

M5S Series

INSTALLATION INSTRUCTIONS

Downflow, Direct Vent (Sealed Combustion) Forced Air Oil Furnaces

For installation in:

- Manufactured Homes
- Recreational Vehicles, Park Models, & Manufactured Buildings
- Modular Homes / Buildings



⚠ WARNING

FIRE OR EXPLOSION HAZARD

- Failure to follow safety warnings exactly could result in serious injury or property damage.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Leave the building immediately.
- Immediately call your gas supplier from a neighbors phone. Follow the gas suppliers instructions.
- If you cannot reach your gas supplier, call the fire department.

⚠ CAUTION

HUD Manufactured Home Construction and Safety Standards (3280.714) prohibit the use of noncertified air conditioning or heat pump equipment with this furnace. It is strongly recommended that manufactured housing air conditioning components from the manufacturer be selected to provide a matched system specifically designed to meet these requirements.

The cutting, splicing or modifying of any internal electrical wiring may void product warranties and create a hazardous condition. Failure to comply with these standards could also provide inadequate heating or cooling performance and cause structural damage to a manufactured home.

Please contact your local distributor for help. A directory of factory authorized servicers is located in the furnace homeowner packet.

Reference: HUD Manufactured Home Construction and Safety Standards 3280.714.

DO NOT DESTROY. PLEASE READ CAREFULLY & KEEP IN A SAFE PLACE FOR FUTURE REFERENCE.

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IMPORTANT SAFETY INFORMATION

Safety markings are used frequently throughout this manual to designate a degree or level of seriousness and should not be ignored. **WARNING** indicates a potentially hazardous situation that if not avoided, could result in personal injury or death. **CAUTION** indicates a potentially hazardous situation that if not avoided, may result in minor or moderate injury or property damage.

WARNING:

The safety information listed below must be followed during the installation, service, and operation of this furnace. Failure to follow safety recommendations could result in possible damage to the equipment, serious personal injury or death.

WARNING:

Do not install this furnace if any part has been submerged under water. A flood damaged furnace is extremely dangerous. Attempts to use the furnace may result in fire or explosion. A qualified service agency should be contacted to inspect the furnace and to replace any electrical or control system parts that have been wet or under water.

CAUTION:

Operating gas furnaces in construction environments can cause a variety of problems within the furnace and may significantly reduce the life or the performance of the furnace. Therefore operating the furnace during construction is not permitted and will void the warranty.

REQUIREMENTS & CODES

- This furnace must be installed in accordance with these instructions, all applicable local building codes and the current revision of the National Fuel Gas Code (NFPA54/ANSI Z223.1) or the Natural Gas and Propane Installation Code, CAN/CSA B149.1.
- Use only with type of gas approved for this furnace. Refer to the furnace rating plate.
- Install this furnace in accordance to the minimum clearances to combustible materials listed in [Table 1](#), ([page 5](#)).
- Provide adequate combustion and ventilation air to the furnace space as specified on [page 6](#) and [page 17](#). Do not block or obstruct air openings on the furnace, air openings to the area where the furnace is installed, or the space around the furnace.
- Combustion products must be discharged outdoors. Connect this furnace to an approved vent system, as specified on [page 10](#).

- This furnace is designed to operate with a maximum external pressure rise of 0.5 inches of water column.
NOTE 1: The static pressure measurement should not include the coil (if applicable). Consult [Table 10](#), ([page 21](#)) and the rating plate for the proper circulating air flow and temperature rise.
NOTE 2: It is important that the duct system be designed to handle the desired flow rate and external pressure rise. An improperly designed duct system can result in nuisance shutdowns, and comfort or noise issues.
- When supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled through the front door of the furnace. Make sure there is sufficient return air through the door. See return air connections [page 6](#).
- Additional information listed below is for reference purposes only and does not necessarily have jurisdiction over local or state codes. Always consult with local authorities before installing any gas appliance.

Combustion & Ventilation Air

- US: National Fuel Gas Code (NFGC), Air for Combustion and Ventilation
- CANADA: Natural Gas and Propane Installation Codes (NSCNGPIC), Venting Systems and Air Supply for Appliances

Duct Systems

- US and CANADA: Air Conditioning Contractors Association (ACCA) Manual D, Sheet Metal and Air Conditioning Contractors National Association (SMACNA), or American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Fundamentals Handbook

Electrical Connections

- US: National Electrical Code (NEC) ANSI/NFPA 70
- CANADA: Canadian Electrical Code CSA C22.1

Gas Piping & Gas Pipe Pressure Testing

- US: NFGC and National Plumbing Codes
- CANADA: NSCNGPIC

General Installation

- US: Current edition of the NFGC and the NFPA 90B. For copies, contact the National Fire Protection Association Inc., Batterymarch Park, Quincy, MA 02269; or American Gas Association, 400 N. Capitol, N.W., Washington DC 20001 or www.NFPA.org
- CANADA: NSCNGPIC. For a copy, contact Standard Sales, CSA International, 178 Rexdale Boulevard, Etobicoke (Toronto), Ontario, M9W 1R3 Canada

Safety

- US: (NFGC) NFPA 54–1999/ANSI Z223.1 and the Installation Standards, Warm Air Heating and Air Conditioning Systems ANSI/NFPA 90B.
- Federal Manufactured Home Constructions & Safety Standard (H.U.D. Title 24, Part 3280.707[a][2])
- The Standard for Manufactured Home Installations (Manufactured Home Sites, Communities, and Set-Ups) ANSI A225.1 and/or CAN/CSA-2240 MH Series).
- American National Standard (ANSI-119.2/NFPA-501C) for all recreational vehicle installations.
- CANADA: CAN/CSA-B149.1 and .2–M00 National Standard of Canada. (NSCNGPIC)

- The Commonwealth of Massachusetts requires compliance with regulation 248 CMR 4.00 and 5.00 for installation of through-the-wall vented gas appliances as follows:

1. For direct-vent appliances, mechanical-vent heating appliances or domestic hot water equipment, where the bottom of the vent terminal and the air intake is installed below four feet above grade the following requirements must be satisfied:

- a.) A carbon monoxide (CO) detector and alarm shall be placed on each floor level where there are bedrooms. The detector shall comply with NFPA 720 (2005 Edition) and be mounted in the living area outside the bedroom(s).
- b.) A (CO) detector shall be located in the room that houses the appliance or equipment and shall:
 - Be powered by the same electrical circuit as the appliance or equipment. Only one service switch shall power the appliance and the (CO) detector;
 - Have battery back-up power;
 - Meet ANSI/UL 2034 Standards and comply with NFPA 720 (2005 Edition); and Approved and listed by a Nationally Recognized Testing Laboratory as recognized under 527 CMR.
- c.) A Product-approved vent terminal must be used, and if applicable, a product-approved air intake must be used. Installation shall be in strict compliance with the manufacturer's instructions. A copy of the installation instructions shall remain with the appliance or equipment at the completion of the installation.
- d.) A metal or plastic identification plate shall be mounted at the exterior of the building, 4 feet directly above the location of vent terminal. The plate shall be of sufficient size, easily read from a distance of eight feet away, and read "Gas Vent Directly Below".

2. For direct-vent appliances, mechanical vent heating appliances or domestic hot water equipment where the bottom of the vent terminal and the air intake is installed above four feet above grade the following requirements must be satisfied:

- a.) A (CO) detector and alarm shall be placed on each floor level where there are bedrooms. The detector shall comply with NFPA 720 (2005 Edition) and be mounted in the living area outside the bedroom(s).
- b.) The (CO) detector shall:
 - Be located in the room that houses the appliance or equipment;
 - Be hard-wired, battery powered or both.
 - Shall comply with NFPA 720 (2005 Edition).
- c.) A product-approved vent terminal must be used, and if applicable, a product-approved air intake must be used. Installation shall be in strict compliance with the manufacturer's instructions. A copy of the installation instructions shall remain with the appliance or equipment at the completion of the installation.

GENERAL INFORMATION



CAUTION:

- **Do Not alter or modify this furnace or any of its components.**
- **Never attempt to repair damaged or inoperable components. This may cause unsafe operation, explosion, fire and/or asphyxiation.**
- **If furnace malfunctions or does not operate properly, contact a qualified service agency or gas utility for assistance.**

Minimum Clearances

This heating appliance must be installed with clearances not less than the minimums listed in [Table 1, \(page 5\)](#). This furnace must be installed with ample clearance for easy access to the air filter, blower assembly, burner assembly, controls, and vent connections. See [Figure 1, Figure 2, and Figure 3 \(page 5\)](#).

- The dimensions of the room or alcove must be able to accommodate the overall size of the furnace and the installation clearances listed in [Table 1](#) and in [Figure 4 \(page 5\)](#).
- Alcove installations: minimum 18" clearance at front of furnace shall be provided for future servicing. A removable access panel should be installed between top of the furnace door frame and the ceiling.
- Closet installations must use a louvered door having a minimum free area of 235 in² when located 6" from furnace or 390 in² for 5 ton ready M5 furnaces. For special clearance between 1" - 6", requirements are a louvered door with a minimum of 250 in² free area, with the openings in the closet door in line with the louvered openings in the furnace door. A fully louvered closet door may be used. See [Circulating Air Requirements section \(page 6\)](#).
- The furnace must be kept free and clear of insulating material. Examine the furnace area when the furnace is installed or when insulation is added. Insulating material may be combustible.

Applications

M5 Series oil furnaces are listed as direct vent (sealed combustion), downflow heating appliances for manufactured (mobile) homes and recreational vehicles. The furnace must be located so that venting can be properly achieved.

Air conditioning may be added to structures with M5 series furnaces using air conditioning or conventional units. This instruction manual includes special requirements for incorporation of air conditioning equipment to the M5 series furnaces. See [Table 11, \(page 21\)](#).

Multi-speed blower assemblies shown in [Table 2, \(page 5\)](#), have been certified for field installation in M5 series furnaces.

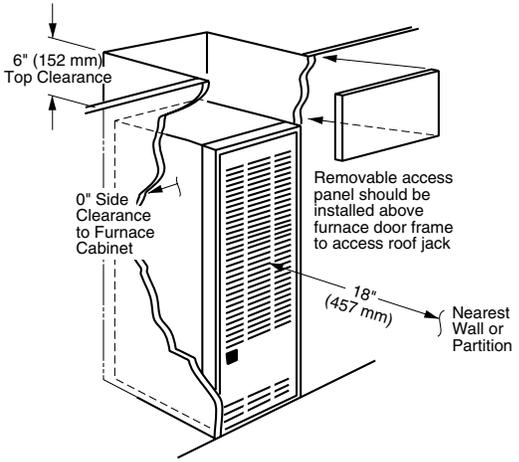


Figure 1. Alcove Installation

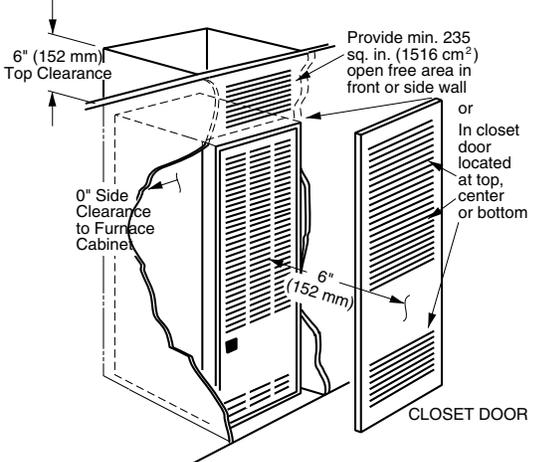


Figure 2. Closet Installation

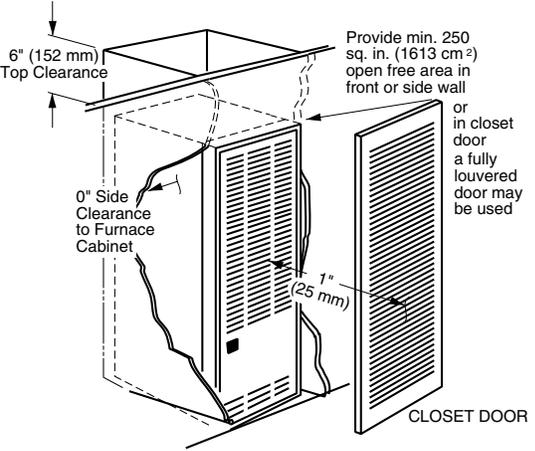


Figure 3. Special 1" Clearance

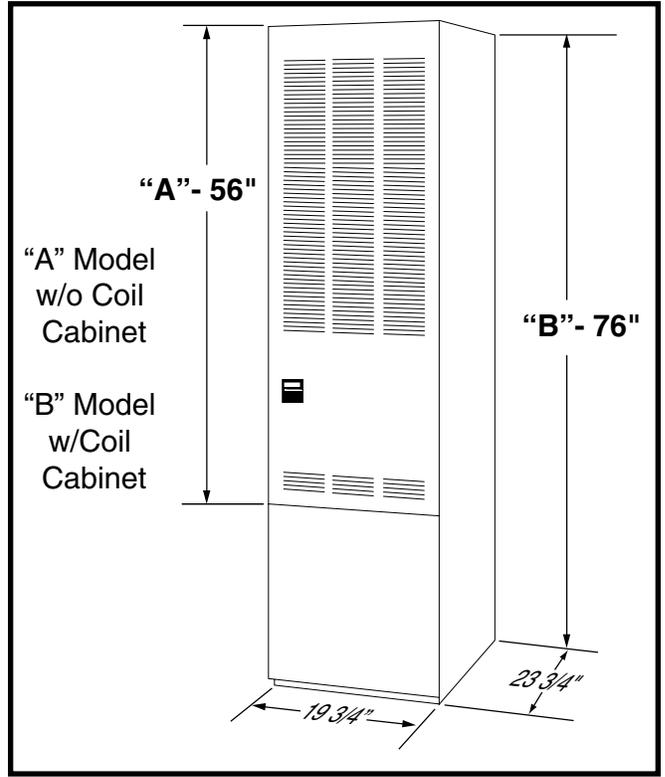


Figure 4. Overall Dimensions

ALL MODELS	CLOSET	ALCOVE
Front	6"	18"
Back	0"	0"
Sides	0"	0"
Roof Jack	0"	0"
Top	6"	6"
Top and Sides of Duct	0"	0"
Bottom of Duct	—	—
A Cabinet (w/ coil box)	0"	0"
A Cabinet (w/o coil box)	1/4"	1/4"
B Cabinet	0"	0"

Table 1. Minimum Clearances

PART NO.	BLOWER / MOTOR ASSEMBLY		A/C CAPACITY (TONS)
	BLOWER WHEEL	MOTOR (HP)	
903413	11 x 8	1/2	2, 2½, 3 & 4
903890	11 x 8	3/4	2, 2½, 3, 4 & 5

Table 2. Blower Assemblies

Unit Location

- The furnace shall be appropriately located to the supply and return air distribution system (page 6). Sides and back of the furnace may be enclosed by wall framing. See Minimum Clearances section on page 4.
- The furnace installation is only intended for free air return through the furnace door louvers. DO NOT connect a ducted return air system directly to the furnace. Improper installation may create a hazard and damage equipment, as well as void all warranties.
- Furnace may be installed on combustible flooring when using manufacturer approved duct connectors. See page 6.
- When installed in a residential garage, the furnace must be positioned so the burners and the source of the ignition are located no less than 18 inches above the floor and protected from physical damage by vehicles.

CIRCULATING AIR REQUIREMENTS

WARNING:

Do not allow combustion products to enter the circulating air supply. Failure to prevent the circulation of combustion products into the living space can create potentially hazardous conditions including carbon monoxide poisoning that could result in personal injury or death.

The surface that the furnace is mounted on must provide sound physical support of the furnace with no gaps, cracks or sagging between the furnace and the floor or platform.

Circulating air ductwork must not be connected to any other heat producing device such as a fireplace insert, stove, etc. This may result in fire, explosion, carbon monoxide poisoning, personal injury, or property damage.

Return Air

U.S.A. home manufacturers shall comply with all of the following conditions to have acceptable return air systems for closet installed forced air heating appliances:

CAUTION:

HAZARD OF ASPHYXIATION: Do not cover or restrict return air opening.

- The return air opening into the closet shall not be less than specified in the appliance's listing.
- The cross-sectional area of the return duct system leading into the closet, when located in the floor or ceiling shall not be less than 235 in² (or 390 in² for M5 furnaces with 5 ton blower kits).

- Means shall be provided that prevent inadvertent closure of flat objects placed over the return air opening located in the floor of the closet (versus the vertical front or side wall).
- The total free area of openings in the floor or ceiling registers serving the return air duct system must be at least 235 in². At least one register should be located where it is not likely to be covered by carpeting, boxes and other objects.
- Materials located in the return duct system must have a flame spread classification of 200 or less. This includes a closet door if the furnace is in a closet.
- Noncombustible pans having 1" upturned flanges are located beneath openings in a floor duct system.
- Wiring materials located in the return duct system shall conform to Articles 300-22 of the National Electrical Code (ANSI C1/NFPA-70).
- Oil piping is not run in or through the return duct system.

CAUTION:

HAZARD OF ASPHYXIATION: Negative pressure inside the closet, with closet door closed and the furnace blower operating on high speed, shall be no more negative than minus 0.05 inch water column.

- Test the negative pressure in the closet with the air-circulating fan operating at high speed and the closet closed. The negative pressure is to be no more negative than minus 0.05 inch water column.
- Air conditioning systems may require more duct register and open louver area to obtain necessary airflow.

Supply Air

For proper air distribution, the supply duct system must be designed so that the static pressure measured external to the furnace does not exceed the listed static pressure rating shown on the furnace rating plate.

Location, size, and number of registers should be selected on the basis of best air distribution and floor plan of the home. **The supply air must be delivered to the conditioned space by duct(s) secured to the furnace casing, running full size and without interruption.** Three typical distribution systems are shown in Figure 5.

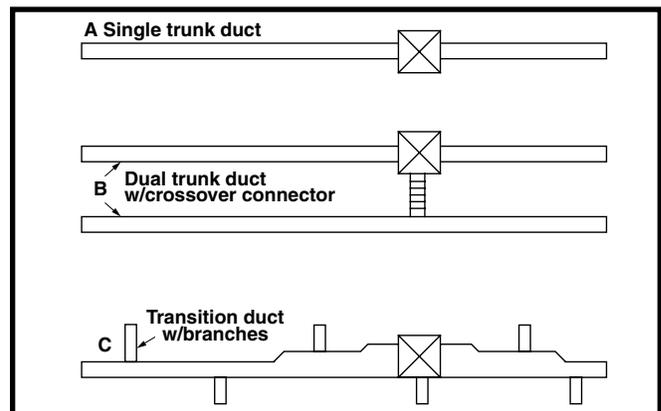


Figure 5. Typical Supply Duct System

FURNACE INSTALLATION

NOTE: These Installation procedures are suggested for typical furnace installations. Since each installation is different, the sequence of instructions may differ from the actual installation. Only qualified HVAC technicians should install this furnace.

The installer must be familiar with and comply with all codes and regulations applicable to the installation of these heating appliances and related equipment. In the absence of local codes, the installation must be in accordance with the current provisions of one or more of the following standards.

- Federal Manufactured Home Construction & Safety Standard (H.U.D. Title 24, Part 3280.707[a][2])
- American National Standard (ANSI-119.2/NFPA-501C) for all recreational vehicle installations.
- American National Standard (ANSI-Z223.1/NFPA-54) and/or CAN/CSA B149 for all gas-fired furnace models.
- American National Standard (ANSI-Z95.1/NFPA-31) and/or CSA B139 for all oil-fired furnace models.
- American National Standard (ANSI-C1/NFPA-70) and/or CSA 22.1 Canadian Electric Code Part 1 for all electrical field wiring.
- Units have been certified under standards UL 307A & B, UL727-1999, ANSI Z21.47/CSA 2.3, and CSA B140.10.

General Information

- The furnace must be leveled at installation and attached to a properly installed duct system. **Do not use the back of the furnace for return air.** See [page 6](#) for circulating requirements.
- The furnace must be installed so that all electrical components are protected from water
- The dimensions of the room or alcove must be able to accommodate the overall size of the furnace and the installation clearances listed in [Table 1, \(page 5\)](#) and [Figure 1 \(page 5\)](#)
- The furnace must be installed upstream from a refrigeration system.
- M5 series oil furnaces are certified for use on wood flooring or supports, but must be installed on top of a duct connector. This factory supplied accessory must be installed in the floor cavity and attached to the supply air duct before the furnace is installed.

Locating & Cutting Duct Openings

Floor cut-outs and fuel line holes must be carefully located to avoid misalignment of the furnace, and vent piping. To locate standard ducts see [Figure 6](#). For round ducts, see [Figure 7](#).

1. Measure 10" from the rear wall or alcove and mark the centerline of the cut-out on the floor.
2. Using the centerline as a starting point, draw the rest of the duct cut-out to the dimensions shown in [Figure 6](#) or [Figure 7](#).
3. Cut out the floor opening 1/16" larger than the actual cutout drawn. This will allow some clearance when installing the duct connector.
4. Measure from the top of the floor down to the top of the supply air duct to obtain the depth of the floor cavity.

NOTE: The depth of the floor cavity shown as "X" in

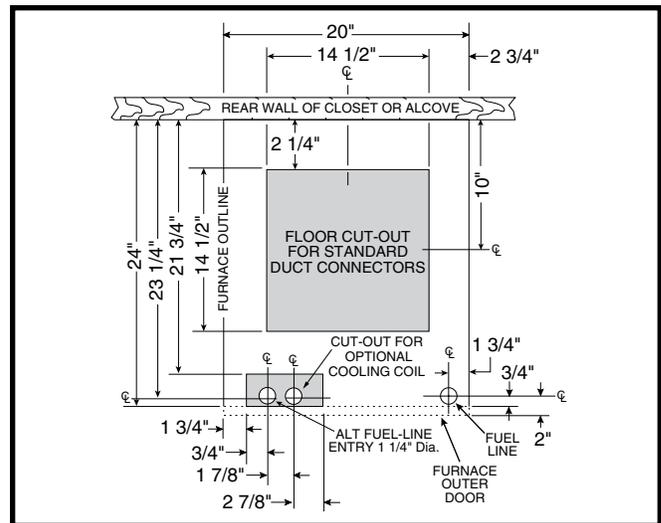


Figure 6. Cut-Out Dimensions for Standard Duct Connectors

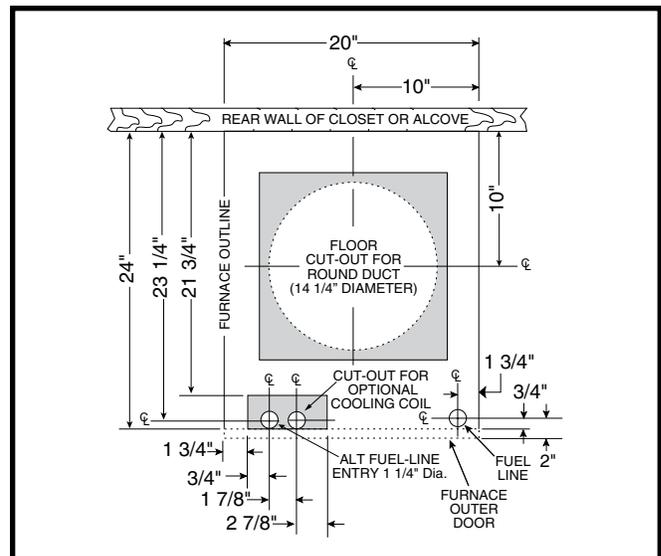


Figure 7. Cut-Out Dimensions for Round Duct Connectors

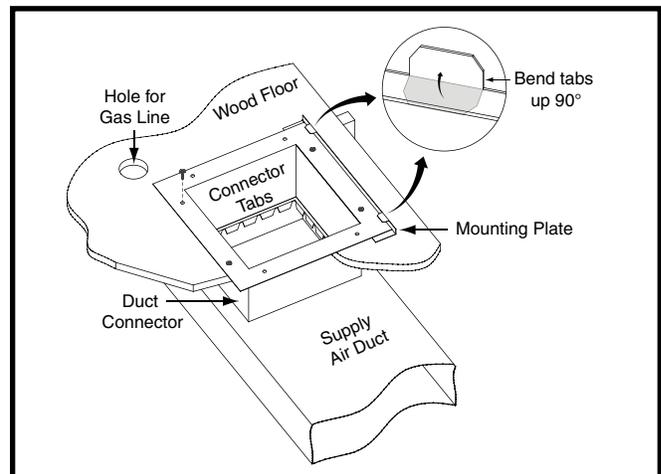


Figure 8. Standard Duct Connector Installed

Figure 9 (page 9) will determine the correct duct connector.

5. Determine which duct connector to use from Table 3, (page 9).
6. Measure and drill gas hole and cut out for cooling coil (if applicable). See Figure 6 or Figure 7.

Standard Duct Connector Installation

The standard duct connector is designed for use on ducts 12" in width. Ducts narrower than 12" may not allow sufficient clearances for this type of installation. See Alternate Attachment Method section below.

1. Center the duct connector in the floor opening with bottom tabs resting on top of the supply air duct.
2. Mark the cut-out area on the supply air duct by tracing around the connector tabs of the duct connector. See Figure 8 (page 7).
3. Remove the duct connector and cut out the marked area of the supply air duct 1/4" larger the actual cutout drawn.
4. Install the duct connector back in the floor opening with the bottom tabs extending into the supply air duct.
5. Install the mounting plate under the back side of the duct connector as shown in Figure 8. Align the screw holes in both components.
6. Secure the duct connector and the mounting plate to the wood floor with appropriate size screws.
7. Bend the connector tabs on the bottom of the duct connector upwards and as tight as possible against the supply air duct.
8. Bend both tabs up 90° on the mounting plate. See Figure 10 (page 9).
9. Seal all connections with industrial grade sealing tape or liquid sealant.

NOTE: Requirements for sealing ductwork vary from region to region. Consult with local codes for requirements specific to your area.

Alternate Attachment Method

The standard duct connector is designed for use on ducts 12" in width. However if there is insufficient clearance to bend the duct connector tabs, this alternate attachment method may be used.

1. Score and cut the top of the supply air duct as indicated in Option 1 or Option 2. See Figure 11 (page 9).
NOTE: If Option 1 is selected, cut out the metal from the shaded area.
2. Fold the two flaps (Options 1 or 2) up to form the opening for the duct connector.
3. Install the duct connector with the bottom tabs extending into the supply air duct.
4. Bend the tabs on the bottom of the duct connector upwards and as tight as possible against the supply air duct. See Figure 12 (page 9).

5. Form the flaps (Options 1 or 2) up against the duct connector as tight as possible.
6. Secure the duct connector flaps to the supply air duct with staples (3 minimum) or if a 2x block/joist is not provided, use sheet metal screws (2 minimum).

NOTE: The duct connector tabs may be attached to the air duct with sheet metal screws or other suitable fasteners as long as the duct connector and the air duct are securely attached.

7. Seal all connections with industrial grade sealing tape or liquid sealant.

NOTE: Requirements for sealing ductwork vary from region to region. Consult with local codes for requirements specific to your area.

Round Duct Connector Installation

1. Apply a bead of caulking, mastic, or other approved sealant around bottom side of connector.
2. Install and center the duct connector in the floor opening.
3. Install the mounting plate under the back side of the duct connector. See Figure 13 (page 9). **NOTE:** Align the screw holes in both components.
4. Secure the duct connector and the mounting plate to the wood floor with appropriate size screws.
5. Connect the round supply duct to the underside of the duct connector and secure them with field supplied sheet metal screws.
6. Seal all connections with industrial grade sealing tape or liquid sealant.

NOTE: Requirements for sealing ductwork vary from region to region. Consult with local codes for requirements specific to your area.

Installing the Furnace

Sides and back of the furnace may be enclosed by wall framing such as in a closet or alcove. The dimensions of the room or alcove must be able to accommodate the overall size of the furnace shown in Figure 4 (page 5) and the installation clearances outlined on page 4. The furnace shall be appropriately connected to the supply distribution system as shown in Figure 14 (page 9) & Figure 15 (page 9).

1. Remove furnace outer door(s) and bottom fuel line knockout.
2. Place furnace onto duct connector and center with floor opening.
3. Slide onto mounting plate. (Bottom rear slots on furnace should engage with mounting plate tabs.)
4. Secure front with one (1) fastener at each corner. See Figure 14 & Figure 15.

NOTE: Additional fasteners may be used at rear, sides or through door frame, as desired, to secure furnace to closet or alcove framing.

IF FLOOR CAVITY "X" IS:	DUCT CONNECTOR TYPE & PART NUMBER	
	STANDARD DUCT	ROUND DUCT
7/8" / (22)	901987A	904008
2" / (51)	901988A	N/A
4-1/4" / (108)	901989A	904010
6-1/4" / (159)	901990A	904011
8-1/4" / (210)	901991A	904012
10-1/4" / (260)	901992A	904013
12-1/4" / (311)	901993A	904014

NOTE: Dimensions shown as Inches / (Millimeter)

Table 3. Duct Connector Sizes

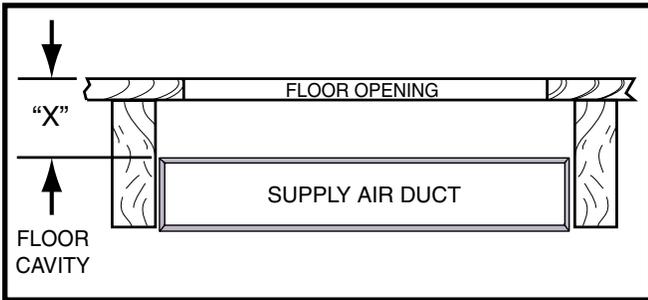


Figure 9. Floor Cavity

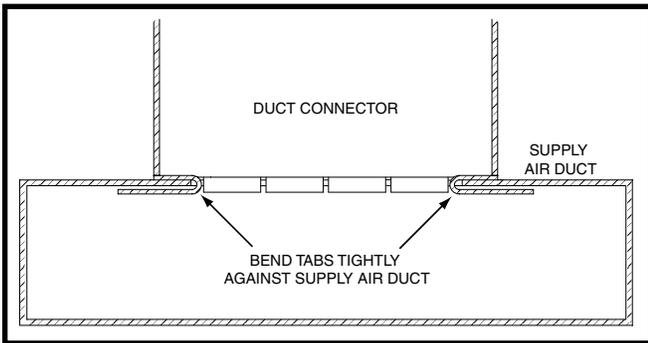


Figure 10. Duct Connector Tabs

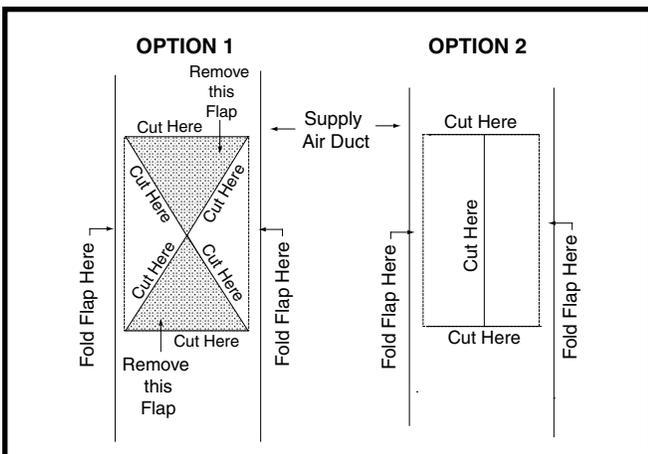


Figure 11. Narrow Air Duct Openings

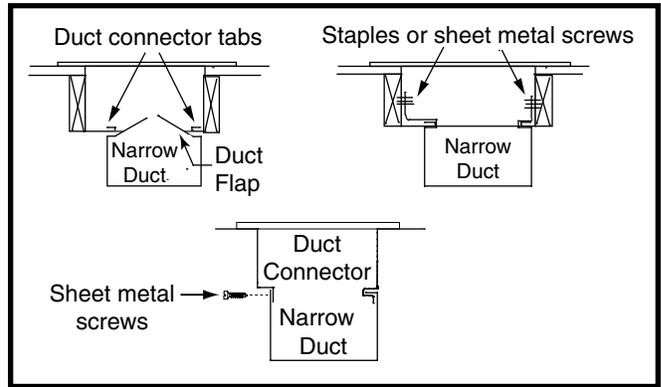


Figure 12. Narrow Ducts

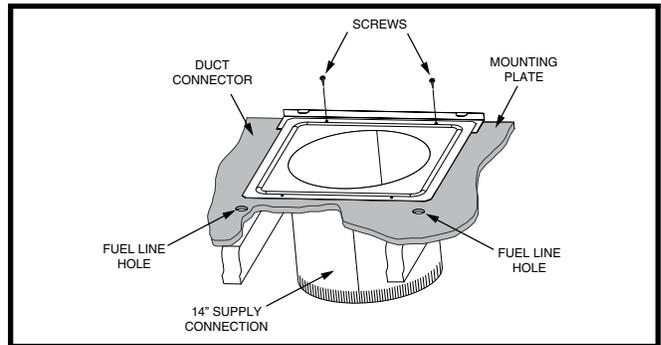


Figure 13. Round Duct Connector Installed

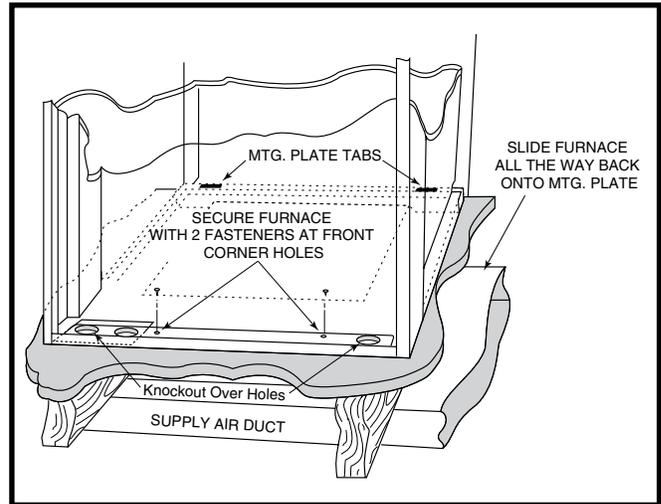


Figure 14. "A" & "B" Cabinet Furnaces

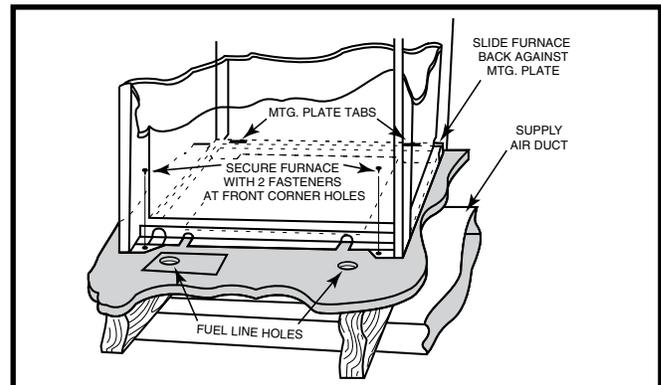


Figure 15. "A" Cabinet Furnace on Coil Cabinet

ROOF JACK INSTALLATION

Required ceiling and roof cut-out openings must be carefully located to avoid misalignment of the furnace and Roof Jack. **NOTE:** Install only roof jack assemblies listed in [Table 4](#), ([page 11](#)) on this heating appliance.

Roof Jack Selection

1. Determine depth of ceiling cavity from center of roof opening to center of ceiling opening noted as "Dimension A" in [Figure 16](#) ([page 11](#)).
2. Determine ceiling height and subtract height of furnace noted as "Dimension B" in [Figure 16](#) ([page 11](#)).
3. Add dimensions "A" & "B" (and X from [Table 5](#), ([page 11](#)) if slant deck flashing is used). The total length of [A] + [B] + [X] must be within the minimum and maximum range of the roof jack listed in [Table 4](#).

Application Notes

- FAW, FAWT, SAW and SAWT series roof jacks with a 5" diameter inner vent pipe may be used with all M5 Series oil furnaces.

F = Flat Flashing: flexes from 0/12 to 1/12 roof slope. See [Figure 17](#) ([page 11](#)).

S = Slant Flashing: 2.5/12 Slope flexes from 1/12 to 4/12 roof slope, 4/12 flexes from 3/12 to 5/12. See [Figure 18](#) ([page 11](#)).

- M5 furnaces may be used with roof jack systems and extension accessories as tall as 170". An internal roof jack extension (p/n 901935 - 10", p/n 903107 - 18") can be used to increase roof jack height. All connections inside the home must be made below the ceiling.
- This furnace must never be connected to a chimney flue servicing a fireplace or other appliance designed to burn solid fuel.
- If the roof jack crown is covered or blocked with snow, the furnace will not operate properly. If the home is located in regions where snow accumulation exceeds 7" (HUD snowload zones) use an external roof jack extension (p/n 901937). A maximum of 2 extensions per roof jacks can be used. Extensions are optional accessories and may be purchased through your distributor.

Locating & Cutting Roof / Ceiling Openings

IMPORTANT NOTE:

Do not allow debris to fall into the furnace. This could cause unsafe operation and void the furnace warranty. Use the top cap that comes with the furnace packaging (or alternate protector) to prevent debris from falling into the furnace before the final roof jack connection is made.

NOTE: Refer to the installation instructions provided with optional air conditioning packages when installing furnaces with optional cooling coil cabinet or with optional C* series indoor coils.

1. Locate center of Roof Jack opening, measure 13 1/2" from the rear wall of closet or alcove along the center line of furnace and floor opening. See [Figure 19](#).
2. Cut ceiling and roof holes:
 - Ceiling = 8 3/4" (222 mm) diameter
 - Roof = 9 3/8" (238 mm) diameter

Installing The Roof Jack

1. Apply caulking compound on underside of roof flashing to form a continuous strip at least 3/8" wide around the underside of the perimeter of the flashing. For flat roof, see [Figure 20](#) or see [Figure 21](#) ([page 12](#)) if roof is pitched.
2. Connect roof jack assembly to the furnace. Insert telescoping roof jack assembly through the opening cut on the roof.
3. Connect inner flue pipe to vent collar of the furnace. See [Figure 22](#) ([page 12](#)).
4. Connect combustion air pipe to furnace collar with sheet metal screw. See [Figure 22](#).

NOTES:

- It is recommended that the connection of the combustion air pipe to the furnace be made before the flashing is secured to the roof to maintain alignment of roof jack and furnace connections.
 - For replacement furnaces, be sure the inner flue pipe connects over the furnace vent collar. **DO NOT use a smaller diameter inner flue pipe which could slide inside the furnace vent collar and restrict the flow of furnace flue products.**
5. Attach roof flashing. If necessary, shift roof flashing slightly in the roof opening so that assembly is in alignment with furnace.
 - NOTE:** If flashing is mounted on 12 degree angle, it may be necessary to adjust the angle to match the roof pitch; (1/12 - 4/12 maximum).
 6. Press down firmly on roof flashing (over caulking) to make the seal with roof water tight.
 7. Secure flashing with appropriate fasteners. **NOTE:** For added protection against leaks, coat the flashing plate and fasteners with approved roofing compound.
 - NOTE:** Upper roof jack crown to be stored in a prominent location inside manufactured home until on-site installation.

Installing Transit-Mode Venting System (Before Home is Moved to Site)

NOTE: For transit purposes, the transit kit (P/N 903838) should be installed before home is moved to site.

1. Furnace must be installed in accordance to furnace installation manual.
2. Select appropriate roof jack from [Table 4](#), ([page 11](#))
3. Roof jack (less upper roof jack crown), with weather cap to be installed as described in Installing The Roof Jack section.
4. Install the four warning tags (factory supplied) on these items:
 - Weather cap
 - Fuel line connection point
 - Furnace flame observation door
 - Furnace wall thermostat

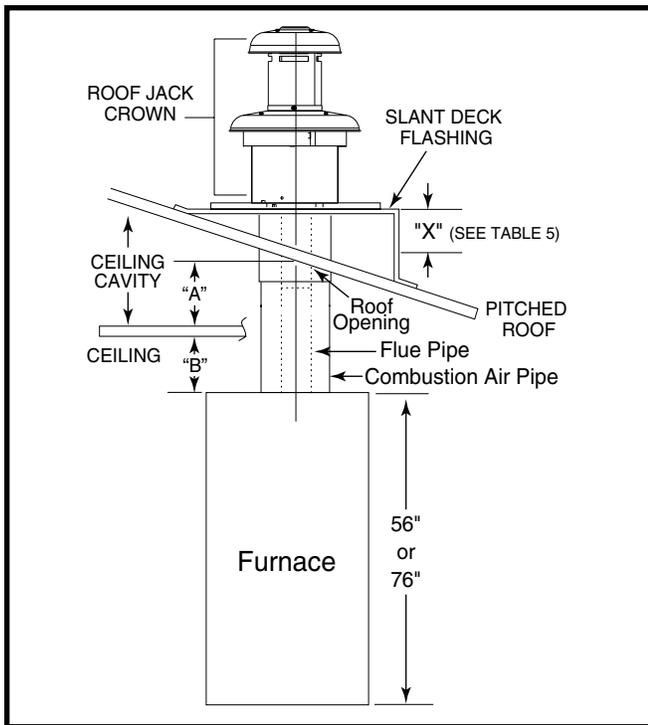


Figure 16. Ceiling Cavity Depth

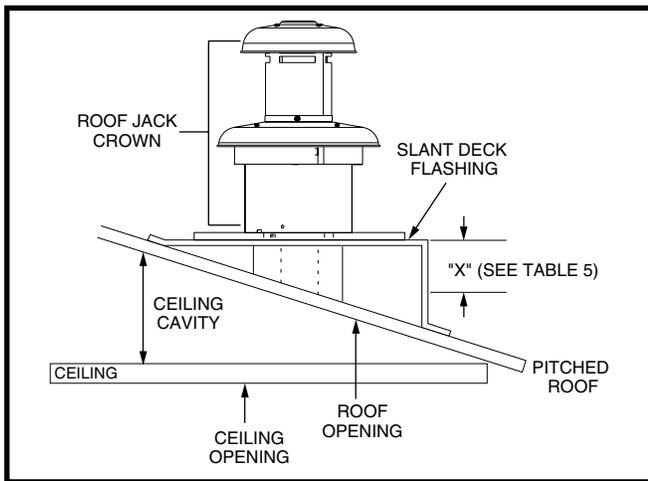


Figure 17. Example of Flat Jack with Flashing

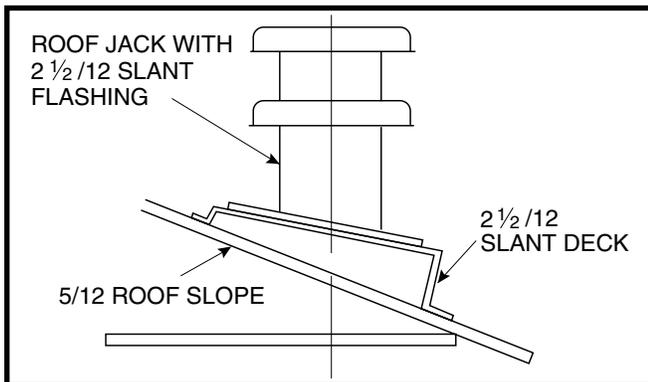


Figure 18. Example of 2 1/2 / 12 Slant Jack with Flashing

MODEL NUMBER	APPROX. LENGTH BELOW FLASHING
(F,S)AW1523-(0,2,4)(A,S)	15" - 23"
(F,S)AW2135-(0,2,4)(A,S)	21" - 35"
(F,S)AW2747-(0,2,4)(A,S)	27" - 47"
(F,S)AW3563-(0,2,4)(A,S)	35" - 63"
(F,S)AW5195-(0,2,4)(A,S)	51" - 95"

NOTE: Not all models are available. Check with your local distributor for available models.

S **AW** **27** **47** **-2** **S**
MIN. ADJ. LENGTH

F = FLAT FLASHING
 S = SLANT FLASHING
 AW= ALL WEATHER

FLUE STEEL TYPE
 A= ALUMINIZED
 S=STAINLESS

FLASHING PITCH/12" RISE
 0=FLAT
 2=2.5/12
 4=4/12

MAX. ADJ. LENGTH

Table 4. Roof Jack Assemblies

ROOF JACK SERIES	IF ROOF PITCH IS:	SLANT DECK FLASHING NUMBER	"X"
"F" Series	2" in 12"	903893 (2.5/12)	2-1/8"
	2-1/2" in 12"	903893 (2.5/12)	2-1/2"
	3" in 12"	903894 (3/12)	2-7/8"
	3-1/2" in 12"	903894 (3/12)	3-1/4"
	4" in 12"	903895 (4/12)	3-5/8"
"S" Series (2.5 / 12 Pitch only)	4-1/2" in 12"	903895 (2.5/12)	2-1/8"
	5" in 12"	903895 (2.5/12)	2-1/2"
	5-1/2" in 12"	903894 (3/12)	2-7/8"
	6" in 12"	903894 (3/12)	3-1/4"
	6-1/2" in 12"	903895 (4/12)	3-5/8"

Optional deck flashings for flat and 2.5/12 pitch roof jacks.
 4/12 pitch roof jacks not applicable.

Table 5. Slant Deck Flashings

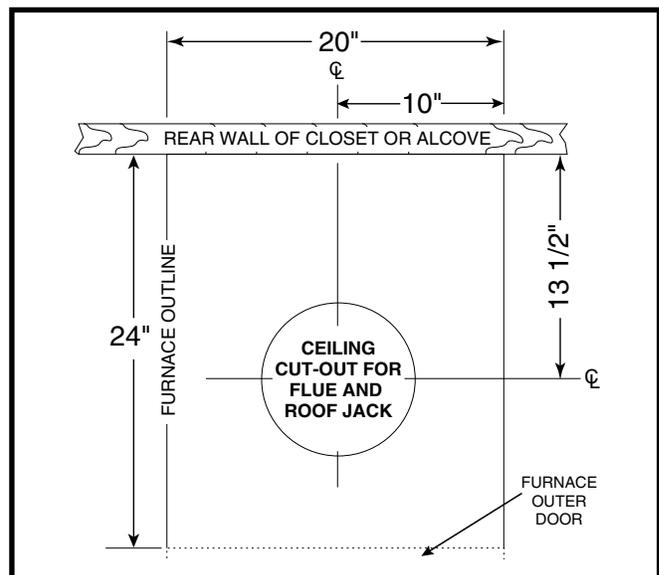


Figure 19. Cut-Out Dimensions for Flue & Roof Jack

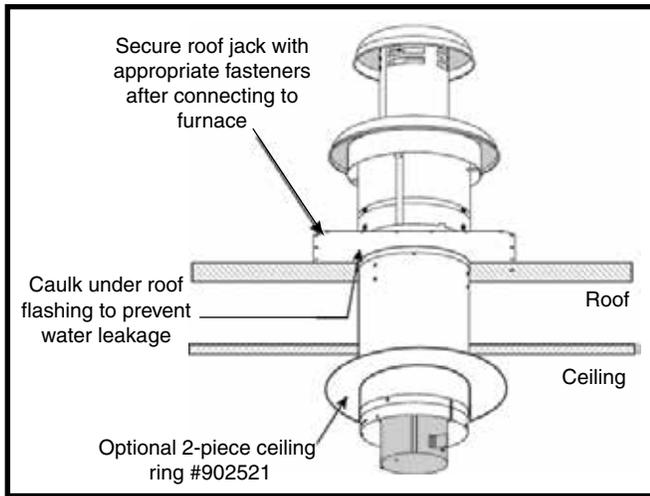


Figure 20. Flat Roof

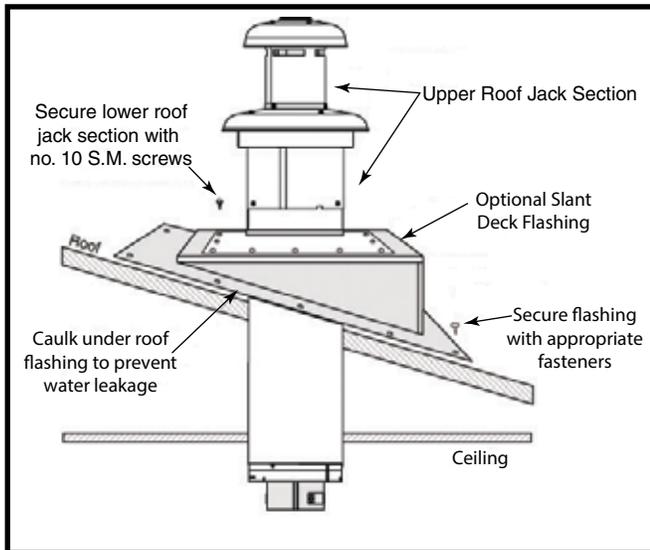


Figure 21. Pitched Roof

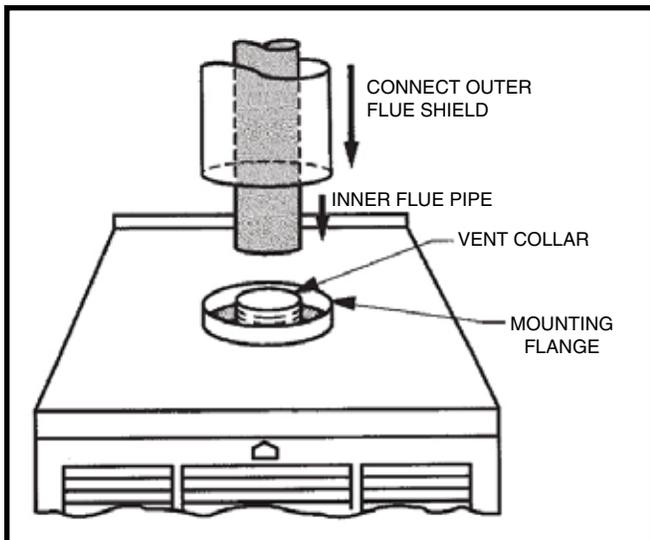


Figure 22. Combustion Air Pipe Connection

Removing the Transit-Mode Venting System (After home is moved to site)

⚠ WARNING:

Failure to properly secure the flue pipe to the furnace may result in fire, explosion or asphyxiation when operating the furnace.

1. Transit-mode weather cap to be removed and upper roof jack crown installed. **Do not discard the screws.** See [Figure 23](#).
2. Place upper roof jack (crown) on the flue pipe assembly.

NOTE: Make sure inside flue pipe attaches over inner flue pipe and outer Roof Jack pipe fits over outer pipe.

3. Secure in place using three sheet metal screws (#10 x 1/2") removed in step 1. Do not use the same holes which secured the rain cap in place.
4. Remove and discard all 4 venting system warning tags.

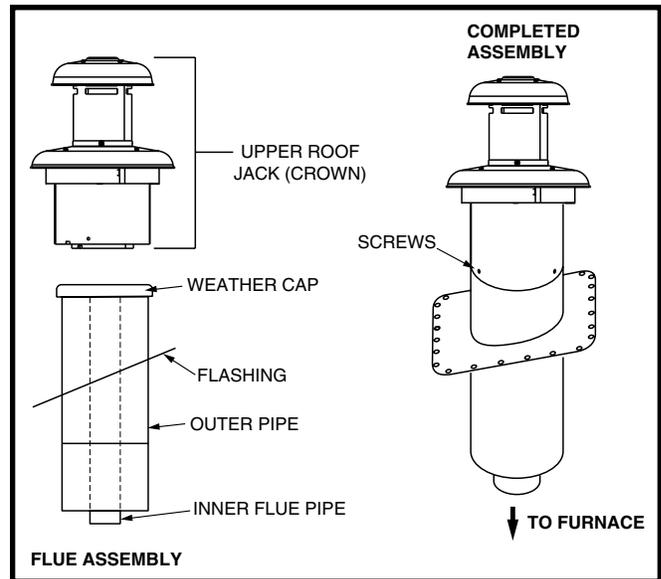


Figure 23. Roof Jack Crown

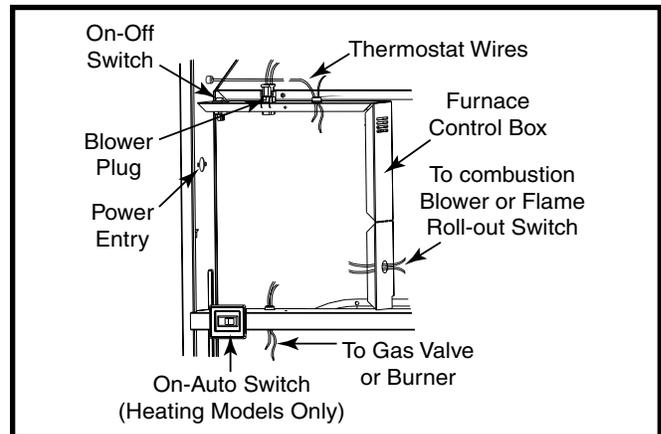


Figure 24. Control Panel (All Models)

ELECTRICAL INFORMATION

WARNING:

ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD

Failure to follow safety warnings exactly could result in serious injury or property damage.

Improper servicing could result in dangerous operation, serious injury, death or property damage.

- **Before servicing, disconnect all electrical power to furnace.**
- **When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.**
- **Verify proper operation after servicing.**

Line Voltage Wiring

WARNING:

To avoid electric shock, personal injury, or death, turn off the electric power at the disconnect or the main service panel before making any electrical connections.

- Electrical connections must be in compliance with all applicable local codes with the current revision of the National Electric Code (ANSI/NFPA 70).
- For Canadian installations the electrical connections and grounding shall comply with the current Canadian Electrical Code (CSA C22.1 and/or local codes).

It is recommended that 115VAC line voltage be supplied to the furnace from a dedicated branch circuit containing the correct fuse or circuit breaker for the furnace as listed in [Table 6, \(page 14\)](#).

CAUTION:

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

IMPORTANT NOTES:

- **Refer to the wiring diagram inside the control box cover or [Figure 31 \(page 22\)](#) for the wiring of your particular unit. Any other wiring methods must be acceptable to authority having jurisdiction.**
- **Proper line voltage polarity must be maintained in order for the control system to operate correctly. Verify the incoming neutral line is connected to the white wire and the incoming “hot” line is connected to the black wire. The furnace will not operate unless the polarity and ground are properly connected as shown in [Figure 25 \(page 14\)](#).**

For installation of A-size Cabinet furnaces, allow sufficient slack in the wiring if an optional cooling coil cabinet is added at a later time. **Use of copper conductors is recommended.**

Connecting Power Supply Wires

1. Remove the furnace control panel cover.
2. Route wires (115 VAC) through the strain relief on the left side of the furnace control box. See [Figure 24 \(page 12\)](#).
3. Connect the **hot** wire to the **black** pigtail lead, and the **neutral** wire to the **white** pigtail lead. Secure all connections with suitable wire nuts.
4. Connect the **ground** wire to the grounding screw.
5. Reinstall the control panel cover and secure with the original mounting screws.

Low Voltage Wiring

- The furnace is designed to be controlled by a 24 VAC thermostat. The thermostat's wiring must comply with the current provisions of the NEC (ANSI/NFPA 70) and with applicable local codes having jurisdiction.
- The thermostat must be installed according to the instructions supplied by the thermostat manufacturer. Low voltage connections (24 VAC) from the thermostat are wired to the terminal strip on the integrated control in the furnace.
- The thermostat should be mounted about 5 feet above the floor on an inside wall. DO NOT install the thermostat on an outside wall or any other location where its operation may be adversely affected by radiant heat from fireplaces, sunlight, or lighting fixtures, and convective heat from warm air registers or electrical appliances. Refer to the thermostat manufacturer's instruction sheet for detailed mounting information.
- The nominal anticipator setting is 0.4. Refer to the thermostat literature for additional information.
- Five-conductor thermostat wire is recommended for 24 volt low-voltage circuit (2-wire is required for furnace only; 5-wire for heating and optional cooling systems). Refer to [Table 6, \(page 14\)](#) for thermostat wire information.

Connecting Thermostat Wires

1. Insert 24 volt wires through the plastic grommet just above the control panel.
2. Connect the thermostat wires to the furnace low voltage pigtails (dependent on the installation application). See [Figure 25 \(page 14\)](#). **NOTE:** To connect an M5 to a thermostat without an **RH & RC** connection, please refer to the wiring diagram and the installation instructions supplied in the kit [P/N 1018453]. Units installed with kit [P/N 1018453] will not use the **RH** connection from the furnace, **RC** on the furnace connects to the thermostat.
3. Connect low-voltage circuit to the wall thermostat.
4. A hole may be made in the furnace cabinet to ease thermostat wiring. Make sure that the wiring is protected from the sharp edge of the added hole.

Verifying Anticipator Setting

After the furnace is installed, check the thermostat anticipator against the nominal setting of 0.4.

1. Connect the milliamp meter in series with one of the gas valve's low voltage terminals.
2. Energize the gas valve.
3. Read the value of the milliamps.
4. Adjust the heat anticipator of the thermostat to the value on the milliamp meter. If the heat anticipator is set too high, the furnace may delay turning on. If set too low, the furnace may cycle frequently and not provide comfort to the homeowner.

Grounding

WARNING:

To minimize personal injury, the furnace cabinet must have an uninterrupted or unbroken electrical ground. The controls used in this furnace require an earth ground to operate properly. Acceptable methods include electrical wire or conduit approved for ground service. Do not use gas piping as an electrical ground!

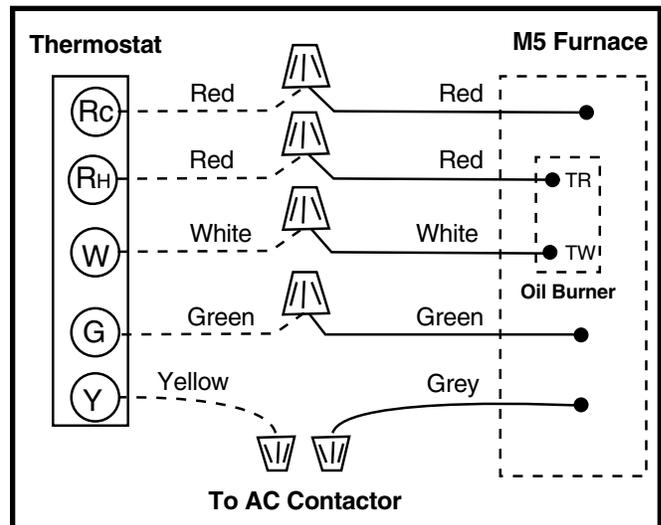


Figure 25. Thermostat Wiring

FURNACE MODEL NUMBER	FURNACE INPUT (BTUH)	CABINET WIDTH (IN.)	NOMINAL ELECTRICAL SUPPLY	MINIMUM OPERATING VOLTAGE	MAXIMUM OPERATING VOLTAGE	MAXIMUM FURNACE AMPERES	MAXIMUM FUSE OR CIRCUIT BREAKER AMPS*	MINIMUM CIRCUIT AMPACITY ¹	MAXIMUM OVERCURRENT PROTECTION ²
M5SB 66	66,000	19 3/4	115-1-60	103	127	10.0	15	11.1	16.1
M5SB 86	86,000	19 3/4	115-1-60	103	127	10.0	15	11.1	16.1
M5SC 66	66,000	19 3/4	115-1-60	103	127	14.0	15	15.3	24.3
M5SC 86	86,000	19 3/4	115-1-60	103	127	14.0	15	15.3	24.3

NOTE: Minimum wire gauge and maximum fuse/circuit breaker amperage are based on MCA¹ and MOP² calculations. This furnace is approved for installation with a 15 or 20 amp fuse/circuit breaker however wiring sizing must adhere to current version of the NEC and/or applicable local codes depending upon the overcurrent protection.

* Time-delay fuses or circuit breakers are required.

THERMOSTAT WIRE GAUGE	RECOMMENDED THERMOSTAT WIRE LENGTH (TOTAL LENGTH)	
	2 - WIRE - HEATING	4 OR 5 WIRE - COOLING
24	55 ft.	25 ft.
22	90 ft.	45 ft.
20	140 ft.	70 ft.
18	225 ft.	110 ft.

Total wire length includes wire from furnace to the thermostat, from thermostat to outdoor unit, & from outdoor unit back to the furnace.

Table 6. Voltage Specifications & Thermostat Wire Gauge

FUEL SUPPLY & PIPING

Flue Gas Sampling

It may be necessary to take flue gas sampling from the oil furnace in order to check the performance after furnace installation. A flue gas sample may be taken from the heat exchanger, which is located behind the hole of the top-front of blower compartment.

1. Turn off all electric power to the appliance.
2. Remove the black plastic cap located above the blower. Do not discard cap.
3. Drill a hole through the top of the blower compartment. **NOTE:** Hole diameter should be same size as sampling tube.
4. Insert sampling tube through the drilled hole and into the heat exchanger.
5. After a complete check and adjustment of furnace performance, seal the drilled hole with a screw larger than the hole. **NOTE:** Seal the screw threads with silicon sealant - rated at least 500° F.
6. Plug the outside hole with the plastic cap removed in step 3.

Oil Tank & Piping Installation

The following procedures are recommended as good practice. However, requirements of local codes and ordinances, H.U.D. Manufactured Home and Safety Standards or National Fire Protection Association must be satisfied, where they apply, for an approved installation.

- Use a tank capacity suitable for the application with a weatherproof, capped fill opening and a shielded vent to let in air as fuel is used.
- The inside of the tank must be clean before filling. All water, rust, sediment, and debris must be flushed out.
- A fuel or tank gauge is recommended for easy checking of the fuel level. Check the gauge reading with a dipstick. See [Figure 26](#).
- Locate the storage tank conveniently near the home. If the fuel tank is installed above ground, the tank may

rest 3 to 4 inches off the ground. Fuel tanks may also be buried if properly coated to resist corrosion. The vertical dimension from the bottom of the fuel tank to the fuel pump must not exceed 10 feet.

- Keep the tank filled, especially in the summer to reduce the accumulation of condensation.

One-Line System

The One-Line System is highly recommended where vertical lift, from bottom of tank to pump, is less than 8 feet. See [Figure 26](#). A single line hookup has the advantage of lower cost and quieter operation.

Two-Line System

If a Two-Line system is used or if oil is taken from the bottom of the tank, a filter is recommended. A Two-Line system should only be used if vertical lift exceeds 8 feet.

1. Install the oil feed line as outlined in steps 1 - 6 below.
2. Install the oil pump bypass plug in the bottom return port.
3. Route the return line up through the furnace base to the return port of the pump. Route the other end of the line to the tank, using 3/8" O.D. copper tubing or 1/4" pipe with the ends capped.
4. Insert the return line through the second opening in the duplex bushing. If the bottom of the tank is lower than the pump intake, the tube should be inserted three or four inches from the tank bottom. If the bottom of the tank is higher than the pump intake, the return line should extend not more than 8" inside the tank.

Fuel line Hook-Up

1. Use a 3/8" O.D. copper tubing for the fuel line. **NOTE:** Cap the end with tape to keep out dirt while the line is being routed.
2. Install duplex bushing for two 3/8" lines in the top fitting of the tank. See [Figure 26](#).
3. Insert one end of the tubing through the duplex bushing until it is three to five inches from the bottom drain. Tighten the bushing.

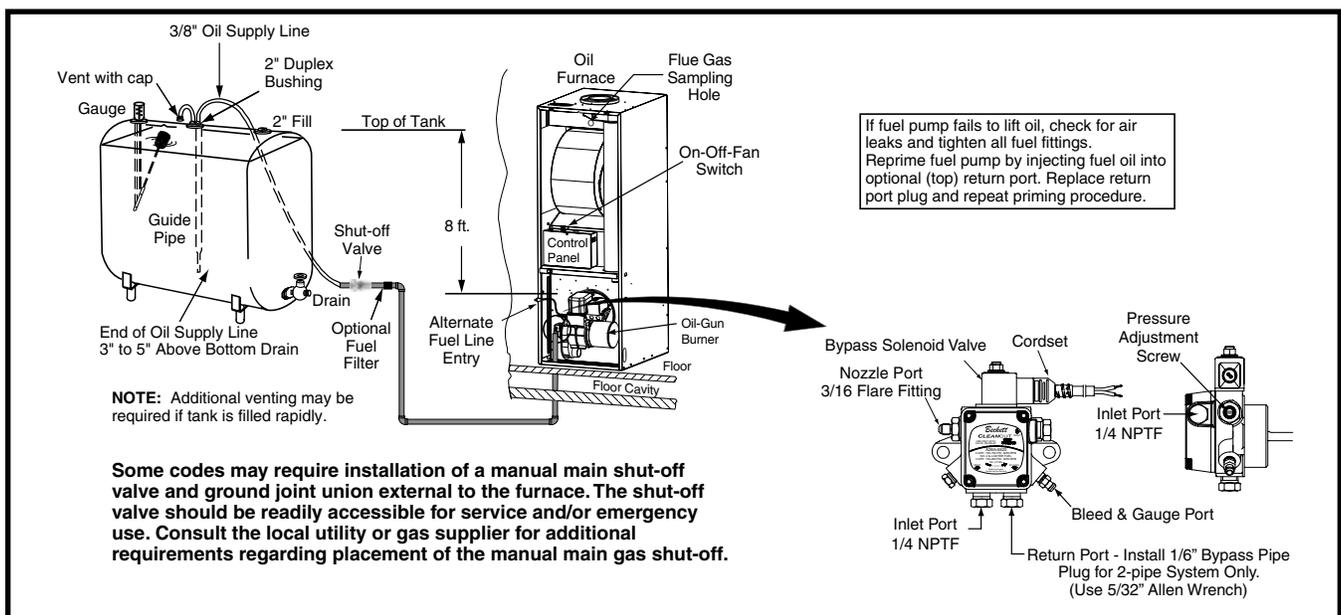


Figure 26. Typical Oil Piping for Above Ground (Single-Line) Supply

4. Route the line where it will not incur any damage. Make bends gradual and avoid kinks which might restrict oil flow.
5. Open the furnace door and connect the oil line to the intake port on the pump. Tighten other port plugs on the pump. **NOTE:** Verify the oil line is airtight! Air leaks can cause the pump to lose prime and will create other problems such as nozzle failure, odors, rumbling noise, and false safety shutdown.
6. Insert the short length of the copper tube level with the bottom of the duplex bushing. Form the tube into an inverted "U" to serve as a vent.

Fuel Line Bleeding

To eliminate problems caused by air in the oil line, all connections in the oil supply line and all plugs, nuts, and fittings on the pump must be airtight. **NOTE:** This includes the nut that covers the pressure adjustment. It is important that the hook-up be done carefully and with a good flaring tool.

Prepare the burner for priming by attaching a clear plastic hose over the bleed port fitting and fully opening the pump bleed port. Use a suitable container to collect purged oil.

To ensure continuous operation, use a wire to jump terminals **T-T** on the primary control while burner is running.

Priming the furnace

1. After the burner starts, press and hold the reset button until the yellow LED turns on (15 seconds). This indicates that the button has been held long enough.
2. Release the reset button. The yellow LED will turn off and the burner will start up again.
3. At burner start up, click the reset button while the igniter is still on. This transitions the control to a dedicated pump prime mode, during which the motor, igniter and valve are powered for 4 minutes. The yellow LED will be on. **NOTE:** If prime is not established during the four minute pump prime mode, repeat step 3 until the oil pump is fully primed.
4. When oil flow is clear and free of air bubbles, close air-bleed valve and tighten. **NOTE:** Air bleed out time will vary depending on length of oil line, number of bends, etc.

Fuel Oil Type

WARNING:

Do not use gasoline, crankcase oil, or any oil containing gasoline. Failure to keep supply of oil clean by various procedures described above may cause failure of certain components such as the fuel pump gears, check valve, shaft seal, or burner nozzle which may result in a burner fire.

Do not use fuel oil heavier than Grade No. 2. In areas where the oil supply is subject to low temperatures, Grade No. 1 may be used.

STARTUP & ADJUSTMENTS

PLEASE READ ALL SAFETY INFORMATION BEFORE OPERATING THE FURNACE

- **The first operation of the furnace after any home setup must be performed by a qualified service technician.**
- Do not use this furnace if any part has been under water. Immediately call a service technician to inspect the furnace and to replace any part of the oil gun or control system which has been under water.

WARNING:

Close the hinged fire door. If door is left open or spring is broken it may allow products of combustion into the living space by the furnace blower, resulting in possible asphyxiation.

Operating Instructions

If your furnace model number begins with M5S*, the furnace is equipped with an ignition device which automatically lights the burner. **Do not try to light this furnace manually.**

1. Open all valves in the oil line.
2. Verify the fire door is closed.
3. Set the furnace On-Off switch to **ON**.
4. Set the thermostat to the desired setting.

NOTE: M5 oil gun furnaces may be converted to gas gun in the field by using the proper conversion kit listed in the Replacement Parts List or Technical Sales Literature.

How to Shut Off Oil Gun Models

1. Set the thermostat to the lowest setting.
2. Turn off all electric power to the appliance at the breaker or fuse box.
3. Set the thermostat MODE switch to **OFF**.

Verifying & Adjusting Temperature Rise

Confirm the temperature rise through the furnace is within the limits specified on the furnace rating plate. Any temperature rise outside the specified limits could result in premature failure of the heat exchanger.

1. Place thermometers in the return and supply air stream as close to the furnace as possible. To avoid false readings, the thermometer on the supply air side must be shielded from direct radiation from the heat exchanger.
2. Adjust all registers and duct dampers to the desired position and run the furnace for 10 to 15 minutes in high fire before taking any temperature readings. The temperature rise is the difference between the supply and return air temperatures.

For typical duct systems, the temperature rise will fall within the limits specified on the rating plate with the blower speed at the factory recommended setting. If the measured temperature rise is outside the specified limits, it may be necessary to change the speed of the blower. **NOTE:** Lowering the blower speed increases the temperature rise and a higher blower speed will decrease the temperature rise.

The furnace is equipped with a multi-speed motor. Refer to the furnace wiring diagram, [Figure 31 \(page 22\)](#) for blower speed selection.

Burner Adjustments

Burner settings are made at the factory. However, these settings may change during shipping, handling, and installation. The following items should be checked and readjusted if necessary.

Combustion Air

CAUTION:

- **Combustion air adjustment must be made only by a qualified technician. Improper air adjustment may cause unsafe operation, explosion and/or fire asphyxiation.**
- **If the input to the furnace is too great because of excessive oil pressure, wrong size nozzle or orifice, etc., the burner flame will be sooty and can produce carbon monoxide, which could result in unsafe operation, explosion and/or fire or asphyxiation.**

In order for the flame to burn efficiently, it must receive adequate combustion air. The amount of combustion air required varies according to altitude, actual BTU content of the fuel, gas pressure, conversion to another gas and other factors. The burner flame should be observed and any necessary adjustments made before the furnace is placed into service. See [Table 7](#) for factory air settings.

It is recommended that the CO₂ and Smoke levels be measured for maximum performance. CO₂ readings should be 10 - 11% for 66,000 Btuh furnaces and 12 - 13% for 86,000 Btuh furnaces. The Smoke should be NO. 0 on the Bacharach Scale, and 0 to 0.02 negative draft over fire.

MODEL	BTUH	OIL
M5	66,000	3.5
M5S	86,000	5

Table 7. Factory Combustion Air Settings

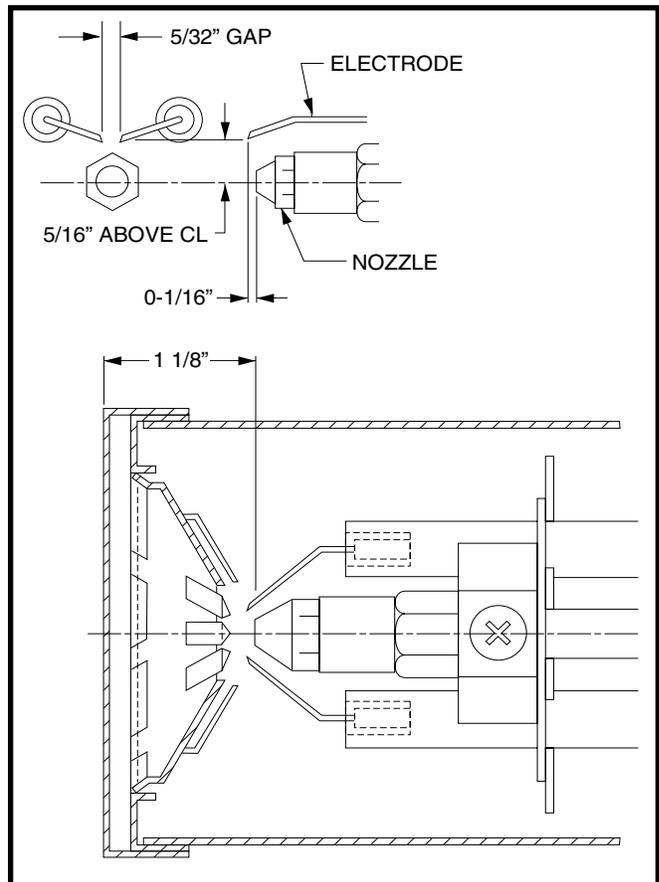


Figure 27. Oil Gun electrode Position

Electrode Setting

Poor ignition of the oil spray may result if the electrodes are not adjusted as shown in [Figure 27](#). Do not permit any electrodes to be grounded to any surface.

Switching Ignition Control between Interrupted and Intermittent Duty

Beckett oil primary controls can be switched between interrupted and intermittent ignition control. To switch from interrupted duty (Factory set) to intermittent duty, remove the blue wire from the quick-connect terminal. Attach the burner motor and igniter wire to the burner motor (orange) control terminal by splicing or adding tab adapters. Seal and isolate any bare wires.

OPERATING SEQUENCE

1. When a call for heat is initiated, there is a 2 to 6 second delay while the control performs a safe start check.
2. The ignition and motor are turned on and a flame should establish within a 15-second lockout time.
NOTE: Burner will prepurge for 15 seconds if equipped with Beckett 7505B control.
3. If flame is not sensed within the 15-second lockout time, the control shuts down on safety lockout and must be manually reset by pushing the reset button on the control. If control locks over three times in a row, the control enters restricted lockout. To reset, hold down the reset button for 15 seconds until the **red** LED turns off and the **yellow** LED turns on.

WARNING:

If furnace still doesn't light, turn the furnace off as described above and call your technician. In the event of flashback or explosion, immediately shut off furnace and call your service technician.

4. After flame is established, the ignition remains on for 10 seconds to ensure flame stability. It then turns off.
5. The circulating air blower will energize after the temperature fan switch closes.
6. The furnace runs until the call for heat is satisfied.
7. The circulating air blower will de-energize when the temperature fan switch opens.

TROUBLESHOOTING

Burner does not start with a call for heat

- Check the electrical supply to furnace.
- Verify the furnace door switch is in the **ON** position. See [Figure 28 \(page 19\)](#).
- Check for line voltage (115 VAC) at the oil primary control.
- Check indicator LED with burner off, no call for heat (no flame). See [Table 9](#).
 - If green LED indicator is on, the cad cell is seeing stray light or the cad cell of controller is defective.
 - If green LED indicator is off, go immediately to step 5.
 - If LED indicator is flashing (red or green on Beckett 7505 control), refer to the next step 1 below - Reset primary control.
- Jumper **T** to **T** terminals on primary control.
 - If burner starts, check thermostat or limit wiring connections.
 - If burner does not start, turn off power. Check all wiring connections.
 - If burner does not start, replace primary control.

Burner starts & then locks out on safety and the red LED flashes

1. Reset primary control: To reset the control from (soft) lockout, the **RED** button needs only to be pressed and released. If the control is in restricted mode, press and hold the **RED** button in for 15 seconds until the red LED turns off and the yellow LED turns on.

LED FLASHES (OHMS)	CAD CELL RESISTANCE
1	0-400
2	400-800
3	800-1600
4	>1600

Table 8. Cad Cell Resistance when sensing flame

BECKETT 7505 CONTROL		
LED INDICATOR	CONTINUOUSLY ON	FLASHING
Red	Restricted (hard) lockout	Soft lockout
Green	Cad cell is sensing flame - (could be flame or stray light)	Recycle
Yellow	Pump prime mode or reset button currently held for 15+ sec.	N/A

Table 9. Control Module Status Indicators

- NOTE:** Restricted Lockout: If the control locks out three times in a row without a complete heat cycle between attempts, the lockout becomes a restricted (hard) lockout.
2. If the LED indicator stops flashing and the ignition remains off, the primary control could be defective. If line voltage is present at the igniter terminals, and there is no ignition, the igniter is likely defective and needs to be replaced.
 3. If the stops flashing, burner turns on, but the control locks out again, check the cad cell. See [Table 8](#). If the cad cell is operational, replace the primary control.
 4. If the LED continues to flash at the interval listed above, verify that the control is not in restricted mode. If in restricted mode, reset it. If not in restricted mode, replace the control.
 5. If the green LED stays off while the flame is on, check the cad cell sighting for view of the flame.
 6. If the burner locks out, check the cad cell resistance. See [Table 8](#).
 7. If the burner stays running, the system is operational.
 8. If the green LED is off, check the cad cell assembly after disconnecting the line voltage.

Burner will not start and the green LED flashes

- Hold the reset button down for 1 - 2 seconds. If LED indicator continues to flash, wait for 60 - 70 seconds. If it still continues to flash, replace the primary control.
- To check cad cell resistance, unplug the cad cell leads (yellow wires) from the control. Measure the resistance with a meter in the conventional way (when a flame is present). For proper burner operation, it is important that the cad cell resistance is under 1,600 Ohms.

FURNACE CONTROLS & FUNCTIONS

Furnace On / Off Switch: This switch turns electrical power to the furnace on and off. The switch must be set in the ON position for the furnace to operate. If blower operation is not desired, the furnace On-Off switch may be set in the Off position to cut the electrical power to the furnace. See [Figure 28](#).

Limit Control: This furnace is protected by two high temperature safety limit switches. The auxiliary (upper) limit switch and the high temperature (lower) limit switch are automatic reset types. If either limit trips, the burner will shut off. If either limit switch trips off again soon after resetting, set the furnace On-Off switch to the Off position and call your authorized serviceman. See [Figure 28](#).

Blower Off Delay: When the blower fan operates under cooling mode, there is a 40 second delay after the call for cooling (from the thermostat) is satisfied before the blower turns off.

Oil Burner Primary Control: The primary control for oil gun furnaces starts the burner, monitors a safe operating cycle, and shuts the burner off at the end of a heating cycle. The control uses a light sensing transducer to determine if fuel ignition has been successfully attained. If ignition is not attained by the end of the safety ignition timing period, the control shuts the burner off and enters "lock-out." See [Figure 28](#).

Summer Cooling - (B & C Series): The unit is equipped to use a 4-wire thermostat. When using a 5-wire thermostat, RC and RH should be jumped. See instructions included with thermostat. A burner isolation kit is available for purchase.

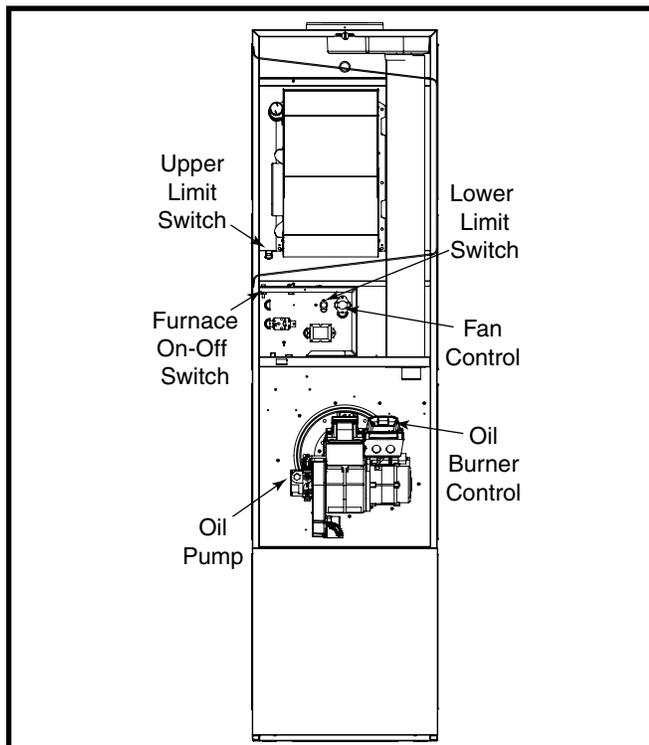


Figure 28. Furnace Controls - Oil Furnace

MAINTENANCE

Installer Information

All furnaces need periodic service at the beginning of each heating season. Call your qualified service contractor for these items:

- Remove the air circulator and clean all dust and lint from the unit with a stiff bristle brush.
- Inspect the combustion chamber blower compartment, flue collar and Roof Jack.
- Check fuel line connections for leaks.
- Make any adjustments necessary for good operation.

WARNING:

Use of furnace or air conditioning components that are not included in the certification of this appliance may create a hazard, invalidate the certification, and in many states, make installations illegal. Listed air conditioning components are specified on the furnace label.

Additional Oil Furnace Maintenance

In addition to the preceding, the following should be performed by a qualified service contractor at least once each season for oil-fired furnaces:

- Replace the oil nozzle with the type nozzle specified for this furnace.
- Clean, adjust and replace if necessary the spark electrodes.
- Reset the nozzle/drawer assembly to factory specifications.
- Clean the inside of the furnace heat exchanger and replace the combustion liner if necessary.
- Clean or replace the oil filter element at the oil tank.
- Adjust the burner for top efficiency and check to make sure all fittings are leak-tight.

OPTIONAL ACCESSORIES

Necessary when the furnace is used with packaged air conditioners

If an air conditioner is installed that does not use the furnace blower for air distribution and operates independently of the furnace, the thermostat system must have an interlock to prevent the furnace and air conditioner from operating at the same time. This interlock system usually contains either a "Heat-Cool" switch which must be turned to one of the positions to activate heat or cool operation, or a positive "OFF" switch on the cooling thermostat.

The furnace must also be equipped with an automatic damper to prevent cold air from being discharged up around the heat exchanger (p/n 901996 for furnaces without coil cavity, or p/n 901083 with coil cavity). See [Figure 29](#) or [Figure 30](#). Cold air may cause condensation inside the heat exchanger which can rust and lead to early failure.

Optional Add-On Air Conditioning

Whether split system or single package, an energy-saving air conditioner is available that has been designed specifically for manufactured housing applications and can best handle your home comfort needs. Ask your dealer or contractor about add-on central air conditioning systems.

Single package unit includes cooling coils, compressor, and vertical discharge fan. This type of unit connects with the existing home air duct system (an optional close-off damper is required with the furnace).

Split system unit with vertical discharge for quiet operation connects with cooling coil furnace (optional coil cavity required with "A" model furnaces).

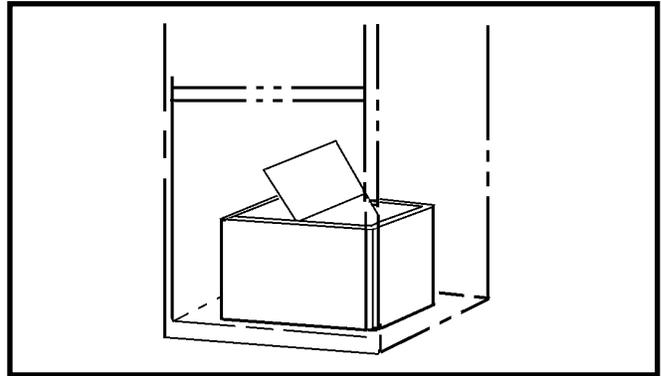


Figure 29. Coil Cavity Damper

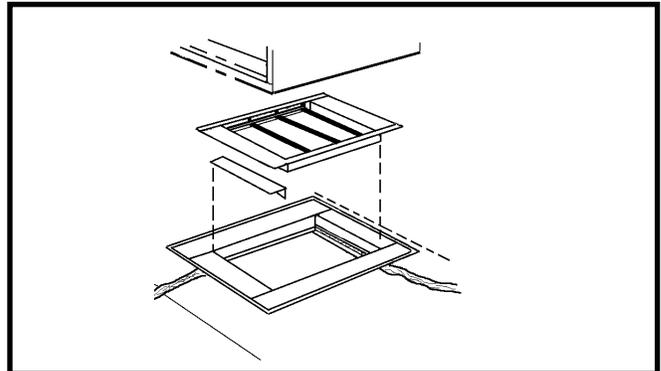


Figure 30. Without Coil Cavity

FIGURES & TABLES

FURNACE MODEL #	INPUT MBTU/H	OUTPUT MBTU/H	E.S.P. IN WC	OIL NOZZLE	IGNITOR DIRECT	COMB. BLOWER	MOTOR HP	A/C READY TONS
M5SB 066	66	56	0.3	.50 Gph	Y	Burner Model: AF-10	1/4	3
M5SC 066	66	56	0.3	.50 Gph	Y		1/2	4
M5SB 086	86	73	0.3	.65 Gph	Y	Spray Angle: 80° A	1/4	3
M5SC 086	86	73	0.3	.65 Gph	Y		1/2	4

- NOTES:**
- Electrical Supply: 120 volts, 60HZ, 1 Ph. Fuse or Breaker - 15 amps
 - Temperature Rise: 45° F to 75° F
 - Thermostat Circuit: 24 volts, 60HZ, 30 vac
 - Normal Anticipator Setting: 0.4
 - Oil Pressure: 100 psi

Table 10. M5 Furnace Specifications and Factory Settings

M5*B MODELS & FOR USE WITH BLOWER KIT NO. 903773 1/4 HP 3 SPEED					
FURNACE INPUT	HEATING SPEED SETTING	COOLING SPEED/ EVAP COIL			
		2 TON	2-1/2 TON	3 TON	
086	H	L	M	H	
066	M	L	M	H	

M5*C MODELS & FOR USE WITH BLOWER KIT NO. 903413 1/2 HP 4 SPEED					
FURNACE INPUT	HEATING SPEED SETTING	COOLING SPEED/ EVAP COIL			
		2 TON	2-1/2 TON & 3 TON	3-1/2 TON	4 TON
086	ML	L	ML	MH	H
066	L	L	ML	MH	H

M5 MODELS WITH BLOWER KIT NO. 903890 3/4 HP 4 SPEED					
FURNACE INPUT	HEATING SPEED SETTING	COOLING SPEED/ EVAP COIL			
		2 TON	2-1/2 TON & 3 TON	3-1/2 TON & 4 TON	5 TON
086	ML	L	ML	MH	H
066	L	L	ML	MH	H

Table 11. A/C Blower Speed Selection Chart

WIRING DIAGRAM

M5S Furnace Series

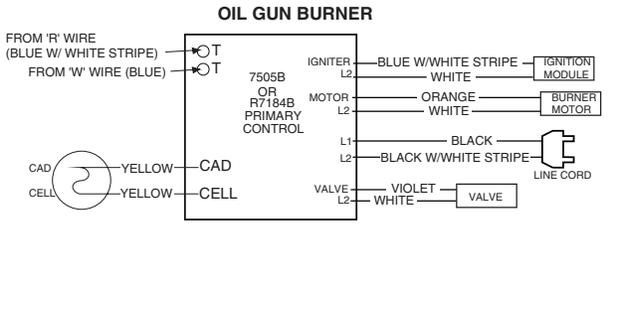
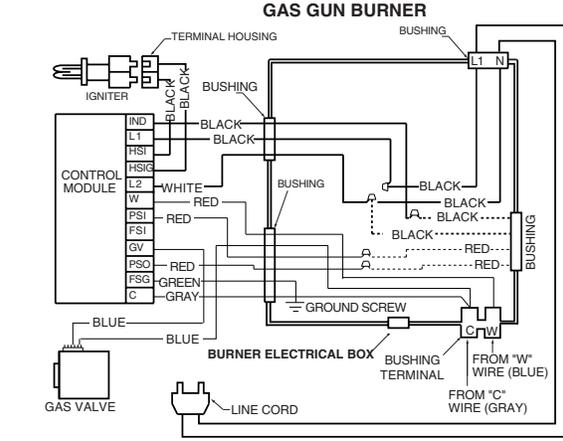
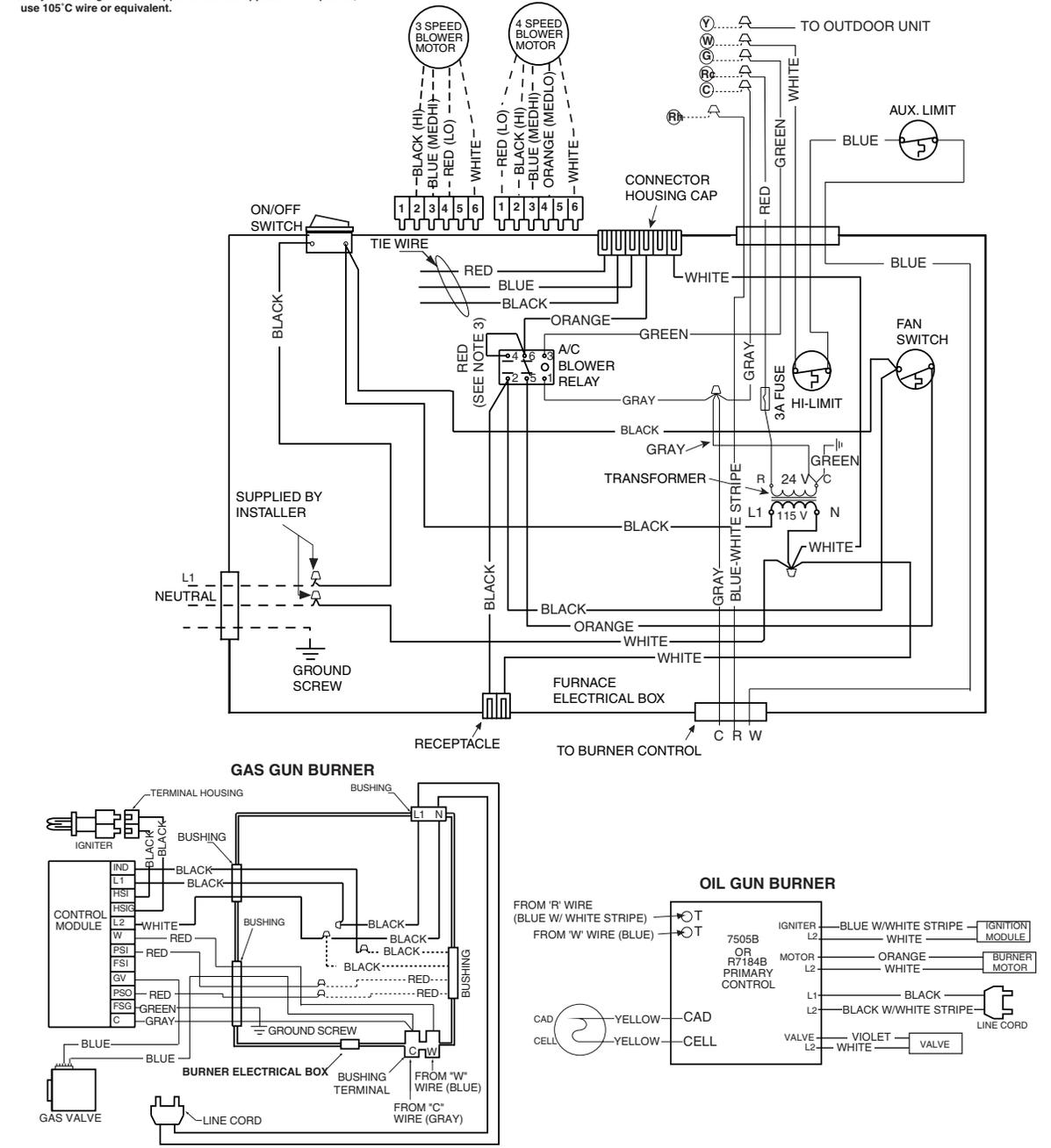
120 Volt

Single Phase / 60 Hz

NOTES:

- Incoming power must be polarized. Observe color coding. (See furnace data label for electrical information.)
- If any of the original wires (as supplied with the appliance) must be replaced, use 105°C Thermoplastic type wire or its equivalent.
- On models M5S 086 jumper wire is installed. On all other models, cooling speed is connected to black wire.
- A/C Heating Speeds: Refer to Table 12, A/C Blower Selection
- If any of the original wire supplied with the appliance is replaced, use 105°C wire or equivalent.

- Use copper conductors only.
- Flash Codes: Refer to Table 9, Control Module Status Indicators.
- For M5 installations paired with thermostats without RH and RC connections, please refer to the wiring diagram and the installation instructions supplied in the kit [P/N 1018453]. NOTE: For units with kit [P/N 1018453], the RH terminal on the furnace is not used; RC on the furnace connects to the thermostat.



1018721A
(Replaces 10187210)
05/18

Figure 31. M5S Wiring Diagram (A/C Ready)

INSTALLATION CHECKLIST

ATTENTION INSTALLERS:

It is your responsibility to know this product better than your customer. This includes being able to install the product according to strict safety guidelines and instructing the customer on how to operate and maintain the equipment for the life of the product. Safety should always be the deciding factor when installing this product and using common sense plays an important role as well. Pay attention to all safety warnings and any other special notes highlighted in the manual. Improper installation of the furnace or failure to follow safety warnings could result in serious injury, death, or property damage.

These instructions are primarily intended to assist qualified individuals experienced in the proper installation of this appliance. Some local codes require licensed installation/service personnel for this type of equipment. Please read all instructions carefully before starting the installation. Return these instructions to the customer's package for future reference.

INSTALLATION ADDRESS:

CITY:	STATE:	
UNIT MODEL #		
UNIT SERIAL #		
Unit Installed Minimum clearances per Table 1 , (page 5)?	YES	NO

INSTALLER NAME:

CITY:	STATE:	
Has the owner's information been reviewed with the customer?	YES	NO
Has the Literature Package been left with the unit?	YES	NO

PROPOSITION 65 WARNING:

WARNING: This product contains chemicals known to the state of California to cause cancer.

WARNING: This product contains chemicals known to the state of California to cause birth defects or other reproductive harm.

ELECTRICAL SYSTEM

Electrical connections tight?	YES	NO
Line voltage polarity correct?	YES	NO
Supply Voltage	VOLTS:	
Has the thermostat been calibrated?	YES	NO
Is the thermostat level?	YES	NO
Is the heat anticipator setting correct?	YES	NO

GAS SYSTEM

Oil Type: (circle one)	NO. 1	NO. 2
Oil line connection leak-tested?	YES	NO
Number of pipes connected to pump	1	2
Oil line pressure	(PSI)	
Furnace Input:	(BTUH)	
Supply Air Temperature	(° F)	
Return Air Temperature	(° F)	
Temperature Rise	(° F)	

COMBUSTION AIR & VENTING SYSTEM

Is there adequate fresh air supply for combustion & ventilation?	YES	NO
Vent free from restrictions?	YES	NO
Filter(s) secured in place?	YES	NO
Filter(s) clean?	YES	NO
Flue connections tight?	YES	NO
Is there proper draft?	YES	NO



1018704A
 (Replaces 10187040)