IMPORTANT PRESENTATION CHANGES THAT MUST BE DONE

1. Change class name for day 1 and day 2
    A. Change the Opening Slide AND the slide just prior to the content starting
2. Update Instructor and co-host name
3. Change instructor and co-host pictures
    A. Pictures can be found in OneDrive>Training Folder>CAM Profile Pics

Once you reach the NEW for Fall 2022 slide 

you will need to do a "stop share" in Zoom and navigate (have it open prior to starting the class) to the www.cesctechsupport.com site and do a show and tell.
Make sure to cover the following:

- My Account Page (also known as dashboard)
- Edit Profile (can add NATE number)
- Training Schedule>Dealer Training>Order Training Coupons
- Troubleshooting videos (pick a couple and actually go into them to show ease of use)
- Self Study Courses (Explain)
- Dealer Resources>TICS and Bulletins
- Dealer Resources>Field Reporting Forms (show and tell one for an example)

Training Will Begin at 8:00am

2023
Carrier/Bryant Zoning

Instructor
NAME

Carrier Enterprise South Central Technical Support
Carrier, Bryant and Payne Technical Training and Support

Technical Support & Training Website

cesctechsupport.com

Tablet View

Desktop View

Mobile View

Technical Support & Training Website

cesctechsupport.com

- Dealer training calendar
- Training registration
- Self-Study Courses (4 Infinity qualifying)
- Manager role (Register your techs for training)
- See your scheduled training
- See all training orders
- See all your submitted forms
- 60+ troubleshooting, service & installation videos
- Troubleshooting guides
- Numerous service manuals available
- VFR checklist and manuals
- RTU replacement quote form (Inside sales)
- 8 Field reporting & troubleshooting forms
- TIC's and Bulletins (back to 2019)
- Serial number decoder
- Technician mentoring request form

and much more being added daily…

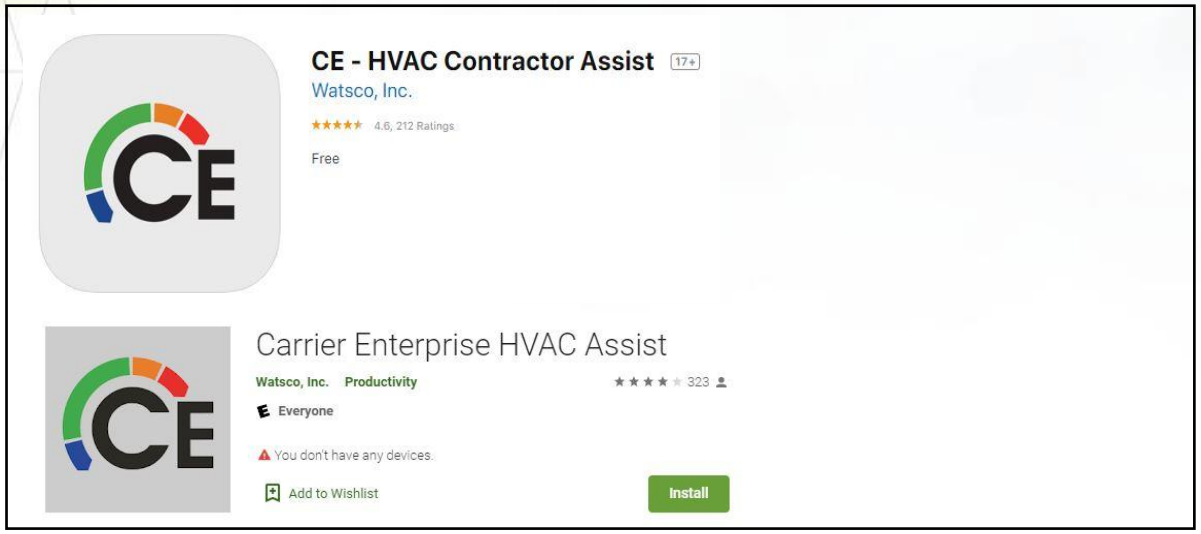
Let's look at the new website. If you have any questions, please ask.

VERY IMPORTANT – IF YOU DO NOT HAVE A LOGIN FOR CESCTECHSUPPORT.COM, PLEASE SCAN THE QR CODE TO GET REGISTERED

If you just registered or do not see this class within your "Purchased Zoom Meetings" please scan the below QR Code and add/enroll in the course

Carrier/Bryant Zoning Course Page Link

Helpful Mobile Apps



Carrier Service Tech App

Bryant Service Tech App

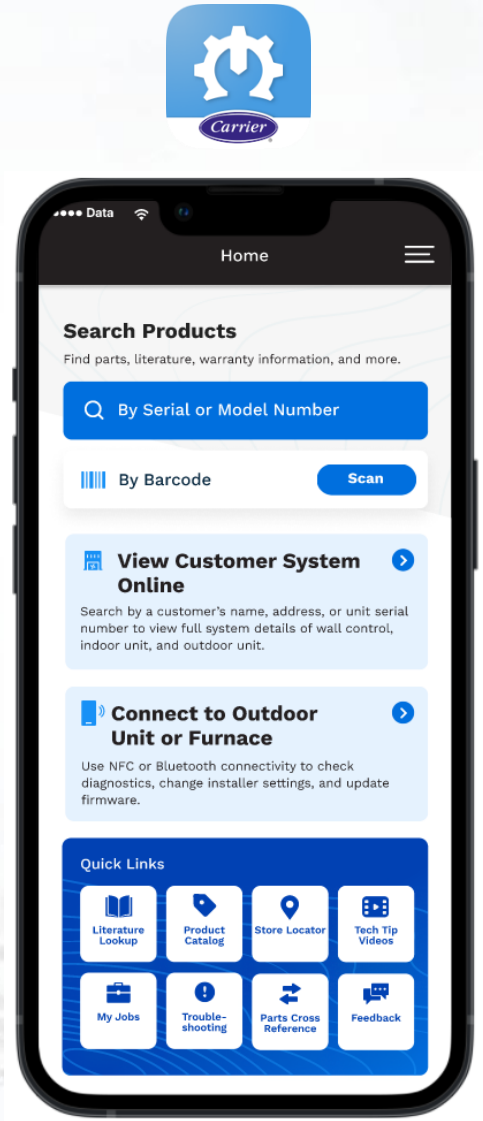
Available on the App Store

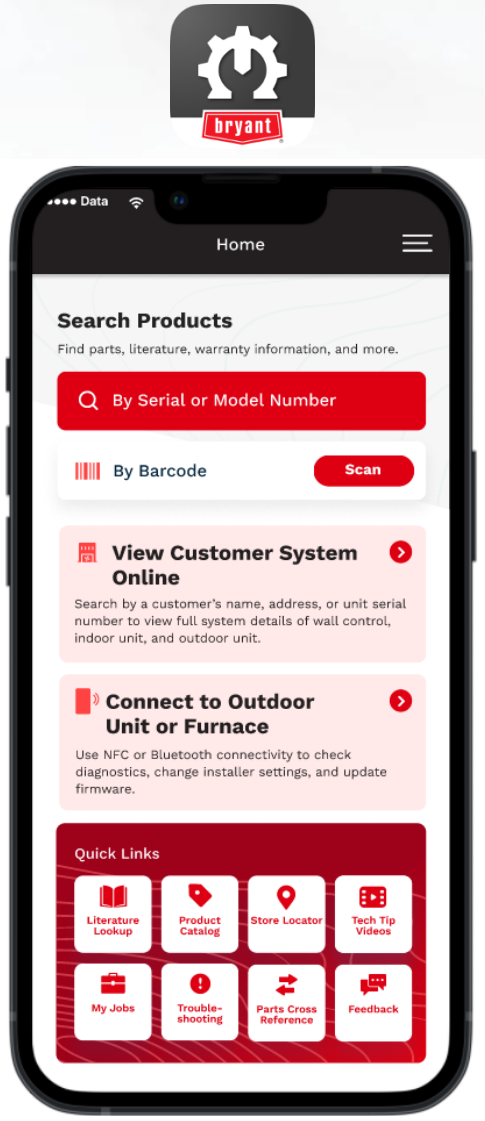
ANDROID APP ON Google play

Available on all Apple® & Android® Phone and Tablet Devices

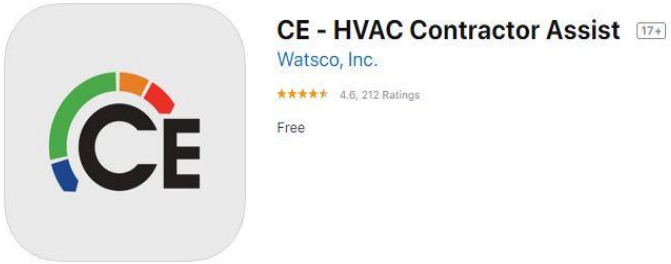
Carrier/Bryant Service Technician Apps – One Page Summary

- ***NEW!*** **User Interface & Quick Links**
- ***NEW!*** **Customer System Online** search customer's equipment profiles
- ***NEW!*** **Near Field Communication (NFC) with select furnaces**
- ***NEW!*** **InteliSense Mid-Tier Equipment**
- ***NEW!*** **Remote Diagnostics (Test Equipment) –** (Mid-Tier InteliSense)
- **Barcode scanning** of unit's serial or model number
- **Warranty** entitlement & service history
- **Literature** list for models and ability to search all available literature
- **Product Catalog** model lookup
- **Bill of Material** parts list including part supersession
- **Bluetooth Connectivity** to pair to select outdoor equipment
- **Aftermarket components** cross reference tool
- **Tech Tips videos** for installation guides, interactive troubleshooting help

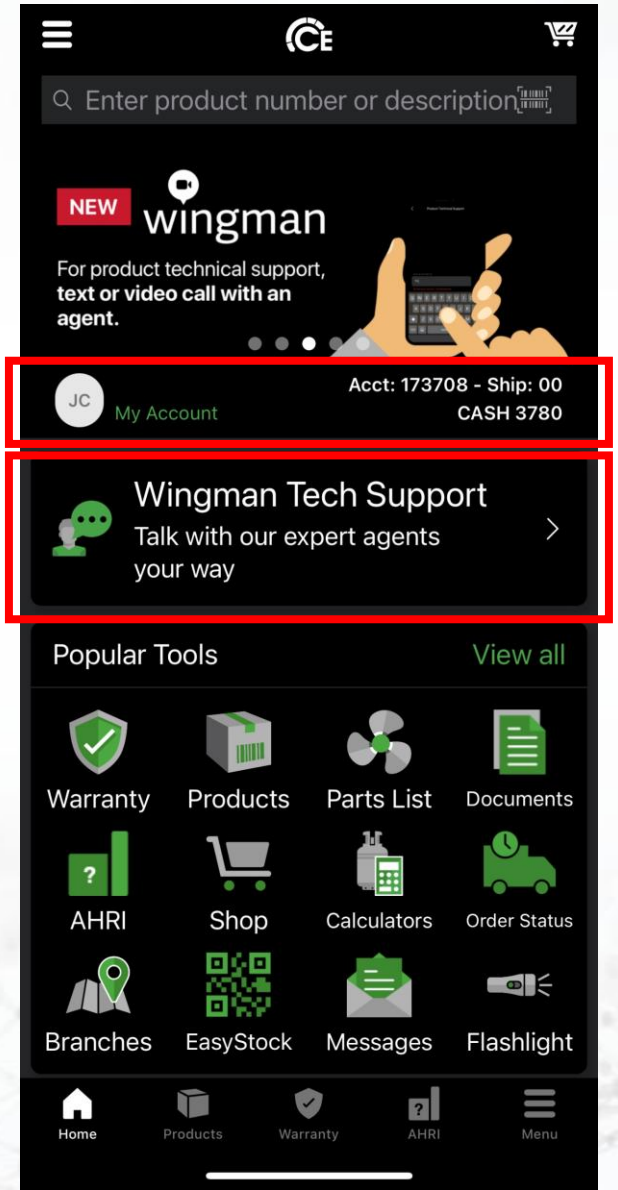




Wingman Tech Support Assistance



You will need the CE app installed on your phone or tablet and you must be logged into your account. (If you have questions on how to get a login, please contact your salesman for assistance)

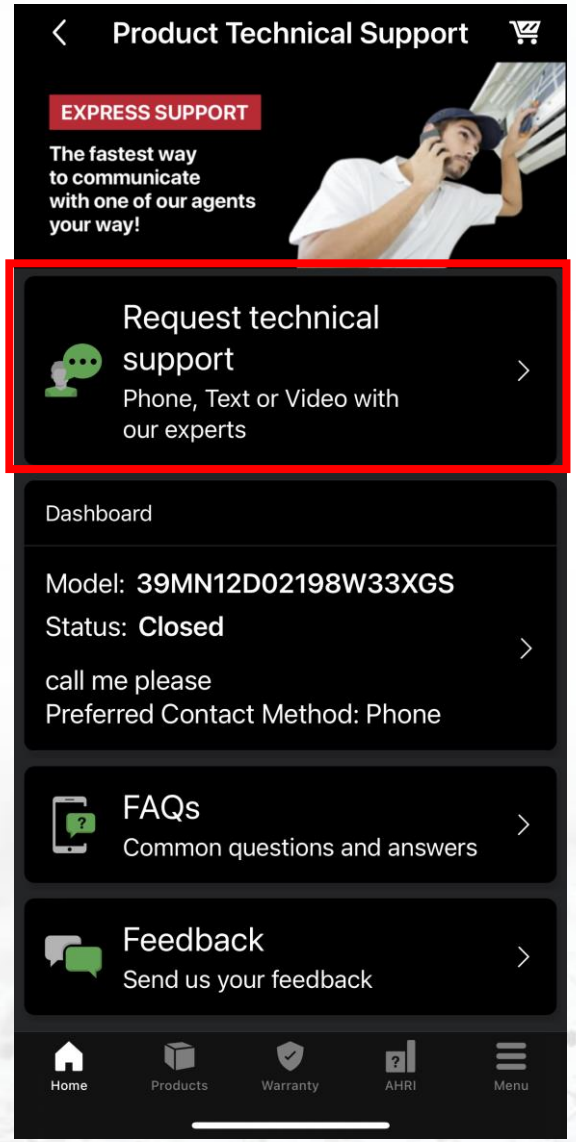


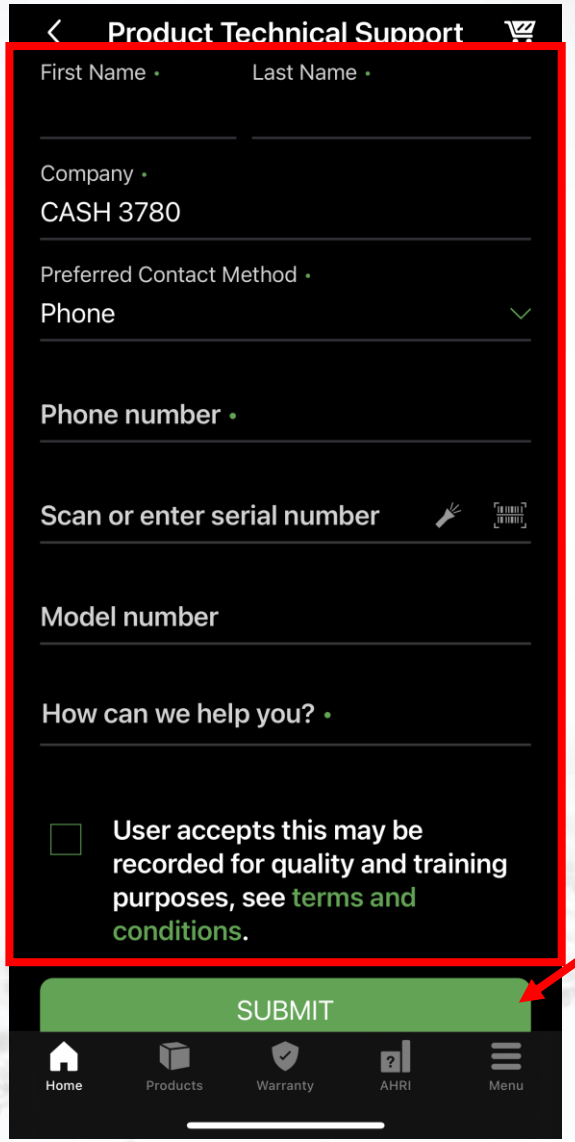
Available on the App Store

ANDROID APP ON Google play

Available on all Apple® & Android® Phone and Tablet Devices

Wingman Tech Support Assistance





LIVE TRAINING TEST

A passing grade of 75 is required in order to receive credit for the class.

If you fail to pass the test the first time you may re-take the test again but if you do not pass the test the second time you will be required to retake the course.

ALL QUIZZES & TEST MUST BE COMPLETED BY MIDNIGHT OF THE SAME DAY AS THE CLASS/COURSE – NO EXCEPTIONS

HOW TO ACCESS THE QUIZ/TEST

- Click “My Account”
- Find “Your Courses”
- Select the appropriate course
- Scroll to “Course Content”
- Click into “Quiz” or “Test”
- Find “Lesson Content”
- Click into “Quiz” or “Test”
- Click 

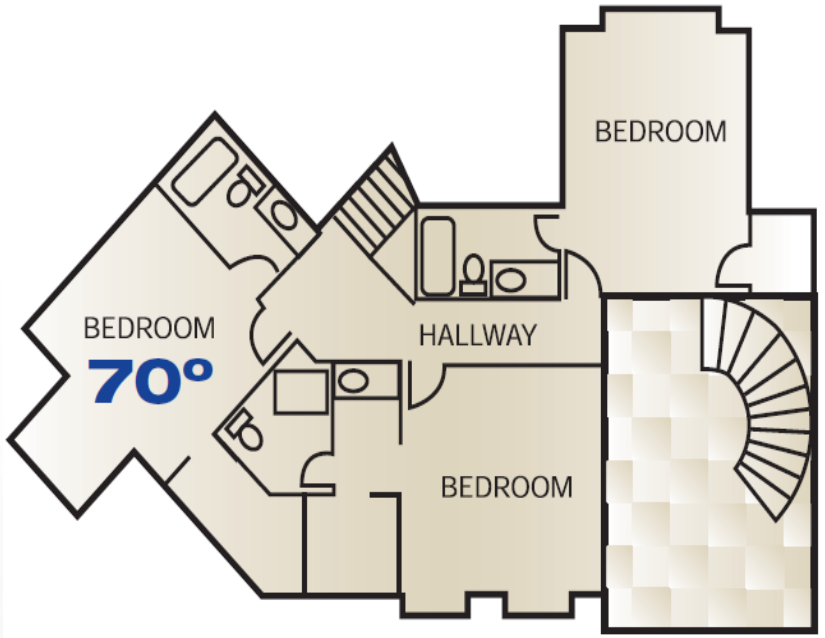
- Answer all questions and submit

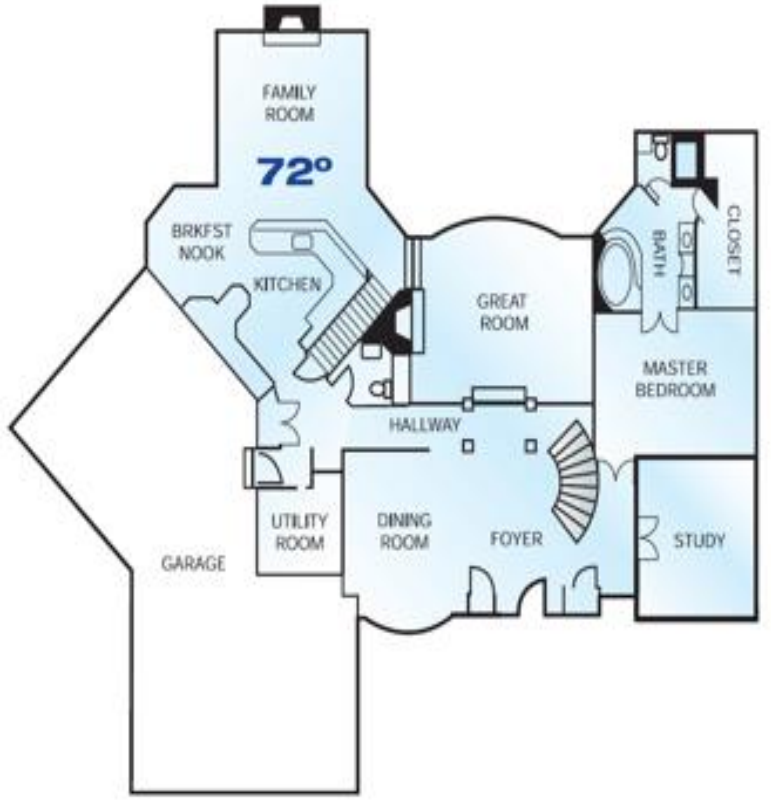
ALL QUIZZES & TEST MUST BE COMPLETED BY MIDNIGHT OF THE SAME DAY AS THE CLASS/COURSE NO EXCEPTIONS

Rest Room Breaks

Go When You Gotta Go! Just Hurry Back.
Cause We Ain't Waitin!

Carrier & Bryant
Zoning Systems Day 1





MODULES

PRODUCT INFORMATION

COMPONENTS

Comfort™ & Legacy™ Series Three-Zone System

Carrier's Comfort Series Three-Zone system provides the ability to control temperature and humidity in up to three zones in a residential or light commercial application. A system will consist of the components below, each sold separately.

- Separate transformer is not needed to provide power
- Designed so wires can enter from behind, above, or below
- Independent temperature settings for each zone controlled by a 24v or a Wi-Fi thermostat and up to five dampers per zone
- Each system controller also includes a duct temperature sensor
- Diagnostic LEDs and intelligent system diagnostics inform homeowners if there is a problem with their system and allows for easy troubleshooting
- Allows four equipment cycles per hour providing maximum equipment protection
- Ten-year parts limited warranty upon timely registration*

COMFORT SERIES THREE-ZONE CONTROL PANEL

ZONECC3ZAC01 (1 Heat / 1 Cool)
or ZONECC3ZHP01 (3 Heat / 2 Cool)
ZONEBB3ZAC01 (1 Heat / 1 Cool)
or ZONEBB3ZHP01 (3 Heat / 2 Cool)

3---ZONE CONTROL ACCESSORIES	
PART NUMBER	DESCRIPTION
ZONEXXODTS01	Duct Temperature Sensor*

* Duct temperature sensor required for heat pump zone board.

Comfort™ & Legacy™ Series Three-Zone System

Carrier's Comfort Series Three-Zone system provides the ability to control temperature and humidity in up to three zones in a residential or light commercial application. A system will consist of the components below, each sold separately.

- 2 Separate Controllers (AC and HP)
- Still Uses conventional TSTATS
- Same Dampers as Other Carrier or Bryant Zone Systems
- Rc Rh Compatible for Dual Heat Markets
- Installer checkout routines
- Modulating damper control in emergency situations
- Damper fuse protection
- High-- and low--temperature limits

COMFORT SERIES THREE-ZONE CONTROL PANEL

ZONECC3ZAC01 (1 Heat / 1 Cool)
or ZONECC3ZHP01 (3 Heat / 2 Cool)
ZONEBB3ZAC01 (1 Heat / 1 Cool)
or ZONEBB3ZHP01 (3 Heat / 2 Cool)

3---ZONE CONTROL ACCESSORIES	
PART NUMBER	DESCRIPTION
ZONEXXODTS01	Duct Temperature Sensor*

* Duct temperature sensor required for heat pump zone board.

Comfort™ & Legacy™ Series Three-Zone System

Carrier's Comfort Series Three-Zone system provides the ability to control temperature and humidity in up to three zones in a residential or light commercial application. A system will consist of the components below, each sold separately.

- Time Guard override
- Compressor protection
- Auto changeover
- Bypass setup routine
- Staging time for energy savings
- Automatic checkout with installer mode
- Override zoning switch
- Timer override for serviceability

COMFORT SERIES THREE-ZONE CONTROL PANEL

ZONECC3ZAC01 (1 Heat / 1 Cool)
or ZONECC3ZHP01 (3 Heat / 2 Cool)
ZONEBB3ZAC01 (1 Heat / 1 Cool)
or ZONEBB3ZHP01 (3 Heat / 2 Cool)

3---ZONE CONTROL ACCESSORIES	
PART NUMBER	DESCRIPTION
ZONEXXODTS01	Duct Temperature Sensor*

* Duct temperature sensor required for heat pump zone board.

Comfort™ & Legacy™ Series Three-Zone System

A system will consist of the following components, each sold separately.

- Advanced energy savings algorithms
- Remote access using your Apple® or Android™ device
- Compatible with your smart home and works seamlessly with Apple HomeKit, and Amazon Alexa.
- Comes with an Outdoor Air Temperature (OAT) sensor and humidity display
- Five-year parts limited warranty

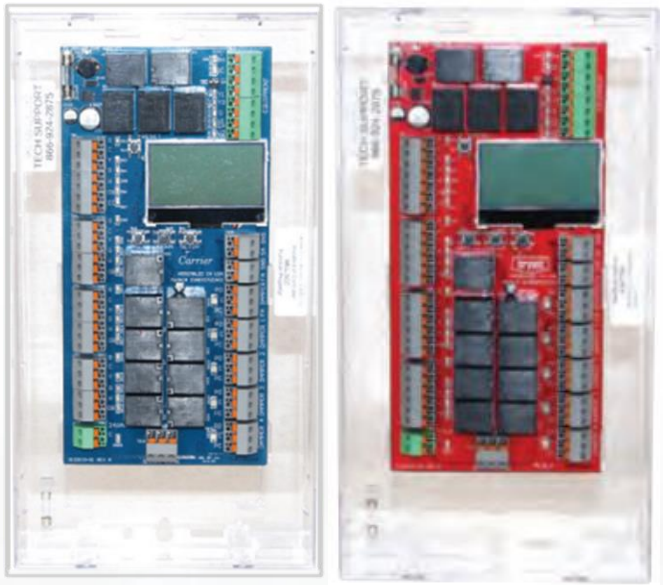
ecobee, POWERED BY CARRIER or BRYANTWI-FI® THERMOSTATS
EB-STATE5CR-01 or EB-STATE3LTCR-01
EB-STATE5BR-01 or EB-STATE3LTBR-01

DAMPERS (8-IN. OR 24-IN.)
DAMPREC, DAMPSL, DAMPRND

- Up to five dampers may be used in each zone by electrically connecting them in parallel
- By-pass damper available to prevent static pressure buildup and noise control
- They can be mixed in different combinations. Round + Slip-In + Rectangular
- Ten-year parts limited warranty upon timely registration*

Performance™ & Preferred™ Series Four-Zone System

Our Performance & Preferred Series Four-Zone system provides the ability to control temperature and humidity in up to four zones in a residential or light commercial application.

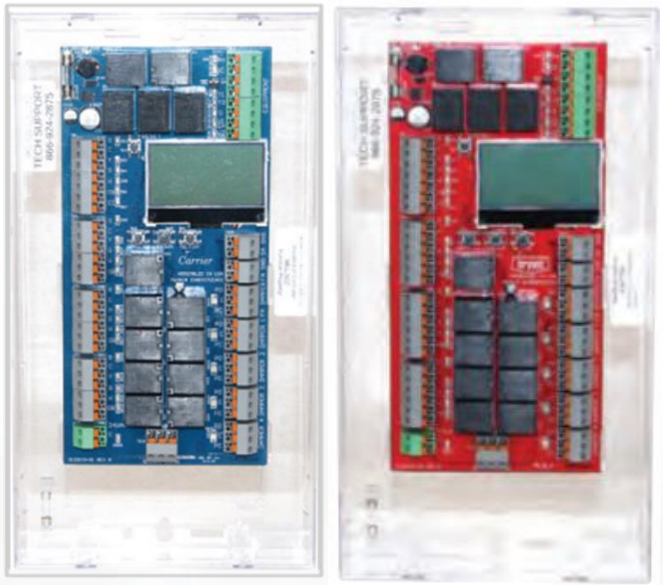


PERFORMANCE & PREFERRED
SERIES FOUR-ZONE CONTROL PANEL
ZONECC4ZCN01
ZONEBB4ZCN01

- Innovative enclosure design with multiple wiring and mounting options
- Controller guides you through simple step-by-step system setup; no dip switches
- Easy-to-read backlit LCD display indicating full system status
- Independent temperature settings for each zone controlled by a 24v or a Wi-Fi® thermostat and up to five dampers per zone
- Exclusive Electronic Limit Control™ (ELC) technology protects the system's compressor and heat exchanger from potential issues associated with freeze-up and over-heating
- Color-coded LED indicators for each thermostat provide easy troubleshooting
- Five-year parts limited warranty upon timely registration**

Performance™ & Preferred™ Series Four-Zone System

Our Performance & Preferred Series Four-Zone system provides the ability to control temperature and humidity in up to four zones in a residential or light commercial application.



PERFORMANCE & PREFERRED
SERIES FOUR-ZONE CONTROL PANEL
ZONECC4ZCN01
ZONEBB4ZCN01

Ease of Operation

- Mix and match standard gas/electric and heat pump thermostats
- Staging based on supply air temperature
- Automatic changeover for maximum comfort
- Microprocessor manages all complex decisions
- Adjustable staging time and temperature for maximum comfort

Configuration

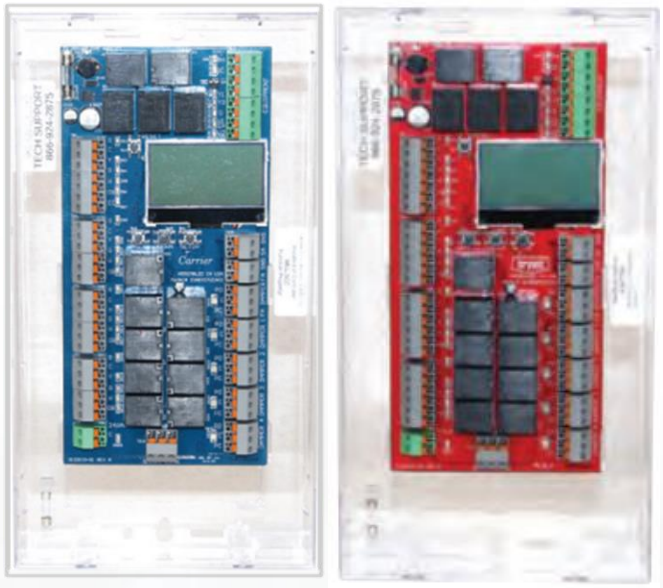
- Simple step-by-step system setup
- Controller guides you through each step
- Easy-to-read backlit LCD display
- No dip switches – no confusion or guessing

Easy Troubleshooting

- Display indicates full system status
- Color-coded LED indicators for each thermostat
- Call and Equipment Call
- Two-color LED indicators show damper position
- Red LED indicates blown fuse

Performance™ & Preferred™ Series Four-Zone System

Our Performance & Preferred Series Four-Zone system provides the ability to control temperature and humidity in up to four zones in a residential or light commercial application.



PERFORMANCE & PREFERRED
SERIES FOUR-ZONE CONTROL PANEL
ZONECC4ZCN01
ZONEBB4ZCN01

Customer Features

- Customer never needs to use the control panel
- Selectable zone-1 priority for more customer control
- Enable Emergency Heat from zone-1 thermostat
- Constant supply air monitoring from ELC ensures customer safety
- Zone specific ventilation – energize fan from any thermostat

Compatibility

- 24V thermostat
- Single-stage thermostats

Ease of Installation

- Mounts with two screws
- Quick-connect screw-less terminals
- Innovative enclosure design with multiple wiring and mounting options

Performance™ & Preferred™ Series Four-Zone System

Our Performance & Preferred Series Four-Zone system will consist of the following components, each sold separately.

- Advanced energy savings algorithms
- Remote access using your Apple® or Android™ device
- Compatible with your smart home and works seamlessly with Apple HomeKit, and Amazon Alexa.
- Comes with an Outdoor Air Temperature (OAT) sensor and humidity display
- Five-year parts limited warranty

ecobee, POWERED BY CARRIER or BRYANTWI-FI® THERMOSTATS
EB-STATE5CR-01 or EB-STATE3LTCR-01
EB-STATE5BR-01 or EB-STATE3LTBR-01

DAMPERS (8-IN. OR 24-IN.)
DAMPREC, DAMPSL, DAMPRND

- Up to five dampers may be used in each zone by electrically connecting them in parallel
- By-pass damper available to prevent static pressure buildup and noise control
- They can be mixed in different combinations. Round + Slip-In + Rectangular
- Ten-year parts limited warranty upon timely registration*

Infinity® & Evolution® Zoning Systems

The Infinity & Evolution zoning systems provides the ability to control temperature and humidity in up to eight zones in a residential or light commercial application. Separate control of multiple zones provides both maximum efficiency and indoor comfort..

- Full-color touch screen
- The brain of the Infinity & Evolution zoning system
- Default temperature and humidity sensor for Zone 1
- Allows user to operate, program, setup, monitor, and troubleshoot the system
- Manages each zone's airflow and adjusts for quiet comfort
- Ten-year parts limited warranty upon timely registration*

INFINITY® EVOLUTION® SYSTEM CONTROL
SYSTXCCITC01-B
SYSTXBBITC01-B

INFINITY® EVOLUTION® SYSTEM CONTROL
SYSTXCCWIC01-B
SYSTXBBWEC01-B

INFINITY® EVOLUTION ® SYSTEM CONTROL
SYSTXCCITC01-C
SYSTXBBITC01-C

Infinity® & Evolution® Zoning Systems

The Infinity & Evolution zoning systems provides the ability to control temperature and humidity in up to eight zones in a residential or light commercial application. Separate control of multiple zones provides both maximum efficiency and indoor comfort..

- Works with Variable Speed Systems
- 4 or 8 zone configurations (with additional zone board)
- No LAT and HPT Sensors Required
- No Bypass Damper Required or Allowed
- Increased Humidity Control
- Easiest to Use and Most Comprehensive Controller in the Business

INFINITY® EVOLUTION®
SYSTEM CONTROL
SYSTXCCITC01-B
SYSTXBBITC01-B

INFINITY® EVOLUTION®
SYSTEM CONTROL
SYSTXCCWIC01-B
SYSTXBBWEC01-B

INFINITY® EVOLUTION ®
SYSTEM CONTROL
SYSTXCCITC01-C
SYSTXBBITC01-C

Infinity® & Evolution® Zoning Components

Separate control of multiple zones provides both maximum efficiency and indoor comfort.
A system will consist of some or all of the components below.

SMART ZONING SENSORS
SYSTXZNSMS01

- Full glass touch screen with 2.8” color display
- Small size (3.5” x 2.5” x 0.85”) provides intuitive user experience
- Temperature accuracy - displays outdoor temperature and indoor humidity
- Change temperature or fan speed from the zone
- Ten-year parts limited warranty upon timely registration*

***You choose the Brand of the Sensor when you power it up!*

REMOTE ROOM SENSORS
SYSTXCCRRS01
SYSTXBBRRS01

- Provides the temperature reading to the Infinity system control in remote locations
- Two wire sensors that are wired back to the Infinity damper control module
- Recommend running four wires for future smart sensor installation
- Ten-year parts limited warranty upon timely registration*

Infinity® & Evolution® Zoning Components

Separate control of multiple zones provides both maximum efficiency and indoor comfort.
A system will consist of the components below.

INFINITY® & EVOLUTION®
DAMPER CONTROL MODULE
SYSTXCC4ZC01 SYSTXBB4ZC01

- Receives signals from the Infinity system control and turns on equipment
- Modulates the necessary dampers to maintain space temperature
- Major components are connected directly to the damper control module
- One damper control module serves up to four zones
- Cycles one zone at a time minimizing load on the system transformer
- Ten-year parts limited warranty upon timely registration*

DAMPERS (8-IN. OR 24-IN.)
DAMPREC, DAMPSL, DAMPRND

- Modulating dampers in round, rectangular or slip-in sizes
- Powered open and powered closed using a 24 VAC three wire connection
- Non-spring return with specific drive timing to track position
- Designed to draw less current allowing up to five dampers to a single zone
- They can be mixed in different combinations. Round + Slip-In + Rectangular
- Ten-year parts limited warranty upon timely registration*

Zoning System Sensors

ZONEXX0DTS01

LAT & HPT SENSOR

TSTATXXSEN01

OAT SENSOR
(connected to thermostat terminals)

Zoning Dampers & Accessories

DAMPERS		
DESCRIPTION	SIZES	PART NUMBER
Round Dampers	8 in.	DAMPRND08INC---B
Rectangular Dampers	8 in. X 10 in.	DAMPREC08X10---B
Rectangular Barometric Bypass	8 in. X 14 in.	DAMPBAR08X14
Round Barometric Bypass	10 in.	DAMPBAR10INC
Slip---In Dampers	Side mount, 8 X 10	DAMPSLS08X10---B
	Bottom mount, 8 X 10	DAMPSLB08X10---B

Description		Part No.
Actuators	45° Actuator for round dampers	DAMPACT45DEG---R
	90° Actuator for rectangular dampers	DAMPACT90DEG---R
	Damper Actuator Cover	DAMPACTXXCOV

NOTE: The above dampers are recommended because they use the latest style actuators designed for zoning systems. These actuators are direct--drive and use slightly less power to operate. If using older style dampers with this zoning system (i.e., dampers with a crankarm), it is recommended to upgrade the actuator to DAMPACT45DEG or DAMPACT90DEG.

Check Out This Side-by-side Comparison Of Our Zoning Systems

	INFINITY® SYSTEM	Performance® SERIES	Comfort® SERIES
	Infinity Zoning System	Performance Series Four-Zone	Comfort Series Three-Zone
	Comfort Management Features		
Number of Zones Supported	Up to 8	Up to 8	Up to 3
Customized Comfort Schedules	✔	✔	✔
Humidity Control	✔	✔**	✔**
Maximum Energy Efficiency	Fully utilizes your Infinity system's variable-speed technology and Hybrid Heat system management	Smart Recovery (Using current weather conditions and scheduled temperature settings, the ecobee thermostats learn the best way to bring the home to its scheduled temperature)	Smart Recovery (Using current weather conditions and scheduled temperature settings, the ecobee thermostats learn the best way to bring the home to its scheduled temperature)
Wall Control	Infinity System Control (purchased separately)	ecobee, Powered by Carrier Smart Thermostats (purchased separately)	ecobee, Powered by Carrier Smart Thermostats (purchased separately)
Sensor Compatibility	Infinity Smart Sensor (purchased separately)	ecobee SmartSensor (purchased separately)	ecobee SmartSensor (purchased separately)
Remote Access	Yes with Carrier Digital App	Yes with ecobee app	Yes with ecobee app
Smart Home Integrations	✔	✔	✔
Energy Tracking and Reporting	✔	No	No

Check Out This Side-by-side Comparison Of Our Zoning Systems

	EVOLUTION™ SYSTEM Evolution Zoning System	PREFERRED™ SERIES Preferred Four-Zone System	LEGACY™ LINE Zone Perfect Three-Zone System
	Comfort Management Features		
Number of Zones Supported	Up to 8	Up to 8	Up to 3
Customized Comfort Schedules	✔	✔	✔
Humidity Control	✔	✔**	✔**
Maximum Energy Efficiency	Fully utilizes your Evolution system's variable-speed technology and Hybrid Heat system management	Smart Recovery (Using current weather conditions and scheduled temperature settings, the ecobee thermostats learn the best way to bring the home to its scheduled temperature)	Smart Recovery (Using current weather conditions and scheduled temperature settings, the ecobee thermostats learn the best way to bring the home to its scheduled temperature)
Wall Control	Evolution Connex™ Wall Control (purchased separately)	ecobee, Powered by Bryant Smart Thermostats (purchased separately)	ecobee, Powered by Bryant Smart Thermostats (purchased separately)
Sensor Compatibility	Evolution Smart Sensor (purchased separately)	ecobee SmartSensor (purchased separately)	ecobee SmartSensor (purchased separately)
Remote Access	Yes - with Bryant Digital App	Yes - with ecobee app	Yes - with ecobee app
Smart Home Integrations	✔	✔	✔
Energy Tracking and Reporting	✔	No	No

** Only with ecobee SmartThermostat Pro

Comfort™ & Legacy™ Series Three-Zone System

UNDERSTANDING SYSTEM OPERATION

The thermostats determine the system heating or cooling mode. The first call in any zone sets the mode to satisfy that call. It will remain in that mode until all calls in that mode are satisfied and the equipment has been off for the time set by the auto changeover time dipswitches. (See Timers section.) In normal heating or cooling, the damper of any zone with a call in the current mode will be open and all other zones will be closed. When there is no call, any zone with its fan set to ON will be open, and any zone with its fan set to AUTO will be closed. If any zone fan is set to ON, the blower will be energized. If all fan settings are AUTO, the dampers will remain in their last position before the equipment turned off and the blower will be off. (This normally means one damper open and all others closed.)

When dampers are to move, all opening is done first, followed by all closing. In multi-stage systems, the equipment stage is set by the greatest thermostat call but may be delayed by the control's cycle and staging timers. (See timers' explanation below.) The AC Control supports only single stage heat and cool. The HP control supports two stage cooling, two stage furnace heating, and three stage HP heating (lo HP, hi HP, hi HP + aux heat.)

Comfort™ & Legacy™ Series Three-Zone System

Emergency Heat

Emergency heat (aux heat without compressor heat) can be selected for a HP system by either of two ways: First, by selecting Eheat using the Eheat override switch on the HP Control, or second, selection of Eheat on each of the thermostats, provided they have the Eheat function. When either of these Eheat selections is made, a heating demand provides a W signal without a Y signal to the equipment. **NOTE:** The second Eheat method requires HP thermostats and that they ***all*** must be set to Eheat.

Indicator LEDs

There are 7 indicator LEDs on the AC Control and an additional 3 on the HP/2S Control. Their locations are shown on the diagrams. Each damper has its own green LED which is ON when the damper opens due to a calling condition or partially open due to an LAT or HPT limit condition. Each equipment output has its own LED which is on when that output is energized. Y and O outputs are yellow, W outputs are red, and the G output is green. In addition, there is a status LED whose operation is described under the section **Error Codes**.

Comfort™ & Legacy™ Series Three-Zone System

Timers

To control excessive equipment cycling or rapid staging up, the control has two timers. The cycle timer prevents the same stage from turning on within 10 minutes of the last time it turned on. This allows a stage to turn on for as short or long as the thermostats request but will not allow more than six cycles per hour.

The Staging Timer

Prevents a higher stage from turning on until the next stage below it has been on for 15 minutes. This minimizes use of electric heat with heat HP systems. There is also a timegaurd timer which will not allow the compressor to be turned on until it has been off for five minutes.

A Changeover Timer

Can be set from 0 to 30 minutes, limits the control's ability to switch between heating and cooling. The opposite mode is prevented from coming on until the first mode has been satisfied for the selected time.

Comfort™ & Legacy™ Series Three-Zone System

Timer Override

A momentary switch is located near the bottom of the control circuit board. Pressing it momentarily overrides all the system timers, allowing the control to immediately jump to the highest calling stage.

Temperature Limits and Sensors

Both the AC and HP controls have a LAT (leaving air temperature) sensor which is to be placed in the downstream air path of the heating /cooling equipment. It is used in both heating and cooling to limit LAT to a safe value. It must be connected. The system will not operate without it. Its setting is fixed for cooling and is adjustable in four settings for heating. Selection of best setting is discussed under **LAT Limit Selection**. The HP control also has an optional HPT Sensor (heat pump temperature) which is to be placed downstream of the coil but ahead of the electric heater. This sensor measures the temperature of the air leaving the coil during HP heating. It is not included with the control, but may be ordered separately as part number TSATXXSEN01-B. A 10K ohm resistor is factory installed in its place when the actual sensor is not used. In the HP control only, dipswitch 11 allows the installer to temporarily disable both the LAT and the HPT sensors. Disabling of these sensors is only to be done on a temporary basis.

Infinity™ & Evolution™ Zoning

- Infinity/Evolution Zoning Control System

EVOLUTION SYSTEM

  - Works with Variable Speed Systems
    - 4 or 8 zone configurations *(with additional zone board)*
    - No LAT and HPT Sensors Required
    - No Bypass Damper Required or Allowed
    - Increased Humidity Control
    - Easiest to Use and Most Comprehensive Controller in the Business

INFINITY ZONE CONTROL

What do the Infinity™ & Evolution™ Zone Systems Control?

- Up to 8 zones independently
- Separate temperature and fan speed in each zone, with ComfortFan™ in each zone
- Smart Recovery
- Smart Sensors
- Each zone can handle 5 dampers.

MODULES

WHY ZONING, DUCTING & DESIGN

INSTALLATION

To Zone or Not to Zone

- **<u>Why is Zoning Important?</u>**
  - Temperature Differences Greater Than 5 Degrees Between Floors or Rooms
  - Customers Are Willing to Pay for Comfort
  - Increase Your Profitability by Over 20%
  - Save Energy

But the primary objective of zoning should be to increase home comfort.

Is a Zoning System Right for this Job?

When designing a zoning system, it is important to keep in mind what a zoning system can and can not do. A zoning system is only part of a complete heating and cooling system. A properly selected heating and cooling system has a limited heating and cooling capacity. The primary challenge when designing a zoning system is to make sure that the air distribution system cannot become so effectively small that the reduction in airflow causes problems.

A zoning system may or may not increase the effective capacity. This depends on whether the system is being designed for Comfort (no increase in capacity) or energy savings (some increase in overall effective system capacity).

First Ask and Answer Some Questions!

1. **Assigning Zones**
   a) Assess the Homeowners goals for comfort and energy savings.
   b) Conduct a site survey and make preliminary zone assignments.

2. **Sizing the Equipment**
   c) Calculate the structure block load estimate and each zones load estimate for heating & cooling.
   d) Size the heating and cooling equipment for the block load, not the zoning load.

3. **Sizing the Duct System**
   e) Determine bypass is needed or allowed and what option to choose.
   f) Explanation of the Duct Sizing Worksheet.

Assigning Zones

- It is essential to understand the goals before beginning to design the system.
- In some situations, a customer's expectations might not be realistic, and it would be impossible to design a system to meet those expectations.
- By identifying this problem from the start, you can help revise these expectations and avoid creating a dissatisfied customer.

Conduct a Site Survey and Make Preliminary Zone Assignments

The purpose of conducting a site survey is to gather the information that you need to make zone assignments.

- Provide the rough dimensions of each area or room.
- Indicate the location and relative size of doors, windows, and skylights.
- Identify any large glass areas (exceeding 30 percent of the wall area).
- Identify any equipment that may add a sensible/latent load (Light Commercial: computers, copiers, and waiting rooms. Residential: hot tubs, etc.).
- Identify whether any overhangs, trees or buildings cast shade on any of the building's exposures.
- Pay attention to the orientation of the home/building so you can determine whether there are any rooms or areas facing south or west where solar heat load may be a factor when making zone assignments.

Considerations for a Retrofitting Installation

It is more of a challenge to design a retrofitted zoning system than it is to design a zoning system for a new home. For a zoning system to operate properly in a retrofitted installation, it usually is necessary to use one or more of the following approaches to compensate for an air distribution system that is too small for the zoning system.

- Modify the existing ductwork and dampers to handle additional airflow.
- Set mechanical minimum damper positions in some zones. ***(if applicable)***
- Improve the home/building's insulation to reduce the demand for heating and cooling (load) so that lower capacity equipment can be used effectively in the installation.
- Use multi-stage heating and cooling equipment so the equipment capacity can match the load when only a limited number of zones require conditioning.
- Select an air handler/furnace that is designed to overcome the high static pressure in the ductwork and force more air through the system. ECM motors are a good choice.

Sizing the Equipment

Calculate block load estimates and zone load estimates.

- Calculate both heating and cooling block load estimates for the entire home/building. The standard Btu load calculations used for non-zoned systems apply equally well to zoned systems. Use a reliable method with which you are comfortable.
- Next calculate individual “room-by-room” ***heating and cooling*** load estimates (in Btu’s) for the home/building.
- The zone load estimates are used to determine whether the zone assignments you have make sense. They are also used to size the zone dampers and ductwork.

Sizing the Duct System

“Rules of thumbs” have been adopted that are misleading contractors to believe that they are designing a proper duct system.

- One common “rule of thumb” used throughout the industry is that .1 (supply) or .08 (return) are the proper friction rates to design a duct system.
- But not everyone knows that this is based on 100 ft of equivalent ductwork.
- Factoring in the equivalent lengths of fittings could cause the Total Effective Length (TEL) to go past 100 ft. ***This would leave the ductwork undersized.***
- When zoning is to be applied to the system, we recommend a 20% to 25% percent oversizing of the ductwork to handle the varying conditions of airflow in the system. Some distributors/dealers have a built-in “safety-factor” by designing the duct system with as much as a 30% percent oversizing.

Types of Bypass *(IF REQUIRED)*

If you need to bypass air to relieve air noise in a zone, what type of bypass system will you decide to use?

1. “Direct Return”
2. “Dump Zone”
3. “Controlled Leakage”

Selecting the Bypass *(IF REQUIRED)*

If you need to bypass air to relieve air noise in a zone, what type of bypass system will you decide to use?

1. "Direct Return"

- A "*DIRECT RETURN*" type takes the excess supply air and directs it back into the return air side of the system. There are some advantages and disadvantages to this type of application.
  a. Direct bypassing only slows the inevitable, the bonnet/plenum temperature will get too hot or cold and eventually shut down the equipment.
  b. You must install additional temperature sensors in an attempt to protect the system.
  c. You must install the bypass duct connections a minimum of 6' away from the equipment.
  d. The leaving air temperature (LAT) must be installed upstream (ahead of) from the bypass inlet.

Selecting the Bypass *(IF REQUIRED)*

If you need to bypass air to relieve air noise in a zone, what type of bypass system will you decide to use?

2. "Dump Zone"

- A "*Dump Zone*" type takes the excess supply air and directs it back into the conditioned space. There are some advantages and disadvantages to this type of application.
  a. Dump Zone bypassing could cause the area you are using as the "Dump Zone" to become over-conditioned resulting in a lack of Comfort for the homeowner.
  b. You must install the bypass duct connection a minimum of 6' away from the equipment or return.
  c. The location of the "Dump Zone" termination could increase air noise at the point of termination.
  d. Reduces the effect of unit shutdown due to temperature rises or decreases in the return and supply plenums of the equipment. (*Does not eliminate the possibility though*).

Selecting the Bypass *(IF REQUIRED)*

If you need to bypass air to relieve air noise in a zone, what type of bypass system will you decide to use?

3. "Controlled Leakage"

- A "*Controlled Leakage*" type can divert the excess supply air and direct it into different zones. There are some advantages and disadvantages to this type of application.
  a. Controlled Leakage bypassing could cause the areas you are using as the "Dump Zone" to become over-conditioned resulting in a lack of Comfort for the homeowner.
  b. You would set a "minimum set screw" position on the zone damper/s so they would not close completely allowing a certain amount of air to continuously leak into the dump zone/s.
  c. The selected "Dump Zone" could increase air noise in that zone.
  d. Eliminates unit shutdown due to temperature rises or decreases in the return and supply plenums of the equipment.

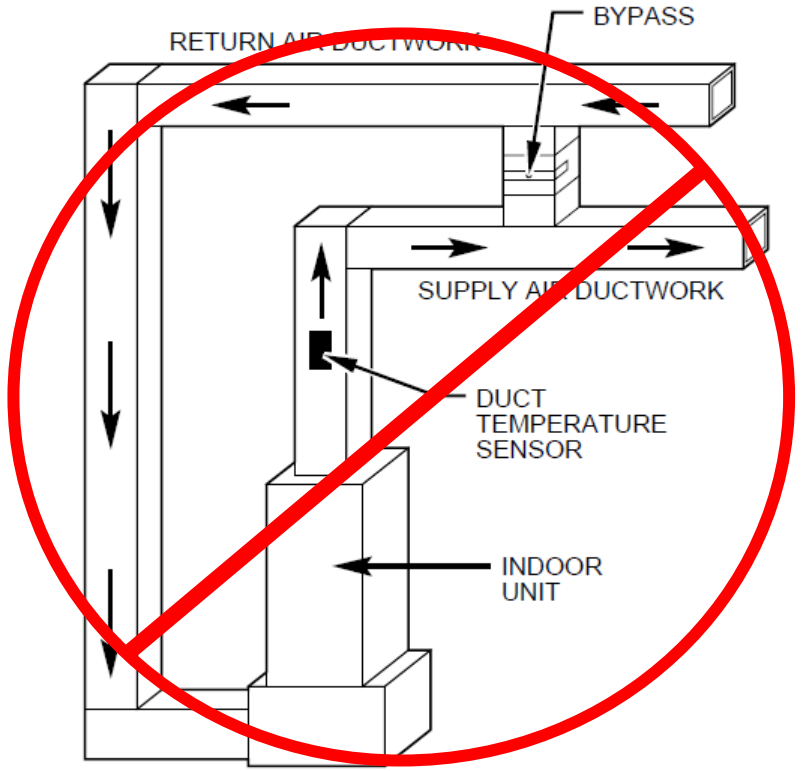
Infinity™ & Evolution™ Zoning Systems

DO NOT USE A BYPASS

- System knows airflow capability of the ductwork and zones through the Duct Assessment.
- System controls the blower and will attempt to provide only the amount of airflow and capacity that is necessary for the zones currently in demand.
- A Bypass will cause more problems than it is worth.
  - Purpose for a Bypass has always been to address noise.
  - Using a Bypass will only be seen by the system as excessive Leakage and cause the system to take steps that may adversely affect airflow and comfort.

Infinity™ & Evolution™ Airflows

The Infinity/Evolution Zoning System uses *NO By-Pass Damper* and will not work properly if one is added!



Summary/Check List

Brief Summary/Check List

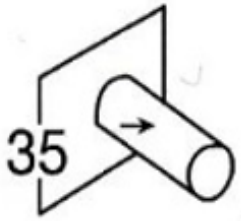
- ✓ 1. Heat Loss/Gain
- ✓ 2. CFM Per Room
- ✓ 3. Equipment Selection
  - ✓ a. With Variable Speed pay close attention to High Heat CFM vs. High Cool CFM
  - ✓ b. Use Equipment Product Data Sheet to determine CFM
- ✓ 4. Calculate Effective Length of longest Supply and Return Duct Runs
  - ✓ a. Use Fittings that have a Low Equivalent Length
    - ✓ - Calculate Fittings Equivalent Length
- ✓ 5. Calculate System Pressure Drops to Determine Friction Rate
  - ✓ a. Pressure Drops

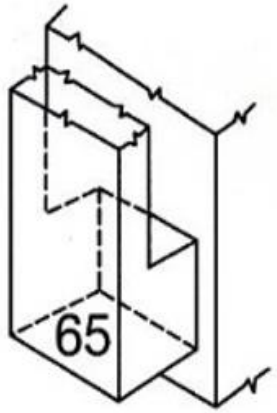
Measurements and Calculations of the Duct System

1. Duct Calculators are based on 100 ft. of duct total length.
2. There are two different length measurements in the duct system.
    a. The Equivalent Length
    b. The Effective Length
3. The Equivalent Length is the calculated length of the fittings in the duct system or duct run.
4. The Effective Length is the actual length of the ductwork plus the equivalent length of the fittings. Most contractors design off of the actual length of the ductwork and miss the actual effective length of the system.
    - That is why most duct systems in homes are undersized and this is especially a problem when applying zoning to a home without properly designing the system.

Fitting Equivalent Lengths

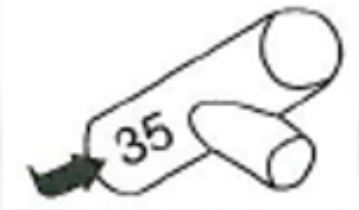
*Return Air Only





PLENUMS

BOOT FITTINGS



ROUND TRUNK DUCT FITTINGS

Friction Rate Calculation

Example:

Manufacturer's Blower Data

Step 1)

External Static Pressure (ESP)= 0.6 IWC cfm= 1200 From Product Data (PDD)

	Device Pressure Losses	**IWC**
	Direct expansion refrigerant coil	0.27
	Electric resistance heating coil	0
	Hot water coil	0
	Heat Exchanger	0
	Low efficiency filter	0
Step 2)	High or mid-efficiency filter	0
	Electronic filter	0
	Humidifier	0
	Supply outlet	0.03
	Return grille	0.03
	Balancing damper	0.03
	Other device	

		PD from PPD	Sum of Component PD	Pressure Difference (Pd)	
	Available Total External Static Pressure				
Step 3)	Available Static Pressure				
	ASP=(ESP-DPL)=	0.6	0.36	0.24	IWC

		Supply	Return	TEL	
Step 4)	Total Effective Length (TEL)				
	Supply-side TEL + Return-side TEL=	200	200	400	Feet

Step 5) FR=Pd*100/TEL 0.060 Friction Rate = Pressure difference*100/TEL

By multiplying the (PD) Pressure Difference times 100' (the standard for duct calculators) then divide by the (TEL) Total Effective Length we get our new Friction Rate number which is what we would use to size the ductwork.

Table from ACCA Manual D

TOTAL EFF. LENGTH DUCT & FITTINGS. (in feet)	CORRECTED PRESSURE DROP (FRICTION) PER 100 FT. DUCT LENGTH* TOTAL PRESSURE DROP (in. of water column)																	
	.05	.06	.08	.10	.125	.14	.16	.18	.20	.25	.30	.34	.375	.40	.50	.625	.75	1.00
35-44	.13	.15	.20	.25	.32	.35	.40	.45	.50	.63	.75	.85	.95	1.00	1.25	1.58	1.90	2.54
45-54	.10	.12	.16	.20	.25	.28	.32	.36	.40	.50	.60	.68	.76	.80	1.00	1.26	1.52	2.02
55-64	.08	.10	.13	.17	.21	.23	.27	.30	.33	.42	.50	.57	.63	.67	.83	1.05	1.26	1.68
65-74	.07	.09	.11	.14	.18	.20	.23	.26	.29	.36	.43	.49	.54	.57	.72	.90	1.08	1.44
75-84	.06	.08	.10	.13	.16	.18	.20	.23	.25	.31	.38	.43	.47	.50	.63	.79	.94	1.26
85-94	.06	.07	.09	.11	.14	.16	.18	.20	.22	.28	.33	.38	.42	.45	.56	.70	.84	1.12
95-104	.05	.06	.08	.10	.13	.14	.16	.18	.20	.25	.30	.33	.38	.40	.50	.63	.75	1.01
105-114	.05	.05	.07	.09	.11	.13	.15	.16	.18	.23	.28	.31	.34	.37	.47	.57	.69	.91
115-129	.04	.05	.07	.08	.10	.12	.13	.15	.17	.21	.25	.28	.31	.33	.46	.51	.62	.82
130-149	.04	.04	.06	.07	.09	.10	.11	.13	.14	.18	.21	.24	.27	.29	.36	.45	.54	.72
150-169	.03	.04	.05	.06	.08	.09	.10	.11	.13	.16	.19	.21	.24	.25	.31	.39	.47	.63
170-189	.03	.03	.04	.06	.07	.08	.09	.10	.11	.14	.17	.19	.21	.22	.28	.35	.42	.56
190-214	.03	.03	.04	.05	.06	.07	.08	.09	.10	.13	.15	.17	.19	.20	.25	.31	.37	.50
215-239	.02	.03	.04	.05	.05	.06	.07	.08	.09	.11	.13	.15	.17	.18	.22	.28	.33	.44
240-264	.02	.02	.03	.04	.05	.06	.06	.07	.08	.10	.12	.14	.15	.16	.20	.25	.30	.40
265-289	.02	.02	.03	.04	.04	.05	.06	.07	.07	.09	.11	.12	.14	.15	.18	.23	.27	.36
290-324	.02	.02	.03	.03	.04	.05	.05	.06	.07	.08	.10	.11	.12	.13	.17	.20	.24	.33
325-374	.02	.02	.02	.03	.04	.04	.05	.05	.06	.07	.09	.10	.11	.11	.14	.18	.21	.29
375-424	.01	.02	.02	.03	.03	.04	.04	.05	.05	.06	.08	.09	.09	.10	.13	.16	.19	.25
425-474	.01	.01	.02	.03	.03	.03	.04	.04	.05	.06	.07	.08	.08	.09	.11	.14	.17	.22
475-524	.01	.01	.02	.02	.03	.03	.03	.04	.04	.05	.06	.07	.08	.08	.10	.13	.15	.20
525-574	.01	.01	.02	.02	.02	.03	.03	.03	.04	.05	.06	.07	.07	.07	.09	.11	.14	.18
575-625	.01	.01	.01	.02	.02	.02	.03	.03	.03	.04	.05	.06	.06	.07	.08	.10	.13	.17

NOTE: Scale on front of chart is for 100 ft. of duct. For greater or lesser equivalent lengths, use friction indicated in above table.

*Formula for Friction Loss (if not found in above table): Friction Loss per 100 ft. = System design pressure x 100 / Total equivalent length of duct

Duct Sizing Worksheet Example 1

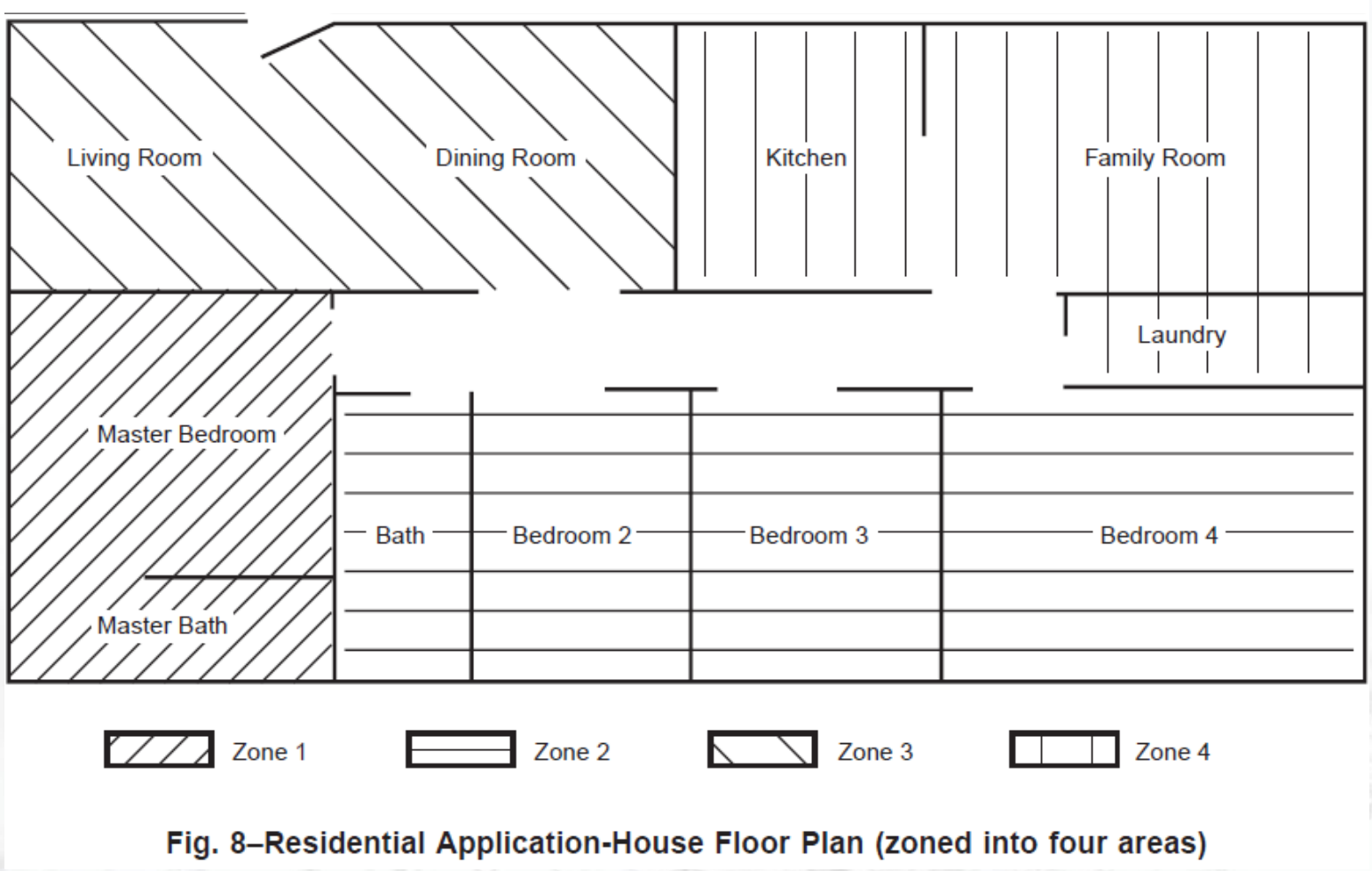


Fig. 8–Residential Application-House Floor Plan (zoned into four areas)

Duct Sizing Worksheet Example 1

Step 1:Calculate Block Load

Heating Load:_____ Btuh Cooling Load:_____ Btuh

Step 2: Room by Room Load

Room	Heating Load (Btuh)	Cooling Load (Btuh)	Airflow (CFM)*	Zone Number
Living Room	_____	_____	150	3
Dining Room/Foyer	_____	_____	150	3
Kitchen/Dinette	_____	_____	200	4
Family Room	_____	_____	200	4
Laundry Room	_____	_____	300	4
Master Bedroom/Bathroom	_____	_____	400	1
Bedrooms 2-4/Bathroom	_____	_____	500	2

Highest CFM determined from Heat/Cool Btuh

Duct Sizing Worksheet Example 1

Step 3: Zone CFM totals

Zone 1	400 CFM	Zone 5	CFM
Zone 2	500 CFM	Zone 6	CFM
Zone 3	300 CFM	Zone 7	CFM
Zone 4	700 CFM	Zone 8	CFM

Step 4: Equipment Selection

Indoor Section	58TN0A100-20	Outdoor Section	24ANB160
Heating Capacity/CFM	89,000/59,000		1465/1295
Cooling Capacity/CFM	55500/46,000		1,600/1,280
Design CFM	1,295 (low speed)		

Step 5: Bypass Determination

System Design CFM * 1,295 X 0.60 = 777

(Value MUST be less than smallest zone CFM; otherwise Bypass Damper may be required)

* Design CFM can be: Step 1C from above OR if Two Speed/Variable Speed equipment is selected, select low speed CFM value...used 2-speed A/C unit/low

CFM=1295 CFM

Duct Sizing Worksheet Example 1

Step 6: Zone Minimum Area (Sq.In.) (From Table 1)

Zone 1 CFM 400	Main Duct 86 Sq.In.	Branch Area 132 Sq.In.
Zone 2 CFM 500	Main Duct 113 Sq.In.	Branch Area 165 Sq.In.
Zone 3 CFM 300	Main Duct 87 Sq.In.	Branch Area 110 Sq.In.
Zone 4 CFM 700	Main Duct 143 Sq.In.	Branch Area 231 Sq.In.
Zone 5 CFM	Main Duct Sq.In.	Branch Area Sq.In.
Zone 6 CFM	Main Duct Sq.In.	Branch Area Sq.In.
Zone 7 CFM	Main Duct Sq.In.	Branch Area Sq.In.
Zone 8 CFM	Main Duct Sq.In.	Branch Area Sq.In.

Table 1
Zone CFM | **Main Duct Area (sq.in.) Equipment Capacity**

		2	2.5	3	3.5	4	5	6	7.5	8
200	Main	57	57	57	64	64	64			
	Branch	66	66	66	75	75	75			
300	Main	79	79	79	79	79	87	87		
	Branch	99	99	99	99	99	110	110		
400	Main	86	86	86	86	86	86	104	104	104
	Branch	132	132	132	132	132	132	140	140	140
500	Main	113	113	113	113	113	113	113	123	123
	Branch	165	165	165	165	165	165	165	179	179
600	Main	123	123	123	123	123	123	123	123	133
	Branch	198	198	198	198	198	198	198	198	208
700	Main		143	143	143	143	143	143	143	143
	Branch		231	231	231	231	231	231	231	231

Duct Sizing Worksheet Example 1

Step 7:Main Trunk (Table 2A) and Branch Duct (Table 2B) Sizes

Zone 1

Main Duct (sq. in.):_____86 = Main Duct Size: 8x14 or 12” Round

Branch (sq. in.):_____132

Size:6″ Qty:__2 Area (from Table 2B) =_____56+

Size:7″ Qty:__2 Area (from Table 2B) =_____76+

=_____132 Total Sq. In.

Zone 2

Main Duct (sq. in.):_____113 = Main Duct Size: 8x16 or 12” Round

Branch (sq. in.):_____165

Size:6″ Qty:__2 Area (from Table 2B) =_____56+

Size:7″ Qty:__3 Area (from Table 2B) =_____114+

=_____165 Total Sq. In.

Zone 3

Main Duct (sq. in.):_____87 = Main Duct Size: 8X12 or 12” Round

Branch (sq. in.):_____110

Size:6″ Qty:__4 Area (from Table 2B) =_____110+

Size:__ Qty:___ Area (from Table 2B) =_____+

=_____110 Total Sq. In.

Duct Sizing Worksheet Example 1

Zone 4
Main Duct Square Inches__143____
Table 2A Main Duct Sizing

Equivalent Areas for Ducts (sq.in.)

Duct Width	Duct Height (in.) 8	10	Round Dia.-Inch	Sq. In.
8	60	80	8	50
10	80	87	10	79
12	90	110	12	113
14	105	135	14	154
16	115	157	16	201
18	125	167		
20	145	190		
22	155	210		
24	165	215		

Branch Square Inches_____231__
Size__6"___Qty___2___ Area (from Table 2B) =___56___+
Size__8"___Qty___3___ Area (from Table 2B) =__180___+
=__236___Total Sq. In.

Duct Sizing Worksheet Example 1

Branch Square Inches_____231__
Size__6"___Qty___2___ Area (from Table 2B)=___56___+
Size__8"___Qty___3___ Area (from Table 2B)=___180___+
=___236___Total Sq. In.

Table 2B Branch Duct Area (Sq. In)

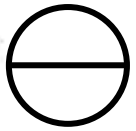
	Duct Diameter - in.				
Quantity	5	6	7	8	10
1	20	28	38	60	79
2	40	56	76	135	180
3	60	84	114	180	330
4	80	112	152	235	465
5	100	140	190	300	530
6	120	168	228	365	660
7	140	196	266	430	760
8	160	224	304	500	825

Duct Sizing Worksheet Example 1 Formulas

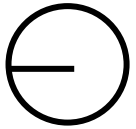
In order to calculate sq. in. into a round duct size you need to know the below formulas.

3.141 = Pi π

Circumference = 3.141 X Circle Diameter



Area = 3.141 X Radius Squared



Square Inch to Round = [Example] 154 sq. in. divided by 3.141 divided by square root X 2 = 14.00

√(49.02897166507482) × 2 =

14.004138197700 68

So 154 sq. in. is equal to a 14” Round Duct

Duct Sizing Worksheet Example 1

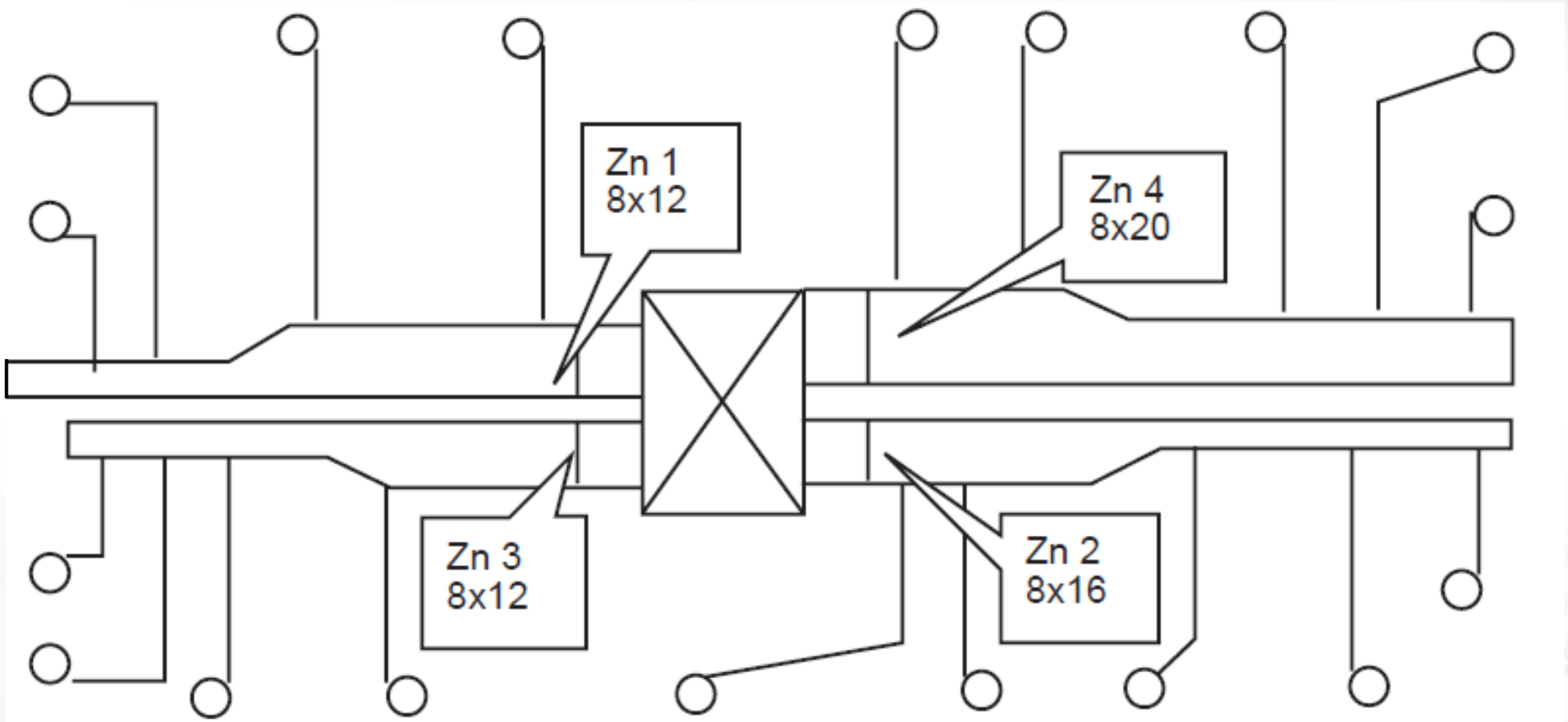


Fig. 9–Residential Duct Work Layout

Duct Sizing Worksheet Example 1 – Table 1

Table 1–Zone CFM

		MAIN & BRANCH DUCT AREA (SQ. IN.) Equipment Capacity											
		2	2.5	3	3.5	4	5	6	7.5	8	8.5	10	12.5
200	Main	57**	57	57	64	64	64						
	Branch	66***	66	66	75	75	75						
300	Main	79	79	79	79	79	87	87					
	Branch	99	99	99	99	99	110	110					
400	Main	86	86	86	86	86	86	104	104	104			
	Branch	132	132	132	132	132	132	140	140	140			
500	Main	113	113	113	113	113	113	113	123	123	123	123	
	Branch	165	165	165	165	165	165	165	179	179	179	179	
600	Main	123	123	123	123	123	123	123	123	133	133	133	133
	Branch	198	198	198	198	198	198	198	198	208	208	208	208
700	Main		143	143	143	143	143	143	143	143	154	154	154
	Branch		231	231	231	231	231	231	231	231	246	246	246
800	Main		154	154	154	154	154	154	154	154	154	154	165
	Branch		264	264	264	264	264	264	264	264	264	264	273
900	Main			165	165	165	165	165	165	165	165	165	177
	Branch			297	297	297	297	297	297	297	297	297	311
1000	Main			189	189	189	189	189	189	189	189	189	201
	Branch			330	330	330	330	330	330	330	330	330	330

Duct Sizing Worksheet Example 1 – Table 2A

Table 2A-Main Duct Sizing

EQUIVALENT AREAS FOR DUCTS (SQ. IN.)					
	Duct Height			Round	
Duct Width	8(in.)	10(in.)		Dia-in.	Sq-in.
8	60	80		8	50
10	80	87		10	79
12	90	110		12	113
14	105	135		14	154
16	115	157		16	201
18	125	167		18	269
20	145	190		20	314
22	155	210		22	380
24	165	215			
26		227			
28		241			
30		254			
32		269			
34		284			
36		299			
38		314			
40		330			
42		346			
44		363			

Duct Sizing Worksheet Example 1 – Table 2B

Table 2B-Branch Duct Area (sq. in.)

	DUCT DIAMETER - IN.							
Quantity	5	6	7	8	10	12	14	16
1	20	28	38	50	79	113	154	201
2	40	56	76	135*	180	365	565	760
3	60	84	114	180	330	530	795	825
4	80	112	152	235	465	730	825	
5	100	140	190	300	530	825		
6	120	168	228	365	660			
7	140	196	266	430	760			
8	160	224	304	500	825			
9	180	252	342	565				
10	200	280	380	630				
11	220	308	418	660				
12	240	336	456	726				
13	260	364	494	795				
14	280	392	532					
15	300	420	570					

Infinity™ & Evolution™ Zoning General Considerations

- User interface, and room sensors in non-condensing areas
  - Ambient between 32° F and 120° F
- Zone Dampers and Zone Damper Module in non-condensing areas
  - Ambient between -4° F to 158° F
- TXV required at indoor unit coil
- Ensure proper equipment selection and duct sizing
- It is desirable for the smallest zone to handle the minimum airflow
  - 275 cfm/ton for 1-stage system or 2-stage system on HIGH
  - 175 cfm/ton for 2-stage system on LOW
- ***DO NOT USE*** bypass damper
  - Bypass will cause improper operation
  - Airflow management performed by the software

Zoning Starting Point

Where to Start:

It is necessary to start the design process with a good heat loss/gain calculation for the structure. Equipment should be selected that matches the heat loss/gain to maintain the best comfort. From an efficiency standpoint, bigger is not better. Bigger wastes energy, shortens the life expectancy of the equipment and may leave the customer feeling uncomfortable in the process.

Determine airflow for each living space

After completing the heat loss/gain calculation it is necessary to determine the required airflow, in cfm, to each zone. This step is crucial in delivering comfort to the customer and is necessary to design an efficient duct system. The duct system should deliver the calculated airflows to each zone in order to maintain temperature throughout the home. Each zone should support the minimum airflow of the equipment selected.

Consult the HVAC Equipment Product Guide to determine systemsminimum airflow requirements.

Zoning Considerations

- **DESIGN TIP:** Use industry--standard design tools to help design the duct and zoning systems. ACCA and SMACNA produce the industries' recognized standards for the design and application of duct systems. Please consult their publications when designing a duct system. (Reference: Consult the latest editions of ACCA *Manual D* and *Manual Zr.* and SMACNA *HVAC Systems—Duct Design*. There are many automated tools based on these manuals as well.)

ACCA Manual J - covers Load Calculations

ACCA Manual D - covers Duct Design

ACCA Manual ZR - covers Residential Zoning

SMACNA - Sheet Metal and Air Conditioning Contractors

SMACNA standards and manuals address all facets of the sheet metal and HVAC industry – including duct construction and installation, indoor air quality, energy recovery, roofing and architectural sheet metal, welding, and commissioning.

Planning the Installation

Usage:
Group together rooms that have similar usage, occupancy, and heat load.

Levels:
Different levels in a home need to be separate zones. Each level may be further divided into zones.

Existing ductwork:
If the installation is a retrofit, the existing duct system may limit zone selection options. Up to 5 dampers may be used in a zone by electrically connecting them in parallel.

Damper types: Round, rectangular, or rectangular slip--in dampers may be intermixed in any arrangement.

Planning the Installation

Comfort vs. energy saving:
If energy saving is an objective, areas which will be unoccupied at different times need to be separated so they can selectively be setback. If maximum comfort is desired, areas with different heat loss/gain as well as different levels need to be separated. Zones in which different comfort temperatures are desired also need to be separated.

Multi--capacity equipment: For best results, choose HVAC system components with more than one stage of heating and/or cooling capacity. This allows a wider range of operation for the zoning system, as the zoning system can stage--down the equipment as fewer zones are calling for heating or cooling. Of course, modulating equipment is the best. Infinity/Evolution System indoor sections typically feature two or more stages of capacity for heating, including the modulating gas furnaces, and variable--speed heat pumps. Infinity/Evolution System outdoor/compressor sections feature capacities from single--stage to full variable speed. If more than four zones are desired, a multi--stage compressor is recommended to be able to quietly supply reduced capacity to calls from smaller zones.

BREAK TIME

5 MINUTES

How to Determine the Necessary Equipment

Before concentrating on the design of the duct system a selection of equipment must be conducted. The equipment will dictate the design criteria for the duct system. It is important to remember that with variable speed equipment it is possible to require more cfm for heating than cooling. The variable speed equipment is very flexible in match--ups with outside air conditioner and heat pump units requiring the designer of the system to pay close attention to each piece of equipment's airflow requirements. You can find this information in the Product Data Manual.

These match-ups were pulled from the website : www.MyCarrierRatings.com for Carrier and website https://cactaxcredits.info/Bryant/AC for Bryant using a CAP** matching coil selection. If a different coil is used, then you *MUST* select the correct coil in the selection table as the cooling airflow could change.

Furnace	Low	High		2-Stage	Low	High
58TN0A90-16	960	1195		24ACB724A	680	800
	960	1195		24ACB736A	840	1050
	960	1195		24ACB748A	1120	1400

Furnace with A/C Example (*NONIMAL AIR FLOW*)

Furnace	Low	High		2-Stage Unit	Low	High
59TP6B100-20	1435	1865		24ACB724	680	800
	1435	1865		24ACB736	840	1050
	1435	1865		24ACB748	1120	1400
	1435	1865		24ACB760	1300	1625
				Variable Speed Unit	Comfort		Efficiency	
					Minimum	Maximum	Minimum	Maximum
58TN0A110C21-20	1295	1465		24VNA936	300	990	600	1050
	1295	1465		24VNA948	542	1389	875	1400
	1295	1465		24VNA960	700	1600	975	1800

Furnace with A/C Example (*NONIMAL AIR FLOW*)

Furnace	Low	Intermediate	High		Variable Speed Unit	Minimum Comfort	Maximum Comfort	Minimum Efficiency	Maximum Efficiency
59MN7B100-22	745	955	1575		24VNA624	300	500	825	900
	745	955	1575		24VNA636	300	300	1150	1150
	745	955	1575		24VNA648	500	500	1450	1450
	745	955	1575		24VNA660	700	700	1650	2000
58TN0A110C21-20	1295		1465		24VNA636	300	300	1150	1150
	1295		1465		24VNA648	500	500	1450	1450
	1295		1465		24VNA660	700	700	1650	2000

Fan Coil with A/C & HP Example (*NONIMAL AIR FLOW*)

Furnace	Electric Heat kW	Emergency Heat	High	Max		Variable Speed Unit	Heat Pump Airflows	Minimum Comfort	Maximum Comfort	Minimum Efficiency	Maximum Efficiency
FE4ANB003L00	10 kW	775	1575	1400		25VNA848	Cooling	542	1389	875	1400
							Heating	429	1550	1000	1600
	15 kW	850	1100	1400		25VNA860	Cooling	300	300	1150	1150
							Heating	500	1600	900	1600
FE4ANB005L00	15 kW	850	1350	1600		25VNA448	Cooling	500	1550	600	1600
							Heating	500	1550	600	1600
	20 kW	1050	1750	1600		25VNA460	Cooling	500	1625	750	2000
							Heating	500	2000	850	2000
FE4ANB006L00	10 kW	1050	1100	2000		24VNA636		300	300	1150	1150
	15 kW	1050	1350	2000		24VNA648		500	500	1450	1450
	20 kW	1125	1750	2000		24VNA660		700	700	1650	2000

How Does Infinity™ & Evolution™ Control The Zones?

The systems sophisticated algorithms were constructed to maintain comfort by continuously monitoring each zone's temperature to satisfy the comfort conditions.

If a zone cannot handle the systems minimum airflow, the controller will look for **AWAY/UNOCCUPIED** zones to allow the system to run to satisfy the original zone calling. If none of the zones are set to **AWAY/UNOCCUPIED**, then the controller will look for a zone that is slightly out from the setpoint (+/-3°F) and open the damper to allow the system to run.

Zones that can not handle the systems minimum airflow will cause other zones to be heated or cooled (***over conditioned***) beyond their setpoint temperature settings. If this is an acceptable alternative, then the undersized zones will not present any major issues. In most circumstances this is not an acceptable situation and the only way to relieve this to make sure each zone handles the minimum airflow of the installed equipment, or to design the system with HVAC equipment with multiple stages of heating and cooling.

How Does Infinity™ & Evolution™ Control The Zones?

Remember the Infinity/Evolution System tries to satisfy all zones simultaneously, so it is common for zones to open incrementally to satisfy the comfort points.

HOWEVER, the default mode of operation is to NOT rapidly switch back and forth between heating and cooling modes; this helps to reduce energy usage. Note that operation with modulating equipment will tend to match the needs of the calling zones with heating and cooling, and further delay transitions to the opposite system mode of operation.

For satisfying ***simultaneous demands*** for heating and cooling, select the appropriate ***simultaneous demand option***, if available for that system; be aware that energy usage will likely increase with using the Infinity/Evolution Zoning System to satisfy simultaneous heating and cooling demands.

Infinity™ & Evolution™ Zoning Design Guides

Catalog Numbers

Carrier SYSTXZNSMS-02DG

Bryant DG-SYSTXZNSMS-02

Infinity™ & Evolution™ Zoning Design Guide Outline

Duct sizing:

Duct sizing practices for the Infinity Zone System are the same as previous zoning systems. Although larger is always better, the Infinity System will make the best possible use of any existing duct system. If Infinity is being forced by load requirements and/or small ducts toward a point where a limit would trip or a coil would freeze, it will take actions to avoid these events. These actions can include partially opening selected dampers, reducing system airflow to its lowest reliable level, and ultimately staging down equipment. There is no need to balance ducts as required with a non--zoned system. The Infinity System modulates dampers automatically to provide duct balancing. Dampers open only as far as needed to provide necessary conditioning.

Infinity™ & Evolution™ Zoning Design Guide Outline

Return ducts:

Returns in each zone are desirable but not necessary if reasonable space exists under doors to allow supplied air to escape. It is good practice to place returns at points where uncomfortable temperatures may collect. Low levels to pull cold air from floors and high levels to pull hot air from ceilings.

Equipment sizing:

When selecting heating and cooling equipment select the sizes, use the same rules as for non-zoned systems. In general, do not oversize or undersize equipment due to zoning.

Infinity™ & Evolution™ Zoning Design Guide Outline

We recommend this process when designing a zoned duct system

1. Heat loss / gain
2. CFM per room
3. Select equipment
    a. With variable speed pay close attention to high heat CFM VS. high cooling CFM .
    b. Use the equipment Product Data to determine CFM
4. Calculate equivalent length of longest duct runs.
    a. Use duct fittings that have low equivalent lengths.
5. Calculate duct system Friction Rate
    a. Pressure drops
        (1.) Wet evaporator coils
        (2.) Supply outlet
        (3.) Return grille
        (4.) Balancing dampers
        (5.) Any accessories
            (a.) Humidifiers
            (b.) Electronic air cleaner
            (c.) Pleated filters
            (d.) High efficiency filters.
6. Design Duct System using the Friction Rate calculated in step 5.

Friction Rate Calculation

Example:

Manufacturer's Blower Data

Step 1)

External Static Pressure (ESP)= 0.6 IWC cfm= 1200 From Product Data (PDD)

	Device Pressure Losses	**IWC**
	Direct expansion refrigerant coil	0.27
	Electric resistance heating coil	0
	Hot water coil	0
	Heat Exchanger	0
	Low efficiency filter	0
Step 2)	High or mid-efficiency filter	0
	Electronic filter	0
	Humidifier	0
	Supply outlet	0.03
	Return grille	0.03
	Balancing damper	0.03
	Other device	

		PD from PPD	Sum of Component PD	Pressure Difference (Pd)	
	Available Total External Static Pressure				
Step 3)	Available Static Pressure				
	ASP=(ESP-DPL)=	0.6	0.36	0.24	IWC

		Supply	Return	TEL	
Step 4)	Total Effective Length (TEL)				
	Supply-side TEL + Return-side TEL=	200	200	400	Feet

Step 5) FR=Pd*100/TEL 0.060 Friction Rate = Pressure difference*100/TEL

By multiplying the (PD) Pressure Difference times 100' (the standard for duct calculators) then divide by the (TEL) Total Effective Length we get our new Friction Rate number which is what we would use to size the ductwork.

Table from ACCA Manual D

TOTAL EFF. LENGTH DUCT & FITTINGS. (in feet)	CORRECTED PRESSURE DROP (FRICTION) PER 100 FT. DUCT LENGTH* TOTAL PRESSURE DROP (in. of water column)																	
	.05	.06	.08	.10	.125	.14	.16	.18	.20	.25	.30	.34	.375	.40	.50	.625	.75	1.00
35-44	.13	.15	.20	.25	.32	.35	.40	.45	.50	.63	.75	.85	.95	1.00	1.25	1.58	1.90	2.54
45-54	.10	.12	.16	.20	.25	.28	.32	.36	.40	.50	.60	.68	.76	.80	1.00	1.26	1.52	2.02
55-64	.08	.10	.13	.17	.21	.23	.27	.30	.33	.42	.50	.57	.63	.67	.83	1.05	1.26	1.68
65-74	.07	.09	.11	.14	.18	.20	.23	.26	.29	.36	.43	.49	.54	.57	.72	.90	1.08	1.44
75-84	.06	.08	.10	.13	.16	.18	.20	.23	.25	.31	.38	.43	.47	.50	.63	.79	.94	1.26
85-94	.06	.07	.09	.11	.14	.16	.18	.20	.22	.28	.33	.38	.42	.45	.56	.70	.84	1.12
95-104	.05	.06	.08	.10	.13	.14	.16	.18	.20	.25	.30	.33	.38	.40	.50	.63	.75	1.01
105-114	.05	.05	.07	.09	.11	.13	.15	.16	.18	.23	.28	.31	.34	.37	.47	.57	.69	.91
115-129	.04	.05	.07	.08	.10	.12	.13	.15	.17	.21	.25	.28	.31	.33	.46	.51	.62	.82
130-149	.04	.04	.06	.07	.09	.10	.11	.13	.14	.18	.21	.24	.27	.29	.36	.45	.54	.72
150-169	.03	.04	.05	.06	.08	.09	.10	.11	.13	.16	.19	.21	.24	.25	.31	.39	.47	.63
170-189	.03	.03	.04	.06	.07	.08	.09	.10	.11	.14	.17	.19	.21	.22	.28	.35	.42	.56
190-214	.03	.03	.04	.05	.06	.07	.08	.09	.10	.13	.15	.17	.19	.20	.25	.31	.37	.50
215-239	.02	.03	.04	.05	.05	.06	.07	.08	.09	.11	.13	.15	.17	.18	.22	.28	.33	.44
240-264	.02	.02	.03	.04	.05	.06	.06	.07	.08	.10	.12	.14	.15	.16	.20	.25	.30	.40
265-289	.02	.02	.03	.04	.04	.05	.06	.07	.07	.09	.11	.12	.14	.15	.18	.23	.27	.36
290-324	.02	.02	.03	.03	.04	.05	.05	.06	.07	.08	.10	.11	.12	.13	.17	.20	.24	.33
325-374	.02	.02	.02	.03	.04	.04	.05	.05	.06	.07	.09	.10	.11	.11	.14	.18	.21	.29
375-424	.01	.02	.02	.03	.03	.04	.04	.05	.05	.06	.08	.09	.09	.10	.13	.16	.19	.25
425-474	.01	.01	.02	.03	.03	.03	.04	.04	.05	.06	.07	.08	.08	.09	.11	.14	.17	.22
475-524	.01	.01	.02	.02	.03	.03	.03	.04	.04	.05	.06	.07	.08	.08	.10	.13	.15	.20
525-574	.01	.01	.02	.02	.02	.03	.03	.03	.04	.05	.06	.07	.07	.07	.09	.11	.14	.18
575-625	.01	.01	.01	.02	.02	.02	.03	.03	.03	.04	.05	.06	.06	.07	.08	.10	.13	.17

NOTE: Scale on front of chart is for 100 ft. of duct. For greater or lesser equivalent lengths, use friction indicated in above table.

*Formula for Friction Loss (if not found in above table): Friction Loss per 100 ft. = System design pressure x 100 / Total equivalent length of duct

Infinity™ & Evolution™ Zoning Design Guide Outline

Example:

Manufacturer's Blower Data

Step 1)

External Static Pressure (ESP) = 0.6 IWC cfm = 1200 From Product Data (PDD)

	Device Pressure Losses	**IWC**
	Direct expansion refrigerant coil	0.27
	Electric resistance heating coil	0
	Hot water coil	0
	Heat Exchanger	0
	Low efficiency filter	0
Step 2)	High or mid-efficiency filter	0
	Electronic filter	0
	Humidifier	0
	Supply outlet	0.03
	Return grille	0.03
	Balancing damper	0.03
	Other device	

	Available Total External Static Pressure	PD from PPD	Sum of Component PD	Pressure Difference (Pd)	
Step 3)	Available Static Pressure ASP = (ESP-DPL) =	0.6	0.36	0.24	IWC
Step 4)	Total Effective Length (TEL) Supply-side TEL + Return-side TEL =	Supply 60	Return 40	TEL 100 Feet	
Step 5)	FR = Pd*100/TEL	0.24		Friction Rate = Pressure difference*100/TEL	

Infinity™ & Evolution™ Zoning Design Guide Outline

Example:

Manufacturer's Blower Data

Step 1)

External Static Pressure (ESP) = 0.6 IWC cfm = 1200 From Product Data (PDD)

	Device Pressure Losses	**IWC**
	Direct expansion refrigerant coil	0.27
	Electric resistance heating coil	0
	Hot water coil	0
	Heat Exchanger	0
	Low efficiency filter	0
Step 2)	High or mid-efficiency filter	0
	Electronic filter	0
	Humidifier	0
	Supply outlet	0.03
	Return grille	0.03
	Balancing damper	0.03
	Other device	

	Available Total External Static Pressure	PD from PPD	Sum of Component PD	Pressure Difference (Pd)	
Step 3)	Available Static Pressure ASP = (ESP-DPL) =	0.6	0.36	0.24	IWC
Step 4)	Total Effective Length (TEL) Supply-side TEL + Return-side TEL =	Supply 200	Return 200	TEL 400 Feet	
Step 5)	FR = Pd*100/TEL	0.060		Friction Rate = Pressure difference*100/TEL	

Infinity™ & Evolution™ Zoning Design Guide Outline

Example:

Manufacturer's Blower Data

Step 1)

External Static Pressure (ESP) = 0.6 IWC cfm = 1200 From Product Data (PDD)

	Device Pressure Losses	**IWC**
	Direct expansion refrigerant coil	0.27
	Electric resistance heating coil	0
	Hot water coil	0
	Heat Exchanger	0
	Low efficiency filter	0
Step 2)	High or mid-efficiency filter	0.25
	Electronic filter	0
	Humidifier	0
	Supply outlet	0.03
	Return grille	0.03
	Balancing damper	0.03
	Other device	

	Available Total External Static Pressure	PD from PPD	Sum of Component PD	Pressure Difference (Pd)	
Step 3)	Available Static Pressure ASP = (ESP-DPL) =	0.8	0.61	0.19	IWC

		Supply	Return	TEL	
Step 4)	Total Effective Length (TEL) Supply-side TEL + Return-side TEL =	200	200	400	Feet

Step 5) FR = Pd*100/TEL 0.048 Friction Rate = Pressure difference*100/TEL

Infinity™ & Evolution™ Zoning Design Guide Outline

- The example showed that the unit duct design currently under consideration has a total effective duct length of 400 feet. ACCA uses TEL which stands for Total Effective Length. This duct system would require that .06 friction rate be used to design the duct system. The wet evaporator coil, supply outlet, return grille, and balancing damper pressure drops are used to calculate the friction rate of the duct system to select the duct work for this system. To calculate the Friction Rate (FR) multiply the Pressure Difference (PD) by 100 then divide the result by the Total Effective Length (TEL).

Example:

- Friction Rate **= Pressure Drop X 100 / Total Equivalent Length**
- FR **= Pd X 100 / TEL**
- FR **= (.24 X 100 = 24 / 400) = .06**

- The remaining ductwork system should be designed around a FR of .06.

MODULES

INSTALLATION

Comfort™ & Legacy™ Series Three-Zone System

Installation

COMFORT SERIES THREE-ZONE CONTROL PANEL
ZONECC3ZAC01 (1 Heat / 1 Cool)
or ZONECC3ZHP01 (3 Heat / 2 Cool)
ZONEBB3ZAC01 (1 Heat / 1 Cool)
or ZONEBB3ZHP01 (3 Heat / 2 Cool)

3---ZONE CONTROL ACCESSORIES	
PART NUMBER	DESCRIPTION
ZONEXXODTS01	Duct Temperature Sensor*

* Duct temperature sensor required for heat pump zone board.

ECOBEE, POWERED
CARRIER or BRYANTWI-FI® THERMOSTATS
EB-STATE5CR-01 or EB-STATE3LTCR-01
EB-STATE5BR-01 or EB-STATE3LTBR-01

Comfort™ & Legacy™ Three-Zone Dampers

If duct work requires multiple dampers for a single zone, up to 5 dampers may be wired in parallel.

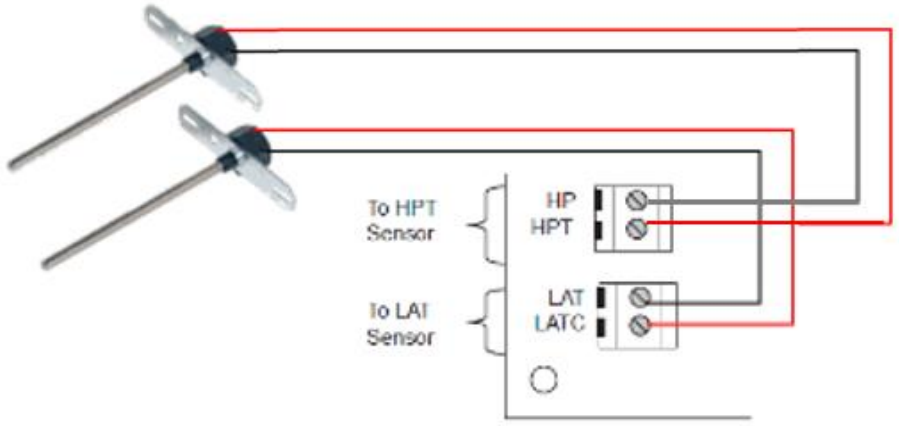
The 45°degree actuators on round ducts have their mechanical stops set at 45° degrees. **DO NOT CHANGE THIS SETTING**. Doing so will allow the actuator to close when it is trying to open. If an actuator is removed, it must be properly aligned when it is reinstalled. Do this by rotating the actuator and the blade to their closed positions and then tightening the actuator to the shaft. This assures alignment at the closed position. (Pressing the blade release button releases the motor and allows the actuator to be manually turned.)

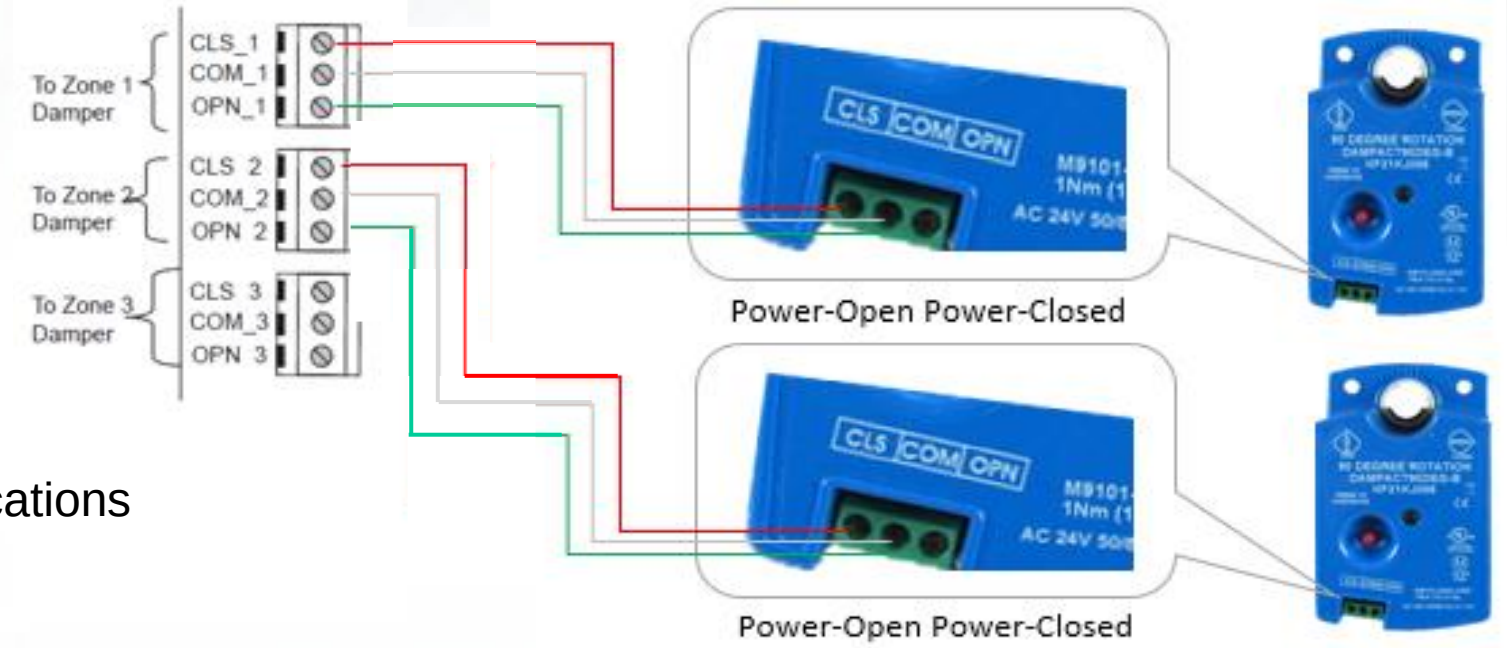
Comfort™ & Legacy™ Three-Zone Dampers

Whenever condensation might occur, it is recommended that plastic actuator covers (Part# DAMPACTXXCOV) be used over the actuator. These covers can help prevent condensation on actuators by locking out ambient humidity. Insulation may be applied over the cover to minimize heat transfer.

To install, place the cover over actuator and seal in place over the surrounding insulation with duct tape on all four sides. Sealing need not be perfect because there will be positive pressure inside the cover. Do not mount the dampers with their actuators hanging directly beneath the ductwork. It is best to mount the actuator facing in either the three or nine o’clock position.

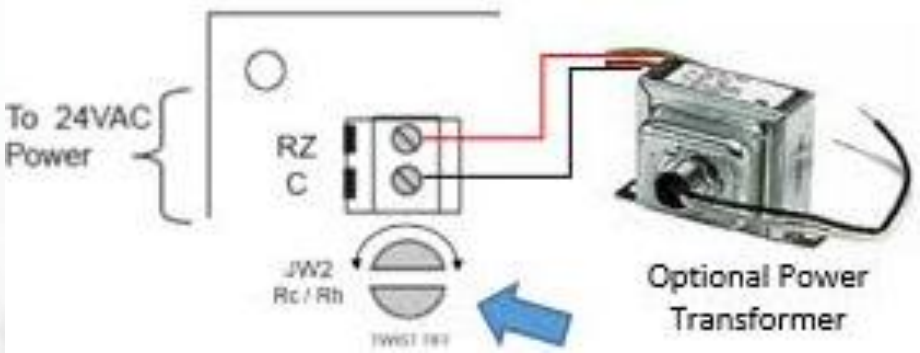
Comfort™ & Legacy™ Three-Zone Accessory Wiring





- You will need to install the LAT Sensor

*HPT Sensor is only required in HP applications



- The transformer is optional, and power can be utilized from the system transformer.

- The Dampers are Power-Open/Power-Closed. Our Dampers are 16 position Dampers (***YOU CAN NOT A MIX DIFFERENT BRAND DAMPES TOGETHER***)

Comfort™ & Legacy™ Three-Zone Accessory Wiring

Install Leaving Air Temperature (LAT) Sensor

The supplied LAT sensor must be installed for normal operation. Heat Pump systems may use an optional HPT (heat pump temperature) sensor for added protection. These sensors protect the equipment when leaving air temperatures approach excessive levels. Locate LAT sensor in main supply trunk after heating and cooling coil and before bypass damper and first branch. The LAT sensor is radiant shielded to prevent heat from affecting correct air temperature.

1. Drill a 1/4-in. hole at location in supply trunk where sensor will be installed.
2. Insert sensor in hole and use as a template to mark the 2 mounting holes.
3. Drill two 1/16-in. holes to accept No. 6 screws through pre-drilled holes in duct temperature sensor back plate.
4. Use 2 No. 6 sheet metal screws to mount duct temperature sensor to unit.
5. Connect sensor to 2-conductor wire using provided wire nuts.

Comfort™ & Legacy™ Three-Zone Accessory Wiring

Install Heat Pump Temperature (HPT) Sensor

The optional HPT sensor is recommended in all Heat Pump/Fan Coil installations. If an optional HPT sensor is not used, the 10K ohm resistor attached to the two HPT terminals on the board must be left in place. The HPT sensor measures the temperature of the air leaving the indoor coil. The sensor is to be installed downstream of the indoor coil but before the electric heaters. It can be installed through the wall of the fan coil or may be located entirely inside the fan coil near the blower inlet. Anchor firmly in place with cable ties so that it cannot interfere with the blower wheel.

Comfort™ & Legacy™ Three-Zone Wiring

All wiring in the Bryant Three-Zone system may be unshielded. Ordinary thermostat wire is ideal. Use 22 gage or larger for normal wiring. Lengths over 100 ft. should use 20 gage or larger wire.

Each damper actuator requires 3 conductors. The connection to thermostats and equipment (furnace or fan coil) could require as many as 8 conductors for a multi-stage installation. The leaving air temperature (LAT) and heat pump temperature (HPT)—*(used with heat pumps only)* sensors require 2 conductors each.

Comfort™ & Legacy™ Three-Zone Wiring

Step 1—Wire Thermostats

a. All zone thermostats are wired identically, so only the Zone 1 thermostat is shown on the wiring diagrams.

Step 2—Wire Equipment

a. Make each connection as shown at the indoor and outdoor units

Step 3—Wire Dampers

a. Each damper has three connections: Close, Open, and Common. Suggested colors are Close = red; Open = green; Common = white.

Step 4—Wire Remainder

Connect the LAT sensor to the LAT and LATC terminals. Polarity does not matter. If used, connect the HPT sensor to the HPT and HPTC terminals. If the HPT sensor is not used, you **must** leave the 10K ohm resistor connected in its place.

Comfort™ & Legacy™ Three-Zone Wiring

Fig. 10 - Shows the 3-Zone AC Control wiring. It supports only 1 stage cooling and 1 stage heating.

Fig. 11 - Shows that the 3-Zone HP/2S Control may be used in 1 stage cooling and 1 or 2-stage heating applications. For 2-stage heating, the stat may be a 2-stage heat AC stat, or a HP stat converted to AC. (Carrier & Bryant HP stats can be field converted to 2 stage heat AC stats.)

Fig. 12 - Shows the conventional HP system, using a HP stat. Only single stage auxiliary heat is supported for heat pump systems. Using the HP stat allows control of emergency heat directly from the stat.

Fig. 13 - Is also a HP system but uses an AC stat with 2-stage heating instead of a HP stat. (Carrier & Bryant HP stats can be field converted to 2-stage heat AC stats.) Here, emergency heat can only be selected by a switch on the 3-Zone Control.

Fig. 14 - Is a 2 speed AC system and may have 1 or 2 stages of heat. An HP/2S Control and a 2S stat set for AC operation must be used.

Fig. 15 - Is for a 2-speed HP. It requires an HP/2S Control and a 2S stat set for HP operation. Only single stage auxiliary heat is supported for heat pump systems.

Table 1—Wiring Diagram Selection Chart

WIRING DIAGRAM	EQUIPMENT	3-ZONE TYPE	STAT TYPE	SWITCH 9	SWITCH 10
Fig. 10	1-spd. AC, 1-stg. heat	AC	AC	not present	not present
Fig. 11	1-spd. AC, 1 or 2-stg. heat	HP/2S	AC	ON	ON
Fig. 12	1-spd. HP, 1-stg. aux heat	HP/2S	HP	OFF	OFF
Fig. 13	1-spd. HP, 1-stg. aux heat	HP/2S	AC (2 STG HT)	OFF	ON
Fig. 14	2-spd. AC, or 2-stg. heat	HP/2S	AC (2 STG / HT)	ON	ON
Fig. 15	2-spd. HP, 1-stg. aux heat	HP/2S	HP (2 STG /wAUX)	OFF	OFF

Comfort™ & Legacy™ Three-Zone Wiring

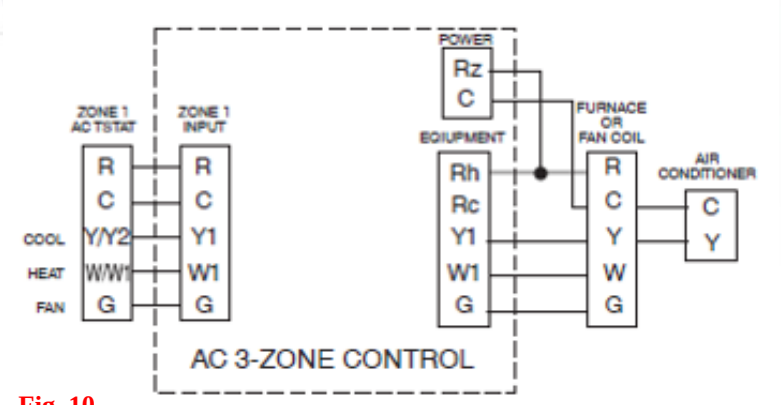


Fig. 10

A04196

AC 3-Zone Control, AC Stat, 1-Stg. AC with 1-Stg. Heat

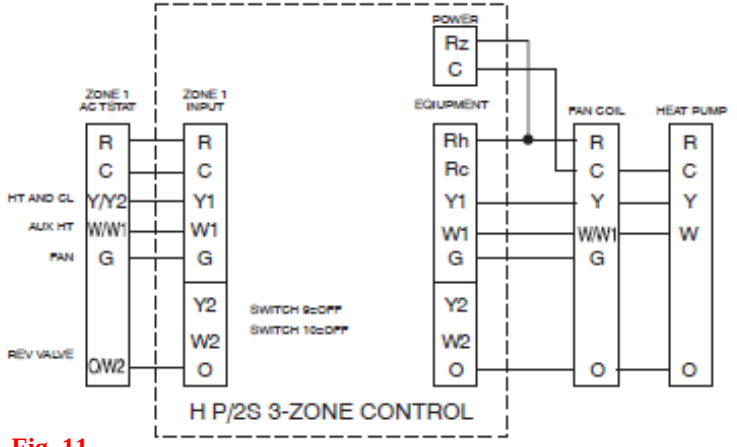


Fig. 11

A04198

HP/2S 3-Zone Control, HP Stat, 1-Stg. HP with 1-Stg. Aux. Heat

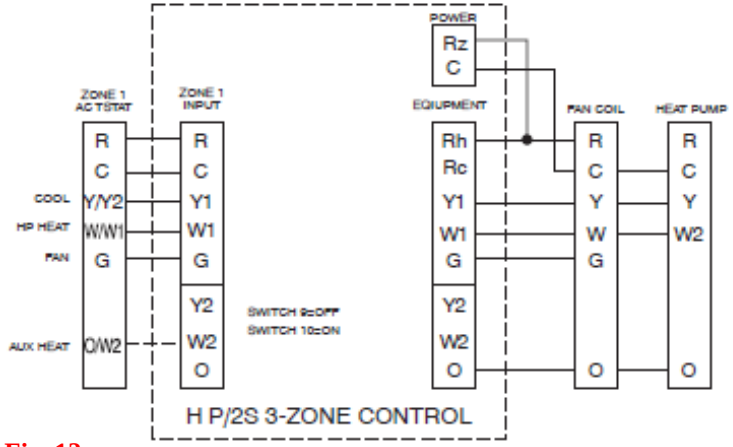


Fig. 12

A04199

HP/2S 3-Zone Control, HP Stat, 1-Stg. HP with 1-Stg. Aux. Heat

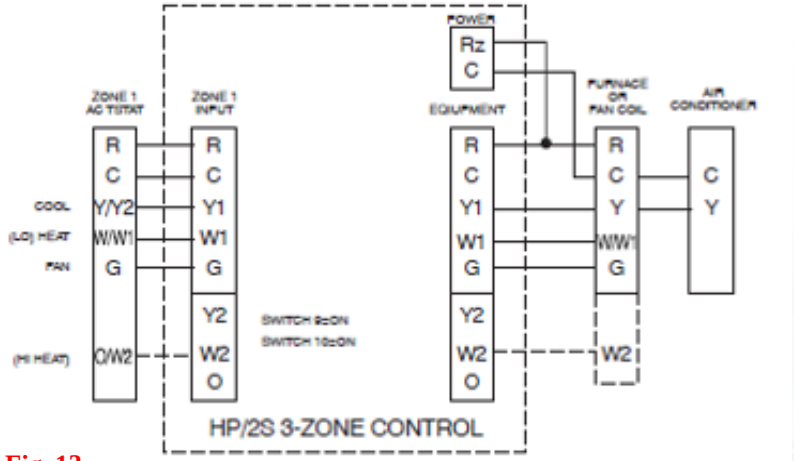


Fig. 13

A04197

HP/2S 3-Zone Control, AC Stat, 1-Stg. AC with 1- or 2-Stg. Heat

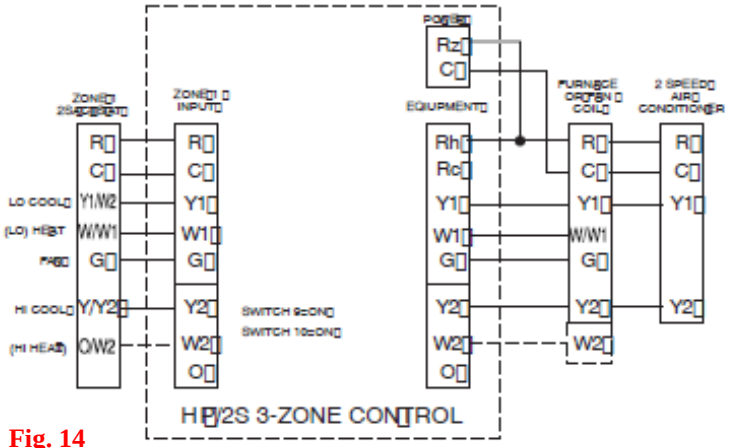


Fig. 14

A04200

HP/2S 3-Zone Control, AC Stat, 2-Spd AC with 1-or 2-Stg. Heat

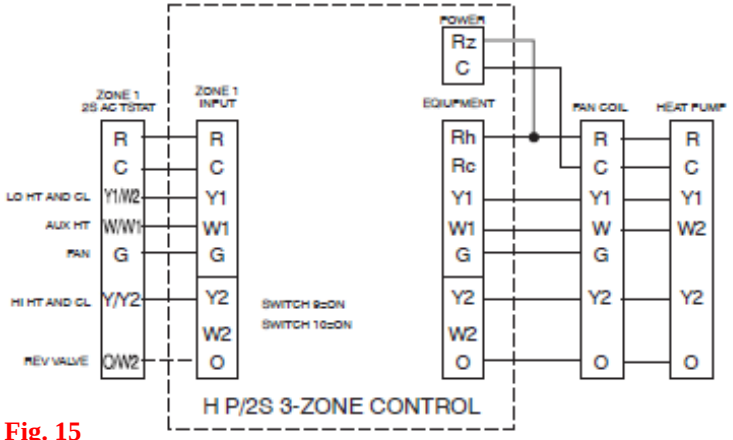
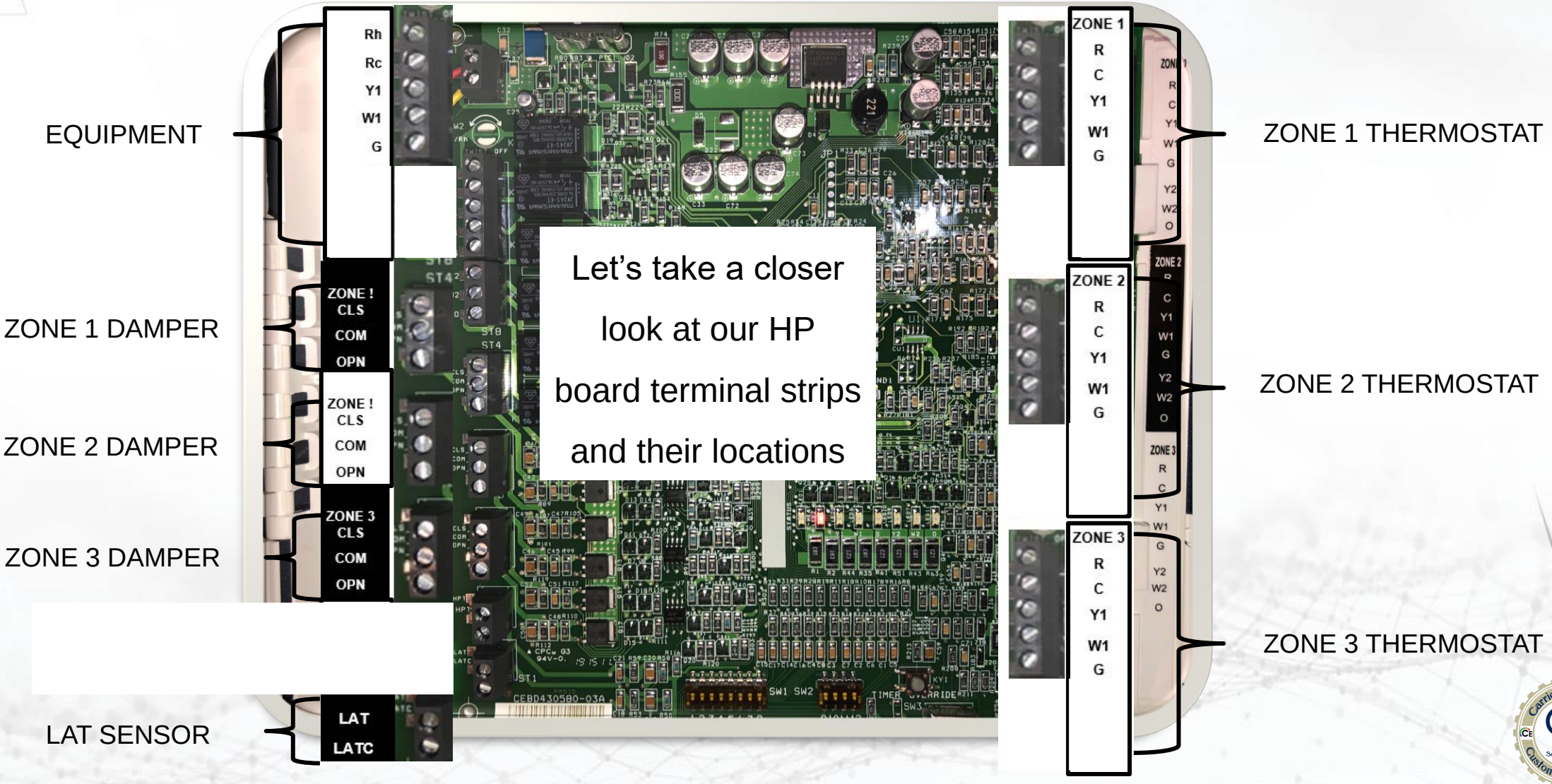


Fig. 15

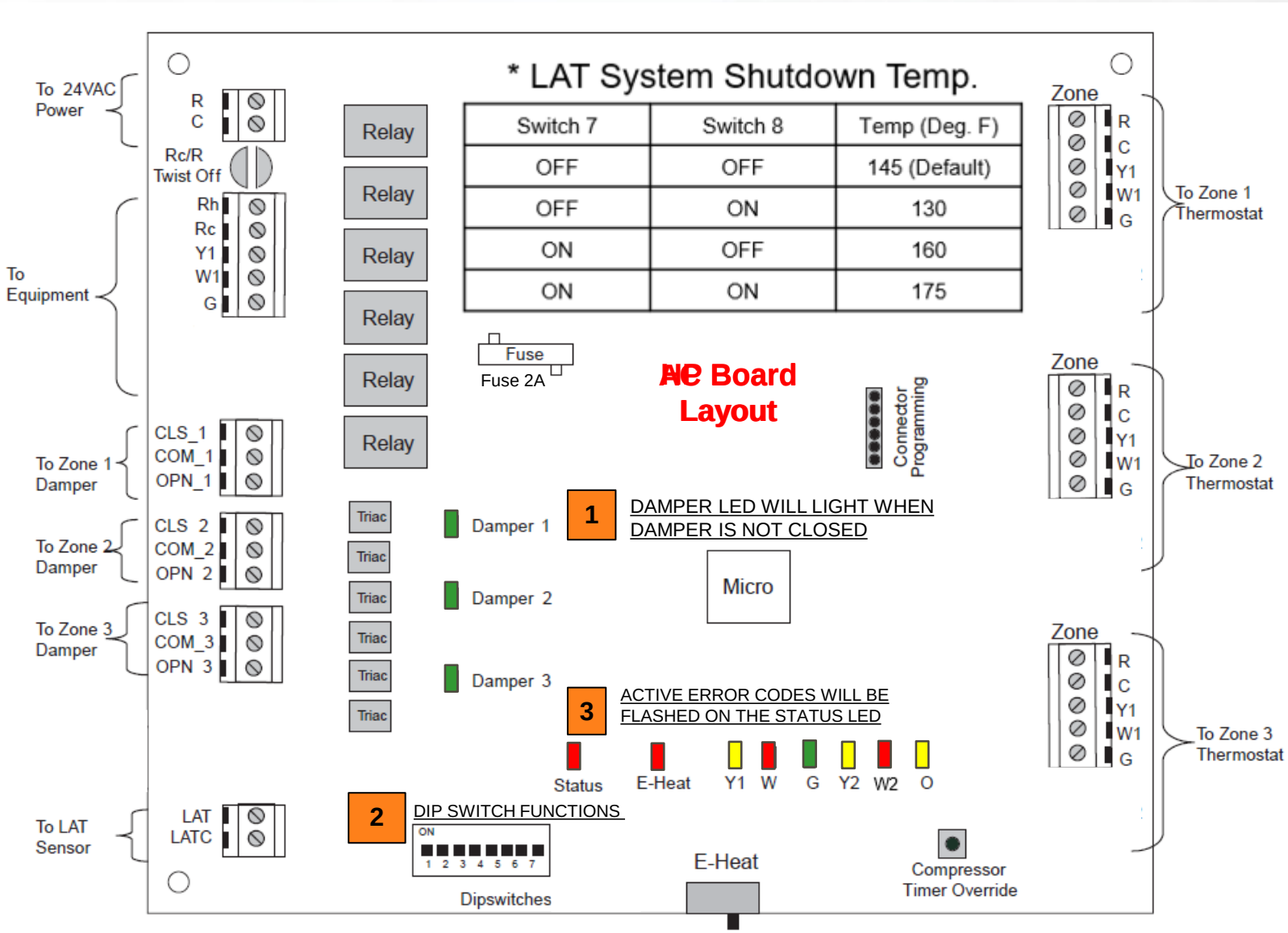
A04201

HP/2S 3-Zone Control, HP Stat, 2-Spd HP with 1-Stg. Aux Heat

Comfort™ & Legacy™ Three-Zone Wiring Connections



Comfort™ & Legacy™ Three-Zone Wiring Right Label



Comfort™ & Legacy™ Three-Zone Wiring Left Label

1 DAMPER LED WILL LIGHT WHEN DAMPER IS NOT CLOSED.

2 DIP SWITCH FUNCTIONS

Dip Switch Position	Function (OFF)	Function (ON)
1	Auto Changeover Timer Active	Auto Changeover Timer Disabled
2	Auto Changeover 20 Minutes	Auto Changeover 30 Minutes
3	Auto Changeover X 1	Auto Changeover X 0.5
4	Normal Operation	Installer Test Mode
5	Zoning Active	Zoning Disabled
6	Fan with G is Disabled	Fan with G is Enabled
7	LAT (*See Chart at Right)	LAT (*See Chart at Right)
8	LAT (*See Chart at Right)	LAT (*See Chart at Right)
9	HP Equipment	AC Equipment
10	HP Thermostat	AC Thermostat
11	HPT/LAT Safeties Enabled	HPT/LAT Safeties Disabled
12	Reversing Valve Active in Cooling (O)	Reversing Valve Active in Heating (B)

3 ACTIVE ERROR CODES WILL BE FLASHED ON THE STATUS LED

(Status LED will flash the Tens digit, pause 2 seconds, flash the Ones digit, pause 4 seconds and repeat.)

Tens = 1, Ones = overload number (1-7)	LAT Overload Condition
Tens = 2, Ones = overload number (1-7)	HPT Overload Condition
Tens = 3, Ones = 1	LAT Open
Tens = 3, Ones = 2	LAT Shorted
Tens = 3, Ones = 3	HPT Open
Tens = 3, Ones = 4	HPT Shorted
Tens = 4, Ones = 1	Invalid Switch 9, 10 Combination

LAT Limit Selection

To accommodate varying heat rises in furnaces and fan coils, the LAT limit adjustment has four selections: 130°, 145°, 160° and 175° degrees. In addition to these, the HPT limit is fixed at 115° degrees and the cooling limit (also sensed by LAT sensor) is 40 degrees. To select the proper limit, check or calculate the rated maximum rise of the equipment. Add 75 degrees to this value. Pick the closest LAT limit choice below this value and use dipswitches 7 and 8 to enter this value using:

TABLE 5—LAT LIMIT

Temperature	Switch 7	Switch 8
130°	Off	On
145° (Default)	Off	Off
160°	On	Off
175°	On	On

Comfort™ & Legacy™ Three-Zone Dip Switches

Dipswitches

Dipswitch 1- This determines if a minimum time must pass before the control is allowed to transition between heating and cooling or vice versa. If it is set to ON, there is no time requirement. Default is OFF.

Dipswitch 2 - This switch, together with dipswitch 3, determines the changeover time, effective if switch 1 is OFF. ON sets 30 minutes. OFF sets 20 minutes. Default is OFF.

Dipswitch 3 - This is a multiplier, modifying the time set on switch 2. ON multiplies the set time by 0.5. OFF multiplies the set time by 1.0. Default is OFF.

Dipswitch 4 - This selects the Installer Test Mode, used to check system operation. Details are provided in section **Installer Test**. ON selects Installer Test. OFF selects normal operation. Default is OFF.

Dipswitch 5 - Enables and disables zoning. ON disables zoning, with all dampers open and zone 1 thermostat controlling. OFF selects normal zoning operation. Default is OFF.

Dipswitch 6 - Selects G ON or OFF with W. Selecting ON causes G to be energized whenever W is energized. Selecting OFF does not bring on G with W. Default is OFF.

Comfort™ & Legacy™ Three-Zone Dip Switches

Dipswitches

Dipswitch 7 and 8 - Sets LAT limit temperature. See **LAT Limit Selection** for proper setting. Default is OFF = 145° limit. The following dipswitches are on the HP/2S control only:

Dipswitch 9 - Informs the control whether it is connected to a heat pump or an air conditioner. OFF selects HP. ON selects AC. Default is OFF (HP).

Dipswitch 10 - Informs the control of the type of thermostat being used. OFF selects HP thermostat. ON selects AC thermostat. A HP thermostat may **not** be selected if the system selection is AC. A 2-stage heat AC thermostat or a HP thermostat may be used with a single stage HP. Default is OFF.

Dipswitch 11 - Disables LAT and HPT safeties when ON. ON is intended only for emergencies. When ON is selected, there is no over/under temperature protection for the equipment. Default is OFF.

Dipswitch 12 - Informs the control whether the reversing valve is energized in cooling (O function) or heating (B function). ON selects B function. OFF selects O function. Default is OFF.

Comfort™ & Legacy™ Three-Zone Dip Switches

Dipswitch 1 Position	Action (OFF)	Action (ON)
1	Auto changeover Timer Active	Defeat Auto Changeover Timer
2	Auto Changeover 20 Minutes	Auto Changeover 30 Minutes
3	Auto Changeover Timer X 1	Auto Changeover Timer X .5
4	Normal Operation	Installer Test
5	Zoning Enabled	Zoning Disabled
6	Fan With W Disabled	Fan With W Enabled
7	LAT Setting	LAT Setting
8	LAT Setting	LAT Setting

Dipswitch 2 Position	Action (OFF)	Action (ON)
9	HP Operation	AC Operation
10	HP Thermostat	AC Thermostat
11	LAT and HPT Safeties Enabled	LAT and HPT Safeties Disabled
12	Reversing Valve Energized in Cooling (O)	Reversing Valve Energized in Heating (B)

Comfort™ & Legacy™ Three-Zone System Operation

Mode and Damper Positions

The thermostats determine the system heating or cooling mode. The first call in any zone sets the mode to satisfy that call. It will remain in that mode until all calls in that mode are satisfied and the equipment has been off for the time set by the auto changeover time dipswitches. (See Timers section.)

In normal heating or cooling, the damper of any zone with a call in the current mode will be open and all other zones will be closed. When there is no call, any zone with its fan set to ON will be open, and any zone with its fan set to AUTO will be closed. If any zone fan is set to ON, the blower will be energized. If all fan settings are AUTO, the dampers will remain in their last position before the equipment turned off and the blower will be off. **(This normally means one damper open and all others closed.)**

When dampers are to move, all opening is done first, followed by all closing.

Stages

In multi-stage systems, the equipment stage is set by the greatest thermostat call but may be delayed by the control's cycle and staging timers. (See timers explanation below.) The AC Control supports only single stage heat and cool. The HP control supports two stage cooling, two stage furnace heating, and three stage HP heating (lo HP, hi HP, hi HP + aux heat.)

Comfort™ & Legacy™ Three-Zone System Operation

Emergency Heat

Emergency heat (aux heat without compressor heat) can be selected for a HP system by either of two ways: First, by selecting Eheat using the Eheat override switch on the HP Control, or second, selection of Eheat on each of the thermostats, provided they have the Eheat function. When either of these Eheat selections is made, a heating demand provides a W signal without a Y signal to the equipment.

NOTE: The second Eheat method requires HP thermostats and that they all must be set to Eheat.

Indicator LEDs

There are 7 indicator LEDs on the AC Control and an additional 3 on the HP/2S Control. Each damper has its own green LED which is ON when the damper opens due to a calling condition or partially open due to an LAT or HPT limit condition. Each equipment output has its own LED which is on when that output is energized. Y and O outputs are yellow, W outputs are red, and the G output is green. In addition, there is a status LED whose operation is described under the section Error Codes.

Comfort™ & Legacy™ Three-Zone System Operation

Timers

To control excessive equipment cycling or rapid staging up, the control has two timers. The cycle timer prevents the same stage from turning on within 10 minutes of the last time it turned on. This allows a stage to turn on for as short or as long as the thermostats request but will not allow more than six cycles per hour.

The staging timer prevents a higher stage from turning on until the next stage below it has been on for 15 minutes. This minimizes use of electric heat with heat HP systems.

There is also a timeguard timer which will not allow the compressor to be turned on until it has been off for five minutes.

A changeover timer, which can be set from 0 to 30 minutes, limits the control's ability to switch between heating and cooling. The opposite mode is prevented from coming on until the first mode has been satisfied for the selected time.

Comfort™ & Legacy™ Three-Zone System Operation

Timer Override

A momentary switch is located near the bottom of the control circuit board. Pressing it momentarily overrides all the system timers, allowing the control to immediately jump to the highest calling stage.

Temperature Limits and Sensors

Both the AC and HP controls have a LAT (leaving air temperature) sensor which is to be placed in the downstream air path of the heating
/cooling equipment. It is used in both heating and cooling to limit LAT to a safe value. It must be connected. The system will not operate without it. Its setting is fixed for cooling and is adjustable in four settings for heating. Selection of best setting is discussed under LAT Limit Selection.

The HP control also has an optional HPT Sensor (heat pump temperature) which is to be placed downstream of the coil but ahead of the electric heater. This sensor measures the temperature of the air leaving the coil during HP heating. It is not included with the control, but may be ordered separately as part number TSATXXSEN01-B. A 10K ohm resistor is factory installed in its place when the actual sensor is not used. In the HP control only, dipswitch 11 allows the installer to temporarily disable both the LAT and the HPT sensors. Disabling of these sensors is only to be done on a temporary basis.

Comfort™ & Legacy™ Three-Zone System Operation

Bypass

The purpose of a bypass is to ***limit noise*** in the duct system when the dampers are excessively restricting it. When a direct bypass (outlet air fed back directly into the return) is used, bypassing decreases entering air temperature in cooling and increases it in heating. Excessive bypassing will lead to limit trips, either through the LAT /HPT sensors or the equipment internal limits.

Setting the Bypass

Setting the bypass is a balance between too much noise (bypass trip pressure set too high) and excessive bypassing which will cause limit trips, diminishing performance. As a general rule, the bypass should remain closed as much as possible. It should never open when all the dampers are open and only open as much as needed to bring noise to an acceptable level when only one damper is open.

LAT Limit Selection

Cycling on internal equipment limits is to be avoided because it overstresses and can shorten the life of the equipment. Therefore, the LAT limit setting should be selected to trip below the equipment limit.
See System Setup for details on how to choose one of four available LAT limits.

Comfort™ & Legacy™ Three-Zone System Operation

Limit Levels and Actions

The response of the system to the LAT/HPT sensors are shown in Table 2. Cooling and HP limits are not adjustable. Looking at Table 2, there are eight limit level index numbers, 0 through 7. These represent the closeness of the actual LAT/HPT temperatures to the final shutdown limit. 0 represents no limit challenge while 7 indicates a final shutdown of the equipment. Note that progressive actions are taken by the control as the LAT/HPT limit is approached. Each action progressively reduces the limit challenge by increasing airflow. Normally, the system will stabilize at limit level 1 or 2 because opening all closed dampers 2 or 4 positions (out of 15) will reduce LAT to a level below its limit

Table 2 – Limit Temperature Levels and Actions

LIMIT LEVEL	0	1	2	3	4	5	6	7
Cooling Limit (40 deg) above	47	46	45	44	43	42	41	40
HP limit (115 deg) below	107	108	109	110	111	112	113	115
Heat Limit (130 deg) below	119	121	122	124	125	127	128	130
Heat Limit (145 deg) below	131	133	135	137	139	141	143	145
Heat Limit (160 deg) below	143	145	148	150	153	155	158	160
Heat Limit (175 deg) below	155	158	161	164	166	169	172	175
LIMIT ACTIONS								
"Closed" Damper Positions	0	2	4	6	8	10	12	14
Allowed stages (1 stg)	1	1	1	1	1	1	1	0
Allowed Stages (2 stg)	2	2	2	1	1	1	1	0
Allowed stages (3 stg)	3	3	3	2	2	1	1	0

Comfort™ & Legacy™ Three-Zone System Operation

Using Limit Level Indicator

The final setting of the bypass for best performance has always been something of a black art. The 3-Zone System has a new feature to simplify this adjustment. While the system is operating, these limit level numbers, if greater than zero, are flashed on the status LED.

Once the proper LAT limit choice is made based on equipment maximum rise, the limit level indicator assists in setting the bypass pressure adjustment.

Comfort™ & Legacy™ Three-Zone Installer Test Mode

Dipswitch 4 selects a special Installer Test Mode, designed to assist the installer (or service person) to commission the system. It verifies damper movement in proper zone and that the heating and cooling equipment operates properly at each stage. When this mode is selected, by moving dipswitch 4 to ON, the following sequence will be executed once:

Step 1 – Two minutes, one flash of status LED. The blower is energized with G, damper 1 opens, and other dampers are closed.

Step 2 – Two minutes, d damper 2 opens.

Step 3 – Two minutes, and damper 2 closes.

Step 4 – Two minutes, ns on. For HP control only, this is followed by iace) for two more minutes. For HP contro us aux heat) comes on for a third 2-minute peri

Step 5 – Two minutes, cooling turns on for 2 minutes. For HP board inutes.

At the end of Step 5, th uence, the switch must be moved to OFF and t rocedure above will be followed, except all the

Dipswitch Settings

Dipswitch 1 Position	Action (OFF)	Action (ON)
1	Auto changeover Timer Active	Defeat Auto Changeover Timer
2	Auto Changeover 20 Minutes	Auto Changeover 30 Minutes
3	Auto Changeover Timer X 1	Auto Changeover Timer X .5
4	Normal Operation	Installer Test
5	Zoning Enabled	Zoning Disabled
6	Fan With W Disabled	Fan With W Enabled
7	LAT Setting	LAT Setting
8	LAT Setting	LAT Setting

Comfort™ & Legacy™ Three-Zone System Setup

Step 1 – Read the thermostat Installation Instructions and be sure to complete the required setup of these devices before using them to bring on the equipment.

Step 2 – There are 8 dipswitch settings on the AC zone control and an additional 4 on the HP board. Below is a table summarizing their function. Below the table is a more detailed description of what each does and how to set it properly for your application.

Table 3 – Dipswitch Settings

Dipswitch 1 Position	Action (OFF)	Action (ON)
1	Auto changeover Timer Active	Defeat Auto Changeover Timer
2	Auto Changeover 20 Minutes	Auto Changeover 30 Minutes
3	Auto Changeover Timer X 1	Auto Changeover Timer X .5
4	Normal Oper	
5	Zoning Ena	
6	Fan With W Di	
7	LAT Settir	
8	LAT Settir	

Table 4 – Dipswitch Settings for HP Control Only

Dipswitch 2 Position	Action (OFF)	Action (ON)
9	HP Operation	AC Operation
10	HP Thermostat	AC Thermostat
11	LAT and HPT Safeties Enabled	LAT and HPT Safeties Disabled
12	Reversing Valve Energized in Cooling (O)	Reversing Valve Energized in Heating (B)

Table 5 – LAT Limit

Temperature	Switch 7	Switch 8
130	OFF	ON
145 (default)	OFF	OFF
160	ON	OFF
175	ON	ON

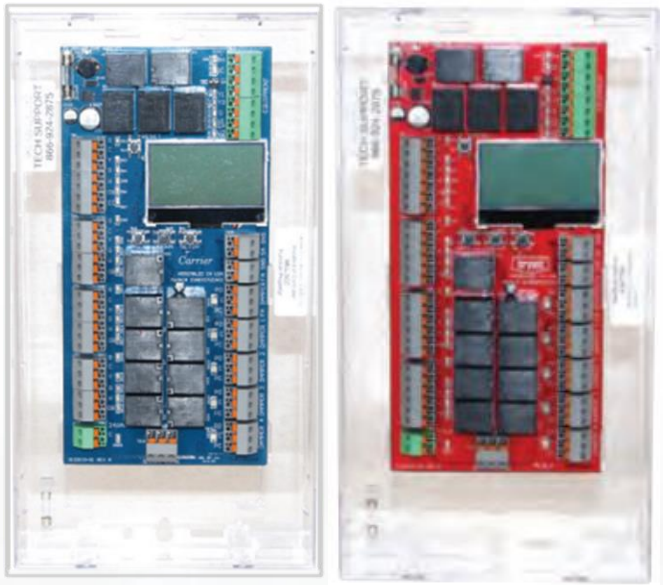
S ryin
li and
fi sed
li the
c psw
S be se
c call from the smallest zone
a forces the largest amount of
a s. Adjust the bypass
p ne level of noise and airflow
in that zone is acceptable. If tting.

Performance™ & Preferred™ Series Installation

Introduction

The Carrier 4-Zone system allows the air conditioning and heating equipment to control temperatures in 4 distinct spaces or zones within a building. Each zone has independent temperature settings controlled by a conventional thermostat.

Each zone system is comprised of a 4-zone controller and a duct temperature sensor. The comfort temperature settings can change automatically, through the use of schedules if programmable thermostats are selected. This allows the Carrier 4-Zone to change the temperature settings in zones to reflect occupancy or usage. The Carrier 4-Zone system uses motorized air volume control dampers (also called zone dampers) to regulate the flow of conditioned air into the zones.



PERFORMANCE & PREFERRED
SERIES FOUR-ZONE CONTROL PANEL
ZONECC4ZCN01
ZONEBB4ZCN01

Performance™ & Preferred™ Series Installation

Configuration Options:

- **Option #01** Set board function - Main or Expansion
- **Option #02** Set expansion address
- **Option #03** Set system type
- **Option #04** Set temperature display (Fahrenheit or Celsius)
- **Option #05** Set equipment stage (two-stage system ONLY)
- **Option #06** Set thermostat type (heat pump system ONLY)
- **Option #07** Set reversing valve actuation
- **Option #08** NOT USED/FOR FUTURE USE
- **Option #09** Set gas high temp cutout (gas and electric furnace ONLY)
- **Option #10** Set low temp cutout

Performance™ & Preferred™ Series Installation

Configuration Options:

- **Option #11** Set heat pump high temp cutout (heat pump system ONLY)
- **Option #12** Set aux. heat cut-in temp (single-stage heat pump ONLY)
- **Option #13** Set aux. heat cut-in time (single-stage heat pump ONLY)
- **Option #14** Set Fresh Air mode - on or off
- **Option #15** Set Fresh Air temperature set point (ONLY if Fresh Air turned ON)
- **Option #16** Set fresh air minutes per hour (ONLY if Fresh Air turned OFF)
- **Option #17** Set fresh air sensor mode - on or off (ONLY if fresh air minutes are greater than ZERO)
- **Option #18** Set fresh air low-temp lockout (ONLY if fresh air sensor mode is ON)
- **Option #19** Set fresh air high-temp lockout (ONLY if fresh air sensor mode is ON)
- **Option #20** Set dual fuel heat pump outdoor low-temp lockout (dual fuel system ONLY)

Performance™ & Preferred™ Series Installation

Configuration Options:

- **Option #21** Set second stage lockout - on or off (two-stage equipment ONLY)
- **Option #22** Set zone 1 priority
- **Option #23** Set auto changeover time - 10 or 15 minutes
- **Option #24** Disable aux. heat staging above 40 degrees outside air (heat pump systems ONLY)
- **Option #25** Allow zone 1 thermostat staging (two-stage systems ONLY)
- **Option #26** Set 2nd stage cut-in time based on time only (OFF or ON)
- **Option #27** Set 2nd stage cut-in based on time and temperature
- **Option #28** Set 2nd stage cut-in time (time only)

Performance™ & Preferred™ Series Installation

Mounting

Mount the controller near the HVAC equipment. It can be mounted on a wall, stud, roof tress or the supply ductwork. It can be mounted in any orientation, including flat on top of the supply plenum. When mounting in a vertical position it should be leveled for a good appearance.

1. Remove the clear lid from the enclosure.
2. Place the controller in the desired position and use the base as a template to mark the hole locations.
3. Attach the controller to the surface with the appropriate screws (not included). If attaching the controller to drywall or ductboard, use hollow wall anchors to secure in place.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution could result in damage to the unit.

Do not attempt to power the controller from the transformer in the indoor unit. Damage could occur.

Performance™ & Preferred™ Series Installation

Power

The system **REQUIRES A SEPARATE 24 VAC TRANSFORMER** (not included) for powering the controller, zone thermostats and dampers. It is recommended to install a fuse on the 24 VAC output from the transformer.

Transformer Sizing

The 24-volt transformer must be sized and fused based on the controller, the total dampers and the thermostats.

Table 2 – Power Examples

Device	Power Used
Performance™ Controller	10 VA
Power Open/Close Damper	3 VA
Typical Thermostat	2 VA

Table 3 – Fuse Sizing Rule of Thumb

Transformer VA	Fuse Size
40	2 amp
75	3 amp
100	4 amp

Example Transformer Calculation:

1 – 4-zone Controller
+ 4 – Power Open/Power Close Dampers (3 VA x 4)
+ 4 – Thermostats (2 VA x 4)
= 30 VA total

Performance™ & Preferred™ Series Installation

Thermostat

Install thermostats using instructions provided with thermostats. **IMPORTANT**: Battery-powered thermostats should not be used with this zoning control. Only 24VAC thermostats powered via R and C should be used.

The controller is compatible with most thermostats that have a common connection. The controller will use time and supply air temperature to automatically manage staging. This eliminates the need for multi-stage thermostats.

On HEAT PUMP equipment ONLY, either a Gas/Electric or Heat Pump thermostats can be used. It is recommended to use a Heat Pump thermostat with an Emergency Heat switch on Zone 1 for all heat pump installations. An emergency heat call can ONLY be initiated from the ZONE 1 THERMOSTAT.

Performance™ & Preferred™ Series Installation

Transformer to Control Board Connection

1. Connect either single stage gas/electric or heat pump thermostats to each terminal blocks labeled Zone 1 TSTAT, Zone 2 TSTAT, Zone 3 TSTAT and Zone 4 TSTAT (Fig. 2).

2. The Zone 1 TSTAT will operate Damper 1. The Zone 2 TSTAT will operate Damper 2, etc.

3. Using 18 Gauge Solid Thermostat Wire, strip 1/2 inch of insulation from each wire. Hold down the orange button and push the thermostat wire into the SCREWLESS terminals on the control board.

4. Connect the other end of the thermostat wire to the corresponding terminals on the thermostat.

5. To use the EC terminal on the Zone 1 TSTAT, a separate switch must be used to supply 24 VAC to this terminal. You may also use a 2-stage thermostat on Zone 1 ONLY if you want to control Zone 1 staging by connecting Y2 from the thermostat to the EC terminal on the Zone 1 terminal block. (See Option #25)

Performance™ & Preferred™ Series Sensor Installation

Supply Air Temperature Sensor (SAS)

Sensor Placement (Location)

Gas/Electric - Electric/Electric

The SAS should be installed in the Supply Air Plenum where it will sense AVERAGE air temperature within the Plenum. The ideal placement is 2 to 4 feet beyond the evaporator coil. Make sure the sensor is in the air stream and secured properly.

Heat Pump

The SAS should be located inside the air handler cabinet AFTER the evaporator coil but BEFORE the blower. Make sure the sensor is in the air stream and properly secured.

Return Air Sensor (RAS)

Sensor Placement (Location)

The RAS should be installed in the return air plenum before the blower or evaporator coil section where it will sense the AVERAGE return air temperature entering the air handler or furnace. Make sure the sensor is in the air stream and properly secured.

Performance™ & Preferred™ Series Sensor Installation

Optional Fresh Air/Outdoor Air Sensor (FAS)

The OAS should be located under the eave of the structure or under a ledge on the outdoor unit where it will not be in direct sunlight. Secure the sensor in place and connect to the controller with thermostat wire and the included plug-in connector. Best location for FAS is the North Side.

You can use either the Return Air Sensor (RAS) or the Optional Fresh Air/Outdoor Air Sensor (FAS), but not both as they use the same terminal connection.

IMPORTANT!! IF THE SUPPLY AIR SENSOR IS NOT PLUGGED INTO THE ZONE BOARD, THE BOARD WILL ONLY ACCEPT A CALL FROM THE ZONE 1 THERMOSTAT AND WILL HOLD ALL OF THE DAMPERS OPEN. This function allows the system to operate and condition all zones if the supply air sensor fails or becomes damaged.

Performance™ & Preferred™ Series Installation

A/C - Gas Furnace and A/C - Electric Furnace

Using 18-gauge solid thermostat wire, connect the Equipment Control Wires from the Indoor Unit to the EQUIPMENT terminal block on the top right corner of the Controller. Use the terminal labeled W1/EH for first stage heat. If using a two-stage furnace, connect W2/OB to W2 on the indoor equipment. Connect R from the equipment to **RC** on the controller.

Connect C from the equipment to C on the Controller.

IMPORTANT: The C terminal from the equipment must be connected to the controller from the equipment for the RC AND RH LEDs to illuminate. Power from the equipment transformer will illuminate the

RC and RH terminal LEDs, indicating the equipment transformer is connected.

NOTE: If using a 2-transformer system, remove the black jumper located just below the RC/RH LEDs to separate the power inputs.

Performance™ & Preferred™ Series Installation

Electric Heat Pump

Using 18-gauge solid thermostat wire, connect the Equipment Control Wires from the Indoor Unit to the EQUIPMENT terminal block on the top right corner of the Controller. Use the terminal labeled W1/EH for the auxiliary heat strips.

Connect the W2/OB terminal to the O/B terminal on the equipment (REVERSING VALVE). Connect R from the equipment to RC on the Controller. Connect C from the equipment to C on the Controller.

IMPORTANT: The C terminal from the equipment must be connected to the controller from the equipment for the RC AND RH LEDs to illuminate. Power from the equipment transformer will illuminate the RC and RH terminal LEDs, indicating the equipment transformer is connected.

NOTE: The jumper for RH/RC should NOT be removed on a heat pump system.

Performance™ & Preferred™ Series Installation

Bypass Elimination on Single-Speed Systems

When the board is set up for 1-speed outdoor unit, the board will energize Y-2 to the equipment if more than one zone is calling. This allows the use of a 2-speed or multi-speed indoor unit with a Y-1 and Y-2 terminal. The indoor fan speeds can be set up to run on a lower speed on Y-1, and a higher speed on Y-2, eliminating the need for a bypass damper.

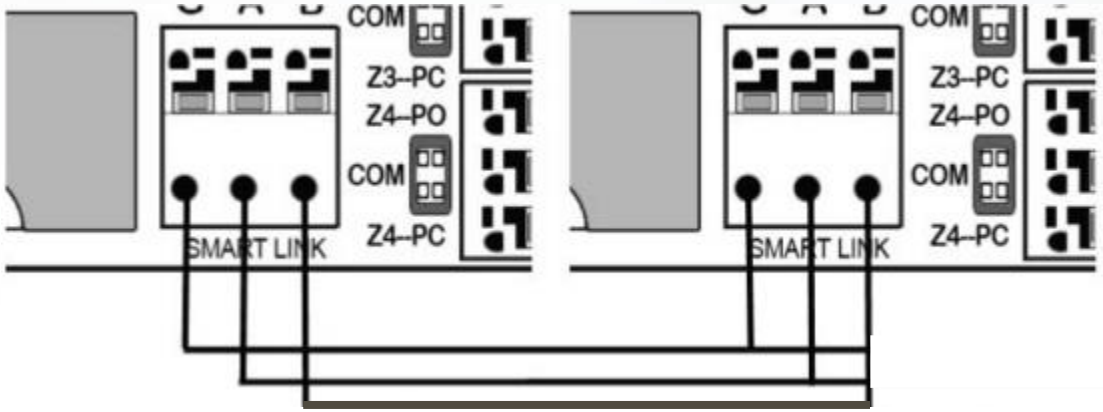
Expansion Module

When using the controller as an expansion module you must connect 24 VAC input power to the expansion controller(s) (Fig. 7). Power IS NOT supplied by the communication cable. If using only one transformer to supply the master and expansion controller, calculate the power needed for all boards, thermostats and damper actuators to determine the correct size. (See Page 2 in the Installation Guide). On larger installations, more than one transformer may be needed.

A communication cable must be installed via the 3-pole plug-in connector at the bottom of the board. Use standard18-3 thermostat wire.

Performance™ & Preferred™ Series Installation

Expansion Module



After all wiring is complete, turn on the 24 VAC input power to all the controllers. On the slave controller, push the setup button. Change the board type to **“EXPANSION”**. Press the setup button again to set the slave address.

The default expansion address is 1. Each controller will need its own address. The second expansion controller will be address 2. Press the setup button and set the equipment type. (If setting up for electric heat pump or dual fuel, the menu will ask you to set the thermostat type for each zone). Press the setup button to exit the configuration menu. The display will show that the controller is an “EXPANSION” and will show “COMM” at the bottom of the display. If “NO COMM” is displayed, check communication wiring connections.

After the expansion controller is configured, press the RESET button on all of the controllers. This will clear the communication bus and allow the expansion controller to make equipment calls.

Performance™ & Preferred™ Series Configuration and Setup

The controller has a state-of-the-art microprocessor for reliable control of the equipment and zone dampers.

The simple step by step setup eliminates the need for confusing dip switches. The full status back-lit LCD display guides you through each step of the setup process. Depending on the type of equipment selected, the display will show you each available Option for the system type selected.

Make sure that all wiring for the thermostats, zone dampers and equipment is complete. The RH and RC LEDs should be illuminated. The connectors from the Supply Air Sensor (SAS) should be plugged firmly into the receptacle marked SA SNS on the controller. If using a Return Air Sensor (RAS) or Fresh Air Sensor (OAS) the connectors should be firmly plugged into the receptacle marked FA SNS on the controller. If using the controller as an expansion module, the wiring should be firmly plugged into the receptacle marked SMART LINK at the bottom of the controller. Apply power from the 24VAC transformer connected to the PWR connector on the controller. The controller will power up and display a splash screen on the LCD display. The red R LEDs for all thermostats and the green LEDs for all dampers will illuminate. The display will then show the factory default settings for the controller.

IMPORTANT: If you go past the desired setup Option, press the RESET button to start over.

Performance™ & Preferred™ Series Configuration and Setup

Press the SETUP button to enter the configuration mode. The screen will display the SETUP MENU and Option #01 - SET BOARD FUNCTION.

The factory default is MAIN. If using the controller as an expansion module, press the UP or DOWN button to change to EXPANSION. Press the SETUP button to proceed to the next Option. (NOTE: If using the controller as an expansion module, the next selection will be Option #02 - SET EXPANSION ADDRESS.) Each expansion board will have its own address, numbered 1 or 2. The default address is 1. If using more than one expansion board, the second expansion board will be address 2.

Press the SETUP button to proceed to the next Option.

There are different configuration settings for:

1. **A/C Gas Heat and A/C Electric Heat**
2. **Electric Heat Pump - Electric Auxiliary Heat**
3. **Dual Fuel Heat Pump (Hybrid Heat)**

We will not go through all the different configuration settings in this presentation, but they will be provided in a separate document that you can download with the class material.

Performance™ & Preferred™ Series Sequence of Operation

Single Stage Cooling (A/C and Heat Pump)

On any cooling call from one of the thermostats, the controller will energize the Y1 and G outputs to the equipment. The damper for the zone calling will remain open, and the damper for the zone NOT calling will close. During this call, if the other zone makes a cooling call, the zone damper will open. When a thermostat becomes satisfied, and if a call exists from the other thermostat, the damper on the satisfied zone will close. Once the other thermostat becomes satisfied, the controller will de-energize the Y1 and G outputs to the equipment, and both dampers will open (system idle).

Low Temp Cutout

During a cooling call, if the Supply Air Temperature falls BELOW the LOW TEMP CUTOUT temperature, the controller will de-energize the Y1 output to the equipment and will leave the G output energized. A 3-minute DELAY TIMER will be displayed. After the 3-minute delay, if the Supply Air Temperature has risen ABOVE the LOW TEMP CUTOUT temperature, the controller will re-energize the Y1 output to the equipment.

Performance™ & Preferred™ Series Sequence of Operation

Two Stage Cooling (A/C and Heat Pump)

The controller utilizes built-in intelligent SmartStaging. This allows the use of single-stage thermostats on both zones. The controller will energize and de-energize second stage based on elapsed run time and the supply air temperature, or elapsed time only. If set up for time and temperature, on an initial call for cooling, the controller will energize the Y1 and G outputs to the equipment. After an initial run time of 8 MINUTES, (adjustable to 6 mins or 4 mins) if the supply air temperature has not fallen to at least 10° F (6° C) above the low temp cutout, the controller will energize Y2 to the equipment. Y2 will stay energized until the supply air temperature falls below 4° F (1° C) above the low temp cutout. The controller will then turn off Y2. This cycle will continue as the supply air temperature rises and falls. If set up for time only, the controller will energize Y2 after an initial run time of 20 mins, 15 mins or 10 mins (Fig. 8).

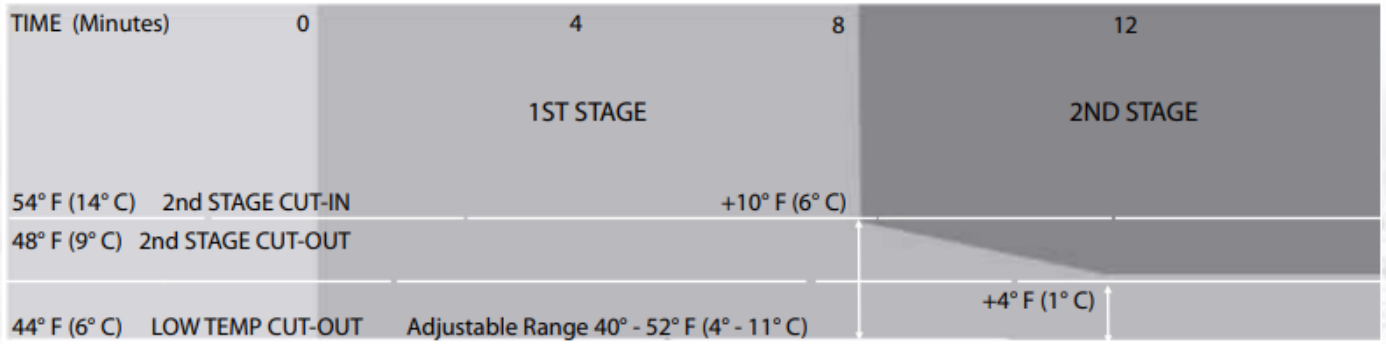


Fig. 8 – A/C and Heat Pump Cooling Example Based on Factory Settings

Performance™ & Preferred™ Series Sequence of Operation

Single Stage Heating (Gas & Electric Heat; NOT Heat Pump)

On any heating call from one of the thermostats, the controller will energize the W1 output to the equipment. After 90 SECONDS of initial run time, the controller will energize the G output to the equipment. If the ntroller will de-energize the W1 d the supply air temperature has output to the equipment.

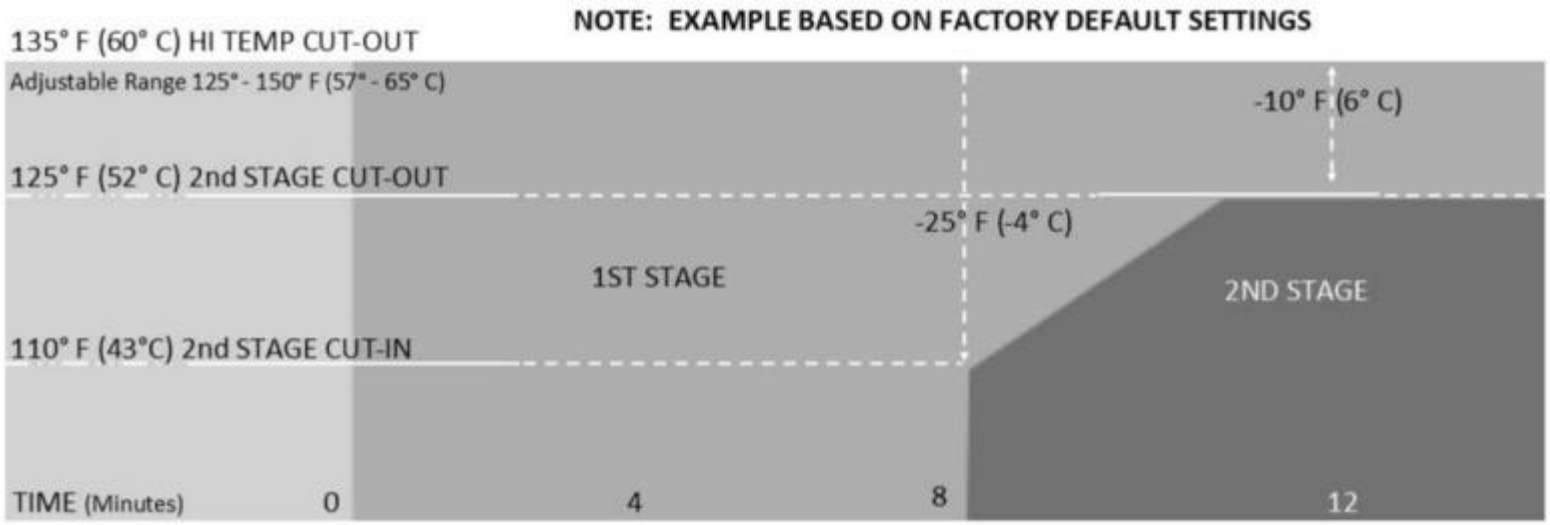


Fig. 9 – Gas & Electric Heat (not Heat Pump) Example Based on Factory Settings

Two Stage He

On any heating c to the equipment. After o the equipment. After o at least 25°F BELOW the HI T em will run in second stage he TOUT. The controller will then de-energize W2. If the supply air temperature falls to 25°F below the HI TEMP CUTOUT, the controller will re-energize W2. This staging will continue until the thermostat is satisfied and the controller turns off the equipment (Fig. 9).

Performance™ & Preferred™ Series Sequence of Operation

Single Stage Heating - Heat Pump

On any heating call from one of the thermostats (Y if using heat pump thermostats, W if using gas/electric thermostats) the controller will energize the Y1 and G outputs to the equipment. A 3-minute minimum run timer will be displayed. After 6 MINUTES of initial run time (Factory default. Adjustable 3-6 minutes) if the supply air temperature has not reached 90° F (32° C) (Factory default. Adjustable 90–100° F [32–37° C]) the controller will energize the W1 output to the equipment (Auxiliary Heat). The equipment will continue to run in AUXILIARY HEAT until the supply air temperature rises to 10° F above the AUXILIARY HEAT CUT-IN TEMPERATURE. (Adjusts with Aux. Heat Cut-In Setting). The controller will continue to stage auxiliary heat on and off based on supply air temperature. If the supply air temperature rises above the HI TEMP CUT-OUT temperature, the controller will de-energize the Y1 output to the equipment and leave the G output energized. A 3-minute compressor delay timer will be displayed. After 3 minutes, if the supply air temperature has fallen below the HI TEMP CUT-OUT temperature, the controller will re-energize the Y1 output to the equipment.

Performance™ & Preferred™ Series Sequence of Operation

Two Stage Heating - Heat Pump

On any heating call from one of the thermostats (Y if using heat pump thermostats, W if using gas/electric thermostats) the [illegible] utes of initial run time, if the s[illegible] TEMP CUTOUT), the c[illegible]ne supply air temperature rea[illegible]oller will then de-energize Y2. [illegible] temperature. After 6 MINUTE[illegible]ne controller will energize W1 to [illegible]ature reaches 100°F (38°C) (2[illegible]

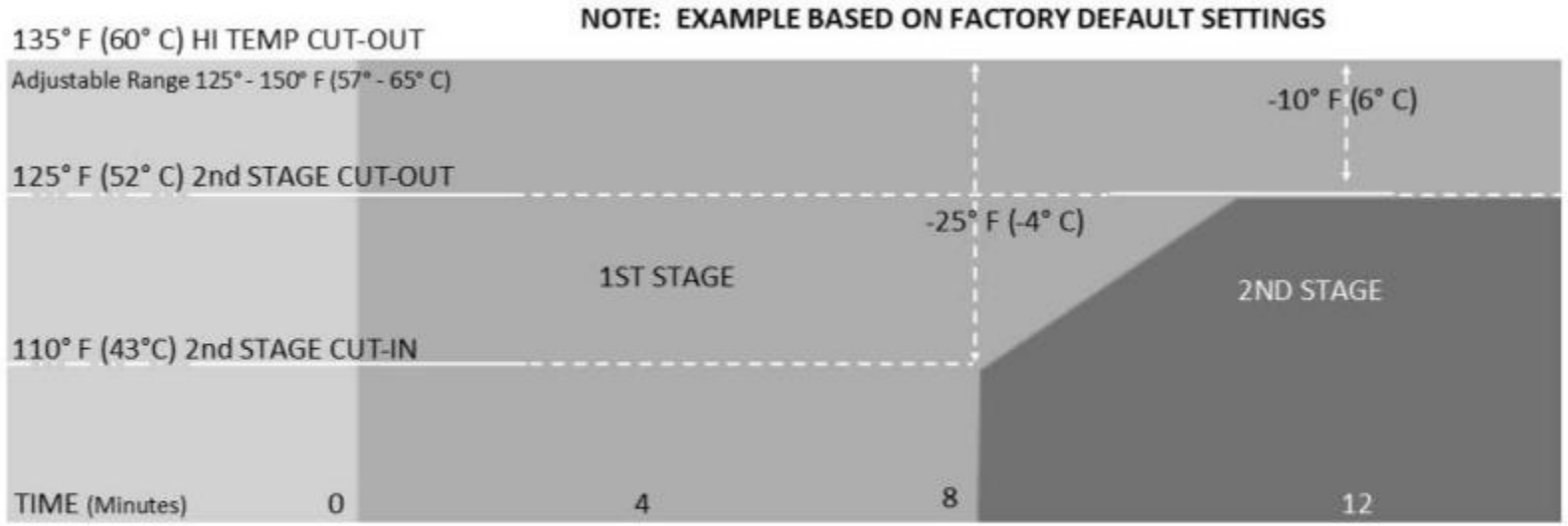


Fig. 10 – Two Stage Heating (Heat Pump) Example Based on Factory Settings

NOTE: AUX hea[illegible]eat pump equipment. The second stage and AUX heat staging temperatures move up and down based on the high temp cutout setting.

Performance™ & Preferred™ Series Sequence of Operation

Single Stage Heating (Dual Fuel Heat Pump)

On any heating call from one of the thermostats (Y if using heat pump thermostats [B with Y if Option #07 is set to B], W if using gas/electric thermostats) the controller will energize the Y1 and G [and B is Option #07 is set to B] outputs to the equipment. A 3-minute minimum run timer will be displayed. After 6 MINUTES of initial run time (Factory default. Adjustable 3-6 minutes, 10, 15 and 20 minutes) if the supply air temperature has not reached 90° F (32° C) (Factory default. Adjustable 90–100°F [32–37°C]) the controller will de-energize the Y1 output to the equipment and energize the W1 output to the equipment (Auxiliary Heat). The equipment will continue to run in AUXILIARY HEAT until the thermostat(s) calling is satisfied. If the supply air temperature rises ABOVE the HIGH TEMP CUTOUT, the controller will turn off W1 to the equipment. The fan will continue to run. After a 3-minute delay, if a call still exists and the supply air temperature has fallen BELOW the high temp cutout, the controller will re-energize W1 to the equipment.

ONCE THE CONTROLLER HAS SWITCHED TO AUXILIARY HEAT, THE CONTROLLER WILL STAY IN AUXILIARY HEAT UNTIL ALL CALLS ARE SATISFIED.

Performance™ & Preferred™ Series Sequence of Operation

Two-Stage Heating (Dual Fuel Heat Pump)

On any heating call from one of the thermostats (Y if using heat pump thermostats [B with Y if Option #07 is set to B], W if using gas/electric thermostats) the controller will energize the Y1 and G [and B is Option #07 is set to B] outputs to the equipment. After 4 minutes of initial run time, if the supply air temperature has not reached 105° (41°C) (15°F [-9°C] degrees below the HIGH TEMP CUTOUT), the controller will energize Y2 to the equipment. Y2 will remain energized until the supply air temperature reaches 115°F (46°C) (5°F [-15°C] below the HIGH TEMP CUTOUT). The controller will then de-energize Y2. The controller will continue to stage Y2 on and off based on the supply air temperature. After 6 MINUTES of initial run time, if the supply air has not reached at least 90°F (32°C), the controller will de-energize Y1 and Y2 and energize W1 to turn on auxiliary heat. W1 will remain energized until the thermostat(s) calling is satisfied. If the supply air temperature rises ABOVE the HIGH TEMP GAS CUTOUT, the controller will turn off W1 to the equipment. The fan will continue to run. After a 3-minute delay, if a call still exists and the supply air temperature has fallen BELOW the high temp cutout, the controller will re-energize W1 to the equipment.

ONCE THE CONTROLLER HAS SWITCHED TO AUXILIARY HEAT, THE CONTROLLER WILL STAY IN AUXILIARY HEAT UNTIL ALL CALLS ARE SATISFIED.

Performance™ & Preferred™ Series Sequence of Operation

NOTE: AUX heat time and temperature staging is not manually adjustable on two-speed heat pump equipment. The second stage and AUX heat staging temperatures move up and down based on the high temp cutout setting.

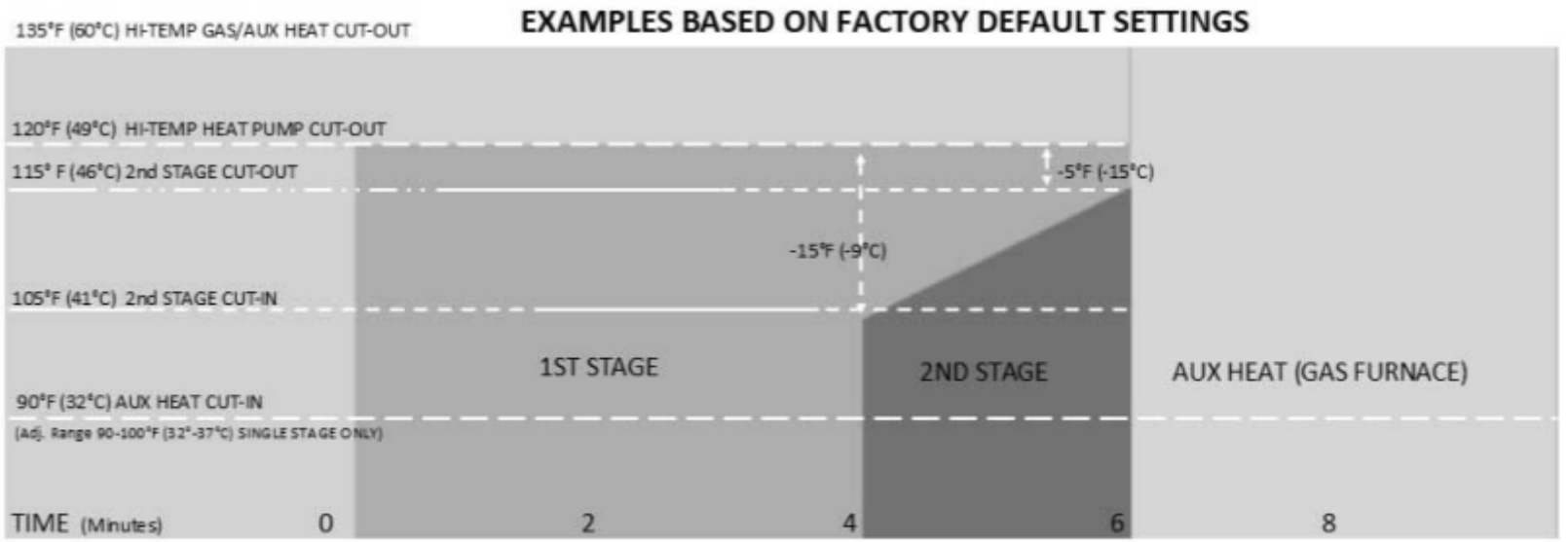


Fig. 11 – Dual Fuel Heat Pump Example Based on Factory Settings

Performance™ & Preferred™ Series Controller Features

Exclusive Equipment Test Mode

The controller can be put into an EQUIPMENT TEST MODE by powering the controller. After the IDLE screen appears, hold down the RESET BUTTON, then hold down the SETUP BUTTON, release the RESET BUTTON and then release the SETUP BUTTON. The controller will display TEST - IDLE -EC. The controller will now only accept calls form the ZONE 1 thermostat and will not operate the dampers. This allows the installer to set the bypass damper, check the refrigerant charge on the system and verify proper airflow thru the system. After all testing is complete, press and release the RESET button. The controller will reset and go into IDLE mode awaiting calls.

Emergency Heat- Heat Pump and Dual Fuel

Emergency heat can ONLY be initiated by a HEAT PUMP THERMOSTAT connected to the ZONE 1 thermostat input. A HEAT PUMP THERMOSTAT SHOULD ALWAYS be used for the ZONE 1 thermostat in heat pump applications. If the ZONE 1 thermostat calls for EMERGENCY HEAT, the controller will be LOCKED into emergency heat (AUX HEAT). ANY call for heat from either zone will turn on auxiliary heat. The controller can be UNLOCKED by making a call for compressor (heat or cool) from the Zone 1 thermostat.

Performance™ & Preferred™ Series Controller Features

Auto Changeover

It is possible to have one zone calling for cooling and the other zone calling for heating (opposing calls). When an opposing call occurs, a CHANGEOVER TIMER (10 or 15 minutes - Adjustable) will display on the screen. After the timer has reached zero, the system will go into PURGE MODE for 3-MINUTES. (See PURGE mode below). At the end of the 3-minute purge, the system will switch over to the other mode. If an opposing call still exists, the CHANGOVER TIMER will restart.

Purge

Purge occurs whenever the system is running with only one zone calling, and the other zone makes an opposing call. After the changeover time has elapsed the controller turns off the equipment and leaves the fan (G) energized. The last zone calling will remain open during the 3 MINUTE purge (countdown timer displayed on screen). This allows the temperature in the ductwork to equalize before starting the opposing call.

Minimum Run Time - Compressor

The controller features a MINIMUM RUN TIME anytime Y1 in energized to the equipment. This protects the compressor from damage caused by short-cycling.

Performance™ & Preferred™ Series Controller Features

Time Delay

The controller features a TIME DELAY MODE that is designed to protect the compressor from short cycling. The time delay is initiated each time the compressor is de-energized. A 3-MINUTE DELAY timer will be displayed on the screen during this time. The compressor CANNOT be restarted until the timer has counted down to zero. In addition, if using a GAS FURNACE and the supply air temperature rises ABOVE the high temp limit, the controller will de-energize W1 and keep G energized. A 3-MINUTE DELAY timer will be displayed on the screen during this time.

Economy Mode

The ECONOMY MODE (EC) input on the ZONE 1 TSTAT connector allows the use of a switch, occupancy sensor or dry contact to apply 24 VAC input to the EC terminal to put the controller into ECONOMY MODE. This prevents ZONE 2 from making equipment calls. ZONE 2 will only be able to open and close the damper. Only ZONE 1 will be able to make equipment calls. Most applications will not use this feature.

RH/RC Jumper

The RH/RC Jumper is factory installed on the TL-EZ4F Controller. If the equipment requires separate transformers for heating and cooling, REMOVE the jumper [JP1] located next to the “C” equipment connector.

NOTE: The jumper should **NOT** be removed for heat pump systems.

Performance™ & Preferred™ Series Controller Features

Fresh Air Mode - Option #14

When the Fresh Air Mode is turned on, the controller will open the Fresh Air and turn on G to the equipment if the outdoor temperature is below the Fresh Air Outdoor Setpoint (Option #15 -55° F (12° C) factory default. Adjustable range 50–75° F (10–24° C). During the cooling call, if the outdoor temperature rises ABOVE the outdoor setpoint, the controller will close the Fresh Air and turn on mechanical cooling.

Fresh Air Control - Option #16

The controller features on board Fresh Air Control. A 2-wire or 3-wire damper may be used. The timer is adjustable from 5 to 60 minutes per hour in 5-minute increments. The controller will open the fresh air damper anytime the controller energizes the G terminal to the equipment as long as minutes per hour remain. At the end of the hour, if run time minutes still exist (displayed on screen), the controller will turn on the G terminal to the equipment, open the fresh air damper, leave the zone dampers open and run until the remaining minutes have elapsed.

Exclusive Fresh Air Sensor Mode - Option #17

An outdoor Fresh Air Sensor may be plugged into the controller. By turning on Option #17, a LOW (Option #18) and HIGH (Option #19) temperature limit for fresh air can be set. The low temp setting has a factory default setting of 20° F (-6° C) and an adjustable range of 20–40° F (-6 to - 4° C). The high-temp setting has a factory default setting of 80° F (26° C) and an adjustable range of 60–80° F (15–37° C).

Performance™ & Preferred™ Series Controller Features

1) Determine the fresh air CFM to comply with ASHRAE 62.2 using the table below or [(Total Sq. Ft) / 100] + [(3 of bedrooms + 1) x 7.5]
2) Use an anemometer to measure the CFM provided by the fresh air damper
3) Calculate fresh air run time and set this number at Option #16.

FRESH AIR CFM

Floor Area	BEDROOMS				
	0–1	2–3	4–5	6–7	> 7
< 1500	30	45	60	75	90
1501 - 3000	45	60	75	90	105
3001 - 4500	60	75	90	105	120
4501 - 6000	75	90	105	120	135
6001 - 7500	90	105	120	135	150
> 7500	105	120	135	150	165

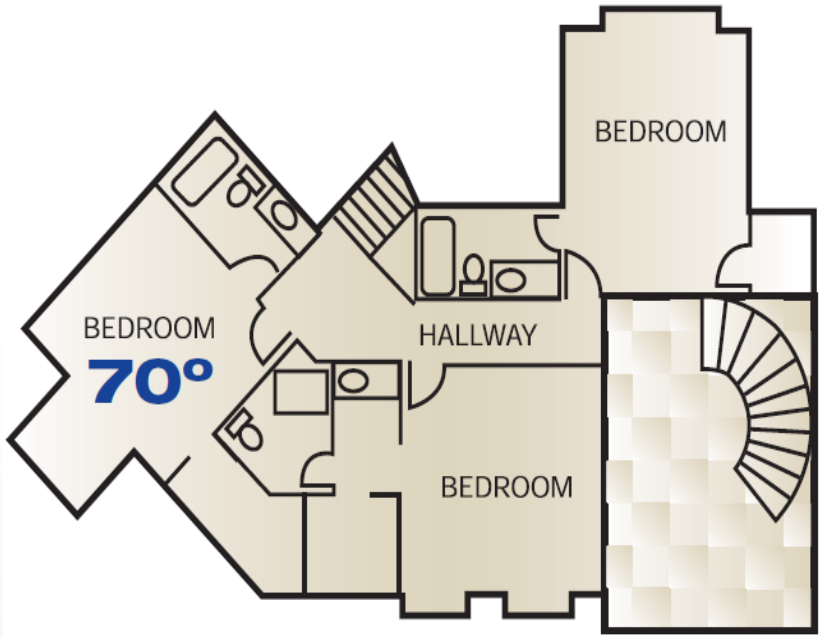
Fig. 12 – ASHRAE 62.2

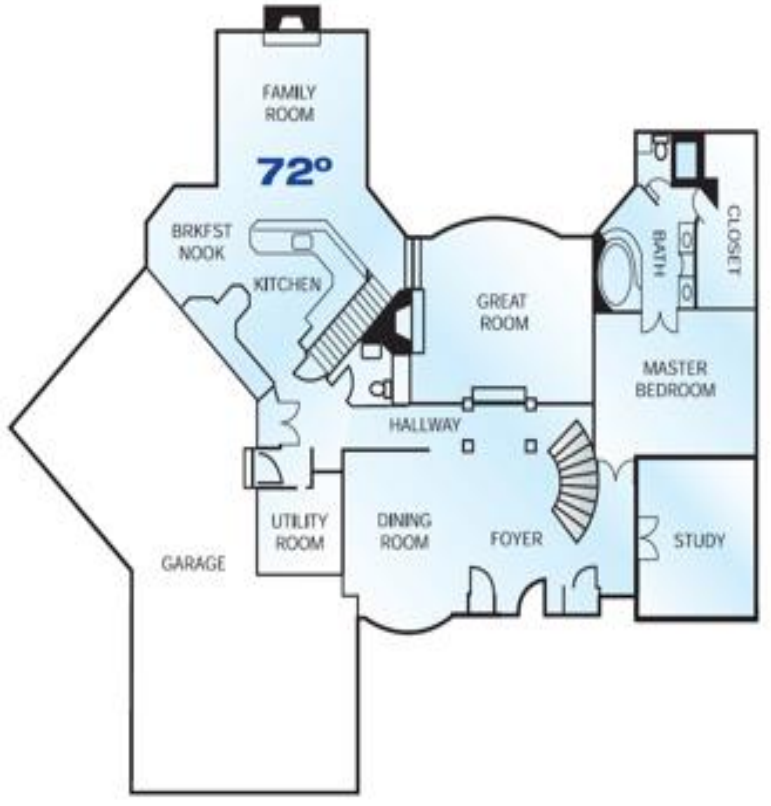
BREAK TIME

10

MINUTES

Carrier & Bryant
Zoning Systems Day 2





Infinity® & Evolution® Zoning System Installation

INFINITY® EVOLUTION®
SYSTEM CONTROL
SYSTXCCITC01-B
SYSTXBBITC01-B

INFINITY® EVOLUTION ®
SYSTEM CONTROL
SYSTXCCITC01-C
SYSTXBBITC01-C

INFINITY® & EVOLUTION®
DAMPER CONTROL MODULE
SYSTXCC4ZC01 SYSTXBB4ZC01

SMART ZONING SENSORS
SYSTXZNSMS01

INFINITY® EVOLUTION®
SYSTEM CONTROL
SYSTXCCWIC01-B
SYSTXBBWEC01-B

DAMPERS (8-IN. OR 24-IN.)
DAMPREC, DAMPSL, DAMPRND

REMOTE ROOM SENSORS
SYSTXCCRRS01
SYSTXBBRRS01

Infinity® & Evolution® Zoning System Installation

• Infinity® Touch Wall Control — Each installation has only one Master wall/zoning control. This is the command center for the entire system. It will typically be in Zone 1 to sense and control the temperature in this zone. If desired, a Remote Room Sensor or a Smart Sensor may be used to sense the Zone 1 temperature. This can give the installer some flexibility in locating the Master Infinity® Touch wall control to another area.

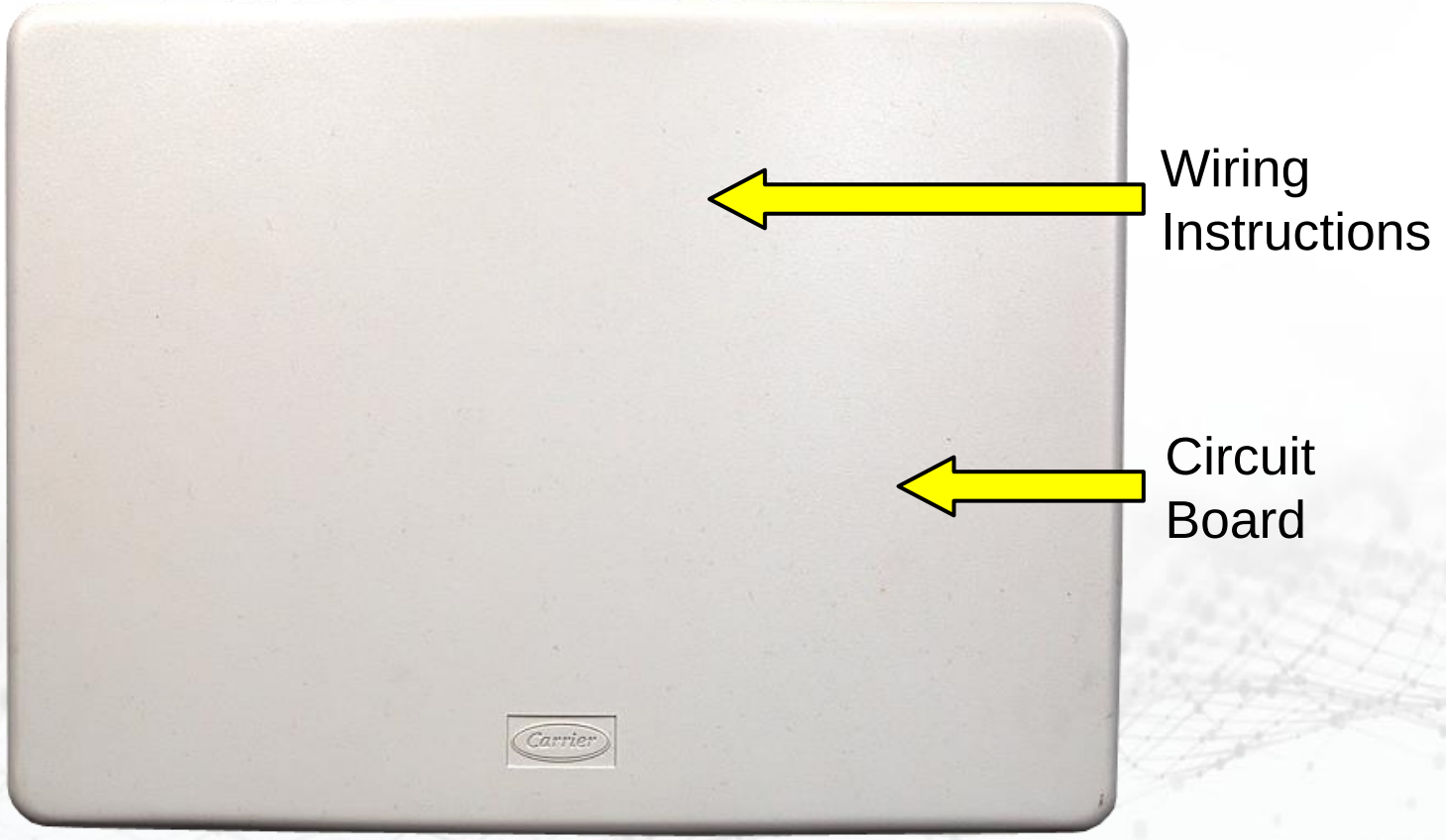
• Remote Room Sensor (p/n SYSTXCCRRS01) — Any zone may use a Remote Room Sensor (including Zone 1). This is a temperature sensor only, having no additional user inputs. In applications where zone temperature averaging may be desired, this may be done using 4 Remote Room Sensors in a series / parallel wiring configuration (See Fig. 11 for Remote Room Sensor Averaging).

• Smart Sensor (p/n SYSTXCCSMS01) — Any zone may use a Smart Sensor (including Zone 1). It provides a temperature display and buttons to adjust the desired temperature in that zone only. It also displays the outdoor temperature and indoor humidity. Be sure to select the desired sensor type for each zone.

Zone sensors other than the Infinity® Touch wall control must be purchased separately. Installation Instructions for these sensors are included with them. *They must equal the correct resistance values.*

Infinity® & Evolution® Zoning Damper Module (ZDM)

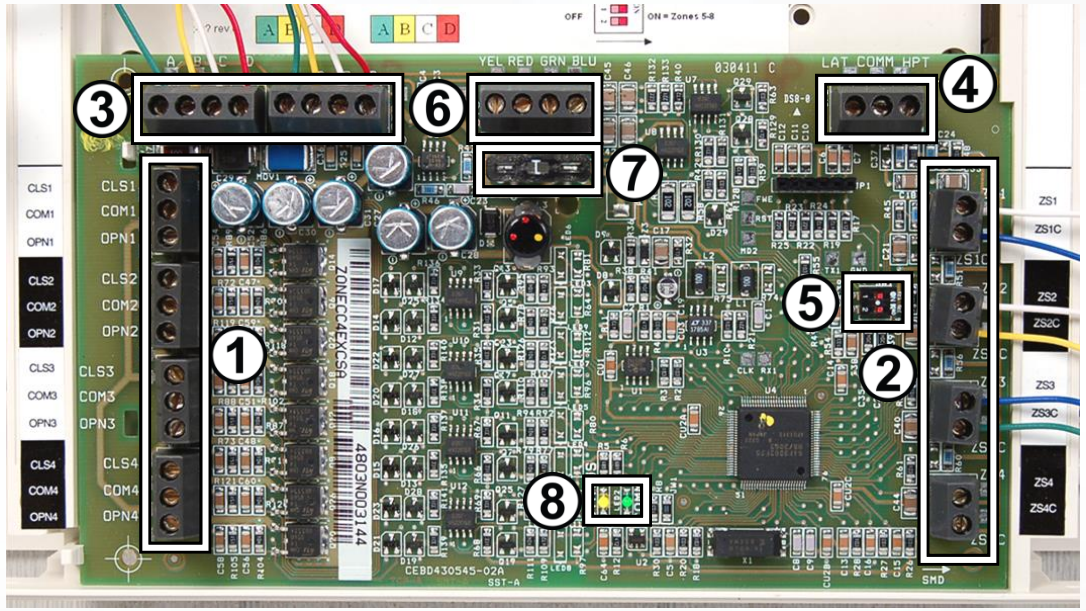
- Zone damper module cover removed
- Note wiring instructions and circuit board



Infinity® & Evolution® Zoning Damper Module Layout

1. Four zone drive outputs (Zones 1 to 4 as default)
   - Up to five zone dampers per drive output for large zones
2. Four sensor connections
3. Four-wire communications bus connection to other system devices
4. LAT and HPT monitoring sensor connections
5. Dip-switches when used as a second ZDM (Zones 5 to 8)
6. Optional HRV/ERV connection
7. 1-amp automotive fuse
8. Yellow and green LED

Zone Damper Module

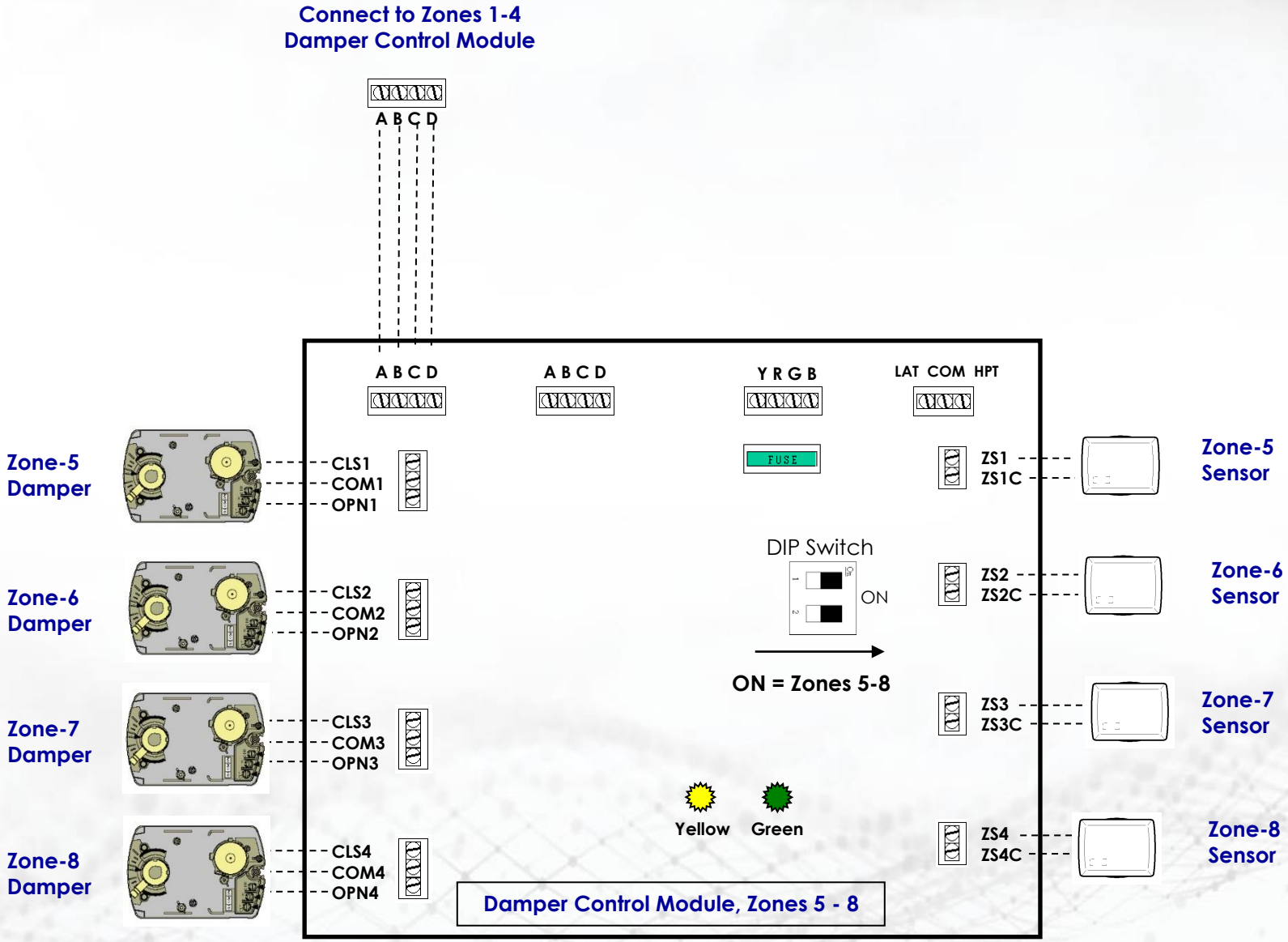


Zone Damper

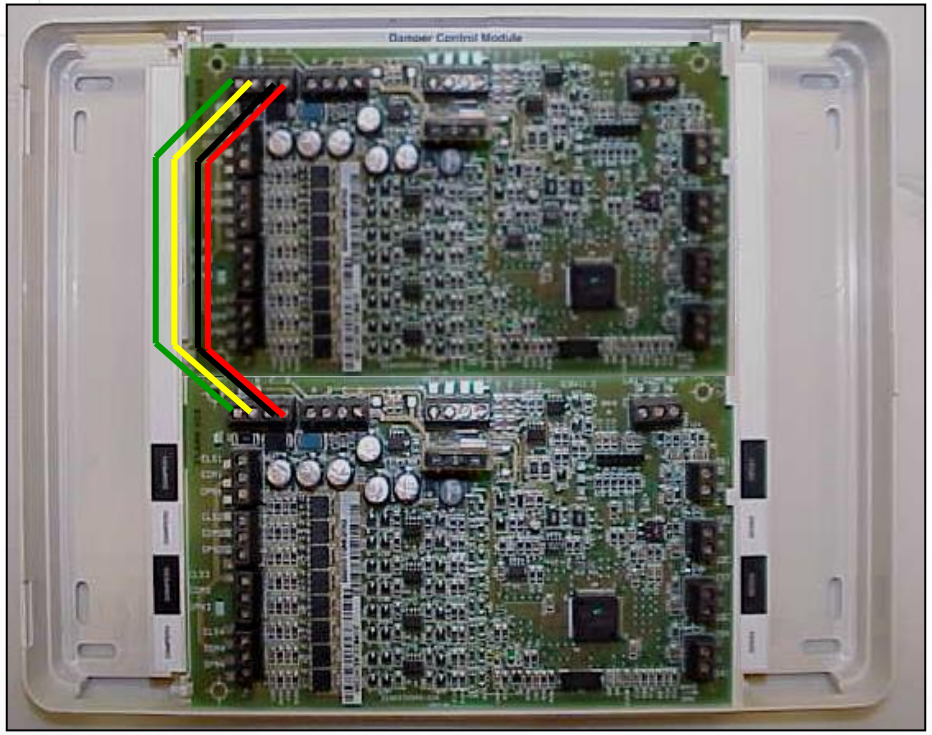
Smart Sensor

Remote Room Sensor

Second Damper Control Module For Zones 5-8



Damper Control Module Consolidation

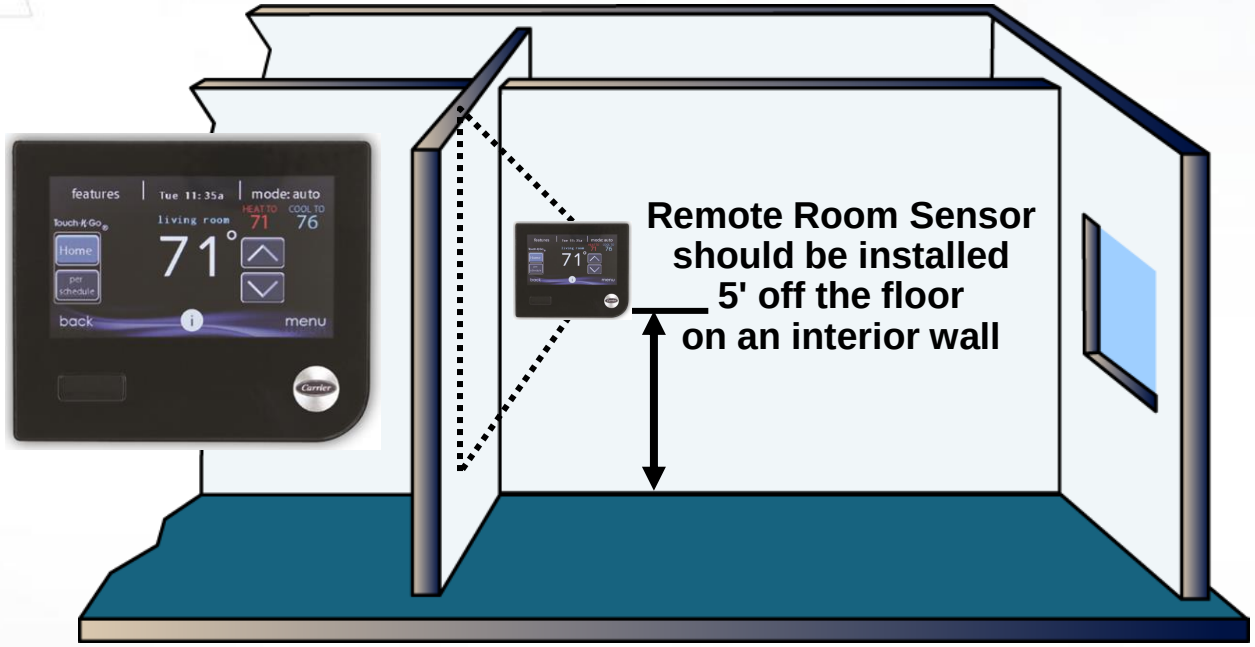


SYSTX(BB,CC)4ZC01

- Never install exposed to the elements
  - May be installed in any area where the temperature remains between -4° F to 158° F
  - and where there is no condensation.
  - The cover must be installed to prevent damage from other sources.

If installing a second zoning board for zones 5-8 you can mount it in the first panel and wire the two together

Infinity® & Evolution® Zoning Sensor Locations



Locate devices:

- Approximately 5 feet (1.5 m) from the floor
- Close to or in a frequently used room
- On an inside partition
- On a wall without pipes or ductwork

Do not locate devices:

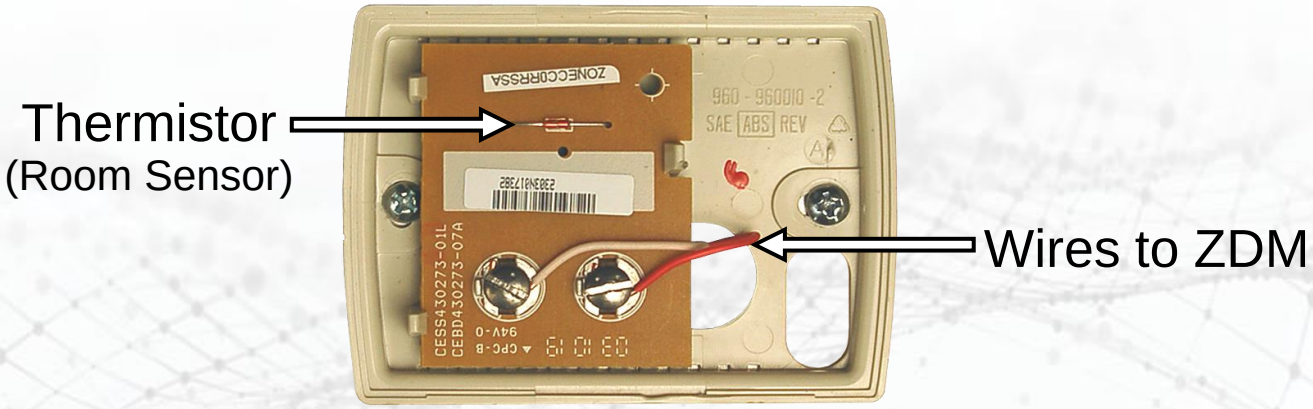
- Close to a window outside wall or a door to the outside
- Exposed to direct light, heat, sun, etc.
- Close to or in direct airflow from registers
- In areas with poor air circulation, such as behind a door or in an alcove.

Infinity® & Evolution® Remote Room Sensor Installation

Install Remote Room Sensors

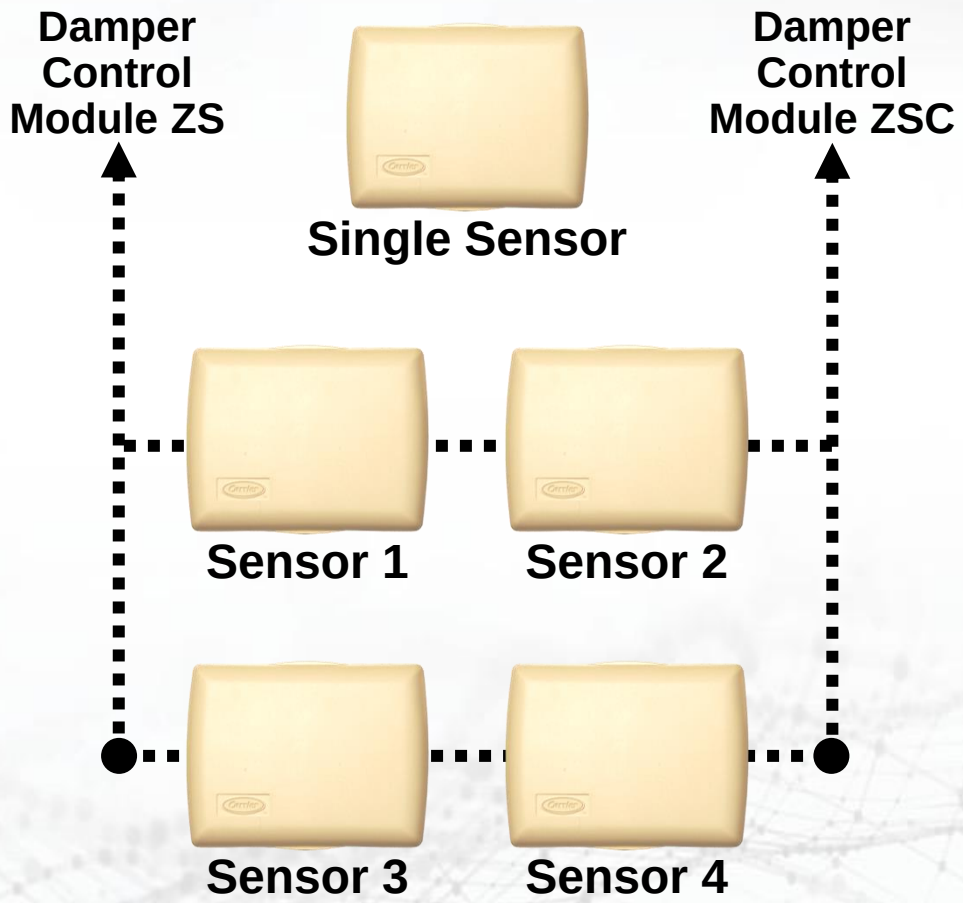
1. Separate the sensor cover and mounting back plate by squeezing the top and bottom of the cover together firmly by grasping the raised top and bottom ridges. This will re- lease the cover. Mount to the wall using the screws and anchors provided.
2. Pull a 2- conductor wire through hole on right-hand side.
3. Recommended connection is BLACK to either terminal, WHITE to remaining terminal (sensor terminals are not marked for polarity because polarity is not important). Stranded or common bell wire may be used. Lengths up to 1000 ft. will contribute no noticeable error.
4. Push any extra wire into the wall and seal the hole to pre- vent air leaks. Align the sensor cover with the base plate, then press firmly until the cover snaps into place.

- Used in any zone
- Temperature sensor only
- Wire to S1 & S2 on Backplate.
  - Automatically detected when attached.
  - May use either 1 sensor, or 4 sensors in Series- Parallel for Averaging.



Infinity® & Evolution® Remote Room Sensor Installation

- Used in any zone
  - Wire to Zone Damper Module
- Instead of User Interface
  - Wire to S1 and S2 on user interface back plate
- User Interface automatically detects its presence
- Temperature sensor only
- Must use 4 sensors together for zone temperature averaging

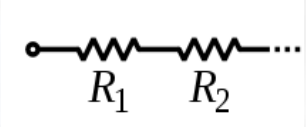


Infinity® & Evolution® Remote Room Sensor Installation

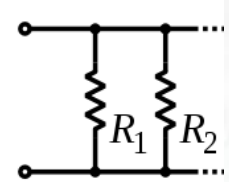
Why are 4 sensors required for sensor averaging?

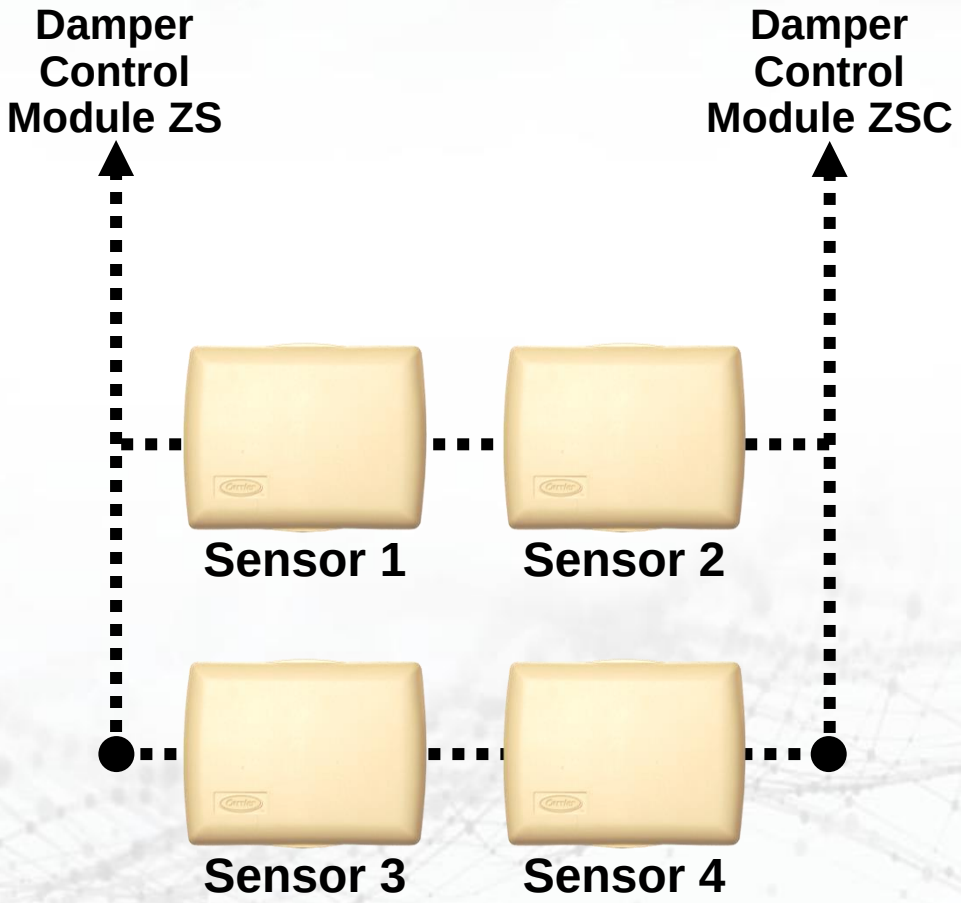
Series sensors add up, sensors in parallel require the addition of the reciprocals (see below)

$Rseries = R1 + R2$



$1/Rparallel = 1/R1 + 1/R2$





Infinity® & Evolution® Smart Sensor Installation

Step 1 – Select Smart Sensor Location

Step 2 – Install Smart Sensor

- If 4 wires exist in wall, they may be used. If not, plan and route wiring to connect with either the Damper Control Module, or User Interface. Multiple Smart Sensors may be daisy chained together, but somewhere chain must connect to either Damper Control Module or the Communicating wall control. (Smart Sensor daisy chain wire limit is 100 ft.)
  - Recommended connection is:
    A - Green = Data A
    B - Yellow = Data B
    C - White = 24vac (com)
    D - Red = 24vac (hot)
  - NOTE: It is not mandatory that the above color code be used, but each ABCD connection in the system MUST be wired consistently.

Infinity® & Evolution® Smart Sensor Installation

Step 3 – Setup and Checkout

After successful communications with the Master Thermostat has occurred, the screen shall change to the Home Screen. However, if the Zone Address has never been set, the Enter Zone Address Screen is displayed instead with an initial zone number of 2. Use the up/down buttons to select the correct zone address number 1 through 8. If only one Damper Control Module exists, the zone address selection will only be 1 through 4. Once the zone number is selected, press the save button to store the zone address and exit the setup menu. The Smart Sensor is ready to operate.

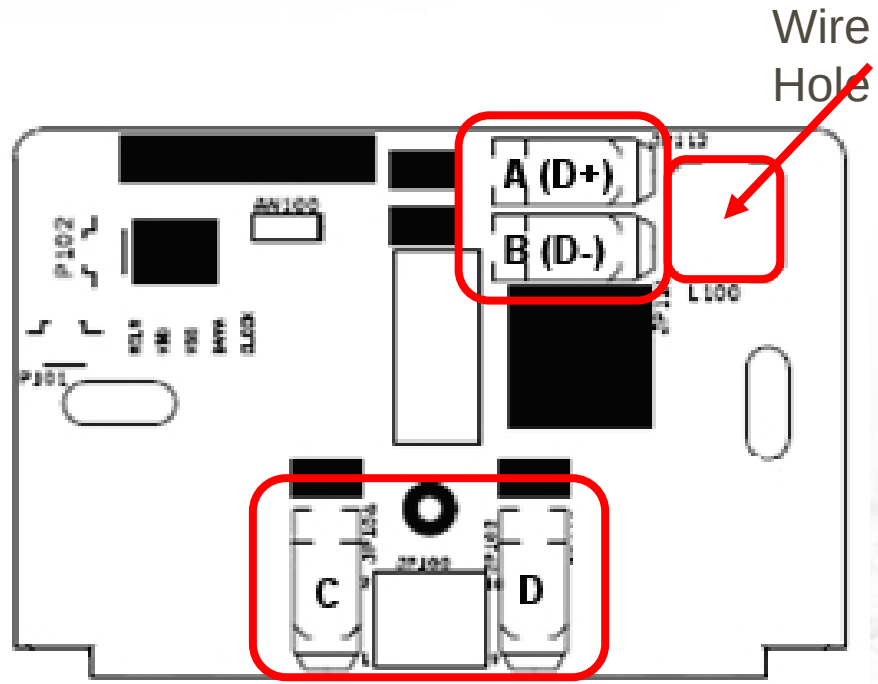
Infinity® & Evolution® Smart Sensor Installation

Changing Zone Address

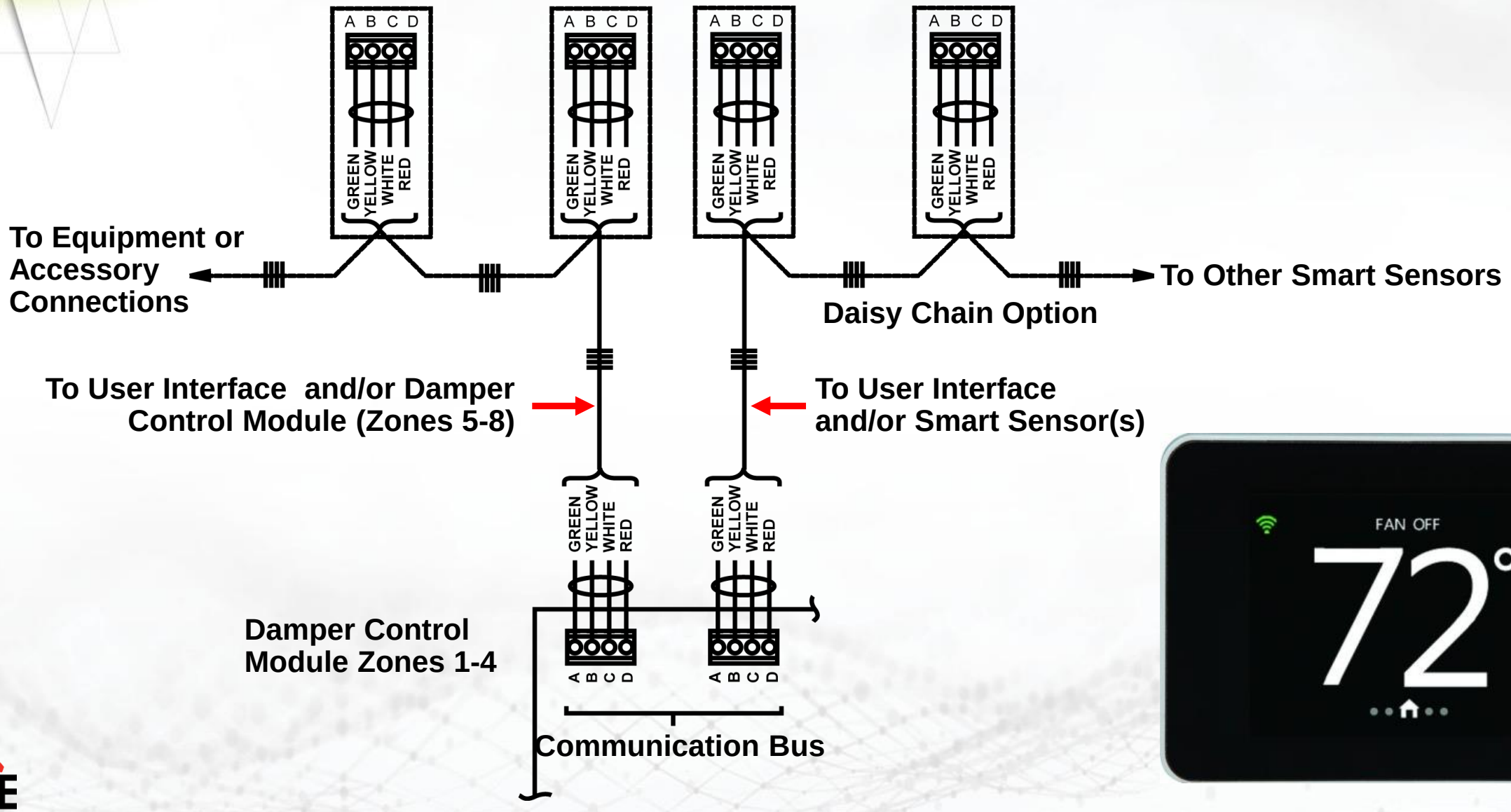
To change an existing zone address, enter the setup menu by swiping from Left to Right on the Home Screen to display the Fan Screen, pressing and holding the Fan button for 6 seconds, and then pressing on the Zone Address Line. Use the up/down buttons to select the correct zone address and then press “Done” and exit the setup menu. If no buttons are pressed for approximately 30 minutes, the screen will automatically save and exit back to a normal display.

Infinity® & Evolution® Smart Sensor Installation

Ordinary thermostat wire is recommended; however, solid conductor, stranded, or shielded wire may be used. Use 22 AWG or larger for normal wiring applications. Continuous wire lengths over 100 ft. should use 20 AWG or larger.



Infinity® & Evolution® Smart Sensor Installation



Infinity® & Evolution® Smart Sensor Installation

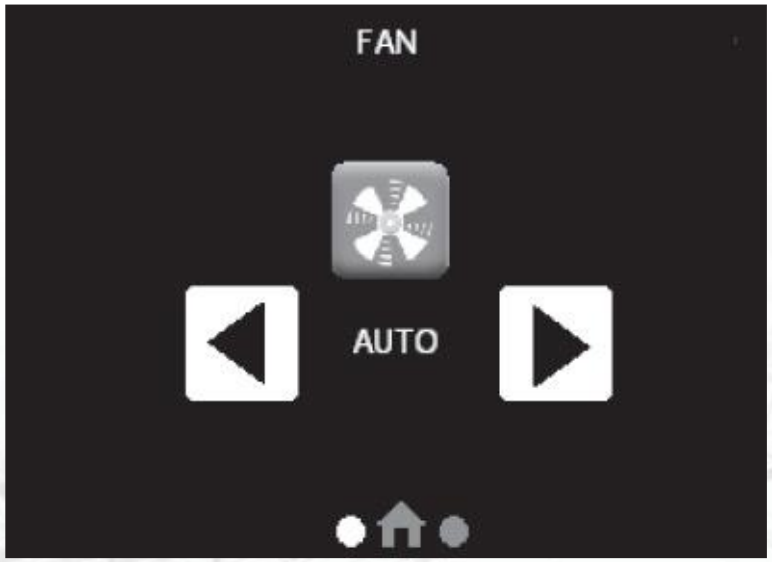
Smart Sensor Backlighting

The screen backlighting will energize whenever a button is pressed. The backlighting will de-energize after 5 - 30 (default 15) seconds of no push button activity (selectable from the Settings button after pressing the menu button). To access the backlighting screen touch Menu from the main screen, then backlight button. Backlight Screen is used to set the backlight intensity in Active and Dormant backlight modes. The blue Active Backlight Wheel is used to adjust the backlight intensity when the thermostat is in an active state. The purple Dormant Backlight Wheel is used to adjust backlight intensity when the thermostat is in a dormant state (not being viewed or adjusted by the end user). Adjustment is made by placing a finger on the wheel and dragging the wheel up or down. Alternatively, a tap at the top of the wheel or the bottom of the wheel shall adjust the setpoint by one number.

Infinity® & Evolution® Smart Sensor Installation

Fan Mode

Swiping left to right from the main screen will show the fan mode screen. The “Fan Screen” is used to allow you to select the fan mode for this thermostats zone. Pressing one of the Left Arrow Button or Right Arrow Button shall scroll through the fan modes of **AUTO** or **OFF**, **LOW**, **MED** and **HIGH**. **AUTO** model will operate the fan only when the system is heating or cooling that zone. **LOW**, **MED** and **HIGH** modes will run continuously at that speed until you switch the zone back to **AUTO** Fan Mode.

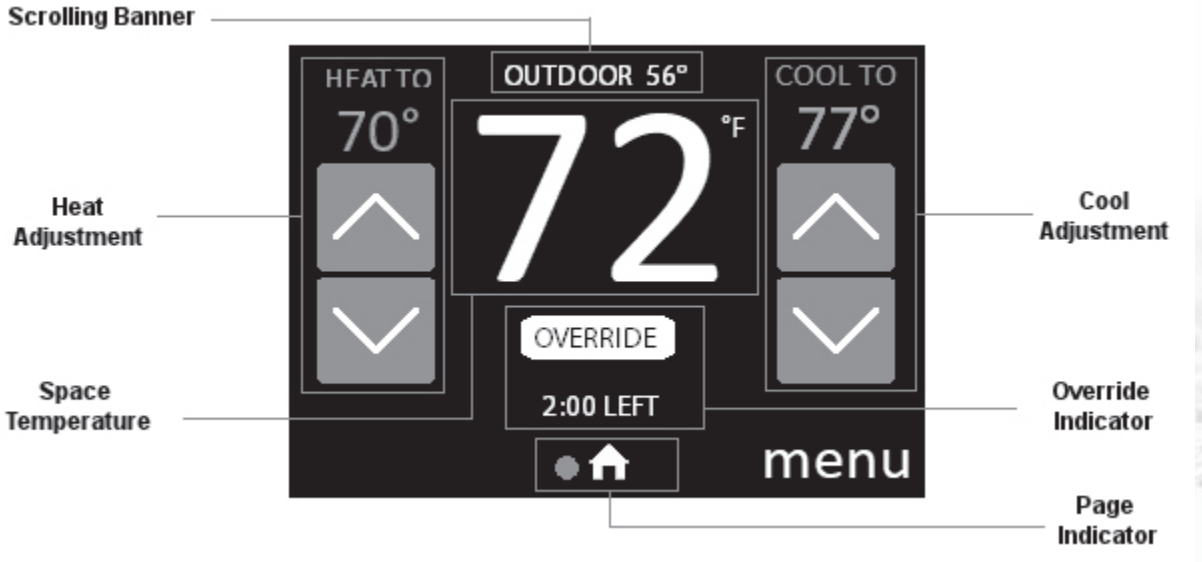


Infinity® & Evolution® Smart Sensor Installation

Changing Desired Temperature

The current zone temperature will be displayed on the screen. Press the up/down arrows for **“HEAT TO or COOL TO”** to change the setpoints. The default time for temporarily overriding the temperature schedule is 2:00 HRS as indicated by the text in the lower center of the screen. Pressing the **OVERRIDE** (User Interface wall control) / **HOLD UNTIL** (main System control) button displays the Select Time Mode Screen where the type of Override can be changed to **HOLD** (permanent length of time), **OVERRIDE/HOLD UNTIL** (specified time length), **SCHEDULED** (removes any override), or **UNOCCUPIED** (User Interface wall control only).

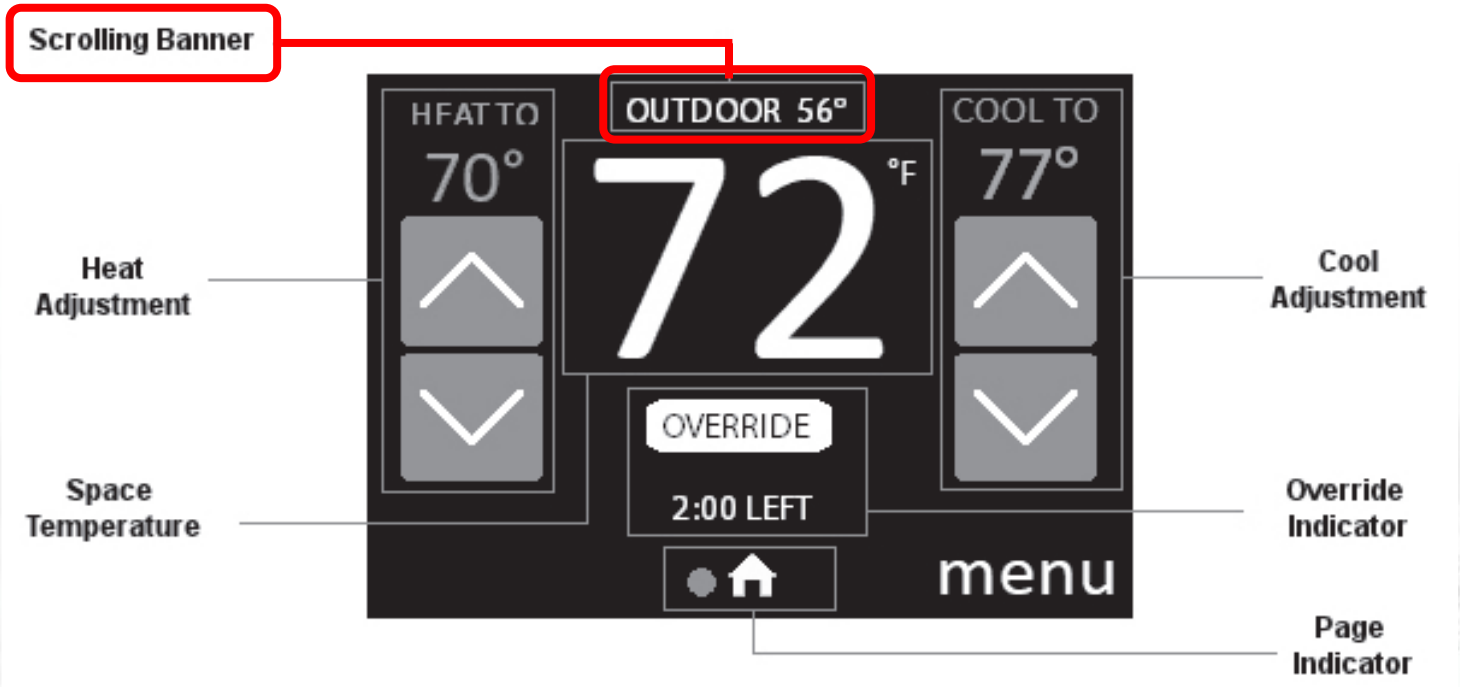
NOTE: If the wall control is configured for non-programmable operation, the Smart Sensor will ignore HOLD and Override functions at the Smart Sensor.



Infinity® & Evolution® Smart Sensor Installation

Outdoor Temperature, Date, Time, Fan Status, Mode & Humidity

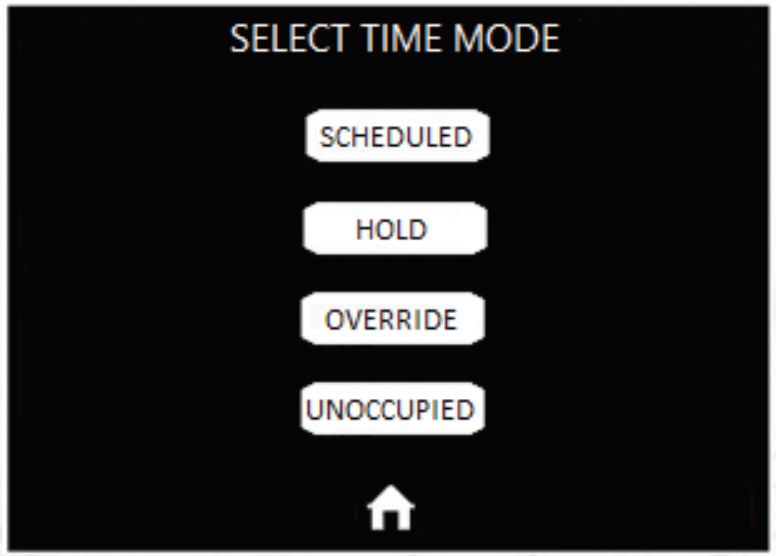
The top area of the screen is used to display the Banner. The Banner is used to provide status information to the end user of the thermostat. The Banner scrolls through several pieces of information, changing every 3 seconds. These pieces of information include **Outdoor Temperature**, **Date, Time**, **Fan Status**, **Mode** and **Humidity**.

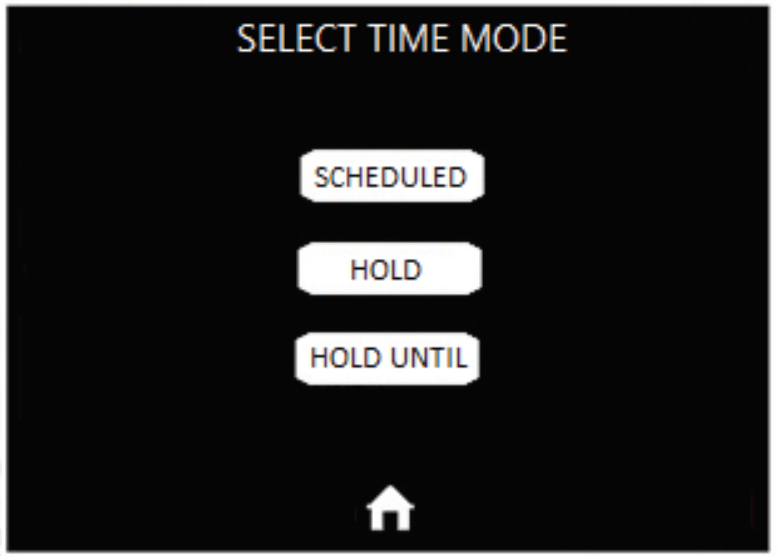


Infinity® & Evolution® Smart Sensor Installation

Select Time Mode Screen
Override / Hold Until / Scheduled / Unoccupied

Pressing the HOLD, HOLD UNTIL/OVERRIDE, SCHEDULED, or OCCUPIED (when used with the User Interface wall control only) (when shown in the middle of the main screen) button will cause the Override Type screen to be displayed. Pressing the HOLD button will cause the system to use the active (displayed) temperature setpoints indefinitely. Pressing the SCHEDULED button cancels any type of override and the system resumes normal programming schedules.



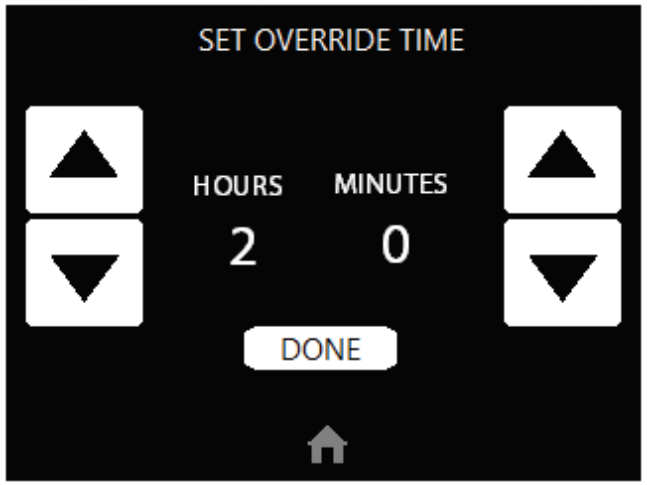


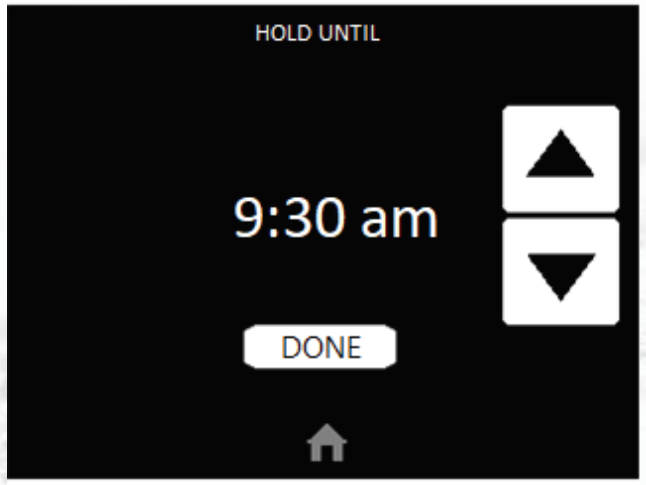
Infinity® & Evolution® Smart Sensor Installation

Override / Hold Until

The default time for temporarily overriding the temperature schedule is 2:00 HRS as indicated by the text in the lower center of the screen. Pressing the OVERRIDE (User Interface wall control) / HOLD UNTIL (main System control) button displays the Select Time Mode Screen where the type of Override can be changed to HOLD (permanent length of time), OVERRIDE/HOLD UNTIL (specified time length), SCHEDULED (removes any override), or UNOCCUPIED (User Interface wall control only). Temporary override time can be changed in 15-minute increments by pressing the OVERRIDE or HOLD UNTIL button to increase or decrease the override timer.

NOTE: Override will not appear if programming has been turned off.





Infinity® & Evolution® Smart Sensor Installation

System Off

When the OFF mode is selected on the Main System Control the Smart Sensor will show “SYSTEM OFF” in the middle of the display screen. The end user will be unable to operate the system from the Smart Sensor.

Vacation Settings

When Vacation Mode gets set from the Master Thermostat and this state transfers to the Smart Sensor, VACATION will be displayed below the indoor temperature and the Heat and Cool Setpoints and Fan State shall change to the vacation settings. A lock icon shall appear to the right of the VACATION text for 15 minutes and the up/down buttons shall be removed. After the 15-minutes elapses, the up/down buttons shall appear again and an override of the vacation setpoints will be allowed. The middle of the screen shall display Vacation when active.

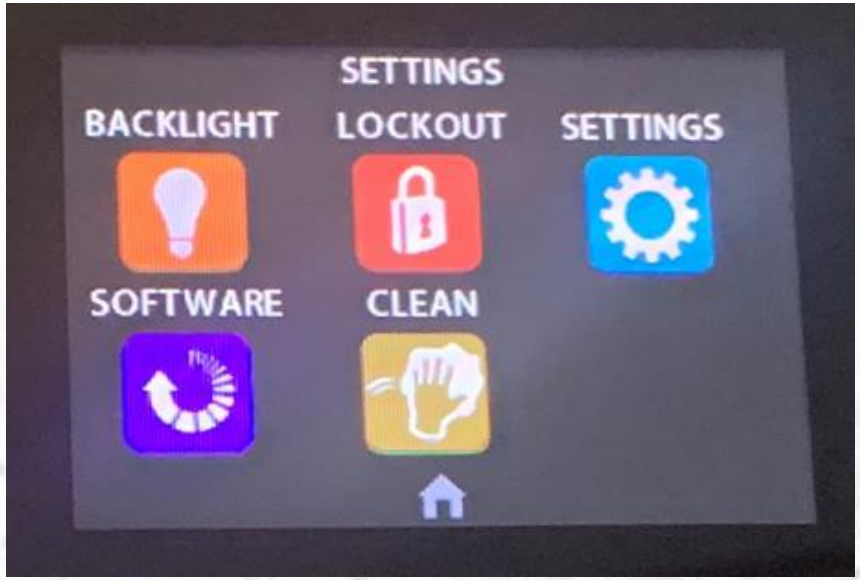
Infinity® & Evolution® Smart Sensor Installation

Keypad Lock

The Smart Sensor can be locked by going to the menu from the main screen, then lockout. Lockout is used to prevent unauthorized changes via the touch screen interface. All touch interaction is locked out until the proper unlock code is entered. After 5 failed attempts at unlocking the thermostat, more attempts shall not be allowed for a 5-minute period.

Forgot the screen lock code?

911 is a universal unlock code



Infinity® & Evolution® Zone Damper Installation

45 Degree Actuator

Input Voltage 24 vac

Nominal Input Power 2 VA

Damper Output Torque 10 in.-Lb

Ambient Temperatures 0°F to 158°F or –18°C to 70°C

Wire Connections Common, Open, Close

Wire Connectors Plated Screw Terminals For 14--22 AWG

Stroke Time Angular Rotation per Sec

DAMPACT45DEG 3° per Sec

DAMPACT90DEG 6° per Sec

Travel Time 15 Sec

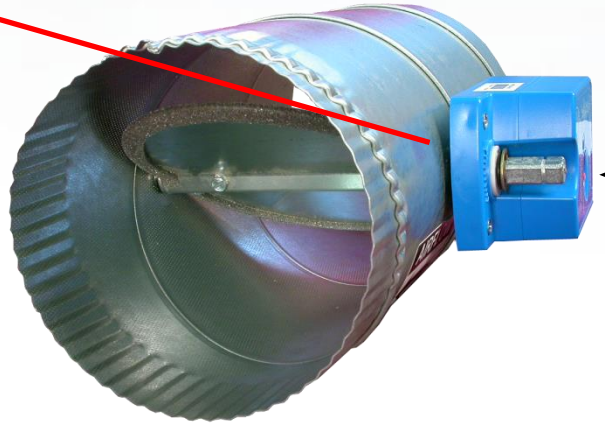
Barometric Bypass Pressure Range 0.2–0.8 in. w.c.

DAMP

90 Degree Actuator

Changeovers are accomplished made to these dampers allowing them to draw less current than older dampers allowing up to five dampers to be connected to a single zone output – while allowing the equipment transformer to still provide all power. The Zoning control only cycles one zone at a time thus minimizing the load on the system transformer

Round Dampers



Rectangular Dampers

Zone Dampers

Infinity® & Evolution® Zoning Damper Module Layout

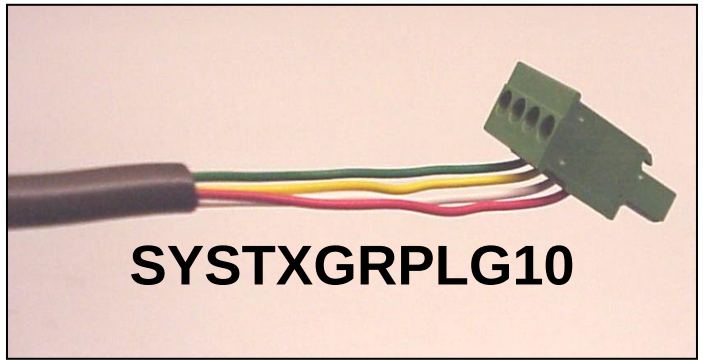
LAT And HPT Monitoring Sensor Connections

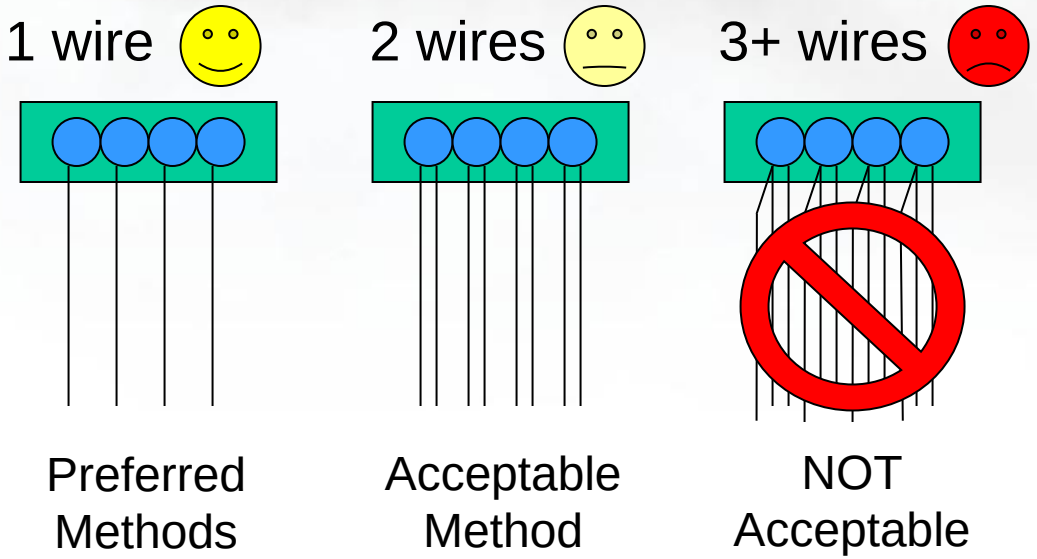
ZONEXX0DTS01

LAT & HPT SENSOR

Zone Damper Module
LAT/HPT Terminals

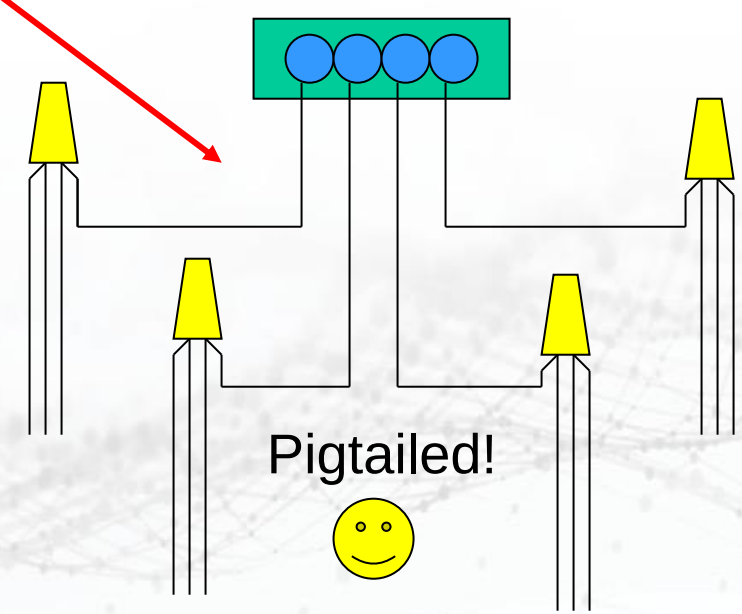
Infinity® & Evolution® Zoning Wiring





The terminal screws under the ABCD Green Plug are not designed to hold large numbers of wires. They hold 1 wire extremely well. They hold 2 wires adequately. But they do a terrible job of holding more than 2 wires.

If you have more than 2 wires that need to be under an ABCD terminal, it is recommended to make your bundle connection under wire nut and use a pig-tail to connect to the actual ABCD Green Plug connector.

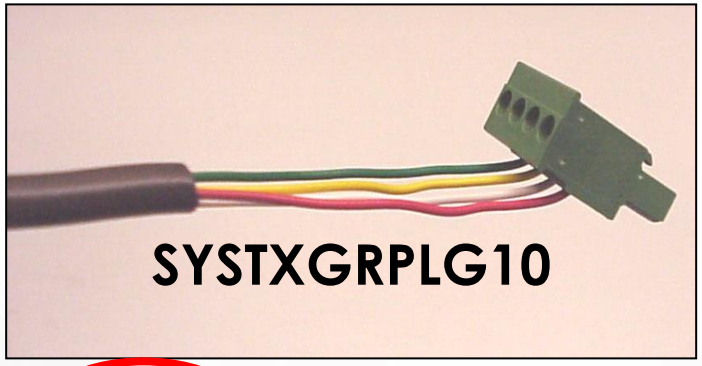


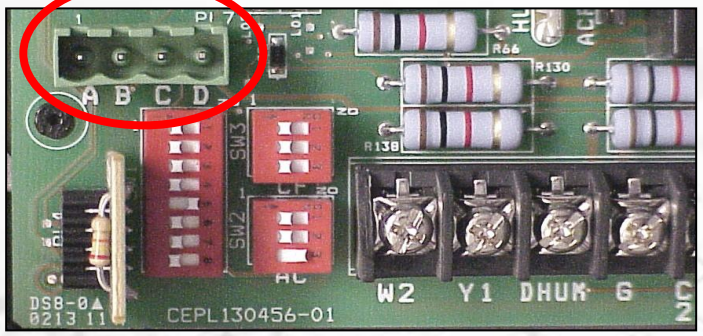
Infinity® & Evolution® Zoning Wiring

Equipment Connections

Improper Wiring of the ABCD connector will cause the Evolution / Infinity Control to operate improperly. Check to make sure all wiring is correct before proceeding with installation.

Safety devices, such as float sensors, can break the “D” signal to the device you want to control.



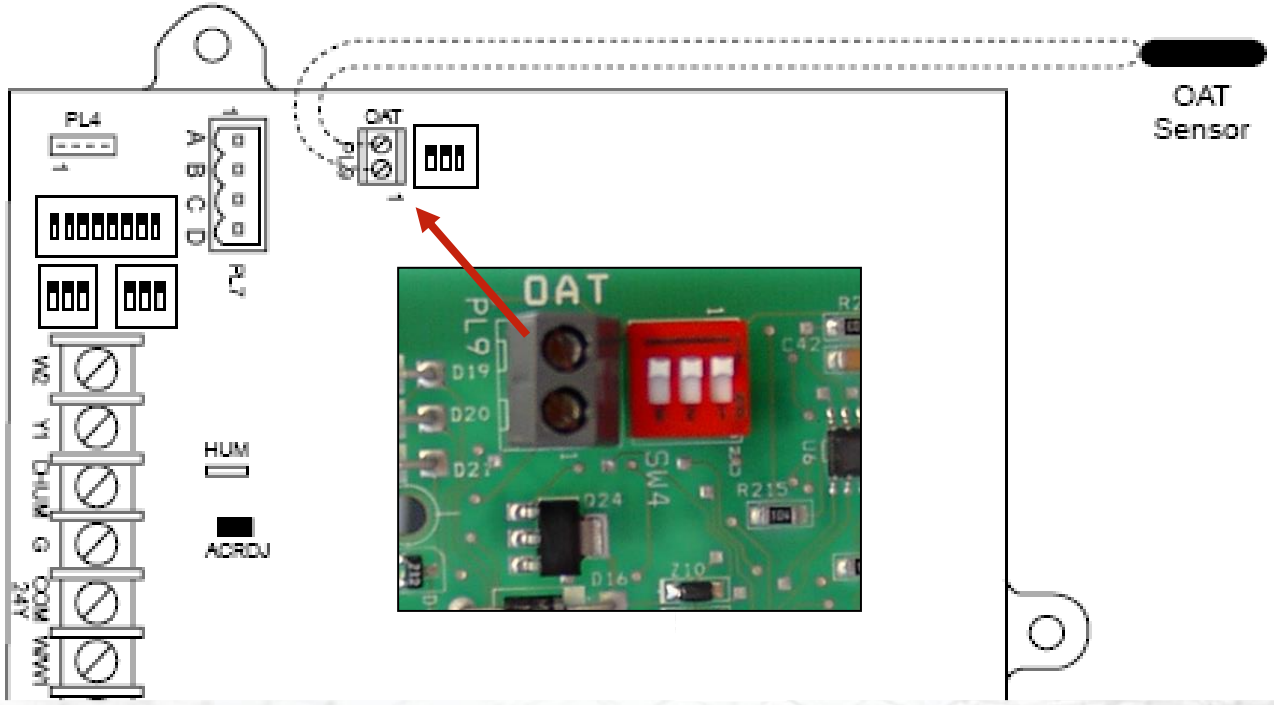


- A-Green Data A
- B-Yellow Data B
- C-White 24VAC (Com)
- D-Red 24VAC (Hot)

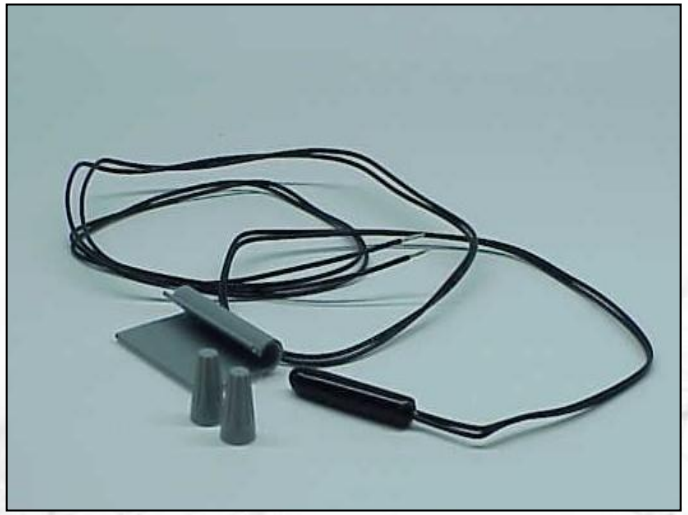
Get Your Wiring Right!

Infinity® & Evolution® (OAT) Sensor

- OAT Sensor provided with Evolution/Infinity Greenspeed/Extreme Series (Outdoor Communicating Units).
- All Other Condensing units (Non-Communicating Units) **require** OAT Sensor be field installed.
- If OAT is connected to Indoor section directly, it takes priority over all other OATs, including the factory-mounted one in the outside unit.

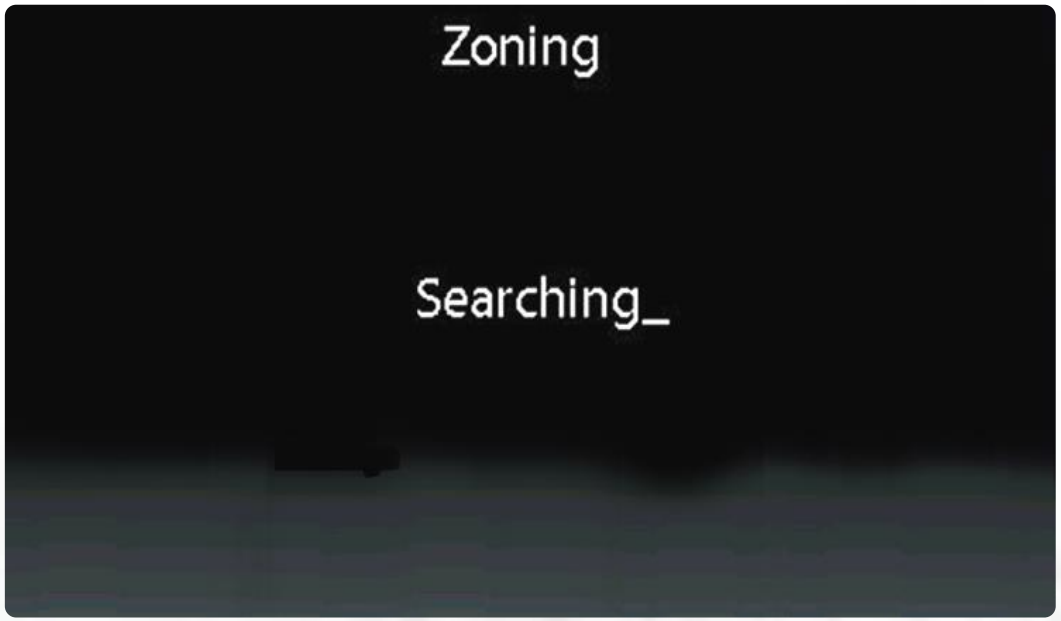


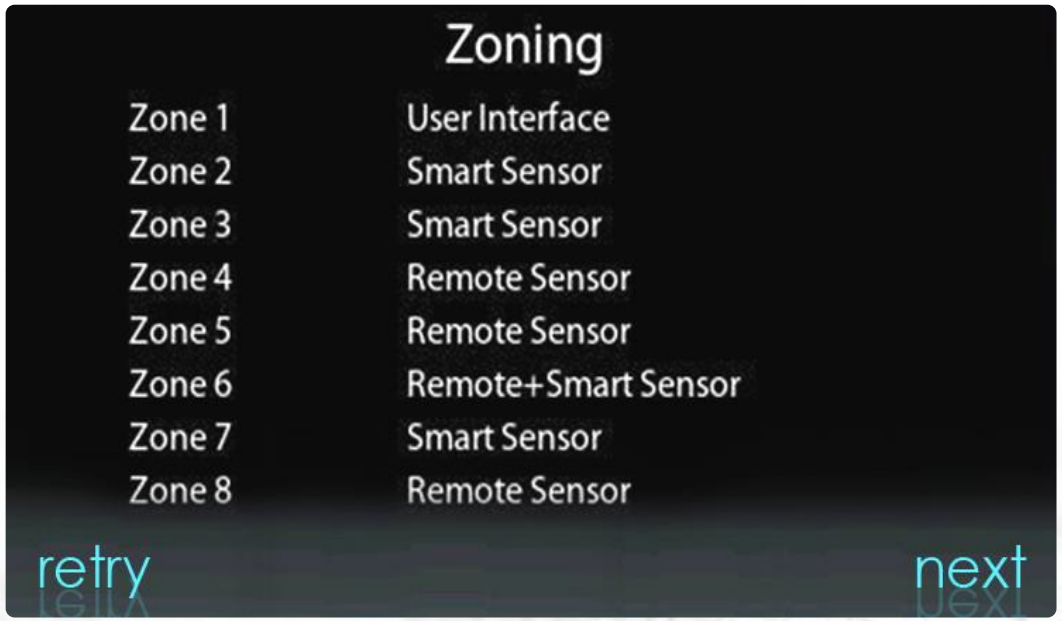
TSTATXXSEN01



Infinity® & Evolution® Sensor Identification

During the initial installation, the User Interface will identify all the sensors installed and recognized by the controller and their types. You can see that Zone 6 has a Remote Sensor and a Smart Sensor.
This is not a mistake as you can mix sensors together in the same zone.





Infinity® & Evolution® Zoning Setup

Infinity® & Evolution® Zoning Setup

First touch **SETUP**, then touch **ZONING** to set up the parameters for the zoning system.

Infinity® & Evolution® Zoning Setup

Zone Offset

This option allows actual temperature offset for each zone, allowing calibration (or deliberate miss-calibration) of each sensor. Use the Left (<) or Right (>) buttons to change the zone. After the selection is made, touch **SAVE**.

- **Temperature Offset:** Adjustable between -5 to +5°F (-3 to +3°C)
- Default = 0°F

Infinity® & Evolution® Zoning Setup

Disable Zoning

This option allows the installer to enable or disable zoning. After the selection is made, touch SAVE.

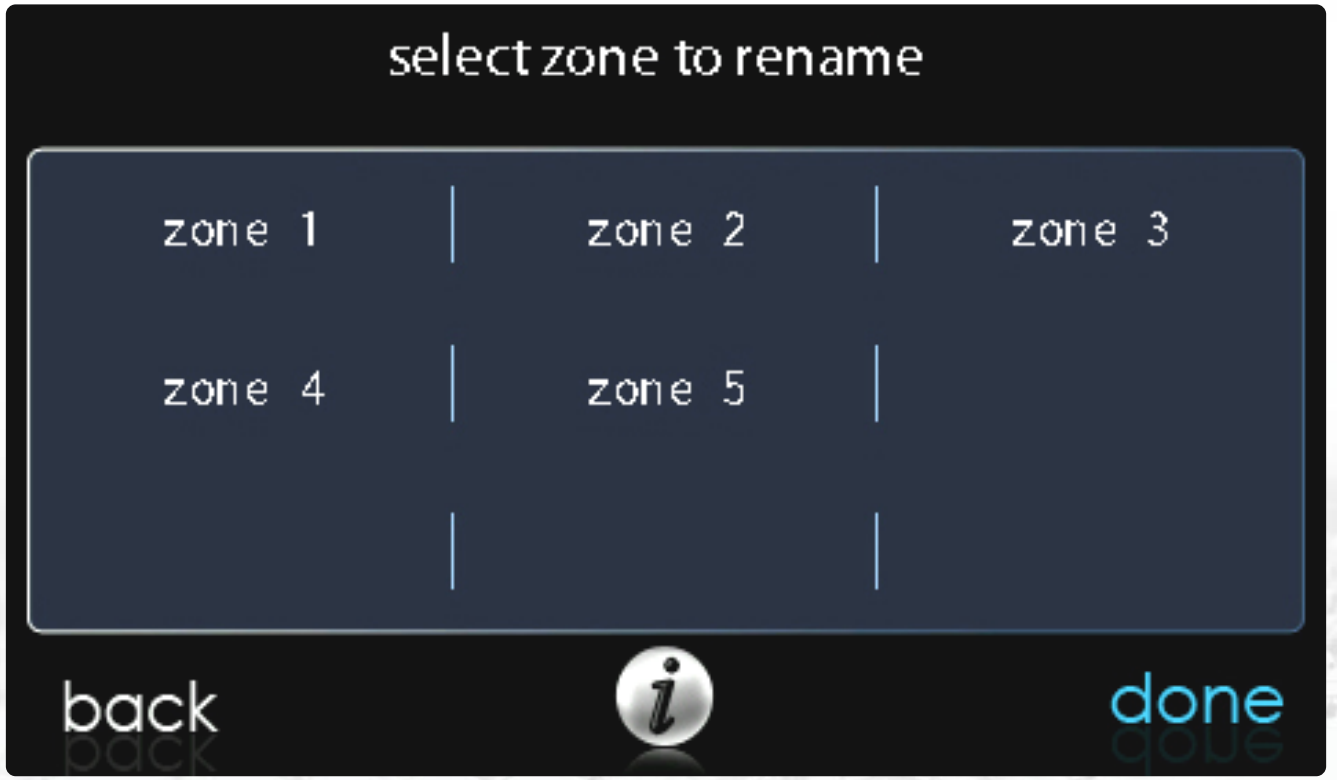
Disable Zoning: Yes or No

Default = No

Infinity® & Evolution® Zoning Setup

Zone Names

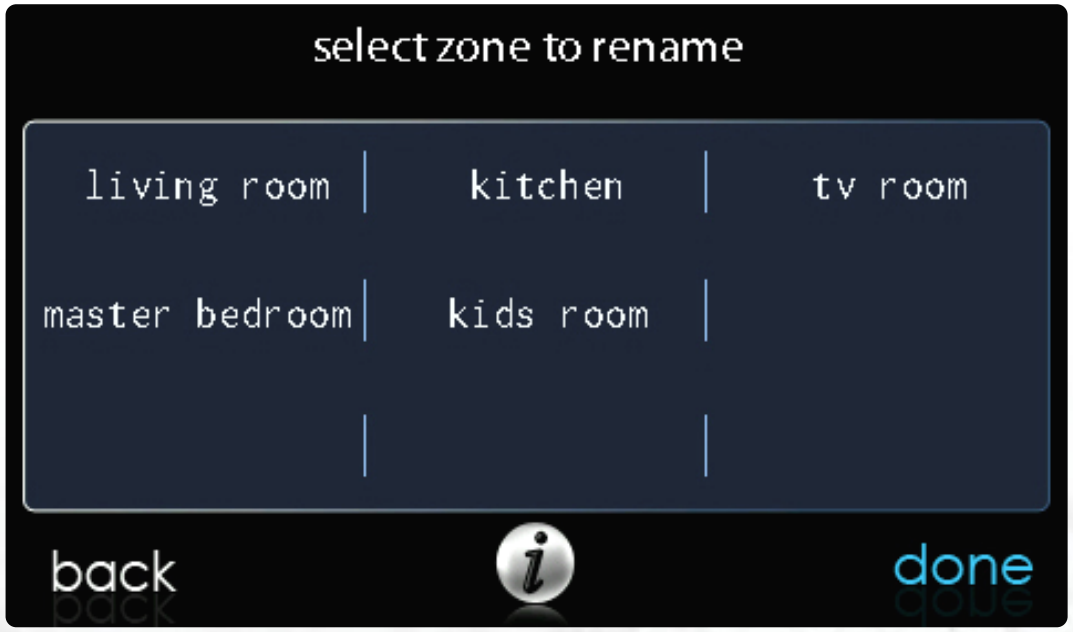
Touch ZONE NAMES in Menu. There are 18 pre-programmed names in the controller Touch the zone to change name Pick name from menu or create name using keyboard Select YES to change name Touch DONE to complete



Infinity® & Evolution® Zoning Setup

Zone Names

Touch ZONE NAMES in Menu. There are 18 pre-programmed names in the controller Touch the zone to change name Pick name from menu or create name using keyboard Select YES to change name Touch DONE to complete



Infinity® & Evolution® Zoning Setup

Airflow Verification Check

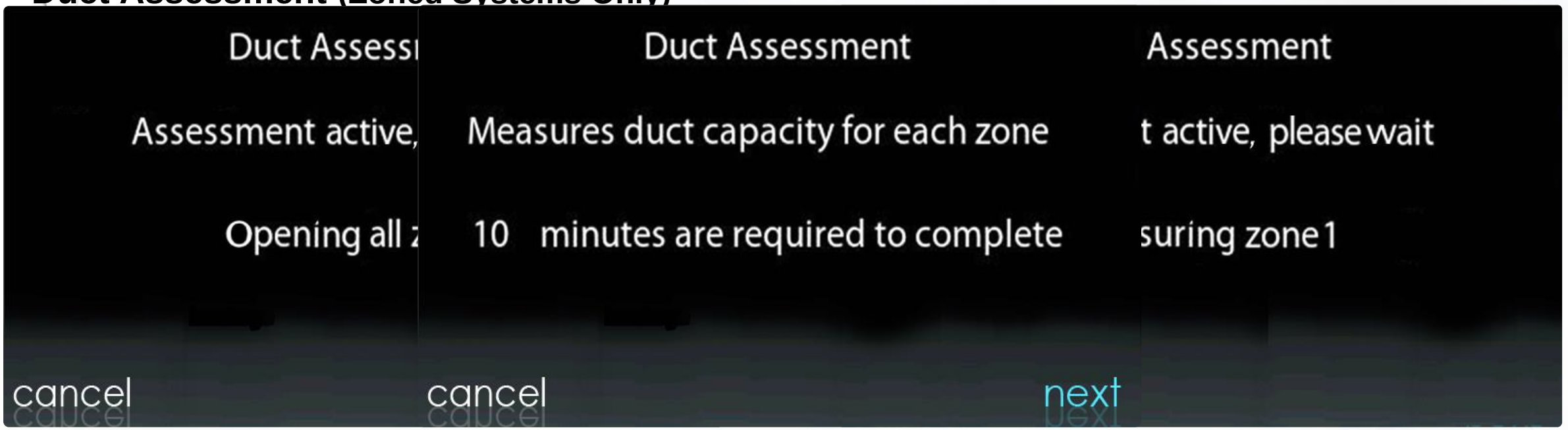
The airflow verification check occurs at initial installation, or when FULL INSTALLATION or AIRFLOW VERIFICATION TEST are selected in the INSTALLATION & SERVICE menu.

Duct Assessment (Zoned Systems Only)

A duct assessment will automatically occur each day at a user selectable time. The factory default time is 1:00 p.m. but, may be changed by entering the Zoning Setup menu. If there is an active call for heating or cooling, the system will wait until the call is satisfied before it performs the duct assessment. The system will first open all zones and drive the blower to 175 CFM/ton of cooling (or the minimum indoor unit's airflow, whichever is greater). It will then take a static pressure measurement. The system will then close all zones and open one zone at a time, taking a static pressure measurement for each zone.

Infinity® & Evolution® Zoning Setup

Duct Assessment (Zoned Systems Only)

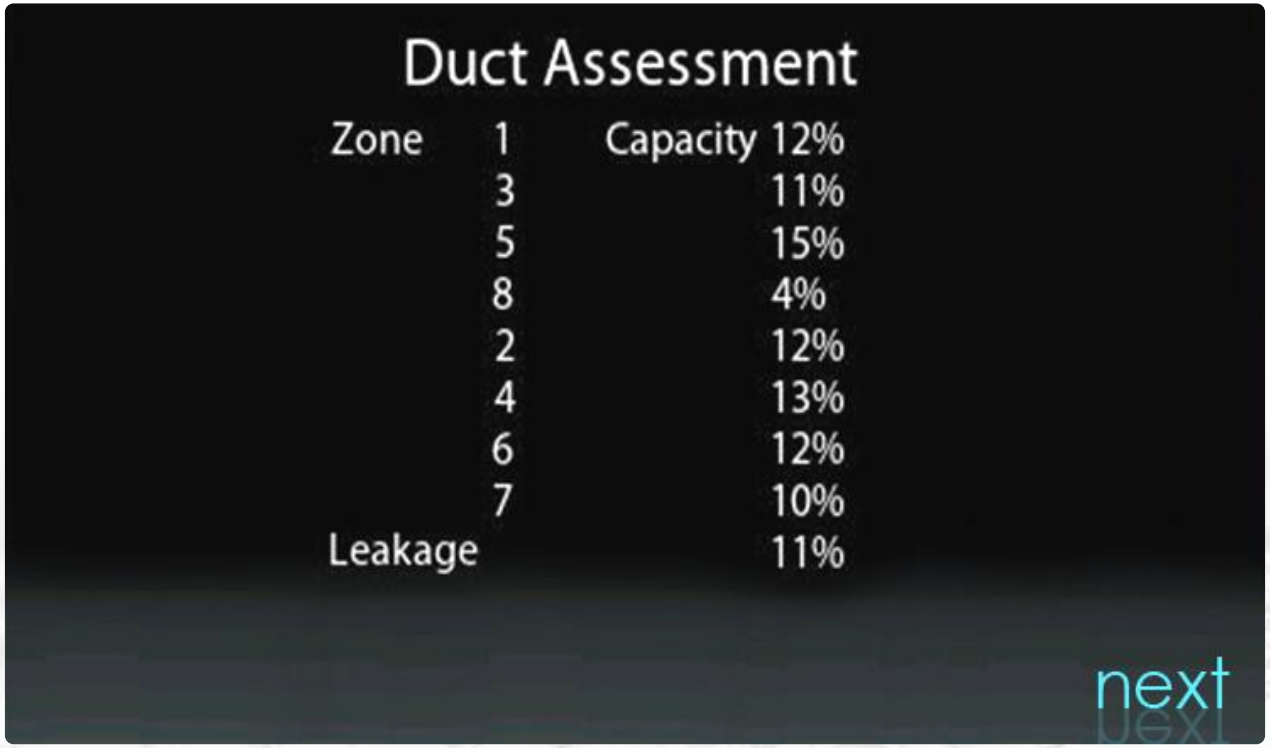


NOTE: DUCT ASSESSMENT CAN BE SKIPPED BUT IF YOU DO THE SYSTEM WILL ASSIGN EQUAL PERCENTAGES TO ALL ZONES SO ***NEVER*** SKIP AN ASSESSMENT

Infinity® & Evolution® Zoning Setup

Duct Assessment Results

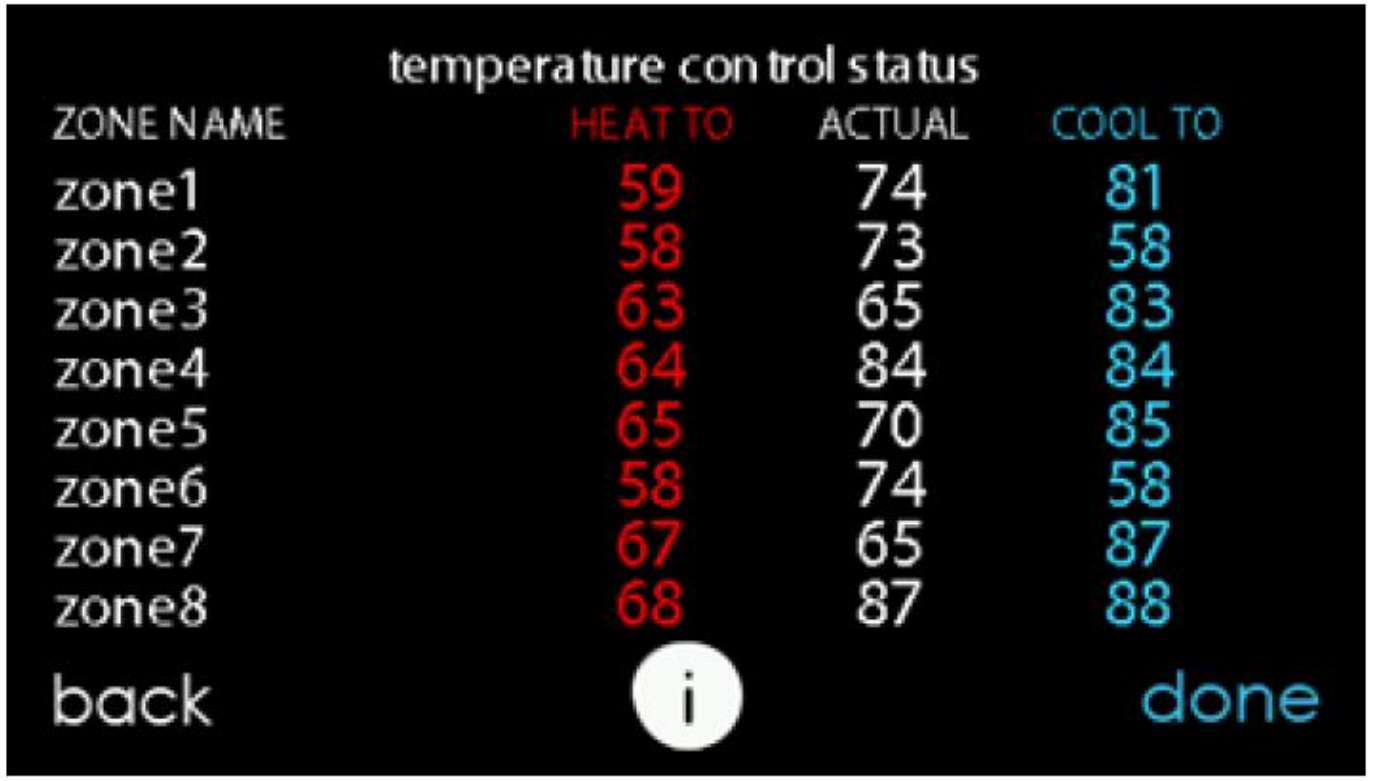
Once the Duct Assessment is complete the values should always equal 100% of the capacity. Leakage is determined by the amount of air leakage in the cabinet, ductwork and around the damper blades. It is recommended to see the leakage number below 10%. 10%-15% is acceptable, but never more than 15%. That would indicate a problem and would need further investigation.



Infinity® & Evolution® Zoning Setup

Temperature Control Status

The Temperature Control Status screen allows you to take a quick look at the actual temperatures, and temperature set points for each zone in your system.



Infinity® & Evolution® Zoning Setup

Damper/Sensor Check

The Sensor/Damper Check allows the installer to check each zone damper for operation, as well as to ensure that the zone sensor corresponds to that particular zone. When first initiated, the Zone 1 damper will fully open, and all other zones will close. Using the Left (<) or Right (>) buttons, the installer can select each zone and verify the damper is fully open while all other dampers remain closed.

After proper damper operation has been verified, the installer can now check and verify that each Remote Room Sensor corresponds to the proper zone damper in the same zone.

Once each zone has been checked, touch DONE to return to the ZONING CHECKOUT menu.

Infinity® & Evolution® Zoning Airflow Limits

Since a bypass damper is prohibited in this system, this setting is used to select the maximum allowable noise/airflow relationship into each zone based on air noise and comfort requirements. **LOW** means **100%** of maximum assessed airflow; **MED--LOW** means **138%** of maximum assessed airflow; **MEDIUM** means **176%** of maximum assessed airflow; **MED--HIGH** means **214%** of maximum assessed airflow; **HIGH** means **250%** of maximum assessed airflow; and **NO LIMIT** means the equipment does not stage down due to airflow, but the system may stage down due to high static pressure.
CFM associated for each limit is shown on the screen. Compare this value with the equipment's low stage CFM value to ensure that equipment will run for each zone. Assessed airflow is determined as described in **DUCT ASSESSMENT**. After the selections are made, touch **SAVE**.

- Touch the zone name that you wish to change
- **Select the zone to adjust airflow:** Low, Med--Low, Medium, Med--High, High, or No Limit
- Default = High

Infinity® & Evolution® Zoning Airflow Limits

Zoning Airflow Limits

A zoned system will react differently than a non-zoned system. This is where it might start to get confusing.

Infinity® & Evolution® Zoning Airflow Limits

Zoned Airflow Limits

The *maximum* airflow that the system will send to any zone is determined by this equation:

(zone% + leakage%)×{(450 CFM per ton)×(# tons)}×(zone airflow limit)

(450 CFM/ton)×(# nominal tons) ***OR***

High Heating Airflow, whichever is larger

System Zone Airflow Limit Values

Low – 100% (1.0)
Medium Low – 138% (1.38)
Medium – 176% (1.76)
Medium High – 214% (2.14)
High- 250% (2.5)
No Limit

Infinity® & Evolution® Zoning Airflow Limits

Air Flow Limiting

- Basically, in Place for Noise Considerations:

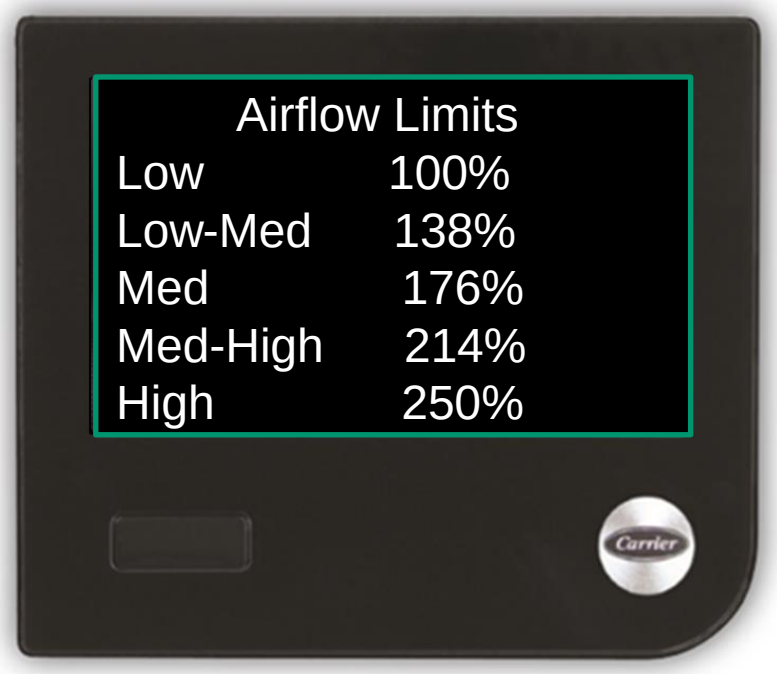
  For Each Mode of Operation there will be a corresponding Minimum Airflow that a Zoning System has to Deliver to Protect the Equipment.

Infinity® & Evolution® Zoning Airflow Limits

Airflow Limits and Equipment Protection

The maximum airflow allowed into a zone is based on the relative size of the zone determined by the duct assessment, and the airflow limits selected for each zone. Airflow limits are set to high as factory default. This means that 200% of the assessed air flow is allowed into the zone. Example if a zone size is determined to be 25% of the entire system, and the maximum airflow (heating or cooling) is 2000 cfm, the maximum airflow into this zone is 2000 x 25% x 250% = 1250 cfm. (assessed zone % + leakage %) x 450cfm/ton x # of tons x airflow limit %= max airflow for that zone (cooling operation) (assessed zone % + leakage %) x max heat x airflow limit % = max airflow for that zone (heating operation) This airflow limit multiplier can be adjusted to reduce or increase allowable noise levels; Low = 100%, Medium Low = 138%, Medium = 176%, Medium High = 214%, High = 250% & *No Limit (will not cause stage down when reached).

Infinity® & Evolution® Zoning Airflow Limits



- Low 100%
- Low-Medium 138%
- Medium176%
- Medium-High 214%
- High 250% (default)
- No Limit (MAX)
- Zoning Airflow Limits have been expanded from 3 to 5 settings with the Touch Controllers. With expanded CFM range, the max zone CFM is now displayed so an installer can see what the max CFM will be for a zone while adjusting the limit.

However, while in MAX airflow, the system will not stage down.

Infinity® & Evolution® Zoning Airflow Limits

Zoned (Heating or Cooling)

This is the *Maximum* airflow that the system will send to ***each zone*** determined by this equation:

(zone% + leakage%)×(450 CFM per ton×(# tons)×(zone airflow limit)

Old Airflow Limits

Low – 100%
Medium – 150%
High- 200%
Maximum – 210%

New Airflow Limits

Low 100%
Low-Medium 138%
Medium176%
Medium-High 214%
High 250% (default)
No Limit

Infinity® & Evolution® Zoning Airflow Limits

Zoned (Cooling)

The *Minimum* airflow that will be delivered to any single zone is determined by the *Dehumidify* airflow setting. Required for *equipment operation*.

Normal – 175 CFM/ton in Low Stage
275 CFM/ton in High Stage

High – 225 CFM/ton in Low Stage
325 CFM/ton in High Stage

Infinity® & Evolution® Zoning Airflow Limits

Zoned

- **What are the two things that we do have control over?**
- Zone airflow limit setting (upper limit)
- Dehumidify airflow limit setting (lower limit)

Infinity® & Evolution® Zoning Airflow Limits

Zoned

Example: 1

3 zones 4-ton system

Zone1 = 25%, Zone 2 = 35%, Zone 3 = 25%, Leakage = 15%
(Determined by Duct assessment)

Dehum => Normal (275 CFM/ton)

All zone limits set at Medium Low (138%)

Infinity® & Evolution® Zoning Airflow Limits

58TN0A

Unit Size			090C17–16	090C21–20	110C21–20	135C24–22
RATINGS AND PERFORMANCE						
Input Btuh* Nonweatherized ICS	All Standard, Low Nox Upflow	High	88,000	88,000	110,000	132,000
		Low	58,000	58,000	72,500	87,000
Input Btuh* Nonweatherized ICS	All Low NOx Downflow/ Horizontal	High	84,000	84,000	105,000	126,000
		Low	58,000	58,000	72,500	87,000
Output Capacity (Btuh) Nonweatherized ICS ^	All Standard, Low Nox Upflow	High	71,000	71,000	89,000	107,000
		Low	47,000	47,000	59,000	70,000
Output Capacity (Btuh) Nonweatherized ICS ^	All Low NOx Downflow/ Horizontal	High	68,000	68,000	85,000	102,000
		Low	47,000	47,000	59,000	70,000
AFUE			80%			
Certified Temperature Rise Range – °F (°C)		High	40–70 (22–39)	25–55 (14–30)	40–70 (22–39)	40–70 (22–39)
		Low	30–60 (17–33)	15–45 (8–25)	25–55 (14–31)	25–55 (14–31)
Certified External Static Pressure		Heat/Cool	0.15/0.50	0.15/0.50	0.20/0.50	0.20/0.50
Airflow CFM ‡		Heating High/Low	1195/960	1600/1435	1465/1295	1835/1660
		Max Cooling	1595	2330	2155	2265

Infinity® & Evolution® Zoning Airflow Limits

Zoned

Comfort / Efficiency 4*350=1400 CFM

Maximum 4*400=1600 CFM

Zone 1 (Medium Low airflow limit)

4*450*1.38*(.25 +.15) = 994 CFM

Zone 1 (High airflow limit)

4*450*2.5*(.25 +.15) = 1800 CFM

Normal Dehumidify Airflow (High Stage) = 4*275 = 1100 CFM

High Dehumidify Airflow (High Stage) = 4*325 = 1300 CFM

Infinity® & Evolution® Zoning Airflow Limits

ZONE 1

Calling for cool

Upper limit = 994 CFM
Lower limit = 1100 CFM

ZONE 2

Not calling for cool

Upper Limit = 1242 CFM
Lower Limit= 1100 CFM

ZONE 3

Not calling for cool

Upper Limit = 994 CFM
Lower Limit = 1100 CFM

Medium Low Airflow is too low, system won't run Zone 1 & 3 in High Stage.

Infinity® & Evolution® Zoning Airflow Limits

Infinity/Evolution Zoning Worksheet

Contractor				Job site	
Indoor model	58TN0A090-16			Serial	
Coil Model	CNPHP4821ALA			Serial	
Outdoor model	24ANB148A003			Serial	

System Tonnage	4
Compressor Stages	2
Number of Zones	3

Duct Assessment Results			
Zone 1	25%	Zone 5	
Zone 2	35%	Zone 6	
Zone 3	25%	Zone 7	
Zone 4	0%	Zone 8	
leakage	15%	Total	100%

Zone Airflow Limits		
Zone Name	AFL	CFM
Zone 1	Airflow Limit	
	Med Low	994
Zone 2	Airflow Limit	
	Med Low	1242
Zone 3	Airflow Limit	
	Med Low	994
Zone 4	Airflow Limit	
Zone 5	Airflow Limit	
Zone 6	Airflow Limit	
Zone 7	Airflow Limit	
Zone 8	Airflow Limit	

Zone Airflow Reference Chart						
	Low	Med-Low	Med	Med-High	High	No Limit
	100%	138%	176%	214%	250%	X
Zone 1	720	994	1267	1541	1800	
Zone 2	900	1242	1584	1926	2250	
Zone 3	720	994	1267	1541	1800	
Zone 4						
Zone 5						
Zone 6						
Zone 7						
Zone 8						

Notes & Formulas

(zone% + leakage%){(450 CFM per ton)*(# tons)}*(zone airflow limit)*
Heat Airflow is always calculated off of what the Product Data Sheet Specifies
If DeHum airflow is set to normal then cooling airflow will be based at 275 CFM in high & 175 in low
If DeHum airflow is set to high then cooling airflow will be based at 325 CFM in high & 225 in low

Infinity® & Evolution® Zoning Airflow Limits

Zoned

Example: 2

4 zones 5-ton system

Zone1 = 25%, Zone 2 = 20%, Zone 3 = 32%, Zone 4 = 13%, Leakage = 10%

Dehum => Normal (275 CFM/ton)

All zone limits set at Medium (176%)

Infinity® & Evolution® Zoning Airflow Limits

58TN0A

Unit Size			090C17–16	090C21–20	110C21–20	135C24–22
RATINGS AND PERFORMANCE						
Input Btuh* Nonweatherized ICS	All Standard, Low Nox Upflow	High	88,000	88,000	110,000	132,000
		Low	58,000	58,000	72,500	87,000
Input Btuh* Nonweatherized ICS	All Low NOx Downflow/ Horizontal	High	84,000	84,000	105,000	126,000
		Low	58,000	58,000	72,500	87,000
Output Capacity (Btuh) Nonweatherized ICS ^	All Standard, Low Nox Upflow	High	71,000	71,000	89,000	107,000
		Low	47,000	47,000	59,000	70,000
Output Capacity (Btuh) Nonweatherized ICS ^	All Low NOx Downflow/ Horizontal	High	68,000	68,000	85,000	102,000
		Low	47,000	47,000	59,000	70,000
AFUE			80%			
Certified Temperature Rise Range – °F (°C)		High	40–70 (22–39)	25–55 (14–30)	40–70 (22–39)	40–70 (22–39)
		Low	30–60 (17–33)	15–45 (8–25)	25–55 (14–31)	25–55 (14–31)
Certified External Static Pressure		Heat/Cool	0.15/0.50	0.15/0.50	0.20/0.50	0.20/0.50
Airflow CFM ‡		Heating High/Low	1195/960	1600/1435	1465/1295	1835/1660
		Max Cooling	1595	2330	2155	2265

Infinity® & Evolution® Zoning Airflow Limits

Zoned

Comfort / Efficiency	5*350=1750 CFM
Maximum	5*400=2000 CFM

Zone 1 (Medium airflow limit)
5*450*1.76*(.25+.10) = 1387 CFM

Zone 1 (High airflow limit)
5*450*2.50*(.25+.10) = 1970 CFM

Normal Dehumidify Airflow = 5*275 = 1375 CFM
High Dehumidify Airflow = 5*325 = 1625 CFM

Infinity® & Evolution® Zoning Airflow Limits

ZONE 1

Calling for cool

Upper limit = 1387 CFM
Lower limit = 1375 CFM

ZONE 2

Not calling for cool

Upper Limit = 1188 CFM
Lower Limit= 1375 CFM

ZONE 3

Not calling for cool

Upper Limit = 1663 CFM
Lower Limit = 1375 CFM

ZONE 4

Not calling for cool

Upper Limit = 911 CFM
Lower Limit = 1375 CFM

Upper limits = 1188 & 911 CFM

Lower limit = 1375 CFM

Medium Low airflow is too low, system won't run Zone 2 or Zone 4 in High Stage alone.

Adjusting zone 2 & 4 airflow limits higher will allow the system to run if it is the only zone calling

Infinity® & Evolution® Zoning Airflow Limits

Infinity/Evolution Zoning Worksheet

Contractor				Job site	
Indoor model	58TN0A110C21-20			Serial	
Coil Model	CNPHP6024ALA			Serial	
Outdoor model	24ANB160A003			Serial	

System Tonnage	5
Compressor Stages	2
Number of Zones	3

Duct Assessment Results			
Zone 1	25%	Zone 5	
Zone 2	20%	Zone 6	
Zone 3	32%	Zone 7	
Zone 4	13%	Zone 8	
leakage	10%	Total	100%

Zone Airflow Limits		
Zone Name	AFL	CFM
Zone 1	Airflow Limit	
	Med	1387
Zone 2	Airflow Limit	
	Med	1188
Zone 3	Airflow Limit	
	Med	1663
Zone 4	Airflow Limit	
	Med	912
Zone 5	Airflow Limit	
Zone 6	Airflow Limit	
Zone 7	Airflow Limit	
Zone 8	Airflow Limit	

Zone Airflow Reference Chart						
	Low	Med-Low	Med	Med-High	High	No Limit
	100%	138%	176%	214%	250%	X
Zone 1	788	1087	1387	1686	1970	
Zone 2	675	932	1188	1445	1688	
Zone 3	945	1304	1663	2022	2363	
Zone 4	518	715	912	1109	1295	
Zone 5						
Zone 6						
Zone 7						
Zone 8						

Notes & Formulas

(zone% + leakage%){(450 CFM per ton)*(# tons)}*(zone airflow limit)*

Heat Airflow is always calculated off of what the Product Data Sheet Specifies

If DeHum airflow is set to normal then cooling airflow will be based at 275 CFM in high & 175 in low

If DeHum airflow is set to high then cooling airflow will be based at 325 CFM in high & 225 in low

BREAK TIME

5 MINUTES

Infinity® & Evolution® Zoning Airflow Limits

Zoned

Example: 3

3 zones 3-1/2-ton system

Zone1 = 25%, Zone 2 = 35%, Zone 3 = 25%, Leakage = 15% (Determined by Duct assessment)

Dehum => Normal (275 CFM/ton)

All zone limits set at Medium Low (138%)

Infinity® & Evolution® Zoning Airflow Limits

880TA

Unit Size			48090C17	60090C21	60110C21	66135C24
RATINGS AND PERFORMANCE						
Input Btuh* Nonweatherized ICS	All Standard, Low Nox Upflow	High	88,000	88,000	110,000	132,000
		Low	58,000	58,000	72,500	87,000
Input Btuh* Nonweatherized ICS	All Low NOx Downflow/ Horizontal	High	84,000	84,000	105,000	126,000
		Low	58,000	58,000	72,500	87,000
Output Capacity (Btuh) Nonweatherized ICS ^	All Standard, Low Nox Upflow	High	71,000	71,000	89,000	107,000
		Low	47,000	47,000	59,000	70,000
Output Capacity (Btuh) Nonweatherized ICS ^	All Low NOx Downflow/ Horizontal	High	68,000	68,000	85,000	102,000
		Low	47,000	47,000	59,000	70,000
AFUE			80%			
Certified Temperature Rise Range – °F (°C)		High	40–70 (22–39)	25–55 (14–30)	40–70 (22–39)	40–70 (22–39)
		Low	30–60 (17–33)	15–45 (8–25)	25–55 (14–31)	25–55 (14–31)
Certified External Static Pressure		Heat/Cool	0.15/0.50	0.15/0.50	0.20/0.50	0.20/0.50
Airflow CFM ‡		Heating High/Low	1195/960	1600/1435	1465/1295	1835/1660
		Max Cooling	1595	2330	2155	2265

Infinity® & Evolution® Zoning Airflow Limits

Zoned

Comfort / Efficiency	5*350=1750 CFM
Maximum	5*400=2000 CFM

Zone 1 (Medium airflow limit)
5*450*1.76*(.25+.10) = 1387 CFM

Zone 1 (High airflow limit)
5*450*2.50*(.25+.10) = 1970 CFM

Normal Dehumidify Airflow = 5*275 = 1375 CFM
High Dehumidify Airflow = 5*325 = 1625 CFM

Infinity® & Evolution® Zoning Airflow Limits

ZONE 1

Calling for cool

Upper limit = 869 CFM
Lower limit = 963 CFM

Medium Low airflow is too low, system won't run unless another zone is calling.

ZONE 2

Not calling for cool

Upper Limit = 1086 CFM
Lower Limit= 963 CFM

The Upper limit for this zone is higher than the lower and would be allowed to run if it was a single caller.

ZONE 3

Not calling for cool

Upper Limit = 869 CFM
Lower Limit = 963 CFM

This will be the same as Zone 1 as its percentage was the same as Zone 1.

Infinity® & Evolution® Zoning Airflow Limits

Infinity/Evolution Zoning Worksheet

Contractor				Job site	
Indoor model	880TA60090C21-16			Serial	
Coil Model	CNPHP4821ALA			Serial	
Outdoor model	126CNA042000A			Serial	

System Tonnage	3 1/2
Compressor Stages	2
Number of Zones	3

Duct Assessment Results			
Zone 1	25%	Zone 5	
Zone 2	35%	Zone 6	
Zone 3	25%	Zone 7	
Zone 4		Zone 8	
leakage	15%	Total	100%

Zone Airflow Limits		
Zone Name	AFL	CFM
Zone 1	Airflow Limit	
	Med Low	869
Zone 2	Airflow Limit	
	Med Low	1087
Zone 3	Airflow Limit	
	Med Low	869
Zone 4	Airflow Limit	
Zone 5	Airflow Limit	
Zone 6	Airflow Limit	
Zone 7	Airflow Limit	
Zone 8	Airflow Limit	

Zone Airflow Reference Chart						
	Low	Med-Low	Med	Med-High	High	No Limit
	100%	138%	176%	214%	250%	X
Zone 1	630	869	1109	1348	1575	
Zone 2	788	1087	1387	1891	1970	
Zone 3	630	869	1109	1348	1575	
Zone 4						
Zone 5						
Zone 6						
Zone 7						
Zone 8						

Notes & Formulas

(zone% + leakage%){(450 CFM per ton)*(# tons)}*(zone airflow limit)*

Heat Airflow is always calculated off of what the Product Data Sheet Specifies

If DeHum airflow is set to normal then cooling airflow will be based at 275 CFM in high & 175 in low

If DeHum airflow is set to high then cooling airflow will be based at 325 CFM in high & 225 in low

Infinity® & Evolution® Zoning Airflow Limits

Zoned

Example: 4

5 zones 5-ton system (Multi-Stage)

Zone1 = 24%, Zone 2 = 33%, Zone 3 = 13%, Zone 4 = 20%, Zone 5 = 8%,
Leakage = 2% (Determined by Duct assessment)

Dehum. => Normal (275 CFM/ton)

All zone limits set at Med Low (138%)

Infinity® & Evolution® Zoning Airflow Limits

880TA

Unit Size			48090C17	60090C21	60110C21	66135C24
RATINGS AND PERFORMANCE						
Input Btuh* Nonweatherized ICS	All Standard, Low Nox Upflow	High	88,000	88,000	110,000	132,000
		Low	58,000	58,000	72,500	87,000
Input Btuh* Nonweatherized ICS	All Low NOx Downflow/ Horizontal	High	84,000	84,000	105,000	126,000
		Low	58,000	58,000	72,500	87,000
Output Capacity (Btuh) Nonweatherized ICS ^	All Standard, Low Nox Upflow	High	71,000	71,000	89,000	107,000
		Low	47,000	47,000	59,000	70,000
Output Capacity (Btuh) Nonweatherized ICS ^	All Low NOx Downflow/ Horizontal	High	68,000	68,000	85,000	102,000
		Low	47,000	47,000	59,000	70,000
AFUE			80%			
Certified Temperature Rise Range – °F (°C)		High	40–70 (22–39)	25–55 (14–30)	40–70 (22–39)	40–70 (22–39)
		Low	30–60 (17–33)	15–45 (8–25)	25–55 (14–31)	25–55 (14–31)
Certified External Static Pressure		Heat/Cool	0.15/0.50	0.15/0.50	0.20/0.50	0.20/0.50
Airflow CFM ‡		Heating High/Low	1195/960	1600/1435	1465/1295	1835/1660
		Max Cooling	1595	2330	2155	2265

Infinity® & Evolution® Zoning Airflow Limits

ZONE 1

Calling for cool

Upper limit = 807 CFM
Lower limit = 600 CFM

The Upper limit for this zone is higher than the lower and would be allowed to run if it was a single caller.

ZONE 2

Not calling for cool

Upper Limit = 1086 CFM
Lower Limit= 600 CFM

The Upper limit for this zone is higher than the lower and would be allowed to run if it was a single caller.

ZONE 3

Not calling for cool

Upper Limit = 466 CFM
Lower Limit = 600 CFM

Medium Low airflow is too low, system won't run unless another zone is calling.

ZONE 4

Not calling for cool

Upper Limit = 683 CFM
Lower Limit = 600 CFM

The Upper limit for this zone is higher than the lower and would be allowed to run if it was a single caller.

ZONE 5

Not calling for cool

Upper Limit = 311 CFM
Lower Limit = 600 CFM

Medium Low airflow is too low, system won't run unless another zone is calling.

Infinity® & Evolution® Zoning Airflow Limits

Carrier CARRIER NORTH TEXAS

Infinity/Evolution Zoning Worksheet

bryant BRYANT NORTH TEXAS

Contractor				Job site	
Indoor model	58CVA110-20			Serial	
Coil Model	CNPVT6024ALA			Serial	
Outdoor model	24VNA060A003			Serial	

System Tonnage	5
Compressor Stages	Multi / 5
Number of Zones	5

Duct Assessment Results			
Zone 1	24%	Zone 5	8%
Zone 2	33%	Zone 6	
Zone 3	13%	Zone 7	
Zone 4	20%	Zone 8	
leakage	2%	Total	100%

Zone Airflow Limits		
Zone Name	AFL	CFM
Zone 1	Airflow Limit	
	Med Low	
Zone 2	Airflow Limit	
	Med Low	
Zone 3	Airflow Limit	
	Med Low	
Zone 4	Airflow Limit	
	Med Low	
Zone 5	Airflow Limit	
	Med Low	
Zone 6	Airflow Limit	
Zone 7	Airflow Limit	
Zone 8	Airflow Limit	

Zone Airflow Reference Chart						
	Low	Med-Low	Med	Med-High	High	No Limit
	100%	138%	176%	214%	250%	X
Zone 1						
Zone 2						
Zone 3						
Zone 4						
Zone 5						
Zone 6						
Zone 7						
Zone 8						

Notes & Formulas

(zone% + leakage%)(450CFM*# tons)*(zone airflow limit)*

Heat Airflow is always calculated off of what the Product Data Sheet Specifies

If DeHum airflow is set to normal then airflow will be based at 275 CFM

If DeHum airflow is set to high then airflow will be based at 325 CFM

Infinity® & Evolution® Zoning Airflow Limits

189BNV AIRFLOWS

Cooling - Comfort Mode			Minimum Cooling (Dehum or Zoning)
Size	Max Stage 5 Airflow	Max Stage 1 Airflow	
1- Ton	420	300	300
2- Ton	739	300	300
3- Ton	990	300	300
4- Ton	1389	542	457
5- Ton	1600	700	600

Cooling - Efficiency Mode		
Size	Max Stage 5 Airflow	Max Stage 1 Airflow
1- Ton	420	300
2- Ton	825	585
3- Ton	1050	600
4- Ton	1400	875
5- Ton	1800	975

189BNV060			
1	1200	32%	57
2	2180	55%	61
3	2850	70%	64
4	3700	90%	70
5	4140	100%	72

Infinity® & Evolution® Zoning Airflow Limits

- If the system determines that it cannot deliver the airflow into a zone that needs conditioning, and that zone has an airflow limit selected, the system will take the following 4 steps:

Infinity® & Evolution® Zoning Airflow Limits

1. Reduce Airflow If Possible

a. 275 CFM per ton minimum in high stage cooling (325 if Dehum airflow set to High). 175 CFM per ton in low stage cooling for Bristol units. Minimum airflow for Copeland 2-stage outdoor units will vary based on the system multiplier.

- b. Comfort Heat airflow is minimum for heat pump heating (3.5 x outdoor temp + 137) cfm /ton
- c. Use heat pump comfort airflow as minimum if AC Airflow is Efficiency or MAX
- c. No adjustment for furnace heating

2. Dump Air To Zones Set To Unoccupied

a) Unoccupied zones can be conditioned up to the most conditioned set point

Infinity® & Evolution® Zoning Airflow Limits

3. Dump Air To Zones With Lower Set Point

a) Zones with lower set points may be conditioned to within 3 deg of the most conditioned set point.

b) Increase or decrease all zones an additional 0.75 deg

4. Stage Down Equipment

a) Equipment will stage down or shut off if necessary

b) Fault history will record an event of (AIRFLOW LIMITED SHUTDOWN OCCURRED)

c) If shut down occurs, other zones need to call before equipment will resume operation

Infinity® & Evolution® Zoning Airflow Limits

What does the system do to protect itself?

Unoccupied is on the older version of controllers and Away is on the Touch Screens

COOL	Zone 1	Zone 2	Zone 3	Zone 4
	(Unoccupied/Away)	(Setback)	(Setback)	(Calling)
Start	80	79	78	72*
Step 2	72	79	78	72*
Step 3	72	75	75	72*
Step 3a	71.25	74.25	74.25	72*
Step 4		Stage System Down/Off		72*

Set point calling, zone not satisfied

Infinity® & Evolution® Zoning Airflow Limits

- **Options if Airflow Limits are not satisfactory and AIRFLOW LIMITED events are occurring:**
- Increase airflow setting in suspect zones if air noise is acceptable. The system will not stage down when the airflow limit is set to MAX (NO LIMIT). In extreme cases, even a zone set to MAX may cause a shut down on static pressure if the minimum airflow through the equipment cannot be maintained. “EXCESS STATIC PRESSURE” will be recorded in these cases.
- Evaluate duct design and make improvements where necessary
- Evaluate structure for zoning suitability

Infinity® & Evolution® Zoning Airflow Limits

- **Zoning system will not run or shuts down intermittently. “EXCESS STATIC PRESSURE” appears in the last 10 faults**

- System may be held off until more zones are calling. If the zone or zones calling are not capable of delivering the minimum required airflow, the system will wait until more zones call for conditioning.

- This system contains a Blower Cutback algorithm that will not allow the system to run in extremely restrictive conditions. Blower Cutback is initiated when the blower has reached its maximum RPM and is unable to deliver the requested airflow. The blower sends a signal at the maximum RPM which varies depending on the equipment installed. This usually occurs at around 1200-1300 RPM.

Infinity® & Evolution® Zoning Airflow Limits

- **The steps below occur when Blower Cutback has been initiated:**
- In furnace heating, or heat pump comfort heating, the system will stage down or shut down immediately until more zones call for heat. In heat pump Efficiency heating, the airflow will be reduced to heat pump Comfort levels and stage down if that is not possible. In cooling, there is more airflow flexibility. The following process occurs in cooling mode:
- CFM request is reduced in 50 RPM increments (this reduction is visible in the status screens) Static pressure display is not valid in this range and should be ignored since the unit cannot deliver the requested airflow.
- If blower RPM is still above cutback levels, continue reducing CFM request about once a minute

Infinity® & Evolution® Zoning Airflow Limits

- If CFM is at minimum, and cutback is still in effect, begin the same airflow relief process used for Airflow Limits and record EXCESS STATIC PRESSURE fault in last 10 system events
- If minimum airflow cannot be achieved after this process, stage down to low and continue until Cutback is no longer active, or shut off if necessary

- **Options if EXCESS STATIC PRESSURE is active in Last 10 Events:**

- Decrease airflow limit setting to from MAX to something else. This will engage the airflow management algorithm sooner and may allow the system to run longer.
- Evaluate duct design and make improvements where necessary
- Evaluate structure for zoning suitability

Infinity® & Evolution® Zoning Airflow Limits

- **Zoning Situation: "AIRFLOW LIMITED, STAGEDOWN/SHUTDOWN OCCURRED" appears in the Last 10 Faults:**
- Factory default airflow limit is High in each zone. This means that the zone is allowed to deliver 250% of the maximum assessed airflow. For example, if the maximum heating airflow is 2000 CFM and a zone's relative size is 25%, the maximum airflow for that zone when set to High is calculated to be 2000 CFM * 25% * 250% = 1250 CFM
- If the airflow limit is set to MED, the max allowable airflow is 176%, if set to LOW; 100%. If set to MAX, there is no airflow limit, but the system could still shut down in heating if the maximum motor RPM is reached due to EXCESS STATIC PRESSURE.

Infinity® & Evolution® Zoning Summary

Zoning Summary

A zone may or may not call depending on what the minimum and maximum airflow settings are. Be aware that if a zone % size is relatively small; the system may not run when only that zone has a demand. This can be a point of confusion.

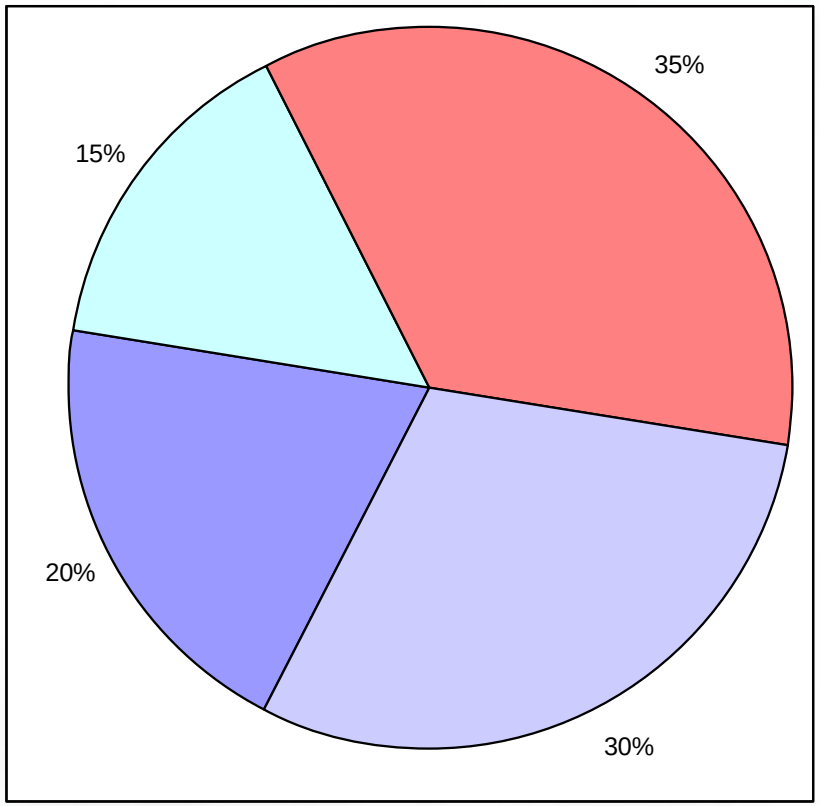
Infinity® & Evolution® Zoning Continuous Fan Airflow

- **Continuous Fan**
  - In Continuous Fan Mode with a *NON - ZONED* system, the system will supply the following airflows:
    - HIGH - Furnace: Greater of High HEAT or High COOL air flow
      Fan Coil: High COOL air flow
    - MED - 75% of High Airflow
    - LOW - Furnace: Lesser of 50% High HEAT or 50% High Cool
      Fan Coil: 50% High COOL

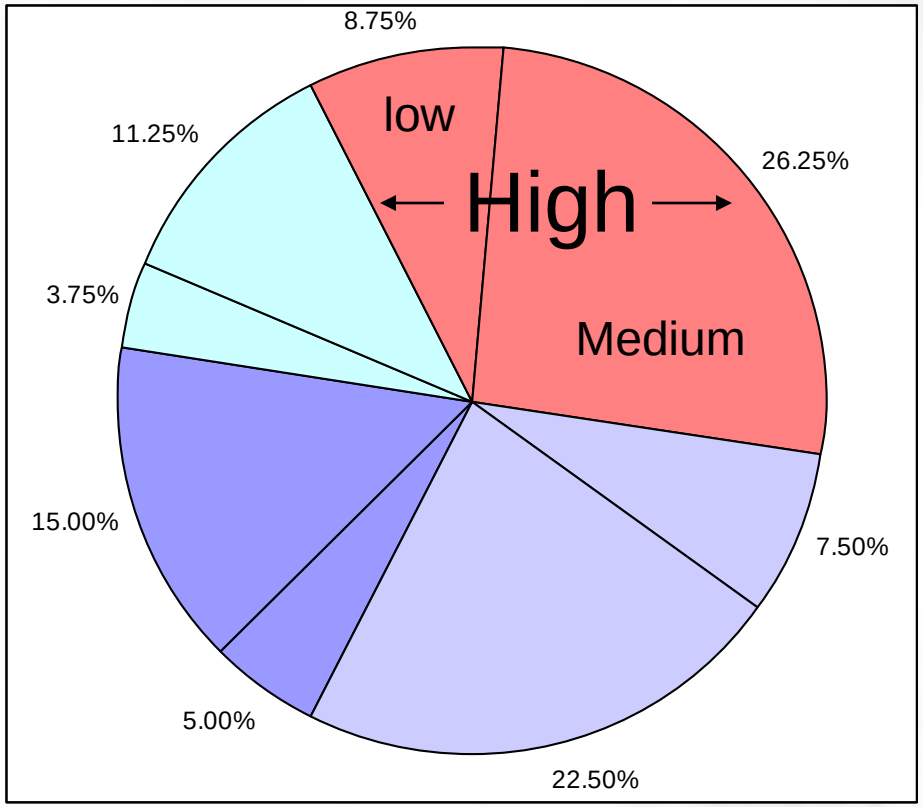
Above are subject to indoor unit minimum air flow

***For a Zoned system, these airflows represent the total system airflow, *NOT* Low, Medium and High airflows for each zone.**

Infinity® & Evolution® Zoning Continuous Fan Airflow



Zone sizes per duct assessment



Continuous fan % values

Continuous fan multipliers are: Low: 25%, Medium: 75%, High: 100%

Example: If total system airflow is 1000 CFM, Medium cont. fan for 35% zone = 1000 x 35% x 75% = 262.5 CFM

Infinity® & Evolution® Zoning Airflow Review

- **Must** Have a Heat Loss/Gain!
- Select Equipment Based on Total Load
- Determine Minimum Air Flow of Equipment Selected
- Lay Out Zones
  - Each zone must handle **minimum** air flow!
    - If not, then you will have to determine how you will handle the excess air

Infinity® & Evolution® Zoning Airflow Limits

Zoning Minimum Air Flow

Infinity® & Evolution® Zoning Airflow Limits

What is Minimum Air Flow?

- In a Zoning System:
  - The minimum amount of air flow required for each zone to maintain proper operation of the equipment.
    - Prevent (s)
      - Tripping limits
      - Tripping freeze protection
      - Tripping other safeties.
      - Over conditioning of zones
    - Allow Infinity/Evolution to maintain operation of the zone without requiring additional zones to operate.

Infinity® & Evolution® Zoning Airflow Limits

Determining Minimum Airflow

- **Selected Furnace**
  - **58TN0A110C21-20**
    - Low Heat CFM 1295
    - High Heat CFM 1465
- **Selected Air Conditioner**
  - **24ANB160**
    - Low Cooling CFM 1225 (As low as 875)
    - High Cooling CFM 1750 (As low as 1375)
- Determine Minimum by Comparing the Furnace Low Heating CFM to the Low Cooling CFM in this Case the Air Conditioner Low CFM is less than the Furnace Low CFM
- Selected Minimum CFM for the System is
  - **1295 CFM is the Minimum Air Flow**

Infinity® & Evolution® Zoning Airflow Limits

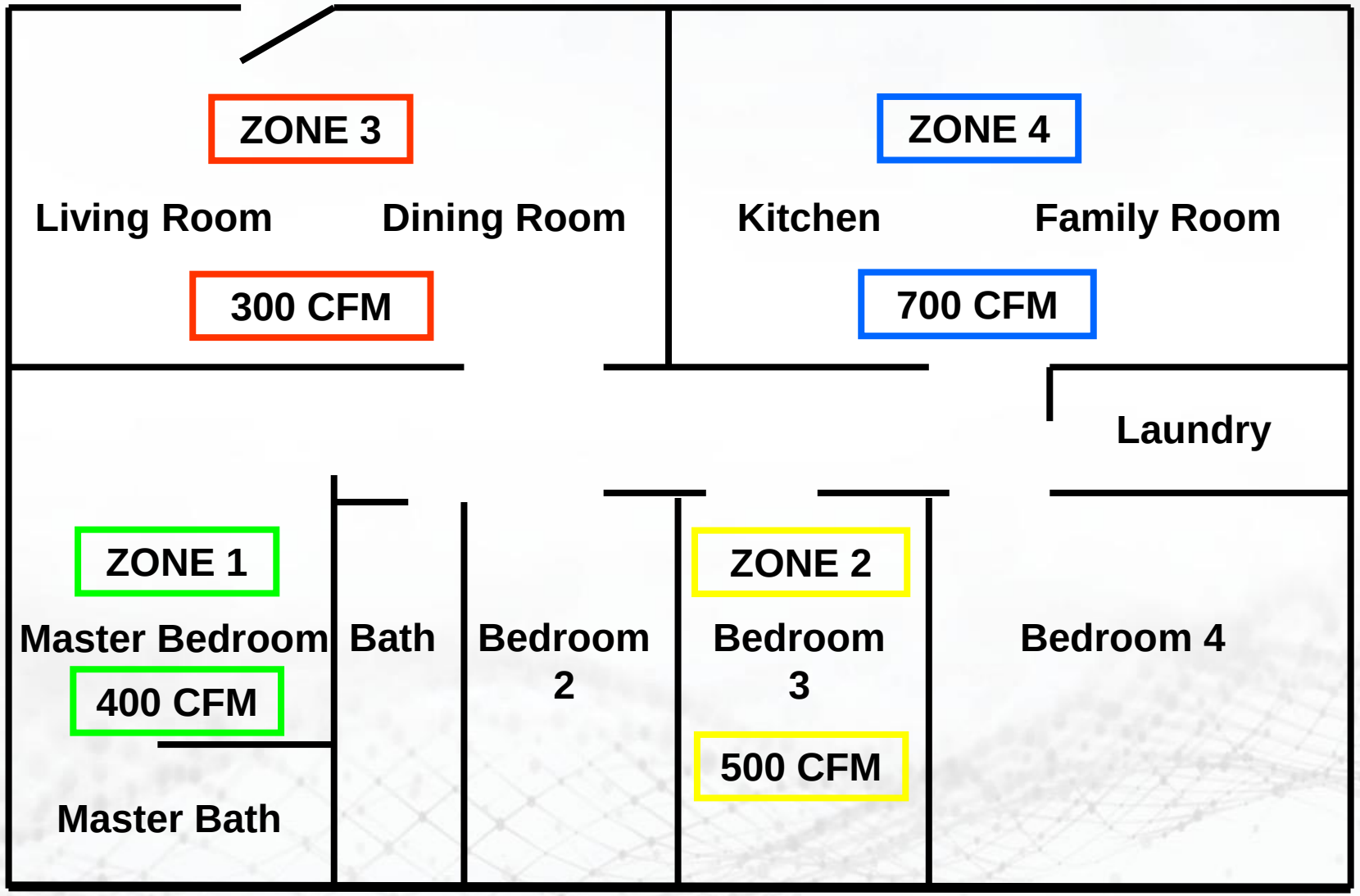
Problems When Zone Won't Handle ***MINIMUM*** AirFlow

- **High STATIC PRESSURE!**
- Unit May Not Run Until More Zones Call.
- Noise Level Will Be High.
- Changing Noise Level May Cause Unit Not To Run Until More Zones Call.
- SET Backed Zones or Out Zones Maybe Conditioned/Over-Conditioned to Allow System to Satisfy Calling Zone.

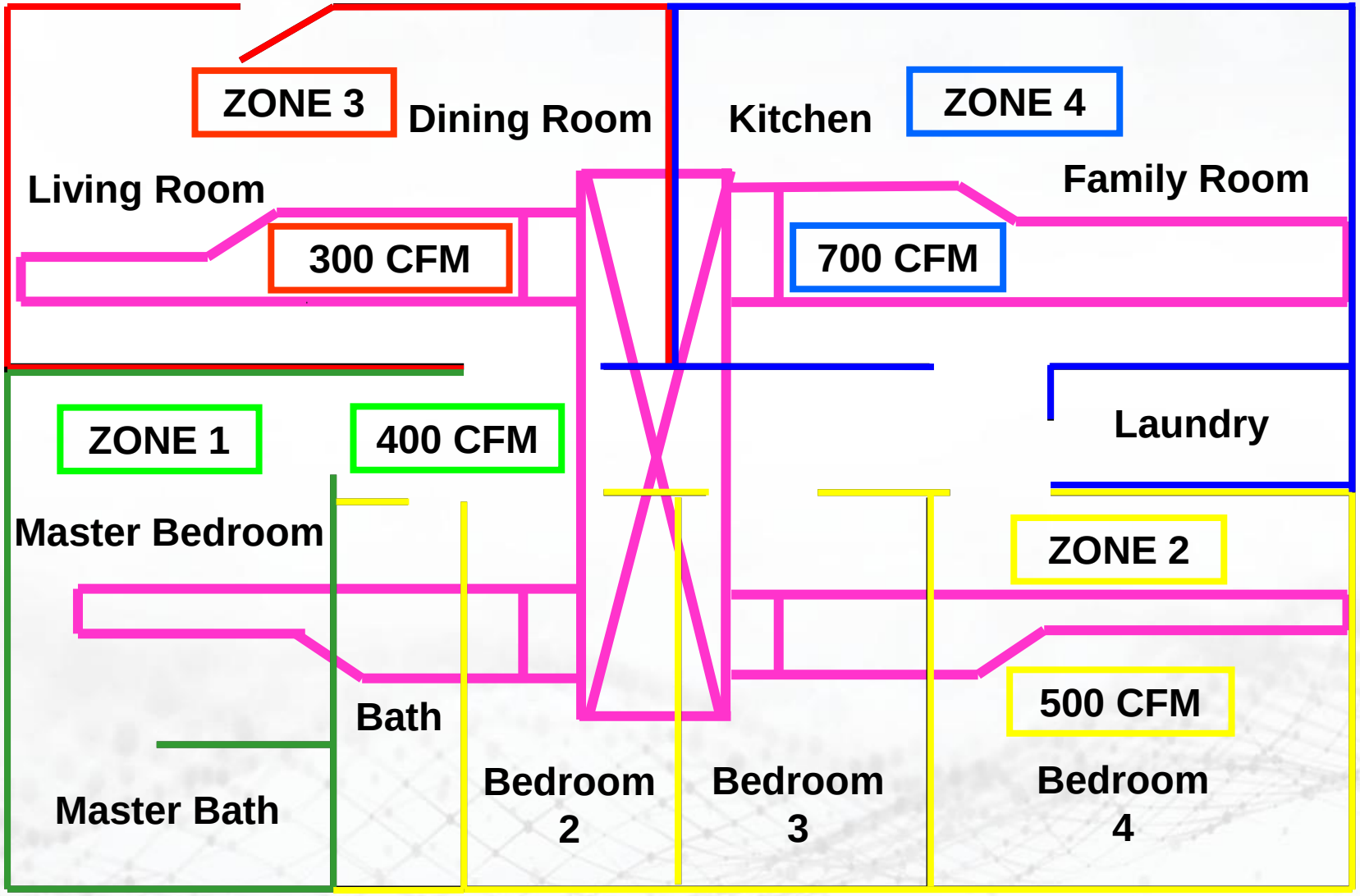
Infinity® & Evolution® Zoning Airflow Limits

- The Zone Airflow Limit check will allow the installer to assess the noise that will generated by the maximum airflow to each zone. This only will come into play in a “Last Zone Calling” scenario.
  - In any other scenario, more than one zone is calling, so a different algorithm is used to determine how to split airflow between zones.
- When a zone is highlighted, any changes made to the setting will take effect within 30 seconds.
  - If the airflow noise is objectionable, the installer can select LOW, or MEDIUM (NORMAL in some software versions) for the airflow noise limit.
  - If the noise is not objectionable, the installer should leave it set for HIGH.
- ***MAXIMUM setting is NOT RECOMMENDED unless it is a necessary step to achieve desired comfort.***
  - A zone set for MAXIMUM is no longer a legal Dump Zone for the controller. Further, the system is not allowed to Dump air to any other zone if this is the only zone calling. All air in such case is required to use this zone, or a stage-back error will be reported.
  - MAXIMUM air value only comes into play in the “Last Zone Calling” scenario. Otherwise, when calling with other zones, the only effect will be that a zone set to MAXIMUM is Open or Closed, rather than modulating.

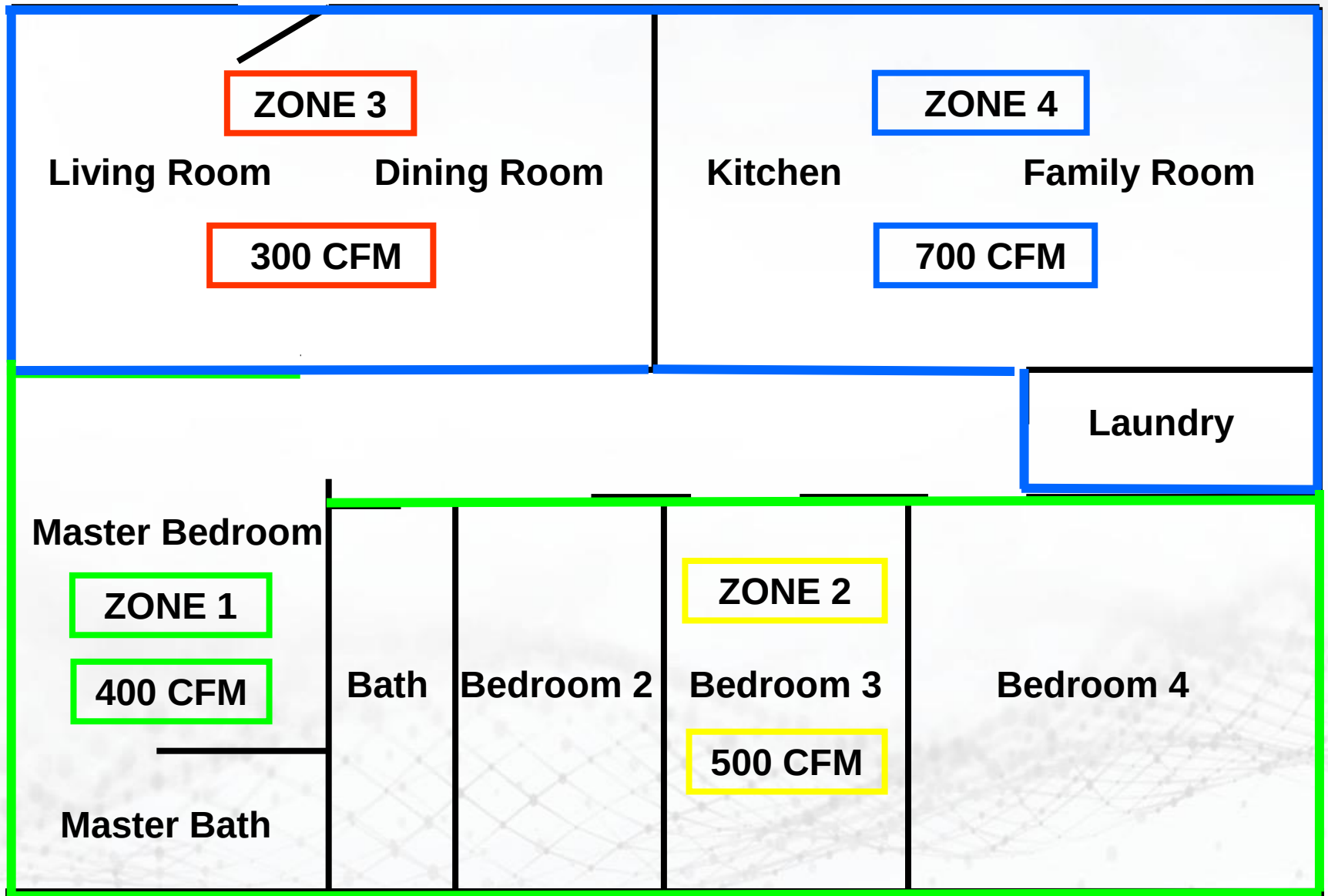
Infinity® & Evolution® Zoning Options



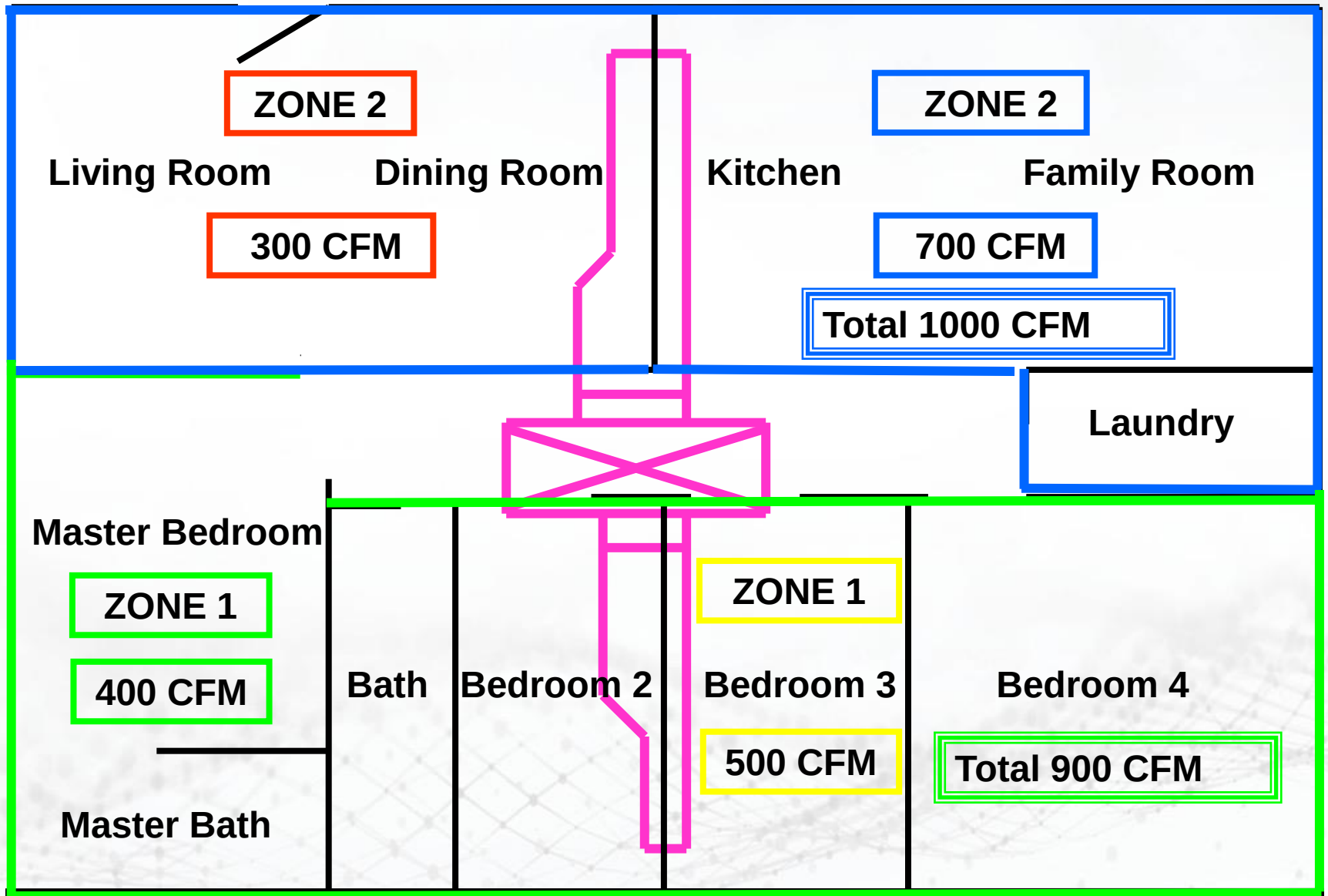
Infinity® & Evolution® Zoning Options



Infinity® & Evolution® Zoning Options



Infinity® & Evolution® Zoning Options



MODULES

SERVICE/TROUBLESHOOTING

CONCLUSION

Q & A

Comfort™ & Legacy™ Series Three-Zone System

Troubleshooting

COMFORT SERIES THREE-ZONE CONTROL PANEL
ZONECC3ZAC01 (1 Heat / 1 Cool) or ZONECC3ZHP01 (3 Heat / 2 Cool)
ZONEBB3ZAC01 (1 Heat / 1 Cool) or ZONEBB3ZHP01 (3 Heat / 2 Cool)

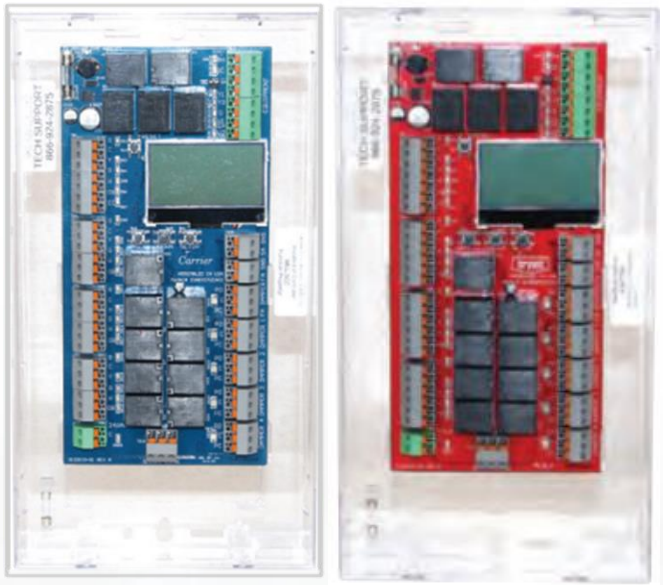
Error Codes The status LED indicates normal operation, problems, and LAT/HPT limit status according to a two-digit code. The first digit flashes its number, followed by a 2 second pause, followed by the second digit, followed by a 4 second pause. The cycle the repeats. The codes are:

Table 6 – Error Codes

On Continuously	No Problems
11 - 17	LAT limit level 1 - 7
21 - 27	HPT limit level 1 - 7
31	LAT shorted
32	LAT open
33	HPT open
34	HPT shorted
41	Invalid: Sw 9=ON; Sw 10=OFF

Performance™ & Preferred™ Series Four-Zone System

Troubleshooting



PERFORMANCE & PREFERRED
SERIES FOUR-ZONE
ZONECC4ZCN01
ZONEBB4ZCN01

Easy Troubleshooting

- Display Indicates Full System Status
- Color-Coded LED Indicators for Each Thermostat Call and Equipment Call
- Two-Color LED Indicators Show Damper Position
- Red LED Indicates Blown Fuse Compatibility

Equipment

10 AMP @ 24VAC Contact Rating
RH - 24VAC HOT from Heating Transformer on Equipment (RED Led)
RC - 24VAC HOT from Cooling Transformer on Equipment (RED Led)
C - 24VAC COMMON from Transformer on Equipment (NO Led)
Y1 - 1st Stage Compressor (YELLOW Led)
Y2 - 2nd Stage Compressor (YELLOW Led)
G - Fan (GREEN Led)
W1/EH - 1st Stage Heat OR Emergency Heat (RED Led)
W2 O/B - Reversing Valve OR 2nd Stage Heat (ORANGE Led)

Thermostat

LABEL - DESCRIPTION (LED COLOR)
R - 24VAC HOT (RED)
C - Common (NONE)
Y - Compressor (YELLOW)
G - Fan (GREEN)
W - Heart OR Emergency Heat (RED)
O/B - Reversing Valve (ORANGE)
EC - Economy Input (GREEN) - Zone ONE Only

Infinity® & Evolution® Zoning System Troubleshooting

INFINITY® EVOLUTION®
SYSTEM CONTROL
SYSTXCCITC01-B
SYSTXBBITC01-B

INFINITY® EVOLUTION ®
SYSTEM CONTROL
SYSTXCCITC01-C
SYSTXBBITC01-C

INFINITY® & EVOLUTION®
DAMPER CONTROL MODULE
SYSTXCC4ZC01 SYSTXBB4ZC01

SMART ZONING SENSORS
SYSTXZNSMS01

INFINITY® EVOLUTION®
SYSTEM CONTROL
SYSTXCCWIC01-B
SYSTXBBWEC01-B

DAMPERS (8-IN. OR 24-IN.)
DAMPREC, DAMPSL, DAMPRND

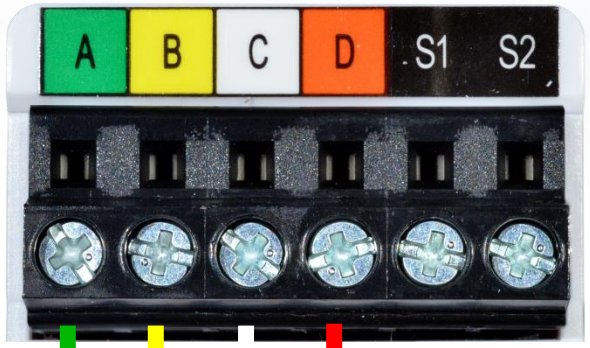
REMOTE ROOM SENSORS
SYSTXCCRRS01
SYSTXBBRRS01

Infinity® & Evolution® Zoning System Troubleshooting

Service Tool

Second User Interface

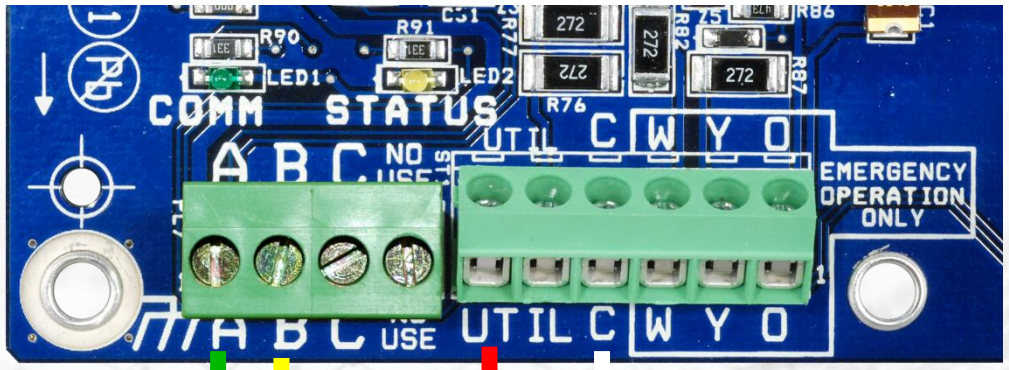
(Service Mode)



(A+B) Communication

(D) 24VAC

(C) Common



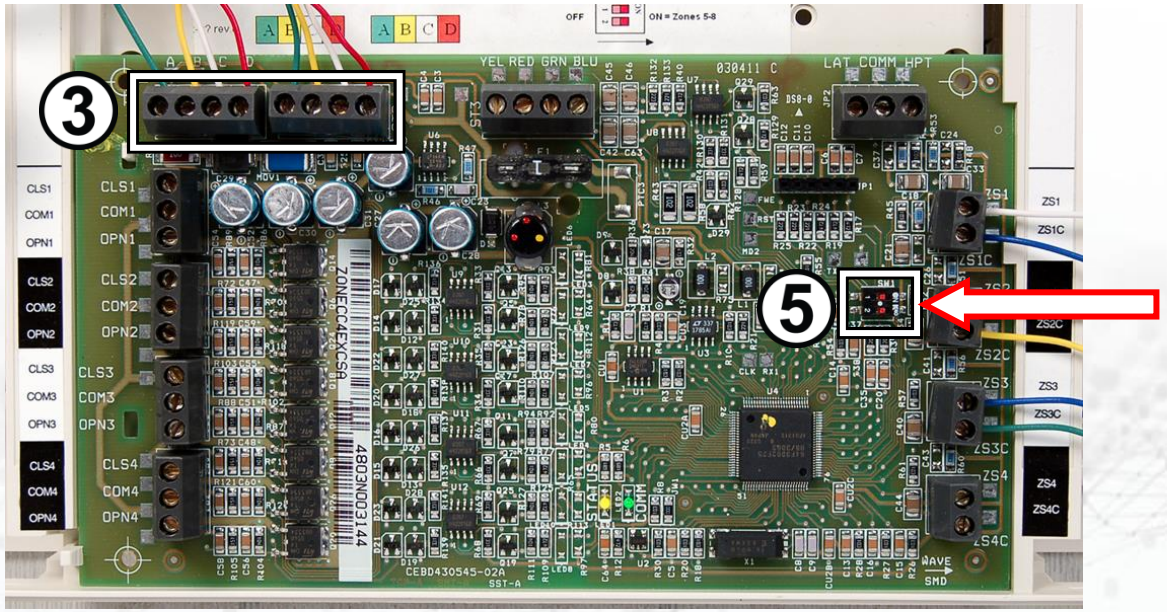
Green Plug

Infinity® & Evolution® Zoning System Troubleshooting

Zones Not Found

- Make sure zone module 1 - 4 has the DIP-switches at ⑤ set to the left
- Make sure zone damper module 5 - 8 has the DIP-switches at ⑤ set to the right
- Recheck wiring to the ABCD connectors at ③
- Perform a re-Install in the INSTALL/SERVICE menu

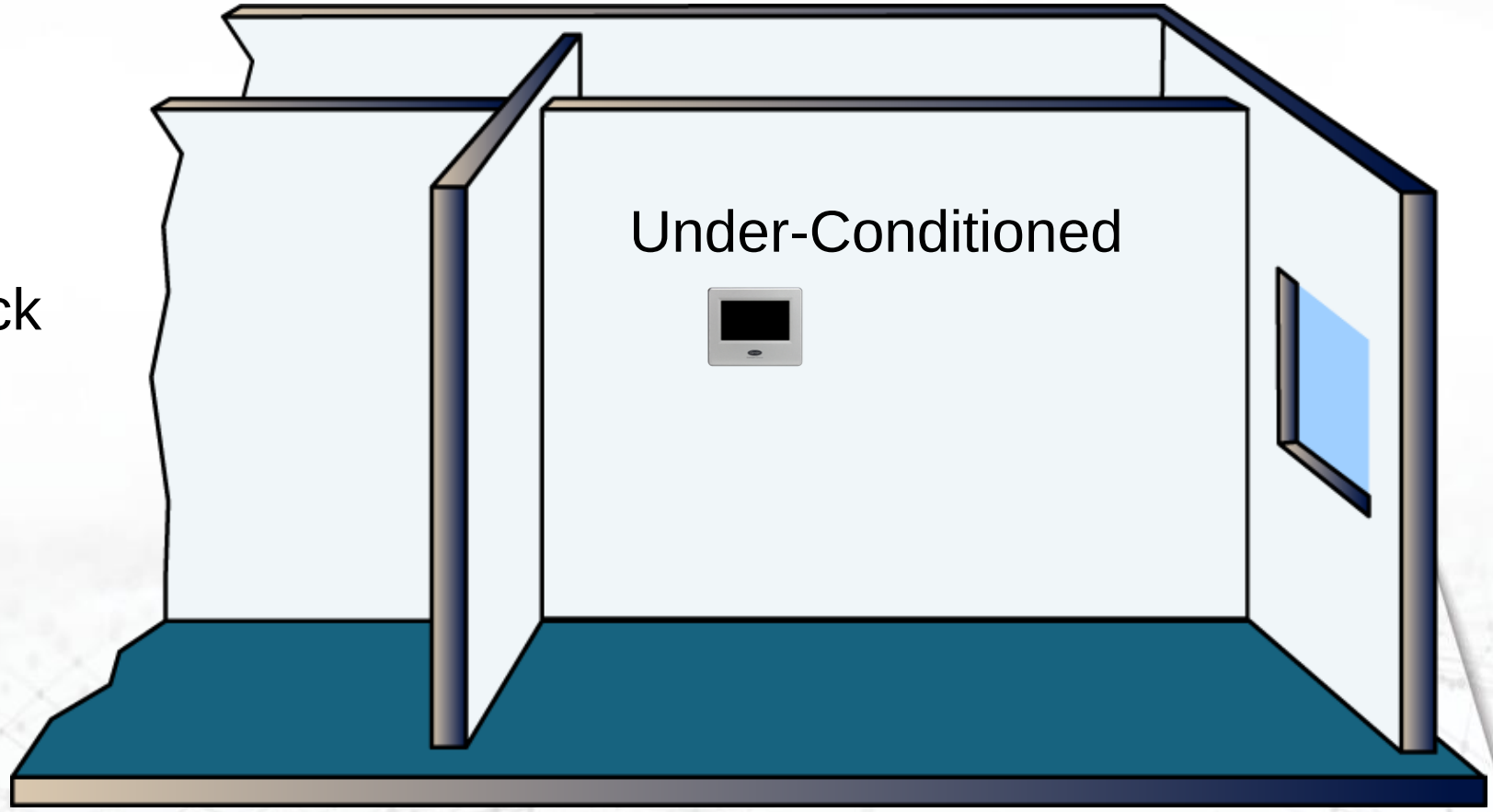
Zone Damper Module



Infinity® & Evolution® Zoning System Troubleshooting

Some Zones Under-Conditioned

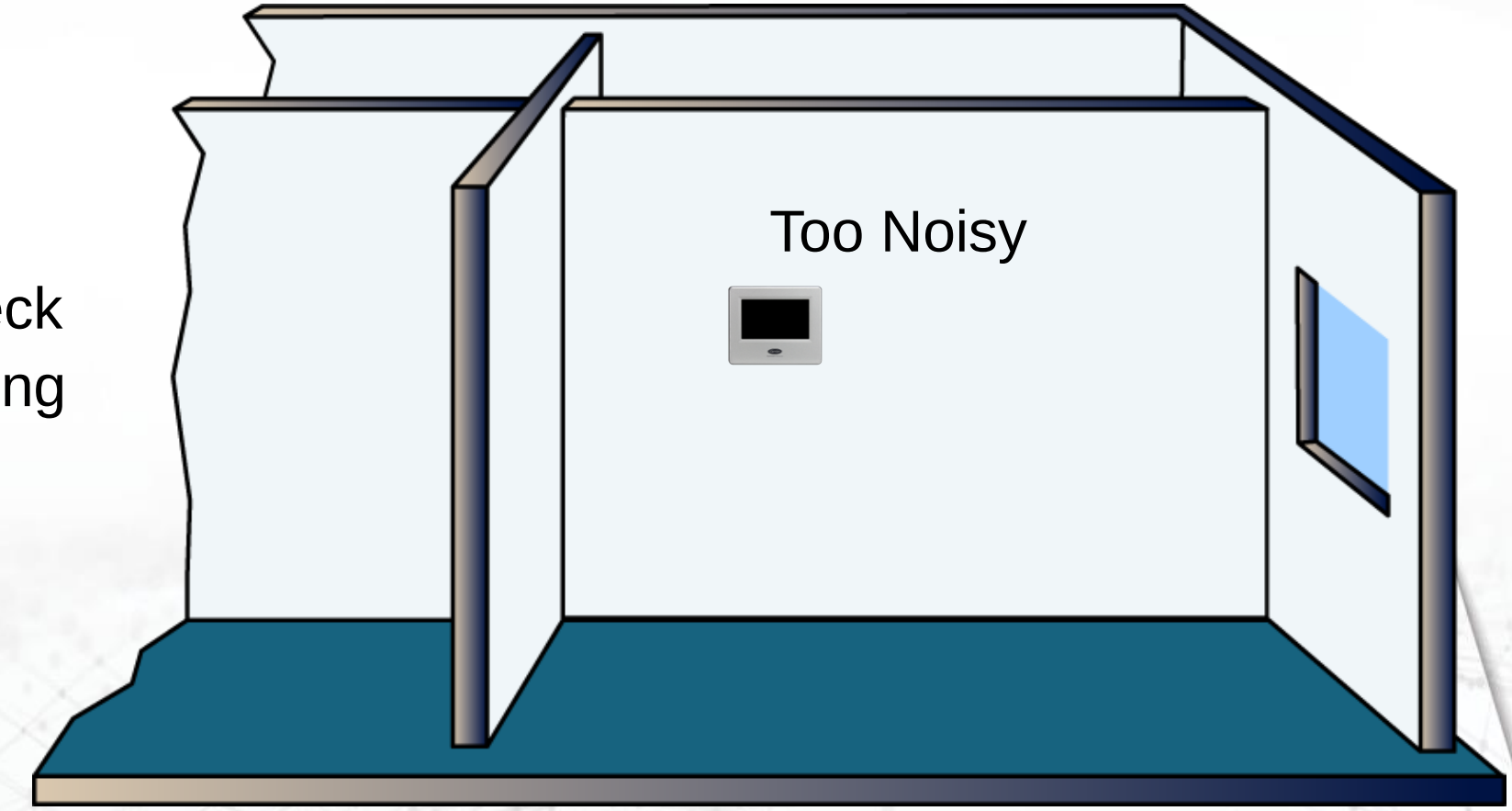
- Airflow limit too low?
- Do zone airflow limit check
- Raise airflow limit setting



Infinity® & Evolution® Zoning System Troubleshooting

Some Zones Noisy – Excessive Airflow

- Airflow limit too high?
- Do zone airflow limit check
- Reduce airflow limit setting



Infinity® & Evolution® Zoning System Troubleshooting

Some Zones Over-Conditioned

Over-conditioning is happening in 1 or more zones

- Check sensor location for drafts behind the wall
- Perform damper/sensor check to ensure sensors wired properly to dampers
- Check for partially broken damper wire or stuck damper
- Understand what system is being told to do and what it is doing:
  - Check system status to view demand
    - Demand may exist even though UI shows actual temp and set point are same
    - System controls to 1/16th of degree
  - Check zoning status to view damper positions
    - Damper open and system is running, probable call for conditioning
    - Damper closed and zone over-conditioned, have damper problem
  - Check zone setback to see if it is a dump zone

Infinity® & Evolution® Zoning System Troubleshooting

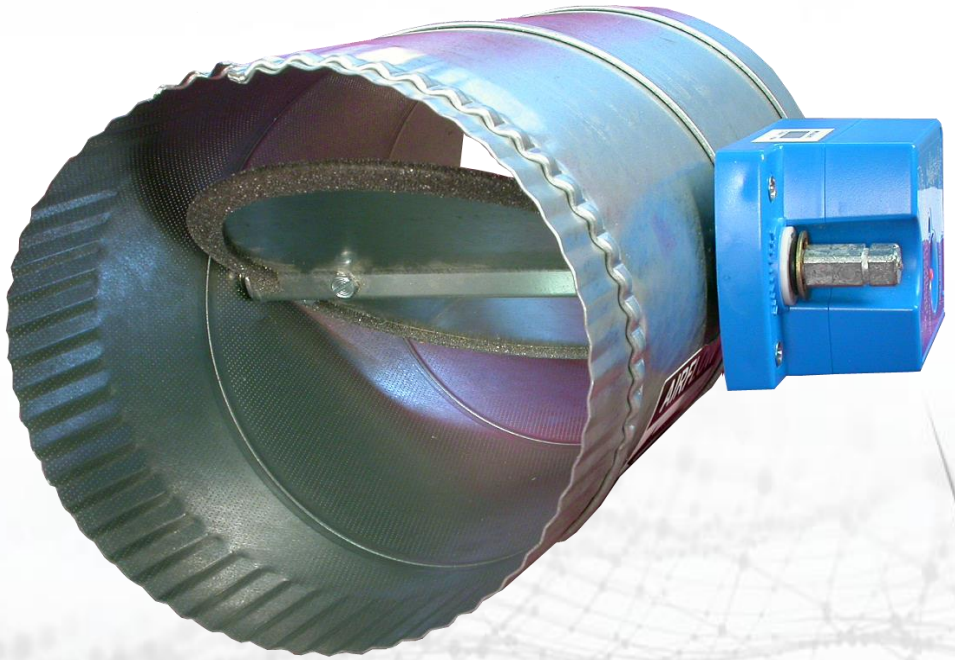
Zoning System– Excess Static Pressure

- Blower RPM at MAX and unable to deliver zones requested airflow
  - Many zones closed and/or
  - Restrictive (undersized) zone duct runs
- Control algorithm attempts to keep system running by staging down and dumping air
- Control then shuts down system if it can't maintain minimum equipment airflow at Maximum RPM
- Solutions:
  - Decrease Zone Airflow Limits in suspected high pressure loss zones
  - Evaluate duct design – improve as necessary
  - Evaluate building suitability for zoning

Infinity® & Evolution® Zoning System Troubleshooting

Airflow Limit – Stage Down Occurred

- This is normal operation
- If no under-conditioning complaint:
  - Ignore
- If under-conditioning complaint:
  - Raise airflow limit for the zone
  - Educate owner on trade-off of noise vs. comfort (airflow)



Infinity® & Evolution® Zoning System Troubleshooting

161 Excessive Static Pressure Stage Down

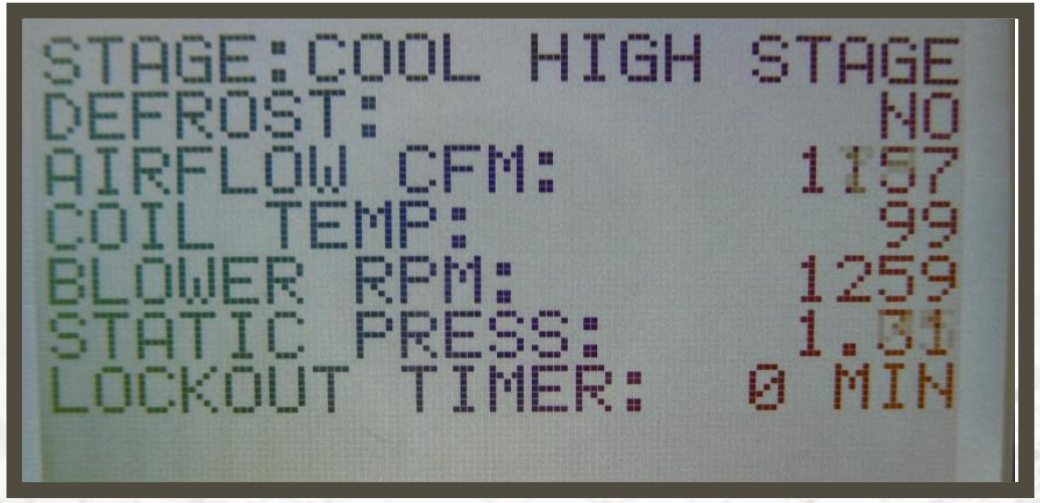
- Max blower RPM was reached due to high static pressure.
  - about 1300 RPM varies per HP
- The airflow will step down in an attempt to maintain system operation.
  - Approximately 50 RPM at a time
- Zoning Controls will dump air or Stage down/Shut Down the equipment until more zones call.
- In non zoned systems, the UI will not shut the equipment down. But will reduce the system airflow

Let's look at the progression of an excessive static stage down

Infinity® & Evolution® Zoning System Troubleshooting

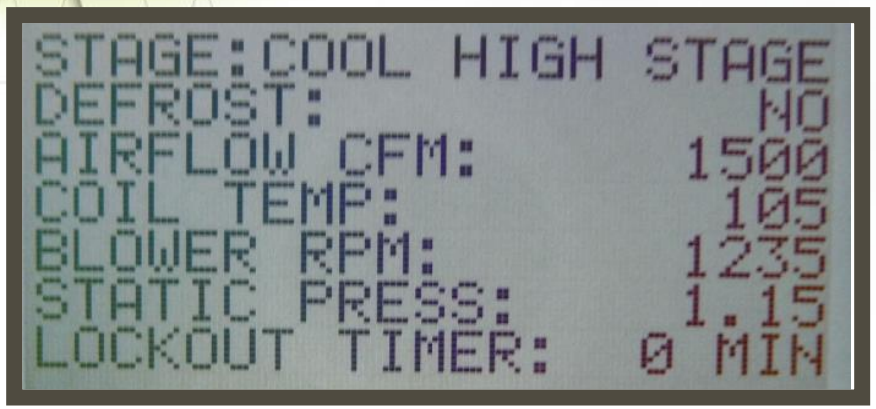
U.I. Generates a Demand for High Cool

Due to poor duct design the blower ramps to 1317 RPM
The static states unknown because its value is greater than 1.40

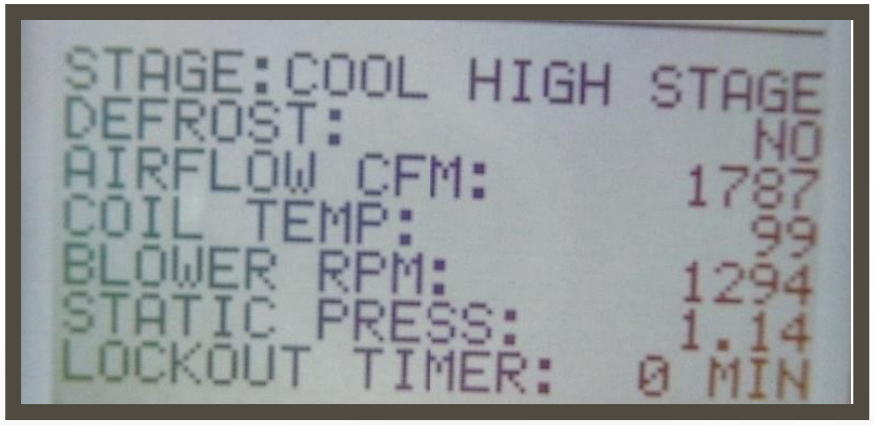


The U.I reduces blower speed 58 RPM, the static drops to 1.31

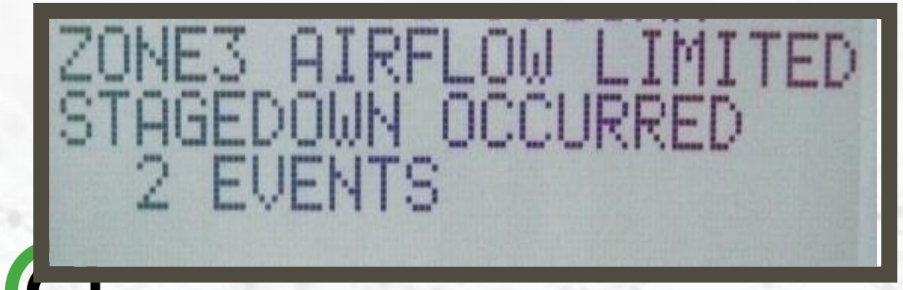
Infinity® & Evolution® Zoning System Troubleshooting



After some time of not being able to reach set point the U.I tried to recover by increasing 35 RPM



Before the control could even properly display the static, it noticed the RPM was reaching 1300 and cutback 59 RPM



The control finally stages down the equipment to prevent the motor from overloading, a fault code is generated, and the system will not return to high stage until another zone calls

Infinity® & Evolution® Zoning System Troubleshooting

Troubleshooting Static Pressure

If your system displays a Check Ductwork or Change Filter message on initial startup:

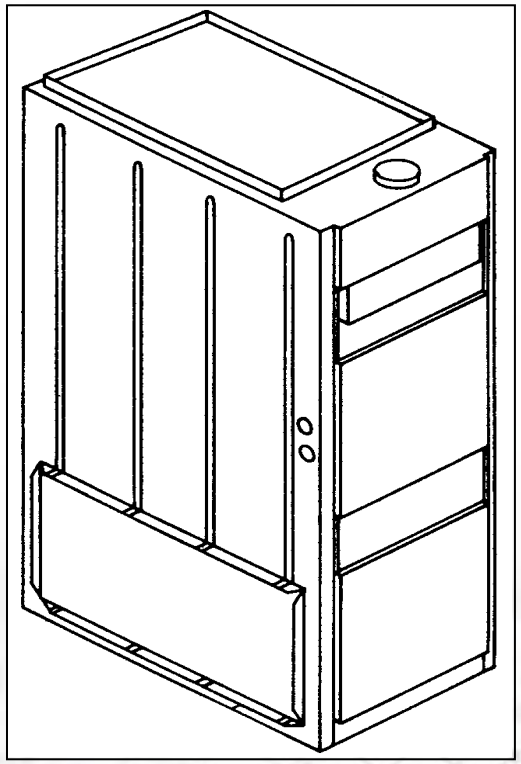
Use the INSTALLER/SERVICE menu to look at the indoor unit. Note the value of the Static Pressure reading.

- **High static pressure is not an equipment problem. It's not a User Interface problem. It's a DUCTWORK problem. You have to fix your duct situation to lower the pressure.**
  - Remember to size for proper static pressures. Typical examples would be .1" (friction loss per 100') for supply and .05" for return. .03" for quieter return. (Proper standards for .5" Fan Static for flex duct system -- .03" SUPPLY, .01" RETURN)
  - Remember it's harder to pull air into the return than it is to push it out in the supply. So, you need to use a lower static pressure on your duct calculator when sizing the return to achieve the proper airflow. Typically, half the value of your supply pressure.
  - When using high efficiency filtration in retrofit applications, it is more important than ever to have adequate return air, and quite probably more than previously existed.

Infinity® & Evolution® Zoning System Troubleshooting

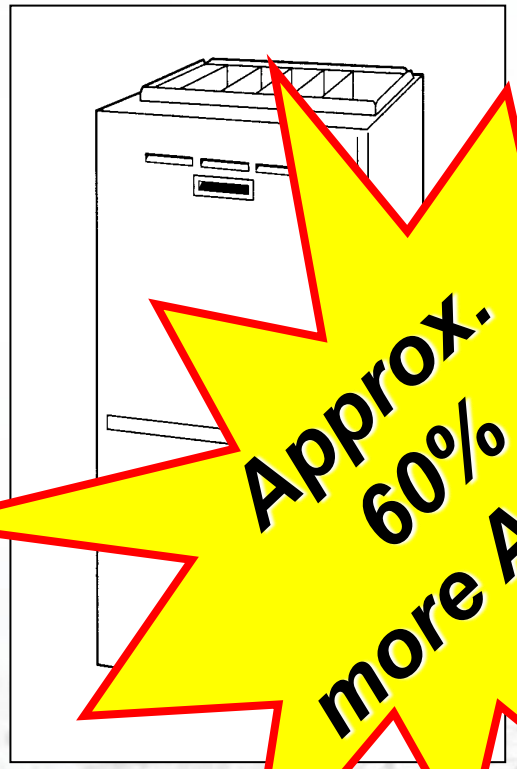
CFM Differences

60% Efficient



CFM= 925

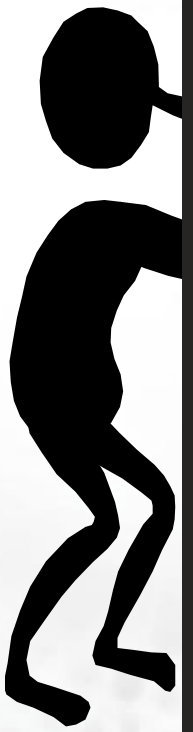
90% Efficient



Approx. 60% more Airflow

CFM= 1550

Infinity® & Evolution® Zoning System Troubleshooting



What has higher CFM. heating or cooling?		
Size		Setting
042040		
††	Low Heat	585†
	High Heat	800
††	1-1/2-Ton Cooling	525
††	2-Ton A/C Cooling	700
	2-1/2-Ton A/C Cooling	875
	3-Ton A/C Cooling	1050
	3-1/2-Ton A/C Cooling	1225
	Maximum	1400

Infinity® & Evolution® Zoning System Troubleshooting

Retrofit Recommendations

Checking the existing system static pressures before installing an Evolution / Infinity system is strongly recommended.

- Identify any need for duct corrections.
- Remember that the static pressure situation will only get WORSE with a variable speed motors when compared to PSC motors.
- 4” and pleated filters create higher static pressure than hog hair or classic 1” disposable filters. If you use high efficiency filters, you WILL need MORE return air.
- A good rule of thumb: You need twice as much return air as you had if you will be using variable speed and/or high efficiency filtration.

  - For *example*, you need at least at recommended velocity: at 4% compression on flex

    2 ton: 1-18” metal, 2-16” flex

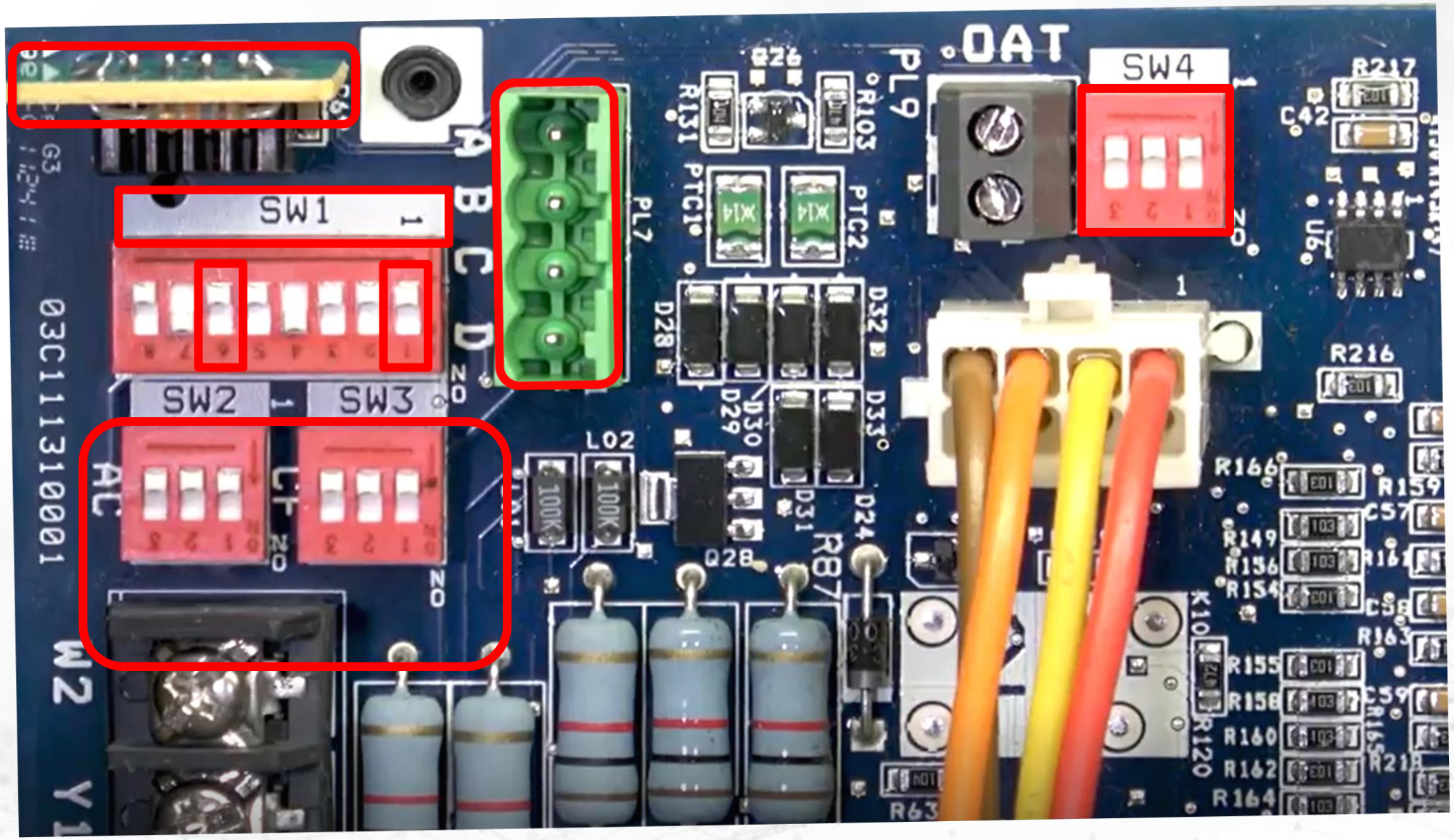
    3 ton: 2-16” metal, 3-16” flex

    4 ton: 1-18” metal, 2-14” metal, or 2 -18” flex

    5 ton: 2-18” metal, 3-16” metal, 2-20” flex, or 3-18” flex

“Refer to Manual D or SMACNA for proper Duct Sizing”

Infinity® & Evolution® Zoning System Troubleshooting



Infinity® & Evolution® Zoning System Troubleshooting

User Interface Does Not Power Up

- Check wiring to ABCD terminals
- Match all colors at all terminals
- Indoor unit power on
- Indoor amber LED on solid
- Check fuse at indoor unit circuit board
- Check for 24 vac at all C-D terminals

Infinity® & Evolution® Zoning System Troubleshooting

Outdoor Unit Not Found

- **Display says outdoor unit not found: (with a communicating outdoor unit)**
  - **Recheck wiring to ABCD on GREEN connector on the outdoor unit**
  - **CHECK OUTDOOR UNIT WIRING DIAGRAM!**
  - **Make sure colors match for every ABCD terminal**
  - **Check for 24 vac between the C & D terminals on the outdoor unit (4-wire outdoor units) if only A & B outdoor check outdoor transformer**
  - **Make sure communication wiring is not close to high voltage wires or other devices like alarm systems etc..**
  - **Connect the User Interface at the outdoor unit wiring to see if you can find the indoor unit from outdoors**

Infinity® & Evolution® Zoning System Troubleshooting

Checking Communication with Outdoor Unit

The purpose of this test is to make sure that the communication wiring going to the outdoor unit is capable of communications.

First make sure that the outdoor unit is powered. You should have 24 vac between UTIL & C on the board. If not, you need to find out why, correct it and try to establish communications.

Remove the User Interface (UI) from it's backplate and take it to the outdoor unit.

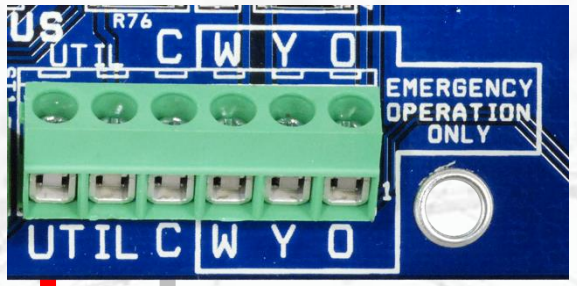
Remove the Green ABCD plug from the outdoor board and push it directly onto the pins on the back of the UI. Add two wires from the outdoor board to the Green plug on C & D.

You should be able to establish communications with the indoor unit from the UI. If not, then there are problems with the wiring, and it needs to be fixed. If you can communicate with the indoor unit there might be a problem with the outdoor board.

When connecting to 5 stage units the UI needs version 10 software or greater to communicate.

To Indoor Unit

Green Plug



Outdoor Board

Infinity® & Evolution® Zoning System Troubleshooting

Troubleshooting the Comm. Buss

TABLE 1 Advance Troubleshooting Fan Coil / Furnace / 2-spd. Communication Bus	
FE Control Board Furnace Control Board Two-Speed Control Board	
-Voltage Readings - With board Power applied, and No U.I. connected	
A to B	4-5 vdc (steady)
A to C	4-5 vdc (steady)
B to C	~.01 to 0.3 vdc (steady)
C to D	24 vac

The above readings are meant to prove that the communication driver is not dead or shorted. It does not guarantee that the unit will communicate. If a communication problem still exists and the voltage readings are good, an external short in the thermostat wire or a miss-applied accessory may be the cause.

Infinity® & Evolution® Zoning System Troubleshooting

Troubleshooting the Comm. Bus

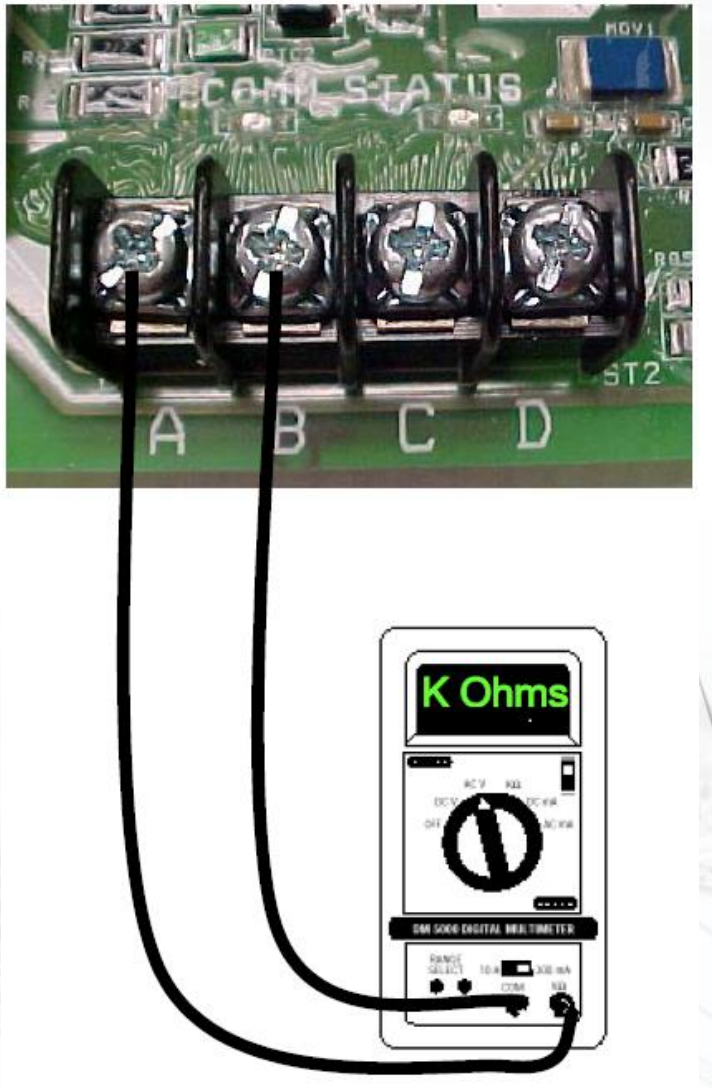
-Voltage Readings - With board Power applied, and U.I. Applied	
A to B	~2.5 to 5 vdc (pulsating)
A to C	~2.5 to 5 vdc (pulsating)
B to C	~0.1 to 0.9 vdc (pulsating)
C to D	24 vac

The above readings are meant to prove that the communication driver are functioning and not dead or shorted and the wiring between the devices is OK. If voltages check out correct and a communication problem still exists, it could be a bad board failure.

Infinity® & Evolution® Zoning System Troubleshooting

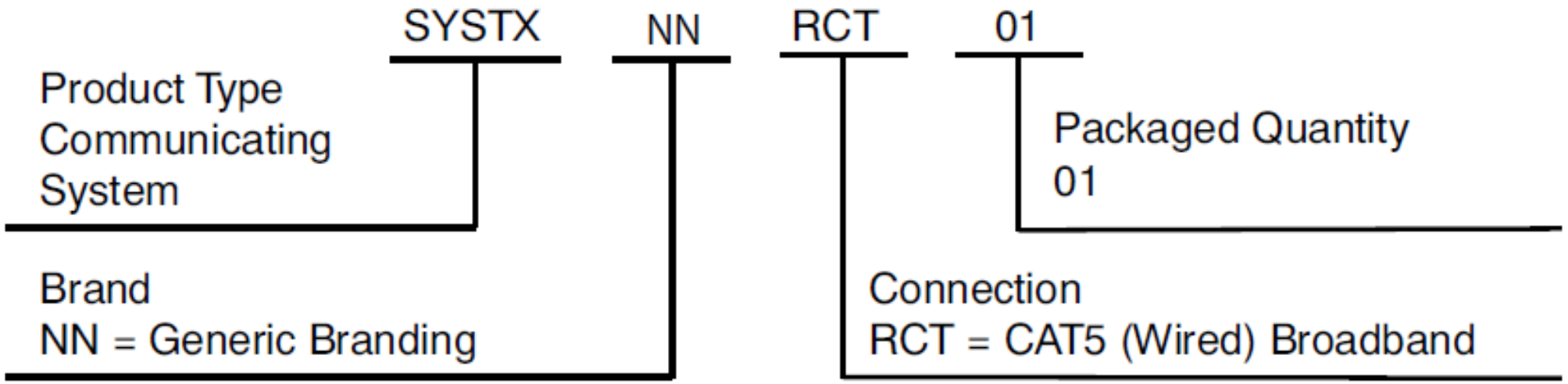
Communication Faults

- NO COMMUNICATION? (Proving if board(s) are good or bad)
- Turn power off and disconnect all the ABCD wires at all the boards before checking the resistance (K ohms) across the A-B of each board.
- UI, UIZ, Zone Board, Smart Sensor, NIM, Touch UI's = A-B 71-75 K ohms
- Furnace & Fan Coil = A-B 17-19 K ohms
- 1 & 2 Speed & Variable Speed Outdoor Boards = A-B 28-34 K ohms; A-C 16-20 K ohms; B-C 13-15 K ohms
- 5 Stage Inverter AOC Boards =
  - A-B 15-17 K ohms (old versions)
  - A-B 28-34 K ohms (newer versions) *Date code of 141203 on AOC Board*



Infinity® & Evolution® New System Access Module

- Now referred to as a Remote Access Module
- Product Data SS-SYSTXNNRC-02
- Installation IM-SYSTXNNRC-01



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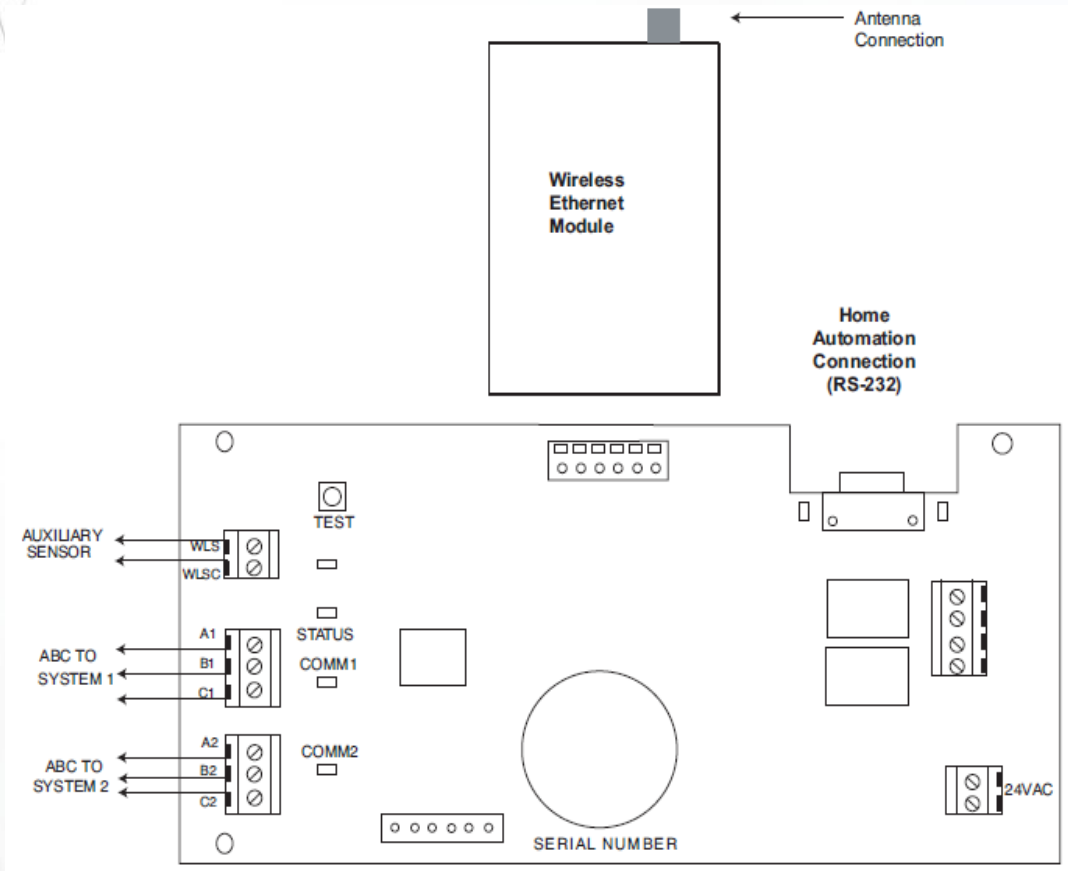
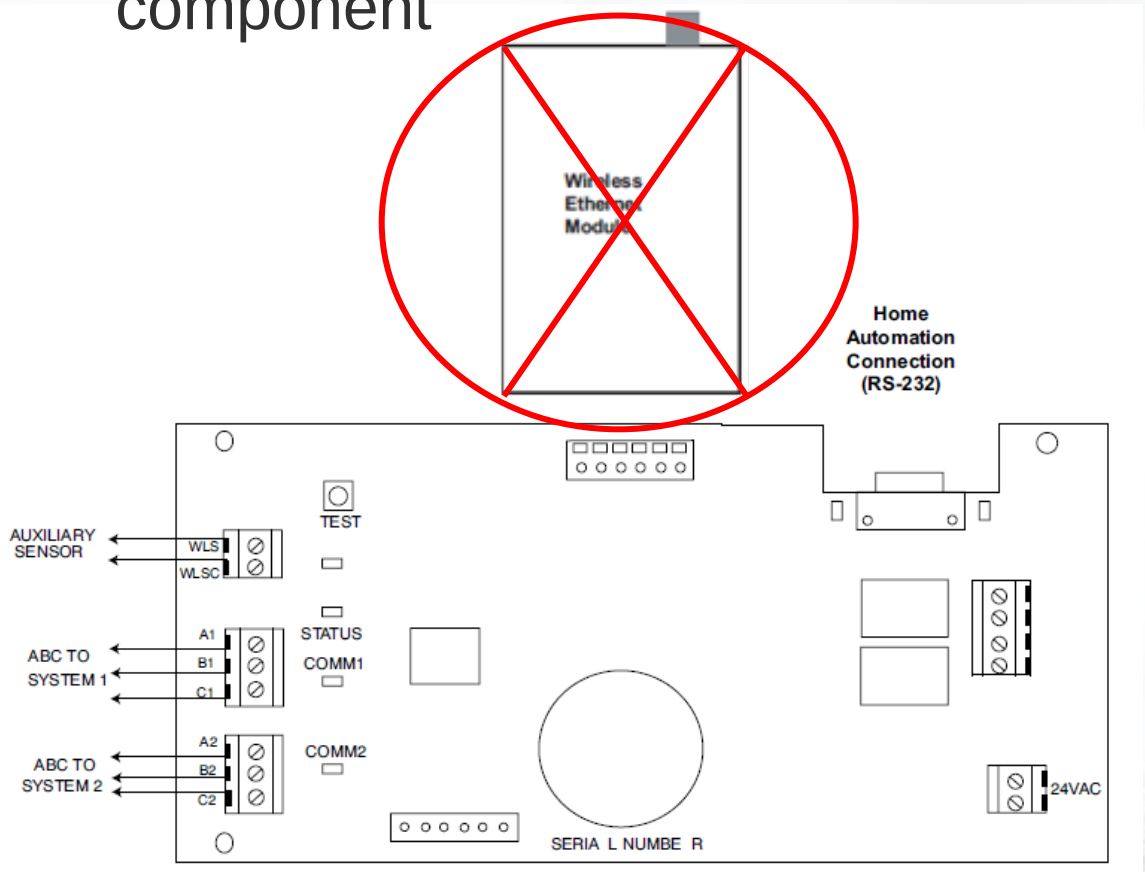
- Original unit



- New Module Removed the Wi-Fi component



Infinity® & Evolution® New System Access Module

- Fault Indicators

Status Code	Description	Resolution
45	Board Failure	Replace Remote Access Module.
62	Loss of communication with Ethernet device	Ignore fault. No action required.
64	Auxiliary sensor active	Auxiliary sensor terminals are shorted by external device.
66	Ethernet network not detected	Ignore fault. No action required.
67	No communication with server	Ignore fault. No action required.

NOTE: The 62, 66 and 67 status codes should be IGNORED for newer generation communicating systems.

Questions ?

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Thank you for ATTENDING!

DON'T LEAVE JUST YET!!!

End

Important Test Taking Information

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1. Scan the QR Code to go to YOUR ACCOUNT login page.
2. Navigate to “Purchased Zoom Meetings”
3. Select today’s course
4. Complete your quiz