

# ENGINEERED EQUIPMENT SALES, INC.

Representing *AAON* Commercial Air Conditioning Products

## SUBMITTAL COVER SHEET

**Job Name:** ACWMA Office Building

**Mechanical Engineer:** Rumsey Engineers, Inc

**Mechanical Contractor:** American Mechanical Services, Inc.

**Equipment Vendor:** AAON, Inc.

### Unit Tag: AC-1 through AC-4

(4) AAON Model RM Packaged Rooftop Air Conditioning Units with the following features and accessories;

- Premium efficiency supply fan motor with factory mounted and wired VFD's (AC-1,2,3)
- Premium efficiency supply fan motor; constant volume unit (AC-4)
- DDC ready unit with isolation relays, control transformer, DDC economizer actuator
- Modulating scroll compressor (AC-1,2,3)
- Hinged, double wall access doors with SS piano type hinges
- Gas heat with 2 stage control (4 stage on AC-1 only)
- Factory mounted and wired smoke detector in supply air (AC-1,2)
- Constant volume OSA sensor, damper and actuator (AC-1,2,3,4)
- Gear drive economizer dampers
- 4" MERV-13 filters and 1" MERV-8 pre filter
- Clogged filter switch, Slide out blower assembly
- Factory mounted disconnect, TEX valves, Stainless steel drain pan
- Roof curb, 14 ga, 14" high for flat roof installation
- Refrigerant sight glass with compressor service isolation valves
- Spare set of filters and fan belts
- R-22 refrigerant AC-1,2,3; R-410a refrigerant AC-4
- 5 year compressor warranty
- Color coded wiring diagram laminated to inside of control compartment

**Not Included:** DDC controls or mounting of DDC controls, Vibration isolation, Seismic Calculations or certifications (15732 I.4.C), Rigging, start-up, redundant gas valve, thermostats, items not specifically mentioned above.

Submittal Prepared by: Douglas P. Herbert Date: April 12, 2006

# Unit Rating



2425 South Yukon Ave - Tulsa, Oklahoma 74107-2728 - Ph. (918) 583-2266 Fax (918) 583-6094  
AAONEcat32 Ver. 4.91 (SN: 0546516)

1A 1B 1C 1D 2 3 4 5A 5B 5C 6A 6B 6C 7 8 9 10 11 12 13 14A 14B 15 16 17 18 19 20 21 22 23  
RM-013-8-0-DB02-234:A000-LOB-DCG-0BA-ROCAC0H-00-0A000000X  
Tag: AC-1

## Job Information

Job Name: ACWMA Office Building  
Job Number: DH-174  
Site Altitude: 0 ft  
Refrigerant: R-22

## Static Pressure

External: 0.80 in. wg.  
Evaporator: 0.70 in. wg.  
Filters Clean: 0.23 in. wg.  
Dirt Allowance: 1 in. wg.

## Cooling Section

	Gross	Net
Total Capacity:	162.86	145.35 MBH
Sensible Capacity:	152.73	135.22 MBH
Latent Capacity:	10.13 MBH	
Mixed Air Temp:	75.00 °F DB	61.20 °F WB
Entering Air Temp:	75.00 °F DB	61.20 °F WB
Lv Air Temp (Coil):	51.59 °F DB	51.46 °F WB
Lv Air Temp (Unit):	54.22 °F DB	52.58 °F WB
Supply Air Fan:	1 x 185 @ 5.94 BHP	
SA Fan RPM / Width:	2186 / 6.290"	
Evaporator Coil:	11.7 ft² / 6 Rows / 12 FPI	
Evaporator Face Velocity:	522.9 fpm	

## EER - ARI Listing Information

EER @ ARI Conditions: 10.8

Application EER @ Op. Conditions: 8.5

## Electrical Data

Rating: 208/3/60  
Unit FLA: 72

Minimum Circuit Amp: 78  
Maximum Overcurrent: 100

	Qty	HP	VAC	Phase	RPM	FLA	RLA
Compressor 1:	2		208	3			18.6
Condenser Fans:	2	0.75	208	1	1075	5.4	
Supply Fan:	1	7.50	208	3	1760	24.2	
Combustion:	1	0.09	208	1	3000	1.3	

## Cabinet Sound Power Levels\*

Octave Bands:	63	125	250	500	1000	2000	4000	8000
Discharge LW(dB):	87	88	92	96	93	89	83	78
Return LW(dB):	77	80	79	76	73	66	56	46

\*Sound power levels are given for informational purposes only. The sound levels are not guaranteed.



# 15.0" STAR Plenum

2425 South Yukon Ave - Tulsa, Oklahoma 74107-2728 - Ph. (918) 583-2266 Fax (918) 583-6094  
AAONEcat32 Ver. 4.91 (SN: 0546516)

## JOB INFORMATION:

Job Name: ACWMA Office Building  
Job Tag: AC-2  
Rep Firm: 245 Engineered Equip Sales  
Date: 04/12/2006

## WHEEL SPECIFICATION:

Max RPM: 2,200  
Diameter x Qty: 15.0 in. x 1  
Width%: 100  
Tip Speed: 7,917 FPM  
Inertia: 3 WR<sup>2</sup>

## OPERATING CONDITIONS:

Air Flow: 2,590 CFM  
Static Pressure: 2.39 in. Wg.  
Plenum DP: 0.00 in. Wg.  
Inlet Grill DP: 0.00 in. Wg.  
TSP: 2.39 in. Wg.  
Site Altitude: 0.00 Ft  
TSP @ Sea Level: 2.39 in. Wg.

## MOTOR SELECTION:

Rated HP / Bypass: 3 / No  
Frame Size: 182T  
Nominal RPM: 1760  
VAC/PH/HZ: 208/3/60  
Efficiency: Premium / 0.895  
Enclosure Type: ODP  
Max Inertial Load: 29 WR<sup>2</sup>

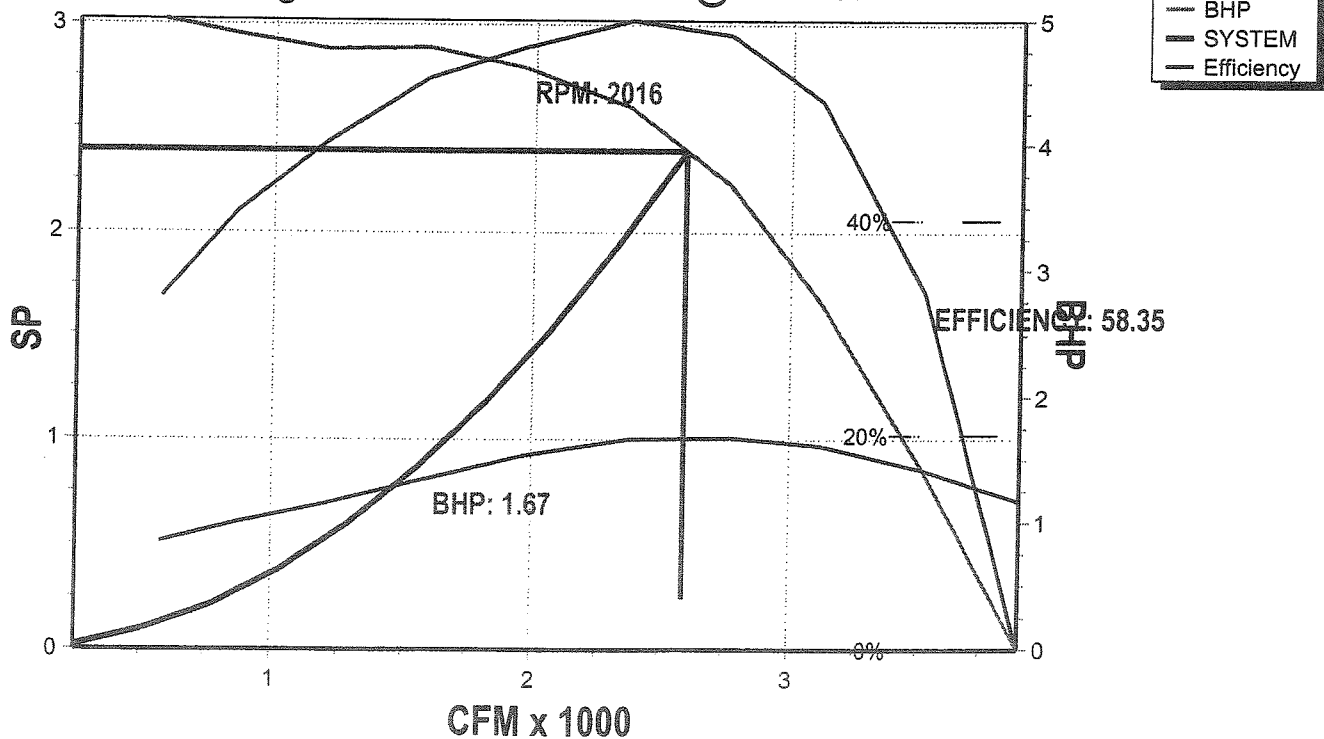
## FAN PERFORMANCE:

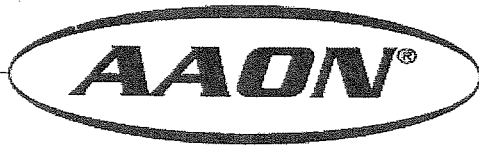
RPM: 2016  
BHP: 1.67  
Efficiency: 58.3%  
In/Out Velocity: 1315/1020 FPM  
Plenum Out Velocity: 43 FPM

## FAN SOUND POWER (Inlet/Outlet):

Octave Band:	(Re 10 <sup>-12</sup> watts)						
	1	2	3	4	5	6	7
	67	67	70	78	69	71	70
	67	66	71	85	79	81	76
SOUND POWER A-Weighted: 77 / 84 dB							

Supply Fan Model: 150 @ 2016 RPM and 100% Width  
Design Conditions: 2590 CFM @ 2.39" SP





# Unit Submittal

2425 South Yukon Ave. Tulsa, Oklahoma 74107-2728 - Ph. (918) 583-2266 Fax (918) 583-6094  
AAONEcat32 Ver. 4.91 (SN: 0546516)

1A 1B 1C 1D 2 3 4 5A 5B 5C 6A 6B 6C 7 8 9 10 11 12 13 14A 14B 15 16 17 18 19 20 21 22 23  
RM-006-8-0-DA01-232:A000-LOB-DBE-0BA-G0CFC0H-00-0A000000X  
Tag: AC-2

Job Name:  
Job Number:

ACWMA Office Building  
DH-174

Unit Submittal For:  
Unit Submittal Date:

American Mechanical Services  
April 05, 2006

	Base Option	Description
R	Series	Roof Top Unit
M	Generation	Eighth Generation
006	Unit Size	Six
8	Voltage	208V/3Ø/60Hz
0	Inter. Protection	Standard
D	Cooling - Style	R22 + Digital Scroll Compressor
A	Cooling - Configuration	Air Cooled Cond w/ Std Coil
0	Cooling - Coating	Standard
1	Cooling - Staging	1 Stage
2	Heating - Type	Nat. Gas Aluminized
3	Heating - Designation	Heat 3 - 180 MBtu/h
2	Heating - Staging	2 Stage

	Feature Option	Description
A	1A. Return / Outside Air Section	Economizer
0	1B. R/A Blower Configuration	Std (None)
0	1C. R/A Blower	Std (None)
0	1D. R/A Motor	Std (No Motor)
L	2. O/A CONTROL	Constant Volume Outside Air + DDC Actuator
0	3. GAS OPTIONS	Standard
B	4. MAINTENANCE OPTIONS	115V convenience outlet, factory wired
D	5A. S/A BLOWER CONFIG.	1 Blower (Premium efficiency motor) w/ one VFD
B	5B. S/A BLOWER	Blower B (BI 15")
E	5C. S/A MOTOR	3.0 hp (1760 rpm)
0	6A. PRE FILTER TYPE	Standard (None)
B	6B. UNIT FILTER TYPE	4" Pleated 30% eff
A	6C. FILTER OPTIONS	Clogged Filter Switch (CFS)
G	7. REFRIG. CONTROL	5 MTDR Off + Fan Cycling
0	8. REFRIG. OPTIONS	Standard
C	9. REFRIG. ACCESSORIES	Sight Glass + Compressor Isolation Valves
F	10. POWER OPTIONS	Power Switch (60 amps)
C	11. SAFETY OPTIONS	S/A Smoke Detector
0	12. CONTROLS	Standard
H	13. SPECIAL CONTROLS	Field Installed DDC Controls by Others
0	14A. PREHEAT CONFIG.	Standard (No Preheat)
0	14B. PREHEAT SIZING	Standard (No Preheat)
0	15. BLANK	Standard
A	16. INT. CAB. OPTIONS	Stainless Steel Drain Pans
0	17. EXT. CAB. OPTIONS	Standard
0	18. CUSTOMER CODE	Standard
0	19. CODE OPTIONS	Std ETL U.S.A. Listing
0	20. CRATING	Standard
0	21. WATER COOLED COND.	Std (No Water Condenser)
0	22. BLANK	Standard
X	23. TYPE	Special Price Authorization & Gray Paint



# Unit Rating

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1A 1B 1C 1D 2 3 4 5A 5B 5C 6A 6B 6C 7 8 9 10 11 12 13 14A 14B 15 16 17 18 19 20 21 22 23  
RM-A04-8-0-DA01-222:A000-LOB-DGD-0BA-00CF00H-00-0A000000X  
Tag: AC-3

## Job Information

Job Name: ACWMA Office Building  
Job Number: DH-174  
Site Altitude: 0 ft  
Refrigerant: R-22

## Unit Information

\*\*WEIGHT AND PERFORMANCE DO NOT INCLUDE SPA

Approx. Op./Ship Weights: 912 / 912 lbs. \*\*  
Supply CFM/ESP: 1595 / 0.7 in. wg.  
Final-Filter FV / Qty: 179.44 fpm / 4  
Outside CFM: 1300  
Ambient Temperature: 89 °F DB / 75 °F WB  
Return Temperature: 75 °F DB / 62 °F WB

## Static Pressure

External: 0.70 in. wg.  
Evaporator: 0.24 in. wg.  
Filters Clean: 0.03 in. wg.  
Dirt Allowance: 1 in. wg.

Economizer: 0.05 in. wg.  
Heating: 0.07 in. wg.  
Total: 2.10 in. wg.

## Cooling Section

	Gross	Net
Total Capacity:	47.85	44.70 MBH
Sensible Capacity:	42.48	39.34 MBH
Latent Capacity:	5.37 MBH	
Mixed Air Temp:	74.70 °F DB	60.80 °F WB
Entering Air Temp:	74.70 °F DB	60.80 °F WB
Lv Air Temp (Coil):	49.80 °F DB	49.67 °F WB
Lv Air Temp (Unit):	51.61 °F DB	50.47 °F WB
Supply Air Fan:	1 x 150B50 @ 0.98 BHP	
SA Fan RPM / Width:	2143 / 2.580"	
Evaporator Coil:	4.7 ft <sup>2</sup> / 3 Rows / 14 FPI	
Evaporator Face Velocity:	337.8 fpm	

## Heating Section

PreHeat Type: Std (No Preheat)  
Heating Type: Nat. Gas Heat  
Heating CFM: 1595  
Total Capacity: 72.9 MBH  
OA Temp: 35.0 DB / 30.0 °F WB  
RA Temp: 75.0 °F DB / 62.0 °F WB  
Entering Air Temp: 60.0 °F DB / 45.0 °F WB  
Leaving Air Temp: 102.4 °F DB / 62.4 °F WB  
Input: 90.0 MBH  
Heater Qty: 1  
Consumption: 90.0 MBH  
Operation: N/A

## EER - ARI Listing Information

SEER @ ARI Conditions: 13.0

Application EER @ Op. Conditions: 9.5

## Electrical Data

Rating: 208/3/60  
Unit FLA: 23

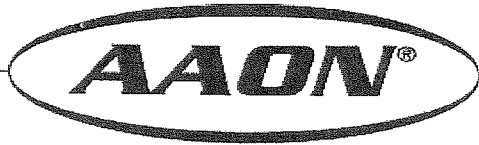
Minimum Circuit Amp: 26  
Maximum Overcurrent: 35

	Qty	HP	VAC	Phase	RPM	FLA	RLA
Compressor 1:	1		208	3			12.8
Condenser Fans:	1	0.33	208	1	1075	2.6	
Supply Fan:	1	2.00	208	3	1760	7.5	
Combustion:	1	0.09	208	1	3000	1.3	

## Cabinet Sound Power Levels \*

Octave Bands:	63	125	250	500	1000	2000	4000	8000
Discharge LW(dB):	77	76	81	86	81	80	76	67
Return LW(dB):	74	74	71	69	65	62	54	46

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# 15.0" STAR Plenum

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## JOB INFORMATION:

Job Name: ACWMA Office Building  
Job Tag: AC-3  
Rep Firm: 245 Engineered Equip Sales  
Date: 04/12/2006

## WHEEL SPECIFICATION:

Max RPM: 2,200  
Diameter x Qty: 15.0 in. x 1  
CFM: 1595  
Tip Speed: 8,416 FPM  
Inertia: 3 WR<sup>2</sup>

## OPERATING CONDITIONS:

Air Flow: 1,595 CFM  
Static Pressure: 2.10 in. Wg.  
Relief Dampers DP: 0.00 in. Wg.

TSP: 2.10 in. Wg.  
Site Altitude: 0.00 Ft  
TSP @ Sea Level: 2.10 in. Wg.

## MOTOR SELECTION:

Rated HP / Bypass: 2 / No  
Frame Size: 145T  
Nominal RPM: 1760  
VAC/PH/HZ: 208/3/60  
Efficiency: Premium / 0.865  
Enclosure Type: ODP  
Max Inertial Load: 27 WR<sup>2</sup>

## FAN PERFORMANCE:

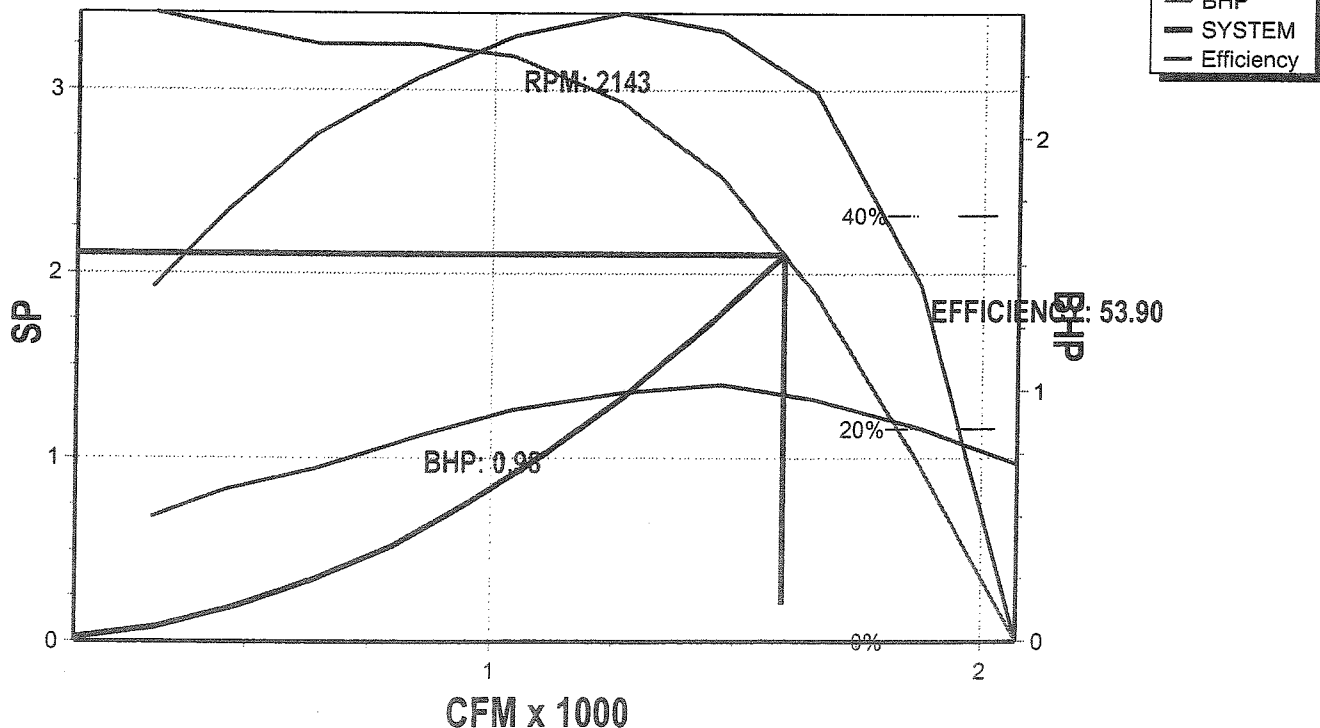
RPM: 2143  
BHP: 0.98  
Efficiency: 53.9%  
In/Out Velocity: 810/897 FPM  
Plenum Out Velocity: 27 FPM

## FAN SOUND POWER (Inlet/Outlet):

Octave Band:		(Re 10 <sup>-12</sup> watts)					
1	2	3	4	5	6	7	8
77	77	80	82	75	74	74	68
77	76	81	88	84	84	80	71

SOUND POWER A-Weighted: 82 / 88 dB

Supply Fan Model: 150B50 @ 2143 RPM and 100% Width  
Design Conditions: 1595 CFM @ 2.10" SP





# Unit Submittal

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1A 1B 1C 1D 2 3 4 5A 5B 5C 6A 6B 6C 7 8 9 10 11 12 13 14A 14B 15 16 17 18 19 20 21 22 23  
RM-A04-8-0-DA01-222:A000-LOB-DGD-0BA-00CF00H-00-0A000000X  
Tag: AC-3

Job Name:  
Job Number:

ACWMA Office Building  
DH-174

Unit Submittal For:  
Unit Submittal Date:

American Mechanical Services  
April 05, 2006

	Base Option	Description
R	Series	Roof Top Unit
M	Generation	Eighth Generation
004	Unit Size	Four
8	Voltage	208V/3Ø/60Hz
0	Inter. Protection	Standard
D	Cooling - Style	R22 + Digital Scroll Compressor
A	Cooling - Configuration	Air Cooled Cond w/ Std Coil
0	Cooling - Coating	Standard
1	Cooling - Staging	1 Stage
2	Heating - Type	Nat. Gas Aluminized
2	Heating - Designation	Heat 2 - 90 MBtu/h
2	Heating - Staging	2 Stage

	Feature Option	Description
A	1A. Return / Outside Air Section	Economizer
0	1B. R/A Blower Configuration	Std (None)
0	1C. R/A Blower	Std (None)
0	1D. R/A Motor	Std (No Motor)
L	2. O/A CONTROL	Constant Volume Outside Air + DDC Actuator
0	3. GAS OPTIONS	Standard
B	4. MAINTENANCE OPTIONS	115V convenience outlet, factory wired
D	5A. S/A BLOWER CONFIG.	1 Blower (Premium efficiency motor) w/ one VFD
G	5B. S/A BLOWER	Blower G (BI 150 Banded 50%)
D	5C. S/A MOTOR	2.0 hp (1760 rpm)
0	6A. PRE FILTER TYPE	Standard (None)
B	6B. UNIT FILTER TYPE	4" Pleated 30% eff
A	6C. FILTER OPTIONS	Clogged Filter Switch (CFS)
0	7. REFRIG. CONTROL	Std (Fixed 55 deg CLO)
0	8. REFRIG. OPTIONS	Standard
C	9. REFRIG. ACCESSORIES	Sight Glass + Compressor Isolation Valves
F	10. POWER OPTIONS	Power Switch (60 amps)
0	11. SAFETY OPTIONS	Standard
0	12. CONTROLS	Standard
H	13. SPECIAL CONTROLS	Field Installed DDC Controls by Others
0	14A. PREHEAT CONFIG.	Standard (No Preheat)
0	14B. PREHEAT SIZING	Standard (No Preheat)
0	15. BLANK	Standard
A	16. INT. CAB. OPTIONS	Stainless Steel Drain Pans
0	17. EXT. CAB. OPTIONS	Standard
0	18. CUSTOMER CODE	Standard
0	19. CODE OPTIONS	Std ETL U.S.A. Listing
0	20. CRATING	Standard
0	21. WATER COOLED COND.	Std (No Water Condenser)
0	22. BLANK	Standard
X	23. TYPE	Special Price Authorization & Gray Paint



# Unit Rating

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AAONEcat32 Ver. 4.91 (SN: 0546516)

1A 1B 1C 1D 2 3 4 5A 5B 5C 6A 6B 6C 7 8 9 10 11 12 13 14A 14B 15 16 17 18 19 20 21 22 23  
RM-A01-9-0-BA01-000:A000-LOB-BGC-0BA-A0CF00H-00-0A000000X  
Tag: AC-4

## Job Information

Job Name: ACWMA Office Building  
Job Number: DH-174  
Site Altitude: 0 ft  
Refrigerant: R-410A

## Unit Information

\*\*WEIGHT AND PERFORMANCE DO NOT INCLUDE SPA

Approx. Op./Ship Weights: 775 / 775 lbs. \*\*  
Supply CFM/ESP: 710 / 0.5 in. wg.  
Final Filter FV / Qty: 79.88 rpm / 4  
Outside CFM: 320  
Ambient Temperature: 89 °F DB / 70 °F WB  
Return Temperature: 75 °F DB / 62 °F WB

## Static Pressure

External: 0.50 in. wg.  
Evaporator: 0.05 in. wg.  
Filters Clean: 0.00 in. wg.  
Dirt Allowance: 1 in. wg.

Economizer: 0.02 in. wg.  
Heating: 0.00 in. wg.  
Total: 1.57 in. wg.

## Cooling Section

	Gross	Net
Total Capacity:	20.17	19.11 MBH
Sensible Capacity:	18.71	17.64 MBH
Latent Capacity:	1.46 MBH	
Mixed Air Temp:	78.30 °F DB	63.50 °F WB
Entering Air Temp:	78.30 °F DB	63.50 °F WB
Lv Air Temp (Coil):	53.71 °F DB	53.51 °F WB
Lv Air Temp (Unit):	55.08 °F DB	54.07 °F WB
Supply Air Fan:	1 x 150B50 @ 0.31 BHP	
SA Fan RPM / Width:	1504 / 2.580"	
Evaporator Coil:	4.4 ft <sup>2</sup> / 3 Rows / 14 FPI	
Evaporator Face Velocity:	161.0 rpm	

## Heating Section

PreHeat Type: Std (No Preheat)  
Heating Type: No Heat

## EER - ARI Listing Information

SEER @ ARI Conditions: 0.0

Application EER @ Op. Conditions: 10.5

## Electrical Data

Rating: 208/1/60  
Unit FLA: 21

Minimum Circuit Amp: 24  
Maximum Overcurrent: 30

	Qty	HP	VAC	Phase	RPM	FLA	RLA
Compressor 1:	1		208	1			10
Condenser Fans:	1	0.33	208	1	1075	2.6	
Supply Fan:	1	1.00	208	1	1760	8.8	

## Cabinet Sound Power Levels \*

Octave Bands:	63	125	250	500	1000	2000	4000	8000
Discharge LW(dB):	74	76	81	79	74	72	65	56
Return LW(dB):	71	73	69	60	58	56	45	36

\*Sound power levels are given for informational purposes only. The sound levels are not guaranteed.





# 15.0" STAR Plenum

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AAONEcat32 Ver. 4.91 (SN: 0546516)

## JOB INFORMATION:

Job Name: ACWMA Office Building  
Job Tag: AC-4  
Rep Firm: 245 Engineered Equip Sales  
Date: 04/12/2006

## WHEEL SPECIFICATION:

Max RPM: 2,200  
Diameter x Qty: 15.0 in. x 1  
CFM: 710  
Tip Speed: 5,906 FPM  
Inertia: 3 WR<sup>2</sup>

## OPERATING CONDITIONS:

Air Flow: 710 CFM  
Static Pressure: 1.57 in. Wg.  
Relief Dampers DP: 0.00 in. Wg.  
  
TSP: 1.57 in. Wg.  
Site Altitude: 0.00 Ft  
TSP @ Sea Level: 1.57 in. Wg.

## MOTOR SELECTION:

Rated HP / Bypass: 1 / No  
Frame Size: 143T  
Nominal RPM: 1760  
VAC/PH/HZ: 208/1/60  
Efficiency: Premium / 0.855  
Enclosure Type: ODP  
Max Inertial Load: 15 WR<sup>2</sup>

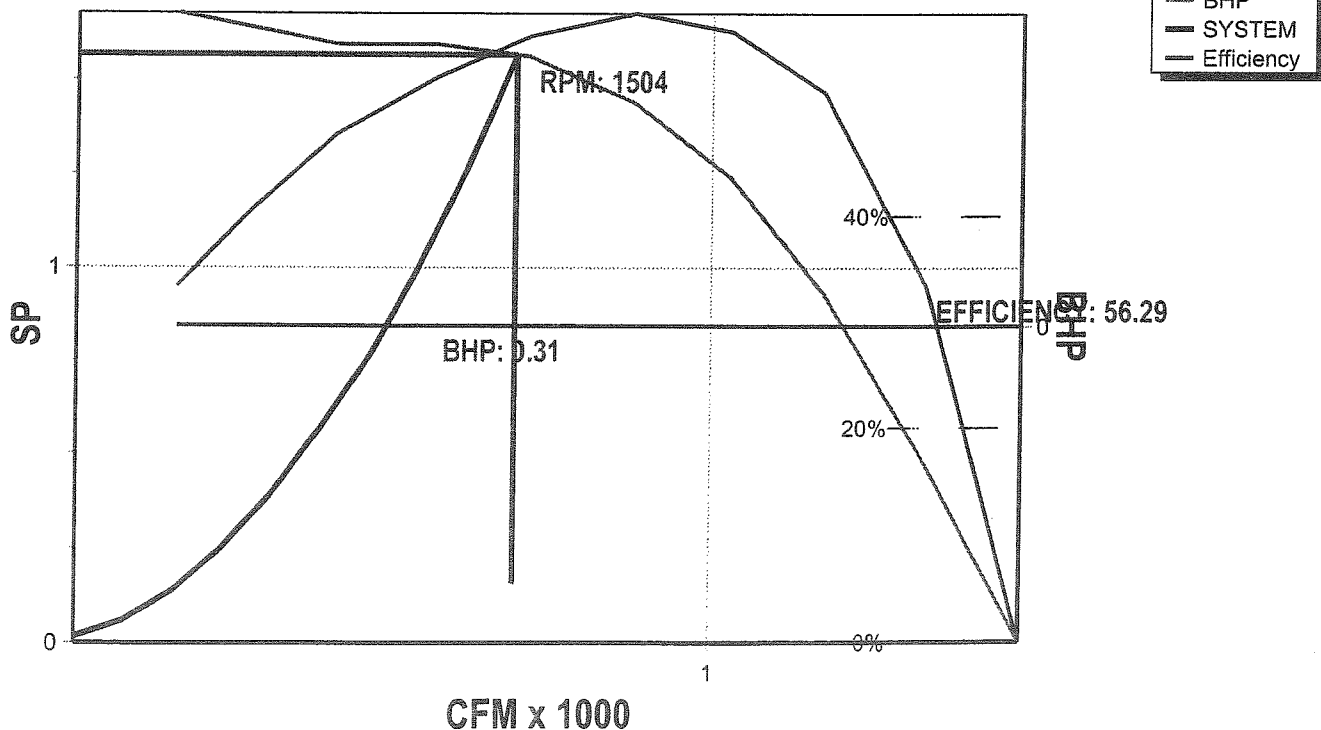
## FAN PERFORMANCE:

RPM: 1504  
BHP: 0.31  
Efficiency: 56.3%  
In/Out Velocity: 360/399 FPM  
Plenum Out Velocity: 12 FPM

## FAN SOUND POWER (Inlet/Outlet):

Octave Band:		(Re 10 <sup>-12</sup> watts)						
1	2	3	4	5	6	7	8	
74	76	78	73	68	68	65	58	
74	76	81	81	78	76	69	60	
SOUND POWER A-Weighted: 76 / 81 dB								

Supply Fan Model: 150B50 @ 1504 RPM and 100% Width  
Design Conditions: 710 CFM @ 1.57" SP





# 18.5" STAR Plenum

2425 South Yukon Ave - Tulsa, Oklahoma 74107-2728 - Ph. (918) 583-2266 Fax (918) 583-6094  
AAONEcat32 Ver. 4.91 (SN: 0546516)

## JOB INFORMATION:

Job Name: ACWMA Office Building  
Job Tag: AC-1  
Rep Firm: 245 Engineered Equip Sales  
Date: 04/05/2006

## WHEEL SPECIFICATION:

Max RPM: 2,200  
Diameter x Qty: 18.5 in. x 1  
Width%: 100  
Tip Speed: 10,587 FPM  
Inertia: 3 WR<sup>2</sup>

## OPERATING CONDITIONS:

Air Flow: 6,100 CFM  
Static Pressure: 3.33 in. Wg.  
Plenum DP: 0.00 in. Wg.  
Inlet Grill DP: 0.00 in. Wg.  
TSP: 3.33 in. Wg.  
Site Altitude: 0.00 Ft  
TSP @ Sea Level: 3.33 in. Wg.

## MOTOR SELECTION:

Rated HP / Bypass: 7.5 / No  
Frame Size: 213T  
Nominal RPM: 1760  
VAC/PH/HZ: 208/3/60  
Efficiency: Premium / 0.91  
Enclosure Type: ODP  
Max Inertial Load: 64 WR<sup>2</sup>

## FAN PERFORMANCE:

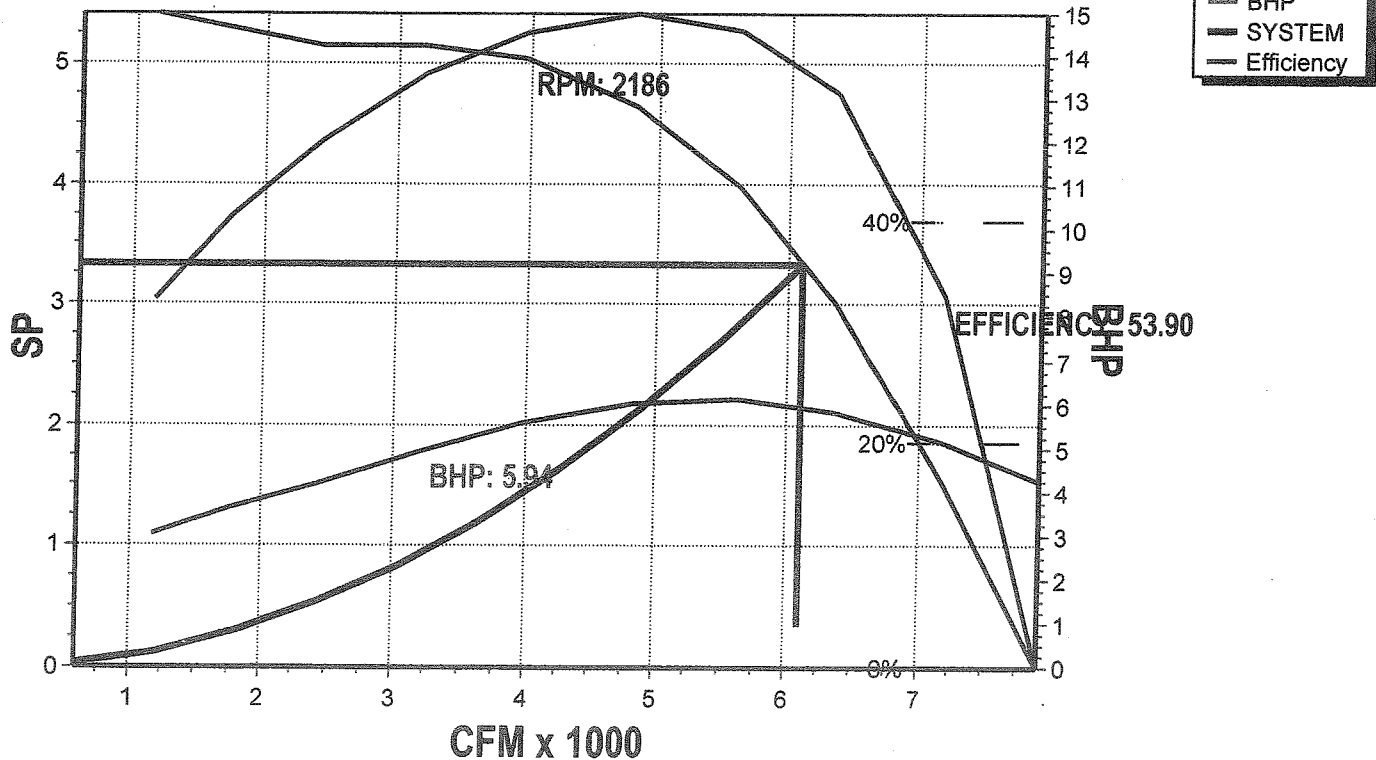
RPM: 2186  
BHP: 5.94  
Efficiency: 53.9%  
In/Out Velocity: 3096/2402 FPM  
Plenum Out Velocity: 102 FPM

## FAN SOUND POWER (Inlet/Outlet):

Octave Band:		(Re 10 <sup>-12</sup> watts)							
1	2	3	4	5	6	7	8		
87	89	91	92	87	84	80	76		
87	88	92	97	96	92	86	81		

SOUND POWER A-Weighted: 91 / 97 dB

Supply Fan Model: 185 @ 2186 RPM and 100% Width  
Design Conditions: 6100 CFM @ 3.33" SP





# Unit Submittal

2425 South Yukon Ave - Tulsa, Oklahoma 74107-2728 - Ph. (918) 583-2266 Fax (918) 583-6094  
AAONEcat32 Ver. 4.91 (SN: 0546516)

1A 1B 1C 1D 2 3 4 5A 5B 5C 6A 6B 6C 7 8 9 10 11 12 13 14A 14B 15 16 17 18 19 20 21 22 23

RM-013-8-0-DB02-234:A000-L0B-DCG-0BA-ROCAC0H-00-0A000000X

Tag: AC-1

Job Name:  
Job Number:

ACWMA Office Building  
DH-174

Unit Submittal For:  
Unit Submittal Date:

American Mechanical Services  
April 05, 2006

	Base Option	Description
R	Series	Roof Top Unit
M	Generation	Eighth Generation
013	Unit Size	Thirteen
8	Voltage	208V/3Ø/60Hz
0	Inter. Protection	Standard
D	Cooling - Style	R22 + Digital Scroll Compressor
B	Cooling - Configuration	Air Cooled Cond w/ 6R Evap coil
0	Cooling - Coating	Standard
2	Cooling - Staging	2 Stage
2	Heating - Type	Nat. Gas Aluminized
3	Heating - Designation	Heat 3 - 180 MBtuh
4	Heating - Staging	4 Stage

	Feature Option	Description
A	1A. Return / Outside Air Section	Economizer
0	1B. R/A Blower Configuration	Std (None)
0	1C. R/A Blower	Std (None)
0	1D. R/A Motor	Std (No Motor)
L	2. O/A CONTROL	Constant Volume Outside Air + DDC Actuator
0	3. GAS OPTIONS	Standard
B	4. MAINTENANCE OPTIONS	115V convenience outlet, factory wired
D	5A. S/A BLOWER CONFIG.	1 Blower (Premium efficiency motor) w/ one VFD
C	5B. S/A BLOWER	Blower C (BI 18.5")
G	5C. S/A MOTOR	7.5 hp (1760 rpm)
0	6A. PRE FILTER TYPE	Standard (None)
B	6B. UNIT FILTER TYPE	4" Pleated 30% eff
A	6C. FILTER OPTIONS	Clogged Filter Switch (CFS)
R	7. REFRIG. CONTROL	5 MTDR Off + 20 STDR Delay + Fan Cycling
0	8. REFRIG. OPTIONS	Standard
C	9. REFRIG. ACCESSORIES	Sight Glass + Compressor Isolation Valves
A	10. POWER OPTIONS	Power Switch (100 amps)
C	11. SAFETY OPTIONS	S/A Smoke Detector
0	12. CONTROLS	Standard
H	13. SPECIAL CONTROLS	Field Installed DDC Controls by Others
0	14A. PREHEAT CONFIG.	Standard (No Preheat)
0	14B. PREHEAT SIZING	Standard (No Preheat)
0	15. BLANK	Standard
A	16. INT. CAB. OPTIONS	Stainless Steel Drain Pans
0	17. EXT. CAB. OPTIONS	Standard
0	18. CUSTOMER CODE	Standard
0	19. CODE OPTIONS	Std ETL U.S.A. Listing
0	20. CRATING	Standard
0	21. WATER COOLED COND.	Std (No Water Condenser)
0	22. BLANK	Standard
X	23. TYPE	Special Price Authorization & Gray Paint



# Unit Rating

2425 South Yukon Ave - Tulsa, Oklahoma 74107-2728 - Ph. (918) 583-2266 Fax (918) 583-6094  
AAONEcat32 Ver. 4.91 (SN: 0546516)

1A 1B 1C 1D 2 3 4 5A 5B 5C 6A 6B 6C 7 8 9 10 11 12 13 14A 14B 15 16 17 18 19 20 21 22 23  
RM-006-8-0-DA01-232:A000-LOB-DBE-0BA-G0CFC0H-00-0A000000X  
Tag: AC-2

## Job Information

Job Name: ACWMA Office Building  
Job Number: DH-174  
Site Altitude: 0 ft  
Refrigerant: R-22

## Unit Information

\*\*WEIGHT AND PERFORMANCE DO NOT INCLUDE SPA

Approx. Op./Ship Weights: 958 / 958 lbs. \*\*  
Supply CFM/ESP: 2590 / 0.8 in. wg.  
Final Filter FV / Qty: 291.38 fpm / 4  
Outside CFM: 1300  
Ambient Temperature: 89 °F DB / 75 °F WB  
Return Temperature: 75 °F DB / 62 °F WB

## Static Pressure

External: 0.80 in. wg.  
Evaporator: 0.23 in. wg.  
Filters Clean: 0.09 in. wg.  
Dirt Allowance: 1 in. wg.

Economizer: 0.09 in. wg.  
Heating: 0.17 in. wg.  
Total: 2.39 in. wg.

## Cooling Section

	Gross	Net
Total Capacity:	78.21	73.10 MBH
Sensible Capacity:	73.99	68.87 MBH
Latent Capacity:	4.22 MBH	
Mixed Air Temp:	79.80 °F DB	63.50 °F WB
Entering Air Temp:	79.80 °F DB	63.50 °F WB
Lv Air Temp (Coil):	52.85 °F DB	52.77 °F WB
Lv Air Temp (Unit):	54.66 °F DB	53.52 °F WB
Supply Air Fan:	1 x 150 @ 1.67 BHP	
SA Fan RPM / Width:	2016 / 5.160"	
Evaporator Coil:	7.6 ft <sup>2</sup> / 3 Rows / 14 FPI	
Evaporator Face Velocity:	342.8 fpm	

## Heating Section

PreHeat Type: Std (No Preheat)  
Heating Type: Nat. Gas Heat  
Heating CFM: 2590  
Total Capacity: 145.8 MBH  
OA Temp: 35.0 DB / 30.0 °F WB  
RA Temp: 75.0 °F DB / 62.0 °F WB  
Entering Air Temp: 60.0 °F DB / 45.0 °F WB  
Leaving Air Temp: 112.2 °F DB / 65.6 °F WB  
Input: 180.0 MBH  
Heater Qty: 1  
Consumption: 180.0 MBH  
Operation: N/A

## EER - ARI Listing Information

EER @ ARI Conditions: 10.2

Application EER @ Op. Conditions: 10.0

## Electrical Data

Rating: 208/3/60  
Unit FLA: 34

Minimum Circuit Amp: 39  
Maximum Overcurrent: 50

	Qty	HP	VAC	Phase	RPM	FLA	RLA
Compressor 1:	1		208	3			18.6
Condenser Fans:	2	0.33	208	1	1075	2.6	
Supply Fan:	1	3.00	208	3	1760	10.6	
Combustion:	1	0.09	208	1	3000	1.3	

## Cabinet Sound Power Levels \*

Octave Bands:	63	125	250	500	1000	2000	4000	8000
Discharge LW(dB):	67	66	71	83	75	77	72	62
Return LW(dB):	62	62	60	64	57	57	49	38

\*Sound power levels are given for informational purposes only. The sound levels are not guaranteed.



# Unit Submittal

2425 South Yukon Ave - Tulsa, Oklahoma 74107-2728 - Ph. (918) 583-2266 Fax (918) 583-6094  
AAONE<sub>ent</sub>32 Ver. 4.91 (SN: 0546516)

1A 1B 1C 1D 2 3 4 5A 5B 5C 6A 6B 6C 7 8 9 10 11 12 13 14A 14B 15 16 17 18 19 20 21 22 23

RM-A01-9-0-BA01-000:A000-LOB-BGC-0BA-A0CF00H-00-0A000000X  
Tag: AC-4

Job Name:  
Job Number:

ACWMA Office Building  
DH-174

Unit Submittal For:  
Unit Submittal Date:

American Mechanical Services  
April 05, 2006

	Base Option	Description
R	Series	Roof Top Unit
M	Generation	Eighth Generation
001	Unit Size	One
9	Voltage	208V1Ø/60Hz
0	Inter. Protection	Standard
B	Cooling - Style	R410A
A	Cooling - Configuration	Air Cooled Cond w/ Std Coil
0	Cooling - Coating	Standard
1	Cooling - Staging	1 Stage
0	Heating - Type	No Heat
0	Heating - Designation	No Heat
0	Heating - Staging	No Heat

	Feature Option	Description
A	1A. Return / Outside Air Section	Economizer
0	1B. R/A Blower Configuration	Std (None)
0	1C. R/A Blower	Std (None)
0	1D. R/A Motor	Std (No Motor)
L	2. O/A CONTROL	Constant Volume Outside Air + DDC Actuator
0	3. GAS OPTIONS	Standard
B	4. MAINTENANCE OPTIONS	115V convenience outlet, factory wired
B	5A. S/A BLOWER CONFIG.	1 Blower (Premium efficiency motor)
G	5B. S/A BLOWER	Blower G (BI 150 Banded 50%)
C	5C. S/A MOTOR	1.0 hp (1760 rpm)
0	6A. PRE FILTER TYPE	Standard (None)
B	6B. UNIT FILTER TYPE	4" Pleated 30% eff
A	6C. FILTER OPTIONS	Clogged Filter Switch (CFS)
A	7. REFRIG. CONTROL	5 Minute Time Delay Relay (MTDR) Orr
0	8. REFRIG. OPTIONS	Standard
C	9. REFRIG. ACCESSORIES	Sight Glass + Compressor Isolation Valves
F	10. POWER OPTIONS	Power Switch (60 amps)
0	11. SAFETY OPTIONS	Standard
0	12. CONTROLS	Standard
H	13. SPECIAL CONTROLS	Field Installed DDC Controls by Others
0	14A. PREHEAT CONFIG.	Standard (No Preheat)
0	14B. PREHEAT SIZING	Standard (No Preheat)
0	15. BLANK	Standard
A	16. INT. CAB. OPTIONS	Stainless Steel Drain Pans
0	17. EXT. CAB. OPTIONS	Standard
0	18. CUSTOMER CODE	Standard
0	19. CODE OPTIONS	Std ETL U.S.A. Listing
0	20. CRATING	Standard
0	21. WATER COOLED COND.	Std (No Water Condenser)
0	22. BLANK	Standard
X	23. TYPE	Special Price Authorization & Gray Paint

# YASKAWA Variable Frequency Drive

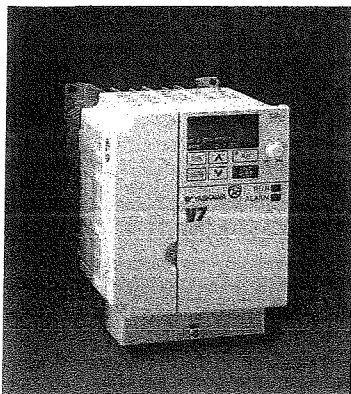
CIMR-V7AM20P71

## Description

1- 10HP

V7 Drive

V7



Yaskawa's V7 is a high performance AC drive for induction motors. This PWM design provides low motor noise and high starting torque. The V7 provides two control methods; V/Hz and also open loop vector control for precision speed regulation applications. In addition to good speed regulation, open loop vector control also provides higher torque at lower speeds. The V7 is intended for constant torque applications, with current overload rating of 150% for 60 seconds; it is provided in a NEMA 1 enclosure from 1/8 to 10 HP at 230 VAC and 1/2 to 10 HP at 460 VAC.

The V7 is fully featured and compact. The digital operator provides 4-digit LED status display with a built-in analog speed potentiometer, as well as digital programming of almost 200 parameters. The digital pulse train input provides a precise frequency input, and is the perfect solution for speed / follower applications. The seven standard multifunction inputs can be programmed to allow for 17 preset speeds. The V7 also has an analog input, a multifunction output, two multifunction open collector outputs, and an analog output as standard.

The V7 is ideally suited for applications such as conveyors, grinders, centrifuges, pumps, fans, blowers, machine tools, packaging, food processing, and commercial laundry.

Old C-H MVX P/N	AAON P/N	Yaskawa P/N	V	HP	Amps	H	W	D	lbs
R15350	R40110	CIMR-V7AM20P71	230	1	5	5.83	2.68	5.04	1.5
R15360	R40120	CIMR-V7AM21P51		2	8	5.83	4.25	5.16	3.5
R15370	R40130	CIMR-V7AM22P21		3	11	5.83	4.25	5.51	3.7
R15380	R40140	CIMR-V7AM23P71		5	17.5	5.83	5.51	5.63	5.3
R15390	R40150	CIMR-V7AM25P51		7.5	25	10.24	7.09	6.7	10.5
P94710	R40160	CIMR-V7AM27P51		10	33	10.24	7.09	6.7	10.5
R15400	R40170	CIMR-V7AM40P71	460	1	3.4	5.83	4.25	5.51	3.7
R15410	R40180	CIMR-V7AM41P51		2	4.8	5.83	4.25	6.14	3.7
R15420	R40190	CIMR-V7AM42P21		3	5.5	5.83	4.25	6.14	3.7
R15430	R40200	CIMR-V7AM43P71		5	8.6	5.83	5.51	5.63	5.3
R15440	R40210	CIMR-V7AM45P51		7.5	14.8	10.24	7.09	6.7	10.14
R15450	R40220	CIMR-V7AM47P51		10	18	10.24	7.09	6.7	10.58

### Performance Features

- Ratings: 1/8 to 10 HP at 230 VAC, 1/2 to 10 HP at 460 VAC
- Constant torque overload rating: 150% for 1 min., 200% for 30 Sec. (250% peak)
- DC injection braking, ramp to stop
- Electronic reversing
- Adjustable accel/decel: 0.01 to 6000 seconds
- Controlled speed range: 40:1<sup>(1)</sup> 100:1<sup>(2)</sup>
- Speed Regulation  $\pm 0.5$  to 1% with slip compensation<sup>(1)</sup>  $\pm 0.2\%$ <sup>(2)</sup>
- Drive efficiency: 95%
- Displacement power factor: 0.98
- Output frequency: 1.0 to 400 Hz
- Frequency resolution: 0.01 Hz with digital reference 0.06 / 60 Hz with analog reference
- Frequency accuracy: 0.01% with digital command 0.5% with analog command
- Volts / hertz ratio: infinitely adjustable pattern
- Open loop vector control
- DC Injection braking: adjustable amplitude, duration, current limited
- Torque boost: full range, auto
- Power loss ride-thru: 0.5 sec.
- Speed search
- Auto restart
- 3 Critical frequency rejection settings
- Slip Compensation
- Energy Savings Function
- PID with loss of feedback function

### Design Features

- 16-bit microprocessor logic
- Digital keypad operator with analog speed pot
- LED status display
- Copy Keypad Function
- Remote Mount Keypad Capability
- RJ-45 Style Digital Operator Connector
- 7 multifunction digital inputs
- Programmable form C output contact for customer use: 1A at 250 VAC or 30 VDC
- 24 VDC control logic compatible with sourcing or sinking outputs (PNP or NPN)
- Carrier frequency: 10 kHz maximum
- 16 multi-speed settings plus jog speed
- Remote speed reference: 0-10 VDC (20 kohms) or isolated 4-20 mA (250 ohms)
- Signal follower: bias and gain
- 2 programmable open collector outputs
- Analog monitor output: 0-10 VDC proportional to output frequency or output current
- Approximately 200 parameters
- Digital pulse train input (30 kHz max.)
- Cooling fan controlled by drive run/stop
- RS485/RS422 serial communication port (up to 32 nodes)
- Baud rate of 19.2 kbps
- UL and cUL listed; CE approved
- UL recognized electronic overload
- MTBF: exceeds 28 years
- Dynamic Braking Transistor
- NEMA 1 enclosure
- <sup>(1)</sup> V/Hz Mode
- <sup>(2)</sup> Open Loop Vector Mode

### Protective Features

- Current limit, stall prevention during accel, decel, and run
- Motor and drive overload
- Over voltage, Under voltage
- Instantaneous over current
- Short circuit, Ground fault protection
- Heatsink overheat
- Over/under torque

### Service Conditions

- Ambient service temperature: -10° to 40°C (14° to 105°F)
- Ambient storage temperature: -20° to 60°C (-4° to 140°F)
- Humidity: to 95% non-condensing
- Altitude: to 3280 ft; higher by derating
- Service factor: 1.0
- Input voltage: -15% to +10% 200 to 230 VAC, 380 to 460 VAC
- Input frequency: +1-5%; 50/60 Hz
- Phase sequence insensitive

### Options

- Dynamic Braking resistor (external)
- Remote operator station
- Profibus, DeviceNet Communications
- External DC link reactor
- DriveWizard
- CASE software

### Standards

- UL 508C (Power Conversion)
- CSA 22.2 No. 14-95 (Industrial Control Equipment)
- UL, cUL listed; CE marked
- EN 50178 (LVD)
- EN 61800-3 (w/ External Filter)
- IEC 529, 146
- FCC CFR 47 Part 15 Subpart B (w/ External Filter)

**AE21-1319****DIGITAL™  
CAPACITY CONTROL FOR REFRIGERATION  
SCROLL COMPRESSORS****April, 2002****Introduction**

On refrigeration applications where the load may vary over a wide range, some means of capacity control is often desirable for optimum system performance and control. In addition, compressor capacity modulation can reduce power and energy consumption, provide better dehumidification, reduce compressor cycling, and decrease the starting electrical load.

In order to achieve the above objectives, Copeland has developed Digital, a unique and highly efficient method for modulating scroll compressors.

Digital technology will, for the first time, permit efficient modulation of Copeland Scroll compressors for high, medium, and low temperature applications. Digital technology assures smooth, vibration free operation by axially unloading the compliant scrolls.

**Theory of Operation**

Digital capacity control is achieved by axially separating the scroll members. During the time the members are separated, there is no gas compression and approximately 10% power usage. By varying the amount of time the members are separated, capacity control between 10 and 100% can be achieved. The separation is achieved by bypassing a controlled amount of discharge gas to the suction side through a solenoid valve. The lowering of the pressure in the modulating chamber allows the scrolls to separate and as a result no pumping action takes place. The position of the scroll elements during the loaded and unloaded modes of operation are shown in **Figure 1 and 2**.

**Nomenclature**

The Digital scroll model numbers are designated by a D in the third character. Please refer to Copeland "Online Product Information" for available models.

The low temperature digital models also offer economizer operation. This is designated by a V after the K in the model number. The requirements for economizer operation are covered in AE Bulletin 1325.

**Digital Performance**

The power requirements vary as the load varies. The power required as a percent of load is shown in **Figure 3**.

For additional information on this product, please refer to the "On-Line Product Information" accessible from the Copeland web site at [www.copeland-corp.com](http://www.copeland-corp.com).

**Control Requirements**

In order to control the Digital modulation, two inputs and one output are required.

**Inputs**

1. A discharge temperature thermistor is required on all compressors. The cut out temperature is to be set at 280°F. The temperature resistance values for the sensor can be found in **Table 1**.
2. Control can be done by any normal control parameter (ie. suction pressure, air temperature, humidity, etc.)

**Outputs**

There must be a 15 watt output to the solenoid valve at the appropriate chosen solenoid voltage.

**Operating Envelope**

The operating envelopes for Digital compressors are very similar to standard scroll compressor envelopes. However, a 75PSI differential between discharge and suction must be maintained. Therefore, the lower right hand corner of the Digital envelopes are somewhat restricted. To view the various envelopes, please refer to the "On-Line Product Information" accessible from the Copeland web site at [www.copeland-corp.com](http://www.copeland-corp.com).

## Control

Capacity modulation is achieved by energizing and de-energizing the solenoid valve. When the solenoid valve is de-energized, the compressor capacity is 100%. When the solenoid valve is energized, the compressor capacity is zero. Therefore, the capacity achieved is the time average capacity, which is a variable from 10 – 100%. Example: If you have a 20-second cycle and the solenoid is de-energized for 16-seconds, then energized for 4-seconds, the resulting capacity will be 80%.

**Caution:** To minimize valve cycling and maximize system responsiveness, cycle times between 10 and 30 seconds should be used. Cycle time is defined as energized plus de-energized time. The minimum de-energized (loaded) time is 10% of the cycle time. This is required to provide gas flow for motor cooling. There is no maximum de-energized time.

**FIGURE 1  
UNLOADED OPERATION**

Solenoid Valve  
Energized (open)

Axial Separation

## Solenoid Valve

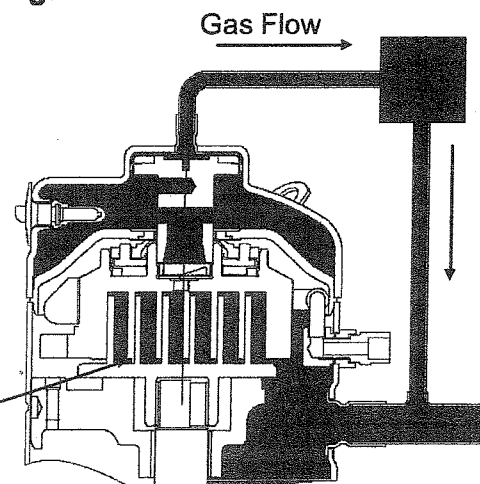
Due to the high life cycle requirements in a hot gas environment, a special valve has been developed.

Due to reliability requirements, only Copeland solenoid valves may be used. All compressor warranties are null and void if the Copeland valve is not used.

Refer to Copeland "Online Product Information" for valve kit part numbers.

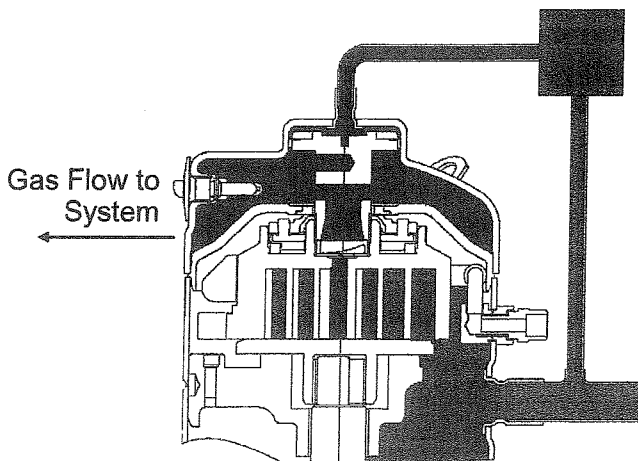
## Mounting

The solenoid valve must be mounted with the plunger tube vertical within the distances shown on **Figure 4**.



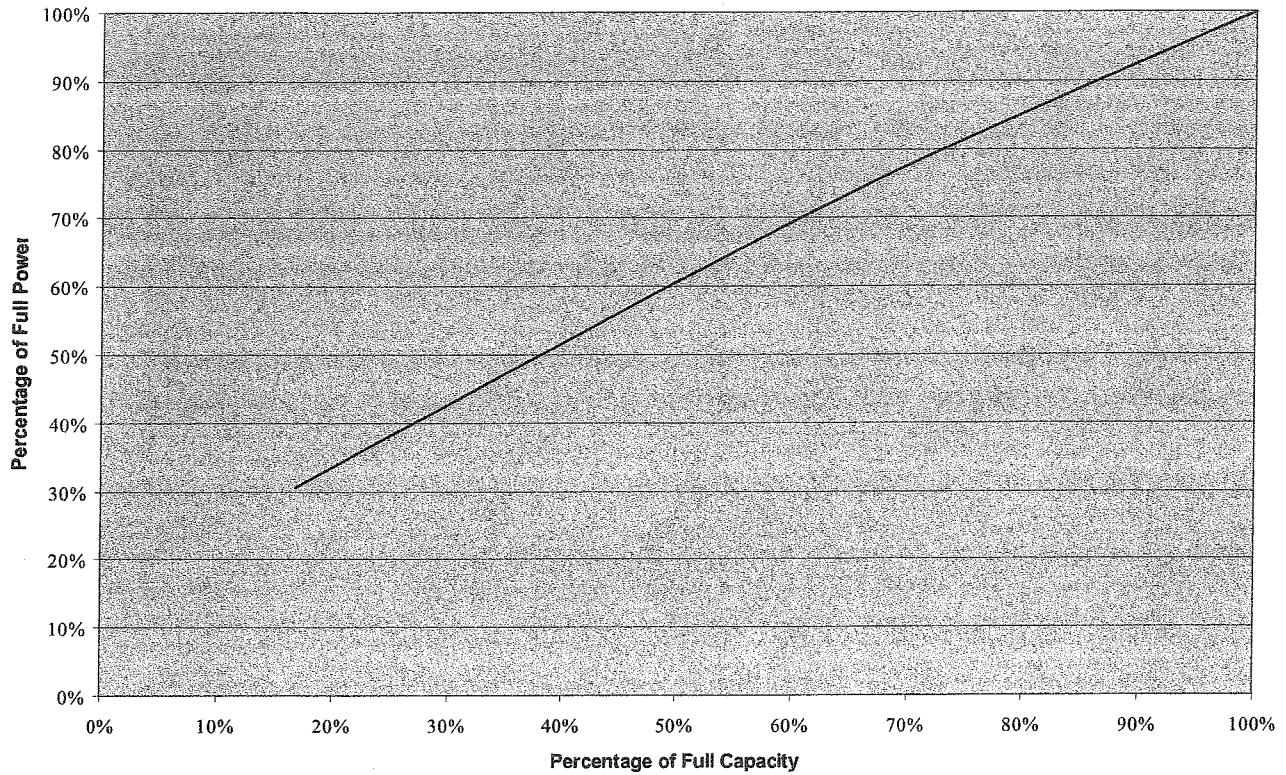
**FIGURE 2  
LOADED OPERATION**

Solenoid Valve  
De-energized (closed)

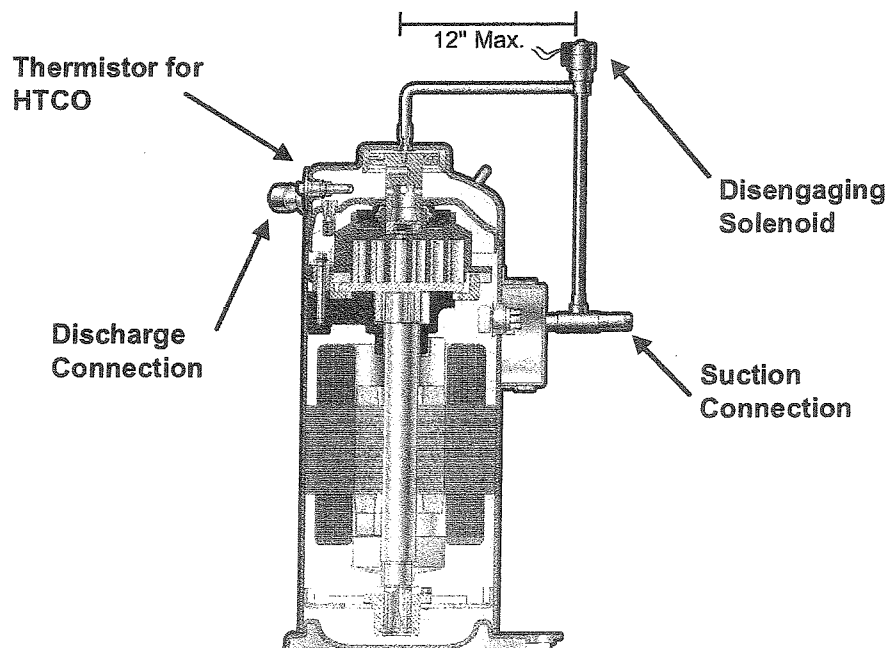




**FIGURE 3  
TYPICAL MODULATED POWER REDUCTION**



**FIGURE 4  
SOLENOID VALVE LOCATION**



**AE8-1328**

**COPELAND SCROLL™  
DIGITAL COMPRESSOR CONTROLLER**

**August, 2003**

**Introduction**

The Digital Compressor Controller (543-0024-00) is the electronics interface between the Copeland Scroll Digital Compressor and the system controller. The Digital Compressor Controller is designed only for single and three phase Copeland Scroll Digital compressors (reference Copeland AE21-1319 for details on the Digital Compressor). The system controller measures temperature, pressure or humidity to calculate the needed compressor capacity and communicates that capacity to the Digital Compressor Controller via an analog signal.

The Digital Compressor Controller provides control, protection and diagnostics for the Digital Compressor system.

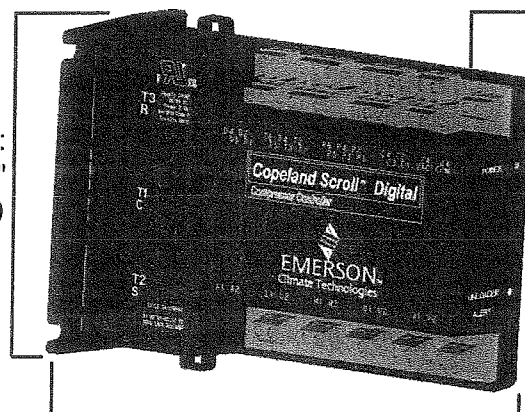
- The Digital Compressor Controller "modulates" or cycles the unloader solenoid in an on/off pattern according to the capacity demand signal from the system controller.
- The compressor contactor coil is controlled based on the capacity demand from the system controller and the presence of any compressor trip or lock out conditions.
- The compressor is protected against high discharge temperature by a discharge temperature thermistor. If the maximum temperature limit is exceeded, the Digital Compressor Controller will protect the compressor by turning it off.
- Seven ALERT codes are displayed indicating an abnormal system or compressor condition. Depending on the severity of the code, the Digital Compressor Controller will shut down the compressor or run the compressor in a limited capacity.

- After each compressor shut down event, a two minute delay timer is active preventing the compressor from restarting.
- For systems that need an accurate suction pressure reading, the Digital Compressor Controller is able to smooth out the pressure swings associated with loading and unloading the compressor. A pressure transducer input is "filtered" by using the unloader control algorithm to output a smooth suction pressure signal.
- For systems that include a vapor injection solenoid valve, the compressor controller energizes this valve whenever the compressor is running.

**Specifications**

Width: 2.0"  
(51 mm)

Height: 4.0"  
(102 mm)



Depth: 6.0" (153 mm)

Operating Temperature:	-40°F to 150°F (-40°C to 65°C)
Storage Temperature:	-40°F to 175°F (-40°C to 80°C)
Supply Voltage:	19-28VAC, 48-62Hz
Supply Power:	2 VA maximum
UL Requirements:	Use only with Class 2 circuits, File #SA8958

### Installation

Four #10 self tapping sheet metal screws, at least ½" length, are required for installation. Locate the Digital Compressor Controller inside the electrical enclosure near the compressor contactor (wire routing for compressor power wiring will be easier in this position). The Digital Compressor Controller will operate in any mounting orientation where the green POWER LED is at the top. Mount the Digital Compressor Controller so all LEDs are visible from a comfortable viewing position.

A service panel label (Form 2003CC-80) describing the terminals and ALERT flash codes is included with each Digital Compressor Controller. This label should be in a visible location for the technician when he is troubleshooting the system.

### Compressor Wiring

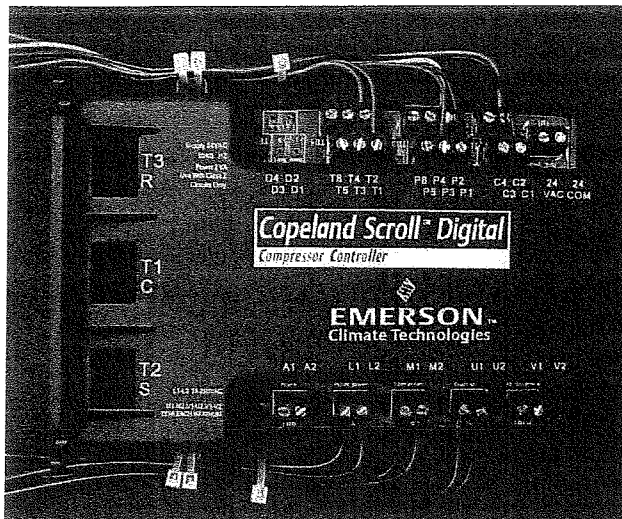
The Digital Compressor Controller senses compressor motor current for diagnostics and protection. The compressor motor leads must be run through the holes in the plastic housing for a current transformer to sense motor current.

**Single Phase Compressors:** the scroll compressor's run (R), common (C) and start (S) wires must be routed through the holes in the Digital Compressor Controller module marked "R," "C" and "S." The run capacitor may be located on either side of the Digital Compressor Controller module.

**Three Phase Compressors:** the scroll compressor's T1, T2 and T3 wires must be routed through the holes in the Digital Compressor Controller module marked "T1," "T2" and "T3." The Digital Compressor Controller module is phase insensitive and will not detect reverse phasing of the compressor.

**NOTE! Do not bundle low voltage wires with compressor power or high voltage wires.**

**NOTE! Attach cable ties through loops on side of Digital Compressor Controller housing for wire strain relief.**



### Compressor Controller Terminals See Figure 1.

#### Low Voltage Terminals

24VAC	Module Power
24COM	Module Common
C1	Demand Input –
C2	Demand Input +
P1	Pressure Common
P2	Pressure Input
P3	Pressure Power 5VDC
P4	Pressure Shield
P5	Pressure Output –
P6	Pressure Output +
T1	Discharge Temp Sensor
T2	Discharge Temp Sensor

#### High Voltage Terminals

A1	Alarm Relay Out
A2	Alarm Relay Out
M1	Contactors
M2	Contactors
L1	Control Voltage L
L2	Control Voltage N
U1	Unloader Solenoid
U2	Unloader Solenoid
V1	Vapor Injection Solenoid
V2	Vapor Injection Solenoid

**NOTE!** To avoid damaging the Digital Compressor Controller do not connect wires to terminals C3, C4, T3, T4, T5 or T6.

### **(24VAC, 24COM) Digital Compressor Controller Power**

The power supply for the Digital Compressor Controller is 19-28VAC, 48-62Hz. The maximum load is 2 VA. The 24VAC phasing for the Digital Compressor Controller must match the system controller to avoid a transformer short circuit condition.

### **(C1, C2) System Controller Demand**

Controller Demand is an analog input signal from the system controller to the Compressor Controller, proportional to the capacity required from the compressor. Controller Demand is a 1-5VDC input where 1.0 VDC is 0% capacity and 5.0 VDC is 100% capacity. When the signal falls below 10% capacity (1.4 VDC) the Digital Compressor Controller will shut down the compressor. When the signal rises above 11% capacity (1.44 VDC) and the anti-short cycle timer has timed out, the Digital Compressor Controller will start the compressor again. See Figure 2 for a graphical representation.

### **(P1, P2, P3, P4) System Pressure Input**

If a pressure transducer is used with the Compressor Controller, the System Pressure Input is a measurement of the system suction pressure. For pressure transducer signal wiring, short wire runs and shielded wiring are recommended. For best signal resolution, the smallest acceptable pressure transducer range for the refrigerant should be used. The Digital Compressor Controller provides a precision source 5VDC for the pressure transducer to accurately measure the pressure. This 5VDC source is capable of sourcing a maximum of 10mA

### **(P5, P6) System Pressure Output**

If a pressure transducer is connected to the System Pressure Input terminals, the System Pressure Output provides an analog output of the

filtered suction pressure. The Digital Compressor Controller "filters" this suction pressure by using the unloader capacity algorithm to smooth the pressure fluctuations measured by the suction pressure transducer. The output of 0.5 – 4.5VDC corresponds to the range of the pressure transducer connected to the System Pressure Input terminals. This output is capable of sourcing a maximum of 10mA.

### **(T1, T2) Discharge Temperature Input**

The Discharge Temperature Input is a thermistor input. There is no polarity requirement for the thermistor. For thermistor signal wiring, short wire runs are recommended. The cut out temperature is 268°F and the cut in or reset temperature is 250°F. See Table 1 for thermistor temperature/resistance values.

### **(A1, A2) Alarm Relay**

The Alarm Relay output is a normally open, dry contact relay output. The maximum operating voltage for this relay is 250VAC or 30VDC. During an alarm condition, the relay contacts close until the alarm condition ceases or power is turned off. Suitable for dry contact or maximum 3 amp load. Once used for high current, the relay can not be used for dry contact.

### **(M1, M2) Compressor Contactor**

The compressor contactor output is a triac output. The maximum continuous contactor coil load is 25VA and the peak inrush current is 10 amps. The maximum coil operating voltage is 250VAC. This output is incompatible with DC coil voltages. The compressor contactor is energized when there are no ALERT conditions and the demand signal is greater than 1.44VDC.

### **(L1, L2) Control Power**

**NOTE!** Control Power supplied to Digital Compressor Controller must be the same voltage as the compressor contactor coil, unloader solenoid and vapor injection solenoid.

The Control Power requirement is a single phase, 19-250VAC, 48-62Hz source. The maximum load on the control power circuit is 75VA based on a motor contactor, unloader solenoid and vapor injection solenoid connected to the Compressor Controller. The maximum inrush current is 10 amps. The table below shows the maximum continuous current draw for the different control voltages.

Control Voltage	Peak Continuous Current Draw
24VAC	3.0A
120VAC	0.6A
240VAC	0.3A

#### (U1, U2) Unloader Solenoid

The Unloader Solenoid output is a triac output. The maximum continuous solenoid load is 25VA and the peak inrush current is 10 amps. The maximum solenoid operating voltage is 250VAC. This output is incompatible with DC solenoid voltages. The unloader solenoid is energized in an on/off pattern to deliver the capacity requested by the demand signal.

#### (V1, V2) Vapor Injection Solenoid

The Vapor Injection Solenoid output is a triac output. The maximum continuous solenoid load is 25VA. The maximum solenoid operating voltage is 250VAC and the peak inrush current is 10 amps. This output is incompatible with DC solenoid voltages. The vapor injection solenoid is energized whenever the compressor contactor is energized.

#### Compressor Start And Shut Down

The Digital Compressor Controller always unloads the compressor for 0.1 seconds at each startup. After this brief unloading period, the unloader solenoid will be deenergized and the compressor will run loaded according to the level of the Demand input signal. Each time the compressor shuts down, the Digital Compressor Controller will run the compressor unloaded for 0.5 seconds.

Energizing the unloader solenoid for this period of time will allow the discharge and suction pressures to equalize, minimizing scroll reverse rotation.

#### Digital Compressor Controller LEDs

**POWER LED (green)** – indicates voltage is present at the 24VAC power terminals. When the anti-short cycle timer is active, the green LED will flash.

**UNLOADER LED (yellow)** – indicates the unloader solenoid status. This LED is on when the unloader solenoid is energized.

**ALERT LED (red)** – communicates an abnormal system condition through a unique flash code. *The ALERT LED will flash a number of times consecutively, pause and then repeat the process. The number of consecutive flashes, defined as the Flash Code, correlates to a particular abnormal condition.*

#### Flash Code Troubleshooting

While each ALERT code is active, the alarm relay contacts (A1 and A2) are closed. The ALERT code will remain active and the alarm relay contacts closed until the reset conditions have been met or 24VAC power has been cycled off and on. All Flash Codes except Code 6 result in the compressor contactor, unloader solenoid and vapor injection solenoid being deenergized.

All LEDs flashing at the same rate indicates 24VAC supply is too low for operation. All LEDs on solid at the same time indicates Digital Compressor Controller failure.

Whenever power is cycled off and on, the current Flash Code and all internal counters are reset.

#### Flash Code 1 - Reserved for future use

#### Flash Code 2 - High Discharge Temperature

The discharge temperature thermistor has measured a temperature above 268°F (130°C) or the thermistor is short circuited (jumped out).



The Digital Compressor Controller will deenergize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts will close.

The compressor will be allowed to restart after a 30 minute delay and after the thermistor temperature is below 250°F (120°C). The flash code and alarm relay contacts will be reset after the compressor has run for 60 uninterrupted minutes without any other ALERTs.

If five high discharge temperature ALERTs have occurred within four hours, the Digital Compressor Controller will lock out the compressor. The lockout can only be reset by cycling the 24VAC power off and on.

#### **Flash Code 3 - Compressor Protector Trip**

The demand signal from the system controller is greater than 1.4VDC and there is no compressor current detected. This could be due to the compressor's internal overload protector being open, fuse or breaker open, power disconnected to compressor contactor, compressor power wiring not run through Digital Compressor Controller current transformer port or a compressor contactor failure.

The Digital Compressor Controller will deenergize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts will close.

The Digital Compressor Controller will wait for the anti-short cycle timer to time out and if the system controller demand signal is still greater than 1.4VDC, energize the compressor contactor again. If the system controller demand signal drops below 1.4VDC or if compressor current is detected on the restart, the ALERT code and alarm relay output will reset. The Digital Compressor Controller will attempt to restart compressor as long as the

system controller demand is above 1.4VDC. There is no lockout feature for this ALERT.

#### **Flash Code 4 - Locked Rotor**

A locked rotor condition in the compressor is sensed by the Digital Compressor Controller on four consecutive start ups.

The Digital Compressor Controller will deenergize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts will close.

This code results in a lockout and can only be reset by cycling the 24VAC power off and on.

#### **Flash Code 5 - Demand Signal Loss**

The demand signal input has dropped below 0.5VDC. The demand input signal wire may be disconnected or the system controller providing the signal may not be powered.

The system controller Digital Compressor Controller will deenergize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts will close.

Once system controller the demand signal input has risen above 0.5VDC, the ALERT code and alarm relay output will reset. If the demand signal is above 1.4VDC and the anti-short cycle timer has timed out, the compressor will restart.

#### **Flash Code 6 - Discharge Thermistor Fault**

The Digital Compressor Controller is not receiving a signal from the discharge temperature thermistor. The thermistor may be missing, disconnected or a wire is broken.

The alarm relay contacts will close and the Digital Compressor Controller will not increase the capacity of the compressor beyond 50% loading.

This ALERT code and alarm relay output are reset by reconnecting the thermistor.

### **Flash Code 7 - Unloader Solenoid Fault**

Reserved for future use

### **Flash Code 8 - Compressor Contactor Fault**

Compressor current is detected when the system controller demand signal is below 1.4VDC. The compressor contactor may have welded contacts or the contacts may be mechanically jammed.

The Digital Compressor Controller will deenergize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts will close.

The compressor will continue to run in this condition since the Digital Compressor Controller cannot open the compressor contactor. The ALERT code and alarm relay output are reset when the demand signal from the system controller rises above 1.4VDC or when current is no longer detected while system controller demand signal is below 1.4VDC.

### **Flash Code 9 - Low 24VAC Supply**

Supply voltage to the Digital Compressor Controller has dropped below 18.5VAC. If the 24VAC transformer is supplied from the same circuit as the compressor supply voltage, the compressor supply voltage is too low for operation.

The Digital Compressor Controller will deenergize the compressor contactor, unloader solenoid and vapor injection solenoid. The alarm relay contacts will close.

The ALERT code and alarm relay output are reset when the supply voltage to the Digital Compressor Controller rises above 19.5VAC.

### **OEM Testing**

The Digital Compressor Controller can remain in circuit during factory hi-pot testing. The maximum hi-pot test voltage that should be applied to the 24VAC Low Voltage Inputs and Outputs is 600VAC. The maximum hi-pot test voltage that should be applied to the High Voltage Control and High Voltage Outputs is 2500VAC.

### **Testing The Installed Digital Compressor Controller**

Once installed, the Digital Compressor Controller can be tested to verify it is working properly. In each test, 24VAC must be supplied to 24VAC and 24COM. For the output test, 24-250VAC must be supplied to L1 and L2.

#### **Input Tests**

**Thermistor Input** – disconnect the discharge temperature sensor wires from terminals T1 and T2. If functioning normally, the Digital Compressor Controller should display a Code 6 unless a previous ALERT code was present.

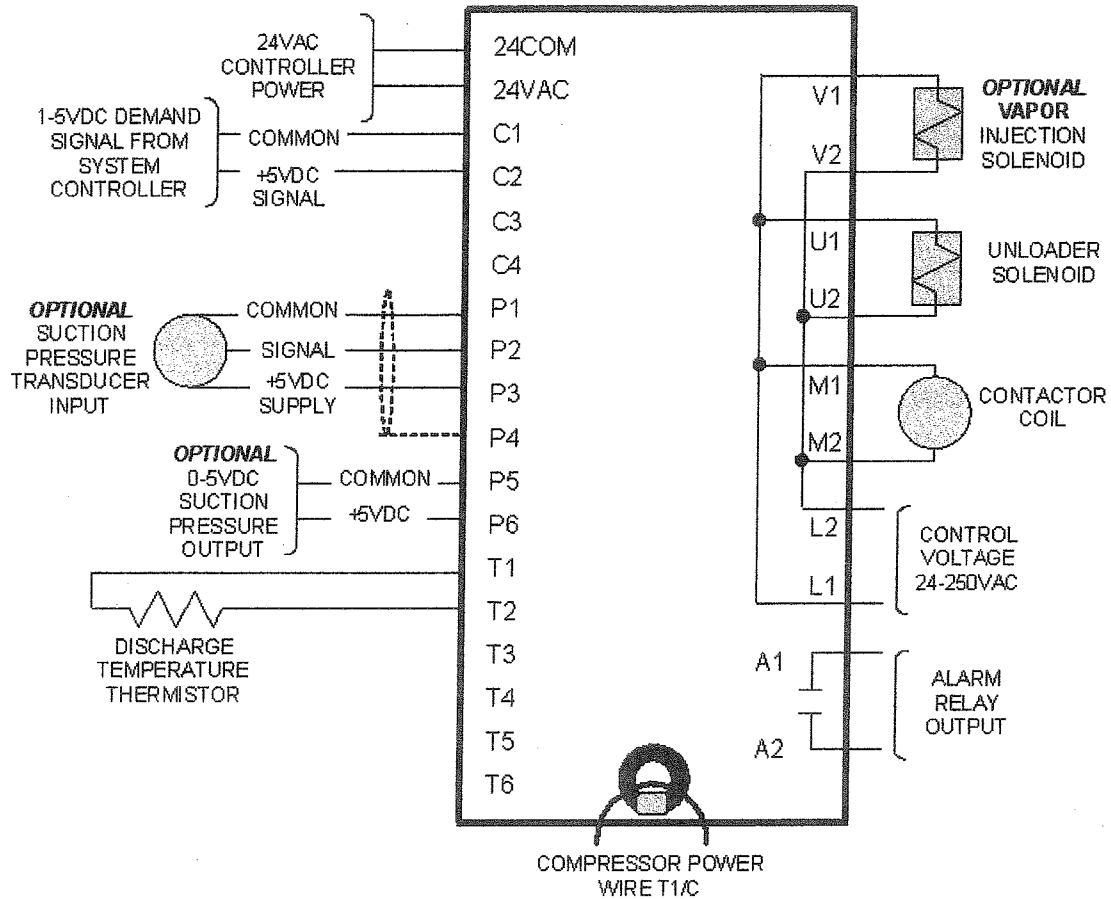
**Demand Input** – disconnect the System Controller Demand signal wires from C1 and C2. If functioning normally, the Digital Compressor Controller should display a Code 5 unless a previous ALERT code was present.

#### **Output Tests**

**Contactor Output** – while the Digital Compressor Controller is powered off (no supply voltage to 24VAC and 24COM), disconnect the System Controller Demand signal wire from C1 and C2. Add a jumper wire from P3 to C2 and a second jumper wire from P1 to C1. Reapply power to 24VAC and 24COM. If functioning normally, a voltmeter should read the same voltage across M1 and M2 as is measured across L1 and L2, unless an ALERT code is present.

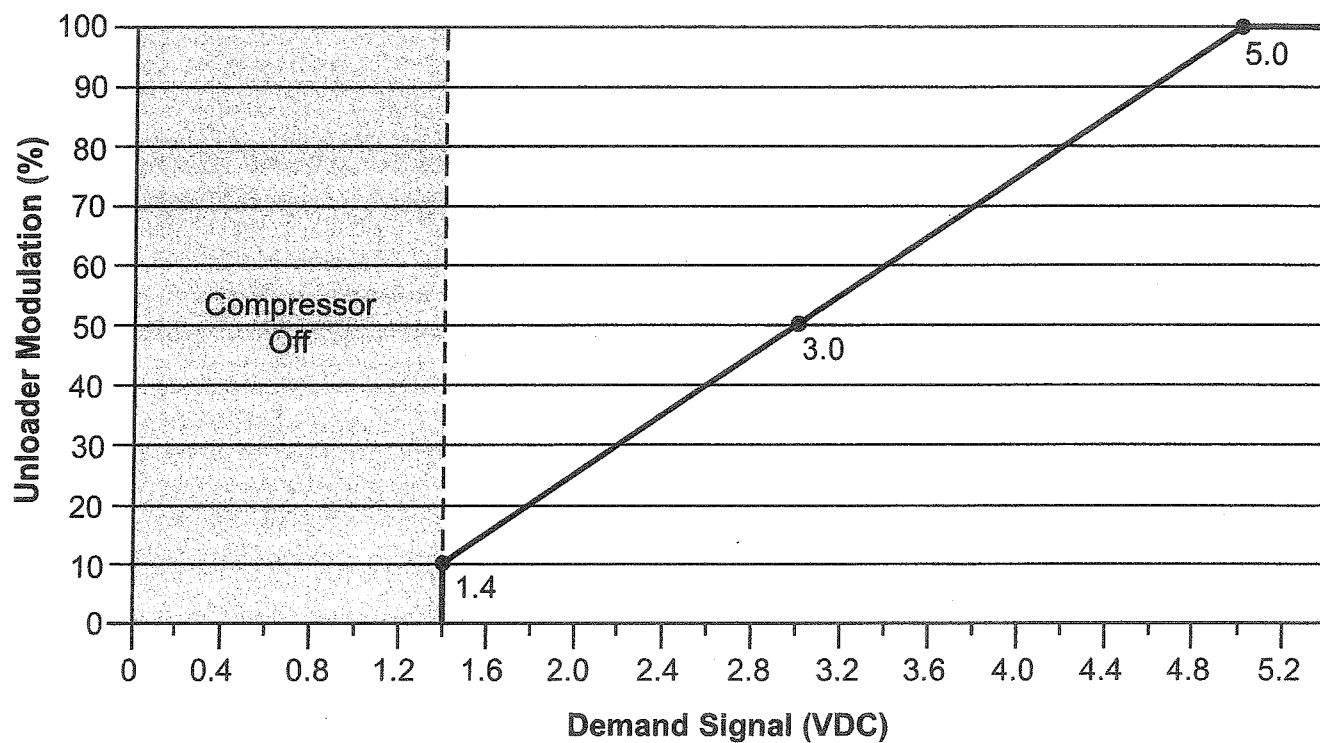
**Unloader Output** – while Digital Compressor Controller is modulating the unloader solenoid, a voltmeter should read the same voltage across U1 and U2 as is measured across L1 and L2 whenever the yellow "Unloader" LED is lit.

**Figure 1**  
**Compressor Controller Wiring Diagram**





**Figure 2**  
**Demand Signal Vs. Modulation Graph**



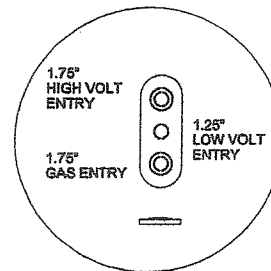
**Table 1**  
**Thermistor Temperature/Resistance Values**

Deg C	Deg F	Resistance (kOhms)
-40	-40	2889.60
-35	-31	2087.22
-30	-22	1522.20
-25	-13	1121.44
-20	-4	834.72
-15	5	627.28
-10	14	475.74
-5	23	363.99
0	32	280.82
5	41	218.41
10	50	171.17
15	59	135.14
20	68	107.44
25	77	86.00
30	86	69.28
35	95	56.16
40	104	45.81
45	113	37.58
50	122	30.99
55	131	25.68
60	140	21.40
65	149	17.91
70	158	15.07
75	167	12.73
80	176	10.79
85	185	9.20
90	194	7.87
95	203	6.77
100	212	5.85
105	221	5.09
110	230	4.45
115	239	3.87
120	248	3.35
125	257	2.92
130	266	2.58
135	275	2.28
140	284	2.02
145	293	1.80
150	302	1.59
155	311	1.39
160	320	1.25
165	329	1.12
170	338	1.01
175	347	0.92
180	356	0.83

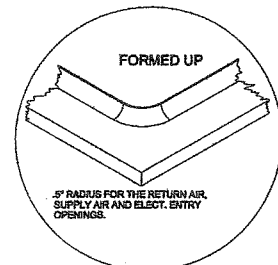
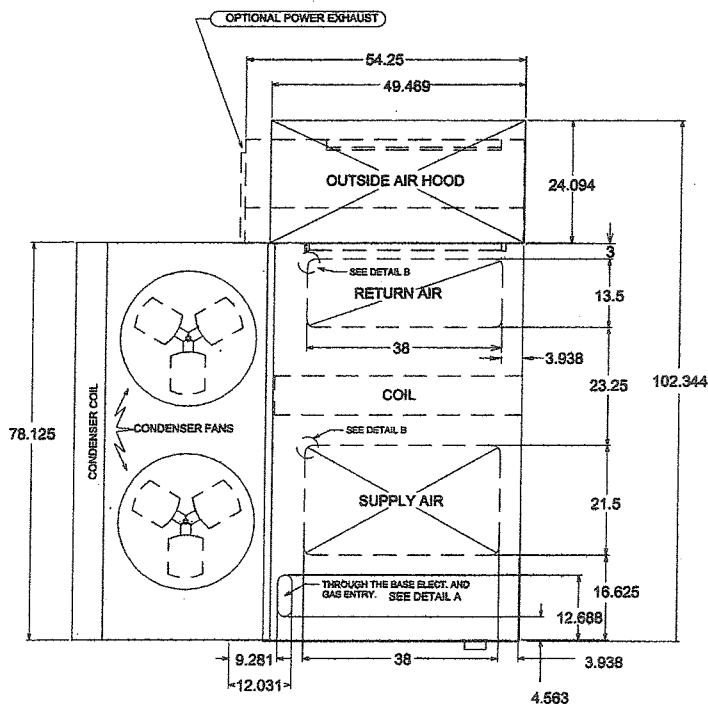
# B Cabinet 8-15 ton w/ economizer & power exhaust option

AC-1

CLEARANCES	
LOCATION	• UNIT SIZE •
	8 • 10 • 13 • 15
RETURN AIR (BACK)	48
VENT SIDE (FRONT)	48
LEFT SIDE	6
RIGHT SIDE	60
TOP	UNOBSTRUCTED

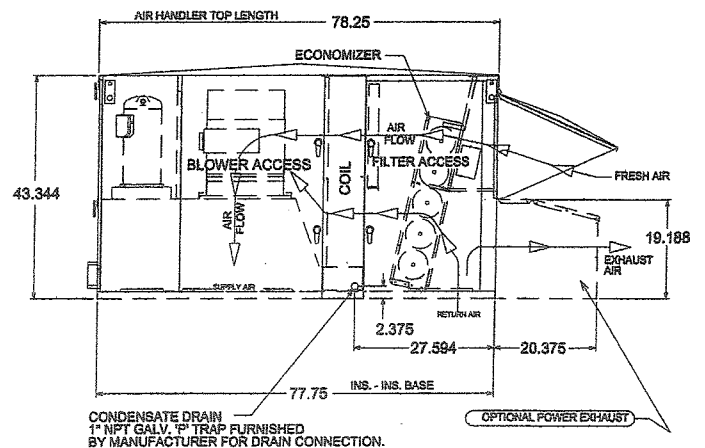
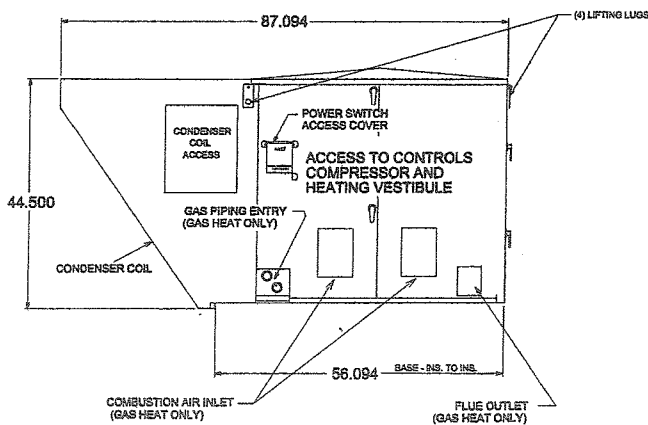


DETAIL A



DETAIL B

NUMBER OF CONDENSER FANS  
8-10 TON - 1 FAN  
13-15 TON - 2 FANS



## NOTES:

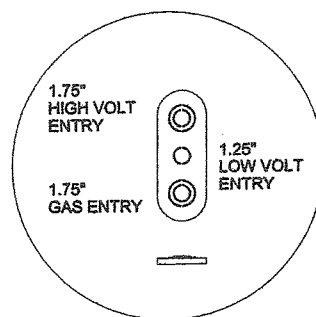
ALL DIMENSIONS ARE OUTSIDE TO OUTSIDE UNLESS NOTED OTHERWISE.

ALLOW .625\"/>

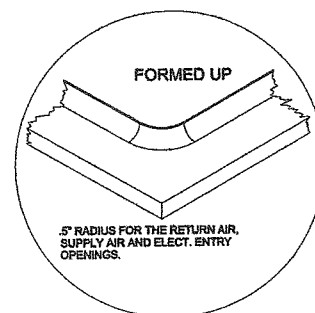
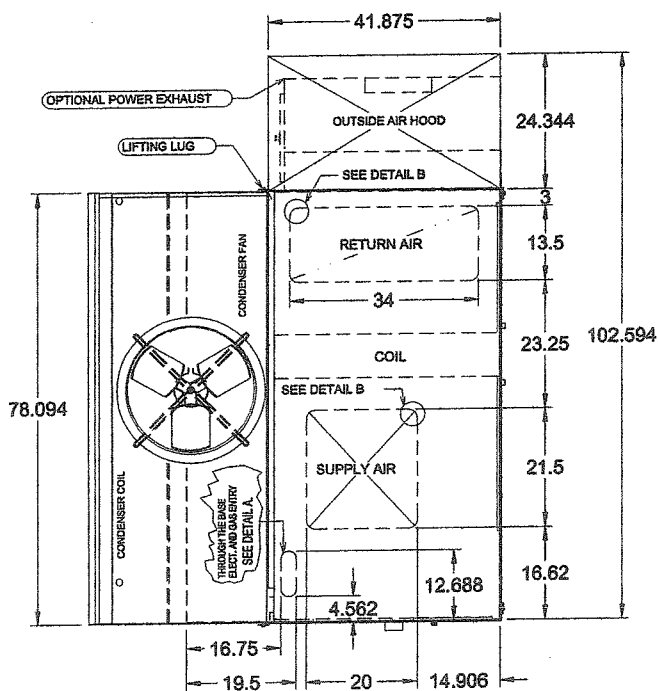
# A Cabinet 2-7 ton w/ economizer & power exhaust option

AC-2,3,4

CLEARANCES	
LOCATION	• UNIT SIZE •
	2•3•4•5•6•7
RETURN AIR (BACK)	36
VENT SIDE (FRONT)	48
LEFT SIDE	6
RIGHT SIDE	48
TOP	UNOBSTRUCTED



DETAIL A

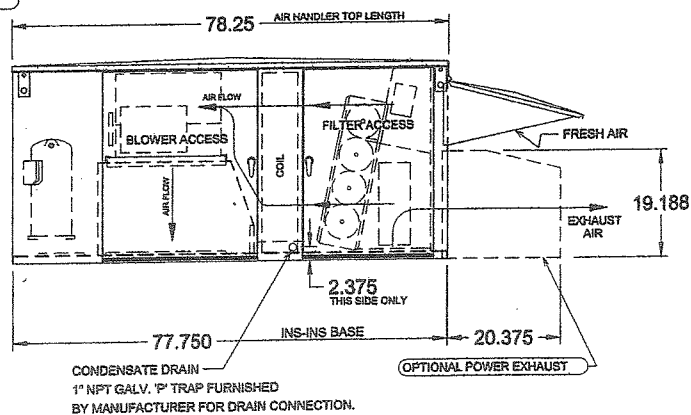
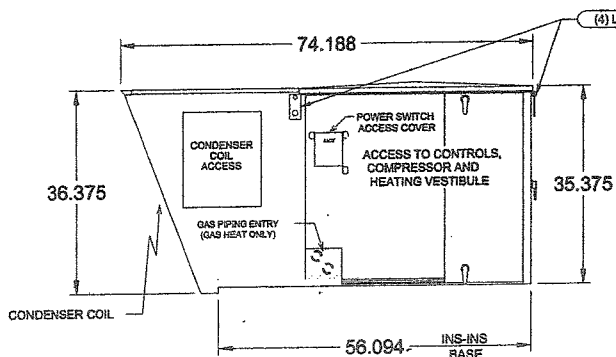


DETAIL B

## NUMBER OF CONDENSER FANS

2-5 TON - 1 FAN

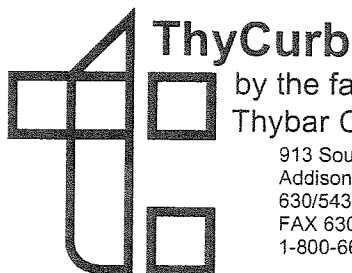
6-7 TON - 2 FANS



## NOTES:

ALL DIMENSIONS ARE OUTSIDE TO OUTSIDE UNLESS NOTED OTHERWISE.

ALLOW .625\"/>



by the fabricating division of  
Thybar Corporation

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Addison, Illinois 60101  
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FAX 972/418-6713  
1-800-777-CURB (2872)

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330/762-0061  
FAX 330/762-0914  
1-800-837-CURB (2872)

Customer:

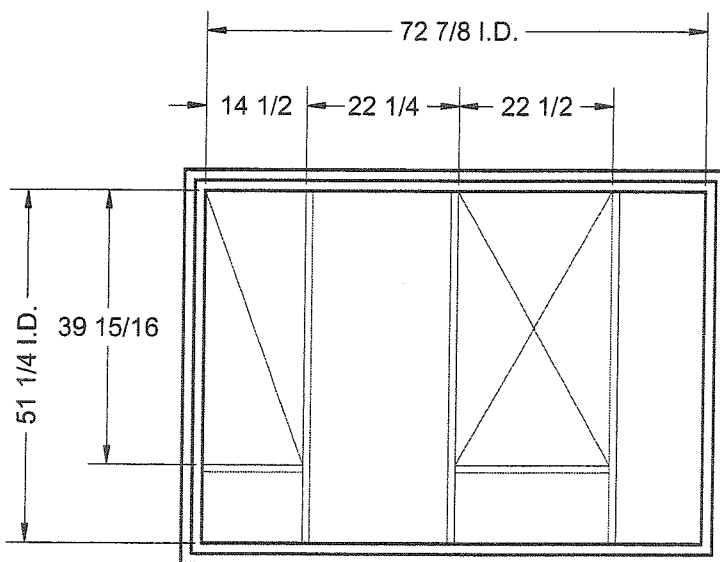
Project: ACWMA

Our Job No.

Customer's Order No.

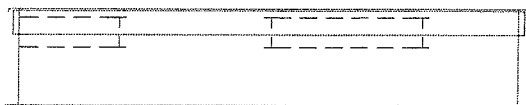
Submittal Date:

### ThyCurb TC-5 Non-Insulated Roof Curb

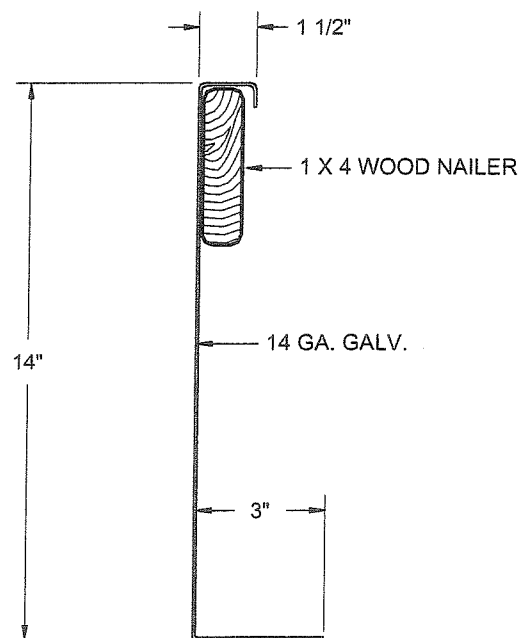


PLAN VIEW

NOTE: HOLD 4" CHANNELS FLUSH TOP

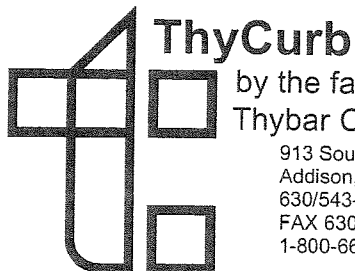


ELEVATION



TYPICAL TC-5 DETAIL

Quantity	AAON Unit	Height	Tag
	RM-08 thru 15 "B" Cabinet – Standard Unit		AC-1
	If pitched please indicate the amount of pitch, direction and minimum height on drawing. (Refer to pitch reference page for type of pitch)		



**ThyCurb**

by the fabricating division of  
Thybar Corporation

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44 East South Street  
Akron, Ohio 44311  
330/762-0061  
FAX 330/762-0914  
1-800-837-CURB (2872)

Customer:

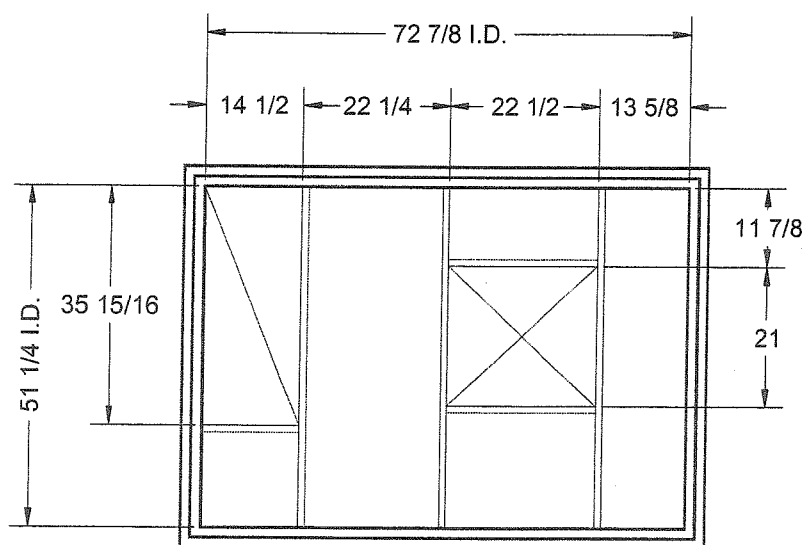
Project: ACWMA

Our Job No.

Customer's Order No.

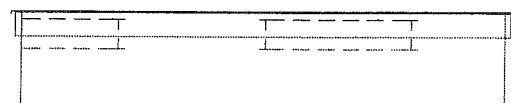
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## ThyCurb TC-5 Non-Insulated Roof Curb

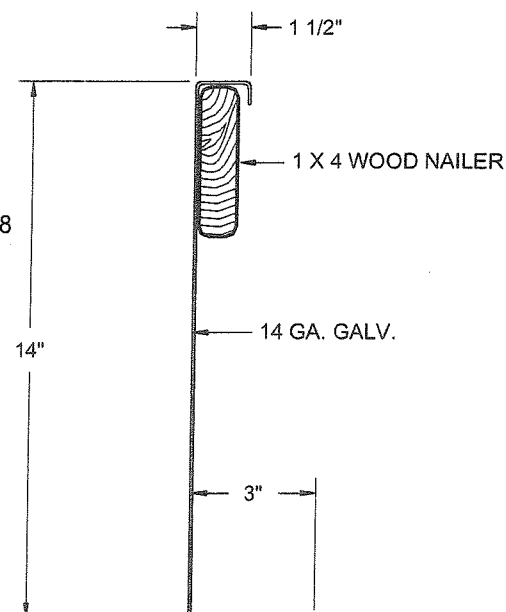


PLAN VIEW

NOTE: HOLD 4" CHANNELS FLUSH TOP



ELEVATION



TYPICAL TC-5 DETAIL

Quantity	AAON Unit	Height	Tag
	RM-02 thru 07 "A" Cabinet – Standard Unit		<u>AC- 2,3,4</u>
	If pitched please indicate the amount of pitch, direction and minimum height on drawing. (Refer to pitch reference page for type of pitch)		