

DAIKIN Service Instructions

80% Single Stage Ultra-Low NOx Gas Furnaces DR80SN*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.

TABLE OF CONTENTS

IMPORTANT INFORMATION.....	2
PRODUCT IDENTIFICATION.....	3
SYSTEM OPERATION.....	4
SCHEDULED MAINTENANCE	15
SERVICING.....	18
CHECKING VOLTAGE	20
CHECKING WIRING.....	20
CHECKING THERMOSTAT, WIRING.....	20
CHECKING TRANSFORMER AND CONTROL	
CIRCUIT	20
CHECKING AIR CIRCULATOR BLOWER MOTOR	21
CHECKING DUCT STATIC	21
CHECKING TEMPERATURE RISE.....	22
CHECKING PRIMARY LIMIT CONTROL	22
CHECKING AUXILIARY LIMIT CONTROL	23
INDUCED DRAFT BLOWER MOTOR	24
CHECKING GAS VALVE (REDUNDANT)	24
CHECKING GAS PRESSURE	24
CHECKING HOT SURFACE IGNITER.....	26
CHECKING PRESSURE TRANSDUCER.....	26
CHECKING FOR DELAYED IGNITION	27
CHECKING INTEGRATED IGNITION CONTROL	
BOARDS.....	27
CHECKING FLAME SENSOR	27
TROUBLESHOOTING	30
WIRING DIAGRAM	40



WARNING

DO NOT BYPASS SAFETY DEVICES.

This manual is to be used by qualified, professionally trained HVAC technicians only. Daikin does not assume any responsibility for property damage or personal injury due to improper service procedures or services performed by an unqualified person. The material in this manual does not supersede manufacturer's installation and operation instructions.

RSD6621302r2
March 2026

IMPORTANT INFORMATION



RECOGNIZE SAFETY SYMBOLS, WORDS AND LABELS



WARNING

THIS UNIT SHOULD NOT BE CONNECTED TO, OR USED IN CONJUNCTION WITH, ANY DEVICES THAT ARE NOT 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.



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.



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, tels 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, assurez-vous qu'il y ait une ventilation directe provenant de l'exterieur.

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 être recirculées 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 même la mort.

B10259-216

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

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.

	D	R	80	S	N	060	3	B	U	A	A	
	1	2	3,4	5	6	7,8,9	10	11	12	13	14	
Brand												Minor Revision
D - Daikin												A - Initial Release
												B - 1st Revision
Configuration												Major Revision
M - Upflow/Horizontal R410A												A - Initial Release
C - Downflow/Horizontal R410A												B - 1st Revision
R - Upflow/Horizontal R32												
D - Downflow/Horizontal R32												
AFUE												NOx
80 - 80% AFUE												N - Natural Gas ≥ 40 NG/JNOx
92 - 92% AFUE												N - Low NOx (90%+) ≤ 40 NG/JNOx
96 - 96% AFUE												X - Low NOx (80%) ≤ 40 NG/JNOx
97 - 97% AFUE												U - Ultra Low NOx ≤ 14 NG/JNOx
Gas Valve												Cabinet Width
S - Single Stage												A - 14"
												B - 17.5"
												C - 21"
												D - 24.5"
MOTOR												Maximum CFM
C - Variable-Speed ECM/ Communicating												3 - 1200 CFM
N - Multi-Speed ECM (9 taps) / Non-Communicating												4 - 1600 CFM
												5 - 2000 CFM
MBTU/h												
040 - 40,000 BTU/h												
060 - 60,000 BTU/h												
080 - 80,000 BTU/h												

SYSTEM OPERATION

SAFETY

Please adhere to the following warnings and cautions when installing, adjusting, altering, servicing, or operating the furnace.



WARNING

TO PREVENT PERSONAL INJURY OR DEATH DUE TO IMPROPER INSTALLATION, ADJUSTMENT, ALTERATION, SERVICE OR MAINTENANCE, REFER TO THIS MANUAL. FOR ADDITIONAL ASSISTANCE OR INFORMATION, CONSULT A QUALIFIED INSTALLER, SERVICE AGENCY OR THE GAS SUPPLIER.



WARNING

TO PREVENT POSSIBLE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK, THE FURNACE MUST BE LOCATED TO PROTECT THE ELECTRICAL COMPONENTS FROM WATER.

CHARGE (ESD) PRECAUTIONS

NOTE: Discharge your body's static electricity before touching unit. An electrostatic discharge can adversely affect electrical components.

Use the following precautions during furnace installation and servicing to protect the integrated control module from damage. By putting the furnace, the control, and the person at the same electrostatic potential, these steps will help avoid exposing the integrated control module to electrostatic discharge. This procedure is applicable to both installed and uninstalled (ungrounded) furnaces.

1. Disconnect all power to the furnace. Do not touch the integrated control module or any wire connected to the control prior to discharging your body's electrostatic charge to ground.
2. Firmly touch a clean, unpainted, metal surface of the furnace near the control. Any tools held in a person's hand during grounding will be discharged.
3. Service integrated control module or connecting wiring following the discharge process in Step 2. Use caution not to recharge your body with static electricity; (i.e., do not move or shuffle your feet, do not touch ungrounded objects, etc.). If you come in contact with an ungrounded object, repeat Step 2 before touching control or wires.
4. Discharge any static electricity from your body to ground before removing a new control from its container. Follow Steps 1 through 3 if installing the control on a furnace. Return any old or new controls to their containers before touching any ungrounded object.

Product Application

This product is designed for NATURAL GAS ONLY. This product is designed for use as a residential home gas furnace. It is **not** designed or certified for use in mobile home, trailer, or recreational vehicle applications.

IMPORTANT NOTE: The 80% furnace cannot be installed as a direct vent (i.e., sealed combustion) furnace. The burner box is present only to help reduce sound transmission from the burners to the occupied space.

To ensure proper installation, operation and servicing, thoroughly read the installation and service manuals for specifics pertaining to the installation, servicing and application of this product.



WARNING

POSSIBLE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH DUE TO FIRE, EXPLOSION, SMOKE, SOOT, CONDENSATION, ELECTRICAL SHOCK OR CARBON MONOXIDE MAY RESULT FROM IMPROPER INSTALLATION, REPAIR, OPERATION OR MAINTENANCE OF THIS PRODUCT.



WARNING

TO PREVENT PROPERTY DAMAGE, PERSONAL INJURY OR DEATH DUE TO FIRE, DO NOT INSTALL THIS FURNACE IN A MOBILE HOME, TRAILER, OR RECREATIONAL VEHICLE.

To ensure proper furnace operation, install, operate, maintain and service the furnace in accordance with the installation, operation and service instructions, all local building codes and ordinances. In their absence, follow the latest edition of the National Fuel Gas Code (NFPA 54/ ANSI Z223.1), and/or CAN/CGA B149 Installation Codes, local plumbing or waste water codes, and other applicable codes.

The rated heating capacity of the furnace should be greater than or equal to the total heat loss of the area to be heated. The total heat loss should be calculated by an approved method or in accordance with "ASHRAE Guide" or "Manual J-Load Calculations" published by the Air Conditioning Contractors of America.



WARNING

UPON COMPLETION OF THE FURNACE INSTALLATION, CAREFULLY INSPECT THE FLUE SYSTEM BOTH INSIDE AND OUTSIDE THE FURNACE TO ASSURE IT IS PROPERLY SEALED. LEAKS IN THE FLUE SYSTEM CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH DUE TO EXPOSURE TO FLUE PRODUCTS, INCLUDING CARBON MONOXIDE.

SYSTEM OPERATION



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.

HIGH ALTITUDE DERATE

The furnace, as shipped, requires no change to run between 0-4500 feet. At all altitudes the air temperature rise must be within the range listed on the Specification Sheet applicable to your model for the fuel used. Manifold pressure adjustments and combustion analysis are required for all installations above 4500 ft. Refer to "Gas Supply Pressure Measurement" section for instruction on how to properly measure and adjust manifold "outlet" pressure. The furnace should operate for a minimum of 15 minutes before taking a combustion sample. Combustion samples should be taken from beyond the furnace exhaust and must be within provided CO₂% range. See table below for recommended manifold pressure adjustments and proper CO₂% range. Gas heating values can vary; further pressure adjustment may be necessary to ensure furnace operates within acceptable CO₂ range.

MODEL	Manifold Pressure at 5000 ft	Manifold Pressure at 7500 ft	CO ₂ % Natural Gas
040	2.5" w.c.	2.4" w.c.	5.5 - 7.0
060	2.5" w.c.	2.4" w.c.	5.7 - 7.2
080	2.5" w.c.	2.4" w.c.	6.0 - 7.5

ELECTRICAL CONNECTIONS



WARNING

HIGH VOLTAGE!
TO AVOID PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK, DISCONNECT ELECTRICAL POWER BEFORE SERVICING OR CHANGING ANY ELECTRICAL WIRING.



CAUTION

LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. WIRING ERRORS CAN CAUSE IMPROPER AND DANGEROUS OPERATION. VERIFY PROPER OPERATION AFTER SERVICING.



WARNING

HIGH VOLTAGE!
TO AVOID RISK OF INJURY, ELECTRICAL SHOCK OR DEATH, THE FURNACE MUST BE ELECTRICALLY POLARIZED AND GROUNDED IN ACCORDANCE WITH LOCAL CODES OR IN THEIR ABSENCE, WITH THE LATEST EDITION OF THE NATIONAL ELECTRIC CODE.



WIRING HARNESS

The wiring harness is an integral part of this furnace. Field alteration to comply with electrical codes should not be required. Wires are color coded for identification purposes. Refer to the wiring diagram for wire routings. 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. Any replacement wiring must be a copper conductor.

120 VOLT LINE CONNECTIONS

Before proceeding with electrical connections, ensure that the supply voltage, frequency, and phase correspond to that specified on the unit rating plate. Power supply to the furnace must be NEC Class 1, and must comply with all applicable codes. The furnace must be electrically grounded in accordance with local codes or, in their absence, with the latest edition of The National Electric Code, ANSI NFPA 70.

Use a separate branch electrical circuit containing properly sized wire, and fuse or circuit breaker. The fuse or circuit breaker must be sized in accordance with the maximum overcurrent protection specified on the unit rating plate. An electrical disconnect must be provided at the furnace location.

Line voltage wiring must enter into the junction box provided with the furnace. Connect hot, neutral and ground wires as shown in the wiring diagram located on the unit's blower door. Metal conduit is not considered a substitute for an actual ground wire to the unit.

Line polarity must be observed when making field connections. Line voltage connections can be made through either the right or left side panel. To relocate the junction box, follow the steps shown in the Junction Box Relocation section.

IMPORTANT NOTE: To avoid possible equipment malfunction, route the low voltage wires to avoid interference with filter removal or other maintenance.

SYSTEM OPERATION



WARNING

HIGH VOLTAGE!

TO AVOID RISK OF INJURY, ELECTRICAL SHOCK OR DEATH, THE FURNACE MUST BE ELECTRICALLY POLARIZED AND GROUNDED IN ACCORDANCE WITH LOCAL CODES OR IN THEIR ABSENCE, WITH THE LATEST EDITION OF THE NATIONAL ELECTRIC CODE.



To ensure proper unit grounding, the ground wire should run from the furnace ground screw located inside the furnace junction box all the way back to the electrical panel. **NOTE:** Do not use gas piping as an electrical ground. To confirm proper unit grounding, turn off the electrical power and perform the following check.

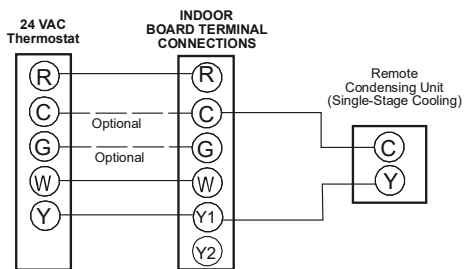
1. Measure resistance between the neutral (white) connection and the unpainted surface on the furnace.
2. Resistance should measure 10 ohms or less.

This furnace is equipped with a blower door interlock switch which interrupts unit voltage when the blower door is opened for servicing. Do not defeat this switch.

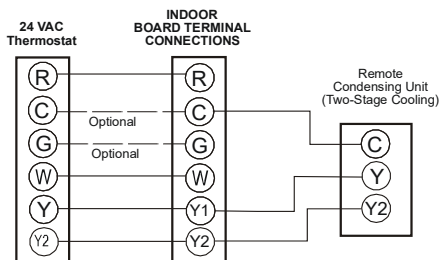
24 VOLT THERMOSTAT WIRING

NOTE: Wire routing must not interfere with circulator blower operation, filter removal, or routine maintenance.

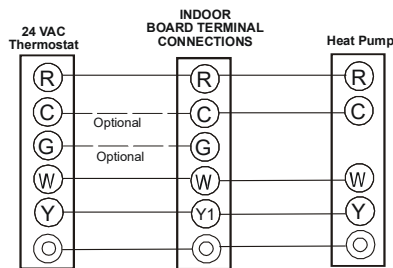
Low voltage connections can be made through either the right or left side panel. Thermostat wiring entrance holes are located in the blower compartment. The following figure shows connections for a “heat only” system and “heat/cool system”.



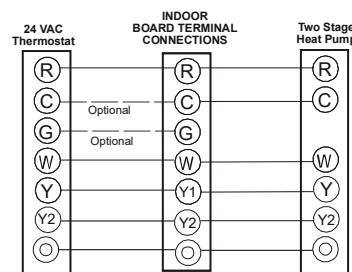
Non-communicating Single Stage A/C
Figure 1A



Non-communicating Two Stage A/C
Figure 1B



Non-Communicating Single Stage Heat Pump
Figure 1C



Non-Communicating Two Stage Heat Pump
Figure 1D

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. See Using Push-Buttons for instructions on how to navigate the control menu.

This furnace is equipped with a 40 VA transformer to facilitate use with most cooling equipment. Consult the wiring diagram, located on the blower compartment door, for further details of 120 Volt and 24 Volt wiring.

A single-stage thermostat with only one heating stage is needed to control this furnace.

LOW VOLTAGE VENTILATION

The Ventilation connections provide a dry contact for field ventilator wiring connections. These connections are normally open and energize during the R-32 fault/alarm condition. A VENT IN and a VENT OUT connector are provided and are shown in the image below.

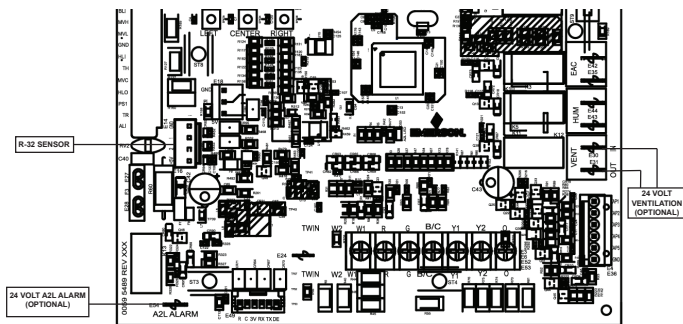
LOW VOLTAGE A2L ALARM

The A2L alarm connection provides 24VAC for field alarm wiring connections. These connections are normally open and energize during the R-32 fault/alarm condition. An A2L Alarm connector is provided and is shown in the image below.

FIELD INSTALLED ACCESSORIES (DAUGHTER BOARD)

Additional accessories that do not have dedicated terminals on the furnace control board may require an additional daughter board to be installed. Please refer to service manual on your product for more information.

SYSTEM OPERATION



24 VAC Accessories - Accessories Wiring
Figure 2

120 VOLT LINE CONNECTION OF ACCESSORIES HUMIDIFIER AND ELECTRONIC AIR CLEANER



WARNING

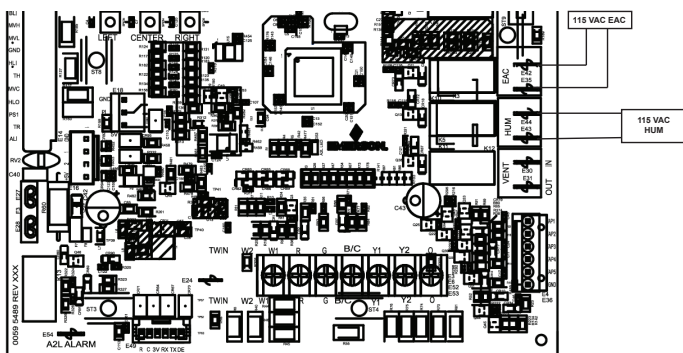
HIGH VOLTAGE!

TO AVOID PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK, DISCONNECT ELECTRICAL POWER BEFORE SERVICING OR CHANGING ANY ELECTRICAL WIRING.



The furnace integrated control module is equipped with dedicated ¼ inch EAC and HUM relay terminals for controlling external power to an optional field-supplied humidifier and/or electronic air cleaner. Additional line voltage wiring to the inside of the furnace must conform to all local codes and have a minimum temperature rating of 105°C. All line voltage wire splices must be made inside the furnace.

When utilized, the HUM relay will be closed during normal heating operation and the EAC relay will be closed during fan operation. 120VAC must be present on the one terminal from HUM or EAC to take advantage of the second terminal.



120 Volt Line Connection of Accessories Humidifier (HUM) & Electronic Air Cleaner (EAC)
Figure 3

FOSSIL FUEL APPLICATIONS

This furnace can be used in conjunction with a heat pump in a fossil fuel application. A fossil fuel application refers to a combined gas furnace and heat pump installation which uses an outdoor temperature sensor to determine the most cost efficient means of heating via heat pump or gas furnace.

A heat pump thermostat with *two stages of heat* is required to properly use a furnace in conjunction with a heat pump. Refer to the fossil fuel kit installation instructions for additional thermostat requirements.

Strictly follow the wiring guidelines in the fossil fuel kit installation instructions. All furnace connections must be made to the furnace integrated control module and the FURNACE terminal strip on the fossil fuel control board.

NORMAL SEQUENCE OF OPERATION

POWER UP

- 120 VAC power applied to furnace.
- Integrated ignition control performs internal checks.
- Upon power-up of the control board, all Seven segments will be illuminated displaying “8 8 8”. After power-up the displays will show “I d L”, idle, or stand-by mode.
- The control is now ready to receive demands from the room thermostat. Refer to Status Menu in this manual for interpretation of items displayed in the status menu.

GAS HEATING MODE

The normal operational sequence in gas heating mode is as follows:

- R and W thermostat contacts close, initiating a call for heat. The control will display heat mode in status menu: - g h
- Integrated control module performs safety circuit checks.
- Induced draft blower is energized for 30 second pre-purge period causing pressure sensor contacts to close.
- Igniter warm up begins after 30 second pre-purge expires.
- Gas valve opens 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 user selected heat speed following a fixed thirty second blower on delay. Electronic air cleaner terminal is energized at the same time the circulator blower is energized.
- The 120V humidifier terminal is energized whenever the induced draft blower is energized.
- Furnace operates; integrated control module monitors safety circuits continuously.
- R and W thermostat contacts open, completing the call for heat.

SYSTEM OPERATION

- Gas valve closes, extinguishing flame.
- Induced draft blower is de-energized following a thirty second post purge.
- HUM terminal relay is de-energized.
- Circulator blower continues running for selected heat off delay. 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 control board supports two stages of cooling. If this furnace is installed with a single stage cooling unit or heat pump, the Y1 terminal of the control board must be used. A Y2 call on the control board will be ignored if a Y1 call is not present.

COOLING MODE SEQUENCE OF OPERATION

1ST STAGE COOLING MODE SEQUENCE:

- On a call for low stage cooling, the Y1 or Y1 and G thermostat contacts close signaling the furnace control board with 24 vac. on Y1 or Y1 and G terminals.
- The 7-Segment will display: 1 A C
- The compressor and condenser fan are energized.
- The circulator fan is energized at low cool speed after the cool on delay period. The electronic air cleaner EAC relay will close the EAC contacts.
- After the thermostat is satisfied, the compressor is de-energized and the Cool Mode Fan Off Delay period begins.
- Following the Cool Mode Fan Off Delay period, the indoor fan and air cleaner relays are de-energized

2ND STAGE COOLING MODE SEQUENCE:

NOTE: A Y1 call must be present or a Y2 call will be ignored.

- On a call for 2nd stage cooling, the Y2 or Y2 and G thermostat contacts close signaling the furnace control board with 24 vac. on Y2 or Y2 and G terminals.
- The 7-Segment will display: 2 A C
- The compressor and condenser fan are energized.
- The circulator fan is energized at cool speed after a cool on delay. The electronic air cleaner EAC relay will close the EAC contacts.
- After the thermostat is satisfied, the compressor is de-energized and the Cool Mode Fan Off Delay period begins.

- Following the Cool Mode Fan Off Delay period, the indoor fan and air cleaner relays are de-energized

HEAT PUMP MODE

1ST STAGE HP HEATING MODE SEQUENCE:

- On a call for low stage HP Heating, the Y1 or Y1 and G thermostat contacts close signaling the furnace control board with 24 vac. on Y1 or Y1 and G terminals.
- The 7-Segment will display: 1 H P
- The compressor and condenser fan are energized.
- The circulator fan is energized at HP1 fan speed after the HP on delay period. The electronic air cleaner, EAC, and humidifier, HUM, relays will close the contacts.
- After the thermostat is satisfied, the compressor is de-energized and the electronic air cleaner EAC and humidifier HUM relays de-energize. The HP Heat Mode Fan Off Delay period begins.
- Following the HP Heat Mode Fan Off Delay period, the indoor fan, EAC, & HUM relays are de-energized.

2ND STAGE HP HEATING MODE SEQUENCE:

NOTE: A Y1 call must be present or a Y2 call will be ignored.

- On a call for 2nd stage HP Heating, the Y2 or Y2 and G thermostat contacts close signaling the furnace control board with 24 vac. on Y2 or Y2 and G terminals.
- The 7-Segment will display: 2 H P
- The compressor and condenser fan are energized.
- The circulator fan is energized at HP2 fan speed after the HP on delay period. The electronic air cleaner EAC and humidifier HUM relays will close the contacts.
- After the thermostat is satisfied, the compressor is de-energized and the electronic air cleaner EAC and humidifier HUM relays de-energize. The HP Heat Mode Fan Off Delay period begins.
- Following the HP Heat Mode Fan Off Delay period, the indoor fan, EAC, & HUM relays are de-energized.

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 user selected fan speed. Electronic air cleaner terminal relay is energized.
- Circulator blower runs, integrated control module monitors safety circuits continuously.
- R and G thermostat contacts open, completing the call for fan.
- Circulator blower is de-energized. Electronic air cleaner terminal relay is de-energized.
- Furnace awaits the next call from thermostat.

SYSTEM OPERATION

DEFROST MODE

Defrost call can only be generated with heat pump outdoor unit properly configured in the OdS menu.

- On a call for Defrost, the Y1 or Y1 with Y2 with/without O contacts and W thermostat contacts close signaling the furnace control board to enter defrost.
- If Y with O and W are present simultaneously, the blower shall be energized at Cooling Speed after COOL on delay, then, switch the blower speed to the Greater of (Cooling Speed or Gas Heat speed) after Gas Heat On Delay expired.
- If Y without O and W are present simultaneously, the blower shall be energized at HP Heat Speed after HP Heat On Delay, then, switch the blower speed to the Greater of (HP Heat Speed or Gas Heat speed) after Gas Heat On Delay expired.
- The 7-Segment will display: d F t
- The electronic air cleaner EAC and humidifier HUM relays will close the contacts.
- After the thermostat is satisfied, the gas valve will de-energize. The Gas Heat Mode Fan Off Delay period begins.
- Following the Gas Heat Mode Fan Off Delay period, the indoor fan, EAC, & HUM relays are de-energized.

START-UP PROCEDURE AND ADJUSTMENT

NOTE: This furnace is equipped with a control board that is capable of monitoring for R-32 refrigerant leaks in the indoor refrigeration unit. Please verify that the R-32 sensor wire is plugged in to the furnace control board before startup, if applicable. If furnace is not paired with an R-32 Refrigeration system, the default settings in the furnace control board will need to be changed. Please see the R-32 section for additional information.

Furnace must have a 120 VAC power supply properly connected and grounded. Proper polarity must be maintained for correct operation. An interlock switch prevents furnace operation if the blower door is not in place. Keep the blower access door in place except for inspection and maintenance.

Upon power-up of the control board, all Seven segments will be illuminated displaying “8 8 8”. After power-up the displays will show “I d L”, idle, or stand-by mode. The control is now ready to receive demands from the room thermostat. Refer to Status Menu in this manual for interpretation of items displayed in the status menu.

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.

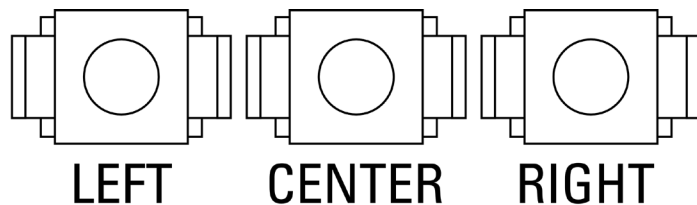
NOTE: Equipment type (Single-stage cooling, Two-stage cooling, Single-stage heat pump, Two-stage heat pump) **MUST** be setup through the OdS menu by the installer for proper system operation.

USING PUSH-BUTTONS

All user settings may be accessed by three push-button on the control board. The three buttons are labeled Left, Center and Right. The center button is used to enter into the option menu and make the selection. The left and right buttons are used to browse the main menu and option menus. When the center button is pressed in the main menu, the furnace control will go to the option menu and display the default or previously selected option. Pressing the left or right button will display the next available option. When the next adjustable or selectable option is displayed, the furnace control will flash the option with ½ second ON and ½ second OFF indicating the option has not yet been selected.

To select an option; press and release the center button to stop the current option from flashing. When the option has stopped flashing, press the center button again to select that option.

While navigating through options, if no buttons are pressed during a 30 second time period, the display will timeout and return to the Status Menu. Simultaneously pressing and releasing any two buttons will also return the furnace control back to the Status Menu. If the previously displayed option was not selected and a timeout occurs, the displayed option will not be stored in control memory as a selected option.



Control Board Main Menu

SYSTEM OPERATION

Menu Description	Main Menu			Option Menu			Display Text	Additional Info
	SEGT #1	SEGT #2	SEGT #3	SEGT #1	SEGT #2	SEGT #3		
Active Alarm menu	E	r	r	E	x	x	Err	(xx code numbers) - See chart for Alarm Code definition
Last 10 Faults	F	1	0	E	x	x	F10	(xx code numbers) - See chart for Alarm Code definition
Code Release Number		C	r	None			Cr	Code number
Shared data Revision		S	r	None			Sr	Shared Data Number
Reset to Factory Default	r	F	d	yes, no			rFd	PCB will revert back to factory default if selected yes
Outdoor Setting Menu	0	d	S	AC1 / AC2 / HP1 / HP2 / OFF			OdS	OdS option is used to select outdoor unit type (1 or 2 stage)
Blower Speed for Continuous Fan Mode	F	S	d	Fxx			FSd	(xx Blower Speed Number F01, F02..)
Single-Stage Cooling Fan Speed		A	C	Fxx			AC	(xx Blower Speed Number F01, F02..)
Low-stage Cooling Blower Speed, Two-Stage	A	C	1	Fxx			AC1	(xx Blower Speed Number F01, F02..)
High-stage Cooling Fan Speed, Two-Stage	A	C	2	Fxx			AC2	(xx Blower Speed Number F01, F02..)
Cool On Delay	C	n	d	Del ay, Seconds			Cnd	Default set at 7 Secs, Adjustments can be made in 7 Secs increments from 0 to 35 Secs
Cool Off Delay	C	f	d	Del ay, Seconds			Cfd	Default set at 65 Secs, Adjustments can be made in 5 Secs increments from 0 to 120 Secs
Gas Heat fan Speed	g	A	F	Fxx			gAF	(xx Blower Speed Number F01, F02..)
Gas Heat On Delay	g	n	d	Del ay, Seconds			gnd	Default set at 30 Secs, Adjustments can be made in 5 Secs increments from 5 to 30 Secs
Gas heat Off Delay	g	F	d	Del ay, Seconds			gFd	Default set at 90 Secs, Adjustments can be made in 30 Secs increments from 30 to 180 Secs
Single-Stage HP Heat Fan Speed		H	P	Fxx			HP	(xx Blower Speed Number F01, F02..)
Low-stage HP Heat Fan Speed, Two-Stage	H	P	1	Fxx			HP1	(xx Blower Speed Number F01, F02..)
High-stage HP Heat Fan Speed, Two-Stage	H	P	2	Fxx			HP2	(xx Blower Speed Number F01, F02..)
HP Heat off Delay	H	F	d	Del ay, Seconds			HFd	Default set at 60 Secs, Adjustments can be made in 5 Secs increments from 30 to 120 Secs
HP Heat on Delay	H	n	d	Del ay, Seconds			Hnd	Default set at 5 Secs, Adjustments can be made in 5 Secs increments from 5 to 30 Secs
Automatic Heat Staging - For Two Stage Control	A	H	S	no, 10, 20, 30, 60, Alt			AHS	Refer to Section " CHANGING HEATING MODE SETTING"
A2L Function Verification	A	2	u	Refer to the R-32 Section			A2u	
A2L Function Enabled	A	2	E	Refer to the R-32 Section			A2E	

Control Board Status Menu

Description of System Status	Main Menu		
	SEGT #1	SEGT #2	SEGT #3
All segments illuminated = control powering up	8	8	8
Control in Idle stage	I	d	I
Constant Fan	F	A	n
Single-Stage Cooling Fan Speed		A	C
Low Stage Cooling	1	A	C
High Stage Cooling	2	A	C
Gas Heat		g	H
Low Stage HP	1	H	P
High Stage HP	2	H	P
Defrost	d	F	t

FURNACE OPERATION

Purge gas lines of air prior to start-up. Do not purge lines into an enclosed burner compartment. Follow NFPA 54, National Fuel Gas Code 8.1 for proper purging methods. Check for leaks using an approved chloride-free soap and water solution, an electronic combustible gas detector, or other approved method.

NOTE: An interlock switch prevents furnace operation if the blower door is not in place. Keep the blower access doors in place except for inspection and maintenance.

R-32 FUNCTION

This furnace is equipped with a control board that is capable of shutting off the gas heat and turning on the blower fan in case of an R-32 refrigerant leak in the indoor evaporator coil. If the cooling unit that is paired with this furnace does not utilize R-32 as the refrigerant, the R-32 functionalities in the furnace control board will need to be turned off for the furnace to run properly.

R-32 function on the control board is ON by default. The R-32 function can be disabled through the furnace control by entering the A2L Function Enabled menu and selecting "no". If A2L function is disabled, the furnace control will ignore all A2L functions. If A2L function is enabled, the control will monitor the R-32 sensor information.

To enter the A2L Function Enabled menu, press the left or right button until LED displays "A2E". Press the center button and the LED will display the selected option (yes or no). Press the left or right button to select one of the two options and press the center button to confirm the option.

R-32 SENSOR WIRE ROUTING

NOTE: Wiring routing must not interfere with circulator blower operation, filter removal or routine maintenance. Wire should not be routed near hot surfaces and should be protected from sharp edges.

The R-32 Sensor wire coming from the indoor evaporator coil will need to be routed into the furnace and connected to the connection point on the furnace control board. This wire should be routed alongside the thermostat wires through the low voltage openings in the left or right side of the furnace blower compartment. Please see the electrical section for the location of the R-32 Sensor connection on the control board.

SYSTEM OPERATION

FURNACE START-UP

During furnace start up, the furnace control will identify the connected R-32 sensor and will start monitoring the sensor communication. A green LED located next to the sensor connection will indicate if there is communication between the furnace control and the R-32 sensor. The LED will be ON during the duration of the startup and then will either start blinking or turn OFF. The blinking LED signifies that communication with the R-32 sensor is present. The LED OFF signifies that there is no signal with the sensor.

If there are no alarms or faults, the furnace will go into regular run mode after a warm up period. The furnace control monitors the R-32 sensor once per second.

R-32 REFRIGERANT LEAK

If the R-32 sensor on the indoor evaporator coil detects a specified concentration of R-32 refrigerant, the furnace will enter Mitigation Mode to dilute the refrigerant concentrations in case of a leak. In Mitigation Mode, the furnace will do the following:

1. Display the A2L Refrigerant Leakage error code (EAL)
2. Shut down the gas operation
3. Energize the optional ventilation and alarm outputs.
4. Run the fan at max CFM airflow

Once the R-32 sensor stops detecting a leak, the fan will continue to run for 5 minutes. After the 5 minutes, if there are no other alarms or faults, the control will de-energize the optional ventilation and alarm outputs and then go back to the original operating mode per the thermostat.

A2L VERIFICATION

The A2L Function Verification menu allows the installer to verify if the R-32 function operates properly. This menu simulates the refrigerant leak process and is only able to be used when there are no active alarms or faults. To verify the R-32 functions, enter the A2L Function Verification menu and select "YES". To enter the A2L Function Verification menu, press the left or right button until LED displays "A2u". Press the center button and the LED will display the selected option (yes or no). Press the left or right button to select one of the two options and press the center button to confirm the option. Once "YES" is selected, the furnace will do the following:

1. Display the A2L Refrigerant Leakage code (EAL)
2. Shut down the gas operation
3. Energize the optional ventilation and alarm outputs.
4. Run the fan at max CFM airflow

The control will exit the verification function if:

1. The 5 minute timeout expires or
2. An alarm or fault is detected or
3. The user turns OFF the A2L Function Verification.

FURNACE START-UP

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.

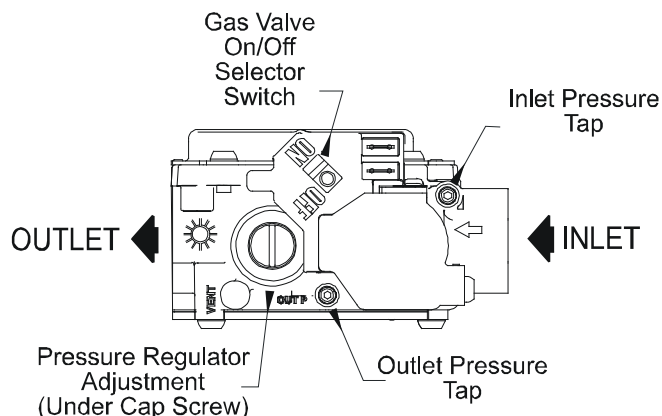
NOTE: This furnace is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

5. *White-Rodgers valves:* Push the switch to the OFF position.
6. Wait five minutes then smell for gas. Be sure to check near the floor, as some types of gas are heavier than air.
7. If gas can be smelled following the five minute waiting period in Step 6, immediately follow the instructions on Page 3 of this manual. If you do not smell gas after five minutes: *White-Rodgers valves:* Push the switch to the ON position.
8. Replace the door on the front of the furnace.
9. Open the manual gas valve external to the furnace.
10. Turn on the electrical power supply to the furnace.
11. Adjust the thermostat to a setting above room temperature.
12. After the burners are lit, set the room thermostat to the desired temperature.

NOTE: There will be a delay between thermostat energizing and burner firing.

FURNACE SHUTDOWN

1. Set the thermostat to lowest setting. 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 circulation blower will shut down when the time delay expires. Time delay is selectable on all models.
2. Turn off the electrical power supply to the furnace.
3. Remove the burner compartment door.
4. *White-Rodgers valve:* Push switch to the OFF position.
5. Close manual gas shutoff valve external to the furnace.
6. Replace the door on the unit.



SYSTEM OPERATION

CIRCULATOR BLOWER SPEED ADJUSTMENT



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. 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.

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 left or right button until LED displays "FSd". Press center 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 left or right button is pressed. All 9 speeds are available for circulation.
3. When the center button is pressed, the current displayed speed shall stop flashing. Press the center 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 left or right button until LED displays "AC1" (for single stage COOLING) or "AC2" (for Two stage COOLING). Press center 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 left or right button is pressed. All 9 speeds are available for both Single and Two Stage cooling.
3. When the center button is pressed, the current displayed speed shall stop flashing. Press the center 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

SYSTEM OPERATION

GAS HEATING MODE SPEED SELECTION

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

1. Press left or right button until LED displays "gAF". Press center 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 left or right button is pressed.
3. When the center button is pressed, the current displayed speed shall stop flashing. Press the center button again to select the option and the control shall immediately apply that blower setting and return to the corresponding main menu.

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 left or right button until LED displays "HP1" (for single stage HP HEATING) or "HP2" (for Two stage HP HEATING). Press center 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 left or right button is pressed. All 9 speeds are available for both Single and Two Stage HP HEATING.
3. When the center 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

CIRCULATOR BLOWER FAN TIMING ADJUSTMENT

NOTE: Items in this section refer to the air circulator blower fan, **NOT** to the induced draft blower. The induced draft blower timing sequence is not adjustable.

The integrated control module on all models provides selectable fan on/off delay adjustments.

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 left or right button until LED displays the desired on/off setting (See MAIN MENU section for selectable blower on/off delay options). Press center 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 left or right button is pressed.
3. When the center button is pressed, the current displayed on/off delay shall stop flashing. Press the center button again to select the option and the control shall immediately apply that delay setting and return to the corresponding main menu.

SAFETY CIRCUIT DESCRIPTION

GENERAL



WARNING

TO AVOID PERSONAL INJURY OR DEATH, DO NOT REMOVE ANY INTERNAL COMPARTMENT COVERS OR ATTEMPT ANY ADJUSTMENT. ELECTRICAL COMPONENTS ARE CONTAINED IN BOTH COMPARTMENTS. CONTACT A QUALIFIED SERVICE AGENT AT ONCE IF AN ABNORMAL OPERATION SHOULD DEVELOP.



WARNING

DO NOT BYPASS SAFETY DEVICES.

SYSTEM OPERATION

A number of safety circuits are employed to ensure safe and proper furnace operation. These circuits serve to control any potential safety hazards and serve as inputs in the monitoring and diagnosis of abnormal function. These circuits are continuously monitored during furnace operation by the integrated control module.

INTEGRATED CONTROL MODULE (IFC)

The integrated control module is an electronic device which controls all furnace operations. Responding to the thermostat, the module initiates and controls normal furnace operation, and monitors and addresses all safety circuits. If a potential safety concern is detected, the module will take the necessary precautions and provide diagnostic information through an LED.

PRIMARY LIMIT

The primary limit control is located on the partition panel and monitors heat exchanger compartment temperatures. It is a normally closed (electrically), automatic reset, temperature activated sensor. The limit guards against the overheating resulting from insufficient air passing over the heat exchanger.

AUXILIARY LIMIT

The auxiliary limit control is located either on or near the circulator blower and monitors heat exchanger compartment temperatures. The control is a normally closed (electrically), automatic reset, temperature activated sensor. It guards against overheating resulting from insufficient air passing over the heat exchanger. The auxiliary limit control is suitable for both horizontal right and horizontal left installations. Regardless of airflow direction, it does not need to be relocated.

PRESSURE SWITCHES

The pressure switches are normally-open (closed during operation) negative air pressure-activated switches. They monitor the airflow (combustion air and flue products) through the heat exchanger via pressure taps located on the induced draft blower and the coil front cover. These switches guard against insufficient airflow (combustion air and flue products) through the heat exchanger and/or blocked condensate drain conditions.

BURNER TEMPERATURE SWITCH

The burner temperature switch is mounted on the burner assembly to monitor the burner box temperature. It is normally closed (electrically), auto-reset sensor. This switch guards against the burner flames not being properly drawn into the heat exchanger.

PRESSURE SENSOR

The pressure sensor is mounted near induced draft blower. Its function is to regulate the induced draft blower's speed in order to maintain proper air-fuel ratio for clean and reliable combustion. The pressure sensor also guards against insufficient airflow (combustion air and flue products) through the heat exchanger.

FLAME SENSOR

The flame sensor is a probe mounted near the burner assembly which uses the principle of flame rectification to determine the presence or absence of flame.

TROUBLESHOOTING

DIAGNOSTIC CHART

Refer to the troubleshooting chart for assistance in determining the source of unit operational problems. The 3 digit diagnostic display provides alarm codes to assist in troubleshooting the unit.

FAULT CODE RETRIEVAL

The ignition control is equipped with push buttons that can be used to see the last ten faults detected by the control. Press the left or right button to navigate to F10. Press the center button to select this option.

CLEAR FAULT MEMORY

To clear all alarm codes, navigate to the last ten faults menu, F10, and hold the option button down for 5 seconds.

RESETTING FROM LOCKOUT

Furnace lockout results when a furnace is unable to achieve ignition after three attempts. It is characterized by a non-functioning furnace and a fault code will be displayed. If the furnace is in "lockout", it will (or can be) reset in any of the following ways.

1. Automatic reset. The integrated control module will automatically reset itself and attempt to resume normal operations following a one hour lockout period.
2. Manual power interruption. Interrupt 120 volt power to the furnace.

NOTE: If the condition which originally caused the lockout still exists, the control will return to lockout. Refer to the Diagnostic Chart for aid in determining the cause.

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, HANDLE WITH CARE. TOUCHING THE 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.

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.

Dial type thermometers or thermocouple meter (optional)
- to measure dry bulb temperature.

Volt-Ohm Meter - to measure amperage and voltage and to test continuity, capacitors and motor windings.

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 obtain 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.

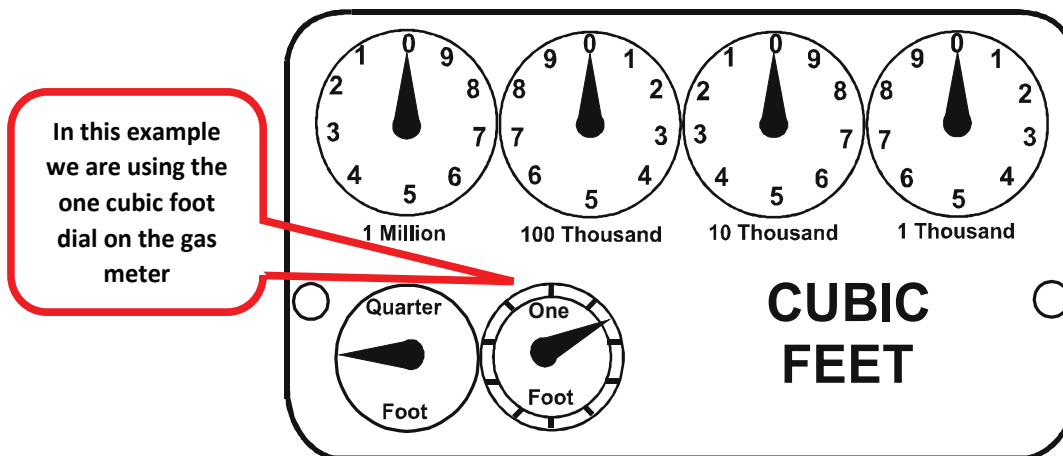


TABLE 1

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:

$$(3600 \times \text{Gas Meter Dial Size}) / \text{Time (seconds)} = \text{Cubic Feet per Hour (CFH)}$$

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):

$$\text{Cubic Feet per Hour (CFH)} \times \text{BTU content of your natural gas} = \text{BTU/HR input}$$

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. 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.



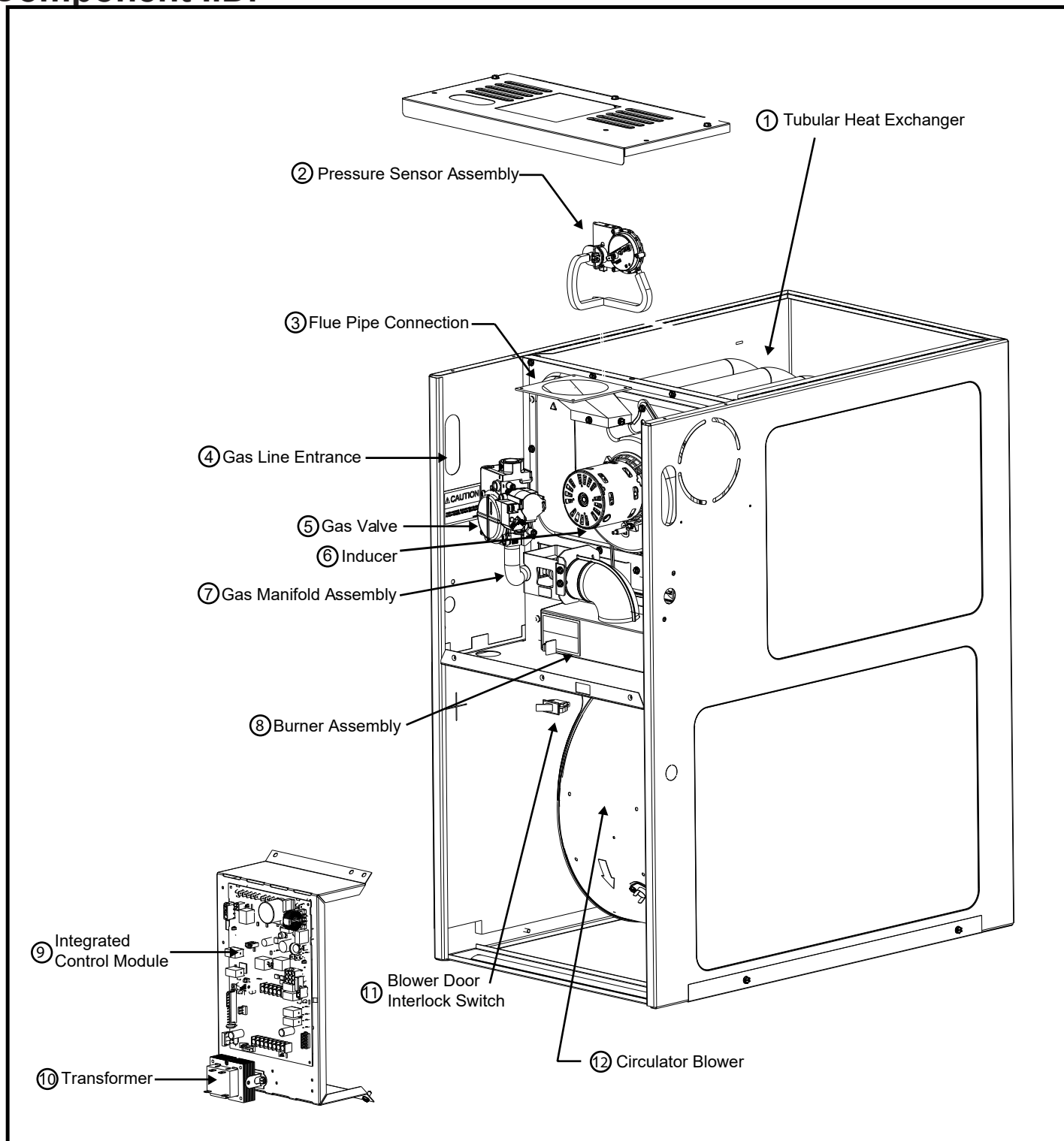
CAUTION

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.



- 1 Tubular Heat Exchanger
- 2 Pressure Switch
- 3 Flue Pipe Connection
- 4 Gas Line Entrance
- 5 Gas Valve
- 6 Inducer
- 7 Gas Manifold Assembly

- 8 Burner Assembly
- 9 Integrated Control Module
- 10 Transformer
- 11 Blower Door Interlock Switch
- 12 Circulator Blower

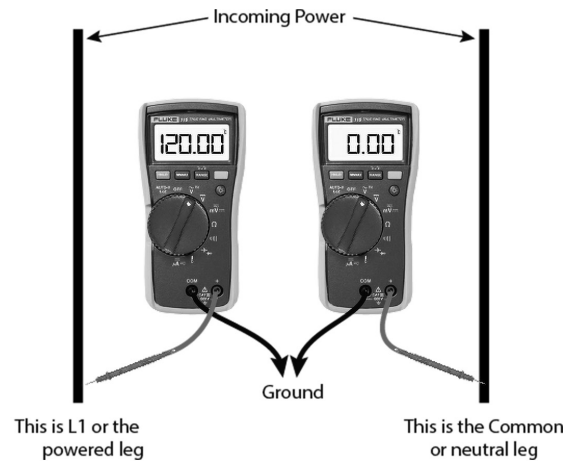
SERVICING

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.

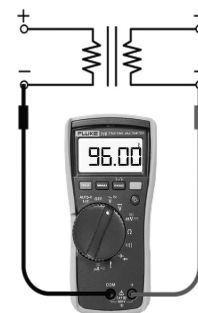
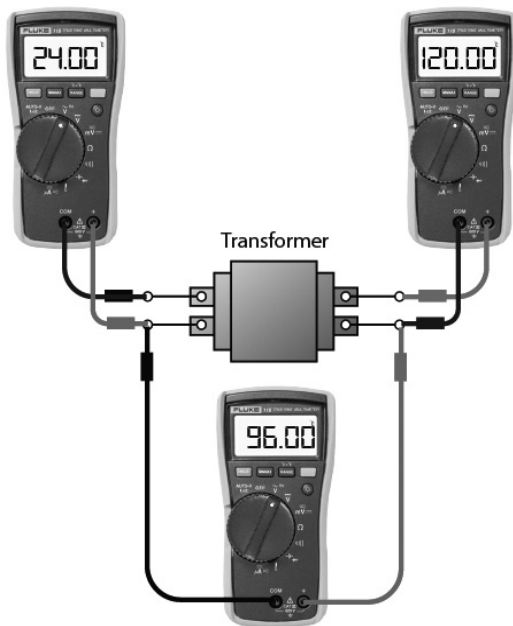
Polarization has been apparent in the Appliance industry since the introduction of the three prong plug, however, the Heating Industry does not use a plug for incoming power, but is hard wired.

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.

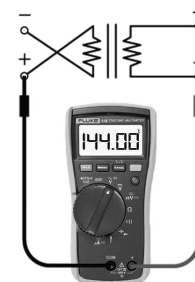
We recommend that these two items be checked during normal installation and/or service calls. See as follows:



CHECKING FOR PHASING - PRIMARY TO SECONDARY OF UNMARKED TRANSFORMERS*



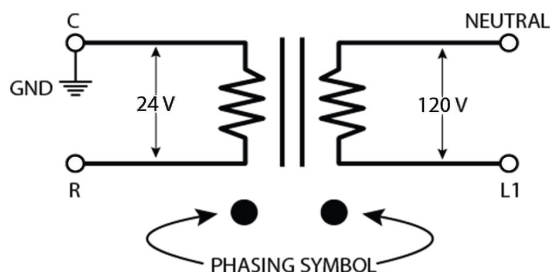
READS 96 VOLTS - IN PHASE



READS 144 VOLTS - OUT OF PHASE

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. Lets 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 120 volts $\pm$ 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 inch 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.
2. Remove the thermostat low voltage wires at the furnace integrated control module terminals.

SERVICING

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


WARNING

DISCONNECT ALL POWER BEFORE SERVICING.

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. 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). 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


WARNING

DISCONNECT ALL POWER BEFORE SERVICING.

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. 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.

EXAMPLE:

Static reading from return duct = -.1" w.c.

Static reading from supply duct = .3" w.c.

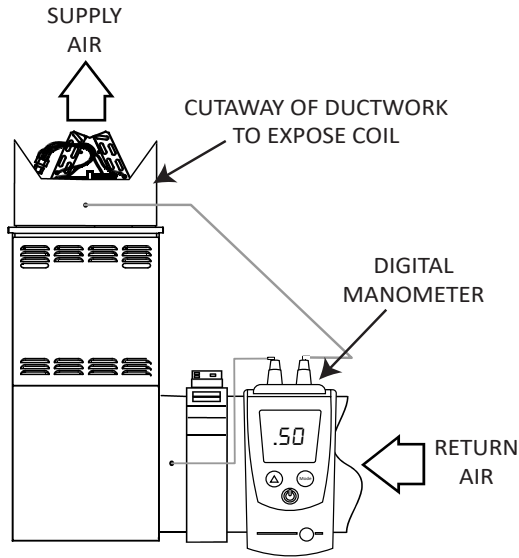
Total external static pressure on this system = .4" w.c.

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 these components, as shown in the following drawing.

4. Consult proper tables for the quantity of air.

SERVICING

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.



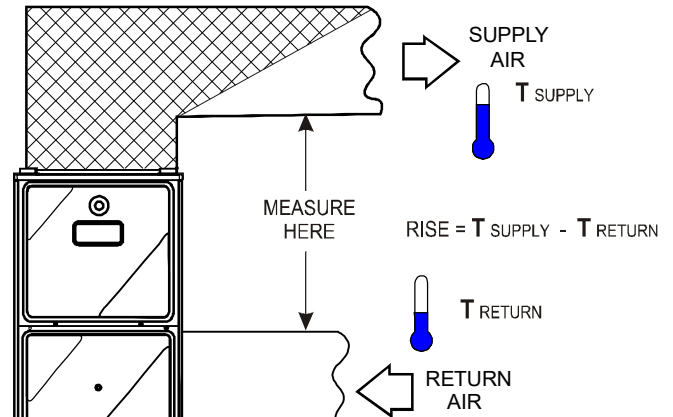
Checking Static Pressure

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:

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.

CROSS-HATCHED AREA SUBJECTED TO RADIANT HEAT. DO NOT MEASURE SUPPLY AIR TEMPERATURE IN THIS AREA.

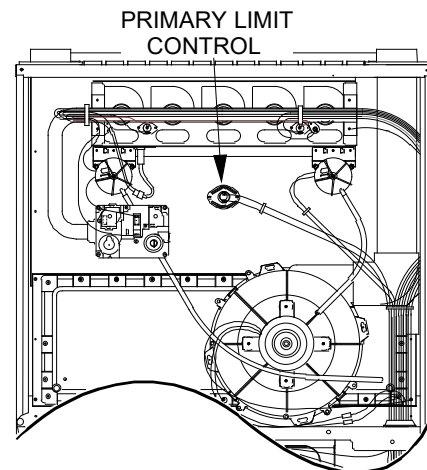


Checking Temperature Rise

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

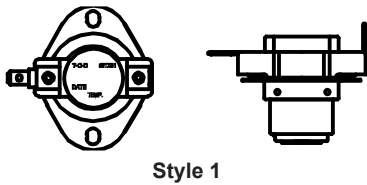
Primary limit switches are nonadjustable, automatic reset, bi-metal type limit controls. Refer to the following drawing for the location of the primary limit.



Primary Limit Control Location

SERVICING

The following drawing illustrates the style of limit switches used on the 80% furnaces.



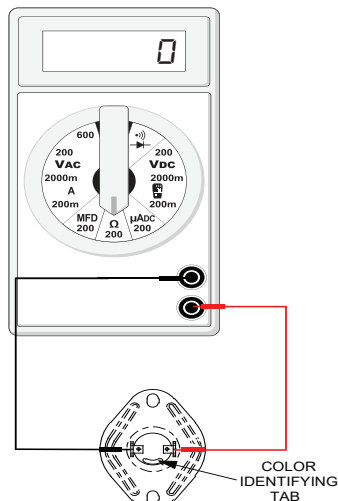
WARNING

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.

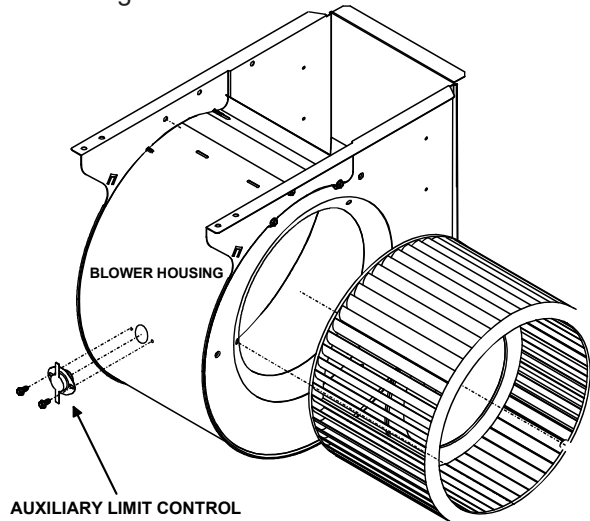


Testing Primary Limit Control

4. After completing check and/or replacement of primary limit control, reinstall burner compartment door.
5. Turn on electric power and verify proper unit operation.

CHECKING AUXILIARY LIMIT CONTROL

Auxiliary limit switches are nonadjustable, automatic reset, bi-metal type limit controls. This control is located in the blower compartment of the furnace and are attached to the blower housing.



Auxiliary Limit Control Location



WARNING

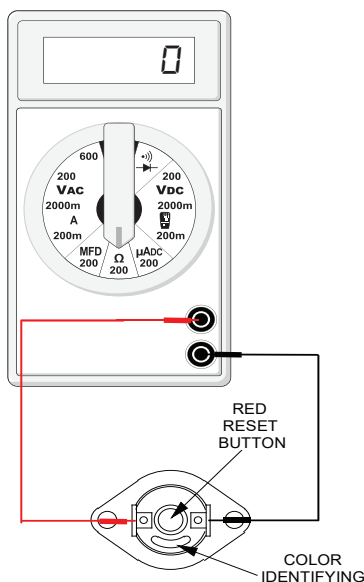
HIGH VOLTAGE!

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 auxiliary limits.
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 limit control is open due to excessive heat from the heat exchanger. If the limit does not automatically reset, replace the control.

SERVICING



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



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.



DR80SN*U

The induced draft assembly uses a three phase motor to draw flue gases through the heat exchanger. The inducer uses ball bearing and is permanently lubricated. This motor is driven at varying speeds by the VFD (variable frequency drive) section of the Integrated Furnace Control (IFC). The IFC take 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 Induced Draft Blower (IDB) 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 re-drilled. 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.



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.

SERVICING

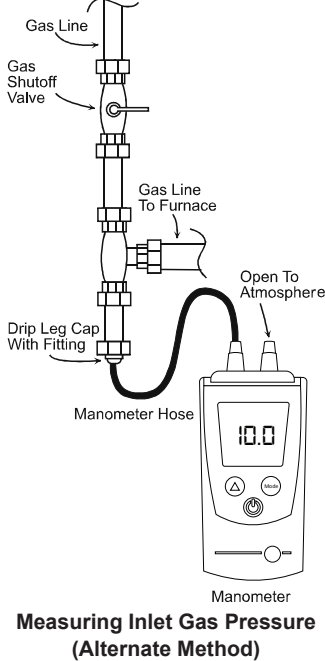
WARNING

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.



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.

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.

SERVICING

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 36G22 Valves:

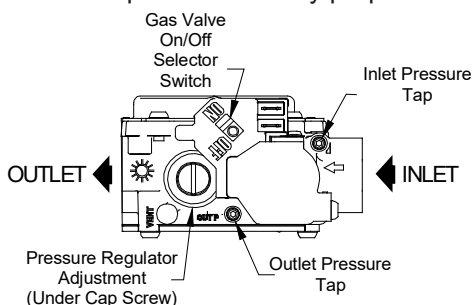
- Back outlet pressure test screw (inlet/outlet pressure boss) out one turn (counterclockwise, not more than one turn).
- Attach a hose and manometer to the outlet pressure boss.
- Turn ON the gas supply.
- Turn on power and close thermostat "R" and "W" contacts to provide a call for low stage heat.
- Measure the gas manifold pressure with burners firing. Adjust manifold pressure using the *Manifold Gas Pressure* table shown below.
- 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.
- Turn off all electrical power and gas supply to the system.
- Remove the manometer hose from the hose barb fitting or outlet pressure boss.
- 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 IGNITER

120V Silicon Nitride Igniter - 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.


WARNING

LINE VOLTAGE NOW PRESENT.

CHECKING PRESSURE TRANSDUCER (80% ULN)

The 80% ULN products utilize a pressure transducer (in lieu of a pressure switch). 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 to -4.0 inches W.C.

Voltage specifications:

- Steady State: 5.0 vDC from red to green wire (transducer wiring harness input).
- With Inducer off: 0.5 vDC from black to green wire (transducer wiring harness output).
- During operation: Output range equals 0.5 - 4.5 vDC.

Potential errors:

- Control board does not receive 0.25 vDC for inducer motor with motor off.
Will result in E1C error code on the control board.
- Control board does not receive the required voltage change (0.5 - 4.5 vDC) during inducer motor operation.
Will result in E1d 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.



SYSTEM OPERATION

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*).

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.



WARNING

LINE VOLTAGE NOW PRESENT.

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 1 & 3 (black & white wire) voltage between these 2 wires should be 120V.
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 DR80SN*U models, refer to the Induced Draft Blower Motor information on page 24 to complete step 3 above.

CHECKING FLAME SENSOR



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. 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 to 8 micro-amps. If the micro-amp reading is less than 1, 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.

AIRFLOW TABLES

DR80SN-U COOLING & CIRCULATION AIFLOW														
MODEL	THERMOSTAT CALL	TAP #	EXTERNAL STATIC PRESSURE (INCHES OF WATER COLUMN)											
			0.10	0.20	0.30	0.40	0.50		0.60		0.70		0.80	
			CFM	CFM	CFM	CFM	CFM	WATTS	CFM	WATTS	CFM	WATTS	CFM	WATTS
DR80SN0403AU*	Y1/Y2/G	F01	590	540	483	429	369	72	311	78	247	84	203	89
		F02	690	643	597	547	498	90	443	96	389	102	343	109
		F03	750	702	660	618	572	104	525	110	477	116	421	124
		F04	876	832	794	758	716	138	678	146	641	152	598	157
		F05^	927	881	841	806	771	155	734	161	698	168	662	174
		F06	1058	1015	976	945	915	202	881	210	849	218	818	226
		F07	1116	1071	1036	1003	975	230	943	236	919	245	884	252
		F08^^	1238	1192	1158	1124	1098	291	1070	299	1044	308	1016	318
		F09	1398	1357	1320	1293	1269	396	1239	405	1216	411	1194	416
DR80SN0603AU*	Y1/Y2/G	F01	587	542	490	437	382	75	318	82	266	88	207	93
		F02	685	638	590	543	498	92	448	98	392	105	339	112
		F03	856	814	774	732	693	136	657	142	622	148	581	154
		F04^	937	892	855	819	786	163	752	170	715	177	684	184
		F05	1060	1017	981	950	921	212	886	219	856	227	828	234
		F06^^	1108	1068	1033	1003	972	234	942	243	914	250	882	259
		F07	1274	1233	1203	1174	1146	327	1118	337	1089	345	1065	353
		F08	1374	1340	1306	1278	1254	399	1227	411	1201	414	1179	421
		F09	1437	1395	1362	1332	1305	473	1278	482	1253	492	1228	502
DR80SN0604BU*	Y1/Y2/G	F01	836	774	711	655	596	108	523	116	456	124	397	130
		F02	1274	1228	1188	1147	1107	248	1064	256	1027	266	990	276
		F03	1295	1256	1214	1181	1140	260	1100	269	1062	279	1024	287
		F04	1385	1337	1301	1260	1222	298	1186	308	1149	315	1114	326
		F05	1454	1407	1372	1353	1325	349	1291	360	1255	370	1219	379
		F06^	1528	1485	1438	1409	1383	382	1349	391	1317	402	1285	412
		F07	1619	1579	1551	1523	1495	444	1463	454	1430	464	1402	476
		F08^^	1746	1697	1667	1642	1617	534	1593	545	1570	559	1540	571
		F09	1772	1735	1698	1674	1645	559	1622	571	1598	584	1574	597
DR80SN0804BU*	Y1/Y2/G	F01	722	658	599	534	458	88	386	94	330	99	268	105
		F02	1270	1223	1179	1139	1105	250	1066	259	1029	267	996	277
		F03	1304	1254	1212	1173	1135	264	1104	273	1069	282	1032	290
		F04	1367	1318	1277	1236	1199	296	1169	306	1135	315	1102	327
		F05^	1473	1429	1386	1355	1320	354	1289	365	1258	372	1224	383
		F06	1560	1518	1476	1441	1409	409	1382	422	1350	429	1321	439
		F07	1647	1605	1562	1531	1497	460	1467	471	1440	481	1408	492
		F08^^	1720	1710	1674	1642	1611	544	1581	558	1553	565	1527	579
		F09	1796	1759	1721	1687	1655	582	1628	595	1604	607	1578	619
DR80SN0805CU*	Y1/Y2/G	F01	1280	1228	1178	1134	1086	204	1036	214	986	226	936	236
		F02	1401	1356	1313	1273	1234	252	1190	262	1145	270	1099	282
		F03	1593	1550	1512	1475	1436	332	1399	341	1360	354	1319	364
		F04	1706	1662	1621	1586	1550	383	1515	395	1479	407	1444	414
		F05^	1821	1775	1736	1703	1669	443	1636	455	1605	468	1576	480
		F06	1836	1793	1757	1721	1689	459	1659	472	1628	486	1592	497
		F07	1932	1888	1855	1825	1794	517	1762	532	1733	545	1701	560
		F08^^	2184	2143	2110	2072	2048	706	2017	724	1989	741	1959	756
		F09	2221	2178	2145	2109	2082	731	2053	747	2025	764	1992	780

*Models

^ Default Y1 speed

^^ Default Y2 speed

NOTE : Watts provided are blower motor watts.

AIRFLOW TABLES

DR80SN-U HEATING AIFLOW													
MODEL	THERMOST AT CALL	TAP #	EXTERNAL STATIC PRESSURE (INCHES OF WATER COLUMN)										
			0.10		0.20		0.30		0.40		0.50		0.60
			CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	
DR80SN0403AU*	W/W1	F02	690	42	643	46	597	49	547	53	498	55	443
		F03^	750	39	702	42	660	45	618	48	572	52	525
		F04	876	34	832	36	794	37	758	39	716	41	678
		F05	927	32	881	34	841	35	806	37	771	38	734
		F06	1058	28	1015	29	976	30	945	31	915	32	881
		F07	1116	27	1071	28	1036	29	1003	30	975	30	943
		F08	1160	26	1117	27	1083	28	1050	29	1018	29	986
DR80SN0603AU*	W/W1	F05	1060	42	1017	44	981	45	950	47	921	48	886
		F06	1108	40	1068	42	1033	43	1003	44	972	46	942
		F07^	1274	35	1233	36	1203	37	1174	38	1146	39	1118
		F08	1274	35	1228	36	1188	37	1147	39	1107	40	1064
DR80SN0604BU*	W/W1	F03	1295	34	1256	35	1214	37	1181	38	1140	39	1100
		F04^	1385	32	1337	33	1301	34	1260	35	1222	36	1186
		F05	1454	31	1407	32	1372	32	1353	33	1325	34	1291
		F02^	1270	47	1223	48	1179	50	1139	52	1105	54	1066
		F03	1304	45	1254	47	1212	49	1173	51	1135	52	1104
DR80SN0804BU*	W/W1	F04	1367	43	1318	45	1277	46	1236	48	1199	49	1169
		F05	1473	40	1429	41	1386	43	1355	44	1320	45	1289
		F06	1560	38	1518	39	1476	40	1441	41	1409	42	1382
		F01	1280	46	1228	48	1178	50	1134	52	1086	55	1036
		F02^	1401	42	1356	44	1313	45	1273	47	1234	48	1190
		F03	1593	37	1550	38	1512	39	1475	40	1436	41	1399
DR80SN0805CU*	W/W1	F04	1706	35	1662	36	1621	37	1586	37	1550	38	1515
		F05	1706	35	1662	36	1621	37	1586	37	1550	38	1515

TEMP RANGE
25 - 55
20 - 50
20 - 50
35 - 65
35 - 65

^ Default Heat Speed

TROUBLESHOOTING

Symptom	LED Status	Fault Description	Possible Causes	Corrective Action(s)	Notes & Cautions
Normal operation.	IdL	Idle	• Normal operation.	• None	• Normal operation.
Furnace fails to operate. Integrated control module LED display provides no signal.	nonE	No 120VAC power to furnace or no 24 volt power to integrated control module.	• Blown fuse or tripped circuit breaker. • Manual disconnect switch turned OFF, door switch open or 24 volt wire improperly connected or loose. • Furnace electrical supply shared with other devices. • Integrated control module is non-functional.	• Check furnace breaker to see if it has tripped. Reset breaker if tripped. • Check 120VAC power to furnace, primary side of the 24 volt transformer and integrated control module. • Check for possible shorts in 120VAC circuit. Repair as necessary. • If transformer has 120VAC on the primary side, confirm transformer has 24 volts on the secondary side. • Verify 24 volt wires from the transformer to the furnace control board are not damaged and are properly connected to the 12-pin harness. Make repairs or wiring corrections if needed. • If all wiring connections have been verified, replace the furnace control board.	• Turn power OFF prior to repair. • Make wiring repairs or wiring corrections as needed. • Read precautions in "Electrostatic Discharge" section of manual. • Replace control with correct replacement part.
Furnace fails to operate and goes into a hard lockout.	EbL	Circulator blower motor is consuming very little current after heat ON delay - below expected value.	• Loose wiring connections to and from the blower motor. • Circulator blower motor 120 volt L1 wire is not plugged into the CIRC-H connection on the integrated control board. • Heating blower speed not set correctly. • Circulator blower motor failure.	• Check for loose wiring connections to and from the circulator blower motor. • Verify 120 volt L1 wire from blower motor is plugged into the CIRC-H connection on the integrated control board. • Verify blower voltage, amps and proper speed setting. Replace blower motor if necessary.	• Turn power OFF prior to repair. • Replace blower motor with correct replacement part.
Furnace fails to operate and goes into a hard lockout.	EbU	Circulator blower motor is consuming too much current during inducer pre-purge is higher than expected value.	• Circulator blower motor power wiring reversed on integrated control board.	• Check for loose wiring connections to and from the circulator blower motor. • Check for miswired connections on the integrated control board.	• Turn power OFF prior to repair.
Furnace fails to operate.	Ed0	No Shared data.	• No Shared data.	• Populate shared data set using BTPIM01.	• Turn power OFF prior to repair. • Use the BTPIM01 Plug-In Module to download the shared data set to the furnace.
Furnace fails to operate.	Ed8	Invalid Call (check ODS setting)	• ODS setting does not match outdoor unit.	• Setup ODS to match outdoor unit. • Setup TON airflow to match outdoor unit.	• Set system to IdL before setting ODS and TON
Furnace fails to operate.	EE0	Furnace lockout due to excessive number of ignition "retries" (3 total). Failure to establish flame. Loss of flame after establishment.	• No gas or improper gas pressure to burners. • Bad igniter or igniter alignment. • Orifices restricted. • Coated/oxidized or improperly connected flame sensor. • Restriction in flue and/or lack of combustion air. • Improper induced draft blower performance.	• Locate and correct gas interruption. • Replace or realign igniter. • Check flame sense signal. Clean sensor if coated and/or oxidized. • Check flue piping for blockage, proper length, elbows and termination. • Verify proper induced draft blower performance.	• Turn power OFF prior to repair. • Igniter is fragile, handle with care. • Clean flame sensor with steel wool. • See "Vent/Flue Pipe" section for piping details.

TROUBLESHOOTING

Symptom	LED Status	Fault Description	Possible Causes	Corrective Action(s)	Notes & Cautions
Furnace fails to operate.	EE1	Pressure switch circuit closed at start of heating cycle.	- Pressure switch contacts sticking. - Short in pressure switch circuit wiring.	- Replace pressure switch. - Repair short in wiring.	- Turn power OFF prior to repair. - Replace pressure switch with proper replacement part.
Induced draft blower runs continuously with no further furnace operation.	EE2	Pressure switch circuit open.	- Pressure switch hose blocked, pinched, or connected improperly. - Blocked flue pipe, or weak induced draft blower. - Incorrect pressure switch set point or malfunctioning switch contacts. - Loose or improperly connected wiring.	- Inspect pressure switch hose. Repair/replace if necessary. - Inspect flue piping for blockage, proper length, elbows and termination. Correct as necessary. - Check induced draft blower performance. Correct as necessary. - Check pressure switch operation. Replace as needed. - Tighten or correct wiring connections.	- Turn power OFF prior to repair. - Replace pressure switch with proper replacement part. - Replace induced draft blower with proper replacement part.
Circulator blower runs continuously with no furnace operation.	EE3	Primary limit circuit 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 connections.	- Turn power OFF prior to repair. - See Specification Sheet applicable for your model for allowable temp rise range and proper circulator speed.
Induced draft blower and circulator blower run continuously with 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 flame. - Verify proper operation of gas valve.	Turn power OFF prior to repair.
No furnace operation.	EE5	Open fuse.	- Blown fuse - Short in low voltage wiring - Back of control board is touching mounting panel because standoffs are missing.	- Replace fuse - Locate and correct short in low voltage wiring. - Replace the missing standoffs.	- Turn power OFF prior to repair. - Replace fuse with 3-amp automotive type.
Normal furnace operation with weak flame signal.	EE6	Flame sense micro amp signal is low.	- 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 flame sensor for proper alignment. - Compare current gas pressure to rating plate and adjust as needed.	- Turn power OFF prior to repair. - Clean flame sensor with steel wool. - See "Vent/Flue Pipe" section for piping details. - See rating plate for proper gas pressure.
Furnace fails to operate.	EE7	Problem with ignitor circuit.	- Improperly connected ignitor. - Shorted ignitor. - Poor furnace ground. - Ignitor relay fault on integrated control module.	- Check and correct wiring from integrated control board to ignitor. - Diagnose and replace shorted ignitor as needed. - Verify and correct furnace ground wiring. - Check ignitor output from control. Replace if necessary.	- Turn power OFF prior to repair. - Replace ignitor with correct replacement part. - Replace control with correct replacement part.
Furnace fails to operate.	E10	Grounding fault	Poor neutral connection.	Verify neutral wire connection to furnace and continuity to ground source.	Turn power OFF prior to repair.

TROUBLESHOOTING

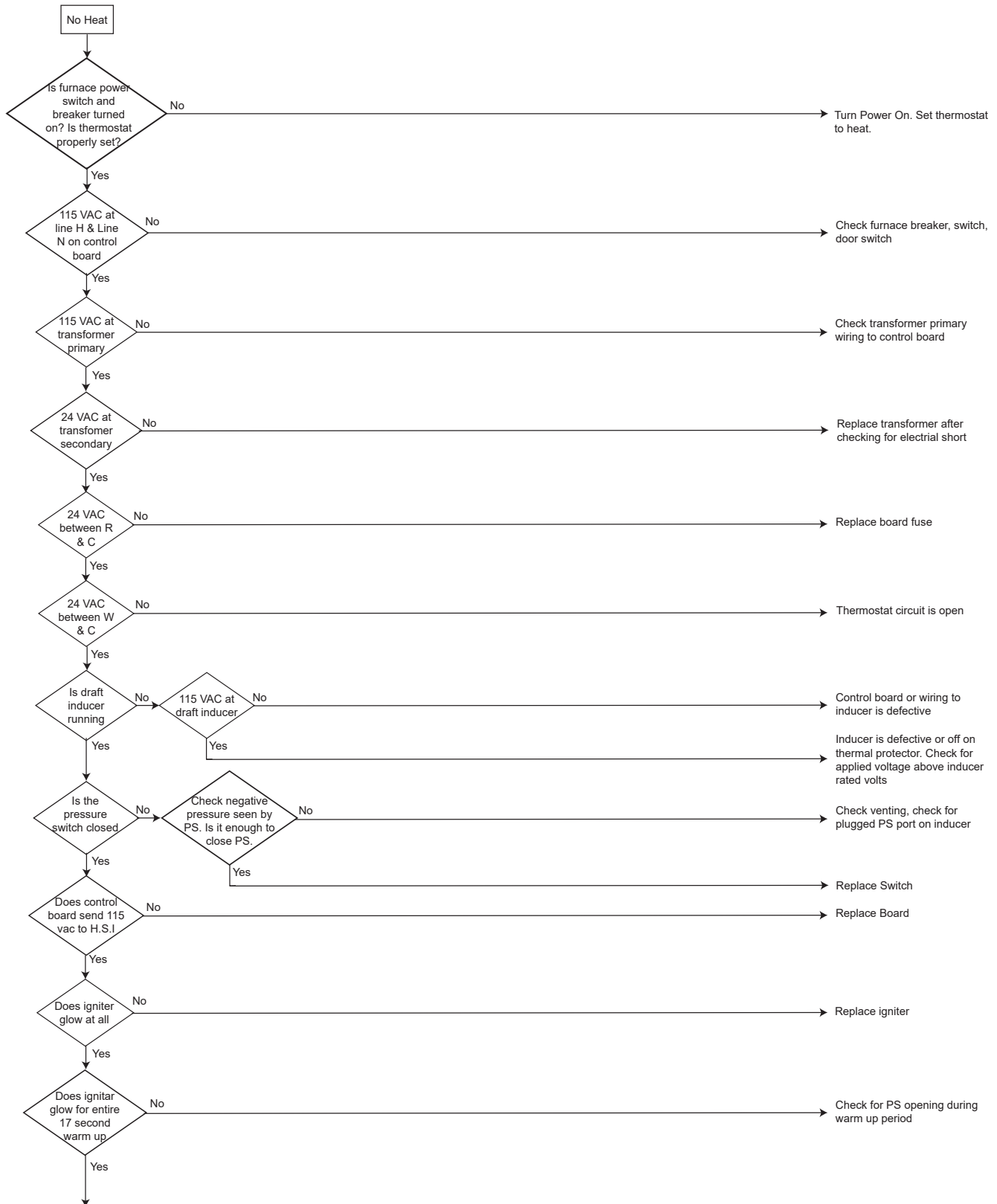
Symptom	LED Status	Fault Description	Possible Causes	Corrective Action(s)	Notes & Cautions
Furnace fails to operate.	E11	Open burner box limit switch circuit.	- Gas pressure too high. - Burners mis-aligned. - Restricted heat exchanger or venting.	- Check and correct gas pressure. - Check and correct burner alignment. - Check and correct restriction.	Turn power OFF prior to repair.
Furnace fails to operate.	E12	Redundant relay open alarm.		- Replace integrated control board. - Do not replace additional components based on this error code.	- Turn power OFF prior to repair. - Replace the integrated control board with proper replacement part.
Furnace fails to operate.	E13	Redundant relay stuck closed alarm.		- Replace integrated control board. - Do not replace additional components based on this error code. NOTE: If E13 error code is still active after replacing control board, replace the system wire harness.	- Turn power OFF prior to repair. - Replace the integrated control board with proper replacement part.
Furnace fails to operate.	EbF	Inducer communication alarm	Loose wiring connections from the integrated control board to the inducer.	Check Red, Black, White harness and connections to the inducer and integrated control board.	Turn power OFF prior to repair.
Furnace fails to operate.	E1b	Analog Pressure Sensor reference error.	5VDC reference voltage out of range (5.0 +/- 0.2 VDC for 5 seconds).	- Check Red, Black, White harness and connections to the inducer and integrated control board. - Replace pressure sensor.	Turn power OFF prior to repair.
Furnace fails to operate.	E1C	Analog Pressure Sensor null error.	Pressure Sensor voltage out of range when inducer is off.	- Check Red, Black, White harness and connections to the inducer and integrated control board. - Check pressure hoses to pressure sensor and pressure switch.	Turn power OFF prior to repair.
Furnace fails to operate.	E1d	Analog Pressure Sensor span error.	- Pressure sensor out of range when pressure switch is closed. - Pressure switch opens and closes outside of expected pressure sensor range.	- Check Red, Black, White harness and connections to the inducer and integrated control board. - Check pressure hoses to pressure sensor and pressure switch. - Replace pressure switch if error continues.	- Turn power OFF prior to repair. - Replace pressure switch with proper replacement part.
Furnace fails to operate.	E1E	Analog Pressure Sensor pressure error.	- Inducer RPM has reached its limit. - Blocked flue pipe.	- Check Red, Black, White harness and connections to the inducer and integrated control board. - Check flue piping for blockage, proper length, elbows and termination. - Replace pressure sensor if necessary.	Turn power OFF prior to repair.
Furnace fails to operate.	E1F	Analog Pressure Sensor input error.	Wrong pressure sensor installed.	- Check Red, Black, White harness and connections to the inducer and integrated control board. - Replace pressure sensor.	- Turn power OFF prior to repair. - Replace pressure sensor with proper replacement part.
Furnace fails to operate.	EbF	Inducer communication alarm	Loose wiring connections from the integrated control board to the inducer.	Check Red, Black, White harness and connections to the inducer and integrated control board.	Turn power OFF prior to repair.
Furnace fails to operate.	EEA	Polarity of 120 volt AC is reversed.	- Polarity of 120 volt AC power to furnace or integrated control module is reversed. - Poor furnace ground.	- Review wiring diagram to correct polarity. - Verify proper ground. Correct if necessary. - Check and correct wiring.	Turn power OFF prior to repair.
Furnace fails to operate.	EEb	Integrated Control Board is not energizing the gas valve when it should be on.	- Miswired gas valve circuit. - Open gas valve circuit. - Gas valve relay on integrated control board stuck open.	- Check wiring in gas valve circuit. - Replace integrated control board. - Do NOT replace the gas valve.	Turn power OFF prior to repair.

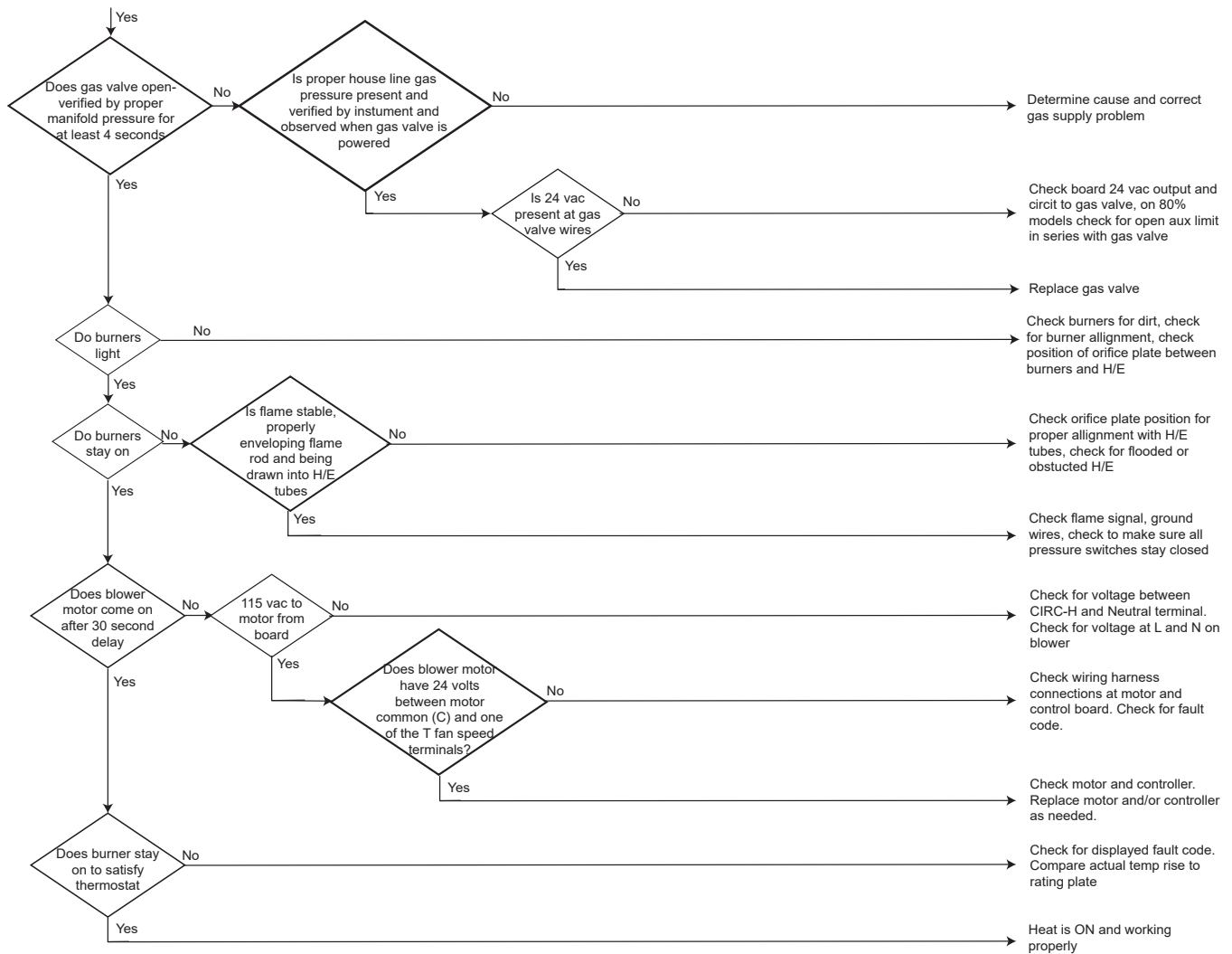
TROUBLESHOOTING

Symptom	LED Status	Fault Description	Possible Causes	Corrective Action(s)	Notes & Cautions
Furnace fails to operate.	EEC	Gas valve is energized when it should be off.	• Miswired gas valve circuit. • Shorted gas valve wiring.	• Cycle 120VAC power to the furnace control. If EEC error code is still active, turn off power to the furnace and continue diagnosis. - NOTE: This error code is a wiring issue external to the furnace control board. • Inspect system wiring for damage and repair if needed. • If EEC error code is still active, replace system wiring harness. - NOTE: After replacing system wire harness, if EEC is still active, replace integrated control board.	• Turn power OFF prior to repair.
Furnace fails to operate.	EEd	Auxiliary limit switch open (blower compartment).	• 120 volt power supply was shut off during heat cycle. • 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 connections.	• Turn power OFF prior to repair. • See Specification Sheet applicable for your model for allowable temp rise range and proper circulator blower speed.
Furnace fails to operate.	EEE	Furnace control board has detected an internal fault.	• 120VAC power wiring loose or damaged. • Poor ground wire. • Damaged or miswired 120V or 24V wiring on the furnace.	• Turn off power to the furnace for at least 3 minutes, then turn power back on (to see if the EEE code will reset). • Inspect 120V and 24V wiring to the furnace and on the furnace for signs of damage or miswiring. • Replace integrated control board. • Do not replace additional components based on this error code.	• Turn power OFF prior to repair. • Replace the integrated control board with proper replacement part. • Do not replace additional components based on this error code.

TROUBLESHOOTING

Symptom	LED Status	Fault Description	Possible Causes	Corrective Action(s)	Notes & Cautions
Twinning feature not working.	EEH	Error with Twinning function.	- Both furnaces not on the same 120VAC power from the breaker panel. - Low voltage wiring error or loose wiring connections.	- Verify both furnaces are on the same 120VAC power from the breaker panel. - Turn off power to both furnaces. Disconnect the twinning wire between the two furnace control boards. Turn power back on to both furnaces. - Confirm both furnaces are powered and the furnace control boards do not have any active error codes. If one of the controls displays the EEH, (without the twinning wire) replace only that control board. 3) Turn power off to both furnaces again. Re-connect the twinning wires between both furnace control boards. Verify the twinning wire is properly connected and not damaged. Replace the wire if necessary. Turn power back on to both furnaces. 4) Confirm thermostat wiring is correct per the installation manual. Provide a G (Fan Only) signal to the main furnace control. Check if the twinned furnace starts running the blower at the same speed as the main furnace. 5) If the twinned furnace is not operating the fan and the EEH fault is still active, Replace one of the furnace control boards. If EEH is still active, replace the second furnace control board.	- Turn power OFF prior to repair. - Replace the integrated control board with proper replacement part.
Furnace stops heating and only the fan is operating.	EAF	Furnace has lost communication with the R-32 sensor and the furnace is in mitigation mode.	Furnace may not be paired with R-32 Cooling Unit. Refer to the R-32 Information Section. Loose or damaged R-32 sensor wire.	- Verify wire connection to R-32 sensor is not loose. - Verify the R-32 sensor wire is not damaged. - Replace R-32 sensor if necessary.	- Turn power OFF prior to repair. - Replace R-32 sensor with proper replacement part.
Furnace stops heating and only the fan is operating.	EAL	R-32 sensor has detected a refrigerant leak and furnace is in mitigation mode.		- Investigate the indoor coil for a refrigerant leak. - Furnace will resume normal operation once a leak is not detected and the 5 minute delay period is over.	Turn power OFF prior to repair.
Furnace stops heating and only the fan is operating.	EAS	R-32 sensor has detected a fault and furnace is in mitigation mode.		- Investigate the R-32 sensor. - Replace the R-32 sensor if necessary.	- Turn power OFF prior to repair. - Replace R-32 sensor with proper replacement part.
Furnace stops heating and only the fan is operating.	EAr	The furnace control board has detected an issue with the internal A2L relay and is running mitigation mode.		- Disconnect any wire connected to the ALARM terminal of the furnace control. - Cycle power to the furnace. If the error code clears, there is an issue with the wiring connected to the ALARM terminal. Repair wiring if necessary. - If the error code does not clear, replace the integrated control board.	- Turn power OFF prior to repair. - Replace the integrated control board with proper replacement part.



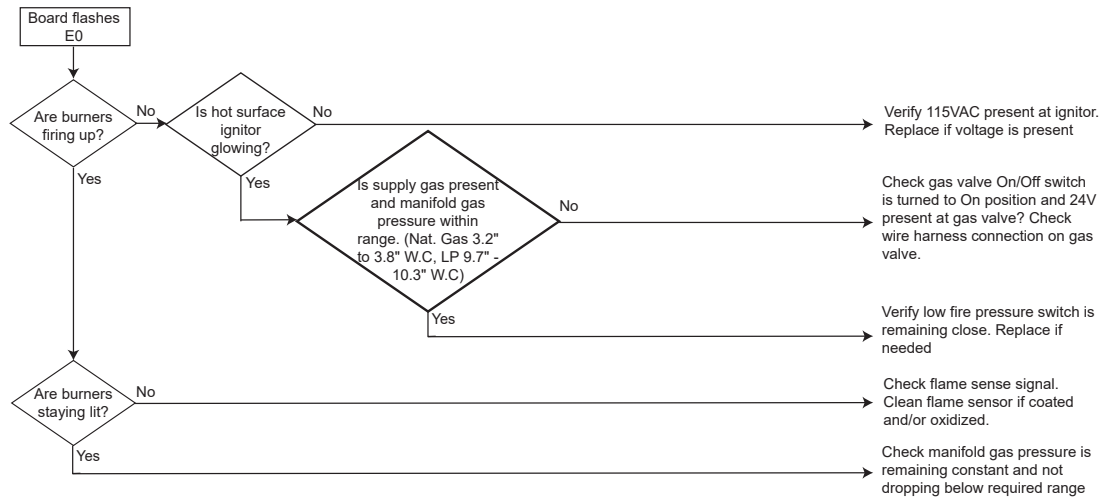


Error Code:
E0 - Lockout due to an excessive number of ignition retries (3 total)

Applicable Models:
All 80% models

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

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



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

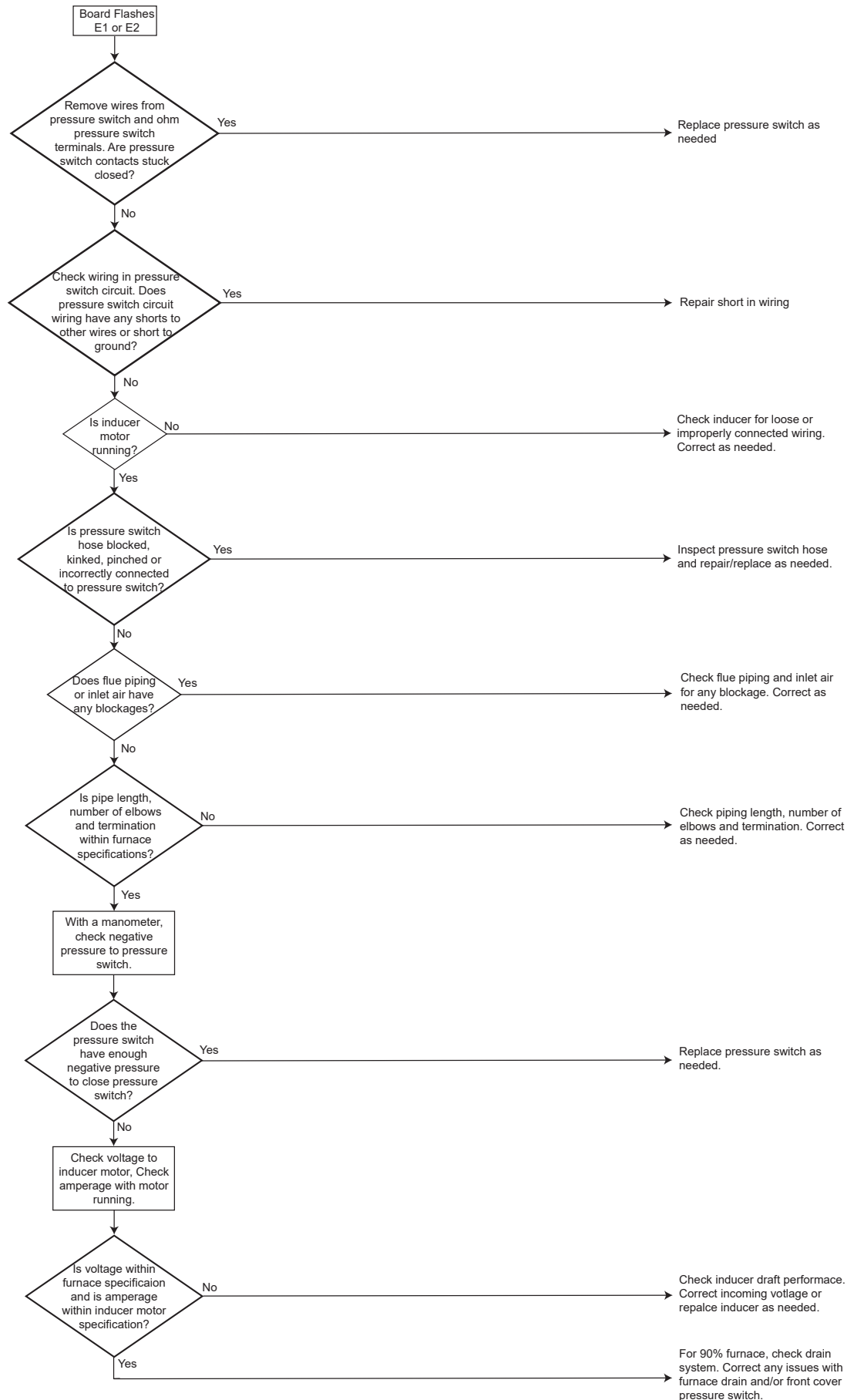
(For Goodman/Amana ULN)
AM9S-U, GM9S-U

(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.

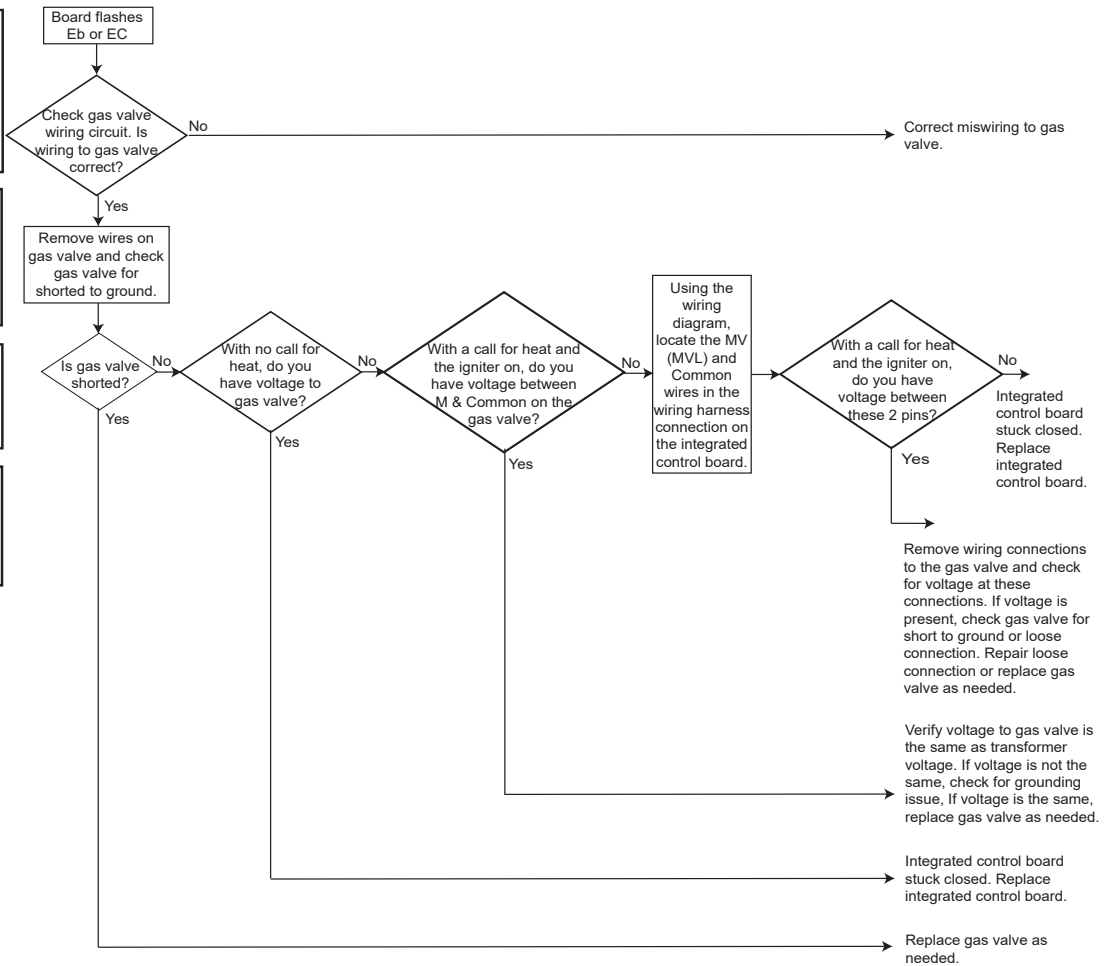
EC - Gas valve is energized when it should not be. Internal Gas Valve Error.

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.

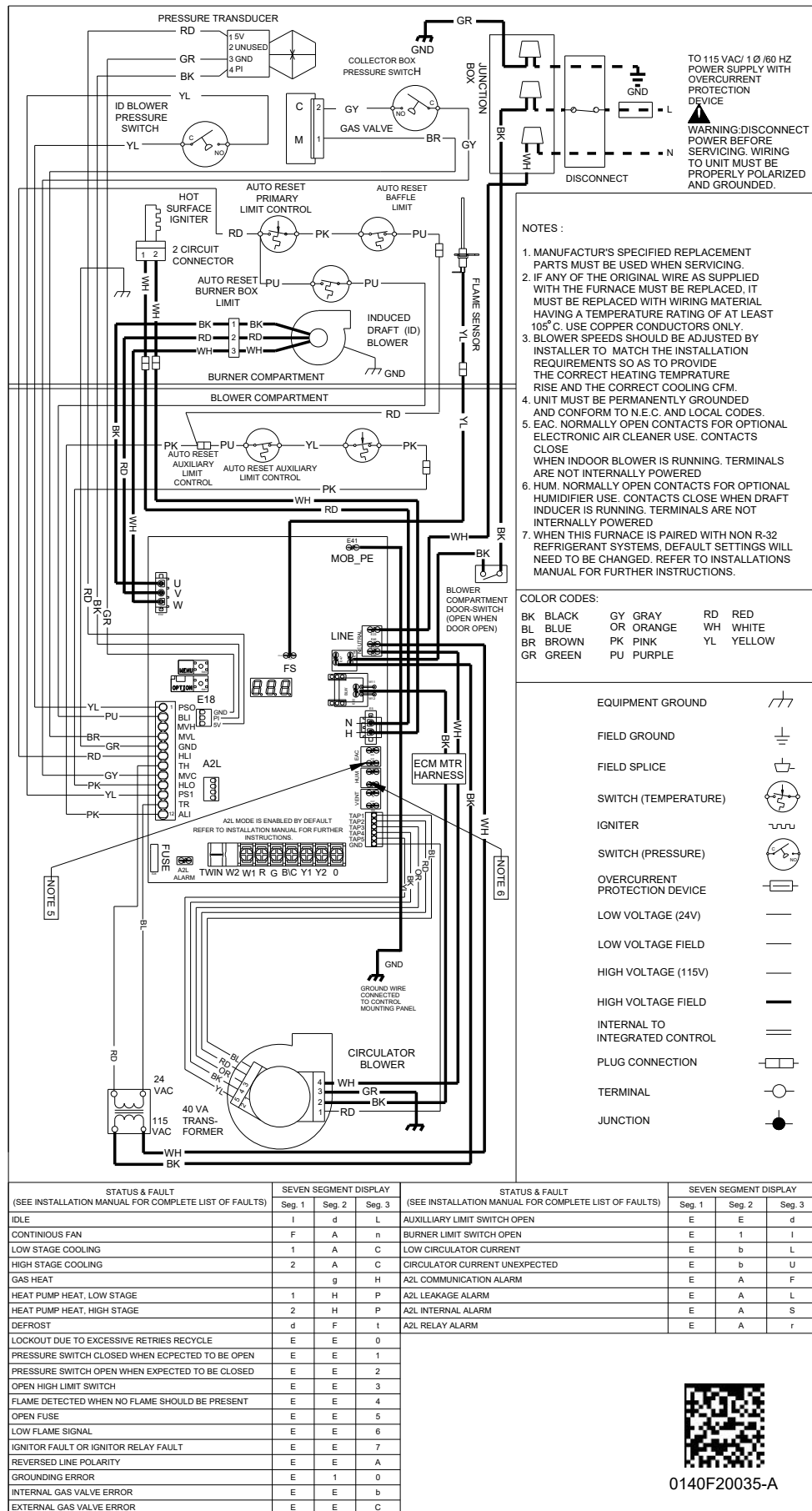
Error Decision Conditions:
No voltage reading at gas valve with a call for heat.
Voltage reading at gas valve with no call for heat.





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



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