

# SERVICING

## S-15 CHECKING CAPACITOR

The direct drive motors are of the permanent split capacitor design. A run capacitor is wired across the auxiliary and a portion of the main windings. The capacitor's primary function is to reduce the line current while greatly improving the torque characteristics of a motor. This is accomplished by using the 90° phase relationship between the capacitor current and voltage in conjunction with the motor windings so that the motor will give two phase operation when connected to a single phase circuit. The capacitor also reduces the line current to the motor by improving the power factor to the load.

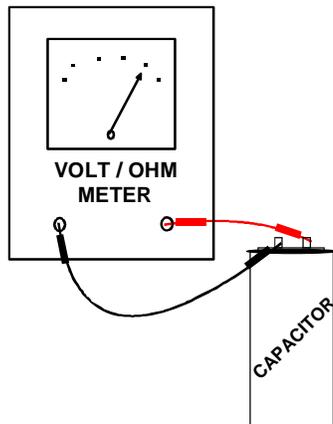
 **WARNING**

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**DISCHARGE CAPACITOR THROUGH A 20 TO 30 OHM RESISTOR BEFORE HANDLING.**

Two quick ways to test a capacitor are a resistance and a capacitance check. Refer to the next two figures for proper meter connections for the resistance and capacitance testing of the capacitor.

### S-15A Resistance Check



Testing Capacitor Resistance

 **WARNING**

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**HIGH VOLTAGE**  
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



1. Remove blower compartment door to gain access to capacitor.
2. Discharge capacitor and remove wire leads.
3. Set an ohmmeter on its highest ohm scale and connect the leads to the capacitor.

- a. Good Condition - indicator swings to zero and slowly returns toward infinity.
- b. Shorted - indicator swings to zero and stops there - replace.
- c. Open - no reading - replace. Reverse leads. Check again no reading - replace.
- d. Reverse leads and recheck.

## S-16A CHECKING AIR CIRCULATOR BLOWER MOTOR (PSC & ECM)

 **WARNING**

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**DISCONNECT ALL POWER BEFORE SERVICING.**

1. Remove blower compartment door to gain access to the circulator blower motor and integrated ignition control.
2. Discharge the capacitor on (PSC) motors. Disconnect the motor wire leads from its connection point at the integrated ignition control module and capacitor if applicable.
3. Using an ohmmeter, test for continuity between each of the motor leads.
4. Touch one probe of the ohmmeter to the motor frame (ground) and the other probe in turn to each lead.

If the windings do not test continuous or a reading is obtained to ground, replace the motor.

5. After completing check and/or replacement of circulator blower motor or induced draft blower motor, reinstall blower compartment door.
6. Turn on electrical power and verify proper unit operation.

The 80% and 90% Two-Stage Variable Speed furnaces incorporate the GE® ICM or variable speed blower motors for greater efficiency. ECM/ICM motors vary the motor RPMs to provide a set volume of air over a wide range of conditions. These motors use an electronic control module attached to the motors end bell to control motor operation. Some unique features of these motors are:

1. Constant Airflow. These motors will maintain constant airflow over a wide static pressure range. In other words, as the static increases so does the motors RPM so that a constant CFM is maintained.

**NOTE:** The motor in these units will move more air under higher static conditions than a similar sized unit using a PSC motor. Because this motor does not load up and reduce airflow like a PSC motor, in some undersized duct installations this may cause noise or high airflow complaints.

2. Ramp-up/Ramp-down feature. These motors ramp up and down at the beginning or end of a cycle to reduce air rush noise.

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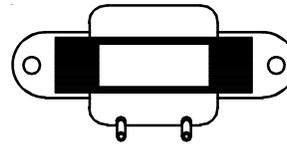
3. High voltage is present at the motor all the time. Motor operation is controlled through the low voltage motor interface board that provides an output voltage to the motor end bell. This voltage output determines the CFM, which the motor will provide.

A Green LED light, located on the integrated ignition control, next to the fuse, indicates the airflow that the motor is supposed to be delivering. The number of blinks depends upon the positioning of the pin selector switches on the integrated ignition control. The number of blinks multiplied by 100 yields the programmed CFM (Example: 10 Blinks x 100 = 1000 CFM). The indicated CFM may vary, depending on the mode of operation and the signals being sent to the control board at the time.

## ECM/ICM Control Connections

EMC/ICM control connections are made through the thermostat connections on the integrated ignition control. No other control connections are needed.

**NOTE:** An inductor (*Factor Power Choke Correction*) is required when powering the 3/4 and 1 horsepower motors with 115 volts (inductor pictured below). The operation of this inductor is to reduce the line current by storing the electrical energy in a magnetic field, such that the voltage AC waveform leads the current AC waveform. In other words, the inductor reduces line current which extends the life of the 3/4 and 1 horsepower motors. The furnaces requiring an inductor are shown in the following chart.

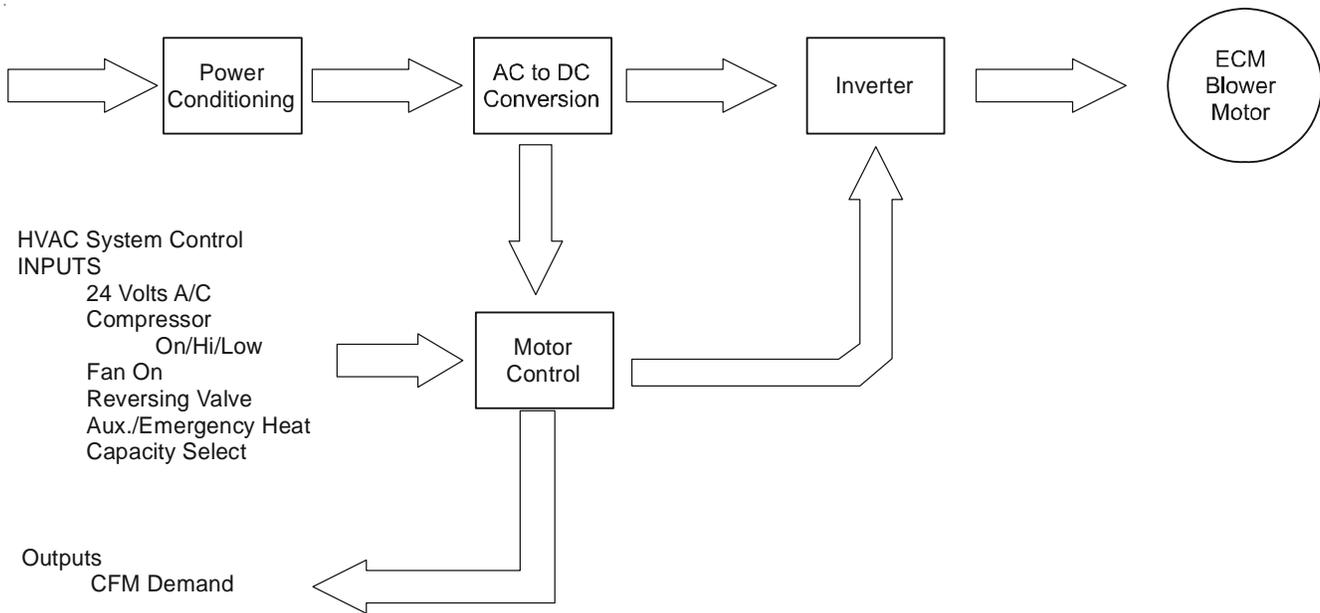


80% Models	90% Models	95% Models
*MV80704BXA	*CV90704CXA	GMV950704CXA
*MV90805CXA	*MV90704CXA	GMV950905DXA
*MV81155CXA	*CV90905DXA	GMV951155DXA
	*MV90905DXA	
	*MV91155DXA	

**IMPORTANT:** If the inductor fails, there will be no motor operation since this is the "LINE" power supply, black wire, from the integrated ignition control to the motor. To determine if the inductor is at fault, you can bypass by the inductor by disconnecting the black wire from the inductor and connecting it directly to the motor. If the motor operates then the inductor will need to be replaced.

## Checking ECM/ICM Motors

ECM/ICM motors connect directly to the AC Line Voltage. **DO NOT** insert contactors in series with the ECM/ICM Motor AC Line. The control is powered continuously to insure reliable start-up. The connector plug is polarized, verify and reverify correct connector orientation before applying power. **DO NOT** force plug into motor and make sure power is off before inserting power connector. **DO NOT** apply voltage to terminals 1 or 2.



**ECM/ICM CONTROL FLOW CHART**

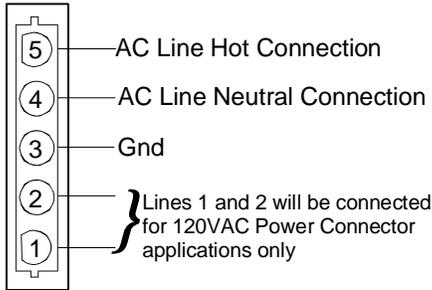
# SERVICING



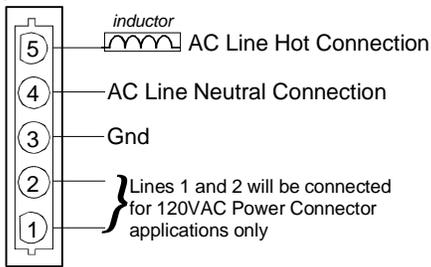
**WARNING**

**LINE VOLTAGE NOW PRESENT**

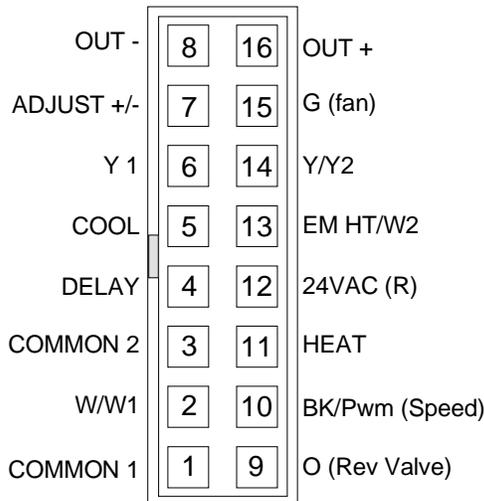
Check for line voltage on terminals 4 and 5. Verify terminal 3 is ground. Terminals 1 and 2 are jumpered in the harness for 120VAC operation.



**POWER CONNECTOR  
 (1/2 HP MOTORS)  
 "Motor Half"  
 (Viewed from Plug End)**



**POWER CONNECTOR  
 (3/4 & 1 HP MOTORS)  
 "Motor Half"  
 (Viewed from Plug End)**



**CONTROL CONNECTOR  
 "Motor Half"  
 (Viewed from connector end)**



**CAUTION**

**HIGH VOLTAGE ON CONTROL PINS WILL DESTROY MOTOR**

Do not apply 24 volts to terminals "Out +" or "Out -".  
 Make sure connector is fully seated.  
 Make sure pins are fully seated in connector housing.  
 Verify C1 and C2 are connected to transformer common.  
 Verify "R" is connected to transformer hot.

After verifying above connections, motor can be tested by applying 24 volts to control pins. Example: R to G will cause the fan to come at "Fan-Only" CFM, R to G to Y will cause the fan to come on at cooling speed and R to G to W will cause the fan to come on at heating speed.

If motor does not respond as noted, ICM control unit is bad and should be replaced.

### Replacing ICM Control Module

Use the following steps to replace the control module for the GE® variable speed indoor blower motor.

1. You must have the correct replacement module. The controls are factory programmed for specific operating modes. Even though they look alike, different modules may have completely different functionality. Using the wrong control module voids all product warranties and may produce unexpected results.
2. Remove all power from the unit being serviced. Do not work on the motor with power applied. Wait at least 5 minutes after disconnecting power from the equipment before opening the motor.
3. It is usually not necessary to remove the motor from the blower assembly. However it is recommended that the whole blower assembly, with the motor, be removed. Unplug the two cable connectors to the motor. There are latches on each connector. Do not pull on the wires. The plugs remove easily when properly released.
4. Locate the two standard 1/4" hex head bolts. Remove these bolts from the motor while holding the control module.
5. The control module is now free of the motor but still attached by a plug and cable. Carefully rotate the control so as to gain access to the plug on the end of the cable. Squeeze the release latch and gently pull the plug out of the control module. Do not pull on the wires. Grip the plug only.

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6. The control module is now completely detached from the motor. Verify with a standard ohmmeter that the resistance from each motor lead (in the motor plug just removed) to the motor shell is greater than 100k ohms. (Measure resistance to unpainted motor end plate). If any motor lead fails this test do not proceed to install the control module. The motor is defective and must be replaced. Installing the new control module will cause it fail also.
7. Verify that the replacement control module is correct for your application. If so, orient the new module next to the motor and carefully insert the plug removed in step 5. Be sure the plug latches. It will click when properly inserted.
8. Install the new control module back on the motor being careful to engage the locating notches onto the appropriate mating tabs. Replace the two 1/4" hex head bolts. Tighten the bolts snugly. It is not necessary to over-tighten.

**Note:** Before replacing the blower/motor assembly, it is important to look at the installation to see if some application fault has caused the motor to fail.

Is there any evidence of water damage to the failed control? (Corrosion on the inside or outside of the casting.) If yes, do a moisture check.

9. Re-install the blower/motor assembly into the furnace.

10. Plug the 16-pin control plug into the motor. The plug is keyed. Make sure the connector is properly seated and latched.
11. Plug the 5 pin power connector into the motor even though the plug is keyed, observe the proper orientation. Do not force the connector. It plugs in very easily when properly oriented. **Reversing this plug will cause immediate failure of the control module.**
12. Final installation check. Make sure the motor is installed as follows:
  - a. As far into the blower housing as possible.
  - b. Belly bands not covering vent holes or on the control module.
  - c. Motor connectors should oriented as to prevent the accumulation of moisture in the control.
  - d. Use wire ties to create a drip loop in the motor cables.
13. The installation is now complete. Reapply power to the furnace and verify that the new motor control module is working properly.

For complete troubleshooting information on the variable speed air circulator blower motors, refer to the *Troubleshooting Chart for ECM/ICM Variable Speed Air Circulator Blower Motors* on the next page of this manual.

# SERVICING

Troubleshooting Chart for ECM/ICM Variable Speed Air Circulator Blower Motors				
Symptoms of Abnormal Operation	Fault Description(s)	Possible Causes	Corrective Action	Cautions and Notes
- Motor rocks slightly when starting.	- This is normal start-up for variable speed motor.	----	----	----
- Motor won't start.	- No movement.	<ul style="list-style-type: none"> <li>- Manual disconnect switch off or door switch open.</li> <li>- Blown fuse or circuit breaker.</li> <li>- 24 Vac wires miswired.</li> <li>- Unseated pins in wiring harness connectors.</li> <li>- Bad motor/control module.</li> <li>- Moisture present in motor or control module.</li> </ul>	<ul style="list-style-type: none"> <li>- Check 115 Vac power at motor.</li> <li>- Check low voltage (24 Vac R to C) at motor.</li> <li>- Check low voltage connections (G, Y, W, R, C) at motor.</li> <li>- Check for unseated pins in connectors on motor harness.</li> <li>- Test with a temporary jumper between R - G.</li> </ul>	<ul style="list-style-type: none"> <li>- Turn power OFF prior to repair. Wait 5 minutes after disconnecting power before opening motor.</li> <li>- Handle electronic motor/control with care.</li> </ul>
- Motor oscillates up & down while being tested off of blower.	- Motor rocks, but won't start.	<ul style="list-style-type: none"> <li>- Loose motor mount.</li> <li>- Blower wheel not tight on motor shaft.</li> <li>- Bad motor/control module.</li> </ul>	<ul style="list-style-type: none"> <li>- Check for loose motor mount.</li> <li>- Make sure blower wheel is tight on shaft.</li> <li>- Perform motor/control replacement check, ICM-2 motors only.</li> </ul>	<ul style="list-style-type: none"> <li>- Turn power OFF prior to repair. Wait 5 minutes after disconnecting power before opening motor.</li> <li>- Handle electronic motor/control with care.</li> </ul>
- Motor starts, but runs erratically.	- It is normal for motor to oscillate with no load on shaft.	----	----	----
	- Varies up and down or intermittent.	<ul style="list-style-type: none"> <li>- Variation in 115 Vac to motor.</li> <li>- Unseated pins in wiring harness connectors.</li> <li>- Erratic CFM command from "BK" terminal.</li> <li>- Improper thermostat connection or setting.</li> <li>- Moisture present in motor/control module.</li> </ul>	<ul style="list-style-type: none"> <li>- Check line voltage for variation or "sag".</li> <li>- Check low voltage connections (G, Y, W, R, C) at motor, unseated pins in motor harness connectors.</li> <li>- Check-out system controls - Thermostat.</li> <li>- Perform Moisture Check.*</li> </ul>	<ul style="list-style-type: none"> <li>- Turn power OFF prior to repair.</li> </ul>
	- "Hunts" or "puffs" at high CFM (speed).	<ul style="list-style-type: none"> <li>- Incorrect or dirty filter(s).</li> <li>- Incorrect supply or return ductwork.</li> <li>- Incorrect blower speed setting.</li> </ul>	<ul style="list-style-type: none"> <li>- Does removing panel or filter reduce "puffing"?</li> <li>- Check/replace filter.</li> <li>- Check/correct duct restrictions.</li> <li>- Adjust to correct blower speed setting.</li> </ul>	<ul style="list-style-type: none"> <li>- Turn power OFF prior to repair.</li> </ul>

CHART CONTINUED ON NEXT PAGE

# SERVICING

## CHART CONTINUED FROM PREVIOUS PAGE

### Troubleshooting Chart for ECM/ICM Variable Speed Air Circulator Blower Motors

Symptoms of Abnormal Operation	Fault Description(s)	Possible Causes	Corrective Action	Cautions and Notes
- Motor starts, but runs erratically.	- Stays at low CFM despite system call for cool or heat CFM.	- 24 Vac wires miswired or loose. - "R" missing/not connected at motor. - Fan is delay mode.	- Check low voltage (Thermostat) wires and connections. - Verify fan is not in delay mode - wait until delay complete. - Perform motor/control replacement check, ICM-2 motors only.	- Turn power OFF prior to repair. Wait 5 minutes after disconnecting power before opening motor. - Handle electronic motor/control with care.
	- Stays at high CFM.	- "R" missing/not connected at motor. - Fan is delay mode.	- Is fan in delay mode? - wait until delay time complete. - Perform motor/control replacement check, ICM-2 motors only.	- Turn power OFF prior to repair. Wait 5 minutes after disconnecting power before opening motor. - Handle electronic motor/control with care.
- Blower won't shut off.	- Blower won't shut off.	- Current leakage from controls into G, Y, or W.	- Check for Triac switched Tstat or solid state relay.	- Turn power OFF prior to repair.
	- Air noise.	- High static creating high blower speed. - Incorrect supply or return ductwork. - Incorrect or dirty filter(s). - Incorrect blower speed setting.	- Check/replace filter. - Check/correct duct restrictions. - Adjust to correct blower speed setting.	- Turn power OFF prior to repair.
	- Noisy blower or cabinet.	- Loose blower housing, panels, etc. - High static creating high blower speed. - Air leaks in ductwork, cabinets, or panels.	- Check for loose blower housing, panels, etc. - Check for air whistling thru seams in ducts, cabinets or panels. - Check for cabinet/duct deformation.	- Turn power OFF prior to repair.
- Excessive noise.	- "Hunts" or "puffs" at high CFM (speed).	- High static creating high blower speed. - Incorrect or dirty filter(s). - Incorrect supply or return ductwork. - Incorrect blower speed setting.	- Does removing panel or filter reduce "puffing"? - Check/replace filter. - Check/correct duct restrictions. - Adjust to correct blower speed setting.	- Turn power OFF prior to repair.
	- Motor failure or malfunction has occurred and moisture is present.	- Moisture in motor/control module.	- Replace motor and perform Moisture Check.*	- Turn power OFF prior to repair. Wait 5 minutes after disconnecting power before opening motor. - Handle electronic motor/control with care.
- Evidence of Moisture.	- Motor failure or malfunction has occurred and moisture is present.	- Moisture in motor/control module.	- Replace motor and perform Moisture Check.*	- Turn power OFF prior to repair. Wait 5 minutes after disconnecting power before opening motor. - Handle electronic motor/control with care.

#### \*Moisture Check

- Connectors are oriented "down" (or as recommended by equipment manufacturer).
- Arrange harnesses with "drip loop" under motor.
- Is condensate drain plugged?
- Check for low airflow (too much latent capacity).
- Check for undercharged condition.
- Check and plug leaks in return ducts, cabinet.

**NOTE:** You must use the correct replacement control motor module since they are factory programmed for specific operating modes. Even though they look alike, different modules may have completely different functionality. The ICM-2 variable speed motors are currently the only motors that can have the motor/control module replaced.

**IMPORTANT NOTE:** Using the wrong motor/control module voids all product warranties and may produce unexpected results.

# SERVICING

## VARIABLE SPEED (ECM) MOTOR TEST (Low Stage Heat Call)

### THERMOSTAT HEAT INPUT(S): R, W1

First, low voltage readings are measured with the 16-pin wire harness disconnected from the motor. A diagram of the harness and pin locations is provided below. Voltage measurement is AC or DC as specified in the chart below under the (Volts) column. Set your voltage meter to the proper AC or DC reading as requested below.

Thermostat Input(s): R, W1			
Description	Pin	Volts <sup>(5)</sup>	Signal Indicates
Com, C1	1	0 VAC	Common
W/W1	2	≥ 13 VAC	W1 = ON
Com, C2	3	0 VAC	Common
Delay <sup>(4)</sup>	4	0 VAC	Delay Tap = A
		≥ 10 VDC	Delay Tap = B
		≤ -10 VDC	Delay Tap = C
		24 VAC	Delay Tap = D
Cool <sup>(4)</sup>	5	0 VAC	Cool Tap = A
		≥ 10 VDC	Cool Tap = B
		≤ -10 VDC	Cool Tap = C
		24 VAC	Cool Tap = D
Y1	6	0 VAC	Y1 = OFF
Adjust <sup>(4)</sup>	7	0 VAC	Adjust Tap = A
		≥ 10 VDC	Adjust Tap = B
		≤ -10 VDC	Adjust Tap = C
		24 VAC	Adjust Tap = D
Out - <sup>(3)</sup>	8	0 VDC	Common
O	9	0 VAC	O = OFF
Bk/PWM <sup>(2)</sup>	10	24 VAC	No Dehumidification
Heat <sup>(4)</sup>	11	0 VAC	Heat Tap = A
		≥ 10 VDC	Heat Tap = B
		≤ -10 VDC	Heat Tap = C
		24 VAC	Heat Tap = D
R	12	24 VAC	R = ON
EM/W2	13	0 VAC	EM/W2 = OFF
Y/Y2	14	0 VAC	Y/Y2 = OFF
G <sup>(1)</sup>	15	≥ 13 VAC	G = ON
Out + <sup>(3)</sup>	16	0-3.5 VDC	CFM LED

### ECM Motor Not Coming On

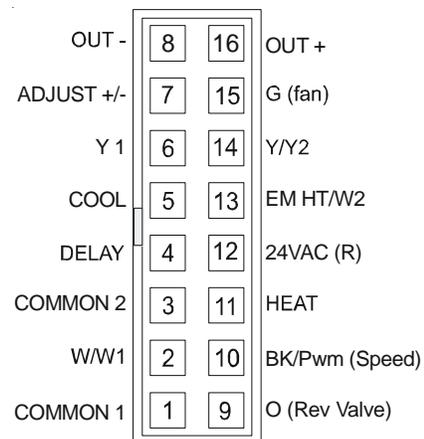
In order for the heating fan speed to operate, the integrated control board has to receive a low-stage (W1) call from the thermostat. The control board now starts the heat sequence, bringing on the burners. After the control board goes through its timing sequence, the following signals should be seen at the end of the 16 pin harness going to the motor while the burners are firing.

Unplug the 16-pin harness from the ECM motor. Set volt meter to read AC volts. Place your voltage meter on Pin 1(Common) and Pin 2 (W1), you should be reading 13 AC volts. Next, check between Pin 1 (Common) and Pin 12 (R), you should read 24 AC volts. Finally, check between Pin 1(Common) and Pin 15 (G), you should read 13 AC Volts.

You **MUST** have all of these low voltage readings before the ECM motor will come on. If you **DO NOT** have these readings you may have a 16-pin harness or integrated control board problem.

Make sure you have high voltage at the 5-pin connector going to the motor as discussed earlier.

We highly recommend using the GE TECMate XL™ or the GE TECMate PRO™ model ECM motor tester. This low cost test instrument will verify whether the motor itself is good.



**CONTROL CONNECTOR**  
"Motor Half"  
(Viewed from connector end)

(1) This input must be active for motor to operate.

(2) 0 VAC indicates humidistat is calling for dehumidification.

(3) These two pins form an output circuit that powers the CFM LED on the ignition control or interface board.

(4) Dipswitch settings determine measure voltage.

(5) Voltage is measured with 16-wire harness disconnected from motor. Voltage measurement is AC or DC as specified in the chart.

# SERVICING

## VARIABLE SPEED (ECM) MOTOR TEST (High Stage Heat Call)

### THERMOSTAT HEAT INPUT(S): R, W1, W2

First, low voltage readings are measured with the 16-pin wire harness disconnected from the motor. A diagram of the harness and pin locations is provided below. Voltage measurement is AC or DC as specified in the chart below under the (Volts) column. Set your voltage meter to the proper AC or DC reading as requested below.

Thermostat Input(s): R, W1, W2			
Description	Pin	Volts <sup>(5)</sup>	Signal Indicates
Com, C1	1	0 VAC	Common
W/W1	2	≥ 13 VAC	W1 = ON
Com, C2	3	0 VAC	Common
Delay <sup>(4)</sup>	4	0 VAC	Delay Tap = A
		≥ 10 VDC	Delay Tap = B
		≤ -10 VDC	Delay Tap = C
		24 VAC	Delay Tap = D
Cool <sup>(4)</sup>	5	0 VAC	Cool Tap = A
		≥ 10 VDC	Cool Tap = B
		≤ -10 VDC	Cool Tap = C
		24 VAC	Cool Tap = D
Y1	6	0 VAC	Y1 = OFF
Adjust <sup>(4)</sup>	7	0 VAC	Adjust Tap = A
		≥ 10 VDC	Adjust Tap = B
		≤ -10 VDC	Adjust Tap = C
		24 VAC	Adjust Tap = D
Out - <sup>(3)</sup>	8	0 VDC	Common
O	9	0 VAC	O = OFF
Bk/PWM <sup>(2)</sup>	10	24 VAC	No Dehumidification
Heat <sup>(4)</sup>	11	0 VAC	Heat Tap = A
		≥ 10 VDC	Heat Tap = B
		≤ -10 VDC	Heat Tap = C
		24 VAC	Heat Tap = D
R	12	24 VAC	R = ON
EM/W2	13	24 VAC	EM/W2 = ON
Y/Y2	14	0 VAC	Y/Y2 = OFF
G <sup>(1)</sup>	15	≥ 13 VAC	G = ON
Out + <sup>(3)</sup>	16	0-3.5 VDC	CFM LED

### ECM Motor Not Coming On

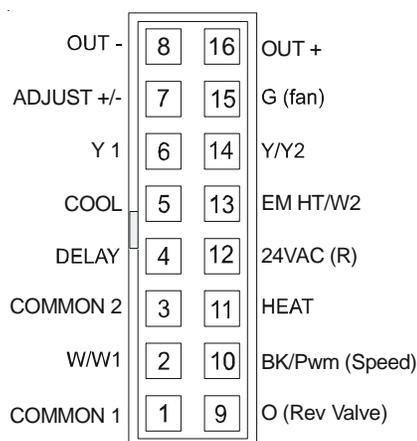
In order for the heating fan speed to operate, the integrated control board has to receive a low-stage (W1) and (W2) call from the thermostat. The control board now starts the heat sequence, bringing on the burners. After the control board goes through its timing sequence, the following signals should be seen at the end of the 16 pin harness going to the motor while the burners are firing.

Unplug the 16-pin harness from the ECM motor. Set volt meter to read AC volts. Place your voltage meter on Pin 1(Common) and Pin 2 (W1), you should be reading 13 AC volts, if the (W2) is calling you should see 24 AC volts. Next, check between Pin 1 (Common) and Pin 12 (R), you should read 24 AC volts. Finally, check between Pin 1 (Common) and Pin 15 (G), you should read 13 AC Volts.

You **MUST** have all of these low voltage readings before the ECM motor will come on. If you **DO NOT** have these readings you may have a 16-pin wire harness or integrated control board problem.

Make sure you have high voltage at the 5-pin connector going to the motor as discussed earlier.

We highly recommend using the GE TECMate PRO™ model ECM motor tester. This low cost test instrument will verify whether the motor itself is good.



**CONTROL CONNECTOR**  
"Motor Half"  
(Viewed from connector end)

(1) This input must be active for motor to operate.

(2) 0 VAC indicates humidistat is calling for dehumidification.

(3) These two pins form an output circuit that powers the CFM LED on the ignition control or interface board.

(4) Dipswitch settings determine measure voltage.

(5) Voltage is measured with 16-wire harness disconnected from motor. Voltage measurement is AC or DC as specified in the chart.

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## VARIABLE SPEED (ECM) MOTOR TEST (Fan Only Call)

### THERMOSTAT CONTINUOUS FAN INPUT(S):

#### R, G

First, low voltage readings are measured with the 16-pin wire harness disconnected from the motor. A diagram of the harness and pin locations is provided below. Voltage measurement is AC or DC as specified in the chart below under the (Volts) column. Set your voltage meter to the proper AC or DC reading as requested below.

Thermostat Input(s): R, G			
Description	Pin	Volts <sup>(5)</sup>	Signal Indicates
Com, C1	1	0 VAC	Common
W/W1	2	0 VAC	W1 = OFF
Com, C2	3	0 VAC	Common
Delay <sup>(4)</sup>	4	0 VAC	Delay Tap = A
		≥ 10 VDC	Delay Tap = B
		≤ -10 VDC	Delay Tap = C
		24 VAC	Delay Tap = D
Cool <sup>(4)</sup>	5	0 VAC	Cool Tap = A
		≥ 10 VDC	Cool Tap = B
		≤ -10 VDC	Cool Tap = C
		24 VAC	Cool Tap = D
Y1	6	0 VAC	Y1 = OFF
Adjust <sup>(4)</sup>	7	0 VAC	Adjust Tap = A
		≥ 10 VDC	Adjust Tap = B
		≤ -10 VDC	Adjust Tap = C
		24 VAC	Adjust Tap = D
Out - <sup>(3)</sup>	8	0 VDC	Common
O	9	0 VAC	O = OFF
Bk/PWM <sup>(2)</sup>	10	24 VAC	No Dehumidification
Heat <sup>(4)</sup>	11	0 VAC	Heat Tap = A
		≥ 10 VDC	Heat Tap = B
		≤ -10 VDC	Heat Tap = C
		24 VAC	Heat Tap = D
R	12	24 VAC	R = ON
EM/W2	13	0 VAC	EM/W2 = OFF
Y/Y2	14	0 VAC	Y/Y2 = OFF
G <sup>(1)</sup>	15	≥ 13 VAC	G = ON
Out + <sup>(3)</sup>	16	0-3.5 VDC	CFM LED

### ECM Motor Not Coming On

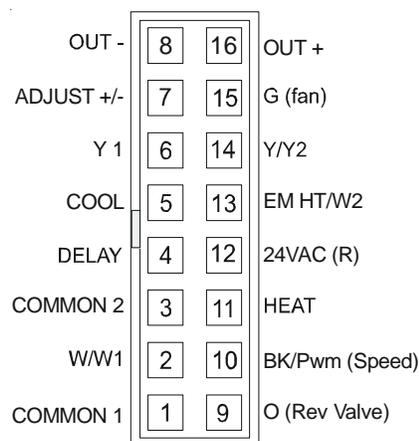
In order for the continuous fan speed to operate, the integrated control board has to receive (G) signal from the thermostat. Turn the thermostat to the Fan On position. If the fan will not run, verify 24 volts on the integrated control boards low voltage terminal strip at (C) and (R) with your volt meter. If you have 24 volts, place a jumper wire between the (R) and (G) terminal on the control board. If the motor now operates then you have a problem in the thermostat cable from the thermostat or with the thermostat.

Unplug the 16-pin harness from the ECM motor. Set volt meter to read AC volts. Place your voltage meter on Pin 1(Common) and Pin 12 (R), you should read 24 AC volts. Finally, check between Pin 1(Common) and Pin 15 (G), you should read 13 AC Volts.

You MUST have all of these low voltage readings before the ECM motor will come on. If you DO NOT have these readings you may have a 16-pin wire harness or integrated control board problem.

Make sure you have high voltage at the 5-pin connector going to the motor as discussed earlier.

We highly recommend using the GE TECMate PRO™ model ECM motor tester. This low cost test instrument will verify whether the motor itself is good.



**CONTROL CONNECTOR**  
"Motor Half"  
(Viewed from connector end)

(1) This input must be active for motor to operate.

(2) 0 VAC indicates humidistat is calling for dehumidification.

(3) These two pins form an output circuit that powers the CFM LED on the ignition control or interface board.

(4) Dipswitch settings determine measure voltage.

(5) Voltage is measured with 16-wire harness disconnected from motor. Voltage measurement is AC or DC as specified in the chart.

# SERVICING

## VARIABLE SPEED (ECM) MOTOR TEST (Cooling Low-Stage Call)

### THERMOSTAT LOW INPUT(S): R, Y1, G

First, low voltage readings are measured with the 16-pin wire harness disconnected from the motor. A diagram of the harness and pin locations is provided below. Voltage measurement is AC or DC as specified in the chart below under the (Volts) column. Set your voltage meter to the proper AC or DC reading as requested below.

Thermostat Input(s): R, Y1, G			
Description	Pin	Volts <sup>(5)</sup>	Signal Indicates
Com, C1	1	0 VAC	Common
W/W1	2	0 VAC	W1 = OFF
Com, C2	3	0 VAC	Common
Delay <sup>(4)</sup>	4	0 VAC	Delay Tap = A
		≥ 10 VDC	Delay Tap = B
		≤ -10 VDC	Delay Tap = C
		24 VAC	Delay Tap = D
Cool <sup>(4)</sup>	5	0 VAC	Cool Tap = A
		≥ 10 VDC	Cool Tap = B
		≤ -10 VDC	Cool Tap = C
		24 VAC	Cool Tap = D
Y1	6	24 VAC	Y1 = ON
Adjust <sup>(4)</sup>	7	0 VAC	Adjust Tap = A
		≥ 10 VDC	Adjust Tap = B
		≤ -10 VDC	Adjust Tap = C
		24 VAC	Adjust Tap = D
Out - <sup>(3)</sup>	8	0 VDC	Common
O	9	0 VAC	O = OFF
Bk/PWM <sup>(2)</sup>	10	24 VAC	No Dehumidification
Heat <sup>(4)</sup>	11	0 VAC	Heat Tap = A
		≥ 10 VDC	Heat Tap = B
		≤ -10 VDC	Heat Tap = C
		24 VAC	Heat Tap = D
R	12	24 VAC	R = ON
EM/W2	13	0 VAC	EM/W2 = OFF
Y/Y2	14	0 VAC	Y/Y2 = OFF
G <sup>(1)</sup>	15	≥ 13 VAC	G = ON
Out + <sup>(3)</sup>	16	0-3.5 VDC	CFM LED

### ECM Motor Not Coming On

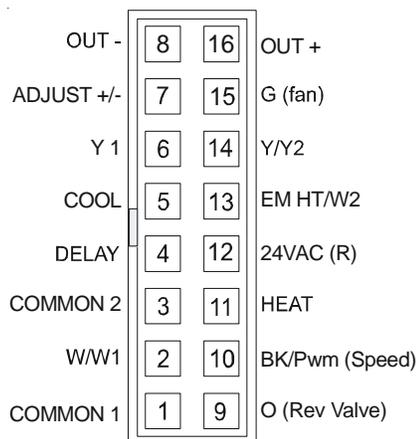
In order for the cooling fan speed to operate, the integrated control board has to receive (Y1) signal from the thermostat. Turn the thermostat to the Cooling 1st stage position. If the fan will not run, verify 24 volts on the integrated control boards low voltage terminal strip at (C) and (R) with your volt meter. If you have 24 volts, place a jumper wire between the (R), (YLO) and (G) terminal on the control board. If the motor now operates then you have a problem in the thermostat or thermostat cable. If the motor does not operate, check for high voltage at the 5-pin connector on the motor.

You should have approximately 120 volts all the time to the motor. Failure to receive power could be faulty harness, loose connection or faulty inductor.

Unplug the 16-pin harness from the ECM motor. Set volt meter to read AC volts. Place your voltage meter on Pin 1(Common) and Pin 12 (R), you should read 24 AC volts. Finally, check between Pin 1(Common) and Pin 15 (G), you should read 13 AC Volts. Next, check between Pin 1 (Common) and Pin 6 (Y1), you should read 24 AC volts.

You **MUST** have all of these low voltage readings before the ECM motor will come on. If you **DO NOT** have these readings you may have a 16-pin wire harness or integrated control board problem.

We highly recommend using the GE TECMate PRO™ model ECM motor tester. This low cost test instrument will verify whether the motor itself is good.



**CONTROL CONNECTOR**  
"Motor Half"  
(Viewed from connector end)

(1) This input must be active for motor to operate.

(2) 0 VAC indicates humidistat is calling for dehumidification.

(3) These two pins form an output circuit that powers the CFM LED on the ignition control or interface board.

(4) Dipswitch settings determine measure voltage.

(5) Voltage is measured with 16-wire harness disconnected from motor. Voltage measurement is AC or DC as specified in the chart.

# SERVICING

## VARIABLE SPEED (ECM) MOTOR TEST (Cooling Two-Stage Call)

### THERMOSTAT HEAT INPUT(S): R, Y1, Y2, G

First, low voltage readings are measured with the 16-pin wire harness disconnected from the motor. A diagram of the harness and pin locations is provided below. Voltage measurement is AC or DC as specified in the chart below under the (Volts) column. Set your voltage meter to the proper AC or DC reading as requested below.

Thermostat Input(s): R, Y1, Y2, G			
Description	Pin	Volts <sup>(5)</sup>	Signal Indicates
Com, C1	1	0 VAC	Common
W/W1	2	0 VAC	W1 = OFF
Com, C2	3	0 VAC	Common
Delay <sup>(4)</sup>	4	0 VAC	Delay Tap = A
		≥ 10 VDC	Delay Tap = B
		≤ -10 VDC	Delay Tap = C
		24 VAC	Delay Tap = D
Cool <sup>(4)</sup>	5	0 VAC	Cool Tap = A
		≥ 10 VDC	Cool Tap = B
		≤ -10 VDC	Cool Tap = C
		24 VAC	Cool Tap = D
Y1	6	24 VAC	Y1 = ON
Adjust <sup>(4)</sup>	7	0 VAC	Adjust Tap = A
		≥ 10 VDC	Adjust Tap = B
		≤ -10 VDC	Adjust Tap = C
		24 VAC	Adjust Tap = D
Out - <sup>(3)</sup>	8	0 VDC	Common
O	9	0 VAC	O = OFF
Bk/PWM <sup>(2)</sup>	10	24 VAC	No Dehumidification
Heat <sup>(4)</sup>	11	0 VAC	Heat Tap = A
		≥ 10 VDC	Heat Tap = B
		≤ -10 VDC	Heat Tap = C
		24 VAC	Heat Tap = D
R	12	24 VAC	R = ON
EM/W2	13	0 VAC	EM/W2 = OFF
Y/Y2	14	24 VAC	Y/Y2 = ON
G <sup>(1)</sup>	15	≥ 13 VAC	G = ON
Out + <sup>(3)</sup>	16	0-3.5 VDC	CFM LED

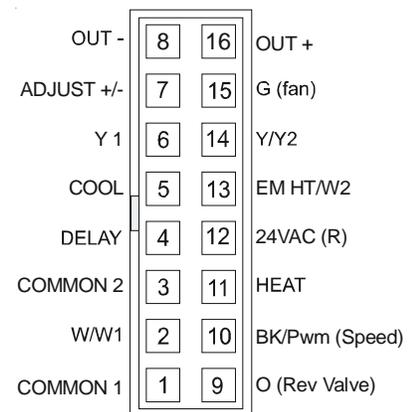
### ECM Motor Not Coming On

In order for the cooling fan speed to operate, the integrated control board has to receive a (Y1) and (Y2) signal from the thermostat. Turn the thermostat to the Cooling two-stage position. If the fan will not run, verify 24 volts on the integrated control boards low voltage terminal strip at (C) and (R) with your volt meter. If you have 24 volts, remove thermostat wires from the integrated control boards terminal strip. Now place a jumper wire between the (R), (Y1), (Y2) and (G) terminal on the control board. If the motor now operates then you have a problem in the thermostat or thermostat cable. If the motor does not operate, with the terminals above jumped out, unplug the 16-pin harness from the ECM motor. Set volt meter to read AC volts. Place your voltage meter on Pin 1 (Common) and Pin 12 (R) should read 24 AC volts, Pin 1 (Common) and Pin 6 (Y1) and to Pin 14 (Y/Y2) should read 24 AC volts. Finally, check between Pin 1 (Common) and Pin 15 (G), you should read 13 AC volts.

You **MUST** have all of these low voltage readings before the ECM motor will come on. If you **DO NOT** have these readings you may have a 16-pin wire harness or integrated control board problem.

Make sure you have high voltage at the 5-pin connector going to the motor as discussed earlier.

We highly recommend using the GE TECMate PRO™ model ECM motor tester. This low cost test instrument will verify whether the motor itself is good.



**CONTROL CONNECTOR  
"Motor Half"  
(Viewed from connector end)**

(1) This input must be active for motor to operate.

(2) 0 VAC indicates humidistat is calling for dehumidification.

(3) These two pins form an output circuit that powers the CFM LED on the ignition control or interface board.

(4) Dipswitch settings determine measure voltage.

(5) Voltage is measured with 16-wire harness disconnected from motor. Voltage measurement is AC or DC as specified in the chart.

# SERVICING

## VARIABLE SPEED (ECM) MOTOR TEST (Heat Pump Cooling Single-Stage Call)

### THERMOSTAT HEAT INPUT(S): R, Y1, O, G

First, low voltage readings are measured with the 16-pin wire harness disconnected from the motor. A diagram of the harness and pin locations is provided below. Voltage measurement is AC or DC as specified in the chart below under the (Volts) column. Set your voltage meter to the proper AC or DC reading as requested below.

Thermostat Input(s): R, Y1, O, G			
Description	Pin	Volts <sup>(5)</sup>	Signal Indicates
Com, C1	1	0 VAC	Common
W/W1	2	0 VAC	W1 = OFF
Com, C2	3	0 VAC	Common
Delay <sup>(4)</sup>	4	0 VAC	Delay Tap = A
		≥ 10 VDC	Delay Tap = B
		≤ -10 VDC	Delay Tap = C
		24 VAC	Delay Tap = D
Cool <sup>(4)</sup>	5	0 VAC	Cool Tap = A
		≥ 10 VDC	Cool Tap = B
		≤ -10 VDC	Cool Tap = C
		24 VAC	Cool Tap = D
Y1	6	24 VAC	Y1 = ON
Adjust <sup>(4)</sup>	7	0 VAC	Adjust Tap = A
		≥ 10 VDC	Adjust Tap = B
		≤ -10 VDC	Adjust Tap = C
		24 VAC	Adjust Tap = D
Out - <sup>(3)</sup>	8	0 VDC	Common
O	9	24 VAC	O = ON
Bk/PWM <sup>(2)</sup>	10	24 VAC	No Dehumidification
Heat <sup>(4)</sup>	11	0 VAC	Heat Tap = A
		≥ 10 VDC	Heat Tap = B
		≤ -10 VDC	Heat Tap = C
		24 VAC	Heat Tap = D
R	12	24 VAC	R = ON
EM/W2	13	0 VAC	EM/W2 = OFF
Y/Y2	14	0 VAC	Y/Y2 = OFF
G <sup>(1)</sup>	15	≥ 13 VAC	G = ON
Out + <sup>(3)</sup>	16	0-3.5 VDC	CFM LED

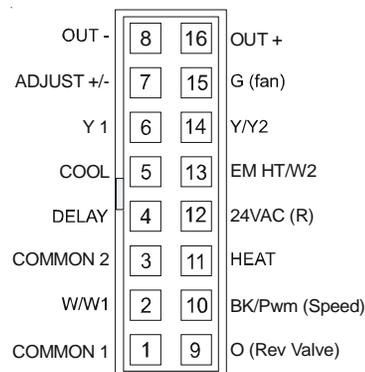
### ECM Motor Not Coming On

In order for the cooling fan speed to operate with a heat pump, the integrated control board has to receive a (Y1) and (O) signal from the thermostat. Turn the thermostat to the Cooling position. If the fan will not run, verify 24 volts on the integrated control boards low voltage terminal strip at (C) and (R) with your volt meter. If you have 24 volts, remove thermostat wires from the integrated control boards terminal bar. Now place a jumper wire between the (R), (Y1), (O) and (G) terminal on the control board. If the motor now operates then you have a problem in the thermostat or thermostat cable. If the motor does not operate, with the terminals above jumped out, unplug the 16-pin harness from the ECM motor. Set volt meter to read AC volts. Place your voltage meter on Pin 1(Common) and Pin 12 (R) should read 24 AC volts, Pin 1(Common) and Pin 6 (Y1) or to Pin 9 (O) should read 24 AC volts. Finally, check between Pin 1(Common) and Pin 15 (G), you should read 13 AC volts.

You **MUST** have all of these low voltage readings before the ECM motor will come on. If you **DO NOT** have these readings you may have a 16-pin wire harness or integrated control board problem.

Make sure you have high voltage at the 5-pin connector going to the motor as discussed earlier.

We highly recommend using the GE TECMate PRO™ model ECM motor tester. This low cost test instrument will verify whether the motor itself is good.



**CONTROL CONNECTOR**  
"Motor Half"  
(Viewed from connector end)

(1) This input must be active for motor to operate.

(2) 0 VAC indicates humidistat is calling for dehumidification.

(3) These two pins form an output circuit that powers the CFM LED on the ignition control or interface board.

(4) Dipswitch settings determine measure voltage.

(5) Voltage is measured with 16-wire harness disconnected from motor. Voltage measurement is AC or DC as specified in the chart.