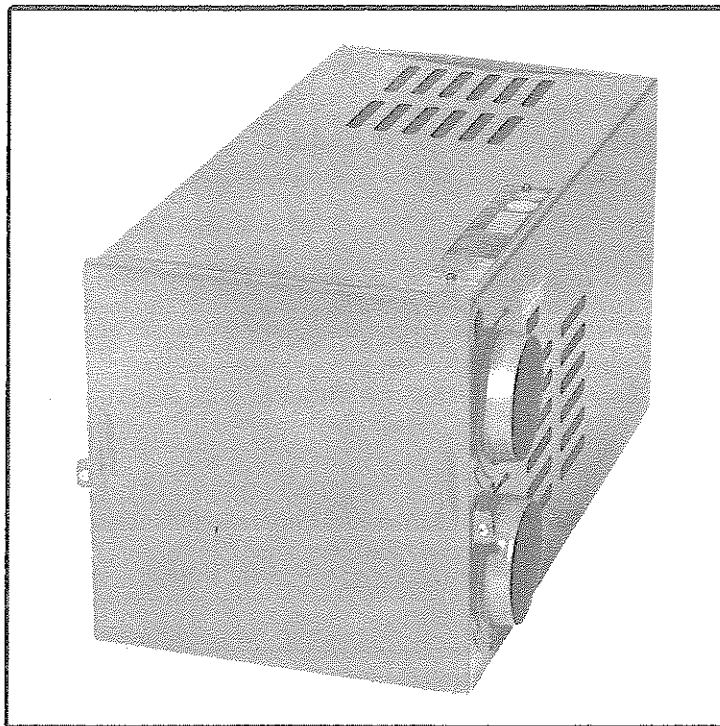




DYNATRAIL

INSTALLATION, OPERATING, AND SERVICE INSTRUCTIONS



FOR MODELS
NT-24M / NT-24MD
NT-30M / NT-30MD
NT-34MM / NT-34MMD

SUBURBAN DYNATRAIL GAS FURNACES

FOR YOUR SAFETY

If you smell gas:

- 1-Open all windows.
- 2-Don't touch any electrical switches.
- 3-Extinguish open flames.
- 4-Immediately call your gas supplier.

FOR YOUR SAFETY

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

This book contains instructions for installation and operation of your furnace. Keep with unit at all times.

Should you require further information, contact your dealer or nearest Suburban Service Center.

Foreword

You have just purchased a Suburban DYNATRIL furnace. Properly installed, your furnace should give satisfactory, dependable service and economical operation. To simplify the proper installation, it requires that you read carefully these step-by-step instructions.

Read This Entire Book

The design of this unit has been certified by the American Gas Association and the Canadian Gas Association. In order for this furnace to operate in conformity with generally accepted safety regulations, the installation and operating instructions outlined in this book *must be followed*. Failure to comply with the installation and operating instructions will void any responsibility of Suburban Manufacturing Company.

Your furnace was inspected before it left the factory. If any parts are found to be damaged, *do not install the furnace*. Immediately contact the transportation company and file a claim.

Keep this book in a safe place, because it is an important collection of facts and figures. This book is intended to be a permanent part of your furnace installation and should be preserved in a convenient location for ready reference.



Important!

Read the following before installing furnace.

- 1-**Do not** install furnace unless the tube on the vent cap overlaps the exhaust tube on furnace at least $\frac{1}{2}$ ".
- 2-**Do not** install vent cap upside down. The words *SUBURBAN* and *DAYTON, TENN.* must be installed right side up.
- 3-**Do not** omit or substitute the special 3" screw on exterior vent cap. This anchors the furnace to the vent cap and outer skin of the coach. (*See Figure 1.*)
- 4-**Do not** install the manual shutoff valve with flare at top position.
- 5-**Do not** use any compound on threaded joints that is not resistant to liquefied petroleum gas.
- 6-**Do not** make any pipe connection without afterwards checking for leakage. (*Use soap and water solution.*)
- 7-**Do not** use open flame to check for leaks.
- 8-**Do not** attempt to alter the furnace for a positive ground system.
- 9-**Do not** install the furnace with floor coverings under the cabinet.
- 10-**Do not** connect the furnace direct to 110 volts A.C.
- 11-**Do not** use unauthorized gauge wire. 14 gauge wire is required.
- 12-**Do not** replace any wiring on the furnace with anything less than type 105C wire or its equivalent.
- 13-**Do not** install furnace without adequate return air (55 square inches minimum).
- 14-**Do not** install furnace unless in compliance with local codes. (*See Installation Instructions.*)
- 15-**Do not** install unless clearances from combustible materials are adhered to.
- 16-**Do not** attempt to ignite a direct ignition furnace with a match, a butane torch, or flint type ignitors. (*Follow Lighting Instructions.*)
- 17-**Do not** operate the furnace with the electrode wire or the electrode assembly disconnected.
- 18-**Do not** operate the furnace through a battery charger.
- 19-**Do not** use a screwdriver or metal object on any portion of the electrode assembly while furnace is in operation.
- 20-**Do not** operate the furnace if the spark from the electrode is jumping to the flame sensor portion of the electrode assembly. (*See Figure 8 for proper gapping of the electrode assembly.*)
- 21-**Do not** install this furnace unless adequate ventilating air is provided.
- 22-**Do not** attempt field repairs, to the module board.
- 23-**Do not** make design changes or modify the operation of the furnace in *any* way.
- 24-**Do not** convert furnace to natural gas.
- 25-**Do not** install furnace where it cannot be easily removed for service.
- 26-**Do not** attempt repairs yourself. All repairs should be made by a qualified service agency.

Thank you for reading this far - please read entire manual before installing furnace.

Introduction

The furnace in your recreational vehicle is a *direct vent system furnace*, design certified by the American Gas Association and the Canadian Gas Association for safety and performance. Your furnace is one of the following models:

NT-24M - 12 Volts D.C., 24,000 BTU/HR Input

NT-24MD - 12 Volts D.C., or 115 Volts A.C.,
24,000 BTU/HR Input

NT-30M - 12 Volts D.C., 30,000 BTU/HR Input

NT-30MD - 12 Volts D.C., or 115 Volts A.C.,
30,000 BTU/HR Input

NT-34MM - 12 Volts D.C., 34,000 BTU/HR Input

NT-34MMD - 12 Volts D.C., or 115 Volts A.C.,
34,000 BTU/HR Input

These furnaces utilize a direct vent system with a patented dual blower, one of which circulates room air while the other furnishes outside air for combustion. The combustion air blower then forces the flue products to the outside atmosphere for maximum safety and heating efficiency.

Installation Instructions

WARNING! These furnaces are not designed nor are they to be used in conjunction with cooling units. To do so will damage furnace and will void the warranty.

These furnaces are design certified for liquefied petroleum (LP) gas only. Do not attempt to convert to natural gas.

These furnaces are designed to operate at the following gas inlet supply pressure: *minimum* - 11" W.C.*; *maximum* - 13" W.C.* (W.C.* - water column).

In the U.S.A., the installation of the furnace must be in accordance with local codes and regulations. In the absence of local codes and regulations, refer to:

1-American National Standard for Recreational Vehicles A119.2 - 1975 (NFPA No. 501C).

2-National Fuel Gas Code ANSI Z223.1 - 1974 and Addenda Z223.1a - 1978.

3-Furnace must be electrically grounded in accordance with the National Electrical Code ANSI/NFPA No. 70 - 1981.

This unit is equipped with an electric igniter device that has an energy consumption of .1 amp @ 12 volts D.C.

In Canada, the furnace must be installed in accordance with:

1-Standard CSA Z240-4 - Gas Equipped Recreational Vehicles and Mobile Housing.

2-CSA Standard Z240.6.1 and Z240.6.2 - Electrical Requirements for Recreational Vehicles.

3-Any applicable local codes and regulations.

There are three methods described below for installing the furnace. Regardless of the method you choose, we require that a permanent opening be provided in the interior cabinetry of the coach directly in front of the furnace. The opening must allow for free, unobstructed removal of the furnace. This opening is also used as a means of providing circulating return air to the furnace. It must contain a louvered grille totaling 55 square inches free area. It is important that adequate return air be provided to assure normal heating and operation of the furnace. Failure to provide the minimum return air opening as well as an adequate opening for furnace removal, voids the warranty.

WARNING! Combustion air must not be drawn from the living area of the recreational vehicle. It is also important that the circulating air openings not be blocked in order to assure adequate heating and safe operation.

A. INSTALLATION DIRECTLY AGAINST OUTER SKIN OF COACH

(See Figure 1)

WARNING! Maximum wall thickness for this type installation is 3".

- 1-Locate the furnace near lengthwise center of the coach.
- 2-Choose a location for installation out of the way of wires, pipes, etc. which might interfere with the installation. Adhere to the minimum clearances from the cabinet to combustible construction as listed in Table I.

NOTE: Side and top clearances may be 0" for through the wall installations up to a maximum wall thickness of 3". (See Figure 1.)

3-Carpet and floor coverings must be removed from under the furnace when the installation is such that the weight of the furnace rests on the floor covering. If the furnace is allowed to rest on the floor covering, it may settle into the material, thus reducing our clearances under the furnace. It will not be necessary to remove the floor covering if the furnace is not mounted directly on the material.

4-Cut an opening through the inner wall 12 7/16" x 13". This will allow the rear of the furnace to be installed against the outer skin of the coach. (See Figure 1.)

5-Cut two 2 1/4" diameter holes through the outer skin of the coach as shown in Figure 1.

6-Put furnace in place, making sure that rear of furnace cabinet is firmly against outer skin of coach.

7-Fasten furnace to floor of coach using the two holes provided in the front plenum area of furnace cabinet. (See Figure 1.)

8-Install vent assembly. (See instructions for installing vent.)

B. INSTALLATION DIRECTLY AGAINST INNER WALL OF COACH

(See Figure 2)

WARNING! Maximum wall thickness for this type installation is 2 1/4".

- 1-Locate the furnace near lengthwise center of the coach.
- 2-Choose a location for installation out of the way of wires, pipes, etc. which might interfere with the installation.

Adhere to the minimum clearances from the cabinet to combustible construction as listed in Table I.

3-Carpet and floor coverings must be removed from under the furnace when the installation is such that the weight of the furnace rests on the floor covering. If the furnace is allowed to rest on the floor covering, it may settle into the material, thus reducing our clearances under the furnace. It will not be necessary to remove the floor covering if the furnace is not mounted directly on the material.

4-Locate center lines for exhaust and intake tubes as shown in Figure 1. Cut two 2 $\frac{3}{8}$ " diameter holes through coach wall for exhaust and intake. (See Figure 2.)

5-Put furnace in place, making sure that rear of furnace cabinet is firmly against inner wall of coach.

6-Fasten furnace to floor of coach using the two holes provided in front plenum area of furnace cabinet. (See Figure 1.)

7-Install vent assembly. (See instructions for installing vent.)

C. INSTALLATION USING VENT EXTENSION TUBES

(See Figure 4)

When it is not possible to install the furnace as described in installations A or B, extension tubes must be used to connect the exhaust and intake tube to the vent assembly on the outside of the coach.

Avoid the use of extension tubes whenever possible. If they must be used, installation must be as follows:

1-Locate center lines for exhaust and intake tubes as shown in Figure 1.

2-Cut two 2 $\frac{3}{8}$ " diameter holes through coach wall for exhaust and intake. (See Figure 4.)

3-Carpet and floor coverings must be removed from under the furnace when the installation is such that the weight of the furnace rests on the floor covering. If the furnace is allowed to rest on the floor covering, it may settle into the material, thus reducing our clearances under the furnace. It will not be necessary to remove the floor covering if the furnace is not mounted directly on the material.

4-Determine what length extension tube is required for the exhaust and intake tube by positioning the furnace in its permanent location and measure the distance from the end of the exhaust and intake tube to the outer edge of the coach skin. Add $\frac{1}{2}$ " to the measured distance. This gives the minimum length extension tubes you must order. Only Suburban extension tubes are to be used.

WARNING! Under no circumstances are the extension tubes, as supplied by Suburban, to be cut, altered, or modified in any way. To do so could be dangerous and will void the responsibility of Suburban Manufacturing Company.

5-Attach extension tubes to furnace as shown in Figure 4. Secure each extension tube to the exhaust and intake tube on the furnace, as shown.

6-Put furnace in place, making sure that the extension tubes terminate flush with outer skin (or no less than $\frac{1}{8}$ " from outer skin) of coach, and fit tightly on the furnace exhaust and intake tubes.

7-Fasten furnace to floor of coach using the two holes provided in the front plenum area of the furnace cabinet. (See Figure 1.)

8-Install vent assembly. (See instructions for installing vent.)

Model	Front	Left Side	*Right Side	Top	Bottom	Back	Exhaust and Intake Tube
NT-24M	0"	1"	1"	0"	0"	0"	$\frac{3}{8}$ "
NT-24MD	0"	1"	6"	0"	0"	0"	$\frac{3}{8}$ "
NT-30M	0"	1"	1"	0"	0"	0"	$\frac{3}{8}$ "
NT-30MD	0"	1"	6"	0"	0"	0"	$\frac{3}{8}$ "
NT-34MM	0"	2"	2"	0"	0"	0"	$\frac{3}{8}$ "
NT-34MMD	0"	2"	6"	0"	0"	0"	$\frac{3}{8}$ "

— NOTE —

0" MEANS TO SPACER BUMPS

CLEARANCE FROM DUCTS TO

COMBUSTIBLE MATERIAL - 1" (See Figure 3)

6" RIGHT SIDE CLEARANCE IS TO ACCOMODATE THE
OPTIONAL NDP-2-4 POWER PACK (See Figure 3)

TABLE I

INSTALLING VENT ASSEMBLY

- 1-Caulk around vent assembly as shown in Figure 2.
- 2-Insert vent assembly over exhaust and intake tube. *Both tubes must be inserted from the outside of the coach. Minimum tube overlap of 1/2" is required.*
- 3-Attach vent assembly to outer skin of coach with the four (4) screws provided.

WARNING! Do not install vent assembly upside down. The words *Suburban* and *Dayton, Tenn.* must be right side up.

- 4-Attach vent assembly to furnace with special 3" screw provided. Insert screw through hole provided in exhaust opening of vent assembly and secure to bracket in exhaust tube of furnace. This anchors the furnace to the vent assembly and the outer skin of the coach. (See Figure 2.)

WARNING! Combustion air must not be drawn from the living area; therefore, one must insure that the vent cap and tube assemblies have been properly installed, allowing a minimum of 1/2" overlap of tubes, to guarantee that adequate combustion air will be supplied from the outside atmosphere.

CONNECTING GAS SUPPLY

Connect the gas supply to the furnace at the manifold, following the suggestions outlined below.

WARNING! The compound used on threaded joints must be resistant to liquefied petroleum (LP) gas.

- 1-Be sure that the manual shut-off valve is outside of the furnace jacket and easily accessible. (See Figure 1.)
- 2-A drip leg should be installed upstream of the manual shut-off valve exterior to unit casing.
- 3-In order to maintain a check on gas supply pressure to the furnace, Suburban advises the installer to provide a 1/8" NPT plug tap for test gauge connection immediately upstream of the gas supply connection to the furnace.
- 4-After the furnace has been connected to the gas supply, all joints must be checked for leaks.

WARNING! Never check for leaks with an open flame. Turn on the gas and apply soapy water to all joints to see if bubbles are formed.

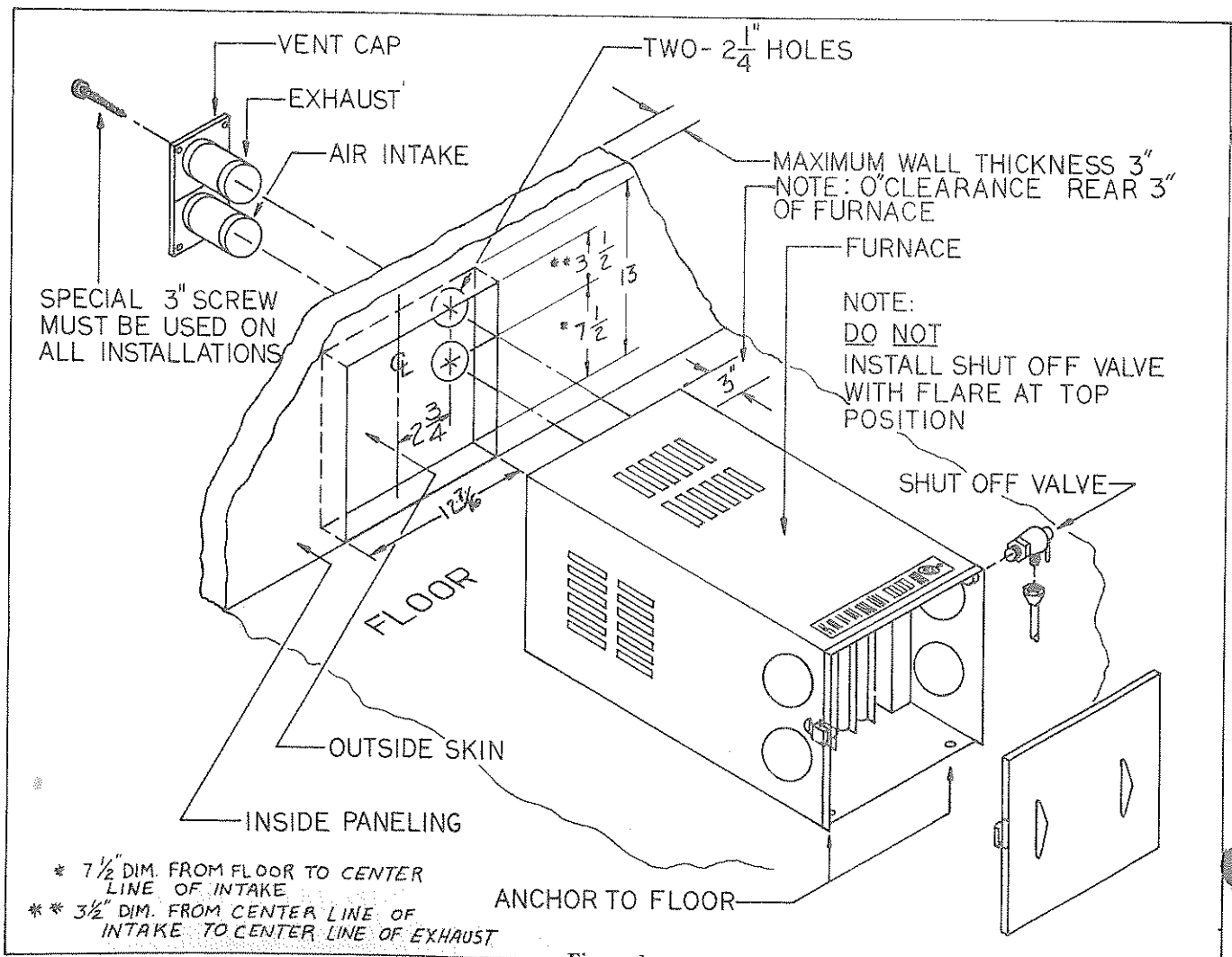


Figure 1

CONNECTING ELECTRICAL SUPPLY

The power supply to the furnace must be from a 12 volt battery. Do not connect the furnace directly to a convertor. Tests have shown that connection directly to a convertor can result in damage to the ignition module. Any convertor system used for supplying power to the furnace must be wired in series with the battery. This will serve two purposes:

- 1-Provide a constant voltage supply to the furnace.
- 2-Filter any A.C. spikes or volt surges.

Connection of the electrical supply is to be made as follows: Connect the 12 volt D.C. power supply (from battery) to the quick connect pigtail on the right side of the furnace. The wires are color coded, red for positive (+) and yellow for negative (-). This polarity must be observed so the furnace motor will run with the proper direction of rotation to insure correct air delivery. (See wiring diagram.)

WARNING! This furnace is designed for negative ground 12 volt D.C. system only. Do not attempt to alter the furnace for a positive ground system or connect the furnace directly to 115 volts A.C. Damage to furnace component parts will occur.

Be sure all wiring to the furnace is of heavy enough gauge to keep the voltage drop through it to a minimum. No. 14 gauge wire is recommended. If any of the original wire that is supplied with the appliance must be replaced, it must be replaced with type 105°C or its equivalent.

NOTE: This furnace is not furnished with a built-in 115 volt A.C. power supply. If Suburban's power pack, Model NDP-2-4, is used, it must be secured to the furnace cabinet as shown in Figure 3. Connect the black and white wires of the power pack to 115 volts A.C. The wires are color coded for polarity (see wiring diagram). The power pack is equipped with an internal relay which automatically switches the furnace power supply source from D.C. to A.C. when the A.C.

power is connected to the coach. The relay automatically switches back to D.C. when the A.C. power is disconnected.

WARNING! Under no circumstances should any other appliance or switching be connected to this power pack (to do so could result in the problem mentioned in the opening paragraph above).

CONNECTING DUCTS TO FURNACE

The following duct requirements must be followed in order to assure proper operation of the furnace.

a-For Models NT-24M, NT-24MD, NT-30M, and NT-30MD, maintain a minimum of 36 square inches duct area from the furnace cabinet to register. (Minimum 3 ducts - 4" diameter.)

For Models NT-34MM and NT-34MMD, maintain a minimum of 48 square inches duct area. (Minimum 4 ducts - 4" diameter.)

On all models maintain a minimum of 48 square inches when under floor ducting is used.

b-Make the duct connections at the furnace cabinet tight. Loose connections will result in overheating of the component parts on the furnace and a reduction of the heated air flow through the duct system.

c-Avoid making any sharp turns in the duct system. Sharp turns will increase the static pressure in the plenum area and could cause the furnace to cycle.

d-Avoid making a lot of turns in the duct system. The straighter the duct system, the better the performance of the furnace.

e-Maintain a minimum of 1" clearance where ducts pass through cabinets.

NOTE: After installation of the furnace and duct system is completed, adjustments must be made to obtain a temperature rise within the range specified on the Rating Plate.

General Notes and Warnings

A-Locate the room thermostat approximately 4½" feet above the floor on an inside bulkhead where it is not affected by heat from any source except room air. Connect thermostat wires to the blue wires leaving power supply plug on right side of furnace. (See wiring diagram.)

B-The efficiency rating of the furnace is a product thermal efficiency rating determined under continuous operating conditions independent of any installed system.

C-To put the furnace in operation, follow the lighting instructions on it. (See Lighting Instructions.)

!!! WARNING !!!

Young children should be carefully supervised when they are in the same room as the appliance.

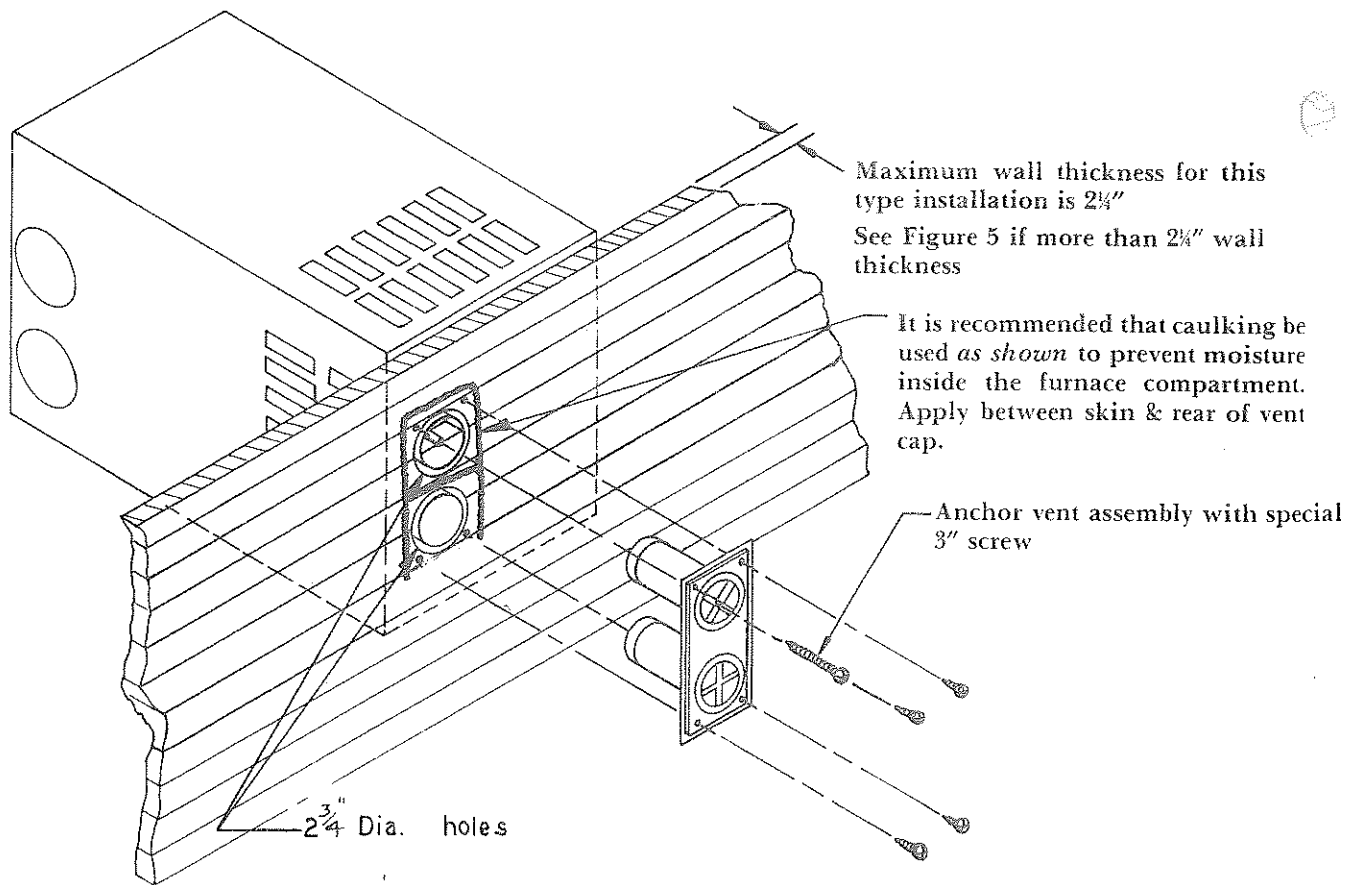
Clothing or other flammable material should not be placed on or near the appliance.

Any safety screen or guard removed for servicing an appliance must be replaced prior to operating the appliance.

Children and adults should be alerted to the hazards of high surface temperatures and should stay away to avoid burns or clothing ignition.

Due to high temperatures, the appliance should be located out of traffic and away from furniture and draperies.

Installation and repair should be done by a qualified service person. The appliance should be inspected before use and at least annually by a professional service person. More frequent cleaning may be required due to excessive lint from carpeting, bedding, etc. It is imperative that control compartments, burners, and circulating air passageways of the appliance be kept clean.

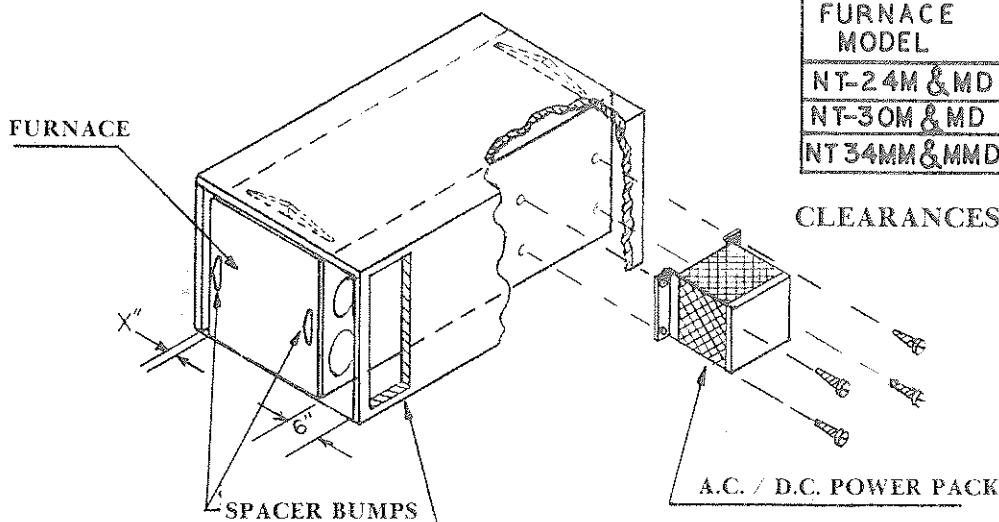


NOTE: Be sure special 3" screw engages exhaust tube and is pulled secure. A minimum of 1/2" overlap of tubes is required on all installations.

NOTE: Both vent tubes must be installed from the outside.

Figure 2

INSTALLATION - A.C. / D.C. POWER PACK

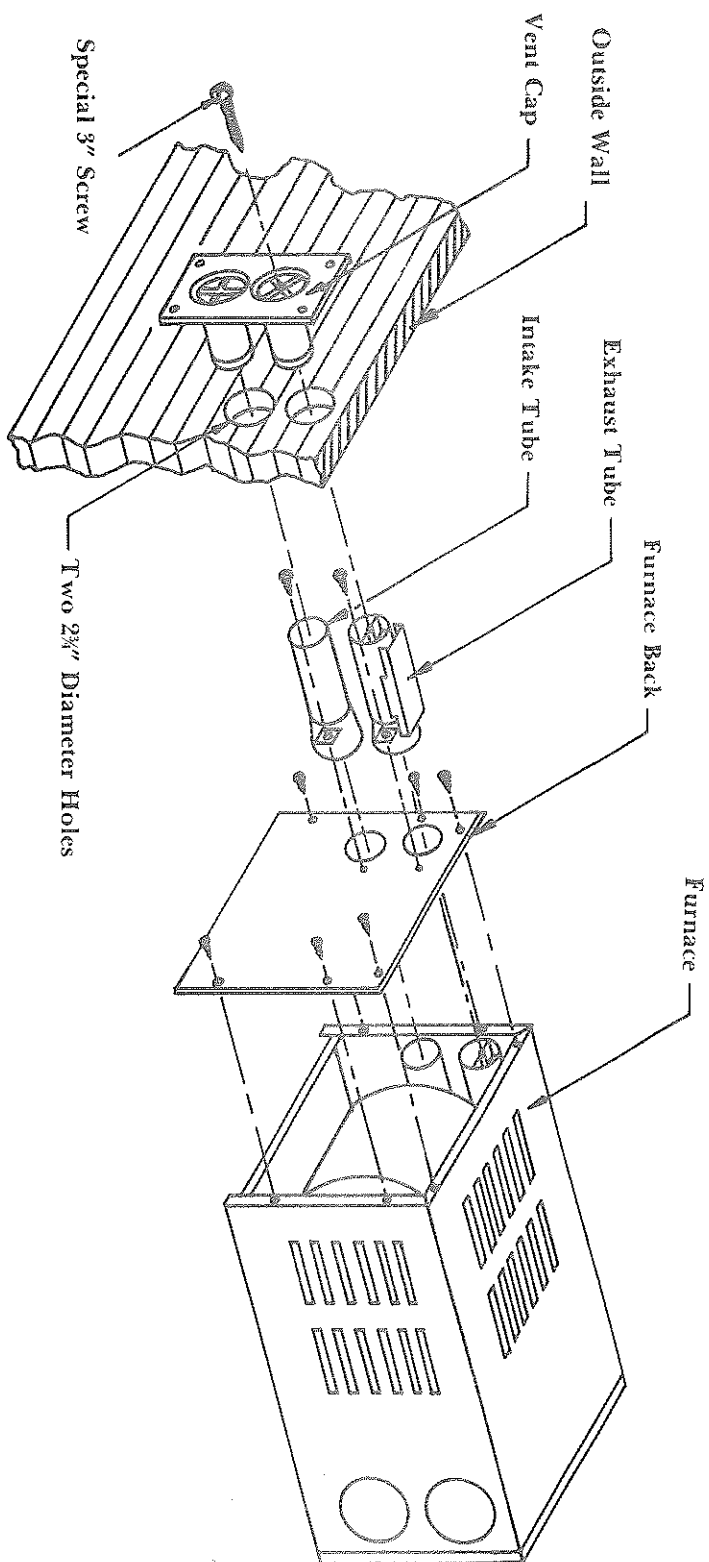


FURNACE MODEL	X" DIMENSION
NT-24M & MD	1"
NT-30M & MD	1"
NT 34MM & MMD	2"

CLEARANCES - SEE TABLE I

MAINTAIN 1" CLEARANCE WHERE DUCTS PASS THROUGH CABINET WALL

Figure 3



EXTENSION TUBE INSTALLATION

- A-Remove furnace from carton and install furnace back with seven screws provided.
- B-Insert exhaust tube and intake tube through furnace back and engage exhaust and intake tube on furnace.
- C-Secure tubes to furnace back through lug on side of tubes.
- D-Put furnace in place, making sure that tubes terminate with outside surface of wall.
- E-Fasten furnace to floor of coach using two holes provided in front plenum area of furnace cabinet. (See Figure 1.)
- F-Install vent cap as shown in Figure 2.
- G-Maintain $\frac{3}{8}$ " clearance around exhaust tube and air intake tube to any combustible.
- H-Maximum extension tube length - 9'.

Figure 4

Operating Instructions

LIGHTING INSTRUCTIONS

- 1-To light the furnace, turn the manual valve to the *Off* position and wait 5 minutes with blower running. (*Set thermostat above actual temperature to operate blower.*)
- 2-After 5 minutes, set the thermostat to the *Off* position.
- 3-Open manual valve. (*Correct operating characteristics depend on this valve being positioned fully open. Never attempt to operate with valve partially closed.*)
- 4-Set thermostat on desired temperature.
- 5-Allow 30 seconds for main burner to light.
- 6-If burner does not light, set thermostat on *Off* and repeat Steps 1 through 5.
- 7-After 3 attempts with no ignition, go to shutdown and determine cause. *NOTE: Do not continue to cycle furnace through thermostat in an attempt to get ignition.*

TO SHUT DOWN

- 1-Turn manual valve to the *Off* position.
- 2-Set thermostat on *Off*.

BURNER ADJUSTMENT

(See Figure 5)

To adjust the primary air to the main burner, the front of the furnace cabinet must be removed. Next, remove the small sheet metal cover found just below and to the right of the electrode. Behind the cover is a slotted screwhead. With a screwdriver, turn screwhead counterclockwise for less primary air and clockwise for more primary air. A symptom of too much primary air will be a howling or screeching noise when the burner is on (reduce air to correct). A symptom of too little air will be sooting on the electrode or exterior vent and a distinct yellow and floating flame (increase air to correct). A hard blue flame is the sign of correct adjustment.

WARNING! If a sooting condition cannot be corrected by the air adjustment on the burner, discontinue use of furnace until problem can be corrected by a qualified service agency. Cleaning of burner is usually required.

SEQUENCE OF NORMAL OPERATION

- 1-When the thermostat calls for heat, the blower motor is energized immediately.
- 2-As the blower motor reaches approximately 75% of the normal r.p.m. (within 3 to 5 seconds), the microswitch, in response to the air flow, will engage, allowing current flow to the module board.
- 3-After a 12 - 18 second delay, current will pass through the board to the solenoid valve.
- 4-The current to the valve opens it and allows gas to the main burner. The spark at the electrode then ignites the main burner.
- 5-After main burner ignition (usually within 18 - 25 seconds), the flame detector will sense the presence of main burner flame and de-energize the lockout feature within the board. After the 12 - 18 second delay, if the main burner does not ignite or the flame detector does not de-energize the lockout feature within 7 seconds, the unit will go into lockout. At this time, it will be necessary to set the thermostat on *Off* and repeat Steps 1 through 6 of the *Lighting Instructions*.

6-After 3 attempts with no ignition, or main burner continues to go off within 30 seconds, go to shutdown and determine cause.

7-If the thermostat is turned back within a period of approximately 2 minutes after the main burner is lit, both the blower motor and solenoid valve are de-energized. However, if the furnace continues to run longer than 2 minutes, which it normally should, a slight snap can be heard from within the casing. The snap is caused by the fan switch as it changes its position. After this occurs, if the thermostat is satisfied or turned back, the solenoid valve will close, the flame on the main burner will go out, but the blower will continue to run for a short period of time and will then shut off. The purpose of this is to remove most of the remaining gases from the heat exchanger. Be assured that this period of blower override is a part of the unit's normal operation.

FAN SWITCH

The purpose of the fan switch is to control the sequence of the blower operation. The fan switch is a two pole switch. When the bimetal disc of the fan switch is heated to the operating temperature, the switch closes. This completes a circuit through the motor from a direct source. The blower will continue to run as long as the chamber is hot even though the thermostat is satisfied and the main burner is off. When the chamber cools, the fan switch changes back to its original position and shuts the blower off. If blower and burner shut off simultaneously after thermostat is satisfied, then the fan switch failed to change over. This is a symptom of a faulty switch - replace it.

LIMIT SWITCH

The purpose of the limit switch is to turn off the gas to the main burner if, for any reason, the furnace becomes hotter than that which is safe. Improper operation of the furnace due to the limit control does not always indicate a defective control. If the circulating air is blocked or only partially so, the limit control will function and cause the main burner to cycle. Cycling on the limit is not always undesirable - if it happens only occasionally. This is a good indication of safe operation and will most likely happen on a warm day. If cycling happens too often or for an extended period, the circulating air system should be thoroughly cleaned.

If, for any reason, the limit control is found to be defective, there is no recommended method of repairing it. Because of its importance for safety reasons, it should be replaced with a new one.

WARNING! Never shunt the limit control even for only temporary operation.

MICROSWITCH

The microswitch has two purposes:

- 1-It is an *air prover*. It operates in response to the flow of air generated by the blower. Hence, if for any reason the air from the blower is not sufficient, the switch will not operate. This may be caused by a slow motor due to low voltage, restricted return air, inadequate duct discharge area, or lint accumulation on the blower wheel.
- 2-The switch allows time for the blower to pull in a sufficient amount of air to support combustion before it engages. Once it engages, the circuit is completed through the limit switch and module board to the gas valve. The valve opens, gas flows

to the burner, and ignition occurs.

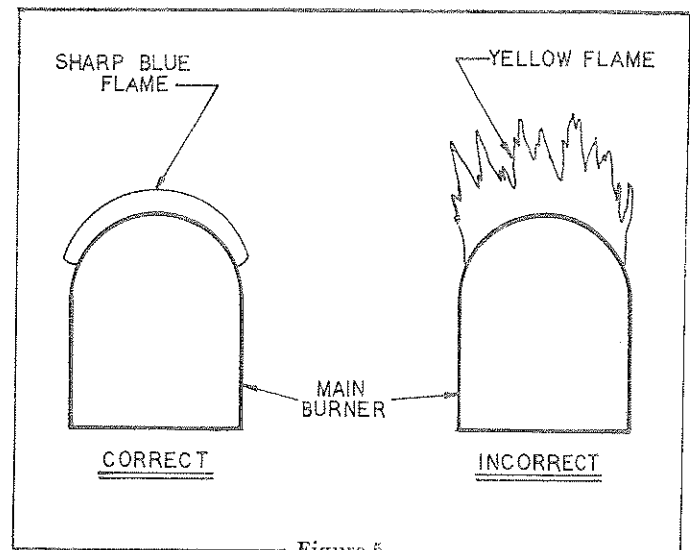
BLOWER ASSEMBLY

Although one motor drives all wheels, the blowers are separate. The combustion - air blower is sealed so as to allow no passage of air between it and the circulating room - air blower. The combustion - air blower draws air from the outside atmosphere, discharges it into the combustion chamber, and forces the combustion products out the exhaust tube. The circulating room - air blower pulls return air in and forces it across the heat chamber, discharging into the area to be heated.

AUTOMATIC SOLID STATE RECTIFIER SYSTEM ON DUAL VOLTAGE MODELS

Two diodes are mounted on a larger heat sink and combine with the transformer to create a full-wave rectifier which converts 115 volt A.C. to 12 volt D.C.

A single-pole, double-throw relay switches the unit from A.C. to D.C. / D.C. to A.C. automatically. (See wiring diagram, Figure 7.)



Maintenance and Cleaning

Your furnace should be inspected before use at least annually by a professional service person. A careful inspection of all gaskets should be made and if any gaskets show signs of leakage or deterioration, they should be replaced.

It is imperative that the control compartment, burner, and circulating air passageways of the furnace be kept clean. More frequent cleaning may be required due to excessive lint from carpeting, bedding material, etc.

Periodic examination of the venting system should be maintained. It is important that the flow of combustion air entering from the rear of the furnace not be obstructed.

Periodic visual checks of the burner in operation should be made. If the primary air should need adjustment, follow the procedure outlined under *Burner Adjustment*.

Cleaning of the chamber and main burner will be required if the furnace has been allowed to operate with a high yellow flame. The yellow flame is due to incomplete combustion (lack of air) and will deposit a soot formation inside the

chamber and on the main burner.

The furnace is equipped with an oiled, sealed motor and requires no oiling.

NOTE: To service the furnace, the combustion chamber assembly must be removed from the furnace cabinet. (See instructions for removing chamber.)

TO REMOVE CHAMBER (All Models)

- 1-Shut off gas at gas bottle.
- 2-Disconnect power supply (quick disconnect plug, right side of cabinet).
- 3-Disconnect gas line from manual shutoff valve.
- 4-Remove shutoff valve from side of furnace.
- 5-Remove shipping screw securing chamber shield to cabinet (lower right corner).
- 6-Remove the vent cap screws (outside) to free exhaust tube.
- 7-Pull chamber forward and out of cabinet.
- 8-To reinstall - reverse above procedure.

Service Hints, Diagnosis and Corrective Measures

NOTE: To service, furnace must be removed from cabinet.

A. COMPLAINT - NO HEAT

1-Thermostat off - Check to be sure thermostat is calling for heat. Wire to thermostat could be off terminal.

2-Gas supply - Be sure manual gas valve is in the open position (level parallel to gas line).

3-Electrical connections and power - Battery must be charged. If battery is low, there will be sufficient power to run the blower, but not enough to run the blower at full speed. If blower doesn't run at its prescribed speed, the microswitch will not engage and gas will not flow to the main burner, nor will the spark begin. Be sure the connection of the voltage lines in the terminals are tight.

4-Malfunctioning microswitch - Be sure the microswitch is sailing in far enough to open the solenoid valve and to energize the spark module board. If the switch is not sailing

in, clean any dust or dirt from the actuator pin. Other reasons for switch not sailing in are:

- a. Insufficient blower speed (slow motor due to low charged battery, faulty motor, lint and dust accumulation on the blower wheels, or restriction of return air to furnace). Check wiring in accordance with unit's wiring diagram to assure the proper polarity of the 12 volt D.C. power supply is observed. This polarity must be observed so the motor will run in the proper direction of rotation to insure correct air delivery.
- b. Replace switch if voltage is not present across red and yellow wires at module board when switch is manually engaged. *NOTE: Contacts in limit switch must be closed.*
- c. Inadequate return air or duct discharge area - (See connecting ducts to furnace).

NOTE: To service switch, furnace must be removed from the furnace cabinet.

5-Gas valve - Within 30 seconds after motor reaches 75% of its r.p.m. and microswitch engages, check the following:

- a. Voltage at valve - If voltage is present, but valve is not opening, check wire connections in valve circuit.
- b. Wire connections OK - Replace valve.
- c. No voltage at valve - Check circuit completion through microswitch, limit switch, and module board.

6-Blower not operating - Possible causes:

- a. Check power supply to furnace.
- b. Check electrical connections at furnace.
- c. With thermostat points closed, check for circuit completion across terminals 2 and 4 of thermostat relay. If there is continuity across terminals 2 and 4 and wiring to motor OK - Replace motor.
- d. No circuit across terminals 2 and 4 and wiring to relay OK - Replace relay.

7-Short cycling (fan switch) - After the furnace has run at least five minutes, if burner and fan shut off simultaneously when the thermostat is satisfied, it indicates a defective fan switch - Replace switch.

8-Defective relay - Relay may be faulty if motor fails to start when thermostat calls for heat. This will be evidenced by a click when the thermostat is raised and motor fails to operate.

9-Ignition failures - Cautions:

- a. Never operate the furnace with the electrode wire disconnected nor with the electrode assembly removed from the furnace.
- b. Never use a battery charger to check out an electronic ignition furnace - use a 12 volt battery.
- c. Never use a screwdriver on any part of the electrode assembly while furnace is in operation.
- d. Be certain that the spark from the electrode never reaches the flame sensor portion of the electrode assembly.
- e. Be sure the electrode assembly screws and electrode ground wire screws are snug at all times, especially after the electrode has been removed and reinstalled.
- f. If the module board is found to be defective, it must be replaced - *it is not field repairable*. Any attempts to repair the board may alter the board and cause it to operate in an unsatisfactory manner.
- g. Insure that the gap between electrode and ground is always $\frac{1}{8}$ ". The gap between the ground and the flame sensor should be approximately twice the gap between electrode and ground to insure no sparking to sensor. Sparking to sensor will damage module board. (See Figure 8.)

The electronic ignition system is made up of three main parts: the module board, the electrode assembly, and the electrode wire. The module board is the brain of the electronic ignition system and it has several functions:

1-When the blower reaches approximately 75% of the normal r.p.m., and sufficient air flow is established, the microswitch engages and completes a 12 volt circuit through the limit switch to the module board.

2-After a 12 - 18 second delay, 12 volt current will pass through the module board to the solenoid valve. The current to the valve opens it and allows gas to the main burner; simultaneously, the module board sends high voltage through the electrode wire to the electrode assembly. The voltage seeks a ground between electrode and ground probe and a spark occurs. The spark ignites the main burner.

3-The module board also performs the lockout function in cases where the spark fails to light the burner. When lockout occurs, the spark stops, the voltage from the module board to the gas valve is discontinued, and the valve closes. The unit will remain in lockout and the blower will continue to run until the thermostat is turned off. Turning the thermostat off disengages the lockout function of the module board and after the blower has stopped, the ignition sequence can be started again.

It is important to determine the type problem being experienced and then the proper checkout procedure can be made. The following is a list of problems, how to identify in which area the problem is located, and how to correct it:

1-Electrode not sparking - with blower running and microswitch engaged, check the following:

- a. Check for proper voltage at module board, across red and yellow wires, after the blower motor reaches full r.p.m. - If no voltage, check continuity through microswitch and limit switch. Also, check wire connections.
- b. Voltage is present, but no spark at electrode after 12 - 18 second delay - Check electrode wire connections.
- c. Wire connections OK, but electrode wire does not show continuity through it - Replace electrode wire.
- d. Electrode wire does show continuity through it - Check electrode gap. (See Figure 8.)
- e. Electrode gap OK - Check electrode assembly for possible cracks or carbon on tip of electrode.
- f. Check green ground wire at electrode assembly to be sure it is securely attached to the electrode mounting screw and the burner mounting screw.
- g. Ground OK - Replace module board.

2-Electrode sparking but gas not coming through burner:

- a. Check to see if voltage is coming out of module board to gas valve after 12 - 18 second delay. Check the wires in the molex connector to be sure they are intact and making contact with the module board. Check the brown wire from the module board to valve for continuity. Wire and connections check OK - Replace module board.
- b. Voltage present at valve, but gas valve not opening - Replace gas valve.

3-Electrode sparking and gas valve opening but burner will not light:

- a. Check to see if gas is coming through burner. If no gas is coming through the burner, check for obstruction in gas line, in main burner orifice, or in main burner.
- b. Gas is coming through burner, but spark will still not ignite burner - Check gas pressure.

	Minimum	Maximum
Line Pressure	11" W.C.*	14" W.C.
Operating Pressure	10.5" W.C.	13.5" W.C.
W.C.* - Water Column		

To properly check pressure, first determine the line pressure, cycle furnace and check pressure drop on demand. The drop in pressure should not be more than $\frac{1}{2}$ " W.C. A drop of more than $\frac{1}{2}$ " would indicate a faulty regulator, a restriction in the gas line, or a pinched gas line.

- c. Gas pressure OK - Check for obstruction in main burner; check for proper air adjustment on main burner (see instructions for adjusting burner); check to be sure electrode is positioned approximately $\frac{1}{4}$ " above and directly over one of the sawed slots on the main burner.
- d. Check all gaskets to be sure they are tight and forming a good seal.

4-Burner ignites but goes off and into lockout:

- a. Check to be certain that flame sensor is positioned in the inner blue cone of the main burner flame and that the main burner flame is burning against the tip of the flame sensor - adjust by bending sensor probe. *NOTE: Sensor probe will be approximately $\frac{1}{4}$ " - $5/16$ " above burner.*
- b. Burner still goes off and into lockout - Check wire connections at flame sensor and at module board.
- c. Wire connections OK - Check continuity through flame sensor wire and sensor wire connections at module board.
- d. Continuity of flame sensor wire OK - Check with micro amp meter in series with flame sensor wire to be certain that the flame sensor is generating at least seven micro amps within seven seconds after the burner is ignited. Connect meter as follows: (+) to sensor wire, (-) to sensor probe. Adjust position of sensor probe, check air adjustment on main burner, and check for carbon deposits on sensor probe if reading is less than 7 micro amps.
- e. Flame sensor circuit generating at least 7 micro amps, but burner still goes off and into lockout - Replace module board.

5-Repeated module board failures:

- a. Check to be certain that the electrode spark is not sparking against the flame sensor portion of the electrode assembly. (See Figure 8 for correct gapping.)
- b. Check to be sure module board or high voltage wires are not shorted to the chamber wrapper or other furnace parts.
- c. Be sure insulator covering the wire connection on the coil of the module board is in place.
- d. Check for high voltage - 14.5 volts D.C. maximum.
- e. Be sure duct connections to furnace are tight. Seal duct connections to furnace cabinet with duct tape, if necessary, to prevent hot air leakage. No air leakage should exist anywhere in the duct system, especially at connections on cabinet.

6-Customer complains of unit going into lockout only once in a while:

- a. Thoroughly check electrode and burner air adjustment.
- b. Lockout can occur if the gas pressure fluctuates at the time the thermostat calls for heat. Pressure fluctuations can be caused by a malfunctioning gas bottle regulator or an obstruction or kink in the gas bottle regulator or in the gas lines.

It is difficult to check for these fluctuations that will not noticeably affect any other appliance in the coach. However, isolating the furnace from the coach gas system will determine if the gas system is responsible. This isolation procedure can be done by connecting a separate upright bottle, regulator and gas line directly to the furnace, eliminating the coach gas system. If the occasional lockout still exists, then the furnace should be thoroughly tested to determine the cause; however, if the furnace works properly on this separate system, then the coach gas system should be checked.

- c. Check furnace return air and ducting to be sure sufficient air flow is present to consistently engage microswitch.
- d. Check microswitch to be sure it moves freely.
- e. Remove burner and electrode assembly. Clean thoroughly.

NOTE: When moisture in the gas system is suspected as being the problem, especially where the horizontal type gas bottle is being used, the following steps should be taken to prepare the gas system against further moisture problems.

Corrective Measures:

1. Disconnect gas bottle and drain it completely dry of all gas and moisture.
2. Disconnect and blow out all gas lines completely dry.
3. Install a new pressure regulator on the gas bottle.
4. Add the drying agent. One half pint of methanol alcohol per 100 pound bottle capacity is recommended.
5. Never fill the gas bottle over 80%.
6. Do not use gas bottle completely dry to avoid using up the drying agent.

We have found the above procedures to be effective in over 95% of all occasional lockout problems. All of these steps must be performed as described for the preparation of a contaminated gas system to be 100% effective.

B. COMPLAINT - EXCESSIVE NOISE

- 1-Blower out of balance - Replace blower wheels or motor.
- 2-Motor hum - Replace motor.

3-Air adjustment - A screeching or howling noise while burner is on is due to excessive primary air. To adjust for less air, see instructions under *Burner Adjustment*.

C. COMPLAINT - ERRATIC BLOWER OPERATION

1-If blower is going off and on, check the following:

- a. Thermostat points - If points are opening and closing, see *Service Hints*, Number 2 below.
- b. If thermostat points are remaining open or closed the internal overload switch in the motor is defective - Replace motor.

2-If thermostat points are observed opening and closing rapidly when furnace first starts, check the following:

- a. Quick disconnect plug on side of furnace - Plug must be wired as shown on electrical diagram.
- b. Miswiring at thermostat relay. (See *wiring diagram*.)
- c. Shorted gas valve - If furnace runs properly with wires at gas valve disconnected, replace gas valve.
- d. Short in wiring - Check all connections, including thermostat.
- e. Incorrect thermostat being used - Thermostat should have a .65 amp anticipator.

D. COMPLAINT - MAIN BURNER WILL NOT CYCLE OFF

- 1-Check thermostat points - Points should break cleanly.
- 2-Check solenoid valve - Valve may be stuck open. If so, replace. *Do not attempt to repair valve.*

E. COMPLAINT - UNIT WILL NOT OPERATE

- 1-Check all wiring to assure proper connections or detect possible shorts.
- 2-On dual voltage furnaces, check the following:
 - a. Proper wiring connections to A.C./D.C. convertor

- b. Transformer for burnout or shorts.
- c. Diodes.
- d. A.C./D.C. switching relay.

NOTE: On dual voltage units, replace the entire convertor under the following conditions:

- a. Source of problem cannot be traced to any one convertor component.
- b. Excessive voltage or lighting has been placed on the input of the convertor.

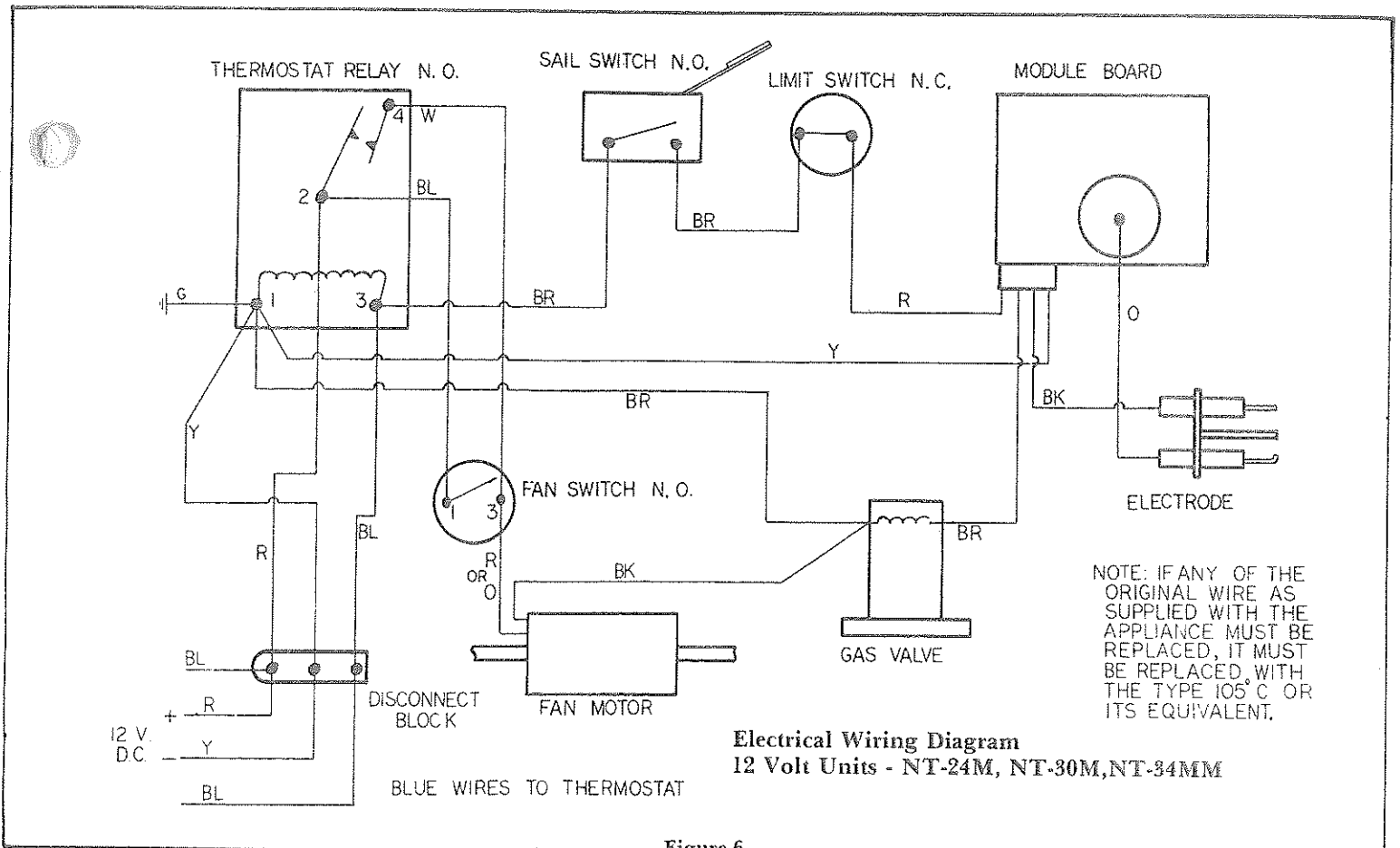


Figure 6

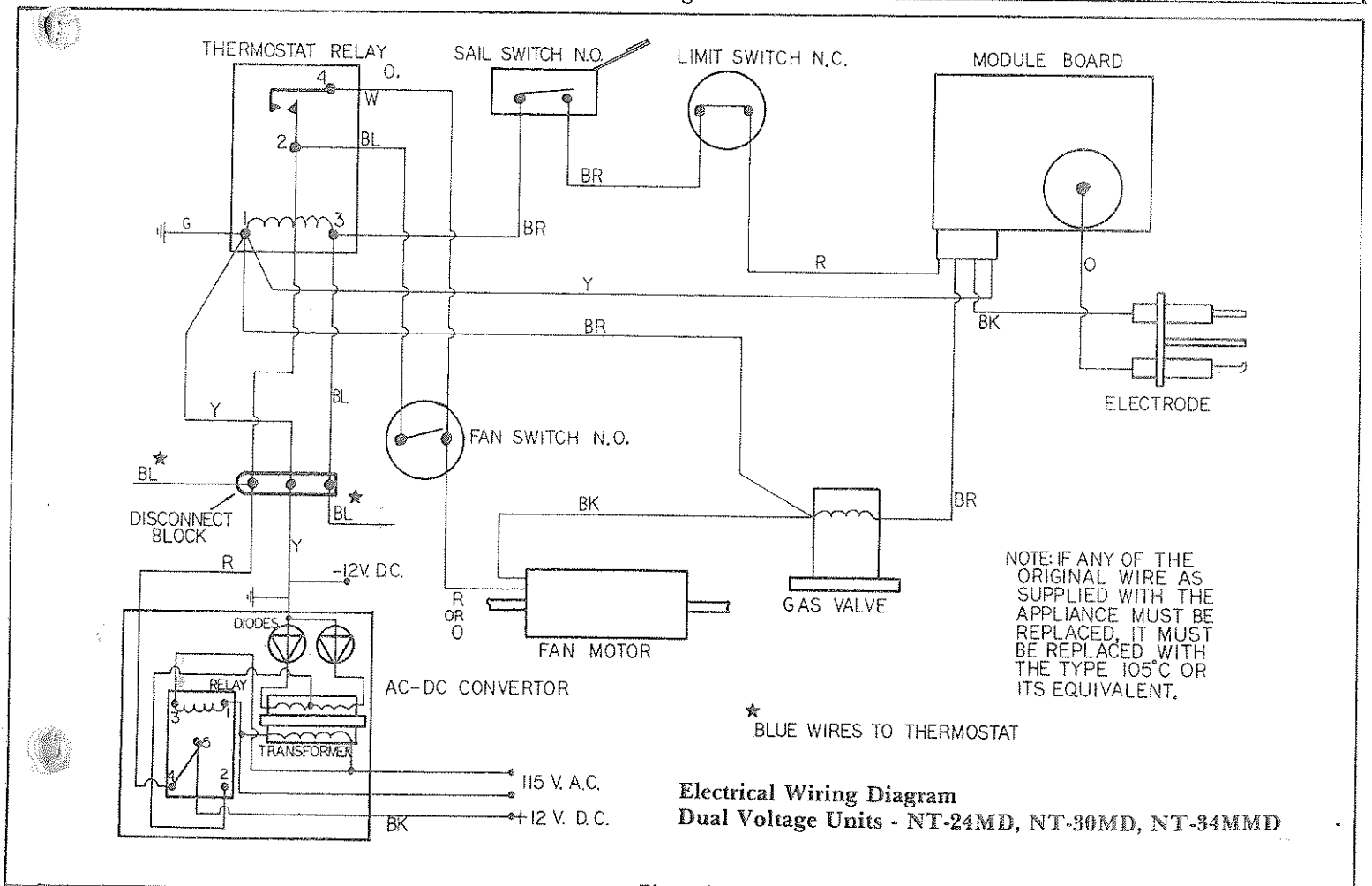


Figure 7

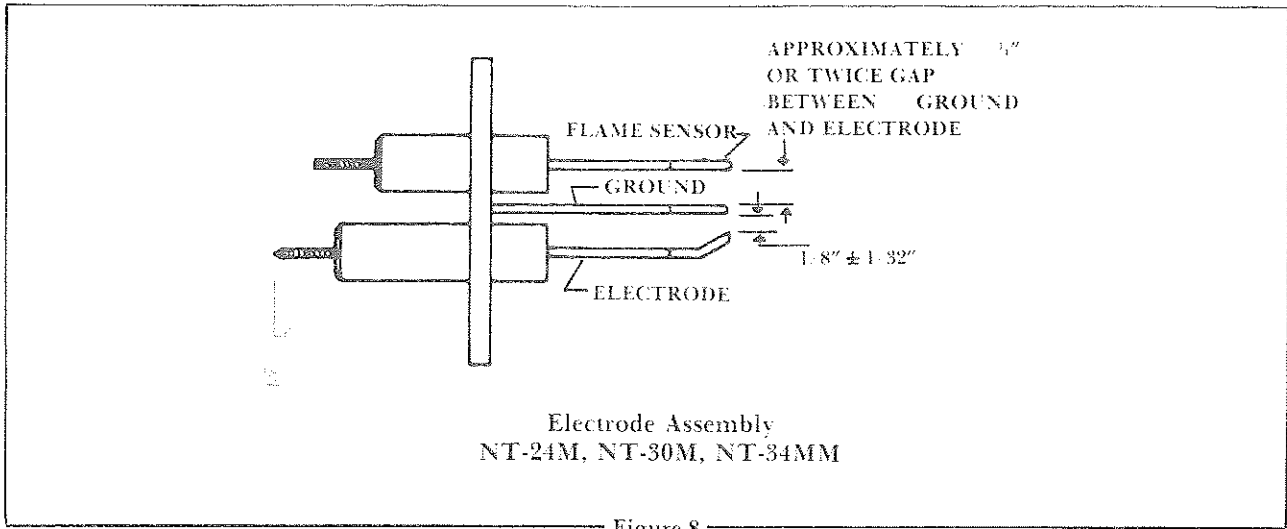


Figure 8

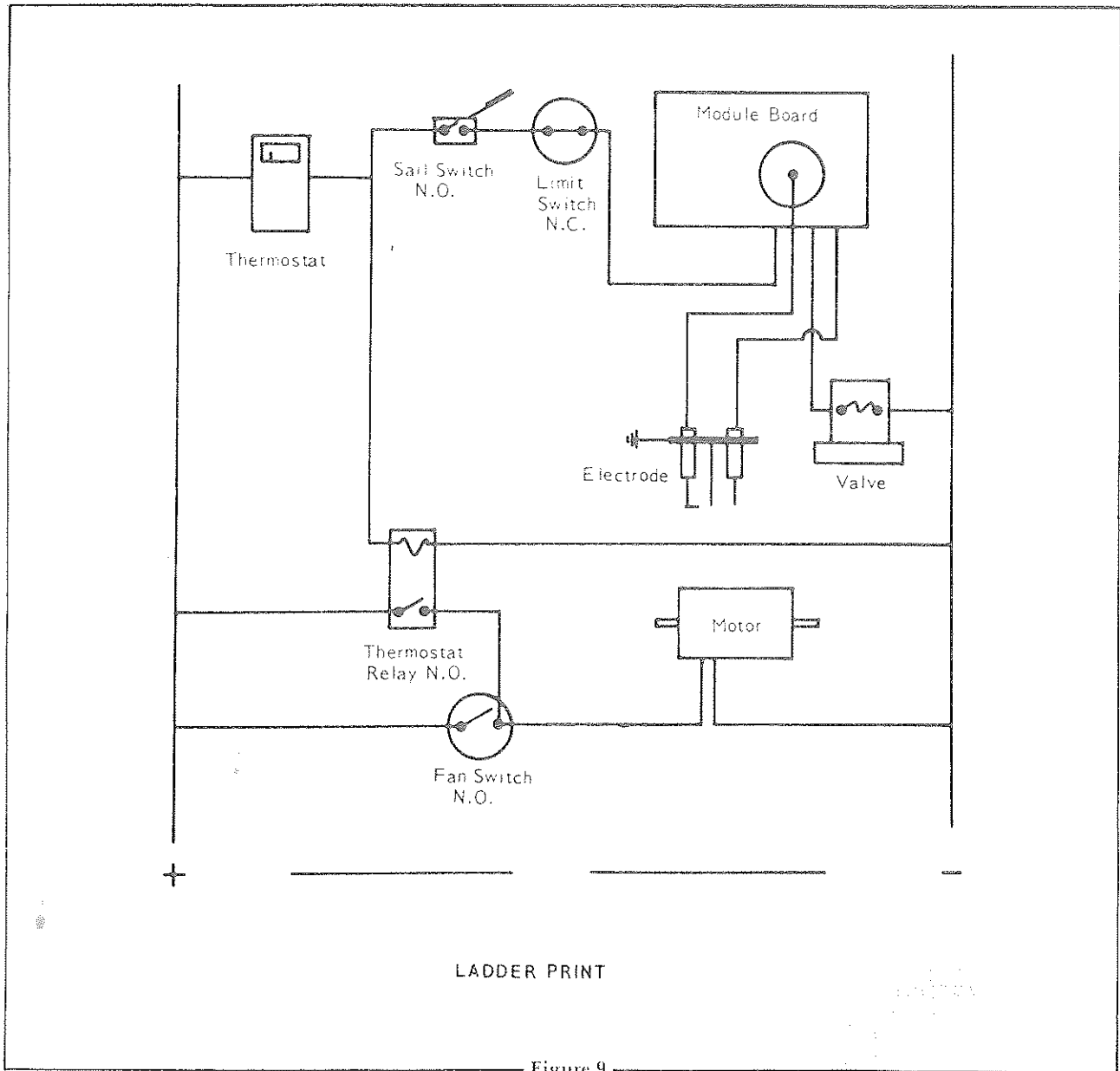
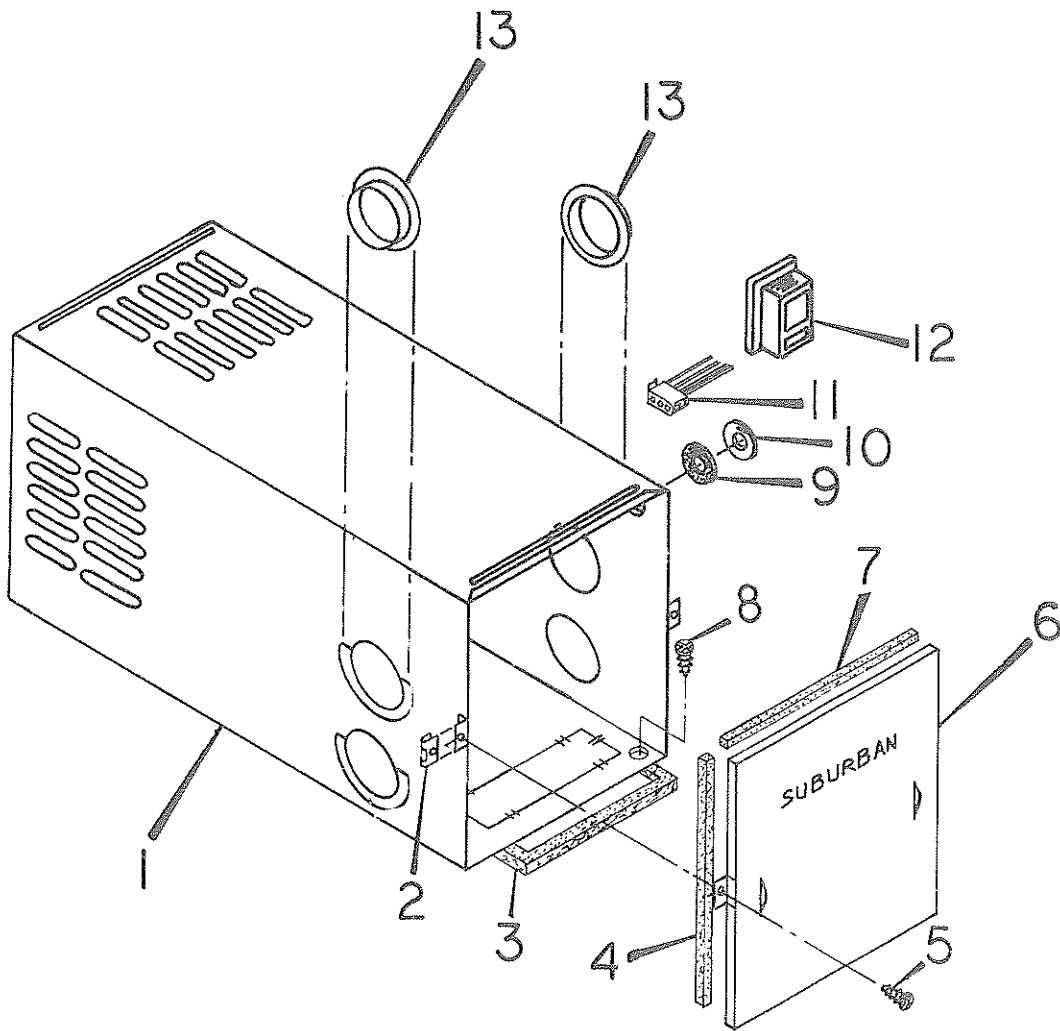


Figure 9



CABINET ASSEMBLY
NT-24M, NT-30M, NT-34MM

Figure 10

COMBUSTION CHAMBER ASSEMBLY COMPLETE
 NT-24M, NT-30M, NT-34MM

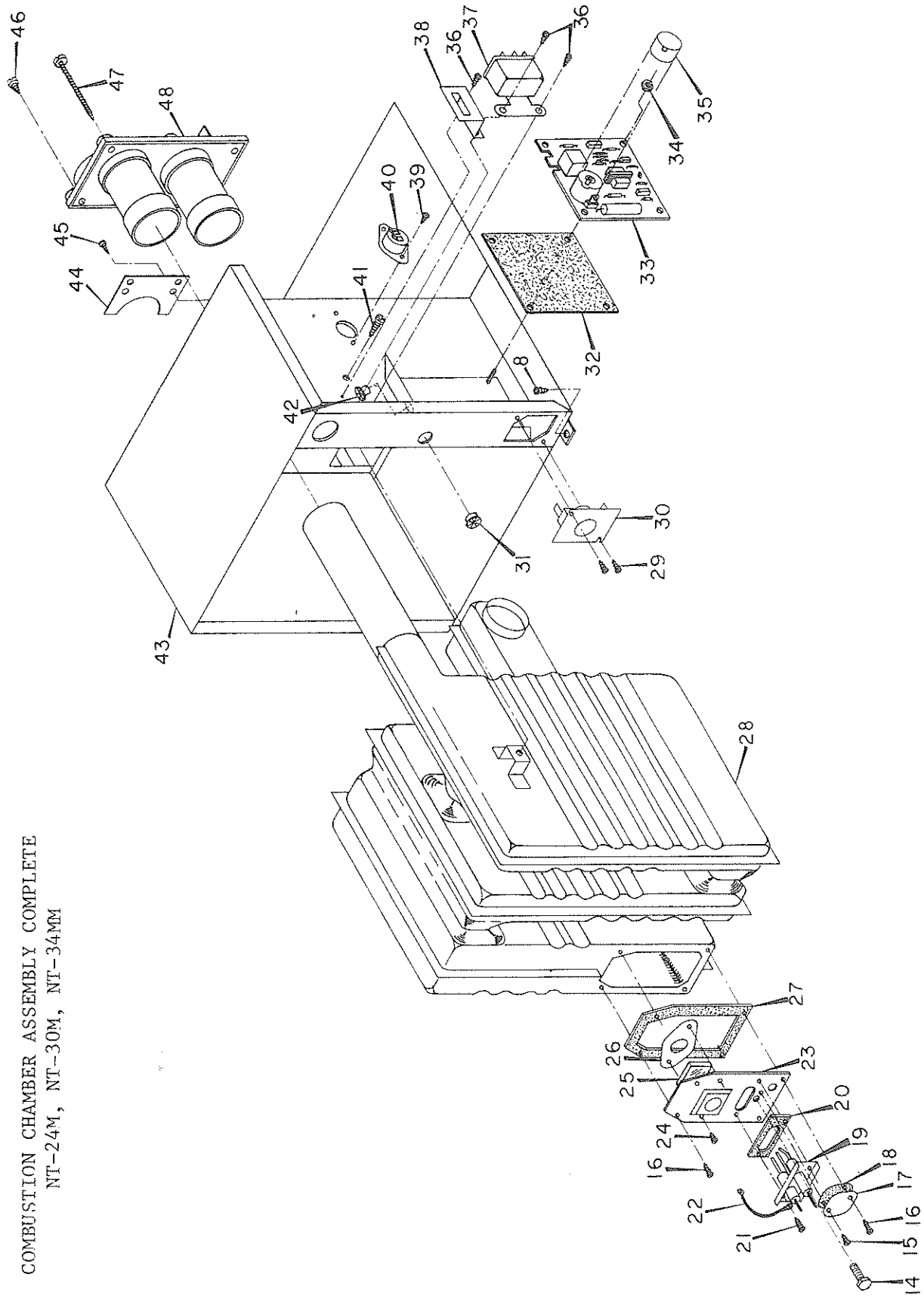


Figure 1

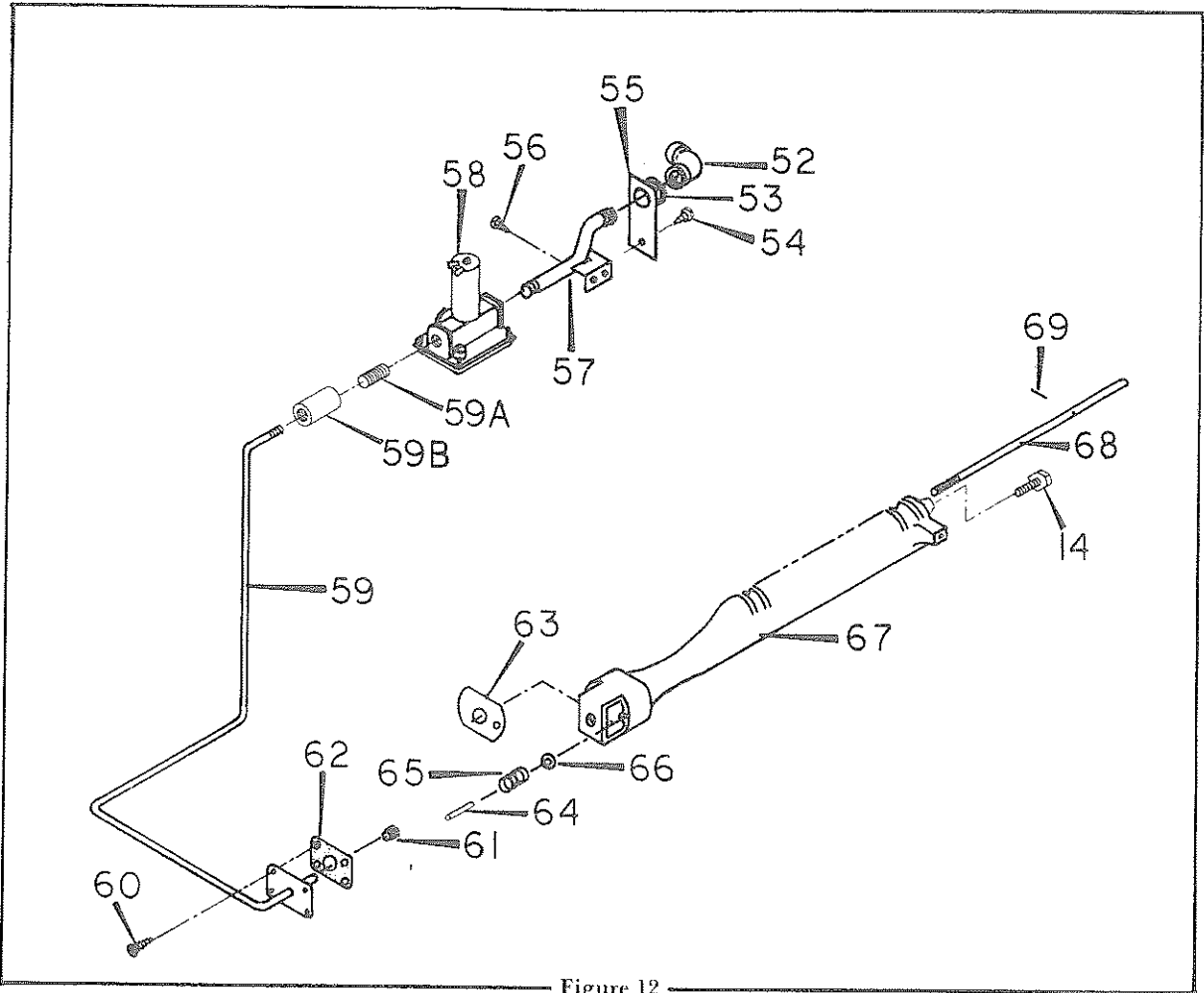


Figure 12

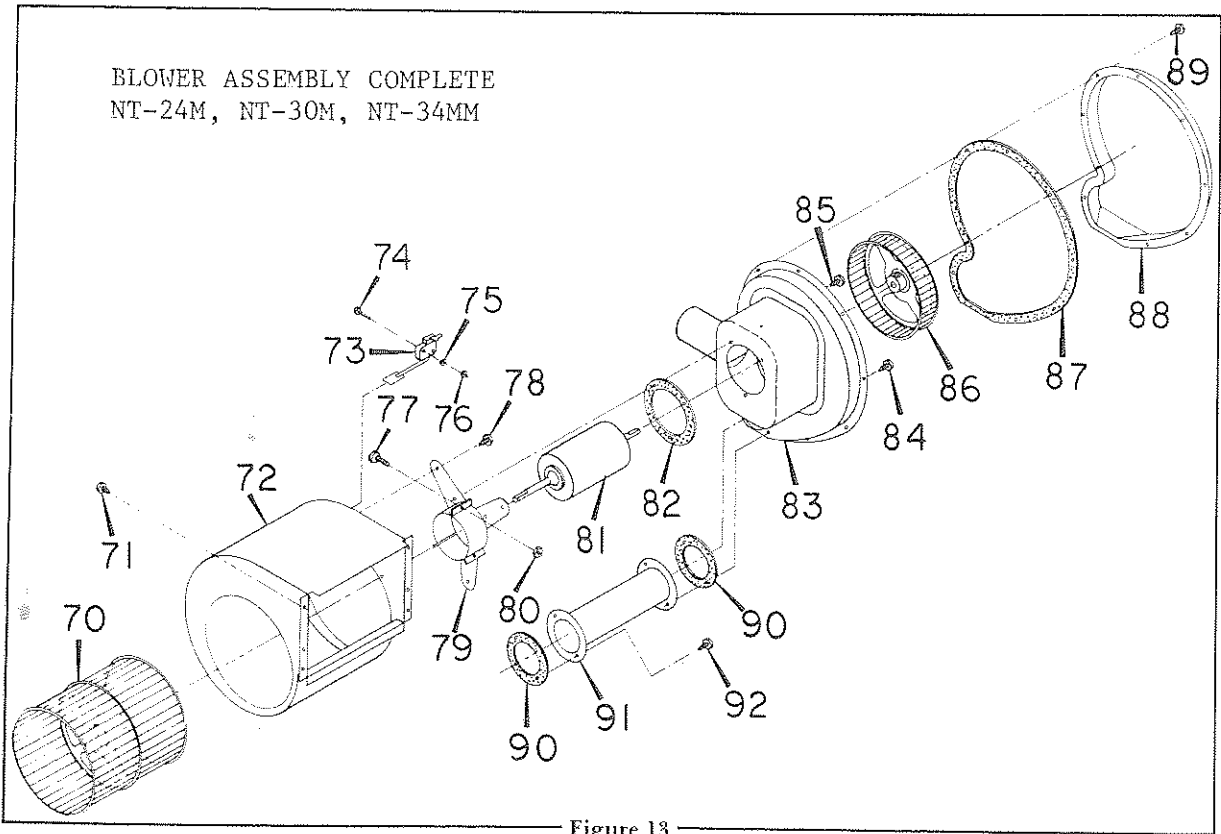


Figure 13

Replacement Parts List

MODELS
 NT-24M / NT-24MD
 NT-30M / NT-30MD
 NT-34MM / NT-34MMD

WARNING! Only factory authorized parts are to be used. Do not attempt to repair defective parts.

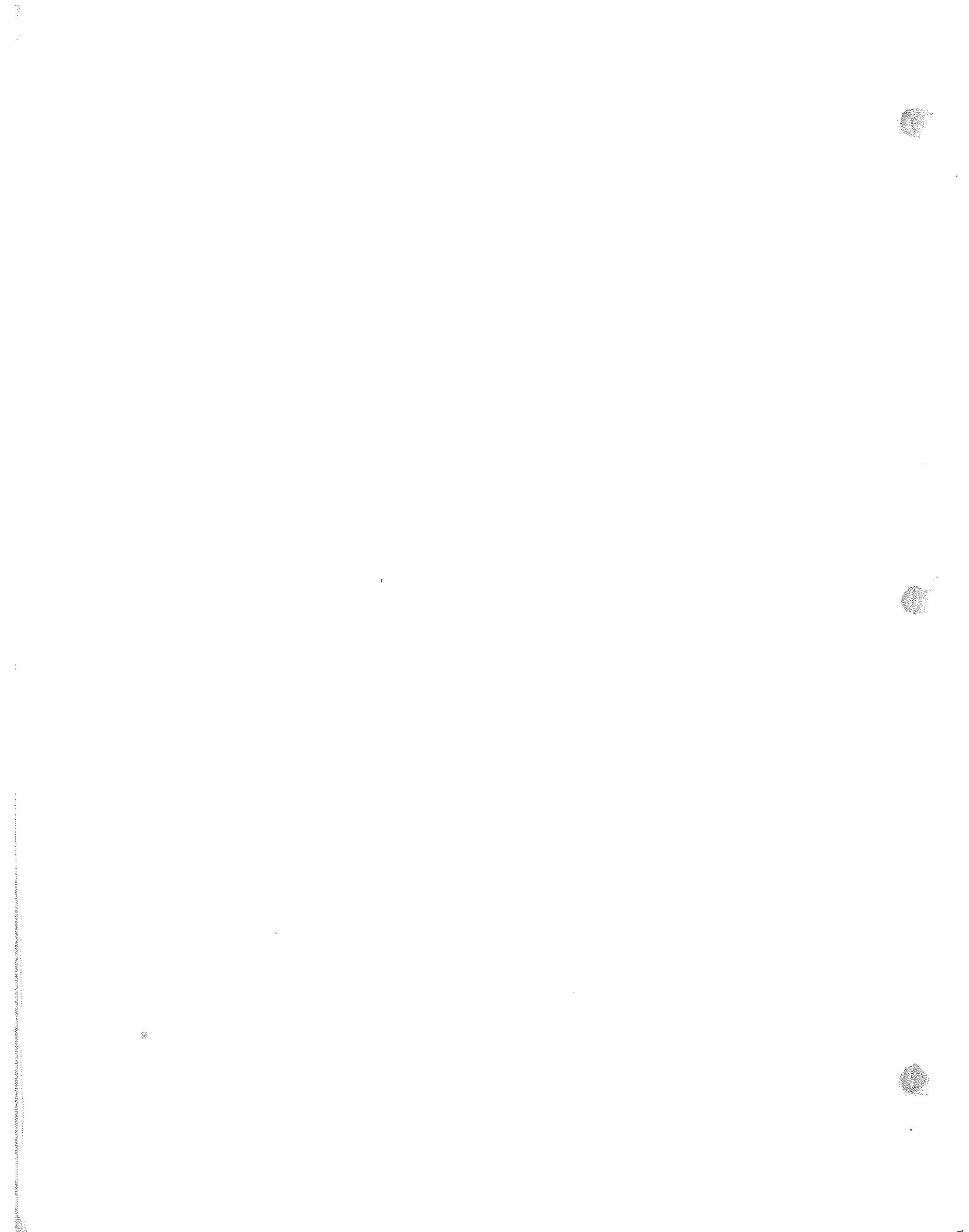
When ordering repair parts from your dealer, a Suburban Service Center, or distributor, always give the following information:

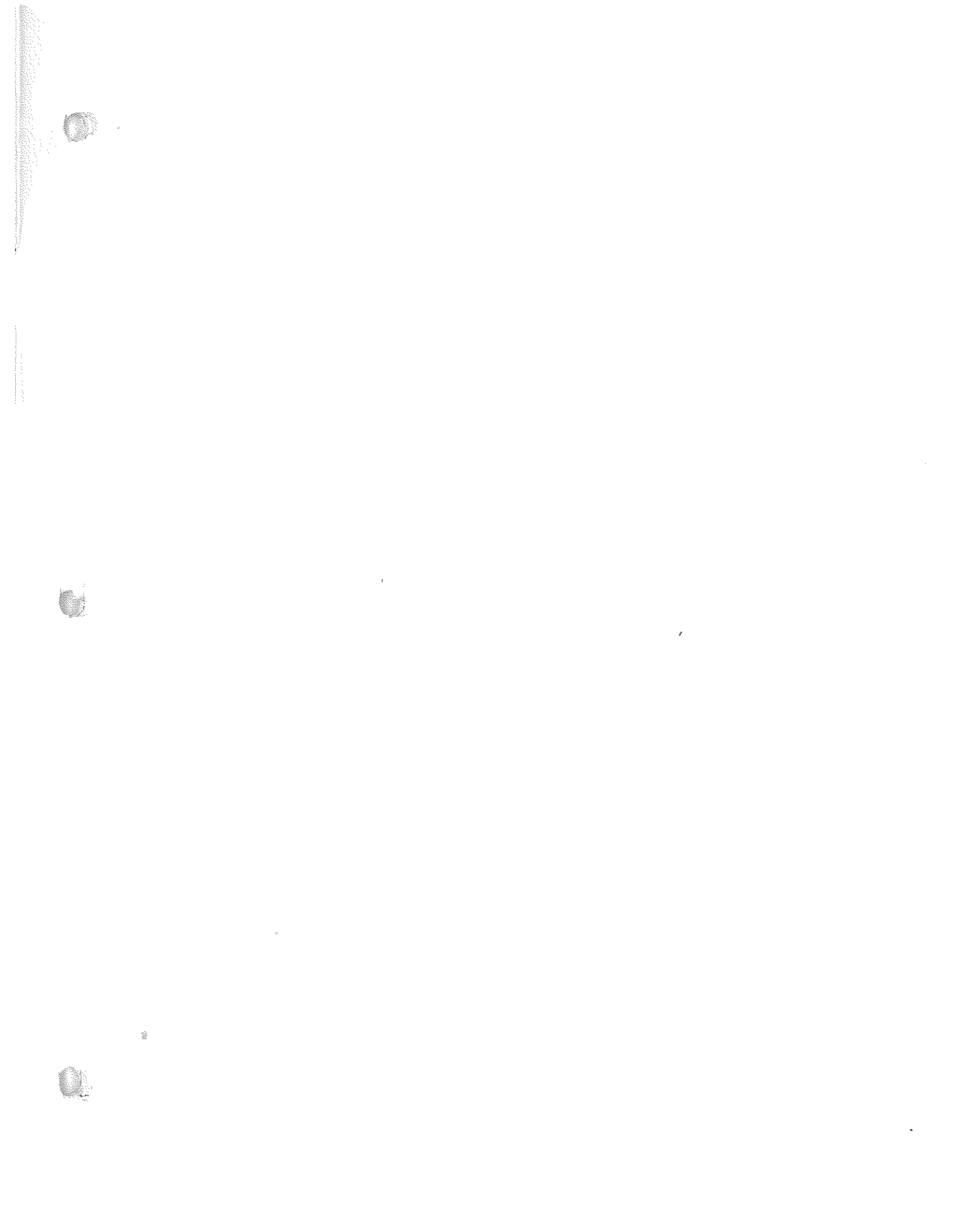
- 1-Part Number (Not Item No.)
- 2-Part Description
- 3-Model and Serial Number of Furnace
- 4-Number of Parts Required

The following parts are for all of the above models unless otherwise specified.

Item No.	Description	Part Number	Item No.	Description	Part Number
1	Cabinet Assembly	X100950	30	Limit Switch (NT-24M, NT-30M)	230496
2	Tinnerman (2 Required)	121378		Limit Switch (NT-34MM)	230612
3	Gasket, Bottom Duct Adaptor (Required Only When Bottom Ducting Used)	062164	31	Bushing	230362
4	Felt Seal, Vertical (2 Required)	070546	32	Insulator, Module Board	070538
5	Screw, #10 x 3/4 (2 Required)	121224	33	Module Board	230587
6	Cabinet Door	100808	34	Nut, Hex 6-32 (2 Required)	120744
6A	Cabinet Door Assembly (Includes Item Numbers 4, 6, and 7)	Z100949	35	Cap, Module Board Coil	070549
7	Felt Seal, Horizontal (2 Required)	070547	36	Screw, Relay Mounting and Power Bracket Mounting (#10 x 3/8) (3 Required)	121252
8	Screw, #10 x 3/8 (Secure Unit to Cabinet)	121252	37	Relay, Thermostat	230530
9	Gasket, Disc Cover (Gas Inlet Pipe)	070534	38	Bracket, Power Supply	062135
10	Disc Cover, Gas Inlet Pipe	062408	39	Screw, Fan Switch Mounting (#10 x 3/8) (2 Required)	121252
11	Harness, Power Supply (Outside Cabinet)	Z520322	40	Fan Switch	230575
12	Thermostat	160813	41	Screw, #10 x 3/8 (For Securing Chamber to Radiation Shield) (2 Required)	121252
13	Duct Collar (3 Required)	050296	42	Bushing	020270
14	Screw, Burner Mounting (#10-24 x 3/8)	121460	43	Radiation Shield Assembly	X110426
15	Screw, Air Adjustment Cover (#8 x 3/8)	120158	44	Baffle, Exhaust Tube (2 Required)	040293
16	Screw, Burner Access Door (#10 x 1/2) (4 Required)	121388	45	Screw, #10-16 x 1/2 Hex, Self Drill (2 Required Per Baffle)	121436
17	Cover, Air Adjustment Hole	290119	46	Screw, Vent Cap Mounting (#10 x 3/8) (4 Required)	121224
18	Gasket, Air Adjustment Hole Cover	070389	47	Screw, #8 x 3" (Special Screw for Securing Vent Cap to Furnace Exhaust Tube)	121256
19	Electrode	230590	48	Vent Cap and Tube Assembly	Z260093
19A	Wire, Electrode (Not Shown)	230491	52	90° Ell (3/4")	170082
20	Gasket, Electrode	070163	53	Gasket, Gas Inlet Pipe	070432
21	Screw, Electrode Mounting (#8-32 x 1/2) (2 Required)	121387	54	Screw, #10 x 3/8	121252
22	Ground Strap	230173	55	Plate, Gas Inlet Cover	062143
23	Burner Access Door	030451	56	Screw, Gas Inlet Pipe Mounting (#10 x 1/2) (2 Required)	121388
23A	Burner Access Door Assembly (Includes Item Numbers 15, 17, 18, 19, 20, 21, 22, 23, 24, 25, and 26)	Z030506	57	Gas Inlet Pipe Assembly	X170566
24	Screw, Observation Hole Cover (#8 x 3/8) (2 Required)	120158	58	Valve, Fenwal	160781
25	Observation Glass Disc	310026	59	Manifold Pipe Assembly (NT-24M, NT-30M)	X170567
26	Plate, Observation Hole Cover	290120		Manifold Pipe Assembly (NT-34MM)	X170597
27	Gasket, Burner Access Door	070398	59A	Close Nipple, 1/2 x 3/4	170546
28	Combustion Chamber	X020786	59B	Coupling, 1/2 NPT x 3/4	170628
29	Screw, Limit Switch Mounting (#8 x 3/8) (2 Required)	120158	59C	Manifold and Valve Assembly Complete (NT-24M Only) (Includes Item Numbers 52, 53, 55, 57, 58, 59, 59A, 59B, and 61)	Z170642

Item No.	Description	Part Number	Item No.	Description	Part Number
59D	Manifold and Valve Assembly Complete (NT-30M Only) (Includes Item Numbers 52, 53, 55, 57, 58, 59, 59A, 59B, and 61)	Z170643	74	Screw, Microswitch Mounting (#2-56 x 3/8) (2 Required)	121247
59E	Manifold and Valve Assembly Complete (NT-34MM Only) (Includes Item Numbers 52, 53, 55, 57, 58, 59, 59A, 59B, and 61)	Z170641	75	Washer, Lock #2 (2 Required)	121364
60	Screw, Manifold Mounting (#10 x 1/2) (4 Required)	121388	76	Nut, Hex #2-56 (2 Required)	120672
61	Orifice, Main Burner #54 (NT-24M)	180215	77	Screw, #10-24 x 1/2 (3 Required)	121227
	Orifice, Main Burner #52 (NT-30M)	180214	78	Screw, #10 x 1/2 (3 Required)	121388
	Orifice, Main Burner #51 (NT-34MM)	180222	79	Bracket, Motor Mount (3 Required)	062138
62	Gasket, Manifold	070408	80	Nut, 10-24 Hex Keps (3 Required)	120717
63	Shutter, Burner Air	010582	81	Motor, NT-24M	230741
64	Pin, Roll 5/32 x 1"	121398		Motor, NT-30M	230742
65	Spring	150026		Motor, NT-34MM	230774
66	Washer, 7/32 x 1/2	120684	82	Gasket, Motor Mount	070384
67	Burner	010581	83	Combustion Air Housing Assembly	X390179
67A	Burner Assembly (Includes Item Numbers 63, 64, 65, 66, 67, 68, and 69)	Z010609	84	Screw, #10-16 x 1/2 (2 Required)	121436
68	Rod, Air Adjustment	121460	85	Screw, #10-16 x 1/2 (2 Required)	121436
69	Pin, Roll 1/4 x 3/32	121250	86	Wheel, Combustion Air	350077
70	Wheel, Room Air	350076	87	Gasket, Combustion Air Housing	070386
71	Screw, Blower Housing Mounting (#10 x 3/8) (4 Required)	121252	88	Housing, Combustion Air Blower (Outside)	390173
72	Room Air Blower Housing	X390269	89	Screw, #10 x 3/8 (9 Required)	121252
73	Microswitch Assembly With Wiring (NT-24M)	Z230747	90	Gasket, Crossover Tube (2 Required)	070385
	Microswitch Assembly With Wiring (NT-30M, NT-34MM)	Z230748	91	Crossover Tube	050439
			92	Screw, #10 x 1/2 With Serrated Head (2 Required)	121388
			93	Valve, Manual Shut-Off (Not Shown)	160740
			94	Rectifier Diodes (2 Required) A.C./D.C. Models Only (Not Shown)	230297
			95	Relay, A.C./D.C. Switching (A.C./D.C. Models Only) (Not Shown)	230255
			96	Transformer (A.C./D.C. Models Only) (Not Shown)	230323





Limited Warranty

RECREATIONAL VEHICLE HEATING UNIT

Suburban Manufacturing Company (SUBURBAN) warrants to the first purchaser, the heating unit against defects in material and workmanship under normal use for a period of one year from date of first purchase of the recreational vehicle. The heat exchanger is warranted to the first purchaser against rustout and burnout for a period of 5 years from date of first purchase of the recreational vehicle. Warranty parts will be replaced at no charge for the parts. Labor will be paid only as set forth in the Service Policy below.

SERVICE POLICY

Suburban Manufacturing Company, with the cooperation of its authorized service centers, will endeavor to assure customer satisfaction. If a defect of material or workmanship in the heating unit is repaired within one year from date of original purchase, Suburban will pay a service allowance to the authorized service center up to the maximum specified under the terms of Suburban's contract with the service center. To obtain repairs or replacements, the owner/user must provide for transportation of the heating unit to and from the service center and must inform the service center of the nature of the defect. A list of authorized service centers is enclosed with Suburban's Installation, Operating and Service Instructions book. The owner/user may obtain an updated list of authorized service centers from Suburban Manufacturing Company at any time. Any warranty labor charges paid by the owner/user will be reimbursed at Suburban's Flat Rate Labor Schedule in effect at time repairs were made. Any parts replaced under warranty and paid for by the owner/user must be returned to the factory for inspection. Reimbursement for parts will be made only at dealer price in effect at time parts were replaced. All repairs made after one year from date of original purchase will be at the expense of the owner/user.

EXCLUSIONS AND LIMITATIONS

A-There are no other express warranties except as set out above, and any implied warranties are limited in duration to one year from date of first purchase of the recreational vehicle. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

B-This Limited Warranty excludes consequential damages, incidental damages, or incidental expenses, including damage to property. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

C-This Limited Warranty does not cover damages caused by improper installation, mishandling, neglect, abuse, improper energy supply, other circumstances beyond Suburban's control such as fire, flood or other acts of God, or operation of the heating unit contrary to the provisions of the Installation, Operating and Service Instructions book of Suburban or contrary to proper voltage and fuel ratings as design certified by the American Gas Association.

D-Certain services are not included under the Service Policy. They are:

- 1-Initial checkout and subsequent checkouts which determine that the furnace is operating properly.
- 2-Cleaning.
- 3-Water or dirt in controls, fuel lines, and gas tanks.
- 4-Broken or shorted wires.
- 5-Restriction or alteration of warm air or return air circulation.
- 6-Thermostat adjustments.
- 7-Instructing owners in operation.
- 8-Adjusting primary air.
- 9-Pilot adjustment.
- 10-Electrode adjustments.
- 11-Clogged orifice.
- 12-Disconnected wires.
- 13-Broken parts.
- 14-Charges incurred in gaining access to the furnace.

No representative or person is authorized to assume for Suburban Manufacturing Company any other liability in connection with the sale of this recreational vehicle furnace.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.



BOX 399, DAYTON, TENNESSEE 37321