SKU# 862A

# MULTI-POSITION, OIL FIRED WARM AIR FURNACE

# Installation, Operation & Maintenance Manual

**Model T169-10A** (03MD)

**Horizontal/Downflow Oil Furnace**

**BTU Inputs: 85,000/Hr, 105,000/Hr and 120,000/Hr**

**Read This Complete Manual Before Beginning Installation.**
**These Instructions Must Be Kept With The Furnace For Future Reference.**

**WARNING:** IMPROPER INSTALLATION, ADJUSTMENT, ALTERATION, SERVICE OR MAINTENANCE CAN CAUSE INJURY OR PROPERTY DAMAGE. FOR ASSISTANCE OR ADDITIONAL INFORMATION CONSULT A QUALIFIED HEATING PROFESSIONAL

FOR YOUR SAFETY - Do not store or use gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance

ALL INSTALLATIONS MUST MEET ALL LOCAL, PROVINCIAL AND STATE CODES WHICH MAY DIFFER FROM THIS MANUAL

**Metzger Machine Corporation**
**8155 N. 76th Street**
**Milwaukee, WI 53223**

# NOTICE TO THE INSTALLER

INSTALLATION OF THIS OIL FURNACE AND OIL-BURNER MUST BE DONE BY A QUALIFIED INSTALLER IN ACCORDANCE WITH REGULATIONS OF THE NATIONAL FIRE PROTECTION STANDARD FOR OIL-BURNING EQUIPMENT, NFPA NO.31, AND IN COMPLETE ACCORDANCE WITH ALL LOCAL CODES AND AUTHORITIES HAVING JURISDICTION.

A QUALIFIED INSTALLER IS AN INDIVIDUAL OR AGENCY WHO IS RESPONSIBLE FOR THE INSTALLATION AND ADJUSTMENT OF THE EQUIPMENT AND WHO IS PROPERLY **LICENSED** AND **EXPERIENCED** TO INSTALL OIL-BURNING EQUIPMENT IN ACCORDANCE WITH ALL CODES AND ORDINANCES.

A properly designed chimney of adequate size and height and adequate combustion air supply are essentials for the proper operation of any heating plant.

When installing the furnace and/or burner be sure to provide adequate space for easy service and maintenance.

RE-CHECK ALIGNMENT OF THE COMBUSTION CHAMBER AND OIL BURNER BEFORE FIRING AS IT IS POSSIBLE FOR THE COMBUSTION CHAMBER TO SHIFT IF THERE HAS BEEN ROUGH HANDLING WHILE IN TRANSIT.

For the safe, efficient and proper operation of this appliance be sure to follow the instruction procedures for both the furnace and oil burner. Furthermore, annual furnace inspection and service is required for safe and proper operation.

**The oil burner provided requires inspection, set-up and proper adjustment. (See manual).**

**Oil Burner must be set-up and adjusted with combustion instruments.**

**CAUTION:** VENTILATE HOUSE WHILE OPERATING FURNACE FOR THE FIRST TIME.

# GENERAL

## REPORT DAMAGE IMMEDIATELY.

In case of damage to this unit caused by shipping, please immediately request TRANSPORTATION COMPANY to inspect the unit and issue a concealed damage report. The claim for such damage should be filed by you.

## SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE.

Please read these instructions completely and carefully before installing and operating the furnace.

The installation of the equipment shall be in accordance and conform with all local, State and National Electric Building and Fire Codes having jurisdiction and the latest edition of the national Fire Protection Association Standard for the "Installation of Oil Burning Equipment" NFPA No. 31. Regulations of these authorities take precedence over the general instruction provided in this installation manual.

# WARNING:

The manufacturer of this equipment will not be liable for any damage resulting from not following existing codes or these instructions; nor for any alterations made in the field to the furnace or any component thereof, without factory authorization.

# LOCATION AND INSTALLATION OF FURNACE

**BE SURE** to read all special instructions before starting work so your installation will conform to Underwriters laboratories or Canadian Standards Association requirements. **BE SURE** the furnace is level when placed on its foundation or in its suspended position. Using a carpenter's level, check furnace in at least two directions. **BE SURE** the weight is distributed evenly on the bottom support or hanger rods before duct work is attached. If the weight is not distributed evenly, it will throw a strain on side of cabinet and may cause popping and cracking noises.

**LOCATION:** The compact, or counterflow design of this unit makes it ideal for installation in a crawl space under a house, utility room or closet, in a wide range of suspended applications. Locate the furnace as centrally as possible so that all warm air pipes to the various rooms are nearly the same length. This will allow each room to receive an equal and proper amount of heat. This may vary with each particular installation. Place the furnace so that the pipe connection to the chimney will be of minimum distance and have a minimum of fittings.

**MINIMUM CLEARANCES:** The furnace must be installled no closer to combustible material than shown in the following table:

| | *HORIZONTAL* |
|---|---|
| 12" | Top |
| 6" | Bottom and Rear |
| 24" | Front |
| 6" | End of Supply Plenum |
| 6" | Discharge End of Furnace |
| 6" | Above Horizontal Warm Air Duct within 3 ft of furnace |
| 6" | Inlet End of Furnace |
| 12" | Smoke Pipe Horizontal |
| 12" | Smoke Pipe Vertical |

**When horizontal installation is on combustible floor, non-combustible spacer must be used.**

| *DOWNFLOW* | |
|---|---|
| 12" | Top of Plenum & Duct Work |
| 6" | Plenum Sides |
| 6" | Furnace Sides |
| 6" | Furance Rear |
| 24" | From Front of Furance |
| 12" | Flue Pipe Horizontal |
| 6" | Flue Pipe Vertical |
| 6" | Inlet End of Furnace |
| 12" | Smoke Pipe VerticaL |

**A minimum of 48" must be provided in front of furnace for servicing the burner and filter. A passage suitable for a large person shall be provided to the furnace and vent system, the latter for inspection or replacement of the flue connector when necessary.**

**HORIZONTAL INSTALLATION REVERSING THE AIR FLOW:** When shipped from the factory the furnace is assembled in the downflow configuration. If horizontal installation is required, it can be done in the following manner:

1. Rotate the furnace 90° so that when facing the front, the warm air is being discharged out the right or left.

2. Remove the oil burner and the screws holding the burner mounting plate. Rotate the burner mounting plate 90° and attach with screws into the heat exchanger. Then mount the burner.

**NON-SUSPENDED INSTALLATION:** To support furnace from below, set furnace on combustible or non-combustible material. Use a level to check level of furnace in at least two directions. To make adjustment, use shims of non-combustible material. There must be 6" minimum clearance between bottom of furnace and combustible material. Installation on a combustible floor requires factory approved non-combustible base.

**SUSPENDED INSTALATION:** When the furnace is to be suspended, use optional angle iron support bracket on bottom of furnace with threaded rod support. Threaded rods should be cut to desired length. Use on (1) flat washer and two (2) nuts on each rod. One (1) nut and washer on top of bar of unit, the other nut on the bottom. This will be the locking nut. Unit can be leveled with the nuts on the inside.

**DOWNFLOW INSTALLATION:** Refer to Figure 1 for installation with or without combustible floor.

**VENT PIPE:** Connect the flue outlet to the chimney with 24 gauge or heavier galvanized steel vent pipe and fittings, the same size as the outlet of the flue pipe. It is desirable to have the vent pipe as short and direct as possible. The flue pipe shall maintain a rise as great as possible or a minimum of at least 1/4 inch to the foot (horizontal length). Make sure the thimble of flue connector does not protrude beyond the inside wall of the chimney. A barometric draft regulator is required.

**RETURN AIR TO FURNACE:** In confined spaces such as utility rooms where there is no complete return duct system, a return air connection must be run full size to a location outside the room.

## AIR FOR COMBUSTION & VENTILATION

**AIR REQUIREMENTS:** Where the furnace is confined in a tightly closed room (such as a utility room) without ventilating openings to outdoors or other rooms, provisions must be made for supplying air for combustion through special openings. Provide two openings each with one square inch of free area per 1,000 BTU input per hour, (minimum, 100 square inches per opening). One is to be below the burner level

## FURNACE LIMIT AND BLOWER CONTROLS

The furnace is supplied with a limit and blower control. The limit control has a setting which will not permit a discharge air temperature above 200°F.

The blower control should be set so that the greatest efficiency of the furnace is obtained. We have found that a blower "ON" setting of 120°F generally gives the past results. After the burner shuts down, the blower will stay on until the temperature inside the cabinet falls below the lower setting on the fan control. If a longer cool down period is desired, the fan control may be set to give any length of cycle desired.

An auxiliary limit control is provided to prevent the blower motor and filters from becoming overheated. Often times the filters become clogged with dirt, a motor fails, or the blower belt breaks, which tends to cause excessive heat in the blower compartment. Should the furnace become inoperative, it is necessary to remove the Blower and Filter access Door to examine for any of the above mentioned failures. After the correction has been made normal operation will ensue. Be sure to replace Blower and Filter Access Door.

## OIL BURNER AND ACCESSORY INFORMATION

**Burner Spec. No. MZ903**
**Approved Firing Rates**

| BTU Input | Nozzel Size | Spray Angle | Pattern |
|---|---|---|---|
| 85,000 | .60 | 80° | A |
| 105,000* | 75* | 80° | A |
| 120,000 | 85 | 80° | A |

*Factory rates

The refractory type Combustion Chamber, Oil Burner and Nozzle are installed at the factory. Run the oil supply line from the oil tank to the burner. We recommend installation of a Filter in the oil line.

Refer to the "Oil Burner Operating instructions" for information on the following:

Oil Storage Tank
Air Supply
Starting of Burne
Adjustment of Burne
Fuel Pump
Setting Draft Control

## OIL BURNER ADJUSTMENT
**(See Oil Burner Instruction Manual)**

Turn the main electrical switch to the "OFF" position. Set the room thermostat above the room temperature. Be sure the oil tank is full. Open all valves in the oil line. Open the inspection door above the burner. Turn on the electrical switch and prime the oil pump according to the pump manufacturers recommendations. Check the oil pump pressure.

**CAUTION:** Do not run the pump dry for more than two (2) minutes.

When ignition is established make a temporary air adjustment for a clean smoke free flame. Close the inspection door above the burner. At this point the final burner adjustment should be made using test instruments to measure draft, smoke, carbon dioxide (CO 2) and stack temperature. In order to achieve the most ideal combustion efficiency the following procedure must be followed:

1.) Draft - Draft readings should be taken over the fire (through the hole in the inspection door) and in the flue pipe not more than 12 inches away from the furnace flue outlet. The over fire draft should be -.015" to -.02" Water Column Pressure and the flue draft should be -.02' to -04" Water Column Pressure. The overfire draft reading takes precedence over the flue draft reading when adjusting the barometric draft control.

2.) Smoke - A smoke sample should be taken in the same opening that the flue draft was taken. If the first reading is "0", close burner air shutter until a No. 1 smoke reading is obtained. Open the air shutter just enough to obtain a "0" smoke reading. Tighten the air shutter in position.

3.) Carbon Dioxide (CO 2) - In order to assure that proper combustion is taking place a CO 2 reading must be taken. A reading of from 10% to 12% is considered normal.

While CO 2 settings in excess of 12.0% may be attainable they are not recommended. Excessive CO 2 readings can lead to Oil Burner choke or end cone problems. Use calibrated combustion instruments for burner set-up.

4.) Flue Gas Temperature - The flue gas temperature will very with BTU inputs, duct design and air flow across the Heat Exchanger. The net stack temperature should not be below 350°F. A net stack temperature below 350°F could result in condensation in the flue pipe.

CAUTION: BEFORE OPERATING THE FURNACE CHECK BURNER ALIGNMENT WITH COMBUSTION CHAMBER. THE END CONE OF THE AIR TUBE MUST FIT SNUG TO THE ACCOMMODATING RING PROVIDED IN THE DESIGN OF THE COMBUSTION CHAMBER. ADJUST AS NECESSARY.

## BURNER ELECTRODE & FIRING ASSEMBLY

Correct adjustment of the electrode tips with respect to each other, to the fuel, oil nozzle, and to the rest of the burner is very important. An electrode gap of 5/32 in. should be maintained with tips 7/16 in. above the center of the nozzle and 1/16 in. ahead of the nozzle. Check and adjust the distance from the front of the end cone to the face of the fuel oil nozzle to 1-1/8 in., see Oil Burner Manual for more information. Be sure Oil Burner "Z" Dimension is checked and set according to manufactures required setting.

## BURNER PRIMARY (SAFETY) CONTROL

The furnace is equipped with a primary combustion control or burner relay which uses a light sensing device (located in the burner housing) and an appropriate thermostat to provide automatic control of the oil heating system. Dust of combustion residuals can, over a long period of time, interfere with proper operation of the light sensing device.

CAUTION: ALL CONTROLS ON THE FURNACE ARE SENSITIVE DEVICES AND SHOULD NOT BE TAMPERED WITH. CALL YOUR SERVICEMAN.

Refer to Oil Burner Manual for additional information.

## COMBUSTION CHAMBER

This furnace is equipped with a combustion chamber made of a very high quality refractory. It is positively located in the heat exchanger strapped to the tube connected to the burner mounting plate. RE-CHECK ALIGNMENT OF THE COMBUSTIO CHAMBER AND OIL BURNER BEFORE FIRING AS IT IS POSSIBLE FOR THE COMBUSTION CHAMBER TO SHIFT IF THERE HAS BEEN ROUGH HANDLING WHILE IN TRANSIT. When your service person removes the oil burner for inspection or maintenance, he should inspect the combustion chamber for damage or carbon deposits.

## CIRCULATING AIR BLOWER

The circulating air blower adjustment must be such as to obtain an air temperature rise of 70° F (47° C) THROUGH THE FURNACE.

## DIRECT DRIVE:

Furnaces equipped with a direct drive blower are supplied with an air conditioning relay to accommodate a wide range of duct static pressures.

However, should the duct be excessively tight or an air conditioning coil be in the system, a higher speed may be used. Simply change the speed by disconnecting the (non-white) lead from the block and re-connect it to another winding lead.

**WARNING:** Never connect power leads between windings (non-white leads).

CAUTION: OPEN THE DISCONNECTOR IN THE ELECTRICAL SUPPLY LINE BEFORE REMOVING THE BLOWER ACCESS DOOR AND DO NOT ATTEMPT TO SERVICE THE FAN OR FAN MOTOR UNLESS THIS SWITCH IS OPEN AND ELECTRIC POWER IS OFF.

## ELECTRICAL

(Refer to sketches and wiring diagrams in this Instruction Manual)

All wiring must conform to Local, State and National Codes and all electrical connections must conform to National Electrical Code, ANSI/NFPA No. 70.

A separate electric line should be run directly from the main house panel to the leads in the furnace junction box. A fused manual switch should be installed in this line.

Connect the thermostat wires to the terminals on the primary combustion control (burner relay).

## ROOM THERMOSTAT

The thermostat should be placed on an inside wall of a room on the principal floor at approximately five feet above the floor where it is responsive to changes in temperature and free from drafts. The living room or dining room is a generally acceptable location. Keep it set at desired room temperature and no higher. If windows are to be opened or heat is not needed, turn thermostat back. Most thermostats are equipped with Heat Anticipation. Check the AMP DRAW of the oil burner relay (usually marked inside the cover of the relay) and make certain the thermostat Heat Anticipator matches it.

## FURNACE LIMIT AND BLOWER CONTROL

The Furnace is supplied with a limit control. The limit control has a setting which will not permit an air temperature above 200° F.

## TO START UNIT:

1. Set the thermostat to call for heat. The burner should start.

   NOTE: It may be necessary to press the RESET button on the primary combustion control relay.

2. After a short period of time the blower should start.

3. Set the thermostat down to lowest setting. The burner should stop.

4. The air circulation blower remains in operation as long as the temperature in the furnace is higher than the "Fan OFF" setting on the fan control. If the air at the room registers is uncomfortably high upon blower start up, or shut down, set the temperature on the fan control to a lower setting.

5. To check the operation of the limit switch, remove the blower drive belt and set the thermostat to call for heat. After three or four minutes of burner operation, the limit control should turn the burner off. The blower motor will run until the heat exchanger cools down. Replace the belt.

**CAUTION:** DO NOT ATTEMPT TO START THE BURNER WHEN EXCESS OIL HAS ACCUMULATED, WHEN THE FURNACE IS FULL OF VAPOR, OR WHEN THE COMBUSTION CHAMBER IS VERY HOT. NEVER BURN GARBAGE OR PAPER IN THE FURNACE, AND NEVER LEAVE PAPER OR ANY COMBUSTIBLE MATERIAL AROUND THE UNIT.

## TO SHUT DOWN UNIT:

1. Set the thermostat to the lowest possible setting.

2. Set the manual switch (if installed) in the Electrical Power Supply Line to "OFF".

3. If the burner is to shut down for an extended period of time, close the oil valves tightly.

## MAINTENANCE INSTRUCTIONS:

**OIL BURNER:** The oil burner on this furnace must be check, cleaned and serviced at least once a year by a qualified oil heat technician. (See Oil Burner Installation Manual)

**FILTER:** Every two months the filters should be removed and dust shaken from them. The filters should be replaced at least once each year and preferably more often. When installing filters, make certain the arrows on the edge of filter points toward blower. The correct size for replacement filter is plainly marked on edge of filter and in the parts list in this instruction.

**DIRECT DRIVE BLOWER:** Motor is factory oiled. Under normal operating conditions it does not require oiling for at least the first two years after installation. Oil sparingly as required with two drops of SAE 20 motor oil thereafter. Over oiling may cause premature motor failure.

**HEAT EXCHANGER:** The Heat Exchanger and oil burner MUST be cleaned and inspected at least once each year. With a mirror inserted thru the Inspection Door Opening above the Burner, you can determine the amount of soot that has collected on the inside of the cylindrical primary heat exchanger surface. If this requires cleaning you can use two alternatives;

1. Remove the burner and mounting plate. Using a brush on a flexible handle loosen any soot on the inside of the Heat Exchanger. Remove the soot with a vacuum. CAUTION - Use care in cleaning to avoid damage to the Combustion Chamber.

   To clean the wrap around Radiator, remove the heat exchanger cleanout covers. With a long flexible handled brush and vacuum, the soot can be loosened and removed from this area.

2. A second method of cleaning of the Heat Exchanger is by using a reliable soot burning chemical. Be sure to follow the directions, take the necessary precautions to prevent overheating of the Heat Exchanger, Flue Pipe and Chimney.

# TROUBLESHOOTING PROCEDURES

| MALFUNCTION | CAUSE | REMEDY |
|---|---|---|
| Too much smoke | Improper burner air adjustment or insufficient stack pressure. | Adjust burner air shutter (increase air intake) and adjust barometric stack control to give highest $CO_2$ with a clear flame to give Bacharach No. 1 smoke. |
| Using too much oil (Check fuel line for leakage). | Too high stack pressure. Heat being taken up through chimney. Leak in fuel oil lines | Check stack temperature and stack pressure of -0.02 in. w.c. draft (before barometric regulator). Tighten or replace fittings or fuel piping. |
| Unit cutting out necessitates resetting of primary control. | Dirty oil filter. Ignition failure. No flame. Oil pressure too low. | Install new filter. Clean and set electrodes. Check all nozzle. Adjust oil pressure to 100 psi. |
| Unit sputtering at nozzle. | Fuel pump pumping air through leak in line or dirt in line. | Clean fuel line and tighten joints. Purge oil pipe and burner. |
| Unit won't come on. | Faulty thermostat. | Cross thermostat wires to confirm failure. Replace thermostat. |
| Unit cutting out (before thermostat is satisfied). | Blower speed incorrect. | Adjust fan belt to correct tension and/or adjust pulley on motor. Adjust dampers in ducts. Check air temperature rise of 85°F. (MAX.) Check Direct Drive Blower motor speed. |
| 'owing cold air. | Fan control setting (Sometimes due to high duct heat loss). | Remove cover of fan control and set fan "OFF" to higher temperature. Insulate ducts. |
| First gush of air at register too hot. | Improper fan control setting. | Remove cover of fan control and set fan "ON" to a lower temperature. |
| Cutting out. | Motor overheating. | Lubricate blower motor and burner motor. Check current draw. |
| Some rooms too hot (others too cold). | Improper warm air distribution. | Balance warm air distribution to suit user by adjusting dampers in ducts. |
| Thermostat calling for heat, unit will come on when reset actuated on primary control. | Nozzle plugged. No fuel oil. | Replace nozzle and put filter on fuel line. Check fuel oil tank and valves in fuel supply pipes. |

NOTE: IF THE ABOVE STEPS DO NOT REMEDY THE COMPLAINT, CALL YOUR SERVICE PERSON AS LISTED. FOR ADDITIONAL TROUBLESHOOTING POINTERS, REFER TO THE MANUAL ENCLOSED WITH THE BURNER AND PAMPHLETS ENCLOSED WITH THE CONTROLS.

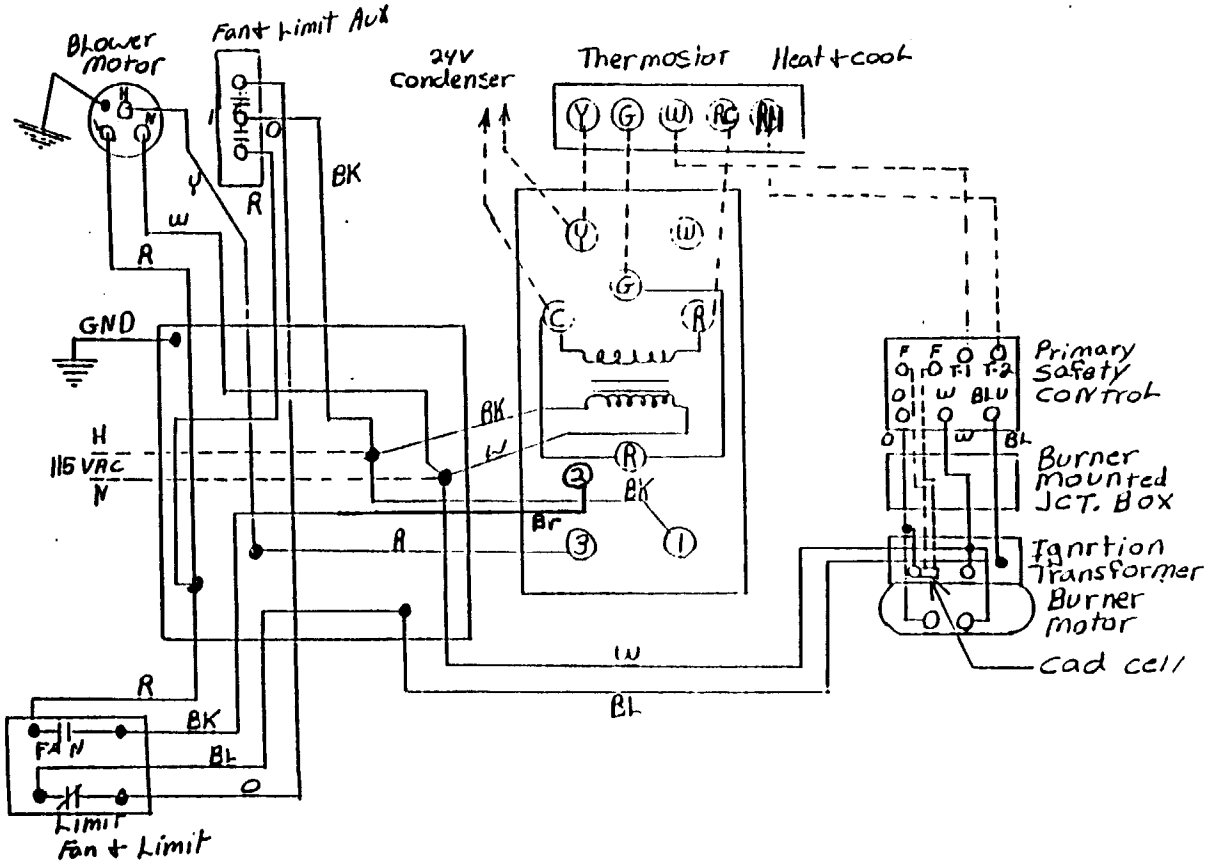
DO NOT TAMPER WITH THE UNIT OR CONTROLS - CALL YOUR SERVICE PERSON.

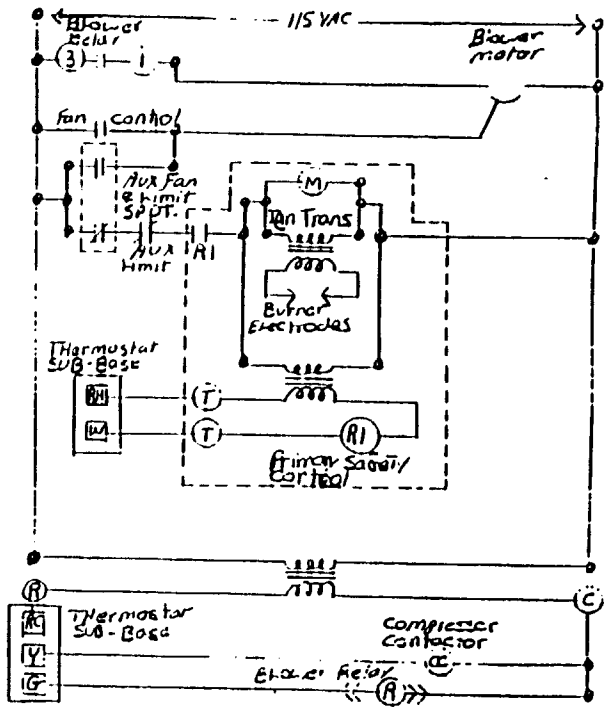
FOR SERVICE CONTACT: NAME _____ TELEPHONE _____ DATE _____

ADDRESS _____

# T165-T169 Series.

## Wiring Diagram Direct Drive Oil.




LADDER

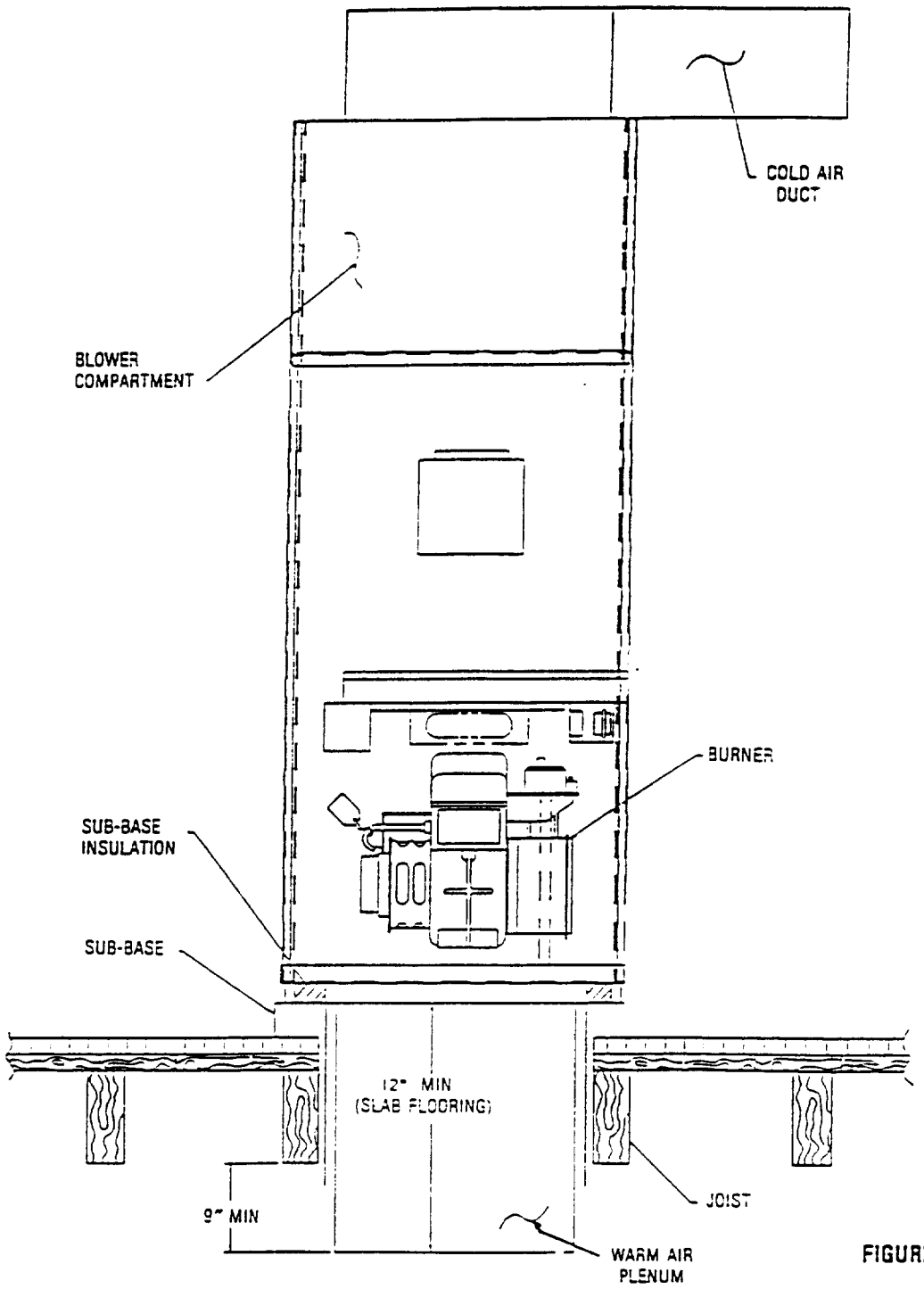



FIGURE 1

| MODEL SIZE (DOWNFLOW) | COLD AIR | WARM AIR | SIZE HOLE IN FLOOR (wood) | SIZE HOLE IN FLOOR (slab) |
|---|---|---|---|---|
| T169-10A | 16-1/4" X 16-1/4" | 16-1/4" X 16-1/4" | 20-1/4" X 20-1/4" | 16-1/4" X 16-1/4" |