



Troubleshooting the CheapHeat™ Hybrid Heating System

-----CAUTION-----

Only qualified service technicians should perform this test
BE sure to adhere to all NEC safety precautions when performing these tests
DO NOT RUN ELECTRIC HEATER WITHOUT FAN RUNNING

The following pages list a number of tests that will help the technician determine what part within the CheapHeat Hybrid has failed, if any and why. When testing the system in the energized mode, be sure the thermostat is at least 10 F degrees above the indoor temperature. When it's off make sure it's 10 F degrees below the indoor temperature.

TWO MOST COMMON PROBLEMS

(I) Fan Runs but no heat

1. Improper voltage or tripped breakers:
 - Be sure to turn breakers completely off and then back on to reset breaker.
 - If not a tripped breaker and you just moved to a new RV site it's not uncommon for it to be wired incorrectly (check the voltage exactly as outlined in the attached docs to confirm the correct phasing).
 - Tripped breaker may be caused by loose wire at the breaker, shorted wire, or defective breaker.

2. Voltage is present at heater power head:
 - Check to see if you have the correct voltage from the breaker to the controller to the power head (Refer to the attached doc's).
 - If voltage is present check Fuse Link to make sure it is not open (Burned out). If the Fuse link is open in EVERY case it is was caused by a lack of airflow.
 - Torn ductwork, allowing hot air to come back through the return air system causing the high temp switch to short cycle.
 - Blockage in ductwork or not enough duct work
 - Intermittent Blower motor (may work in gas mode because there is NO fail safe fuse link).
 - Blower running too slow (this can happen to a new motor and may be caused by loose wire in motor).
 - Blower overheated and shut down (after it cools it will restart for short periods).

The only solution to a blower motor problem is to replace it, if your system has been running for any period of time (Weeks or Months before the fuse link burned out you can pretty much figure it is a blower motor problem (Duct work doesn't usually go bad for no reason).

(II) Low Heat Output

(This assumes the heater is set on the correct heater range)

1. Duct work related problem:

- Check ductwork for holes, leaks, blockages or tears.
 - Torn or leaking ductwork will allow hot air to short cycle back through the return air causing the high temp safety switch to short cycle reducing the output temperature.
 - Blockage in duct work or not enough duct work will cause a reduced air flow across the heater coil causing a high temperature short cycle by the high temp safety switch, resulting in a lower output temperature of the over all system.

2. Not enough ductwork:

- Ductwork minimums specs must be followed *see installation instructions for required ducting minimums based on heater setting*.
 - The CheapHeat system is a UL listed device, which requires us to have safeties in place that will not allow any part of our ductwork to exceed very specific surface temperatures. Because of that if the ducting minimums are not followed the system will short cycle on high temperature lockout reducing output temperatures.

3. Fan Motor Problem:

- Furnace blower motor running slow or below full load amp draw (**verify blower amps on motor sticker**), this can happen for one of three reasons.
 - The first reason is a restriction in airflow; contrary to popular belief closing off registers will NOT increase airflow to the other registers. The fan will only move a predetermined amount of air so as you restrict the airflow all that happens is the fan blade cavitates. Which reduces the load on the motor ultimately reducing the current draw (amp load).
 - The second reason is a slow blower motor this is usually an internal problem with the motor, on 12 volt direct current motors this is usually defective brushes, **not uncommon on new motors** (results in low current).
 - The third reason is dried out bearings, this usually happens on a blower that is older and will ultimately result in a failed blower motor.

***Note: Lower blower motor amps can be caused by one of two issues, airflow restriction or bad brushes.**

Duct Heater and Controller Installation Standards

Electrical Specifications

<i>Heat Range Configuration</i>	<i>Voltage</i>	<i>Current</i>	<i>Wattage</i>	<i>Fuse/Breakers</i>	<i>UL Rated, Wire Size Max length 100 ft.</i>
1800	120 VAC	15 Amp	1800	(1) Single 20 Amp	(2) 12 Gauge W/Ground
3750	240 VAC	15.6 Amp	3750	(2) Dual 20 Amp	(2) 12 Gauge W/Ground
5000	240 VAC	20.8 Amp	5000	(2) Dual 30 Amp	(2) 10 Gauge W/Ground

Fan Specifications (Third party Air Handler)

<i>Heat Range Configuration</i>	<i>Max Voltage</i>	<i>Max Current</i>	<i>Minimum CFM</i>	<i>Minimum Velocity</i>	<i>Static Pressure</i>	<i>Max inlet Air Temp Energized</i>	<i>Max Air Temp De-Energized</i>
1800 Watt	15 VDC	12.6 Amps	120	400 fpm	.01-0.5" wc	75 F Degrees	250 F Degrees
3750 Watts	15 VDC	12.6 Amps	180	400 fpm	.01-0.5" wc	75 F Degrees	250 F Degrees
5000 Watts	15 VDC	12.6 Amps	240	400 fpm	.01-0.5" wc	75 F Degrees	250 F Degrees

VERTICAL MOUNTED FURNACES REQUIRE AUTO TEMP LIMIT UPGRADE TO 200°F

(Contact RV Comfort Systems LLC for correct Auto Temp Limit upgrade part)

Air Flow Specifications 4" Round Duct

UL 2158A Rated-Max temp rating 285° F, Max Static 1.0 in.

<i>Heat Range Configuration</i>	<i>Min Total CFM</i>	<i>Max Total CFM</i>	<i>Min # Supply Runs</i>	<i>Single 4" Round Duct</i>			<i>Average all 4" Round Ducts Combined</i>		
				<i>Max Length Supply Runs</i>	<i>Max 45° Bends</i>	<i>Max 90° Bends</i>	<i>Max Avg. Length of Runs</i>	<i>Max 45° Bends</i>	<i>Max 90° Bends</i>
1800 Watt	120	300	3	25 Ft	2	1	15 Ft	6	3
3750 Watts	180	400	5	25 ft	2	1	15 Ft	10	5
5000 Watts	240	500	6	25 ft	2	1	15 Ft	12	6

Air Flow Specifications Rectangle Duct

28 Ga. Sheet Metal

<i>Heat Range Configuration</i>	<i>Min Total CFM</i>	<i>Max Total CFM</i>	<i>Min Sq. in Supply Side Trunk line</i>	<i>Min # 4x8 Supply Registers</i>	<i>Min # 4X10 Supply Registers</i>	<i>Min # 2 1/4x10 Supply Registers</i>	<i>Min # 2 1/4x12 Supply Registers</i>
1800 Watts	120	300	40	3	2	3	3
3750 Watts	180	400	60	4	3	5	5
5000 Watts	240	500	80	5	4	6	6

Clearance Around Duct Heater Plenum

<i>Heat Range Configuration</i>	<i>Top</i>	<i>Bottom</i>	<i>Left Side Without Power Head</i>	<i>Left Side With Power Head</i>	<i>Right Side Without Power Head</i>	<i>Right Side With Power Head</i>	<i>Model PL-7 Front</i>	<i>Model SA-7 Front</i>
1800 Watts	1"	0"	1"	2 ½"	1"	2 ½"	1"	N/A
3750 Watts	1"	0"	1"	2 ½"	1"	2 ½"	1"	N/A
5000 Watts	1"	0"	1"	2 ½"	1"	2 ½"	1"	N/A

Multiple Systems

Setting up multiple systems in one coach requires the following configurations and a separate CH-50 controller for each system.

Shore Power	CheapHeat™ Heater Configurations	Ducting
50 Amp	1@ 1800W & 1@ 1800W	<i>Each system requires its own ducting with no common connections to the other system.</i>
50 Amp	1@ 1800W & 1@ 3750W	
50 Amp	1@ 3750W & 1@ 3750W	

Air Flow and Temperatures

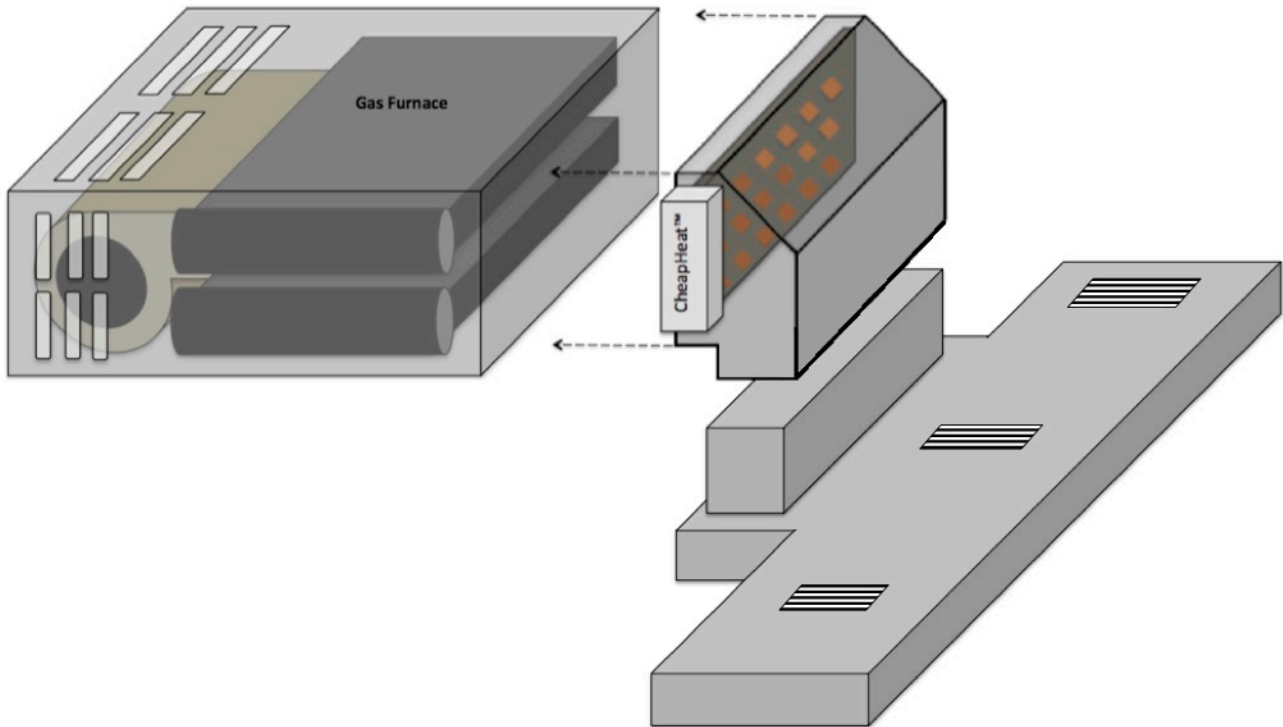
Plenum System **Minimum** Air Flows

MAX Ducting inside air temperature
with in 6 inches of heater coil

Heater Setting	2 x10	2 x 12	2 x 14	4 x 8	4 x 10	Cabinet Adapter	Plenum
1800 Watts	3	2	2	2	2	155 F Deg	145 F Deg
3750 Watts	5	4	4	5	4	155 F Deg	145 F Deg
5000 Watts	6	6	5	6	5	155 F Deg	145 F Deg

Actual Readings

Temperature Cabinet adapter Discharge	Temperature With-in 6 inch's		Register 1	Register 2	Register 3	Register 4	Register 5	Register 6
		Size of Register						
		Temperature						



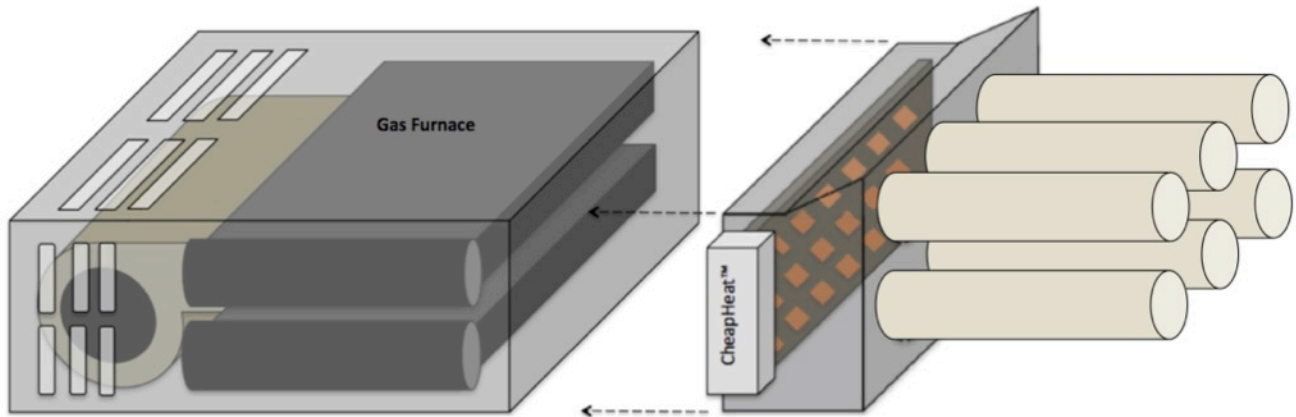
Ducted System **Minimum** Air Flows

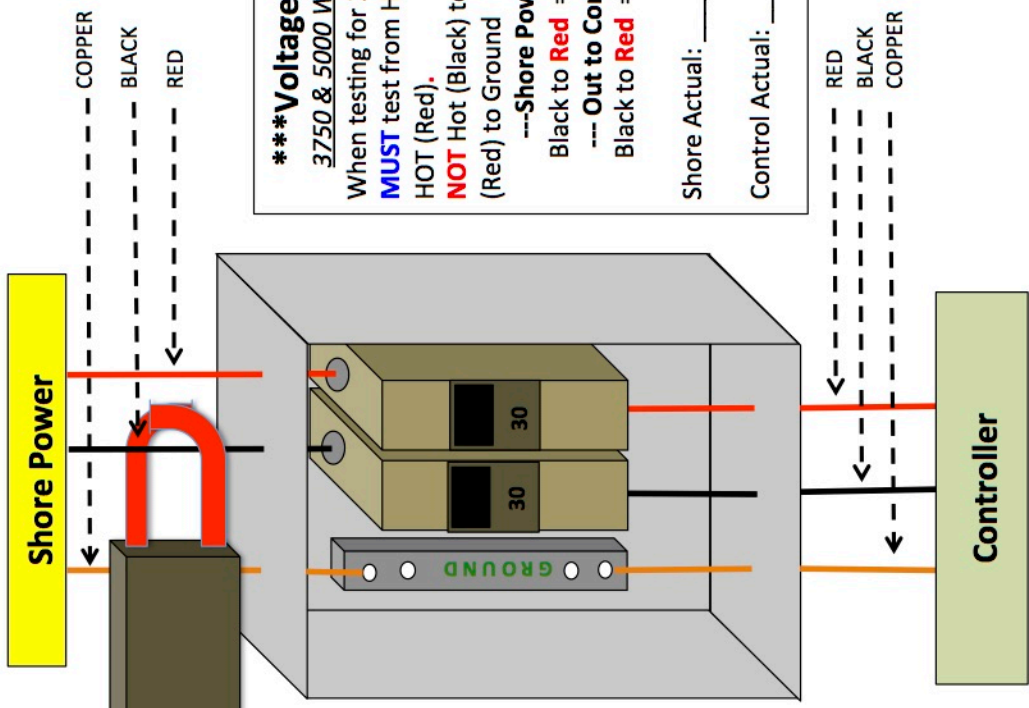
MAX Ducting inside air temperature
with in 6 inches of heater coil

Heater Setting	2 x10 or 4" Round	2 x 12	2 x 14	4 x 8	4 x 10	Temperature of Air
1800 Watts	3	2	2	2	2	145 F Deg
3750 Watts	4	4	4	5	4	145 F Deg
5000 Watts	6	6	5	6	5	145 F Deg

Actual Readings

Temperature with-in 6 " of Cabinet Adapter		Register 1	Register 2	Register 3	Register 4	Register 5	Register 6
	Size of Register						
	Temperature						

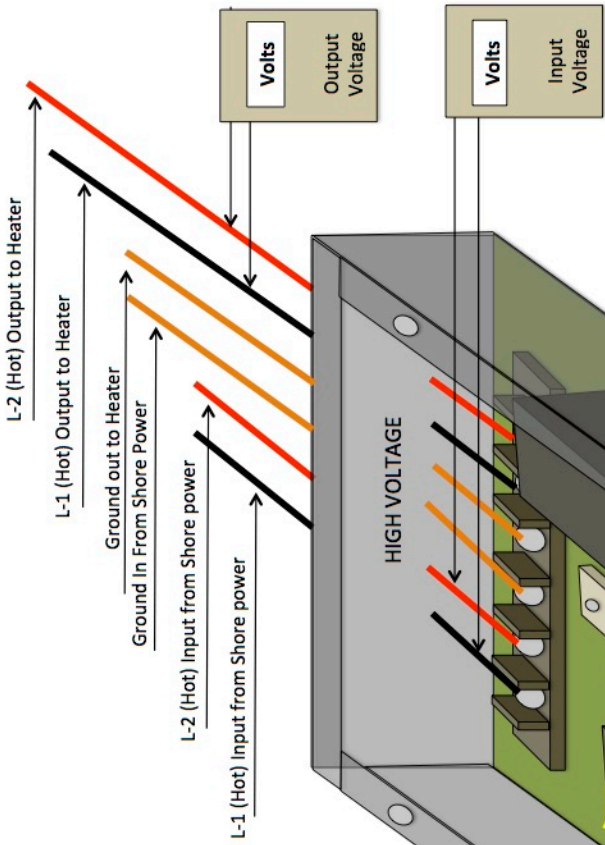




*****Current Test*****
 When testing for Current you **MUST** only clamp your meter around **ONE** hot wire at a time. It doesn't matter which side of the breaker your on
 ---5000 Watts---
 Black or **Red** = **21 Amps**
 --- 3750 Watts---
 Black or **Red** = **16 Amps**
 --- 1800 Watts---
 Black or **White** = **16 Amps**
 Amps Actual: _____Amps
**** Note: ONLY ONE BREAKER USED ON 1800 WATT 120 VAC SYSTEM**

*****Voltage Test*****
3750 & 5000 Watt System
 When testing for 240 VAC you **MUST** test from HOT (Black) to HOT (Red).
NOT Hot (Black) to Ground, Hot (Red) to Ground
 ---Shore Power In---
 Black to **Red** = **240 VAC**
 --- Out to Controller---
 Black to **Red** = **240 VAC**
 Shore Actual: _____VAC
 Control Actual: _____VAC

*****Voltage Test*****
1800 Watt System
 When testing for 120 VAC you **MUST** test from HOT (Black) to Neutral (White).
NOT Hot (Black) to Ground, Neutral (White) to Ground
 ---Shore Power In---
 Black to **White** = **120 VAC**
 --- Out to Controller---
 Black to **White** = **120 VAC**
 Shore Actual: _____VAC
 Control Actual: _____VAC



LOW VOLTAGE

****Heat Calling (ON)****
 Black to Orange 12 VDC
 Black to Red 12 VDC
 Black to Blue 12 VDC

**** Heat Not Calling (OFF)****
 Black to Orange 12 VDC
 Black to Red Zero VDC
 Black to Blue Zero VDC

Actual Volts (ON)
 Black to Orange VDC
 Black to Red VDC
 Black to Blue VDC

System on Readings Voltage Testing
 When testing voltage all test should be made L-1 to L-2 Hot to Hot, NOT Hot to ground.

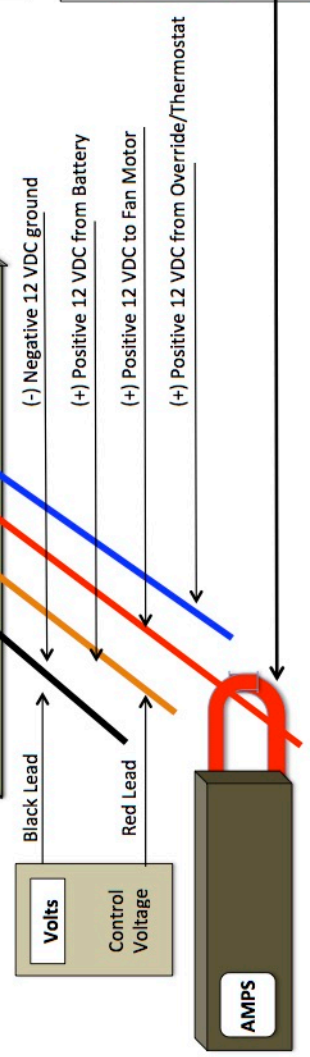
Correct Readings
 Low Heat (1800 Watts) = 120 VAC
 Med Heat (3750 Watt) = 240 VAC
 High Heat (5000 Watts = 240 VAC

Actual Input VAC
 Actual Output VAC

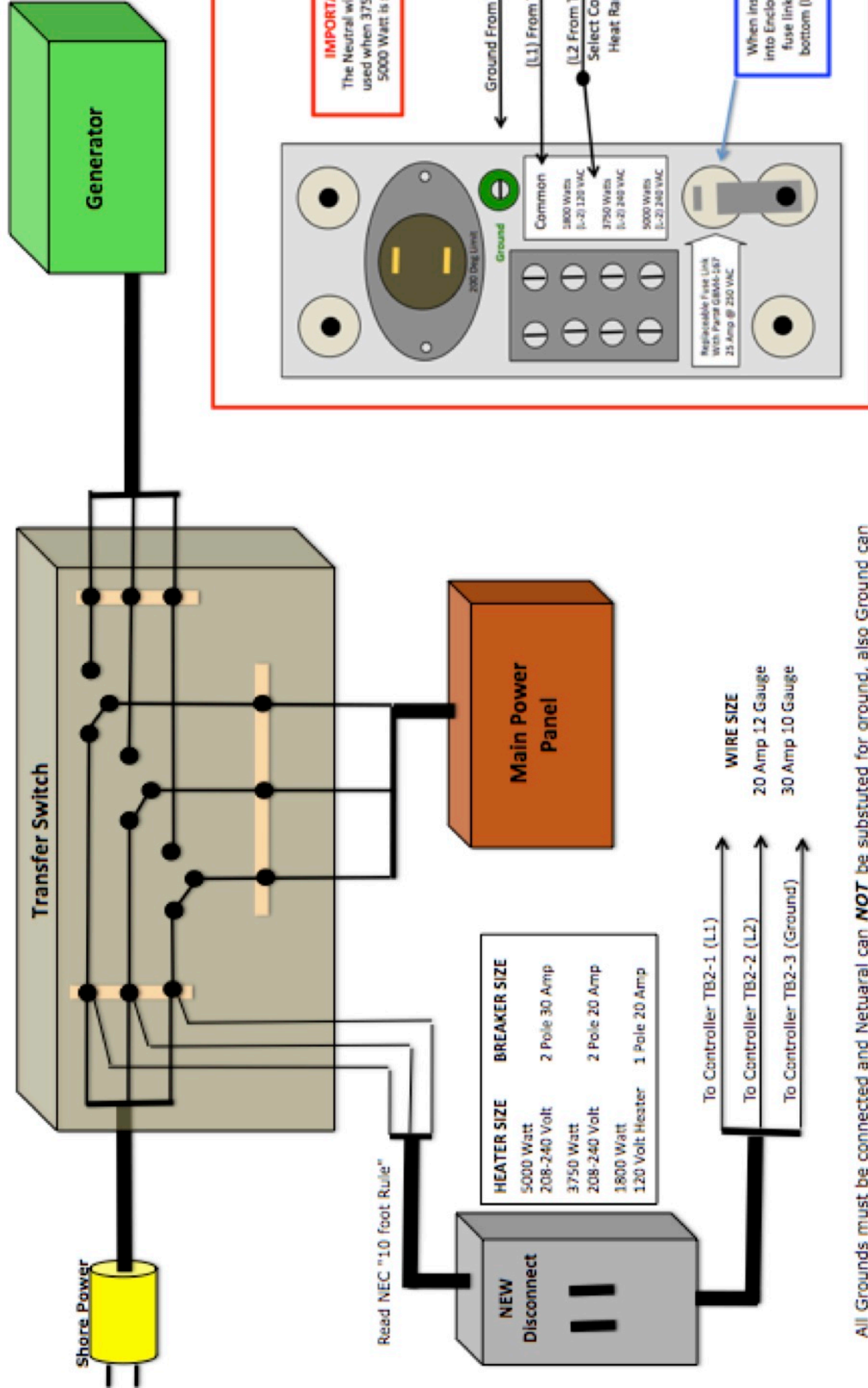
Blower Motor Test
 Voltage Red to Black 13.5 to 14.1 VDC
 Actual Black to Red VDC

Current Check
 If rating is not with-in 10% of factory rating you have:
 Low Voltage, or Supply ducting blockage, or Defective motor.

Furnace Manufacture Rating Amps
 Actual Current Reading Amps



HIGH VOLTAGE WIRE DIAGRAM FOR CHEAPHEAT SYSTEM



All Grounds must be connected and Neutral can **NOT** be substituted for ground, also Ground can **NOT** be used as Neutral. The Neutral leg is only used in the 120 VAC configuration.

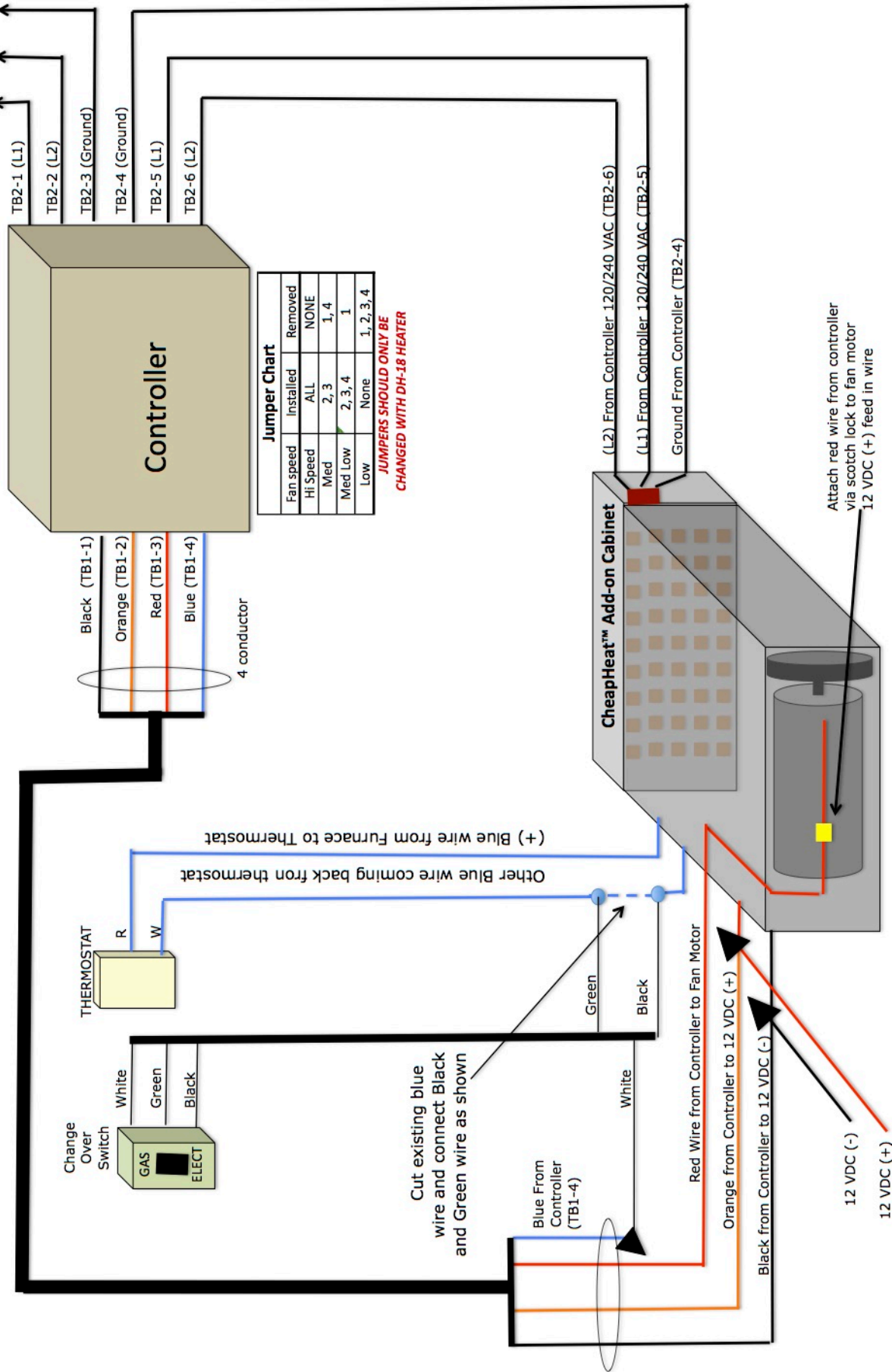
IMPORTANT SAFETY INSTRUCTIONS READ THESE INSTRUCTIONS

1. To provide continued protection against risk of electric shock, connect to properly grounded outlets only.
2. All wiring must comply with local and national electrical codes and be installed by a qualified electrician.
3. Check the available power supply and resolve any wiring problems BEFORE installing or operating this unit.
4. Contact a qualified electrician with any questions about the following instructions.
5. Do not immerse in water.
6. Make sure to install cable clamp in to ½" knock out hole on heater panel to prevent wire from chaffing

SAVE THESE INSTRUCTIONS

LOW VOLTAGE WIRE DIAGRAM FOR CHEAPHEAT SYSTEM

From Disconnect
(See Installation Manual)



CHEAPEAT LOW VOLTAGE WIRE DIAGRAM FOR (SUBURBAN MODEL 2542) DUAL HEAT FURNACE

