2022 Residential Zoning

Instructor: Josh Goodman
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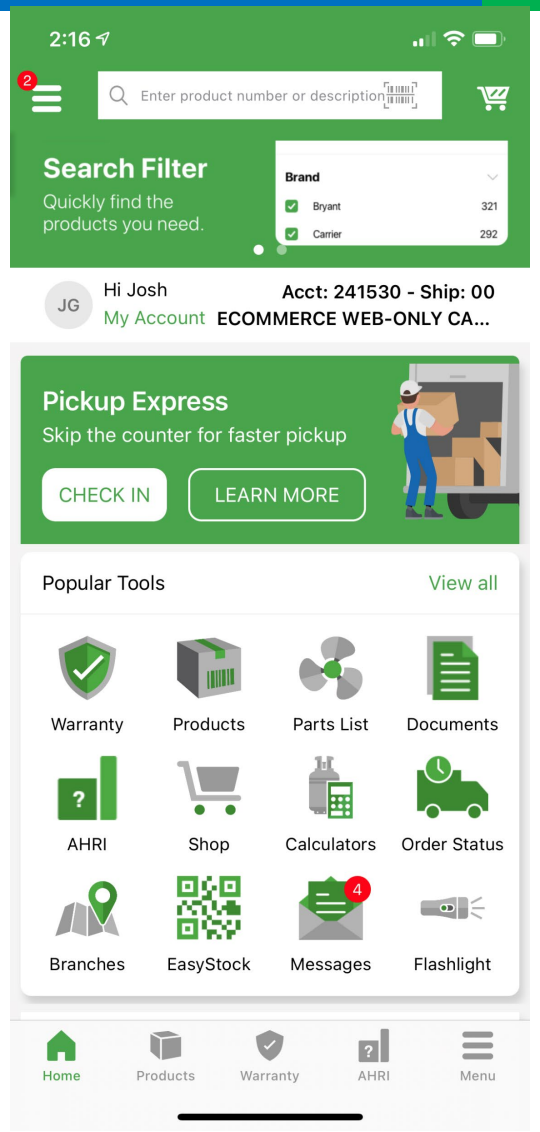
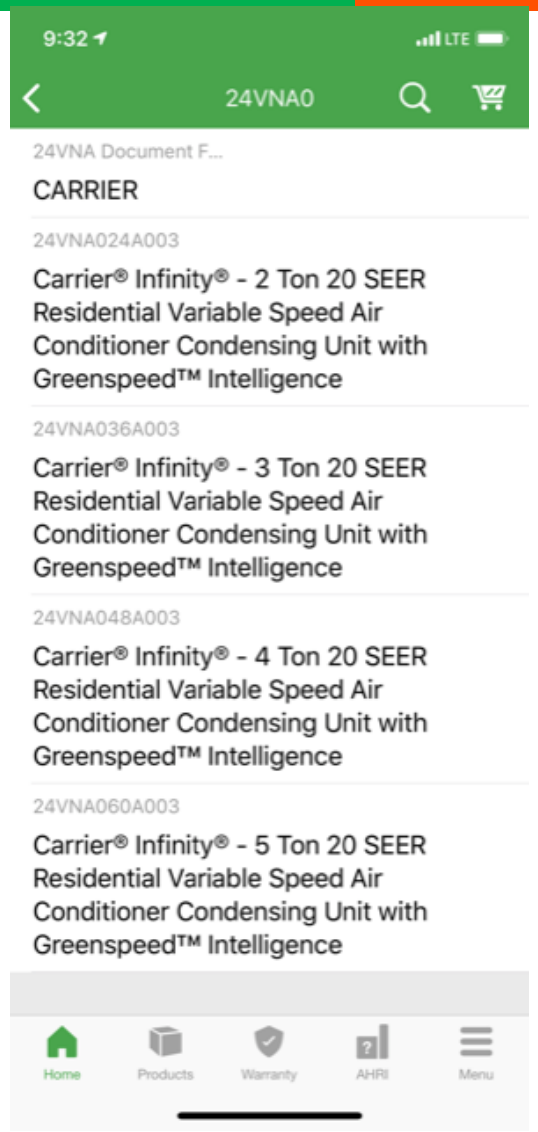
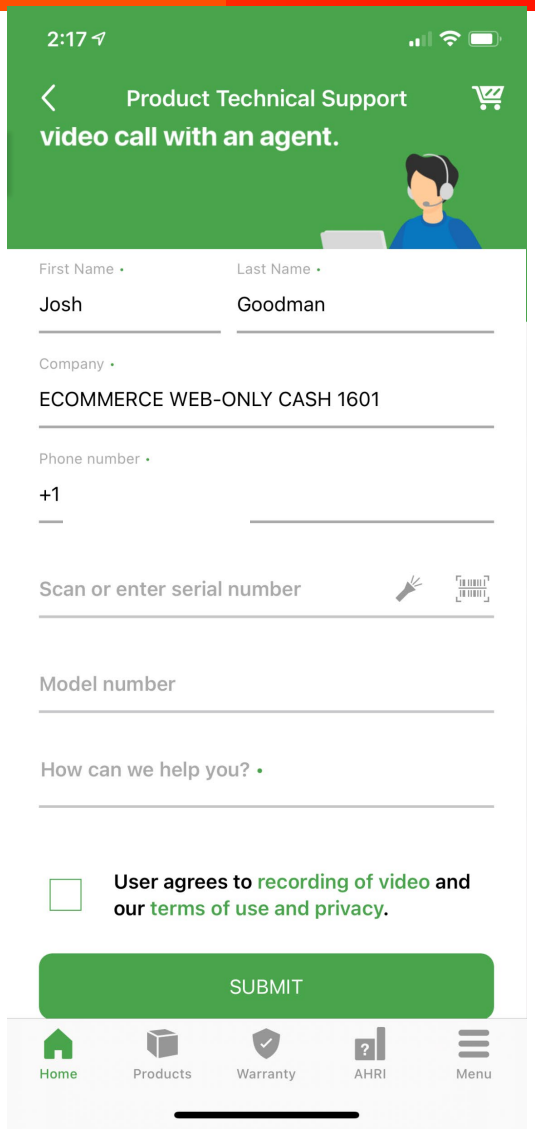
Site Demo

CEMATRAINING.COM

“CE – HVAC CONTRACTOR ASSIST”



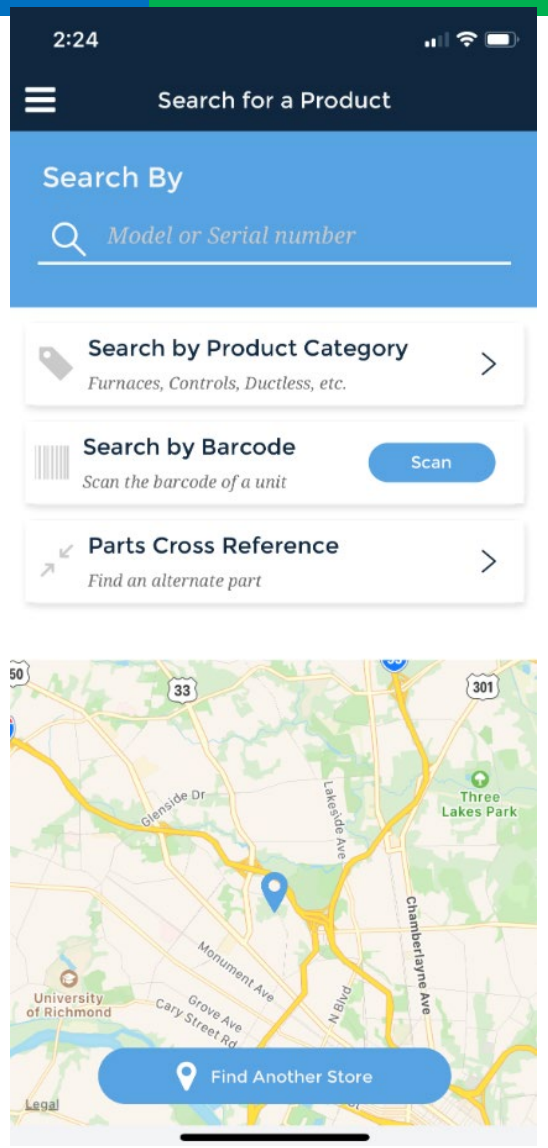


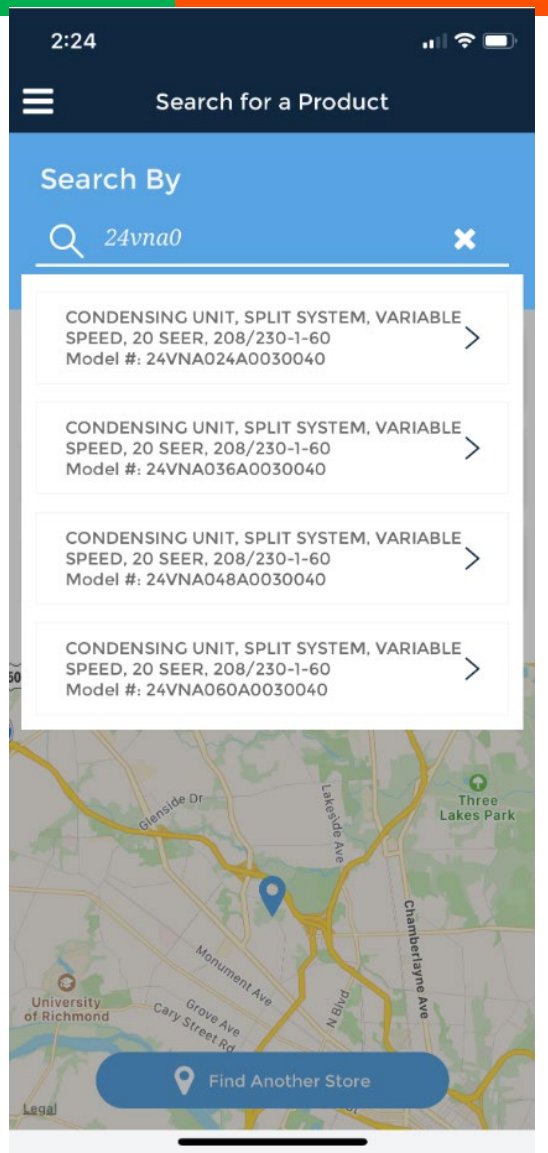


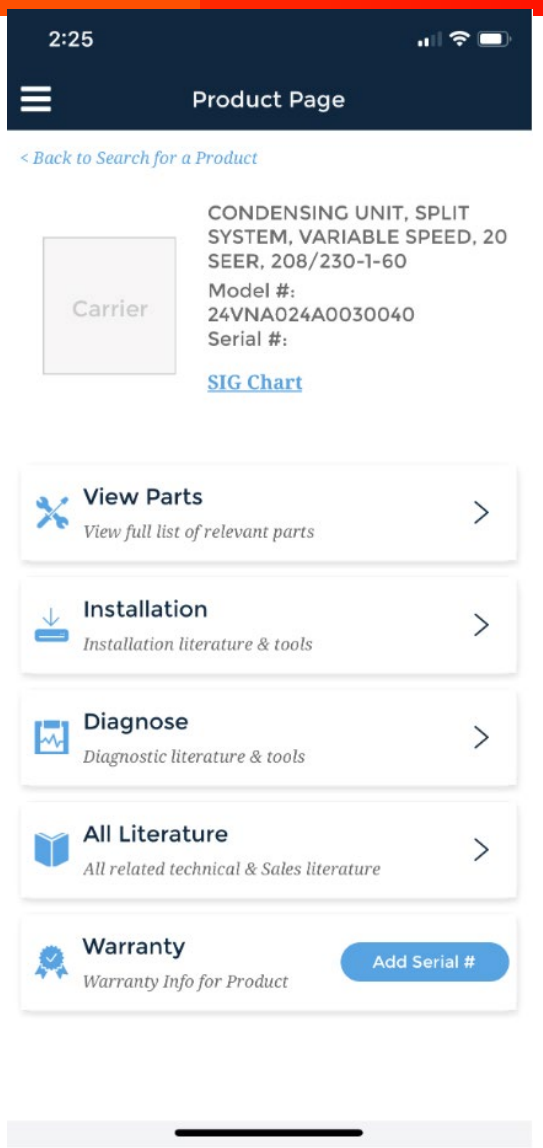
We call it Wingman

“CARRIER SERVICE TECH”

Service Tech







TECH SUPPORT

866-902-4822

Option #3

or

CE App(Wingman)

or

Cematraining.com

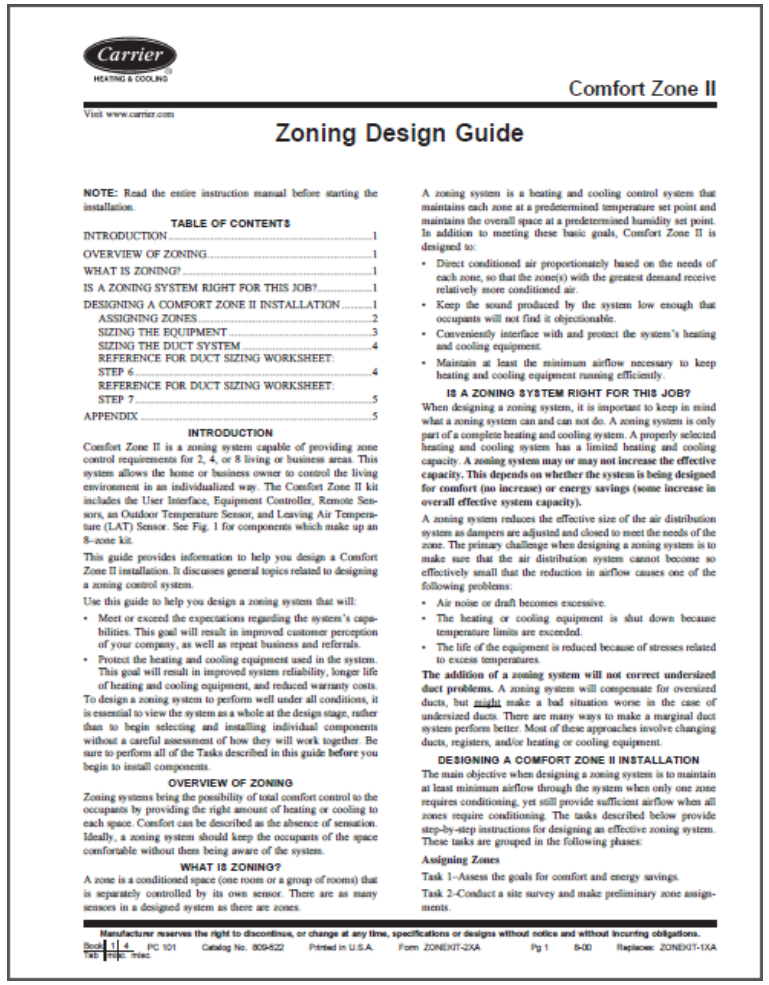
or

cma.techsupport@carrierenterprise.com

WHAT WE WILL COVER

- Theory
- Application
- Design
- Selection of Zoning kits available.
- Bypass Dampers – Sizing and Installation
- Troubleshooting
- Do’s and Don’ts!

DESIGN GUIDES



Carrier
HEATING & COOLING

Comfort Zone II

Visit www.carrier.com

Zoning Design Guide

NOTE: Read the entire instruction manual before starting the installation.

TABLE OF CONTENTS

INTRODUCTION

Comfort Zone II is a zoning system capable of providing zone control requirements for 2, 4, or 8 living or business areas. This system allows the home or business owner to control the living environment in an individualized way. The Comfort Zone II kit includes the User Interface, Equipment Controller, Remote Sensors, an Outdoor Temperature Sensor, and Leaving Air Temperature (LAT) Sensor. See Fig. 1 for components which make up an 8–zone kit.

This guide provides information to help you design a Comfort Zone II installation. It discusses general topics related to designing a zoning control system.

Use this guide to help you design a zoning system that will:

- Meet or exceed the expectations regarding the system's capabilities. This goal will result in improved customer perception of your company, as well as repeat business and referrals.
- Protect the heating and cooling equipment used in the system. This goal will result in improved system reliability, longer life of heating and cooling equipment, and reduced warranty costs.

To design a zoning system to perform well under all conditions, it is essential to view the system as a whole at the design stage, rather than to begin selecting and installing individual components without a careful assessment of how they will work together. Be sure to perform all of the Tasks described in this guide before you begin to install components.

OVERVIEW OF ZONING

Zoning systems bring the possibility of total comfort control to the occupants by providing the right amount of heating or cooling to each space. Comfort can be described as the absence of sensation. Ideally, a zoning system should keep the occupants of the space comfortable without them being aware of the system.

WHAT IS ZONING?

A zone is a conditioned space (one room or a group of rooms) that is separately controlled by its own sensor. There are as many sensors in a designed system as there are zones.

A zoning system is a heating and cooling control system that maintains each zone at a predetermined temperature set point and maintains the overall space at a predetermined humidity set point. In addition to meeting these basic goals, Comfort Zone II is designed to:

- Direct conditioned air proportionately based on the needs of each zone, so that the zone(s) with the greatest demand receive relatively more conditioned air.
- Keep the sound produced by the system low enough that occupants will not find it objectionable.
- Conveniently interface with and protect the system's heating and cooling equipment.
- Maintain at least the minimum airflow necessary to keep heating and cooling equipment running efficiently.

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

A zoning system reduces the effective size of the air distribution system as dampers are adjusted and closed to meet the needs of the zone. 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 one of the following problems:

- Air noise or draft becomes excessive.
- The heating or cooling equipment is shut down because temperature limits are exceeded.
- The life of the equipment is reduced because of stresses related to excess temperatures.

The addition of a zoning system will not correct undersized duct problems. A zoning system will compensate for oversized ducts, but might make a bad situation worse in the case of undersized ducts. There are many ways to make a marginal duct system perform better. Most of these approaches involve changing ducts, registers, and/or heating or cooling equipment.

DESIGNING A COMFORT ZONE II INSTALLATION

The main objective when designing a zoning system is to maintain at least minimum airflow through the system when only one zone requires conditioning, yet still provide sufficient airflow when all zones require conditioning. The tasks described below provide step-by-step instructions for designing an effective zoning system. These tasks are grouped in the following phases:

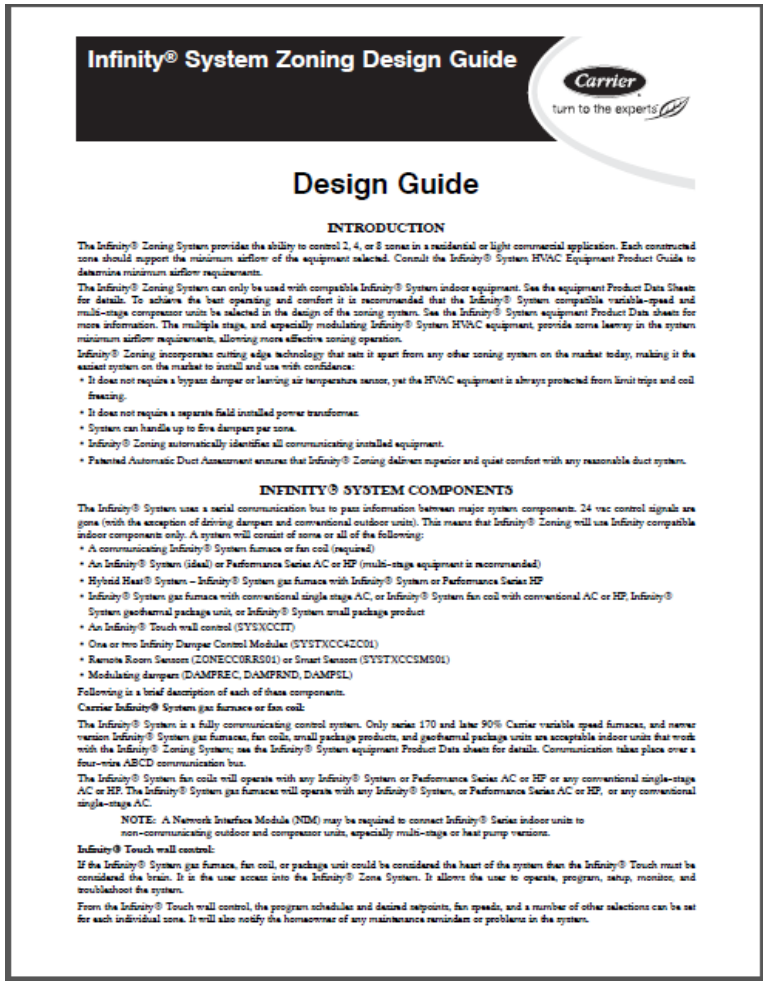
Assigning Zones

Task 1–Assess the goals for comfort and energy savings.

Task 2–Conduct a site survey and make preliminary zone assignments.

Book 1 4 Tab PI PC Tricc PC 101 Catalog No. 809-522 Printed in U.S.A. Form ZONEKIT-2XA Pg 1 8-00 Replaces: ZONEKIT-1XA

Bypass Damper



Infinity® System Zoning Design Guide

Carrier
turn to the experts

Design Guide

INTRODUCTION

The Infinity® Zoning System provides the ability to control 2, 4, or 8 zones in a residential or light commercial application. Each constructed zone should support the minimum airflow of the equipment selected. Consult the Infinity® System HVAC Equipment Product Guide to determine minimum airflow requirements.

The Infinity® Zoning System can only be used with compatible Infinity® System indoor equipment. See the equipment Product Data Sheets for details. To achieve the best operating and comfort it is recommended that the Infinity® System compatible variable-speed and multi–stage compressor units be selected in the design of the zoning system. See the Infinity® System equipment Product Data sheets for more information. The multiple stage, and especially modulating Infinity® System HVAC equipment, provide some leeway in the system minimum airflow requirements, allowing more effective zoning operation.

Infinity® Zoning incorporates cutting edge technology that sets it apart from any other zoning system on the market today, making it the easiest system on the market to install and use with confidence:

- It does not require a bypass damper or leaving air temperature sensor, yet the HVAC equipment is always protected from limit trips and coil freezing.
- It does not require a separate field installed power transformer.
- System can handle up to five dampers per zone.
- Infinity® Zoning automatically identifies all communicating installed equipment.
- Patented Automatic Duct Assessment ensures that Infinity® Zoning delivers superior and quiet comfort with any reasonable duct system.

INFINITY® SYSTEM COMPONENTS

The Infinity® System uses a serial communication bus to pass information between major system components. 24 vac control signals are gone (with the exception of driving dampers and conventional outdoor units). This means that Infinity® Zoning will use Infinity compatible indoor components only. A system will consist of some or all of the following:

- A communicating Infinity® System furnace or fan coil (required)
- An Infinity® System (ideal) or Performance Series AC or HP (multi–stage equipment is recommended)
- Hybrid Heat® System – Infinity® System gas furnace with Infinity® System or Performance Series HP
- Infinity® System gas furnace with conventional single stage AC, or Infinity® System fan coil with conventional AC or HP, Infinity® System geothermal package unit, or Infinity® System small package product
- An Infinity® Touch wall control (SYSXCCIT)
- One or two Infinity Damper Control Modules (SYSTXCC4ZC01)
- Remote Room Sensors (ZONECCORRS01) or Smart Sensors (SYSTXCCSMS01)
- Modulating dampers (DAMPREC, DAMPRND, DAMPSL)

Following is a brief description of each of these components.

Carrier Infinity® System gas furnace or fan coil:

The Infinity® System is a fully communicating control system. Only series 170 and later 90% Carrier variable speed furnaces, and newer version Infinity® System gas furnaces, fan coils, small package products, and geothermal package units are acceptable indoor units that work with the Infinity® Zoning System; see the Infinity® System equipment Product Data sheets for details. Communication takes place over a four–wire ABCD communication bus.

The Infinity® System fan coils will operate with any Infinity® System or Performance Series AC or HP or any conventional single–stage AC or HP. The Infinity® System gas furnaces will operate with any Infinity® System, or Performance Series AC or HP, or any conventional single–stage AC.

NOTE: A Network Interface Module (NIM) may be required to connect Infinity® Series indoor units to non–communicating outdoor and compressor units, especially multi–stage or heat pump versions.

Infinity® Touch wall control:

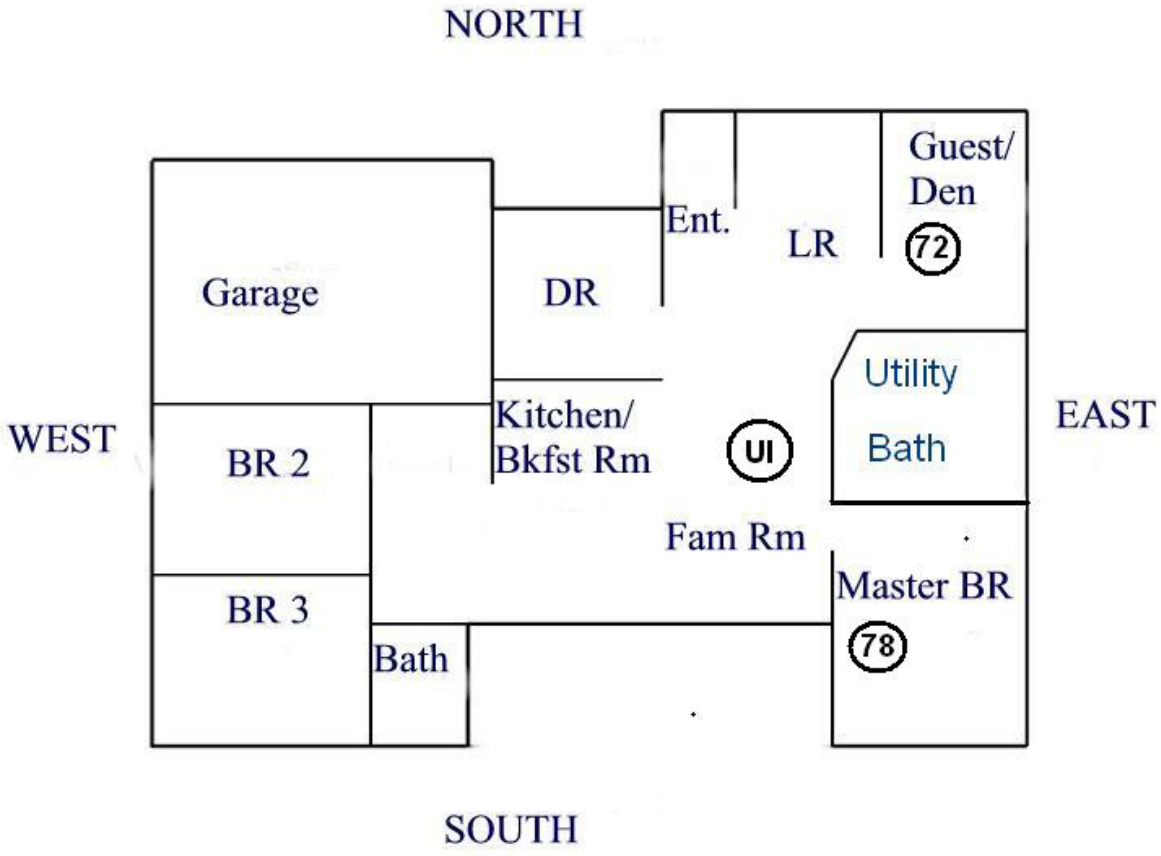
If the Infinity® System gas furnace, fan coil, or package unit could be considered the heart of the system then the Infinity® Touch must be considered the brain. It is the user access into the Infinity® Zone System. It allows the user to operate, program, setup, monitor, and troubleshoot the system.

From the Infinity® Touch wall control, the program schedules and desired setpoints, fan speeds, and a number of other selections can be set for each individual zone. It will also notify the homeowner of any maintenance reminders or problems in the system.

No Bypass Damper

WHAT IS ZONING?

A **zoning system** is a heating and cooling control system that maintains each zone at a predetermined temperature set point and maintains the overall space at a predetermined humidity set point.



QUESTION: 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 reduces the effective size of the air distribution system as dampers are adjusted and closed to meet the needs of the zone.

QUESTION: IS A ZONING SYSTEM RIGHT FOR THIS JOB?

<u>One primary challenge when designing a zoning system is to make sure a zone isn't so small that is causes one of the following:</u>

•Air Noise

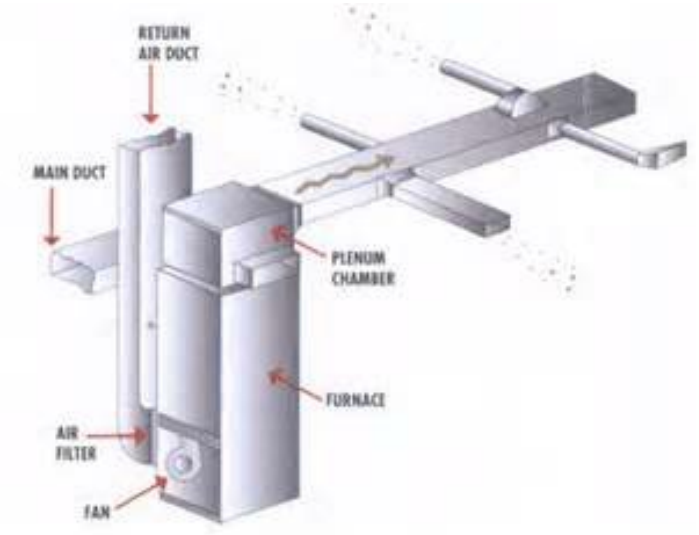
•Equipment shut down because of temperature limits exceeded.

•The life of the equipment is reduced because of stress related to excess temperatures.

QUESTION: IS A ZONING SYSTEM RIGHT FOR THIS JOB?

A zoning system will compensate for an oversized duct system BUT will not correct an undersized duct system!

It COULD make a bad situation WORSE!



HOW WILL ZONING BE USED?

TASK 1–ASSESS THE GOALS FOR COMFORT AND ENERGY SAVINGS

For a zoning system to be successful, it must meet the customer's goals for comfort and/or energy savings. Therefore, 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.

Excerpt from Zoning Design Guide

HOW WILL ZONING BE USED?

Will the zoning system be primarily used for:

Comfort or Economic?

HOW WILL ZONING BE USED?

How can a zoning solution deliver more comfort?

The right zoning product helps in various ways:

- It delivers proper amounts of conditioned air to the **right** areas at the **right** times
- It controls humidity (that is a system featuring IdealHumidity)

HOW WILL ZONING BE USED?

Comfort design:

In a system designed primarily for comfort, all zones usually have **comfort set points that remain relatively constant** and that have similar time schedules. Such a system may have a large number of zones (5 to 8) of a relatively small size.

HOW WILL ZONING BE USED?

How can a zoning solution deliver economic control?

Zoning helps homeowners, not their homes, decide what areas will be heated or cooled (and how much.)

HOW WILL ZONING BE USED?

Economic design:

In a system designed primarily for energy savings, **zones must be larger to guarantee proper airflow to the zones that need conditioning (occupied), while the remaining zones will be closed (unoccupied)**. Such a system generally must have a smaller number of zones of a relatively larger size. In this case, you must be careful not to “over zone” (i.e., assign too many zones).

ASSESSMENT

You will need all the information you would normally use to do a load calculation.

Include orientation of the house good notes on windows, doors and anything that would alter the load on a given area such as porches with roofs and large shade trees.

If the home has an existing system, you will need to make good notes and a sketch of the existing ductwork.

LOAD SIZING

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. Then, tentatively choose zone loads by adding rooms together.

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.

GROUP AREAS TOGETHER THAT:

Are in use the same time of day.

Have similar heating and cooling needs.

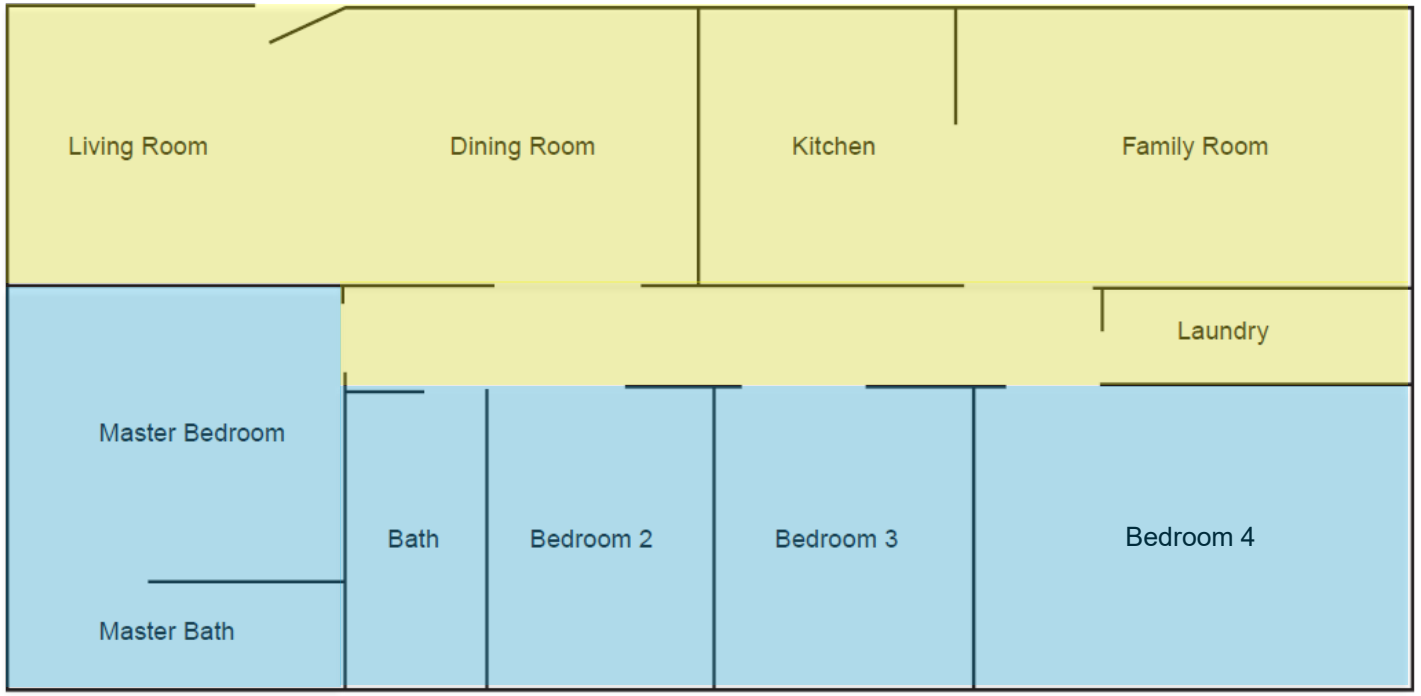
Are physically separated from other areas.

Are on the same level in the home.

Have similar exposures to external heating gains and losses.

GROUPING AREAS

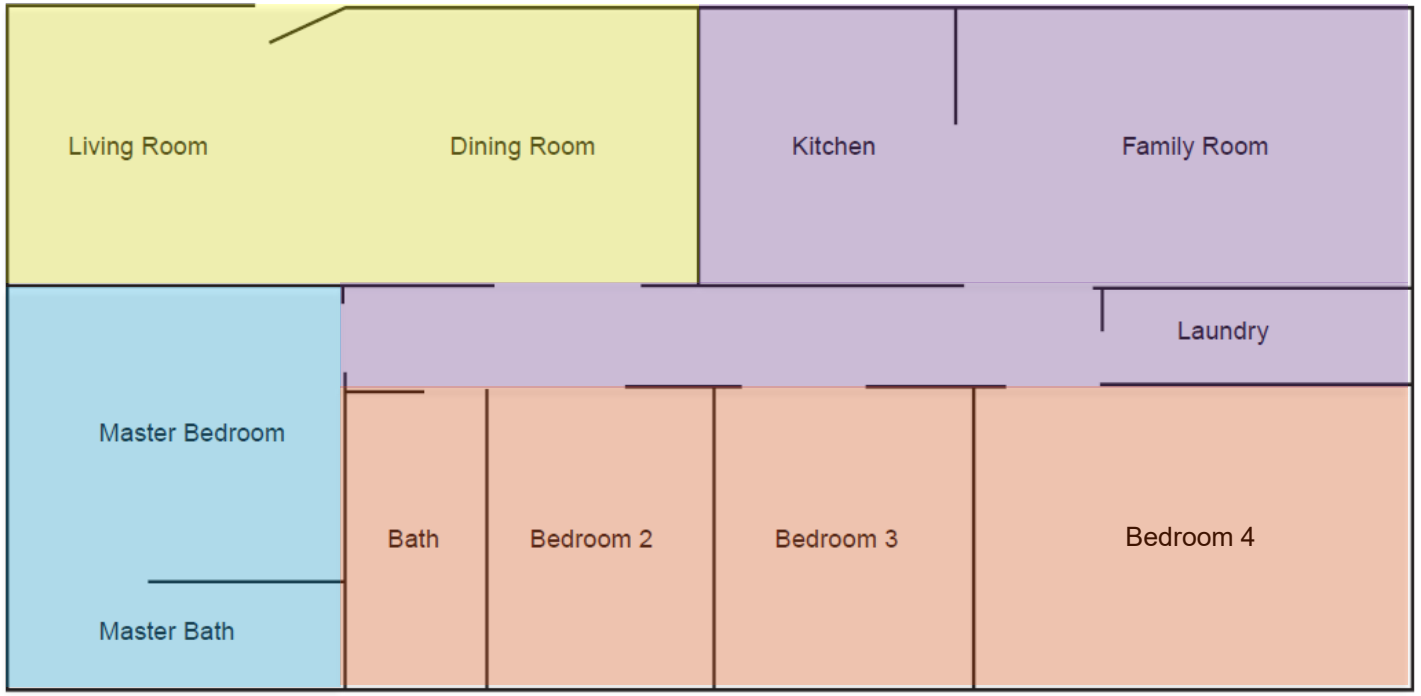
2-stage



Each zone needs to be able to handle the minimum cfm required for low stage of operation

GROUPING AREAS

5-stage or
Variable Speed



Each zone needs to be able to handle the minimum cfm required for low stage of operation

DUCTWORK

Considerations for a Retrofitting Installation

It is a far greater challenge to design a retrofitted zoning system than it is to design a system for a new home or office. 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:

DUCTWORK

- Modify the existing ductwork and dampers to handle additional airflow.
- Set mechanical minimum damper positions in some zones.
- 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 that is designed to overcome the high static pressure in the ductwork and force more air through the system. ECM is a good choice.

DON'T FORGET THE RETURN DUCT!!

Return-air Ductwork

The return-air system should be able to remove the same amount of air from each zone as was supplied to it.

If each zone does not have its own return, then a cross-contamination of zone temperatures could occur.

A good sizing method would be to size the return at least as large as the main trunk of that particular zone.

EQUIPMENT

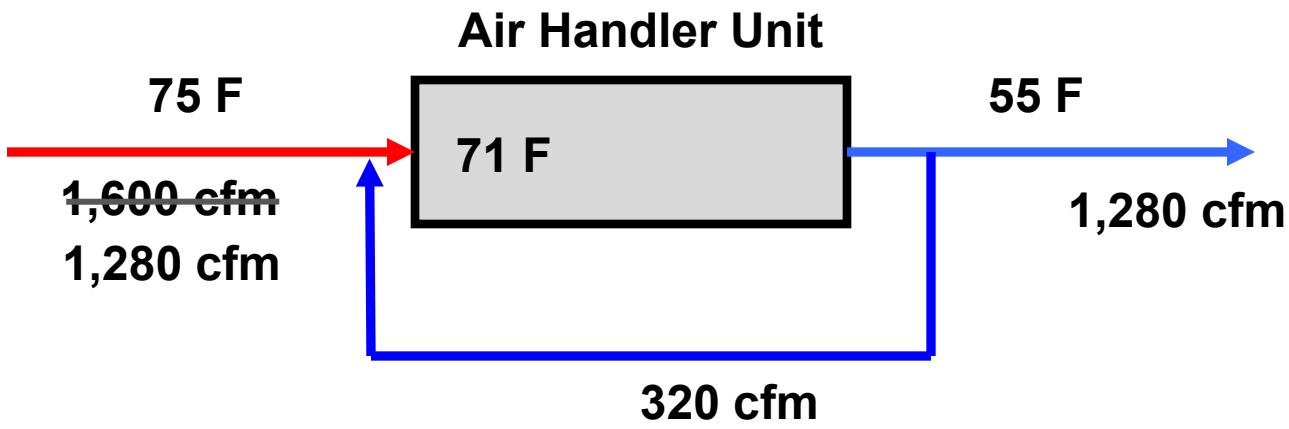
- DO NOT OVERSIZE!
- Do not add a fudge factor.
- Equipment must be protected.
- Additional safeties or controls may be need to be added.
- Always use TXV’s
- Multi-Stage or Variable Speed should be a must.

EQUIPMENT (NON-INFINITY/EVOLUTION ZONING)

If the smallest zone can't handle a ***minimum of 60%*** of the nominal CFM, some type of relief strategy must be used.

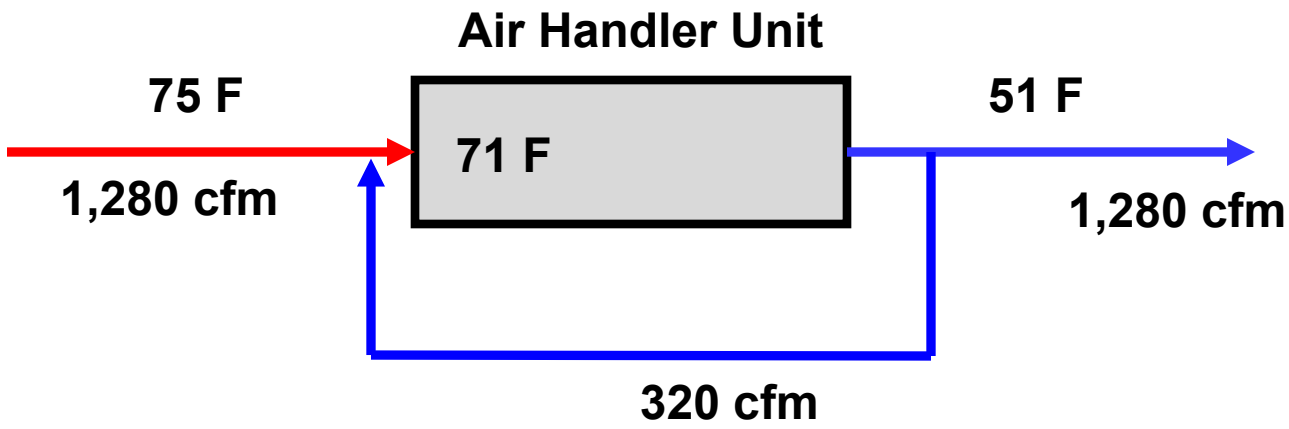
This is what zoning manufacture's state

EFFECT OF BYPASSED AIR



First minute of steady-state bypass operation

EFFECT OF BYPASSED AIR



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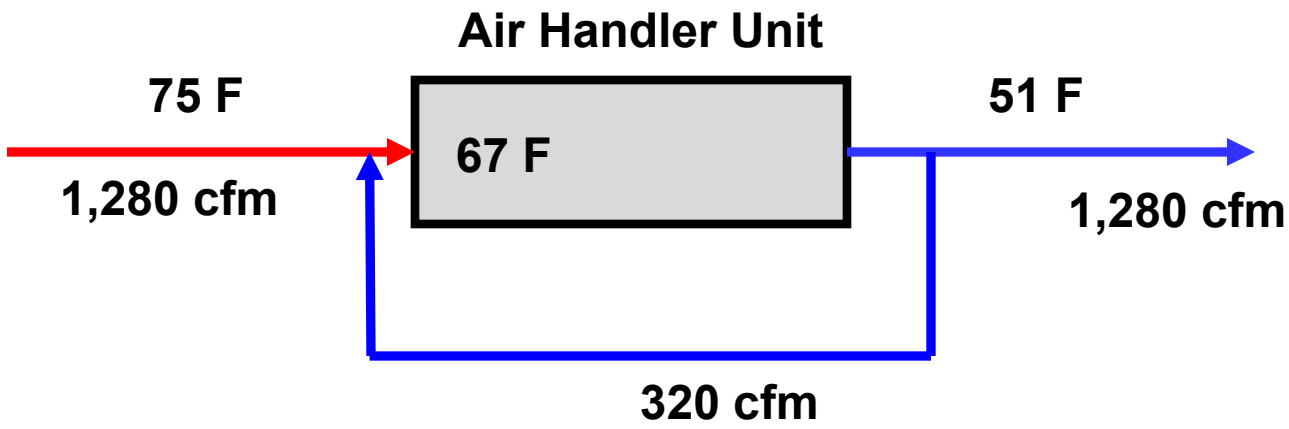
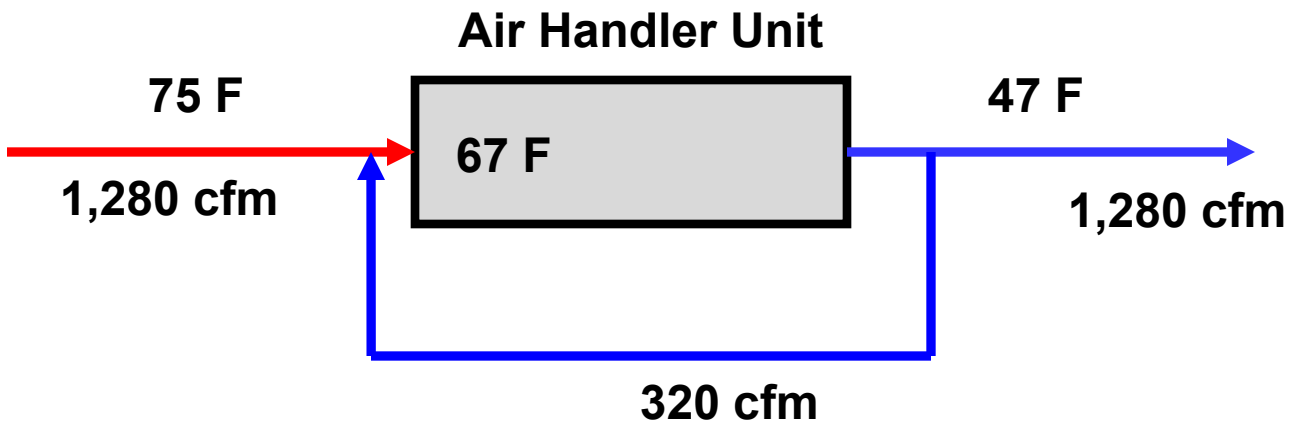


Second minute of steady-state bypass operation

EFFECT OF BYPASSED AIR



Second minute of steady-state bypass operation

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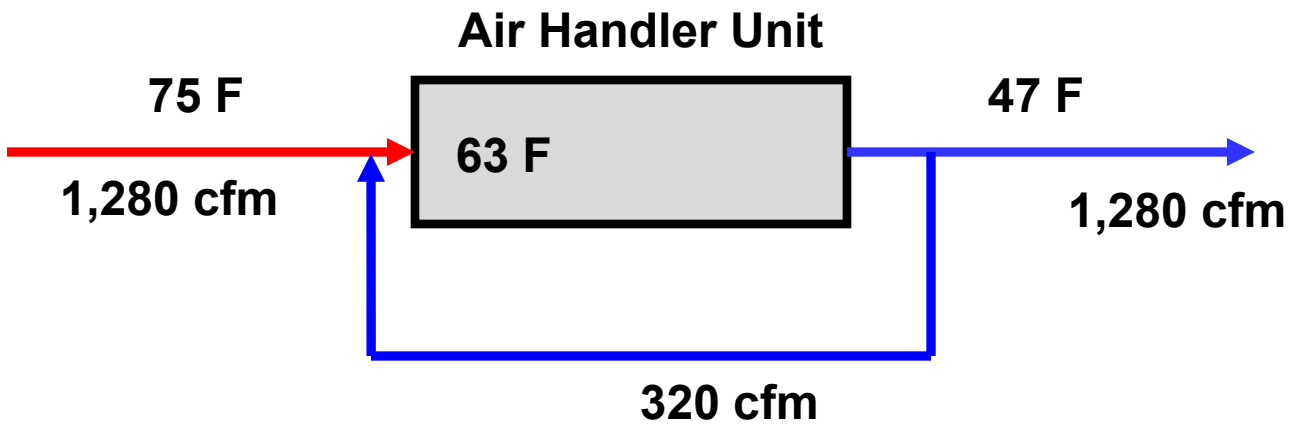
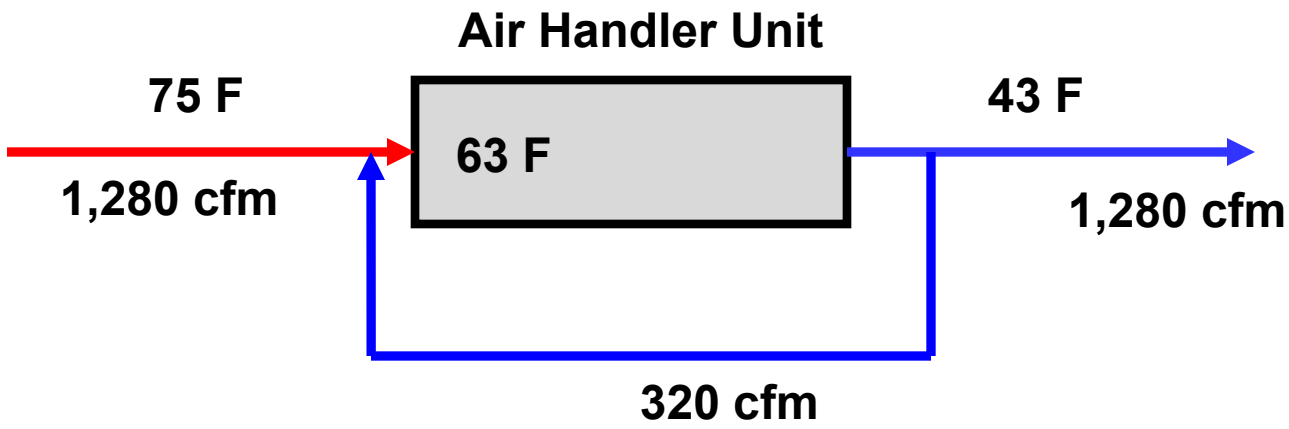


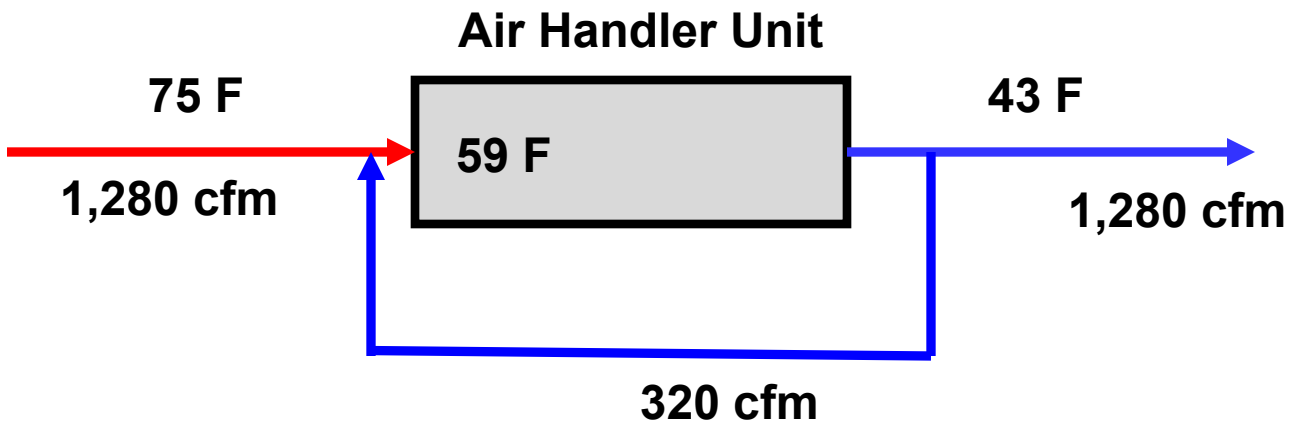
Third minute of steady-state operation

EFFECT OF BYPASSED AIR



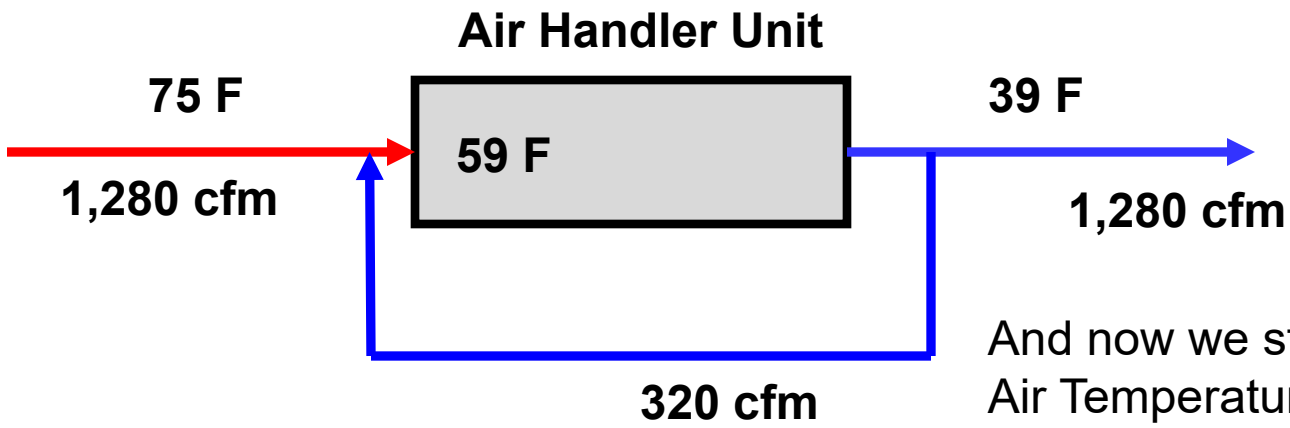
Third minute of steady-state operation

EFFECT OF BYPASSED AIR



Fourth minute of steady-state operation

EFFECT OF BYPASSED AIR



And now we start cycling on the Leaving Air Temperature sensor(LAT)

Fourth minute of steady-state operation

BY-PASS DAMPER SIZING

Total System CFM

MINUS

Smallest Zone CFM=

Bypass CFM Requirement

Recommend No more then 20% of total system CFM

BY-PASS DAMPER SIZING

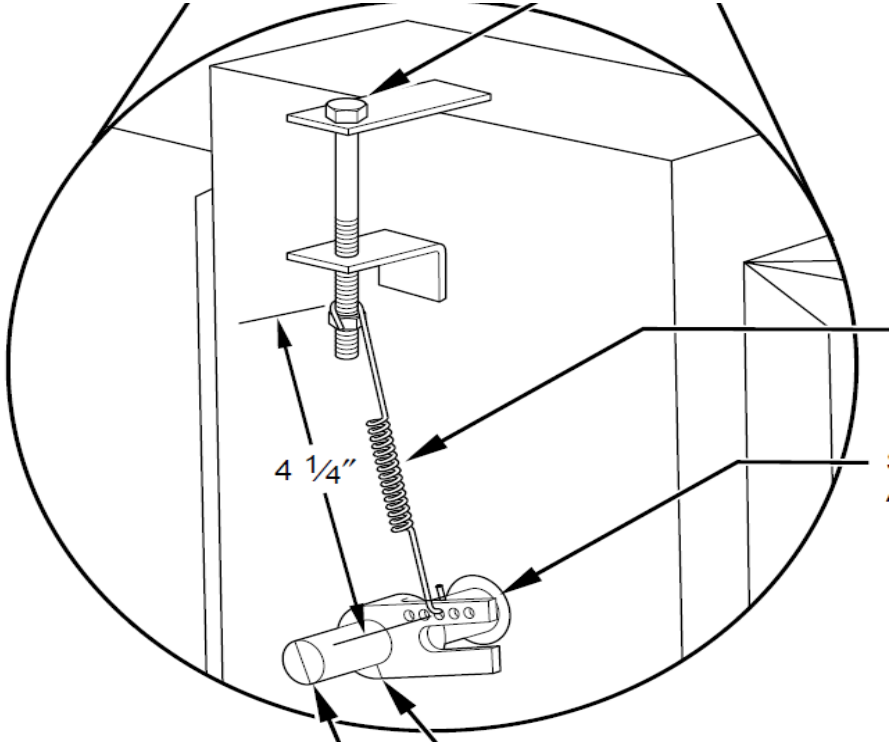
Rectangular:

MODEL NO.	HEIGHT (IN.)	WIDTH (IN.)	LENGTH (IN.)	MAXIMUM AIR-FLOW (CFM)
DAMPBAR08X14	8	14	13-3/4	1200
DAMPBAR08X24	8	24	13-3/4	1800

Uses spring tension that is adjustable.
Set by the factory at approximately 0.75 i.w.c.

BY-PASS DAMPER SIZING

Rectangular:



BY-PASS DAMPER SIZING

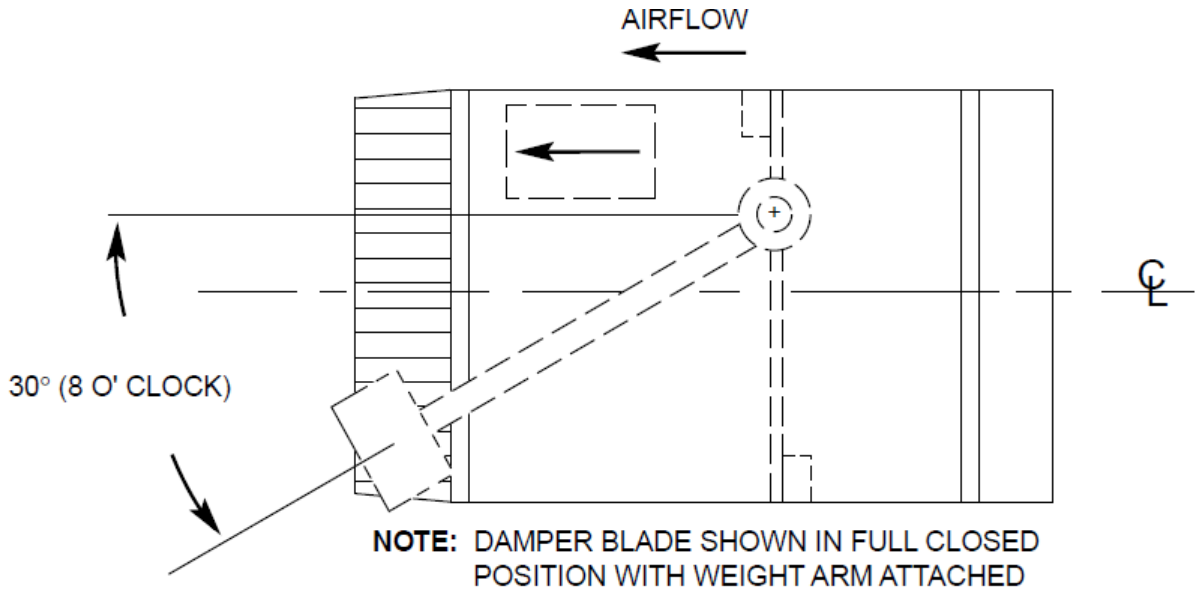
Round:

MODEL NO.	A	B	C	MAXIMUM AIR-FLOW (CFM)
DAMPBAR08INC	8	9	6	400
DAMPBAR10INC	10	11-1/8	8	650
DAMPBAR12INC	12	13-1/8	10	900
DAMPBAR14INC	14	15-3/8	10	1200
DAMPBAR16INC	16	17-5/8	12	1600

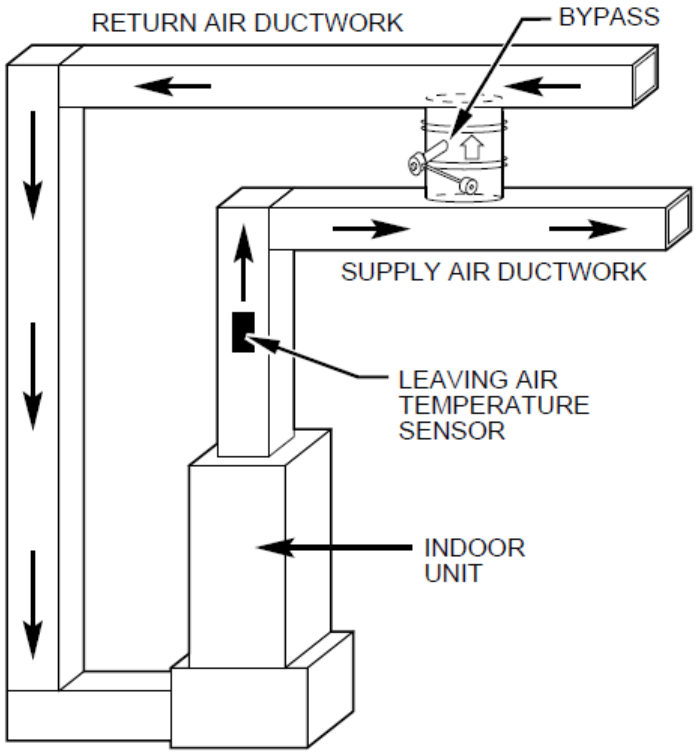
Uses a pendulum with an adjustable weight.

BY-PASS DAMPER SIZING

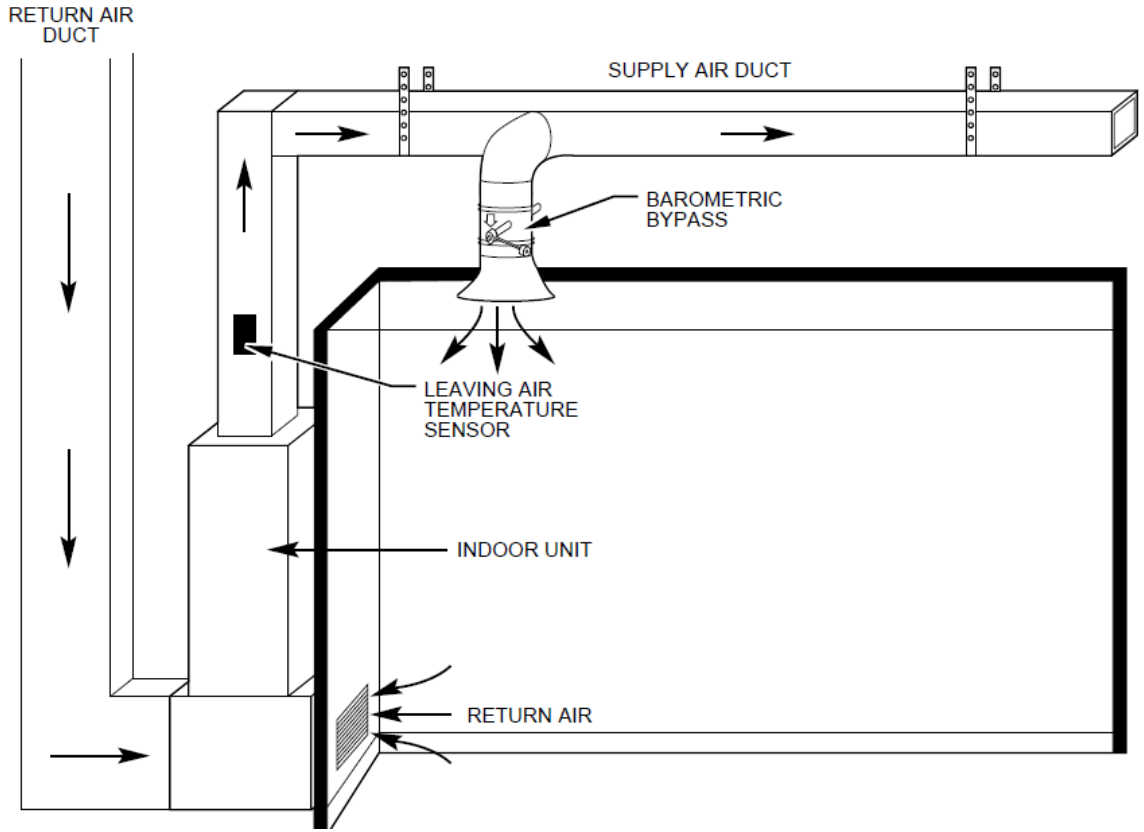
Round:



BY-PASS DAMPER LOCATION



BY-PASS DAMPER LOCATION



BY-PASS DAMPER ADJUSTMENT

Rule of Thumb:

With only the smallest zone calling, adjust to relieve only the minimum amount of air necessary to quiet down the air noise in the smallest zone.

ZONING CONTROL OPTIONS

Carrier

- Comfort - Comfort 3 Zone
- Performance - Comfort Zone II
  - (discontinued)
- Infinity Zoning

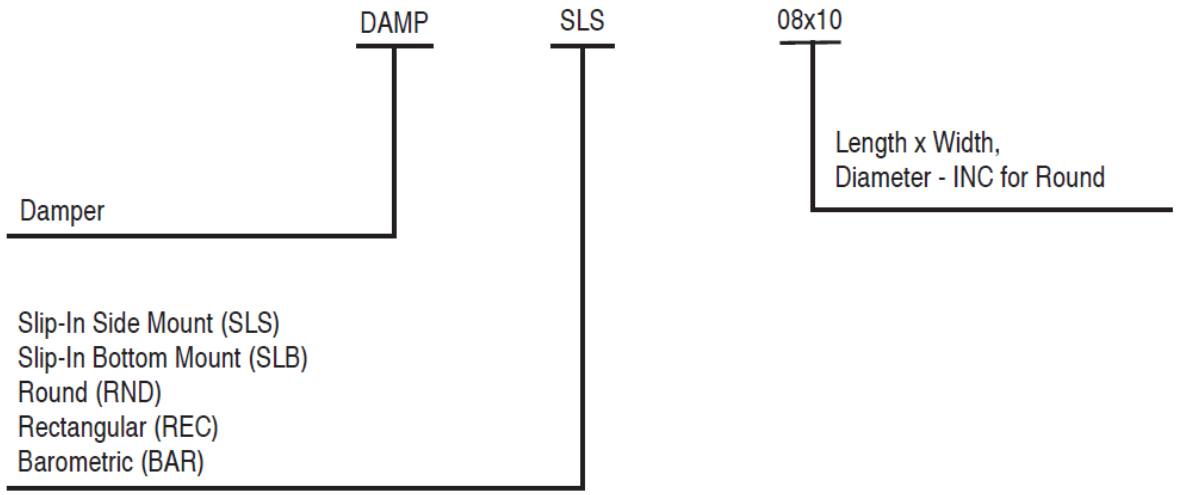
Bryant

- Legacy - Zone Perfect 3 Zone
- Preferred – Zone Perfect Plus
  - (discontinued)
- Evolution Zoning

All Three systems use the same motorized dampers!

ZONING DAMPERS

MODEL NUMBER NOMENCLATURE



All Carrier/Bryant motorized dampers are 3 wire, power open and power closed with 15 second modulation.

ZONING DAMPERS

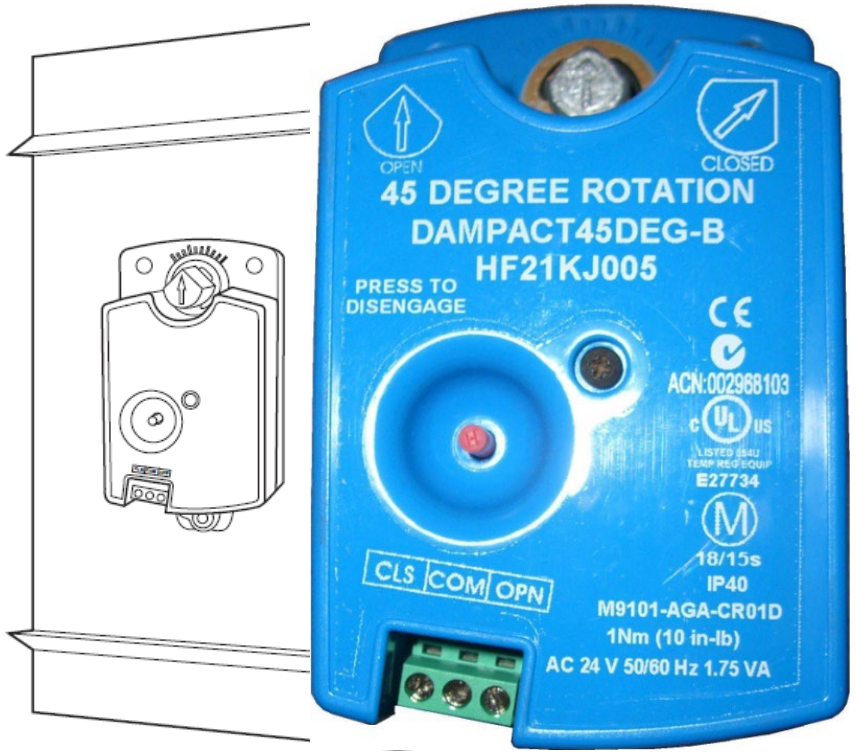


Fig. 2 - Rectangular Damper

ZONING DAMPERS

Available in Bottom and Side Mount.

SLS is Side Mount
SLB are Bottom Mount

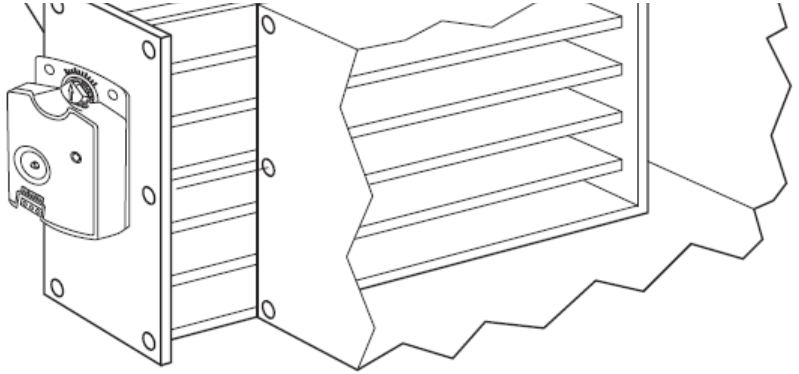


Fig. 3 - Slip-In Damper

ZONING DAMPERS

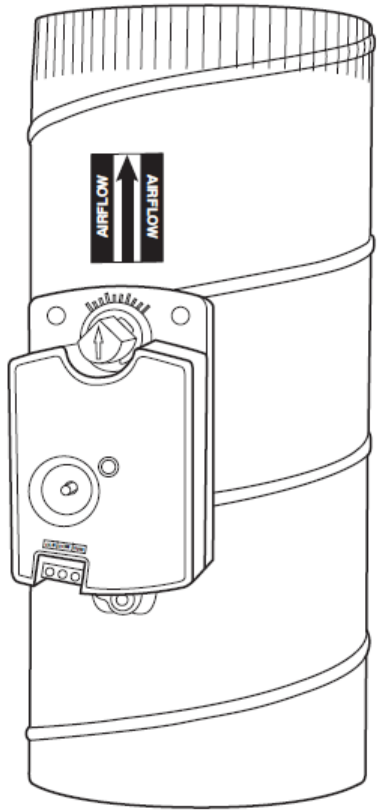


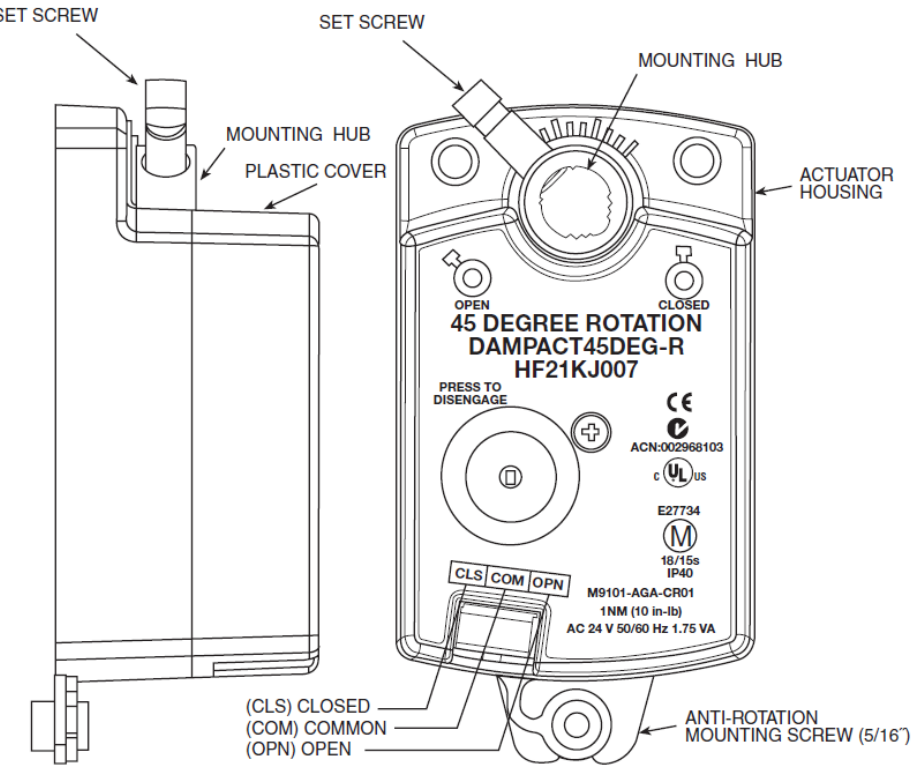
Fig. 1 - Round Damper

ZONING DAMPERS

Installation Instructions

Replacer
Damper

Γ45DEG-R
Γ90DEG-R



ZONING CONTROL OPTIONS

Carrier

- Comfort - Comfort 3 Zone

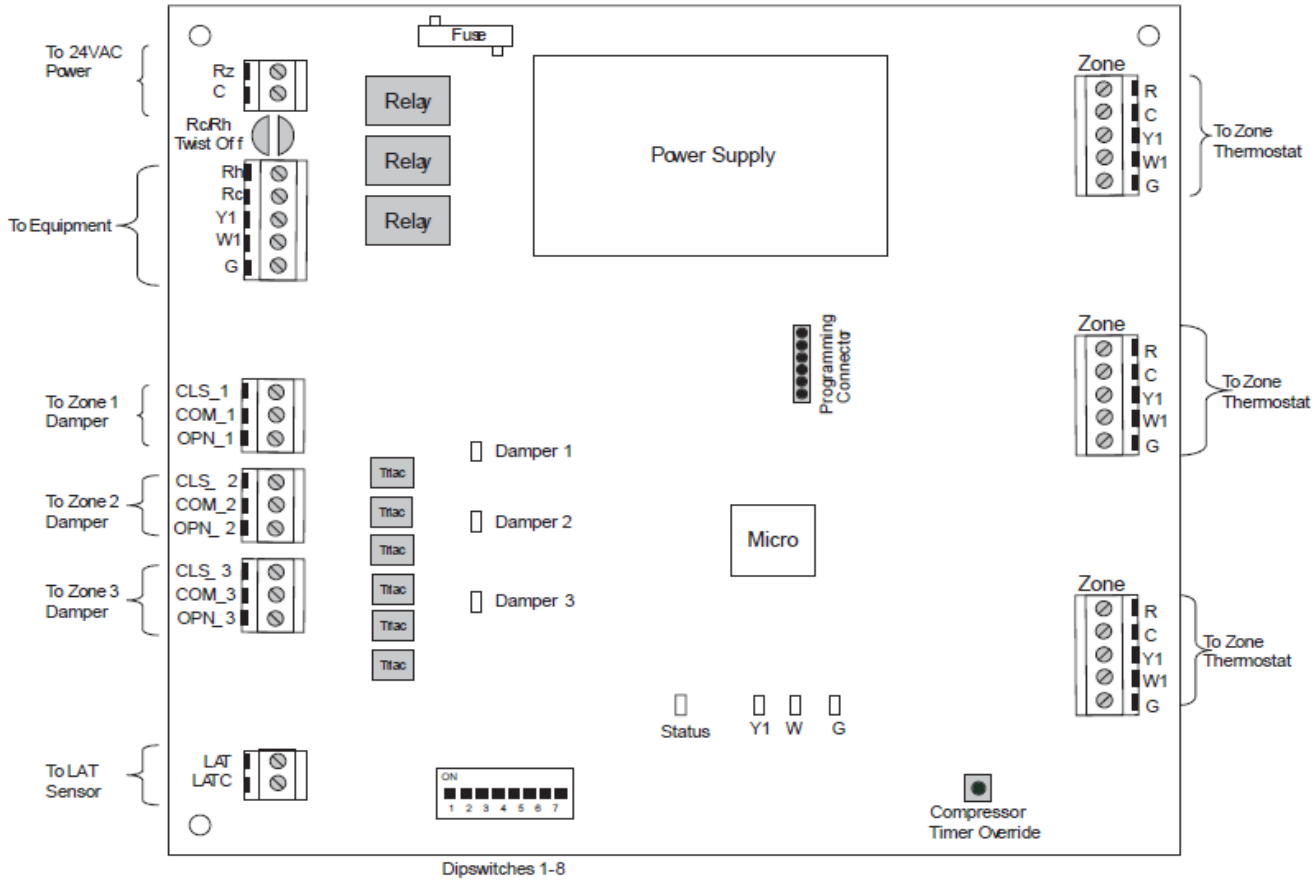
Bryant

- Legacy - Zone Perfect 3 Zone

COMFORT / LEGACY SERIES 3-ZONE FEATURES

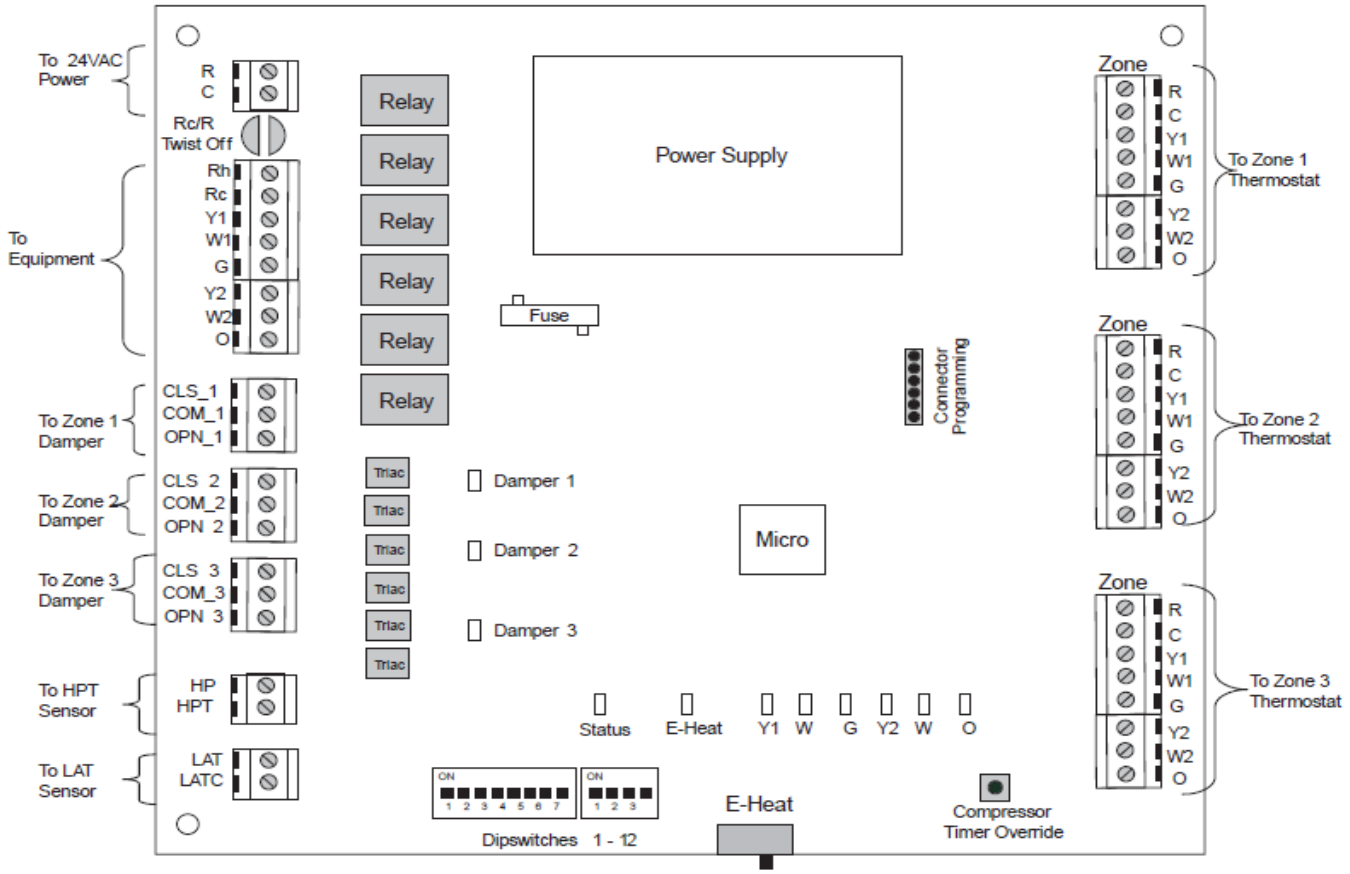
- Up to 3 zones with distinct temperature settings
- Works with a programmable or non-programmable thermostat
- Includes Smart Recovery™ with a programmable thermostat
- Multi-Stage HP or AC Systems ***(No Hybrid)***
- Blinking light diagnostics
- Each zone can handle 5 dampers.

COMFORT / LEGACY SERIES 3-ZONE FEATURES



Straight AC Version

COMFORT / LEGACY SERIES 3-ZONE FEATURES



HP Version

COMFORT / LEGACY SERIES 3-ZONE FEATURES

NOTE: 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.

COMFORT / LEGACY SERIES 3-ZONE FEATURES

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 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

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)

ZONING CONTROL OPTIONS

Carrier

- Comfort - Comfort 3 Zone
- Performance - Comfort Zone II
  - (discontinued)

Bryant

- Legacy - Zone Perfect 3 Zone
- Preferred – Zone Perfect Plus
  - (discontinued)

PERFORMANCE / PREFERRED SERIES ZONING

From the Performance / Preferred Series a product known for reliability and performance since Carrier / Bryant introduced it in 1997

– Comfort Zone II

– Zone Perfect Plus

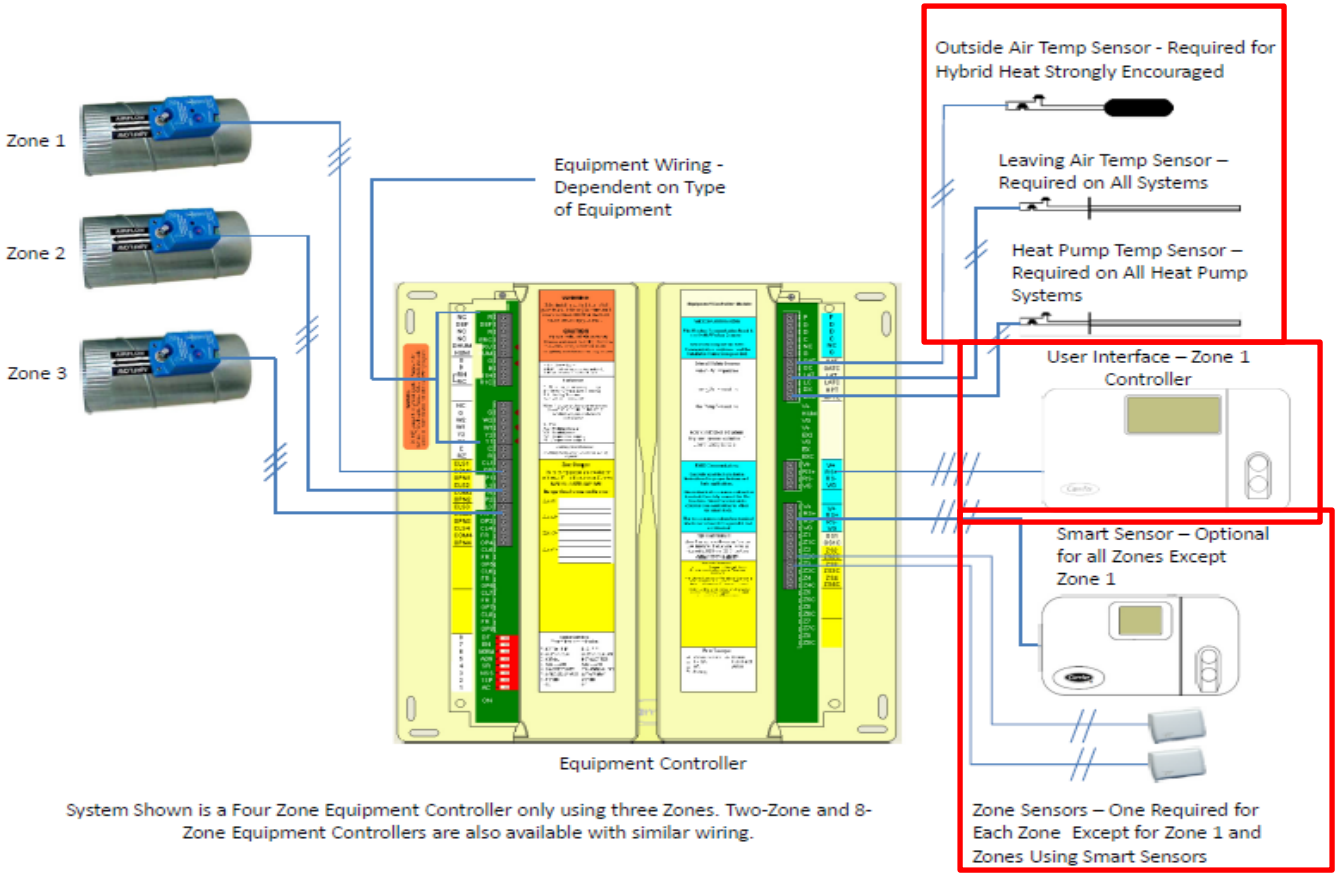
Performance SERIES

Preferred™ SERIES

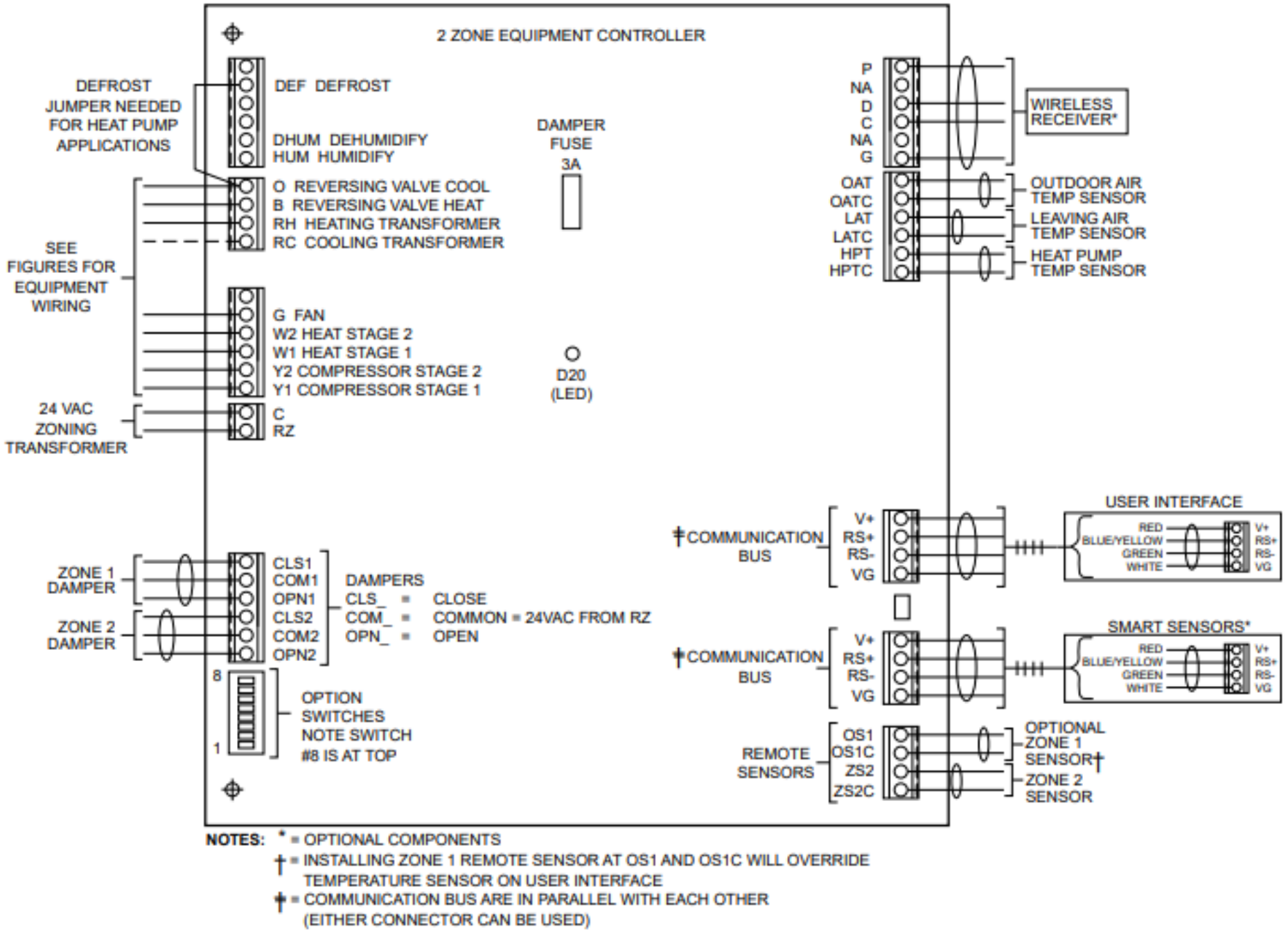
COMFORT ZONE II - ZONE PERFECT PLUS FEATURES

- Up to 8 zones
- Modulating damper control
- Controls both temperature and humidity if system includes variable speed
- Displays outdoor air temp (with outdoor sensor)
- Supports IdealHumidity™
- Includes Smart Recovery™
- Includes LAT sensor as safety feature
- Each zone can handle 5 dampers

COMFORT ZONE II - ZONE PERFECT PLUS FEATURES



System Shown is a Four Zone Equipment Controller only using three Zones. Two-Zone and 8-Zone Equipment Controllers are also available with similar wiring.



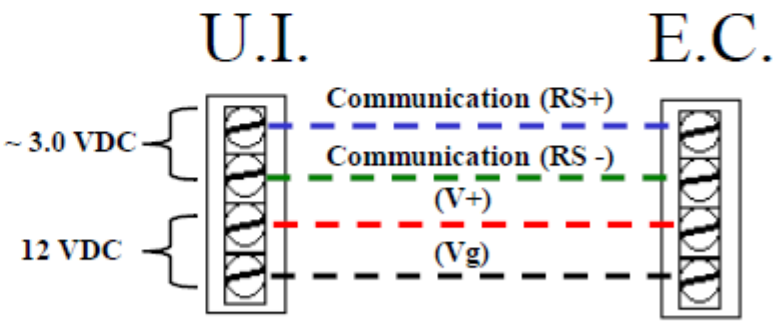
NOTES: * = OPTIONAL COMPONENTS

† = INSTALLING ZONE 1 REMOTE SENSOR AT OS1 AND OS1C WILL OVERRIDE TEMPERATURE SENSOR ON USER INTERFACE

‡ = COMMUNICATION BUS ARE IN PARALLEL WITH EACH OTHER (EITHER CONNECTOR CAN BE USED)

Troubleshooting Error Codes

- E 1 Communication Failure:
  - User Interface cannot find the Equipment Controller.
    - On new install check:
      - Wiring between U.I. & E.C.
      - Check address;
        - » Dip-Switch #5 (Off)
        - » Config. Option #34 (01)
    - Existing application:
      - Cycle power.
      - D20 LED should flicker ~15 sec.



Comfort Zone II - Zone Perfect Plus Configuration

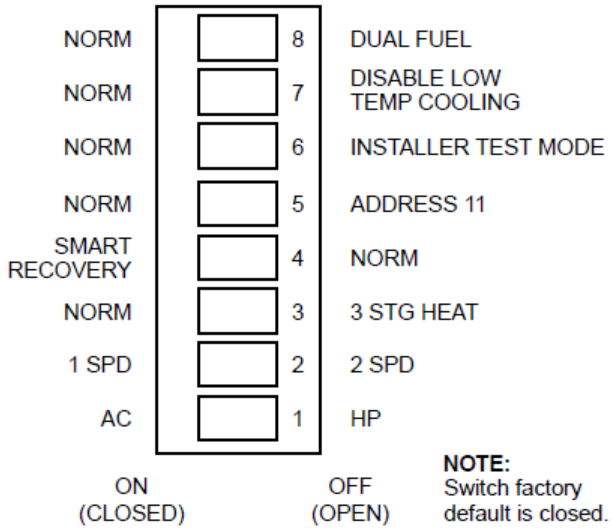


Fig. 12—DIP Switch Settings

Comfort Zone II - Zone Perfect Plus Configuration

At power up the User Interface displays all segments for a few sec. This is followed by the selected system type for an additional few sec. The system type shows as follows:

1. AC—1-Speed Air Conditioner
2. HP—1-Speed Heat Pump
3. A2—2-Speed Air Conditioner
4. H2—2-Speed Heat Pump
5. HS—1 or 2-Speed Heat Pump with 3-Stage Auxiliary Heat
6. dF—Dual Fuel with 1-Speed Heat Pump
7. d2—Dual Fuel with 2-Speed Heat Pump

Comfort Zone II - Zone Perfect Plus Configuration

TO ENTER THE CONFIGURATION MODE:

Press and hold FAN button for approximately 10 sec until room temperature and set point displays change to 2 numbers. You are now in the configuration mode.

CONFIGURATION OPTIONS:

Option 2—Clean filter timer

Option 3—Fahrenheit or Celsius

Option 4—Fan (G) ON with W

Option 5—Variable speed ICM motor

Option 6—Low ambient cooling lockout temperature

Option 7—Variable speed superdehumidification

Option 8—Auxiliary heat lockout Temperature

Option 11—Dual fuel crossover temperature

Option 12—Defrost heat selection

Option 13—Zone temperature offset adjustment

Option 14—Heat/cool dead band adjustment

Comfort Zone II - Zone Perfect Plus Configuration

Option 15—Enable AUTO mode

Option 16—Enable Comfort Heat mode

Option 18—Humidity offset adjustment

Option 19—Outdoor air temperature offset adjustment

Option 20—Enable programmable fan

Option 30—Display damper positions

Option 31—Display HPT temperature reading

Option 32—Display LAT temperature reading

Option 33—Select LAT shutdown temperature

Option 34—User Interface address

Option 35—Disable zoning

Option 36—Select HPT or LAT sensor to monitor cooling

Option 37—Ignore LAT/HPT safeties

Option 38—Select auto changeover time
(1,9,10,17,21-29 are not applicable)

Comfort Zone II - Zone Perfect Plus Configuration

OPTION 5—VARIABLE SPEED (ICM) BLOWER

If the furnace or fan coil contains a variable speed ICM blower, set this option ON. For normal (PSC) blowers, set to OF (off). This selection enables the system to use Comfort Heat features available only with the ICM blower. Factory default is OF (off).

Comfort Zone II - Zone Perfect Plus Configuration

OPTION 7—VARIABLE SPEED SUPER DEHUMIDIFICATION

This function only operates with selected Comfort Heat compatible furnaces and fan coils. Refer to furnace or fan coil instructions. Option 5 must be set to ON for this option to appear. When there is a '*cool to dehumidify*' demand (a dehumidification demand but no cooling demand), the blower CFM is reduced to a minimum to obtain maximum dehumidification. While a '*cool to dehumidify*' demand exists, the equipment is cycled ON for 10 min. and then OFF for 10 min. The reduced blower CFM is produced by a Y signal without a G signal. ON enables this function. Factory default is OF.

Comfort Zone II - Zone Perfect Plus Configuration

OPTION 20—ENABLE PROGRAMMABLE FAN

This option allows the blower to operate continuously (fan = ON) during the day and automatically (fan = AUTO) at night. When enabled, if the fan mode is set to ON, it will operate in AUTO during the Zone 1 SLEEP period. Factory default is OF (off).

Comfort Zone II - Zone Perfect Plus Configuration

OPTION 33—SELECT LAT SHUTDOWN TEMPERATURE

This option selects maximum allowable LAT in furnace and fan coil auxiliary heat installations. Equipment will be turned off if its LAT exceeds selected value. Values are 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, or 75 corresponding to temperatures of 115° to 175°F. As LAT nears selected limit, actions are taken by the system to try to reduce the LAT. These include staging down multi-stage equipment and limited conditioning of OUT zones.

ZONING CONTROL OPTIONS

Carrier

- Comfort - Comfort 3 Zone
- Performance - Comfort Zone II
  - (discontinued)
- Infinity Zoning

Bryant

- Legacy - Zone Perfect 3 Zone
- Preferred – Zone Perfect Plus
  - (discontinued)
- Evolution Zoning

ZONING CONTROL OPTIONS

INFINITY™ SERIES

EVOLUTION™ SYSTEM

INFINITY / EVOLUTION ™ CONTROL USER INTERFACE

- Cutting-edge technology
- Designed with input from dealers and consumers
- Increased intelligence, comfort, and capabilities

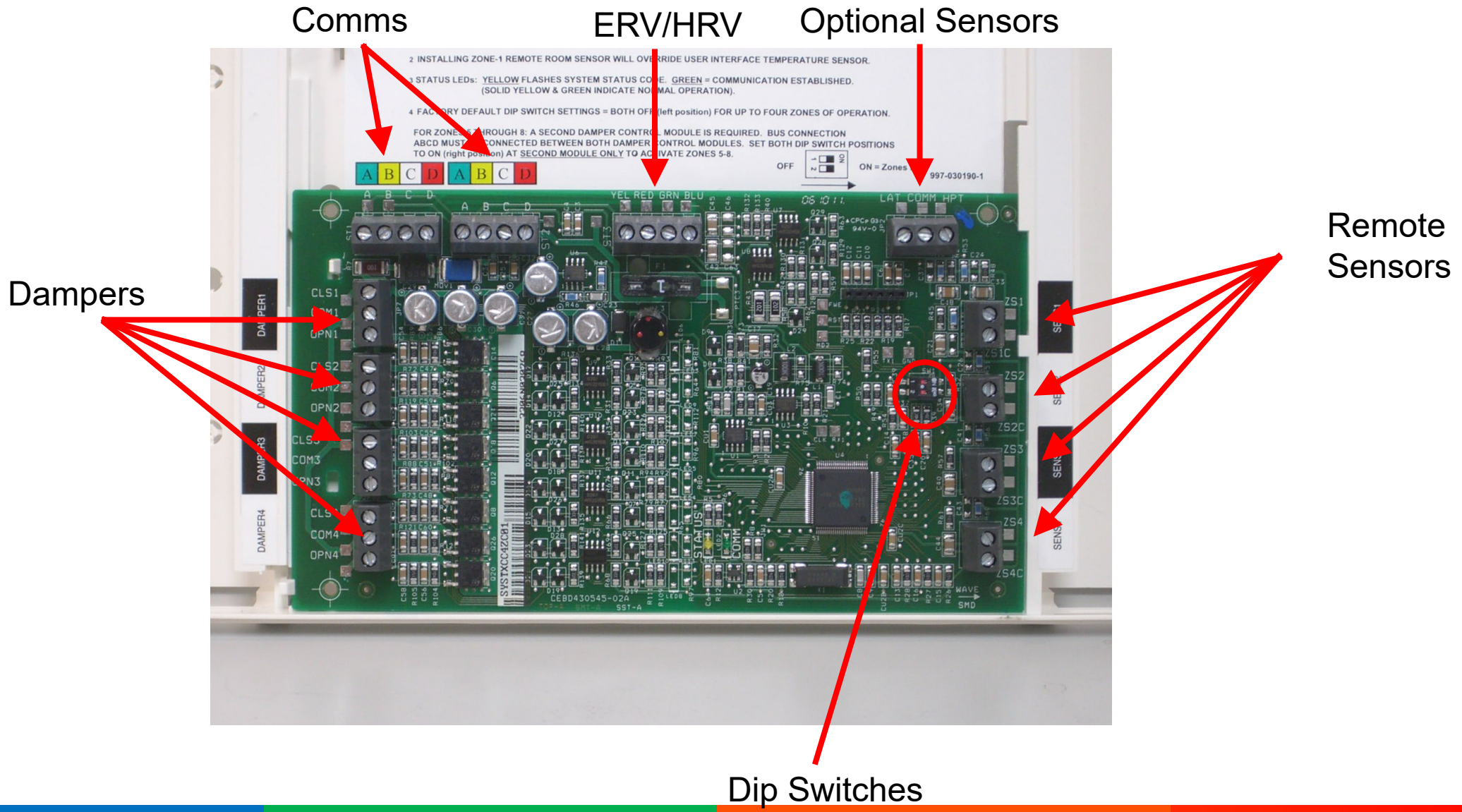
THE INFINITY / EVOLUTION™ ZONE SYSTEM

- Must be installed as part of an Infinity / Evolution Series system, allowing the homeowner to receive full system benefits.
- Infinity / Evolution Series systems include appropriate IAQ products.

WHAT DOES INFINITY / EVOLUTION ZONE SYSTEM CONTROL?

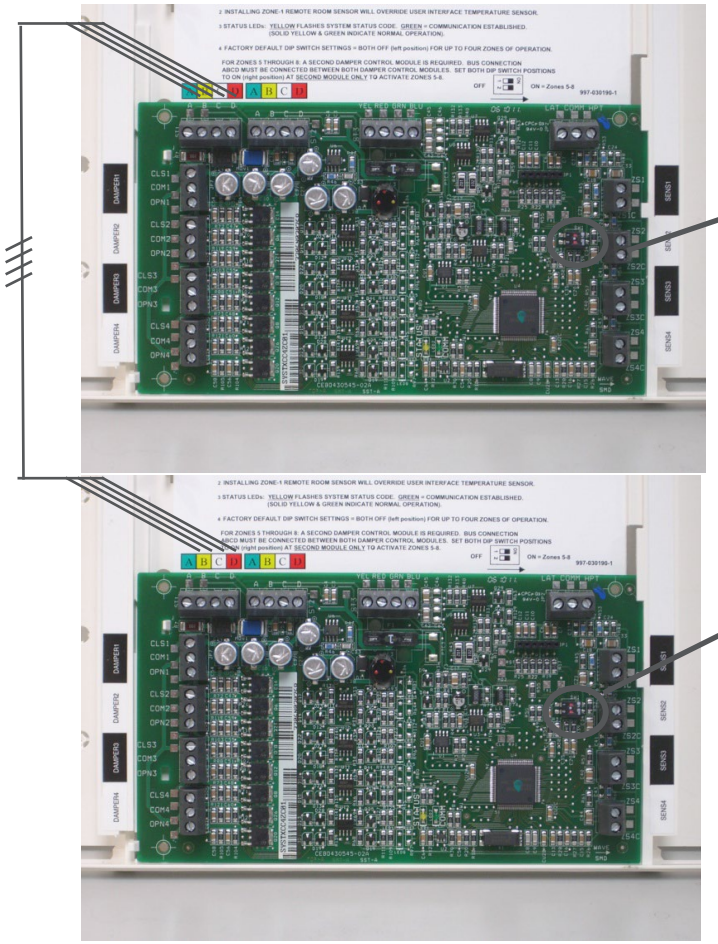
- Up to 8 zones
- Separate temperature and fan speed in each zone, with ComfortFan in each zone
- Smart Recovery
- Smart Sensors
- By-Pass – Less Algorithms
- Each zone can handle 5 dampers.

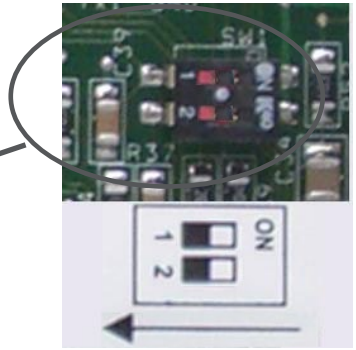
DAMPER CONTROL MODULE



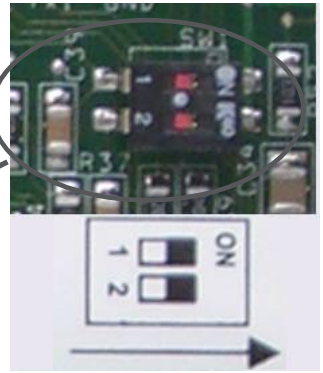
WHEN ADDING AN ADDITIONAL DAMPER CONTROL MODULE FOR 5 – 8 ZONES:

Connect 4-Wire Bus (GYWR) together.





Zones 1 - 4
Leave DIP Switches OFF



Zones 5 - 8
Turn DIP Switches ON

DAMPER CONTROL MODULE

- Allows zoning of up to 8 zones
  - 1 Damper Module for up to 4 zones
  - 2 Damper Modules for 5 to 8 zones

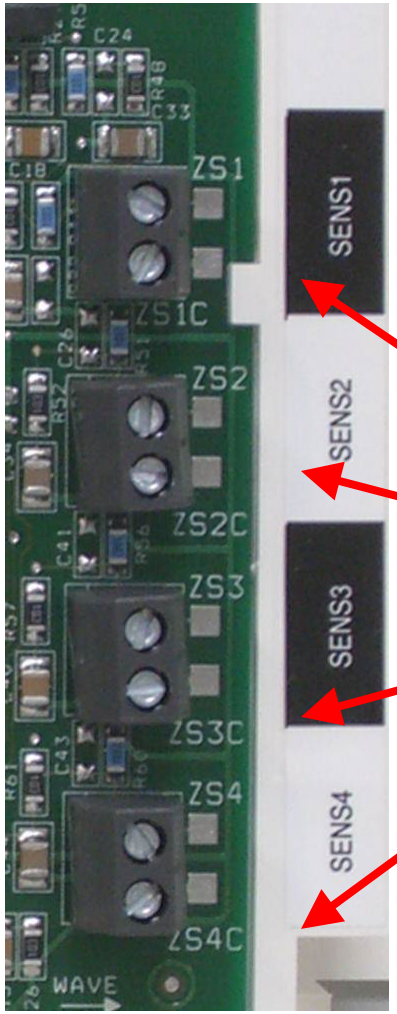
- Will accept inputs from remote room sensors or Smart Sensors
- Will control existing Comfort Zone Dampers

REMOTE ROOM SENSOR

- Can send temperature information from remote zones to Damper Interface Module
- Can be wired to a User Interface (Single Zone or Multiple Zone) to sense temperature remotely (S1 & S2)

Humidity sensor cannot be mounted remotely!!

REMOTE ROOM SENSOR



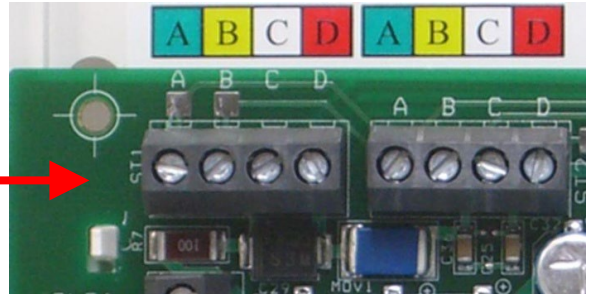
2-Wire Connection to Damper Control Module

2-Wire Connection to User Interface (S1/S2)

SMART SENSOR INSTALL

- 4-Wire Communications Bus
- Same Mounting and Wiring Considerations as User Interface
- Large Back Plate available P/N **SYSTXX0LBP01**

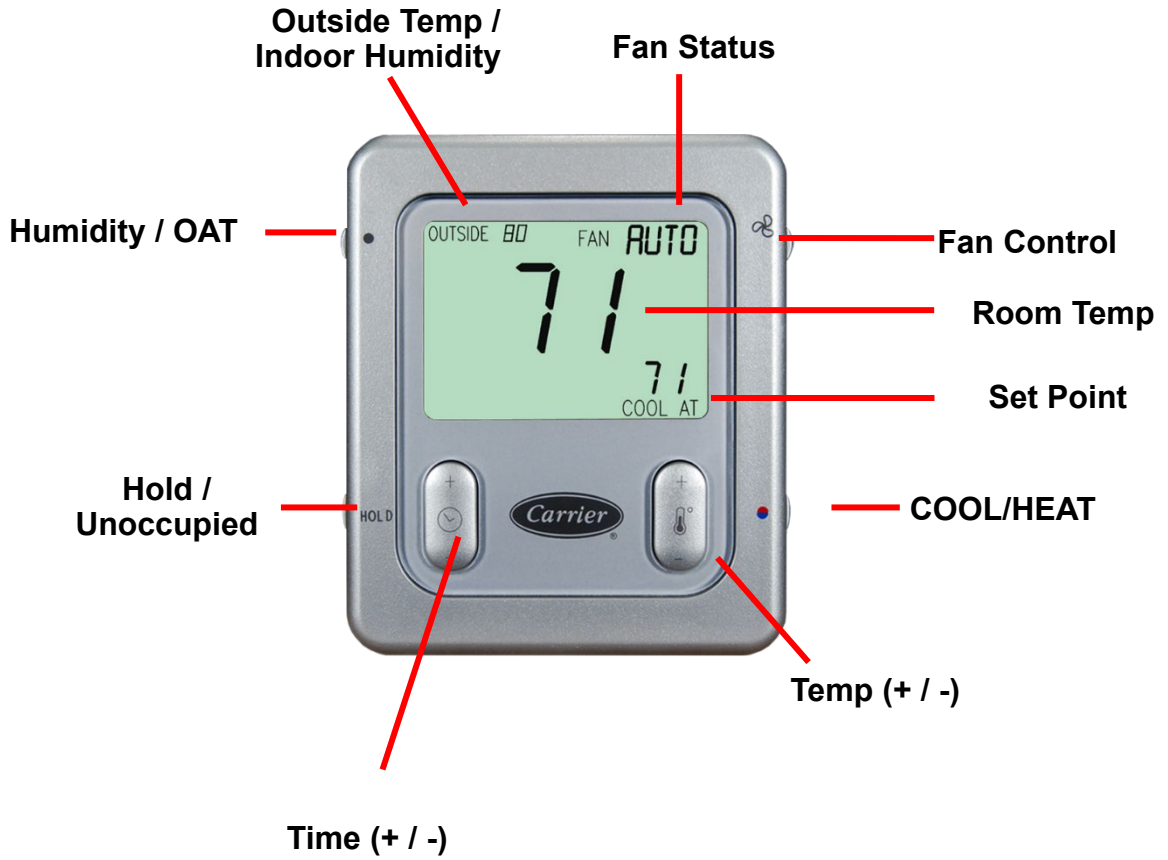
End Run 4-Wire Comms Bus to Terminals on Damper Control Module



Allows remote Status and Control of Zone mode, set points and fan settings

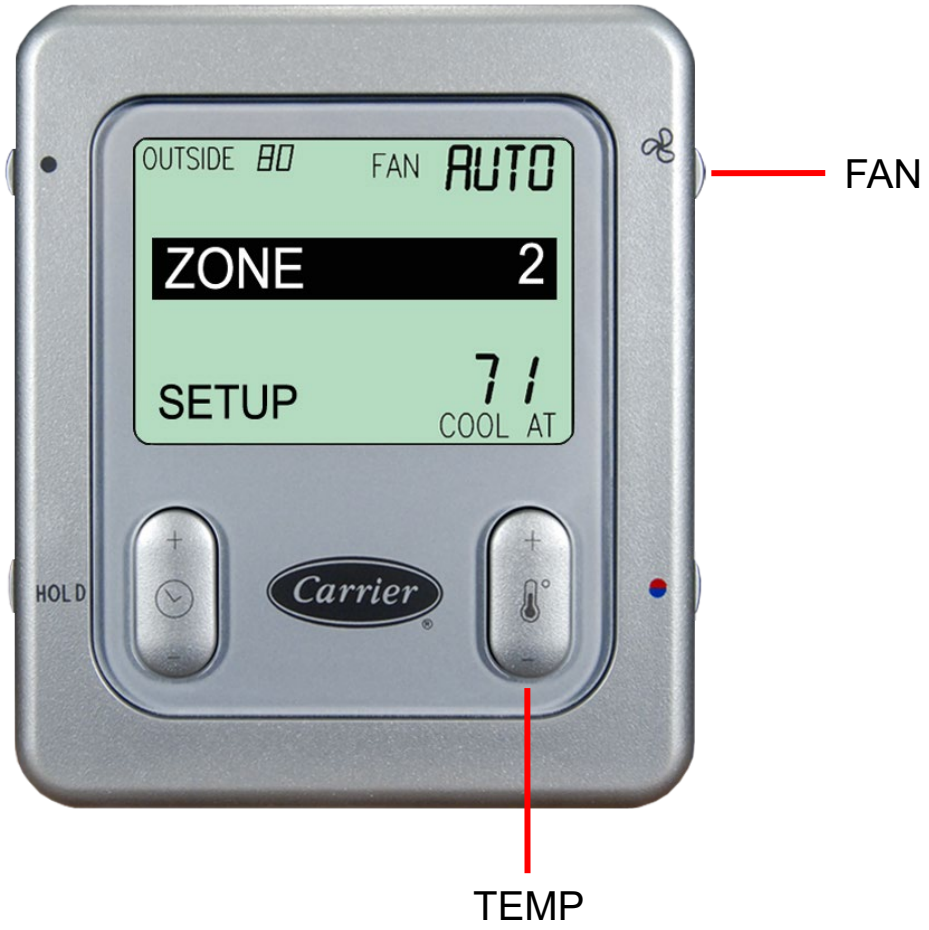
SMART SENSOR

- Used in any zone
- Displays:
  - Zone temperature
  - Indoor fan status
  - Outdoor air temperature
  - Indoor humidity
  - Vacation mode
  - Timed override status
  - System off when it is off
- Buttons for adjusting:
  - Zone cool/heat set point temperatures
  - Timed override
  - Humidity or OAT display



ZONE ADDRESS

- During power-up, ZONE is displayed with address 2 in TEMP display and SETUP also shows in lower left
- Use TEMP +/- button to set address (1-8)
- Press “FAN” button to store address



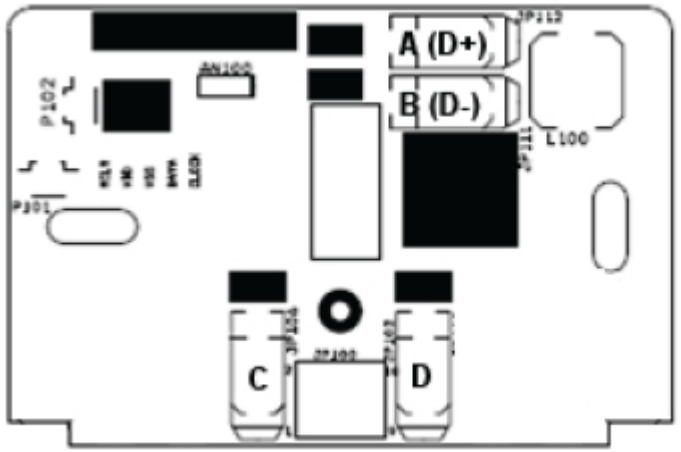
SMART SENSOR

- Used in any zone
- 2.8” Glass touchscreen with swipe capability
- Displays:
  - Indoor air temp
  - Indoor humidity
  - Outdoor air temperature
  - Outdoor air humidity
- Change
  - Change Zone Mode & Temperature
  - Change Indoor fan speed

ZONE ADDRESS

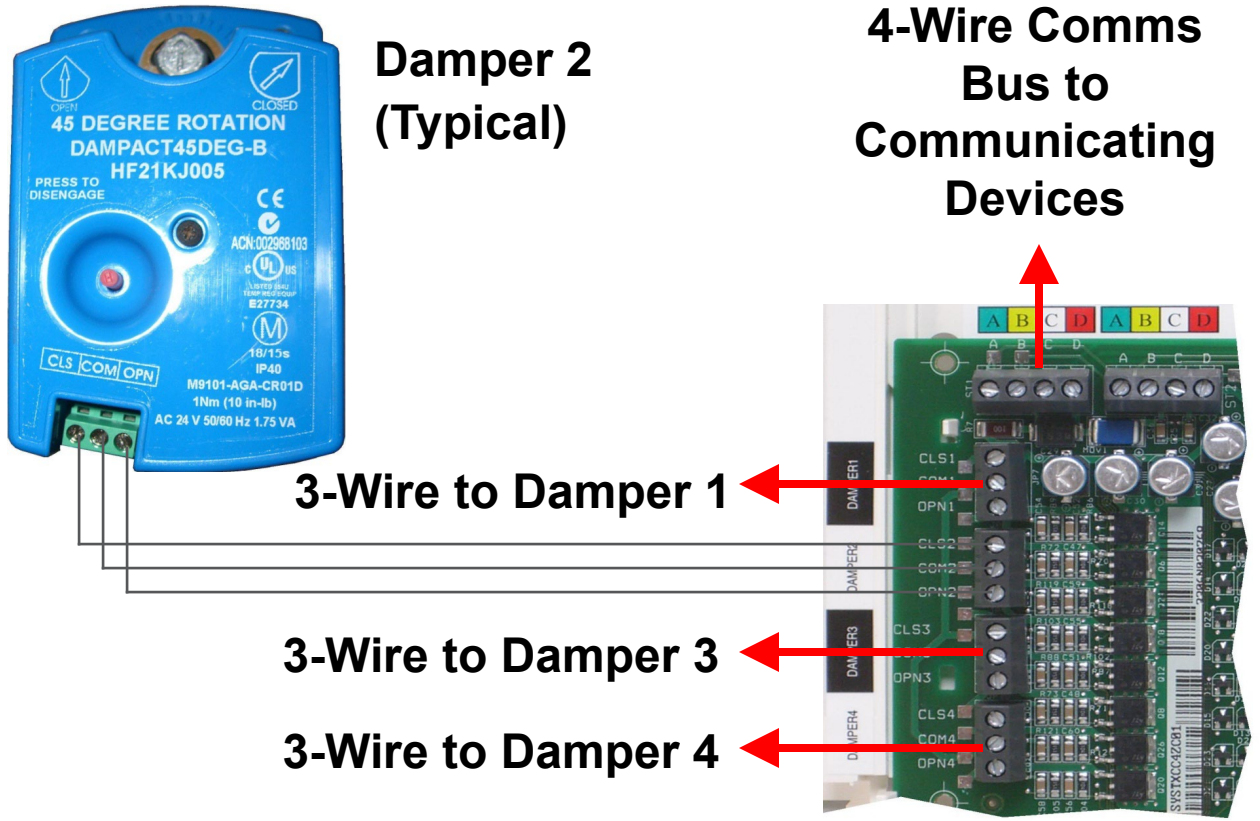
Smart Sensor Setup

After successful communications with the User Interface 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.

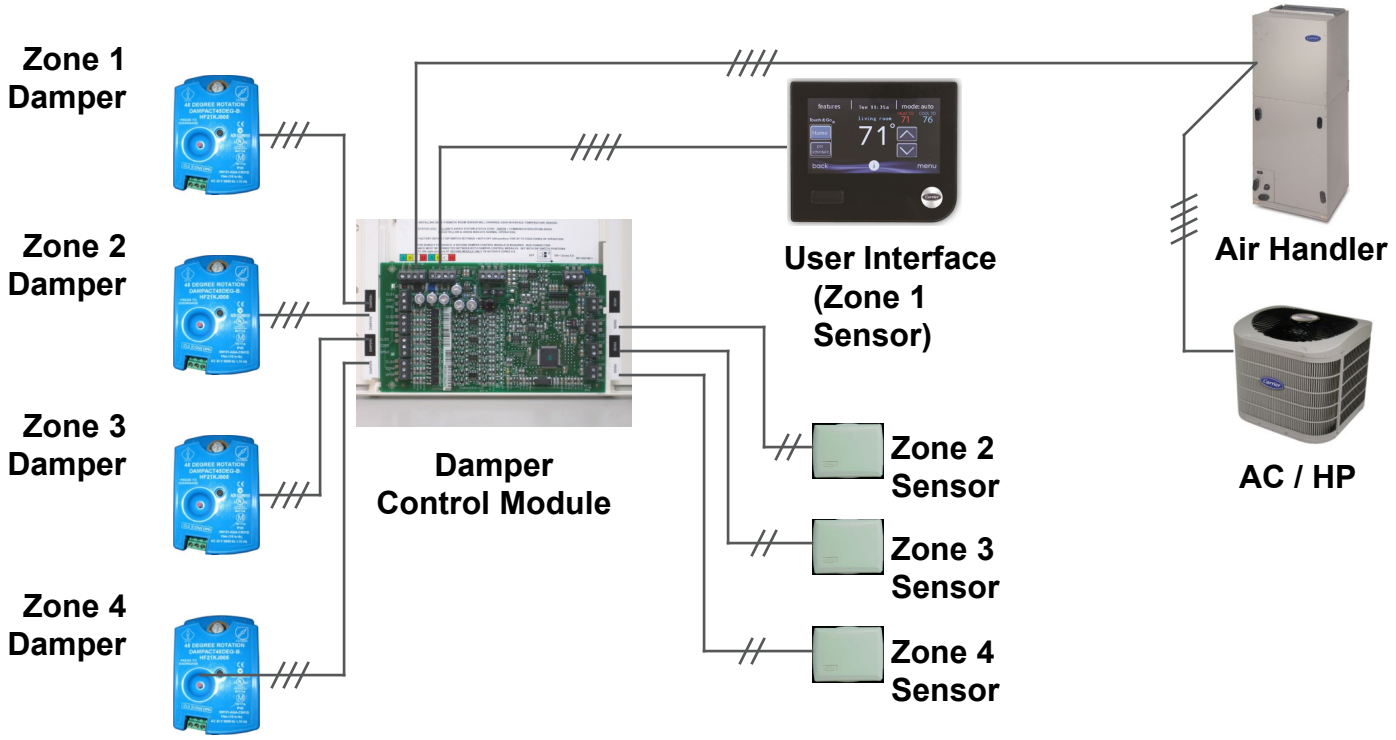


Wiring connections

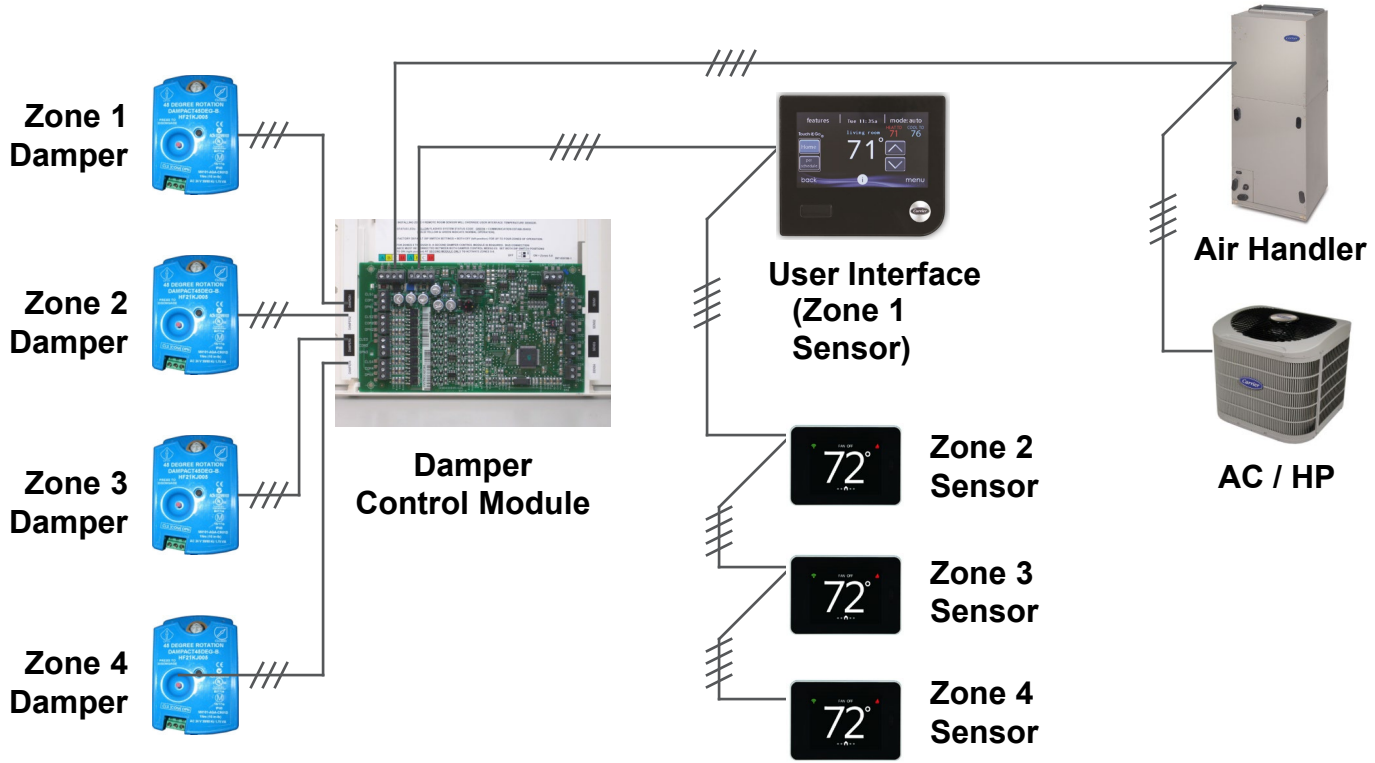
DAMPER CONTROL MODULE WIRING



TYPICAL WIRING (4-ZONE SYSTEM)

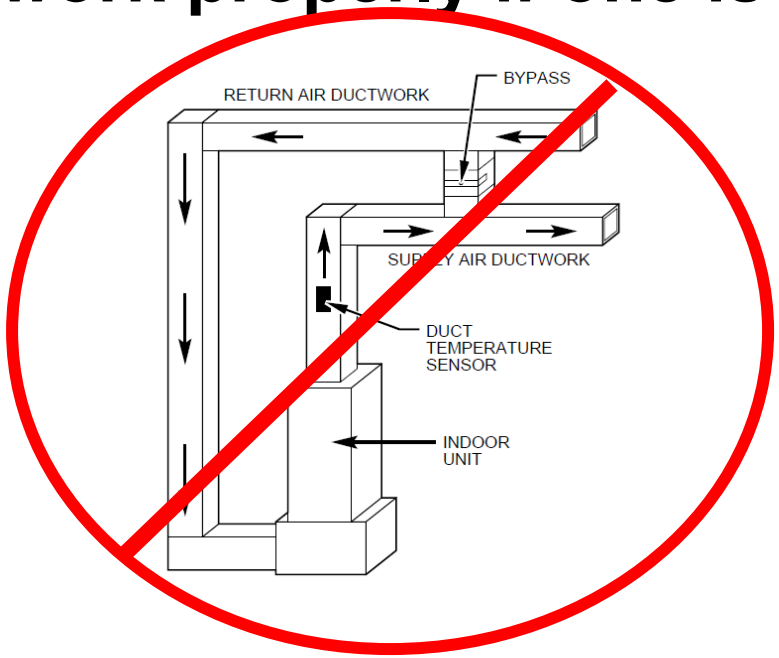


TYPICAL WIRING (4-ZONE SYSTEM WITH SMART SENSORS)

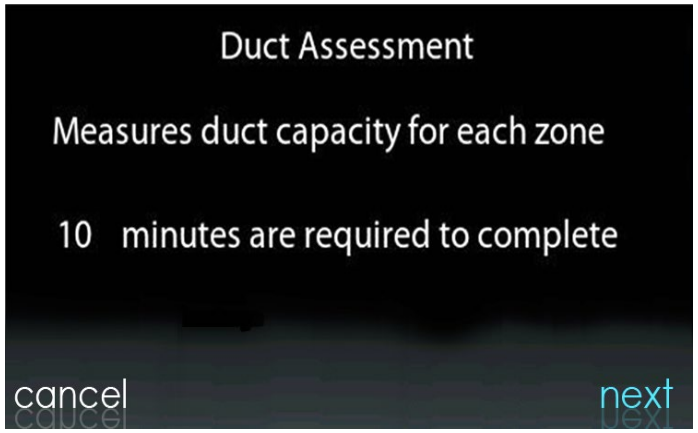


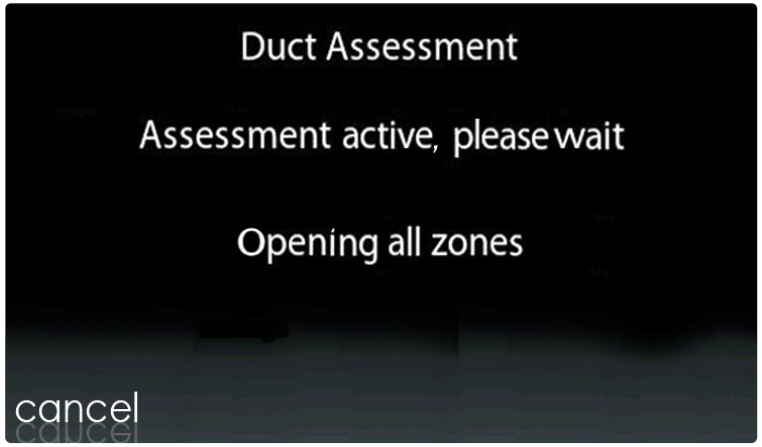
INFINITY/EVOLUTION AIRFLOWS

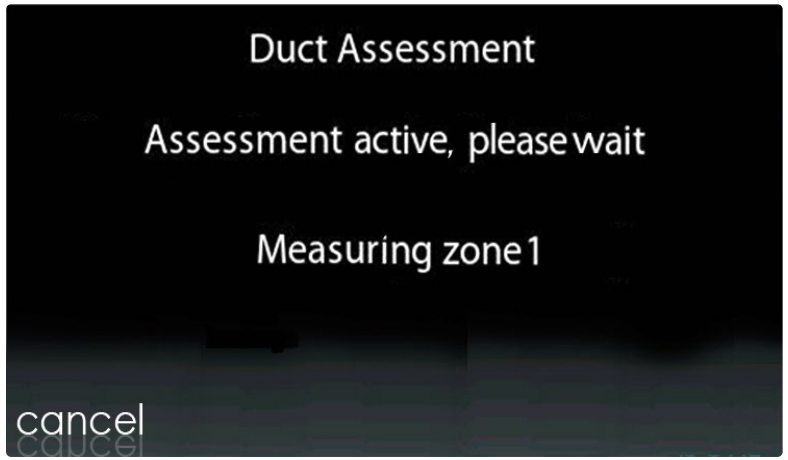
The Infinity/Evolution Zoning System uses *NO BY-Pass Damper* and will not work properly if one is added!



ZONE SYSTEM DUCT ASSESSMENT







DUCT ASSESSMENT RESULTS

The duct assessment will take approximately 1-½ minutes per zone to complete. 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. The system will then close all zones and take a pressure measurement, getting a value for the duct leakage up to and through the dampers. With these static pressure measurements, the system will calculate the relative size of each zone as well as the percent leakage through the dampers.

DUCT ASSESSMENT RESULTS

INFINITY/EVOLUTION AIRFLOWS

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 AIRFLOWS

Zoned

The *minimum* airflow that will be delivered to any single zone is determined by the *Dehumidify* airflow setting.

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

This is the minimum airflow for the unit to operate(Lower Limit).

INFINITY/EVOLUTION AIRFLOWS

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

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

Zone Airflow Limits

LOW - 100%

MED-LOW - 138%

MED - 176%

MED-HIGH - 214%

HIGH - 250% (default)

MAX - Maximum cfm

This is the airflow delivered to the zone(Upper Limit).

INFINITY/EVOLUTION AIRFLOWS

Zoned

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

INFINITY/EVOLUTION AIRFLOWS

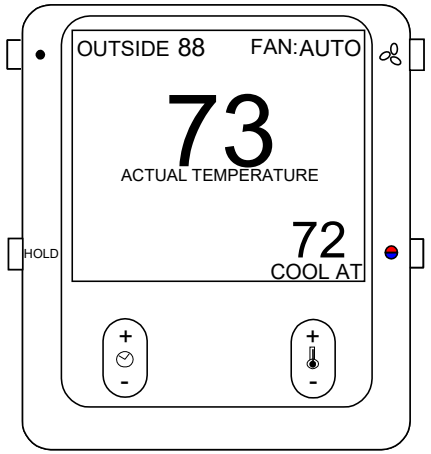
Zoned

Example:
3 zones 3.5 ton
Zone1 = 25%, Zone 2 = 35%, Zone 3 = 25%, Leakage = 15% (Determined by Duct assessment)

All zone limits set at Medium Low (138%)
(zone% + leakage%)*(450CFM/ton*# tons)*(zone airflow limit)
25%(.25) + 15%(.15) = 40%(.40)
450 CFM X 3.5 ton = 1575 total CFM
1575 CFM X 40%(.40) = 640 CFM
640 CFM X 138%(1.38) = 869 CFM Upper Limit

Dehum => Normal (275 CFM/ton)
3.5 tons X 275 CFM = 962.5 CFM Lower limit

INFINITY/EVOLUTION AIRFLOWS



ZONE 1

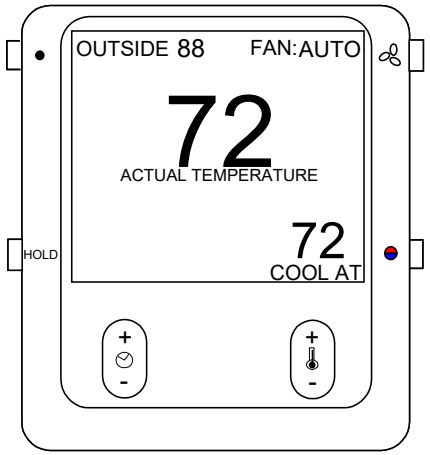
Zone airflow

Calling for cool

Upper limit = 869 CFM
Lower limit = 963 CFM

Minimum CFM for the ODU

Airflow is too low; system won't run unless another zone is calling.

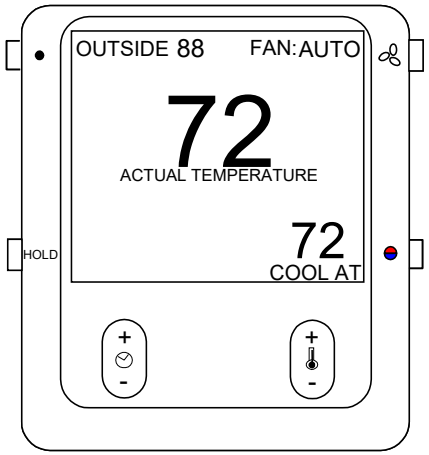


ZONE 2

Not calling for cool

Upper Limit = 1086 CFM
Lower Limit= 963 CFM

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



ZONE 3

Not calling for cool

Upper Limit = 869 CFM
Lower Limit = 963 CFM

Airflow is too low; system won't run unless another zone is calling.

INFINITY/EVOLUTION AIRFLOWS

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

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

Zone Airflow Limits

LOW - 100%

MED-LOW - 138%

MED - 176%

MED-HIGH - 214%

HIGH - 250% (default)

MAX - Maximum cfm

This is the airflow delivered to the zone(Upper Limit).

INFINITY/EVOLUTION AIRFLOWS

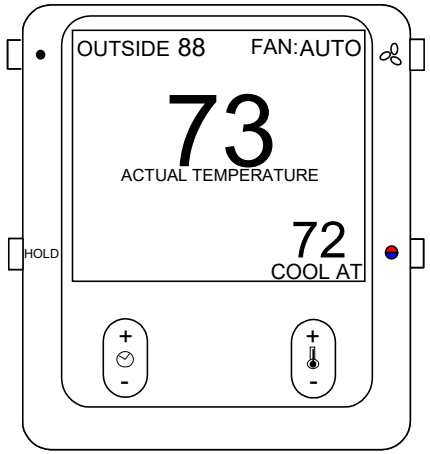
Zoned

Example:
3 zones 3.5 ton
Zone1 = 25%, Zone 2 = 35%, Zone 3 = 25%, Leakage = 15% (Determined by Duct assessment)

Change zone 1 limit to Medium (176%)
(zone% + leakage%)*(450CFM/ton*# tons)*(zone airflow limit)
25%(.25) + 15%(.15) = 40%(.40)
450 CFM X 3.5 ton = 1575 total CFM
1575 CFM X 40%(.40) = 640 CFM
640 CFM X 176%(1.76) = 1126 CFM Upper Limit

Dehum => Normal (275 CFM/ton)
3.5 tons X 275 CFM = 962.5 CFM Lower limit

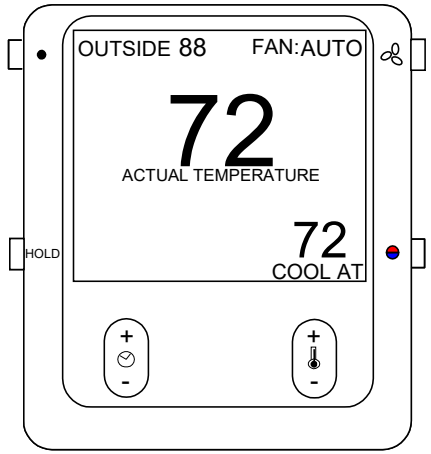
INFINITY/EVOLUTION AIRFLOWS



ZONE 1

Calling for cool

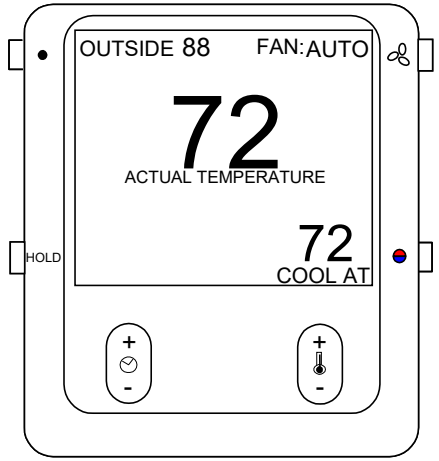
Upper limit = 1126 CFM
Lower limit = 963 CFM



ZONE 2

Not calling for cool

Upper Limit = 1086 CFM
Lower Limit = 963 CFM



ZONE 3

Not calling for cool

Upper Limit = 869 CFM
Lower Limit = 963 CFM

Adjusting zone 1 airflow limit to Medium 176% allows the system to run without further modification if it is the only zone calling. We also should look at changing zone 3 if there are comfort complaints.

Airflow sound to Zone 1 will increase since we are trying to force more air into that zone.

INFINITY/EVOLUTION AIRFLOWS

How do I get this information?

Glad you asked.

Lower Limit

Can be found in the Service area of the UI
Go to Installation / Blower assessment

Upper Limit

Can be found in the Service area of the UI
Go to Checkout / zoning / airflow limit

WHAT THE SYSTEM WILL DO IF AIRFLOW IS INSUFFICIENT:

Step 1 — Reduce airflow if possible

a. 275 CFM per ton minimum in cooling. 175 CFM/ton for low stage cooling if 2-stage unit is installed.

b. Comfort Heat airflow is minimum for heat pump heating (3.5 X Outdoor Temp + 137) CFM/ton.

c. No adjustment for furnace heating

Step 2 — Dump air to unoccupied zones

a. Unoccupied zones can be conditioned up to the most conditioned setpoint.

Step 3 — Dump air to zones with less conditioned setpoints

a. Zones with lower setpoints in heating and higher setpoints in cooling may be conditioned to within 3°F (1.7°C) of the most conditioned setpoint.

b. Increase or decrease unoccupied zones 0.75°F (.4°C).

Step 4 — Single stage cooling

a. System will reduce airflow to 275 CFM/ton in single stage cooling systems.

Step 5 — Stage down equipment

a. Equipment stage down or shut off if necessary.

b. Fault history will record an event of "AIRFLOW LIMITED STAGEDOWN OCCURRED" on stagedown and "EXCESS STATIC PRESSURE" if shut down.

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

INFINITY/EVOLUTION AIRFLOWS

Zoned 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.

- Remember that the dehumidify airflow controls the lower limit.
- Adjusting the zone airflow limits may help with a system that won't run high stage (for 2-stage systems) or won't run at all (for single-stage systems or multi-stage systems).

BLOWER CUTBACK

- Protects IDU from high static
- Motor sends a flag to the UI (~1300RPM)
- CFM begins cutback in 50 RPM Increments
- Continues until motor removes flag or minimum airflow
- System will attempt to dump air using the same method as airflow limiting
- If continues “EXCESS STATIC PRESSURE” fault in last 10 system events
- Start again when more zones are calling for conditioning

BLOWER CUTBACK

At cutback RPM, requested CFM steps down in 50 CFM increments

- Change is reflected in CFM status screens
  - Static pressure readings not accurate when in cutback
- Steps down until RPM is below cut back setting
- Minimum airflow for cooling:
  - 275 cfm/ton for high stage or single stage cooling
    - **325 if dehum airflow set to high**
  - 175 cfm/ton for low stage cooling

BLOWER CUTBACK

- Cooling only - When minimum airflow is reached, and RPM is still above cutback levels 2-stage system will stage down
  - EXCESS STATIC PRESSURE registered in Last 10 System Events
  - Single stage system will shut down until cycle timer expires or until more zones call for conditioning
    - EXCESS STATIC PRESSURE registered in Last 10 System Events
  - If no more zones calling, process repeats

BLOWER CUTBACK

- Furnace and Heat Pump heating(Comfort airflow)
  - System stages down immediately at minimum CFM

- Heat Pump heating (Efficiency or Max airflow)
  - System uses Comfort Heat airflow for minimum
  - Minimum airflow will vary with outdoor temperature

INFINITY/EVOLUTION AIRFLOWS

Zoned

If the system is running with 2 zones calling and has to stage down after only one of the two zones satisfies due to airflow limiting, the message **“airflow limited stage down”** will appear.

This is stored in the system Run/Fault history but is not a **FAULT**… it is a **Historical Event!**

TO DETERMINE IF A ZONE WILL RUN IN HIGH STAGE COOLING

- Set airflow limit to MAX for that zone
- Set all other Zones to OFF by increasing temperature setting all the way up
- Give the system a call for cooling, go to status screen and watch RPM
- If it is above 1250 or so, you may witness the cutback algorithm. If the zone stabilizes before reaching minimum CFM, the zone can handle high stage
- If RPM is below cutback, it will run high stage unless airflow limit is changed
- If airflow limit is not on MAX, it may not be allowed to run with only that zone calling

ZONED SYSTEM STAGING

Each zone's temperature is continually measured to within 1/16 degree.

The display on the User Interface has a .9 degree swing to change the display
Example the display shows 72, it could truly be any temperature between 71.1 to 72.9

The User Interface functions by using a PID algorithm

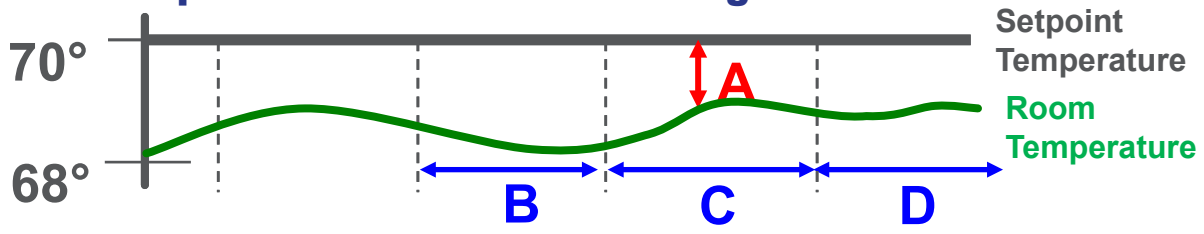
When any zone's demand is greater than 0.8 degree or the average of all zone demands is greater than 0.5 degree, the equipment is turned on or staged up one stage if it is already on.

When the average demand of all zones is zero, the equipment turns off or stages down.
This provides temperature control in all controlled zones within less than one degree off set point.

Proportional Error: The difference between the room temperature and the setpoint temperature.

Integral Error: The length of time the room temperature has differed from the setpoint temperature.

P+I Control: The P+I error is the sum of the two errors. The cycle rate used to maintain the set-point temperature is calculated using the P+I Error.



B + C + D = Integral Error

COIL FREEZE DETECTION

Another algorithm will attempt to detect a freezing coil while cooling is active.

It will do this by periodically measuring the static pressure of the system and comparing the restriction to the initial restriction on the system at the start of the cooling cycle.

If the restriction has increased by a certain amount, then a *possible* freezing coil will be declared.

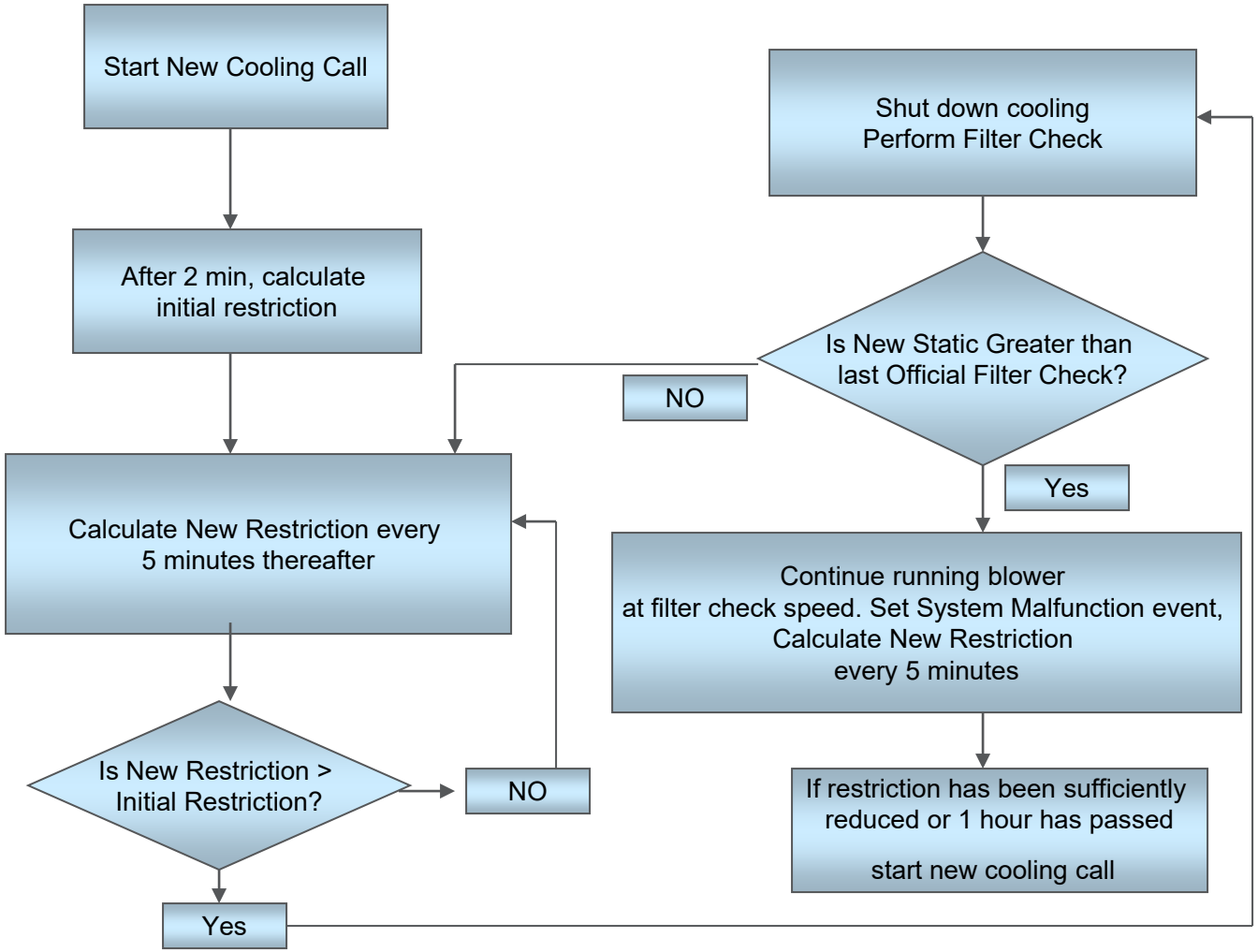
The system will turn off cooling and immediately perform a filter check.

If this new filter static pressure measurement has increased by a certain amount over the last “official” filter measurement (performed at 1pm everyday), then the coil will be declared as frozen.

The system will continue to run the fan at the filter measurement speed with cooling off while taking restriction measurements every five minutes.

A System Malfunction will be displayed and logged in the Last 10 Events. If the restriction measurement is reduced to a certain amount, or one hour has passed, then cooling will resume, if demand still exists.

COIL FREEZE DETECTION



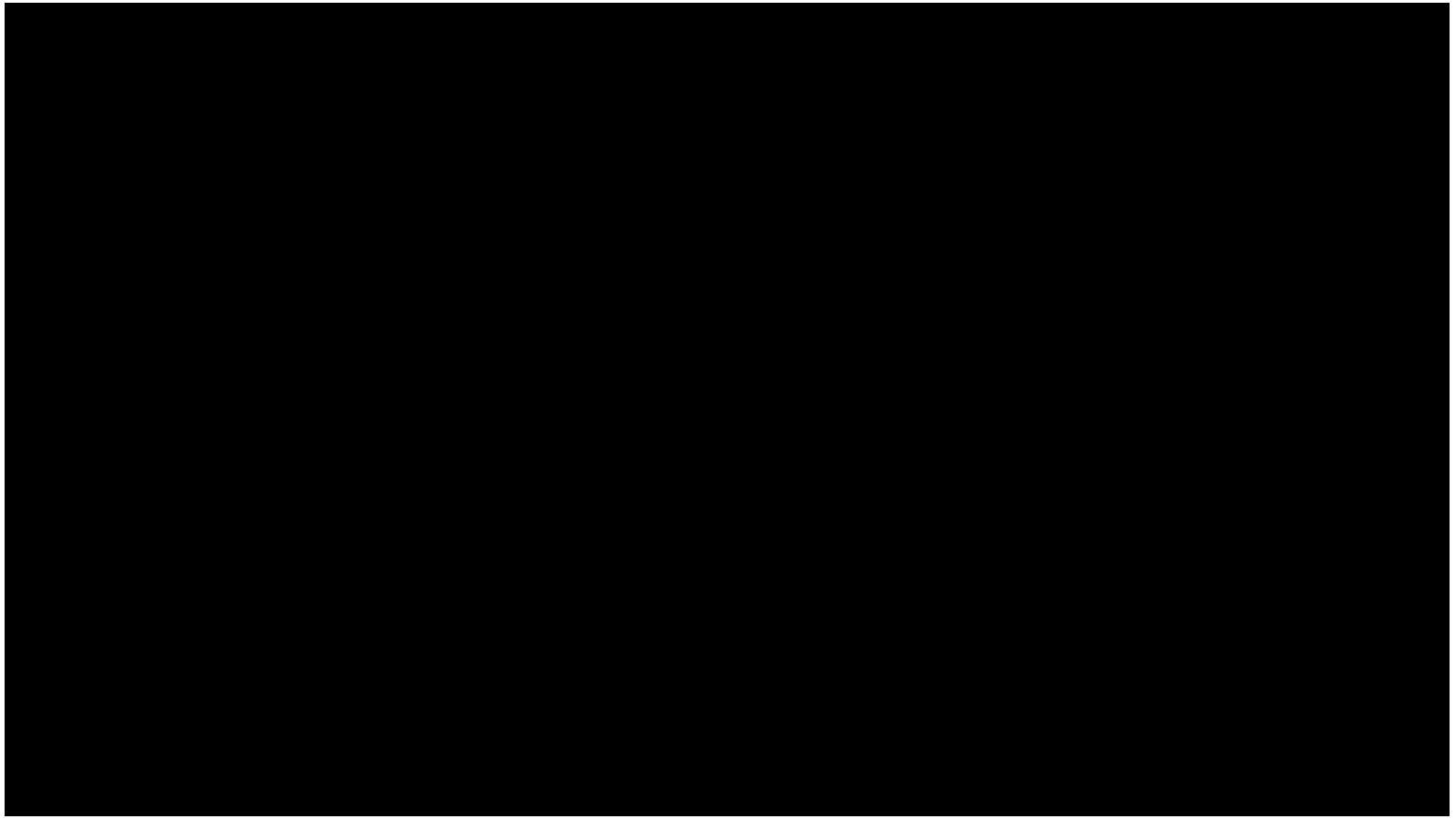
COMMUNICATION VOLTAGES AT THE ABCD PLUG

Check voltages with the ABCD 4-wire plug disconnected from the board. If the voltage behavior does not the match table, the board most likely has failed.

Check voltages with the ABCD 4-wire plug, connected to the board. If the voltage behavior does not match the table, check the wiring for shorts or bad UI.

-Voltage Readings - With board Power applied, and No U.I. connected	
A to B	~3 vdc
A to C	~3 vdc
B to C	~.01 to 0.3 vdc
C to D	24 vac
-Voltage Readings - With board Power applied, and U.I. Applied	
A to B	~2.5 to 3.9 vdc (pulsating)
A to C	~2.5 to 3.9 vdc (pulsating)
B to C	~0.1 to 0.9 vdc (pulsating)
C to D	24 vac

CODE 16 COMMUNICATION



SAME ON ALL

TROUBLESHOOTING AND SET UP HINTS

- Most important thing is to NOT be in a hurry!
- Always check one zone at a time!
- Always check zones that are not calling for airflow as well as the zone that is calling.
- Always make sure that zone dampers, wires feeding them, and ducts are clearly marked as to what zone they belong to.

TROUBLESHOOTING AND SET UP HINTS

ALWAYS verify the voltage going to a zone damper using relay that is known to be good before condemning a zone damper.

Some digital meters have been known to read phantom voltage.

TROUBLESHOOTING AND SET UP HINTS

- Determine the complaint before trying to troubleshoot the system.
- Is the equipment operating correctly?
- Is a specific zone over/under conditioning?
- Is a specific zone noisy?

TROUBLESHOOTING AND SET UP HINTS

Particular Zone is Over Conditioning:

- Does that zone's damper open and close properly?
- Is that zone's call terminating properly?
- Is that's zone's set point way off as compared to the set point of the neighboring zone?
- Is that zone calling with another zone when it should not?

TROUBLESHOOTING AND SET UP HINTS

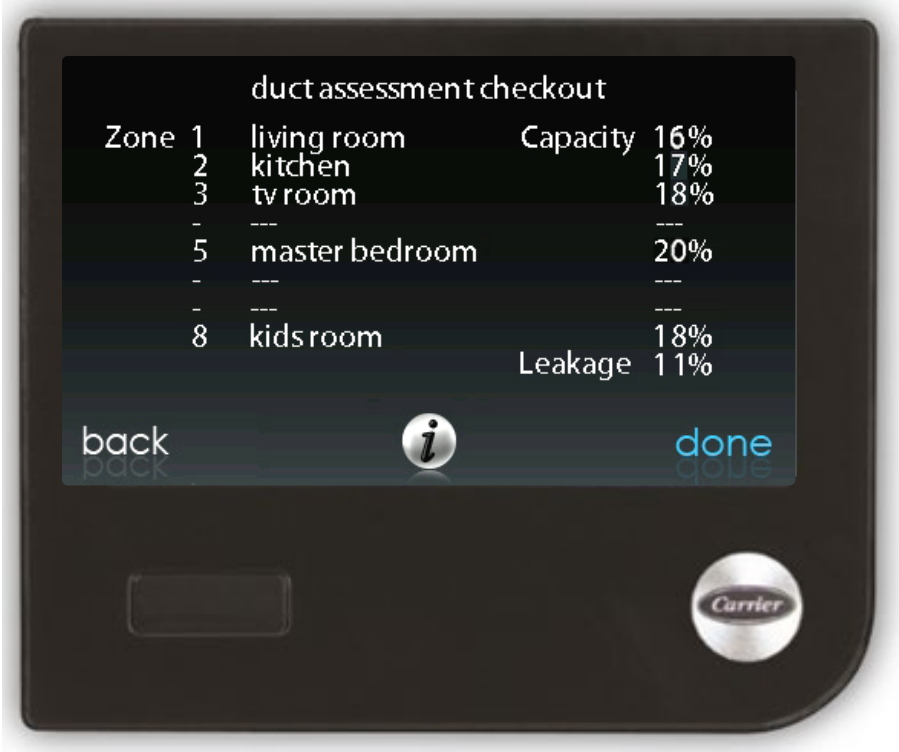
Particular Zone is Under Conditioning:

- Does that zone's damper open and close properly?
- Is that zone calling when it should (board function)?
- Is the equipment functioning properly (possibly overheating)?
- Is the By-Pass damper stuck?

INFINITY/EVOLUTION ZONING

Troubleshooting the Infinity / Evolution zoning system is a little different!!

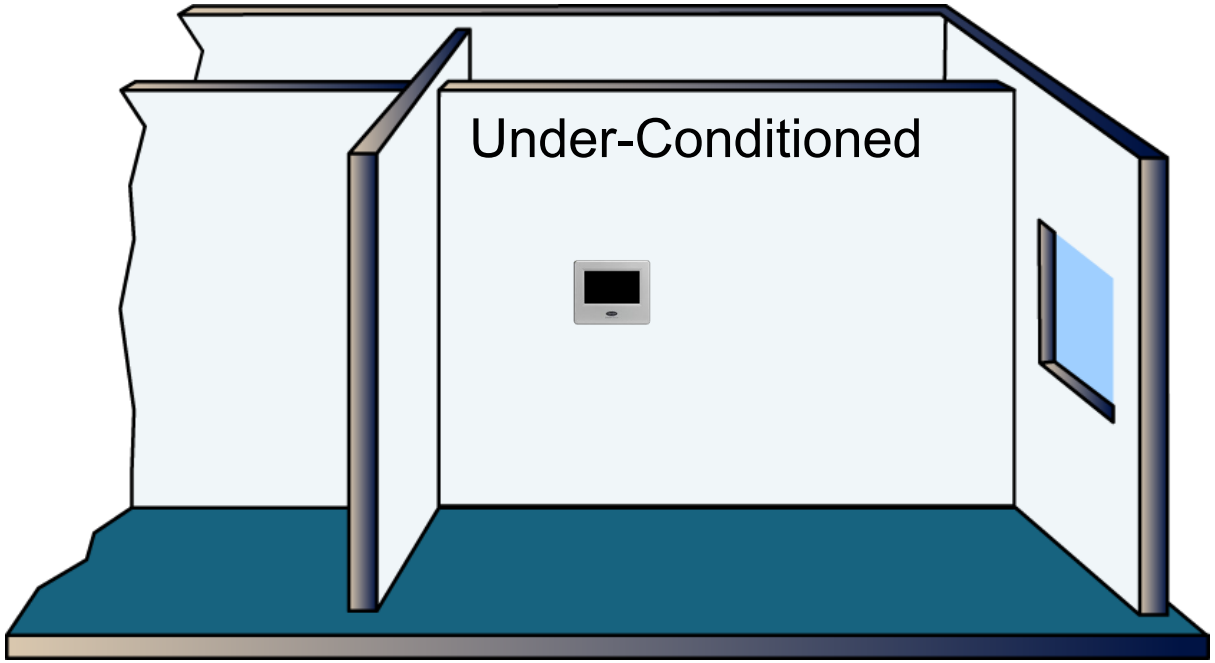
ZONING CHECK



ZONE DAMPER CHECK

SOME ZONES UNDER-CONDITIONED

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

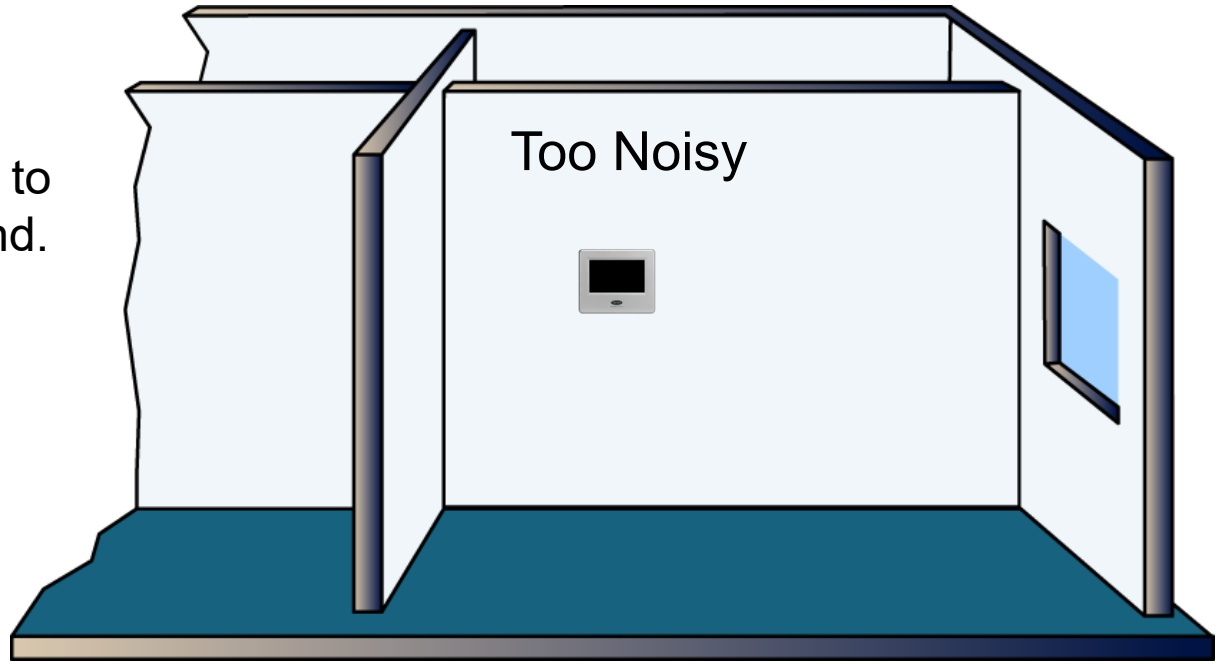


AIRFLOW LIMIT CHECK

SOME ZONES NOISY – EXCESS AIRFLOW

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

Do not forget about the grills. Most home when built used standard construction grills. For sound concerns upgrade the grills to a premium model to help manage the airflow sound.



SOME ZONES OVER-CONDITIONED

Over-conditioning is happening in 1 or more zones

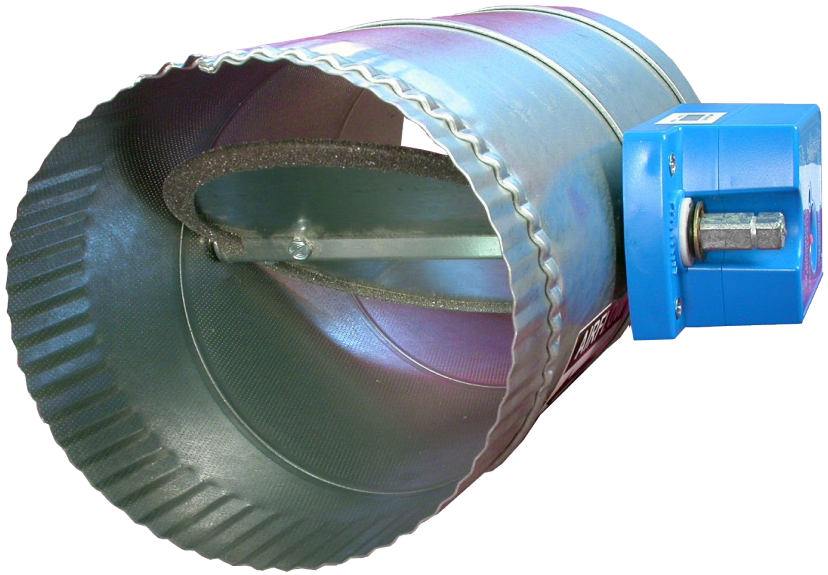
- Check sensor location for drafts behind the wall
- Perform damper/sensor check to ensure sensors wired properly to dampers
- Check for partially broken damper wire or stuck damper
- Understand what system is being told to do and what it is doing:
  - Check system status to view demand
    - Demand 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

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

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)



Questions?

Next slide set