



HIGH VELOCITY REHEAT UNITS—ELECTRIC COILS

FOR ALL AIR COOLING and TERMINAL REHEAT



DESIGNED TO:

- Reheat chilled primary air so as to allow the use of a single duct system for year around air conditioning with individual zone control at reasonable cost, in minimum space, and with system simplicity.
- Reduce high velocities and pressures for discharge of the air at conventional low-velocity values.
- Add heat to the primary air in response to the space thermostat.
- Attenuate self-generated and duct air-borne noises.
- Automatically control the volume of air discharge despite system static pressure unbalance.

FEATURES:

- Electric reheat coil . . . open coil for immediate response . . . listed by UL and CSA . . . complete with built-in contactors, high limit and manual reset safety devices . . . conforms with 1965 NEC.
- Slip-in type heater with integral terminal housing . . . Zero clearance construction requires no airspace between heater casing and flammable materials.
- Galvanized steel casing . . . sealed to prevent leakage in excess of 3% of nominal capacity (Per ADC Code 1062R2, nominal capacity is based on 3000 FPM inlet velocity) when all connections are sealed with pressures of eight inches water upstream and one inch water downstream of volume controller.
- Unit is acoustically baffled and insulated with fibrous glass acoustical liner . . . mat faced to prevent air-erosion. Cut edges of liner facing air stream are metal protected against delamination.
- Constant volume controller is of mechanical type operating on principle of pressure conversions in air flowing through unit . . . A minimum of moving parts.
- Controller will maintain air volume within $\pm 5\%$ despite static pressure variations between minimum and six inches water.
- Variable constant volume model . . . Reset motor does not prevent controller from compensating for pressure variations.

CATALOG E-76L

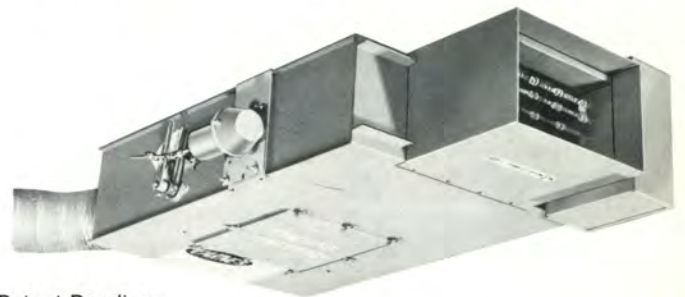
MODEL X CONSTANT VOLUME



Patent Pending

The CFM is factory set per order with actual air flow. The CFM can be reset after installation at any point between 100% and 50% capacity by external dial, after observing the minimum CFM recommended for KW rating.

MODEL W VARIABLE CONSTANT VOLUME



Patent Pending

The quantity of chilled primary air is varied in response to the room thermostat. The motor is adjusted to reset the controller between any two limits within the catalogued capacity range of 100%-50%. (See page 4 for responsibility of motor installation and adjustment.)

The KW of the electric heater is sized according to the lower limit of CFM.

The motor is field connected to operate in sequence with the electric heater's contactor.

When the direct-acting thermostat calls for full cooling, motor has controller set to high CFM and contactor is open.

When thermostat calls for less cooling, motor resets volume controller to maintain a lower flow rate of primary air. Contactor remains open.

When thermostat calls for tempered air, motor adjusts volume controller to minimum primary air and contactor closes to provide heating.

If thermostat and heater are multi-stage, a further call for tempering will close other contactors to provide more heating and the motor maintains the controller at minimum air.

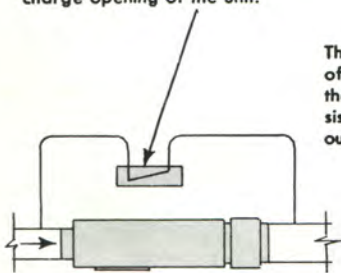
TABLE NO. 1

SIZE	CFM	MIN. SPD.	SPD = 1"		SPD = 2"		SPD = 3"		SPD = 4"		SPD = 6"						
			PWL-NC INDEX	NC	PWL-NC INDEX	NC	PWL-NC INDEX	NC	PWL-NC INDEX	NC	PWL-NC INDEX	NC					
													LINED DUCT	LINED DUCT	LINED DUCT	LINED DUCT	LINED DUCT
0'	5'	0'	5'	0'	5'	0'	5'	0'	5'	0'	5'						
4L	75	0.75	31	23	L	35	27	L	39	31	L	42	34	L	44	36	L
	100	0.75	33	25	L	38	30	L	42	34	L	45	37	L	47	39	22
	125	0.75	35	27	L	40	32	L	44	36	L	47	39	22	50	42	25
	150	1.00	37	29	L	42	34	L	46	38	L	49	41	24	52	44	27
4H	100	0.75	33	23	L	38	30	L	42	34	L	45	37	L	47	39	22
	125	0.75	35	27	L	40	32	L	44	36	L	47	39	22	50	42	25
	150	0.75	37	29	L	42	34	L	46	38	L	49	41	24	52	44	27
	200	1.00	39	31	L	45	37	L	49	41	24	52	44	27	55	47	30
5	175	0.75	34	26	L	38	30	L	42	34	L	44	36	L	46	38	22
	225	0.75	37	29	L	41	33	L	45	37	21	47	39	23	50	42	26
	275	0.75	39	31	L	43	35	L	47	39	23	49	41	25	52	44	28
	350	1.00	40	32	L	45	37	21	49	41	25	51	43	27	54	46	30
6	250	0.75	35	27	L	39	31	L	42	34	L	44	36	21	47	39	24
	325	0.75	38	30	L	42	34	L	45	37	22	47	39	24	50	42	27
	400	0.75	40	32	L	44	36	21	47	39	24	49	41	26	52	44	29
	500	1.00	41	33	L	47	39	24	50	42	27	51	43	28	54	46	31
7	325	0.75	36	28	L	40	32	L	43	35	22	45	37	24	47	39	26
	425	0.75	39	31	L	43	35	22	46	38	25	48	40	27	51	43	30
	525	0.75	41	33	20	45	37	24	48	40	27	50	42	29	53	45	32
	650	1.00	43	35	L	47	39	23	50	42	26	53	45	29	55	47	31
8	425	0.75	37	29	L	41	33	20	44	36	23	46	38	25	48	40	27
	525	0.75	40	32	L	44	36	23	47	39	25	49	41	28	51	43	30
	675	0.75	42	34	L	46	38	22	49	41	25	51	43	27	54	46	30
	850	1.10	44	36	20	49	41	25	52	44	28	54	46	30	56	48	32
9	550	0.75	39	31	22	42	34	25	45	37	28	48	40	31	50	42	33
	700	0.75	42	34	22	45	37	25	48	40	28	51	43	31	53	45	33
	900	0.75	44	36	24	48	40	28	51	43	31	53	45	33	55	47	35
	1100	1.00	45	37	25	50	42	30	53	45	33	55	47	35	57	49	37
10	700	0.75	40	32	21	44	36	25	48	40	29	50	42	31	52	44	33
	900	0.75	43	35	24	47	39	28	51	43	32	53	45	34	56	48	37
	1150	0.75	45	37	26	49	41	30	53	45	34	55	47	36	58	50	39
	1400	1.00	46	38	25	51	43	28	55	47	34	57	49	36	60	52	39
12	1000	0.75	42	34	25	47	39	30	51	43	34	53	45	36	56	48	39
	1250	0.75	45	37	26	50	42	31	54	46	35	56	48	37	59	51	40
	1600	0.75	47	39	28	53	45	34	56	48	37	58	50	39	61	53	42
	2000	1.10	49	41	29	55	47	36	58	50	38	60	52	40	63	55	43

STATIC PRESSURE

SPD = STATIC PRESSURE DROP (inches of water) measured across the inlet and discharge opening of the unit.

The total minimum SP required at the inlet of the ATC unit for the required CFM is the sum of the tabulated SPD plus the resistances of the downstream ductwork and outlets.



SOUND RATINGS

PWL-NC INDEX

indicates the sound power level (PWL) in decibels, re 10⁻¹² watt, radiated from the discharge end of the unit.

By definition, the PWL-NC Index is a single number assigned to the PWL spectrum of a noise source which indicates the minimum NC curve which will not be exceeded in any octave band (when subsequent attenuation is zero).

The NC (Noise Criteria, sound-pressure level in decibels re 0.0002 microbar) which will result in the room served will be less than the tabulated decibels, depending upon:

- a. the attenuation of the system downstream of the unit, due to branches, lined duct and bends, and end reflection, and
- b. the attenuation of the room (RA) due to its acoustical characteristics.

NC values show the noise criteria which will result in the average room (RA = 8 db when PWL is re 10⁻¹² watt) under two conditions:

- .0' is based on no acoustically lined duct between the unit and room outlet, and all the air is discharged from one outlet.
- .5' is based on five feet of acoustically lined duct (1" thick and 1.5 pcf density) between the unit and room outlet, and a maximum of 600 CFM per outlet. Rating "L" means that the NC will be less than 20 db.

Additional attenuation will be provided by more lengths of lined duct, lining of square elbows and tees, and more outlets per ATC unit. For further information see Carnes Catalog 1160 pages 24-27 as well as "Sound Control" in ASHRAE GUIDE & DATA BOOK.

PWL-NC Index values were determined with no lined duct on outlet of unit.

Casing radiation: If units are installed exposed, rather than behind a ceiling or wall, add 3 db to the ratings of PWL-NC Index and of NC with 0'. In this case, the addition of downstream attenuation can effect a maximum decrease of only 3 db since the casing radiation noise will control the resultant room level.

The typical PWL spectra generated by these units has the following shape.

Octave Band	2	3	4	5	6	7	8
db	+4	+6	0	-4	-8	-11	-14

This advises that the spectra are tangent to the NC curves in bands 3, 4 and 5.

Sound tests per ASHRAE Standard 36B-63.

Table 3. HEATER LINE VOLTAGE

CATALOG LETTER	VOLTS
A	120
B	208
C	240
D	277
E	480

Table 4. CONTROL VOLTAGE (CONTACTOR COIL)

CATALOG LETTER	VOLTS
G	24
H	120
J	208
K	240
L	277

TABLE NO. 2

4L		4H		5		6		7		8		9		10		12	
CFM	MAX. KW	CFM	MAX. KW	CFM	MAX. KW	CFM	MAX. KW	CFM	MAX. KW	CFM	MAX. KW	CFM	MAX. KW	CFM	MAX. KW	CFM	MAX. KW
75	0.75	100	1.1	175	2.0	250	2.9	325	3.9	425	4.9	550	6.9	700	8.4	1000	12.4
100	1.1	125	1.5	225	2.7	325	4.0	425	5.3	525	6.4	700	8.9	900	11.5	1250	16.6
125	1.5	150	1.9	275	3.6	400	5.4	525	7.1	675	9.5	900	12.7	1150	16.9	1600	24.0
150	1.8	200	2.7	350	4.9	500	7.4	650	10.0	850	13.2	1100	17.2	1400	22.5	2000	32.8

THERMAL RATINGS

The "Maximum KW" shown in Table #2 for a given CFM assures sufficient air velocity over the electric coil to prevent nuisance tripping of the thermal limit controls. These conservative values are based on the inlet air temperature being below 78°F. This maximum should be observed since one of the limit controls required by the 1965 NEC must be a manual-reset type.

The KW required to provide the desired temperature rise in the specified CFM is determined by:

$$KW = \frac{BTUH}{3413} = \frac{1.08 \times CFM (T_L - T_E)}{3413}$$

Example: To heat 675 CFM from 55°F to 85°F in a size 8 unit, requires a heater capacity of:

$$\frac{1.08 \times 675 (85-55)}{3413} = 6.4 \text{ KW}$$

Table #2 shows that the KW can be as high as 9.5 KW. So, the proper capacity to order would be 6.5 KW.

Table #5 AVAILABLE HEATER CAPACITIES
From 0.50 KW to 5.0 KW in 0.25 KW increments

" 5.5	" 10	" 0.5	"
" 11	" 20	" 1.0	"
" 22	" 32	" 2.0	"

ELECTRICAL RATINGS

Heater Line Voltage

Standards are 120 V, 208 V, 240 V, 277 V, & 480 V. Voltages within ± 10% of standard will be furnished using the closest standard voltage rating.

Upon special request, specific non-standard voltage ratings are available.

Phase of Operation

Single phase is available for all voltages. Three phase is available in 208 V, 240 V, & 480 V. Heaters supplied for three phase operation will be delta or wye connected at factory option to provide for balanced loads at all times.

Staging

To comply with the NEC limit of 40 amperes per circuit, heaters will be standardly supplied staged (with one built-in magnetic contactor per circuit) according to the following schedule:

Volts	Maximum KW per Stage	
	1φ	3φ
120	4.8	Not applicable
208	8.3	14.4
240	9.6	16.6
277	11.0	Not applicable
480	19.2	33.2

Thus, a 10 KW heater for 240 V will be supplied with two stages if it is ordered for 1φ and with one stage if it is ordered for 3φ.

Upon special request a greater number of stages, up to a maximum of four stages is available.

Control Voltage

Standards are 24 V, 120 V, 208 V 240 V. & 277 V.

HEATER CONSTRUCTION

High nickel chrome alloy resistance wire, heliarc welded to terminals for solid, low-resistance joints . . . Steatite ceramic insulators firmly supported by nickel plated racks to prevent shifting . . . Aluminized steel housing for heater and controls . . . Listed by Underwriters' Laboratories, Inc. and Canadian Standards Association.

1965 NATIONAL ELECTRIC CODE AND INSTALLATION REQUIREMENTS

a. Code Section 422-56(b) requires that each heater be provided with an approved temperature limiting control to de-energize the circuit.

Each Carnes heater is provided with a built-in auto-reset limit switch in series with the holding coils of the built-in primary magnetic contactors.

b. Code Section 422-56(c) requires, in addition, a supplementary independent control to prevent overheating. This device must be manually resettable or replaceable.

Each Carnes heater is provided with a built-in manual-reset limit switch set to operate at 20°F above the auto-reset limit switch. The manual-reset switch must be connected in series with the holding coil of a secondary magnetic contactor which is supplied on the jobsite by others.

c. Code Section 422-27(e) requires that a heater rated in excess of 40 amperes shall have the heating elements subdivided so that all subdivisions are rated at 40 amperes or less.

Each Carnes heater is factory prewired and staged to meet this requirement.

It also requires that each subdivision must be protected by an overcurrent protective device rated at no more than 50 amperes.

Each circuit must (unless the heater draws less than 40 amperes total) be provided with a fuse or circuit breaker supplied on the jobsite by others. To facilitate the connections, Carnes heaters are provided with one set of line terminals for each circuit.

d. The heater and fan must be wired so that the heater cannot operate unless the fan is on. This is accomplished by interlocking the heater with the blower system. Do not use a fan delay.

SPECIAL REQUEST FEATURES

Remote Control Installation

Upon special request, heaters will be provided *less* the primary magnetic contactors. In such case the contactors are to be supplied on the jobsite by others. Heaters will be prewired to comply with the 40 ampere per circuit requirement.

Built-In Secondary Contactor

Upon special request, the secondary contactor required to meet NEC Section 422-56(c) can be supplied built into the terminal housing. This may require an increase in the size of the housing.

Built-In Fusing

Upon special request, the supplemental fusing required by NEC Section 422-27(e) can be supplied built into the terminal housing. This may require an increase in the size of the housing.

Control Circuit Transformer

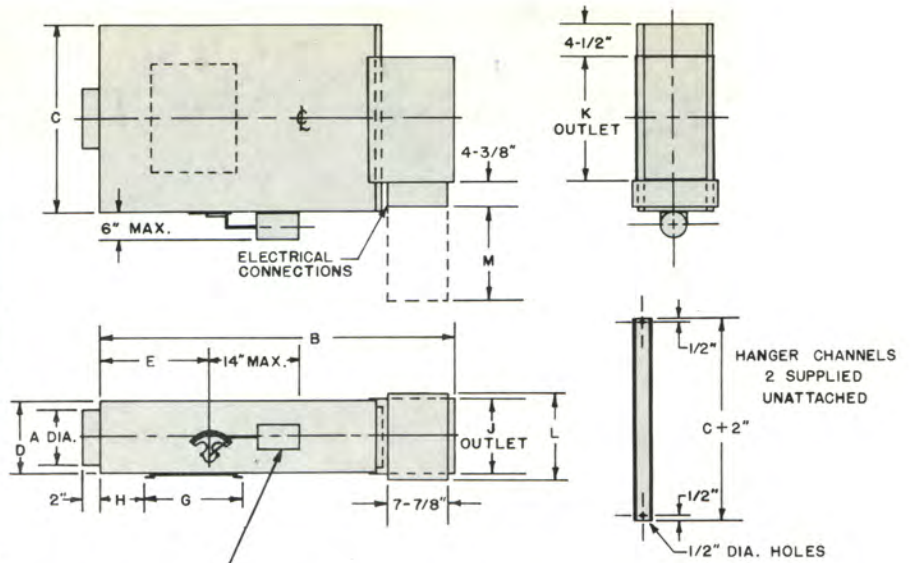
Upon special request a transformer can be supplied built inside the terminal housing to step down the voltage from heater line voltage to one of the standard control voltages listed above. This may require an increase in the size of the housing.

75-2000 CFM

	UNIT SIZE NUMBER							
	4	5	6	7	8	9	10	12
	DIMENSIONS, INCHES							
A	4	5	6	7	8	9	10	12
B	36	41	45	49	53	61	63	65
C	17	21	23	25	27	30	32	35
D	7 3/4	7 3/4	8 3/4	9 3/4	10 3/4	11 3/4	12 3/4	14 3/4
E	8 1/2	11 1/8	11 1/8	12 1/8	12 3/4	15 5/8	16 1/4	17 3/8
G	10 1/2	13 1/2	13 1/2	13 1/2	13 1/2	18	18	18
H	4	5 1/2	6 1/4	7	7 1/2	8 1/2	9 1/4	10 1/2
J	7 7/8	7 7/8	8 7/8	9 7/8	10 7/8	11 7/8	12 7/8	14 7/8
K	8	12	14	16	18	21	23	26
L	10	10	10	12 7/8	12 7/8	12 7/8	15 3/4	15 3/4
M*	8 1/2	12 1/2	14 1/2	16 1/2	18 1/2	21 1/2	23 1/2	26 1/2

*M-CLEARANCE NEEDED TO REMOVE HEATER

Heater terminal housing is shown on right hand side. Left hand may be ordered. Reversible in field.



Motor for reset of volume controller to be provided by control contractor. Must be provided with adjustable stops to limit rotation of controller shaft to any maximum and minimum positions within 90°.

Model W unit is shown. Model X is same except it does not have motor mounting.

CATALOG NUMBERING SYSTEM

Mechanitrol Reheat
End Discharge Ceiling Model
Electric Coil
W = Variable Constant Volume
X = Constant Volume

KW

Heater Volts (See Table 3)

Heater Phase (1 or 3)

Control Volts (See Table 4)

W 4H-2.25 C 1 H L

Unit Size: 4L, 4H, 5, 6, 7, 8, 9, 10, 12

Hand of Electric Control
L = Left Hand
R = Right Hand

TEMPERATURE CONTROLS: Temperature controls are furnished by the control contractor. Pneumatic motors for variable constant volume units will be installed at the Carnes factory. If electric motors are specified they will be field installed and adjusted by the control contractor.

SUGGESTED SPECIFICATIONS FOR CARNES MECHANITROL REHEAT ATC UNIT

TERMINAL REHEAT UNITS: Units shall be Carnes high velocity acoustic terminal control units.

Capacities: Each unit shall deliver the air capacity specified on the mechanical drawings with inlet velocity not in excess of 2600 fpm and with minimum static pressure drop not in excess of 1.1 inches water. The specified CFM shall be within the cataloged limits of the unit, and the low limit shall be not greater than 50% of the high limit. Units shall have cataloged performance ratings for CFM, static pressure drop, electrical characteristics, and sound power level (PWL-NC Index) in decibels re 10⁻¹² watt.

Temperature Control: An electric reheat coil shall be provided to heat the primary supply air to required room conditions. Heater shall be controlled by thermostat supplied and installed by the temperature control contractor.

Reheat Coil: The electric heater shall be listed by UL and CSA for duct heater application. Heater shall be of slip-in type removable from side of unit. Hand of terminal housing shall be reversible in the field. Construction shall include nickel chrome alloy resistance wire, ceramic insulator, nickel plate racks and aluminized steel housings.

Constant Volume Controller: Controller shall be self-contained and maintain air volume within 5% despite inlet static pressure variations between minimum and 6 inches water.

Controller shall be factory set with air flow for CFM and shall have an exterior CFM dial and adjustment shaft to allow re-setting to any CFM within the limits specified under "Capacities" above. The complete range of adjustment shall be obtainable within less than one complete revolution of adjustment shaft. The controller shall be integral with the unit's access cover.

Casing: Casing shall be of galvanized steel construction, sealed to prevent leakage in excess of 3% of nominal capacity (based on 3000 FPM inlet velocity) when all connections are sealed against pressure of 8 inches water upstream, and 1 inch water downstream, of volume controller.

Attenuation and Insulation: The interior of the casing and baffles shall be covered with 1 inch thick mat-faced fibrous glass acoustical liner with cut edges covered so no raw edges face the air flow.

Variable Constant Volume: Where specified, units shall be equipped with a motor to adjust the volume controller to operate at any CFM between the high and low limits specified on the drawings. The combination shall be such that the motor does not prevent the controller from compensating for pressure variations. The motor shall be furnished by the temperature control contractor. Pneumatic motors will be factory installed by the terminal unit manufacturer. Electric motors will be field installed and adjusted by the control contractor.



HIGH VELOCITY REHEAT

WITH MANUAL BALANCING VALVE

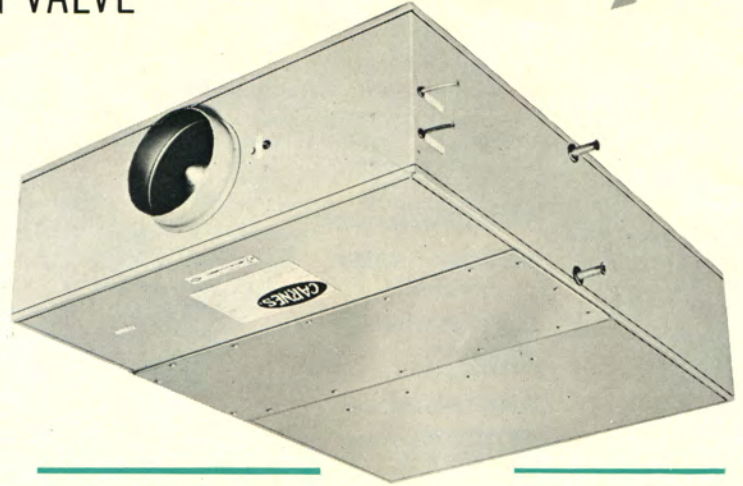


The Carnes High Velocity Reheat ATC Unit is designed to:

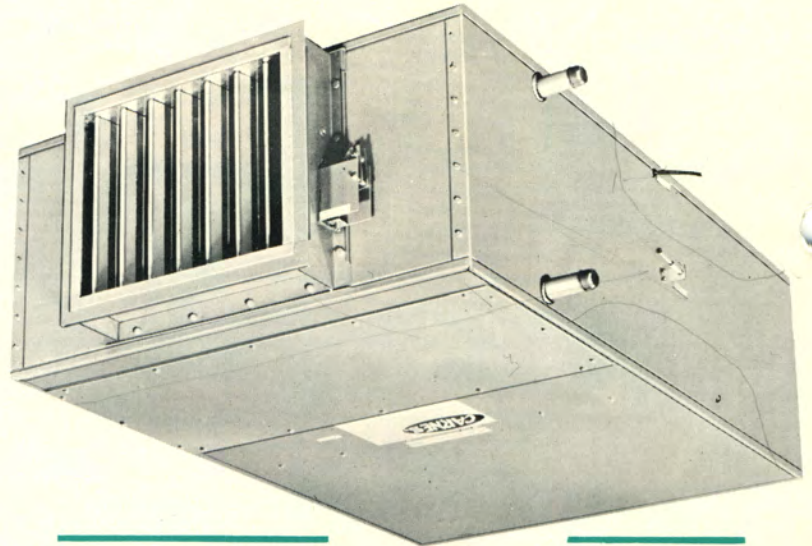
1. Reheat chilled primary air so as to allow the use of a single duct system for year around air conditioning with individual zone control at reasonable cost with maximum system simplicity, and in minimum space.
2. Assure continuous air motion in the conditioned space for proper ventilation and odor dilution at all times.
3. Add heat to the primary air in response to the space thermostat and water or steam valve.
4. Reduce high velocities and pressures for discharge of the air at conventional low velocity values.
5. Provide for easy field balancing by means of inlet valve and calibration chart on which is plotted CFM versus unit's internal pressure drop.
6. Attenuate self-generated and duct air-borne noise.
7. Provide above functions within a factory built, tested and performance-rated unit.

FEATURES:

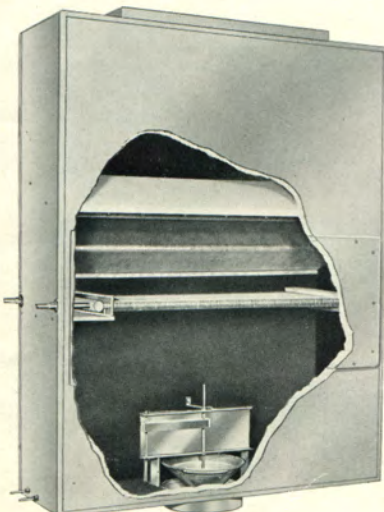
- Reheat coil . . . for steam or hot water . . . available in one row or two rows . . . seamless copper tubing mechanically bonded in corrugated aluminum plate fins . . . external water or steam connections.
- Choice of bottom or end discharge.
- External valve adjustment for easy initial balancing, or rebalancing in event of revision of load requirements.
- Calibrated sensing tips for attachment of manometer to measure CFM.
- Acoustically baffled and lined with fibrous glass liner, mat faced to prevent air erosion.
- Balancing valve will adjust to complete blank off.
- Access door to coil.
- Galvanized steel casing.



75 to 1800 CFM . . . Six sizes for ceiling mounting . . . Circular inlets . . . Bottom or end discharge.

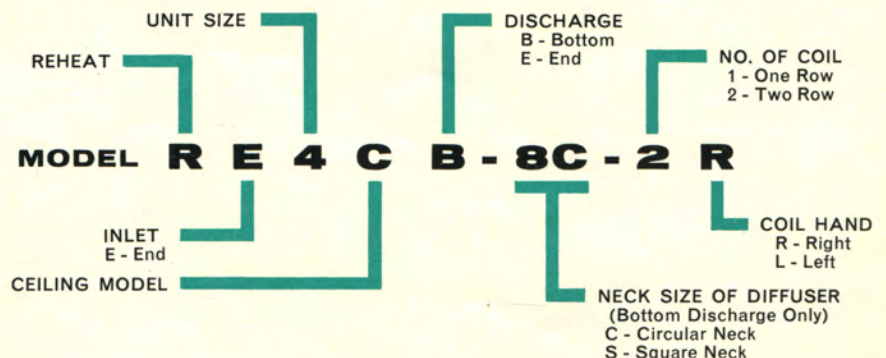


1000 to 4000 CFM . . . Three sizes for ceiling mounting . . . Rectangular inlets . . . End discharge.



CUTAWAY VIEW OF REHEAT ATC UNIT, CIRCULAR INLET

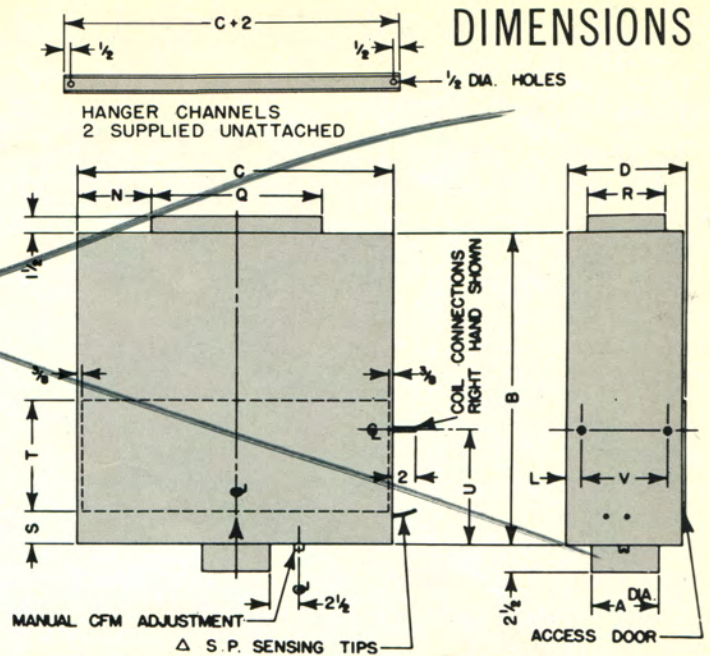
CATALOG NUMBERING SYSTEM



75-1800 CFM END DISCHARGE

	UNIT SIZE NUMBER					
	3C	4C	5C	6C	8C	10C
DIMENSIONS INCHES						
A	3	4	5	6	8	10
B	23	26	30	37	48	56
C	22	25	28	33	36	38
D	7½	7½	8½	9	12½	15
L	1½	1½	1½	1½	1½	1½
N	6½	6	6½	6	6½	6½
Q	9	13	15	21	23	25
R	6	6	7	7	10	13
S	3¾	4¼	5	8	12½	14¾
T	10¾	11¾	11¾	11¾	13¾	13¾
U	10⅞	10⅞	11⅞	15½	20¼	21⅞
V	5	5	6	6¼	10	12½
1 Row*	½	½	½	½	¾	¾
2 Row*	½	½	½	¾	¾	¾

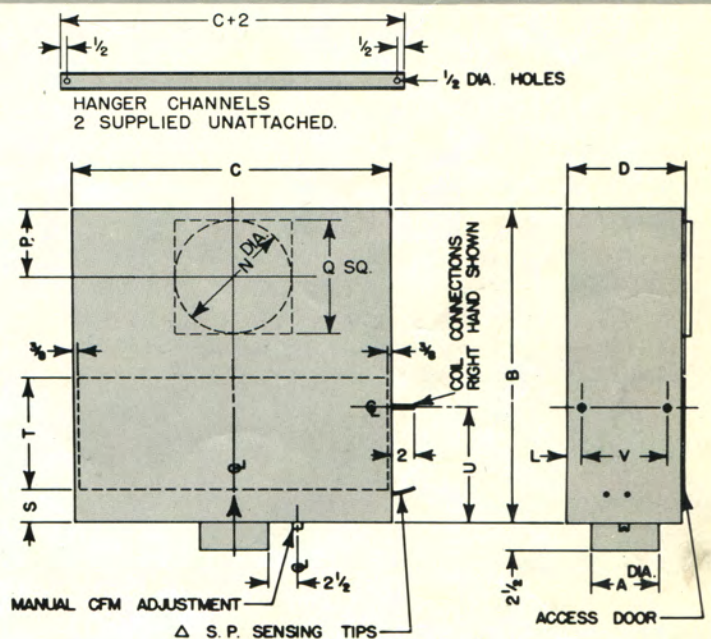
*O.D. SIZE OF COIL CONNECTION



75-1800 CFM BOTTOM DISCHARGE

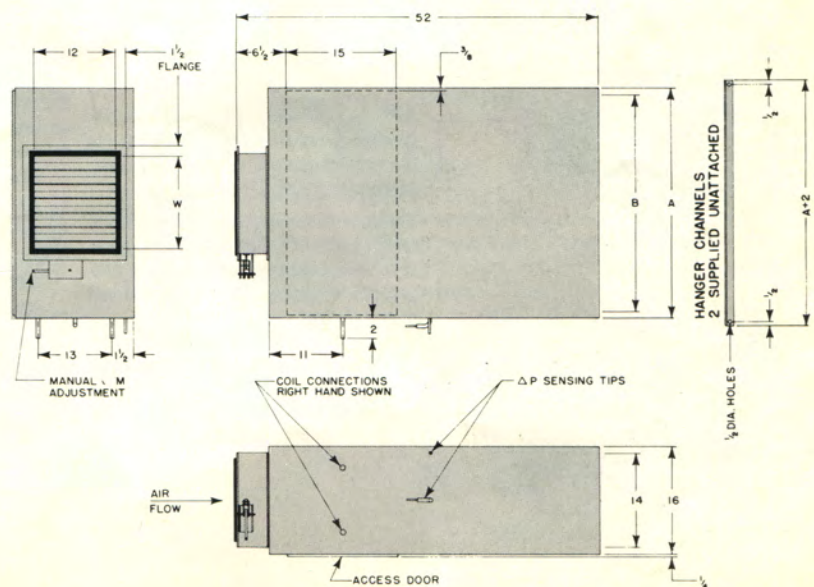
	UNIT SIZE NUMBER					
	3C	4C	5C	6C	8C	10C
DIMENSIONS INCHES						
A	3	4	5	6	8	10
B	23	26	30	37	48	56
C	22	25	28	33	36	38
D	7½	7½	8½	9	12½	15
L	1½	1½	1½	1½	1½	1½
N (Std.)	6	8	10	12	16	18
N (Alt.)	5	6	8 & 6	10 & 8	12 & 14	14 & 16
Q	6 x 6	6 x 6	9 x 9	12 x 12	15 x 15	18 x 18
P	4	5	6	7	9	10
S	3¾	4¼	5	8	12½	14¾
T	10¾	11¾	11¾	11¾	13¾	13¾
U	10⅞	10⅞	11⅞	15½	20¼	21⅞
V	5	5	6	6¼	10	12½
1 Row*	½	½	½	½	¾	¾
2 Row*	½	½	½	¾	¾	¾

*O.D. SIZE OF COIL CONNECTION



	UNIT SIZE NUMBER		
	12C	14C	16C
DIMENSIONS, INCHES			
A	32	38	48
B	30	36	46
W	14	18	24
1 Row*	¾	¾	¾
2 Row*	¾	¾	¾

* O.D. SIZE OF COIL CONNECTIONS



PERFORMANCE/SOUND RATINGS

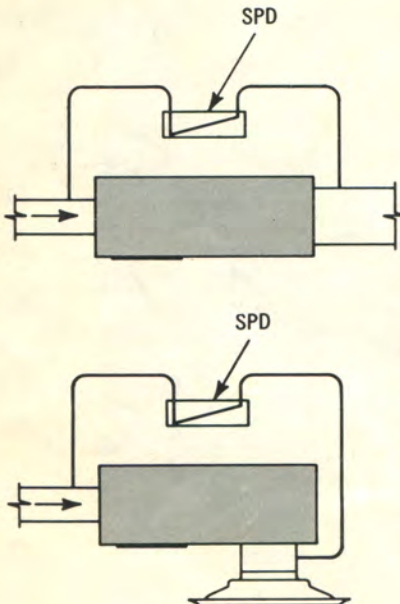
TABLE NO. 1

CFM	3C							4C							5C							6C							8C							CFM							
	STATIC PRESSURE DROP							STATIC PRESSURE DROP							STATIC PRESSURE DROP							STATIC PRESSURE DROP							STATIC PRESSURE DROP														
	SOUND POWER LEVEL PWL-NC INDEX, db							SOUND POWER LEVEL PWL-NC INDEX, db							SOUND POWER LEVEL PWL-NC INDEX, db							SOUND POWER LEVEL PWL-NC INDEX, db							SOUND POWER LEVEL PWL-NC INDEX, db														
MIN.	1"	2"	3"	4"	6"	8"	MIN.	1"	2"	3"	4"	6"	8"	MIN.	1"	2"	3"	4"	6"	8"	MIN.	1"	2"	3"	4"	6"	8"	MIN.	1"	2"	3"	4"	6"	8"	MIN.	1"	2"	3"	4"	6"	8"		
75	.10	39	42	44	46	47	48																																			75	
100	.17	43	46	48	50	51	52																																				100
125	.26	46	49	51	53	54	55	.14	41	44	46	48	49	50																													125
150	.37	49	52	54	55	56	57	.20	43	46	48	50	51	52	.13	41	44	47	49	50	51																						150
175	.50	53	55	57	58	59	60	.27	45	48	50	52	53	54	.17	43	46	48	50	51	52																						175
200	.64	56	58	59	60	61	62	.34	47	50	52	53	54	55	.22	44	47	49	51	52	53																						200
225	.80	59	61	62	63	64	65	.43	49	51	53	54	55	56	.28	46	49	51	52	53	54	.11	42	45	48	50	51	52														225	
250	.97	61	63	64	65	66	67	.52	51	53	55	56	57	58	.34	47	50	52	53	54	55	.13	43	46	49	51	52	53														250	
275								.62	53	55	57	58	59	60	.41	48	51	53	54	55	56	.16	44	47	50	52	53	54														275	
300								.74	55	57	59	60	61	62	.47	49	52	54	55	56	57	.18	45	48	51	53	54	55	.09	43	46	49	51	52	53							300	
325								.87	57	59	60	61	62	63	.55	50	53	55	56	57	58	.21	46	49	52	54	55	56	.10	44	47	50	51	52	53								325
350								.99	59	60	61	62	63	64	.64	52	54	56	57	58	59	.24	47	50	53	55	56	57	.11	44	47	50	52	53	54								350
375															.72	53	55	57	58	59	60	.28	48	51	54	55	56	57	.13	45	48	51	52	53	54								375
400															.81	54	56	58	59	60	61	.32	49	52	54	56	57	58	.15	45	48	51	52	53	54								400
425															.91	55	57	59	60	61	62	.35	50	53	55	56	57	58	.16	46	48	51	53	54	55								425
450															1.00	56	58	60	61	62	63	.39	51	54	56	57	58	59	.18	46	49	51	53	54	55								450
475															1.12	57	59	61	62	63	64	.43	51	54	56	57	58	59	.21	47	50	52	54	55	56								475
500															1.23	58	60	62	63	64	65	.48	52	55	57	58	59	60	.23	47	50	52	54	55	56								500
550																																											550
600																																											600
650																																											650
700																																											700
750																																											750
800																																											800
850																																											850
900																																											900
1000																																											1000
1100																																											1100

Minimum SPD values in table are for units with a 1-row coil.
 For 2-row coil in sizes 3 thru 10, multiply table values by 1.12.
 For 2-row coil in sizes 12, 14, 16, multiply table values by 1.45.

60 62 64 65 66

PWL-NC values are re: 10⁻¹³ watt.



SPD = STATIC PRESSURE DROP (inches of water) measured across the inlet and discharge opening of the unit. Minimum is with valve wide open.

The total minimum SP required at the inlet of the ATC unit for the required CFM is the sum of the tabulated SPD plus the resistances of the downstream ductwork and outlets.

* Indicates the octave bands wherein the spectrum is tangent to NC curve.

PWL = Decibel rating, the SOUND POWER LEVEL generated at the ATC unit. This decibel rating indicates the PWL-NC Index, a single number which expresses the PWL (sound-power level) in relation to the NC (noise criteria) curves.

The NC level which will result in the room served will be less than the tabulated decibels, depending upon

- a. the attenuation of the system downstream of the ATC unit, due to branches and lined duct and bends, and
- b. the attenuation of the room due to its acoustical characteristics.

The sound ratings for ceiling units include the additive effect of models DM6 or DA5 diffusers of the standard sizes listed in the dimension table. Sound ratings were determined with no lined duct between ATC unit and diffuser.

If units are installed exposed, rather than behind a ceiling or wall, add 3 db to the ratings.

To determine the NC (noise criteria) resulting from the ATC unit discharging directly into a room, subtract the RA (room attenuation) from the decibel rating given in the table.

Example: For size 8c unit delivering 900 CFM at 3.0" inlet SPD in a room having RA = 20 db,

$$NC = 60 - 20 = 40 \text{ db}$$

The typical PWL spectra have the following shapes:

Sizes		OCTAVE BAND						
		2	3	4	5	6	7	8
3 thru 10	db	+4	+7	+3	0*	-8	-14	-17
12, 14, 16	db	-1	0*	-7	-14	-21	-26	-27



CFM	10C							12C							14C							16C							CFM
	STATIC PRESSURE DROP							STATIC PRESSURE DROP							STATIC PRESSURE DROP							STATIC PRESSURE DROP							
	SOUND POWER LEVEL PWL-NC INDEX, db							SOUND POWER LEVEL PWL-NC INDEX, db							SOUND POWER LEVEL PWL-NC INDEX, db							SOUND POWER LEVEL PWL-NC INDEX, db							
MIN.	1"	2"	3"	4"	6"	8"	MIN.	1"	2"	3"	4"	6"	8"	MIN.	1"	2"	3"	4"	6"	8"	MIN.	1"	2"	3"	4"	6"	8"		
600	.12	47	50	53	55	56	57																					600	
650	.14	48	51	54	56	57	58																					650	
700	.16	49	52	55	57	58	59																					700	
750	.18	50	53	56	58	59	60																					750	
800	.21	51	54	57	59	60	61																					800	
850	.23	52	55	58	60	61	62																					850	
900	.26	53	56	58	60	61	62																					900	
1000	.32	54	57	59	61	62	63	.15	55	58	61	64	65	66														1000	
1100	.39	55	58	60	62	63	64	.18	56	59	62	64	65	66														1100	
1200	.46	56	59	61	62	63	64	.21	56	59	62	64	65	66	.13	55	58	61	63	65	66							1200	
1300	.53	57	60	62	63	64	65	.24	57	60	63	65	66	67	.15	55	58	61	63	65	66							1300	
1400	.62	58	61	63	64	65	66	.28	57	60	63	65	66	67	.17	56	59	62	64	65	66							1400	
1500	.71	59	62	64	65	66	67	.31	58	61	64	66	67	68	.19	56	59	62	64	65	66	.14	55	58	61	64	66	67	1500
1600	.80	60	63	65	66	67	68	.35	58	61	64	66	67	68	.22	57	60	63	65	66	67	.16	55	58	61	64	66	67	1600
1700	.91	61	64	66	67	68	69	.39	59	62	65	67	68	69	.25	57	60	63	65	66	67	.18	56	59	62	64	66	67	1700
1800	1.02	62	65	67	68	69	70	.43	59	62	65	67	68	69	.28	58	61	64	66	67	68	.20	56	59	62	64	66	67	1800
1900								.48	60	63	66	68	69	70	.31	58	61	64	66	67	68	.22	57	60	63	65	67	68	1900
2000								.53	60	63	66	68	69	70	.34	59	62	65	67	68	69	.24	57	60	63	65	67	68	2000
2200								.63	61	64	67	68	69	70	.41	60	63	66	68	69	70	.28	58	61	64	66	67	68	2200
2400								.74	62	65	68	69	70	71	.48	61	64	67	69	70	71	.33	59	62	65	67	68	69	2400
2600															.56	61	64	67	69	70	71	.38	60	63	66	68	69	70	2600
2800															.64	62	65	68	70	71	72	.44	60	63	66	68	69	70	2800
3000															.73	63	66	69	71	72	73	.49	61	64	67	69	70	71	3000
3200																						.55	62	65	68	70	71	72	3200
3400																						.61	63	66	69	71	72	73	3400
3600																						.68	63	66	69	71	72	73	3600
3800																						.75	64	67	70	72	73	74	3800
4000																						.83	64	67	70	72	73	74	4000

Suggested Specification
CARNES REHEAT ATC UNIT

Reheat Unit: Units shall be Carnes reheat, high velocity, acoustic terminal control units.

Capacities: Units shall have capacities as indicated on the drawings. Units shall have factory cataloged ratings for CFM, static pressure drop, and sound power level (PWL-NC index) ratings in decibels. Manufacturer shall provide data that units have been installed in operation on jobs for at least one year. A list of such installations shall be supplied upon request.

Temperature Control: A steam or hot water reheat coil shall be used to reheat the air to provide proper room conditions. Coil shall be controlled by valve and room thermostat supplied by the temperature control contractor.

Reheat Coil: The reheat coil shall be located the proper distance down stream from the inlet valve to insure equal air velocities over the coil. Coil shall be easily reversible in the field. Plugged connection openings shall be provided at opposite side of stubbed connections. An access door the full width of units shall be provided. Coil shall be constructed of seamless copper tubing and mechanically bonded aluminum plate fins, tested at not less than 350 psig.

Valve: Valve shall be constructed of spun aluminum cones or continuously hinged, gang operated pairs of rigid extruded aluminum vanes to insure uniform air velocities.

Attenuation: Interior of casing and baffles shall be covered with 1" thick, coated fibrous glass acoustical liner. Units shall be rated in sound power levels (PWL-NC index) in decibels, re 10⁻¹³ watt.

Air Balancing Adjustment: Units shall be provided with air pressure reducing valve which shall be operable by an external screw driver adjustment. Valve shall be located at inlet to minimize noise generation. Pressure sensing tips shall be provided for calibrated air balancing. Manufacturer shall provide calibration curve.

Casing: Casing shall be constructed of heavy gauge galvanized steel. Leakage shall not exceed 2% rated capacity, with all connections sealed and internal pressure of 2 in. water. Units shall be provided with hanger channels for ease of installation.



HIGH VELOCITY REHEAT

WITH MANUAL BALANCING VALVE



PERFORMANCE/THERMAL RATINGS

Capacities shown in Table #2 are based on commonly encountered conditions of 55° F. entering air temperature and either 200° F. entering water temperature or 2 psig steam. In the case of the water coil the water rate of flow is as shown in the table.

If the reheat capacity (BTUH) of the unit exceeds that which is required, the size selected will be adequate because the room thermostat in combination with the valve will modulate the water flow to satisfy the requirements.

How to Use Performance Tables:

EXAMPLE NO. 1: When conditions allow the system design to be based on entering air of 55° F. and hot water of 200° F.

Required: To heat 425 cfm @ 55° F. to 90° F. PWL-NC Index not to exceed 60 db when SPD = 3". Minimum SPD to not exceed 1".

Solution: BTUH = 425 x 1.085 (90-55) = 16,150. From Table #2, a size 5c with a 1-row coil will be satisfactory. It has an output of 16,600 BTUH with a water flow of 1.19 gallons per minute at 0.49 ft. head loss. Table #1 shows a minimum SPD of only 0.91" and a PWL-NC Index at 3" of only 59 db.

EXAMPLE NO. 2: When conditions of entering air, water or steam are different than the headings in Table #2, correction factors from Tables 3 and 4 or 5 must be used.

Required: To heat 425 cfm @ 50° F. to 95° F. The sound and duct pressure requirements are the same as in Example No. 1. Entering water to be at only 170° F.

Solution: BTUH = 425 x 1.085 (95-50) = 20,750. A size 5c unit will meet the sound and pressure requirements, but additional calculations must be made to determine whether the necessary reheat can be obtained.

First, from Table #3 select the proper correction factor. At 120° F. temperature difference (170°-50°) the factor is 0.83. Multiplying this factor by the BTUH at 425 cfm from Table #2 yields 16,600 x 0.83 = 13,800 BTUH. Therefore, a 1-row coil will not be adequate unless an increase in water flow will cause sufficient increase in BTUH. To determine this, multiply this BTUH by the largest factor from Table #4 (13,800 x 1.04 = 14,350 BTUH) and compare with the required BTUH. Because this value is still too low, the same procedure must be followed on a 2-row coil.

Table #2 shows that 30,700 BTUH will be transferred under the standard conditions by a 2-row coil. Multiplying this by the correction factor from Table #3 (30,700 x 0.83 = 25,500) discloses that the unit will be adequate. In fact, for this particular case the water flow could be reduced (20,750/25,500 = 0.813) to 40% of the standard 2.23 GPM.

TABLE NO. 2 — WATER AND STEAM COIL CAPACITY RATING

Unit Size G.P.M. Head Loss	C.F.M.	BTUH with 55° F. Entering Air			
		Ent. Water 200°		Steam — 2 P.S.I.	
		1 Row	2 Row	1 Row	2 Row
SIZE 3C G.P.M. 1 Row = .49 2 Row = .98 Head Loss Ft. of Water 1 Row = .10 2 Row = .34	75	4,100	7,200	4,600	8,300
	100	4,800	8,800	5,600	10,000
	125	5,500	10,100	6,300	11,400
	150	6,000	11,200	7,100	12,700
	175	6,400	12,300	7,600	13,700
	200	6,800	13,100	8,100	14,800
	225	7,100	13,900	8,600	15,900
250	7,400	14,700	9,100	16,900	
SIZE 4C G.P.M. 1 Row = .80 2 Row = 1.52 Head Loss Ft. of Water 1 Row = .15 2 Row = .92	125	7,700	12,200	7,700	13,500
	150	7,900	14,000	8,600	15,400
	175	8,600	15,400	9,400	16,800
	200	9,200	16,800	10,100	18,100
	225	9,800	18,000	10,800	19,400
	250	10,300	19,000	11,500	20,700
	275	10,800	20,100	12,100	21,700
	300	11,200	21,100	12,600	22,800
	325	11,600	21,900	13,100	23,800
	350	12,000	22,800	13,600	24,900
SIZE 5C G.P.M. 1 Row = 1.19 2 Row = 2.23 Head Loss Ft. of Water 1 Row = .49 2 Row = 2.52	150	9,300	15,500	9,800	17,400
	175	10,300	17,700	10,900	19,200
	200	11,200	19,300	11,700	20,800
	225	12,200	21,000	12,500	22,500
	250	12,800	22,500	13,300	23,800
	275	13,500	23,900	14,200	25,200
	300	14,100	25,400	14,800	26,600
	325	14,700	26,500	15,500	27,900
	350	15,200	27,800	16,200	29,000
	375	15,600	28,800	16,800	30,200
	400	16,200	29,800	17,400	31,300
	425	16,600	30,700	18,000	32,400
	450	17,000	31,800	18,400	33,500
	475	17,400	32,500	18,900	34,600
	500	17,800	33,500	19,300	35,400

TABLE NO. 3 — CAPACITY CORRECTION FACTORS FOR TEMPERATURE DIFFERENCES (For All Sizes)

Temperature Difference	ENTERING WATER OR STEAM MINUS ENTERING AIR																	
	40	50	60	70	80	90	100	110	120	130	140	145	150	160	163.5	170	180	190
Steam Factor									.73	.79	.86	.89	.92	.98	1.00	1.04	1.10	1.16
Water Factor	.28	.35	.41	.48	.55	.62	.69	.76	.83	.90	.96	1.00	1.03	1.10				

TABLE NO. 4 — CORRECTION FACTORS TO BE APPLIED TO CAPACITY AND WATER PRESSURE DROP FOR WATER FLOW (For Sizes 3C Thru 10C)

% Water Flow	30	40	50	60	70	80	90	100	110	120	130	140	150
BTUH	.70	.82	.88	.91	.94	.96	.98	1.00	1.01	1.02	1.03	1.04	1.04
Head Loss	.13	.20	.29	.41	.54	.68	.83	1.00	1.20	1.40	1.60	1.80	2.00

TABLE NO. 5 — CORRECTION FACTORS TO BE APPLIED TO CAPACITY AND WATER PRESSURE DROP FOR WATER FLOW (For Sizes 12C, 14C, and 16C)

% Water Flow	30	40	50	60	70	80	90	100	110	120	130	140	150
BTUH	.60	.72	.80	.85	.89	.93	.97	1.00	1.02	1.04	1.06	1.08	1.10
Head Loss	.12	.19	.28	.39	.51	.65	.81	1.00	1.18	1.38	1.60	1.83	2.10

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TABLE NO. 2 CONTINUED

Unit Size G.P.M. Head Loss	C.F.M.	BTUH with 55° F. Entering Air			
		Ent. Water 200°		Steam — 2 P.S.I.	
		1 Row	2 Row	1 Row	2 Row
SIZE 6C G.P.M. 1 Row = 1.95 2 Row = 3.36 Head Loss Ft. of Water 1 Row = 1.58 2 Row = 1.10	225	14,800	23,300	15,200	27,000
	250	16,000	25,300	16,300	28,900
	275	17,200	27,200	17,400	30,700
	300	18,100	29,100	18,300	32,400
	325	19,100	30,800	18,700	33,300
	350	20,000	32,600	19,600	35,000
	375	20,800	33,800	20,400	36,500
	400	21,600	35,600	21,300	38,100
	425	22,300	36,900	22,200	39,600
	450	23,000	37,900	22,800	41,100
	475	23,700	39,500	23,700	42,400
	500	24,400	40,700	24,600	43,900
	550	25,500	42,700	25,000	45,200
	600	26,500	45,000	26,700	48,300
	650	27,700	46,700	28,100	50,700
700	28,500	49,000	29,100	52,800	
750	29,200	50,400	30,000	54,600	
SIZE 8C G.P.M. 1 Row = 2.80 2 Row = 4.97 Head Loss Ft. of Water 1 Row = .75 2 Row = 1.23	300	19,900	31,500	21,300	37,600
	325	21,200	33,900	21,900	38,900
	350	22,500	36,000	22,900	40,500
	375	23,600	38,100	24,500	43,500
	400	24,500	39,900	25,200	44,800
	425	25,800	41,900	26,200	46,100
	450	26,500	43,700	26,800	47,400
	475	27,300	45,500	28,100	50,000
	500	28,200	46,800	28,800	51,300
	550	29,900	49,700	30,100	54,000
	600	31,400	53,200	32,000	57,200
	650	32,800	55,600	33,300	59,500
	700	34,100	58,500	35,000	62,800
	750	35,300	60,900	36,300	64,700
	800	36,400	62,400	37,600	68,000
850	37,600	65,000	38,900	69,700	
900	38,600	67,400	40,200	72,600	
1000	40,300	71,000	42,500	77,200	
1100	42,000	74,600	44,800	81,100	
SIZE 10C G.P.M. 1 Row = 4.26 2 Row = 7.44 Head Loss Ft. of Water 1 Row = 2.02 2 Row = 1.56	600	36,500	58,200	36,100	64,100
	650	38,400	61,700	37,800	67,500
	700	40,300	65,000	39,600	71,000
	750	41,900	68,600	41,300	74,000
	800	43,500	71,100	42,100	75,300
	850	45,100	73,800	43,900	78,300
	900	46,400	76,900	45,200	81,300
	1000	49,100	81,600	48,600	86,900
	1100	51,500	86,600	51,200	91,600
	1200	53,800	90,600	53,800	96,300
	1300	55,600	94,700	55,500	100,200
	1400	57,700	98,700	57,600	104,500
	1500	59,400	102,100	59,800	109,200
	1600	61,100	105,000	61,500	113,100
	1700	62,700	108,400	63,600	117,400
1800	63,900	111,600	64,900	120,400	

Unit Size G.P.M. Head Loss	C.F.M.	BTUH with 55° F. Entering Air			
		Ent. Water 200°		Steam — 2 P.S.I.	
		1 Row	2 Row	1 Row	2 Row
SIZE 12C G.P.M. 1 Row = 5.06 2 Row = 8.87 Head Loss Ft. of Water 1 Row = 5.05 2 Row = 3.94	1000	51,100	84,100	57,300	99,000
	1100	53,700	90,000	60,300	104,400
	1200	56,300	94,800	63,000	109,800
	1300	58,600	98,100	65,700	114,900
	1400	60,700	102,800	68,400	119,600
	1500	62,600	107,200	70,400	124,600
	1600	64,500	110,900	72,800	129,000
	1700	66,000	113,700	74,800	132,700
	1800	67,600	117,000	76,800	137,100
	1900	69,200	120,300	78,800	141,100
	2000	70,700	123,500	80,500	144,800
	2100	72,600	126,700	82,500	149,200
	2200	73,700	128,900	84,200	152,900
	2300	74,700	130,700	85,900	157,000
	2400	75,800	133,000	87,200	160,000
SIZE 14C G.P.M. 1 Row = 5.95 2 Row = 11.03 Head Loss Ft. of Water 1 Row = 1.25 2 Row = 1.98	1200	59,300	102,400	72,300	124,900
	1300	61,700	107,300	74,500	128,800
	1400	64,200	112,800	77,600	134,500
	1500	66,400	117,500	80,600	140,200
	1600	68,500	121,700	83,300	145,500
	1700	70,600	125,300	85,400	149,400
	1800	72,600	129,400	88,100	154,700
	1900	74,500	133,000	90,300	159,500
	2000	76,100	137,000	92,900	164,300
	2100	77,800	141,000	94,600	167,800
	2200	79,100	144,300	97,300	172,600
	2300	80,500	147,600	99,000	177,000
	2400	81,800	150,400	101,200	181,400
	2600	84,800	155,000	104,700	188,400
	2800	87,000	159,800	108,700	196,300
3000	89,300	165,500	112,600	206,400	
SIZE 16C G.P.M. 1 Row = 8.65 2 Row = 14.51 Head Loss Ft. of Water 1 Row = 2.97 2 Row = 1.08	1500	81,500	129,900	94,300	162,400
	1600	84,400	134,500	97,900	169,100
	1700	87,600	140,000	101,600	175,200
	1800	90,400	145,500	103,400	178,800
	1900	92,800	150,000	106,400	184,900
	2000	95,500	154,500	109,500	190,400
	2100	98,200	158,200	111,900	194,600
	2200	100,100	162,600	115,000	200,100
	2300	102,000	166,400	117,400	205,600
	2400	105,000	170,200	119,200	209,200
	2600	108,600	178,200	124,700	219,600
	2800	112,400	185,100	128,900	228,100
	3000	115,800	191,800	133,800	238,400
	3200	119,200	197,700	137,500	245,700
	3400	122,500	202,800	141,700	253,000
3600	125,300	208,600	145,400	261,500	
3800	127,700	212,900	149,000	269,400	
4000	129,600	217,700	152,100	276,100	

STANDARD GUARANTEE The Carnes Corporation guarantees all catalogued ATC Units to be free from defects in workmanship and materials for a period of one year from the date of shipment. Any parts proving defective will be replaced at our option, when returned to our factory, transportation charges prepaid. In every case, returned materials must be accompanied by a copy of our "Return Authorization" or the materials will not be accepted.

PERFORMANCE GUARANTEE The Carnes Corporation guarantees all ATC Units to perform in accordance with the published data as set forth in our catalogs and bulletins.

No warranties, expressed or implied, other than those set forth herein, shall be binding upon the Corporation, nor shall the Corporation be liable for consequent damage or delays caused by defective material or objectionable performance.



HIGH VELOCITY REHEAT

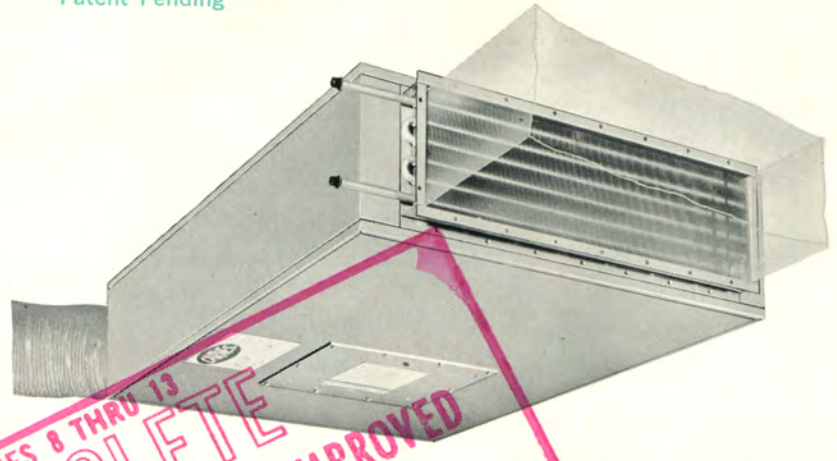


WITH MECHANICAL CONSTANT VOLUME CONTROL

Patent Pending

The Carnes **MECHANITROL**[®] Reheat ATC Unit is designed to:

1. Reheat chilled primary air so as to allow the use of a single duct system for year around air conditioning with individual zone control at reasonable cost, in minimum space, and with system simplicity.
2. Reduce high velocities and pressures for discharge of the air at conventional low-velocity values.
3. Add heat to the primary air in response to the space thermostat and water or steam valve.
4. Attenuate self-generated and duct air-borne noises.
5. Automatically control the volume of air discharge despite system static pressure unbalance.
6. Provide above functions within a factory built, tested and performance-rated unit.

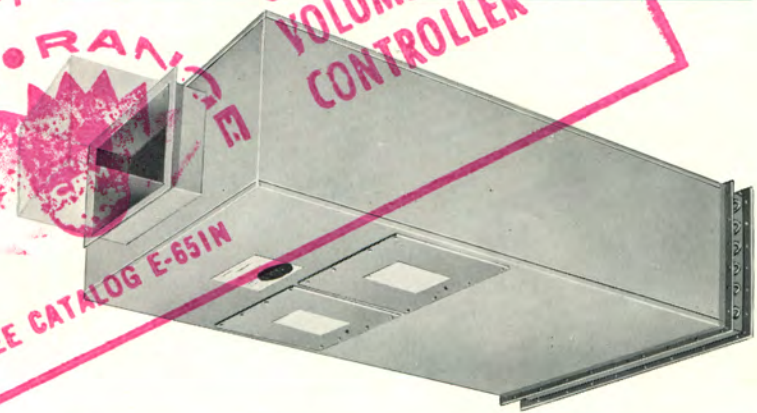


75 to 2000 CFM . . . Nine sizes for ceiling mounting . . . Circular inlets . . . End discharge.

Optional feature: Inlet valve, for operation by internally mounted pneumatic motor.

FEATURES:

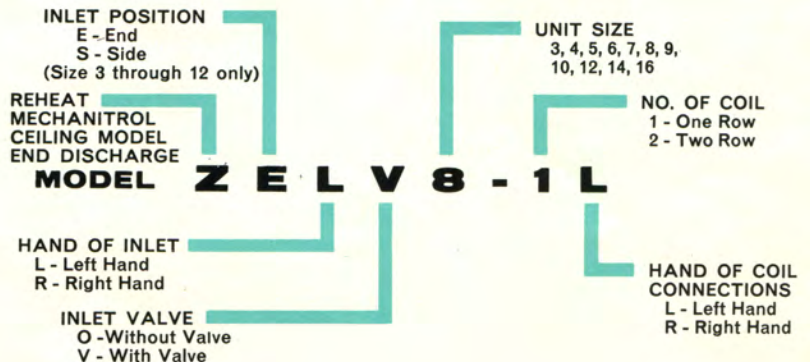
- Reheat coil . . . for steam or hot water . . . available in one row or two rows . . . seamless copper tubing mechanically bonded in corrugated aluminum plate fins . . . external water or steam connections to coil.
- Galvanized steel casing with corners and joints sealed to prevent leakage of more than 2% of maximum CFM at 6 inches static pressure.
- Unit is acoustically baffled and lined with fibrous glass acoustical liner, mat faced to prevent air erosion.
- Constant volume controller is of mechanical type operating on the principle of pressure conversions in air flowing through the unit.
- Constant volume controller will maintain air volume within $\pm 5\%$ despite inlet static pressure variations between minimum and 6 inches.
- Each unit is factory tested and set for specified CFM.
- Available with or without inlet valve for operation by pneumatic motor supplied by control contractor. Valve allows thermostat or pressure switch to reduce or blank off air flow.



1600 to 4000 CFM . . . Two sizes for ceiling mounting . . . Square inlets . . . End discharge.

Optional feature: Inlet valve, for operation by externally mounted pneumatic motor.

CATALOG NUMBERING SYSTEM



PAGES 8 THRU 13
OBSOLETE
Replaced by unit with NEW IMPROVED
MECHANICAL CONSTANT VOLUME CONTROLLER
SEE CATALOG E-651N

75-2000 CFM WITH OR WITHOUT INLET VALVE

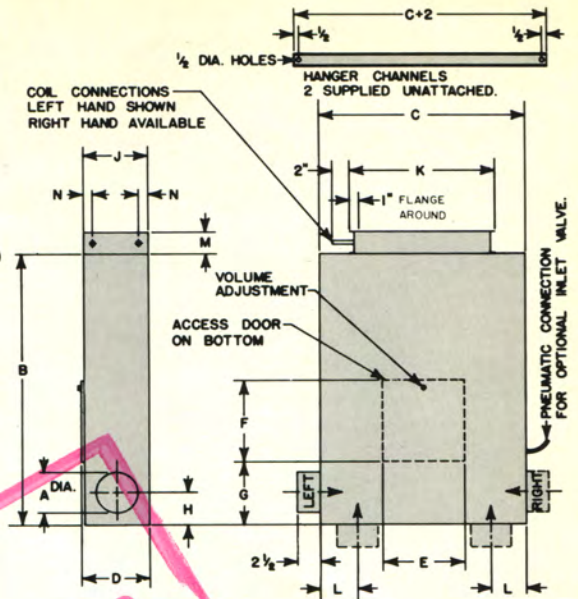
	UNIT SIZE NUMBER									
	3	4	5	6	7	8	9	10	12	
	DIMENSIONS, INCHES									
A	3	4	5	6	7	8	9	10	12	
B	30	30	34	38	42	46	50	54	62	
C	24	24	26	29	31	33	35	37	45	
D	8	8	8	9	10	11	12	13	15	
E	8½	8½	11	12½	13½	15	16½	17½	20½	
F	11	11	11	11¾	12½	13	13½	14	15	
G	6¼	6¼	7¾	9	10¼	11¼	13¼	14½	17¼	
H	3¾	3¾	4¼	4¾	5¼	5¾	6¼	6¾	7¾	
J	7	7	7	8¼	9½	9½	10¾	12	14½	
K	10	14	20	22	23	27	28	30	32	
L	3¾	3¾	4¼	4¾	5¼	5¾	6¼	6¾	9¾	
1-Row*	½	½	½	½	½	½	⅝	⅝	⅝	
2-Row*	½	½	½	½	⅝	⅝	⅝	⅞	⅞	

* O.D. of Coil Connection M = 2½ For 1-Row N = 1¾ For 1-Row
 3½ For 2-Row 1¾ For 2-Row

INLET POSITION CHOICES:

L.H. (Shown in solid line in drawing).
 R.H. SIDE } (Shown in dotted lines in drawing.)
 L.H. END }
 R.H. END }

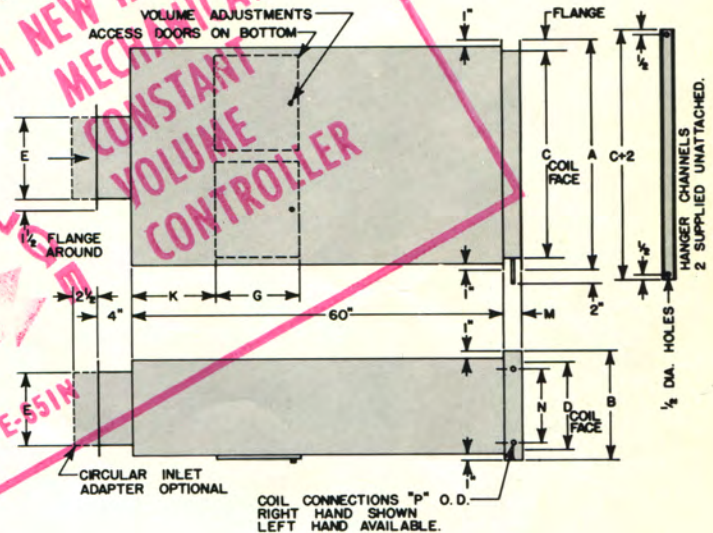
WHEN OPTIONAL INLET VALVE IS SPECIFIED, PNEUMATIC MOTOR IS TO BE SUPPLIED BY CONTROL CONTRACTOR AND INTERNALLY MOUNTED BY CARNES' FACTORY.



1600-4000 CFM WITHOUT INLET VALVE

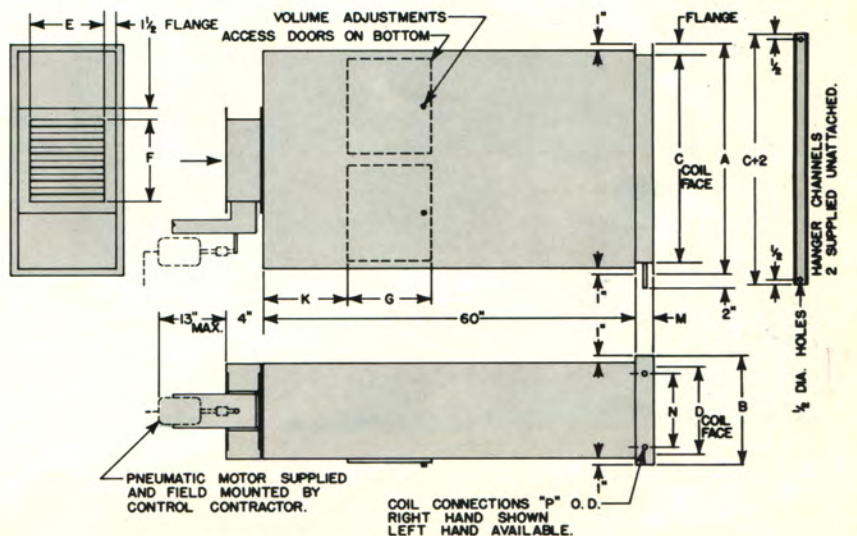
	UNIT SIZE NUMBER	
	14	16
	DIMENSIONS, INCHES	
A	40	49
B	19	21
C	36	45
D	15	17½
E	14	16
G	14	15
K	15	13½
M 1-Row	2½	2½
2-Row	3½	3½
N 1-Row	13¾	16¼
2-Row	14¾	16¾
P 1-Row	⅝	⅞
2-Row	⅞	⅞

PAGES 8 THRU 13
OBSOLETE
 Replaced by unit with NEW IMPROVED MECHANICAL CONSTANT VOLUME CONTROLLER
 WIDE-RANGE
 SEE CATALOG E-551K



1600-4000 CFM WITH INLET VALVE

	UNIT SIZE NUMBER	
	14	16
	DIMENSIONS, INCHES	
A	40	49
B	19	21
C	36	45
D	15	17½
G	14	15
K	15	13½
M 1-Row	2½	2½
2-Row	3½	3½
N 1-Row	13¾	16¼
2-Row	14¾	16¾
P 1-Row	⅝	⅞
2-Row	⅞	⅞
E	14	16
F	16	18



PERFORMANCE / SOUND RATINGS

TABLE No. 6

CFM	3							4							5							6							CFM	
	STATIC PRESSURE DROP							STATIC PRESSURE DROP							STATIC PRESSURE DROP							STATIC PRESSURE DROP								
	SOUND POWER LEVEL PWL-NC INDEX, db							SOUND POWER LEVEL PWL-NC INDEX, db							SOUND POWER LEVEL PWL-NC INDEX, db							SOUND POWER LEVEL PWL-NC INDEX, db								
	MIN.	1"	2"	3"	4"	6"	8"	MIN.	1"	2"	3"	4"	6"	8"	MIN.	1"	2"	3"	4"	6"	8"	MIN.	1"	2"	3"	4"	6"	8"		
75	.76	40	43	45	46	48	49																						75	
100	.79	44	47	49	50	52	53																						100	
125	1.05	47	50	52	53	55	56	.77	44	47	49	50	52	53															125	
150								.79	46	49	51	52	54	55															150	
175								.80	48	51	53	54	56	57															175	
200								.86	50	53	55	56	58	59	.78	44	47	49	50	52	53									200
225								1.07	52	55	56	58	60	61	.78	46	49	51	52	54	55									225
250															.79	48	51	53	54	56	57									250
275															.80	50	53	55	56	58	59									275
300															.81	51	54	56	57	59	60	.78	45	48	50	51	53	54		300
325															.93	53	56	57	59	61	62	.79	47	50	52	53	55	56		325
350															1.08	54	57	58	60	62	63	.79	49	52	54	55	57	58		350
400																						.81	51	54	56	57	59	60		400
450																						.88	52	55	57	58	60	61		450
500																						1.08	53	56	58	59	61	62		500
550																														550
600																														600

CFM	UNIT CATALOG NUMBER																												
	14								16																				
	STATIC PRESSURE DROP								STATIC PRESSURE DROP																				
	SOUND POWER LEVEL PWL-NC INDEX, db								SOUND POWER LEVEL PWL-NC INDEX, db																				
	MIN.	1"	2"	3"	4"	6"	8"	MIN.	1"	2"	3"	4"	6"	8"	MIN.	1"	2"	3"	4"	6"	8"								
1600	.80	60	66	70	71	72	73																						
1700	.80	61	66	70	72	73	74																						
1800	.81	61	67	71	72	74	75																						
1900	.81	62	68	72	73	75	76																						
2000	.82	63	69	73	74	76	77																						
2200	.83	63	69	73	75	77	78																						
2400	.85	64	70	74	76	78	79	.80	60	65	68	71	74	76															
2600	.97	65	71	75	77	79	80	.81	61	66	70	73	76	77															
2800	1.13	66	72	76	78	80	81	.82	62	66	71	75	77	78															
3000								.82	62	67	72	76	78	79															
3200								.83	63	68	73	77	79	80															
3400								.84	63	69	74	78	80	81															
3600								.91	64	70	75	79	81	82															
3800								1.01	65	71	76	80	82	83															
4000								1.12	66	72	77	81	83	84															

PWL = Decibel rating, the SOUND POWER LEVEL (re: 10⁻¹³ watt) generated at the ATC unit. This decibel rating indicates the PWL-NC Index, a single number which expresses the PWL (sound-power level) in relation to the NC (noise criteria) curves.

The NC level which will result in the room served will be less than the tabulated decibels, depending upon

- the attenuation of the system downstream of the ATC unit, due to branches and lined duct and bends, and
- the attenuation of the room due to its acoustical characteristics.

Sound ratings were determined with no lined duct between ATC unit and diffuser.

If units are installed exposed, rather than behind a ceiling or wall, add 3 db to the ratings.

To determine the NC (noise criteria) resulting from the ATC unit discharging directly into a room, subtract the RA (room attenuation) from the decibel rating given in the table.

Example: For size 7 unit delivering 650 CFM at 3.0" inlet SPD in a room having RA = 20 db: NC = 60 - 20 = 40 db

The typical PWL spectrum generated by these units has the following shape:

Octave Band	2	3	4	5	6	7	8
db	-2	0	0*	-4*	-9	-14	-19

* Indicates the octave bands wherein the spectrum is tangent to NC curve.

Additional attenuation will need to be incorporated in the downstream ductwork when air quantities are high and noise goals are low. For example, 10 feet of 1 inch thick acoustical lining will reduce the largest unit's self-generated sound in the speech interference range to not exceed NC 35 in the room served when operating at maximum rated capacity and 3 inches SPD. This assumes that all the air is delivered into one room and that the room attenuation is only 18 db. If more than one room is served, the resulting level will be less than NC 35 because of the attenuation due to branching.

For further information see Carnes Catalog 1160 page 21 on testing and rating methods, and pages 24 through 27 on noise control methods.



HIGH VELOCITY REHEAT

WITH MECHANICAL CONSTANT VOLUME CONTROL



PERFORMANCE/THERMAL RATINGS

Capacities shown in Table #7 are based on commonly encountered conditions of 55° F. entering air temperature and either 200° F. entering water temperature or 2 psig steam. In the case of the water coil, the water rate of flow is shown in the table.

If the reheat capacity (BTUH) of the unit exceeds that which is required, the room thermostat in combination with the valve will modulate the water flow to satisfy the requirements.

How to Use Performance Tables:

EXAMPLE NO. 1: When conditions allow the system design to be based on entering air of 55° F. and hot water of 200° F.

Required: To heat 425 cfm @ 55° F. to 90° F. PWL-NC Index not to exceed 60 db when SPD = 3". Minimum SPD to not exceed 1".

Solution: BTUH = 425 x 1.085 (90-55) = 16,150. From Table #7 a size 6 with a 1-row coil will be satisfactory. It has an output of 16,750 BTUH with a water flow of 1.20 gallons per minute at 0.50 ft. head loss. Table #6 shows a minimum SPD of about 0.84" and a PWL-NC Index at 3" of only 57 db.

EXAMPLE NO. 2: When conditions of entering air, water or steam are different than the headings in Table #7, correction factors from Tables 8 and 9 must be used.

Required: To heat 425 cfm @ 50° F. to 95° F. The sound and duct pressure requirements are the same as in Example No. 1. Entering water to be at only 170° F.

Solution: BTUH = 425 x 1.085 (95-50) = 20,750. A size 6 unit will meet the sound and pressure requirements, but additional calculations must be made to determine whether the necessary reheat can be obtained.

First, from Table #8 select the proper correction factor. At 120° F. temperature difference (170°-50°) the factor is 0.83. Multiplying this factor by the BTUH at 425 cfm from Table #7 yields 16,750 x 0.83 = 13,900 BTUH. Therefore, a 1-row coil will not be adequate unless an increase in water flow will cause sufficient increase in BTUH. To determine this, multiply this BTUH by the largest factor from Table #9 (13,900 x 1.04 = 14,450 BTUH) and compare with the required BTUH. Because this value is still too low, the same procedure must be followed on a 2-row coil.

Table #7 shows that 30,500 BTUH will be transferred under the standard conditions by a 2-row coil. Multiplying this by the correction factor from Table #8 (30,500 x 0.83) = 25,300 discloses that the unit will be adequate. In fact, for this particular case the water flow could be reduced (20,750/25,300 = 0.82) to 40% of the standard 2.30 GPM.

TABLE NO. 7 — WATER AND STEAM COIL CAPACITY RATING

Unit Size G.P.M. Head Loss	C.F.M.	BTUH with 55° F. Entering Air			
		BTUH Water EWT = 200°		BTUH Steam 2 Psig	
		1 Row	2 Row	1 Row	2 Row
SIZE 3 G.P.M. 1 Row = .29 2 Row = .54 Head Loss Ft. of Water 1 Row = .02 2 Row = .12	75	3,200	6,100	4,100	7,600
	100	3,600	7,200	5,000	8,500
	125	4,400	8,100	5,400	10,000
SIZE 4 G.P.M. 1 Row = .50 2 Row = .97 Head Loss Ft. of Water 1 Row = .06 2 Row = .39	125	5,600	10,000	6,600	12,000
	150	6,100	11,500	7,500	13,500
	175	6,600	12,500	7,800	14,500
	200	7,100	13,500	8,400	16,000
	225	7,500	14,500	8,900	17,000
SIZE 5 G.P.M. 1 Row = .83 2 Row = 1.53 Head Loss Ft. of Water 1 Row = .18 2 Row = 1.13	200	9,600	17,000	10,500	19,000
	225	10,000	18,500	11,000	20,000
	250	10,500	19,500	11,500	21,000
	275	11,000	20,500	12,000	22,500
	300	11,500	21,000	12,500	23,500
	325	12,000	22,000	13,000	25,000
	350	12,500	23,000	14,000	25,500
SIZE 6 G.P.M. 1 Row = 1.20 2 Row = 2.30 Head Loss Ft. of Water 1 Row = .50 2 Row = 2.97	300	14,500	24,500	15,000	27,000
	325	15,000	25,500	15,500	28,000
	350	15,500	27,000	16,000	29,500
	400	16,500	29,500	17,000	32,000
	450	17,000	31,500	18,500	34,000
	500	18,000	34,000	19,500	36,000

TABLE NO. 8 — CAPACITY CORRECTION FACTORS FOR TEMPERATURE DIFFERENCES

Temperature Difference	ENTERING WATER OR STEAM MINUS ENTERING AIR																	
	40	50	60	70	80	90	100	110	120	130	140	145	150	160	163.5	170	180	190
Steam Factor									.73	.79	.86	.89	.92	.98	1.00	1.04	1.10	1.16
Water Factor	.28	.35	.41	.48	.55	.62	.69	.76	.83	.90	.96	1.00	1.03	1.10				

TABLE NO. 9 — CORRECTION FACTORS TO BE APPLIED TO CAPACITY WATER PRESSURE DROP FOR WATER FLOW

% Water Flow	30	40	50	60	70	80	90	100	110	120	130	140	150
BTUH	.70	.82	.88	.91	.94	.96	.98	1.00	1.01	1.02	1.03	1.04	1.04
Head Loss	.13	.20	.29	.41	.54	.68	.83	1.00	1.20	1.40	1.60	1.80	2.00

TABLE NO. 7 CONTINUED

Unit Size G.P.M. Head Loss	C.F.M.	BTUH with 55° F. Entering Air			
		BTUH Water EWT = 200°		BTUH Steam 2 Psig	
		1 Row	2 Row	1 Row	2 Row
SIZE 7 G.P.M. 1 Row = 1.60 2 Row = 2.80 Head Loss Ft. of Water 1 Row = 1.04 2 Row = .78	400	19,500	32,500	19,000	35,000
	450	20,500	34,500	20,500	37,500
	500	21,500	36,500	21,500	40,000
	550	22,500	38,500	22,500	42,000
	600	23,500	40,000	23,500	44,000
SIZE 8 G.P.M. 1 Row = 2.07 2 Row = 3.60 Head Loss Ft. of Water 1 Row = 1.66 2 Row = 1.42	650	24,000	42,000	23,500	43,000
	550	25,500	43,500	25,000	45,000
	600	26,500	45,500	26,000	47,000
	650	27,500	47,000	27,000	50,000
	700	28,500	49,000	28,000	52,000
	750	29,500	50,500	29,000	54,000
	800	30,500	52,000	30,000	56,500
SIZE 9 G.P.M. 1 Row = 2.46 2 Row = 4.66 Head Loss Ft. of Water 1 Row = 1.49 2 Row = 2.67	850	31,000	54,000	31,000	60,500
	650	29,000	52,500	29,500	54,000
	700	30,000	54,500	30,500	56,500
	750	31,000	56,500	32,000	58,500
	800	31,500	58,500	33,000	61,000
	850	32,500	60,500	33,500	63,500
	900	33,500	62,500	35,000	65,500
SIZE 10 G.P.M. 1 Row = 3.10 2 Row = 5.57 Head Loss Ft. of Water 1 Row = 1.71 2 Row = 1.68	1000	35,500	67,500	37,000	69,500
	1100	37,000	70,000	38,500	73,500
	800	35,500	63,000	36,000	66,000
SIZE 12 G.P.M. 1 Row = 4.43 2 Row = 7.86 Head Loss Ft. of Water 1 Row = 2.03 2 Row = 1.88	850	36,500	65,000	37,500	69,000
	900	37,500	67,500	38,500	71,000
	1000	39,500	71,500	40,500	76,000
	1100	41,000	75,500	43,000	80,000
	1200	43,000	77,000	45,000	84,000
	1300	44,500	82,000	46,500	88,000
	1400	46,500	85,500	48,500	92,000

Unit Size G.P.M. Head Loss	C.F.M.	BTUH with 55° F. Entering Air			
		BTUH Water EWT = 200°		BTUH Steam 2 Psig	
		1 Row	2 Row	1 Row	2 Row
SIZE 12 G.P.M. 1 Row = 4.43 2 Row = 7.86 Head Loss Ft. of Water 1 Row = 2.03 2 Row = 1.88	1200	53,000	91,500	51,500	95,500
	1300	54,500	95,000	53,500	100,000
	1400	56,500	98,500	55,500	104,000
	1500	58,500	102,000	58,000	108,500
	1600	60,000	104,000	60,000	112,000
	1700	61,500	108,500	61,500	115,500
	1800	63,500	111,000	63,500	120,000
	2000	66,500	118,000	67,000	127,000
SIZE 14 G.P.M. 1 Row = 6.67 2 Row = 11.51 Head Loss Ft. of Water 1 Row = 5.40 2 Row = 4.18	1600	75,500	128,500	71,500	130,000
	1700	77,500	132,500	73,500	136,000
	1800	80,000	136,500	76,500	141,000
	1900	82,000	140,500	78,000	144,000
	2000	84,000	144,000	80,000	149,000
	2200	88,000	151,500	84,000	158,000
	2400	92,000	159,000	88,000	165,000
	2600	96,000	166,000	91,500	174,000
SIZE 16 G.P.M. 1 Row = 9.50 2 Row = 16.60 Head Loss Ft. of Water 1 Row = 5.95 2 Row = 4.92	2800	100,000	173,000	95,500	181,000
	2400	109,500	194,000	106,500	195,000
	2600	113,500	201,000	111,000	204,000
	2800	118,000	208,500	115,000	212,000
	3000	122,000	215,000	118,000	222,000
	3200	126,500	222,500	122,500	230,000
	3400	130,500	229,000	127,500	238,000
	3600	134,000	236,000	131,000	246,000
3800	138,000	242,500	134,000	254,000	
4000	142,500	249,500	138,000	261,000	

5. #703 of H2O
IN FULL COIL

STANDARD GUARANTEE The Carnes Corporation guarantees all catalogued ATC Units to be free from defects in workmanship and materials for a period of one year from the date of shipment. Any parts proving defective will be replaced at our option, when returned to our factory, transportation charges prepaid. In every case, returned materials must be accompanied by a copy of our "Return Authorization" or the materials will not be accepted.

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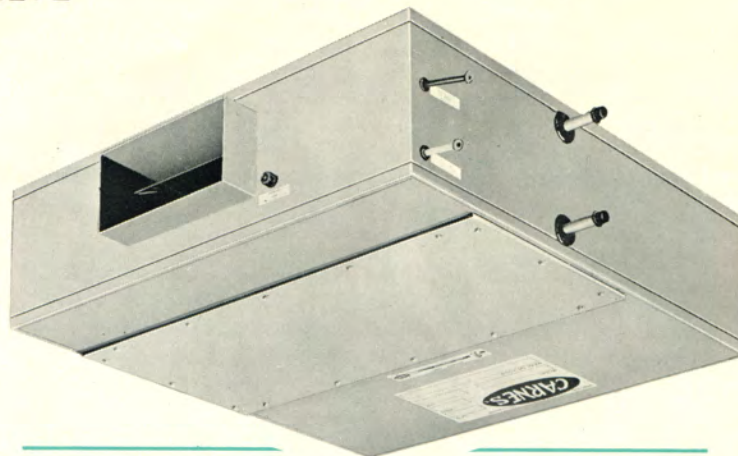
LOW VELOCITY REHEAT

WITH MANUAL BALANCING VALVE



The Carnes Low Velocity Reheat ATC Unit is designed to:

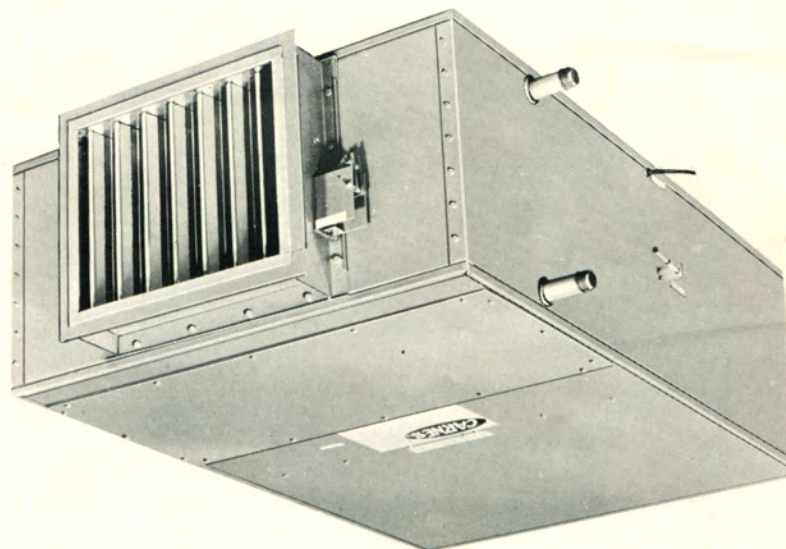
1. Reheat chilled primary air so as to allow the use of a single duct system for year around air conditioning with individual zone control at reasonable cost and maximum system simplicity.
2. Assure continuous air motion in the conditioned space for proper ventilation and odor dilution at all times.
3. Add heat to the primary air in response to the space thermostat and water or steam valve.
4. Provide for easy field balancing by means of inlet valve and calibration chart on which is plotted CFM versus unit's internal pressure drop.
5. Attenuate self-generated and duct air-borne noise.
6. Provide above functions within a factory built, tested and performance-rated unit.



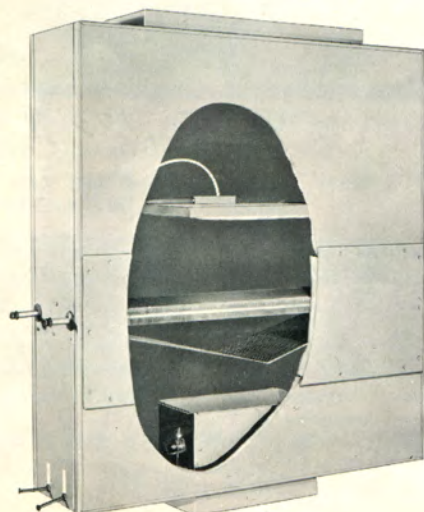
75 to 1800 CFM . . . Six sizes for ceiling mounting . . . Rectangular inlets . . . Bottom or end discharge.

FEATURES:

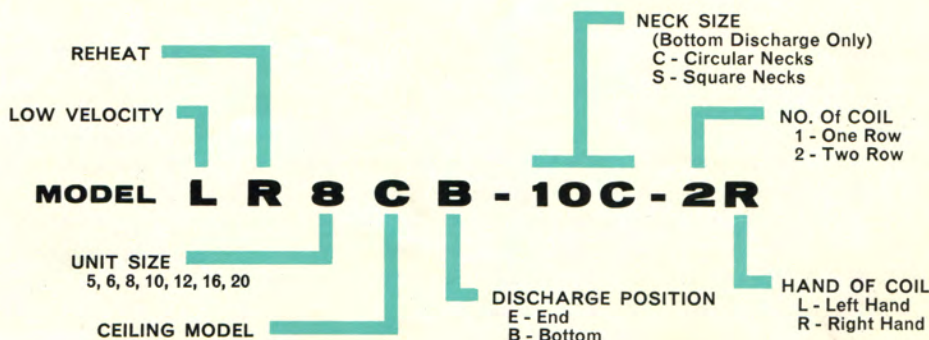
- Reheat coil . . . for steam or hot water . . . available in one row or two rows . . . seamless copper tubing mechanically bonded in corrugated aluminum plate fins . . . external water or steam connections.
- Choice of bottom or end discharge.
- External valve adjustment for easy initial balancing, or rebalancing in event of revision of load requirements.
- Calibrated sensing tips for attachment of manometer to measure CFM.
- Acoustically baffled and lined with fibrous glass liner, mat faced to prevent air erosion.
- Low pressure drop. Only 0.33" inlet static for maximum CFM with 1-row coil.
- Balancing valve will adjust to hold minimum catalogued CFM at 4" inlet static pressure.
- Access door to coil.
- Galvanized steel casing.



1200 to 2400 CFM . . . One size for ceiling mounting . . . Rectangular inlet . . . End discharge.



CATALOG NUMBERING SYSTEM

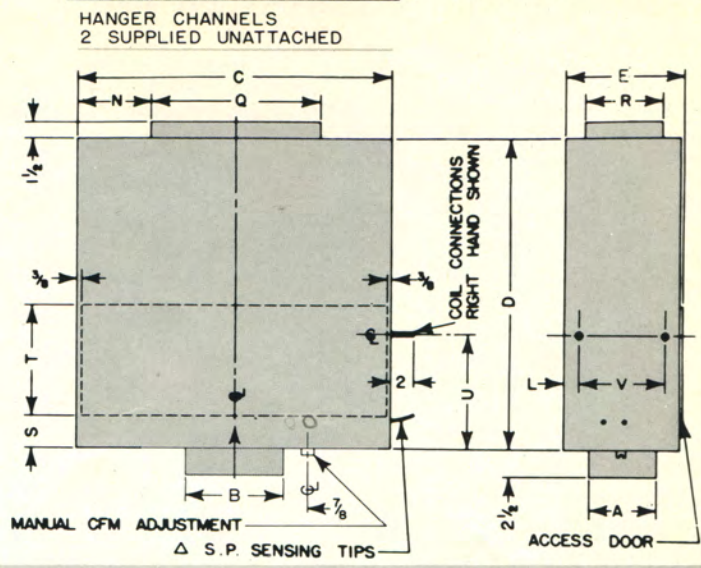


75-1800 CFM END DISCHARGE

	UNIT SIZE NUMBER					
	5C	6C	8C	10C	12C	16C
A	4	4	5	6	9	12
B	6	8	9	12	12	16
C	22	25	28	33	36	38
D	23	26	30	37	48	56
E	7 1/2	7 1/2	8 1/2	9	12 1/2	15
L	1 3/32	1 3/32	1 3/32	1 3/32	1 3/32	1 3/32
N	6 1/2	6	6 1/2	6	6 1/2	6 1/2
Q	9	13	15	21	23	25
R	6	6	7	7	10	13
S	3 3/8	4 1/4	5	8	12 1/8	14 5/8
T	10 3/8	11 3/8	11 3/8	11 3/8	13 3/8	13 3/8
U	10 1/8	10 3/8	11 1/8	15 1/2	20 1/4	21 7/8
V	5	5	6	6 1/4	10	12 1/2
1-Row*	1/2	1/2	1/2	1/2	5/8	5/8
2-Row*	1/2	1/2	1/2	5/8	7/8	7/8

* O.D. Of Coil Connection

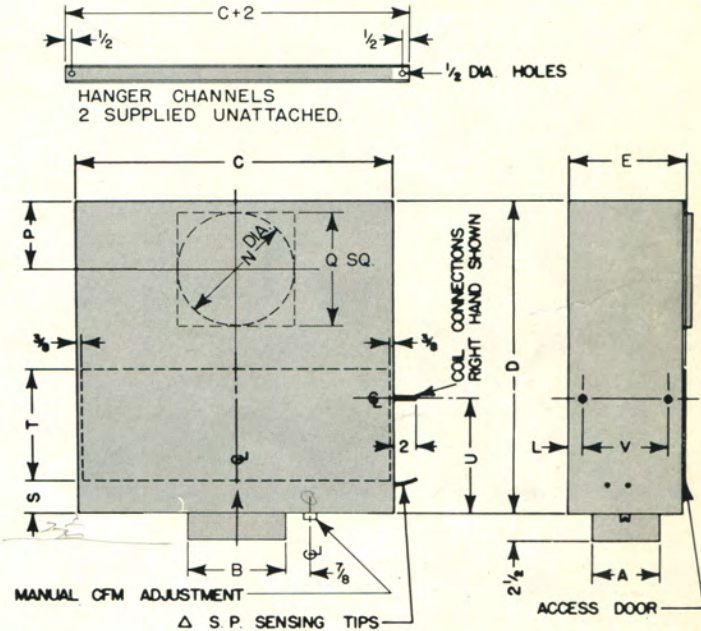
DIMENSIONS



75-1800 CFM BOTTOM DISCHARGE

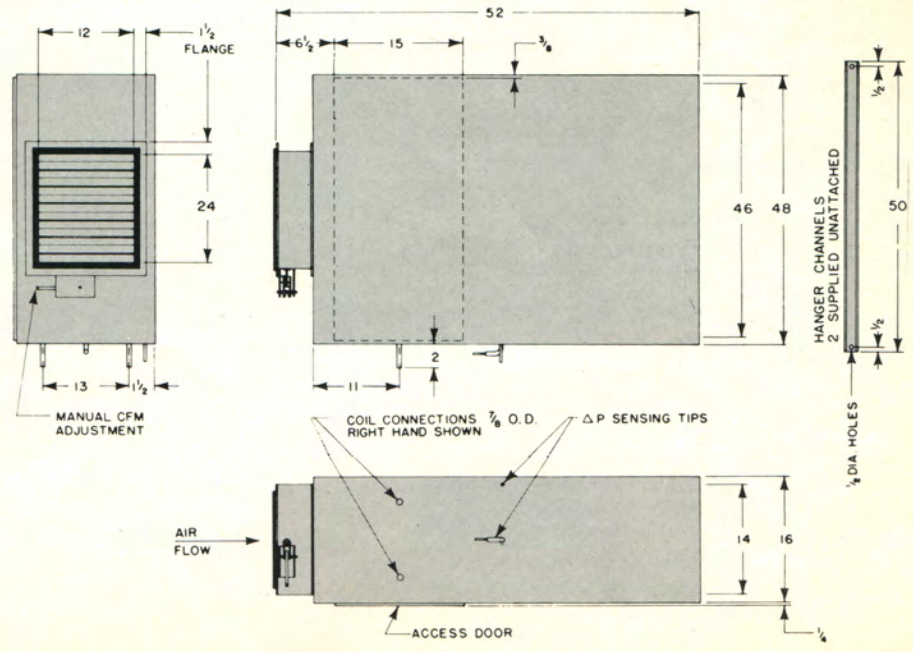
	UNIT SIZE NUMBER					
	5C	6C	8C	10C	12C	16C
A	4	4	5	6	9	12
B	6	8	9	12	12	16
C	22	25	28	33	36	38
D	23	26	30	37	48	56
E	7 1/2	7 1/2	8 1/2	9	12 1/2	15
L	1 3/32	1 3/32	1 3/32	1 3/32	1 3/32	1 3/32
N (Std.)	6	8	10	12	16	18
N (Alt.)	5	6	8 & 6	10 & 8	12 & 14	14 & 16
Q	6 x 6	6 x 6	9 x 9	12 x 12	15 x 15	18 x 18
P	4	5	6	7	9	10
S	3 3/8	4 1/4	5	8	12 1/8	14 5/8
T	10 3/8	11 3/8	11 3/8	11 3/8	13 3/8	13 3/8
U	10 1/8	10 3/8	11 1/8	15 1/2	20 1/4	21 7/8
V	5	5	6	6 1/4	10	12 1/2
1-Row*	1/2	1/2	1/2	1/2	5/8	5/8
2-Row*	1/2	1/2	1/2	5/8	7/8	7/8

* O.D. Of Coil Connection



1200-2400 CFM END DISCHARGE

UNIT SIZE 20C



PERFORMANCE/SOUND RATINGS

REHEAT

LOW VELOCITY

WITH MANUAL BALANCING CONTROL



TABLE NO. 10

CFM	5c							6c							8c							10c							CFM
	STATIC PRESSURE DROP							STATIC PRESSURE DROP							STATIC PRESSURE DROP							STATIC PRESSURE DROP							
	Min.	Min.	0.50"	0.75"	1.0"	1.5"	2.0"	Min.	Min.	0.50"	0.75"	1.0"	1.5"	2.0"	Min.	Min.	0.50"	0.75"	1.0"	1.5"	2.0"	Min.	Min.	0.50"	0.75"	1.0"	1.5"	2.0"	
75	.05	L	41	45	48	52	54																						75
100	.08	L	42	46	49	53	55																						100
125	.13	36	42	46	49	54	56																						125
150	.19	38	43	47	50	55	57	.06	L	43	47	50	54	56															150
175	.25	40	44	48	51	56	58	.08	L	44	48	51	55	57															175
200	.33	42	45	49	52	56	59	.11	35	44	48	51	56	58	.07	L	44	48	51	55	57								200
225								.14	37	45	49	52	57	59	.08	L	45	49	52	56	58								225
250								.17	39	46	50	53	58	60	.10	35	45	49	52	56	58								250
275								.20	40	46	50	53	58	60	.12	37	46	50	53	57	59								275
300								.24	41	46	50	53	58	61	.15	38	46	50	53	58	60								300
325								.28	43	47	51	54	59	62	.17	39	46	50	53	58	60	.06	L	46	50	53	57	59	325
350								.33	45	48	52	55	60	63	.20	40	47	51	54	59	61	.07	L	47	51	54	58	60	350
375															.23	41	47	51	54	59	61	.08	L	47	51	54	58	60	375
400															.26	42	47	51	54	59	61	.09	35	48	52	55	59	61	400
425															.29	44	48	52	55	60	62	.11	36	48	52	55	59	61	425
450															.33	45	48	52	55	60	63	.12	37	48	52	55	59	61	450
475																						.13	38	48	52	55	60	62	475
500																						.15	39	48	52	55	60	62	500
550																						.18	41	49	53	56	61	63	550
600																						.21	42	49	53	56	61	63	600
650																						.25	44	49	53	56	61	64	650
700																						.29	46	50	54	57	62	65	700
750																						.33	47	50	54	57	62	65	750

Minimum SPD values in table are for units with 1-row coil.
For 2-row coil, multiply table value by 1.20.

PWL = Decibel rating, the SOUND POWER LEVEL (re: 10⁻¹³ watt) generated at the ATC unit. This decibel rating indicates the PWL-NC Index, a single number which expresses the PWL (sound-power level) in relation to the NC (noise criteria) curves. Rating 'L' means less than 35 db.

The NC level which will result in the room served will be less than the tabulated decibels, depending upon

- the attenuation of the system downstream of the ATC unit, due to branches and lined duct and bends, and
- the attenuation of the room due to its acoustical characteristics.

Sound ratings were determined with no lined duct between ATC unit and diffuser.

If units are installed exposed, rather than behind a ceiling or wall, add 3 db to the ratings.

To determine the NC (noise criteria) resulting from the ATC unit discharging directly into a room, subtract the RA (room attenuation) from the decibel rating given in the table.

Example: For size 12 unit delivering 1100 CFM at 0.50" inlet SPD in a room having RA = 18.

$$NC = 52 - 18 = 34 \text{ db}$$

The typical PWL spectra generated by these units have the following shapes:

Sizes	OCTAVE BAND							
	2	3	4	5	6	7	8	
5 thru 16	db +4	+6*	0*	-10	-15	-17	-18	
20	db +2	0*	-8	-16	-20	-24	-25	

* Indicates the octave bands wherein the spectrum is tangent to NC curve.

On bottom discharge units, neck sizes listed as standard were selected so that when the unit is operating at maximum rated CFM, the noise level in the average room due to models DM6 or DA5 diffusers will not exceed NC 35.

For further information see Carnes Catalog 1160 page 21 on testing and rating methods, and pages 24 through 27 on noise control methods.

Suggested Specifications CARNES REHEAT ATC UNIT

Reheat Unit: Units shall be Carnes reheat, low velocity, acoustic terminal control units.

Capacities: Units shall have capacities as indicated on the drawings. Units shall have catalogued performance ratings for CFM, static pressure drop, sound power level (PWL-NC Index) in decibels, and heating capacity.

Temperature Control: A reheat coil for hot water or steam shall be provided to heat the primary supply air to required room conditions. Coil shall be controlled by valve and room thermostat supplied and installed by the temperature control contractor.

Reheat Coil: The reheat coil shall be located for uniform face velocity. Hand of coil connections shall be easily reversible in the field. Coil shall be constructed of seamless copper tubing and mechanically bonded aluminum plate fins, tested at not less than 350 psig.

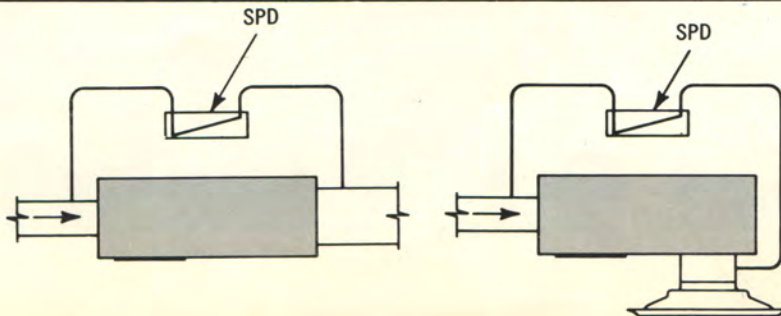
Air Balancing Adjustment: An air pressure reducing valve shall be operable by an external screw driver adjustment. Valve shall be capable of throttling to the minimum specified CFM against a static pressure drop of 4 inches. With valve in wide open position, static pressure drop across unit at maximum rated CFM shall not exceed 0.35 inches with 1-row coil nor 0.45 inches with 2-row coil.

Calibration: Pressure sensing tips shall be provided for calibrated air balancing. Manufacturer shall provide calibration chart. Calibration ΔP shall be not less than 0.035 inches water at minimum rated CFM.

Attenuation: Interior of casing and baffles shall be covered with mat-faced fibrous glass acoustical liner. Decibel ratings shall be in sound power levels (PWL-NC Index) re 10^{-13} watt.

Casing: Casing shall be of galvanized steel construction with sealed corners and joints.

CFM	12c							16c							20c							CFM		
	STATIC PRESSURE DROP							STATIC PRESSURE DROP							STATIC PRESSURE DROP									
	SOUND POWER LEVEL PWL-NC INDEX, db							SOUND POWER LEVEL PWL-NC INDEX, db							SOUND POWER LEVEL PWL-NC INDEX, db									
	Min.	Min.	0.50"	0.75"	1.0"	1.5"	2.0"	Min.	Min.	0.50"	0.75"	1.0"	1.5"	2.0"	Min.	Min.	0.50"	0.75"	1.0"	1.5"	2.0"			
475	.06	L	49	53	56	60	62																475	
500	.07	L	49	53	56	60	62																	500
	.08	L	49	53	56	60	62																	550
600	.10	35	49	53	56	61	63																	600
650	.12	37	50	54	57	62	64																	650
700	.13	38	50	54	57	62	64																	700
750	.15	40	50	54	57	62	64																	750
800	.17	42	51	55	58	63	65	.07	L	50	54	57	61	63										800
850	.20	44	51	55	58	63	65	.07	L	50	54	57	61	63										850
900	.22	46	51	55	58	63	66	.08	35	51	55	58	62	64										900
1000	.27	48	52	56	59	64	67	.10	37	51	55	58	62	64										1000
1100	.33	49	52	56	59	64	67	.12	39	51	55	58	63	65										1100
1200								.15	41	51	55	58	63	65	.08	L	50	53	55	57	58			1200
1300								.17	43	51	55	58	63	65	.10	36	50	53	55	57	58			1300
1400								.20	45	52	56	59	64	66	.11	38	50	53	55	57	58			1400
1500								.23	47	53	57	60	65	67	.13	40	51	54	56	58	59			1500
1600								.26	48	53	57	60	65	67	.15	42	51	54	56	58	59			1600
1700								.29	49	53	57	60	65	68	.17	44	52	55	57	59	60			1700
1800								.33	50	53	57	60	65	68	.19	46	52	55	57	59	60			1800
1900															.21	48	53	56	58	60	61			1900
2000															.23	50	53	56	58	60	61			2000
2200															.28	52	54	57	59	61	62			2200
2400															.33	53	55	58	60	62	63			2400



SPD = STATIC PRESSURE DROP (inches of water) measured across the inlet and discharge opening of the unit. Minimum is with valve wide open.

The total minimum SP required at the inlet of the ATC unit for the required CFM is the sum of the tabulated SPD plus the resistances of the downstream ductwork and outlets.



LOW VELOCITY REHEAT WITH MANUAL BALANCING VALVE



PERFORMANCE/THERMAL RATINGS

Capacities shown in Table 11 are based on commonly encountered conditions of 55° F. entering air temperature and either 200° F. entering water temperature or 2 psig steam. In the case of the water coil, the water rate of flow is shown in the table.

If the reheat capacity (BTUH) of the unit exceeds that which is required, the room thermostat in combination with the valve will modulate the water flow to satisfy the requirements.

How to Use Performance Tables:

EXAMPLE NO. 1: When conditions allow the system design to be based on entering air of 55° F. and hot water of 200° F.

Required: To heat 1600 cfm @ 55° F. to 90° F. PWL-NC Index not to exceed 60 db when SPD = 1". Minimum SPD to not exceed 0.35".

Solution: BTUH = 1600 x 1.085 (90-55) = 60,600. From Table 11, a size 16 with a 1-row coil will be satisfactory. It has an output of 61,100 BTUH with a water flow of 4.26 gallons per minute at 2.02 ft. head loss. Table 10 shows a minimum SPD of only 0.26" and a PWL-NC Index at 1" of 60 db.

EXAMPLE NO. 2: When conditions of entering air, water or steam are different than the headings in Table 11 correction factors from Tables 12 and 13 or 14 must be used.

Required: To heat 1600 cfm @ 50° F. to 95° F. The sound and duct pressure requirements are the same as in Example No. 1. Entering water to be at only 170° F.

Solution: BTUH = 1600 x 1.085 (95-50) = 78,000. A size 16 unit will meet the sound and pressure requirements, but additional calculations must be made to determine whether the necessary reheat can be obtained.

First, from Table 12 select the proper correction factor. At 120° F. temperature difference (170°-50°) the factor is 0.83. Multiplying this factor by the BTUH at 1600 cfm from Table 11 yields 61,100 x 0.83 = 50,700 BTUH. Therefore, a 1-row coil will not be adequate unless an increase in water flow will cause sufficient increase in BTUH. To determine this, multiply this BTUH by the largest factor from Table 13 (50,700 x 1.04 = 52,700 BTUH) and compare with the required BTUH. Because this value is still too low, the same procedure must be followed on a 2-row coil.

Table 11 shows that 105,000 BTUH will be transferred under the standard conditions by a 2-row coil. Multiplying this by the correction factor from Table 12 (105,000 x 0.83 = 87,100) discloses that the unit will be adequate. In fact, for this particular case the water flow could be reduced (78,000/87,100) = 0.895 to 55% of the standard 7.44 GPM.

**TABLE NO. 11 — WATER AND STEAM
COIL CAPACITY RATING**

Unit Size G.P.M. Head Loss	C.F.M.	BTUH with 55° F. Entering Air			
		Ent. Water 200°		Steam 2 PSIG	
		1 Row	2 Row	1 Row	2 Row
SIZE 5 G.P.M. 1 Row = .453 2 Row = .848 Head Loss Ft. of Water 1 Row = .05 2 Row = .26	75	3,700	6,600	4,600	8,300
	100	4,700	8,000	5,600	10,000
	125	5,300	9,500	6,300	11,400
	150	5,800	10,500	7,100	12,700
	175	6,300	11,700	7,600	13,700
200	6,700	12,700	8,100	14,800	
SIZE 6 G.P.M. 1 Row = .80 2 Row = 1.52 Head Loss Ft. of Water 1 Row = .15 2 Row = .92	150	7,900	14,000	8,600	15,400
	175	8,600	15,400	9,400	16,800
	200	9,200	16,800	10,100	18,100
	225	9,800	18,000	10,800	19,400
	250	10,300	19,000	11,500	20,700
	275	10,800	20,100	12,100	21,700
	300	11,200	21,100	12,600	22,800
	325	11,600	21,900	13,100	23,800
	350	12,000	22,800	13,600	24,900

**TABLE NO. 12 — CAPACITY CORRECTION FACTORS FOR
TEMPERATURE DIFFERENCES (For All Sizes)**

Temperature Difference	ENTERING WATER OR STEAM MINUS ENTERING AIR																	
	40	50	60	70	80	90	100	110	120	130	140	145	150	160	163.5	170	180	190
Steam Factor									.73	.79	.86	.89	.92	.98	1.00	1.04	1.10	1.16
Water Factor	.28	.35	.41	.48	.55	.62	.69	.76	.83	.90	.96	1.00	1.03	1.10				

**TABLE NO. 13 — CORRECTION FACTORS TO BE APPLIED
TO CAPACITY WATER PRESSURE DROP
FOR WATER FLOW (For Sizes 5 thru 16).**

% Water Flow	30	40	50	60	70	80	90	100	110	120	130	140	150
BTUH	.70	.82	.88	.91	.94	.96	.98	1.00	1.01	1.02	1.03	1.04	1.04
Head Loss	.13	.20	.29	.41	.54	.68	.83	1.00	1.20	1.40	1.60	1.80	2.00

**TABLE NO. 14 — CORRECTION FACTORS TO BE APPLIED
TO CAPACITY WATER PRESSURE DROP
FOR WATER FLOW (For Size 20).**

% Water Flow	30	40	50	60	70	80	90	100	110	120	130	140	150
BTUH	.60	.72	.80	.85	.89	.93	.97	1.00	1.02	1.04	1.06	1.08	1.10
Head Loss	.12	.19	.28	.39	.51	.65	.81	1.00	1.18	1.38	1.60	1.83	2.10

TABLE NO. 11 CONTINUED

Unit Size G.P.M. Head Loss	C.F.M.	BTUH with 55° F. Entering Air			
		Ent. Water 200°		Steam 2 PSIG	
		1 Row	2 Row	1 Row	2 Row
SIZE 8 G.P.M. 1 Row = 1.14 2 Row = 2.07 Head Loss Ft. of Water 1 Row = .46 2 Row = 2.18	200	11,200	18,100	11,700	20,800
	225	12,200	19,700	12,500	22,500
	250	12,800	21,200	13,300	23,800
	275	13,500	22,700	14,200	25,200
	300	14,100	24,200	14,800	26,600
	325	14,700	25,500	15,500	27,900
	350	15,200	26,700	16,200	29,000
	375	15,600	27,800	16,800	30,200
	400	16,200	28,900	17,400	31,300
	425	16,600	29,800	18,000	32,400
450	17,000	31,000	18,400	33,500	
SIZE 10 G.P.M. 1 Row = 1.95 2 Row = 3.36 Head Loss Ft. of Water 1 Row = 1.58 2 Row = 1.10	325	19,100	30,800	18,700	33,300
	350	20,000	32,600	19,600	35,000
	375	20,800	33,800	20,400	36,500
	400	21,600	35,600	21,300	38,100
	425	22,300	36,900	22,200	39,600
	450	23,000	37,900	22,800	41,100
	475	23,700	39,500	23,700	42,400
	500	24,400	40,700	24,600	43,900
	550	25,500	42,700	25,000	45,200
	600	26,500	45,000	26,700	48,300
650	27,700	46,700	28,100	50,700	
700	28,500	49,000	29,100	52,800	
750	29,200	50,400	30,000	54,600	
SIZE 12 G.P.M. 1 Row = 2.80 2 Row = 4.97 Head Loss Ft. of Water 1 Row = .75 2 Row = 1.23	475	27,300	45,500	28,100	50,100
	500	28,200	46,800	28,800	51,300
	550	29,900	49,700	30,100	54,000
	600	31,400	53,200	32,000	57,200
	650	32,800	55,600	33,300	59,500
	700	34,100	58,500	35,000	62,800
	750	35,300	60,900	36,300	64,700
	800	36,400	62,400	37,600	68,000
	850	37,600	65,000	38,900	69,700
	900	38,600	67,400	40,200	72,600
1000	40,300	71,000	42,500	77,200	
1100	42,000	74,600	44,800	81,100	

Unit Size G.P.M. Head Loss	C.F.M.	BTUH with 55° F. Entering Air			
		Ent. Water 200°		Steam 2 PSIG	
		1 Row	2 Row	1 Row	2 Row
SIZE 16 G.P.M. 1 Row = 4.26 2 Row = 7.44 Head Loss Ft. of Water 1 Row = 2.02 2 Row = 1.56	800	43,500	71,100	42,100	75,300
	850	45,100	73,800	43,900	78,300
	900	46,400	76,900	45,200	81,300
	1000	49,100	81,600	48,600	86,900
	1100	51,500	86,600	51,200	91,600
	1200	53,800	90,600	53,800	96,300
	1300	55,600	94,700	55,500	100,200
	1400	57,700	98,700	57,600	104,500
	1500	59,400	102,100	59,800	109,200
	1600	61,100	105,000	61,500	113,100
1700	62,700	108,400	63,600	117,400	
1800	63,900	111,600	64,900	120,400	
SIZE 20 G.P.M. 1 Row = 6.4 2 Row = 10.4 Head Loss Ft. of Water 1 Row = 1.56 2 Row = .58	1200	64,000	103,000	85,000	143,000
	1300	67,000	108,000	88,000	149,000
	1400	70,000	111,000	91,000	156,000
	1500	72,000	117,000	94,300	162,400
	1600	75,000	121,000	97,900	169,100
	1700	78,000	125,000	101,600	175,200
	1800	80,000	130,000	103,400	178,800
	1900	83,000	134,000	106,400	184,900
	2000	86,000	139,000	109,500	190,400
	2200	91,000	147,000	115,000	200,100
2400	96,000	156,000	119,200	209,200	

STANDARD GUARANTEE The Carnes Corporation guarantees all catalogued ATC Units to be free from defects in workmanship and materials for a period of one year from the date of shipment. Any parts proving defective will be replaced at our option, when returned to our factory, transportation charges prepaid. In every case, returned materials must be accompanied by a copy of our "Return Authorization" or the materials will not be accepted.

PERFORMANCE GUARANTEE The Carnes Corporation guarantees all ATC Units to perform in accordance with the published data as set forth in our catalogs and bulletins.

No warranties, expressed or implied, other than those set forth herein, shall be binding upon the Corporation, nor shall the Corporation be liable for consequent damage or delays caused by defective material or objectionable performance.