35L,N Dual Duct Terminal Units
Variable Volume System

Installation and Start-Up Instructions

CONTENTS

SAFETY CONSIDERATIONS

SAFETY NOTE

Air-handling equipment will provide safe and reliable service when operated within design specifications. The equipment should be operated and serviced only by authorized personnel who have a thorough knowledge of system operation, safety devices and emergency procedures.

Good judgment should be used in applying any manufacturer's instructions to avoid injury to personnel or damage to equipment and property.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could cause personal injury or death.

Before performing service or maintenance operations on unit, turn off main power switch to unit and install lock(s) and lockout tag(s). Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate. Unit may have more than one power switch.

See Fig. 1 for Proposition 65 label.

WARNING: Cancer - www.P65Warnings.ca.gov

Fig. 1 — Proposition 65 Warning Label

PRE-INSTALLATION

General

The 35L,N units are dual duct terminals available with factory-installed pneumatic, analog, and Carrier Comfort Network® (CCN) Direct Digital Control (DDC) control options. See Table 1. Figure 2 shows the basic box. Figure 3 is an example of a unit identification label.

Table 1 — 35L,N Units

UNIT	DESCRIPTION
35L	Basic unit, no mixing
35N	Premium unit, high mixing, constant volume flow sensing

STORAGE AND HANDLING

Inspect for damage upon receipt. Shipping damage claims should be filed with shipper at time of delivery. Store in a clean, dry, and covered location. Do not stack cartons. When unpacking units, care should be taken that the inlet collars and externally mounted components do not become damaged. Do not lift units using collars, sensors or externally mounted components as handles. Do not lay uncrated units on end or sides. Do not stack uncrated units over 6 ft high. Do not manhandle. Do not handle control boxes by tubing connections or other external attachments. Table 2 shows component weights.

INITIAL INSPECTION

Once items have been removed from the carton, check carefully for damage to duct connections, coils or controls. File damage claim immediately with transportation agency and notify Carrier.

UNIT IDENTIFICATION

Each unit is supplied with a shipping label and an identification label (Fig. 3).

INSTALLATION PRECAUTION

Check that construction debris does not enter unit or ductwork. Do not operate the central-station air-handling fan without final or construction filters in place. Accumulated dust and construction debris distributed through the ductwork can adversely affect unit operation.

SERVICE ACCESS

Provide service clearance for unit access.

CODES

Install units in compliance with all applicable code requirements.

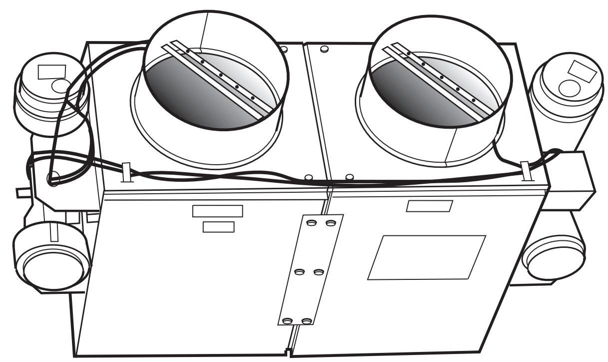


Fig. 2 — 35L Dual Duct Box

Carrier®

UP

ODS: 2181487

TAG:

FACTORY NO: 832889 **ITEM:** 003

MODEL NO: 35LN 06 **SIZE:** C=06 H=06

	MAX	MIN		MAX	MIN
COLD INLET CFM:		0	**VP:**	.000	.000
HOT INLET CFM:			**VP:**	.000	.000
HAND (COLD INLET LOC):		RC			

D000 CTRL BOX E

CFGCD: 1A*0*0*0R*0606*D000*00*000*0000

Fig. 3 — Unit Identification Label

Table 2 — 35L,N Unit Weights

UNIT	SIZE	BASE UNIT (lb)	WITH PNEUMATIC CONTROLS (lb)	WITH DDC OR ANALOG CONTROLS (lb)
35L	4, 5, 6	29	37	47
	7, 8	33	41	51
	9, 10	41	49	59
	12	51	59	69
	14	67	75	85
	16	75	83	93
	22	129	137	147
35N	6	31	39	49
	8	42	50	60
	10	61	69	79
	12	80	88	98
	14	98	106	116
	16	111	119	129

LEGEND

DDC — Direct Digital Controls

NOTE: Data is based on the following conditions:
1. Unit casing is 22 gage.
2. Unit insulation is $^{1}/_{2}$-in. thick, 1.5-lb Tuf-Skin[1] Rx dual density fiberglass.
3. Units rated with standard linear flow sensor.

Warranty

All Carrier-furnished items carry the standard Carrier warranty.

CONTROL ARRANGEMENTS

The 35L,N dual duct units are offered with a wide variety of factory-mounted controls that regulate the volume of air delivery from the unit and respond to cooling and heating load requirements of the conditioned space. Stand-alone controls will fulfill the thermal requirements of a given control space. These devices are available in both pneumatic and electronic arrangements. Carrier PIC (Product Integrated Controls) is a communicating control that is integrated with the building system. The PIC controls are compatible with the CCN system. A number of DDC (Direct Digital Controls) control packages by others are available for consignment mounting, as indicated.

Control offerings are:

35(L,N)A: Analog Electronic

35(L,N)C: CCN Direct Digital Electronic

35(L,N)P: Pneumatic

35(L,N)N: None or DDC by others

Each control approach offers a variety of operating functions; a control package number identifies combinations of control functions. The following listings contain the basic function arrangements for each control offering. Because of the variety of functions available, circuit diagrams, operating sequences, and function descriptions are contained in separate Application Data publications. Refer to the specific control publication for details.

CCN Control Arrangement

The CCN control packages must be used in combination with a thermostat. Thermostats are not included in the CCN package.

4160: Constant volume dual duct

4170: 35N only, variable volume dual duct, constant minimum cooling (requires cold deck inlet and total flow probe)

4175: 35N only, variable volume dual duct, cooling close-off during heating (requires hot deck inlet and total flow probe)

4180: 35N only, constant ventilation dual duct, Cooling only (requires cold deck inlet and total flow probe)

4190: Variable air volume (VAV) with Demand Controlled Ventilation (DCV) requires separate CO_2 sensor

Analog Electronic Control Arrangement

Control package is pressure independent and includes a standard linear airflow sensor in both the hot and cold inlets for variable air volume control, 24-volt transformer, control enclosures, and a wall thermostat to match the control type.

Variable volume control:

2400 — Heating and cooling control, hot and cold inlet sensor location (35L,N)

2440 — Heating and cooling control, hot inlet and discharge airflow sensing (35N only)

2470 — Heating and cooling control, cold inlet and discharge airflow sensing (35N only)

Direct Digital Electronic Control Arrangement (Field-Supplied)

Control packages are field-supplied for factory mounting, unless otherwise noted. All DDC control arrangements include a standard linear inlet flow sensor, 24-volt transformer and control enclosure.

Contact Carrier for details about mounting field-supplied controls.

Pneumatic Control Arrangement

All control packages are pressure independent and include standard linear airflow sensors in both the hot and cold inlets for variable air volume control or an airflow sensor in one inlet and the unit discharge for constant volume control arrangements. Thermostats will either be direct acting (DA) or reverse acting (RA), and damper position will be identified as normally open (NO) or normally closed (NC).

Variable air volume control with inlet air sensing (all units):

- 1500 — Multi-function controller, DA-NC cold inlet, NC hot inlet
- 1501 — Multi-function controller, DA-NC cold inlet, NO hot inlet
- 1502 — Multi-function controller, DA-NO cold inlet, NO hot inlet
- 1503 — Multi-function controller, DA-NO cold inlet, NC hot inlet
- 1504 — Multi-function controller, RA-NC cold inlet, NC hot inlet
- 1505 — Multi-function controller, RA-NC cold inlet, NO hot inlet
- 1506 — Multi-function controller, RA-NO cold inlet, NO hot inlet
- 1507 — Multi-function controller, RA-NO cold inlet, NC hot inlet

Constant volume control with hot inlet and discharge air sensing (35N Units):

- 1508 — Multi-function controller, DA-NC cold inlet, NC hot inlet
- 1509 — Multi-function controller, DA-NC cold inlet, NO hot inlet
- 1510 — Multi-function controller, DA-NO cold inlet, NO hot inlet
- 1511 — Multi-function controller, DA-NO cold inlet, NC hot inlet
- 1512 — Multi-function controller, RA-NC cold inlet, NC hot inlet
- 1513 — Multi-function controller, RA-NC cold inlet, NO hot inlet

1. Tuf-Skin is a trademark of Johns Manville.

- 1514 — Multi-function controller, RA-NO cold inlet, NO hot inlet
- 1515 — Multi-function controller, RA-NO cold inlet, NC hot inlet

Constant volume control with cold inlet and discharge air sensing (35N units):

- 1516 — Multi-function controller, DA-NC cold inlet, NC hot inlet
- 1517 — Multi-function controller, DA-NC cold inlet, NO hot inlet
- 1518 — Multi-function controller, DA-NO cold inlet, NO hot inlet
- 1519 — Multi-function controller, DA-NO cold inlet, NC hot inlet
- 1520 — Multi-function controller, RA-NC cold inlet, NC hot inlet
- 1521 — Multi-function controller, RA-NC cold inlet, NO hot inlet
- 1522 — Multi-function controller, RA-NO cold inlet, NO hot inlet
- 1523 — Multi-function controller, RA-NO cold inlet, NC hot inlet

A multi-function controller is capable of providing DA-NO, DA-NC, RA-NC or RA-NO functions (all units).

No Control

0000: 35L,N box only

D000: 35L,N box with control box only

D001: 35L,N box with control box and transformer

INSTALLATION

Step 1 — Install Volume Control Box

1. Move unit to installation area. Remove unit from shipping package. Do not handle by controls or damper extension rod.
2. The unit has factory-installed brackets.
3. Suspend units from building structure with straps, rods, or hanger wires. Secure the unit and level it in each direction.

Step 2 — Make Duct Connections

1. Install supply ductwork on each of the unit inlet collar. Check that air-supply duct connections are airtight and follow all accepted medium-pressure duct installation procedures. (Refer to Tables 3-5 for pressure data.)
2. Install the discharge ducts. Fully open all balancing dampers.

A straight length of inlet duct is not required before the unit inlet. Ninety-degree elbows or tight radius flexible duct immediately upstream of inlet collar should be avoided.

Step 3 — Install Sensors and Make Field Wiring Connections — Electric Analog or DDC (Direct Digital Controls)

Refer to specific unit dimensional submittals and control application diagrams for control specifications. All field wiring must comply with National Electrical Code (NEC) and local requirements. Refer to the wiring diagram on the unit for specific wiring connections.

A field-supplied transformer is required if the unit was not equipped with a factory-installed transformer. See Fig. 4.

NOTE: Refer to wiring diagram attached to each unit for specific information on that particular unit.

Unit airflow should not be set outside of the range noted in Fig. 4-6 and the performance data section of this document.

Table 3 — 35L Non-Mixing Dual Duct Basic Pressure Data

INLET SIZE (in.)	CFM	MINIMUM AIRFLOW (CFM)*	MINIMUM CCN AIRFLOW (CFM)	MINIMUM INLET STATIC PRESSURE (Unit Pressure Drop) (in. wg) Velocity Pressure ΔV_{PS}	Basic Unit ΔP_S	MINIMUM SYSTEM OPERATING PRESSURE (in. wg) AT MAXIMUM LISTED FLOW RATE
4 (0.09)	50 110 170 230	40 or 0	23 or 0	0.02 0.10 0.23 0.43	0.00 0.01 0.02 0.03	0.03
5 (0.14)	75 170 265 360	63 or 0	36 or 0	0.02 0.09 0.23 0.43	0.00 0.02 0.04 0.08	0.08
6 (0.20)	100 240 380 520	90 or 0	52 or 0	0.02 0.09 0.22 0.42	0.01 0.04 0.09 0.17	0.17
7 (0.27)	150 330 525 710	123 or 0	71 or 0	0.02 0.09 0.23 0.41	0.01 0.04 0.09 0.17	0.17
8 (0.35)	200 440 675 925	160 or 0	93 or 0	0.02 0.09 0.21 0.39	0.01 0.04 0.09 0.17	0.18
9 (0.44)	250 550 875 1200	203 or 0	117 or 0	0.02 0.08 0.21 0.40	0.01 0.07 0.17 0.32	0.31
10 (0.55)	300 675 1075 1450	251 or 0	145 or 0	0.02 0.08 0.20 0.36	0.01 0.04 0.10 0.17	0.17
12 (0.78)	450 1000 1550 2100	361 or 0	208 or 0	0.02 0.08 0.19 0.34	0.01 0.04 0.09 0.17	0.17
14 (1.07)	600 1375 2125 2900	491 or 0	284 or 0	0.01 0.07 0.17 0.31	0.01 0.04 0.10 0.19	0.18
16 (1.40)	800 1775 2725 3700	642 or 0	371 or 0	0.01 0.06 0.14 0.25	0.01 0.04 0.10 0.17	0.18
22 (2.63)	1200 3300 5200 7000	1211 or 0	699 or 0	0.02 0.07 0.16 0.31	0.01 0.04 0.09 0.17	0.17

*CCN (Carrier Comfort Network®) controls permit a lower minimum flow.

NOTES:

ΔP_s is the difference in static pressure across the assembly, with the damper fully open.

To obtain Total Pressure, add the Velocity Pressure for a given CFM to the Static Pressure drop (ΔP_s) of the desired configuration.

Table 4 — 35N Dual Duct, Full Blending Basic Pressure Data — Inlet Sensor Pickup

INLET SIZE (Area)	CFM	MINIMUM AIRFLOW (CFM)	MINIMUM CCN AIRFLOW (CFM)	MINIMUM INLET STATIC PRESSURE (Unit Pressure Drop) (in. wg)		MINIMUM SYSTEM OPERATING PRESSURE (in. wg) AT MAXIMUM LISTED FLOW RATE
				Velocity Pressure	Basic Unit	
				ΔV_{PS}	ΔP_S	
6 (0.20)	100 240 380 520	90 or 0	52 or 0	0.01 0.06 0.15 0.28	0.03 0.16 0.40 0.72	0.42
8 (0.35)	200 440 675 925	160 or 0	93 or 0	0.01 0.06 0.14 0.26	0.03 0.15 0.36 0.68	0.44
10 (0.55)	300 675 1075 1450	251 or 0	145 or 0	0.01 0.05 0.14 0.25	0.04 0.20 0.52 0.94	0.43
12 (0.78)	450 1000 1550 2100	361 or 0	208 or 0	0.01 0.04 0.09 0.16	0.04 0.18 0.44 0.80	0.43
14 (1.07)	600 1375 2125 2900	491 or 0	284 or 0	0.01 0.04 0.09 0.17	0.04 0.23 0.54 1.01	0.48
16 (1.40)	800 1775 2725 3700	642 or 0	371 or 0	0.00 0.02 0.04 0.08	0.04 0.19 0.44 0.81	0.48

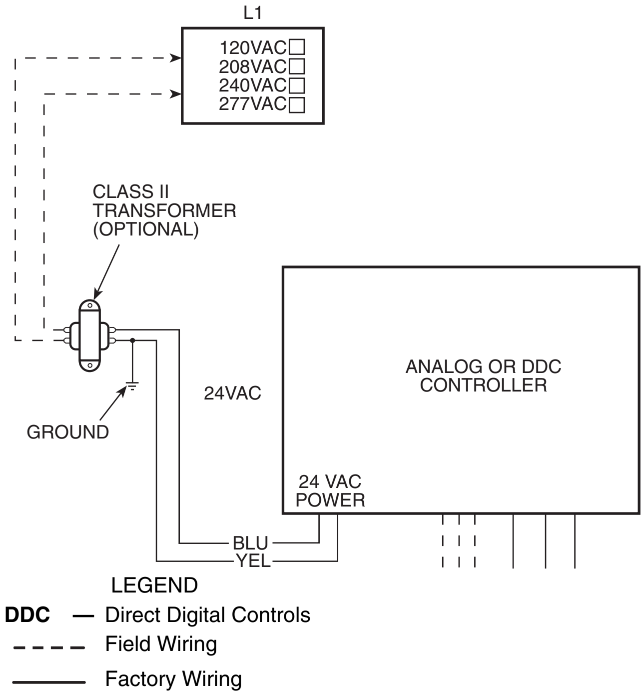
*Assumes inlet flow sensor. For discharge flow sensor, use data for next even size. CCN (Carrier Comfort Network®) controls permit a lower minimum flow. Size 16 discharge is same as inlet.

NOTES:
1. ΔP_s is the difference in static pressure across the assembly, with the damper fully open.
2. Minimum recommended airflow (cfm) is based on 0.03 in. wg differential pressure on the inlet sensor or 0 airflow. 0.03 in. wg is equal to 15-20% of the nominal flow rating of the terminal unit. Less than 15-20% may result in greater than ±5% control of the unit airflow. Some DDC controls, supplied by others, may have different limitations.
3. Minimum airflow may be 0.
4. Maximum airflow (cfm) is based on a 1-in. wg differential pressure from the airflow sensor.
5. To obtain Total Pressure, add the Velocity Pressure for a given CFM to the Static Pressure drop (ΔP_s) of the desired configuration.

Table 5 — 35N Dual Duct, Full Blending — Discharge Sensor Pickup

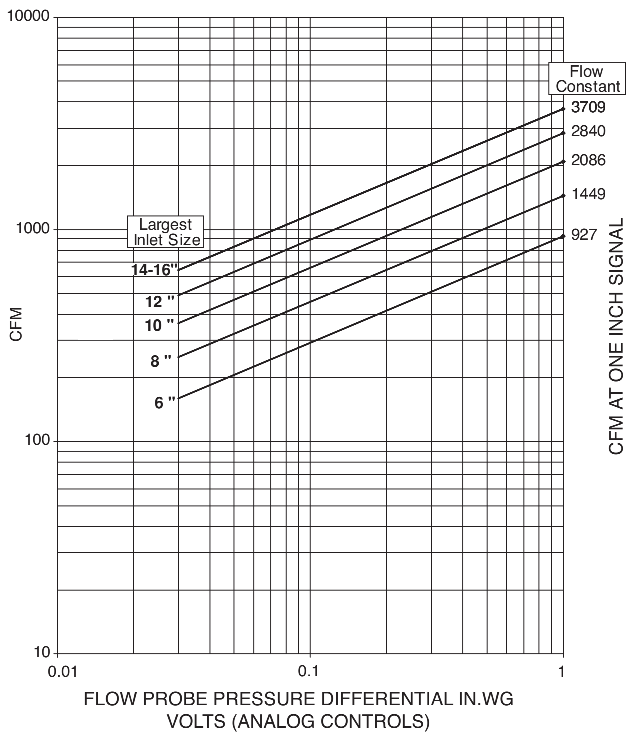
INLET SIZE	MAX. PRIMARY AIRFLOW (cfm)	MINIMUM AIRFLOW	
		Standard	CCN
6	927	185 or 0	93 or 0
8	1448	290 or 0	145 or 0
10	2085	417 or 0	208 or 0
12	2838	568 or 0	284 or 0
14 **16**	3706	741 or 0	371 or 0

LEGEND
CCN — Carrier Comfort Network



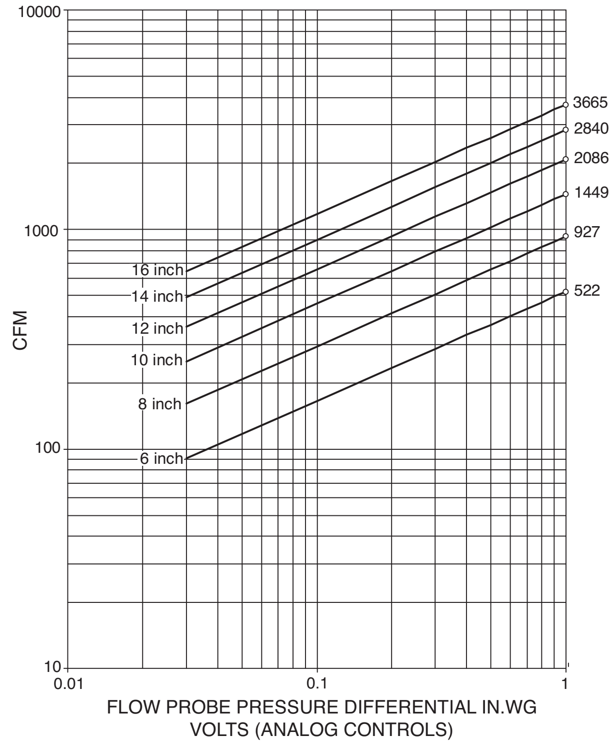
NOTE: Drawing is typical — refer to actual unit wiring diagram for details.

Fig. 4 — Wiring of Optional Factory-Mounted Transformer



NOTE: Size 16 discharge is same as inlet.

Fig. 5 — Dual Duct Outlet Flow Probe Chart (35N only)



NOTE: Size 16 discharge is same as inlet.

Fig. 6 — Dual Duct Inlet Flow Probe Chart (35N only)

CONTROL SET UP

General

The 35L,N dual duct terminals are designed to maintain optimum temperatures in the conditioned zone by varying the air volume supplied by the hot and cold ducts while providing the proper discharge air temperature.

To balance the unit, it is necessary to set both the maximum and minimum set points of the controllers. Many types of control options are available and each have specific procedures required for balancing the unit.

Set Points

Maximum and minimum airflow set points are normally specified for the job and specific for each unit on the job. Where maximum and minimum airflow levels are not specified on the order, default values are noted on unit ID label.

Field Adjustment of Minimum and Maximum Airflow Set Points

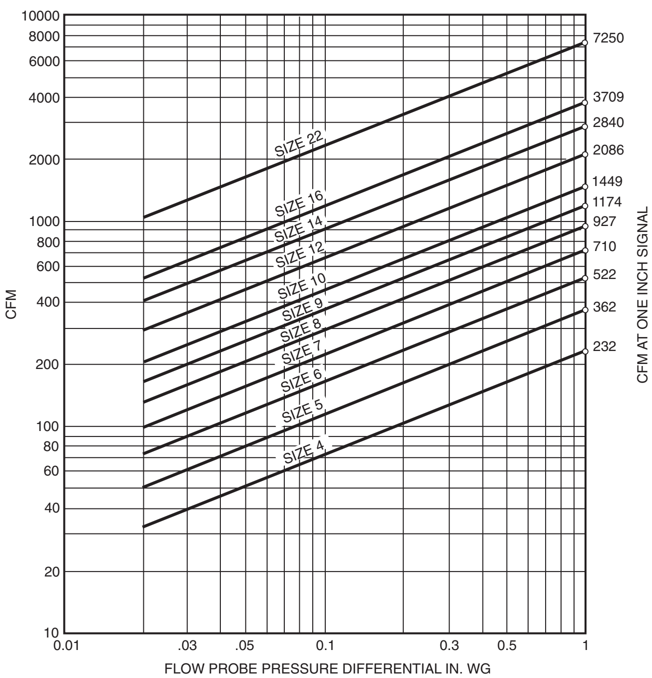
Each unit is equipped with a flow probe which measures a differential pressure proportional to the airflow. The relationship between flow probe pressures and cfm is shown in the Flow Probe Chart (Fig. 5-7). This chart is attached to each unit.

System Calibration of the Linear Averaging Flow Probe

To achieve accurate pressure independent operation, the velocity sensor and linear averaging flow probe must be calibrated to the controller. This will ensure that airflow measurements will be accurate for all terminals at system start-up.

System calibration is accomplished by calculating a flow coefficient that adjusts the pressure fpm characteristics. The flow coefficient is determined by dividing the flow for a given unit (design air volume in cfm), at a pressure of 1.0-in. wg differential pressure, by the standard pitot tube coefficient of 4005. This ratio is the same for all sizes if the standard linear averaging probe is used.

Determine the design air velocity by dividing the design air volume (the flow at 1.0-in. wg) by the nominal inlet area (sq ft). This factor is the K factor.



NOTE: Size 22 available on 35L units only.

Fig. 7 — Dual Duct Inlet Flow Probe Chart (35L only)

Carrier inlet areas are shown in Table 6. The design air volume is shown in this table. It can be determined from this table that the average design air velocity for those units is equal to 2656 fpm at 1.0-in. wg.

Table 6 — Inlet Areas

35L,N UNIT SIZE	04*	05*	06	07*	08	09*
INLET DIAMETER	4.0	5.0	6.0	7.0	8.0	9.0
CFM AT 1-IN. WG	232	362	502	710	927	1174
INLET AREA (sq ft)	0.087	0.136	0.196	0.267	0.349	0.442

35L,N UNIT SIZE	10	12	14	16	22*
INLET DIAMETER	10.0	12.0	14.0	16.0	16 x 24
CFM AT 1-IN. WG	1449	2086	2840	3709	7250
INLET AREA (sq ft)	0.545	0.785	1.069	1.396	2.640

*35L units only.
NOTE: For Carrier ComfortID™ terminals, all flow sizes are normalized using a single Probe Multiplier (PMF) for all sizes equal to 2.273.

PNEUMATIC CONTROLS

All control packages are pressure independent and include standard linear airflow sensors in both the hot and cold inlets for variable air volume control (control sequence 1500 to 1507) or an airflow sensor in one inlet and unit discharge for constant volume control arrangements (control sequence 1508 to 1523).

Preparation for Balancing

1. Inspect all pneumatic connections to assure tight fit and proper location.
2. Verify that the thermostat being used is compatible with the control sequence provided (direct acting or reverse acting).
3. Check main air pressure at the controller(s). The main air pressure must be between 15 psi and 25 psi. (If dual or switched-main air pressure is used, check the pressure at both high and low settings.) The difference between "high" pressure main and "low" pressure main should be at least 4 psi, unless otherwise noted, and the "low" setting difference should exceed 15 psi.
4. Check that the unit damper will fail to the proper position when main air pressure is lost. Disconnect the pneumatic actuator line from the velocity controller and observe the VAV damper position. The damper should fail to either a normally open position (indicator mark on shaft end is horizontal) or a normally closed position (indicator mark on shaft end is vertical).
5. Check that there is primary airflow in the inlet duct.
6. Connect a Magnehelic gage, inclined manometer or other differential pressure measuring device to the balancing taps provided in the velocity probe sensor lines. The manometer should have a full scale reading of 0.0 to 1.0-in. wg. The high pressure signal is delivered from the front sensor tap (away from the valve), and the low pressure signal is delivered from the back line (near the valve). The pressure differential between high and low represents the amplified velocity pressure in the inlet duct.
7. Read the differential pressure and enter the Flow Probe Chart to determine the airflow in the terminal unit. This chart is shown in Fig. 5-7 and is also attached to the side of each unit. For example, a differential pressure of 0.10-in. wg for a size 8 unit yields an airflow of 275 cfm.

Volume controller for units is shown in Fig. 8.

Balancing Procedure (Control Sequences 1500-1523)

1. Damper action is factory set at NO (normally open), or NC (normally closed). To reselect loosen damper selection switch screw and align pointer with damper pointer and tighten screw. The spring range of the actuator is not critical since the controller will output the necessary pressure to the actuator to position the damper according to set point. (See Fig. 8.)
2. Pipe the controller: Connect port "B" to the damper actuator. Connect port "M" to the clean, dry main air. Connect port "T" to the thermostat output. Connect port "H" to the total pressure tap on the airflow sensor. Connect port "L" to the static pressure tap on the airflow sensor.

The controller can be set up for cooling or heating applications using either a direct acting (DA) or reverse acting (RA) thermostat signal. The two flow adjustments are labeled "LO STAT ΔP" and "HI STAT ΔP."

LO STAT ΔP setting is the desired airflow limit when the thermostat pressure is less than, or equal to, the reset start point.

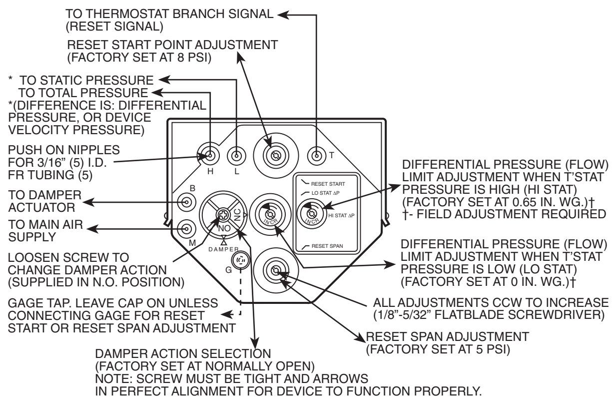


Fig. 8 — CSC-3011 Controller

- For DA Cooling or RA Heating:
  Adjust LO STAT ΔP to the desired minimum airflow with 0 psig (or a pressure less than the reset start point) at port "T." The LO STAT ΔP must be set first. The LO STAT ΔP will affect the HI STAT ΔP setting.
- For RA Cooling or DA Heating:
  Adjust LO STAT ΔP to the desired maximum airflow with 0 psig (or a pressure less than the reset start point) at port "T." The LO STAT ΔP must be set first. The LO STAT ΔP will affect the HI STAT ΔP setting.

HI STAT ΔP setting is the desired airflow limit when the thermostat pressure is greater than, or equal to, the reset stop-point. The reset stop-point is the reset span pressure added to the reset start-point pressure.

- For DA Cooling or RA Heating (see Fig. 9):
  Adjust HI STAT ΔP to the desired maximum airflow with 20 psig (or a pressure greater than the reset stop point) at port "T." The HI STAT ΔP must be set last. The HI STAT ΔP setting will be affected by the LO STAT ΔP setting.
- For RA Cooling or DA Heating (see Fig. 9):
  Adjust HI STAT ΔP to the desired minimum airflow with 20 psig (or a pressure greater than the reset stop point) at port "T." The HI STAT ΔP must be set last. The HI STAT ΔP setting will be affected by the LO STAT ΔP setting.

NOTE: After the "LO STAT ΔP" and "HI STAT ΔP" initial adjustments are made, cycle the thermostat pressure a few times to settle the internal reset mechanisms and verify settings. Fine tune the settings if necessary. The thermostat pressure may be left at a high pressure and the "G" port cap may be removed and replaced to cycle the reset mechanism.

RESET START setting is factory set at 8.0 psig. This is the lowest thermostat pressure that the LO STAT ΔP airflow will begin to reset towards the HI STAT ΔP airflow. To change the RESET START setting; regulate thermostat pressure to the "T" port to the desired reset start point pressure, adjust RESET START adjustment until pressure at the "G" port is slightly higher than 0 psig, i.e., 0.1 psig.

NOTE: The "G" port taps into the controller's internal reset chamber, which always starts at 0 psig. The RESET START adjustment is a positive bias adjustment that sets the desired thermostat start point to the controller's internal reset start point of 0 psig.

RESET SPAN setting is factory set at 5.0 psig. This is the required change in thermostat pressure that the controller will reset between the LO STAT ΔP setting and the HI STAT ΔP setting. To change the RESET SPAN setting; adjust RESET SPAN adjustment until pressure at the "G" port equals the desired reset span pressure.

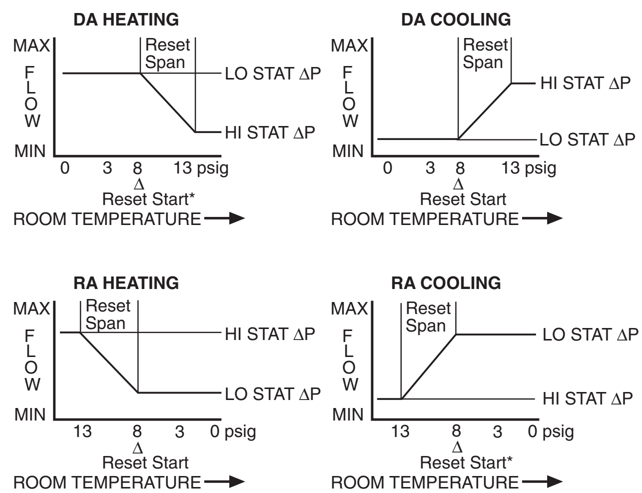
NOTE: The "G" port taps into the controller's internal reset chamber, which will always be at a pressure between 0 psig and the RESET SPAN pressure.

Preventative Maintenance

1. Inspect pneumatic tubing for loose connections or leaks.
2. Clean out pneumatic line filters regularly according to manufacturer's recommendations.

Pneumatic Control Troubleshooting

See Table 7.



*May require changing the RESET START from 8.0 to 3.0 psig if sequencing is involved.

Fig. 9 — Reset Cycle for CSC-3011 Control

Table 7 — Troubleshooting

PROBLEM	PROBABLE CAUSE
Controller does not reset to maximum or minimum set point during balance procedure.	Balancer is using the thermostat for control signal. An artificial signal must be provided in place of the thermostat.
Controller does not reset to maximum or minimum set point during operation.	Thermostat is not demanding maximum or minimum air volume. Main air pressure at the controller is less than 15 psi.
Pneumatic actuator does not stroke fully.	Leak in pneumatic line between the controller and the actuator. Main air pressure at the controller is less than 15 psi. Leak in the diaphragm.
Air valve stays in wide open position.	Velocity probe is blocked by an obstruction (sandwich bag, etc.). Insufficient supply air in the inlet duct.

NOTE: Always check:
- Main air pressure (15 psi to 25 psi) at the controller.
- Disconnected or kinked pneumatic lines to the controller.
- Quality of compressed air (oil or water in lines).
- Proper thermostat signal and logic (Direct/Reverse Acting).
- Blocked velocity probe or insufficient primary supply air.
- Leaks in the actuator diaphragm.
- Mechanical linkage of the actuator/air valve.

ANALOG CONTROLS

Balancing Procedures (Control Sequences 2400, 2440, 2470)

The analog electronic control system is a pressure independent volume reset control that uses KMC Controls CSP-5001 controller-actuator. See Fig. 10.

The system provides for independently adjustable set points for minimum, maximum, and auxiliary airflow limits.

Room temperature control is provided by the associated room thermostat which is selected according to the application. The room thermostat provides a fixed 2°F reset span regardless of the minimum and maximum velocity limit set points.

Adjustments for the minimum and maximum airflows are made at the thermostat.

The thermostat (CTE-5100 Series) operates on a 16 vdc power supply from the CSP controller and outputs a 0 to 10 vdc signal on the T terminals; T_1 in the cooling mode (DA [direct acting]) and T_2 in the heating mode (RA [reverse acting]). See the reference sequence diagram on unit for details on which 'T' terminals are used on each model thermostat, but in general T_1 and T_3 are used for the cooling mode, T_2 and T_4 for heating. Terminals T_1 and T_2 are adjustable to limit minimum and maximum flow. Terminals T_3 and T_4 have a fixed 0 to 10 vdc output signal.

1. Required tools:
   a. $^{1}/_{16}$-in. hex/key wrench
   b. Small flat blade ($^{1}/_{8}$-in.) screwdriver
   c. Digital voltmeter capable of displaying a 0 to 10 vdc range which will display in hundredths of vdc
   d. HSO-5001 Test Leads (optional for meter taps)
2. Remove thermostat cover.
   Thermostat cover is removed by loosening the setscrews on each side of the thermostat. Using a $^{1}/_{6}$-in. hex/key wrench turn the setscrews clockwise until cover is loose.
3. Check voltages.
   Verify 16 vdc between (+) and (–) terminals.

Applications for Dual Duct (Minimum Air From Cold Duct)

Dual duct applications are easily accomplished by connecting two CSP-5001 Series controllers with a dual set point (RA/DA) thermostat, as shown in Fig. 11. In this application, the CSP controllers are mounted separately on the cold and hot deck dampers with each utilizing its own flow sensor. The cold deck utilizes the T_1 signal from the thermostat while the hot deck controller receives its requested flow signal from T_2. Both units can be set independently for minimum and maximum flow settings. In addition, by using the "R" override terminal on the thermostat cold deck, minimum flow can be overridden to zero upon a call for heating (or vice-versa). See Fig. 12 and 13.

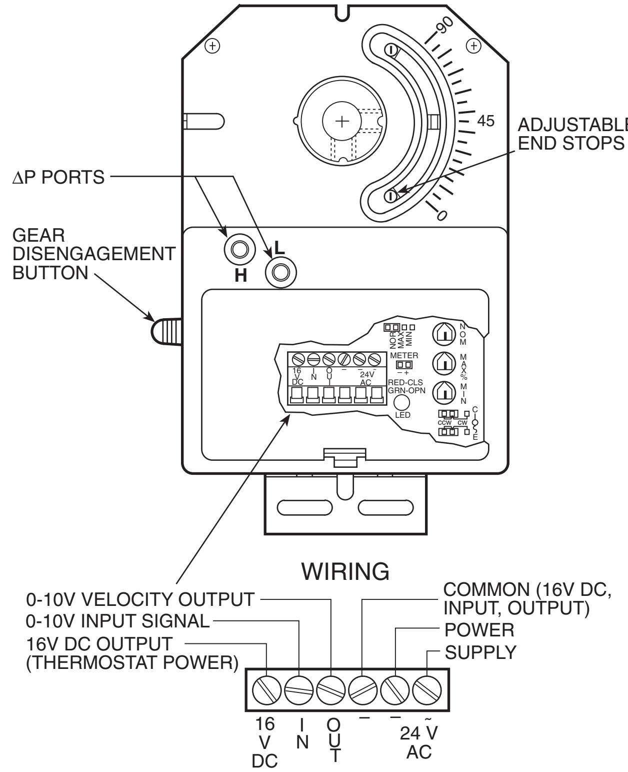


Fig. 10 — CSP-5001 Controller

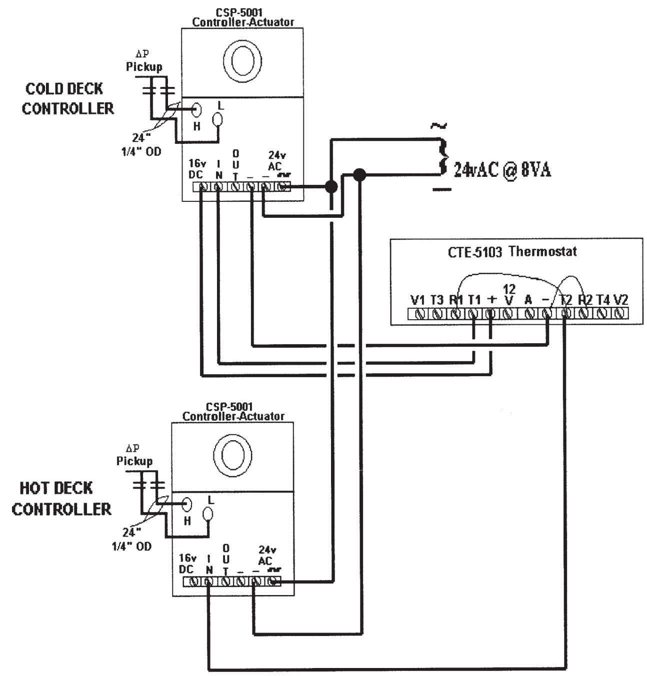
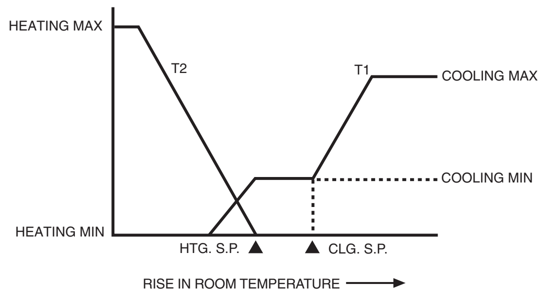
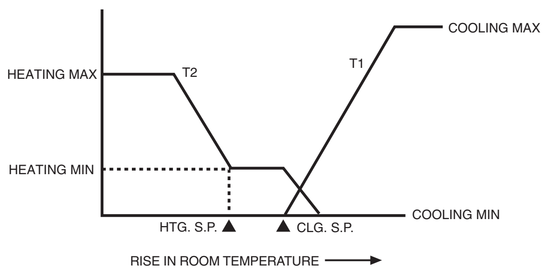


Fig. 11 — Dual Control Connections



*Connect jumper from T2 to R1 to override cooling minimum to zero, upon call for heating. Leave R2 connected to ground.

Fig. 12 — Minimum Air from Cooling



*Connect jumper from T1 to R2 to override heating minimum to zero, upon call for heating. Leave R1 connected to ground.

Fig. 13 — Minimum Air From Heating

Analog Control Troubleshooting

The following troubleshooting guide is directed towards single duct cooling applications, the same concepts can be applied to other configurations.

⚠ CAUTION

ELECTRIC HAZARD

Failure to follow this caution may result in damage to power supply.

Never jumper terminal 16 vdc to "-" terminal, as this would cause a power short and could cause damage to the power supply.

CONTROLLER

1. Verify 24 vac at terminals "~" (phase) and "-" (ground). Tolerance can be –15% to +20% (20.4 to 28.8 vac).
2. Verify 16 vdc at terminals "16 VDC" and "-".
   a. Tolerance is 15.0 to 17.0 vdc power supply to thermostat.
   b. If not correct, disconnect thermostat and recheck. If still incorrect, replace CSP controller.
1. Check requested flow voltage on terminal "IN" and "-".
   a. Use Fig. 5-7 on pages 7-8 to correlate into cubic feet per minute (cfm).
   b. If reading is not what is desired, see the System Calibration of the Linear Averaging Flow Probe section to adjust thermostat.
2. Check actual flow voltage on terminal "OUT" and "-" (for 0 to 10 vdc).
   Use Fig. 5-7 on pages 7-8 to correlate into cfm.
3. Check box movement, damper rotation, etc.
   a. Review requested flow and actual flow parameters above to determine if unit should be satisfied (within 50 fpm) or driving open or closed.
   b. If damper is not moving, verify damper is not stuck or at end of travel. Check rotation jumpers for proper position.
   c. Change requested flow to make unit drive opposite direction. This can be accomplished by moving the set point sliders or 1) and 2) below.
      1). To manually open the box, remove wiring from terminal "IN" and jumper terminal "IN" to terminal "16VDC". This will tell unit to control at 3300 fpm/ full airflow, and the green LED should turn on (and the box should drive open).
      2). To manually close the box, remove wiring from terminal "IN", jumper and "IN" terminal to "-" terminal. This will tell unit to control at zero fpm/no airflow, and the red LED should be on (and the box should drive closed).

NOTE: When using the same transformer for more than one control, the phase and ground must be consistent with each device.

ComfortID™ CONTROLS

Install Sensors and Make Field Wiring Connections

GENERAL

All field wiring must comply with National Electrical Code (NEC) and local requirements. Refer to Tables 8-11 for electrical and wiring specifications.

For information on how to test and balance CCN controls, refer to the 33ZC Installation and Operation Instructions.

⚠ CAUTION

ELECTRIC HAZARD

Failure to follow this caution may result in personal injury.

Disconnect all electrical power before wiring inside the controller. Electrical shock, personal injury, or damage to the zone controller could occur if this caution is not followed.

Wire the control as shown on the control package diagram for the specific installation. Control wiring diagrams can be found inside the control box.

SUPPLY-AIR TEMPERATURE (SAT) SENSOR INSTALLATION

On terminals with heat, the SAT sensor is provided. The sensor is factory-wired to the controller and shipped in the control box. The SAT must be field-installed in the duct downstream from the air terminal. The SAT sensor part number is 33ZCSENSAT. See Table 8 for resistance information.

To install the sensor, proceed as follows:

1. Remove the plug from one of the $^7/_8$-in. openings in the control box and pass the sensor probe through the hole.
2. Drill or punch a $^1/_2$-in. hole in the duct downstream of the unit, at a location meeting the requirements shown in Fig. 14.
3. Using 2 self-drilling screws (supplied), secure the sensor probe to the duct.

The SAT sensor probe is 6 inches in length. The tip of the probe must not touch the inside of the duct. Use field-supplied bushings as spacers when mounting the probe in a duct that is 6-in. or less in diameter.

If the unit is a cooling-only unit, the SAT sensor is not provided and is not required.

For units with hot and cold airstreams, locate SAT sensor probe at least 2 ft downstream (see Fig. 14).

⚠ CAUTION

ELECTRIC HAZARD

DO NOT run sensor wires or relay wires in the same conduit or raceway with Class 1 service wiring.

DO NOT abrade or nick the outer jacket of the cable.

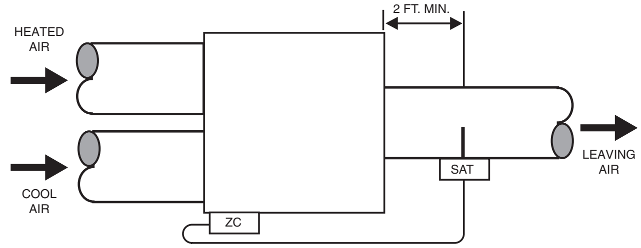
DO NOT pull or draw cable with a force that may harm the physical or electrical properties.

DO NOT bend a cable through a radius sharper than that recommended by its manufacturer.

AVOID splices in any control wiring.

Perform the following steps if state or local code requires the use of conduit, or if your installation requires a cable length of more than 8 ft:

1. Disconnect the sensor cable from the ComfortID zone controller, at the terminals labeled SAT and GND.
2. Mount the sensor to the duct (see steps 2 and 3 in the Supply-Air Temperature Sensor Installation section).
3. Mount a field-supplied 4-in. x 4-in. x 20-in. extension box over the duct sensor.
4. Connect a conduit ($^{1}/_{2}$-in. nominal) to the zone controller enclosure and extension box.
5. Pass the sensor probe through the extension box opening and into the conduit.
6. Reconnect the sensor leads to the zone controller labeled SAT and GND.



LEGEND
SAT - Supply Air Temperature Sensor
ZC - Zone Controller

Fig. 14 — Supply Air Temperature Probe (Part No. 33ZCSENSAT) Locations

Table 8 — Thermistor Resistance vs Temperature Values for Supply-Air Temperature Sensor, Primary Air Temperature Sensor and Space Temperature Sensor

RESISTANCE (Ohms)	TEMP (°F)	RESISTANCE (Ohms)	TEMP (°F)	RESISTANCE (Ohms)	TEMP (°F)	RESISTANCE (Ohms)	TEMP (°F)	RESISTANCE (Ohms)	TEMP (°F)
29481	32	17050	54	10227	76	6340	98	4051	120
28732	33	16646	55	10000	77	6209	99	3972	121
28005	34	16253	56	9779	78	6080	100	3895	122
27298	35	15870	57	9563	79	5954	101	3819	123
26611	36	15497	58	9353	80	5832	102	3745	124
25943	37	15134	59	9148	81	5712	103	3673	125
25295	38	14780	60	8948	82	5595	104	3603	126
24664	39	14436	61	8754	83	5481	105	3533	127
24051	40	14101	62	8563	84	5369	106	3466	128
23456	41	13775	63	8378	85	5260	107	3400	129
22877	42	13457	64	8197	86	5154	108	3335	130
22313	43	13148	65	8021	87	5050	109	3272	131
21766	44	12846	66	7849	88	4948	110	3210	132
21234	45	12553	67	7681	89	4849	111	3150	133
20716	46	12267	68	7517	90	4752	112	3090	134
20212	47	11988	69	7357	91	4657	113	3033	135
19722	48	11717	70	7201	92	4564	114	2976	136
19246	49	11452	71	7049	93	4474	115	2920	137
18782	50	11194	72	6900	94	4385	116	2866	138
18332	51	10943	73	6755	95	4299	117	2813	139
17893	52	10698	74	6613	96	4214	118	2761	140
17466	53	10459	75	6475	97	4132	119		

SPACE TEMPERATURE SENSOR INSTALLATION AND WIRING

The SPT sensor accessory is ordered separately for field-installation. It is installed on interior walls to measure room space air temperature. See Fig. 15-19 and Table 8.

The wall plate accommodates both the NEMA (National Electrical Manufacturing Association) standard and the European 1/4 DIN standard. The use of a junction box to accommodate the wiring is recommended for installation. The sensor may be mounted directly on the wall, if acceptable by local codes.

DO NOT mount the sensor in drafty areas such as near heating or air-conditioning ducts, open windows, fans, or over heat sources such as baseboard heaters or radiators. Sensors mounted in those areas will produce inaccurate readings.

Avoid corner locations. Allow at least 3 ft between the sensor and any corner. Air in corners tends to be stagnant resulting in inaccurate sensor readings.

Sensor should be mounted approximately 5 ft up from the floor, in an area that best represents the average temperature found in the space (zone).

The space temperature sensor cover includes a service jack connector. If wiring connection is made to the service jack, the connector can then be used to connect a network service tool with the Carrier Comfort Network® system.

Before installing the space temperature sensor, decide whether or not the service jack wiring connection will be made. If connection is desired, the CCN communication cable should be available at time of sensor installation, for convenient wiring connections. The cable selected must meet the requirements for the entire network. See page 17 for CCN communication cable specifications.

Install and wire the space temperature sensor as follows:

NOTE: Space temperature sensor will be identified as T55 or T56. Refer to Control Sequence drawings to determine which SPT is part of the particular control package being installed. (The difference between T55 and T56 is that T56 includes set point adjustment capability.)

1. Locate the two Allen type screws at the bottom of the sensor.
2. Turn the two screws clockwise to release the cover from the sensor wall mounting plate.
3. Lift the cover from the bottom and then release it from the top fasteners.
4. Feed the wires from the electrical box through the opening in the center of the sensor mounting plate.
5. Using two no. 6-32 x 1 mounting screws (provided with the sensor), secure the sensor to the electrical box.
6. Use 20 gage wire to connect the sensor to the controller. This size is suitable for distances of up to 500 ft. Use a three-conductor shielded cable for the sensor and set point adjustment connections. The standard CCN communication cable may be used. If the set point adjustment (slide-bar) is not required, then an unshielded, 18 or 20 gage, two-conductor, twisted pair cable may be used. Refer to Table 9.
   The CCN network service jack requires a separate, shielded CCN communication cable. Always use separate cables for CCN communication and sensor wiring. (Refer to Fig. 18 and 19 for wire terminations.)
7. Replace the cover by inserting the cover at the top of the mounting plate first, then swing the cover down over the lower portion. Rotate the two Allen head screws counterclockwise until the cover is secured to the mounting plate and locked in position.
8. For more sensor information, see Table 8 for thermistor resistance vs temperature values.

NOTE: Clean sensor with damp cloth only. Do not use solvents.

Table 9 — Recommended Sensor and Device Wiring

MANUFACTURER	PART NUMBER	
	Regular	Plenum
Belden	8205	88442
Columbia	D6451	—
American	A21501	A48301
Quabik	6130	—
Alpha	1895	—
Manhattan	M13402	M64430

NOTE: Wiring is 20 gage, 2 conductor twisted cable.

WIRING THE SPACE TEMPERATURE SENSOR AND SET POINT ADJUSTMENT SLIDEBAR

To wire the sensor and slidebar, perform the following (see Fig. 18 and 19):

1. Identify which cable is for the sensor wiring.
2. Strip back the jacket from the cables for at least 3 inches. Strip 1/4-in. of insulation from each conductor. Cut the shield and drain wire from the sensor end of the cable.

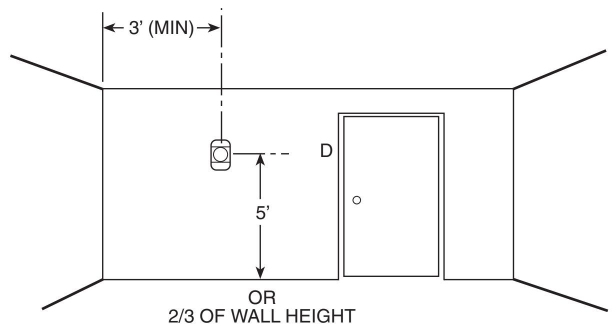


Fig. 15 — Typical Space Temperature Sensor Room Location

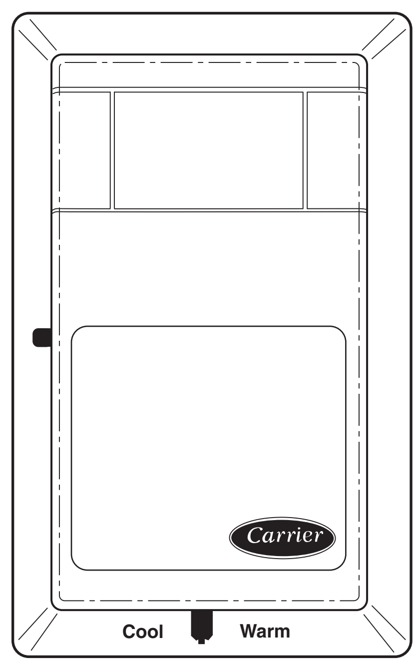
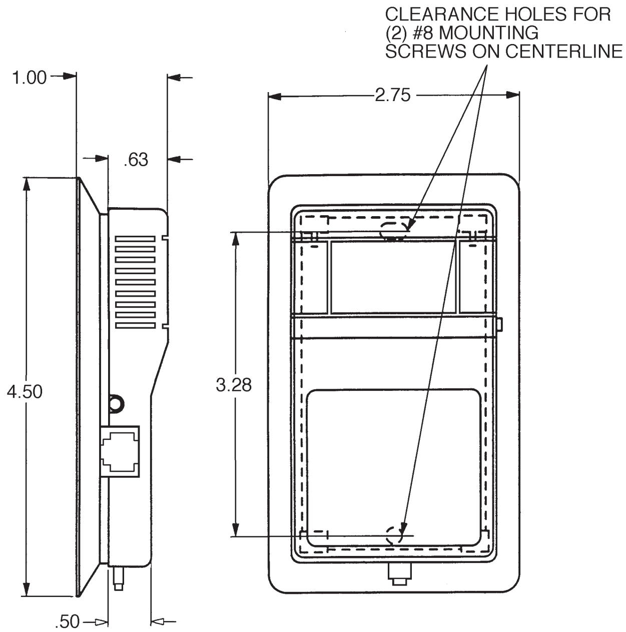


Fig. 16 — Space Temperature Sensor (P/N 33ZCT56SPT Shown)



NOTE: Dimensions are in inches.

Fig. 17 — Space Temperature Sensor and Wall-Mounted Humidity Sensor Mounting

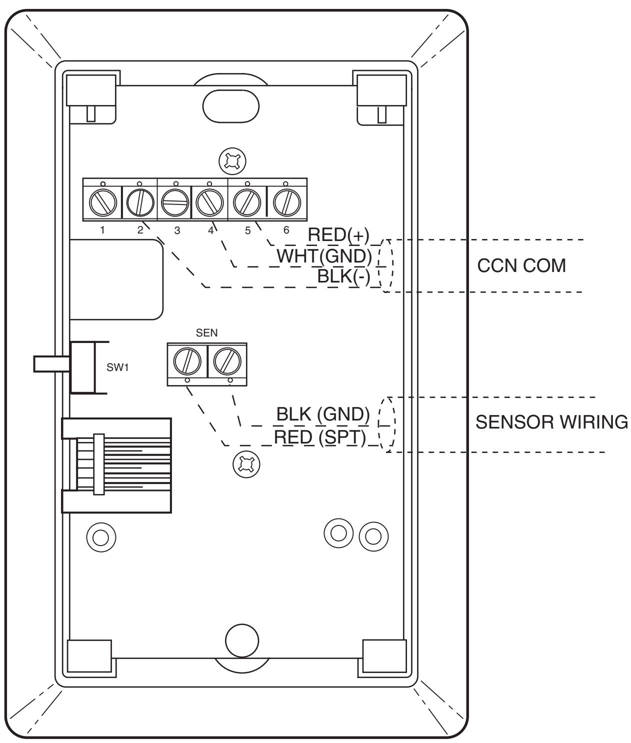


Fig. 18 — Space Temperature Sensor Wiring (33ZCT55SPT)

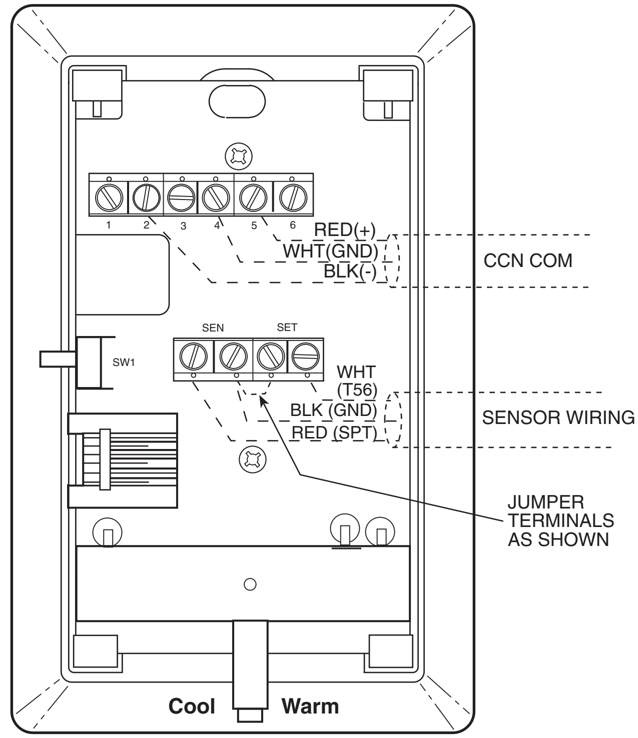


Fig. 19 — Space Temperature Sensor Wiring (33ZCT56SPT)

3. Connect the sensor cable as follows:
   a. Connect one wire from the cable (RED) to the SPT terminal on the controller. Connect the other end of the wire to the left terminal on the SEN terminal block of the sensor.
   b. Connect another wire from the cable (BLACK) to the ground terminal on the controller. Connect the other end of the wire to the remaining open terminal on the SEN terminal block.
   c. For T56 sensors, connect the remaining wire (WHITE/CLR) to the T56 terminal on the controller. Connect the other end of the wire to the right most terminal on the SET terminal block.
   d. In the control box, connect the cable shield to J1-3, equipment ground.
   e. Install a jumper between the two center T56 terminals (right SEN and left SET).

WIRING THE CCN NETWORK COMMUNICATION SERVICE JACK

To wire the service jack, perform the following:

1. Strip back the jacket from the CCN communication cable(s) for at least 3 inches. Strip $^{1}/_{4}$-in. of insulation from each conductor. Remove the shield and separate the drain wire from the cable. Twist together all the shield drain wires and fasten them together using an closed end crimp lug or a wire nut. Tape off any exposed bare wire to prevent shorting.
2. Connect the CCN + signal wire(s) (RED) to Terminal 5.
3. Connect the CCN – signal wire(s) (BLACK) to Terminal 2.
4. Connect the CCN GND signal wire(s) (WHITE/CLR) to Terminal 4.

PRIMARY AIR TEMPERATURE SENSOR INSTALLATION

A primary air temperature (PAT) sensor is used on a zone controller which is functioning as a Linkage Coordinator for a non-CCN (Carrier Comfort Network®)/Linkage compatible air source. The part number is 33ZCSENPAT. See Fig. 20. The sensor is also available as field-supplied accessory.

When used on a zone controller, try to select a zone controller which will allow installation of the PAT sensor in the main trunk, as close to the air source as possible. See Fig. 21.

To mount the PAT sensor, remove sensor cover.

1. Drill a 1/2-in. hole in supply duct.
2. Using field-supplied drill tap screw, secure sensor to duct.
3. Connect sensor to zone controller using field-supplied 2-conductor cable. Refer to Table 9.
4. Use field-supplied wire nuts to connect cable to sensor.
5. At zone controller, connect sensor wires to PAT and GND terminals.

INDOOR-AIR QUALITY SENSOR INSTALLATION

The indoor-air quality (IAQ) sensor accessory monitors carbon dioxide levels. This information is used to increase the airflow to the zone and may also modify the position of the outdoor-air dampers to admit more outdoor air as required to provide the desired ventilation rate. The wall sensor is used to monitor the conditioned space. The sensor uses infrared technology to measure the levels of CO_2 present in the air. The wall sensor is available with or without an LCD readout to display the CO_2 level in ppm and is also available in a combination model which senses both temperature and CO_2 level.

The CO_2 sensors are factory set for a range of 0 to 2000 ppm and a linear voltage output of 0 to 10 vdc. Refer to the instructions supplied with the CO_2 sensor for electrical requirements and terminal locations. The sensor requires a separate field-supplied 24 vac 25 va transformer to provide power to the sensor. The transformer may be mounted in the control box if space is provided (except electric heat units).

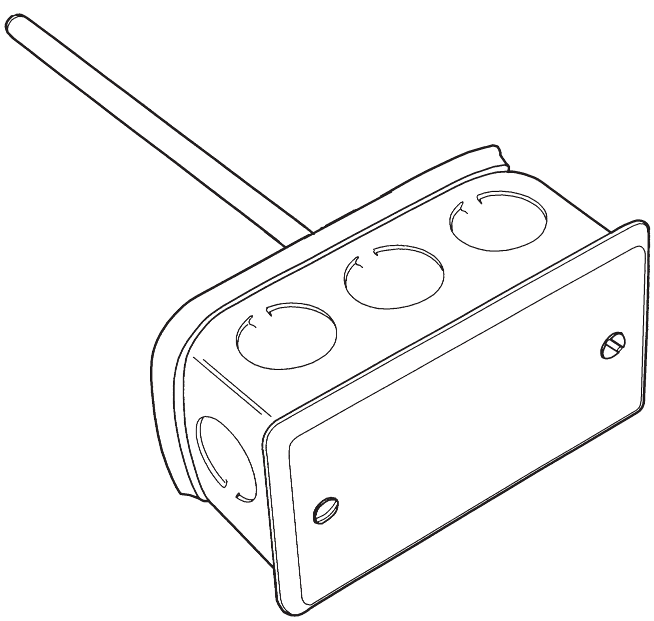


Fig. 20 — Primary Air Temperature Sensor (Part Number 33ZCSENPAT)

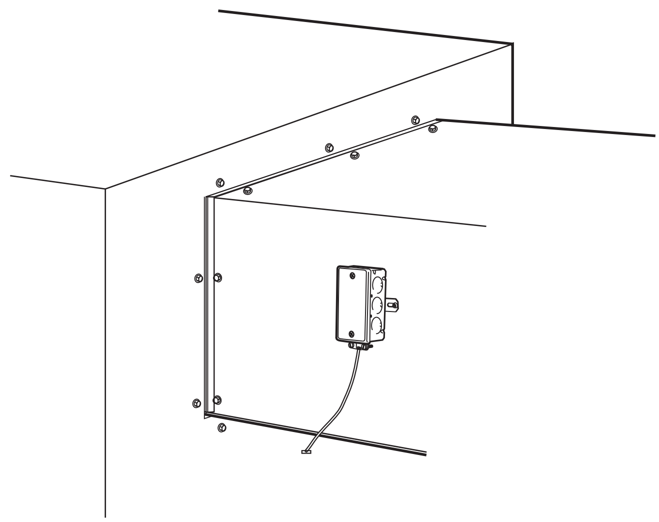


Fig. 21 — Primary Air Temperature Sensor Installation (Air-Handling Unit Discharge Locations)

For factory configuration changes to some models of the sensor, the User Interface Program (UIP) or Sensor Calibration Service Kit is required.

To accurately monitor the quality of the air in the conditioned air space, locate the sensor near the return air grille so it senses the concentration of CO_2 leaving the space. The sensor should be mounted in a location to avoid direct breath contact.

Do not mount the space sensor in drafty areas such as near supply diffusers, open window, fans, or over heat sources. Allow at least 3 ft between the sensor and any corner. Avoid mounting the sensor where it is influenced by the supply air; the sensor gives inaccurate readings if the supply air is blown directly onto the sensor.

To mount the sensor, refer to the installation instructions shipped with the accessory kit.

INDOOR AIR QUALITY SENSOR WIRING

To wire the sensor after it is mounted in the conditioned air space, see Fig. 22-24 and the instructions shipped with the sensor. Use two 2-conductor 20 AWG twisted-pair cables (see Table 9) to connect the field-supplied separate isolated 24 vac power source to the sensor and to connect the sensor to the control terminals. To connect the sensor to the control, identify the positive (+) and ground (GND) terminals on the sensor and connect the positive terminal to the RH/IAQ terminal on the control and connect the ground terminal to terminal GND.

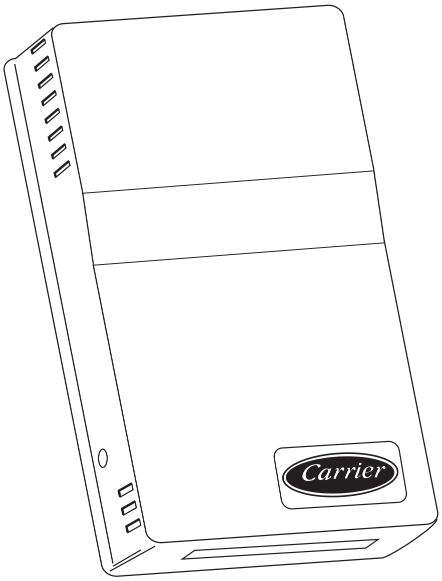


Fig. 22 — Indoor Air Quality Sensor (Wall-Mounted Version Shown) 33ZCSENCO2

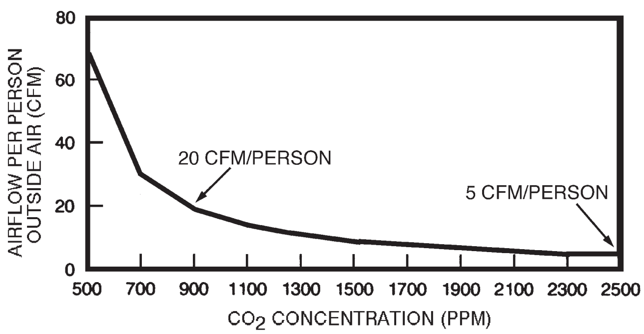


Fig. 23 — Ventilation Rates Based on CO_2 Set Point

HUMIDITY SENSOR (WALL-MOUNTED) INSTALLATION

The accessory space humidity sensor is field-supplied and installed on an interior wall to measure the relative humidity of the air within the occupied space. See Fig. 25.

The use of a standard 2-in x 4-in. electrical box to accommodate the wiring is recommended for installation. The sensor can be mounted directly on the wall, if acceptable by local codes.

If the sensor is installed directly on a wall surface, install the humidity sensor using 2 screws and 2 hollow wall anchors (field-supplied); *do not over-tighten screws*.

⚠ CAUTION

Do NOT clean or touch sensing element with chemical solvents. They will permanently damage the sensor.

The sensor must be mounted vertically on the wall. The Carrier logo should be oriented correctly when the sensor is properly mounted.

DO NOT mount the sensor in drafty areas such as near heating or air-conditioning ducts, open windows, fans, or over heat sources such as baseboard heaters, radiators, or wall-mounted light dimmers. Sensors mounted in those areas will produce inaccurate readings.

Avoid corner locations. Allow at least 4 ft between the sensor and any corner. Airflow near corners tends to be reduced, resulting in erratic sensor readings.

Sensor should be vertically mounted approximately 5 ft up from the floor, beside the space temperature sensor.

For distances up to 500 feet, use a 3-conductor, 18 or 20 AWG cable. A CCN communication cable can be used, although the shield is not required. The shield must be removed from both ends of the cable if this cable is used.

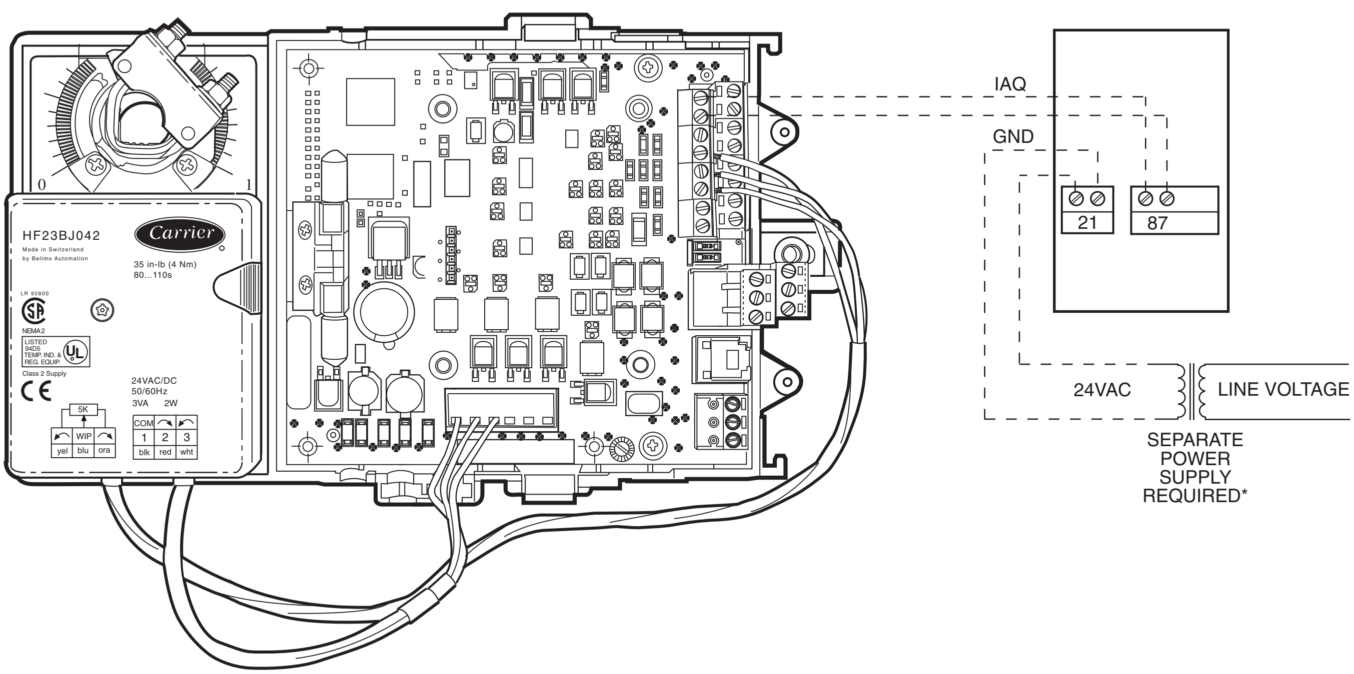


Fig. 24 — Indoor Air Quality Sensor Wiring

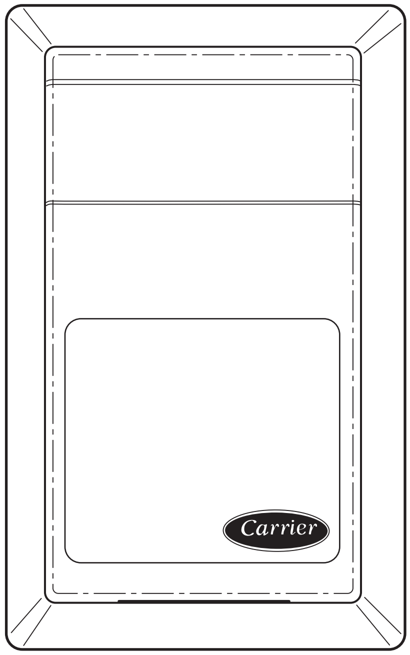


Fig. 25 — Wall-Mounted Relative Humidity Sensor

The power for the sensor is provided by the control board. The board provides 24 vdc for the sensor. No additional power source is required.

To wire the sensor, perform the following:

1. At the sensor, remove 4-in. of jacket from the cable. Strip $^1/_4$-in. of insulation from each conductor. Route the cable through the wire clearance opening in the center of the sensor. See Fig. 26.
2. Connect the RED wire to the sensor screw terminal marked (+).
3. Install one lead from the resistor (supplied with the sensor) and the WHITE wire, into the sensor screw terminal marked (–). After tightening the screw terminal, test the connection by pulling gently on the resistor lead.
4. Connect the remaining lead from the resistor to the BLACK wire and secure using a field-supplied closed end type crimp connector or wire nut.
5. Using electrical tape, insulate any exposed resistor lead to prevent shorting.
6. At the control box, remove the jacket from the cable.
7. Strip $^1/_4$-in. of insulation from each conductor.
8. Connect the RED wire to terminal +24v on the control board.
9. Connect the BLACK wire to terminal GND on the control board.
10. Connect the WHITE/CLEAR wire to terminal RH/IAQ on the control board.

Connect the CCN Communication Bus

The zone controllers connect to the bus in a daisy chain arrangement. The zone controller may be installed on a primary CCN bus or on a secondary bus from the primary CCN bus. Connecting to a secondary bus is recommended.

At 9,600 baud, the number of controllers is limited to 128 zones maximum, with a limit of 8 systems (Linkage Coordinator configured for at least 2 zones.) Bus length may not exceed 4000 ft, with no more than 60 devices on any1000-ft section. Optically isolated RS-485 repeaters are required every 1000 ft.

At 19,200 and 38,400 baud, the number of controllers is limited to 128 maximum, with no limit on the number of Linkage Coordinators. Bus length may not exceed 1000 ft.

The first zone controller in a network connects directly to the bridge and the others are wired sequentially in a daisy chain fashion.

The CCN communication bus also connects to the zone controller space temperature sensor. Refer to Step 3 on page 4 of the installation section for sensor wiring instructions.

COMMUNICATION BUS WIRE SPECIFICATIONS

The Carrier Comfort Network (CCN) Communication Bus wiring is field-supplied and field-installed. It consists of shielded three-conductor cable with drain (ground) wire. The cable selected must be identical to the CCN communication bus wire used for the entire network. See Table 10 for recommended cable.

Table 10 — Recommended Cables

MANUFACTURER	CABLE PART NO.
Alpha	2413 or 5463
American	A22503
Belden	8772
Columbia	02525

NOTE: Conductors and drain wire must be at least 20 AWG (American Wire Gage), stranded, and tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon[1], or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of –20°C to 60°C is required.

CONNECTION TO THE COMMUNICATION BUS

1. Strip the ends of the red, white, and black conductors of the communication bus cable.
2. Connect one end of the communication bus cable to the bridge communication port labeled COMM2 (if connecting on a secondary bus).
3. When connecting the communication bus cable, a color code system for the entire network is recommended to simplify installation and checkout. See Table 11 for the recommended color code.
4. Refer to Fig. 26. Connect the other end of the communication bus cable to the terminal block labeled CCN in the zone controller of the first air terminal. Following the color code in Table 11, connect the Red (+) wire to Terminal 1. Connect the White (ground) wire to Terminal 2. Connect the Black (–) wire to Terminal 3.
5. Connect additional zone controllers in a daisy chain fashion, following the color coded wiring scheme in Table 11.

Table 11 — Color Code Recommendations

SIGNAL TYPE	CCN BUS WIRE COLOR	PLUG PIN NUMBER
+	Red	1
Ground	White	2
–	Black	3

NOTE: The communication bus drain wires (shield) must be tied together at each zone controller. If the communication bus is entirely within one building, the resulting continuous shield must be connected to ground at only one single point. If the communication bus cable exits from one building and enters another building, connect the shields to ground at a lightning suppressor in each building where the cable enters or exits (one point only).

1. Teflon is a registered trademark of Dupont.

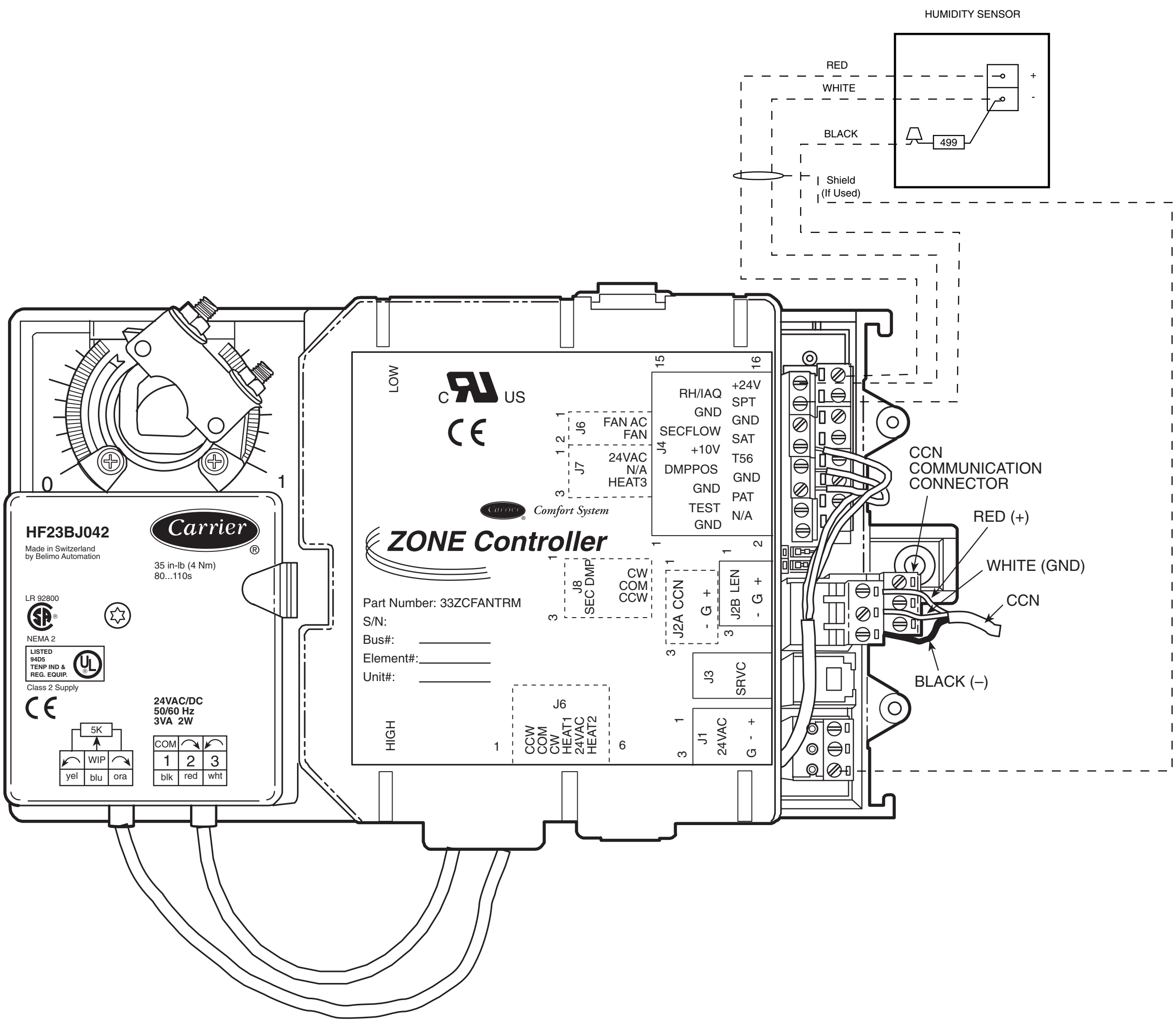


Fig. 26 — Zone Controller Connections

ComfortID™ Controls Start-Up

GENERAL

Air volume delivery to the conditioned space is controlled by the modulating of the primary air damper and the sequencing of the air source supply fan. The controller positions the damper by way of an actuator and turns the fan on and off through linkage for the CCN compatible air source equipment control.

PRIMARY SYSTEM CHECK

1. Check that all controls, control box, and ductwork have been properly installed and set according to installation instructions and job requirements.
2. Check that final filters have been installed in the air-handling apparatus. Dust and debris can adversely affect system operation.
3. Check fan and system controls for proper operation.
4. Check electrical system connections.
5. Check that all air duct connections are tight.
6. See that all balancing dampers at box outlets are in full-open position.

ComfortID CONTROL SYSTEM CHECK

1. Check interconnections between thermostats and unit controls.
2. Force all dampers to control to the maximum cooling cfm using the Building Supervisor, ComfortWORKS®, Network Service Tool or ComfortID Test and Balance Tool software.
3. Set supply-duct balancing dampers, if used, in maximum cool position.
4. Check that the static pressure available at each box is above the minimum required, force all dampers to control to the minimum cooling cfm and verify that the static pressure is below the maximum safe operating limits when the damper is providing minimum cooling airflow.
5. Set air source supply fan speed and duct static pressure regulator to obtain satisfactory static pressure at design airflow.
6. While at peak system load, check system operation and pressures.
7. Check duct pressure at various points in the system. If system static pressure probe has been properly located, pressure at last units of all branch headers should remain essentially the same. If pressure has changed considerably, recheck the supply air static pressure controller or relocate the probe to better sense system pressure changes.

8. Remove all forces and balance each control box zone using through the balancing procedure described on page 10.

CCN System Start-Up

The Building Supervisor, ComfortWORKS®, and the Network Service Tool can aid in system start-up and troubleshooting.

All set-up and set point configurations are factory-set and field-adjustable. Changes are made by using either Building Supervisor, ComfortWORKS or the Network Service Tool. The Network Service Tool can be used as a portable device to change system set-up and set points from a zone sensor or terminal control module. During start-up, the Building Supervisor or the Network Service Tool can also be used to verify communication with each controller.

For specific operating instructions, refer to the appropriate user manual.

ComfortID TEST AND BALANCE TOOL SOFTWARE

The ComfortID Test and Balance Tool software is used for testing each controller if the Network Service Tool or CCN are not available. The ComfortID Test and Balance Tool is compatible with Windows95 and higher and Windows NT4 (with Service Pack Level 3 or better) operating systems.

This software is used for control calibration. It allows for various functions that expedite system checks and testing.

Carrier requires the use of the B&B485CARLP9A Port Powered RS232 to RS485 Converter for proper operation.

The B&B485CARLP9A Port Powered RS232 to RS485 Converter is available through:

B&B Electronics
1500 Boyce Memorial Drive
P.O. Box 1040
Ottawa, IL 61350

Refer to the ComfortID Test and Balance Tool Software Installation and Operation Instructions for additional information.

ComfortID CONSTANT VOLUME DUAL DUCT CONTROL PACKAGE NO. 4160

Dual duct units are designed to provide accurate temperature control while maintaining a constant airflow to the space. A typical application is shown in Fig. 27. Use package no. 4160 with 35L,N units.

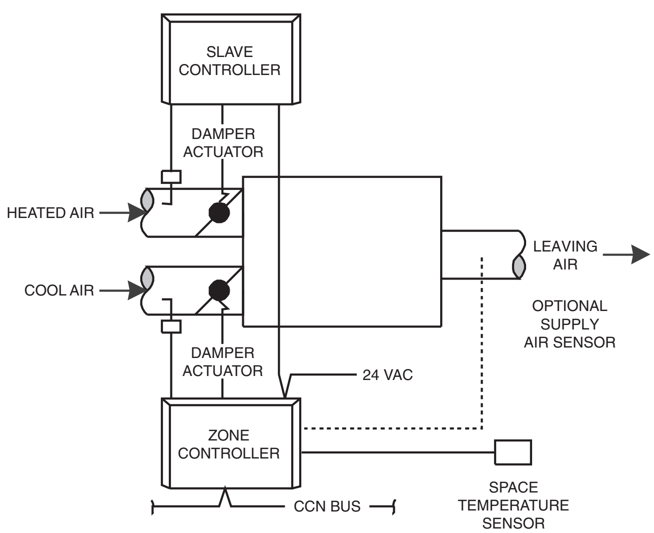


Fig. 27 — Constant Volume Dual Duct Control

ComfortID VARIABLE AIR VOLUME DUAL DUCT WITH CONSTANT MINIMUM COLD DECK AIRFLOW CONTROL PACKAGE NO. 4170

Dual duct units are designed to provide accurate variable air volume (VAV) temperature control in both heating and cooling modes with a minimum amount of energy consumption. Typically system used with this control package provide all the ventilation air though the cold deck only. This control package provides VAV cooling operation and VAV heating with variable air temperature. The control will maintain the minimum cooling airflow set point during heating to provide the required ventilation to the space. A typical application is shown in Fig. 28. Use package no. 4170 with 35N units.

ComfortID VARIABLE AIR VOLUME DUAL DUCT WITH COLD DECK CLOSE-OFF CONTROL PACKAGE NO. 4175

Dual duct units are designed to provide accurate variable air volume (VAV) temperature control in both heating and cooling modes with a minimum amount of energy consumption. A typical system used with this control package provides ventilation air though both the hot and cold decks. This control package provides VAV cooling operation and variable air temperature heating. It will reduce the cold deck (cooling) airflow to zero during maximum heating to eliminate energy waste. A typical application is shown in Fig. 29. Use package No. 4175 with 35N units.

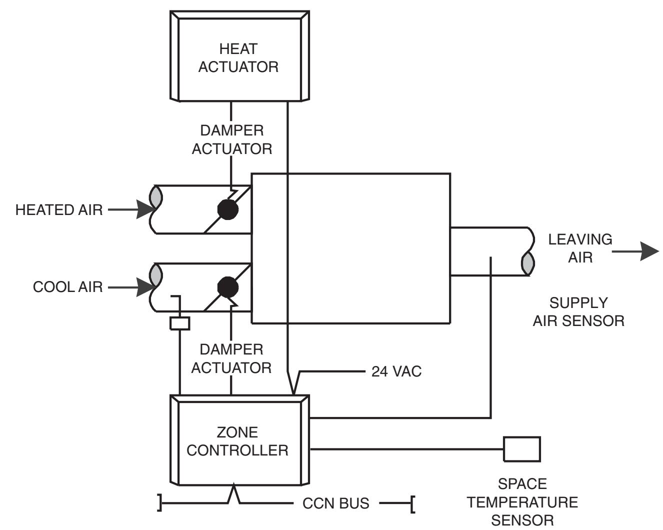


Fig. 28 — VAV Dual Duct with Constant Minimum Cold Deck Airflow Control

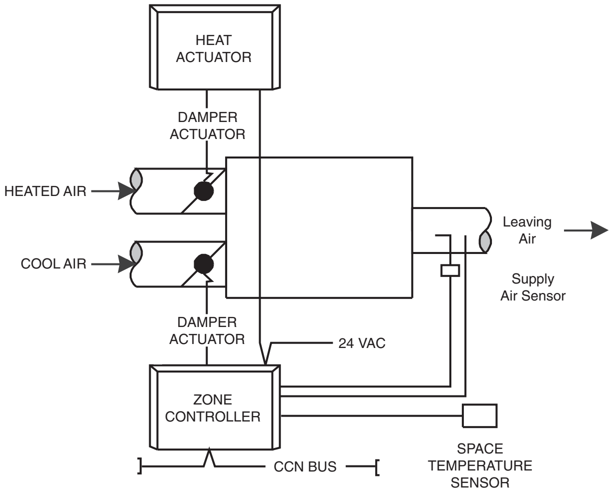


Fig. 29 — VAV Dual Duct with Cold Deck Close-Off Controls

ComfortID VARIABLE AIR VOLUME DUAL DUCT WITH CONSTANT VENTILATION CONTROL PACKAGE NO. 4180

Dual duct units are designed to provide accurate variable air volume (VAV) temperature control with a minimum amount of energy consumption. A typical system used with this control package provides all the ventilation air though a separate outside air system. The ventilation air is conditioned (heated/cooled/dehumidified) as required to provide a neutral temperature. The ventilation air is connected to the hot deck inlet of the terminal. The control package provides VAV cooling operation and constant volume ventilation. It will maintain the ventilation airflow set point at all times to provide the required ventilation to the space. Field-supplied and installed perimeter or ducted heating may additionally be controlled. A typical application is shown in Fig. 30. Use package no. 4180 with 35N units.

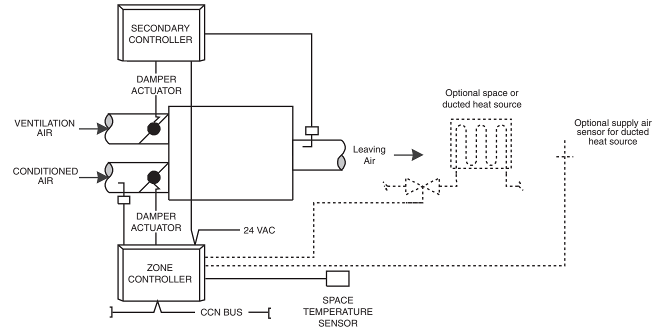


Fig. 30 — VAV Dual Duct with Constant Ventilation Control

ComfortID VARIABLE AIR VOLUME DUAL DUCT WITH DEMAND CONTROLLED VENTILATION CONTROL PACKAGE NO. 4190

Dual duct units are designed to provide accurate variable air volume (VAV) temperature control with a minimum amount of energy consumption. A typical system used with this control package provides all the ventilation air though a separate outside air system. The ventilation air is conditioned (heated/cooled/dehumidified) as required to provide a neutral temperature. The ventilation air is connected to the hot deck inlet of the terminal. The control package provides VAV cooling operation and demand controlled ventilation. It will adjust the ventilation to maintain the required ventilation rate when occupied and maintain at least the minimum base ventilation rate at all times. Field-supplied and installed perimeter or ducted heating may additionally be controlled. A typical application is shown in Fig. 31. Use package no. 4190 with 35L,N units.

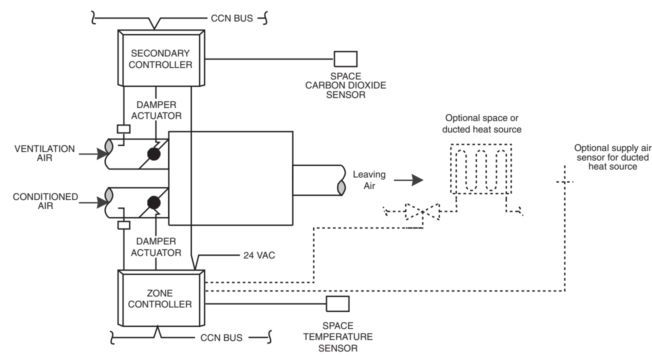


Fig. 31 — VAV Dual Duct with Demand Controlled Ventilation