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LITERATURE NUMBER MPD 33940

hydro flame™

8500-IV Series Furnace

**MODELS 8516, 8520, 8525,
8531, 8535**

Technical Installation Manual

•Installation •Maintenance
 Effective 9/1/03

ENGLISH, FRANCAIS (et Canada)

THIS INSTRUCTION MANUAL IS FOR USE BY AN AUTHORIZED SERVICE TECHNICIAN TO INSTALL AN ATWOOD - *hydro flame™* FURNACE.

TO THE INSTALLER:
 THESE INSTRUCTIONS MUST BE SUPPLIED WITH THE FURNACE TO THE CONSUMER. PLEASE RETAIN THESE INSTRUCTIONS FOR FURTHER REFERENCE.

This furnace design has been certified for installation in recreation vehicles as a MSP Category III furnace. Follow this installation instruction to insure safe operation of the furnace. Failure to install furnace according to this installation instruction nullifies the furnace warranty.

SAFETY ALERT SYMBOLS

Safety Symbols alerting you to potential personal safety hazards. Obey all safety messages following these symbols.



WARNING
 avoid possible injury or death



CAUTION
 avoid possible injury and/or property damage



WARNING
 FIRE OR EXPLOSION

• If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

FOR YOUR SAFETY



WARNING
 FIRE OR EXPLOSION

**WHAT TO DO
 IF YOU SMELL GAS**

- Evacuate ALL persons from vehicle.
- Shut off gas supply at gas container or source.
- DO NOT touch any electrical switch, or use any phone or radio in vehicle.
- DO NOT start vehicle's engine or electric generator.
- Contact nearest gas supplier or qualified Service Technician for repairs.
- If you cannot reach a gas supplier or qualified Service Technician, contact the nearest fire department.
- DO NOT turn on gas supply until gas leak(s) has been repaired. Installation and service must be performed by a qualified Service Technician, Service Center or gas supplier.

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SPECIFICATIONS						(W.C. = Water Column)
MODEL #	8516-IV	8520-IV	8525-IV	8531-IV	8535-IV	
BTU Input	16,000	20,000	25,000	30,000	34,000	
Duct Static Pressure	20" W.C.*	10" W.C.*	10" W.C.*	10" W.C.*	10" W.C.*	
12 Volt Amperage (AMPS)	4.6	4.6	7.6	7.6	9.8	
Watts	55	55	91	91	118	
Power Supply (VOLT DC)	12	12	12	12	12	
Recommended Return Air	80 in ²	80 in ²	80 in ²	80 in ²	80 in ²	
MINIMUM RETURN AIR	65 in²	65 in²	65 in²	65 in²	65 in²	
DIMENSIONS						WEIGHT
ALL MODELS	WIDTH	HEIGHT	DEPTH			
Casing	16-1/2"	7-3/8"	18"	FURNACE		30 lbs
Door	19-1/4"	9-1/4"	1/4"	SHIPPING		32 lbs
Recess Bezel	20-9/16"	11-1/2"				

**MINIMUM CLEARANCE TO
FLOORBOARDS, WALLS & SIMILAR COMBUSTIBLE BUILDING MATERIALS***

MUST BE PROVIDED THE FULL LENGTH AND WIDTH OF UNIT


HORIZONTAL	TOP AND SIDES -----1/2"	REAR --1"	BOTTOM --3/16"
VERTICAL	TOP AND SIDES -----1/2"	REAR --1"	BOTTOM -----0"(SLIDE PLATE)

Spacing of 1/4" to ducting within 3 feet of furnace must be provided unless UL listed wire bound vinyl ducts are used. All ducting material should be rated for continuous use at 200°F.

NOTE: Clearances are specifically for plywood or similar building materials surrounding furnace (i.e. furnace should NOT be located under furniture or in closet space where clothing or other material could be located.)

NOTE: Furnace efficiency rating is a thermal rating determined under continuous operating conditions, independent of any installation. Efficiency rate is given at 77% minimum, actual efficiency rating may be higher.

*When furnaces are installed to minimum clearances, an additional 16 in² of return air must be provided to blower side of furnace, or a 2" clearance the full length and height on blower side must be maintained.

 **WARNING**
CARBON MONOXIDE POISONING


- Furnace must be installed and vented to these instructions.
- Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage.
- Improper installation location may cause furnace to produce negative pressure, affecting combustion air or venting of other appliances.

 **CRITICAL INSTALLATION WARNINGS**

- DO NOT install furnace on material that restricts return air, like carpet or any soft material such as vinyl.
- DO NOT install furnace where clearance to combustibles cannot be maintained.
- DO NOT modify furnace in any way.
- DO NOT alter furnace for a positive grounding system.
- DO NOT HI-POT furnace unless electronic ignition system (circuit board) has been disconnected.
- DO NOT use battery charger to supply power to DC model furnace even when testing.
- DO NOT use 120 volt AC current with DC models.
- DO NOT use furnace cabinet area as a storage compartment.
- DO NOT vent furnace with venting system serving another appliance.
- DO NOT vent furnace to an outside enclosed porch area.
- DO NOT use for temporary heating of buildings or structures under construction.
- Protect building materials from degrading from flue gas exhaust.
- Protect furnace electrical components from water.

- USA AND CANADA - FOLLOW ALL APPLICABLE STATE AND LOCAL CODES - IN THE ABSENCE OF LOCAL CODES OR REGULATIONS, REFER TO CURRENT STANDARDS OF:**
- Recreation Vehicles ANSI A119.2/NFPA 501C.
 - National Fuel Gas Code ANSI Z223.1 and/or CAN/CGA B149 Installation Codes
 - Federal Mobile Home Construction & Safety Standard, Title 24 CFR, part 3280, or when this Standard is not applicable, the Standard for Manufactured Home Installations (Manufactured Home Sites, Communities and Set-Ups), ANSI A255.1 and/or CAN/CSA-Z240 MH Series, Mobile Homes.
 - Ground-National Electrical Code ANSI/NFPA No. 70 and/or CSA C22.1
 - Park Trailers ANSI 119.5

NOTE: The direct high voltage spark ignition generates a radio frequency that could cause interference with other microprocessor based equipment. Locate equipment at least five feet (5') from furnace location. If this distance cannot be maintained, purchase MPD 37773 (a shielded high voltage lead).

 **WARNING**
CARBON MONOXIDE POISONING

- Properly seal door, adjust draft cap (OR ON MODELS WITHOUT DOOR) install vent assembly) to prevent carbon monoxide from entering coach.
- DO NOT draw combustion air from living area. DO NOT vent exhaust air into the living area or an enclosed porch.

Return air is supplied through openings in furnace casing. All return air passages must be kept clear for furnace to function properly. Refer to **MINIMUM CLEARANCE TO FLOORBOARDS, WALLS & SIMILAR COMBUSTIBLE BUILDING MATERIAL**. The total unobstructed return air opening size(s) must NOT BE LESS than specified in SPECIFICATIONS - **MINIMUM RETURN AIR**. Failure to meet minimum return air requirements nullifies furnace warranty.

STANDARD FURNACE INSTALLATION

General Installation - LOCATION

- Install furnace through an exterior wall.
- DO NOT install furnace near tilt-out rooms, slide-outs, doors or other projections that could obstruct furnace exhaust.
- Locate furnace near midpoint of coach for single furnace applications.
- DO NOT install vent in areas where projections or door openings come within 6" of vent tube opening.
- DO NOT install furnace in an area where wires, pipes, or other objects will interfere with installation or operation of furnace.
- It is not recommended to install furnace on material that restricts return air, such as directly on carpet, or soft material (like vinyl).
- If you must install furnace on carpet or soft material, install furnace on cleats, or on a wood or metal panel extending the full width and depth of furnace plus minimum clearances to combustibles.
- DO NOT use petroleum or citrus type cleaners on plastic parts, as damage may occur.


WALL CUTOUT OPTIONS

RECOMMENDED WALL THICKNESS 1-1/2" to 2-1/2"

DO NOT OVERSIZE HOLE - OVERSIZING CAN RESULT IN WATER LEAKAGE

EXTERIOR WALL CUTOUT	A	B	C
HORIZONTAL (FIG 1)	17"	7-1/2"	19"
VERTICAL (FIG 2)	7-1/2"	17"	19"
RECESS BEZEL (FIG 1)	19-1/2"	10"	*

*RECESS BEZEL: To cut rounded corners: with radius blocks 2-1/8" radius without radius blocks a 45° angle

 **CAUTION**
PERSONAL INJURY

- DO NOT allow furnace tabs to protrude through side wall cutout opening during installation process until door is installed and tabs are bent over. Tabs have sharp edges.

ALL OPTIONS: Place furnace in cavity. DO NOT have tabs protrude outside exterior wall until door is ready to be installed.

DUCTING (FIG 4-7)

Proper duct installation is critical to operation of furnace. When installing ducts, use materials rated for continuous use at 200°F.

HORIZONTAL INSTALLION - USING SIDE DUCT OPTIONS - must have a minimum of one duct from both left and right side of casing.

Required Minimum Discharge - (also see STATIC PRESSURE TEST)

MODELS	REQUIRED DISCHARGE
8516-IV, 8520-IV	24in ²
8525-IV & 8531-IV	36in ²
8535-IV	48in ²
ALL MODELS - TOP OR BOTTOM DISCHARGE SYSTEMS.....	48in ²
8525-IV, 8531-IV, 8535-IV VERTICAL INSTALLATION	48in ²

(EXCEPT WHEN USING THE THREE REAR DUCT OPENINGS OR MODELS WITHOUT DOOR)

- See **MINIMUM CLEARANCE TO FLOORBOARDS, WALLS & SIMILAR COMBUSTIBLE BUILDING MATERIALS.**
- Each 4-inch duct opening provides 12 in² of discharge area. Provide an extra 12 in² of non closeable duct discharge area for each closeable register used.
- Use of 2" ducts does not count toward achieving minimum discharge requirements. Ducting in dead air space with no return air, such as holding tank areas, does not count toward achieving minimum discharge requirements.
- Adjust ducting installation to obtain air rise of 100°F-130°F.

Flexible Ducting Systems

When designing Flexible Duct Systems:

- avoid sharp bends or crushed ducts
 - stretch all ducts and run them directly to outlets, keeping quantity and angles of bends to a minimum
1. Remove knockout plates from desired outlets.
 2. Attach a duct adapter to each opening, by inserting flange over casing, locking the tab into casing slot and turning adapter 90°.
 3. Attach and secure **FOUR-INCH** flexible ducts to adapters.
 4. Run ducts to desired location within RV, secure to registers.
 5. Additional ducting may be needed to maintain correct static pressure.

Hard Ducting Floor Systems

When designing Hard Ducting Systems:

- undersize ducting will cause high temperature limiting
- oversize ducting will cause inadequate air flow from registers
- when hard ducting is 1-1/2" in depth, an additional flex duct may be needed to maintain installation static requirements
- DO NOT install floor registers within 2 feet of return air openings.

OPTIONAL INSTALLATION - BOTTOM/TOP DISCHARGE (FIG 5)

1. Remove bottom/top discharge cover plate. This ducting option must be connected to a ducting system. FIG 15 #4 -GASKET AND PLENUM PLATE is available when attaching furnace.
2. If cutout is required:

	FLOOR CUTOUT			
BOTTOM DISCHARGE(FIG 5)	A	B	C	D
	8-1/4"	9-1/2"	6-1/4"	1/4"

3. Fasten plenum plate (5-E) over floor cutout. If a gasket and plenum plate are not used, seal furnace to hard duct system making sure seal is air-tight and continue with STEP 5.
4. Position gasket (5-F) on plenum plate.
5. Set furnace on gasket, make sure gasket remains in position.
6. Additional ducting can be used to maintain correct static pressure.

OPTIONAL INSTALLATION - EXTENSION BOX KIT (FIG 6)

FIG 15 #7 Extension Box #7 and FIG 15 #54 Plenum Plate may be used for top or bottom discharge installation. A casing extension box adds 6" of depth to furnace.

1. Remove three knockouts from rear of furnace.
2. If cutout is required:

	FLOOR CUTOUT				
(FIG. 6)	A	B	C	D	E
EXTENSION BOX	18"	1/2"	5"	16"	1/4"

3. Place extension box with foam gasket against furnace, making sure the three openings are enclosed within extension box. With extension box held in place, secure with two 1/2" sheet metal screws.

4. Fasten plenum plate over cutout.
5. Position gasket on plenum plate.
6. Set furnace on gasket, make sure gasket remains in position.
7. Fasten extension box to floor with two 1/2" sheet metal screws.
8. Additional ducting can be used to maintain correct static pressure.

OPTIONAL INSTALLATION - FLEX ADAPTER KIT (FIG. 7)

A flex adapter FIG 15 #26 may be used to provide more flexibility for alignment of discharge opening on hard duct systems. This system can be used on all models installed horizontally or vertically providing ducting from rear of furnace without using side ducts.

1. Remove three knockouts from rear of furnace.
2. If cutout is required, use placement and cutout dimensions for the **EXTENSION BOX (FIG. 6).**
3. Install duct adapters (7-A) in each opening.
4. Place flex adapter plate (7-C) with foam tape against hard ducting, making sure openings line up.
5. With plate held in place, fasten plate to ducting (7-D).
6. Install three duct adapters into flex adapter plate.
7. Attach flexible ducting (7-B) from furnace to flex adapter plate and secure ducting in place.
8. Additional ducting can be used to maintain correct static pressure.

PROPANE GAS CONNECTION (FIG. 1)

1. Connect gas line to brass fitting on right side of furnace. Be sure all male pipe threads, other than flare fittings, are treated with a sealing compound resistant to the action of propane (LP) gas. DO NOT put sealing compound on flare fittings.

WITH DOOR ONLY

- Remove slide plate (1-E) and gas inlet plug (1-F) from furnace.
 - Insert gas line (1-G) through gas inlet plug (DO NOT CUT).
 - Connect gas line through gas inlet plug inside furnace casing immediately ahead of gas control valve.
 - A 1/8" N.P.T. plug is accessible for test gauge connection on gas valve assembly.
2. A 3/8" flared fitting connection is provided at gas control valve inlet for gas supply connection to furnace. The gas supply line of the furnace must be of adequate size to provide 11" W.C. gas pressure. This pressure must be maintained under maximum flow conditions with all gas appliances in operation.
 3. Use two wrenches to hold brass fitting and flare nut when tightening gas line to brass fitting. DO NOT twist valve assembly (FIG. 8).

ELECTRICAL CONNECTION (FIG. 14)

⚠ WARNING	
INJURY OR PROPERTY DAMAGE	
<ul style="list-style-type: none"> • Label all wires before disconnecting for servicing. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing. • Disconnect electrical power before servicing. 	

Conductor Sizing Table - MAX. 10% VOLTAGE DROP - (12 VDC)

GAGE	CURRENT DRAW (AMPS)								
	3	4	5	6	7	8	9	10	15
18	57	43	34	29	25	21	19	17	11
16	87	65	52	43	37	33	29	26	17

CAUTION	
PROPERTY DAMAGE	
<ul style="list-style-type: none"> • This connection is for low-voltage battery or direct current only. Do not connect to 120- or 240- volts AC. 	

This furnace is designed for negative ground 12 volts DC only. Do NOT attempt to alter furnace for a positive ground system or connect the furnace directly to 120 volts AC. Damage to furnace components will occur and warranty will be voided.

Use a minimum of 18 GA wire to minimize voltage drop. Furnace must be installed so electrical components are protected from water. To make electrical connections see wiring diagram FIG. 14.

1. Route wiring to left side of furnace.
2. Connect red wire to positive side of power supply.
3. Connect yellow wire to grounded side of power supply.
4. Connect blue wire marked positive thermostat to + side wire of thermostat using 22-18 GA stranded wire.
5. Connect other blue wire to other thermostat lead using minimum 22-18 GA stranded wire.

For best furnace performance when power supply is from a converter equipped with a charging port, wire converter to furnace parallel with battery. This provides consistent voltage to furnace, increasing component life, filtering power surges and AC spikes.

Each model with door is shipped with a standard field harness connection with 12" wire leads. An optional field harness with a double end is available in bulk FIG 15 #55. This harness contains 12" leads, a four pin housing, and standard six pin housing FIG. 10-F

NOTE: All units are supplied with a power switch which when turned off for servicing will remove power through furnace wiring. Switch must be in ON position for furnace to operate FIG 1-D.

POWER SUPPLY

Atwood Mobile Products highly recommends the use of an electronic (solid state) converter with clean, clear power output. This will assure the life of the electronic controls and motor life could be extended as much as 500% beyond typical linear converter applications.


THERMOSTAT INSTALLATION

The thermostat is very sensitive. **HANDLE WITH CARE AT ALL TIMES.**

Locate thermostat 48" to 54" above floor on an INTERIOR wall away from areas of abnormal heat or cold. EXTERIOR wall location must have a 3/4" spacer between thermostat and exterior wall.

Follow manufacturer's installation instructions provided with thermostat. When thermostat is not supplied, use a thermostat rated for 12 VDC or 24 VDC minimum 1 AMP.

DOOR INSTALLATION (FIG. 9-11)

 WARNING CARBON MONOXIDE POISONING
· Properly seal door to prevent carbon monoxide from entering coach.

HORIZONTAL & VERTICAL INSTALLATION

NOTE: STANDARD DOOR (FIG 10) OR DELUXE DOOR (FIG 9) may be used alone or with optional RECESSED BEZEL (FIG 11).

1. Pull furnace forward until mounting tabs protrude through exterior wall. The edge of control box is flush with coach's outer skin, (VERTICAL - with gas connection on bottom).
2. The door bezel must fit tightly, to prevent water leakage.
3. To prevent moisture from entering inside of coach, apply RTV type sealant to the following areas:

HORIZONTAL & VERTICAL INSTALLATION

- entire mounting surface of door bezel, making sure caulking is tight against inner flange of bezel.
- fill tab slots with caulking after bending tabs over, securing with screws.

VERTICAL INSTALLATION

YOU MUST CAULK -


- around red gas inlet plug (slide plate and casing bottom intersect).
- around back slide plate where it joins metal casing.
- around gas line where it enters gas inlet plug.
- along welded joints of two bottom corners of casing.

4. The inlet plug and slide plate must be in closed position and bezel flange inside of casing. Insert six mounting tabs through slots provided in bezel, bezel must be tight against casing and cutting into RTV sealant on bezel.
5. Bend tabs flush with door bezel, aligning holes in tabs with slots in door bezel.
6. Install 12 mounting screws. Do NOT deform bezel.
7. Remove excess sealant from around door bezel and visually inspect door bezel to make sure it is completely sealed.
8. Secure mounting legs on the back of the unit to floor for horizontal installation. For vertical installation secure legs to a vertical member that is attached to floor. Seal around slide plate, gas plug and joint between control box right side and back wall.

OPTIONAL INSTALLATION - RECESS BEZEL

1. Position and secure mounting brackets to door framing on each side of opening, allowing 5/16" from end of bracket face to outside of coach.
2. Pull furnace forward until edge of control box is flush with recess pan, with mounting tabs protruding through exterior wall.
3. Insert recess bezel and door bezel until furnace tabs go through notches on door bezel. RTV type sealant must be applied to entire back flange of both parts creating a water tight seal. Secure to mounting brackets.
4. Fasten recess bezel and door bezel to brackets with three screws on each side. Do not deform recess bezel or door bezel.
5. Bend tabs over and secure with six screws. Fill tab slots with RTV type sealant after installing furnace.

DRAFT CAP ASSEMBLY (FIG. 12)

 WARNING CARBON MONOXIDE POISONING
· Properly adjust draft cap to prevent carbon monoxide from entering coach.

With wing nut 12-C loose on draft cap assembly, close door 12-A and adjust draft cap 12-D. The draft cap assembly must be pulled out tight against door screen 12-B. Open door 12-A and tighten wing nut 12-C.

OPTIONAL FURNACE INSTALLATION

RECESSED FURNACE - FIG 13 INSERT

Only intake and exhaust portion of furnace is viewed from exterior of coach when furnace is installed.

- Furnace must be removable for service.
- All 65 in² return air should be taken from interior of coach.

Areas to be sealed.

- Coach access door butting against furnace pan cover.
- Bottom edge of cut out section in metal pan cover.
- Draft cap assemblies to be maintained tight against the coach outside compartment doors where intake screens will be mounted.
- INSTALLATION OF DRAFT CAP ASSEMBLY-DO NOT PULL COMPLETELY OUT OF EXHAUST TUBE. Draft Cap assembly must overlap 1.25" inside exhaust tube.

1. Remove four (4) outside tabs located on control box. Leave two (2) center tabs to mount door. Bend these two center tabs toward inside of control box area 90°, as close to control box as possible, to maintain a good seal. Install two fastening clips provided.
2. Install furnace in coach as close to outer compartment door as possible. Furnace must maintain a pressure seal against gasket on screen to prevent flue products and water leakage from entering interior of coach.
3. Connect gas line to right side of furnace. Tighten gas fitting using two wrenches. Attach electrical wiring to left side of furnace. Attach red wire to positive connection and yellow wire to negative. Attach two blue wires to the thermostat wires.

- Secure furnace to coach floor with four screws. LOCATE SCREWS TO AVOID DAMAGE TO ANY WORKING COMPONENTS, WHILE MAINTAINING PRESSURE SEAL AGAINST GASKET ON SCREEN.

CUTOUT

RECOMMENDED WALL THICKNESS 1-1/2" - 2-1/2"

DO NOT OVERSIZE HOLE - OVERSIZING CAN RESULT IN WATER LEAKAGE

EXTERIOR WALL CUTOUT	A	B
RECESS FURNACE(FIG 13)	4-3/4"	5"

- Place recess cover over top of furnace with all edges of door outside of control box. Hold firmly into place while using holes in door to locate mounting tabs and clips. Use #8 or #10 sheet metal screws to fasten door in place.

Follow STANDARD FURNACE INSTALLATION instructions for ducting, thermostat and draft cap assembly.

SYSTEM CHECKS



WARNING
FIRE OR EXPLOSION

- Never check for leaks with an open flame.

PROPANE GAS PRESSURE TEST

The furnace and any individual shut-off valve must be disconnected from gas supply piping system during any pressure testing of system at test pressures of more than 1/2 PSI.

Before furnace is connected piping systems must be tested to be leak free. The test must maintain air pressure of at least 6" of mercury or 3 PSI for at least 10 minutes.

The entire piping system must be maintained within a range of 10-14" W.C. when all appliances are in operation. Test gas connections for leakage with a leak test solution.

STATIC PRESSURE TEST (FIG. 1)

Please refer to Engineering Addendum when installing the furnace. This will provide you with allowable maximum case static pressures with each possible variation of duct configurations. The addendum is available from your Atwood Field Service Representative or by calling Atwood Service Toll Free.

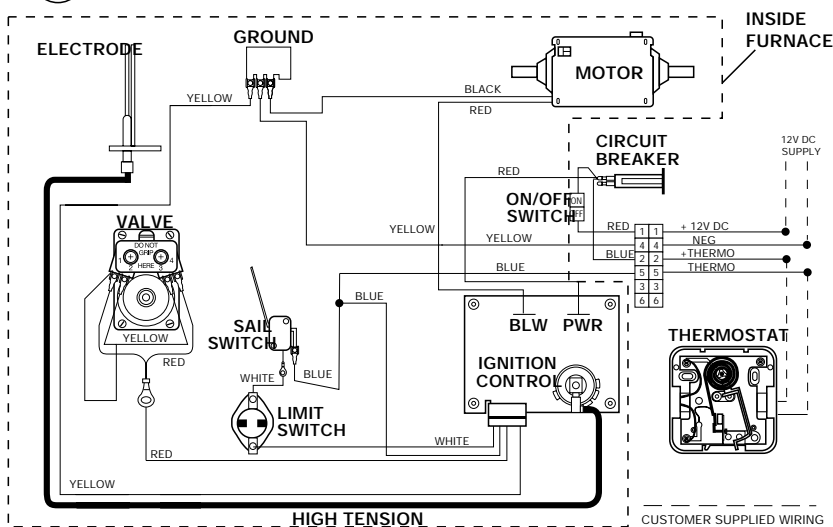
Reducing the number of duct turns and stretching the ducts will increase airflow and reduce static pressure. Adding ducts or increasing the discharge (hard duct) system will also reduce static pressure.

You must follow the manufacturer's recommendations and specifications for optimum performance and proper operation.

DIAGNOSTIC CHART

FAULT	LED INDICATION
Internal Circuit Board Failure	Steady on, no flashing
Limit switch/Airflow problems	1 flash with 3-second pause
Flame Sense Fault	2 flashes with 3-second pause
Ignition Lockout Fault	3 flashes with 3-second pause

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Note: On/OFF Switch may be separate or combined with Circuit Breaker.

IMPORTANT: If any original wire has to be replaced, it must be replaced with type 105° C or its equivalent. Terminal Block on 85 Models only.

