



ENGINEERING ADDENDUM

8500-IV Series &
2-Stage (Models 2334 & 1522)
Furnaces

RECOMMENDATIONS AND REQUIREMENTS TO ENHANCE THEIR PERFORMANCE

SUP 10000

EFFECTIVE DATE 1/05/01



A Division of Dura Automotive Systems

1120 North Main Street • Elkhart, IN 46514

PHONE: 574•264•2131 **FAX:** 574•262•2550

INTERNET: <http://www.atwoodmobile.com>

CONTENTS

Definition of Terms	1
Furnace Sizing Recommendations	1
Minimum Discharge Requirements	1
Furnace Dimensions	1
Return Air Requirements	1
Enclosure Recommendations	2
Power Supplies	2
Duct Static Requirements	2
Specifications	3
Clearance to Combustibles	3

DEFINITION OF TERMS

RECOMMENDATION	Manufacturer's suggestions to enhance performance.
REQUIREMENT	Mandatory for safety, operation and product optimization and efficiencies.

FURNACE SIZING

The following methods should be used to determine the proper size furnace to use in the application.

1. **If the unit is 8 ft. wide and has no slide-outs**, use the following formula.

The inside length of the unit times 1000.

EXAMPLE: Unit length is 30 feet $30 \times 1000 = 30,000$ BTU (Required size).

2. **If the unit has slide-outs**, take length times width of the slide-out, add to length times width of unit, times 125.

EXAMPLE: Unit 31 feet long x 8 feet wide and has a slide-out that is 14 feet long x 3 feet wide. $(31 \times 8) + (14 \times 3) = 248 + 42 = 290$ (125) = 36,250 BTU required.

If the unit is wider than 8 ft. or has any slide-outs, use the following formula.

The inside length times width times 125.

EXAMPLE: Unit length is 35 feet, width is 12 feet, $(35 \times 12) \times 125 = 52,500$ BTU.

3. **If below-the-floor area is going to be heated**, it is necessary to consider how much ducting will be dedicated to that area and calculate the required heat input, added to the required living area requirements.

NOTE: In some cases, use of a 34,000 BTU furnace may calculate as adequate, but due to the floor plan and distribution requirements, two 20,000 BTU furnaces could provide better air distribution and more balanced zone heating. Consult your Atwood Field Service Representative for evaluation of new designs and applications.

MINIMUM DISCHARGE REQUIREMENTS

MODELS	DISCHARGE	REQUIREMENT
8516 IV, 8520 IV	24 in. sq.	155 cm. sq.
8525 IV, 8531 IV, 1522	36 in. sq.	232 cm. sq.
8535 IV, 2334	48 in. sq.	310 cm. sq.
ALL MODELS - Top or Bottom Discharge	48 in. sq.	310 cm. sq.
VERTICAL INSTALLATION - 8525, 8531, 8535 IV, 2334, 1522 (except duct openings 3, 4, & 5 see figure)	48 in. sq.	310 cm. sq.

IMPORTANT NOTE: Minimum duct requirements are essential, however long duct runs, turns and outlet diffusers add friction and restrictions to the air distribution system.

Additional ducts may be required if case static pressures do not meet Atwood guidelines. High static conditions can cause the furnace to cycle from the high limit switch rather than the intended thermostat control.

Your Atwood Field Service Representative should be consulted for evaluation of your installation and can make suggestions, which will optimize your application.

FURNACE DIMENSIONS

ALL MODEL	WIDTH	HEIGHT	DEPTH
Casing	16-1/2"	7-3/8"	18"
Door	19-1/4"	9-1/4"	1/4"
Recess Bezel (OPTIONAL)	20-9/16"	11-1/2"	
		MAXIMUM	IDEAL
RECOMMENDED WALL THICKNESS		2-1/2"	1-1/2"

RETURN AIR REQUIREMENTS

Recommended Return Air is 80 in², the minimum required is 65 in² (OPEN).

NOTE: Open area must be calculated precisely with material specifications from the manufacturer.

When furnaces are installed to the minimum clearances, an additional 16 in² is required or a minimum of 2" clearance from the furnace side grille intake.

The recommended minimum distance between return air grille and discharge outlet is 36". There can be exceptions to this rule if the outlet provides high enough velocities and deep penetration of the cabin, eliminating recirculation of the hot air into the furnace intake. Consult your Atwood Field Service Representative for an evaluation.

It is suggested that care be taken to locate the return air grille away from areas where the sound of rushing air can interfere with conversations and audio entertainment equipment.

ENCLOSURE RECOMMENDATIONS

As noted in the Minimum Clearance Chart there are minimum clearances, which are required to avoid potential for ignition of surrounding materials. Conversely, one must avoid over reacting by providing large open enclosures. Bigger is not better in that the larger the cavity in which the furnace is housed, the greater the potential for sound magnification and resonance transmittal.

It is recommended the Engineer avoid excesses when designing the cabinet to house the furnace. Ideally, 2-3" of clearance on the side and top would minimize noise and provide adequate "breathing" room for the recirculating air paths.

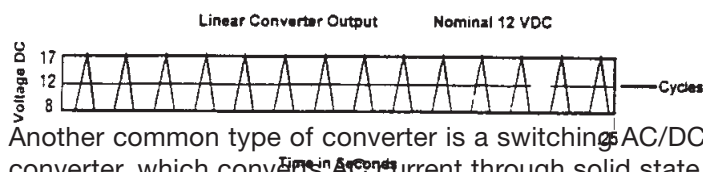
IMPORTANT: Furnace installed in an enclosure below drawers (which could contain combustibles capable of falling onto the furnace) or below a cooking appliance, such as a range, (creating a negative pressure condition) **MUST HAVE A PARTITION ADDED TO COMPLETELY SEAL THE COOKING APPLIANCE FROM THE FURNACE.**

Following the above recommendation will maintain noise levels in line with the design intent. Additional steps can be taken to reduce noise even more such as the addition of sound absorption material. Atwood Mobile Products Engineering can recommend several materials commercially available, should it be deemed necessary to take additional steps to abate noise in unusual circumstances.

POWER SUPPLIES

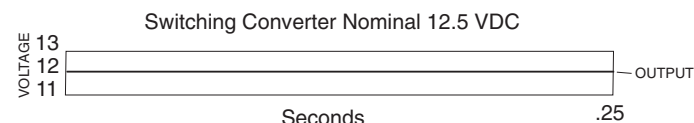
Numerous power supplies are available, all can and will provide a nominal 12 volts of DC power for appliances and lighting needs. The output characteristics however can be significantly different, effecting the performance of electronic equipment, appliances and controls.

The most common type of converter is the linear variety, converting AC current to DC current through a transformer. These converters transfer the alternating waveform to the DC output, effectively starting and stopping the motor in the furnace approximately 120 times a second. Under load, the voltage peaks can range from 8 volts to 17 volts. This "dirty voltage" condition will cause premature failure of the motor, effectively destroying the brushes in the first 20% of the potential life of a motor. The figure below is a depiction of a linear DC output.



Another common type of converter is a switching AC/DC converter, which converts AC current through solid state technology. The output of this type of converter is clean filtered and regulated, regardless of the unstable AC input voltage. The result is a consistent output, free of spikes and surges, and ideal for all of the sensitive

appliances and electronic equipment installed in the vehicle. The figure below is a depiction of a switched, filtered DC output.



RECOMMENDATION

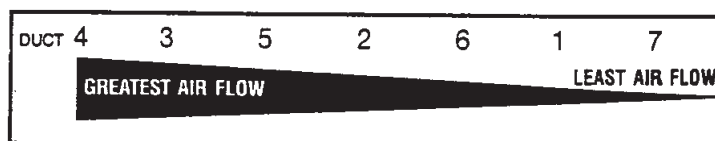
Atwood Mobile Products highly recommends the use of an electronic (solid state) converter with clean, clear power output. This will assure the life of the electronic controls and motor life could be extended as much as 500% beyond typical linear converter applications.

DUCT STATIC REQUIREMENTS

See Minimum Discharge Requirements Chart of this manual. Although these cross-section requirements are minimum, there are some configurations that are less than ideal. It is imperative that the application of the furnace be optimum wherever possible. Should the installation envelope be restrictive, care must be taken to avoid bends and long runs of duct which create increased static conditions and restrict airflow due to internal duct friction.

Some duct openings provided in the furnace plenum were made available for extenuating circumstances and, were they not requested by certain customers, would have not been included. Exceptional effort should be taken to avoid use of these adapter locations. It will be evident which locations are not recommended by the static value at which the system will cycle or "limit". **You will find locations 1 and 7 are not adequate and use of these two adapter ports is not recommended.**

The outlets which provide the greatest amount of air flow and delivery are as follows:



A matrix is shown on the next page providing the limit static values in laboratory conditions. The furnace was installed with minimum clearances in an enclosure and the burner was operating.

Consult your Atwood Field Service Representative for help in establishing and optimizing your installation. He will communicate the installation characteristics to Engineering for verification and evaluation.

SPECIFICATIONS

(*W.C. = Water Column)

MODEL #	8516-IV	8520-IV	8525-IV	8531-IV	8535-IV	2334	2334	1522	1522
						LOW	HIGH	LOW	HIGH
BTU Input	16,000	20,000	25,000	30,000	34,000	23,000	34,000	15,000	22,000
Duct Static Pressure	.20" W.C.*	.10" W.C.*	.10" W.C.*	.10" W.C.*	.10" 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	5.0	11.2	4.8	10.2
Watts	55	55	91	91	118	60	134	58	122
Power Supply (VOLT DC)	12	12	12	12	12	12	12	12	12
Recommended Return Air	80 in ²	80 in ²	80 in ²	80 in ²	80 in ²	80 in ²	80 in ²	80 in ²	80 in ²
MINIMUM RETURN AIR	65 in ²	65 in ²	65 in ²	65 in ²	65 in ²	65 in ²	65 in ²	65 in ²	65 in ²

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

MUST BE PROVIDED THE FULL LENGTH AND WIDTH OF UNIT

TOP AND SIDES -----1/2" REAR -----1" BOTTOM -----3/16"

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.

*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.

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.

8535-IV & 2334			
MAXIMUM CASE STATIC AT			
DUCT CONFIG.	10.5 VDC	12 VDC	13 VDC
3,4,5,7	0.15	0.35	0.40
1,2,6,7	0.15	0.20	0.25
2,3,4,5	0.10	0.15	0.25
3,4,5,6	0.15	0.30	0.40
3,4,5	0.20	0.30	0.35
1,3,4,5	0.10	0.15	0.25
8,9,10,11	0.22	0.40	0.45
TOP	0.35	0.45	0.50
BOTTOM	0.25	0.35	1.45

8531-IV			
MAXIMUM CASE STATIC AT			
DUCT CONFIG.	10.5 VDC	12 VDC	13 VDC
3,4,5	0.20	0.30	0.30
1,2,7	0.20	0.20	0.20
1,2,6	0.20	0.20	0.25
2,6,7	0.20	0.20	0.20
1,6,7	0.20	0.20	0.35
8,9,10	0.20	0.30	0.35
9,10,11	0.20	0.25	0.30
TOP	0.20	0.25	0.35
BOTTOM	0.20	0.25	0.35

8525-IV & 1522			
MAXIMUM CASE STATIC AT			
DUCT CONFIG.	10.5 VDC	12 VDC	13 VDC
1,6,7	0.30	0.40	0.55
8,9,10	0.20	0.40	0.45
9,10,11	0.20	0.40	0.45
3,4,5	0.20	0.40	0.45
1,2,7	0.20	0.30	0.30
1,2,6	0.20	0.30	0.45
2,6,7	0.25	0.40	0.50
TOP	0.30	0.45	0.50
BOTTOM	0.30	0.40	0.50

8520-IV			
MAXIMUM CASE STATIC AT			
DUCT CONFIG.	10.5 VDC	12 VDC	13 VDC
3,5	0.05	0.10	0.15
3,4	0.05	0.10	0.15
4,5	0.15	0.20	0.25
6,7	0.15	0.20	0.25
1,2	0.00	0.00	0.00
1,7	0.20	0.30	0.35
1,6	0.15	0.20	0.25
2,6	0.20	0.30	0.35
2,7	0.15	0.20	0.25
1,3	0.00	0.00	0.00
1,4	0.03	0.05	0.15
1,5	0.03	0.05	0.15
2,3	0.05	0.10	0.15
2,4	0.05	0.10	0.15
2,5	0.15	0.25	0.30
3,6	0.05	0.10	0.15
4,6	0.15	0.30	0.35
5,6	0.15	0.30	0.35
3,7	0.05	0.10	0.15
4,7	0.14	0.30	0.35
5,7	0.15	0.20	0.25
8,9	0.15	0.20	0.25
10,11	0.20	0.25	0.30
8,10	0.20	0.25	0.30
8,11	0.20	0.25	0.30
9,11	0.20	0.25	0.30
9,10	0.20	0.25	0.30

8516-IV			
MAXIMUM CASE STATIC AT			
DUCT CONFIG.	10.5 VDC	12 VDC	13 VDC
1,2	0.00	0.00	0.00
1,7	0.20	0.30	0.35
1,6	0.20	0.30	0.30
2,6	0.20	0.30	0.35
2,7	0.00	0.25	0.30
1,3	0.30	0.00	0.00
1,4	0.10	0.05	0.15
1,5	0.10	0.20	0.30
2,3	0.20	0.15	0.20
2,4	0.20	0.25	0.25
2,5	0.20	0.25	0.30
3,6	0.20	0.30	0.35
4,6	0.20	0.30	0.35
5,6	0.20	0.25	0.35
3,7	0.20	0.30	0.30
4,7	0.20	0.25	0.35
5,7	0.20	0.30	0.35
8,9	0.20	0.30	0.35
10,11	0.20	0.30	0.35
8,10	0.20	0.25	0.35
8,11	0.20	0.30	0.35
9,11	0.20	0.30	0.35
9,10	0.15	0.25	0.30
3,5	0.20	0.30	0.40
3,4	0.15	0.25	0.30
4,5	0.25	0.30	0.40
6,7	0.25	0.30	0.40

