XCI Controls
www.xcicontrols.com

SmartZone™ System Manual

Rev C3
June 1, 2007

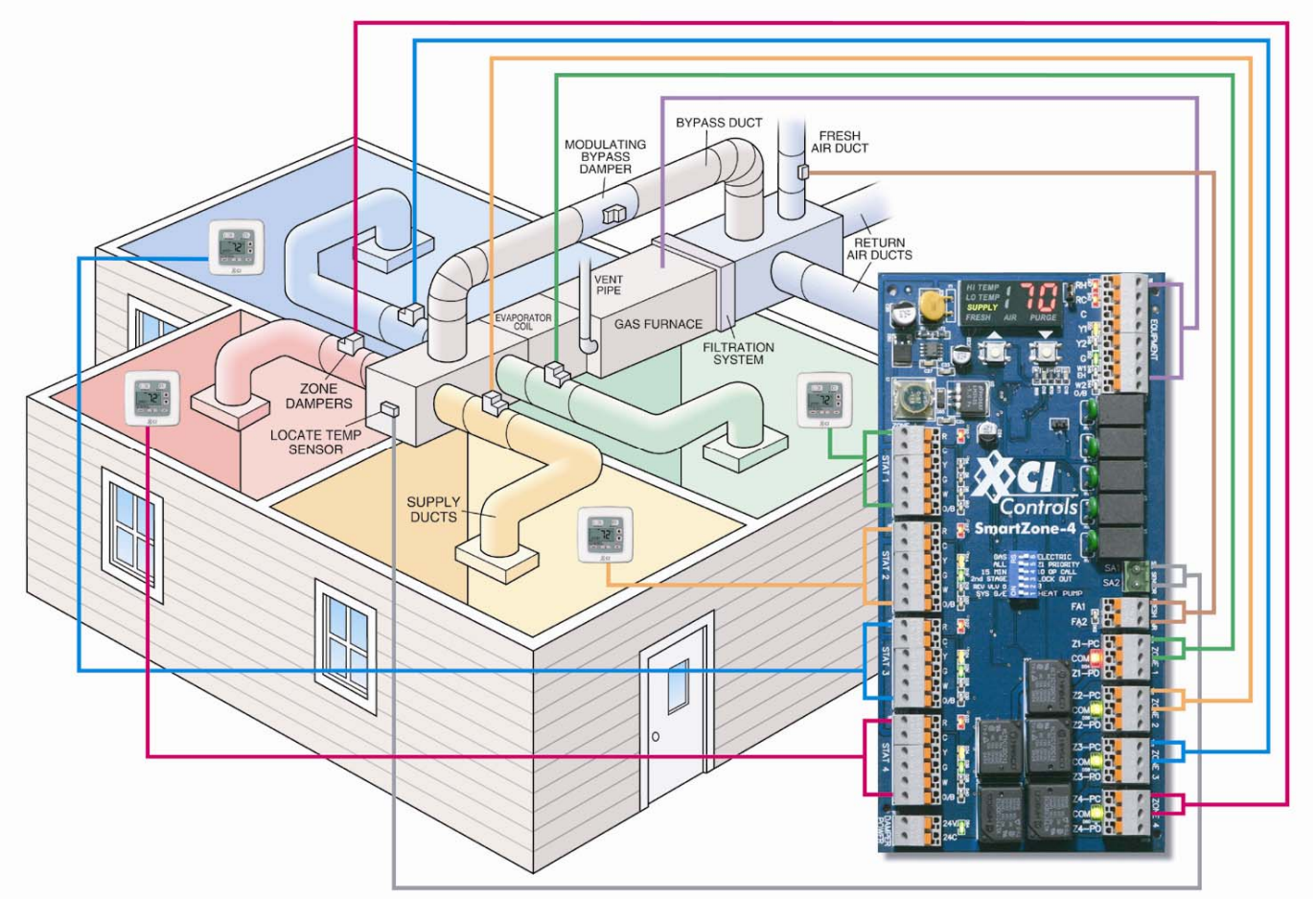


Table of Contents

Introduction

XCI Controls strives to give the contractor all knowledge and information necessary to successfully install a comfortable and quiet zoning system.

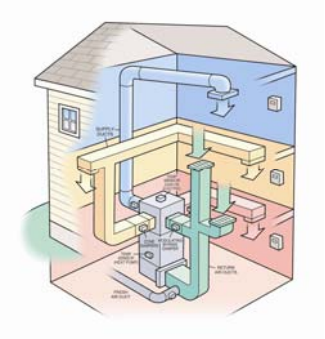
Call the Technical Support Hotline at 1-866-XCI-CTRL (866-924-2875) or email us at **sales@xcicontrols.com** with questions, comments or suggestions.

Operations Hotline: (214) 270-1984

Sales Hotline: (817) 937-9740

Why Use Residential Zoning?

Modern homes are designed with high ceilings, large windows and uniquely shaped spaces that will loose and gain heat at different rates. This fact combined with the numerous uses and occupancy times for these rooms make a zoning system the most convenient and cost effective comfort solution.



Architectural Challenges: Custom town homes, lofts, garden homes and zero lot line residences with two, three and even four stories more closely resemble chimneys than residences with regard to thermodynamics. Cool air will sink to the bottom of these buildings because it is heavier than the warm air which will rise to the top. This physical law of nature is magnified when the outdoor temperatures are extreme. A Zoning system can counteract this by providing appropriate conditioning only where necessary.

Area Usage: Rooms have many different uses in today's home. Large rooms with high ceilings and huge windows may only be used during gatherings and must be conditioned comfortably when in use. The home theater with no windows and a high amount of heat producing audio/video equipment must be conditioned silently as well as comfortably. The formal rooms may only be used occasionally, so why condition this room constantly. The home office with computer equipment and extra lighting produces heat that changes the room load considerably when in use. Many modern kitchens come with commercial appliances and a cooking hood able to exhaust the entire building in a matter of minutes. Game rooms may be adjacent to outside patios and swimming pool areas where the back door is constantly opening during summer entertainment. A Zoning system would allow each of these rooms to handle the particular load only when necessary.

Energy Savings: All of the above are all examples of spaces that will not be comfortable without control in each individual space. XCI Controls' SmartZone™ system allows each space (Zone) to have a thermostat that controls the temperature in just that particular space or zone. This allows the building to have different comfort settings during occupied times as well as allowing for energy savings when unoccupied.

SmartZone™ Overview

SmartZone Controller – Features

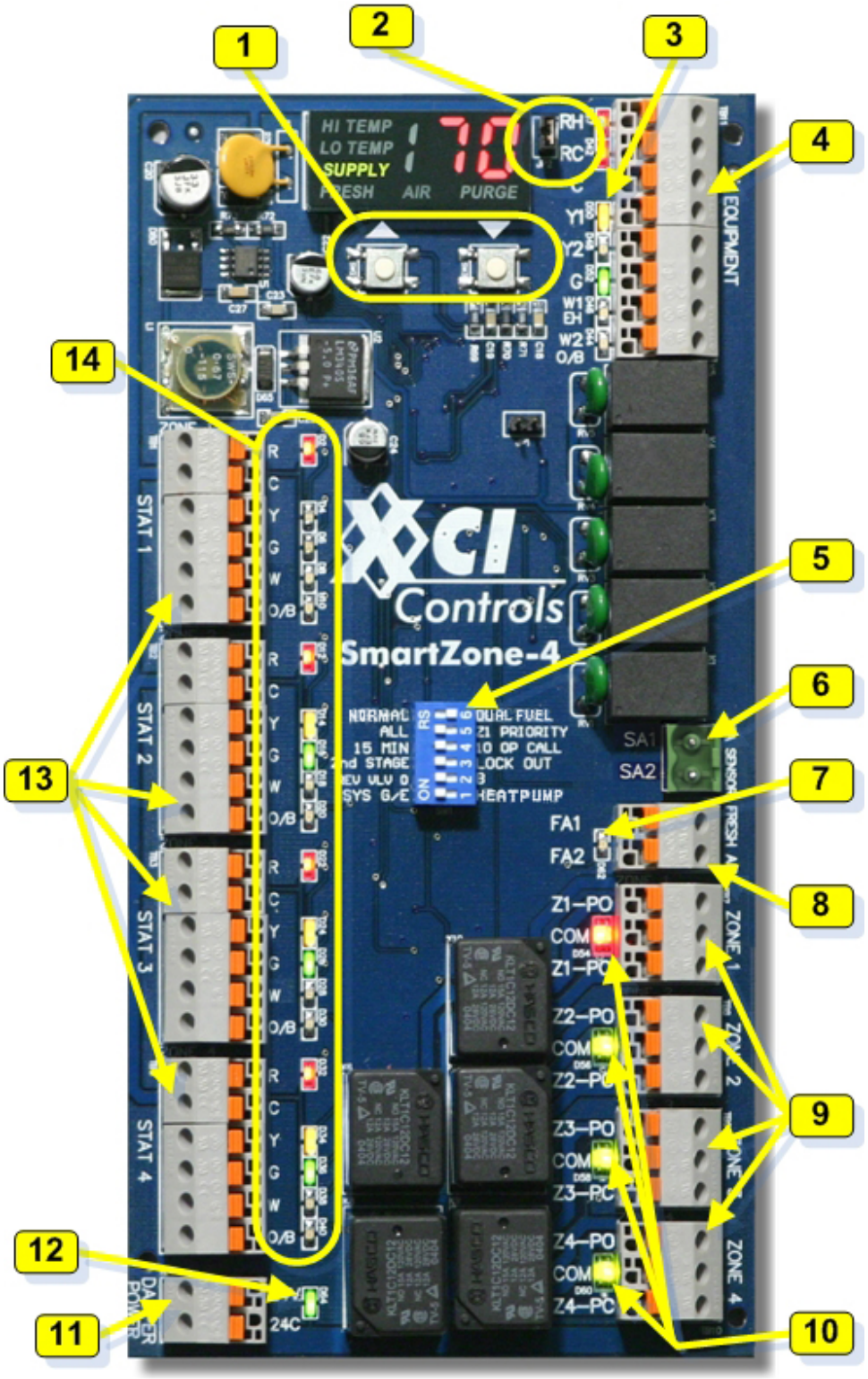


Figure 1: SmartZone-4 (*pictured)*

The ***SmartZone-2*** has two thermostat terminal blocks and two zone damper terminal blocks where the ***SmartZone-4*** has terminal blocks for four thermostats and terminal blocks for four zone damper. **On the following pages, each component numbered on the picture above is discussed in further detail.**

SmartZone Controller – Feature Details *(See **Figure 1** above and matching descriptions below)*

(1) Push Buttons with Display – These buttons have three different functions described below.

A. Fresh-Air Damper Time *(Also SEE Page 18 below – Fresh Air Control)*

To set the Minutes-Per-Hour that the Fresh-Air Damper is OPEN follow the below steps:

1. While the SmartZone-4 Controller Board is powered, momentarily press and release BOTH of the UP and DOWN Arrow buttons. The Green "FRESH AIR" indication will begin to flash.
2. Within 5 seconds press either the UP or the DOWN Arrow button to change the time. *The time is indicated in Number of Minutes-Per-Hour that the Fresh-Air Damper will be OPEN.*
3. After the desired time has been selected, wait 5 seconds and 'ST' will flash on the Display, indicating that the time has been set.

***NOTE:** If NO Fresh Air Damper is installed,'0' (Zero) Time must be set or the equipment fan will run unnecessarily.*

B. Electronic Limit Control™ (ELC) *(Also SEE Page 14 below – Electronic Limit Control)*

To set the High and Low Temperature Equipment Cut-Out Set Points follow the below steps, before completing these steps, ensure that DIP #6 is set correctly choosing the proper equipment type.

HIGH Temperature Cut-Out (Factory Default - GAS/ELECTRIC = 135°F; HEAT PUMP = 120°F)

1. While the SmartZone-4 Controller Board is powered, press momentarily and release the UP arrow to set the HIGH Temperature Cut-Out. The Red "HI TEMP" indication with begin to flash.
2. Within 5 seconds press either the UP or the DOWN Arrow button to change the HIGH Temperature Cut-Out. The temperature indicated here represents the highest temperature allowed at the supply air sensor.
3. After the desired temperature has been selected, wait 5 seconds and 'ST' will flash on the Display, indicating that the HIGH Temperature Cut-Out has been set.

LOW Temperature Cut-Out (Factory Default - GAS/ELECTRIC = 48°F; HEAT PUMP = 48°F)

4. While the SmartZone-4 Controller Board is powered, press momentarily and release the DOWN arrow to set the LOW Temperature Cut-Out. The Red "LO TEMP" indication with begin to flash.
5. Within 5 seconds press either the UP or the DOWN Arrow button to change the LOW Temperature Cut-Out. The temperature indicated here represents the lowest temperature allowed at the supply air sensor.
6. After the desired temperature has been selected, wait 5 seconds and 'ST' will flash on the Display, indicating that the LOW Temperature Cut-Out has been set.

C. Thermostat Type

***NOTE:** THIS ONLY APPLIES TO HEAT-PUMP INSTALLATIONS*

To set type of Thermostat being used on the system follow the below steps:

1. While the SmartZone-4 Controller Board is powered, press AND HOLD both the UP and DOWN Arrow buttons until the Numeral "1" appears [this Numeral is an indication of the ZONE Thermostat number], then either "GE" or "HP" will appear on the display.
2. Within 5 seconds press the DOWN Arrow button to toggle between the thermostat types. *"GE" = Gas/Electric Thermostat; "HP"= Heat Pump Thermostat*
3. After the desired thermostat type has been selected for this ZONE, press the UP arrow (within 5 seconds) to select the next zone. The Numeral "2" will appear [this Numeral is an indication of the ZONE Thermostat number], then either "GE" or "HP" will appear on the display.
4. Repeat Steps 2 and 3 for each of the ZONEs being used.
5. After all thermostat types have been selected for each ZONE, wait 5 seconds and 'ST' will flash on the Display indicating that the Thermostat Type has been set.

(2) RC RH Jumper for Separate Heating and Cooling Transformers - When installing floor heating, baseboard heating, fan-powered box, VAV with heating, or any system using separate transformers for heating and cooling this jumper must be disconnected. When using a single transformer on the HVAC system, leave the jumper in place so that 24 volts from the equipment will energize both Y and W terminals.

(3) EQUIPMENT Diagnostic LEDs - Diagnostic LEDs indicate which equipment circuits are being powered with 24 volts. When no 'R' LED is on check power from the HVAC unit.

SmartZone Controller – Feature Details (Continued 1)

(4) EQUIPMENT Terminal Block - Connect heat pump or gas/electric equipment using the Screwless terminals. **RC & RH** both are used for **24VAC** from the equipment. **C** should be connected to **24VAC Common** on the equipment. **Y1 and Y2** should be connected to **first and second stage compressor** on the equipment. **G** energizes **Fan** on the equipment. Use **W1 EH** for 1st stage heat when using gas/electric equipment or for emergency heat on heat pump equipment. Use **O/B W2** for 2nd stage heat when using gas/electric equipment or for reversing valve on heat pump equipment.

(5) DIP Switches - These DIP Switches MUST BE SET according to the equipment being used as well as the desired functionality of the SmartZone System. If not, unpredictable and undesirable results may occur. See ***Table 4*** on Page 19 at the end of this document for individual descriptions.

(6) Supply Air Sensor Terminal Block

*Sensor Placement (Location) See **Figure 3** below.*

Gas/Electric – Sensor should be located in Supply Air Plenum where it will sense AVERAGE air temperature within the plenum. The most ideal placement for the Sensor will be 2 to 4 feet beyond the evaporator. Make sure the sensor is in the air stream and secured properly.

Heat Pump – The sensor is placed inside the cabinet of the air handler after the coil but before the blower. Make sure the sensor is in the air stream and secured properly.

Sensor Wiring

Using the provided *GREEN* connector (Factory Connected to Sensor Wire), plug the SA Sensor wire into the SmartZone Controller Board. ***NOTE:** WITHOUT THIS SENSOR, the SmartZone CONTROLLER BOARD WILL NOT OPERATE.*

(7) Fresh Air Diagnostic LED – Green LED will be ON when damper is powered OPEN. The LED will NOT BE ON when the damper is CLOSED.

(8) Fresh Air Damper Terminal Block – Using 18/2 solid core wire, strip approximately 3/8" of insulation from each end. Then, hold down ORANGE button adjacent to the terminal block openings and push two wires into screwless terminals labeled FA1 and FA2. Connect the other end of this wire to the Fresh Air Damper terminals. Use only a power-open/spring-close damper (Part Number FAD-06 or FAD-08). *NOTE:* No other transformer or power connections are required.

(9) Zone Damper Terminal Blocks, 1 thru 4 – *SmartZone-2* will have 2 zone damper terminal blocks, ***SmartZone-4*** will have 4 zone damper terminal blocks.

When using Power-close/Spring-open dampers follow the steps below to connect each of the dampers to the SmartZone-4 Controller Board:

1. Use 18/2 or 18/3 solid core wire (Strip approximately 3/8" of insulation from each end)
2. Hold down the orange button adjacent to the terminal block openings labeled Z1-PC and COM and push wires for the ZONE damper into the SCREWLESS terminals.
3. Connect the other end of the wire to the SCREWLESS terminals on the ZONE damper.

If using a Power Open/Power Close damper follow the steps below to connect each of the dampers to the SmartZone-4 Controller Board:

1. Use 18/3 solid core wire
2. Hold down the orange button adjacent to the terminal block openings labeled Z1-PC,COM and Z1-PO and push wires for the ZONE damper into the SCREWLESS terminals.
3. Connect the other end of the wire to the terminals labeled the same on the ZONE damper.

(10) Zone Damper Diagnostic LEDs – Red LED will be ON when damper is powered CLOSED. Green LED will be ON when damper is OPEN.

(11) Power Terminal Block – *For detailed power parameters refer to the **SmartZone-4: Specification Document**.* The SmartZone-4 System requires a separate 24 volt transformer for powering the SmartZone-4 Controller Board, Zone Thermostats and Dampers. Connect 24V and 24(C) to the POWER Connector on the bottom left of the SmartZone-4 Controller Board. *(Continued on next page)*

SmartZone Controller – Feature Details (Continued 2)

NOTE: *DO NOT use the HVAC unit transformer(s) to power this terminal. The HVAC unit transformer is furnishing power to the equipment terminal block only.*

TRANSFORMER SIZE = 18VA (for Controller and Thermostats) + 10VA (per Damper)

[***Example:*** If the system has 4 Dampers, the transformer needs to be greater than 58VA]

(12) Power LED – Green LED is on when controller is correctly powered. The controller transformer sends power to all thermostats, dampers and the SmartZone controller itself.

(13) Thermostat Terminal Blocks – ***SmartZone-2*** will have 2 thermostat terminal blocks, ***SmartZone-4*** will have 4 thermostat terminal blocks. *SmartZone operates using thermostats that have a common or are battery operated, DO NOT USE POWER-STEALING THERMOSTATS. Follow the below steps to connect each of the thermostats to the SmartZone-4 Controller Board.*

1. Connect either single stage heat pump thermostats or gas/electric thermostats to each terminal block labeled THERMOSTAT 1 through 4.
2. The THERMOSTAT 1 will operate ZONE 1 damper(s), THERMOSTAT 2 will operate ZONE 2 damper and so on through THERMOSTAT 4.
3. Hold down the orange button adjacent to the terminal openings, push thermostat wires (stripped approximately 3/8" of insulation) into SCREWLESS terminals labeled R,C,Y,G,W and O/B (as applicable).
4. Connect the other end of the thermostat wire to the thermostat for the associated ZONE.

(14) Thermostat Diagnostic LEDs – Each LED will indicate what mode is being powered through the thermostat. The Red LED adjacent to 'R' indicates ***SmartZone*** has power available for the thermostat. The Yellow LED adjacent to 'Y' indicates a Cooling call from the thermostat, the Green LED adjacent to 'G' indicates Fan call from thermostat, the Red LED adjacent to 'W' indicates Heat call from thermostat, and the Orange LED adjacent to 'O/B' indicates Reversing Valve call from thermostat.

(15) SmartZone Enclosure – The clear cover on the enclosure allows the installer/user to immediately see complete system status including Supply Air Temp, Fresh Air Control, Thermostat Calls, Equipment Calls, Damper Positions, etc. To install the base of the enclosure, use appropriate holes and screws based on mounting surface. (See ***Figure 2*** below)

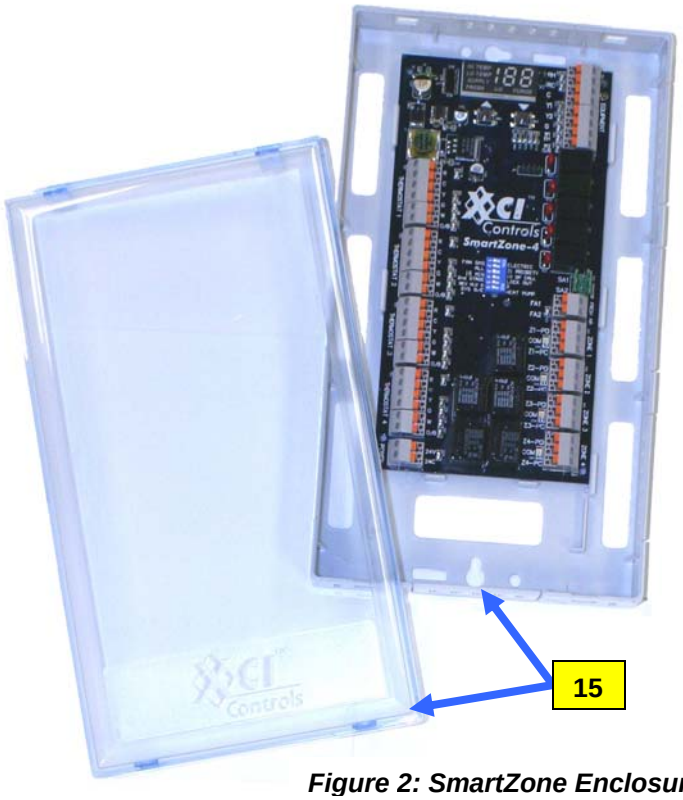


Figure 2: SmartZone Enclosure

The Duct System

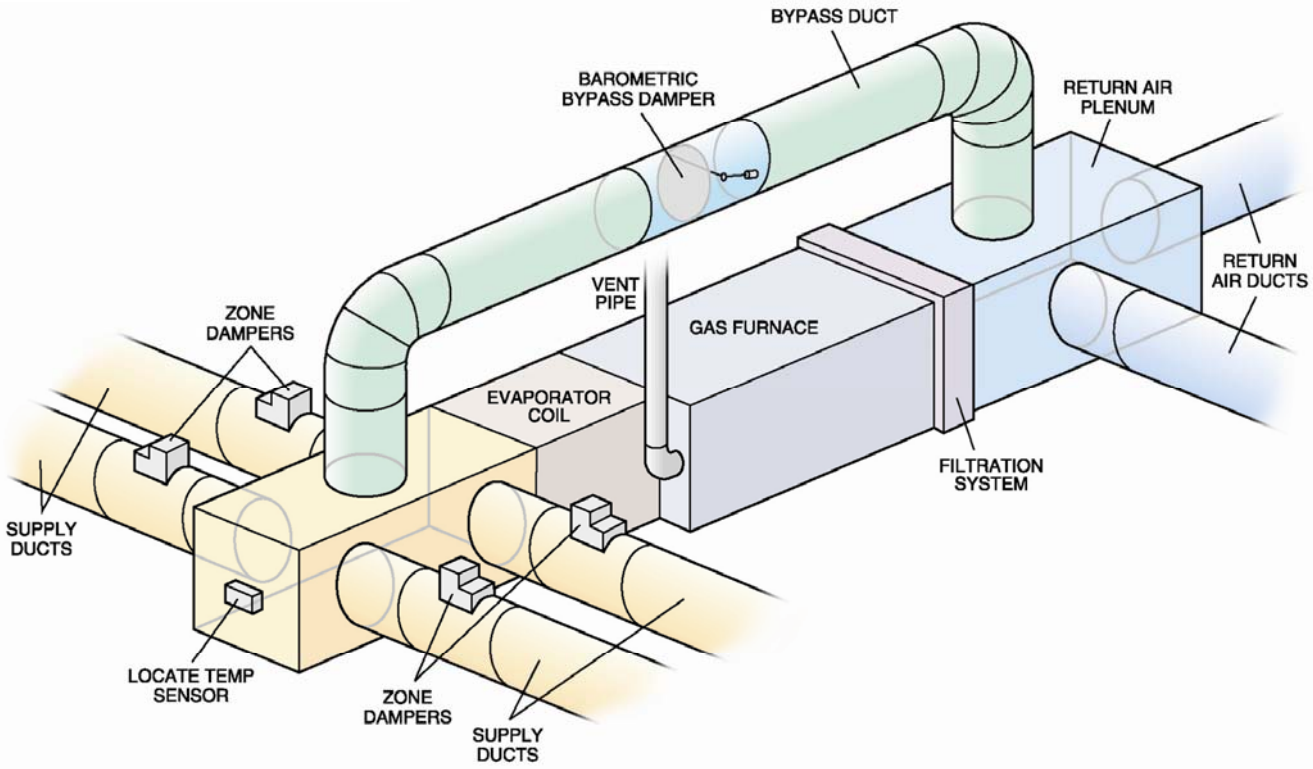


Figure 3: SmartZone Duct System Overview

SmartZone™ will often furnish conditioned air to only part of the whole area that is serviced by the heating and cooling system. Yet, most residential HVAC equipment is designed to operate at full capacity or be turned off. When all zones are open the system will operate normally, but when a few dampers are open it is critical that the zoning system relieve the excess air pressure back into the return air plenum. This is accomplished with a bypass duct and an adjustable bypass damper. THE BYPASS DAMPER IS DESIGNED TO MAINTAIN A REASONABLY CONSTANT SUPPLY DUCT PRESSURE AS ZONE DAMPERS OPEN AND CLOSE SO AS TO ELIMINATE AIR NOISE. Temperature in the supply duct will be affected as more or less supply air is bypassed into the return air plenum. This supply air temperature cannot be allowed to get too cold or too hot. Included with the SmartZone controller is a temperature sensor connected to the Electronic Limit Control (ELC). This function in the controller will break Y1 or W1 if the supply air temperature exceeds the heating or cooling cutout set points. The ELC will automatically allow Y1 or W1 to close after a minimum 3 minute time delay as long as the supply temperature has recovered within the cutout limits.

Load Calculation

When sizing a supply duct system using zoning, XCI Controls recommends calculating a “whole house load calculation” as well as a “room-by-room load calculation”. The equipment should be sized based on the conditioning requirements of the “whole house” using maximum diversity. This simply means that the sun will never shine from the east and the west at the same time, all the occupants will not be in all the rooms at the same time, etc. These are examples of items of diversity that are automatically calculated into a load when maximum diversity is applied. Once the building’s Total Design CFM is established, choose HVAC equipment that will provide the Total Design CFM while also working within the static pressure requirements of the duct system of choice (flex duct, round metal, duct board, rectangular metal with exterior liner). Next, divide the Design CFM requirements for each zone by the total CFM available from the indoor equipment. Use ***Table 1: Damper Sizing Chart*** below to select each damper that will accommodate the Zone Design CFM. *(Continued on Next Page)*

The Duct System (Continued)

On the other hand, room-by-room loads should be calculated with little or no diversity. No diversity means that using worst conditions, each zone should have a branch duct system designed to deliver the conditioned air necessary to satisfy the user-requested conditions. In low load conditions, each thermostat in each zone will reach setpoint and the zone damper will close, not allowing over conditioning.

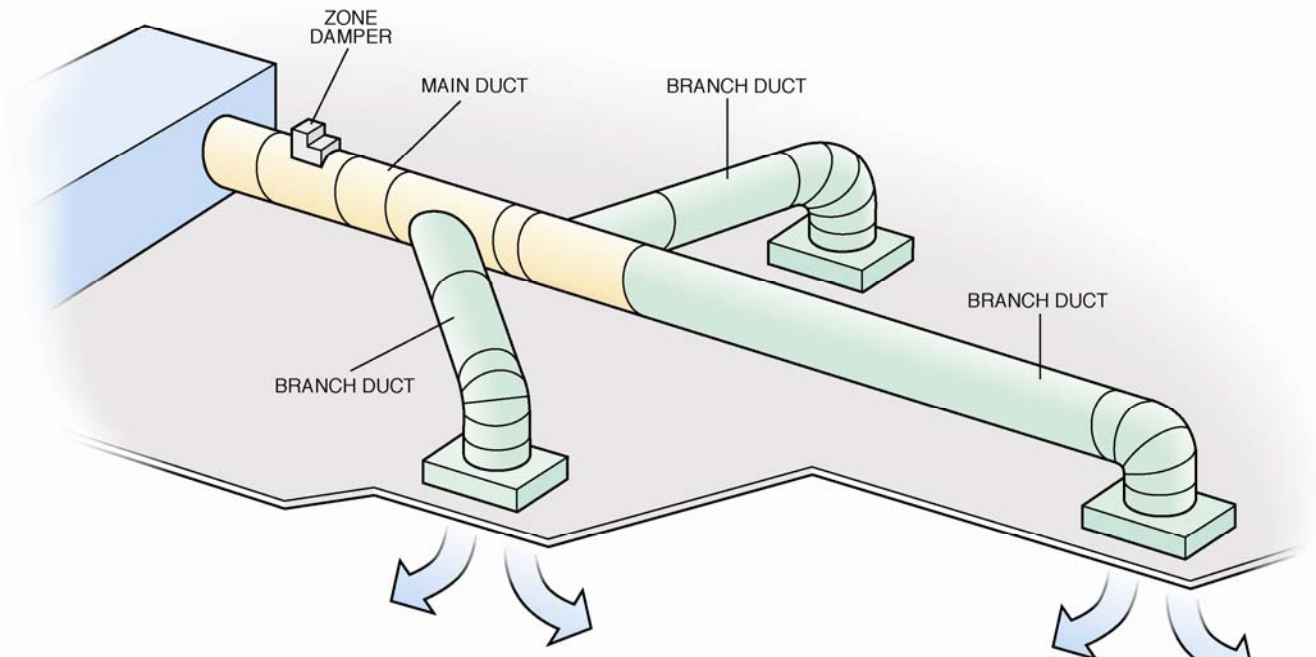


Figure 4: SmartZone Duct System – Branch Ducts

Supply Air Duct Sizing

IMPORTANT: All air out of the blower must be routed through a supply air damper and ultimately through a supply defuser. Supply air ducts not routed through a damper will "dump" unwanted air into a space whenever the system is running whether the space is requesting the conditioned air or not. This is called a "dump zone" and is not recommended.

1. Once the total CFM of the HVAC system is determined, size the dampers using the "Design CFM" column on ***Table 1: Damper Sizing Chart*** below. A four ton HVAC system might be rated at 1600 CFM. If four zones are used the total CFM chosen for all four dampers should be approximately 1600 CFM.
2. Size each damper based on a percentage of the whole house load. If one zone requires 600 design CFM, choose a 12" damper. Dampers totaling approximately 1000 CFM still need to be selected.
3. Notice in ***Table 1*** that the "Max Design CFM" for the 12" damper is 900. This is the maximum CFM that might move through the 12" damper if that damper is the only one open. Design the branch outlet duct system to accommodate Max Design CFM. This will insure that the system is quiet even when a single zone is receiving the maximum CFM when only one damper is open.
4. To design the individual branches in the duct system, no more than 700 FPM face velocity at the outlet defuser is acceptable in order to provide a quiet system.
   EXAMPLE: Outlet size of 14" x 8". Multiply 14 x 8 =112 sq. inches. Divide 112 by 144 (sq. inches in a sq. foot) to find .78 sq. ft. of opening. Multiply the maximum FPM of 700 moving through the duct into the opening size of .78 sq. ft. = 546 CFM. One last item must be considered; most defuser charts will include a "free area multiplier". (Continued on Next Page)

This is simply the amount of air that will pass through the defuser uninterrupted by the diffuser's restriction through the opening. If the free area multiplier is .80, multiply 546 CFM x .80 for the actual maximum design of 437 CFM. Since our branch CFM is 437,two 14" x 8" outlet defusers with 10" round inlets can be used to quietly deliver 900 CFM to a room at less than 700 FPM.

DAMPER SIZING CHART			
Damper Size	Design CFM	Max Design CFM	Example Wye
6"	100	200	6 X 6 X 6
7"	150	250	7 X 6 X 6
8"	200	300	8 X 7 X 7
9"	300	450	9 X 8 X 8
10"	400	600	10 X 9 X 9
12"	600	900	12 X 10 X 10
14"	1000	1400	14 X 12 X 12
16"	1500	2000	16 X 14 X 14

Table 1: Damper Sizing Chart

Excess Supply Plenum Pressure

XCI Controls recommends any of three methods to control excess supply plenum pressure caused as supply dampers open and close. The best method will be determined based on the specific requirements of the application such as customer sensitivity to excess air noise, type of duct system used, actual duct design, ability to locate bypass duct in tight equipment location and installation cost.

1. No Bypass; Oversizing the duct system of a 2-zone system.
2. Barometric relief damper placed in the bypass duct from the supply plenum to the return air plenum.
3. Modulating power open/ power close bypass damper operated with a static pressure controller (SPC).

No Bypass

When using **SmartZone 2**, with two zones that are approximately the same size, it is acceptable to oversize the duct in each zone so that when only one of the two zones is open, all the air produced by the indoor blower is applied to the open zone. This requires calculating the duct size to deal with approximately twice the amount of air normally placed in the space. The duct sizing calculations should allow no more than 800 feet per minute of conditioned air at the terminal points (diffusers, registers and grills located in each zone). This duct design has one advantage and several disadvantages. The advantage is that no bypass duct or damper is required; consequently the system's operating temperature and pressure should be normal. One disadvantage is a very low duct pressure when both zones are calling. This means that the system's ability to throw the air to the outside walls may be diminished. Another disadvantage is that when only one zone is calling, excess air in the calling zone tends to be drafty and conditions the calling zone too quickly, possibly over conditioning the space. Also, the larger than normal duct system is more expensive than a smaller duct system.

Bypass Damper [And How it Works]

A bypass duct is a short duct placed between the supply plenum and the return air plenum. The purpose of the bypass duct is to allow the excess pressure from the supply plenum to escape into the return air plenum. Excess pressure can occur in the supply plenum when less than all the zone dampers are open. This excess air must pass through a bypass damper that is mounted in the bypass duct. Excess pressure is restricted from freely flowing back to the return air plenum by adjusting the bypass damper. A bypass damper must be adjusted so that when all zones are open the bypass damper is closed, but lightly closed so that as supply dampers close and pressure mounts in the supply air plenum; this pressure pushes the bypass damper open. Excess pressure escaping through the bypass damper is taken back into the return air system and re-circulated through the equipment (see **Electronic Limit Control**).

Barometric Bypass

A barometric relief damper is not motorized and houses a blade in the bypassed air stream attached to a shaft. The blade is opened as air pressure in the supply plenum builds and escapes through the bypass duct. As the damper blade opens the attached shaft rotates. The shaft extends outside the damper. There is a shaft collar with a ½ inch hole that slides over the end of the ½ inch shaft ***(See Figure 5 below)***. A ¼ inch bolt that is 8 inches long screws through the side of the shaft collar and tightens onto the shaft. When weights are applied to this bolt, it is used as a weighted arm. The shaft collar allows the weighted arm to be positioned at any location (360 degrees) on the shaft. By sliding the weight toward the end of the bolt, leverage is applied to the attached shaft, closing the blade in the bypassed air stream and adding restriction to the bypassed air flow.

Set-Up and Adjusting a Barometric Bypass

1. Make certain that the arrow label on the barometric bypass damper is pointed in the direction of air flow; from the supply plenum toward the return air plenum.
2. Make certain that the shaft is located horizontally in the air stream and the blade is actually hanging down from the shaft inside the damper. This insures that the damper will swing open from the bottom and pivot from the shaft.
3. The barometric bypass damper shaft extends 3 inches on both sides of the damper. This allows room to insulate the bypass damper completely and still allow the weighted arm to pivot freely from the end of the shaft.
4. An eight inch long bolt with a ½" hex head is used as the weighted arm. Tighten the ½" hex head bolt that is threaded into a shaft collar that slides over the end of the shaft. Loosen the bolt slightly to allow rotation of the shaft collar on the shaft. This allows positioning of the weighted arm a full 360°.
5. Locate the weighted arm at approximately the 8:00 o'clock position or the 4:00 o'clock position depending on which direction the air is moving through the bypass damper. This weight should add restriction to the air moving past the blade inside the bypass damper. Retighten bolt onto the shaft and tighten the locking nut positioning the shaft collar onto the shaft.
6. As the air pressure increases the blade inside the damper will be forced to pivot open which will turn the shaft. The weighted arm attached to the shaft should be lifted from it's at rest position.
7. The weight that slides up and down the 8" arm allows more or less leverage or weight to the arm. The weight includes an Allen screw so that an Allen wrench will tighten the weight after it is in position.

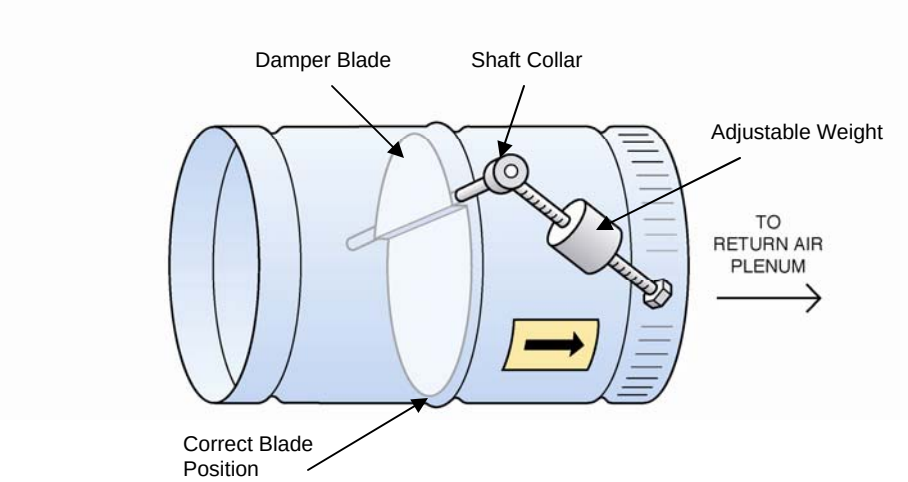


Figure 5: SmartZone Barometric Bypass Damper

Modulating Bypass (Static Pressure Operated Bypass)

The static pressure operated bypass requires the use of a motorized power open/power close modulating damper. As pressure increases in the supply plenum, the static pressure sensor will register this increase and power the motorized damper open slowly so as to relieve the excess pressure. As the pressure is removed, the static pressure sensor may register less pressure in the supply plenum, consequently powering the bypass damper closed so as to make pressure. This constant hunting for the correct pressure requires a motorized damper that moves from open to close in approximately 35 seconds. In this application, no dead band is required.

Set-Up and Adjusting a Modulating Bypass Damper with Static Pressure Controller

1. Power-open/Power-close damper can be mounted in any position in the bypass duct.
2. The static pressure controller (SPC) must be mounted so that the diaphragm is in the vertical position (See ***Figure 6*** below). Use sheet metal screws to attach the feet of the SPC to the supply plenum within 6 to 8 inches of the pitot tube.
3. The pitot tube should be inserted into the supply plenum between 2 and 4 feet from the beginning of the plenum. Insert the pitot tube perpendicular to air flow. The purpose of the tube is to measure AVERAGE supply air plenum pressure and report this pressure to the static pressure controller.
4. Attach the provided 12 inch rubber tube to the static pressure controller on the inlet barb labeled High-Pressure Inlet. Attach the other end of the 12 inch rubber tube to the installed pitot tube.
5. Wire the SPC, PO/PC Damper, included relay and a field supplied transformer as shown the included wiring instructions below ***(Figure 7)***
6. Start the indoor blower in high speed and make certain all zones are open.
7. Using a flat head screw driver, turn the set screw on the SPC clockwise ¼ turn so that the motor continues to power the damper closed. If the damper reverses itself and starts to open, turn the set screw another ¼ turn clockwise until the bypass damper has closed and is remaining closed.
8. Slowly turn the set screw counter clockwise until the damper starts to open. Immediately reverse the motor by moving the set screw clockwise slightly so that the position is located where the damper is barely staying closed with all Zones OPEN. This becomes the setpoint for the static pressure controller.
9. As the supply dampers open and close the SPC will constantly hunt to maintain the static pressure that was established during the above start up procedure.
10. When all zones are satisfied and the indoor blower is de-energized, make certain that the bypass damper is powering open so that when it begins its next cycle, the bypass damper will start modulating from the OPEN position. If the relay is not wired correctly, the damper will close. On the next cycle with only one zone open, the bypass will start from the closed position and cause several seconds of excess air noise in the zone that is open.

NOTE: *See Next Page,* ***Figures 6 & 7*** *for wiring and mounting information. For further information about the Static Pressure Controller refer to the SPC Specification Sheet* (separate document).

Wiring of Modulating Bypass Damper

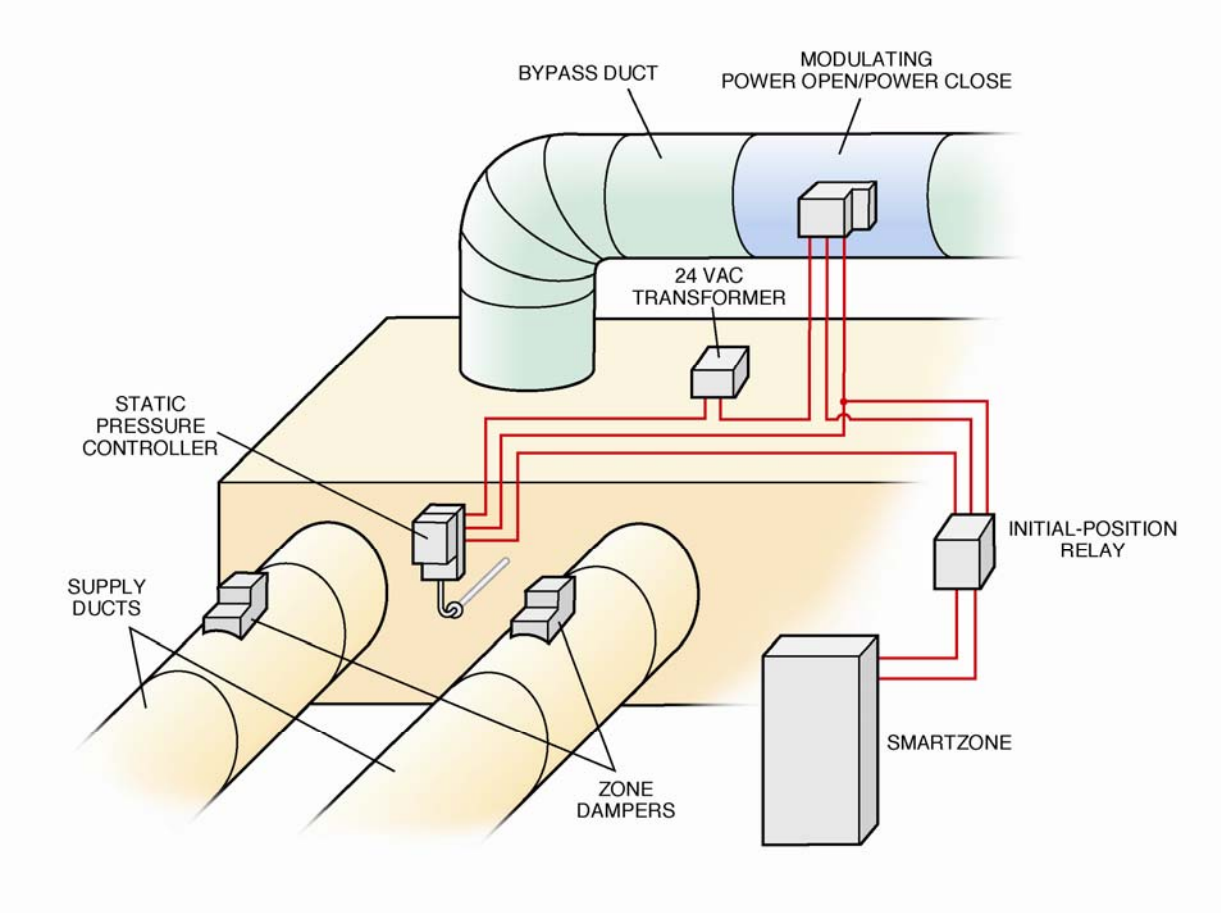


Figure 6: Static Pressure Controlled Bypass Damper Installation

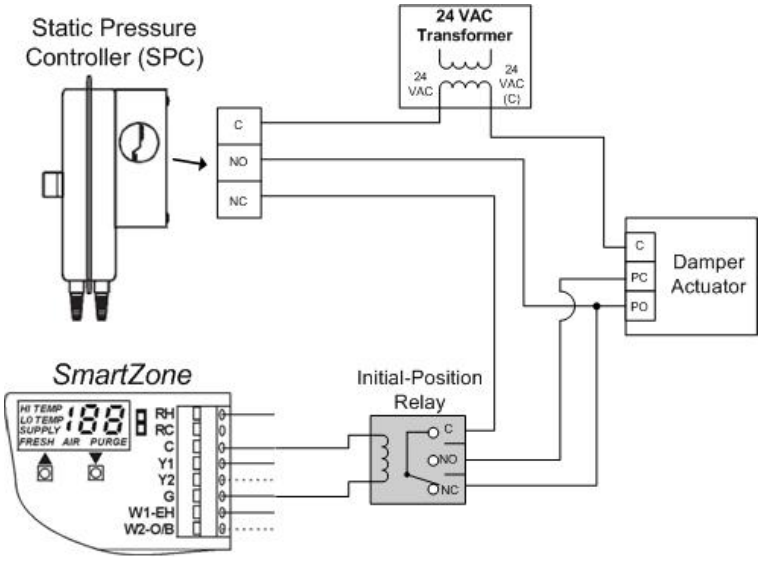


Figure 7: Static Pressure Controlled Bypass Damper Wiring Detail

SmartZone Sequence of Operation

Single Stage Equipment (Not Heat Pump)

Use the same controller for gas/electric or heat pump systems. Choose 'G/E' on the SYS DIP Switch (#6). On a call from any zone, the corresponding zone damper will open and the zone controller will make a call to the equipment terminal block. On a call for either mode contact is made between Rc (or Rh) and Y1 (or W1) and between Rc (or Rh) and G on the equipment terminal block. The equipment contactor and the fan should be energized. After three minutes of initial run time, the **Electronic Limit Control (ELC)** will control the supply air temperature. If the supply air temperature is out of the set range of limits (see Page 4 above (1)A), the **ELC** will de-energize Y1 or W1 for three minutes. The G terminal remains energized and the fan continues to blow air into the calling zone(s) thus bringing the supply plenum temperature back within cutout range. After three minutes, Y1 or W1 will be reenergized as long as a thermostat's call still exists (see **Electronic Limit Control** below).

Two Stage Equipment (Not Heat Pump)

On a call from any zone, the corresponding zone damper will open and the zone controller will make a call to the equipment terminal block. On a call for either mode, a contact is made between Rc (or Rh) and Y1 (or W1) and between Rc (or Rh) and G on the equipment terminal block. After eight minutes of continuous run time and based on the supply air temperature, the controller may make a contact between Rc (or Rh) and Y2 (or W2) (see **Electronic Limit Control**). If Y2 (or W2) is energized, the second stage contactor will be energized and the equipment will operate in second stage. After a minimum run time of 3 minutes the **ELC** will monitor supply air temperature and automatically deenergize and energize Y2 (or W2) based on supply air temperature as long as the call is received from a thermostat. If the supply air temperature is out of the set cutout range, the **ELC** will deenergize Y1 or W1 for three minutes. The G terminal remains energized and the fan continues to blow air into the calling zone(s). After three minutes, Y1 or W1 will be energized as long as the thermostat's call still exists (see **Electronic Limiting Control** below).

Single Stage Heat Pump

Use the same controller for heat pump or gas/electric system. Choose 'Heat Pump' on the SYS Dipswitch (#6). Choose "O" or "B" on the REV VLV Dipswitch (#5). A single stage heat pump thermostat must be used on Zone #1, to control emergency heat. Thermostat #1 must MAKE A CALL for EH to initiate emergency heat, not just be switched into EH mode. After emergency heat has been initiated at zone 1, any other zone calling for heat pump heating or emergency heat will be controlled by emergency heat. Once emergency heat has been initiated, only making a cooling or standard heat pump heat call from the thermostat #1 will unlatch the controller and allow the system to energize in standard heat pump heating or cooling. A call from thermostat #1 or any other stat will now energize heat pump heating or cooling. Standard single stage gas/electric thermostats can be used on any zone where emergency heat is not required. If using GE thermostats on a heat pump (see **Thermostat Configuration**), the configuration of the thermostat corresponding to the zone using that thermostat must be changed. XCI Controls recommends that a least one heat pump thermostat be used on the ***SmartZone™*** Heat Pump Zoning System so that Emergency Heat can be initiated in the event of heat pump failure in the heating mode. Both ***SmartZone™*** controllers allow any call from a GE single stage thermostat to operate the reversing valve and energize the compressor for the heating mode or the cooling mode. On a call from any zone, the corresponding zone damper will open and the zone controller will make a call to the equipment terminal block. Always leave the Rc-Rh jumper connected in heat pump operation. On a call for either mode, a contact is made from Rc-Rh to Y1 and O/B (depending on equipment reversing valve configuration and the calling mode, see **REV VLV Dipswitch**), and between Rc-Rh and G on the equipment terminal block. The compressor contactor, the reversing valve (if applicable), and the fan should be energized. After three minutes of initial run time, the **Electronic Limit Control** will monitor the supply air temperature. If the supply air temperature is out of the set range, the **ELC** will deenergize Y1 for three minutes. The G terminal remains energized and the fan continues to blow air into the calling zone(s). After three minutes, Y1 will be reenergized as long as the thermostat's call still exists. Auxiliary heat will be energized after six minutes of continuous run time and if the supply air temperature is below the Auxiliary Heat Cut-In Setpoint (see **Electronic Limit Control** below). Emergency Heat can only be initiated through a heat pump thermostat.

Two Stage Heat Pump

Use the same controller for two-stage heat pump or gas/electric system. Choose 'Heat Pump' on the SYS Dipswitch (#6). Choose "O" or "B" on the REV VLV Dipswitch (#5). A single stage heat pump thermostat must be used on Zone #1, to control emergency heat. Thermostat #1 must MAKE A CALL for EH to initiate emergency heat, not just be switched into EH mode. After emergency heat has been initiated at zone 1, any other zone calling for heat pump heating or emergency heat will be controlled by emergency heat. Once emergency heat has been initiated, only making a cooling or standard heat pump heat call from the thermostat #1 will unlatch the controller and allow the system to energize in standard heat pump heating or cooling. A call from thermostat #1 or any other stat will now energize heat pump heating or cooling. A two-stage thermostat is not required (and should not be used) since staging is not accomplished through the thermostat. Standard Gas/Electric single stage thermostats may be used in any zone where the control of Emergency Heat is not required. XCI Controls recommends that a least one heat pump thermostat be used on the ***SmartZone™*** Heat Pump Zoning System so that Emergency Heat can be initiated in the event of heat pump failure in the heating mode. Both ***SmartZone™*** controllers allow any call from a standard thermostat to operate the reversing valve and energize the compressor for the heating mode or the cooling mode. On a call from any zone, the corresponding zone damper will open and the zone controller will make a call to the equipment terminal block. Always leave the Rc-Rh jumper connected in heat pump operation. On a call for either mode, a contact is made from Rc-Rh to Y1 and O/B (depending on equipment reversing valve configuration and the calling mode, see **REV VLV Dipswitch**), and between Rc-Rh and G on the equipment terminal block. The compressor contactor, the reversing valve (if applicable), and the fan should be energized. After eight minutes of continuous run time in cooling or four minutes of continuous run time in heating, and based on the Supply Air Temperature, the controller may make a micro-relay between Rc-Rh and Y2 (see **Electronic Limit Control**). If Y2 is energized, the second stage contactor will be energized and the equipment will operate in second stage. After a minimum run time of 3 minutes the **ELC** will monitor supply air temperature and automatically deenergize and energize Y2 based on the supply air temperature as long as the cooling or heating call is still being received from a thermostat. If, at any time, the supply air temperature is out of the set range, the **ELC** will deenergize Y1 for three minutes. The G terminal remains energized and the fan continues to blow air into the calling zone(s). After three minutes, Y1 will be energized as long as the thermostat's call still exists (see **Electronic Limit Control**).

Heat Pump Using Fossil Fuel Furnace Backup (Dual Fuel)

Use the same controller for heat pump with fossil fuel furnace backup system. Choose 'Heat Pump' on the SYS Dipswitch (#6). Choose 'O' or 'B' on the REV VLV Dipswitch (#5). Choose DUAL FUEL Dipswitch (#1). ***SmartZone™*** does not require a heat pump dual fuel kit to operate equipment correctly. When the heat pump compressor is operating in the heating mode, the high temperature cut-out will correspond to the Heat Pump Heating Cut-Out Temperature (see Electronic Limit Control). Once the heat pump is operating in the fossil fuel mode, the Gas Heating Cut-Out will be used automatically by ***SmartZone™***. A two-stage thermostat is not required (and should not be used) since staging is not accomplished through the thermostat. Standard Gas/Electric single stage thermostats may be used in any zone where the control of Emergency Heat is not required. On a call from any zone, the corresponding zone damper will open and the zone controller will make a call to the equipment terminal block. Always leave the Rc-Rh jumper connected in heat pump operation. On a call for either mode, a contact is made from Rc-Rh to Y1 and O/B (depending on equipment reversing valve configuration and the calling mode, see REV VLV Dipswitch), and between Rc-Rh and G on the equipment terminal block. The compressor contactor, the reversing valve (if applicable), and the fan should be energized. After eight minutes of continuous run time in cooling or four minutes of continuous run time in heating, and based on the Supply Air Temperature, the controller may energize Y2 (see **Electronic Limit Control**). If Y2 is energized, the equipment will operate in second stage. After a minimum run time of 3 minutes the **ELC** will monitor supply air temperature and automatically de-energize and energize Y2 based on the supply air temperature as long as the call is still being received from a thermostat. If, at any time, the supply air temperature is out of the set range, the **ELC** will de-energize Y1 for three minutes. The G terminal remains energized and the fan continues to blow air into the calling zone(s). After three minutes, Y1 will be energized as long as the thermostat's call still exists (see **Electronic Limit Control**).

Emergency Heat: XCI Controls recommends that a least one heat pump thermostat be used on the ***SmartZone™*** Heat Pump Zoning System so that Emergency Heat can be initiated in the event of heat pump failure in the heating mode. Thermostat #1 must MAKE A CALL for EH to initiate emergency heat, not just be switched into EH mode. This will latch the board into Emergency Heat and any other zone thermostat calling for heat will now initiate the fossil fuel starting sequence. Once emergency heat has been initiated, only making a cooling or standard heat pump heat call from the thermostat #1 will unlatch the controller and allow the system to energize in standard heat pump heating or cooling.

Note: Use SmartZone Thermostat TSZ-1 with the Outdoor Sensor in the #1 position to initiate Emergency Heat based on outdoor temperature.

Auxiliary Heat: After 6 minutes of initial run time, if the supply air temperature sensor goes below 90° F, Y1 and Y2 will be de-energized and W1/EH will initiate the fossil fuel furnace starting sequence. Once the furnace has been initiated, the heating cycle will be completed using fossil fuel. No compressor will be operable until the next heating cycle.

Note 1: A DUAL FUEL KIT IS NOT REQUIRED when using ***SmartZone™***.

Note 2: Always install the heat pump evaporator downstream of the furnace. This prevents condensation in the heat exchanger during the cooling mode.

Note 3: The **HIGH Temperature Cut-Out for the gas furnace in a dual fuel** application can only be identified and the setpoint adjusted when the **# 1 dipswitch is in the DUAL FUEL** position and the **# 6 dipswitch is in the GAS FURNACE** position. **MAKE CERTAIN TO RESET THE #6 DIPSWITCH BACK TO HEAT PUMP AFTER SETTING THE FURNACE SETPOINT.**

Electronic Limit Control [ELC]

The ELC consists of two setpoints stored in the *SmartZone™* Controller Board. These are set by pressing either the UP or the DOWN Pushbuttons just below the Temperature Display. *(See **Page 4 (1)B** above)*

- To set the ***Cooling Cut-Out Temperature*** press the **DOWN** Pushbutton one time and release. When the ***LO TEMP*** Indicator is flashing press either the **UP** or the **DOWN** Pushbutton to adjust to the desired ***Cooling Cut-Out Temperature***. When the desired ***Cooling Cut-Out Temperature*** is reached, simply wait 5 seconds and the display will show '**St**' indicating that the settings were saved.
- To set the ***Heating Cut-Out Temperature*** press the **UP** Pushbutton one time and release. When the ***HI TEMP*** Indicator is flashing press either the **UP** or the **DOWN** Pushbutton to adjust to the desired ***Heating Cut-Out Temperature***. When the desired ***Heating Cut-Out Temperature*** is reached, simply wait 5 seconds and the display will show '**St**' indicating that the settings were saved.

When conditioned air is bypassed and re-circulated through the cooling or heating equipment, there is the possibility of the conditioned air becoming too cold or too hot. To keep this from becoming a problem, the temperature inside the plenum is monitored and controlled with the **Electronic Limit Control (ELC)** and a sensor (provided with both ***SmartZone2™*** and ***SmartZone4™***) placed in the supply air stream. The **ELC** is integrated on the ***SmartZone™*** board. The **ELC** reads a supply air temperature sensor that connects to the ***SmartZone™*** board after being mounted in the plenum (See Sensor Placement Above). The temperature read by the **ELC** is displayed on the ***SmartZone™*** Board during normal operation. The **ELC** has adjustable, technician-established temperature setpoints. These setpoints relate to the lowest temperature (for cooling) and the highest temperature (for heating) allowed in the supply air plenum by the **ELC** so as not to cause HVAC system damage. Two buttons on the ***SmartZone™*** board allow the technician to easily check and change the heating and cooling cut out setpoints.

ELC with Gas/Electric Single Stage

The system will automatically turn off the necessary equipment (i.e. open the Y1 circuit in cooling or open the W1 EH circuit in heating) for three minutes if the temperature sensor goes beyond the designated setpoints. During the three minutes however, the indoor blower is still energized and conditioned air is still being applied in the calling zone(s). When the three minute delay period is over, the cooling or heating equipment is restarted. See below for default settings.

COOLING – The default cooling cut out temperature is 48°F. (See Figure 2)
HEATING – The default heating cut out temperature is 135°F. (See Figure 2)

ELC with Gas/Electric Two Stage

The system will automatically turn off the necessary equipment (i.e. open the Y1 circuit in cooling or open the W1 EH circuit in heating) for three minutes if the temperature sensor goes beyond the designated setpoints. During the three minutes however, the indoor blower is still energized and conditioned air is still being applied in the calling zone(s). When the three minute delay period is over, the cooling or heating equipment is restarted. When using two stage HVAC equipment (not heat pump), the **ELC** monitors the supply air temperature ***AND*** controls staging based on the temperature of the supply air as well as time. See table below (Figure 2) for factory settings.

COOLING – On a call for cooling from any zone, first stage cooling (Y1) will energize. AFTER THE INITIAL **EIGHT MINUTES** OF CONTINUOUS RUN TIME **IN Y1 COOLING**, if the supply air temperature is above a temperature that is 10°F higher than cooling cut out setpoint, second stage will be energized. Once Y2 is energized, it will remain energized for no less than three minutes. After a three-minute minimum run time, if the supply air temperature is less than 4°F above the cooling cut out setpoint, the system will de-energize Y2 (see *Figure2*). This will allow first stage to continue. The **ELC** will constantly monitor the supply air temperature, energize and de-energize second stage when necessary during the cooling call.

HEATING – On a call for heating from any zone, first stage heating (W1 EH) will energize. AFTER THE INITIAL **EIGHT MINUTES** OF CONTINUOUS RUN TIME **IN HEATING**, if the supply air temperature is lower than 25°F below the heating cut out setpoint, second stage will be energized (W2 OB). After a three-minute minimum run time, if the supply air temperature is higher than 10°F below the heating cut out setpoint, the system will de-energize W2 OB (see *Figure 2*). This will allow first stage heating to continue. The **ELC** will constantly monitor the supply air temperature, energize and de-energize second stage when necessary during the call.

ELC Staging Temperature Chart (Gas/Electric)	
135°F	***Heating Cut-Out Setpoint***
125°F	Second Stage Heating Cut-Out Setpoint
110°F	Second Stage Heating Cut-In Setpoint
58°F	Second Stage Cooling Cut-In Setpoint
52°F	Second Stage Cooling Cut-Out Setpoint
48°F	***Cooling Cut-Out Setpoint***

Table 2: Typical **ELC** setpoint temperatures for two stage gas/electric equipment. When using the pushbuttons to set the Cooling Cut-Out and Heating Cut-Out Setpoints the two parameters in the table in ***red*** ***and*** ***blue*** *(top and bottom of the table)* are being set and the rest are automatically adjusted within the controller. The values shown are the suggested defaults.

ELC with Single Stage Heat Pump

When conditioned air is bypassed and re-circulated through the heat pump air handler, there is the possibility of the conditioned air becoming too cold or too hot. In a Heat Pump application, auxiliary heat must also be controlled. To keep this from becoming a problem, the temperature coming off the indoor coil is monitored and controlled with the **Electronic Limit Control (ELC)** and a sensor (provided with both ***SmartZone2™*** and ***SmartZone4™***) placed in the supply air stream. The **ELC** is integrated on the ***SmartZone™*** board. The **ELC** reads a supply air temperature sensor that connects to the ***SmartZone™*** board after being mounted in the air handler. LOCATE THIS SENSOR AFTER THE INDOOR COIL, BUT BEFORE THE BLOWER. Make sure the sensor is in the air stream and secured properly. This location is required so that the **ELC** can operate the auxiliary heat in the heating mode. The temperature read by the **ELC** is displayed on the ***SmartZone™*** Board during normal operation. The **ELC** has adjustable, technician-established temperature setpoints. These setpoints relate to the lowest temperature (for cooling) and the highest temperature (for heating) allowed in the air handler by the **ELC** so as not to cause HVAC system damage. Two buttons on the ***SmartZone™*** board allow the technician to easily check and change the heating and cooling cut out setpoints. If the temperature sensor goes beyond the designated setpoints the system will automatically open the Y1 circuit for three minutes. During the three minutes however, the indoor blower is still energized and conditioned air is still being applied in the calling zone(s). When the three minute delay period is over, the cooling or heating equipment is restarted. See below for default settings and operation in Auxiliary Heat.

COOLING – On a call for cooling from any zone, the heat pump will start. After a three minute minimum run time, the default cooling cut out temperature is 48°F.

HEATING – On a call for heating from any zone, the heat pump will start. The default heating cut out temperature is 120°F.

AUXILIARY HEAT – After six minutes of continuous heating in the heat pump mode, if the supply air sensor is less than 90°F, the **ELC** will energize auxiliary heat (W1 EH on the equipment terminal block). The auxiliary heat will be de-energized when the supply air temperature sensor rises above 100°F. There is no other means of energizing auxiliary heat. Thermostats can not energize auxiliary heat.

ELC and Two-Stage Heat Pump

When conditioned air is bypassed and re-circulated through the heat pump air handler, there is the possibility of the conditioned air becoming too cold or too hot. In a Heat Pump application, auxiliary heat must also be controlled. To keep this from becoming a problem, the temperature inside the plenum is monitored and controlled with the **Electronic Limit Control (ELC)** and a sensor (provided with both ***SmartZone2™*** and ***SmartZone4™***) is placed in the supply air stream. The **ELC** is integrated on the ***SmartZone™*** board. The **ELC** reads a supply air temperature sensor that connects to the ***SmartZone™*** board after being mounted in the air handler. Locate this sensor after the evaporator coil, but before the blower. Make sure the sensor is in the air stream and secured properly. This location is required so that the **ELC** can operate the auxiliary heat in the heating mode. The temperature read by the **ELC** is displayed on the ***SmartZone™*** Board during normal operation. The **ELC** has adjustable, technician-established temperature setpoints. These setpoints relate to the lowest temperature (for cooling) and the highest temperature (for heating) allowed in the air handler by the **ELC** so as not to cause HVAC system damage. See below for operation in each mode.

COOLING – On a call for cooling from any zone, the heat pump will start in first stage. AFTER THE INITIAL **EIGHT MINUTES** OF CONTINUOUS RUN TIME IN **FIRST STAGE COOLING**, if the supply air temperature is more than 10°F higher than the cooling cut out setpoint, second stage will be energized *(*see *Figure 3)*. Once Y2 is energized, it will remain energized for no less than three minutes. After a three-minute minimum run time, if the supply air temperature is less than 4°F above the cooling cut out setpoint, the system will de-energize Y2 (see *Figure 3*). This will allow first stage to continue. The **ELC** will constantly monitor the supply air temperature, energize and de-energize second stage when necessary during the call.

HEATING – On a call for heating from any zone, the heat pump will start in first stage. AFTER THE INITIAL **FOUR MINUTES** OF CONTINUOUS RUN TIME IN **FIRST STAGE HEATING**, if the supply air temperature is more than 15°F lower than the heating cut out setpoint, second stage (Y2) will be energized. Once Y2 is energized, it will remain energized for no less than three minutes. After a three-

minute minimum run time, if the supply air temperature is less than 5°F below the heating cut out setpoint, the system will de-energize Y2 (see *Figure 3*). This will allow first stage to continue. The **ELC** will constantly monitor the supply air temperature, energize and de-energize second stage when necessary during the call.

AUXILIARY HEAT – AFTER **SIX MINUTES** OF CONTINUOUS RUN TIME **IN HEATING**, if the supply air temperature is less than 90°F, auxiliary heat (W1 EH terminal on the equipment terminal block) will be energized. The auxiliary heat terminal will stay energized until the supply air temperature sensor rises above 100°F (see *Figure 3*). This setting is not adjustable.

ELC Staging Temperature Chart (Heat Pump)	
120°F	***Heating Cut-Out Setpoint***
115°F	Second Stage Heating Cut-Out Setpoint
105°F	Second Stage Heating Cut-In Setpoint
100°F	Auxiliary Heat Cut-Out
90°F	Auxiliary Heat Cut-In
58°F	Second Stage Cooling Cut-In Setpoint
52°F	Second Stage Cooling Cut-Out Setpoint
48°F	***Cooling Cut Out Setpoint***

Table 3: Typical **ELC** setpoint temperatures for two stage heat pump equipment. When using the pushbuttons to set the Cooling Cut-Out and Heating Cut-Out Setpoints the two parameters in the table in ***red*** ***and*** ***blue*** *(top and bottom of the table)* are being set and the rest are automatically adjusted within the controller. The Auxiliary Heat Cut-In and Cut-Out Setpoints are not adjustable. The values shown are the suggested defaults.

NOTE: If the Temperature Sensor becomes disconnected from *SmartZone*™, all zones will open and zoning will be inoperable. The number one thermostat will be the only thermostat that can make a recognized call and second stage will be inoperable. Once the Temperature Sensor is reconnected, the *SmartZone*™ board will resume operating all zones normally.

ELC and Two-Stage Heat Pump with Fossil Fuel Backup (Dual Fuel)

When conditioned air is bypassed and re-circulated through the heat pump, there is the possibility of the conditioned air becoming too cold or too hot. In a Heat Pump application, auxiliary heat must also be controlled. To keep this from becoming a problem, the temperature inside the plenum is monitored and controlled with the **Electronic Limit Control (ELC)** and a sensor (provided with both ***SmartZone2™*** and ***SmartZone4™***) is placed in the supply air plenum. Make sure the sensor is in the air stream and secured properly. The temperature read by the **ELC** is displayed on the ***SmartZone™*** board during normal operation. The **ELC** has adjustable, technician-established temperature setpoints. These setpoints relate to the lowest temperature (for cooling) and the highest temperature (for heating) allowed in the supply plenum by the **ELC** so as not to cause HVAC system damage. See below for operation in each mode.

COOLING – On a call for cooling from any zone, the heat pump will start in first stage. AFTER THE INITIAL **EIGHT MINUTES** OF CONTINUOUS RUN TIME IN **FIRST STAGE COOLING**, if the supply air temperature is more than 10°F higher than the cooling cut out setpoint, second stage will be energized *(see Figure 3)*. Once Y2 is energized, it will remain energized for no less than three minutes. After a three-minute minimum run time, if the supply air temperature is less than 4°F above the cooling cut out setpoint, the system will de-energize Y2 (see *Figure 3*). This will allow first stage to continue. The **ELC** will constantly monitor the supply air temperature, energize and de-energize second stage when necessary during the call.

HEATING – On a call for heating from any zone, the heat pump will start in first stage. AFTER THE INITIAL **FOUR MINUTES** OF CONTINUOUS RUN TIME IN **FIRST STAGE HEATING**, if the supply air temperature is more than 15°F lower than the heating cut out setpoint, second stage (Y2) will be energized. Once Y2 is energized, it will remain energized for no less than three minutes. After a three-minute minimum run time, if the supply air temperature is less than 5°F below the heating cut out setpoint, the system will de-energize Y2 (see *Figure 3*). This will allow first stage to continue. The **ELC** will constantly monitor the supply air temperature, energize and de-energize second stage when necessary during the call.

AUXILIARY HEAT – After 6 minutes of initial run time, if the supply air temp drops below 90 degrees, W1/EH will be energized. This will remove Y1 and Y2 and energize W1/EH. W1/EH will initiate start up of the fossil fuel furnace. Only the W1/EH and G will remain energized for the remainder of the heating cycle.

EMERGENCY HEAT - Can only be initiated thru a heat pump stat in the # 1 position. If this stat is placed in Emer Heat and a call for Emer Heat is made, the ***SmartZone™*** board is latched into emergency heat. No compressor will run and only heating calls will be recognized. Only the W1/EH and G will remain energized for the remainder of the heating cycle. Remove the Emer Heat call at stat #1 and make a call for something other than Emer Heat from stat #1 in order to unlatch the board and take it out of emergency heat.

Note: Use the Wireless Outdoor Temperature Transmitter (Part #TOS) with TSD-1 thermostat to control emergency heat mode using outdoor temperature through the heat pump stat in the #1 position.

CHANGEOVER or PURGE Mode

SmartZone2™ and ***SmartZone4™*** are automatic changeover controllers capable of receiving cooling calls and heating calls simultaneously even though cooling and heating cannot occur in the same duct at the same time. During a call from one mode, if an opposing call is received, a timer is started. This timer allows the current mode to continue running for either 10 or 15 minutes, depending on the OPPOSING CALL DIP Switch (#3) setting. Once the current call is satisfied or the time has elapsed allowing the system to switch to the opposing call, the equipment is deenergized and the system will go into a three-minute **CHANGEOVER or PURGE Mode**. During this time, no heating or cooling equipment is allowed to energize, however, the G terminal operating the FAN will be energized and the word **PURGE** is illuminated on the display. During a changeover, the indoor blower will be allowed to blow tempered air into the zone(s) calling for the previous mode. Also, any zones that are not calling for the opposite mode will be opened to allow hot or cold air from the previous mode to be dissipated into the unobjectionable space. (EXAMPLE: If Zone 3 has a call for COOLING and the previous mode of the equipment was HEATING, Zone 3 will stay closed and all other zones will open during CHANGEOVER or PURGE Mode.) After the changeover is complete, if there is still an opposing call, the equipment will be energized in the opposite mode and the zone dampers for the calling zones will be opened. This process of changeover will continue to repeat until all zones are satisfied with their correct mode.

Time-Delay Mode

Time-Delay is a three minute period occurring after all zones are satisfied. This differs from Purge Mode because, in the Time-Delay Mode, the indoor blower is NOT energized through SmartZone and may or may not continue to blow. Whether the fan continues to blow is contingent on the indoor blower fan control set-up. All zoned dampers will open during Time-Delay Mode, therefore, allowing any air that is operated through the fan control on the equipment to be dissipated into all zones.
NOTE: There is NO indication of Time Delay during Time-Delay Mode, on the SmartZone board.

Fresh Air Control

The Fresh Air Control system incorporated with the SmartZone™ controller allows the user to introduce fresh air by controlling a power-open/spring-close damper (FA Damper). Press both the up and down buttons simultaneously and release quickly to activate the set up for the Fresh Air Control (See Item number 1A on Page 4 of this document for setup instructions). Set the number of minutes that are required to maintain fresh air in the building. The Fresh Air Control will open the FA Damper during any fan run time (except Purge Mode)

and accumulate the number of minutes of fresh air activation. Once the number of minutes required for one hour has been reached, the Fresh Air Output will be turned off. With no power being applied to a fresh air damper (use part # FAD06 or FAD08 fresh air damper), the damper will spring closed. If at the end of an hour the fresh air time requirement hasn't been met because of too-short fan run time, the Fresh Air Control will energize G and open the FA Damper to fulfill the remaining number or minutes per hour of fresh air into the space.

Fresh-Air NOTE 1*: If no FA Damper is required or connected, set the Fresh Air Control on "0", otherwise the fan could be operating to support fresh air unnecessarily.*
Fresh Air NOTE 2*: The 24 volt output from the SmartZone™ controller can control any device that can be controlled using a pilot duty relay (such as an energy recovery ventilator).*

DIP Switches

DIP #1	**HP NORMAL**	Operates heat pump using electric auxiliary or emergency heat. (Factory Default)
	DUAL FUEL	Operates heat pump using a fossil furnace as auxiliary and emergency heat.
DIP #2	**ALL**	Allows any thermostat to change equipment mode. (Factory Default)
	Z1 PRIORITY	Allows ZONE 1 to control equipment mode unless satisfied.
DIP #3	**15 MIN**	15 Minute delay between opposing calls. (Factory Default)
	10 OP CALL	10 Minute delay between opposing calls.
DIP #4	**2nd STAGE**	Normal Operation – 2nd Stage is always active. (Factory Default)
	LOCK OUT	Will not Allow 2nd Stage if only one ZONE is calling.
DIP #5	**REV VLV O**	Reversing valve is energized in COOLING. (Factory Default)
	B	Reversing valve is energized in HEATING.
DIP #6	**SYS G/E**	Gas/Electric or Electric/Electric Equipment. (Factory Default)
	HEAT PUMP	Heat Pump Equipment ONLY.

Table 4: Dip Switch Settings

Jumper for Two Transformers

The ***SmartZone™*** has a jumper that allows the use of a two-transformer heating and cooling system. When using electric cooling with forced air heating that is controlled using the same transformer, the jumper will be connected *(Factory Default)*. This allows a single transformer to power both the Rc (24 VAC power for cooling) and the Rh (24 VAC power for heating) circuits. When using an independent transformer for a heating system that is separate from the transformer used for the indoor blower, such as radiant floor heat, radiant baseboard heat or a fan powered box the jumper must be disconnected so the transformers are not connected to the same terminal at the same time.