



**GE APPLIANCES**  
*a Haier company*

# Service Manual

**NF80UT**

80% Upflow/Horizontal Two-Stage  
Constant Torque Gas Furnaces



**READ CAREFULLY.  
KEEP THESE INSTRUCTIONS.**

# SERVICE MANUAL

## NF80UT Gas Furnace - Upflow/Horizontal



This is a safety alert symbol and should never be ignored. When you see this symbol on labels or in manuals, be alert to the potential for personal injury or death.

### **WARNING**

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional HVAC installer (or equivalent), service agency or the gas supplier.

### **CAUTION**

As with any mechanical equipment, contact with sharp sheet metal edges can result in personal injury. Take care while handling this equipment and wear gloves and protective clothing.

### **WARNING**



Electric shock hazard.

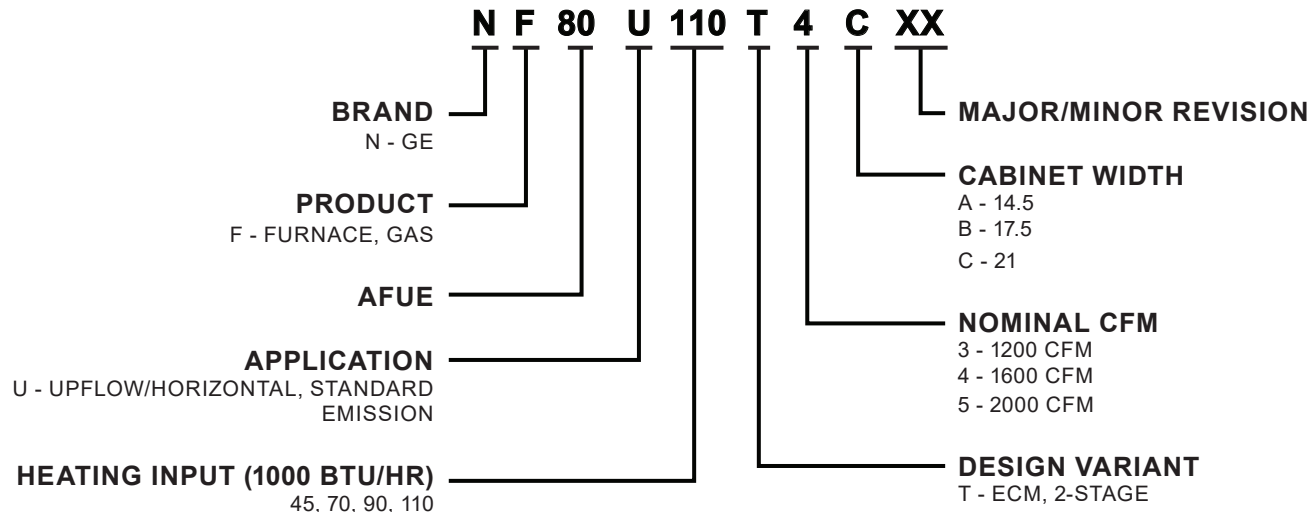
Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.

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## Technical Specifications

### MODEL NUMBER GUIDE



### PHYSICAL AND ELECTRICAL DATA

|                     | Model       | High Fire    |               | Low Fire     |               | AFUE (ICUS) | Nom. Cooling Capacity (tons) | Gas Inlet (in.) | Volts/ Hz/ Phase | Max. Overcurrent Protection | Nominal F.L.A. | Trans. (V.A.) | Motor Output (hp) | Approx. Weight (lbs.) |
|---------------------|-------------|--------------|---------------|--------------|---------------|-------------|------------------------------|-----------------|------------------|-----------------------------|----------------|---------------|-------------------|-----------------------|
|                     |             | Input (Btuh) | Output (Btuh) | Input (Btuh) | Output (Btuh) |             |                              |                 |                  |                             |                |               |                   |                       |
| UPFLOW / HORIZONTAL | NF80U045T3A | 44,000       | 35,000        | 29,000       | 23,000        | 80.0        | 3                            | 1/2             | 120-60-1         | 15                          | 6.1            | 40            | 1/2               | 111                   |
|                     | NF80U070T3A | 66,000       | 53,000        | 43,000       | 35,000        | 80.0        | 3                            | 1/2             | 120-60-1         | 15                          | 6.1            | 40            | 1/2               | 121                   |
|                     | NF80U090T4B | 88,000       | 72,000        | 57,000       | 46,000        | 80.0        | 4                            | 1/2             | 120-60-1         | 15                          | 8.2            | 40            | 3/4               | 140                   |
|                     | NF80U110T5C | 110,000      | 87,000        | 72,000       | 58,000        | 80.0        | 5                            | 1/2             | 120-60-1         | 15                          | 10.0           | 40            | 1                 | 156                   |

Note: For vent length and clearances to combustibles, please reference installation instructions.

Note: Filters and provisions for mounting are not furnished and must be field provided.

## BLOWER PERFORMANCE

### NF80U045T3A

| External Static Pressure in. w.g. | Air Volume / Watts at Various Blower Speeds |       |                     |       |               |       |                     |       |           |       |
|-----------------------------------|---------------------------------------------|-------|---------------------|-------|---------------|-------|---------------------|-------|-----------|-------|
|                                   | High (Black)                                |       | Medium-High (Brown) |       | Medium (Blue) |       | Medium-Low (Yellow) |       | Low (Red) |       |
|                                   | cfm                                         | Watts | cfm                 | Watts | cfm           | Watts | cfm                 | Watts | cfm       | Watts |
| 0.00                              | 1500                                        | 300   | 1220                | 175   | 1050          | 114   | 850                 | 65    | 800       | 48    |
| 0.10                              | 1485                                        | 311   | 1200                | 179   | 1025          | 118   | 810                 | 68    | 790       | 50    |
| 0.20                              | 1460                                        | 323   | 1170                | 188   | 980           | 125   | 725                 | 73    | 580       | 53    |
| 0.30                              | 1420                                        | 334   | 1140                | 195   | 930           | 133   | 670                 | 76    | 455       | 54    |
| 0.40                              | 1395                                        | 343   | 1095                | 203   | 890           | 138   | 600                 | 86    | 375       | 60    |
| 0.50                              | 1355                                        | 355   | 1050                | 212   | 840           | 149   | 550                 | 93    | 325       | 64    |
| 0.60                              | 1325                                        | 368   | 1020                | 222   | 790           | 158   | 495                 | 96    | 275       | 67    |
| 0.70                              | 1290                                        | 369   | 980                 | 228   | 745           | 164   | 420                 | 103   | 238       | 69    |
| 0.80                              | 1260                                        | 381   | 945                 | 238   | 700           | 172   | 380                 | 107   | ---       | ---   |

### NF80U070T3A

| External Static Pressure in. w.g. | Air Volume / Watts at Various Blower Speeds |       |                     |       |               |       |                     |       |           |       |
|-----------------------------------|---------------------------------------------|-------|---------------------|-------|---------------|-------|---------------------|-------|-----------|-------|
|                                   | High (Black)                                |       | Medium-High (Brown) |       | Medium (Blue) |       | Medium-Low (Yellow) |       | Low (Red) |       |
|                                   | cfm                                         | Watts | cfm                 | Watts | cfm           | Watts | cfm                 | Watts | cfm       | Watts |
| 0.00                              | 1375                                        | 340   | 1350                | 240   | 1110          | 190   | 970                 | 93    | 780       | 50    |
| 0.10                              | 1350                                        | 346   | 1325                | 254   | 1100          | 194   | 940                 | 104   | 725       | 57    |
| 0.20                              | 1330                                        | 346   | 1310                | 264   | 1080          | 200   | 895                 | 113   | 680       | 64    |
| 0.30                              | 1315                                        | 353   | 1280                | 272   | 1060          | 204   | 860                 | 118   | 610       | 70    |
| 0.40                              | 1300                                        | 368   | 1250                | 283   | 1040          | 212   | 810                 | 125   | 550       | 76    |
| 0.50                              | 1285                                        | 369   | 1220                | 293   | 1010          | 222   | 765                 | 132   | 510       | 78    |
| 0.60                              | 1260                                        | 384   | 1190                | 301   | 975           | 227   | 725                 | 140   | 460       | 83    |
| 0.70                              | 1240                                        | 391   | 1150                | 314   | 950           | 236   | 680                 | 147   | 400       | 89    |
| 0.80                              | 1210                                        | 399   | 1120                | 319   | 915           | 244   | 640                 | 152   | 355       | 95    |

### NF80U090T4B

| External Static Pressure in. w.g. | Air Volume / Watts at Various Blower Speeds |       |                     |       |               |       |                     |       |           |       |
|-----------------------------------|---------------------------------------------|-------|---------------------|-------|---------------|-------|---------------------|-------|-----------|-------|
|                                   | High (Black)                                |       | Medium-High (Brown) |       | Medium (Blue) |       | Medium-Low (Yellow) |       | Low (Red) |       |
|                                   | cfm                                         | Watts | cfm                 | Watts | cfm           | Watts | cfm                 | Watts | cfm       | Watts |
| 0.00                              | 1800                                        | 370   | 1555                | 260   | 1425          | 207   | 1370                | 172   | 1240      | 131   |
| 0.10                              | 1765                                        | 381   | 1525                | 272   | 1390          | 218   | 1320                | 184   | 1190      | 144   |
| 0.20                              | 1725                                        | 397   | 1485                | 283   | 1350          | 229   | 1255                | 195   | 1130      | 157   |
| 0.30                              | 1685                                        | 416   | 1450                | 296   | 1310          | 241   | 1205                | 206   | 1075      | 165   |
| 0.40                              | 1635                                        | 425   | 1390                | 312   | 1260          | 250   | 1165                | 217   | 1015      | 174   |
| 0.50                              | 1600                                        | 438   | 1350                | 322   | 1205          | 263   | 1100                | 230   | 955       | 185   |
| 0.60                              | 1560                                        | 453   | 1300                | 332   | 1140          | 270   | 1050                | 239   | 905       | 193   |
| 0.70                              | 1520                                        | 467   | 1255                | 344   | 1110          | 284   | 1000                | 249   | 840       | 202   |
| 0.80                              | 1470                                        | 474   | 1215                | 352   | 1050          | 294   | 935                 | 258   | 765       | 211   |

| External Static Pressure<br>in. w.g. | Air Volume / Watts at Different Blower Speeds                                                                                                                                                                     |            |                        |            |                  |       |                        |       |              |       |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------|------------|------------------|-------|------------------------|-------|--------------|-------|
|                                      | Bottom Return Air, Side Return Air from Both Sides or Return Air from Bottom and One Side.                                                                                                                        |            |                        |            |                  |       |                        |       |              |       |
|                                      | High<br>(Black)                                                                                                                                                                                                   |            | Medium-High<br>(Brown) |            | Medium<br>(Blue) |       | Medium-Low<br>(Yellow) |       | Low<br>(Red) |       |
|                                      | cfm                                                                                                                                                                                                               | Watts      | cfm                    | Watts      | cfm              | Watts | cfm                    | Watts | cfm          | Watts |
| 0.00                                 | 2175                                                                                                                                                                                                              | 590        | 2050                   | 410        | 1850             | 310   | 1695                   | 275   | 1510         | 195   |
| 0.10                                 | 2158                                                                                                                                                                                                              | 607        | 1943                   | 421        | 1778             | 328   | 1650                   | 283   | 1461         | 205   |
| 0.20                                 | 2131                                                                                                                                                                                                              | 620        | 1897                   | 436        | 1719             | 345   | 1591                   | 299   | 1405         | 215   |
| 0.30                                 | 2085                                                                                                                                                                                                              | 639        | 1847                   | 456        | 1678             | 354   | 1563                   | 308   | 1351         | 228   |
| 0.40                                 | 2055                                                                                                                                                                                                              | 652        | 1806                   | 466        | 1641             | 371   | 1499                   | 317   | 1297         | 238   |
| 0.50                                 | 2030                                                                                                                                                                                                              | 668        | 1767                   | 476        | 1588             | 387   | 1462                   | 333   | 1256         | 254   |
| 0.60                                 | 1976                                                                                                                                                                                                              | 686        | 1724                   | 495        | 1550             | 399   | 1419                   | 348   | 1215         | 265   |
| 0.70                                 | 1949                                                                                                                                                                                                              | 700        | 1685                   | 510        | 1512             | 408   | 1371                   | 357   | 1168         | 271   |
| 0.80                                 | 1896                                                                                                                                                                                                              | 716        | 1649                   | 527        | 1473             | 419   | 1332                   | 372   | 1121         | 287   |
| External Static Pressure<br>in. w.g. | Single Side Return Air - Air volumes in bold (over 1800 cfm) require Optional Return Air Base and field fabricated transition to accommodate 20 x 25 x 1 in. air filter in order to maintain proper air velocity. |            |                        |            |                  |       |                        |       |              |       |
|                                      | High<br>(Black)                                                                                                                                                                                                   |            | Medium-High<br>(Brown) |            | Medium<br>(Blue) |       | Medium-Low<br>(Yellow) |       | Low<br>(Red) |       |
|                                      | cfm                                                                                                                                                                                                               | Watts      | cfm                    | Watts      | cfm              | Watts | cfm                    | Watts | cfm          | Watts |
| 0.00                                 | 2175                                                                                                                                                                                                              | 605        | 1930                   | 420        | 1785             | 320   | 1675                   | 260   | 1500         | 195   |
| 0.10                                 | 2129                                                                                                                                                                                                              | 628        | 1892                   | 441        | 1733             | 345   | 1627                   | 288   | 1458         | 209   |
| 0.20                                 | 2091                                                                                                                                                                                                              | 649        | <b>1838</b>            | <b>458</b> | 1691             | 360   | 1586                   | 297   | 1407         | 220   |
| 0.30                                 | 2072                                                                                                                                                                                                              | 660        | <b>1806</b>            | <b>471</b> | 1631             | 371   | 1529                   | 313   | 1353         | 232   |
| 0.40                                 | 2014                                                                                                                                                                                                              | 677        | 1772                   | 485        | 1591             | 385   | 1485                   | 327   | 1302         | 243   |
| 0.50                                 | 1977                                                                                                                                                                                                              | 690        | 1742                   | 498        | 1554             | 395   | 1444                   | 337   | 1252         | 256   |
| 0.60                                 | 1960                                                                                                                                                                                                              | 707        | 1696                   | 511        | 511              | 410   | 1412                   | 348   | 1204         | 265   |
| 0.70                                 | <b>1913</b>                                                                                                                                                                                                       | <b>720</b> | 1661                   | 525        | 1480             | 424   | 1351                   | 359   | 1149         | 274   |
| 0.80                                 | <b>1873</b>                                                                                                                                                                                                       | <b>738</b> | 1617                   | 538        | 1440             | 437   | 1313                   | 371   | 1117         | 285   |

## Accessories

| Accessory                                | Catalog Number |
|------------------------------------------|----------------|
| <b>Return Air Base</b>                   |                |
| Return Air Base 14.5"                    | 68W61          |
| Return Air Base 17.5"                    | 68W62          |
| Return Air Base 21.0"                    | 68W62          |
| <b>Natural to LP Kits</b>                |                |
| 2-Stage (0 - 7500 ft)                    | 11K48          |
| 2-Stage (7501 - 10,000 ft)               | 11K47          |
| <b>Twinning Kit</b>                      |                |
| Constant Torque Gas Furnace Twinning Kit | 16W72          |

*For vent length and clearances to combustibles, please reference installation instructions.*

## Parts Arrangement

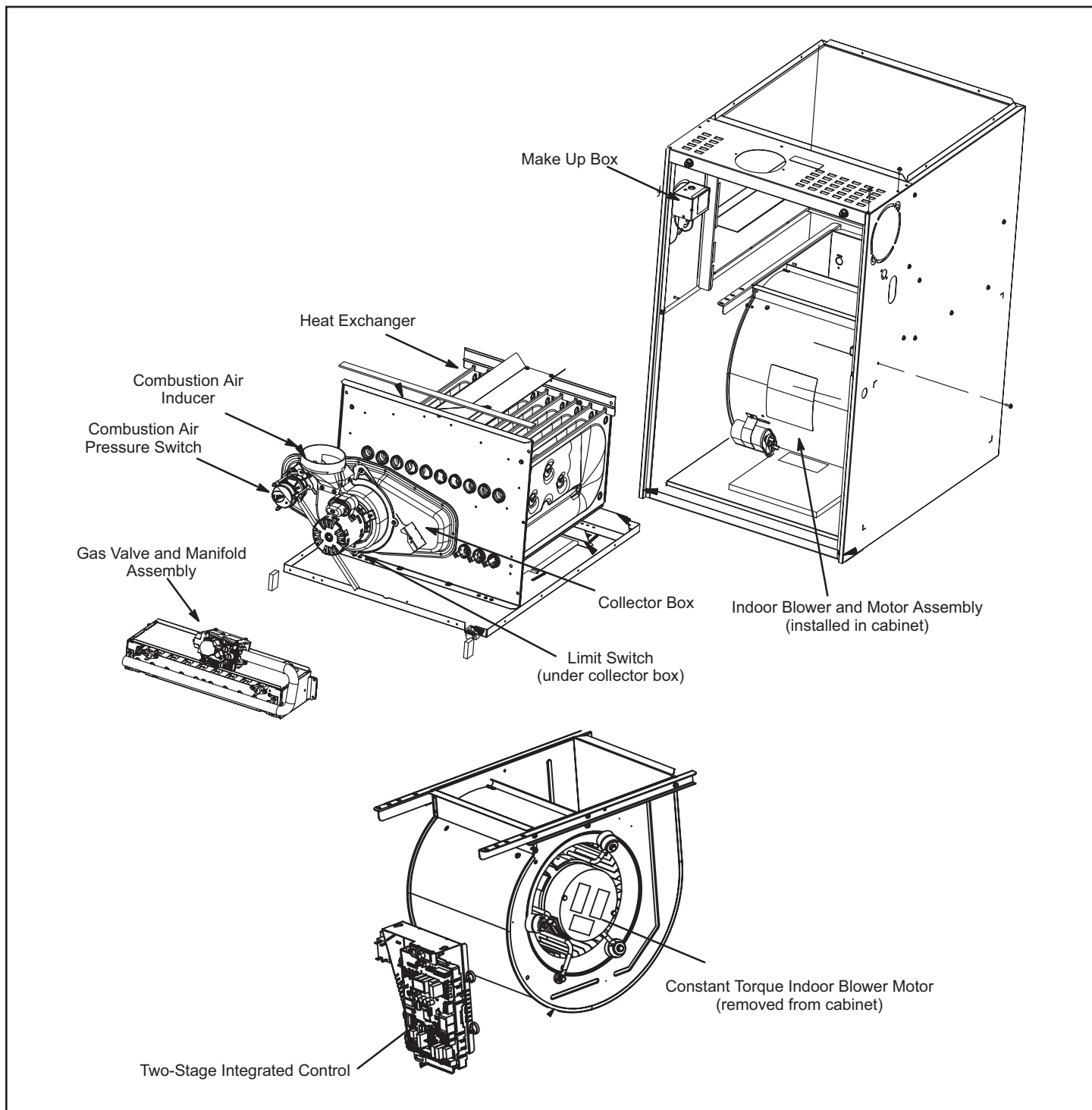


Figure 1.

## Unit Components

### ELECTROSTATIC DISCHARGE (ESD)

#### Precautions and Procedures

#### ⚠ CAUTION



Electrostatic discharge can affect electronic components. Take precautions to neutralize electrostatic charge by touching your hand and tools to metal prior to handling the control.

NF80UT unit components are shown in Figure 1. The gas valve, combustion air inducer and burners can be accessed by removing the access panel. Electrical components are in the control box (Figure 2) found in the blower section.

NF80UT units are factory equipped with a bottom return air panel in place. The panel is designed to be field removed as required for bottom air return. Markings are provided for side return air and may be cut out in the field.

#### Control Box Components (Figure 2)

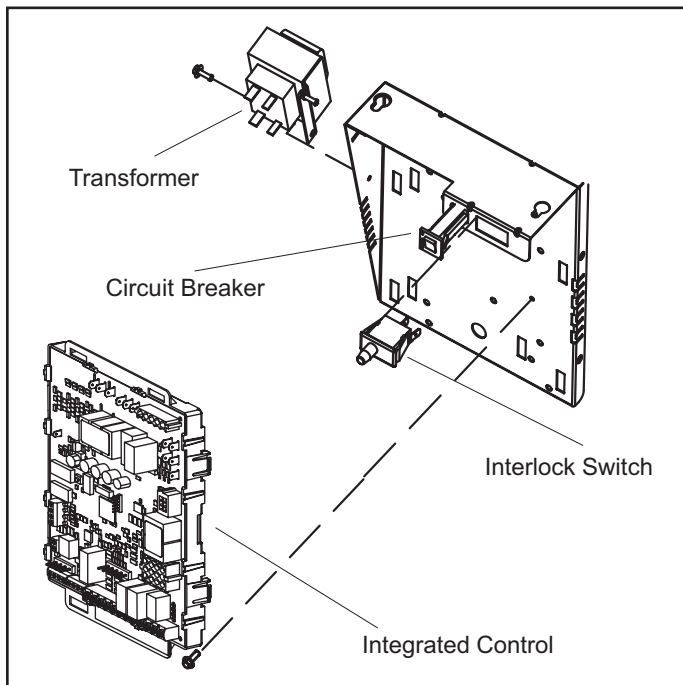


Figure 2. Control Box

#### Transformer (T1)

A transformer located in the control box provides power to the low voltage section of the unit. Transformers on all models are rated 40VA with a 120V primary and a 24V secondary.

#### Door Interlock Switch (S51)

A door interlock switch is wired in series with line voltage. When the inner blower access panel is removed the unit will shut down.

#### Circuit Breaker (CB8)

A 24V circuit breaker is also located in the control box. The switch provides overcurrent protection to the transformer (T1). The breaker is rated at 3A at 32V. If the current exceeds this limit the breaker will trip and all unit operation will shutdown. The breaker can be manually reset by pressing the button on the face. See Figure 3.

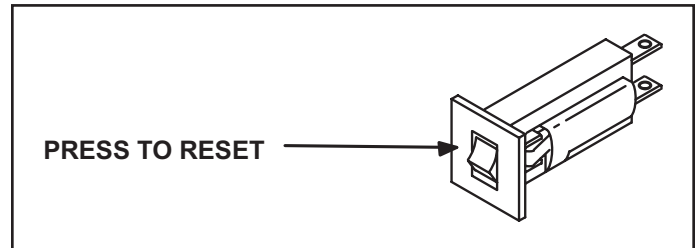


Figure 3. Circuit Breaker (CB8)

#### Integrated Ignition Control (A92)

#### ⚠ WARNING



Shock hazard.

Disconnect power before servicing. Control is not field repairable. If control is inoperable, simply replace entire control.

Can cause injury or death. Unsafe operation will result if repair is attempted.

Units are equipped with a two-stage, integrated control. The system consists of a ignition / blower control (Figure 4 and Figure 5) with control pin designations in Table 1 and Table 2 and ignitor. The control and ignitor work in combination to ensure furnace ignition and ignitor durability. The control provides gas ignition, safety checks and indoor blower control with two-stage gas heating. The furnace combustion air inducer, gas valve and indoor blower are controlled in response to various system inputs such as thermostat signal, pressure and limit switch signal and flame signal. The control features a seven-segment LED display, indicating furnace status and error codes. The LED flashes in single digits. For example, using Table 4 under LIMIT CODE, an "E" followed by "2" followed by "5" followed by "0", the limit switch circuit is open. The control also has two unpowered (dry) 1/4" contacts for a humidifier and a 120 volt accessory terminal. Both rated at (1) one amp each.

| Pin # | Function                          |
|-------|-----------------------------------|
| 1     | Ignitor                           |
| 2     | Combustion Air Inducer High Speed |
| 3     | Combustion Air Inducer Low Speed  |
| 4     | Combustion Air Inducer Neutral    |
| 5     | Ignitor Neutral                   |

**Table 1. 5-Pin Terminal Designations**

| Pin # | Function                     |
|-------|------------------------------|
| 1     | Gas Valve Second Stage       |
| 2     | Second Stage Pressure Switch |
| 3     | Rollout Switch In            |
| 4     | Ground                       |
| 5     | 24V Hot                      |
| 6     | Primary Limit In             |
| 7     | Gas Valve First Stage        |
| 8     | Gas Valve Common             |
| 9     | 24V Neutral                  |
| 10    | Ground                       |
| 11    | Primary Limit Out            |
| 12    | First Stage Pressure Switch  |

**Table 2. 12-Pin Terminal Designations**


**WARNING**



**Electric Shock Hazard.**

Can cause injury or death. Unit must be properly grounded in accordance with national and local codes.


**WARNING**

**Fire Hazard.**

Use of aluminum wire with this product may result in a fire, causing property damage, severe injury or death. Use copper wire only with this product.

### Electronic Ignition

At the beginning of the heat cycle the integrated control monitors the first stage and second stage combustion air inducer pressure switch. The control will not begin the heating cycle if the first stage pressure switch is closed (bypassed). Likewise the integrated control will not begin the second stage heating cycle if the second stage pressure switch is closed, and will remain in first stage heat. However, if the second stage pressure switch closes during the first stage heat pre-purge, the control will allow second stage heat. Once the first stage pressure switch is determined to be open, the combustion air inducer is

energized on low (first stage) heat speed. When the differential in the pressure switch is great enough, the pressure switch closes and a 15-second pre-purge begins.

After the 15-second pre-purge period, the ignitor warms up for 20 seconds after which the gas valve opens for a 4-second trial for ignition. The ignitor remains energized during the trial until flame is sensed. If ignition is not proved during the 4-second period, the control will try four more times with an inter purge and warm-up time between trials of 35 seconds. After a total of five trials for ignition (including the initial trial), the control goes into Soft Lockout-Flame Failure mode. After a 60-minute reset period, the control will begin the ignition sequence again.

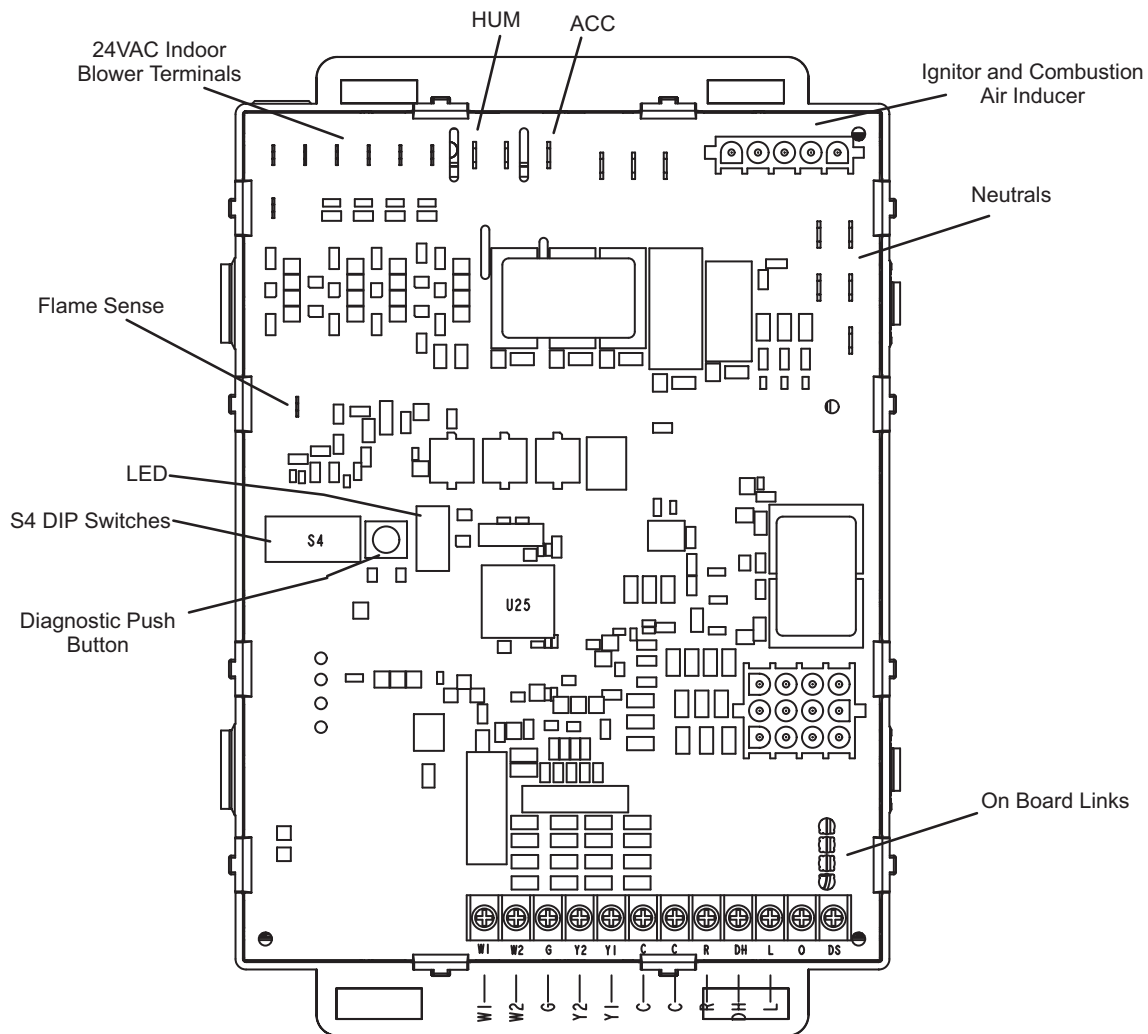
**NOTE:** During abnormal conditions such as low supply voltage or low outdoor temperatures and the low fire pressure switch does not close, the combustion air inducer will switch to high speed. After the low & high pressure switch close, the unit will proceed with a 15 sec pre-purge, followed by a 20 sec ignitor warm up, then ignition on highfire. After 10 to 20 seconds of high fire operation the unit will switch to low fire.

### Two Stage Operation / Thermostat Selection DIP Switch

The control can be utilized in two modes: SINGLE-STAGE thermostat or TWO-STAGE thermostat. The thermostat selection is made using a DIP switch and must be positioned for the particular application. DIP switch 1, labeled T"STAT HEAT STAGE is factory-set in the OFF position for use with a two-stage thermostat. Move the DIP switch to ON for use with a single stage thermostat.

While in the single-stage thermostat mode, the burners will always fire on first-stage heat. The combustion air inducer will operate on low speed and indoor blower will operate on low heat speed. The unit will switch to second stage heat after a "recognition period". DIP switch 2, labeled SECOND STAGE DELAY, is factory set in the OFF position for a 7 minute recognition period. The switch can be moved to the ON position for a 12 minute recognition period, after which time the unit will switch to second-stage heat.

While in the two-stage thermostat mode, the burners will fire on first-stage heat. The combustion air inducer will operate on low speed and indoor blower will operate on low heat speed. The unit will switch to second-stage heat on call from the indoor thermostat. If there is a simultaneous call for first and second stage heat, the unit will fire on first stage heat and switch to second stage heat after 30 seconds of operation. See Sequence of Operation flow charts in the back of this manual for more detail.



### 3/16" QUICK CONNECT TERMINALS

FLAME SENSE SIGNAL

HI COOL 24VAC

LO COOL 24VAC

LO HEAT 24VAC

PARK

PARK

COMMON 24VAC

### 1/4" QUICK CONNECT TERMINALS

NEUTRALS = 120 VAC NEUTRAL

HUM = UNPOWERED NORMALLY OPEN (DRY) CONTACTS

LI = 120VAC INPUT TO CONTROL

ACC = 120VAC OUTPUT TO OPTIONAL ACCESSORY

### THERMOSTAT CONNECTIONS (TB1)

DS = DEHUMIDIFICATION SIGNAL

W2 = HEAT DEMAND FROM 2ND STAGE TSTAT

W1 = HEAT DEMAND FROM 1ST STAGE TSTAT

R = CLASS 2 VOLTAGE TO TSTAT

G = MANUAL FAN FROM TSTAT

C = TSTAT SIGNAL GROUND CONNECTED TO TRANSFORMER GRD (TR) & CHASSIS GROUND (GRD)

Y1 = TSTAT 1ST STAGE COOL SIGNAL

Y2 = TSTAT 2ND STAGE COOL SIGNAL

O = TSTAT SIGNAL TO HEAT PUMP REVERSING VALVE

DH = NOT USED

L = NOT USED

**Figure 4. Integrated Control**

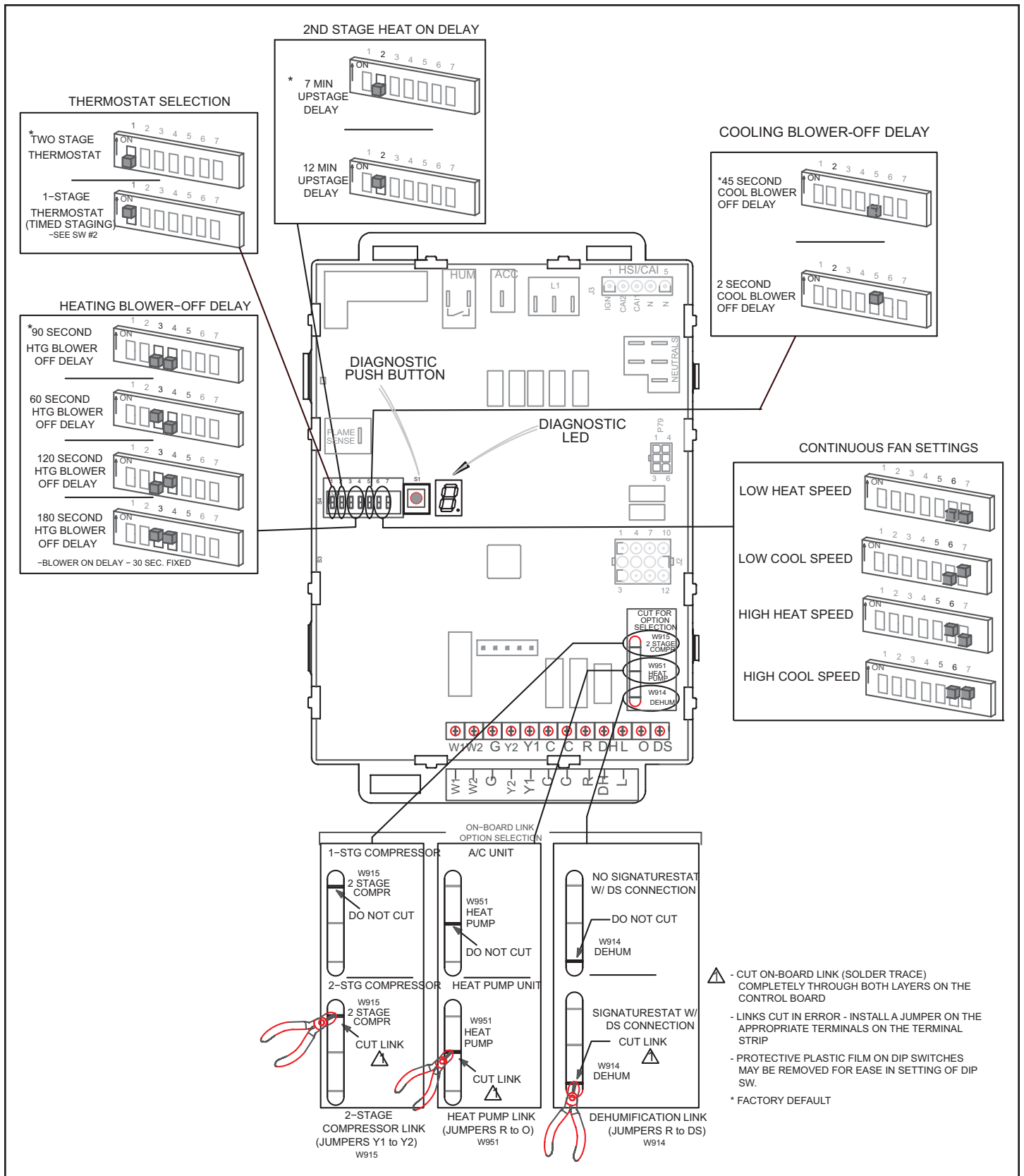


Figure 5. Integrated Control Configuration Guide

| Display                                                                                                                                                                  | Action (when button released) |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| No change (idle)*                                                                                                                                                        | Remain in idle mode           |
| Solid "E"                                                                                                                                                                | Enter diagnostic recal mode   |
| Solid "F"                                                                                                                                                                | Enter flame signal mode       |
| * No change implies the display will continue to show whatever is currently being displayed for normal operation (blinking decimal, active error code, heat state, etc.) |                               |

**Table 3. Integrated Control Diagnostic Modes**

| Code | Diagnostic Codes/Status of Equipment                                                                                                                                                                     | Action Required to Clear and Recover                                                                                                                                                                                                                                |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| .    | Idle mode (Decimal blinks at 1 Hertz -- 0.5 second ON, 0.5 second OFF).                                                                                                                                  |                                                                                                                                                                                                                                                                     |
| C    | Cooling stage (1 second ON, 0.5 second OFF) 1 or 2 displayed / Pause / Repeat codes.                                                                                                                     |                                                                                                                                                                                                                                                                     |
| d    | Dehumidification mode (1 second ON, 1 second OFF) / Pause / Repeat Codes).                                                                                                                               |                                                                                                                                                                                                                                                                     |
| H    | Gas Heat Stage (1 second ON, 0.5 second OFF) 1 or 2 displayed / Pause / Repeat codes. Blinking during ignition.                                                                                          |                                                                                                                                                                                                                                                                     |
| h    | Heat pump stage.                                                                                                                                                                                         |                                                                                                                                                                                                                                                                     |
| E110 | Low line voltage.                                                                                                                                                                                        | Line Voltage Low (Voltage lower than nameplate rating). Check power line voltage and correct. Alarm clears 5 seconds after fault recovered.                                                                                                                         |
| E111 | Line voltage polarity reversed.                                                                                                                                                                          | Reverse line power voltage wiring. System resumes normal operation 5 seconds after fault recovered.                                                                                                                                                                 |
| E112 | Ground not detected.                                                                                                                                                                                     | System shuts down. Provide proper earth ground. System resumes normal operation 5 seconds after fault recovered.                                                                                                                                                    |
| E113 | High line voltage.                                                                                                                                                                                       | Line Voltage High (Voltage higher than nameplate rating). Provide power voltage within proper range. System resumes normal operation 5 seconds after fault recovered.                                                                                               |
| E114 | Line voltage frequency out-of-range.                                                                                                                                                                     | No 60 Hertz Power. Check voltage and line power frequency. Correct voltage and frequency problems. System resumes normal operation 5 seconds after fault recovered.                                                                                                 |
| E115 | Low 24V - Control will restart if the error recovers.                                                                                                                                                    | 24-Volt Power Low (Range is 18 to 30 volts). Check and correct voltage. Check for additional power-robbing equipment connected to system. May require installation of larger VA transformer to be installed in furnace / air handler. Clears after fault recovered. |
| E117 | Poor ground detected (Warning only)                                                                                                                                                                      | Provide proper grounding for unit. Check for proper earth ground to the system. Warning only will clear 30 seconds after fault recovered.                                                                                                                           |
| E125 | Control failed self-check, internal error, failed hardware. Will restart if error recovers. Integrated control not communicating. Covers hardware errors (flame sense circuit faults, pin shorts, etc.). | Hardware problem on the control. Cycle power on control. Replace if problem prevents service and is persistent. Critical alert. Cleared 300 seconds after fault recovered.                                                                                          |
| E200 | Hard lockout - Rollout circuit open or previously open.                                                                                                                                                  | Correct cause of rollout trip, or replace flame rollout switch. Test furnace operation. Cleared after fault recovered.                                                                                                                                              |
| E204 | Gas valve mis-wired.                                                                                                                                                                                     | Check gas valve operation and wiring. Clears when repaired.                                                                                                                                                                                                         |
| E205 | Gas valve control relay contact shorted.                                                                                                                                                                 | Check wiring on control and gas valve. If wiring is correct, replace control.                                                                                                                                                                                       |
| E206 | Gas valve second-stage relay failure.                                                                                                                                                                    | Furnace will operate on 1st stage for remainder of the heating demand. Will clear after fault recovered. If unable to operate 2nd stage, replace control.                                                                                                           |
| E207 | Hot surface ignitor sensed open.                                                                                                                                                                         | Measure resistance of hot surface ignitor. Replace if open or not within specified range found in IOM. Resumes normal operation after fault is cleared.                                                                                                             |

**Table 4. Integrated Diagnostic Codes / Status of Equipment**

| Code | Diagnostic Codes/Status of Equipment                                                                                                                   | Action Required to Clear and Recover                                                                                                                                                                                                                                                                                               |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E223 | Low pressure switch failed open.                                                                                                                       | Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.                                                                                |
| E224 | Low pressure switch failed closed.                                                                                                                     | Check operation of low pressure switch to see if it is stuck closed on heat call longer than 150 seconds. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.                                                |
| E225 | High pressure switch failed open.                                                                                                                      | Check pressure (inches w.c.) of high pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.                                                                               |
| E226 | High pressure switch failed closed.                                                                                                                    | Check operation of high pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.                                                                                            |
| E227 | Low pressure switch open during trial for ignition or run mode.                                                                                        | Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.                                                                                |
| E229 | Ignition on High Fire - Information Only.                                                                                                              | Code is displayed if 1) low pressure switch fails to close, then furnace will switch to high speed inducer to close both low and high pressure switches, then furnace lights on high fire, or 2) if continuous fan is active, furnace lights on high fire for 60 seconds to improve heat exchanger warm up time.                   |
| E240 | Low flame current - Run mode.                                                                                                                          | Check micro-amperes of flame sensor using control diagnostics or field-installed mode. Clean or replace sensor. Measure voltage of neutral to ground to ensure good unit ground. Alert clears after current heat call has been completed.                                                                                          |
| E241 | Flame sensed out of sequence - Flame still present.                                                                                                    | Shut off gas. Check for gas valve leak. Replace, if necessary. Alert clears when fault is recovered.                                                                                                                                                                                                                               |
| E250 | Limit switch circuit open.                                                                                                                             | Check for proper firing rate on furnace. Ensure there is no blockage in heater. Check for proper air flow. If limit not closed within 3 minutes, unit will go into 1-hour soft lockout. Resumes normal operation after fault is cleared.                                                                                           |
| E270 | Soft lockout - Exceeded maximum number of retries. No flame current sensed.                                                                            | Check for proper gas flow. Ensure that ignitor is lighting burner. Check flame sensor current. Clears when heat call finishes successfully.                                                                                                                                                                                        |
| E271 | Soft lockout - Exceeded maximum number of retries. Last retry failed due to the pressure switch opening.                                               | Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Clears when heat call finishes successfully.                                                                                    |
| E272 | Soft lockout - Exceeded maximum number of recycles. Last recycle due to the pressure switch opening.                                                   | Check operation of low pressure switch to see if it is stuck closed on heat call. Check pressure (inches w.c.) of high pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Clears when heat call finishes successfully. |
| E273 | Soft lockout - Exceeded maximum number of recycles. Last recycle due to flame failure.                                                                 | Check micro-amperes of flame sensor using control diagnostics or field-installed mode. Clean or replace sensor. Measure voltage of neutral to ground to ensure good unit ground. Clears when heat call finishes successfully.                                                                                                      |
| E274 | Soft lockout - Exceeded maximum number of recycles. Last recycle failed due to the limit circuit opening or limit remained open longer than 3 minutes. | Shut down system. 1-hour soft lockout. Check firing rate and air flow. Check for blockage. Clears when heat call finishes successfully.                                                                                                                                                                                            |
| E275 | Soft lockout - Flame sensed out of sequence. Flame signal is gone.                                                                                     | Shut off gas. Check for gas valve leak. 1-hour soft lockout. Clears when flame has been proven stable.                                                                                                                                                                                                                             |

**Table 4. Integrated Diagnostic Codes / Status of Equipment**

| Code | Diagnostic Codes/Status of Equipment                            | Action Required to Clear and Recover                                                                                                                    |
|------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| E290 | Ignitor circuit fault - Failed ignitor or triggering circuitry. | Measure resistance of hot surface ignitor. Replace if open or not within specifications. 1-hour soft lockout. Clears when flame has been proven stable. |

**Table 4. Integrated Diagnostic Codes / Status of Equipment**

#### **Diagnostic LED (Figure 4)**

The seven-segment diagnostic LED displays operating status, error codes and other information. Table 4 lists diagnostic LED codes.

#### **Diagnostic Push Button (Figure 4)**

The diagnostic push button is located adjacent to the seven-segment diagnostic LED. This button is used to enable the Error Code Recall "E" mode and the Flame Signal "F" mode. Press the button and hold it to cycle through a menu of options. Every five seconds a new menu item will be displayed. When the button is released, the displayed item will be selected. Once all items in the menu have been displayed, the menu resumes from the beginning until the button is released.

#### **Error Code Recall Mode**

Select "E" from the menu to access the most recent 10 error codes. Select "c" from the Error Code Recall menu to clear all error codes. Button must be pressed a second time while "c" is flashing to confirm command to delete codes. Press the button until a solid "≡" is displayed to exit the Error Code Recall mode.

#### **Flame Signal Mode**

Select "F" from the menu to access the flame signal mode. The integrated control will display the flame current on seven-segment LED in in micro amps (uA).

Flame signal mode is exited after any of the following:

- Power is reset
  - Pressing and holding push button until 3 horizontal lines "≡" are displayed
  - 10 minutes after entering the flame sense mode.
- Integrated Control DIP Switches

#### **Integrated Control DIP Switches**

NF80UT units are equipped with a two-stage integrated control. This control manages ignition timing, heating mode fan off delays and indoor blower speeds based on selections made using the control dip switches and jumpers. The control includes an internal soft lockout feature which automatically resets the ignition control when it has been locked out. After one hour of continuous thermostat demand for heat, the soft lockout will break and remake thermostat demand to the furnace and automatically reset the control to relight the furnace.

#### **Heating Operation DIP Switch Settings**

**Switch 1 -- Thermostat Selection --** This unit may be used with either a single-stage or two-stage thermostat. The thermostat selection is made using a DIP switch which must be properly positioned for the particular application. The DIP switch is factory-positioned for use with a two-stage thermostat. If a single-stage thermostat is to be used, the DIP switch must be repositioned.

- Select "OFF" for two-stage heating operation controlled by a two-stage heating thermostat (factory setting);
- Select "ON" for two-stage heating operation controlled by a single-stage heating thermostat. This setting provides a timed delay before second-stage heat is initiated.

**Switch 2 --- Second Stage Delay (Used with Single-Stage Thermostat Only) --** This switch is used to determine the second stage on delay when a single-stage thermostat is being used. The switch is factory-set in the OFF position, which provides a 7-minute delay before second-stage heat is initiated. If the switch is toggled to the ON position, it will provide a 12-minute delay before second-stage heat is initiated. This switch is only activated when the thermostat selector jumper is positioned for single-stage thermostat use.

## Indoor Blower Operation DIP Switch Settings

### Switches 3 and 4 -- Heating Mode Blower-Off Delay --

The blower-on delay of 30 seconds is not adjustable. The blower-off delay (time that the blower operates after the heating demand has been satisfied) can be adjusted by moving switches 3 and 4 on the integrated control. The unit is shipped from the factory with a blower-off delay of 90 seconds. The blower off delay affects comfort and is adjustable to satisfy individual applications. Adjust the blower off delay to achieve a supply air temperature between 90° and 110°F at the exact moment that the blower is de-energized. Longer off delay settings provide lower supply air temperatures; shorter settings provide higher supply air temperatures. Table 5 provides the blower off timings that will result from different switch settings.

| Blower Off Delay (seconds) | Switch 3 | Switch 4 |
|----------------------------|----------|----------|
| 60                         | On       | Off      |
| 90 (Factory)               | Off      | Off      |
| 120                        | Off      | On       |
| 180                        | On       | On       |

**Table 5. Blower Off Heating Mode Delay Switch Settings**

**Switch 5 -- Cooling Mode Blower-Off Delay --** The unit is shipped from the factory with the dip switch positioned OFF for a 45 second delay. Table 6 provides the cooling mode off delay settings.

| Blower Off Delay (seconds) | Switch 5 |
|----------------------------|----------|
| 45 (Factory)               | Off      |
| 2                          | On       |

**Table 6. Blower Off Cooling Mode Delay Switch Settings**

**Switches 6 and 7 -- Continuous Fan Mode --** Continuous fan speed can be controlled by changing DIP switch positions. Table 7 provides DIP switch settings for continuous fan mode.

| Continuous Fan Mode      | Switch 6 | Switch 7 |
|--------------------------|----------|----------|
| Low Heat Speed (Factory) | Off      | Off      |
| Low Cool Speed           | Off      | On       |
| High Heat Speed          | On       | Off      |
| High Cool Speed          | On       | On       |

**Table 7. Continuous Fan Mode Settings**

## Onboard Links

### W914 Dehum

Onboard link W914, is a clippable connection between terminals R and DS on the integrated control. W914 must be cut when the furnace is installed with a thermostat which features humidity control. If the link is not cut, terminal "DS" will remain energized not allowing the blower to reduce to low cool speed upon a call for dehumidification.

### W951 Heat Pump (R to O)

Onboard link W951 is a clippable connection between terminals R and O on the integrated control. W951 must be cut when the furnace is installed in applications which include a heat pump unit and a thermostat which features dual fuel use. If the link is left intact, terminal "O" will remain energized eliminating the HEAT MODE in the heat pump.

### W915 2 Stage Compr (Y1 to Y2)

Onboard link W915 is a clippable connection between terminals Y1 and Y2 on the integrated control. W915 must be cut if two-stage cooling will be used. If the Y1 to Y2 link is not cut the outdoor unit will operate in second-stage cooling only.



### IMPORTANT

If any onboard link is cut by mistake, install a jumper across the corresponding terminals on the low voltage terminal strip. Do not replace control.

## Blower Compartment

### IMPORTANT

Each blower is statically and dynamically balanced as an assembly before installation in the unit.

NF80UT unit is equipped with a constant torque ECM motor. It has a DC motor coupled to an electronic control module both contained in the same motor housing. The motor is programmed to provide constant torque at each of the five selectable speed taps. Each tap requires 24 volts to energize.

### **Input Voltage Requirements**

The circuit is designed to be operated with AC voltage. To enable a tap requires 12 to 33VAC. Expected current draw will be less than 20mA.

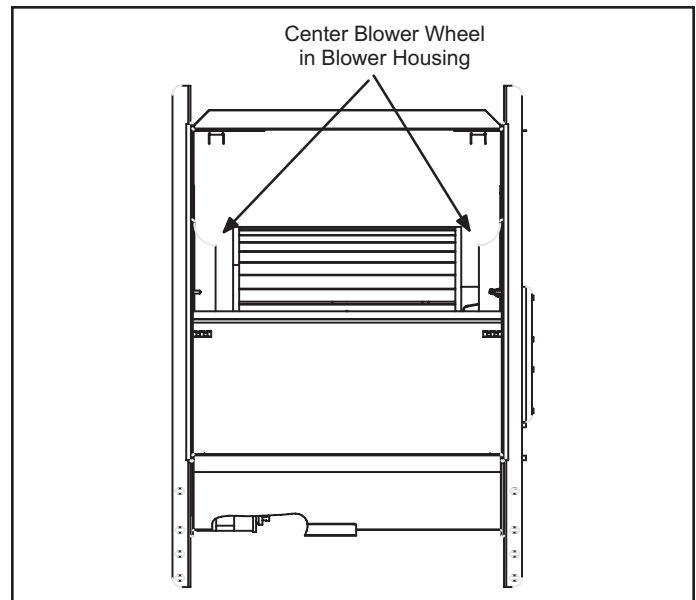
### **Troubleshooting the Motor**

Troubleshooting the motor is an easy process. Follow steps below.

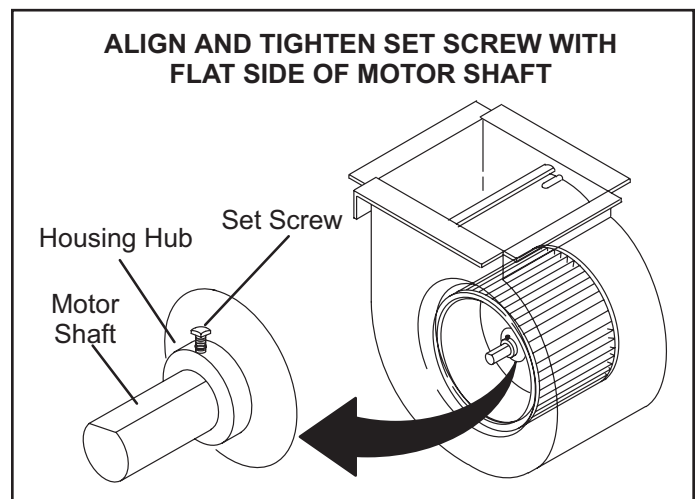
1. Shut off power to unit.
2. Remove input plugs P48 and P49 from motor. See Figure 8 for troubleshooting procedure.

If correct voltage is present in tests 1 and 2 and motor is not operating properly, replace motor. The motor is not field repairable.

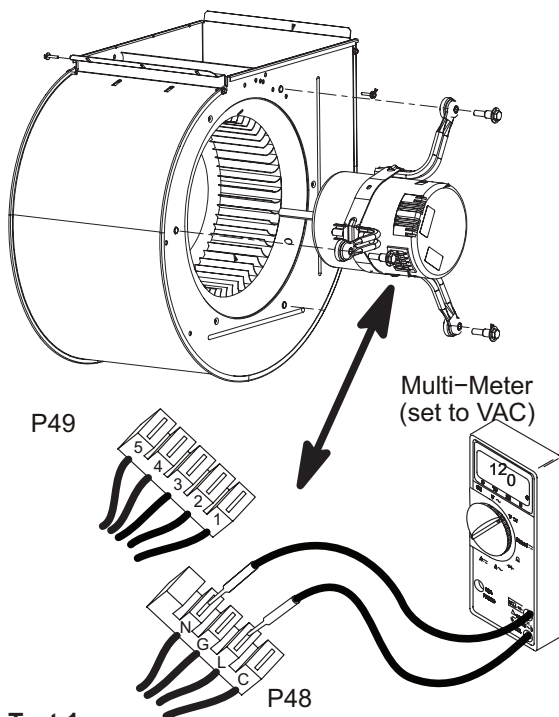
If replacing the indoor blower motor or blower wheel is necessary, placement is critical. The blower wheel must be centered in the blower housing as shown in Figure 6. When replacing the indoor blower motor the set screw must be aligned and tightened with the motor shaft as shown in Figure 7.



**Figure 6. Blower Wheel Replacement**

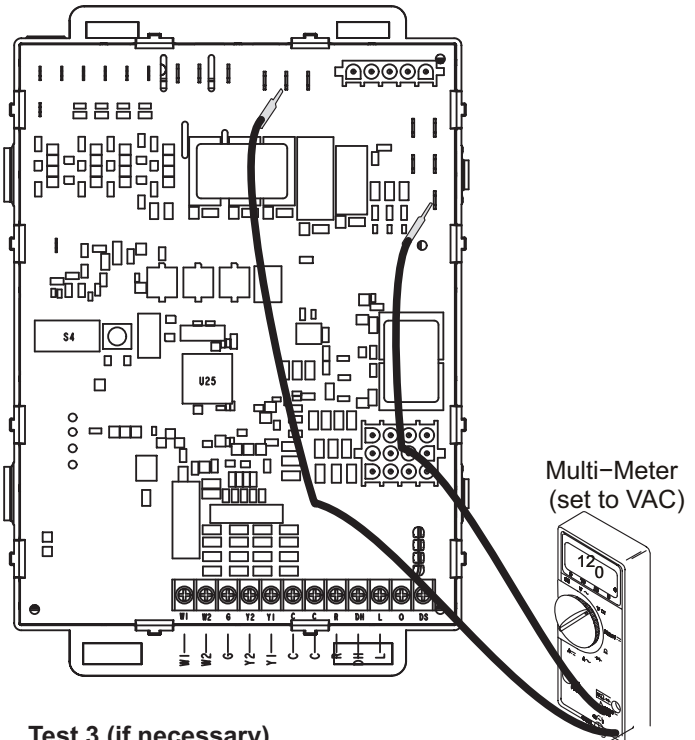


**Figure 7.**



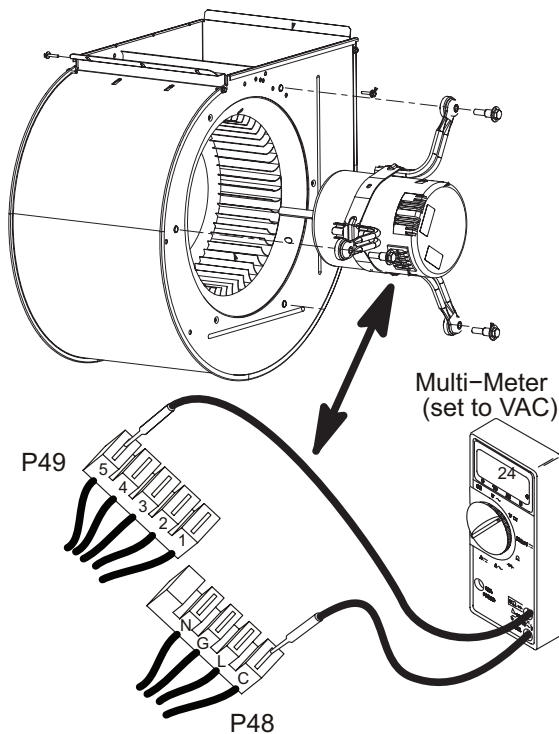
### Test 1

Turn on power to unit. Check for 120 volts across terminals "L" and "N" on input plug P48. If voltage is present continue to test 2. If voltage is not present, problem may be upstream of plug P48 and proceed to test 3.



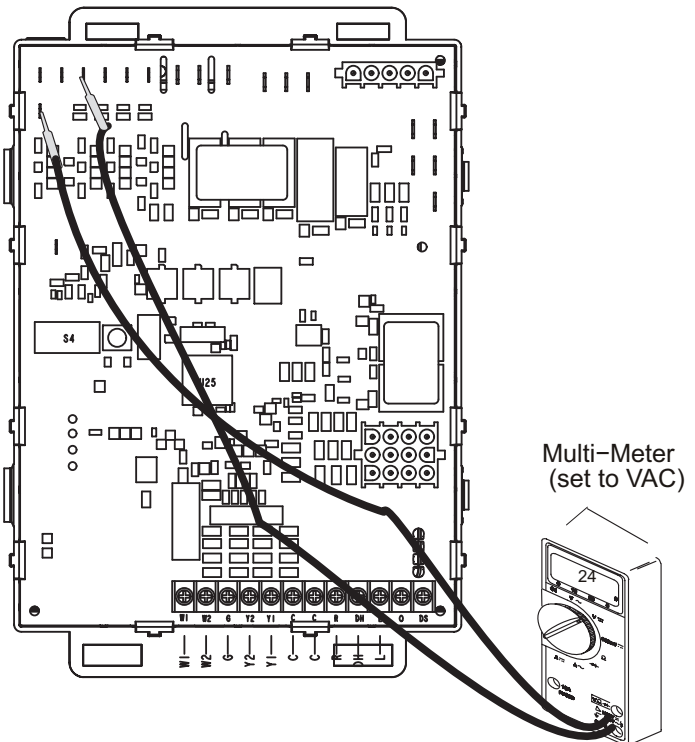
### Test 3 (if necessary)

Check for 120 volts across terminals "L1" and "Neutrals" on the integrated control. If voltage is present, problem is with the harness. If voltage is not present problem may be with the integrated control.



### Test 2

Switch thermostat to CONTINUOUS FAN MODE. Check for 24 volts across terminal "C" on input plug P48 and speed tap used for continuous fan (1, 2, 3, 4 or 5) on input plug P49. If 24 volts is not present, problem may be upstream of plug P49. Proceed to test 4.



### Test 4 (if necessary)

Check for 24 volts across terminals "24 COM" and the "active speed trap" on the integrated control. If voltage is present, problem is with the harness. If voltage is not present, problem may be with the integrated control.

Figure 8.

## Heating Components

### Ignitor

The ignitor is made of durable silicon nitride. The integrated control provides 120 volts to the ignitor for a consistent ignition and long ignitor life. Ohm value should be 39 to 70. See Figure 9 for ignitor location and Figure 10 for ignitor check out.

**NOTE:** *The NF80UT furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.*

### Flame Sensor

A flame sensor is located on the left side of the burner support. See Figure 9. The sensor tip protrudes into the flame envelope of the left-most burner. The sensor can be removed for service without removing any part of the burners. During operation, flame is sensed by current passed through the flame and sensing electrode. The control allows the gas valve to remain open as long as flame signal is sensed. To check flame sense signal use the push-button found on the integrated control and go to Field Test Mode. The menu will display the flame signal. See Table 8 for flame signal.

#### **To Measure Flame Signal - Integrated Control:**

Use a digital readout meter capable of reading DC microamps. See Figure 11 and Table 8 for flame signal check.

1. Set the meter to the DC amps scale.
2. Turn off supply voltage to control.
3. Disconnect integrated control flame sensor wire from the flame sensor.
4. Connect (-) lead to flame sensor.
5. Connect (+) lead to the ignition control sensor wire.
6. Turn supply voltage on and close thermostat contacts to cycle system.
7. When main burners are in operation for two minutes, take reading.

| Normal         | Low         | Drop Out |
|----------------|-------------|----------|
| 2.6 or greater | 2.5 or less | 0.06     |

**Table 8. Flame Signal in Microamps**

### Gas Valve

The valve (Figure 14) is internally redundant to assure safety shut-off. If the gas valve must be replaced, the same type valve must be used.

24VAC terminals and gas control knob are located on the valve. A wire harness connects the terminals from the gas valve to the electronic ignition control. 24V applied to the terminals energizes the valve.

Inlet and outlet pressure taps are located on the valve. A regulator adjustment screw is located on the valve.

LPG change over kits are available from GE Appliances. Kits include burner orifices and a gas valve conversion.

### Flame Rollout Switches (S47)

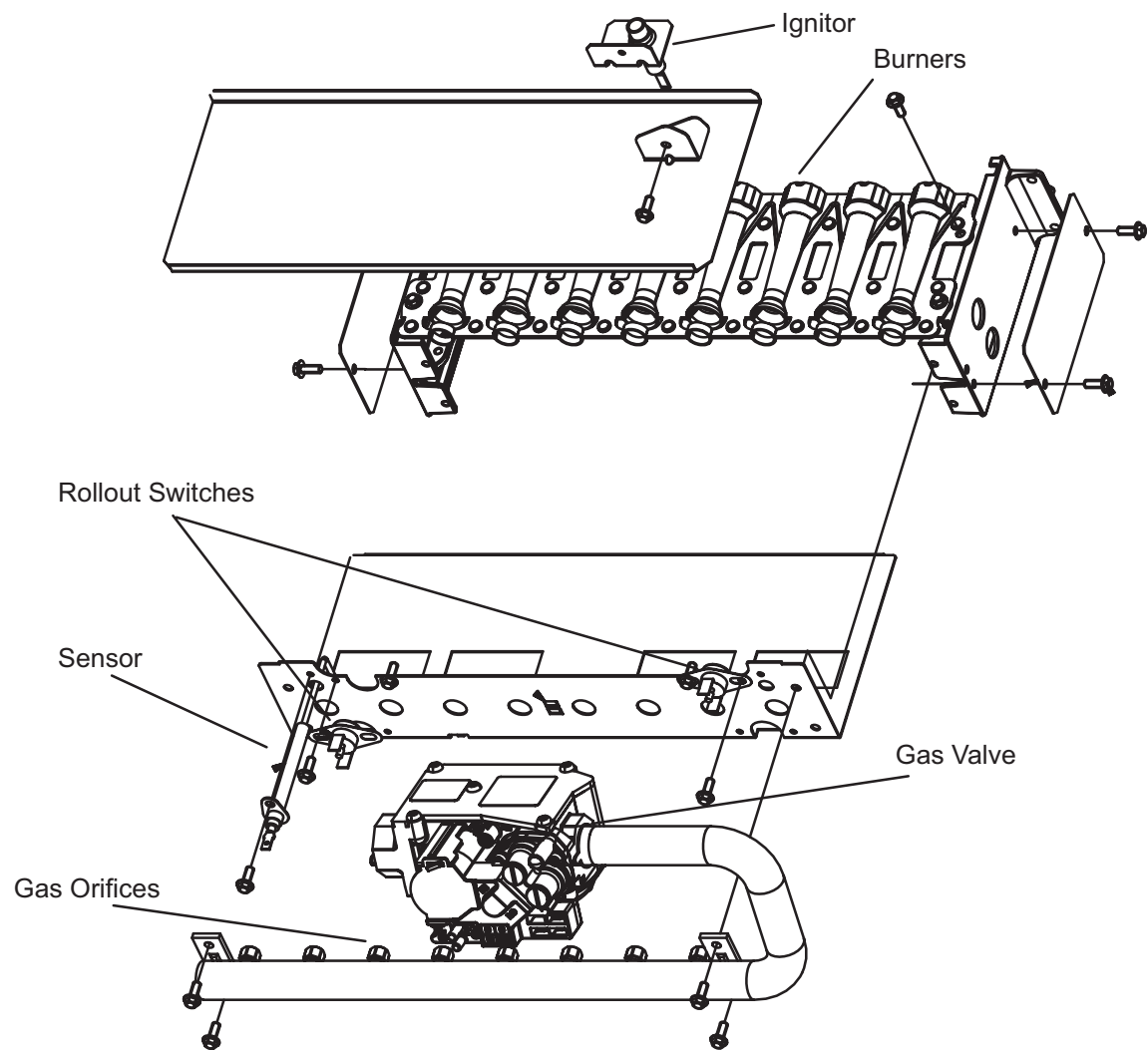
Flame rollout switch is a high temperature limit located on top of the burner box, one on each side.- See Figure 9. The limit is a N.C. SPST manual-reset limit. When S47 senses rollout, the circuit breaks and the ignition control immediately stops ignition and closes the gas valve. Rollout can be caused by a blocked exchanger, flue or lack of combustion air. The switch is factory set to trip (open) at 210°F and cannot be adjusted. The switch can be manually reset. To manually reset a tripped switch, push the reset button located on the control.

### Burners

All units use inshot burners. Burners are factory set and require no adjustment. Always operate the unit with the burner box front panel in place. Each burner uses an orifice that is precisely matched to the burner input. Burners can be removed as a one piece assembly for service. If burner assembly has been removed, it is critical to align center of each burner to the center of the clamshell when re-installing. See more detail in the Maintenance section.

### Primary Limit Control (S10)

The primary limit (S10) is located in the heating vestibule panel. When excess heat is sensed in the heat exchanger, the limit will open. If the limit is open, the furnace control energizes the supply air blower and closes the gas valve. The limit automatically resets when unit temperature returns to normal. The switch must reset within three minutes or the control will go into Soft Lockout for one hour. The switch is factory set and cannot be adjusted. The switch may have a different set point for each unit model number.

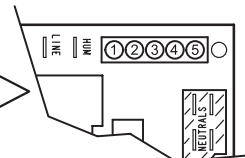
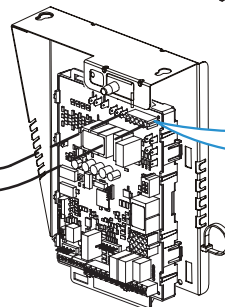
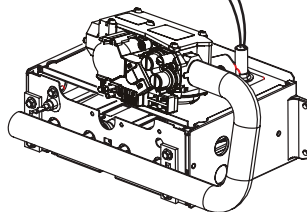
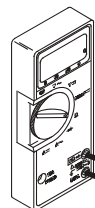


**Figure 9. Heating Components**

### Test 1 Checking resistance of ignitor circuit

Remove 5-pin plug from integrated control. Check Ohms reading across terminal 1 and 5. Reading should be between 39 and 70 ohms. If value is correct, this is the only test needed. If the meter reading is not correct ("0" or infinity), then a second test is needed.

Meter  
(set to ohms)

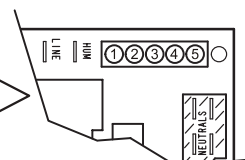
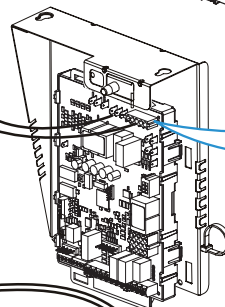
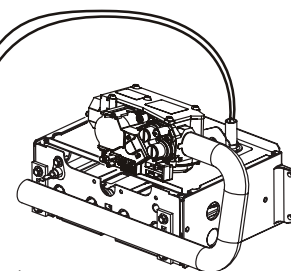
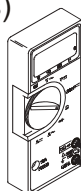


Integrated control detail

### Test 2 Checking the resistance of the ignitor

Separate the 2-pin jack plug near the manifold and check resistance of the ignitor. Reading should be between 39 and 70 ohms. If reading is correct, then there is a problem with the wiring between the jack plug and the control. If reading is not correct, the issue is the ignitor.

Meter  
(set to ohms)

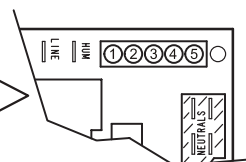
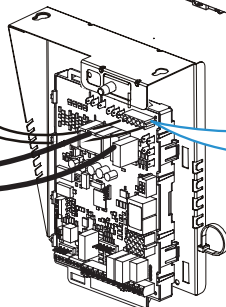
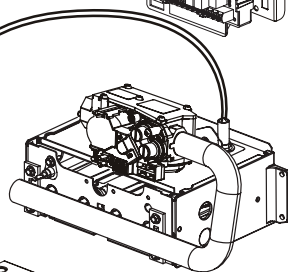
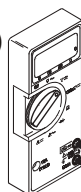


Integrated control detail

### Test 3 Checking voltage to ignitor

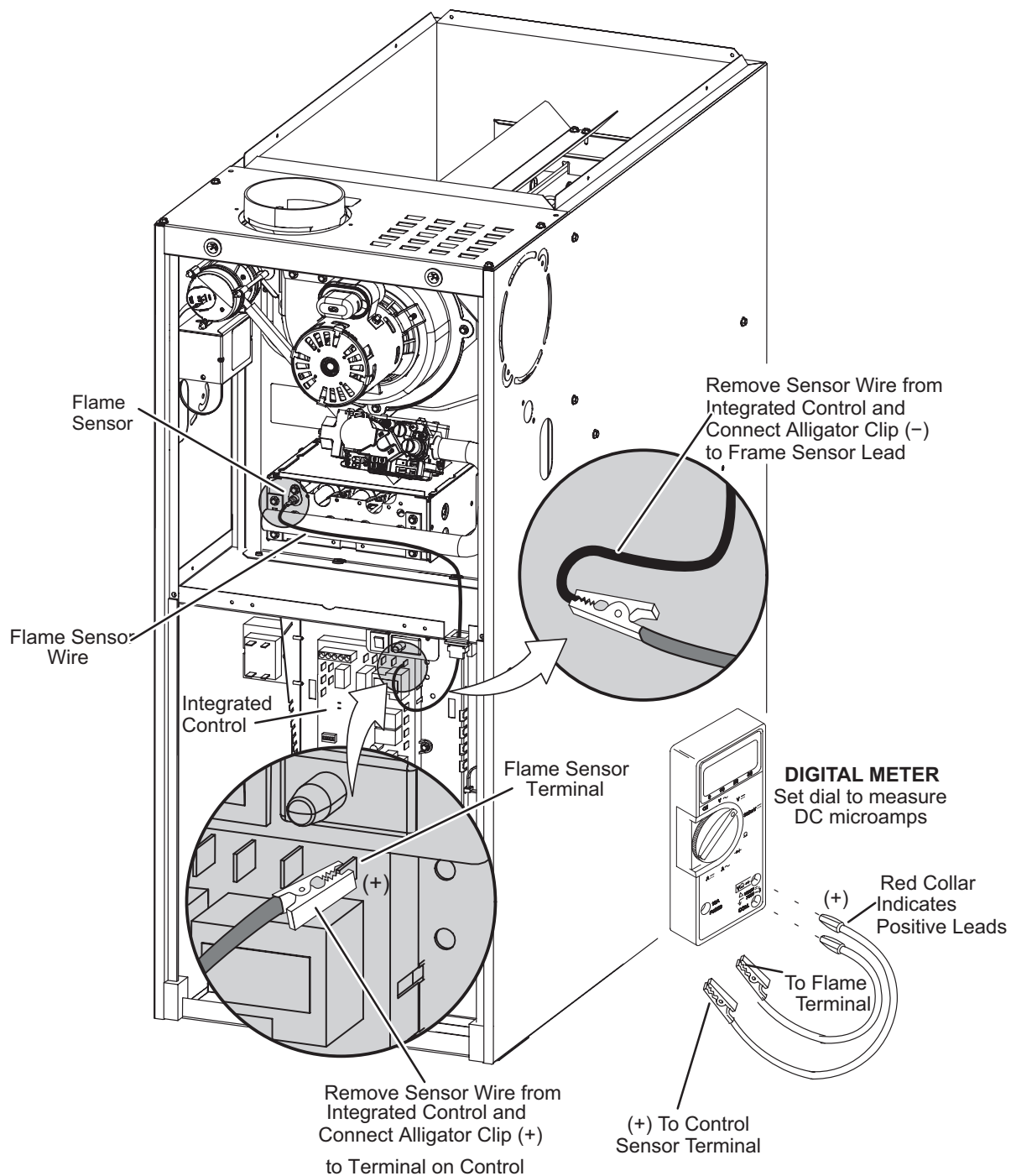
Insert meter probes into terminals 1 and 5. (use small diameter probes in order to not damage plug). Check voltage during 20 second ignitor warm up period. Voltage should read 120 volts + or - 10%. If voltage is above or below these values, check for correct supply voltage to furnace.

Meter  
(set to AC volts)



Integrated control detail

Figure 10. Ignitor Check Out



**Figure 11. Measuring Flame Signal**

### Combustion Air Inducer (B6)

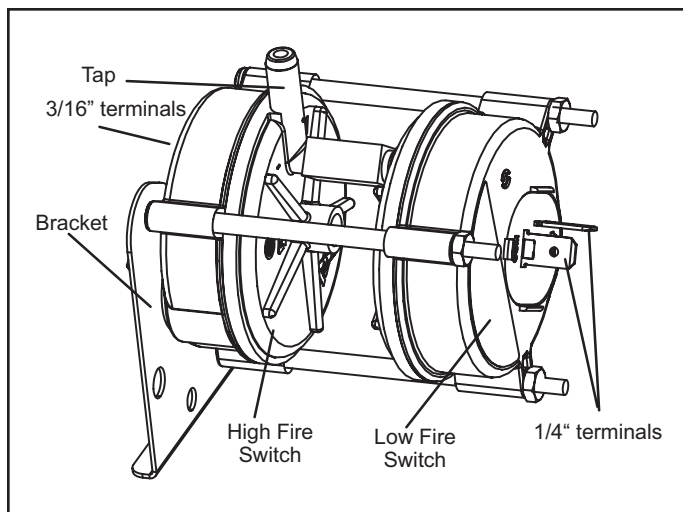
All NF80UT units use a two-stage combustion air inducer to move air through the burners and heat exchanger during heating operation. The blower uses a 120VAC motor. The motor operates during all heating operation and is controlled by integrated control A92. The inducer also operates for 15 seconds before burner ignition (pre-purge) and for 5 seconds after the gas valve closes (post-purge). The inducer operates on low speed during firststage heat, then switches to high speed for second stage heat..

### Combustion Air Inducer Pressure Switch (S18) (Figure 12)

NF80UT series units are equipped with a dual combustion air pressure switch (first and second stage) located on the combustion air inducer orifice bracket. The switch is connected to the combustion air inducer housing by means of a flexible silicone hose. It monitors negative air pressure in the combustion air inducer housing.

The switches are a single-pole single-throw proving switch electrically connected to the integrated control. The purpose of the switch is to prevent burner operation if the combustion air inducer is not operating or if the flue becomes obstructed.

On heat demand (first or second stage) the switch senses that the combustion air inducer is operating. It closes a circuit to the integrated control when pressure inside the combustion air inducer decreases to a certain set point. Set points vary depending on unit size. See Table 6. The pressure sensed by the switch is negative relative to atmospheric pressure. If the flue becomes obstructed during operation, the switch senses a loss of negative pressure (pressure becomes more equal with atmospheric pressure) and opens the circuit to the furnace control and gas valve.



**Figure 12. Combustion Air Inducer Pressure Switch**

**NOTE:** The switch is factory set and is not field adjustable. It is a safety shut-down control in the furnace and must not be by-passed for any reason. If switch is closed or bypassed, the control will not initiate ignition at start up.

| Unit | Set Point<br>Low Heat<br>(in. w.c.) | Set Point<br>High Heat<br>(in. w.c.) |
|------|-------------------------------------|--------------------------------------|
| -045 | 0.30                                | 0.68                                 |
| -070 | 0.35                                |                                      |
| -090 | 0.30                                |                                      |
| -110 |                                     |                                      |

**Table 9. 0 - 4,500 ft.**

**NOTE:** See Table 13 for high altitude pressure switch kits.

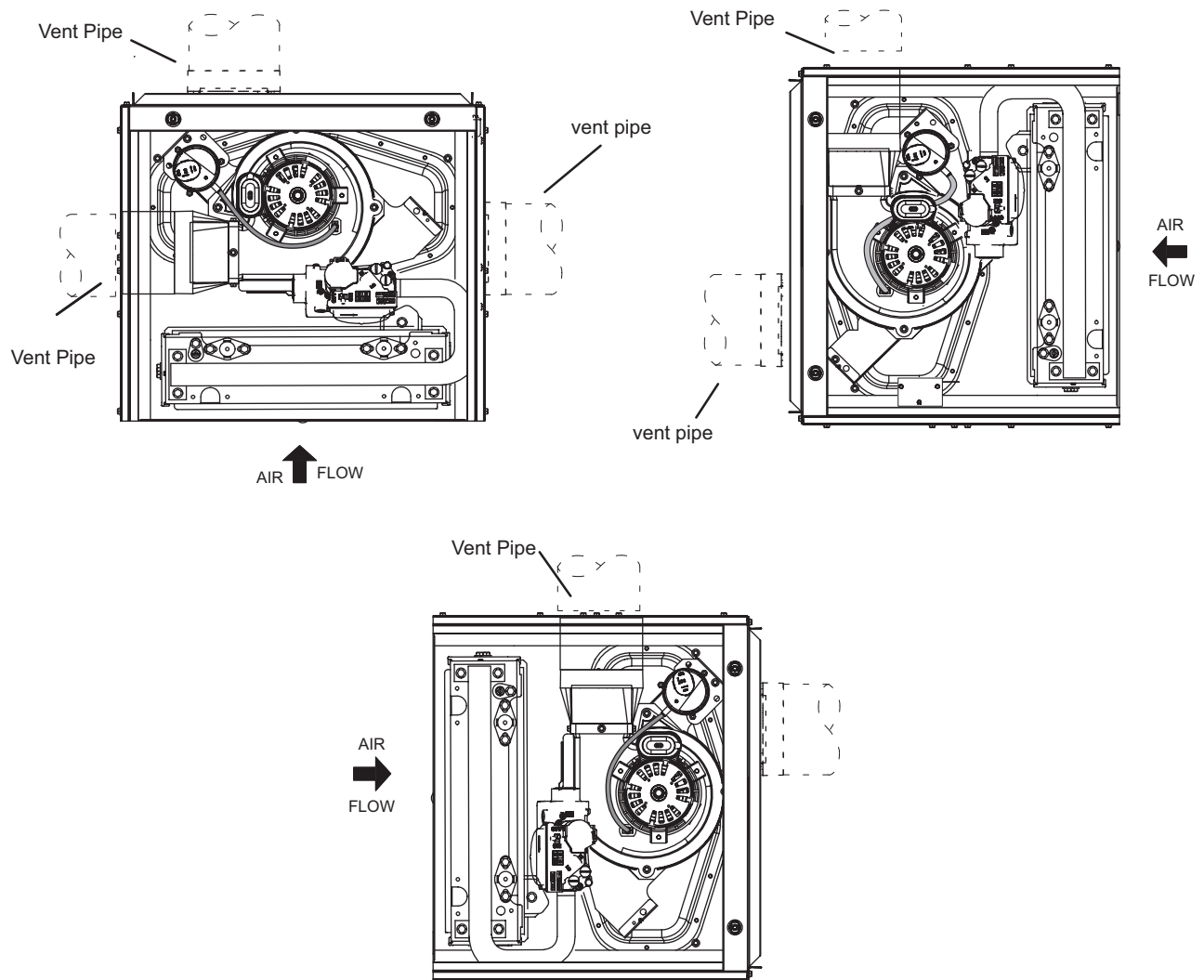
## Multiple Venting

The NF80UT furnace can vent in multiple positions. See Figure 13.

The make up box may be removed and the combustion air inducer may be rotated clockwise or counterclockwise 90° to allow for vertical or horizontal vent discharge in a vertical or horizontal cabinet position. Remove the four mounting screws, rotate the assembly (assembly consists of orifice plate, proving switch, gasket and combustion air inducer), then reinstall the mounting screws. See unit Installation Instructions for more detail.

### IMPORTANT

The combustion air pressure switch must be moved for horizontal discharge air left position.



In all positions route the wires away from moving parts and the heat of the inducer motor to prevent damage to the wires. The pressure switch must be installed above the CAI to prevent moisture from collecting in the hoses or switch.

Figure 13.

## Placement and Installation

Make sure unit is installed in accordance with installation instructions and applicable codes.

## Start-Up

### Preliminary and Seasonal Checks

1. Inspect electrical wiring, both field and factory installed for loose connections. Tighten as required.
2. Check voltage at disconnect switch. Voltage must be within range listed on the nameplate. If not, consult the power company and have voltage condition corrected before starting unit.
3. Inspect condition of condensate traps and drain assembly. Disassemble and clean seasonally.

### Heating Start-Up

**BEFORE LIGHTING** the unit, smell all around the furnace area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

The gas valve on the NF80UT is equipped with a gas control switch. Use only your hand to move the switch. Never use tools. If the the switch will not move by hand, replace the valve. Do not try to repair it. Force or attempted repair may result in a fire or explosion.

### WARNING

Shock and burn hazard.

NF80UT units are equipped with a hot surface ignition system. Do not attempt to light manually.

### Gas Valve Operation (Figure 14)

1. **STOP!** Read the safety information at the beginning of this section.
2. Set the thermostat to the lowest setting.
3. Turn off all electrical power to the unit.
4. This furnace is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.
5. Remove the access panel.
6. Move gas valve switch to OFF. See Figure 14.
7. Wait five minutes to clear out any gas. If you then smell gas, **STOP!** Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you do not smell gas go to next step.
8. Move gas valve switch to ON. See Figure 14.

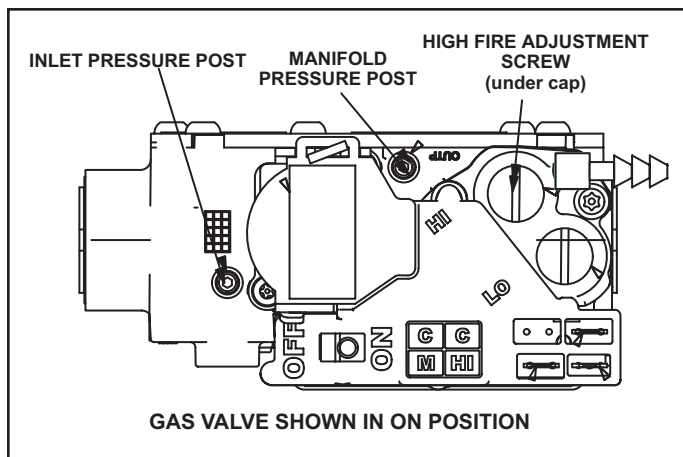


Figure 14. Gas Valve

9. Replace the access panel.
10. Turn on all electrical power to the unit.
11. Set the thermostat to desired setting.

**NOTE:** When unit is initially started, steps 1 through 11 may need to be repeated to purge air from gas line.

12. If the appliance will not operate, follow the instructions "Turning Off Gas to Unit" and call your service technician or gas supplier.

### Turning Off Gas to Unit

1. Set the thermostat to the lowest setting.
2. Turn off all electrical power to the unit if service is to be performed.
3. Remove the access panel.
4. Move gas valve switch to OFF.
5. Replace the access panel.

### Failure To Operate

If the unit fails to operate, check the following:

1. Is the thermostat calling for heat?
2. Are access panels securely in place?
3. Is the main disconnect switch closed?
4. Is there a blown fuse or tripped breaker?
5. Is the filter dirty or plugged? Dirty or plugged filters will cause the limit control to shut the unit off.
6. Is gas turned on at the meter?
7. Is the manual main shut-off valve open?
8. Is the internal manual shut-off valve open?
9. Is the unit ignition system in lockout? If the unit locks out again, inspect the unit for blockages.
10. Is pressure switch closed? Obstructed flue will cause unit to shut off at pressure switch. Check flue and outlet for blockages.

11. Are flame rollout switches tripped? If flame rollout switches are tripped, call the service technician for inspection.

### Safety or Emergency Shutdown

Turn off unit power. Close manual and main gas valves.

### Extended Period Shutdown

Turn off thermostat or set to "UNOCCUPIED" mode. Close all gas valves (both internal and external to unit) to guarantee no gas leak into combustion chamber. Turn off power to unit. All access panels and covers must be in place and secured.

## Heating System Service Checks

### C.S.A. Certification

All units are C.S.A. design certified without modifications.

Refer to the NF80UT Operation and Installation Instruction.

### Gas Piping

Gas supply piping should not allow more than 0.5" W.C. drop in pressure between gas meter and unit. Supply gas pipe must not be smaller than unit gas connection.

Compounds used on gas piping threaded joints should be resistant to action of liquefied petroleum gases.

### CAUTION

If a flexible gas connector is required or allowed by the authority that has jurisdiction, black iron pipe shall be installed at the gas valve and extend outside the furnace cabinet. The flexible connector can then be added between the black iron pipe and the gas supply line.

### WARNING

Do not over torque (800 in-lbs) or under torque (350 in-lbs) when attaching the gas piping to the gas valve.

## Testing Gas Piping

### IMPORTANT

In case emergency shutdown is required, turn off the main shut-off valve and disconnect the main power to unit. These controls should be properly labeled by the installer.

When pressure testing gas lines, the gas valve must be disconnected and isolated. Gas valves can be damaged if subjected to more than 0.5 psig (14" W.C.). See Figure 15. If the pressure is greater than 0.5psig (14"W.C.), use the manual shut-off valve before pressure testing to isolate furnace from gas supply.

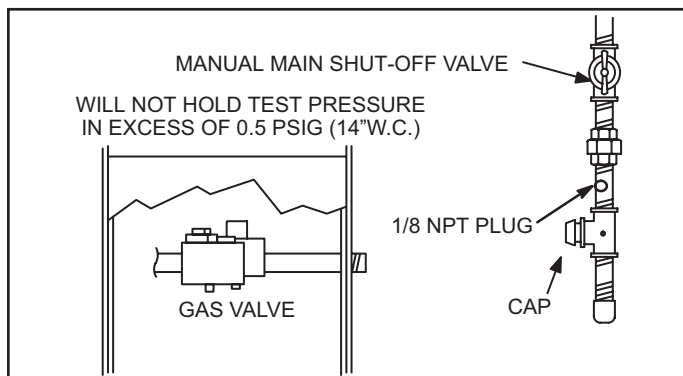


Figure 15.

When checking piping connections for gas leaks, use preferred means. Kitchen detergents can cause harmful corrosion on various metals used in gas piping. Use of a specialty Gas Leak Detector is strongly recommended.

### WARNING

Do not use matches, candles, flame or any other source of ignition to check for gas leaks.

### Supply Pressure Measurement

A threaded plug on the inlet side of the gas valve provides access to the supply pressure tap. Remove the threaded plug, install a field-provided barbed fitting and connect a manometer to measure supply pressure. Replace the threaded plug after measurements have been taken. See Table 12 for supply line pressure.

## Manifold Pressure Measurement

After line pressure has been checked and adjusted, check manifold pressure. Checks of manifold pressure are made as verification of proper regulator adjustment. Manifold pressure for the NF80UT can be measured at any time the gas valve is open and is supplying gas to the unit.

**NOTE:** The gas valve is factory set and should not require adjustment. All gas valves are factory regulated.

### IMPORTANT

For safety, connect a shut-off valve between the manometer and the gas tap to permit shut off of gas pressure to the manometer.

1. Connect test gauge to manifold pressure post (Figure 14) on gas valve.
2. Ignite unit on low fire and let run for 5 minutes to allow for steady state conditions.
3. After allowing unit to stabilize for 5 minutes, record manifold pressure and compare to value given in Table 12.
4. If necessary, make adjustments. Figure 14 shows location of high fire and low fire adjustment screw.
5. Repeat steps 2, 3 and 4 on high fire.
6. Shut unit off and remove manometer as soon as an accurate reading has been obtained. Take care to replace pressure tap plug.
7. Start unit and perform leak check. Seal leaks if found.

## Gas Flow (Approximate)

Furnace should operate at least 5 minutes before checking gas flow. Determine time in seconds for two revolutions of gas through the meter. (Two revolutions assures a more accurate time.) Divide by two and compare to time in Table 10. If manifold pressure matches Table 12 and rate is incorrect, check gas orifices for proper size and restriction. Remove temporary gas meter if installed.

**NOTE:** To obtain accurate reading, shut off all other gas appliances connected to meter.

| Capacity                                 | Seconds for One Revolution |              |              |              |
|------------------------------------------|----------------------------|--------------|--------------|--------------|
|                                          | Natural                    |              | LP           |              |
|                                          | 1 cu ft Dial               | 2 cu ft Dial | 1 cu ft Dial | 2 cu ft Dial |
| -45                                      | 80                         | 160          | 200          | 400          |
| -70                                      | 55                         | 110          | 136          | 272          |
| -90                                      | 41                         | 82           | 102          | 204          |
| -110                                     | 33                         | 66           | 82           | 164          |
| Natural-1000 btu/cu ft LP-2500 btu/cu ft |                            |              |              |              |

**Table 10. Gas Meter Clocking Chart**

### IMPORTANT

For safety, shut unit off and remove manometer as soon as an accurate reading has been obtained. Take care to replace pressure tap plug.

## Proper Combustion

Furnace should operate a minimum 15 minutes with correct manifold pressure and gas flow rate before checking combustion. Table 11 shows acceptable combustion for all NF80UT models. **The maximum carbon monoxide reading should not exceed 100 ppm.**

| Capacity  | CO <sub>2</sub> % for Nat | CO <sub>2</sub> % for LP |
|-----------|---------------------------|--------------------------|
| High Fire | 6.0 - 7.5                 | 7.0 - 8.5                |
| Low Fire  | 5.0 - 6.5                 | 5.8 - 7.3                |

**Table 11.**

## High Altitude

The manifold pressure may require adjustment and combustion air pressure switch may need replacing to ensure proper combustion at higher altitudes. Refer to Table 12 for manifold pressure and Table 13 for pressure switch change and gas conversion kits.

| Capacity | Gas                     | Manifold Pressure<br>in. wg. 0 - 4,500 ft. |           | Manifold Pressure<br>in. wg. 4,501 - 7,500 ft. |           | Manifold Pressure<br>in. wg. 7,501 - 10,000 ft. <sup>2</sup> |           | Supply Line Pressure<br>in. wg. |      |
|----------|-------------------------|--------------------------------------------|-----------|------------------------------------------------|-----------|--------------------------------------------------------------|-----------|---------------------------------|------|
|          |                         | Low Fire                                   | High Fire | Low Fire                                       | High Fire | Low Fire                                                     | High Fire | Min.                            | Max. |
| 045      | Natrual                 | 1.7                                        | 3.5       | 1.5                                            | 3.2       | 1.7                                                          | 3.5       | 4.5                             | 13.0 |
|          | LP/Propane <sup>3</sup> | 4.5                                        | 10.0      | 4.5                                            | 10.0      | 4.5                                                          | 10.0      | 11.0                            | 13.0 |
| 070      | Natrual                 | 1.7                                        | 3.5       | 1.6                                            | 3.4       | 1.7                                                          | 3.5       | 4.5                             | 13.0 |
|          | LP/Propane <sup>3</sup> | 4.5                                        | 10.0      | 4.5                                            | 10.0      | 4.5                                                          | 10.5      | 11.0                            | 13.0 |
| 090      | Natrual                 | 1.7                                        | 3.5       | 1.5                                            | 3.2       | 1.7                                                          | 3.5       | 4.5                             | 13.0 |
|          | LP/Propane <sup>3</sup> | 4.5                                        | 10.0      | 4.5                                            | 10.0      | 4.5                                                          | 10.0      | 11.0                            | 13.0 |
| 110      | Natrual                 | 1.7                                        | 3.5       | 1.5                                            | 2.8       | 1.7                                                          | 3.5       | 4.5                             | 13.0 |
|          | LP/Propane <sup>3</sup> | 4.5                                        | 10.0      | 4.5                                            | 10.0      | 4.5                                                          | 10.0      | 11.0                            | 13.0 |

1. This is the only permissible derate for these units.

2. Natural gas high altitude orifice kit required.

3. A natural to L.P. propane gas changeover kit is necessary to convert this unit. Refer to the changeover kit installation instruction for the conversion procedure.

NOTE - Units may be installed at altitudes up to 4500 ft. above sea level without modifications.

**Table 12. Manifold Pressure and Line Pressure at Various Altitudes**

|              |                              | Natural Gas High Altitude<br>Conversion Kit |               |                 | Pressure Switch |               |                 | LP High Alt. Conversion Kit |               |                 |
|--------------|------------------------------|---------------------------------------------|---------------|-----------------|-----------------|---------------|-----------------|-----------------------------|---------------|-----------------|
| MODEL NUMBER | Description                  | 0-4500                                      | 4500-<br>7500 | 7500-<br>10,000 | 0-4500          | 4500-<br>7500 | 7500-<br>10,000 | 0-4500                      | 4500-<br>7500 | 7500-<br>10,000 |
| NF80U045T3A  | 80% Upflow<br>2-Stage<br>ECM | Not Required                                |               |                 | Not<br>Required | 91W53         | 73W35           | 11K48                       |               | 11K47           |
| NF80U070T3A  |                              |                                             |               |                 |                 |               |                 |                             |               |                 |
| NF80U090T4B  |                              |                                             |               |                 |                 |               |                 |                             |               |                 |
| NF80U110T5C  |                              |                                             |               |                 |                 |               |                 |                             |               |                 |

**Table 13. Orifice Kits and Pressure Switch Kits at Various Altitudes**

Proper Ground and Voltage

Furnace must be properly grounded for proper performance. Use the following procedure to check for ground and voltage to the integrated control.

- 1. Measure the AC voltage between Line Neutral (spade terminals) and “C” terminal (low voltage terminal block) on the integrated control. See Figure 16. A wide variation in the voltage between Line Neutral and “C” as a function of load indicates a poor or partial ground. Compare the readings to Table 14. If the readings exceed the maximum shown in Table 14, make repairs before operating the furnace.

- 2. In addition, measure the AC voltage from Line Hot to Line Neutral (spade terminals) on the integrated control. See Figure 16. This voltage should be in the range of 97 to 132 Vac.

| Furnace Status          | Measurement VAC |         |
|-------------------------|-----------------|---------|
|                         | Expected        | Maximum |
| Power On Furnace Idle   | 0.3             | 2       |
| CAI / Ignitor Energized | 0.75            | 5       |
| Indoor Blower Energized | Less than 2     | 10      |

Table 14.

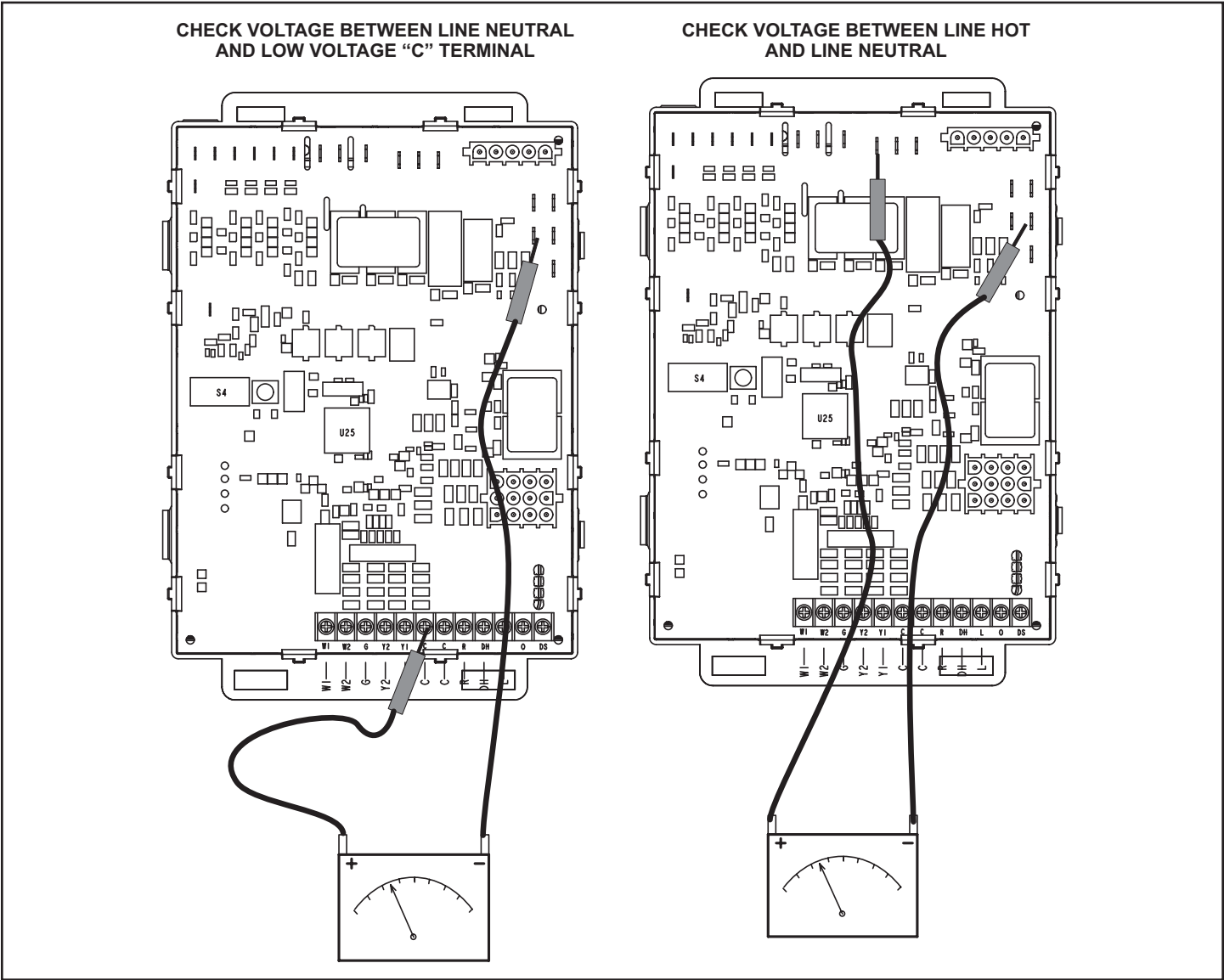


Figure 16.

## Typical Operating Characteristics

### Blower Operation and Adjustment

**NOTE:** The following is a generalized procedure and does not apply to all thermostat controls.

1. Blower operation is dependent on thermostat control system.
2. Generally, blower operation is set at thermostat subbase fan switch. With fan switch in ON position, blower operates continuously. With fan switch in AUTO position, blower cycles with demand or runs continuously while heating or cooling circuit cycles.
3. Depending on the type of indoor thermostat, blower and entire unit will be off when the system switch is in OFF position.

### Temperature Rise (Figure 17)

Temperature rise for NF80UT units depends on unit input, blower speed, blower horsepower and static pressure as marked on the unit rating plate. The blower speed must be set for unit operation within the range of "TEMP. RISE °F" listed on the unit rating plate.

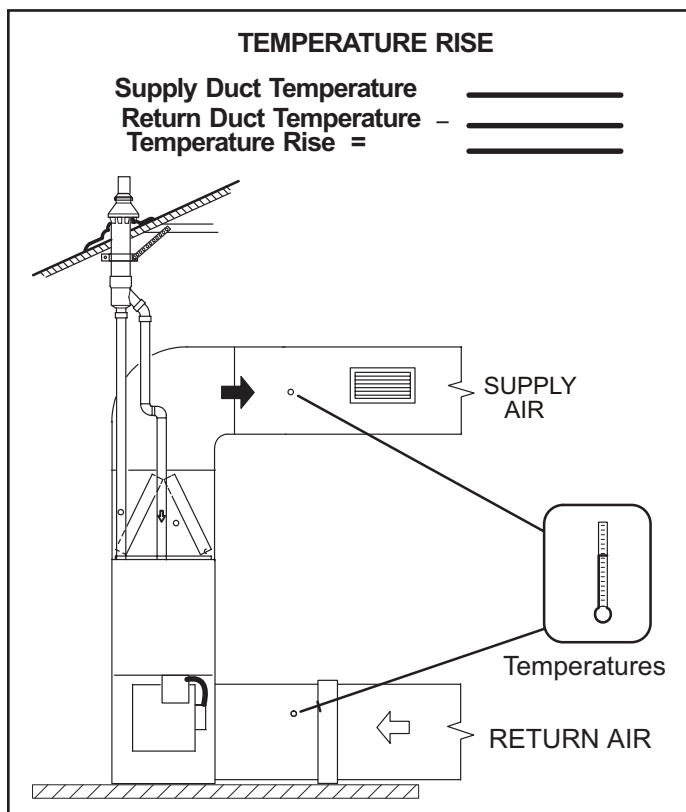


Figure 17.

### External Static Pressure

1. Tap locations shown in Figure 18.
2. Punch a 1/4" diameter hole in supply and return air plenums. Insert manometer hose flush with inside edge of hole or insulation. Seal around the hose with permagum. Connect the zero end of the manometer to the discharge (supply) side of the system. On ducted systems, connect the other end of manometer to the return duct as above.
3. With only the blower motor running and the evaporator coil dry, observe the manometer reading. Adjust blower motor speed to deliver the air desired according to the job requirements. For heating speed (second stage heat speed) external static pressure drop must not be more than 0.5" W.C. For cooling speed (second stage cool speed) external static pressure drop must not be more than 0.5" W.C.
4. Seal the hole when the check is complete.

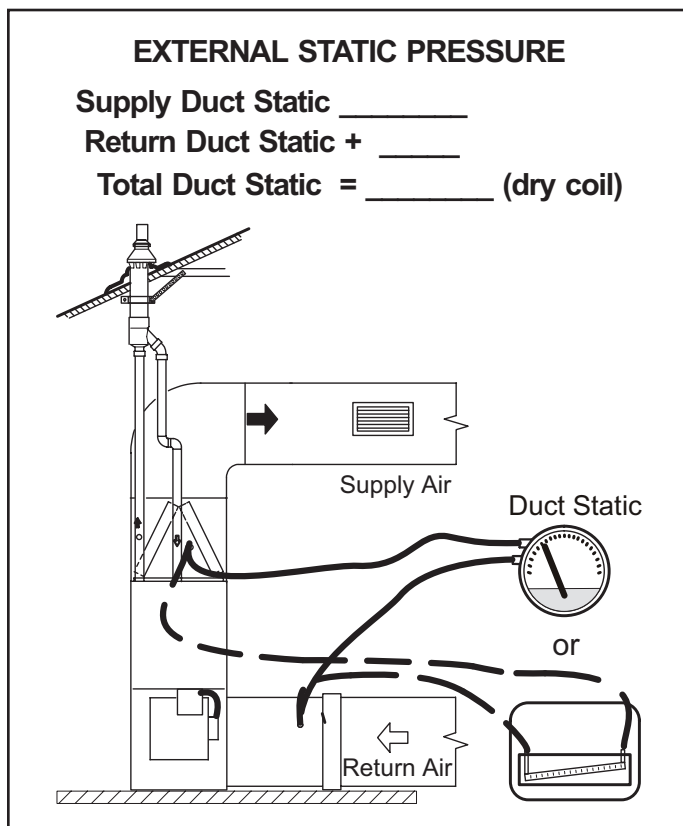


Figure 18.

## Maintenance

### **WARNING**

#### **ELECTRICAL SHOCK, FIRE, OR EXPLOSION HAZARD.**

Failure to follow safety warnings exactly could result in dangerous operation, serious injury, death or property damage.

Improper servicing could result in dangerous operation, serious injury, death, or property damage.

Before servicing, disconnect all electrical power to furnace.

When servicing controls, label all wires prior to disconnecting. Take care to reconnect wires correctly. Verify proper operation after servicing.

### **Annual Furnace Maintenance**

At the beginning of each heating season, and to comply with the GE Appliances Limited Warranty, your system should be checked by a licensed professional technician (or equivalent) as follows:

#### **Blower**

Check the blower wheel for debris and clean if necessary. The blower motors are prelubricated for extended bearing life. No further lubrication is needed.

### **WARNING**

The blower access panel must be securely in place when the blower and burners are operating. Gas fumes, which could contain carbon monoxide, can be drawn into living space resulting in personal injury or death.

#### **Filters**

All air filters are installed external to the unit. Filters should be inspected monthly. Clean or replace the filters when necessary to ensure proper furnace operation. Table 15 lists recommended filter sizes.

### **IMPORTANT**

If a high-efficiency filter is being installed as part of this system to ensure better indoor air quality, the filter must be properly sized. High-efficiency filters have a higher static pressure drop than standard-efficiency glass/foam filters. If the pressure drop is too great, system capacity and performance may be reduced. The pressure drop may also cause the limit to trip more frequently during the winter and the indoor coil to freeze in the summer, resulting in an increase in the number of service calls.

Before using any filter with this system, check the specifications provided by the filter manufacturer

| Cabinet Width | Filter Size |               |
|---------------|-------------|---------------|
|               | Side Return | Bottom Return |
| 14-1/2"       | 16 x 25 x 1 | 14 x 25 x 1   |
| 17-1/2"       |             | 16 x 25 x 1   |
| 21"           |             | 20 x 25 x 1   |

**Table 15.**

### **WARNING**

Disconnect power before servicing unit.

### **CAUTION**

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

### **WARNING**

The blower access panel must be securely in place when the blower and burners are operating. Gas fumes, which could contain carbon monoxide, can be drawn into living space resulting in personal injury or death.

1. Check wiring for loose connections, voltage at indoor unit and amperage of indoor motor.
2. Check the condition of the belt and shaft bearings if applicable.
3. Inspect all gas pipe and connections for leaks.
4. Check the cleanliness of filters and change if necessary (monthly).

5. Check the condition and cleanliness of burners and heat exchanger and clean if necessary.
6. Check the cleanliness of blower assembly and clean the housing, blower wheel and blower motor if necessary. The blower motors are prelubricated for extended bearing life. No further lubrication is needed.
7. Inspect the combustion air inducer and clean if necessary.
8. Evaluate the heat exchanger integrity by inspecting the heat exchanger per the AHRI heat exchanger inspection procedure. This procedure can be viewed at [www.ahrinet.org](http://www.ahrinet.org)
9. Ensure sufficient combustion air is available to the furnace. Fresh air grilles and louvers (on the unit and in the room where the furnace is installed) must be properly sized, open and unobstructed to provide combustion air.
10. Inspect the furnace venting system to make sure it is in place, structurally sound, and without holes, corrosion, or blockage. Vent system must be free and clear of obstructions and must slope upward away from the furnace. Vent system should be installed per the National Fuel Gas Code.
11. Inspect the furnace return air duct connection to ensure the duct is sealed to the furnace. Check for air leaks on supply and return ducts and seal where necessary.
12. Check the condition of the furnace cabinet insulation

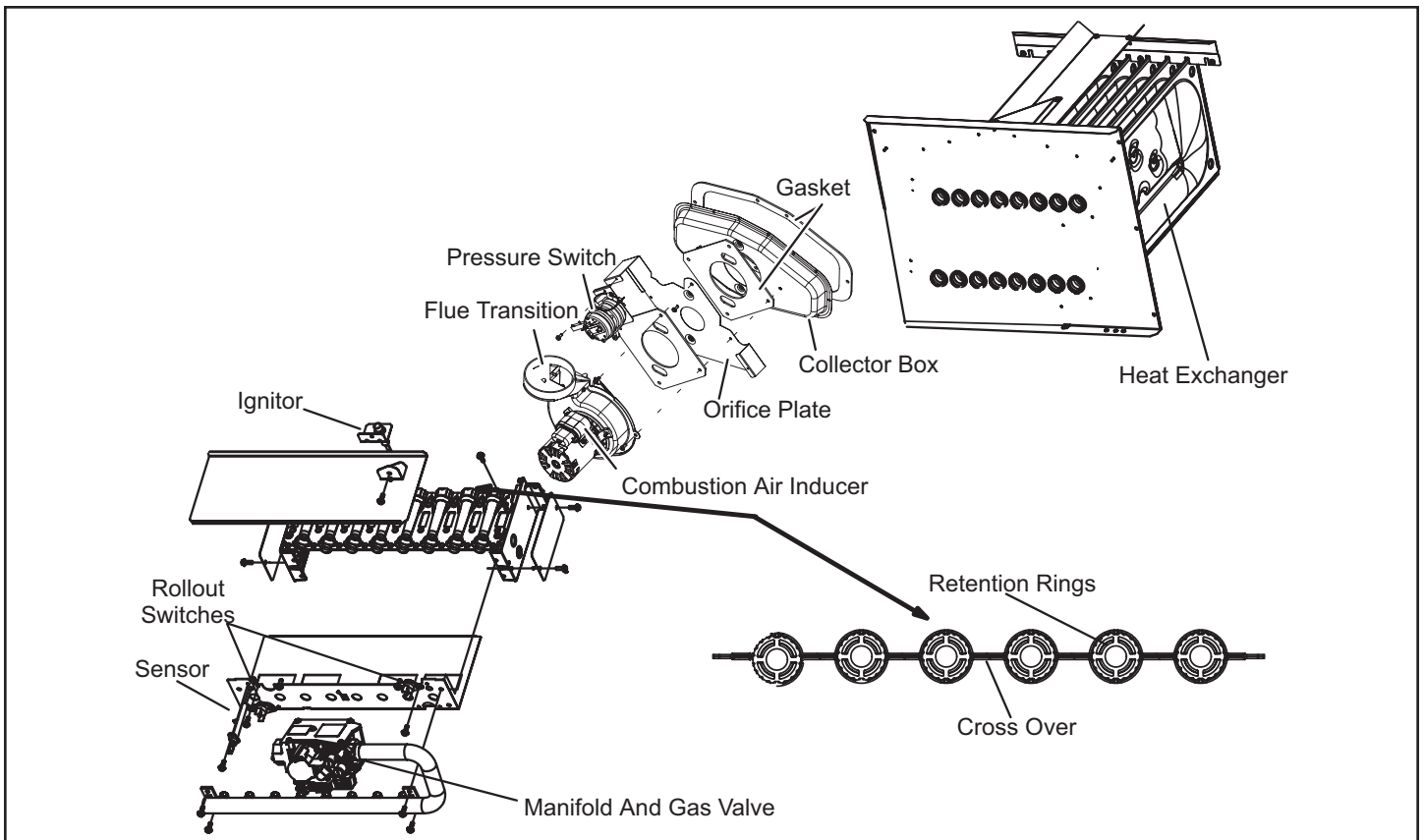
and repair if necessary.

13. Perform a complete combustion analysis during the furnace inspection to ensure proper combustion and operation. Consult Service Literature for proper combustion values.

14. Verify operation of CO detectors and replace batteries as required.

Perform a general system test. Turn on the furnace to check operating functions such as the start-up and shut-off operation.

1. Check the operation of the ignition system, inspect and clean flame sensor. Check microamps before and after. Check controls and safety devices (gas valve, flame sensor, temperature limits). Consult Service Manual for proper operating range. Thermal Limits should be checked by restricting airflow and not disconnecting the indoor blower.
2. Verify that system total static pressure and airflow settings are within specific operating parameters.
3. Clock gas meter to ensure that the unit is operating at the specified firing rate. Check the supply pressure and the manifold pressure. On two-stage gas furnaces check the manifold pressure on high fire and low fire. If manifold pressure adjustment is necessary, consult the Service Literature for unit specific information on adjusting gas pressure. Not all gas valves are adjustable. Verify correct temperature rise.



**Figure 19. Burner, Combustion Air Inducer Assembly & Heat Exchanger Removal**

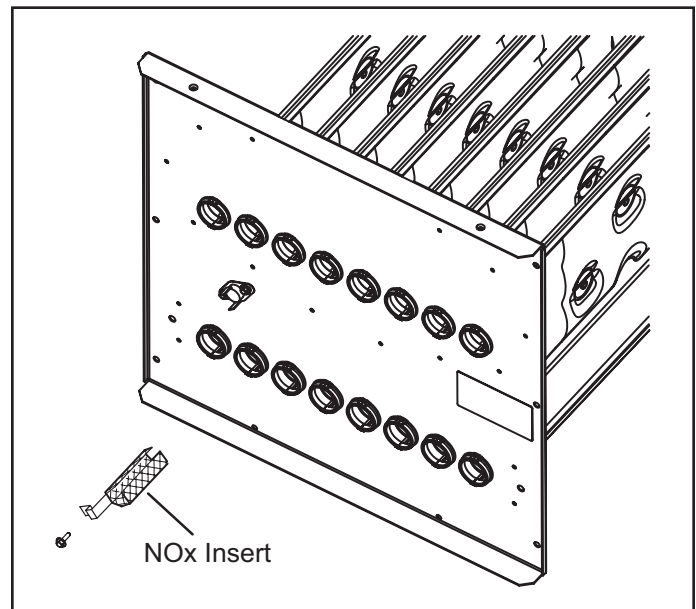
## Cleaning the Heat Exchanger and Burners

**NOTE:** Use papers or protective covering in front of the furnace during cleaning.

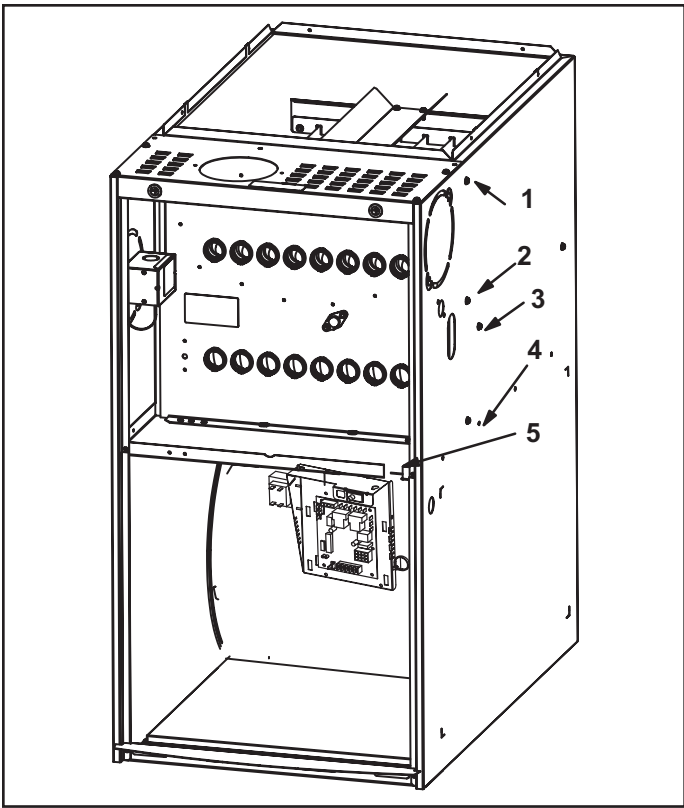
1. Turn off both electrical and gas power supplies to furnace.
2. Remove flue pipe and top cap (some applications top cap can remain) from the unit.
3. Label the wires from gas valve, rollout switches, primary limit switch and make-up box then disconnect them.
4. Remove the screws that secure the combustion air inducer/pressure switch assembly to the collector box. Carefully remove the combustion air inducer to avoid damaging blower gasket. If gasket is damaged, it must be replaced to prevent leakage.
5. Remove the collector box located behind the combustion air inducer. Be careful with the collector box gasket. If the gasket is damaged, it must be replaced to prevent leakage.
6. Disconnect gas supply piping. Remove the screw securing the burner box cover and remove cover. Remove the four screws securing the burner manifold assembly to the vestibule panel and remove the assembly from the unit.
7. Remove screws securing burner box and remove burner box.
8. NOx units only - Remove screw securing NOx insert. Remove NOx insert. See Figure 20.
9. Remove screws from both sides, top and bottom of vestibule panel.
10. Remove heat exchanger. It may be necessary to spread cabinet side to allow more room. If so, remove five screws from the left side or right side of cabinet. See Figure 21.
11. Backwash using steam. Begin from the burner opening on each clam. Steam must not exceed 275°F.
12. To clean burners, run a vacuum cleaner with a soft brush attachment over the face of burners. Visually inspect inside the burners and crossovers for any blockage caused by foreign matter. Remove any blockage. Figure 19 shows burner detail.
13. To clean the combustion air inducer visually inspect and using a wire brush clean where necessary. Use compressed air to clean off debris and any rust.
14. Reinstall heat exchanger in vestibule. (Replace the five screws in the cabinet from step 10 if removed).
15. NOx units only - Replace NOx inserts.
16. Reinstall collector box and combustion air assembly. Reinstall all screws to the collector box and combustion air inducer. Failure to replace all screws may cause leaks. Inspect gaskets for any damage and replace if necessary.
17. Reinstall burner box, manifold assembly and burner box cover.
18. Reconnect all wires.
19. Reconnect top cap and vent pipe to combustion air inducer outlet.
20. Reconnect gas supply piping.
21. Turn on power and gas supply to unit.
22. Set thermostat and check for proper operation.
23. Check all piping connections, factory and field, for gas leaks. Use a leak detecting solution or other preferred means.
24. If a leak is detected, shut gas and electricity off and repair leak.
25. Repeat steps 23 and 24 until no leaks are detected.
26. Replace access panel.

### CAUTION

Some soaps used for leak detection are corrosive to certain metals. Carefully rinse piping thoroughly after leak test has been completed. Do not use matches, candles, flame or other sources of ignition to check for gas leaks.



**Figure 20. NOx Inserts (NOx units only)**



**Figure 21. Remove 5 screws if necessary  
(either side of cabinet)**

# Wiring and Sequence of Operation

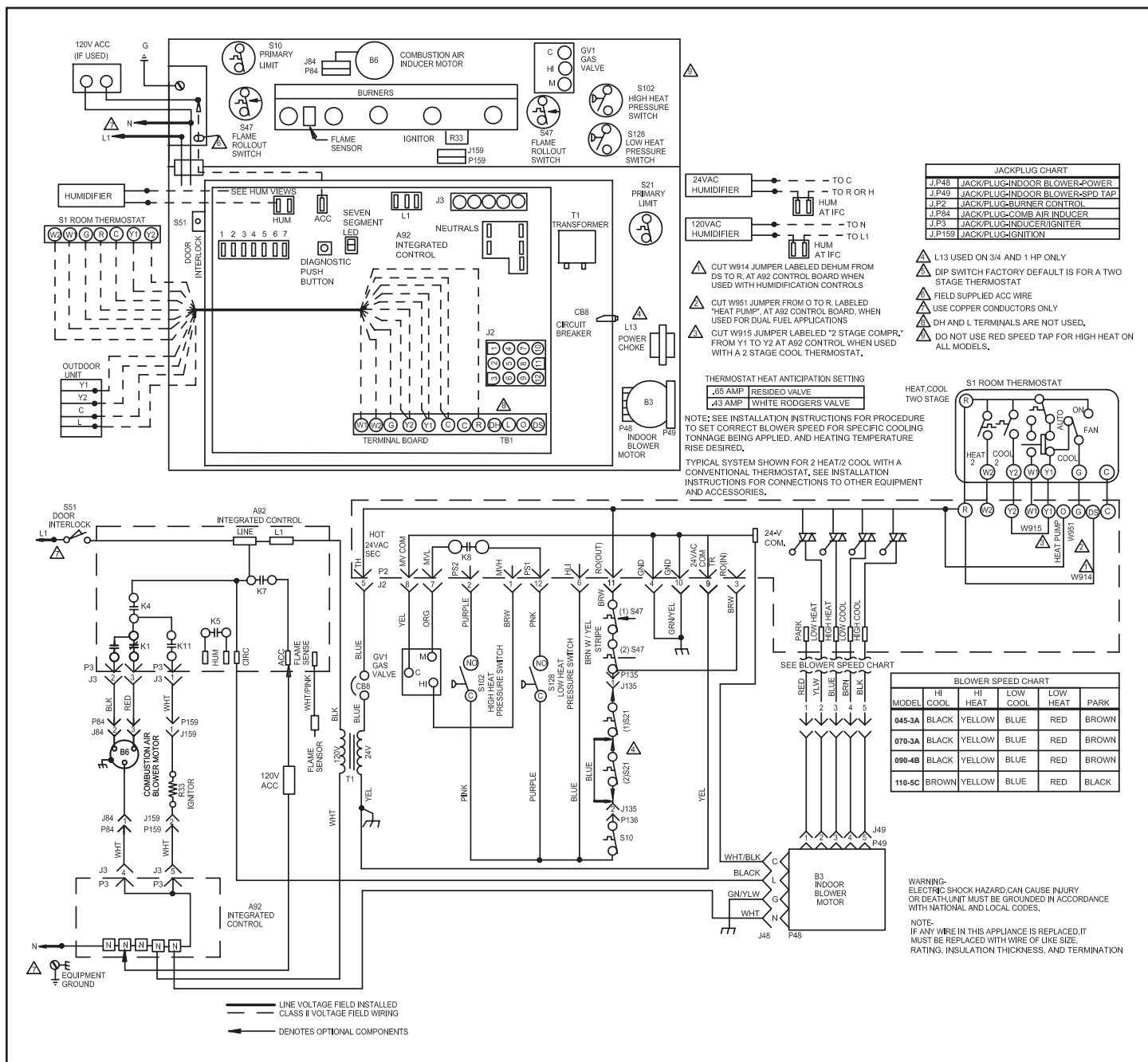


Figure 22. Wiring Diagram with Resideo/Honeywell Integrated Furnace Control 103132-xx

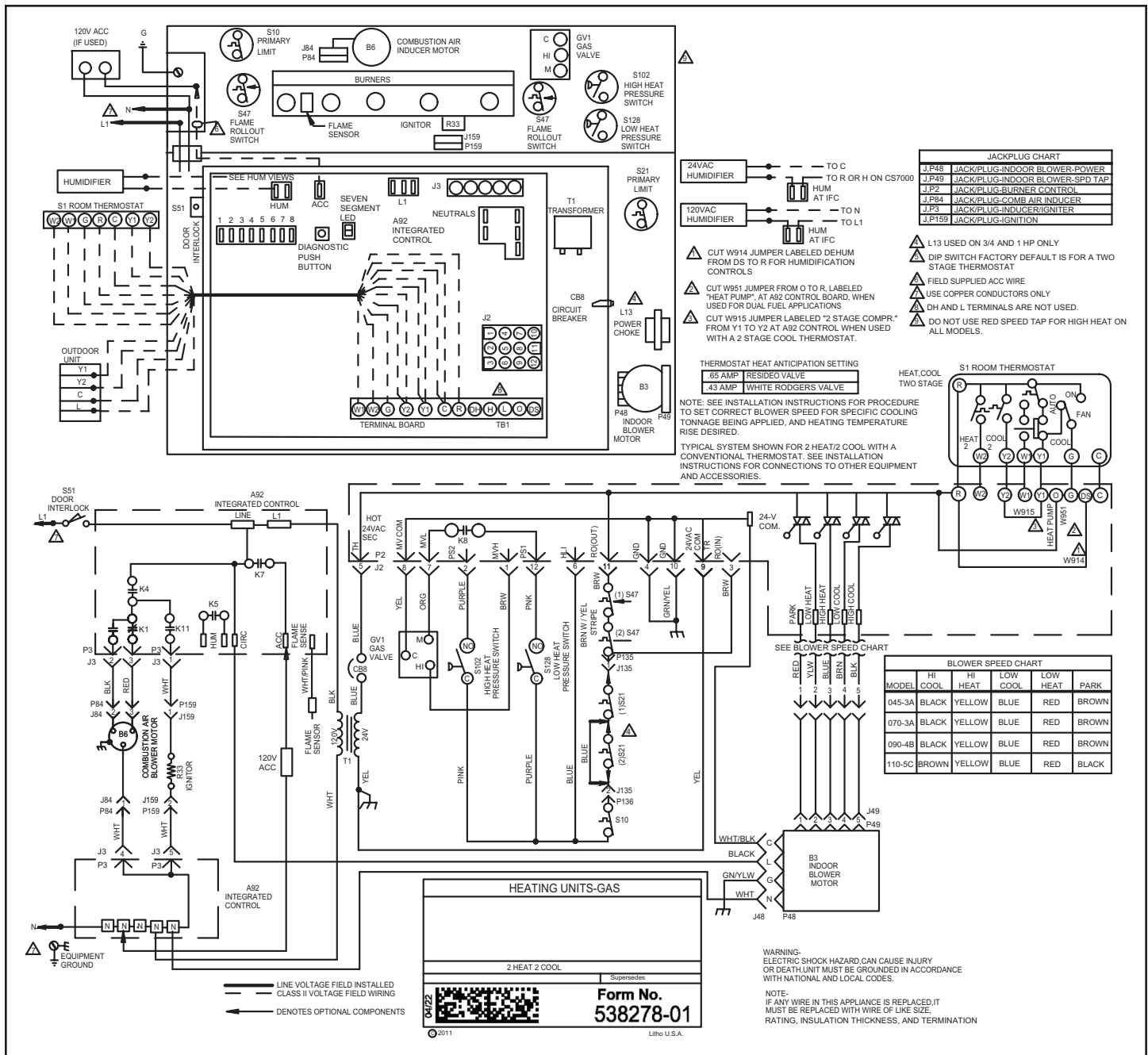


Figure 23. Wiring Diagram with UTEC Integrated Furnace Control 107047-xx

## Electronic Ignition

The two-stage, variable speed integrated control used in NF80UT units has an added feature of an internal soft lockout control. The feature serves as an automatic reset device for ignition control lockout caused by ignition failure. After one hour of continuous thermostat demand for heat, soft lockout will break and remake thermostat demand to the furnace and automatically reset the control to begin the ignition sequence.

**NOTE:** *The ignition control thermostat selection DIP switch is factory-set in the "TWO-STAGE" position.*

## Applications Using a Two-Stage Thermostat

### **A - Heating Sequence -- Integrated Control Thermostat Selection DIP Switch 1 OFF in "Two-Stage" Position (Factory Setting)**

1. On a call for heat, thermostat first-stage contacts close sending a signal to the integrated control. The integrated control runs a self-diagnostic program and checks high temperature limit switches for normally closed contacts and pressure switches for normally open contacts. The combustion air inducer is energized at low speed.
2. Once the control receives a signal that the low pressure switch has closed, the combustion air inducer begins a 15-second pre-purge in low speed.

**NOTE:** *If the low fire pressure switch does not close the combustion air inducer will switch to high fire. After a 15 second pre-purge the high fire pressure switch will close and the unit will begin operation on high fire. After 10 to 20 seconds of high fire operation the unit will switch to low fire.*

3. After the pre-purge is complete, a 20-second initial ignitor warm-up period begins. The combustion air inducer continues to operate at low speed.
4. After the 20-second warm-up period has ended, the gas valve is energized on low fire (first stage) and ignition occurs. At the same time, the control module sends a signal to begin an indoor blower 30-second ON-delay. When the delay ends, the indoor blower motor is energized on the low fire heating speed, the HUM contacts close energizing the humidifier and 120V ACC terminal is energized. The furnace will continue this operation as long as the thermostat has a first-stage heating demand.
5. If second-stage heat is required, the thermostat second-stage heat contacts close and send a signal to the integrated control. The integrated control initiates a 30-second second-stage recognition delay.

6. At the end of the recognition delay, the integrated control energizes the combustion air inducer at high speed. The control also checks the high fire (second-stage) pressure switch to make sure it is closed. The high fire (second stage) gas valve is energized and the indoor blower motor is energized for operation at the high fire heating speed.
7. When the demand for high fire (second stage) heat is satisfied, the combustion air inducer is switched to the low-fire heating speed and the high-fire (second-stage) gas valve is de-energized. The low-fire (first-stage) gas valve continues operation. The indoor blower motor is switched to the low-fire heating speed.
8. When the thermostat demand for low-fire (first stage) heat is satisfied, the gas valve is de-energized and the field-selected indoor blower off delay begins. The combustion air inducer begins a 5-second postpurge period.
9. When the combustion air post-purge period is complete, the inducer and the HUM contacts are deenergized. The indoor blower is de-energized at the end of the off delay as well as the ACC terminals.

## Applications Using A Single-Stage Thermostat

### **B - Heating Sequence -- Integrated Control Thermostat Selection DIP Switch 1 ON in "Single-Stage" Position**

**NOTE:** *In these applications, two-stage heat will be initiated by the integrated control if heating demand has not been satisfied after the field adjustable period (7 or 12 minutes).*

1. On a call for heat, thermostat first-stage contacts close sending a signal to the integrated control. The integrated control runs a self-diagnostic program and checks high temperature limit switches for normally closed contacts and pressure switches for normally open contacts. The combustion air inducer is energized at low speed.
  2. Once the control receives a signal that the low pressure switch has closed, the combustion air inducer begins a 15-second pre-purge in low speed.
- NOTE:** *If the low fire pressure switch does not close the combustion air inducer will switch to high fire. After a 15 second pre-purge the high fire pressure switch will close and the unit will begin operation on high fire. After 10 to 20 seconds of high fire operation the unit will switch to low fire.*
3. After the pre-purge is complete, a 20-second initial ignitor warm-up period begins. The combustion air inducer continues to operate at low speed.

4. After the 20-second warm-up period has ended, the gas valve is energized on low fire (first stage) and ignition occurs. At the same time, the control module sends a signal to begin an indoor blower 30-second ON-delay. When the delay ends, the indoor blower motor is energized on the low fire heating speed and the HUM contacts are energized. The integrated control also initiates a second-stage on delay (factory-set at 7 minutes; adjustable to 12 minutes).
5. If the heating demand continues beyond the second-stage on delay, the integrated control energizes the combustion air inducer at high speed. The control also checks the high fire (second stage) pressure switch to make sure it is closed. The high fire (second stage) gas valve is energized and the indoor blower motor is energized for operation at the high fire heating speed.
6. When the thermostat heating demand is satisfied, the combustion air inducer begins a 5-second low speed post-purge. The field-selected indoor blower off delay begins. The indoor blower operates at the low-fire heating speed.
7. When the combustion air post-purge period is complete, the inducer and the HUM contacts are deenergized. The indoor blower is de-energized at the end of the off delay as well as the 120 ACC terminals

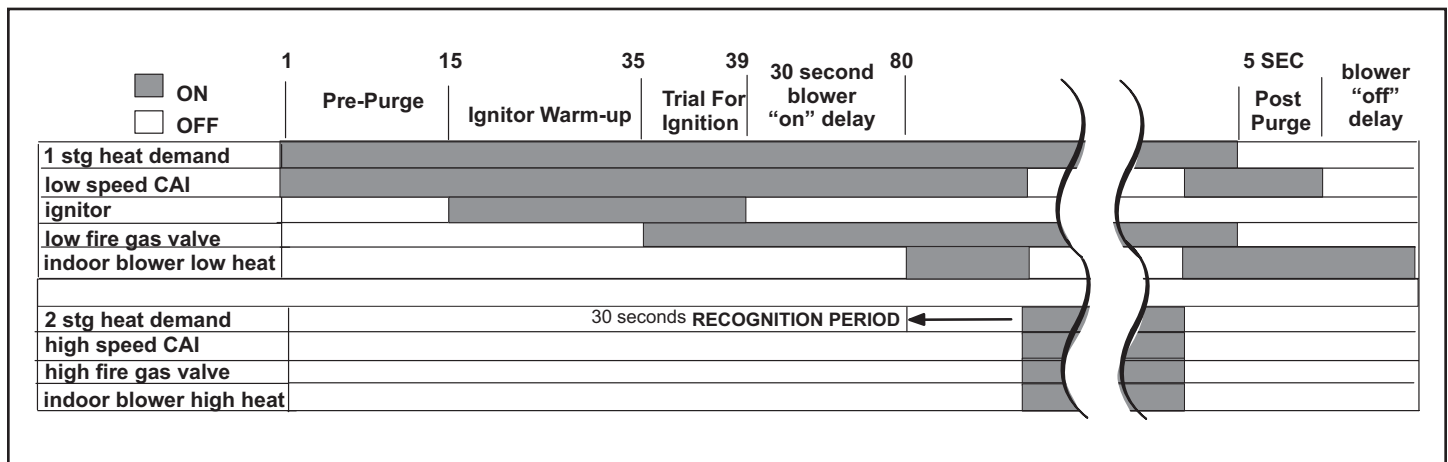


Figure 24. Heating Operation with Two-Stage Thermostat

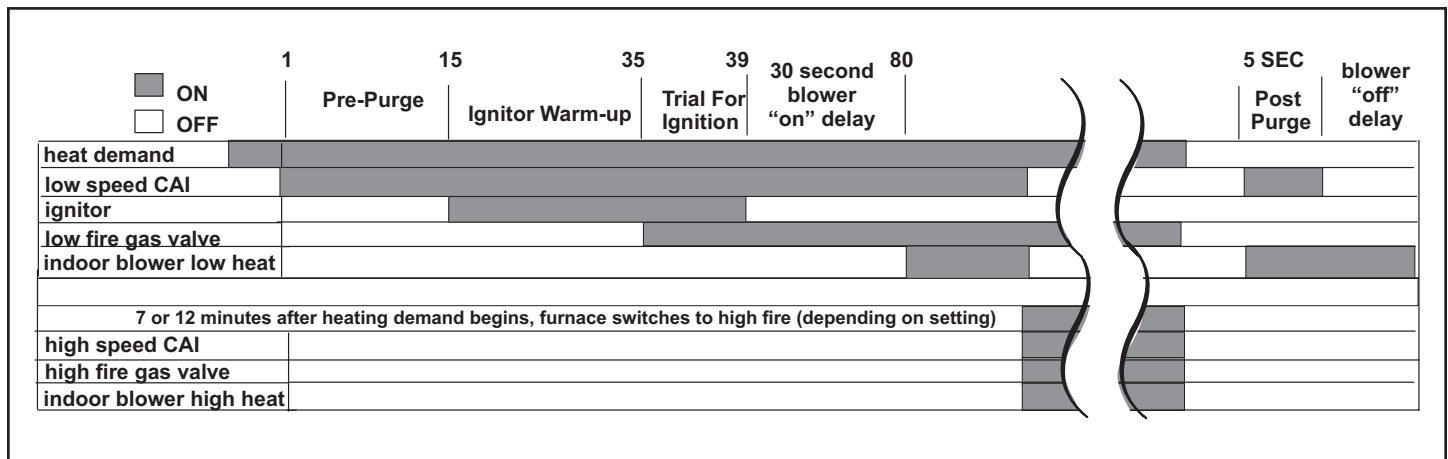


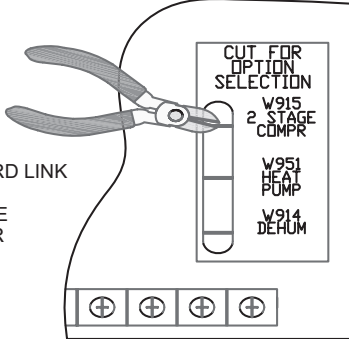
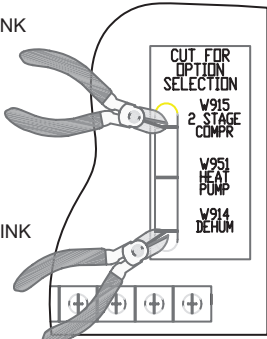
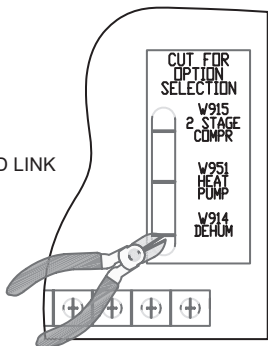
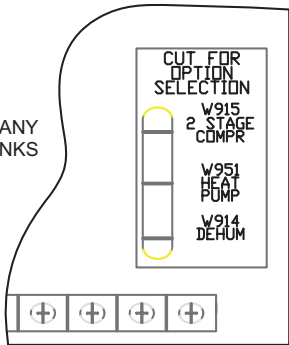
Figure 25. Heating Operation with Single-Stage Thermostat

## Field Wiring and DIP Switch Settings

| Thermostat                                                                                                                                                              | DIP Switch Settings and On-Board Links |                                                                                                     | Wiring Connections                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------------|--------------|-----------|------|--|------|------|--|-----------|------|--|----------|-----------|-----|----------|-----|--|----------|----------|-----|-----------|------|------|-----------|-----------|------|--|-----|--|
|                                                                                                                                                                         | DIP Switch 1                           | On Board Links Must Be Cut To Select System Options                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| <b>1 Heat / 1 Cool</b><br><b>NOTE:</b> Use DIP switch 2 to set sceond-stage heat ON delay.<br>OFF - 7 minutes<br>ON - 12 minutes                                        | ON                                     | <div>DO NOT CUT ANY ON-BOARD LINKS</div> <div></div>                                                | <table><thead><tr><th>T'STAT</th><th>FURNACE TERM. STRIP</th><th>OUTDOOR UNIT</th></tr></thead><tbody><tr><td></td><td>(DS)</td><td></td></tr><tr><td>(W2)</td><td>(W2)</td><td></td></tr><tr><td>(W1)-----</td><td>(W1)</td><td></td></tr><tr><td>(R)-----</td><td>(R)-----*</td><td>(R)</td></tr><tr><td>(G)-----</td><td>(G)</td><td></td></tr><tr><td>(C)-----</td><td>(C)-----</td><td>(C)</td></tr><tr><td></td><td>(Y2)</td><td></td></tr><tr><td>(Y)-----</td><td>(Y1)-----</td><td>(Y1)</td></tr><tr><td></td><td>(O)</td><td></td></tr></tbody></table> <p>*Not required on all units</p>                    | T'STAT | FURNACE TERM. STRIP | OUTDOOR UNIT |           | (DS) |  | (W2) | (W2) |  | (W1)----- | (W1) |  | (R)----- | (R)-----* | (R) | (G)----- | (G) |  | (C)----- | (C)----- | (C) |           | (Y2) |      | (Y)-----  | (Y1)----- | (Y1) |  | (O) |  |
| T'STAT                                                                                                                                                                  | FURNACE TERM. STRIP                    | OUTDOOR UNIT                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
|                                                                                                                                                                         | (DS)                                   |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (W2)                                                                                                                                                                    | (W2)                                   |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (W1)-----                                                                                                                                                               | (W1)                                   |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (R)-----                                                                                                                                                                | (R)-----*                              | (R)                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (G)-----                                                                                                                                                                | (G)                                    |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (C)-----                                                                                                                                                                | (C)-----                               | (C)                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
|                                                                                                                                                                         | (Y2)                                   |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (Y)-----                                                                                                                                                                | (Y1)-----                              | (Y1)                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
|                                                                                                                                                                         | (O)                                    |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| <b>1 Heat / 2 Cool</b><br><b>NOTE:</b> Use DIP switch 2 to set sceond-stage heat ON delay.<br>OFF - 7 minutes<br>ON - 12 minutes                                        | ON                                     | <div>CUT ON-BOARD LINK W915 2 STAGE COMPR</div> <div></div>                                         | <table><thead><tr><th>T'STAT</th><th>FURNACE TERM. STRIP</th><th>OUTDOOR UNIT</th></tr></thead><tbody><tr><td></td><td>(DS)</td><td></td></tr><tr><td></td><td>(W2)</td><td></td></tr><tr><td>(W)-----</td><td>(W1)</td><td></td></tr><tr><td>(R)-----</td><td>(R)-----*</td><td>(R)</td></tr><tr><td>(G)-----</td><td>(G)</td><td></td></tr><tr><td>(C)-----</td><td>(C)-----</td><td>(C)</td></tr><tr><td>(Y2)-----</td><td>(Y2)</td><td>(Y2)</td></tr><tr><td>(Y1)-----</td><td>(Y1)-----</td><td>(Y1)</td></tr><tr><td></td><td>(O)</td><td></td></tr></tbody></table> <p>*Not required on all units</p>           | T'STAT | FURNACE TERM. STRIP | OUTDOOR UNIT |           | (DS) |  |      | (W2) |  | (W)-----  | (W1) |  | (R)----- | (R)-----* | (R) | (G)----- | (G) |  | (C)----- | (C)----- | (C) | (Y2)----- | (Y2) | (Y2) | (Y1)----- | (Y1)----- | (Y1) |  | (O) |  |
| T'STAT                                                                                                                                                                  | FURNACE TERM. STRIP                    | OUTDOOR UNIT                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
|                                                                                                                                                                         | (DS)                                   |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
|                                                                                                                                                                         | (W2)                                   |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (W)-----                                                                                                                                                                | (W1)                                   |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (R)-----                                                                                                                                                                | (R)-----*                              | (R)                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (G)-----                                                                                                                                                                | (G)                                    |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (C)-----                                                                                                                                                                | (C)-----                               | (C)                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (Y2)-----                                                                                                                                                               | (Y2)                                   | (Y2)                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (Y1)-----                                                                                                                                                               | (Y1)-----                              | (Y1)                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
|                                                                                                                                                                         | (O)                                    |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| <b>1 Heat / 2 Cool with t'stat with dehumidification mode</b><br><b>NOTE:</b> Use DIP switch 2 to set sceond-stage heat ON delay.<br>OFF - 7 minutes<br>ON - 12 minutes | ON                                     | <div>CUT ON-BOARD LINK W915 2 STAGE COMPR</div> <div>CUT ON-BOARD LINK W914 DEHUM</div> <div></div> | <table><thead><tr><th>T'STAT</th><th>FURNACE TERM. STRIP</th><th>OUTDOOR UNIT</th></tr></thead><tbody><tr><td>(DS)-----</td><td>(DS)</td><td></td></tr><tr><td></td><td>(W2)</td><td></td></tr><tr><td>(W1)-----</td><td>(W1)</td><td></td></tr><tr><td>(R)-----</td><td>(R)-----*</td><td>(R)</td></tr><tr><td>(G)-----</td><td>(G)</td><td></td></tr><tr><td>(C)-----</td><td>(C)-----</td><td>(C)</td></tr><tr><td>(Y2)-----</td><td>(Y2)</td><td>(Y2)</td></tr><tr><td>(Y1)-----</td><td>(Y1)-----</td><td>(Y1)</td></tr><tr><td></td><td>(O)</td><td></td></tr></tbody></table> <p>*Not required on all units</p> | T'STAT | FURNACE TERM. STRIP | OUTDOOR UNIT | (DS)----- | (DS) |  |      | (W2) |  | (W1)----- | (W1) |  | (R)----- | (R)-----* | (R) | (G)----- | (G) |  | (C)----- | (C)----- | (C) | (Y2)----- | (Y2) | (Y2) | (Y1)----- | (Y1)----- | (Y1) |  | (O) |  |
| T'STAT                                                                                                                                                                  | FURNACE TERM. STRIP                    | OUTDOOR UNIT                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (DS)-----                                                                                                                                                               | (DS)                                   |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
|                                                                                                                                                                         | (W2)                                   |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (W1)-----                                                                                                                                                               | (W1)                                   |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (R)-----                                                                                                                                                                | (R)-----*                              | (R)                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (G)-----                                                                                                                                                                | (G)                                    |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (C)-----                                                                                                                                                                | (C)-----                               | (C)                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (Y2)-----                                                                                                                                                               | (Y2)                                   | (Y2)                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
| (Y1)-----                                                                                                                                                               | (Y1)-----                              | (Y1)                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |
|                                                                                                                                                                         | (O)                                    |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |                     |              |           |      |  |      |      |  |           |      |  |          |           |     |          |     |  |          |          |     |           |      |      |           |           |      |  |     |  |

NOTE - Do NOT make a wire connection between the room thermostat L terminal and the L terminal of the integrated control.

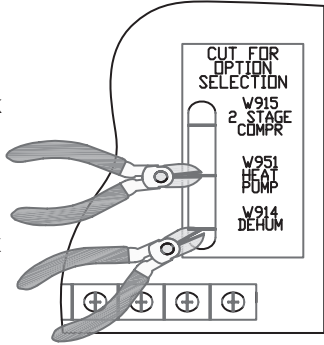
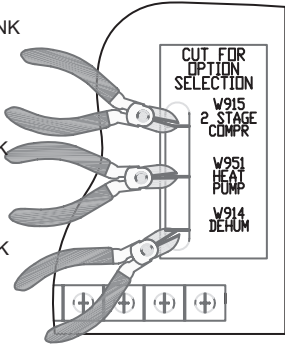
**Table 16. Field Wiring for Non-Communicating Thermostat Applications**

| Thermostat                                                                                                                | DIP Switch Settings and On-Board Links |                                                                                                                                                              | Wiring Connections                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                           | DIP Switch 1                           | On Board Links Must Be Cut To Select System Options                                                                                                          |                                                                                                                                                                                                                                                                                                                  |
| 2 Heat / 2 Cool                                                                                                           | OFF                                    | <p>CUT ON-BOARD LINK W915 2 STAGE COMPR</p>                                | <p>T'STAT      FURNACE TERM. STRIP      OUTDOOR UNIT</p> <p>(DS)      (DS)</p> <p>(W2) --- (W2)</p> <p>(W1) --- (W1)</p> <p>(R) --- (R) --- * --- (R)</p> <p>(G) --- (G)</p> <p>(C) --- (C) --- (C)</p> <p>(Y2) --- (Y2) --- (Y2)</p> <p>(Y1) --- (Y1) --- (Y1)</p> <p><i>*Not required on all units</i> (O)</p> |
| 2 Heat / 2 Cool with t'stat with dehumidification mode                                                                    | OFF                                    | <p>CUT ON-BOARD LINK W915 2 STAGE COMPR</p> <p>CUT ON-BOARD LINK W914</p>  | <p>T'STAT      FURNACE TERM. STRIP      OUTDOOR UNIT</p> <p>(DS) --- (DS)</p> <p>(W2) --- (W2)</p> <p>(W1) --- (W1)</p> <p>(R) --- (R) --- * --- (R)</p> <p>(G) --- (G)</p> <p>(C) --- (C) --- (C)</p> <p>(Y2) --- (Y2) --- (Y2)</p> <p>(Y1) --- (Y1) --- (Y1)</p> <p><i>*Not required on all units</i> (O)</p>  |
| 2 Heat / 1 Cool with t'stat with dehumidification mode                                                                    | OFF                                    | <p>CUT ON-BOARD LINK W914</p>                                             | <p>T'STAT      FURNACE TERM. STRIP      OUTDOOR UNIT</p> <p>(DS) --- (DS)</p> <p>(W2) --- (W2)</p> <p>(W1) --- (W1)</p> <p>(R) --- (R) --- * --- (R)</p> <p>(G) --- (G)</p> <p>(C) --- (C) --- (C)</p> <p>(Y1) --- (Y1) --- (Y1)</p> <p><i>* Not required on all units</i> (O)</p>                               |
| 2 Heat / 1 Cool                                                                                                           | OFF                                    | <p>DO NOT CUT ANY ON-BOARD LINKS</p>                                     | <p>T'STAT      FURNACE TERM. STRIP      OUTDOOR UNIT</p> <p>(DS)      (DS)</p> <p>(W2) --- (W2)</p> <p>(W1) --- (W1)</p> <p>(R) --- (R) --- * --- (R)</p> <p>(G) --- (G)</p> <p>(C) --- (C) --- (C)</p> <p>         (Y2)</p> <p>(Y) --- (Y1) --- (Y1)</p> <p><i>*Not required on all units</i> (O)</p>           |
| NOTE - Do NOT make a wire connection between the room thermostat L terminal and the L terminal of the integrated control. |                                        |                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                  |

**Table 16. Field Wiring for Non-Communicating Thermostat Applications**

| Thermostat                                                                                                                          | DIP Switch Settings and On-Board Links |                                                     | Wiring Connections |
|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------------------------------------------|--------------------|
|                                                                                                                                     | DIP Switch 1                           | On Board Links Must Be Cut To Select System Options |                    |
| <b>Dual Fuel Single-Stage Heat Pump</b><br><b>Thermostat w/dual fuel capabilities</b><br><b>Capable of 2-stage gas heat control</b> | OFF                                    |                                                     |                    |
| <b>Dual Fuel Two-Stage Heat Pump</b><br><b>Thermostat w/dual fuel capabilities</b><br><b>Capable of 2-stage gas heat control</b>    | OFF                                    |                                                     |                    |
| NOTE - Do NOT make a wire connection between the room thermostat L terminal and the L terminal of the integrated control.           |                                        |                                                     |                    |

**Table 16. Field Wiring for Non-Communicating Thermostat Applications**

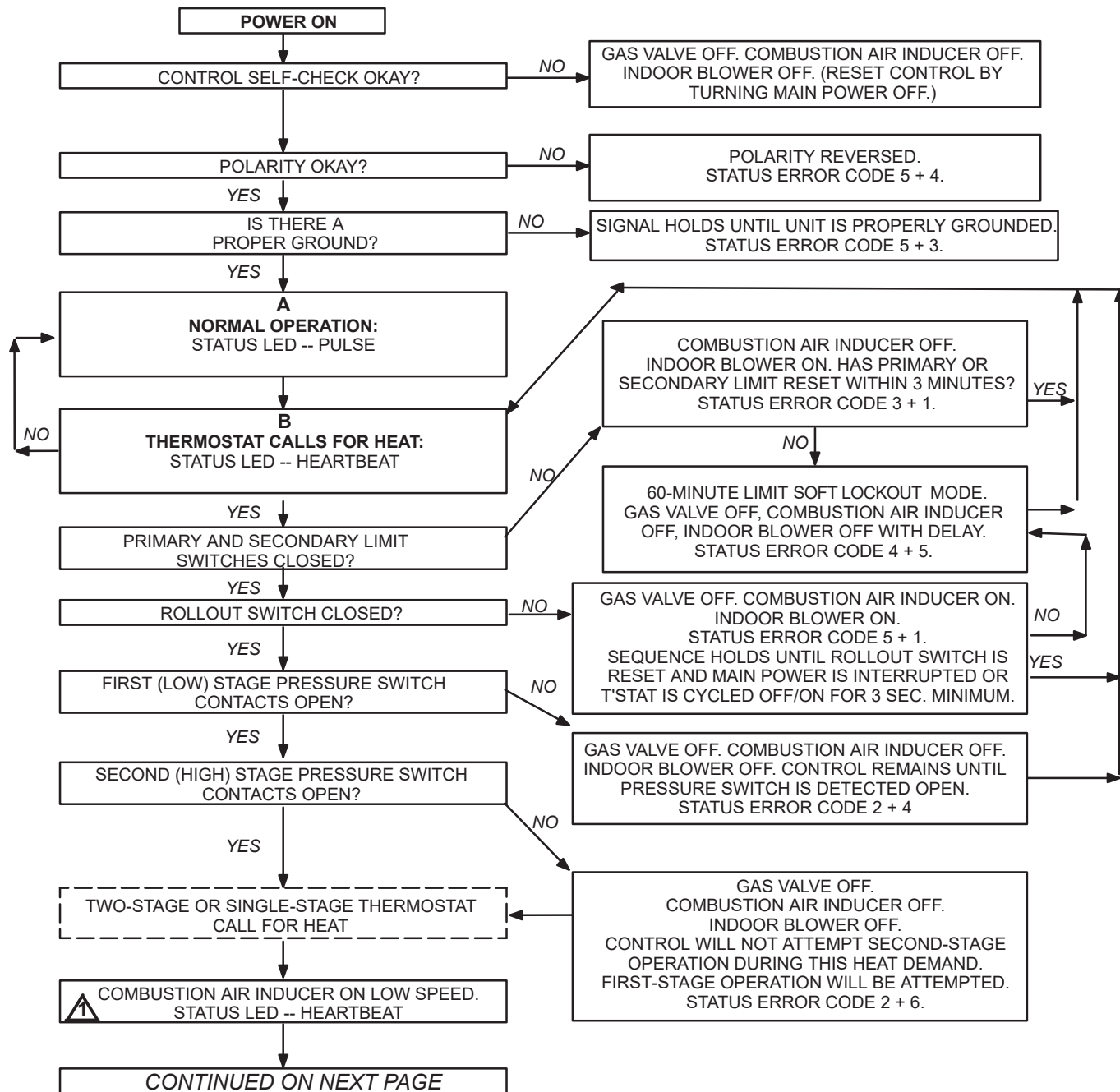
| Thermostat                                                                                                                                                     | DIP Switch Settings and On-Board Links |                                                                                                                                                                                                             | Wiring Connections                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                | DIP Switch 1                           | On Board Links Must Be Cut To Select System Options                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Dual Fuel Single-Stage Heat Pump</b><br><b>Thermostat w/dual fuel capabilities</b><br><b>Capable of 2-stage gas heat control with dehumidification mode</b> | OFF                                    | <p>CUT ON-BOARD LINK W951 HEAT PUMP</p> <p>CUT ON-BOARD LINK W914 DEHUM</p>                                               | <p><b>FURNACE TERM. STRIP</b></p> <p><b>T'STAT</b></p> <p>(R) --- (R) --- (R)</p> <p>(H) --- (W2) 67M41* --- (W1)</p> <p>(W2) --- (W1)</p> <p>(O) --- (O)</p> <p>(L) --- (L)</p> <p>(Y1) --- (Y1) --- (Y)</p> <p>(Y2) --- (G)</p> <p>(G) --- (G)</p> <p>(D) --- (DS)</p> <p>(B) --- (Y2)</p> <p>(C) --- (C) --- (C)</p> <p>(T) --- (T)</p> <p>(T) --- (T)</p> <p>outdoor sensor</p>           |
| <b>Dual Fuel Two-Stage Heat Pump</b><br><b>Thermostat w/dual fuel capabilities</b><br><b>Capable of 2-stage gas heat control with dehumidification mode</b>    | OFF                                    | <p>CUT ON-BOARD LINK W915 2 STAGE COMPR</p> <p>CUT ON-BOARD LINK W951 HEAT PUMP</p> <p>CUT ON-BOARD LINK W914 DEHUM</p>  | <p><b>FURNACE TERM. STRIP</b></p> <p><b>T'STAT</b></p> <p>(R) --- (R) --- (R)</p> <p>(H) --- (W2) 67M41* --- (W1)</p> <p>(W2) --- (W1)</p> <p>(O) --- (O)</p> <p>(L) --- (L)</p> <p>(Y1) --- (Y1) --- (Y1)</p> <p>(Y2) --- (G)</p> <p>(G) --- (G)</p> <p>(D) --- (DS)</p> <p>(B) --- (Y2) out blue</p> <p>(C) --- (C) --- (C)</p> <p>(T) --- (T)</p> <p>(T) --- (T)</p> <p>outdoor sensor</p> |

NOTE - Do NOT make a wire connection between the room thermostat L terminal and the L terminal of the integrated control.

**Table 16. Field Wiring for Non-Communicating Thermostat Applications**

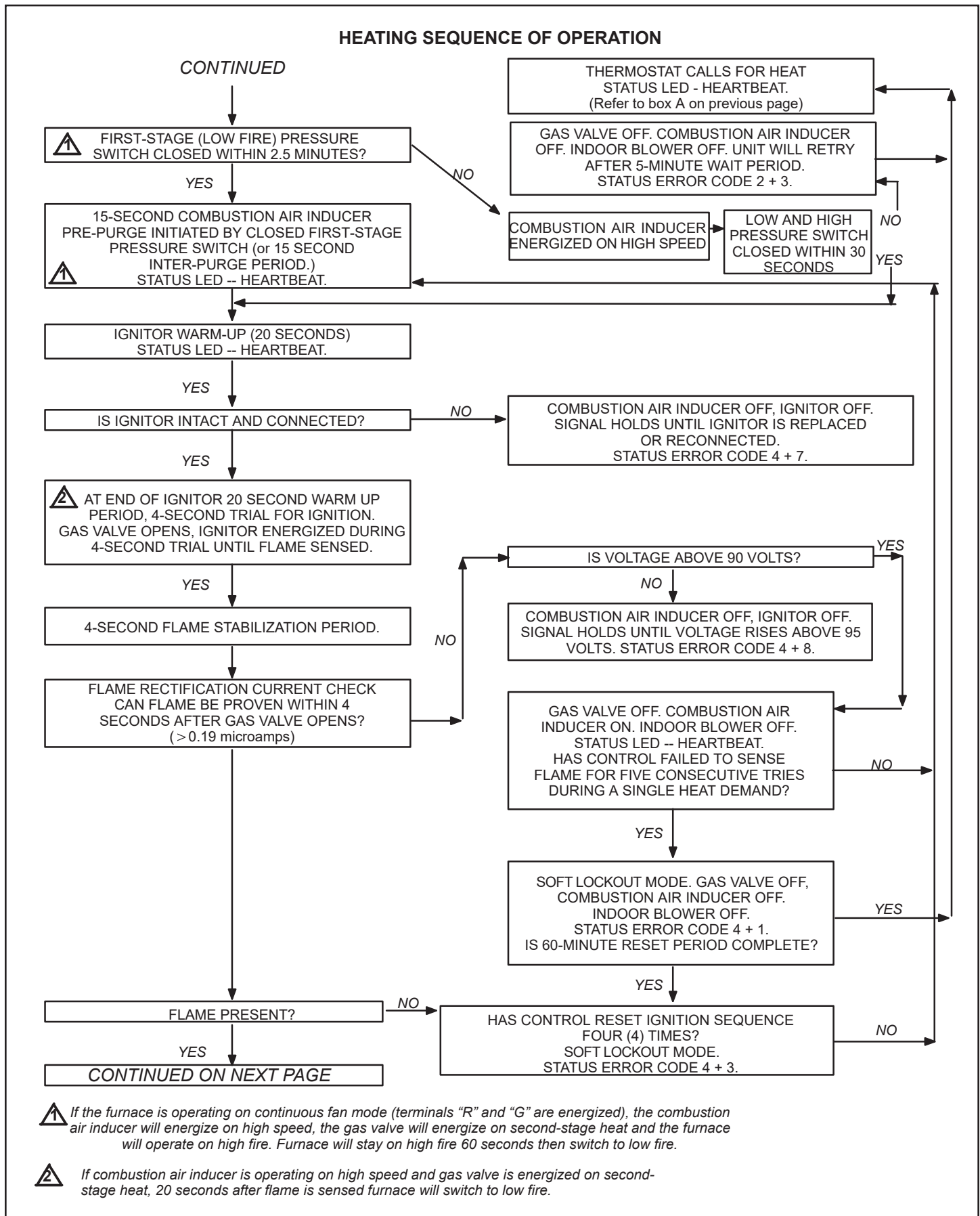
## Troubleshooting: Heating Sequence of Operation

### HEATING SEQUENCE OF OPERATION NORMAL AND ABNORMAL HEATING MODE



**1** If the furnace is operating on continuous fan mode (terminals "R" and "G" are energized), the combustion air inducer will energize on high speed, the gas valve will energize on second-stage heat and the furnace will operate on high fire. Furnace will stay on high fire 60 seconds then switch to low fire.

## Troubleshooting: Heating Sequence of Operation (Continued)

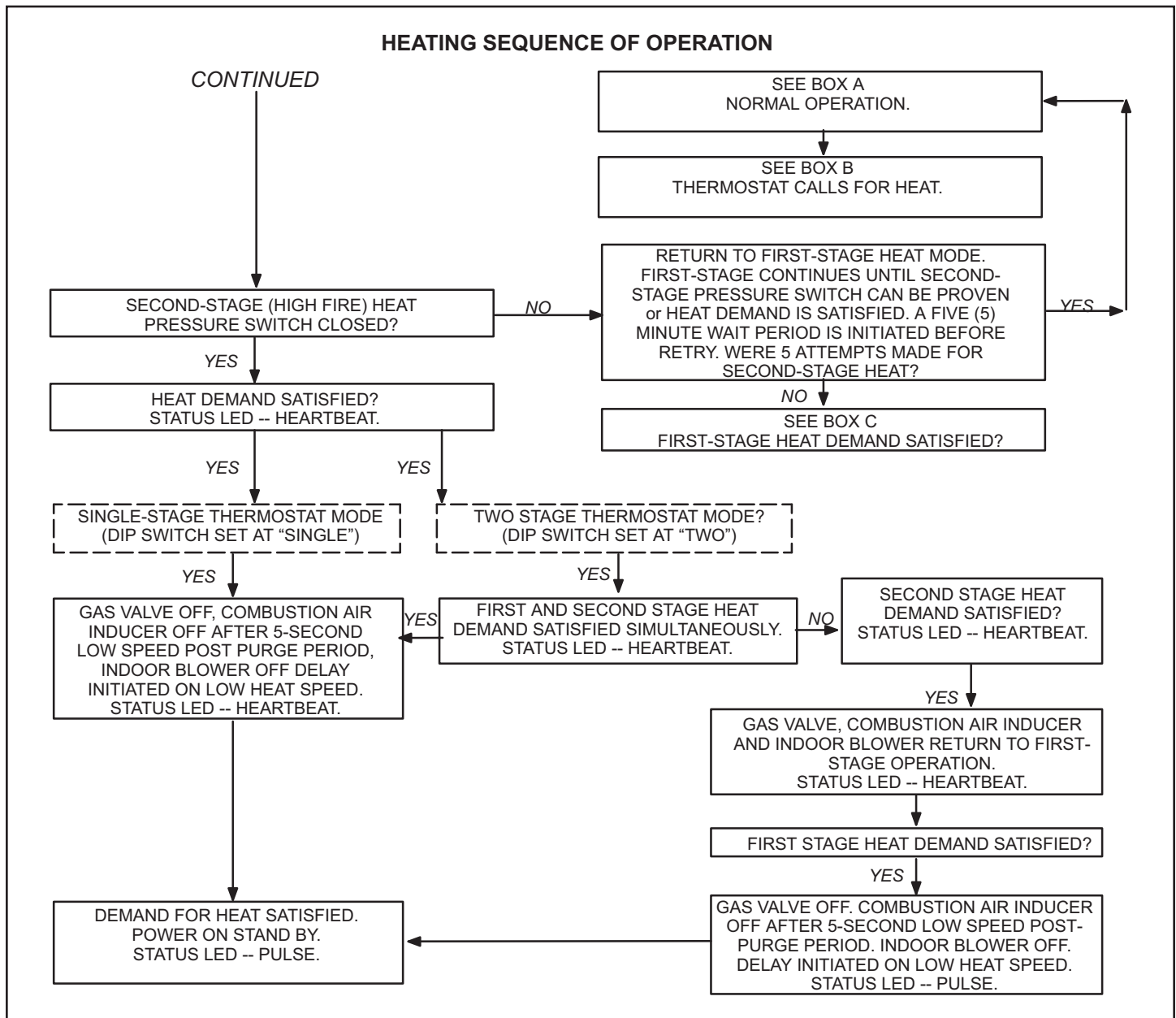


### HEATING SEQUENCE OF OPERATION

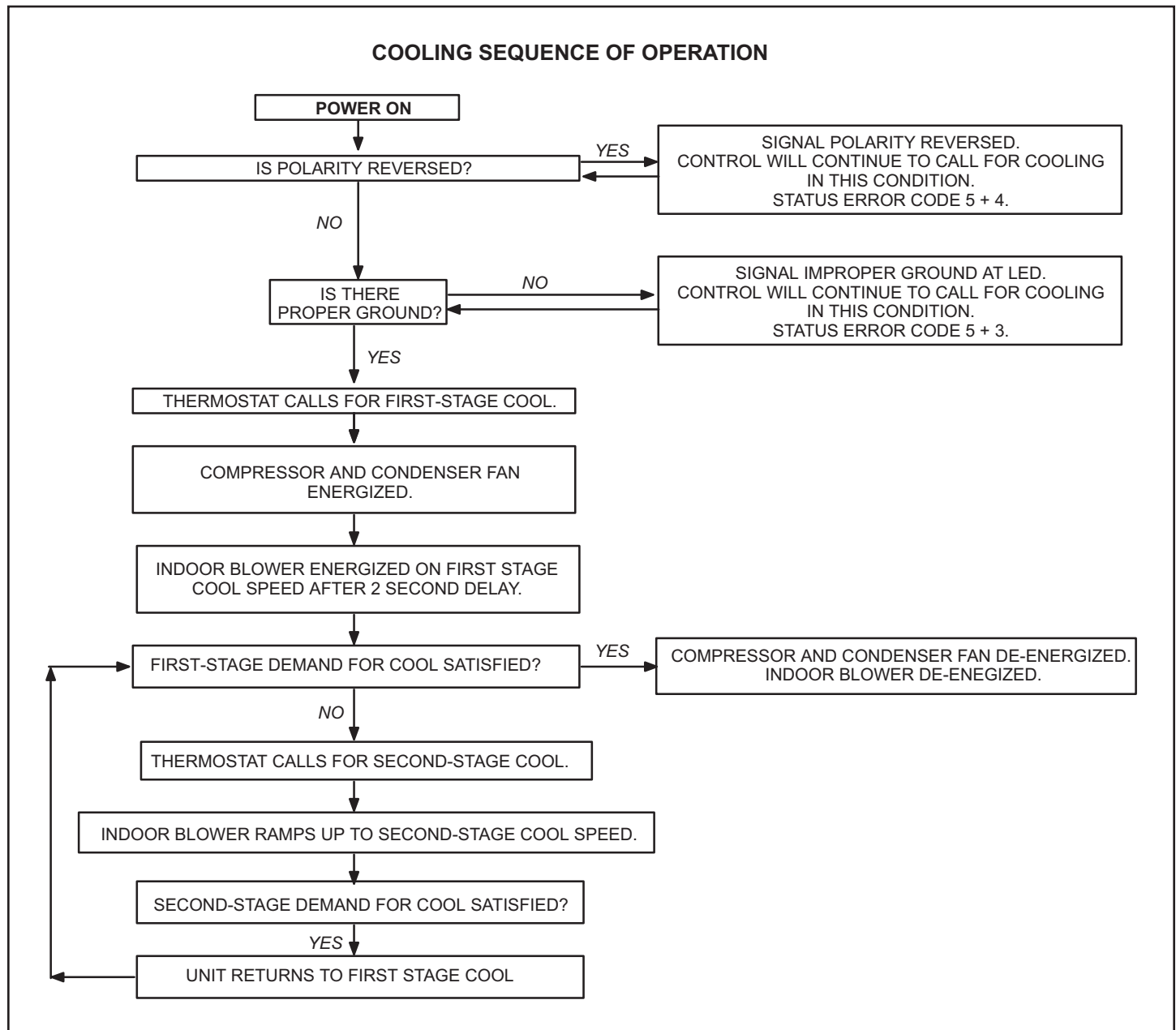
*CONTINUED*

```
graph TD
    Start([CONTINUED]) --> FlameSignal[FLAME SIGNAL ABOVE  
( > 1.40 microamps )]
    FlameSignal -- NO --> LowFlame[LOW FLAME SIGNAL  
( Does not affect control operation )  
STATUS ERROR CODE 1 + 2.]
    FlameSignal -- YES --> Mode[DIP SWITCH SET AT "ON"]
    Mode --> SingleStage[SINGLE-STAGE THERMOSTAT MODE]
    Mode --> TwoStage[TWO STAGE THERMOSTAT MODE  
( DIP SWITCH SET AT "OFF" )]
    
    SingleStage --> SecondStageRec[START SECOND-STAGE RECOGNITION  
ON DELAY ( 10 OR 15 MINUTES ).  
STATUS LED -- HEARTBEAT]
    TwoStage --> BlowerDelay[45-SECOND INDOOR BLOWER ON DELAY BEGINS.  
STATUS LED -- HEARTBEAT.]
    
    SecondStageRec --> RolloutSwitches[ROLLOUT SWITCHES CLOSED?]
    BlowerDelay --> LimitSwitches[PRIMARY & SECONDARY LIMIT SWITCHES  
CLOSED?]
    
    RolloutSwitches -- YES --> FirstStagePressure[FIRST-STAGE ( LOW FIRE )  
PRESSURE SWITCH CLOSED?]
    RolloutSwitches -- NO --> GasValveOff1[GAS VALVE OFF. COMBUSTION AIR INDUCER ON.  
INDOOR BLOWER ON.  
STATUS ERROR CODE 5 + 1. SEQUENCE HOLDS  
UNTIL ROLLOUT SWITCH IS RESET AND MAIN  
POWER IS INTERRUPTED OR THERMOSTAT  
IS CYCLED OFF/ON FOR 3 SECOND MINIMUM.]
    FirstStagePressure -- YES --> FirstStageSatisfied[FIRST-STAGE HEAT DEMAND SATISFIED?]
    FirstStagePressure -- NO --> GasValveOff1
    
    LimitSwitches -- YES --> GasValveOff2[GAS VALVE OFF, COMBUSTION AIR INDUCER OFF,  
INDOOR BLOWER ON.  
STATUS ERROR CODE 3 + 1.]
    LimitSwitches -- NO --> LimitSwitch3Min[HAS PRIMARY OR SECONDARY LIMIT  
SWITCH CLOSED WITHIN 3 MINUTES?  
( Indoor blower on low speed during 3-minute period )]
    
    FirstStageSatisfied --> GasValveOff3[GAS VALVE OFF, COMBUSTION AIR INDUCER  
OFF FOLLOWING POST PURGE.  
INDOOR BLOWER OFF WITH DELAY  
STATUS LED -- PULSE]
    GasValveOff3 --> SecondStageDemand[SECOND-STAGE HEAT DEMAND.  
SECOND-STAGE HEAT DEMAND REQUIRED?]
    
    SecondStageDemand -- YES --> SecondStagePressureSwitch[SECOND STAGE PRESSURE SWITCH CLOSED?  
ABNORMAL FLASH CODE.  
NOTE - IF SECOND-STAGE PRESSURE SWITCH  
WAS ORIGINALLY FOUND CLOSED,  
ABNORMAL CODE WILL FLASH.]
    SecondStageDemand -- NO --> SecondStageRec
    
    SecondStagePressureSwitch -- YES --> SecondStage30SecDelay[SECOND-STAGE 30-SECOND DELAY ON BEGINS.  
STATUS LED -- HEARTBEAT.]
    SecondStagePressureSwitch -- NO --> SecondStageRec
    
    SecondStage30SecDelay --> SecondStageBlowerOn[SECOND-STAGE COMBUSTION AIR INDUCER  
ON. SECOND-STAGE GAS VALVE ON. HIGH  
HEAT INDOOR BLOWER SPEED ON.  
STATUS LED -- HEARTBEAT.]
    SecondStageBlowerOn --> SecondStagePressureSwitch10Sec[SECOND-STAGE PRESSURE SWITCH CLOSED  
IN LESS THAN TEN ( 10 ) SECONDS?  
STATUS LED -- HEARTBEAT]
    
    SecondStagePressureSwitch10Sec -- YES --> ContinuesFirstStage[CONTINUED ON NEXT PAGE]
    SecondStagePressureSwitch10Sec -- NO --> SecondStageHeatDemand[SECOND STAGE HEAT DEMAND  
STATUS LED -- HEARTBEAT.]
    
    LimitSwitch3Min -- YES --> LimitSwitchSoftLockout[LIMIT SWITCH SOFT LOCKOUT MODE.  
GAS VALVE OFF, COMBUSTION AIR INDUCER OFF,  
INDOOR BLOWER OFF WITH DELAY.  
STATUS ERROR CODE 4 + 5  
IS 60-MINUTE RESET PERIOD COMPLETE?]
    LimitSwitch3Min -- NO --> GasValveOff4[GAS VALVE OFF. COMBUSTION AIR INDUCER ON.  
INDOOR BLOWER OFF AFTER DELAY.  
STATUS ERROR CODE 2 + 3. CONTROL RESTARTS  
IGNITION SEQUENCE IF PRESSURE SWITCH  
CLOSES WITHIN 2-1/2 MINUTES.]
    
    LimitSwitchSoftLockout -- YES --> ContinuesFirstStage
    LimitSwitchSoftLockout -- NO --> GasValveOff4
    
    GasValveOff4 --> SecondStagePressureSwitch2Min[SECOND-STAGE PRESSURE SWITCH CLOSED  
AT BEGINNING OF HEAT DEMAND?  
STATUS ERROR CODE 2 + 6.]
    SecondStagePressureSwitch2Min -- YES --> SecondStageHeatDemand
    SecondStagePressureSwitch2Min -- NO --> ReturnsFirstStage[RETURNS TO FIRST-STAGE HEAT MODE WHICH  
CONTINUES UNTIL SECOND-STAGE PRESSURE  
SWITCH CAN BE PROVEN or HEAT DEMAND IS  
SATISFIED. FIVE ( 5 ) MINUTE WAIT PERIOD  
INITIATED BEFORE RETRY. WERE 5 ATTEMPTS  
MADE FOR SECOND-STAGE HEAT?]
    
    ReturnsFirstStage -- YES --> ContinuesFirstStage
    ReturnsFirstStage -- NO --> SecondStageHeatDemand
    
    SecondStageHeatDemand --> ContinuesFirstStage
```

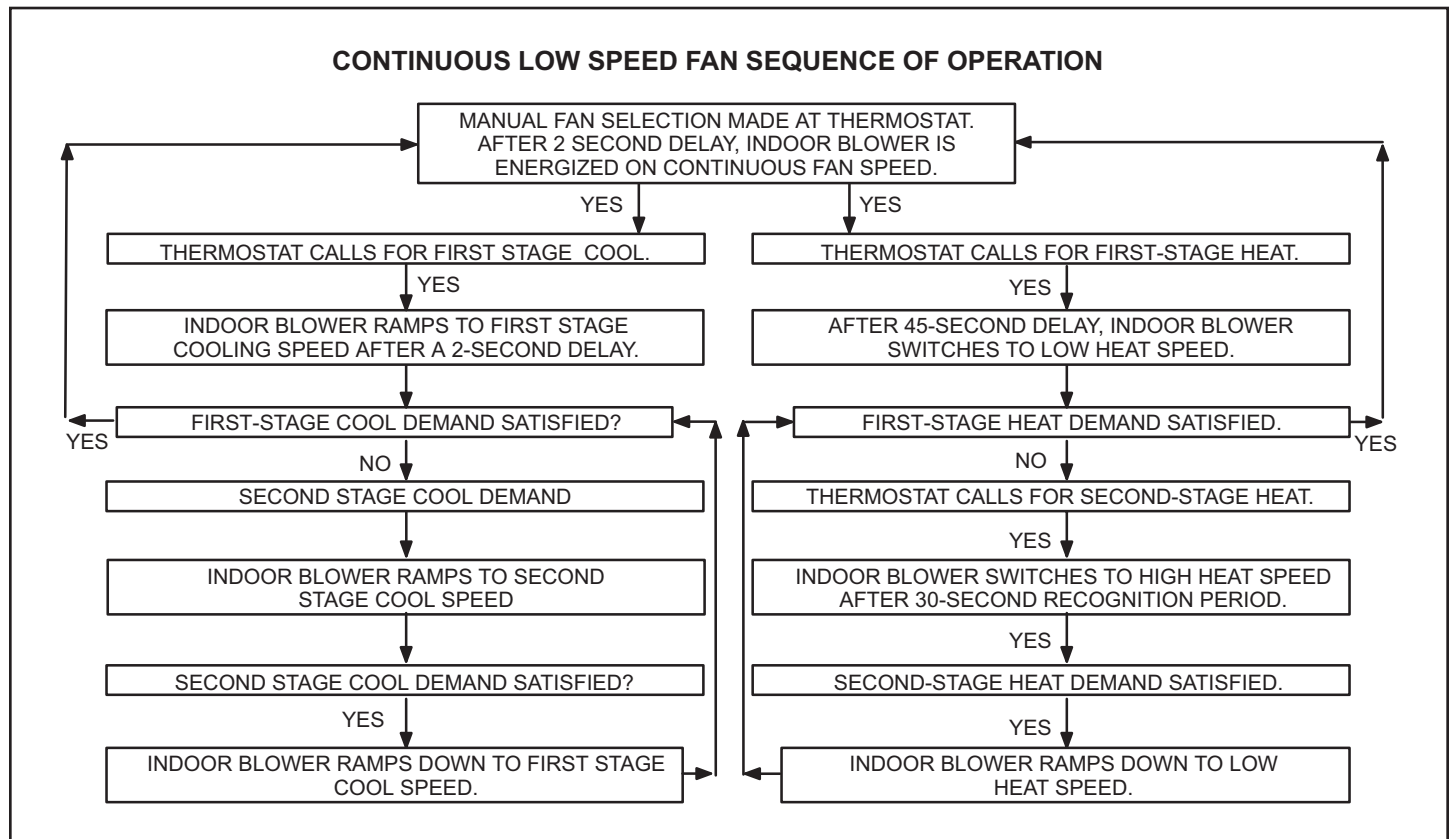
## Troubleshooting: Heating Sequence of Operation (Continued)



## Troubleshooting: Cooling Sequence of Operation



## Troubleshooting: Continuous Fan Sequence of Operation





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