Deluxe 2-Stage Gas-Fired Induced-Combustion Furnaces With PSC or ICM Blower Motor

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Troubleshooting Guide

NOTE: Read the entire instruction manual before starting the installation.

SAFETY CONSIDERATIONS

This symbol → indicates a change since the last issue.

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INSTRUCTIONS

This guide uses your expertise and observations to lead you to the trouble spot as efficiently as possible. This is only intended as a guide and should not be used blindly. Your experience and expertise are of high value when troubleshooting this unit. Do not disregard all of your instincts.

The 2-stage furnace control was designed with diagnostic capabilities built in. A RED LED is used to flash a status code which will lead you to 1 of the sections as listed in the Index.

You should **ALWAYS** begin in the **START HERE** section (see Index for page number) which will guide you to the appropriate section where a minimal number of steps will be used to correct the problem. If you are very experienced at how this furnace operates, you can use the Quick Reference Troubleshooting Guide in Appendix D to isolate the problem. Once in a section, read the ACTION. An ACTION may have a number in the GO TO column. Do whatever the ACTION says, then proceed to the step indicated in the GO TO column.

If the ACTION is a question (a question will have a number in the YES or NO column), answer it YES or NO. If the answer is YES, go to the step indicated in the YES column. If the answer is NO, go to the step indicated in the NO column.

Let's try our guide out using the EXAMPLE table on page 3, and see how it works. Suppose that the problem is a defective low-heat pressure switch (for example the contacts will not open). This is an internal problem and cannot simply be seen. We go to the START HERE section to Step 1.

GENERAL

The furnace must have a 115-vac power supply properly connected and grounded. Correct polarity must be maintained to enable gas heating operation.

The gas service pressure must not exceed 0.5 psig (14-in.wc), and be no less than 0.16 psig (4.5-in.wc).

Thermostat wire connections to furnace at R and W/W1 are the minimum required for gas heating operation. W2 must be connected for 2-stage heating thermostats. Y/Y2 and G are required to be connected to furnace for cooling and heat pumps. G is required for continuous fan. COM-24V is required for some clock thermostats. These connections must be made at 24-vac terminal block on furnace control. (See Appendix A.) O is required for heat pumps for ICM blower motors only. Y1 is required for 2-stage cooling and 2-stage heat pumps for ICM blower motors only. The O and Y1 connections must be made to ICM furnaces' orange and blue leads flagged "O" and "Y1", respectively.

These furnaces can be installed with either a single-stage heating or a 2-stage heating thermostat.

80% Efficient Non-Condensing Furnace Models and Nomenclature

58 UHV 060 --- 1 0 1 12

Model Number Description
58—Gas Furnace

Type of Unit

UHV—80% Efficient, Upflow and Horizontal, 2-Stage, Variable-Speed ICM

TUA—80% Efficient, Upflow, 2-Stage, PSC Motor

TMA—80% Efficient, Downflow and Horizontal, 2-Stage, PSC Motor

Low NOx, California Units (X)

UXT—80% Efficient, Upflow and Horizontal, 2-Stage, PSC Motor, Low NO_x

UXV—80% Efficient, Upflow and Horizontal, 2-Stage, Variable-Speed, ICM, Low NO_x

DXT—80% Efficient, Downflow, 2-Stage, PSC Motor, Low NO_x

1000 of BTU Input
040—40,000
060—60,000
065—65,000
080—80,000
085—85,000
100—100,000
105—105,000
120—120,000
125—125,000

Not Used

Electrical Supply
1—115 Volts

Series

Packaging
0—Not Packaged
1—Packaged

Nominal CFM @ 0.5 Total ESP
08—800 CFM
12—1200 CFM
14—1400 CFM
16—1600 CFM
20—2000 CFM

EXAMPLE
Start Here Section

STEP	ACTION	YES	NO	GO TO
1.	Step 1 tells us to remove control door first and NOT TO REMOVE THE BLOWER DOOR because it will erase status codes stored in memory. It then asks the question, "Is RED LED status light on?" If low-heat pressure switch was defective, a low-heat pressure switch did not open, and a status code would be flashing, so the answer is YES. We go to Step 2.	2	19	—
2.	Step 2 asks the question, "Is RED LED status light blinking rapidly without a pause?" If low-heat pressure switch was defective, a low-heat pressure switch did not open, and a status code would be flashing, so the answer is NO. We go to Step 4.	3	4	—
4.	Step 4 asks the question, "Is RED LED status light blinking ON/OFF slowly with a combination of short and long flashes?" If low-heat pressure switch was defective, a low-heat pressure switch did not open, and a status code would be flashing, so the answer is YES. We go to Step 5.	5	7	—
5.	Step 5 tells us to determine the status code. The status code is a 2 digit number with the first digit determined by the number of short flashes and the second digit by the number of long flashes. So we count the short and long flashes and see that status code 23 is flashing and go to Step 6.	—	—	6
6.	Step 6 tells us to go to Status Code 23 section.	—	—	INDEX

For single-stage thermostats, connect thermostat R to W/W1 at furnace control terminal block. For single-stage thermostats, the control determines (based on lengths of previous heating on and off cycles) when to operate in low- and high-gas heat for optimum comfort. (See Appendix F.) Setup switch-2 (SW-2) must be in factory-shipped OFF position.

If a 2-stage heating thermostat is to be used, move SW-2 to ON position at end of furnace installation. This overrides the built-in control process for selecting high and low fire and allows the 2-stage thermostat to select gas heating modes. W2 from thermostat must be connected to W2 on control terminal block.

⚠ CAUTION

This furnace is equipped with a manual reset limit switch in the gas control area. The switch will open and shut off power to the gas valve, if a flame rollout or overheating condition occurs in the gas control area. DO NOT bypass the switch. Correct inadequate combustion-air supply, component failure, or restricted flue gas passageway before resetting the switch.

Before operating furnace, check each manual reset switch for continuity. If necessary, press and release the button to reset the switch.

SEQUENCE OF OPERATION

Using schematic diagrams in Appendix A, follow the sequence of operation through the different modes. Read and follow diagram very carefully.

NOTE: Permanent-split-capacitor(PSC) motors and G.E. Integrated Control Motors(ICM) operate differently. PSC motors are basically fixed-multiple-speed motors, that is they operate within small ranges of speed. The ranges, usually 4, can be selected by connecting to different 115-vac motor wires. The speed ranges are small, about 100 RPM wide, and are dependent on the motor's synchronous speed (1200 for most furnaces). The characteristics of PSC motors limit selections to fixed speeds between about 700 and 1100 RPM. The ICM motor speeds are infinitely variable from 300 to 1400 RPM and are dynamically controlled to precisely control airflow CFM. The start and stop characteristics of PSC and ICM motors differ in that PSC motors ramp up to speed rapidly and coast to a stop slowly. ICM motors ramp up to speed at a controlled rate to reduce start-up noise perception (4 to 11 sec, depending on target operating CFM). ICM ramp-down time is the same as ramp-up time. ICM ramp-up and ramp-down times are additive to blower on and off delays, respectively. The PSC motor is energized with 115 vac only when operating. The ICM is energized with 115 vac whenever power is available at furnace control, but operates only when 24-vac motor control input(s) are ON. Other motor differences will be included in the following information.

NOTE: If a power interruption occurs during a "call for heat" (W/W1 or W/W1-and-W2) and if thermostat is still calling for gas heating, the control starts a 90-sec blower-only ON period 2 sec after power is restored. The red LED will flash status code 12 during the 90-sec period, after which LED will be on continuously as long as no faults are detected. PSC motors operate at low-gas-heat or high-gas-heat CFM, respectively. ICM motors operate at low-gas-heat CFM in both cases. After the 90-sec period, furnace responds to thermostat normally.

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

Step 1—Adaptive Heating Mode—Single-Stage Thermostat with 2-Stage Heating

NOTE: With high-heat-only switch SW-1 in OFF position, low-heat-only switch SW-2 selects either low-heat-only operation mode when on (see Step 2 below), or adaptive heating mode when off in response to a call for heat. (See Appendix F.) When high-heat-only switch SW-1 is in ON position, it always initiates high-gas-heat operation when R-W/W1 circuit is closed, regardless of setting of low-heat-only switch SW-2.

These furnaces can operate as a 2-stage furnace with a single-stage thermostat because furnace control CPU includes a programmed adaptive sequence of controlled operation, which selects low-gas-heat or high-gas-heat operation. This selection is based upon the stored history of the lengths of previous gas heating on/off periods of the single-stage thermostat.

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

If power is interrupted, stored history is erased. When this happens, the control CPU selects low-gas heat for 16 minutes and then switches to high-gas heat, as long as thermostat continues to call for heat. Subsequent selection is based on stored history of thermostat cycle times.

When wall thermostat "calls for heat," R-W/W1 circuit closes. The furnace control performs a self-check, verifies low-heat and high-heat pressure switches' contacts LPS and HPS are open, and starts inducer motor IDM in low speed or high speed as appropriate.

1. Inducer prepurge period—As inducer motor IDM comes up to low speed or high speed, low-heat (and high-heat) pressure switch contacts LPS (and HPS) close to begin a 15-sec prepurge period.
2. Igniter warm-up—At the end of prepurge period, the hot surface igniter HSI is energized for a 17-sec ignitor warm-up period.
3. Trial-for-ignition sequence—When igniter warm-up period is completed, main gas valve relay contacts MGVR-1 and -2 (and high-heat pressure switch relay HPSR) close to energize low-heat gas valve solenoid(s) GV and humidifier terminal HUM. The gas valve opens, and 24-vac power is supplied for a field-installed humidifier at terminals HUM and COM-24V. The low-heat (and high-heat) gas valve solenoid(s) GV permit(s) gas flow to burners where it is ignited. After 5 sec, igniter HSI is de-energized, and a 2-sec flame-proving period begins. If high-heat pressure switch HPS fails to close on a call for high-gas heat and low-heat pressure switch LPS closes, furnace operates at low-heat gas flow rate until high-heat pressure switch closes.
4. Flame-proving—When burner flame is proved at flame-proving sensor electrode FSE, the control CPU begins blower on delay period and continues to hold gas valve GV open. If burner flame is not proved within 2 sec, the control CPU closes gas valve GV, and the control CPU repeats ignition sequence for up to 3 more trials-for-ignition before going to ignition lockout. LOCKOUT IS RESET AUTOMATICALLY after 3 hr, or by momentarily interrupting 115-vac power to furnace, or by interrupting 24-vac power at SEC1 or SEC2 to control CPU (not at W/W1, G, R, etc.). Opening thermostat R-W circuit will not reset an ignition lockout. If flame is proved when flame should not be present, the control CPU locks out of gas heating mode and operates inducer motor IDM on high speed until flame is no longer proved.
5. Blower on delay—If burner flame is proven, 45 sec after gas valve GV is opened, blower motor BLWM is energized at appropriate heating airflow, low-gas-heat or high-gas-heat CFM. Simultaneously, EAC terminals EAC-1 and EAC-2 are energized with 115 vac and remain energized as long as blower motor BLWM is operating.
6. Switching from low- to high-gas heat—If furnace control CPU switches from low-gas heat to high-gas heat, the control CPU switches inducer motor IDM speed from low to high. The high-heat pressure switch relay HPSR closes. When inducer motor IDM provides sufficient pressure to close high-heat pressure switch HPS, high-heat gas valve solenoid GV is energized. Blower motor BLWM switches to high-gas-heat airflow 5 sec after control CPU switches from low-gas heat to high-gas heat.
7. Switching from high- to low-gas heat—The control CPU will not switch from high-gas heat to low-gas heat while thermostat R-W circuit is closed when a single-stage thermostat is used.
8. Blower off delay—When thermostat is satisfied, R-W circuit opens, de-energizing gas valve GV, stopping gas flow to burners, and de-energizing humidifier terminals HUM and COM-24V. Inducer motor IDM remains energized for a 5-sec post-purge period. A PSC blower motor BLWM continues operating at the same airflow for 90, 135, 180, or 225 sec (depending on selection at blower off delay switches SW-3 and SW-4). An ICM blower motor BLWM which had been operating at low- or high-gas-heat airflow operates at low-gas-heat airflow for 90 sec. If selected off delay period exceeds 90 sec, ICM blower motor BLWM operates at continuous blower airflow for remainder of off delay period. The furnace control CPU is factory set for a 135-sec blower off delay.

Step 2—Non-Adaptive Heating Mode—Two-Stage Thermostat with 2-Stage Heating

NOTE: The low-heat-only switch SW-2 in ON position selects low-heat-only operation mode in response to closing thermostat R-W1 circuit when high-heat-only switch SW-1 is in OFF position. Closing thermostat R to W1 and W2 circuits is required for high-gas-heat operation. When high-heat-only switch SW-1 is in ON position, it always initiates high-gas-heat operation when R-W1 circuit is closed, regardless of setting of low-heat-only switch SW-2 and regardless of whether R-W2 circuit is closed or open.

The start-up and shutdown functions and delays described in Step 1 apply to 2-stage heating mode as well, except for switching from low- to high-gas heat and vice versa.

1. When wall thermostat "calls for heat," R-W/W1 circuit closes for low-gas heat or R to W1-and-W2 circuits close for high-gas heat. The furnace control performs a self-check, verifies low-heat and high-heat pressure switches' contacts LPS and HPS are open, and starts inducer motor IDM in low speed or high speed as appropriate.
2. Switching from low- to high-gas heat—If thermostat R-W/W1 circuit for low-gas heat is closed and R-W2 circuit for high-gas heat closes, the control CPU switches inducer motor IDM speed from low to high. High-heat pressure switch relay HPSR closes. When inducer motor IDM provides sufficient pressure to close high-heat pressure switch HPS, high-heat gas valve solenoid GV is energized. Blower motor BLWM switches to high-gas-heat airflow 5 sec after R-W2 circuit closes.
3. Switching from high- to low-gas heat—If thermostat R-W2 circuit for high-gas heat opens and R-W/W1 circuit for low-gas heat remains closed, the control CPU switches inducer motor IDM speed from high to low. High-heat pressure switch relay HPSR opens to de-energize high-heat gas valve solenoid GV. When inducer motor IDM reduces pressure sufficiently, high-heat pressure switch HPS opens. Low-heat gas valve solenoid GV remains energized as long as low-heat pressure switch LPS remains closed. Blower motor BLWM switches to low-gas-heat airflow 5 sec after R-W2 circuit opens.

Step 3—Cooling Mode

1. Single-Speed Cooling Outdoor Unit
   a. The thermostat closes R to G-and-Y circuits. The R-Y circuit starts outdoor unit, and R to G-and-Y/Y2 circuits operate furnace blower motor BLWM on cooling airflow.
   b. EAC terminals EAC-1 and EAC-2 are energized with 115 vac when blower motor BLWM is operating.
   c. When thermostat is satisfied, R to G-and-Y circuits open. The outdoor unit stops, and furnace blower motor BLWM continues operating at cooling airflow for an additional 90 sec.

2. Two-Speed Cooling Outdoor Unit

   a. The thermostat closes R to G-and-Y1 circuits for low cooling or closes R to G-and-Y1-and-Y/Y2 circuits for high cooling. The R to Y1 circuits operate outdoor unit on low-cooling speed.

      PSC—The R-G circuit operates furnace blower motor BLWM at low-cooling airflow (same airflow as for low-gas heat and continuous blower).

      ICM—The R to G-and-Y1 circuit operates furnace blower motor BLWM at low-cooling airflow (65% of single-speed cooling airflow; different airflow than for low-gas heat).

      The R to Y1-and-Y2 circuits operate outdoor unit on high-cooling airflow, and R to G-and-Y2 (-and-Y1, for ICM) circuits operate furnace blower motor BLWM at high-cooling airflow.

      PSC—Two-speed high-cooling airflow is 100% of single-speed cooling airflow.

      ICM—Two-speed high-cooling airflow is 105% of single-speed cooling airflow.

NOTE: Y1 is found in outdoor unit. The furnace controls blower motor BLWM airflow by sensing only G (PSC) or G-and-Y1 (ICM) for low-cooling airflow and Y/Y2 (PSC) or G-and-Y1-and-Y/Y2 (ICM) for high-cooling airflow.

   b. EAC terminals EAC-1 and EAC-2 are energized with 115 vac when blower motor BLWM is operating at either cooling airflow.

   c. When thermostat is satisfied, R to G-and-Y1 or R to G-and-Y1-and-Y/Y2 circuits open. The outdoor unit stops, and furnace blower continues operating at the same cooling airflow for an additional 90 sec.

Step 4—Continuous Blower Mode

1. When R-G circuit is closed by thermostat, blower motor BLWM operates at:

   PSC—Low-gas-heat airflow (identical to low-cooling airflow).

   ICM—Low, Med, or High (50%, 65%, or 100% of single-speed cooling airflow; different than low-gas-heat airflow). Low, Med, and High selection is described in Set-Up Procedures section of Appendix B.

   Terminals EAC-1 and EAC-2 are energized with 115 vac as long as blower motor BLWM is operating.

2. During a "call for heat," blower motor BLWM stops during ignitor warm-up (17 sec), ignition (7 sec), and blower on delay (45 sec), allowing furnace heat exchangers to heat up quickly, after which blower motor BLWM operates at appropriate gas heating airflow.

3. The blower motor BLWM reverts to continuous blower airflow after heating cycle is completed.

   PSC—In high-gas heat, the furnace control CPU holds blower motor BLWM at high-gas-heat airflow during selected blower off delay period before reverting to continuous blower airflow.

   ICM—In high-gas heat, the furnace control CPU and ICM motor control hold blower motor BLWM at low-gas-heat airflow for a 90-sec blower off delay period (irrespective of selected blower off delay) before reverting to continuous blower airflow.

4. When thermostat "calls for low-cooling," blower motor operates as follows:

   PSC—The blower motor BLWM continues to operate at low-cooling (continuous blower) airflow.

   ICM—The blower motor BLWM switches to low-cooling airflow or selected continuous-blower airflow, whichever is greater. Note that a "HI" selection for continuous blower airflow WILL provide more than normal airflow during 2-speed low-cooling.

5. When thermostat is satisfied, blower motor operates as follows:

   PSC—The blower motor BLWM continues to operate at continuous blower airflow.

   ICM—The blower motor BLWM switches to continuous blower airflow.

6. When thermostat "calls for high-cooling," blower motor BLWM operates at high-cooling airflow. When thermostat is satisfied, blower motor BLWM operates an additional 2 sec at high-cooling airflow before reverting back to continuous blower airflow.

7. When R-G circuit is opened, blower motor BLWM continues operating for an additional 90 sec, if no other function requires blower motor BLWM operation.

Step 5—Heat Pump Mode

NOTE: A dual-fuel thermostat or accessory interface kit is required with single-speed heat pumps. See dual-fuel thermostat or interface kit Installation Instructions for single-speed heat pump thermostat and interface connections. No interface kit is needed for 2-speed heat pumps. See 2-speed heat pump Installation Instructions to determine whether a standard or dual-fuel heat pump thermostat is required and for thermostat connections.

1. Single-Speed Heat Pump Cooling

   a. The thermostat and interface kit close R to G-and-Y/Y2 (-and-O with an ICM blower motor) circuit(s) to operate furnace blower motor BLWM at cooling airflow. The Y/Y2 input to furnace control is necessary to provide adequate cooling airflow.

   b. EAC terminals EAC-1 and EAC-2 are energized with 115 vac when blower motor BLWM is operating.

   c. When thermostat is satisfied, furnace blower motor BLWM continues operating at cooling airflow for an additional 90 sec.

2. Two-Speed Heat Pump Cooling

   a. PSC—The thermostat R-G circuit operates furnace blower motor BLWM at low-cooling airflow.

      ICM—The thermostat R to G-and-Y1-and-O circuits operate furnace blower motor BLWM at low-cooling airflow.

   b. The thermostat R to G-and-Y/Y2 (-and-Y1-and-O with an ICM blower motor) circuits operate furnace blower motor BLWM at high-cooling airflow.

      PSC—100% of single-speed cooling airflow.

      ICM—105% of single-speed cooling airflow.

      NOTE: The furnace controls blower airflow by sensing:

      (1.) Only G for low-cooling airflow with a PSC blower motor.

      (2.) G, Y1, and O for low-cooling airflow with an ICM blower motor.

      (3.) Y2 (with or without Y1) for single-speed cooling or 2-speed high-cooling airflow with a PSC blower motor.

      (4.) G, Y1, Y/Y2, and O for 2-speed high-cooling airflow with an ICM blower motor.

c. EAC terminals EAC-1 and EAC-2 are energized with 115 vac when blower motor BLWM is operating at either cooling airflow.

d. When thermostat is satisfied, furnace blower motor BLWM continues operating at the same cooling airflow for an additional 90 sec.

3. Single-Speed Heat Pump Heating

   a. The thermostat (and accessory interface kit) R to G-and-Y/Y2 circuits operate furnace blower motor BLWM at heat pump heating airflow (identical to cooling airflow with a PSC blower motor). Heating airflow is same as cooling airflow for Airflow Selector HP-EFFY selection and 90% of cooling airflow for HP-CMFT selection.

   b. EAC terminals EAC-1 and EAC-2 are energized with 115 vac when blower motor BLWM is operating.

   c. When thermostat is satisfied, furnace blower motor BLWM continues operating at the same heat pump heating airflow for an additional 90 sec.

4. Two-Speed Heat Pump Heating

   a. The thermostat closes R to Y1-and-G circuit for low-heat and operates furnace blower motor BLWM at heat pump low-heating airflow (identical to low-cooling airflow with PSC and may not be identical to low-cooling airflow with ICM, depending on selection at Airflow Selector). Closing R-Y/Y2 circuit to furnace (with Y1 and G for ICM) provides blower motor BLWM heat pump high-heating airflow.

   NOTE: The furnace controls blower motor BLWM airflow by sensing:

   (1.) Only G for heat pump low-heating airflow with a PSC blower motor.

   (2.) G and Y1 for heat pump low-heating airflow with an ICM blower motor.

   (3.) Y/Y2 for heat pump high-heating airflow with a PSC blower motor.

   (4.) G, Y1, and Y/Y2 for heat pump high-heating airflow (105% of single-speed heating airflow) with an ICM blower motor.

   b. EAC terminals EAC-1 and EAC-2 are energized with 115 vac when blower motor BLWM is operating at either heating airflow.

   c. When thermostat is satisfied, furnace blower motor BLWM continues operating at the same heating airflow for an additional 90 sec.

   d. Opening only R-Y/Y2 circuit switches blower motor BLWM to heat pump low-heating airflow.

Step 6—Defrost

1. When furnace control R to W/W1-and-Y/Y2 circuits are closed, furnace control CPU continues blower motor BLWM operation at heat pump heating airflow until end of prepurge period, then stops BLWM until end of HSI ignitor on period (22 sec).
2. When installed with a heat pump, furnace control CPU automatically holds blower off time to 22 sec during HSI ignitor on period. After 17 sec of HSI ignitor on period, a trial-for-ignition sequence occurs as described above for gas heating. After flame is proved and without a blower on delay, blower motor BLWM then operates at high-gas-heat airflow during defrost. For both single-speed and 2-speed heat pumps, defrost mode is in high-gas heat only.
3. When furnace control R-W/W1 circuit is opened, furnace control CPU begins normal inducer post purge period and blower motor BLWM continues operating for blower off delay period. If R-G circuit remains closed, blower motor BLWM reverts to continuous blower operation.

Step 7—Component Test

The furnace features a component test system to help diagnose a system problem in the case of a component failure. To initiate component test procedure, ensure that there are no thermostat inputs to control and all time delays have expired. Short TWIN/TEST terminal to ground or COM-24V for 1 to 4 sec. (See Appendix A.)

NOTE: The component test feature will not operate if control is receiving any thermostat signals or until all time delays have expired. The ICM blower motor speed ramp-up will slightly delay blower response times.

The component test sequence is as follows:

1. The furnace control performs a self-check, operates inducer motor on low speed for 7 sec and on high speed for 7 sec, then stops.
2. The hot surface igniter is energized for 15 sec, then de-energized.
3. The blower motor operates at continuous fan (PSC-only—low-gas-heat/heat pump low-heating/low-cooling) airflow for 7 sec.
4. The blower motor operates at high-gas-heat airflow for 7 sec. The gas valve and humidifier terminal HUM are not energized for safety reasons.
5. The blower motor operates at single-speed cooling/heat pump heating airflow (or 2-speed heat pump high-heat/high-cooling) for 7 sec, then stops.

NOTE: The EAC terminals are energized when blower is operating.

SERVICE

If status code recall is needed, do not remove power or blower door. Briefly remove and then reconnect one main limit wire to display stored status code.

LED CODE	STATUS
CONTINUOUS OFF -	Check for 115VAC at L1 and L2, and 24VAC at SEC1 and SEC2.
CONTINUOUS ON -	Control has 24VAC power.
RAPID FLASHING -	Line voltage (115VAC) polarity reversed. If twinned, refer to twining kit instructions.

EACH OF THE FOLLOWING STATUS CODES IS A TWO-DIGIT NUMBER WITH THE FIRST DIGIT DETERMINED BY THE NUMBER OF SHORT FLASHES AND THE SECOND DIGIT BY THE NUMBER OF LONG FLASHES.

11 **NO PREVIOUS CODE** - Stored status codes are erased when power (115VAC or 24VAC) to control is interrupted or 48 hours after each fault is cleared.

12 **BLOWER ON AFTER POWER UP (115VAC or 24 VAC)** - Blower runs for 90 seconds, if unit is powered up during a call for heat (R-W closed).

13 **LIMIT OR FLAME ROLL-OUT SWITCH LOCKOUT** - Control will auto reset after three hours. Reset switch or replace fuse link. Refer to #33

14 **IGNITION LOCKOUT** - Control will auto-reset after three hours. Refer to #34

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

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

23 **PRESSURE SWITCH DID NOT OPEN** Check for:
- Obstructed pressure tubing - Pressure switch stuck closed.

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

31 **HIGH-HEAT PRESSURE SWITCH OR RELAY DID NOT CLOSE OR REOPENED**
Check for: - Control relay may be defective - Refer to #32

32 **LOW HEAT PRESSURE, DRAFT SAFEGUARD, AUX-LIMIT** (when used*) **SWITCH DID NOT CLOSE OR REOPENED (DOWNFLOW ONLY*)** If open longer than five minutes, inducer shuts off for 15 minutes before retry. Check for:
- Proper vent sizing - Low inducer voltage (115VAC)
*- Defective Blower motor or capacitor - Defective inducer motor
- Defective pressure switch - Restricted vent
- Inadequate combustion air supply - Excessive wind
- Disconnected or obstructed pressure tubing If it opens after trial for ignition period, blower will come on for 90 second recycle delay.

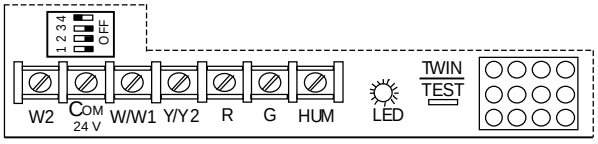
33 **LIMIT OR FLAME ROLL-OUT SWITCH IS OPEN** - If open longer than three minutes, code changes to #13. Flame roll-out switch requires manual reset.
Check for: - Dirty filter or restricted duct system. - Loose blower wheel.
- Defective blower motor or capacitor. - Defective switch or connections.
- Inadequate combustion air supply (Flame Roll-out Switch or fuse link open).
- Open Flame Roll-out switch, or fuse link. Manual reset or replace.

34 **IGNITION PROVING FAILURE** - Control will try three more times before lockout #14 occurs. If flame signal is lost after trial for ignition period, blower will come on for 90 second recycle delay. Check for: - Gas valve defective or gas valve turned off.
- Oxide buildup on flame sensor (clean with fine steel wool).
- Proper flame sense microamps (.5 microamps D.C. min., 4.0 - 6.0 nominal in HIGH HEAT). - Green wire **MUST** be connected to furnace sheet metal.
- Flame sensor must be ungrounded. - Manual valve shut-off.
- Defective Hot Surface Ignitor - Control ground continuity.
- Inadequate flame carryover or rough ignition. - Low inlet gas pressure.

43 **LOW-HEAT PRESSURE, DRAFT SAFEGUARD, OR AUXILIARY LIMIT** (when used*) **SWITCH OPEN WHILE HIGH HEAT PRESSURE SWITCH IS CLOSED** Check for:
- Disconnected or obstructed pressure tubing
- Pressure switch stuck open - Refer to #32 and #33

45 **REPLACE CONTROL**

COMPONENT TEST



To initiate the component test sequence, shut "OFF" the room thermostat or disconnect the "R" thermostat lead. Briefly short TWIN/TEST terminal to "Com 24 V" Terminal. Status LED will turn off, control will turn "ON" the inducer motor-low speed, inducer motor-high speed, hot surface ignitor, blower motor-low gas heat speed, blower motor-high gas heat speed and blower motor-high cool speed for 7-15 seconds each. Gas valve and humidifier will not be turned on.

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Fig. 1—Service Information Label

START HERE—If a problem exists, the service technician should always begin troubleshooting here.

SPECIAL NOTE: ALL VOLTMETERS ARE NOT THE SAME; YOUR VOLTAGE READINGS WILL VARY. THIS APPLIES TO THE ENTIRE CONTENT OF THIS TROUBLESHOOTING MANUAL. THEY ARE NOT ABSOLUTE VALUES. CORRECT 115-VAC VOLTAGE, CURRENT, AND POWER MEASUREMENTS CANNOT BE MADE ON ICM FURNACES UNLESS USING A TRUE RMS METER.

STEP	ACTION	YES	NO	GO TO
1.	Remove control door first. DO NOT REMOVE BLOWER DOOR! Removing blower door interrupts power (115-vac or 24-vac) and erases previous status codes stored in memory. Is RED LED status light on?	2	19	—
2.	Is RED LED status light blinking rapidly without a pause?	3	4	—
3.	Go to page number indicated in Index for RAPID FLASHING LED.	—	—	INDEX
4.	Is RED LED status light blinking ON/OFF slowly with a combination of short and long flashes?	5	7	—
5.	Determine status code. The status code is a 2 digit number with the first digit determined by the number of short flashes and the second digit by the number of long flashes.	—	—	6
6.	Go to page number indicated in Index for section covering the status code.	—	—	INDEX
7.	To retrieve previous codes, no thermostat inputs to control must be present and all time delays must have expired. Disconnect 1 of the RED main limit wires 1 to 4 sec until RED LED status light goes out, then reconnect it and read status code. To recover additional codes repeat this procedure. The 2-stage furnace control is capable of retaining 5 previous status codes. **NOTE:** DO NOT leave RED wire disconnected for longer than 4 sec as control will assume an over-temperature condition exists and will respond with indoor blower operation.	—	—	8
8.	Was there a previous status code other than code 11? **NOTE:** Status codes are erased after 48 hr or whenever power (115-vac or 24-vac) is interrupted.	9	10	—
9.	Go to page number indicated in Index for section covering the first previous status code.	—	—	INDEX
10.	Does problem appear to be low cooling airflow?	11	12	—
11.	Go to page number indicated in Index for section covering IMPROPER COOLING AIRFLOW.	—	—	INDEX
12.	Set thermostat to call for heat and set thermostat fan control to AUTO position if equipped.	—	—	13
13.	Does furnace respond to the call for heat?	14	28	—
14.	Observe operation of furnace for 20 minutes or until RED LED status light starts blinking.	—	—	15
15.	Does RED LED status light blink ON/OFF slowly with a combination of short and long flashes?	5	16	—
16.	Is temperature rise below range specified on rating plate when unit is operating in high heat? **NOTE:** If temperature rise is above range specified on rating plate, refer to Start-Up and Adjustment section in Installation, Start-Up, and Operating Instructions.	17	18	—
17.	Go to page number indicated in Index for section covering HIGH HEAT TEMPERATURE RISE TOO LOW (COLD BLOW).	—	—	INDEX
18.	Go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX
19.	Make sure power is being supplied to furnace.	—	—	20
20.	Check fuses, breakers, or manual disconnects to be sure they are correctly set. If not, reset them and go back to Step 1.	—	—	21
21.	Remove blower door and depress door switch. Use a piece of tape to hold switch closed.	—	—	22
22.	Do you have 115 vac across L1 and L2?	24	23	—
23.	Turn power off. Check continuity of power leads and door switch. If necessary repair power leads and/or replace door switch.	—	—	18
24.	Do you have 24 vac across SEC-1 and SEC-2?	25	26	—
25.	Replace 2-stage furnace control.	—	—	18
26.	Do you have 115 vac across PR1 and PR2?	27	25	—
27.	Replace transformer. If transformer fails again, replace transformer and 2-stage furnace control.	—	—	18
28.	Do you have 24 vac across W/W1 and COM-24V on 2-stage furnace control?	25	29	—
29.	You have a defective thermostat or a break in wiring between thermostat and furnace. Fix problem.	—	—	18

RAPID FLASHING LED—Indicates line voltage polarity is reversed, or the transformers are out of phase in twinned units.

STEP	ACTION	YES	NO	GO TO
1.	Is this furnace twinned with another furnace?	7	2	—
2.	Remove blower door and depress door switch. Use a piece of tape to hold switch closed.	—	—	3
3.	Do you have 115 vac across L2 and chassis ground?	4	6	—
4.	Line voltage polarity is reversed. Fix problem.	—	—	5
5.	Go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX
6.	Replace 2-stage furnace control.	—	—	5
7.	Remove blower doors and depress door switch in each unit. Use tape to hold switches closed.	—	—	8
8.	Is RED LED status light blinking rapidly in only 1 of the twinned units?	9	16	—
9.	Are fuses, breakers, or manual disconnects to problem unit correctly set?	11	10	—
10.	Fix problem.	—	—	5
11.	Are Master and Slave Auxiliary Limit switches properly set?	12	10	—
12.	Do you have 115 vac across L1 and L2 in problem unit?	13	15	—
13.	Do you have 24 vac across SEC-1 and SEC-2 in problem unit?	6	14	—
14.	Replace transformer.	—	—	5
15.	Turn power off to both units. Check continuity of power leads and door switch in problem unit. If necessary repair power leads and/or replace door switch in problem unit.	—	—	5
16.	Check furnace circuit breaker location in service panel. On single-phase (residential) systems, each furnace circuit breaker should be located directly across from each other in service panel, or each furnace circuit breaker should be located on the same side of service panel, but must skip 1 space to be connected to the same leg of the 1-phase power supply. On 3-phase (commercial) systems, each furnace circuit breaker should be located directly across from each other in service panel, or each furnace circuit breaker should be located on the same side of service panel, but must skip 2 spaces to be connected to the same leg of the 3-phase power supply.	—	—	17
17.	Check 115-vac power lead connections at 2-stage furnace control of each furnace. The BLACK lead goes to L1 and the WHITE lead goes to L2.	—	—	18
18.	Check 115-vac transformer lead connections at 2-stage furnace control of each furnace. The BLACK lead goes to PR1 and the WHITE lead goes to PR2.	—	—	19
19.	If circuit breaker location and 115-vac wiring is correct, reverse transformer secondary lead connections SEC-1 and SEC-2 in master furnace.	—	—	5

IMPROPER COOLING AIRFLOW—Generally, this indicates the Y/Y2 thermostat lead is not connected to Y/Y2 at furnace, or blower motor has failed.

STEP	ACTION	YES	NO	GO TO
1.	Remove blower door and depress door switch. Use a piece of tape to hold switch closed.	—	—	2
2.	Set thermostat to call for cooling. If thermostat does not have G connection, jumper across thermostat terminals R and G.	—	—	3
3.	Make sure thermostat fan control is in AUTO position if equipped.	—	—	4
4.	Do you have 24 vac across Y/Y2 and COM-24V on 2-stage furnace control?	8	5	
5.	You have a defective thermostat, or a break in wiring between thermostat and furnace, or the Y/Y2 thermostat terminal is not wired to thermostat.	—	—	6
6.	Fix problem.	—	—	7
7.	Go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX
8.	Does blower motor turn on? Wait several sec to verify.	31	9	—
9.	Remove tape from door switch and turn power off at main disconnect.	—	—	10
10.	Does blower wheel rub against blower housing?	6	11	—
11.	Does blower wheel turn freely?	12	13	—
12.	Is blower wheel firmly mounted on motor shaft?	14	6	—
→13.	Replace blower motor. On variable-speed ICM blower motors, replace entire ICM blower motor or ICM blower control module attached to the ICM blower motor. If you replace the ICM blower control module go to step 47. Always inspect failed motor for water damage. If present, find source of water and fix. Check A-coil and/or humidifier.	—	—	6
14.	Turn power back on. Depress door switch. Use a piece of tape to hold switch closed.	—	—	15
15.	Set thermostat to call for cooling. If thermostat does not have G connection, jumper across thermostat terminals R and G.	—	—	16
16.	Make sure thermostat fan control is in AUTO position if equipped.	—	—	17

STEP	ACTION	YES	NO	GO TO
17.	Does furnace have a variable-speed ICM blower motor?	18	24	—
18.	Do you have 115 vac across BLACK and WHITE power leads at blower motor.	20	19	—
19.	You have an open wire or bad terminal on either the BLACK or WHITE wire between 2-stage furnace control and blower motor, or the power choke (if equipped) failed. Fix problem.	—	—	7

STEP	TERMINAL CONNECTIONS*			VOLTAGE	ACTION
20.	PL4-1 YELLOW (+)	to	PL4-3 BLACK (-)	-5 vdc to -10 vdc	If voltages are correct, go to Step 21. If not, replace 2-stage furnace control.
	PL4-2 BLUE (+)	to	PL4-3 BLACK (-)	-5 vdc to -13 vdc	
	PL4-5 RED (+)	to	PL4-3 BLACK (-)	24 vac	
21.	PL7-2 YELLOW (+)	to	PL7-10 BLACK (-)	-5 vdc to -10 vdc	If voltages are correct, go to Step 22. If not, repair or replace ICM blower harness.
	PL7-12 BLUE (+)	to	PL7-10 BLACK (-)	-5 vdc to -13 vdc	
	PL7-13 RED (+)	to	PL7-10 BLACK (-)	24 vac	
22.	PL7-1 YELLOW (+)	to	PL7-8 BLACK (-)	-5 vdc to -10 vdc	If voltages are correct, go to Step 23. If not, replace EZ-SELECT airflow control.
	PL7-11 GREEN (+)	to	PL7-8 BLACK (-)	5 vdc to 10 vdc	
	PL7-14 RED (+)	to	PL7-9 BLACK (-)	24 vac	
→**23.**	PL9-14 YELLOW (+)	to	PL9-3 BLACK (-)	-5 vdc to -10 vdc	If voltages are correct, replace entire ICM blower motor or ICM blower control module attached to the ICM blower motor. If you replace the ICM blower control module go to step 47.. If voltages are not correct, repair or replace the ICM blower harness.
	PL9-15 GREEN (+)	to	PL9-3 BLACK (-)	5 vdc to 10 vdc	
	PL9-12 RED (+)	to	PL9-1 BLACK (-)	24 vac	

STEP	ACTION	YES	NO	GO TO
24.	Do you have 115 vac across HI-COOL and high voltage COMMON?	26	25	—
25.	Replace 2-stage furnace control.	—	—	7
26.	Remove tape from door switch and turn power off at main disconnect.	—	—	27
27.	Note location of all blower leads, then disconnect blower motor leads from 2-stage furnace control and capacitor.	—	—	28
28.	Do you have continuity between the following motor leads: • RED to WHITE • YELLOW to WHITE • BROWN to BROWN • BLUE to WHITE • BLACK to WHITE • BROWN to WHITE	29	30	—
29.	Replace capacitor. If problem still exists after replacing capacitor, replace blower motor.	—	—	7
30.	Replace blower motor. If problem still exists after replacing blower motor, replace capacitor.	—	—	7
31.	Does furnace have a variable-speed ICM blower motor?	34	32	—
32.	Do you have 115 vac across HI-COOL and high voltage COMMON?	33	25	—
33.	• Check blower motor speed selection. Refer to Appendix E to evaluate external static. • Check filter(s) and ductwork for restrictions. • Check outdoor unit for correct suction pressure and verify charge.	—	—	7

STEP	TERMINAL CONNECTIONS*			VOLTAGE	ACTION
34.	PL4-1 YELLOW (+)	to	PL4-3 BLACK (-)	-5 vdc to -10 vdc	If voltages are correct, go to Step 35. If not, replace 2-stage furnace control.
35.	PL7-2 YELLOW (+)	to	PL7-10 BLACK (-)	-5 vdc to -10 vdc	If voltages are correct, go to Step 36. If not, repair or replace ICM blower harness.
36.	PL7-1 YELLOW (+)	to	PL7-8 BLACK (-)	-5 vdc to -10 vdc	If voltages are correct, go to Step 37. If not, replace EZ-SELECT airflow control.
37.	PL9-14 YELLOW (+)	to	PL9-3 BLACK (-)	-5 vdc to -10 vdc	If voltages are correct, go to Step 38. If not, repair or replace ICM blower harness.

STEP	ACTION	YES	NO	GO TO
38.	Is YELLOW COOL SIZE jumper on EZ-SELECT airflow control set to match needed tons for cooling or heat pump system? (See Table 1.)	40	39	—
39.	Set YELLOW COOL SIZE jumper on EZ-SELECT airflow control to match needed tons for cooling or heat pump system? (See Table 1.)	—	—	7

STEP	ACTION	YES	NO	GO TO
40.	Note position of GREEN CONTINUOUS-FAN CFM jumper on EZ-SELECT airflow control, then disconnect it.	—	—	41
41.	Disconnect Y/Y2 thermostat lead from 2-stage furnace control.	—	—	42
42.	Does blower motor change speed after Y/Y2 thermostat lead was disconnected from 2-stage furnace control?	45	43	—
43.	Reconnect GREEN CONTINUOUS-FAN CFM jumper on EZ-SELECT airflow control to position noted earlier.	—	—	44
→**44.**	Replace the ICM blower motor or ICM blower control module attached to the ICM blower motor. If you replace the ICM blower control module go to step 47. Always inspect failed motor for water damage. If present, find source of water and fix. Check A-coil and/or humidifier.	—	—	6
45.	Reconnect GREEN CONTINUOUS-FAN CFM jumper on EZ-SELECT airflow control to position noted earlier.	—	—	46
46.	• Check filter(s) and ductwork for restrictions. • Check outdoor unit for correct suction pressure and verify charge.	—	—	7

* (+) and (-) designate Volt Ohm Meter Leads

⚠ WARNING

Wait at least 5 minutes after disconnecting line voltage from equipment before opening blower motor to prevent electric shock which can cause personal injury or death.

STEP	ACTION	YES	NO	GO TO
→**47.**	Remove tape from door switch and turn power off at main disconnect.	—	—	48
→**48.**	Disconnect both multi-pin connectors from blower control module attached to the blower motor. Be sure to depress release latches on connectors or they may get damaged.	—	—	49
→**49.**	Remove control box assembly from blower shelf and position out of the way.	—	—	50
→**50.**	Remove blower assembly from furnace.	—	—	51
→**51.**	Remove two 1/4-in. hex head bolts from blower control module attached to blower motor. DO NOT REMOVE TORX HEAD SCREWS located next to 1/4-in. hex head bolts.	—	—	52
→**52.**	Carefully lift blower control module off blower motor. Depress latch on internal connector to disconnect blower control module from motor portion of blower motor. DO NOT PULL ON WIRES. GRIP PLUG ONLY.	—	—	53
→**53.**	When blower control module is completely detached from blower motor, verify with standard ohmmeter that the resistance from each motor lead in motor plug to unpainted motor end plate is greater than 100k ohms. Then verify motor windings are not shorted or open by measuring resistance between each combination of pins in motor plug (there are three different combinations, pin 1-2, pin 2-3, and pin 1-3). Resistance should be approximately equal across each combination of pins.	—	—	54
→**54.**	Did the motor pass the resistance check?	55	57	—
→**55.**	Does blower wheel turn freely with blower control module removed?	56	57	—
→**56.**	Replace blower control module. Inspect failed blower control module for water damage. If present, find source of water and fix. Check A-coil and/or humidifier.	—	—	7
→**57.**	Replace entire blower motor including blower control module. Inspect blower control module for water damage. If present, find source of water and fix. Check A-coil and/or humidifier.	—	—	7

Table 1—Cooling and Heat Pump Size Selections

TONS (12,000 BTUH)	1-1/2	2	2-1/2	3	3-1/2	4	5
Upflow/Horizontal Unit Size	**COOL SIZES (YELLOW WIRE)**						
060-12	LO	M-LO	M-HI	HI	—	—	—
080-16	—	—	LO	M-LO	M-HI	HI	—
100-20	—	—	—	LO	M-LO	M-HI	HI
120-20	—	—	—	LO	M-LO	M-HI	HI

NOTE: Confirm CFM/ton selection on EZ-SELECT airflow control.

HIGH-HEAT TEMPERATURE RISE TOO LOW—Generally, this indicates the HI solenoid in gas valve GV has failed or furnace is extremely underfired.

STEP	ACTION	YES	NO	GO TO
1.	Remove blower door. Make sure thermostat is NOT calling for heat. Note current settings for setup switches SW-1 and SW-2, then set SW-1 and SW-2 to OFF position. On variable-speed units, check VIOLET wire pin connection on EZ-SELECT airflow control for conformance with PIN marked on lower right of furnace rating plate. Set RED gas heat temperature rise jumper on MID.	—	—	2
2.	Depress door switch. Use a piece of tape to hold switch closed.	—	—	3
3.	Set thermostat to call for heat or jumper R and W/W1 thermostat terminals.	—	—	4
4.	When furnace is running in low heat, clock low-heat gas rate. You have 16 minutes on this first call for heat before unit switches to high heat. On propane installations, check manifold pressure.	—	—	5
5.	When furnace is running in high heat, clock high-heat gas rate. On propane installations, check manifold pressure.	—	—	6
6.	Is high-heat rate approximately the same as low-heat rate?	7	11	—
7.	Do you have 24 vac across gas valve terminals HI and Com-24V on 2-stage furnace control during high heat?	10	8	—
8.	You have an open wire or bad terminal on BROWN wire from high-heat pressure switch HPS to gas valve GV. Repair it or replace harness.	—	—	9
9.	Go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX
10.	Replace gas valve.	—	—	9
11.	Is high-heat rate within 2% of that specified on rating plate?	13	12	—
12.	Ensure gas inlet pressure and burner orifice are correct, then adjust gas valve to proper rate. If it cannot be adjusted to proper rate, replace gas valve.	—	—	9
13.	Is outdoor condensing unit operating during heating cycle?	16	14	—
14.	Check temperature rise and external static pressure with blower door in place. Temperature rise should be mid-range or higher than midpoint of range stated on furnace rating plate. External static pressure must not exceed 0.5 in. wc for PSC and 0.7 in. wc for ICM motors. If return temperature is below 60°F, condensation may form on heat exchangers. If left uncorrected, failure will result.	—	—	15
15.	Check return air ducts in unheated spaces for leaks.	—	—	9
16.	Fix problem.	—	—	9

Status Code 11

NO PREVIOUS CODE—Stored status codes are erased after 48 hr or whenever power source (115-vac or 24-vac) is interrupted. Run system through a heating or cooling cycle to check system.

Status Code 12

BLOWER ON AFTER POWER UP—Blower will run for 90 sec when furnace power is interrupted and later restored during a call for heat (R-W/W1 closed). If this status code repeats every couple of minutes, it is probably caused by a direct short in pressure switch circuits, gas valve GV, wiring to gas valve GV, or humidifier coil.

STEP	ACTION	YES	NO	GO TO
1.	Remove blower door and disconnect W/W1 thermostat lead from 2-stage furnace control.	—	—	2
2.	Depress door switch. Use piece of tape to hold switch closed.	—	—	3
3.	Set thermostat to call for heat and set thermostat fan control to AUTO position if equipped. Reconnect W/W1 thermostat lead to 2-stage furnace control.	—	—	4

STEP	ACTION	YES	NO	GO TO
4.	Does furnace keep repeating the following cycle? Induced draft motor IDM runs, induced draft motor IDM stops, blower motor BLWM runs for 90 sec while RED LED status light flashes status code 12.	5	20	—
5.	Do you have less than 17 vac across R and Com-24V on 2-stage furnace control?	6	14	—
6.	Do you have less than 90 vac across PR1 and PR2 on 2-stage furnace control?	7	10	—
7.	Make sure wire gage between main fuse box and furnace complies with wire size specification in Installation, Start-Up, and Operating Instructions.	—	—	8
8.	Fix problem.	—	—	9
9.	Go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX
10.	Disconnect R thermostat lead.	—	—	11
11.	Do you have less than 19 vac across R and Com-24V on 2-stage furnace control?	12	13	—
12.	Replace transformer.	—	—	9
13.	The thermostat and/or thermostat wires are loading down transformer. Replace thermostat or repair thermostat wires.	—	—	9
14.	Does hot surface ignitor HSI come on during cycle?	15	19	—
15.	Disconnect humidifier lead from HUM terminal on 2-stage furnace control.	—	—	16
16.	Does furnace still alternately cycle induced draft motor IDM and blower motor BLWM as described in Step 4.	18	17	—
17.	There is a direct short in wiring to humidifier solenoid coil, diode bridge (if used), or humidifier solenoid coil.	—	—	8
18.	There is a short in gas valve GV or wiring to gas valve GV. Refer to Appendix G to check gas valve GV.	—	—	8
19.	There is a direct short in YELLOW wire from low-heat pressure switch LPS.	—	—	8
20.	While unit is operating in low heat, jumper R and W2 thermostat terminals.	—	—	21
21.	Does furnace abruptly shut down with no inducer post-purge and then run blower motor BLWM for 90 sec while RED LED status light flashes status code 12.	22	26	—
22.	Disconnect BROWN wire to gas valve GV.	—	—	23
23.	Does furnace still abruptly shut down as described in Step 21?	25	24	—
24.	Replace gas valve.	—	—	9
25.	There is a direct short to ground in GRAY or BROWN wires connected to high-heat pressure switch HPS.	—	—	8
26.	Power to furnace was probably interrupted, or line voltage was too low during a call for heat. This is normal operation. Go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX

Status Code 13

LIMIT (LS) OR FLAME ROLLOUT (FRS) SWITCH LOCKOUT—This status code indicates that limit switch opened 5 times for at least 3 minutes each time during 1 thermostat cycle. The 2-stage furnace control will auto-reset in 3 hr. Flame rollout switch FRS requires manual-reset.

STEP	ACTION	YES	NO	GO TO
1.	Remove blower door. Make sure thermostat is NOT calling for heat. This action resets control.	—	—	2
2.	Depress door switch. Use piece of tape to hold switch closed.	—	—	3
3.	Set thermostat to call for heat or jumper R and W/W1 thermostat terminals.	—	—	4
4.	Does blower motor turn on within 1 minute of ignition?	28	5	—
5.	Remove tape from door switch, turn power off at main disconnect, and remove jumper across R and W/W1.	—	—	6
6.	Does blower wheel rub against blower housing?	7	9	—
7.	Fix problem.	—	—	8
8.	Go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX
9.	Does blower wheel turn freely?	10	11	—
10.	Is blower wheel firmly mounted on motor shaft?	12	7	—

STEP	ACTION	YES	NO	GO TO
→11.	Replace blower motor. On variable speed ICM blower motors replace entire ICM blower motor or ICM blower control module attached to the ICM blower motor. If you replace the ICM blower control module go to step 35. Always inspect failed motor for water damage. If present, find source of water and fix. Check A-coil and/or humidifier.	—	—	7
12.	Turn power back on. Depress door switch. Use a piece of tape to hold switch closed, then jumper R and W/W1 thermostat terminals.	—	—	13
13.	Does furnace have a variable-speed ICM blower motor?	14	21	—
14.	Do you have 115 vac across BLACK and WHITE power leads at blower motor.	16	15	—
15.	You have an open wire or bad terminal on either the BLACK or WHITE wire between 2-stage furnace control and blower motor, or the power choke (if equipped) failed. Fix problem.	—	—	8
16.	Wait 1 minute after burners ignite before proceeding to step 17.	—	—	17

STEP	TERMINAL CONNECTIONS*			VOLTAGE	ACTION
17.	HUM WHITE (+)	to	Com-24V (-)	24 vac	If voltages are correct, go to Step 18. If not, replace 2-stage furnace control.
	PL4-2 BLUE (+)	to	PL4-3 BLACK (-)	-5 vdc to -13 vdc	
	PL4-5 RED (+)	to	PL4-3 BLACK (-)	24 vac	
18.	PL7-12 BLUE (+)	to	PL7-10 BLACK (-)	-5 vdc to -13 vdc	If voltages are correct, go to Step 19. If not, repair or replace ICM blower harness.
	PL7-13 RED (+)	to	PL7-10 BLACK (-)	24 vac	
19.	PL7-11 GREEN (+)	to	PL7-8 BLACK (-)	5 vdc to 10 vdc	If voltages are correct, go to Step 20. If not, replace EZ-SELECT airflow control.
	PL7-14 RED (+)	to	PL7-9 BLACK (-)	24 vac	
→20.	PL9-2 WHITE (+)	to	PL9-3 BLACK (-)	24 vac	If voltages are correct, replace entire ICM blower motor or ICM blower control module attached to the ICM blower motor. If you replace the ICM blower control module go to step 35. If voltages are not correct, repair or replace the ICM blower harness.
	PL9-15 GREEN (+)	to	PL9-3 BLACK (-)	5 vdc to 10 vdc	
	PL9-12 RED (+)	to	PL9-1 BLACK (-)	24 vac	

STEP	ACTION	YES	NO	GO TO
21.	Do you have 115 vac across LO-GAS-HEAT and high voltage COMMON?	23	22	—
22.	Replace 2-stage furnace control.	—	—	8
23.	Remove tape from door switch and turn power off at main disconnect.	—	—	24
24.	Note location of all blower leads, then disconnect blower motor leads from 2-stage furnace control and capacitor.	—	—	25
25.	Do you have continuity between the following motor leads: • RED to WHITE • YELLOW to WHITE • BROWN to BROWN • BLUE to WHITE • BLACK to WHITE • BROWN to WHITE	26	27	—
26.	Replace capacitor. If problem still exists after replacing capacitor, replace blower motor.	—	—	8
27.	Replace blower motor. If problem still exists after replacing blower motor, replace capacitor.	—	—	8
28.	Does furnace have a variable-speed ICM blower motor?	30	29	—
29.	Lockout was caused by excessive return-air restriction. Check filter and return-air grilles for blockage. Add more return-air openings if necessary. Use Appendix E to evaluate external static pressure.	—	—	8

STEP	TERMINAL CONNECTIONS*			VOLTAGE	ACTION
30.	HUM WHITE (+)	to	Com-24V (-)	24 vac	If voltages are correct, go to Step 31. If not, replace 2-stage furnace control.
31.	PL9-2 WHITE (+)	to	PL9-3 BLACK (-)	24 vac	If voltages are correct, go to Step 32. If not, repair or replace ICM blower harness.

STEP	ACTION	YES	NO	GO TO
32.	Make sure blower off delay is set to 135 sec or more, then disconnect W/W1 thermostat lead from 2-stage furnace control.	—	—	33
33.	Does blower motor change speed 90 sec after W/W1 thermostat lead was disconnected from 2-stage furnace control.	29	34	—
→ 34.	Replace the ICM blower motor or ICM blower control module attached to the ICM blower motor. If you replace the ICM blower control module go to step 35. Always inspect failed motor for water damage. If present, find source of water and fix. Check A-coil and/or humidifier.	—	—	7

* (+) and (-) designate Volt Ohm Meter Leads

⚠ WARNING

Wait at least 5 minutes after disconnecting line voltage from equipment before opening blower motor to prevent electric shock which can cause personal injury or death.

STEP	ACTION	YES	NO	GO TO
→**35.**	Remove tape from door switch and turn power off at main disconnect.	—	—	36
→**36.**	Disconnect both multi-pin connectors from blower control module attached to the blower motor. Be sure to depress release latches on connectors or they may get damaged.	—	—	37
→**37.**	Remove control box assembly from blower shelf and position out of the way.	—	—	38
→**38.**	Remove blower assembly from furnace.	—	—	39
→**39.**	Remove two 1/4-in. hex head bolts from blower control module attached to blower motor. DO NOT REMOVE TORX HEAD SCREWS located next to 1/4-in. hex head bolts.	—	—	40
→**40.**	Carefully lift blower control module off blower motor. Depress latch on internal connector to disconnect blower control module from motor portion of blower motor. DO NOT PULL ON WIRES. GRIP PLUG ONLY.	—	—	41
→**41.**	When blower control module is completely detached from blower motor, verify with standard ohmmeter that the resistance from each motor lead in motor plug to unpainted motor end plate is greater than 100k ohms. Then verify motor windings are not shorted or open by measuring resistance between each combination of pins in motor plug (there are three different combinations, pin 1-2, pin 2-3, and pin 1-3). Resistance should be approximately equal across each combination of pins.	—	—	42
→**42.**	Did the motor pass the resistance check?	43	45	—
→**43.**	Does blower wheel turn freely with blower control module removed?	44	45	—
→**44.**	Replace blower control module. Inspect failed blower control module for water damage. If present, find source of water and fix. Check A-coil and/or humidifier.	—	—	8
→**45.**	Replace entire blower motor including blower control module. Inspect blower control module for water damage. If present, find source of water and fix. Check A-coil and/or humidifier.	—	—	8

Status Code 14

IGNITION LOCKOUT—This status code indicates furnace failed to ignite gas and/or prove flame in 4 attempts. The 2-stage furnace control will auto-reset in 3 hr. Refer to Status Code 34.

Status Code 21

GAS HEATING LOCKOUT—This status code indicates main gas valve relay MGVR on 2-stage furnace control is stuck closed, or there is a miswire/short to gas valve wiring. The 2-stage furnace control will NOT auto-reset.

STEP	ACTION	YES	NO	GO TO
1.	Turn power off and set thermostat to OFF position. Then turn power back on.	—	—	2
2.	Does status code 21 flash?	3	6	—
3.	There is a miswire or short to gas valve wiring.	—	—	4
4.	Fix problem.	—	—	5
5.	Go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX
6.	Does a different status code flash?	7	8	—
7.	Go to page number indicated in Index for section covering the status code.	—	—	INDEX
8.	Remove blower door and depress door switch. Use a piece of tape to hold switch closed.	—	—	9
9.	Jumper R and W/W1 thermostat terminals.	—	—	10
10.	Does status code 21 start flashing when low-heat pressure switch LPS makes?	11	12	—
11.	Replace 2-stage furnace control.	—	—	5
12.	Does a different status code flash?	7	13	—

STEP	ACTION	YES	NO	GO TO
13.	Disconnect jumper wire across R and W/W1 thermostat terminals and wait until blower stops.	—	—	14
14.	Jumper R, W/W1, and W2 thermostat terminals on 2-stage furnace control.	—	—	15
15.	Does status code 21 start flashing when high-heat pressure switch HPS makes?	16	17	—
16.	Replace gas valve.	—	—	5
17.	Cycle furnace several times to check for intermittent operation.	—	—	18
18.	Does status code 21 ever flash?	11	19	—
19.	Go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS. If problem persists on an intermittent basis, replace 2-stage furnace control. If problem still persists on an intermittent basis after replacing 2-stage furnace control, contact your distributor.	—	—	INDEX

Status Code 22

ABNORMAL FLAME-PROVING SIGNAL—This status code indicates flame signal was sensed while gas valve GV was de-energized. The inducer will run until fault is cleared.

STEP	ACTION	YES	NO	GO TO
1.	Turn off gas to furnace by shutting off external manual shutoff valve.	—	—	2
2.	Does status code 22 stop flashing?	3	4	—
3.	Replace gas valve.	—	—	5
4.	Replace 2-stage furnace control.	—	—	5
5.	Go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX

Status Code 23

LOW-HEAT PRESSURE SWITCH DID NOT OPEN—This status code indicates low-heat pressure switch LPS is made when a call for heat is initiated. The 2-stage furnace control will flash status code 23 until switch opens, then cycle begins.

STEP	ACTION	YES	NO	GO TO
1.	Turn power off, remove blower door, and disconnect R thermostat lead.	—	—	2
2.	Turn power on and depress door switch. Use a piece of tape to hold switch closed.	—	—	3
3.	Jumper R and W/W1 thermostat terminals.	—	—	4
4.	Does status code 23 flash?	8	5	—
5.	Does a different status code flash?	6	7	—
6.	Go to page number indicated in Index for section covering the status code.	—	—	INDEX
7.	Go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX
8.	Do you have 24 vac across YELLOW wire on low-heat pressure switch LPS and Com-24V on 2-stage furnace control?	13	9	—
9.	Do you have 24 vac across connector terminal PL1-5 and Com-24V on 2-stage furnace control?	10	12	—
10.	The main harness is miswired.	—	—	11
11.	Rewire low-heat pressure switch LPS per wiring diagram.	—	—	7
12.	Replace 2-stage furnace control.	—	—	7
13.	Is low-heat pressure switch LPS wired correctly?	14	11	—
14.	Replace pressure switch assembly.	—	—	7

Status Code 24

SECONDARY VOLTAGE FUSE IS OPEN—Indicates fuse is open, and there is a short in low-voltage wiring.

STEP	ACTION	YES	NO	GO TO
1.	Turn power off and remove blower door.	—	—	2
2.	Is secondary voltage fuse blown? Check continuity to make sure.	5	3	—
3.	Replace 2-stage furnace control.	—	—	4
4.	Replace secondary voltage fuse if necessary, then go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX
5.	Disconnect all thermostat leads from 2-stage furnace control (including all wires connected to HUM terminal) and replace secondary voltage fuse. On variable-speed units, disconnect WHITE wires from HUM terminal on 2-stage furnace control, and disconnect Y1 and O thermostat leads in blower compartment (if used).	—	—	6
6.	Replace fuse. Turn power on and depress door switch. Use a piece of tape to hold switch closed.	—	—	7
7.	Does status code 24 flash?	8	12	—
8.	Turn power off and disconnect PL1 from 2-stage furnace control.	—	—	9
9.	Do you have continuity between either RED wire connected to limit switch LS and chassis ground?	10	76	—
10.	You have a short circuit in limit switch circuit. This includes limit switch and flame rollout switch.	—	—	11
11.	Fix problem.	—	—	4
12.	Disconnect pressure tube from collector box. Jumper R and W/W1 thermostat terminals.	—	—	13
13.	Does status code 24 begin flashing when W/W1 is energized?	14	21	—
14.	Turn power off and disconnect PL1 from 2-stage furnace control.	—	—	15
15.	Do you have continuity between ORANGE wire connected to low-heat pressure switch LPS and chassis ground?	16	17	—
16.	You have a short circuit in low-heat pressure switch circuit. This includes draft safeguard switch DSS and auxiliary limit switches ALS1, 2 (if used).	—	—	11
17.	Do you have continuity between GRAY wire connected to high-heat pressure switch HPS and chassis ground?	18	3	—
18.	Disconnect PL2 from 2-stage furnace control.	—	—	19
19.	Do you have continuity between PL2-2 and PL1-10 on 2-stage furnace control.	3	20	—
20.	You have a short circuit in either GRAY wire connected to high-heat pressure switch HPS or GRAY wire connected between PL1-9 and PL2-2	—	—	11
21.	Reconnect pressure tube from pressure switch assembly back to collector box.	—	—	22
22.	Does status code 24 begin flashing when low-heat pressure switch LPS is energized?	23	26	—
23.	Turn power off and disconnect PL1 from 2-stage furnace control.	—	—	24
24.	Do you have continuity between YELLOW wire connected to low-heat pressure switch LPS and chassis ground?	25	3	—
25.	The YELLOW wire from low-heat pressure switch LPS is shorting to ground. Replace or repair it.	—	—	11
26.	Does status code 24 begin flashing when gas valve GV is energized?	27	34	—
27.	Disconnect jumper wire across R and W/W1 thermostat terminals and replace secondary voltage fuse.	—	—	28
28.	Disconnect BLUE wire to gas valve GV. Jumper R and W/W1 thermostat terminals.	—	—	29
29.	Does status code 34 flash? If not, status code 24 should occur when BLUE wire is energized.	33	30	—
30.	Turn power off and disconnect PL1 from 2-stage furnace control.	—	—	31
31.	Do you have continuity between BLUE wire and chassis ground?	32	3	—
32.	The BLUE wire to gas valve GV is shorting to ground. Replace or repair it.	—	—	11
33.	Replace gas valve GV.	—	—	4
34.	Disconnect jumper wire across R and W/W1 thermostat terminals and wait until inducer stops.	—	—	35
35.	Jumper R, W/W1, and W2 thermostat terminals.	—	—	36
36.	Does status code 24 begin flashing when high-heat pressure switch HPS is energized?	37	79	—
37.	Disconnect jumper wire across R, W/W1, and W2 thermostat terminals and replace secondary voltage fuse.	—	—	38
38.	Disconnect BROWN wire to gas valve GV. Jumper R, W/W1, and W2 thermostat terminals.	—	—	39

STEP	ACTION	YES	NO	GO TO
39.	Does status code 24 begin flashing when high-heat pressure switch HPS is energized?	40	33	—
40.	Turn power off and disconnect PL1 from 2-stage furnace control.	—	—	41
41.	Do you have continuity between BROWN wire and chassis ground?	42	3	—
42.	The BROWN wire to high-heat pressure switch HPS and gas valve GV is shorting to ground. Replace or repair it.	—	—	11
43.	Disconnect jumper wire across R, W/W1, and W2 thermostat terminals and wait until blower stops.	—	—	44
44.	Jumper R, G, and Y/Y2 thermostat terminals.	—	—	45
45.	Does status code 24 begin flashing when G and Y/Y2 are energized?	72	46	—
46.	Does furnace have a variable-speed ICM blower motor.	55	47	—
47.	Reconnect all thermostat leads (except humidifier lead to HUM terminal) to 2-stage furnace control and operate furnace in heating and cooling mode from thermostat.	—	—	48
48.	Does status code 24 occur during heating cycle?	49	50	—
49.	You have a defective thermostat or a short circuit in R, W/W1, or W2 wiring between thermostat, furnace, and outdoor unit. If furnace is twinned, also check twinning kit relay TKR.	—	—	11
50.	Does status code 24 occur during cooling cycle?	51	52	—
51.	You have a defective thermostat; short circuit in G, Y1, Y/Y2, or O wiring between thermostat and outdoor unit; or a short circuit in outdoor unit contactor or reversing valve (heat pump only).	—	—	11
52.	Does problem usually occur in cooling mode?	53	54	—
53.	Check outdoor unit contactor. Failure to pull in can cause excessive current draw on low-voltage circuit. This can be an intermittent problem.	—	—	11
54.	Reconnect humidifier and check for excessive current draw. If current draw is excessive check wiring to humidifier solenoid, diode bridge (if used), and humidifier solenoid.	—	—	11
55.	Disconnect jumper wire across R, G, and Y/Y2 thermostat terminals.	—	—	56
56.	Jumper loose end of WHITE wire that is normally connected to HUM quick-connect terminal on 2-stage furnace control to R thermostat terminal.	—	—	57
57.	Does status code 24 flash?	58	65	—
58.	Disconnect PL9 from variable-speed ICM blower motor and replace secondary voltage fuse.	—	—	59
59.	Does status code 24 flash?	61	60	—
→60.	Replace ICM blower motor or ICM blower control module attached to the ICM blower motor. If you replace the ICM blower control module go to step 83. Always inspect failed motor for water damage. If present, find source of water and fix. Check A-coil and/or humidifier.	—	—	11
61.	Disconnect PL7 from EZ-SELECT airflow control and replace secondary voltage fuse.	—	—	62
62.	Does status code 24 flash?	64	63	—
63.	Replace EZ-SELECT airflow control.	—	—	4
64.	There is a direct short to ground in ICM blower harness. Repair or replace ICM blower harness then reconnect PL7.	—	—	4
65.	Disconnect jumper from WHITE wire that is normally connected to HUM quick-connect terminal on 2-stage furnace control. Then reconnect WHITE wire back to HUM quick-connect terminal on 2-stage furnace control.	—	—	66
66.	Jumper Y1 from EZ-SELECT airflow control to R thermostat terminal.	—	—	67
67.	Does status code 24 flash?	58	68	—
68.	Disconnect jumper across Y1 and R.	—	—	69
69.	Jumper O from EZ-SELECT airflow control to R thermostat terminal.	—	—	70
70.	Does status code 24 flash?	58	71	—
71.	Reconnect thermostat leads to Y1 and O from EZ-SELECT airflow control.	—	—	47
72.	Does furnace have a variable-speed ICM blower motor?	73	3	—
73.	Disconnect PL4 from 2-stage furnace control and replace secondary voltage fuse.	—	—	74
74.	Does status code 24 flash?	3	75	—
75.	Reconnect PL4 to 2-stage furnace control.	—	—	58
76.	Does furnace have a variable-speed ICM blower motor?	77	3	—
77.	Reconnect PL1 to 2-stage furnace control, disconnect PL4 from 2-stage furnace control, replace secondary voltage fuse, and turn power back on.	—	—	78
78.	Does status code 24 flash?	3	75	—
79.	Continue to observe furnace operation for 10 minutes.	—	—	80
80.	Does status code 24 flash after blower comes on?	81	82	—
81.	The insulation is loose and has shorted against limit switch.	—	—	11

STEP	ACTION	YES	NO	GO TO
82.	Check for loose or torn insulation, because it can cause intermittent occurrences of status code 24.	—	—	43

⚠ WARNING

Wait at least 5 minutes after disconnecting line voltage from equipment before opening blower motor to prevent electric shock which can cause personal injury or death.

STEP	ACTION	YES	NO	GO TO
→**83.**	Remove tape from door switch and turn power off at main disconnect.	—	—	84
→**84.**	Disconnect both multi-pin connectors from blower control module attached to the blower motor. Be sure to depress release latches on connectors or they may get damaged.	—	—	85
→**85.**	Remove control box assembly from blower shelf and position out of the way.	—	—	86
→**86.**	Remove blower assembly from furnace.	—	—	87
→**87.**	Remove two 1/4-in. hex head bolts from blower control module attached to blower motor. DO NOT REMOVE TORX HEAD SCREWS located next to 1/4-in. hex head bolts.	—	—	88
→**88.**	Carefully lift blower control module off blower motor. Depress latch on internal connector to disconnect blower control module from motor portion of blower motor. DO NOT PULL ON WIRES. GRIP PLUG ONLY.	—	—	89
→**89.**	When blower control module is completely detached from blower motor, verify with standard ohmmeter that the resistance from each motor lead in motor plug to unpainted motor end plate is greater than 100k ohms. Then verify motor windings are not shorted or open by measuring resistance between each combination of pins in motor plug (there are three different combinations, pin 1-2, pin 2-3, and pin 1-3). Resistance should be approximately equal across each combination of pins.	—	—	90
→**90.**	Did the motor pass the resistance check?	91	93	—
→**91.**	Does blower wheel turn freely with blower control module removed?	92	93	—
→**92.**	Replace blower control module. Inspect failed blower control module for water damage. If present, find source of water and fix. Check A-coil and/or humidifier.	—	—	4
→**93.**	Replace entire blower motor including blower control module. Inspect blower control module for water damage. If present, find source of water and fix. Check A-coil and/or humidifier.	—	—	4

Status Code 31

HIGH-HEAT PRESSURE SWITCH OR RELAY DID NOT CLOSE OR REOPENED—This status code can occur under the scenarios shown below. Keep in mind that whenever 2-stage furnace control shuts unit down, gas remains off or shuts off immediately, inducer continues running for 5 sec, and if blower is running, it remains running at low-heat speed or reduces to low-heat speed for selected off delay.

- HIGH HEAT

1. PREPURGE—If high-heat pressure switch HPS does not make within 30 sec after a call for high heat is initiated, 2-stage furnace control begins flashing status code 31, and changes inducer motor speed back to low-heat speed for 15 sec. After waiting 15 sec, if there is still a request for high heat, 2-stage furnace control changes inducer speed back to high-heat speed and stops flashing status code 31 if high-heat pressure switch HPS closes. If high-heat pressure HPS remains open, 2-stage furnace control continues flashing status code 31 and proceeds with high-heat cycle.

   NOTE: Gas valve GV will be at low-heat rate.

2. LOW HEAT TO HIGH HEAT TRANSITION—If high-heat pressure switch HPS fails to make within 30 sec after high heat was requested, 2-stage furnace control begins flashing status code 31. If high-heat pressure switch HPS fails to make within 2 minutes after high heat was requested, 2-stage furnace control continues flashing status code 31, shuts unit down, and restarts a high-heat cycle.
3. STEADY-STATE—If high-heat pressure switch HPS opens and fails to reclose within 30 sec, 2-stage furnace control begins flashing status code 31. If high-heat pressure switch fails to reclose within 2 minutes, 2-stage furnace control continues flashing status code 31, shuts unit down, and restarts high-heat cycle.

STEP	ACTION	YES	NO	GO TO
1.	Turn power off, remove blower door, and disconnect R thermostat lead.	—	—	2
2.	Turn power on and depress door switch. Use a piece of tape to hold switch closed.	—	—	3

STEP	ACTION	YES	NO	GO TO
3.	Jumper R, W/W1, and W2 thermostat terminals.	—	—	4
4.	Wait 1 minute before proceeding to next step.	—	—	5
5.	Does status code 31 flash?	9	6	—
6.	Does a different status code flash?	7	34	—
7.	Go to page number indicated in Index for section covering the status code.	—	—	INDEX
8.	Go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX
9.	Do you have 24 vac across GRAY wire on high-heat pressure switch HPS and Com-24V on 2-stage furnace control?	14	10	—
10.	Do you have 24 vac across connector terminal PL2-1 and Com-24V on 2-stage furnace control?	11	12	—
11.	You have an open wire or bad terminal on GRAY wire from 2-stage furnace control to high-heat pressure switch HPS. Repair it or replace harness.	—	—	8
12.	Do you have 24 vac across connector terminal PL2-2 and Com-24V on 2-stage furnace control?	13	32	—
13.	Replace 2-stage furnace control.	—	—	8
14.	Do you have 115 vac across connector terminals PL2-7 and PL2-8?	15	13	—
15.	Do you have 24 vac across BROWN wire on high-heat pressure switch HPS and Com-24V on 2-stage furnace control?	16	18	—
16.	Do you have 24 vac across connector terminal PL1-4 and Com-24V on 2-stage furnace control?	13	17	—
17.	You have an open wire or bad terminal on BROWN wire from high-heat pressure switch HPS to 2-stage furnace control. Repair it or replace harness.	—	—	8
18.	Turn power off and disconnect jumper wire across R, W/W1, and W2 thermostat terminals.	—	—	19
19.	Connect 1 side of slope manometer with a tee to collector box pressure tap. Refer to Pressure Check Diagram in Appendix C.	—	—	20
20.	Turn power on and jumper R, W/W1, and W2 thermostat terminals.	—	—	21
21.	Do you have enough pressure across heat exchangers to make high-heat pressure switch HPS when status code 31 flashes? Reference high-altitude settings if a High-Altitude Pressure Switch Kit is installed. (See Table 2.) If this is a high-altitude installation and a High-Altitude Pressure Switch Kit is not installed, replace pressure switch assembly with a High-Altitude Pressure Switch Kit. NOTE: High altitude is over 5500 ft for Category I vent and over 4000 ft for Category III vent.	22	23	—
22.	Replace pressure switch assembly.	—	—	8
23.	Is inducer motor rotating in direction indicated on cooling fan?	25	24	—
24.	Replace inducer motor or inducer motor assembly.	—	—	8
25.	Turn power off.	—	—	26
26.	Is inducer wheel okay?	28	27	—
27.	If possible, replace inducer wheel. Otherwise, replace inducer motor assembly. NOTE: If inducer wheel shows signs of excessive deterioration, find cause by checking venting, input rates, and temperature rise. If other parts are affected, replace them.	—	—	8
28.	Is inducer wheel properly mounted to inducer motor shaft?	29	30	—
29.	Does furnace have proper cell outlet plates and collector box?	31	30	—
30.	Fix problem.	—	—	8
31.	You have excessive restriction in vent pipe or excessive leakage before pressure tap in collector box. Check for the following: • Restriction in vent pipe. • Proper vent sizing for installation. • Leakage in collector box. • Leakage in heat exchanger. NOTE: If leakage is due to excessive corrosion, find cause by checking venting, input rates, and temperature rise. If other parts are affected, replace them.	—	—	30
32.	Do you have 24 vac across connector terminal PL1-9 and Com-24V on 2-stage furnace control?	33	13	—
33.	You have an open wire or bad terminal on GRAY wire connecting PL1-9 to PL2-2 on 2-stage furnace control. Repair it or replace harness.	—	—	8
34.	Continue to observe furnace operation for 20 minutes or until status code starts flashing.	—	—	35
35.	Does status code 31 flash?	37	36	—
36.	Does a different status code flash?	7	8	—
37.	Turn power off and disconnect jumper wire across R, W/W1, and W2 thermostat terminals.	—	—	38
38.	Connect 1 side of slope manometer with a tee to collector box pressure tap. Refer to Pressure Check Diagram in Appendix C.	—	—	39
39.	Turn power on and jumper R, W/W1, and W2 thermostat terminals.	—	—	40

STEP	ACTION	YES	NO	GO TO
40.	Do you have enough pressure across heat exchangers to prevent high-heat pressure switch HPS from breaking when status code 31 flashes? Reference high-altitude settings if a High-Altitude Pressure Switch Kit is installed. (See Table 2.) If this is a high-altitude installation and a High-Altitude Pressure Switch Kit is not installed, replace pressure switch assembly with a High-Altitude Pressure Switch Kit. NOTE: High altitude is over 5500 ft for Category I vent and over 4000 ft for Category III vent.	22	23	—

Table 2—High-Heat Pressure Switch HPS Settings

MODEL NO.	FACTORY SETTINGS		HIGH-ALTITUDE SETTINGS	
	Make Point	Break Point	Make Point	Break Point
58DXT, 58TUA, 58UXT, 58UXV	0.58 in. wc	0.43 ± 0.05 in. wc (YELLOW LABEL)	0.54 in. wc	0.39 ± 0.05 in. wc (GRAY LABEL)
58TMA	0.67 in. wc	0.52 ± 0.05 in. wc (BLUE LABEL)	0.62 in. wc	0.47 ± 0.05 in. wc (RED LABEL)
58UHV	0.68 in. wc	0.54 ± 0.04 in. wc (ORANGE LABEL)	0.58 in. wc	0.44 ± 0.04 in. wc (LT. GREEN LABEL)

Status Code 32

LOW-HEAT PRESSURE, DRAFT SAFEGUARD, LOW GAS PRESSURE (IF USED), OR AUXILIARY LIMIT (DOWNFLOW ONLY) SWITCH DID NOT CLOSE OR REOPENED—This status code can occur as a result of low-heat pressure switch LPS not making, or draft safeguard switch DSS opening, low gas pressure switch LGPS (if used) opening, or auxiliary limit switch ALS1, 2 (if used) opening. Regardless of which switch opens, 2-stage furnace control operates under the scenarios shown below. Keep in mind that whenever 2-stage furnace control shuts unit down, gas remains off or shuts off immediately and inducer continues running for 5 sec.

- LOW HEAT

1. PREPURGE—If low-heat pressure switch LPS does not make within 30 sec after a call for heat is initiated, 2-stage furnace control changes inducer motor speed to high-heat speed and starts flashing status code 32. If low-heat pressure switch LPS closes, 2-stage furnace control changes inducer motor speed back to low-heat speed and stops flashing status code 32. If low-heat pressure switch fails to remain closed after inducer returns to low-heat speed, 2-stage furnace control flashes status code 32 and continues running inducer at low-heat speed. If low-heat pressure switch LPS fails to close after inducer is switched to high-heat speed, 2-stage furnace control continues to flash status code 32 and runs inducer at high-heat speed. If low-heat pressure switch LPS fails to close within 5 minutes, 2-stage furnace control continues flashing status code 32, shuts unit down, and waits 15 minutes before restarting heating cycle.
2. AFTER IGNITION—If low-heat pressure switch LPS opens after burners ignite, 2-stage furnace control starts flashing status code 32, shuts unit down, turns blower on or continues to operate blower at low-heat blower speed for a 90-sec blower off delay period, stops flashing status code 32, and restarts heating cycle.

NOTE: On furnaces with variable-speed ICM blower motors, blower will turn on and operate at continuous-fan speed if low-heat pressure switch LPS opens during blower on delay period.

STEP	ACTION	YES	NO	GO TO
1.	Turn power off, remove blower door, and disconnect R thermostat lead. Note current settings for setup switches SW-1 and SW-2, then set SW-1 to OFF and SW-2 to ON.	—	—	2
2.	Turn power on and depress door switch. Use a piece of tape to hold switch closed.	—	—	3
3.	Jumper R and W/W1 thermostat terminals.	—	—	4
4.	Observe operation of inducer motor for 1 minute before proceeding to next step.	—	—	5
5.	Does status code 32 flash?	9	6	—
6.	Does a different status code flash?	7	41	—
7.	Return SW-1 and SW-2 to original desired settings and go to page number indicated in Index for section covering the status code.	—	—	INDEX
8.	Return SW-1 and SW-2 to original desired settings and go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX
9.	Did inducer motor turn on at all within the first minute after jumpering R and W/W1?	15	10	—
10.	Do you have 115 vac across PL3-1 and PL3-3?	11	12	—

STEP	ACTION	YES	NO	GO TO
11.	Replace inducer motor or inducer motor assembly.	—	—	8
12.	Do you have 115 vac across PL2-7 and PL2-8?	13	14	—
13.	You have an open wire or bad terminal on BLACK or WHITE wire from 2-stage furnace control to inducer motor. Repair it or replace harness.	—	—	8
14.	Replace 2-stage furnace control.	—	—	8
15.	Did inducer motor remain off for the first 30 sec after R and W/W1 were jumpered?	16	19	—
16.	Do you have 115 vac across PL3-2 and PL3-3?	11	17	—
17.	Do you have 115 vac across PL2-4 and PL2-8?	18	14	—
18.	You have an open wire or bad terminal on RED wire from 2-stage furnace control to inducer motor. Repair it or replace harness.	—	—	8
19.	Do you have 24 vac across ORANGE wire on low-heat pressure switch LPS and Com-24V on 2-stage furnace control?	24	20	—
20.	Do you have 24 vac across connector terminal PL1-6 and Com-24V on 2-stage furnace control?	21	27	—
21.	Turn power off. Disconnect jumper wire across R and W/W1 thermostat terminals.	—	—	22
22.	You have an open circuit between low-heat pressure switch LPS and 2-stage furnace control. This includes all the ORANGE wire interconnecting low-heat pressure switch LPS and 2-stage furnace control. It also includes draft safeguard switch DSS and auxiliary limit switch(es) ALS1 & 2 (if used). 1. Check continuity across draft safeguard switch DSS and auxiliary limit switch ALS1 (if used). If there is no continuity across the switch, reset it. If manual reset switch cannot be reset, replace it. 2. Check continuity across auxiliary limit switch ALS2 (if used). If there is no continuity across the switch, replace it. 3. Check continuity of each ORANGE wire interconnecting low-heat pressure switch LPS and 2-stage furnace control. Repair open wire or replace harness. NOTE: An open circuit between low-heat pressure switch LPS and 2-stage furnace control normally causes status code 43 to occur. Go back to Step 1 after fixing this problem, because there is another problem.	—	—	1
23.	Turn power on and jumper R and W/W1 thermostat terminals.	—	—	24
24.	Do you have 24 vac across YELLOW wire on low-heat pressure switch LPS and Com-24V on 2-stage furnace control?	25	28	—
25.	Do you have 24 vac across connector terminal PL1-5 and Com-24V on 2-stage furnace control?	27	26	—
→26.	You have an open wire or bad terminal on the YELLOW wire from the low heat pressure switch LPS to 2-stage furnace control or low gas pressure switch LGPS (when used) is open. Check propane line pressure if using LGPS otherwise repair wire or replace harness. NOTE: An open circuit in the YELLOW wire between low-heat pressure switch LPS and 2-stage furnace control normally causes status code 43 to occur. Go back to Step 1 after fixing this problem, because there is another problem.	—	—	1
27.	Replace 2-stage furnace control. NOTE: Go back to Step 1 after replacing 2-stage furnace control, because there may be an additional problem.	—	—	1
28.	Turn power off and disconnect jumper wire across R and W/W1 thermostat terminals.	—	—	29
29.	Connect 1 side of slope manometer with a tee to collector box pressure tap. Refer to Pressure Check Diagram in Appendix C.	—	—	30
30.	Turn power on. Jumper R and W/W1 thermostat terminals.	—	—	31
31.	Do you have enough pressure across heat exchangers to make low-heat pressure switch LPS when status code 32 flashes? Reference high-altitude settings if a High-Altitude Pressure Switch Kit is installed. (See Table 3.) If this is a high-altitude installation and a High-Altitude Pressure Switch Kit is not installed, replace pressure switch assembly with a High-Altitude Pressure Switch Kit. NOTE: High altitude is over 5500 ft for Category I vent and over 4000 ft for Category III vent.	32	33	—
32.	Replace pressure switch assembly.	—	—	8
33.	Is inducer motor rotating in direction indicated on cooling fan?	34	11	—
34.	Turn power off.	—	—	35
35.	Is inducer wheel okay?	37	36	—
36.	If possible, replace inducer wheel. Otherwise, replace inducer motor assembly. NOTE: If inducer wheel shows signs of excessive deterioration, find cause by checking venting, input rates, and temperature rise. If other parts are affected, replace them.	—	—	8
37.	Is inducer wheel properly mounted to inducer motor shaft?	38	39	—
38.	Does furnace have proper cell outlet plates and collector box?	40	39	—
39.	Fix problem.	—	—	8

STEP	ACTION	YES	NO	GO TO
40.	You have excessive restriction in vent pipe or excessive leakage before pressure tap in collector box. Check for the following: • Restriction in vent pipe. • Proper vent sizing for installation. • Leakage in collector box. • Leakage in heat exchanger. NOTE: If leakage is due to excessive corrosion, find cause by checking venting, input rates, and temperature rise. If other parts are affected, replace them.	—	—	39
41.	Continue to observe furnace operation for 20 minutes or until status code starts flashing.	—	—	42
42.	Does status code 32 flash?	44	43	—
43.	Does a different status code flash?	7	48	—
44.	Turn power off and disconnect jumper wire across R and W/W1 thermostat terminals.	—	—	45
45.	Connect 1 side of slope manometer with a tee to collector box pressure tap. Refer to Pressure Check Diagram in Appendix C.	—	—	46
46.	Turn power on and jumper R and W/W1 thermostat terminals.	—	—	47
→**47.**	Do you have enough pressure across heat exchangers to prevent the low-heat pressure switch LPS from breaking when status code 32 flashes? Reference high-altitude settings if a High-Altitude Pressure Switch Kit is installed. (See Table 3.) If this is a high-altitude installation and a High-Altitude Pressure Switch Kit is not installed, replace pressure switch assembly with a High-Altitude Pressure Switch Kit. NOTE: High altitude is over 5500 ft for Category I vent and over 4000 ft for Category III vent.	61	33	—
48.	While unit is operating in low heat, jumper R and W2 thermostat terminals.	—	—	49
49.	Did inducer motor shut off when R and W2 were jumpered?	50	51	—
50.	Wait for blower motor to shut off.	—	—	10
51.	Continue to observe furnace operation for 20 minutes or until status code starts flashing.	—	—	52
52.	Does status code 32 flash?	54	53	—
53.	Does a different status code flash?	7	57	—
54.	Turn power off and disconnect PL3.	—	—	55
55.	Do you have continuity across PL3-1 and PL3-3	56	11	—
56.	Check for intermittent connections in inducer motor power leads at connectors PL2 and PL3.	—	—	39
57.	Is this unit in downflow or horizontal position?	58	8	—
58.	Disconnect jumper wire across R, W/W1, and W2 thermostat terminals, put blower door in place, wait for blower to stop, and continue to wait for 5 minutes while monitoring continuity across ALS1 and 2. To do this with blower door in place, monitor continuity across GRAY wire on high-heat pressure switch HPS and ORANGE wire on low-heat pressure switch LPS.	—	—	59
59.	Have you had continuity across ALS1 & 2 since jumper wire across R, W/W1, and W2 was disconnected.	8	60	—
60.	Increase blower off delay time to 225 sec by putting setup switches SW-3 and SW-4 in ON position.	—	—	8
→**61.**	Check propane line pressure if using low gas pressure switch LGPS otherwise go to step 32.	—	—	39

Table 3—Low-Heat Pressure Switch LPS Settings

MODEL NO.	FACTORY SETTINGS		HIGH-ALTITUDE SETTINGS	
	Make Point	Break Point	Make Point	Break Point
58DXT, 58TUA, 58UXT, 58UXV	0.37 in. wc	0.22 ± 0.05 in. wc (YELLOW LABEL)	0.35 in. wc	0.20 ± 0.05 in. wc (GRAY LABEL)
58TMA	0.37 in. wc	0.22 ± 0.05 in. wc (BLUE LABEL)	0.35 in. wc	0.20 ± 0.05 in. wc (RED LABEL)
58UHV	0.42 in. wc	0.27 ± 0.05 in. wc (ORANGE LABEL)	0.35 in. wc	0.20 ± 0.05 in. wc (LT. GREEN LABEL)

Status Code 33

LIMIT (LS) OR FLAME ROLLOUT (FRS) SWITCH IS OPEN—This status code indicates limit switch or flame rollout switch is open.

STEP	ACTION	YES	NO	GO TO
1.	Turn power off, remove blower door, and disconnect R thermostat lead. Note current settings for setup switches SW-1 and SW-2, then set SW-1 to OFF and SW-2 to ON.	—	—	2
2.	Turn power on and depress door switch. Use a piece of tape to hold switch closed.	—	—	3
3.	Is status code flashing?	12	4	—
4.	Jumper R and W/W1 thermostat terminals.	—	—	5
5.	Does blower motor turn on within 1 minute of ignition?	6	11	—
6.	Observe furnace operation for 25 minutes or until status code starts flashing.	—	—	7
7.	Does status code 33 flash?	29	8	—
8.	Does a different status code flash?	9	10	—
9.	Return SW-1 and SW-2 to original desired settings and go to page number indicated in Index for section covering status code.	—	—	INDEX
10.	Return SW-1 and SW-2 to original desired settings and go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX
11.	Consider this like a status code 13 and go to page number indicated in Index for Status Code 13.	—	—	INDEX
12.	Do you have 24 vac across connector terminal PL1-2 and Com-24V on 2-stage furnace control?	14	13	—
13.	Replace 2-stage furnace control.	—	—	10
14.	Do you have 24 vac across connector terminal PL1-3 and COM-24V on 2-stage furnace control?	13	15	—
15.	Turn power off.	—	—	16
16.	Do you have continuity across limit switch LS?	20	17	—
17.	Wait for unit to cool then recheck for continuity across limit switch LS.	—	—	18
18.	Do you have continuity across limit switch LS?	20	19	—
19.	Replace limit switch.	—	—	10
20.	Do you have continuity across flame rollout switch(es) FRS?	28	21	—
21.	Can flame rollout switch(es) FRS be reset?	23	22	—
22.	Replace flame rollout switch FRS.	—	—	10
23.	Reset flame rollout switch(es) FRS, turn power on, and observe furnace operation for (2) 15 minute cycles.	—	—	24
24.	Does flame rollout switch(es) FRS trip again?	26	25	—
25.	Does a different status code flash?	9	10	—
26.	You have inadequate combustion-air supply. This may be caused by: • Poor burner, manifold, or orifice alignment. • Blocked heat exchanger. • Leak in heat exchanger. • Furnace installed in a negative pressure area.	—	—	27
27.	Fix problem	—	—	10
28.	You have an open RED wire or bad terminal in limit circuit. Repair wire or replace harness.	—	—	10
29.	Does furnace have proper limit switch, limit shield, and blower shelf (if used)? If so, are limit switch, limit shield, and heat exchangers properly aligned?	30	27	—
30.	Does furnace have a variable-speed ICM blower motor?	31	37	—

STEP	TERMINAL CONNECTIONS*			VOLTAGE	ACTION
31.	HUM WHITE (+)	to	Com-24V (-)	24 vac	If voltages are correct, go to Step 32. If not, replace 2-stage furnace control.
32.	PL9-2 WHITE (+)	to	PL9-3 BLACK (-)	24 vac	If voltages are correct, go to Step 33. If not, repair or replace ICM blower harness.

STEP	ACTION	YES	NO	GO TO
33.	Make sure blower off delay is set to 135 sec or more, then disconnect W/W1 thermostat lead from 2-stage furnace control.	—	—	34
34.	Does blower motor change speed 90 sec after W/W1 thermostat lead was disconnected from 2-stage furnace control.	36	35	—
→35.	Replace the ICM blower motor or ICM blower control module attached to the ICM blower motor. If you replace the ICM blower control module go to step 64. Always inspect failed motor for water damage. If present, find source of water and fix. Check A-coil and/or humidifier.	—	—	27
36.	Jumper R and W/W1 thermostat terminals.	—	—	37

STEP	ACTION	YES	NO	GO TO
37.	Does status code 33 occur during low fire?	38	59	—
38.	Clean or replace filter if necessary, then recycle furnace after limit resets.	—	—	39
39.	Observe furnace operation for 25 minutes or until status code 33 starts flashing.	—	—	40
40.	Does status code 33 occur?	41	10	—
41.	Is furnace considerably overfired (10% or more)? Clock input rate. Do not use manifold pressure method unless using propane.	42	43	—
42.	Ensure gas inlet pressure and burner orifices (natural or propane) are correct. Then adjust gas valve to proper rate per Installation, Start-Up, and Operating Instructions. If it cannot be adjusted to proper rate, replace gas valve.	—	—	10
43.	Is temperature rise within rise range?	56	44	—
44.	Does installation have a bypass humidifier or zoning system bypass?	45	48	—
45.	With blower door in place, record temperature rise across return-air duct before and after bypass.	—	—	46
46.	Is temperature rise from bypass greater than 15°F?	47	48	—
47.	The bypass is oversized. Adjust damper or replace with properly sized bypass.	—	—	10
48.	Does installation have modulating zone dampers?	49	53	—
49.	Disable modulating zone damper system with all dampers in open position except bypass damper. If installation is equipped with a bypass damper, it should be in closed position.	—	—	50
50.	Turn power off and disconnect jumper from R thermostat terminal. Turn power back on and reconnect jumper to R thermostat terminal. Observe for 15 minutes with blower door in place.	—	—	51
51.	Does status code 33 flash?	53	52	—
52.	The problem is caused by modulating zone damper system. Check zoning system manufacturer's Installation and Troubleshooting Guide for corrective action.	—	—	10
53.	Turn power off and install a temperature probe in front of limit switch button.	—	—	54
54.	Turn power on and cycle unit. Does limit switch open at a temperature at least 10°F below temperature setpoint for limit switch? EXAMPLE: The setpoint is 220°F, but switch opens at a temperature below 210°F.	19	55	—
55.	Adjust blower speed to get temperature rise within rise range.	—	—	27
56.	Turn power off and install a temperature probe in front of limit switch button.	—	—	57
57.	Turn power on and cycle unit. Does limit switch open at a temperature at least 10°F below temperature setpoint for limit switch? EXAMPLE: The setpoint is 220°F, but switch opens at a temperature below 210°F.	19	58	—
58.	The problem may be related to poor air distribution or excessive pressure drop across filter. If pressure drop across filter is more than 0.3 in. wc, replace filter, otherwise add turning vanes, more supply-air openings, or more return-air openings. Use Appendix E to evaluate external static pressure.	—	—	27
59.	While unit is operating in low heat, jumper R and W2.	—	—	60
60.	Does furnace have a variable-speed ICM blower motor?	61	38	—

STEP	TERMINAL CONNECTIONS*			VOLTAGE	ACTION
61.	PL4-4 BROWN (+)	to	PL4-3 BLACK (-)	-7 vdc to -13 vdc	If voltages are correct, go to Step 62. If not, replace 2-stage furnace control.
62.	PL9-13 BROWN (+)	to	PL9-3 BLACK (-)	-7 vdc to -13 vdc	If voltages are correct, go to Step 63. If not, repair or replace ICM blower harness.

STEP	ACTION	YES	NO	GO TO
63.	Did blower motor change speed when R and W2 were jumpered?	38	35	—

* (+) and (-) designate Volt Ohm Meter Leads

⚠ WARNING

Wait at least 5 minutes after disconnecting line voltage from equipment before opening blower motor to prevent electric shock which can cause personal injury or death.

STEP	ACTION	YES	NO	GO TO
→**64.**	Remove tape from door switch and turn power off at main disconnect.	—	—	65
→**65.**	Disconnect both multi-pin connectors from blower control module attached to the blower motor. Be sure to depress release latches on connectors or they may get damaged.	—	—	66
→**66.**	Remove control box assembly from blower shelf and position out of the way.	—	—	67
→**67.**	Remove blower assembly from furnace.	—	—	68
→**68.**	Remove two 1/4-in. hex head bolts from blower control module attached to blower motor. DO NOT REMOVE TORX HEAD SCREWS located next to 1/4-in. hex head bolts.	—	—	69

STEP	ACTION	YES	NO	GO TO
→**69.**	Carefully lift blower control module off blower motor. Depress latch on internal connector to disconnect blower control module from motor portion of blower motor. DO NOT PULL ON WIRES. GRIP PLUG ONLY.	—	—	70
→**70.**	When blower control module is completely detached from blower motor, verify with standard ohmmeter that the resistance from each motor lead in motor plug to unpainted motor end plate is greater than 100k ohms. Then verify motor windings are not shorted or open by measuring resistance between each combination of pins in motor plug (there are three different combinations, pin 1-2, pin 2-3, and pin 1-3). Resistance should be approximately equal across each combination of pins.	—	—	71
→**71.**	Did the motor pass the resistance check?	72	74	—
→**72.**	Does blower wheel turn freely with blower control module removed?	73	74	—
→**73.**	Replace blower control module. Inspect failed blower control module for water damage. If present, find source of water and fix. Check A-coil and/or humidifier.	—	—	10
→**74.**	Replace entire blower motor including blower control module. Inspect blower control module for water damage. If present, find source of water and fix. Check A-coil and/or humidifier.	—	—	10

Status Code 34

IGNITION-PROVING FAULT—This status code indicates flame was not sensed during trial for ignition period. The control will repeat ignition sequence 3 more times before going to Status Code 14—IGNITION LOCKOUT. This status code can also indicate flame signal was lost during steady-state operation.

STEP	ACTION	YES	NO	GO TO
1.	Shut power off, remove blower door, and disconnect R thermostat lead from furnace control board.	—	—	2
2.	Turn power on and depress door switch. Use a piece of tape to hold switch closed.	—	—	3
3.	Jumper R and W/W1 thermostat terminals.	—	—	4
4.	Observe operation of furnace through 1 heating cycle.	—	—	5
5.	Does status code 34 flash?	9	6	—
6.	Does a different status code flash?	7	8	—
7.	Go to page number indicated in Index for section covering status code.	—	—	INDEX
8.	Go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX
9.	Turn off power and disconnect jumper across R and W/W1 thermostat terminals.	—	—	10
10.	Turn power on.	—	—	11
11.	Check hot surface ignitor. To do this, run a COMPONENT TEST by shorting TWIN/TEST terminal to Com-24V thermostat terminal for 2 sec. Does ignitor glow orange/white hot by end of 15-sec warm-up period?	16	12	—
12.	Hook an AC voltmeter across PL2-3 and PL2-9 on 2-stage furnace control. Repeat COMPONENT TEST by shorting TWIN/TEST terminal to Com-24V thermostat terminal for 2 sec. Do you have 115 vac across PL6-1 and PL6-2 during 15-sec warm-up period?	14	13	—
13.	Replace 2-stage furnace control.	—	—	8
14.	Check continuity in harness and ignitor. Replace failed component.	—	—	15
15.	Fix problem.	—	—	8
16.	Jumper R and W/W1 thermostat terminals.	—	—	17
17.	Do you have 24 vac across BLUE and GREEN wire to gas valve GV?	21	18	—
18.	Turn power off.	—	—	19
19.	Do you have continuity across the following connections? • PL1-1 and BLUE wire at gas valve GV. • PL1-10 and GREEN wire at gas valve GV.	13	20	—
20.	The BLUE or GREEN wire from 2-stage furnace control to gas valve GV is not making a good connection. Repair wire(s) or replace harness.	—	—	8
21.	Does gas valve open and allow gas to flow?	24	22	—
22.	Are all manual gas cocks in ON position?	23	15	—
23.	Replace gas valve.	—	—	8
24.	Do main burners ignite?	26	25	—

STEP	ACTION	YES	NO	GO TO
25.	Check for the following: • Inadequate flame carryover or rough ignition. • Low inlet gas pressure.	—	—	15
26.	Do main burners stay on?	36	27	—
27.	Turn power off and disconnect jumper across R and W/W1 thermostat terminals.	—	—	28
28.	Connect a DC microammeter in series with flame sensor wire.	—	—	29
29.	Turn power on. Jumper R and W/W1 thermostat terminals.	—	—	30
30.	Is DC current below 0.5 microamps?	32	31	—
31.	Check connections and retry. If current is near typical value and control will not stay on, replace 2-stage furnace control. Current is typically 4.0 to 6.0 microamps.	—	—	8
32.	Clean flame sensor with fine sandpaper and recheck current. Current is typically 4.0 to 6.0 microamps.	—	—	33
33.	Is current near typical value?	35	34	—
34.	Replace electrode.	—	—	8
35.	Will main burners ignite and stay on?	8	13	—
36.	Do you have burner pulsations?	37	38	—
37.	Check the following: • Inadequate flame carryover. • Low inlet gas pressure. • Proper vent sizing for installation. • Poor gas valve regulation. • Leakage in, or around heat exchanger. • Leakage in collector box. • Leakage between inducer and collector box.	—	—	8
38.	While unit is operating in low heat, jumper R and W2.	—	—	39
39.	Do you have burner pulsations in high heat?	37	8	—

Status Code 43

LOW-HEAT PRESSURE, DRAFT SAFEGUARD, LOW GAS PRESSURE (IF USED), OR AUXILIARY LIMIT SWITCH OPEN WHILE HIGH-HEAT PRESSURE SWITCH IS CLOSED—This status code can occur as a result of low-heat pressure switch LPS not making, draft safeguard switch DSS opening, auxiliary limit switch ALS1, 2 (if used) opening, low gas pressure switch LGPS (if used) opening, or high-heat pressure switch HPS is made when a call for heat is initiated. Regardless of which switch opens, 2-stage furnace control operates under the scenarios shown below. Keep in mind that whenever 2-stage furnace control shuts unit down, gas remains off or shuts off immediately, and if inducer is running, it continues running for 5 sec.

- CALL FOR HEAT—If high-heat pressure switch HPS is made when a call for heat is initiated, 2-stage furnace control flashes status code 43 until high-heat pressure switch HPS opens, then heating cycle begins.
- LOW HEAT

1. PREPURGE—If low-heat pressure switch LPS does not make within 30 sec after a call for heat is initiated, 2-stage furnace control changes inducer motor speed to high-heat speed. If high-heat pressure switch HPS makes and low-heat pressure switch LPS is still open, 2-stage furnace control starts flashing status code 43. If low-heat pressure switch LPS eventually closes, 2-stage furnace control changes inducer motor speed back to low-heat speed, stops flashing status code 43, and continues heating cycle. If low-heat pressure switch LPS fails to close within 5 minutes, 2-stage furnace control continues flashing status code 43, shuts unit down, and waits 15 minutes before restarting heating cycle.
2. AFTER IGNITION—If low-heat pressure switch LPS opens after burners ignite, 2-stage furnace control shuts unit down and flashes status code 32 once. At the same time, 2-stage furnace control turns on blower or continues to operate blower at low-heat blower speed for a 90-sec blower off delay period. When inducer shuts off if high-heat pressure switch is made, 2-stage furnace control stops flashing status code 32 and starts flashing status code 43. After 90-sec blower off delay period is completed, 2-stage furnace control stops flashing status code 43 and restarts heating cycle.

- HIGH HEAT

1. PREPURGE—If high-heat pressure switch HPS makes and low-heat pressure switch LPS is still open, 2-stage furnace control starts flashing status code 43. If low-heat pressure switch LPS eventually closes, 2-stage furnace control stops flashing status code 43 and continues heating cycle. If low-heat pressure switch LPS fails to close within 5 minutes, 2-stage furnace control continues flashing status code 43, shuts unit down, and waits 15 minutes before restarting heating cycle.
2. AFTER IGNITION—If low-heat pressure switch LPS opens after burners ignite, 2-stage furnace control starts flashing status code 43, shuts unit down, turns blower on or changes blower speed to low-heat blower speed for a 90-sec blower off delay period, stops flashing status code 43, and restarts heating cycle.

NOTE: On furnaces with variable-speed ICM blower motors, blower turns on and operates at continuous fan speed if low-heat pressure switch LPS opens during blower on delay period.

STEP	ACTION	YES	NO	GO TO
1.	Turn power off, remove blower door, and disconnect R thermostat lead from furnace control board.	—	—	2
2.	Turn power on and depress door switch. Use a piece of tape to hold switch closed.	—	—	3
3.	Jumper R and W/W1 thermostat terminals.	—	—	4
4.	Observe operation of furnace through 1 heating cycle.	—	—	5
5.	Does status code 43 flash?	9	6	—
6.	Does a different status code flash?	7	8	—
7.	Go to page number indicated in Index for section covering status code.	—	—	INDEX
8.	Go to page number indicated in Index for CLEANUP AND START-UP INSTRUCTIONS.	—	—	INDEX
9.	Do you have 24 vac across BROWN wire on high-heat pressure switch HPS and Com-24V on 2-stage furnace control?	40	10	—
10.	Do you have 24 vac across connector terminal PL1-6 and COM-24V ON 2-STAGE FURNACE CONTROL?	12	11	—
11.	Replace 2-stage furnace control.	—	—	8
12.	Do you have 24 vac across ORANGE wire on low-heat pressure switch LPS and Com-24V on 2-stage furnace control?	36	13	—
13.	Turn power off. Disconnect jumper wire across R and W/W1 thermostat terminals.	—	—	14
14.	Do you have continuity across draft safeguard switch DSS? NOTE: Answer YES to this question if installation has a Category III vent system. Category III vent systems cause draft safeguard switch DSS to trip if installed. CAUTION: Category I vent systems must have draft safeguard switch installed in order to detect a blocked vent.	22	15	—
15.	Can draft safeguard switch DSS be reset?	17	16	—
16.	Replace draft safeguard switch DSS.	—	—	8
17.	Reset draft safeguard switch DSS, turn power on, and observe furnace operation for 30 minutes.	—	—	18
18.	Does draft safeguard switch trip again?	20	19	—
19.	Does a different status code flash?	7	8	—
20.	You have excessive restriction in vent pipe or excessive leakage before pressure tap in collector box. Check for the following: • Restriction in vent pipe. • Proper vent sizing for installation. • Leakage in collector box. • Leakage in heat exchanger. NOTE: If leakage is due to excessive corrosion, find cause by checking venting, input rates, and temperature rise. If other parts are affected, replace them.	—	—	21
21.	Fix problem.	—	—	8
22.	Do you have continuity across auxiliary limit switch ALS2? NOTE: Answer YES to this question if auxiliary limit switch ALS2 is not used.	24	23	—
23.	Replace auxiliary limit switch ALS2.	—	—	8
24.	Do you have continuity across auxiliary limit switch ALS1? NOTE: Answer YES to this question if auxiliary limit switch ALS1 is not used.	25	26	—
25.	You have an open ORANGE wire between 2-stage furnace control and low-heat pressure switch LPS.	—	—	8
26.	Can auxiliary limit switch ALS1 be reset?	28	27	—
27.	Replace auxiliary limit switch ALS1.	—	—	8
28.	Reset auxiliary limit switch ALS1, turn power on, make sure door switch is taped closed, jumper R and W/W1 thermostat terminals, replace blower door, and observe furnace operation for 30 minutes.	—	—	29
29.	Does status code 43 flash?	34	30	—
30.	Does a different status code flash?	7	31	—
31.	Remove blower door, disconnect jumper wire across R and W/W1 thermostat terminals, put blower door in place, wait for blower to stop, and continue to wait for 5 minutes while monitoring continuity across ALS1 and 2. To do this with blower door in place, monitor continuity across GRAY wire on high-heat pressure switch HPS and ORANGE wire on low-heat pressure switch LPS.	—	—	32
32.	Have you had continuity across ALS1 and 2 since jumper wire across R and W/W1 was disconnected.	8	33	—
33.	Increase blower off delay time to 225 sec by putting setup switches SW-3 and SW-4 in ON position.	—	—	8
34.	Does blower motor turn on within 1 minute of ignition?	27	35	—
35.	Consider this like a status code 13 and go to page number indicated in the Index for Status Code 13.	—	—	INDEX

STEP	ACTION	YES	NO	GO TO
36.	Do you have 24 vac across YELLOW wire on low-heat pressure switch LPS and Com-24V on 2-stage furnace control?	37	39	—
37.	Do you have 24 vac across connector terminal PL1-5 and Com-24V on 2-stage furnace control?	11	38	—
→**38.**	You have an open wire or bad terminal on theYELLOW wire from the low-heat pressure switch LPS to the 2-stage furnace control or low gas pressure switch LGPS (when used) is open. Check propane line pressure if using LGPS otherwise repair wire or replace harness.	—	—	21
39.	Replace pressure switch assembly.	—	—	8
40.	Is high-heat pressure switch HPS wired correctly?	39	41	—
41.	Rewire high-heat pressure switch HPS per wiring diagram.	—	—	8

Status Code 45

REPLACE CONTROL—This status code indicates 2-stage furnace control should be replaced, because it has detected a failure in flame sense circuitry, or main gas valve relay MGVR-1 has failed to close.

CLEANUP AND START-UP INSTRUCTIONS

1. Start furnace using procedure outlined on Lighting Instructions attached to furnace. Observe operation of furnace through at least 1 complete heating cycle controlled from room thermostat. Observe cycle for 20 minutes or until a status code is flashed. If status code flashes, refer to Index.
2. Recycle as necessary and check thermostat heat anticipator setting, gas input rates, and temperature rises. These procedures are outlined in Installation, Start-Up, and Operating Instructions.
3. Check operation of safety devices: draft safeguard switch, limit switch, and flame rollout switch(es).
4. Put all setup switches in their proper positions. On variable-speed units, put EZ-SELECT airflow control jumpers in their proper positions.
5. Remove tape from door switch.
6. Replace thermostat leads (if necessary).
7. Set thermostat in AUTO position, calling for heat.
8. Set thermostat to desired temperature.
9. Replace blower and control doors. Clean up.

Appendix A
Board Layout and Schematics

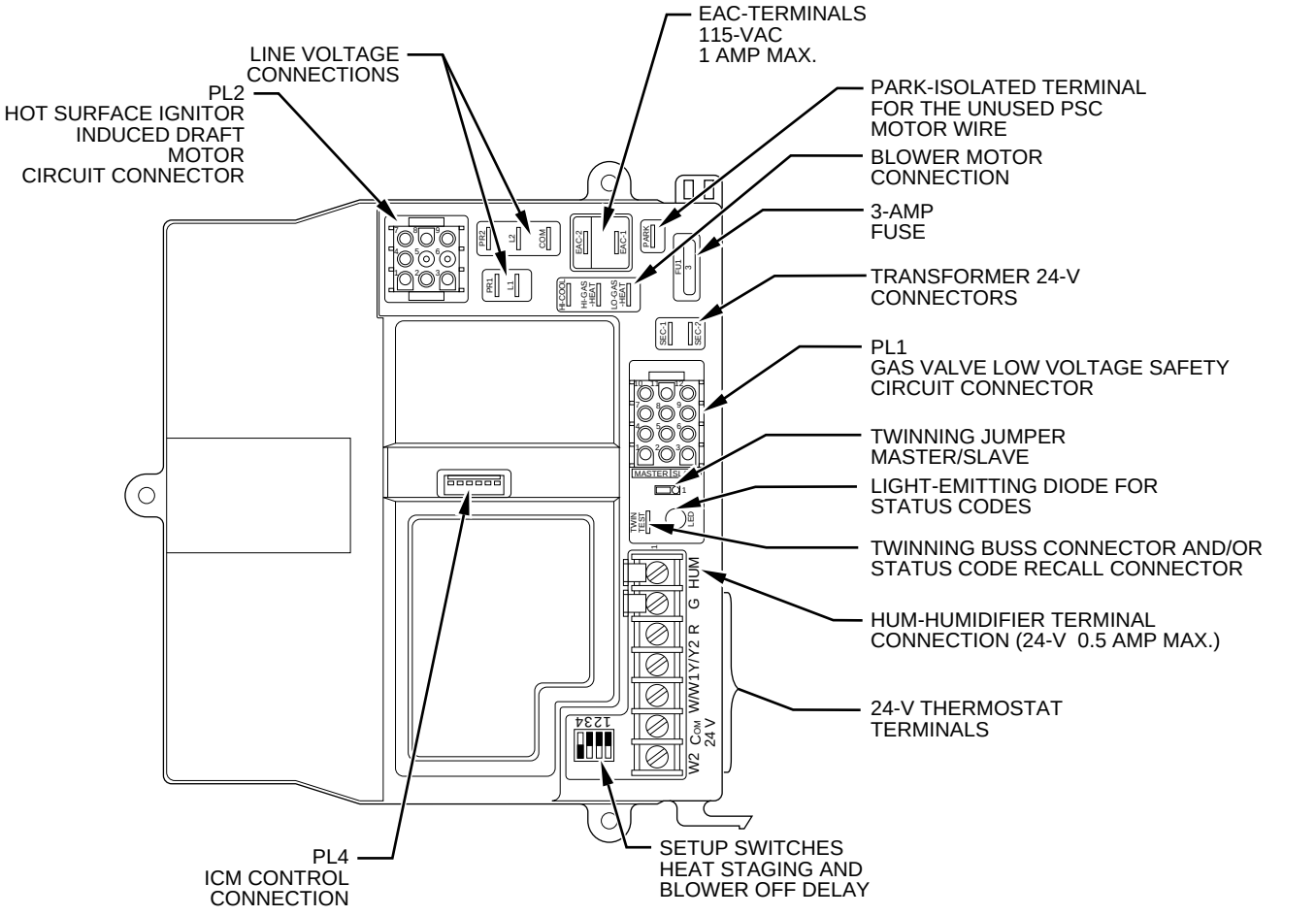

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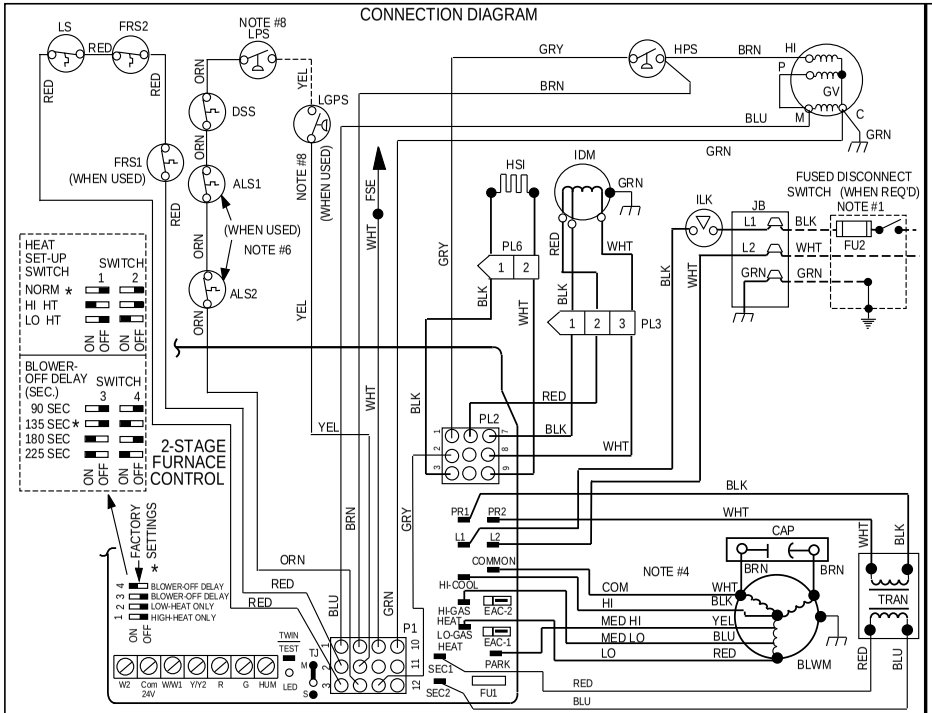
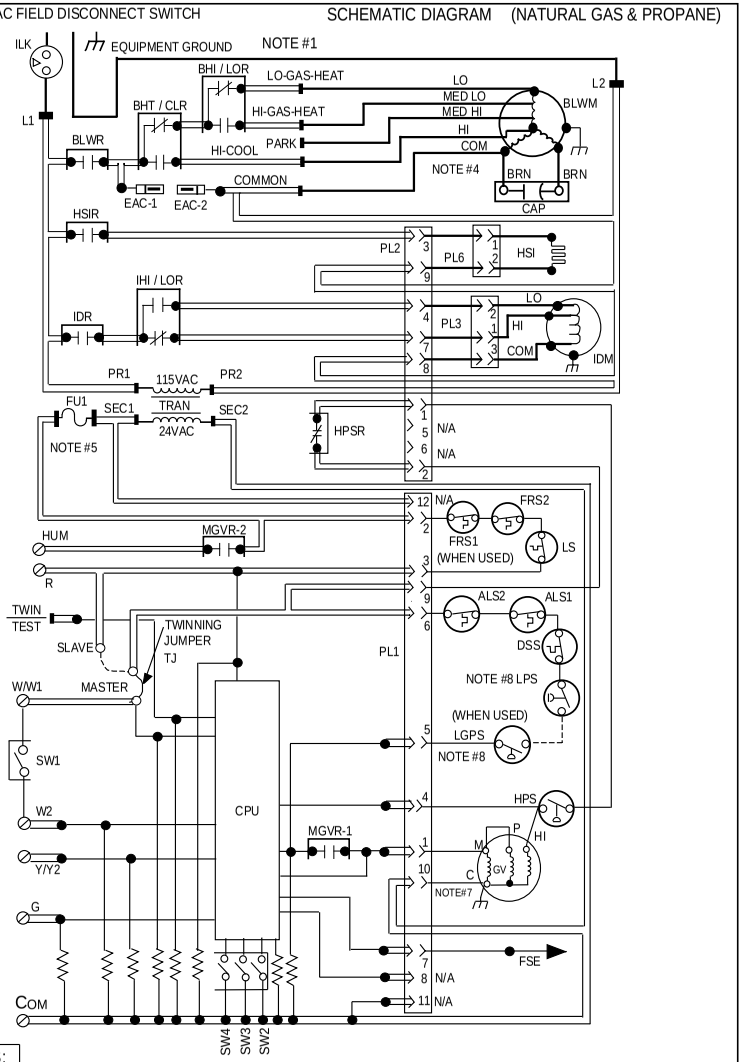
Fig. 2—Control Center





LEGEND

ALS1	AUXILIARY LIMIT SWITCH, OVERTEMP. MANUAL RESET, SPST (N.C.)
ALS2	AUXILIARY LIMIT SWITCH, OVERTEMP. AUTO RESET, SPST (N.C.)
BHI / LOR	BLOWER MOTOR SPEED CHANGE RELAY, SPDT
BHT / CLR	BLOWER MOTOR SPEED CHANGE RELAY, SPDT
BLWM	BLOWER MOTOR, 4-SPEED, PERMANENT-SPLIT-CAPACITOR
BLWR	BLOWER MOTOR RELAY, SPST (N.O.)
CAP	CAPACITOR
CPU	MICROPROCESSOR AND CIRCUITRY
DSS	DRAFT SAFEGUARD SWITCH (N.C.)
EAC-1	ELECTRONIC AIR CLEANER CONNECTION (115 VAC, 1 AMP MAX.)
EAC-2	ELECTRONIC AIR CLEANER CONNECTION (COMMON)
FRS1	FLAME ROLLOUT SWITCH OVERTEMP. MANUAL RESET, SPST (N.C.)
FRS2	FLAME ROLLOUT SWITCH OVERTEMP. MANUAL RESET, SPST (N.C.)
FSE	FLAME-PROVING SENSOR ELECTRODE
FU1	FUSE, 3 AMP, AUTOMOTIVE BLADE TYPE, FACTORY INSTALLED
FU2	FUSE, FIELD INSTALLED
GV	GAS VALVE, REDUNDANT LOW-HEAT OPERATORS, 2-STAGE
HPS	HIGH-HEAT PRESSURE SWITCH, SPST (N.O.)
HPSR	HIGH-HEAT PRESSURE SWITCH RELAY, SPST (N.C.)
HSI	HOT-SURFACE IGNITER (115 VAC)
HSIR	HOT-SURFACE IGNITOR RELAY, SPST (N.O.)
HUM	24VAC HUMIDIFIER CONNECTION (0.5 AMP. MAX.)
IDM	INDUCED DRAFT MOTOR, 2-SPEED, SHADED-POLE
IDR	INDUCER MOTOR RELAY, SPST (N.O.)
IHI / LOR	INDUCER MOTOR SPEED CHANGE RELAY, SPDT
ILK	BLOWER DOOR INTERLOCK SWITCH, SPST (N.O.)
JB	JUNCTION BOX
LED	LIGHT-EMITTING DIODE FOR STATUS CODES
LGPS	LOW GAS-PRESSURE SWITCH, SPST (N.O.)
LPS	LOW-HEAT PRESSURE SWITCH, SPST (N.O.)
LS	LIMIT SWITCH, OVERTEMPERATURE-AUTO RESET, SPST (N.C.)
MGVR	MAIN GAS VALVE RELAY, DPST (N.O.) -1 = VALVE -2 = HUMIDIFIER
PL1	12-CIRCUIT CONNECTOR
PL2	9-CIRCUIT CONNECTOR
PL3	3-CIRCUIT IDM CONNECTOR
PL6	2-CIRCUIT HSI CONNECTOR
SW1	HIGH-HEAT-ONLY SWITCH, SPST (MANUAL)*
SW2	LOW-HAT-ONLY SWITCH, SPST (MANUAL)*
SW3 & 4	BLOWER-OFF DELAY SETTING SWITCHES, SPST (MANUAL)*
TJ	TWINNING JUMPER, SPDT FOR MASTER OR SLAVE STATUS (MANUAL CHANGE OVER)
TRAN	TRANSFORMER-115VAC/24VAC
TWIN/TEST	1-CIRCUIT TWINNING BUSS CONNECTOR, ALSO STATUS CODE RECALL
	JUNCTION
	TERMINAL
	CONTROL TERMINAL
	FACTORY POWER WIRING (115VAC)
	FACTORY CONTROL WIRING (24VAC)
	FIELD POWER WIRING (115VAC)
	FIELD CONTROL WIRING (24VAC)
	CONDUCTOR ON CONTROL
	FIELD WIRING SCREW TERMINAL
	FIELD GROUND
	EQUIPMENT GROUND
	FIELD SPLICE
	PLUG RECEPTACLE

NOTES:

1. Use only copper wire between the disconnect switch and the unit.
2. If any of the original wire, as supplied, must be replaced, use the same or equivalent type wire.
3. Inducer (IDM) and blower (BLWM) motors contain internal auto-reset thermal overload switches.
4. Blower motor speed selections are for average conditions. See Installation Instructions for details on optimum speed selection.
5. Replace only with a 3-AMP fuse.
6. Auxiliary limit switches (ALS1 & 2) used on some horizontal and some downflow models.
7. This wire must be connected to furnace sheet metal for control to prove flame.
8. Factory connected when LGPS not used.
9. Symbols are an electrical representation only.
10. BLOWER-ON DELAY: Gas heating 45 seconds, Cooling/Heat Pump 2 seconds.
11. Cooling/Heat Pump BLOWER-OFF DELAY is 90 seconds.
12. IGNITION-LOCKOUT will occur after four consecutive unsuccessful trials-for-ignition. Control will automatically reset after three hours.
13. Control must be grounded at pin 10 of 12-pin connector.
14. NA - Not Applicable

COMPONENT TEST

To initiate the component test sequence with no thermostat inputs and with all inducer Post-Purge and Blower-Off Delay periods completed, short the "TWIN/TEST" terminal to the "COM" terminal for about two seconds. The control will turn ON the inducer motor Low-Speed, inducer motor High-Speed, HSI, blower motor Low-Gas-Heat Speed, blower motor High-Gas-Heat Speed, and blower motor High-Cool Speed for 7-15 seconds each. Neither the gas valve nor the humidifier will be turned ON.

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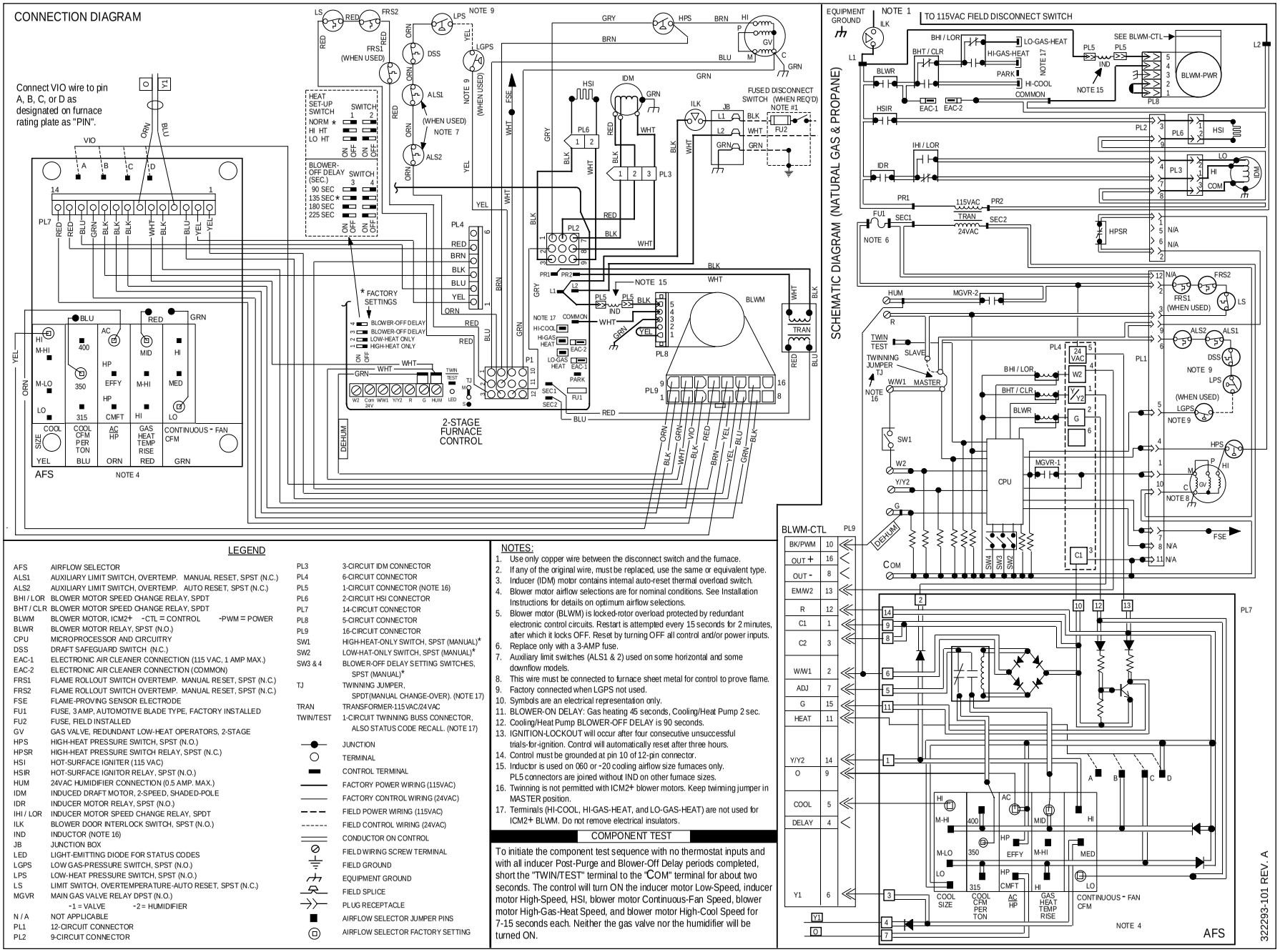
Fig. 3—Wiring Schematic for PSC Blower Motor



LEGEND

AFS	AIRFLOW SELECTOR
ALS1	AUXILIARY LIMIT SWITCH, OVERTEMP. MANUAL RESET, SPST (N.C.)
ALS2	AUXILIARY LIMIT SWITCH, OVERTEMP. AUTO RESET, SPST (N.C.)
BHI / LOR	BLOWER MOTOR SPEED CHANGE RELAY, SPDT
BHT / CLR	BLOWER MOTOR SPEED CHANGE RELAY, SPDT
BLWM	BLOWER MOTOR, ICM2+ -CTL = CONTROL -PWM = POWER
BLWR	BLOWER MOTOR RELAY, SPST (N.O.)
CPU	MICROPROCESSOR AND CIRCUITRY
DSS	DRAFT SAFEGUARD SWITCH (N.C.)
EAC-1	ELECTRONIC AIR CLEANER CONNECTION (115 VAC, 1 AMP MAX.)
EAC-2	ELECTRONIC AIR CLEANER CONNECTION (COMMON)
FRS1	FLAME ROLLOUT SWITCH OVERTEMP. MANUAL RESET, SPST (N.C.)
FRS2	FLAME ROLLOUT SWITCH OVERTEMP. MANUAL RESET, SPST (N.C.)
FSE	FLAME-PROVING SENSOR ELECTRODE
FU1	FUSE, 3 AMP, AUTOMOTIVE BLADE TYPE, FACTORY INSTALLED
FU2	FUSE, FIELD INSTALLED
GV	GAS VALVE, REDUNDANT LOW-HEAT OPERATORS, 2-STAGE
HPS	HIGH-HEAT PRESSURE SWITCH, SPST (N.O.)
HPSR	HIGH-HEAT PRESSURE SWITCH RELAY, SPST (N.C.)
HSI	HOT-SURFACE IGNITER (115 VAC)
HSIR	HOT-SURFACE IGNITOR RELAY, SPST (N.O.)
HUM	24VAC HUMIDIFIER CONNECTION (0.5 AMP. MAX.)
IDM	INDUCED DRAFT MOTOR, 2-SPEED, SHADED-POLE
IDR	INDUCER MOTOR RELAY, SPST (N.O.)
IHI / LOR	INDUCER MOTOR SPEED CHANGE RELAY, SPDT
ILK	BLOWER DOOR INTERLOCK SWITCH, SPST (N.O.)
IND	INDUCTOR (NOTE 16)
JB	JUNCTION BOX
LED	LIGHT-EMITTING DIODE FOR STATUS CODES
LGPS	LOW GAS-PRESSURE SWITCH, SPST (N.O.)
LPS	LOW-HEAT PRESSURE SWITCH, SPST (N.O.)
LS	LIMIT SWITCH, OVERTEMPERATURE-AUTO RESET, SPST (N.C.)
MGVR	MAIN GAS VALVE RELAY DPST (N.O.) -1 = VALVE -2 = HUMIDIFIER
N / A	NOT APPLICABLE
PL1	12-CIRCUIT CONNECTOR
PL2	9-CIRCUIT CONNECTOR
PL3	3-CIRCUIT IDM CONNECTOR
PL4	6-CIRCUIT CONNECTOR
PL5	1-CIRCUIT CONNECTOR (NOTE 16)
PL6	2-CIRCUIT HSI CONNECTOR
PL7	14-CIRCUIT CONNECTOR
PL8	5-CIRCUIT CONNECTOR
PL9	16-CIRCUIT CONNECTOR
SW1	HIGH-HEAT-ONLY SWITCH, SPST (MANUAL)*
SW2	LOW-HAT-ONLY SWITCH, SPST (MANUAL)*
SW3 & 4	BLOWER-OFF DELAY SETTING SWITCHES, SPST (MANUAL)*
TJ	TWINNING JUMPER, SPDT(MANUAL CHANGE-OVER). (NOTE 17)
TRAN	TRANSFORMER-115VAC/24VAC
TWIN/TEST	1-CIRCUIT TWINNING BUSS CONNECTOR, ALSO STATUS CODE RECALL. (NOTE 17)
	JUNCTION
	TERMINAL
	CONTROL TERMINAL
	FACTORY POWER WIRING (115VAC)
	FACTORY CONTROL WIRING (24VAC)
	FIELD POWER WIRING (115VAC)
	FIELD CONTROL WIRING (24VAC)
	CONDUCTOR ON CONTROL
	FIELD WIRING SCREW TERMINAL
	FIELD GROUND
	EQUIPMENT GROUND
	FIELD SPLICE
	PLUG RECEPTACLE
	AIRFLOW SELECTOR JUMPER PINS
	AIRFLOW SELECTOR FACTORY SETTING

NOTES:

1. Use only copper wire between the disconnect switch and the furnace.
2. If any of the original wire, must be replaced, use the same or equivalent type.
3. Inducer (IDM) motor contains internal auto-reset thermal overload switch.
4. Blower motor airflow selections are for nominal conditions. See Installation Instructions for details on optimum airflow selections.
5. Blower motor (BLWM) is locked-rotor overload protected by redundant electronic control circuits. Restart is attempted every 15 seconds for 2 minutes, after which it locks OFF. Reset by turning OFF all control and/or power inputs.
6. Replace only with a 3-AMP fuse.
7. Auxiliary limit switches (ALS1 & 2) used on some horizontal and some downflow models.
8. This wire must be connected to furnace sheet metal for control to prove flame.
9. Factory connected when LGPS not used.
10. Symbols are an electrical representation only.
11. BLOWER-ON DELAY: Gas heating 45 seconds, Cooling/Heat Pump 2 sec.
12. Cooling/Heat Pump BLOWER-OFF DELAY is 90 seconds.
13. IGNITION-LOCKOUT will occur after four consecutive unsuccessful trials-for-ignition. Control will automatically reset after three hours.
14. Control must be grounded at pin 10 of 12-pin connector.
15. Inductor is used on 060 or -20 cooling airflow size furnaces only. PL5 connectors are joined without IND on other furnace sizes.
16. Twinning is not permitted with ICM2+ blower motors. Keep twinning jumper in MASTER position.
17. Terminals (HI-COOL, HI-GAS-HEAT, and LO-GAS-HEAT) are not used for ICM2+ BLWM. Do not remove electrical insulators.

COMPONENT TEST

To initiate the component test sequence with no thermostat inputs and with all inducer Post-Purge and Blower-Off Delay periods completed, short the "TWIN/TEST" terminal to the "COM" terminal for about two seconds. The control will turn ON the inducer motor Low-Speed, inducer motor High-Speed, HSI, blower motor Continuous-Fan Speed, blower motor High-Gas-Heat Speed, and blower motor High-Cool Speed for 7-15 seconds each. Neither the gas valve nor the humidifier will be turned ON.

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Fig. 4—Wiring Schematic for ICM Blower Motor

Appendix B
ICM Blower Motor Description and Operation

G.E. Integrated Control Motors (ICM) shown in Fig. 5 and permanent-split-capacitor (PSC) motors operate differently. PSC motors are basically fixed-multiple-speed motors, that is they operate within small ranges of speed. The ranges, usually 4, can be selected by connecting to different 115-vac motor wires. The speed ranges are small, about 100 RPM wide, and are dependent on motor's synchronous speed (1200 for most furnaces). The characteristics of PSC motors limit the selections to fixed speeds between about 700 and 1100 RPM. ICM motor speeds are infinitely variable from 300 to 1400 RPM and are dynamically controlled to precisely control airflow CFM. The start and stop characteristics of PSC and ICM motors differ in that PSC motors ramp up to speed rapidly and coast to a stop slowly. ICM motors ramp up to speed at a controlled rate to reduce start-up noise perception (4 to 11 sec, depending on target operating CFM). ICM ramp-down time is the same as ramp-up time. ICM ramp-up and ramp-down times are additive to blower on and off delays, respectively. PSC motors are energized with 115 vac only when operating. ICM motors are energized with 115 vac whenever power is available at 2-stage furnace control, but operate only when 24-vac motor control input(s) at PL9 are ON.

An ICM is first fed 115-vac power through 5-pin connector PL8. The 115-vac power is then rectified to DC by a diode module. After rectification, the DC signal is electronically commutated and fed in sequential order to 3 stator windings. The frequency of commutation pulses determines motor speed.

Setting up desired airflow CFM on an ICM is obtained by selections made on EZ-SELECT airflow control. (See Fig. 6.) The ICM motor delivers requested airflow CFM as defined by signals received from EZ-SELECT airflow control.

The major difference between ICM and PSC motors is that ICM motors react to changes in system static pressures to maintain constant airflow CFM. Unlike conventional PSC motors where static pressure affects airflow CFM, the ICM blower motor is a constant airflow CFM motor. The ICM blower motor delivers requested airflow CFM up to about 0.7 in. wc of static pressure. The ICM motor is pre-programmed and contains airflows for all modes of operation. Blower characteristics (airflow CFM, torque, and speed-versus-static pressure) are known from laboratory testing. If any 3 characteristics are known, the fourth can be defined. Requested airflow CFM is known, because of EZ-SELECT airflow control configuration and thermostat signals. Torque is known, because it is directly related to armature current which is measured by ICM motor control. Speed is measured from the generated back EMF by ICM motor control. This information (airflow CFM, torque, and speed) is entered into an expression which calculates torque from speed and airflow CFM numbers. If calculation does not match stored blower characteristics, torque is adjusted every 0.8 sec until agreement is reached. The ICM blower motor does not directly measure static pressure, but does react to changes in static pressure to maintain constant airflow CFM.

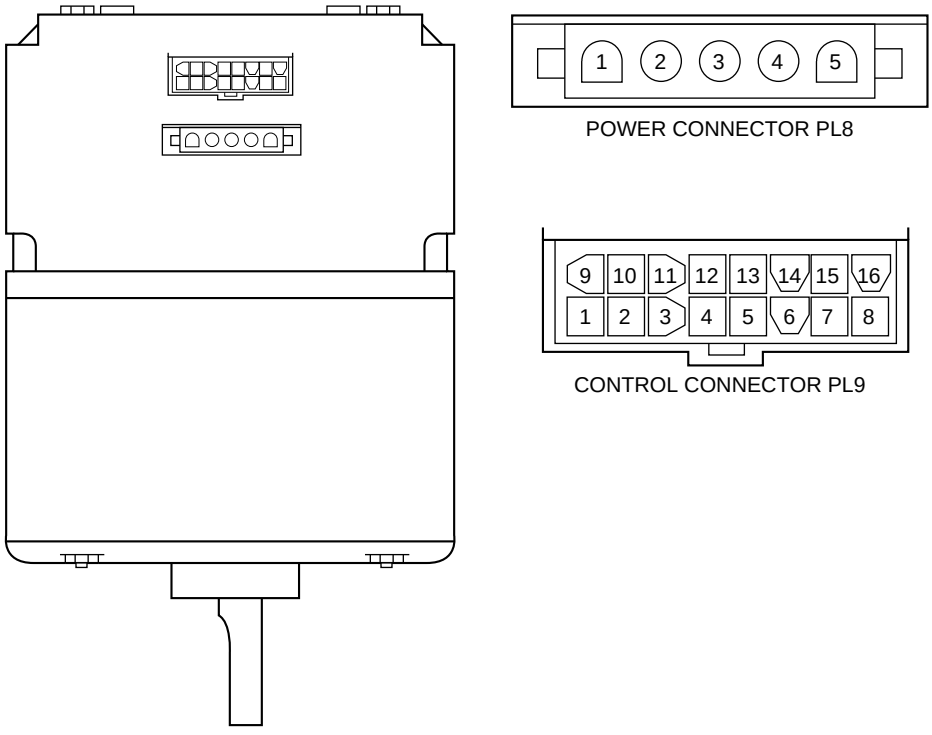

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Fig. 5—ICM Blower Motor

Violet Wire from blower wire harness is factory connected to PIN A, B, C, or D on EZ-SELECT airflow control. The PIN selection can be verified by checking the PIN marking in lower right-hand of furnace rating plate.

P12 is the main plug connection and is depicted as PL7 on wiring schematic.

Yellow Wire from blower harness is for Cool Size selection. It is used to select airflow to match the needed tons for cooling or heat pump system. This setting works in conjunction with Blue and Orange jumper.

3 Ton Drive	4 Ton Drive	5 Ton Drive
HI - 3 Ton	HI - 4 Ton	HI - 5 Ton
M-HI - 2.5 Ton	M-HI - 3.5 Ton	M-HI - 4 Ton
M-LO - 2 Ton	M-LO - 3 Ton	M-LO - 3.5 Ton
LO - 1.5 Ton	LO - 2.5 Ton	LO - 3 Ton

Blue Wire is called the CFM/TON jumper. It is used to select a slight adjustment to cooling airflow. The traditional airflow value is 400 CFM/TON. The 350 CFM/TON setting is for best efficiency with our units.
The 315 CFM/TON setting is used for improved dehumidification and/or with undersized ductwork. This setting works in conjunction with Yellow and Orange jumper.

Orange Wire from blower harness is called the AC/HP jumper. It Is used to select cooling-only AC, heat pump efficiency HP EFFY, or heat pump comfort HP CMFT. HP EFFY provides the same heating airflow used for cooling. HP CMFT reduces heating airflow to 90% of cooling airflow.

Red Wire is called the GAS HEAT TEMP RISE jumper. It is used to select gas heating air temperature rise. The selections are MID for midpoint of temperature rise range stated on rating plate, HI for high end of rise range, and M-HI which is about half way between MID and HI. This jumper selects the rise for both low- and high-heat.

Green Wire is called the CONTINUOUS FAN CFM jumper. It is used to select continuous fan airflow CFM. The selections are LO for 50% of cooling airflow, MED for 65% of cooling airflow, and HI for 100% of cooling airflow.

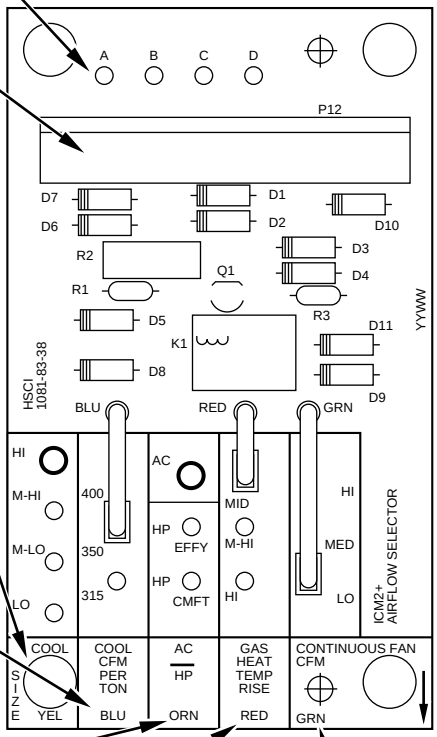

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Fig. 6—EZ-SELECT Airflow Control

SETUP PROCEDURES (ICM BLOWER MOTORS)

The ICM blower motor operating mode selections are made on EZ-SELECT airflow control with color-coded jumper wires. Factory jumper settings have large bold circles marked around pins. (See Fig. 6.) BLUE, RED, and GREEN jumpers are shown at factory settings. Furnaces with ICM blower motors are not approved for twinning.

Step 1—Gas Heating

1. The VIOLET wire is factory-connected to 1 of the 4 pins (A, B, C, or D) on Airflow Selector. Pin selection can be checked by noting the "PIN" marking in lower right-hand corner of furnace rating plate.
2. Gas heating air temperature rise is selected on EZ-SELECT airflow control with RED jumper wire. The selections are MID (midpoint of temperature rise range marked on rating plate), HI (approximately the high end of rise range), and M-HI (about half-way between MID and HI). Select rise by moving WHITE connector on RED jumper wire to desired pin position. This setting selects rises for high- and low-gas heating.

Step 2—Cooling and Heat Pump Heating

1. Cooling and heat pump selections can be determined from Table 4. Selections are made by moving WHITE connector on appropriately colored YELLOW jumper wire to desired pin position. Power must be cycled off and then on for Cool Size selection to take effect. Power need not be cycled off and on for CFM/TON to take effect.

   The YELLOW COOL SIZE jumper is used to select airflow CFM to match needed tons for cooling or heat pump system. The BLUE CFM/TON jumper is used to select a slight adjustment to airflow CFM. The traditional cooling and heat pump airflow is 400 CFM/TON. An airflow CFM of 350 CFM/TON is used to attain the best efficiency with Carrier units. An airflow CFM of 315 CFM/TON is used for improved dehumidification and/or with undersized ducts. Additional humidity control can be attained by using a humidistat.

   As an alternative to selecting 315 CFM per ton for cooling airflow CFM, an active de-humidification mode can be invoked by connecting a humidistat in series with GREEN wire marked DEHUM connected to the 1/4-in. quick-connect terminal at G on 2-stage furnace control. The humidistat contacts should open on a rise in humidity. When humidistat contacts open, airflow CFM will be reduced to 80% of selected airflow CFM, except airflow CFM will not be reduced to less than 280 CFM per ton.
2. The ORANGE jumper wire selects cooling-only (AC) or heat pump heating and cooling, and selects heat pump heating best efficiency (HP EFFY) or enhanced comfort (HP CMFT). HP EFFY provides the same heating airflow CFM as used for cooling. HP CMFT reduces heating airflow CFM to 90% of cooling airflow CFM for a higher air temperature rise and better comfort.

Step 3—Continuous Fan

The GREEN jumper wire selects airflow CFM for continuous fan. LO provides 50% of airflow CFM used for single-speed cooling or 2-speed cooling. MED provides 65% of this cooling airflow CFM. HI provides 100% of this cooling airflow CFM for continuous fan operation.

NOTE: If HI is selected with a 2-speed cooling or heat pump system, airflow CFM remains at 100% of high-cooling/heating when system is in low-cooling and heat pump low-heating mode. Continuous fan selection has no effect on gas heating airflow CFM.

Table 4—Cooling and Heat Pump Airflow Selections

TONS (12,000 BTUH)		1-1/2	2	2-1/2	3	3-1/2	4	5
Unit Size		COOL SIZES (YELLOW WIRE)						
060-12		LO	M-LO	M-HI	HI	—	—	—
080-16		—	—	LO	M-LO	M-HI	HI	—
100-20 120-20		—	—	—	LO	M-LO	M-HI	HI
Operating Mode	**CFM/TON (Blue Wire)**	**NOMINAL AIRFLOW (CFM)**						
Single-Speed G and Y/Y2 (100%)	400	600	800	1000	1200	1400	1600	2000
	350	525	700	875	1050	1225	1400	1750
	315	500*	630	788	945	1102	1260	1575
2-Speed HI G, Y1, and Y/Y2 (105%)	420	630	840	1050	1260	1470	1680	2100
	368	551	735	919	1102	1286	1470	1838
	331	496	662	827	992	1157	1323	1654
2-Speed LO G and Y1 (65%)	—	500*	520	650	780	910	1040	1300
		500*	500*	569	700†	796	910	1138
		500*	500*	512	700†	700†	819	1024

* 500 CFM minimum airflow is set for use with electrostatic air cleaner.
† 700 CFM minimum airflow is set for -20 furnace sizes only for use with electrostatic air cleaner.

Follow these examples to determine cooling and continuous fan airflows:

Example 1

Model No. 58UHV120---10120
-20---2000 CFM Blower Drive Package
Single-Speed Cooling Unit

If you select:

COOL SIZE (YEL WIRE)	COOL CFM/TON (BLU WIRE)	AC HP (ORN WIRE)	CONTINUOUS FAN CFM (GRN WIRE)
HI	400	AC	HI

You selected HI (5 ton) maximum blower capacity of furnace model, 400 CFM/TON of cooling CFM, AC setting for air conditioner, and HI continuous fan setting for 100% of cool size and cool CFM/TON airflow CFM for continuous fan operation.

Cooling Air Flow = (5 X 400) = 2000 CFM
Continuous Fan = (5 X 400) X 100% = 2000 CFM

Example 2

Model No. 58UHV120---10120
-20---2000 CFM Blower Drive Package
Single-Speed Cooling Unit

If you select:

COOL SIZE (YEL WIRE)	COOL CFM/TON (BLU WIRE)	AC HP (ORN WIRE)	CONTINUOUS FAN CFM (GRN WIRE)
HI	400	HP CMFT	MED

You selected HI (5 ton) maximum blower capacity of furnace model, 400 CFM/TON of cooling CFM, HP CMFT for 90% of selected cool size and cool CFM/TON airflow CFM settings for heat pump heating operation, and 100% of selected cool size and cool CFM/TON airflow CFM settings for cooling operation, and MED continuous fan setting for 65% of cooling airflow CFM for continuous fan operation.

Heat Pump Heating Air Flow = (5 X 400) X 90% = 1800 CFM
Heat Pump Cooling Air Flow = (5 X 400) X 100% = 2000 CFM
Continuous Fan = (5 X 400) X 65% = 1300 CFM

Example 3

Model No. 58UHV120---10120
-20---2000 CFM Blower Drive Package
2-Speed Cooling Unit

If you select:

COOL SIZE (YEL WIRE)	COOL CFM/TON (BLU WIRE)	AC HP (ORN WIRE)	CONTINUOUS FAN CFM (GRN WIRE)
M-LO	350	AC	LO

You selected M-LO (3.5 ton) of blower capacity of furnace model, 350 CFM/TON of cooling CFM, AC setting for air conditioner, and LO continuous fan setting for 50% of single-speed cooling airflow CFM for continuous fan operation.

Low Cooling Airflow = (3.5 X 350) X 65% = 796 CFM
High Cooling Air Flow = (3.5 X 350) X 105% = 1286 CFM
Continuous Fan = (3.5 X 350) X 50% = 612 CFM NOTE: This is less than 700 CFM minimum airflow. Furnace will run Continuous Fan at 700 CFM. (See Table 4.)

Appendix C
Pressure Check Diagram

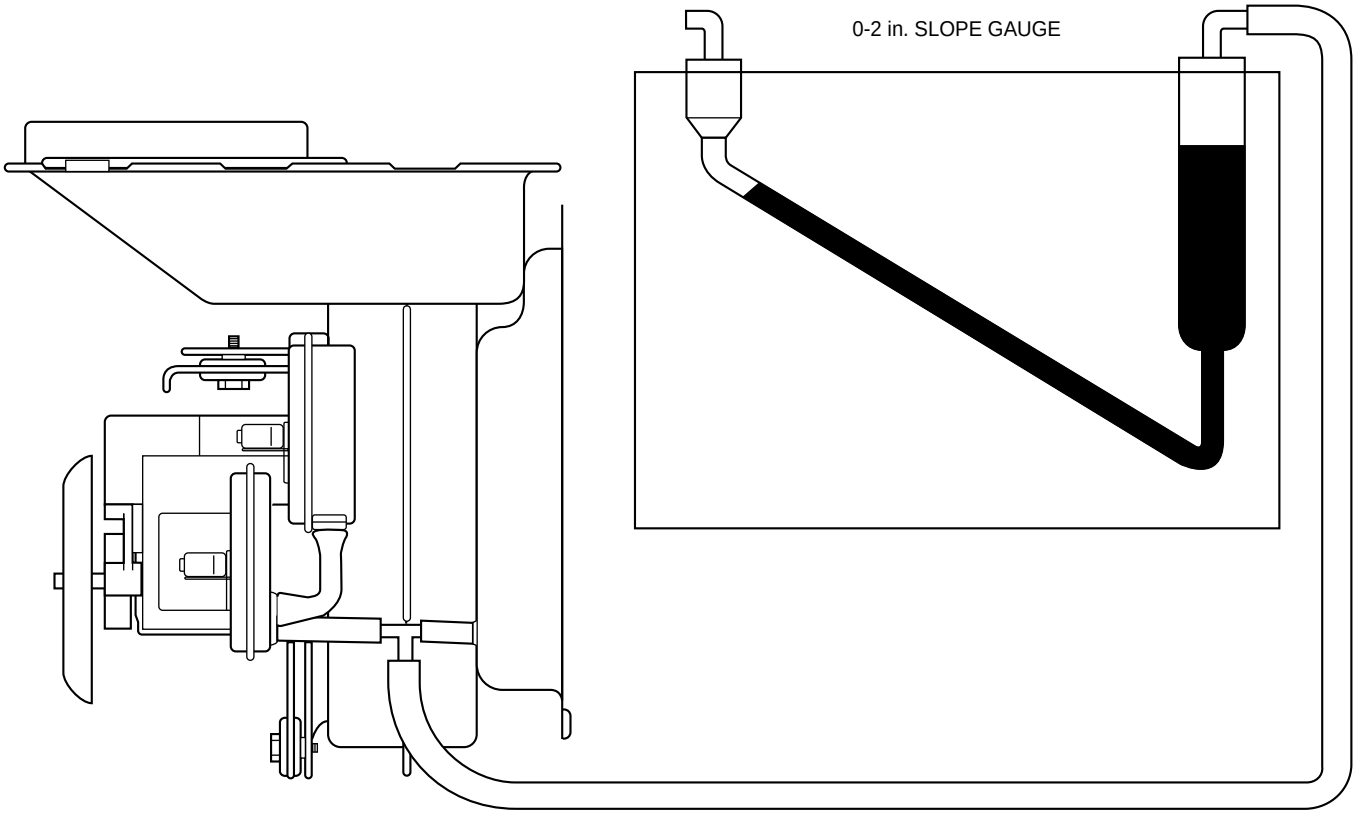

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Fig. 7—Pressure Check Diagram

Low-Heat Pressure Switch LPS Settings

MODEL NO.	FACTORY SETTINGS		HIGH-ALTITUDE SETTINGS	
	Make Point	Break Point	Make Point	Break Point
58DXT, 58TUA, 58UXT, 58UXV	0.37 in. wc	0.22 ± 0.05 in. wc (YELLOW LABEL)	0.35 in. wc	0.20 ± 0.05 in. wc (GRAY LABEL)
58TMA	0.37 in. wc	0.22 ± 0.05 in. wc (BLUE LABEL)	0.35 in. wc	0.20 ± 0.05 in. wc (RED LABEL)
58UHV	0.42 in. wc	0.27 ± 0.05 in. wc (ORANGE LABEL)	0.35 in. wc	0.20 ± 0.05 in. wc (LT. GREEN LABEL)

High-Heat Pressure Switch HPS Settings

MODEL NO.	FACTORY SETTINGS		HIGH-ALTITUDE SETTINGS	
	Make Point	Break Point	Make Point	Break Point
58DXT, 58TUA, 58UXT, 58UXV	0.58 in. wc	0.43 ± 0.05 in. wc (YELLOW LABEL)	0.54 in. wc	0.39 ± 0.05 in. wc (GRAY LABEL)
58TMA	0.67 in. wc	0.52 ± 0.05 in. wc (BLUE LABEL)	0.62 in. wc	0.47 ± 0.05 in. wc (RED LABEL)
58UHV	0.68 in. wc	0.54 ± 0.04 in. wc (ORANGE LABEL)	0.58 in. wc	0.44 ± 0.04 in. wc (LT. GREEN LABEL)

Appendix D
Quick Reference Troubleshooting Guide

NOTES:
1. Refer to information label on blower compartment door for procedure for use of LED status codes and problem solving suggestions.
2. LED indicator is viewed through window in blower compartment door.
3. If 115-vac power is de-energized or interrupted during a call for heat, the indoor blower will run for 90 sec before a gas heating cycle begins – **Code 12**.
4. After replacing any component, verify correct operating sequence.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

ONLY QUALIFIED AND TRAINED SERVICE PERSONNEL SHOULD PERFORM THIS PROCEDURE

START

Turn thermostat **OFF**.

On furnace control, note current settings for setup switches 1 (SW-1) and 2 (SW-2) then set SW-1 to **OFF** and SW-2 to **ON**.

Cycle 115-v power off for 3 sec, then on.

Continuous LED? — No →
- If LED is flashing rapidly, check line voltage polarity.
- If **Code 24** is displayed, check for blown fuse.
- If LED is **OFF**, check line voltage and 24-v transformer.
- If **Code 45** is displayed, replace control.

Yes ↓

Set thermostat to call for heat. Set **FAN** switch to **AUTO**.

Draft inducer motor starts. — No →
- 24v should be present across C and W. If not, check for:
  1. Open thermostat.
  2. Open 24-v fuse (FU1) – **Code 24.**
  3. Failed transformer.
- If **Code 23** is displayed, the pressure switch(es) is stuck closed. Replace switch and/or check pressure tube for blockage.
- System malfunction – **Code 21.**
- 115v should be present at the inducer motor. If so, replace inducer motor. If not, check 115-v wiring.

Yes ↓

Is **Code 22** displayed? — No →
- If **Code 32** is displayed check for:
  1. Open gas inlet pressure switch (when used).
  2. Open pressure switch (LPS) and/or tube – **Code 32.**
  3. Open draft safeguard switch (DSS) – **Code 32.**
  4. Open auxiliary switch (ALS)(downflow only) – **Code 32.**
  5. Check all low-voltage wiring connections.
- 115v should be present at the ignitor. If so, replace the ignitor; if not, check 115-vac wiring to ignitor.
- LPS, DSS, or ALS open while HPS if closed (high-gas-heat only) – **Code 43.**

Yes ↓

Flame present when not normal. Replace gas valve.

15-sec inducer pre-purge.

ignitor warms up and glows orange/yellow; 17-sec warm-up. — No →
- Control will attempt to light burners 4 times (approximately 1 minute between attempts – **Code 34**). Voltage is present at the gas valve for 7 sec during each ignition trial. System will lockout after 4 attempts.
- Is the gas valve control knob in the **OPEN** or **ON** position?
- 24v should be present across the gas valve terminals **C** and **M/P** (and **C** and **HI** for high-stage test) during the 7 sec ignition trial. If not, check all low-voltage wiring connections to valve.
- If 24v are present, and main gas does not flow:
  1. Is supply pressure between 4.5- and 13.6-in. wc? If not, adjust supply pressure.
  2. If supply pressure is between 4.5- and 13.6-in. wc, replace gas valve.
- Check ignitor position.
- Check burner carryover gap.
- Check manifold pressure (1.3- to 1.7-in. wc for low-stage gas heat; 3.2- to 3.8-in. wc for high-stage gas heat).
- Check for proper orifice size.

Yes ↓

Main burners ignite. — No →
- Is **Code 31** (high-gas-heat only), **32, 33, or 34** displayed? Check code information label to diagnose.
- Check polarity of 115-v power at J-box and control – **Rapid flashing LED**.
- Check ground continuity from J-box to control.
- Check flame sensor microamps (4.0 nominal; 0.5 minimum for control to recognize flame).

Yes ↓

Main burners stay on. — No →
- See 2-Stage Gas-Fired Induced-Combustion Furnaces with PSC and ICM Blower Motor Troubleshooting Guide.

Yes ↓

Indoor blower motor starts on heating speed after 45-sec warm-up period. — No →
- If not, check for:
  1. Satisfied thermostat.
  2. Open inlet gas pressure switch (when used).
  3. Open pressure switch (LPS) – **Code 32**.
  4. Open draft safeguard switch (DSS) – **Code 32**.
  5. Open auxiliary limit (ALS)(downflow only) – **Code 32**.
  6. Open 24-v fuse (FU1) – **Code 24**.
  7. Open limit switch (LS) – **Code 13** or **33**.
  8. Open flame rollout switch (FRS) – **Code 13** or **33**.
  9. Check 115-v line voltage – **LED** off.

  Check for sources of electrical noise interference (electronic air cleaners, nearby TV, or radio antennas).

Yes ↓

Furnace runs until call for heat ends. — No →
- If inducer and burners continue to operate, check for 24v at the gas valve. If 24v are present, verify that the thermostat is open across R and W. If no voltage is present, turn the gas valve control knob to the **OFF** position. Replace gas valve.

Yes ↓

Turn thermostat to **OFF**; gas valve shuts off burners; 5-sec inducer post purge. — No →
- 24v should be present across R and C. If not, check for:
  1. Open limit switch (LS) – **Code 13 or 33**.
  2. Open flame rollout switch (FRS) – **Code 13 or 33**.
- 24v should not be present across R and G. If so, turn thermostat **FAN** switch to **AUTO**.

Yes ↓

Indoor blower motor stops after 90, 135, 180, or 225 sec. — No →
- Is indoor blower on ?

Yes ↓

Heating sequence of operation complete. Remove blower door, move setup switch 1 (SW-1) to **ON** position and repeat process to check high-stage gas heat operation. (When finished return SW-1 and SW-2 to original desired settings.)

Yes →
- 24v should be present across R and C. If not, check for:
  1. Open flame rollout switch (FRS) – **Code 33**.
  2. Open limit switch (LS) – **Code 33.**
  3. Check all low-voltage wiring connections.

No ↓

Replace control only if all checks are OK.

No →
- Replace control only if **Code 45** is displayed, or if all checks are OK.
- Replace control only if all checks are OK.
- Replace control if **Code 45** is displayed, or if all checks are OK. Clean flame sensor if microamps are below nominal.

Appendix E
Static Pressure Reading Location Diagrams

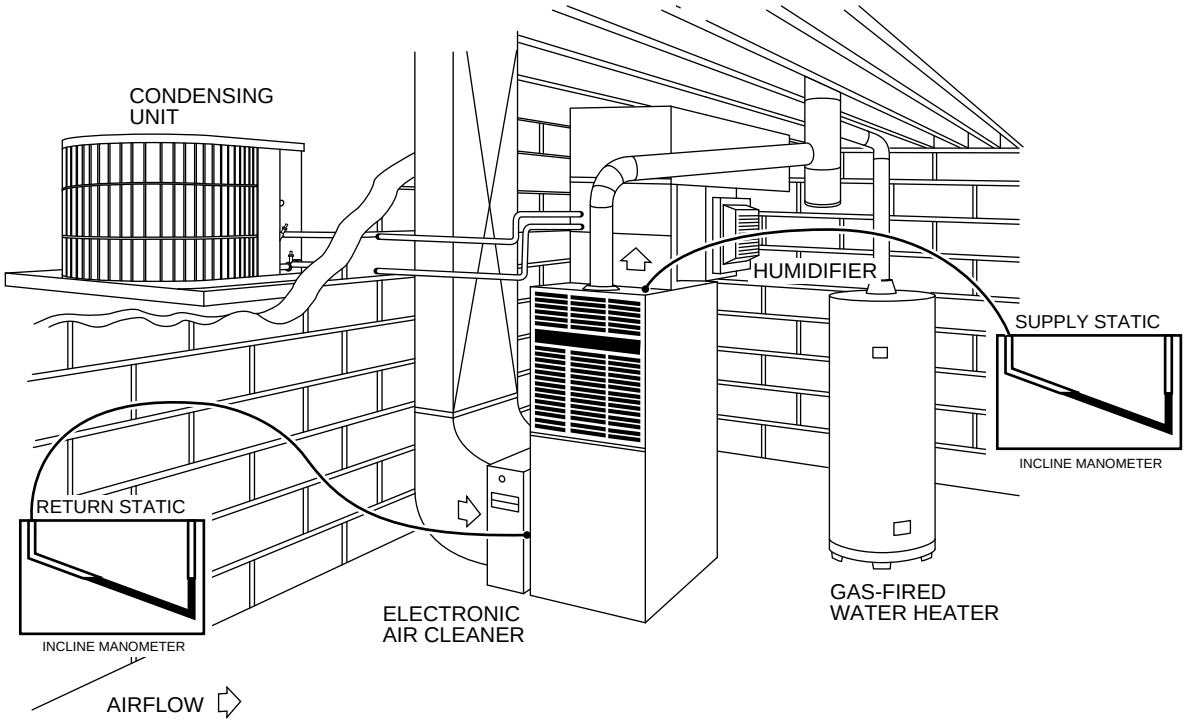


Fig. 8—Upflow Total Static Pressure Reading Locations

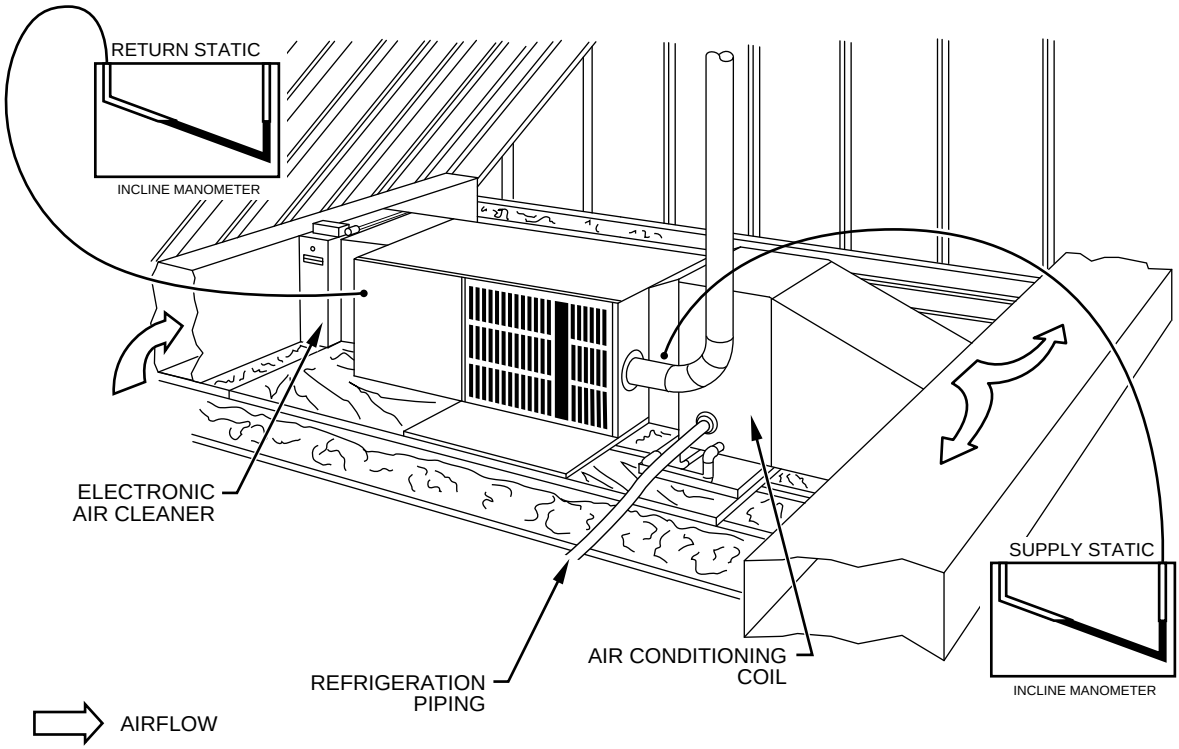


Fig. 9—Horizontal Right and Left Airflow Total Static Pressure Reading Locations

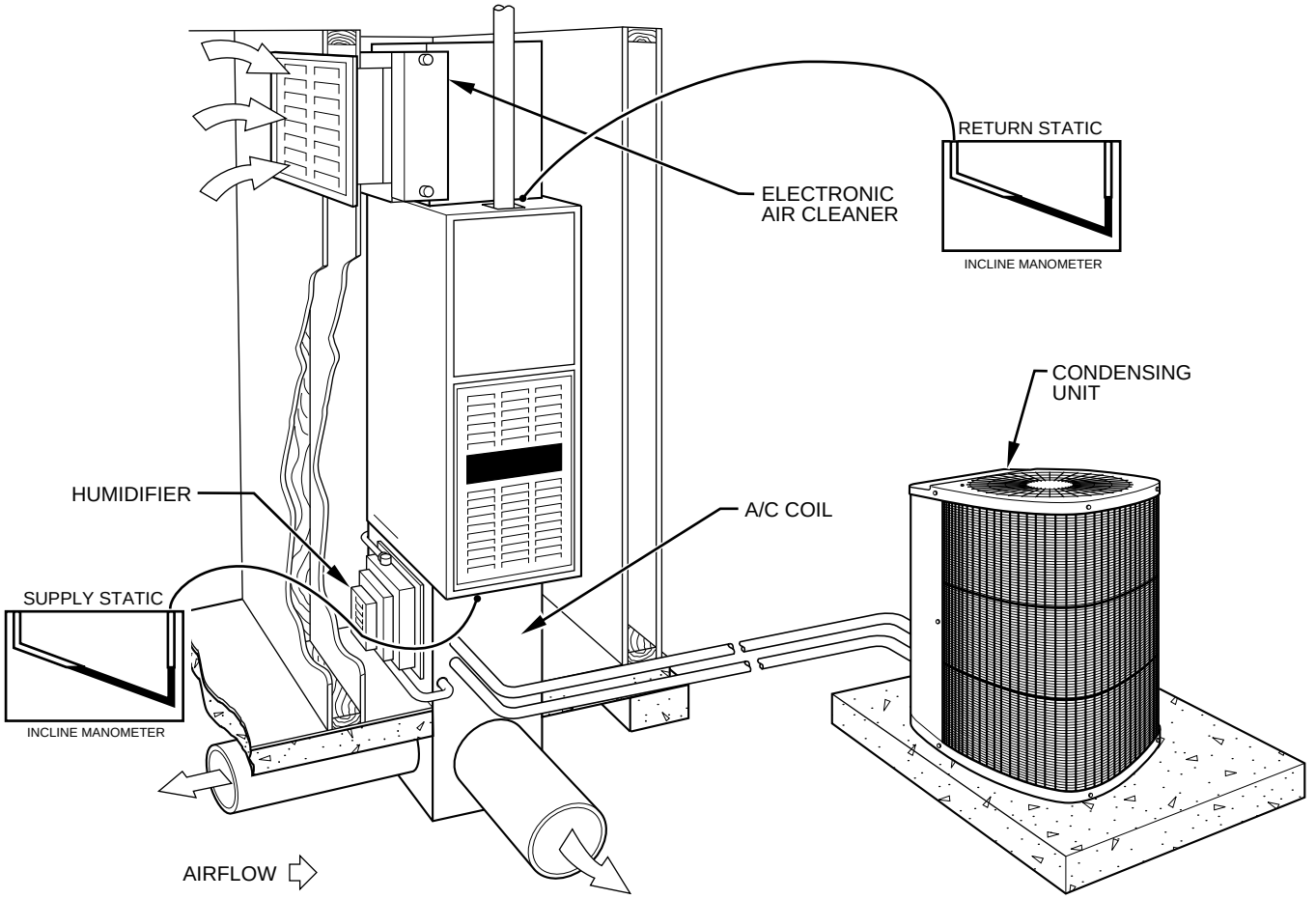


Fig. 10—Downflow Total Static Pressure Reading Locations

Tools Needed:

1. Pitot Tube
2. Incline Manometer/Magnahelic

Example 1

Return ESP after Filter	0.20 in. wc
Supply ESP before Coil	0.40 in. wc
Total ESP	0.60 in. wc

Example 2

Return ESP before Filter	**0.10 in. wc**
Filter Static Drop @ 2000 CFM	0.10 in. wc
Supply ESP after Coil	0.20 in. wc
Coil Static Pressure Drop Wet	0.20 in. wc
Total ESP	0.60 in. wc

Both Examples 1 and 2 are correct. Example 1 ESP readings were taken as laid out in static pressure reading location diagrams. (See Fig. 8-10). Example 2 readings were taken as described. The coil and filter static pressure drops were taken from the manufacturer's product data sheets with the assumption that 2000 CFM is being delivered.

Appendix F
Furnace Staging Algorithm

On initial thermostat call for heat after power-up, furnace staging algorithm provides 16 minutes of low heat provided SW-1 and SW-2 are off. If call for heat still exists after operating for 16 minutes in low heat, furnace switches to high heat until thermostat is satisfied.

During subsequent calls for heat:

- Low Heat run time is calculated based on previous heating cycle.
- High Heat on time is not calculated. High Heat is energized 1 of 3 ways and runs until thermostat is satisfied.
  1. After Low Heat has run for 16 minutes and call for heat is still present.
  2. When furnace staging algorithm (using previous cycle information) determines High Heat is necessary for entire thermostat cycle.
  3. After calculated Low Heat on time has elapsed and call for heat is still present.
- The following flowchart shows how furnace staging algorithm calculates Low Heat on times. To predict low-heat operation, the times in Low Heat (LH) and High Heat (HH) during previous cycle must be known. The furnace staging algorithm uses these values to determine how much low-heat operation will occur on next call for heat.
- Four examples are shown below to illustrate what furnace will do on a cold start, coming out of night setback, coming on in Low Heat, and coming on in High Heat.

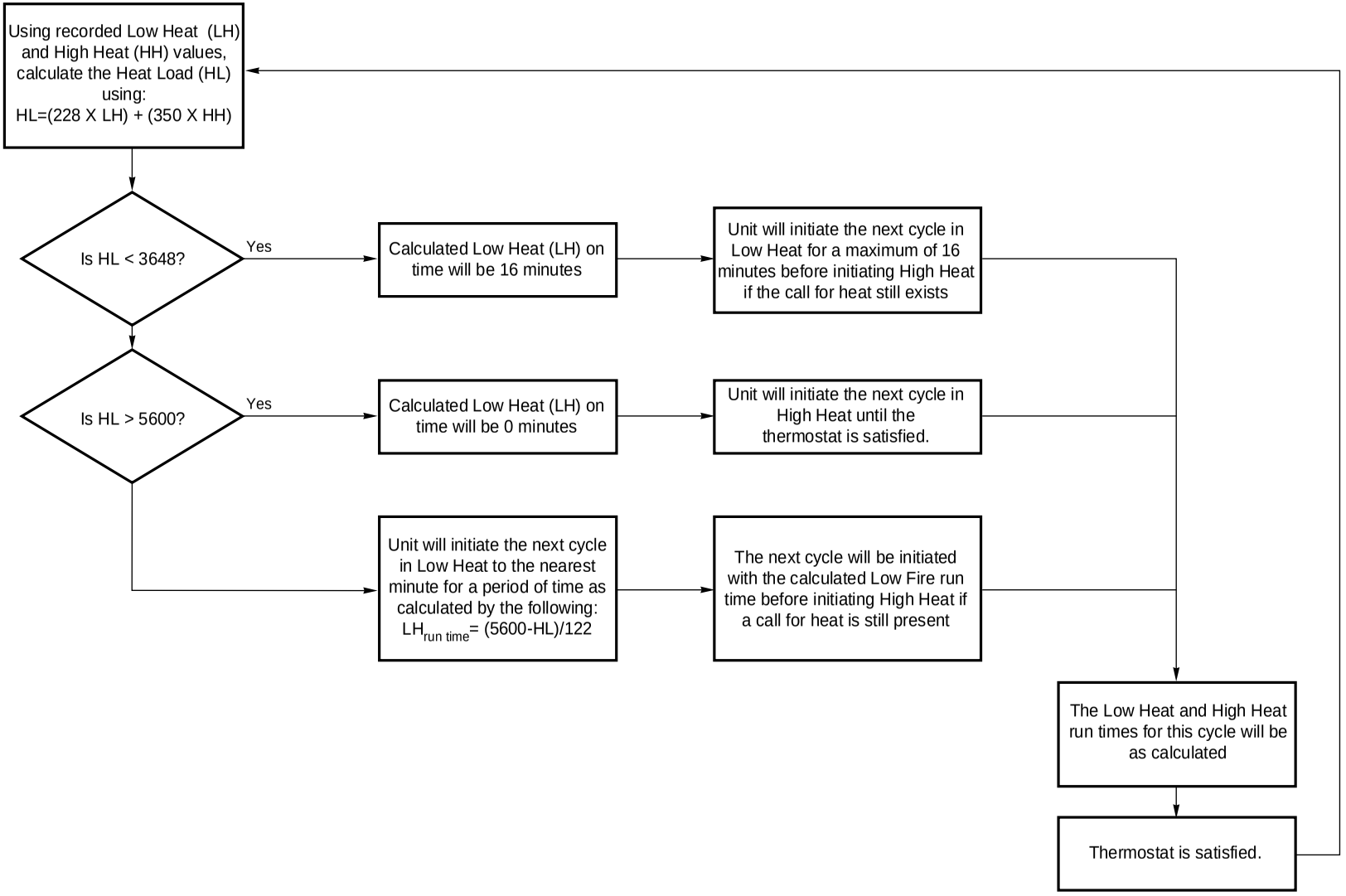
EXAMPLE 1:
Furnace ran for 16 minutes in Low Heat and 5 minutes in High Heat during previous call for heat.
LH = 16 HH = 5
Calculate: (228 X 16) + (350 X 5) = 5398
$3648 < 5398 < 5600 \Rightarrow$ Calculate Low Heat run time for next cycle.
$\text{LHrun time} = \frac{5600 - 5398}{122} = 1.6 \Rightarrow$ Next cycle, furnace will run for 1 to 2 minutes in Low Heat and then switch to High Heat if call for heat is still present.

EXAMPLE 2:
Furnace ran for 16 minutes in Low Heat and 10 minutes in High Heat during previous call for heat.
LH = 16
HH = 10
Calculate: (228 X 16) + (350 X 10) = 7148
$7148 > 5600 \Rightarrow$ Next cycle furnace will only run in High Heat. Low Heat run time is 0 minutes.

EXAMPLE 3:
Furnace ran for 13 minutes in Low Heat and 5 minutes in High Heat during previous call for heat. This can happen if furnace staging algorithm calculated 13 minutes based on a previous call for heat.
LH = 13
HH = 5
Calculate: (228 X 13) + (350 X 5) = 4714
$3648 < 4714 < 5600 \Rightarrow$ Calculate Low Heat run time for next cycle.
$\text{LHrun time} = \frac{5600 - 4714}{122} = 7.26 \Rightarrow$ Next cycle, furnace will run for 7 to 8 minutes in Low Heat and then switch to High Heat if call for heat is still present.

EXAMPLE 4:
Furnace ran for 0 minutes in Low Heat and 10 minutes in High Heat during previous call for heat.
LH = 0
HH = 10
Calculate: (228 X 0) + (350 X 10) = 3500
$3500 < 3648 \Rightarrow$ Next cycle furnace will only run in Low Heat for 16 minutes maximum, then switch to High Heat if call for heat is still present.

Furnace Staging Algorithm



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Appendix G
Quick Reference Information

Low-Heat Pressure Switch LPS Settings

MODEL NO.	FACTORY SETTINGS		HIGH-ALTITUDE SETTINGS	
	Make Point	Break Point	Make Point	Break Point
58DXT, 58TUA, 58UXT, 58UXV	0.37 in. wc	0.22 ± 0.05 in. wc (YELLOW LABEL)	0.35 in. wc	0.20 ± 0.05 in. wc (GRAY LABEL)
58TMA	0.37 in. wc	0.22 ± 0.05 in. wc (BLUE LABEL)	0.35 in. wc	0.20 ± 0.05 in. wc (RED LABEL)
58UHV	0.42 in. wc	0.27 ± 0.05 in. wc (ORANGE LABEL)	0.35 in. wc	0.20 ± 0.05 in. wc (LT. GREEN LABEL)

High-Heat Pressure Switch HPS Settings

MODEL NO.	FACTORY SETTINGS		HIGH-ALTITUDE SETTINGS	
	Make Point	Break Point	Make Point	Break Point
58DXT, 58TUA, 58UXT, 58UXV	0.58 in. wc	0.43 ± 0.05 in. wc (YELLOW LABEL)	0.54 in. wc	0.39 ± 0.05 in. wc (GRAY LABEL)
58TMA	0.67 in. wc	0.52 ± 0.05 in. wc (BLUE LABEL)	0.62 in. wc	0.47 ± 0.05 in. wc (RED LABEL)
58UHV	0.68 in. wc	0.54 ± 0.04 in. wc (ORANGE LABEL)	0.58 in. wc	0.44 ± 0.04 in. wc (LT. GREEN LABEL)

Flame Sensor Microamperage:
Microamp Range: 0.5 to 6.0 microamps
Typical Reading: 4.0 to 6.0 microamps

Hot Surface Ignitor Reading:
Ohm reading of HSI new cold: 40 to 90 ohms (Resistance will go up with HSI life and exceed new HSI resistance over time.)

Gas Valve Ohm Readings:
M to C: 98 ohms (solenoid coil)
Hi to C: 1.5 ohms (bridge rectifier, use diode test function setting on meter)

Power Choke (Inductor):
Run unit in cooling mode and measure motor amp draw before power choke. Then rerun unit in cooling mode, but this time measure amp draw without power choke in line. The amp draw should be higher without power choke. Some ammeters will register a lower amp draw (look for a change in amperage).

Draft Safeguard Switch:
HH18HA215 (Manual Reset) Break Point 215°F ± 6

Flame Rollout Switch:
HH18HA291 (Manual Reset) Break Point 290°F ± 6

Appendix H
Twinning

Only upflow, PSC, 2-speed furnaces can be twinned. Units that are certified to be twinned are listed in twinning kit Installation Instructions. Both of the units to be twinned must be the same size and same model furnace. Mis-matching twinned units is not allowed.

NOTE: When troubleshooting twinned furnaces, it is helpful to disconnect twinning jumper and troubleshoot furnaces separately. If a polarity status code is flashed, go to page number indicated in Index for Rapid Flashing LED.

⚠ WARNING

Do not use back of furnace for return-air duct connection as limit cycling will occur. A failure to follow this warning can cause fire, personal injury, or death.

⚠ WARNING

Do not remove center return-air partitions between furnaces. Failure to follow this warning could result in improper auxiliary limit operation, fire, personal injury, or death.

⚠ CAUTION

Failure to select identical blower speed taps in both furnaces can result in overheating of furnace components, possible loss of furnace operation, insufficient airflow, and damage to the furnaces.

⚠ CAUTION

When common-venting twinned, Category I (negative pressure venting) furnaces, excessive condensate may occur as a result of oversized vent systems. Dedicated vents and/or proper vent sizing per furnace Installation Instructions will reduce the potential for condensation.

IMPORTANT TWINNING REQUIREMENTS TO CONSIDER

Please read and follow the entire furnace Installation Instructions and twinning kit Installation Instructions when installing these furnaces.

A combination of 1 full side and bottom inlet plenum or a bottom-only inlet plenum must be used for return air for each furnace. The preferred method is that all return air be brought into bottom of furnaces through a common bottom plenum.

With 2-speed furnaces, low-speed gas heat in both furnaces is used for single-stage heat. High-gas heat in both furnaces is used for second-stage heat.

The furnace installed on left-hand (LH) side is considered the MASTER furnace. The right-hand (RH) furnace is considered the SLAVE. Thermostat connections are made only to MASTER unit.

SEQUENCE OF OPERATION

See Fig. 11 and 12 for 2-speed PSC furnace twinning connection and schematic wiring diagrams while reviewing sequence of operation.

Twinning operation is controlled by LH or MASTER furnace. The TWIN/TEST and Com-24V connection wires ensure the 2 furnaces coordinate their blower operation. When either furnace requires blower operation, both furnaces operate their blowers at the same speed (the highest speed required by either furnace). Both furnaces operate simultaneously in the same mode: low-gas heat, high-gas heat, low-cool, high-cool, or continuous fan. Exceptions can occur if a safety device in either furnace is activated (such as low-gas-heat or high-gas-heat pressure switch, flame rollout switch, limit switch, draft safeguard switch, twinning auxiliary limit switch, or flame-proving sensor). In such a case, the other furnace continues to operate unless the safety device is the flame rollout, limit, or twinning auxiliary limit switch, in which case both furnaces respond.

TWO-STAGE HEAT WITH SINGLE-STAGE GAS-HEAT THERMOSTAT

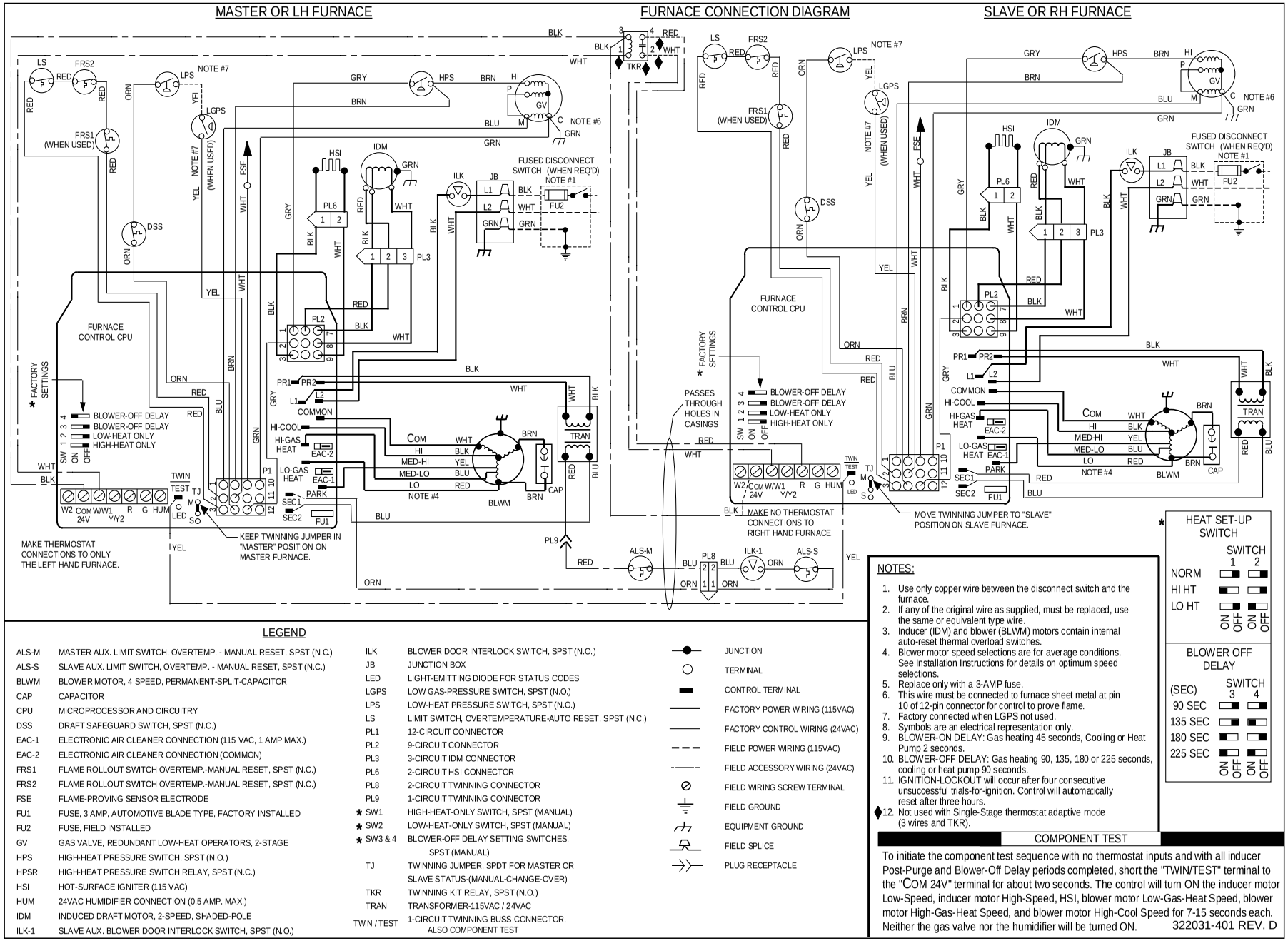
NOTE: SW-1 and SW-2 in BOTH furnaces in OFF position.

1. LH or MASTER furnace control determines whether furnaces are both operating in low-gas heat or high-gas heat, depending on control's adaptive gas heating mode when R-W/W1 circuit is closed in MASTER furnace.
2. Operation in all modes is the same for twinned furnaces as for individual furnaces. See Sequence of Operation section in this guide or in the furnace Installation, Start-Up, and Operating Instructions.

TWO-STAGE HEAT WITH 2-STAGE GAS-HEAT THERMOSTAT

NOTE: SW-1 in both furnaces in OFF position, SW-2 in both furnaces in ON position.

1. The 2-stage thermostat (NOT 2-stage furnace control's adaptive gas heating mode) determines whether furnaces are both operating in low-gas heat or high-gas heat, depending on whether 1 or both thermostat stages (W/W1 or W/W1-and-W/W2) are calling for heat.
2. Operation in all modes is the same for twinned furnaces as for individual furnaces. See Sequence of Operation section in this guide or in the furnace Installation, Start-Up, and Operating Instructions.



LEGEND

ALS-M	MASTER AUX. LIMIT SWITCH, OVERTEMP. - MANUAL RESET, SPST (N.C.)	ILK	BLOWER DOOR INTERLOCK SWITCH, SPST (N.O.)
ALS-S	SLAVE AUX. LIMIT SWITCH, OVERTEMP. - MANUAL RESET, SPST (N.C.)	JB	JUNCTION BOX
BLWM	BLOWER MOTOR, 4 SPEED, PERMANENT-SPLIT-CAPACITOR	LED	LIGHT-EMITTING DIODE FOR STATUS CODES
CAP	CAPACITOR	LGPS	LOW GAS-PRESSURE SWITCH, SPST (N.O.)
CPU	MICROPROCESSOR AND CIRCUITRY	LPS	LOW-HEAT PRESSURE SWITCH, SPST (N.O.)
DSS	DRAFT SAFEGUARD SWITCH, SPST (N.C.)	LS	LIMIT SWITCH, OVERTEMPERATURE-AUTO RESET, SPST (N.C.)
EAC-1	ELECTRONIC AIR CLEANER CONNECTION (115 VAC, 1 AMP MAX.)	PL1	12-CIRCUIT CONNECTOR
EAC-2	ELECTRONIC AIR CLEANER CONNECTION (COMMON)	PL2	9-CIRCUIT CONNECTOR
FRS1	FLAME ROLLOUT SWITCH OVERTEMP.-MANUAL RESET, SPST (N.C.)	PL3	3-CIRCUIT IDM CONNECTOR
FRS2	FLAME ROLLOUT SWITCH OVERTEMP.-MANUAL RESET, SPST (N.C.)	PL6	2-CIRCUIT HSI CONNECTOR
FSE	FLAME-PROVING SENSOR ELECTRODE	PL8	2-CIRCUIT TWINNING CONNECTOR
FU1	FUSE, 3 AMP, AUTOMOTIVE BLADE TYPE, FACTORY INSTALLED	PL9	1-CIRCUIT TWINNING CONNECTOR
FU2	FUSE, FIELD INSTALLED	* SW1	HIGH-HEAT-ONLY SWITCH, SPST (MANUAL)
GV	GAS VALVE, REDUNDANT LOW-HEAT OPERATORS, 2-STAGE	* SW2	LOW-HEAT-ONLY SWITCH, SPST (MANUAL)
HPS	HIGH-HEAT PRESSURE SWITCH, SPST (N.O.)	* SW3 & 4	BLOWER-OFF DELAY SETTING SWITCHES, SPST (MANUAL)
HPSR	HIGH-HEAT PRESSURE SWITCH RELAY, SPST (N.C.)	TJ	TWINNING JUMPER, SPDT FOR MASTER OR SLAVE STATUS-(MANUAL-CHANGE-OVER)
HSI	HOT-SURFACE IGNITER (115 VAC)	TKR	TWINNING KIT RELAY, SPST (N.O.)
HUM	24VAC HUMIDIFIER CONNECTION (0.5 AMP. MAX.)	TRAN	TRANSFORMER-115VAC / 24VAC
IDM	INDUCED DRAFT MOTOR, 2-SPEED, SHADED-POLE	TWIN / TEST	1-CIRCUIT TWINNING BUSS CONNECTOR, ALSO COMPONENT TEST
ILK-1	SLAVE AUX. BLOWER DOOR INTERLOCK SWITCH, SPST (N.O.)		

JUNCTION
TERMINAL
CONTROL TERMINAL
FACTORY POWER WIRING (115VAC)
FACTORY CONTROL WIRING (24VAC)
FIELD POWER WIRING (115VAC)
FIELD ACCESSORY WIRING (24VAC)
FIELD WIRING SCREW TERMINAL
FIELD GROUND
EQUIPMENT GROUND
FIELD SPLICE
PLUG RECEPTACLE

NOTES:

1. Use only copper wire between the disconnect switch and the furnace.
2. If any of the original wire as supplied, must be replaced, use the same or equivalent type wire.
3. Inducer (IDM) and blower (BLWM) motors contain internal auto-reset thermal overload switches.
4. Blower motor speed selections are for average conditions. See Installation Instructions for details on optimum speed selections.
5. Replace only with a 3-AMP fuse.
6. This wire must be connected to furnace sheet metal at pin 10 of 12-pin connector for control to prove flame.
7. Factory connected when LGPS not used.
8. Symbols are an electrical representation only.
9. BLOWER-ON DELAY: Gas heating 45 seconds, Cooling or Heat Pump 2 seconds.
10. BLOWER-OFF DELAY: Gas heating 90, 135, 180 or 225 seconds, cooling or heat pump 90 seconds.
11. IGNITION-LOCKOUT will occur after four consecutive unsuccessful trials-for-ignition. Control will automatically reset after three hours.
12. ♦ Not used with Single-Stage thermostat adaptive mode (3 wires and TKR).

* HEAT SET-UP SWITCH

	SWITCH 1	SWITCH 2
NORM	ON	ON
HI HT	OFF	ON
LO HT	ON	OFF

BLOWER OFF DELAY

(SEC)	SWITCH 3	SWITCH 4
90 SEC	ON	ON
135 SEC	OFF	ON
180 SEC	ON	OFF
225 SEC	OFF	OFF

COMPONENT TEST

To initiate the component test sequence with no thermostat inputs and with all inducer Post-Purge and Blower-Off Delay periods completed, short the "TWIN/TEST" terminal to the "COM 24V" terminal for about two seconds. The control will turn ON the inducer motor Low-Speed, inducer motor High-Speed, HSI, blower motor Low-Gas-Heat Speed, blower motor High-Gas-Heat Speed, and blower motor High-Cool Speed for 7-15 seconds each. Neither the gas valve nor the humidifier will be turned ON.

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Fig. 11—Connection Diagram for Twinned 2-Speed Non-Condensing Furnaces

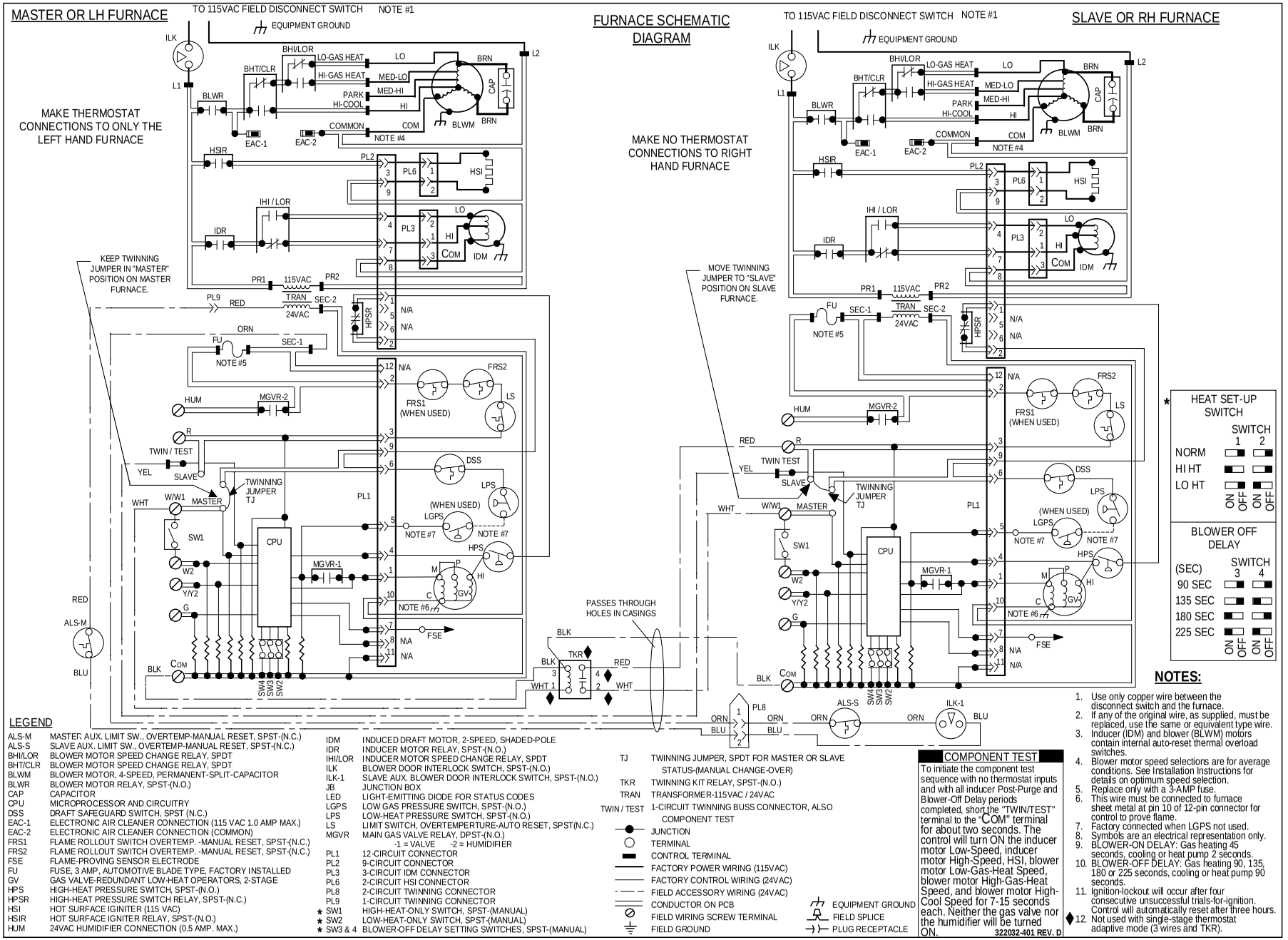

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Fig. 12—Schematic Diagram for Twinned 2-Speed Non-Condensing Furnaces

SERVICE TRAINING

Packaged Service Training programs are an excellent way to increase your knowledge of the equipment discussed in this manual, including:

- Unit Familiarization
- Maintenance
- Installation Overview
- Operating Sequence

A large selection of product, theory, and skills programs is available, using popular video-based formats and materials. All include video and/or slides, plus companion book.

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