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**LITERATURE NUMBER MPD 34468**

**hydro flame™**

**8500-IV**

**Two Stage Series Furnace**  
**MODELS 1522, 2334**

**Technical Installation Manual**

Patent No US 6,464,000 Other Patents Pending

**ENGLISH, FRANCAIS** (et Canada)

**•Installation •Maintenance**

Effective 4/1/03

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.

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

<b>WARNING</b> avoid possible injury or death	<b>CAUTION</b> avoid possible injury and/or property damage
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**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.

MODEL	1522		2334	
	LOW	HIGH	LOW	HIGH
BTU Input	15,000	22,000	23,000	34,000
Duct Static Pressure	.10" W.C.	.10" W.C.	.10" W.C.	.10" W.C.
12 Volt Amperage (AMPS)	4.8	10.2	5.0	11.2
Watts	58	122	60	134
Power Supply (VOLT DC)	12	12	12	12
Recommended Return Air	80 in <sup>2</sup>	80 in <sup>2</sup>	80 in <sup>2</sup>	80 in <sup>2</sup>
<b>MINIMUM RETURN AIR</b>	<b>65 in<sup>2</sup></b>	<b>65 in<sup>2</sup></b>	<b>65 in<sup>2</sup></b>	<b>65 in<sup>2</sup></b>

(w.c. = WATER COLUMN) When furnaces are installed to minimum clearances, an additional 16 in<sup>2</sup> 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.

DIMENSIONS	WIDTH	HEIGHT	DEPTH	WEIGHT	
				FURNACE	SHIPPING
ALL MODELS					
Casing	16-1/2"	7-3/8"	18"	31 lbs	
Door	19-1/4"	9-1/4"	1/4"	33 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)

NO VERTICAL INSTALLATION ON MODELS WITHOUT DOORS

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 the furnace (i.e. furnace should not be located under furniture or in a 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.



**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 a KIT MPD 37773 (a shielded high voltage lead).



**WARNING  
CARBON MONOXIDE POISONING**

- Properly seal door, adjust draft cap 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.

**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: 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.

**HORIZONTALLY INSTALLED FURNACES - 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**)

<b>MODEL 1522</b>	<b>REQUIRED DISCHARGE</b>	<b>MODEL 2334</b>	<b>REQUIRED DISCHARGE</b>
LOW & HIGH	.....36in <sup>2</sup>	LOW & HIGH	.....48in <sup>2</sup>

- See **MINIMUM CLEARANCE TO FLOORBOARDS, WALLS & SIMILAR COMBUSTIBLE BUILDING MATERIALS.**
- Each 4-inch duct opening provides 12 in<sup>2</sup> of discharge area. Provide an extra 12 in<sup>2</sup> 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 MPD 37745 - GASKET AND PLENUM PLATE KIT is available when attaching furnace.

	<b>FLOOR CUTOUT</b>			
<b>BOTTOM DISCHARGE (FIG 5)</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
	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 (FIG 6)**

FIG 15 Extension Box #7 with Plate #54 - 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:

	<b>FLOOR CUTOUT</b>				
<b>(FIG. 6)</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
<b>EXTENSION BOX</b>	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.
8. Additional ducting can be used to maintain correct static pressure.

**OPTIONAL INSTALLATION - FLEX ADAPTER KIT #26 (FIG. 7)**

A flex adapter kit 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 (7-D) plate to ducting.
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.
  - 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)**

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

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

<b>CURRENT DRAW (AMPS)</b>									
	3	4	5	6	7	8	9	10	15
<b>GAGE</b>	<b>MAX. LENGTH OF SAE CONDUCTOR (IN FEET) FROM SOURCE TO DEVICE</b>								
<b>18</b>	57	43	34	29	25	21	19	17	11
<b>16</b>	87	65	52	43	37	33	29	26	17

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

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 to thermostat using 22-18 GA stranded wire.
5. Connect green wire to the green thermostat lead using min. 22-18 GA stranded wire.

See instruction with thermostat for complete wiring directions.

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 unit ships with a standard field harness connection with 12" wire leads.

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 (MODEL 2H2C)

##### FURNACE - MODEL 1522 & 2334 MUST USE THIS THERMOSTAT

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

Locate thermostat 48" to 54" above floor on an INTERIOR wall. Pick a dry area where air circulation is good. EXTERIOR wall location must have a 3/4" spacer between thermostat and exterior wall.

1. Be sure all electrical power has been disconnected from the air conditioner, furnace and the power supply.
2. Do not install the thermostat where there are unusual heating conditions: such as direct sunlight, heat producing appliances (television, radio, wall lamp, etc.) or a furnace or air conditioner supply register.
3. **ATTACHING THE WALL THERMOSTAT.** Separate the thermostat body from the sub-base by gently squeezing the top and bottom. Pull wires through access hole in base plate. Attach thermostat sub-base to the wall at the desired mounting location. Mount the sub-base to the wall before connecting the wires. See Thermostat instruction attached for complete instruction.

#### 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 9) OR DELUXE DOOR (FIG 10) may be used alone or with 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

- 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 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 (13-E) . 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 in<sup>2</sup> return air must 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.
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 blue and green wires to thermostat as described in electrical connection section.
4. 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"

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 in Furnace Technical Manual.

## SYSTEM CHECKS



### WARNING FIRE OR EXPLOSION

- Never check for leaks with an open flame.

### DIAGNOSTIC CHART

A diagnostic LED is located inside the exterior access cover on the outside edge of the horizontal (2) stage control board. The following graph defines the codes.

NUMBER OF LED FLASHES	DIANOSTIC INFORMATION	LOCKOUT
1	Low Input voltage	SOFT
2	Ignition Failure	SOFT
3	Open High Limit	SOFT
4	Stuck Sail Switch	HARD
5	Module Fault	HARD

NOTE: A SOFT lockout is a condition that is timed and will make additional attempts to correct the problem. A HARD lockout requires reset of the thermostat or turning the power switch off then back on.

### 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.





