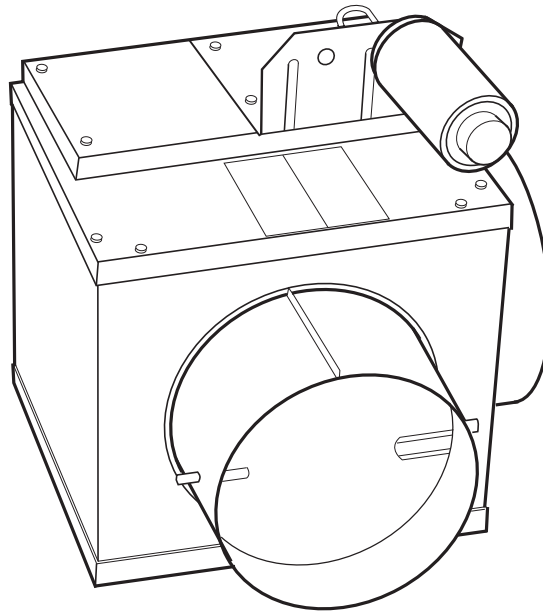




Product Data

35K Bypass Terminal

110 to 4400 cfm



Carrier's 35K bypass air terminal units are flexible and reliable, and achieve high performance.

Carrier's 35K Series bypass terminals offer:

- 20-gage, galvanized steel casing construction
- 1/2 in. thick, dual density fiberglass insulation meeting NFPA 90A and UL 181 safety requirements
- Bypass discharge collar
- Outlet discharge collar
- 5 to 10 psi spring range actuator
- Balancing damper with 0 to 20 psi operation from thermostat signal

The 35K bypass terminal is designed to maintain optimum occupant comfort by varying the amount of cold air supplied to a zone from a constant volume air handler. The 35K unit responds to a thermostat demand for cooling by varying the position of the bypass damper. The damper position determines the quantity of cold air

entering the zone. Excess air is diverted into the ceiling plenum or back to the air handler return duct. The 35K unit allows a constant volume air handler to provide variable air volume to a zone.

The 35K unit is offered in 7 sizes covering an air delivery range up to 4400 cfm. The basic unit is a small diverting box with a single blade diverting damper. The unit's small size ensures an easy fit in all applications.

The unit casing is 20-gage galvanized steel. The 35K unit offers pneumatic and electric control options, with a damper actuator that responds directly to a thermostat output to control room temperature.

During reduced loads, the damper position changes to deflect supply air into the ceiling plenum or return air duct. In this way, the 35K unit allows a constant volume air handler to provide variable air volume to individual zones, increasing the control and comfort of those zones.

Savings result from the elimination of variable speed drives for the air handling system. At reduced zone loads, cool primary air can be returned to the air handler through a plenum or return air duct without experiencing zone heat gains. The lower return air temperature allows the air handler to operate more efficiently.

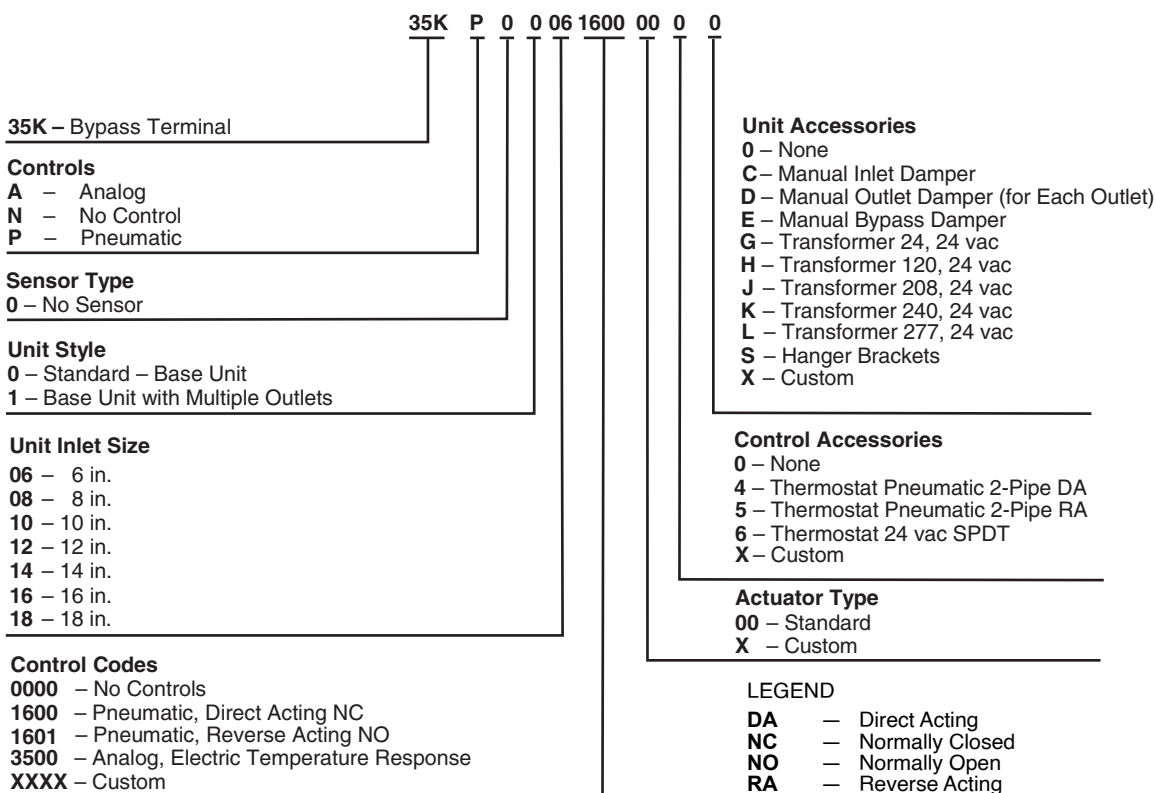
NOTE: The unit's maximum recommended inlet pressure is 0.6 in. wg static pressure.

Designed for easy installation

All inlet collars are round to accommodate standard flex duct sizes. For proper operation, bypass and outlet connection are also round. Supply duct dimensions for 35 Series units are the same as for 45 Series fan-powered boxes, for easy interchangeability.

Standard casing insulation 1/2 in. thick, 1-1/2 lb dual density fiberglass liner meeting UL 181 (Underwriters' Laboratories) and NFPA-90A (National Fire Protection Association) requirements.

Model number nomenclature



35K SIZE	MAXIMUM PRIMARY AIRFLOW (cfm)	MINIMUM PRIMARY AIRFLOW (cfm)	MAXIMUM INLET PRESSURE (psig)	MINIMUM PRESSURE (psig)	
				100% Bypass	0% Bypass
06	500	110	0.6	0.43	0.03
08	900	185	0.6	0.44	0.03
10	1300	290	0.6	0.38	0.02
12	2000	420	0.6	0.43	0.03
14	2500	580	0.6	0.38	0.02
16	3600	740	0.6	0.44	0.03
18	4400	740	0.6	0.41	0.02

Physical data

35K SIZE	UNIT ONLY (lb)	UNIT WITH ACTUATOR/ CONTROLLER (lb)
06	19	23
08	19	23
10	21	25
12	27	31
14	27	31
16	34	38
18	34	38

NOTE: Unit casing is 20 gage.

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Factory-installed options

Control options

The 35K bypass terminal unit is 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 by opening and closing the bypass damper. Stand-alone controls will fulfill the thermal requirements of a given control space. These devices are available in both pneumatic and electronic arrangements. Control offerings are:

35KA: Analog electronic

35KP: Pneumatic

35KN: No control or control field-supplied by others

Analog electronic control arrangement

The damper actuator responds to changes in the thermostat demand. As the room temperature increases, the room thermostat modulates the room damper open and the bypass damper is closed. As the room temperature decreases, the room thermostat modulates the room damper closed and the bypass damper is opened.

All analog electronic control arrangements include a sheet metal enclosure, flow probe, thermostat, and damper actuator and analog controller.

3500: Electric Temperature Responsive

Pneumatic control arrangement

The damper actuator responds to changes in the thermostat demand. As the room temperature increases, the room thermostat modulates the room damper open and the bypass damper is closed. As the room temperature

decreases, the room thermostat modulates the room damper closed and the bypass damper is opened.

All pneumatic control arrangements include a sheet metal enclosure, flow probe, and damper actuator and pneumatic controller. Thermostats are not included as standard.

1600: Pneumatic DA-NC control

1601: Pneumatic RA-NO control

DA: Direct-acting thermostat

RA: Reverse-acting thermostat

NO: Normally open damper position

NC: Normally closed damper position

No control

0000: 35K terminal only (includes electric actuator and controls enclosure)

Multiple outlet attenuator option

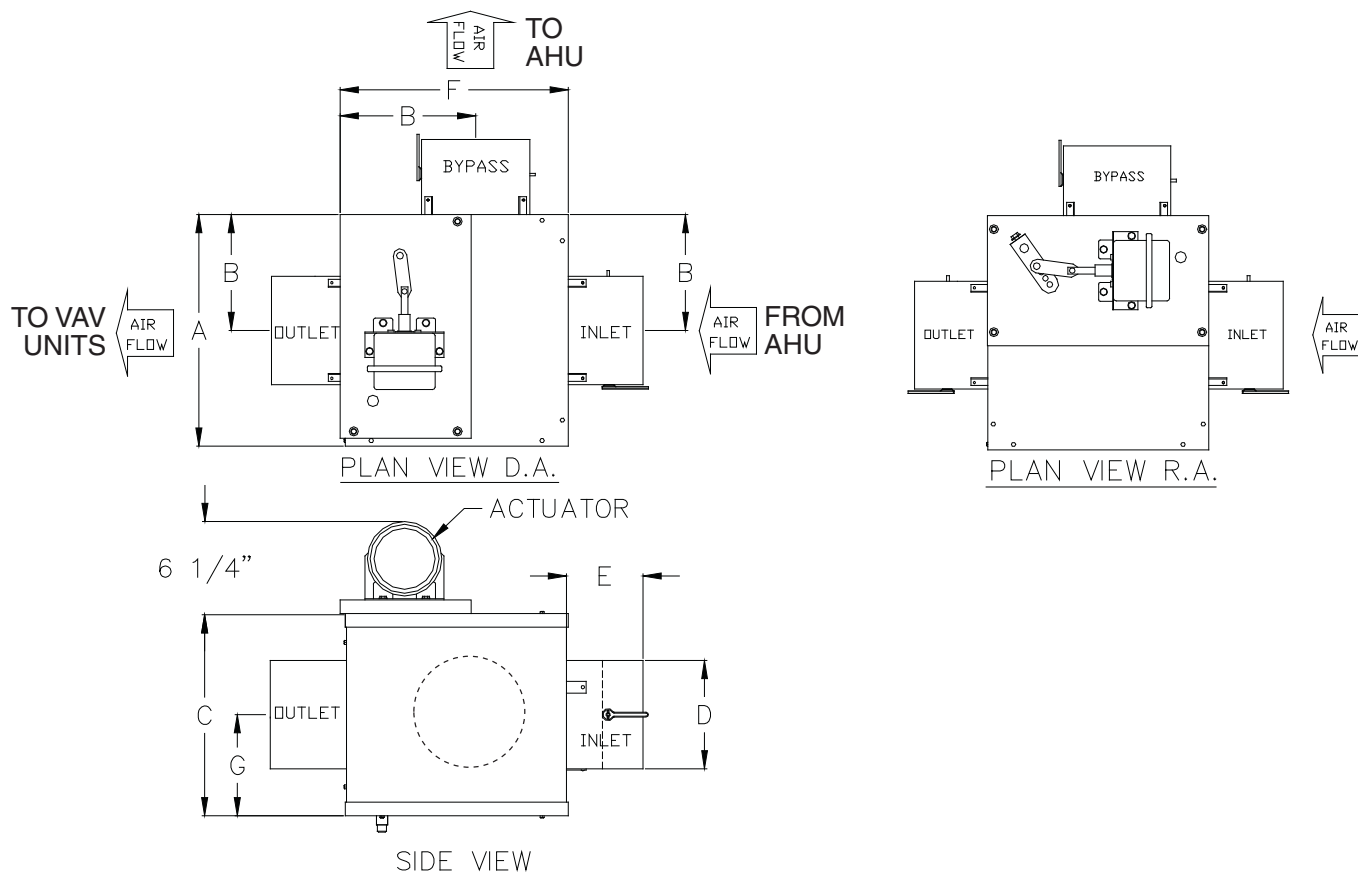
Units may be equipped with an optional multiple outlet attenuator. This offers a factory-installed series of round outlets with manual dampers (optional) in a number of configurations, depending on size.

- Other options
- Manual inlet damper
- Manual outlet dampers (one for each outlet)
- Manual bypass damper
- 24-volt control transformers
- Hanger brackets

Field-installed accessories

- Thermostats for pneumatic terminals
- 24 vac SPDT thermostat for analog electronic terminals

BYPASS TERMINAL WITH PNEUMATIC CONTROLS



INLET SIZE	A	B	C	D	E	F	G
6	12-7/8	7-1/8	11-1/8	5-7/8	4-1/4	12-3/8	5-9/16
8	12-7/8	7-1/8	11-1/8	7-7/8	5-1/4	12-3/8	5-9/16
10	14-7/8	8-1/8	13-1/8	9-7/8	6-1/4	14-3/8	6-9/16
12	18-7/8	10-1/8	17-1/8	11-7/8	7-1/4	18-3/8	8-9/16
14	18-7/8	10-1/8	17-1/8	13-7/8	8-1/4	18-3/8	8-9/16
16	22-7/8	12-1/8	21-1/8	15-7/8	9-1/4	22-3/8	10-9/16
18	22-7/8	12-1/8	21-1/8	17-7/8	10-1/4	22-3/8	10-9/16

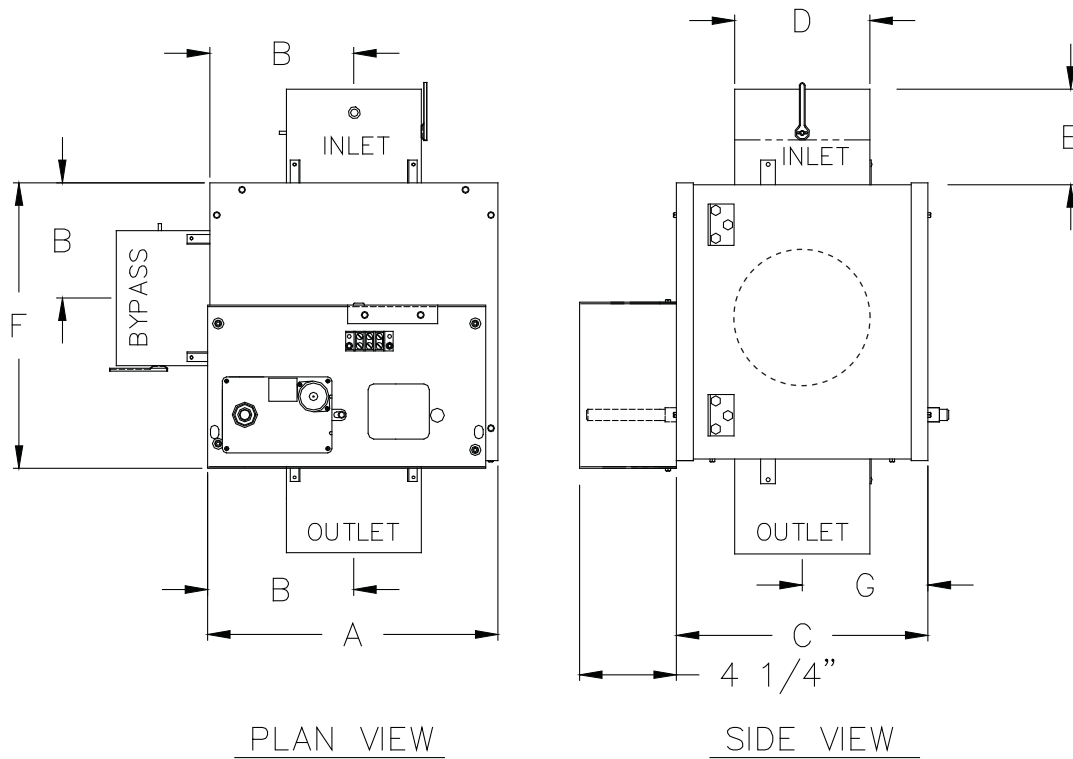
LEGEND

AHU — Air Handling Unit
DA — Direct Acting
RA — Reverse Acting
VAV — Variable Air Volume

NOTES:

1. Dimensions are in inches.
2. 20 gage steel construction.
3. The "D" dimension is the diameter of the inlet, bypass, and outlet connection.
4. The 1/2 in. dual density coated insulation meets NFPA 90A and UL 181.
5. The damper operates on a 0 to 20 psi thermostat signal.
6. Unit may be field-rotated 180 degrees if necessary to have controls located on the bottom of the unit.

BYPASS TERMINAL WITH ANALOG ELECTRONIC CONTROLS

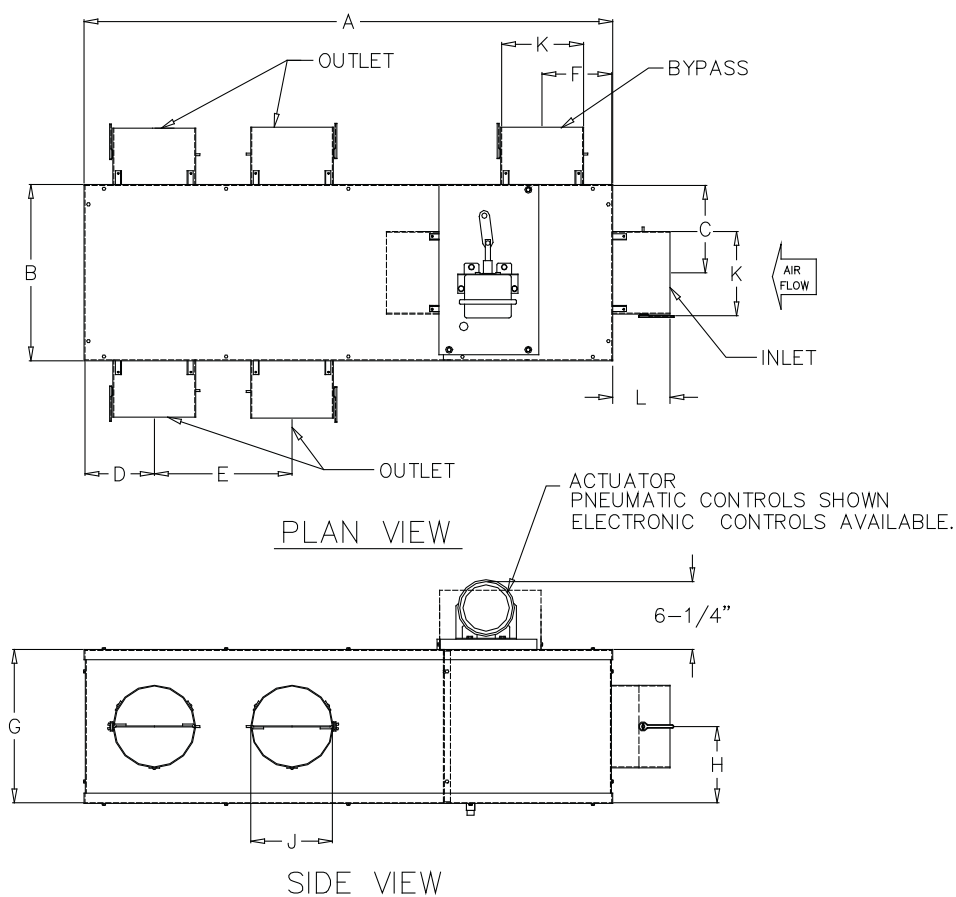


INLET SIZE	A	B	C	D	E	F	G
6	12-7/8	7-1/8	11-1/8	5-7/8	4-1/4	12-3/8	5-9/16
8	12-7/8	7-1/8	11-1/8	7-7/8	5-1/4	12-3/8	5-9/16
10	14-7/8	8-1/8	13-1/8	9-7/8	6-1/4	14-3/8	6-9/16
12	18-7/8	10-1/8	17-1/8	11-7/8	7-1/4	18-3/8	8-9/16
14	18-7/8	10-1/8	17-1/8	13-7/8	8-1/4	18-3/8	8-9/16
16	22-7/8	12-1/8	21-1/8	15-7/8	9-1/4	22-3/8	10-9/16
18	22-7/8	12-1/8	21-1/8	17-7/8	10-1/4	22-3/8	10-9/16

NOTES:

1. Dimensions are in inches.
2. 20 gage steel construction.
3. The "D" dimension is the diameter of the inlet, bypass, and outlet connection.
4. The 1/2 in. dual density coated insulation meets NFPA 90A and UL 181.
5. The damper operates on a 24 volt thermostat signal.
6. Unit may be field-rotated 180 degrees if necessary to have controls located on the bottom of the unit.

BYPASS TERMINAL WITH PNEUMATIC OR ANALOG ELECTRONIC CONTROLS AND MULTIPLE OUTLETS



INLET SIZE	A	B	C	D	E	F	G	H	J	K	L
6	38-3/8	12-7/8	7-1/8	5-1/8	10	5-1/4	11-1/8	5-9/16	5-7/8	5-7/8	4-1/4
8	38-3/8	12-7/8	7-1/8	5-1/8	10	5-1/4	11-1/8	5-9/16	5-7/8	7-7/8	5-1/4
10	44-3/8	14-7/8	8-1/8	6-1/8	12	6-1/4	13-1/8	6-9/16	7-7/8	9-7/8	6-1/4
12	52-3/8	18-7/8	10-1/8	6-1/8	12	8-1/4	17-1/8	8-9/16	7-7/8	11-7/8	7-1/4
14	52-3/8	18-7/8	10-1/8	6-1/8	12	8-1/4	17-1/8	8-9/16	9-7/8	13-7/8	8-1/4
16	56-3/8	22-7/8	12-1/8	7-1/8	14	10-1/4	21-1/8	10-9/16	9-7/8	15-7/8	9-1/4
18	56-3/8	22-7/8	12-1/8	7-1/8	14	10-1/4	21-1/8	10-9/16	9-7/8	17-7/8	10-1/4

NOTES:

1. Dimensions are in inches.
2. 20 gage steel construction.
3. The "D" dimension is the diameter of the inlet, bypass, and multiple outlet connections.
4. The 1/2 in. dual density coated insulation meets NFPA 90A and UL 181.
5. The damper operates on a 0 to 20 psi or 24 volt thermostat signal.

Sound data

The sound level in an occupied space, sound pressure, can be measured directly with a sound meter or estimated from published sound power charts after accounting for room volume and other acoustical factors. Sound level meters measure the sound pressure level at the microphone location. Estimation techniques calculate sound pressure level at a specified point in an occupied space. Measured sound pressure levels in frequency bands can then be plotted and analyzed, and compared with established criteria for room sound levels.

Sound power cannot be measured directly (except by using special acoustic intensity techniques) and is a measure of the acoustical energy created by a source. It is normally determined in special facilities and reported for devices under stated conditions. Sound power level (L_w) values for air terminal devices are usually reported as the sound power level in each of several octave bands with center

frequencies. Sound power levels are given in decibels (dB) referenced to a base power in watts, typically 10 to 12 watts. Sound power levels can also be reported for full or $1/3$ octave bands, but usually as full octave bands, unless pure tones (narrow bands significantly louder than adjacent bands) are present.

Information from AHRI (Air Conditioning & Refrigeration Institute) and ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers) provides guidance in both measuring sound power levels, and in estimating the resultant room sound pressure. Handbooks from ASHRAE provide detailed acoustical guidance. AHRI Standard 885 is an application standard which provides tables and equations for determining acoustical deducts based on the ASHRAE guides, as well as additional information provided by manufacturers.

See Carrier HVAC Acoustical Guidelines, catalog no. 811-449.

35K BYPASS TERMINAL SOUND POWER

INLET SIZE (in.)	FLOW RATE		DISCHARGE SOUND (Bypass Closed)									RADIATED SOUND (Bypass Open)								
			Min ΔPs		0.5 in. wg ΔPs						L _p	Min ΔPs		0.5 in. wg ΔPs						L _p
					Octave Band Sound Power, L _w									Octave Band Sound Power, L _w						
	CFM	L/s	in. wg	pa	2	3	4	5	6	7	NC	in. wg	pa	2	3	4	5	6	7	NC
6	200	94	0.004	1.0	34	31	29	23	18	—	—	0.069	17.2	48	41	37	37	30	20	—
	300	142	0.009	2.2	46	42	39	35	30	23	—	0.155	38.6	59	52	49	49	43	34	23
	400	189	0.016	4.0	54	51	47	43	39	33	—	0.276	68.6	67	60	57	57	52	44	32
	500	236	0.025	6.2	61	57	53	49	45	41	—	0.431	107.3	73	67	63	64	59	51	39
8	300	142	0.003	0.7	31	28	25	20	16	—	—	0.049	12.2	44	36	32	30	24	14	—
	500	236	0.008	2.0	46	42	38	35	31	26	—	0.136	33.8	58	50	47	45	40	31	21
	700	330	0.016	4.0	55	51	47	44	41	37	—	0.266	66.3	67	60	56	55	50	42	31
	900	425	0.026	6.6	63	58	54	52	48	45	—	0.440	109.6	74	67	64	62	58	51	40
10	500	236	0.003	0.8	34	31	27	24	20	13	—	0.056	13.9	46	37	34	31	25	16	—
	700	330	0.006	1.5	44	40	36	34	30	25	—	0.109	27.2	55	47	43	41	36	27	—
	1000	472	0.013	3.1	54	50	46	44	41	37	—	0.223	55.5	65	57	54	51	47	39	28
	1300	614	0.021	5.3	62	57	53	51	48	46	—	0.377	93.8	72	64	61	59	55	48	38
12	800	378	0.004	1.0	38	34	30	29	25	19	—	0.069	17.1	43	34	30	27	21	11	—
	1200	566	0.009	2.2	50	45	41	40	37	34	—	0.155	38.6	57	49	45	42	38	29	—
	1600	755	0.016	4.0	58	53	49	48	46	44	—	0.275	68.5	68	60	56	53	50	41	32
	2000	944	0.025	6.2	65	59	55	54	52	52	21	0.430	107.1	76	68	65	61	59	51	42
14	1000	472	0.003	0.8	36	32	28	27	24	19	—	0.061	15.1	47	37	34	30	25	16	—
	1500	708	0.008	1.9	48	43	39	39	36	33	—	0.136	34.0	58	49	46	41	38	29	—
	2000	944	0.013	3.3	57	52	47	47	45	43	—	0.243	60.4	66	57	54	50	47	39	30
	2500	1180	0.021	5.2	63	58	53	53	51	51	—	0.379	94.3	72	63	61	56	54	46	38
16	1200	566	0.003	0.7	35	31	26	26	23	18	—	0.049	12.2	45	35	32	26	22	12	—
	1800	849	0.006	1.6	47	42	37	37	35	32	—	0.110	27.4	56	46	43	38	34	26	—
	2700	1274	0.014	3.6	58	53	48	49	47	46	—	0.248	61.7	67	58	55	50	47	40	31
	3600	1699	0.025	6.3	67	61	56	57	56	56	24	0.440	109.6	75	66	63	58	56	49	41
18	1600	755	0.003	0.8	37	33	28	28	26	21	—	0.054	13.5	38	36	33	27	23	14	—
	2400	1133	0.007	1.8	49	44	39	40	38	35	—	0.122	30.3	53	48	45	39	36	28	—
	3200	1510	0.013	3.1	57	52	47	48	46	46	—	0.217	54.0	64	56	53	47	45	37	27
	4400	2077	0.024	5.9	66	60	55	57	56	57	23	0.410	102.0	76	65	62	57	55	48	43

LEGEND

- AHRI — Air Conditioning, Heating and Refrigeration Institute
- CFM — Air Volume (cubic feet per minute)
- L_p — Room Sound Pressure
- L_w — Sound Power
- Min ΔP_s — Minimum Static Pressure Required to Achieve Rated Airflow
- NC — ARI 885-98 Test Conditions
- — Indicates an NC Level Less Than 20

NOTES:

1. ΔP_s is the difference in static pressure from inlet to discharge.
2. Sound power levels are in decibels, re: 10^{-12} watts.
3. All sound data is based on tests conducted in accordance with AHRI standard 880-98.
4. Discharge sound power is the noise emitted from the unit discharge. Radiated sound power is the noise emitted from the unit casing.

Refer to the Air Terminal Builder software. Several factors should be considered when selecting bypass units. These include controls, airflow, and acoustics.

Controls

Each control approach offers a variety of operating functions; a control package number identifies combinations of control functions. Also, each control offers pressure dependent, variable air volume control to the zone.

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.

Application data

Airflow range

Carrier bypass units are designed to operate with low-pressure constant volume systems. For best results, a manual balancing damper must be installed upstream of the unit set to provide the maximum zone airflow with the unit damper set 100% to the room. This unit is not a true VAV terminal, and failure to limit the flow upstream of the unit may lead to damper failure. In most cases, inlet duct maximum airflow of more than 1500 fpm should be avoided to prevent possible unit damage. As the unit is not pressure independent, there is no minimum airflow requirement. Design flows less than 400 fpm will likely result in poor room temperature control, however.

System pressure

Control of duct pressures is the most effective means of ensuring low noise levels, accurate flow control, and minimum energy use. The use of various fan-tracking techniques can ensure optimum system efficiency and operation.

Acoustics

The primary determinant in the acoustics of a terminal is the inlet, or duct, static pressure. While velocity (flow rate) is also a factor, significant reductions in sound can be

realized by reducing duct pressures in the branch duct supplying the unit.

Lined duct downstream of the unit is very effective in reducing discharge noise levels. Where no duct lining is employed between the unit and the room diffusers, a noisy system is possible. Reducing inlet pressure drop will help, provided the techniques used to reduce local duct pressure levels do not increase noise levels in the duct that will be carried into the space.

Radiated sound is rarely a problem with bypass terminals. Flexible duct at the inlet, however, can transmit airborne sound levels into the plenum space, where they add to the radiated sound component.

If both the diffuser and the terminal are selected at the same delivered sound power level, the discharge (airborne) sound levels should be combined, by octave band, with the sound power generated by the selected diffuser when predicting sound levels in the space. In many cases, diffusers generate higher frequency sound than the terminal, and the two power levels combine without raising the room NC level. Each application of unit and diffuser must be examined individually to verify that the net NC does not increase. (Equal sound power levels, when added, increase the sound level by 3 dB.)

35K UNIT — APPLICATION ASSUMPTIONS (dB)

AHRI 885-98	OCTAVE BANDS					
DISCHARGE <300 CFM	2	3	4	5	6	7
Environmental Effect	2	1	0	0	0	0
Duct Lining, 5 ft, 8x8x1 in.	2	6	12	25	29	18
End Reflection	9	5	2	0	0	0
Power Division (0 outlets)	0	0	0	0	0	0
5 Ft, 8 in. Flex Duct	6	10	18	20	21	12
Space Effect	5	6	7	8	9	10
Total Attenuation	24	28	39	53	59	40

AHRI 885-98	OCTAVE BANDS					
DISCHARGE 300-700 CFM	2	3	4	5	6	7
Environmental Effect	2	1	0	0	0	0
Duct Lining, 5 ft, 12x12x1 in.	2	4	10	20	20	14
10 in. End Reflection	9	5	1	0	0	0
Power Division (2 outlets)	3	3	3	3	3	3
5 Ft, 8 in. Flex Duct	6	10	18	20	21	12
Space Effect	5	6	7	8	9	10
Total Attenuation	27	29	40	51	53	39

Notes For Sound Data Tables:

Acoustic performance data shown for 35K Series is based on tests conducted in accordance with AHRI Standard 880-98. Data is presented as sound power for the units indicated.

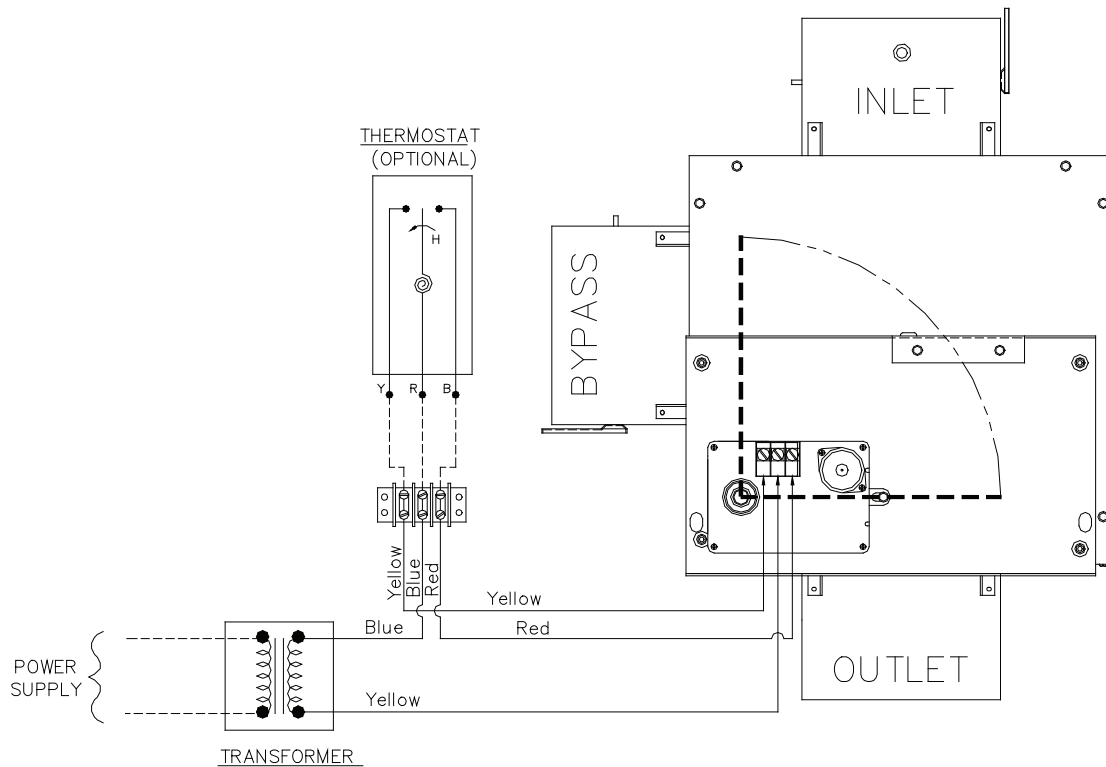
Application sound levels are provided as NC levels. These are determined by applying factors provided in both AHRI Standards 885-98, as indicated above. Lined duct, ceiling

AHRI 885-98	OCTAVE BANDS					
DISCHARGE >700 CFM	2	3	4	5	6	7
Environmental Effect	2	1	0	0	0	0
Duct Lining, 5 ft, 15x15x1 in.	2	3	9	18	17	12
End Reflection	9	5	2	0	0	0
Power Division (3 outlets)	5	5	5	5	5	5
5 Ft, 8 in. Flex Duct	6	10	18	20	21	12
Space Effect	5	6	7	8	9	10
Total Attenuation	29	30	41	51	52	39

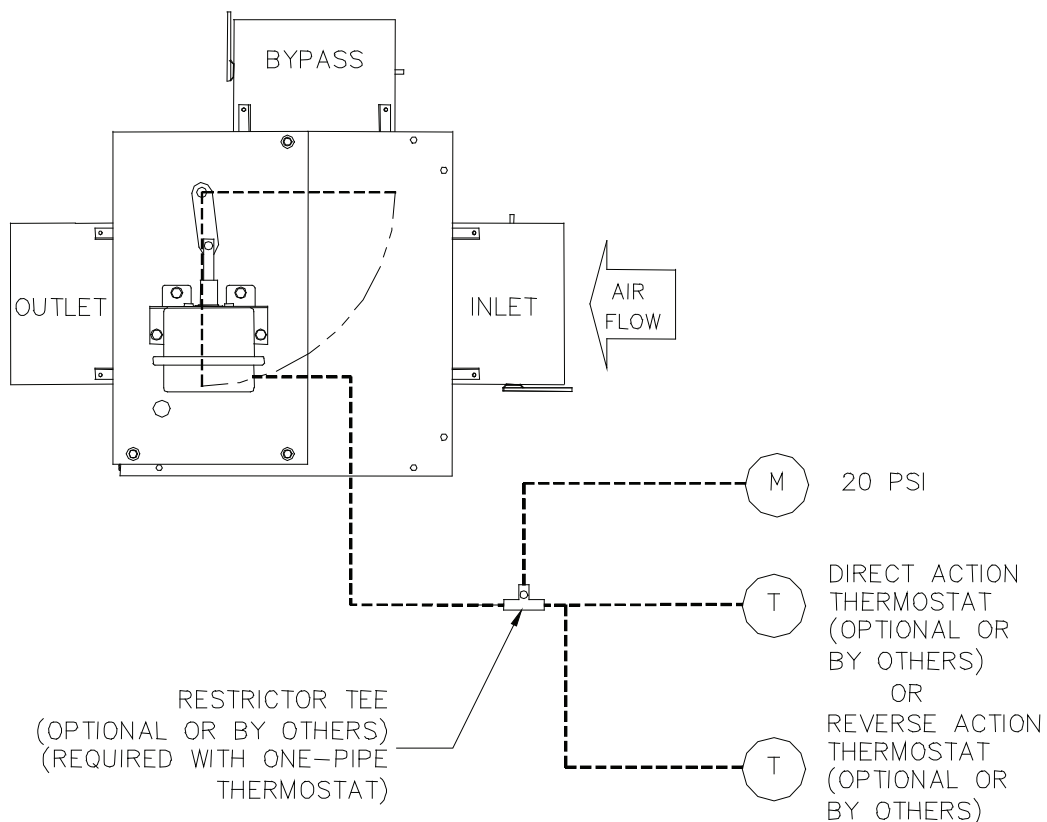
AHRI 885-98	OCTAVE BANDS					
RADIATED	2	3	4	5	6	7
Mineral Tile Space/Ceiling Effect	16	18	20	26	31	36
Environmental Effect	2	1	0	0	0	0
Total Attenuation	18	19	20	26	31	36

effect, and room attenuation are typical for many office spaces. These assumptions, for discharge (airborne) sound, also include a typical end reflection effect. Alternate effects can be examined by using the Air Terminal Builder program or AHRI Standard 885, available at no charge from AHRI's Web page (www.ahri.org). See Carrier's HVAC Acoustic Application Guidelines, catalog no. 811-449.

TYPICAL WIRING - 35KA ELECTRONIC ANALOG ELECTRONIC BYPASS TERMINALS



TYPICAL PNEUMATIC PIPING - 35KP PNEUMATIC BYPASS TERMINALS



Guide specifications

Single Duct VAV Bypass Terminal Unit HVAC Guide Specifications

Size Range: **110 to 4400 cfm**

Carrier Model Number:

35KA (Analog Control)

35KP (Pneumatic Control)

35KN (No Control)

Part 1 — General

1.01 SYSTEM DESCRIPTION:

Variable air volume control box for installation in a ceiling that permits access to the unit. Manufacturer shall supply unit(s) of the design, number, size and performance as shown on equipment drawings and schedules. Unit(s) are for use in conjunction with air distribution manifolds, distribution ductwork and ceiling-mounted diffusers.

1.02 QUALITY ASSURANCE:

Insulation shall meet NFPA-90A requirements for flame spread and smoke generation and UL 181 requirements for anti-erosion, corrosion and fungus properties.

1.03 DELIVERY AND STORAGE:

Units shall be stored and handled per manufacturer's recommendations.

Part 2 — Products

2.01 EQUIPMENT:

A. General:

Factory-assembled, externally powered, bypass terminal. Unit shall be complete with a damper assembly, externally mounted volume controller, collars for duct connection and all required features.

B. Unit Cabinet:

1. Constructed of 20-gage galvanized steel with round inlet, bypass, and discharge collars. All primary air inlet and discharge collars shall accommodate standard flex duct sizes.
2. Insulated with 1/2 in. thick, 1.5-lb equivalent density mat-faced insulation that meets the requirements of UL 181 and NFPA-90A.

C. Damper Assembly:

The control air damper assembly shall be constructed of heavy gage steel with solid shaft rotating in Delrin® bearings. Damper shaft shall be marked on the end to indicate damper position. Damper blade shall operate over a full 90 degrees.

D. Controls:

Units shall have pressure-dependent pneumatic controls, analog electronic controls, or no controls as specified.

E. Special Features:

1. Multiple Outlet Attenuator Option:

Units shall be equipped with an optional multiple outlet attenuator. This option shall offer a factory-installed series of round outlets with manual dampers (optional) in a number of configurations, depending on size.

2. Manual Inlet Damper:

Shall be available for manual adjustment of inlet air flow.

3. Manual Outlet Dampers:

Shall be available for manual adjustment of outlet air flow. Dampers shall be provided for multiple outlets if needed.

4. Manual Bypass Damper:

Shall be available for manual adjustment of bypass air flow.

5. Transformers:

Shall be available for analog electronic terminal units for power connection.

6. Hanger Brackets:

Shall be available for use of ceiling installation of the terminal unit.

7. Pneumatic Control Terminal Unit Thermostats:

Shall be available for use with pneumatic control terminal units.

8. Analog Terminal SPDT Thermostat:

Shall be available for use with analog control terminal units.