DANGER, WARNING, CAUTION, and NOTE

The signal words DANGER, WARNING, CAUTION, and NOTE are used to identify levels of hazard seriousness. The signal word DANGER is only used on product labels to signify an immediate hazard. The signal words WARNING, CAUTION, and NOTE will be used on product labels and throughout this manual and other manuals that may apply to the product.

DANGER – Immediate hazards which will result in severe personal injury or death.

WARNING – Hazards or unsafe practices which could result in severe personal injury or death.

CAUTION – Hazards or unsafe practices which may result in minor personal injury or product or property damage.

NOTE – Used to highlight suggestions which will result in enhanced installation, reliability, or operation.

Signal Words in Manuals

The signal word WARNING is used throughout this manual in the following manner:

⚠ WARNING

The signal word CAUTION is used throughout this manual in the following manner:

⚠ CAUTION

Signal Words on Product Labeling

Signal words are used in combination with colors and/or pictures or product labels.

⚠ Safety–alert symbol

When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

TABLE OF CONTENTS

START–UP, ADJUSTMENT, AND SAFETY CHECK ............... 4
SETUP SWITCHES ........................................ 4
PRIME CONDENSATE TRAP WITH WATER ...................... 4
PURGE GAS LINES ........................................ 5
ADJUSTMENTS .......................................... 5
ADJUST TEMPERATURE RISE ................................ 11
ADJUST BLOWER OFF DELAY (HEAT MODE) ................... 12
ADJUST COOLING AIRFLOW ................................ 12
ADJUST CONTINUOUS FAN AIRFLOW ......................... 12
ADJUST THERMOSTAT HEAT ANTICIPATOR .................... 14
CHECK SAFETY CONTROLS ................................ 14
CHECKLIST .............................................. 14
COOLING AND HEATING AIR DELIVERY - CFM ............... 15
SERVICE AND MAINTENANCE PROCEDURES ............... 17
ELECTRICAL CONTROLS AND WIRING ....................... 17
CLEANING AND/OR REPLACING AIR FILTER ................. 19
BLOWER MOTOR AND WHEEL MAINTENANCE ................. 20
CLEANING BURNERS AND FLAME SENSOR ................. 21
SERVICING HOT SURFACE IGNITER .......................... 22
FLUSHING COLLECTOR BOX AND DRAINAGE SYSTEM .... 23
CLEANING CONDENSATE DRAIN AND TRAP ............... 23
CLEANING HEAT EXCHANGERS ............................. 23
SERVICE LABEL ........................................ 26
WIRING DIAGRAM ....................................... 27
TROUBLESHOOTING GUIDE – FLOW CHART ................... 28
SEQUENCE OF OPERATION ................................ 30
PARTS REPLACEMENT INFORMATION GUIDE ............... 35
PRODUCT NOMENCLATURE ................................ 36

MODELS

(F/G)9MVE0401410A2
(F/G)9MVE0401712A2
(F/G)9MVE0601412A2
(F/G)9MVE0601714A2
(F/G)9MVE0801716A2
(F/G)9MVE0802120A2
(F/G)9MVE1002120A2
(F/G)9MVE1202422A2

Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program. For verification of certification for individual products, go to www.ahridirectory.org.
SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock, or other conditions which may cause death, personal injury, or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses, protective clothing, and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit. Consult local building codes, the current editions of the National Fuel Gas Code (NFCG) NFPA 54/ANSI Z223.1, and the National Electrical Code (NEC) NFPA 70.

In Canada refer to the current editions of the National standards of Canada CAN/CSA–B149.1 and .2 Natural Gas and Propane Installation Codes, and Canadian Electrical Code CSA C22.1.

Recognize safety information. This is the safety–alert symbol ⚠️. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury. Understand these signal words: DANGER, WARNING, and CAUTION. These words are used with the safety–alert symbol. DANGER identifies the most serious hazards which will result in severe personal injury or death. WARNING signifies hazards which could result in personal injury or death. CAUTION is used to identify unsafe practices which may result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which will result in enhanced installation, reliability, or operation.

⚠️ WARNING

PERSONAL INJURY, AND/OR PROPERTY DAMAGE HAZARD

Failure to carefully read and follow this warning could result in equipment malfunction, property damage, personal injury and/or death.

Installation or repairs made by unqualified persons could result in equipment malfunction, property damage, personal injury and/or death. The information contained in this manual is intended for use by a qualified service technician familiar with safety procedures and equipped with proper tools and test instruments.

Installation must conform with local building codes and with the Natural Fuel Gas Code (NFCG) NFPA 54/ANSI Z223.1, and National standards of Canada CAN/CSA–B149.1 and .2 Natural Gas and Propane Installation Codes.

⚠️ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could cause personal injury or death.

Before performing service or maintenance operations on unit, always turn off main power switch to unit and install lockout tag. Unit may have more than one power switch.

⚠️ WARNING

CARBON MONOXIDE POISONING AND FIRE HAZARD

Failure to follow safety warnings could result in personal injury, death, and/or property damage.

This furnace is not designed for use in mobile homes, trailers or recreational vehicles.

⚠️ CAUTION

CUT HAZARD

Failure to follow this caution may result in damage personal injury.

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing furnaces.
START–UP CHECK SHEET
For Variable Speed Models (F/G)9MVE
(This sheet is optional. Keep for future reference.)

Date of Start–Up: __________________________

Dealer Name: ______________________________

Address: ________________________________

City, State(Province), Zip or Postal Code: ________

Phone: ________________________________

Owner Name: ______________________________

Address: ________________________________

City, State(Province), Zip or Postal Code: ________

Model Number: ______________________________

Serial Number: ______________________________

Setup Checks
Check the box when task is complete.

All Electrical Connections Tight? □

Have hoses been relocated for furnace U/D/H application? □

Condensate Drain Connected? □

Condensate Drain Trapped? □

Manual Gas Shut–off Upstream of Furnace/Drip Leg □

Gas Valve turned ON? □

Type of Gas: Natural: □ Propane: □

Filter Type and Size: __________________________

Shade in Final Furnace Settings Below:

<table>
<thead>
<tr>
<th>OAT</th>
<th>PL9</th>
</tr>
</thead>
<tbody>
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</table>

Calculated Input (BTU) Rate: (See Checks and Adjustments Section).

Heating Check

Measured Line Pressure During High Heat: _________

Measured Manifold Pressure: High Heat _________

Low Heat _________

Temperature of Supply Air: High Heat _________

Low Heat _________

Temperature of Return Air: _________

Temperature Rise (Supply – Return): High Heat _________

Low Heat _________

In Rise Range (see furnace rating plate)? □

Static Pressure (Ducts) High Heat: Supply _________

Return _________

Optional Check: CO? _________

CO2? _________

Cooling Check

Temperature of Supply Air: _________

Temperature of Return Air: _________

Temperature Difference: _________

Static Pressure (Ducts) Cooling: Supply _________

Return _________

Dealer Comments: __________________________

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Specifications subject to change without notice.
START-UP, ADJUSTMENT, AND SAFETY CHECK

NOTICE

IMPORTANT INSTALLATION AND START-UP PROCEDURES
Failure to follow this procedure may result in a nuisance smoke or odor complaint.
The manifold pressure, gas rate by meter clocking, temperature rise and operation must be checked after installation. Minor smoke and odor may be present temporarily after start-up from the manufacturing process. Some occupants are more sensitive to this minor smoke and odor. It is recommended that doors and windows be open during the first heat cycle.

General
1. Furnace must have a 115-v power supply properly connected and grounded.

NOTE: Proper polarity must be maintained for 115-v wiring. Control status indicator light flashes code 10 and furnace does not operate if polarity is incorrect or if the furnace is not grounded.

2. Thermostat wire connections at terminals R, W/W1, G, and Y/Y2 must be made at 24-v terminal block on furnace control.

3. Natural gas service pressure must not exceed 0.5 psig (14-in. w.c., 350 Pa), but must be no less than 0.16 psig (4.5-in. w.c., 1125 Pa).

4. Blower door must be in place to complete 115-v electrical circuit and supply power to furnace components.

CAUTION

UNIT OPERATION HAZARD
Failure to follow this caution may result in intermittent unit operation or performance satisfaction.
These furnaces are equipped with a manual reset limit switch in burner assembly. This switch opens and shuts off power to the gas valve if an overheat condition (flame rollout) occurs in burner assembly. Correct inadequate combustion-air supply or improper venting condition before resetting switch. DO NOT jumper this switch.

Before operating furnace, check flame rollout manual reset switch for continuity. If necessary, press button to reset switch.
EAC-1 terminal is energized whenever blower operates. HUM terminal is only energized when blower is energized in heating.

Setup Switches
There are four sets of setup switches on the furnace control board. These switches configure the furnace for correct application requirement. They also select the airflow settings for Air Conditioning and Continuous Fan CFM.
The Setup Switch locations are shown and described on Figure 4, Figure 5 and Table 5. The setup switches are also shown on the unit wiring label.

Setup Switches (SW1)
The furnace control has 8 setup switches that may be set to meet the application requirements. To set these setup switches for the appropriate requirement:
1. Remove blower door.
2. Locate setup switches on furnace control.
3. Configure the set-up switches as necessary for the application.
4. Replace blower door.

NOTE: If a bypass humidifier is used, setup switch SW1-3 (Low Heat Rise Adjust) should be in ON position. This compensates for the increased temperature in return air resulting from bypass.

Setup Switch (SW2)
Setup switches SW2 are used for applications used for Twinning two furnaces of the same model and BTU's and to adjust airflow. SW2-2 is used to adjust airflow. Refer to the Adjustments section for set up switch configurations. Refer to Figure 5 for configuration of SW2 airflow options.
1. Remove blower door.
2. Locate setup switch SW2 on furnace control.
3. Configure the switches as necessary for the application.
4. Replace blower door.

Continuous Fan (CF) Setup Switches (SW2-5, SW2-4, SW2-3)
The CF setup switches are used to select desired airflow when thermostat is in continuous fan mode or to select low-cooling airflow for two-speed cooling units. Refer to the Adjustments section for set up switch configurations.
To set the desired cooling airflow:
1. Remove blower door.
2. Locate CF setup switches on furnace control.
3. Determine air conditioning tonnage used for low cooling (when used) or desired continuous fan airflow.
4. Configure the switches for the required airflow.
5. Replace blower door.

Air Conditioning (A/C) Setup Switches (SW2-6, SW2-7, SW2-8)
The air conditioning setup switches are used to match furnace airflow to required cooling airflow or high stage cooling airflow when a two-stage outdoor unit is used. Refer to the Adjustments section for set up switch configurations.
To set the desired cooling airflow:
1. Remove blower door.
2. Locate A/C setup switches on furnace control.
3. Determine air conditioning tonnage used.
4. Configure the switches for the required cooling airflow.
5. Replace blower door.

NOTE: Incorrect airflow caused by improper A/C switch setup may cause condensate blow-off or frozen indoor coil in the cooling mode.
Prime Condensate Trap with Water

**WARNING**

CARBON MONOXIDE POISONING HAZARD
Failure to follow these warnings could result in personal injury or death.
Failure to use a properly configured trap or NOT water-priming trap before operating furnace may allow positive pressure vent gases to enter the structure through drain tube. Vent gases contain carbon monoxide which is tasteless and odorless.

**CAUTION**

UNIT OPERATION HAZARD
Failure to follow this caution may result in intermittent unit operation or performance satisfaction.
Condensate trap must be PRIMED or proper draining may not occur. The condensate trap has two internal chambers which can ONLY be primed by pouring water into the inducer drain side of condensate trap.

1. Remove upper and middle collector box drain plugs opposite of the condensate trap. (See Figure 1)
2. Connect field-supplied 5/8-in. (16 mm) ID tube with attached funnel (see Figure 1) to upper collector box drain connection.
3. Pour one quart (liter) of water into funnel/tube. Water should run through collector box, overfill condensate trap, and flow into open field drain.
4. Remove funnel; replace collector box drain plug.
5. Connect field-supplied 5/8-in. (16 mm) ID tube to middle collector box drain port.
6. Pour one quart (liter) of water into funnel/tube. Water should run through collector box, overfill condensate trap, and flow into open field drain.
7. Remove funnel and tube from collector box and replace collector box drain plug.

---

**Purge Gas Lines**

If not previously done, purge the lines after all connections have been made and check for leaks.

**WARNING**

FIRE OR EXPLOSION HAZARD
Failure to follow this warning could result in personal injury, death, and/or property damage.
Never purge a gas line into a combustion chamber. Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

**Adjustments**

**WARNING**

FIRE HAZARD
Failure to follow this warning could result in personal injury, death and/or property damage.
DO NOT bottom out gas valve regulator adjusting screw. This can result in unregulated manifold pressure and result in excess overfire and heat exchanger failures.

**CAUTION**

FURNACE DAMAGE HAZARD
Failure to follow this caution may result in reduced furnace life.
DO NOT redrill orifices. Improper drilling (burrs, out-of-round holes, etc.) can cause excessive burner noise and misdirection of burner flames. This can result in flame impingement of heat exchangers, causing failures. (See Figure 2)

**Figure 1** Priming Condensate Drain

![Figure 1](image1.png)

Representative drawing only, some models may vary in appearance.

---

**Figure 2** Orifice Hole

![Figure 2](image2.png)

For proper operation and long term reliability the furnace input rate must be within ±2 percent of input rate on furnace rating plate, or as adjusted for altitude.
The gas input rate on rating plate is for installation at altitudes up to 2000 ft. (610 M).

**NOTICE**

The NATURAL GAS manifold pressure adjustments in Table 3 compensate for BOTH altitude AND gas heating value. DO NOT apply an additional de–rate factor to the pressures shown in Table 3.

The heating content of natural gas at altitude may already provide for a reduction in capacity or altitude. Refer to Table 3. No adjustments to the furnace may be necessary at altitude for certain gas heating values.

Refer to the instructions provided in the factory-specified Propane conversion kit for instructions for setting gas manifold pressures for Propane applications.

In the USA, the input rating for altitudes above 2000 ft. (610 M) must be reduced by 2 percent for each 1000 ft. (305 M) above sea level refer to Table 1. The natural gas manifold pressures in Table 3 adjust for BOTH altitude and natural gas heating value.

In Canada, the input rating must be reduced by 5 percent for altitudes of 2000 ft. (610 M) to 4500 ft. (1372 M) above sea level. The natural gas manifold pressures in Table 3 adjust for BOTH altitude and natural gas heating value.

**Table 1**

<table>
<thead>
<tr>
<th>ALTITUDE FT. (M)</th>
<th>PERCENT OF DERATE</th>
<th>DERATE MULTIPLIER FACTOR*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–2000 (0–610)</td>
<td>0</td>
<td>1.00</td>
</tr>
<tr>
<td>2001–3000 (610–914)</td>
<td>4–6</td>
<td>0.95</td>
</tr>
<tr>
<td>3001–4000 (914–1219)</td>
<td>6–8</td>
<td>0.93</td>
</tr>
<tr>
<td>4001–5000 (1219–1524)</td>
<td>8–10</td>
<td>0.91</td>
</tr>
<tr>
<td>5001–6000 (1524–1829)</td>
<td>10–12</td>
<td>0.89</td>
</tr>
<tr>
<td>6001–7000 (1829–2134)</td>
<td>12–14</td>
<td>0.87</td>
</tr>
<tr>
<td>7001–8000 (2134–2438)</td>
<td>14–16</td>
<td>0.85</td>
</tr>
<tr>
<td>8001–9000 (2438–2743)</td>
<td>16–18</td>
<td>0.83</td>
</tr>
<tr>
<td>9001–10,000 (2743–3048)</td>
<td>18–20</td>
<td>0.81</td>
</tr>
</tbody>
</table>

*Derate multiplier factors are based on midpoint altitude for altitude range.

**NOTE** For Canadian altitudes of 2000 to 4500 ft. (610 to 1372 M), use USA altitudes of 2001 to 3000 ft. (610 to 914 M) in Table 3.

To adjust manifold pressure to obtain the proper input rate, first, determine if the furnace has the correct orifice installed. At higher altitudes or different gas heat contents, it may be necessary to change the factory orifice to a different orifice.

Tables have been provided in the furnace Service and Technical Manual to match the required orifice to the manifold pressure to the heat content and specific gravity of the gas. To do this:

1. Obtain average yearly gas heat value (at installed altitude) from local gas supplier.
2. Obtain average yearly gas specific gravity from local gas supplier.
3. Find installation altitude in Table 3.
4. Find closest natural gas heat value and specific gravity in Table 3. Follow heat value and specific gravity lines to point of intersection to find orifice size and low–and high–heat manifold pressure settings for proper operation.
5. Check and verify burner orifice size in furnace. NEVER ASSUME ORIFICE SIZE. ALWAYS CHECK AND VERIFY.

**EXAMPLE 1:**

- **0 - 2000 ft. (0 - 609.6M) altitude**
  - Heating value = 1050 Btu/cu ft.
  - Specific gravity = 0.62
  - Therefore: Orifice No. 44

(Furnace is shipped with No. 44 orifices. In this example, all main burner orifices are the correct size and do not need to be changed to obtain proper input rate.)

**Check Inlet Gas Pressure**

The inlet gas pressure must be checked with the furnace operating in maximum heat. This is necessary to make sure the inlet gas pressure does not fall below the minimum pressure of 4.5 in. w.c. (1121 Pa).

1. Make sure the gas supply is turned off to the furnace and at the electric switch on the gas valve.
2. Remove the 1/8 in. NPT plug from the inlet pressure tap on the gas valve.
3. Connect a manometer to the inlet pressure tap on gas valve.
4. Turn on furnace power supply.
5. Turn gas supply manual shut off valve to ON position.
6. Turn furnace gas valve switch to ON position.
7. Jumper the R to W/W1 and W2 thermostat connections at the furnace control board.
8. When main burners ignite, confirm inlet gas pressure is between 4.5 in. w.c. (1125 Pa) and 13.6 in. w.c.(3388 Pa).
9. Remove jumper across thermostat connections to terminate call for heat. Wait until the blower off delay is completed.
10. Turn furnace gas valve electric switch to OFF position.
11. Turn gas supply manual shut off valve to OFF position.
12. Turn off furnace power supply.
13. Remove manometer from the inlet pressure tap of the gas valve.

**WARNING**

**FIRE HAZARD**

Failure to follow this warning could result in personal injury, death, and/or property damage.

Re–install manifold pressure tap plug in gas valve to prevent gas leak.

Adjust Manifold Pressure

1. Adjust manifold pressure to obtain low fire input rate. (See Figure 3)
   a. Turn gas valve ON/OFF switch to OFF.
   b. Remove manifold pressure tap plug from gas valve.
   c. Connect a water column manometer or similar device to manifold pressure tap.
   d. Turn gas valve ON/OFF switch to ON.
   e. Move setup SW1—2 on furnace control to ON position to lock furnace in low–heat operation. (See Figure 4 and Figure 5)
   f. Manually close blower door switch.
   g. Jumper R and W/W1 thermostat connections on control to start furnace. (See Figure 4)
   h. Remove regulator adjustment cap from low heat gas valve pressure regulator (See Figure 3) and turn low–heat adjusting screw (3/16 in. or smaller flat–tipped screwdriver) counterclockwise (out) to decrease input rate or clockwise (in) to increase input rate.

2. Adjust manifold pressure to obtain high fire input rate. (See Figure 3)
   a. Jumper R to W/W1 and W2 thermostat connections on furnace control. This keeps furnace locked in high–heat operation.
   b. Remove regulator adjustment cap from high–heat gas valve pressure regulator (See Figure 3) and turn high heat adjusting screw (3/16 in. or smaller flat–tipped screwdriver) counterclockwise (out) to decrease input rate or clockwise (in) to increase input rate.

i. Install low–heat regulator adjustment cap.
j. Re–install manifold pressure tap plug from gas valve.
k. Move setup switch SW1–2 to OFF position after completing low–heat adjustment.
l. Leave manometer or similar device connected and proceed to Step 2.

3. Verify natural gas input rate by clocking meter.
   **NOTE:** Contact your HVAC distributor or gas supplier for metric gas meter Tables, if required.
   a. Turn off all other gas appliances and pilots served by the meter.
   b. Move setup switch SW1–2 to ON position. This keeps furnace locked in low–heat operation when only W/W1 is energized.
   c. Jumper R to W/W1.
   d. Run furnace for 3 minutes in low–heat operation.
   e. Measure time (in sec) for gas meter to complete 1 revolution and note reading. The 2 or 5 cubic feet dial provides a more accurate measurement of gas flow.
   f. Refer to Table 2 for cubic ft. of gas per hr.
   g. Multiply gas rate cu ft./hr by heating value (Btuh/cu ft.) to obtain input.
   h. If clocked rate does not match required input from Step 1, increase manifold pressure to increase input or decrease manifold pressure to decrease input. Repeat steps b through e until correct low–heat input is achieved. Re–install low heat regulator seal cap on gas valve.
   i. Jumper R to W/W1, and W2. This keeps furnace locked in high–heat operation when both W/W1 and W2 are energized.
   j. Repeat items (d) through (h) for high–heat operation, repeating Step 2 and adjusting the high–heat regular screw, as required.

4. Restore furnace to normal operating condition.
   a. Turn gas valve On/Off switch to OFF.
   b. Remove water column manometer or similar device from manifold pressure tap.
   c. Replace manifold pressure tap plug to gas valve.
   d. Turn gas valve On/Off switch to ON.
   e. Move setup SW1–2 on furnace control to position required for attached thermostat (OFF for single–stage thermostats, ON for two–stage thermostats).
   f. Check for gas leaks and verify furnace operation.

**NOTICE**

DO NOT set high–heat manifold pressure less than 3.2–in. w.c. (797 Pa) or more than 3.8 in. w.c. (947 Pa) for natural gas. If required manifold pressure is outside this range, change main burner orifices to obtain manifold pressure in this range.

c. When correct input is obtained, replace caps that conceal gas valve regulator adjustment screws. Main burner flame should be clear blue, almost transparent. (See Figure 14)
d. Re–install manifold pressure tap plug to gas valve.
e. Remove jumpers R to W/W1 and R to W2.

**WARNING**

**FIRE HAZARD**

Failure to follow this warning could result in personal injury, death, and/or property damage.

Re–install manifold pressure tap plug in gas valve to prevent gas leak.

3. Verify natural gas input rate by clocking meter.
Figure 4  Example of Variable Speed Furnace Control for Variable Speed ECM Blower Motor

- SW1 Setup Switches and Blower Off-Delay
- Model Plug Connector
- Outdoor Air Temp Connector
- Air Conditioning (A/C) & Continuous Fan (CF) Airflow Setup Switches
- Humidifier Terminal (24-VAC 0.5 Amp Max.)
- ACRDJ – Air Conditioning Relay Disable Jumper

- 24-V Thermostat Terminals
- Status and Comm LED Lights
- PL1 – Low Voltage Main Harness Connector
- 3-Amp Fuse
- Transformer 24-VAC Connections
- 115-VAC (L2) Neutral Connections

- 115-VAC (L1) Line Voltage Connections
- EAC-1 Terminal (115-VAC 1.0 Amp Max.)
- PL2 – Hot Surface Igniter & Inducer Motor Connector
- Software Version

Specifications subject to change without notice.
Table 2

<table>
<thead>
<tr>
<th>SECONDS FOR 1 REVOLUTION</th>
<th>Gas Rate (CU ft./hr)</th>
<th>SECONDS FOR 1 REVOLUTION</th>
<th>SIZE OF TEST DIAL</th>
<th>SIZE OF TEST DIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 Cu Ft.</td>
<td>2 Cu Ft.</td>
<td>5 Cu Ft.</td>
<td>1 Cu Ft.</td>
</tr>
<tr>
<td>10</td>
<td>360</td>
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## Table 3

Orifice Size and Manifold Pressure (in. w.c.) for Gas Input Rate – Two-Stage

**TWO-STAGE FURNACE**

(TABULATED DATA BASED ON 20,000 BTUH HIGH-HEAT / 13,000 BTUH LOW-HEAT PER BURNER, DERATED 2%/1000 FT (305M) ABOVE SEA LEVEL)

<table>
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<tr>
<th>ALTITUDE RANGE (ft (m))</th>
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Specifications subject to change without notice.

440 04 4801 00
Table 3 (cont.)  Orifice Size and Manifold Pressure (in. w.c.) for Gas Input Rate – Two–Stage

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<th>ALTITUDE RANGE</th>
<th>HEAT VALUE AT ALTITUDE (Btu/cu ft)</th>
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<td>3.8 / 1.6</td>
<td>45</td>
<td>3.8 / 1.6</td>
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</tbody>
</table>

* Orifice numbers shown in BOLD are factory-installed.

Adjust Temperature Rise

**NOTE:** Blower door must be installed when taking temperature rise reading. Leaving blower door off will result in incorrect temperature measurements, due to possible changes in duct static pressure and airflow.

---

**CAUTION**

FURNACE DAMAGE HAZARD

Failure to follow this caution may result in:

- Overheating the heat exchangers or condensing flue gases in heat exchanger areas not designed for condensate.
- Shortened furnace life.
- Component damage.

Temperature rise must be within limits specified on furnace rating plate. Recommended operation is at midpoint of rise range or slightly above.

Furnace must operate within ranges of temperature rise specified on the furnace rating plate.

When setup switch SW1–4 is ON, operation will be near the high end of the rise range for improved comfort.

Determine air temperature rise as follows:

1. Place thermometers in return and supply ducts as near furnace as possible. Be sure thermometers do not see heat exchanger so that radiant heat does not affect readings. This practice is particularly important with straight–run ducts.

2. When thermometer readings stabilize, subtract return–air temperature from supply–air temperature to determine air temperature rise.

**NOTE:** Temperature rise can be determined for low–heat operation by locking the furnace in each mode of operation. The mode of operation is based on the position of set up switch SW1–2 on the furnace control board.

This furnace is capable of automatically providing proper airflow to maintain the temperature rise within the range specified on furnace rating plate. If temperature rise is outside this range, proceed as follows:

a. Check gas input for low– and high–heat operation.
b. Check derate for altitude if applicable.
c. Check all return and supply ducts for excessive restrictions causing static pressure greater than 0.5–in. w.c.
d. Ensure Low Heat Rise Adjust switch SW1–3 on furnace control is in ON position when a bypass humidifier is used. (See Figure 4 for switch location.)
e. Check Troubleshooting Guide for Variable–Speed Condensing Furnaces.

To lock the furnace in Low Heat:

1. Turn SW1–2 ON at the furnace control. Set up switch
2. Connect a jumper across R and W/W1 at the thermostat terminals at the furnace control.
3. Allow the burners to ignite and the blower to turn on.
4. Allow the supply temperature to stabilize and verify the proper rise range.

If the temperature rise is too high or too low in Low Heat:
1. Remove jumpers from R and W/W1.
2. Wait until the blower off delay is completed.
3. Turn 115 VAC power off.
4. Check the position of Set up switch SW1-3. When set to ON, airflow is raised 18% for Low Heat. Factory default position is OFF.
5. Turn 115 VAC power on.
6. Re--check Low Heat Temperature Rise

To lock the furnace in High Heat:
1. Connect a jumper across R and W/W1 and W2 at the thermostat terminals at the furnace control.
2. Allow the burners to ignite and the blower to turn on.
3. Turn 115 VAC power off.
4. Check the position of Set up switch SW1-4. When set to mid, on the rating plate. Recommended operation is at the proper rise range.
5. Turn 115 VAC power on.
6. Allow the supply temperature to stabilize and verify the proper rise range.

If the temperature rise is too high or too low in High Heat:
1. Remove jumpers from R and W/W1 and W2.
2. Wait until the blower off delay is completed.
3. Turn 115 VAC power off.
4. Check the position of Set up switch SW1-4. When set to OFF and SW1-3 is set to OFF, airflow is raised 7% for Low Heat and 10% for High Heat. Factory default position is ON. If SW1-3 is ON and SW1-4 is OFF, airflow is raised 18% for Low Heat and 10% for High Heat
5. Turn 115 VAC power on.

After the temperature rise has been verified:
1. Remove jumpers from thermostat terminals.
2. Allow the blower off delay to complete.
3. Turn Set up switches SW1-2 to the desired position.
4. Proceed to “Adjust Blower Off Delay” or install blower door if complete.

**WARNING**

**FIRE HAZARD**

Failure to follow this warning could result in personal injury, death, and/or property damage.

Reinstall manifold pressure tap plug in gas valve to prevent gas leak.

**CAUTION**

**FURNACE OVERHEATING HAZARD**

Failure to follow this caution may result in reduced furnace life.

Recheck temperature rise. It must be within limits specified on the rating plate. Recommended operation is at the mid–point of rise range or slightly above.

---

**Adjust Blower Off Delay (Heat Mode)**

a. Remove blower door if installed.

b. Turn Dip switch SW1–7 or SW1–8 ON or OFF for desired blower off delay. (See Table 4 and Figure 4, Figure 5)

---

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<tr>
<th>Table 4</th>
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<td>DESIRED HEATING MODE</td>
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<td>120</td>
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<tr>
<td>180</td>
<td>ON</td>
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</table>

**Adjust Cooling Airflow – High-Speed and Low-Speed Cooling**

The ECM blower can be adjusted for a range of airflows for low-speed or high-speed cooling. See Table 5–Air Delivery – CFM (with Filter) and Figure 5. Furnace Setup Switches and Descriptions. Depending on the model size, the cooling airflow can be adjusted from 1.5 tons to 6 tons of nominal cooling based on 350 CFM ton.

**NOTE:** 6 ton airflow will truncate at 2200 CFM on applicable models.

The high-speed or single-speed cooling airflow is adjusted by turning setup switches SW2–6, SW2–7 and SW2–8 either ON or OFF. Select the required airflow from Table 5. Table 5 is based on 350 CFM per ton. For other CFM per ton setup switch selections, see Figure 4, Figure 5 and Figure 16.

The Continuous Fan airflow selection via setup switches SW2–3, SW2–4 and SW2–5 is also the airflow for low-speed cooling when the furnace is used with a two-speed cooling or heat pump unit. Adjust the Continuous Fan CFM setup switches SW2–3, SW2–4 and SW2–5 to match the airflow required for low-speed cooling. Select the required airflow from Table 5 and Figure 5.

**NOTE:** The airflow selected via SW2–3, SW2–4 and SW2–5 (low-speed cooling airflow) cannot exceed the airflow selected via SW2–6, SW2–7 and SW2–8 (high-speed cooling airflow). For other CFM per ton setup switch selections, see Figure 4 and Figure 5.

For a complete explanation of cooling airflow, refer to the section titled “Sequence of Operation.”

**Adjust Continuous Fan Airflow/Low Speed Cooling Airflow**

**NOTE:** When the furnace is used with a two-speed cooling or heat pump unit, the airflow selected for Continuous Fan via setup switch SW2–3, SW2–4 and SW2–5 will also be the airflow used for low-speed cooling, and vice versa.

**NOTE:** When the furnace is used with a two-speed cooling or heat pump unit, adjust the Continuous Fan CFM setup switches SW2–3, SW2–4 and SW2–5 to match the airflow required for low-speed cooling.

Select the required Continuous Fan airflow using setup switches SW2–3, SW2–4 and SW2–5 as shown in Figure 5 and Table 5.
### Furnace Setup Switch Description

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<th>SWITCH NAME</th>
<th>NORMAL POSITION</th>
<th>DESCRIPTION OF USE</th>
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</thead>
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<td>SW1-1</td>
<td>Status Code Recovery</td>
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<td>Turn ON to retrieve up to 7 stored status codes for troubleshooting assistance when R thermostat lead is disconnected.</td>
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<tr>
<td>SW1-2</td>
<td>Low Heat Only (Adaptive Heat Mode when SW1-2 is OFF)</td>
<td>OFF</td>
<td>When SW1-2 is OFF allows two-stage operation with a single stage thermostat. Turn ON when using two-stage thermostat to allow Low Heat operation when R to WW1 closes and High Heat operation when R to WW1 and W2 close.</td>
</tr>
<tr>
<td>SW1-3</td>
<td>Low Heat Rise Adjustment</td>
<td>OFF</td>
<td>Turn ON to increase Low Heat airflow by 18 percent. This compensates for increased room air temperature caused by bypass humidifier.</td>
</tr>
<tr>
<td>SW1-4</td>
<td>Comfort/ Efficiency Adjustment</td>
<td>ON</td>
<td>Turn ON to decrease Low Heat airflow by approximately 7 percent and High Heat airflow by approximately 10 percent for maximum comfort.</td>
</tr>
<tr>
<td>SW1-5</td>
<td>CFM per ton adjust</td>
<td>OFF</td>
<td>Turn ON for 400 CFM per ton, Turn OFF for 350 CFM per ton. See also SW2.</td>
</tr>
<tr>
<td>SW1-6</td>
<td>Component Self Test</td>
<td>OFF</td>
<td>Turn ON to initiate Component Self Test for troubleshooting assistance when R thermostat lead is disconnected. Turn OFF when Self Test is completed.</td>
</tr>
<tr>
<td>SW1-7 &amp; SW1-8</td>
<td>Blower OFF delay</td>
<td>ON or OFF</td>
<td>Blower Off Delay time – adjustable 90 seconds to 180 seconds. See table in Adjustments section or refer to unit wiring diagram.</td>
</tr>
<tr>
<td>SW2-1</td>
<td>Twinning</td>
<td>OFF</td>
<td>Allows for selection of furnace Main (OFF) or Secondary (ON) when Twinned furnace setup is required. See kit instructions for further directions on installation and setup.</td>
</tr>
<tr>
<td>SW2-2</td>
<td>CFM per ton Adjust</td>
<td>OFF</td>
<td>Allows additional CFM per ton selections when used with SW1-5 325 CFM per ton (nominal) when SW2-2 ON and SW1-5 OFF 350 CFM per ton (nominal) when SW2-2 OFF and SW1-5 OFF 370 CFM per ton (nominal) when SW2-2 ON and SW1-5 ON 400 CFM per ton (nominal) when SW2-2 OFF and SW1-5 ON See Air Delivery Tables for model specific CFM vs. static pressure</td>
</tr>
<tr>
<td>SW2-6, 7, 8</td>
<td>AC (Cooling Airflow)</td>
<td>OFF</td>
<td>The AC setup switches select desired cooling or high stage cooling (two-stage units) airflow. See Cooling Air Delivery Tables for specific switch settings.</td>
</tr>
<tr>
<td>SW2-3, 4, 5</td>
<td>CF (Continuous Fan)</td>
<td>OFF</td>
<td>The CF setup switches select desired Continuous Fan Airflow The CF switch position is the low cooling airflow selection for two-stage cooling units. The CFM values are shown in the Air Delivery Tables below for SW2 settings. SW2-3, 4, 5 cannot be set for airflow higher than SW 2-6, 7, 8. See Continuous Fan Air Flow Table for specific switch settings.</td>
</tr>
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### Based on 350 CFM/Ton (Factory Default: SW1-5 = OFF, SW2-2 = OFF)

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<tr>
<th>Model Size</th>
<th>CFM</th>
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<td>1400</td>
<td>1750</td>
<td>1750</td>
<td>1925</td>
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</table>
Adjust Thermostat Heat Anticipator

a. Mechanical thermostat. Set thermostat heat anticipator to match the amp. draw of the electrical components in the R–W/W1 circuit. Accurate amp. draw readings can be obtained at the wires normally connected to thermostat subbase terminals, R and W. The thermostat anticipator should NOT be in the circuit while measuring current.

1. Set SW1–2 switch on furnace control board to ON.
2. Remove thermostat from subbase or from wall.
3. Connect an amp. meter as shown in Figure 6 across the R and W subbase terminals or R and W wires at wall.
4. Record amp. draw across terminals when furnace is in low heat and after blower starts.
5. Set heat anticipator on thermostat per thermostat instructions and install on subbase or wall.
6. Turn SW1–2 switch OFF.
7. Install blower door.

b. Electronic thermostat: Set cycle rate for 3 cycles per hr.

Check Safety Controls

The flame sensor, gas valve, and pressure switch were all checked in the Start-up procedure section as part of normal operation.

1. Check Main Limit Switch
   This control shuts off combustion system and energizes air-circulating blower motor, if furnace overheats. By using this method to check limit control, it can be established that limit is functioning properly and will operate if there is a restricted return-air supply or motor failure. If limit control does not function during this test, cause must be determined and corrected.
   a. Run furnace for at least 5 minutes.
   b. Gradually block off return air with a piece of cardboard or sheet metal until the limit trips.
   c. Unblock return air to permit normal circulation.
   d. Burners will re-light when furnace cools down.
2. Check Pressure Switch(es)
   This control proves operation of the draft inducer blower.
   a. Turn off 115–v power to furnace.
   b. Disconnect inducer motor lead wires from wire harness.
   c. Turn on 115–v power to furnace.
   d. Set thermostat to “call for heat” and wait 1 minute.
   When pressure switch is functioning properly, hot surface igniter should NOT glow and control diagnostic light flashes a status code 3. If hot surface igniter glows when inducer motor is disconnected, shut down furnace immediately.
   e. Determine reason pressure switch did not function properly and correct condition.
   f. Turn off 115–v power to furnace.
   g. Reconnect inducer motor wires, replace door, and turn on 115–v power.
   h. Blower will run for 90 seconds before beginning the call for heat again.
   i. Furnace should ignite normally.

Checklist

1. Put away tools and instruments. Clean up debris.
2. Verify that switches SW1–1 and SW1–6 are OFF and other setup switches are set as desired. Verify that switches SW1–7 and SW1–8 for the blower OFF DELAY are set as desired per Table 4.
3. Verify that blower and control doors are properly installed.
5. Check operation of accessories per manufacturer’s instructions.
6. Review Home Owner’s Information with owner.
7. Attach literature packet to furnace.
## Table 5

<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Cooling Switch Settings</th>
<th>External Static Pressure (ESP)</th>
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<tr>
<td></td>
<td>SW2-6</td>
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## Cooling Switch Settings - CFM (Bottom Return5 with filter)

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</tbody>
</table>

**NOTE:**

1. Nominal 350 CFM/ton cooling airflow is delivered with SW1–5 and SW2–2 set to OFF. Set both SW1–5 and SW2–2 to ON for +7% airflow (nominal 370 CFM/ton). Set SW1–5 to ON and SW2–2 to OFF for +15% airflow (nominal 400 CFM/ton). Set SW2–2 to ON and SW1–5 to OFF for –7% airflow (nominal 325 CFM/ton). The above adjustments in airflow are subject to motor horsepower range/capacity.

2. Maximum cooling airflow is achieved when switches SW2–6, SW2–7, SW2–8 and SW1–5 are set to ON, and SW2–2 is set to OFF.

3. All heating CFM’s are when low heat rise adjustment switch (SW1–3) and comfort/efficiency adjustment switch (SW1–4) are both set to OFF.

4. Ductwork must be sized for high–heating CFM within the operational range of ESP. Operation within the blank areas of the chart is not recommended because high–heat operation will be above 1.0 ESP.

5. All airflow of 1880 CFM or less on 21” and 24.5” casing size furnaces are 5% less on side return only installations.

6. Airflows over 1800 CFM require bottom return, two–side return, or bottom and side return. A minimum filter size of 20” x 25” is required.

7. For upflow applications, air entering from one side into both the side of the furnace and a return air base counts as a side and bottom return.

8. Airflow not stable at this ESP.
Untrained personnel can perform basic maintenance functions such as cleaning and replacing air filters. All other operations must be performed by trained service personnel. A qualified service person should inspect the furnace once a year.

**WARNING**

**FIRE, INJURY OR DEATH HAZARD**
Failure to follow this warning could result in personal injury, death and/or property damage.
The ability to properly perform maintenance on this equipment requires certain knowledge, mechanical skills, tools, and equipment. If you do not possess these, do not attempt to perform any service and maintenance on this equipment other than those procedures recommended in the Owner’s Manual.

**CAUTION**

**ENVIRONMENTAL HAZARD**
Failure to follow this caution may result in environmental pollution.
Remove and recycle all components or materials (i.e. oil, refrigerant, control board, etc.) before unit final disposal.

**WARNING**

**ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD**
Failure to follow this warning could result in personal injury or death.
Before installing, modifying, or servicing system, main electrical disconnect switch must be in the OFF position and install a lockout tag. There may be more than one disconnect switch. Lock out and tag switch with a suitable warning label. Verify proper operation after servicing.

**CAUTION**

**ELECTRICAL OPERATION HAZARD**
Failure to follow this caution may result in improper furnace operation or failure of furnace.
Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

**General**
These instructions are written as if the furnace is installed in an upflow application. An upflow furnace application is where the blower is located below the combustion and controls section of the furnace, and conditioned air is discharged upward. Since this furnace can be installed in any of the 4 positions shown in Figure 7, you must revise your orientation to component location accordingly.

The electrical ground and polarity for 115–v wiring must be properly maintained. Refer to Figure 8 for field wiring information and to Figure 16 for furnace wiring information.

**NOTE:** If the polarity is not correct, the STATUS LED on the control will flash code 10 and prevent the furnace from heating. The control system also requires an earth ground for proper operation of the control and flame-sensing electrode.
The 24–v circuit contains an automotive–type, 3–amp. fuse located on the control. (See Figure 4) Any shorts of the 24–v wiring during installation, service, or maintenance will cause this fuse to blow. If fuse replacement is required, use ONLY a 3–amp. fuse. The control LED display will be off when fuse needs to be replaced.

**Troubleshooting**
Refer to the service label. (See Figure 15—Service Label)
The Troubleshooting Guide – Flow Chart (See Figure 17) can be a useful tool in isolating furnace operation problems. Beginning with the word “Start,” answer each question and follow the appropriate arrow to the next item.
The Guide – Flow Chart will help to identify the problem or failed component. After replacing any component, verify correct operation sequence.
Proper instrumentation is required to service electrical controls. The control in this furnace is equipped with a Status Code LED (Light– Emitting Diode) to aid in installation, servicing, and troubleshooting. Status codes can be viewed at the indicator in blower door. The amber furnace control LED is either a heartbeat, off or a code composed of 1 or 2 digits. The first digit is the number of short flashes, the second digit is the number of long flashes.
Figure 8  Heating and Cooling Application Wiring Diagram with Single–Stage Thermostat

For an explanation of status codes, refer to service label located on control door or Figure 15, and the troubleshooting guide which can be obtained from your distributor.

Retrieving Stored Fault Codes

The stored status codes will NOT be erased from the control memory, when 115– or 24–v power is interrupted. The control will store up to the last 7 Status Codes in order of occurrence.

1. To retrieve status codes, proceed with the following:

   NOTE:  NO thermostat signal may be present at control, and all blower–OFF delays must be completed.
   a. Leave 115–v power to furnace turned on.
   b. Look into blower door indicator for current LED status.
   c. Remove blower door.

   NOTE:  The Status Codes cannot be retrieved by disconnecting the limit switch. To retrieve Status Codes, follow the procedure below.

2. Turn Setup Switch, SW1–1 “ON.”
3. Manually close blower door switch.
4. Control will flash up to 7 Status Codes.
5. The last Status Code, or 8th Code, will be a heartbeat.
6. Turn SW1–1 “OFF.”
7. A heartbeat amber LED will appear and indicates proper operation.
8. Release blower door switch, install control door and refer to the SERVICE label on the control door for more information.

Component Self–Test

Component Test can ONLY be initiated by performing the following:

1. Remove blower door.
2. Remove the wire from the “R” terminal of the control board.
3. Turn Setup Switch, SW1–6 “ON.”
4. Manually close blower door switch.
Blower door switch opens 115–v power to control. No component operation can occur unless switch is closed. Caution must be taken when manually closing this switch for service purposes.

WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury, or death.

Blower door switch opens 115–v power to furnace control. No component operation can occur unless switch is closed. Exercise caution to avoid electrical shock from exposed electrical components when manually closing this switch for service purposes.

5. Component Test sequence will function as follows:
   a. Inducer motor starts on high–speed and continues to run until Step (d.) of component test sequence.
   b. Hot surface igniter is ON for 15 sec, then OFF.
   c. Blower operates for 15 sec, then turns off.
   d. Inducer motor goes to low–speed for 10 seconds, then turns off.
   e. After component test is completed, one or more status codes (heartbeat, 2+5) will flash. See component test section of service label for explanation of status codes.

   NOTE:  To repeat component test, turn setup switch SW1–6 OFF then back ON.
   f. Turn setup switch SW1–6 OFF.
6. Release blower door switch, reattach wire to “R” terminal on furnace control board and replace blower door.

Care and Maintenance

**WARNING**

FIRE OR EXPLOSION HAZARD
Failure to follow this warning could result in personal injury, death and/or property damage.
Never store flammable or combustible materials on, near, or in contact with the furnace, such as:
1. Spray or aerosol cans, rags, brooms, dust mops, vacuum cleaners, or other cleaning tools.
2. Soap powders, bleaches, waxes or other cleaning compounds, plastic or plastic containers, gasoline, kerosene, cigarette lighter fluid, dry cleaning fluids, or other volatile fluids.
3. Paint thinners and other painting compounds, paper bags, or other paper products. Exposure to these materials could lead to corrosion of the heat exchangers.

**WARNING**

ELECTRICAL SHOCK AND FIRE HAZARD
Failure to follow this warning could result in personal injury, death, and/or property damage. Turn off the gas and electrical supplies to the furnace and install lockout tag before performing any maintenance or service. Follow the operating instructions on the label attached to the furnace.

**WARNING**

CARBON MONOXIDE POISONING AND FIRE HAZARD
Failure to follow this warning could result in personal injury, death and/or property damage. Never operate furnace without a filter or filtration device installed. Never operate a furnace with filter or filtration device access doors removed.

**CAUTION**

CUT HAZARD
Failure to follow this caution may result in personal injury. Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts, and servicing furnaces.

The minimum maintenance on this furnace is as follows:
1. Check and clean air filter each month or more frequently if required. Replace if torn.
2. Check blower motor and wheel for cleanliness each heating and cooling season. Clean as necessary.
3. Check electrical connections for tightness and controls for proper operation each heating season. Service as necessary.
4. Inspect burner compartment before each heating season for rust, corrosion, soot or excessive dust. If necessary, have furnace and burner serviced by a qualified service agency.
5. Inspect the vent pipe/vent system before each heating season for water leakage, sagging pipes or broken fittings. Have vent pipes/vent system serviced by a qualified service agency.
6. Inspect any accessories attached to the furnace such as a humidifier or electronic air cleaner. Perform any service or maintenance to the accessories as recommended in the accessory instructions.

Cleaning and/or Replacing Air Filter
The air filter type may vary depending on the application or orientation. The filter is external to the furnace casing. There are no provisions for an internal filter with this furnace. See “Filter Arrangement” under the “Installation” section of this manual.

**NOTE:** If the filter has an airflow direction arrow, the arrow must point toward the blower.

To clean or replace filters, proceed as follows:

1. Turn off electrical supply to furnace.
2. Remove filter cabinet door.
3. Slide filter out of cabinet.
4. If equipped with permanent, washable filter, clean filter by spraying cold tap water through filter in opposite direction of airflow. Rinse filter and let dry. Oiling or coating of the filter is not recommended.
5. If equipped with factory specified disposable media filter, replace only with a factory specified media filter of the same size.
6. Slide filter into cabinet.
7. Replace filter cabinet door.
8. Turn on electrical supply to furnace.

Blower Motor and Wheel Maintenance
To ensure long life, economy, and high efficiency, clean accumulated dirt and grease from blower wheel and motor annually.
The inducer and blower motors are pre-lubricated and require no additional lubrication. These motors can be identified by the absence of oil ports on each end of the motor.
The following items should be performed by a qualified service technician. Clean blower motor and wheel as follows:
1. Turn off electrical supply to furnace.
2. Remove blower door.
3. All factory wires can be left connected, but field thermostat and accessory wiring may need to be disconnected depending on their length and routing.

4. If the vent and combustion air pipe passes through the blower compartment, it will be necessary to remove the pipes from the blower compartment.

Disconnect the vent and combustion air pipe by:
   a. Loosen the clamps on the vent couplings and combustion air pipe external to the furnace.
   b. Separate the pipes from the couplings and move them aside.
   c. Loosen the clamps on the vent couplings and combustion air pipe located on the blower shelf.
   d. Separate the pipes from the blower compartment and set aside.
   e. Remove the couplings from the pipe adapters and set aside.
   f. After servicing the blower, reverse steps a through e.
   g. Tighten all clamps 15 lb−in.

See Figure 9 for steps 5 through 14.

5. Remove screws securing blower assembly to blower shelf and slide blower assembly out of furnace. Detach ground wire and disconnect blower motor harness plugs from blower motor.

**NOTE:** Blower wheel is fragile. Use care.

6. Clean blower wheel and motor by using a vacuum with soft brush attachment. Be careful not to disturb balance weights (clips) on blower wheel vanes. Do not bend wheel or blades as balance will be affected.

7. If greasy residue is present on blower wheel, remove wheel from the blower housing and wash it with an appropriate degreaser. To remove wheel:
   a. Mark blower wheel location on shaft before disassembly to ensure proper reassembly.
   b. Loosen setscrew holding blower wheel on motor shaft.

**NOTE:** Mark blower mounting arms and blower housing so each arm is positioned at the same hole location during reassembly.

   c. Mark blower wheel orientation and cutoff plate location to ensure proper reassembly.
   d. Remove screws securing cutoff plate and remove cutoff plate from housing.
   e. Remove bolts holding motor mounts to blower housing and slide motor and mounts out of housing.
   f. Remove blower wheel from housing.
   g. Clean wheel per instructions on degreaser cleaner. Do not get degreaser in motor.

8. Reassemble motor and blower wheel by reversing items 7b through 7f. Ensure wheel is positioned for proper rotation.

9. Torque motor mounting bolts to 40 +/- 10 lb−in. when reassembling.

10. Torque blower wheel set screw to 160 +/- 20 lb−in. when reassembling.

11. Verify that blower wheel is centered in blower housing and set screw contacts the flat portion of the motor shaft. Loosen set screw on blower wheel and reposition if necessary.
12. Spin the blower wheel by hand to verify that the wheel does not rub on the housing.
13. Reinstall blower assembly in furnace.
14. Reinstall 2 screws securing blower assembly to blower deck.
15. Reconnect blower leads to furnace control. Refer to furnace wiring diagram, and connect thermostat leads if previously disconnected.

**NOTE:** Be sure to attach ground wire and reconnect blower harness plugs to blower motor.

**WARNING**

**ELECTRICAL OPERATION HAZARD**

Failure to follow this warning could result in personal injury or death.
Blower door switch opens 115−v power to control. No component operation can occur unless switch is closed. Caution must be taken when manually closing this switch for service purposes.

16. Downflow or horizontal furnaces with vent pipe through furnace only:
   a. Install and connect short piece of vent pipe inside furnace to existing vent.
   b. Connect vent connector to vent elbow.

17. Turn on electrical supply. Manually close blower door switch. Use a piece of tape to hold switch closed. Check for proper rotation and speed changes between heating and cooling by jumpering R to G and R to Y/Y2 on furnace control thermostat terminals. If outdoor temperature is below 70°F (21°C), turn off circuit breaker to outdoor unit before running furnace in the cooling cycle. Turn outdoor circuit breaker on after completing cooling cycle. (See Figure 4)

**NOTE:** If R−W/W1 thermostat terminals are jumpered at the time blower door switch is closed, blower will run for 90 sec before beginning a heating cycle.
   a. Perform component self−test as shown at the bottom of the SERVICE label, located on the control door.
   b. Verify blower is rotating in the correct direction

18. If furnace is operating properly, RELEASE BLOWER DOOR SWITCH. Remove any jumpers or reconnect any disconnected thermostat leads. Replace blower door.

19. Turn on gas supply and cycle furnace through one complete heating cycle. Verify the furnace temperature rise as shown in Adjustments Section. Adjust temperature rise as shown in Adjustments Section.

**Cleaning Burners and Flame Sensor**

The following items must be performed by a qualified service technician. If the burners develop an accumulation of light dirt or dust, they may be cleaned by using the following procedure:

**NOTE:** Use a back-up wrench on the gas valve to prevent the valve from rotating on the manifold or damaging the mounting to the burner assembly.

1. Disconnect power at external disconnect, fuse or circuit breaker.
2. Turn off gas at external shut-off or gas meter.
3. Remove control door and set aside.
4. Turn electric switch on gas valve to OFF.
5. Disconnect the gas pipe from gas valve and remove pipe from the furnace casing.
6. Remove individual wires from terminals on gas valve (All other models).
7. Disconnect Hot Surface Igniter (HSI) wires from HSI.
9. Support the manifold and remove the 4 screws that secure the manifold assembly to the burner assembly and set aside. Note the location of the green/yellow wire and ground terminal.
10. Inspect the orifices in the manifold assembly for blockages or obstructions. Remove orifice and clean or replace orifice.
11. Remove the four screws that attach the top plate of the casing to the furnace.
12. Raise top plate up slightly and prop it up with a small piece of wood or folded cardboard.
13. Support the burner assembly and remove the screws that attach the burner assembly to the heat exchanger cell panel.
14. Remove wires from both rollout switches.
15. Slide one−piece burner out of slots on sides of burner assembly.
16. Remove the flame sensor from the burner assembly.
17. (Optional) Remove the Hot Surface Igniter (HSI) and bracket from the burner assembly.
18. Check igniter resistance. Nominal resistance is 40 to 70 ohms at room temperature and is stable over the life of the igniter.
19. Clean burner with a brush and a vacuum.
20. Clean the flame sensor with fine steel wool (0000 grade). Do not use sand paper or emery cloth.

To reinstall burner assembly:
1. Install the Hot Surface Igniter (HSI) and bracket in burner assembly.
2. Install flame sensor on burner.
3. Align the edges of the one-piece burner with the slots in the burner assembly and slide the burners forward until they are fully seated in the burner assembly.

4. Align the orifices in the manifold assembly with the support rings on the end of the burner.

5. Insert the orifices in the support rings of the burners.

**NOTE:** If manifold does not fit flush against the burner, do not force the manifold on the burner assembly. The burners are not fully seated forward in the burner assembly. Remove the manifold and check burner positioning in the burner assembly before re-installing the manifold.

6. Attach the green/yellow wire and ground terminal to one of the manifold mounting screws.

7. Install the remaining manifold mounting screws.

8. Check the igniter alignment. See Figure 10, Figure 11 and Figure 12.

9. Attach the wires to the roll-out switches.

10. Align the burner assembly with the openings in the primary cell inlet panel and attach the burner assembly to the cell panel.

11. Connect the wire for the flame sensor.

12. Connect the wire for the Hot Surface Igniter.

**NOTE:** Use propane-resistant pipe dope to prevent leaks. Do not use Teflon tape.

13. Install the gas pipe to the gas valve.

**WARNING**

**FIRE OR EXPLOSION HAZARD**

Failure to follow this warning could result in personal injury, death, and/or property damage.

Never purge a gas line into a combustion chamber. Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

14. Check for gas leaks with a commercially available soap solution made specifically for the detection of leaks.

15. Turn gas on at electric switch on gas valve and at external shut-off or meter.

16. Turn power on at external disconnect, fuse or circuit breaker.

17. Run the furnace through two complete heating cycles to check for proper operation.

18. Install control door when complete.

**Servicing Hot Surface Igniter**

The igniter does NOT require annual inspection. Check igniter resistance before removal. Refer to Figure 10, Figure 11 and Figure 12.

1. Turn off gas and electrical supplies to furnace.

2. Remove control door.

3. Disconnect igniter wire connection.

4. Check igniter resistance. Igniter resistance is affected by temperature. Only check resistance when the igniter is at room temperature.

   a. Using an ohm meter, check resistance across both igniter leads in connector.

   b. Cold reading should be between 40 ohms and 70 ohms.
5. Remove igniter assembly.
   a. Using a 1/4–in. driver, remove the two screws securing the igniter mounting bracket to the burner assembly. (See Figure 10)
   b. Carefully withdraw the igniter and bracket assembly through the front of the burner assembly without striking the igniter on surrounding parts.
   c. Inspect igniter for signs of damage or failure.
   d. If replacement is required, remove the screw that secures the igniter on igniter bracket and remove the igniter.
6. To replace igniter and bracket assembly, reverse items 5a through 5d.
7. Reconnect igniter harness to the igniter, dressing the igniter wires to ensure there is no tension on the igniter itself. (See Figure 10)
8. Turn on gas and electrical supplies to furnace.
9. Verify igniter operation by initializing control board self–test feature or by cycling thermostat.
10. Replace control door.

### Flushing Collector Box and Drainage System

**WARNING**

**ELECTRICAL SHOCK AND FIRE HAZARD**

Failure to follow this warning could result in personal injury, death, and/or property damage.

Turn off the gas and electrical supplies to the furnace and install lockout tag before performing any maintenance or service. Follow the operating instructions on the label attached to the furnace.

1. Turn off gas and electrical supplies to furnace.
2. Remove control door.
3. Disconnect pressure switch tube from pressure switch port.

**NOTE:** Ensure the pressure switch tube disconnected from the pressure switch is higher than the collector box opening or water will flow out of tube.

4. Remove the collector box plug from the top port on the upper corner of the collector box. (See Figure 1)
5. Attach a funnel with a flexible tube to port on the collector box.
6. Flush inside of collector box with water until discharge water from condensate trap is clean and runs freely.
7. Repeat steps 4 thru 6 with middle plug on upper corner of collector box.
8. Remove the pressure switch tube from the collector box.

**NOTE:** Do NOT blow into tube with tube connected to the pressure switch.

9. Clean pressure switch port on collect box with a small wire. Shake any water out of pressure switch tube.
10. Reconnect tube to pressure switch and pressure switch port.
11. Remove the relief tube from the port on the collector box and the trap.
12. Clean the relief port on collect box and the trap with a small wire. Shake any water out of the tube.
13. Reconnect relief tube to trap and collector box ports.

### Cleaning Condensate Drain and Trap

**NOTE:** If the condensate trap is removed, a new gasket between the trap and collector box is required. Verify a condensate trap gasket is included in the service kit or obtain one from your local distributor.

1. Disconnect power at external disconnect, fuse or circuit breaker.
2. Turn off gas at external shut-off or gas meter.
3. Remove control door and set aside.
4. Turn electric switch on gas valve to OFF.
5. Disconnect external drain from condensate drain elbow or drain extension pipe inside the furnace and set aside.
6. Disconnect the condensate trap relief hose from collector box port and condensate trap.

**NOTE:** If condensate has a heat pad attached to the trap, trace the wires for the pad back to the connection point and disconnect the wires for the heat pad.

7. Remove the screw that secures the condensate trap to the collector box, remove the trap and set aside.
8. Remove the trap gasket from the collector box if it did not come off when the trap was removed.
9. Discard the old trap gasket.
10. Rinse condensate trap in warm water until trap is clean.
11. Flush condensate drain lines with warm water. Remember to check and clean the relief port on the collector box.
12. Shake trap dry.
13. Clean port on collector box with a small wire.

To re-install Condensate Drain and Trap:

1. Remove adhesive backing from condensate trap gasket
2. Install gasket on collector box
3. Align the condensate trap with the drain opening on the collector box and secure the trap with the screw
4. Attach the relief hose to the relief port on the condensate trap and collector box.
5. Secure tubing to prevent any sags or traps in the tubing.
6. Connect condensate drain elbow or drain extension elbow to the condensate trap
7. Connect the leads of the condensate heat pad (if used)
8. Connect external drain piping to the condensate drain elbow or drain extension pipe
9. Turn gas on at electric switch on gas valve and at external shut-off or meter
10. Turn power on at external disconnect, fuse or circuit breaker.
11. Run the furnace through two complete heating cycles to check for proper operation
12. Install control door when complete.

### Checking Heat Pad Operation (If Applicable)

In applications where the ambient temperature around the furnace is 32°F (0°C) or lower, freeze protection measures are required. If this application is where heat tape has been applied, check to ensure it will operate when low temperatures are present.

**NOTE:** The Heat Pad, when used, should be wrapped around the condensate drain trap. There is no need to use heat tape within the furnace casing. Most heat tapes are temperature activated, and it is not practical to verify the actual heating of the tape. Check the following:

1. Check for signs of physical damage to heat tape such as nicks, cuts, abrasions, gnawing by animals, etc.
2. Check for discolored heat tape insulation. If any damage or discolored insulation is evident, replace heat tape.
3. Check that heat tape power supply circuit is on.
Cleaning Heat Exchangers

The following items must be performed by a qualified service technician.

Primary Heat Exchangers

If the heat exchangers get an accumulation of light dirt or dust on the inside, they may be cleaned by the following procedure:

**NOTE:** If the heat exchangers get a heavy accumulation of soot and carbon, both the primary and secondary heat exchangers should be replaced rather than trying to clean them thoroughly due to their intricate design. A build-up of soot and carbon indicates that a problem exists which needs to be corrected, such as improper adjustment of manifold pressure, insufficient or poor quality combustion air, improper vent termination, incorrect size or damaged manifold orifice(s), improper gas, or a restricted heat exchanger (primary or secondary). Action must be taken to correct the problem.

1. Turn off gas and electrical supplies to furnace.
2. Remove control door.
3. Disconnect wires or connectors to flame rollout switch, gas valve, igniter, and flame sensor.
4. Using backup wrench, disconnect gas supply pipe from furnace gas control valve.
5. Remove two screws attaching top filler plate and rotate upwards to gain access to screws attaching burner assembly to cell panel.
6. Remove screws attaching burner assembly to cell panel. (See Figure 10)

**NOTE:** Burner cover, manifold, gas valve, and burner assembly should be removed as one assembly.

7. Clean heat exchanger openings with a vacuum and a soft brush. (See Figure 13)

**Figure 13** Cleaning Heat Exchanger Cell

**NOTE:** After cleaning, inspect the heat exchangers to ensure they are free of all foreign objects that may restrict flow of combustion products.

8. Reverse items 6 through 1 for reassembly.
9. Refer to furnace wiring diagram and reconnect wires to flame rollout switch, gas valve, igniter, and flame sensor.
10. Turn on gas and electrical supplies to furnace.
11. Check furnace operation through two complete heat operating cycles. Look at burners. Burner flames should be clear blue, almost transparent. (See Figure 14)
12. Check for gas leaks.

**Figure 14** Burner Flame

13. Replace main furnace door.

Secondary Heat Exchangers

The condensing side (inside) of the secondary heat exchanger CANNOT be serviced or inspected without complete removal of the heat exchanger assembly. Detailed information on heat exchanger removal can be obtained from your Distributor.

Winterization

**CAUTION**

UNIT AND PROPERTY DAMAGE HAZARD

Failure to follow this caution may result in unit component or property damage.

If the furnace is installed in an unconditioned space where the ambient temperatures may be 32°F (0°C) or lower, freeze protection measures must be taken to prevent property or product damage.

Since the furnace uses a condensing heat exchanger, some water will accumulate in the unit as a result of the heat transfer process. Therefore, once it has been operated, it cannot be turned off and left off for an extended period of time when temperatures will reach 32°F (0°C) or lower unless winterized. Follow these procedures to winterize your furnace:
UNIT COMPONENT DAMAGE HAZARD
Failure to follow this caution may result in damage to the furnace and other property damage.
Do not use ethylene glycol (automotive antifreeze coolant or equivalent). Failure of plastic components may occur.

1. Obtain propylene glycol (RV/swimming pool antifreeze or equivalent).
2. Turn off gas and electrical supplies to your furnace.
3. Remove furnace control door.
4. Remove the top unused rubber plug from the port on the collector box opposite the condensate trap. (See Figure 1)
5. Connect a field supplied 3/8-in. (9.5-mm) ID tube to the open port on the collector box

6. Insert a field supplied funnel into the tube.
7. Pour 1 quart of antifreeze solution into the funnel/tube. Antifreeze should run through the collector box, overfill condensate trap and flow to an open drain.
8. Replace the rubber plug in the port on the collector box.
9. Remove the middle unused rubber plug from the port on the collector box opposite the condensate trap. See Figure 1.
10. Repeat Steps 5 through 8.
11. If a condensate pump is used, check with pump manufacturer to verify pump is safe for use with antifreeze used. Allow pump to start and pump antifreeze to open drain.
12. Replace main door.
13. When furnace is re-started, flush condensate pump with clear water to check for proper operation before re-starting furnace.
14. Propylene glycol need not be removed before re-starting furnace.
SERVICE

If status code recall is needed, disconnect the "R" thermostat lead, reset power, and put setup switch "SW1-1" to the ON position. To clear the status code, History put setup switch "SW1-1" to the ON position and jumper thermostat to "SW1-1" and "YYZ" simultaneously until heartbeat is flashed. Stored status codes are erased automatically after 72 hours or as specified.

LED CODE
CONTINUOUS OFF - HEARTBEAT - ON SOLID -

STATUS
Check for 115VAC at Neutral and 24VAC at SEC-1 and SEC-2, and 24VAC fuse. (bright - dim) Control has 24 VAC power.
- Auto-reset after 1 hour lockout due to - Gas valve relay contact stuck open
- Flame sense circuit failure - Software check error
- Reset power to clear lockout. Replace control if status code repeats.

Each of the following status codes is a single or two digit number with the first number determined by the number of short flashes and the second number after the plus (+) sign is the number of long flashes.

4
OFF SECONDARY VOLTAGE FUSE IS OPEN - Check for: - Short circuit in secondary voltage (24VAC) wiring.

3
LOW-VOLTAGE PRESSURE SWITCH DID NOT OPEN - Check for: - Obstructed pressure tubing - Pressure switch stuck closed
- Low heat pressure switch did not close or reopened - Indicates the low heat pressure switch input failed to close on a call for low heat, or opened during low heat. If open during 5 minutes after ignition the next heating cycle will be restricted to high heat. Check for: - Proper vent sizing - Plugged condensate drain
- Excessive wind - Low inlet gas pressure (if LPGS used) - Improper pressure switch wiring
- Restricted combustion air supply - Disconnected or obstructed pressure tubing
- Water in vent piping, possible sagging pipe - Failed or "Out-of-Calibration" pressure switches

4
LIMIT CIRCUIT FAULT - Indicates a limit or flame rollout, is open or the furnace is operating in high heat only mode due to 2 successive low heat limit trips. Blower will run for 4 minutes or until open switch remains whatever is longer. If open longer than 3 minutes, code changes to lockout #7. If open less than 3 minutes status code #4 continues to flash until blower shuts off. Flame rollout switch requires manual reset. Check for:
- Improper limit switch or no limit gasket - Defective switch or connections - Loose blower wheel
- Improper low or high heat gas input adjustment - Shack high or low heat solenoid in gas valve

5
ABNORMAL FLAME-PROVING SIGNAL - Flame is proved while gas valve is de-energized. Inducer will run until fault is cleared. Check for: - Leaky gas valve - Sluck-open gas valve

6
IGNITION PROVING FAULT - Control will try three more times before lockout #6 + 1 occurs. If flame signal lasts during blower on-delay period, blower will come on for the selected blower on-delay period. Check for:
- Grids buildup on flame sensor (clean with fine steel wool)
- Proper flame sense microamps .5 microamps O.C. nom., 4.0 - 6.0 nominal
- Manual valve shut-off - Control ground continuity - Gas valve defective turn off "OFF"
- Low inlet gas pressure - Inadequate flame carryover or rough ignition - Defective Hot Surface Ignitor
- Flame sensor must not be grounded - Green/yellow wire MUST be connected to furnace sheet metal

7
LIMIT CIRCUIT LOCKOUT - Lockout occurs if a limit or flame rollout switch is open longer than 3 minutes or 10 successive limit trips occurred during high heat. - Control will auto reset after 3 hours. Refer to #4.

8
GEAS HEATING LOCKOUT - Control will NOT auto reset. Check for: - Mis-wired gas valve
- Defective control (valve relay)

9
HIGH-HEAT PRESSURE SWITCH OR HPFR RELAY DID NOT CLOSE OR REOPENED - Indicates the high heat pressure switch input failed to close on a call for high heat, or opened during high heat. HPFR relay may be defective. Refer to status code #3.

10
POLARITY - Check for correct line voltage polarity. If units are twinned, check for proper line-voltage (24V) transformer phasing.

1 + 2
BLOWER ON AFTER POWER UP [115VAC OR 24VAC] - Blower runs for 90 seconds, if unit is powered up during a call for heat (R-W/W1) closed or (R-W/W1) opens during blower on-delay period.

2 + 4
MODEL SELECTION OR SETUP ERROR - Either indicates the model plug (PL4) is missing or incorrect or setup switch "SW1-1" or "SW1-6" is positioned improperly. If code flashes only 4 times on power-up control is defaulting to model selection stored in memory. Check the following:
- Thermostat call with "SW1-1" ON
- Thermostat call with "SW1-6" ON
- "SW1-1" and "SW1-6" both ON together
- Two different furnace models twinned
- See Rating Plate for model plug number and resistance values if code flashes continuously

4 + 3
LOW-VOLTAGE PRESSURE SWITCH OPEN WHILE HIGH-VOLTAGE PRESSURE SWITCH IS CLOSED - Check for:
- Plugged condensate drain - Low inlet gas pressure (if LPGS used) - Improper pressure switch wiring
- Water in vent piping, possibly sagging pipe - Stuck open low heat pressure switch
- Disconnected or obstructed pressure tubing

6 + 1
IGNITION LOCKOUT - Control will auto reset after 3 hours. Refer to #6.

COMPONENT TEST
To initiate the component test sequence that OFF the room thermostat or disconnected the "R" thermostat lead. Reset power and then put setup switch "SW1-6" in the OFF position and start the component test sequence. Once initiated the furnace control will turn the inducer ON. The inducer motor will run for the entire test. The hot surface igniter and blower motor will be turned ON for 15 seconds each. When the blower is turned OFF the inducer will be switched to low speed for 10 seconds. When the component test is completed one or more of the following codes will be shown.

CODE
HEARTBEAT Indicates no errors detected.
Visual check of hot surface igniter, inducer, blower motor, required.
2 + 5
SETUP ERROR - Same as code 2 + 3 above.
To repeat component test turn setup switch "SW1-6" OFF and then back ON. After component test is completed put setup switch "SW1-6" in the OFF position and reconnect the "R" thermostat lead.
NOTES:

1. If any of the original equipment wire is replaced, use wire rated for 105°C.
2. Use only copper wire between the disconnect switch and the furnace junction box (JB).
3. This wire must be connected to furnace sheet metal for control to prove flame.
4. Symbols are electrical representation only.
5. Solid lines inside PCB are printed circuit board conductors and are not included in legend.
6. Replace only with a 3 amp fuse.
7. Inductor is typically used with 3/4 hp and 1 hp ECM Blower motors. Review motor instructions if replacing motor to see if Inductor is required.
8. Factory connected when (LGPS) not used.
9. Blower off-delay, gas heating selections are (90, 120, 150, 180) seconds, cooling or heat pump 90 seconds or 5 seconds when dehumidify call is active.
10. Ignition lockout will occur after four consecutive unsuccessful trials for only. Control will auto-restart after three hours.
11. Any of the 5 wires shown within the NEUTRAL L2 box can be connected to any terminal within the box.
12. Blower motor (BLWM) and Inductor motor (IDM) are locked-rotor overload protected by redundant electronic control circuits.

Figure 16 Wiring Diagram

SCHEMATIC DIAGRAM

To 115 VAC Field Disconnect Switch

NOTES:

Legend

- JUNCTION TERMINAL
- CONTROL TERMINAL
- POE CONTROL TERMINAL
- FIELD EARTH GROUND
- EQUIPMENT GROUND
- FACTORY POWER WIRING (115VAC)
- FACTORY CONTROL WIRING (24VAC)
- FIELD CONTROL WIRING (24VAC)
- CONDUCTOR ON CONTROL
- FIELD WIRING SCREW TERMINAL
- PLUG RECEPTACLE

ACR Air Conditioning Relay, SPST (N.O.)
ACRJD Air Conditioning Relay Defeat Jumper
BLWM Blower Motor (ECM)
CPU Microprocessor/Crystal
ENV Power Connection (115VAC)
EAC-1 Electronic Air Cleaner Connection (115VAC 1.0 Amp Max)
EAC-2 Electronic Air Cleaner Connection (Common)
FRS Flame-Rollout Switch Main, Reset, SPST (N.O.
FSE Flame-Proving Sensor Electrode
FUS Fuse, 3Amp, Automotive Blade Type
FUSD Fuse or Disconnect
GV Gas Valve
GVW Gas Valve Relay, SPST (N.O.)
HPF High Pressure Switch, SPST (N.O.)
HPSR High Pressure Switch Relay, SPST (N.O)
HSR High Surface Ignitor Relay (115VAC)
HUM 24VAC humister Connection (3Amp Max)
HUMR Humister Relay, SPST (N.O.)
IDM Induced Draft Motor, ECM
IDR Induced Motor Relay, SPST (N.O.)
IDLR Induced Motor Speed Change Relay, SPST
LDK Blower Door Interlock Switch, SPST
LED Light Emitting Diode for Status Codes
PL1-13 12-Circuit Connector
PL1-14 4-Circuit Motor Power Connector
PL1-15 4-Circuit ECM Power Connector
PL1-16 3-Circuit Power Connector
PL1-17 Manual Switch, Status Code Recall
PL1-18 Manual Switch, Low Heat Only
PL1-19 Manual Switch, Low Heat Rise Adj
PL1-20 Manual Switch, Cool/Fan/Max Adj
PL1-21 Manual Switch, Cool/Fan/Max
PL1-22 4-Circuit ECM Power Connector
PL1-23 Continuous Fan (Adjustable Airflow – CPM)
PL1-24 4-Circuit ECM Power Connector
PL1-25 Transformer, 115VAC 120VAC

340688-2 REV B
### Troubleshooting Guide

- **Is AMBER LED status light ON solid, alternately flashing bright-dim-bright-dim like a heartbeat, or flashing ON and OFF?**
  - Yes: Check to make sure that the correct model plug PL4 is installed. The wiring schematic shows all valid model plugs. Is the correct model plug installed?
    - Yes: The last status code has cleared. To recall a previous status code disconnect the R thermostat connection, reset power, and put setup switch SW1-1 in the ON position. The AMBER LED will flash the status codes in the order of occurrence. Record status codes until heartbeat flashes. After heartbeat flashes several times the status codes will repeat. Status codes are erased after 72 hours or can be manually erased by putting setup switch SW1-1 in the ON position and jumpering R, WW1, and Y/Y2 simultaneously until the heartbeat flashes. When done put setup switch SW1-1 in the OFF position.
    - No: Go to section below for the status code that was flashed.
  - No: Is there 115V at L1 and L2?
    - Yes: Is door switch closed?
      - Yes: Close the door switch.
      - No: Is there 24V at SEC-1 and SEC-2?
        - Yes: Is there 115V going to switch?
          - Yes: Is circuit breaker closed?
            - Yes: Check for continuity in wire from circuit breaker to furnace.
            - No: Close circuit breaker and go back to START.
          - No: Is the 24V fuse open?
            - Yes: Replace fuse then disconnect thermostat leads to isolate short circuit.
            - No: Replace door switch.
    - No: Is the 24V fuse open?
      - Yes: Replace fuse then disconnect thermostat leads to isolate short circuit.
      - No: Replace door switch.
- **Is 24V present at W/W1, W2, Y1, Y/Y2 or G (24V) thermostat terminals on the furnace control?**
  - Yes: Disconnect all the thermostat wires from the furnace control.
    - Yes: Does the problem repeat when using a jumper wire?
      - Yes: Replace model plug PL4.
      - No: Replace thermostat.
    - No: Run system through a low-heat, high-heat, or cooling cycle to check operation. Status codes are erased after 72 hours or can be manually erased by putting setup switch SW1-1 in the ON position and jumpering R, WW1, and Y/Y2 simultaneously until the heartbeat flashes. Then put setup switch SW1-1 in the OFF position. Does the control respond to W/W1, W2, Y1, Y/Y2, and G (24V) thermostat signals?
      - Yes: The thermostat is not compatible with the furnace control. Either install a ballast resistor, connect the Com24V thermostat terminal to the thermostat, or replace the thermostat.
      - No: Replace furnace control.
2 PRESSURE SWITCH DID NOT OPEN –
Check for:
- Obstructed pressure tube.
- Pressure switch stuck closed.

3 LOW-HEAT PRESSURE SWITCH DID NOT CLOSE OR REOPEN – If opens during blower on-delay period, blower will come on for the selected low heat limit trips. If open longer than 5 minutes inducer shuts off for 15 minutes before retry.
Check for:
- Proper vent sizing.
- Air leak between vestibule and blower compartment.
- Low inlet gas pressure (if LGPS used).
- Restricted vent.
- Disconnected or obstructed pressure tubing.
- Defective or miswired pressure switches.
- Excessive wind.
- Plugged condensate drain.
- Water in vent piping, possible sagging pipe.
- Defective Inducer motor.
- Low inducer voltage (115 VAC)

4 LIMIT CIRCUIT FAULT – Indicate the limit or a flame rollout switch is open or the furnace is operating in high-heat only mode due to 2 or more low heat limit trips. Blower will run for 4 min. or until open switch remakes whichever is longer. If open longer than 3 min., code changes to lockout #7. If open less than 3 min., status code #4 continues to flash until blower shuts off. Flame rollout switch requires manual reset. Check for:
- Loose blower wheel.
- Defective switch or connections.
- Improper low- or high-heat gas input adjustment.
- Improper limit switch or no limit gasket.
- Dirty filter or restricted duct system.

5 ABNORMAL FLAME-PROVING SIGNAL
Flame is proved while gas valve is de-energized. Inducer will run until fault is cleared. Check for:
- Stuck open or leaky gas valve.

6 IGNITION PROVING FAILURE – If flame is not sensed during the trial for ignition period, the control will repeat the ignition sequence 3 more times before lockout #6 occurs. If flame signal is lost during the blower on-delay period, blower will come on for the selected blower off-delay. Check the following before going to the next step.
- Gas valve turned off.
- GREEN/YELLOW wire MUST be connected to furnace sheet metal.
- Flame sensor must not be grounded.

7 LIMIT CIRCUIT LOCKOUT – Lockout occurs if the limit or flame rollout switch is open longer than 3 minutes or 10 successive limit trips occurred during high-heat. Control will auto-reset after 3 hours. Refer to status code #4.

8 GAS HEATING LOCKOUT – Control will NOT auto reset. Turn off power and wait 5 minutes before retry. Check for:
- Stuck closed gas valve relay on control.
- Miswire or short to gas valve wire.

9 HIGH-HEAT PRESSURE SWITCH OR RELAY DID NOT CLOSE OR REOPEN – Check for:
- Control relay may be defective.
- Gas valve is miswired.
- Refer to status code #3.

10 POLARITY – Check for correct line voltage polarity. If units are twinned, check for proper low-voltage (24 V) transformer phasing.

1 + 2 BLOWER ON AFTER POWER UP – (115 V OR 24 V) – Normal operation. Blower runs for 90 seconds, if unit is powered up during a call for heat (R-W/W1 closed) or when (R-W/W1 opens) during the blower on-delay period.

6 + 1 IGNITION LOCKOUT – System failed to ignite gas and prove flame in 4 attempts. Control will auto-reset after 3 hours. Refer to status code #6.

2 + 5 INVALID MODEL SELECTION OR SETUP ERROR – If status code 2 + 5 only flashes 4 times on power-up, the control is missing its model plug PL4 and is defaulting to the model selection stored in memory. If status code 2 + 5 flashes continuously it could indicate any of the following:
- Model plug PL4 is missing and there is no valid model stored in permanent memory. This will happen if you forget to install the model plug PL4 on a service replacement control.
- Thermostat call with SW1-1 ON.
- Thermostat call with SW1-6 ON.
- SW1-1 and SW1-6 both ON.
- Two different furnace models twinned.
- Service replacement control is incorrect. Need non-modulating board with software version V24 or later.

Unplug igniter harness from control and repeat component test by turning setup switch SW1-6 OFF then back ON. Check for 115V between pin 3 and NEUTRAL-L2 on the control. Was 115V present for the 15 second period?

If open less than 3 min. status code #7 continues to flash until lockout #7. If open less than 3 min. status code #4 continues to flash until blower shuts off. Flame rollout switch requires manual reset. Check for:
- Gas valve turned off.
- GREEN/YELLOW wire MUST be connected to furnace sheet metal.
- Flame sensor must not be grounded.

Is current near typical value?

If current is near typical value (4.0 to 6.0 nominal) and burners will not stay on replace control. If burners still not stay on replace control.

Replace furnace control.

Replace electrode.

Replace furnace control.

Replace connections. If OK, replace control.

Check that all gas valves are turned on. Replace valve.

Check for:
- Inadequate flame carryover or rough ignition.
- Low inlet gas pressure.
- Proper firing rate.

Allow blower to come on and repeat test for check for intermittent operation.

Check connections and retry.

Repeat call for heat and check flame sensor current during trial for ignition period. Is the DC microamps below 0.5?

Clean flame sensor with fine steel wool and recheck current. Nominal current is 4.0 to 6.0 microamps.

Will main burners ignite and stay on?

Do the main burners stay on?

To determine whether the problem is in the gas valve, igniter, or flame sensor the system can be operated in component test mode. To check the igniter remove the R thermostat connection from the control, reset power, and put setup switch SW1-6 ON in the ON position to start the component test. Does the igniter glow orange/white by the end of the 15 second warm-up period?
Sequence of Operation

**NOTE:** Furnace control must be grounded for proper operation or else control will lock out. Control is grounded through green/yellow wire routed to gas valve and burner box screw. Using the schematic diagram in Figure 16, follow the sequence of operation through the different modes. Read and follow the wiring diagram very carefully.

**NOTE:** If a power interruption occurs during a call for heat (W/W1 or W/W1–and–W2), the control will start a 90–second blower–only ON period two seconds after power is restored, if the thermostat is still calling for gas heating. The amber LED light will flash code 1+2 during the 90–second period, after which the LED will flash a heartbeat (bright–dim), as long as no faults are detected. After the 90–second period, the furnace will respond to the thermostat normally.

The blower door must be installed for power to be conducted through the blower door interlock switch ILK to the furnace control CPU, transformer TRAN, inducer motor IDM, blower motor BLWM, hot–surface igniter HSI, and gas valve GV.

1. **Two–Stage Heating (Adaptive Mode) with Single–Stage Thermostat**

   **NOTE:** The low–heat only switch SW1–2 selects either the low–heat only operation mode when ON, (see item 2. below) or the adaptive heating mode when OFF in response to a call for heat. (See Figure 5) When the W2 thermostat terminal is energized it will always cause high–heat operation when the R–to–W circuit is closed, regardless of the setting of the low–heat only switch. This furnace can operate as a two–stage furnace with a single–stage thermostat because the furnace control CPU includes a programmed adaptive sequence of controlled operation, which selects low–heat or high–heat operation. This selection is based upon the stored history of the length of previous gas–heating periods of the single–stage thermostat.

   The furnace will start up in either low– or high–heat. If the furnace starts up in low–heat, the control CPU determines the low–heat on–time (from 0 to 16 minutes) which is permitted before switching to high–heat.

   If the power is interrupted, the stored history is erased and the control CPU will select low–heat for up to 16 minutes and then switch to high–heat, as long as the thermostat continues to call for heat. Subsequent selection is based on stored history of the thermostat cycle times.

   The wall thermostat “calls for heat”, closing the R–to–W circuit. The furnace control performs a self–check, verifies the low–heat and high–heat pressure switch contacts LPS and HPS are open, and starts the inducer motor IDM in high–speed.

   a. **Inducer Prepurge Period**

      1. If the furnace control CPU selects low–heat operation the inducer motor IDM comes up to speed, the low–heat pressure switch LPS closes, and the furnace control CPU begins a 15–second prepurge period. If the low–heat pressure switch LPS fails to remain closed the inducer motor IDM will remain running at high–speed. After the low–heat pressure switch re–closes the furnace control CPU will begin a 15–second prepurge period, and continue to run the inducer motor IDM at high–speed.

      2. If the furnace control CPU selects high–heat operation, the inducer motor IDM remains running at high–speed, and the high–heat pressure switch relay HPSR is de–energized to close the NC contact. When sufficient pressure is available the high–heat pressure switch HPS closes, and the high–heat gas valve solenoid GV–HI is energized. The furnace control CPU begins a 15–second prepurge period after the low–heat pressure switch LPS closes. If the high–heat pressure switch HPS fails to close and the low–heat pressure switch LPS closes, the furnace will operate at low–heat gas flow rate until the high–heat pressure switch closes for a maximum of 2 minutes after ignition.

b. **Igniter Warm–Up** – At the end of the prepurge period, the Hot–Surface Igniter HSI is energized for a 17–second igniter warm–up period.

c. **Trial–For–Ignition Sequence** – When the igniter warm–up period is completed the main gas valve relay contact GVR closes to energize the gas valve solenoid GV–M. The gas valve solenoid GV–M permits gas flow to the burners when it is ignited by the HSI. Five seconds after the GVR closes, a 2–second flame proving period begins. The HSI igniter will remain energized until the flame is sensed or until the 2–second flame proving period begins. If the furnace control CPU selects high–heat operation, the high–heat gas valve solenoid GV–HI is also energized.

d. **Flame–Proving** – When the burner flame is proved at the flame–proving sensor electrode FSE, the inducer motor IDM switches to low–speed unless the furnace is operating in high–heat, and the furnace control CPU begins the blower–ON delay period and continues to hold the gas valve GV–M open. If the burner flame is not proved within two seconds, the control CPU will close the gas valve GV–M, and the control CPU will repeat the ignition sequence for up to three more Trials–For–Ignition before going to Ignition–Lockout. Lockout will be reset automatically after three hours, or by momentarily interrupting 115 vac power to the furnace, or by interrupting 24 vac power at SEC1 or SEC2 to the furnace control CPU (not at W/W1, G, R, etc.). If flame is proved when flame should not be present, the furnace control CPU will lock out of Gas–Heating mode and operate the inducer motor IDM on high speed until flame is no longer proved.

e. **Blower–On delay** – If the burner flame is proved the blower–ON delays for low–heat and high–heat are as follows:

   **Low–heat** – 45 seconds after the gas valve GV–M is opened the blower motor BLWM is turned ON at low–heat airflow.

   **High–heat** – 25 seconds after the gas valve GV–M is opened the BLWM is turned ON at high–heat airflow. Simultaneously, the humidifier terminal HUM and electronic air cleaner terminal EAC–1 are energized and remain energized throughout the heating cycle.

f. **Switching from Low– to High–Heat** – If the furnace control CPU switches from low–heat to high–heat, the furnace control CPU will switch the inducer motor IDM speed from low to high. The high–heat pressure switch relay HPSR is de–energized to close the NC contact. When sufficient pressure is available the high–heat pressure switch HPS closes, and the high–heat gas valve solenoid GV–HI is energized. The blower motor BLWM will transition to high–heat airflow five seconds after the furnace control CPU switches from low–heat to high–heat.

g. **Switching from High– to Low–Heat** – The furnace control CPU will not switch from high–heat to low–heat while the thermostat R–to–W circuit is closed when using a single–stage thermostat.

h. **Blower–Off Delay** – When the thermostat is satisfied, the R to W circuit is opened, de–energizing the gas...
valve GV–M, stopping gas flow to the burners, and de–energizing the humidifier terminal HUM. The inducer motor IDM will remain energized for a 15–second post–purge period. The blower motor BLWM and air cleaner terminal EAC–1 will remain energized at low–heat airflow or transition to low–heat airflow for 90, 120, 150, or 180 seconds (depending on selection at blower–OFF delay switches). The furnace control CPU is factory–set for a 120–second blower–OFF delay.

2. Two–Stage Thermostat and Two–Stage Heating

See Figure 18–Figure 21 for thermostat connections.

NOTE: In this mode the low–heat only switch SW1–2 must be ON to select the low–heat only operation mode in response to closing the thermostat R–to–W1 circuit. Closing the thermostat R–to–W1 and W2 circuits always causes high–heat operation, regardless of the setting of the low–heat only switch.

The wall thermostat “calls for heat”, closing the R–to–W1 circuit for low–heat or closing the R–to–W1 and W2 circuits for high–heat. The furnace control performs a self–check, verifies the low–heat and high–heat pressure switch contacts LPS and HPS are open, and starts the inducer motor IDM in high–speed.

The start up and shut down functions and delays described in item 1. above apply to the 2–stage heating mode as well, except for switching from low– to high–Heat and vice versa.

a. Switching from Low– to High–Heat  – If the thermostat R–to–W1 circuit is closed and the R–to–W2 circuit closes, the furnace control CPU will switch the inducer motor IDM speed from low to high. The high–heat pressure switch relay HPSR is de–energized to close the NC contact. When sufficient pressure is available the high–heat pressure switch HPS closes, and the high–heat gas valve solenoid GV–HI is energized. The blower motor BLWM will transition to high–heat airflow five seconds after the R–to–W2 circuit closes.

b. Switching from High– to Low–Heat  – If the thermostat R–to–W2 circuit opens, and the R–to–W1 circuit remains closed, the furnace control CPU will switch the inducer motor IDM speed from high to low. The high–heat pressure switch relay HPSR is energized to open the NC contact and de–energize the high–heat gas valve solenoid GV–HI. When the inducer motor IDM reduces pressure sufficiently, the high–heat pressure switch HPS will open. The gas valve solenoid GV–M will remain energized as long as the low–heat pressure switch LPS remains closed. The blower motor BLWM will transition to low–heat airflow five seconds after the R–to–W2 circuit opens.

3. Cooling mode

The thermostat “calls for cooling”.

a. Single–Speed Cooling

See Figure 18 and Figure 20 for thermostat connections. The thermostat closes the R–to–G–and–Y circuits. The R–to–Y circuit starts the outdoor unit, and the R–to–G–and–YY2 circuits start the furnace blower motor BLWM on cooling airflow. Cooling airflow is based on the A/C selection shown in Table 5. The electronic air cleaner terminal EAC–1 is energized with 115 vac when the blower motor BLWM is operating.

When the thermostat is satisfied, the R–to–G–and–Y circuits are opened. The outdoor unit will stop, and the furnace blower motor BLWM will continue operating at cooling airflow for an additional 90 seconds. Jumper Y/YY2 to DHUM to reduce the cooling off–delay to 5 seconds. (See Figure 4)

b. Two–Stage Thermostat and Two–Speed Cooling

See Figure 19 and Figure 21 for thermostat connections. The thermostat closes the R–to–G–and–Y1 circuits for low–cooling or closes the R–to–G–and–Y1–and–Y2 circuits for high–cooling. The R–to–Y1 circuit starts the outdoor unit on low–cooling speed, and the R–to–G–and–Y1 circuit starts the furnace blower motor BLWM at low–cooling airflow which is the CF (continuous fan) selection as shown in Figure 5. The R–to–Y1–and–Y2 circuits start the outdoor unit on high–cooling speed, and the R–to–G–and–YY2 circuits start the furnace blower motor BLWM at high–cooling airflow. High–cooling airflow is based on the A/C (air conditioning) selection shown in Figure 5.

The electronic air cleaner terminal EAC–1 is energized with 115 vac whenever the blower motor BLWM is operating.

When the thermostat is satisfied, the R–to–G–and–Y1 or R–to–G–and–Y1–and–Y2 circuits are opened. The outdoor unit stops, and the furnace blower BLWM and electronic air cleaner terminal EAC–1 will remain energized for an additional 90 seconds. Jumper Y1 to DHUM to reduce the cooling off–delay to 5 seconds. (See Figure 16)

4. Dehumidify Mode

See Figure 18–Figure 24 for thermostat connections. The H output on the humidifying sensing thermostat should be connected to the furnace control thermostat terminal DHUM. When there is a dehumidifying demand, the DHUM input is activated, which means 24 vac signal is removed from the DHUM input terminal. In other words, the DHUM input logic is reversed. The DHUM input is turned ON when no dehumidifying demand exists.

a. Low Cooling  – When the R–to–G–and–Y1 circuit is closed and there is a demand for dehumidification, the low cooling airflow demand is reduced by 10 percent.

b. High–Cooling  – When the R–to–G–and–YY2 circuit is closed and there is a demand for dehumidification, the high cooling airflow demand is reduced by 10 percent.

c. Cooling off–delay  – When the “call for cooling” is satisfied and there is a demand for dehumidification, the cooling blower–off delay is decreased from 90 seconds to 5 seconds.

5. Continuous Blower Mode

When the R–to–G circuit is closed by the thermostat, the blower motor BLWM will operate at continuous blower airflow. Continuous blower airflow selection is initially based on the CF (continuous fan) selection shown in Figure 5. Factory default is shown in Figure 5. Terminal EAC–1 is energized as long as the blower motor BLWM is energized.

During the call for heat, the furnace control CPU will keep the blower motor BLWM to continuous blower airflow. The blower motor BLWM will remain ON until the main burners ignite then shut OFF and remain OFF for the blower–ON delay (45 seconds in low–heat, and 25 seconds in high–heat), allowing the furnace heat exchangers to heat up more quickly, then restarts at the end of the blower–ON delay period at low–heat or high–heat airflow, respectively.
The blower motor BLWM will revert to continuous–blower airflow after the heating cycle is completed. In high–heat, the furnace control CPU will drop the blower motor BLWM to low–heat airflow during the selected blower–OFF delay period before transitioning to continuous–blower airflow.

When the thermostat "calls for low–cooling", the blower motor BLWM will switch to operate at low–cooling airflow. When the thermostat is satisfied, the blower motor BLWM will operate an additional 90 seconds at low–cooling airflow before transitioning back to continuous–blower airflow.

When the thermostat "calls for high–cooling", the blower motor BLWM will operate at high cooling airflow. When the thermostat is satisfied, the blower motor BLWM will operate an additional 90 seconds at high–cooling airflow before transitioning back to continuous–blower airflow.

When the thermostat "calls for high–cooling", the blower motor BLWM will operate at high cooling airflow. When the thermostat is satisfied, the blower motor BLWM will continue operating for an additional 5 seconds, if no other function requires blower motor BLWM operation.

6. Heat pump
See Figure 20 and Figure 21 for thermostat connections. When installed with a heat pump, the furnace control automatically changes the timing sequence to avoid long blower off times during demand defrost cycles. Whenever W/W1 is energized along with Y1 or Y/Y2, the furnace control CPU will transition to or bring on the blower motor BLWM at cooling airflow, low–heat airflow, or whichever is lowest. The blower motor BLWM will remain on until the main burners ignite then shut OFF and remain OFF for 25 seconds before coming back on at heating airflow. When the W/W1 input signal disappears, the furnace control begins a normal inducer post–purge period while changing the blower airflow. If Y/Y2 input is still energized the furnace control CPU will transition the blower motor BLWM airflow to cooling airflow. If Y/Y2 input signal disappears and the Y1 input is still energized the furnace control CPU will transition the blower motor BLWM airflow to low–cooling airflow. If both the Y1 and Y/Y2 signals disappear at the same time, the blower motor BLWM will remain on at low–heat airflow for the selected blower–OFF delay period. At the end of the blower–OFF delay, the blower motor BLWM will shut OFF unless G is still energized, in which case the blower motor BLWM will operate at continuous blower airflow.

Component Self Test
Refer to page 18 for instructions.
NOTES FOR FIGURES Figure 18 – Figure 24

1. Refer to outdoor equipment Installation Instructions for additional information and setup procedure.
2. Outdoor Air Temperature Sensor must be attached in all dual fuel applications.
3. Refer to ICP thermostat Installation Instructions for additional information and setup procedure.
4. When using a Humidity Sensing Thermostat, set DEHUMIDIFY OPTIONS to H DE–ENRGZD FOR DEHUM.
5. Optional connection. If wire is connected SW1–2 on VS furnace control should be set in ON position to allow ICP Thermostat to control the furnace staging.
6. HUM connection is 24 VAC and is energized when the blower turns on during a call for heat.
7. When connecting 115 VAC to humidifier use a separate 115 VAC supply.
8. When using a humidifier on a HP installation connect humidifier to hot water.
9. Thermostat signals may vary. Consult thermostat installation instructions for more information.
PARTS REPLACEMENT INFORMATION GUIDE

Casing Group
Control door
Blower door
Top filler plate
Bottom filler plate
Door Knob Assembly

Electrical Group
Control box
Junction box
Limit switch(es)
Circuit board
Door switch
Transformer
3−Amp fuse
Flame Rollout switch
Main Wiring harness
Blower Motor harness (when used)

Filter Group
Filter(s)

Blower Group
Cut−off Plate
Blower housing
Blower motor
Blower wheel
Capacitor (when used)
Capacitor strap (when used)
Power choke (where used)

Gas Control Group
Manifold
Burner
Orifice
Flame sensor
Hot surface igniter
Gas valve

Heat Exchanger group
Primary Heat Exchanger assembly
Primary Heat Exchanger cell panel
Secondary Heat Exchanger assembly
Coupling box
Containment Plate
Tubing Gaskets

Inducer Group
Pressure switch(es)
Inducer assembly
Inducer
Inducer motor
Motor Module (when used)
Inducer motor capacitor (when used)
Collector box
Condensate trap
Condensate trap elbow
Gaskets

Filter Group
Filter(s)

Blower Group
Cut−off Plate
Blower housing
Blower motor
Blower wheel
Capacitor (when used)
Capacitor strap (when used)
Power choke (when used)

Adobe Reader XI

Fire, Explosion, Electrical Shock and Carbon Monoxide Poisoning Hazard

Failure to follow this warning could result in dangerous operation, personal injury, death or property damage. Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, local gas supplier, or your distributor or branch for information or assistance. The qualified installer or agency must use only factory-authorized and listed kits or accessories when modifying this product.

Have available the product/model number and the serial number located on the unit rating plate to ensure correct replacement parts.

TO OBTAIN INFORMATION ON PARTS: Consult your installing dealer or the classified section of your local telephone directory under the "Heating Equipment" or "Air Conditioning Contractors and Systems" headings for dealer listing by brand name.

International Comfort Products
Consumer Relations Department
P.O. Box 128
Lewisburg, TN 37091, USA
931−270−4100

Specifications subject to change without notice.

Gas Furnace: (F/G)9MVE

440 04 4801 00
### PRODUCT NOMENCLATURE

<table>
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<tr>
<th>DIGIT POSITION</th>
<th>1</th>
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<td>9</td>
<td><strong>M</strong></td>
<td>V</td>
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<td>17</td>
<td>14</td>
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- **G** = Mainline Look 1
- **F** = Mainline Look 2
- **N** = Entry
- **9** = 90% – 100% **EFFICIENCY**
- **M** = Multiposition
- **H** = Horizontal
- **U** = Upflow
- **D** = Downflow
- **A** = Modulating Variable Speed ECM
- **V** = Variable Speed
- **X** = ECM
- **S** = Single-stage
- **T** = Two-stage
- **B** = Base AFUE Efficiency
- **E** = Extra AFUE Efficiency
- **C** = Communicating
- **D** = Dual Certified 2-pipe or 1-pipe
- **R** = 2-pipe only
- **S** = Single-stage
- **T** = Two-stage
- **N** = Standard
- **L** = Low Nox

#### INPUT HEAT
- 040 = 40,000 BTU/hr
- 060 = 60,000 BTU/hr
- 080 = 80,000 BTU/hr
- 100 = 100,000 BTU/hr
- 120 = 120,000 BTU/hr

#### CABINET WIDTH
- 14 = 14–3/16"
- 17 = 17–1/2"
- 21 = 21"
- 24 = 24–1/2"

#### COOLING AIRFLOW
- 10 = 1000 CFM (max)
- 14 = 1400 CFM (max)
- 16 = 1600 CFM (max)
- 20 = 2000 CFM (max)
- 22 = 2200 CFM (max)