CheapHeat™

RV Comfort Systems
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# 20 Minute Test
# For
# Low Heat Output/Short Cycling

*This assumes the heater is set on the correct heater range*

## Short Cycle Test

This is a simple test that verifies if your ducting system has adequate air flow to prevent your Heater Coil from short cycling, ultimately causing a reduced heat output (*Fan will continue to run even if the heater coil is cycling on over temp*).

- Turn your thermostat up to 82 F degrees and clamp your **Amp Meter around only one** of the high voltage wires coming out of the breakers, that feed the CheapHeat Controller.
- Note current reading, reading should be as follows:

  1800 Watt setting = 14.5 to 15 amps @ 120 VAC
  3750 Watt setting = 14.5 to 15 amps @ 240 VAC
  5000 Watts setting = 19.5 to 20 amps @ 240 VAC
- During this test you need to watch the amp meter for a full 20 minutes to make sure that the current reading stays constant (***you may need to open the windows and door to keep the thermostat from shutting off during this test***).
- If at any time during this test while the thermostat is calling for heat the meter reading drops out. That is an indication that you have an airflow related problem causing the system to short cycle, which will result in substantial loss in heating capacity.

**Note:**

1. Make sure all of the outside storage compartment doors are closed. This is to make sure the furnace it NOT sucking in outside air, which will through off the test.
2. Be sure you have the correct voltage coming out of the breakers that feed the controller. (See correct voltage requirements for given wattage above).

(***Testing one lead to ground will not give you the correct reading always check hot leg to hot leg***).

## Possible cause of short cycling

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 in a high temperature short cycle by the high temp safety switch, resulting in a lower output temperature of the overall system.
  - ***Excessively warm space around the Gas furnace cavity is a good indicator that you have hot air leaking from the ducting or around the ducting connections to the furnace.***

2. Not enough ductwork:

- Ductwork minimums specs must be follow as shown in the installation manual **(Spec's shown below)**.
  - The CheapHeat system is a UL listed device we are 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 ail short cycle on high temperature lock out 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 of a restriction in airflow, contrary to popular belief closing off registers will NOT increase airflow to the other registers. The fan will only move so much air as you restrict the air flow all that happens is the fan blade caveats. Which reduces the load o the motor ultimately reducing the current draw (amp load).
  - The second reason is slow blower motor this is usually an internal problem with the motor, on 12 volt direct current motors this is defective brushed, **not uncommon on new motors** (results in low current).
  - The third reason is dried out bearings, this usually happens on a blower that is 1 year or older and will ultimately result in a failed blower motor.
  - ***Just because the fan motor runs in the gas mode does NOT mean it is operating correctly.***

**Important Note:**

1. Since Gas Furnaces are **not** UL Listed, they are not held to the same high temperature reset standard. In fact, most gas furnaces operated at as much as a 100 F degree higher reset temperature. Because of this when blower motors start to fail due to bad bearings, the problem doesn't show its self as soon as it does on a UL Listed product. There higher reset point can also cover up overheating caused by leaking or restricted duct work.
2. Low blower motor amps are caused by one of two issues, airflow restriction or bad brushes.
3. Do not include 2" ducts in minimum ducting requirements (*it takes 4-2' ducts to equal the air flow of one 4" duct*).

**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**

Max Air Temperature 155° F, Max Static 1.0 in.

| *Heat Range Configuration* | *Min Total CFM* | *Max Total CFM* | *Min # Supply Runs* | *Single 4" Round Duct* | | | *Average all 4" Round Ducts Combined* | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *Max Length* Supply Runs | Max 45° Bends | Max 90° Bends | Max Avg. Length of Runs | Max 45° Bends | Max 90° Bends |
| 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

| *Heat Range Configuration* | *Min Total CFM* | *Max Total CFM* | *Min Sq. in Supply Side Trunk line* | *Min # 4x8 Supply Registers* | *Min # 4X10 Supply Registers* | *Min # 2 1/4x10 Supply Registers* | *Min # 2 1/4x12 Supply Registers* |
|---|---|---|---|---|---|---|---|
| 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 |

**Gas Furnace motors are Direct Current motors and require a special meter designed to test DC current to make these amperage test on the blower motor.

| Atwood/Dometic | | | |
|---|---|---|---|
| Model | Motor Watts | Current | Voltage |
| 8516 | 55 | 4.6 amps | 12.5 VDC |
| 8520 | 55 | 4.6 amps | 12.5 VDC |
| 8525 | 91 | 7.6 amps | 12.5 VDC |
| 8531 | 91 | 7.6 amps | 12.5 VDC |
| 8535 | 118 | 9.8 amps | 12.5 VDC |
| 8935 | 132 | 11.0 amps | 12.5 VDC |
| 8940 | 132 | 11.0 amps | 12.5 VDC |
| 8900-2450 | 86/202 | 7.2/16.8 amps | 12.5 VDC |
| AFMD/DFMD-16 | 50 | 4.2 amps | 12.5 VDC |
| AFMD/DFMD-20 | 50 | 4.2 amps | 12.5 VDC |
| AFMD/DFMD-25 | 90 | 7.5 amps | 12.5 VDC |
| AFMD/DFMD-30 | 90 | 7.5 amps | 12.5 VDC |
| AFMD/DFMD-35 | 132 | 11.1 amps | 12.5 VDC |
| AFLD/DFLD-35 | 150 | 12.5 amps | 12.5 VDC |
| AFLD/DFLD-40 | 150 | 12.5 amps | 12.5 VDC |

| Suburban | | | |
|---|---|---|---|
| Model | Motor diameter | Current | Voltage |
| SF Series - 20 Mbtu | 2.5" | 6.5 amps | 12.5 VDC |
| SF Series - 20 Mbtu | 3.0" | 8.5 amps | 12.5 VDC |
| SF Series - 25 Mbtu | 2.5" | 6.5 amps | 12.5 VDC |
| SF Series - 25 Mbtu | 3.0" | 8.5 amps | 12.5 VDC |
| SF Series -30 Mbtu | 2.5" | 6.5 amps | 12.5 VDC |
| SF Series - 30 Mbtu | 3.0" | 6.5 amps | 12.5 VDC |
| SF Series - 35 Mbtu | 2.5 | 8.5 amps | 12.5 VDC |
| SF Series - 35 Mbtu | 3.0" | 9.4 amps | 12.5 VDC |
| SF Series - 42 Mbtu | 3.0" | 11.5 amps | 12.5 VDC |
| SH Series - 35 Mbtu | 3.0" | 8.2 amps | 12.5 VDC |
| SH Series - 42 Mbtu | 3.0" | 10.6 amps | 12.5 VDC |
| SHD Series - 25/42 Mbtu | 3.0" | 8.8/12.0 amps | 12.5 VDC |
| Current draw should be within 5% of factory spec's<br>10% loss in current = 15% loss in air flow<br>20% loss in current = 30% loss in air flow | | | |