



# SUCCESS WITH Atwood® TRAINING



# SWAAT

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# **Welcome to S.W.A.T**

## **Atwood Furnace Part 1**

- 1. Product Identification**
- 2. Equipment needed**
- 3. Gas Pressure**
- 4. Voltage**
- 5. Tester**
- 6. Installation**

**Presenter:**

**(Picture)**

**Customer Service 866-869-3118**

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# **Welcome to S.W.A.T**

**These classes are to help you troubleshoot our product to reduce time and money to get the customer on the road to their next destination.**

**These classes are training and not a certification program for RVIA hours.**

**If you have questions you can email to [training@atwoodmobile.com](mailto:training@atwoodmobile.com)**

**Next week furnace 2 program will be held February 19<sup>th</sup> so please join us.**

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*"We employ eight certified techs in our dealership. They have helped improve productivity and lower operational costs."*

**Rick Horsey**  
Parkview RV Center

*"We advertise that we employ certified technicians, It helps us explain and justify the rates we charge for labor,"*

**Gary Kraemer**  
Webster City RV

## **Become a Certified RV Service Technician**

Join more than 2,200 of your peers in being recognized for your experience and knowledge. What does becoming a Certified RV Service Technician do for you?

- Signifies your individual knowledge of RV technical service
- Exemplifies your advanced capabilities
- Represents your enhanced credibility
- Showcases your commitment to your customers
- Earns money for you and your dealership, which makes you stand apart from non-certified RV technicians

## **Staying Certified Increases Your Value to Your Dealership and Customers**

By retaining your Certification status you are showing your renewed commitment to your customers and reaffirming your elite knowledge of RV technical service.

## **The Certification Program**



# Tools and Equipment

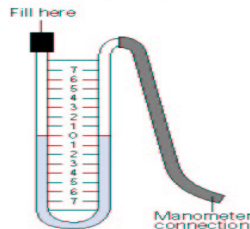
## Recommended Tools and Equipment

**U-Tube Manometer - P/N 34706** - This is the most accurate device for measuring gas pressure. If you use a dial-type manometer, it should be calibrated periodically with this type of manometer.

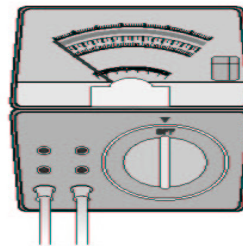
**Slack Tube Manometer - P/N 34880** - A more portable U-Tube Manometer.

**Multi-meter** - This is the most effective meter capable of reading voltage, amperage and continuity. A test light cannot give you specific enough information to trouble-shoot a furnace properly.

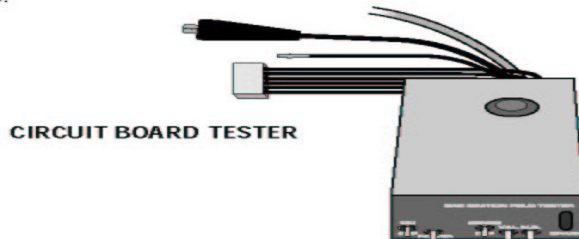
**U-TUBE MANOMETER**  
with 1/8" pipe nipple



**VOLT OHM-AMP METER**



**Circuit Board Tester - P/N 32779** - This is a table top device that will test all furnace circuit boards. It will specifically test the following board functions: power, spark, lamp, sense and valve. It will test Fenwal and Channel circuit boards.



**Air Speed Indicator - P/N 34207** - This hand held device will let you determine air flow out of a heat register. It will help you isolate restricted ducting.

**Incline Manometer - P/N 34208** - This meter measures the static pressure of the furnace cavity. It provides an x-ray of the total heating system. It will indicate if all of the heat being produced by the furnace is being sufficiently distributed out to the heat registers.

**Long-handled Allen Wrenches (9/64" and 1/8")** - These two wrenches are necessary to remove the blower wheel and the combustion wheel.

**Common Hand Tools** - 1/4" nut drivers, open end wrenches, flat blade and Phillips screw drivers.

**Leak Test Solution** - A solution that bubbles when applied to gas fittings or connections showing where a gas leak is present.

**U-Tube manometer**-More accurate than an analog or Digital, Used to calibrate the other two manometers. Used to perform three tests. Drop pressure (8 inches W.C. for 3 min.), Flow regulation (11to 14 inches W.C. at 50% demand at main manifold.), and Lock – out (14 inches W. C.). Stress importance of gas pressure to furnace more than any other gas appliance because of BTU demand.

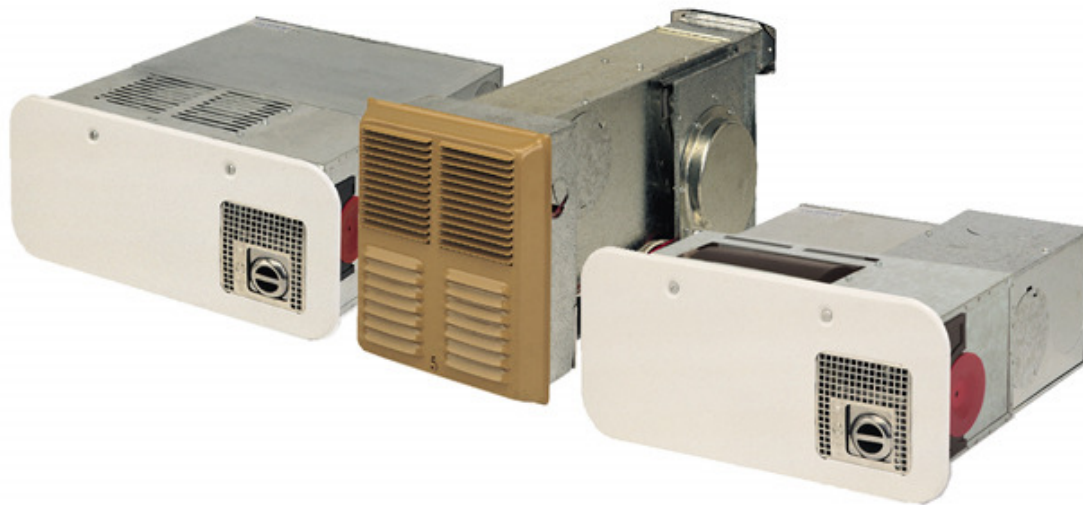
### Gas Pressure

**Multi meter**-Explain the method of doing Volts, Ohms, and Amps test. Also explain Series and Parallel circuits. Explain the importance of the meter giving you the amount of voltage and a test light not telling you how much volts are there, but how the test lights loads the circuit.

**Circuit board tester**-Explain how the board tester test will test all three phases of the board (Spark, Gas valve opening, and Sense.)

# How an RV Furnace Works

All RV furnaces are designed on the concept of sealed combustion with two blower wheels.



1. **Room air wheel**-This pulls air from the inside of the RV and blows it over the outside of the heat chamber to wipe the heat from the chamber to force into the duct system to distribute it throughout the RV.
2. **Combustion air wheel**-Pulls the air from the outside of the RV and blows it into the chamber in to the burner to mix the gas for combustion and then blows the combustion air out the exhaust.
3. All the furnaces work the same just different shapes and sizes.

# Sizing Furnace

How to determine the proper size furnace for the size of the RV (1000 BTU per liner foot plus slide outs, basements and under belly area.

**8900  
Series**



**7900  
Series**



**8500  
Series**





## 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.

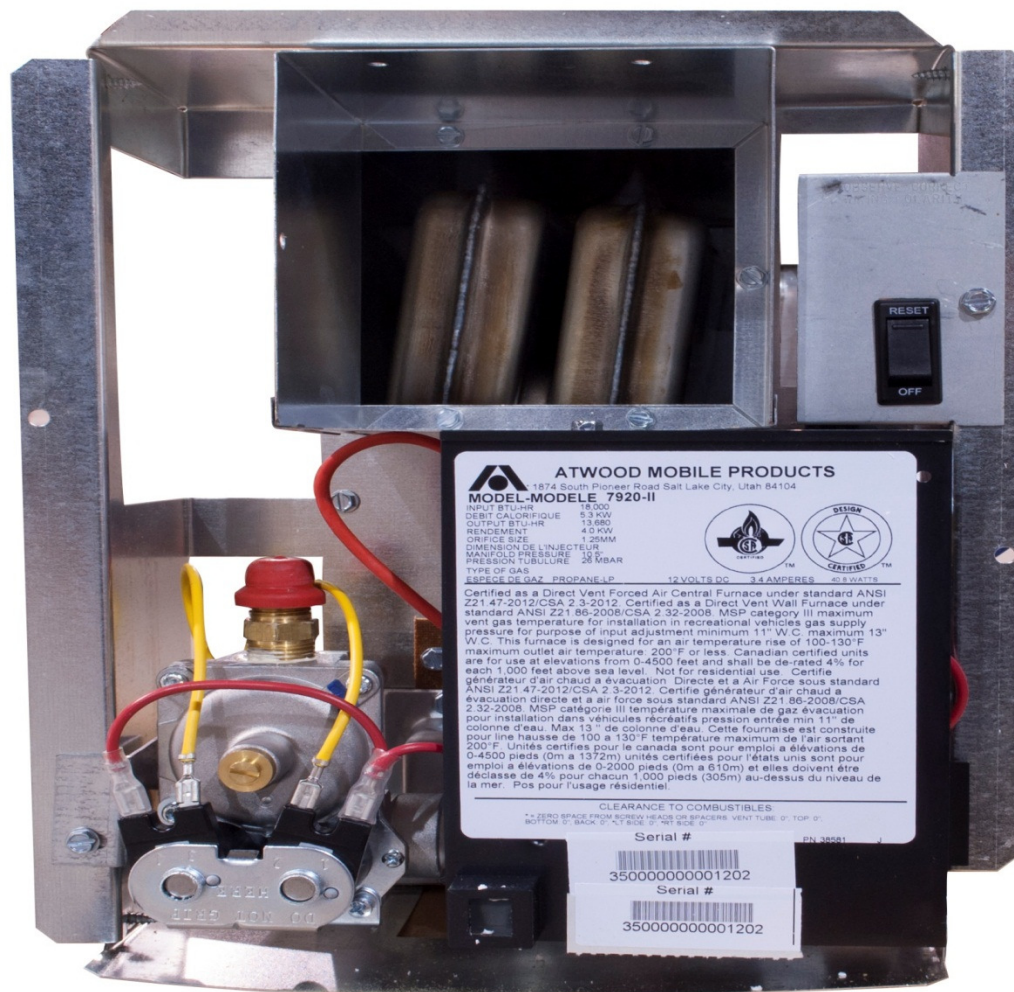
If the unit is wider than 8 ft. or has any slide-outs, use the following formula.

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.

# 7900 Series Direct Discharge

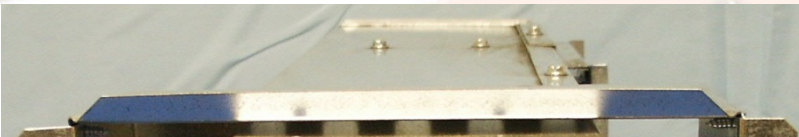
## BTU 12K, 16K, 20K



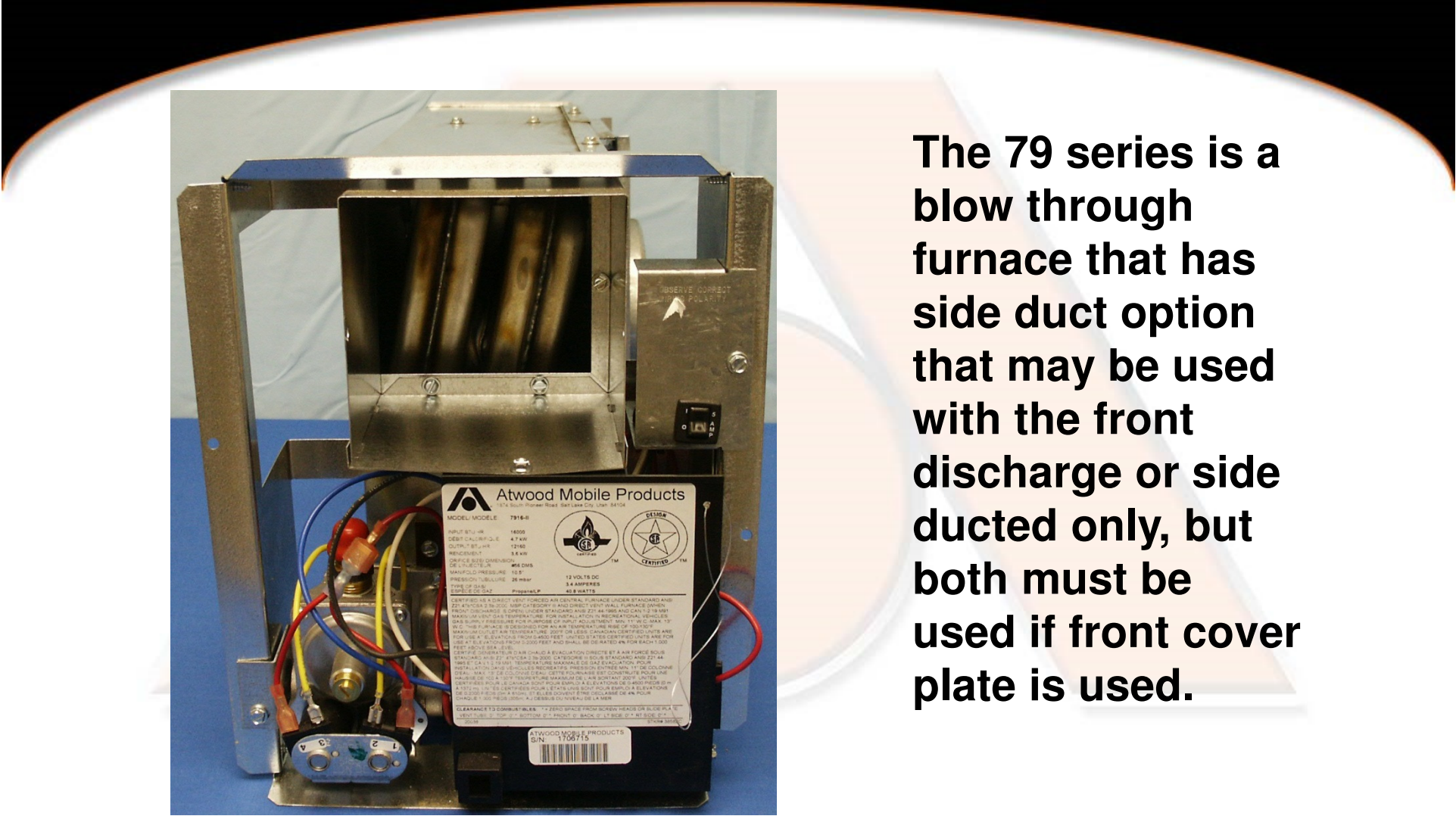
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# 7900 Series

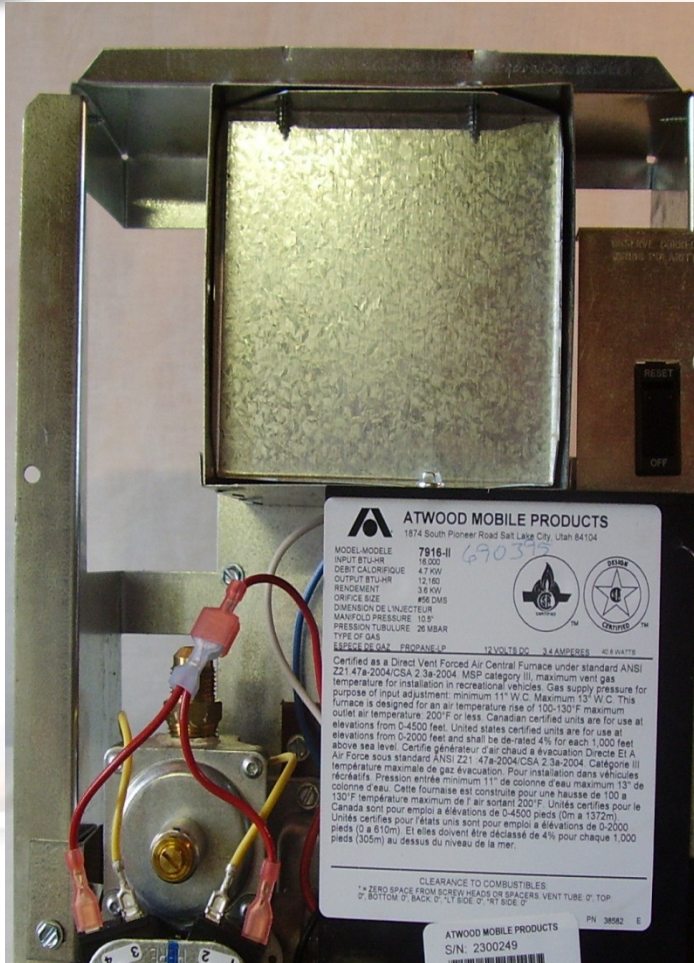


The 79 series is a



**The 79 series is a blow through furnace that has side duct option that may be used with the front discharge or side ducted only, but both must be used if front cover plate is used.**

# Blocked Off Installation



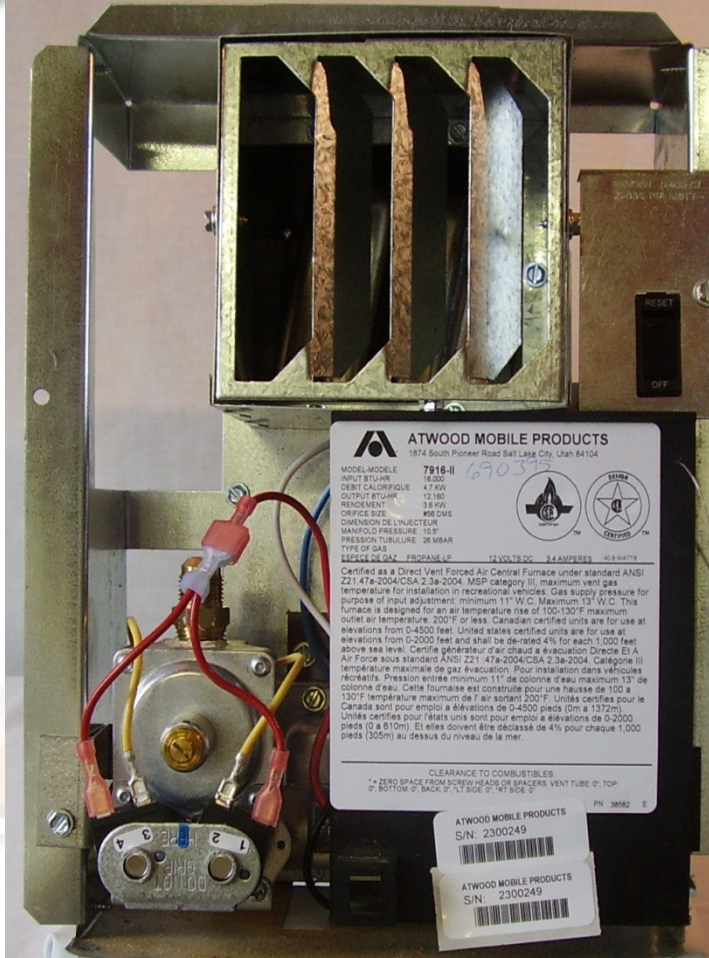
**Blocked off installation**

**Note: This requires both side discharge outlets to be used.**

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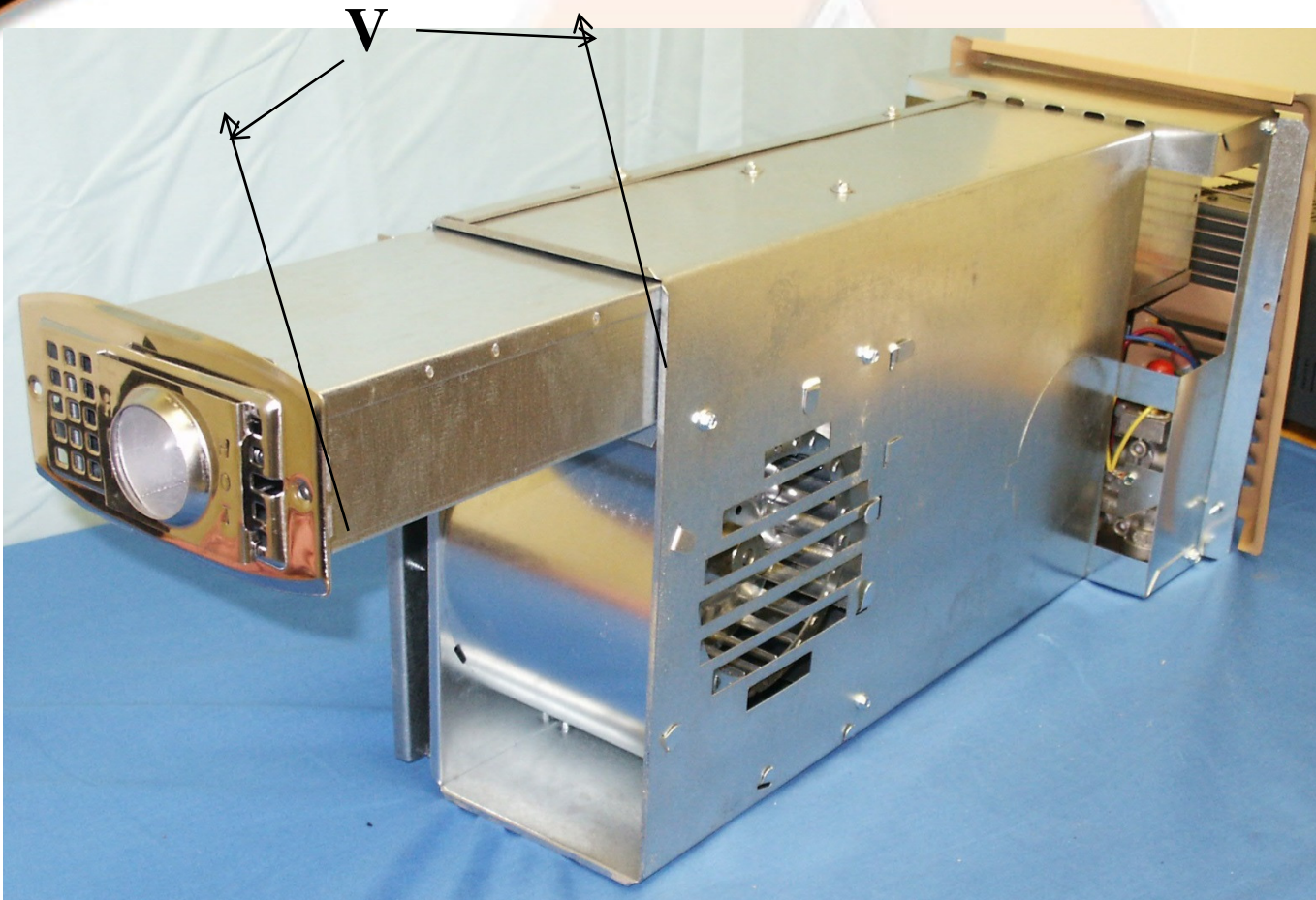


# Directional Diverter



**Directional diverter  
installed can be installed  
in any direction.**

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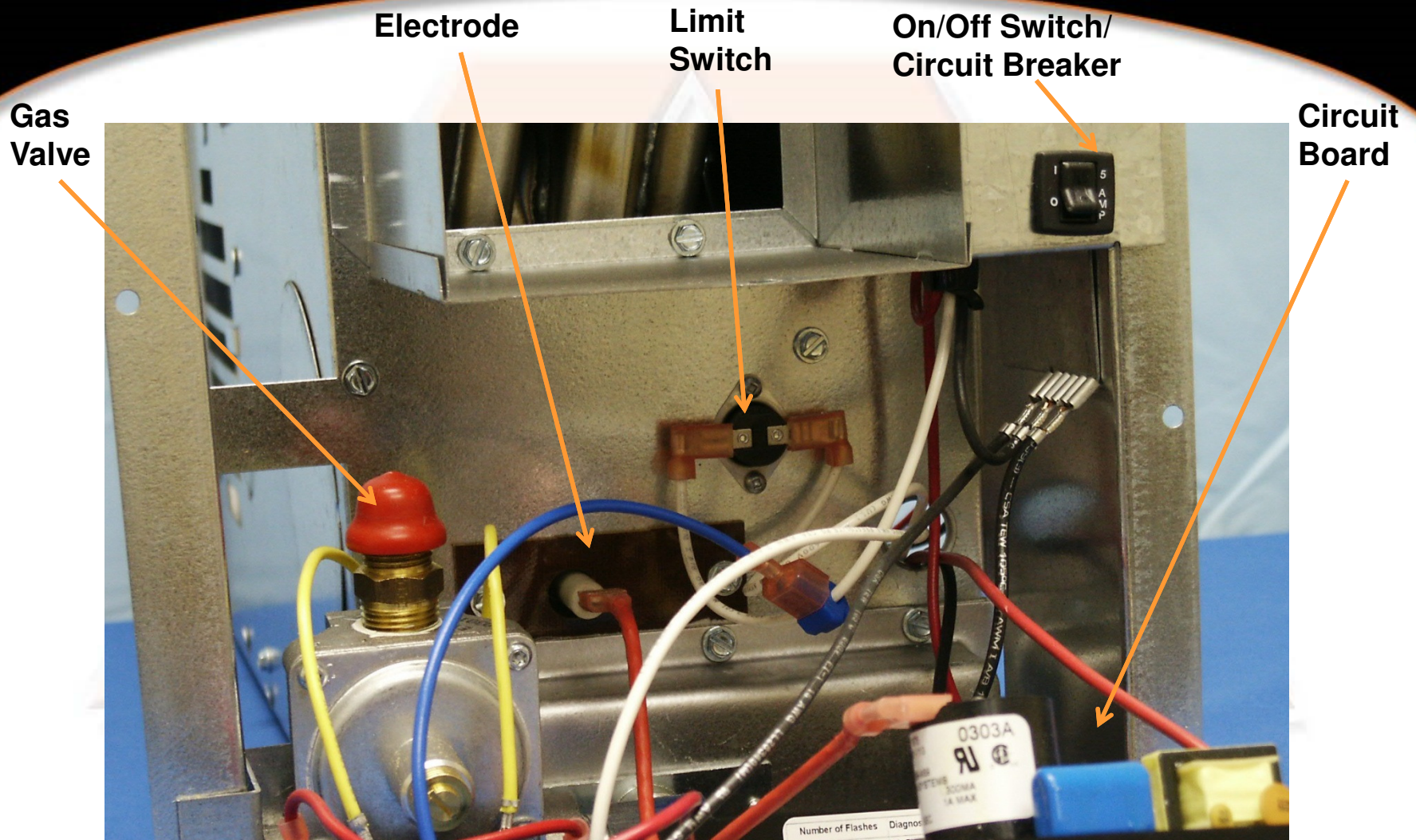


The vent tube dimension “V” is called out in the IOM. Talk about direction of box top and bottom for proper installation.

3 sizes available 4”, 8”, 12” options

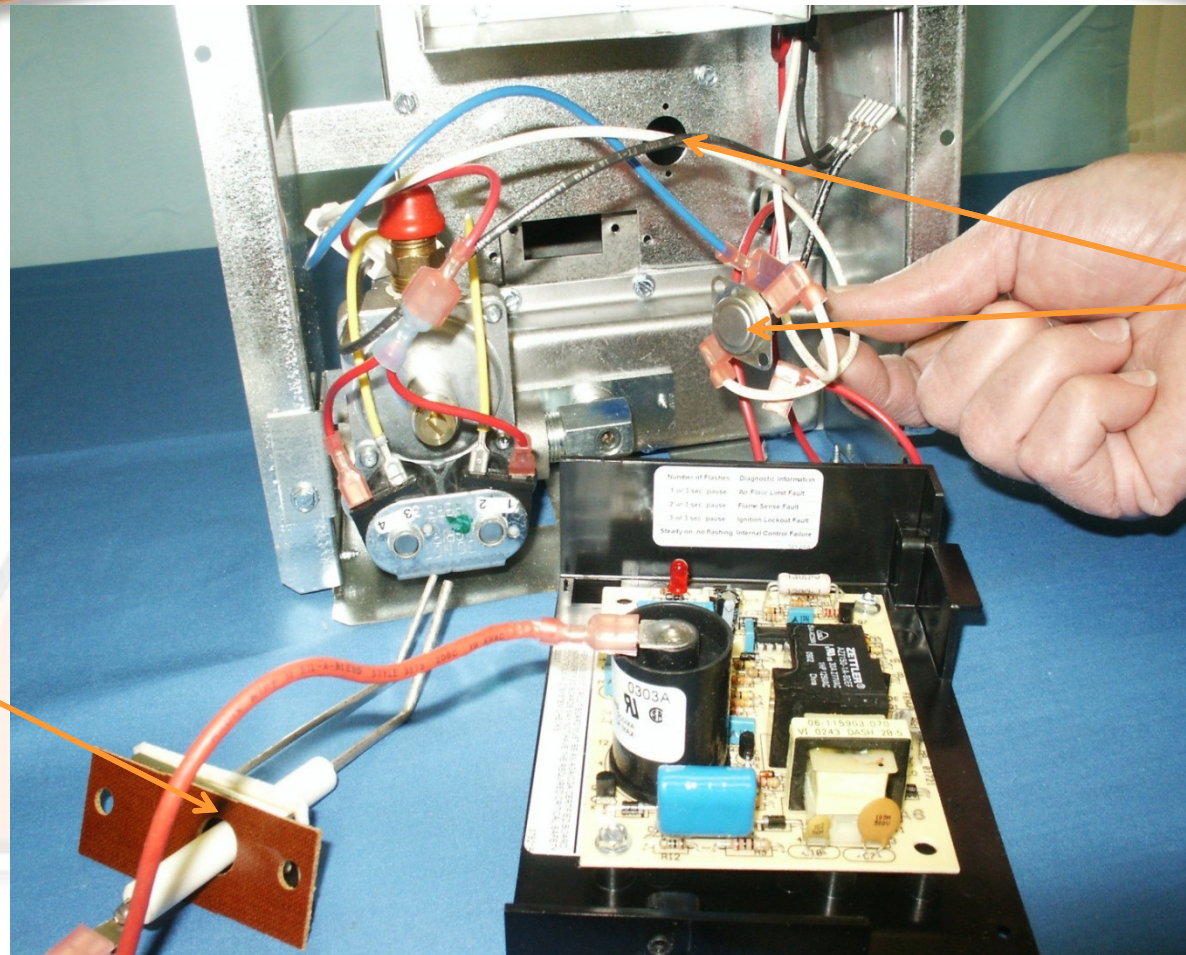


# Component Location





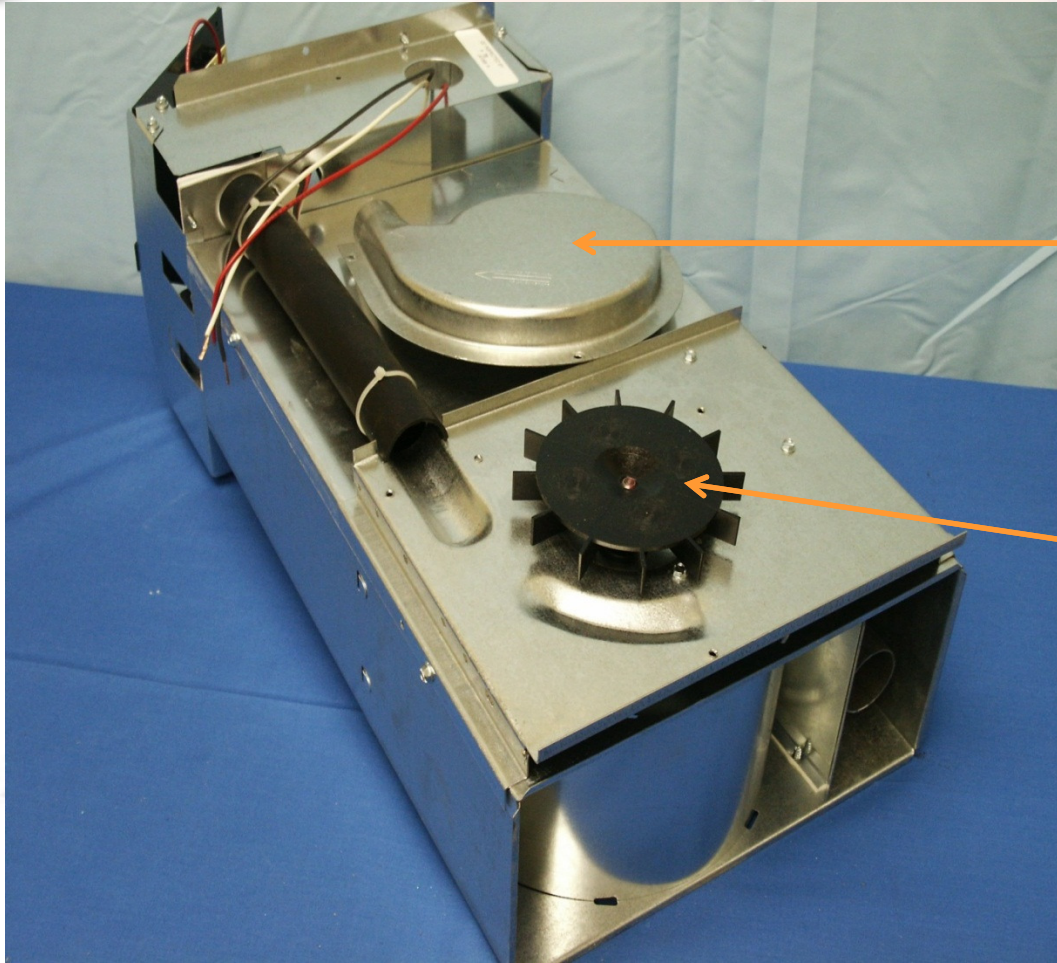
# Component Location



**Limit Switch**

**Electrode**  
The electrode gasket needs to be in tact if this is removed.

# Component Location

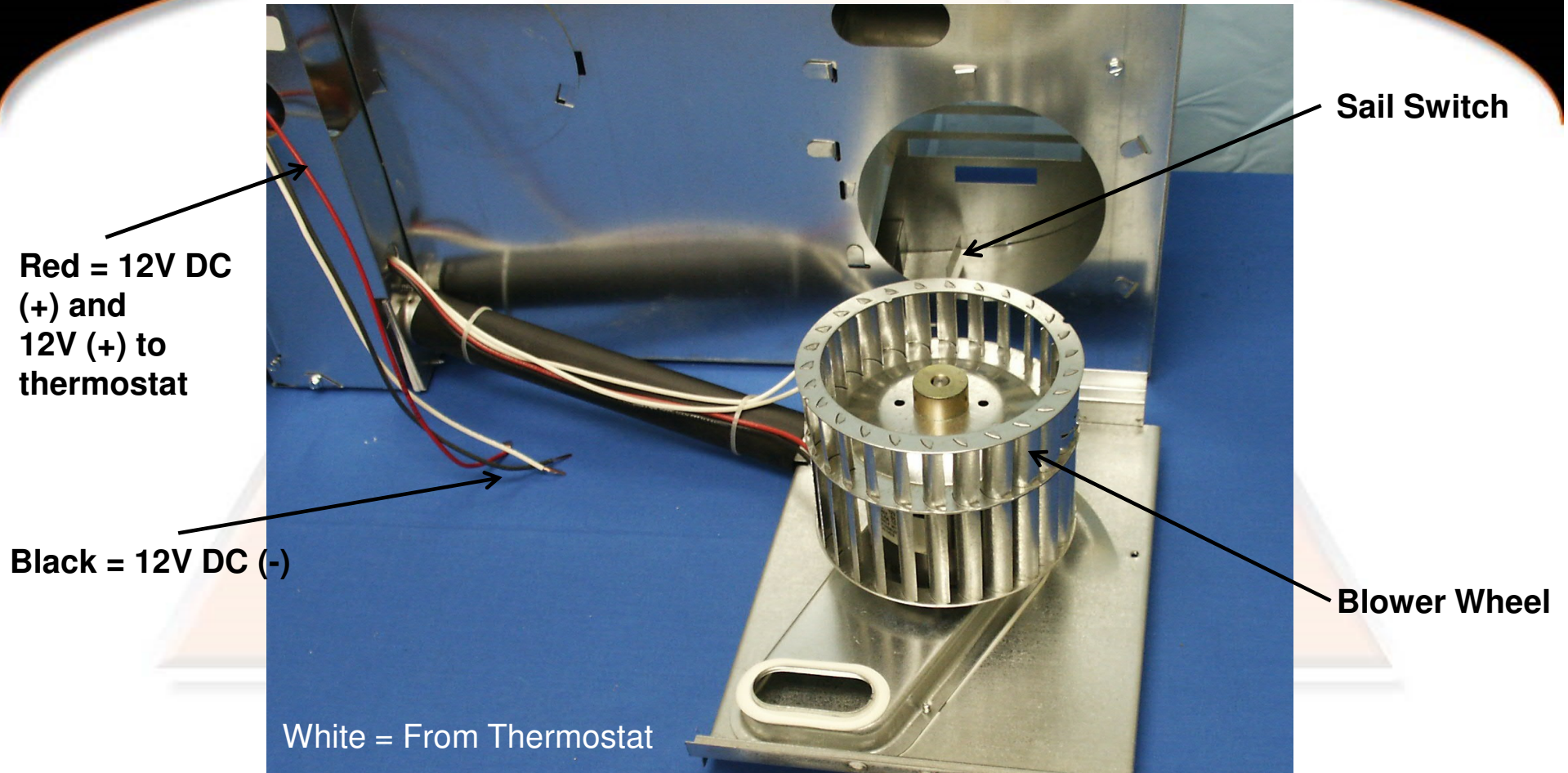


Cover

Combustion  
Wheel

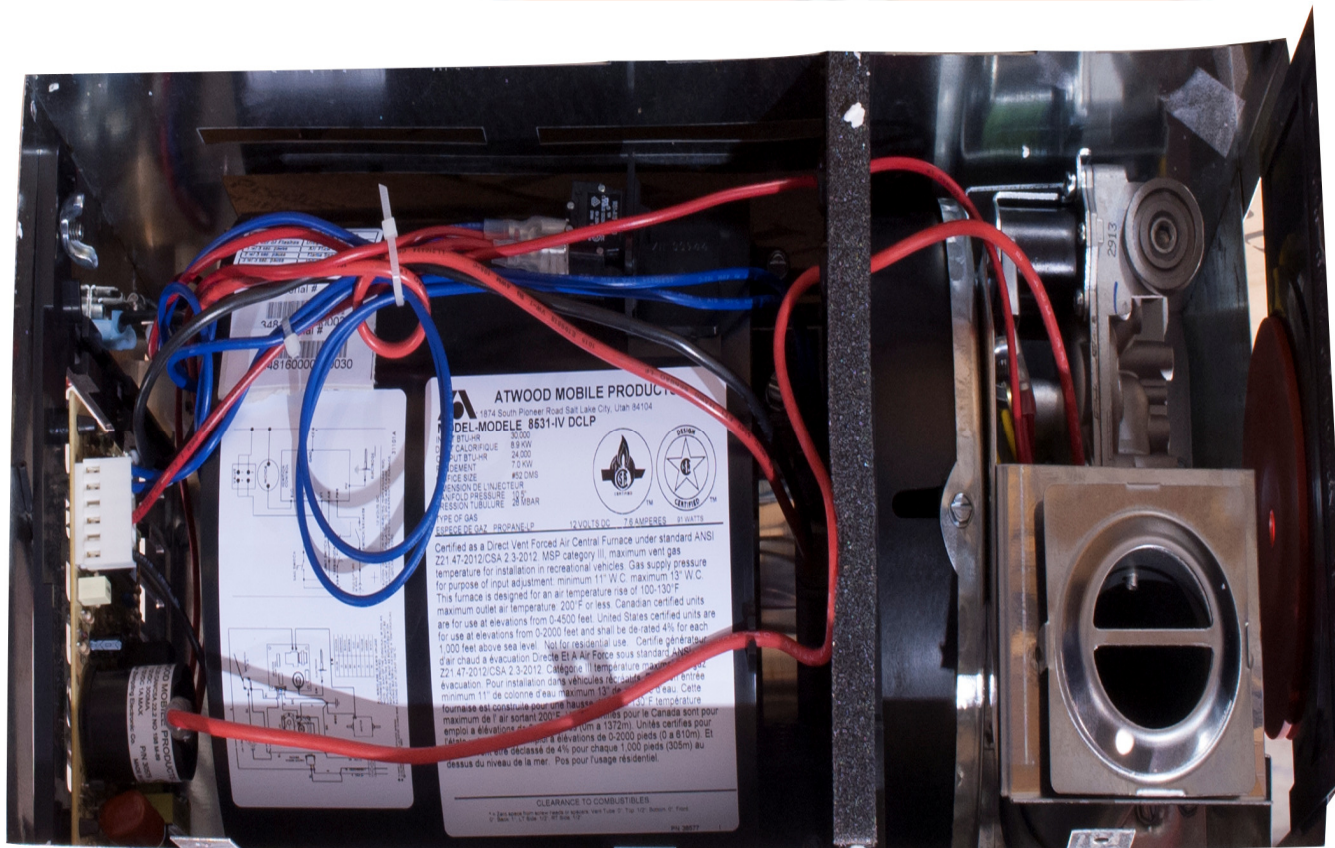


# Component Location



# 8500 Series

## BTU 16K, 20K, 25K, 30K, 35K



**8500 Series  
With and without  
an access door**

**Available in door  
and no door  
application**

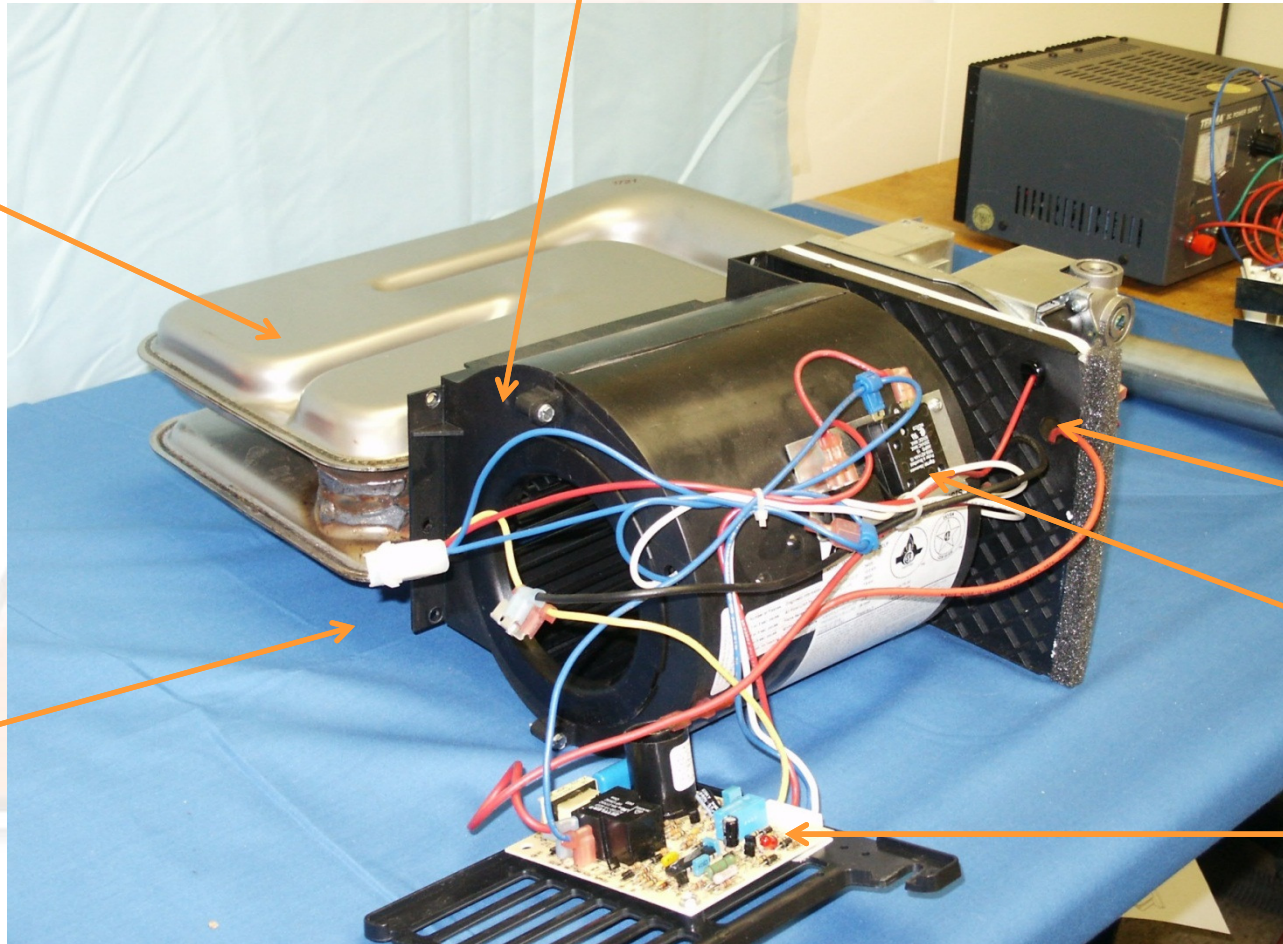
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# Fresh Air Side

Blower wheel

Heat  
exchanger



Circuit  
breaker

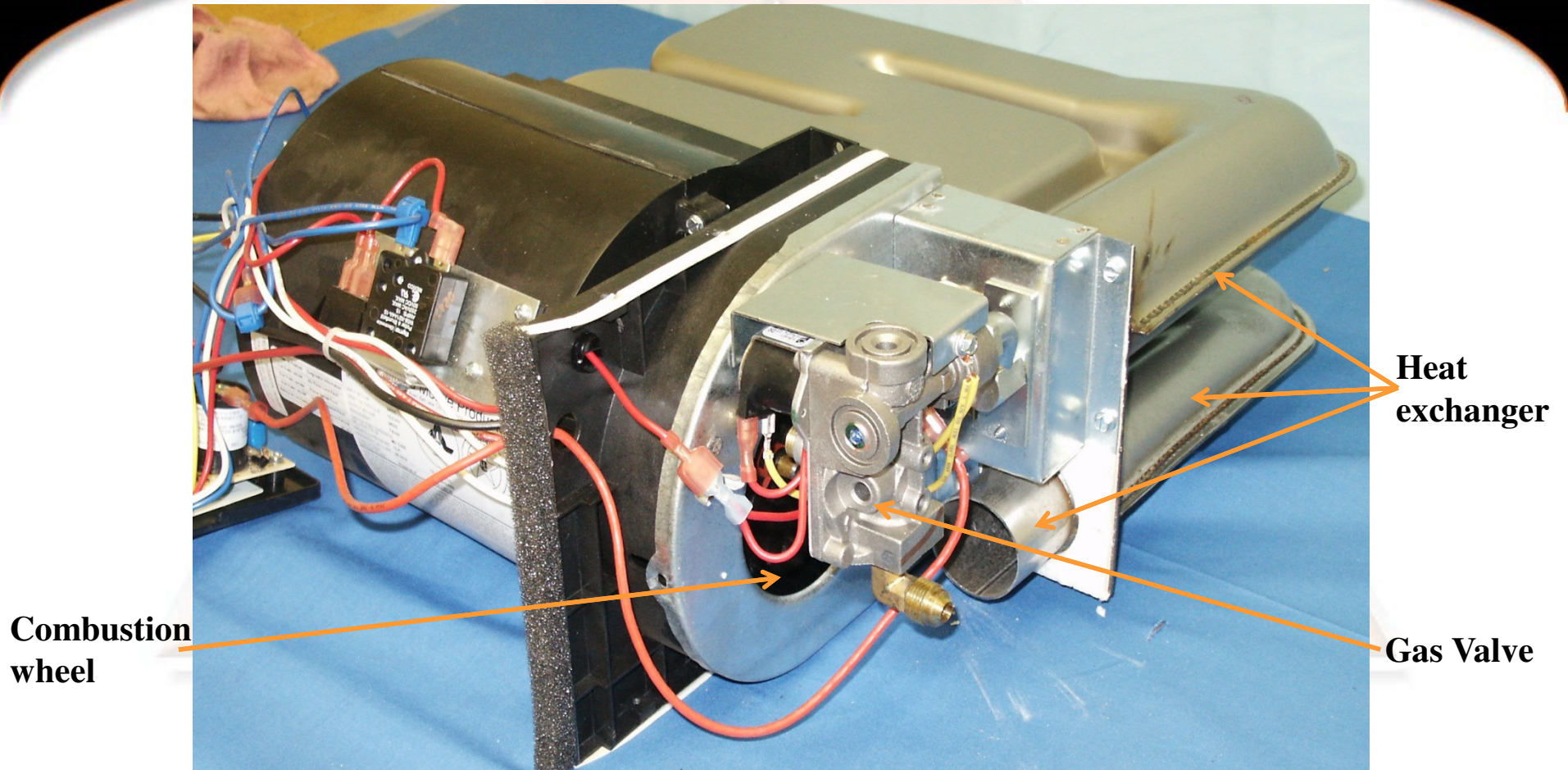
On/Off  
switch

Circuit  
board

Field  
Connector



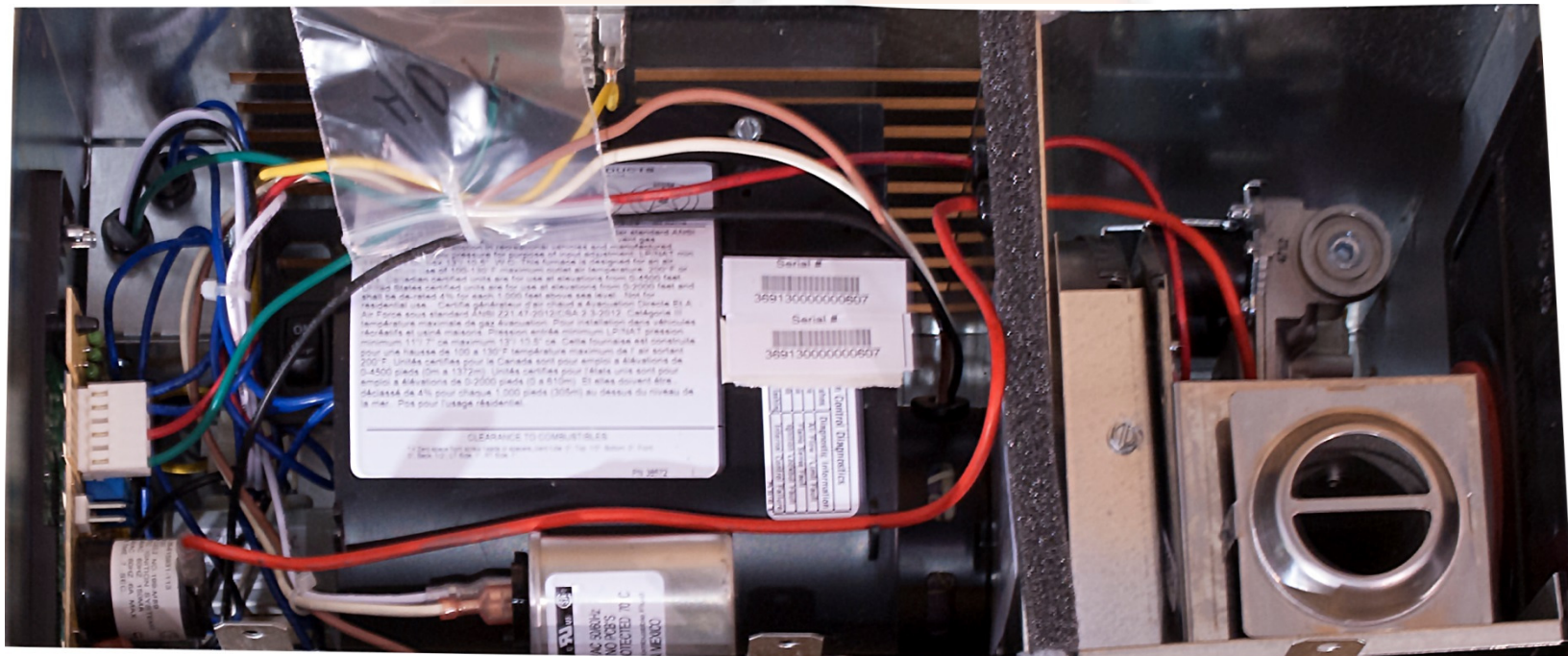
# Combustion Side



# 8900 Series DC/AC

## BTU 35K & 40K Only

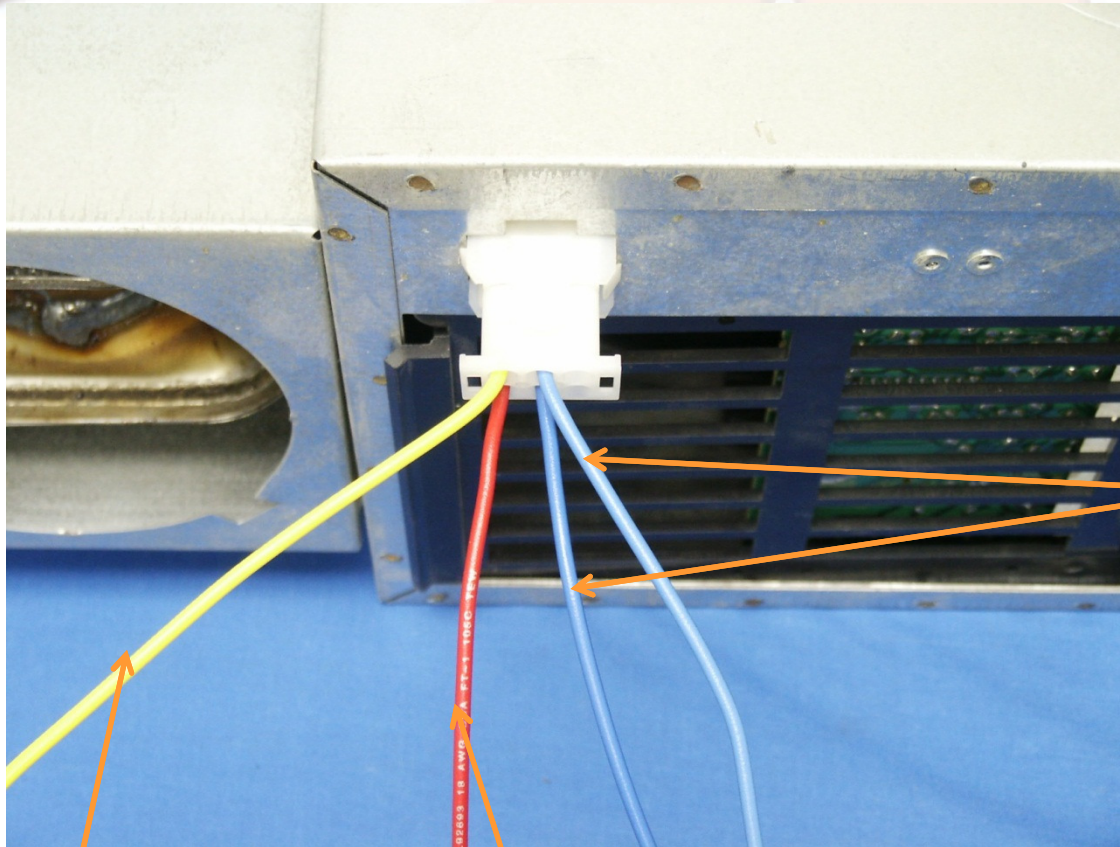
**Used in Motor Home and large 5<sup>th</sup> Wheel applications.**



**\*Note current recall on this product for AC models only  
check Atwood's website for details**

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Ground

12V + DC

To and from thermostat.  
Note: One lead is positive (+) and one is negative (-). This information is needed for some thermostats. L/D does not have this pigtail and the wires must be cut and hooked back up correctly.

## #2 - Voltage

See 4 Always previous page.

## #3 - Minimum Ducting Requirements

The various BTU sizes of 85, 89 and 2-stage series furnaces require a minimum number of square inches of heat ducting. The most common size of soft ducting is 4" diameter. Therefore, since a 4" duct is equal to 12 square inches, we can call out the minimum number of ducts needed for the models of furnaces noted below.

### Furnace Model

8516, 8520  
8525, 8531  
8535, 8935, 8940, 1522, 2334, 2540

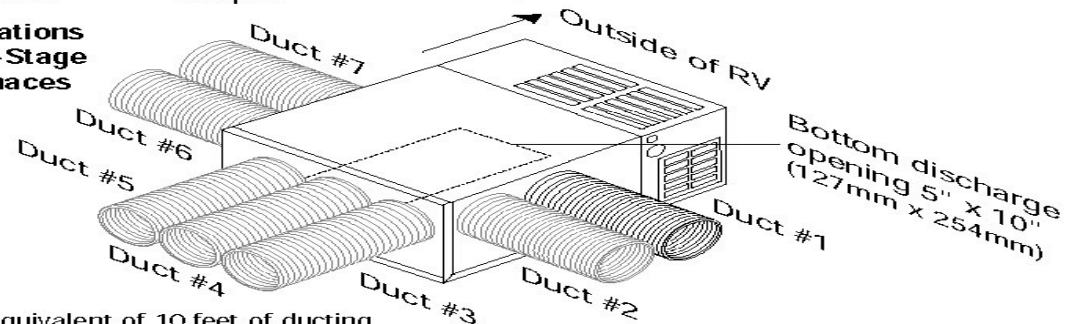
### Minimum Ducting

24 sq. in.  
36 sq. in.  
48 sq. in.

### Minimum Ducts

2  
3  
4

### Ducting Locations 85, 89 and 2-Stage Series Furnaces



### CAUTION - Ducting Installation

#### 4" Flexible Hose

- each 90° bend adds the equivalent of 10 feet of ducting
- ducting should be securely attached to furnace
- each run should be as straight and short as possible

#### 2" Flexible Hose

- 2 - 2" duct runs do not equal one 4" duct. A 2" duct is only 3 sq/inches
- 2" duct adapters are available
- 2" ducts are ideally suited for bathroom and holding tank compartments

#### Closeable Outlets

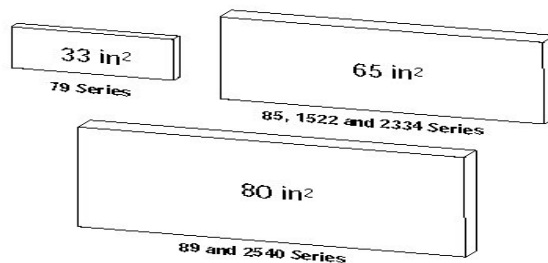
- a closeable outlet does not contribute to the minimum of total outlets recommended for a furnace.

#### Bottom Discharge

- furnace must be completely sealed to floor and plenum with a bottom discharge gasket, with no air gaps.
- if furnace is installed in middle of run, the main duct run must be a minimum of 24 sq/inches.
- if furnace is installed at the end of the run, the main duct must be 48 sq/inches.

## #4 - Return Air

This return air requirement can be met in a couple of ways.



- The return air grille mounted on an inside wall of the trailer, exposed to the cabinet area of the furnace is the most common mounting used on the 85, 89 and 2-Stage Series furnaces.
- Another option is to provide openings at various locations in the furnace cabinet area capable of drawing air from inside the trailer (ie. rowtered holes at bases of sofas or walls, etc.).

The total square inches of openings must meet minimum requirements.

Do not place any types of air filters in front of or behind the return air door. Blocking this area will substantially decrease the return air causing - less air delivery to the heat registers - short cycle of the furnace - limiting of the furnace.

We recommend electrical air filters that can be placed anywhere in the open living area of the recreation vehicle. They can be purchased in most hardware stores.

## The 4 Always

Remember that you are working on a heating system and not just a furnace. A majority of furnace problems lie outside of the product itself. Therefore, when trouble-shooting a furnace problem, always check the following items before testing or replacing components.

### #1 - GAS PRESSURE

The gas pressure should be set at a minimum of 11" W.C. with a minimum of 50% and ideally 100% of the gas fired appliances operating. You should test this pressure with a U-tube Manometer only. If you choose to use a dial-type manometer, calibrate it often with a U-tube manometer.

### #2 - VOLTAGE

Voltage to the furnace should be between 10.5 and 13.5 VDC during operation with the interior lights ON and OFF. This check should be made with the battery, converter or generator when applicable. Use a digital or analog multi-meter when taking voltage readings. Do not use a test light. It does not provide enough useful information for proper diagnosis.

### #3 - DUCTING

Always make sure that the furnace has at least the minimum number of ducts (not including closeable outlets) called out in the installation instructions. Check for proper duct connections at the furnace and heat registers, collapsed ducts and holes in the ducting. The duct runs must be as straight and tight as possible. The heat ducts must also be clean and clear of obstructions.

### #4 - RETURN AIR

The return air passage should meet the minimum square inches as specified for the particular model of furnace in the installation instructions. This air passage should also be clean and clear of obstructions. Do not put air filters in this passage way. Also make sure that combustibles are not stored in the furnace compartment.

## #1 - Gas Pressure

A furnace is a consumer's friend when the outside temperature gets colder. Unfortunately though, cold is an enemy of LP gas. The BTU capacity of LP per volume decreases as the outside temperature gets colder. Therefore, based on how full the LP tanks are, the ambient temperature outside and how many BTU's the furnace is, there may not be enough gas to sustain ignition on the furnace.

Using the charts below, let's say that a 40,000 BTU furnace won't fire up, and we also know that the 65 lb. LP bottle on the RV is 40% full and it is 0 degrees F. outside. One's first thought might be that the burner or valve is bad. However, if

we use the chart, the vaporization capacity of the tank in these conditions is only 38,500 BTU's. The furnace is not going to perform very well because there is insufficient BTU capacity in the tank.

If you were to put an insulated fire resistant blanket over the tanks and a 75 watt light bulb under that, you would probably raise the temperature of the bottles 10-20 degrees and almost double the BTU capacity of the tank. This in turn would allow the furnace to operate properly. So keep in mind that a furnace problem is not always a component problem.

20 lb. Bottle (*30 lb. bottle multiply X 1.40)					
% Full	+20°	0°	-5°	-10°	-15°
60%	36,000	18,000	12,750	8,500	4,250
50%	32,400	16,200	12,150	8,100	4,050
40%	28,800	14,400	11,400	7,600	3,800
30%	25,200	12,600	10,450	7,300	3,150
20%	21,600	10,800	8,100	5,400	2,700
10%	16,200	8,100	6,075	4,050	2,025

65 lb. Under Mtd. LP Gas Tank BTU available at					
% Full	+20°	0°	-5°	-10°	-15°
60%	95,600	47,800	36,000	23,900	12,100
50%	86,000	43,000	32,250	21,500	11,750
40%	77,000	38,500	29,250	19,250	9,625
30%	68,000	34,000	25,500	17,000	8,500
20%	58,000	29,000	21,750	14,500	7,250
10%	43,200	21,600	16,200	10,800	5,400



If there is excess ducting it will slow the air flow through the duct.



Ducting should be taught and as straight as possible



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**Questions???**

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Over the years of running a mobile RV repair service, having a dedicated place to access service manuals for all the different appliances and components found on RVs was something that I always had a desire to create.

I hope this resource makes your RV repairs easier, as it has mine, but please be careful and follow proper safety practices when attempting to repair your own RV.

If in doubt, please consult with a professional RV technician!



DARREN KOEPP - OWNER, MY RV WORKS, INC.

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