Service and Troubleshooting

96% Single Stage Ultra-Low NOx Gas Furnaces
A/GMES96*U* & A/GM9S96*U*

Pride and workmanship go into every product to provide our customers with quality products. It is possible, however, that during its lifetime a product may require service. Products should be serviced only by a qualified service technician who is familiar with the safety procedures required in the repair and who is equipped with the proper tools, parts, testing instruments and the appropriate service manual. **REVIEW ALL SERVICE INFORMATION IN THE APPROPRIATE SERVICE MANUAL BEFORE BEGINNING REPAIRS.**

WARNING

ONLY PERSONNEL THAT HAVE BEEN TRAINED TO INSTALL, ADJUST, SERVICE, MAINTENANCE OR REPAIR (HEREINAFTER, "SERVICE") THE EQUIPMENT SPECIFIED IN THIS MANUAL SHOULD SERVICE THE EQUIPMENT.

THIS EQUIPMENT IS NOT INTENDED FOR USE BY PERSONS (INCLUDING CHILDREN) WITH REDUCED PHYSICAL, SENSORY OR MENTAL CAPABILITIES, OR LACK OF EXPERIENCE AND KNOWLEDGE, UNLESS THEY HAVE BEEN GIVEN SUPERVISION OR INSTRUCTION CONCERNING USE OF THE APPLIANCE BY A PERSON RESPONSIBLE FOR THEIR SAFETY.

CHILDREN SHOULD BE SUPERVISED TO ENSURE THAT THEY DO NOT PLAY WITH THE EQUIPMENT.

THE MANUFACTURER WILL NOT BE RESPONSIBLE FOR ANY INJURY OR PROPERTY DAMAGE ARISING FROM IMPROPER SUPERVISION, SERVICE OR SERVICE PROCEDURES. IF YOU SERVICE THIS UNIT, YOU ASSUME RESPONSIBILITY FOR ANY INJURY OR PROPERTY DAMAGE WHICH MAY RESULT. IN ADDITION, IN JURISDICTIONS THAT REQUIRE ONE OR MORE LICENSES TO SERVICE THE EQUIPMENT SPECIFIED IN THIS MANUAL, ONLY LICENSED PERSONNEL SHOULD SERVICE THE EQUIPMENT. IMPROPER SUPERVISION, INSTALLATION, ADJUSTMENT, SERVICING, MAINTENANCE OR REPAIR OF THE EQUIPMENT SPECIFIED IN THIS MANUAL, OR ATTEMPTING TO INSTALL, ADJUST, SERVICE OR REPAIR THE EQUIPMENT SPECIFIED IN THIS MANUAL WITHOUT PROPER SUPERVISION OR TRAINING MAY RESULT IN PRODUCT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

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WARNING

DO NOT BYPASS SAFETY DEVICES.

RS6612017r5
November 2026

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IMPORTANT INFORMATION

DANGER
PELIGRO



CARBON MONOXIDE POISONING HAZARD

Special Warning for Installation of Furnace or Air Handling Units in Enclosed Areas such as Garages, Utility Rooms or Parking Areas

Carbon monoxide producing devices (such as an automobile, space heater, gas water heater, etc.) should not be operated in enclosed areas such as unventilated garages, utility rooms or parking areas because of the danger of carbon monoxide (CO) poisoning resulting from the exhaust emissions. If a furnace or air handler is installed in an enclosed area such as a garage, utility room or parking area and a carbon monoxide producing device is operated therein, there must be adequate, direct outside ventilation.

This ventilation is necessary to avoid the danger of CO poisoning which can occur if a carbon monoxide producing device continues to operate in the enclosed area. Carbon monoxide emissions can be (re)circulated throughout the structure if the furnace or air handler is operating in any mode.

CO can cause serious illness including permanent brain damage or death.

B10259-216

RIESGO DE INTOXICACIÓN POR MONÓXIDO DE CARBONO

Advertencia especial para la instalación de calentadores ó manejadoras de aire en áreas cerradas como estacionamientos ó cuartos de servicio.

Los equipos ó aparatos que producen monóxido de carbono (tal como automóvil, calentador de gas, calentador de agua por medio de gas, etc) no deben ser operados en áreas cerradas debido al riesgo de envenenamiento por monóxido de carbono (CO) que resulta de las emisiones de gases de combustión. Si el equipo ó aparato se opera en dichas áreas, debe existir una adecuada ventilación directa al exterior.

Esta ventilación es necesaria para evitar el peligro de envenenamiento por CO, que puede ocurrir si un dispositivo que produce monóxido de carbono sigue operando en el lugar cerrado.

Las emisiones de monóxido de carbono pueden circular a través del aparato cuando se opera en cualquier modo.

El monóxido de carbono puede causar enfermedades severas como daño cerebral permanente ó muerte.

B10259-216

RISQUE D'EMPOISONNEMENT AU MONOXYDE DE CARBONE

Avertissement special au sujet de l'installation d'appareils de chauffage ou de traitement d'air dans des endroits clos, tets les garages, les locaux d'entretien et les stationnements.

Evitez de mettre en marche les appareils produisant du monoxyde de carbone (tels que les automobile, les appareils de chauffage autonome,etc.) dans des endroits non ventilés tels que les d'empoisonnement au monoxyde de carbone. Si vous devez faire fonctionner ces appareils dans un endroit clos, assures-vous qu'il y ait une ventilation directe provenant de l'exterier.

Cette ventilation est nécessaire pour éviter le danger d'intoxication au CO pouvant survenir si un appareil produisant du monoxyde de carbone continue de fonctionner au sein de la zone confinée.

Les émissions de monoxyde de carbone peuvent etre recircules dans les endroits clos, si l'appareil de chauffage ou de traitement d'air sont en marche.

Le monoxyde de carbone peut causer des maladies graves telles que des dommages permanents au cerveau et meme la mort.

B10259-216

WARNING

TO PREVENT THE RISK OF PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH. DO NOT STORE COMBUSTIBLE MATERIALS OR USE GASOLINE OR OTHER FLAMMABLE LIQUIDS OR VAPORS IN THE VICINITY OF THIS APPLIANCE.

WARNING

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



WARNING

IF THE INFORMATION IN THESE INSTRUCTIONS IS NOT FOLLOWED EXACTLY, A FIRE OR EXPLOSION MAY RESULT CAUSING PROPERTY DAMAGE, PERSONAL INJURY OR LOSS OF LIFE.

- DO NOT STORE OR USE GASOLINE OR OTHER FLAMMABLE VAPORS AND LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE.
- WHAT TO DO IF YOU SMELL GAS:
  - DO NOT TRY TO LIGHT ANY APPLIANCE.
  - DO NOT TOUCH ANY ELECTRICAL SWITCH; DO NOT USE ANY PHONE IN YOUR BUILDING.
  - IMMEDIATELY CALL YOUR GAS SUPPLIER FROM A NEIGHBOR'S PHONE. FOLLOW THE GAS SUPPLIER'S INSTRUCTIONS.
  - IF YOU CANNOT REACH YOUR GAS SUPPLIER, CALL THE FIRE DEPARTMENT.
- INSTALLATION AND SERVICE MUST BE PERFORMED BY A QUALIFIED INSTALLER, SERVICE AGENCY OR THE GAS SUPPLIER.

WARNING

SHOULD OVERHEATING OCCUR OR THE GAS SUPPLY FAIL TO SHUT OFF, TURN OFF THE MANUAL GAS SHUTOFF VALVE EXTERNAL TO THE FURNACE BEFORE TURNING OFF THE ELECTRICAL SUPPLY.

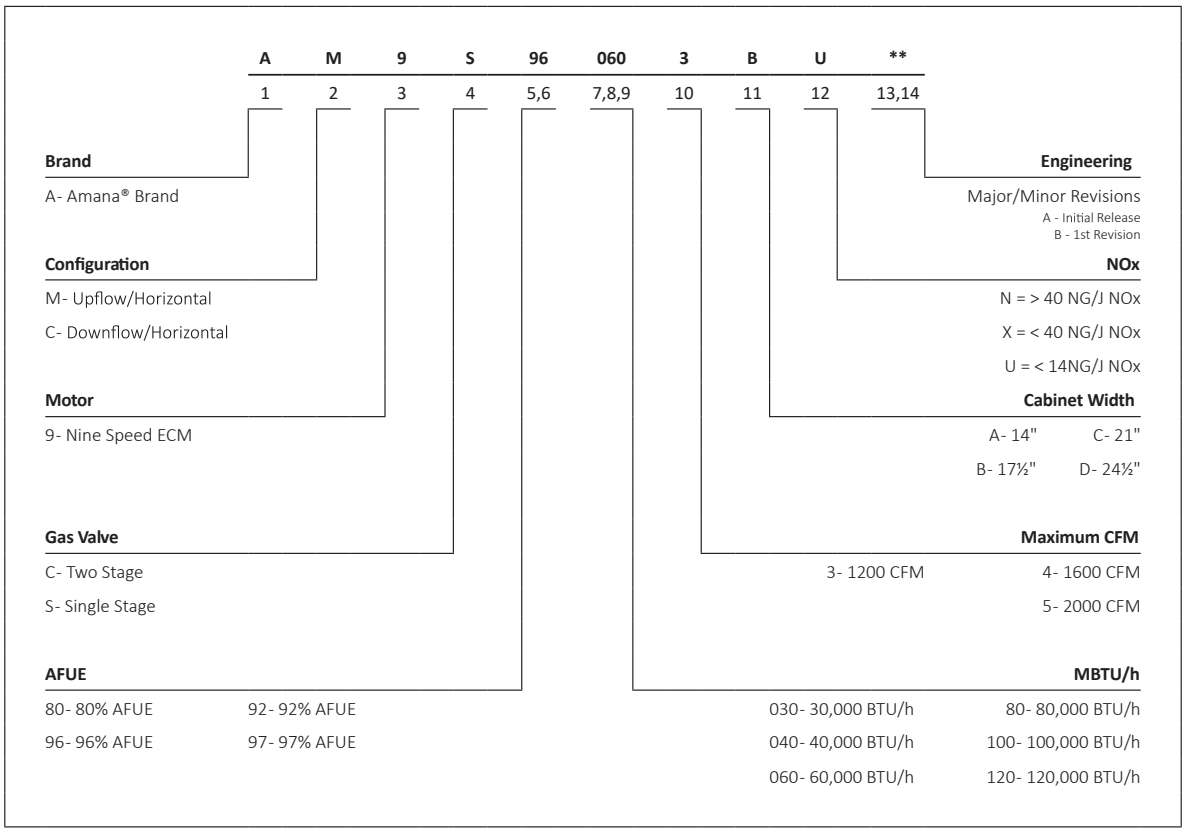
WARNING

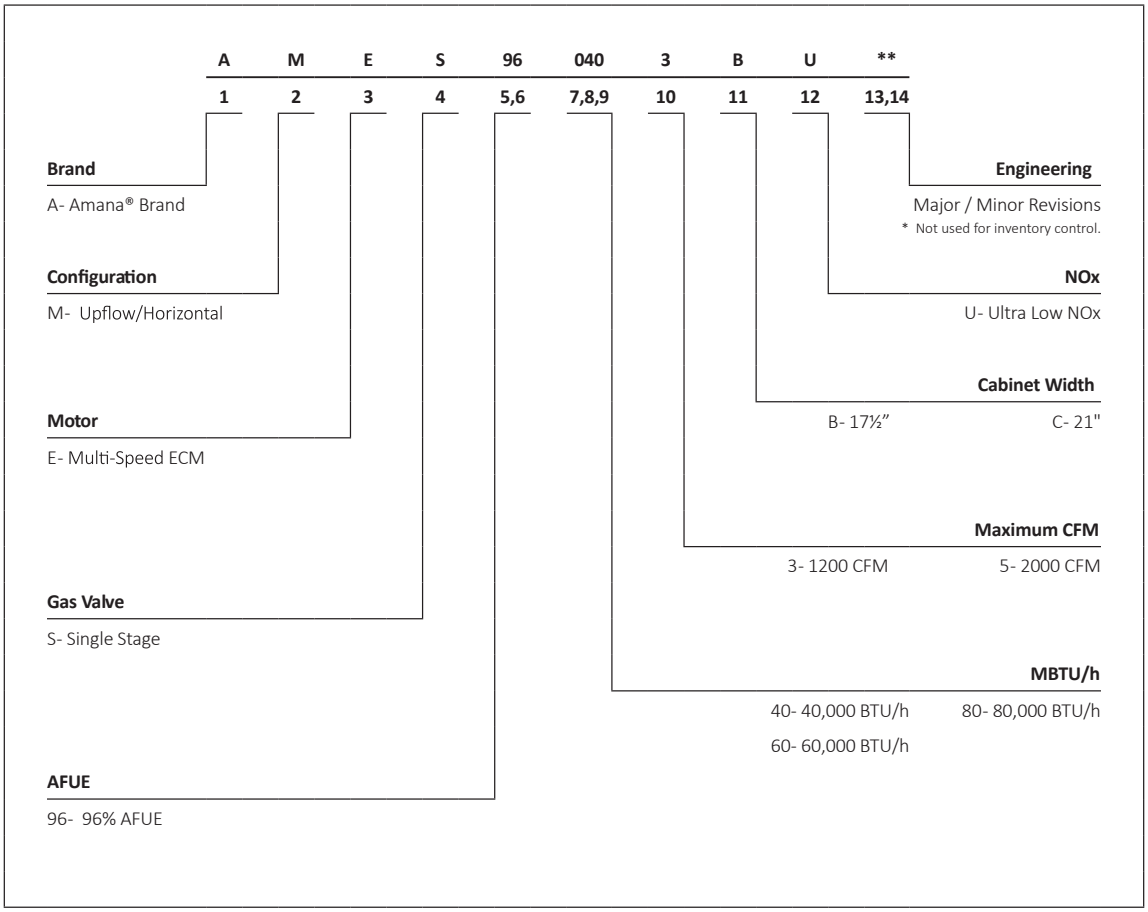
THIS UNIT SHOULD NOT BE CONNECTED TO, OR USED IN CONJUNCTION WITH, ANY DEVICES THAT ARE NOT DESIGN CERTIFIED FOR USE WITH THIS UNIT OR HAVE NOT BEEN TESTED AND APPROVED BY THE MANUFACTURER. SERIOUS PROPERTY DAMAGE OR PERSONAL INJURY , REDUCED UNIT PERFORMANCE AND/OR HAZARDOUS CONDITIONS MAY RESULT FROM THE USE OF DEVICES THAT HAVE NOT BEEN APPROVED OR CERTIFIED BY THE MANUFACTURER.

OUTSIDE THE U.S., **call 1-713-861-2500**.
(Not a technical assistance line for dealers.) Your telephone company will bill you for the call.

PRODUCT IDENTIFICATION NOMENCLATURE

The model and manufacturing number are used for positive identification of component parts used in manufacturing. Please use these numbers when requesting service or parts information.





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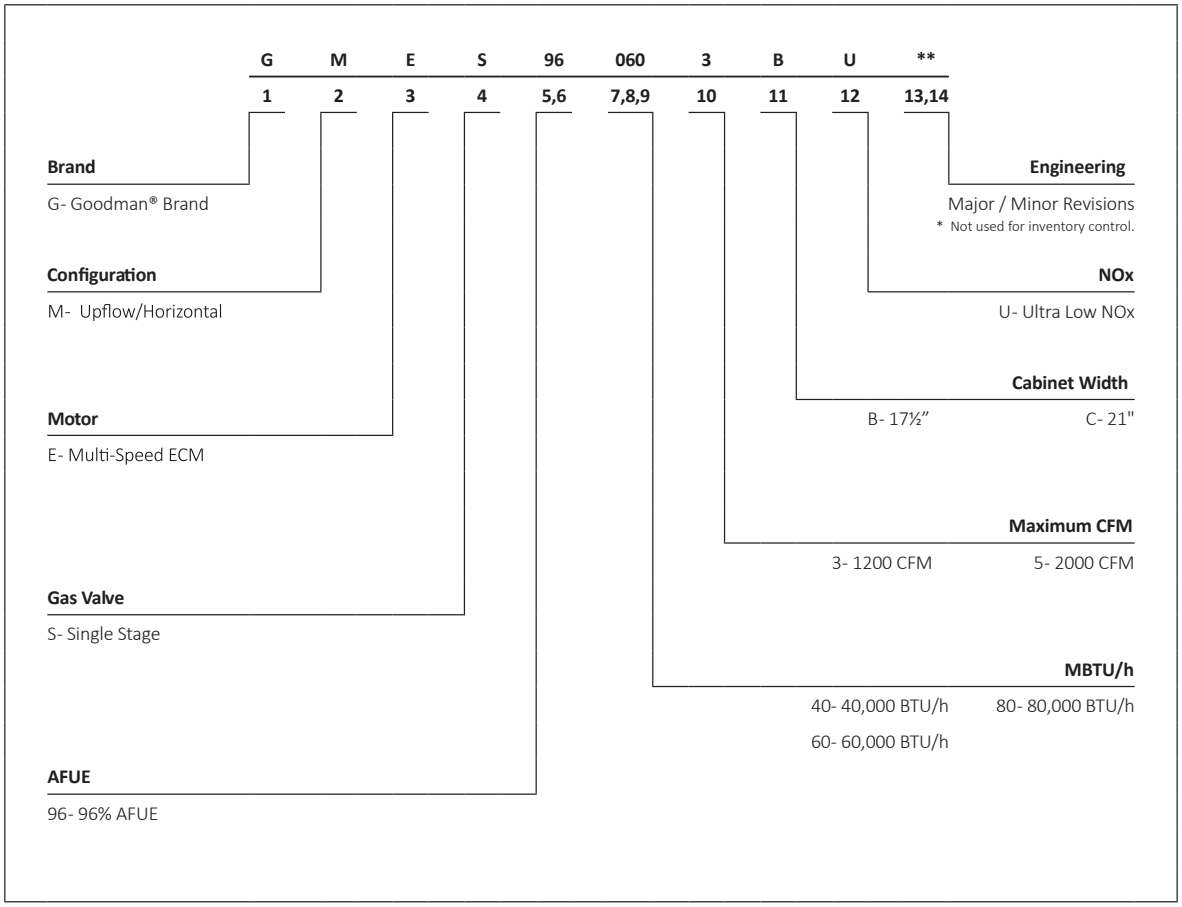
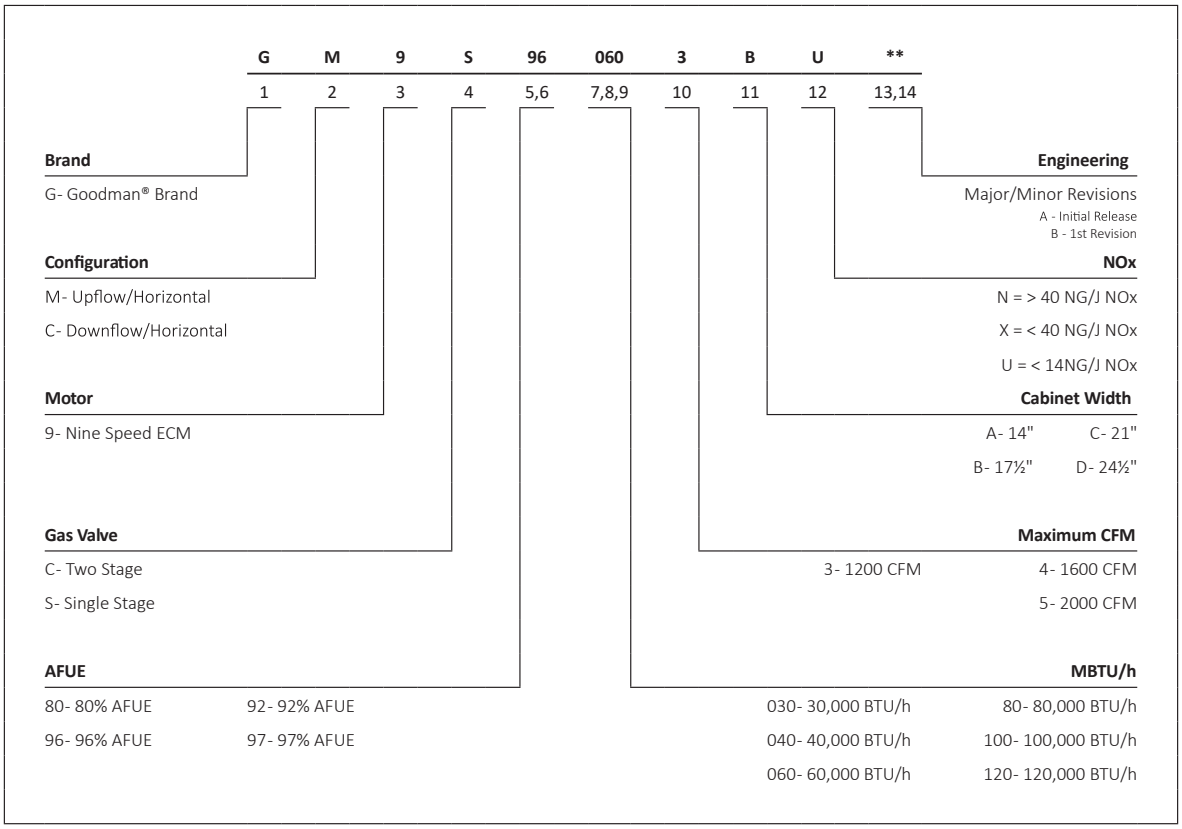




SYSTEM OPERATION

NORMAL SEQUENCE OF OPERATION

*MES96*UAA WITH PCBBF158 - 160 CONTROL BOARDS

POWER UP

- 120 VAC power applied to furnace.
- Integrated ignition control performs internal checks.
- LED light will flash once at power up and then remain on.
- Integrated ignition control monitors safety circuit continuously.
- Furnace awaits call from thermostat.

HEATING MODE

The normal operational sequence in heating mode is as follows:

- R and W thermostat contacts close, initiating a call for heat.
- Integrated control module performs safety circuit checks.
- **Pressure Sensor Verification:** The control operates the inducer in a manner to verify the pressure sensor null value and span operation are within specification. If the system is operating correctly, this test takes only a few seconds. If the system is not functioning properly, the control times out after a maximum 90 seconds and display the proper fault code.
- Induced draft blower is energized for 30 second prepurge.
- Igniter warm up begins after 30 second prepurge expires.
- Gas valves open at end of igniter warm up period, delivering gas to burners and establishing flame.
- Integrated control module monitors flame presence. Gas valve will remain open only if flame is detected.
- Circulator blower is energized on high heat speed following a fixed 30 second blower on delay. Electronic air cleaner terminals are energized with circulator blower.
- Furnace operates; integrated control module monitors safety circuits continuously.
- R and W thermostat contacts open, completing the call for heat.
- Gas valve closes, extinguishing flame.
- Induced draft blower is de-energized following a thirty second post purge.
- HUM terminal is de-energized.
- Circulator blower continues running for selected heat off delay period factory set at 120 seconds. If required this can be changed in the field.
- Electronic air cleaner is de-energized.
- Furnace awaits the next call from thermostat.

COOLING MODE

The normal operational sequence in cooling mode is as follows:

- R, Y and G thermostat contacts close, initiating a call for cool.
- Integrated control module performs safety circuit checks.
- Outdoor fan and compressor are energized.
- Circulator blower is energized on cool speed following a fixed six second on delay. If required this can be changed in the field to 45 seconds. Electronic air cleaner terminals are energized with circulator blower.
- Furnace circulator blower and outdoor cooling unit run, integrated control module monitors safety circuits continuously.
- R, Y and G thermostat contacts open, completing the call for cool.
- Outdoor fan and compressor are de-energized.
- Circulator blower is de-energized following a fixed forty five second cool off delay period. Electronic air cleaner terminals are de-energized.
- Furnace awaits the next call from thermostat.

FAN ONLY MODE

The normal operational sequence in Fan Only Mode is as follows:

- R and G thermostat contacts close, initiating a call for fan.
- Integrated control module performs safety circuit checks.
- Circulator blower is energized on low heat speed. Electronic air cleaner terminals are energized.
- Circulator blower runs, integrated control module monitors safety circuits continuously.

*M9S96*UAA WITH PCBBF241 CONTROL BOARD STARTUP PROCEDURE & ADJUSTMENT

Furnace must have a 115 VAC power supply properly connected and grounded. Proper polarity must be maintained for correct operation. In addition to the following start-up and adjustment items, refer to further information in *Operational Checks* section.

QUICK START

Initial set up of outdoor systems are required to be configured through the control board. Navigate to OdS menu using the push buttons to properly configure the outdoor system. Selections for AC1, AC2, HP1, HP2 must be made to enable specific fan speeds and thermostat signals to function.

NOTE: Equipment type (Single-stage cooling, Two-stage cooling, Single-stage heat pump, Two-stage heat pump) MUST be setup through the OdS menu by the installer for proper system operation.

SYSTEM OPERATION

USING PUSH-BUTTON

All user settings may be accessed by two push-buttons on the control board. The switches are identified as “menu” & “option”. To enter the main menu, press the “menu” button. Each time the menu button is pressed the display will show the next available item in the main menu.
While in the main menu, press the “option” button to scroll through available options corresponding to the main menu item displayed. In the option menu, the default option will be displayed first. If the default option has been changed to another option, the current option selection will be displayed first.

The option menu will display both adjustable & non-adjustable options. When an adjustable option is displayed, the display will flash continuously until a switch is pressed. If a non-adjustable option is displayed (such as Code Release Number) the display will not flash.

While navigating the option menus, press the menu button to select the displayed option. The displayed selection will stop flashing indicating the selection was made. Press the menu button again to finalize the selection and return to the corresponding main menu.

In the option menu, after the last option has been displayed, the display will revert to the corresponding main menu & display the default (or selected) option.
If buttons are inactive for 30 seconds the display will revert to the status menu.

Control Board Main Menu

Description	Main Menu LED Display	Option Menu LED Display	Default
Idle - system awaiting input	idl		
Display Active Alarm	Err	See Troubleshooting chart for alarm code definition	
Display Last 6 Faults	L6F		
Code Release Number	Cr	None	
Shared Data Revision	Sr	None	
Reset to Factory Default	rFd	Yes / No	
Outdoor Setting Menu	OdS	AC1 / AC2 / HP1 / HP2 / OFF	OFF
Blower Speed for Continuous Fan Mode	FSd	F01 - F09	F01
Blower Speed for 1st Stage Compressor Mode	AC1	F01 - F09	Model specific
Blower Speed for 2nd Stage Compressor Mode	AC2	F01 - F09	Model specific
Cooling Fan Off Delay	CFd	0 - 120 seconds	65 seconds
Cooling Fan On Delay	Cnd	0 - 35 seconds	7 seconds
Blower Speed for Gas Heat Mode	gAF	Allowable speeds Fxx	Model specific
Gas Heat Off Delay	gFd	30 - 120 seconds	90 seconds
Gas Heat On Delay - locked	gnd	None	30 seconds
Blower Speed for 1st Stage HP Heat Mode	HP1	F01 - F09	Model specific
Blower Speed for 2nd Stage HP Heat Mode	HP2	F01 - F09	Model specific
HP Heat Off Delay	HFd	30 - 120 seconds	60 seconds
HP Heat On Delay	Hnd	5 - 30 seconds	5 seconds

Control Board Status Menu

LED Display	Description of System Status
888	All segments illuminated = control powering up
IDL	Idle
FAn	Constant Fan
1AC	Low Stage Cooling
2AC	High Stage Cooling
1AC	Compressor Heat, Low Stage
2AC	Compressor Heat, High Stage
gH	Gas Heat
1HP	Low Stage HP
2HP	High Stage HP
dFt	Defrost

SYSTEM OPERATION

DRAIN TRAP PRIMING

The drain trap MUST be primed prior to furnace startup. To prime, fill both sides of the drain trap with water. This ensures proper furnace drainage upon startup and prohibits the possibility of flue gases escaping through the drain system.

FURNACE OPERATION

Purge gas lines of air prior to startup. Be sure not purge lines into an enclosed burner compartment. Follow NFPA 54, National Fuel Gas Code 8.1.

Check for leaks using an approved chloride-free soap and water solution, an electronic combustible gas detector, or other approved method.

CAUTION

TO PREVENT UNRELIABLE OPERATION OR EQUIPMENT DAMAGE, THE INLET GAS SUPPLY PRESSURE MUST BE AS SPECIFIED ON THE UNIT RATING PLATE WITH ALL OTHER HOUSEHOLD GAS FIRED APPLIANCES OPERATING.

FURNACE STARTUP

1. Close the manual gas shutoff valve external to the furnace.
2. Turn off the electrical power to the furnace.
3. Set the room thermostat to the lowest possible setting.
4. Remove the burner compartment door.

NOTE: This furnace is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

5. Move the furnace gas valve manual control to the OFF position.
6. Wait five minutes then smell for gas. Be sure check near the floor as some types of gas are heavier than air.
7. If you smell gas after five minutes, immediately follow the safety instructions in the *Safety Considerations* on page 3 of this manual. If you do not smell gas after five minutes, move the furnace gas valve manual control to the ON position.
8. Replace the burner compartment door.
9. Open the manual gas shutoff valve external to the furnace.
10. Turn on the electrical power to the furnace.
11. Adjust the thermostat to a setting above room temperature.
12. After the burners are lit, set the thermostat to desired temperature.

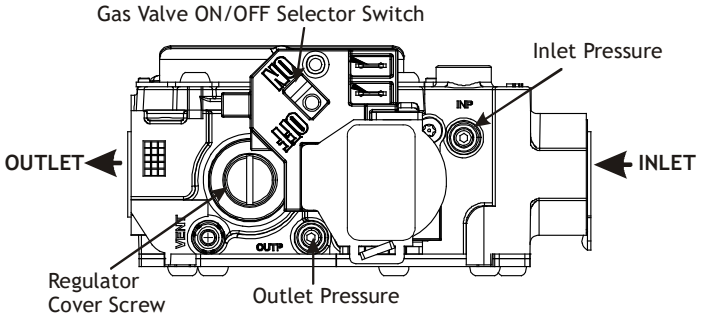
FURNACE SHUTDOWN

1. Set the thermostat to the lowest setting.
2. The integrated control will close the gas valve and extinguish flame. Following a 30 second delay, the induced draft blower will be de-energized. The circulator blower will shut down when the time delay expires (Time delay is selectable on all models).
3. Remove the burner compartment door and move the furnace gas valve manual control to the OFF position.
4. Close the manual gas shutoff valve external to the furnace.
5. Replace the burner compartment door.

GAS SUPPLY PRESSURE MEASUREMENT
GAS PRESSURE TEST

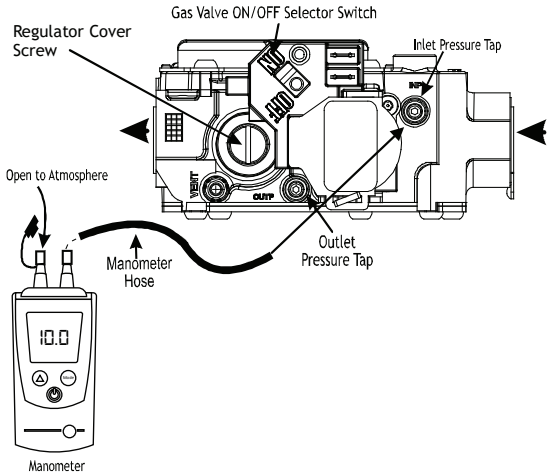
The line pressure supplied to the gas valve must be within the range specified on Table 4. The supply pressure can be measured at the gas valve inlet pressure tap or at a hose fitting installed in the gas piping drip leg. The supply pressure must be measured with the burners operating. To measure the gas supply pressure, use the following procedure.

1. Turn OFF gas to furnace at the manual gas shutoff valve external to the furnace. Back inlet pressure test port screw turn counter clockwise, not more than one turn.
2. Connect a calibrated manometer (or appropriate gas pressure gauge) at either the gas valve inlet pressure tap or the gas piping drip leg. See White-Rodgers 36J22Y-204 gas valve figure below for location of inlet pressure tap.



White-Rodgers Model 36J22Y-204

SYSTEM OPERATION



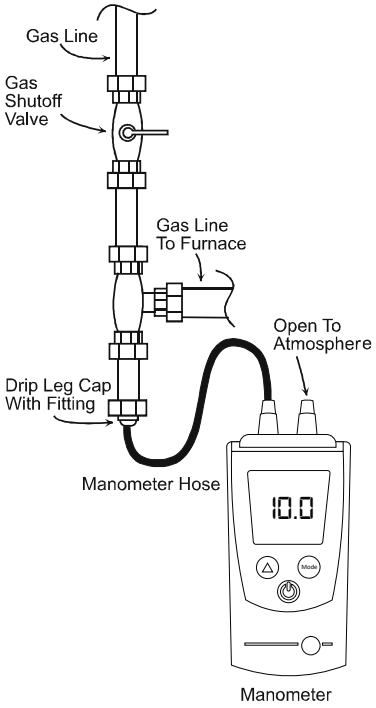
White-Rodgers Model 36J22Y-204 Connected to Manometer

NOTE: If measuring gas pressure at the drip leg, a field-supplied hose barb fitting must be installed prior to making the hose connection. If using the inlet pressure tap on the White-Rodgers 36J22 gas valve, then use the 36G/J Valve Pressure Check Kit, Part No. 0151K00000S.

3. Turn ON the gas supply and operate the furnace and all other gas consuming appliances on the same gas supply line.
4. Measure furnace gas supply pressure with burners firing. Supply pressure must be within the range specified in the *Inlet Gas Supply Pressure* table 4.

If supply pressure differs from table, make the necessary adjustments to pressure regulator, gas piping size, etc., and/or consult with local gas utility.

5. Turn OFF gas to furnace at the manual shutoff valve and disconnect manometer. Reinstall plug and tighten as needed before turning on gas to furnace.
6. Turn OFF any unnecessary gas appliances stated in step 3.



Measuring Inlet Gas Pressure (Alt. Method)

GAS MANIFOLD PRESSURE MEASUREMENT AND ADJUSTMENT

Only small variations in gas pressure should be made by adjusting the gas valve pressure regulator. The manifold pressure must be measured with the burners operating. To measure and adjust the manifold pressure, use the following procedure.

1. Turn OFF gas to furnace at the manual gas shutoff valve external to the furnace.
2. Turn off all electrical power to the system.
3. Outlet pressure tap connections:
4. White-Rodgers 36J22 valve: Back outlet pressure test screw (outlet pressure tap) out one turn (counterclockwise, not more than one turn).
5. Connect calibrated manometer (or appropriate pressure gauge) at the gas valve outlet pressure tap. See White-Rodgers 36J22Y-204 gas valve Figure 34A & 34B for location of outlet pressure tap.
6. Turn ON the gas supply.
7. Turn on power and close thermostat “R” and “W” contacts to provide a call for heat.
8. Measure the gas manifold pressure with burners firing. Adjust manifold pressure using the *Manifold Gas Pressure* table 8 shown below.
9. Remove regulator cover screw from the outlet pressure regulator adjust tower and turn screw clockwise to increase pressure or counterclockwise to decrease pressure. Replace regulator cover screw.
10. Turn off all electrical power and gas supply to the system.
11. Remove the manometer hose from the hose barb fitting or outlet pressure tap.

SYSTEM OPERATION

12. Replace outlet pressure tap: White-Rodgers 36J22 valve: Turn outlet pressure test screw in to seal pressure port (clockwise, 7 in-lb minimum).
13. Turn on electrical power and gas supply to the system.
14. Close thermostat contacts “R” and “W” to energize the valve.
15. Using a leak detection solution or soap suds, check for leaks at outlet or screw (White-Rodgers valve). Bubbles forming indicate a leak. SHUT OFF GAS AND REPAIR ALL LEAKS IMMEDIATELY!

NOTE: For gas to gas conversion, consult your dealer for appropriate conversion.

Manifold Gas Pressure		
Gas	**Range**	**Nominal**
Natural	2.8 - 3.2" w.c.	3.0" w.c.

GAS INPUT RATE MEASUREMENT (NATURAL GAS ONLY)

The actual gas input rate to the furnace must never be greater than that specified on the unit rating plate. To measure natural gas input using the gas meter, use the following procedure.

1. Turn OFF the gas supply to all other gas-burning appliances except the furnace.
2. While the furnace is operating at high fire rate, time and record one complete revolution of the gas meter dial, measuring the smallest quantity, usually the dial that indicates ½ cu. ft. per revolution. You will use this number to calculate the quantity of gas in cubic ft. if the furnace would consume if it ran steadily for one hour (3600 seconds).
3. If the ½ cu. ft. dial was used, multiply your number x 2. **EXAMPLE:** If it took 23 seconds to complete one revolution of the ½ ft. dial (23 x 2 = 46).

This tells us that at this rate, it would take 46 seconds to consume one cu. ft. of gas.

This tells us that in one hour, the furnace would consume 78 cu. ft. of gas. (3600 / 46 = 78)

The typical value range for 1 cu. ft. of natural gas is around 1025 BTU. Check with your gas utility, if possible. In this example, the furnace is consuming 80,000 BTUH.

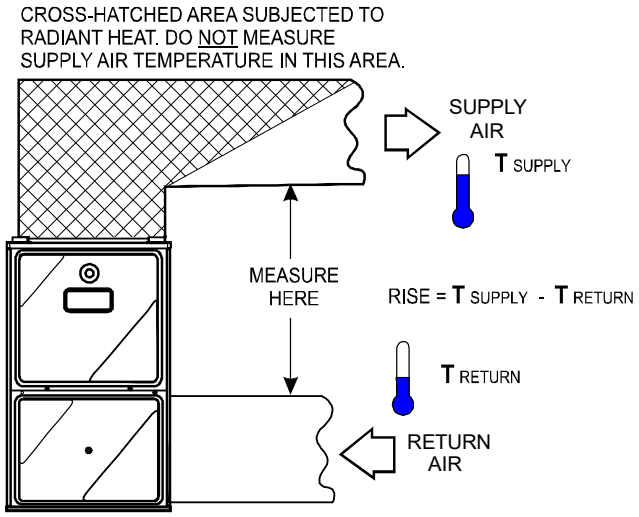
NOTE: The final manifold pressure cannot vary by more than ± 0.2” w.c. for natural gas from the specified setting. Consult your local gas supplier if additional input rate adjustment is required.

4. Turn ON gas to and relight all other appliances turned off in step 1. Be certain that all appliances are functioning properly and that all pilot burners (if applicable) are operating.

TEMPERATURE RISE

Temperature rise must be within the range specified on the unit rating plate. An incorrect temperature rise may result in condensing in or overheating of the heat exchanger. An airflow and temperature rise table is provided on page 34 and in the Specification Sheet applicable to your model. Determine and adjust temperature rise as follows:

1. Operate furnace with burners firing for approximately ten minutes. Ensure all registers are open and all duct dampers are in their final (fully or partially open) position.
2. Place thermometers in the return and supply ducts as close to the furnace as possible. Thermometers must not be influenced by radiant heat by being able to “see” the heat exchanger.
3. Subtract the return air temperature from the supply air temperature to determine the air temperature rise. Allow adequate time for thermometer readings to stabilize.
4. Adjust temperature rise by adjusting the circulator blower speed. Increase blower speed to reduce temperature rise. Decrease blower speed to increase temperature rise. Refer to *Startup Procedure and Adjustment - Circulator Blower Speeds* for speed changing details.



Temperature Rise Measurement

CIRCULATOR BLOWER SPEEDS

WARNING

TO AVOID PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK, TURN OFF POWER TO THE FURNACE BEFORE CHANGING SPEED TAPS.

This furnace is equipped with a multi-speed circulator blower. This blower provides ease in adjusting blower speeds. Table 9 and the Specification Sheet applicable to your model provides an airflow table, showing the relationship between airflow (CFM) and external static pressure (E.S.P.), for the proper selection of heating and cooling speeds.

SYSTEM OPERATION

1. Determine the tonnage of the cooling system installed with the furnace. If the cooling capacity is in BTU/hr divide it by 12,000 to convert capacity to tons.
   Example: Cooling Capacity of 30,000 BTU/hr. 30,000/12,000 = 2.5 Tons
2. Determine the proper air flow for the cooling system. Most cooling systems are designed to work with air volume between 350 and 450 CFM per ton. Most manufacturers recommend an air flow of about 400 CFM per ton.
   EXAMPLE: 2.5 tons X 400 CFM per ton = 1000 CFM
3. Select the heating speed for your model from the heating speed chart in the Specification Sheet. The selected speed must provide a temperature rise within the rise range listed with the particular model.

CONTINUOUS FAN MODE SPEED SELECTION

To change the main blower speed in circulation mode, see the following steps:

1. Press menu button until LED displays “FSd”. Press option button and LED will display the currently selected speed number as Fxx (xx: Blower speed number from 1 to 9).
2. The control shall cycle through available fan speeds every time the option button is pressed. All 9 speeds are available for circulation.
3. When the menu button is pressed, the current displayed speed shall stop flashing. Press the menu button again to select the option and the control shall immediately apply that blower setting and return to the corresponding main menu.

THERMOSTAT CALL	AVAILABLE SPEEDS (FSd menu)
G	F01
	F02
	F03
	F04
	F05
	F06
	F07
	F08
	F09

Circulation Speed Table

COOLING MODE SPEED SELECTION

To change the main blower speed in COOLING mode, follow the following steps:

NOTE: If Heat Pump system is configured in OdS menu (HP1 or HP2) COOLING thermostat calls will include “Y1”/ Y2” + “O” terminals energized.

1. Press menu button until LED displays “AC1” (for single stage COOLING) or “AC2” (for Two stage COOLING).
2. Press option button and the LED will display the currently selected speed number as Fxx (xx: Blower speed number from 1 to 9).
3. The control shall cycle through available fan speeds every time the option button is pressed. All 9 speeds are available for both Single and Two Stage cooling.
4. When the menu button is pressed, the current displayed speed shall stop flashing. Press the menu button again to select the option and the control shall immediately apply that blower setting and return to the corresponding main menu.

THERMOSTAT CALL (OdS: Terminal)	AVAILABLE SPEEDS (AC1 menu)
1AC: Y1 1HP: Y1 + O	F01
	F02
	F03
	F04
	F05
	F06
	F07
	F08
	F09

Single Stage Cooling Speed Table

THERMOSTAT CALL (OdS: Terminal)	AVAILABLE SPEEDS (AC2 menu)
2AC: Y1 + Y2 2HP: Y1 + Y2 + O	F01
	F02
	F03
	F04
	F05
	F06
	F07
	F08
	F09

Two Stage Cooling Speed Table

GAS HEATING MODE SPEED SELECTION

To change the main blower speed in GAS HEATING mode, see the following steps:

1. Press menu button until LED displays “gAF”. Press option button and LED will display the currently selected fan speed as Fxx (xx: Blower speed number).
2. The control shall cycle through available speed number every time the option button is pressed.
3. When the menu button is pressed, the current displayed speed shall stop flashing. Press the menu button again to select the option and the control shall immediately apply that blower setting and return to the corresponding main menu.

SYSTEM OPERATION

NOTE: Each furnace model contains different allowable gas heating speeds. Allowable gas heating speeds will be visible within gAF fan speed menu.

HEAT PUMP HEATING MODE SPEED SELECTION

To change the main blower speed in Heat Pump HEATING mode, follow the following steps:

1. Press menu button until LED displays “HP1” (for single stage HP HEATING) or “HP2” (for Two stage HP HEATING). Press option button and the LED will display the currently selected speed number as Fxx (xx: Blower speed number from 1 to 9).
2. The control shall cycle through available fan speeds every time the option button is pressed. All 9 speeds are available for both Single and Two Stage HP HEATING.
3. When the menu button is pressed, the current displayed speed shall be selected, and control shall apply the newly selected speed in next HP HEATING call.

THERMOSTAT CALL (OdS: Terminal)	AVAILABLE SPEEDS (HP1 menu)
1HP: Y1	F01
	F02
	F03
	F04
	F05
	F06
	F07
	F08
	F09

Single Stage HP Heating Speed Table

THERMOSTAT CALL (OdS: Terminal)	AVAILABLE SPEEDS (HP2 menu)
2HP: Y1 + Y2	F01
	F02
	F03
	F04
	F05
	F06
	F07
	F08
	F09

Two Stage HP Heating Speed Table

In general lower heating speeds will: reduce electrical consumption, lower operating sound levels of the blower, and increase the outlet air temperature delivered to the home. The speeds available allow the blower performance to be optimized for the particular homeowner’s needs.

ON/OFF FAN DELAY SELECTION

To change the fan on or off delay for COOLING, HP HEATING & GAS HEATING modes, see the following steps:

1. Press menu button until LED displays the desired on/off setting (See MAIN MENU section for selectable blower on/off delay options). Press option button and LED will display the selected on/off delay time in seconds.
2. The control shall cycle through available on/off delay times every time the option button is pressed.
3. When the menu button is pressed, the current displayed on/off delay shall stop flashing. Press the menu button again to select the option and the control shall immediately apply that delay setting and return to the corresponding main menu.

Combustion Quality

Combustion quality can be affected by several factors. Major factors are venting and draining.

Venting

The venting system should be planned and installed with the following in mind:

- Should not be longer than necessary
- Use 45°elbows rather than 90° elbows when possible
- Must not sag or otherwise trap condensate
- Use longest radius fittings possible
- If using 3” venting, make the transition from 2” to 3” as close as practically possible
- Make sure there is no flue gas recirculation into the combustion air pipe

Condensate Drainage

Furnace combustion can be affected if a furnace is holding condensate. Check for proper connections of drain hoses, make sure furnace condensate trap is clean. Make sure furnace is not improperly sloped. Make sure air conditioning coil drain is not interfering with furnace drain.

Other Causes

1. Manifold Gas Pressure must be set within the range stated on the furnace rating plate.
2. Remove Draft Inducer, Check the integrity of the gasket between the inducer and the collector box cover, any air leak here will have a negative effect on combustion. Check the orifice hole in the collector box, it must be free of burrs on both sides.
3. Make sure the field installed gas line is not binding and causing distortion of burner assembly.
4. If the furnace is installed as a one pipe system; make sure the surrounding area and structure are adequate to provide combustion air.
5. Make sure there are no cabinet air leaks allowing supply air to affect combustion.
6. If heat exchanger integrity is uncertain, follow procedures in Service Bulletin SF-041.

SCHEDULED MAINTENANCE

WARNING

High Voltage!
Disconnect all power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.



CAUTION

If you must handle the ignitor, handler with care. Touching th ignitor body with bare fingers, rough handling, or vibration could result in early ignitor failure. Only a qualified servicer should ever handle the ignitor.

ANNUAL INSPECTION

The furnace should be inspected by a qualified installer, or service agency at least once per year. This check should be performed at the beginning of the heating season. This will ensure that all furnace components are in proper working order and that the heating system functions appropriately. Pay particular attention to the following items. Repair or service as necessary.

- Flue pipe system. Check for blockage and/or leakage. Check the outside termination and the connections at and internal to the furnace.
- Heat exchanger. Check for corrosion and/or buildup within the heat exchanger passageways.
- Burners. Check for proper ignition and flame sense.
- Wiring. Verify that electrical connections are tight and free from corrosion.
- Filters.

AIR FILTER

WARNING

Never operate furnace without a filter installed as dust and lint will build up on internal parts resulting in loss of efficiency, equipment damage, and possible fire.

Filters must be used with this furnace. Filters do not ship with these furnaces but must be provided by the installer for proper furnace operation.

Dirty filters are the most common cause of inadequate heating or cooling performance.

WARNING

High Voltage!
Disconnect all power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.



MAINTENANCE

Improper filter maintenance is the most common cause of inadequate heating or cooling performance. Filters should be cleaned (permanent) or replaced (disposable) every two months or as required.

HORIZONTAL UNIT FILTER REMOVAL

Filters in horizontal installations are located in the central return register.

INDUCED DRAFT AND CIRCULATION BLOWERS

The bearings in the induced draft blower and circulator blower motors are permanently lubricated by the manufacturer. No further lubrication is required. Check motor windings for accumulation of dust which may cause overheating. Clean as necessary.

FLAME SENSOR (QUALIFIED SERVICER ONLY)

Under some conditions, the fuel or air supply can create a nearly invisible coating on the flame sensor. This coating acts as an insulator, causing a drop in the flame sensing signal. If this occurs, a qualified servicer must carefully clean the flame sensor with steel wool. After cleaning, the flame sensor output should be as listed on the specification sheet.

The following is a must for every service technician and service shop.

1. Dial type thermometers or thermocouple meter (optional) - to measure dry bulb temperature.
2. Volt-Ohm Meter - to measure amperage and voltage and to test continuity, capacitors and motor windings.
3. Manometer - to measure static pressure, pressure drop across coils, filters and draft and to test gas inlet and manifold pressure.

Other recording type instruments can be essential in solving abnormal problems, however, in many instances they may be rented from local sources.

Proper equipment promotes faster, more efficient service and accurate repairs resulting in fewer call backs.

HEATING PERFORMANCE TEST

Before attempting to diagnose an operating fault code, run a Heating Performance Test to determine if the heating system is performing within 5% of the BTU input found on the rating plate of the unit being tested. To conduct a heating performance test, the BTU input to the unit must be calculated (see Clocking a Gas Meter). Before clocking a gas meter, contact your local utility to provide the caloric value (BTU content) of the natural gas in the area.
It is also important to confirm the airflow (CFM) is within the temperature rise range (see Airflow Data in spec sheet) and external static pressure range (approximately 0.5" water column). How-to instructions can be found in the service manual under Checking External Static Pressure and Checking Temperature Rise.

SCHEDULED MAINTENANCE

CLOCKING A GAS METER

1. Turn off all gas appliances in the home.
2. Turn on the furnace. Ensure the furnace is operating at a 100% firing rate on 2 stage and modulating furnace product.
3. Once heating cycle is at a steady state (typically 15 minutes of operation), use a stopwatch to time how long it takes the smallest unit of measure dial on the gas meter to make a full revolution. In Table 1, one cubic foot is selected. The smallest unit of measure will vary depending on the gas meter.

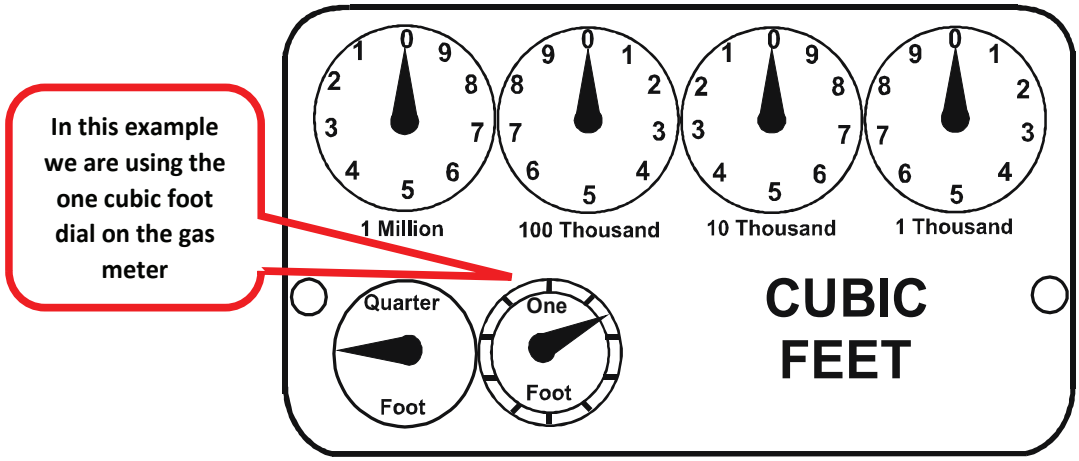


TABLE 1

4. Using Table 2 below, find the number of seconds it took for the dial to make a full revolution. To the right of that number of seconds and below the Size of Test Dial (selected in step 3 and shown in Table 1) will be the Cubic Feet per Hour (CFH).

Locate 40 seconds for one revolution in the chart below

Then locate the 1 cu ft dial column and select the corresponding CFH from the 40 seconds for one revolution row

GAS RATE -- CUBIC FEET PER HOUR											
Seconds for One Revolution	Size of Test Dial					Seconds for One Revolution	Size of Test Dial				
	1/4 cu/ft	1/2 cu/ft	1 cu/ft	2 cu/ft	5 cu/ft		1/4 cu/ft	1/2 cu/ft	1 cu/ft	2 cu/ft	5 cu/ft
10	90	180	360	720	1800	36	25	50	100	200	500
11	82	164	327	655	1636	37	--	--	97	195	486
12	75	150	300	600	1500	38	23	47	95	189	474
13	69	138	277	555	1385	39	--	--	92	185	462
14	64	129	257	514	1286	40	22	45	90	180	450
15	60	120	240	480	1200	41	--	--		176	439
16	56	113	225	450	1125	42	21	43	86	172	429
17	53	106	212	424	1059	43	--	--	--	167	419
18	50	100	200	400	1000	44	--	41	82	164	409
19	47	95	189	379	947	45	20	40	80	160	400
20	45	90	180	360	900	46	--	--	78	157	391
21	43	86	171	343	857	47	19	38	76	153	383
22	41	82	164	327	818	48	--	--	75	150	375
23	39	78	157	313	783	49	--	--	--	147	367
24	37	75	150	300	750	50	18	36	72	144	360
25	36	72	144	288	720	51	--	--	--	141	355
26	34	69	138	277	692	52	--	--	69	138	346
27	33	67	133	265	667	53	17	34	--	136	340
28	32	64	129	257	643	54	--	--	67	133	333
29	31	62	124	248	621	55	--	--	--	131	327
30	30	60	120	240	600	56	16	32	64	129	321
31	--	--	116	232	581	57	--	--	--	126	316
32	28	56	113	225	563	58	--	31	62	124	310
33	--	--	109	218	545	59	--	--	--	122	305
34	26	53	106	212	529	60	15	30	60	120	300
35	--	--	103	206	514						

TABLE 2

SCHEDULED MAINTENANCE

5. Use this formula to verify the Cubic Feet per Hour (CFH) input determined in step 4 is correct:

(3600 x Gas Meter Dial Size) / Time (seconds) = Cubic Feet per Hour (CFH)

3600 is used as there are 60 seconds in a minute and 60 minutes in an hour. 60x60=3600

6. Check with your local utility for actual BTU content (caloric value) of natural gas in the area (the average is 1025 BTU's).
7. Use this formula to calculate the BTU/HR input (See BTU/HR Calculation Example):

Cubic Feet per Hour (CFH) x BTU content of your natural gas = BTU/HR input

8. Should the figure you calculated not fall within five (5) percent of the nameplate rating of the unit, adjust the gas valve pressure regulator or resize orifices. To adjust the pressure regulator on the gas valve, turn downward (clockwise) to increase pressure and input, and upward (counterclockwise) to decrease pressure and input. A properly operating unit must have the BTU per hour input and CFM of air, within the limits shown to prevent short cycling of the equipment. As the external static pressure goes up, the temperature rise will also increase. Consult the proper tables for temperature rise limitation.

BTU/HR Calculation Example:

The unit being tested takes 40 seconds for the 1 cubic foot dial to make one complete revolution. Using the chart, this translates to 90 cubic feet per hour. Based upon the assumption that one cubic foot of natural gas has 1,025 BTU's (Check with your local utility for actual BTU content), the **calculated input is 92,250 BTU's per hour.**

Furnace Nameplate Input in this example: 90,000 BTU/HR

Calculated Gas Input in this example: 92,250 BTU/HR

This example is within the 5% tolerance input and does not need adjustment.

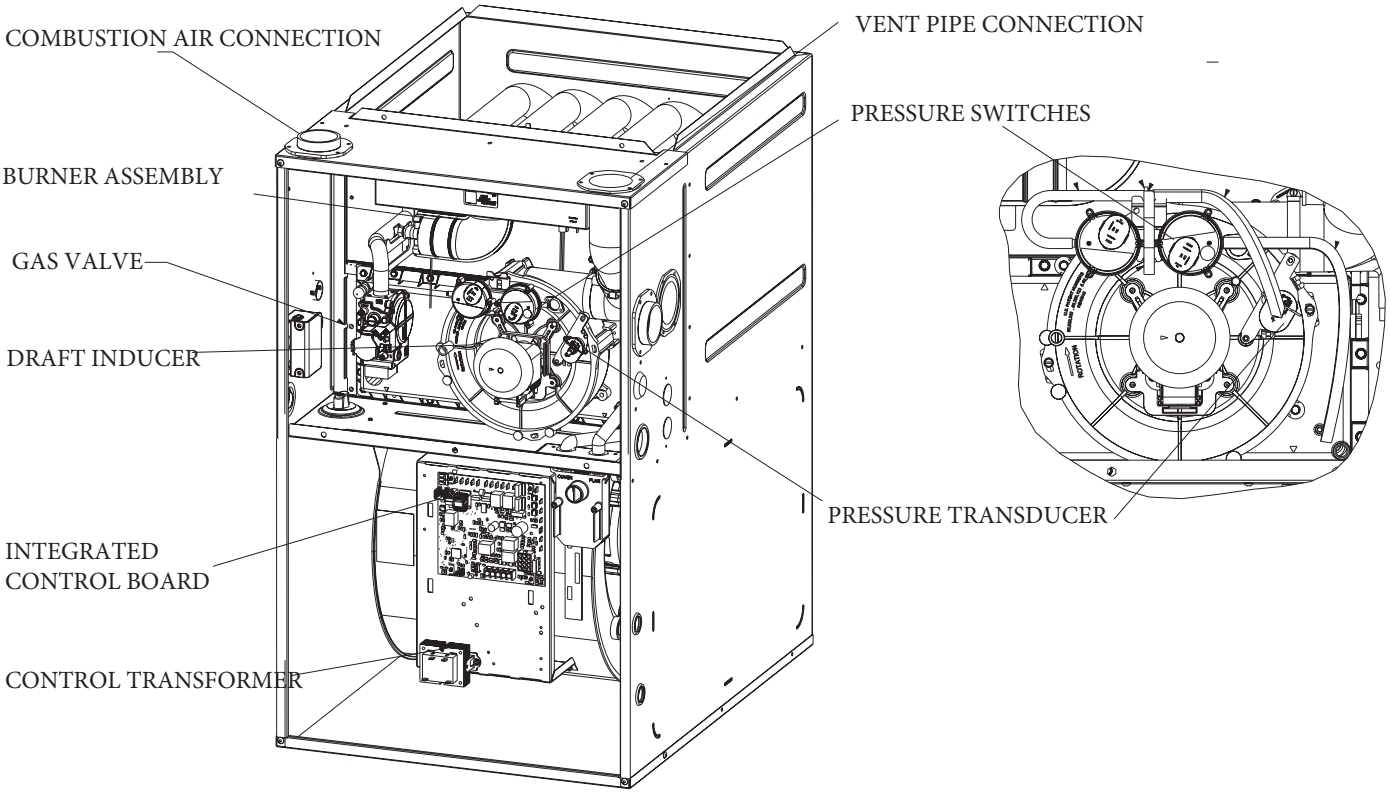
CAUTION

ALWAYS CONNECT A MANOMETER TO THE OUTLET TAP AT THE GAS VALVE BEFORE ADJUSTING THE PRESSURE REGULATOR. IN NO CASE SHOULD THE FINAL MANIFOLD PRESSURE VARY MORE THAN PLUS OR MINUS .2 INCHES WATER COLUMN FROM 3 INCHES WATER COLUMN FOR NATURAL GAS.

A properly operating unit must have the BTU per hour input and CFM of air, within the limits shown to prevent short cycling of the equipment. As the external static pressure goes up, the temperature rise will also increase. Consult the proper tables for temperature rise limitation.

SERVICING

Component I.D.



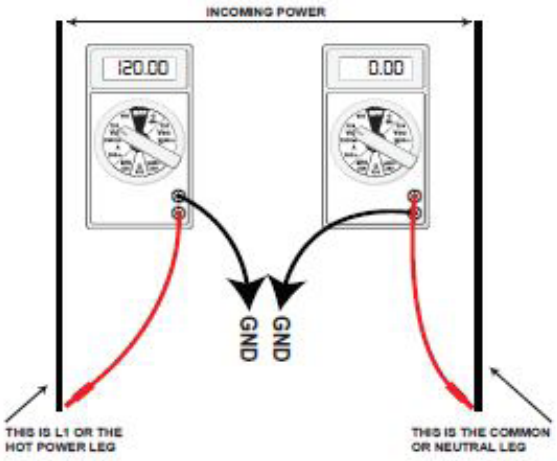
SERVICING

As more and more electronics are introduced to the Heating Trade, Polarization of incoming power and phasing of primary to secondary voltage on transformers becomes more important.

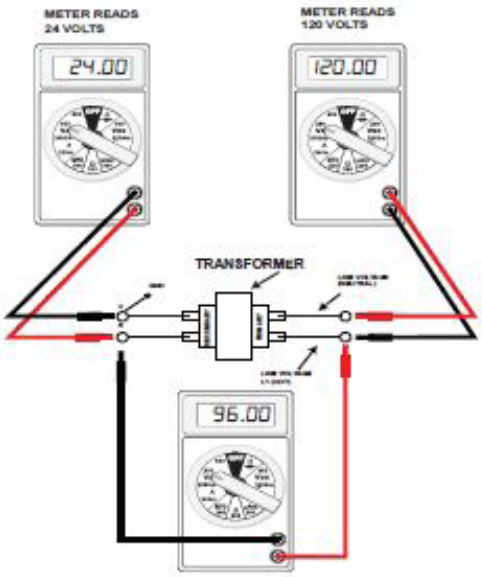
Polarization has been apparent in the Appliance industry since the introduction of the three prong plug, however, the Heating Industry does not use a plug for incoming power, but is hard wired.

Some of the electronic boards being used today, with flame rectification, will not function properly and/or at all without polarization of incoming power. Some also require phasing between the primary and secondary sides of step-down transformers.

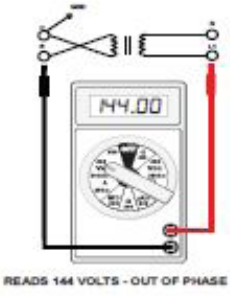
We recommend that these two items be checked during normal installation and/or service calls. See as follows:



CHECKING FOR PHASING - PRIMARY TO SECONDARY OF UNMARKED TRANSFORMERS*

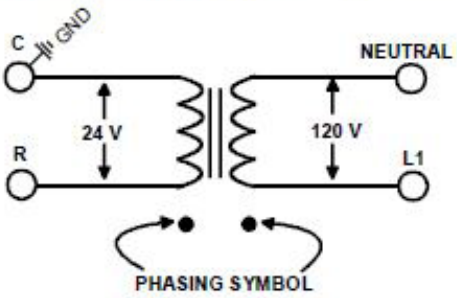






If meter reads approximately 96 volts - the primary to secondary are in phase - if reads approximately 144 volts out of phase - reverse low voltage wires.

***NOTE:** For flame rectification the common side of the secondary voltage (24 V) is cabinet grounded. If you were to bench test a transformer the primary neutral and secondary common must be connected together for testing purposes.



These then should be wired to the furnace accordingly.

Some transformers will display phasing symbols as shown in the illustration to the left to assist in determining proper transformer phasing.

Checking for polarization and phasing should become a habit in servicing. Let's start now.

SERVICING

CHECKING VOLTAGE

WARNING

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



1. Remove the burner door to gain entry to the Junction Box.
2. Remove cover from the Junction Box and gain access to incoming power lines.

With Power ON:

WARNING

LINE VOLTAGE NOW PRESENT.

3. Using a voltmeter, measure the voltage across the hot and neutral connections.

NOTE: To energize the furnace, the Door Interlock Switch must be engaged at this point.

4. No reading - indicates open wiring, open fuse, no power, or faulty Door Interlock Switch from unit to fused disconnect service. Repair as needed.
5. With ample voltage at line voltage connectors, energize the furnace blower motor by jumpering terminals R to G on the integrated ignition control.
6. With the blower motor in operation, the voltage should be 115 volts ± 10 percent.
7. If the reading falls below the minimum voltage, check the line wire size. Long runs of undersized wire can cause low voltage. If wire size is adequate, notify the local power company of the condition.
8. After completing check and/or repair, replace Junction Box cover and reinstall the service panel doors.
9. Turn on electrical power and verify proper unit operation.

CHECKING WIRING

WARNING

DISCONNECT ALL POWER BEFORE SERVICING.

1. Check wiring visually for signs of overheating, damaged insulation and loose connections.
2. Use an ohmmeter to check continuity of any suspected open wires.
3. If any wires must be replaced, replace with AWM, 105°C. 2/64 thick insulation of the same gauge or its equivalent.

THERMOSTAT AND WIRING

WARNING

DISCONNECT ALL POWER BEFORE SERVICING.

1. Remove the blower compartment door to gain access to the thermostat low voltage wires located at the furnace integrated control module terminals.
2. Remove the thermostat low voltage wires at the furnace control panel terminal board.
3. Jumper terminals R to W on the integrated ignition control.

With Power On (and Door Interlock Switch closed):

WARNING

LINE VOLTAGE NOW PRESENT.

4. Induced Draft Motor must run and pull in pressure switch.
5. If the hot surface ignitor heats and at the end of the ignitor warm-up period the gas valve opens and the burners ignite, the trouble is in the thermostat or wiring.
6. With power off, check the continuity of the thermostat and wiring. Repair or replace as necessary.
   If checking the furnace in the air conditioning mode, proceed as follows.
7. With power off, Jumper terminals R to Y to G.
8. Turn on the power.
9. If the furnace blower motor starts and the condensing unit runs, then the trouble is in the thermostat or wiring. Repair or replace as necessary.
10. After completing check and/or repair of wiring and check and/or replacement of thermostat, reinstall blower compartment door.
11. Turn on electrical power and verify proper unit operation.

CHECKING TRANSFORMER AND CONTROL CIRCUIT

A step-down transformer 120 volt primary to 24 volt secondary, 40 VA (Heating and Cooling Models) supplies ample capacity of power for either operation.

WARNING

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



1. Remove blower compartment door to gain access to the thermostat low voltage wires located at the furnace integrated control module.

SERVICING

2. Remove the thermostat low voltage wires at the furnace integrated control module terminals.

WITH POWER ON (AND DOOR INTERLOCK SWITCH CLOSED):

WARNING

LINE VOLTAGE NOW PRESENT.

3. Use a voltmeter, check voltage across terminals R and C. Must read 24 VAC.
4. No voltage indicates faulty transformer, open fuse, bad wiring, bad splice, or open door interlock switch.
5. Check transformer primary voltage at incoming line voltage connections, fuse, splices, and blower door interlock switch.
6. If line voltage is available to the primary side of transformer and not at secondary side, the transformer is inoperative. Replace.
7. After completing check and/or replacement of transformer and check and/or repair of control circuit, reinstall blower compartment door.
8. Turn on electrical power and verify proper unit operation.

CHECKING AIR CIRCULATOR BLOWER MOTOR (5-SPEED ECM MOTOR)

1. Remove blower compartment door to gain access to the circulator blower motor and integrated ignition control.
2. Check for any obstruction that would keep the fan wheel / fan motor from turning.
3. Check wiring, the motor has two wiring harnesses, a main harness and a control harness. The main pin harness has: White neutral wire connected to the Neutral terminal on the control board. Black wire connected to the CIRC H terminal on the control board. Red wire connected to the COM terminal, which is a female spade connection next to the T1 – T4 wires on the control board.

Green ground wire connected to cabinet ground .
The control harness has:
Blue wire connected to T1 on the control board.
Red wire connected to T2 on the control board.
Orange wire connected to T3 on the control board.
Black wire connected to T4 on the control board.
The multi-speed ECM motor requires a line voltage power supply (black connected to CIRC H and white connected to neutral on the control board) as well as a signal on one of the speed taps (T1-T4).
The speed tap voltage is A.C. and can vary which tap is energized depending on DIP switch selection. The voltage reading from any one of the speed taps is referenced between the female COM terminal next to the speed taps on the control board. From COM to T1 or T2, T3, T4, you should read 24 VAC on the low voltage speed taps.

Motor Tap Identification		
CONNECTOR ID	DESCRIPTION	CONNECTOR VOLTAGE
L	LINE, L1	LINE, L1
G	GROUND	CHASSIS GROUND
N	LINE, L2	LINE, L2
C	SIGNAL COMMON	24VAC COMMON
1	TAP 1	24VAC
2	TAP 2	24VAC
3	TAP 3	24VAC
4	TAP 4	24VAC
5	TAP 5	24VAC

Heat Off Delay (S1-4)				
S1-4	Min	Nom	Max	Units
ON		*150		Seconds
OFF		100		Seconds
* = DEFAULT SETTING				

COOL MOTOR SPEED DIP SWITCH SETTING (S1-1, S1-2, S1-3)					
		1 2 3	1 2 3	1 2 3	1 2 3
	Position	OFF OFF OFF	ON OFF OFF	ON ON OFF	OFF ON OFF
Motor Speed COOL	Y	T1	T2	T3	T4
		*1 2 3	1 2 3	1 2 3	1 2 3
	Position	OFF OFF ON	OFF ON ON	ON OFF ON	ON ON ON
Motor Speed COOL	Y	T1+T2	T1	T1	T1
* = DEFAULT SETTING					

HEAT MOTOR SPEED DIP SWITCH SETTING (S2-1, S2-2)					
		1 2	*1 2	1 2	1 2
	Position	OFF OFF	ON OFF	ON ON	OFF ON
Motor Speed HEAT	W	T1	T2	T3	T4
* = DEFAULT SETTING					

FAN MOTOR SPEED DIP SWITCH SETTING (S2-3, S2-4)					
		*3 4	3 4	3 4	3 4
	Position	OFF OFF	ON OFF	OFF ON	ON ON
Motor Speed FAN	G	T1	T2	T4	T1+T2
* = DEFAULT SETTING					

CHECKING AIR CIRCULATOR BLOWER MOTOR (9-SPEED ECM MOTOR)

The multi-speed ECM motor requires a line voltage power supply (black connected to CIRC H or Current Sensor and white connected to neutral on the control board) as well as a signal on one or two of the speed taps (T1-T5).

SERVICING

The speed tap voltage is 6-17 vDC and can vary based on the tap or taps that are energized. The voltage reading from any one of the speed taps is referenced between the female COM terminal next to the speed taps on the control board.

CONNECTOR ID	DESCRIPTION	CONNECTOR VOLTAGE (REFERENCE)
L	LINE, L1	LINE, L1
G	GROUND	CHASSIS GROUND
N	LINE, L2	LINE, L2
C	SIGNAL COMMON	COMMON
1	TAP 1	6 - 17 VDC
2	TAP 2	6 - 17 VDC
3	TAP 3	6 - 17 VDC
4	TAP 4	6 - 17 VDC
5	TAP 5	6 - 17 VDC

Speed	9-Tap Mode (Energized Tap Signal)				
	1	2	3	4	5
1	ON	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF
3	OFF	x	ON	OFF	OFF
4	OFF	x	x	ON	OFF
5	OFF	x	x	x	ON
6	ON	ON	OFF	OFF	OFF
7	ON	x	ON	OFF	OFF
8	ON	x	x	ON	OFF
9	ON	x	x	x	ON

ON = THE TAP IS ENERGIZED (6 - 17VDC)
OFF = THE TAP IS NOT ENERGIZED
X = THE TAP CAN BE EITHER ON OR OFF

CHECKING DUCT STATIC

The maximum and minimum allowable external static pressures are found in the specification section. These tables also show the amount of air being delivered at a given static by a given motor speed or pulley adjustment. The furnace motor cannot deliver proper air quantities (CFM) against statics other than those listed.

Too great of an external static pressure will result in insufficient air that can cause excessive temperature rise, resulting in limit tripping, etc. Whereas not enough static may result in motor overloading.

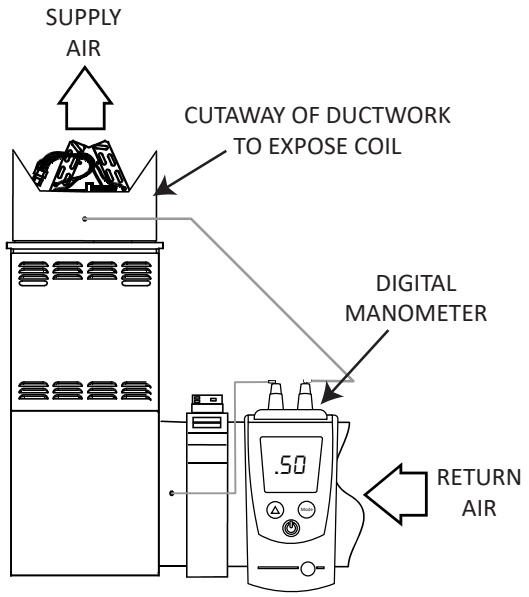
To determine proper air movement, proceed as follows:

1. With clean filters in the furnace, use a manometer to measure the static pressure of the return duct at the inlet of the furnace. (Negative Pressure)
2. Measure the static pressure of the supply duct. (Positive Pressure)
3. Add the two (2) readings together for total external static pressure.

NOTE: Both readings may be taken simultaneously and read directly on the manometer if so desired. If an air conditioner coil or Electronic Air Cleaner is used in conjunction with the furnace, the readings must also include theses components, as shown in the following drawing.

4. Consult proper tables for the quantity of air.

If the total external static pressure exceeds the minimum or maximum allowable statics, check for closed dampers, registers, undersized and/or oversized poorly laid out duct work.



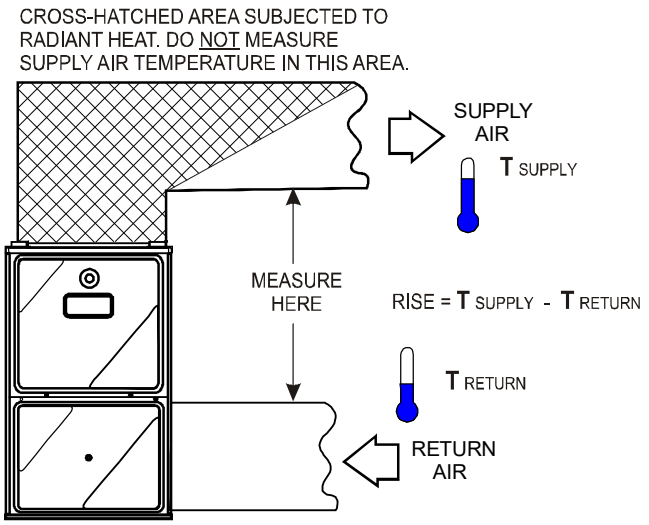
Checking Static Pressure

CHECKING TEMPERATURE RISE

The more air (CFM) being delivered through a given furnace, the less the rise will be; so the less air (CFM) being delivered, the greater the rise. The temperature rise should be adjusted in accordance to a given furnace specifications and its external static pressure. An incorrect temperature rise may result in condensing in or overheating of the heat exchanger. An airflow and temperature rise table is provided in the blower performance specification section. Determine and adjust temperature rise as follows:

SERVICING

1. Operate furnace with burners firing for approximately ten minutes. Check BTU input to furnace - do not exceed input rating stamped on rating plate. Ensure all registers are open and all duct dampers are in their final (fully or partially open) position.
2. Place thermometers in the return and supply ducts as close to the furnace as possible. Thermometers must not be influenced by radiant heat by being able to “see” the heat exchanger.

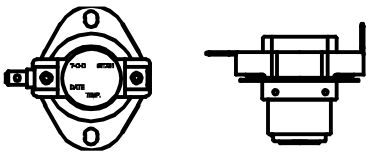


Checking Temperature Rise

3. Subtract the return air temperature from the supply air temperature to determine the air temperature rise. Allow adequate time for thermometer readings to stabilize.
4. Adjust temperature rise by adjusting the circulator blower speed. Increase blower speed to reduce temperature rise. Decrease blower speed to increase temperature rise. Refer to *Circulator Blower Speed* section in the Product Design section of this manual for speed changing details. Temperature rise is related to the BTUH output of the furnace and the amount of air (CFM) circulated over the heat exchanger. Measure motor current draw to determine that the motor is not overloaded during adjustments.

CHECKING PRIMARY LIMIT CONTROL

All use a nonadjustable, automatic reset, bi-metal type limit control.

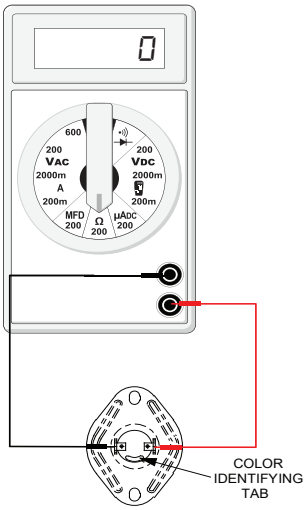


Style 1

WARNING

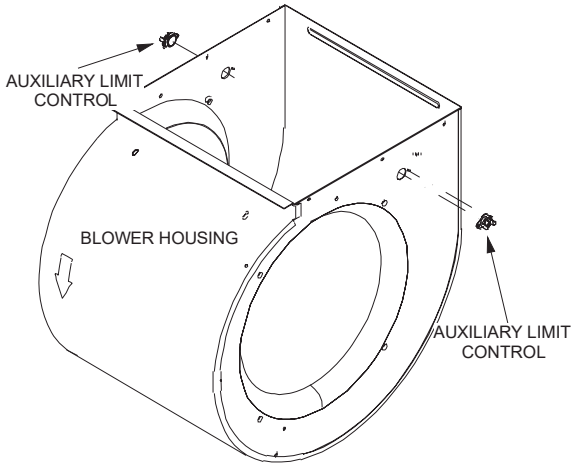
HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

1. Remove burner compartment door to gain access to the primary limit.
2. Remove low voltage wires at limit control terminals.
3. With an ohmmeter, test between these two terminals as shown in the following drawing. The ohmmeter should read continuous unless heat exchanger temperature is above limit control setting. If not as above, replace the control.



Testing Primary Limit Control

CHECKING AUXILIARY LIMIT CONTROL

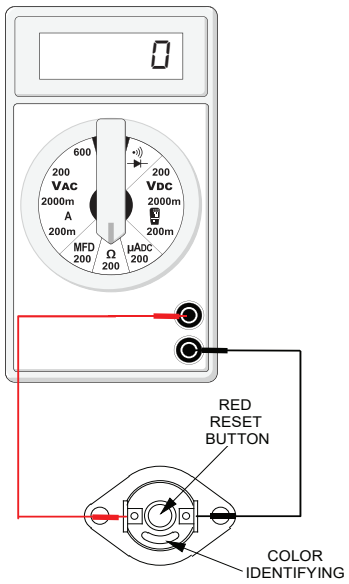


Auxiliary Limit Control Location

SERVICING

WARNING

High Voltage!
Disconnect all power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.



Testing Auxiliary Limit Control

WARNING

To avoid possible fire, only reset the auxiliary limit control once. If it should open a second time, a qualified servicer must determine why the auxiliary limit opened before resetting again.

INDUCED DRAFT BLOWER MOTOR *MES96*U

WARNING

High Voltage!
Disconnect all power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Remove burner compartment door to gain access to the induced draft blower motor.
2. Disconnect the motor wire leads from its connection point at the induced draft motor.
3. Using a ohmmeter, test for continuity between each of the motor leads.
4. Touch one probe of the ohmmeter to the motor frame (ground) and the other probe in turn to each lead. If the windings do not test continuous or a reading is obtained to ground, replace the motor.
5. If the windings have a continuity reading, reconnect wires. Turn power on to the furnace and turn the thermostat on in the heating mode. Check voltage for 115V at the induced draft motor terminals during the trial for ignition. If you have 115V and the motor does not run, replace the induced draft motor.
6. After completing check and/or replacement of induced draft motor, reinstall burner compartment door.
7. Turn on electrical power and verify proper unit operation.

INDUCED DRAFT BLOWER MOTOR *M9S96*U

The induced draft assembly uses a three phase motor to draw flu gases through the heat exchanger. This inducer uses ball bearings and is permanently lubricated. This motor is driven at varying speeds by the VFD (variable frequency drive) section of the IFC. The IFC takes typical single phase power supplied to the furnace and converts it to a three phase supply to operate the draft inducer at the desired speed. The windings of the induced draft motor will have equal resistance +/- 5%. Normal resistance readings at room temperature will range from 14-17 ohms. The voltage supplied by the IFC to drive the induced draft blower will vary from 15-110 volts A/C between any two windings. This would be read between any two of the three power wires between the IFC and the induced draft blower. This voltage to the IBD will vary between furnace models and is dependent on what percentage of maximum fire is being called for. The power wires are colored red, white, and black. A green colored ground wire is also present.

CHECKING GAS VALVE (REDUNDANT)

A combination redundant operator type gas valve which provides all manual and automatic control functions required for gas fired heating equipment is used.

The valve provides control of main burner gas flow, pressure regulation, and 100 percent safety shut-off.

WARNING

Disconnect ALL power before servicing.

Single stage gas valves should be tested on the furnace with 24 VAC connected to the gas valve and manometers reading supply line and manifold pressures.

WARNING

Disconnect ALL Gas and Electrical Power Supply.

Orifices should be treated with care in order to prevent damage. They should be removed and installed with a box-end wrench in order to prevent distortion. In no instance should an orifice be peened over and redrilled. This will change the angle or deflection of the vacuum effect or entraining of primary air, which will make it difficult to adjust the flame properly. This same problem can occur if an orifice spud of a different length is substituted.

SERVICING

WARNING

Disconnect ALL Gas and Electrical Power Supply.

CHECKING GAS PRESSURE

Gas Supply Pressure Measurement

CAUTION

To prevent unreliable operation or equipment damage, the inlet gas supply pressure must be as specified on the unit rating plate with all other household gas fired appliances operating.

Gas inlet and manifold pressures should be checked and adjusted in accordance to the type of fuel being consumed. The line pressure supplied to the gas valve must be within the range specified below. The supply pressure can be measured at the gas valve inlet pressure tap or at a hose fitting installed in the gas piping drip leg. The supply pressure must be measured with the burners operating. To measure the gas supply pressure, use the following procedure.

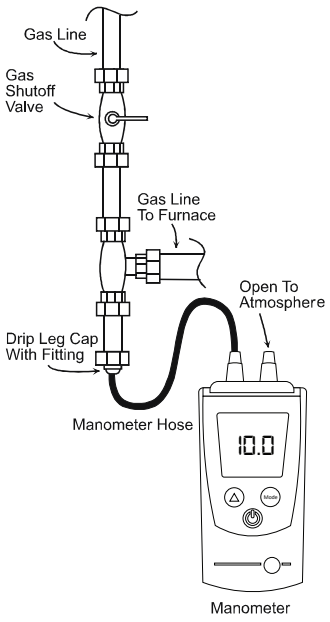
WARNING

Disconnect electrical power and shut off gas supply.

1. After turning off gas to furnace at the manual gas shutoff valve external to the furnace, remove burner compartment door to gain access to the gas valve.
2. Connect a calibrated manometer (or appropriate gas pressure gauge) at either the gas valve inlet pressure tap or the gas piping drip leg as shown in the following figures. Refer to *Measuring Gas Pressure: Single Stage Valves* figure for single stage valve inlet pressure tap connections.

NOTE: At either location, a hose fitting must be installed prior to making the hose connection.

NOTE: Use adapter kit #0151K00000S to measure gas pressure on White-Rodgers 36J22 gas valves.



Measuring Inlet Gas Pressure (Alternate Method)

3. Turn ON the gas and electrical power supply and operate the furnace and all other gas consuming appliances on the same gas supply line.
4. Measure furnace gas supply pressure with burners firing. Supply pressure must be within the range specified in the following table.

INLET GAS SUPPLY PRESSURE		
Natural Gas	Minimum: 4.5" w.c.	Maximum: 10.0" w.c.

If supply pressure differs from above, make necessary adjustments to pressure regulator, gas piping size, etc., and/or consult with local gas utility.

WARNING

High Voltage!
Disconnect all power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.



5. Disconnect manometer after turning off gas at manual shutoff valve. Reinstall plug before turning on gas to furnace.
6. Turn OFF any unnecessary gas appliances started in step 3.
7. Turn on gas to furnace and check for leaks. If leaks are found, repair and then reinstall burner compartment door.
8. Turn on electrical power and verify proper unit operation.

SERVICING

GAS MANIFOLD PRESSURE MEASUREMENT AND ADJUSTMENT

CAUTION

To prevent unreliable operation or equipment damage, the gas manifold pressure must be as specified on the unit rating plate. Only minor adjustments should be made by adjusting the gas valve pressure regulator.

NOTE: Use adapter kit #0151K00000S to measure gas pressure on White-Rodgers 36J22 gas valves.

Only small variations in gas pressure should be made by adjusting the gas valve pressure regulator. The manifold pressure must be measured with the burners operating. To measure and adjust the manifold pressure, use the following procedure.

WARNING

HIGH VOLTAGE
Disconnect ALL electrical power and shut off gas supply before servicing or installing.

1. After turning off gas to furnace at the manual gas shutoff valve external to the furnace, remove burner compartment door to gain access to the gas valve.
2. Connect a calibrated manometer (or appropriate gas pressure gauge) at the gas valve outlet pressure tap. Refer to *Measuring Gas Pressure: Single Stage Valves* figure for single stage valve outlet pressure tap connections.

WARNING

Line voltage now present.

3. Turn ON the gas and electrical power supply and operate the furnace.
4. Measure gas manifold pressure with burners firing. Adjust manifold pressure using the table below.

Manifold Gas Pressure	
Natural Gas	2.8 -3.2" w.c.

The final manifold pressure must not vary from the above specified pressures. Any necessary major changes in gas flow rate should be made by changing the size of the burner orifice.

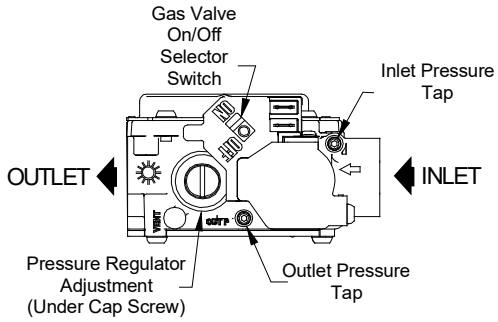
5. White-Rodgers 36J22 Valves:
   a. Back outlet pressure test screw (inlet/outlet pressure boss) out one turn (counterclockwise, not more than one turn).
   b. Attach a hose and manometer to the outlet pressure outlet pressure boss.
   c. Turn ON the gas supply.
   d. Turn on power and close thermostat “R” and “W” contacts to provide a call for low stage heat.
   e. Measure the gas manifold pressure with burners firing. Adjust manifold pressure using the *Manifold Gas Pressure* table shown below.
   f. Remove regulator cover screw from the outlet pressure regulator adjust tower and turn screw clockwise to increase pressure or counterclockwise to decrease pressure. Replace regulator cover screw.
   g. Turn off all electrical power and gas supply to the system.
   h. Remove the manometer hose from the hose barb fitting or outlet pressure boss.
   i. Turn outlet pressure test screw in to seal pressure port (clockwise, 7 in-lb minimum).

WARNING

High Voltage!
Disconnect all power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.



6. Turn on gas to furnace and check for leaks. If leaks are found, repair and then reinstall burner compartment door.
7. Turn on electrical power and verify proper unit operation.



WARNING

HIGH VOLTAGE
Disconnect ALL electrical power and shut off gas supply before servicing or installing.

WARNING

Disconnect ALL power before servicing.

CHECKING HOT SURFACE IGNITOR

120V Silicon Nitride Ignitor - ULN furnaces use a 120V silicone nitride igniter, part #0130F00717. The normal operating temperature is approximately 2156°F - 2678°F. At room temperature the igniter ohm reading should be from 20-100 ohms.

SERVICING

WARNING

LINE VOLTAGE NOW PRESENT.

CHECKING PRESSURE TRANSDUCER (96% ULN)

The 96% ULN products utilize a pressure transducer. The pressure transducer signals the control board to modulate the heating cycle during a call for heat by regulating the induced draft motor speed. By regulating the speed of the induced draft motor, proper air-fuel ratios are maintained.

Sensing range specification: 0.0-2.0 inches W.C.

Voltage specifications:

- Steady State: 5.0 vDC from red to green wire (transducer wiring harness input)
- With Inducer off: 0.25 vDC from black to green wire (transducer wiring harness output)
- During operation: Output range equals 0.25 - 4.0 vDC

Potential errors:

1. Control board does not receive 0.25 vDC for inducer motor with motor off.
   a. Will result in 2-flash error code on the control board.
2. Control board does not receive the required voltage change (0.25 - 4.0 vDC) during inducer motor operation.
   a. Will result in 3-flash error code on the control board.

WARNING

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



CHECKING FOR DELAYED IGNITION

Delayed ignition is a delay in lighting a combustible mixture of gas and air which has accumulated in the combustion chamber.

Furnace design makes this extremely unlikely unless safety controls have been by-passed or tampered with. Never by-pass or alter furnace controls.

If delayed ignition should occur, the following should be checked:

1. Improper gas pressure - adjust to proper pressure (See *CHECKING GAS PRESSURE*).

*MES96*UAA WITH PCBBF158 - 160 CONTROL BOARDS

FIELD TEST MODE

Function: When the SW1 button is pressed and held until the LED is blinking in AMBER (more than 10 seconds, less than 15 seconds), the control will execute a field test mode sequence to cycle through component operation.

Operation: The control must be powered and the thermostat satisfied (no call for heat or cool). Depress and hold the SW1 button for at least 10 seconds (but not more than 15 seconds), until the LED is blinking in AMBER, then release. The control will execute the following functions:

1. Blower - “Heat” Speed 15 seconds
2. Blower - “Cool” Speed 15 seconds
3. Blower - “Fan” Speed 15 seconds
4. Hot Surface Igniter 17 seconds
5. Inducer - “Run” setting 15 seconds
6. Inducer - 1.0” w.c. 60 seconds
7. Return to OFF mode

Once the Field Test Mode is initiated, all thermostat inputs will be ignored until the field test sequence is completed. If the SW1 button is held for more than 15 seconds, the button press will be ignored and the LED display will return to its prior state.

CHECKING INTEGRATED IGNITION CONTROL BOARDS

NOTE: Failure to earth ground the furnace, reversing the neutral and hot wire connection to the line (polarity), or a high resistance connection in the neutral line may cause the control to lockout due to failure to sense flame.

WARNING

TO AVOID THE RISK OF ELECTRICAL SHOCK, WIRING TO THE UNIT MUST BE PROPERLY POLARIZED AND GROUNDED. DISCONNECT POWER BEFORE PERFORMING SERVICE LISTED BELOW.

The ground wire must run from the furnace all the way back to the electrical panel. Proper grounding can be confirmed by disconnecting the electrical power and measuring resistance between the neutral (white) connection and the burner closest to the flame sensor. Resistance should be less than 10 ohms.

The ignition control is a combination electronic and electromechanical device and is not field repairable. Complete unit must be replaced.

*MES96*UAA WITH PCBBF158 - 160 CONTROL BOARDS

WARNING

LINE VOLTAGE NOW PRESENT.

SERVICING

These tests must be completed within a given time frame due to the operation of the ignition control.

1. Check for 120 volts from Line 1 (Hot) to Line 2 (Neutral) at the ignition control. No voltage, check the door switch connections and wire harness for continuity.
2. Check for 24 volts from W to C terminal on the ignition control. No voltage. Check transformer, room thermostat, and wiring.
   If you have 24 volts coming off the transformer but receive approximately 13 volts on the terminal board between (C) and (R), check for blown fuse.
3. Check for 120 volts to the induced draft blower by measuring voltage between Pin 4 & 5 (black & white wire on 5 pin connector.)
4. If voltage is present in Steps 1 through 3 and the induced draft blower is operating, check for 120 volts to the ignitor during the preheat cycle.
5. After the ignitor warmup time, begin checking for 24 volts to the gas valve. Voltage will be present for seven seconds only if proof of flame has been established.

NOTE: For *M9S96*UAA models, refer to the Induced Draft Blower Motor *M9S96*U information on page 28 to complete step 3 above.

WARNING

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



CHECKING FLAME SENSOR

1. Disconnect the yellow flame sensor wire from the sensor.
2. Connect a micro-amp meter in series with this wire and the sensor terminal.
3. Place the unit into a heating cycle.

WARNING

LINE VOLTAGE NOW PRESENT.

4. As soon as flame is established a micro-amp reading should be evident once proof of flame (micro-amp reading) is established, the hot surface ignitor will be de-energized.
5. The Integrated Ignition controls will have 3-10 uAmps. 1-3 uAmps is considered low and will flash 1 amber light. Anything below 1 uAmps and the unit will shut down. If the micro-amp reading is less than the minimum specified, check for high resistance wiring connections, sensor to burner gap, dirty flame sensor, or poor grounding.
6. If absolutely no reading, check for continuity on all components and if good - replace ignition control module.

NOTE: Contaminated fuel or combustion air can create a nearly invisible coating on the flame sensor. This coating works as an insulator causing a loss in the flame sense signal. If this situation occurs the flame sensor must be cleaned with steel wool.

NOTE: For *M9S96*U models, the micro-amp reading will be 1 to 4 micro-amps.

TROUBLESHOOTING *MES96*U*

Furnace Status	LED Code[1]	Fault Description(s)	Possible Causes	Corrective Action	Cautions & Notes
• Furnace fails to operate. • Control LED is off.	· **None**	• No 120-volt power to furnace or 24-volt power to integrated control module. · Integrated control has an internal fault.	• Manual disconnect switch OFF, door switch open, or 24-volt wires improperly connected or loose. • Bad integrated control module.	• Assure 120- and 24-volt power to furnace integrated control module. • Check for possible shorts in 120- and 24-volt circuits. Repair as necessary. • Replace bad control module.	• Turn power OFF prior to repair. • Read precautions in “Electrostatic Discharge” section of manual.
• Furnace fails to operate. • Control LED is flashing **ONE (1) RED** flash.	☼ 1 Flash **RED**	• Furnace lockout due to an excessive number of ignition attempts. (3 total retries)[2]	• Failure to establish flame maybe due to no gas to burner, bad igniter or igniter alignment, improper orifices, or coated/oxidized or improperly connected or shorted flame sensor. • Loss of flame after establishment maybe due to interrupted gas supply, lazy burner flames (improper gas pressure or restriction in flue or improper induced draft blower performance). • Improperly connected igniter or bad igniter or ground connection to unit or burner. • Faulty integrated control.	• Locate and correct gas interruption. • Replace bad gas valve or gas orifice size. • Check flame sense signal. Clean sensor if coated and/or oxidized. • Replace induced draft blower pressure sensor. Inspect pressure sensor hose. Repair, if necessary. Inspect flue or condensate for blockage, proper length, elbows, and termination. • Compare igniter resistance to specification. Replace igniter if necessary. • Check and correct unit ground wiring. • Replace bad control module.	• Turn power and gas OFF prior to repair. · Igniter is fragile, handle with care. • Clean flame sensor with steel wool. • Replace igniter with proper replacement part. • Read precautions in “Electrostatic Discharge” section of manual.
• Furnace Fails to operate • Control LED is flashing **TWO (2) RED** flashes.	☼ 2 Flashes **RED**	• Pressure sensor indicates pressure reading when it should be zero.	• Faulty wiring to the pressure sensor. • Faulty pressure sensor.	• Check and correct pressure sensor wiring. • Replace pressure sensor.	• Turn power OFF prior to repair. • Replace pressure sensor with proper replacement part.
• Induced draft blower runs continuously with no further furnace operation. • Control LED is flashing **THREE (3) RED** flashes.	☼ 3 Flashes **RED**	• Inducer not making pressure setting. • Induced draft blower is operating properly.	• Pressure sensor hoses blocked, pinched or connected improperly. Bad wire connection. • Blocked intake, flue or weak induced draft blower.	• Replace induced draft blower pressure sensor and hoses. Replace with proper parts. • Check wiring connections. • Inspect intake and flue for blockage, proper length, elbows, and termination. • Replace induced draft blower.	• Turn power OFF prior to repair. • See “Combustion and Ventilation Air Requirements” and “Category I Venting (Vertical Venting)” section for details.
• Circulator blower runs continuously. No furnace operation. • Control LED is flashing **FOUR (4) RED** flashes.	☼ 4 Flashes **RED**	• Primary limit insert; or aux limit circuit is open.	• Insufficient conditioned air over the heat exchanger. Blocked filters, restrictive ductwork, improper circulator blower speed, or failed circulator blower. •Faulty primary limit insert; or aux limit switch. • Loose or improperly connected wiring.	• Check circulator blower speed and performance. Correct speed or replace blower if necessary. • Check filters and ductwork for blockage. Clean filters or remove obstruction. • Check primary limit. • Check position of heat exchanger shield. • Check wiring connections.	· Turn power OFF prior to repair. · Replace blower with correct replacement part. · Replace primary switch insert; or aux limit with proper replacement part.
• Induced draft blower and circulator blower runs continuously. No furnace operation. • Control LED is flashing **FIVE (5) RED** flashes.	☼ 5 Flashes **RED**	• Flame sensed with no call for heat.	· Faulty integrated control module.	· Replace bad integrated control module.	· Turn power OFF prior to repair.

TROUBLESHOOTING *MES96*U*

Furnace Status	LED Code[1]	Fault Description(s)	Possible Causes	Corrective Action	Cautions & Notes
• Furnace fails to operate. • Control LED is flashing **SIX (6) RED** flashes.	☼ 6 Flashes **RED**	• Burner temperature limit switch open.	• Excessive flame. • Blocked flue and/or air inlet pipe, or a failed induced draft blower. • Loose or improperly connected wiring. • Faulty burner temperature switch.	• Check and correct gas supply pressure. • Replace bad gas valve or gas orifice size. • Check flue and air inlet piping for blockage, proper length, elbows, and termination. • Check induced draft blower for proper performance. Replace, if necessary. • Check burner temperature switch. Replace if necessary. • Check wiring connections.	• See “Vent/Flue Pipe” section for piping details. • Replace induced draft blower with proper replacement part. • Replace burner temperature switch with correct replacement part.
• No furnace operation. • Control LED is flashing **SEVEN (7) RED** flashes.	☼ 7 Flashes **RED**	• Gas valve circuit shorted.	• Bad wiring • Faulty integrated control module.	• Inspect and replace wiring as needed. • Replace bad integrated control module.	• Turn power OFF prior to repair. • Read precautions in “Electrostatic Discharge” section of manual.
• LED is steady on	☼ Steady On **AMBER**	• OEM test mode	• N/A		
• Control LED is flashing **ONE (1) AMBER** flash.	☼ 1 Flash **AMBER**	• Low flame sense	• Flame sensor incorrectly positioned in burner flame. • Flame sensor is coated/ oxidized. • Lazy burner flame due to improper gas pressure or combustion air.	• Inspect for proper sensor alignment. • Clean flame rod. • Compare current gas pressure to rating plate info. Adjust as needed.	• Turn power OFF prior to repair. • Clean flame sensor with steel wool. • See rating plate for proper gas pressure.
• Control LED is flashing **TWO (2) AMBER** flashes.	☼ 2 Flashes **AMBER**	• ID plug failure	• Improper ID plug.	• Replace ID plug.	• Turn power OFF prior to repair.
• Control LED is flashing **THREE (3) AMBER** flashes.	☼ 3 Flashes **AMBER**	• Integrated control module fuse is blown.	• Blown fuse.	• Replace integrated control module fuse (3A).	• Turn power OFF prior to repair.
• LED is steady on	☼ Steady On **GREEN**	• Normal operation, idle/ standby.	· N/A		
• Integrated control module LED is flashing rapidly.	☼ Rapid flashes **GREEN**	• Clear error history.	· N/A	• Press and hold the SW1 button for more than 5 secs results in the display of this mode.	• Release the button while LED is flashing GREEN to clear error history.
• Integrated control module LED is flashing ONE (1) GREEN flash.	☼ 1 Flash **GREEN**	• Call for heating.	· N/A		
• Integrated control module LED is flashing **TWO (2) GREEN** flashes.	☼ 2 Flashes **GREEN**	• Call for cooling.	N/A		
• Integrated control module LED has **THREE (3) GREEN** rapid flashes.	☼ 3 Flashes **GREEN**	• Continuous fan operation.	• N/A		

• Integrated control module LED has **THREE (3) GREEN** rapid flashes.	☼ 3 Rapid Flashes **GREEN**	• ID plug installed	• N/A	• For control with unit-specific programming imbedded in the CPU, this indicates at power-up that a valid ID plug has been installed and the control will use the alternate parameters.	
• Abnormal high pitch noise during burner operation.	☼ **1 Flash GREEN**	• Abnormal combustion noise during heating.	• Insufficient combustion air or high input. · Blocked flue and/or air inlet pipe, or faulty induced draft blower or pressure sensor.	• Check and correct gas supply and manifold pressures. • Replace bad gas valve or gas orifice size. • Check flue and air inlet piping for blockage, proper length, elbows, and termination. • Check induced draft blower and pressure sensor for proper performance.	• Turn power and gas OFF prior to repair. • See “Vent/Flue Pipe” section for piping details. • Replace induced draft blower or pressure sensor with proper replacement part.

FAULT CODE RECALL

Function: When the SW1 button is pressed momentarily, the control displays the last five (5) fault codes recorded in non-volatile memory upon demand.

Operation: Any time the control is powered, the fault code history can be retieved for display by depressing and releasing the SW1 button once (less than 5 seconds); the LED will flash the Fault Code History (up to 5 fault codes from newest to oldest.)

FAULT CODE CLEAR

Function: When the SW1 button is pressed and held for an extended period (more than 5 seconds, less than 10 seconds), the control erases the stored fault code history.

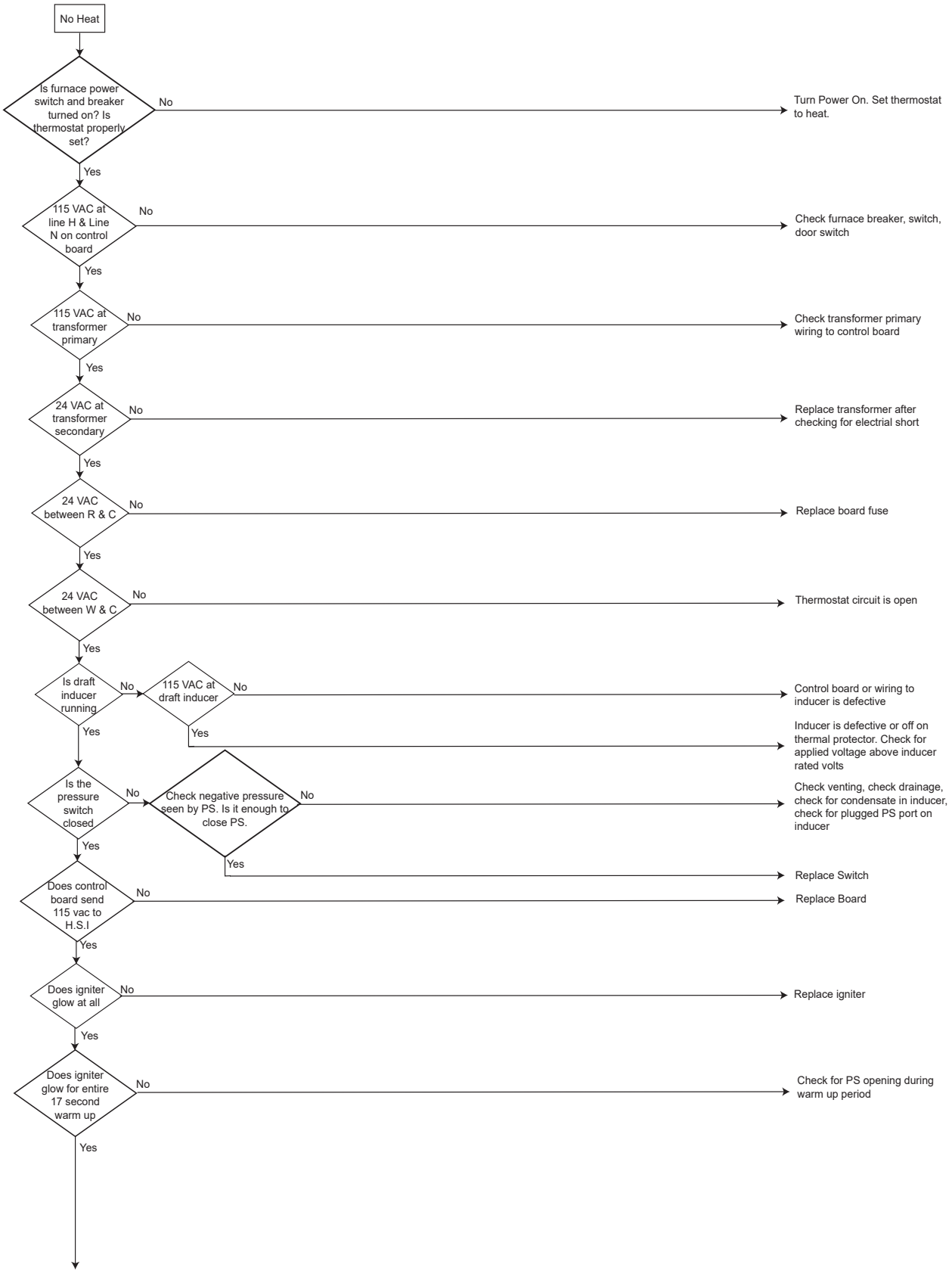
Operation: Any time the control is powered, the fault code history can be cleared by depressing and holding the SW1 button for at least 5 seconds (but not more than 10 seconds) until the LED is blinking GREEN, and then release the switch while the LED is still blinking GREEN. The fault code history will be erased.

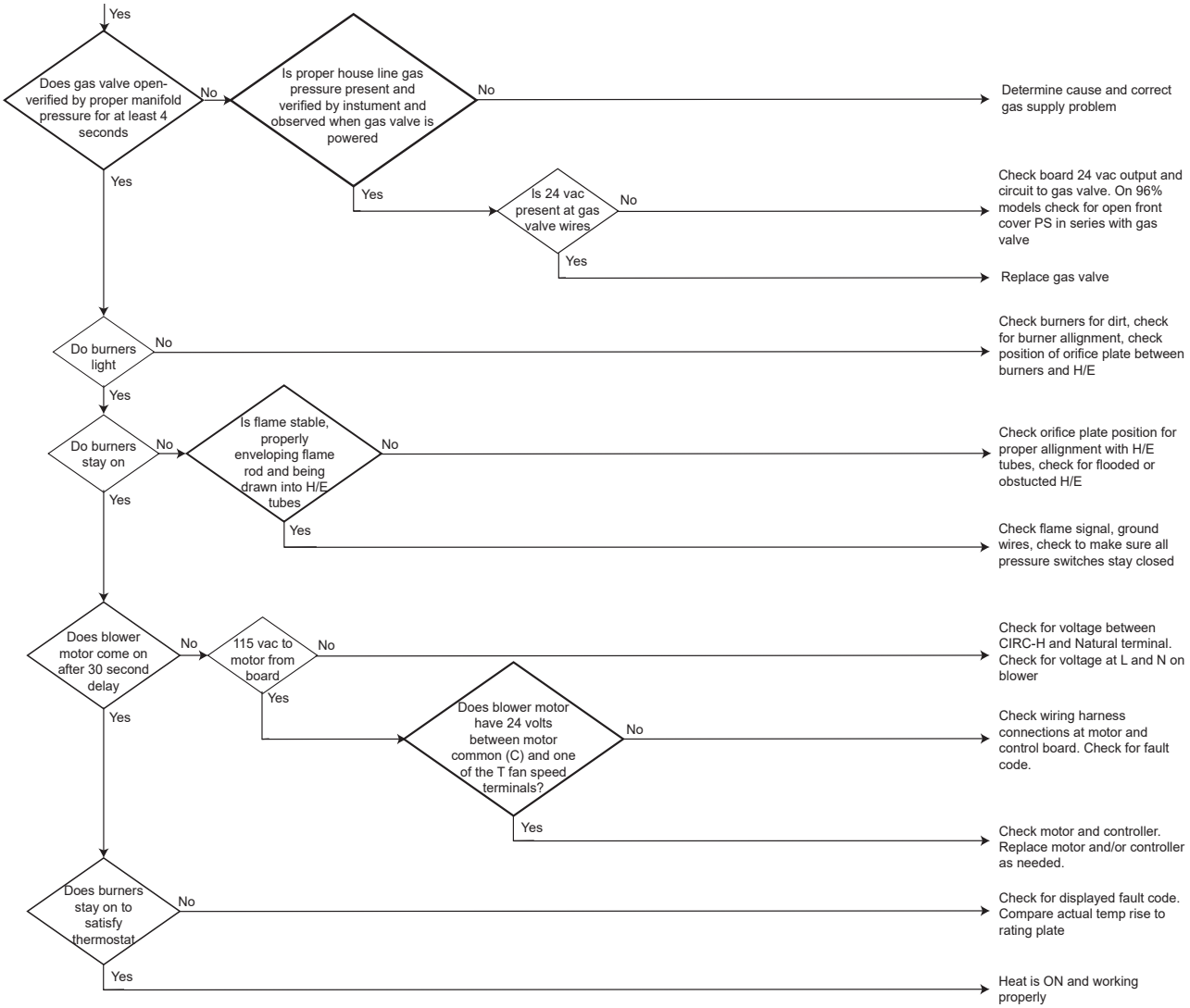
TROUBLESHOOTING *M9S96*U*

Symptom	LED Status	Fault Description	Corrective Actions
Normal Operation	IdL	Stand-by Mode Normal Operation	None
Furnace fails to operate	EEE	Internal Control Fault	Replace control board
Furnace fails to operate	EE0	Furnace lockout due to an excessive number of ignition “retries” (3 total) Failure to establish flame Loss of flame after establishment	Locate and correct gas interruption Replace or realign igniter Check flame sense signal, clean sensor if coated or oxidized Check flue piping for blockage, proper length, elbows, and termination Verify proper induced draft blower performance
Furnace fails to operate	EE1	Draft Inducer pressure switch circuit is closed at start of heating cycle Draft Inducer pressure switch contacts sticking Short in pressure switch circuit wiring	Replace Draft Inducer pressure switch Repair short in wiring
Induced draft blower runs continuously with no operation	EE2	Draft Inducer pressure switch circuit is not closed Pressure switch hose blocked pinched, or connected improperly Blocked flue and/or inlet air or weak induced draft blower Incorrect pressure switch set point or malfunctioning switch contacts Loose or improperly connected wiring in high limit circuit	Inspect pressure switch hose, repair/replace if necessary Inspect flue and/or inlet air for blockage, proper length, elbows, and termination Check induced draft blower performance, correct as neccesary Check pressure switch operation, replace as needed Tighten or correct wiring connection
Circulator blower runs continuously No furnace operation	EE3	Primary limit circuit is open Insufficient conditioned air over the heat exchanger Blocked filters, restrictive ductwork, improper circulator blower speed, or failed circulator blower motor Loose or improperly connected wiring in high limit circuit	Check filters and ductwork for blockage Clean filters or remove obstruction Check circulator blower speed and performance Correct speed or replace blower motor if necessary Tighten or correct wiring connection
Induced draft blower and circulator blower runs continuously No furnace operation	EE4	Flame sensed with no call for heat Short to ground in flame sense circuit Lingering burner flame Slow closing gas valve	Correct short at flame sensor or in flame sensor wiring Check for lingering or lazy flame Verify proper operation of gas valve
No furnace operation	EE5	Open fuse Short in low voltage wiring	Replace fuse Locate and correct short in low voltage wiring
Furnace operates but shows weak flame signal fault	EE6	Flame sense micro amp signal is minimal Flame sensor is coated/oxidized Flame sensor incorrectly positioned in burner flame Lazy burner flame due to improper gas pressure or combustion air	Clean flame sensor if coated or oxidized Inspect for proper flame sensor alignment Check inlet air for blockage Compare current gas pressure to rating plate and adjust as needed
Furnace fails to operate	EE7	Problem with igniter circuit Improperly connected or shorted igniter Poor unit ground Igniter relay fault on integrated control module	Check and correct wiring from integrated control module to igniter Diagnose and replace shorted igniter as needed Verify and correct unit ground wiring if needed Check igniter output from control, replace if necessary

TROUBLESHOOTING *M9S96*U*

Symptom	LED Status	Fault Description	Corrective Actions
Furnace fails to operate	EEA	Polarity of 115 volt AC is reversed Poor unit ground	Correct polarity, check and correct wiring if necessary Verify proper ground, correct if necessary
Furnace fails to operate	EEb	Gas valve is energized when it should not be Internal gas valve error	Check wiring in gas valve circuit Replace integrated control board
Furnace fails to operate	EEC	Gas valve is not energized when it should be External Gas Valve Error	Check wiring in gas valve circuit Replace integrated control board
Furnace fails to operate	EEd	Auxiliary limit switch (blower compartment) circuit is open	Furnace power was turned off during heat cycle Blower not operating during heat Faulty aux limit or wiring
Furnace fails to operate	E 10	Grounding Error	Check grounding
Furnace fails to operate	E 11	Burner limit switch circuit is open	Check and correct gas supply pressure Check flue and air inlet for blockage, proper length, elbows, and termination Check wiring connection in limit circuit Check burner temperature switch, replace if necessary
Furnace fails to operate	E 12	Redundant relay open alarm	Replace integrated control board
Furnace fails to operate	E 13	Redundant relay stuck closed alarm	Replace integrated control board
Furnace fails to operate	EbF	Inducer communication alarm	Check Red, Black, White harness & connections to inducer & control board
Furnace fails to operate	E 1b	APS reference error	Check Red, Black, Green harness & connections to pressure sensor & control board Replace pressure sensor
Furnace fails to operate	E 1C	APS null error	Check Red, Black, Green harness & connections to pressure sensor & control board Check pressure hoses to pressure sensor and pressure switch
Furnace fails to operate	E 1d	APS span error	Check Red, Black, Green harness & connections to pressure sensor & control board Check pressure hoses to pressure sensor and pressure switch
Furnace fails to operate	E 1E	APS pressure error	Check Red, Black, Green harness & connections to pressure sensor & control board Replace pressure sensor
Furnace fails to operate	E 1F	APS input error	Check Red, Black, Green harness & connections to pressure sensor & control board Replace pressure sensor
	EEH	Twinning error	
Furnace fails to operate	EbL	Low circulator current	Check motor 120V line wire is connected to terminal inside current transformer loop Check wire connections to motor and PCB
Furnace fails to operate	EbU	Circulator current unexpected	Check motor 120V line wire is connected to terminal inside current transformer loop
Furnace fails to operate	Ed0	No shared data	Populate shared data set using memory card


No Heat
Is furnace power switch and breaker turned on? Is thermostat properly set?
No
Turn Power On. Set thermostat to heat.
Yes
115 VAC at line H & Line N on control board
No
Check furnace breaker, switch, door switch
Yes
115 VAC at transformer primary
No
Check transformer primary wiring to control board
Yes
24 VAC at transformer secondary
No
Replace transformer after checking for electrial short
Yes
24 VAC between R & C
No
Replace board fuse
Yes
24 VAC between W & C
No
Thermostat circuit is open
Yes
Is draft inducer running
No
115 VAC at draft inducer
No
Control board or wiring to inducer is defective
Yes
Inducer is defective or off on thermal protector. Check for applied voltage above inducer rated volts
Yes
Is the pressure switch closed
No
Check negative pressure seen by PS. Is it enough to close PS.
No
Check venting, check drainage, check for condensate in inducer, check for plugged PS port on inducer
Yes
Replace Switch
Yes
Does control board send 115 vac to H.S.I
No
Replace Board
Yes
Does igniter glow at all
No
Replace igniter
Yes
Does igniter glow for entire 17 second warm up
No
Check for PS opening during warm up period
Yes

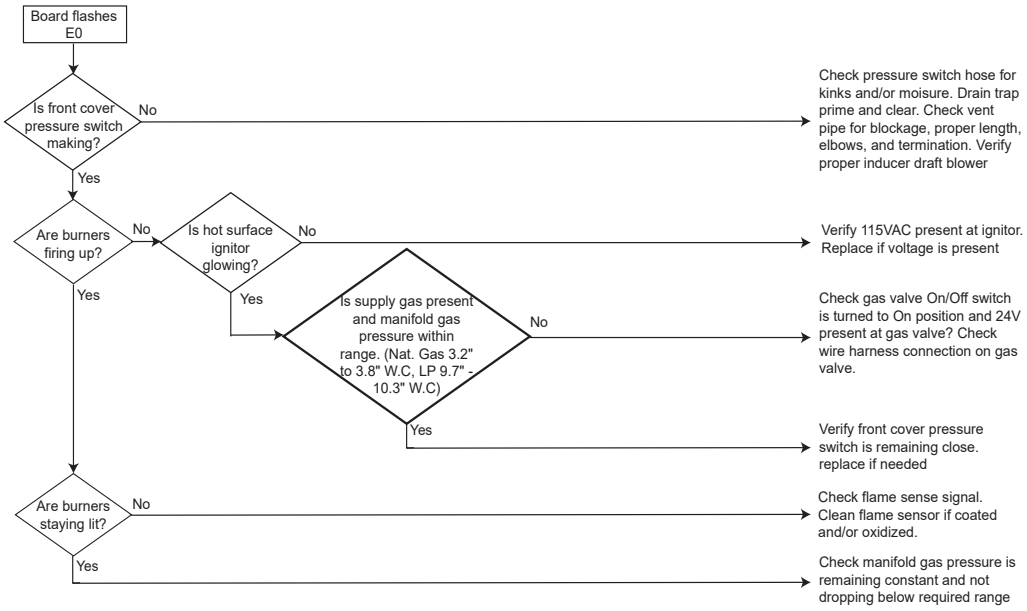

Yes
Does gas valve open-verified by proper manifold pressure for at least 4 seconds
No
Is proper house line gas pressure present and verified by instument and observed when gas valve is powered
No
Determine cause and correct gas supply problem
Yes
Is 24 vac present at gas valve wires
No
Check board 24 vac output and circuit to gas valve. On 96% models check for open front cover PS in series with gas valve
Yes
Replace gas valve
Yes
Do burners light
No
Check burners for dirt, check for burner allignment, check position of orifice plate between burners and H/E
Yes
Do burners stay on
No
Is flame stable, properly enveloping flame rod and being drawn into H/E tubes
No
Check orifice plate position for proper allignment with H/E tubes, check for flooded or obstucted H/E
Yes
Check flame signal, ground wires, check to make sure all pressure switches stay closed
Yes
Does blower motor come on after 30 second delay
No
115 vac to motor from board
No
Check for voltage between CIRC-H and Natural terminal. Check for voltage at L and N on blower
Yes
Yes
Does blower motor have 24 volts between motor common (C) and one of the T fan speed terminals?
No
Check wiring harness connections at motor and control board. Check for fault code.
Yes
Check motor and controller. Replace motor and/or controller as needed.
Yes
Does burners stay on to satisfy thermostat
No
Check for displayed fault code. Compare actual temp rise to rating plate
Yes
Heat is ON and working properly

Error Code:
E0 - Lockout due to an excessive number of ignition retries (3 total)

Applicable Models:
All 90% models

Method of Error Detection:
Furnace fails to ignite after 3 retires

Error Decision Conditions:
No gas or low gas pressure at manifold. Bad hot surface ignitor - not glowing, dirty flame sensor



Error Code E1, E2 1-Stage & ULN

Error Code:
E1 - Pressure switch circuit closed at the start of heating cycle

E2 - Pressure switch closed circuit is not closed

Applicable Models:
(For Goodman/Amana 1-stage)
AM9S, GM9S

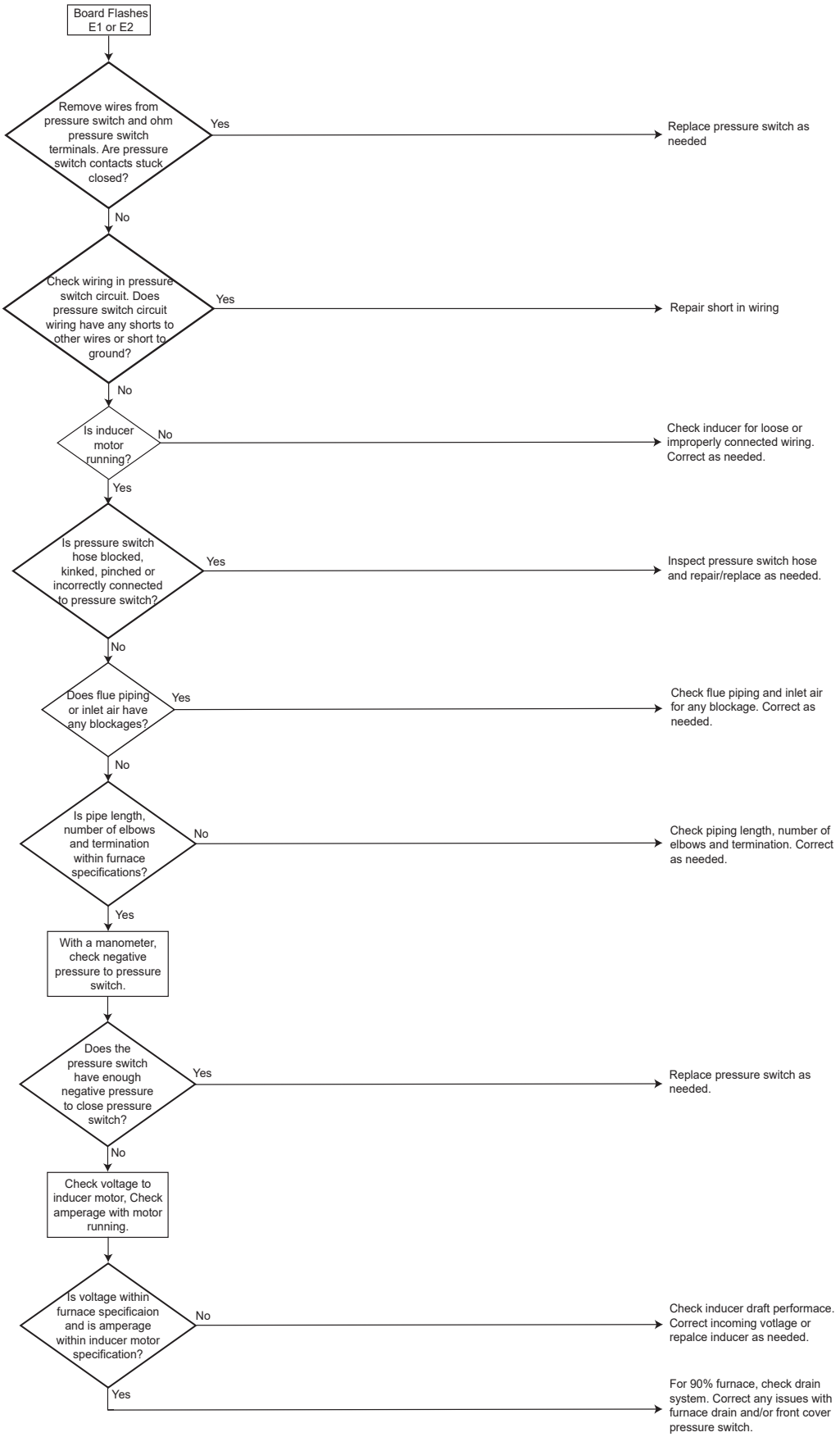
(For Goodman/Amana ULN)
AM9S-U, GM9S-U

(For Daikin 1-stage)
DM**SN

(For Daikin ULN)
DM**SN-U

Method of Error Detection:
Pressure switch during heating operation

Error Decision Conditions:
Pressure switch circuit closed when it should be open.
Pressure switch circuit open when it should be closed.



Error Code:
Eb - Gas valve is not energized when it should be. External Gas Valve Error.

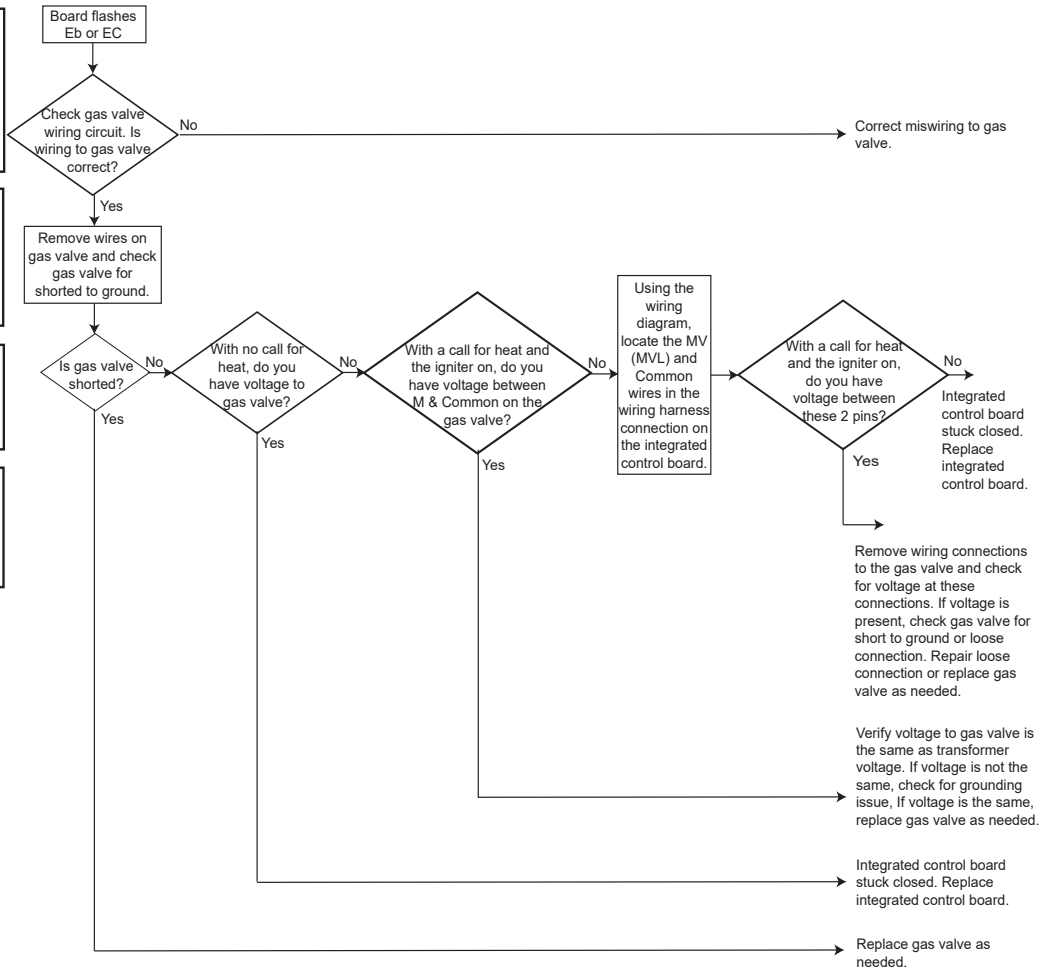
EC - Gas valve is energized when it should not be. Internal Gas Valve Error.

Applicable Models:
(for Goodman/Amana)
All furnace models

(for Daikin)
All furnace models, except Daikin modulating furnaces

Method of Error Detection:
No voltage to gas valve when voltage should be present.
Voltage to gas valve with no call for heat.

Error Decision Conditions:
No voltage reading at gas valve with a call for heat.
Voltage reading at gas valve with no call for heat.

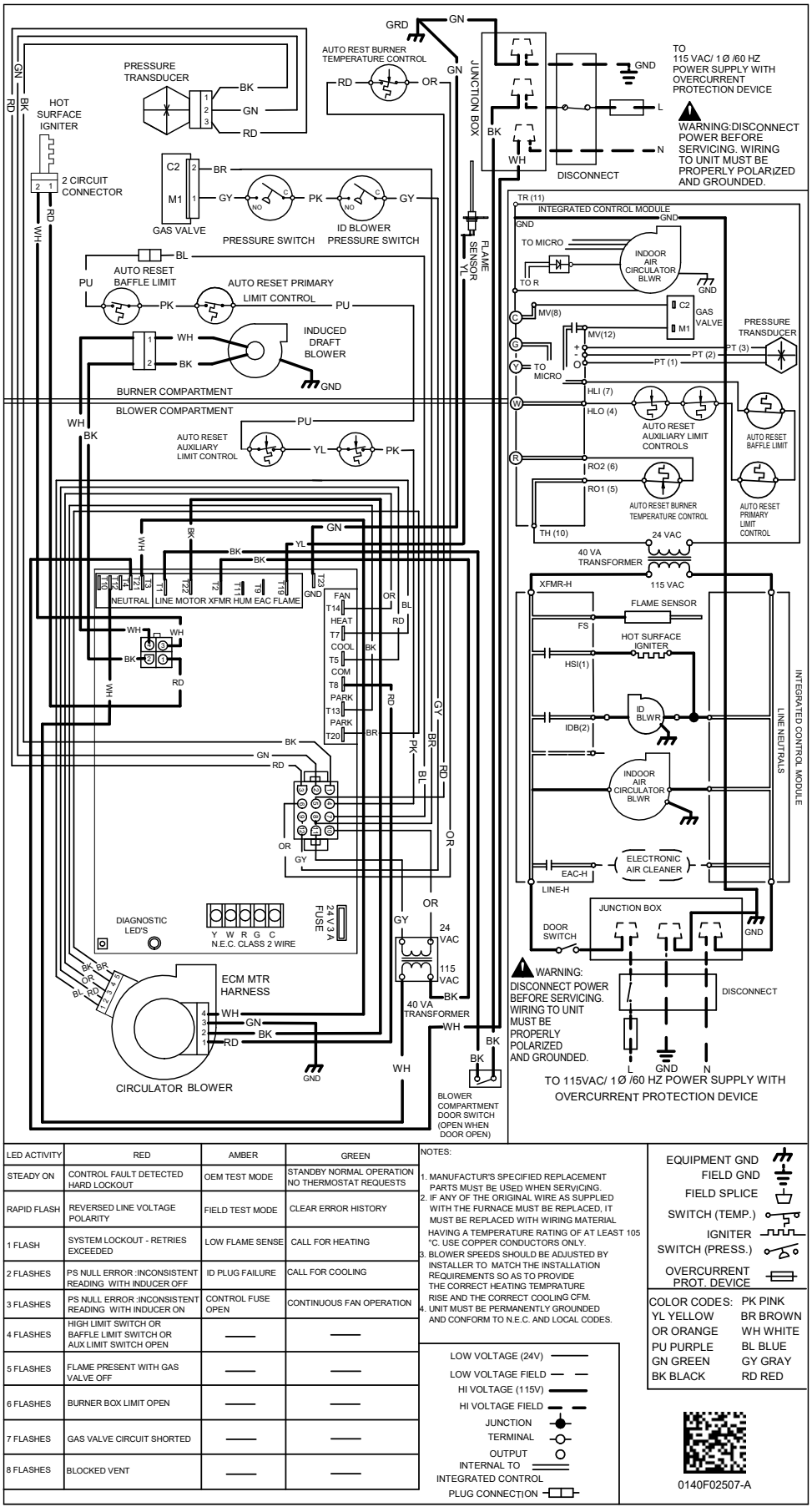


WIRING DIAGRAMS

*MES96*U

WARNING

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



LED ACTIVITY	RED	AMBER	GREEN
STEADY ON	CONTROL FAULT DETECTED HARD LOCKOUT	OEM TEST MODE	STANDBY NORMAL OPERATION NO THERMOSTAT REQUESTS
RAPID FLASH	REVERSED LINE VOLTAGE POLARITY	FIELD TEST MODE	CLEAR ERROR HISTORY
1 FLASH	SYSTEM LOCKOUT - RETRIES EXCEEDED	LOW FLAME SENSE	CALL FOR HEATING
2 FLASHES	PS NULL ERROR :INCONSISTENT READING WITH INDUCER OFF	ID PLUG FAILURE	CALL FOR COOLING
3 FLASHES	PS NULL ERROR :INCONSISTENT READING WITH INDUCER ON	CONTROL FUSE OPEN	CONTINUOUS FAN OPERATION
4 FLASHES	HIGH LIMIT SWITCH OR BAFFLE LIMIT SWITCH OR AUX LIMIT SWITCH OPEN	——	——
5 FLASHES	FLAME PRESENT WITH GAS VALVE OFF	——	——
6 FLASHES	BURNER BOX LIMIT OPEN	——	——
7 FLASHES	GAS VALVE CIRCUIT SHORTED	——	——
8 FLASHES	BLOCKED VENT	——	——

NOTES:

1. MANUFACTUR'S SPECIFIED REPLACEMENT PARTS MUST BE USED WHEN SERVICING.
2. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE FURNACE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105 °C. USE COPPER CONDUCTORS ONLY.
3. BLOWER SPEEDS SHOULD BE ADJUSTED BY INSTALLER TO MATCH THE INSTALLATION REQUIREMENTS SO AS TO PROVIDE THE CORRECT HEATING TEMPRATURE RISE AND THE CORRECT COOLING CFM.
4. UNIT MUST BE PERMANENTLY GROUNDED AND CONFORM TO N.E.C. AND LOCAL CODES.

LOW VOLTAGE (24V)
LOW VOLTAGE FIELD
HI VOLTAGE (115V)
HI VOLTAGE FIELD
JUNCTION
TERMINAL
OUTPUT
INTERNAL TO INTEGRATED CONTROL
PLUG CONNECTION

EQUIPMENT GND
FIELD GND
FIELD SPLICE
SWITCH (TEMP.)
IGNITER
SWITCH (PRESS.)
OVERCURRENT PROT. DEVICE

COLOR CODES:	
YL YELLOW	PK PINK
OR ORANGE	BR BROWN
PU PURPLE	WH WHITE
GN GREEN	BL BLUE
BK BLACK	GY GRAY
	RD RED

0140F02507-A

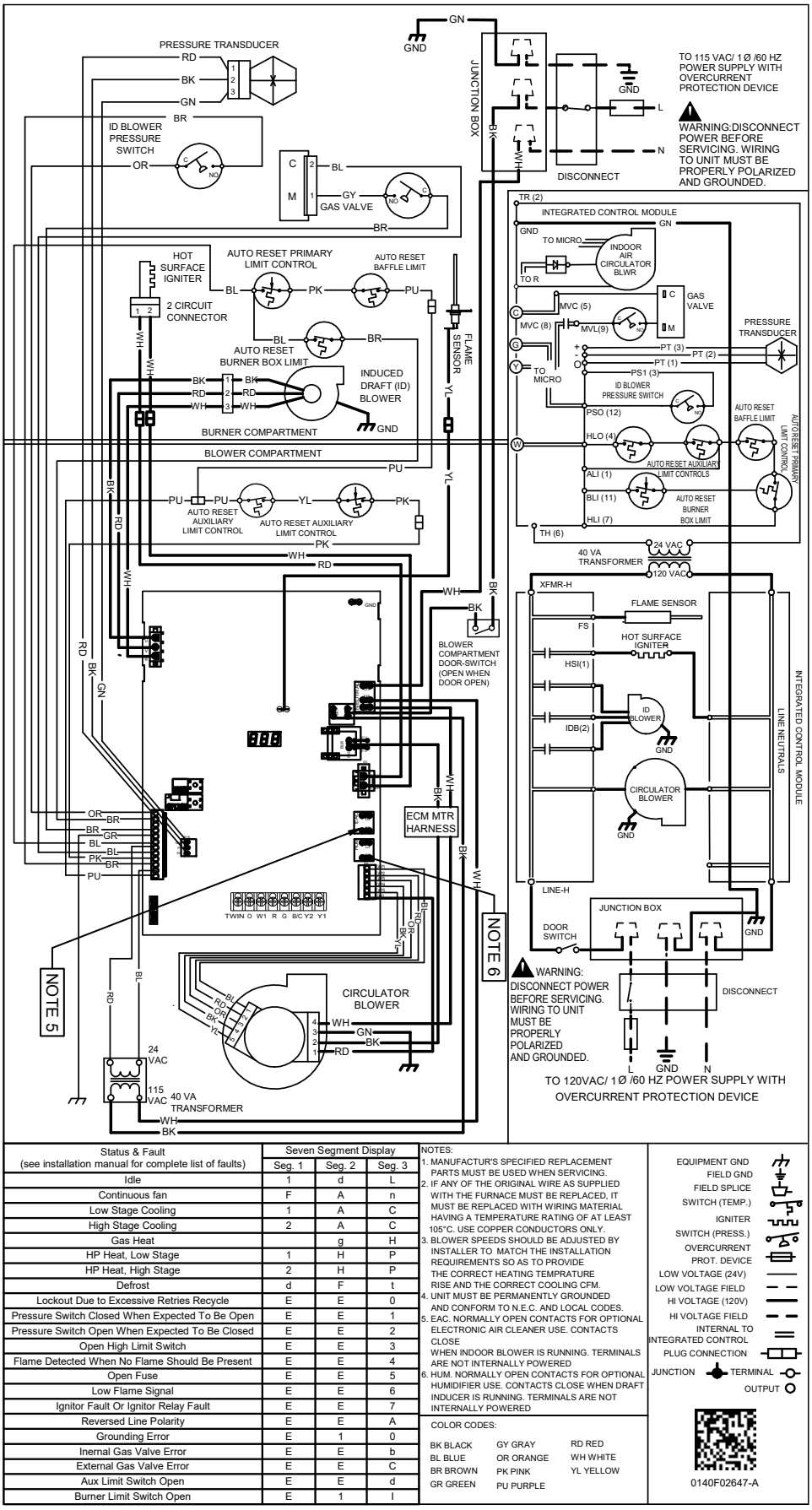
Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

WIRING DIAGRAMS

*M9S96*U

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

WARNING



Status & Fault (see installation manual for complete list of faults)	Seven Segment Display		
	Seg. 1	Seg. 2	Seg. 3
Idle	1	d	L
Continuous fan	F	A	n
Low Stage Cooling	1	A	C
High Stage Cooling	2	A	C
Gas Heat		g	H
HP Heat, Low Stage	1	H	P
HP Heat, High Stage	2	H	P
Defrost	d	F	t
Lockout Due to Excessive Retries Recycle	E	E	0
Pressure Switch Closed When Expected To Be Open	E	E	1
Pressure Switch Open When Expected To Be Closed	E	E	2
Open High Limit Switch	E	E	3
Flame Detected When No Flame Should Be Present	E	E	4
Open Fuse	E	E	5
Low Flame Signal	E	E	6
Ignitor Fault Or Ignitor Relay Fault	E	E	7
Reversed Line Polarity	E	E	A
Grounding Error	E	1	0
Inernal Gas Valve Error	E	E	b
External Gas Valve Error	E	E	C
Aux Limit Switch Open	E	E	d
Burner Limit Switch Open	E	1	I

NOTES:
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3. BLOWER SPEEDS SHOULD BE ADJUSTED BY INSTALLER TO MATCH THE INSTALLATION REQUIREMENTS SO AS TO PROVIDE THE CORRECT HEATING TEMPRATURE RISE AND THE CORRECT COOLING CFM.
4. UNIT MUST BE PERMANENTLY GROUNDED AND CONFORM TO N.E.C. AND LOCAL CODES.
5. EAC. NORMALLY OPEN CONTACTS FOR OPTIONAL ELECTRONIC AIR CLEANER USE. CONTACTS CLOSE WHEN INDOOR BLOWER IS RUNNING. TERMINALS ARE NOT INTERNALLY POWERED
6. HUM. NORMALLY OPEN CONTACTS FOR OPTIONAL HUMIDIFIER USE. CONTACTS CLOSE WHEN DRAFT INDUCER IS RUNNING. TERMINALS ARE NOT INTERNALLY POWERED

COLOR CODES:

BK BLACK	GY GRAY	RD RED
BL BLUE	OR ORANGE	WH WHITE
BR BROWN	PK PINK	YL YELLOW
GR GREEN	PU PURPLE	

EQUIPMENT GND
FIELD GND
FIELD SPLICE
SWITCH (TEMP.)
IGNITER
SWITCH (PRESS.)
OVERCURRENT PROT. DEVICE
LOW VOLTAGE (24V)
LOW VOLTAGE FIELD
HI VOLTAGE (120V)
HI VOLTAGE FIELD
INTERNAL TO INTEGRATED CONTROL
PLUG CONNECTION
JUNCTION
TERMINAL
OUTPUT

0140F02647-A

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.