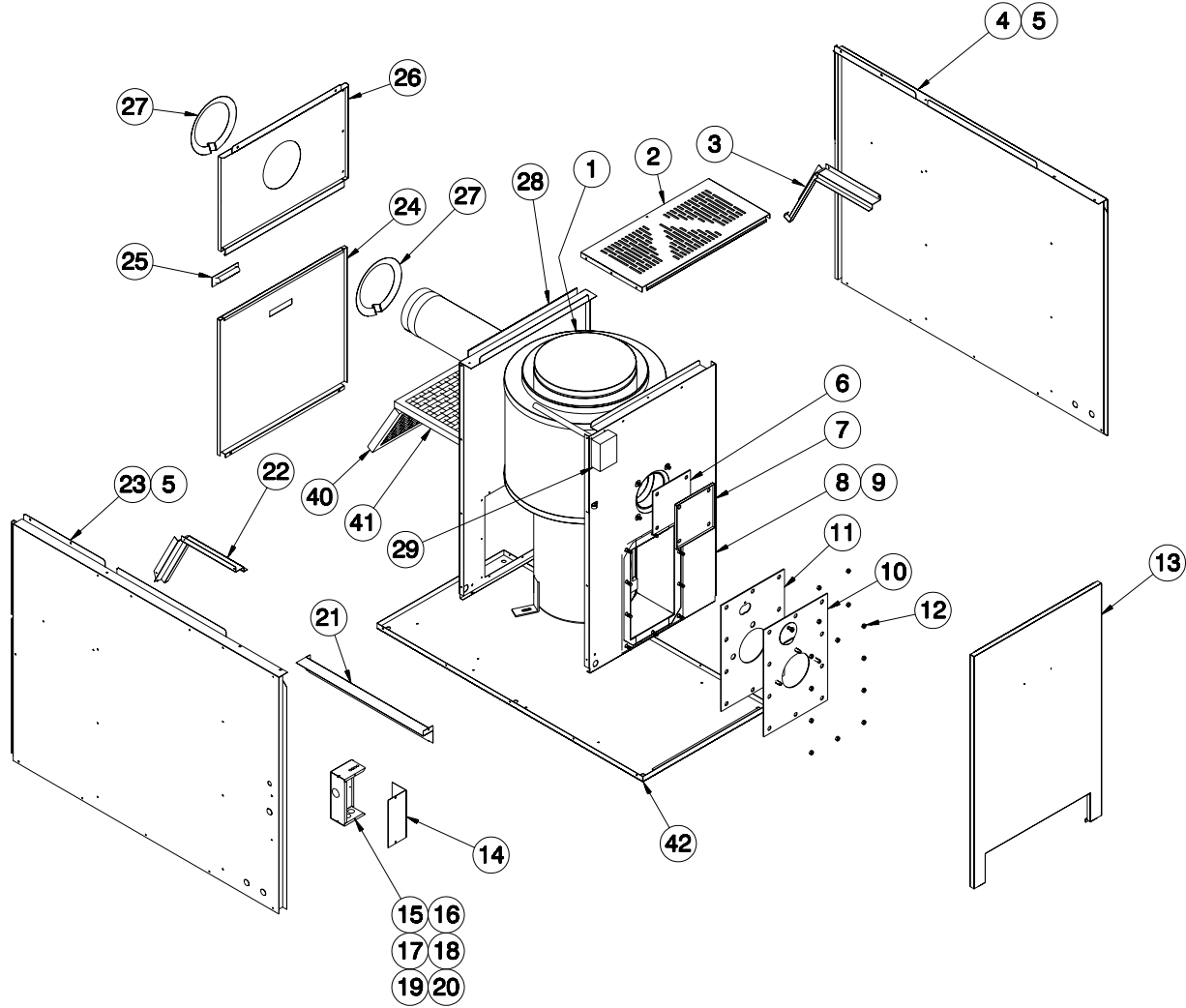
Model THB furnaces – Parts list

Item	Part description	Part number
1	Complete heat exchanger (Combustion chamber included)	B03037-01
2	Rear panel assembly (item 3, 28 & 29 included)	B03101
3	Rear panel insulation	B03107
4	Right side panel assembly (item 5 included)	B03100-01
5	Side panel insulation	B03106
6	Baffle, side	B03061
7	Top front panel	B03057
8	Front divider panel (item 9 included)	B03104
9	Front divider insulation	B03108
10	Burner gasket	B03071
11	Burner plate	B03105
12	Hexagonal flange nut 3/8-16nc brass	F07O001
13	Front door	B03109
14	Lower front door	B03110
15	Blower divider panel (blower slides included)	B03103
16	Floor	B03102
17	Electrical box cover	B02978
18	Electrical box assembly (item 19,20,21,22 & 23 included)	B02977
19	Terminal strip, 4 positions	L05F009
20	Transformer 120/24 VAC / 40 VA	L01F009

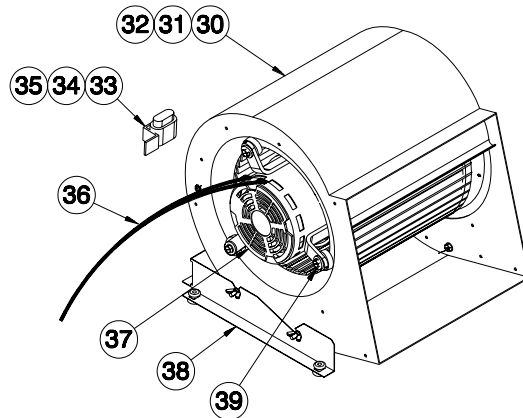
Item	Part description	Part number
21	Relay SPDT 24VAC	L01H009
22	Electrical wire harness (burner)	B02915
23	Electrical wire harness (fan limit)	B02917
24	Filter rack access	B01696-01
25	Filter rack "U" frame	B01695-01
26	Left side panel assembly (item 5 included)	B03100-02
27	Fan limit control	R02I002
28	Rear, baffle	B03062
29	Heat shield baffle	B03060
30	Blower assembly (item 31,33,34,35,36 & 37B)	B02974-01
31	Blower 10 X 10 (housing & item 32)	Z01I004
32	Blower wheel 10 X 10	Z01L002
33	5 MF capacitor	L01I001
34	Capacitor holder	B01024
35	Rubber cap capacitor	L99Z007
36	Electrical wire harness (blower)	B02916
37A	1/3 HP motor only	L06G007
37B	1/3 HP motor with legs	B01932-01
38	Belly band assembly (band, legs, nuts & bolts included)	B01888
39	Paper filter 16"x24"x1"	Obtain locally

11 Components and replacement parts

Figure 4 Model TLB Rear flue furnaces – Component locations



Direct-Drive



11 Components and replacement parts (continued)

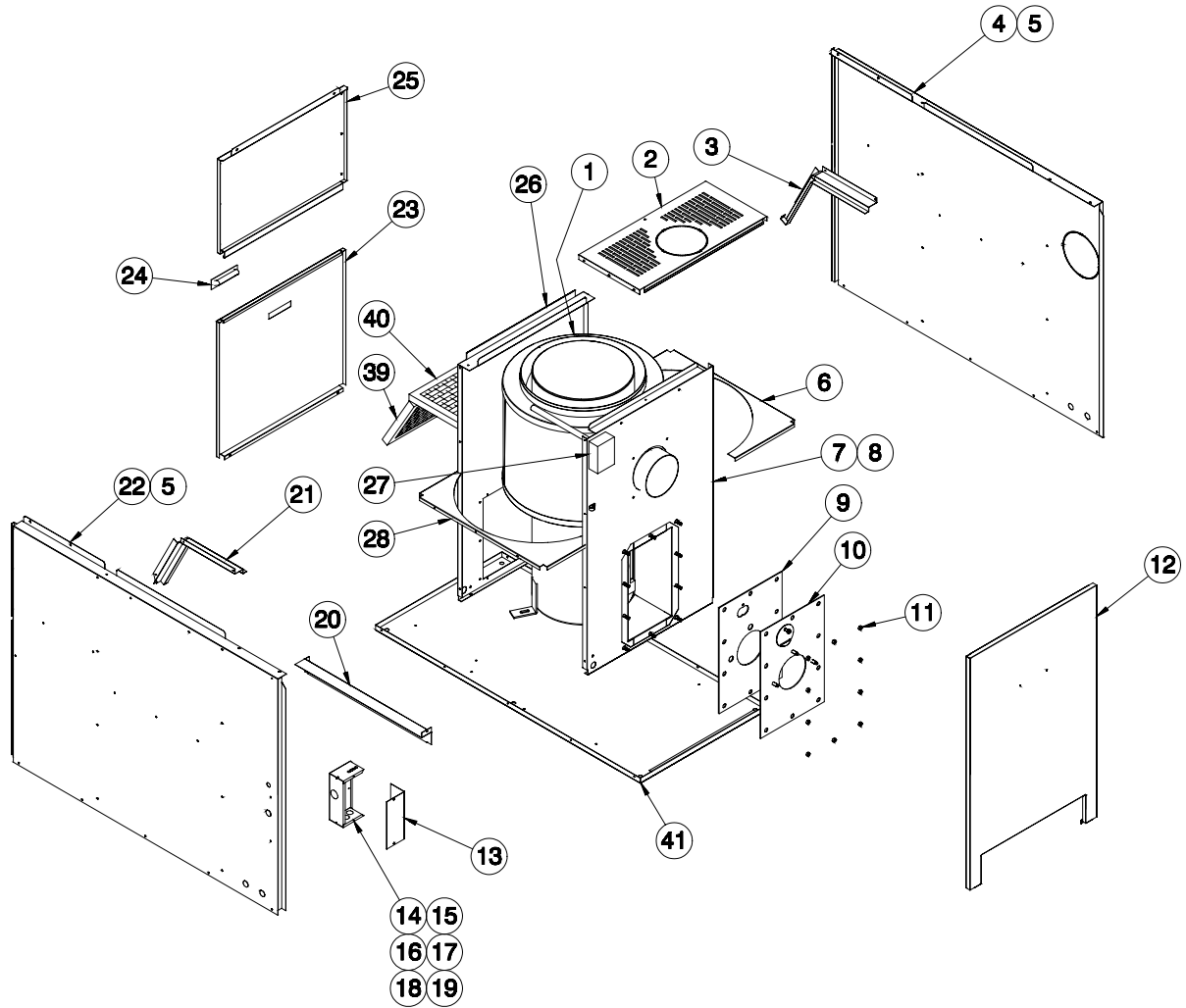
Model TLB Rear flue furnaces – Parts list

Item	Part description	Part number
1	Complete heat exchanger (Combustion chamber included)	B03037-02
2	Top front panel	B03072
3	Filter support, left	B03073-01
4	Right side panel assembly (item 3 & 5 included)	B03087-03
5	Side panel insulation	B03078
6	Gasket, heat exchanger	B30415-01
7	Flange	B30487-01
8	Front divider panel (item 9 included)	B03090
9	Front divider panel insulation	B03089
10	Burner panel	B03071
11	Burner panel gasket	B03105
12	Hexagonal flange nut 3/8-16nc brass	F07O001
13	Front door	B03085
14	Electrical box cover	B02978
15	Electrical box assembly (item 16,17,18,19 & 20 included)	B02977
16	Terminal strip, 4 positions	L05F009
17	Transformer 120/24 VAC / 40 VA	L01F009
18	Relay SPDT 24VAC	L01H009
19	Electrical wire harness (burner)	B02915
20	Electrical wire harness (fan limit)	B02917
21	Wire conduit	B03074
22	Left filter support	B03073-02
23	Left side panel assembly (item 5 & 22 included)	B03087-04

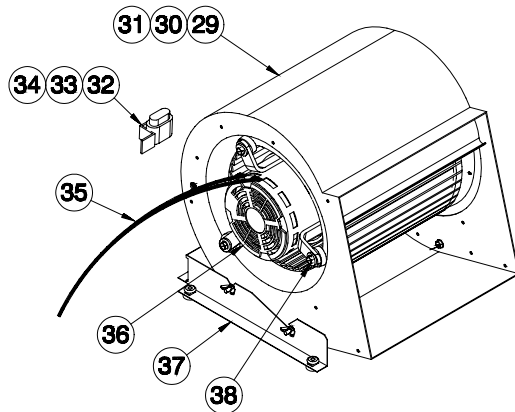
Item	Part description	Part number
24	Blower door assembly (item 25 included)	B03083
25	Door handle	Z99F050
26	Top rear panel	B03069-02
27	Ring	B10016-06
28	Divider back panel	B03084-02
29	Fan limit control	R02I002
30	Blower assembly (item 31,33,34,35,36 & 37B)	B03023-02
31	Blower 10 X 10 (housing & item 32)	Z01I004
32	Blower wheel 10 X 10	Z01L002
33	5 MF capacitor	L01I001
34	Capacitor holder	B01024
35	Rubber cap capacitor	L99Z007
36	Electrical wire harness (blower)	B02916
37A	1/3 HP motor only	L06G007
37B	1/3 HP motor with legs	B01932-01
38	Blower support	B03013
39	Belly band assembly (band, legs, nuts & bolts included)	B01888
40	Paper filter 10"x20"x1"	Obtain locally
41	Paper filter 12"x20"x1"	Obtain locally
42	Floor	B03082

11 Components and replacement parts

Figure 5 Model TLB Front flue furnaces – Components locations



Direct-Drive



DNS-0901 Rev. B

11 Components and replacement parts (continued)

Model TLB Front flue furnaces – Part list

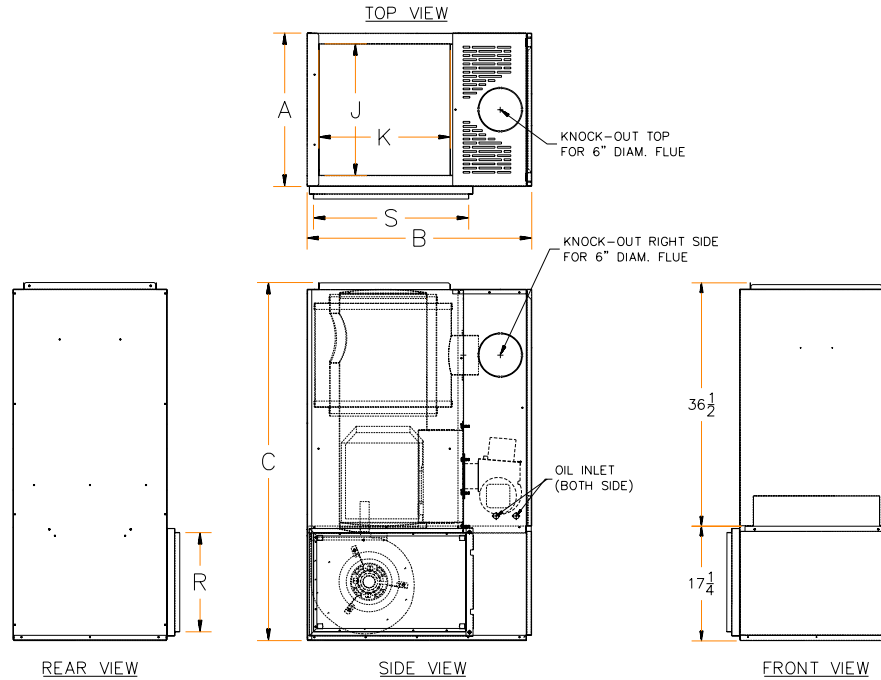
Item	Part description	Part number
1	Complete heat exchanger (Combustion chamber included)	B03037-01
2	Top front panel	B03057
3	Filter support, left	B03073-01
4	Right side panel assembly (item 3 & 5 included)	B03087-01
5	Side panel insulation	B03078
6	Baffle, right side	B03075-01
7	Front divider panel assembly (item 8 included)	B03088
8	Front panel insulation	B03086
9	Burner panel gasket	B03071
10	Burner panel	B03105
11	Hexagonal flange nut 3/8-16nc brass	F07O001
12	Front door	B03085
13	Electrical box cover	B02978
14	Electrical box assembly (item 15,16,17,18 & 19 included)	B02977
15	Terminal strip, 4 positions	L05F009
16	Transformer 120/24 VAC / 40 VA	L01F009
17	Relay SPDT 24VAC	L01H009
18	Electrical wire harness (burner)	B02915
19	Electrical wire harness (fan limit)	B02917
20	Wire conduit	B03074
21	Left filter support	B03073-02
22	Left side panel assembly (item 5 & 21 included)	B03087-02

Item	Part description	Part number
23	Blower door assembly (item 24 included)	B03083
24	Door handle	Z99F050
25	Top rear panel	B03069-01
26	Divider back panel	B03084-01
27	Fan limit control	R02I002
28	Baffle, left side	B03075-02
29	Blower assembly (item 30,32,33,34,36B, 37& 53)	B03023-02
30	Blower 10 X 10 (housing & item 31)	Z01I004
31	Blower wheel 10 X 10	Z01L002
32	5 MF capacitor	L01I001
33	Capacitor holder	B01024
34	Rubber cap capacitor	L99Z007
35	Electrical wire harness (blower)	B02916
36A	1/3 HP motor only	L06G007
36B	1/3 HP motor with legs	B01932-01
37	Blower support	B03013
38	Belly band assembly (band, legs, nuts & bolts included)	B01888
39	Paper filter 10"x20"x1"	Obtain locally
40	Paper filter 12"x20"x1"	Obtain locally
41	Floor	B03082

12 Dimensions and ratings

Figure 6 Model THB dimensional data – ALL DIMENSIONS IN INCHES

Model	Furnace casing			Warm air supply (top)		Return air (side)		Flue pipe diam.
	Width	Depth	Height	Width	Depth	Width	Depth	
	A	B	C	J	K	R	S	
THB-105	23	33 1/2	53 3/4	19 3/4	19 3/4	15	23	6



DNS-0906 Rev. B

Model	Input	Output	Firing rate	Installed nozzle	AFUE with vent damper	AFUE	Blower size	Blower motor HP	Blower speed		Maximum cooling capacity (tons)	Blower CFM	
	(BTU/h)	(BTU/h)	(GPH)						@ 0.25" W.C.	@ 0.50" W.C.		@ 0.25" WC	@ 0.50" WC
Direct-drive units													
THB-105	91,000	77,700	0.65		83.5	81.0	GT10-10	1/3	Med. - Low	Med. - Low	3	975	925
	105,000	87,900	0.75		82.0	80.5	GT10-10	1/3	Med. - High	High	3	1100	1050
	119,000	98,400	0.85		81.0	80.0	GT10-10	1/3	High	High	3	1225	1150

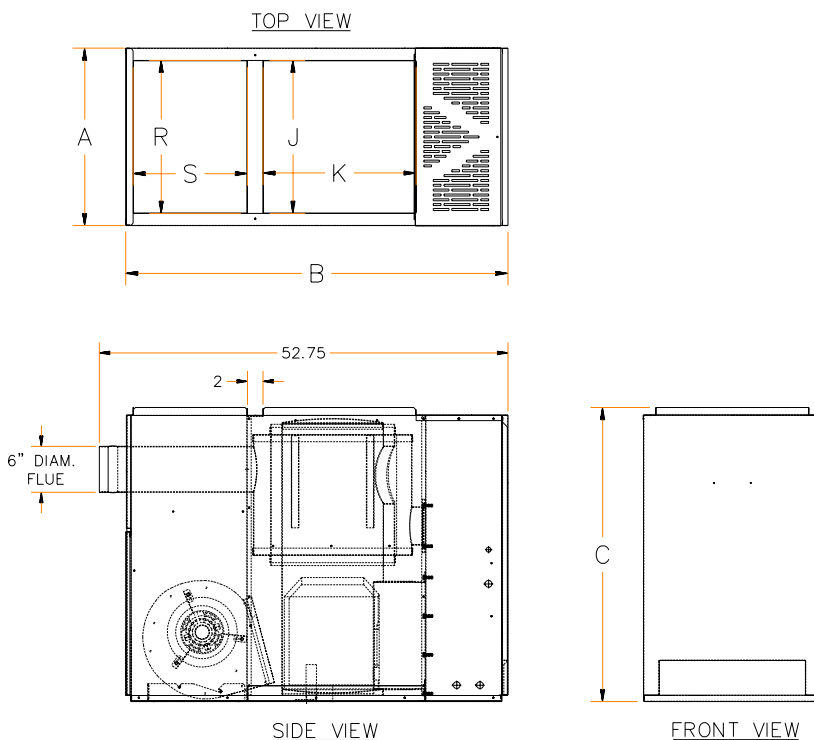
Model	Maximum heating temperature rise (°F)	Filter quantity and size	Volt - Hertz - Phase	Electrical load (amps)	Minimum ampacity for wiring sizing	Maximum fuse size (amps)	Ship weight (pounds)
THB-105	65 - 90	1 (16 X 24 X 1)	115 - 60 - 1	12.2	13.7	15	210



12 Dimensions and ratings

Figure 7 Model TLB Rear dimensional data – ALL DIMENSIONS IN INCHES

Model	Furnace casing			Warm air supply (top)		Return air (top)		Flue pipe diam.
	Width	Depth	Height	Width	Depth	Width	Depth	
	A	B	C	J	K	R	S	
TLB-105R	23	49 1/4	38	19 3/4	19 3/4	19 3/4	14 3/4	6



DNS-0905 Rev. B

Model	Input (BTU/h)	Output (BTU/h)	Firing rate (GPH)	Installed nozzle	AFUE with vent damper	AFUE	Blower size	Blower motor HP	Blower speed		Maximum cooling capacity (tons)	Blower CFM	
									@ 0.25" W.C.	@ 0.50" W.C.		@ 0.25" W.C.	@ 0.50" W.C.
Direct-drive units													
TLB-105R	91,000	79,100	0.65		83.5	81.0	GT10-10	1/3	Med. - Low	Med. - Low	3	1050	975
	105,000	90,500	0.75		82.0	80.5	GT10-10	1/3	Med. - High	High	3	1150	1125
	119,000	101,500	0.85		81.0	80.0	GT10-10	1/3	High	High	3	1300	1150

Model	Maximum heating temperature rise (°F)	Filter quantity and size	Volt - Hertz - Phase	Electrical load (amps)	Minimum ampacity for wiring sizing	Maximum fuse size (amps)	Ship weight (pounds)
TLB-105R	65 - 90	1 (12 X 20 X 1) 1 (10 X 20 X 1)	115 - 60 - 1	12.2	13.7	15	225

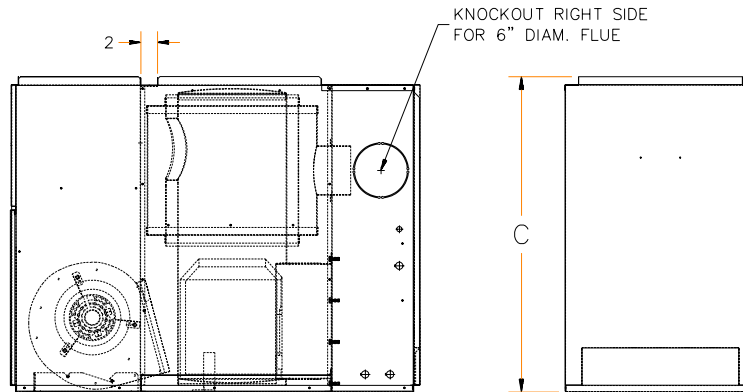
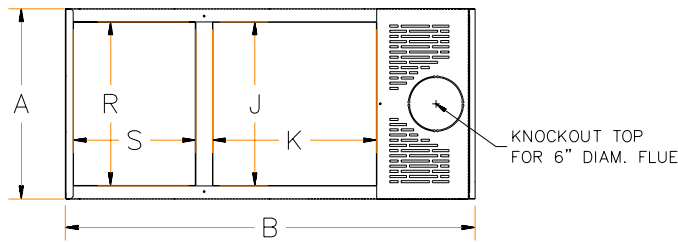


12 Dimensions and ratings

Figure 8 Model TLB Front dimensional data – ALL DIMENSIONS IN INCHES

Model	Furnace casing			Warm air supply (top)		Return air (top)		Flue pipe diam.
	Width	Depth	Height	Width	Depth	Width	Depth	
	A	B	C	J	K	R	S	
TLB-105F	23	49 1/4	38	19 3/4	19 3/4	19 3/4	14 3/4	6

TOP VIEW



DNS-0904 Rev. B

SIDE VIEW

FRONT VIEW

Model	Input (BTU/h)	Output (BTU/h)	Firing rate (GPH)	Installed nozzle	AFUE with vent damper	AFUE	Blower size	Blower motor HP	Blower speed		Maximum cooling capacity (tons)	Blower CFM	
									@ 0.25" W.C.	@ 0.50" W.C.		@ 0.25" W.C.	@ 0.50" W.C.
Direct-drive units													
TLB-105F	91,000	78,900	0.65		83.5	81.0	GT10-10	1/3	Med. - Low	Med. - Low	3	1050	975
	105,000	89,300	0.75		82.0	80.5	GT10-10	1/3	Med. - High	High	3	1150	1125
	119,000	99,900	0.85		81.0	80.0	GT10-10	1/3	High	High	3	1300	1150

Model	Maximum heating temperature rise (°F)	Filter quantity and size	Volt - Hertz - Phase	Electrical load (amps)	Minimum ampacity for wiring sizing	Maximum fuse size (amps)	Ship weight (pounds)
TLB-105F	65 - 90	1 (12 X 20 X 1) 1 (10 X 20 X 1)	115 - 60 - 1	12.2	13.7	15	225



12 Dimensions and ratings

Burners data

BECKETT BURNER - Model AF-F3 (3450 RPM) - Tube insertion 6 1/2"

Model	Input BTU/h	Firing rate USGPH	Nozzle (Delavan)	Pump pressure (PSIG)	Head	Low firing rate baffle	Static disc	Combustion air adjustment (band/shutter)
THB-105 / TLB-105F/R	91,000	0.65	0.65-80A	100	F3	NO	3 3/8	0 / 1
	105,000	0.75	0.75-80A	100	F3	NO	3 3/8	1 / 3
	119,000	0.85	0.85-80A	100	F3	NO	3 3/8	2 / 3

RIELLO BURNER - Model 40-F3 - Tube insertion 6 1/2"

Model	Input BTU/h	Firing rate USGPH	Nozzle (Delavan)	Pump pressure (PSIG)	Combustion air adjustment (Turbulator / Band)
THB-105 / TLB-105F/R	91,000	0.65	0.55-60W	140	2 / 1.25
	105,000	0.75	0.60-60W	155	2 / 2.25
	119,000	0.85	0.75-60W	130	2 / 3.25

CARLIN BURNER - EZ-1 - Tube insertion 6 1/2"

Model	Input BTU/h	Firing rate USGPH	Nozzle (Delavan)	Pump pressure (PSIG)	Combustion air adjustment (Bar / Band)
THB-105 / TLB-105F/R	91,000	0.65	0.65-70A	100	Bar # 0.60-0.65 / 0.60
	105,000	0.75	0.75-70A	100	Bar # 0.75 / 0.75
	119,000	0.85	0.85-60A	100	Bar # 0.85-1.00 / 0.85

12 Dimensions and ratings

Airflow data

Model	Blower speed	External static pressure						
		0.1	0.2	0.3	0.4	0.5	0.6	0.7
THB-105	Med-Low	1005	985	965	945	925	905	885
	Med-High	1130	1110	1090	1070	1050	1030	1010
	High	1270	1240	1210	1180	1150	1120	1090
TLB-105F	Med-Low	1095	1065	1035	1005	975	945	915
	Med-High	1165	1155	1145	1135	1125	1090	1030
	High	1360	1330	1270	1210	1150	1090	1030
TLB-105R	Med-Low	1095	1065	1035	1005	975	945	915
	Med-High	1165	1155	1145	1135	1125	1090	1030
	High	1360	1330	1270	1210	1150	1090	1030

Notes :

Airflow values in cubic ft per minute (CFM) rounded to nearest 5 CFM.

Data taken with filters in place.

13 Owner's information

The furnace must be inspected and started ANNUALLY, at the beginning of the heating season, only by a qualified service technician.

The service technician must perform annual service and maintenance on the furnace to ensure reliable operation. Failure to service and maintain the furnace and system could result in equipment failure, causing severe personal injury, death or substantial property damage.

As the owner, you need to be aware of the following needs of your furnace. You must inspect and clean or replace the furnace filter monthly, as described below, and perform the other inspection procedures as well. Failure to maintain a clean filter will result in unsatisfactory cycling of the furnace and could lead to a no-heat condition. Failure to perform this maintenance could result in substantial property damage.

Follow all of the procedures below. Failure to comply could result in severe personal injury, death or substantial property damage.

Operating the furnace

1. The furnace should operate automatically on call for heat from the room thermostat.
2. If the furnace oil burner should shut down on flame failure, the burner primary control will lock out. Ask your service technician to show you the correct procedure to reset the primary control button. NEVER push the button more than once in an attempt to start the burner after lockout. Continued lockout of the control means something is wrong with the burner, controls or oil system. The condition must be corrected by a qualified service technician.

Daily inspection

1. Verify there are no combustible materials in the furnace room or near the furnace.
2. Verify the air openings to the furnace room are not obstructed in any way.
3. Verify the furnace seems to be operating normally. Notify your service technician immediately if you notice any abnormal behavior.

Monthly – inspect and clean/replace filter

1. Ask your service technician to show you the correct way to remove and clean your furnace filter. Replace the filter if you are unable to thoroughly clean it.

To shut down furnace

1. Set the room thermostat to its lowest setting.
2. Turn off the disconnect switch in the 120-VAC power line to the furnace.
3. If the burner will be shut down for an extended time, tightly close all oil valves.
4. Refer to burner manual for any additional instructions.

