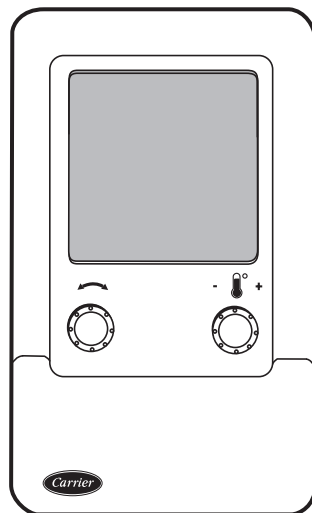
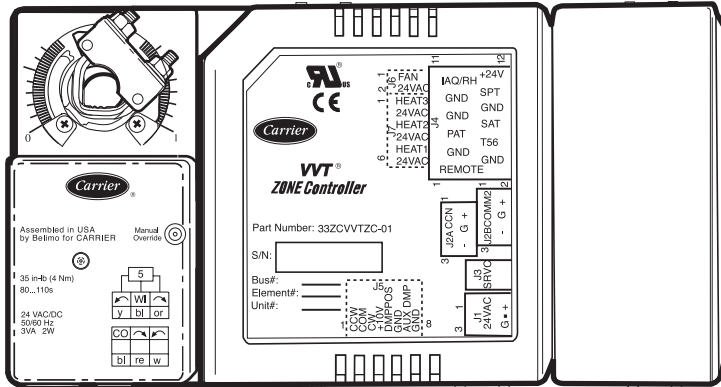




# Product Data

# VVT® (Variable Volume and Temperature) Zoning System 3V™ Control System



The VVT zoning system provides the following features and benefits:

- New, easy-to-use System Pilot interface
- Flexible architecture
- Simplified installation and commissioning

## Features/Benefits

The VVT zoning system provides an effective balance between flexible zone comfort, diverse system application requirements, and efficient high-performance unit operation.

### User interface

The VVT zoning system is designed to allow a service person or building owner to configure and operate the VVT bypass controller and zone controllers, linkage compatible air source and all other networked devices through the System Pilot user interface. The System Pilot's backlit, alphanumeric Liquid Crystal Display (LCD) and rotary knob design allow the user to navigate through the menus, select desired options and modify data with ease. All VVT zoning system maintenance, configuration, setup and diagnostic information is available through the Level II communications port to allow data access by the System Pilot or an attached computer running Network Service Tool or ComfortVIEW™ software.

### Flexibility for every application

The VVT zoning system maintains precise temperature control in the space by regulating the flow of conditioned



air into the space using Carrier's VVT® Zone and Bypass Controllers. Buildings with diverse loading conditions can be supported by controlling reheat applications, including two-position hot water, modulating hot water, up to 3-stage electric heat or combination baseboard and ducted heat.

Carrier's VVT zoning system offers zone level flexibility with its expanded range of compatible zone sensors. Now select the zone level of control required for every application. Carrier's sensor offering includes simple space temperature sensors up to full network compatible devices.

→ **Carrier Linkage System compatibility**

When linked to a Carrier Linkage System, the VVT zoning system components provide numerous features and benefits such as weighted average demand for system operation, reference

zone temperature and set points, set point averaging, global set point schedule, and occupancy scheduling.

**Additional control features**

The VVT zoning system components provide additional control features such as Occupied/Unoccupied scheduling initialized via the network. The VVT zone controller offers override invoked from a wall sensor during unoccupied hours from 1 to 1440 minutes in 1-minute increments. Optional Demand Controlled Ventilation (DCV) control or relative humidity monitoring are also available.

**Simple actuator connection**

The VVT zone controller control assembly contains an integral actuator assembly that is field mounted to the VVT terminal damper shaft, similar to the mounting of a standard actuator. The actuator is rated at 35 lb-in.

(3.95 N-m) torque, a 45, 60, or 90-degree stroke, and provides 90-second nominal timing at 60 Hz. The actuator is suitable for mounting onto a 3/8-in. (9.5 mm) square or round VVT box damper shaft, or onto a 1/2-in. (13 mm) round damper shaft. The minimum VVT box damper shaft length is 1 3/4-in. (45 mm). The VVT zone controller is designed for vertical or horizontal mounting.

→ **Ease of installation**

The VVT zoning system components are provided with removable connectors for power, communications, and damper output. Non-removable screw type connectors are used for inputs. The VVT zone controller also provides an RJ-14 modular phone jack for the Network Service tool connection to the module via the Carrier communicating network.

**Table of contents**

Features/Benefits . . . . .	1,2
VVT System Key Components . . . . .	3,4
Dimensions . . . . .	5-7
Performance Data . . . . .	8-10
Application Data . . . . .	11-14
Guide Specifications — 3V Control System . . . . .	15-22

# VVT® system key components



## Terminal control

**Bypass controller (33ZCBC-01)** — The VVT bypass controller is a component of Carrier's 3V™ control system and is used to regulate the supply duct static pressure for Variable Volume and Temperature Applications. The bypass Controller is an essential system component that allows constant volume HVAC equipment to provide zone level temperature control.

**VVT zone controller (33ZCVVTZC-01)** — The VVT Zone Controller is a component of Carrier's 3V control system and is used to provide zone level temperature and air quality control for Variable Volume and Temperature Applications. The VVT zone controller is a pressure dependent device that maintains space temperature by modulating the amount of supply airflow through its primary damper. An integrated 35 in.-lb actuator is standard on all VVT zone controllers.

VVT zone controllers are available factory mounted to Carrier's round and rectangular dampers. Round dampers are available in 6, 8, 10, 12, 14, and 16-in. sizes. Rectangular dampers are available in 8x10, 8x14, 8x18, and 8x24-in. sizes. All damper assemblies are equipped with an integrated duct temperature sensor.

Zone controllers are available for field retrofit applications.

**VAV zone controller (33ZCVA/TRM, 33ZCFAN/TRM)** — Carrier's 3V control system provides seamless integration of pressure independent zones for use with VVT systems. Simply use Carrier's family of VAV zone controllers (ComfortID™) to regulate the flow of conditioned air into the space. The VAV zone controllers provide dedicated control functions for single duct terminals with modulating heat (up to 2-stages of heat), series fan or parallel fan powered terminals, or as a primary controller for dual duct or zone pressurization applications. Refer to Carrier's ComfortID literature for additional information.

## Linkage compatible unit controls and auxiliary controls

Carrier's 3V control system provides optimized equipment control through airside linkage. Linkage allows the air source to adjust its supply air temperature set points and occupancy schedules to run in the most efficient manner. The 3V control system linkage compatible controllers include *ComfortLink*™, *PremierLink*™ and the Universal Controller.

**ComfortLink™ controls** — The factory-integrated controls are available on Carrier's 2 to 25 ton Centurion rooftop product line. The *ComfortLink* controller is a component of Carrier's 3V system and provides: optimum performance of the rooftop's refrigeration circuits, an easy to read English scrolling marquee display and user interface, and unparalleled diagnostic information with factory-mounted sensors.

→ **PremierLink™ control (33CSPREMLK)** — The PremierLink communicating controller is available as a factory-installed option on 3 to 25 ton rooftop units and as a field-installed accessory. The control is DCV (Demand Controlled Ventilation) compatible and internet ready.

**Universal controller (33UNIVCTRL-01)** — The Universal Controller provides auxiliary building control to interface with lighting, fans, pumps and other HVAC equipment in a stand-alone or Carrier-networked environment using closed-loop, direct digital controls. The Universal Controller's pre-engineered algorithms provide simple building integration for small-to-medium commercial applications with 16 field point capability (8 inputs and 8 outputs).

## → Interface devices

**System Pilot (33PILOT-01)** — The System Pilot is a component of Carrier's 3V control system and serves as the user-interface and configuration tool for all Carrier communicating devices. The System Pilot can be used to install and commission a 3V zoning system, linkage compatible air source, universal controller and all other devices operating on the Carrier communicating network.

**ComfortVIEW™ software (CEPL130548-01)** — ComfortVIEW software can be installed on a PC and is used to configure and monitor the 3V system.

**Remote monitoring capability device (33CSCCNWEB-01)** — The remote monitoring device installs on the Carrier network and provides a connection for a phone line or ethernet connection, allowing the user to view and change information using a standard web browser. The user will also have access to the point displays, set point schedules, and operating schedules.

## Field-installed accessories

**Option board (33ZCOPTBRD-01)** — Carrier's optional relay board may be used with VVT zone controllers to provide control functions for heat and fan air terminals. Heating capabilities include modulating heat, up to 3 stages of ducted heat or combination baseboard and ducted heat control.

**Mounting kit** — Mounting kits are used to field install the VVT zone controllers onto Carrier 33CS dampers. Mounting kits come in packages of 10. The 33ZCMBRC-01 kit is used when mounting on rectangular dampers. The 33ZCMBRD-01 kit is used when mounting on round dampers.

## Sensors

**Outdoor-air sensor (HH79NZ039)** — The outdoor-air sensor reads temperatures between 0° and 150 F and is used to report the outdoor-air temperature to the communication bus. The information can be used to lock out heating or cooling modes when the temperature is not within user-configured limits. The outdoor-air sensor is needed when an economizer is used.

**Supply air temperature sensor (33ZCSENSAT)** — The supply air temperature sensor is required for heating applications or stand-alone operation. The sensor has an operating range of -40 to 245 F (-40 to 118 C) and includes a 6-in. stainless steel probe and cable.

→ **Duct temperature sensor (33ZCSENDAT)** — The duct temperature sensor is required for use with a bypass controller and must be installed in the supply air duct.

# VVT® system key components (cont)



For bypass systems, the duct temperature sensor should be moved to a location which will provide the best sensing of the supply-air temperature during heating and cooling.

For bypass systems, the duct temperature sensor should be located in the main supply duct downstream of the discharge of the air source and before the bypass damper to allow good mixing of the supply airstream.

**Primary air temperature sensor** — The primary air temperature (PAT) sensor (part number 33ZCSENPAT) is used on a zone controller which is functioning as a Linkage Coordinator for a non-communicating or Linkage compatible air source.

**Space temperature sensor** — A space temperature (SPT) sensor must be installed for each zone controller. There are 3 types of SPT sensors available from Carrier: the 33ZCT55SPT space temperature sensor with timed override button, the 33ZCT56SPT space temperature sensor with timed override button and set point adjustment, and the 33ZCT59SPT space temperature sensor with timed push button override button, set point adjustment and digital readout display.

The space temperature sensor is used to measure the building interior temperature and should be located on an interior building wall.

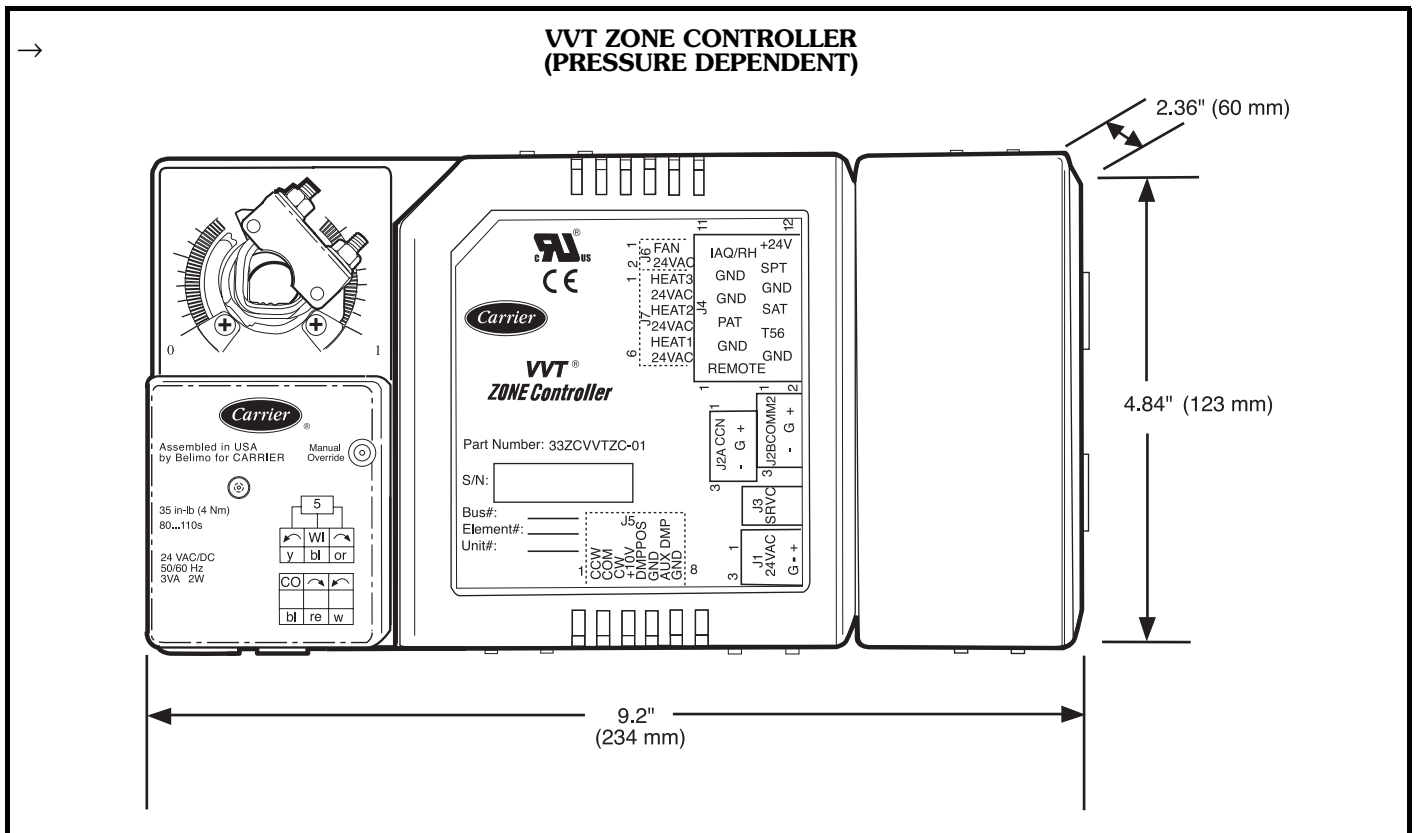
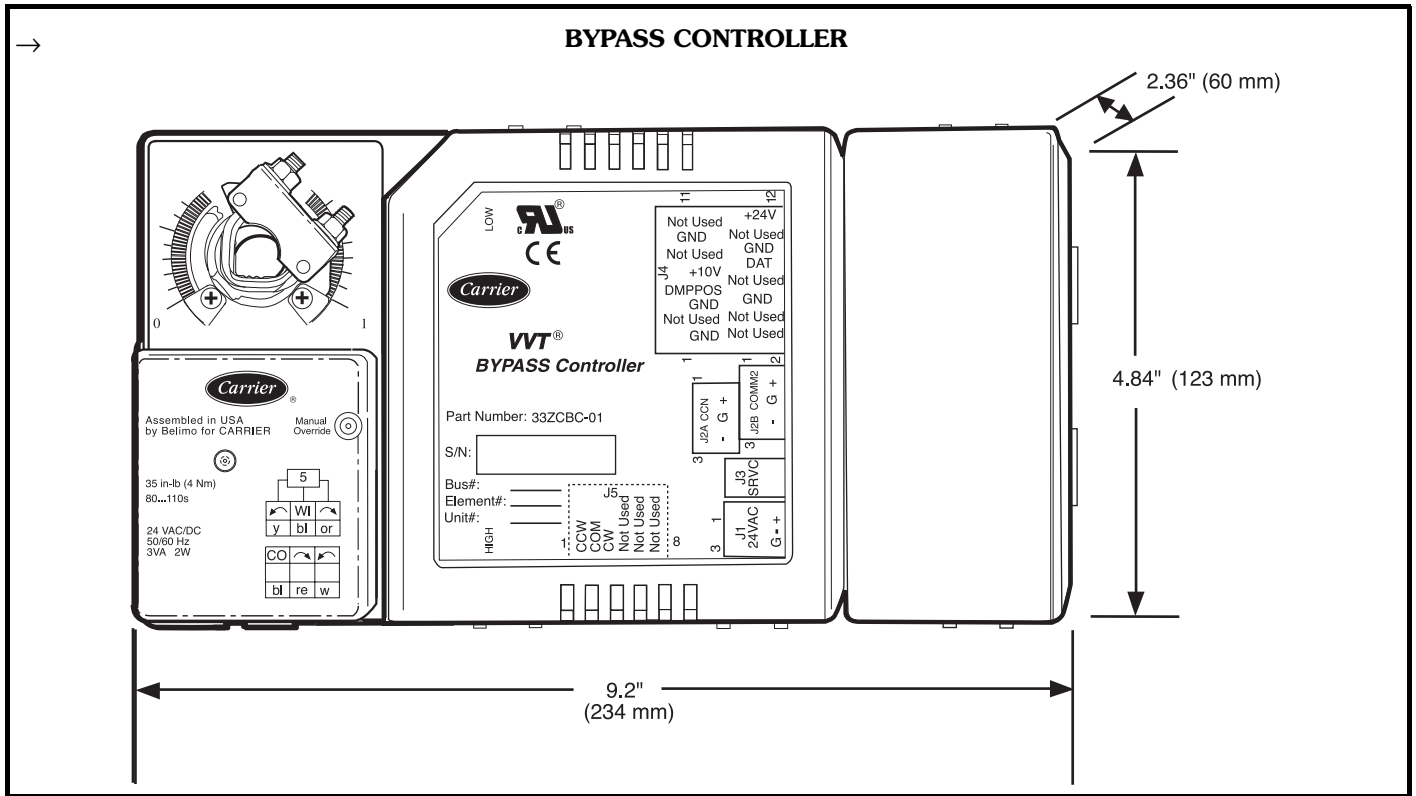
→ **Demand Controlled Ventilation sensor (CO<sub>2</sub>)** — An indoor air quality sensor is required for optional Demand Controlled Ventilation. The 33ZCT55CO<sub>2</sub> and 33ZCT56CO<sub>2</sub> CO<sub>2</sub> sensors are indoor, wall-mounted sensors without display.

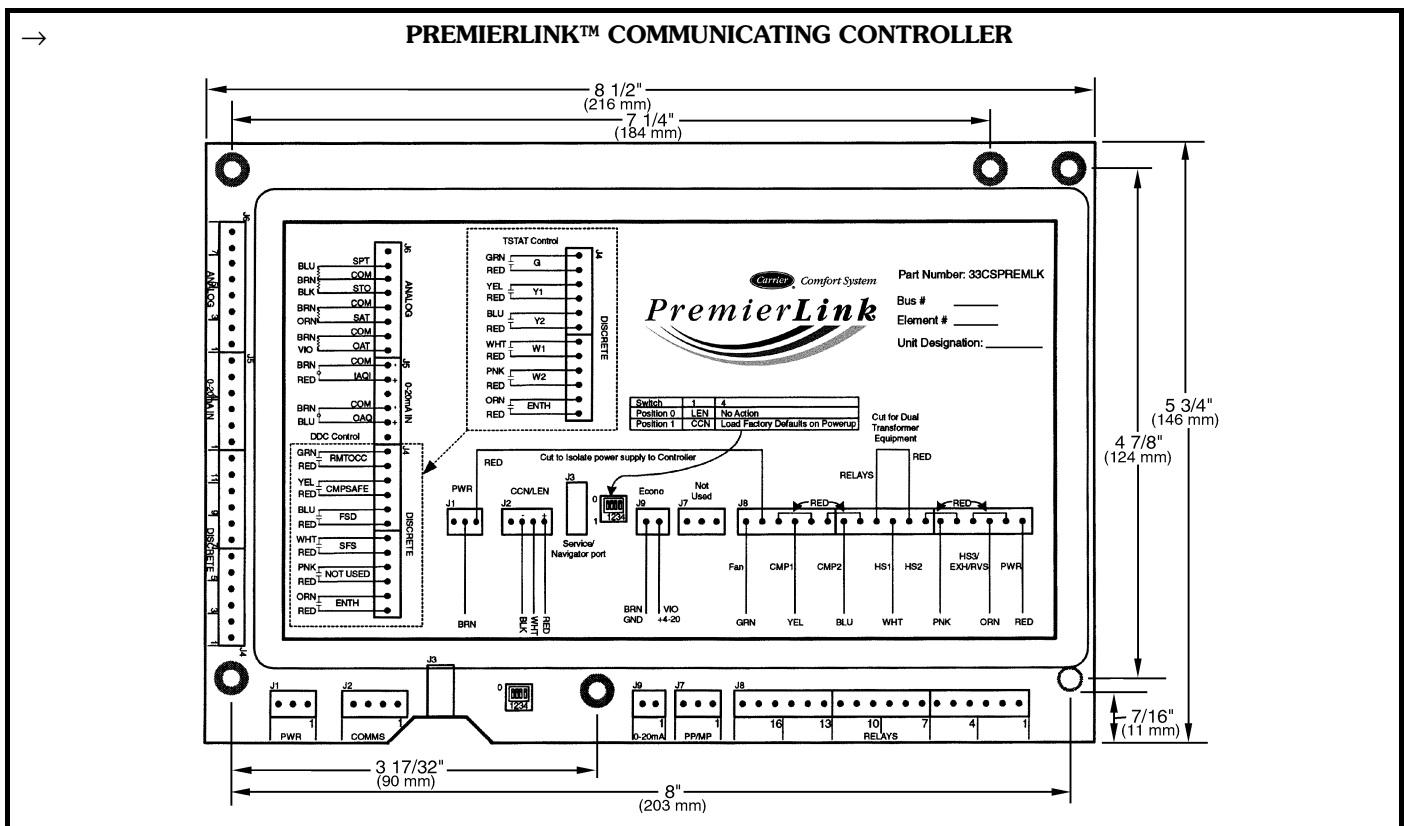
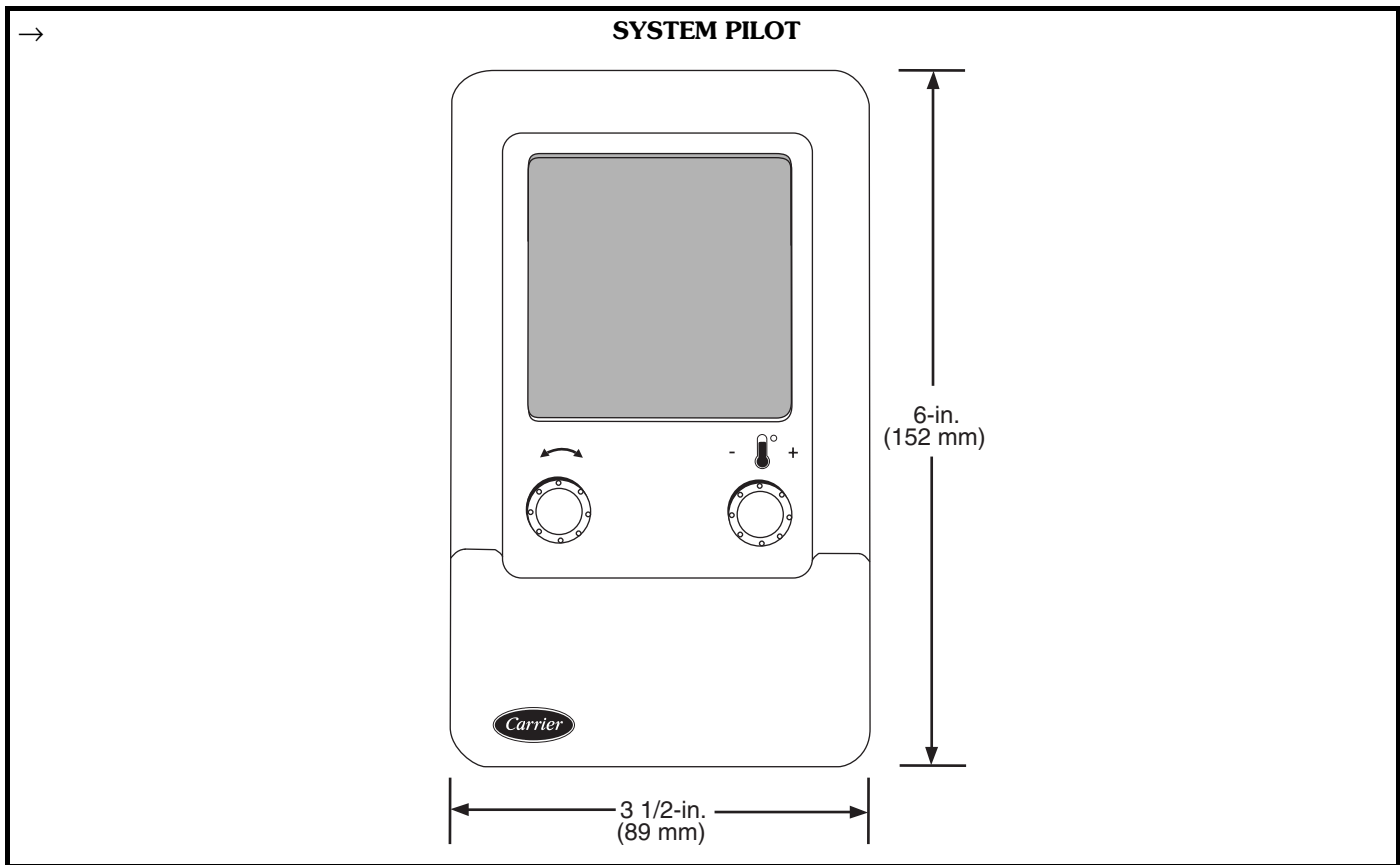
NOTE: The relative humidity sensor and CO<sub>2</sub> sensor cannot be used on the same zone controller.

**Humidity sensors** — The relative humidity sensor is required for zone humidity control (dehumidification) for pressure independent zones only. The indoor wall-mounted relative humidity sensor (33ZCSENSRH-01) or duct mounted relative humidity sensor (33ZCSENDRH-01) can be used.

NOTE: The relative humidity sensor and CO<sub>2</sub> sensor cannot be used on the same zone controller.

# Dimensions





**RECTANGULAR DAMPERS WITH VVT ZONE CONTROLLER**

**DIMENSIONS (Inches)**

PART NUMBER	A	B	C	D	E
33ZCD1008ZC-01	10 <sup>1</sup> / <sub>4</sub>	13 <sup>1</sup> / <sub>4</sub>	8	10	13 <sup>1</sup> / <sub>2</sub>
33ZCD1408ZC-01	10 <sup>1</sup> / <sub>4</sub>	17 <sup>1</sup> / <sub>4</sub>	8	14	13 <sup>1</sup> / <sub>2</sub>
33ZCD1808ZC-01	10 <sup>1</sup> / <sub>4</sub>	21 <sup>1</sup> / <sub>4</sub>	8	18	13 <sup>1</sup> / <sub>2</sub>
33ZCD2408ZC-01	10 <sup>1</sup> / <sub>4</sub>	27 <sup>1</sup> / <sub>4</sub>	8	24	13 <sup>1</sup> / <sub>2</sub>

PART NUMBER	DUCT SIZE (in.)	WEIGHT (lb)	CFM AIRFLOW RANGE	
			Min	Max
33ZCD1008ZC-01	8 x 10	10.0	410	610
33ZCD1408ZC-01	8 x 14	11.5	560	825
33ZCD1808ZC-01	8 x 18	13.0	725	1075
33ZCD2408ZC-01	8 x 24	16.0	925	1175

**ROUND DAMPERS WITH VVT ZONE CONTROLLER**

**DIMENSIONS (Inches)**

PART NUMBER	A	B	C
33ZCDR06ZC-01	6	18	9.0
33ZCDR08ZC-01	8	18	11.0
33ZCDR10ZC-01	10	18	13.0
33ZCDR12ZC-01	12	24	15.0
33ZCDR14ZC-01	14	24	17.0
33ZCDR16ZC-01	16	24	19.0

PART NUMBER	DUCT DIAMETER (in.)	WEIGHT (lb)	CFM AIRFLOW RANGE	
			Min	Max
33ZCDR06ZC-01	6	7.0	160	240
33ZCDR08ZC-01	8	9.0	280	420
33ZCDR10ZC-01	10	10.5	440	660
33ZCDR12ZC-01	12	14.0	630	950
33ZCDR14ZC-01	14	16.0	850	1275
33ZCDR16ZC-01	16	17.5	1125	1575

# Performance data



→

## APPLICATION NC\* LEVELS (RADIATED SOUND) — ROUND ZONE DAMPERS

DAMPER	CFM	STATIC PRESSURE (in. wg)	NC LEVEL
33ZCDR06ZC-01	160	0.02	<20
		0.52	<20
		1.00	25
	200	0.04	<20
0.50		22	
1.00		24	
240	0.06	<20	
	0.50	24	
	1.00	28	
360	0.10	28	
	0.50	32	
	1.00	35	
33ZCDR08ZC-01	280	0.03	<20
		0.50	<20
		1.00	22
	350	0.04	<20
0.50		22	
1.00		22	
420	0.06	25	
	0.50	25	
	1.00	27	
630	0.10	28	
	0.50	28	
	1.00	30	
33ZCDR10ZC-01	440	0.01	22
		0.50	25
		1.00	27
	514	0.02	22
		0.50	28
1.00	29		
584	0.03	25	
	0.50	27	
1.00	32		
659	0.04	30	
	0.50	32	
	1.00	34	
990	0.09	35	
	0.50	35	
	1.00	37	
33ZCDR12ZC-01	630	0.01	22
		0.50	35
		1.00	38
	700	0.03	22
		0.50	37
		1.00	38
770	0.02	22	
	0.50	38	
	1.00	39	
860	0.04	27	
	0.50	39	
	1.00	40	
950	0.05	32	
	0.50	40	
	1.00	40	
1425	0.11	40	
	0.50	44	
	1.00	45	

Exceeds recommended NC.

\*Noise Criteria.

NOTE: The NC values are based on ARI (Air Conditioning and Refrigeration Institute) Standard 885-90 application assumptions.





→

**APPLICATION NC\* LEVELS (RADIATED SOUND) — ROUND ZONE DAMPERS (cont)**

DAMPER	CFM	STATIC PRESSURE (in. wg)	NC LEVEL
33ZCDR14ZC-01	852	0.02	22
		0.50	30
		1.00	35
	976	0.01	25
		0.50	32
		1.00	36
1074	0.01	30	
	0.50	32	
	1.00	27	
1175	0.01	30	
	0.50	35	
	1.00	38	
1275	0.06	30	
	0.50	36	
	1.00	39	
1910	0.13	41	
	0.50	45	
	1.00	47	
33ZCDR16ZC-01	1125	0.02	27
		0.50	39
		1.00	41
	1175	0.04	30
		0.50	39
		1.00	41
	1275	0.05	31
		0.50	40
		1.00	42
	1376	0.05	35
0.50		41	
1.00		44	
1475	0.06	35	
	0.50	42	
	1.00	45	
1574	0.07	36	
	0.50	44	
	1.00	46	
1676	0.03	38	
	0.50	45	
	1.00	46	
2512	0.18	50	
	0.50	51	
	1.00	54	

Exceeds recommended NC.

\*Noise Criteria.

NOTE: The NC values are based on ARI (Air Conditioning and Refrigeration Institute) Standard 885-90 application assumptions.

# Performance data (cont)



→

## APPLICATION NC\* LEVELS (RADIATED SOUND) — RECTANGULAR ZONE DAMPERS

DAMPER	CFM	STATIC PRESSURE (in. wg)	NC LEVEL
33ZCD1008ZC-01	410	0.01	<20
		0.50	30
		1.00	45
	509	0.03	<20
0.50		30	
1.00		40	
610	0.07	23	
	0.50	31	
	1.00	40	
914	0.16	35	
	0.50	37	
	1.00	45	
33ZCD1408ZC-01	561	0.02	<20
		0.50	36
		1.00	47
	625	0.02	22
		0.50	37
1.00	45		
725	0.03	25	
	0.50	38	
	1.00	45	
825	0.05	32	
	0.50	40	
	1.00	46	
1237	0.11	40	
	0.50	45	
	1.00	54	
33ZCD1808ZC-01	725	0.01	22
		0.50	38
		1.00	48
	775	0.01	22
		0.50	38
	1.00	48	
874	0.02	28	
	0.50	40	
1.00	48		
974	0.02	30	
	0.50	42	
	1.00	48	
1075	0.03	33	
	0.50	44	
	1.00	50	
1611	0.06	40	
	0.50	50	
	1.00	60	
33ZCD2408ZC-01	925	0.01	26
		0.50	38
		1.00	48
	974	0.01	27
		0.50	38
		1.00	50
	1075	0.01	32
0.50		40	
1.00		50	
1175	0.02	35	
	0.50	41	
	1.00	50	
1275	0.02	37	
	0.50	43	
	1.00	50	
1375	0.03	38	
	0.50	44	
	1.00	50	
2062	0.06	47	
	0.50	50	
	1.00	55	

Exceeds recommended NC.

\*Noise Criteria.

NOTE: The NC values are based on ARI (Air Conditioning and Refrigeration Institute) Standard 885-90 application assumptions.

# Application data

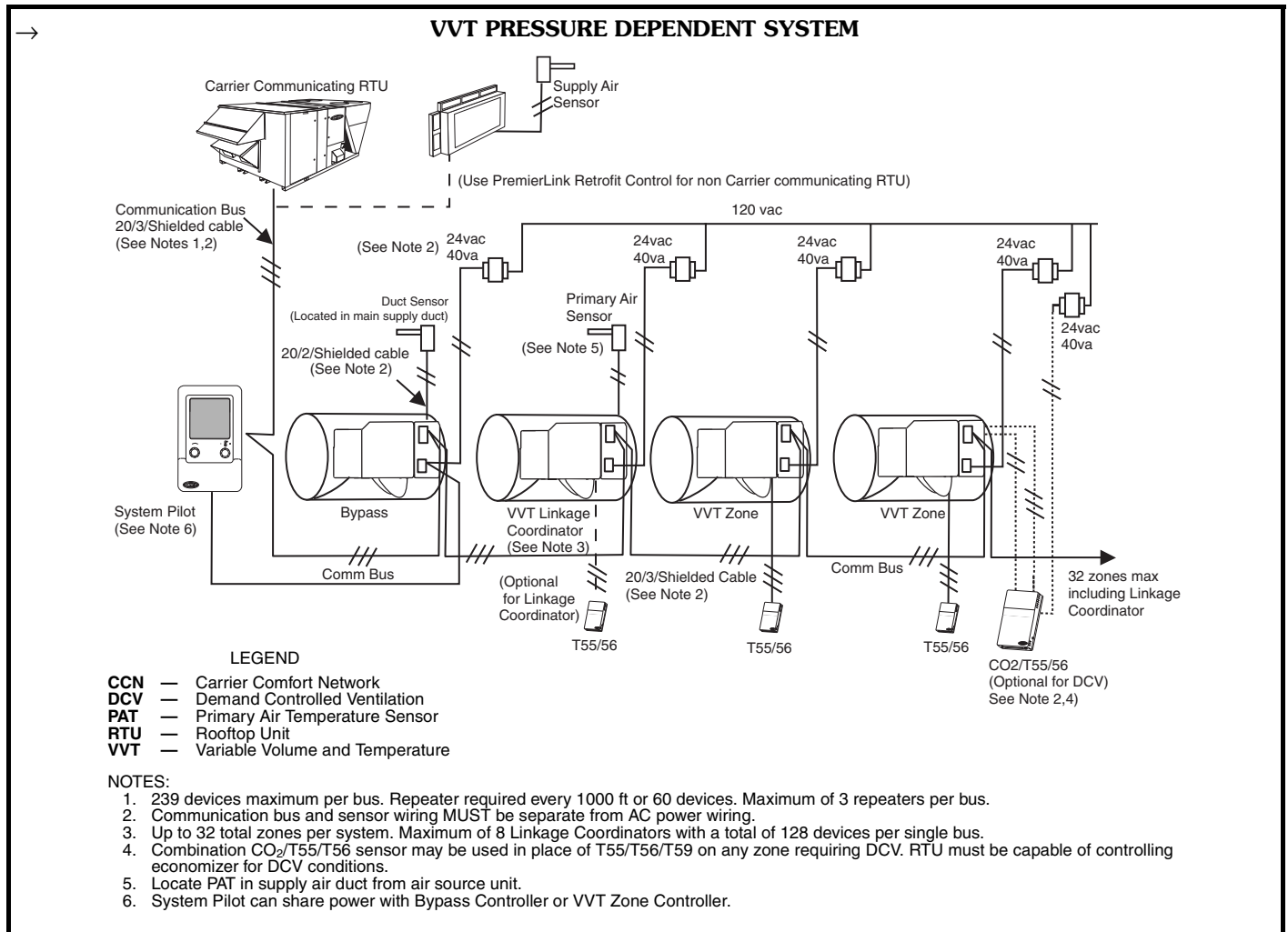


## Typical VVT® system overview

The VVT system is a control system designed to provide multiple zones of temperature control using a single, constant volume heating and cooling packaged unit. Traditionally, the VVT system has been primarily a pressure

dependant system that adjusts damper position based on space temperature variation from set point.

Typical VVT applications include medical and dental offices, 1 to 3 story commercial buildings, and strip mall and retail stores.



## TYPICAL VVT SYSTEM PRESSURE DEPENDENT CONTROL ONLY

REQUIRED COMPONENTS			OPTIONAL COMPONENTS		
Devices	Part Number	Usage	Devices	Part Number	Usage
VVT Zone Controller	33ZCVVTZC-01	1 per pressure dependent zone	PremierLink™ Controller	33CSPREMLK	1 required per system if non-communicating air source.
Bypass Controller	33ZCBC-01	1 per system	Supply Air Temp Sensor	33ZCSENSAT	1 required for bypass Option for zones
System Pilot	33PILOT-01	1 per system on com bus. Optional for space sensors	CO <sub>2</sub> Sensors	33ZCT55CO2 33ZCT56CO2	as required per zone for DCV
Space Sensor	33ZCT55SPT 33ZCT56SPT 33ZCT59SPT	1 per zone	Relative Humidity Sensor	33ZCSENSRH-01 33ZCSENDERH-01	Optional to Monitor RH only (if no DCV sensor).
Primary Air Temp Sensor	33ZCSENPAT	1 per Linkage Coordinator	Outside Air Temp Sensor	HH79NZ039	Required with field-installed PremierLink control

**LEGEND**

**DCV** — Demand Controlled Ventilation  
**RH** — Relative Humidity

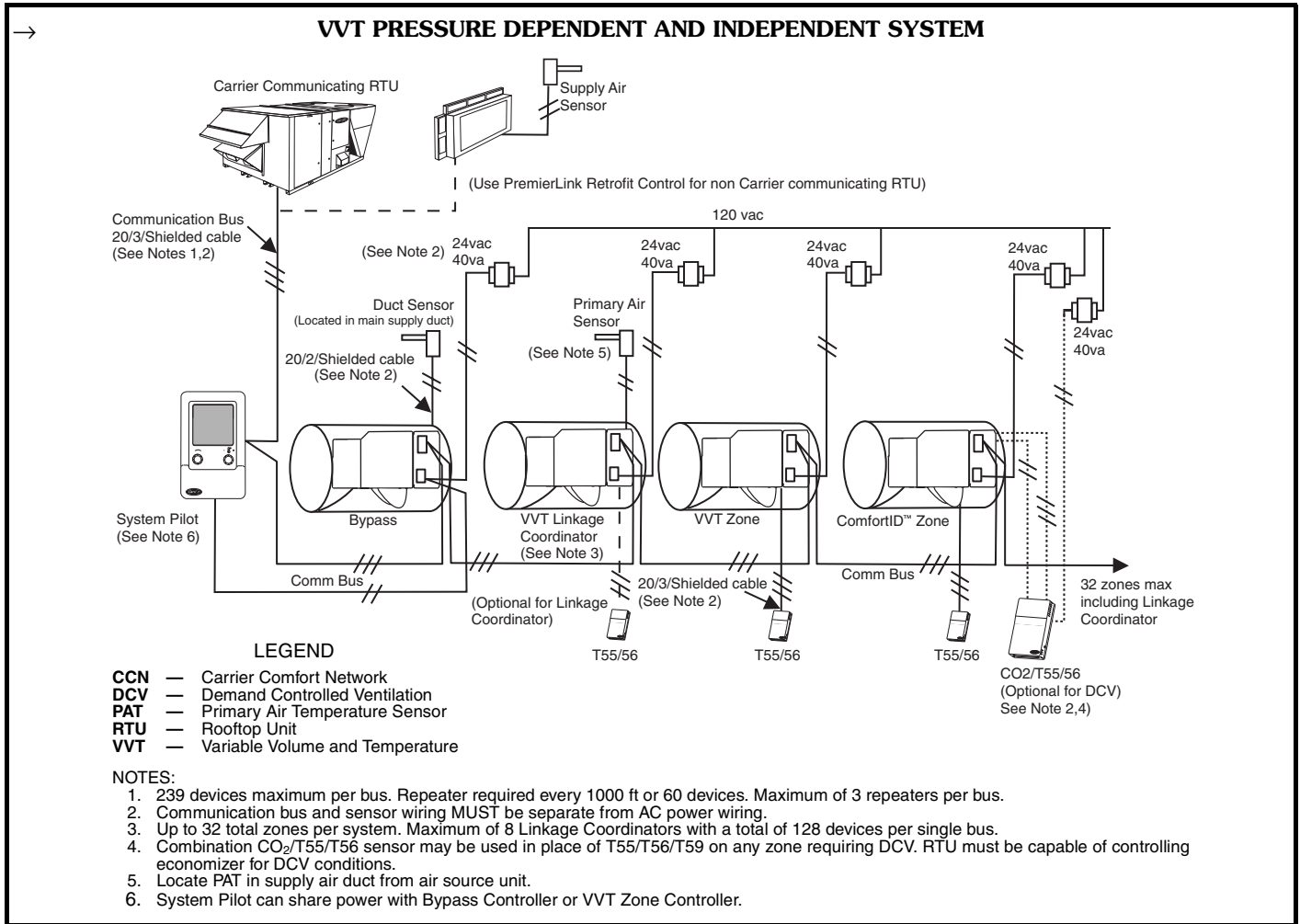
# Application data (cont)



## VVT® pressure dependent and independent system overview

In many applications VVT Systems require both pressure dependent and independent zone control. With 3V™

control system both forms of control are available. Simply use Carrier's VAV Zone Controller, to provide pressure independent control for critical airflow zones.



## VVT PRESSURE DEPENDENT AND INDEPENDENT SYSTEM

REQUIRED COMPONENTS			OPTIONAL COMPONENTS		
Devices	Part Number	Usage	Devices	Part Number	Usage
VVT Zone Controller	33ZCVVZC-01	1 per pressure dependent zone	PremierLink™ Controller	33CSPREMLK	1 required per system if non-communicating air source.
VAV Zone Controller (ComfortID)	33ZCAVTRM	1 per pressure independent zone	Supply Air Temp Sensor	33ZCSENSAT	1 required for bypass Option for zones
Bypass Controller	33ZCBC-01	1 per system	CO <sub>2</sub> Sensors	33ZCT55CO2 33ZCT56CO2	as required per zone for DCV
System Pilot	33PILOT-01	1 per system on com bus. Optional for space sensors	Relative Humidity Sensor	33ZCSENSRH-01 33ZCSENDRH-01	Optional to Monitor RH only (if no DCV sensor).
Space Sensor	33ZCT55SPT 33ZCT56SPT 33ZCT59SPT	1 per zone	Outside Air Temp Sensor	HH79NZ039	Required with field-installed PremierLink control
Primary Air Temp Sensor	33ZCSENPAT	1 per Linkage Coordinator			

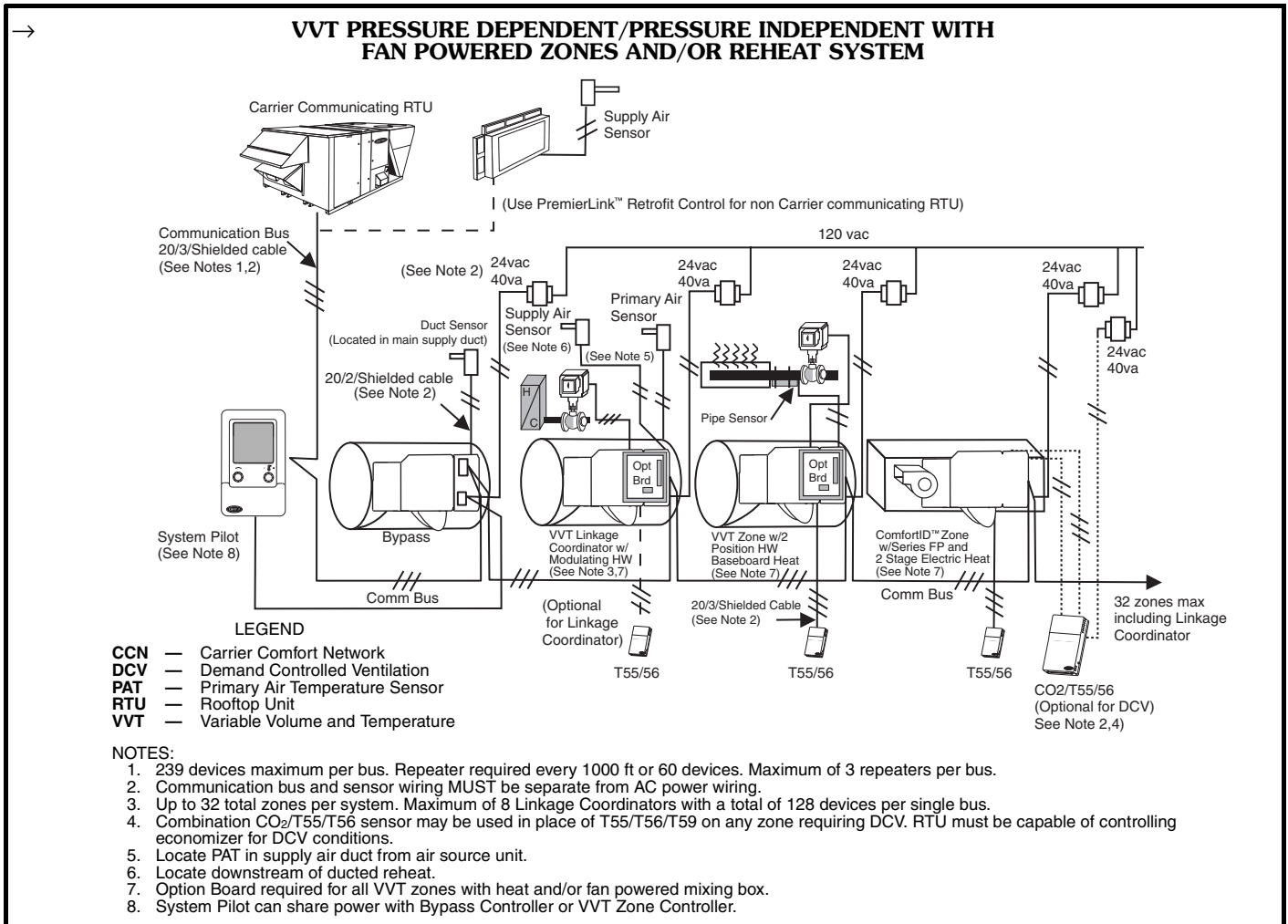
**LEGEND**

DCV — Demand Controlled Ventilation

## Fan powered and reheat VVT® system overview

Adding supplemental heat and fan-powered terminals has never been simpler than with 3V™ control system. Simply add a stackable option board to any VVT zone controller

and your system is ready. New reheat flexibility offers floating-point control for hot water valves and combination 2-position baseboard with ducted staged heat.



### FAN POWERED AND REHEAT VVT SYSTEMS PRESSURE DEPENDENT AND INDEPENDENT CONTROL CAPABILITY

REQUIRED COMPONENTS			OPTIONAL COMPONENTS		
Devices	Part Number	Usage	Devices	Part Number	Usage
VVT Zone Controller	33ZCVVTZC-01	1 per pressure dependent zone	PremierLink™ Controller	33CSPREMLK	1 required per system if non-communicating air source.
VAV Zone Controller (ComfortID)	33ZCFANTRM	1 per pressure independent zone with fan or reheat	Supply Air Temp Sensor	33ZCSENSAT	1 required for bypass Option for zones
Bypass Controller	33ZCBC-01	1 per system	CO <sub>2</sub> Sensors	33ZCT55CO2 33ZCT56CO2	as required per zone for DCV
System Pilot	33PILOT-01	1 per system on com bus. Optional for space sensors	Relative Humidity Sensor	33ZCSENSRH-01 33ZCSENSDRH-01	Optional to Monitor RH only (if no DCV sensor).
Space Sensor	33ZCT55SPT 33ZCT56SPT 33ZCT59SPT	1 per zone	Strap-on Pipe Temp Sensor	33ZCSENCHG	Optional if baseboard heat ONLY. (Not required with zone ducted heat)
Primary Air Temp Sensor	33ZCSENPAT	1 per Linkage Coordinator	Outside Air Temp Sensor	HH79NZ039	Required with field-installed PremierLink control
Fan/Reheat Option Board	33ZCOPTBRD-01	1 required per VVT Zone with Reheat			

**LEGEND**

- DCV** — Demand Controlled Ventilation
- PD** — Pressure Dependent
- RH** — Relative Humidity

# Application data (cont)



## Compatibility of Carrier systems

The following chart shows the compatibility of Carrier's 3V™ Control System and GEN-III VVT® products.

**VVT Gen II conversion (manufactured prior to July 1995)** — There is no compatibility between VVT Gen II systems and 3V control systems. A complete change of system components is required with the exception of physical dampers which may remain in place. The existing

5-wire control wiring from the thermostat to the damper may be used for the System Pilot communication wire or for a T55, T56, or T59 space sensor. The wiring must be 18 to 20 AWG (American Wire Gage) stranded, shielded cable and conform to 3V control system and Carrier communicating network wiring guidelines. Any wiring that does not conform to these guidelines must be replaced.

### 3V AND GEN-III VVT PRODUCT COMPATIBILITY CHART

GEN III PRODUCT	DESCRIPTION	COMPATIBLE FOR USE WITH 3V CONTROL SYSTEM
<b>TEMP SYSTEMS</b>		
Working Gen-III TEMP systems may reside on same bus with a 3V control system. If an existing Gen-III TEMP system needs component replacement, refer to the components below.		
33CSTM(T)-01	TEMP Monitor	No. Replace with PremierLink™ control
33CSUCE-06	TEMP System Relay Pack	No. Replace with PremierLink control
<b>VVT GEN-III SYSTEM COMPONENTS</b>		
Working Gen-III VVT systems may reside on same bus with a 3V control system. If an existing Gen-III system needs component replacement, refer to the components below.		
33CSVM(T)-32	VVT Monitor Thermostats	Yes for a 3V Zone(s)*
33CSBC-00	Bypass Controllers	Yes. †
33CSZC-01	Pressure Dependent Zone Controller	No. Use 33ZCVTZC-01.**
33CSZC-PI	Pressure Independent Zone Controller	No. Use 33ZCVAVTRM-01.††
<b>DAMPERS</b>		
33CSDCDR	Round or Rectangular	Yes – <i>sheet metal only</i>
33CASDCARPL, M08	Damper Actuators	No
33CSDCA060,090	High Torque Damper Actuators	No
<b>RELAY PACKS</b>		
33CSZRP-06	Universal Damper Relay Pack	No
33CSUCE-06	Monitor-only Relay Pack	No
<b>SENSORS</b>		
920238 (HS)	Humidity Sensor	No, 3V system uses 2 to 10 vdc humidity sensor.
920247 (RAS)	Refrigerated Air (DX) Sensor	No. 3V system uses standard 10K sensors.
920076 (RDS)	Remote Duct Sensor	No. 3V system uses standard 10K sensors.
920077 (RDS)	Remote Room Sensor	No. 3V system uses standard 10K sensors.
920089 (OAS)	Outside Air Sensor	No. 3V system uses standard 10K sensors.
33CSPS-01	Pressure Sensor	No, 3V static pressure sensor is integrated into Bypass Controller. For PI zones, velocity pressure sensor is integrated into the VAV (ComfortID™) controller.
33CSPS-02	Pressure Sensor	No, 3V static pressure sensor is integrated into Bypass Controller. For PI zones, velocity pressure sensor is integrated into the VAV (ComfortID) controller.
→ 33ZCSENC02	CO <sub>2</sub> Sensor	Yes — vdc type
<b>EXISTING WIRING</b>		
	Non-Shielded device, bus or sensor wiring	No
	Shielded device, bus or sensor wiring	Yes
	24 VAC power wiring	Yes

#### LEGEND

- DX** — Direct Expansion  
**PI** — Pressure Independent  
**VVT** — Variable Volume/Variable Temperature

\*A Gen-III VVT Monitor will scan new 3V zones. No special configuration is required. Address 3V zone within the Gen-III Monitor's scanning range. If the Gen-III VVT monitor needs replacement and components are not available, 3V zone controller(s) may be substituted for all zones with compatible sensors. Existing damper may be re-used, but with new 3V actuator(s).

†An Integrated Gen-III Bypass Controller and damper may remain in 3V system, but must be re-addressed out of the 3V system's scanning range, and must be configured for Standalone operation. If the Gen-III Bypass

Controller needs replacement and components are not available, 3V bypass controller may be substituted with compatible sensors. Existing damper may be re-used, but with new 3V actuator.

\*\*A Gen-III Pressure Dependent Zone Controller is not compatible in 3V system. However, a 3V zone controller is compatible in a Gen-III system. If the Gen-III Zone Controller needs replacement and components are not available, 3V zone controller may be substituted with compatible sensors. Existing damper may be re-used, but with new 3V actuator.

††A Gen-III Pressure Independent Zone Controller is not compatible with 3V systems. If the Gen-III PI Zone Controller needs replacement and components are not available, ComfortID controller may be substituted when configured for Standalone only out of Gen-III Monitors scanning range, and with compatible sensors. Existing damper may be re-used, but with new ComfortID actuator.

# Guide specifications — 3V™ control system



## Variable Volume/Variable Temperature (VVT®) Multiple Zone HVAC Control System

### Model Number:

**33ZCVVTZC-01 Zone Controller**  
**33ZCBC-01 Bypass Controller**  
**33PILOT-01 System Pilot**

### Part 1 — General

#### 1.01 SYSTEM DESCRIPTION

The 3V™ control system shall consist of programmable, multiple communicating Zone Controllers; and a Bypass Controller. The system shall also include a complete array of input and output devices. The system shall provide full control of HVAC heating and cooling equipment in a multiple zone application. The 3V system shall be capable of operating as a stand-alone system or networked with multiple systems connected on a communications bus to communicating air source controllers.

#### 1.02 DELIVERY, STORAGE AND HANDLING

The products shall be stored and handled per manufacturer's recommendations.

### Part 2 — Products

#### 2.01 EQUIPMENT

##### A. General:

The control system shall be available as a complete package with the required input sensors and devices readily available. The system shall be capable of providing complete control of HVAC functions; variable air zone control, bypass air control in both pressure dependent and pressure independent applications. Airside controls shall be capable of operating 3V system dampers as well as VAV (variable air volume) terminal boxes and Fan Powered terminal boxes with and without supplemental heat sources at the zone.

All temperature sensors shall be capable of being read and displayed in 0.1° F increments. Controllers shall support either a local dedicated or remote System Pilot capable of displaying sensor and input information applicable to the controller in degrees Fahrenheit or Celsius. The System Pilot shall be capable of displaying the following information as a minimum:

#### **System Pilot Linkage Coordinator Zone Controller Display:**

1. Space Temperature
2. Primary Air Temperature
3. Damper Position Desired
4. Damper Position Actual
5. Cfm (Pressure Independent Controllers Only)
6. Average Temperature from multiple remote Room Sensor(s)
7. Zone Indoor Relative Humidity
8. Zone Indoor CO<sub>2</sub> concentration
9. Zone Supply Air Temperature
10. Outside Air Temperature
11. Air Source Mode

#### **System Pilot Zone Controller Display:**

1. Space Temperature
2. Damper Position Desired
3. Damper Position Actual
4. Cfm (Pressure Independent Controllers Only)
5. Average Temperature from multiple remote Room Sensor(s)
6. Zone Indoor Relative Humidity
7. Zone Indoor CO<sub>2</sub> concentration
8. Zone Supply Air Temperature
9. Outside Air Temperature
10. Air Source Mode

#### **System Pilot Bypass Controller Display:**

1. System Pressure in hundredths of an inch
2. System Pressure Set Point
3. Damper Position Desired
4. Damper Position Actual
5. Air Source Supply Air Temperature
6. Air Source Mode
7. All applicable sensors shall be accessed for calibration at the controller display.

##### B. Rooftop Controller Interface:

The VVT zone controller shall be capable of zone demand data coordination with a communicating rooftop. Set point and temperature information from the zones shall be shared with the rooftop controller so that the rooftop controllers error reduction calculations can determine the proper number of heating or cooling stages to operate in order to balance the system load.

##### C. Memory and Timeclock:

The system shall not require the use of batteries for any data storage. The VVT zone controller and Bypass Controller shall have a Non-Volatile Memory providing indefinite storage of configuration data. The VVT zone controller shall have a 365-day software clock with built in daylight savings time and leap year adjustment. In the event of power failure, the timeclock may be automatically updated with current time and date from a network Time Sync device. The network time sync device shall update all software and Hardware clocks on the communications network twice a day. The System Pilot shall be capable of sharing time information with other 3V system controls or any other General Purpose Electronic Controller existing on the communications bus with timeclock capabilities. The VVT zone controller shall also have the capability of changing occupancy mode by reading a set of discrete, dry contacts controlled by an external timeclock.

##### D. Set Points:

1. The VVT zone controller shall utilize and store the following set points:
  - a. Occupied Heating Set Point

# Guide specifications — 3V™ control system (cont)



- b. Occupied Cooling Set Point
- c. Unoccupied Heating Set Point
- d. Unoccupied Cooling Set Point
- e. Ventilation CO<sub>2</sub> Set Point
- 2. The Linkage Coordinator shall utilize and store these additional set points:
  - a. Space Temperature Occupied Hysteresis
  - b. Unoccupied Space Temperature Low Limit
  - c. Unoccupied Space temperature High Limit
  - d. Heating OAT Lockout Set Point
  - e. Cooling OAT Lockout Set Point
- 3. VAV Zone Controllers with the pressure independent control feature shall utilize and store these additional set points:
  - a. Heat Minimum Airflow Set Point
  - b. Heat Maximum Airflow Set Point
  - c. Cool Minimum Airflow Set Point
  - d. Cool Maximum Airflow Set Point
  - e. Reheat Airflow Set Point
- 4. Bypass Controllers shall utilize and store these set points:
  - a. System Pressure Set Point
  - b. Heat Leaving Air Temperature Limit
  - c. Cool Leaving Air Temperature Limit
  - d. Leaving Air Temperature Pressure Delta
- 5. All set points shall be capable of being modified at the controller display or through a communication network with a System Pilot or PC and EMS (Energy Management System) software.

## E. Scheduling:

The system shall be capable of operating in an occupied or unoccupied mode with up to 8 period changes per day including holidays. All 3V™ zone controllers shall have the capability to follow independent local schedules or receive the schedule from other Application specific controllers as well as all General Purpose Electronic Controllers (GPECs) existing on the communications bus with scheduling capabilities. All schedules shall be adjustable in one-minute increments.

The VVT® zone controller shall be capable of utilizing up to 16 holiday schedules with up to 99 days per schedule for overriding the occupancy schedule.

The VVT zone controller shall have built-in override capabilities for unoccupied schedule override from 0 to 24 hours in 1-minute increments. Schedule overrides and schedules shall be flexible enough to allow individual zones to become occupied without the rest of the system becoming occupied or allow some or all zones of an associated piece of equipment, or from several pieces of equipment to become occupied together. When scheduled to become occupied together, all zones from that group should participate in a single occupancy override from any single

request. When scheduled to operate independently only the zone where the Occupancy override was requested should become occupied.

## F. Security Level:

The System Pilot(s) shall have four levels of security for access of control tasks and decisions with level one providing full access and level four providing read access only from the controller. Levels two and three provide limited access.

## G. HVAC Equipment Protection:

The air sources controller shall be capable of monitoring the leaving air temperature to control stages in both the heating and cooling modes. It shall have the capability to shut down stages based on a rise or fall in leaving air temperature above or below adjustable or calculated values. Calculated supply air temperature requirements shall be based on error reduction calculations from reference zone data to determine the optimum supply air temperature to satisfy space requirements. The system shall provide protection from short cycling of heating and cooling by utilizing time guards and minimum run time configurations.

## H. Sensor Calibration:

All applicable sensors shall be accessed for calibration at the controller or through a communicating network with a System Pilot device or PC and EMS software.

## I. Energy Conservation:

The system shall incorporate the following features for the provision of energy conservation:

- 1. Load balancing from error reduction calculations that optimize staging.
- 2. The locking out of mechanical heating or cooling modes based on configurable outside air temperature limits.
- 3. The system shall intelligently start all equipment in a stagger start manner after a transition from unoccupied to occupied modes as well as power failure to reduce high peak power consumption on start-up.
- 4. 3V controllers shall have the capability of being overridden by a Peak Demand Limiting Option Module existing on the communications bus with demand limiting functions to reduce overall energy consumption and control on and off peak time kW usage.
- 5. Temperature compensated start. The zone controller shall be capable of supporting temperature compensated start with the air source. Prior to occupancy the zone controllers and Air Source shall work together to provide zone-by-zone temperature compensated conditioning. The air source will track the time required for recovery report the optimal start bias time to the zones prior to each occupied period so that



the zone can start conditioning the space prior to occupancy.

J. Stand-Alone Capability:

The controllers shall be capable of providing all control functions of the HVAC system without the use of a computer. All configuration selections shall be capable of being performed at a System Pilot display via push button access.

The controllers shall include the inherent capability to access the system control selections as well as to monitor system performance by means of a communicating network with a PC and EMS software program.

K. DDC Control Networking:

The 3V™ system controllers shall be capable of sharing the same communication network as General Purpose Electronic Modules and option modules.

The System Pilot shall be capable of broadcasting time and date. The air source controller shall be capable of broadcasting outside air temperature, outside air enthalpy status, or outside air CO<sub>2</sub> concentration on the communications bus to other Application Specific Controllers, and General Purpose Electronic Controllers existing on the network. The VVT® zone controllers shall also be able to receive this information and more from the same type of controllers on the network communications bus.

The VVT zone controllers shall also be capable of receiving commands from General Purpose Electronic Controllers (GPEC) existing on the communications bus. This information shall be used in a variety of ways to control the HVAC system as well as other building functions and applications.

L. VVT Zone Controller as a Linkage Coordinator:

1. The VVT zone controller shall be capable of controlling space demand in a variable volume application by monitoring space temperature and determining the heating or cooling demand. The space temperatures shall be controlled to maintain individual heating and cooling setpoints. The VVT zone controller shall have the capability of scanning up to 32 linked zones including itself and determining system heating and cooling requirements. Individual zones may be configured so that they do not participate in system mode determination for heating and cooling or just for the heating if zone supplemental heat is installed.

The zone controller shall include adjustable system mode lockouts for Cooling, Heating and a configuration for intermittent fan when occupied. These settings shall be accessible from a System Pilot or from a PC with EMS software. The system fan shall be capable of operating in a continuous or automatic mode during occupied hours and in an automatic mode during unoccupied hours. The zone controller shall be

capable of operating the system in manual or automatic changeover mode.

2. The zone controller shall include a heating/cooling mode temperature changeover cycle to eliminate zone thermal shock during periods of system mode change.
3. The zone controller shall have a system commissioning mode whereby the installer may easily command all dampers to the maximum or all dampers to the minimum positions or position individual dampers. While this mode is active, maximum and minimum damper settings may be set. The system static pressure reading may be viewed from the same screen while performing the operations above and the Bypass pressure set point adjusted as required. The screen data for this mode may be displayed from the System Pilot or from a PC with EMS software.
4. The Zone Controller shall be capable of providing a communication check of all associated controls and display device type as well as error conditions.

M. VVT Zone Controller:

1. The VVT zone controller shall be capable of independent zone control.
2. The zone controller shall operate all 3V VVT zone dampers as well as VAV and fan powered terminal boxes equipped with VVT zone controllers.
3. The zone controller shall be capable of controlling supplemental heat or auxiliary heat sources, including fan control, when required at the zone level. Conversion to supplemental heat shall not require replacement of the control system.
4. The zone controller shall operate in a pressure dependent mode. Damper inlet area shall be adjustable in increments of one square inch. The zone controller shall be capable of reading zone airflow in cfm and controlling zone airflow based upon this information when operating in pressure independent mode.
5. The zone controller shall have the capability to support adjustable minimum and maximum damper positions.

N. 3V Bypass Controller:

1. The 3V bypass controller shall be capable of reading supply static pressure and controlling the bypass damper to maintain the supply static set point. This operation shall be provided when operating within a 3V system application or in a stand-alone mode.
2. The bypass controller shall include a pre-positioning mode for opening the damper prior to fan operation. The bypass controller shall provide configurable minimum and maximum damper position settings.

# Guide specifications — 3V™ control system (cont)



3. The bypass controller shall have the capability of displaying system static pressure, duct temperature, pressure set point and damper position.
4. The bypass controller shall provide the capability of increasing the maintained supply static pressure when the system supply-air temperature exceeds adjustable high and low duct temperature set point limits.

## O. Demand Controlled Ventilation (DCV):

The 3V™ zone controller shall be capable of reading an analog signal from a CO<sub>2</sub> sensor or other sensor measuring volatile contaminants, or relative humidity and provide DCV at the zone by calculating a DCV damper position and participate in system DCV operation with the air source.

### 1. System DCV (System Level):

The zone controller when operating as a Linkage Supervisor shall have the ability to collect the DCV value from any or all of the zone controllers it is configured to scan. These values may be averaged or the high or low sensor value may be transmitted to an air source controller's analog DCV sensor input. The air sources configured DCV routine may perform the appropriate actions to reduce CO<sub>2</sub> concentration at the reporting zones. If not being used for DCV this system composite value collection may be used to collect zone relative humidity readings or another type of analog sensor values to be reported to the air source.

### 2. Local DCV (Zone Level):

All VVT® Comfort System Zone Controllers shall be capable of reading an analog signal from a CO<sub>2</sub> sensor or other sensors measuring volatile contaminants at the zone level, for independent DCV mode operation. The zone controller shall calculate a DCV damper position for the zone based on an error reduction calculation. When the DCV damper position value is greater than temperature control damper position the DCV damper position shall be used to position the damper.

3. System heating and cooling and zone supplemental heat shall be allowed to operate.
4. Pre-Occupancy Purge:  
The 3V system shall be capable of providing a pre-occupied purge to flush the building of contaminants up to one hour before the occupancy period.
5. The CO<sub>2</sub> sensor shall be available in wall-mount as well as duct-mount with or without an LED display of parts per million of measured contaminant. The set point shall be adjustable.

## P. Zone Dampers:

Each Zone Damper shall include:

1. A motorized damper assembly constructed of 24 gage galvanized iron with blade of 20 gage.

2. Blade operation providing full modulation from open to closed position.
3. The ability to operate in a controlling/link arrangement, where the controlling damper is operated by the zone controller. The controlling damper shall have the capability to have up to 4 linked dampers tracking its position. The linked dampers shall modulate to the same position as the controlling damper.
4. Round dampers shall have elliptical blades with a seal around the entire damper blade edge. Rectangular dampers shall have fully sealed edges.
5. A duct temperature sensor shall be an integral part of the damper assembly.

## Q. Diagnostics:

The Zone and Bypass controllers shall provide self-test, on board diagnostics and alarm conditions, and shall be capable of performing diagnostics on its critical components as well as all hard-wired sensors and inputs. The controllers shall display any alarm messages on the System Pilot until the alarm condition has been corrected. The controllers shall store at a minimum the last five alarm conditions. The controllers may be configured to report alarms on a network or to not report alarms. All alarms shall be capable of being read from the controller through the use of a communicating network with a PC and EMS software.

## R. Monitoring:

The 3V system controllers shall be capable of providing the following information for monitoring of system parameters:

1. Space temperatures
2. Filter status
3. CO<sub>2</sub> status
4. Space temperature averaging
5. Space temperature sharing
6. Occupancy mode
7. Supply air temperatures
8. Leaving air temperature conditions
9. Air source supply temperature
10. Heat/Cool mode conditions
11. Error reduction optimized staging
12. Indoor relative humidity
13. Fan run time
14. Compressor run time
15. Compressor starts
16. Outside air temperature
17. Fan status

## 2.02 SOFTWARE

### A. Access Capability:

Access capability to the system, whether local or remote, shall be accomplished using a communications bus, modem or AutoDial Gateway/TeLINK (as applicable) and PC with EMS software.

### B. Information Retrieval:

The software shall be capable of, but not limited to, listing all current system sensor readings, listing and modifying configuration parameters such as set point, occupancy schedules, alarm options, temperature limits and functional configuration data. System temperature and input information shall be available for local or remote site trending.

## Part 3 — ADS Requirements

### 3.01 AIR DISTRIBUTION SYSTEM (ADS)

A. Multiple zone controllers being serviced by the same air handler shall be networked together.

B. Each zone controller shall include an occupancy schedule or may share a global occupancy control for an entire designated group.

C. Each zone controller shall be capable of supporting holiday periods.

D. Each zone controller shall include the capability to monitor one space temperature sensor and CO<sub>2</sub> sensor or Relative Humidity sensor.

E. The zone controller shall monitor primary damper position, space temperature, air handler status and mode, supply-air temperature (as applicable) and shall position its terminal damper based on its PID (Proportional, Integral, Derivative) temperature control algorithm to maintain the desired zone temperature set point.

F. Each zone controller shall include the inherent ability to override the temperature control loop and modulate the terminal's damper with a PID loop, based on a ventilation sensor with its associated set point schedule, in conjunction with the normal temperature control loop.

G. The zone controller shall be capable of maintaining an air quality set point through a Demand Controlled Ventilation algorithm in conjunction with the Air Handler to fulfill the requirements of ASHRAE standard, 62-1989 "Ventilation For Acceptable Indoor Air Quality" (including addendum 62a-1990). The algorithm shall also be capable of modulating the heat to keep the space temperature between the heating and cooling set points. The IAQ algorithm shall be temporarily suspended if the space temperature falls below the heating set point or the system mode is Heat or Morning Warmup. The system shall also include the capability for a maximum primary damper position limit to protect the zone from over cooling for those units that do not include local heating.

H. Depending upon the type of terminal, the zone controller shall sequence the terminal's fan, hot water valve or auxiliary heat as required.

I. Depending on the equipment mode of operation, separate heat/cool, minimum/maximum, damper position set points shall be used to help protect the equipment from insufficient airflow during heating (minimum heating damper position) or overload (maximum heating and maximum cooling damper position).

J. Auxiliary heating for IAQ applications shall be of the modulating hydronic type. Two-position actuator or staged heat shall not be acceptable for IAQ applications.

K. All parallel fan powered terminals with local auxiliary heat shall include a heat on delay timer (unless in the commissioning mode) to ensure that the use of plenum air is insufficient before any heat stage is enabled. All ducted heat shall be controlled so as not to exceed a user defined maximum duct temperature.

All fan powered terminals with local auxiliary heat shall also include a fan off delay value, to ensure that the heat has been sufficiently dispersed before disabling the fan. All timers shall be provided in software.

L. Each space temperature sensor shall include an override button as an integral part of the sensor. Whenever the button is pushed during the unoccupied mode, the zone shall be indexed to control to its occupied set points, the air source shall start, and the zone shall stay in its Occupied mode for the duration of the override period. The timed override duration shall be operator configurable from one minute to 24 hours in one-minute increments.

### 3.02 SYSTEM TERMINAL MODES

A. Each air terminal mode shall be based on the current air handler mode, terminal type, space temperature, and the current temperature set points.

B. All zone controller's servicing Series fan terminals shall include a Series Fan Terminal Precheck (**SFTP**) algorithm before starting its fan and control sequence. The SFTP algorithm shall ensure proper fan rotation whenever the fan is commanded on, by closing its damper, waiting for a short time delay, and then enabling its fan. Actual damper position shall be required for this algorithm. After the fan starts the zone controller shall modulate its damper. Each zone controller servicing Series terminals shall include a unique time delay to prevent all dampers from closing at once, and to prevent all the fans from starting at the same time.

C. The terminal operation depends upon the air source operation and zone requirements as follows:

#### 1. Off:

a. All terminal dampers will maintain a 70% open position. Both Parallel and Series fans shall be disabled.

b. If the zone requirement is heating, all single duct terminals shall maintain their damper position at 70%. Any zone controller servicing

# Guide specifications — 3V™ control system (cont)



a parallel or series box shall fully close their dampers while the fan is operating. If local heat is available, the series and parallel fans shall start and local heat shall be enabled to maintain its unoccupied heating set point. The damper shall be modulated open to 70% after heating is no longer required.

## 2. Cooling and Night Time Free Cooling (NTFC):

a. If the zone requirement is none, then the zone controllers shall modulate their dampers to maintain their minimum cooling damper position or damper ventilation position if the supply air temp is between 65 and 75 F. Any zone controllers servicing Series terminals shall also modulate their dampers to maintain their minimum cooling damper position or damper ventilation position if the supply air temp is between 65 and 75 F after completing their SFTP cycle. During the NTFC mode the zone controller shall control between its heating and cooling set points. During the other modes the zone controller shall modulate its damper to its occupied cooling set point.

b. If the zone requirement is cooling, then the zone controllers shall modulate their air dampers between their minimum and maximum cooling damper position to maintain their cooling set point. Parallel fans shall be disabled. Series fans shall start and control after completing their SFTP cycle.

c. If the zone requirement is heating, then the zone controllers shall modulate their dampers to maintain their minimum cooling damper position. Any zone controllers servicing Series fans shall complete their SFTP cycle before modulating their dampers. Any zone controllers servicing single duct units with reheat capability shall maintain the greater of either the minimum cooling damper position or the minimum reheat damper position. Zone controllers servicing parallel units shall enable their fans. Zone controllers servicing Series terminals shall complete their SFTP cycle before modulating their dampers. After the fan starts, the damper shall be modulated to maintain its minimum cooling damper position.

## 3. Heat:

a. If the zone requirement is none, then the zone controller shall maintain its minimum heating damper position. Parallel fans shall be disabled and their air damper shall be modulated to maintain their minimum heating damper position. Series units shall complete their SFTP cycle checks and then modulate its damper to maintain its minimum heating damper position.

b. If the zone requirement is cooling, then the zone controller shall modulate its damper to maintain its minimum heating damper position. Parallel fans shall be disabled. Zone controllers servicing Series units shall complete their SFTP cycle and then shall modulate their primary damper to maintain their minimum heating damper position.

## 4. Pressurization:

a. If the zone requirement is none or cooling, then the zone controller shall maintain its maximum cooling damper position. Parallel fans shall be disabled. The damper for series fans, after successfully completing its SFTP cycle, shall modulate to maintain the maximum cooling damper position.

b. If the zone requirement is heating, and the zone controller has been enabled to provide local heating, then the zone controller shall modulate its damper to its maximum cooling damper position and enable its auxiliary heat. If local heat is not available, the damper shall be modulated to maintain its maximum cooling damper position.

c. For series fan operations, the SFTP cycle shall be completed before modulating the primary air damper to its maximum cooling damper position.

## 5. Evacuation:

During the Evacuation mode all terminal fans shall be disabled and all dampers shall close.

## Part 4 — Abnormal Conditions

4.01 The proposed system shall include the ability to detect abnormal conditions, and to react to them automatically.

A return to normal conditions shall also generate a return to normal notification and the system shall revert back to its original control scheme before the abnormal condition existed.

The following abnormal terminal conditions shall automatically generate an alarm and the system shall take the following actions:

A. If a space temperature sensor is determined by the zone controller to be invalid, the zone controller shall generate an alarm, default to its Ventilation mode and maintain its configured ventilation damper position.

B. If a relative humidity sensor (monitor only function) is determined by the zone controller to be invalid, the zone controller shall generate an alarm.

C. If an indoor air quality sensor is determined by the zone controller to be invalid, the zone controller shall generate an alarm, and disable its IAQ algorithm.



- D. If a zone controller loses communication with its associated coordinator, it shall generate an alarm. If the zone controller does not have a supply-air sensor installed, then the zone controller shall assume it is in a Cooling mode and modulate its primary air damper between its minimum and maximum damper position. If the zone includes a reheat coil, it shall not allow reheat to function unless the zone has a valid supply air sensor.
- E. If a linkage master loses communications with the equipment controller and it has a primary air temperature sensor installed, the linkage master zone controller shall determine the equipment operating mode based on the temperature of the primary air, and the system pressure measured at the bypass controller. If no bypass controller exists, the air source will be determined to be always on.
- F. If a linkage master loses communication with an associated zone controller, the linkage master shall alarm and remove that zone temperature from its weighted averages. The zone controller shall continue to operate in a stand-alone mode.

#### **Part 5 — System**

- 5.01 The system shall include the ability to configure and display up to 32 zones for each air source. A zone shall be defined as a space temperature sensor wired to a zone controller.
  - A. Configuration:

Each zone shall have the ability to configure and display the following:

    1. Minimum/Maximum damper position limits used by the terminal control when the air source is in the Cooling mode.
    2. Minimum/Maximum damper position limits used by the terminal control when the air source is in the Heating mode.
    3. Reheat damper position limit (single duct units only) used when local heat is required and the air source is in Cooling mode.
    4. Ventilation damper position when air source is in cooling or free cooling mode.
    5. Terminal Inlet size (diameter or square inches).
    6. Heating type.
    7. Central Heating caller.
    8. Heat on delay.
    9. Fan off delay (parallel terminal fans only).
    10. Maximum duct temperature.
    11. Alarm set points.
    12. Occupancy Override value.
    13. Heating and cooling Occupied/Unoccupied temperature set points.
    14. Ventilation set point (CO<sub>2</sub>) and maximum damper position limit.
    15. Heat enable/disable.

- B. Zone Display:

Zones shall have the capability to display the following as a minimum:

  1. Terminal operating mode and terminal type.
  2. Zone space temperature.
  3. Actual damper blade position (0 to 100% open).
  4. Primary air temperature (if applicable).
  5. Terminal fan status (if applicable).
  6. Leaving temperature (heating only).
  7. Zone CO<sub>2</sub> (if applicable).
  8. Zone Relative Humidity (if applicable).
- C. Maintenance Display:

Maintenance screens shall be provided to ease and expedite the task of troubleshooting. The screens shall have the capability to display the following as a minimum:

  1. The current calculated damper reference.
  2. Occupancy and override status.
  3. Current user set point offset value.
  4. Current heating and cooling set points.
  5. Heat Status (if applicable).
  6. Ducted heating reference temperature.
  7. Current Air Source operating mode and supply temperature.
  8. Average zone temperature, average occupied zone temperature, and the next occupied/unoccupied day and time for all terminals serviced by each respective air handler (linkage master only).
  9. Occupancy maintenance screens shall display such information as timed override status and duration and current occupied and unoccupied time (Local schedule only).
  10. Position of the open primary air damper of all terminals serviced by their respective air handler (coordinator only).

#### **Part 6 — Linkage**

- 6.01 Each zone controller shall have the capability to directly communicate to a factory supplied air source microprocessor to provide a totally linked and coordinated Air Distribution System.
  - A. The linkage shall include the following air source modes for use by the Coordinator as a minimum: Off, Cooling, Heating, Night Time Free Cooling, Pressurization, and Evacuation.
  - B. The linkage shall also provide system data to the air source controller for use in its algorithms.
  - C. The coordinator shall periodically poll its assigned zones to acquire their updated values.
  - D. Space temperature and space temperature set points acquired by the coordinator for use by the air handler controller shall include a weighted factor, proportional to the size of the zone.

## Guide specifications — 3V™ control system (cont)



- E. Only those zones with valid temperature readings shall be included.
- F. The system data shall include average zone temperature, average occupied zone temperature, average occupied and unoccupied heat/cool set points, occupancy status, and the next occupied zones terminal time and day.
- G. Maximum CO<sub>2</sub> or space relative humidity shall be supplied to the air source through other networking means.
- H. The system shall provide the capability of using the above data in the air source algorithms for adaptive optimal start, Night Time Free Cooling, dehumidification and Demand Controlled Ventilation adjustments to the mixed air damper routine.
- I. The air handler controller shall, through the Air Distribution System, bias its occupancy time schedules to provide optimization routines and occupant override.
- J. For those systems that do not include inherent linkage software, the Coordinator shall determine the operational mode of the equipment through its associated bypass controller pressure sensor and a temperature sensor mounted in the supply ductwork. If there is no bypass controller then the system will assumed to be always on.
- K. The vendor shall make it clear in the bid/proposal if linkage software is not going to be part of their offering.





Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.