



© 2004 Lennox Industries Inc.
Dallas, Texas, USA

ZONING SYSTEM

504,926M
5/2004

TP Technical
Publications

Litho U.S.A.

LZP-2 ZONE CONTROL PANEL

INSTALLATION INSTRUCTIONS FOR ZONE CONTROL PANELS USED WITH LENNOX HEATING AND COOLING EQUIPMENT

Shipping & Packing List

Package 1 of 1 contains the following:

- (1) Model LZP-2 Zone Control Panel
- (1) Model 88K38 Temperature Sensor
- (1) Installation Instructions
- (1) Owners Manual
- (1) Warranty Card

Required Components (ordered separately):

24 VAC Transformer – The size of the transformer needed is determined by the total power requirements for the control panel, thermostats and dampers. The control panel and thermostats together require 10VA. The dampers require 10VA each. The size of the transformer will depend on the greatest number of dampers that could be energized at any given time.

NOTE – When power closed/spring open dampers are used, at least one zone's dampers will not be energized during a call for heating or cooling.

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
83P74		4" Square Electrical Box

Thermostats – single-stage, electronic, 24-volt heat/cool thermostats which include a "C" (24VAC common) terminal. Do not use mechanical or power robbing thermostats.

Dampers – 2 or 3-wire, 24-volt dampers required. 2-wire, power closed/spring open preferred.

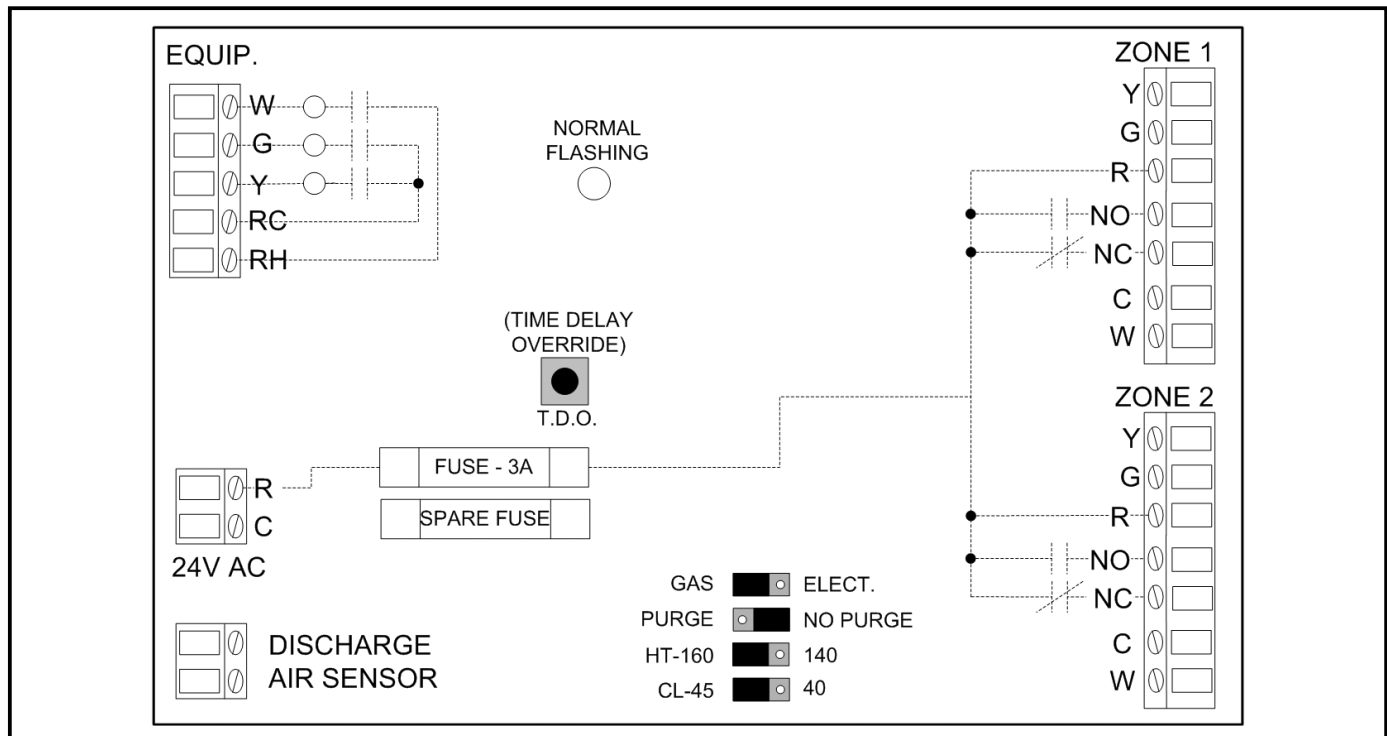


FIGURE 1 – LENNOX® MODEL LZP-2 CONTROL PANEL LAYOUT

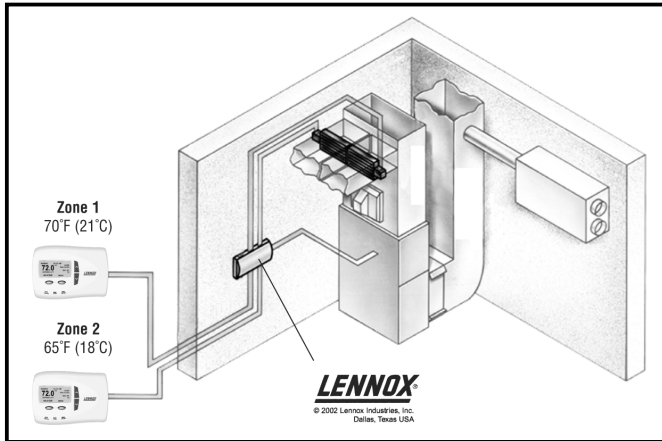
Application

- Two zones
- Single-stage electric or gas furnace
- Single-stage air conditioner
- Multi-stage equipment can be used provided that it stages on it's own internal controls
- Not applicable to heat pump systems

Features

- Adjustable high and low discharge air temperature limits
- ON/OFF duct air purge control
- LED indicators for outputs
- Time Delay Override
- 2 or 3-wire damper compatibility

Installation



The above illustration shows a typical two zone control system.

- Install the control panel indoors only.
- Do not install the control panel where the temperature will exceed 140°F or will drop below 32°F.
- Do not install the control panel on foundation walls, HVAC equipment or duct system 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 a laundry room.

1. Remove the cover. Replace the cover when installation is complete.
2. There are eight slots on the base of the enclosure (see Figure 2).
3. Use #8 screws (field supplied) to install the base.

⚠ 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 qualified installer, service agency or the gas supplier.

⚠ CAUTION

Electrostatic discharge can damage the control. Touch a grounded metal object before touching the circuit board, and then only touch the circuit board on the edges when handling.

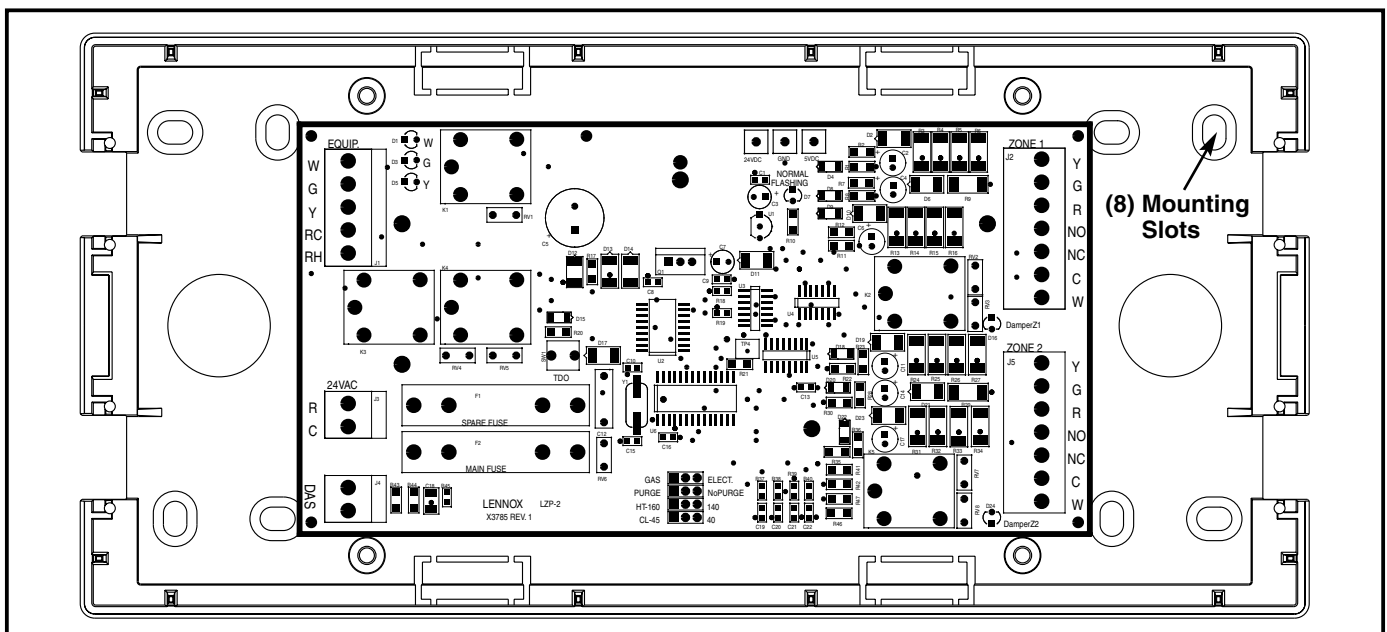


FIGURE 2 – CONTROL PANEL AND ENCLOSURE BASE

Installation (continued)

4. Install and Wire the Discharge Air Temperature Sensor

⚠ CAUTION

As with any mechanical equipment, personal injury can result from contact with sharp sheet metal edges. Be careful when you handle this equipment.

⚠ CAUTION

Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch.

The tip of the sensor must be located in a region of fully mixed supply of air before the take-offs (not in a dead air space) in order for the system to work correctly.

- Wire discharge air temperature probe to control panel using thermostat wire. Note that the temperature sensor is not polarity sensitive.
- 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, and $D/3$ of the depth ($D/3$) of the plenum (D) from the front of the plenum (the front is the side with the furnace or CB access doors), and centered side to side. Move the adjustable bracket along the length of the discharge air sensor to achieve proper 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 3**.

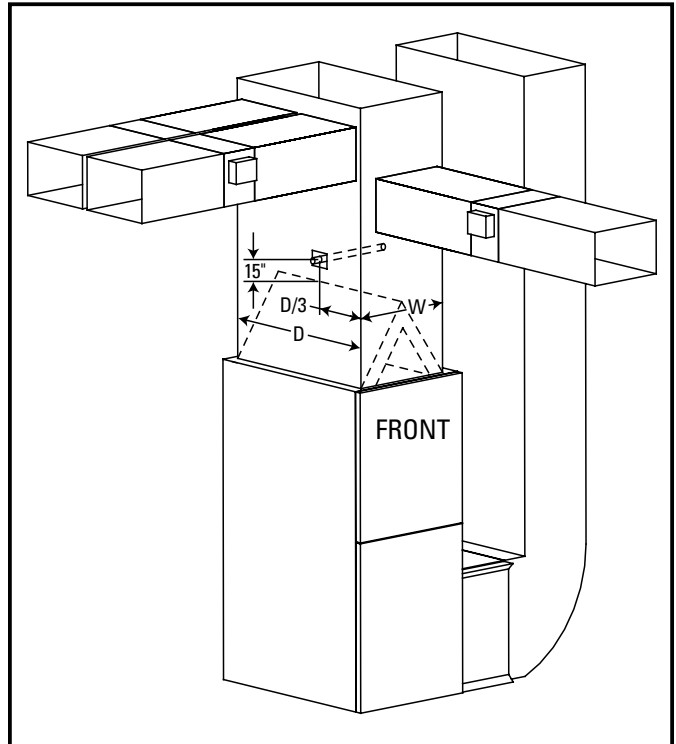


FIGURE 3 – DISCHARGE AIR SENSOR LOCATION

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

Installation (continued)

5. Install the required transformer selected from **Table 1** – DO NOT USE the HVAC equipment transformer to power the control panel. Refer to the instructions provided with the transformer.

18 AWG thermostat wire minimum recommended.

Sizing the Transformer:

The system requires approximately 10 VA for the control panel and thermostats and 10 VA for each damper. The size of the transformer will depend on the greatest number of dampers that could be energized at any given time (at least one zone's dampers will not be energized during a heating or cooling call when using power close, spring open dampers). 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 – refer to Field Wiring Damper **Diagram 2** on page 6.

For instance, if you have 3 dampers, then you would require 10VA for the system, 20VA (10VA X 2) for the dampers for a total of 30VA, so catalog number 10P17 would be an adequate transformer size at 40VA.

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
83P74		4" Square Electrical Box

The transformers listed in this chart include a plate mount for a 4" square electrical box.

6. Install the thermostats. Refer to the instructions provided with the thermostat.

Any 24-volt electronic thermostat with a "C" (24 VAC common) terminal can be used. Power robbing thermostats can cause unintended operation – DO NOT use mechanical or power robbing thermostats. **Table 2** lists the required terminals and recommended Lennox thermostats:

18 AWG thermostat wire minimum recommended.

TABLE 2 – THERMOSTAT REQUIREMENTS

Type	Terminals	Recommended Thermostat
HEAT/COOL	R, C, W, Y, G	• SignatureStat 1H/1C (51M26) • Elite 1H/1C (49M55)

Thermostat Terminal	Function
R	24 VAC Hot
C	24 VAC Common
W	Heat
Y	Cool
G	Fan

7. Install the dampers. Refer to the instructions provided with the damper.

18 AWG thermostat wire minimum recommended.

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 (see **Figure 4**). 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 6 ft. 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 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

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 **Table 3**.

TABLE 3	
Round	Rectangular
8 in. dia. – 400 cfm	12 x 8 – 1000 cfm
10 in. dia. – 750 cfm	12 x 10 – 1200 cfm
12 in. dia. – 1200 cfm	12 x 12 – 1400 cfm
14 in. dia. – 1800 cfm	20 x 8 – 1600 cfm
16 in. dia. – 2400 cfm	20 x 10 – 2000 cfm
	20 x 12 – 3000 cfm

Refer to the parts and supplies catalog for information on available barometric bypass dampers.

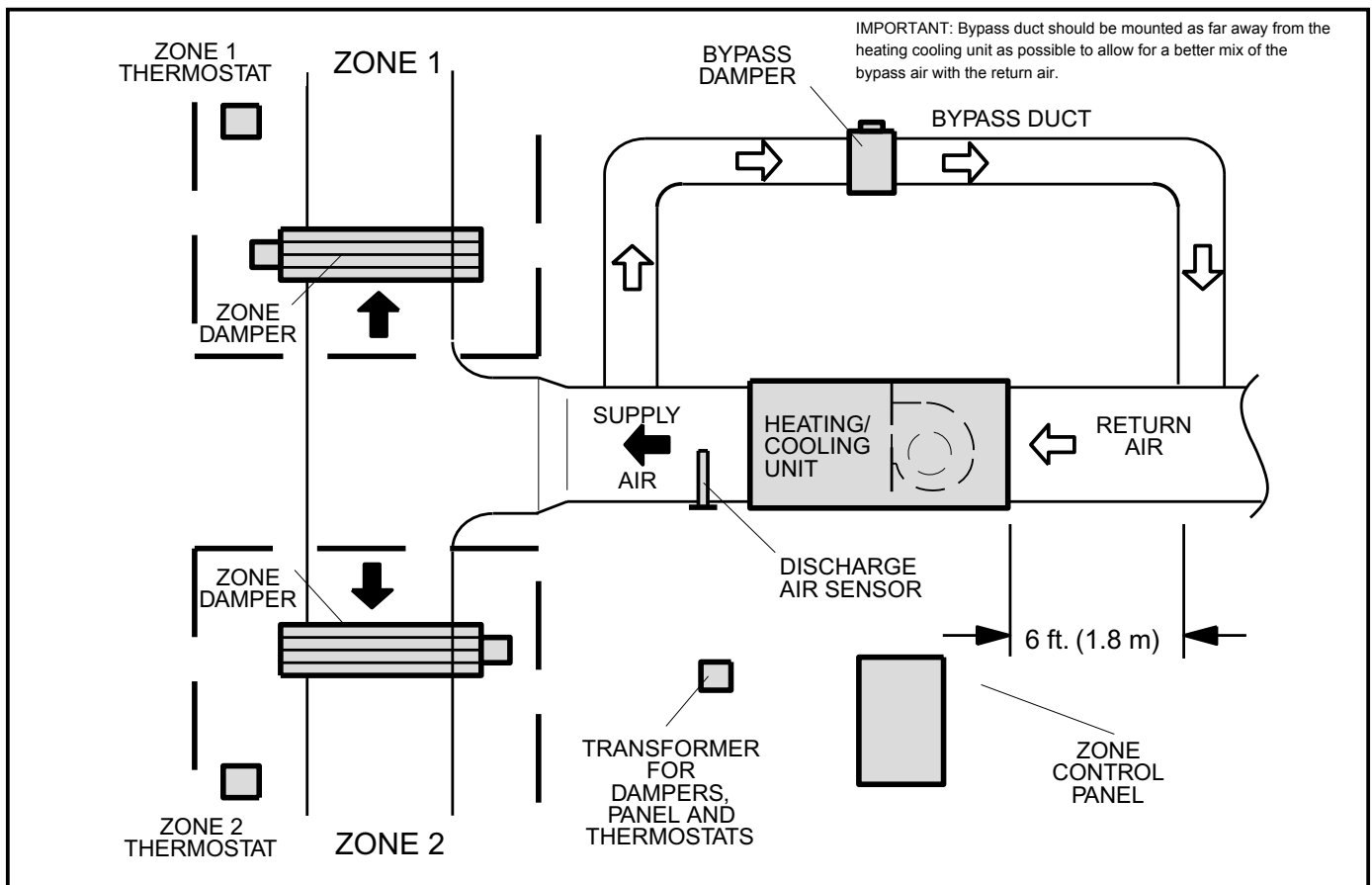


FIGURE 4 – BYPASS DAMPER INSTALLATION

Field Wiring

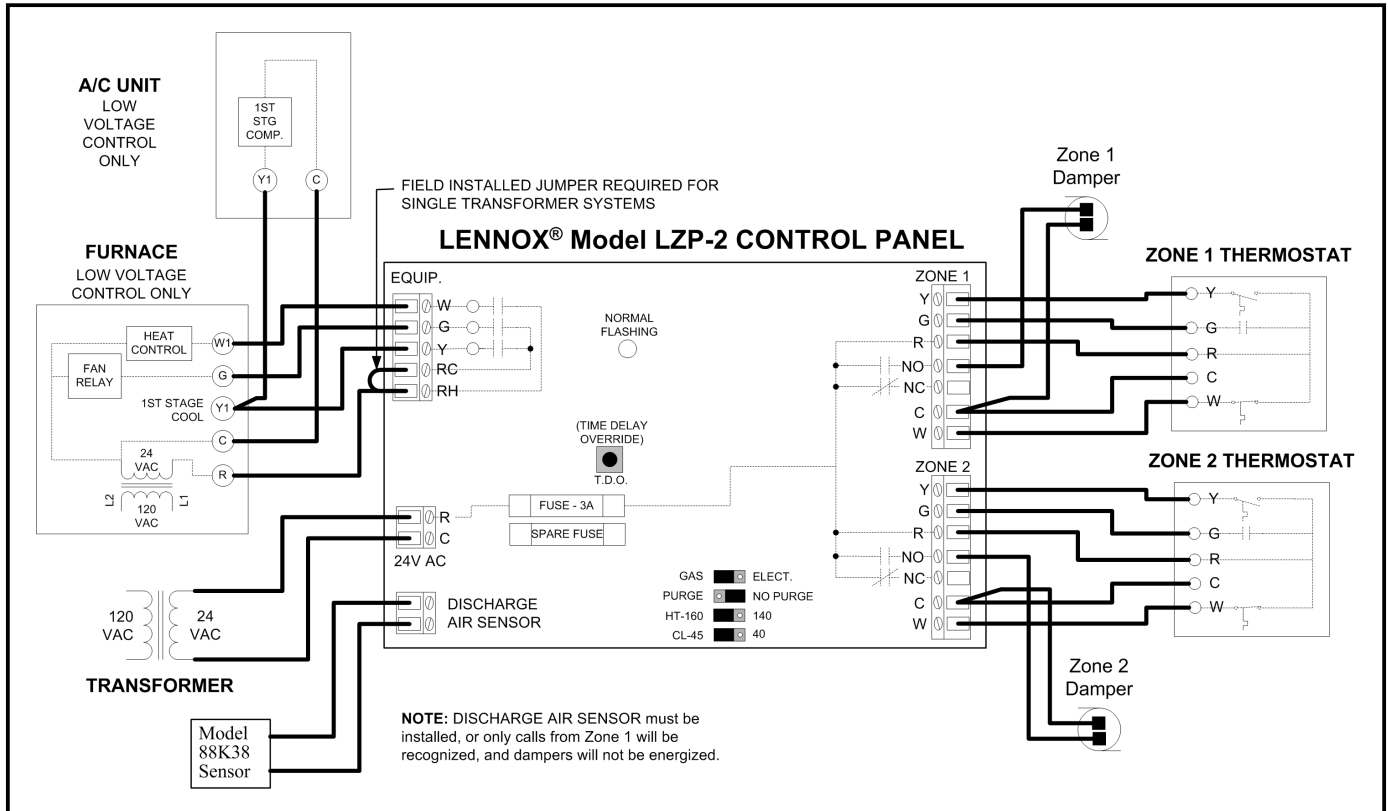


DIAGRAM 1 – FIELD WIRING

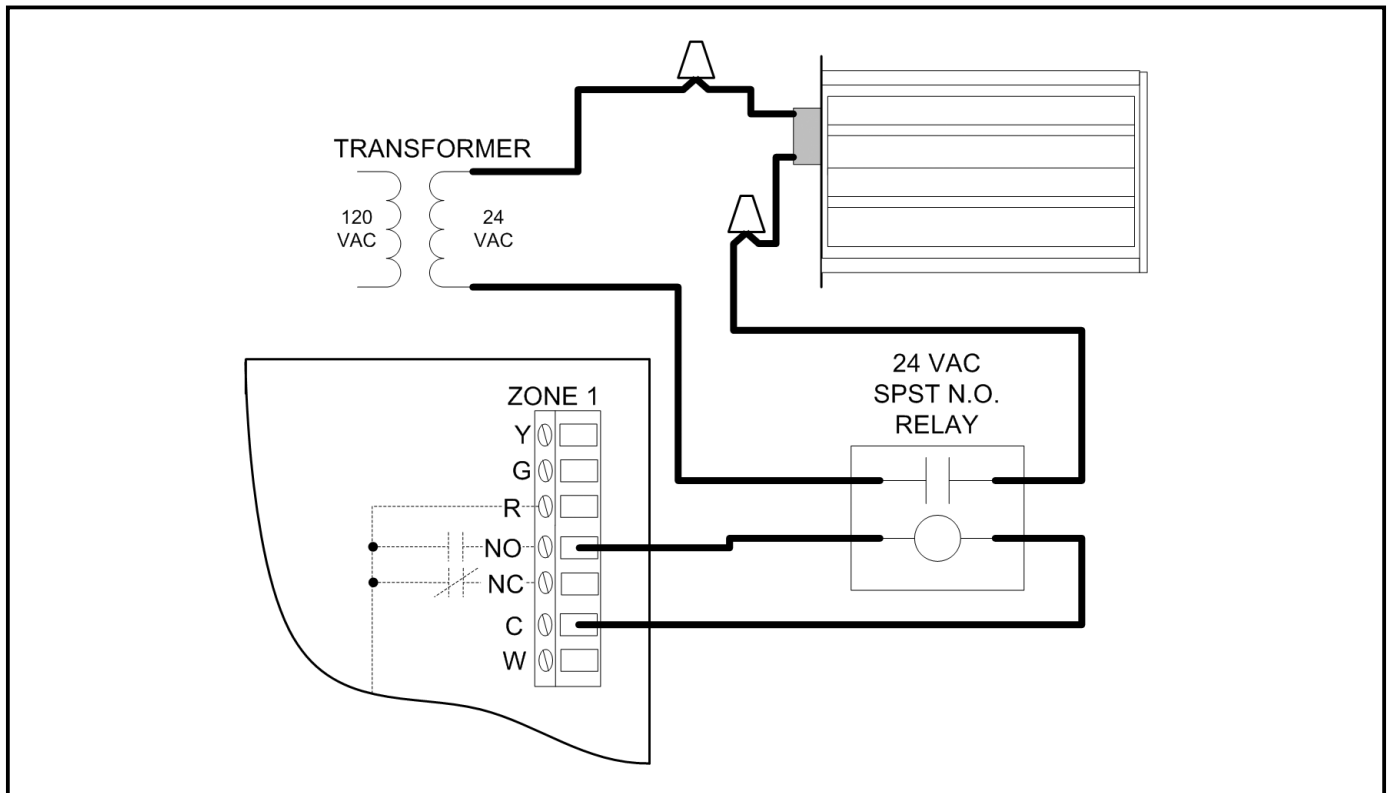


DIAGRAM 2 – DAMPER WIRING WITH SEPARATE TRANSFORMER

Pin Jumper Settings (see Figure 5)

GAS		ELECT.
PURGE		NO PURGE
HT-160		140
CL-45		40

FIGURE 5 – PIN JUMPER SETTINGS

ELECTRIC/GAS: If electric heat is to be used, move the jumper to the “ELECT” position. This will turn on the fan (G output terminal) with a heat call (W output terminal). If the jumper is in the “GAS” position, it is assumed that the heating equipment will control the fan operation.

NO PURGE / PURGE: If the NO PURGE / PURGE jumper is moved to the “PURGE” purge position, the G terminal will remain energized for a one minute purge delay following the completion of a cooling call. If the jumper is moved to the “NO PURGE” position, the G terminal will de-energize immediately following the completion of a cooling call. The NO PURGE setting is designed for use with systems where the furnace or air handler has a built in fan purge. The NO PURGE damper hold time is longer than the PURGE setting due to the Lennox furnaces installer settable maximum blower off delay of 3 minutes. The following chart details the zone panel outputs and damper hold times when a heating or cooling call is satisfied:

Jumper Settings	Mode	Purge		No Purge	
		Output	Damper Hold Time	Output	Damper Hold Time
Heat/Cool Gas	Cooling	G ¹	1 minute	No G,	3-1/2 minutes
	Heating	No G	1 minute	No G,	3-1/2 minutes
Heat/Cool Elect.	Cooling	G ¹	1 minute	No G,	3-1/2 minutes
	Heating	G ¹	1 minute	No G,	3-1/2 minutes

¹The G terminal will remain energized for 1 minute.

LEDs

POWER – Blinks during normal operation. Starts to blink approximately 6 seconds after power up.

G, Y and W – Lights when respective equipment outputs are energized. The W LED will flash if the heating high temperature limit has been reached. The Y LED will flash if the cooling low temperature limit has been reached.

DISCHARGE AIR SENSOR HT-140/160: This jumper controls the temperature at which the heating equipment will cut out to prevent overheating. For a high limit temperature of 140°F, move the jumper to the “140” position. For a high limit temperature of 160°F, leave the jumper in the “160” position.

IMPORTANT: The temperature sensor is required. If a short or open circuit is detected between the Discharge Air Sensor (DAS) terminals, the control panel will only respond to Zone 1 and the dampers will not close.

DISCHARGE AIR SENSOR CL-45/40: This jumper controls the temperature at which the cooling equipment will cut out to prevent freezing the indoor coil. For a low limit temperature of 45°F, leave the jumper in the “45” position. For a low limit temperature of 40°F, move the jumper to the “40” position. To maintain optimum operation, it is recommended to leave this setting at “45”.

ZONE 1 Damper and ZONE 2 Damper – Lights when the Normally Open (NO) damper terminal for that zone is energized (i.e. LEDs show which zones are NOT receiving conditioning when the HVAC equipment is operating).

Sequence of Operation

A Time Delay Override (TDO) button is available on the control panel to speed up the internal timer by a factor of 60 for system checkout. One second of holding down the button relates to one minute of speed up time in the control.

HEATING AND COOLING EQUIPMENT OPERATION

Heating Operation

When a zone makes a call for Heat, the W output terminal will energize. The G terminal will also energize if the ELECTRIC/GAS jumper is in the ELECT position. The W terminal de-energizes when (1) all zones stop calling for Heat, (2) the call has exceeded the heat/cool changeover time limit while a cooling call exists or (3) the call is interrupted by the high limit setting. When the W terminal is de-energized, a minimum off time delay of 4 minutes must elapse before it can be energized again.

Fan Purge Time Delay

If the ELECTRIC/GAS jumper is in the ELECT position and the PURGE/NO PURGE jumper is in the PURGE position, the G terminal will remain energized for one minute after the W terminal is de-energized. The NO PURGE setting is the preferred purge control setting for Lennox equipment. Lennox equipment includes controls which sequence the indoor fan off after a call for heat has been satisfied.

If the ELECTRIC/GAS jumper is set in the GAS position, the G terminal does not turn on during purge regardless of the position of the PURGE or NO PURGE switch. Lennox furnaces will control the purge though the furnace control board cool down feature. The cool down time is often adjustable at the furnace control board up to 3.5 minutes. NO PURGE is the preferred method of purge when this zone panel is applied to Lennox equipment.

Cooling Operation

When a zone makes a call for Cooling, the Y and G terminals will energize. The Y terminal de-energizes when (1) all zones stop calling for Cooling, (2) the call has exceeded the heat/cool changeover time limit while a heat call exists or (3) the call is interrupted by the low limit temperature setting. When the Y terminal is de-energized, a minimum off time delay of 4 minutes must elapse before it can be energized again.

Fan Purge Time Delay

If the PURGE/NO PURGE jumper is in the PURGE position, the G terminal will remain energized for one minute after the Y terminal is de-energized. If the jumper is in the NO PURGE position, the G terminal will de-energize immediately.

Heat/Cool Changeover: When a call for heating or cooling exists and an opposing call is made from another zone, a 20 minute timer is activated. If the original call is not satisfied within that 20-minute time period, the call will be interrupted, turning the equipment off and allowing for 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.

High/Low Limit Temperature: The high/low limit temperature settings are designed to prevent the heat exchanger from overheating or the cooling coil from freezing. The temperature sensor in the supply duct senses the discharge air temperature and interrupts the heating/cooling equipment (depending on the Heat and Cool temperatures set on the control panel) before overheating/freezing occurs. When a heating/cooling call is interrupted by the high/low temperature limit, the zone control panel turns the equipment off and energizes the G terminal (if not already energized). The W or Y LED on the control panel will flash during a high/low limit temperature interrupt. Once the temperature drops/rises 10°F and the minimum off time has expired, the equipment is turned back on if the call for conditioning still exists. The Heating/Cooling LED will stop flashing.

IMPORTANT: Should a short or open circuit be detected across the DAS terminals, the zone system will respond only to Zone 1 and the dampers will not energize.

Sequence of Operation (continued)

CONTINUOUS FAN OPERATION

A call for Fan from any zone will initiate the G equipment output terminal. The normally open (NO) damper terminal at all zones not calling for continuous fan will be energized.

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 while the equipment output is energized and during the damper purge time delay. During equipment operation or during the damper purge time delay, should all zones stop calling for heating or cooling, the damper terminals will remain in the position they were in before all zones stopped calling.

Damper Purge Time Delay

When the **Purge/No Purge** jumper is at **No Purge**, the damper purge time delay is 3.5 minutes and begins when the equipment output(s) turn off. NO PURGE is the preferred method of purge control for Lennox furnaces and air conditioners. When the jumper is at **Purge**, the damper purge time delay is one (1) minute.

Troubleshooting

DETECTING HVAC SYSTEM PROBLEMS	
Symptom	Possible Solution
Condensing unit receiving signal but will not turn on.	Pressure switch open. Consult condensing unit manual for possible cause.
	Compressor is off due to internal overload protector. Consult condensing unit manual for possible cause.
	Condenser control board anti short cycle timer is not yet expired. Most anti short cycle timers are 5 minutes or less, if the unit does not start after 5 minutes consult the condensing unit manual for possible causes.
Furnace tripped the primary limit, but the zone panel does not indicate that the discharge air limit has been exceeded.	A high static condition exists. Move the sensor further down stream to sense air that has mixed more thoroughly. Be sure not to place the sensor past the take offs. High static pressure must be corrected.
	Bypass tap is too close to inlet of air handler. Adjust bypass tap in the return air duct so that is further away from the furnace. This will give the air more of a chance to be tempered with room return air before entering the air handler again.
Air handler receiving signal but will not turn on.	Limit on furnace open. Check position of DAS in the plenum and move further down stream if possible. High static condition must be corrected.
	DAS limit jumper needs to be moved to a lower setting.
	Trouble shoot air handler – see air handler documentation.

Troubleshooting (continued)

DETECTING HEATING, COOLING AND FAN PROBLEMS	
Symptom	Possible Solution
Nothing comes on.	No power to control panel. Green "Normal Flashing" LED should be blinking, if not apply power to 24VAC inputs of control panel. Check fuse.
Heat will not come on.	Single transformer system. Install jumper between RC and RH at HVAC Equipment outputs of control panel.
	Interlock switch on furnace is open – close access doors.
	Thermostat is not calling for heat. Check voltage at the thermostat W input on the control panel.
	Zone 2 calling while open or short at DAS inputs is causing control panel to respond only to Zone 1.
	Thermostat is power robbing or mechanical. Only use line powered electronic thermostat with a C terminal.
Cooling will not come on.	Single transformer system. Install jumper between RC and RH at HVAC equipment outputs of control panel.
	Thermostat is not calling for cooling. Check voltage at the thermostat Y input on the control panel.
	Thermostat could be invoking a timed off delay.
	Zone 2 calling while open or short at DAS inputs is causing control panel to respond only to Zone 1.
	Zone panel could be invoking a timed off delay.
	Thermostat is power robbing or mechanical. Only use line powered electronic thermostat with a C terminal.
Fan will not come on.	Check if G is energized at the zone panel.
	Check if G is energized at the thermostat.
	Check if G is energized at the air handler.
Dampers do not position on a call for heating, cooling or fan. Heat, cooling or fan will not come on when the Zone 2 thermostat is calling.	System requires the Discharge Air sensor. If DAS is not installed, only Zone 1 calls will be recognized and dampers will not operate. Disconnect power to the control panel, install the DAS and restore power to the control panel.
Fan immediately comes on with heat call.	ELECT/GAS jumper set to ELECT – change setting to GAS.
After a cool call, the fan stops then starts right away only to stop a short while later.	HVAC system has built in duct purge. Set PURGE/NO PURGE jumper on control panel to NO PURGE.
Fan is running but no heat, and W LED is blinking.	Discharge air temperature exceeds set limit. Allow discharge air to cool 10° below set limit and allow timed off delay to expire.
Fan is running but no cooling, and Y LED is blinking.	Discharge air temperature dropped below set limit. Allow discharge air to warm 10° above set limit and allow timed off delay to expire.
Both the Y and W LEDs are blinking.	An open or short in the DAS sensor has been detected. Install or repair the sensor.

Troubleshooting (continued)

DETECTING DAMPER PROBLEMS

Symptom	Possible Solution
Damper opens when it should be closed.	DAS shorted or open causing the panel to only respond to zone 1 inputs while not closing any dampers.
	Damper wired incorrectly. Spring open power close dampers should be connected between NO and C terminals.
Damper will not close.	DAS shorted or open causing the panel to only respond to zone 1 inputs while not closing any dampers.
	Damper motor faulty.

CHECKING THERMOSTAT VOLTAGES

Using a digital voltmeter (DVM) measure the AC voltage supplied at the R and C terminals of the Thermostat inputs on the control panel for the zone in question. This voltage should be same as the voltage supplied to the control panel 24VAC terminals. Make a call for heat, cooling or fan. Measure the voltage across the terminal that should be energized (i.e. W for heat, Y for cooling, etc.) and the C terminal. This should be the same voltage as there is between the R and C terminals. Measure the voltage across a terminal that should NOT be energized and the C terminal; this voltage should be zero.

DISCHARGE AIR SENSOR CHECKOUT

The discharge air sensor is a temperature dependent resistor; the higher the temperature, the lower the resistance. In order to confirm the sensor is working, both sensor leads must be disconnected from the zone panel board. Using a digital voltmeter (DVM) set to read resistance, touch the leads from the sensor to the probes of the DVM. Take care not to create a parallel resistance path through your body by touching both probes with your fingers or a faulty reading will be obtained. At 77F, the resistance of the sensor will be 10K ohm. If the sensor is cooler than 77F, the resistance will be higher, if it is warmer, the resistance will be lower. 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. This reading should be noticeable lower than the room temperature reading.

<u>Temperature (°F)</u>	<u>Resistance (ohms)</u>
65	13476
70	11884
75	10501
80	9298
85	8249
90	7333

The zone panel is well equipped to monitor the operation of the probe and determine if a failure has occurred.

The probe should be considered an integral (but replaceable) part of the zone panel. The zone panel will indicate if the probe is operating improperly and needs to be replaced.