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## ZONING SYSTEM

LZP-4

# FOUR ZONE CONTROL PANEL

### INSTALLATION INSTRUCTIONS FOR ZONE CONTROL PANELS USED WITH LENNOX HEATING AND COOLING EQUIPMENT (Y7768)

## ⚠ WARNING

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

## Shipping & Packing List

- (1) Model LZP-4 Zone Control Panel
- (2) 88K38 Temperature Sensor
- (3) Installation Instructions and Warranty Card

### Required Components (ordered separately):

**24VAC Transformer** - The zone panel and thermostats are powered by a separate transformer than the transformer for the dampers. The transformer for the zone panel and thermostats should be sized for the zone panel (4VA) and thermostats. The dampers require 10VA for each. The transformer for the dampers should be sized based on the greatest number of dampers that could be energized at any given time.

Table 1. Transformers

Part Number	Size	Voltage Description
10P17	40VA	120/208/240V-24V
10P87	50VA	120/208/240V-24V
12P61	75VA	120/208/240V-24V

The transformers listed in this chart include a plate mount for a 4" square electrical box, Lennox catalog number 83P74.

- **Thermostats** - see Table 3. *Recommended Thermostats on page 5.* Only 24VAC thermostats with a common wire are to be used with this zoning panel. **Do not use mechanical or power robbing thermostats.**
- **Zone Dampers** - Properly sized two- or three-wire, 24VAC dampers required. Two-wire and power closed/spring open preferred.
- **Bypass Dampers** - See Table 4. *Bypass Damper Air Volume Capacities on page 5.*
- **Outdoor Temperature Sensor** - Needed only in dual-fuel application.

## Specifications

### INPUT RATINGS

**Voltage:** 18-30VAC, 50/60Hz

### MAXIMUM CURRENT

**Zone panel damper output per zone (fused):** 18VA at 158°F, 30VA at 90°F.

**Zone panel and thermostats (fused):** 18VA at 158°F, 30VA at 90°F.

**Zone panel consumption:** 4VA maximum.

**NOTE** – Use 18 or 20 AWG solid (**non-stranded**) wire with a maximum length of 300 feet.

### ENVIRONMENT

**Temperature (operating):** -30°F – 158°F

**Temperature (shipping):** -30°F – 180°F

### DIMENSIONS

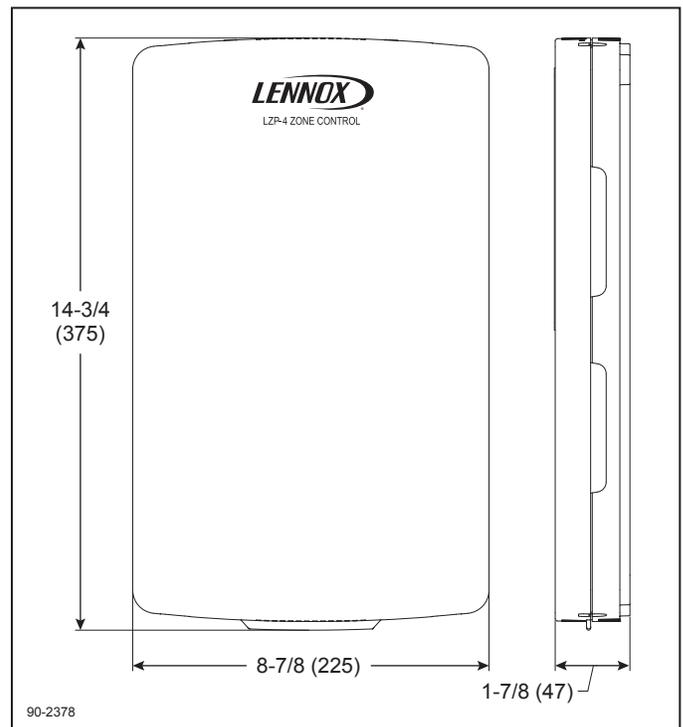


Figure 1. Zone Panel Dimensions – inches (mm)

## Application

- Up to four zones
- Single- or two-stage furnaces
- Single-stage air handlers
- Single- or two-stage heat pump with single- or two-stage fossil fuel auxiliary heat (dual-fuel system)
- Single- or two-stage heat pump with one or two stages of electric auxiliary heat
- Not for use with variable-speed gas furnaces, air handlers or variable-capacity outdoor units (see iHarmony® Zoning System for variable-capacity units)

## Features

- LED indicators for outputs
- Time delay override
- Two- or three-wire damper compatible
- Adjustable high and low discharge air temperature limits
- Vacation (central mode setting)
- Staging control by number of zones calling
- Staging control by time or thermostat input
- Auxiliary heat control by time or thermostat input
- Standard single-stage heat/cool thermostats or heat pump thermostats can be used to control heat pumps or multiple-stage equipment
- Dual-fuel system compatible
- ON/OFF duct air purge control
- LCD display of zone panel status
- LCD for installer setup/configuration and checkout

## Specifications

### WIRING TERMINALS

- 1 - **HVAC** - HVAC connection
- 2 - **ZONE 1 THERMOSTAT** - Thermostat connection
- 3 - **ZONE 2 THERMOSTAT** - Thermostat connection
- 4 - **ZONE 3 THERMOSTAT** - Thermostat connection
- 5 - **ZONE 4 THERMOSTAT** - Thermostat connection
- 6 - **DAMPER 1** - Zone 1 damper connection
- 7 - **DAMPER 2** - Zone 2 damper connection
- 8 - **DAMPER 3** - Zone 3 damper connection
- 9 - **DAMPER 4** - Zone 4 damper connection
- 10 - **REMOTE SENSOR DAT** - Discharge air temperature sensor
- 11 - **REMOTE SENSORS ODT** - Outdoor temperature sensor

- 12 - **DAMPER POWER** - Damper power (dedicated 24VAC)
- 13 - **POWER** - Zone panel and thermostat (dedicated 24VAC)

### LEDs (under cover)

- 14 - **POWER** - Green: 24VAC is present. Flashing: Time Delay Override (TDO) button is pressed.
- 15 - **HEATING** - Green: Heating is active. Flashing: Discharge air high temperature limit reached.
- 16 - **COOLING** - Green: Cooling is active. Flashing: Discharge air low temperature limit reached.
- 17 - **FAN** - Green: Fan output is active.
- 18 - **ZONE 1** - Green: Damper is open. Red: Damper is closed.
- 19 - **ZONE 2** - Green: Damper is open. Red: Damper is closed.
- 20 - **ZONE 3** - Green: Damper is open. Red: Damper is closed.
- 21 - **ZONE 4** - Green: Damper is open. Red: Damper is closed.
- 22 - **EM HEAT** - Amber: Emergency Heat mode is enabled using the EM Heat button or an Emergency Heat call is active based on a thermostat Emergency Heat call.
- 23 - **VACATION** - Green: Vacation mode is enabled.

### BUTTONS (under cover)

- 24 - **EM HEAT** - Used to enable/disable Emergency Heat mode. In Emergency Heat mode the compressor will be locked out and only auxiliary heat will be used to satisfy heating calls. **NOTE** – The EM Heat button does not function when the zone panel is configured to control conventional equipment.
- 25 - **VACATION** - Used to enable/disable Vacation mode. In Vacation mode all zones will be controlled by the thermostat in Zone 1.
- 26 - **NAVIGATION BUTTONS (under cover)** - Used for installer setup and checkout.
- 27 - **TDO (Time Delay Override) (under cover)** - Accelerates timing (six seconds = one minute) used to speed up equipment protection minimum on and off timers.

### LCD (under cover)

- 28 - In normal operation, displays zone panel status. In installer setup, used to configure the zone panel. In installer checkout, used to step through the installer test.

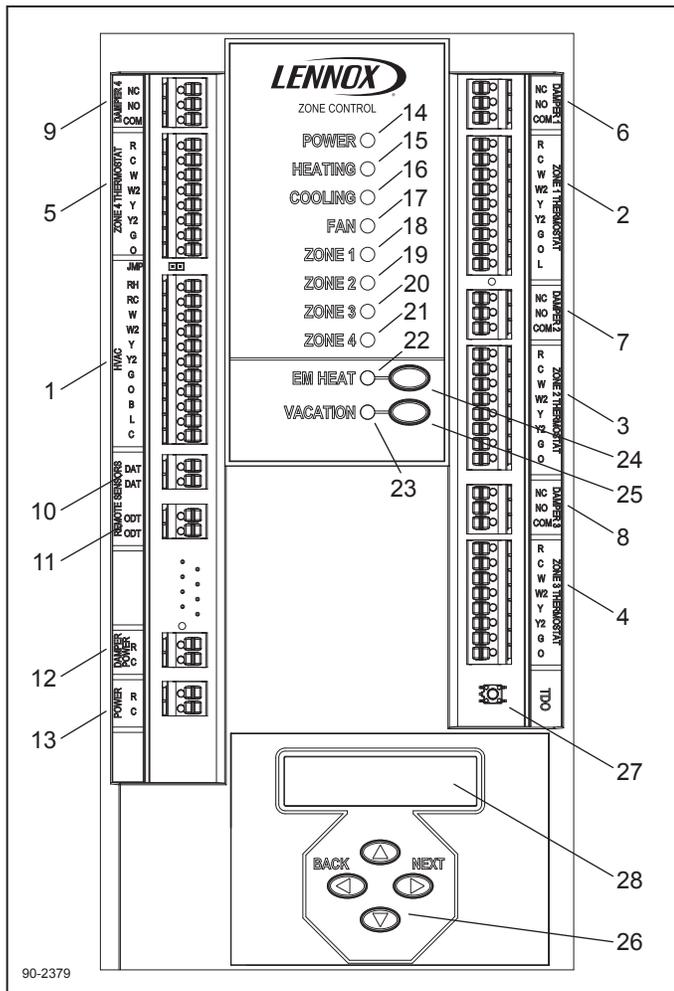


Figure 2. Zone Panel Layout

## Installation

### ⚠ IMPORTANT

After installation perform the Installer Checkout on page 17 to confirm proper operation of the system.

#### MOUNTING ENCLOSURE

- Install the control panel indoors only.
- Do not install the control panel where the temperature will exceed 158°F or will drop below -30°F.
- Do not install the control panel on foundation walls, HVAC equipment or duct systems where moisture may condense on the enclosure.
- Do not install the control panel in a room where it will be exposed to elevated humidity levels, such as in a laundry room.

To begin the installation follow these steps:

- 1 - Remove the cover (replace the cover when installation is complete).
- 2 - There are a total of six mounting holes. Use the 4 outside corners when attaching to drywall/plaster. Use the two middle holes when mounting to a wall stud.

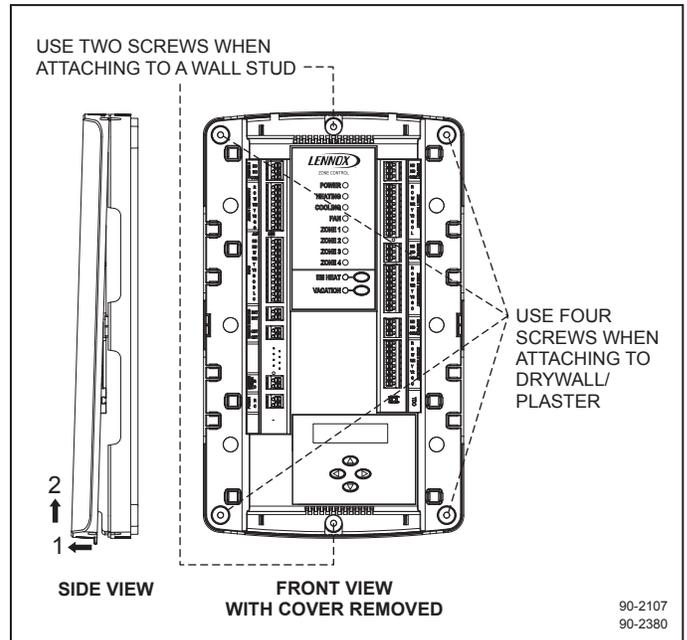


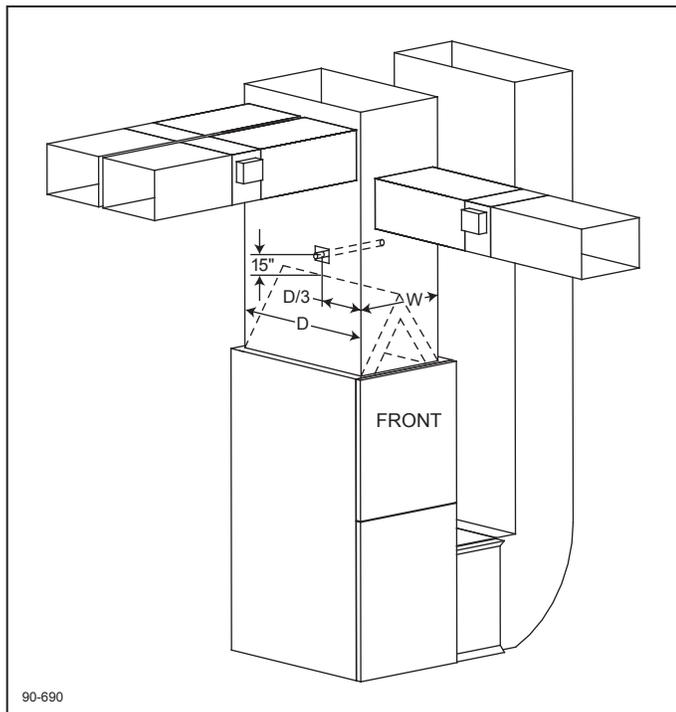
Figure 3. Mounting Panel

- 3 - Use field-provided #8 screws to install the base.

#### DISCHARGE AIR TEMPERATURE SENSOR

We recommend traversing the supply plenum to find the best mixed air location. Use the following instructions as a reference.

- 1 - Before wiring the sensor to the control panel, measure the resistance across the sensor. The resistance corresponds (approximately) to the sensed temperature according to *Table 2. Discharge Air Temperature Sensors - Temperature / Resistance Chart (88K58) on page 4*. If the reading does not correspond, verify that the wiring is not shorted or open and correct if necessary. If the wiring does not correct the problem, replace the sensor.
- 2 - The tip of the sensor must be located before the take-offs in a region with a fully mixed supply of air (not in a dead air space) in order for the system to work correctly.



**Figure 4. Discharge Air Temperature Sensor Location**

- a. Wire discharge air temperature probe to control panel using thermostat wire. Note that the temperature sensor is not polarity sensitive.
- b. Be sure that the tip of the sensor is located at least 15 inches downstream from the leaving air side of the evaporator, in the discharge plenum, 1/3 of the depth (D/3) of the plenum (D) from the wall of the plenum, and centered side-to-side. Move the adjustable bracket along the length of the discharge air sensor to achieve property sensor tip location (tip of sensor to be located at  $W \div 2$ ). The sensor can be inserted from any side of the plenum, as long as the tip of the sensor is in the correct position (see *Figure 4. Discharge Air Temperature Sensor Location*). Also refer to *Table 2. Discharge Air Temperature Sensors - Temperature / Resistance Chart (88K58)*.

**Table 2. Discharge Air Temperature Sensors - Temperature / Resistance Chart (88K58)**

°C	°F	Sensor (ohm)	°C	°F	Sensor (ohm)
-6.6	20	46,134	46.2	115	4,169
-3.9	25	39,869	49	120	3,749
-1.1	30	34,520	51.8	125	3,368
1.7	35	29,936	54.5	130	3,037
4.4	40	26,104	57.3	135	2,750
7.2	45	22,764	60	140	2,489
10.1	50	19,842	62.8	145	2,250
12.8	55	17,406	65.7	150	2,033
15.6	60	15,294	68.5	155	1,847
18.4	65	13,442	71.3	160	1,678
21.2	70	11,849	73.9	165	1,536
23.9	75	10,501	76.8	170	1,397
26.7	80	9,282	79.7	175	1,272
29.5	85	8,233	82.2	180	1,170
32.3	90	7,322	85.1	185	1,070
35	95	6,523	87.8	190	982
37.8	100	5,819	90.8	195	895
40.6	105	5,193	93.4	200	829
43.4	110	4,654			

**⚠ IMPORTANT**

The discharge air sensor is required. If a short or open circuit is detected between the DAT sensor terminals, the control panel will only respond to Zone 1 and the dampers will stay in the open position.

## SIZING THE ZONE TRANSFORMER

- 1 - Install the required transformer(s) selected from *Table 1. Transformers on page 1*. DO NOT USE the HVAC equipment transformer to power the control panel. Refer to the instructions provided with the transformer. The zone panel has separate inputs for control panel and thermostat power and damper power. If the total VA exceeds 75VA separate transformers should be used. The system requires approximately 10VA for the control panel and thermostats. The damper power requirement will depend on the greatest number of dampers that can be energized at any given time. The size of the transformer must not exceed 75VA. If the value is greater than 75VA, some dampers will need to be powered by a separate transformer. For instance, if you have a maximum of three dampers that can be energized at one time, then you would require 10VA for the system and an additional 30VA (3x10VA) for the dampers for a total of 40VA. In this application a single transformer could be used for control panel and thermostat power and damper power. Catalog number 10P17 would be an adequate transformer size at 40VA.
- 2 - Install the thermostats. Refer to the instructions provided with the thermostats. Any 24VAC electronic thermostat with a (24VAC) common terminal can be used. Power robbing thermostats can cause unintended operation - DO NOT use mechanical or power robbing thermostats. Use 18 - 20 AWG thermostat non-stranded wire.

**Table 3. Recommended Thermostats**

Model	Stages	Type	Catalog No.
ComfortSense® 7500 Programmable Touchscreen	4 htg. / 2 clg.	Universal	13H14
ComfortSense® 7500 (Commercial) Programmable Touchscreen	4 htg. / 2 clg.	Universal	13H15
ComfortSense® 5500 Programmable Touchscreen	1 htg. / 1 clg.	Conventional	13H13
ComfortSense® 3000 Programmable	2 htg. / 2 clg.	Conventional	51M35
	1 htg. / 1 clg.	Conventional	51M34
	3 htg. / 2 clg.	Heat Pump	51M37
ComfortSense® 3000 Non-Programmable	1 htg. / 1 clg.	Conventional	24Z12
	2 htg. / 1 clg.	Heat Pump	24Z13
M30 iComfort Programmable Wi-Fi Thermostat	Multistage	Universal	15Z69
E30 iComfort Smart Thermostat	Multistage	Universal	15S63

## Bypass Damper Sizing

When fewer than the maximum number of zones are calling for heating or cooling, an excess volume of air is delivered, and because of the excess air, an excess amount of static pressure is produced as well. Zone systems often require a bypass duct to relieve this pressure. A properly sized barometric bypass damper must be installed in the bypass duct, which is run between the supply and return air duct systems. The barometric damper and the bypass duct must be sized to accommodate the excess static pressure from the supply duct.

The bypass tap in the return air duct must be at least six feet from the furnace/air handler to ensure that the hot or cold air coming off of the plenum has time to mix with the return air before it passes through the air handler again. The provided discharge air sensor will prevent any damage to the equipment from overheating or coil freeze-up by downstaging or interrupting the HVAC equipment.

The bypass damper and duct should be sized to handle the excess pressure created when the smallest zone is operating alone (worst case). To size the bypass damper, subtract the total air volume capacity of the smallest zone from the total air volume of the system.

Example:

- Total System air volume: 2000 CFM
- Air volume of smallest zone: 600 CFM
- Bypass requirement: 2000 - 600 = 1400 CFM

CFM = Cubic Feet Per Minute

In this example, the bypass duct should be sized to handle the 1400 CFM excess pressure created when only the smallest zone has a demand. For bypass damper air volume capacities see the following table.

**Table 4. Bypass Damper Air Volume Capacities**

Round	Catalog No.
8 inch diameter - 400 CFM	X4142
10 inch diameter - 750 CFM	X4203
12 inch diameter - 1200 CFM	X4204
14 inch diameter - 1800 CFM	X4205
16 inch diameter - 2400 CFM	X4206

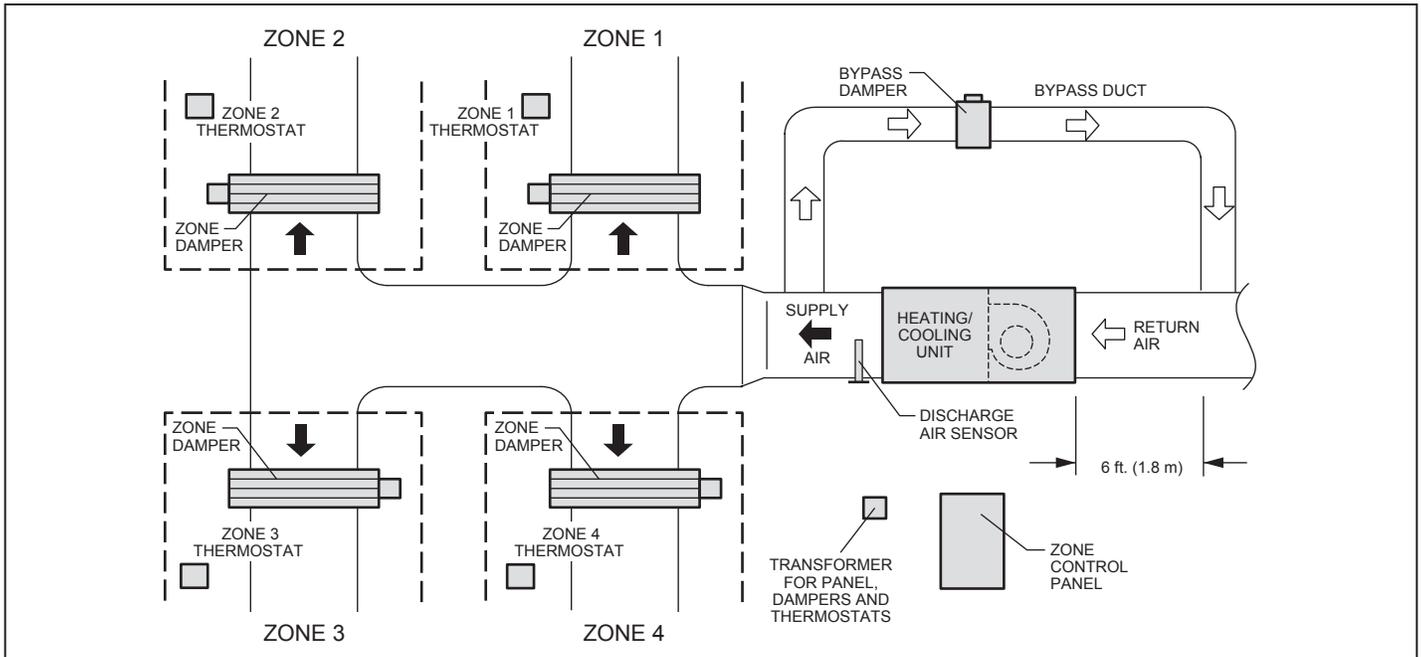


Figure 5. Bypass Damper

**Field Wiring**

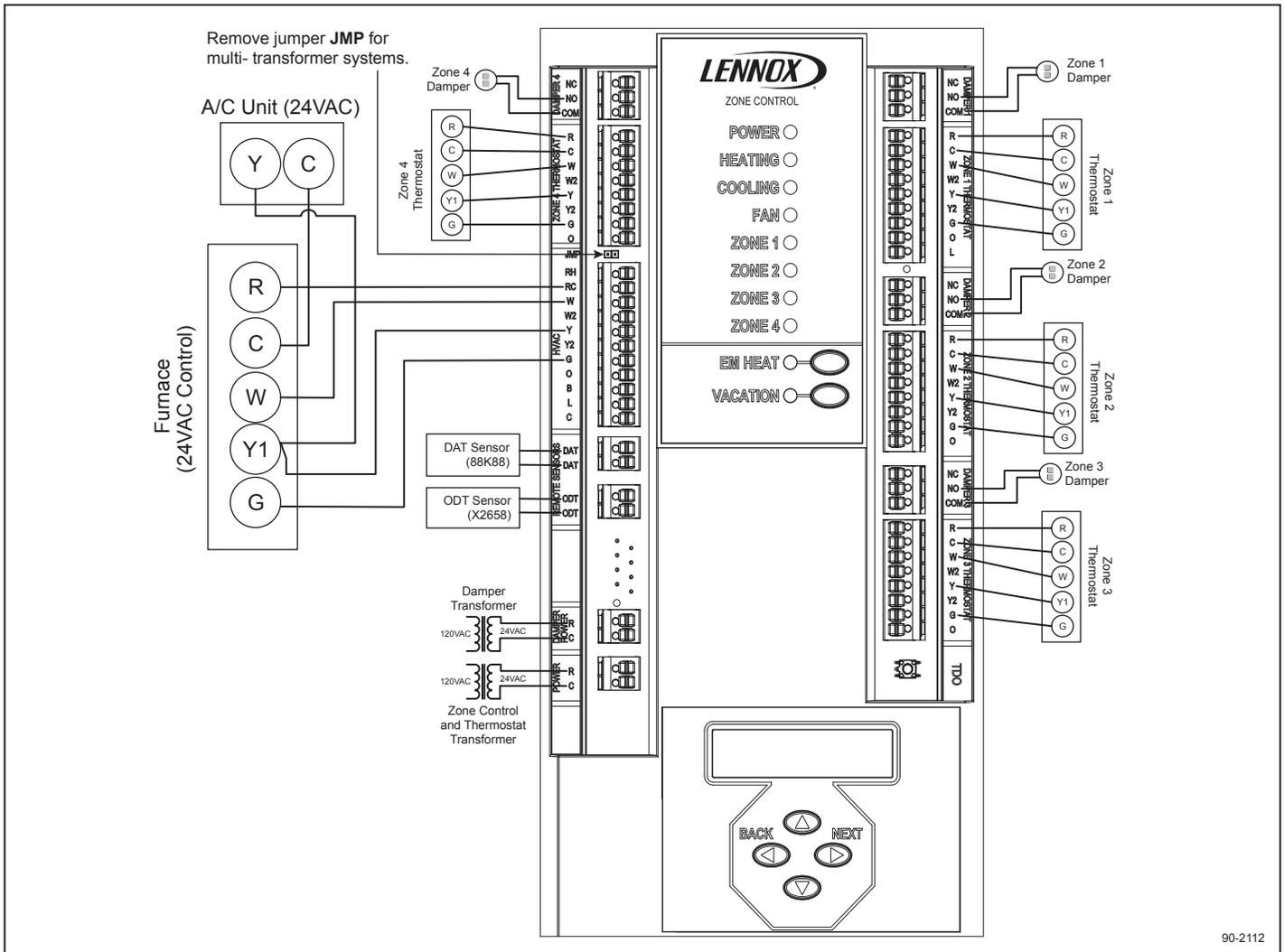


Figure 6. Terminal Connections

**Table 5. Typical Thermostat Terminals**

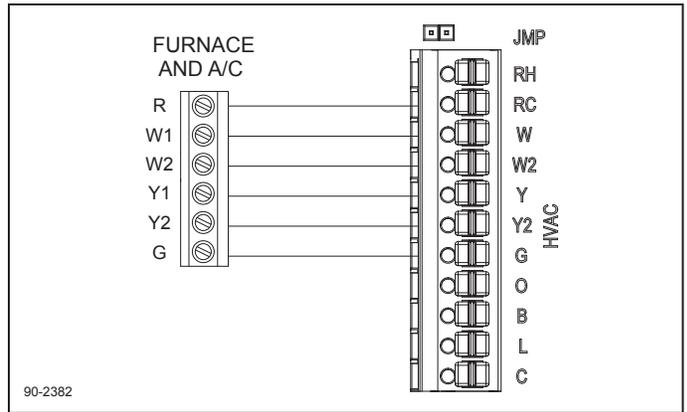
Terminal	Function
<b>R</b>	24VAC Power to thermostat
<b>C</b>	24VAC Common to thermostat
<b>W or W1</b>	First stage heat (conventional) / First stage auxiliary (heat pump)
<b>W2</b>	Second stage heat (conventional) / Second stage auxiliary (heat pump)
<b>Y or Y1</b>	First stage cooling (conventional) / First stage compressor (heat pump)
<b>Y2</b>	Second stage cooling (conventional) / Second stage compressor (heat pump)
<b>G</b>	Fan
<b>O</b>	Reversing valve (heat pump)
<b>L</b>	System fault indicator (heat pump) (optional)

**NOTE** – The **L** output to the thermostat is derived from the **L** system fault indicator input to the zone panel from the HVAC equipment. The **L** output to the thermostat is only available in Zone 1. If using the system fault indicator choose Zone 1 to be a thermostat that is in a frequently occupied space.

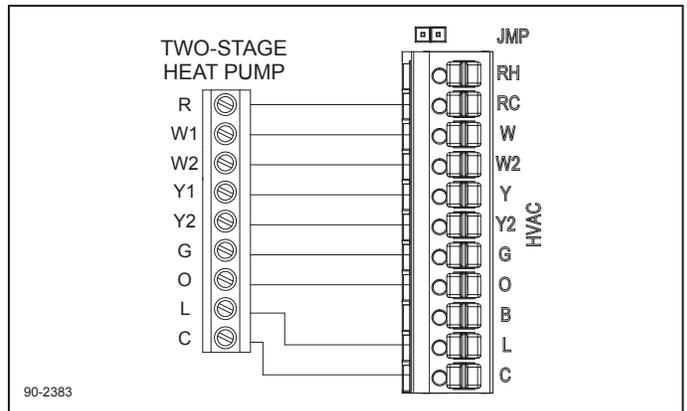
**Table 6. Typical HVAC Terminals**

Terminal	Function
<b>RH</b>	24VAC from heating or auxiliary heat equipment
<b>RC</b>	24VAC from cooling equipment or compressor
<b>W or W1</b>	First stage heat (conventional) / First stage auxiliary (heat pump)
<b>W2</b>	Second stage heat (conventional) / Second stage auxiliary (heat pump)
<b>Y or Y1</b>	First stage cooling (conventional) / First stage compressor (heat pump)
<b>Y2</b>	Second stage cooling (conventional) / Second stage compressor (heat pump)
<b>G</b>	Fan
<b>B</b>	Reversing valve – heating (heat pump)
<b>O</b>	Reversing valve – cooling (heat pump)
<b>L</b>	System fault indicator (heat pump)
<b>C</b>	24VAC common from RC transformer (only required if L input is used)

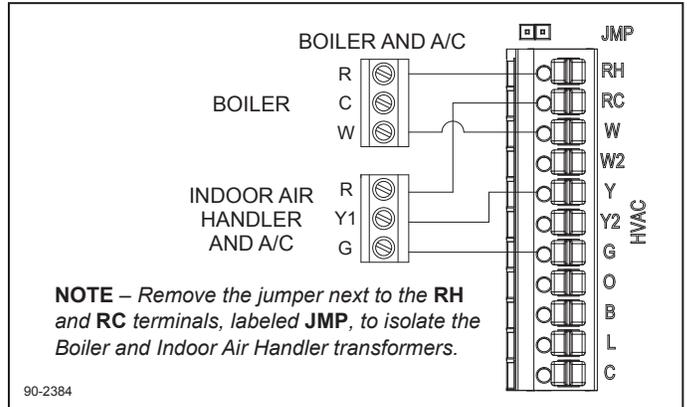
**NOTE** – For two transformer systems, remove the jumper next to the **RH** and **RC** terminals labeled **JMP**.



**Figure 7. Two-Stage Furnace and Air Conditioner**

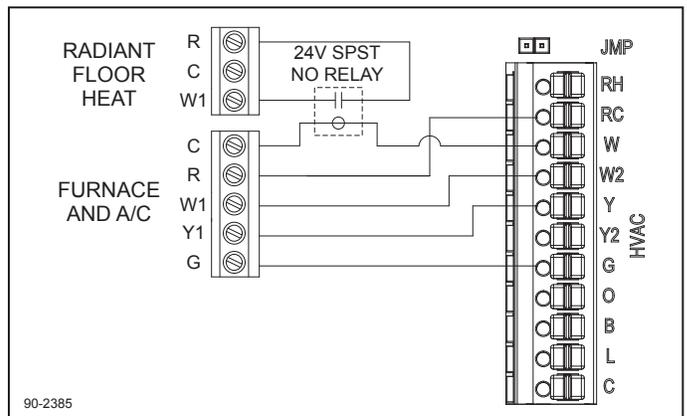


**Figure 8. Two-Stage Heat Pump**



**NOTE** – Remove the jumper next to the **RH** and **RC** terminals, labeled **JMP**, to isolate the Boiler and Indoor Air Handler transformers.

**Figure 9. Boiler and Air Conditioner**



**Figure 10. Radiant Floor Heating**

# Installer Setup

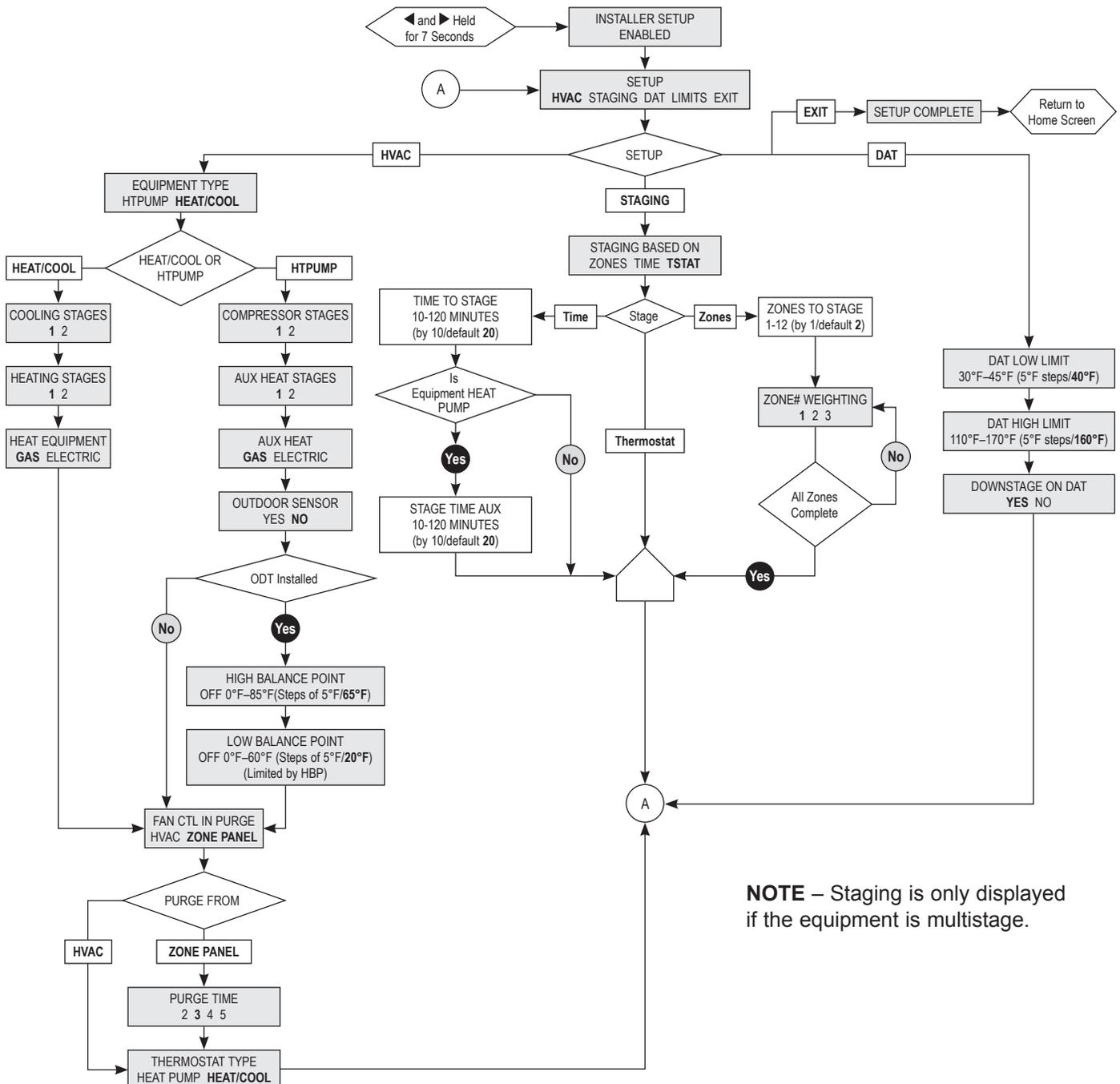
## How to Configure

- Press the **BACK** ◀ and **NEXT** ▶ buttons for 7 seconds continuously.
- The message **INSTALLER SETUP ENABLED** will be displayed for 2 seconds and then transition to the first system setting.
- Use the ▲ or ▼ buttons to select HVAC, STAGING, or DAT (Discharge Air Temperature) LIMITS setup, then press **NEXT** ▶ to enter the setup menu. Selecting EXIT and then pressing **NEXT** ▶ will save installer settings and exit the installer setup.
- Within each sub-menu use the ▲ or ▼ buttons to adjust the setting.

- The **NEXT** ▶ button will accept the current setting and navigate to the next system setting unless the last sub-menu setting is displayed. If the last sub-menu setting is displayed, pressing the **NEXT** ▶ button will return to the main menu.

**NOTE** – If no buttons are pressed for 60 seconds during the installer setup, the installer setup will exit automatically and save any changes.

The flow chart below shows the steps of the installer setup. Default settings are show in bold. For more detailed information about each of the system settings, see *Table 7. Installer Setup* on page 9.



**NOTE** – Staging is only displayed if the equipment is multistage.

## LCD INSTALLER SCREEN SETTINGS AND DESCRIPTIONS

Table 7. Installer Setup		
Menu Title	Description	Factory default setting (bold) and setting range
<b>HVAC Setup</b>		
EQUIPMENT TYPE	Selects whether zone panel is controlling a Heat/Cool or Heat Pump system.	<b>HEAT/COOL</b> HTPUMP
COOLING STAGES	Number of cooling stages. <b>NOTE:</b> Only displayed if EQUIPMENT TYPE is set to HEAT/COOL.	<b>1</b> 2
COMPRESSOR STAGES	Number of compressor stages. <b>NOTE:</b> Only displayed if EQUIPMENT TYPE is set to HTPUMP.	<b>1</b> 2
HEATING STAGES	Number of heating stages. <b>NOTE:</b> Only displayed if EQUIPMENT TYPE is set to HEAT/COOL.	<b>1</b> 2
AUX HEAT STAGES	Number of auxiliary heating stages. <b>NOTE:</b> Only displayed if EQUIPMENT TYPE is set to HTPUMP.	<b>1</b> 2
HEAT EQUIPMENT	Determines if the zone panel or equipment controls the fan in heating. <b>NOTE:</b> Only displayed if EQUIPMENT TYPE is set to HEAT/COOL.	<b>GAS</b> ELECTRIC
AUX HEAT	Auxiliary heat type. <b>NOTE:</b> Only displayed if EQUIPMENT TYPE is set to HTPUMP.	<b>GAS</b> ELECTRIC
OUTDOOR SENSOR	Determines if an outdoor sensor is installed for balance point control. <b>NOTE:</b> Only displayed if EQUIPMENT TYPE is set to HTPUMP.	<b>YES</b> <b>NO</b>
HIGH BALANCE PNT	Selects the temperature at which the auxiliary heating equipment will be locked out and only the compressor will be used for heating. Set to OFF to disable. <b>NOTE:</b> Only displayed if EQUIPMENT TYPE is set to HTPUMP and OUTDOOR SENSOR is set to YES.	OFF 0°F–85°F (Steps of 5°F / Default <b>65°F</b> )
LOW BALANCE PNT	Selects the temperature at which the compressor will be locked out and only the auxiliary heat will be used for heating. Set to OFF to disable. <b>NOTE:</b> Only displayed if EQUIPMENT TYPE is set to HTPUMP and OUTDOOR SENSOR is set to YES.	OFF 0°F–60°F (Steps of 5°F / Default <b>20°F</b> )
FAN CTL IN PURGE	Determines whether the fan is controlled by the HVAC equipment or zone panel during purge.	HVAC <b>ZONE PANEL</b>
PURGE TIME	Selects the number of minutes the fan will run during purge. <b>NOTE:</b> Only displayed if FAN CTL IN PURGE is set to ZONE PANEL.	<b>3 Minutes</b> 2 to 5 Minutes
THERMOSTAT TYPE	Selects what type of thermostat is being used. <b>NOTE:</b> All thermostats used must be the same type.	HEAT PUMP <b>HEAT/COOL</b>
<b>Staging Setup</b>		
STAGING BASED ON	Determines whether staging of multi-stage equipment is based on the thermostat inputs, the duration (time) of an active call, or the number of zones that are calling for heating or cooling.	<b>ZONES</b> TIME TSTAT
TIME TO STAGE	Number of minutes to delay before engaging second stage. <b>NOTE:</b> Only displayed if STAGING BASED ON is set to TIME.	10-120 Minutes (Steps of 10 / Default <b>20</b> )
STAGE TIME AUX	Number of minutes to delay before engaging auxiliary heating or second stage auxiliary heating. <b>NOTE:</b> Only displayed if EQUIPMENT TYPE is set to HTPUMP and STAGING BASED ON is set to TIME.	10-120 Minutes (Steps of 10 / Default <b>20</b> )
ZONES TO STAGE	Determines how many zones must be calling for the zone panel to go to the next available stage of heating or cooling. <b>NOTE:</b> Only displayed if STAGING BASED ON is set to ZONES.	1-12 (Default <b>2</b> )
ZONE # WEIGHTING	Determines the weighting of each zone. For example, setting ZONE 2 WEIGHTING to 3 means that when Zone 2 has an active heating or cooling call, it would count as 3 zones calling for heating or cooling. <b>NOTE:</b> Only displayed when STAGING BASED ON is set to ZONES.	1, 2, 3 (Default <b>1</b> )
<b>DAT (Discharge Air Temperature) Setup</b>		
DAT LOW LIMIT	Determines the discharge temperature at which the HVAC equipment will turn off to prevent freezing the indoor coil.	30°F–45°F (Steps of 5°F / Default <b>40°F</b> )
DAT HIGH LIMIT	Determines the discharge temperature at which the HVAC equipment will turn off to prevent overheating.	110°F–170°F (Steps of 5°F / Default <b>160°F</b> )
DOWN STAGE ON DAT	Allows the zone panel to downstage multistage equipment when DAT temperature comes within 5°F of the DAT LOW LIMIT or DAT HIGH LIMIT.	<b>YES</b> NO

## Sequence of Operation

The zone panel is a heat call priority system with automatic heating/cooling changeover after 20 minutes of operation. If two opposing (heating/cooling) thermostat calls exist while the system is idle, the heating call will be satisfied first. The zone panel can be configured to control either a conventional heat/cool system or a heat pump system based on the EQUIPMENT TYPE setting. For heat/cool systems, the COOLING STAGES, HEATING STAGES, and HEAT EQUIPMENT settings are used to configure the zone panel for the appropriate number of stages and type of heating equipment. For heat pump systems, the COMPRESSOR STAGES, AUX HEAT STAGES, and AUX HEAT settings are used to configure the zone panel for the appropriate number of stages and type of auxiliary heating equipment. For heat pump applications, either heat/cool or heat pump thermostats can be used and the zone panel will translate the thermostat call to the appropriate equipment call. The THERMOSTAT TYPE setting is used to configure the zone panel for the type of thermostat used in the application.

Note that immediately after the board is powered, there is a four minute minimum off delay where only the fan output will respond.

### Heat/Cool Changeover

When a call for heating/cooling exists and an opposing call is made from another zone, a changeover time limit of 20 minutes begins at the time that the opposing call is made. If the original call is not satisfied within that 20-minute time period, the call will be interrupted, and the zone panel will turn the equipment off and complete the normal fan purge cycle and minimum equipment off time. The opposing call will then be answered. After 20 minutes, if the original call still exists, the opposing call will be interrupted and the original call can once again be recognized.

### Discharge Air Temperature (DAT) Sensor High/Low Temperature Limit

The high/low temperature limit settings are designed to prevent the heat exchanger from overheating and the cooling coil from freezing. A Discharge Air Temperature Sensor mounted in the supply duct senses the discharge air temperature and can either downstage or interrupt the heating/cooling equipment before overheating/freezing occurs.

When DOWNSTAGE ON DAT is set to YES, if the discharge air temperature comes within 5°F of the HIGH DAT LIMIT or LOW DAT LIMIT, setting the zone panel will go to the next lowest equipment stage, if it is not already in first stage heating or cooling. The zone panel will remain in this lower stage until the discharge air temperature is 10°F from the HIGH DAT LIMIT or LOW DAT LIMIT setting. The LCD will display the DOWN STAGED ON HIGH TEMP LIMIT or DOWN STAGED ON LOW TEMP LIMIT message while the zone panel is in a lower stage due to the discharge air temperature.

When the discharge air temperature reaches the HIGH DAT LIMIT or LOW DAT LIMIT, the zone panel will interrupt the heating/cooling call. When the interrupt occurs, the zone panel ends the heating/cooling call and energizes the fan terminal (if not already energized). The Heating/Cooling LED on the zone panel will flash during a high/low limit temperature interrupt and the LCD will display DISCHARGE HIGH TEMP EXCEEDED or DISCHARGE LOW TEMP EXCEEDED. Once the temperature drops/rises 10°F, the high/low temperature interrupt will end and the heating/cooling call to the equipment can resume.

### Vacation Mode

The Vacation mode button allows the homeowner to switch from normal operation to Vacation mode. When Vacation mode is enabled, the thermostat in Zone 1 becomes the only zone from which a call for heating or cooling is recognized. Additionally, when in Vacation mode, all dampers remain in the open position. This feature allows the homeowner to create a setback at a single thermostat and control the whole home based on that thermostat. The Vacation LED will illuminate when Vacation mode is enabled.

## Emergency Heat Mode

This feature can only be used with heat pump systems. The EM Heat button can be used to enable Emergency Heat mode. When Emergency Heat mode is enabled, any call for heat will be answered with auxiliary heat equipment and the heat pump will be locked out. This feature allows the homeowner to activate Emergency Heat mode at the zone panel. The EM Heat LED will illuminate whenever Emergency Heat mode is enabled or there is an Emergency Heat call from a thermostat.

## Fan Operation

A call for Fan from any zone will initiate the G equipment output terminal. The dampers for all zones not calling for a continuous fan will be closed during the fan call.

## Heating Operation

When a thermostat makes a call to the zone panel for heating, the zone panel will initiate a heating call to the equipment and close the damper for all zones that are not calling for heat. Following a 2-minute (heat/cool or auxiliary) or 4-minute (heat pump) minimum on time, the heating call will end when all zones stop calling for heating, the call has exceeded the 20-minute heating/cooling changeover time limit while a cooling call exists, or the call is interrupted because the discharge air temperature sensor reaches the DAT HIGH LIMIT setting. When the heating call ends, if FAN CTL IN PURGE is set to ZONE PANEL, the fan output will remain on and the dampers will hold their position for 2 to 5 minutes based on the PURGE TIME setting. After the fan output turns off, the dampers will hold their position for an additional minute before completing purge. If FAN CTL IN PURGE is set to HVAC, when a heating call ends the fan output will turn off immediately and the dampers will hold their position for 3-1/2 minutes before completing the purge. When a heating call ends, a minimum off time delay of 4 minutes must elapse before another heating/cooling call can begin.

## Cooling Operation

When a thermostat makes a call to the zone panel for cooling, the zone panel will initiate a cooling call to the equipment and close the damper for all zones that are not calling for cooling. Following a 4-minute minimum on time, the cooling call will end when all zones stop calling for cooling, the call has exceeded the 20-minute heating/cooling changeover time limit while a heat call exists, or the call is interrupted because the discharge air temperature sensor has reached the DAT LOW LIMIT setting. When the cooling call ends, if FAN CTL IN PURGE is set to ZONE PANEL, the fan output will remain on and the dampers will hold their position for 2 to 5 minutes based on the PURGE TIME setting. After the fan output turns off, the dampers will hold their position for an additional minute before completing purge. If FAN CTL IN PURGE is set to HVAC, when a cooling call ends the fan output will turn off immediately and the dampers will hold their position for 3-1/2 minutes before completing the purge. When a cooling call ends, a minimum off time delay of 4 minutes must elapse before another heating/cooling call can begin.

## Multistage Equipment Staging

The zone panel can be configured to control staging of multi-stage HVAC equipment in multiple ways based on the STAGING BASED ON setting.

### Staging Based on the Zone Thermostat

When STAGING is set to TSTAT, the zone panel will stage the HVAC equipment to the highest stage thermostat call.

For example, if the thermostat in Zone 1 is calling for first stage heating, and the thermostat in Zone 2 is calling for second stage heating, the zone panel will create a second stage heating call to the equipment, open the dampers for Zone 1 and Zone 2 and close the dampers for all other zones.

**NOTE** – *This setting should only be used when multi-stage thermostats are installed.*

## Staging Based on Time

When STAGING is set to TIME, the zone panel will stage the HVAC equipment based on the time (duration) of the active call and the TIME TO STAGE and STAGE TIME TO AUX settings. This is useful when single-stage thermostats are installed in applications with multi-stage equipment.

Example:

EQUIPMENT TYPE = HTPUMP  
COMPRESSOR STAGES = 2  
AUX HEAT STAGES = 1  
AUX HEAT = ELECTRIC  
TIME TO STAGE = 20 MINUTES  
STAGE TIME TO AUX = 20 MINUTES

When a heating call occurs from a thermostat, the zone panel will initiate a first stage heating call to the heat pump. If that call persists for 20 minutes, the zone panel will stage up to a second stage heating call to the heat pump. If the second stage heating call persists for 10 minutes, the zone panel will add electric auxiliary heat to the heating call.

## Staging Based on Zones Calling

When STAGING is set to ZONES, the zone panel will stage the HVAC equipment based on the number of zones calling and the ZONES TO STAGE setting. Note that each zone can be counted as more than one zone calling based on the ZONE WEIGHTING setting for that zone. This is useful if the zones are not equally sized. Additionally, this can be used when single stage thermostats are installed in applications with multi-stage equipment.

Example:

EQUIPMENT TYPE = HTPUMP  
COMPRESSOR STAGES = 2  
ZONES TO STAGE = 3  
ZONE 1 WEIGHTING = 3  
ZONE 2 WEIGHTING = 1  
ZONE 3 WEIGHTING = 1  
ZONE 4 WEIGHTING = 1

When a cooling call occurs from the thermostats in Zone 2 and Zone 3, the zone panel will initiate a first stage cooling call to the heat pump, because the total number of zones calling is 2 which does not meet the ZONES TO STAGE setting of 3. If the thermostat in Zone 4 then initiates a call for cooling, the zone panel would stage up to a second stage cooling call to the heat pump, because the number of zones calling is now 3. With the same set-up as above, if only the thermostat in Zone 1 were to call for cooling the zone panel would answer that call with a second stage cooling call to the heat pump because Zone 1 would meet the ZONES TO STAGE setting of 3.

## Dual-Fuel Operation

For heat pump applications, an outdoor temperature sensor can be installed to efficiently utilize an air source heat pump. When the OUTDOOR SENSOR setting is set to YES, The HIGH BALANCE POINT and LOW BALANCE POINT settings will determine the temperatures at which the heat pump and auxiliary heat will be locked out. When the outdoor temperature is less than the LOW BALANCE POINT setting, the heat pump will be locked out and only auxiliary heating will be used when the zone panel initiates a heating call. When the outdoor temperature is greater than the HIGH BALANCE POINT setting, the auxiliary heating will be locked out and only the heat pump will be used when the zone panel initiates a heating call. For troubleshooting the outdoor temperature sensor, use *Table 11. Outdoor Temperature Sensor Resistances versus Temperature (X2658)* on page 16

## Time Delay Override

A Time Delay Override (TDO) button is available on the zone panel to speed up the internal timer for system checkout.

## Damper Operation

The “NO” output will be energized and the “NC” output will be de-energized for any zone not calling for heating or cooling during heating/cooling equipment operation and during the damper purge time delay. During heating/cooling equipment operation or during the damper purge time delay, should all zones stop calling for heating or cooling, the dampers will remain in the position they were in before all zones stopped calling.

## Fan Purge Operation

ON/OFF purge time can be controlled by the HVAC equipment or the Zone Panel (default) during a fan purge. Default time is 3 minutes (adjustable from 2 to 5 minutes).

Table 8. Air Conditioner and Furnace Setup Options illustrates the behavior of the HVAC outputs for Air Conditioner and Furnace systems based on the zone panel set-up and the state of the thermostat inputs.

Table 8. Air Conditioner and Furnace Setup Options									
Setup			Thermostat Input(s)	Resulting Call	HVAC Output				
HEATING STAGES	HEAT EQUIPMENT TYPE	COOLING STAGES	Heat/Cool Thermostat		Y	Y2	W	W2	G
<b>Heating</b>									
1	GAS	NA	W or W + G	First Stage Heat			ON		
	ELECTRIC						ON		ON
2	GAS	NA	W or W + G	First Stage Heat			ON		
	ELECTRIC						ON		ON
	GAS		W + W2, W + W2 + G, by Stage Timer, or by Number of Zones Calling	Second Stage Heat			ON	ON	
	ELECTRIC						ON	ON	ON
<b>Cooling</b>									
NA	NA	1	Y + G	First Stage Cool	ON				ON
NA	NA	2	Y + G	First Stage Cool	ON				ON
			Y + Y2 + G, by Stage Timer, or by Number of Zones Calling	Second Stage Cool	ON	ON			ON

Table 9. Heat Pump with Electric Heat Setup Options illustrates the behavior of the HVAC outputs for Heat Pump systems with Electric Supplemental Heat based on the zone panel set-up and the state of the thermostat inputs.

Table 9. Heat Pump with Electric Heat Setup Options												
Setup		Thermostat Input(s)		Resulting Call	HVAC Output							
COMPRESSOR STAGES	AUX STAGES	Heat/Cool Thermostat	Heat Pump Thermostat		Y	Y2	W	W2	G	O	B	
<b>Heating</b>												
1	1	W or (W+G)	Y + G	First Stage Heat	ON				ON		ON	
		W + W2, W + W2 + G, by Stage Timer, or by Number of Zones Calling	Y + W + G, Y + Y2 + G, by Stage Timer, or by Number of Zones Calling	Second Stage Heat	ON		ON		ON		ON	
		W + Emergency Heat Button	W or (Y + G+ Emergency Heat Button)	Emergency Heat			ON		ON		ON	
2	1	W	Y + G	First Stage Heat	ON				ON		ON	
		W + W2, by Stage Timer, or by Number of Zones Calling	Y + W + G, Y + Y2 + G, by Stage Timer, or by Number of Zones Calling	Second Stage Heat	ON	ON			ON		ON	
		By Stage Timer or by Number of Zones Calling	Y + Y2 + W + G, Y + W + W2 + G, by Stage Timer, or by Number of Zones Calling	Third Stage Heat	ON	ON	ON		ON		ON	
		W + Emergency Heat Button	W or (Y + G+ Emergency Heat Button)	First Stage Emergency Heat			ON		ON		ON	
1	2	W or (W+G)	Y + G	First Stage Heat	ON				ON		ON	
		W + Y2 + G, by Stage Timer, or by Number of Zones Calling	Y + W + G, Y + Y2 + G, by Stage Timer, or by Number of Zones Calling	Second Stage Heat	ON		ON		ON		ON	
		By Stage Timer or by Number of Zones Calling	Y + Y2 + W + G, Y + W + W2 + G, by Stage Timer, or by Number of Zones Calling	Third Stage Heat	ON		ON	ON	ON		ON	
		W + Emergency Heat Button	W or (Y + G+ Emergency Heat Button)	First Stage Emergency Heat			ON		ON		ON	
		Emergency Heat Button + (W+W2, by Stage Timer, or by Number of zones calling)	W + W2 Or Emergency Heat Button + (Y + Y2, Y + W, by Stage Timer, or by Number of Zones Calling)	Second Stage Emergency Heat				ON	ON	ON		ON
2	2	W or (W+G)	Y + G	First Stage Heat	ON				ON		ON	
		W + W2 + G, by Stage Timer, or by Number of Zones Calling	Y + W + G, Y + Y2 + G, by Stage Timer, or by Number of Zones Calling	Second Stage Heat	ON	ON			ON		ON	
		By Stage Timer or by Number of Zones Calling	Y + Y2 + W + G, Y + W + W2 + G, by Stage Timer, or by Number of Zones Calling	Third Stage Heat	ON	ON	ON		ON		ON	
		By Stage Timer or by Number of Zones Calling	Y + Y2 + W + W2 + G, by Stage Timer, or by Number of Zones Calling	Fourth Stage Heat	ON	ON	ON	ON	ON		ON	
		W + Emergency Heat Button	W or (Y + G+ Emergency Heat Button)	First Stage Emergency Heat				ON		ON		ON
		Emergency Heat Button + (W+W2, by Stage Timer, or by Number of zones calling)	W + W2 Or Emergency Heat Button + (Y + Y2, Y + W, by Stage Timer, or by Number of Zones Calling)	Second Stage Emergency Heat				ON	ON	ON		ON
<b>Cooling</b>												
1	NA	Y + G	Y + G + O	First Stage Cool	ON				ON	ON		
2	NA	Y + Y2 + G	Y + Y2 + G + O	Second Stage Cool	ON	ON			ON	ON		

Table 10. Heat Pump with Gas Furnace Setup Options (Dual-Fuel) illustrates the behavior of the HVAC outputs for Dual Fuel Heat Pump systems based on the zone panel set-up and the state of the thermostat inputs.

Table 10. Heat Pump with Gas Furnace Setup Options (Dual-Fuel)											
Setup		Thermostat Input(s)		Resulting Call	HVAC Output						
COMPRESSOR STAGES	AUX STAGES	Heat/Cool Thermostat	Heat Pump Thermostat		Y	Y2	W	W2	G	O	B
<b>Heating</b>											
1	1	W or (W+G)	Y + G	First Stage Heat	ON				ON		ON
		W + W2, W + W2 + G, by Stage Timer, or by Number of Zones Calling	Y + W + G, Y + Y2 + G, by Stage Timer, or by Number of Zones Calling	Second Stage Heat			ON				ON
		W + Emergency Heat Button	W or (Y + G+ Emergency Heat Button)	Emergency Heat			ON				ON
2	1	W	Y + G	First Stage Heat	ON				ON		ON
		W + W2, by Stage Timer, or by Number of Zones Calling	Y + W + G, Y + Y2 + G, by Stage Timer, or by Number of Zones Calling	Second Stage Heat	ON	ON			ON		ON
		By Stage Timer or by Number of Zones Calling	Y + Y2 + W + G, Y + W + W2 + G, by Stage Timer, or by Number of Zones Calling	Third Stage Heat			ON				ON
		W + Emergency Heat Button	W or (Y + G+ Emergency Heat Button)	First Stage Emergency Heat			ON				ON
1	2	W or (W+G)	Y + G	First Stage Heat	ON				ON		ON
		W + Y2 + G, by Stage Timer, or by Number of Zones Calling	Y + W + G, Y + Y2 + G, by Stage Timer, or by Number of Zones Calling	Second Stage Heat			ON				ON
		By Stage Timer or by Number of Zones Calling	Y + Y2 + W + G, Y + W + W2 + G, by Stage Timer, or by Number of Zones Calling	Third Stage Heat			ON	ON			ON
		W + Emergency Heat Button	W or (Y + G+ Emergency Heat Button)	First Stage Emergency Heat			ON				ON
		Emergency Heat Button + (W+W2, by Stage Timer, or by Number of zones calling)	W + W2 Or Emergency Heat Button + (Y + Y2, Y + W, by Stage Timer, or by Number of Zones Calling)	Second Stage Emergency Heat			ON	ON			ON
2	2	W or W + G	Y + G	First Stage Heat	ON				ON		ON
		W + W2 + G, by Stage Timer, or by Number of Zones Calling	Y + W + G, Y + Y2 + G, by Stage Timer, or by Number of Zones Calling	Second Stage Heat	ON	ON			ON		ON
		By Stage Timer or by Number of Zones Calling	Y + Y2 + W + G, Y + W + W2 + G, by Stage Timer, or by Number of Zones Calling	Third Stage Heat			ON				ON
		By Stage Timer or by Number of Zones Calling	Y + Y2 + W + W2 + G, by Stage Timer, or by Number of Zones Calling	Fourth Stage Heat			ON	ON			ON
		W + Emergency Heat Button	W or (Y + G+ Emergency Heat Button)	First Stage Emergency Heat			ON				ON
		Emergency Heat Button + (W+W2, by Stage Timer, or by Number of zones calling)	W + W2 Or Emergency Heat Button + (Y + Y2, Y + W, by Stage Timer, or by Number of Zones Calling)	Second Stage Emergency Heat			ON	ON			ON
<b>Cooling</b>											
1	NA	Y + G	Y + G + O	First Stage Cool	ON				ON	ON	
2	NA	Y + Y2 + G	Y + Y2 + G + O	Second Stage Cool	ON	ON			ON	ON	

**Table 11. Outdoor Temperature Sensor Resistances versus Temperature (X2658)**

Temp °F (°C)	R <sub>min</sub>	R <sub>nominal</sub>	R <sub>max</sub>	Temp °F (°C)	R <sub>min</sub>	R <sub>nominal</sub>	R <sub>max</sub>
-40(-40)	184.4	191.8	199.6	42(6)	20.85	21.22	21.60
-38(-39)	174.7	181.7	188.9	44(7)	20.01	20.36	20.71
-36(-38)	165.6	172.1	178.9	46(8)	19.21	19.53	19.86
-34(-37)	157.0	163.1	169.4	48(9)	18.44	18.74	19.05
-32(-36)	149.0	154.6	160.5	50(10)	17.71	17.99	18.28
-31(-35)	141.3	146.6	152.1	51(11)	17.01	17.27	17.54
-29(-34)	134.1	139.1	144.2	53(12)	16.34	16.59	16.84
-27(-33)	127.3	132.0	136.8	55(13)	15.70	15.93	16.17
-25(-32)	120.9	125.3	129.8	57(14)	15.09	15.31	15.53
-23(-31)	114.9	118.9	123.1	59(15)	14.51	14.71	14.91
-22(-30)	109.2	113.0	116.9	60(16)	13.95	14.14	14.33
-20(-29)	103.7	107.3	111.0	62(17)	13.42	13.59	13.77
-18(-28)	98.64	102.0	105.4	64(18)	12.91	13.07	13.24
-16(-27)	93.81	96.94	100.2	66(19)	12.42	12.57	12.73
-14(-26)	89.24	92.17	95.18	68(20)	11.95	12.10	12.24
-13(-25)	84.92	87.66	90.48	69(21)	11.50	11.64	11.77
-11(-24)	80.84	83.40	86.04	71(22)	11.08	11.20	11.33
-9(-23)	76.97	79.37	81.84	73(23)	10.67	10.78	10.90
-7(-22)	73.30	75.56	77.87	75(24)	10.28	10.38	10.49
-5(-21)	69.83	71.94	74.11	77(25)	9.900	10.00	10.10
-4(-20)	66.55	68.52	70.55	78(26)	9.533	9.633	9.733
-2(-19)	63.43	65.29	67.19	80(27)	9.181	9.281	9.381
-0.4(-18)	60.48	62.22	64.00	82(28)	8.845	8.944	9.043
1(-17)	57.68	59.31	60.98	84(29)	8.522	8.621	8.720
3(-16)	55.03	56.55	58.12	86(30)	8.213	8.311	8.410
5(-15)	52.51	53.94	55.41	87(31)	7.916	8.014	8.112
6(-14)	50.12	51.46	52.84	89(32)	7.632	7.729	7.827
8(-13)	47.85	49.11	50.40	91(33)	7.360	7.456	7.553
10(-12)	45.70	46.88	48.09	93(34)	7.099	7.194	7.290
12(-11)	43.66	44.76	45.89	95(35)	6.848	6.942	7.038
14(-10)	41.71	42.75	43.81	96(36)	6.607	6.701	6.795
16(-9)	39.87	40.84	41.84	98(37)	6.377	6.469	6.562
17(-8)	38.12	39.03	39.96	100(38)	6.155	6.247	6.339
19(-7)	36.45	37.31	38.18	102(39)	5.942	6.033	6.124
21(-6)	34.86	35.67	36.48	104(40)	5.738	5.827	5.918
23(-5)	33.36	34.11	34.88	105(41)	5.542	5.630	5.719
24(-4)	31.92	32.63	33.35	107(42)	5.353	5.440	5.528
26(-3)	30.56	31.22	31.89	109(43)	5.172	5.258	5.345
28(-2)	29.26	29.88	30.51	111(44)	4.998	5.083	5.168
30(-1)	28.02	28.60	29.19	113(45)	4.831	4.914	4.999
32(0)	26.84	27.39	27.94	114(46)	4.670	4.752	4.835
33(1)	25.72	26.23	26.75	116(47)	4.515	4.596	4.678
35(2)	24.65	25.13	25.62	118(48)	4.366	4.446	4.527
37(3)	23.63	24.08	24.54	120(49)	4.223	4.302	4.381
39(4)	22.66	23.08	23.51	122(50)	4.085	4.163	4.241
41(5)	21.74	22.13	22.53				

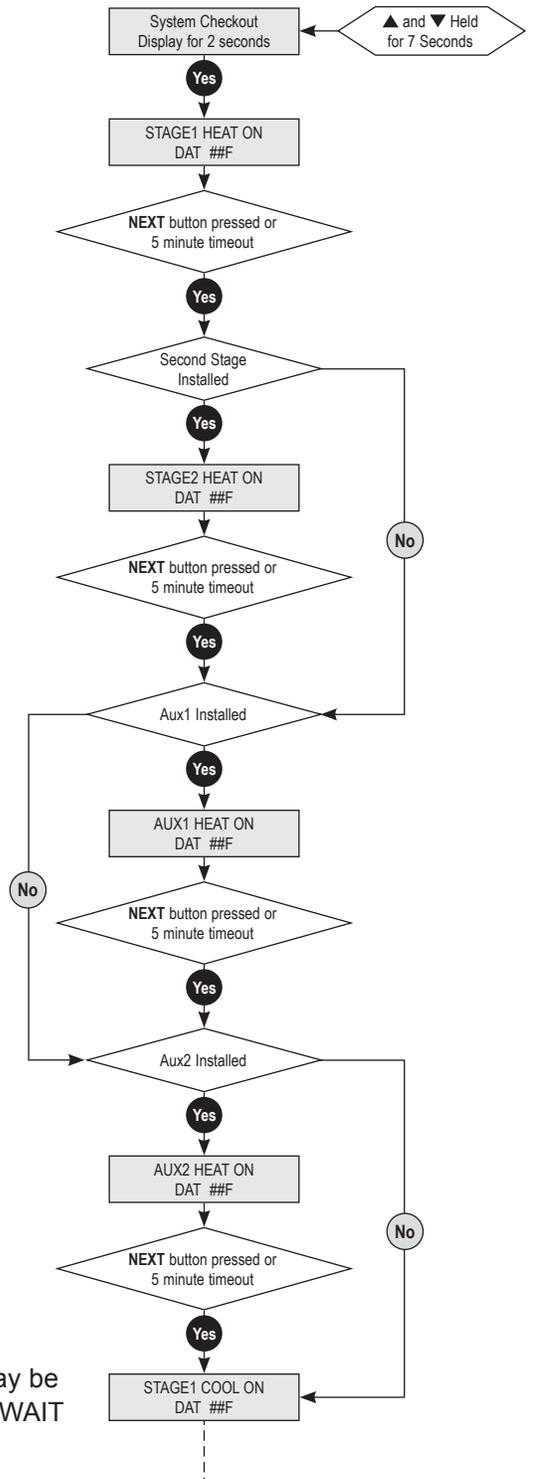
# LCD Home Screen Display and Description

The LCD will display the zone panel status during normal operation. The table below shows the available messages and corresponding descriptions.

Table 12. LCD Home Screen				
Normal Operation	The outdoor temperature will be displayed if OUTDOOR SENSOR is set to YES.		OUTDOOR SENSOR <value>F	
	The discharge air temperature is displayed.		DAT SENSOR <value>F	
	Vacation mode is enabled with the Vacation button.		VACATION ENABLED ZONE1 CONTROLS	
	Emergency Heat mode is enabled at the zone panel with the EM Heat button.		EMERGENCY HEAT ENABLED	
Error	Wired outdoor sensor failure (open or short).		CHECK WIRED OUTDOOR SENSOR	
	Discharge air temperature sensor failure (open or short).		CHECK DISCHARGE AIR TEMP SENSOR	
	The thermostat inputs are not a recognized combination.		CHECK ZONE# THERMOSTAT	
Equipment Status	HVAC equipment output held off by minimum off timers.		EQUIPMENT WAIT	
	FAN ON is only displayed when there is a continuous fan call to the HVAC equipment, and that call is caused by a continuous fan call (G only) from one or more thermostats.		FAN ON	
	Equipment Type	Aux Heat Type	Active Stage	Message Text
	Heat/Cool	N/A	1	STAGE 1
			2	STAGE 1 AND 2
	Heat Pump	Don't care	1 Compressor	COMPRESSOR 1
			2 Compressor	COMPRESSOR 1 AND 2
		Electric	1 Auxiliary	ELECTRIC HEAT 1
			2 Auxiliary	ELECTRIC HEAT 2
		Gas	1 Auxiliary	AUX HEAT 1
2 Auxiliary			AUX HEAT 2	
Discharge Air Temperature Sensor Limits	Discharge high temperature limit exceeded and has not recovered 10°F below the limit.		DISCHARGE HIGH TEMP EXCEEDED	
	Equipment has staged down based on the high temperature limit.		DOWNSTAGED ON HIGH TEMP LIMIT	
	Discharge low temperature limit exceeded and has not recovered 10°F below the limit.		DISCHARGE LOW TEMP EXCEEDED	
	Equipment has staged down based on the low temperature limit.		DOWNSTAGED ON LOW TEMP LIMIT	
Purge	Damper purge is active.		PURGE ACTIVE	
Time Delay Override	Time Delay Override is active.		TIME DELAY OVERRIDE ACTIVE	

# Installer Checkout

- The installer checkout is entered by holding the ▲ and ▼ buttons for 7 seconds continuously. Upon entering the installer checkout all outputs will turn off and thermostat inputs will be ignored. The **SYSTEM CHECKOUT** message will be displayed for 2 seconds and then transition to the first step of the installer checkout as shown in the diagram on this page.
- In installer checkout, the zone panel can only step forward through the test steps, so the **BACK** button will have no effect.
- The **NEXT** button will navigate to the next step.
- **Minimum on time:** The minimum on and off times for heating and cooling apply to the installer test. The Time Delay Override button can be used to speed up the minimum on and off timers.
- **Timeout:** If no button is pressed, installer checkout will transition to the next step once the associated timeout for that step has expired.



**NOTE** – A minimum off time may be enforced and an EQUIPMENT WAIT message displayed.

