PRMH20240272

NORTEK™
AIR SOLUTIONS
HUNTAIR

City of Puyallup Building ACCEPTED
JMontgomery
03/01/2024
1:49:41 PM

City of Puyallup Development & Permitting Services ISSUED PERMIT
Building | Planning
Engineering | Public Works
Fire | Traffic

South Hill

SUBMITTAL

Generated Date:	**2023-11-28**
Revision:	**S4**
SALES ORDER #	061070
QUOTE #	23-0137
EQUIPMENT	RAU-56, RAU-58, RAU-55, RAU-57, RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40 ...
REPRESENTATIVE	Whitney Walker Air Reps, LLC: Bellevue 3290 146th Place SE Bldg A Bellevue, WA 98007, USA Email: whitney@airreps.com
SALES APPLICATIONS CONTACT	Darin Bennett

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IMPORTANT NOTICE ABOUT THIS SUBMITTAL:

This revision supersedes previous revisions. Approval of this submittal indicates that it has been thoroughly reviewed and approved by all relevant mechanical, electrical, and structural disciplines involved in the project. The equipment Nortek Air Solutions proposes to furnish will be produced in accordance with the contents of this submittal. Nortek Air Solutions is not responsible or liable for features or performance requirements included in plans & specifications that were not furnished to Nortek Air Solutions prior to the preparation of this submittal. An approved and/or reviewed submittal, returned to Nortek Air Solutions with a "Release For Production", shall be deemed to be in essential compliance with plans & specifications and shall be manufactured in accordance with the contents of this submittal. In the event of any discrepancy between this submittal and plans & specifications or other contract documents, this submittal will control.

Approved By:

Signature of Responsible: _____ Date _____

Name of Responsible (Print):

Title:

Generated By: Darin Bennett, Nortek Air Solutions: Tualatin

FULL SIZED LEDGIBLE COLOR PLANS ARE REQUIRED TO BE PROVIDED BY THE PERMITTEE ON SITE FOR ALL INSPECTIONS

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NORTEK AIR SOLUTIONS HUNTAIR

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Release to Production Form

Project Name: South Hill

Sales Order #: 061070

Release to Production Form

- A release to production indicates complete approval of entire submittal. A returned submittal with any open comments will NOT be considered a release.
- It is the responsibility of the representative firm to ensure that this form is provided in conjunction with the approved submittal mentioned above.
- This document must be sent via email to the applicable Sales Application Engineer at Nortek Air Solutions from the person responsible at the representative firm. An assistant may also send the release email on behalf of the responsible person, provided that the responsible person at the representative firm is on copy.
- Units which are released for production will be placed into Nortek Air Solution's next available production slot. Specific shipping dates may be requested below and are subject to approval by Nortek Air Solutions. Refer to the weekly Back Log Reports or contact your SAE for current lead times.
- Shipping dates will be officially confirmed once a release acknowledgement is sent from Nortek Air Solutions to the representative firm and may be subject to change.
- Upon receipt of this completed form, the following criteria must be met in order to release a project.
  - Correct Purchase Order must be credit approved (Company issuing Purchase Order cannot change after release)
  - Material/Parts by others form needs to be completed (if applicable)
- Any change following a release to production is contingent upon factory approval and is subject to a minimum Change Order Fee of $1,000.00 USD. This is in addition to all material, labor, freight and logistical costs necessitated by the change.

Representative Firm Name	Air Reps, LLC: Bellevue	Ship to Contact Email	
Representative Contact	Whitney Walker	Ship to Attention	
Ship to Contact Name		Ship to Location Name	
Ship to Phone Number		Ship to Address	Puyallup, Washington Puyallup, Washington

SALES ORDER #	Tag Name	Released	ROJ
061070-001	RAU-56	2023-11-17	
061070-001	RAU-58	2023-11-17	
061070-002	RAU-55	2023-11-17	
061070-002	RAU-57	2023-11-17	
061070-003	RAU-10	2023-11-17	
061070-003	RAU-12	2023-11-17	
061070-003	RAU-14	2023-11-17	
061070-003	RAU-18	2023-11-17	
061070-003	RAU-32	2023-11-17	
061070-003	RAU-40	2023-11-17	

SALES ORDER #	Tag Name	Released	ROJ
061070-003	RAU-41	2023-11-17	
061070-003	RAU-47	2023-11-17	
061070-003	RAU-48	2023-11-17	
061070-003	RAU-51	2023-11-17	
061070-003	RAU-52	2023-11-17	
061070-004	RAU-17	2023-11-17	
061070-004	RAU-27	2023-11-17	
061070-004	RAU-39	2023-11-17	
061070-004	RAU-49	2023-11-17	
061070-004	RAU-50	2023-11-17	

ROJ = Requested on Jobsite

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Project Revision History

PROJECT	South Hill
SALES ORDER #	061070
EQUIPMENT	RAU-56, RAU-58, RAU-55, RAU-57, RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU-47, RAU-48, RAU-51, RAU-52, RAU-17, RAU-27, RAU-39, RAU-49, RAU-50

Date	Revision	Description
2023-11-28	S4	Revised: RAU-56, RAU-58, RAU-55, RAU-57, RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-...
2023-11-20	S3	Revised: RAU-56, RAU-58, RAU-55, RAU-57, RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-...
2023-11-17	S2	Revised: RAU-56, RAU-58, RAU-55, RAU-57, RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-...
2023-11-16	S1	Initial Revision

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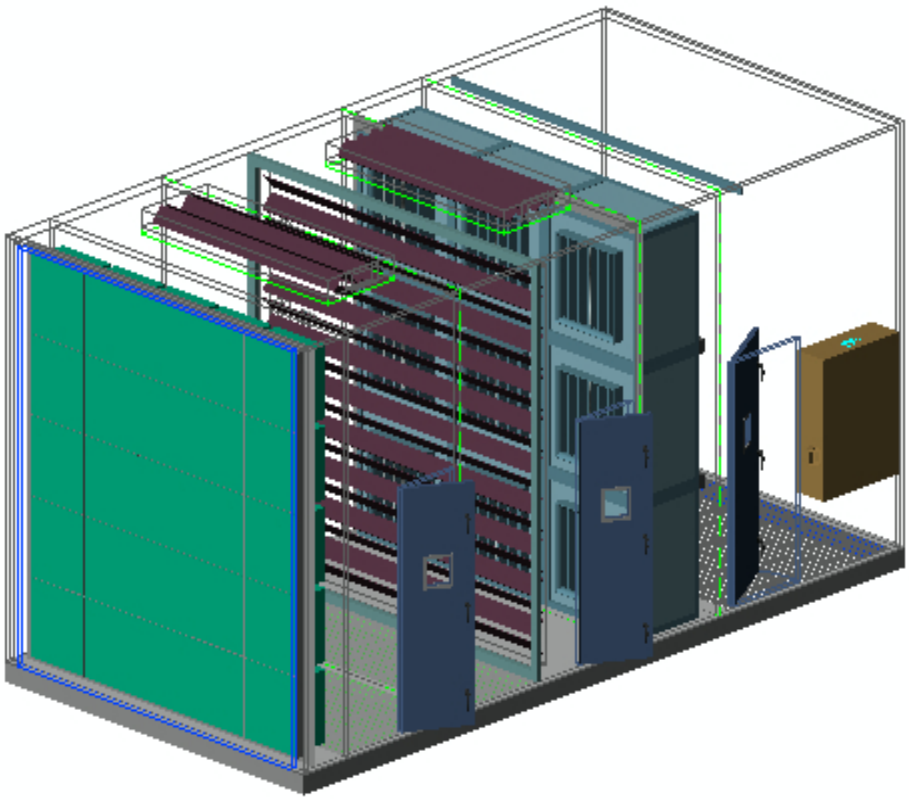
Unit Design Revision History

PROJECT	South Hill
SALES ORDER #	061070-001
UNIT TAG	RAU-56, RAU-58
QUANTITY	2

Revision History

Date	Rev	Revision Description
2023-11-16	A	Mechanical submittal. Electrical schematics to follow later.
2023-11-17	B	Added grating to the drain pan in Box B.
2023-11-20	C	Moved drain connection to the opposite side of the unit for Box B drain pan. Released for production.
2023-11-28	D	Added electrical schematics and re-sized the electrical panel to match.



JOB #	UNIT TAG
061070-001	RAU-56
061070-001	RAU-58

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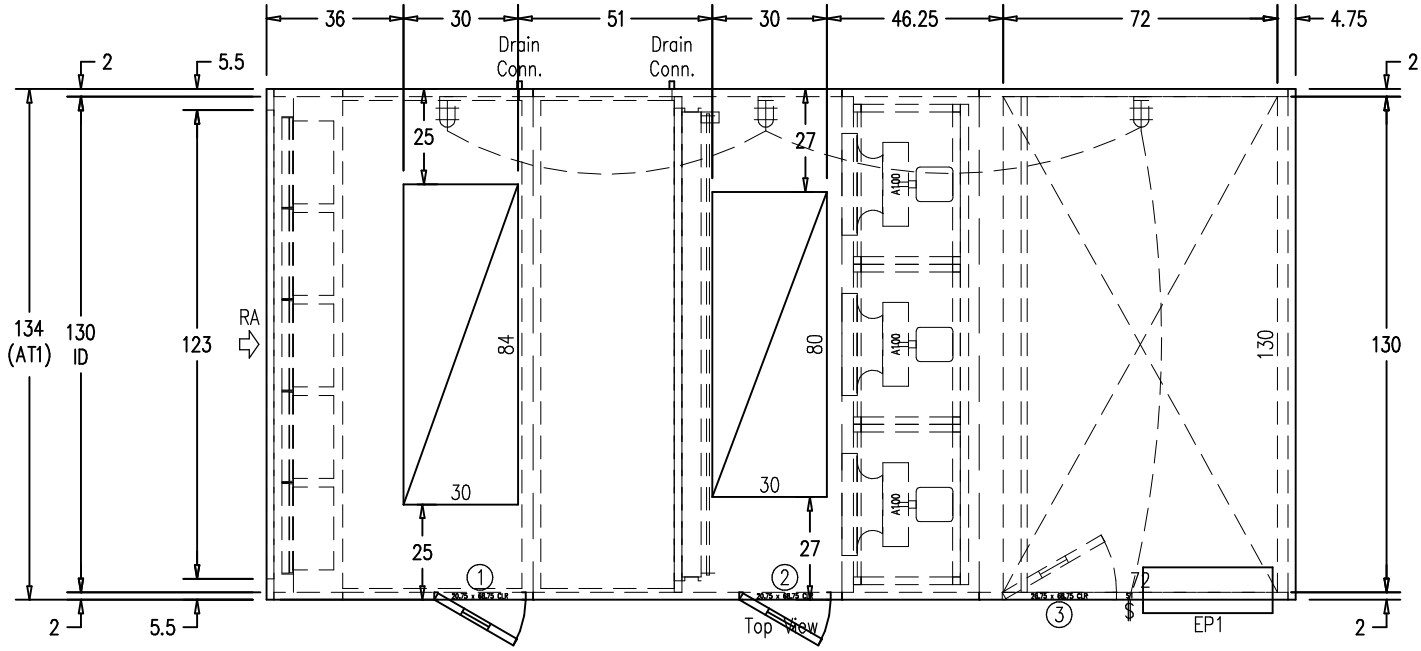
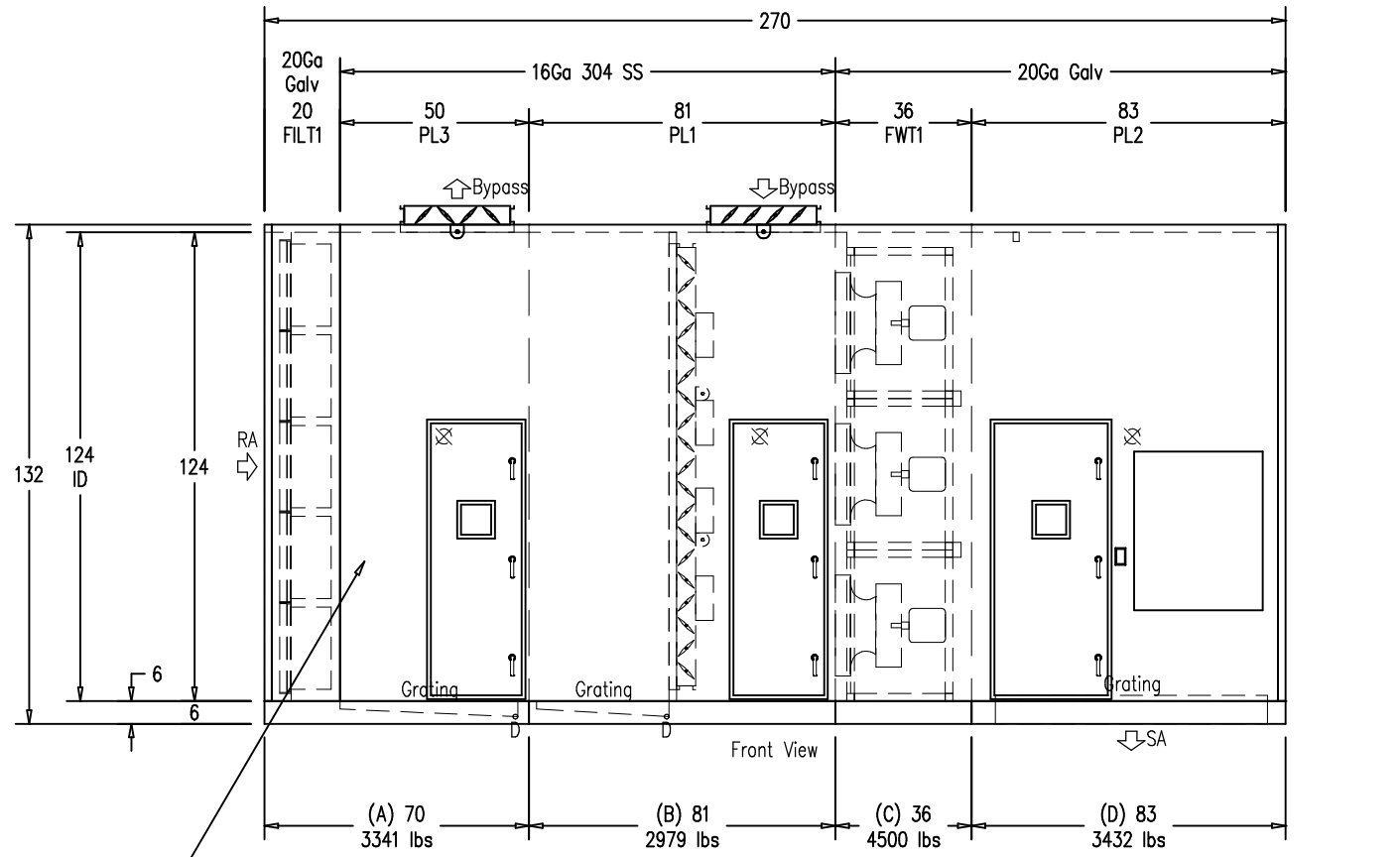
Knockdown Construction





Space for future coil provided by others.

Rev	Revision Description	Date m/d/y
D	Added electrical schematics and re-sized the electrical panel to match.	11/28/2023
C	Moved drain connection to the opposite side of the unit for Box B drain pan. Released for production.	11/20/2023
B	Added grating to the drain pan in Box B.	11/17/2023

All dimensions shown in inches, Operating weights shown in pounds. Overall unit dimensions do not include lifting lugs, electrical panels, pipe connections, door handles, etc. Weight and Box Qty are for a quantity of 1 design.
Panelized Factory Knockdown Construction 53,000 ACFM

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South Hill

Unit Tag	Unit Type	Dsg Qty
See Table	Indoor	2
Rep Firm	Weight	Box Qty
Air Reps, LLC: Bellevue Bellevue, WA, USA	14,251	4
Rep Contact	Model No	
Whitney Walker	CSU-53K	
SALES ORDER #	NASDA Ver / Factory SAE / Date m/d/y / Rev	
061070 – See Table	9.1.0 / DB / 11/16/2023 / D	

Printed (yyyy-MM-dd): 2023-11-28

PROJECT	South Hill
SALES ORDER #	061070-001
UNIT TAG	RAU-56, RAU-58
QUANTITY	2

Unit Design Options

Project Name: South Hill
Unit Tag: RAU-56, RAU-58

Sales Order #: 061070-001

101 Unit Details

101.1 Weights / Jobsite Elevation			
1. Shipping Weight	20,244 lb	3. Elevation	400 ft
2. Operating Weight	14,251 lb		

101.2 Testing			
1. Air Performance	NO	4. Witness Test	NO
2. Sound	NO	5. Inspection	NO
3. Cabinet Leak Test	NO		

101.3 Preparation for Shipment	
1. Cleaning & Wrapping	Ship on open bed truck and heat shrink wrap.
2. Knockdown Construction	Yes, factory pre-assembled unit shipped knock down in crates. (Electrical components, wiring and conduit are installed at the factory, final connections done onsite by others)

102 Unit Construction

102.1 Construction			
1. Cabinet Construction	Panelized	6. Panel Fastener	Drive Screws
2. Design Environment	Indoor	7. Thermal Break	Non Thermal Break
3. Panel Depth	2 in	8. Mounting	Slab Mounted
4. Caulk Type	3M 540	9. Roof Curb By	N/A
5. Model #	CSU-53K	10. Curb Height	N/A

102.2 Cabinet Material			
1. Exterior Material	16Ga Galv	8. Blankoff Finish	None
2. Interior Liner type(s)	See Drawing	9. Internal Wall Material	16Ga Galv
3. Exterior Paint Type	Powder Coat	10. Sheet Rock	No
4. Interior Paint Type	None	*Insulation by liner type*	
5. Paint Color	White (Standard)	11. Solid liner	Fiberglass Std - Unfaced (R8)
6. Meets Salt Spray Rating	1000 Hours	12. Perforated liner	N/A
7. Blankoff Material	16Ga Galv	13. No liner	N/A

102.3 Base Construction			
1. Base Structure Material	Steel Tube	7. Base Structure Height	See Drawing
2. Base Floor Material	16Ga Galv	8. Sub Floor Material	20Ga Galv
3. Base Floor Seams	Caulked	9. Lifting Lugs	Yes - Removable
4. Insulation	Polyurethane Foam	10. Sheet Rock	No
5. Floor Drain	None		
6. Floor Options	None		

102.4 Box Dimensions

Box	*X*	*Y*	*Z*	*Shipping Weight*	*Operating Weight*
A	70.000 in	134.000 in	132.000 in	0 lb	3,341 lb
B	81.000 in	134.000 in	132.000 in	0 lb	2,979 lb
C	36.000 in	134.000 in	132.000 in	0 lb	4,500 lb
D	83.000 in	134.000 in	132.000 in	0 lb	3,432 lb

102.5 Notes / Features

1. Box dimensions do not include lifting lugs, electrical panels, pipe connections, door handles, etc.
2. Base to be powdercoated to match cabinet exterior.

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103 Doors

103.1 All Doors (including those associated with specific components)

#	Box	Section	Type[1]	Width	Height	Hinge	Swing	Window	Interior	Exterior	Options
1	A	PL3	2" SF	24	72	LH	Out	8 x 8 TBW	16Ga 304 SS	16Ga Galv	
2	B	PL1	2" SF	24	72	LH	Out	8 x 8 TBW	16Ga 304 SS	16Ga Galv	
3	D	PL2	2" SF	30	72	LH	In	8 x 8 TBW	16Ga Galv	16Ga Galv	

103.2 Notes / Features

1. Door Types
   SF = Standard Factory
2. All doors insulated with Fiberglass Std - Unfaced.
3. Door paint follows its section's paint type and color.
4. Mechanical Safety Latch to be provided on all fan access doors.

104 Drains

104.1 All Drains (including those associated with specific components)

Box	Section	Type	Conn (in)	Hand	Above Floor	Pipe Ext.	Grating Material	Pan Material
A	PL3	Drain Pan	1.25	Left	0.00 in	0.00 in	304 Stainless Steel	16Ga 304 SS
B	PL1	Drain Pan	1.25	Left	0.00 in	0.00 in	304 Stainless Steel	16Ga 304 SS

104.2 Notes / Features

1. Drain Constructions included: Double Sloped, solid welded to base

105 Internal Walls

105.1 All Internal Walls (including those associated with specific components)

Box	Section	Wall Name	Depth	Panel Mat.	Liner Mat.	Insulated
B	Plenum 1	InternalWall 1	2 in	Default	None	False

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106 Static Pressure Summary

106.1 Condition 1

106.1.1 Unassigned

Tunnel	*Description*	*APD (in.H20)*
AirTunnel 1	Bypass - Damper (Return Air)	0.18
AirTunnel 1	Bypass - Damper (Exhaust Air)	1.25
	Total Static Pressure:	1.43

106.1.2 Supply

Tunnel	*Description*	*APD (in.H20)*
AirTunnel 1	RA Opening (Return Air)	0.00
AirTunnel 1	Filter 1, Pre / Final (Average Pressure Drop)	1.78
AirTunnel 1	SA Opening - Damper (Supply Air)	0.04
AirTunnel 1	FANWALL 1 (Supply) 53,000 ACFM @ 3.00 in.H20	0.00
AirTunnel 1	SA Opening (Supply Air)	0.10
	External Static Pressure	1.08
	Total Static Pressure:	3.00

Legend: ESP - External Static Pressure, OSA - Outside Air, EXH - Exhaust Air, RA - Return Air, SA - Supply Air

106.2 Notes/Legend

1. Summary report does not include static pressure of components supplied by others in the field unless otherwise noted.

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PROJECT	South Hill
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Fans

Project Name: South Hill
Unit Tag: RAU-56, RAU-58

Sales Order #: 061070-001

200 FANWALL 1 (Supply) : FWT1 : Box C — 22-75 - 182T - 40 x 42 x 28 - C3

200.1 Configuration / Quantity

1. Function	Supply Fan	Cell Size	7.Height	8.Width	9.Depth	10.Overall Depth
2. Quantity	9		40	42	28	33.25
3. Array	3 Rows x 3 Cols	11. Elev. / Temp.	400 ft / 70.0 °F			
4. Construction	Gen III (with Isolators)	12. Motor & Wheel Weight	186 lb	14. Redundant	0	
5. Inlet Cone Location	Upstream Removable	13. Fan Cell Weight	358 lb	15. Empty	0	
6. Stand Height	N/A	16. Ship Loose Fan (Wheel, Motor and Mounting Base)			0	

200.2 Options

1. Coplanar Insulation	Standard Melamine	8. Cell Finish	None
2. Extended Coplanar	No	9. Insulation Retainer	No
3. Back Draft Dampers	HBD0216	10. Inlet Attenuation	None
4. Inlet Cone Type	A100 Curved Cone	11. Blankoff Material	16Ga Galv
5. Solid Perimeter Material	None	12. Blankoff Finish	None
6. Discharge Safety Guard	No	13. Removal Rail	Yes
7. Cell Material	Aluminum / Steel		

200.3 Fan Wheel

1. Wheel Type	HPF-A100	4. Width	75
2. Diameter	22	5. Wheel Finish	None
3. Balancing Planes	1		

200.4 Motor

1. Manufacturer	Toshiba	7. Model	4OA003L1ZVS210
2. HP Each / Total	4.5 / 40.5	8. Efficiency	87.5
3. Poles / RPM	4-Pole / 1,735	9. Service Factor	1.15
4. Frame / Casing	182T / TEAO	10. Shaft Isolation	Ceramic Bearings
5. Volts / Phase / Hz	460/3/60	11. FLA Each / Total	5.7 / 51.3 Amps
6. Winding	N/A	12. Motor HP Safety Factor	3.0 %

200.5 Variable Frequency Drive

1. Furnished by	Factory	7. Input / Output Amps	52 / 52 Amps
2. Quantity	1	8. Maximum Hertz	63.83
3. Manufacturer	ABB ACH580	9. Input Line Reactor	No
4. Model No	ACH580-01-052A-4	10. VFD Communication	BACNet MSTP
5. Horsepower	40	11. Switching Frequency	Default
6. Voltage	460/3/60	12. Drive Position	N/A

200.6 Control System

1. Redundant VFD	No	6. Flow Monitoring	None
2. Bypass Circuit	None	7. Fans to Monitor	None
3. Drive	Standard	8. Display	N/A
4. Optimization Control	No	9. Communication	N/A
5. Control Method	By Others		

200.7 Notes / Features

1. To view patents and other pending U.S. or Canadian applications visit www.nortekair.com/patents.
2. Cone constant = 3086, cone flow differential pressure = 3.59 in.H2O at 5889 CFM per fan.
3. The estimated VFD input watts are based on the motor and VFD efficiency at the selected load and RPM.
4. Fans balanced to a maximum allowable level of 0.022 inches per second peak.
5. Fan cells to be shipped up to 2 wide x 2 high per skid.

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Unit Tag: RAU-56, RAU-58

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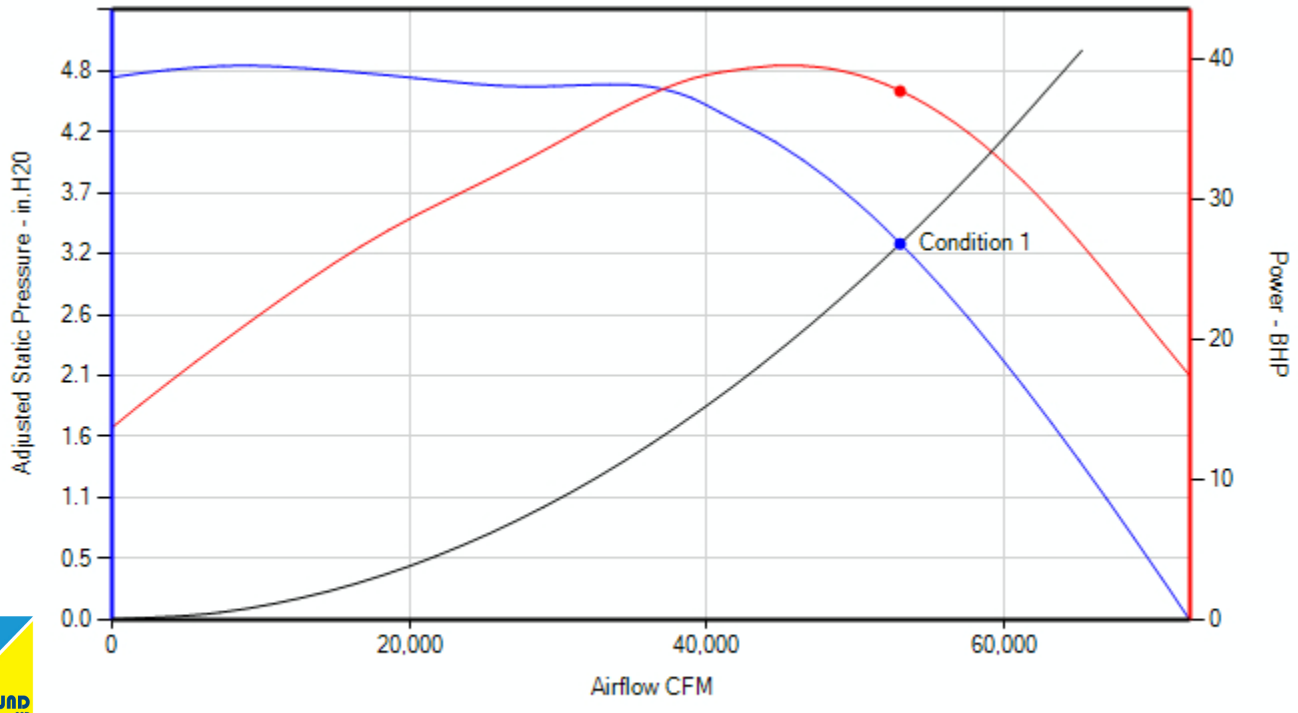
200 FANWALL 1 (Supply) : FWT1 : Box C (Continued) 22-75 - 182T - 40 x 42 x 28 - C3



AMCA Licensed for Sound and Air Performance Without Appurtenances (Accessories).
Performance certified is for installation type A: Free Inlet/Free Outlet
Power [bhp] excludes drives

200.8 Operating Conditions

Operating Condition	Usage (%)	CFM	SP (in.H20)		Cell Qty			RPM	Hz	Fanwheel BHP		Vel. (ft/min)	Watts	FEG % O.P.	FEI
			Input	Adj.	On	Off	Fail			Each	Total				
Condition 1	100	53,000	3.00	3.27	9	0	0	1,805	62.4	4.19	37.68	620	33,248	FEG85 0%	1.27

200.9 Bare Fan Sound Power with Coplanar Silencer (dB re: 10E-12 watts)

Operating Condition		63	125	250	500	1k	2k	4k	8k	LwA	Lw
Condition 1	Inlet	82	80	99	85	84	84	81	78	93	100
	Outlet	87	83	92	83	82	79	76	64	88	94

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200 FANWALL 1 (Supply) : FWT1 : Box C (Continued) 22-75 - 182T - 40 x 42 x 28 - C3

200.10 AMCA Statement

Nortek Air Solutions LLC certifies that the HPF-A100 fan wheel shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

The AMCA licensed air and/or sound performance data has been modified for installation,appurtenances or accessories, etc. not included in the certified data. The modified performance is not AMCA licensed but is provided to aid in selection and applications of the product. Performance certified is for installation type A: Free Inlet/Free Outlet Power [bhp] excludes drives

FWTRating DLL: Ver-1.6 / May 2022

PROJECT	South Hill
SALES ORDER #	061070-001
UNIT TAG	RAU-56, RAU-58
QUANTITY	2

Components

Project Name: South Hill
Unit Tag: RAU-56, RAU-58

Sales Order #: 061070-001

500 Filter 1 : FILT1 : Box A

500.1 Pre / Final Size & Quantity			
1. Loading	Upstream Face Load	7. Bank Size	120.500 in W x 120.000 in H
2. Frame Material	Galvanized	8. Blankoff Location	N/A
3. Frame Finish	None	9. Qty / set & Frame Size 1	(25) 24 in x 24 in
4. Filter Clips	(50) C-70, (50) C-86	10. Qty / set & Frame Size 2	
5. Blankoff / Rack Material	16Ga Galv	11. Qty / set & Frame Size 3	
6. Blankoff / Rack Finish	None	12. Qty / set & Frame Size 4	

500.2 Pre Filter			
1. Filter Depth	2.000 in	4. Number of Sets	1
2. Efficiency	MERV 8	5. Max Face Velocity	530.00 ft/min at 53,000 ACFM
3. Manufacturer	American Air Filter	6. Model	PerfectPleat Ultra

500.3 Final Filter			
1. Filter Depth	12.000 in	4. Number of Sets	1
2. Efficiency	MERV 13	5. Max Face Velocity	530.00 ft/min at 53,000 ACFM
3. Manufacturer	American Air Filter	6. Model	VariCel SH

500.4 Notes / Features
1. All sets of Filters and clips to ship loose inside unit, installed by others.

Project Name: South Hill
Unit Tag: RAU-56, RAU-58

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600 SA Opening : SA : Box D : Floor

600.1 Opening Construction			
1. Description	Supply Air	4. Shape	Rectangle
2. Max CFM	53,000 ACFM	5. Max APD	0.10 in.H20
3. Size	130 W x 72 H in	6. Max Velocity	816.00 ft/min

600.2 Notes / Features
1. Stainless Steel 304 Floor Grate included.

601 RA Opening : RA : Box A : End Wall

601.1 Opening Construction			
1. Description	Return Air	4. Shape	Rectangle
2. Max CFM	53,000 ACFM	5. Max APD	0.00 in.H20
3. Size	123 W x 124 H in	6. Max Velocity	501.00 ft/min

602 Bypass : Bypass : Box B : Roof

602.1 Opening Construction			
1. Description	Return Air	4. Shape	Rectangle
2. Max CFM	53,000 ACFM	5. Max APD	0.18 in.H20
3. Size	80 W x 30 H in		

602.2 Damper Specifications			
1. Manufacturer	Ruskin	6. Jackshaft	Yes
2. Model	Ruskin CD 50 (Aluminum)	7. Max Face Velocity	3,180.00 ft/min
3. Size	80.000 in (Blade Direction) x 30.000 in	8. Torque	117 lb-in
		9. End Switches	No
4. Blade Config	Parallel		
5. Blade Orientation	Horizontal		

Notes:
1. Ordered with 1.5" frame flange

602.3 Damper Actuator			
1. Manufacturer	Siemens	5. Qty	1
2. Model	GCA156.1U	6. Floor Mounted	No
3. Location	Right Hand	7. Furnished By	Factory
4. Type	Modulating 24V – NC	8. Mounted By	Factory
		9. Wiring By	Others

603 Bypass : Bypass : Box A : Roof

603.1 Opening Construction			
1. Description	Exhaust Air	4. Shape	Rectangle
2. Max CFM	53,000 ACFM	5. Max APD	1.25 in.H20
3. Size	84 W x 30 H in		

603.2 Damper Specifications			
1. Manufacturer	Ruskin	6. Jackshaft	Yes
2. Model	Ruskin CD 50 (Aluminum)	7. Max Face Velocity	3,028.57 ft/min
3. Size	84.000 in (Blade Direction) x 30.000 in	8. Torque	88 lb-in
		9. End Switches	No
4. Blade Config	Opposed		
5. Blade Orientation	Horizontal		

Notes:
1. Ordered with 1.5" frame flange

603 Bypass : Bypass : Box A : Roof (Continued)

603.3 Damper Actuator			
1. Manufacturer	Siemens	5. Qty	1
2. Model	GCA156.1U	6. Floor Mounted	No
3. Location	Right Hand	7. Furnished By	Factory
4. Type	Modulating 24V – NC	8. Mounted By	Factory
		9. Wiring By	Others

604 SA Opening : SA : Box B : Internal Wall

604.1 Opening Construction			
1. Description	Supply Air	4. Shape	Rectangle
2. Max CFM	53,000 ACFM	5. Max APD	0.04 in.H20
3. Size	124 W x 118 H in		

604.2 Damper Specifications			
1. Manufacturer	Ruskin	6. Jackshaft	Yes
2. Model	Ruskin CD 50 (Aluminum)	7. Max Face Velocity	521.60 ft/min
3. Size	124.000 in (Blade Direction) x 118.000 in	8. Torque	508 lb-in
		9. End Switches	No
4. Blade Config	Opposed		
5. Blade Orientation	Horizontal		

Notes:
1. Ordered with 1.5" frame flange

604.3 Damper Actuator		
1. Qty	4	
2. Furnished By	Others	
3. Mounted By	Others	
4. Wiring By	Others	

604.4 Notes / Features

1. Damper Actuators and mounting accessories furnished and mounted by Others at Face Mounted (LH) location.
2. Damper Actuators wired by Others

PROJECT	South Hill
SALES ORDER #	061070-001
UNIT TAG	RAU-56, RAU-58
QUANTITY	2

Separate electrical permit is required with Washington State Department of Labor & Industries. https://lni.wa.gov/licensing-permits/electrical/electrical-permits-fees-and-inspections or Licensing information: Call 1-800-647-0982

Electrical

Project Name: South Hill
Unit Tag: RAU-56, RAU-58

Sales Order #: 061070-001

700 ElecPanel 1 : PL2 : Box D : Near Side

700.1 Electrical Service Information			
1. Volt/Phase/Hertz	460/3/60	2. Provides power to	Supply Fan
1. For electrical loads see electrical drawings			

700.2 Construction			
1. Enclosure Type	Electrical Panel	4. Route	C
2. Type	NEMA 1 Indoor	5. Mounting	Recessed panel
3. Size	See electrical drawings	6. Finish	Powder Coat (White (Standard))

700.3 Options			
1. Cooling Fan	Yes	4. Floor Stand	No
2. Keypad or Touch screen on Door	Yes - VFD Keypad	5. Control Transformer	Yes
		6. Window Kit	No
3. Power Transformer	No		

700.4 Notes / Features

1. Shipping splits only - The wiring for the motors will be disconnected for shipment at the section shipping splits. The wiring will be coiled at the motors for shipment and must be pulled through the conduit and reconnected to the electrical panel by others. NOTE: If there are no shipping splits then all wiring is to be completed at the factory before shipping.
2. Electrical panel includes: VFD, disconnect, fuses, and motor protection.

701 Lighting Circuit

701.1 Electrical Service Information			
1. Volt/Phase/Hertz	120/1/60	2. Provides power to	ElecSwitch 1, Lighting
1. For electrical loads see electrical drawings			

701.2 Switches / Outlets

	Name	Box	Section	Type	Mounted	Illum. Switch	Timer	Cover	GFCI	MOCP
•	ElecSwitch 1	D	PL2	Light Switch	External	No	None	Yes	No	N/A

• Switch is connected to service.

701.3 Lighting Types and Quantities

(3) Vapor Proof 8.5W LED

19855 SW 124TH AVENUE • TUALATIN, OR 97062
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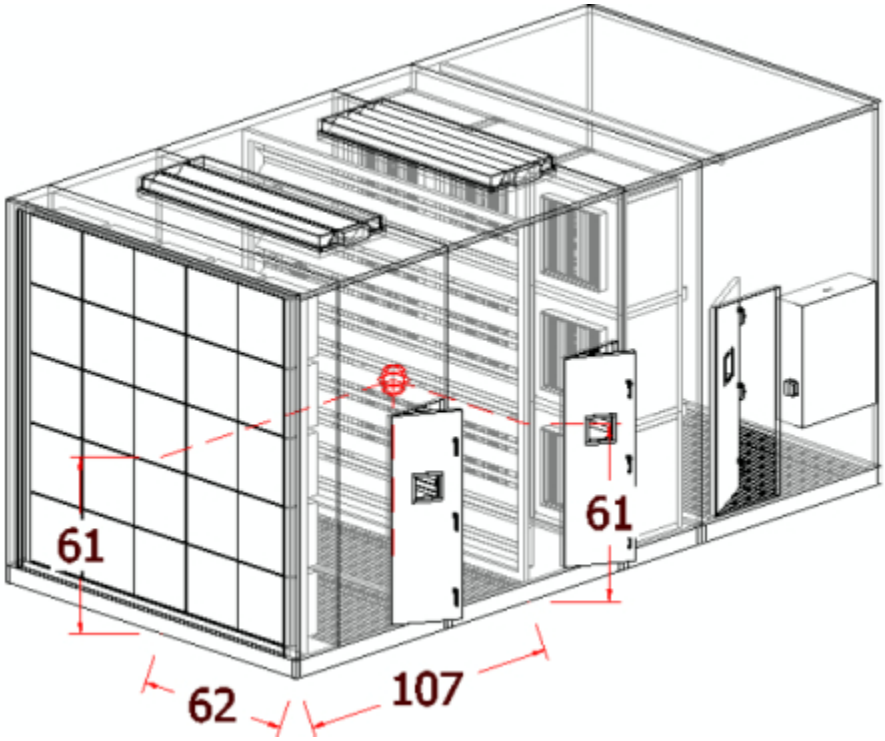
PROJECT	South Hill
SALES ORDER #	061070-001
UNIT TAG	RAU-56, RAU-58
QUANTITY	2

Unit Data

Project Name: South Hill
Unit Tag: RAU-56, RAU-58

Sales Order #: 061070-001

901 Center of Gravity



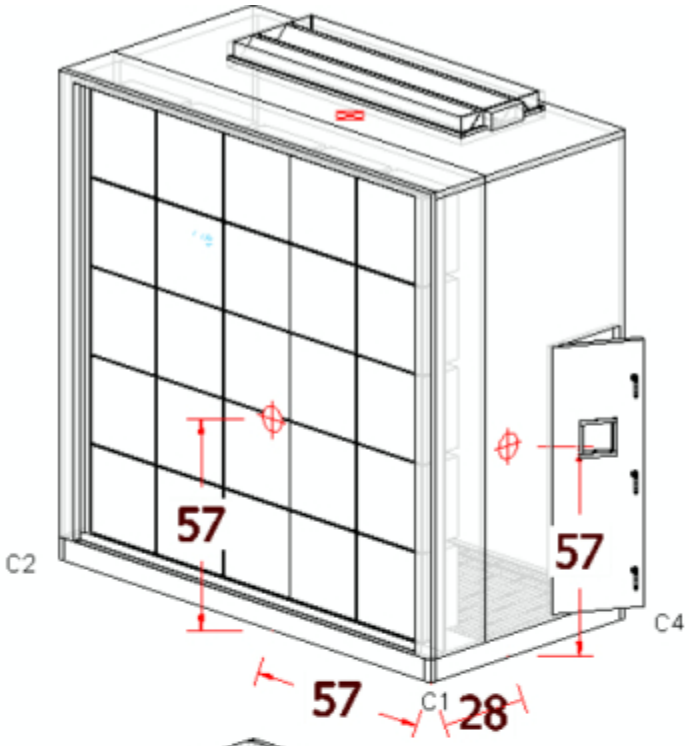
Size (Inches)			Operating Weight (Pounds)	Center of Gravity (Inches)		
X	Y	Z		X	Y	Z
270.00	134.00	132.00	14,251	138.00	60.00	59.00

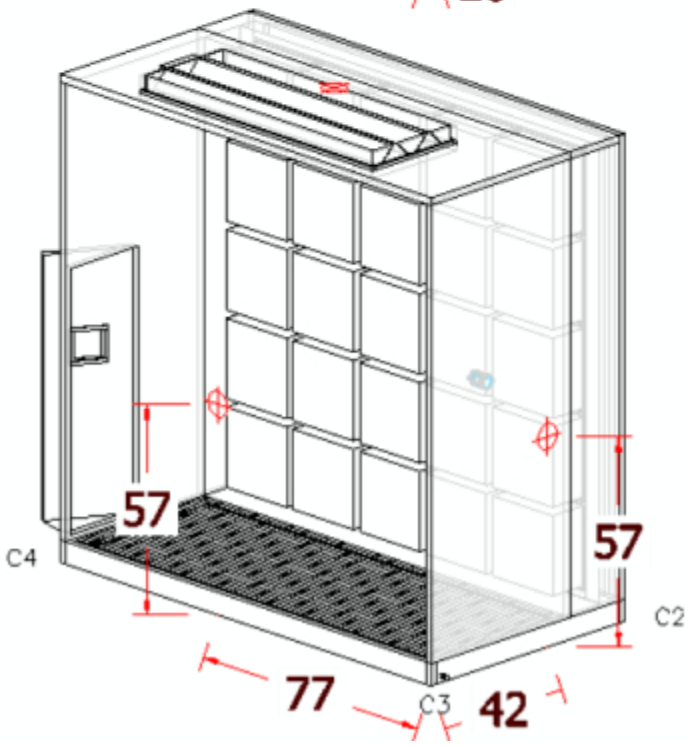
901.1 Notes

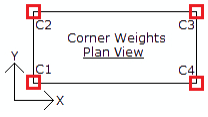
1. Center of gravity and weights are estimates and subject to change.
2. The center of gravity and weights shown above are based on operating weights and do not include packaging materials.
3. A 5% safety factor has been applied to the operating weights.
4. Corner weights apply to rectangular boxes only.
5. Corner weights are to assist in handling of the unit. Some units are not intended to be supported only at the corners. Contact your Sales Representative for support information.

901 Center of Gravity (Continued)

901.2 Box A







Size (Inches)			Shipping Weight (Pounds)	Corner Weights (Pounds)			
X	Y	Z		C1	C2	C3	C4
70.00	134.00	132.00		N/A	N/A	N/A	N/A

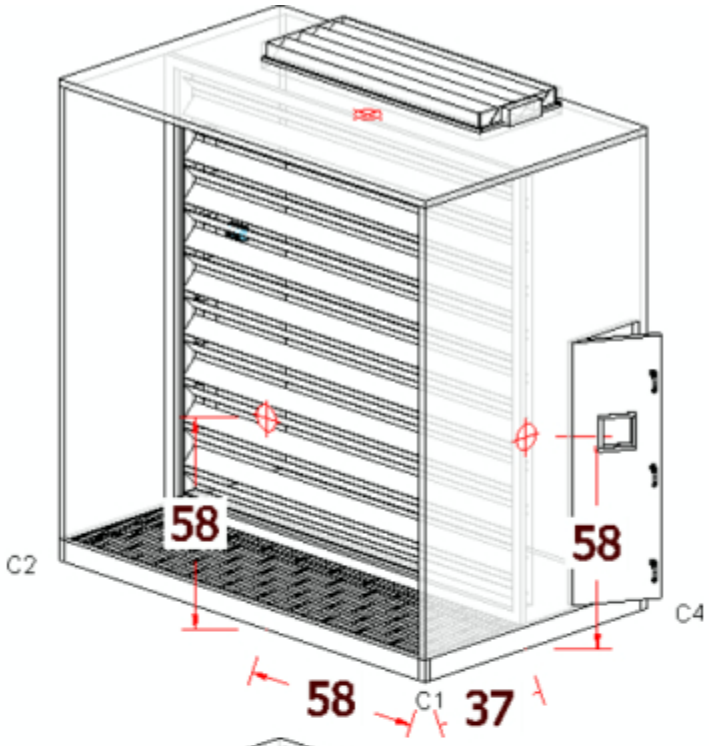
◊ Center of gravity, weight, and corner weights shown are based on shipping weight. Values are estimates and subject to change.

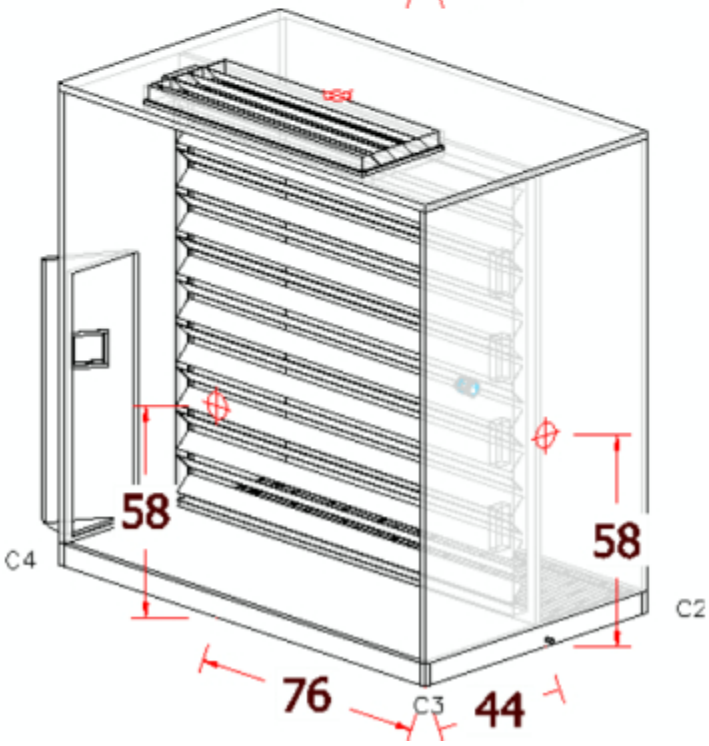
Project Name: South Hill
Unit Tag: RAU-56, RAU-58

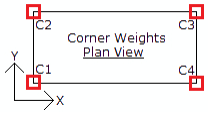
Sales Order #: 061070-001

901 Center of Gravity (Continued)

901.3 Box B







Size (Inches)			Shipping Weight (Pounds)	Corner Weights (Pounds)			
X	Y	Z		C1	C2	C3	C4
81.00	134.00	132.00		N/A	N/A	N/A	N/A

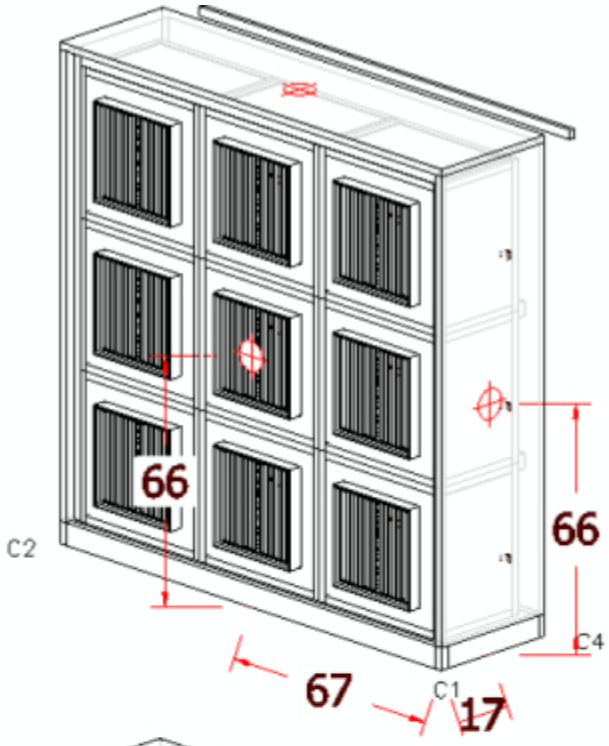
◊ Center of gravity, weight, and corner weights shown are based on shipping weight. Values are estimates and subject to change.

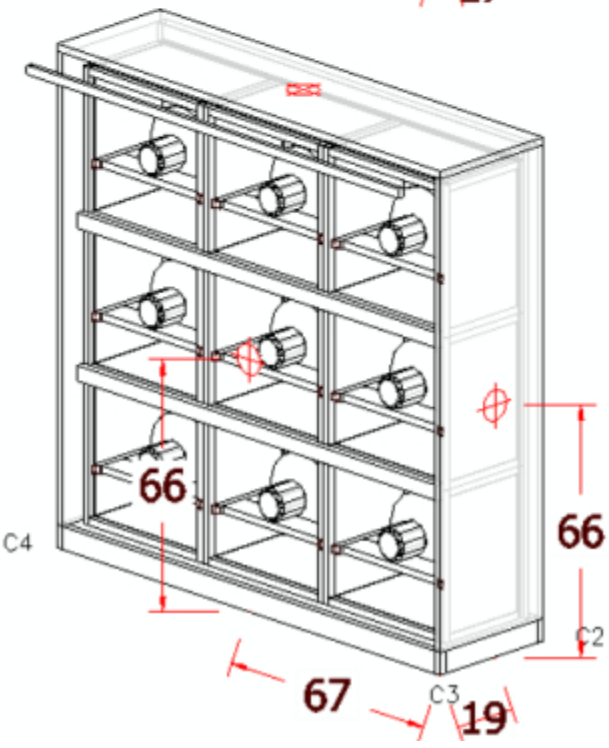
Project Name: South Hill
Unit Tag: RAU-56, RAU-58

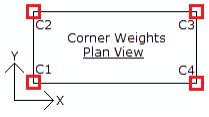
Sales Order #: 061070-001

901 Center of Gravity (Continued)

901.4 Box C







Size (Inches)			Shipping Weight (Pounds)	Corner Weights (Pounds)			
X	Y	Z		C1	C2	C3	C4
36.00	134.00	132.00		N/A	N/A	N/A	N/A

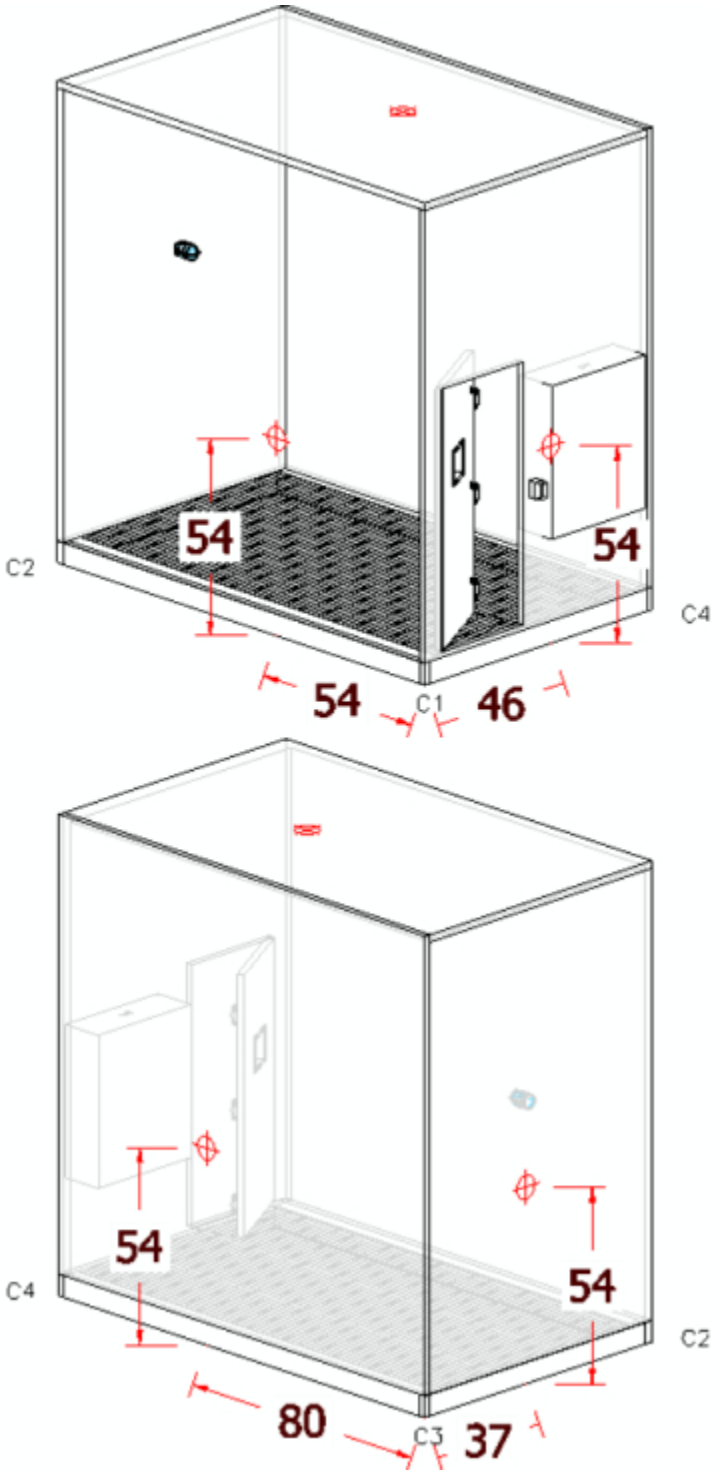
◊ Center of gravity, weight, and corner weights shown are based on shipping weight. Values are estimates and subject to change.

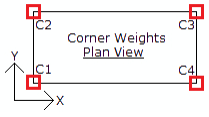
Project Name: South Hill
Unit Tag: RAU-56, RAU-58

Sales Order #: 061070-001

901 Center of Gravity (Continued)

901.5 Box D





Size (Inches)			Shipping Weight (Pounds)	Corner Weights (Pounds)			
X	Y	Z		C1	C2	C3	C4
83.00	134.00	132.00		N/A	N/A	N/A	N/A

◊ Center of gravity, weight, and corner weights shown are based on shipping weight. Values are estimates and subject to change.

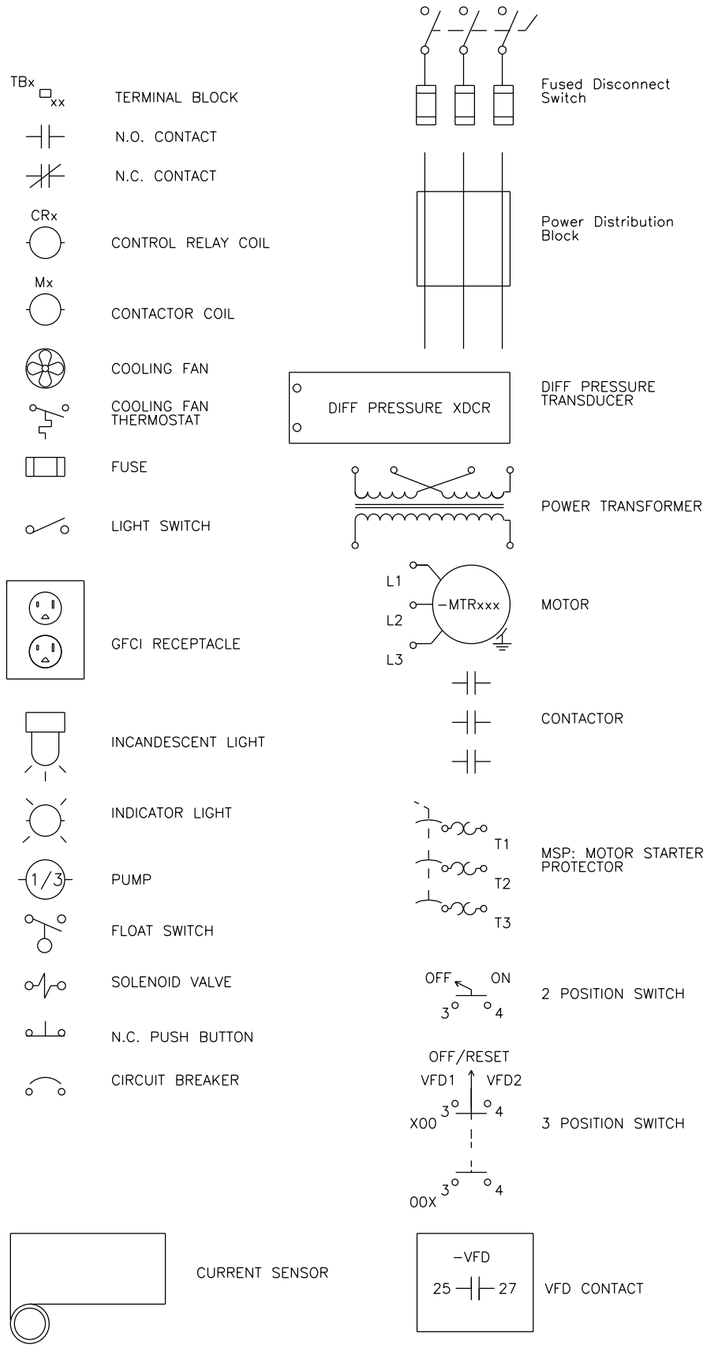
PROJECT	South Hill
SALES ORDER #-001	061070
QUOTE #	23-0137
UNIT TAG	RAU-56, RAU-58
QUANTITY	2

Electrical Schematics

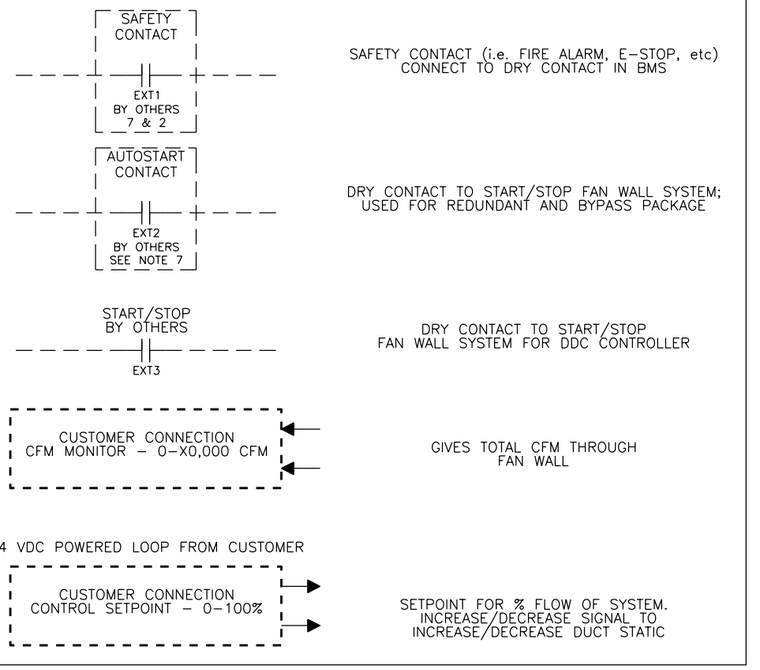
NORTEK AIR SOLUTIONS

PRMH20240272

HUNTAIR SCHEMATIC SYMBOL LEGEND



TYPICAL CUSTOMER CONNECTIONS



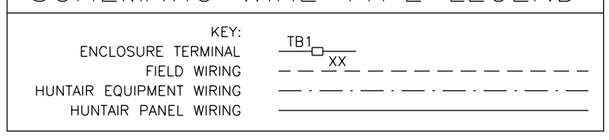
CONTROL PANEL WIRE COLOR CODE

COLOR:	DESCRIPTION OF USE:
BLACK	ALL UNGROUNDED 120VAC CONTROL CIRCUIT CONDUCTORS OPERATING AT THE SUPPLY VOLTAGE.
WHITE	GROUNDED 120VAC CURRENT-CARRYING CONTROL CIRCUIT CONDUCTOR
RED	ALL UNGROUNDED 24VAC CONTROL CIRCUIT CONDUCTORS OPERATING AT THE SUPPLY VOLTAGE.
WHT W RED TRACE	GROUNDED 24VAC CURRENT-CARRYING CONTROL CIRCUIT CONDUCTOR
BLUE	UNGROUNDED DC CONTROL CIRCUIT CONDUCTOR
WHT W BLU TRACE	GROUNDED DC CURRENT-CARRYING CONTROL CIRCUIT CONDUCTOR
GREEN	GROUND CONDUCTOR

MOTOR CONNECTION WIRE COLOR CODE

BLACK	3 PHASE SUPPLY VOLTAGE CONDUCTORS

SCHEMATIC WIRE TYPE LEGEND



SYSTEM PACKAGE OPTIONS & DESCRIPTIONS

REDUNDANT:	MANUAL DESIGNATION OF PRIMARY VFD; AUTOMATIC SWITCH TO BACKUP VFD UPON FAILURE OF PRIMARY DRIVE
BYPASS:	AUTOMATIC SWITCH TO BYPASS CIRCUIT UPON FAILURE OF VFD
[1.] MICRO-DRIVE w/Optimization	INDIVIDUAL DRIVE PER MOTOR; MAY CONTROL SYSTEM BY: CFM, TOTAL STATIC PRESSURE, or DUCT STATIC PRESSURE SETPOINT
MICRO-DRIVE w/VFD Speed Control	INDIVIDUAL DRIVE PER MOTOR; CONTROL BY A VFD SPEED SETPOINT. (HZ SETPOINT FOR INDUCTION MOTORS; RPM SETPOINT FOR PM MOTORS)[2.]
MICRO-DRIVE w/Control by others	INDIVIDUAL DRIVE PER MOTOR; ALL CONTROL IS BY OTHERS (NOTE: THIS OPTION DOES NOT INCLUDE A HUNTAIR DDC CONTROLLER)
VFD/NO BYPASS Control by others	INDIVIDUAL DRIVE FOR MULTIPLE MOTORS. NO BYPASS OR REDUNDANT DRIVE INCLUDED
MSP PANEL	EACH MOTOR IS SUPPLIED WITH ITS OWN MECHANICAL AND THERMAL OVERLOAD DEVICE
CUSTOM	SEE SUBMITTAL FOR DESCRIPTION

1. The control method described is also available without the optimization feature.
2. PM MOTOR = Permanent Magnet Motor

IDENTICAL DRAWING	
DASH	TAG NAME
-201	RAU-56, RAU-58
-202	RAU-55, RAU-57

SOUTH HILL
MULTIPLE DASHES

HUNTAIR
19855 SW 124th AVE, TUALATIN, OR 97062
(503) 639-0113 FAX (503) 639-1269

DRAWN BY	DATE	RTP BY:	DATE	DATE / TIME STAMP	SCALE	SHEET
J. GRAGG	11/17/23			11/17/23 16:07		1 of 5

JOB NO	DWG NO	REV
61070-201	61070-201 26	

480 VAC, 3 PH, 60 HZ
(BY OTHERS, SEE NOTE 1)

L1 L2 L3 GND L70 GND LUG

MAIN_DISC1

L1 L2 L3 H1

EATON FUSIBLE DISCONNECT
R9K3100FJ
100A
MAIN_FUSES1

BUSSMANN J TYPE FUSES
DFJ-80
80 AMP

T1 T2 T3

480 V, 3 PH, 60 HZ
FULL LOAD AMPS = 53A
MINIMUM CIRCUIT AMPACITY = 66A
MAXIMUM OVERCURRENT PROTECTION = 110A
SHORT-CIRCUIT CURRENT RATING = 65K A

PRMH20240272

4 AWG

206A

206B

206C

VFD1

ABB
ACH580-01-052A-4
380-480 VAC
52 A
40 HP

L1 L2 L3 PE

T1 T2 T3

4 AWG

208A

209A

210A

Cooper-Bussman
PWR DIST BLOCK
175A PDB321-3
PD1

305 306 307

10 AWG

345 346 347

FNQ-R-3
3 AMP
FU1

14 AWG

FNQ-R-3
3 AMP
FU2

MICRON
B500BTZ13RBF
500VA
480 VAC

H1 H2 H3 H4

X1 X2

120 VAC
T1

FNM-6-1/4
6-1/4 AMP
FU3

220A

220B

FAN1

TB1 1

TS1

223A

TB1 2

SETPOINT 70 DEG F

6" FAN 220 CFM

CP	9 5	10 6	
	225		
CP	11 7	12 8	
CP	9 1	10 2	
CP	11 3	12 4	

RELAY: AC SIG.
EXTERNAL FAULT

SAFETY
CONTACT
BY OTHERS

EXT1
SEE NOTES
7 & 2

TB1 1

TB1 3

229A

CR1
EATON D2RF4A

13 14

4PDT
120VAC 6A

TB1 2

CP	9 5	10 6	
	224		
CP	11 7	12 8	
CP	9 1	10 2	
CP	11 3	12 4	

RELAY: VFD
START/STOP

START/STOP
CONTACT
BY OTHERS

EXT2
SEE NOTE
2

TB1 1

TB1 4

235A

CR2
EATON D2PA6

13 14

4PDT
120VAC 6A

TB1 2

28 SCR — SCR 1

29 B+ — AI/1 2 — FROM CUSTOMER BMS 0-10VDC

30 A- — AGND 3

31 AGND — +10V REF 4

32 SCR — AI/2 5

OUT1 — AGND 6

OUT2 — AO/1 7

SGND — AO/2 8

IN1 — AGND 9

IN2 — +24VDC 10

221A

GND 11

DCOM 12

START/STOP — DI/1 13

224A

CR2
9 235 5

RUN ENABLE — DI/2 14

225A

CR1
9 229 5

DI/3 15

DI/4 16

DI/5 17

DI/6 18

R1 NC — RO1A 20

COMMON — RO1C 19
READY

R1 NO — RO1B 21

R2 NC — RO2A 23

COMMON — RO2C 22
RUNNING

R2 NO — RO2B 24

R3 NC — RO3A 26

COMMON — RO3C 25
FAULT

R3 NO — RO3B 27

ALL CONTROL WIRING BY OTHERS
EXCEPT WHERE INDICATED

KEY:
ENCLOSURE TERMINAL — TB1 XX
FIELD WIRING
HUNTAIR EQUIPMENT WIRING
HUNTAIR PANEL WIRING

GENERAL NOTES
1. FEEDER CIRCUIT MUST BE SELECTED IN ACCORDANCE WITH THE NEC AND LOCAL CODES.
2. FOR SAFETY CONTACT AMPERAGE RATING SEE SECONDARY FUSING OF TRANSFORMER.
4. LAMPS ARE LOCATED OUTSIDE OF ELECTRICAL PANEL.
5. DEVICES ARE TO BE WIRED BY HUNTAIR.
7. JUMPER IF NOT USED.

IDENTICAL DRAWING	
DASH	TAG NAME
-201	RAU-56, RAU-58
-202	RAU-55, RAU-57

SOUTH HILL
MULTIPLE DASHES

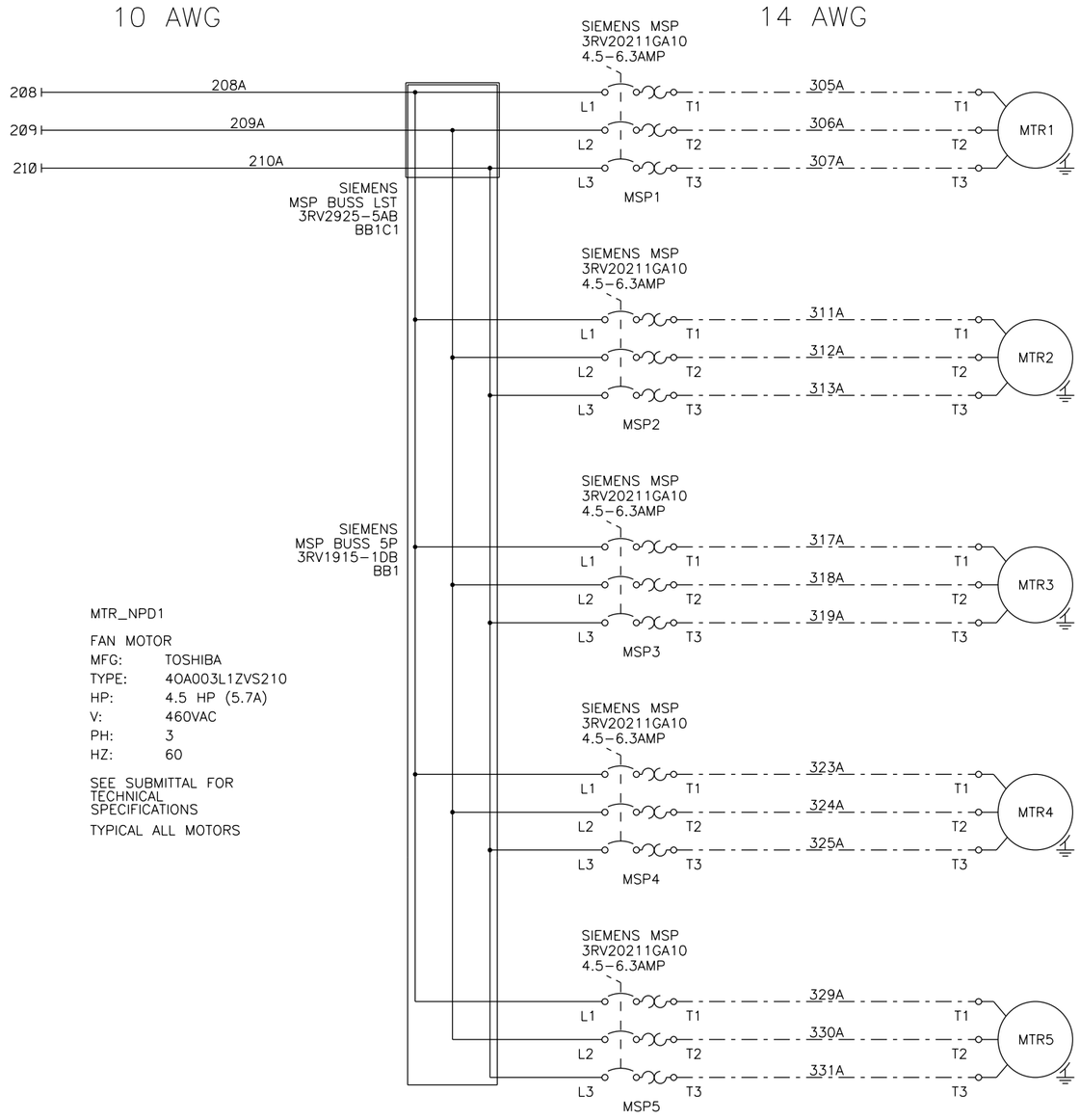
HUNTAIR
19855 SW 124th AVE, TUALATIN, OR 97062
(503) 639-0113 FAX (503) 639-1269

DRAWN BY	DATE	RTP BY:	DATE	DATE / TIME STAMP	SCALE	SHEET
J. GRAGG	11/17/23			11/17/23 16:08		2 OF 5

JOB NO 61070-201

DWG NO 61070-201 27 REV

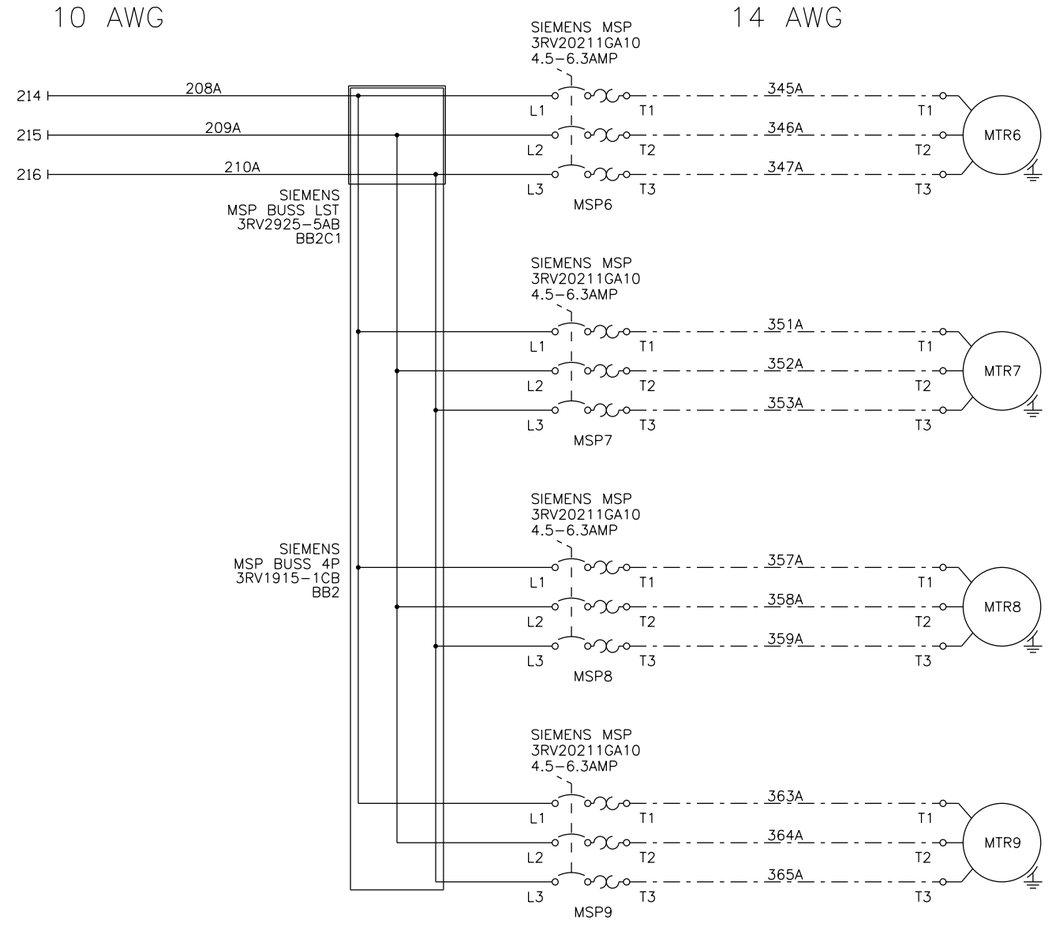
PRMH20240272



MTR_NPD1

FAN MOTOR
MFG: TOSHIBA
TYPE: 40A003L1ZVS210
HP: 4.5 HP (5.7A)
V: 460VAC
PH: 3
HZ: 60

SEE SUBMITTAL FOR TECHNICAL SPECIFICATIONS
TYPICAL ALL MOTORS



KEY:
ENCLOSURE TERMINAL — TB1 / XX
FIELD WIRING
HUNTAIR EQUIPMENT WIRING
HUNTAIR PANEL WIRING

GENERAL NOTES
1. FEEDER CIRCUIT MUST BE SELECTED IN ACCORDANCE WITH THE NEC AND LOCAL CODES.
2. –
3. STATS INSTALLED BY HUNTAIR. MAKE SETPOINT AS NOTED. MOUNT SENSOR IN HEATER DISCHARGE.
4. DEVICE(S) ARE TO BE LOCATED OUTSIDE OF ELECTRICAL PANEL.
5. DEVICES ARE TO BE WIRED BY HUNTAIR.

IDENTICAL DRAWING	
DASH	TAG NAME
-201	RAU-56, RAU-58
-202	RAU-55, RAU-57

SOUTH HILL
MULTIPLE DASHES

HUNTAIR
19855 SW 124th AVE, TUALATIN, OR 97062
(503) 639-0113 FAX (503) 639-1269

DRAWN BY	DATE	RTP BY:	DATE	DATE / TIME STAMP	SCALE	SHEET
J. GRAGG	11/17/23			11/17/23 16:08		3 of 5

JOB NO	DWG NO	REV
61070-201	61070-201 28	

PRMH20240272

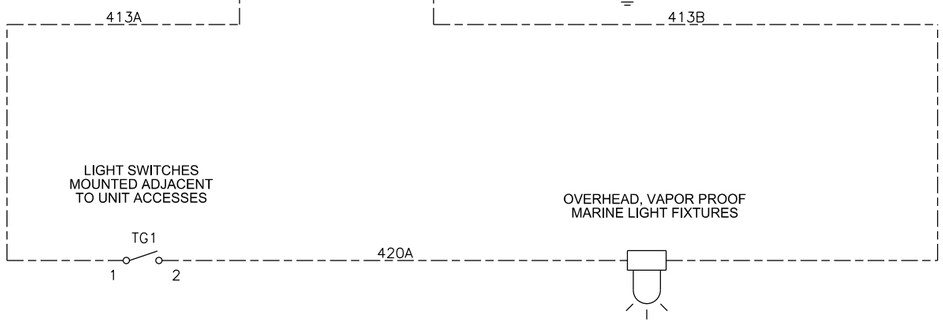
120 VAC BY OTHERS

L1 NEUT GND

SEE NOTES:
1, 4, & 5

JUNCTION BOX

MINIMUM CIRCUIT AMPACITY = 20A
MAXIMUM OVERCURRENT PROTECTION = 20A



SEE SUBMITTAL FOR TECHNICAL SPECIFICATIONS

GENERAL NOTES
1. FEEDER CIRCUIT MUST BE SELECTED IN ACCORDANCE WITH THE NEC AND LOCAL CODES.
2. –
3. STATS INSTALLED BY HUNTAIR. MAKE SETPOINT AS NOTED. MOUNT SENSOR IN HEATER DISCHARGE.
4. DEVICE(S) ARE TO BE LOCATED OUTSIDE OF ELECTRICAL PANEL.
5. DEVICES ARE TO BE WIRED BY HUNTAIR.

KEY:
ENCLOSURE TERMINAL TB1 XX
FIELD WIRING
HUNTAIR EQUIPMENT WIRING
HUNTAIR PANEL WIRING

IDENTICAL DRAWING	
DASH	TAG NAME
-201	RAU-56, RAU-58
-202	RAU-55, RAU-57

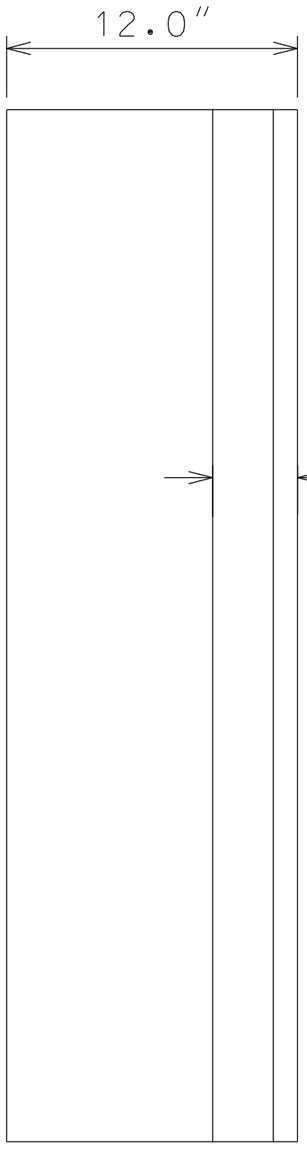
SOUTH HILL
MULTIPLE DASHES

HUNTAIR
19855 SW 124th AVE, TUALATIN, OR 97062
(503) 639-0113 FAX (503) 639-1269

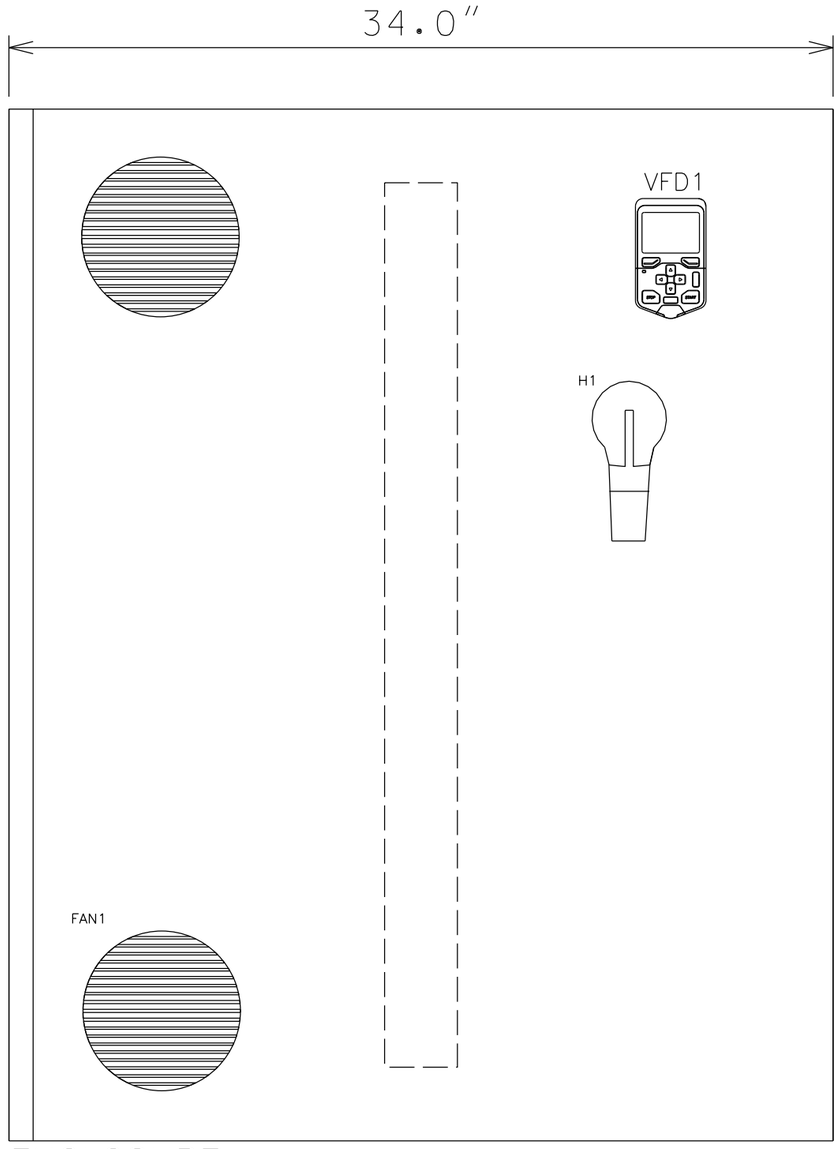
DRAWN BY	DATE	RTP BY:	DATE	DATE / TIME STAMP	SCALE	SHEET
J. GRAGG	11/17/23			11/17/23 16:08		4 OF 5

JOB NO	DWG NO	REV
61070-201	61070-201 29	

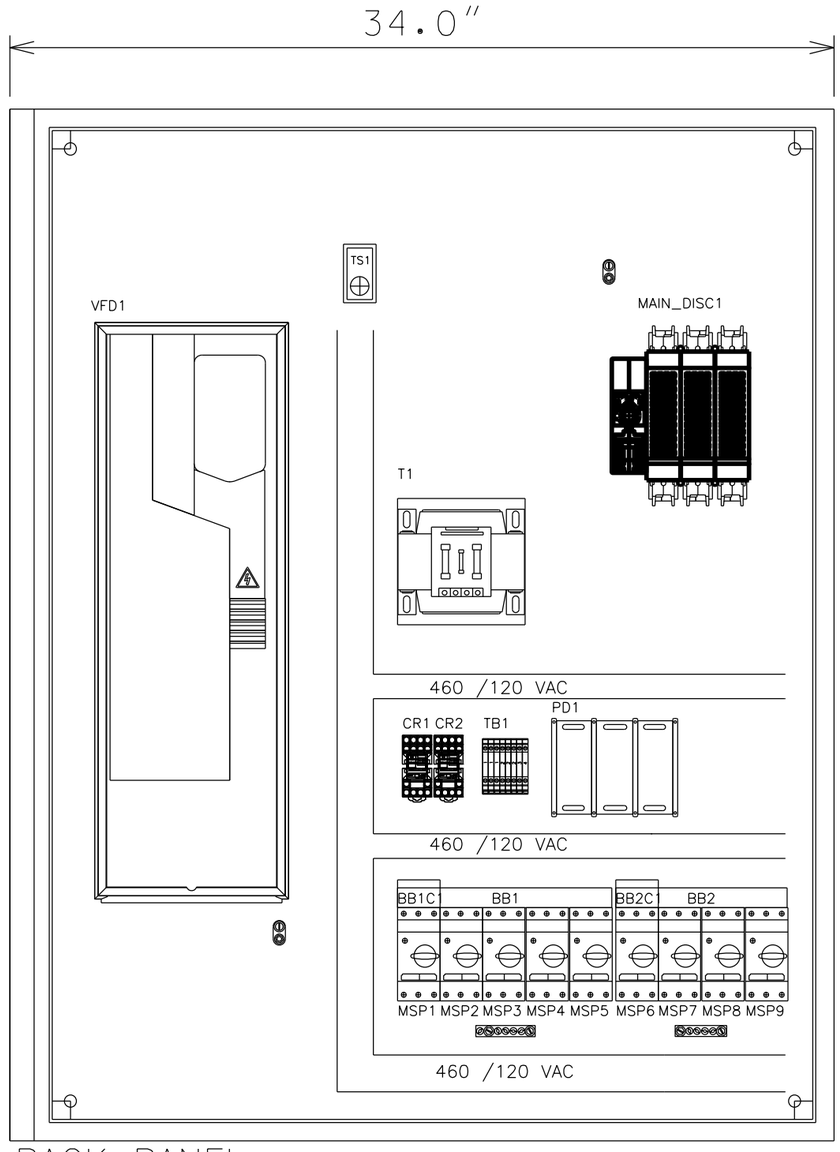
PRMH20240272



ENCLOSURE
LEFT SIDE



ENCLOSURE



BACK PANEL

ELECPANEL 1 : PL2 : BOX D
DOOR HINGES ON LEFT WITH
(1) 6" FAN BLOWING IN ON BOTTOM
42"H x 34"W x 12"D TYPE 1
RECESSED TO 3.5"

PANEL LAYOUT IS NOT MEANT TO BE AN EXACT REPRESENTATION OF AS BUILT PANEL IT IS FOR GENERAL INFORMATION ONLY I.E. DIMENSIONS AND POSSIBLE CONFIGURATION AND MAY VARY FROM ACTUAL LAYOUT

IDENTICAL DRAWING	
DASH	TAG NAME
-201	RAU-56, RAU-58
-202	RAU-55, RAU-57

SOUTH HILL
MULTIPLE DASHES
PANEL LAYOUT

HUNTAIR
19855 SW 124th AVE, TUALATIN, OR 97062
(503) 639-0113 FAX (503) 639-1269

DRAWN BY	DATE	RTP BY:	DATE	DATE / TIME STAMP	SCALE	SHEET
J. GRAGG	11/17/23			11/28/23 09:09		5 of 5

JOB NO	DWG NO	REV
61070-201	61070-201 30	

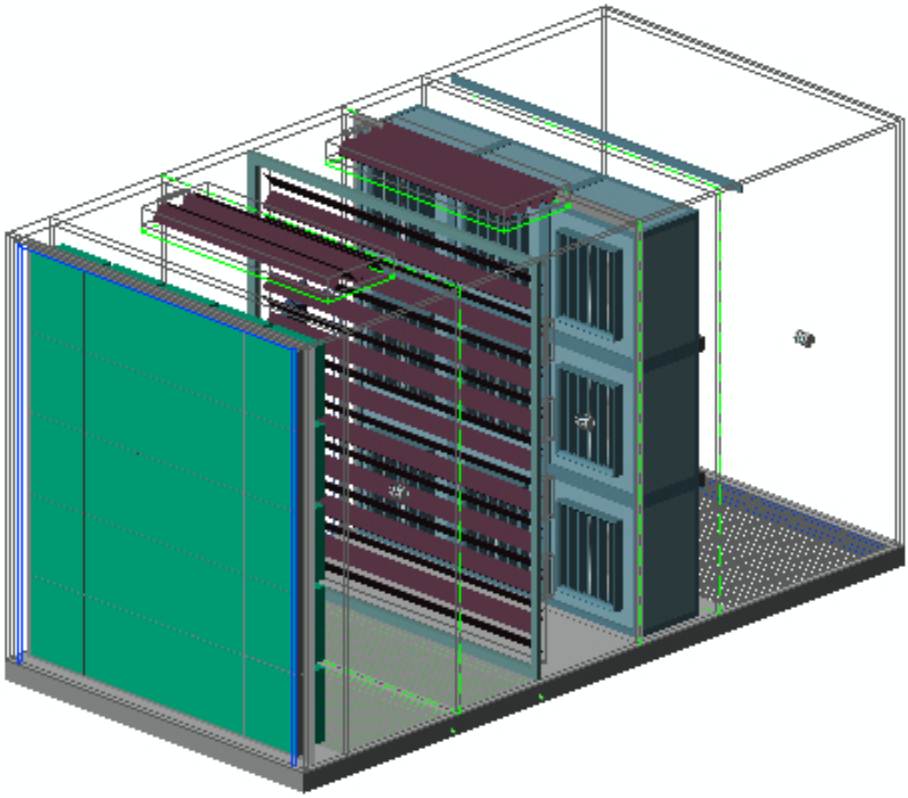
Unit Design Revision History

PRMH20240272

PROJECT	South Hill
SALES ORDER #	061070-002
UNIT TAG	RAU-55, RAU-57
QUANTITY	2

Revision History

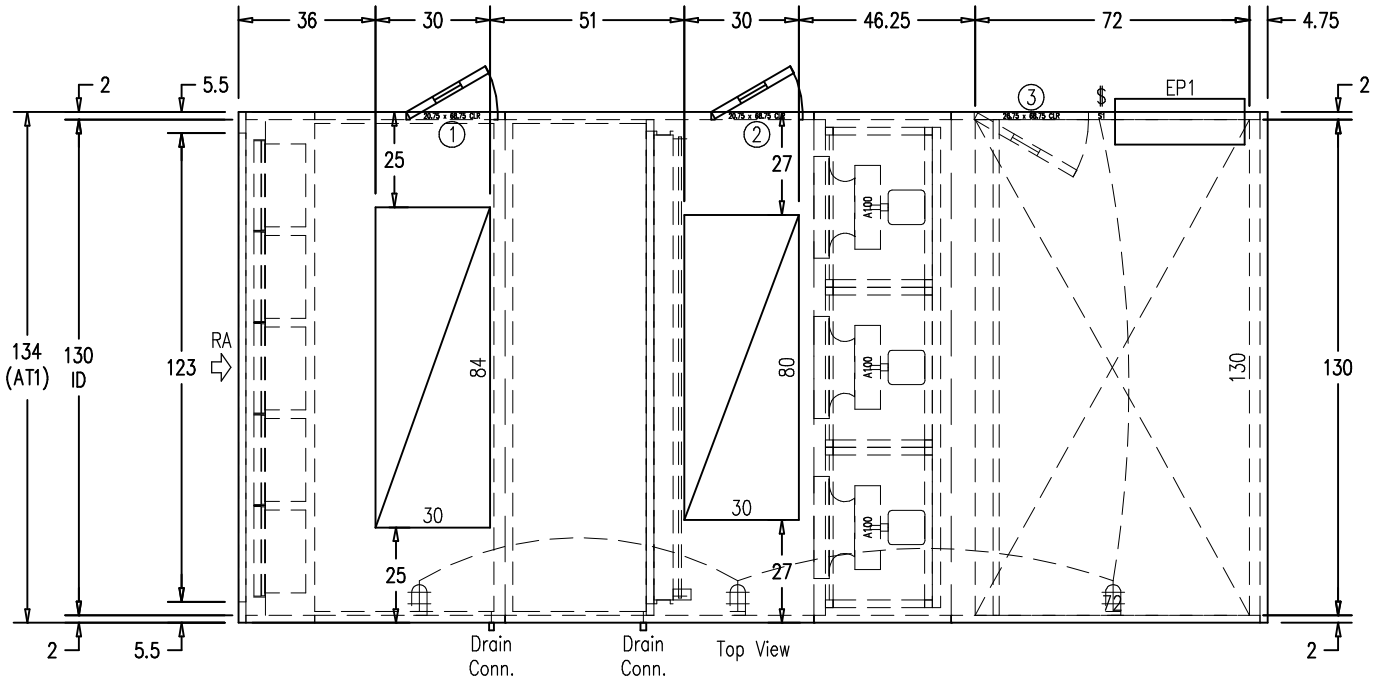
Date	Rev	Revision Description
2023-11-16	A	Mechanical submittal. Electrical schematics to follow later.
2023-11-17	B	Added grating to the drain pan in Box B.
2023-11-20	C	Released for production.
2023-11-28	D	Added electrical schematics and re-sized the electrical panel to match.

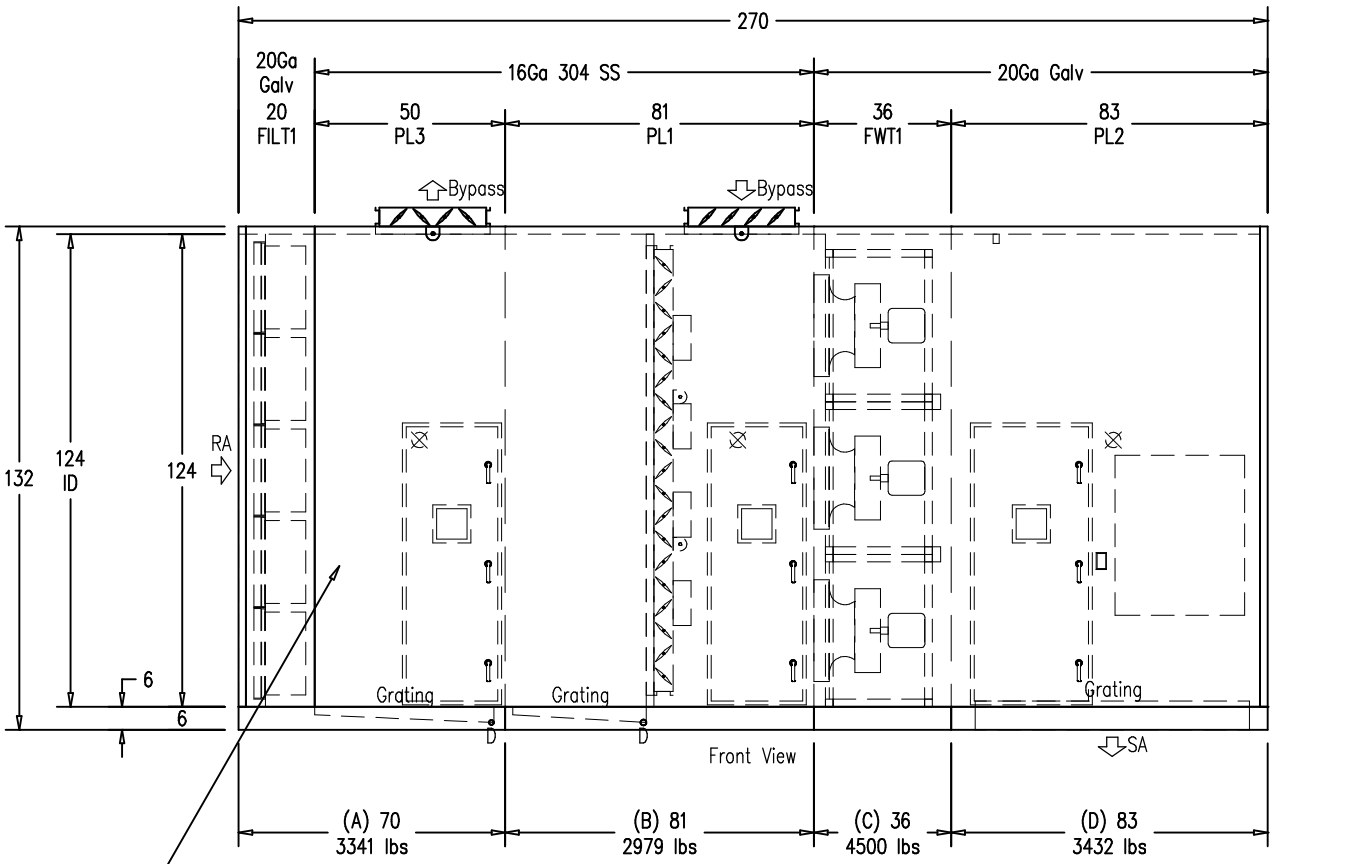


JOB #	UNIT TAG
061070-002	RAU-55
061070-002	RAU-57

PRMH20240272

Knockdown Construction





Space for future coil provided by others.

Rev	Revision Description	Date m/d/y
D	Added electrical schematics and re-sized the electrical panel to match.	11/28/2023
C	Released for production.	11/20/2023
B	Added grating to the drain pan in Box B.	11/17/2023

All dimensions shown in inches, Operating weights shown in pounds. Overall unit dimensions do not include lifting lugs, electrical panels, pipe connections, door handles, etc. Weight and Box Qty are for a quantity of 1 design.
Panelized Factory Knockdown Construction 53,000 ACFM

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Tualatin, OR 97062
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www.nortekair.com

South Hill

Unit Tag	Unit Type	Dsg Qty
See Table	Indoor	2
Rep Firm	**Weight**	**Box Qty**
Air Reps, LLC: Bellevue Bellevue, WA, USA	14,252	4
Rep Contact	**Model No**	
Whitney Walker	CSU-53K	
SALES ORDER #	**NASDA Ver** / **Factory SAE** / **Date m/d/y** / **Rev**	
061070 – See Table	9.1.0 / DB / 11/16/2023 / D	

Printed (yyyy-MM-dd): 2023-11-28

PROJECT	South Hill
SALES ORDER #	061070-002
UNIT TAG	RAU-55, RAU-57
QUANTITY	2

Unit Design Options

Project Name: South Hill
Unit Tag: RAU-55, RAU-57

Sales Order #: 061070-002

101 Unit Details

101.1 Weights / Jobsite Elevation			
1. Shipping Weight	20,245 lb	3. Elevation	400 ft
2. Operating Weight	14,252 lb		

101.2 Testing			
1. Air Performance	NO	4. Witness Test	NO
2. Sound	NO	5. Inspection	NO
3. Cabinet Leak Test	NO		

101.3 Preparation for Shipment	
1. Cleaning & Wrapping	Ship on open bed truck and heat shrink wrap.
2. Knockdown Construction	Yes, factory pre-assembled unit shipped knock down in crates. (Electrical components, wiring and conduit are installed at the factory, final connections done onsite by others)

102 Unit Construction

102.1 Construction			
1. Cabinet Construction	Panelized	6. Panel Fastener	Drive Screws
2. Design Environment	Indoor	7. Thermal Break	Non Thermal Break
3. Panel Depth	2 in	8. Mounting	Slab Mounted
4. Caulk Type	3M 540	9. Roof Curb By	N/A
5. Model #	CSU-53K	10. Curb Height	N/A

102.2 Cabinet Material			
1. Exterior Material	16Ga Galv	8. Blankoff Finish	None
2. Interior Liner type(s)	See Drawing	9. Internal Wall Material	16Ga Galv
3. Exterior Paint Type	Powder Coat	10. Sheet Rock	No
4. Interior Paint Type	None	*Insulation by liner type*	
5. Paint Color	White (Standard)	11. Solid liner	Fiberglass Std - Unfaced (R8)
6. Meets Salt Spray Rating	1000 Hours	12. Perforated liner	N/A
7. Blankoff Material	16Ga Galv	13. No liner	N/A

102.3 Base Construction			
1. Base Structure Material	Steel Tube	7. Base Structure Height	See Drawing
2. Base Floor Material	16Ga Galv	8. Sub Floor Material	20Ga Galv
3. Base Floor Seams	Caulked	9. Lifting Lugs	Yes - Removable
4. Insulation	Polyurethane Foam	10. Sheet Rock	No
5. Floor Drain	None		
6. Floor Options	None		

102.4 Box Dimensions

Box	*X*	*Y*	*Z*	*Shipping Weight*	*Operating Weight*
A	70.000 in	134.000 in	132.000 in	0 lb	3,341 lb
B	81.000 in	134.000 in	132.000 in	0 lb	2,979 lb
C	36.000 in	134.000 in	132.000 in	0 lb	4,500 lb
D	83.000 in	134.000 in	132.000 in	0 lb	3,432 lb

102.5 Notes / Features

1. Box dimensions do not include lifting lugs, electrical panels, pipe connections, door handles, etc.
2. Base to be powdercoated to match cabinet exterior.

Project Name: South Hill
Unit Tag: RAU-55, RAU-57

Sales Order #: 061070-002

103 Doors

103.1 All Doors (including those associated with specific components)

#	Box	Section	Type[1]	Width	Height	Hinge	Swing	Window	Interior	Exterior	Options
1	A	PL3	2" SF	24	72	RH	Out	8 x 8 TBW	16Ga 304 SS	16Ga Galv	
2	B	PL1	2" SF	24	72	RH	Out	8 x 8 TBW	16Ga 304 SS	16Ga Galv	
3	D	PL2	2" SF	30	72	RH	In	8 x 8 TBW	16Ga Galv	16Ga Galv	

103.2 Notes / Features

1. Door Types
   SF = Standard Factory
2. All doors insulated with Fiberglass Std - Unfaced.
3. Door paint follows its section's paint type and color.
4. Mechanical Safety Latch to be provided on all fan access doors.

104 Drains

104.1 All Drains (including those associated with specific components)

Box	Section	Type	Conn (in)	Hand	Above Floor	Pipe Ext.	Grating Material	Pan Material
A	PL3	Drain Pan	1.25	Right	0.00 in	0.00 in	304 Stainless Steel	16Ga 304 SS
B	PL1	Drain Pan	1.50	Right	0.00 in	0.00 in	304 Stainless Steel	16Ga 304 SS

104.2 Notes / Features

1. Drain Constructions included: Double Sloped, solid welded to base

105 Internal Walls

105.1 All Internal Walls (including those associated with specific components)

Box	Section	Wall Name	Depth	Panel Mat.	Liner Mat.	Insulated
B	Plenum 1	InternalWall 1	2 in	Default	None	False

Project Name: South Hill
Unit Tag: RAU-55, RAU-57

Sales Order #: 061070-002

106 Static Pressure Summary

106.1 Condition 1

106.1.1 Unassigned

Tunnel	*Description*	*APD (in.H20)*
AirTunnel 1	Bypass - Damper (Return Air)	0.18
AirTunnel 1	Bypass - Damper (Exhaust Air)	1.25
	Total Static Pressure:	1.43

106.1.2 Supply

Tunnel	*Description*	*APD (in.H20)*
AirTunnel 1	RA Opening (Return Air)	0.00
AirTunnel 1	Filter 1, Pre / Final (Average Pressure Drop)	1.78
AirTunnel 1	SA Opening - Damper (Supply Air)	0.04
AirTunnel 1	FANWALL 1 (Supply) 53,000 ACFM @ 3.00 in.H20	0.00
AirTunnel 1	SA Opening (Supply Air)	0.10
	External Static Pressure	1.08
	Total Static Pressure:	3.00

Legend: ESP - External Static Pressure, OSA - Outside Air, EXH - Exhaust Air, RA - Return Air, SA - Supply Air

106.2 Notes/Legend

1. Summary report does not include static pressure of components supplied by others in the field unless otherwise noted.

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PROJECT	South Hill
SALES ORDER #	061070-002
UNIT TAG	RAU-55, RAU-57
QUANTITY	2

Fans

Project Name: South Hill
Unit Tag: RAU-55, RAU-57

Sales Order #: 061070-002

200 FANWALL 1 (Supply) : FWT1 : Box C — 22-75 - 182T - 40 x 42 x 28 - C3

200.1 Configuration / Quantity

1. Function	Supply Fan	Cell Size	7.Height	8.Width	9.Depth	10.Overall Depth
2. Quantity	9		40	42	28	33.25
3. Array	3 Rows x 3 Cols	11. Elev. / Temp.	400 ft / 70.0 °F			
4. Construction	Gen III (with Isolators)	12. Motor & Wheel Weight	186 lb	14. Redundant	0	
5. Inlet Cone Location	Upstream Removable	13. Fan Cell Weight	358 lb	15. Empty	0	
6. Stand Height	N/A	16. Ship Loose Fan (Wheel, Motor and Mounting Base)			0	

200.2 Options

1. Coplanar Insulation	Standard Melamine	8. Cell Finish	None
2. Extended Coplanar	No	9. Insulation Retainer	No
3. Back Draft Dampers	HBD0216	10. Inlet Attenuation	None
4. Inlet Cone Type	A100 Curved Cone	11. Blankoff Material	16Ga Galv
5. Solid Perimeter Material	None	12. Blankoff Finish	None
6. Discharge Safety Guard	No	13. Removal Rail	Yes
7. Cell Material	Aluminum / Steel		

200.3 Fan Wheel

1. Wheel Type	HPF-A100	4. Width	75
2. Diameter	22	5. Wheel Finish	None
3. Balancing Planes	1		

200.4 Motor

1. Manufacturer	Toshiba	7. Model	4OA003L1ZVS210
2. HP Each / Total	4.5 / 40.5	8. Efficiency	87.5
3. Poles / RPM	4-Pole / 1,735	9. Service Factor	1.15
4. Frame / Casing	182T / TEAO	10. Shaft Isolation	Ceramic Bearings
5. Volts / Phase / Hz	460/3/60	11. FLA Each / Total	5.7 / 51.3 Amps
6. Winding	N/A	12. Motor HP Safety Factor	3.0 %

200.5 Variable Frequency Drive

1. Furnished by	Factory	7. Input / Output Amps	52 / 52 Amps
2. Quantity	1	8. Maximum Hertz	63.83
3. Manufacturer	ABB ACH580	9. Input Line Reactor	No
4. Model No	ACH580-01-052A-4	10. VFD Communication	BACNet MSTP
5. Horsepower	40	11. Switching Frequency	Default
6. Voltage	460/3/60	12. Drive Position	N/A

200.6 Control System

1. Redundant VFD	No	6. Flow Monitoring	None
2. Bypass Circuit	None	7. Fans to Monitor	None
3. Drive	Standard	8. Display	N/A
4. Optimization Control	No	9. Communication	N/A
5. Control Method	By Others		

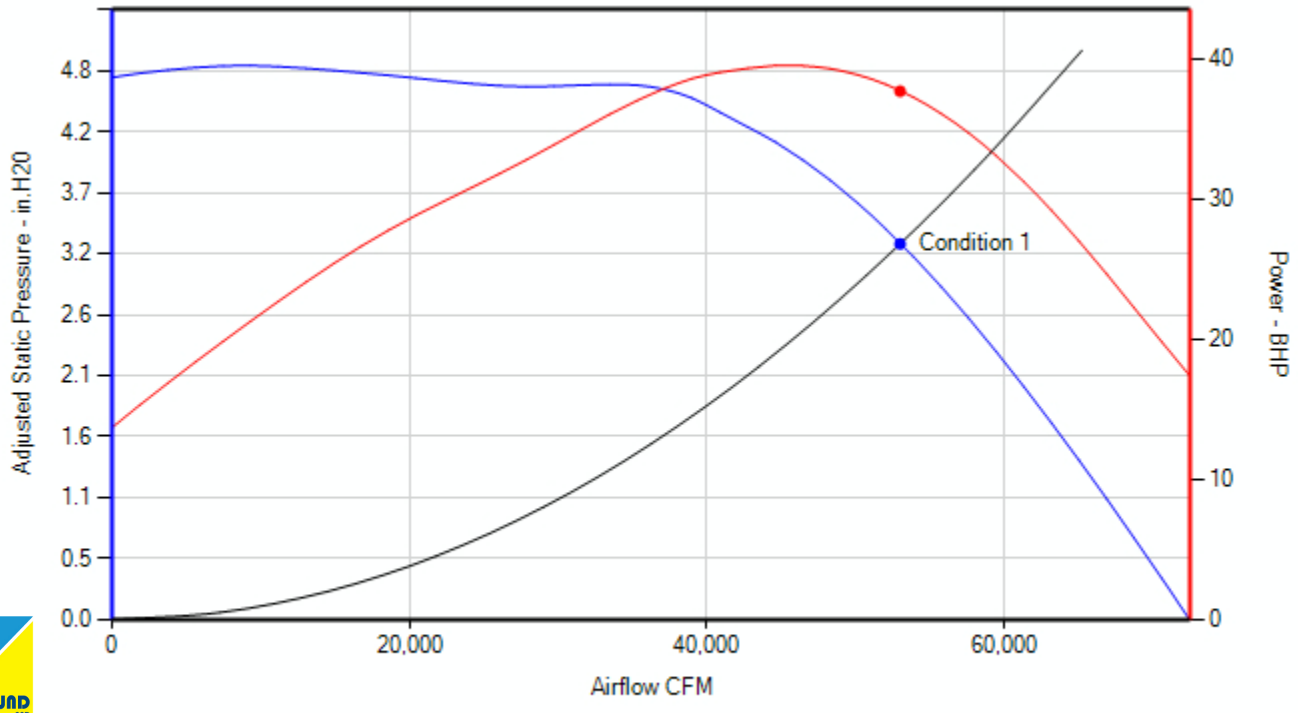
200.7 Notes / Features

1. To view patents and other pending U.S. or Canadian applications visit www.nortekair.com/patents.
2. Cone constant = 3086, cone flow differential pressure = 3.59 in.H2O at 5889 CFM per fan.
3. The estimated VFD input watts are based on the motor and VFD efficiency at the selected load and RPM.
4. Fans balanced to a maximum allowable level of 0.022 inches per second peak.
5. Fan cells to be shipped up to 2 wide x 2 high per skid.

Project Name: South Hill
Unit Tag: RAU-55, RAU-57

Sales Order #: 061070-002

200 FANWALL 1 (Supply) : FWT1 : Box C (Continued) 22-75 - 182T - 40 x 42 x 28 - C3



AMCA Licensed for Sound and Air Performance Without Appurtenances (Accessories).
Performance certified is for installation type A: Free Inlet/Free Outlet
Power [bhp] excludes drives

200.8 Operating Conditions

Operating Condition	Usage (%)	CFM	SP (in.H20)		Cell Qty			RPM	Hz	Fanwheel BHP		Vel. (ft/min)	Watts	FEG % O.P.	FEI
			Input	Adj.	On	Off	Fail			Each	Total				
Condition 1	100	53,000	3.00	3.27	9	0	0	1,805	62.4	4.19	37.68	620	33,248	FEG85 0%	1.27

200.9 Bare Fan Sound Power with Coplanar Silencer (dB re: 10E-12 watts)

Operating Condition		63	125	250	500	1k	2k	4k	8k	LwA	Lw
Condition 1	Inlet	82	80	99	85	84	84	81	78	93	100
	Outlet	87	83	92	83	82	79	76	64	88	94

Project Name: South Hill
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200 FANWALL 1 (Supply) : FWT1 : Box C (Continued) 22-75 - 182T - 40 x 42 x 28 - C3

200.10 AMCA Statement

Nortek Air Solutions LLC certifies that the HPF-A100 fan wheel shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

The AMCA licensed air and/or sound performance data has been modified for installation,appurtenances or accessories, etc. not included in the certified data. The modified performance is not AMCA licensed but is provided to aid in selection and applications of the product. Performance certified is for installation type A: Free Inlet/Free Outlet Power [bhp] excludes drives

FWTRating DLL: Ver-1.6 / May 2022

PROJECT	South Hill
SALES ORDER #	061070-002
UNIT TAG	RAU-55, RAU-57
QUANTITY	2

Components

Project Name: South Hill
Unit Tag: RAU-55, RAU-57

Sales Order #: 061070-002

500 Filter 1 : FILT1 : Box A

500.1 Pre / Final Size & Quantity			
1. Loading	Upstream Face Load	7. Bank Size	120.500 in W x 120.000 in H
2. Frame Material	Galvanized	8. Blankoff Location	N/A
3. Frame Finish	None	9. Qty / set & Frame Size 1	(25) 24 in x 24 in
4. Filter Clips	(50) C-70, (50) C-86	10. Qty / set & Frame Size 2	
5. Blankoff / Rack Material	16Ga Galv	11. Qty / set & Frame Size 3	
6. Blankoff / Rack Finish	None	12. Qty / set & Frame Size 4	

500.2 Pre Filter			
1. Filter Depth	2.000 in	4. Number of Sets	1
2. Efficiency	MERV 8	5. Max Face Velocity	530.00 ft/min at 53,000 ACFM
3. Manufacturer	American Air Filter	6. Model	PerfectPleat Ultra

500.3 Final Filter			
1. Filter Depth	12.000 in	4. Number of Sets	1
2. Efficiency	MERV 13	5. Max Face Velocity	530.00 ft/min at 53,000 ACFM
3. Manufacturer	American Air Filter	6. Model	VariCel SH

500.4 Notes / Features
1. All sets of Filters and clips to ship loose inside unit, installed by others.

Project Name: South Hill
Unit Tag: RAU-55, RAU-57

Sales Order #: 061070-002

600 SA Opening : SA : Box D : Floor

600.1 Opening Construction			
1. Description	Supply Air	4. Shape	Rectangle
2. Max CFM	53,000 ACFM	5. Max APD	0.10 in.H20
3. Size	130 W x 72 H in	6. Max Velocity	816.00 ft/min

600.2 Notes / Features
1. Stainless Steel 304 Floor Grate included.

601 RA Opening : RA : Box A : End Wall

601.1 Opening Construction			
1. Description	Return Air	4. Shape	Rectangle
2. Max CFM	53,000 ACFM	5. Max APD	0.00 in.H20
3. Size	123 W x 124 H in	6. Max Velocity	501.00 ft/min

602 Bypass : Bypass : Box B : Roof

602.1 Opening Construction			
1. Description	Return Air	4. Shape	Rectangle
2. Max CFM	53,000 ACFM	5. Max APD	0.18 in.H20
3. Size	80 W x 30 H in		

602.2 Damper Specifications			
1. Manufacturer	Ruskin	6. Jackshaft	Yes
2. Model	Ruskin CD 50 (Aluminum)	7. Max Face Velocity	3,180.00 ft/min
3. Size	80.000 in (Blade Direction) x 30.000 in	8. Torque	117 lb-in
		9. End Switches	No
4. Blade Config	Parallel		
5. Blade Orientation	Horizontal		

Notes:
1. Ordered with 1.5" frame flange

602.3 Damper Actuator			
1. Manufacturer	Siemens	5. Qty	1
2. Model	GCA156.1U	6. Floor Mounted	No
3. Location	Left Hand	7. Furnished By	Factory
4. Type	Modulating 24V – NC	8. Mounted By	Factory
		9. Wiring By	Others

603 Bypass : Bypass : Box A : Roof

603.1 Opening Construction			
1. Description	Exhaust Air	4. Shape	Rectangle
2. Max CFM	53,000 ACFM	5. Max APD	1.25 in.H20
3. Size	84 W x 30 H in		

603.2 Damper Specifications			
1. Manufacturer	Ruskin	6. Jackshaft	Yes
2. Model	Ruskin CD 50 (Aluminum)	7. Max Face Velocity	3,028.57 ft/min
3. Size	84.000 in (Blade Direction) x 30.000 in	8. Torque	88 lb-in
		9. End Switches	No
4. Blade Config	Opposed		
5. Blade Orientation	Horizontal		

Notes:
1. Ordered with 1.5" frame flange

Project Name: South Hill
Unit Tag: RAU-55, RAU-57

Sales Order #: 061070-002

603 Bypass : Bypass : Box A : Roof (Continued)

603.3 Damper Actuator			
1. Manufacturer	Siemens	5. Qty	1
2. Model	GCA156.1U	6. Floor Mounted	No
3. Location	Left Hand	7. Furnished By	Factory
4. Type	Modulating 24V – NC	8. Mounted By	Factory
		9. Wiring By	Others

604 SA Opening : SA : Box B : Internal Wall

604.1 Opening Construction			
1. Description	Supply Air	4. Shape	Rectangle
2. Max CFM	53,000 ACFM	5. Max APD	0.04 in.H20
3. Size	124 W x 118 H in		

604.2 Damper Specifications			
1. Manufacturer	Ruskin	6. Jackshaft	Yes
2. Model	Ruskin CD 50 (Aluminum)	7. Max Face Velocity	521.60 ft/min
3. Size	124.000 in (Blade Direction) x 118.000 in	8. Torque	508 lb-in
		9. End Switches	No
4. Blade Config	Opposed		
5. Blade Orientation	Horizontal		

Notes:
1. Ordered with 1.5" frame flange

604.3 Damper Actuator		
1. Qty	4	
2. Furnished By	Others	
3. Mounted By	Others	
4. Wiring By	Others	

604.4 Notes / Features

1. Damper Actuators and mounting accessories furnished and mounted by Others at Face Mounted (RH) location.
2. Damper Actuators wired by Others

PROJECT	South Hill
SALES ORDER #	061070-002
UNIT TAG	RAU-55, RAU-57
QUANTITY	2

Electrical

Project Name: South Hill
Unit Tag: RAU-55, RAU-57

Sales Order #: 061070-002

700 ElecPanel 1 : PL2 : Box D : Far Side

700.1 Electrical Service Information			
1. Volt/Phase/Hertz	460/3/60	2. Provides power to	Supply Fan
1. For electrical loads see electrical drawings			

700.2 Construction			
1. Enclosure Type	Electrical Panel	4. Route	C
2. Type	NEMA 1 Indoor	5. Mounting	Recessed panel
3. Size	See electrical drawings	6. Finish	Powder Coat (White (Standard))

700.3 Options			
1. Cooling Fan	Yes	4. Floor Stand	No
2. Keypad or Touch screen on Door	Yes - VFD Keypad	5. Control Transformer	Yes
		6. Window Kit	No
3. Power Transformer	No		

700.4 Notes / Features

1. Shipping splits only - The wiring for the motors will be disconnected for shipment at the section shipping splits. The wiring will be coiled at the motors for shipment and must be pulled through the conduit and reconnected to the electrical panel by others. NOTE: If there are no shipping splits then all wiring is to be completed at the factory before shipping.
2. Electrical panel includes: VFD, disconnect, fuses, and motor protection.

701 Lighting Circuit

701.1 Electrical Service Information			
1. Volt/Phase/Hertz	120/1/60	2. Provides power to	ElecSwitch 1, Lighting
1. For electrical loads see electrical drawings			

701.2 Switches / Outlets

	Name	Box	Section	Type	Mounted	Illum. Switch	Timer	Cover	GFCI	MOCP
•	ElecSwitch 1	D	PL2	Light Switch	External	No	None	Yes	No	N/A

• Switch is connected to service.

701.3 Lighting Types and Quantities

(3) Vapor Proof 8.5W LED

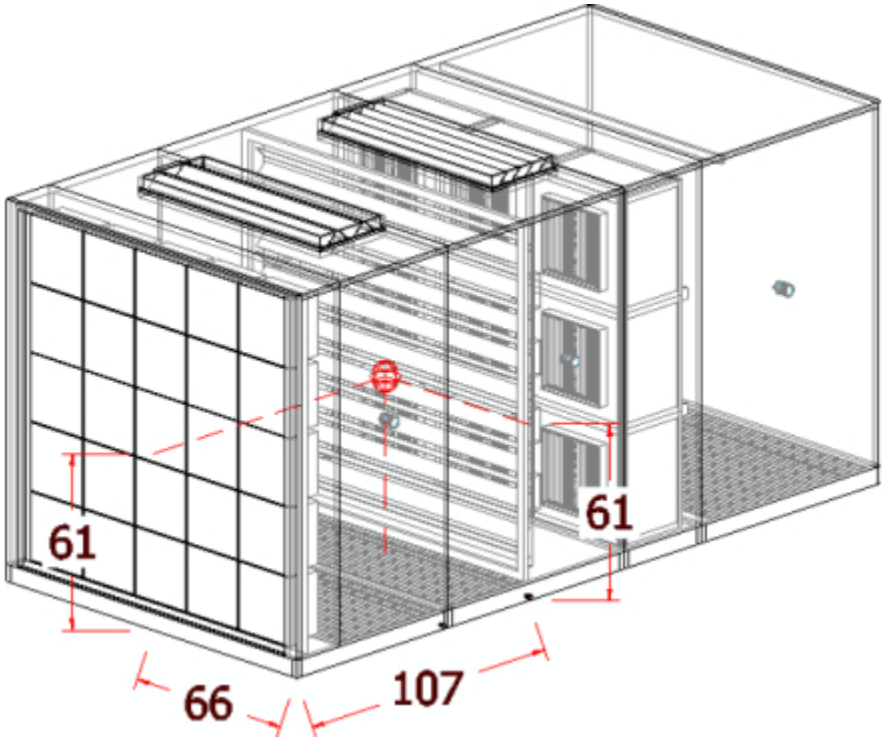
PROJECT	South Hill
SALES ORDER #	061070-002
UNIT TAG	RAU-55, RAU-57
QUANTITY	2

Unit Data

Project Name: South Hill
Unit Tag: RAU-55, RAU-57

Sales Order #: 061070-002

901 Center of Gravity



Size (Inches)			Operating Weight (Pounds)	Center of Gravity (Inches)		
X	Y	Z		X	Y	Z
270.00	134.00	132.00	14,252	138.00	66.00	59.00

901.1 Notes

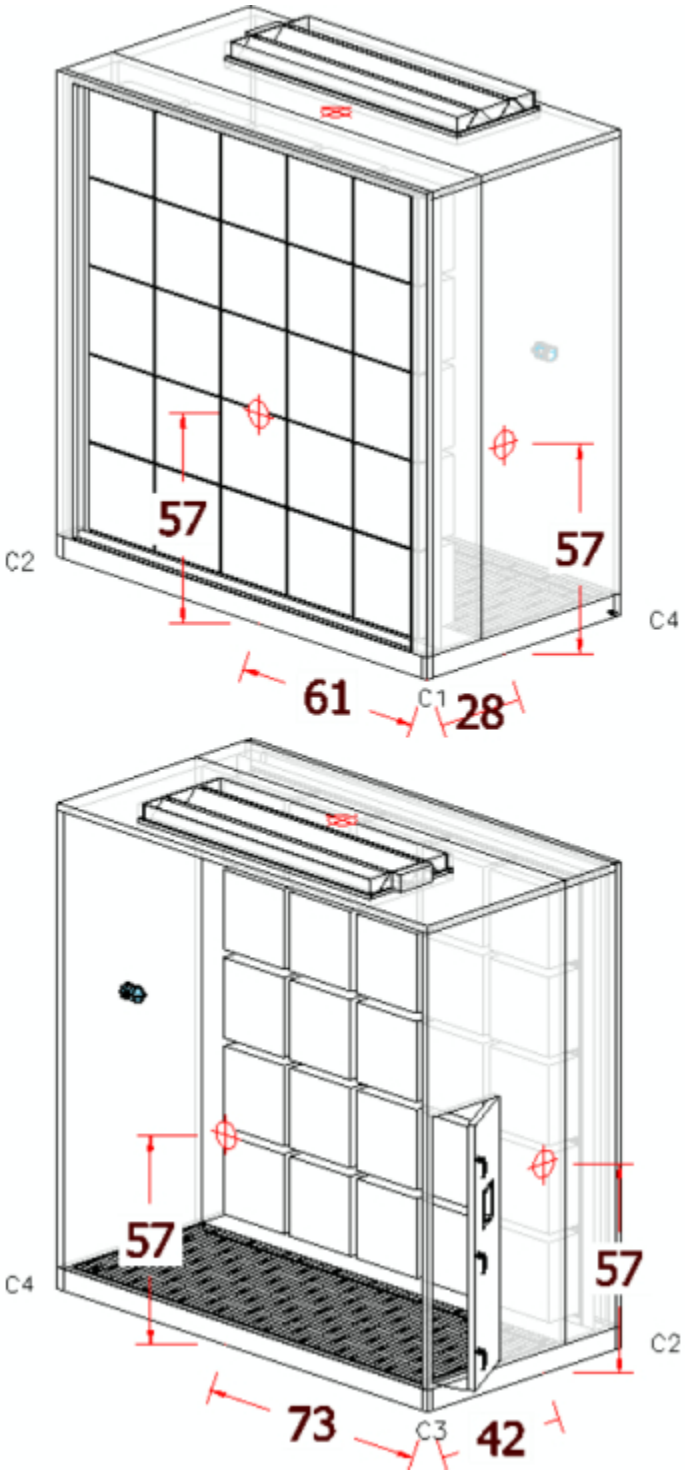
1. Center of gravity and weights are estimates and subject to change.
2. The center of gravity and weights shown above are based on operating weights and do not include packaging materials.
3. A 5% safety factor has been applied to the operating weights.
4. Corner weights apply to rectangular boxes only.
5. Corner weights are to assist in handling of the unit. Some units are not intended to be supported only at the corners. Contact your Sales Representative for support information.

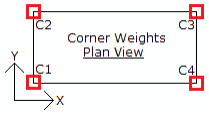
Project Name: South Hill
Unit Tag: RAU-55, RAU-57

Sales Order #: 061070-002

901 Center of Gravity (Continued)

901.2 Box A





Size (Inches)			Shipping Weight (Pounds)	Corner Weights (Pounds)			
X	Y	Z		C1	C2	C3	C4
70.00	134.00	132.00		N/A	N/A	N/A	N/A

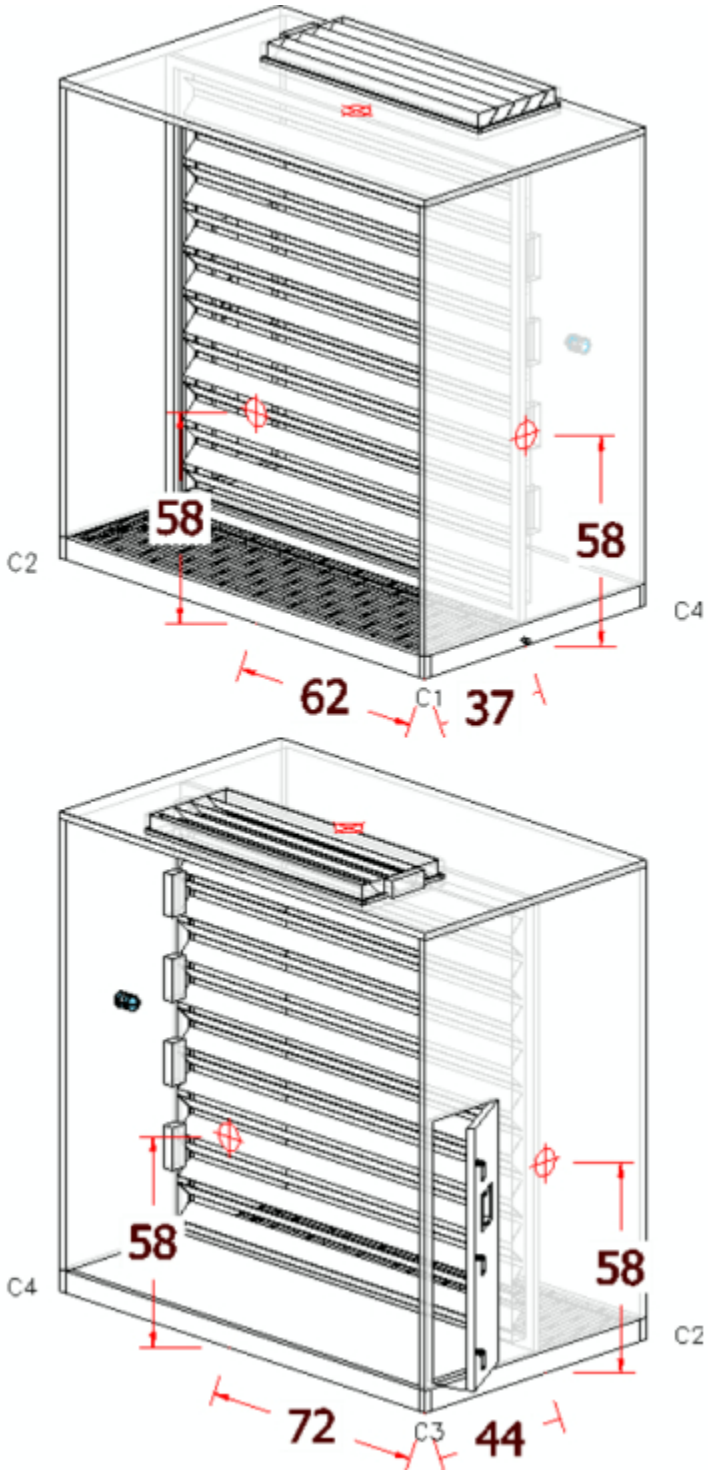
◊ Center of gravity, weight, and corner weights shown are based on shipping weight. Values are estimates and subject to change.

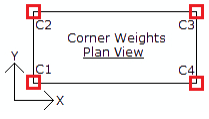
Project Name: South Hill
Unit Tag: RAU-55, RAU-57

Sales Order #: 061070-002

901 Center of Gravity (Continued)

901.3 Box B





Size (Inches)			Shipping Weight (Pounds)	Corner Weights (Pounds)			
X	Y	Z		C1	C2	C3	C4
81.00	134.00	132.00		N/A	N/A	N/A	N/A

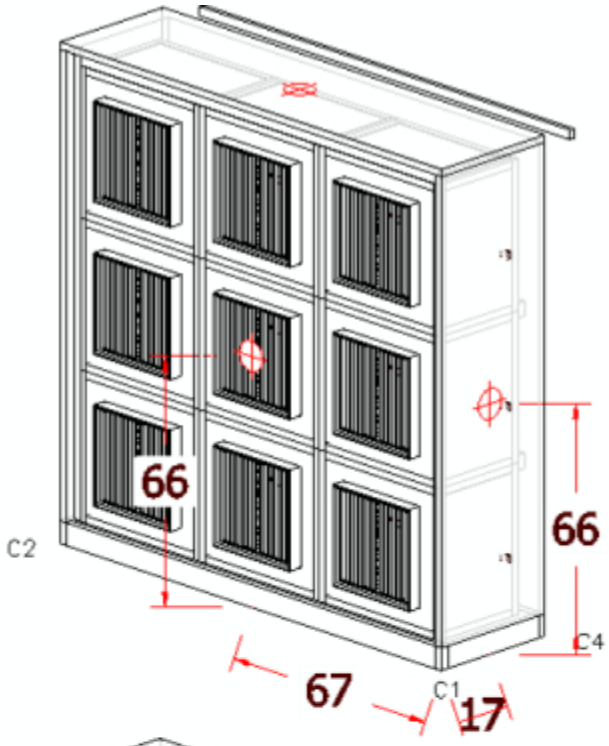
◊ Center of gravity, weight, and corner weights shown are based on shipping weight. Values are estimates and subject to change.

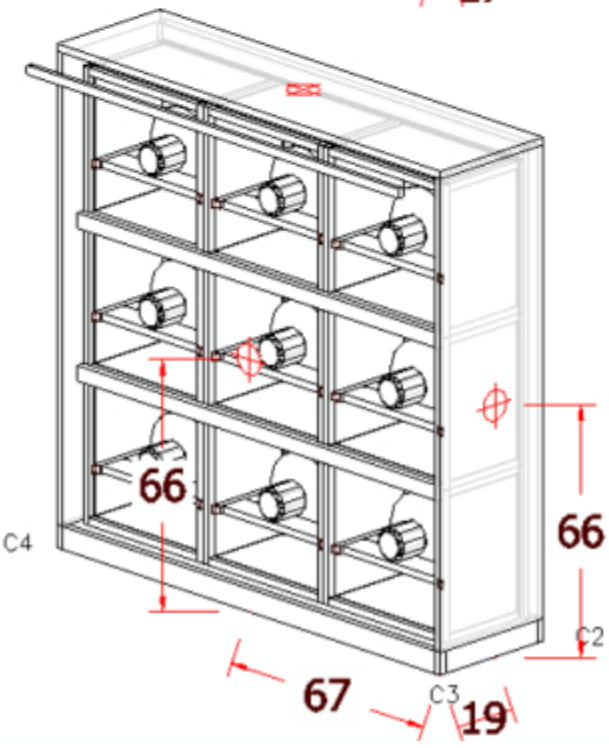
Project Name: South Hill
Unit Tag: RAU-55, RAU-57

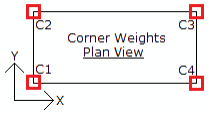
Sales Order #: 061070-002

901 Center of Gravity (Continued)

901.4 Box C







Size (Inches)			Shipping Weight (Pounds)	Corner Weights (Pounds)			
X	Y	Z		C1	C2	C3	C4
36.00	134.00	132.00		N/A	N/A	N/A	N/A

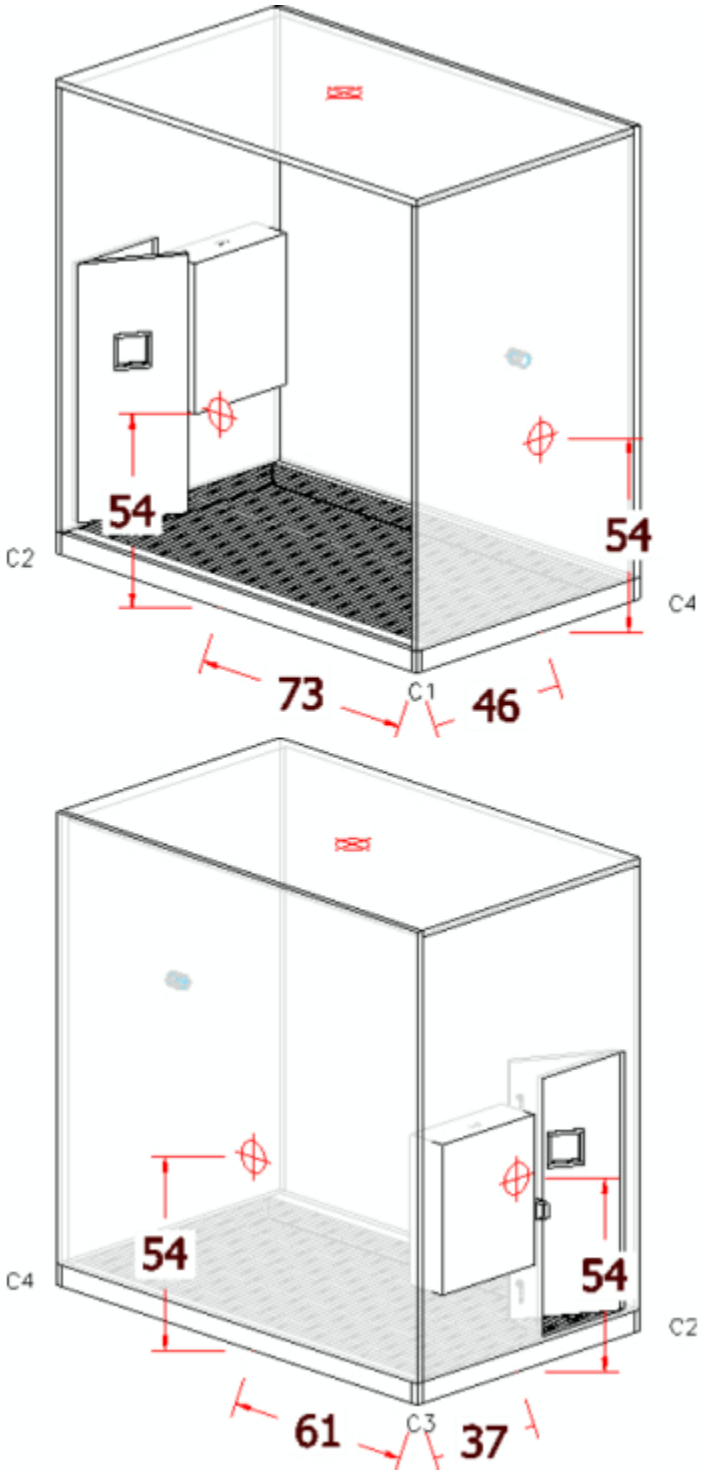
◊ Center of gravity, weight, and corner weights shown are based on shipping weight. Values are estimates and subject to change.

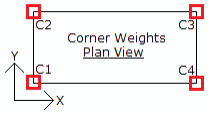
Project Name: South Hill
Unit Tag: RAU-55, RAU-57

Sales Order #: 061070-002

901 Center of Gravity (Continued)

901.5 Box D





Size (Inches)			Shipping Weight (Pounds)	Corner Weights (Pounds)			
X	Y	Z		C1	C2	C3	C4
83.00	134.00	132.00		N/A	N/A	N/A	N/A

◊ Center of gravity, weight, and corner weights shown are based on shipping weight. Values are estimates and subject to change.

NORTEK AIR SOLUTIONS
HUNTAIR

PRMH20240272

PROJECT	South Hill
SALES ORDER #-002	061070
QUOTE #	23-0137
UNIT TAG	RAU-55, RAU-57
QUANTITY	2

Separate electrical permit is required with Washington State Department of Labor & Industries. https://lni.wa.gov/licensing-permits/electrical/electrical-permits-fees-and-inspections or Licensing information: Call 1-800-647-0982

Electrical Schematics

NORTEK AIR SOLUTIONS

PRMH20240272

HUNTAIR SCHEMATIC SYMBOL LEGEND

TBx xx — TERMINAL BLOCK

N.O. CONTACT

N.C. CONTACT

CRx — CONTROL RELAY COIL

Mx — CONTACTOR COIL

COOLING FAN

COOLING FAN THERMOSTAT

FUSE

LIGHT SWITCH

GFCI RECEPTACLE

INCANDESCENT LIGHT

INDICATOR LIGHT

1/3 — PUMP

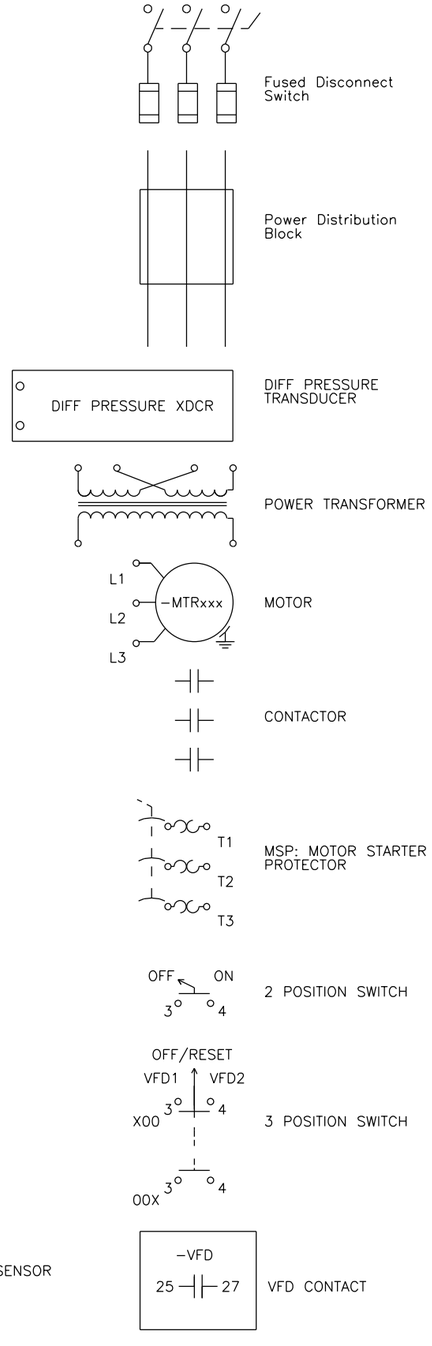
FLOAT SWITCH

SOLENOID VALVE

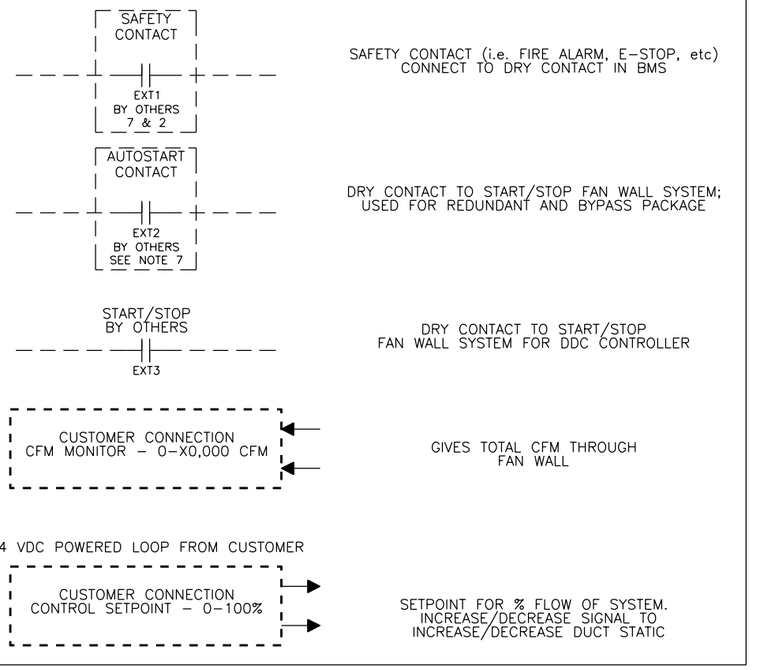
N.C. PUSH BUTTON

CIRCUIT BREAKER

CURRENT SENSOR



TYPICAL CUSTOMER CONNECTIONS



CONTROL PANEL WIRE COLOR CODE

COLOR:	DESCRIPTION OF USE:
BLACK	ALL UNGROUNDED 120VAC CONTROL CIRCUIT CONDUCTORS OPERATING AT THE SUPPLY VOLTAGE.
WHITE	GROUNDED 120VAC CURRENT-CARRYING CONTROL CIRCUIT CONDUCTOR
RED	ALL UNGROUNDED 24VAC CONTROL CIRCUIT CONDUCTORS OPERATING AT THE SUPPLY VOLTAGE.
WHT W RED TRACE	GROUNDED 24VAC CURRENT-CARRYING CONTROL CIRCUIT CONDUCTOR
BLUE	UNGROUNDED DC CONTROL CIRCUIT CONDUCTOR
WHT W BLU TRACE	GROUNDED DC CURRENT-CARRYING CONTROL CIRCUIT CONDUCTOR
GREEN	GROUND CONDUCTOR

MOTOR CONNECTION WIRE COLOR CODE

BLACK	3 PHASE SUPPLY VOLTAGE CONDUCTORS

SCHEMATIC WIRE TYPE LEGEND

KEY:

ENCLOSURE TERMINAL — TB1 XX

FIELD WIRING

HUNTAIR EQUIPMENT WIRING

HUNTAIR PANEL WIRING

SYSTEM PACKAGE OPTIONS & DESCRIPTIONS

REDUNDANT:	MANUAL DESIGNATION OF PRIMARY VFD; AUTOMATIC SWITCH TO BACKUP VFD UPON FAILURE OF PRIMARY DRIVE
BYPASS:	AUTOMATIC SWITCH TO BYPASS CIRCUIT UPON FAILURE OF VFD
[1.] MICRO-DRIVE w/Optimization	INDIVIDUAL DRIVE PER MOTOR; MAY CONTROL SYSTEM BY: CFM, TOTAL STATIC PRESSURE, or DUCT STATIC PRESSURE SETPOINT
MICRO-DRIVE w/VFD Speed Control	INDIVIDUAL DRIVE PER MOTOR; CONTROL BY A VFD SPEED SETPOINT. (HZ SETPOINT FOR INDUCTION MOTORS; RPM SETPOINT FOR PM MOTORS)[2.]
MICRO-DRIVE w/Control by others	INDIVIDUAL DRIVE PER MOTOR; ALL CONTROL IS BY OTHERS (NOTE: THIS OPTION DOES NOT INCLUDE A HUNTAIR DDC CONTROLLER)
VFD/NO BYPASS Control by others	INDIVIDUAL DRIVE FOR MULTIPLE MOTORS. NO BYPASS OR REDUNDANT DRIVE INCLUDED
MSP PANEL	EACH MOTOR IS SUPPLIED WITH ITS OWN MECHANICAL AND THERMAL OVERLOAD DEVICE
CUSTOM	SEE SUBMITTAL FOR DESCRIPTION

1. The control method described is also available without the optimization feature.
2. PM MOTOR = Permanent Magnet Motor

IDENTICAL DRAWING	
DASH	TAG NAME
-201	RAU-56, RAU-58
-202	RAU-55, RAU-57

SOUTH HILL
MULTIPLE DASHES

HUNTAIR
19855 SW 124th AVE, TUALATIN, OR 97062
(503) 639-0113 FAX (503) 639-1269

DRAWN BY	DATE	RTP BY:	DATE	DATE / TIME STAMP	SCALE	SHEET
J. GRAGG	11/17/23			11/17/23 16:07		1 of 5

JOB NO 61070-201 | DWG NO 61070-201 | REV 54

480 VAC, 3 PH, 60 HZ
(BY OTHERS, SEE NOTE 1)

L1 L2 L3 GND L70 GND LUG

MAIN_DISC1

L1 L2 L3 H1

EATON FUSIBLE DISCONNECT
R9K3100FJ
100A
MAIN_FUSES1

BUSSMANN J TYPE FUSES
DFJ-80
80 AMP

T1 T2 T3

480 V, 3 PH, 60 HZ
FULL LOAD AMPS = 53A
MINIMUM CIRCUIT AMPACITY = 66A
MAXIMUM OVERCURRENT PROTECTION = 110A
SHORT-CIRCUIT CURRENT RATING = 65K A

PRMH20240272

4 AWG

206A

206B

206C

VFD1

ABB
ACH580-01-052A-4
380-480 VAC
52 A
40 HP

L1 L2 L3 PE

T1 T2 T3

4 AWG

208A

209A

210A

Cooper-Bussman
PWR DIST BLOCK
175A PDB321-3
PD1

305 306 307

10 AWG

345 346 347

FNQ-R-3
3 AMP
FU1

14 AWG

FNQ-R-3
3 AMP
FU2

MICRON
B500BTZ13RBF
500VA
480 VAC

H1 H2 H3 H4

FNM-6-1/4
6-1/4 AMP
FU3

220A

X1 X2

120 VAC
T1

220B

28 SCR — SCR 1
29 B+ — AI/1 2
30 A- — AGND 3
31 AGND — +10V REF 4
32 SCR — AI/2 5
OUT1 — AGND 6
OUT2 — AO/1 7
SGND — AO/2 8
IN1 — AGND 9
IN2 — +24VDC 10
GND 11
DCOM 12
START/STOP — DI/1 13
RUN ENABLE — DI/2 14
DI/3 15
DI/4 16
DI/5 17
DI/6 18

FROM CUSTOMER BMS
0-10VDC

221A

224A

225A

CR2
9 235 5

CR1
9 229 5

FAN1

TB1 1 — TS1 3 4 — 223A — 1 2 — TB1 2

SETPOINT 70 DEG F

6" FAN 220 CFM

CP	9 5	10 6
	225	
CP	11 7	12 8
CP	9 1	10 2
CP	11 3	12 4

RELAY: AC SIG.
EXTERNAL FAULT

SAFETY CONTACT BY OTHERS
EXT1
SEE NOTES 7 & 2

TB1 1 — TB1 3 — 229A — CR1 EATON D2RF4A 13 14 — TB1 2

4PDT
120VAC 6A

CP	9 5	10 6
	224	
CP	11 7	12 8
CP	9 1	10 2
CP	11 3	12 4

RELAY: VFD
START/STOP

START/STOP CONTACT BY OTHERS
EXT2
SEE NOTE 2

TB1 1 — TB1 4 — 235A — CR2 EATON D2PA6 13 14 — TB1 2

4PDT
120VAC 6A

R1 NC - RO1A — 20
COMMON - RO1C — 19
READY
R1 NO - RO1B — 21

R2 NC - RO2A — 23
COMMON - RO2C — 22
RUNNING
R2 NO - RO2B — 24

R3 NC - RO3A — 26
COMMON - RO3C — 25
FAULT
R3 NO - RO3B — 27

ALL CONTROL WIRING BY OTHERS
EXCEPT WHERE INDICATED

KEY:
ENCLOSURE TERMINAL — TB1 XX
FIELD WIRING
HUNTAIR EQUIPMENT WIRING
HUNTAIR PANEL WIRING

GENERAL NOTES
1. FEEDER CIRCUIT MUST BE SELECTED IN ACCORDANCE WITH THE NEC AND LOCAL CODES.
2. FOR SAFETY CONTACT AMPERAGE RATING SEE SECONDARY FUSING OF TRANSFORMER.
4. LAMPS ARE LOCATED OUTSIDE OF ELECTRICAL PANEL.
5. DEVICES ARE TO BE WIRED BY HUNTAIR.
7. JUMPER IF NOT USED.

IDENTICAL DRAWING	
DASH	TAG NAME
-201	RAU-56, RAU-58
-202	RAU-55, RAU-57

SOUTH HILL
MULTIPLE DASHES

HUNTAIR
19855 SW 124th AVE, TUALATIN, OR 97062
(503) 639-0113 FAX (503) 639-1269

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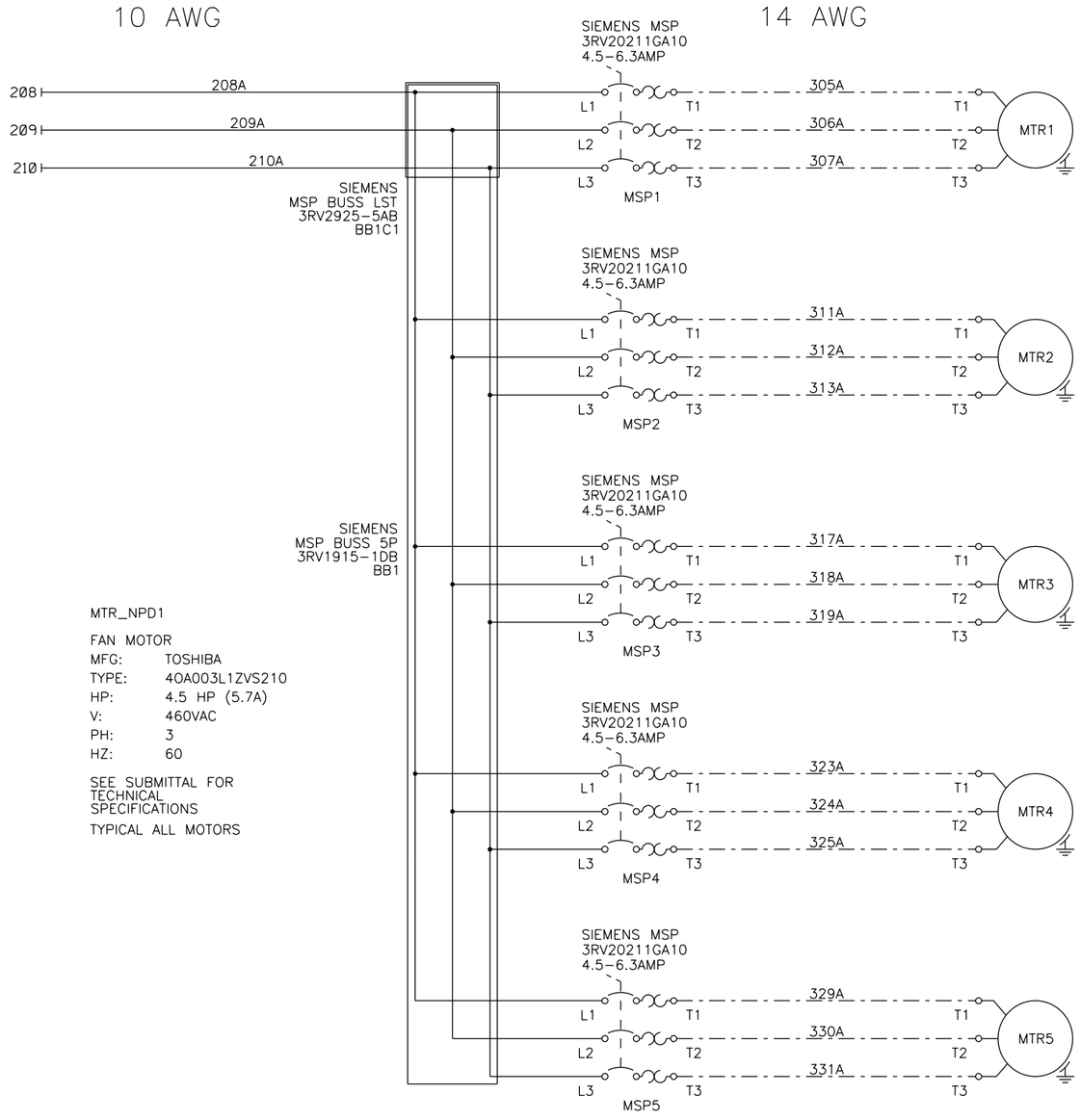
J. GRAGG	11/17/23			11/17/23 16:08		2 OF 5

JOB NO	DWG NO	REV
61070-201	61070-201 55	

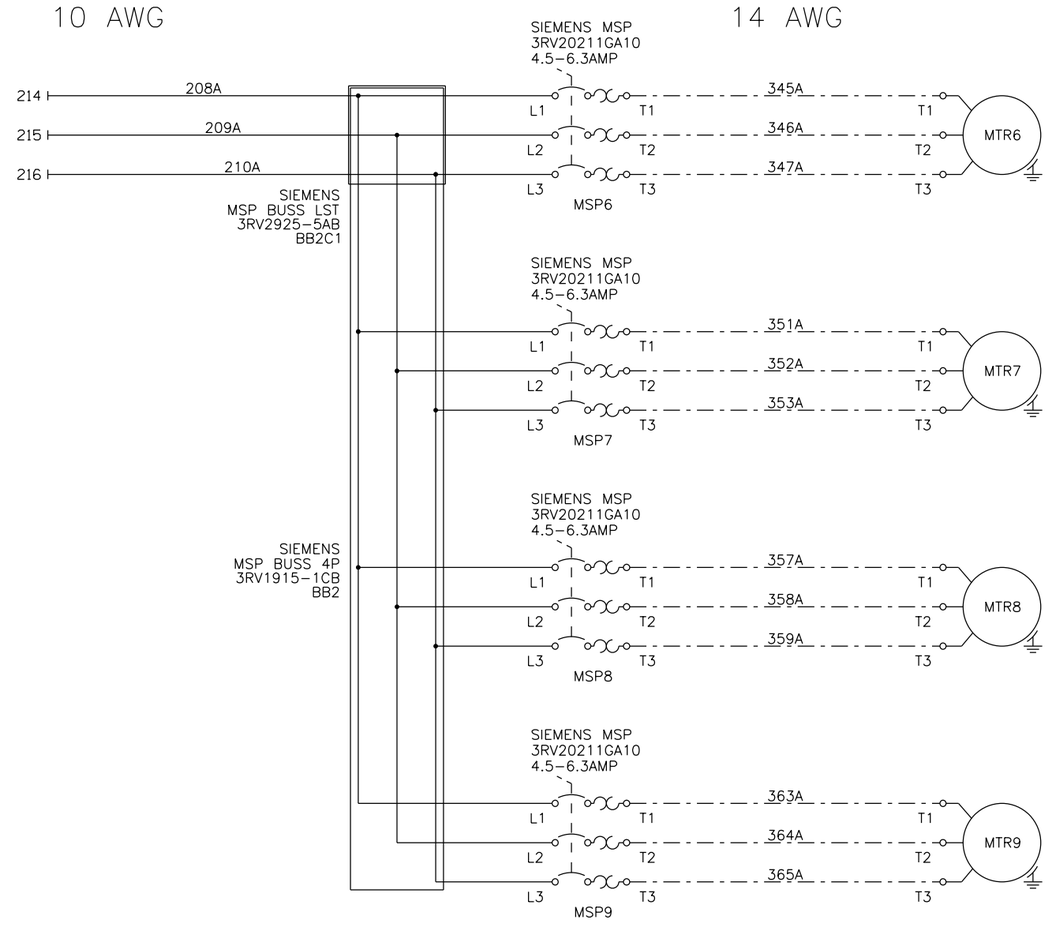
PRMH20240272



MTR_NPD1

FAN MOTOR
MFG: TOSHIBA
TYPE: 40A003L1ZVS210
HP: 4.5 HP (5.7A)
V: 460VAC
PH: 3
HZ: 60

SEE SUBMITTAL FOR TECHNICAL SPECIFICATIONS
TYPICAL ALL MOTORS



KEY:
ENCLOSURE TERMINAL — TB1 / XX
FIELD WIRING
HUNTAIR EQUIPMENT WIRING
HUNTAIR PANEL WIRING

GENERAL NOTES
1. FEEDER CIRCUIT MUST BE SELECTED IN ACCORDANCE WITH THE NEC AND LOCAL CODES.
2. –
3. STATS INSTALLED BY HUNTAIR. MAKE SETPOINT AS NOTED. MOUNT SENSOR IN HEATER DISCHARGE.
4. DEVICE(S) ARE TO BE LOCATED OUTSIDE OF ELECTRICAL PANEL.
5. DEVICES ARE TO BE WIRED BY HUNTAIR.

IDENTICAL DRAWING	
DASH	TAG NAME
-201	RAU-56, RAU-58
-202	RAU-55, RAU-57

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J. GRAGG	11/17/23			11/17/23 16:08		3 of 5

JOB NO	DWG NO	REV
61070-201	61070-201 56	

PRMH20240272

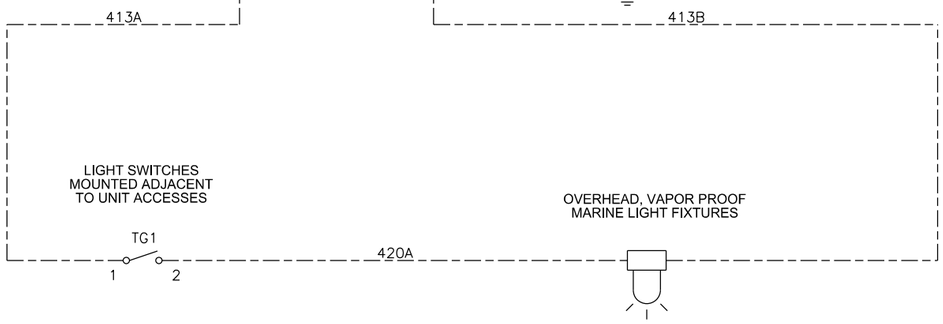
120 VAC BY OTHERS

L1 NEUT GND

SEE NOTES:
1, 4, & 5

JUNCTION BOX

MINIMUM CIRCUIT AMPACITY = 20A
MAXIMUM OVERCURRENT PROTECTION = 20A



SEE SUBMITTAL FOR TECHNICAL SPECIFICATIONS

GENERAL NOTES
1. FEEDER CIRCUIT MUST BE SELECTED IN ACCORDANCE WITH THE NEC AND LOCAL CODES.
2. –
3. STATS INSTALLED BY HUNTAIR. MAKE SETPOINT AS NOTED. MOUNT SENSOR IN HEATER DISCHARGE.
4. DEVICE(S) ARE TO BE LOCATED OUTSIDE OF ELECTRICAL PANEL.
5. DEVICES ARE TO BE WIRED BY HUNTAIR.

KEY:
ENCLOSURE TERMINAL TB1 XX
FIELD WIRING
HUNTAIR EQUIPMENT WIRING
HUNTAIR PANEL WIRING

IDENTICAL DRAWING	
DASH	TAG NAME
-201	RAU-56, RAU-58
-202	RAU-55, RAU-57

SOUTH HILL
MULTIPLE DASHES

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J. GRAGG	11/17/23			11/17/23 16:08		4 OF 5

JOB NO	DWG NO	REV
61070-201	61070-201 57	

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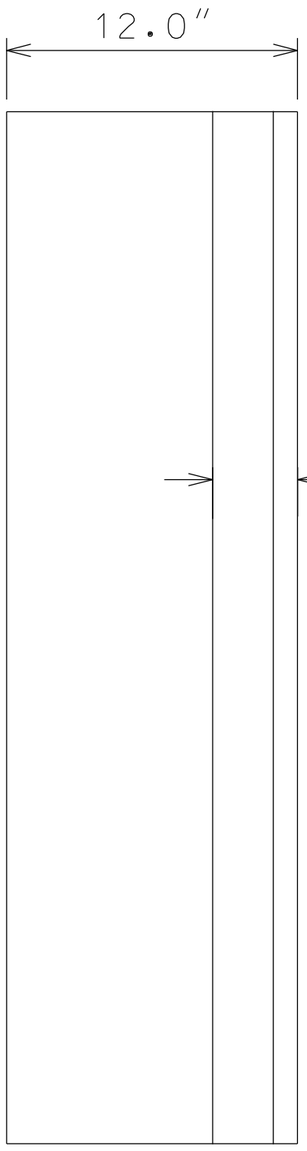
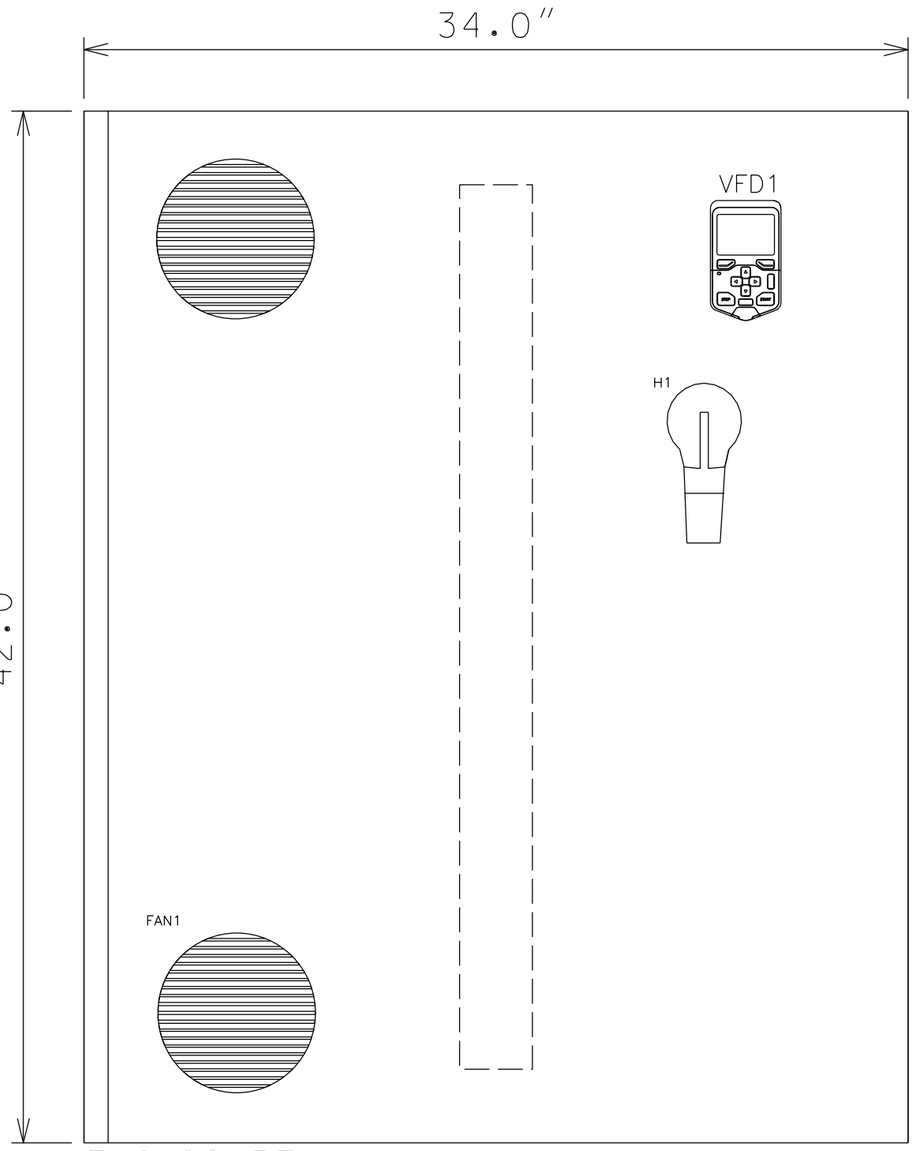


ENCLOSURE
LEFT SIDE



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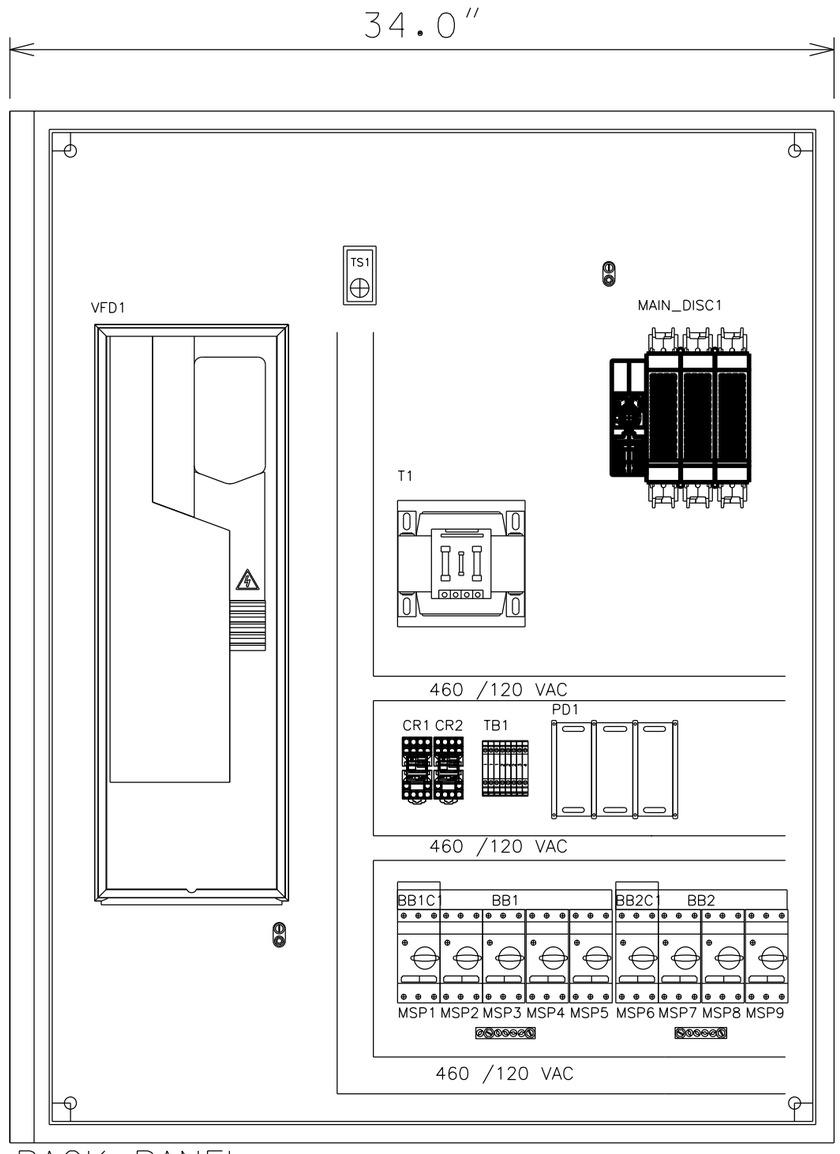

BACK PANEL

ELECPANEL 1 : PL2 : BOX D
DOOR HINGES ON LEFT WITH
(1) 6" FAN BLOWING IN ON BOTTOM
42"H x 34"W x 12"D TYPE 1
RECESSED TO 3.5"

PANEL LAYOUT IS NOT MEANT TO BE AN EXACT REPRESENTATION OF AS BUILT PANEL IT IS FOR GENERAL INFORMATION ONLY I.E. DIMENSIONS AND POSSIBLE CONFIGURATION AND MAY VARY FROM ACTUAL LAYOUT

IDENTICAL DRAWING	
DASH	TAG NAME
-201	RAU-56, RAU-58
-202	RAU-55, RAU-57

SOUTH HILL
MULTIPLE DASHES
PANEL LAYOUT

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J. GRAGG	11/17/23			11/28/23 09:09		5 of 5

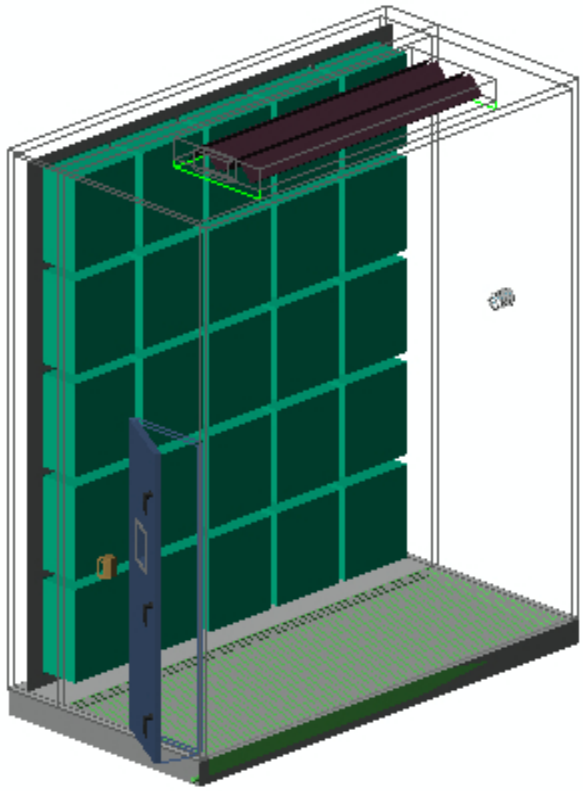
JOB NO	DWG NO	REV
61070-201	61070-201 58	

PRMH20240272

PROJECT	South Hill
SALES ORDER #	061070-003
UNIT TAG	RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU-47, RAU-48, RAU-51, RAU-52
QUANTITY	11

Revision History

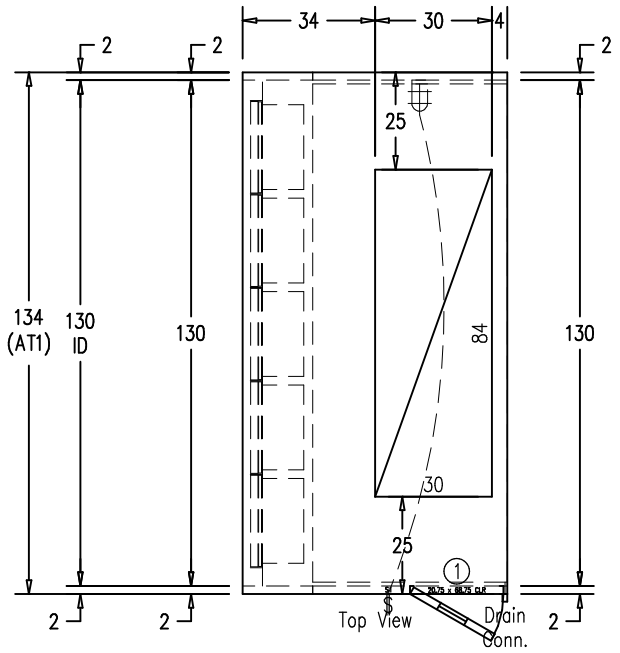
Date	Rev	Revision Description
2023-11-16	A	Mechanical submittal. Electrical schematics to follow later.
2023-11-20	B	Released for production.
2023-11-28	C	Added electrical schematics.

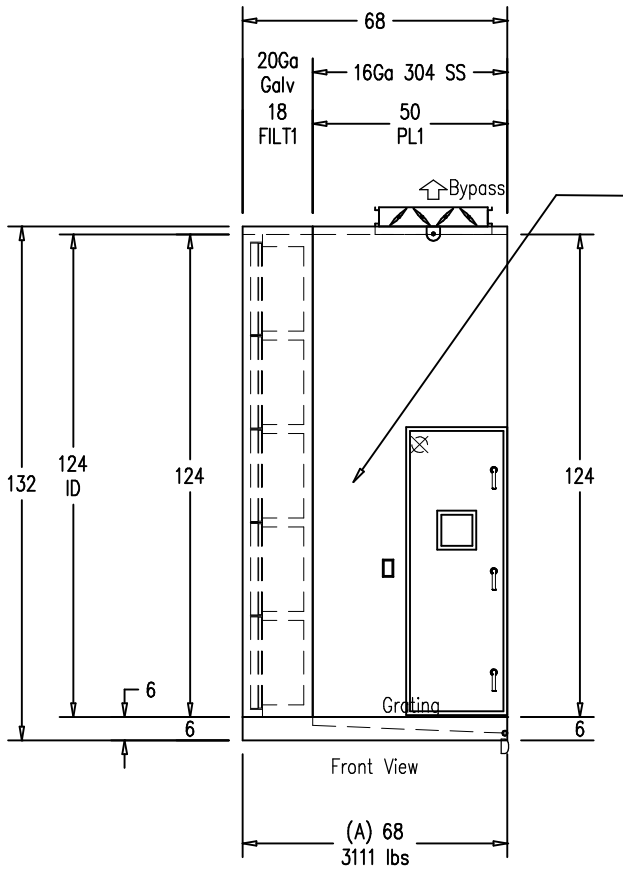


JOB #	UNIT TAG
061070-003	RAU-10
061070-003	RAU-12
061070-003	RAU-14
061070-003	RAU-18
061070-003	RAU-32
061070-003	RAU-40
061070-003	RAU-41
061070-003	RAU-47
061070-003	RAU-48
061070-003	RAU-51
061070-003	RAU-52

PRMH20240272

Knockdown Construction





Printed (yyyy-MM-dd): 2023-11-28

Rev	Revision Description	Date m/d/y
C	Added electrical schematics.	11/28/2023
B	Released for production.	11/20/2023
A	Mechanical submittal. Electrical schematics to follow later.	11/16/2023

All dimensions shown in inches, Operating weights shown in pounds. Overall unit dimensions do not include lifting lugs, electrical panels, pipe connections, door handles, etc. Weight and Box Qty are for a quantity of 1 design.
Panelized Factory Knockdown Construction 53,000 ACFM

NORTEK™ AIR SOLUTIONS
HUNTAIR
19855 SW 124th Ave.
Tualatin, OR 97062
(503) 639-0113
www.nortekair.com

South Hill

Unit Tag	Unit Type	Dsg Qty
See Table	Indoor	11
Rep Firm	**Weight**	**Box Qty**
Air Reps, LLC: Bellevue Bellevue, WA, USA	3,111	1
Rep Contact	**Model No**	
Whitney Walker	CSU-53K	
SALES ORDER #	**NASDA Ver** / **Factory SAE** / **Date m/d/y** / **Rev**	
061070 – See Table	9.1.0 / DB / 11/16/2023 / C	

NORTEK AIR SOLUTIONS
HUNTAIR

PRMH20240272

PROJECT	South Hill
SALES ORDER #	061070-003
UNIT TAG	RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU-47, RAU-48, RAU-51, RAU-52
QUANTITY	11

Unit Design Options

Project Name: South Hill
Sales Order #: 061070-003
Unit Tag: RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU...

101 Unit Details

101.1 Weights / Jobsite Elevation			
1. Shipping Weight	6,087 lb	3. Elevation	400 ft
2. Operating Weight	3,111 lb		

101.2 Testing			
1. Air Performance	NO	4. Witness Test	NO
2. Sound	NO	5. Inspection	NO
3. Cabinet Leak Test	NO		

101.3 Preparation for Shipment	
1. Cleaning & Wrapping	Ship on open bed truck and heat shrink wrap.
2. Knockdown Construction	Yes, factory pre-assembled unit shipped knock down in crates. (Electrical components, wiring and conduit are installed at the factory, final connections done onsite by others)

102 Unit Construction

102.1 Construction			
1. Cabinet Construction	Panelized	6. Panel Fastener	Drive Screws
2. Design Environment	Indoor	7. Thermal Break	Non Thermal Break
3. Panel Depth	2 in	8. Mounting	Slab Mounted
4. Caulk Type	3M 540	9. Roof Curb By	N/A
5. Model #	CSU-53K	10. Curb Height	N/A

102.2 Cabinet Material			
1. Exterior Material	16Ga Galv	8. Blankoff Finish	None
2. Interior Liner type(s)	See Drawing	9. Sheet Rock	No
3. Exterior Paint Type	Powder Coat	*Insulation by liner type*	
4. Interior Paint Type	None	10. Solid liner	Fiberglass Std - Unfaced (R8)
5. Paint Color	White (Standard)	11. Perforated liner	N/A
6. Meets Salt Spray Rating	1000 Hours	12. No liner	N/A
7. Blankoff Material	16Ga Galv		

102.3 Base Construction			
1. Base Structure Material	Steel Tube	7. Base Structure Height	See Drawing
2. Base Floor Material	16Ga Galv	8. Sub Floor Material	20Ga Galv
3. Base Floor Seams	Caulked	9. Lifting Lugs	Yes - Removable
4. Insulation	Polyurethane Foam	10. Sheet Rock	No
5. Floor Drain	None		
6. Floor Options	None		

102.4 Box Dimensions

Box	*X*	*Y*	*Z*	*Shipping Weight*	*Operating Weight*
A	68.000 in	134.000 in	132.000 in	0 lb	3,111 lb

102.5 Notes / Features

1. Box dimensions do not include lifting lugs, electrical panels, pipe connections, door handles, etc.
2. Base to be powdercoated to match cabinet exterior.

Project Name: South Hill
Sales Order #: 061070-003
Unit Tag: RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU...

103 Doors

103.1 All Doors (including those associated with specific components)

#	Box	Section	Type[1]	Width	Height	Hinge	Swing	Window	Interior	Exterior	Options
1	A	PL1	2" SF	24	72	LH	Out	8 x 8 TBW	16Ga 304 SS	16Ga Galv	

103.2 Notes / Features

1. Door Types
   SF = Standard Factory
2. All doors insulated with Fiberglass Std - Unfaced.
3. Door paint follows its section's paint type and color.
4. Mechanical Safety Latch to be provided on all fan access doors.

104 Drains

104.1 All Drains (including those associated with specific components)

Box	Section	Type	Conn (in)	Hand	Above Floor	Pipe Ext.	Grating Material	Pan Material
A	PL1	Drain Pan	1.25	Right	0.00 in	0.00 in	304 Stainless Steel	16Ga 304 SS

104.2 Notes / Features

1. Drain Constructions included: Double Sloped, solid welded to base

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Project Name: South Hill
Sales Order #: 061070-003
Unit Tag: RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU...

106 Static Pressure Summary

106.1 Condition 1

106.1.1 Unassigned

Tunnel	*Description*	*APD (in.H20)*
AirTunnel 1	Filter 1, Pre / Final (Average Pressure Drop)	1.78
AirTunnel 1	Bypass - Damper (Exhaust Air)	1.25
	Total Static Pressure:	3.03

Legend: ESP - External Static Pressure, OSA - Outside Air, EXH - Exhaust Air, RA - Return Air, SA - Supply Air

106.2 Notes/Legend

1. Summary report does not include static pressure of components supplied by others in the field unless otherwise noted.

PROJECT	South Hill
SALES ORDER #	061070-003
UNIT TAG	RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU-47, RAU-48, RAU-51, RAU-52
QUANTITY	11

Components

Project Name: South Hill
Sales Order #: 061070-003
Unit Tag: RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU...

500 Filter 1 : FILT1 : Box A

500.1 Pre / Final Size & Quantity			
1. Loading	Upstream Face Load	7. Bank Size	120.500 in W x 120.000 in H
2. Frame Material	Galvanized	8. Blankoff Location	N/A
3. Frame Finish	None	9. Qty / set & Frame Size 1	(25) 24 in x 24 in
4. Filter Clips	(50) C-70, (50) C-86	10. Qty / set & Frame Size 2	
5. Blankoff / Rack Material	16Ga Galv	11. Qty / set & Frame Size 3	
6. Blankoff / Rack Finish	None	12. Qty / set & Frame Size 4	

500.2 Pre Filter			
1. Filter Depth	2.000 in	4. Number of Sets	1
2. Efficiency	MERV 8	5. Max Face Velocity	530.00 ft/min at 53,000 ACFM
3. Manufacturer	American Air Filter	6. Model	PerfectPleat Ultra

500.3 Final Filter			
1. Filter Depth	12.000 in	4. Number of Sets	1
2. Efficiency	MERV 13	5. Max Face Velocity	530.00 ft/min at 53,000 ACFM
3. Manufacturer	American Air Filter	6. Model	VariCel SH

500.4 Notes / Features
1. All sets of Filters and clips to ship loose inside unit, installed by others.

Project Name: South Hill
Sales Order #: 061070-003
Unit Tag: RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU...

600 Bypass : Bypass : Box A : Roof

600.1 Opening Construction			
1. Description	Exhaust Air	4. Shape	Rectangle
2. Max CFM	53,000 ACFM	5. Max APD	1.25 in.H20
3. Size	84 W x 30 H in		

600.2 Damper Specifications			
1. Manufacturer	Ruskin	6. Jackshaft	Yes
2. Model	Ruskin CD 50 (Aluminum)	7. Max Face Velocity	3,028.57 ft/min
3. Size	84.000 in (Blade Direction) x 30.000 in	8. Torque	88 lb-in
		9. End Switches	No
4. Blade Config	Opposed		
5. Blade Orientation	Horizontal		

Notes:
1. Ordered with 1.5" frame flange

600.3 Damper Actuator			
1. Manufacturer	Siemens	5. Qty	1
2. Model	GCA156.1U	6. Floor Mounted	No
3. Location	Right Hand	7. Furnished By	Factory
4. Type	Modulating 24V – NC	8. Mounted By	Factory
		9. Wiring By	Others

PROJECT	South Hill
SALES ORDER #	061070-003
UNIT TAG	RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU-47, RAU-48, RAU-51, RAU-52
QUANTITY	11

Separate electrical permit is required with Washington State Department of Labor & Industries. https://lni.wa.gov/licensing-permits/electrical/electrical-permits-fees-and-inspections or Licensing information: Call 1-800-647-0982

Electrical

Project Name: South Hill
Sales Order #: 061070-003
Unit Tag: RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU...

700 Lighting Circuit

700.1 Electrical Service Information

1. Volt/Phase/Hertz	120/1/60	2. Provides power to	ElecSwitch 1, Lighting

1. For electrical loads see electrical drawings

700.2 Switches / Outlets

	Name	Box	Section	Type	Mounted	Illum. Switch	Timer	Cover	GFCI	MOCP
•	ElecSwitch 1	A	PL1	Light Switch	External	No	None	Yes	No	N/A

• Switch is connected to service.

700.3 Lighting Types and Quantities

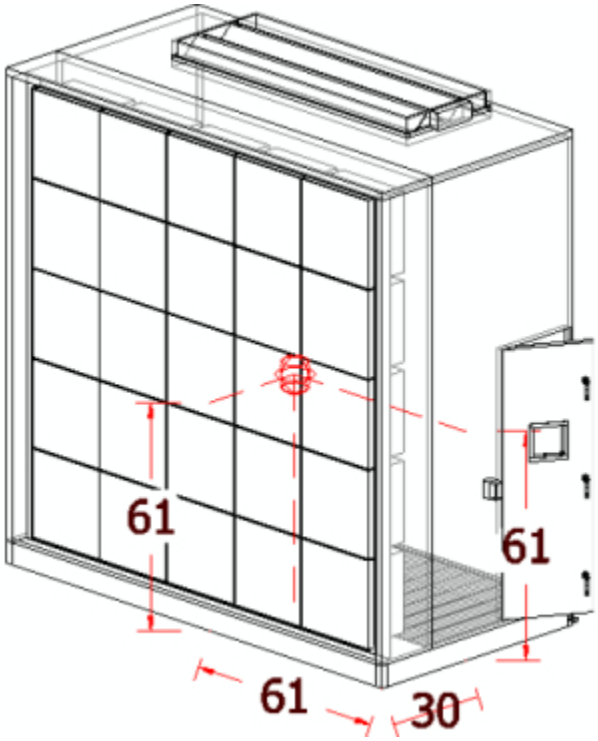
(1) Vapor Proof 8.5W LED

PROJECT	South Hill
SALES ORDER #	061070-003
UNIT TAG	RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU-47, RAU-48, RAU-51, RAU-52
QUANTITY	11

Unit Data

Project Name: South Hill
Sales Order #: 061070-003
Unit Tag: RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU...

901 Center of Gravity



Size (Inches)			Operating Weight (Pounds)	Center of Gravity (Inches)		
X	Y	Z		X	Y	Z
68.00	134.00	132.00	3,111	26.00	55.00	56.00

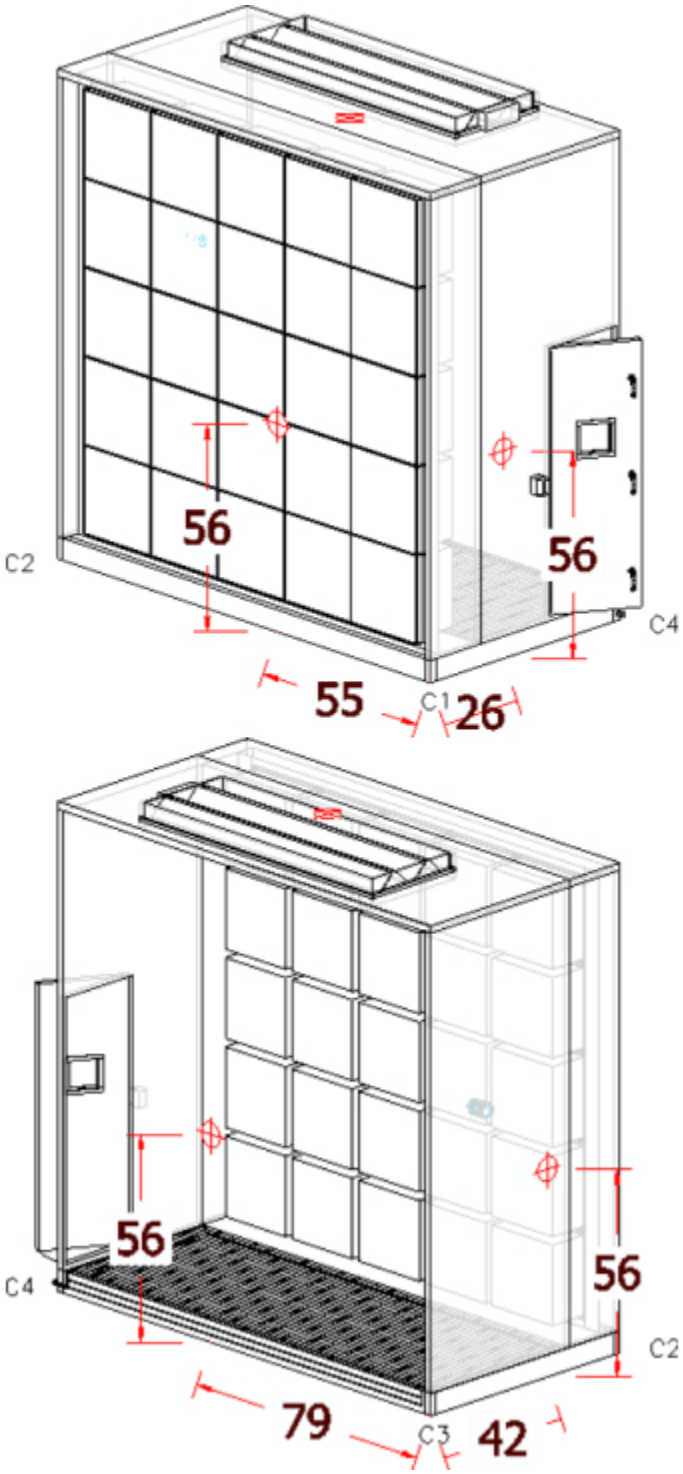
901.1 Notes

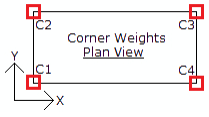
1. Center of gravity and weights are estimates and subject to change.
2. The center of gravity and weights shown above are based on operating weights and do not include packaging materials.
3. A 5% safety factor has been applied to the operating weights.
4. Corner weights apply to rectangular boxes only.
5. Corner weights are to assist in handling of the unit. Some units are not intended to be supported only at the corners. Contact your Sales Representative for support information.

Project Name: South Hill
Sales Order #: 061070-003
Unit Tag: RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU...

901 Center of Gravity (Continued)

901.2 Box A





Size (Inches)			Shipping Weight (Pounds)	Corner Weights (Pounds)			
X	Y	Z		C1	C2	C3	C4
68.00	134.00	132.00		N/A	N/A	N/A	N/A

◊ Center of gravity, weight, and corner weights shown are based on shipping weight. Values are estimates and subject to change.

PROJECT	South Hill
SALES ORDER #-003	061070
QUOTE #	23-0137
UNIT TAG	RAU-10, RAU-12, RAU-14, RAU-18, RAU-32, RAU-40, RAU-41, RAU-47, RAU-48, RAU-51, RAU-52
QUANTITY	11

Electrical Schematics

NORTEK AIR SOLUTIONS

PRMH20240272

HUNTAIR SCHEMATIC SYMBOL LEGEND

TBx xx — TERMINAL BLOCK

N.O. CONTACT

N.C. CONTACT

CRx — CONTROL RELAY COIL

Mx — CONTACTOR COIL

COOLING FAN

COOLING FAN THERMOSTAT

FUSE

LIGHT SWITCH

GFCI RECEPTACLE

INCANDESCENT LIGHT

INDICATOR LIGHT

1/3 — PUMP

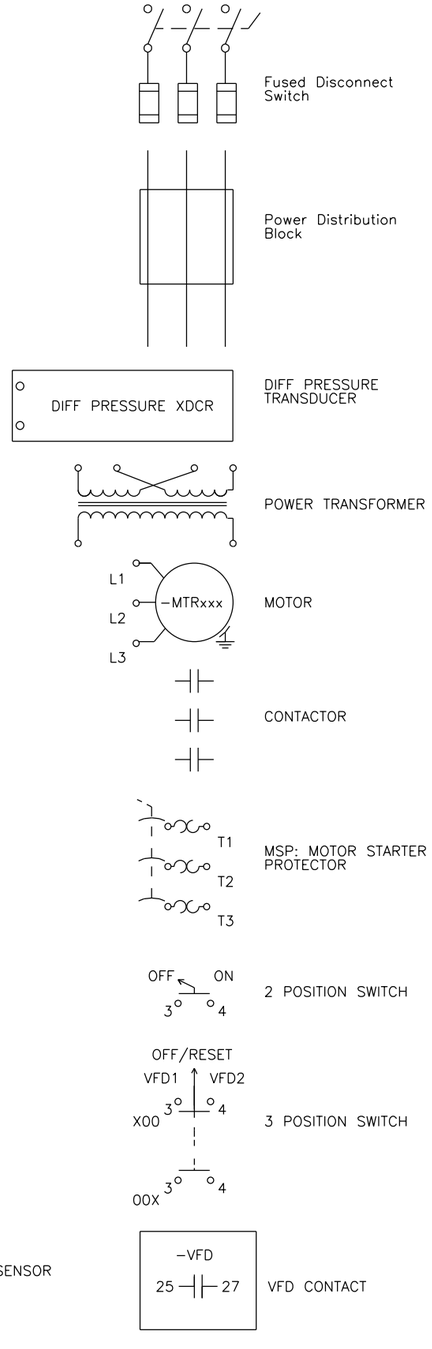
FLOAT SWITCH

SOLENOID VALVE

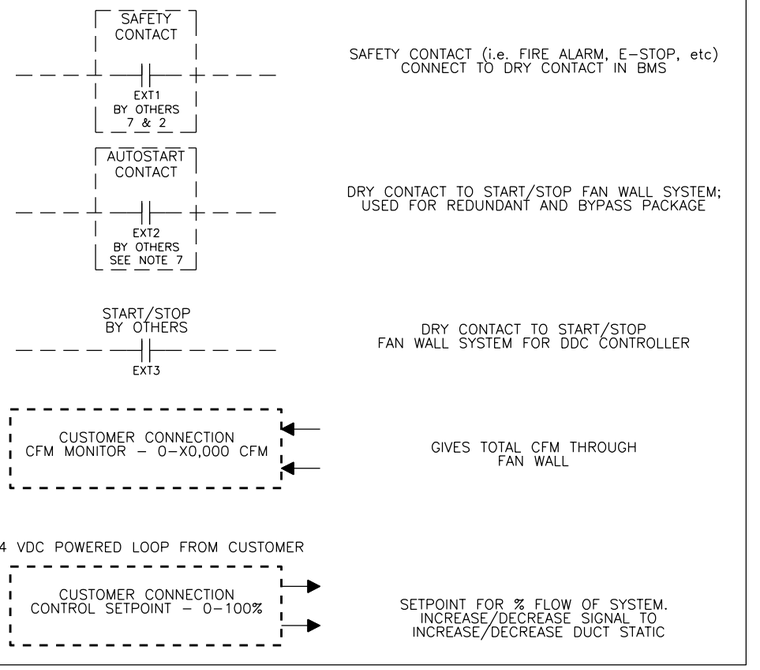
N.C. PUSH BUTTON

CIRCUIT BREAKER

CURRENT SENSOR



TYPICAL CUSTOMER CONNECTIONS



CONTROL PANEL WIRE COLOR CODE

COLOR:	DESCRIPTION OF USE:
BLACK	ALL UNGROUNDED 120VAC CONTROL CIRCUIT CONDUCTORS OPERATING AT THE SUPPLY VOLTAGE.
WHITE	GROUNDED 120VAC CURRENT-CARRYING CONTROL CIRCUIT CONDUCTOR
RED	ALL UNGROUNDED 24VAC CONTROL CIRCUIT CONDUCTORS OPERATING AT THE SUPPLY VOLTAGE.
WHT W RED TRACE	GROUNDED 24VAC CURRENT-CARRYING CONTROL CIRCUIT CONDUCTOR
BLUE	UNGROUNDED DC CONTROL CIRCUIT CONDUCTOR
WHT W BLU TRACE	GROUNDED DC CURRENT-CARRYING CONTROL CIRCUIT CONDUCTOR
GREEN	GROUND CONDUCTOR

MOTOR CONNECTION WIRE COLOR CODE

BLACK	3 PHASE SUPPLY VOLTAGE CONDUCTORS

SCHEMATIC WIRE TYPE LEGEND

KEY:

ENCLOSURE TERMINAL — TB1 XX

FIELD WIRING

HUNTAIR EQUIPMENT WIRING

HUNTAIR PANEL WIRING

SYSTEM PACKAGE OPTIONS & DESCRIPTIONS

REDUNDANT:	MANUAL DESIGNATION OF PRIMARY VFD; AUTOMATIC SWITCH TO BACKUP VFD UPON FAILURE OF PRIMARY DRIVE
BYPASS:	AUTOMATIC SWITCH TO BYPASS CIRCUIT UPON FAILURE OF VFD
[1.] MICRO-DRIVE w/Optimization	INDIVIDUAL DRIVE PER MOTOR; MAY CONTROL SYSTEM BY: CFM, TOTAL STATIC PRESSURE, or DUCT STATIC PRESSURE SETPOINT
MICRO-DRIVE w/VFD Speed Control	INDIVIDUAL DRIVE PER MOTOR; CONTROL BY A VFD SPEED SETPOINT. (HZ SETPOINT FOR INDUCTION MOTORS; RPM SETPOINT FOR PM MOTORS)[2.]
MICRO-DRIVE w/Control by others	INDIVIDUAL DRIVE PER MOTOR; ALL CONTROL IS BY OTHERS (NOTE: THIS OPTION DOES NOT INCLUDE A HUNTAIR DDC CONTROLLER)
VFD/NO BYPASS Control by others	INDIVIDUAL DRIVE FOR MULTIPLE MOTORS. NO BYPASS OR REDUNDANT DRIVE INCLUDED
MSP PANEL	EACH MOTOR IS SUPPLIED WITH ITS OWN MECHANICAL AND THERMAL OVERLOAD DEVICE
CUSTOM	SEE SUBMITTAL FOR DESCRIPTION

1. The control method described is also available without the optimization feature.
2. PM MOTOR = Permanent Magnet Motor

IDENTICAL DRAWING	
DASH	TAG NAME
-203	RAU-10, RAU-12, RAU-14, RAU-18, RAU-32
	RAU-40, RAU-41, RAU-47, RAU-48, RAU-51
	RAU-52
-204	RAU-17, RAU-27, RAU-39, RAU-49, RAU-50

SOUTH HILL MULTIPLE DASHES

HUNTAIR
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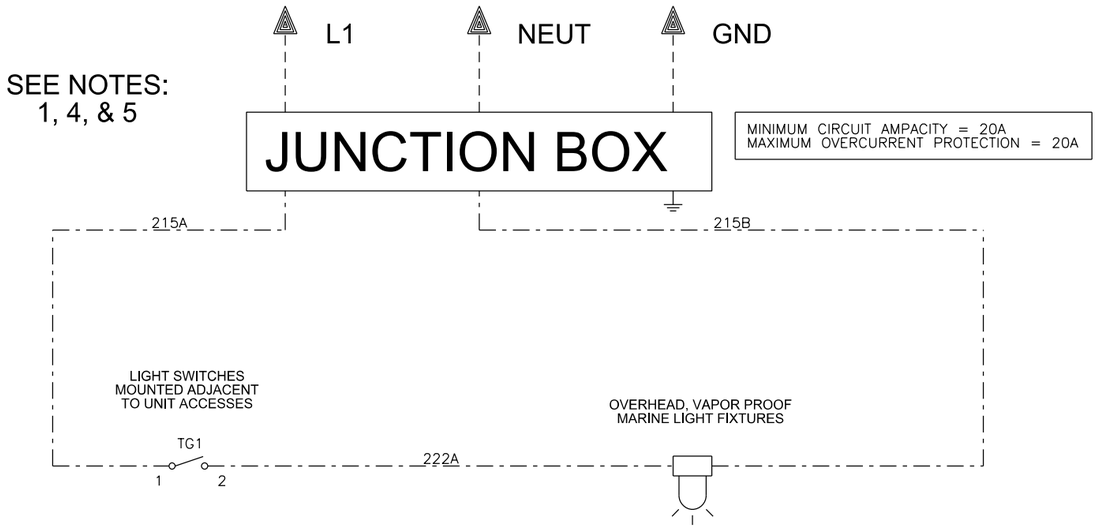
DRAWN BY	DATE	RTP BY:	DATE	DATE / TIME STAMP	SCALE	SHEET
J. GRAGG	11/27/23			11/28/23 09:57		1 of 2

JOB NO	DWG NO	REV
61070-203	61070-203 74	

PRMH20240272

120 VAC BY OTHERS



SEE SUBMITTAL FOR TECHNICAL SPECIFICATIONS

KEY:
ENCLOSURE TERMINAL TB1 XX
FIELD WIRING
HUNTAIR EQUIPMENT WIRING
HUNTAIR PANEL WIRING

GENERAL NOTES
1. FEEDER CIRCUIT MUST BE SELECTED IN ACCORDANCE WITH THE NEC AND LOCAL CODES.
2. FOR SAFETY CONTACT AMPERAGE RATING SEE SECONDARY FUSING OF TRANSFORMER.
4. LAMPS ARE LOCATED OUTSIDE OF ELECTRICAL PANEL.
5. DEVICES ARE TO BE WIRED BY HUNTAIR.
7. JUMPER IF NOT USED.

ALL CONTROL WIRING BY OTHERS
EXCEPT WHERE INDICATED

IDENTICAL DRAWING	
DASH	TAG NAME
-203	RAU-10, RAU-12, RAU-14, RAU-18, RAU-32
	RAU-40, RAU-41, RAU-47, RAU-48, RAU-51
	RAU-52
-204	RAU-17, RAU-27, RAU-39, RAU-49, RAU-50

SOUTH HILL
MULTIPLE DASHES

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19855 SW 124th AVE, TUALATIN, OR 97062
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DRAWN BY	DATE	RTP BY:	DATE	DATE / TIME STAMP	SCALE	SHEET
J. GRAGG	11/27/23			11/28/23 09:57		2 OF 2

JOB NO	DWG NO	REV
61070-203	61070-203 75	

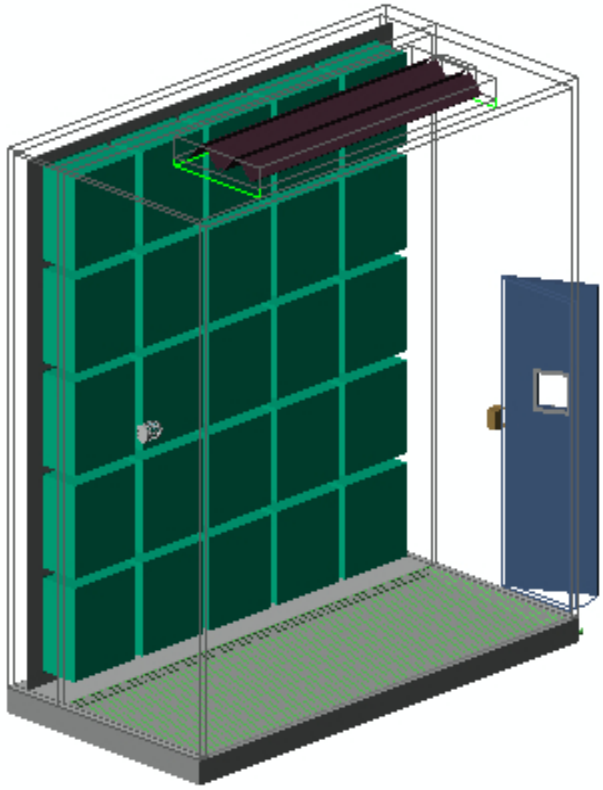
Unit Design Revision History

PRMH20240272

PROJECT	South Hill
SALES ORDER #	061070-004
UNIT TAG	RAU-17, RAU-27, RAU-39, RAU-49, RAU-50
QUANTITY	5

Revision History

Date	Rev	Revision Description
2023-11-16	A	Mechanical submittal. Electrical schematics to follow later.
2023-11-20	B	Released for production.
2023-11-28	C	Added electrical schematics.



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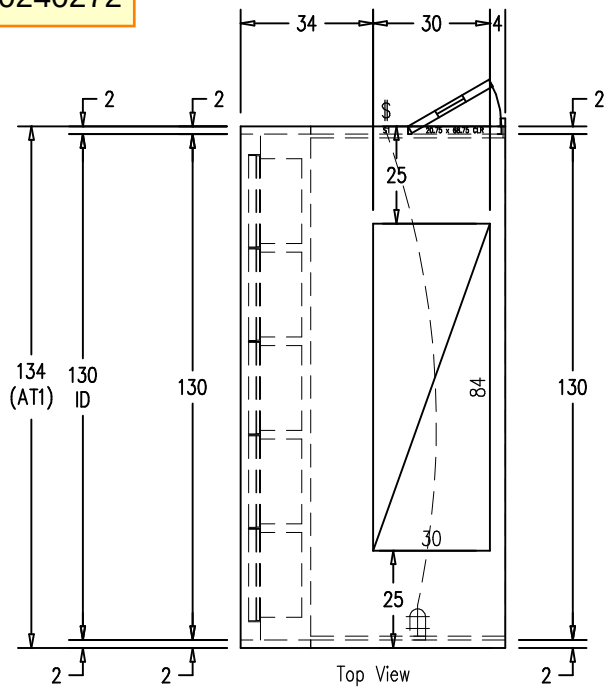
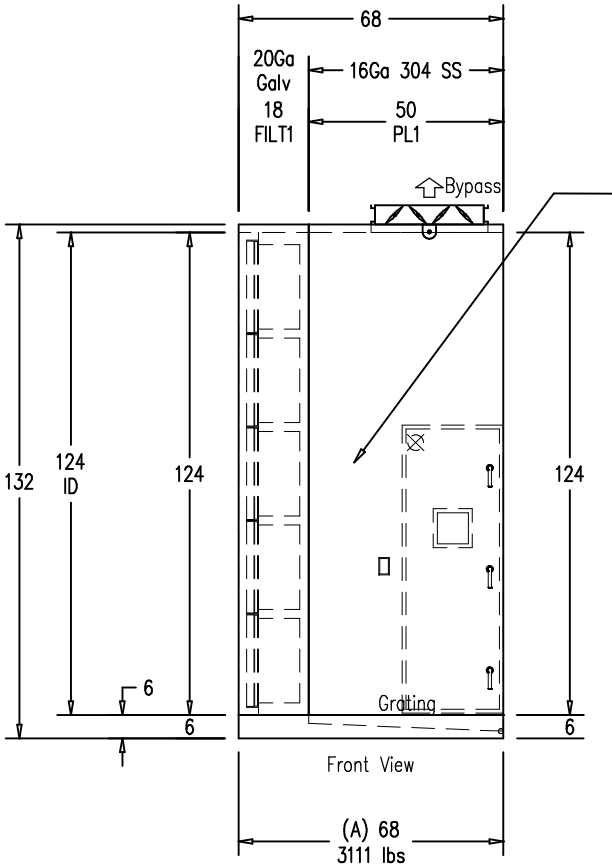
JOB #	UNIT TAG
061070-004	RAU-17
061070-004	RAU-27
061070-004	RAU-39
061070-004	RAU-49
061070-004	RAU-50

PRMH20240272

Knockdown Construction





Printed (yyyy-MM-dd): 2023-11-28

Rev	Revision Description	Date m/d/y
C	Added electrical schematics.	11/28/2023
B	Released for production.	11/20/2023
A	Mechanical submittal. Electrical schematics to follow later.	11/16/2023

All dimensions shown in inches, Operating weights shown in pounds. Overall unit dimensions do not include lifting lugs, electrical panels, pipe connections, door handles, etc. Weight and Box Qty are for a quantity of 1 design.
Panelized Factory Knockdown Construction 53,000 ACFM

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www.nortekair.com

South Hill

Unit Tag	Unit Type	Dsg Qty
See Table	Indoor	5
Rep Firm	**Weight**	**Box Qty**
Air Reps, LLC: Bellevue Bellevue, WA, USA	3,111	1
Rep Contact	**Model No**	
Whitney Walker	CSU-53K	
SALES ORDER #	**NASDA Ver / Factory SAE / Date m/d/y / Rev**	
061070 – See Table	9.1.0 / DB / 11/16/2023 / C	

NORTEK AIR SOLUTIONS
HUNTAIR

PRMH20240272

PROJECT	South Hill
SALES ORDER #	061070-004
UNIT TAG	RAU-17, RAU-27, RAU-39, RAU-49, RAU-50
QUANTITY	5

Unit Design Options

Project Name: South Hill
Unit Tag: RAU-17, RAU-27, RAU-39, RAU-49, RAU-50

Sales Order #: 061070-004

101 Unit Details

101.1 Weights / Jobsite Elevation

1. Shipping Weight	6,087 lb	3. Elevation	400 ft
2. Operating Weight	3,111 lb		

101.2 Testing

1. Air Performance	NO	4. Witness Test	NO
2. Sound	NO	5. Inspection	NO
3. Cabinet Leak Test	NO		

101.3 Preparation for Shipment

1. Cleaning & Wrapping	Ship on open bed truck and heat shrink wrap.
2. Knockdown Construction	Yes, factory pre-assembled unit shipped knock down in crates. (Electrical components, wiring and conduit are installed at the factory, final connections done onsite by others)

102 Unit Construction

102.1 Construction

1. Cabinet Construction	Panelized	6. Panel Fastener	Drive Screws
2. Design Environment	Indoor	7. Thermal Break	Non Thermal Break
3. Panel Depth	2 in	8. Mounting	Slab Mounted
4. Caulk Type	3M 540	9. Roof Curb By	N/A
5. Model #	CSU-53K	10. Curb Height	N/A

102.2 Cabinet Material

1. Exterior Material	16Ga Galv	8. Blankoff Finish	None
2. Interior Liner type(s)	See Drawing	9. Sheet Rock	No
3. Exterior Paint Type	Powder Coat	*Insulation by liner type*	
4. Interior Paint Type	None	10. Solid liner	Fiberglass Std - Unfaced (R8)
5. Paint Color	White (Standard)	11. Perforated liner	N/A
6. Meets Salt Spray Rating	1000 Hours	12. No liner	N/A
7. Blankoff Material	16Ga Galv		

102.3 Base Construction

1. Base Structure Material	Steel Tube	7. Base Structure Height	See Drawing
2. Base Floor Material	16Ga Galv	8. Sub Floor Material	20Ga Galv
3. Base Floor Seams	Caulked	9. Lifting Lugs	Yes - Removable
4. Insulation	Polyurethane Foam	10. Sheet Rock	No
5. Floor Drain	None		
6. Floor Options	None		

102.4 Box Dimensions

Box	*X*	*Y*	*Z*	*Shipping Weight*	*Operating Weight*
A	68.000 in	134.000 in	132.000 in	0 lb	3,111 lb

102.5 Notes / Features

1. Box dimensions do not include lifting lugs, electrical panels, pipe connections, door handles, etc.
2. Base to be powdercoated to match cabinet exterior.

Project Name: South Hill
Sales Order #: 061070-004
Unit Tag: RAU-17, RAU-27, RAU-39, RAU-49, RAU-50

103 Doors

103.1 All Doors (including those associated with specific components)

#	Box	Section	Type[1]	Width	Height	Hinge	Swing	Window	Interior	Exterior	Options
1	A	PL1	2" SF	24	72	RH	Out	8 x 8 TBW	16Ga 304 SS	16Ga Galv	

103.2 Notes / Features

1. Door Types
   SF = Standard Factory
2. All doors insulated with Fiberglass Std - Unfaced.
3. Door paint follows its section's paint type and color.
4. Mechanical Safety Latch to be provided on all fan access doors.

104 Drains

104.1 All Drains (including those associated with specific components)

Box	Section	Type	Conn (in)	Hand	Above Floor	Pipe Ext.	Grating Material	Pan Material
A	PL1	Drain Pan	1.25	Left	0.00 in	0.00 in	304 Stainless Steel	16Ga 304 SS

104.2 Notes / Features

1. Drain Constructions included: Double Sloped, solid welded to base

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Project Name: South Hill
Sales Order #: 061070-004
Unit Tag: RAU-17, RAU-27, RAU-39, RAU-49, RAU-50

106 Static Pressure Summary

106.1 Condition 1

106.1.1 Unassigned

Tunnel	*Description*	*APD (in.H20)*
AirTunnel 1	Filter 1, Pre / Final (Average Pressure Drop)	1.78
AirTunnel 1	Bypass - Damper (Exhaust Air)	1.25
	Total Static Pressure:	3.03

Legend: ESP - External Static Pressure, OSA - Outside Air, EXH - Exhaust Air, RA - Return Air, SA - Supply Air

106.2 Notes/Legend

1. Summary report does not include static pressure of components supplied by others in the field unless otherwise noted.

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PROJECT	South Hill
SALES ORDER #	061070-004
UNIT TAG	RAU-17, RAU-27, RAU-39, RAU-49, RAU-50
QUANTITY	5

Components

Project Name: South Hill
Unit Tag: RAU-17, RAU-27, RAU-39, RAU-49, RAU-50

Sales Order #: 061070-004

500 Filter 1 : FILT1 : Box A

500.1 Pre / Final Size & Quantity			
1. Loading	Upstream Face Load	7. Bank Size	120.500 in W x 120.000 in H
2. Frame Material	Galvanized	8. Blankoff Location	N/A
3. Frame Finish	None	9. Qty / set & Frame Size 1	(25) 24 in x 24 in
4. Filter Clips	(50) C-70, (50) C-86	10. Qty / set & Frame Size 2	
5. Blankoff / Rack Material	16Ga Galv	11. Qty / set & Frame Size 3	
6. Blankoff / Rack Finish	None	12. Qty / set & Frame Size 4	

500.2 Pre Filter			
1. Filter Depth	2.000 in	4. Number of Sets	1
2. Efficiency	MERV 8	5. Max Face Velocity	530.00 ft/min at 53,000 ACFM
3. Manufacturer	American Air Filter	6. Model	PerfectPleat Ultra

500.3 Final Filter			
1. Filter Depth	12.000 in	4. Number of Sets	1
2. Efficiency	MERV 13	5. Max Face Velocity	530.00 ft/min at 53,000 ACFM
3. Manufacturer	American Air Filter	6. Model	VariCel SH

500.4 Notes / Features
1. All sets of Filters and clips to ship loose inside unit, installed by others.

Project Name: South Hill
Unit Tag: RAU-17, RAU-27, RAU-39, RAU-49, RAU-50

Sales Order #: 061070-004

600 Bypass : Bypass : Box A : Roof

600.1 Opening Construction

1. Description	Exhaust Air	4. Shape	Rectangle
2. Max CFM	53,000 ACFM	5. Max APD	1.25 in.H20
3. Size	84 W x 30 H in		

600.2 Damper Specifications

1. Manufacturer	Ruskin	6. Jackshaft	Yes
2. Model	Ruskin CD 50 (Aluminum)	7. Max Face Velocity	3,028.57 ft/min
3. Size	84.000 in (Blade Direction) x 30.000 in	8. Torque	88 lb-in
		9. End Switches	No
4. Blade Config	Opposed		
5. Blade Orientation	Horizontal		

Notes:
1. Ordered with 1.5" frame flange

600.3 Damper Actuator

1. Manufacturer	Siemens	5. Qty	1
2. Model	GCA156.1U	6. Floor Mounted	No
3. Location	Left Hand	7. Furnished By	Factory
4. Type	Modulating 24V – NC	8. Mounted By	Factory
		9. Wiring By	Others

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PROJECT	South Hill
SALES ORDER #	061070-004
UNIT TAG	RAU-17, RAU-27, RAU-39, RAU-49, RAU-50
QUANTITY	5

Electrical

Project Name: South Hill
Unit Tag: RAU-17, RAU-27, RAU-39, RAU-49, RAU-50

Sales Order #: 061070-004

700 Lighting Circuit

700.1 Electrical Service Information

1. Volt/Phase/Hertz	120/1/60	2. Provides power to	ElecSwitch 1, Lighting

1. For electrical loads see electrical drawings

700.2 Switches / Outlets

	Name	Box	Section	Type	Mounted	Illum. Switch	Timer	Cover	GFCI	MOCP
•	ElecSwitch 1	A	PL1	Light Switch	External	No	None	Yes	No	N/A

• Switch is connected to service.

700.3 Lighting Types and Quantities

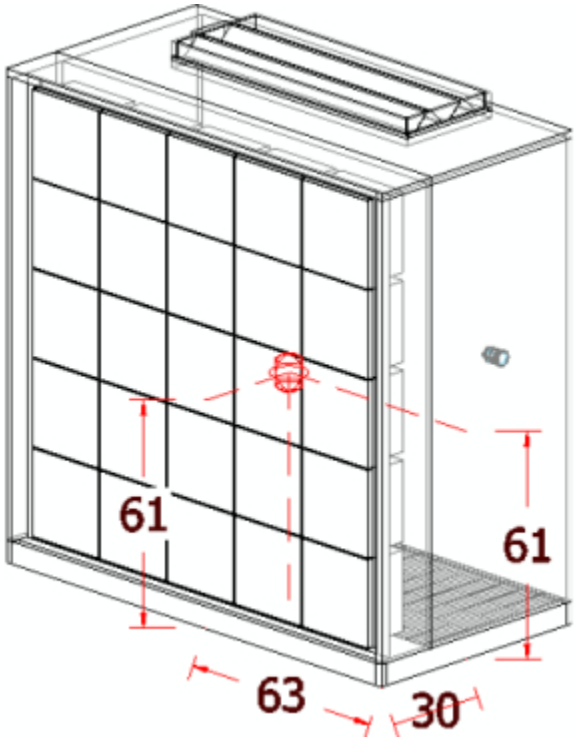
(1) Vapor Proof 8.5W LED

PROJECT	South Hill
SALES ORDER #	061070-004
UNIT TAG	RAU-17, RAU-27, RAU-39, RAU-49, RAU-50
QUANTITY	5

Unit Data

Project Name: South Hill
Sales Order #: 061070-004
Unit Tag: RAU-17, RAU-27, RAU-39, RAU-49, RAU-50

901 Center of Gravity



Size (Inches)			Operating Weight (Pounds)	Center of Gravity (Inches)		
X	Y	Z		X	Y	Z
68.00	134.00	132.00	3,111	26.00	60.00	56.00

901.1 Notes

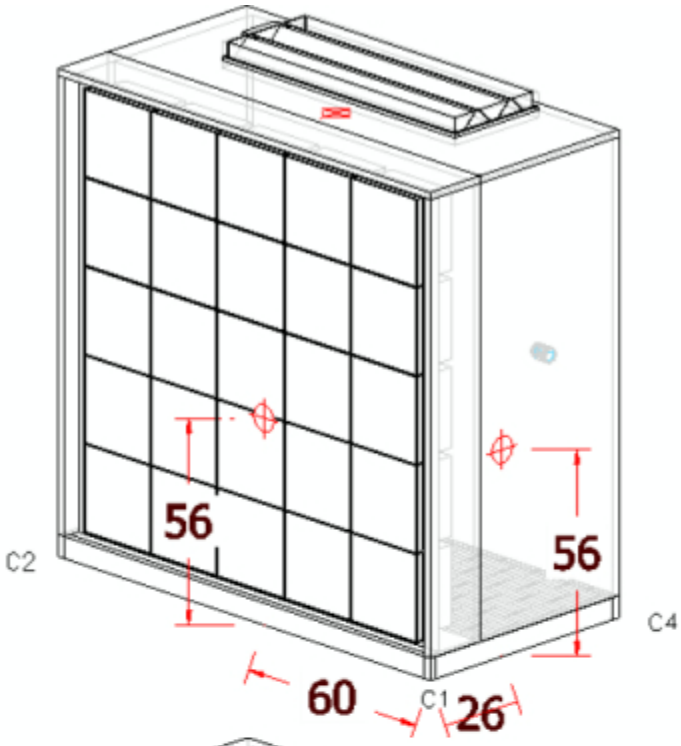
1. Center of gravity and weights are estimates and subject to change.
2. The center of gravity and weights shown above are based on operating weights and do not include packaging materials.
3. A 5% safety factor has been applied to the operating weights.
4. Corner weights apply to rectangular boxes only.
5. Corner weights are to assist in handling of the unit. Some units are not intended to be supported only at the corners. Contact your Sales Representative for support information.

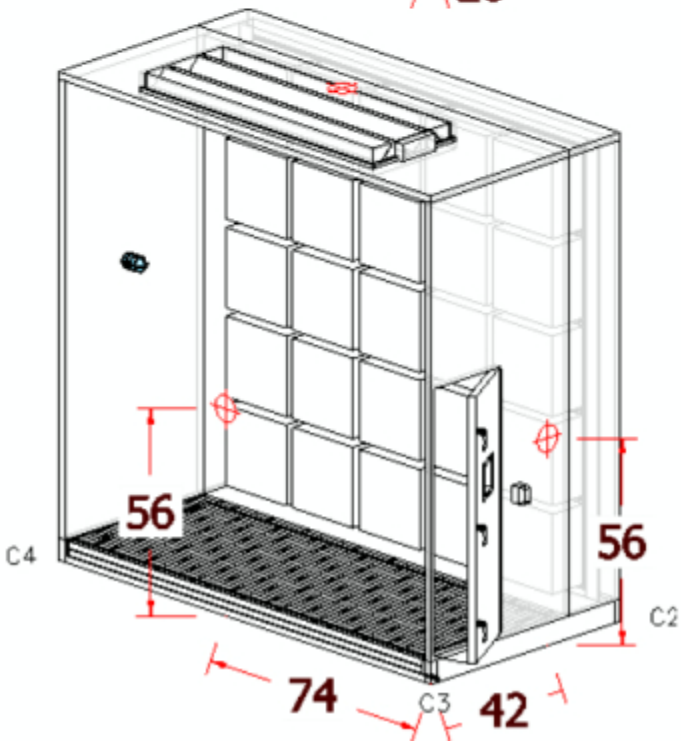
Project Name: South Hill
Unit Tag: RAU-17, RAU-27, RAU-39, RAU-49, RAU-50

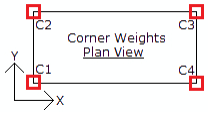
Sales Order #: 061070-004

901 Center of Gravity (Continued)

901.2 Box A







Size (Inches)			Shipping Weight (Pounds)	Corner Weights (Pounds)			
X	Y	Z		C1	C2	C3	C4
68.00	134.00	132.00		N/A	N/A	N/A	N/A

◊ Center of gravity, weight, and corner weights shown are based on shipping weight. Values are estimates and subject to change.

NORTEK AIR SOLUTIONS
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PROJECT	South Hill
SALES ORDER #-004	061070
QUOTE #	23-0137
UNIT TAG	RAU-17, RAU-27, RAU-39, RAU-49, RAU-50
QUANTITY	5

Electrical Schematics

NORTEK AIR SOLUTIONS

PRMH20240272

HUNTAIR SCHEMATIC SYMBOL LEGEND

TBx xx — TERMINAL BLOCK

N.O. CONTACT

N.C. CONTACT

CRx — CONTROL RELAY COIL

Mx — CONTACTOR COIL

COOLING FAN

COOLING FAN THERMOSTAT

FUSE

LIGHT SWITCH

GFCI RECEPTACLE

INCANDESCENT LIGHT

INDICATOR LIGHT

1/3 — PUMP

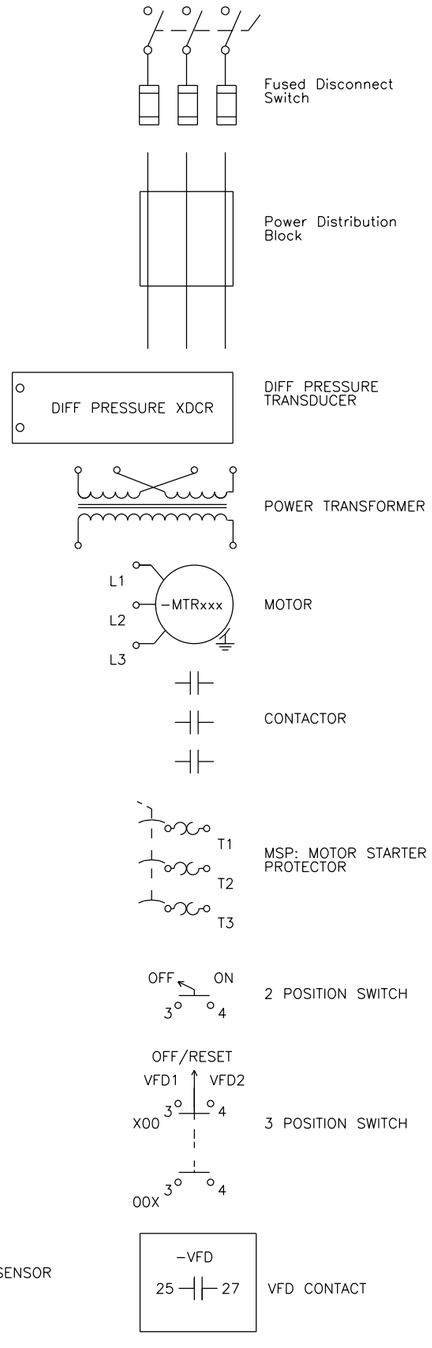
FLOAT SWITCH

SOLENOID VALVE

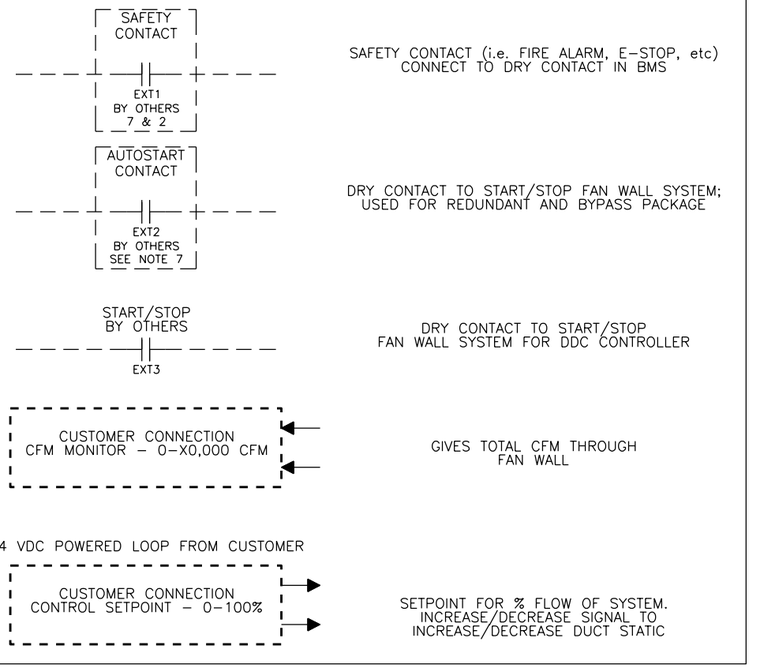
N.C. PUSH BUTTON

CIRCUIT BREAKER

CURRENT SENSOR



TYPICAL CUSTOMER CONNECTIONS



CONTROL PANEL WIRE COLOR CODE

COLOR:	DESCRIPTION OF USE:
BLACK	ALL UNGROUNDED 120VAC CONTROL CIRCUIT CONDUCTORS OPERATING AT THE SUPPLY VOLTAGE.
WHITE	GROUNDED 120VAC CURRENT-CARRYING CONTROL CIRCUIT CONDUCTOR
RED	ALL UNGROUNDED 24VAC CONTROL CIRCUIT CONDUCTORS OPERATING AT THE SUPPLY VOLTAGE.
WHT W RED TRACE	GROUNDED 24VAC CURRENT-CARRYING CONTROL CIRCUIT CONDUCTOR
BLUE	UNGROUNDED DC CONTROL CIRCUIT CONDUCTOR
WHT W BLU TRACE	GROUNDED DC CURRENT-CARRYING CONTROL CIRCUIT CONDUCTOR
GREEN	GROUND CONDUCTOR

MOTOR CONNECTION WIRE COLOR CODE

BLACK	3 PHASE SUPPLY VOLTAGE CONDUCTORS

SCHEMATIC WIRE TYPE LEGEND

KEY:

ENCLOSURE TERMINAL — TB1 XX

FIELD WIRING

HUNTAIR EQUIPMENT WIRING

HUNTAIR PANEL WIRING

SYSTEM PACKAGE OPTIONS & DESCRIPTIONS

REDUNDANT:	MANUAL DESIGNATION OF PRIMARY VFD; AUTOMATIC SWITCH TO BACKUP VFD UPON FAILURE OF PRIMARY DRIVE
BYPASS:	AUTOMATIC SWITCH TO BYPASS CIRCUIT UPON FAILURE OF VFD
[1.] MICRO-DRIVE w/Optimization	INDIVIDUAL DRIVE PER MOTOR; MAY CONTROL SYSTEM BY: CFM, TOTAL STATIC PRESSURE, or DUCT STATIC PRESSURE SETPOINT
MICRO-DRIVE w/VFD Speed Control	INDIVIDUAL DRIVE PER MOTOR; CONTROL BY A VFD SPEED SETPOINT. (HZ SETPOINT FOR INDUCTION MOTORS; RPM SETPOINT FOR PM MOTORS)[2.]
MICRO-DRIVE w/Control by others	INDIVIDUAL DRIVE PER MOTOR; ALL CONTROL IS BY OTHERS (NOTE: THIS OPTION DOES NOT INCLUDE A HUNTAIR DDC CONTROLLER)
VFD/NO BYPASS Control by others	INDIVIDUAL DRIVE FOR MULTIPLE MOTORS. NO BYPASS OR REDUNDANT DRIVE INCLUDED
MSP PANEL	EACH MOTOR IS SUPPLIED WITH ITS OWN MECHANICAL AND THERMAL OVERLOAD DEVICE
CUSTOM	SEE SUBMITTAL FOR DESCRIPTION

1. The control method described is also available without the optimization feature.
2. PM MOTOR = Permanent Magnet Motor

IDENTICAL DRAWING	
DASH	TAG NAME
-203	RAU-10, RAU-12, RAU-14, RAU-18, RAU-32
	RAU-40, RAU-41, RAU-47, RAU-48, RAU-51
	RAU-52
-204	RAU-17, RAU-27, RAU-39, RAU-49, RAU-50

SOUTH HILL MULTIPLE DASHES

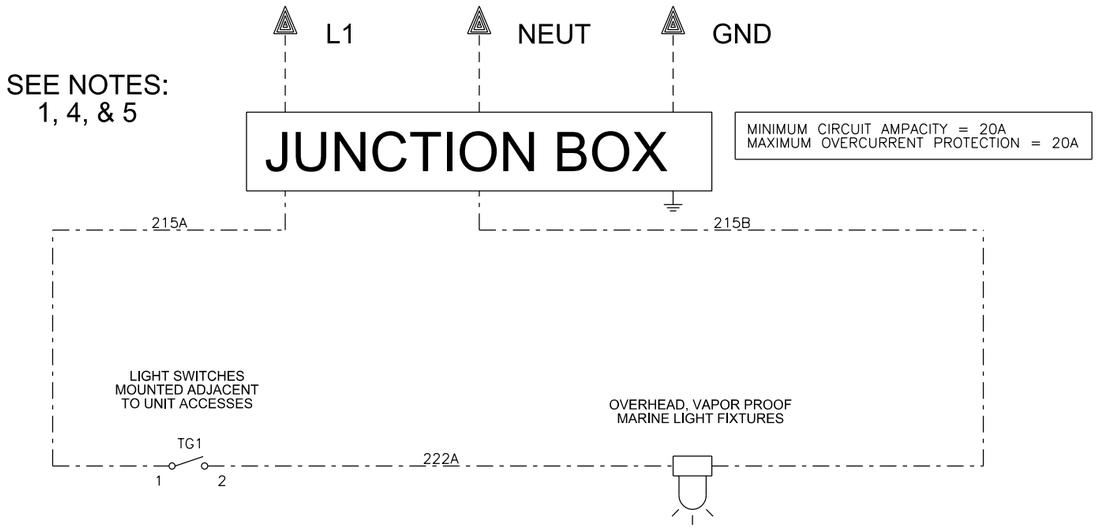
HUNTAIR
19855 SW 124th AVE, TUALATIN, OR 97062
(503) 639-0113 FAX (503) 639-1269

DRAWN BY	DATE	RTP BY:	DATE	DATE / TIME STAMP	SCALE	SHEET
J. GRAGG	11/27/23			11/28/23 09:57		1 of 2

JOB NO	DWG NO	REV
61070-203	61070-203 91	

PRMH20240272

120 VAC BY OTHERS



SEE SUBMITTAL FOR TECHNICAL SPECIFICATIONS

KEY:
ENCLOSURE TERMINAL TB1 XX
FIELD WIRING
HUNTAIR EQUIPMENT WIRING
HUNTAIR PANEL WIRING

GENERAL NOTES
1. FEEDER CIRCUIT MUST BE SELECTED IN ACCORDANCE WITH THE NEC AND LOCAL CODES.
2. FOR SAFETY CONTACT AMPERAGE RATING SEE SECONDARY FUSING OF TRANSFORMER.
4. LAMPS ARE LOCATED OUTSIDE OF ELECTRICAL PANEL.
5. DEVICES ARE TO BE WIRED BY HUNTAIR.
7. JUMPER IF NOT USED.

ALL CONTROL WIRING BY OTHERS
EXCEPT WHERE INDICATED

IDENTICAL DRAWING	
DASH	TAG NAME
-203	RAU-10, RAU-12, RAU-14, RAU-18, RAU-32
	RAU-40, RAU-41, RAU-47, RAU-48, RAU-51
	RAU-52
-204	RAU-17, RAU-27, RAU-39, RAU-49, RAU-50

SOUTH HILL
MULTIPLE DASHES

HUNTAIR
19855 SW 124th AVE, TUALATIN, OR 97062
(503) 639-0113 FAX (503) 639-1269

DRAWN BY	DATE	RTP BY:	DATE	DATE / TIME STAMP	SCALE	SHEET
J. GRAGG	11/27/23			11/28/23 09:57		2 OF 2

JOB NO 61070-203
DWG NO 61070-203 92
REV

PROJECT	South Hill
SALES ORDER #	061070
QUOTE #	23-0137

Appendix

PROJECT	South Hill
SALES ORDER #	061070
QUOTE #	23-0137

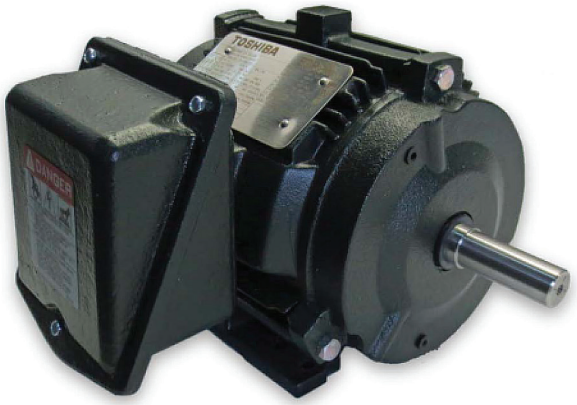
Component Details

PRMH20240272

TOSHIBA EQP Global™ SD

With Hybrid Ceramic Bearings (208, 230, 460 Volt)

Efficiency, Quality & Performance (EQP)



The TOSHIBA EQP Global SD premium efficient motor are suited for the FANWALL® applications. Motors are balanced to vibration levels at half the allowable NEMA limits. The totally enclosed air over (TEAO) design runs quiet, is very compact and is a superior enclosure for any application, including dirty or wet environments.

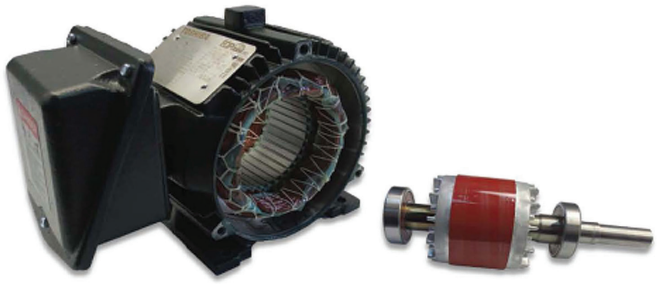
The insulation system in a motor is designed to handle the sum of three temperatures: an ambient design temperature 40°C / 104°F; the temperature rise in the motor under load; and a 10°C hot spot allowance. For example, a NEMA Class B rated motor can have a maximum motor temperature rise during operation of 80°C. This results in a total motor temperature rating of 130°C (40°C ambient temp. + 80°C motor temp. rise + 10°C hot spot temp.). A NEMA Class F rating allows for a motor temperature rise of 105°C yielding a total motor temperature rating of 155°C. A NEMA Class F ratings allows for a 125°C motor temperature rise for a total motor temperature rating of 180°C. Additionally, NEMA allows the motor temperature rating limit to increase by 10°C for motors rated with a 1.15 service factor. TOSHIBA EQP motors provided for FANWALL systems incorporate Class F rated wire and Class F rated varnish as part of the insulation system.

Testing: Through manufacturers testing the TOSHIBA EQP motors are suitable for continuous duty in ambient temperatures from –25°C to 40°C in 100% humidity. The increased airflow over the motor fins, produced by the Coplanar Silencer® design in FANWALL systems, helps to keep the motor windings cooler and well below a Class F 180°C [356°F] rating. This unique cooling design makes available a significantly greater number of motor horsepower increments that can be selected to more closely match brake horsepower requirements. These incremental horsepower motors carry a full factory warranty, maintain a 1.15 service factor, are constructed for 120 Hz continuous operation, and are readily available from Nortek Air Solutions LLC stock inventory.

Frame mounting dimensions are industry standard for readily available replacement. The motors utilize an insulation system which meets the requirements of NEMA MG1 Part 31.4.4.2 for VFD use, and is considered inverter ready. Cast iron motor construction is rigid, durable and quiet. The motors have double sealed hybrid ceramic ball bearings that exceed a L-10 life of 150,000 hours in direct coupled applications. These hybrid ceramic bearings prevent electrical arcing that damages traditional bearings.

The TOSHIBA motors are in accordance with the latest revisions of the applicable sections of the NEMA MG1, NEC, CSA, UL, IEEE and CE standards. The nominal efficiency is stamped on the nameplate of the motor. The nameplate and fasteners surpass a 720 hour salt spray (fog) test for corrosion resistance per ASTM B117/IEEE 841 A.4.

All efficiency testing and labeling are done in accordance with the NEMA MG1 standard. The motors are dynamically balanced to 0.10 inches per second peak velocity and vibration testing is per NEMA MG1 Part 7. All motors are painted with a corrosion-resistance, severe duty, alkyd resin primer paint with an acrylic enamel finish.



NORTEK™ AIR SOLUTIONS

TOSHIBA EQP Global™ SD With Hybrid Ceramic Bearings (208, 230, 460 Volt)

Efficiency, Quality & Performance (EQP) 1800 RPM MOTORS

1800 RPM Motors										
						FLA				
HP	Part #	Toshiba Spec #	RPM @ 60Hz with slip	FRAME	EFF	460V	230V	208V	LBS	Max RPM
1	200.0789	4OA001L1ZVS210	1760	143T	85.5	1.7	3.4	3.3	53	3600
1.5			1745			2.1	4.2			
2	200.0790	4OA002L1ZVS210	1750	145T	86.5	3.0	6.0	6.1	58	3600
2.5			1730		84.0	3.5	7.0			2700
3	200.0791	4OA003L1ZVS210	1760	182T	89.5	4.0	8.0	8.6	92	3600
3.5			1750		88.5	4.5	9.0			3150
4			1740		87.5	5.1	10.2			2700
4.5			1735		87.5	5.7	11.4			2400
5	200.0792	4OA005L1ZVS210	1755	184T	89.5	6.4	12.8	13.8	104	3600
5.5			1750		88.5	6.9	13.8			3300
6			1745		88.5	7.5	15.0			3000
6.5			1740		87.5	8.1	16.2			2850
7			1735		87.5	8.8	17.6			2700
7.5	200.0793	4OAY75L1ZVS210	1760	213T	91.7	9.8	19.6	21.0	175	3600
8			1760		91.0	10.1	20.2			3450
8.5			1760		91.0	10.7	21.4			3300
9			1760		91.0	11.2	22.4			3000
9.5			1755		91.0	11.8	23.6			2850
10	200.0794	4OA010L1ZVS210	1760	215T	91.7	13.0	26.0	28.0	190	3600
10.5			1760		91.0	13.3	26.6			3000
11			1760		91.0	13.9	27.8			2850
11.5			1760		91.0	14.5	29.0			2700
12			1755		91.0	15.1	30.2			2250
15	200.0795	4OA015L1ZVS210	1770	254T	92.4	19.0	38.0	42.0	289	3600
20	200.0796	4OA020L1ZVS210	1770	256T	93.0	25.0	50.0	55.0	331	2550

TOSHIBA EQP Global™ SD With Hybrid Ceramic Bearings (208, 230, 460 Volt)

Efficiency, Quality & Performance (EQP) 3600 RPM MOTORS

3600 RPM Motors										
						FLA				
HP	Part #	Toshiba Spec #	RPM @ 60Hz with slip	FRAME	EFF	460V	230V	208V	LBS	Max RPM
1	200.0797	2OAY15L1ZVS210	3525	143T	82.5	1.5	3.0		50	4800
1.5			3490		84.0	2.0	4.0	4.4		
2	200.0798	2OA002L1ZVS210	3490	145T	85.5	2.6	5.2	5.7	53	4800
2.5			3455		82.5	3.1	6.2			
3	200.0799	2OA003L1ZVS210	3500	182T	86.5	3.7	7.4	8.0	80	4800
3.5			3480		85.5	4.2	8.4			
4			3460		84.0	4.8	9.6			
4.5			3440		82.5	5.5	11.0			
5	200.0800	2OA005L1ZVS210	3500	184T	88.5	5.8	11.6	13.0	95	4800
5.5			3480		87.5	6.3	12.6			
6			3465		86.5	6.9	13.8			
6.5			3455		86.5	7.6	15.2			
7			3440		85.5	8.2	16.4			
7.5	200.0801	2OAY75L1ZVS210	3500	213T	89.5	9.0	18.0	20.0	159	4800
8			3490		89.5	9.4	18.8			
8.5			3485		89.5	10.0	20.0			
9			3475		88.5	10.6	21.2			
9.5			3470		88.5	11.2	22.4			
10	200.0802	2OA010L1ZVS210	3510	215T	90.2	11.8	24.0	26.0	177	4800
10.5			3500		89.5	12.3	24.6			
11			3495		89.5	12.9	25.8			
11.5			3490		88.5	13.4	26.8			
12			3485		88.5	14.1	28.2			
15	200.0803	2OA015L1ZVS210	3530	254T	91.0	18.0	36.0	40.0	274	4800
20	200.0804	2OA020L1ZVS210	3520	256T	91.0	24.0	48.0	53.0	292	4800

PRMH20240272

503F-0521 (Replaces 503F-0919)

Please recycle

www.nortekair.com
nortekairinfo@nortek.com

The next step in HVAC drives

The new ACH580 drives come with a range of advanced features, such as a new primary settings menu that makes commissioning the drives much easier and faster. Optional Bluetooth connectivity offers improved accessibility for drives in remote areas and increases safety by letting users stay out of arc flash zones.

Simple to select, install and use
All the essentials – such as chokes, EMC filters, cabling clamps, certified BACnet communication, and enclosures from UL (NEMA) Type 1 to UL (NEMA) Type 12 – are a standard part of the drive, simplifying selection, installation, and commissioning.

Safe maintenance
The packaged disconnect solution provides a main disconnect switch, further increasing safety for people working on air-handling units.

Motor control options to meet your application needs
ACH580 drives can be integrated with several types of AC motors, even high-efficiency permanent magnet (PM) and synchronous reluctance (SynRM) motors. Using these motors can reduce your energy costs even more.

Additional I/O options
Take advantage of the added flexibility and accessibility – never be without back-up I/O points at the job site again.

ACH580 drives are ideal for HVAC fans, pumps, compressors, air-handling units, and chillers. These are used in hospitals, data centers, shopping centers, tunnel ventilation, factories, office buildings, and more.

Intuitive control panel
The drive's HVAC-specific software, intuitive control panel with customizable text, and menu-driven programming simplify setup and operation of even the most complex applications. You can customize the view so that it only shows the information you need, and it automatically saves a backup of your most recent configuration so that it's always available.

Optional Bluetooth® capability
ABB's new HVAC Bluetooth control panel lets you commission the drive remotely, safely outside the arc flash boundary. The Drivetune smartphone app allows you to commission and tune the drive from a distance, giving you access to the same primary settings and other menus available on the drive's HVAC control panel.

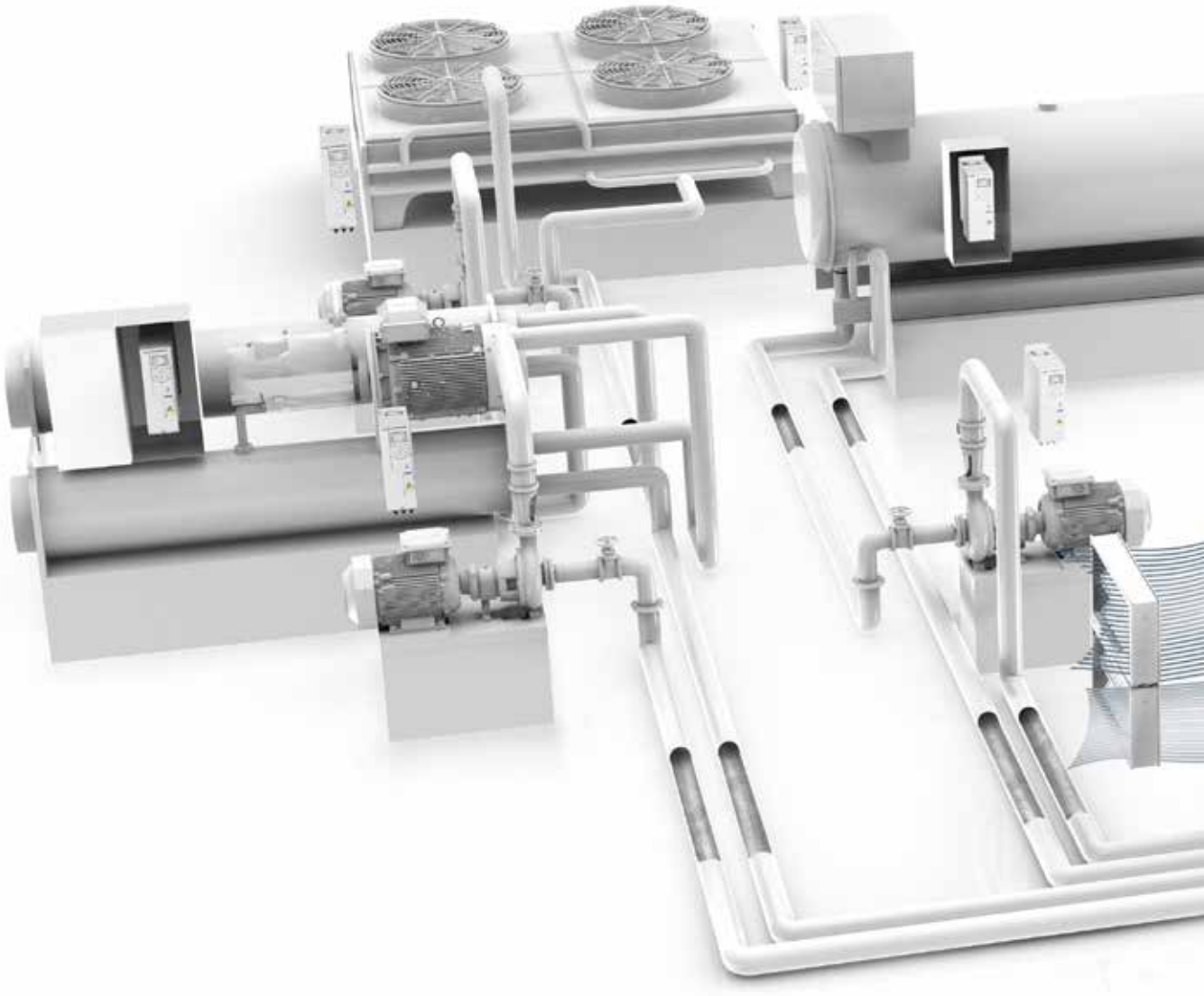
Reliable communication
BACnet MS/TP, Modbus RTU and Johnson Controls N2 are embedded in every ACH580. In addition, a wide range of optional fieldbus adapters are available to enable connectivity with all major building automation and control systems.

Harmonic mitigation
The drive provides reduced harmonics with built-in, optimized DC choke in a small and lightweight design.

Ultra-low harmonic (ULH) drive for a clean network
The revolutionary ACH580 ultra-low harmonic drive is designed specifically for the HVAC market, minimizing the effect of harmonics on your system. This all-in-one solution is fully integrated within the ACH580 platform and leverages the same programming tools, user settings, options, and functions, while providing superior harmonic performance.

Premier air handling

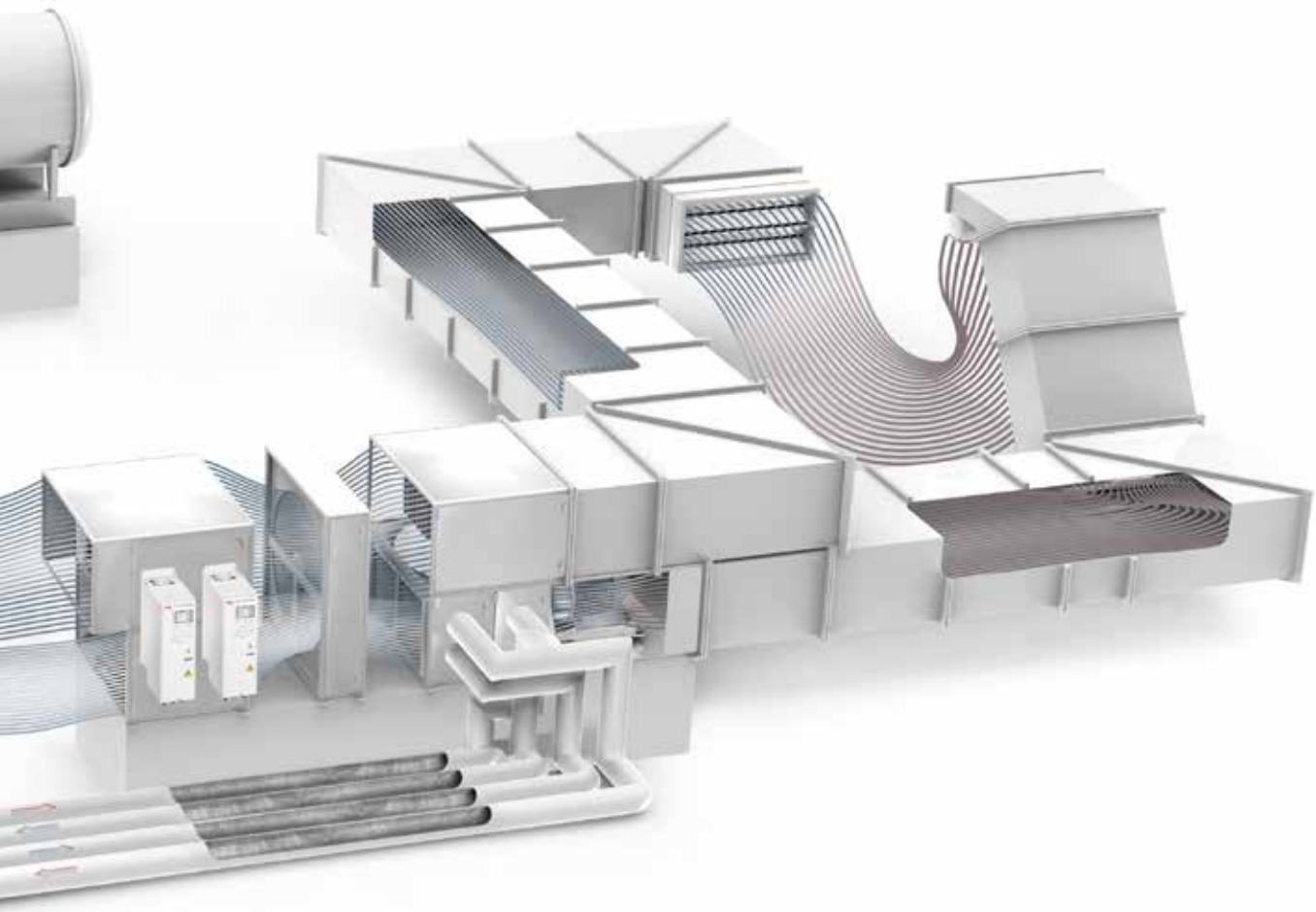
We understand the complexity of air handling systems and the need to produce high levels of comfort, control, and safety. Regardless of the season or external conditions, we help make your system efficient, safe, and informative.



Effortless system startup
The ACH580 ensures a smooth, coordinated start to your HVAC system. Embedded interlock logic enables the drive to confirm that equipment such as dampers are in the right position and sensors are showing the correct status before operations begin. The control panel's Primary Settings menu and built-in assistants streamline commissioning, allowing basic setup to be completed in minutes. The Drive Composer PC tool simplifies the customization of the drive.

Increased energy savings
Increase energy savings by using the appropriate motor and drive combination. The ACH580 drive works with a variety of motors, such as induction, PM, or SynRM, enabling high efficiencies.

Improved safety
Built-in safety functionality, such as override mode, enables your system to override all non-essential faults during emergencies to maintain air quality in the fire exit paths.



The control panel's optional Bluetooth capability provides an extra level of safety for commissioning and troubleshooting.

Reduced costs
The ACH580 reduces costs by eliminating dependencies on external controllers. The drive can use its internal PID loops to maintain a pressure setpoint by checking the active pressure and adjusting the fan speed accordingly.

Improved monitoring and maintenance
Leverage advanced system monitoring, giving you access to data on all aspects of the operation. Use this information to plan maintenance based on the actual needs of the application. With built-in monitoring, the drive lets you know when it’s time to take action if a fan stalls, a belt breaks, a filter clogs, and more.

Common characteristics of the ACH580 drives family

ACH580 series

HVAC control panel with primary settings
- Primary settings makes commissioning the drive easier than ever before
- The optional Bluetooth-enabled control panel allows easy smartphone connection and remote support capability
- Easily available USB interface for PC and tool connection
- Help button for problem-solving

HVAC communication protocols
- The most common HVAC communication protocols – BACnet MS/TP, Johnson Controls N2 and Modbus RTU – are standard
- BACnet/IP with optional fieldbus adapter

Ingress protection
- ACH580 drives are available in multiple different UL/NEMA classes. Check the details at the end of this catalog.

Suitable for various HVAC applications
- Suitable not only for variable-torque applications like fans and pumps, but also for basic constant-torque applications like compressors
- Support for induction, premanent magnet and synchronous reluctance motors

Reliability and quality
- All units are tested under full load at maximum allowed ambient temperature to verify quality
- Printed circuit boards have an extra coating to protect against humid and harsh environments

Harmonic mitigation options
- The ACH580-01 has optimized DC chokes standard for harmonic mitigation.
- Compliant with IEC/EN61000-3-12
- The ACH580-31 ultra-low harmonic drive results in harmonic current as low as 3 percent at the input terminals of the drive, meeting even the most stringent IEEE519 requirements.

Shared features of the ABB all-compatible drives portfolio

Drivetune smartphone app
- The Drivetune smartphone app together with the Bluetooth-enabled control panel allow you to set up and commission the drive remotely from a safe and comfortable location, using the same primary settings menu that is available on the control panel on the drive.

Energy efficiency calculators
- Optimize energy efficiency with features that help you to save and manage energy. You can monitor the hourly, daily cumulative, last hour, last day and last month energy consumption via kWh counters.

Diagnostic menu
- Analyze and resolve issues with the control panel's diagnostics menu. You can quickly analyze why the drive is performing as it is; running, stopped or running at the present speed.

Embedded load analyzers
- Analyze and optimize the application with the load profile log, which shows how the drive has been operating.

EMC/RFI category C2
- The EMC category C2 level design allows installation in commercial and residental buildings.

Reduced motor noise
- User-selectable switching frequencies to manage audible noise.

Integrated process control
- Reduce costs with built-in PID controllers, allowing drives to self-govern, limiting the need for external controllers.

Flexibility in programming
- Align the drive to the needs of your application and users with customized home screens and adaptive programming.

Extensive I/O capabilities
- ABB HVAC drives have an extensive number of I/O terminals in standard configuration
- Color-coded terminals and clear terminal marking significantly ease drive wiring process
- I/O status can be monitored via the I/O menu
- I/O can be forced on or off to verify the drive's programming

Same PC tools for ABB all-compatible drives
- Drive composer entry available for free at www.abb.com
- Same parameter structure makes the all-compatible platform easy to use

Connectivity
- ABB's F-series fieldbus adapters can be used throughout the all-compatible platform
- Fieldbus settings are made easy with the Primary Settings menu
- Bluetooth connectivity to apple and android devices

Technical data for the ACH580-01 and ACH580-31

Product compliance (complete list on following page)	
ACH580-01, ACH580-31	CE, UL, cUL, and EAC
Supply connection	
Input voltage (U_1)	
ACH580-xx-xxxA-2	208/240V
ACH580-xx-xxxA-4	480V
ACH580-xx-xxxA-6	600V
Input voltage tolerance	+10% / -15%
Phase	3-phase (1-phase, 240 V)
Frequency	48 to 63 Hz
Line Limitations	Max ±3% of nominal phase to phase input voltage
Power Factor (cos φ) at nominal load	
ACH580-01	0.98
ACH580-31	1.0
Efficiency at rated power	
ACH580-01	98.0%
ACH580-31	96.5%
Power Loss	Approximately 2% of rated power
Motor connection	
Supported motor control	Scalar and vector
Supported motor types	Asynchronous motor, permanent magnet motor (vector), SynRM (vector)
Voltage	3-phase, from 0 to supply voltage
Frequency	0 to 500 Hz
Short Term Overload Capacity Variable Torque	110% for 1 min/10min
Peak Overload Capacity Variable Torque	1.35 for 2 second (2 sec / 10 min)
Switching Frequency	2, 4, 8 or 12 kHz Automatic fold back in case of overload
Acceleration/ Deceleration Time	0 to 1800 s
Short Circuit Current Rating (SCCR)	100 kA with fusing

Inputs and outputs (drive)	
2 analog inputs	Selection of Current/Voltage input mode is user programmable.
Voltage reference	0 (2) to 10 V, R_{in} > 200 kΩ
Current reference	0 (4) to 20 mA, R_{in} = 100 Ω
Potentiometer reference value	10 V ±1% max. 20 mA
2 analog outputs	AO1 is user programmable for current or voltage. AO2 current
Voltage reference	0 to 10 V, R_{load}: > 100 kΩ
Current reference	0 to 20 mA, R_{load}: < 500 Ω
Applicable potentiometer	1 kΩ to 10 kΩ
Internal auxiliary voltage	24 V DC ±10%, max. 250 mA
Accuracy	+/- 1% full scale range at 25°C (77°F)
Output updating time	2 ms
6 digital inputs	12 to 24 V DC, 10 to 24 V AC, Connectivity of PTC sensors supported by a single digital input. PNP or NPN connection (5 DIs with NPN connection). Programmable
Input Updating Time	2 ms
3 relay outputs	Maximum switching voltage 250 V AC/30 V DC. Maximum continuous current 2 A rms. Programmable, Form C
Contact material	Silver Tin Oxide ($AgSnO_2$)
PTC, PT100 and PT1000	Any of the analog inputs, or digital input 6, are configurable for PTC with up to 6 sensors.
Adjustable filters on analog inputs and outputs	
All control inputs isolated from ground and power	
Operation	
Air temperature	-15 to +50 °C (5 to 122 °F). -15 to 0 °C (5 to 32 °F): No frost allowed. Output derated above +40 °C (104 °F)
Installation site altitude	0 to 4000 m (13123 ft) above sea level Output derated above 1000 m (3281 ft)
Relative humidity	5 to 95%: No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Atmospheric pressure	70 to 106 kPa (10.2 to 15.4 PSI) 0.7 to 1.05 atmospheres
Vibration	Risk category IV Certified (IBC 2018)

Environmental protections	
Chemical Gasses	Class 3C2
Solid Particles	Class 3S2 No conductive dust allowed
Pollution degree (IEC/EN 61800-5-1)	Pollution degree 2
Product compliance	
Standards and directives	Low Voltage Directive 2006/95/EC EMC Directive 2004/108/EC 60721-3-3: 2002 60721-3-1:1997 Quality assurance system ISO 9001 and Environmental system ISO 14001 CE, UL, cUL, and EAC approvals Galvanic isolation according to PELV RoHS2 (Restriction of Hazardous Substances) EN 61800-5-1: 2007; IEC/EN 61000-3-12; EN61800-3: 2017 + A1: 2012 Category C2 (1st environment restricted distribution); Safe torque off (EN 61800-5-2) BACnet Testing Laboratory (BTL) Seismic (IBC, OSHPD) Plenum rated
EMC (according to EN61800-3)	ACH580-01 and ACH580-31 class C2 (1st environment restricted distribution)
Storage (in Protective Shipping Package)	
Air Temperature	-40 to +70 °C (-40 to +158 °F)
Relative Humidity	Less than 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Chemical Gasses	Class 1C2
Solid Particles	Class 1S2 Contact ABB regarding Class 1S3
Atmospheric pressure	70 to 106 kPa 0.7 to 1.05 atmospheres
Vibration (ISTA)	
R1…R4	In accordance with ISTA 1A
R5…R9	In accordance with ISTA 3E

Transportation (in Protective Shipping Package)	
Air Temperature	-40° to 70°C (-40° to 158°F)
Relative Humidity	Less than 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Atmospheric Pressure	60 to 106 kPa (8.7 to 15.4 PSI) 0.6 to 1.05 atmospheres
Free Fall	R1: 76 cm (30 in) R2: 61 cm (24 in) R3: 46 cm (18 in) R4: 31 cm (12 in) R5: 25 cm (10 in)
Chemical Gasses	Class 2C2
Solid Particles	Class 2S2
Shock/ Drop (ISTA)	
R1…R4	In accordance with ISTA 1A
R5…R9	In accordance with ISTA 3E
Vibration (ISTA)	
R1…R4	In accordance with ISTA 1A
R5…R9	In accordance with ISTA 3E

Ratings, types and voltages
ACH580-01, wall-mounted drives

Type Code	Nominal Output Ratings [1]		Frame Size	Dim Ref UL Type 1	Dim Ref UL Type 12 +B056
	Current A	Power HP			
U_1 = 200 to 240 V. Power ratings are valid at nominal output voltage U_N = 208/230 V 60 Hz					
ACH580-01-04A6-2	4.6	1	R1	01-1-R1	01-12-R1
ACH580-01-06A6-2	6.6	1.5	R1	01-1-R1	01-12-R1
ACH580-01-07A5-2	7.5	2	R1	01-1-R1	01-12-R1
ACH580-01-10A6-2	10.6	3	R1	01-1-R1	01-12-R1
ACH580-01-017A-2	16.7	5	R1	01-1-R1	01-12-R1
ACH580-01-024A-2	24.2	7.5	R2	01-1-R2	01-12-R2
ACH580-01-031A-2	30.8	10	R2	01-1-R2	01-12-R2
ACH580-01-046A-2	46.2	15	R3	01-1-R3	01-12-R3
ACH580-01-059A-2	59.4	20	R3	01-1-R3	01-12-R3
ACH580-01-075A-2	74.8	25	R4	01-1-R4	01-12-R4
ACH580-01-088A-2	88	30	R5	01-1-R5	01-12-R5
ACH580-01-114A-2	114	40	R5	01-1-R5	01-12-R5
ACH580-01-143A-2	143	50	R6	01-1-R6	01-12-R6
ACH580-01-169A-2	169	60	R7	01-1-R7	01-12-R7
ACH580-01-211A-2	211	75	R7	01-1-R7	01-12-R7
ACH580-01-273A-2	273	100	R8	01-1-R8	01-12-R8
U_1 = 440 to 480 V. Power ratings are valid at nominal output voltage U_N = 460 V 60 Hz					
ACH580-01-02A1-4	2.1	1	R1	01-1-R1	01-12-R1
ACH580-01-03A0-4	3.0	1.5	R1	01-1-R1	01-12-R1
ACH580-01-03A5-4	3.5	2	R1	01-1-R1	01-12-R1
ACH580-01-04A8-4	4.8	3	R1	01-1-R1	01-12-R1
ACH580-01-07A6-4	7.6	5	R1	01-1-R1	01-12-R1
ACH580-01-012A-4	12	7.5	R1	01-1-R1	01-12-R1
ACH580-01-014A-4	14	10	R2	01-1-R2	01-12-R2
ACH580-01-023A-4	23	15	R2	01-1-R2	01-12-R2
ACH580-01-027A-4	27	20	R3	01-1-R3	01-12-R3
ACH580-01-034A-4	34	25	R3	01-1-R3	01-12-R3
ACH580-01-044A-4	44	30	R3	01-1-R3	01-12-R3
ACH580-01-052A-4	52	40	R4	01-1-R4	01-12-R4
ACH580-01-065A-4	65	50	R4	01-1-R4	01-12-R4
ACH580-01-077A-4	77	60	R4	01-1-R4	01-12-R4
ACH580-01-096A-4	96	75	R5	01-1-R5	01-12-R5
ACH580-01-124A-4	124	100	R6	01-1-R6	01-12-R6
ACH580-01-156A-4	156	125	R7	01-1-R7	01-12-R7
ACH580-01-180A-4	180	150	R7	01-1-R7	01-12-R7
ACH580-01-240A-4	240	200	R8	01-1-R8	01-12-R8
ACH580-01-302A-4	302	250	R9	01-1-R9	01-12-R9
ACH580-01-361A-4	361	300	R9	01-1-R9	01-12-R9
ACH580-01-414A-4	414	350	R9	01-1-R9	01-12-R9
U_1 = 500 to 600 V. Power ratings are valid at nominal output voltage U_N = 575 V 60 Hz					
ACH580-01-02A7-6	2.7	2	R2	01-1-R2	01-12-R2
ACH580-01-03A9-6	3.9	3	R2	01-1-R2	01-12-R2
ACH580-01-06A1-6	6.1	5	R2	01-1-R2	01-12-R2
ACH580-01-09A0-6	9.0	7.5	R2	01-1-R2	01-12-R2
ACH580-01-011A-6	11	10	R2	01-1-R2	01-12-R2
ACH580-01-017A-6	17	15	R2	01-1-R2	01-12-R2
ACH580-01-022A-6	22	20	R3	01-1-R3	01-12-R3
ACH580-01-027A-6	27	25	R3	01-1-R3	01-12-R3
ACH580-01-032A-6	32	30	R3	01-1-R3	01-12-R3
ACH580-01-041A-6	41	40	R5	01-1-R5	01-12-R5
ACH580-01-052A-6	52	50	R5	01-1-R5	01-12-R5
ACH580-01-062A-6	62	60	R5	01-1-R5	01-12-R5
ACH580-01-077A-6	77	75	R5	01-1-R5	01-12-R5
ACH580-01-099A-6	99	100	R7	01-1-R7	01-12-R7
ACH580-01-125A-6	125	125	R7	01-1-R7	01-12-R7
ACH580-01-144A-6	144	150	R8	01-1-R8	01-12-R8
ACH580-01-192A-6	192	200	R9	01-1-R9	01-12-R9
ACH580-01-242A-6	242	250	R9	01-1-R9	01-12-R9
ACH580-01-271A-6	271	250	R9	01-1-R9	01-12-R9

[1] See notes and definitions on page 18.

FANWALL® FAN CELL - GENERATION III

Generation III Features and Benefits

- Reduced weight
- Dimensional flexibility
- Integral electrical/control raceway
- All fans manufactured inhouse
- Increased stiffness of the supporting fan structure (specifically on the motor pedestal mounts and rails) to increase the natural frequency of the system
- Built-in Coplanar Silencer® for fan noise reduction
- Available in Huntair® brand products

Aluminum Perforated Interior Panels

Stainless steel option

Aluminum Structure

Innovative Fan/Motor Adjustable Slide Rail

Aluminum Perforated or Solid Exterior Panels

Stainless steel option

Integral Lifting Lugs and Connection Points

Generation III FANWALL Backdraft Damper

- Low profile – only protrudes into the airstream 3”
- Aluminum construction

NORTEK AIR SOLUTIONS HUNTAIR

753F-0921 (Replaces HUNT-FWT-SB-3A October 2013)

Website: nortekair.com

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FANWALL® Low Profile Backdraft Damper

Near Zero System Effect

CONSTRUCTION

MODELS

- (5) sizes that serve the 10", 12", 14", 16", 18", 20" and 22" FANWALL cone sizes

FRAME

- Low profile 4" deep non-corrosive extruded aluminum 6063 (T6)
- Integrated
  - Curved inlet
  - Perimeter seal gasket track
  - Bearing track
  - Discharge mounting flange

BLADES

- 1.5" wide non-corrosive extruded aluminum 6063 (T6)
- Integrated blade seal gasket track

BEARINGS

- Low friction sealed metal ball bearings for long life and continuous operation.

MAXIMUM VELOCITY

- 2000 fpm

The patent pending FANWALL Low Profile backdraft damper prevents parasitic losses due to backflow through idled fans and motors. It is the only commercially available means that does so automatically and with near zero impact (or system effect) on airflow while fans and motors are operating normally. When closed, the damper has an extremely low leak rate of 3.5 cfm/sq. ft. at 4" static pressure, which is less than half the 8 cfm/sq. ft. at 4" static pressure required for highest Class 1A rating of AMCA Standard 511. Alternative dampers used for the same purpose can introduce 0.5" to as much as 1.25" of static pressure penalty every minute the system is operating, with cataloged leak rates as high as 17.5 cfm/sq. ft. at 1" static pressure when they are closed!

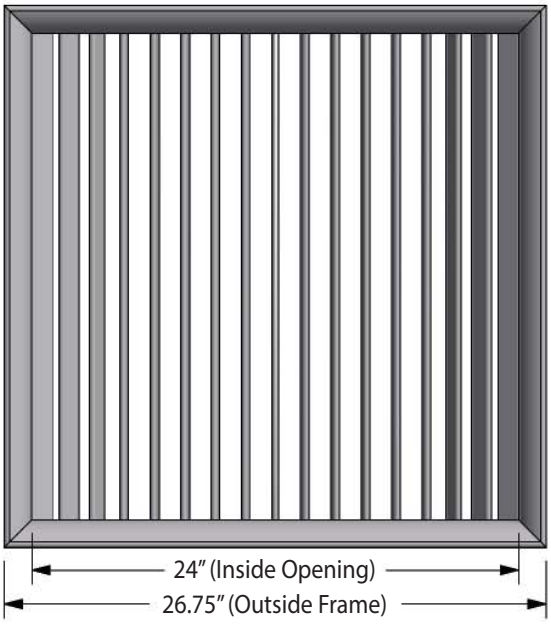
HUNTAIR®
a CES Group® Brand

PRMH20240272

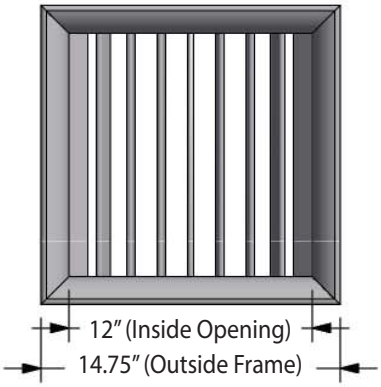
FANWALL® Low Profile Backdraft Damper

Near Zero System Effect

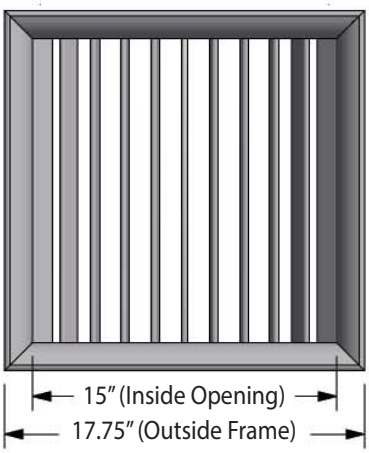
Model #: HBD0216
(Serves the 22″ Cone)



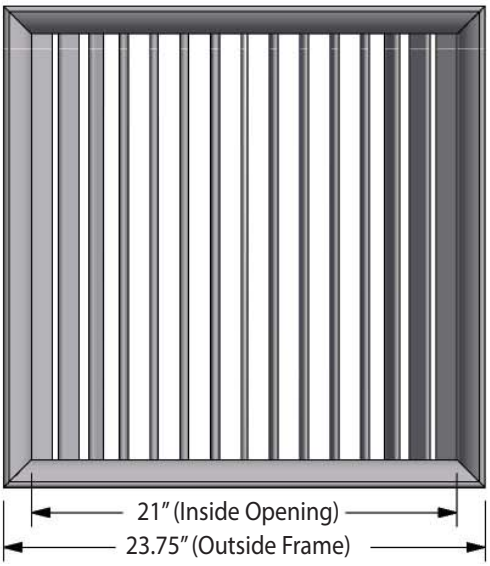
Model #: HBD0208
(Serves the 10″ Cone)



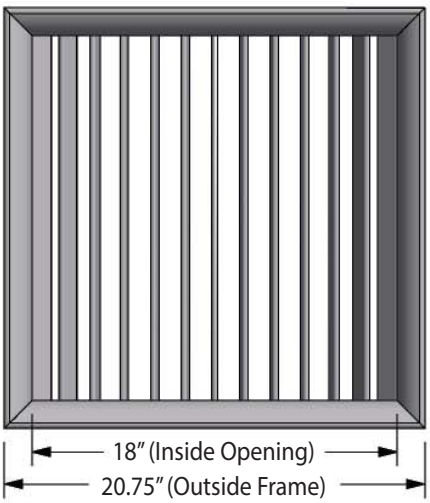
Model #: HBD0210
(Serves the 12″ & 14″ Cone)



Model #: HBD0214
(Serves the 18″ & 20″ Cone)



Model #: HBD0212
(Serves the 16″ Cone)



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RUSKIN®

AMCA LICENSED
See Page 2

3900 Dr. Greaves Rd. • Kansas City, MO 64030 • (816) 761-7476 • FAX (816) 765-8955

CD50 LOW LEAKAGE CONTROL DAMPER

High Performance Extruded Aluminum Airfoil
Class 1A Leakage Rated

APPLICATION

The CD50 is a low leak, extruded aluminum damper designed with airfoil blades for higher velocity and pressure HVAC stystems. It meets the leakage requirements of the International Energy Conservation Code by leaking less than 3 cfm/sq. ft. at 1" of static pressure and is AMCA licensed as a Class 1A damper.

STANDARD CONSTRUCTION

FRAME
5" x 1" x 6063T5 extruded aluminum hat channel with .125" minimum wall thickness (127 x 25 x 3.2). Low profile, 5" x 1/2" (127 x 13) top and bottom frames on dampers 12" (305) high and less. Mounting flanges on both sides of frame.

BLADES
6" (152) wide, 6063T5 heavy gage extruded aluminum, airfoil shape.

SEALS
Ruskiprene blade edge seals and flexible metal compressible jamb seals.

BEARINGS
Molded synthetic.

LINKAGE
Concealed in frame.

AXLES
1/2" (13) plated steel hex.

MAXIMUM SIZE
Single section – 60"w x 72"h (1524 x 1829).
Multiple section assembly – Unlimited size.

MINIMUM SIZE
Single blade – 6"w x 5"h (152 x 127).
Two blades, parallel or opposed action: 6"w x 9"h (152 x 229).

TEMPERATURE LIMITS
-72°F (-58°C) and +275°F (+135°C) .

FEATURES

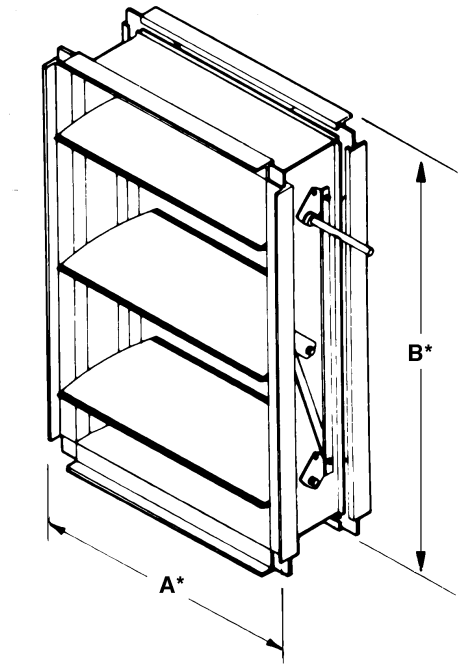
- Airfoil blade design for low pressure drop and less noise generation.
- Positive lock axles, noncorrosive bearings and shake proof linkage for low maintenance operation.
- Blade edge seals mechanically lock into the blade for superior sealing.

OPTIONS

- Factory-installed, pneumatic and electric actuators.
- Enamel and epoxy finishes.
- SP100 Switch Package to remotely indicate damper blade position.
- 16 gage galvanized steel hat channel frame.
- Front, rear or double flange frame with or without bolt holes.
- Face and bypass configurations.

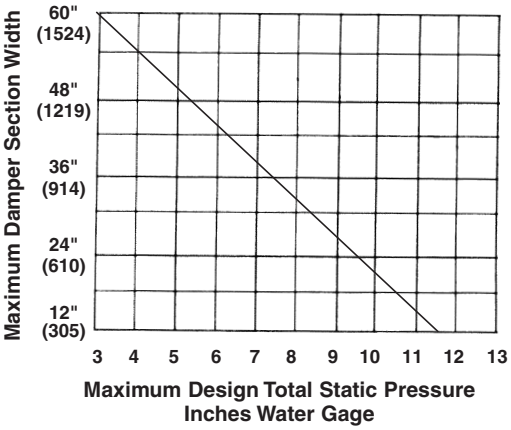
NOTE: Dimensions shown in parenthesis ( ) indicate millimeters.

*Units furnished approximately 1/4" (6) smaller than given opening dimensions.



CD50 AMCA LICENSED PERFORMANCE DATA

CD50 PRESSURE LIMITATIONS



The CD50 may be used in systems with total pressures exceeding 3.5" by reducing damper section width as indicated. Example: Maximum design total pressure of 8.5" w.g. would require CD50 damper with maximum section width of 36" (914).

Pressure limitations shown above allow maximum blade deflection of 1/180 of span on 60" (1524) damper widths. Deflections in other damper widths (less than 48" [1219]) at higher pressures shown will result in blade deflection substantially less than 1/180 of span.

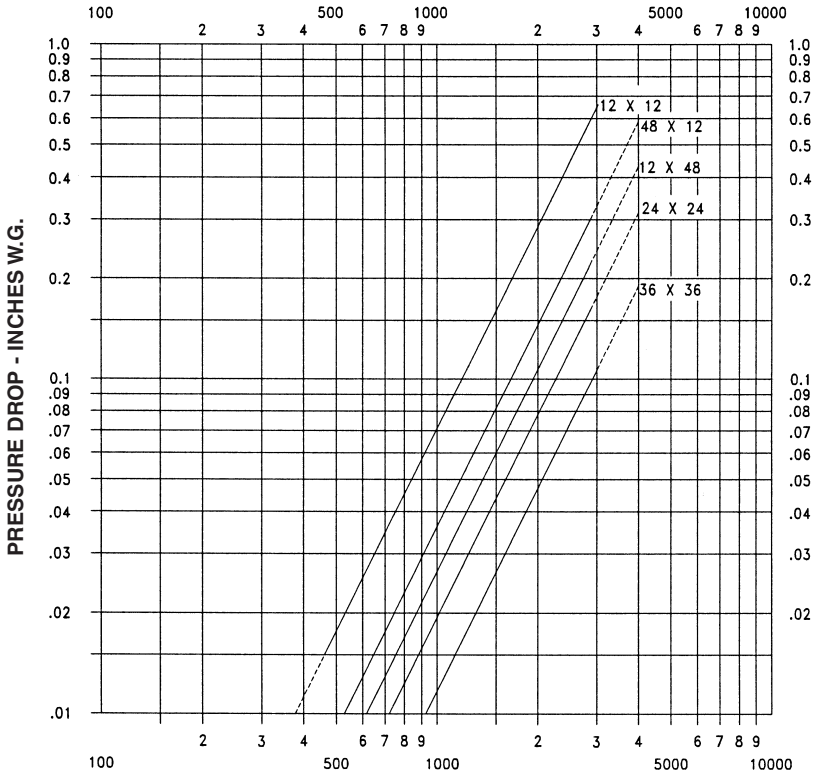
Ruskin Company certifies that the CD50 shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program.The AMCA International Certified Ratings Seal applies to Air Performance and Air Leakage.

Pressure/ Class	Leakage, L/s/m² (ft³/min/ft²)			
	Required Rating		Extended Ranges (Opt.)	
	1" (0.25 kPa)	4" (1.0 kPa)	8" (2.0 kPa)	12" (3.0 kPa)
1A	3 (15.2)	N/A	N/A	N/A
1	4 (20.3)	8 (40.6)	11 (55.9)	14 (71.1)
2	10 (50.8)	20 (102)	28 (142)	35 (178)
3	40 (203)	80 (406)	112 (569)	140 (711)

DAMPER WIDTH (INCHES)	1 IN. W.G.	4 IN. W.G.	8 IN. W.G.
12" (305)	IA	I	II
24" (610)	IA	I	II
36" (914)	IA	I	NA
48" (1219)	IA	I	NA
60"(1524)	IA	I	NA

Leakage testing conducted in accordance with AMCA Standard 500-D-98. Torque applied holding damper closed, 5 in. lbs./sq. ft. on opposed blade dampers and 7 in. lbs./sq. ft. on parallel blade dampers. Air leakage is based on operation between 50°F to 104°F. All data corrected to represent standard air density 0.075 lbs/ft³.

VELOCITY VS. PRESSURE DROP



FACE VELOCITY - FEET/MINUTE
AMCA FIG. 5.3

CD50 sizes 12 x 12, 24 x 24, 48 x 12, 12 x 48, 36 x 36 (305 x 305, 610 x 610, 1219 x 305, 305 x 1219, 914 x 914)

All data corrected to represent standard air at a density of 0.075 lbs/ft³.

PRMH20240272

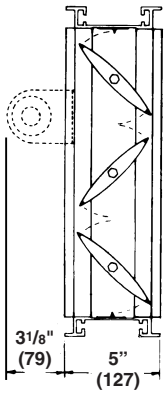
SOUND RATINGS

CD50 SOUND RATINGS

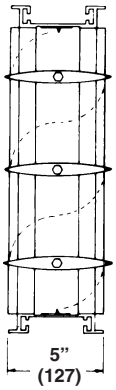
Damper Size	Damper Full Open		Damper 75% Open		Damper 50% Open		Damper 25% Open	
	CFM	NC	CFM	NC	CFM	NC	CFM	NC
12 x 12 (305 x 305)	2000	17	1500	11	1000	11	500	*
	3000	28	2250	22	1500	19	750	*
	4000	35	3000	29	2000	24	1000	*
18 x 18 (457 x 457)	2250	17	1688	10	1125	21	563	*
	4500	33	3375	26	2250	32	1125	*
	6750	43	5063	37	3375	40	1688	15
24 x 24 (610 x 610)	4000	11	3000	10	2000	26	1000	*
	8000	32	6000	30	4000	38	2000	21
	12000	43	9000	42	6000	46	3000	31

NC = Noise criteria in Decibels is based on 10db room effect and 10db of room attenuation.
* = Less than 10 NC
See ASHRAE Handbook (1977 Fundamentals, Chapter 7) for explanation of NC Ratings.

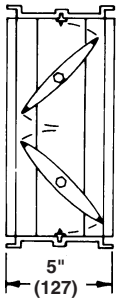
DIMENSIONAL INFORMATION



OPPOSED BLADE



PARALLEL BLADE



LOW PROFILE
Standard construction for higher free area on dampers 12" (305) high and less.

CD50 SUGGESTED SPECIFICATION

Furnish and install, at locations shown on plans, or in accordance with schedules, Low leakage dampers shall meet the following minimum construction standards: Frames shall be 5" x 1" x .125" (minimum thickness) (127 x 25 x 3.2) 6063T5 extruded aluminum hat channel with hat mounting flanges on both sides of the frame. Each corner shall be reinforced with two die formed internal braces and machine staked for maximum rigidity. Blades shall be airfoil type extruded aluminum (maximum 6" [152] depth) with integral structural reinforcing tube running full length of each blade.

Blade edge seals shall be extruded double edge design with inflatable pocket which enables air pressure from either direction to assist in blade to blade seal off. Blades seals shall be mechanically locked in extruded blade slots, yet shall be easily replaceable in field. Adhesive or clip-on type blade seals are not acceptable. Bearings shall be non-corrosive molded synthetic. Axles shall be hexagonal (round not acceptable) to provide positive locking connection to blades and linkage. Linkage shall be concealed in frame. Submittal must include leakage, maximum air flow and maximum pressure ratings based on AMCA Publication 500. Damper shall be tested and licensed in accordance with AMCA 511 for Air Performance and Air Leakage. Damper widths from 12" to 60" (305 to 1524) wide shall not leak any greater than 8 cfm sq. ft. @ 4" w.g. and a maximum of 3 CFM sq. ft. @ 1" w.g. Dampers shall be in all respects equivalent to Ruskin Model CD50.

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SIEMENS

Submittal Sheet
Document No. 154-001P25
December 7, 2009

OpenAir™ GCA Series, Spring Return,160 lb-in, Electronic Damper Actuators

Description

The OpenAir GCA Series spring return, 160 lb-in (18 Nm) electronic damper actuators provide modulating, two-position and floating control of building HVAC dampers.

Product Number	Operating Voltage			Control				Cables		Built-in Control Options			
	24 Vac ± 20%	24 Vdc ±10%	120 Vac ± 10%	0 to 10 Vdc	2 to 10 Vdc or 0 to 10 Vdc	Floating	2-position	Standard	Plenum	Position Feedback	Dual Auxiliary Switches	Signal Inversion	Offset 0 to 5 Vdc Span 2 to 30 Vdc
GCA121.1U	●	●					●	●					
GCA121.1P	●	●					●		●				
GCA126.1U	●	●					●	●			●		
GCA126.1P	●	●					●		●		●		
GCA221.1U			●				●	●					
GCA226.1U			●				●	●			●		
GCA131.1U	●	●				●		●					
GCA131.1P	●	●				●			●				
GCA132.1U	●	●				●		●		●			
GCA132.1P	●	●				●			●	●			
GCA136.1U	●	●				●		●			●		
GCA136.1P	●	●				●			●		●		
GCA151.1U	●	●			●			●		●		●	
GCA151.1P	●	●			●				●	●		●	
GCA156.1U	●	●			●			●		●	●	●	
GCA156.1P	●	●			●				●	●	●	●	
GCA161.1U	●	●		●				●		●			
GCA161.1P	●	●		●					●	●			
GCA163.1U	●	●		●				●		●			●
GCA163.1P	●	●		●					●	●			●
GCA164.1U	●	●		●				●		●	●		●
GCA164.1P	●	●		●					●	●	●		●
GCA166.1U	●	●		●				●		●	●		
GCA166.1P	●	●		●					●	●	●		

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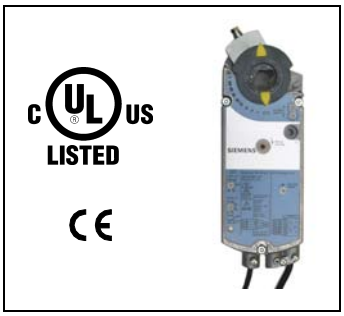


Features

- Brushless DC motor technology with stall protection
- Bi-directional fail-safe spring return
- Patented self-centering shaft coupling
- Models available with dual independently adjustable auxiliary switches
- All modulating models offer built-in feedback
- Floating control models available with feedback potentiometer
- All metal housing
- Manual override
- 5° preload as shipped from factory
- Mechanical range adjustment capability by moving shaft coupling to desired position
- Easily visible position indicator
- Precabled
- CE, UL60730, and cUL (C22.2 No. 24-93) listed

Technical Data

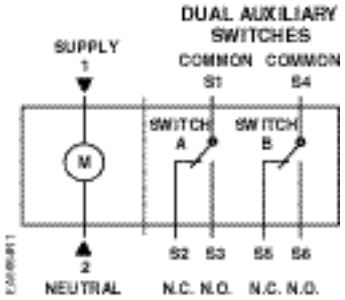
24 Vac, 120 Vac Torque:	160 lb-in (18 Nm) running and spring return <360 lb-in (40 Nm) maximum
NOTE:	At -25°F, spring return is 142 lb-in (16 Nm)
Runtime for 90°:	90 sec. operating, 15 sec. typical (30 sec. max.) closing on power loss
Frequency:	50/60 Hz
Power consumption: Running:	7 VA/5W (24 Vac/dc; GCA12x, GCA13x) 7 VA/5W (24 Vac/dc, GCA15x) 7 VA/5W (24 Vac/dc GCA16x) 8 VA (120 Vac GCA22x)
Power consumption: Holding	5 VA/3W (24 Vac/dc, GCA12x) 5 VA/3W (24 Vac/dc, GCA13x, GCA15x) 5 VA (24 Vac/dc, GCA16x) 6 VA (120 Vac, GCA22x)
Equipment rating (24V):	Class 2 per UL/CSA
Noise level:	<45 dBA (running)
Angle of rotation:	90° nominal, 95° max.
Shaft dimensions:	3/8-in to 1-in (8 to 25.6 mm) dia. 1/4-in to 3/4-in (6 to 18 mm) sq. 3/4-in (20 mm) min. length
Operating temperature:	-25°F to 130°F (-32°C to 55°C)
Storage temperature:	-40°F to 158°F (-40°C to 70°C)
Ambient humidity:	95% rh (non-condensing)
Pre-cabled connection:	18 AWG, 3 ft (0.9 m) long
Enclosure:	NEMA 2, IP54 per EN 60 529
Material:	Die cast aluminum alloy
Agency listings:	CE, UL60730, cUL C22.2 No. 24-93
Gear Lubrication:	Silicone-free
Weight:	4.85 lb (2.2 kg)
Dimensions:	11-13/16 in (300 mm) H 4-3/4 in (120 mm) W 2-7/8 in (72 mm) D

Typical Specifications

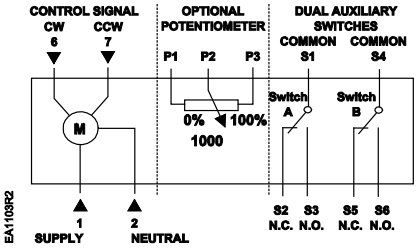
Spring-return damper actuators shall be the type that requires no connecting linkages. The spring return actuators shall have a self-centering damper shaft coupling that assures concentric alignment of the actuator's output coupling with the damper shaft and be capable of direct mounting to a shaft up to a 1-inch diameter. Actuators shall use a brushless DC motor and provide stall protection throughout the full range of rotation. All spring return actuators shall be capable of both clockwise and counterclockwise spring return fail-safe operation using a continuously engaged mechanical return spring that returns the actuator to a fail-safe position in <20 seconds in response to a loss of power. All actuators shall provide a means of manually positioning the output coupling in the absence of power. Dual independently adjustable auxiliary switches must be integral to the actuator. All actuators must be precabled and provide an easily readable high contrast yellow on black position indicator. All actuators shall be UL60730 and CSA22.2 listed and manufactured under ISO 9002 and ISO 14000 procedures. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuators rated torque and temperatures. Actuators shall be as manufactured by Siemens Building Technologies, Inc.

Wiring Diagrams

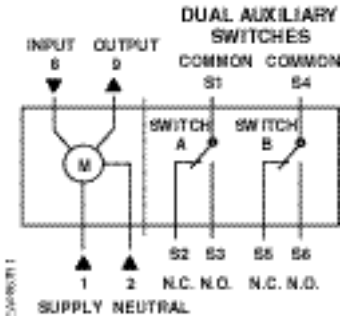
2-Position, 24 Vac/dc:



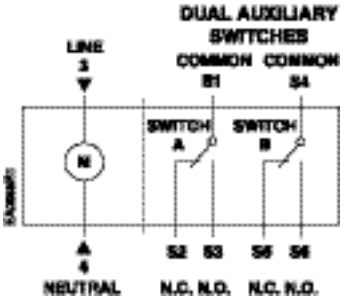
Floating, 24 Vac/dc:



0 to 10 Vdc, GCA16x, 24 Vac/dc;
2 to 10 Vdc, GCA15x, 24 Vac/dc:



2-Position, 120 Vac:



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Your feedback is important to us. If you have comments about this document, please send them to
sbt_technical.editor.us.sbt@siemens.com

PRMH20240272

AAF INTERNATIONAL *Better Air is Our Business®*

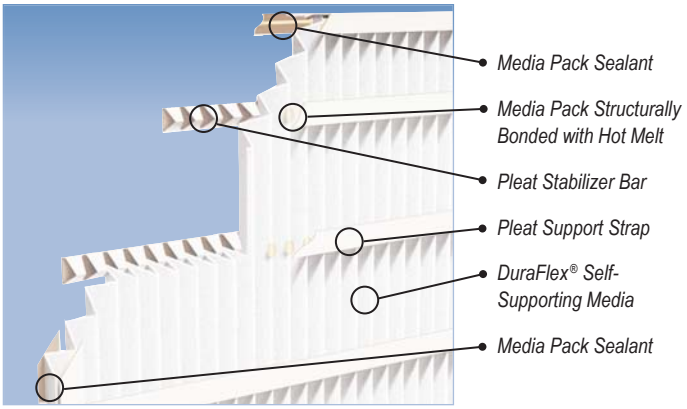
AmericanAirFilter

PerfectPleat® ULTRA

Extended Surface, Pleated Filter with Antimicrobial – MERV 8

- ***Mechanical efficiency — does not rely on electret charge technology***
- ***Self-supporting DuraFlex® media made from virgin fiber; no wire support needed***
- ***Consistent media with controlled fiber size and blend***
- ***Incorporates antimicrobial***
- ***Available in 1", 2" and 4" models***
- ***Environmentally friendly – no dies, no metal, fully incinerable***
- ***Patented media, filter design, and manufacturing process. Covered under one or more of the following patents: US 6398839 B2; US 6254653 B1; US 6159318; US 6165242; US 6387140 B1 (1" model only)***

The PerfectPleat ULTRA filter is designed to consistently increase efficiency throughout the service life of the filter. The PerfectPleat ULTRA filter has approximately 25% more media than our standard capacity filter and also incorporates an antimicrobial. The antimicrobial is applied to the media to preserve the integrity of the media throughout the filter's useful life by inhibiting microbial growth. PerfectPleat ULTRA filters have an initial MERV 8 rating respectively, but the efficiency increases significantly when dust holding begins. PerfectPleat ULTRA filters have distinctive self-supporting characteristics that allow a pleating pattern, which promotes airflow and maximizes dust holding capacity (DHC). The PerfectPleat ULTRA filter is ideal for applications where pleated filters are currently in use and higher efficiencies are desired or required. It is also suited to high moisture conditions where bacterial growth may be likely to occur on air filters.



PerfectPleat® *ULTRA 2" Filter Construction*

Superior Design and Construction

The perimeter frame is constructed from the highest wet-strength 28 pt. beverage carrier board, securely bonded to the media pack. The 1" model employs three supporting straps on the air-entering and air-leaving sides of the filter to control pleat spacing and support the media pack in the perimeter frame.

Support straps on the air entering side are used in combination with uniquely designed pleat stabilizers on the air-leaving side of the 2" model to provide additional strength. The support straps and pleat stabilizers ensure integrity against turbulent airflow. The 2" filter resists crushing and abuse and provides excellent lateral stability for installation in side-access systems.

The 4" model utilizes a two piece die cut frame with integral pleat spacers on the air leaving side. Pleat spacing is controlled by straps bonded to the air entering side and the multiple rows of pleat spacers on the air leaving side. The pleat spacers also ensure the pleats remain open during use, maximizing filter life.

DuraFlex® Media – Patented Media Design

Uniform size virgin fibers are assembled in closely controlled blends to create a media that is both self-supporting and consistent in performance. When pleated, DuraFlex media will hold its shape without the wire support characteristic of conventional pleated filters. That means no potential for the formation of rust and safer handling. With the superior resiliency of DuraFlex media and no need for wire support, PerfectPleat ULTRA filters can sustain significant abuse and maintain their shape and pleat spacing. The absence of wire also makes the filter totally incinerable, which can simplify disposal.

PRMH20240272

AmericanAirFilter

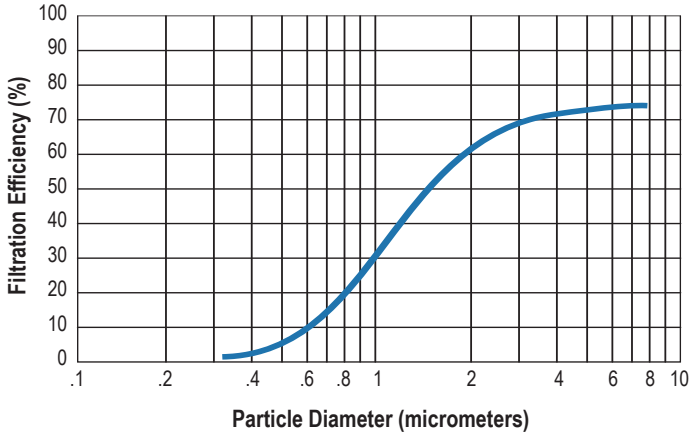
PerfectPleat® ULTRA

Performance Data

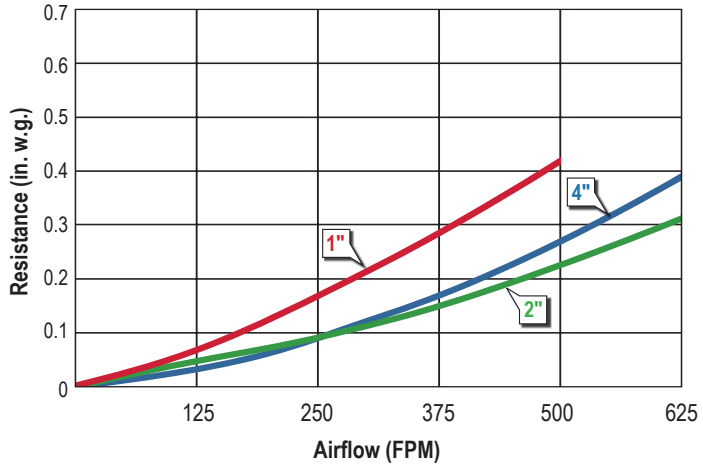
Filter	Pleats Per Lineal Foot	Rated Initial Resistance (in. w.g.) 300 FPM	500 FPM	625 FPM	Recommended Final Resistance (in. w.g.)	ASHRAE 52.2 MERV	Continuous Operating Temperature Limits
1" PerfectPleat ULTRA	15.0	.23	**.42**	--	1.0	8	150ºF / 66ºC
2" PerfectPleat ULTRA	15.0	.12	**.23**	.31	1.0	8	150ºF / 66ºC
4" PerfectPleat ULTRA	11.0	.12	**.27**	.39	1.0	8	200ºF / 93ºC

Composite Minimum Efficiency

Efficiency vs. Particle Size



Resistance to Airflow



Product Information — Standard Sizes

Nominal Sizes (Inches) (W x H x D)	Actual Sizes (Inches) (W x H x D)	Rated Airflow (SCFM) 300 FPM	500 FPM	625 FPM	Pleats Per Filter
10 x 10 x 1	9½ x 9½ x ¾	200	**350**		11
10 x 20 x 1	9½ x 19½ x ¾	400	**700**		11
12 x 12 x 1	11½ x 11½ x ¾	300	**500**		14
12 x 20 x 1	11½ x 19½ x ¾	500	**850**		14
12 x 24 x 1	11⅜ x 23⅜ x ¾	600	**1000**		14
14 x 20 x 1	13½ x 19½ x ¾	600	**1000**		16
14 x 25 x 1	13½ x 24½ x ¾	750	**1200**		16
15 x 20 x 1	14½ x 19½ x ¾	650	**1050**		17
16 x 16 x 1	15½ x 15½ x ¾	550	**900**		19
16 x 20 x 1	15½ x 19½ x ¾	650	**1100**		19
16 x 25 x 1	15½ x 24½ x ¾	850	**1400**		19
18 x 20 x 1	17½ x 19½ x ¾	750	**1250**		21
18 x 24 x 1	17⅜ x 23⅜ x ¾	900	**1500**		21
18 x 25 x 1	17½ x 24½ x ¾	950	**1550**		21
20 x 20 x 1	19½ x 19½ x ¾	850	**1400**		24
20 x 25 x 1	19½ x 24½ x ¾	1050	**1750**		24
24 x 24 x 1	23⅜ x 23⅜ x ¾	1200	**2000**		29
25 x 25 x 1	24½ x 24½ x ¾	1300	**2200**		30
10 x 20 x 2	9½ x 19½ x 1¾	400	**700**	850	11
12 x 20 x 2	11½ x 19½ x 1¾	500	**850**	1050	14
12 x 24 x 2	11⅜ x 23⅜ x 1¾	600	**1000**	1250	14
14 x 25 x 2	13½ x 24½ x 1¾	750	**1200**	1500	16
15 x 20 x 2	14½ x 19½ x 1¾	650	**1050**	1300	17
15 x 25 x 2	14½ x 24½ x 1¾	800	**1300**	1650	17
16 x 16 x 2	15½ x 15½ x 1¾	550	**900**	1100	19
16 x 20 x 2	15½ x 19½ x 1¾	650	**1100**	1400	19
16 x 24 x 2	15⅜ x 23⅜ x 1¾	800	**1350**	1650	19
16 x 25 x 2	15½ x 24½ x 1¾	850	**1400**	1750	19
18 x 24 x 2	17⅜ x 23⅜ x 1¾	900	**1500**	1900	21
18 x 25 x 2	17½ x 24½ x 1¾	950	**1550**	1950	21
20 x 20 x 2	19½ x 19½ x 1¾	850	**1400**	1750	24
20 x 24 x 2	19⅜ x 23⅜ x 1¾	1000	**1650**	2100	24
20 x 25 x 2	19½ x 24½ x 1¾	1050	**1750**	2150	24
24 x 24 x 2	23⅜ x 23⅜ x 1¾	1200	**2000**	2500	29
25 x 25 x 2	24½ x 24½ x 1¾	1300	**2150**	2700	30
12 x 24 x 4	11⅜ x 23⅜ x 3¾	600	**1000**	1250	10
16 x 20 x 4	15⅜ x 19⅜ x 3¾	650	**1100**	1400	13
16 x 25 x 4	15⅜ x 24⅜ x 3¾	850	**1400**	1750	13
18 x 24 x 4	17⅜ x 23⅜ x 3¾	900	**1500**	1875	15
20 x 20 x 4	19⅜ x 19⅜ x 3¾	850	**1400**	1750	17
20 x 25 x 4	19⅜ x 24⅜ x 3¾	1050	**1750**	2150	17
24 x 20 x 4	23⅜ x 19⅜ x 3¾	1000	**1650**	2100	17
24 x 24 x 4	23⅜ x 23⅜ x 3¾	1200	**2000**	2500	21
25 x 29 x 4	24⅜ x 28⅜ x 3¾	1500	**2500**	3150	26

PerfectPleat® and DuraFlex® are registered trademarks of AAF-McQuay Inc. in the U.S. and Canada.

PerfectPleat ULTRA filters are UL classified.
Testing was performed according to UL Standard 900 and CAN 4-S111.

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AFP-1-203H OCT '12

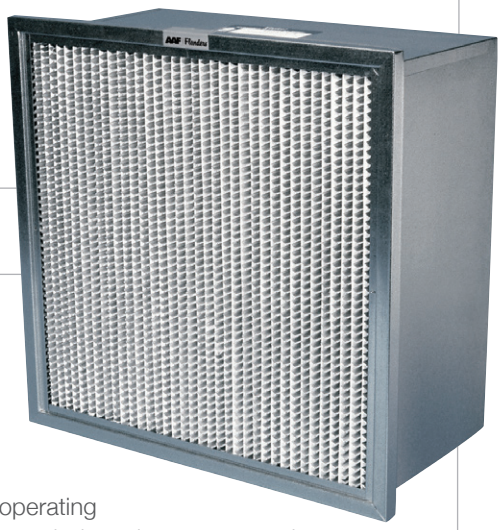
AAF has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.

ISO Certified Firm

PRMH20240272

THE WORLD LEADER IN CLEAN AIR SOLUTIONS

VariCel®



HIGH EFFICIENCY SUPPORTED PLEAT FILTERS

- MERV 14, MERV 13, and MERV 11 efficiencies
- Excellent performance in difficult operating conditions
- MERV 14 and MERV 11 available with antimicrobial
- MERV 14 and MERV 13 meet LEED® Project Certification efficiency requirements
- UL Classified

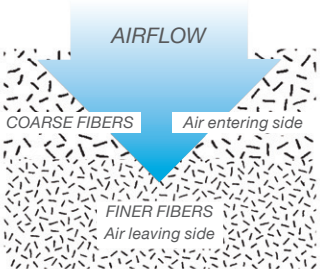
The VariCel filter is a high capacity, extended surface, supported pleat filter engineered for a variety of applications. With a supported pleat media pack, the VariCel filter's rigid construction maintains a compact, unitized structure even under difficult operating conditions, such as variable air volume, turbulent airflow, repeated fan shutdown, high temperature operation, high humidity, or intermittent exposure to water, such as seacoast installations. Variable air velocity and repeated fan shutdown do not compromise performance.

Designed to Improve Indoor Air Quality

VariCel filters with antimicrobial are designed specifically to improve Indoor Air Quality (IAQ). These air filters are designed to trap and concentrate particulate air contaminants, including viable fungal and bacterial spores. The presence of antimicrobial preservative in the filter media is intended to preserve the integrity of the media throughout the useful life of the filter. Antimicrobial preservatives are not meant to increase the efficiency of the filter, nor to kill microorganisms "on the fly" as they pass through a filter. Antimicrobial is EPA registered and environmentally safe.

Dual-Density Media Reduces Operating Costs

VariCel media is manufactured with two layers of glass fibers, coarser fibers on the air entering side and finer fibers on the air leaving side.



Our dual-density design allows dirt particles to be collected throughout the entire depth of the filter, utilizing the full cleaning potential of the media. Maximum dust holding capacity extends the life of the filter, minimizing operating costs.

The water-resistant media can withstand intermittent exposure to water, making VariCel filters ideal for installations in humid areas, or where the filters are exposed to moisture.

AAF | Flanders®

VariCel® Filters

Engineered for a Variety of Applications

Type SH Single Header VariCel filters are designed for systems originally supplied by AAF Flanders. A unique 13⁄16″ flanged header on the air entering side allows the filter to be easily inserted and latched into front and side access systems.

Type DH Double Header VariCel filters are designed to upgrade air cleaning performance and reliability. Two 13⁄16″ thick flanged headers make the filters compatible with the holding frames and latching devices of various manufacturers, including rear access systems.

XL Series VariCel filters, single header (XL-S) and double header (XL-D), contain up to 67% more media and offer more than twice the service life of standard single and double header models. XL Series VariCel filters are offered in a 12″ depth, MERV 14 and MERV 11.

Type HT (High Temperature) Series VariCel filters are designed for systems operating from 350°-900°F. Constructed of aluminized steel, HT VariCel filters offer rated efficiency with proven reliability over the life of the filter. See page 4 for models and temperature limits. HT VariCel filters are offered in a 12″ depth, MERV 14 and MERV 11.

Type NH Series VariCel filters are designed for special sizes and applications, including incineration and compaction disposal systems. Manufactured of fire-retardant, ¾″ thick, heavy wall particle board, Type NH VariCel filters are UL Classified and are operable at temperatures up to 200°F. The filters are constructed without headers, and cell sides are flush with front face dimensions.

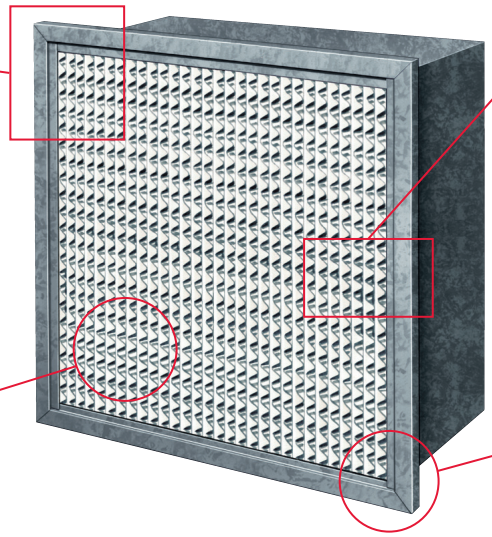
Type SH

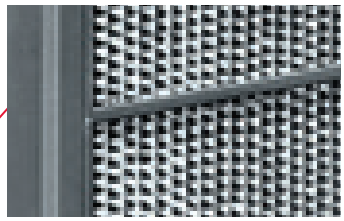
Type DH

Type HT Series

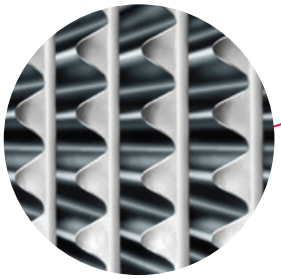
Type NH Series

Crimped Rear Flanges (SH) *are rolled over and riveted to add strength, eliminate sharp edges, and prevent bypass leakage.*

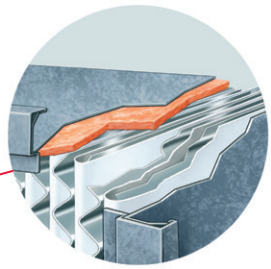




Media Pack Restraint Steel Brace *on air leaving side adds support to the media pack.*



Corrugated Aluminum Separators with Rolled Edges *maintain uniform pleat spacing for optimum airflow. The separators are rolled to eliminate sharp edges, preventing media damage during shipping and personal injury during installation.*



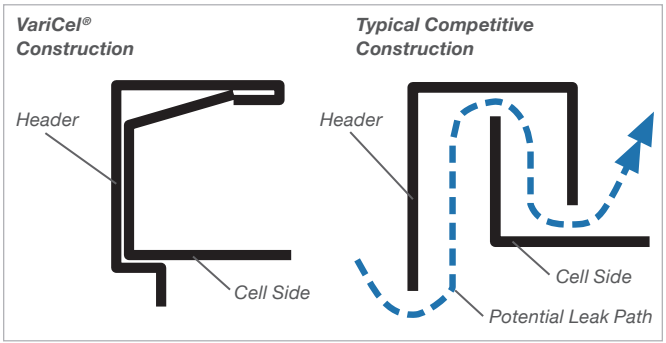
Media Pack Sealant – *A layer of high efficiency media seals the media pack into the cell sides. The media sealant prevents by-pass leakage and damage to the media and separators during shipping and handling. By allowing slight movement of the media pack when the filter is jarred, the cushioning sealant helps prevent tears and punctures to the media.*

Built Rugged for Dependable Performance

The VariCel filter's rigid construction with supported pleat media pack maintains a compact, unitized structure even under tough operating conditions. Variable air velocity and repeated fan shutdown do not compromise performance.

Unitized Construction

Interlocked header and cell sides, along the entire length of each side, provide maximum sealing. Competitive filters are designed with loose fitting headers that allow greater potential for bypass leakage.



Pleats and Separators Bonded for Strength

During the pleating process, spots of glue are applied to bond each separator to the adjacent pleat. This solidifies the media pack to minimize movement and prevent media damage. Burst strength is increased to prevent the filter from blowing out under variable air volume conditions or unusually high resistance.

Galvanized steel headers and cell sides resist damage during shipping and handling, and prevent corrosion over long service life (HT VariCel filters are constructed of aluminized steel).

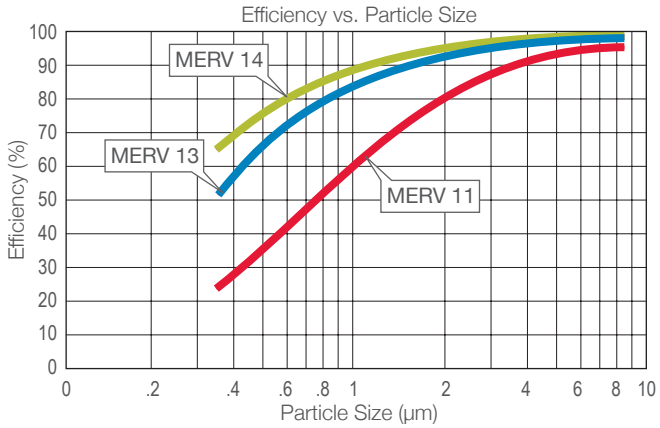
Easy Installation

Rigid construction and minimum depth make VariCel filters easy to install in all types of systems.

VariCel® Filters

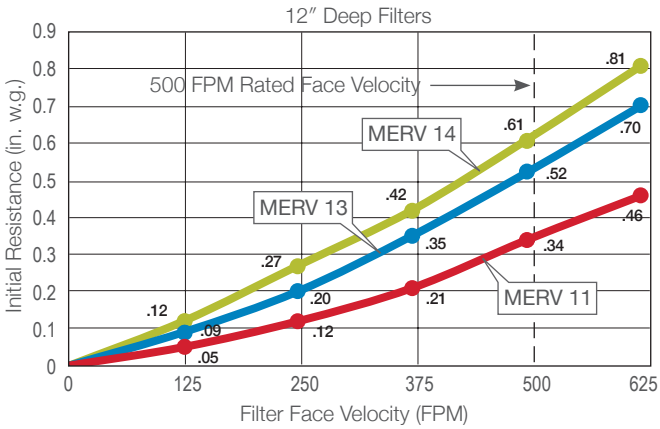
Performance Data

Composite Minimum Efficiency Curve



**Tested in accordance with ASHRAE Standard 52.2.*

Initial Resistance vs. Filter Face Velocity



12″ deep filters are rated at 500 FPM filter face velocity.
6″ deep filters are rated at 250 FPM filter face velocity.
Recommended final resistance for VariCel filters is 1.5″ w.g.
Recommended final resistance for HT VariCel filters is 1.2″ w.g.

Operating Temperature Limits

VariCel Model	Temperature Limit
Types SH, DH, XL	350°F 177°C
Type HT-500	500°F 260°C
Type HT-725	750°F 385°C
Type HT-900	900°F 482°C
Type NH	200°F 93°C

Underwriters Laboratories Classification: All VariCel filters are UL Classified. Testing was performed according to UL Standard 900 and ULC-S111.

Prefilters Can Double VariCel® Filter Life

Using prefilters, such as AAF Flanders' MEGApleat® M8 and PerfectPleat® pleated filters or "5700" panel filters, will greatly extend the life of VariCel filters.

Options

- VariCel filters can be ordered with faceguards made of flattened, expanded, galvanized, or aluminized steel on one or both sides of the filter.
- Factory installed gaskets are available on the front or back of the header.
- Vinyl coated separators are available for corrosive conditions.
- 1⅛″ Single Header VariCel filters, designed for other manufacturers' equipment, are also available.

AAF Flanders®

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PROJECT	South Hill
SALES ORDER #	061070
QUOTE #	23-0137

Installation, Operation and Maintenance

PRMH20240272

NORTEK™

AIR SOLUTIONS

HUNTAIR

MODEL CSU - CENTRAL STATION UNIT

Featuring Generation II & III Fan Cell Construction

INSTALLATION, OPERATION, AND MAINTENANCE GUIDE

FOR YOUR SAFETY

Improper installation, adjustment, alteration service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

NORTEK AIR SOLUTIONS HUNTAIR

TABLE OF CONTENTS

GENERAL DESCRIPTION

The Huntair CSU Series is a central station air handling unit designed for either indoor or outdoor installation. The unit may come equipped with a heating section which can be electrical resistance, hot water coil, glycol coil, or steam coil.

The unit may be provided with various cooling options to meet a particular building's requirements. Among them are evaporative, chilled water, and direct expansion. The unit will also be supplied with either throwaway filters or washable filters and may include a variety of damper options.

Refer to the drawings in the submittal for the specific unit configuration for this installation.

Safety Considerations

Installing and servicing air conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install or service air conditioning equipment.

Untrained personnel can perform basic maintenance, such as cleaning and replacing filters. All other operations should be performed by trained service personnel. When working on air conditioning equipment, observe precautions in literature and on tags and labels attached to unit.

Follow all safety codes. Wear safety glasses and work gloves.

WARNING

Before installing or servicing system, always turn off main power to system. There may be more than one disconnect switch.
If your unit has permanent magnet motors, high voltage can be generated whenever the motor is rotating, even if power is off. **ALWAYS MAKE SURE MOTORS CANNOT ROTATE DURING SERVICING.**

Turn off accessory heater power if applicable. Electrical shock can cause personal injury or death.

CAUTION: Before proceeding, make sure all electrical service to unit is locked in "Off" position.

INSTALLATION CODES / PRECAUTIONS

INSTALLATION CODES

Electrical characteristics are shown on the unit rating plate.

The unit shall be carefully installed in accordance with the standards of the National Fire Protection Association (National Electrical Code).

Authorities having jurisdiction should be consulted before installations are made to verify local codes and installation procedures.

INSTALLATION PRECAUTIONS

1. The services of qualified field service personnel are mandatory for safe and proper installation of this equipment.

2. Air volumes and external static pressures that do not coincide with those listed on the rating plate will adversely affect the performance of the unit. Please consult the factory if either of these values change.

3. The following clearances from combustible materials are to be maintained: Top - 6", control side - 48", opposite controls - 6", bottom - 0". If roof curb is provided by others, it must be at least 4" high and constructed from non-combustible material.

4. This unit is designed for installation on a level surface.

5. Do not locate the supply inlet opening within 10' of any exhaust discharge point or within 24" of any obstruction.

ATTENTION INSTALLERS

WARNING: Equipment must be mounted on a flat level surface wether it be a pad, rail, or curb. All must be level before equipment can be mounted.

Uncrating

The unit may be shipped in sections. The quantity of sections will depend upon the configuration of the unit. Upon receipt of the unit, verify that the electrical ratings on the unit nameplates agree with the electrical sources available.

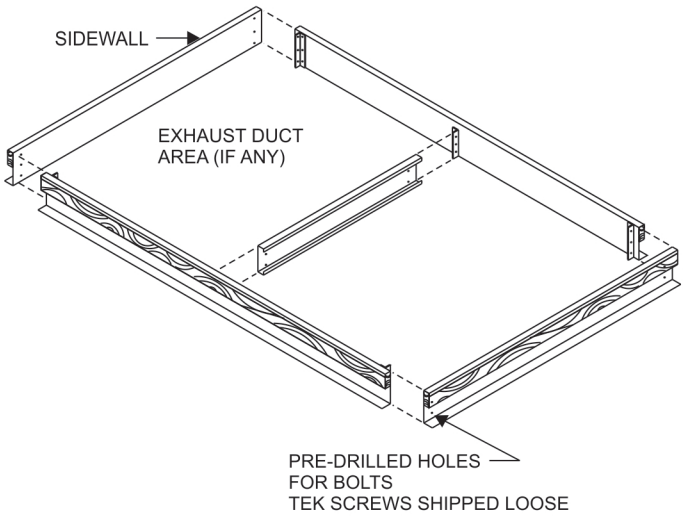
Remove the crate(s) from the unit taking care to keep track of control accessories and installation hardware. Check the entire unit for any damage that may have occurred during transit. If damage is found, immediately file a claim with the transport company. All units are inspected at the factory and fully operation tested prior to shipment.

Roof Curb Assembly (Optional)

IMPORTANT: Refer to roof curb drawings in the submittal for the roof curb dimensions for this unit.

STEP 1:
Arrange the four large perimeter sidewalls so that all of the pre-drilled holes line up. Using the provided bolts, securely fasten each corner.

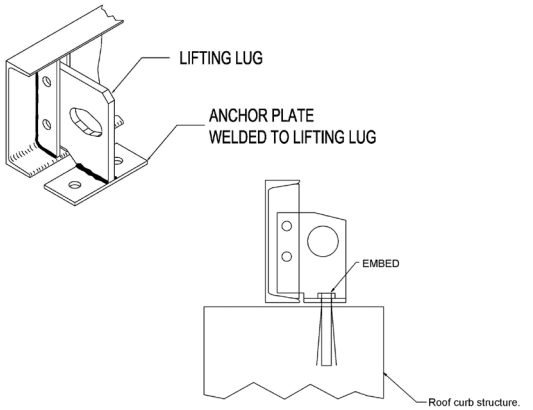
STEP 2:
The remaining pieces are supports. Pilot holes have been pre-drilled into these supports and in the long sidewalls of the curb for fastening with the provided bolts. For each support, make sure that the holes line up at both ends and that the flanges are turned out before fastening.



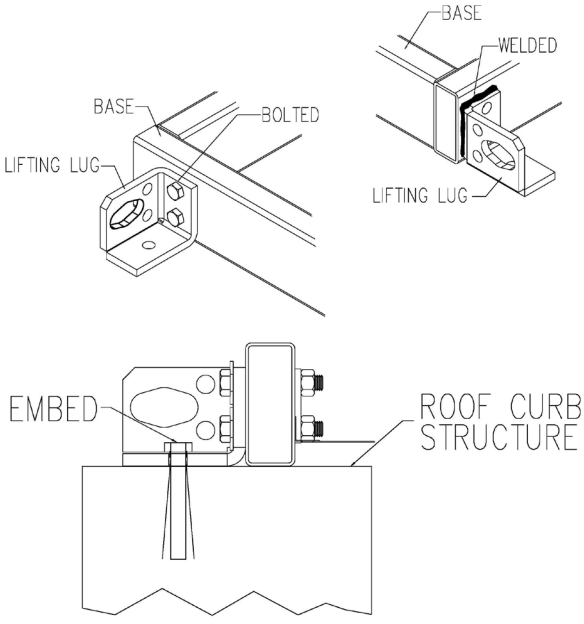
ROOF CURB EXPLODED VIEW

STEP 3:
Move the assembled curb into place lining up with both the supply and exhaust roof openings. Square up the curb by measuring the diagonal distance between opposite corners and adjusting until they are equal. The curb must also be level.

STEP 4:
A foam rubber seal strip has been provided to make the curb airtight and to isolate the roof from vibration. It is extremely important that this strip is installed over the entire perimeter of the curb. Wipe off the top horizontal surface of the curb with a clean dry cloth to remove any dirt, water or oil that would inhibit the adherence to the metal. Peel off the paper exposing the adhesive back of the rubber and press firmly down against the top of the curb. Use the fewest possible splices and do not attempt to miter the corners.



UNIT ANCHORING TO CURB CHANNEL BASE



UNIT ANCHORING TO CURB TUBE BASE

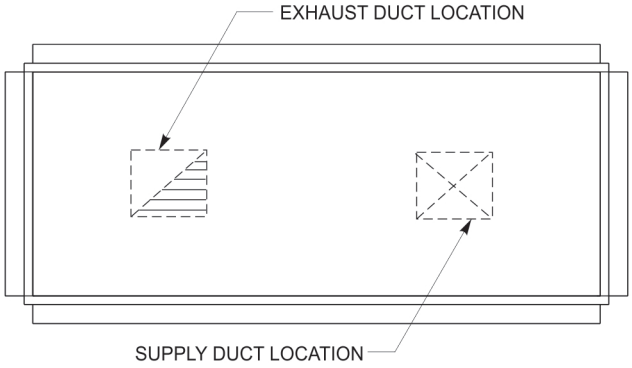
Curb Mounting

Following the roof curb assembly instructions, make sure that the curb is entirely assembled, leveled and roofed-in. It must be mounted on a flat level surface.

Slab & Steel Pad Mounting

Units that were ordered for direct mounting on a slab or on a roof include an integral metal frame which provides a required bottom clearance from combustibles. The unit will be supported around the entire perimeter of the primary section as well as across the width and base splits. Vestibules and any other additions will be supported around their perimeter. Verify that the support is adequate for the unit weight shown on the drawings in the submittal. The duct connections for this type of installation are normally provided for horizontal runs. Refer to the submittal for the duct connections on this unit. **Slab must have a flat level surface.**

STEP 5:
The curb is now ready to receive the CSU unit. Please note that roofing in the curb is much easier without the unit in place. Refer to the roof curb section detail on the previous page for the recommended roofing procedure.



ROOF CURB PLAN

Shipping

Under no circumstances should the trucks moving the units on low loader or flat beds be strapped over the roof of the equipment, as this will cause damage to the roof and sides. The lifting points of each unit are the place to attach securing devices only.

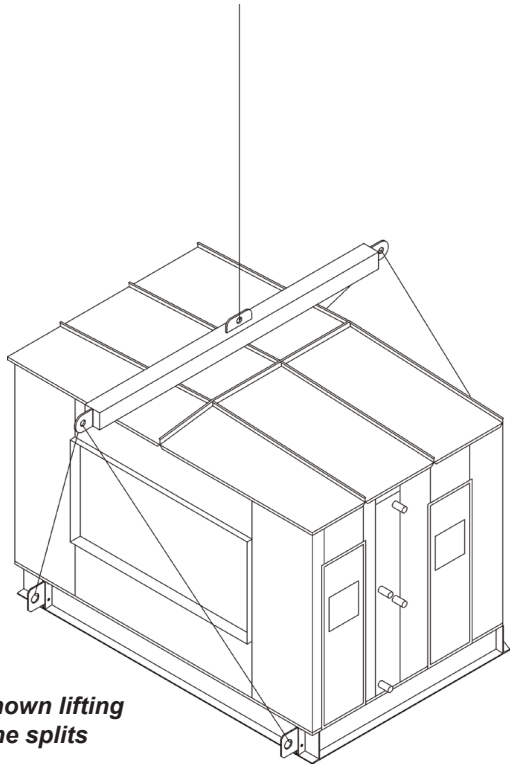
WARNING: If a fork lift is used to lift the unit then fork extensions are required to ensure that the bars reach all the way through to avoid damaging equipment underneath when forks are tilted up, and the forklift tower does not contact the equipment causing damage to the sides or tubing extended from the sides of the unit.

Rigging

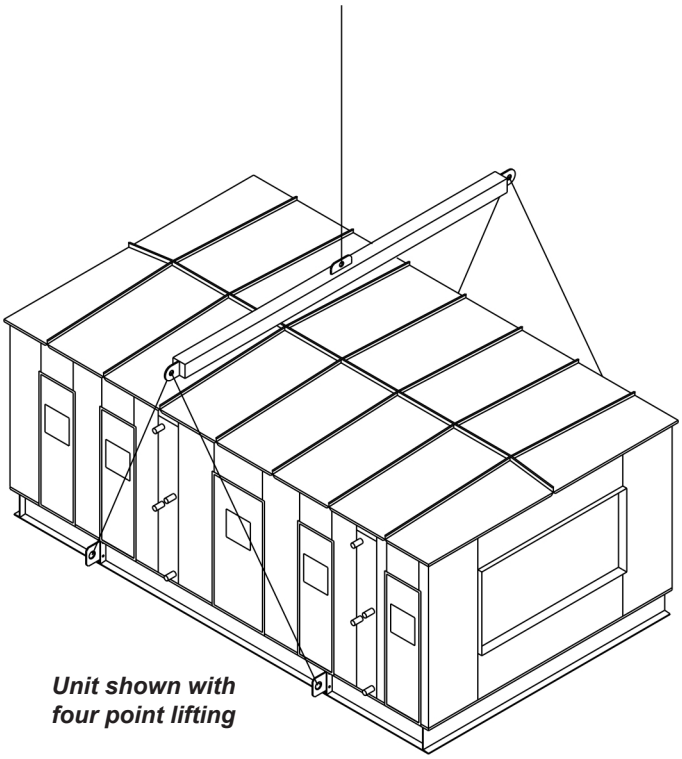
All units designed for roof curb installation are provided with an integral curb cap and a minimum of (4) lifting points for rigging attachment.

Units designed for slab or roof mounting without a curb are provided with a minimum of (4) lifting points on the base frame for rigging attachment.

WARNING: Use all lifting points provided. Spreader bars are mandatory to prevent contact and damage to the unit by lifting hooks, straps, cables or chains. Tension on each lifting line must be adjusted before lifting unit for proper load distribution. Consult the mechanical or structural engineer before moving the unit across the roof deck.



Unit shown lifting from the splits

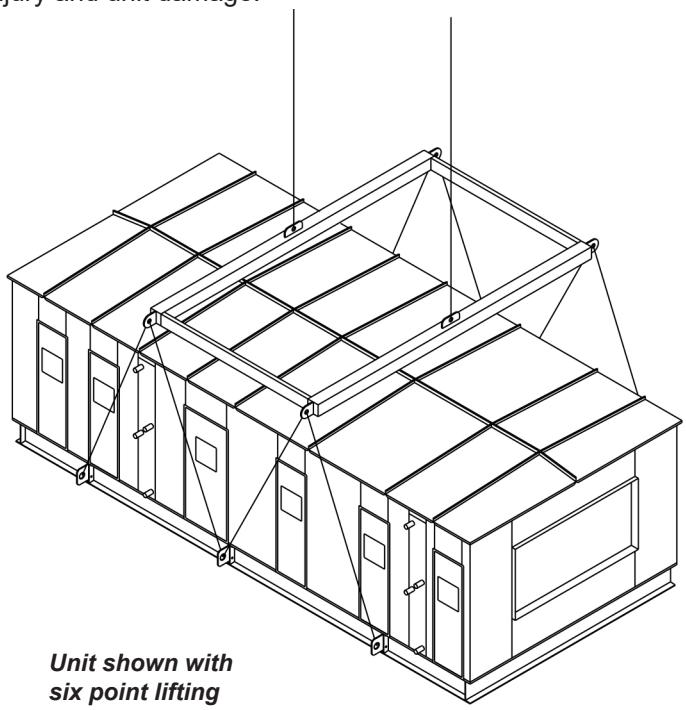


Unit shown with four point lifting

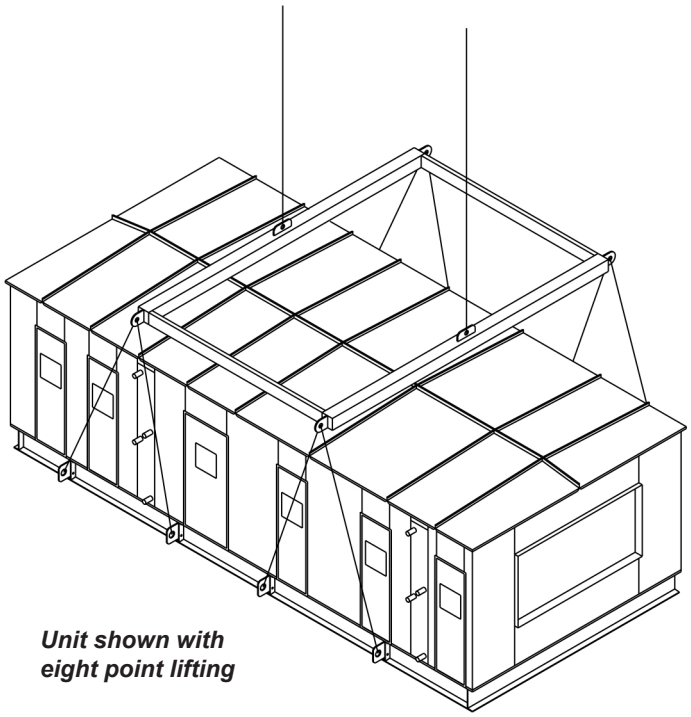
Handling

The load distribution on some units may cause them to become unstable when lifting due to its internal components. Use of additional slings or other available means may be required to stabilize the unit during lifting. Test lift unit to verify balance and center of gravity.

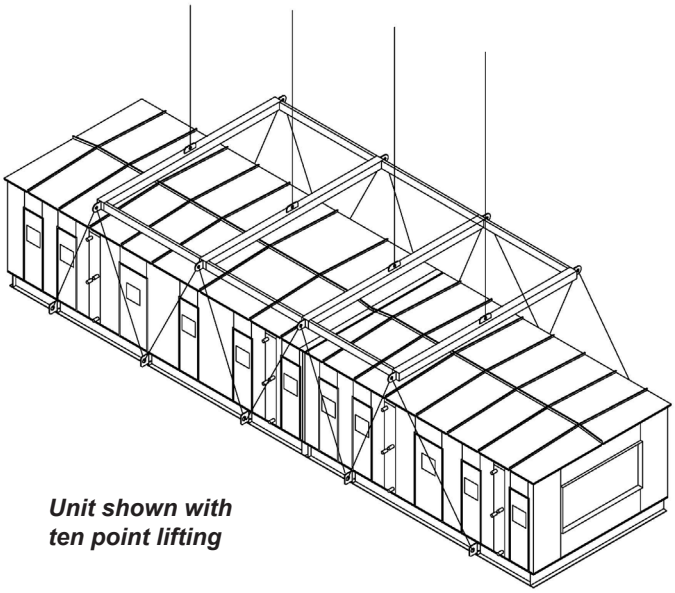
Air handling unit is to be lifted in an upright position only. Failure to properly rig and lift a unit can result in personal injury and unit damage.



Unit shown with six point lifting



Unit shown with eight point lifting



Unit shown with ten point lifting

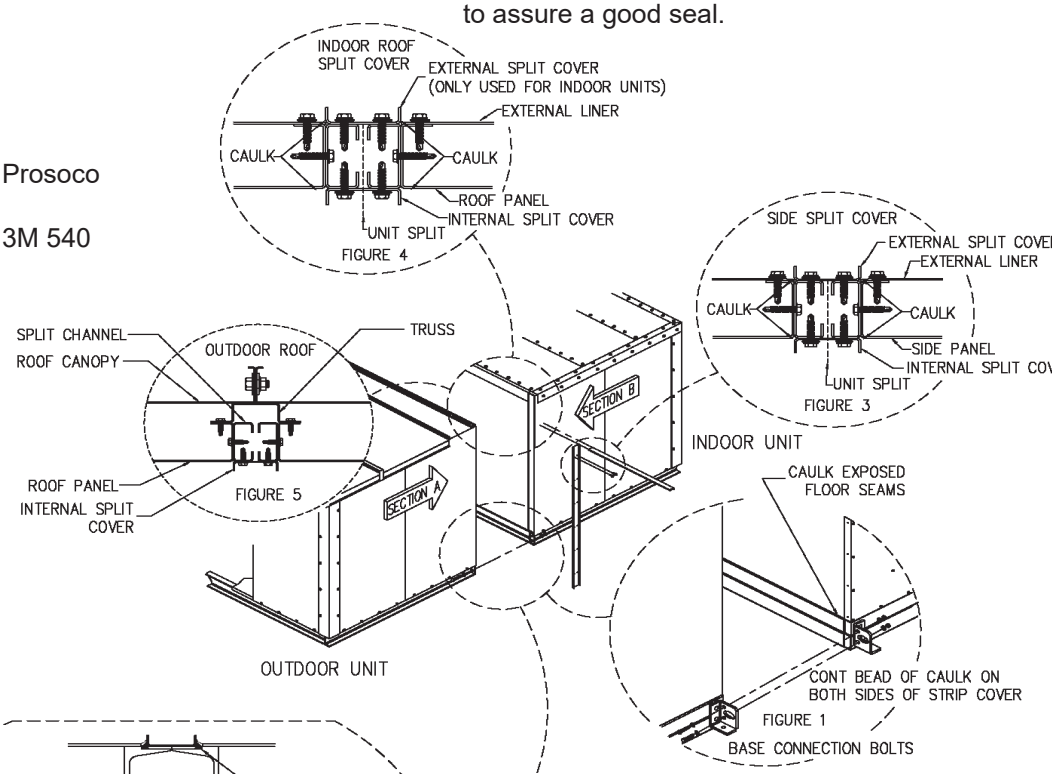
Re-assembly Instructions

1.Place first section.
2.Caulk seams, interior and exterior in figures 1, 2, 3, and 5.
3.Place next section. Make sure bolt holes are aligned.
4.Install one nut and bolt finger tight at one end of base (see figure 1 & 3).
5.Uneven mounting surface or rocking during transit and rigging may cause roof bolt holes to misalign. If this happens they must be re-aligned prior to installing other fasteners. Re-alignment may be accomplished by using pipe clamps, jacks, and drift pins. If a gap exists between bases or roof panels do not attempt to draw unit together with re-assembly fasteners - use clamps, jacks, crane, etc.

6. Once the two surfaces are next to each other and aligned, bolt the base and roof together (see figure 1 and 3).
7.Caulk the roof and wall seams with 3M 540 (see figure 1 and 2).
8.At the interior base floor, attach and caulk the standing floor seam with Prosoco. Also any exposed base floor seams should be caulked with Prosoco (see figure 2 on this page and page 7).
9. Caulk and attach split cover with 1/4" tek screws and 3M 540 (see figure 4 and 5).
10. Caulk both sides of split cover with 3M 540 (see figure 4).
11. Weather proof only Slide roof drive cleat over newly bolted roof seam (outdoor units only). With a hammer, bend ends down 1-1/2". Caulk all edges of roof cleat (see figure 4).
12. All caulking needs to be put on heavy, about 3/8" thick to assure a good seal.

Prosoco

3M 540



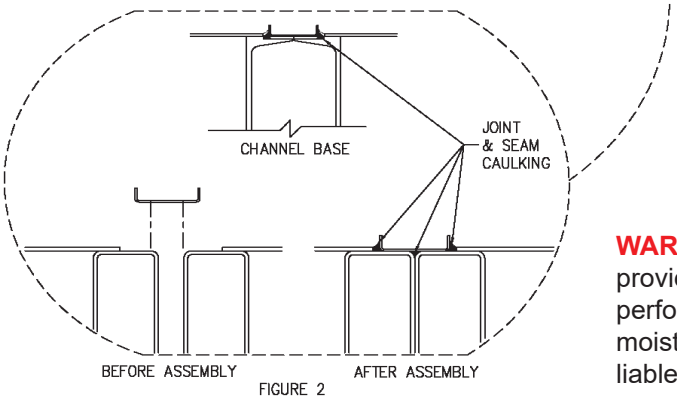
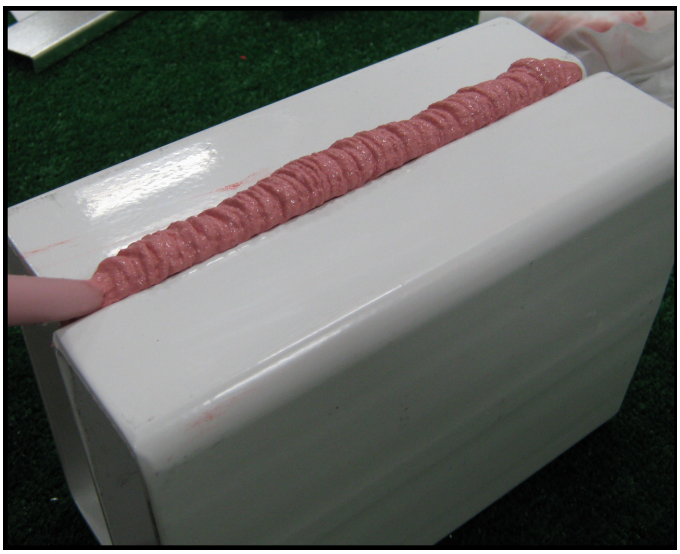


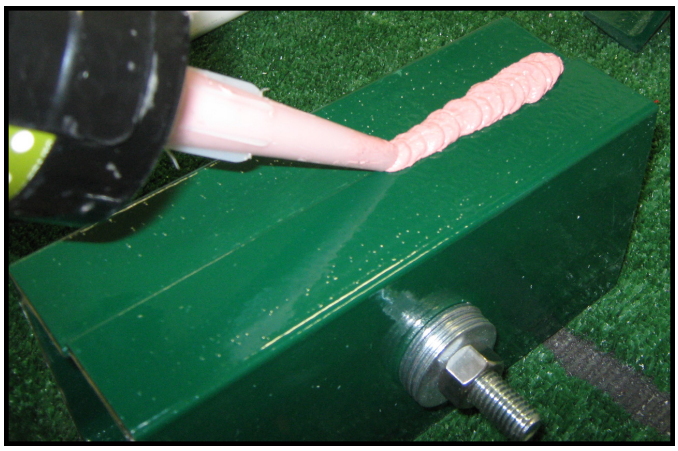
FIGURE 2

ATTENTION INSTALLERS

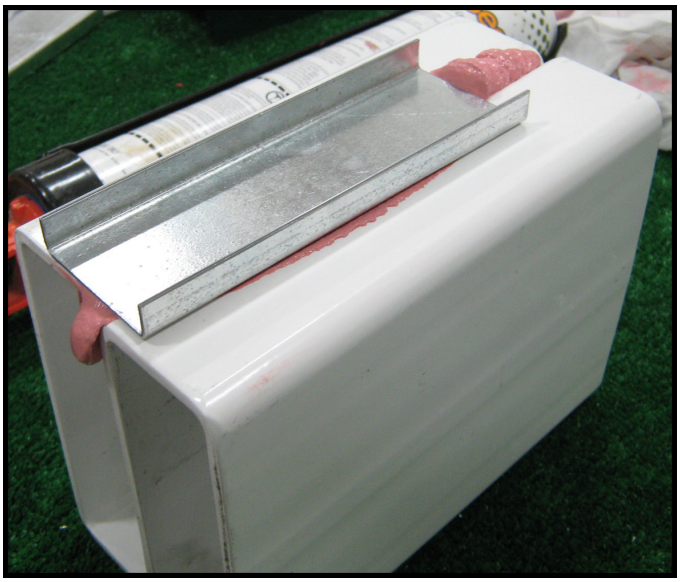
WARNING: Failure to follow the assembly instructions provided in this document may result in the loss of performance, condensation issues, and excessive moisture for which Nortek Air Solutions cannot be held liable and is **NOT** covered under the manufacturer's warranty.

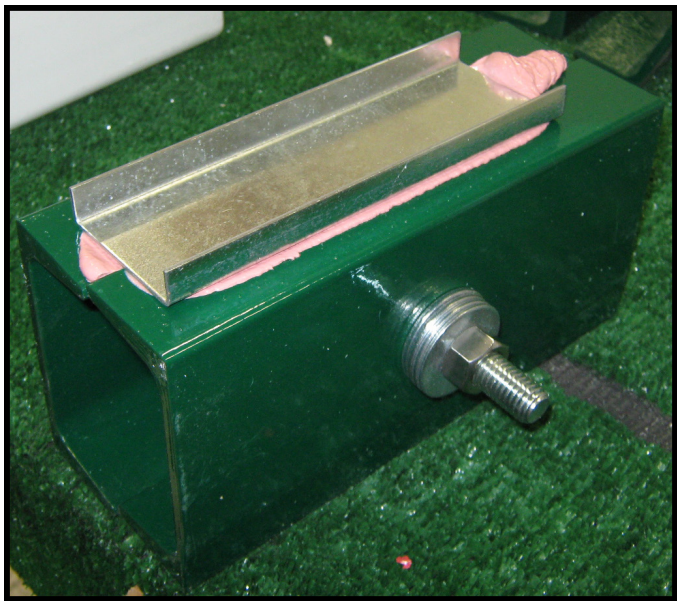
Figure 2





Caulk split with Joint & Seam caulking.

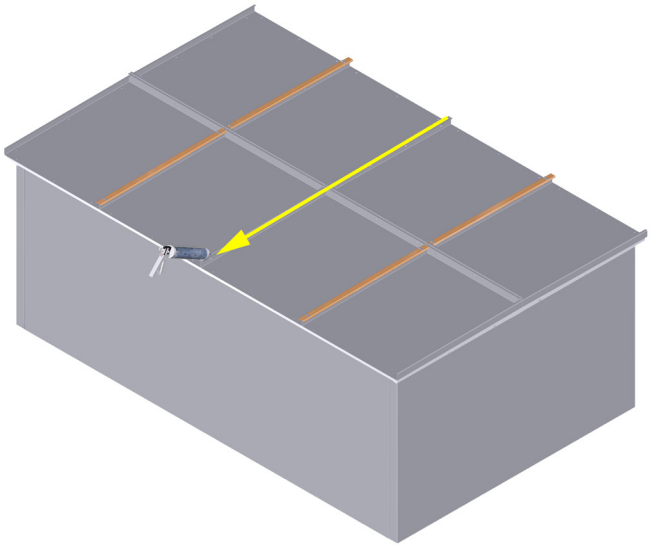




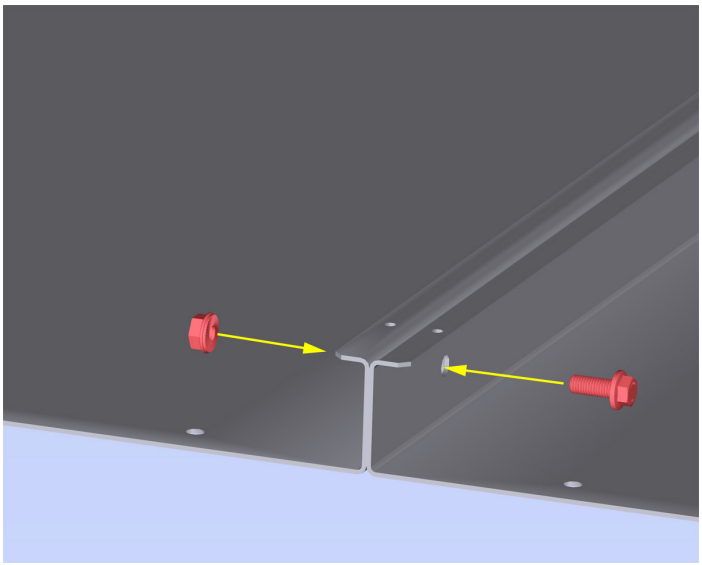
Press split cover down over the center of the caulking until caulking seeps out of both sides of cover.

Outdoor Roof Split Assembly:

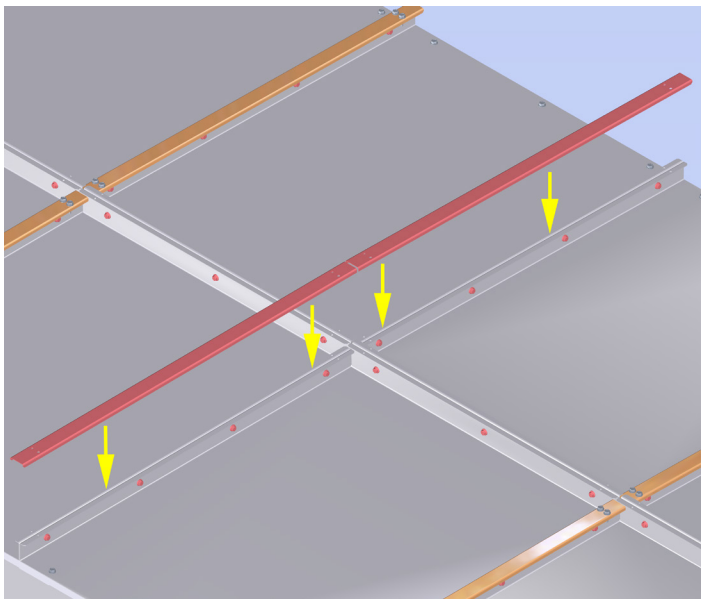
1. Caulk panels along the split with 3M 540.



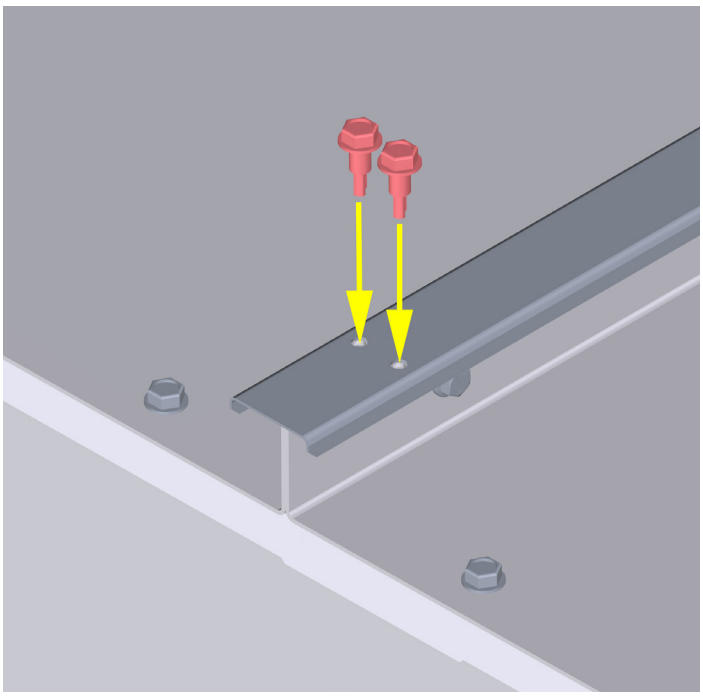
2. Place 5/16 x 18 bolts through holes, then thread on nuts and tighten.



3. Place the seam cleats over the roof panel seams.

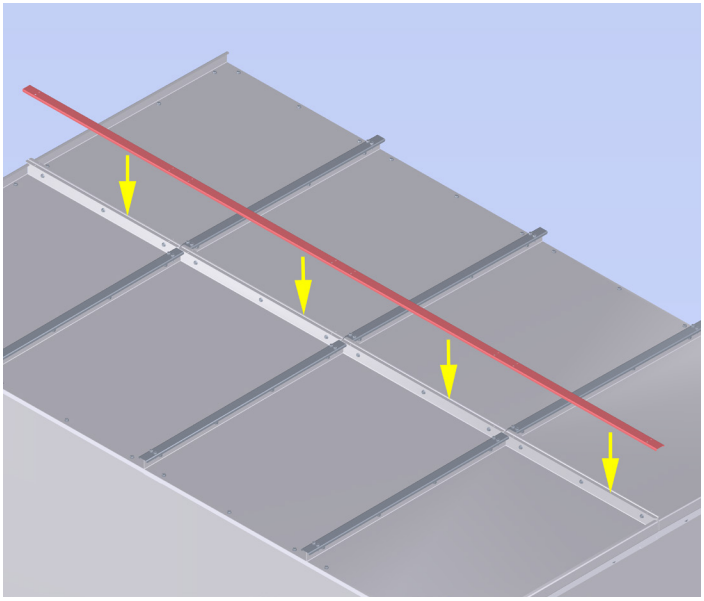


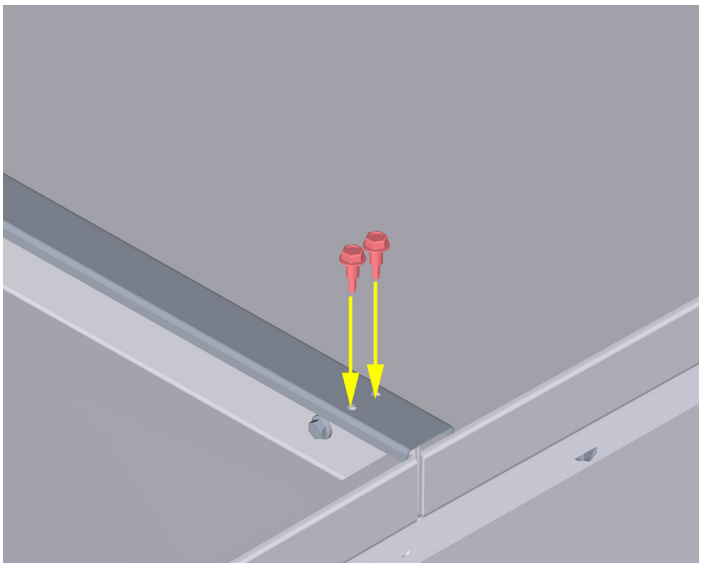
4. Use #10-16 x 3/4 drive screws w/washer to secure the roof cleats



Outdoor Roof Split Assembly Continue:

5. Place center cleat over middle seam of the roof panels. Use #10-16 x 3/4 drive screws w/washer to secure the roof cleats.



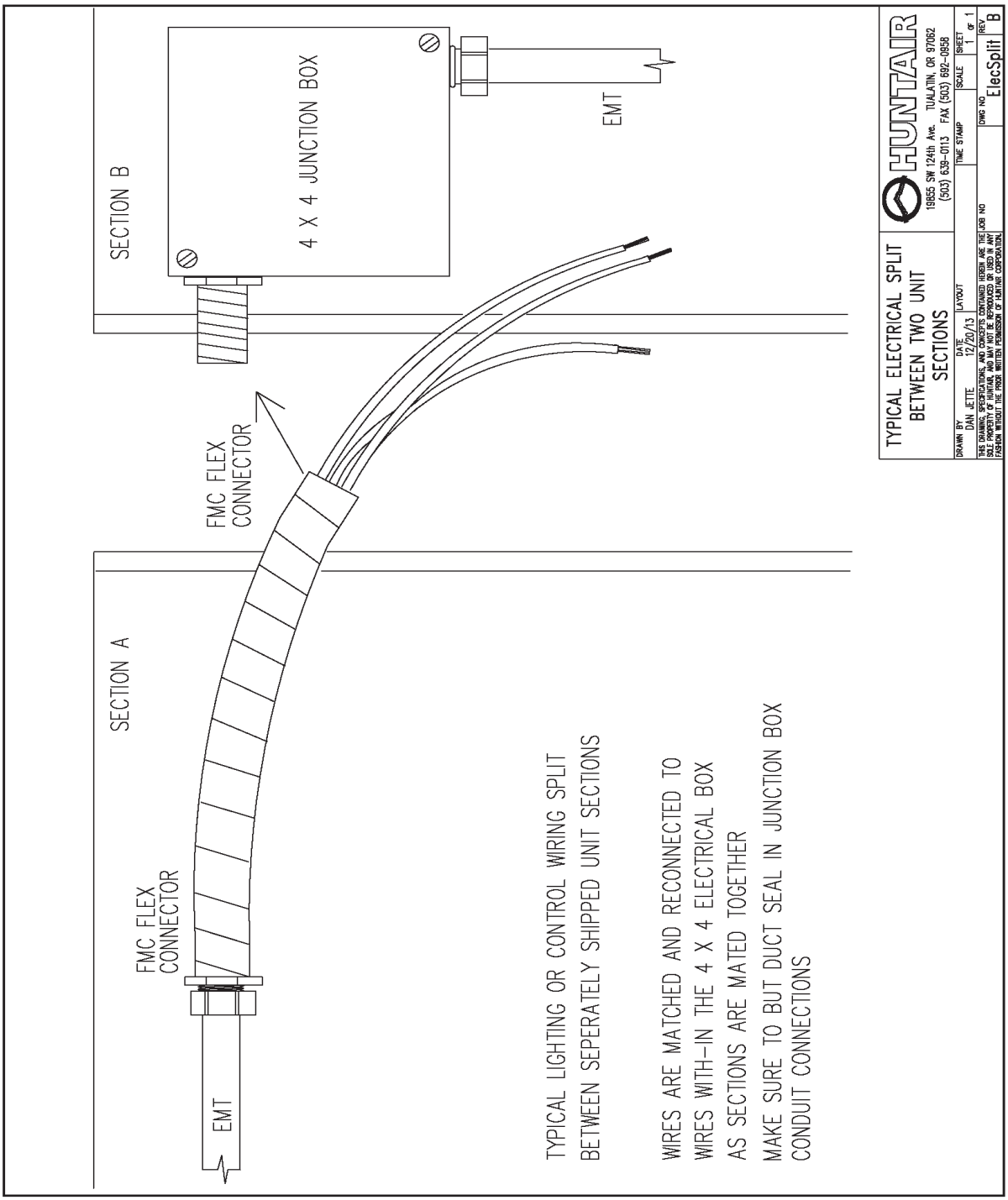


Electrical Split Assembly

To be installed by others (Electrical Contractor).

DANGER! Risk of Electric Shock

Always disconnect power to the fan control panel before maintenance. Follow all lockout / tag out procedures. Failure to follow these procedures may result in injury or even death.

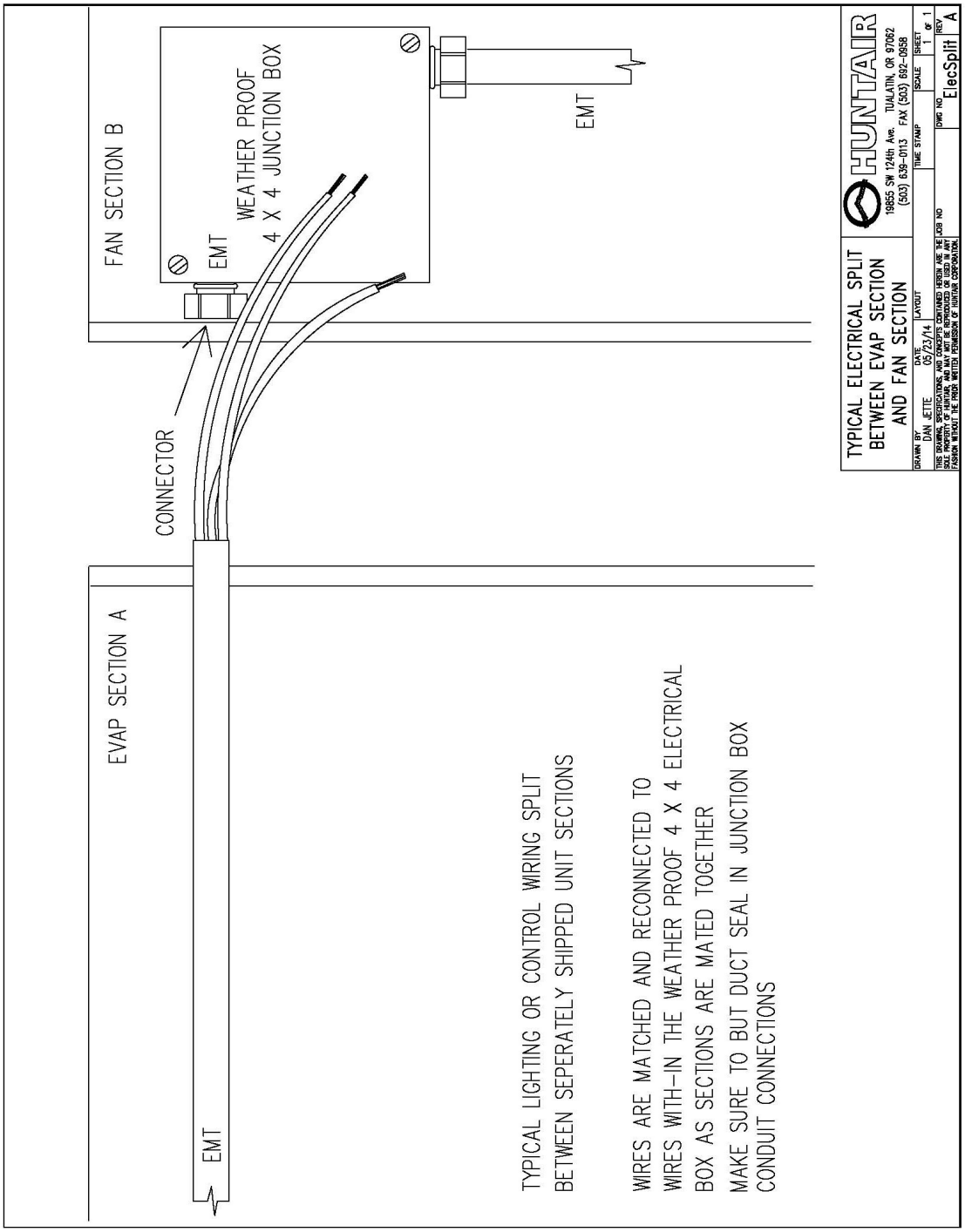


Evap Electrical Split Assembly

To be installed by others (Electrical Contractor).

DANGER! Risk of Electric Shock

Always disconnect power to the fan control panel before maintenance. Follow all lockout / tag out procedures. Failure to follow these procedures may result in injury or even death.



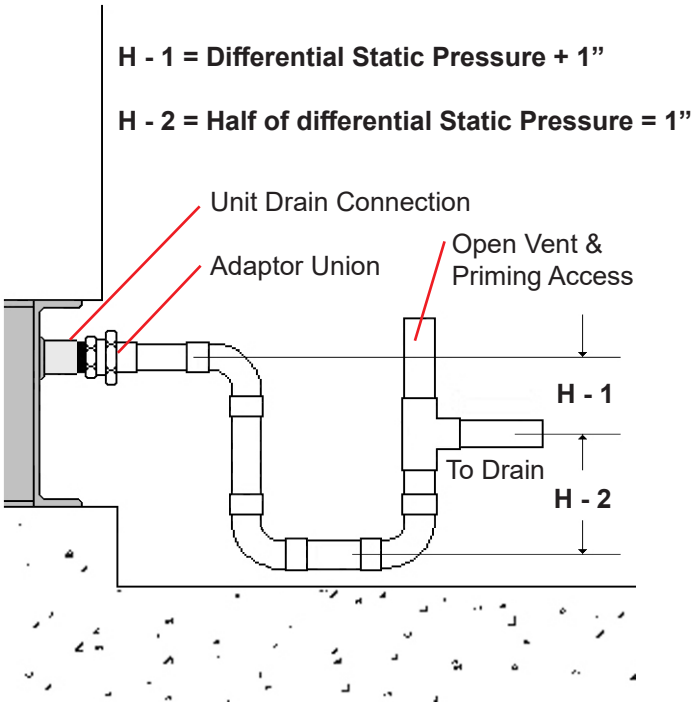
Drain Traps

All air handlers with drains must have the condensate connections properly trapped to provide adequate drainage. Improperly trapped drain lines may restrict/prevent drainage causing pan to overflow inside the air handler and surrounding areas.

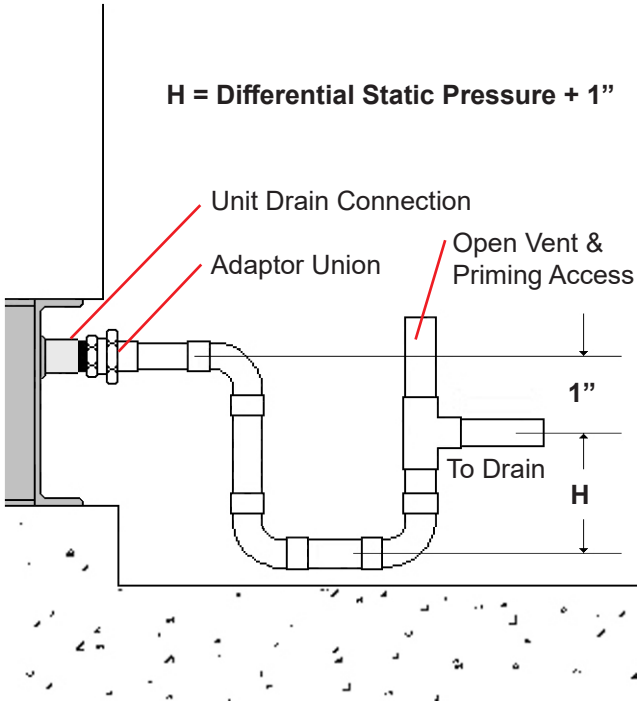
The two illustrations provided show the recommended construction and sizing procedure for a Draw - Through (Negative Pressure) and Blow - Through (Positive Pressure) applications.

The ideal method of sizing the “H” dimension of the trap is to take a “Differential Static Pressure” measurement across the plenum in which the drain is located after the system has been installed and balanced. An alternative method is to develop an estimate of the plenum differential static from the Fans Peak Static Pressure.

For drain traps to function properly they must always be filled with water (Primed) and the piping connecting to it should be sloped down a minimum of 1/8” per foot in direction of water flow as shown in the illustrations. Precautions should be taken on outdoor air handlers to prevent drain traps from freezing in winter type conditions.



DRAW THROUGH
(Drain pan under negative pressure)



BLOW THROUGH
(Drain pan under positive pressure)

Duct Installation

The type of duct installation to be used will vary depending on the construction of the roof and ceiling and the configuration of the CSU unit.

Suggestions for ducts

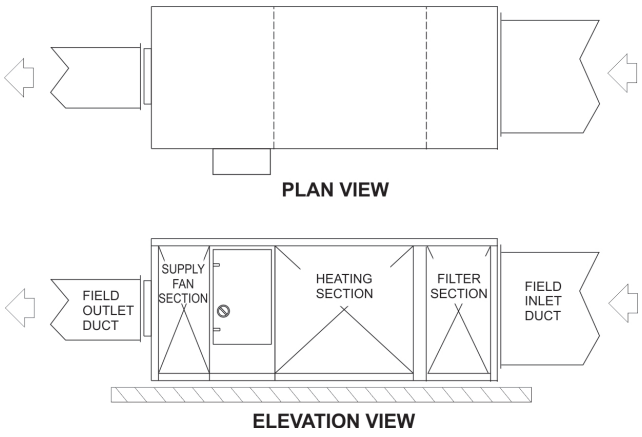
a.Construct ducts with no lighter than no. 26 U.S. gauge galvanized iron or no. 24 B & S gauge aluminum.

b.All duct sections wider than 24" and more than 48" long, should have cross breaks on the top and bottom and have angle iron braces or standing seams. Use joints of the S and drive strip or locked type.

c.Insulate all ducts from CSU units.

d.Support ducts from building members. Do not support ducts from CSU unit connection points.

e.Proper duct sizing is essential for a satisfactory installation. A detailed duct sizing manual may be purchased from the Air Conditioning Contractors Association, 1228 17th St. N.W., Washington, DC 20036.



TYPICAL INDOOR UNIT DUCT CONNECTIONS

Electrical Connections

All electrical wiring and connections including electrical grounding must be made in accordance with the latest edition of the National Electric Code (or the edition your authority having jurisdiction has adopted). There may also be local ordinances that apply.

a.The CSU nameplate and the drawings in the submittal state the line voltage and minimum ampacity requirements for this unit. A separate line voltage power supply should be run directly from the building distribution panel to the electrical panel provided on the side of the CSU unit. The quantity of wires and the connection terminals are identified on the wiring diagram in the submittal. All external wiring must be within approved conduit and have a minimum temperature rating of 90°C.

Note: For units with electric heating, a separate power source is to be supplied to the electric heater control panel on the side of the CSU. Refer to the submittal for wire quantity and points of termination.

b.IMPORTANT: If any of the original wire supplied with the unit must be replaced, it must be replaced with type THHN 90°C wire or its equivalent, except for miscellaneous 120 volt control wiring that must be type SJO 90°C.

c.Refer to the submittal for other control interface connections.

HEATING COILS

Description

The CSU may include a hot water, hot water/glycol, or steam coil heating section. The coil is constructed of 5/8" od copper tubes with either copper or aluminum fins. The maximum operating pressure is 150 psig. The coil may or may not be supplied with control valves and associated piping. In lieu of a control valve, the unit may include an optional face and bypass damper for temperature control. Refer to the submittal for unit configuration drawings. Most units are provided with coil drain and vent connections. Care must be taken not to block the air vent or poor coil performance may result. It is highly recommended that an inlet line strainer be installed to trap debris before becoming lodged in the coil tubes or control valve.

Common Causes of Heating Coil Damage

When several undesirable conditions combine or become severe, coils fail prematurely. All of the following conditions can be controlled by good installation and operating practices.

1. **IMPROPER PIPING INSTALLATION:**
   If the coil connection is not held, the stress of tightening pipe fittings to the coil is borne by the header and tubes. Except in severe cases where the header has been noticeably distorted, damage is difficult to detect and usually denied. Damage is indicated by distortion of header at the connection stub and/or cracks in tube to header joints at either or both ends of the header.

2. **WATER HAMMER:**
   Severe cases of water hammer can expand and rupture headers and bends and expand and crack tubes. In milder cases the effects are cumulative and many reoccurrences may be necessary to produce noticeable damage.

3. **FREEZE-UP:**
   Freezing of heating solution is the most common and is the most easily recognizable damage to heating coils. The relatively soft tubes show considerable expansion and wide open longitudinal cracks.

4. **CONTROL VALVE CYCLING:**
   Coils are designed to withstand the normal stress created by their own internal expansion and contraction. However, rapid cycling or hunting of control valve will result in early failures.

5. **INTERNAL CORROSION:**
   Internal corrosion is usually first discovered by the appearance of several small leaks at various parts of the tubes in the coil. It can be confirmed by cutting open a tube specimen from the coil. Pitting, discoloration, channeling, encrustation's and cracks are all evidences of chemical attack.

6. **EXTERNAL CORROSION:**
   External corrosion is usually a selective chemical attack most often directed against the fins of the coil. Some chemicals attack the brazing alloys. Although the damage is clearly visible, sometimes the source and agent are difficult to identify. In some cases, it is from traces of airborne impurities that have become concentrated on the surface of the coil.

EVAPORATIVE

Description

The CSU may include a direct evaporative cooling section. This simple, yet efficient cooling method consists of a water distribution tray, evaporative cooling media, sump, circulating pump, float valve and cooling controller.

Operation

The float valve maintains the level of domestic water in the sump at approximately 4". IMPORTANT: The circulating pump must be completely immersed in water for proper pump cooling. Operating the pump with less than 4" of sump water will Void the warranty. As the outside air temperature rises to the adjustable set point of the heating/cooling controller (typically 65°F), the heating section is de-energized and the evaporative cooler circulating pump is started. The circulating pump discharges water from the sump into the distribution pipe where it flows down through the evaporative cooling media. Optionally, the circulating pump will be cycled by a cooling discharge temperature controller when enabled by the heating/cooling controller.

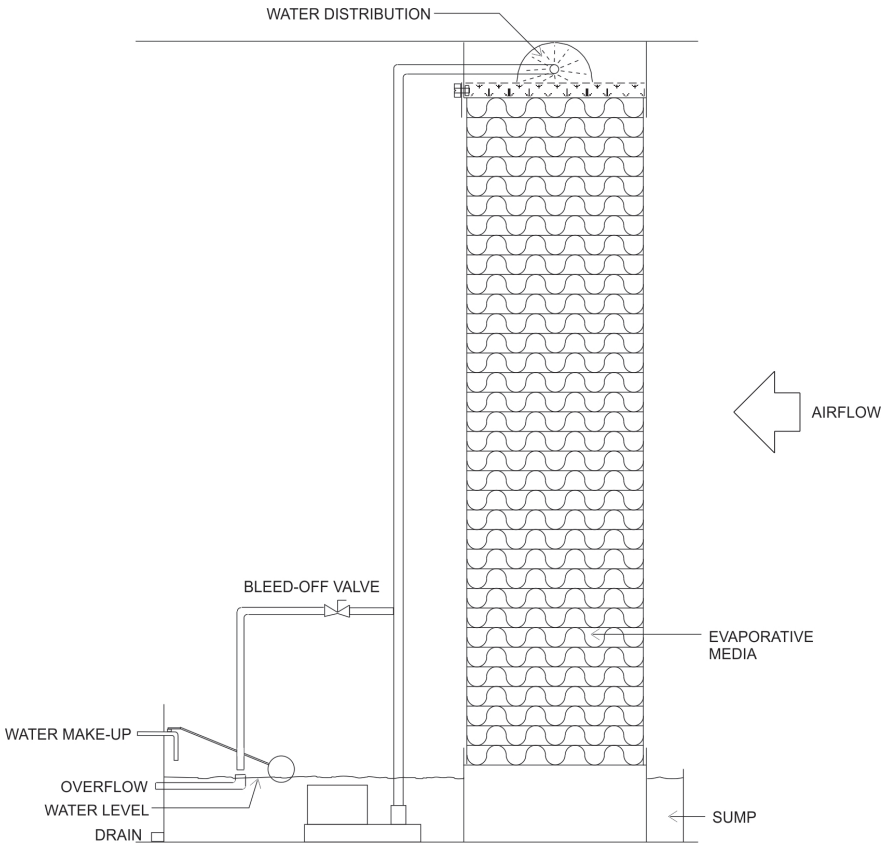
The supply fan draws air through the media where it is cooled by the process of evaporation. A flow adjustment orifice is provided in the distribution line from the circulating pump. This orifice has been factory set and is not field adjustable. Overflow and drain must be properly trapped to compensate for pressure differential.
Refer to the submittal for the performance data for this unit.

Operational Sequence of Events:
When the system calls for evaporative cooling, there is a sequence of events that is sent in motion.
Fans:
- If running, set to 20Hz or off.
- If off hold state.

Pumps:
- Initialize and begin to wet evaporative media.

Hold state for 5 minutes. Initialize fan operation to design and continue normal evaporative operation.

WARNING: Follow the evaporative media operating instructions that start on page 19 before installation. Failure to do so may cause media to not perform as expected and can cause severe damage to other components.



EVAPORATIVE COOLER

Installation Notes

Make-up valve supply line must be protected from water hammer damage with an appropriate device or stand pipe. Local codes may require that a back-flow prevention device be installed in the domestic water inlet line to the evaporative cooler. The cooler bleed-off/drain connection may require an air gap to prevent siphoning of waste water. Consult your local code authorities for requirements.

It is essential that this unit be installed on a level surface for satisfactory performance. Failure to do so may result in severe water damage to surrounding areas.
A bleed-off valve is provided to reduce the amount of dissolved minerals and scale. Huntair recommends the initial setting be approximately 10% of the recirculating pump flow. For a complete review of the water treatment advice refer to the submittal.

CHILLED WATER COIL

Description

The CSU may include a chilled water coil cooling section. The coil is constructed of 5/8" od copper tubes with either copper or aluminum fins. The maximum operating pressure is 150 psig. A condensate drain pan is located under the coil with a 1-14" NPT drain outlet provided for a field drain line connection. The coil may or may not be supplied with control valves and associated piping. In lieu of a control valve, the unit may include an optional face and bypass damper for temperature control. Refer to the submittal for unit configuration drawings. Most units are provided with coil drain and vent connections. Care must be taken not to block the air vent or poor coil performance may result. It is highly recommended that an inlet line strainer be installed to trap debris before becoming lodged in the coil tubes or control valve. Drain pan connection must be properly trapped to compensate for pressure differential.

Common Causes of Chilled Water Coil Damage

When several undesirable conditions combine or become severe, coils fail prematurely. All of the following conditions can be controlled by good installation and operating practices.

1. IMPROPER PIPING INSTALLATION:
If the coil connection is not held, the stress of tightening pipe fittings to the coil is borne by the header and tubes. Except in severe cases where the header has been noticeably distorted, damage is difficult to detect and usually denied. Damage is indicated by distortion of header at the connection stub and/or cracks in tube to header joints at either or both ends of the header.

2. WATER HAMMER:
Severe cases of water hammer can expand and rupture headers and bends and expand and crack tubes. In milder cases the effects are cumulative and many reoccurrences may be necessary to produce noticeable damage.

3. FREEZE-UP:
Freezing of chilled water is the most common and is the most easily recognizable damage to chilled water coils. The relatively soft tubes show considerable expansion and wide open longitudinal cracks.

4. CONTROL VALVE CYCLING:
Coils are designed to withstand the normal stress created by their own internal expansion and contraction. However, rapid cycling or hunting of control valve will result in early failures.

5. INTERNAL CORROSION:
Internal corrosion is usually first discovered by the appearance of several small leaks at various parts of the tubes in the coil. It can be confirmed by cutting open a tube specimen from the coil. Pitting, discoloration, channeling, encrustation's and cracks are all evidences of chemical attack.

6. EXTERNAL CORROSION:
External corrosion is usually a selective chemical attack most often directed against the fins of the coil. Some chemicals attack the brazing alloys. Although the damage is clearly visible, sometimes the source and agent are difficult to identify. In some cases, it is from traces of airborne impurities that have become concentrated on the surface of the coil.

DIRECT EXPANSION COIL

The CSU may include a direct expansion coil cooling section. The coil is constructed of 5/8" od copper tubes with aluminum fins. Coils are thermal counterflow construction with same end liquid and suction connections. The refrigerant distributors are brass, pressure type with copper distributor tubes factory mounted. A condensate drain pan is located under the coil with a 1-1/4" NPT drain outlet provided for a field drain line connection. Observe applicable codes when connecting this drain.

The thermostatic expansion valve and remote condensing unit are normally shipped separately or provided by others. If provided by others, data for these items are shipped with the components. If provided by Huntair, this data will be found in the submittal. Verify that the capacity and refrigerant type of the condensing unit meet the requirements of the evaporator coil in the CSU. Evaporator coil data can be found in the direct expansion table on the drawings in the submittal or on the label affixed to the CSU electrical panel.

The remote condensing unit requires connection to power as per the installation instructions packaged with the unit. A control interlock is provided for a field wired interface between the CSU electrical panel and the remote condensing unit. This interlock prevents the operation of the direct expansion system while the supply fan is off. Additionally, an interlock with a space temperature thermostat may be required to prevent low space temperatures. If provided, the space temperature thermostat should have a N.O. voltage free contact that closes on temperature rise above set point. The contact must be rated for a minimum of 1 amp at 120 vac. Refer to the drawings in the submittal for designation of the supply fan interlock terminals in the CSU.

Refrigerant piping is not supplied.

Common Causes of Direct Expansion Coil Damage

When several undesirable conditions combine or become severe, coils fail prematurely. All of the following conditions can be controlled by good installation and operating practices.

1. IMPROPER PIPING INSTALLATION:

If the coil connection is not held, the stress of tightening pipe fittings to the coil is borne by the header and tubes. Except in severe cases where the header has been noticeably distorted, damage is difficult to detect and usually denied. Damage is indicated by distortion of header at the connection stub and/or cracks in tube to header joints at either or both ends of the header.

2. FREEZE-UP:

Freezing of condensate is a common cause of damage to direct expansion coils. This is usually the result of an excessively low pressure in the coil causing moisture in the conditioned air to freeze on the coil surface. In extreme cases, blocks of ice may form on the coil separating fins and bending coil tubes.

3. EXTERNAL CORROSION:

External corrosion is usually a selective chemical attack most often directed against the fins of the coil. Some chemicals attack the brazing alloys. Although the damage is clearly visible, sometimes the source and agent are difficult to identify. In some cases, it is from traces of airborne impurities that have become concentrated on the surface of the coil.

4. INTERNAL CORROSION:

Internal corrosion is normally the result of the factory holding charge in the coil being released before the installation of the refrigerant tubing. The moisture and other contaminants such as dust and lint in atmospheric air deposit and react with the internal copper surfaces. Additionally, copper oxide may form if nitrogen or other inert gas is not passed through the piping during brazing operations.

CAUTION: This unit has rotating parts, high voltage, and possibly high temperature solutions or components. Safety precautions must be exercised during installation, operation and maintenance. Service should only be performed by a qualified technician who has been specially trained to service air conditioning equipment.

PRELIMINARY INSPECTION

1. Disconnect all power to unit. Lockout and label all disconnect means to prevent accidental power application.
2. Verify that all field electrical wiring and connections including electrical grounding are made in accordance with the National Electrical Code and local codes. Verify that supply voltage(s) agree with unit data plate. Check all wiring for completeness and terminals for tightness.
3. Inspect all supplementary cooling (if any) piping for leaks and conformance with the Uniform Plumbing Code and local codes.
4. Remove supply and exhaust fan compartment covers and make sure all steel banding, bolts and wood braces installed for shipping have been removed from fans prior to starting the unit.
5. Remove filter section access panel and ensure all filters are securely in place. Replace and secure the access panel.
6. Check all unit manual reset devices and reset if necessary.
7. Check supply and exhaust ducts for obstructions and damper positions and open all diffusers.

FAN START-UP

1. Open the fan access door and inspect the fan and drive assembly. A typical fan and motor arrangement using Fanwall Technology is shown above.
2. Before operation, start the motor slowly to ensure the fan rotation is correct. It should be rotating “CWR” when looking at the motor end. If the fan wheel is not rotating correctly, check the motor power leads for proper installation. Also check inlet cone alignment to the fan wheel. Fan wheel should not be rubbing on the inlet cone. If cone alignment is required loosen the retaining fasteners for the cone and adjust cone for proper clearance from fan wheel.
3. Replace and fasten down the fan housing access panel.

FAN / MOTOR ARRANGEMENT

AIRFLOW VERIFICATION

IMPORTANT NOTE: Air quantities as specified on the unit data plate are essential for safe and economic operation. The unit fan RPMs were carefully set at the factory to deliver the specified air quantity at the specified external static pressure. We cannot overemphasize that these values be field verified as external static pressures are often found to be different than what was anticipated.

a. Air volume measurements should be made using AMCA suggested methods. This would normally be a traverse of the supply duct or ducts. For test and measurement guidelines, write to: AMCA, 30 West University Drive, Arlington Heights, IL 60004

b. Start the fan, observe the motorized inlet air damper (if any) to be certain that it fully opens (90°). Check the fan for proper rotation.

c. Measure airflow and compare to the value stamped on the CSU data plate. Adjust the supply fan motor drive pitch to increase or decrease the fan speed until the desired airflow is reached.

d. Once the proper air volume has been established, check the supply motor AMP draw against the motor nameplate full load amp’s to be sure the motor is not overloaded. All access doors must be closed while checking amps.

HEATING COIL START-UP
(For factory control valve loops)

1. Turn the CSU off, remove the access panel and fully open both the supply and return shut-off valves.
2. Set the adjustable heating/cooling control about 10°F above the present outside air temperature and set the heating coil discharge air control at its highest setting.
3. Adjust balancing valves per instructions in the submittal. Refer to unit data plate for gpm.
4. Turn the CSU on and after 5 minutes measure and record the supply and return line temperatures at the universal test taps provided. The modulating valve should move to full open (heat) position. Measure and record the inlet air and discharge air temperatures.
5. Verify that piping is leak-free.
6. Set the discharge air control to its lowest setting and after 5 minutes, repeat the temperature measurements taken in step 4. The modulating valve should move to full closed bypass position. Record these values.
7. Return heat/cool control to its original setting (typically 65°F). Return discharge air control to its original setting (typically 65°F).
8. Replace access panel.

HEATING COIL START-UP
(For factory face and bypass dampers)

1. Turn the CSU off, remove the access panel and fully open both the supply and return shut-off valves.
2. Adjust balancing valves per instructions in the submittal. Refer to unit data plate for gpm.
3. Turn the CSU on and after 5 minutes measure and record the supply and return line temperatures at the universal test taps provided. Measure and record the inlet air and discharge air temperatures. The modulating valve (if any) should move to full open (heat) position and damper should assume full face and zero bypass position.
4. Verify that piping is leak-free.
5. Set the discharge air control to its lowest setting and after 5 minutes, repeat the temperature measurements taken in step 4. The modulating valve (if any) should move to full closed bypass position and damper should assume full face and zero bypass position.
6. Replace access panel.

EVAPORATIVE COOLER START-UP

Water quality is crucial to maintaining optimum operating conditions for the evaporative cooler system. A water analysis is highly recommended before start-up. Maintain the pH of the recirculating water between 6 and 8.

1. Clean Evap Sump Tank before filling.
2. Media clean and in place. 45° flutes slope down towards air entering side.
3. Connect water service to the water inlet. This should include a shut-off valve for service. Extend the drain to the nearest available waste location as desired. Line pressure = Min. 50 psi / Max. 125 psi. Observe code requirements regarding these connections.
4. Open the service valve and fill the sump with water. If water spills over the edge of the sump, adjust the float valve and make sure the unit is level. Both front to back and side to side. Water level must be within 1” of the top of the sump. The circulating pump must be fully submerged to keep the motor from overheating.
5. Check the tube connections at the outlet of the pump and inlet of the water distribution pan located above the cooling media.
6. Apply power to the unit.
7. Flush and drain the media and sump a minimum of twice before operating the cooler.
8. Wait approximately 5 minutes for the water to thoroughly saturate the cooling media checking both inlet and outlet sides.
9. Manually turn on the pumps to run fresh water over the pads for about 30 minutes. Use as much water as possible.

CHILLED WATER COOLING START-UP
(For factory control valve loops)

1. Turn the CSU off, remove the access panel and fully open both the supply and return shut-off valves.
2. Set the adjustable heating/cooling control about 10°F below the present outside air temperature and set the discharge air control at its lowest setting.
3. Adjust balancing valves per instructions in the submittal. Refer to the unit data plate for gpm.
4. Turn the CSU on and after 5 minutes measure and record the supply and return line temperatures at the universal test taps provided. The modulating valve should move to full open position. Measure and record the inlet air and discharge air temperatures.

5. Verify that piping is leak free and that condensate forming on piping and the coil is collected by the condensate drain pans.
6. Set the discharge air control to its highest setting and after 5 minutes, repeat the temperature measurements taken in step 4. The modulating valve should move to full closed position.
7. Return the heat/cool control to its original setting (typically 65°F). Return discharge air control to its original setting (typically 65° F).
8. Replace access panel.

CHILLED WATER COOLING START-UP

(For factory face and bypass dampers)

1. Turn the CSU off, remove the access panel and fully open both the supply and return shut-off valves.
2. Set the adjustable heating/cooling control about 10°F below the present outside air temperature and set the discharge air control at its lowest setting.
3. Adjust balancing valves (if any) per instructions in the submittal. Refer to the unit data plate for gpm.
4. Turn the CSU on and after 5 minutes measure and record the supply and return line temperatures at the universal test taps provided. Measure and record the inlet air and discharge air temperatures. The modulating valve (if any) should move to full open position and damper should assume full face and zero bypass position.
5. Verify that piping is leak free and that condensate forming on piping and the coil is collected by the condensate drain pans.
6. Set the discharge air control to its highest setting and after 5 minutes, repeat the temperature measurements taken in step 4. Record these values. The modulating valve (if any) should move to full closed position and damper should assume zero face and full bypass position.
7. Return heat/cool control to its original setting (typically 65°F). Return discharge air control to its original setting (typically 65°F).
8. Replace access panel.

DIRECT EXPANSION COOLING START-UP

1. Carefully read the instructions for the remote condensing unit and perform all start-up checks required. If the remote condensing unit is provided by Huntair, this information will be found in the submittal. Ordinarily, power must be applied to the remote condensing unit for a period of 24 hours prior to start-up to allow the crankcase heater to vaporize the refrigerant out of the crankcase oil.
2. Set the adjustable heating/cooling control about 10°F below the present outside air temperature. If the unit is provided with a remote space thermostat, set it at its lowest setting.
3. Turn the CSU on and observe that the remote condensing unit operates. There will be a slight delay in most cases as the CSU inlet damper opens and the condensing unit internal time delay times out. This should be no more than 30 seconds total. 4. Allow the unit to operate for about 3 minutes and then measure and record the CSU inlet and discharge air temperatures while the remote condensing unit is still running.
5. Adjust the heating/cooling control to its highest setting and, assuming this is higher than the outside air temperature, the remote condensing unit should not operate. Test the remote space thermostat (if any) in similar fashion by selecting a setting above the present space temperature.

IMPORTANT: Wait about 5 minutes after the remote condensing unit is shut-off prior to restarting it. This will allow system refrigerant pressures to equalize.

6. Remove access panel and verify that condensate forming on the tubing and the coil is collected by the condensate drain pans.
7. Return heating/cooling control to its original setting (typically 65°F). Return the remote thermostat to its original position (typically 72°F)
8. Replace access panel.

Motors are provided with a means to minimize electrical pitting due to arcing across bearings. Motors provided with hybrid ceramic bearings require no maintenance. Motors with an external spring-loaded shaft grounding stick should be checked after 3 years of run time for active length on the grounding stick, and every year thereafter, and replaced if necessary.

Daily

1. Check evaporative cooler pads for bowing and sagging or dry streaks.
2. Remove any debris from the evap sump tank and make sure water level is correct.
3. Dry the evap cooler pads every 24 hours.

Weekly

1. During the cooling season, flush the evap cooler pads, gutter and sump to prevent algae buildup.
2. Check and adjust bleed-off rate if necessary.

Quaterly

1. Check evaporative cooler pads for bowing and sagging or dry streaks. Clean and flush evaporative cooling pads, drain and disinfect the entire water distribution system.

Every Six Months

1. Check supply fan and/or exhaust fan wheels for dirt and grease accumulation. Clean as necessary. Do not use caustic cleaning solutions.
2. If applicable, clean/replace fan filters on the electrical enclosures.

Yearly

1. Lightly lubricate damper bushings and associated linkage. Use a petroleum-based penetrant and corrosion inhibitor lubricant.
2. Lightly lubricate control valve linkage.

Every Two Years

1. Examine unit housing for signs of corrosion. Clean, replace or touch up with paint, as necessary.

Please Direct Service Needs To:

Nortek Air Solutions Customer Service Manager:

Phone: 503-639-0113
Fax: 503-639-1269
Email: service@huntair.com
Address: 19855 SW 124th Ave,
Tualatin, OR 97062

Fan Wheel/Motor Replacement

DANGER! Risk of Electric Shock

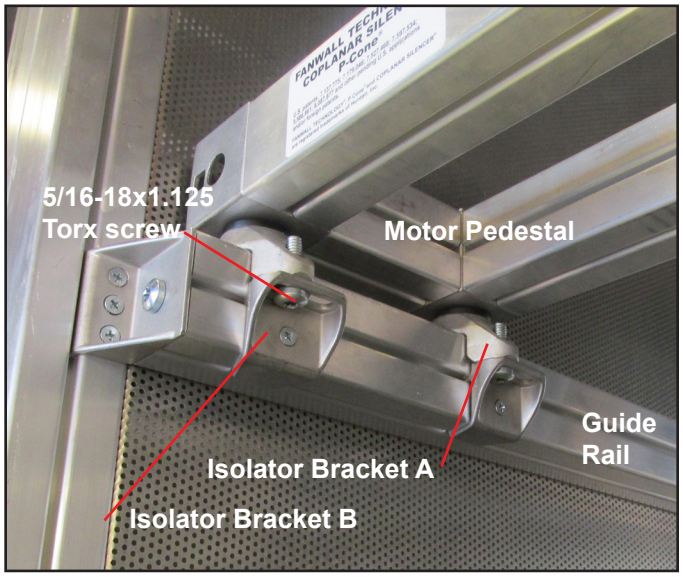
Always disconnect power to the fan control panel before maintenance. Follow all lockout and tag out procedures.

DANGER! Risk of Shock

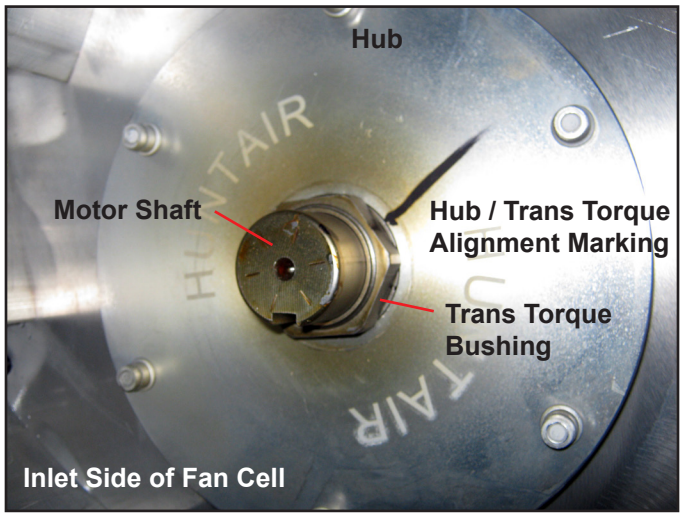
Always disconnect power to the fan motor before maintenance. Follow all lockout and tag out procedures.
If your unit has permanent magnet motors, high voltage can be generated whenever the motor is rotating, even if power is off. **ALWAYS MAKE SURE MOTORS CANNOT ROTATE DURING SERVICING.**

Note: Tools required for fan removal include torque wrench with 12” extension, 1-3/4” socket, and a length of pipe or wood block to brace fan wheel from spining.

1. To replace a fan wheel/motor assembly, first disconnect power to the FWT at the main control panel.
2. To gain access to the fan/motor cartridge, remove the personel safety screen on the discharge side if applicable.
3. Disconnect power to the existing fan at the main disconnect control panel.
4. Make note of all wire locations for reinstallation later.
5. Disconnect existing fan motor power cable from terminal located in motor J-Box and conduit fitting from electrical chase.
6. Loosen and remove (4) 5/16-18x1.125 Torx screws at the bottom of Isolator Bracket B that retain the motor pedestal to the guide rails.
7. After removing the mounting bolts slide the motor pedestal to the point where the motor lifting ring is exposed enough to use. If a mechanical device is available for use, attach it to the lifting ring for use. Lift the motor/fan/pedestal assembly and turn 180°. Set back down on the motor guide rails so that the fan is now facing you.



8. Push the pedestal back in to the fan cell so that the fan wheel is in the cell. Block the fan from rotating by using a wood block or a pipe.
9. Mark the location of the transtorgue bushing on the shaft and the fan. To remove the fan wheel from the motor shaft, remove the trans torque bushing retaining hex nut by turning counterclockwise. Loosen progressively until bushing is free from wheel hub and motor shaft. Remove fan/hub assembly.
10. If needed the motor may now be removed for service by removing the 3/8” motor bolts.



11. With the motor pedestal on the guide rails that run front to back along the cell, set the motor on the pedestal using the same holes. Use proper lifting techniques, crane or motor/rail system if possible for lifting the motor into position. Once the motor is placed on the pedestal align the bolt holes on the motor to the bolt holes on the pedestal making sure that the motor shaft is pointing towards you.

a. Next, insert 3/8" bolts into the holes from the underside, make sure to use a standard washer on the bolt side, only a locknut is required on the motor side.

b. Square the motor and tighten the bolts to 40 ft-lbs.

12. Reinstall the fan on the motor shaft with the hub facing towards you. Line up the markings on the hub/trans torque bushing/shaft. Make sure that the trans torque bushing nut is flush to the hub, tighten the bushing nut to 80 ft-lbs.

13. Once the fan/motor/pedestal assembly is done, turn it 180° so the the fan is facing the inlet of the fan cell. Slide the pedestal forward lining up Isolator Brackets A & B.

a. Insert (4) 5/16-18x1.125 Torx screws into the holes. Do not tighten down all the way. Leave loose so that the motor assembly can slide back and forth freely.

14. Follow Fan / Cone Alignment procedures starting on page 28.

Important: Before Restarting

Re-balance fan wheel once the complete motor pedestal/ fan wheel/motor assembly is re-installed.

Before operation, start the motor slowly to ensure the fan rotation is correct.

Drive Side = Clockwise rotation when looking at motor end

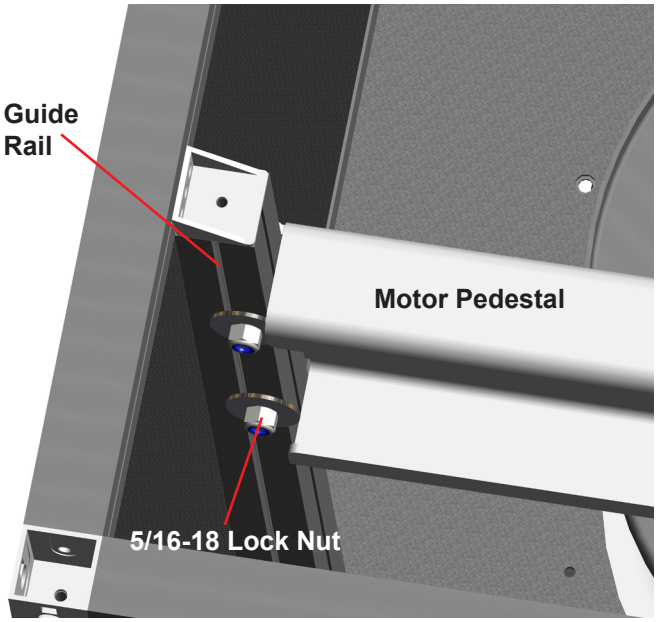
Inlet side = Counter-clockwise rotation looking at fan.

Extruded Fan Cell W/Formed Pedestal Fan Wheel/Motor Replacement

DANGER! Risk of Electric Shock

Always disconnect power to the fan control panel before maintenance. Follow all lockout and tag out procedures.

Note: Tools required for fan removal include torque wrench with 12” extension, 1-3/4” socket, and a length of pipe or wood block to brace fan wheel from spining.



1. To replace a fan wheel/motor assembly, first disconnect power to the FWT at the main control panel.
2. To gain access to the fan/motor cartridge, remove the personel safety screen on the discharge side if applicable.
3. Disconnect power to the existing fan at the main disconnect control panel.
4. Make note of all wire locations for reinstallation later.
5. Disconnect existing fan motor power cable from terminal located in motor J-Box and conduit fitting from electrical chase.
6. Loosen and remove (4) 5/16-18 lock nuts at the bottom of the guide rails.
7. After removing the mounting bolts slide the motor pedestal to the point where the motor lifting ring is exposed enough to use. If a mechanical device is available for use, attach it to the lifting ring for use. Lift the motor/fan/pedestal assembly and turn 180°. Set back down on the motor guide rails so that the fan is now facing you.
8. Push the pedestal back in to the fan cell so that the fan wheel is in the cell. Block the fan from rotating by using a wood block or a pipe.
9. Mark the location of the transtorgue bushing on the shaft and the fan. To remove the fan wheel from the motor shaft, remove the trans torque bushing retaining hex nut by turning counterclockwise. Loosen progressively until bushing is free from wheel hub and motor shaft. Remove fan/hub assembly.
10. If needed the motor may now be removed for service by removing the 3/8” motor bolts.
11. With the motor pedestal on the guide rails that run front to back along the cell, set the motor on the pedestal using the same holes. Use proper lifting techniques, crane or motor/rail system if possible for lifting the motor into position. Once the motor is placed on the pedestal align the bolt holes on the motor to the bolt holes on the pedestal making sure that the motor shaft is pointing towards you.
    a. Next, insert 3/8” bolts into the holes from the underside, make sure to use a standard washer on the bolt side, only a locknut is required on the motor side.
    b. Square the motor and tighten the bolts to 40 ft-lbs.
12. Reinstall the fan on the motor shaft with the hub facing towards you. Line up the markings on the hub/trans torque bushing/shaft. Make sure that the trans torque bushing nut is flush to the hub, tighten the bushing nut to 80 ft-lbs.
13. Once the fan/motor/pedestal assembly is done, turn it 180° so the the fan is facing the inlet of the fan cell. Slide the pedestal forward to the line up with the holes in the motor rail. Insert 5/16 x 18 bolts into the holes. Hand tighten the nuts for now.
14. Follow Fan / Cone Alignment procedures starting on page 28.

Extruded Fan Cell
Fan Wheel/Motor Replacement Continue

15. For removing polymer fan wheel, you start by removing the two set screws in the taper lock bushing.

16. Reinsert one set screw in the middle hole and start tightening the set screw. This will seperate the taper lock bushing from the fan wheel hub.

17. Once the two have been seperated, carefully remove the taper lock bushing from the motor shaft. Make sure not to damage the polymer fan wheel when removing the taper lock bushing. Once the polymer fan wheel has been removed from the motor shaft, place taper lock busing back into the fan wheel hub. Align the three half holes in the bushing with the half holes in the fan wheel hub. Reinsert set screws far enough so that the bushing and set screw do not fall out of the fan wheel hub.

18. Replace bad motor on the pedestal. After the new motor has been installed on the pedestal, align the keyway in the bushing to the keyway on the motor shaft and carefully slide fan wheel on.

19. In a alternating pattern, tighten set screws. Make sure the fan wheel is no less than 1/4 inch from the shaft bearing. Torque set screws to the specs in the table below.

20. Inspect polymer fan wheel for any cracks or damage.

21. Once the fan/motor/pedestal assembly is done, turn it 180° so the the fan is facing the inlet of the fan cell. Slide the pedestal forward lining up Isolator Brackets A & B.
a. Insert (4) 5/16-18x1.125 Torx screws into the holes. Do not tighten down all the way. Leave loose so that the motor assembly can slide back and forth freely.

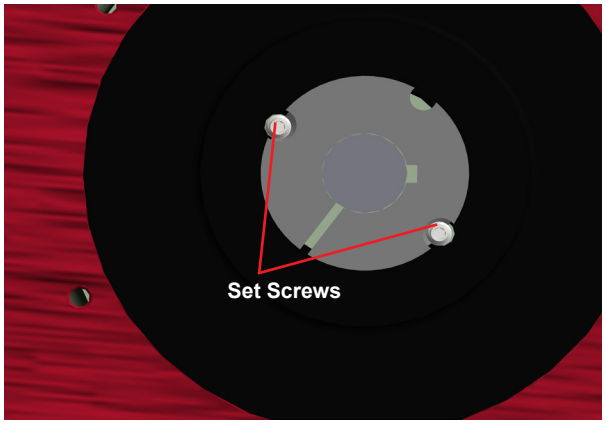
22. Follow Fan / Cone Alignment procedures starting on page 28.

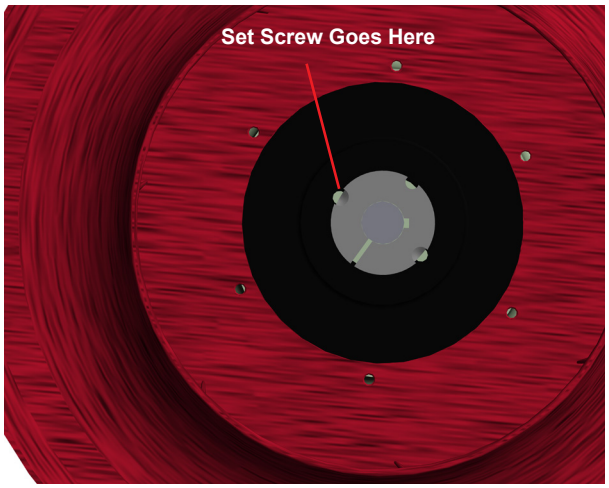
Important: Before Restarting

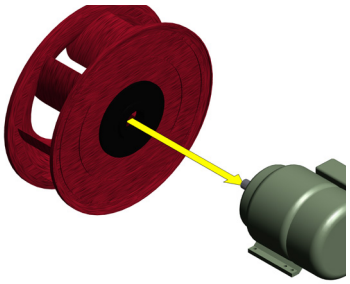
Re-balance fan wheel once the complete motor pedestal/ fan wheel/motor assembly is re-installed.
Before operation, start the motor slowly to ensure the fan rotation is correct.
Drive Side = Clockwise rotation when looking at motor end
Inlet side = Counter-clockwise rotation looking at fan.

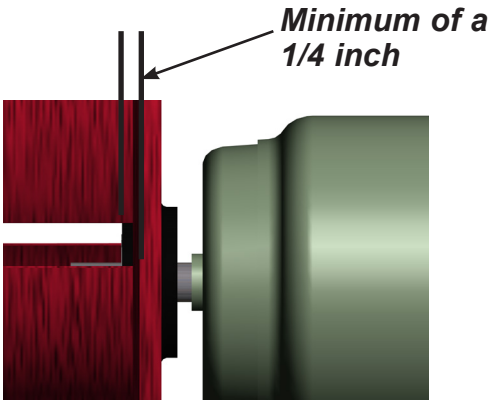
Polymer Fan Wheels:
Drive Side = Counter-clockwise rotation when looking at motor end
Inlet side = Clockwise rotation looking at fan.

Recommended Torque	
Bushing No.	**LB. – Ft.**
1210	15
2012	24
2517	36









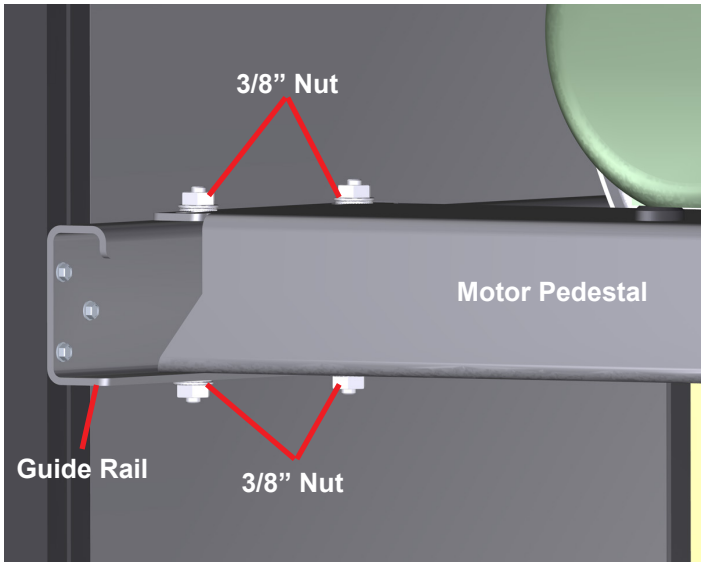
Extruded Fan Cell W/Formed Pedestal And Formed Rails Fan Wheel/Motor Replacement

DANGER! Risk of Electric Shock

Always disconnect power to the fan control panel before maintenance. Follow all lockout and tag out procedures.

Note: Tools required for fan removal include torque wrench with 12” extension, 1-3/4” socket, and a length of pipe or wood block to brace fan wheel from spining.

1. To replace a fan wheel/motor assembly, first disconnect power to the FWT at the main control panel.
2. To gain access to the fan/motor cartridge, remove the personel safety screen on the discharge side if applicable.
3. Disconnect power to the existing fan at the main disconnect control panel.
4. Make note of all wire locations for reinstallation later.
5. Disconnect existing fan motor power cable from terminal located in motor J-Box and conduit fitting from electrical chase.
6. Loosen and remove (8) 3/8” nuts at the top and bottom of the guide rails.
7. After removing the mounting bolts slide the motor pedestal to the point where the motor lifting ring is exposed enough to use. If a mechanical device is available for use, attach it to the lifting ring for use. Lift the motor/fan/pedestal assembly and turn 180°. Set back down on the motor guide rails so that the fan is now facing you.
8. Push the pedestal back in to the fan cell so that the fan wheel is in the cell. Block the fan from rotating by using a wood block or a pipe.
9. Mark the location of the transtorgue bushing on the shaft and the fan. To remove the fan wheel from the motor shaft, remove the trans torque bushing retaining hex nut by turning counterclockwise. Loosen progressively until bushing is free from wheel hub and motor shaft. Remove fan/hub assembly.



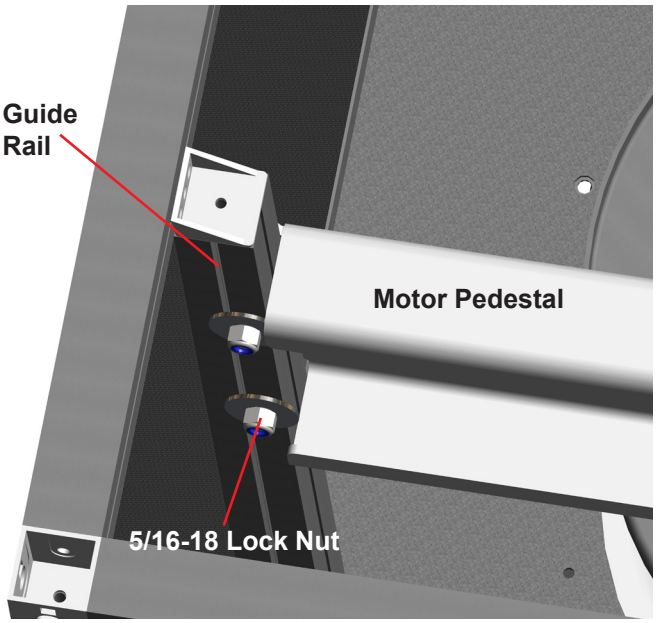
10. If needed the motor may now be removed for service by removing the 3/8” motor bolts.
11. With the motor pedestal on the guide rails that run front to back along the cell, set the motor on the pedestal using the same holes. Use proper lifting techniques, crane or motor/rail system if possible for lifting the motor into position. Once the motor is placed on the pedestal align the bolt holes on the motor to the bolt holes on the pedestal making sure that the motor shaft is pointing towards you.
    a. Next, insert 3/8” bolts into the holes from the underside, make sure to use a standard washer on the bolt side, only a locknut is required on the motor side.
    b. Square the motor and tighten the bolts to 40 ft-lbs.
12. Reinstall the fan on the motor shaft with the hub facing towards you. Line up the markings on the hub/trans torque bushing/shaft. Make sure that the trans torque bushing nut is flush to the hub, tighten the bushing nut to 80 ft-lbs.
13. Once the fan/motor/pedestal assembly is done, turn it 180° so the the fan is facing the inlet of the fan cell. Slide the pedestal forward to the line up with the holes in the motor rail. From the inside of the pedestal, slide 3/8 x 3/4 carriage bolt up through the top holes. Screw on the nut finger tight From the inside of the pedestal, slide 3/8 x 3/4 carriage bolt down through the bottom holes. Screw on the nut to finger tight. Repeat until all carriage bolts have been installed.
14. Follow Fan / Cone Alignment procedures starting on page 28. Once aligned, the 3/8” should be torqued to 23 ft-lbs.

Extruded Fan Cell w/Polymer Wheel and ECMI Motor Replacement

DANGER! Risk of Electric Shock

Always disconnect power to the fan control panel before maintenance. Follow all lockout and tag out procedures.

1. To replace a fan wheel/motor assembly, first disconnect power to the FWT at the main control panel.
2. To gain access to the fan/motor cartridge, remove the personel safety screen on the discharge side if applicable.
3. Disconnect power to the existing fan at the main disconnect control panel.
4. With a T20 Torx bit, remove the back plate on the ECMi motor.
5. Make note of all wire locations for reinstallation later.
6. With a small straight screw driver. Loosen the terminal block screws and remover the power and data cable wires.
7. Loosen and remove (4) 5/16-18x1.125 Torx screws at the bottom of Isolator Bracket B that retain the motor pedestal to the guide rails.
8. After removing the mounting bolts slide the motor pedestal to the point where the motor lifting ring is exposed enough to use. If a mechanical device is available for use, attach it to the lifting ring for use.
9. Slowly rase the motor/fan wheel/pedistal and remove from the fan cell. Slowly lower the motor/fan wheel/ pedistal to the floor.
10. Removing the 3/8" motor bolts and attach the replacement motor and fan wheel, and insert the 3/8" motor bolts and finger tignten.
11. Lifting the motor/fan wheel/pedistal into position. Square the motor and tighten the bolts to 40 ft-lbs.
13. Once the fan/motor/pedestal assembly is done, turn it 180° so the the fan is facing the inlet of the fan cell. Slide the pedestal forward to the line up with the holes in the motor rail. Insert 5/16 x 18 bolts into the holes. Hand tighten the nuts for now.
14. Follow Fan / Cone Alignment procedures starting on page 28.



Important: Before Restarting

Before operation, start the motor slowly to ensure the fan rotation is correct.

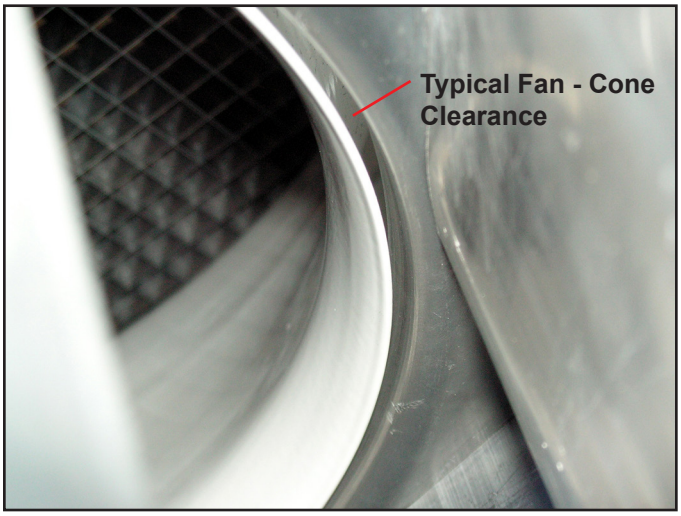
Drive Side = Counter-clockwise rotation when looking at motor end

Inlet side = Clockwise rotation looking at fan.

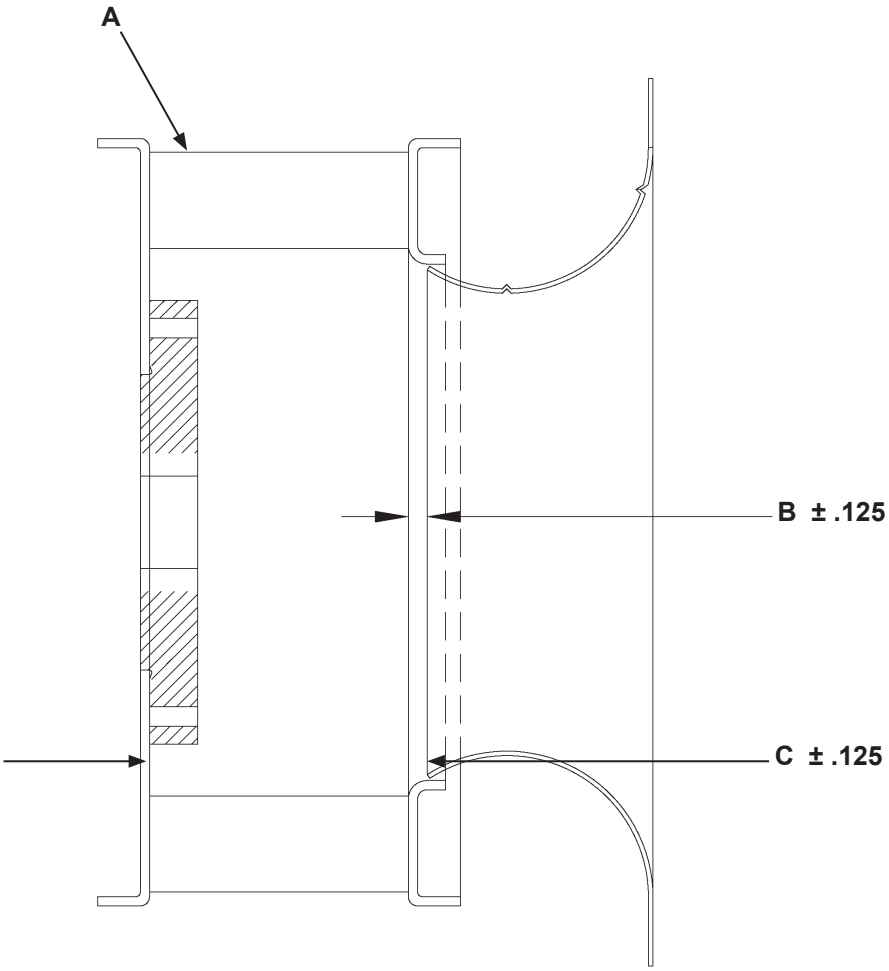
1. Temporarily attach the cone to the cell inlet using the screws and washers provided, or slightly loosen the screws holding the cone if already installed (remove the backdraft damper to access the cone). Use a minimum of four screws for this step.
   a. Refer to the fan wheel overlap drawings provided to determine where to set the wheel with respect to the cone. See page 27.
   b. Adjust the amount of overlap by moving the motor pedestal forward or backward to line up the cone with the wheel (wheel/cone overlap is designed to insert the cone 50% of the distance of the rolled shroud lip on the wheel). Once you have the wheel approximately located tighten the ½" pedestal bolts to 90ft-lbs.

2. Center the cone in the wheel shroud.
   a. The cone alignment can be a tedious process as there are no tools that effectively work to align the cone. It is a hands on process to align the cone. Huntair cones have a running clearance of about 1/16" (see image top right).
   b. Start by loosening the four screws that were used to hold the cone for the depth alignment. Hold the cone with one hand and with the other use a drill to attach a screw to hold the cone in place. Feel between the wheel inlet shroud and the cone and set the gap to approximately 1/16" and tighten the screw in that location (top of the cone is usually the best place to start). At this point you should be able to move the cone about that screw location, adjust the cone on the left or right until there is approximately a 1/16" gap.
   c. Spin the wheel by hand at this point to check for any clearance issues. If the wheel spins clear tighten the remaining screws on the cone. Check that the wheel spins clear after tightening each screw.

3. Attach the inlet backdraft damper using the predrilled holes in the faceplate (see middle image).
   a. Start by loosely installing (don't tighten screws all the way) the top two screws. Align the holes on the sides.
   b. Loosely install screws on side. Install bottom 2 screws.
   c. Tighten all screws (middle image).
   d. Install safety screen on discharge side if applicable.



WHEEL/CONE ALIGNMENT



A	B	C
Wheel Type & Dia (in)	Cone to Wheel Overlap (in)	Cone to Wheel Overlap (in)
Aluminum		
All Diameters	0.375	
Polymer		
10”		4.134
12”		5.158
14”		5.768
16”		6.437
18”		7.244
20”		8.189
22”		9.095

Note: Drawings not to scale

Water Coil Freeze Protection Instructions

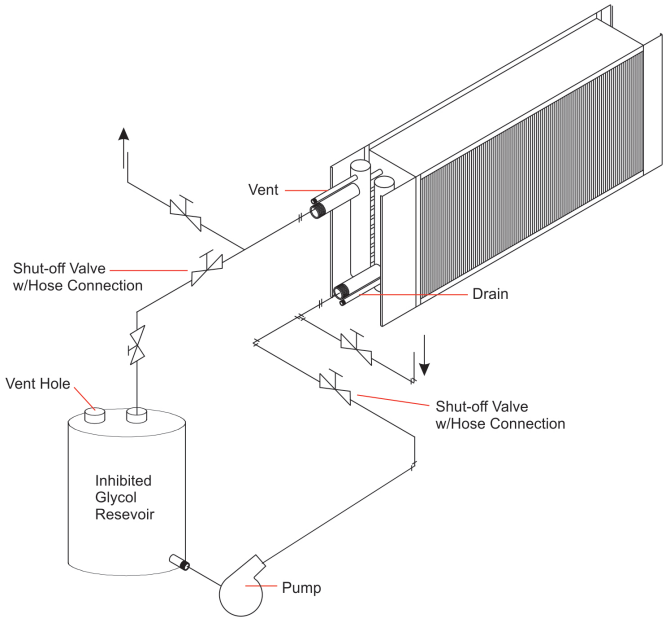
Air stratification and outside air damper failure are just a couple of causes that can trigger coil failure. Permanent coil damage can result. Chilled water coils need to be protected during the winter months by a variety of methods described below:

Coil Blow-Out

1. Close the valves on both supply and return lines to isolate the coil from the rest of the system.
2. Open all drain valves and/or the drain plug to drain coil. Remove the vent plug to speed the draining process.
3. When completely drained, hook up a blower. Ideal locations to hook up the blower are where end caps are installed on straight runsfor the supply and return connection. Do not hook up the blower to the air vent or drain.
4. Close the drain plug or vent tube on the header that the blower is attached to, open the cap or drain valve on the other header.
5. Run the blower for 45 minutes to an hour, then check the coil to see if it is dry. A small mirror placed in the discharge will fog if moisture is present. If so, continue running blower until coil is dry.
6. Let the coil stand for several minutes and blow once again. Repeat blowing process if water comes out.
7. Leave plugs out and drains open until freeze threats have passed.

Flushing Coils

1. The use of inhibited glycol designed specifically for HVAC applications is highly recommended by Huntair for use in their coils for corrosion protection. Uninhibited glycol can produce ant nest corrosion in copper tubing.
2. Estimate the volume of the coil in gallons. For 1/2” tubes (1.25” face tube spacing) (finned height in inches) x (finned length in inches) x (# of rows) x 0.00083 = gallons.
3. Close the valves on both supply and return lines.
4. Open all drain valves and/or drain plug and drain the coil. Remove the vent cap to speed the draining process.
5. Close the drain plug and valve(s).
6. Connect the flushing system to the coil.
7. Close the throttling valve and start the pump. When all the air is ventilated from the coil close the air vent.
8. Open the throttle valve 50% and circulate fluid through the coil for 15 minutes. Use a hydrometer or test kit to check the fluid strength.
9. Adjust fluid strength as needed and circulate 15 minutes more.
10. Check the strength of the fluid again. Repeat adjustments to fluid, circulate and test until desired concentration is reached.
11. Turn off pump and drain coil.



Evaporative Media Replacement

In order to get the best performance from your cooling pads, they must be installed properly. If you have pads with two equal angles, they can be installed in either direction, otherwise pads are manufactured with special angle combinations. Those having combinations of 15° x 45° or 30° x 45° are made to direct more water toward the air entering side of the pads. If installed backwards, the pads may not work properly.

Pads must be installed with the steeper flute angle sloping down toward the air entering side. The steeper angle puts more water on the entering side of the pad where the air is hot, dry, and dusty and extra water it is needed most. The unequal angles also counteract the tendency of the air to push the water toward the air leaving side of the pad.

Caution

Do not expose evaporative cooling pads to sparks, open flame, welding spatter, temperatures in excess of 350° F, or other sources which may ignite the paper.

1. Turn off all water supply lines.
2. Drain sump tank.

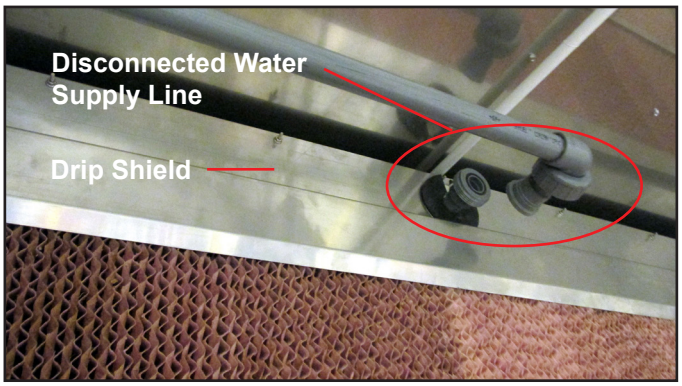
DANGER! Risk of Electric Shock

Always disconnect power to the evap cooler control panel before maintenance. Follow all lockout and tag out procedures.

3. Disconnect the water supply line going to the distribution manifold at the top of the evap cooler by turning the coupling counter-clockwise.
4. Remove the drip shield at the top on the evap cooler tower exposing the top layer of horizontal media. These are used to help distribute water evenly through the media below.

Evaporative Cooler Air Entering Side

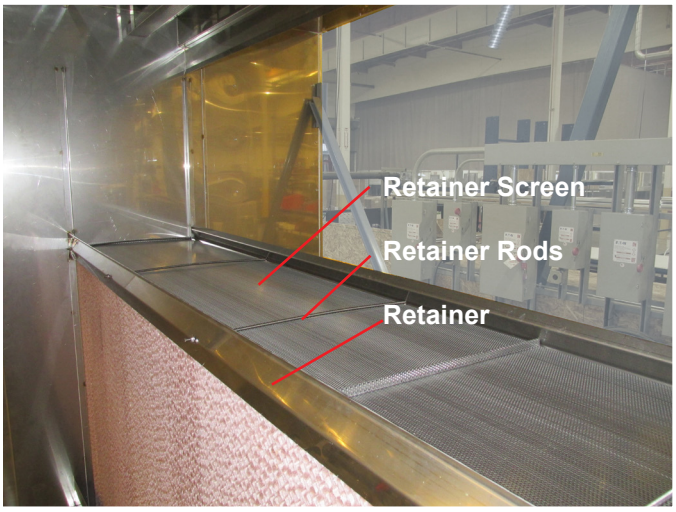
Evaporative Cooler Air Leaving Side



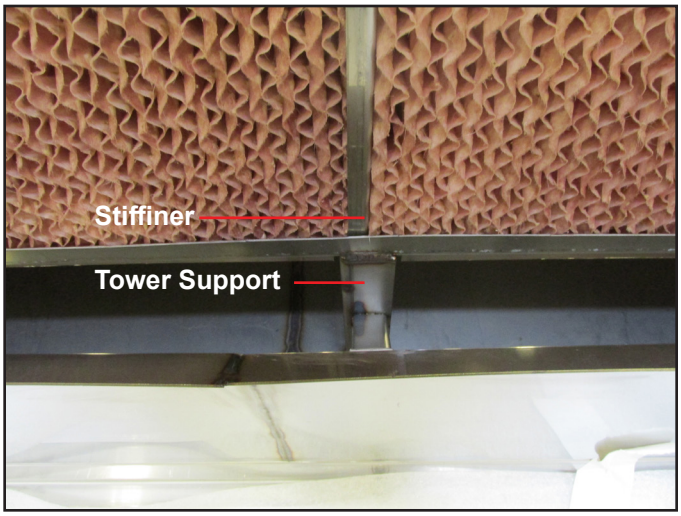
Top Center of Evaporative Cooler

5. Remove horizontal layer of media. Remove vertical media starting in the center and working outward.

6. Remove retainer rods and then then retainer screen. Lift out bottom media starting in the middle and working outward.



7. Depending on the size of your evaporative cooler media, there may be stiffiner(s) between the media for additional support. Stiffiners are located over leg suppots for the evap tower.



Evap Cooler Air Entry Side

Cleaning the Water Distribution System

Refer to Maintenance section for suggested scheduled cleaning and flushing of the system to increase their service life.

When water evaporates, dirt and chemicals are left behind and build up on the pads and in the sump. Eventually, the water becomes so contaminated that it is harmful to the pads and gutters.

After removing media from evap cooler tower completely empty the sump of water and silt.

Refill with clean water.

Open the ends of the water distribution pipes to flush out debris which could clog the holes. Replace the covers when done. When using silt collection, remove plug and drain the system.

Gently hose stubborn deposits from the face of the pads.

Completely empty the sump to remove the old algae and dirt which was just rinsed off the pads.

Disinfect the system by adding the proper amount of approved chemical.

Check to make sure the bleed off is still functioning properly.

Refill with clean water.

Install cleaned or new pads.

Manually turn on the pumps to run fresh water over the pads for about 30 minutes. Use as much water as possible.

Common Algae Treatment Chemicals

Algae control begins with cleaning and flushing of the system, after that process treatment with an approved disinfectant is advised. Use only products that are designed for use in evaporative coolers, many are commercially available. ***Do not use products that do not list active ingredients.*** Nonoxidizing biocides, copper compounds and quaternary amines are the three most common chemicals.

Quaternary amines examples include:
- Alkyl diMethyl Benzyl Ammonium Chloride
- Octyl Decyl diMethyl Amonium Chloride

Recommended usage: 30 to 50 PPM.
Commercial disinfectants, swimming pool chemicals and cooling water biocides include these chemicals.

Nonoxidizing biocides examples include:
- DBNPA
- Carbamates
- Methylene bis-thiocyanate
- Isothiazolin

Recommended usage: Follow product labeling.
These are available from industrial water treatment specialists.

Oxidizing biocides examples include:
- Hydrogen Peroxide
- Solid Calcium hypochloride
- Sodium hypochlorite (Chlorine bleach)
- Potassium peroxymonosulfate (non chlorine bleach)
- dimethyl Hydantoin
- Ethyl Methyl Hysantoin (Bromine)
- Copper compounds

Do not use in evaporative cooler, these products are detramental to cellulose and metals.

Allow drying of the pads for several hours at a time to prevent algae growth.

- Minimize the number of drying cycles, though. Too many will weather the pad. Ideally, during the cooling season, they should cycle on and off once each day.
- Set automatic controllers so the water to the pads turns off before the fans turn off. Pad pumps should be turned on last and turned off first.
- Do not allow the bottom of the pads to set down in the water when the system is not running. Adjust the float valve and overflow after the system shuts down and all of the water returns to the troug

Scale Control

Proper water distribution will aid in prolonging pad life by flushing away dirt and contaminants, which may be harmful to the pad. Areas that do not get enough water will clog or soften first.

- Check the pressure in the distribution pipe. The distribution systems consist of a perforated plastic pipe with holes directed at a splash plate. If the pressure is low, the water will not break up at the splash plate. Streaking and dry areas will occur.
- Check for adequate water flow. Adjust the flow until there are no dry streaks. When the pads are operating properly, they will be thoroughly wetted with a visible flow of water trickling down the flutes. Most of the water will pass over the pad and return to the sump. If there is little water running out the bottom of the pad, the dirt and minerals are not being flushed.
- Check for clogged holes in the distributer pipe. The simplest way to clean the holes is to install a ball valve or threaded end cap at the end of each distributer pipe. While the pump is running, open the valve and allow the water to flush the dirt and debris from the pipe. Usually the first signs of blockage will be at the end of the pipe farthest from the pump.
- Clean the water filter often. A dirty filter will substantially restrict the flow of water. Install a ball valve on the clean-out for the filter. This way the filter can be flushed without tools and without shutting off the pump.

Required water flow for CELdek and GLASdek evaporative cooling pads:
4 inch depth 0.50 GPM/ linear foot of pad
6 inch depth 0.75 GPM/ linear foot of pad
8 inch depth 1.0 GPM/ linear foot of pad
12 inch depth 1.50 GPM/ linear foot of pad
18 inch depth 2.25 GPM/ linear foot of pad

Door Adjustment

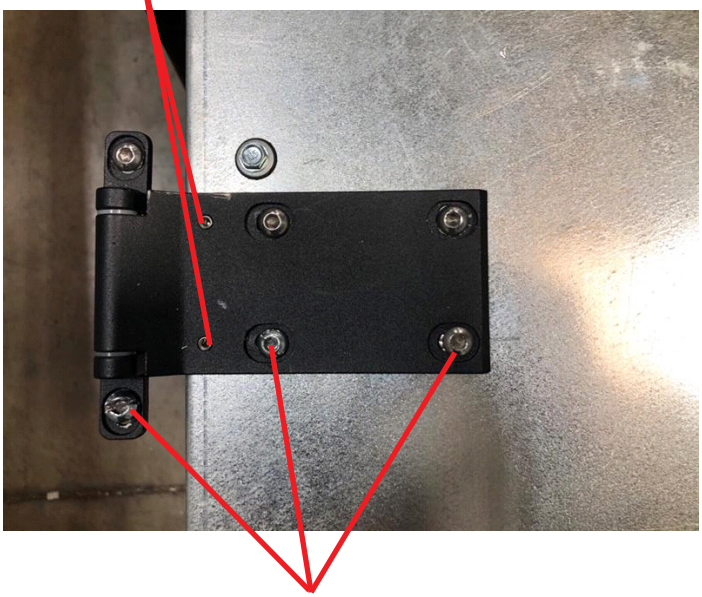
The CSU Series air handler comes standard with 2” or 4” inward or outward opening doors equipped with removable hinges allowing doors to be easily removed by lifting, and making adjustments in the X, Y, and Z axis easy.

1. Centering the Door in Frame
   - **a.** Loosen the M6-1.0 screws with a 10mm Allen wrench (must be done to all hinges).
   - **b.** Shift door to desired position.
   - **c.**Tighten zinc screws to 100 in-lbs if screws. Stainless Steel screws tighten to 80 in-lbs.

2. Compression Adjustment
   - **a.** Adjust the compression adjustment screw on both the top and bottom hinges by turning them to achieve the desired compression of the door against the seal.

Standard Huntair Door with Adjustable Hinges

Compression Adjustment Screw



M6-1.0 x 2.0 Screws

SYMPTOM	POSSIBLE CAUSE	FIELD TEST	REMEDY
FAN WILL NOT START OR RUN AT ALL	1 No main power.	1 Check main power fuses with ohm meter.	1 Correct problem and replace fuses with size indicated on electrical diagram.
		1A Check disconnect switch.	1A Turn to "On" position.
		1B Use volt meter to check for proper main voltage to unit.	1B Restore power to unit.
	2 Faulty control cirvuit auxiliary contact on unit disconnect switch.	2 Check contact with ohm meter.	2 Replace switch if faulty.
	3 No control transformer output.	3 Check primary and secondary fuses on transformer.	3 Correct problem and replace fuses with size indicated on electrical diagram.
		3A Check control transformer primary and secondary voltages.	3A Replace transformer if faulty.
	4 Tripped overloads on motor starters.	4 Verify overload trip setting is at or slightly above the motor nameplate fla.	4 Adjust overload trip setting (not to exceed motor fla x 1.15 for ODP motors and not to exceed motor fla for TEFC motors).
		4A Reset overloads and measure operating current of motors.	4A If current values are above nameplate fla, go to Motor Failure.
MOTOR FAILURE	1 Improper supply voltage.	1 Check voltage at motor.	1 If incorrect, correct to proper value.
		1A Check for proper wiring at motor.	1A Wire motor per diagram on motor or inside motor junction box.
	2 Motor overloaded.	2 Check ampage at motor.	2 If amperage outside of motor nameplate limits, conduct additional field tests that follow.
		2A Check rotation of fan.	2A Correct rotation, if necessary.
		2B Check motor shaft for freedom of movement.	2B Replace motor or motor bearings if necessary.
		2C Check fan shaft for freedom of movement.	2C Replace fan bearings or align fan wheel if necessary.
		2D Check for excessive cfm and/or staticpressure.	2D Correct cause of high static pressure and adjust airflow per start-up section instructions.
	3 Motor overheating.	3 Verify correct supply cfm.	3 Adjust cfm to unit data plate value.
		3A Check for temperatures above 110°F	3A Consult factory for motor heat shield.

SYMPTOM	POSSIBLE CAUSE	FIELD TEST	REMEDY
FAN CAPACITY LOW	1 High external static pressure. 2 Dampers improperly positioned. 3 Air leaks in system. 4 Damaged fan w heel. 5 Incorrect fan rotation. 6 Obstructed inlet or dirty filters.	1 Check actual pressure against unit data plate pressure. 2 Verify proper position of unit air control dampers (if an) and all external dampers/diffusers. 3 Check ductw ork and duct connections for leaks. 4 Visually inspect w heel. 5 Check w heel rotation w ith arrow on fan. 6 Inspect inlet and filters.	1 Correct static pressure. If not possible, consult factory. 2 Correct damper position. 3 Repair any leaks. 4 Replace fan w heels if necessary. 5 Correct rotation if backw ards. 6 Clear inlet or replace filters.
VIBRATION AND NOISE	1 Misalignment of w heel 2 Unstable foundation. 3 Dirty fan w heel. 4 Broken or loose bolts or setscrew s. 5 Fan delivering more than rated capacity. 6 Loose dampers. 7 Shipping bolts and/or braces not removed.	1 Check alignment 2 Check roof curb or mounting platform for stability. 3 Inspect fan w heel. 4 Check bolts and setscrew s for tightness. 5 Refer to airflow verification in start-up procedure section. 6 Inspect dampers. 7 Verify all shipping blocks and braces are removed.	1 Align if necessary. 2 Correct roof curb or platform installation deficiency. 3 Clean fan w heel. 4 Replace or tighten as necessary. 5 Adjust drives per instructions in start-up procedure section. 6 Tighten dampers if loose. 7 Remove shipping attachments.
OVERHEATED BEARINGS	1 Too much grease in ball bearings. 2 Dirt in bearings.	1 Inspect bearings. 2 Inspect bearings.	1 Remove excessive grease and/or replace bearings if necessary. 2 Replace bearings if dirty (alw ays clean grease fittings prior to applying grease).

SYMPTOM	POSSIBLE CAUSE	FIELD TEST	REMEDY
INLET DAMPER FAILS TO OPEN	1 No voltage to motor.	1 Check primary voltage unit. Check voltage at motor (should be 120 vac).	1 Restore power if not present.
		1A Check fan service switch.	1A Place in "On" position. Replace if faulty.
		1B Check control transformer output and control fuse.	1B Replace control transformer if faulty. Determine cause of blown fuse, repair, and replace fuse with one of same type and value.
	2 Damper of linkage binding.	2 Disconnect linkage at motor end and operate damper and linkage by hand. Both should operate freely.	2 Lightly lubricate damper and linkage if necessary. Replace bent or worn linkage and damper blades.
	3 Motor faulty.	3 Check motor windings for open circuit.	3 Replace motor if faulty.
INLET DAMPER MOTOR CONTINUES TO DRIVE AT END OF DESIRED STROKE	1 Linkage improperly adjusted.	1 Observe that motor is free to travel to end of stroke while opening damper (drive motor stops and brake solenoid holds damper in open position).	1 Adjust linkage such that motor stroke is terminated by internal limit switch and not by opening force.
INLET DAMPER FAILS TO CLOSE	1 Damper or linkage binding.	1 Disconnect linkage at motor end and operate damper and linkage by hand. Both should operate freely.	1 Lightly lubricate damper and linkage if necessary. Replace bent or worn linkage and damper blades.
	2 Spring-return mechanism broken.	2 Examine spring-return mechanism for broken spring.	2 Replace mechanism if faulty.
EVAPORATIVE COOLER NOT COOLING	1 Outside air temperature too low.	1 Verify setting of heat/cool changeover control.	1 If temperature is below the setpoint plus the differential (about 3-5º F) the cooler should not operate. This is normal.
			1A If desired, lower setpoint (keep in mind this will cause the heat to lockout at a lower temperature)
	2 Circulating pump faulty.	2 Verify 120 vac is present at motor.	2 If voltage is present and pump does not operate, replace pump.
	3 Sump level too low.	3 Check if water level in sump is 1" from top of sump.	3 Adjust inlet float and/or bleed-off valve (if any) to raise water level.
	4 No power to circulating pump.	4 Verify setting of T-1 per above.	4 See above.
		4A Verify sump level switch contact closes at proper cump water level.	4A Replace switch if faulty.
		4B Check circulating pump circuit fuse.	4B If blown, trace problem, correct and replace fuse.
	5 Poor water distribution to media.	5 Check water distribution pipe.	5 Clean holes in distribution pipe.
		5A Check for distribution pipe hole blockages.	5A For scale build-up try increasing bleed rate
		5B Check media for clogging.	5B Remove clogged media and clean with low pressure water. If unable to clean, replace media.
	6 Outside air temperature and/or humidity excessively high.	6 Check evaporative cooler performance data in appendix A. Verify outside air temperature and humidity (wet bulb temperature).	6 Evaporative cooler not effective beyond design criteria. Consult factory if conditions persist.

SYMPTOM	POSSIBLE CAUSE	FIELD TEST	REMEDY
CHILLED WATER COIL NOT COOLING	1 Control valve not opening.	1 Verify setting of heat/cool changeover control.	1 If temperature is below the setpoint plus the differential (about 3-5°F) the control valve should be closed (no cooling). This is normal. 1A If desired, lower setpoint (keep in mind this will cause the heat to lockout at a lower temperature)
		2 Verify setting of coil discharge temperature control (typically set at 65°F).	2 Set control to desired discharge air temperature. Replace control if faulty.
		3 Check differential pressure across valve.	3 If pressure exceeds allowances specified in the cooling coil component description section of this manual, reduce pressure to valve or consult factory for replacement lonkage and/or motor.
		4 Valve or linkage stuck or binding condition.	4 Lightly lubricate valve stem and linkage. Replace valve, valva packing, or linkage if unable to correct problem.
		5 Coil excessively dirty.	5 Using low pressure air direct toward downstream side of coil. Inspect filters for proper installation and cleanliness. Replace filters if necessary.
DIRECT EXPANSION COIL NOT COOLING	1 Remote condensing unit not operating.	1 Verify setting of heat/cool changeover control.	1 If temperature is below the setpoint plus the differential (about 3-5°F) the condensing unit should be off. This is normal. 1A If desired, lower setpoint (keep in mind this will cause the heat to lockout at a lower temperature)
		2 Verify setting of space thermostat (if any).	2 Set thermostat to desired temperature. In most make-up air applications this serves only as a low space temperature limit control.
		3 Refer to remote condensing unit manufacturers trouble-shooting instructions. If provided by Huntair, refer to submittal.	

SYMPTOM	POSSIBLE CAUSE	FIELD TEST	REMEDY
HEATING COIL NOT HEATING	1 Control valve not opening	1 Verify setting of heat/cool changeover control.	1 If temperature is above the setpoint, the control valve should be closed (no heat). This is normal. 1A If desired, raise setpoint (keep in mind this will cause the cooling to lockout at a higher temperature).
		2 Verify setting of coil discharge temperature control (typically set at 65°F).	2 Set control to desired discharge air temperature. Replace control if faulty.
		3 Check differential pressure across valve.	3 If pressure exceeds allowance specified in the heating coil component description section of this manual, reduce pressure to valve or consult factory for replacement lonkage and/or motor.
		4 Valve or linkage stuck or binding condition.	4 Lightly lubricate valve stem and linkage. Replace valve, valve packing, or linkage if unable to correct problem.
		5 Coil excessively dirty.	5 Using low pressure air directing toward downstream side of coil, inspect filters for proper installation and cleanliness. Replace filters if necessary.

VFD UNIT MODELS

Nortek Air Solutions recommends that the following **FWT Start~up Report** be performed on each unit and the results filed with the appropriate facility engineering office.

Unit Nameplate Data:

Model No.

Serial No.

Supply CFM: Supply HP:

Exhaust/Return CFM: Exhaust/Return HP:

Mechanical System Checks

1 Visually inspect fanwall for damage.
- a. On Discharge side look for damage to Fans, Motors, Cells, etc.
- b. On Inlet side look for damage to inlet straigtening grid and frame as well as cells.

2 Fan Wheel / Motor
- a. Rotate fan wheel by hand to ensure it is properly aligned with inlet cone.
- b. Check motor bearings as fan wheel is rotating. Bearings should operate freely and be free of noise.
- c Check that the shaft grounding kit has been installed correctly.
- d Check backdraft damper for smooth operation if supplied. Open damper by hand to ensure a full range of motion without obstruction.

3 HVAC System
- a. Check that all ducts, dampers and registers are set.
- b. Check that all openings and pentrations are sealed.

Electrical System Checks

1 De-Energized
- a. Check for any loose connections
- b. Check circuit breaker disconnect mechanisms / Mechanical interlocks operate properly
- c. Check VFD size and rating (voltage and horsepower)
- d. Check and set motor start protectors (MSP) for correct size and setting.
- e. Ensure all system components are adjusted to proper settings (temperature, amperage)

2 Energized
- a. Connect proper input voltage power to line side of panel
- b. Energize incoming power circuit.
- c. Check for proper line voltage.
- d. Check voltage between all neutral terminations and panel ground (should be zero volts)
- e. Check internal power supplies for proper voltage output(s) and adjust as required
- f. Test and verify proper operations of all GFCI devices
- g. Check operation of cabinet cooling fans, adjust thermostat as specified on drawing
- h. Check and record all voltage readings
- i. Energize MSP one at a time to ensure correct motor rotation.
- j. Ensure that CFM monitoring system is functioning (if applicable).

Comments

PRMH20240272

NORTEK AIR SOLUTIONS HUNTAIR

CSU START-UP REPORT

FOR FAN COIL UNIT MODELS

JOB NAME _____

JOB # _____

Unit Tag #_____

CAUTION: Read and familiarize yourself with the installation and operating instructions shipped with unit.

1. PRELIMINARY CHECKS
   - a. Are all shipping supports removed? ❑Yes ❑No
   - b. Are all wiring connections tight and correct for size, phase, voltage per NEC code and any applicable codes and regulations? ❑Yes ❑No
   - c. Are all heating coil connections (if any) leak free? ❑Yes ❑No
   - d. Are all cooling section connections (if any) leak free? ❑Yes ❑No

Follow the instructions for initial start-up and put unit into operation.

2. FILTER CHECK
   - a. Filters in place? ❑Yes ❑No
   - b. Filters clean? ❑Yes ❑No
3. FAN
   - a. Does fan rotate freely without rubbing on cone? ❑Yes ❑No
   - b. Fan rotation correct? ❑Yes ❑No
4. DIRECT EXPANSION COOLING CHECKS
   - a. Does remote condensing unit operate? ❑Yes ❑No
   - b. Is rotation of compressor and condenser fan correct? ❑Yes ❑No
   - c. Record evaporator coil entering air temperature. _____°F
   - d. Record evaporator coil leaving air temperature. _____°F
   - e. Is space thermostat provided? ❑Yes ❑No
5. COMMENTS

_____

_____

_____

_____

_____

_____

Signature _____Date _____

NORTEK AIR SOLUTIONS

NORTEK AIR SOLUTIONS LIMITED WARRANTY

NORTH AMERICA

Unless otherwise agreed in writing signed by Seller:

(a) Seller warrants: (i) All Products (excluding software and spare parts) manufactured by Seller will conform to the specifications and submittals provided by Seller and will be free of defects in material and workmanship ("Defects") for 12 months following start-up or 18 months following ship date, whichever occurs first, under normal use and regular service and maintenance, if installed and maintained pursuant to Seller's instructions. Extended warranties, if offered, may be purchased for an additional fee at the time of Product sale. For warranty purposes, start-up occurs when the equipment (or any portion thereof) is started for operation regardless of when the building may be ready for operation. (Per submittal, certain DX Products require Seller or its authorized Agent to perform start up or Product warranties are void. Any Seller required completed start-up form shall be delivered to Seller within six (6) months from shipment, or start-up will be deemed to have occurred on the ship date.) With the exception of OEM parts that may provide a longer pass-through warranty term from the third party manufacturer, new spare parts will be free of Defects for 3 months following ship date. Refer to New Spare Parts Warranty Policy. Buyer must notify Seller in writing of any Defect promptly upon discovery and if such notification occurs within the applicable warranty period, Seller shall remedy such Defect by, at Seller's option, adjustment, repair or replacement of Products or any affected portion of Products, or providing a refund of the portion of the purchase price attributable to the defective portion of the Product. Buyer must grant Seller access to the premises at which Products are located at all reasonable times so that Seller may evaluate the Defect and make repairs or replacements on site. Repaired or replaced portions of Products are warranted until the later of the end of the original warranty period applicable to the defective portion of Products repaired or replaced or 30 days following the completion of the repair or ship date of the replacement parts; and (ii) Services will be of workmanlike quality. If Buyer notifies Seller in writing of any nonconforming Services within 30 days after Services are completed, Seller shall re-perform, if able to be cured, those Services directly affected by such failure, at its sole expense. Buyer's sole remedy for such nonconforming Services is limited to Seller's cost of re-performing the Services.

(b) Buyer is responsible for disassembly, removal and re-assembly or otherwise of non-Seller supplied products. Seller does not warrant and shall have no obligation with respect to any Products or parts that: (i) have been repaired or altered by someone other than Seller or Seller's authorized representative; (ii) have been subject to misuse, abuse, neglect, intentional misconduct, accident, Buyer or third party negligence, unauthorized modification or alteration, use beyond rated capacity, improper grounding, voltage irregularities, a Force Majeure Event, or improper, or a lack of, maintenance; (iii) are comprised of materials provided by, or designed pursuant to instructions from Buyer; (iv) have failed due to ordinary wear and tear; or (v) have been exposed to adverse operating or environmental conditions, including but not limited to contaminants, corrosive agents, chemicals or minerals, (vi) were manufactured or furnished by others and which are not an integral part of a product manufactured by Seller, or (vii) have not been fully paid for by Buyer. Refrigerants, fluids, oils and expendable items such as filters are not covered by this Limited Warranty. If Seller has relied upon any specifications, information, representations or descriptions of operating conditions or other data supplied by Buyer or its agents to Seller in the selection or design of Products, and actual operating conditions or other conditions differ, any warranties or other provisions contained herein that are affected by such conditions will be null and void.

(c) Buyer is solely responsible for determining the fitness and suitability of Products for the use contemplated by Buyer. Buyer shall ensure that (i) the Products are used only for the purposes and in the manner for which they were designed and supplied, (ii) all persons likely to use or come into contact with the Products receive appropriate training and copies of applicable instructions and documentation supplied by Seller, (iii) all third parties who use or may be affected by or rely upon the Products are given

full and clear warning of any hazards associated with them or limitations of their effectiveness and that safe working practices are adopted and complied with, (iv) any warning notices displayed on the Products are not removed or obscured, (v) any third party to whom the Products are supplied agrees not to remove or obscure such warning notices.

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Limitation of Remedy and Liability. Unless otherwise provided by law, Seller's total liability under the Agreement, whether in law, equity, contract, infringement, negligence, strict liability or other otherwise, shall not exceed the price paid by Buyer under the Agreement for the Product or Services giving rise to the claim. Under no circumstances shall Seller be liable for special, incidental, indirect, delay or liquidated, punitive or consequential damages for any reason. "**Consequential damages**" includes, without limitation, loss of anticipated profits; business interruption; loss of use, revenue, reputation or data; costs incurred, including without limitation, costs for capital, fuel or power; loss or damage to property or equipment; and environmental clean-up. Any action arising under or relating to the Agreement, (whether based in law, equity, contract, infringement, negligence, strict liability, other tort or otherwise), must be commenced with one year from the date the claim arose. Seller assumes no obligation or liability for technical advice given or not given, or results obtained. Seller has set its prices and entered into the Agreement in reliance upon the limitations of liability and other terms and conditions specified herein, which allocate the risk between Buyer and Seller and form a basis of this bargain between the parties.

PRMH20240272

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KNOCKDOWN REASSEMBLY, AND MAINTENANCE GUIDE

FOR YOUR SAFETY

Improper installation, adjustment, alteration service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

HUNTAIR®
a Nortek Air Solutions Brand

TABLE OF CONTENTS

GENERAL DESCRIPTION

Huntair Fanwall Technology® is a fan-array approach to air handler design that that uses several smaller fans to replace one larger fan, providing design flexibility, reducing maintenance costs, and increasing energy savings.

Safety Considerations

Installing and servicing air conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install or service air conditioning equipment.

Untrained personnel can perform basic maintenance, such as cleaning and replacing filters. All other operations should be performed by trained service personnel. When working on air conditioning equipment, observe precautions in literature and on tags and labels attached to unit.

Follow all safety codes. Wear safety glasses and work gloves.

WARNING

Before installing or servicing system, always turn off main power to system. There may be more than one disconnect switch.

If your unit has permanent magnet motors, high voltage can be generated whenever the motor is rotating, even if power is off. **ALWAYS MAKE SURE MOTORS CANNOT ROTATE DURING SERVICING.**

Turn off accessory heater power if applicable. Electrical shock can cause personal injury or death.

CAUTION: Before proceeding, make sure all electrical service to unit is locked in “Off” position.

INSTALLATION CODES / PRECAUTIONS

INSTALLATION CODES

Electrical characteristics are shown on the unit rating plate.

The unit shall be carefully installed in accordance with the standards of the National Fire Protection Association (National Electrical Code).

Authorities having jurisdiction should be consulted before installations are made to verify local codes and installation procedures.

INSTALLATION PRECAUTIONS

1. The services of qualified field service personnel are mandatory for safe and proper installation of this equipment.

2. Air volumes and external static pressures that do not coincide with those listed on the rating plate will adversely affect the performance of the unit. Please consult the factory if either of these values change.

3. The following clearances from combustible materials are to be maintained: Top - 6", control side - 48", opposite controls - 6", bottom - 0". If roof curb is provided by others, it must be at least 4" high and constructed from non-combustible material.

4. This unit is designed for installation on a level surface.

5. Do not locate the supply inlet opening within 10' of any exhaust discharge point or within 24" of any obstruction.

Tools needed

T40 Torx Allen Wrench 

T40 Torx bit, 4" & 6" lengths and Phillips bit 

Screw gun 

Wrench set 

Parts Provided per fan cell

Motor Assembly (Motor Pedestal, Fan Wheel and Motor).

5/16-18 x 1.125 Torx screw for attaching corner brackets to the extrusions.
3/8-16 x 3/4 Carriage bolts and 3/8-16 Whiz nuts, for bolting the fan cubes together.
10-16 x flat head phil tek screws
10-16 Pan head phil tek screws
#10 x 3/4 tek screws
5/16 x 1.25 fender washers
5/16 flat washer
Perforated side panels
Faceplate (solid).
Side Rail Assembly
Insulation for sides.
Inlet cone.
Backdraft Damper
Silicone caulking (Alum Gray)
Blank-Offs (for perimeter of array only).

Electrical enclosure (if applicable).

Uncrating

The unit may be shipped in several crates in multiple sections. The quantity of sections will depend upon the configuration of the unit. Components are marked for easy identification.

Remove the parts from the crate(s) taking care to keep track of control accessories and installation hardware. Check the entire unit for any damage that may have occurred during transit. If damage is found, immediately file a claim with the transport company. All units are inspected at the factory prior to shipment.

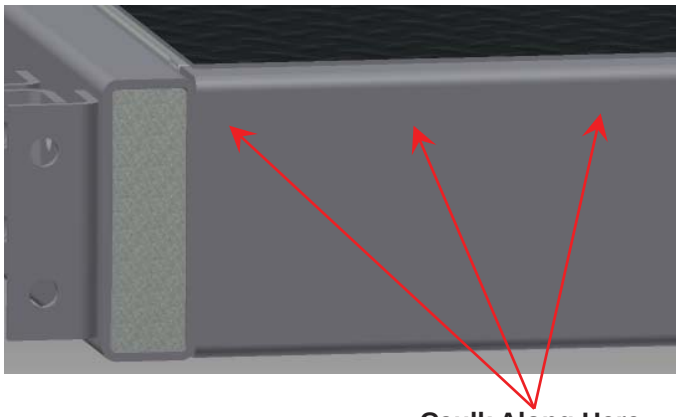
Inventory all Components

Before starting assembly of unit, inventory all internal and external components. Place all components strategically in their respective areas where they can be easily accessed. Before starting assembly of unit reconfirm configuration and location of base. Once assembly has commenced moving the base may not be advisable.

WARNING: The base of the unit must be level before the components can be attached. In order for the base to be level it must sit on a level slab or curb.

Confirm Configuration of Base

Confirm configuration of base. Locate base or bases and position in place. If base is comprised of more than one piece, caulk areas between bases before attaching pieces together. Attach sections together by bolting channel base flanges together or if necessary, pull sections together mechanically from base with a come-a-long or other mechanical device. A tight seal is required to prevent air and/or water leakage when the unit is running. Remove all excess caulk squeezed out from between joints during assembly. Once base is assembled level base.



Caulk Along Here with Prosoco Caulking

Tube Base End

FANWALL Assembly

DANGER! Risk of Electric Shock

Always disconnect power to the fan control panel before maintenance. Follow all lockout / tag out procedures. Failure to follow these procedures may result in injury or even death.

Verify factory furnished components are complete against enclosed packing list. Each FANWALL retrofit cube is numbered and must be located in the array with #1 on the very top left corner looking from the motor side of the cube. See Images below. Fan cells are banded to a skid and shrink wrapped for shipment. Cells may or may not be equipped with Coplaner Silencer option.

Cell Identification

1	2	3
4	5	6
7	8	9

Individual components such as the motor removal rail, etc. are shipped on a separate skid.

Fancells banded on shipping skid

Fancells banded on shipping skid and shrink wrapped

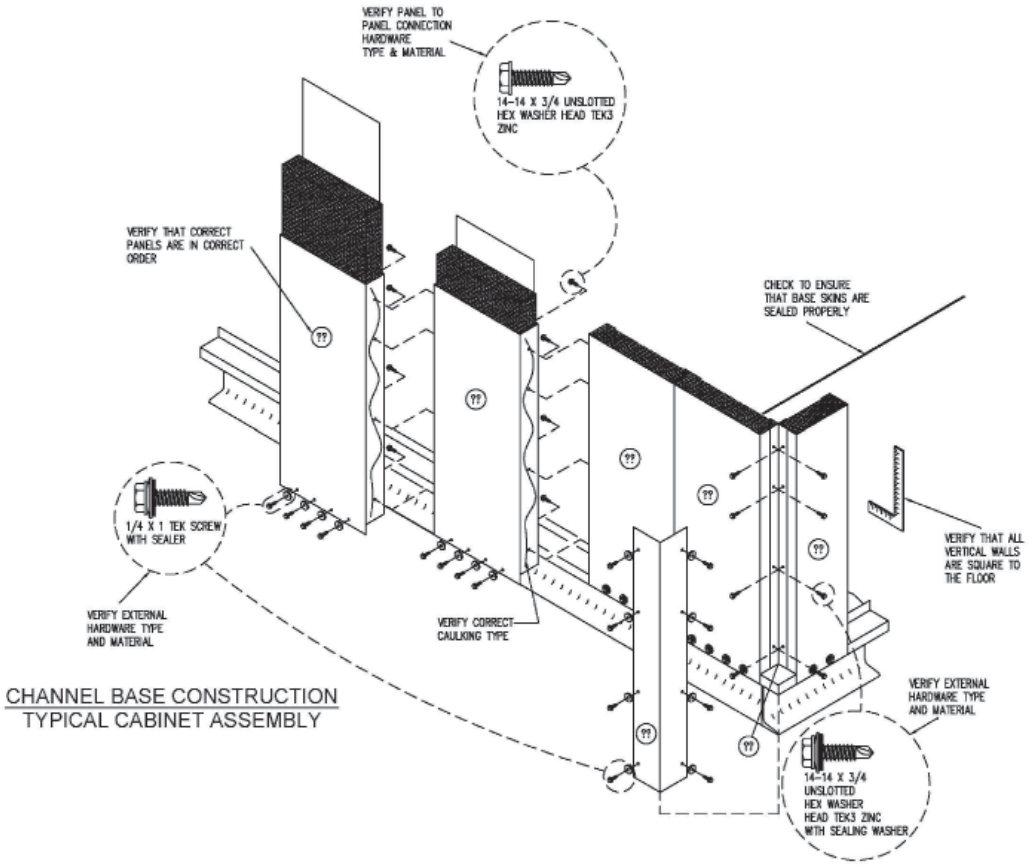
Slab Mounting

Units that were ordered for direct mounting on a slab or on a roof include an integral metal frame which provides required bottom clearance from combustibles. Verify that the support is adequate for the unit weight shown on the drawings in the submittal. The duct connections for this type of installation are normally provided for horizontal runs. Refer to submittal for the duct connections on this unit. Slab must have a flat level surface.

Setting External Walls

Depending on the unit, if there is a large fan or fans you may want to set them first depending on their size and location, i.e. the fan may weigh 2000 lbs. or there may be multiple fan cells. If fan(s) is of no concern, assembly may begin with a minimum of four people. Begin assembly by placing back and end walls that have no access. One person to confirm with prints width, length, and depth of panels. In some cases internal walls can be similar to outside wall panels except may be 1" shorter or could go from 4" depth to 2" depth, depending on the type of unit.

Use three people to pull parts and layout back and side walls. Once walls have been laid out, confirm what type of connecting hardware unit requires. All panels require #14-14x1" screws with bonded washers. Both styles of construction will require #14-14x1" screws with bonded washers. Start with the corner panels; attach two screws to the top and two screws to the bottom. Do not install all the corner screws until the roof has been set in place. For ease of installment the top corner screw may have to be removed in order to install roof . Once roof is in place all corner screws can be attached. All corner seams must be fully caulked.

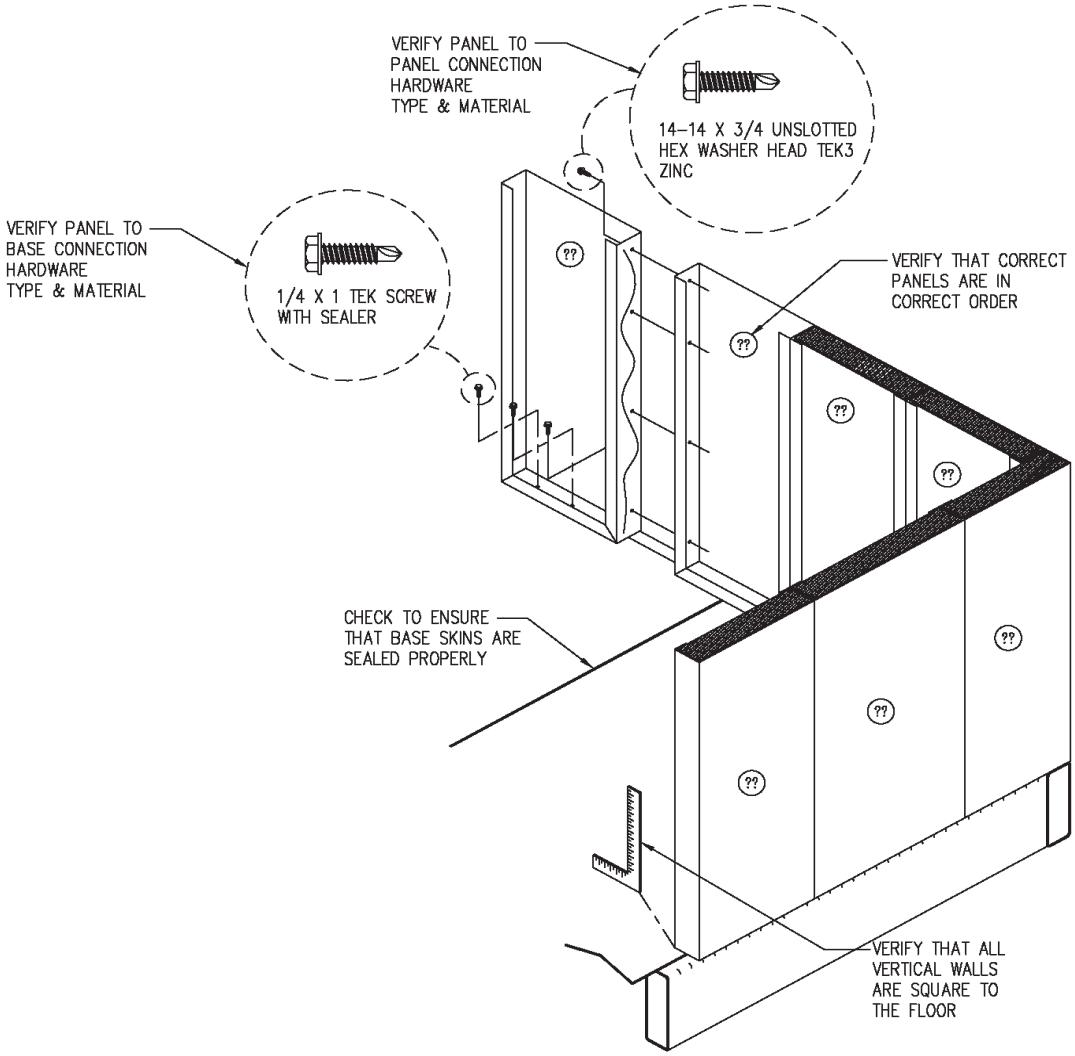


CHANNEL BASE CONSTRUCTION
TYPICAL CABINET ASSEMBLY

Setting External Walls (continued)

Confirm caulking type and caulk between panels and the inside corners before installing insulation. While back panels are laid out, check to insure you split the difference between standing panels up (check both ends of the unit to see if the space on both sides are the same) After determining what the difference is mark one side and start standing wall panels up. Make sure you have something in place or a plan for holding walls up. On a single base unit it is easy to put up three or four back wall panels and then an entire side wall. Side walls are the same as back walls, i.e. you must always split the difference from end to end. Continue to set back wall. Should wall start to lean or sway you may want to start second side wall and attach to back wall for stability

Make sure to reconfirm dimensions, or you may have to move an entire wall. For split base units, always start at the split points. Installing internal components may help in stabilizing walls, plan ahead. Once the walls are up, confirm hardware to be used for assembly, make sure unit is square and matches drawings being used to assemble unit. Vacuum all metal shavings out from bottom of panels before installing insulation in side panels.

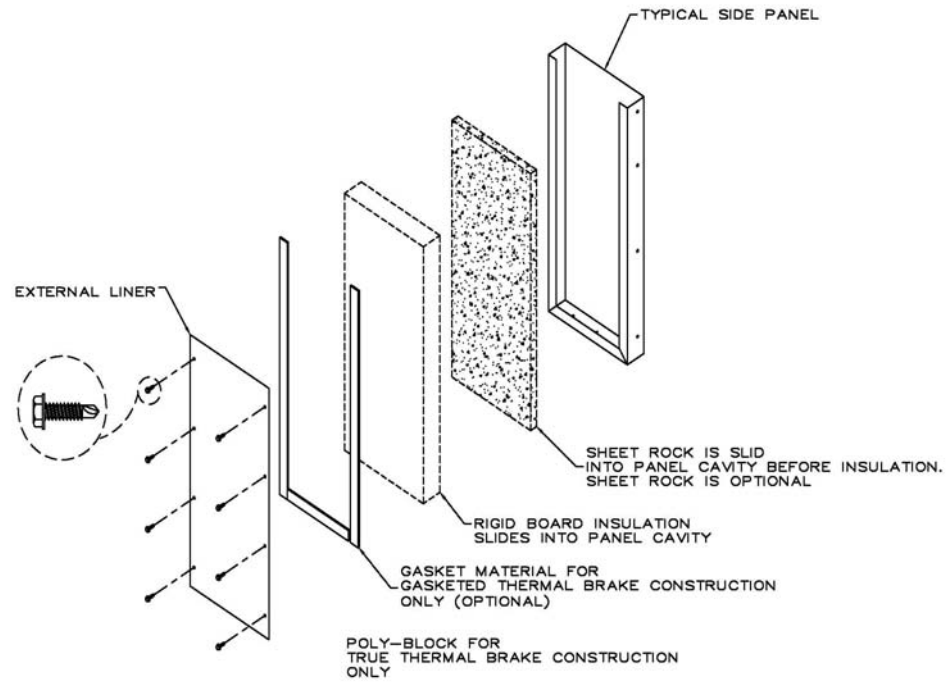


TUBE BASE CONSTRUCTION
TYPICAL CABINET ASSEMBLY

Insulation Installation

Huntair insulation comes premarked from the factory to match the bubble drawings used for assembly. Most insulation used on Huntair units are fiberglass based. Masks and gloves should be worn to prevent irritation. Two people should lay out insulation while two people on ladders install insulation. Insulation options include 2" 3lb. white face, which may or may not require caulking. If it requires caulking, it is considered "encapsulated". If this should get caught on a seam or is mishandled and is damaged, a roll of insulation tape will be included for repairs. Also offered is a 2" 1.5 lb. black insulation which is easily installed and easy to work with. Other options include a 1" 1.5 lb., a 2" 3 lb., and a 4" 3 lb. yellow no face. Typically these all require solid liners.

Once insulation has been installed, the type of unit determines the next step. Modified thermal brake units require that all internal seams must be caulked completely. Some units may have only a section that is thermal brake. This information will be on the bubble drawings. After caulking all panel seams required, there must be a 3"x1/8" poron gasket added over panel seams (this ensures no metal to metal contact while liners and internal components are being installed. Vestibule will not require thermal brake options (only the wall to the vestibule).



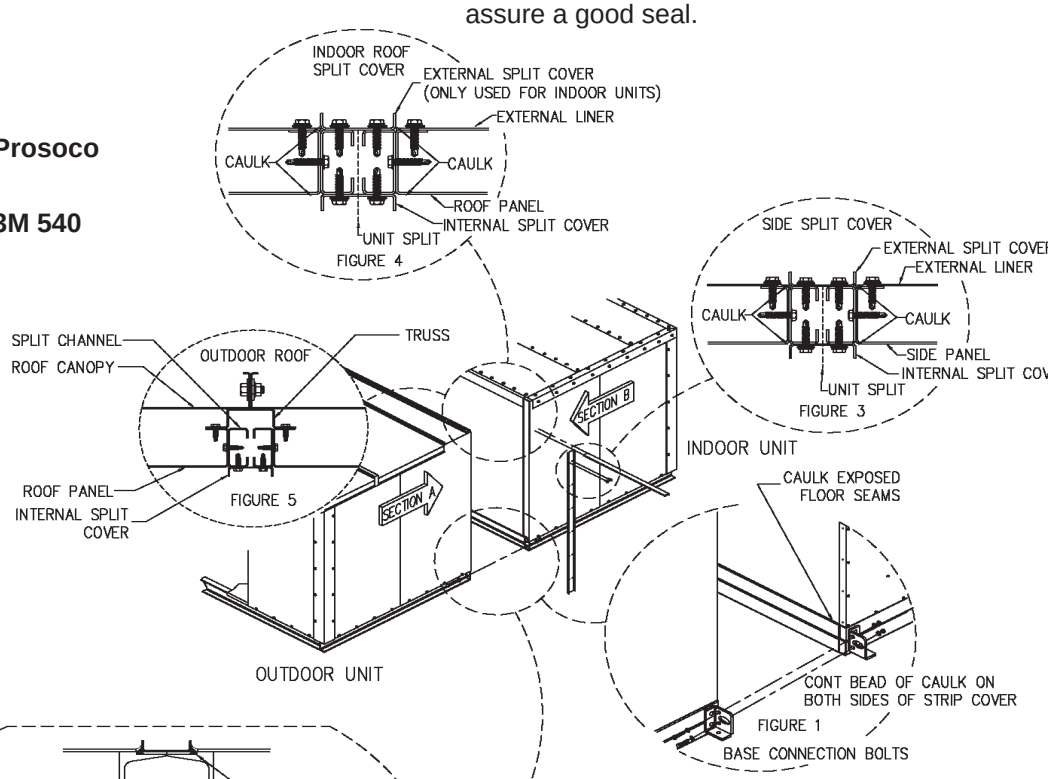
DRIVE SCREW LINER ON TO PANEL CONSTRUCTION
EXPLODED ISOMETRIC VIEW

Re-assembly Instructions

1. Place first section.
2. Caulk seams, interior and exterior in figures 1, 2, 3, and 5.
3. Place next section. Make sure bolt holes are aligned.
4. Install one nut and bolt finger tight at one end of base (see figure 1 & 3).
5. Uneven mounting surface or rocking during transit and rigging may cause roof bolt holes to misalign. If this happens they must be re-aligned prior to installing other fasteners. Re-alignment may be accomplished by using pipe clamps, jacks, and drift pins. If a gap exists between bases or roof panels do not attempt to draw unit together with re-assembly fasteners - use clamps, jacks, crane, etc.
6. Once the two surfaces are next to each other and aligned, bolt the base and roof together (see figure 1 and 3).
7. Caulk the roof and wall seams with 3M 540 (see figure 1 and 2).
8. At the interior base floor, attach and caulk the standing floor seam with Prosoco. Also any exposed base floor seams should be caulked with Prosoco (see figure 2 on this page and page 8).
9. Caulk and attach split cover with 1/4" tek screws and 3M 540 (see figure 4 and 5).
10. Caulk both sides of split cover with 3M 540 (see figure 4).
11. Weather proof only Slide roof drive cleat over newly bolted roof seam (outdoor units only). With a hammer, bend ends down 1-1/2". Caulk all edges of roof cleat (see figure 4).
12. All caulking needs to be put on heavy, about 3/8" thick to assure a good seal.

Prosoco

3M 540



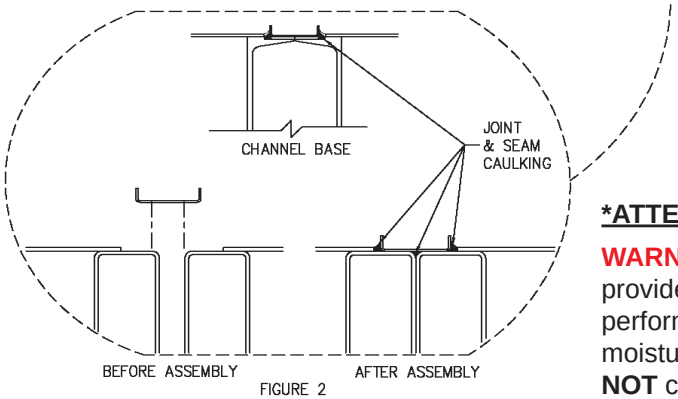
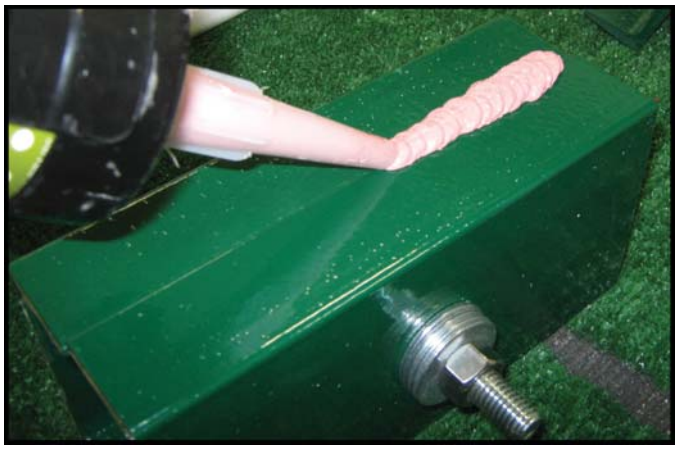


FIGURE 2

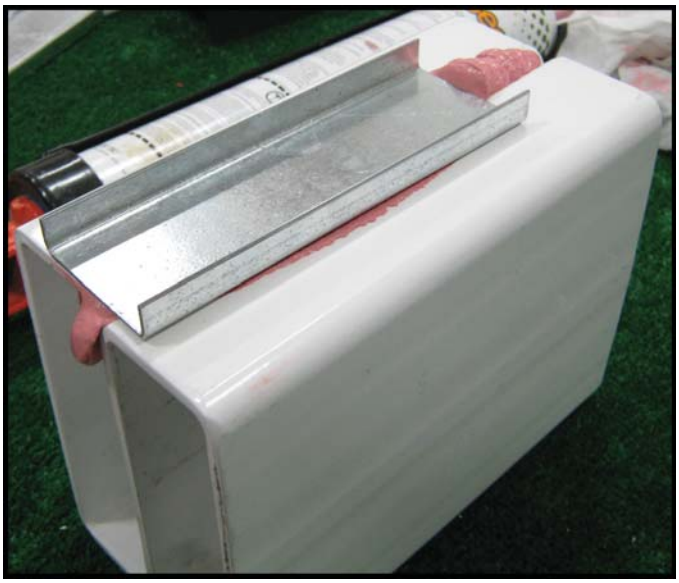
ATTENTION INSTALLERS

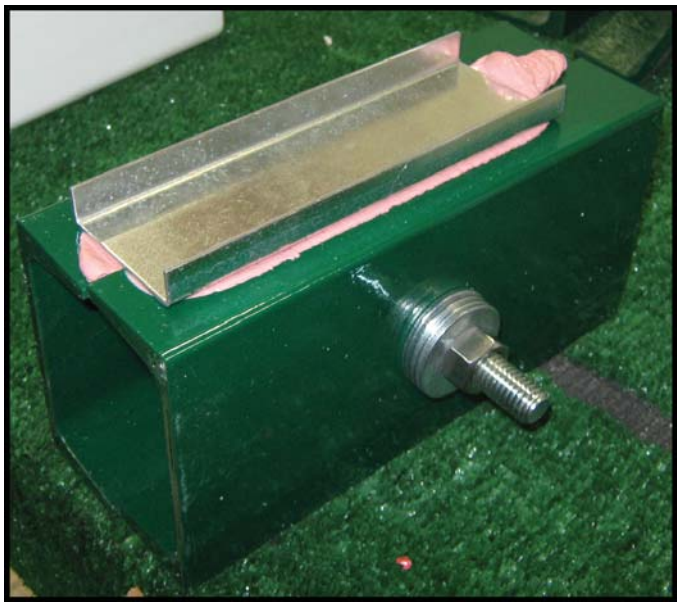
WARNING: Failure to follow the assembly instructions provided in this document may result in the loss of performance, condensation issues, and excessive moisture for which Huntair cannot be held liable and is **NOT** covered under the manufacturer's warranty.

Figure 2



Caulk split with Joint & Seam caulking.

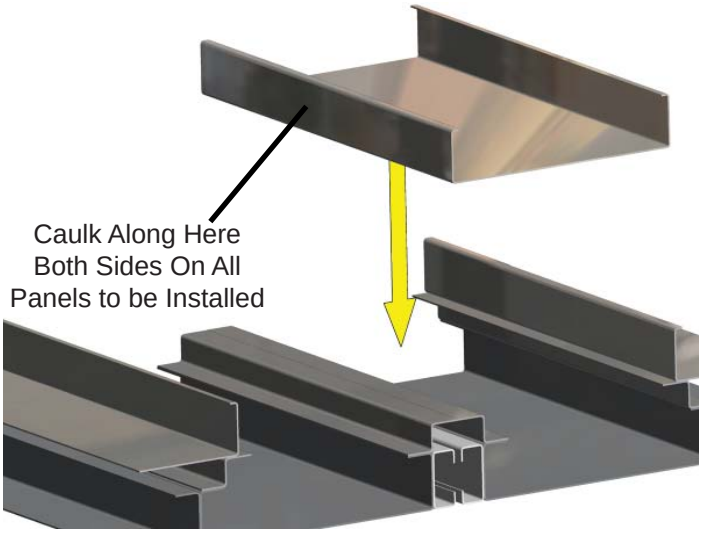


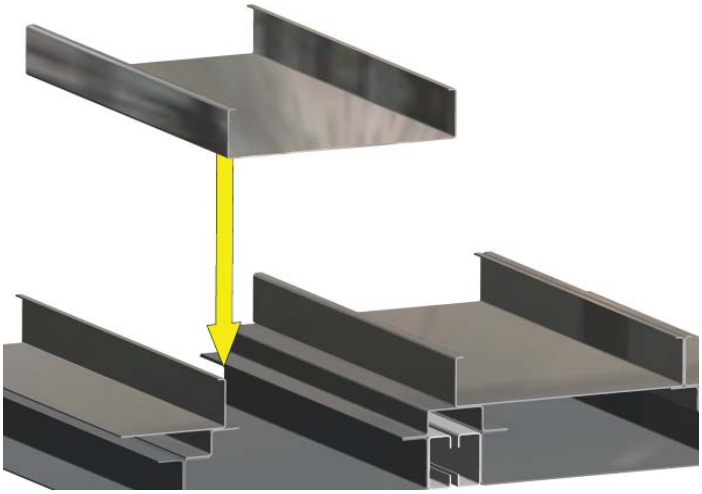


Press split cover down over the center of the caulking until caulking seeps out of both sides of cover.

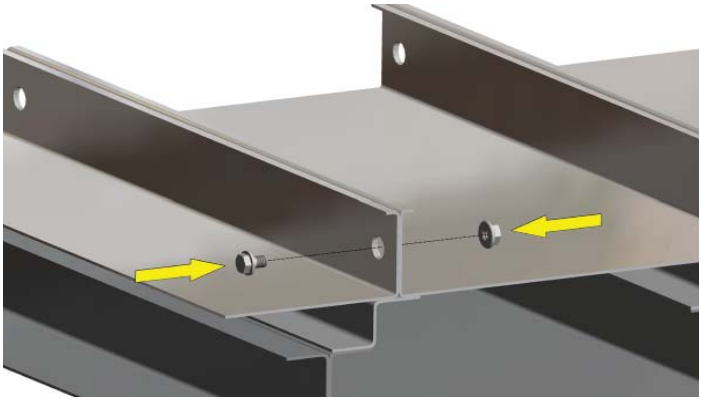
Outdoor Roof Split Assembly

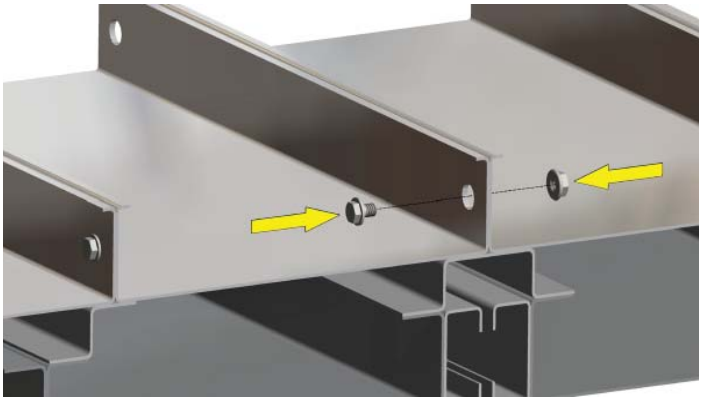
1. Caulk panels along the outside where indicated with 3M 540. Place first panel then place second panel beside the first. Place 5/16 x 18 bolts through holes, then thread on nuts and tighten.





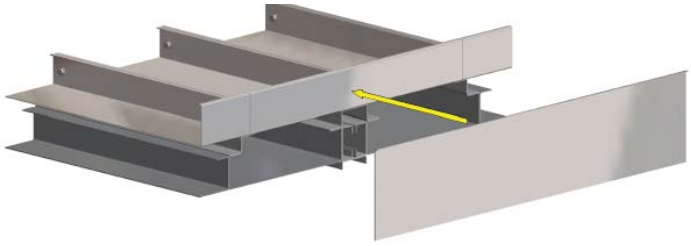
2. Place 5/16 x 18 bolts through holes, then thread on nuts and tighten.

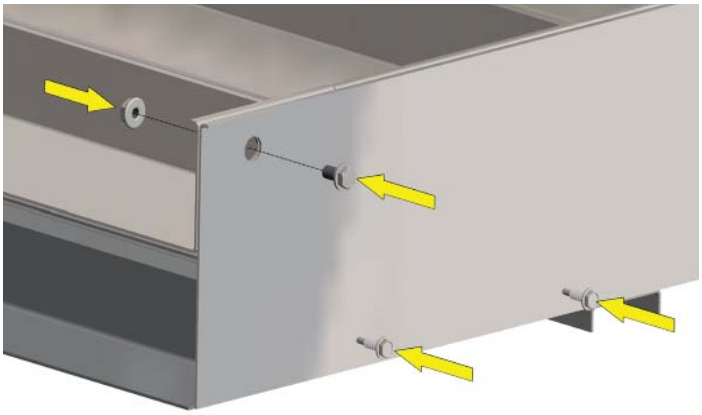




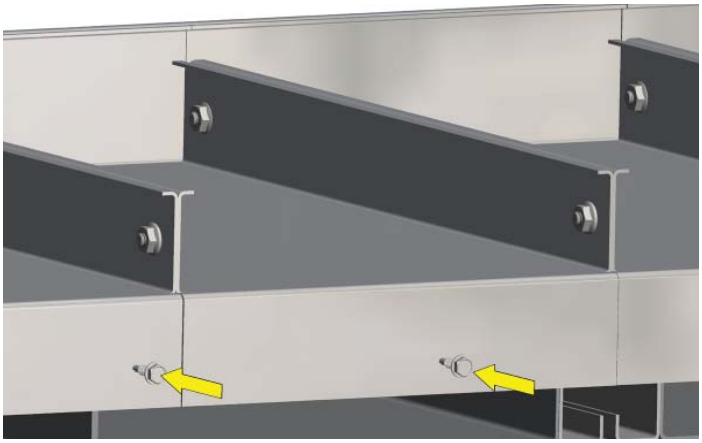
Outdoor Roof Split Assembly Continue:

3. Line up the top of the face plate with the roof panel. Use 5/16 x 18 bolts and bolt into place. Use drive screws to secure bottom.

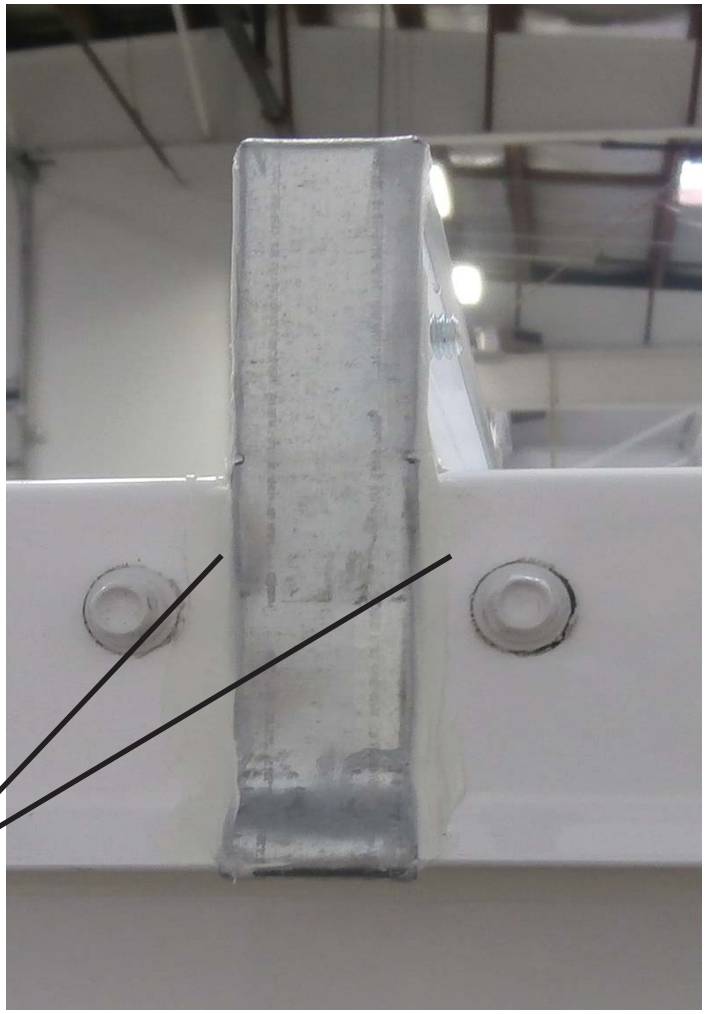




4. Use drive screws to secure the other end of the roof panels.



5. Slide cleat over the roof panel flanges. Crimp into place. Bend over the ends. Make sure the bend fits tightly against the flanges. Caulk where cleat meets the roof panels using 3M 540.



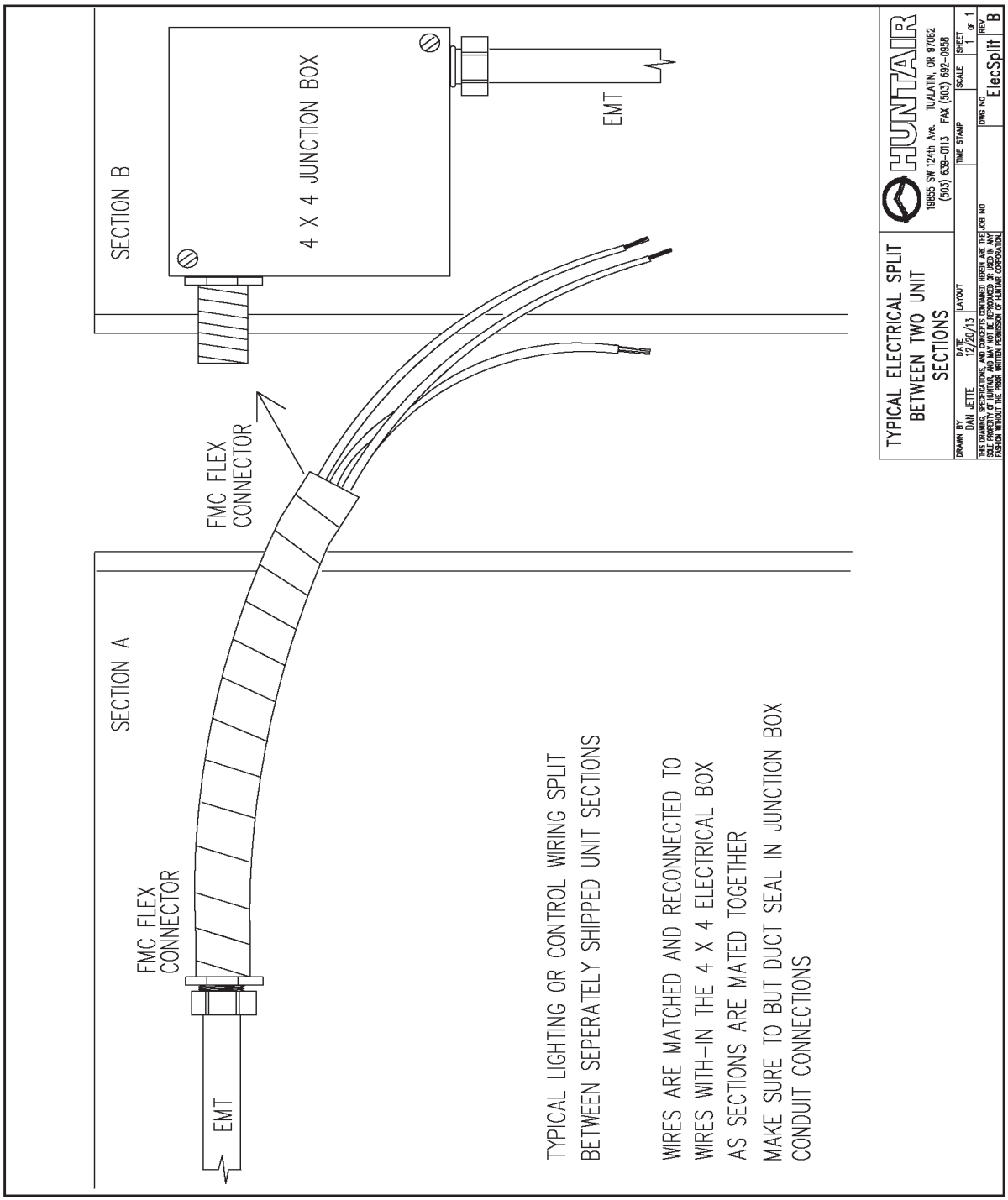
Caulk Along Here Both Sides On All Panels.

Electrical Split Assembly

To be installed by others (Electrical Contractor).

DANGER! Risk of Electric Shock

Always disconnect power to the fan control panel before maintenance. Follow all lockout / tag out procedures. Failure to follow these procedures may result in injury or even death.

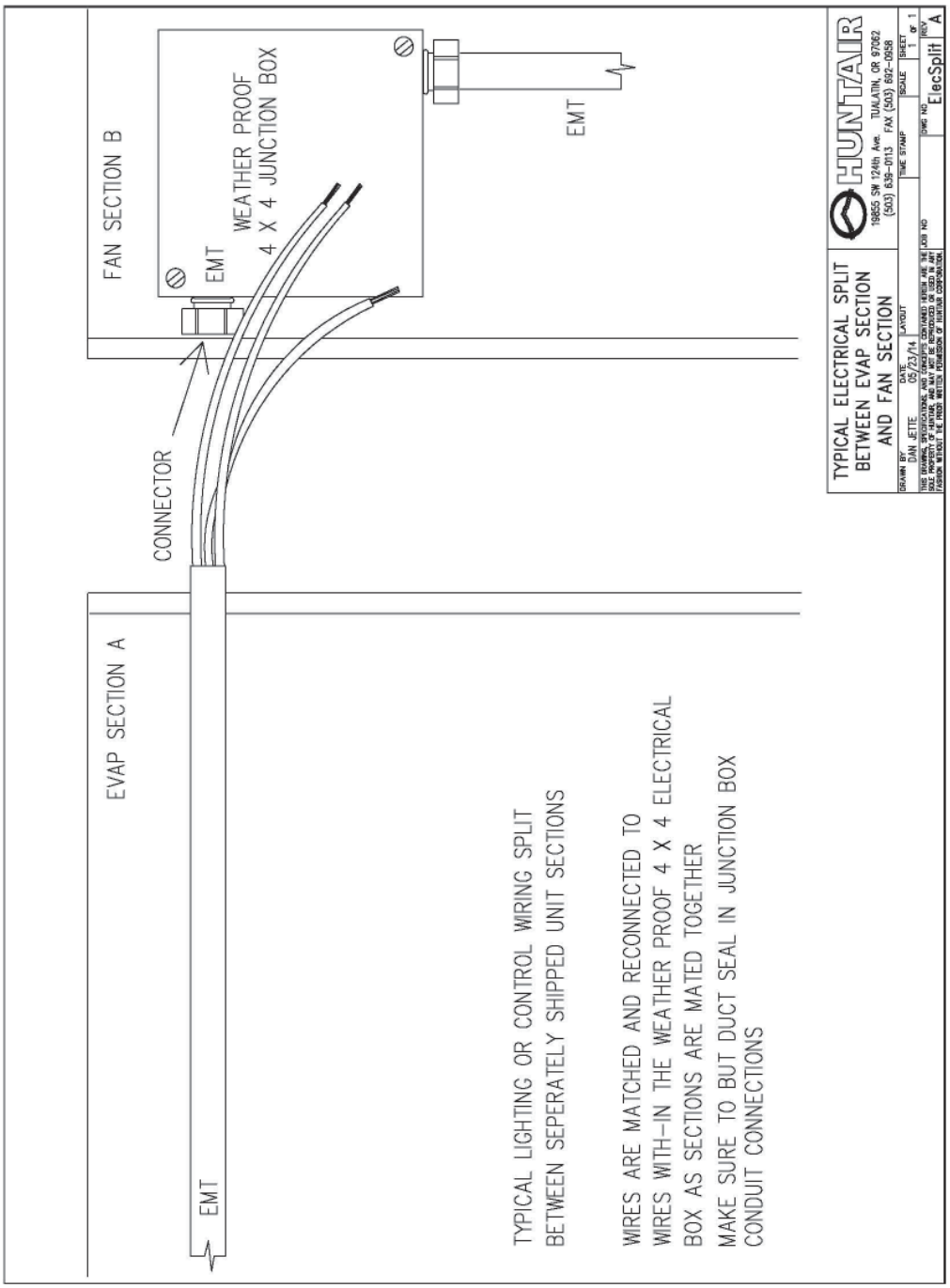


Evap Electrical Split Assembly

To be installed by others (Electrical Contractor).

DANGER! Risk of Electric Shock

Always disconnect power to the fan control panel before maintenance. Follow all lockout / tag out procedures. Failure to follow these procedures may result in injury or even death.

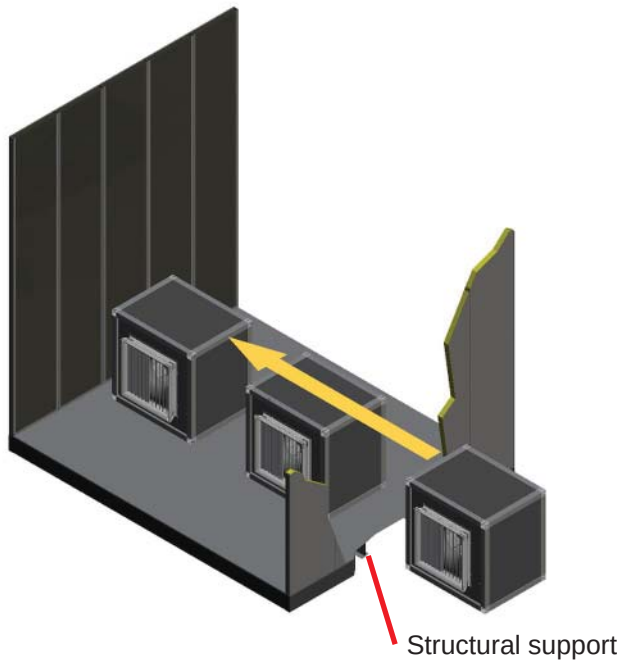


Installing Fan Cells

Make sure that floor on air handler is level and rigid. Confirm FANWALL cell location with unit construction drawing. Each cell is individually number and is located in a specific array. Cell numbers typically run from top left to right, next row down, left to right. Refer to the reference drawing for layout. Confirm insulation is installed around each fan cell including top and bottom.
Locate internal wall seam on side wall as starting point for FANWALL..

This section addresses fan cells that were shipped individually due to access restrictions. If your retrofit array was shipped assembled in an array please skip to next section.

Align the first fan cell frame needed at the bottom row, furthest from the access door. Make sure to maintain the correct distance from the unit side panel. Run a bead of Alum gray silicone caulking between inlet plate support members. See Figure 1 on next page. Place the next fan cell next to the first one. Line up the corner cubes and slide a 3/8-16 x 3/4 carriage bolt through the square holes in the corner cubes. Finger tighten a 3/8 whiz nut onto the end. SEE FIGURE 2 on next page.



Repeat this process until the proper number of fan cell per row has been obtained. To create columns stack fan cells on top of the first row of fan cells, run a bead of caulking along the top of the base cube. Line up the corner cubes and slide a 3/8-16 x 3/4 carriage bolt through the square holes in the corner cubes. Note the configuration of carriage bolts and whiz nuts in FIGURE 3 on next page. Once all bolts are in place, tighten to 25 ft-lbs.

FIGURE 1

Note the configuration of the Carriage Bolts and Whiz Nuts. This configuration allows for easier movement of tools within the corner pieces.

FIGURE 3

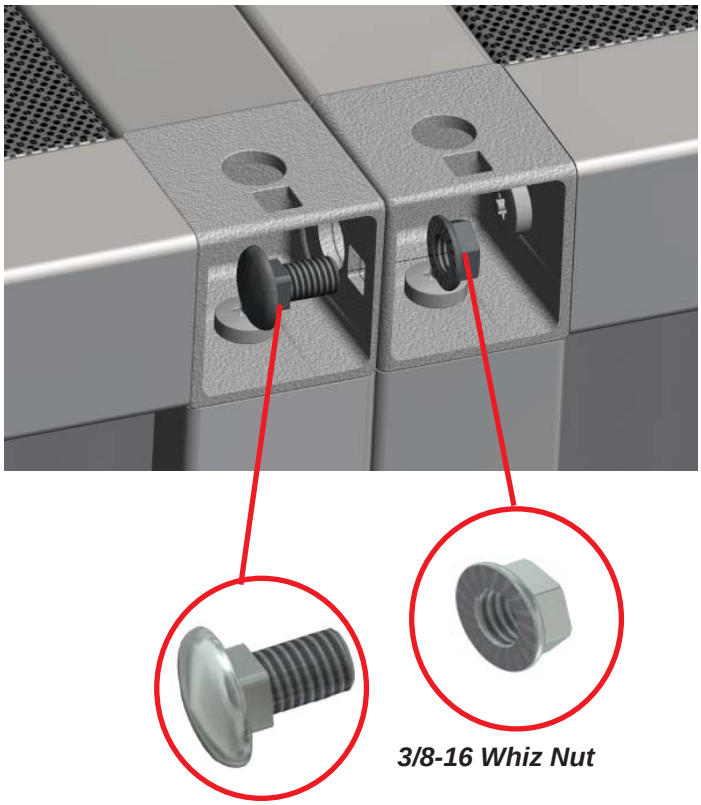


FIGURE 2

DANGER! Risk of Injury or Death

Minimum material gauge for blank-offs, when required 16 gauge minimum. Maximum side and top blank-offs “width” before reinforcement required 12” maximum.
Failure to follow these procedures may result in injury or even death.

Starting on the sides, use #10 x 3/4 tek screws and attach the blankoffs to the leading air side edge of the extrusion. After both side blankoffs have been attached, screw top blankoff to the fanwall then to the side blankoffs. Make sure to caulk all seams around the blankoffs. Caulk all seams on the the entering air side of the fanwall.

Once all the insulation and blank-offs have been installed. Secure the FANWALL to the base by using the #12-24 x 1-1/2” unslotted HWT self tapping tek screws and 1/4 inch flat washer. Make sure to screw into the structural supports. SEE FIGURE 4

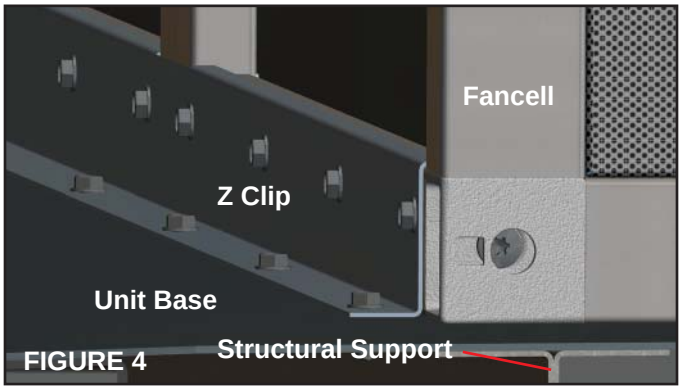


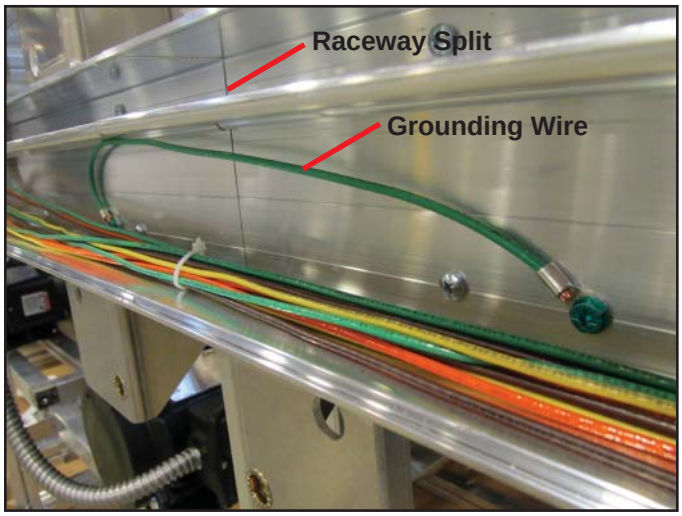
FIGURE 4

FANWALL Electrical Installation

DANGER! Risk of Electric Shock

Always disconnect power to the fan control panel before maintenance. Follow all lockout and tag out procedures.

1. Verify fanwall assembly install is complete.
2. Install electrical chase on the discharge side between cells using drive screws. See seprate installation design drawings. Attach electrical chase using #10 x 3/4 tek screws. Raceway is noncontinuous, code requires grounding wire pigtail run section to section (supplied).

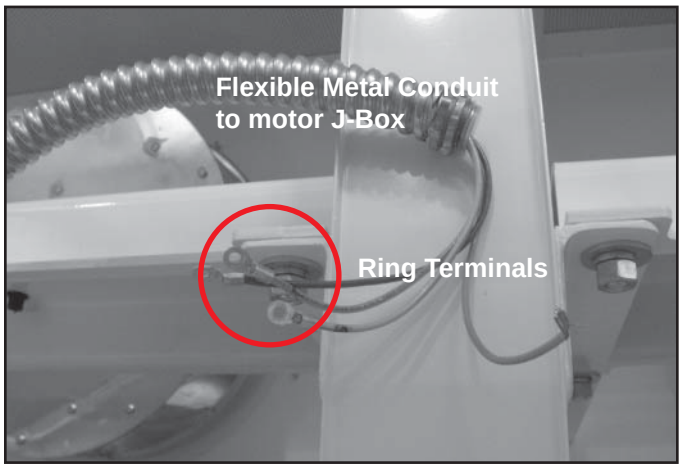


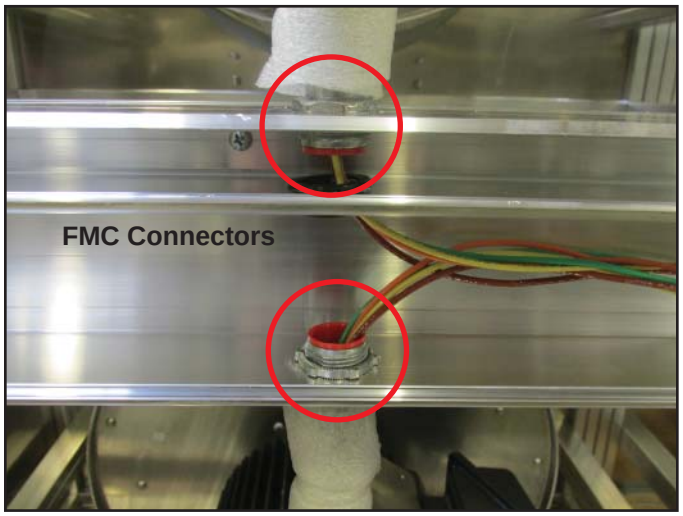
3. Attach FMC (flexible metal conduit) from motor j-box (Pecker head) to electrical chase using FMC connectors.
4. Size wire (per NEC code) and pull from motor(s) to enclosure/j-box.
5. Wire internal motor connection (for 208 volt system).
- **a.** Crimp on ring terminals.
- **b.** Bolt terminals together for what ever voltage you are using (see motor nameplate).
- **c.** First layer wrap with Friction tape (3M Varnished Cambric).
- **d.** Second layer with rubber splicing tape (3M 130C).
- **e.** Third layer use vinyl tape (3M Super33).

Note: 3 wraps on all taped layers.

For systems with 12 or 14 ga. wiring use WAGO pressure connectors.

6. Hi-pot wires.
7. Connect wires to Enclosure / j-box.





FANWALL Electrical Installation Continue

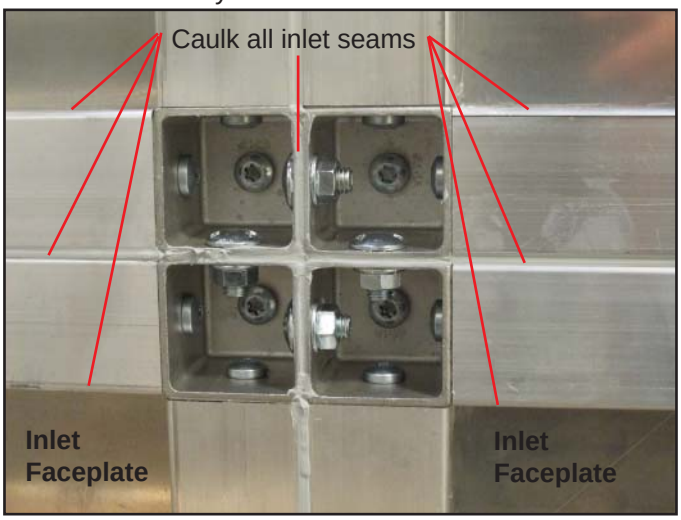
8. Install electrical chase cover.
9. Re-assemble air handling unit walls, doors, safety devices etc. that removed during retrofit per manufacturer's recommendations.
10. Prior to connection to main power check fan wheel/cone alignment per instructions starting on page 10.
11. Perform VFD startup as specified by VFD manufacturer.
12. Verify that the fans are rotating in the correct direction as indicated by the fan rotation sticker and operating at required CFM at design static pressure.

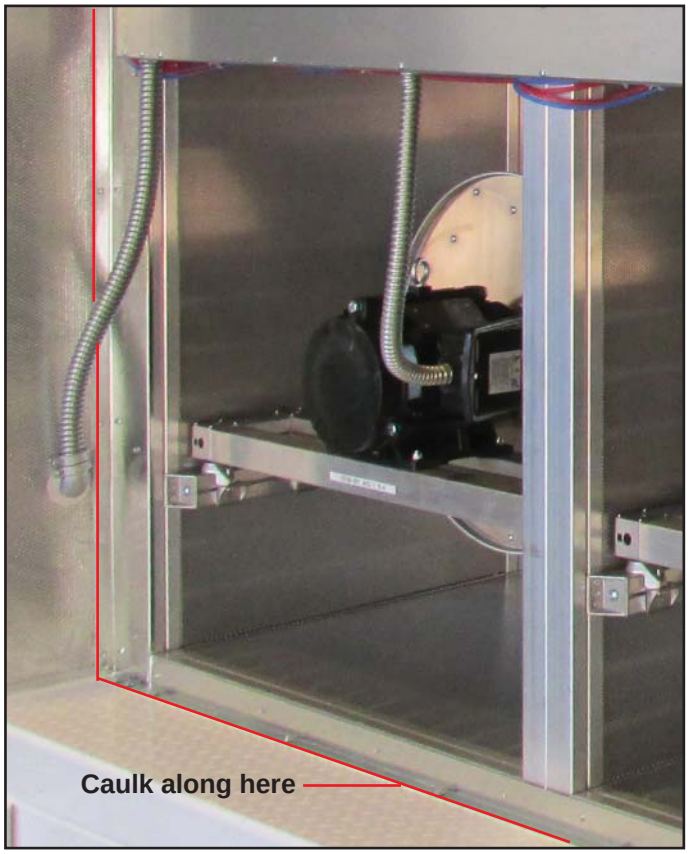
Note: If fans are rotating in the opposite direction of the fan rotation sticker. **DO NOT** correct rotation by switching Line or Load wiring of the drive units. Change rotation by switching wires on the Load side of the MSP.

ELECTRICAL Note

All electrical work must be preformed by a licenced electrician. All grounds are pulled continuously thru fanwall chase without splicing to accommodate for box fill calculations.

13. After wiring is completed caulk all inlet seams.
14. Caulk the seams between the roof and the blank-offs with 3M 540. Caulk the seams between the side panels and the blank-offs with 3M 540.
15. Caulk all flanges bolting the blank-off together and caulk all flanges bolting the blank-offs the the FANWALL array with 3M 540.
16. Caulk seam between the floor and the bottom of the FANWALL array with 3M 540.



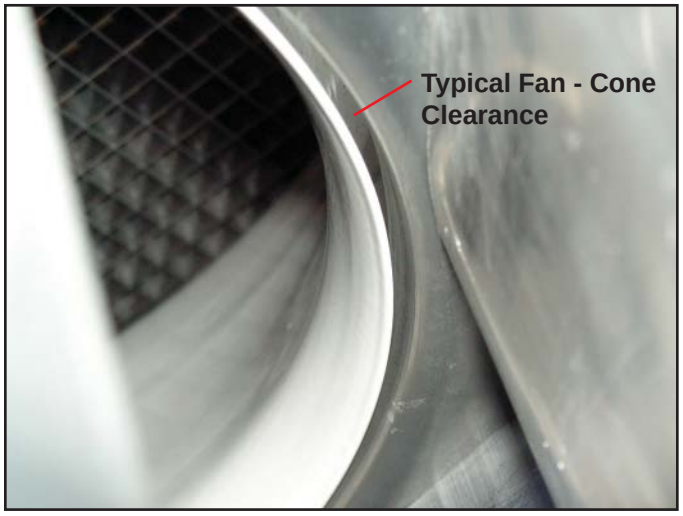


Cone Alignment / Damper Install / Safety Screen Install

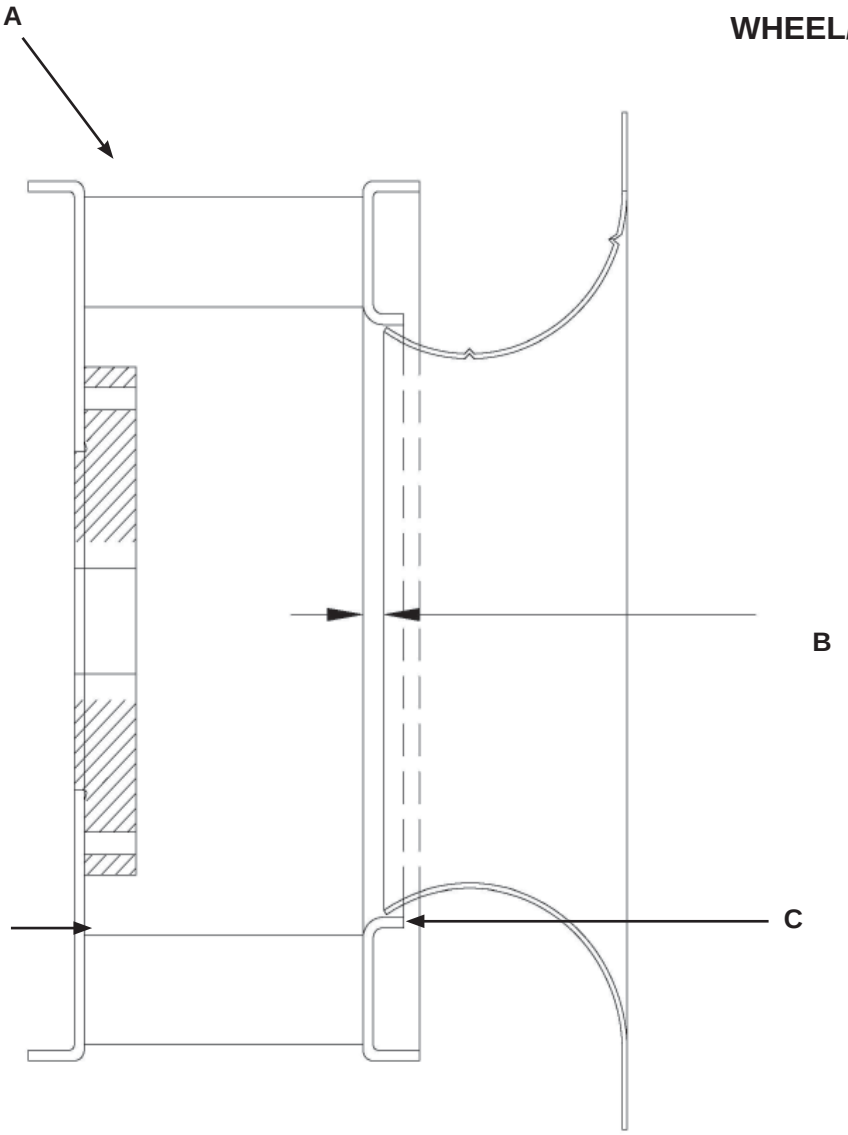
1. Temporarily attach the cone to the cell inlet using the screws and washers provided, or slightly loosen the screws holding the cone if already installed (remove the backdraft damper to access the cone). Use a minimum of four screws for this step.
   - **a.** Refer to the fan wheel overlap drawings provided to determine where to set the wheel with respect to the cone. See page 19.
   - **b.** Adjust the amount of overlap by moving the motor pedestal forward or backward to line up the cone with the wheel (wheel/cone overlap is designed to insert the cone 50% of the distance of the rolled shroud lip on the wheel). Once you have the wheel approximately located tighten the ½" pedestal bolts to 90ft-lbs.

2. Center the cone in the wheel shroud.
   - **a.** The cone alignment can be a tedious process as there are no tools that effectively work to align the cone. It is a hands on process to align the cone. Huntair cones have a running clearance of about 1/16" (see image top right).
   - **b.** Start by loosening the four screws that were used to hold the cone for the depth alignment. Hold the cone with one hand and with the other use a drill to attach a screw to hold the cone in place. Feel between the wheel inlet shroud and the cone and set the gap to approximately 1/16" and tighten the screw in that location (top of the cone is usually the best place to start). At this point you should be able to move the cone about that screw location, adjust the cone on the left or right until there is approximately a 1/16" gap.
   - **c.** Spin the wheel by hand at this point to check for any clearance issues. If the wheel spins clear tighten the remaining screws on the cone. Check that the wheel spins clear after tightening each screw.

3. Attach the inlet backdraft damper using the predrilled holes in the faceplate (see middle image).
   - **a.** Start by loosely installing (don't tighten screws all the way) the top two screws. Align the holes on the sides.
   - **b.** Loosely install screws on side. Install bottom 2 screws.
   - **c.** Tighten all screws (middle image).
   - **d.** Install safety screen on discharge side if applicable.



WHEEL/CONE ALIGNMENT



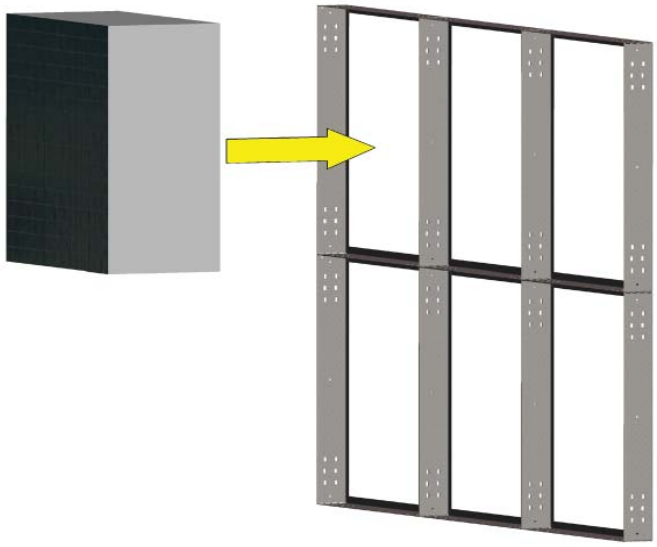
A	B	C
Wheel Type & Dia (in)	Cone to Wheel Overlap (in)	Cone to Wheel Overlap (in)
Aluminum		
All Diameters	0.375	
Polymer		
10”		4.134
12”		5.158
14”		5.768
16”		6.437
18”		7.244
20”		8.189
22”		9.095

Note: Drawings not to scale

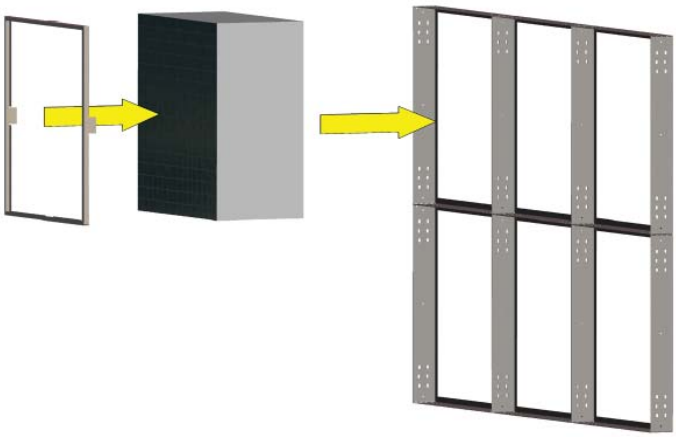
Filter Installation

Note: Make sure of air flow dirction. Refer to next page for clips installation.

1. Place primary filter into the filter rack and with secure with clips.
2. Pre-Filter Standoff Otional. Place the pre-filter standoff over the primary filter and place in fillter and secure with clips.



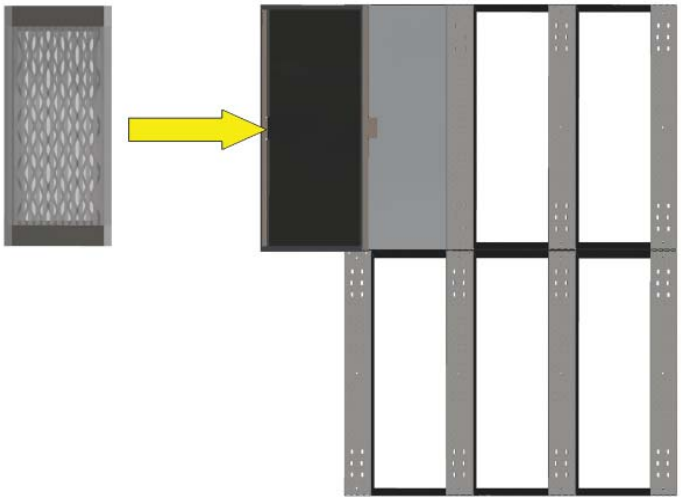
Primary Filter



Primary Filter with Pre-FIlter Standoff

3. Place pre-filter clips on the top and bottom of the pre-filter standoff.

4. Carefuly place the pre-filter into the clips.

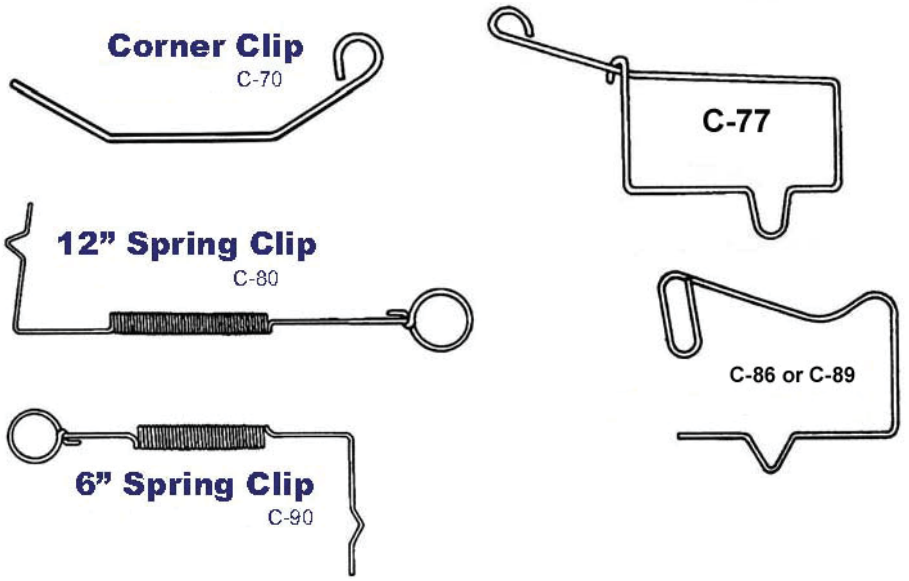


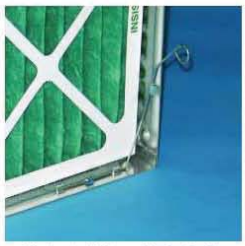
Pre-Filter

Filter Clips Installation

1. There are verious styles of clips for the filters.

2. Slide the proper clip into the notches on the side of the filter rack frame.




2" pleated filter with C-70 clip

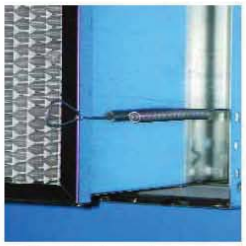

C-70 clip positions, lower for 1" deep filter, upper for 2" deep filter.


C-86 clip for 4" deep filter.


C-86 clip positioning.

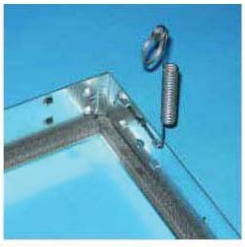

C-80 clip positioning.


C-80 positioning on Riga-Flo filter.


C-80 positioning on Aeropac filter.


Riga-Flo and Aeropac filters have pilot holes for C-80 attachment.

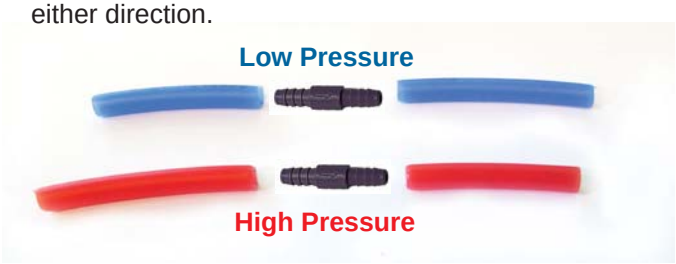

2" deep and 4" deep pre-filter clips.


C-71 clip positioning.

Air Monitoring Option

If the retrofit comes with the VFD (variable frequency drive) option use the following steps for installation of the red and blue poly tube.

1. Starting at the cone, connect the red poly tubing to the barbed nipple on the inlet side of the cone. Connect the blue poly tubing to the barbed nipple on the discharge side of the cone. (SEE FIGURE 1)
2. Making sure not to kink the tubing, route the tubing along the top of the fan cells toward the control panel securing tubing as it is being routed. (SEE FIGURE 2)
3. Secure tubing to perf panels with plastic cable tie with screw mount. (SEE FIGURE 3)
4. Install the pressure in-line orifice restrictors on both the high and low pressure tubing no less than 4ft from pressure transducers. Restrictors can be installed in either direction.



5. Route tubing to the control panel. Attach tubing to the transmitters. See figure 4 for transmitter location and see electrical schematics for which transmitter is designated to which fan.

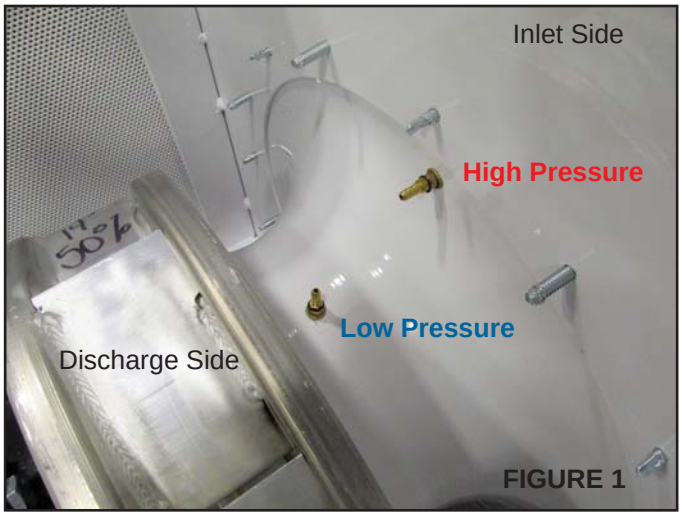


FIGURE 1


FIGURE 2

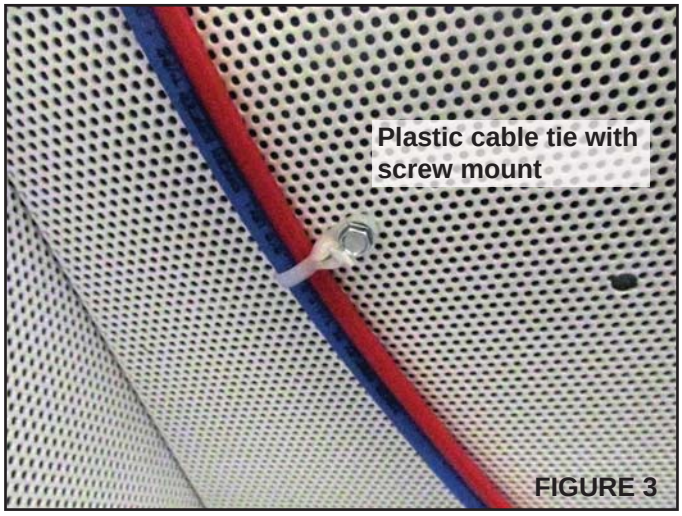


FIGURE 3

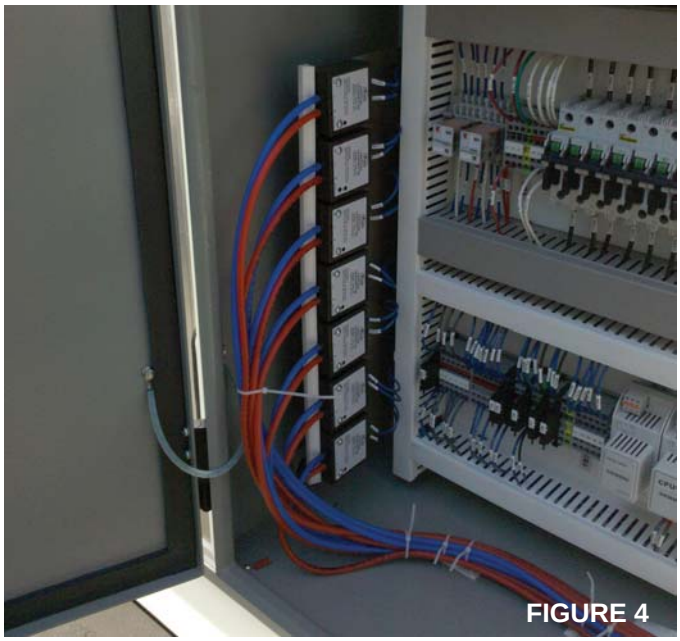
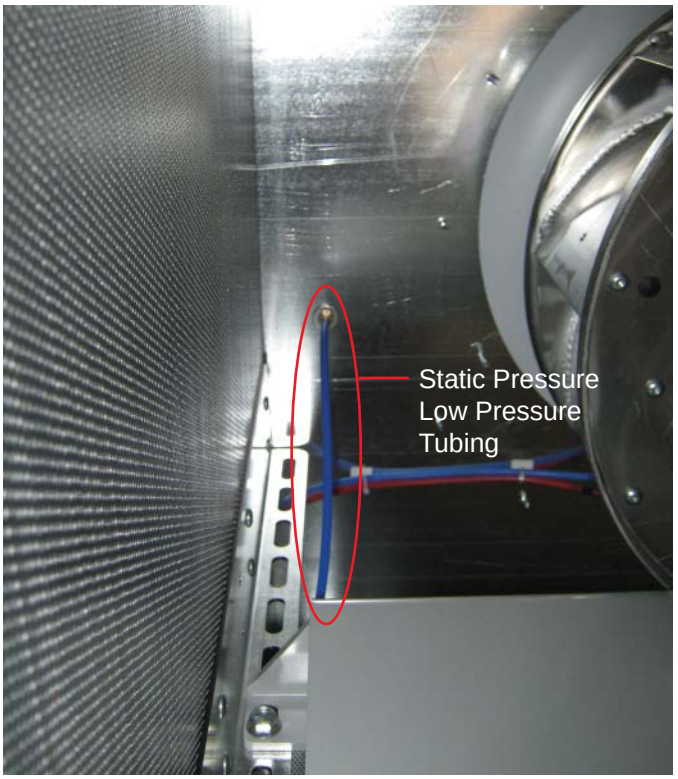


FIGURE 4

Static pressure measuring tubing installation

1. Install the low pressure tap and blue tubing in the upper left most fan cell. Drill hole for tap half way between the bottom two bolts of the damper and center between the damper and the outer edge of th inlet plate.
2. Install the hight pressure red tubing in the upper left most fan cell. Make sure to install the tube on the bottom left hand side of the fan cube. Make sure that the end of the tube is within an inch of the inlet plate.
3. Route static pressure tubing along the same path as the air monitoring tubing to the electrical panel.
4. Install the pressure in-line orifice restrictor on both the high and low pressure tubing no less then 4-ft from pressure transducers on the unit.

Note: In-line orifice restrictor can be installed in either direction.



CAUTION: This unit has rotating parts, high voltage, and possibly high temperature solutions or components. Safety precautions must be exercised during installation, operation and maintenance. Service should only be performed by a qualified technician who has been specially trained to service air conditioning equipment.

PRELIMINARY INSPECTION

1. Disconnect all power to unit. Lockout and label all disconnect means to prevent accidental power application.
2. Verify that all field electrical wiring and connections including electrical grounding are made in accordance with the National Electrical Code and local codes. Verify that supply voltage(s) agree with unit data plate. Check all wiring for completeness and terminals for tightness.
3. Inspect all supplementary cooling (if any) piping for leaks and conformance with the Uniform Plumbing Code and local codes.
4. Remove supply and exhaust fan compartment covers and make sure all steel banding, bolts and wood braces installed for shipping have been removed from fans prior to starting the unit.
5. Remove filter section access panel and ensure all filters are securely in place. Replace and secure the access panel.
6. Check all unit manual reset devices and reset if necessary.
7. Check supply and exhaust ducts for obstructions and damper positions and open all diffusers.

FAN START-UP

1. Open the fan access door and inspect the fan and drive assembly. A typical fan and motor arrangement using Fanwall Technology is shown above.
2. Before operation, start the motor slowly to ensure the fan rotation is correct. It should be rotating “CWR” when looking at the motor end. If the fan wheel is not rotating correctly, check the motor power leads for proper installation. Also check inlet cone alignment to the fan wheel. Fan wheel should not be rubbing on the inlet cone. If cone alignment is required loosen the retaining fasteners for the cone and adjust cone for proper clearance from fan wheel.
3. Replace and fasten down the fan housing access panel.

FAN / MOTOR ARRANGEMENT

AIRFLOW VERIFICATION

IMPORTANT NOTE: Air quantities as specified on the unit data plate are essential for safe and economic operation. The unit fan RPMs were carefully set at the factory to deliver the specified air quantity at the specified external static pressure. We cannot overemphasize that these values be field verified as external static pressures are often found to be different than what was anticipated.

a. Air volume measurements should be made using AMCA suggested methods. This would normally be a traverse of the supply duct or ducts. For test and measurement guidelines, write to: AMCA, 30 West University Drive, Arlington Heights, IL 60004

b. Start the fan, observe the motorized inlet air damper (if any) to be certain that it fully opens (90°). Check the fan for proper rotation.

c. Measure airflow and compare to the value stamped on the CSU data plate. Adjust the supply fan motor drive pitch to increase or decrease the fan speed until the desired airflow is reached.

d. Once the proper air volume has been established, check the supply motor AMP draw against the motor nameplate full load amp’s to be sure the motor is not overloaded. All access doors must be closed while checking amps.

Fan Wheel/Motor Replacement

DANGER! Risk of Electric Shock

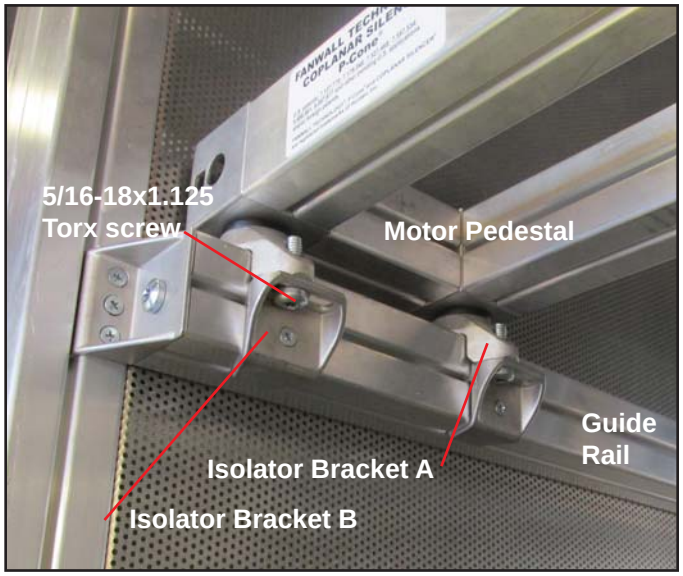
Always disconnect power to the fan control panel before maintenance. Follow all lockout and tag out procedures.

DANGER! Risk of Shock

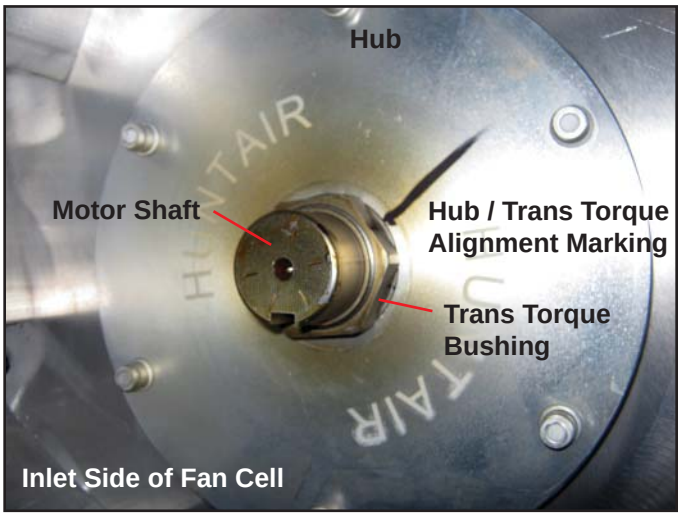
Always disconnect power to the fan motor before maintenance. Follow all lockout and tag out procedures.
If your unit has permanent magnet motors, high voltage can be generated whenever the motor is rotating, even if power is off. **ALWAYS MAKE SURE MOTORS CANNOT ROTATE DURING SERVICING.**

Note: Tools required for fan removal include torque wrench with 12” extension, 1-3/4” socket, and a length of pipe or wood block to brace fan wheel from spining.

1. To replace a fan wheel/motor assembly, first disconnect power to the FWT at the main control panel.
2. To gain access to the fan/motor cartridge, remove the personel safety screen on the discharge side if applicable.
3. Disconnect power to the existing fan at the main disconnect control panel.
4. Make note of all wire locations for reinstallation later.
5. Disconnect existing fan motor power cable from terminal located in motor J-Box and conduit fitting from electrical chase.
6. Loosen and remove (4) 5/16-18x1.125 Torx screws at the bottom of Isolator Bracket B that retain the motor pedestal to the guide rails.
7. After removing the mounting bolts slide the motor pedestal to the point where the motor lifting ring is exposed enough to use. If a mechanical device is available for use, attach it to the lifting ring for use. Lift the motor/fan/pedestal assembly and turn 180°. Set back down on the motor guide rails so that the fan is now facing you.



8. Push the pedestal back in to the fan cell so that the fan wheel is in the cell. Block the fan from rotating by using a wood block or a pipe.
9. Mark the location of the transtorgue bushing on the shaft and the fan. To remove the fan wheel from the motor shaft, remove the trans torque bushing retaining hex nut by turning counterclockwise. Loosen progressively until bushing is free from wheel hub and motor shaft. Remove fan/hub assembly.
10. If needed the motor may now be removed for service by removing the 3/8” motor bolts.



11. With the motor pedestal on the guide rails that run front to back along the cell, set the motor on the pedestal using the same holes. Use proper lifting techniques, crane or motor/rail system if possible for lifting the motor into position. Once the motor is placed on the pedestal align the bolt holes on the motor to the bolt holes on the pedestal making sure that the motor shaft is pointing towards you.

a. Next, insert 3/8" bolts into the holes from the underside, make sure to use a standard washer on the bolt side, only a locknut is required on the motor side.

b. Square the motor and tighten the bolts to 40 ft-lbs.

12. Reinstall the fan on the motor shaft with the hub facing towards you. Line up the markings on the hub/trans torque bushing/shaft. Make sure that the trans torque bushing nut is flush to the hub, tighten the bushing nut to 80 ft-lbs.

13. Once the fan/motor/pedestal assembly is done, turn it 180° so the the fan is facing the inlet of the fan cell. Slide the pedestal forward lining up Isolator Brackets A & B.

a.Insert (4) 5/16-18x1.125 Torx screws into the holes. Do not tighten down all the way. Leave loose so that the motor assembly can slide back and forth freely.

14. Follow Fan / Cone Alignment procedures starting on page 18 and 19.

Important: Before Restarting

Re-balance fan wheel once the complete motor pedestal/ fan wheel/motor assembly is re-installed.

Before operation, start the motor slowly to ensure the fan rotation is correct.

Drive Side = Clockwise rotation when looking at motor end

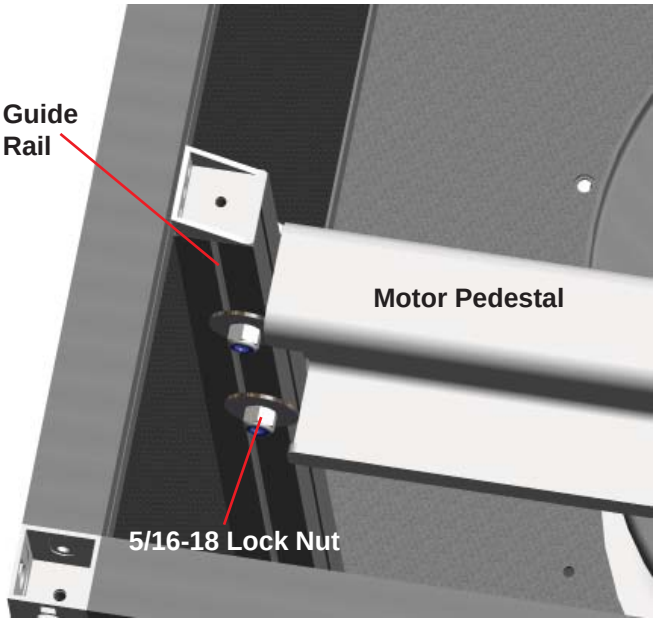
Inlet side = Counter-clockwise rotation looking at fan.

Extruded Fan Cell W/Formed Pedestal Fan Wheel/Motor Replacement

DANGER! Risk of Electric Shock

Always disconnect power to the fan control panel before maintenance. Follow all lockout and tag out procedures.

Note: Tools required for fan removal include torque wrench with 12” extension, 1-3/4” socket, and a length of pipe or wood block to brace fan wheel from spining.



1. To replace a fan wheel/motor assembly, first disconnect power to the FWT at the main control panel.
2. To gain access to the fan/motor cartridge, remove the personel safety screen on the discharge side if applicable.
3. Disconnect power to the existing fan at the main disconnect control panel.
4. Make note of all wire locations for reinstallation later.
5. Disconnect existing fan motor power cable from terminal located in motor J-Box and conduit fitting from electrical chase.
6. Loosen and remove (4) 5/16-18 lock nuts at the bottom of the guide rails.
7. After removing the mounting bolts slide the motor pedestal to the point where the motor lifting ring is exposed enough to use. If a mechanical device is available for use, attach it to the lifting ring for use. Lift the motor/fan/pedestal assembly and turn 180°. Set back down on the motor guide rails so that the fan is now facing you.
8. Push the pedestal back in to the fan cell so that the fan wheel is in the cell. Block the fan from rotating by using a wood block or a pipe.
9. Mark the location of the transtorgue bushing on the shaft and the fan. To remove the fan wheel from the motor shaft, remove the trans torque bushing retaining hex nut by turning counterclockwise. Loosen progressively until bushing is free from wheel hub and motor shaft. Remove fan/hub assembly.
10. If needed the motor may now be removed for service by removing the 3/8” motor bolts.
11. With the motor pedestal on the guide rails that run front to back along the cell, set the motor on the pedestal using the same holes. Use proper lifting techniques, crane or motor/rail system if possible for lifting the motor into position. Once the motor is placed on the pedestal align the bolt holes on the motor to the bolt holes on the pedestal making sure that the motor shaft is pointing towards you.
    a. Next, insert 3/8” bolts into the holes from the underside, make sure to use a standard washer on the bolt side, only a locknut is required on the motor side.
    b. Square the motor and tighten the bolts to 40 ft-lbs.
12. Reinstall the fan on the motor shaft with the hub facing towards you. Line up the markings on the hub/trans torque bushing/shaft. Make sure that the trans torque bushing nut is flush to the hub, tighten the bushing nut to 80 ft-lbs.
13. Once the fan/motor/pedestal assembly is done, turn it 180° so the the fan is facing the inlet of the fan cell. Slide the pedestal forward to the line up with the holes in the motor rail.
    a. Insert 5/16 x 18 bolts into the holes. Hand tighten the nuts for now.
14. Follow Fan / Cone Alignment procedures starting on page 18 and 19.

Extruded Fan Cell
Fan Wheel/Motor Replacement Continue

15. For removing polymer fan wheel, you start by removing the two set screws in the taper lock bushing.

16. Reinsert one set screw in the middle hole and start tightening the set screw. This will seperate the taper lock bushing from the fan wheel hub.

17. Once the two have been seperated, carefully remove the taper lock bushing from the motor shaft. Make sure not to damage the polymer fan wheel when removing the taper lock bushing. Once the polymer fan wheel has been removed from the motor shaft, place taper lock busing back into the fan wheel hub. Align the three half holes in the bushing with the half holes in the fan wheel hub. Reinsert set screws far enough so that the bushing and set screw do not fall out of the fan wheel hub.

18. Replace bad motor on the pedestal. After the new motor has been installed on the pedestal, align the keyway in the bushing to the keyway on the motor shaft and carefully slide fan wheel on.

19. In a alternating pattern, tighten set screws. Make sure the fan wheel is no less than 1/4 inch from the shaft bearing. Torque set screws to the specs in the table below.

20. Inspect polymer fan wheel for any cracks or damage.

21. Once the fan/motor/pedestal assembly is done, turn it 180° so the the fan is facing the inlet of the fan cell. Slide the pedestal forward lining up Isolator Brackets A & B.
a. Insert (4) 5/16-18x1.125 Torx screws into the holes. Do not tighten down all the way. Leave loose so that the motor assembly can slide back and forth freely.

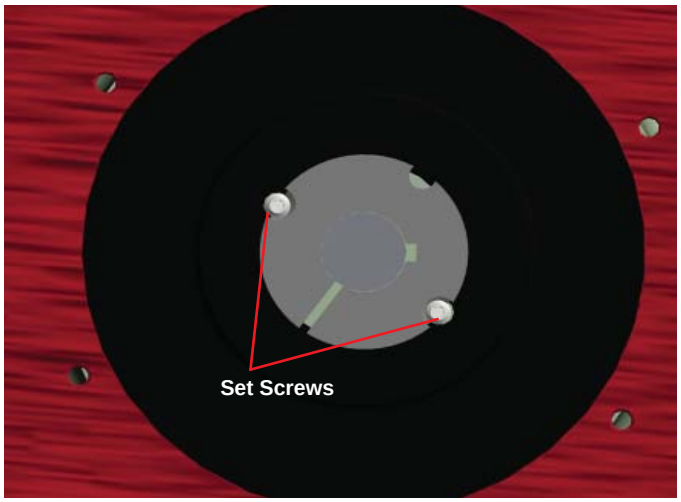
22. Follow Fan / Cone Alignment procedures starting on pages 18 and 19.

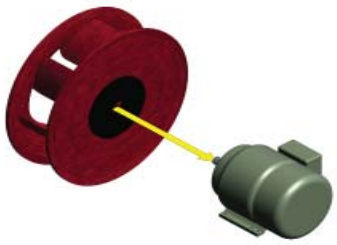
Important: Before Restarting

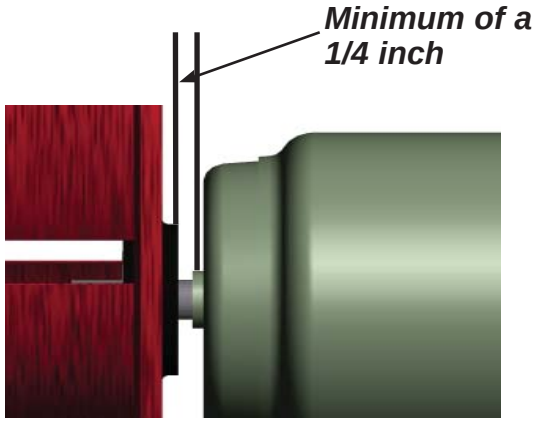
Re-balance fan wheel once the complete motor pedestal/ fan wheel/motor assembly is re-installed.
Before operation, start the motor slowly to ensure the fan rotation is correct.
Drive Side = Clockwise rotation when looking at motor end
Inlet side = Counter-clockwise rotation looking at fan.

Polymer Fan Wheels:
Drive Side = Counter-clockwise rotation when looking at motor end
Inlet side = Clockwise rotation looking at fan.

Recommended Torque	
Bushing No.	**LB. – Ft.**
1210	15
2012	24
2517	36







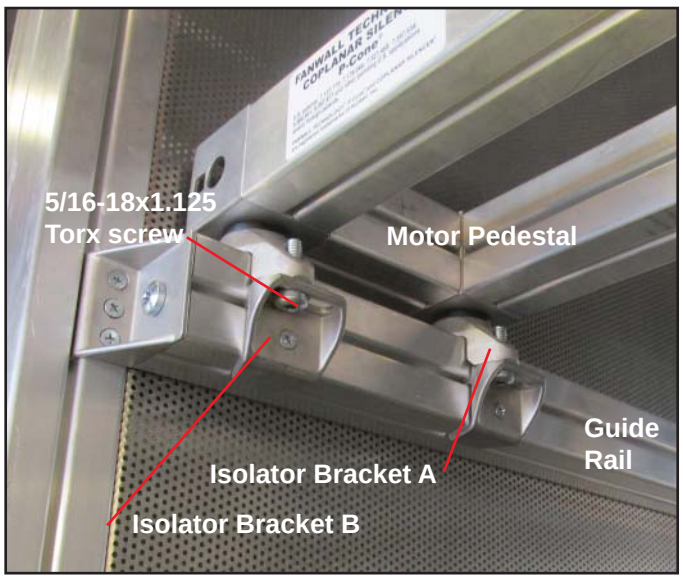
HUNTAIR®
a Nortek Air Solutions Brand

Extruded Fan Cell w/Polymer Wheel and ECMI motor Replacement

DANGER! Risk of Electric Shock

Always disconnect power to the fan control panel before maintenance. Follow all lockout and tag out procedures.

1. To replace a fan wheel/motor assembly, first disconnect power to the FWT at the main control panel.
2. To gain access to the fan/motor cartridge, remove the personel safety screen on the discharge side if applicable.
3. Disconnect power to the existing fan at the main disconnect control panel.
4. With a T20 Torx bit, remove the back plate on the ECMi motor.
5. Make note of all wire locations for reinstallation later.
6. With a small straight screw driver. Loosen the terminal block screws and remover the power and data cable wires.
7. Loosen and remove (4) 5/16-18x1.125 Torx screws at the bottom of Isolator Bracket B that retain the motor pedestal to the guide rails.
8. After removing the mounting bolts slide the motor pedestal to the point where the motor lifting ring is exposed enough to use. If a mechanical device is available for use, attach it to the lifting ring for use.
9. Slowly rase the motor/fan wheel/pedistal and remove from the fan cell. Slowly lower the motor/fan wheel/ pedistal to the floor.
10. Removing the 3/8" motor bolts and attach the replacement motor and fan wheel, and insert the 3/8" motor bolts and finger tignten.
11. Lifting the motor/fan wheel/pedistal into position. Quare the motor and tighten the bolts to 40 ft-lbs.
13. Slide the pedestal forward lining up Isolator Brackets A & B. Insert (4) 5/16-18x1.125 Torx screws into the holes. Do not tighten down all the way. Leave loose so that the motor assembly can slide back and forth freely.
14. Follow Fan / Cone Alignment procedures starting on page 18 and 19.



mportant: Before Restarting

Before operation, start the motor slowly to ensure the fan rotation is correct.
Drive Side = Counter-clockwise rotation when looking at motor end
Inlet side = Clockwise rotation looking at fan.

Water Coil Freeze Protection Instructions

Air stratification and outside air damper failure are just a couple of causes that can trigger coil failure. Permanent coil damage can result. Chilled water coils need to be protected during the winter months by a variety of methods described below:

Coil Blow-Out

1. Close the valves on both supply and return lines to isolate the coil from the rest of the system.

2. Open all drain valves and/or the drain plug to drain coil. Remove the vent plug to speed the draining process.

3. When completely drained, hook up a blower. Ideal locations to hook up the blower are where end caps are installed on straight runsfor the supply and return connection. Do not hook up the blower to the air vent or drain.

4. Close the drain plug or vent tube on the header that the blower is attached to, open the cap or drain valve on the other header.

5. Run the blower for 45 minutes to an hour, then check the coil to see if it is dry. A small mirror placed in the discharge will fog if moisture is present. If so, continue running blower until coil is dry.

6. Let the coil stand for several minutes and blow once again. Repeat blowing process if water comes out.

7. Leave plugs out and drains open until freeze threats have passed.

Flushing Coils

1. The use of inhibited glycol designed specifically for HVAC applications is highly recommended by Huntair for use in their coils for corrosion protection. Uninhibited glycol can produce ant nest corrosion in copper tubing.

2. Estimate the volume of the coil in gallons. For 1/2” tubes (1.25” face tube spacing) (finned height in inches) x (finned length in inches) x (# of rows) x 0.00083 = gallons.

3. Close the valves on both supply and return lines.

4. Open all drain valves and/or drain plug and drain the coil. Remove the vent cap to speed the draining process.

5. Close the drain plug and valve(s).

6. Connect the flushing system to the coil.

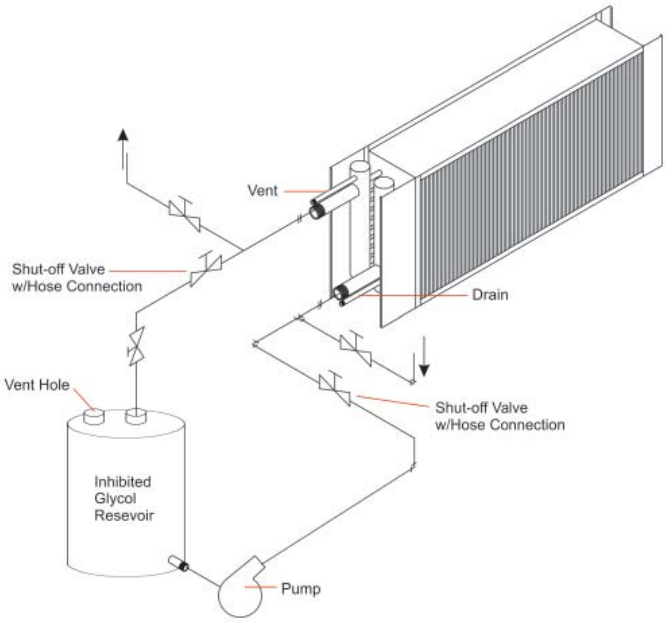
7. Close the throttling valve and start the pump. When all the air is ventilated from the coil close the air vent.

8. Open the throttle valve 50% and circulate fluid through the coil for 15 minutes. Use a hydrometer or test kit to check the fluid strength.

9. Adjust fluid strength as needed and circulate 15 minutes more.

10. Check the strength of the fluid again. Repeat adjustments to fluid, circulate and test until desired concentration is reached.

11. Turn off pump and drain coil.



Evaporative Media Replacement

In order to get the best performance from your cooling pads, they must be installed properly. If you have pads with two equal angles, they can be installed in either direction, otherwise pads are manufactured with special angle combinations. Those having combinations of 15° x 45° or 30° x 45° are made to direct more water toward the air entering side of the pads. If installed backwards, the pads may not work properly.

Pads must be installed with the steeper flute angle sloping down toward the air entering side. The steeper angle puts more water on the entering side of the pad where the air is hot, dry, and dusty and extra water it is needed most. The unequal angles also counteract the tendency of the air to push the water toward the air leaving side of the pad.

Caution

Do not expose evaporative cooling pads to sparks, open flame, welding spatter, temperatures in excess of 350° F, or other sources which may ignite the paper.

1. Turn off all water supply lines.

2. Drain sump tank.

DANGER! Risk of Electric Shock

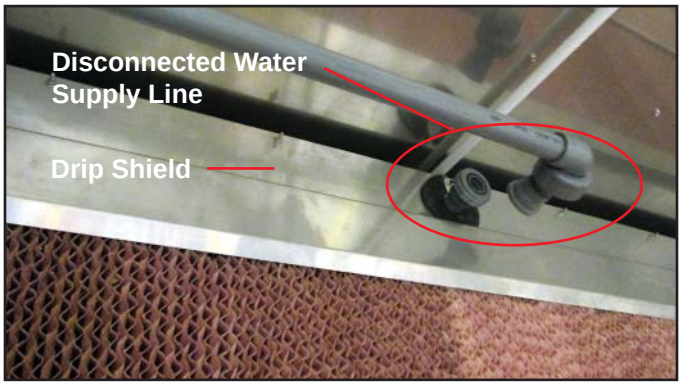
Always disconnect power to the evap cooler control panel before maintenance. Follow all lockout and tag out procedures.

3. Disconnect the water supply line going to the distribution manifold at the top of the evap cooler by turning the coupling counter-clockwise.

4. Remove the drip shield at the top on the evap cooler tower exposing the top layer of horizontal media. These are used to help distribute water evenly through the media below.

Evaporative Cooler Air Entering Side

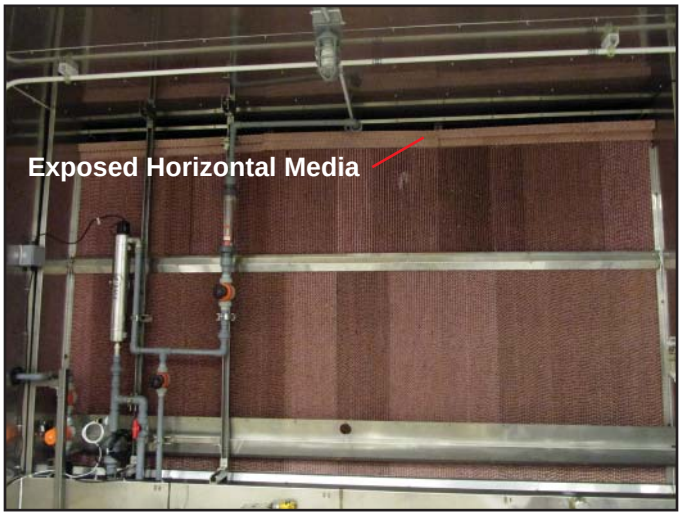
Evaporative Cooler Air Leaving Side



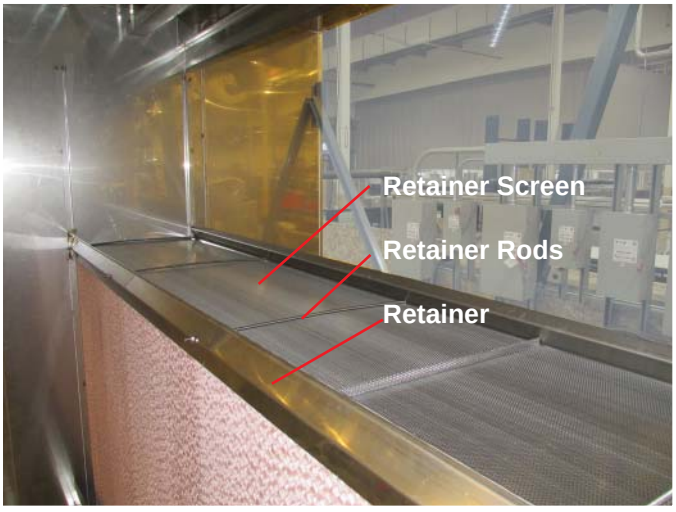
Top Center of Evaporative Cooler

Evaporative Media Replacement Continue

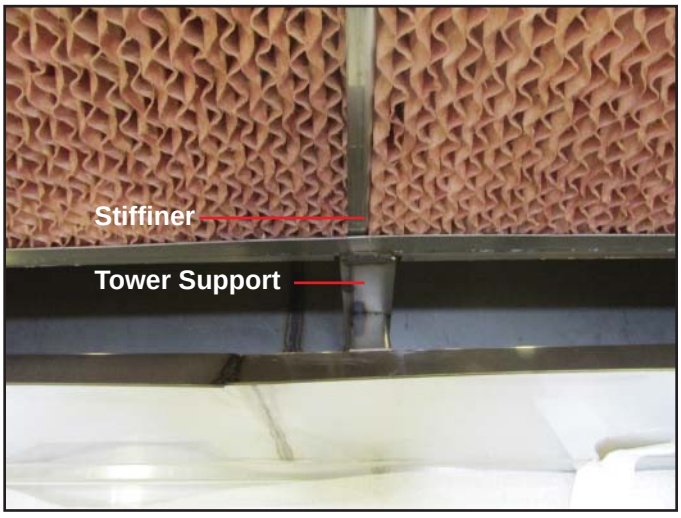
5. Remove horizontal layer of media. Remove vertical media starting in the center and working outward.



6. Remove retainer rods and then then retainer screen. Lift out bottom media starting in the middle and working outward.



7. Depending on the size of your evaporative cooler media, there may be stiffiner(s) between the media for additional support. Stiffiners are located over leg suppots for the evap tower.



Evap Cooler Air Entry Side

Cleaning the Water Distribution System

Refer to Preventative Maintenance section for suggested scheduled cleaning and flushing of the system to increase their service life.

When water evaporates, dirt and chemicals are left behind and build up on the pads and in the sump. Eventually, the water becomes so contaminated that it is harmful to the pads and gutters.

After removing media from evap cooler tower completely empty the sump of water and silt.

Refill with clean water.

Open the ends of the water distribution pipes to flush out debris which could clog the holes. Replace the covers when done. When using silt collection, remove plug and drain the system.

Gently hose stubborn deposits from the face of the pads.

Completely empty the sump to remove the old algae and dirt which was just rinsed off the pads.

Disinfect the system by adding the proper amount of approved chemical.

Check to make sure the bleed off is still functioning properly.

Refill with clean water.

Install cleaned or new pads.

Manually turn on the pumps to run fresh water over the pads for about 30 minutes. Use as much water as possible.

Common Algae Treatment Chemicals

Algae control begins with cleaning and flushing of the system, after that process treatment with an approved disinfectant is advised. Use only products that are designed for use in evaporative coolers, many are commercially available. ***Do not use products that do not list active ingredients.*** Nonoxidizing biocides, copper compounds and quaternary amines are the three most common chemicals.

Quaternary amines examples include:
- Alkyl diMethyl Benzyl Ammonium Chloride
- Octyl Decyl diMethyl Amonium Chloride

Recommended usage: 30 to 50 PPM.
Commercial disinfectants, swimming pool chemicals and cooling water biocides include these chemicals.

Nonoxidizing biocides examples include:
- DBNPA
- Carbamates
- Methylene bis-thiocyanate
- Isothiazolin

Recommended usage: Follow product labeling.
These are available from industrial water treatment specialists.

Oxidizing biocides examples include:
- Hydrogen Peroxide
- Solid Calcium hypochloride
- Sodium hypochlorite (Chlorine bleach)
- Potassium peroxymonosulfate (non chlorine bleach)
- dimethyl Hydantoin
- Ethyl Methyl Hysantoin (Bromine)
- Copper compounds

Do not use in evaporative cooler, these products are detramental to cellulose and metals.

Allow drying of the pads for several hours at a time to prevent algae growth.

- Minimize the number of drying cycles, though. Too many will weather the pad. Ideally, during the cooling season, they should cycle on and off once each day.
- Set automatic controllers so the water to the pads turns off before the fans turn off. Pad pumps should be turned on last and turned off first.
- Do not allow the bottom of the pads to set down in the water when the system is not running. Adjust the float valve and overflow after the system shuts down and all of the water returns to the trough.

Scale Control

Proper water distribution will aid in prolonging pad life by flushing away dirt and contaminants, which may be harmful to the pad. Areas that do not get enough water will clog or soften first.

- Check the pressure in the distribution pipe. The distribution systems consist of a perforated plastic pipe with holes directed at a splash plate. If the pressure is low, the water will not break up at the splash plate. Streaking and dry areas will occur.
- Check for adequate water flow. Adjust the flow until there are no dry streaks. When the pads are operating properly, they will be thoroughly wetted with a visible flow of water trickling down the flutes. Most of the water will pass over the pad and return to the sump. If there is little water running out the bottom of the pad, the dirt and minerals are not being flushed.
- Check for clogged holes in the distributer pipe. The simplest way to clean the holes is to install a ball valve or threaded end cap at the end of each distributer pipe. While the pump is running, open the valve and allow the water to flush the dirt and debris from the pipe. Usually the first signs of blockage will be at the end of the pipe farthest from the pump.
- Clean the water filter often. A dirty filter will substantially restrict the flow of water. Install a ball valve on the clean-out for the filter. This way the filter can be flushed without tools and without shutting off the pump.

Required water flow for CELdek and GLASdek evaporative cooling pads:
4 inch depth 0.50 GPM/ linear foot of pad
6 inch depth 0.75 GPM/ linear foot of pad
8 inch depth 1.0 GPM/ linear foot of pad
12 inch depth 1.50 GPM/ linear foot of pad
18 inch depth 2.25 GPM/ linear foot of pad

Motors are provided with a means to minimize electrical pitting due to arcing across bearings. Motors provided with hybrid ceramic bearings require no maintenance. Motors with an external spring-loaded shaft grounding stick should be checked after 3 years of run time for active length on the grounding stick, and every year thereafter, and replaced if necessary.

Daily

1. Check evaporative cooler pads for bowing and sagging or dry streaks.
2. Remove any debris from the evap sump tank and make sure water level is correct.
3. Dry the evap cooler pads every 24 hours.

Weekly

1. During the cooling season, flush the evap cooler pads, gutter and sump to prevent algae buildup.
2. Check and adjust bleed-off rate if necessary.

Quaterly

1. Check evaporative cooler pads for bowing and sagging or dry streaks. Clean and flush evaporative cooling pads, drain and disinfect the entire water distribution system.

Every Six Months

1. Check supply fan and/or exhaust fan wheels for dirt and grease accumulation. Clean as necessary. Do not use caustic cleaning solutions.
2. If applicable, clean/replace fan filters on the electrical enclosures.

Yearly

1. Lightly lubricate damper bushings and associated linkage. Use a petroleum-based penetrant and corrosion inhibitor lubricant.
2. Lightly lubricate control valve linkage.

Every Two Years

1. Examine unit housing for signs of corrosion. Clean, replace or touch up with paint, as necessary.

HUNTAIR Customer Service Manager:

Phone: 503-639-0113
Fax: 503-639-1269
Email: service@huntair.com
Address: 19855 SW 124th Ave,
Tualatin, OR 97062

What Happened	Probable Cause	Posible Solution
Fan fails to start	**1.** No main power supply.	**1.** Check main power fuses and replace if necessary. Check disconnect switch.
	2. Tripped overloads on motor starters.	**2.** Excessive current draw. Reset overloads and check operating current of motor.
	3. Tripped lock-out device such as damper or door interlock switches if so equipped.	**3.** Check linkage to switch. Check voltage supply to switch.
Excessive vibration and noise	**1.** Fan isolator shipping restraints have not been changed to operating position.	**1.** See Submittal for shipping restraint release procedure.
	2. Worn Motor bearings.	**2.** Inspect bearings.
	3. Check Fan wheel setscrews and bolts for tightness.	**3.** Tighten or replace as required.
Motor fails to start	**1.** Motor overloaded.	**1.** Check for proper fan rotation. Check for excessive cfm and/or static pressure.
	2. Improper supply voltage.	**2.** Check for proper wiring at motor.Check voltage at motor.
Fan capacity to low	**1.** Incorrect fan rotation.	**1.** Check fan rotation on drive side.
	2. Fan RPM to slow.	**2.** Verify fan RPM vs design RPM.
	3. High external static pressure.	**3.** Check actual static pressure against fan design pressure.
	4. Dampers improperly positioned.	**4.** Verify proper damper position.
	5. Airflow is restricted.	**5.** Inspect inlet dampers, and filters for restricted airflow.

VFD UNIT MODELS

Huntair recommends that the following FWT Start~up Report be performed on each unit and the results filed with the appropriate facility engineering office.

Unit Nameplate Data:

Model No.

Serial No.

Supply CFM: Supply HP:

Exhaust/Return CFM: Exhaust/Return HP:

Mechanical System Checks

1 Visually inspect fanwall for damage.
- **a.** On Discharge side look for damage to Fans, Motors, Cells, etc.
- **b.** On Inlet side look for damage to inlet straigtening grid and frame as well as cells.

2 Fan Wheel / Motor
- **a.** Rotate fan wheel by hand to ensure it is properly aligned with inlet cone.
- **b.** Check motor bearings as fan wheel is rotating. Bearings should operate freely and be free of noise.
- **c.** Check that the shaft grounding kit has been installed correctly.
- **d.**Check backdraft damper for smooth operation if supplied. Open damper by hand to ensure a full range of motion without obstruction.

3 HVAC System
- **a.** Check that all ducts, dampers and registers are set.
- **b.** Check that all openings and pentrations are sealed.

Electrical System Checks

1 De-Energized
- **a.** Check for any loose connections
- **b.** Check circuit breaker disconnect mechanisms / Mechanical interlocks operate properly
- **c.** Check VFD size and rating (voltage and horsepower)
- **d.** Check and set motor start protectors (MSP) for correct size and setting.
- **e.** Ensure all system components are adjusted to proper settings (temperature, amperage)

2 Energized
- **a.** Connect proper input voltage power to line side of panel
- **b.** Energize incoming power circuit.
- **c.** Check for proper line voltage.
- **d.** Check voltage between all neutral terminations and panel ground (should be zero volts)
- **e.** Check internal power supplies for proper voltage output(s) and adjust as required
- **f.** Test and verify proper operations of all GFCI devices
- **g.** Check operation of cabinet cooling fans, adjust thermostat as specified on drawing
- **h.** Check and record all voltage readings
- **i.** Energize MSP one at a time to ensure correct motor rotation.
- **j.** Ensure that CFM monitoring system is functioning (if applicable).

Comments

JOB NAME _____

JOB # _____

Unit Tag # _____

CAUTION: Read and familiarize yourself with the installation and operating instructions shipped with unit.

1. GENERAL UNIT INSPECTION:

a. Is there any shipping or rigging damage?
❑Yes ❑No ❑N/A

b. Is there any damage to the seals at joints and seams?
❑Yes ❑No ❑N/A

c. Is the unit level?
❑Yes ❑No ❑N/A

d. Is the unit clearance from combustible material?

Top — 6” ❑Yes ❑No ❑N/A

Control side — 48” ❑Yes ❑No ❑N/A

Opposite controls — 6” ❑Yes ❑No ❑N/A

Bottom — 0” ❑Yes ❑No ❑N/A

Follow the instructions for initial start-up and put unit into operation.

2. FAN SYSTEM:

a. Was the fan and drive assembly inspected?
❑Yes ❑No ❑N/A

b. Is the fan rotating in the correct direction?
❑Yes ❑No ❑N/A

c. Does fan rotate freely without rubbing on cone?
❑Yes ❑No ❑N/A

All cooling system checks must be made with heat/cool changeover control set lower than ambient temperature.

3. WATER SYSTEM:

a. Are all the water supply and drain connections connected and tight?
❑Yes ❑No ❑N/A

b. Is power supplied to the unit?
❑Yes ❑No ❑N/A

c. Are all the water level switches off?
❑Yes ❑No ❑N/A

3. WATER SYSTEM CONTINUE:

d. Was each level switch manually toggledand checked that they are closed?
❑Yes ❑No ❑N/A

e. Was PRV installed on the supply line and set at 20 lbs?
❑Yes ❑No ❑N/A

f. Was stage valves 1 and 2, cycle valve, and bleed cycle valve individually opened and operating correctly?
❑Yes ❑No ❑N/A

g. Was water flowing through the media after stage 1 valve was open, pump activated, and UV light if any was turned on?
❑Yes ❑No ❑N/A

h. If there is a stage 2. Was water flowing through media when valve pump was turned on?
❑Yes ❑No ❑N/A

i. Is float valve functioning correctly and not sticking?
❑Yes ❑No ❑N/A

j. Did water go through media after stage valves were opened and supply flush valve opened?
❑Yes ❑No ❑N/A

k. Pump
❑Yes ❑No ❑N/A

l. Pump Status: ❑Yes ❑No ❑N/A

m. Level Switches:

Low: ❑Yes ❑No ❑N/A

High: ❑Yes ❑No ❑N/A

High High: ❑Yes ❑No ❑N/A

n. Drain: ❑Yes ❑No ❑N/A

o. Fill: ❑Yes ❑No ❑N/A

p. Flush: ❑Yes ❑No ❑N/A

q. Stage 1: ❑Yes ❑No ❑N/A

r. Stage 2: ❑Yes ❑No ❑N/A

s. UV:

Operational: ❑Yes ❑No ❑N/A

Status: ❑Yes ❑No ❑N/A

t. Conductivity meter set: ❑Yes ❑No ❑N/A

4. AIR SUPPLY:

a. Was each damper visually inspected for impedance of movement and complete linkage?
❑Yes ❑No ❑N/A

b. Are dampers mounted straight and solid?
❑Yes ❑No ❑N/A

c. Is the actuator drive shaft connection tight?
❑Yes ❑No ❑N/A

d. Did the all damper actuators open 100% open and 100 % closed when operated?
❑Yes ❑No ❑N/A

e. Did damper blades seal completely?
❑Yes ❑No ❑N/A

f. Dampers - Operation Feedback

SA ❑ Open: _____ Close:_____

RA ❑ Open: _____ Close:_____

BP ❑ Open: _____ Close:_____

OSA ❑ Open: _____ Close:_____

MOSA ❑ Open: _____ Close:_____

g. Supply Air Temp:
#1_____ #2 _____

h. Supply Air Humidity:
#1_____ #2 _____

i. Return Air Temp: _____

j. Return Air Humidity: _____

k. Mixed Air Temp: _____

l. Filter DP jumper set?
❑Yes ❑No ❑N/A

m. CFM meter jumper set?
❑Yes ❑No ❑N/A

5. VFD:

a. VFD speed command?
❑Yes ❑No ❑N/A

b. VFD speed feedback?
❑Yes ❑No ❑N/A

c. VFD fault?
❑Yes ❑No ❑N/A

d. VFD status?
❑Yes ❑No ❑N/A

JOB NAME _____

JOB # _____

Unit Tag # _____

6. HOA:

a. HOA Off?
❑Yes ❑No ❑N/A

b. HOA Auto?
❑Yes ❑No ❑N/A

c. HOA Hand?
❑Yes ❑No ❑N/A

7. PRESSURE SWITCH

a. High: _____

b. Low: _____

8. ELECTRICAL PANEL:

a. Have all wiring connections check for tightness?
❑Yes ❑No ❑N/A

b. Are relays seated?
❑Yes ❑No ❑N/A

c. If possible check VFD parameter list to VFD setting.
❑Yes ❑No ❑N/A

d. Verify customer connections to schematic
❑Yes ❑No ❑N/A

e. When BMS starts test, check set points and unit response.
❑Yes ❑No ❑N/A

f. Verify safety connection and that unit will shut down.
❑Yes ❑No ❑N/A

g. Verify MSP overload settings to motor name plate.
❑Yes ❑No ❑N/A

9. FANWALL:

a. Check for wall securing, caulking around front of unit, and blank-offs.
❑Yes ❑No ❑N/A

b. Verify motor connections to remote panel.
❑Yes ❑No ❑N/A

10. COMMENTS

_____

_____

_____

_____

_____

_____

_____

Signature _____ Date _____

NAS recommends that the following field check list be performed on each unit and the results filed with the appropriate facility engineering office.

Startup/Test Conditions

Job # _____

Tag # _____

Date _____

Operating Hz _____

Operating TSP _____

Operating CFM _____

	Voltage L1	Voltage L2	Voltage L3	Amps L1	Amps L2	Amps L3
Fan #1						
Fan #2						
Fan #3						
Fan #4						
Fan #5						
Fan #6						
Fan #7						
Fan #8						
Fan #9						
Fan #10						
Fan #11						
Fan #12						
Fan #13						
Fan #14						
Fan #15						
Fan #16						
Fan #17						
Fan #18						

NORTEK AIR SOLUTIONS LIMITED WARRANTY

NORTH AMERICA

Unless otherwise agreed in writing signed by Seller:

(a) Seller warrants: (i) All Products (excluding software and spare parts) manufactured by Seller will conform to the specifications and submittals provided by Seller and will be free of defects in material and workmanship ("Defects") for 12 months following start-up or 18 months following ship date, whichever occurs first, under normal use and regular service and maintenance, if installed and maintained pursuant to Seller's instructions. Extended warranties, if offered, may be purchased for an additional fee at the time of Product sale. For warranty purposes, start-up occurs when the equipment (or any portion thereof) is started for operation regardless of when the building may be ready for operation. (Per submittal, certain DX Products require Seller or its authorized Agent to perform start up or Product warranties are void. Any Seller required completed start-up form shall be delivered to Seller within six (6) months from shipment, or start-up will be deemed to have occurred on the ship date.) With the exception of OEM parts that may provide a longer pass-through warranty term from the third party manufacturer, new spare parts will be free of Defects for 3 months following ship date. Refer to New Spare Parts Warranty Policy. Buyer must notify Seller in writing of any Defect promptly upon discovery and if such notification occurs within the applicable warranty period, Seller shall remedy such Defect by, at Seller's option, adjustment, repair or replacement of Products or any affected portion of Products, or providing a refund of the portion of the purchase price attributable to the defective portion of the Product. Buyer must grant Seller access to the premises at which Products are located at all reasonable times so that Seller may evaluate the Defect and make repairs or replacements on site. Repaired or replaced portions of Products are warranted until the later of the end of the original warranty period applicable to the defective portion of Products repaired or replaced or 30 days following the completion of the repair or ship date of the replacement parts; and (ii) Services will be of workmanlike quality. If Buyer notifies Seller in writing of any nonconforming Services within 30 days after Services are completed, Seller shall re-perform, if able to be cured, those Services directly affected by such failure, at its sole expense. Buyer's sole remedy for such nonconforming Services is limited to Seller's cost of re-performing the Services.

(b) Buyer is responsible for disassembly, removal and re-assembly or otherwise of non-Seller supplied products. Seller does not warrant and shall have no obligation with respect to any Products or parts that: (i) have been repaired or altered by someone other than Seller or Seller's authorized representative; (ii) have been subject to misuse, abuse, neglect, intentional misconduct, accident, Buyer or third party negligence, unauthorized modification or alteration, use beyond rated capacity, improper grounding, voltage irregularities, a Force Majeure Event, or improper, or a lack of, maintenance; (iii) are comprised of materials provided by, or designed pursuant to instructions from Buyer; (iv) have failed due to ordinary wear and tear; or (v) have been exposed to adverse operating or environmental conditions, including but not limited to contaminants, corrosive agents, chemicals or minerals, (vi) were manufactured or furnished by others and which are not an integral part of a product manufactured by Seller, or (vii) have not been fully paid for by Buyer. Refrigerants, fluids, oils and expendable items such as filters are not covered by this Limited Warranty. If Seller has relied upon any specifications, information, representations or descriptions of operating conditions or other data supplied by Buyer or its agents to Seller in the selection or design of Products, and actual operating conditions or other conditions differ, any warranties or other provisions contained herein that are affected by such conditions will be null and void.

(c) Buyer is solely responsible for determining the fitness and suitability of Products for the use contemplated by Buyer. Buyer shall ensure that (i) the Products are used only for the purposes and in the manner for which they were designed and supplied, (ii) all persons likely to use or come into contact with the Products receive appropriate training and copies of applicable instructions and documentation supplied by Seller, (iii) all third parties who use or may be affected by or rely upon the Products are given

full and clear warning of any hazards associated with them or limitations of their effectiveness and that safe working practices are adopted and complied with, (iv) any warning notices displayed on the Products are not removed or obscured, (v) any third party to whom the Products are supplied agrees not to remove or obscure such warning notices.

(d) If Software is Licensed: To the extent available and authorized by the Third Party Software supplier, Seller hereby assigns to Buyer any warranties provided by Third Party Software providers. Seller provides Third Party Software "as is," without any warranties, express or implied. Seller has no obligation for Third Party Software failures.

(e) THE WARRANTIES SET FORTH HEREIN ARE SELLER'S SOLE AND EXCLUSIVE WARRANTIES WITH RESPECT TO PRODUCTS, SOFTWARE AND SERVICES, AND ARE IN LIEU OF AND EXCLUDE ALL OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY AGAINST INFRINGEMENT; AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY, USAGE OF TRADE, AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to Buyer. **SELLER DOES NOT WARRANT THAT THE OPERATION OF SOFTWARE WILL BE UNINTERRUPTED OR ERROR FREE, OR THAT ANY DEFECT OR MALFUNCTION IN THE SOFTWARE IS CORRECTABLE OR WILL BE CORRECTED. THE REMEDIES PROVIDED HEREIN ARE BUYER'S EXCLUSIVE REMEDIES FOR ANY AND ALL CLAIMS ARISING FROM OR RELATED TO PRODUCTS AND SERVICES**. All warranty claims must be received by Seller in writing on or before the end of the applicable warranty period.

Limitation of Remedy and Liability. Unless otherwise provided by law, Seller's total liability under the Agreement, whether in law, equity, contract, infringement, negligence, strict liability or other otherwise, shall not exceed the price paid by Buyer under the Agreement for the Product or Services giving rise to the claim. Under no circumstances shall Seller be liable for special, incidental, indirect, delay or liquidated, punitive or consequential damages for any reason. "**Consequential damages**" includes, without limitation, loss of anticipated profits; business interruption; loss of use, revenue, reputation or data; costs incurred, including without limitation, costs for capital, fuel or power; loss or damage to property or equipment; and environmental clean-up. Any action arising under or relating to the Agreement, (whether based in law, equity, contract, infringement, negligence, strict liability, other tort or otherwise), must be commenced with one year from the date the claim arose. Seller assumes no obligation or liability for technical advice given or not given, or results obtained. Seller has set its prices and entered into the Agreement in reliance upon the limitations of liability and other terms and conditions specified herein, which allocate the risk between Buyer and Seller and form a basis of this bargain between the parties.

PRMH20240272

MODEL CSU ~ CENTRAL STATION UNIT

NORTEK AIR SOLUTIONS

HUNTAIR® a Nortek Air Solutions Brand

19855 SW 124th Ave, • Tualatin, Oregon 97062 U.S.A.

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FORM NO. CSU SE KD Guide 0417

NORTEK AIR SOLUTIONS
HUNTAIR

PROJECT	South Hill
SALES ORDER #	061070
QUOTE #	23-0137

Terms and Conditions

NORTEK AIR SOLUTIONS TERMS AND CONDITIONS OF SALE

These Terms and Conditions of Sale and the non-conflicting provisions in Seller's quotation, acknowledgement or invoice from Seller form the parties' agreement (the "**Agreement**") which governs all sales of any products ("**Products**") and services ("**Services**") from Nortek Air Solutions, LLC or its North American affiliates or business units selling Products and Services ("**Seller**") to purchaser ("**Buyer**"). Seller disclaims any Buyer terms that are different or conflicting. Any agreed exceptions to these terms and conditions shall be made in writing and attached to this Agreement.

1. Prices and Taxes. Prices are those in effect when Seller accepts a purchase order. Seller may accept or reject purchase orders in its sole discretion. All sales are subject to prior credit approval. Buyer must pay or promptly reimburse Seller for any sales, use or any other local, state, provincial or federal taxes arising from the sale or delivery of the Products and Services or provide an exemption certificate.

2. Payment. Unless otherwise agreed in writing, Buyer shall pay invoices, without setoff, NET 30 days from invoice date in the currency specified on the invoice. If Buyer fails to make payment (a) Buyer shall pay all of Seller's costs arising from Buyer's failure to pay according to terms including attorneys' fees, commissions, and product cancellation costs, (b) Seller may accelerate all Buyer payments, and (c) Seller may terminate or suspend further performance under the Agreement and any other agreements with Buyer. Past due amounts are subject to service charges of 1½% per month (or the maximum amount permitted by law) and, if credit terms have been agreed to in writing, Seller reserves the right to charge lawful rates of interest upon any outstanding balance, whether past due or not. If in Seller's judgment, reasonable grounds for insecurity arise concerning Buyer's ability to make payment when due, Seller may demand additional satisfactory security or adequate assurance of due performance, may refuse delivery except for cash, including payment for all goods previously delivered under the contract, or may stop delivery or reclaim the Products, in addition to all other remedies provided for by law. Buyer's purchase order, and any shipping or delivery instructions, shall each constitute the Buyer's separate written representation that it is solvent.

3. Changes. Seller may revise prices, dates of delivery, and warranties upon acceptance of requests by Buyer for modifications to Products or Services. If Buyer rejects proposed changes to made-to-order Products deemed necessary by Seller to conform to the applicable specification, Seller is relieved of its obligation to conform to such specification.

4. Shipment and Delivery. Deliveries of Products, risk of loss and title (subject to reservation of Seller's security interest) pass to Buyer FCA Seller's facility (Incoterms 2010) for domestic shipments or EXW Seller's Facility (Incoterms 2010) for international shipments. Buyer is responsible for all demurrage or detention charges. Title to any software provided with Products remains with Seller or its supplier. Any claims for shortages or transit damages must be submitted directly to the carrier. All shipping dates are approximate and not guaranteed. Seller reserves the right to make partial shipments. Seller is not bound to tender delivery of any Products for which Buyer has not provided shipping instructions. If shipment of Products is postponed or delayed by Buyer for any reason, including a Force Majeure Event (see Section 9), Seller may move Products to storage at Buyer's cost and risk of loss, the Products then deemed delivered. Products may not be returned except with the prior written consent of Seller, which may include additional terms.

5. Inspection and Acceptance. Unless otherwise agreed in writing signed by Seller, Buyer shall inspect Products upon receipt at the first delivery destination. Buyer's failure to inspect Products and give written notice to Seller of rejection within ten (10) days after receipt at first delivery destination shall constitute Buyer's irrevocable acceptance of Products delivered. Notice of any latent defect must be delivered to Seller in writing within ten (10) days of start-up.

6. Limited Warranty. Unless otherwise agreed in writing signed by Seller:

(a) Seller warrants: (i) All Products (excluding software and spare parts) manufactured by Seller will conform to the specifications and submittals provided by Seller and will be free of defects in material and workmanship ("**Defects**") for 12 months following start-up or 18 months following ship date, whichever occurs first, under normal use and regular service and maintenance, if installed and maintained pursuant to Seller's instructions. Extended warranties, if offered, may be purchased for an additional fee at the time of Product sale. For warranty purposes, start-up occurs when the equipment (or any portion thereof) is started for operation regardless of when the building may be ready for operation. (Per submittal, certain DX Products require Seller or its authorized Agent to perform start up or Product warranties are void. Any Seller required completed start-up form shall be delivered to Seller within six (6) months from shipment, or start-up will be deemed to have occurred on the ship date.) . With the exception of OEM parts that may provide a longer pass-through warranty term from the third party manufacturer, new spare parts will be free of Defects for 3 months following ship date. Refer to New Spare Parts Warranty Policy.

. Buyer must notify Seller in writing of any Defect promptly upon discovery and if such notification occurs within the applicable warranty period, Seller shall remedy such Defect by, at Seller's option, adjustment, repair or replacement of Products or any affected portion of Products, or providing a refund of the portion of the purchase price attributable to the defective portion of the Product. Buyer must grant Seller access to the premises at which Products are located at all reasonable times so that Seller may evaluate the Defect and make repairs or replacements on site. Repaired or replaced portions of Products are warranted until the later of the end of the original warranty period applicable to the defective portion of Products repaired or replaced or 30 days following the completion of the repair or ship date of the replacement parts; and (ii) Services will be of workmanlike quality. If Buyer notifies Seller in writing of any nonconforming

Services within 30 days after Services are completed, Seller shall re-perform, if able to be cured, those Services directly affected by such failure, at its sole expense. Buyer's sole remedy for such nonconforming Services is limited to Seller's cost of re-performing the Services.

b) Buyer is responsible for disassembly, removal and re-assembly or otherwise of non-Seller supplied products. Seller does not warrant and shall have no obligation with respect to any Products or parts that: (i) have been repaired or altered by someone other than Seller or Seller's authorized representative; (ii) have been subject to misuse, abuse, neglect, intentional misconduct, accident, Buyer or third party negligence, unauthorized modification or alteration, use beyond rated capacity, improper grounding, voltage irregularities, a Force Majeure Event, or improper, or a lack of, maintenance; (iii) are comprised of materials provided by, or designed pursuant to instructions from, Buyer; (iv) have failed due to ordinary wear and tear; or (v) have been exposed to adverse operating or environmental conditions, including but not limited to contaminants, corrosive agents, chemicals or minerals, (vi) were manufactured or furnished by others and which are not an integral part of a product manufactured by Selleror (vii) have not been fully paid for by Buyer. Refrigerants, fluids, oils and expendable items such as filters are not covered by this Limited Warranty. If Seller has relied upon any specifications, information, representations or descriptions of operating conditions or other data supplied by Buyer or its agents to Seller in the selection or design of Products, and actual operating conditions or other conditions differ, any warranties or other provisions contained herein that are affected by such conditions will be null and void.

(c) Buyer is solely responsible for determining the fitness and suitability of Products for the use contemplated by Buyer. Buyer shall ensure that (i) the Products are used only for the purposes and in the manner for which they were designed and supplied, (ii) all persons likely to use or come into contact with the Products receive appropriate training and copies of applicable instructions and documentation supplied by Seller, (iii) all third parties who use or may be affected by or rely upon the Products are given full and clear warning of any hazards associated with them or limitations of their effectiveness and that safe working practices are adopted and complied with, (iv) any warning notices displayed on the Products are not removed or obscured, (v) any third party to whom the Products are supplied agrees not to remove or obscure such warning notices.

(d) If Software is Licensed: To the extent available and authorized by the Third Party Software supplier, Seller hereby assigns to Buyer any warranties provided by Third Party Software providers. Seller provides Third Party Software "as is," without any warranties, express or implied. Seller has no obligation for Third Party Software failures.

(e) THE WARRANTIES SET FORTH IN THIS SECTION 6 ARE SELLER'S SOLE AND EXCLUSIVE WARRANTIES WITH RESPECT TO PRODUCTS, SOFTWARE AND SERVICES, AND ARE IN LIEU OF AND EXCLUDE ALL OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY AGAINST INFRINGEMENT; AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY, USAGE OF TRADE, AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to Buyer. SELLER DOES NOT WARRANT THAT THE OPERATION OF SOFTWARE WILL BE UNINTERRUPTED OR ERROR FREE, OR THAT ANY DEFECT OR MALFUNCTION IN THE SOFTWARE IS CORRECTABLE OR WILL BE CORRECTED. THE REMEDIES PROVIDED IN THIS SECTION 6 ARE BUYER'S EXCLUSIVE REMEDIES FOR ANY AND ALL CLAIMS ARISING FROM OR RELATED TO PRODUCTS AND SERVICES. All warranty claims must be received by Seller in writing on or before the end of the applicable warranty period.

7. Limitation of Remedy and Liability. Unless otherwise provided by law, Seller's total liability under the Agreement, whether in law, equity, contract, infringement, negligence, strict liability or other otherwise, shall not exceed the price paid by Buyer under the Agreement for the Product or Services giving rise to the claim. Under no circumstances shall Seller be liable for special, incidental, indirect, delay or liquidated, punitive or consequential damages for any reason. "**Consequential damages**" includes, without limitation, loss of anticipated profits; business interruption; loss of use, revenue, reputation or data; costs incurred, including without limitation, costs for capital, fuel or power; loss or damage to property or equipment; and environmental clean-up. Any action arising under or relating to the Agreement, (whether based in law, equity, contract, infringement, negligence, strict liability, other tort or otherwise), must be commenced with one year from the date the claim arose. Seller assumes no obligation or liability for technical advice given or not given, or results obtained. Seller has set its prices and entered into the Agreement in reliance upon the limitations of liability and other terms and conditions specified herein, which allocate the risk between Buyer and Seller and form a basis of this bargain between the parties.

8. Indemnity. (a) Seller shall defend at its own expense any action brought against Buyer by a third party alleging that Products (the "**Indemnified Items**") directly infringe any United States patent, and shall pay all damages and costs finally awarded in any such action, provided that Buyer has promptly notified Seller in writing of the action, delivers all necessary assistance in the defense of the action, and permits Seller to control all aspects of the defense, including settlement rights. Seller has no obligation with regard to: (i) any non-Seller originated Products, software or processes, including Indemnified Items or processes which have been modified or combined with non-Seller products or processes; (ii) any Indemnified Items or process provided pursuant to a design provided by or on behalf of Buyer; (iii) any patent issued after the date of the Agreement; (iv) any action settled or otherwise terminated without the prior written consent of Seller; or (v) any claims arising from, or related to, Seller's adherence to any specifications or instructions provided by or on behalf of Buyer.

(b) Buyer shall indemnify, defend and hold harmless Seller and its affiliates and their respective shareholders, officers, directors, members, agents and employees against all expenses, costs (including reasonable attorneys' fees),

claims, demands, damages, liability, suits or the like arising in connection with or out of (i) any breach by Buyer of the Agreement; or (ii) Seller's adherence to specifications or use of material furnished or specified by Buyer or any of its agents. Additionally, if all or a part of the Indemnified Items sold hereunder are incorporated into an improvement to real property owned by a third party, Buyer will indemnify, defend and hold harmless Seller and its affiliates and their respective shareholders, officers, directors, members, agents and employees against any claim by such third party or its guests or invitees to the extent that the claim seeks to recover damages or otherwise to invoke any legal or equitable remedies beyond those for which Seller has agreed to be liable hereunder.

9. Excuse of Performance. Seller has no liability for non-performance due to acts of God; acts of Buyer; war (declared or undeclared); terrorism or other criminal conduct; fire; flood; weather; sabotage; strikes, or labor or civil disturbances; governmental requests, restrictions, laws, regulations, orders, omissions or actions; unavailability of, or delays in, utilities or transportation; default of suppliers or other inability to obtain necessary materials; embargoes or any other events or causes beyond Seller's reasonable control (each, a "**Force Majeure Event**"). Deliveries or other performance may be suspended for an appropriate period of time or canceled by Seller upon notice to Buyer in the event of a Force Majeure Event, but the remainder of the Agreement will otherwise remain unaffected as a result of the Force Majeure Event. If Seller determines that its ability to perform the Services or the total demand for Products is hindered, limited or made impracticable due to a Force Majeure Event, Seller may delay delivery of Products and Services and allocate its available supply of Products (without obligation to acquire other supplies of any such Products) among its customers on such basis as Seller determines to be equitable without liability for any failure of performance. In the event of a Force Majeure Event, the date of delivery will be extended by a period equal to the delay plus a reasonable time to train and resume production, and the price will be equitably adjusted to compensate Seller for such delay and related costs and expenses.

10. Laws and Regulations. Compliance with any federal, state, provincial or local laws, regulations and directives ("**Laws**") relating to the installation, operation or use of Products or Services is the sole responsibility of Buyer. In addition, Buyer shall comply with all applicable laws, rules, regulations and orders related to anti-bribery or anti-corruption legislation (including without limitation the U.S. Foreign Corrupt Practices Act of 1977 and all national, state, provincial or territorial anti-bribery and anti-corruption statutes). The Agreement is governed by the laws of the State where Seller's principal office is located, without giving effect to its conflict of laws rules, and the parties consent to the exclusive jurisdiction and venue of the federal and state courts located in such State. The application of the United Nations Convention on Contracts for the International Sale of Goods does not apply.

11. Drawings. Any designs, manufacturing drawings or other information submitted to Buyer remain the exclusive property of Seller. Buyer shall not, without Seller's prior written consent, copy such information or disclose such information to a third party.

12. Cancellation. Buyer may cancel orders only upon reasonable advance written notice and upon payment to Seller of cancellation charges which include: (a) all costs and expenses incurred by Seller, and (b) a fixed sum of 10% of the total price of Products to compensate for disruption in scheduling, planned production and other indirect and administrative costs.

13. Export Control. Certain Products may be subject to export controls under the Laws of the US and other countries. Buyer must comply with all such Laws and not export, re-export or transfer, directly or indirectly, any such Product except in compliance with such Laws.

14. Assignment. Buyer acknowledges that Seller, through its affiliates (i.e., parents, subsidiaries and other affiliates) offers expanded manufacturing capability, and Seller may in its sole discretion manufacture, supply or deliver from any location or source, including any of its affiliates, any Products or Services and such manufacture, supply or delivery from such affiliates shall also be subject to these Terms and Conditions.

15. General Provisions. The Agreement constitutes the entire agreement between the parties and supersedes all other communications between the parties relating to the subject matter of the Agreement. Seller's quotations are offers that may only be accepted in full. No conditions, usage or trade, course of dealing or performance, understanding or agreement purporting to modify, vary, explain, reject, or supplement the Agreement shall be binding unless made in writing and signed by both parties, expressly and specifically referencing the Agreement, and no modification or objection shall be caused by Seller's receipt, acknowledgment, or acceptance of purchase orders, shipping instruction forms, or other documentation containing different or additional terms to those set forth herein. No waiver by either party with respect to any breach or default or of any right or remedy and no course of dealing, shall be deemed to constitute a continuing waiver of any other breach or default or of any other right or remedy, unless such waiver is expressed in writing signed by both parties, specifically referencing the Agreement. Nothing in the Agreement confers upon any person other than Seller and Buyer any right or remedy under or by reason of this Agreement. All typographical or clerical errors made by Seller in any quotation, acknowledgment or publication are subject to correction.

BUYER accepts these terms and conditions:

Signature:_____

Print Name: _____

Title: _____

Company: _____

Date:_____