HARMONY III™ zoning system (X9953)

Installation, Setup and User Guide

507936-01 6/2021
Supersedes 7/2019

Table of Contents

1. General

1.1. Shipping and Packing List

Table 1. Packing List

Quantity	Description
1	Harmony III zoning system unit
1	Discharge Air Sensor
1	Installation Instruction
1	Warranty (W-031-L2-02)

1.2. Acronyms Used

Table 2. Acronyms

Acronym	Description
AC	Air Conditioner
CFM	Cubic Feet per Minute
DAS	Discharge Air Sensor
DF	Down Flow
EDA	Enhanced Dehumidification Accessory
HZA	Humiditrol Zoning Accessory Kit
IFC	Integrated Furnace Control
PIAB	Percentage into Adjustment Band
PWM	Pulse Width Modulated
UH	Up Flow
VSM	Variable Speed Motor

1.3. Additional Parts Required

Table 3. Additional Parts

Quantity	Description
Application specific	Transformer
	Dampers
	Thermostats
	Balance Point Sensor kit (10Z23)
	Pressure switch (For Heat Pump Option): HFC-22 (27W12); HFC-410A (27W13
	Tee for vapor line High Pressure Switch (87071)
	Defrost Tempering Kit (67M41)
	Humiditrol® Enhanced Dehumidification Accessory (EDA), EDA-024B (94M41), EDA-036C (94M42), EDA-060D (94M43)
	Humiditrol® Zoning Accessory Kit (39W67) (required if Humiditrol® EDA, above, is used)

NOTE: *Due to Lennox' ongoing commitment to quality, features and options are subject to change without notice and without incurring liability. Improper installation, adjustment, alteration, service or maintenance can cause property damage or personal injury. Installation and service must be performed by a qualified installer and servicing agency.*

1.4. Introduction

IMPORTANT

Variable Speed Blower Motor (VSM) technology is required for use with Harmony III zoning system.

The Lennox Harmony III zoning system manages the distribution of conditioned air to specific areas or zones in a house or small commercial building by directing heated or cooled air to occupied areas without conditioning unused areas. The system can be used in the following Lennox HVAC system applications:

Table 4. System Applications

Option	Description
1	Variable speed gas furnace used with a 2-stage air conditioner unit. *
2	Variable speed air handler unit (with or without electric heat) used with a 2-stage air conditioner unit or heat pump. *
3	Variable speed gas furnace used with a 2-stage heat pump (dual fuel).*

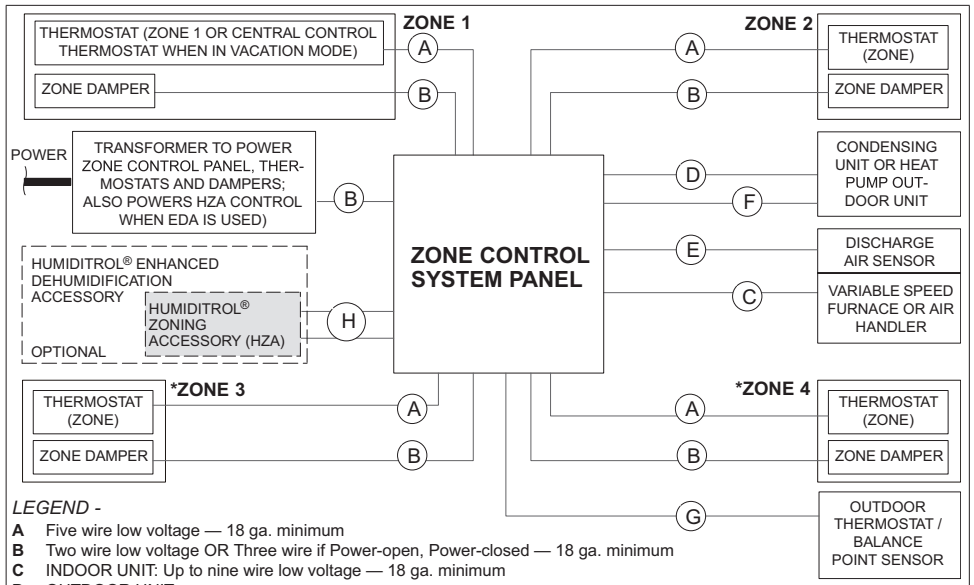
*A 1-stage air conditioner unit (heat pump) may be used under specific circumstances as listed in "Table 8. Lennox AC or Heat Pump Units" on page 7.

Variations on the options described above and included in this document are cooling-only, hot water coil and cooling system with electric heat applications. The Harmony III zoning system uses off-the-shelf, single-stage, non-heat pump, non-power-robbing electronic thermostats and motorized dampers in any of the applications to control distribution of conditioned air to different zones. This control

allows conditioning of different zones within a residence while using a single HVAC system. The zone control system operates in two modes: central control (vacation mode) or zone control. LEDs on the zone control panel indicate the current operating mode.

When the system is in the central control mode, a demand from the central control thermostat results in conditioned air being directed to all of the zones. In this mode, zone 1 thermostat is designated as the controlling thermostat; other thermostats are not used. When the system is in the zone control mode, a zone is conditioned only upon demand from that zone's thermostat. The zone control system is ideal for retrofit applications as well as new construction. The system controls the air volume, eliminating the need for bypass dampers in most applications. The homeowner controls the system using zone thermostats to make comfort settings for each zone. A programmable thermostat should be used to provide a specialized heating and cooling sequence. While the system is in the zone mode, a programmable thermostat controls the temperature for its particular zone.

1.5. Residential Zone Control System - Overview of Field Wiring



LEGEND -

A Five wire low voltage — 18 ga. minimum
B Two wire low voltage OR Three wire if Power-open, Power-closed — 18 ga. minimum
C INDOOR UNIT: Up to nine wire low voltage — 18 ga. minimum
D OUTDOOR UNIT:
- Two (3, if LSOM equipped unit) wire low voltage (single-stage condensing unit or EDA) 18 ga. minimum
- Three (4, if LSOM equipped unit) wire low voltage (two-stage condensing unit) 18 ga. minimum
- Up to seven wire low voltage (single-stage heat pump outdoor unit) 18 ga. minimum
- Up to eight wire low voltage (two-stage heat pump outdoor unit) 18 ga. minimum

E Two wire low voltage (discharge air sensor) 18 ga. minimum
F Two wire low voltage (pressure switch, heat pump only) — 18 ga. minimum
G Two wire — 18 ga. minimum
H Refer to the Humiditrol® Zoning Accessory (HZA) for wiring requirements.

**NOTE - Zone 3 and zone 4 not available with single-stage outdoor unit.*

Figure 1. Field Wiring

1.6. System Components

The Harmony III zoning system consists of the following (required):

- Harmony III zoning system zone control panel (included)
- Discharge Air sensor (included)
- Thermostats (one for each zone; ordered separately)
- 24VAC Power Transformer(s) (ordered separately)
- Dampers (ordered separately)
- Pressure Switch and Tee with Schrader valve (for Heat Pump systems; ordered separately)
- Balance Point Sensor (Optional for Dual Fuel systems)
- Defrost Tempering Kit (Optional for Dual Fuel systems)
- Remote Vacation Switch (optional; ordered separately)

1.6.1. Zone Control System

The Harmony III zoning system monitors electrical signals and directs control signals between thermostats, dampers, and HVAC equipment.

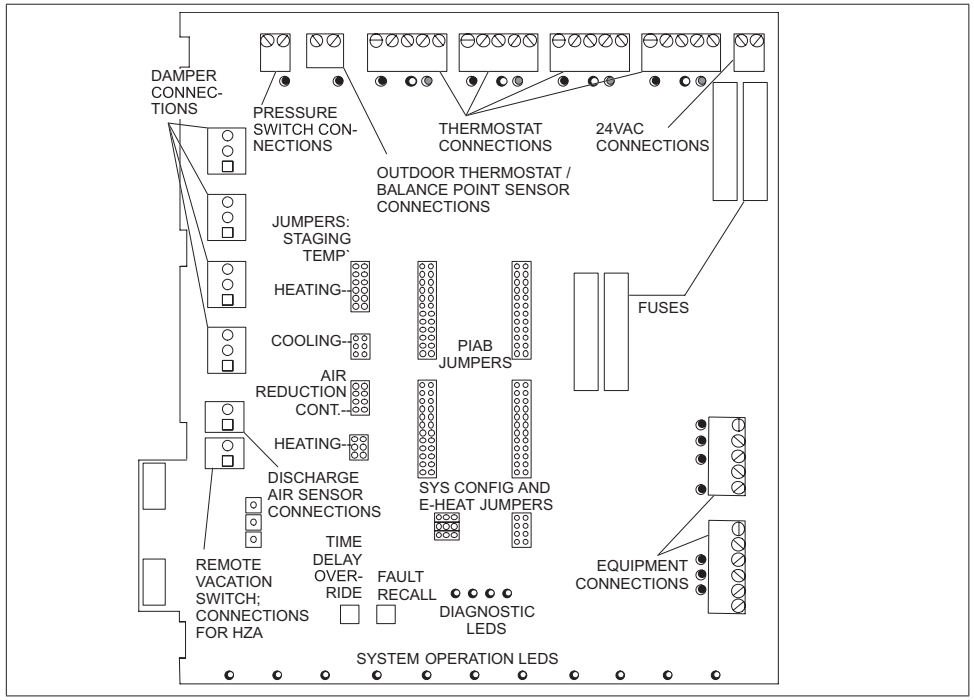


Figure 2. Harmony III Zoning System Zone Control Panel

1.6.2. Discharge Air Sensor (DAS)

A discharge air temperature sensor (19V99) monitors the supply air. This electronic sensor's probe is inserted into the discharge air plenum to gather air temperature data for the zone control panel. "Figure 4. Discharge Air Sensor Installation" on page 8 for location of the sensor.

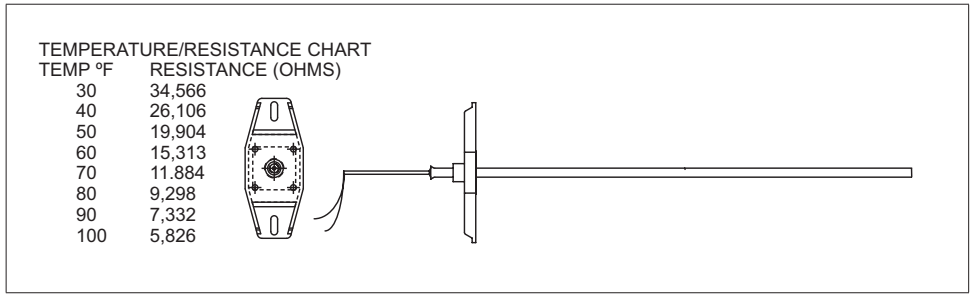


Figure 3. Discharge Air Sensor

1.6.3. Thermostats

IMPORTANT

Use only Electronic thermostats. Mechanical or electro-mechanical thermostats will not work with the Harmony III zoning system.

For all zones, use thermostats that are of this type:

- Electronic thermostat
- Single-stage
- Non-heat pump
- Non-power robbing
- Auto-changeover or non auto-changeover
- Lennox recommends that zone 1 thermostat (central [vacation] mode controller) be programmable.
- Each thermostat must have a deadband between HEAT and COOL.

Recommended thermostats include:

- **ComfortSense® 5500** (13H13) 7-Day Programmable Touch Screen Thermostat - 1 heat / 1 cool
- **ComfortSense® 7500** (13H14) 7-Day Programmable Touch Screen Thermostat - 4 Heat / 2 Cool (configured for non-heat pump operation). When using this thermostat, only Precision Mode dehumidification can be used wherein 2°F of over-cooling is allowed. Also, it cannot reduce the blower speed because the zone control DS signal controls the blower. Thermostat **D** terminal is not used.
- **iComfort M30 (15Z69**) 4 Heat / 2 Cool, Universal Multi-Stage Touch Screen Thermostat.

1.6.4. Transformers

The dampers, zone control panel, zone thermostats and Humiditrol® Zoning Accessory (if EDA is used) are powered by a single, field-provided 24VAC transformer. Together, the zone control panel and thermostats require 10VA; dampers require 10VA each. The transformer must have an adequate VA rating to serve all components as described in the following table.

IMPORTANT

Up to 5 dampers per zone may be connected in parallel to the zone control panel —not to exceed a total of six dampers for entire system.

Also, if more than 6 dampers are used, another transformer and isolation relay will be necessary.

Table 5. 24VAC Transformer Selection Chart

Catalog Number	Size	Description	VA LOAD = Panel Plus
10P17	40VA	120/208/240VAC, 24VAC	3 dampers
10P87	50VA	120/208/240VAC, 24VAC	4 dampers
12P61	75VA	120/208/240VAC, 24VAC	6 dampers
83P74	_	Electrical Box (4-in. Square)	

1.6.5. Dampers

Motorized 24VAC powered closed/spring return open dampers are standard for the Harmony III zoning system. However, "power-open/spring-close" and "power-open/power-close" dampers can be accommodated

1.6.6. Remote Vacation Switch

The Harmony III zoning system control panel includes connections for an optional remote vacation switch (see "Figure 2. Harmony III Zoning System Zone Control Panel" on page 5). The same connections are also used for connecting an optional Humiditrol® Zoning Accessory controller (see Humiditrol® Zoning Accessory Installation Instructions for details).

NOTE: *If a remote vacation switch is connected for routing to a convenient location for end user operation, be sure the switch (field-provided) is properly labeled and instructions provided for proper operation.*

IMPORTANT

Do not locate the remote vacation switch next to other house switches! The recommend location is next to Zone 1 thermostat.

1.7. Installation Planning and Selecting Heating and Cooling Equipment

⚠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) or a service agency.

1.7.1. Installation Considerations

The total HVAC system must be properly sized to provide the best comfort. Also, for best performance, zones should be similar in size so that each zone would require about the same CFM. Each zone's ducting lengths should be similar in length whenever possible. Always attempt to keep CFM requirements per zone within 25% of the average CFM as referenced in the following table.

If a "small" zone cannot be avoided, give consideration to increasing the CFM of the small zone and linking a damper in a nearby zone that will open along with the small zone's damper(s). The procedure for zone linking is described in "1.9.6. Zone Linking" on page 8.

Table 6. Adjusting for Average CFM Example

Required CFM				CFM Adjusted to within Average			
Zone	CFM	Avg	%CFM	Adj	Avg	%CFM	
1	500	713	0.70	600	738	0.81	Damper linked with Zone 2
2	825		1.16	825		1.12	
3	775		1.09	775		1.05	
4	750		1.05	750		1.02	

1.7.2. Variable Speed Blower Motor (VSM)

Indoor units with variable speed "blower" motors (VSM) are required to allow the zone control system to distribute adequate air to each zone. Use only units recommended in the following 3 options referenced in "1.7.3. Selecting/Installing Indoor and Outdoor Units" as only those will work with the Harmony III zoning system; other types of units will not allow the Harmony III zoning system to proportion the amount of air going to each zone.

1.7.3. Selecting/Installing Indoor and Outdoor Units

Outdoor units may be single or two-stage; use the following table to determine which to use, based on the number of zones being implemented, and whether the air conditioned zones are of equal or unequal size.

Table 7. Indoor / Outdoor Options

Options	Indoor Unit	Outdoor Unit
1	Any Lennox Gas Furnace with VSM only.	Lennox Air Conditioner unit as described in "Table 8. Lennox AC or Heat Pump Units".
2	Lennox Air Handler Unit with VSM only.	Lennox Heat Pump unit as described in "Table 8. Lennox AC or Heat Pump Units".
3	Any Lennox Gas Furnace with VSM only.	Lennox Heat Pump unit as described in "Table 8. Lennox AC or Heat Pump Units".

NOTE: *Limited variations to AC units described herein are detailed. Go to "4.1. Variations on Common AC Unit Applications" on page 39 for further details.*

Table 8. Lennox AC or Heat Pump Units

Number of Zones	Comparative Zone Sizes	Lennox AC or Heat Pump Unit
2	Equal	Single or Two-stage and VSM units
2	*Unequal	Two-stage only and VSM units
3 or 4	Equal or Unequal	Two-stage only and VSM units

*Equal zones would have very similar total ducting lengths with CFM requirements within 10% of average CFM per zone. Unequal would have less similar ducting length and greater variances from average CFM (see "Table 6. Adjusting for Average CFM Example" on page 7 example).

1.8. Optional Dehumidification Accessories

The Harmony III zoning system may be used in conjunction with a Humiditrol® Enhanced Dehumidification Accessory (EDA) and which also requires a Humiditrol® Zoning Accessory (39W67). This document reflects the control which is outfitted for connection to, and control of, the EDA in a zone control system using the HZA. See Humiditrol® Zoning Accessory Installation Instructions for more information.

1.9. Installing Zone Control Components

1.9.1. Discharge Air Sensor (DAS)

⚠CAUTION

This device is manufactured using unpainted and pre-painted metal. Sharp sheet metal edges can cause injury. When installing the device, avoid accidental contact with sharp edges.

Install the discharge air sensor in the discharge plenum downstream from the cooling coil. Be sure that the discharge air will pass over the sensor before the air is distributed into the duct system. Typical up-flow sensor applications are shown in figure 4; the sensor dimensions shown (distance from heat strips, coil, and position in plenum) also apply to other applications.

1. When possible, position the sensor some distance away from the coil rather than in the immediate coil area. The discharge air sensor should be located at least 10 inches above the coil if possible.
2. Fasten the sensor bracket to the plenum with two self-tapping sheet metal screws.
3. Connect wires to DAS on zone control panel. Not on the air handler control or IFC (see “Figure 20. Option 2 - Typical Lennox Heat Pump and Lennox Variable-Speed Air Handler (Troubleshooting)” on page 20).
4. Be sure that the tip of the sensor is located approximately 10 inches from the indoor coil in the discharge plenum, and half the depth of the plenum, and center over the discharge airflow, side-to-side.

IMPORTANT

For the DAS, transversing the supply duct for the best location is recommended. Optimal location is critical to the proper operation of the zoning system

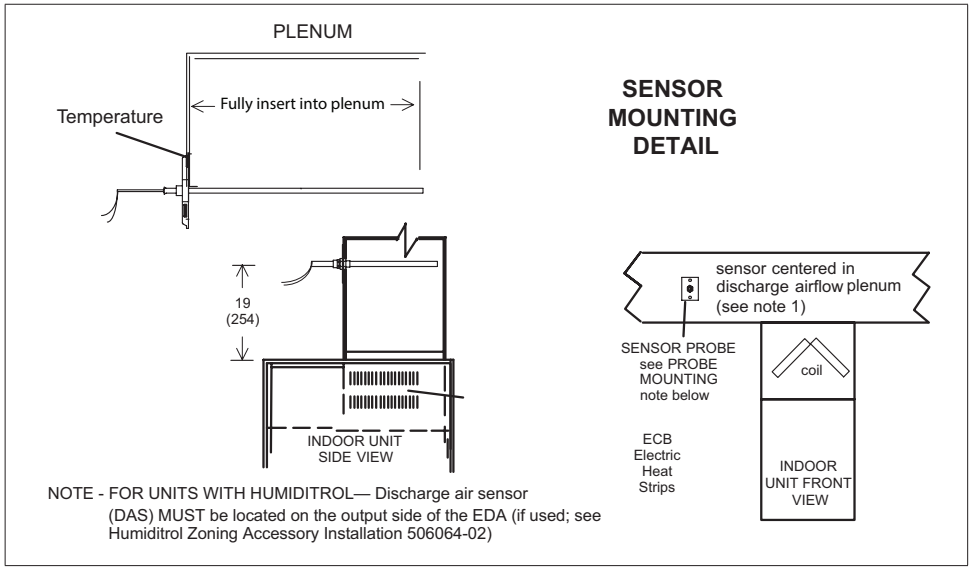


Figure 4. Discharge Air Sensor Installation

1.9.2. Zone Control Panel

IMPORTANT

The electrical power source for the zone control system, i.e. the transformer primary, and furnace or air handler unit must be the same source. In addition, the zone control system power-up must occur at the same time or before the furnace or air handler unit is powered up.

Select an installation site for the Harmony III zoning system control considering the following location parameters:

- Is conveniently accessible and centrally located to facilitate wiring from thermostats, dampers, pressure switch (if used), and HVAC equipment.
- Is in a non-condensing area (such as a closet).
- Is NOT in a laundry room (nor other room in the house where the humidity would typically be much higher than the rest of the house).
- Is NOT in any part of the building where the temperature may exceed 150°F.

1.9.3. Thermostats

Identify the best location for a thermostat in each zone. If two or more rooms are within a single zone, place the thermostat in a location that is central to all rooms. For example, if a zone contains two bedrooms, try to place the thermostat in a hallway near both bedrooms.

Do not install thermostats in drafty areas, behind doors, in corners, near radiant heat sources (appliances), near sunny windows, near concealed pipes and chimneys, nor in unconditioned spaces such as closets or exterior walls.

1.9.4. Transformer

Obtain an appropriately-rated transformer (see “Table 5. 24VAC Transformer Selection Chart” on page 6). Install the transformer in either the indoor unit or in an electrical junction box near the zone control panel.

NOTE: *Two transformer systems need to be in phase with each other.*

1.9.5. Dampers

NOTE: *The power source for the transformer must be the same power source as the indoor unit’s transformer.*

Motorized dampers in the supply duct system regulate air to the zones. Some applications will be unique and require more than one damper per zone. If additional dampers are required, refer to the wiring diagram in “1.12. Component Specific Wiring” on page 14. Also, if more than six dampers are used, another transformer and isolation relay will be necessary.

For more effective zone isolation, the return duct system may also be dampered by zone. Dampers for each zone must be wired in parallel. Install dampers in the desired locations; then run thermostat wire from the damper to the zone control panel and damper relays as needed.

1.9.6. Zone Linking

Zone link a small zone to a large zone by wiring dampers in a manner similar to figure 4. Effectively, this distributes some of the small zone’s air to another zone to reduce the chance of overheating or overcooling the smaller zone. Refer to “Table 8. Lennox AC or Heat Pump Units” on page 7 which shows an example of an unequal zone and how to adjust to bring it within 25% of the average CFM. Figure

4 shows how the dampers may be linked to distribute some of the air from a small zone into another zone.

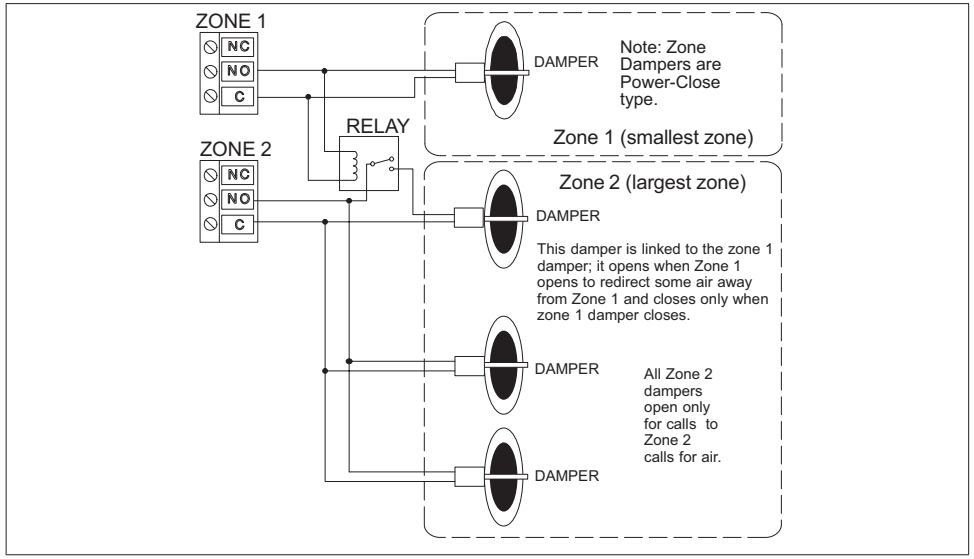


Figure 5. Zone Linking

Table 9. Zone Demands to Small and Large Zones

Zone Dampers	Zone with Demand			
	None	Small	Sm.& Lg.	Large
Small Zone	Closed (24V)	Open (0V)	Open (0V)	Closed (24V)
Large Zone	Closed (24V)	Open (0V)	Open (0V)	Open (0V)
	Closed (24V)	Closed (24V)	Open (0V)	Open (0V)
	Closed (24V)	Closed (24V)	Open (0V)	Open (0V)
NOTE: *Zone Dampers are Power-Close type.*				

1.10. Zone Control Panel Jumpers

1.10.1. Setup for Controlling Equipment Staging and Volume of Air to Zones

This section provides information for installing jumpers on the zone control panel jumper banks (see “Figure 6. Zone Control Panel Jumper Banks”). These jumpers define how the zone control system functions to control equipment staging and to deliver the proper amount of CFM to the zones.

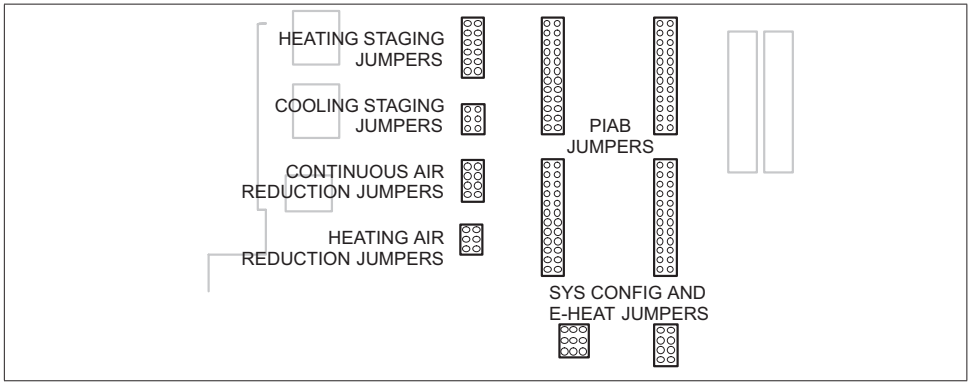


Figure 6. Zone Control Panel Jumper Banks

⚠CAUTION

Static electrical discharge will damage electronics.

Discharge static electricity before touching the zone control panel. Touch a grounded metal object before touching the circuit board.

1.10.2. PIAB Jumpers Affect Blower Operation

A variable-speed motor will operate at its minimum speed or at any increment faster up to its maximum speed. The Percentage Into Adjustment Band (PIAB) jumpers control the speed variance of the motor. When the zone control’s PIAB jumpers are set to 0%, the blower operates at the minimum air volume produced by the air handler and when set to 100%, the blower operates at maximum air volume produced by the air handler (see your air handler installation instructions for specific CFMs).

For example: if an air handler has a minimum air volume of 800 CFM, and a maximum of 1500 CFM, and the jumper is set to **0%**, the air delivered to the zone will be 800 CFM. Similarly, if the jumper is set to **100%**, the air delivered to the zone is 1500 CFM. By placing a jumper in the **50%** position, you will direct airflow midway between the blower's minimum and maximum CFM capacities.

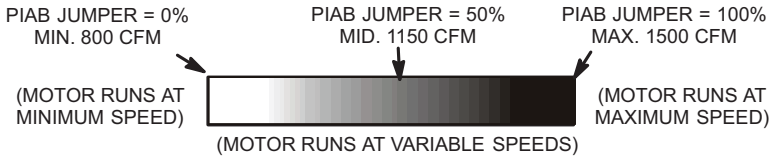


Figure 7. VSM Adjustment Band Example

By installing jumpers at different % on each PIAB bank, you can direct different amounts of air volume to each zone. You must jumper a % on zone 1 and at least one other zone, and you must jumper OFF on unused zones as shown in the following figure.

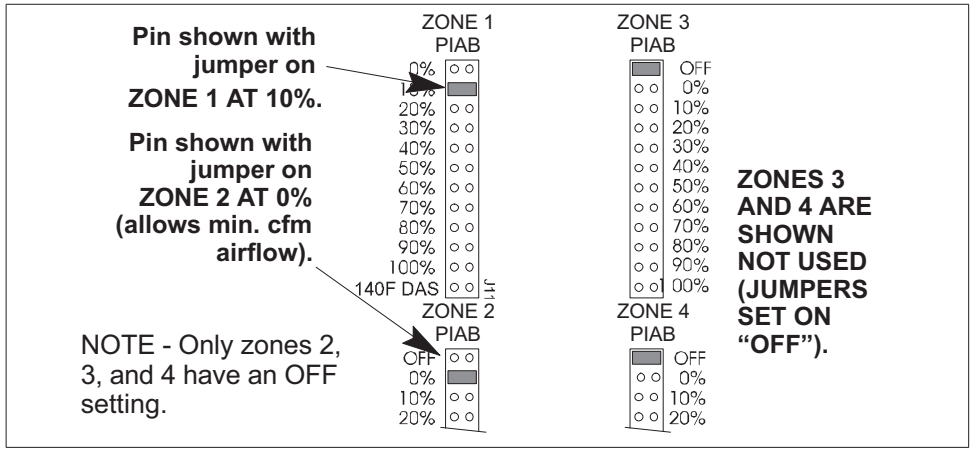


Figure 8. PIAB Jumper Settings (Typical)

NOTE: *The blower speed may be affected by the reduction jumpers, if installed. See "1.10.6. Continuous Air Reduction Jumpers" on page 11 for more details.*

1.10.3. Upgrading from Harmony II zoning system?

NOTE: *If replacing a Harmony II zoning system, use conversion values in "Table 10. Air Jumper Positions Conversion Chart" to maintain equivalent air settings when setting up the Harmony III zoning system.*

Table 10. Air Jumper Positions Conversion Chart

Model	Equivalent Positions (%)							
Harmony II zoning system	25	35	45	55	65	75	85	95
Harmony III zoning system	0	10	30	40	50	70	80	90

1.10.4. Zone 1 PIAB Jumpers – 140ºF DAS

Zone 1 PIAB terminal strip has an additional jumper setting (labeled 140F DAS) that may be used for added operational flexibility (see "Figure 9. 140ºF DAS Jumper"). When the supplied jumper is in place across both pins, the discharge air sensor (DAS) upper limit will be 140°F instead of 160°F (default) to provide added operational flexibility.

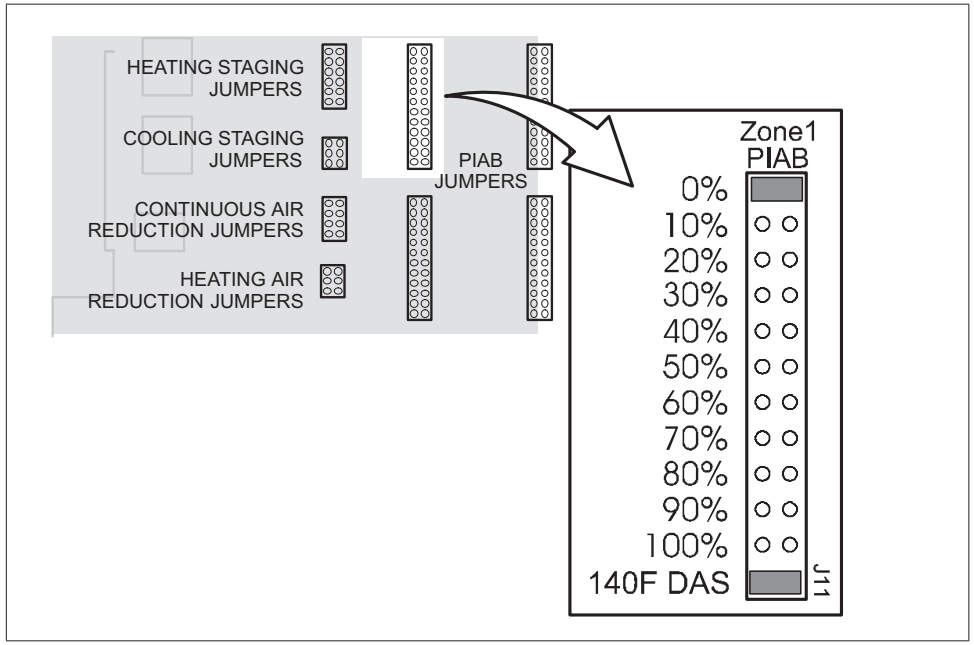


Figure 9. 140°F DAS Jumper

NOTE: *If the heating staging jumper is set to either 120 or 130 and the 140F DAS jumper is in place, the furnace will stage up at 115ºF and down to 130ºF (see "1.10.8.1. Heating Staging Temperature Jumper" on page 11) for further details.*

1.10.5. Determining PIAB Jumper Settings

NOTE: *Use "6.3.2. PIAB Calculation Worksheet" on page 65 (also see example below) to help calculate the zone control system PIAB settings.*

1. From a cooling load analysis, determine what CFM is required for each zone. Also, from the air handler, determine its minimum and maximum CFM ratings.
2. Using the PIAB formula, found in Table 5 and reflected in the worksheet below, calculate the Percent Into Adjustment Band (PIAB) using the values from step 1 for each zone. "Determine PIAB Jumper Settings" on page 11 also gives example CFM values to illustrates how to determine the correct jumper for the PIAB for Zone 1 using those values.
3. Set the air selection jumper for the zone using the percent air determined in step 2. If the percent air falls between available jumper settings, select the nearest unit of ten.
4. For each zone, repeat steps 1 through 3.

NOTE: *See "1.10.4. Zone 1 PIAB Jumpers – 140ºF DAS" or information on 140F DAS (discharge air sensor) jumper used on Zone 1 PIAB.*

PIAB = [(Required CFM - Minimum CFM) / (Maximum CFM - Minimum CFM)] * 100

Sample CFM ➧ Required Minimum Maximum Minimum

Sample PIAB = ([___920____ - ___450___] / [__2000___ - ___450___]) x 100

= =

Sample PIAB = ([_____470_____] / [_____1550_____]) x 100

=

Sample PIAB = [_____0.303_____] x 100 = _____30_____%

Figure 10. PIAB Calculation Example

example CFM values

Required CFM				CFM	
Zone 1	Zone 2	Zone 3	Zone 4	Min.	Max.
1020	1500	720	OFF	720	2200*

*High cool jumper setting

PIAB formula

$$\frac{\text{(Req'd CFM – min. CFM)}}{\text{(Max. CFM – min. CFM)}} \times 100$$

Using example values above, find PIAB for Zone 1:

PIAB ..... (1020 - 720) = 300 ..... =.20

..... (2220 - 720) =1500

PIAB Jumper setting % .20 x 100 ..... 20%

Figure 11. Determine PIAB Jumper Settings

1.10.6. Continuous Air Reduction Jumpers

During continuous fan mode without either a heating or cooling demand, the blower runs at the total percentage of the CFM jumper settings of the zones calling for continuous fan (not to exceed 100% of blower capacity). A continuous air reduction jumper allows the blower speed to be reduced by a percentage during continuous fan mode.

The selections are 75%, 50%, 25% and 0%. At the factory, the jumper is set on 0%. Set the jumper to the position equal to the amount of continuous air reduction desired.

NOTE: *If the calculations using a reduction percentage indicated a resulting CFM lower than the blower's minimum CFM rating, the blower will deliver its minimum CFM*

1.10.7. Heating Air Reduction Jumpers

NOTE: *For heat pump applications, ALWAYS set the jumper on 0%. High head pressures may result if air is reduced during heating mode.*

NOTE: *For use in warm-climate areas where units have high cooling capacity with low heat capacity, ALWAYS set the jumper on 0%.*

The heating air reduction jumper enables the blower speed, during heating only, to run at a reduced rate compared to the cooling blower speed.

The selections are 40%, 20% and 0%. Jumpers are set to 0% from the factory. Set the jumper to the position equal to the amount of heating air reduction desired.

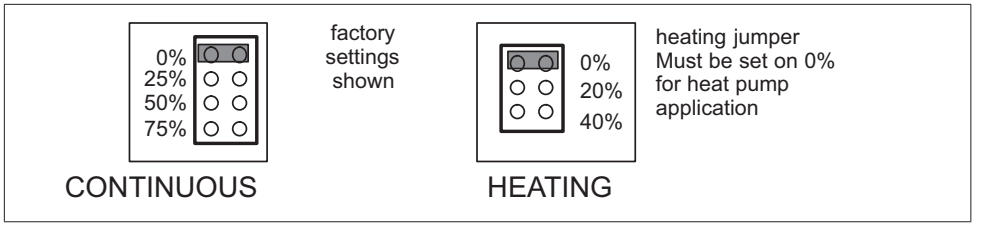


Figure 12. Heating Air Reduction Jumpers

1.10.8. Heat/Cool Staging

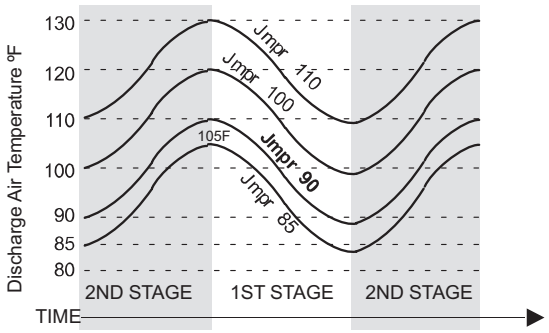
Heating/Cooling staging jumpers prevent any rapid staging of the equipment. This section shows the recommended settings for heating/cooling staging temperatures and explains the temperature differentials for different equipment configurations. In the diagrams, sine waves indicate which stage operates during the rise and fall of discharge air temperature for the different heating/cooling staging jumpers. Recommended jumper settings are shown in bold type.

1.10.8.1. Heating Staging Temperature Jumper

Heating Staging temperature jumpers are used to set the temperature at which the second stage heating equipment comes ON. Its selections range from 85 - 130 (°F). The setting has a built-in differential of 20°F (except as described when 140DAS jumper is used). During operation, when the discharge air temperature falls below the jumper setpoint, 2nd-stage heating begins. If the discharge air temperature reaches the differential temperature, 2nd-stage operation ceases and 1st-stage heating resumes until the temperature again falls below the jumper set point.

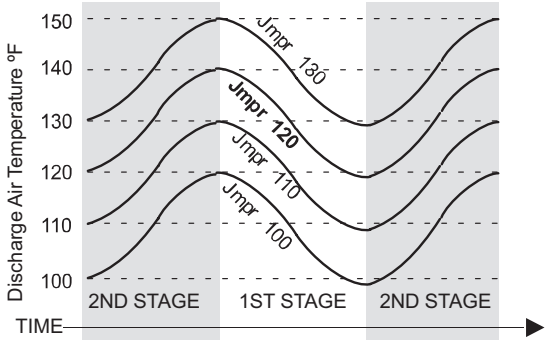
NOTE: *For SLP98 furnaces only, the furnace ignition control will automatically adjust firing rate without a second stage heat demand to match the blower airflow (CFM) requested by the Harmony III zoning system.*

Heat Pump (range: 85 - 110°F, recommended: 90). The maximum discharge air temperature at which the heat pump/electric heat is allowed to run is fixed at 135°F.



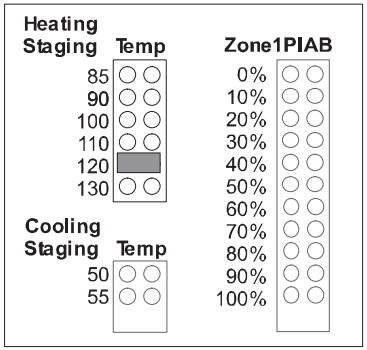
When the zone control system is applied to a heat pump with electric heat, the electric heat will be staged ON to maintain the discharge air temperature set by the heating staging jumper position.

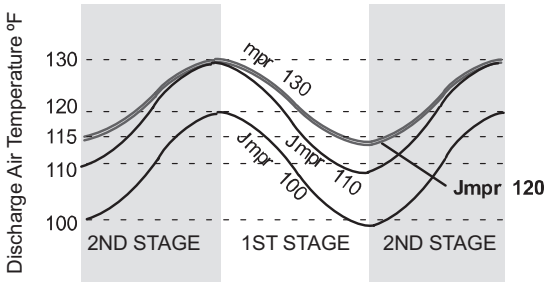
Gas furnace with 160°F upper limit (range: 100 - 130; recommended: 120). The maximum discharge air temperature at which the furnace may run is fixed at 160°F.



Gas Furnace with 140F DAS jumper (range: 100 - 130; recommended: 120). When the 140F DAS jumper is in place (as shown to the following illustration), the maximum discharge air temperature at which the furnace may run is fixed at 140°F.

NOTE: *Note the 140F DAS jumper's impact on the differential at 120 and 130 settings.*

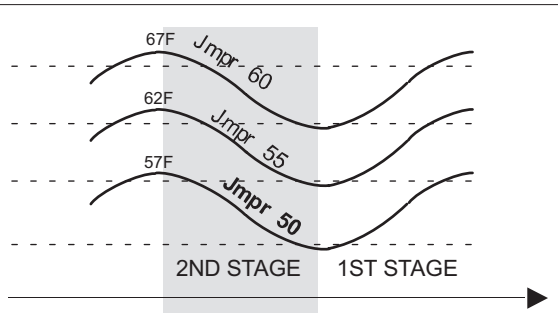




1.10.8.2. Cooling Staging Temperature Jumper

Cooling Staging temperature jumpers are used to set the discharge air temperature at which second stage cooling comes on. It is selectable between 50°, 55° and 60°F. A 7 degree total differential is associated with this staging temperature, beginning at the jumper setpoint, and extending to seven degrees above the setpoint.

For any jumper setting, if the discharge air should fall to 45°F and any zone still demands cooling, the compressor will not run leaving only the blower to operate until the discharge air once again rises to 50°F and the five minute compressor OFF delay has been satisfied. For this reason, and to better satisfy latent loads, the jumper recommended setting is 50.

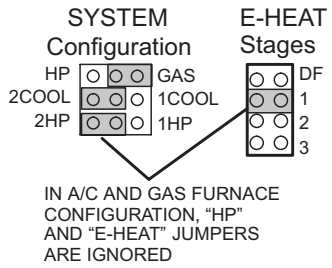


1.10.9. System Configuration/E-Heat Stages)

The SYSTEM configuration jumpers must be inserted to select the type of cooling and heating system that has been installed and the E-HEAT Stages jumper defines if the system is dual fuel or defines the number of electric heating stages used.

1.10.9.1. Gas Furnace and Air Conditioning

For a gas furnace and air conditioning combinations, put the jumper on GAS (as shown) and select the number of equipment cooling stages by placing the cooling jumper to the appropriate site (place on 1COOL for 1stage cooling or 2COOL for 2-stage cooling).

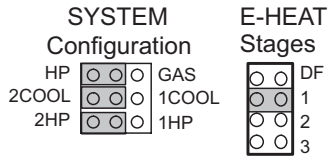


In this configuration, the maximum discharge temperature (upper temperature limit) at which the furnace is allowed to run is 160°F (except when 140F DAS jumper is in place). At the upper limit, the zone control system removes any heat demand from the furnace for a minimum of five minutes and until the temperature comes back within normal operating temperatures.

While at or above the upper temperature limit, the control unit signals for continuous blower operation to those zones from which a thermostat heat demand is received. When setting up the furnace control board options, be sure to set the BLOWER-OFF DELAY to no greater than 210 seconds.

1.10.9.2. Heat Pump with Electric Backup Heat

For heat pump with electric backup heat, select HP position as shown in this diagram.



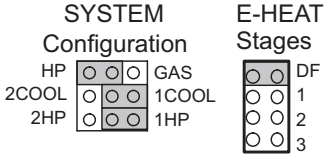
In this configuration, the maximum discharge temperature the electric heat or heat pump is allowed to run is 135°F. At that temperature, the zone control system removes demand from the heating unit for a minimum of five minutes and until the temperature returns to the normal operating temperature range. While at or above 135°F, the control unit signals for continuous blower operation to those zones from which a thermostat heat demand is received.

Select the number of equipment cooling stages by placing the COOL stages jumper to the appropriate side (1COOL or 2COOL). Similarly, set the number of Heat Pump stages (1HP or 2HP). Jumper settings on the above diagram illustrate the proper settings for a two stage heat pump and two-stage air conditioning system.

When using a heat pump with electric backup heat, insert an E-HEAT jumper to select the total number of available electric heat stages. The diagram above shows a single heat-strip configuration.

1.10.9.3. Heat Pump - Dual Fuel heating, 1-stage or 2 Stage Heat Pump and Gas Furnace

This diagram shows a dual-fuel configuration (heat pump for heat and cool with gas backup heat).



HP position must be jumpered for Dual Fuel applications and the E-Heat Stages jumper must be set to “DF” for dual fuel operation.

Select the number of equipment cooling stages by placing the COOL stages jumper to the appropriate side (1COOL or 2COOL). Similarly, set the number of Heat Pump stages (1HP or 2HP). Jumper settings on the above diagram illustrate the proper settings for a one stage heat pump and one stage of cooling.

1.11. Common System Component Wiring

Use thermostat wire to connect dampers, damper transformers, and the DAS probe with the zone control system.

IMPORTANT

Avoid running any control wiring close to AC house wiring. If this cannot be avoided, limit close parallel of power and control wiring to a few feet.

1.11.1. Dampers and Damper Transformer

Connect dampers to the zone control panel. A total of six dampers may be connected at the damper output terminals on the zone control panel. If additional dampers are used, additional transformers and relays will be needed.

Fuse F1 will protect the damper outputs from a short circuit or overload in the damper wiring.

If dampers are applied to the return duct system, the dampers for each zone must be wired in parallel. Connect damper transformer to zone control panel terminal block.

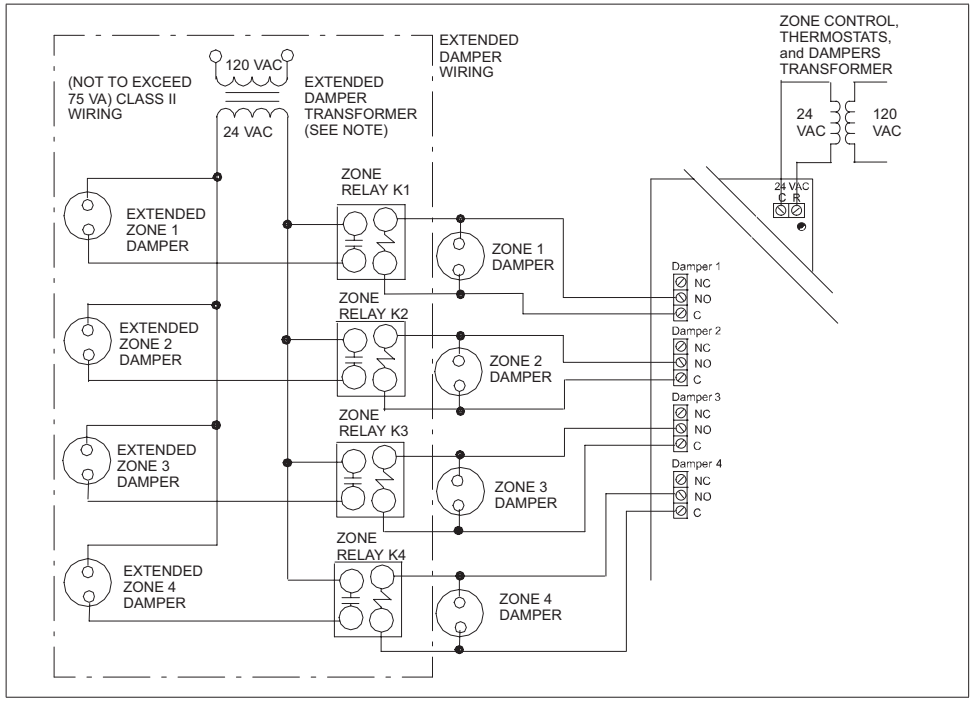


Figure 13. Heating Air Reduction Jumpers

NOTE: *The extended damper transformer rating should be sized to adequately handle zone dampers (1-4) plus relays (K1-K4) not to exceed class II wiring limit of 75 VA. Combined load of zone dampers and zone relays not to exceed 60 VA. Use Lennox Catalog number 56L68 for Zone Relays 1 through 4.*

1.11.2. Discharge Air Sensor (DAS) Probe

Wire discharge air sensor probe to zone control panel. The variable immersion-temperature probe is not polarity sensitive.

1.12. Component Specific Wiring

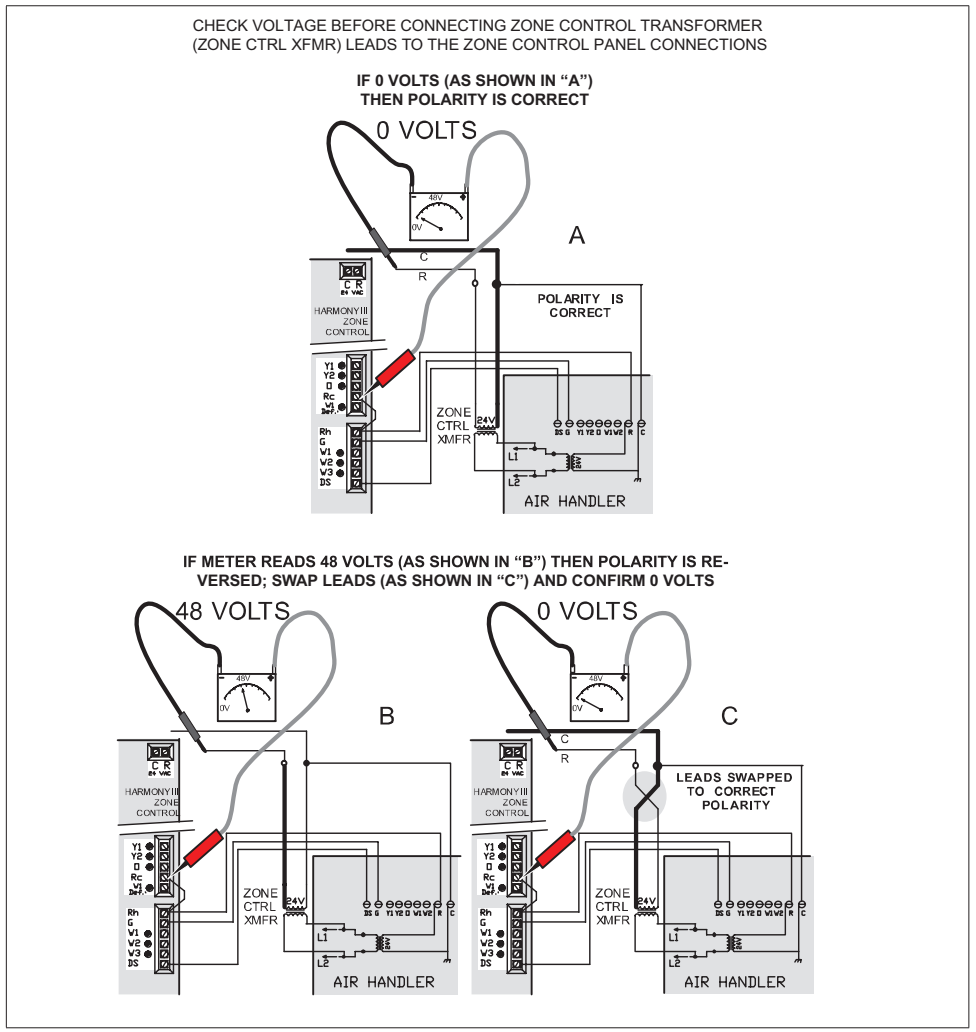


Figure 14. Confirming Transformer Phasing (Polarity) is Correct

1.12.1. Zone Control Transformer Phasing

Using two transformers on a single system—When the Harmony III zoning system control panel is connected to a system that has its own transformer, the phasing (or polarity) of the air handler transformer to the zone control's add-on transformer is extremely **IMPORTANT** because the zone control transformer powers the **DS** circuit within the zone control and then connects to the air handler **DS** circuit.

The only two transformers that need correct phasing with their commons connected are the zone control and air handler transformers. Check the phasing prior to connecting the zone control transformer zone control panel's connections. The

zone control transformer primary should be the same source as the air handler to keep it uncomplicated.

- Use a 230VAC primary transformer with air handlers (CBX25UHV, CBX32MV, CBA38MV and CBX40UHV)
- Use a 115VAC transformer with furnaces (SLP98, SL280V,EL296V and SL297NV) and with CBWMV.

1. Connect the zone control transformer primary to the air handler voltage source.
2. Do not connect the zone control transformer secondary to the zone control panel at this time.
3. Connect air handler secondary common to the assumed zone control transformer common.
4. Measure voltage between air handler **R** and unconnected zone control transformer secondary lead.
    - » if 0 volts (A, “Figure 14. Confirming Transformer Phasing (Polarity) is Correct” on page 14) then polarity is correct; connect the leads to zone control **C** and **R** as shown.
    - » if 48 volts (B, “Figure 14. Confirming Transformer Phasing (Polarity) is Correct” on page 14) then polarity is reversed; swap leads as shown and confirm 0 volts (C, “Figure 14. Confirming Transformer Phasing (Polarity) is Correct” on page 14); connect the leads to zone control **C** and **R** as shown.
5. With the correct polarity determined, connect **C** wire to zone control 24VAC **C** terminal and **R** wire to **R** terminal.

1.12.2. Thermostat

Using standard electronic 1-heat/1-cool non-heat pump, non-power robbing thermostats, and five-wire thermostat cable, wire units as follows:

1. Wire each thermostat to terminals **Y**, **W**, **G**, **R**, and **C**.
2. Run cable from each of the thermostats to the zone control panel. Mark each cable according to the zone thermostat from where it originates.
3. Strip the cables and attach each of the five wires to the zone control panel.

1.12.3. Gas Furnace

IMPORTANT

The common **C** terminal of the Harmony III zoning system zone control panel MUST be connected to the common terminal of the integrated control, or if using an air handler, MUST be connected to the common terminal of the air handler terminal strip.

If not connected, blower may operate only at the minimum CFM or will not ramp to zone air volume.

After the furnace is installed, field wire the unit as described in the installation instructions provided with the furnace. Use thermostat wire to connect the furnace and the zone control panel and to connect the zone control panel 24VAC **C** to the integrated control terminal strip **C**.

1.12.4. Air Conditioner Unit

After the air conditioner unit is installed, field wire the unit as shown in the installation instructions provided with the unit. Use thermostat wire to connect the AC unit to the zone control panel.

1.13. Minimum CFM in Variable Speed Furnace and Air Handlers

Harmony III™ zoning system minimum CFM values for variable speed furnaces are listed in the following tables.

These apply to furnaces and air handlers with serial numbers indicating they were built in 2004 or later. With furnaces built before 2004, use the Harmony II zone system control system minimum air note in the installation instructions or product specification for that furnace or air handler's air handling data.

These listed CFM numbers are the lowest the blower can run in order not to tripped gas furnace limits. .

Table 11. Minimum indoor variable speed blower CFM per model number (Gas furnace models)

Unit Model Numbers	CFM (min)	Unit Model Numbers	CFM (min)
EL296DF090XV60C EL296DF110XV60C	450	SL280UH135V60D	450
ML180UH030V36A ML180UH045V36A ML180UH070V36A ML180UH070V36B	350	SL297UH040NV36B SL297UH060NV36B	250
ML180UH110V60C	550	SL297UH080NV48C	380
ML180UH070V48B ML180UH090V48B	400	SL297UH080NV60C	450
SL280DF070V36A	250	SLP98DF070XV36B** SLP98DF090XV36C**	250
SL280DF090V48B	380	SLP98DF090XV48C**	360
SL280DF090V60C	450	SLP98DF090XV60C** SLP98DF110XV60C**	450
SL280UH060NV36A	250	SLP98UH070XV36B** SLP98UH090XV36C** SLP98UH090XV48C**	250
SL280UH080NV48B	380	SLP98UH090XV60C**	450
SL280UH080NV60C SL280UH100NV60C	450		
SL280UH070V36A SL280UH090V36B	250		
SL280UH090V48B	380		
SL280UH090V60C SL280UH110V60C	450		

Table 12. "Minimum indoor variable speed blower CFM per model number (Air Handlers)

Unit Model Number	CFM (min)	Unit Model Number	CFM (min)
CBA25UHV-018 CBA25UHV-024 CBA25UHV-030 CBA25UHV-036	250	CBX32MV-048** CBX32MV-068**	450
CBA25UHV-042 CBA25UHV-048 CBA25UHV-060	450	CBX40UHV-024** CBX40UHV-030**	250
CBA38MV-018/024** CBA38MV-030** CBA38MV-036**	250	CBX40UHV-036**	380
CBA38MV-042** CBA38MV-048** CBA38MV-060**	450	CBX40UHV-042** CBX40UHV-048** CBX40UHV-060**	450
CBX25UHV-018 CBX25UHV-024 CBX25UHV-030 CBX25UHV-036	250	CBWMV-24B-040 CBWMV-36B-070 CBWMV-36C-090	250
CBX25UHV-042 CBX25UHV-048 CBX25UHV-060	450	CBWMV-60C-100	450
CBX32MV-018/024** CBX32MV-024/030** CBX32MV-036**	250	CBWMV-60C-120	380

NOTE: *Three percent duty cycle corresponds to the minimum CFM, and a 97% duty cycle corresponds to the maximum CFM.*

** Listed values in the table correspond to 0% duty cycle of the Harmony III zoning system control signal. Since the Harmony III zoning system puts 3% at minimum, actual value may be 10-30 CFM higher.

NOTE: *For discontinued air handlers and furnaces, please refer to the individual product installation instruction. Minimum CFM values for Harmony III will be listed at the end of the listed CFM tables.*

See "7. Airflow Data" on page 66 for safe operations based on load and system minimum, and maximum CFMs when used with Harmony III.

1.14. System Flow Diagrams

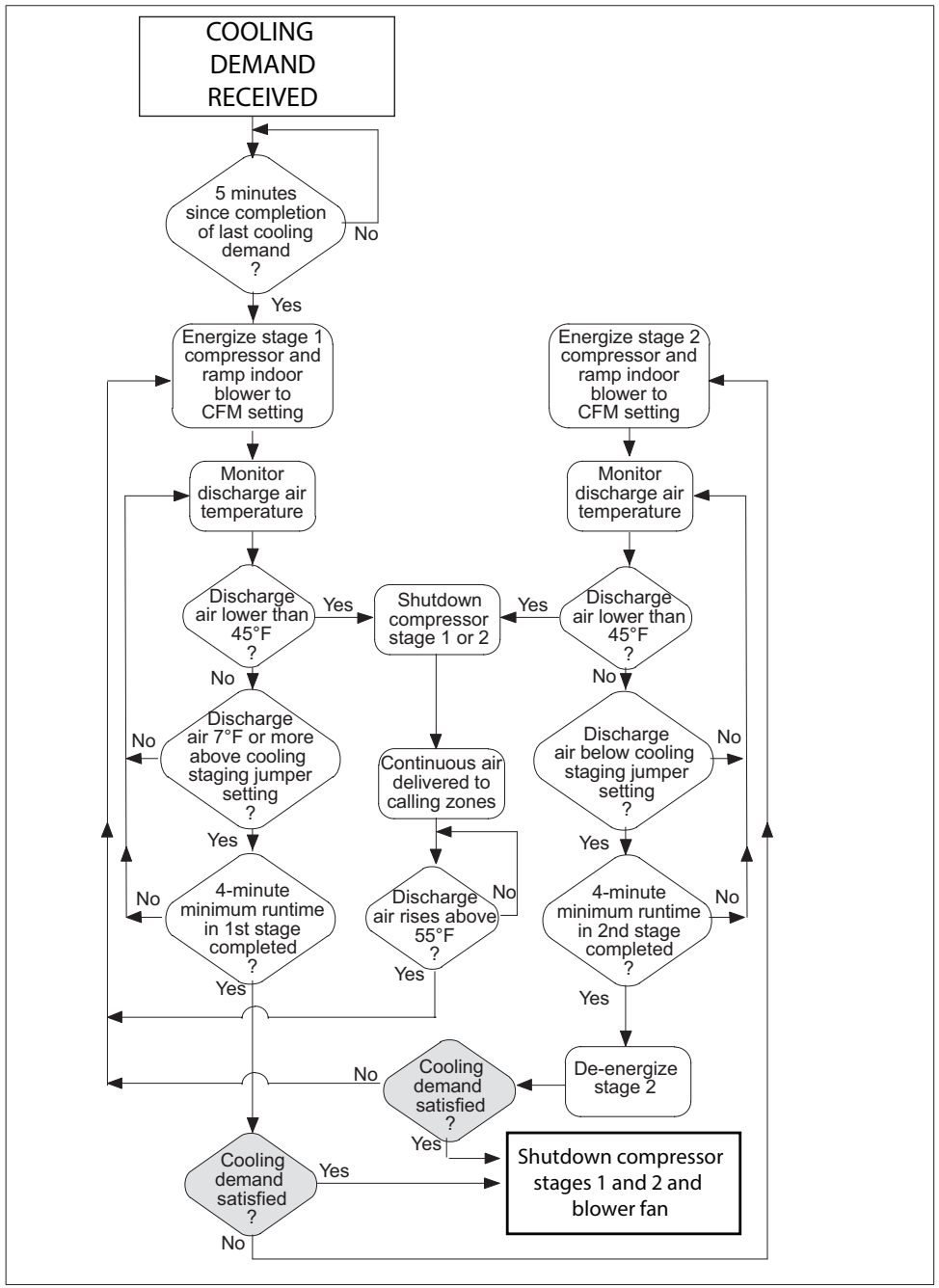


Figure 15. Cooling Operations - AC/HP

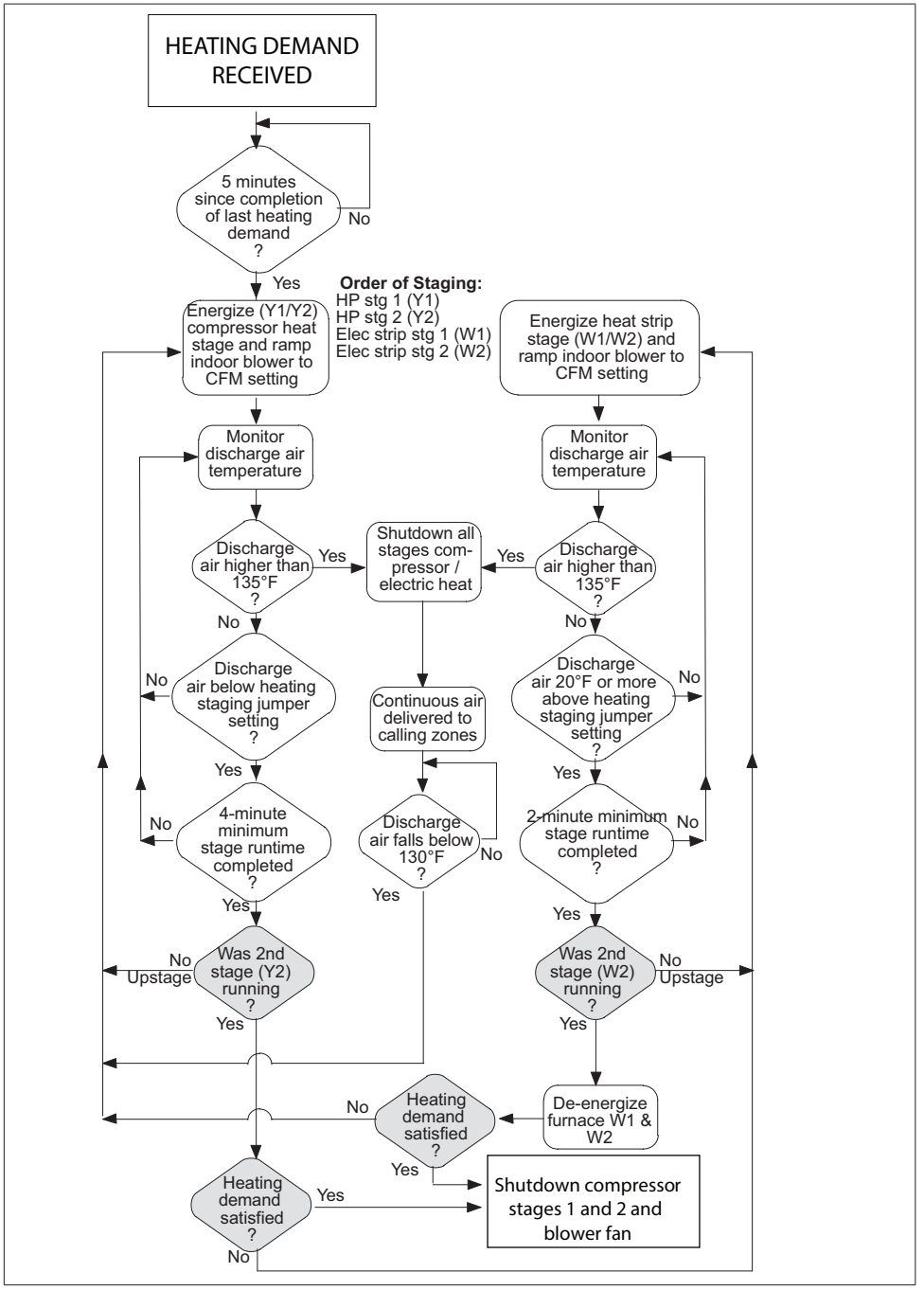


Figure 16. Heating Operation - HP and Electric Heat Strips

2. Heat Pump

2.1. Installing Heat Pump and Accessories

2.1.1. Equipment Installation

Follow all equipment installation instructions provided with each unit.

2.1.2. Pressure Switch

The high pressure switch is a normally closed (N.C.) auto-reset high pressure switch located in the compressor discharge line or on the suction valve service port. The switch is factory set to open when operating pressures rise and close when the pressure drops (see following table). The intent of the switch is to protect the outdoor unit from abnormally high operating pressures during mild weather heating days. The green pressure LED comes on when the heat pump pressure switch is closed indicated normal condensing pressures.

Table 13. High Pressure Switch Operation

Refrigerant	Open on pressure rise (psig)	Close on pressure fall (psig)
HFC-22	375	275
HFC-410A	550	425

NOTE: *If a pressure switch is factory installed in the unit, do not remove the switch or switch wires.*

The switch may also be fastened directly to the vapor valve service port which becomes the discharge line in heat pump heating mode (see “Figure 17. Tee and Vapor Line High Pressure Switch”).

1. Connect refrigerant gauge set to the outdoor unit vapor line.
2. Establish a compressor heating demand and allow system to begin operating (see heat pump heating checkout section for details). Note that the green pressure switch LED comes on.
3. Allow system to operate several minutes so refrigerant pressures can balance.
4. Momentarily block the return air opening and observe the high pressure gauge. When hot gas line pressure reaches the “open on” pressure and the green pressure switch LED turns off, an error code will be set in the zone control system, DIAGs 1 and 4 will turn on, and outdoor unit will stage down and turn off if the switch does not close within 90 seconds. Afterwards, backup heat will be used to satisfy the demand.
5. Remove the restriction. When hot gas pressure drops below the “close on” pressure, the green pressure switch LED will turn on and all DIAGs should turn off.

2.1.3. Pressure Switch Wiring

Pull a two-wire thermostat cable from the field-installed pressure switch to the zone control panel and connect at the pressure switch, and at the zone control panel as shown in the connection location diagram.

2.1.4. Tee (High Pressure Switch; Heat Pumps only)

A tee (Lennox #87071) is needed to install the pressure switch along with a valve core (Schrader) for checking pressure in the vapor line during heat pump heating mode. The switch may also be fastened directly to the vapor valve service port which becomes the discharge line in heat pump mode.

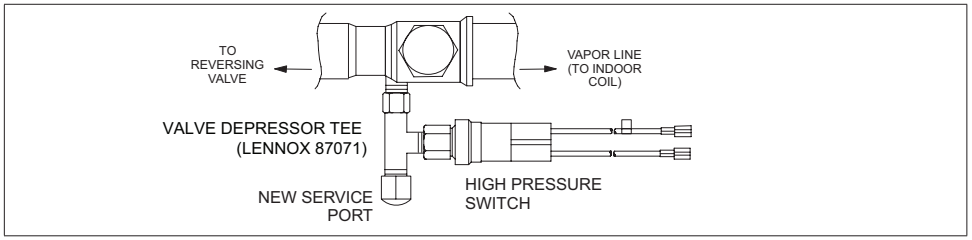


Figure 17. Tee and Vapor Line High Pressure Switch

IMPORTANT

High pressure switch must be installed on open side of tee first to prevent refrigerant loss.

2.1.5. Balance Point Sensor (Outdoor Thermostat)

A balance point sensor as illustrated in the following figure may be implemented in a dual-fuel (Option 3) system. This thermostat monitors the outdoor temperature, compares it to the balance point setting, and signals the zone control if the reading is below the set point. The zone control then instructs the gas furnace to provide all the heating and prohibits the heat pump from attempting to fill a demand for heat. See “Figure 32. Option 3 - Typical Lennox Heat Pump and Lennox Variable-Speed Gas Furnace (Dual Fuel) (Troubleshooting)” on page 48 for connecting sensor switch to Harmony III.

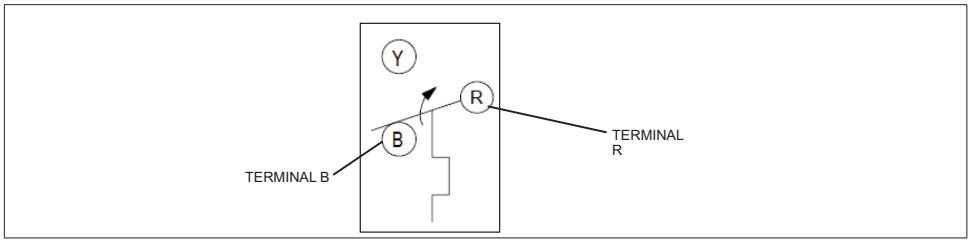


Figure 18. Balance Point Sensor (10Z23)

NOTE: *In Harmony III zoning system applications, terminal B and R are wired to the Harmony III zoning system panel.*

2.1.6. Defrost Tempering Kit

A defrost tempering kit (67M41) may be implemented in a dual-fuel (Option 3) system. This kit consists of a thermostat probe/switch which is installed between the furnace and the evaporator coil to turn the furnace on (at 80°F) and off (at 90°F) during a defrost cycle. This tempers the discharge air and protects the compressor from high refrigeration pressures during defrost. The following figure show the defrost temperating kit components and see “Figure 4. Discharge Air Sensor Installation” on page 8 for location of the probe.

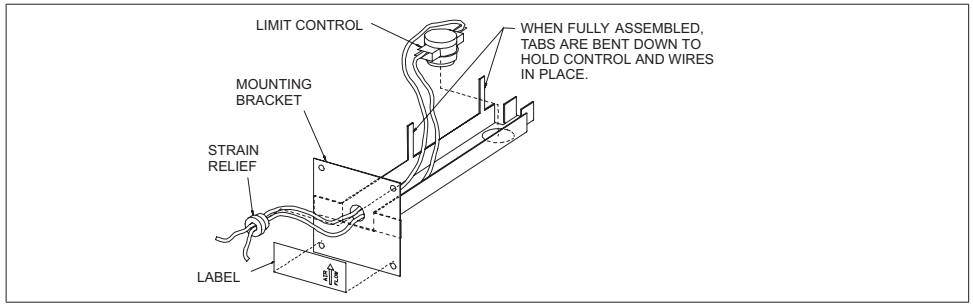


Figure 19. Defrost Tempering Limit Control

2.2. Variable Speed Motor (VSM) Air Handler and Heat Pump - Option 2 (Zoning System)

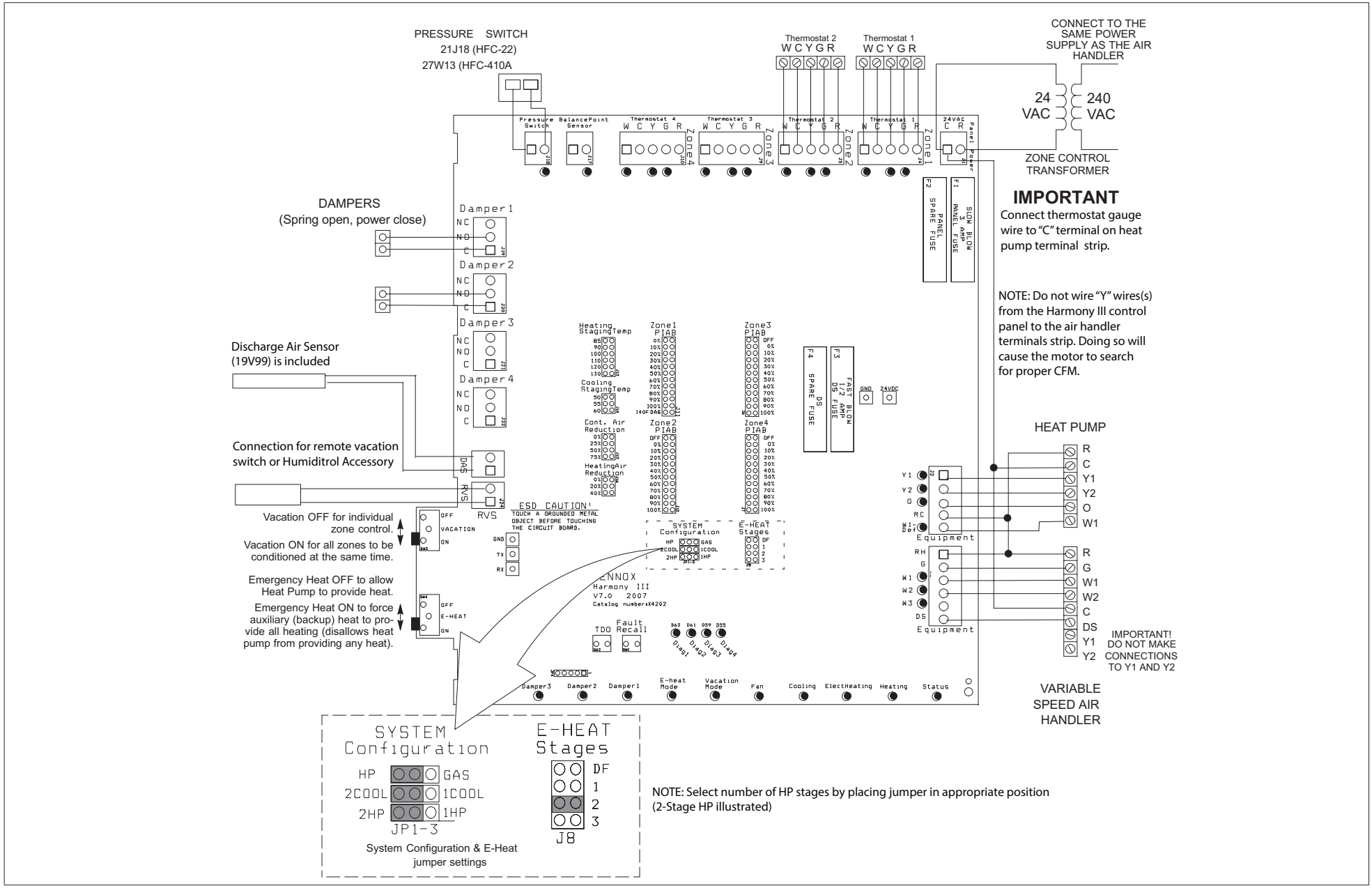


Figure 20. Option 2 - Typical Lennox Heat Pump and Lennox Variable-Speed Air Handler (Troubleshooting)

2.3. Heat Pump System Start-Up and Checkout

IMPORTANT

The zone control system power-up must occur at the same time or before the furnace or air handler unit is powered up.

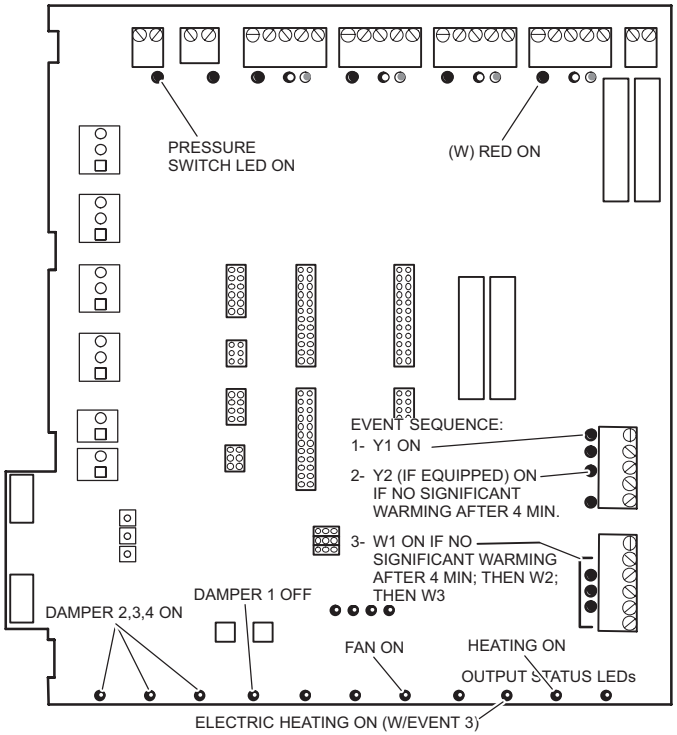
2.3.1. Powering the System (All Systems)

1. Adjust all thermostat settings so that no demand will occur.
2. Apply power to the zone panel transformer and to the air handler and observe the following: all four diagnostic LEDs will light; then each individual diagnostic LED will light in sequence; then all four diagnostic LEDs will light and extinguish.
3. Finally, the status light will begin to flash, indicating proper operation. Perform heat pump heating checkouts referenced in this section.

2.3.2. Checkouts

2.3.2.1. Typical Heat Pump Heating Checkout (Single Zone)

Prerequisites: Zone 1 thermostat set to heat.



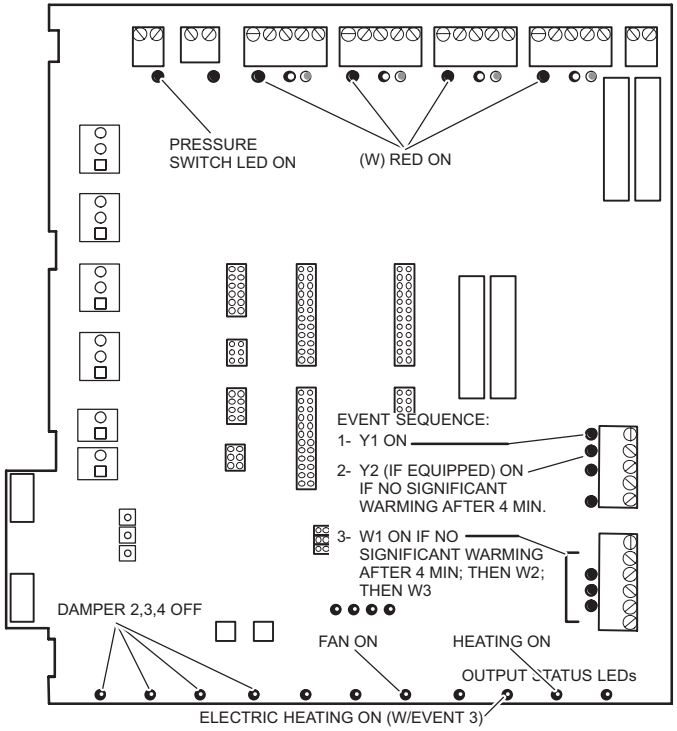
1. Set zone 1 thermostat for a heat demand; check:
   - Zone 1 thermostat **W** LED on (heating demand).
   - Damper LED 1 off (damper open).
   - Damper LEDs 2, 3, and 4 on (dampers closed).
   - Output Heat **Y1** LED on (compressor on).
   - Heating LED on.
   - Fan LED on.
   - Pressure Switch LED on.

   The compressor in the outdoor unit begins operating in the heating mode. At approximately the same time, the indoor blower starts, operating at a speed according to the setting of the PIAB jumper for zone 1. It may take the blower 60 to 90 seconds to reach this speed.
2. If Single-Stage Heat Pump - Skip to step 3. The discharge air sensor continually samples air temperature. If, after 4 minutes, air temperature is not warming significantly, the high speed compressor energizes. Output Heat **Y2** LED on (high speed compressor).
3. The discharge air sensor continually samples air temperature. If, after (another) 4 minutes, air is not warming significantly, auxiliary heat sequence begins:
   - Electric Heating (E-Heating) LED on.
   - Output Heat **W1** on, followed by (if available, and if necessary) **W2**, and then **W3**.
4. Remove heat demand from zone 1.
   - All LEDs off, except:
   - Damper LEDs 2, 3, 4 on.

   To check the amount of air being delivered to each zone and to confirm that each individual zone damper functions properly, repeat these steps for zones 2 - 4.

2.3.2.2. Typical Heat Pump Heating Checkout (Multiple Zone)

Prerequisites: All zone thermostats set to heat.



1. Apply heating demand to all thermostats.

- All zone thermostat **W** LEDs on (heat demands).
- Output Heat LED **Y1** on (compressor).
- Heating and Fan LEDs on.
- LEDs dampers 1 - 4 off (all dampers open).
- Pressure Switch LED on.

The compressor in the outdoor unit begins operating in the heating mode. At approximately the same time, the indoor blower starts, operating at a speed according to the PIAB jumper settings for all zones. It may take the blower 60 to 90 seconds to reach this speed.

2. If Single-Stage Heat Pump - skip to step 3. The discharge air sensor continually samples air temperature. If, after four minutes, air temperature is not warming significantly, the high speed compressor energizes. Output Heat **Y2** LED on (high speed compressor).

3. The discharge air sensor continually samples air temperature. If, after (another) four minutes, air is not warming significantly, auxiliary heat sequence begins:

- Electric Heating (E-Heating) LED on.
- Output Heat **W1** on, followed by (if available, and if necessary) **W2**, and then **W3**.

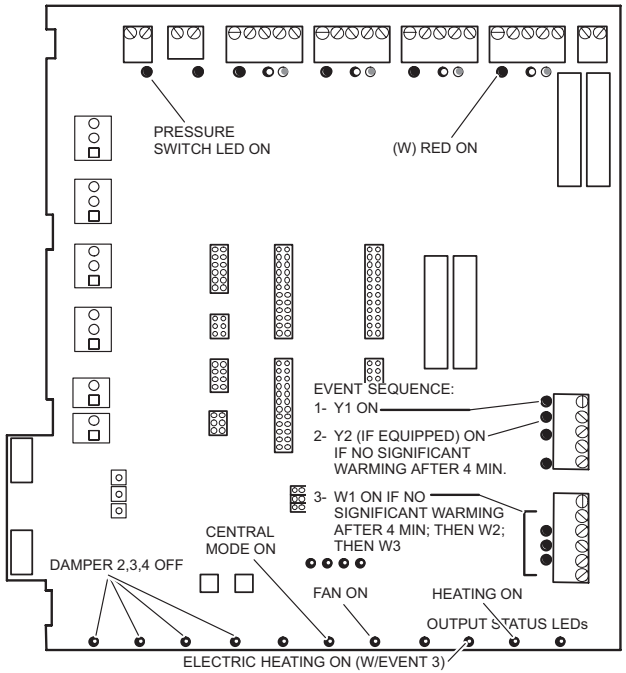
4. Remove the heat demand from all zones.

- Input LEDs off.
- Fan LED off (Blower off).
- Heating LEDs off.
- Damper LEDs - Last zone thermostat demand removed: LED is off (this zone's damper remains open during 3-1/2 minute purge); Other zones damper LEDs are on during the 3-1/2 minute purge (dampers closed). After 3-1/2 minute delay, all dampers LEDs go off (dampers open).

2.3.2.3. Typical Heat Pump Heating Checkout (Central Mode)

Prerequisites:

- Central mode switch on
- Red LED on the central mode fan switch on.



1. Set zone 1 thermostat for a heat demand; check:

- Zone 1 thermostat **W** LED on (heating demand).
- Output Heat **Y1** LED on (compressor on).
- Heating LED on.
- All damper LEDs off (dampers open).
- Pressure Switch LED on.

The outdoor-unit compressor begins operating in the heating mode (low-speed if 2-stage compressor). At approximately the same time, the indoor blower starts, operating at a speed according to the PIAB jumper settings for all zones. It may take the blower 60 to 90 seconds to reach this speed.

2. If Single-Stage Heat Pump - skip to step 3. The discharge air sensor continually samples air temperature. If, after four minutes, air temperature is not warming significantly, the high speed compressor energizes. Output Heat **Y2** LED on (high speed compressor).

3. The discharge air sensor continually samples air temperature. If, after (another) four minutes, air is not warming significantly, auxiliary heat sequence begins:

- Electric Heating (E-Heating) LED on.
- Output Heat **W1** LED on, followed by (if available, and if necessary) **W2**, and then **W3**.

4. Remove the heat demand from zone 1. Upon removal of the demand from zone 1, check:

- Zone 1 thermostat **W** LED off (no heat demand).
- Output Heat **Y1**, (**Y2**) LED(s) off.
- Fan and Heating LEDs off.

2.4. Heat Pump System Start-Up and Checkout

2.4.1. Troubleshooting Diagram

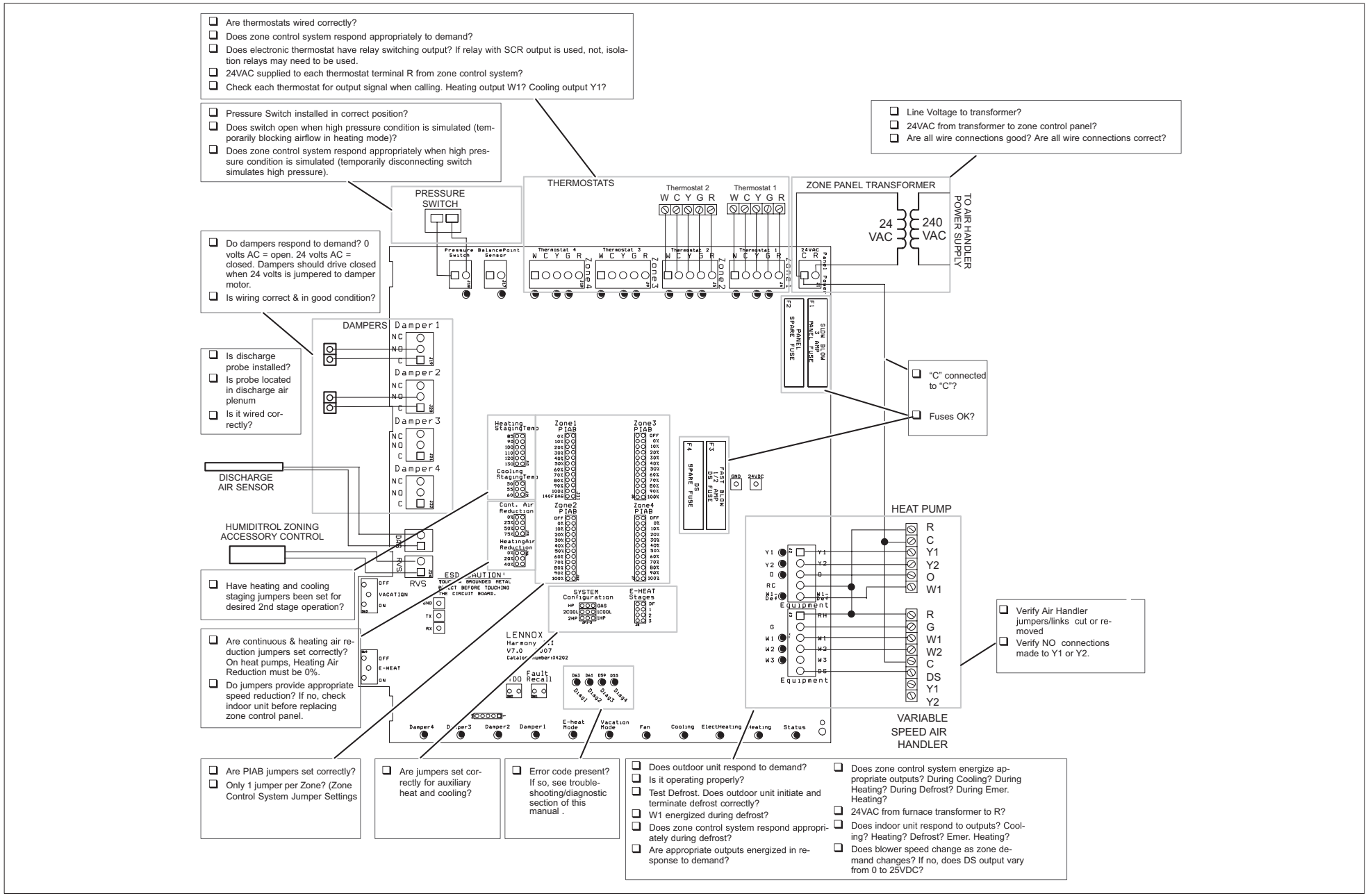
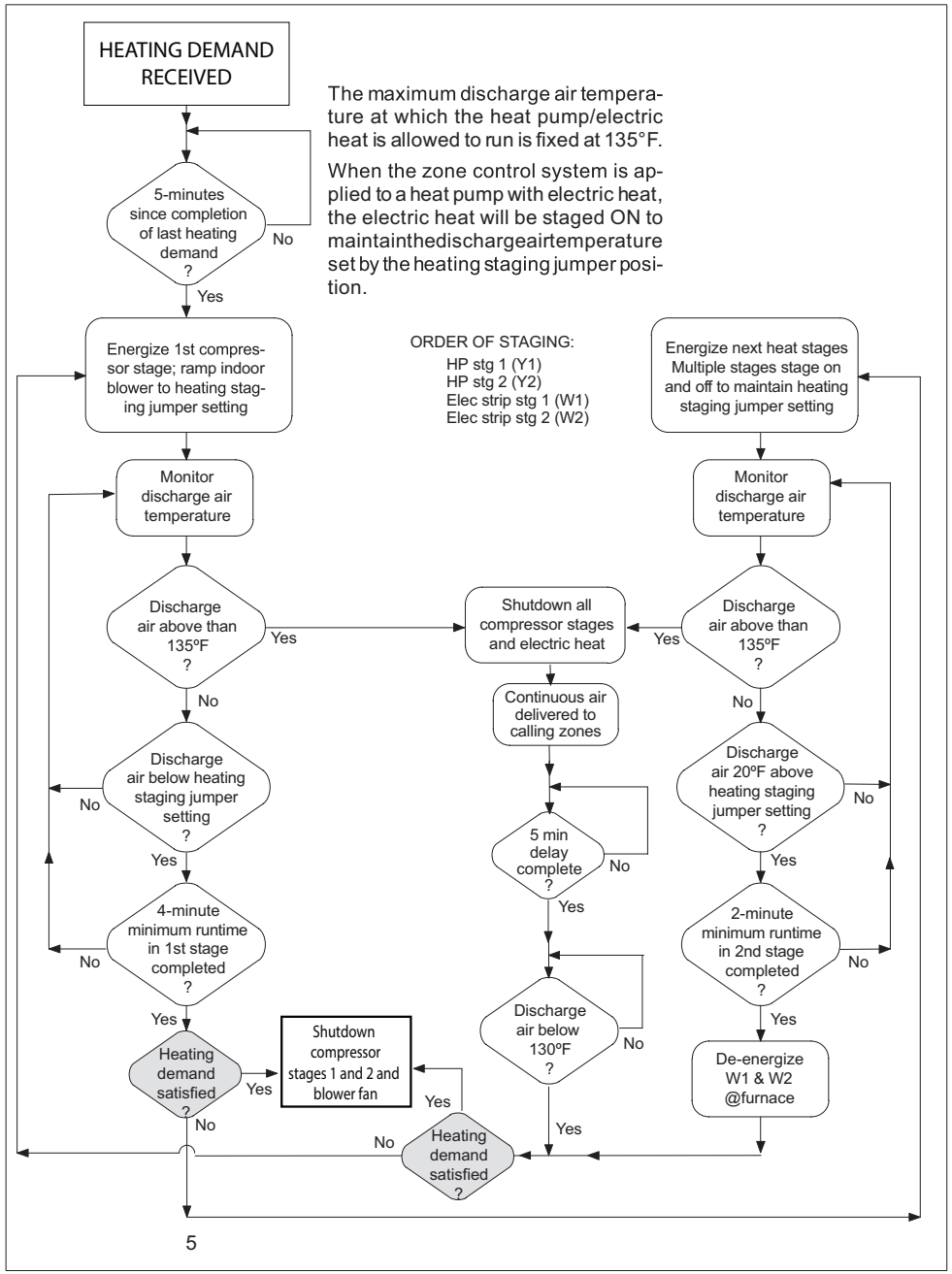
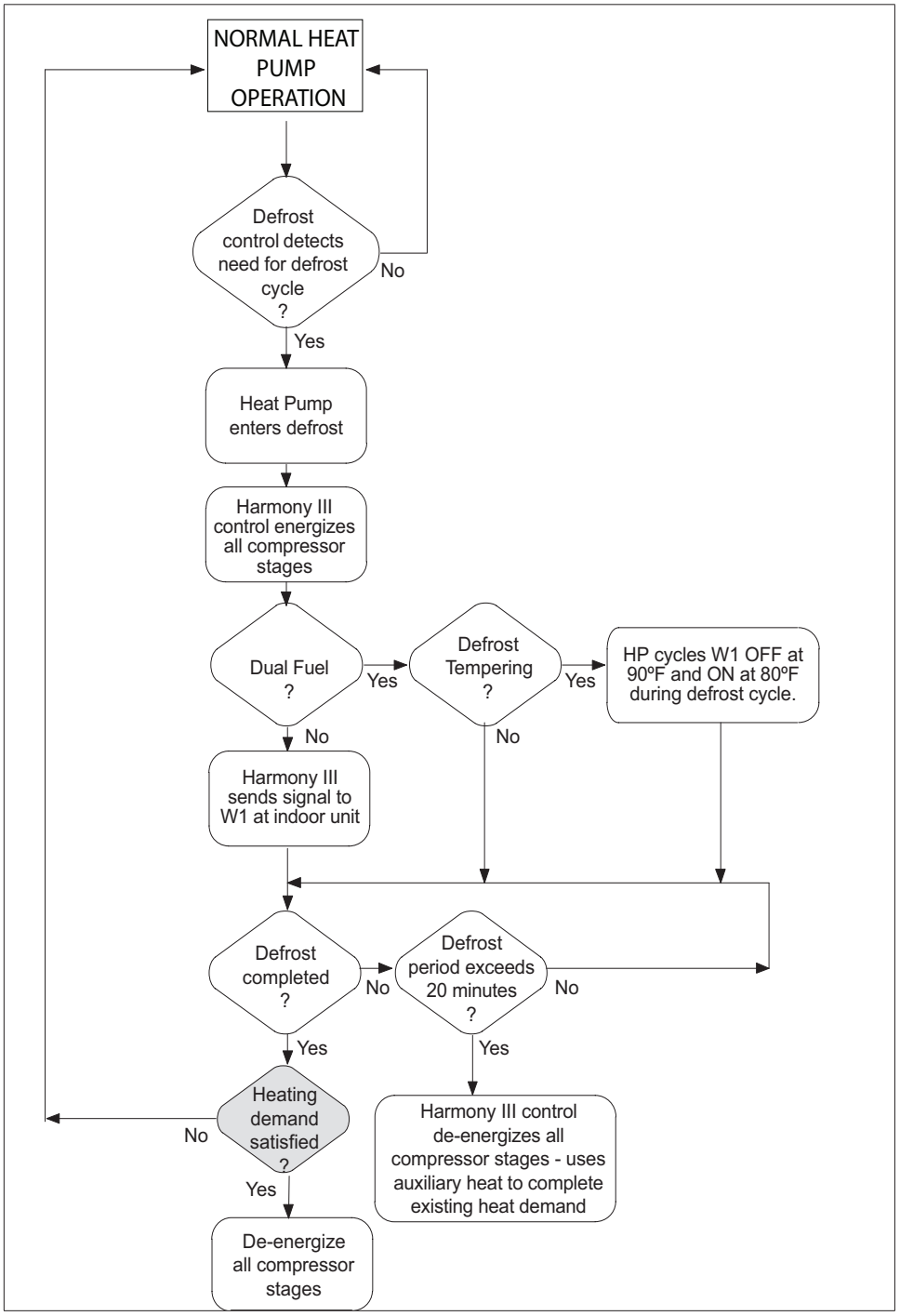


Figure 21. Option 2 - Typical Lennox Heat Pump and Lennox Variable-Speed Air Handler (Troubleshooting)

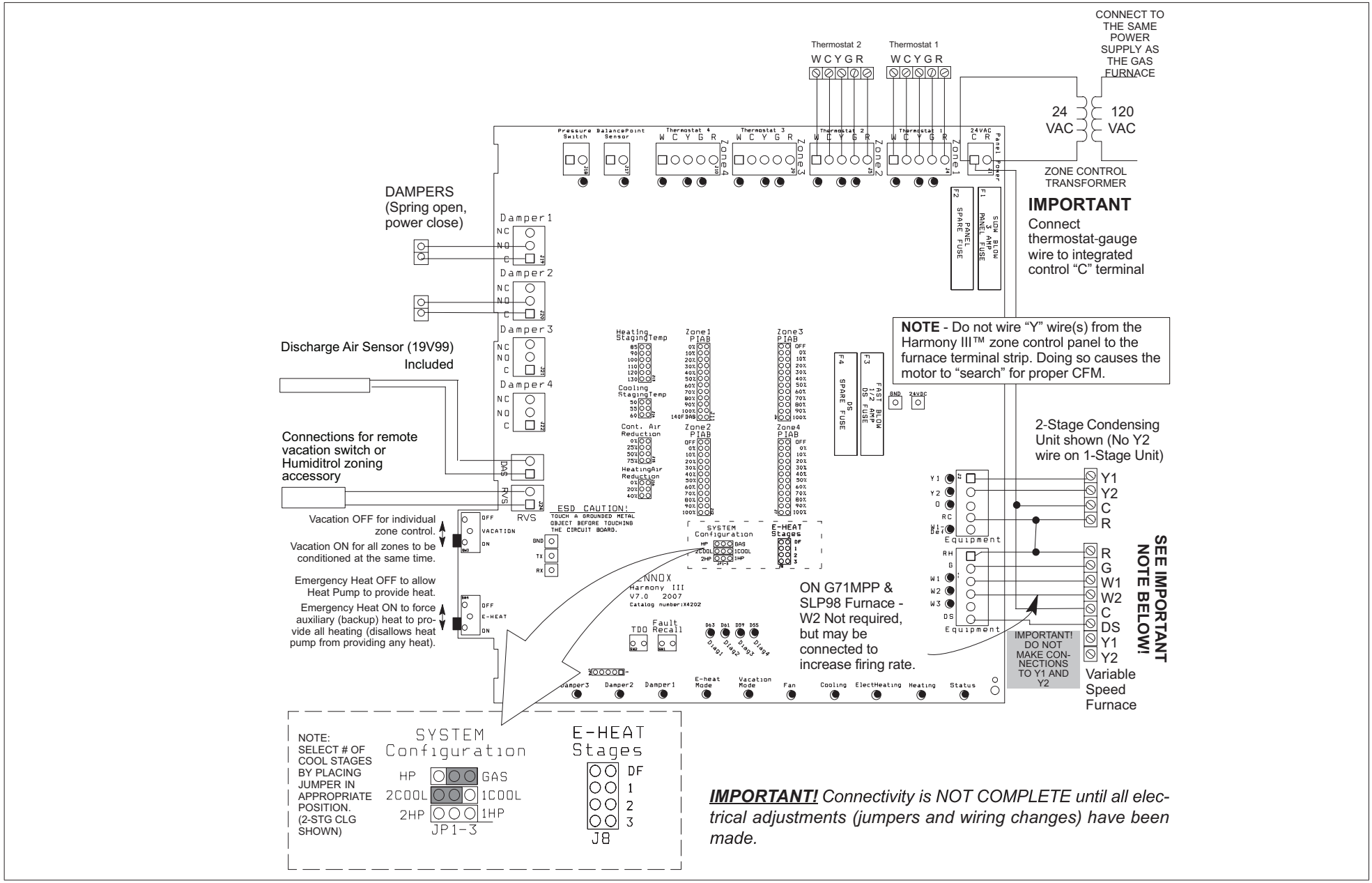
2.4.2. Heat Pump Heating Operation



2.4.3. Defrost Operations



3.1. Typical Wiring for Variable-Speed Gas Furnace and Outdoor AC Unit - Option 1



IMPORTANT! *Connectivity is NOT COMPLETE until all electrical adjustments (jumpers and wiring changes) have been made.*

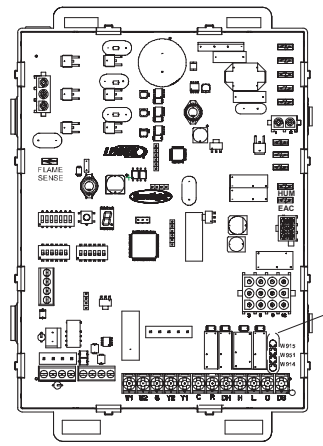
Figure 22. Harmony III zoning system Option 1 - Typical Lennox Variable-Speed Gas Furnace and 1- or 2-Stage Air Conditioner

3.2. Furnace Variable Speed Motor Electrical Adjustments

NOTE: *Follow all equipment installation instructions provided with each unit.*

The variable-speed motor (VSM) in the furnace is controlled by the integrated furnace control (IFC). Adjustment of these drive controls is made by cutting the clippable on-board links and selecting DIP switch settings. This is described in the following paragraphs.

- The furnace blower motor speed must be adjusted to produce the zoning CFM requirements managed by the zone control system.
- The Harmony III zoning system control's pulse width modulated (PWM) output signal is connected to the DS terminal on the furnace control. The PWM signal, along with any other thermostat request (**G**, **W1**, or **W1**+**W2**), controls fan speed linearly between the minimum and maximum CFM for the furnace as determined by the cool speed DIP switches (see SLP98 Installation Instructions for settings).
- Locate the integrated control in the furnace control box area. Before connecting the zone control panel to the integrated control, complete the applicable electrical adjustments shown in the following figures.



Electrical Adjustments

1. **In all cases**—cut the clippable on-board link W914 Dehum - Harmony (between R and DS, see figure 18); if not cut, the zone control panel DS fuse will blow.
2. DO NOT CUT the clippable on-board link W915 2 Stage Compr (between Y1 and Y2).

Do NOT cut any wires in the variable speed motor harness.

ON-BOARD LINKS:

W915	W915 2 Stage Compr (Y1 to Y2)—DO NOT CUT
W951	W951 Heat Pump (R to O)—DO NOT CUT
W914	W914 Dehum - Harmony (R to DS)—CUT IN ALL CASES

Figure 23. Typical Furnace VSM Electrical Adjustments

Set the upper limit of blower CFM as follows:

1. Determine the maximum system CFM requirements (sum of all the individual zones).

2. From the Blower Motor Performance tables (see furnace Installation Instructions) determine the HIGH speed cool DIP switch setting that corresponds to this CFM.

3. Set the HIGH speed cool DIP switch setting on the integrated control to this value.

NOTE: *The lower limit of blower CFM is factory set. It is not field adjustable.*

The minimum airflow achieved by the any of the gas furnaces when connected to a Harmony III zoning system control listed in "Minimum CFM for Harmony III zoning system with Variable Speed Blower Motors (Gas Furnaces)" on page 16. A 3% duty cycle corresponds to the minimum CFM, and a 97% duty cycle corresponds to the maximum CFM.

NOTE: *Any on/off delays present for a heating or cooling sequence are still present with Harmony III zoning system control operation.*

3.3. Variable Speed Motor Furnace System Operations

The dehumidification on-board clippable link W914 Dehum - Harmony (R to DS) on the integrated furnace control must be cut for operation with the Harmony III zoning system control. Once the link is cut, the presence of the Harmony III™ zoning system, versus a standard dehumidification control, is automatically detected by the integrated control.

IMPORTANT

DO NOT alter blower harness!

3.3.1. Operation

When the integrated control is properly connected to a Harmony III zone control, operation is as follows:

- Integrated control DIP switches 1 and 2, which configure the control for operation with various types of thermostats, are ignored.
- The zone control sends a **W1** Signal to the furnace which goes through its normal ignition sequence as described in the furnace installation instructions.
- The blower will start and operate at the minimum blower speed after a 45 second delay.
- After the temperature of the DAS rises above 100ºF the zone control will provide a PWM signal to the furnace on terminal **DS** based upon the Zone PIAB Jumper selections (and the heating air reduction jumper).
- The blower speed (CFM) is set according to the pulse width modulated (PWM) signal from the Harmony III zoning system control.
- The blower speed adjusts immediately with PWM adjustments.
- The furnace firing rate is based on current operating CFM and internal lookup table for midpoint temperature rise. If resulting firing rate is below minimum firing rate, it will operate at minimum fire rate. Accordingly, if resulting firing rate is above maximum firing rate, it will operate at maximum firing rate.
- Firing rate adjusts anytime the PWM deviates by more than 5% (e.g. 60% > 65%).

NOTE: *Integrated control DIP switches 14 through 19 are not disabled, and can be used in conjunction with Harmony III zoning system to increase or decrease airflow volume during heating operation.*

NOTE: *DIP switches 14-19 adjust firing rate when Harmony III zoning system is detected. Air volume is controlled by Harmony III zoning system. The*

furnace looks at air volume and determines proper firing rate based on DIP switch 14-19 settings. See SLP98 Installation Instructions for adjustment options.

3.3.2. Integrated Furnace Control W2 terminal to Harmony III zoning system Control

Since the furnace automatically adjusts firing rate to match CFM to achieve a target temperature rise, connection of Harmony III zoning system control to **W2** terminal on the integrated control is not required.

With **W2** connected, lower firing rates can be used for **W1** demand usually resulting in greater comfort levels per zone. If temperature cannot be maintained, then **W2** will quickly increase firing rates to satisfy demand.

If discharge air temperature is too low, the integrated control **W2** can be connected to Harmony III zoning system control to cause the furnace to increase firing rate. Every two minutes, the integrated control looks at **W2**. If **W2** is ON, the firing rate increases by 5%. This 5% increase is added to the desired firing rate as determined by the PWM. Therefore, if a 50% duty cycle corresponds to a 70% firing rate, after 2 minutes of **W2**, that same 50% duty cycle will correspond to a 75% firing rate. This will last for the remainder of the heat cycle.

When **W2** goes from ON to OFF, the integrated control decreases the firing rate by 5%.

3.3.3. Installation Setup Worksheets

3.3.3.1. SLP98V — Cooling/Heating (Non-Heat Pump Applications)

Job Name:		
Indoor Unit Model:		
Outdoor Unit Model:		
Indoor Unit Setup:		
√ Cut on-board link W914 DEHUM OR HARMONY (R to DS) on furnace IFC control (if not cut, fuse will blow in Harmony III zoning system control board) √ W2 connection from Harmony III zoning system to SLP98 is optional – see Harmony III zoning system / furnace installation instructions for details √ DIP switch settings (ON or OFF):		
DIP Switch	**ON or OFF**	Condition
1	OFF	DIP switch 1 – leave at factory setting – ignored by Harmony III zoning system
2	OFF	DIP switch 2 – leave at factory setting – ignored by Harmony III zoning system
3	OFF	DIP switch 3 – leave at factory setting – ignored by Harmony III zoning system
4	ON	DIP switches 4 and 5 determine heating blower “off” delay – recommended 180 seconds
5	ON	

Job Name:		
Indoor Unit Model:		
Outdoor Unit Model:		
Indoor Unit Setup:		
√ Cut on-board link W914 DEHUM OR HARMONY (R to DS) on furnace IFC control (if not cut, fuse will blow in Harmony III zoning system control board) √ W2 connection from Harmony III zoning system to SLP98 is optional – see Harmony III zoning system / furnace installation instructions for details √ DIP switch settings (ON or OFF):		
6	OFF	DIP switches 6 and 7 – leave at factory setting – ignored by Harmony III zoning system
7	OFF	
8		DIP switches 8 and 9 – cooling blower speed – determines maximum system CFM – see G71MPP blower tables)
9		
10		DIP switches 10 and 11–cooling blower adjust–determines maximum system CFM – see G71MPP blower tables
11		
12	OFF	DIP switches 12 and 13 – leave at factory setting – ignored by Harmony III zoning system
13	OFF	
14	OFF	DIP switches 14,15,and16 – sets low fire, minimum capacity, firing rate - DEFAULT SETTING SHOWN and IS RECOMMENDED STARTING POINT– see Harmony III zoning system/furnace install instruction
15	OFF	
16	OFF	
17	OFF	DIP switches 17,18 and 19 – sets high fire, 100% capacity, firing rate - DEFAULT SETTING SHOWN and IS RECOMMENDED STARTING POINT– see Harmony III zoning system/furnace install instruction
18	OFF	
19	OFF	

Panel Setup:		
✓ Heating staging jumper	Circle one: 85 90 100 110 120 130	Recommended 120 deg-F
✓ Zone 1 PIAB 140F DAS jumper in place	Circle one: Yes No	See “1.10.4. Zone 1 PIAB Jumpers – 140ºF DAS” on page 10.
✓ Cooling staging jumper	Circle one: 50 55 60	Select desired discharge air temp during cooling
✓ Cont. Air Reduction jumper	Circle one: 0 25 50 75	Percentage airflow reduction for continuous fan operation
✓ Heating Air Reduction jumper	Circle one: 0 20 40	Percentage air flow reduction for heating mode
✓ System Configuration jumpers	Circle one: HP GAS	Set to GAS
✓ Stages	Circle one: 2COOL 1COOL	Set to match condenser, 1 or 2 stage
✓ Stages	Circle one: 2HP 1HP	Ignored for gas heat, non-heat pump application
✓ E-HEAT Stages	Circle one: DF 1 2 3	Ignored for gas heat, non-heat pump application
✓ Desired total system CFM with all zones calling:	Total system CFM per tables:	Minimum CFM:

✓ Zone 1	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 2	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 3	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 4	Name:	Desired CFM:	PIAB Setting:	Actual CFM:

Field Wiring Checklist		
√	Indoor Unit Wiring Completed:	
		DS” on Harmony III to “DS” on indoor unit connected
		”C” on indoor unit connected to Harmony III zoning system transformer “C”,
		No connection to “Y1” or “Y2” on indoor unit.
√	Outdoor Unit Wiring Completed	
√	Thermostat and damper wiring completed	
√	Discharge Sensor wired to Harmony III zoning system	

3.3.3.2. SL280V, SL280NV, EL296V and SL297NV — Cooling/Heating (Non-Heat Pump)

Job Name:		
Indoor Unit Model:		
Outdoor Unit Model:		
Indoor Unit Setup:		
✓ Cut on-board link W914 DEHUM OR HARMONY (R to DS) on furnace IFC control (if not cut, fuse will blow in Harmony III zoning system control board)		
✓ DIP switch settings (ON or OFF):		
DIP Switch	**ON or OFF**	**Condition**
1	OFF	DIP switch 1 – leave at factory setting – ignored by Harmony III zoning system
2	OFF	DIP switch 2 – leave at factory setting – ignored by Harmony III zoning system
3	ON	DIP switches 3 and 4 – Blower Off Delay Switch Settings, set DIP switches 3 and 4 to ON (180 seconds)
4	ON	DIP switches 4 and 5 determine heating blower “off” delay – recommended 180 seconds
5	OFF	DIP switches 5 and 6 - Cooling Mode Blower Speed, set DIP switches 5 and 6 to OFF (High - Factory)
6	OFF	
7	OFF	DIP Switches 7 and 8 - Cooling Blower Speed Adjustment, set DIP switches 7 and 8 to OFF (Factory Default)
8	OFF	
9	OFF	DIP Switches 9 and 10 - Cooling Mode Blower Speed Ramping, set DIP switches 9 and 10 to OFF (A - Factory)
10	OFF	
11	OFF	DIP Switches 11, 12 and 13 - Heating Mode Blower Speed, set DIP switches 11, 12 and 13 to OFF (Factory Default)
12	OFF	
13	OFF	
14	OFF	DIP Switches 14 and 15 - Continuous Blower Speed, set DIP switches 14 and 15 to OFF (38% of High Cool Speed - Factory Default)
15	OFF	

Panel Setup:		
✓ Heating staging jumper	Circle one: 85 90 100 110 120 130	Recommended 120 deg-F
✓ Zone 1 PIAB 140F DAS jumper in place	Circle one: Yes No	See "1.10.4. Zone 1 PIAB Jumpers – 140ºF DAS" on page 10.
✓ Cooling staging jumper	Circle one: 50 55 60	Select desired discharge air temp during cooling
✓ Cont. Air Reduction jumper	Circle one: 0 25 50 75	Percentage airflow reduction for continuous fan operation
✓ Heating Air Reduction jumper	Circle one: 0 20 40	Percentage air flow reduction for heating mode
✓ System Configuration jumpers	Circle one: HP GAS	Set to GAS
✓ Stages	Circle one: 2COOL 1COOL	Set to match condenser, 1 or 2 stage
✓ Stages	Circle one: 2HP 1HP	Ignored for gas heat, non-heat pump application
✓ E-HEAT Stages	Circle one: DF 1 2 3	Ignored for gas heat, non-heat pump application
✓ Desired total system CFM with all zones calling:	Total system CFM per tables:	Minimum CFM:

✓ Zone 1	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 2	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 3	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 4	Name:	Desired CFM:	PIAB Setting:	Actual CFM:

Field Wiring Checklist		
√	Indoor Unit Wiring Completed:	
		DS" on Harmony III to "DS" on indoor unit connected
		"C" on indoor unit connected to Harmony III transformer "C",
		No connection to "**Y1**" or "**Y2**" on indoor unit.
√	Outdoor Unit Wiring Completed	
√	Thermostat and Damper Wiring Completed	
√	Discharge Sensor wired to Harmony III zoning system	

3.3.4. Zone Control Operation in a Gas Furnace System

This section describes the operation of the zone control in a system that uses a gas furnace.

3.3.4.1. Zone Thermostats

Only electronic thermostats with a **C** terminal may be used with the zone control system. The zone control system distinguishes between heat pump and heat/cool applications via the SYSTEM jumper placement on the zone control panel.

1. **Cool / Heat / Auto-Changeover Modes** — Zone thermostats send a heating or cooling signal to the zone control panel. Thermostat servicing zone 1 is the central control thermostat. Zones 2, 3 and 4 each have their own thermostat. Thermostats may be standard or auto-changeover type.

   Heat and cool demands present at the same time from different zones (opposing demands) are satisfied on a first come first served basis. If a heating demand and a cooling demand reach the zone control panel at the same time, the heating demand is satisfied first. If opposing demands persist, the system will work to satisfy the current demand for a maximum of 20 minutes, then switch over and try to satisfy the opposing demand for a maximum of 20 minutes. When either demand is satisfied, the system works to satisfy the other demand.

NOTE: *Allowing opposing demands to persist may consume excess energy. If this condition continues, check the installation (i.e. zone arrangement, supply registers, return registers, zone loads etc.) and make adjustments as necessary. "Table 14. Time Delays" on page 60 shows the time delays that may be expected when opposing demands are received from the zone thermostats.*

   The zone control system acknowledges a new or opposing demand as soon as it is received by illuminating that zone's thermostat input lights. If the first demand is not satisfied by the time the delays elapse, the system switches over and begins satisfying the opposing demand. During the switch-over, a delay may be imposed before the system begins satisfying the new demand.

2. **Fan On / Auto Mode** — Zone thermostats can send a continuous fan signal to the zone control system. The zone control system will signal the blower to supply air to zones calling for continuous fan while no other conditioning calls exist. When the zone control system receives a conditioning call while satisfying a demand for continuous fan, it signals the damper controlling the continuous-fan zone to close. After the conditioning demand is satisfied, the continuous-fan zone damper is signaled to reopen.

3.3.4.2. Balance Point Setting

(Dual Fuel Systems) Balance Point Sensor (kit 10Z23) communicates with the zone control panel whether or not to force the Gas Furnace to satisfy heating demands, based on a comparison of the Balance Point setting with the outdoor temperature. Terminals 2-3 close on temperature fall to lock out heat pump.

3.3.4.3. Zone Mode

The zone control mode (Vacation switch OFF) utilizes the zone control system's full potential. While in this mode, the zone control system will respond to demands from any zone, controlling dampers and regulating blower CFM to maintain comfort. When the system is in zone mode, the zone control system responds to demands from any zone thermostat.

The only OPEN supply-air dampers are those zones from which a demand was received; all other dampers are CLOSED. The blower operates at a speed based on the position of the Zone PIAB selection jumpers (and the heating air reduction jumper, if a call for heat is present).

NOTE: *To ensure that the zone control performs optimally, avoid mixing air between the zones.*

3.3.4.4. Central (Vacation) Mode

When in central mode (Vacation switch ON), the system responds only to heating or cooling demands from the central control (Zone 1) thermostat; all zones will receive conditioned air. All dampers remain open and the blower operates at full speed (minus the amount selected by the heating air reduction jumper).

In Fan-Auto mode, the blower will cycle on and off with each demand. During gas or electric-strip heating, the blower may continue after the end of a demand until the heater is cooled sufficiently.

3.3.4.5. Cooling Operation

When the Harmony III™ zoning system receives a thermostat cooling call, the following events occur:

- The zone control checks to make sure it has been at least five minutes since the last cooling call ended to prevent starting against high head pressures.
- When timed-off delay is satisfied, the zone control starts the outdoor unit with 1st-stage compressor and slowly increases the indoor blower speed to achieve proper CFM. Four minutes must elapse at this state to allow the system to reach steady-state operation before staging again.
- The zone control checks the discharge air sensor for proper temperature. If measured temperature is 7ºF or more above the cooling staging jumper setting, then **Y2** energizes (if available). If both stages of cooling are energized and 4 minutes has elapsed since the last staging event, and the discharge air sensor (DAS) detects a temperature less than the cooling staging jumper, then **Y2** is staged off.
- If, at any time, the discharge air sensor measures a temperature of 45ºF or below, the zone control de-energizes the **Y1** and/or **Y2** output, stopping the compressor and preventing the indoor coil from freezing up. The compressor will not be energized again until the temperature at the DAS rises by 10ºF and the timed-off delay expires. During this time, continuous fan is supplied to the zones calling for cooling.

3.3.5.

3.3.6. Installation Setup Worksheets for Honeywell 2-Stage IFC Control — Cooling/Heating (Non-Heat Pump)

Job Name:		
Indoor Unit Model:		
Outdoor Unit Model:		
Indoor Unit Setup:		
✓ Cut on-board link W914 DEHUM OR HARMONY (**R** to **DS**) on furnace IFC control (if not cut, fuse will blow in Harmony III zoning system control board). ✓ Cut and tape wires from pin # 2 and pin #13 on plug J46 of the variable speed motor wiring harness routed from the motor to the furnace Integrated control (IFC). ✓ Furnace IFC Control DIP switch settings (ON or OFF):		
DIP Switch	**ON or OFF**	Condition
1	OFF	DIP switch 1 must be set to Off for 2-stage heating operation
2	OFF	DIP switch 2 determines 2nd stage heat time delay and is ignored by Harmony III zoning system
3	ON	DIP switches 3 and 4 determines heating blower off delay, recommended is 180 sec
4	ON	
5		DIP switches 5 and 6 determines 2nd stage cooling blower speed or maximum system air vol.
6		
7		DIP switches 7 and 8 determine blower "adjust" setting for maximum system air volume
8		
9	OFF	DIP switches 9 and 10 determines cooling blower ramping profile and is ignored by Harmony III zoning system
10	OFF	
11	OFF	DIP switches 11 and 12 determines heating blower speed and is ignored by Harmony III zoning system
12	ON	

Panel Setup:		
✓ Heating staging jumper	Circle one: 85 90 100 110 120 130	Recommended 120 deg-F
✓ Zone 1 PIAB 140F DAS jumper in place	Circle one: Yes No	See “1.10.4. Zone 1 PIAB Jumpers – 140ºF DAS” on page 10.
✓ Cooling staging jumper	Circle one: 50 55 60	Select desired discharge air temp during cooling
✓ Cont. Air Reduction jumper	Circle one: 0 25 50 75	Percentage airflow reduction for continuous fan operation
✓ Heating Air Reduction jumper	Circle one: 0 20 40	Percentage air flow reduction for heating mode
✓ System Configuration jumpers	Circle one: HP GAS	Set to GAS
✓ Stages	Circle one: 2COOL 1COOL	Set to match condenser, 1 or 2 stage
✓ Stages	Circle one: 2HP 1HP	Ignored for gas heat, non-heat pump application
✓ E-HEAT Stages	Circle one: DF 1 2 3	Ignored for gas heat, non-heat pump application
✓ Desired total system CFM with all zones calling:	Total system CFM per tables:	Minimum CFM:

✓ Zone 1	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 2	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 3	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 4	Name:	Desired CFM:	PIAB Setting:	Actual CFM:

Field Wiring Checklist		
√	Indoor Unit Wiring Completed:	
		DS on Harmony III to **DS** on indoor unit connected
		C on indoor unit connected to Harmony III transformer **C**
		No connection to **Y1** or **Y2** on indoor unit.
√	Outdoor Unit Wiring Completed	
√	Thermostat and Damper Wiring Completed	
√	Discharge sensor wired to Harmony III zoning system	

3.4. Furnace System Start-Up and Checkout

IMPORTANT

The zone control system power-up must occur at the same time or before the furnace or air handler unit is powered up.

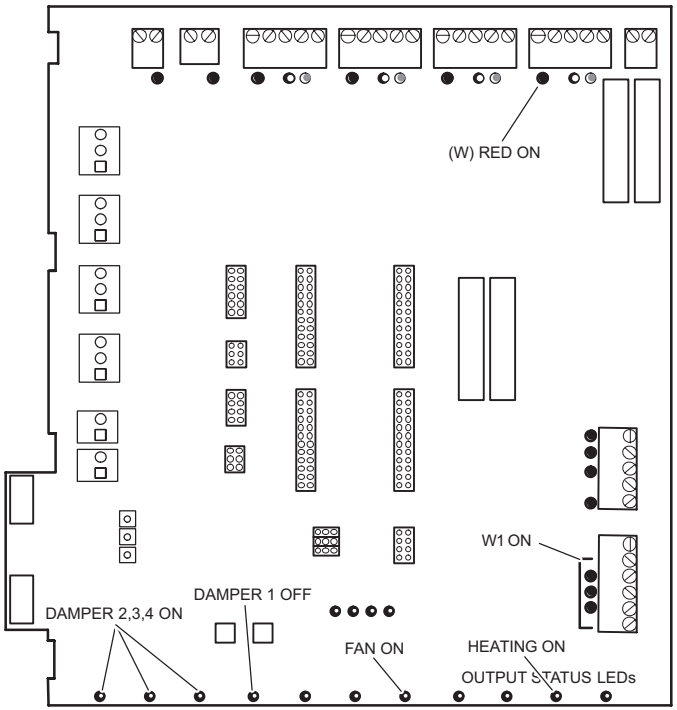
3.4.1. Start-Up the System (All Models)

1. Adjust all thermostat settings so that no demand will occur.
2. Apply power to the zone panel transformer and to the air handler and observe the following: all four diagnostic LEDs will light; then each individual diagnostic LED will light in sequence; then all four diagnostic LEDs will light and extinguish.
3. Finally, the status light will begin to flash, indicating proper operation. Perform gas heating checks.

3.4.2. Checkouts

3.4.2.1. Typical Gas Heating Checkout (Single Zone)

Prerequisites: Zone 1 thermostat set to heat.



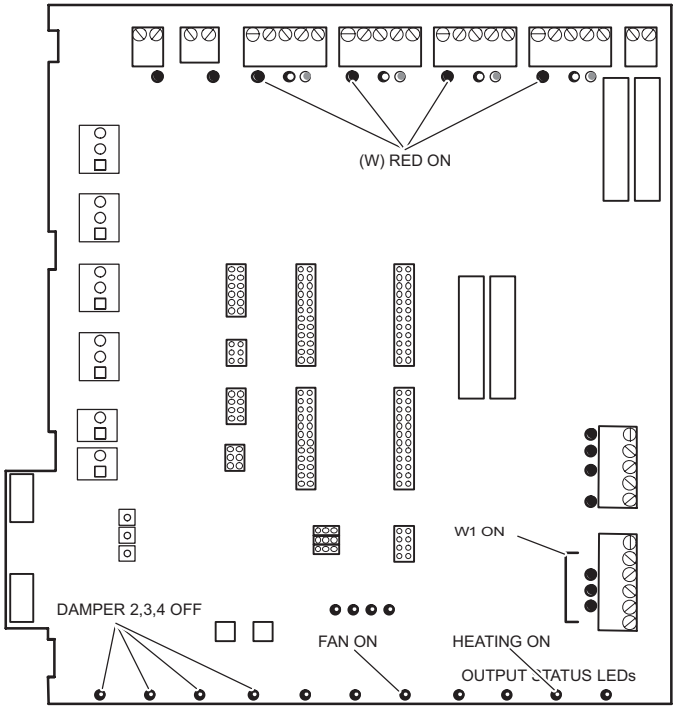
1. Set zone 1 thermostat for a heat demand; check:
   - Zone 1 thermostat **W** LED on (heating demand).
   - Damper LED 1 off (damper open).
   - Damper LEDs 2, 3, and 4 on (dampers closed).
   - Output Heat **W1** LED on (furnace on).
   - Heating LED on.

   The furnace begins ignition sequence after zone 1 has demanded heat. The zone control system will start the furnace blower on low speed (0 PIAB) 45 seconds after the combustion cycle has begun. .
2. When 100ºF warm air is sensed by the discharge air sensor, the fan LED will light and the blower will slowly increase to speed required by the zone calling. The blower operates at speed setting of PIAB jumper for zone 1 and the jumper for heating air reduction. It may require 60 - 90 seconds to reach this speed.
3. Set zone 1 thermostat for NO heat demand; check:
   - Zone 1 thermostat W LED off (no heat demand).
   - Output Heat **W1** LED off.
   - Fan LED off.
   - Heating LED off.
   - Damper LEDs 2-4 remain on until after 3-1/2 minute purge; then off.

   To check the amount of air being delivered to each zone and to confirm that each individual zone damper functions properly, repeat these steps for zones 2 - 4.

3.4.2.2. Typical Gas Heating Checkout (Multiple Zone)

Prerequisites: All zone thermostats set to heat.



1. Apply heating demand to all thermostats.

- All zone thermostat **W** LEDs on (heat demands)
- LEDs dampers 1 - 4 off (all dampers open)
- Output Heat LED **W1** on (furnace on)
- Heating LEDs on

The furnace begins ignition sequence after a heat demand is detected. The zone control system will start the furnace blower on low speed (0 PIAB) 45 seconds after the combustion cycle has begun.

2. When 100ºF warm air is sensed by the discharge air sensor, the fan LED comes on and the blower will slowly increase to speed required by the zones calling. The blower operates at a speed equivalent to the sum of all zone PIAB jumpers but at a maximum not to exceed the setting of the heating air reduction jumper. It may take the blower 60 to 90 seconds to reach this speed.

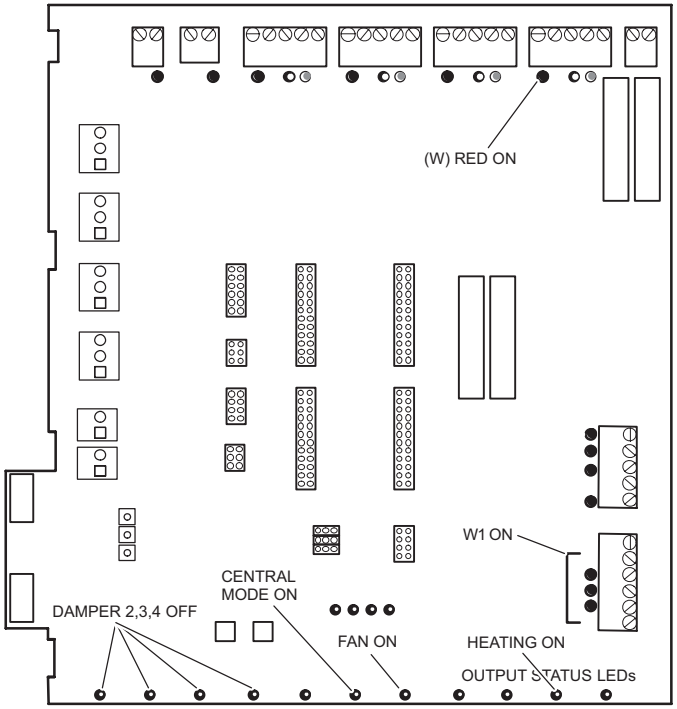
3. Set all zone thermostats for NO heat demands; check:

- Output Heat **W1** LED off
- Heating LED off
- Fan LED off (blower turns off after delay)
- All zone thermostat **W** LEDs off
- Damper LEDs - Last zone thermostat demand removed: LED is off (this zone's damper remains open during 3-1/2 minute purge); other zones damper LEDs are on during the 3-1/2 minute purge (dampers closed). After 3-1/2 minute delay, all dampers LEDs go off (dampers open).

3.4.2.3. Typical Gas Heating Checkout (Central Mode)

Prerequisites:

- Central mode switch on
- Red LED on the central mode fan switch on.



1. Set zone 1 thermostat for a heat demand; check:
   - Zone 1 thermostat **W** LED on (heating demand).
   - Output Heat **Y1** LED on (furnace on).
   - Heating LED on.
   - All damper LEDs off (dampers open).
2. The furnace will begin its ignition sequence after Zone 1 has demanded heat. The zone control system will start the furnace blower on low speed (0 PIAB air) 45 seconds after the combustion cycle has begun.
3. When 100ºF warm air is sensed by the discharge air sensor, the fan LED will light and the blower will slowly increase to speed. The blower will operate at a speed equivalent to the PIAB calculated for all zones calling, taking into account the heating air reduction jumper position. It may take the blower 60 to 90 seconds to reach this speed.
4. Remove the heat demand from zone 1 (no heat input or output and no blower demand). Upon removal of the demand from zone 1, check:
   - Zone 1 thermostat **W** LED off (no heat demand).
   - Output Heat **W1** LED off.
   - Fan and Heating LEDs off.

3.5. Zoning System with Gas Furnace Troubleshooting - Option 1

3.5.1. Troubleshooting Diagrams

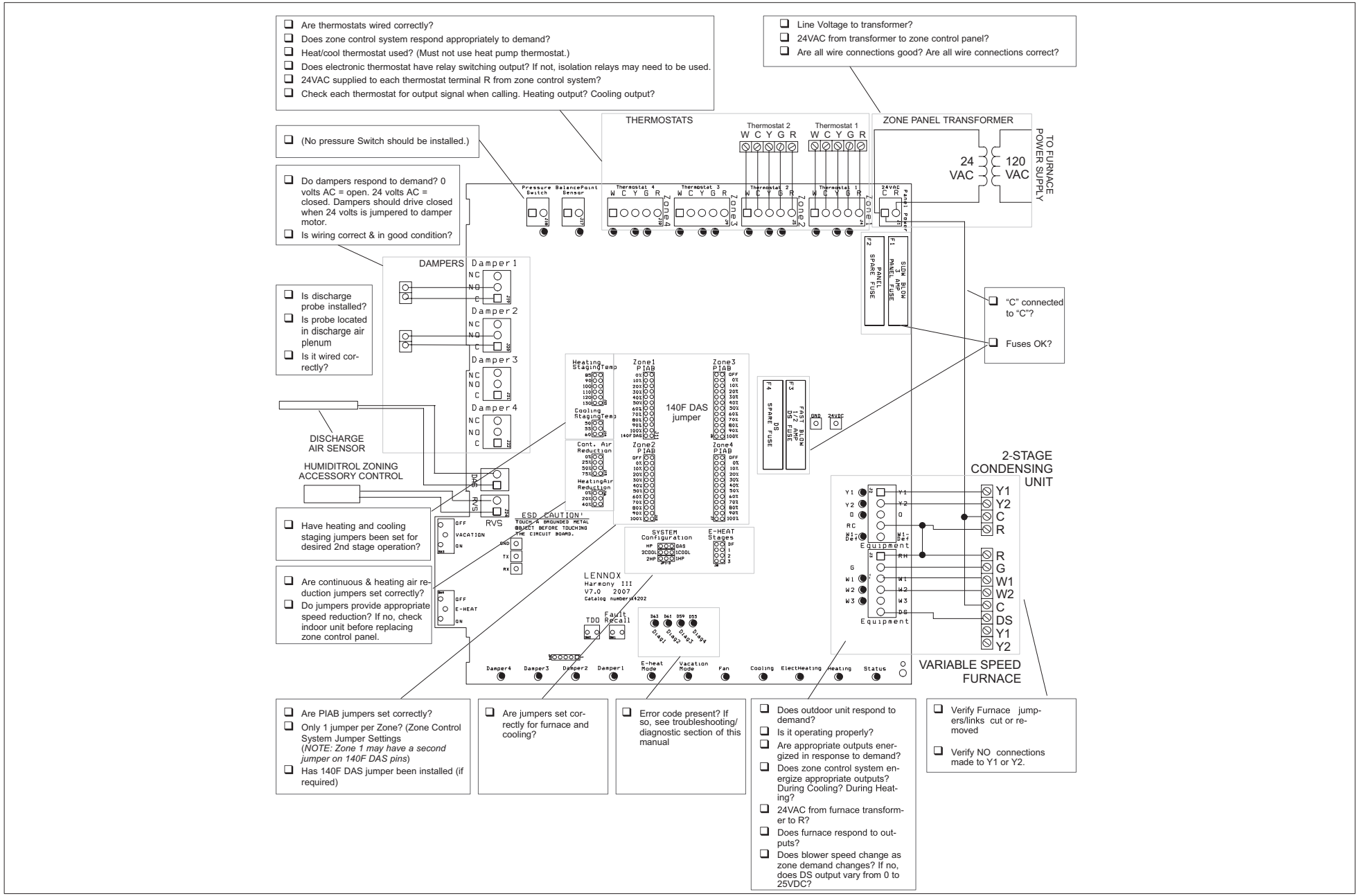


Figure 24. Integrated Control Cable Modifications for Furnaces (Two Stages)

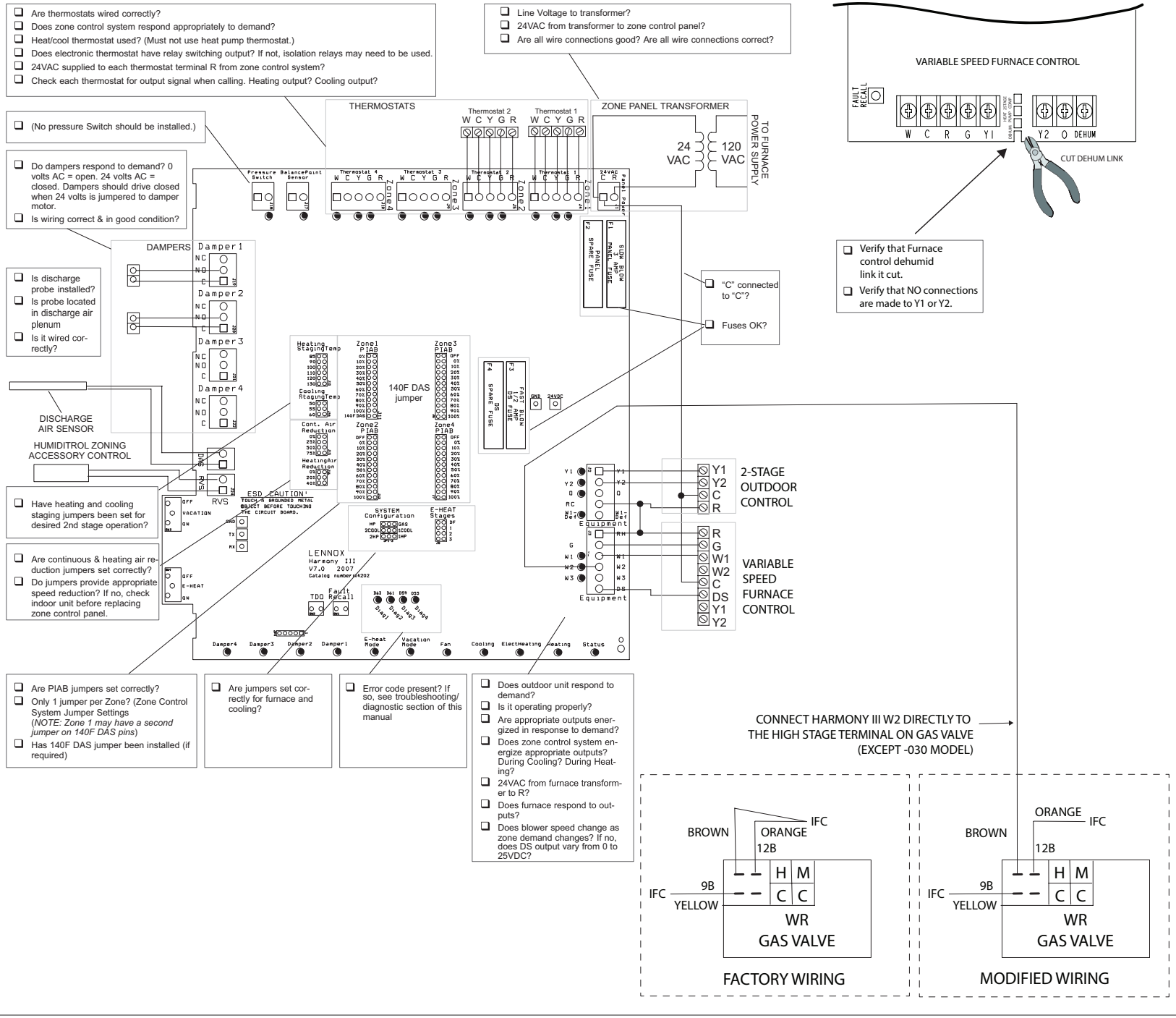
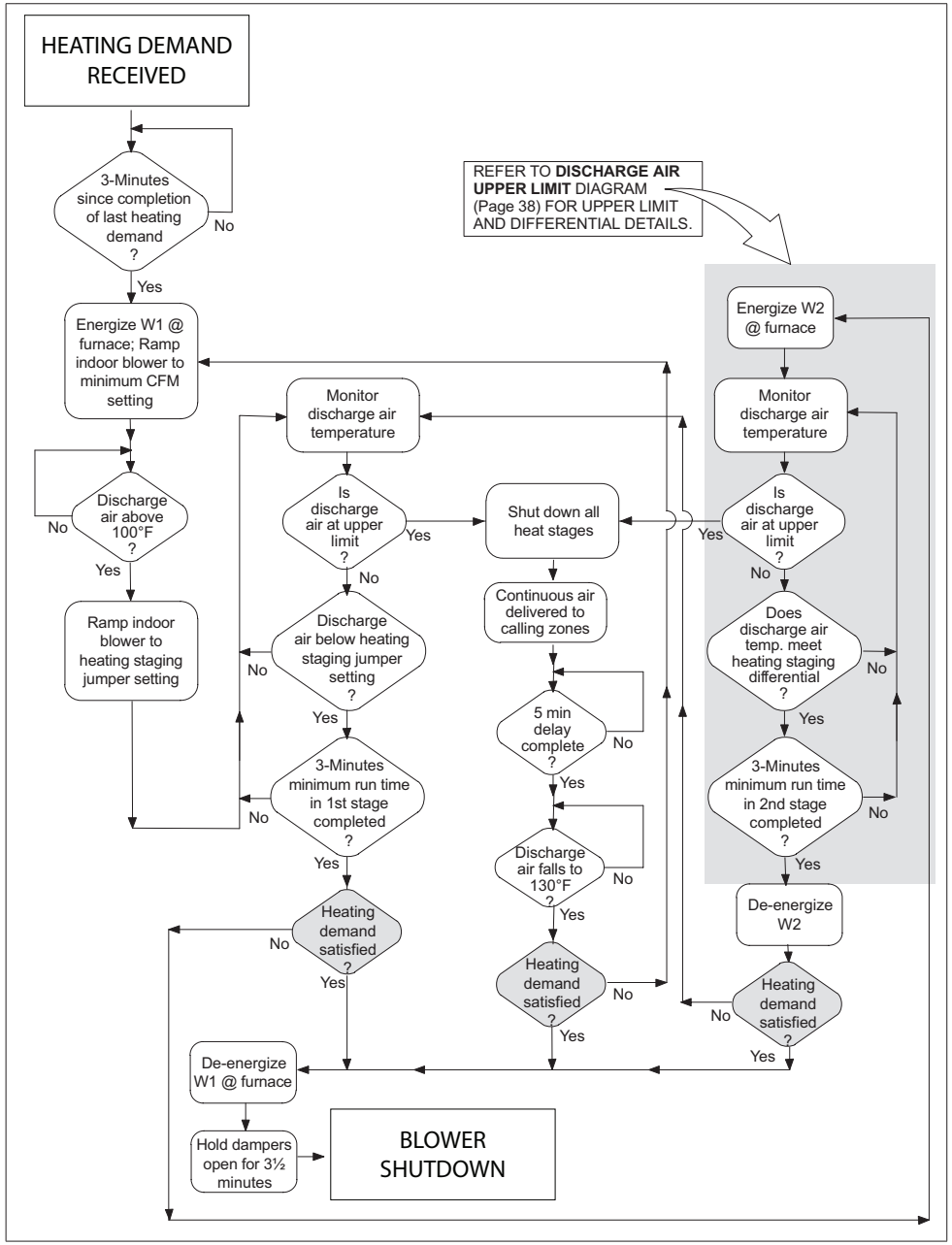
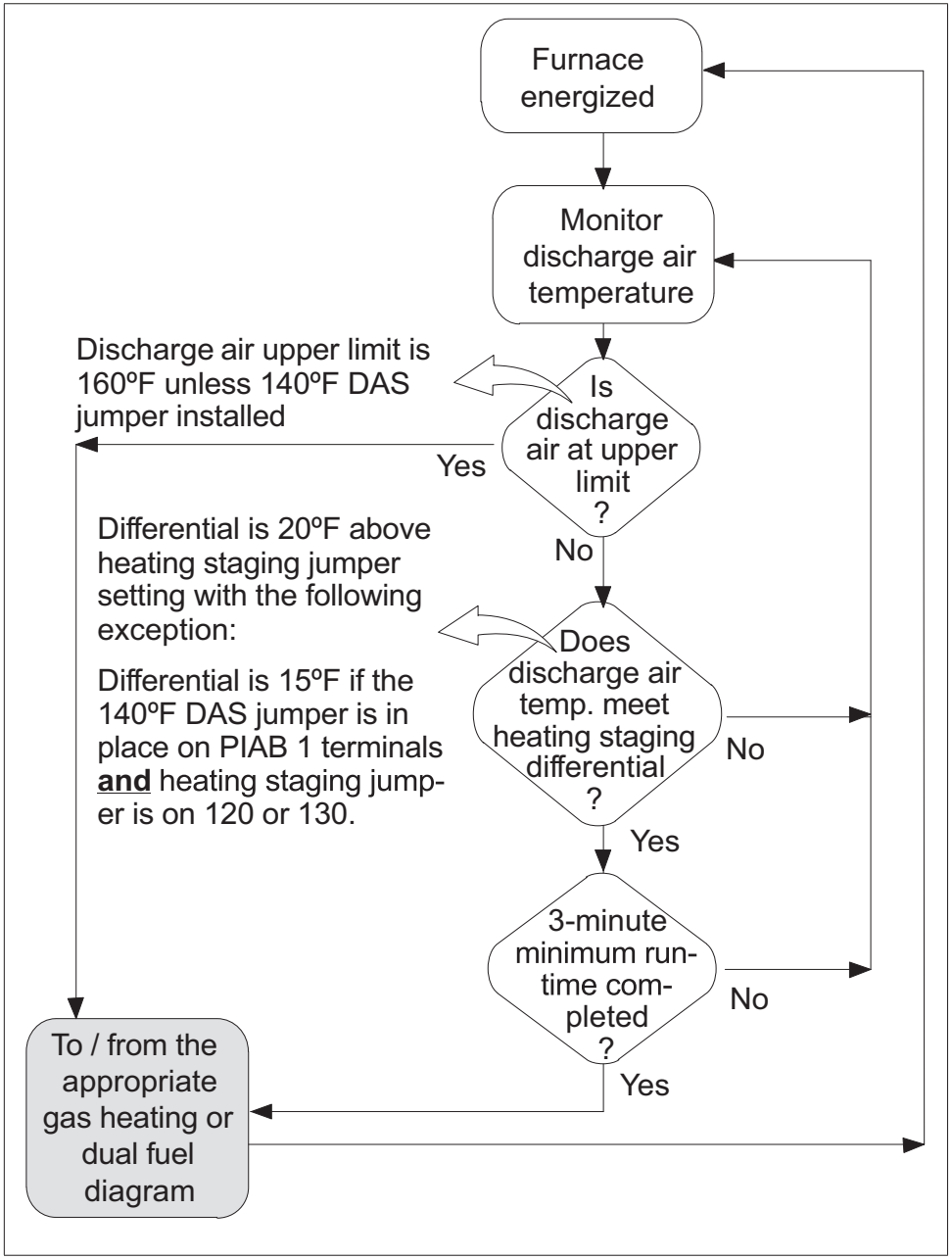


Figure 25. Integrated Control Cable Modifications for Furnaces - ML180UHV Models Only

3.5.2. Gas Heating Operation



3.5.3. Discharge Air Upper Limit and Differential Temperatures



4. Air Handlers

4.1. Variations on Common AC Unit Applications

4.1.1. Heating/Cooling Equipment Installation

Follow all equipment installation instructions provided with each unit.

4.1.2. Air Handler Wiring

After the air handler unit is installed, field wire the line voltage as shown in the installation instructions provided with the unit. Use thermostat wire to connect the air handler to the zone control panel and to connect wire from zone control panel 24V **C** to air handler terminal strip **C** (24VAC common) blue wire in CBX25UHV air handler..

NOTE: *Be sure to remove the factory installed jumper bar between **W1** to **W2** and **W2** to **W3** (CBA38MV, CBX40 or CBX32MV rev 06) or remove the jumper wires between **R** to **W1** and **R** to **W2** (CBX32MV prior to rev 06). CBX25UHV does not have any factory jumpers.*

4.1.3. Variations

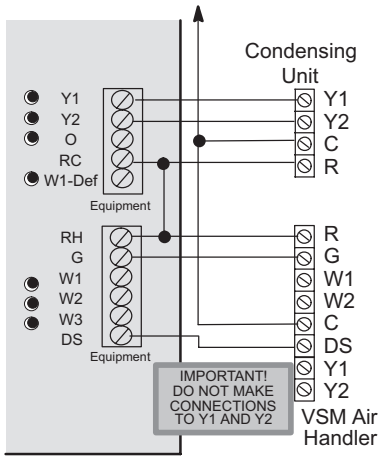
Several variations may be required for specific applications. The following figure shows alternate wiring and describes specific jumper configurations and other special modifications required for each variation.

COOLING ONLY

- System configuration jumpers:
  GAS;
  1COOL or 2COOL;
  Others do not matter.
- As applicable, cut jumpers and harness wires

HEATING ONLY

NOTE - JUMPER between RC and RH must be in place on the control!



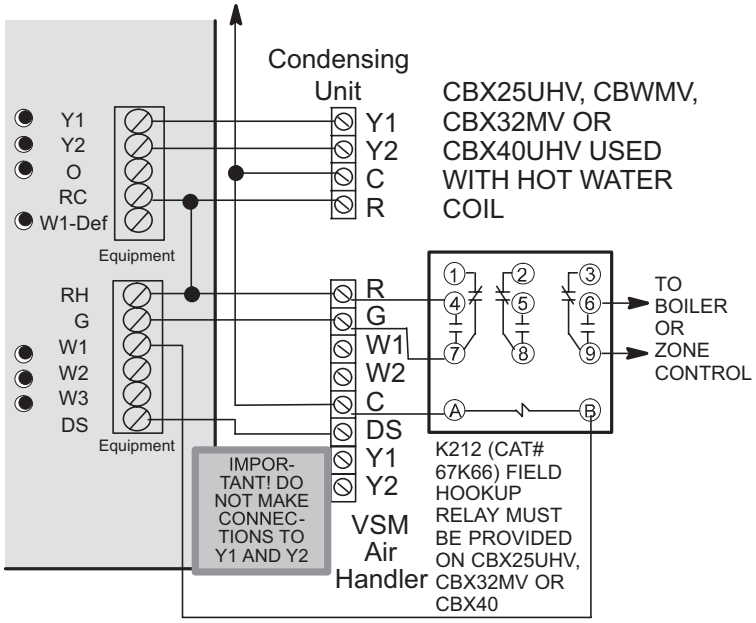
For any option or variation, connect thermostat wire between “C” on terminal strip(s) of controlled equipment and zone control

Figure 26. Cooling Only

- System configuration jumpers:
  GAS;
  1COOL or 2COOL;
  Others do not matter.
- AHC (prior to revision 06): Cut or remove 24 volt jumper Y1 to DS.
- AHC (revision 06): Cut R to DS clippable link on air handler control.
- CBWMV has no K20 relay, therefore wiring harness modification is not required.
  - Cut or remove 24v jumper Jumper Y1 to DS
  - Remove Pink wire from TB1-W1 to J46-2 on CBWMV
- CBX25UHV does not have factory jumper between R to DS.

NOTE - K212 field hookup relay must be field provided on the CBX25UHV, CBX32MV and CBX40UHV

NOTE - DAS must be located downstream of the cooling coil and HW coil



For any option or variation, connect thermostat wire between “C” on terminal strip(s) of controlled equipment and zone control

Figure 27. Hot Water Coil and Current Lennox Air Handlers

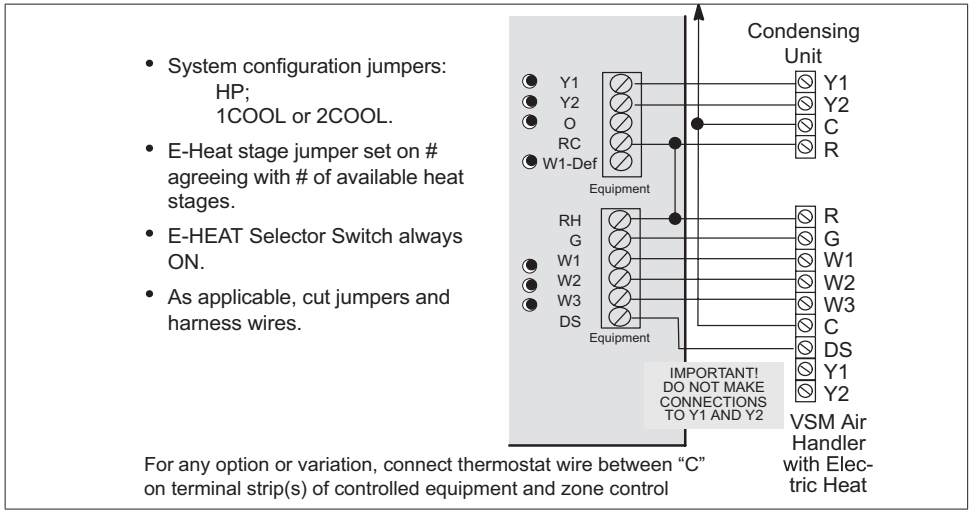


Figure 28. Cooling with Electric Heat

4.2. Electrical Adjustments

4.2.1. Communicating Indoor Control

As illustrated in the following diagram, make the following adjustments:

1. Cut on-board link **R** to **DS** (Dehum or Harmony).
2. Remove jump bars from **W1** to **W2** and **W2** to **W3**.
3. DO NOT CUT on-board links **Y1**-Y**2 2 STAGE COMPR** and **R-O HEAT PUMP**.

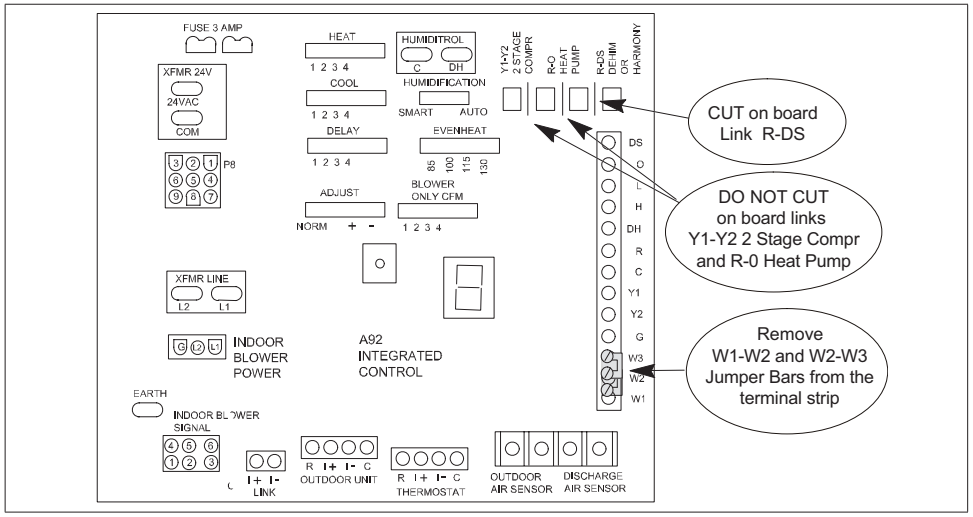


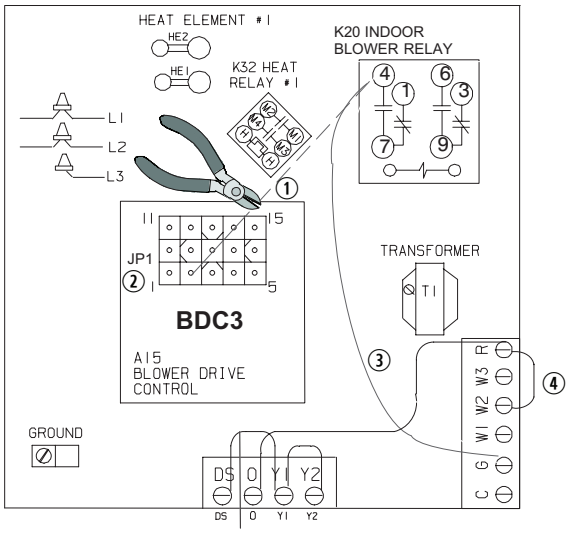
Figure 29. Electrical Adjustments for Air Handler Control CBX32MV (revision 06) and CBX40UHV

4.2.2. Non-Communicating Indoor Control

These air handler blower motors are controlled by the BDC3 drive control; CFM adjustment Is by jumper setting selection.

Locate the BDC3 board in the blower control box. Before connecting the zone control panel to the BDC3 board, complete all of the applicable electrical adjustments as shown in the following figure.

NOTE: *Before cutting wires or jumpers, be sure your installation is not affected by "4.1. Variations on Common AC Unit Applications" on page 39.*



Electrical Adjustments

As shown in this diagram, make the following adjustments:

In all cases except "Cooling Only" or CBWMV units:

① Cut wire near the BDC3 board JP1 pin 2

② Tape exposed end of short JP1 pin 2 wire

③ Re-route wire connected to K20 terminal 4; strip end and connect to terminal "G" (K20 wiring change not required on CBWMV)

If CBWMV, remove pink wire TB1-W1 to J46-2

④ Except for cooling onloy units, remove any jumper between R-W2 and R-W3

DO NOT CUT jumper R - O

DO NOT CUT Jumper Y1 - Y2

In all cases, CUT Jumper DS - Y1

Figure 30. Electrical Adjustments for Air Handler Control CBX32MV (pre-rev. 06) and CBWMV

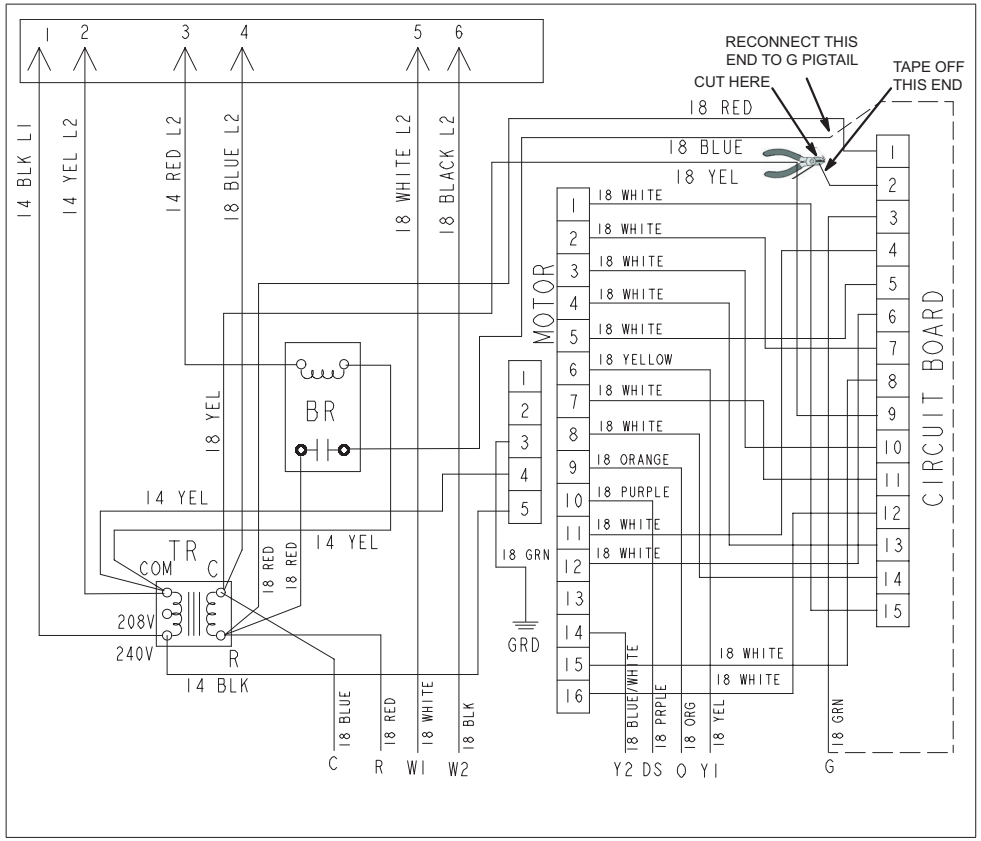


Figure 31. Electrical Adjustments for Air Handler Control CBX25UHV

As shown in the figure above, make the following adjustments:

- Blue wire that goes between plug # 2 of the circuit board and one side of the contacts on the BR relay must be removed and connected to the **G** pigtail. Tape off end of wiring going to the circuit board jack plug. If this wire is not removed, the **DS** signal from the Harmony III zoning system control will not be able to vary the speed of the indoor blower motor.
- Connection from BR relay to **G** required to provide blower operation during electric heat sequencer shutoff time period after demand ends. Otherwise electric heat can remain on for a period without blower operation and trip one shot thermal limits on elements.

4.2.3. Installation Worksheets

4.2.3.1. Cooling/Heating with Electric Strip Heat (Non-Heat Pump)

Job Name:
Indoor Unit Model:
Outdoor Unit Model:

CBX32MV, Rev 6 or higher, CBX40UHV and CBA38MV Indoor Unit Setup:		
✓ Cut on-board link R to DS “DEHUM or HARMONY”		
✓ Remove any factory-installed jumpers bars from **W1** to **W2** or **W2** to **W3**.		
✓ Air handler control jumper settings:		
Function	**Settings**	Condition
COOL		This setting, along w/ ADJUST setting, determines maximum system CFM (See blower tables)
ADJUST		Setting affects both heating and cooling blower speeds (see blower tables to determine setting)
HEAT	HIGH	Heating blower speed selection – Ignored by Harmony III zoning system
DELAY	4	Cooling blower ramping – Ignored by Harmony III zoning system
BLOWER ONLY CFM		Continuous fan speed – Ignored by Harmony III zoning system
EVENHEAT		EVENHEAT is not used with Harmony III zoning system

Panel Setup:		
✓ Heating staging jumper	Circle one: 85 90 100 110 120 130	Recommended 120 deg-F
✓ Zone 1 PIAB 140F DAS jumper in place	Circle one: Yes No	See “1.10.4. Zone 1 PIAB Jumpers – 140ºF DAS” on page 10.
✓ Cooling staging jumper	Circle one: 50 55 60	Select desired discharge air temp during cooling
✓ Cont. Air Reduction jumper	Circle one: 0 25 50 75	Percentage airflow reduction for continuous fan operation
✓ Heating Air Reduction jumper	Circle one: 0 20 40	Percentage air flow reduction for heating mode
✓ System Configuration jumpers	Circle one: HP GAS	Set to GAS
✓ Stages	Circle one: 2COOL 1COOL	Set to match condenser, 1 or 2 stage
✓ Stages	Circle one: 2HP 1HP	Ignored for gas heat, non-heat pump application
✓ E-HEAT Stages	Circle one: DF 1 2 3	Ignored for gas heat, non-heat pump application
✓ Desired total system CFM with all zones calling:	Total system CFM per tables:	Minimum CFM:

✓ Zone 1	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 2	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 3	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 4	Name:	Desired CFM:	PIAB Setting:	Actual CFM:

Field Wiring Checklist		
√	Indoor Unit Wiring Completed:	
	☐	**DS** on Harmony III to **DS** on indoor unit connected
	☐	**C** on indoor unit connected to Harmony III transformer **C**,
	☐	No connection to **Y1** or **Y2** on indoor unit.
√	Outdoor Unit Wiring Completed	
√	Thermostat and Damper Wiring Completed	
√	Discharge Sensor wired to Harmony III zoning system	

Job Name:
Indoor Unit Model:
Outdoor Unit Model:

CBX25UHV (all units) and CBX32MV units prior to Revision 06 Indoor Unit Setup:
✓ Remove DS to **Y1** jumper"
✓ No jumper between **DS** and **Y1** on CBX25UHV
✓ On the CBX32MV the wire from K20 terminal 4 to BDC3 board JP1 pin 2 must be re-routed to establish an electrical connection between K20 terminal 4 and terminal **G**. Cut the wire near JP1 pin 2.
✓ Using the wire still connected to K20 terminal 4, strip the cut end and connect it to terminal **G**. Tape the exposed end of the short JP1pin 2 wire.
✓ On the CBX25UHV the blue wire that goes between plug # 2 of the circuit board and one side of the contacts on the BR relay must be removed and connected to the **G** pigtail. Tape off end of wire going to the circuit board jack plug.
✓ Remove any factory-installed jumpers between terminal **R** and **W1**, **W2**, or **W3**. No jumper between **R** and **W1** or **W2** on CBX25UHV.
✓ BDC3 control clip jumper settings (CBX25UHV and CBX32MV):

Function	**Settings**	Condition
COOL		This setting, along w/ ADJUST setting, determines maximum system CFM (See blower tables)
ADJUST		Setting affects both heating and cooling blower speeds (see blower tables to determine setting)
HEAT	HIGH	Heating blower speed selection – Ignored by Harmony III zoning system
DELAY	4	Cooling blower ramping – Ignored by Harmony III zoning system

Panel Setup:		
✓ Heating staging jumper	Circle one: 85 90 100 110 120 130	Recommended 120 deg-F
✓ Zone 1 PIAB 140F DAS jumper in place	Circle one: Yes No	See "1.10.4. Zone 1 PIAB Jumpers – 140ºF DAS" on page 10.
✓ Cooling staging jumper	Circle one: 50 55 60	Select desired discharge air temp during cooling
✓ Cont. Air Reduction jumper	Circle one: 0 25 50 75	Percentage airflow reduction for continuous fan operation
✓ Heating Air Reduction jumper	Circle one: 0 20 40	Percentage air flow reduction for heating mode
✓ System Configuration jumpers	Circle one: HP GAS	Set to GAS
✓ Stages	Circle one: 2COOL 1COOL	Set to match condenser, 1 or 2 stage
✓ Stages	Circle one: 2HP 1HP	Ignored for gas heat, non-heat pump application
✓ E-HEAT Stages	Circle one: DF 1 2 3	Ignored for gas heat, non-heat pump application
✓ Desired total system CFM with all zones calling:	Total system CFM per tables:	Minimum CFM:

✓ Zone 1	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 2	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 3	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 4	Name:	Desired CFM:	PIAB Setting:	Actual CFM:

Field Wiring Checklist		
√	Indoor Unit Wiring Completed:	
		DS on Harmony III to **DS** on indoor unit connected
		C on indoor unit connected to Harmony III transformer **C**,
		No connection to **Y1** or **Y2** on indoor unit.
√	Outdoor Unit Wiring Completed	
√	Thermostat and Damper Wiring Completed	
√	Discharge Sensor wired to Harmony III zoning system	

4.2.3.2. Heat Pump — Electric Strip Heat

Job Name:
Indoor Unit Model:
Outdoor Unit Model:

CBX32MV, Rev 6 or higher, CBX40UHV and CBA38MV Indoor Unit Setup:		
✓ Cut on-board link **R** to **DS** "DEHUM or HARMONY"		
✓ Remove any factory-installed jumpers bars from **W1** to **W2** or **W2** to **W3**.		
✓ Air handler control jumper settings:		
Function	**Settings**	Condition
COOL		This setting, along w/ ADJUST setting, determines maximum system CFM (See blower tables)
ADJUST		Setting affects both heating and cooling blower speeds (see blower tables to determine setting)
HEAT	HIGH	Heating blower speed selection – Ignored by Harmony III zoning system
DELAY	4	Cooling blower ramping – Ignored by Harmony III zoning system
BLOWER ONLY CFM		Continuous fan speed – Ignored by Harmony III zoning system
EVENHEAT		EVENHEAT is not used with Harmony III zoning system

Panel Setup:		
✓ Heating staging jumper	Circle one: 85 90 100 110 120 130	Recommended 120 deg-F
✓ Zone 1 PIAB 140F DAS jumper in place	Circle one: Yes No	See "1.10.4. Zone 1 PIAB Jumpers – 140ºF DAS" on page 10.
✓ Cooling staging jumper	Circle one: 50 55 60	Select desired discharge air temp during cooling
✓ Cont. Air Reduction jumper	Circle one: 0 25 50 75	Percentage airflow reduction for continuous fan operation
✓ Heating Air Reduction jumper	Circle one: 0 20 40	Percentage air flow reduction for heating mode
✓ System Configuration jumpers	Circle one: HP GAS	Set to GAS
✓ Stages	Circle one: 2COOL 1COOL	Set to match condenser, 1 or 2 stage
✓ Stages	Circle one: 2HP 1HP	Ignored for gas heat, non-heat pump application
✓ E-HEAT Stages	Circle one: DF 1 2 3	Ignored for gas heat, non-heat pump application
✓ Desired total system CFM with all zones calling:	Total system CFM per tables:	Minimum CFM:

✓ Zone 1	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 2	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 3	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 4	Name:	Desired CFM:	PIAB Setting:	Actual CFM:

Field Wiring Checklist		
√	Indoor Unit Wiring Completed:	
	☐	**DS** on Harmony III to **DS** on indoor unit connected
	☐	**C** on indoor unit connected to Harmony III transformer **C**.
	☐	No connection to **Y1** or **Y2** on indoor unit.
√	Outdoor Unit Wiring Completed	
√	Thermostat and Damper Wiring Completed	
√	Discharge Sensor wired to Harmony III zoning system	

Job Name:
Indoor Unit Model:
Outdoor Unit Model:

CBX25UHV (all units) and CBX32MV units prior to Revision 06 Indoor Unit Setup:		
✓ Remove **DS** to **Y1** jumper"		
✓ No jumper between **DS** and **Y1** on CBX25UHV		
✓ On the CBX32MV the wire from K20 terminal 4 to BDC3 board JP1 pin 2 must be re-routed to establish an electrical connection between K20 terminal 4 and terminal **G.** Cut the wire near JP1 pin 2.		
✓ Using the wire still connected to K20 terminal 4, strip the cut end and connect it to terminal **G**. Tape the exposed end of the short JP1pin 2 wire.		
✓ On the CBX25UHV the blue wire that goes between plug # 2 of the circuit board and one side of the contacts on the BR relay must be removed and connected to the **G** pigtail. Tape off end of wire going to the circuit board jack plug.		
✓ Remove any factory-installed jumpers between terminal **R** and **W1**, **W2**, or **W3**. No jumper between **R** and **W1** or **W2** on CBX25UHV.		
✓ BDC3 control clip jumper settings (CBX25UHV and CBX32MV		
Function	**Settings**	Condition
COOL		This setting, along w/ ADJUST setting, determines maximum system CFM (see blower CFM tables)
ADJUST		Setting affects both heating and cooling blower speeds (see blower tables to determine setting)
HEAT	HIGH	Heating blower speed selection – Ignored by Harmony III zoning system
DELAY	4	Cooling blower ramping – Ignored by Harmony III zoning system

Panel Setup:		
✓ Heating staging jumper	Circle one: 85 90 100 110 120 130	Recommended 120 deg-F
✓ Zone 1 PIAB 140F DAS jumper in place	Circle one: Yes No	See "1.10.4. Zone 1 PIAB Jumpers – 140ºF DAS" on page 10.
✓ Cooling staging jumper	Circle one: 50 55 60	Select desired discharge air temp during cooling
✓ Cont. Air Reduction jumper	Circle one: 0 25 50 75	Percentage airflow reduction for continuous fan operation
✓ Heating Air Reduction jumper	Circle one: 0 20 40	Percentage air flow reduction for heating mode
✓ System Configuration jumpers	Circle one: HP GAS	Set to GAS
✓ Stages	Circle one: 2COOL 1COOL	Set to match condenser, 1 or 2 stage
✓ Stages	Circle one: 2HP 1HP	Ignored for gas heat, non-heat pump application
✓ E-HEAT Stages	Circle one: DF 1 2 3	Ignored for gas heat, non-heat pump application
✓ Desired total system CFM with all zones calling:	Total system CFM per tables:	Minimum CFM:

✓ Zone 1	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 2	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 3	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 4	Name:	Desired CFM:	PIAB Setting:	Actual CFM:

Field Wiring Checklist		
√	Indoor Unit Wiring Completed:	
		DS on Harmony III to **DS** on indoor unit connected
		C on indoor unit connected to Harmony III transformer **C**.
		No connection to **Y1** or **Y2** on indoor unit.
√	Outdoor Unit Wiring Completed	
√	Thermostat and Damper Wiring Completed	
√	Discharge Sensor wired to Harmony III zoning system	

4.2.3.3. Cooling Only or Cooling with Hot Water Coil (Non-Heat Pump)

Job Name:
Indoor Unit Model:
Outdoor Unit Model:

CBX32MV, Rev 6 or higher, CBX40UHV and CBA38MV Indoor Unit Setup:		
✓ Cut on-board link **R** to **DS** "DEHUM or HARMONY"		
✓ For Hot Water Coil Only—Add K212 Relay and wire per Harmony III wiring detail. NOTE - Discharge air sensor must be located downstream of cooling coil and hot water coil.		
✓ Air handler control jumper settings:		
Function	**Settings**	Condition
COOL		This setting, along w/ ADJUST setting, determines maximum system CFM (See blower tables)
ADJUST		Setting affects both heating and cooling blower speeds (see blower tables to determine setting)
HEAT	HIGH	Heating blower speed selection – Ignored by Harmony III zoning system
DELAY	4	Cooling blower ramping – Ignored by Harmony III zoning system
BLOWER ONLY CFM		Continuous fan speed – Ignored by Harmony III zoning system
EVENHEAT		EVENHEAT is not used with Harmony III zoning system

Panel Setup:		
✓ Heating staging jumper	Circle one: 85 90 100 110 120 130	Recommended 120 deg-F
✓ Zone 1 PIAB 140F DAS jumper in place	Circle one: Yes No	See "1.10.4. Zone 1 PIAB Jumpers – 140ºF DAS" on page 10.
✓ Cooling staging jumper	Circle one: 50 55 60	Select desired discharge air temp during cooling
✓ Cont. Air Reduction jumper	Circle one: 0 25 50 75	Percentage airflow reduction for continuous fan operation
✓ Heating Air Reduction jumper	Circle one: 0 20 40	Percentage air flow reduction for heating mode
✓ System Configuration jumpers	Circle one: HP GAS	Set to GAS
✓ Stages	Circle one: 2COOL 1COOL	Set to match condenser, 1 or 2 stage
✓ Stages	Circle one: 2HP 1HP	Ignored for gas heat, non-heat pump application
✓ E-HEAT Stages	Circle one: DF 1 2 3	Ignored for gas heat, non-heat pump application
✓ Desired total system CFM with all zones calling:	Total system CFM per tables:	Minimum CFM:
✓ CB unit "minimum" CFM _____ (determined by unit spec listed below unit blower table)		

√ Zone 1	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
√ Zone 2	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
√ Zone 3	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
√ Zone 4	Name:	Desired CFM:	PIAB Setting:	Actual CFM:

NOTE: *All of the above are recommended starting positions for DIP switches and Harmony III zoning system jumpers. Slight variations may be required during system start up and operation checks.*

Field Wiring Checklist		
√	Indoor Unit Wiring Completed:	
		DS on Harmony III to **DS** on indoor unit connected
		C on indoor unit connected to Harmony III transformer **C**
		No connection to **Y1** or **Y2** on indoor unit.
√	Outdoor Unit Wiring Completed	
√	Thermostat and Damper Wiring Completed	
√	Discharge Sensor wired to Harmony III zoning system and if a hot water coil is used, the sensor must be located down stream of the hot water coil.	

Job Name:
Indoor Unit Model:
Outdoor Unit Model:

CBX25UHV (all units) and CBX32MV units prior to Revision 06 Indoor Unit Setup:		
✓ Remove DS to **Y1** jumper"		
✓ No jumper between DS and **Y1** on CBX25UHV		
✓ On the CBX32MV the wire from K20 terminal 4 to BDC3 board JP1 pin 2 must be re-routed to establish an electrical connection between K20 terminal 4 and terminal **G**. Cut the wire near JP1 pin 2.		
✓ Using the wire still connected to K20 terminal 4, strip the cut end and connect it to terminal **G**. Tape the exposed end of the short JP1 pin 2 wire.		
✓ On the CBX25UHV the blue wire that goes between plug # 2 of the circuit board and one side of the contacts on the BR relay must be removed and connected to the **G** pigtail. Tape off end of wire going to the circuit board jack plug.		
✓ Remove any factory-installed jumpers between terminal **R** and **W1**, **W2**, or W3. No jumper between **R** and **W1** or **W2** on CBX25UHV.		
✓ BDC3 control clip jumper settings (CBX25UHV and CBX32MV		
Function	**Settings**	Condition
COOL		This setting, along with ADJUST setting, determines maximum system CFM (see blower tables)
ADJUST		Setting affects both heating and cooling blower speeds (see blower tables to determine setting)
HEAT	4	Heating blower speed selection – Ignored by Harmony III zoning system
DELAY	4	Cooling blower ramping – Ignored by Harmony III zoning system

Panel Setup:		
✓ Heating staging jumper	Circle one: 85 90 100 110 120 130	Recommended 120 deg-F
✓ Zone 1 PIAB 140F DAS jumper in place	Circle one: Yes No	See "1.10.4. Zone 1 PIAB Jumpers – 140ºF DAS" on page 10.
✓ Cooling staging jumper	Circle one: 50 55 60	Select desired discharge air temp during cooling
✓ Cont. Air Reduction jumper	Circle one: 0 25 50 75	Percentage airflow reduction for continuous fan operation
✓ Heating Air Reduction jumper	Circle one: 0 20 40	Percentage air flow reduction for heating mode
✓ System Configuration jumpers	Circle one: HP GAS	Set to GAS
✓ Stages	Circle one: 2COOL 1COOL	Set to match condenser, 1 or 2 stage
✓ Stages	Circle one: 2HP 1HP	Ignored for gas heat, non-heat pump application
✓ E-HEAT Stages	Circle one: DF 1 2 3	Ignored for gas heat, non-heat pump application
✓ Desired total system CFM with all zones calling:	Total system CFM per tables:	Minimum CFM:
✓ CB unit "minimum" CFM _____ (determined by unit spec listed below unit blower table)		

√ Zone 1	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
√ Zone 2	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
√ Zone 3	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
√ Zone 4	Name:	Desired CFM:	PIAB Setting:	Actual CFM:

NOTE: *All of the above are recommended starting positions for DIP switches and Harmony III zoning system jumpers. Slight variations may be required during system start up and operation checks.*

Field Wiring Checklist		
√	Indoor Unit Wiring Completed:	
	☐	**DS** on Harmony III to **DS** on indoor unit connected
	☐	C on indoor unit connected to Harmony III transformer **C**
	☐	No connection to **Y1** or **Y2** on indoor unit.
√	Outdoor Unit Wiring Completed	
√	Thermostat and Damper Wiring Completed	
√	Discharge Sensor wired to Harmony III zoning system and if a hot water coil is used, the sensor must be located down stream of the hot water coil.	

5. Dual Fuel (Option 3)

Follow all equipment installation instructions provided with each unit.

5.1. Zone Control System Wiring - Option 3

After the heat pump unit is installed, field wire the line voltage as shown in the installation instructions provided with the unit. Use thermostat wire to connect the heat pump to the zone control panel as illustrated in the following figure.

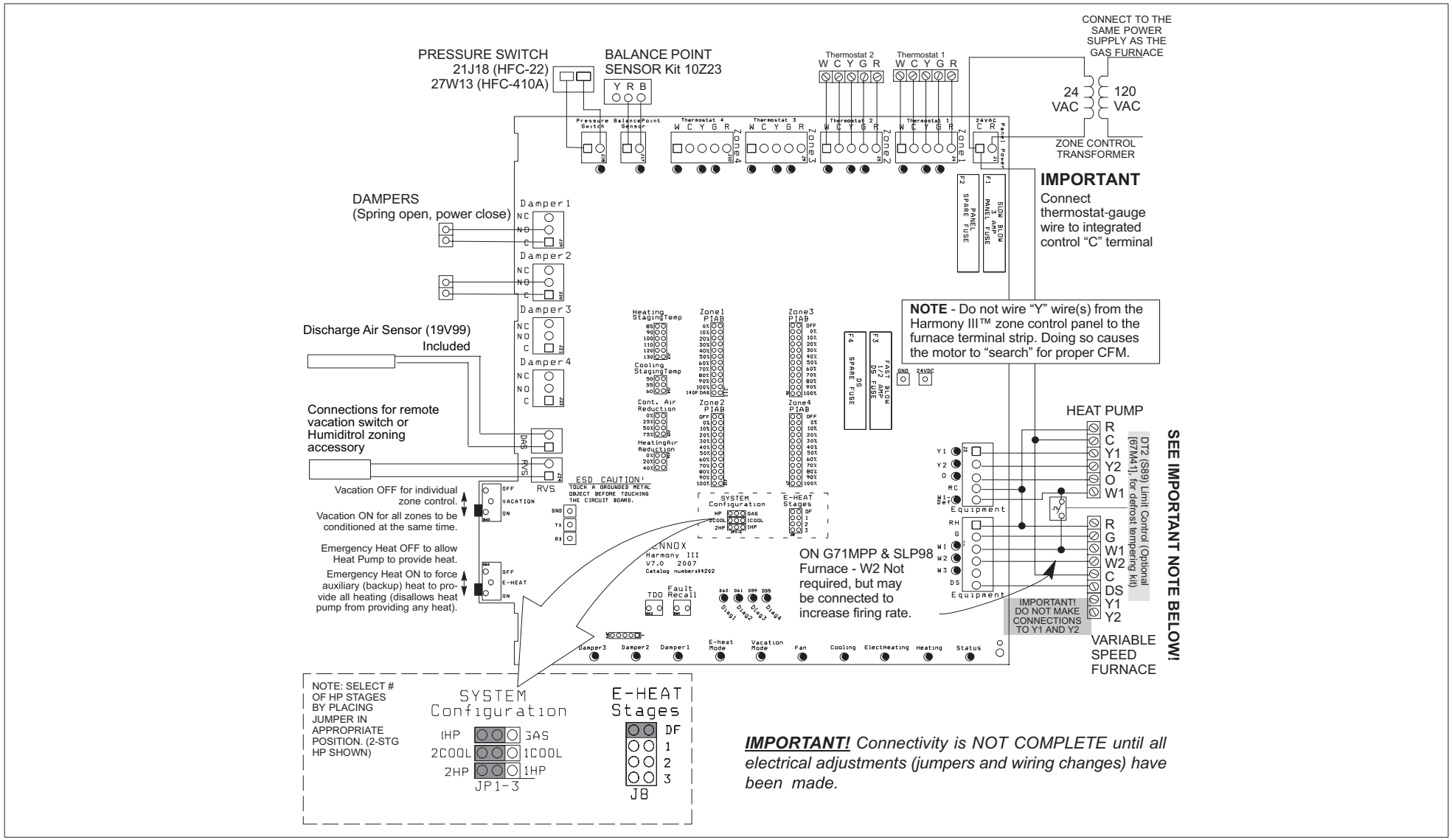


Figure 32. Option 3 - Typical Lennox Heat Pump and Lennox Variable-Speed Gas Furnace (Dual Fuel) (Troubleshooting)

5.2. Dual Fuel System Start-Up Defrost Temperating Sensor Placement and Checkout

5.2.1. Start-Up the System (All Models)

1. Adjust all thermostat settings so that no demand will occur.
2. Apply power to the zone panel transformer and to the furnace and observe the following: all four diagnostic LEDs will light; then each individual diagnostic LED will light in sequence; then all four diagnostic LEDs will light and extinguish.
3. Finally, the status light will begin to flash, indicating proper operation. Perform the gas heating checks using the information in the following sections.

5.2.2. Defrost Temperating Sensor Placement

Install the defrost temperating sensor (if used) where shown in the following illustration. For additional information, see the installation instruction that came with the Defrost Temperating Kit (67M41).

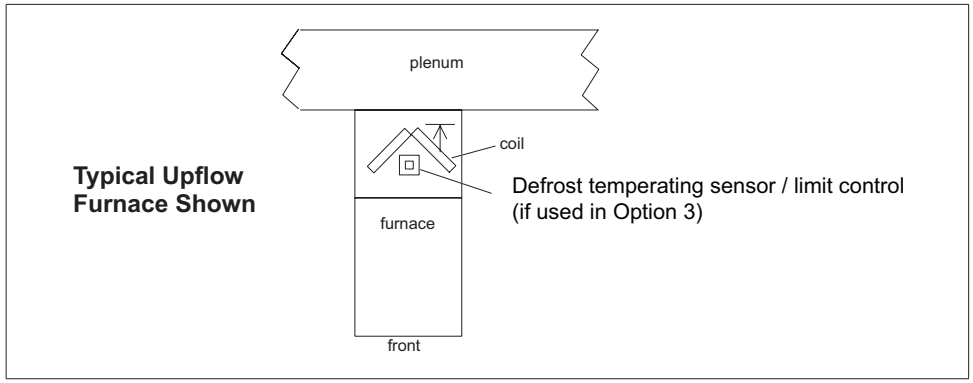


Figure 33. Defrost Tempering Sensor Placement

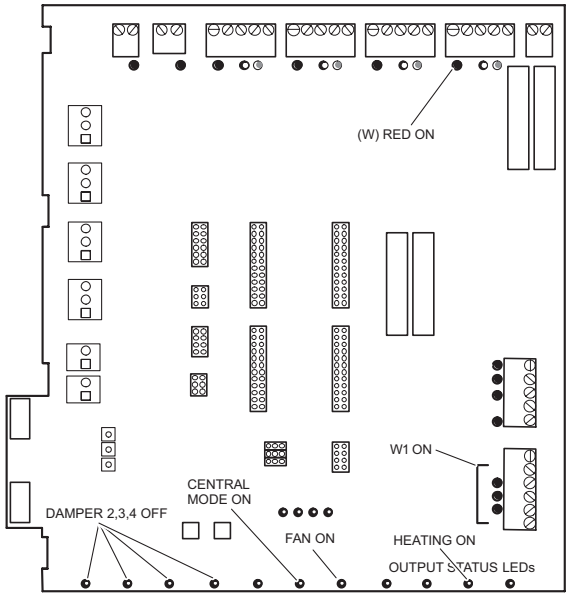
5.2.3. Checkouts

5.2.3.1. Typical Dual Fuel Gas Heating (Single Zone)

Prerequisites:

- Zone 1 thermostat set to Heat.
- Balance Point Sensor set at higher temperature than outdoor BPS-sensed temperature (red balance point sensor LED on) or
- Balance Point Sensor inputs jumpered to simulate cold outdoor temperature below balance point (red balance point sensor LED on).

.



1. Set zone 1 thermostat for a heat demand; check:

- Zone 1 thermostat **W** LED on (heating demand).
- Damper LED 1 off (damper open).
- Damper LEDs 2, 3, and 4 on (dampers closed).
- Output Heat **W1** LED on (furnace on).
- Heating LED on.

The furnace begins ignition sequence after zone 1 has demanded heat. The zone control system will start the furnace blower on low speed (0 PIAB) 45 seconds after the combustion cycle has begun. .

2. When 100ºF warm air is sensed by the discharge air sensor, the fan LED will light and the blower will slowly increase to speed required by the zone calling. The blower operates at speed setting of PIAB jumper for zone 1 and the jumper for heating air reduction. It may require 60 - 90 seconds to reach this speed.

3. Set zone 1 thermostat for NO heat demand; check:

- Zone 1 thermostat **W** LED off (no heat demand).
- Output Heat **W1** LED off.
- Fan LED off.
- Heating LED off.
- Damper LEDs 2-4 remain on until after 3-1/2 minute purge; then off.

To check the amount of air being delivered to each zone and to confirm that each individual zone damper functions properly, repeat these steps for zones 2 - 4.

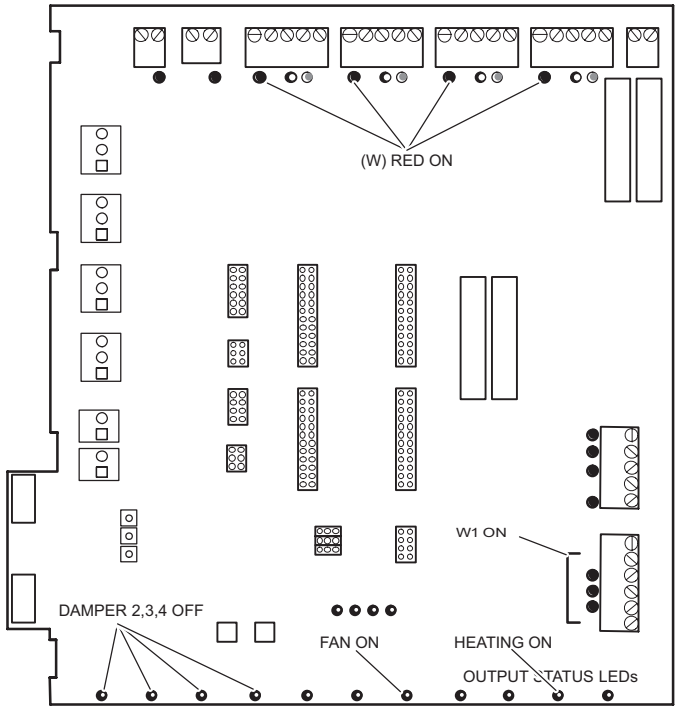
5.2.3.2. Typical Dual Fuel Gas Heating (Multiple Zone)

Prerequisites:

Zone 1 thermostat set to Heat.

- Balance Point Sensor set at higher temperature than outdoor BPS-sensed temperature (red balance point sensor LED on) or
- Balance Point Sensor inputs jumpered to simulate cold outdoor temperature below balance point (red balance point sensor LED on).

.



1. Set all zone thermostats for a heat demand; check:
   - All zone 1 thermostat **W** LED on (heating demand).
   - Damper LED 1 - 4 off (all damper open).
   - Damper LEDs 2, 3, and 4 on (dampers closed).
   - Output Heat **W1** LED on (furnace on).
   - Heating LED on.

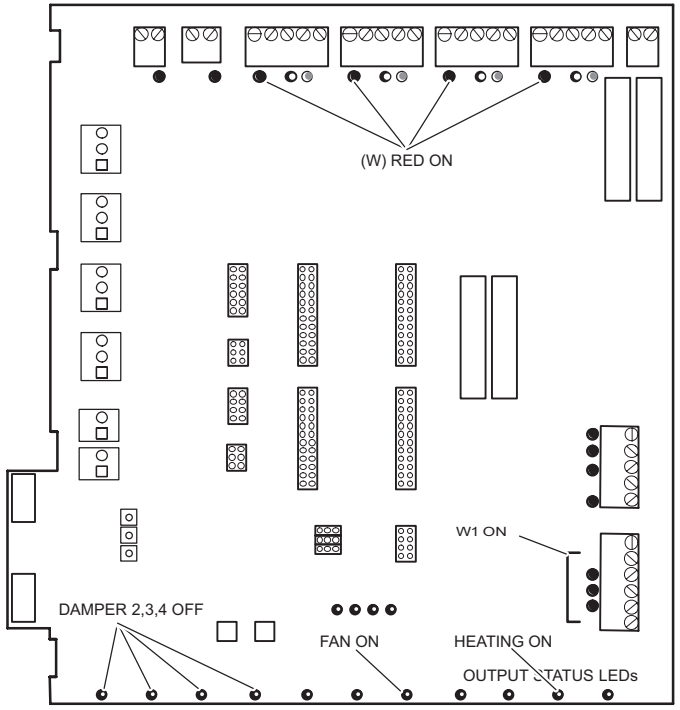
   The furnace begins ignition sequence after a heat demand is detected. The zone control system will start the furnace blower on low speed (0 PIAB) 45 seconds after the combustion cycle has begun. .
2. When 100ºF warm air is sensed by the discharge air sensor, the fan LED will light and the blower will slowly increase to speed required by the zone calling. The blower operates at speed setting of PIAB jumper for zone 1 and the jumper for heating air reduction. It may require 60 - 90 seconds to reach this speed.
3. Set all zone thermostats for NO heat demand; check:
   - Output Heat **W1** LED off.
   - Heating LED off.
   - Fan LED off (blower turns off after delay).
   - All zone thermostat **W** LEDs off.
   - Damper LEDs - Last zone thermostat demand removed: LED is off (this zone's damper remains open during 3-1/2 minute purge); other zones damper LEDs are on during the 3-1/2 minute purge (dampers closed). After 3-1/2 minute delay, all dampers LEDs go off (dampers open).

5.2.3.3. Typical Dual Fuel Gas Heating (Central Mode)

Prerequisites:

- Central mode switch on.
- Red LED on the central mode fan switch on.
- Zone 1 thermostat set to Heat.
  - ✓ Balance Point Sensor set at higher temperature than outdoor BPS-sensed temperature (red balance point sensor LED on) or
  - ✓ Balance Point Sensor inputs jumpered to simulate cold outdoor temperature below balance point (red balance point sensor LED on).

.



1. Set zone 1 thermostat for a heat demand; check:
   - Zone 1 thermostat **W** LED on (heating demand).
   - Output Heat **W1** LED on (furnace on).
   - Heating LED on.
   - All damper LEDs off (damper open).
2. The furnace will begin its ignition sequence after Zone 1 has demanded heat. The zone control system will start the furnace blower on low speed (0 PIAB air) 45 seconds after the combustion cycle has begun.
3. When 100ºF warm air is sensed by the discharge air sensor, the fan LED will light and the blower will slowly increase to speed. The blower will operate at a speed equivalent to the PIAB calculated for all zones calling, taking into account the heating air reduction jumper position. It may take the blower 60 to 90 seconds to reach this speed.
4. Remove the heat demand from zone 1 (no heat input or output and no blower demand). Upon removal of the demand from zone 1, check:
   - Zone 1 thermostat **W** LED off (no heat demand).
   - Output Heat W1 LED off.
   - Fan LED off.
   - Heating LED off.

   After 3-1/2 minute purge time, furnace blower turns off.

5.3. Zoning System with Dual Fuel Troubleshooting - Option 3

5.3.1. Troubleshooting Diagram

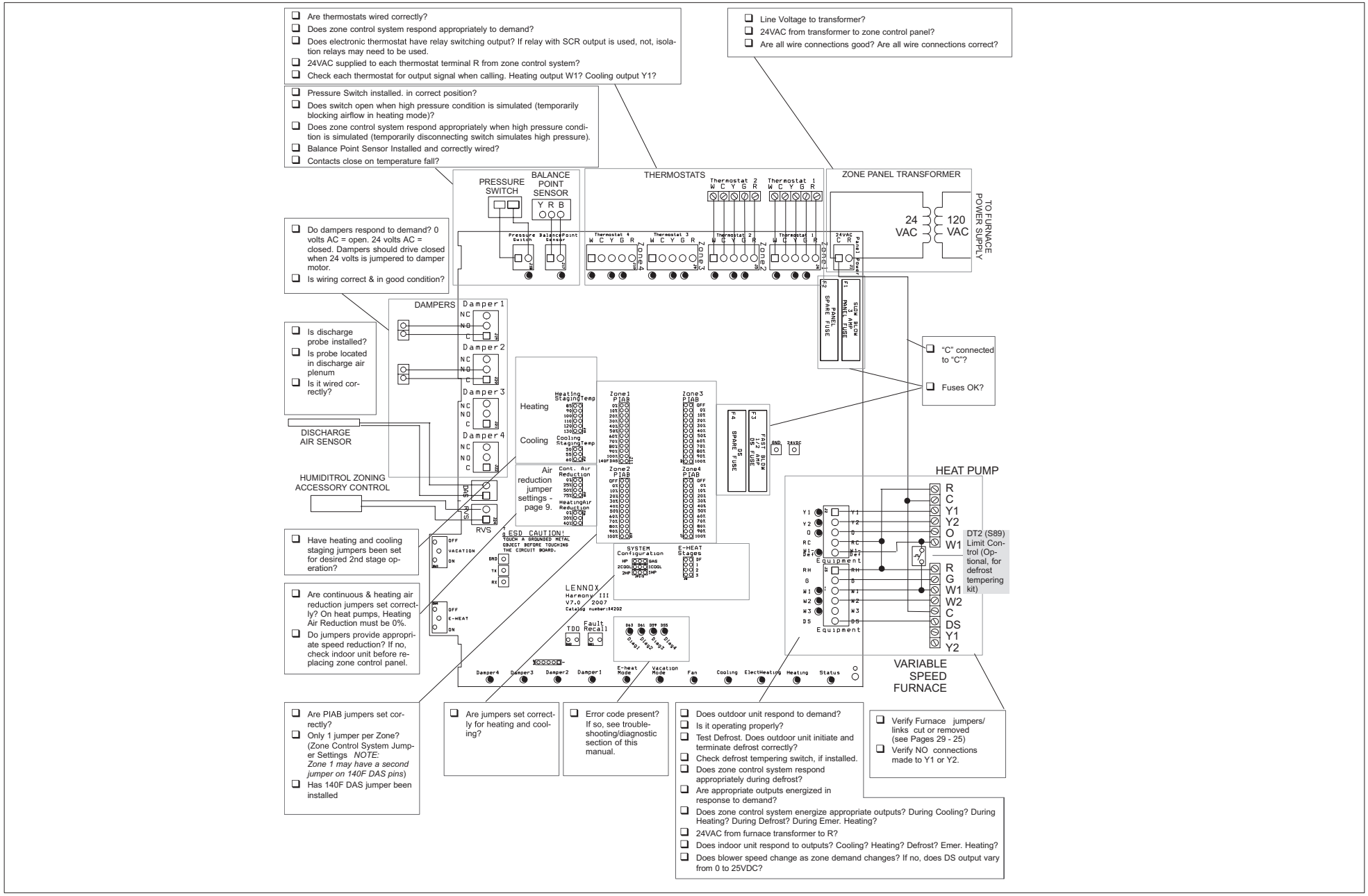
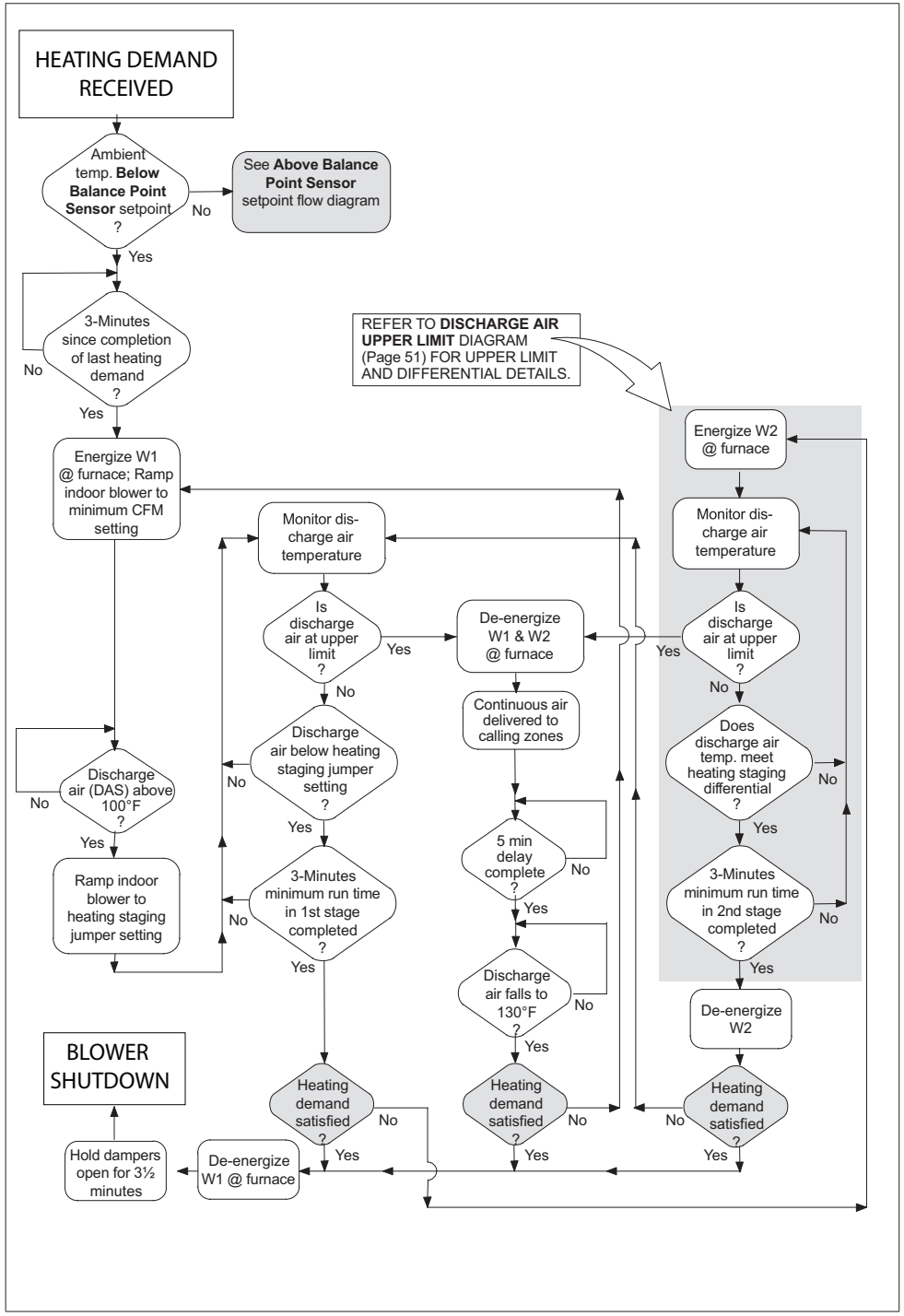
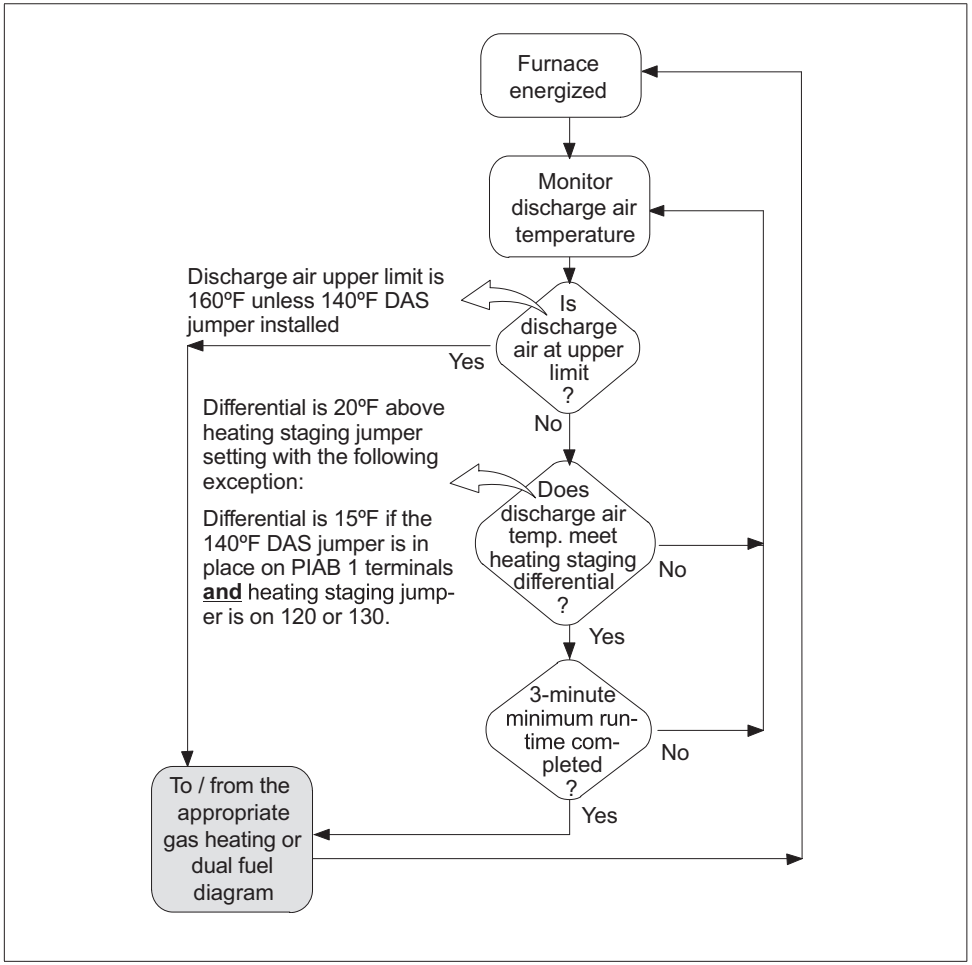


Figure 34. Option 3 - Typical Lennox Heat Pump and Lennox Variable-Speed Gas Furnace (Dual Fuel) (Troubleshooting

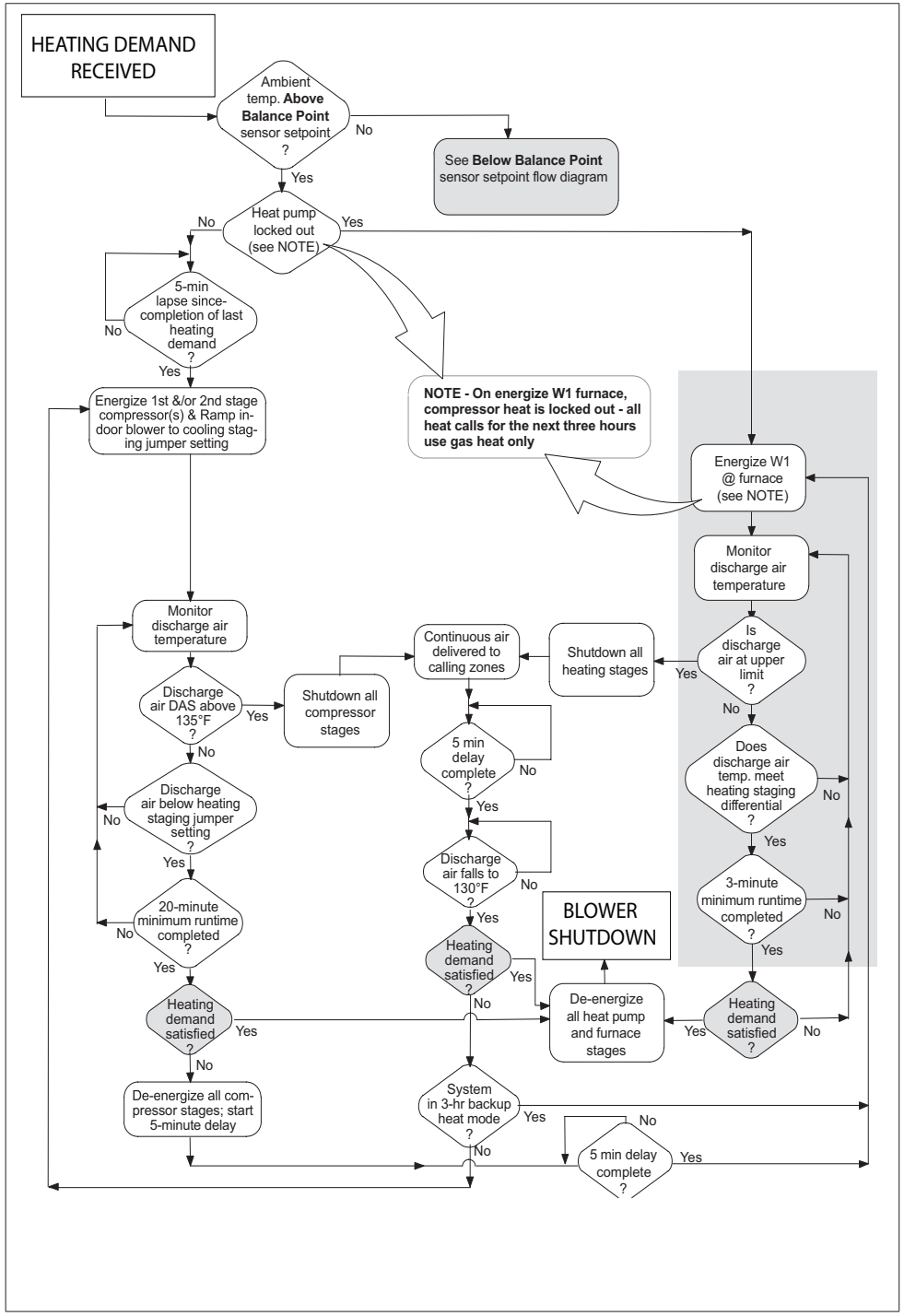
5.3.2. Dual Fuel Operation (Below Balance Point)



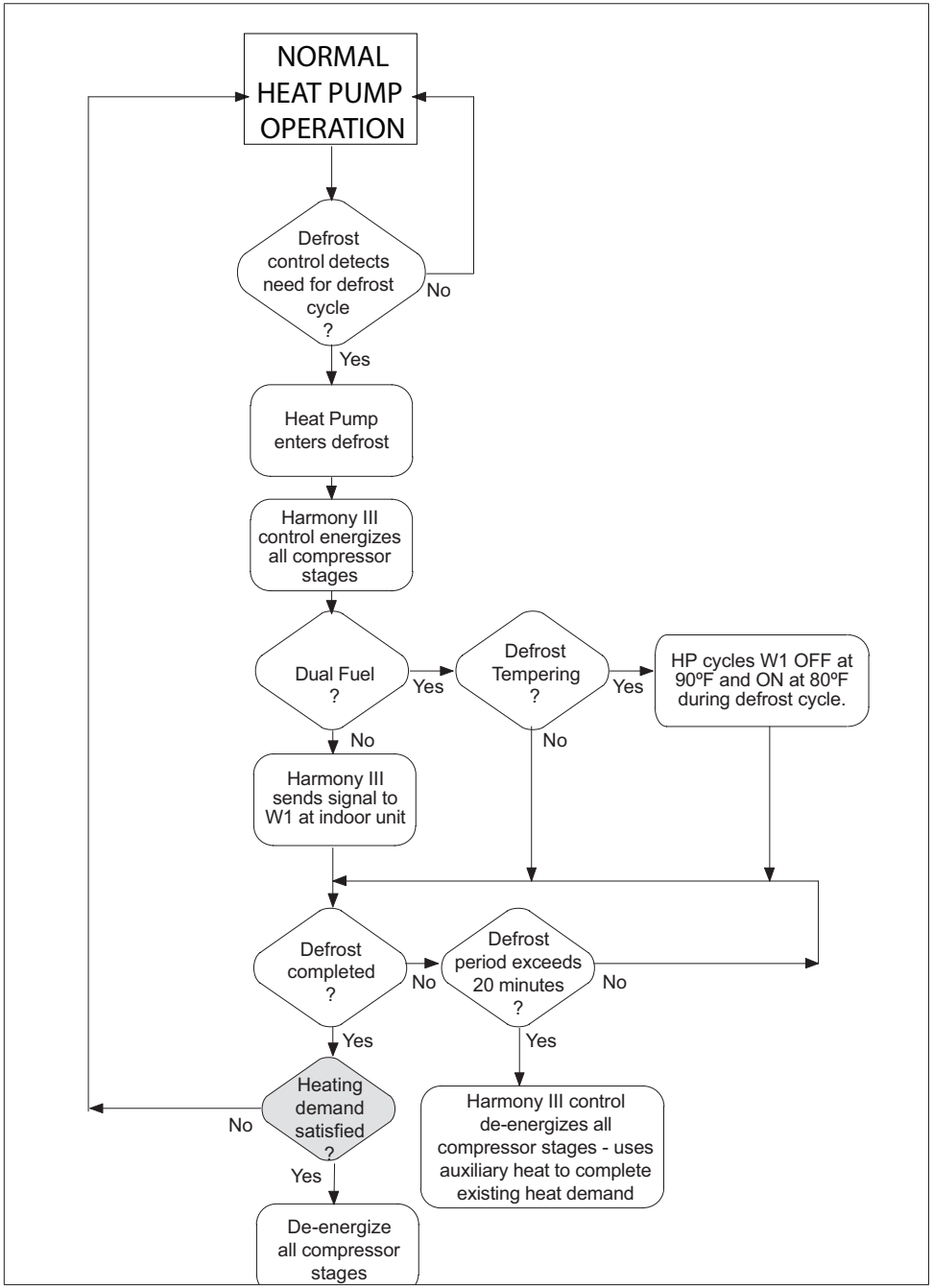
5.3.3. Discharge Air Upper Limit and Differential Temperatures



5.3.4. Dual Fuel Operation (Above Balance Point)



5.3.5. Defrost Operation



5.3.6. Installation Setup Worksheets

5.3.6.1. Dual Fuel - Indoor Unit Honeywell 2-Stage IFC Control and Heat Pump

Job Name:
Indoor Unit Model:
Outdoor Unit Model:

Miscellaneous Items:
✓ Install Pressure Switch in the outdoor unit per this instructions (27W13 for R410A or 21J18 for R22)
✓ Install Balance Point Sensor (10Z23) as per this installation instruction. Set to desired outdoor lock out temperature for HP
✓ Install Optional Defrost Tempering Sensor 67M41 (if used) per installation instructions. **NOTE**: MUST be located in coil delta plate between furnace and coil
✓ Install Discharge Air Sensor per installation instructions. The location of the sensor is CRITICAL for proper system operation
Indoor Unit Setup:
✓ Cut on-board link W914 DEHUM OR HARMONY (R to DS) on furnace IFC control (if not cut, fuse will blow in zone control board)
✓ Cut and tape wires from pin # 2 and pin #13 on plug J46 of the VSM wiring harness routed from the motor to the Furnace Integrated control.
✓ Furnace IFC Control DIP switch settings (ON or OFF):

DIP Switch	ON or OFF	Condition
1	OFF	DIP switch 1 must be set to OFF for two stage heating operation
2	OFF	DIP switch 2 determines second stage heat time delay and is ignored by Harmony III zoning system
3	ON	DIP switches 3 and 4 determines heating blower off delay, recommended is 180 sec
4	ON	
5		DIP switches 5 and 6 determines second stage cooling blower speed or maximum system air vol.
6		
7		DIP switches 7 and 8 determine blower “adjust” setting for maximum system air volume
8		
9	OFF	DIP switches 9 and 10 determines cooling blower ramping profile and is ignored by Harmony III zoning system
10	OFF	
11	OFF	DIP switches 11 and 12 determines heating blower speed and is ignored by Harmony III zoning system
12	ON	

Panel Setup:		
√ Heating staging jumper	Circle one: 85 90 100 110 120 130	Recommended 120 deg-F
√ Zone 1 PIAB 140F DAS jumper in place	Circle one: Yes No	See “1.10.4. Zone 1 PIAB Jumpers – 140ºF DAS” on page 10.
√ Cooling staging jumper	Circle one: 50 55 60	Select desired discharge air temp during cooling
√ Cont. Air Reduction jumper	Circle one: 0 25 50 75	Percentage airflow reduction for continuous fan operation
√ Heating Air Reduction jumper	Circle one: 0 20 40	Percentage air flow reduction for heating mode
√ System Configuration jumpers	Circle one: HP GAS	Set to GAS
√ Stages	Circle one: 2COOL 1COOL	Set to match condenser, 1 or 2 stage
√ Stages	Circle one: 2HP 1HP	Ignored for gas heat, non-heat pump application
√ E-HEAT Stages	Circle one: DF 1 2 3	Ignored for gas heat, non-heat pump application
√ Desired total system CFM with all zones calling:	Total system CFM per tables:	Minimum CFM:

√ Zone 1	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
√ Zone 2	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
√ Zone 3	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
√ Zone 4	Name:	Desired CFM:	PIAB Setting:	Actual CFM:

NOTE: *All of the above are recommended starting positions for furnace DIP switches and Harmony III jumpers. Slight variations may be required during system start up and operation checks.*

Field Wiring Checklist		
√	Indoor Unit Wiring Completed:	
	☐	**DS** on Harmony III to **DS** on indoor unit connected
	☐	**C** on indoor unit connected to Harmony III transformer **C**
	☐	No connection to **Y1** or **Y2** on indoor unit.
√	Outdoor Unit Wiring Completed	
√	Thermostat and Damper Wiring Completed	
√	Discharge Sensor wired to Harmony III zoning system	
√	Heat Pump Pressure Switch wired to Harmony III zoning system	

5.3.6.2. Dual Fuel - SLP98 Variable Capacity and Heat Pump

Job Name:
Indoor Unit Model:
Outdoor Unit Model:

Miscellaneous Items:
✓ Install Pressure Switch in the outdoor unit per this instructions (27W13 for R410A or 21J18 for R22)
✓ Install Balance Point Sensor (10Z23) as illustrated in the kit installation instruction. Set to desired outdoor lock out temperature for HP
✓ Install Optional Defrost Tempering Sensor 67M41 (if used) per installation instructions. **NOTE**: MUST be located in coil delta plate between furnace and coil
✓ Install Discharge Air Sensor per installation instructions. The location of the sensor is CRITICAL for proper system operation
Indoor Unit Setup:
✓ Cut on-board link W914 DEHUM OR HARMONY (**R** to **DS**) on furnace IFC control (if not cut, fuse will blow in Harmony III zoning system control board)
✓ **W2** connection from Harmony III to SLP98 is optional.
✓ DIP switch settings (ON or OFF):

DIP Switch	**ON or OFF**	Condition
1	OFF	DIP switch 1 – leave at factory setting – ignored by Harmony III zoning system
2	OFF	DIP switch 2 – leave at factory setting – ignored by Harmony III zoning system
3	OFF	DIP switch 3 – leave at factory setting – ignored by Harmony III zoning system
4	ON	DIP switches 4 and 5 determine heating blower “off” delay – recommended 180 seconds
5	ON	
6	OFF	DIP switches 6 and 7 – leave at factory setting – ignored by Harmony III zoning system
7	OFF	
8		DIP switches 8 and 9 – cooling blower speed – determines maximum system CFM – see furnace blower tables
9		
10		DIP switches 10 and 11–cooling blower adjust–determines maximum system CFM – see furnace blower tables
11		
12	OFF	DIP switches 12 and 13 – leave at factory setting – ignored by Harmony III zoning system
13	OFF	
14	OFF	DIP switches 14, 15,and 16 – sets low fire, minimum capacity, firing rate - default setting shown and is recommended starting point.
15	OFF	
16	OFF	
17	OFF	DIP switches 17,18 and 19 – sets high fire, 100% capacity, firing rate - default setting shown and is recommended starting point
18	OFF	
19	OFF	

Panel Setup:		
✓ Heating staging jumper	Circle one: 85 90 100 110 120 130	Recommended 120 deg-F
✓ Zone 1 PIAB 140F DAS jumper in place	Circle one: Yes No	See “1.10.4. Zone 1 PIAB Jumpers – 140ºF DAS” on page 10.
✓ Cooling staging jumper	Circle one: 50 55 60	Select desired discharge air temp during cooling
✓ Cont. Air Reduction jumper	Circle one: 0 25 50 75	Percentage airflow reduction for continuous fan operation
✓ Heating Air Reduction jumper	Circle one: 0 20 40	Percentage air flow reduction for heating mode
✓ System Configuration jumpers	Circle one: HP GAS	Set to GAS
✓ Stages	Circle one: 2COOL 1COOL	Set to match condenser, 1 or 2 stage
✓ Stages	Circle one: 2HP 1HP	Ignored for gas heat, non-heat pump application
✓ E-HEAT Stages	Circle one: DF 1 2 3	Ignored for gas heat, non-heat pump application
✓ Desired total system CFM with all zones calling:	Total system CFM per tables:	Minimum CFM:

✓ Zone 1	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 2	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 3	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 4	Name:	Desired CFM:	PIAB Setting:	Actual CFM:

NOTE: *All of the above are recommended “starting” positions for the furnace DIP switches and Harmony III jumpers. Slight variations may be required during system start up and operation checks.*

Field Wiring Checklist		
√	Indoor Unit Wiring Completed:	
	☐	**DS** on Harmony III to **DS** on indoor unit connected
	☐	C on indoor unit connected to Harmony III transformer **C**
	☐	No connection to **Y1** or **Y2** on indoor unit.
√	Outdoor Unit Wiring Completed	
√	Thermostat and Damper Wiring Completed	
√	Discharge Sensor wired to Harmony III zoning system	
√	Heat Pump Pressure Switch wired to Harmony III zoning system	

5.3.6.3. Dual Fuel - Variable Speed SL280V, EL296V, SL297NV and Heat Pump

Job Name:
Indoor Unit Model:
Outdoor Unit Model:

Miscellaneous Items:
✓ Install Pressure Switch in the outdoor unit per Harmony III installation instructions (27W13 for R410A or 27W12 for R22)
✓ Install Balance Point Sensor (10Z23) as per installation instructions. Set to desired outdoor lock out temperature for HP
✓ Install Optional Defrost Tempering Sensor 67M41 (if used) per installation instructions. **NOTE**: MUST be located in coil delta plate between furnace and coil
✓ Install Discharge Air Sensor per installation instructions. The location of the sensor is CRITICAL for proper system operation

Indoor Unit Setup:

√ Cut on-board link W914 DEHUM OR HARMONY (**R** to **DS**) on furnace IFC control (if not cut, fuse will blow in Harmony III zone control board)

√ DIP switch settings (ON or OFF):

DIP Switch	ON or OFF	Condition
1	OFF	DIP switch 1 – leave at factory setting – ignored by Harmony III
2	OFF	DIP switch 2 – leave at factory setting – ignored by Harmony III
3	ON	DIP switches 3 and 4 – Blower off delay switch settings, set DIP switches 3 and 4 to ON (180 seconds)
4	ON	DIP switches 4 and 5 – Determines heating blower “off” delay – recommended 180 seconds
5	OFF	DIP switches 5 and 6 – Cooling bode blower speed, set DIP switches 5 and 6 to OFF (High - Factory)
6	OFF	
7	OFF	DIP Switches 7 and 8 – Cooling blower speed adjustment, set DIP switches 7 and 8 to OFF (Factory Default)
8	OFF	
9	OFF	DIP Switches 9 and 10 – Cooling mode blower Speed ramping, set DIP switches 9 and 10 to OFF (A - Factory)
10	OFF	
11	OFF	DIP Switches 11, 12 and 13 – Heating mode blower speed, set DIP switches 11, 12 and 13 to OFF (Factory Default)
12	OFF	
13	OFF	
14	OFF	DIP Switches 14 and 15 – Continuous blower speed, set DIP switches 14 and 15 to OFF (38% of High Cool Speed - Factory Default)
15	OFF	

Panel Setup:		
✓ Heating staging jumper	Circle one: 85 90 100 110 120 130	Recommended 120 deg-F
✓ Zone 1 PIAB 140F DAS jumper in place	Circle one: Yes No	See Harmony III install instructions for info
✓ Cooling staging jumper	Circle one: 50 55 60	Select desired discharge air temp during cooling
✓ Cont. Air Reduction jumper	Circle one: 0 25 50 75	Percentage airflow reduction for continuous fan operation
✓ Heating Air Reduction jumper	Circle one: 0 20 40	Percentage air flow reduction for heating mode
✓ System Configuration jumpers	Circle one: HP GAS	Set to GAS
✓ Stages	Circle one: 2COOL 1COOL	Set to match condenser, 1 or 2 stage
✓ Stages	Circle one: 2HP 1HP	Ignored for gas heat, non-heat pump application
✓ E-HEAT Stages	Circle one: DF 1 2 3	Ignored for gas heat, non-heat pump application
✓ Desired total system CFM with all zones calling:	Total system CFM per tables:	Minimum CFM:

✓ Zone 1	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 2	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 3	Name:	Desired CFM:	PIAB Setting:	Actual CFM:
✓ Zone 4	Name:	Desired CFM:	PIAB Setting:	Actual CFM:

NOTE: *All of the above are recommended “starting” positions for the furnace DIP switches and Harmony III jumpers. Slight variations may be required during system start up and operation checks.*

Field Wiring Checklist		
√	Indoor Unit Wiring Completed:	
	☐	**DS** on Harmony III to **DS** on indoor unit connected
	☐	C on indoor unit connected to Harmony III transformer **C**
	☐	No connection to **Y1** or **Y2** on indoor unit.
√	Outdoor Unit Wiring Completed	
√	Thermostat and Damper Wiring Completed	
√	Discharge Sensor wired to Harmony III zoning system	

6. Troubleshooting

6.1. Operation and Troubleshooting Indicators

6.1.1. Zone Control Panel LEDs

The zone control system operation is indicated by light emitting diodes (LEDs) located on the zone control panel. In addition to operating condition, the LEDs provide valuable information system troubleshooting. The LEDs (shown in figure 30) are thermostat, diagnostic, and output status.

1. **Thermostat LEDs** — Located along the upper edge of the zone control panel. Each zone has three LEDs to indicate a call for heating or cooling: green (indicates a **Y** / compressor demand), red (indicates a **W** / heating demand) and amber (indicates a **G** / indoor blower demand). These LEDs are labeled according to the zone and demand.

2. **Diagnostic LEDs** — Diags 1, 2, 3, 4—located near the bottom center of the the zone control panel. These LEDs aid the technician in troubleshooting problems. When an error is detected, LEDs illuminate in a pattern. See Fault Recall and Time Delay Override on page 58.

3. **Output LEDs** — Located along the bottom of the zone control panel and near connection terminals. These red LEDs indicate the output status of dampers, furnace, outdoor unit, etc. When an output is powered or active, the corresponding LED is illuminated.

4. **Pressure Switch LED** — Located at the top left corner. Green LED illuminates when the heat pump pressure switch is closed indicated normal pressures. The LED will be off when the pressure switch opens under abnormal or excessive condensing pressure in the heat pump heating mode. Pressure switch is used only on heat pump systems.

5. **Balance Point Sensor LED** — Located at the top left corner. Red LED illuminates when the balance point sensor is closed indicating outdoor temperature is below the balance point sensor setting. Only used on dual fuel heat pump systems.

The LEDs are labeled according to output and function. For example, if Damper 1 LED is illuminated, it's damper has been signaled to close; when the LED is extinguished, it's damper has been signaled to open, allowing air flow to that zone.

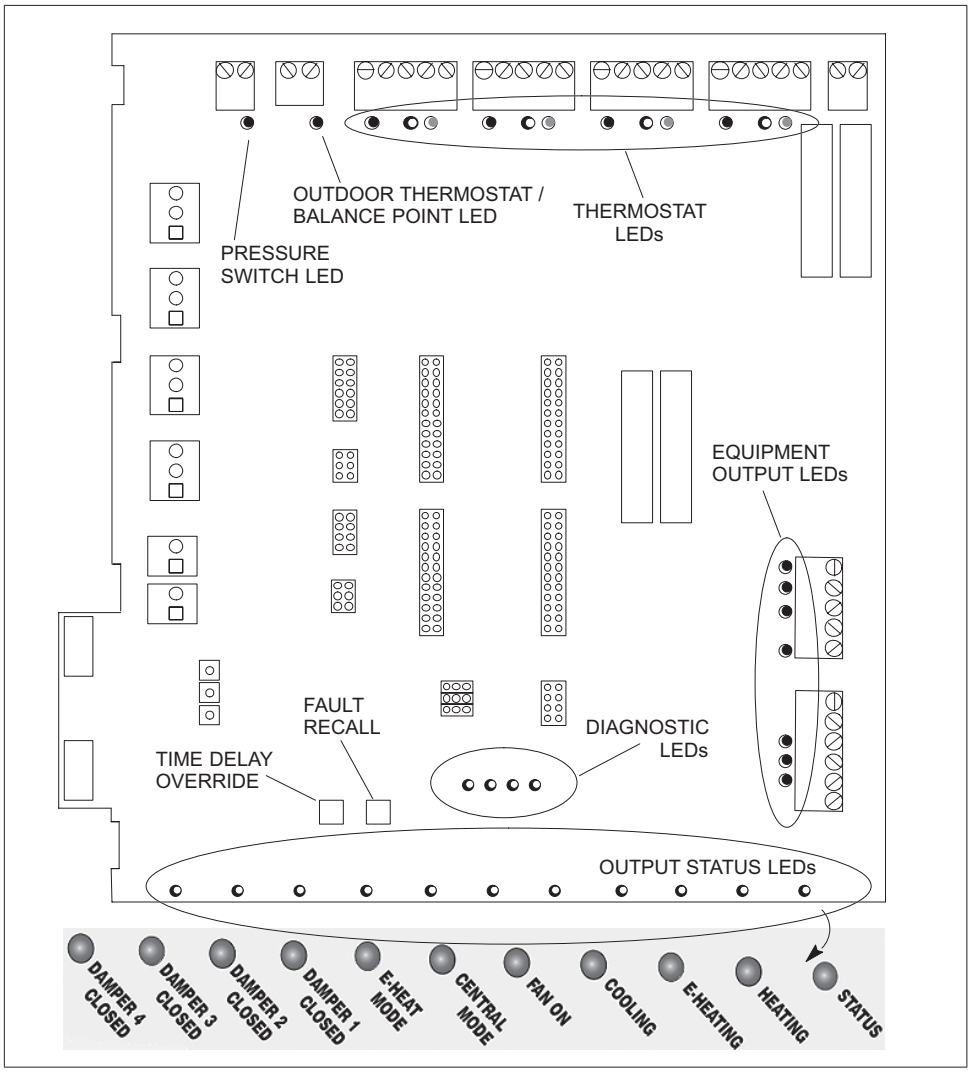


Figure 35. System Indicators/Troubleshooting Devices

6.1.2. Fault Recall and Time Delay Override

When the Time Delay Override is pressed and held, the internal clock speeds up by a factor of 60. This overrides the current time delay and permits the next event to occur. “Table 14. Time Delays” on page 60 identifies the time delays used by the system.

When the Fault Recall button is pressed and released (clicked), the fault codes are displayed (10 most recent). When the fault recall button is pressed and held, the fault codes are erased. Each code will be displayed for 10 seconds starting with the most recent code, then the next most recent, and so on. Pressing the button while recalling fault codes will bypass the 10-second timer and go right to the next fault code.

Use the Fault Recall button to observe diagnostic codes that will indicate either correct operation, or help checkout and troubleshoot problems in the zone control system. “Table 15. Diagnostics Codes” on page 62 identifies all diagnostic codes.

Press the button once while the system is operating. The system will respond by momentarily lighting all four DIAG LEDs then displaying the error code, if an error code is stored in memory. This allows a visual check to verify that all four LEDs are operational before displaying an error code.

6.1.3. Time Delays

Timers used in the Harmony III zoning system define delays which precede or follow a demand, depending on the type of function. The delays are used to control equipment connected to the system. The following table shows how the most noticeable delays are used.

Table 14. Time Delays

Delay	Time	Function
Blower Off Delay (gas heat only)	3-1/2 min.	Gas Furnace only. Delivers air into last zone called during cool down following heat demand.
Compressor Speed Change	4 min.	Between low speed and high speed in order to make sure steady state is reached before staging.
Compressor Off Time	5 min.	At end of demand. Equalizes pressure in refrigerant system and prevents short cycling.
Heat Staging (electric)	2 min.	Between staging up or down (May stage faster to prevent overshoot/undershoot).
Heat Staging (gas)	3 min.	Between staging up or down to achieve steady state.
Dual Fuel Furnace Lock-in Timer	3 hrs.	Starts when system enters dual fuel furnace heating when the outdoor temperature is above balance point. When operating within this 3-hour time, only the furnace is used for heating. Heat pump will be tried again on the next call after this timer expires. Diagnostic LEDs 2, 3, and 4 will flash when this timer is active.
Damper Hold	3-1/2 min.	This timer is defined as the amount of time to hold the last zone calling open past the thermostat call drop out. During this time, the panel will not energize the blower (except when a continuous fan call exists); the controlled equipment will provide this signal. This is a non-adjustable timer set at 210 seconds.
Auto-changeover	20 min.	When opposing demands are present, zone control system must work to satisfy current demand at least 20 min. If current demand is not satisfied after time has elapsed, system will changeover and satisfy opposing demand. On and Off delays above will also apply.
Dual Fuel Auto-changeover	20 min.	When temperature is above balance point, heat pump will operate for 20 minutes before allowing gas furnace to take over heating demand.

6.1.4. Discharge Air Probe Checkout (All Systems)

The discharge air sensor is a temperature-dependent resistor; the higher the temperature, the lower the resistance. To confirm the sensor is functioning, disconnect both sensor leads from the zone control panel. Using a digital voltmeter (DVM) set to read resistance, touch the leads from the sensor to the probes of the DVM.

Temp ºF (ºC)	Resistance (ohms)
65 (18)	13476
70 (21)	11884
75 (24)	10501
80 (27)	9298
85 (29)	8249
90 (32)	7333

Do not touch both probes with your fingers—doing so will produce a faulty reading. At 77°F, the resistance of the sensor will be 10K ohm; at lower probe temperatures, expect higher resistance; at warmer probe temperatures, expect lower resistance.

After reading the resistance at room temperature, warm the tip of the sensor by holding it in the palm of your hand, and take another resistance reading. The resistance should be noticeably lower than the previous reading.

The zone control system will monitor the operation of the probe and determine if a failure has occurred. The probe is an integral (but replaceable) part of the zone control system. The zone control system will indicate if the probe is operating improperly and needs to be replaced. The discharge air temperature probe serves several purposes:

1. In cooling systems (and heat pump systems in cooling mode) the probe varies the speed of the compressor from high to low to off in order to maintain a constant discharge air temperature and prevent coil freezing.

2. In gas heating systems, it is responsible for increasing the speed of the blower to the setting of the CFM jumpers after the discharge air has warmed up to about 100ºF. Also stages equipment up and down to control discharge air temperature.

3. In heat pump systems operating in the heating mode, the probe varies compressor speed and stages of auxiliary heat in order to maintain a constant discharge air temperature.

6.1.5. Blower Speed Checkout

The indoor blower speed should vary as zone demand changes. The fan speed LED varies in brightness as the blower varies in speed. The brighter the LED, the more CFM being delivered. Blower speed can also be viewed by attaching an electronic voltmeter between **DS** and any **C** terminal on the zone control panel. While not a precise measurement, the voltmeter fluctuation indicates that the blower speed is changing.

1. Connect electronic voltmeter between **DS** and any **C** terminal on the zone control panel. Leave all field wiring in place.

2. Select DC volts scale.

3. Start zone heating or cooling checkout procedure.

4. Observe voltages:
   - 22 volts DC = high speed (varies depending on input voltage at primary transformer).
   - 11 volts DC (approx.) = Medium speed 50% into adjustment band of blower.
   - 0 volts DC = low speed or off.

NOTE: *All speeds in between are a percentage of 22VDC.*

5. Also measure voltage at the indoor unit between **DS** and **C**. If the voltage is lower than the voltage measured at the Harmony zone panel and/or the blower runs at a minimum fan speed, check and make sure **C** on the indoor unit is connected to C on the zone panel transformer connection.

NOTE: *SLP98 furnace models are equipped with an LED on the integrated control which displays blower airflow in all modes of operation. See SLP98 installation instructions for additional information.*

NOTE: *CBA38MV, CBX40UHV and CBX32MV Rev 06 or higher have an LED display that will indicate the unit air volume. "A" followed by the number indicates the CFM. For example, "A-2-0-0-5" indicates 2005 CFM.*

NOTE: *If blower operates only at the minimum CFM or will not ramp to zone air volume, check and make sure terminal* ***C*** *on the indoor unit terminal strip is connected to Harmony 24 VAC terminal* **C** *(see figures 17 through 27).*

NOTE: *If blower "hunts", check and make sure there is no connections on Y1 or Y2 on the indoor unit terminals strip.*

NOTE: *Units without a 7-Segment LED will have a "CFM" LED to indicate blower airflow. One blink of the LED is equal to approximately 100 CFM; then it pauses and repeats. For example if the CFM indicator LED blinks 10 times this indicates approximately 1000 CFM.*

NOTE: *Make sure DS on the Harmony board is connected to DS on the furnace/ air handler terminal strip.*

6.2. Diagnostic LED Error Codes

When the zone control system finds a problem (error condition), it will turn on one or more of the diagnostic LEDs on the zone control. These LEDs can be lit in several different patterns, each pattern corresponding to a different error condition. The following table shows each possible display pattern, a description of the error, and ways to correct the error.

Some of the errors found in table will cause a fail-safe or shutdown condition. The system will shutdown after the error is present for about five seconds. During a shutdown condition, all dampers will open, there is no demand to the air conditioner unit or furnace. Normal operation will resume five seconds after the error has been corrected.

The blower may run during a fail-safe condition after a heating demand. This is due to the operation of the integrated control inside the furnace.

If a shutdown condition occurs while there is a call for cooling, a five-minute timer is initiated before cooling can be called for again. The timer begins at the time of the shutdown condition and does not affect the response to, nor is affected by, a heating demand.

Troubleshooting diagrams in this instruction identify common areas to check when troubleshooting specific equipment. The diagrams provide checkpoints related to connectivity and operation of system equipment. Use these diagrams, along with installation information contained throughout this manual, to identify and correct problems.

Table 15. Diagnostics Codes

Code #	(0-off;1-on) Diag LED1234	Fault Indicated	Remedy	Fail-safe (System Shut Down)
0	0000	Normal operation	No remedial action required.	
1	1000	Insufficient cooling	Occurs when there is a call for cooling and the Discharge Air Sensor does not sense a decrease in supply air temperature indicating the cooling is not functioning properly.	No
2	0100	Defrost time > 20 minutes	The defrost board should never allow a defrost for greater than 20 minutes. If this error occurs, check the outdoor unit to see if it is stuck in defrost mode. The zone control system will use the backup heat during this error and not the heat pump.	No
3	1100	Unsteady thermostat input	This error occurs when a thermostat changes state repeatedly and rapidly, indicating that the thermostat is making intermittent contact and needs attention. The offending thermostat will be ignored for four minutes after the zone control system detects the problem. After four minutes if the signal from the thermostat is steady again, it will be recognized by the zone control system. Disconnect thermostats until error goes away. This will identify the source of bad input. If error remains after all inputs have been disconnected, replace zone control panel.	No
4	0010	Defrost while gas heat selected	System detected defrost signal at W1-Def terminal block while the jumper is selected for the furnace. May be caused by: • Wrong selection for indoor unit jumper. • Outdoor unit terminal block misfired. • Zone control system failure. Check unit installation instructions for correct wiring. If no signal is present at W1, then replace zone control panel.	Yes
5	1010	Discharge Air Sensor (DAS) detects high heating temperature	This condition may occur any time the discharge probe senses air warmer than 160ºF for furnace or 135ºF for heat pump. If system is in zone mode when this code is set, the system continues in zone mode, shuts off equipment, and runs continuous blower to satisfy demand. The heat pump or furnace will remain off for a minimum of five minutes and until the DAS senses 130ºF. Add more air to zone or redistribute zones to divide air more evenly.	No
6	0110	Zone air jumper not selected	Air selected for fewer than two zones. No air is selected for zone 1 or, 3. If a zone air selection jumper is left off of a zone that issues a heat or cool demand. In this case the system will assume that a PIAB of 100 is required to service the zone. Make a zone air jumper selection. If jumpers are in place, replace the zone control panel.	No
7	1110	Open or shorted DAS	If system is operating, system will be forced into central mode. The compressor will cycle from high to off in cooling. The compressor will cycle from high to off in heating. The furnace will operate normally in gas heat. Replace discharge probe. If error persists, replace zone control panel.	No
8	0001	Simultaneous heat and cool call from same thermostat	In addition, possible inconsistent thermostat signals. Verify thermostats are correctly connected to the zone control panel. If error persists after you check the thermostats and jumper selections or try another thermostat model or brand. Demand will be ignored from the zone sending the bad signals. See “Table 14. Time Delays” on page 60.	No

Table 15. Diagnostics Codes

Code #	(0-off;1-on) Diag LED1234	Fault Indicated	Remedy	Fail-safe (System Shut Down)
9	1001	Open pressure switch (heat pump systems only)	Displayed when the pressure switch opens and does not necessarily mean there is anything wrong. However, try increasing the air delivered to the smallest zone. An open pressure switch will stage the heat pump down to 1st stage only, if after 90 seconds the switch does not close, the heat pump is shut off and backup heat is used to satisfy the call. Green Pressure switch LED on zone panel will be off.	No
10	0101	Insufficient heating	Occurs when there is a call for heating and the Discharge Air Sensor does not sense a increase in supply air temperature indicating the heating is not functioning properly.	No
11	1101	DAS sensed frozen coil	Indicates discharge air temperature sensed by discharge air sensor drops below 45 degrees during the cooling mode. When sensed, the air conditioner unit will stop and as long as the cooling demand is present the ID blower will continue to run until the 5 minute timed off timer expires and the discharge air sensor senses 55ºF.	No
12	0011	Multiple jumper selection	Each jumper block on zone control panel is allowed only one jumper, except for the system setup block. Remove extra jumper.	No
13	0111	Dual-fuel furnace use lock-in	Heat pump was not able to maintain desired discharge air temperature; furnace will be used to satisfy heat calls for the next three hours. After three hours, the heat pump will be used again.	No

6.3. Air Delivered By Blower

The actual CFM delivered to each zone will be determined by the zone control system settings, blower motor control board settings, zone thermostat demand status (calling for heating, cooling, continuous fan, or no demand [zone damper closed]), and the air distribution system's duct size.

6.3.1. Formulas

When the zone control system is set for a particular zone, heating reduction jumper, and/or continuous air reduction settings determine the total CFM available from the unit as follows:

1. **Determine Total Unit PIAB** — Using the formula in "Table 16. Determine total PIAB and Total CFM Delivered" calculate the Total Percent into Adjustment Band. This illustrates the percentage into the adjustment band that the motor runs when more than one zone is calling for conditioning.

2. **Determine Total CFM Delivered** — Continuing from the previous example and assumptions, and using the formula in Table 11, calculate the total CFM delivered. The maximum and minimum CFM values used in the formula should correspond to the jumper settings on the blower control board. This value represents the volume of air received if all zones were calling for cooling.

3. **Determine heating PIAB and Total Heating air CFM Delivered during a Heating Call** — Calculate these totals using the formulas and examples in "Table 17. Determine Total Heating CFM delivered".

4. Check "CFM" LED or 7-Segment LED on indoor unit to obtain approximately CFM the indoor unit is operating at.

5. **Determine Total Air Delivered during a Continuous Blower Cal**l — Calculate these totals using the formulas and examples in "Table 18. Determine Total Continuous CFM delivered".

IMPORTANT

If any blower speed settings (furnace or air handler) are changed, the zone control PIAB calculations must be performed again to ensure proper airflow.

Table 16. Determine total PIAB and Total CFM Delivered

Jumpers						CFM	
Zn1	**Zn2**	**Zn3**	**Zn4**	**Cont. Air Reduction**	**Heating Air Red.**	**Min.**	**Max.**
30%	10%	20%	OFF	25%	20%	720	2200

Gray zones are calling.

Total PIAB Formula

(# of zones calling - 1)3(Sum of calling zones 1 to 4 jumper positions)+

1. Using example values above, find Total PIAB:

- Jumper positions .10 +.20 .30(# of Calling zones minus 1) divided by 3 (2-1)/3 +.33 Total (motor runs 63% into adjustment band of motor) . 63
- Total CFM Formula
- Total PIAB x (CFM max. - CFM min.) + (min. CFM)

2. Then find Total CFM:

- Total PIAB from step 1. 63CFM max. - CFM min. (2220-720) x1500
- CFM into adjustment band 945
- Total CFM (CFM min + CFM into adjustment band) 1665

Table 17. Determine Total Heating CFM delivered

Example values

Jumpers						CFM	
Zn1	**Zn2**	**Zn3**	**Zn4**	**Cont. Air Reduction**	**Heating Air Red.**	**Min.**	**Max.**
30%	50%	40%	OFF	25%	20%	720	2200

- Gray zones are calling.
- Total PIAB Formula
- (# of zones calling - 1) 3 (Sum of calling zones 1 to 4 jumper positions)+

1. Using example values above, find Total PIAB:

- Jumper positions .30 +.40 .70(Calling zones minus 1) divided by 3 (2-1)/3 +.33 Total (use sum or 1.00, whichever is less) 1.03 *1.00*Blower cannot support 103%; uses 100%
- Heating PIAB Formula
- Total PIAB x (1 - Heating air reduction setting)

2. Then find Heating PIAB:

- Total PIAB from step 1 1.00(1-Heating air reduction setting) (1.00-.20) x.80Total Heating PIAB .80
- Total Heating CFM Formula
- Heating PIAB x (CFM Max. - Min.) + (Min. CFM)

3. Then find Total Heating CFM:

- Heating PIAB from step 2 .80CFM max. - CFM min. (2220-720) x1500
- Subtotal 1200Min CFM +720Total Heating CFM 1920

Table 18. Determine Total Continuous CFM delivered

Example values

Jumpers						CFM	
Zn1	**Zn2**	**Zn3**	**Zn4**	**Cont. Air Reduction**	**Heating Air Red.**	**Min.**	**Max.**
30%	50%	40%	OFF	25%	20%	720	2200

- Gray zones are calling.
- Total PIAB Formula
- (# of zones calling - 1)3(Sum of calling zones 1 to 4 jumper positions)+

1. Using example values above, find Total PIAB:

- Jumper positions (.30+.50+.40) 1.20(Calling zones minus 1) divided by 3 (3-1)/3 +. 66 Total (use sum or 1.00, whichever is less) 1.86 *1.00*Blower cannot support 186%; uses 100%
- Continuous Air PIAB Formula
- Total PIAB x (1 - continuous air reduction setting)

2. Then find Continuous Air PIAB:

Total PIAB from step 1. 1x (1-Continuous air reduction setting) (1.00-.25) x.75Total Continuous Air PIAB .75

- Total Continuous CFM Formula
- Continuous air PIAB x (CFM max. - CFM min.) + (min. CFM)

3. Then find Total Continuous Air CFM:

- Continuous Air PIAB from step 2. .75CFM max. - CFM min. (2220-720) x1500
- Subtotal 1125Min CFM +720Total Continuous Air CFM 1845

6.3.2. PIAB Calculation Worksheet

PIAB Calculation Worksheet

PIAB = [(Required CFM - Minimum CFM) / (Maximum CFM - Minimum CFM)] * 100

Sample CFM ⏵	**Required**	**Minimum**	**Maximum**	**Minimum**		
Sample PIAB =	**([920] -**	**[450]) / ([2000] -**	**[450])**	**x 100**		
		=		=		
Sample PIAB =	**([470]) / ([1550])**			**x 100**		
		=				
Sample PIAB =		**[0.303]**		**x 100**	**= 30**	**%**
Zone 1 CFM ⏵	**Required**	**Minimum**	**Maximum**	**Minimum**		
ZONE 1 PIAB =	([ ] -	[ ]) / ([ ] -	[ ])	x 100		
		=		=		
ZONE 1 PIAB =	([ ]) / ([ ])			x 100		
		=				
ZONE 1 PIAB =		[ ]		x 100	=	%
Zone 2 CFM ⏵	**Required**	**Minimum**	**Maximum**	**Minimum**		
ZONE 2 PIAB =	([ ] -	[ ]) / ([ ] -	[ ])	x 100		
		=		=		
ZONE 2 PIAB =	([ ]) / ([ ])			x 100		
		=				
ZONE 2 PIAB =		[ ]		x 100	=	%
Zone 3 CFM ⏵	**Required**	**Minimum**	**Maximum**	**Minimum**		
ZONE 3 PIAB =	([ ] -	[ ]) / ([ ] -	[ ])	x 100		
		=		=		
ZONE 3 PIAB =	([ ]) / ([ ])			x 100		
		=				
ZONE 3 PIAB =		[ ]		x 100	=	%
Zone 4 CFM ⏵	**Required**	**Minimum**	**Maximum**	**Minimum**		
ZONE 4 PIAB =	([ ] -	[ ]) / ([ ] -	[ ])	x 100		
		=		=		
ZONE 4 PIAB =	([ ]) / ([ ])			x 100		
		=				
ZONE 4 PIAB =		( )		x 100	=	%

7. Airflow Data

ML180

All of the below are approximations and examples only. All equipment can differ output by load and system matching. All the attached is meant to show common examples for safe operation of Lennox equipment. CFM valves are not all exact available targets but will yield a close approximation to all applications.

Example: ML180UH045V36A (If the target cfm is 407 then a blower running at 400 to 420 CFM would be close)

Table 19. ML180

Model	ML180UH030V36A	ML180UH045V36A	ML180UH070V36A	ML180UH070V36B
Minimum CFM For Zoning	411 CFM @55˚F TR Output BTU 24,430	407 CFM @55˚F TR Output BTU 24,000*	589 CFM @55˚F TR Output BTU 35,000*	589 CFM @55˚F TR Output BTU 35,000*
Example CFM For Harmony III	565 CFM @40˚F TR Output BTU 24,430	559 CFM @40˚F TR Output BTU 24,000*	810 CFM @40˚F TR Output BTU 35,000*	810 CFM @40˚F TR Output BTU 35,000*
Maximum CFM	904 CFM @25˚F TR Output BTU 24,430	1320 CFM @25˚F TR Output BTU 36,100	1345 CFM @36˚F TR Output BTU 53,400	1290 CFM @38˚F TR Output BTU 53,400
Model	ML180UH070V48B	ML180UH090V48B	ML180UH110V60C	
Minimum CFM For Zoning	589 CFM @55˚F TR Output BTU 35,000*	791 CFM @55˚F TR Output BTU 47,000*	976 CFM @55˚ TR Output BTU 58,000*	
Example CFM For Harmony III	810 CFM @40˚F TR Output BTU 35,000*	1,109 CFM @40˚F TR Output BTU 47,000*	1,343 CFM @40˚F TR Output BTU 58,000	
Maximum CFM	1,648 CFM @30˚F TR Output BTU 53,400	1,740 CFM @38˚F TR Output BTU 71,500	2,180 CFM @38˚F TR Output BTU 89,700	

Table 20. ML296

Model	ML296UH045XV36B	ML296UH070XV36B	ML296UH090XV48C	ML296UH110XV60C
Minimum CFM For Zoning	519 CFM @50˚F TR Output BTU 28,000	690 CFM @55˚F TR Output BTU 41,000	849 CFM @60˚F TR Output BTU 55,000	997 CFM @65˚F TR Output BTU 70,000
Factory CFM	780 CFM @33˚F TR Output BTU 28,000	900 CFM @42˚F TR Output BTU 41,000	1,135 CFM @45˚F TR Output BTU 55,000	1,375 CFM @47˚F TR Output BTU 70,000
Maximum CFM	1,296 CFM @30˚F TR Output BTU 42,000	1,518 CFM @25˚F Tr Output BTU 41,000	1,728 CFM @45˚F Tr Output BTU 84,000	2,181 CFM @ 45˚F Tr Output BTU 106,000

EL296

Table 21. EL296UHV

Model	EL296UH045XV36B	EL296UH070XV36B	EL296UH090XV36C	EL296UH090XV48C
Minimum CFM	518 CFM @50˚F TR Output BTU 28,000	690 CFM @55˚F TR Output BTU 41,000	848 CFM @60˚F TR Output BTU 55,000	848 CFM @60˚F TR Output BTU 55,000
Factory CFM	740 CFM @35˚F TR Output BTU 28,000	850 CFM @45˚F TR Output BTU 41,000	965 CFM @53˚F TR Output BTU 55,000	1220 CFM @42˚F TR Output BTU 55,000
Maximum CFM	1,143 CFM @35˚F TR Output BTU 42,000	1,240 CFM @50˚F TR Output BTU 62,000	1,296 CFM @ 60˚F TR Output BTU 84,000	1,749 CFM @45˚F TR Output BTU 85,000
Model	EL296UH090XV60C	EL296UH110XV48C	EL296UH010XV60C	EL296UH135XV60D
Minimum CFM	926 CFM @55˚F TR Output BTU 55,000	997 CFM @65˚F TR Output BTU 70,000	997 CFM @65˚F TR Output BTU 70,000	1,111 CFM @70˚F TR Output BTU 84,000
Factory CFM	1,185 CFM @43˚F TR Output BTU 55,000	1,225 CFM @53˚F TR Output BTU 70,000	1,200 CFM @54˚F TR Output BTU 70,000	1,440 CFM @54˚F TR Output BTU 84,000
Maximum CFM	1,966 CFM @40˚F TR Output BTU 85,000	1620 CFM @60˚F TR Output BTU 105,000	2181 CFM @45˚F TR Output BTU 106,000	2121 CFM @55˚F TR Output BTU 126,000

Table 22. EL296DFV

Model	EL296DF045XV36B	EL296DF070XV48B	EL296DF090XV60C	EL296DF110XV60C
Minimum CFM	518 CFM @50˚F TR Output BTU 28,000	707 CFM @55˚F TR Output BTU 42,000	864CFM @60˚F TR Output BTU 56,000	997CFM @65˚F TR Output BTU 70,000
Factory CFM	745 CFM @35˚F TR Output BTU 28,000	850 CFM @46˚F TR Output BTU 42,000	1160CFM @45˚F TR Output BTU 56,000	1220CFM @57˚F TR Output BTU 70,000
Maximum CFM	1,137 CFM @35˚F TR Output BTU 43,000	1,693 CFM @35˚F TR Output BTU 64,000	1,966 CFM @40˚F TR Output BTU 85,000	2,181 CFM @45˚F TR Output BTU 106,000

SL280UH

Table 23. SL280UH

Model	SL280UH070V36A	SL280UH090V36B	SL280UH090V48B	SL280UH090V60C
Model - Low Nox	SL280UH070XV36A	- - -	SL280UH090XV48B	SL280UH090XV60C
Minimum CFM	589 CFM @55˚F TR Output BTU 35,000	791 CFM @55˚F TR Output BTU 47,000	791 CFM @55˚F TR Output BTU 47,000	791 CFM @55˚F TR Output BTU 47,000
Factory CFM	850 CFM @38˚F TR Output BTU 35,000	1,070 CFM @41˚F TR Output BTU 47,000	1,035 CFM @42˚F TR Output BTU 47,000	1,145 CFM @38˚F TR Output BTU 47,000
Maximum CFM	1,203 CFM @40˚F TR Output BTU 52,000	1,620 CFM @40˚F TR Output BTU 70,000	1,620 CFM @40˚F TR Output BTU 70,000	1,620 CFM @40˚F TR Output BTU 70,000
Model	SL280UH110V60C	SL280UH135V60D		
Model - Low Nox	SL280UH110XV60C	- - -		
Minimum CFM	976 CFM @55˚F TR Output BTU 58,000	1,191 CFM @55˚F TR Output BTU 105,000		
Factory CFM	1,360 CFM @40˚F TR Output BTU 58,000	1,515 CFM @42˚F TR Output BTU 69,000		
Maximum CFM	2,210 CFM @36˚F TR Output BTU 87,000	2,235 CFM @45˚F TR Output BTU 105,000		

Table 24. SL280UHNV

Model	SL280UH060NV36A	SL280UH080NV48B	SL280UH080NV60C	SL280UH100NV60C
Minimum CFM	574 CFM @50˚F TR Output BTU 31,000	759 CFM @50˚F TR Output BTU 41,000	759 CFM @50˚F TR Output BTU 41,000	963 CFM @50˚F TR Output BTU 52,000
Factory CFM	825 CFM @35˚F TR Output BTU 31,000	1,060 CFM @36˚F TR Output BTU 41,000	1,130 CFM @34˚F TR Output BTU 41,000	1,425 CFM @34˚F TR Output BTU 52,000
Maximum CFM	1,482 CFM @30˚F TR Output BTU 48,000	1,975 CFM @30˚F TR Output BTU 64,000	1,975 CFM @30˚F TR Output BTU 64,000	2,469 CFM @30˚F TR Output BTU 80,000

Table 25. SL280DF

Model	SL280DF070V36A	SL280DF090V48B	SL280DF090V60C	SL280DF110V60C
Minimum CFM	589 CFM @55˚F TR Output BTU 35,000	774 CFM @55˚F TR Output BTU 46,000	774 CFM @55˚F TR Output BTU 46,000	993 CFM @55˚F TR Output BTU 59,000
Factory CFM	860 CFM @38˚F TR Output BTU 35,000	1,075 CFM @40˚F TR Output BTU 46,000	1,245 CFM @34˚F TR Output BTU 46,000	1,325 CFM @41˚F TR Output BTU 59,000
Maximum CFM	1,375 CFM @35˚F TR Output BTU 52,000	1,825 CFM @35˚F TR Output BTU 69,000	1,851 CFM @35˚F TR Output BTU 70,000	2,302 CFM @35˚F TR Output BTU 87,000

SL297UHNV

Table 26. SL297UHNV

Model	SL297UH040NV36B	SL297UH060NV36B	SL297UH080NV48C	SL297UH080NV60C
Minimum CFM	463 CFM @50˚F TR Output BTU 25,000	640 CFM @55˚F TR Output BTU 38,000	787 CFM @60˚F TR Output BTU 51,000	859 CFM @55˚F TR Output BTU 51,000
Factory CFM	704 CFM @33˚F TR Output BTU 25,000	886 CFM @40˚F TR Output BTU 38,000	1,219 CFM @39˚F TR Output BTU 51,000	1,178 CFM @40.˚F TR Output BTU 51,000
Maximum CFM	772 CFM @30˚F TR Output BTU 39,000	704 CFM @50˚F TR Output BTU 58,000	1050 CFM @45˚F TR Output BTU 78,000	1181 CFM @40˚F TR Output BTU 78,000

Table 27. SLP99UHV

Starting at 70% of High Fire
(Temperature rise based on primary limit and room at 70˚ and before tripping furnace primary limit)

Model	SLP99UH070XV36B	SLP99UH090XV36C	SLP99UH090XV48C	SLP99UH090XV60C
Primary Limit	145˚F	150˚F	140˚F	140˚F
Minimum CFM (Fail at CFM) Zoning	553 CFM @75˚F TR Output BTU 44,800	688 @80˚F TR Output BTU 59,500	787 CFM @70˚F TR Output BTU 59,500	805 CFM @70˚F TR Output BTU 60,900
Maximum CFM	1,185 CFM @50˚F TR Output BTU 64,000	1,312 CFM @60˚F TR Output BTU 85,000	1,574 CFM @50˚F TR Output BTU 85,000	1,611 CFM @50˚F TR Output BTU 87,000
Model	**SLP99UH110XV60C**	**SLP99UH135XV60D**		
Primary Limit	140˚	135˚		
Minimum CFM (Fail at CFM) Zoning	981 CFM @70˚F TR Output BTU 74,200	1,276 CFM @65˚F TR Output BTU 89,600		
Maximum CFM	1,963 CFM @50˚F TR Output BTU 106,000	2,020 CFM @55˚F TR Output BTU 128,000		

Table 28. SLP99DF

Starting at 70% of High Fire
(Temperature rise based on primary limit and room at 70˚and before tripping furnace primary limit)

Model	SLP99DF070XV36B	SLP99DF090XV36C	SLP99DF090XV48C	SLP99DF090XV60C
Primary Limit	145˚F	145˚F	140˚F	140˚F
Minimum CFM (Fail at CFM) Zoning	553 CFM @75˚F TR Output BTU 44,800	726 CFM @75˚F TR Output BTU 58,800	787 CFM @70˚F TR Output BTU 59,500	787 CFM @70˚F TR Output BTU 59,500
Maximum CFM	1,185 CFM @50˚F TR Output BTU 64,000	1,296 CFM @60˚F TR Output BTU 84,000	1,574 CFM @50˚F TR Output BTU 85,000	1,574 CFM @50˚F TR Output BTU 85,000
Model	**SLP99DF110XV60C**			
Primary Limit	145˚F			
Minimum CFM (Fail at CFM) Zoning	925 CFM @75˚F TR Output BTU 74,900			
Maximum CFM	1,982 CFM @50˚F TR Output BTU 107,000			

Table 29. Single Stage Condensing In Cooling

(At minimum blower CFM superheat must be at or above 5˚SH)

Size	1.5 Tons	2 Tons	2.5 Tons	3 Tons
Minimum CFM @180 CFM Per Ton	270 CFM	360 CFM	450 CFM	540 CFM
Recommend CFM @300 CFM Per Ton For Zoning	450 CFM	600 CFM	750 CFM	900 CFM
CFM @400CFM Per Ton	600 CFM	800 CFM	1,000 CFM	1200 CFM
Size	**3.5 Tons**	**4Tons**	**5 Tons**	
Minimum CFM @180 CFM Per Ton	630 CFM	720 CFM	900 CFM	
Recommend CFM @300 CFM Per Ton For Zoning	1,050 CFM	1200 CFM	1,500 CFM	
CFM @400CFM Per Ton	1,400 CFM	1,600 CFM	2,000 CFM	

Single Stage Heat Pump In Heating

Table 30. Single Stage Heat Pump In Heating

(Maximum pressure approximately @ 525PSI)

Size	1.5 Tons	2 Tons	2.5 Tons	3 Tons
Minimum CFM @380 CFM Per Ton	570 CFM	760 CFM	950 CFM	1,140 CFM
Recommend CFM @450 CFM Per Ton	675 CFM	900 CFM	1,125 CFM	1,350 CFM
Size	**3.5 Tons**	**4Tons**	**5 Tons**	
Minimum CFM @380 CFM Per Ton	1,330 CFM	1,520 CFM	1,900 CFM	
Recommend CFM @450 CFM Per Ton	1,575 CFM	1,800 CFM	2,250 CFM	

Two Stage Condensing Unit In First Stage Cooling

Table 31. Two Stage Condensing Unit In First Stage Cooling

(At minimum blower CFM superheat must be at or above 5˚SH)

Size	2 Tons	3 Tons	4 Tons	5 Tons
Unit In First Stage	1.34 Tons	2.01 Tons	2.68 Tons	3.35 Tons
Minimum CFM @180 CFM Per Ton	241 CFM	362 CFM	482 CFM	603 CFM
Recommend CFM @300 CFM Per Ton	402 CFM	603 CFM	804 CFM	1,005 CFM
Maximum CFM @400 CFM Per Ton	536 CFM	804 CFM	1,072 CFM	1,340 CFM

Two Stage Heat Pump Unit In First Stage Heating

Table 32. Two Stage Heat Pump Unit In First Stage Heating

(Maximum pressure approximately @525PSI)

Size	2 Tons	3 Tons	4 Tons	5 Tons
Unit In First Stage	1.34 Tons	2.01 Tons	2.68 Tons	3.35 Tons
Minimum CFM @380 CFM Per Ton	509 CFM	764 CFM	1,018 CFM	1,273 CFM
Recommend CFM @450 CFM Per Ton	603 CFM	904 CFM	1,206 CFM	1,508 CFM

Variable Condensing Unit: Minimum Cooling CFM

Table 33. Variable Condensing Unit: Minimum Cooling CFM

(At minimum blower CFM superheat must be at or above 5˚SH)

Model	EL18XCV-024	EL18XCV-036	EL18XCV-048	EL18XCV-060
System at Minimum Capacity	.8 Tons	.875 Ton	1.49 Ton	1.625 Ton
Minimum CFM @300 CFM Per Ton For Zoning	250 CFM	262.5 CFM	447 CFM	488 CFM
Model	**EL18XPV-024**	**EL18XPV-036**	**EL18XPV-048**	**EL18XPV-060**
System at Minimum Capacity	.8 Tons	.87 Tons	1.55 Tons	1.78 Tons
Minimum CFM @300 CFM Per Ton For Zoning	250 CFM	261 CFM	465 CFM	534 CFM

Variable Condensing Unit Minimum Heat Pump Heating CFM

Table 34. Variable Condensing Unit Minimum Heat Pump Heating CFM

(Maximum pressure approximately @525PSI)

Model	EL18XPV-024	EL18XPV-036	EL18XPV-048	EL18XPV-060
System at Minimum Capacity	.875 Tons	.86 Tons	1.6 Tons	1.78 Tons
Minimum CFM @380 CFM Per Ton For Zoning	333 CFM	327 CFM	608 CFM	677 CFM
Recommend CFM @450 CFM Per Ton	394 CFM	387 CFM	720 CFM	801 CFM

Electric Heating ECBA25-P / CBA25UHV

Table 35. Electric Heating ECBA25-P / CBA25UHV

(@240VAC 3.413 BTU per Watt)

Size by kW	No. Of Stages	Low Heating BTU	Airflow to 30°Tr	Max Heating BTU
4kW	1	13,652	421 CFM	13,652
5kW	1	17,065	527 CFM	17,065
7.5kW	1	25,598	790 CFM	25,598
10kW	1	34,130	1053 CFM	34,130
12.5kW	2	28,441	878 CFM	42,662
15kW	2	34,130	1053 CFM	51,195
20kW	2	34,130	1053 CFM	68,260

Table 36. Electric Heating CFM ECB38-P CBA38MV

(@240VAC 3.413 BTU per Watt)

Size by kW	No. Of Stages	Low Heating BTU	Airflow to 30°Tr	Max Heating BTU
4kW	1	13,652	421 CFM	13,652
5kW	1	17,065	527 CFM	17,065
6kW	1	20,478	632 CFM	20,478
8kW	2	13,652	421 CFM	27,304
9kW	2	15,358.5	474 CFM	30,717
12.5kW	2	14,221	439 CFM	42,662
15kW	2	17,065	527 CFM	51,195
20kW	2	34,130	1,053 CFM	68,260

8. User Guide

8.1. What is the Harmony III™ zoning system?

Lennox Harmony III zoning system manages the distribution of conditioned air to as many as four specific areas or zones in the home. The Harmony III is an advanced control system that allows a home to be zoned for heating and cooling without the extra expense of purchasing two or more HVAC (Heating, Ventilation, and Air Conditioning) systems.

This control allows the owner to heat or cool occupied areas, without conditioning unused areas. The system adapts the HVAC components to provide a balanced and comfortable environment.

8.2. What does the Harmony III™ zoning system consist of?

The principle system component is the control center which acts as the “brains” of the Harmony III zoning system. It coordinates all of the operations of thermostats, motorized dampers, and HVAC equipment.

Harmony III zoning system uses off-the-shelf 1-heat/1-cool, non-power-robbing, non-heat pump electronic thermostats and motorized dampers with one of the following Lennox HVAC systems to distribute conditioned air to zones:

- **Option 1**. Gas Furnace with Variable Speed Blower Motor (VSM) and either a single- or two-speed air conditioner unit.
- **Option 2**. Blower coil unit with Variable Speed Blower Motor and either a single- or two-speed heat pump.
- **Option 3**. Gas furnace with Variable Speed Blower Motor and heat pump.
- **Option 4**. Adding Humiditrol® Interface to any of the above options.

8.3. How do I set the Control Center Switches?

The Harmony III control center has only two ON/OFF switches (see illustration). For the most part, the system relies on thermo- stats to provide control of the desired comfort level for each zone. The control center also has LEDs (light emitting diodes) which light to indicate the current operating mode and which zone dampers are closed.

Later models of the Harmony III™ control center board includes connecting points for a remote vacation switch which may be installed near the Zone 1 thermostat for the homeowners convenience.

1. **Vacation Switch**. The Harmony III control center operates in either of two modes: central mode (Vacation switch ON) or zone mode (Vacation switch OFF).
   - **Central Mode** (Vacation ON) − all zones receive conditioned air at the same time (like traditional, non−zoned HVAC systems). The master thermostat (located in Zone 1) controls any heating or cooling need for all zones in the building.
   - **Zone Mode** (Vacation OFF) − specific zones are conditioned only when the demand comes from that zone. Each zone (not necessarily each room) has its own thermostat. The individual zone thermostats only work when the control center is in zone mode.

IMPORTANT

The heating and air conditioning equipment includes safety devices that protect you and your property. If one or more of these devices is activated, heating operation will stop. If your home is left unattended for an extended period of time, equipment operation must be checked periodically. If this is not possible, the water supply to the house should be shut off and the pipes should be drained. This will prevent problems associated with a NO HEAT condition (frozen pipes, etc.)

8.4. How do I use the Thermostat Controls?

Whether in central mode (where only zone 1 thermostat is functional) or in the zone mode (where all thermostats are functional), thermostats function as in a traditional, non−zoned, system. That is:

- HEAT setting tells the control center that it should provide heat to the zone(s) when it is needed.
- COOL setting tells the control center to provide cool air to the zone(s) when there is a need.
- AUTO setting allows either heating or cooling to occur, depending on the need. This selection is best in spring or autumn, when the temperature is cool in the morning but still warms in the afternoon. By placing the thermostats in AUTO, heating would come on in the morning and cooling in the afternoon, if needed.
- FAN AUTO or FAN ON tells the control center how the blower should operate. Select one or the other. FAN AUTO allows the blower to turn on and turn off with the heating or cooling needs. FAN ON tells the blower to run continuously. Zone-controlled dampers in the system make it possible to have some zones call for continuous fan (FAN ON) while other zones are set to FAN AUTO.

8.5. How do I use the Central (Vacation) Mode?

When you choose central (Vacation ON) mode, heating and cooling will affect all zones.

1. Move the vacation switch on the zone control to VACATION ON (or, if used, move the remote vacation switch to “vacation on”).
2. Choose either HEAT or COOL or AUTO on the master (zone 1) thermostat.

3. Choose either FAN AUTO or FAN ON on the master thermostat.
4. Set master thermostat to desired room temperature.

8.6. How do I use the Zone Mode?

When you choose zone (Vacation OFF) mode, heating and cooling is controlled by specific zone thermostats.

1. Move the Vacation switch on the control center to OFF.
2. Choose either HEAT or COOL or AUTO on each thermostat (thermostats need not be set alike).
3. Choose either FAN AUTO or FAN ON on each thermostat (these may be set differently in each zone).
4. Set thermostats to desired room temperature.

8.7. How are Zones Determined?

Your Lennox dealer has sectioned the rooms of your home or building into zones using the following considerations:

- **Structural and Architectural Considerations** - In multi-level houses using regular HVAC systems, heated air rises to the upper floor(s) causing those rooms become too hot. Zoning will remedy this situation by splitting the conditioned space into two specific zones (1st and 2nd floors). The 2nd floor temperature is now controlled by its own thermostat, not that of the 1st floor.
- **Climate Considerations** - Exposure from the sun and weather can produce cold and hot spots in homes that are conditioned with the use of one thermostat. Zoning lessens this by grouping rooms with the same exposure into one zone. Therefore, rooms with a northern exposure and rooms with a southern exposure should not be zoned together. In the winter, northern rooms may be too cool while southern rooms may be too hot. In order to keep a balance of conditioned air, the zone must contain rooms with the same weather exposure.
- **Occupancy Considerations** - A single structure contains different types of living spaces. Without zoning, it is difficult to condition all areas so that everyone will be comfortable. Zoning a home or office allows the owner to control the zones which need to be conditioned. Rooms that are used or occupied at the same time are zoned together. Bedrooms which are generally used at night, should not zoned with a living room that is used only during the day or evening.

8.8. How do I use the Optional Humiditrol® Dehumidification Accessory?

If your zoned system is equipped with an optional Humiditrol dehumidification accessory, see instructions provided with the Humiditrol Zoning Accessory manual for setting up zone control and thermostat for operation.

8.9. Enabling and Disabling Humiditrol Setting in Thermostat

You installer should have already enabled Humiditrol option during the installation of the equipment. Please contact our installer to verify installation is completed and configured correctly.

8.10. Humiditrol User Adjustment is also available under the User Settings

Please refer to your thermostat user guide on instructions on how to adjust your specific thermostat for Humiditrol function.

8.11. Owner Reminder!

Be sure the system installer has recorded the zoning information in “Table 37. Homeowners Zone Information Record” and has identified a contact person and phone number in case of problems. If you have the optional Humiditrol® Enhanced Dehumidification Accessory (EDA) along with the Humiditrol® Zoning Accessory installed, ask for a copy of those kit’s installation and operation instructions.

8.12. Thermostat replacement

In the event a thermostat should fail and require replacement, be aware that not all thermostats will work for all systems. Certain types of thermostats, known as power-robbing thermostats, have no “C” (common) wire connection terminal; these can cause unintended system operation and therefore must not be used. Call your Lennox dealer to help you identify and install an appropriate thermostat with a “C” terminal.

8.13. Maintenance

Once your Lennox Harmony III zoning system is properly installed, no maintenance is required for the control panel’s components. Only standard heating and cooling equipment (HVAC) maintenance is required.

If you experience problems turning the system on to either heat or cool, the problem may simply be a programmed time delay, which, in most cases, would expire within 5 to 20 minutes. Such delays are normal and are built-in to assure proper equipment operation.

8.14. Homeowners Zone Information Record

Table 37. Homeowners Zone Information Record

Zone Number	Record which rooms are zoned together and controlled by thermostat number.
1	
2	
3	
4	
Lennox Dealer:	
Contact:	
Telephone Number:	
Installation Date	