

[Patent 5,486,140]

## Model AHC

The **Carnes Model AHC** is available as a basic control unit with open end discharge.

This unit offers low pressure drop, low sound levels, and valve characteristics which create stable control

conditions within the conditioned space. This product is ideal for Hospitals, Labs, Schools, Government Buildings, i.e., anywhere indoor Air Quality (IAQ) concerns exist.

### *Features Include:*

- Air flow capacities from full shut-off to 4,200 CFM (0-3,000 FPM for each unit size).
- Open-end discharge units are provided with slip and drive connections for easy installation.
- Externally thermally and acoustically insulated casing meets **UL** and **NFPA** standards.
- No insulation comes in contact with the air stream.
- Shell insulation is 1" thick and has a continuous density of 4.25 lbs./cu. ft. with a 4.5 R-value.
- Low leakage damper design.
- Pneumatic, electric, electronic, or manual control options available.
- Averaging type air flow sensor at inlet of unit.
- Optional cross flow averaging type velocity sensor at inlet of unit.
- Optional pressure independent and pressure dependent controls.
- Optional controls enclosure.
- Optional access panel for component inspection.
- **ARI** certified product.

### *Available Modules:*

- Basic Control Unit — **Model AHC**



External Insulation  
Standard



A Participating Member  
in the ARI 880  
Certification Program

**AHC**

Discharge and Radiated (NC) Noise Criteria

Inlet Size (Inches)	CFM	Minimum Pressure Drop (Damper Full Open)	
		Min. $\Delta P_s$	Min. $\Delta P_t$
		Basic Unit	Basic Unit
5	75	.01	.03
	100	.03	.06
	200	.10	.25
	300	.24	.57
	350	.33	.77
6	110	.01	.03
	200	.03	.10
	300	.08	.23
	400	.14	.40
	500	.22	.64
7	140	.01	.02
	200	.01	.05
	400	.05	.18
	600	.10	.41
	700	.14	.55
8	185	.00	.02
	400	.02	.09
	600	.03	.20
	800	.05	.24
	1000	.09	.55
10	300	.00	.02
	500	.00	.04
	800	-.01	.10
	1200	-.02	.22
	1500	-.03	.35
12	430	.00	.02
	800	-.01	.04
	1200	-.02	.10
	1800	-.05	.22
	2300	-.06	.38
14	600	.01	.02
	1000	-.01	.04
	1600	-.02	.09
	2400	-.05	.22
	3100	-.07	.37
16	780	.00	.02
	1600	-.01	.05
	2400	-.02	.12
	3600	-.03	.30
	4200	-.04	.41

$\Delta P_t$	Min. $\Delta P_s$ (Damper Full Open)			1.0" $\Delta P_s$			1.5" $\Delta P_s$			3.0" $\Delta P_s$		
	Discharge NC		Rad. NC	Discharge NC		Rad. NC	Discharge NC		Rad. NC	Discharge NC		Rad. NC
	Unit	NC	NC	Unit	NC	NC	Unit	NC	NC	Unit	NC	NC
.03	—	—	1.02	—	—	1.52	13	16	3.02	14	22	
.06	—	—	1.04	14	15	1.54	14	18	3.04	15	23	
.25	12	11	1.14	24	16	1.64	22	20	3.14	24	25	
.57	14	13	1.33	25	18	1.83	28	21	3.33	30	26	
.77	14	14	1.44	25	19	1.94	28	22	3.44	30	26	
.03	—	—	1.02	13	14	1.52	14	19	3.02	15	25	
.10	10	10	1.07	15	18	1.57	18	21	3.07	21	27	
.23	12	12	1.15	20	19	1.65	22	23	3.15	25	30	
.40	12	13	1.27	21	21	1.77	22	24	3.27	25	31	
.64	13	15	1.42	22	21	1.92	24	25	3.42	28	32	
.02	—	—	1.02	15	18	1.52	16	22	3.02	21	30	
.05	—	—	1.03	16	18	1.53	20	22	3.03	23	31	
.18	12	10	1.14	20	18	1.64	22	23	3.14	27	31	
.41	14	11	1.30	23	18	1.80	25	24	3.30	30	31	
.55	13	13	1.41	23	18	1.91	25	24	3.41	30	31	
.02	—	—	1.02	18	18	1.52	20	23	3.02	25	31	
.09	10	10	1.07	20	19	1.57	22	23	3.07	28	32	
.20	12	11	1.16	23	19	1.66	25	24	3.16	31	32	
.34	12	12	1.29	23	19	1.79	25	24	3.29	31	33	
.55	14	13	1.45	23	20	1.95	27	24	3.45	31	33	
.02	—	—	1.02	20	23	1.52	23	29	3.02	29	37	
.04	—	—	1.04	20	25	1.54	23	30	3.04	29	39	
.10	—	—	1.11	20	26	1.61	23	31	3.11	29	40	
.22	12	14	1.24	22	26	1.74	25	32	3.24	31	41	
.35	12	16	1.38	22	27	1.88	25	33	3.38	31	41	
.02	—	—	1.02	16	23	1.52	21	27	3.02	28	35	
.04	—	10	1.05	16	23	1.55	21	29	3.05	28	26	
.10	—	12	1.12	19	24	1.62	22	29	3.12	30	37	
.22	11	16	1.27	19	24	1.77	22	30	3.27	30	27	
.38	12	22	1.43	19	25	1.93	22	30	3.43	31	38	
.02	—	—	1.02	20	22	1.52	23	26	3.02	31	35	
.04	—	10	1.05	19	24	1.55	23	29	3.05	31	36	
.09	—	13	1.12	19	25	1.62	24	30	3.12	31	38	
.22	11	20	1.26	20	26	1.76	24	32	3.26	33	39	
.37	11	26	1.44	20	27	1.94	25	33	3.44	33	40	
.02	—	10	1.02	20	29	1.52	23	34	3.02	30	41	
.05	10	12	1.07	20	29	1.57	23	34	3.07	30	41	
.12	12	18	1.15	22	30	1.65	27	34	3.15	33	41	
.30	13	30	1.33	22	30	1.83	27	34	3.33	33	42	
.41	14	34	1.45	22	30	1.95	27	35	3.45	33	42	

- NOTES:**
1.  $\Delta P_s$  static pressure difference from inlet to discharge.
  2.  $\Delta P_s$  is the minimum pressure required to deliver CFM shown with the primary damper in wide open position.
  3.  $\Delta P_t$  is the total pressure difference from inlet to discharge.
  4. Dash (—) indicates NC level less than 10.

NC levels are derived from tests conducted in accordance with ARI Standard 880-98 and are calculated in accordance with ARI Standard 885-98 as application data based on the following:

Discharge NC levels are based on —

- a) 5 foot rectangular 12" x 12" duct lined with 1" fiberglass insulation.
- b) Rectangular tee attenuation entering branch duct.
- c) 6 foot lined flex duct (8" diameter).
- d) Maximum of 300 CFM per outlet.
- e) Space effect factor (5000 ft<sup>3</sup>) at 5 feet from outlet.
- f) End reflection.
- g) Environmental adjustment factor.

Radiated NC levels are based on—

- a) Plenum / ceiling effect - 5/8" mineral fiber tile, 35 lb / ft<sup>3</sup> - 3 foot plenum.
- b) Space effect factor (5000 ft<sup>3</sup>) at 10 feet from source.
- c) Environmental adjustment factor.

NC is not part of the ARI 880 Certification Program.

Sound Data (Sound Power by Octave Band)

Discharge Sound Power

Inlet Size (Inches)	CFM	Minimum Δ P <sub>s</sub>							1.0" Δ P <sub>s</sub>							1.5" Δ P <sub>s</sub>							3.0" Δ P <sub>s</sub>						
		Sound Power (db) by Octave Band							Sound Power (db) by Octave Band							Sound Power (db) by Octave Band							Sound Power (db) by Octave Band						
		Δ P <sub>s</sub>	(2)	(3)	(4)	(5)	(6)	(7)	(2)	(3)	(4)	(5)	(6)	(7)	(2)	(3)	(4)	(5)	(6)	(7)	(2)	(3)	(4)	(5)	(6)	(7)			
5	75	.01	36	28	17	16	15	16	47	44	47	45	45	42	48	46	49	49	49	46	50	48	54	55	55	52			
	100	.03	39	32	23	23	21	20	52	47	49	47	47	43	53	49	52	51	51	47	54	51	56	57	57	54			
	200	.10	48	43	40	38	36	29	61	55	55	52	51	46	63	57	58	56	55	50	64	59	62	62	61	57			
	300	.24	54	49	50	47	44	35	67	60	58	55	54	48	68	62	61	59	58	52	70	64	66	65	64	59			
	350	.33	56	51	53	50	48	37	69	62	60	56	55	49	71	63	62	60	58	53	72	66	67	66	65	59			
6	110	.01	36	26	20	19	14	17	47	45	49	49	47	45	49	47	52	53	51	49	52	50	57	59	58	57			
	200	.03	42	35	32	30	25	25	54	51	53	52	49	47	56	53	56	56	53	52	59	56	61	62	60	59			
	300	.08	46	41	40	38	33	30	59	55	55	55	51	49	61	57	58	58	55	53	64	60	64	65	62	60			
	400	.14	48	45	46	44	38	34	62	57	57	56	52	50	66	61	62	62	58	56	67	63	66	66	63	61			
	500	.22	51	48	50	49	43	37	65	60	59	57	53	51	67	62	62	62	58	56	70	65	67	67	64	62			
7	140	.01	36	26	16	18	15	16	51	50	48	48	46	43	53	52	51	52	50	47	56	56	57	58	56	54			
	200	.01	40	32	24	25	22	21	55	52	50	51	48	45	57	55	54	54	51	49	60	58	59	61	58	56			
	400	.05	48	43	38	39	36	30	62	58	55	55	51	48	64	60	58	59	55	52	67	64	64	65	61	59			
	600	.10	53	50	47	48	43	36	66	61	58	58	53	49	68	63	61	61	56	53	71	67	67	68	63	60			
	700	.14	55	52	50	51	46	38	68	62	59	59	53	50	70	64	62	62	57	54	73	68	68	69	64	61			
8	185	.00	33	27	16	15	14	16	56	53	52	52	48	45	59	55	55	56	52	48	63	60	61	63	59	54			
	400	.02	43	39	34	33	30	27	62	58	56	56	52	48	64	60	60	60	56	52	69	65	66	67	63	58			
	600	.03	49	45	43	42	38	33	65	61	58	58	54	50	67	63	62	62	58	54	72	68	68	69	65	60			
	800	.05	53	49	49	49	44	37	67	62	60	60	56	52	70	65	64	64	59	55	74	70	70	71	66	61			
	1000	.09	56	53	54	54	49	40	69	64	61	61	57	53	71	67	65	65	61	56	75	71	71	72	67	62			
10	300	.00	34	28	18	18	15	15	55	55	56	58	53	49	57	58	60	62	57	54	62	62=3	66	68	64	61			
	500	.00	39	35	29	29	25	23	59	58	58	60	55	51	61	61	62	63	59	55	66	66	68	70	66	63			
	800	-.01	43	41	40	40	34	31	63	61	60	61	56	53	65	64	63	65	60	57	69	69	69	72	67	65			
	1200	-.02	47	47	49	50	42	37	66	63	61	63	57	54	68	66	65	67	61	59	73	71	71	73	68	66			
	1500	-.03	49	50	54	55	46	41	68	64	62	63	58	55	70	67	66	67	62	59	75	72	72	74	69	67			
12	430	.00	37	27	17	17	16	16	52	55	57	59	53	51	56	59	61	63	57	55	61	65	67	70	64	63			
	800	-.01	42	36	34	31	29	25	58	58	59	61	55	52	61	62	63	65	59	57	67	68	70	72	66	64			
	1200	-.02	46	41	45	40	37	32	62	60	61	62	56	53	65	63	65	66	60	58	71	70	72	73	67	65			
	1800	-.05	50	47	56	49	46	38	66	62	63	63	58	54	69	65	67	67	62	58	75	71	73	74	68	66			
	2300	-.06	52	50	63	55	51	42	68	63	64	64	58	55	71	66	68	68	62	59	77	72	74	75	69	66			
14	600	.01	32	23	17	17	17	18	57	58	59	60	53	50	61	62	64	64	57	55	67	68	71	71	65	62			
	1000	-.01	38	32	32	28	27	25	61	60	62	61	55	52	65	64	66	66	59	56	71	71	73	73	66	64			
	1600	-.02	43	40	46	39	37	32	65	62	63	63	57	54	68	66	68	67	61	58	74	73	75	74	68	65			
	2400	-.05	48	47	58	49	46	37	68	64	65	64	58	55	72	68	69	68	63	59	78	75	77	75	70	67			
	3100	-.07	51	51	65	54	51	41	70	65	66	65	59	56	74	69	70	69	64	60	80	76	78	76	71	67			
16	780	.00	38	30	20	21	17	18	63	61	62	63	58	54	66	64	65	67	61	59	72	70	71	73	67	66			
	1600	-.01	49	43	43	38	34	31	67	64	65	65	60	57	71	68	69	69	63	61	76	73	75	75	70	68			
	2400	-.02	55	51	56	48	43	38	70	66	67	67	61	58	73	70	71	70	65	62	79	75	77	77	71	70			
	3600	-.03	60	58	68	58	52	45	72	69	70	68	62	59	76	72	73	72	66	64	81	77	79	78	72	71			
	4200	-.04	63	61	73	62	56	48	73	69	70	68	63	60	77	73	74	72	66	64	82	78	80	79	72	72			

- NOTES: 1. Based on tests conducted in accordance with ARI Standard 880-98.  
 2. Δ P<sub>s</sub> static pressure difference from inlet to discharge.  
 3. Δ P<sub>s</sub> is the minimum pressure required to deliver CFM shown with primary damper in wide open position.  
 4. Dash (—) indicates db level less than 10.



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**Sound Data (Sound Power by Octave Band)**

**Radiated Sound Power**

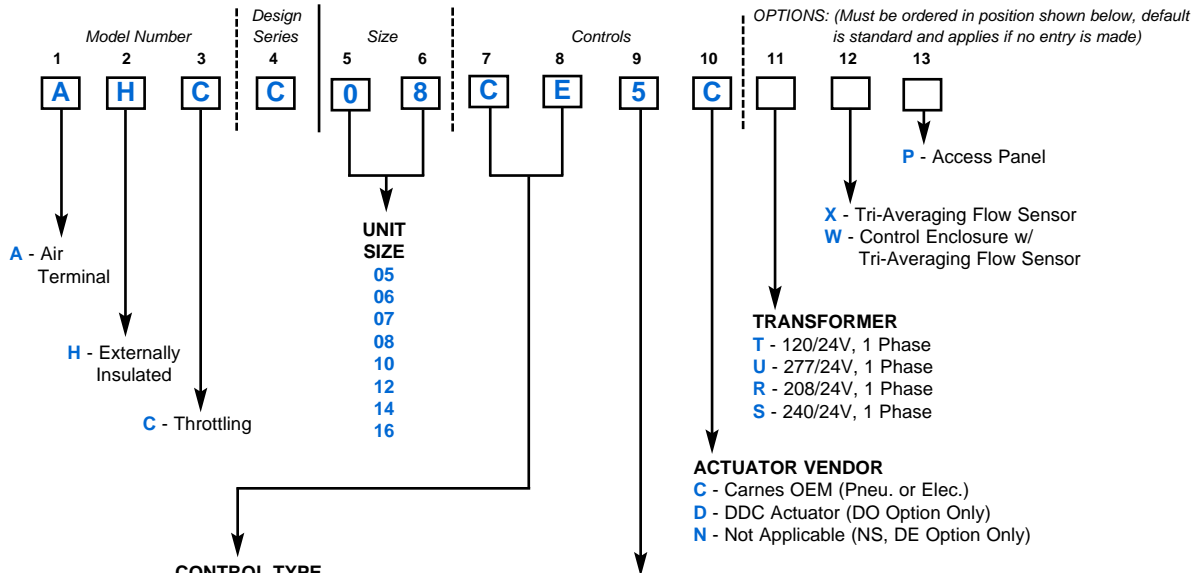
Inlet Size (Inches)	CFM	Minimum Δ P <sub>S</sub>							1.0" Δ P <sub>S</sub>							1.5" Δ P <sub>S</sub>							3.0" Δ P <sub>S</sub>						
		Sound Power (db) by Octave Band							Sound Power (db) by Octave Band							Sound Power (db) by Octave Band							Sound Power (db) by Octave Band						
		Δ P <sub>S</sub>	(2)	(3)	(4)	(5)	(6)	(7)	(2)	(3)	(4)	(5)	(6)	(7)	(2)	(3)	(4)	(5)	(6)	(7)	(2)	(3)	(4)	(5)	(6)	(7)			
5	75	.01	36	28	19	17	15	20	41	44	46	37	31	28	42	46	48	40	35	31	44	47	53	45	41	38			
	100	.03	38	31	23	20	17	21	45	46	47	37	32	28	46	47	49	41	35	32	47	49	54	46	42	38			
	200	.10	43	39	35	27	23	22	53	51	48	38	33	29	54	52	51	41	37	33	56	54	56	47	43	39			
	300	.24	46	43	42	32	26	23	58	54	49	39	34	29	59	55	52	42	37	33	61	57	57	47	44	40			
	350	.33	47	45	45	34	28	24	60	55	50	39	34	29	61	56	53	42	38	33	63	58	57	47	44	40			
6	110	.01	32	27	20	21	21	21	43	46	46	40	36	32	44	48	50	44	41	36	47	53	56	50	49	44			
	200	.03	38	36	29	28	25	23	50	50	49	43	37	33	51	52	52	47	42	37	53	57	58	53	50	45			
	300	.08	42	43	36	33	28	25	54	53	50	45	38	34	56	55	54	49	43	38	58	59	60	55	51	46			
	400	.14	45	47	40	36	29	26	58	54	52	47	39	34	61	59	57	52	45	41	61	61	61	57	51	47			
	500	.22	47	51	44	39	31	27	60	56	52	48	39	35	62	59	57	52	45	41	64	63	62	58	52	47			
7	140	.01	37	27	19	20	16	19	46	47	49	42	38	32	48	50	53	47	44	37	51	55	60	56	53	46			
	200	.01	40	31	24	24	19	20	49	48	49	42	38	32	51	51	53	47	43	37	54	56	61	55	52	46			
	400	.05	45	37	34	30	25	22	56	51	49	41	37	32	58	53	54	46	42	37	61	58	61	54	51	46			
	600	.10	48	41	39	35	29	24	60	52	49	40	36	32	61	55	54	45	42	38	64	60	61	54	51	46			
	700	.14	50	42	42	36	30	24	61	53	49	40	36	32	63	55	54	45	41	38	66	60	61	54	51	47			
8	185	.00	41	30	17	17	15	19	46	48	49	43	38	31	48	51	54	48	43	36	52	56	61	56	51	44			
	400	.02	45	36	28	26	21	22	54	51	50	44	37	31	56	54	54	49	42	36	60	59	62	57	51	45			
	600	.03	47	39	34	31	24	23	58	52	50	44	37	32	60	55	55	49	42	37	64	60	62	57	50	45			
	800	.05	49	41	38	35	26	23	61	53	50	44	37	32	63	56	55	49	42	37	67	61	63	57	50	45			
	1000	.09	50	42	41	38	27	24	63	54	51	44	36	32	65	57	55	49	41	37	69	62	63	57	50	45			
10	300	.00	33	26	20	18	15	19	52	54	54	47	42	35	54	58	59	53	47	41	58	65	67	62	56	51			
	500	.00	37	31	29	25	19	20	55	55	56	49	42	36	58	59	60	54	48	42	62	66	69	63	57	52			
	800	-.01	40	35	37	30	23	21	59	56	57	50	43	37	61	61	61	55	48	43	66	68	70	64	57	53			
	1200	-.02	43	39	44	35	26	22	62	57	57	51	43	38	64	62	62	56	49	44	69	69	71	65	58	54			
	1500	-.03	45	41	48	38	28	23	64	58	58	51	44	39	66	62	63	57	49	45	70	69	71	66	58	55			
12	430	.00	40	31	19	16	17	21	51	56	54	46	39	33	54	59	58	50	44	37	60	66	65	58	52	45			
	800	-.01	44	37	32	24	22	23	56	56	54	46	40	34	59	60	59	51	44	38	65	67	66	59	52	47			
	1200	-.02	46	41	40	29	25	25	59	57	55	47	40	34	62	61	59	52	44	39	68	67	67	60	53	47			
	1800	-.05	49	45	48	34	28	26	63	57	55	48	40	35	66	61	60	52	45	40	71	68	67	60	53	48			
	2300	-.06	50	47	53	37	30	27	64	57	56	48	40	35	68	61	60	53	45	40	73	68	68	61	53	48			
14	600	.01	44	29	20	15	14	19	53	55	53	46	39	32	56	59	57	51	43	37	62	67	65	60	50	44			
	1000	-.01	45	35	32	22	21	22	56	56	55	47	41	35	60	60	59	52	45	39	66	68	66	61	52	47			
	1600	-.02	46	41	42	29	28	25	59	57	56	48	42	37	63	61	60	53	47	42	69	69	68	62	53	49			
	2400	-.05	46	46	51	34	33	27	62	58	57	49	44	39	65	62	62	54	48	44	72	70	69	62	55	51			
	3100	-.07	47	49	57	38	37	29	64	58	58	50	45	40	67	63	63	55	49	45	73	70	70	63	56	52			
16	780	.00	39	31	21	20	19	18	56	60	60	56	49	42	60	64	64	53	47	47	65	71	71	67	61	56			
	1600	-.01	45	42	39	30	28	24	60	61	60	55	50	43	63	65	64	59	54	49	69	71	71	66	62	57			
	2400	-.02	48	49	49	36	33	28	62	61	60	55	50	44	66	65	64	59	55	50	71	72	70	66	62	58			
	3600	-.03	51	55	60	42	38	31	64	61	59	54	50	45	68	65	64	58	55	50	73	72	70	66	63	59			
	4200	-.04	53	57	64	44	40	32	65	61	59	54	51	46	68	65	63	58	55	51	74	72	70	66	63	60			

- NOTES:**
1. Based on tests conducted in accordance with ARI Standard 880-98.
  2. Δ P<sub>S</sub> static pressure difference from inlet to discharge.
  3. Δ P<sub>S</sub> is the minimum pressure required to deliver CFM shown with primary damper in wide open position.
  4. Dash (—) indicates db level less than 10.



A Participating Member in the ARI 880 Certification Program

# MODEL NUMBERING SYSTEM - Model AHC



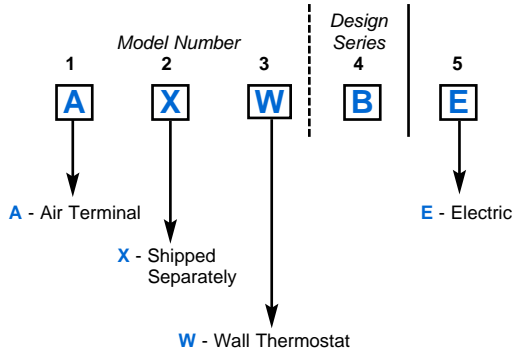
- CONTROL TYPE**
- CA - Pneumatic Actuator with Mechanical Max./Min. Stops by Carnes
  - CM - Pneumatic Actuator by Carnes
  - CE - Pneumatic Actuator by Carnes, Reset Controller by Carnes
  - CX - Pneumatic Actuator by Carnes (Multi-Function) Reset Controller by Carnes
  - EA - Electric Actuator by Carnes (Enclosure Included)
  - EB - Electric Actuator by Carnes Changeover Thermostat by Carnes (Enclosure Included)
  - ET - Analog Electronic Velocity Controller with Integral Damper Actuator (Enclosure Included)
  - DO - DDC Provided by Others, Mounted and Wired by Carnes, w/Carnes Inlet Sensor, w/3/8" Damper Shaft, w/Enclosure
  - DE - DDC Enclosure w/Carnes Inlet Sensor & Bare 3/8" Damper Shaft
  - NS - No Damper Controls, w/Carnes Inlet Sensor, & Bare 3/8" Damper Shaft (No Enclosure)
- Minimum setting cannot be zero with these controls. Duct sensor needs at least 20% of maximum rated CFM to sense duct air temperature.

- CONTROL and DAMPER ARRANGEMENTS**
- \*1 - Normally Open - Right Hand Controls  
(All Electric/Electronic/Manual Control Types/DO, DE, NS)  
(All Pneumatic Control Types for Reverse Acting Thermostat)
  - \*2 - Normally Open - Left Hand Controls  
(All Electric/Electronic/Manual Control Types/DO, DE, NS)  
(All Pneumatic Control Types for Reverse Acting Thermostat)
  - 3 - Normally Closed - Right Hand Controls  
(All Pneumatic Control Types for Direct Acting Thermostat)
  - 4 - Normally Closed - Left Hand Controls  
(All Pneumatic Control Types for Direct Acting Thermostat)
  - 5 - Normally Open - Right Hand Controls  
(All Pneumatic Control Types for Direct Acting Thermostat)
  - 6 - Normally Open - Left Hand Controls  
(All Pneumatic Control Types for Direct Acting Thermostat)
  - 7 - Normally Closed - Right Hand Controls  
(All Pneumatic Control Types for Reverse Acting Thermostat)
  - 8 - Normally Closed - Left Hand Controls  
(All Pneumatic Control Types for Reverse Acting Thermostat)

\* Electric, Electronic and DDC Units **DO NOT** fail open. '1' or '2' is used for Right or Left Hand Only. Electric/Electronic Units are shipped with the Damper in the Open Position.

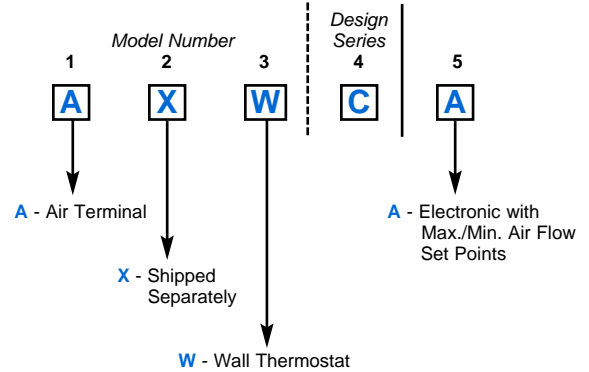
**NOTE:** Hand of controls is determined by facing the averaging flow sensor (inlet of the unit) with the supply air hitting the back of your head.

## ▼ Electric Thermostat



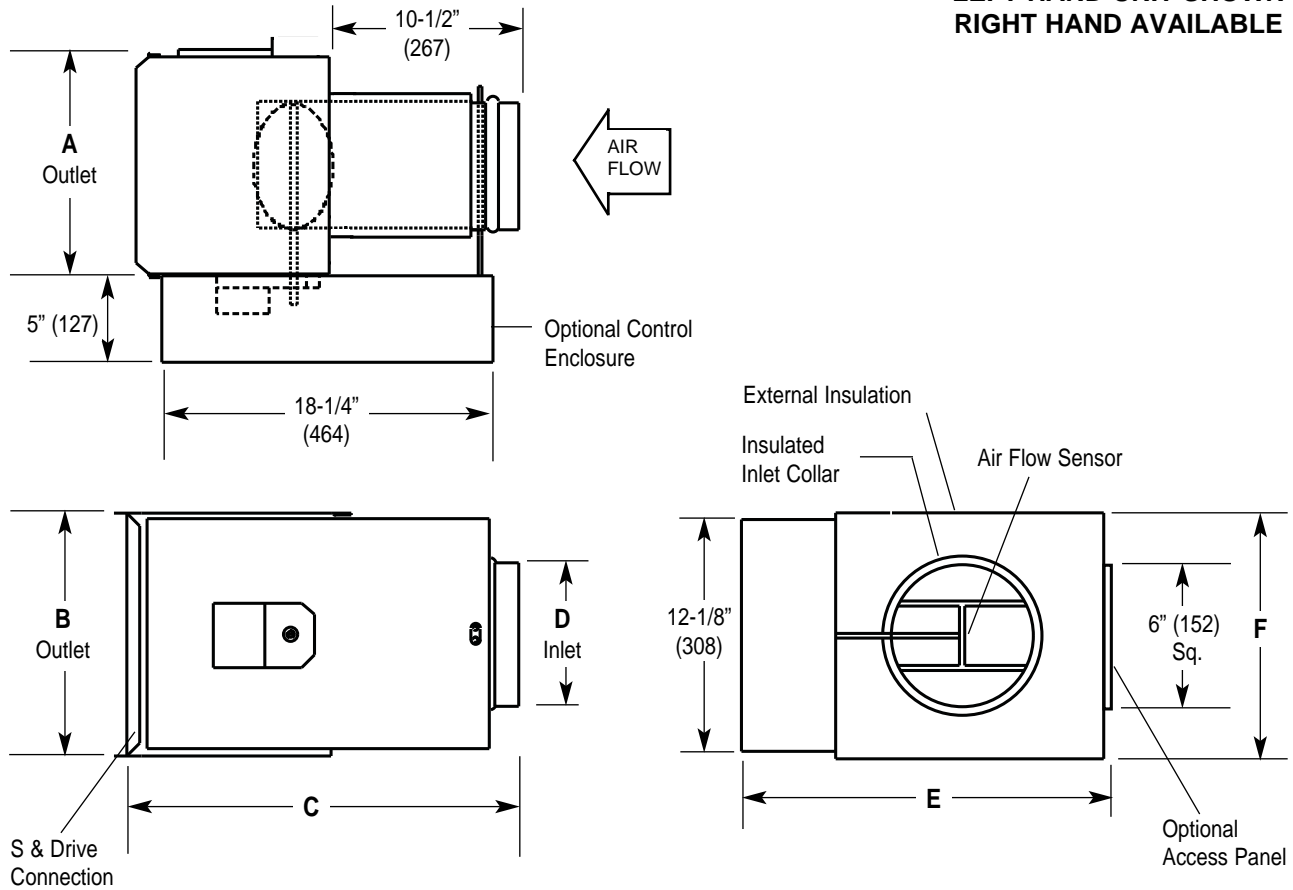
A Carnes Electric Thermostat **must be ordered** with the Electric EA and EB Control Options.

## ▼ Electronic Thermostat



A Carnes Electronic Thermostat **must be ordered** with the ET Electronic Control Option.

LEFT HAND UNIT SHOWN  
RIGHT HAND AVAILABLE



DIMENSIONS LISTED IN INCHES (Millimeters)

Unit Size	CFM Range	Outlet		C	Inlet		E	F
		A	B		D			
05	0-350 (0-165)	12 (305)	10 (254)	20-1/2 (521)	4-7/8 (124)	19 (482)	12 (305)	
06	0-500 (0-236)	12 (305)	10 (254)	20-1/2 (521)	5-7/8 (149)	19 (482)	12 (305)	
07	0-700 (0-330)	12 (305)	10 (254)	20-1/2 (521)	6-7/8 (175)	19 (482)	12 (305)	
08	0-1000 (0-472)	12 (305)	10 (254)	20-1/2 (521)	7-7/8 (200)	19 (482)	12 (305)	
10	0-1500 (0-708)	14 (356)	12-1/2 (318)	20-1/2 (521)	9-7/8 (251)	21 (533)	14-1/2 (368)	
12	0-2300 (0-1085)	16 (406)	15 (381)	20-1/2 (521)	11-7/8 (302)	23 (584)	17 (432)	
14	0-3100 (0-1463)	20 (508)	17-1/2 (445)	20-1/2 (521)	13-7/8 (352)	27 (685)	19-1/2 (495)	
16	0-4200 (0-1982)	24 (610)	17-1/2 (445)	21-1/2 (546)	15-7/8 (403)	31 (787)	19-1/2 (495)	