HAMLETT ASSOCIATES, INC. SUBMITTAL REVIEW

REVIEW DATE: 1/18/2022

PROJECT NAME: ABSS Pleasant Grove ES

CONTRACTOR: Hamlett Associates Inc.

JOB NUMBER: ABSS #2019-09. Sud #19253. HAI #7604

ENGINEER: Sud Associates

ARCHITECT: DTW Architects

PRODUCT/MATERIAL ID: S#10 ERV

SPEC. SECTION/PARAGRAPH NO.: Div 23 23 72 13

SUBCONTRACTOR/SUPPLIER: JR Mech

NOTES:

Engineer Reviw Comments: (M. Saenger)

1.The VFD for the ERV is mounted remotely. See drawing sheets. Note the ERV wheel motor will be getting a VSD signal. Control power transformer for the dampers will come from DDC system not the ERV.

2.Please coordinate on a curb for the unit.

ARCHITECT/ENGINEER REVIEW/APPROVAL	HAMLETT ASSOCATES REVIEW/APPROVAL
SUD ASSOCIATES, P.A. CONSULTING ENGINEERS ☐ REVIEWED ☑ REVIEWED WITH NOTATIONS ☐ REVIEWED AS TO MANUF. ONLY ☐ DISAPPROVED, RESUBMIT ☐ FOR INFORMATION ONLY CHECKED FOR DESIGN ONLY. CONTRACTOR RESPONSIBLE FOR ALL SIZES, CAPACITIES AND QUANTITIES. VERIFY ALL DIMENSIONS & CONDITIONS AT THE BUILDING AND SITE. BY Michael Szigeti Digitally signed by Michael Szigeti DN: C=US, E=michael@sudassociates.com, O="Sud Associates, PA", CN=Michael Szigeti Date: 2022.03.01 17:12:43-05'00' DATE 3/1/2022 See review comments above.	x Approved as noted Exceptions Indicated Rejected - Revise & Resubmit THIS REVIEW IS FOR CONFORMANCE WITH THE GENERAL DESIGN CONCEPT AND FOR GENERAL ARRANGEMENT ONLY. REVIEW SHALL NOT BE CONSTRUED TO MEAN THAT HAMLETT ASSOC. ACCEPTS ANY DEVIATIONS FROM THE CONTRACT DOCUMENTS UNLESS NOTED AND APPROVED BY HAMLETT AND BY THE ARCH/ENG. SUPPLIER IS RESPONSIBLE FOR ERRORS OR OMISSIONS IN THE SHOP DRAWINGS, FOR MEETING ALL REQUIREMENTS OF THE CONTRACT DOCUMENTS, FOR CONFIRMING AND CORRELATING JOBSITE DIMENSIONS, FOR INFORMATION THAT PERTAINS SOLELY TO FABRICATION PROCESSES OR TO TECHNIQUES EQUIPMENT AND/OR SUPPLIES PROJECT MANAGER Justin Graves ALL MATERIAL MUST BE SHIPPED AS PER HAMLETT ASSOCIATES

JR Mechanical, LLC

Submittal Cover Sheet

ABSS Pleasant Grove Elementary School Renovations

2847 Pleasant Grove Union School Rd

Burlington, NC 27217

Submitted to:

Hamlett Associates Inc.

3704 Security Mills Rd.

Climax, NC 27233

Energy Recovery Ventilators

Spec Section: 237213

Submittal #237213-1.0

Manufacturer / Supplier

Greenheck / Hoffman & Hoffman

Representative: Chris Arbogast: (704) 364-4700

Reviewed by:

John Rocan Date: 1/07/2021

Approval Stamp

1309 Spencer Ridge Rd, Rock Hill, SC 704-248-8378

Date	**December 31, 2021**
Hoffman & Hoffman Order #	**125.252.11666**
Branch Office	**Charlotte, NC**
Salesman	**Chris Arbogast**

PROJECT: **ABSS Pleasant Grove Elementary School Bond Project Renovations**
Burlington, NC

CONTRACTOR: **JR Mechanical**
Rock Hill, SC

ENGINEER: **SUD Associates, P.A.**
Durham, NC

EQUIPMENT: **Energy Recovery Ventilators by Greenheck**

SUBMITTAL

General Notes:

Above per the attached data and cut sheets

- Energy recovery ventilators to include materials of construction, accessories and options as per the attached cut sheets.
- Following must be verified: electrical requirements, controls communication protocol
- We don't include any control signals, external sensors, smoke detectors, structural steel, sloped standing seam metal roof curbs, duct transitions, rigging, installation or wiring.

APPROVAL REQUIRED

HOFFMAN HOFFMAN, INC.

HVAC Manufacturers Representative

Website: **www.hoffman-hoffman.com**

Asheville, NC (828) 252-5782 | **Charleston, SC (843) 884-3201**
Charlotte, NC (704) 364-4700 | **Columbia, SC (803) 765-9360**
Raleigh, NC (919) 781-8011 | **Greenville, SC (864) 676-1888**
Wilmington, NC (910) 791-4775 | **Chesapeake, VA (757) 548-1700**
Chattanooga, TN (423) 693-2890 | **Richmond, VA (804) 272-1500**
Knoxville, TN (865) 450-9770 | **Roanoke, VA (540) 725-8701**
Corporate: Greensboro, NC (336) 292-8777

We have exercised care in the preparation of this submittal. We believe it satisfies our interpretation of the designer's intent and scope. It contains the list of materials, quantities, sizes, style and the finish as we propose to furnish for this job. Please examine and check carefully that all items are exactly as required and that our interpretation of the applicable plans and/or specifications are consistent with the design. Approval by the engineer and purchaser will be required before release of this equipment for production. If any discrepancies are discovered, please notify us as soon as possible.

ABSS Pleasant Grove Elementary School

ERVe-35-15H energy recovery ventilators (ERV-A, B) include the following:

- UL-1995 listed
- Roof mounted outdoor unit with galvanized double wall construction and galvanized finish
- Hinged access doors
- Weatherhoods
- 2” MERV 8 pleated filters
- OA & EA low leakage motorized dampers (includes actuators)
- Desiccant polymer energy wheel with economizer control via VFD modulation based on OA temp setpoint
- Forward curved fans with neoprene vibration isolation
- Factory mounted fan VFD’s – modulated via 0-10 VDC control signal by others
- Single point power connection with factory wired non-fused disconnect switch
- Microprocessor controller with BACNet MSTP communication protocol
- Dirty filter sensor (both airstreams)
- Energy wheel rotation sensor
- 18” tall flat roof curb
- One spare set of the following: filters, fan belts and energy wheel belt
- Two-year parts & labor warranty
- Factory authorized start-up assistance and owner training (2 hrs)

ERVe-35-15H

Unit Performance

Design Conditions

Elevation (ft)	Summer		Winter DB (F)	Outdoor Air (CFM)	Exhaust Air (CFM)
	DB (F)	WB (F)			
886	95.0	78.0	11.0	3,250	3,000

Unit Specifications

Qty	Weight (lb)	Unit Installation	Unit ETL Listing
1	1,268 (+/- 5%)	Outdoor	UL\cUL 1995

Configuration

Outdoor Air		Exhaust Air	
Intake	Discharge	Intake	Discharge
End	Bottom	Bottom	Side

Energy Recovery Performance

Design Condition	Temperature (F)								Capacity Reduction (BTU/h)
	Outdoor Air		Supply Air		Return Air		Exhaust Air		
	DB	WB	DB	WB	DB	WB/RH	DB	WB	
Summer	95.0	78.0	81.0	68.5	75.0	62.4/50	89.9	73.8	131,625.0
Winter	11.0	8.5	50.5	41.3	70.0	54.2/35	25.7	24.2	139,801.0

Air Performance

Type	Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	FRPM	Fan		
					Qty	Type	Drive-Type
Supply	3,250	0.5	1.234	1508	1	Forward Curve	Belt
Exhaust	3,000	1	1.385	1503	1	Forward Curve	Belt

Motor Specifications

Motor	Qty	Operating Power (hp)	Size (hp)	Enclosure	Efficiency	RPM
Supply	1	2.4	3	ODP	PE	1725
Exhaust	1	2.15	3	ODP	PE	1725

Electrical Specifications

Power Supply	Rating (V/C/P)	MCA (A)	MOP (A)	Fan Power (W/CFM)*
Unit	460/60/3	11.8	15.0	1.042

*Fan Power (W/CFM) = (Supply BHP + Exhaust BHP) / Supply CFM

Construction Features And Accessories

Unit	
UL-1995	Std
Unit Installation - Outdoor	Std
Outdoor Air Filters - 2" MERV 8, 3-16x20	Std
Exhaust Air Filters - 2" MERV 8, 3-16x25	Std
Energy Recovery Device - Polymer Wheel w/ Silica Gel Desiccant	Std
Unit Construction - Double Wall	Std
Insulation - 1 inch 3# R4 fiberglass	Std
Corrosion Resistant Fasteners	Std
Access - Hinged	Std
Unit Finish - Galvanized	Std
Fan VFDs - Modulating	X
Single Point Power	Std
Factory Wired Non-Fused Disconnect Switch	Std
Supply Weatherhood: Downturn	Std
Exhaust Weatherhood: Downturn	Std
Fan Vibration Isolation - Neoprene	Std
Controls	
Unit Controls - Microprocessor	X
Sensors - OAI, OAD	Std
Unit On/Off Control - Microprocessor	X
Sensor Monitoring Package	
Heating Enable - None	
Cooling Enable - None	
Supply Fan Control - 0-10 VDC Signal by Others	X
Exhaust Fan Control - 0-10 VDC Signal by Others	X
Network Protocol - BACNetMSTP	X
Energy Wheel Economizer Control - Modulating Wheel, OA Temp Setpoint w/VFD Wheel	X
Exhaust Only Operation	
Control Accessories	
Remote Display	
CO2 Sensor	
Dirty Filter Sensor(s) - Both	X
Airflow Monitoring - None	
Wheel Rotation Sensor	X

Accessories	
Frost Control	
Service Outlet - 120 VAC GFCI Service Outlet, Shipped Loose	
Spare Filters - Both, Qty: 1 set(s)	X
Spare Energy Wheel Segments	
Spare Fan Belts	X
Shipped Loose Smoke Detectors	
Outdoor Air Damper - Low Leakage	X
Return Air Damper - Low Leakage	X
Damper End Switch	
Roof Curb - GKD - 48.48/63.35-G18	X
Spare Energy Wheel Belt	X
Warranty Options	
Unit Warranty - 2 Yr (Extended)	X
Energy Wheel Warranty - 5 Yrs Less Motor	Std

Standard Option	Std
Not Included	
Included	X

Notes
Outdoor Air Damper supplied is low leakage, motorized VCD-23 (leakage rate of 3 CFM / ft^2 @ 1 in. wg), Class 1A
Return Air Damper supplied is low leakage, motorized VCD-23 (leakage rate of 3 CFM / ft^2 @ 1 in. wg), Class 1A
A backdraft damper is included as an integral part of the exhaust weatherhood assembly.

Supply Fan Charts And Performance

Supply Fan Performance

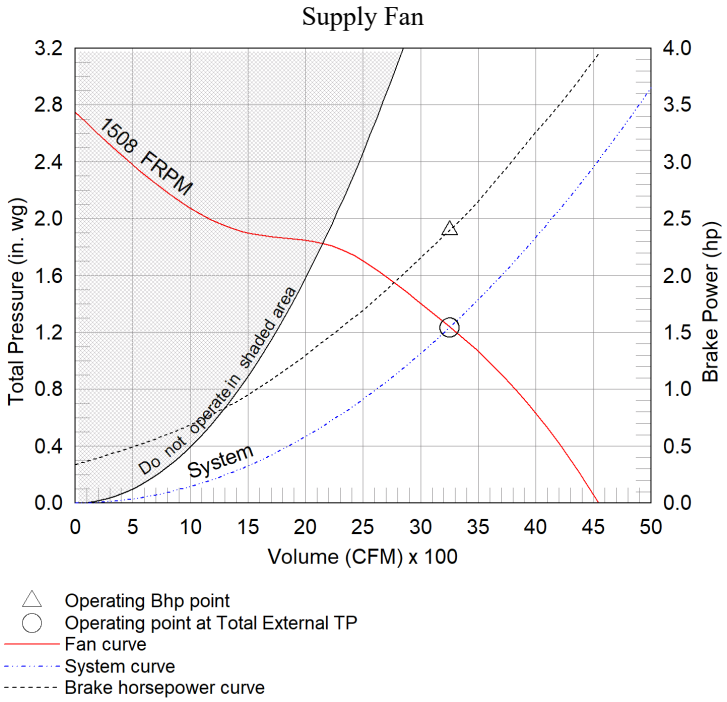
Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor		Fan		
					Qty	Size (hp)	Qty	Type	Drive-Type
3,250	0.5	1.234	1508	2.4	1	3	1	Forward Curve	Belt

Pressure Drop (in. wg)

Weatherhood	Filter	Damper	External	Total
0.324	0.368	0.04	0.5	1.234

Sound Performance in Accordance with AMCA

Sound Power by Octave Band								Lwa	dBA	Sones
62.5	125	250	500	1000	2000	4000	8000			
104.9	101.5	91.2	83.3	80.2	77.9	77.4	73.4	90.2	78.7	38

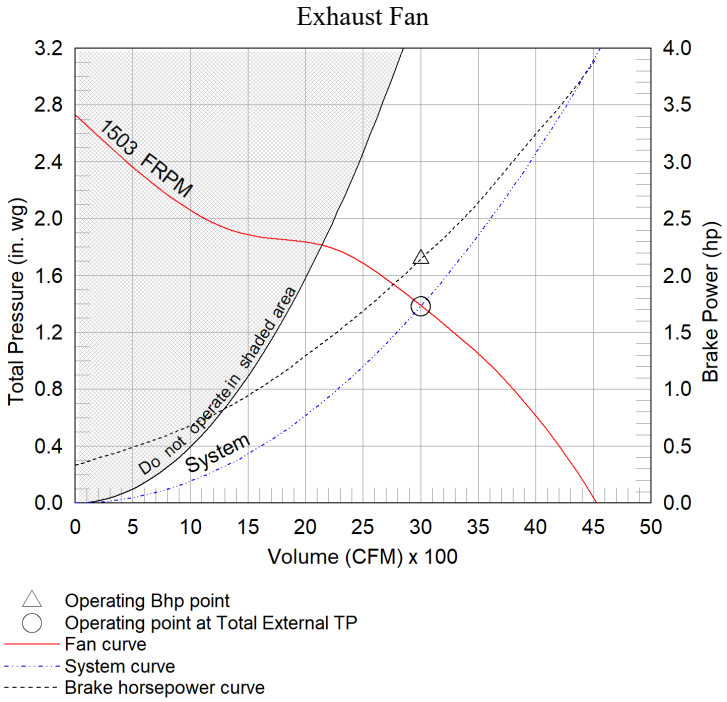


Exhaust Fan Charts And Performance

Exhaust Fan Performance									
Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor		Fan		
					Qty	Size (hp)	Qty	Type	Drive-Type
3,000	1	1.385	1503	2.15	1	3	1	Forward Curve	Belt

Pressure Drop (in. wg)				
Weatherhood	Filter	Damper	External	Total
0.13	0.192	0.063	1	1.385

Sound Performance in Accordance with AMCA										
Sound Power by Octave Band								Lwa	dBA	Sones
62.5	125	250	500	1000	2000	4000	8000			
100.2	98.4	89.1	82.1	79.4	77.1	76.6	72.5	88.1	76.6	31.9



Energy Recovery Summer Performance

Outdoor Air		Supply Air	
Dry Bulb (F)	95.0	Dry Bulb (F)	81.0
Wet Bulb (F)	78.0	Wet Bulb (F)	68.5
Specific Humidity (gr/lb)	123	Specific Humidity (gr/lb)	88
Enthalpy (BTU/lb)	42.2	Enthalpy (BTU/lb)	33.2
Exhaust Air		**Return Air**	
Dry Bulb (F)	89.9	Dry Bulb (F)	75.0
Wet Bulb (F)	73.8	Rel. Humidity (%)	50
Specific Humidity (gr/lb)	103	Specific Humidity (gr/lb)	67
Enthalpy (BTU/lb)	37.8	Enthalpy (BTU/lb)	28.5

ENERGY WHEEL

Design Air Flow Conditions

OA Volume (CFM)	ASHRAE 90.1 OA Enthalpy Recovery Ratio	EA Volume (CFM)	EA Wheel Effectiveness
3,250	65.1	3,000	68.4

Outdoor Air Cooling Reduction

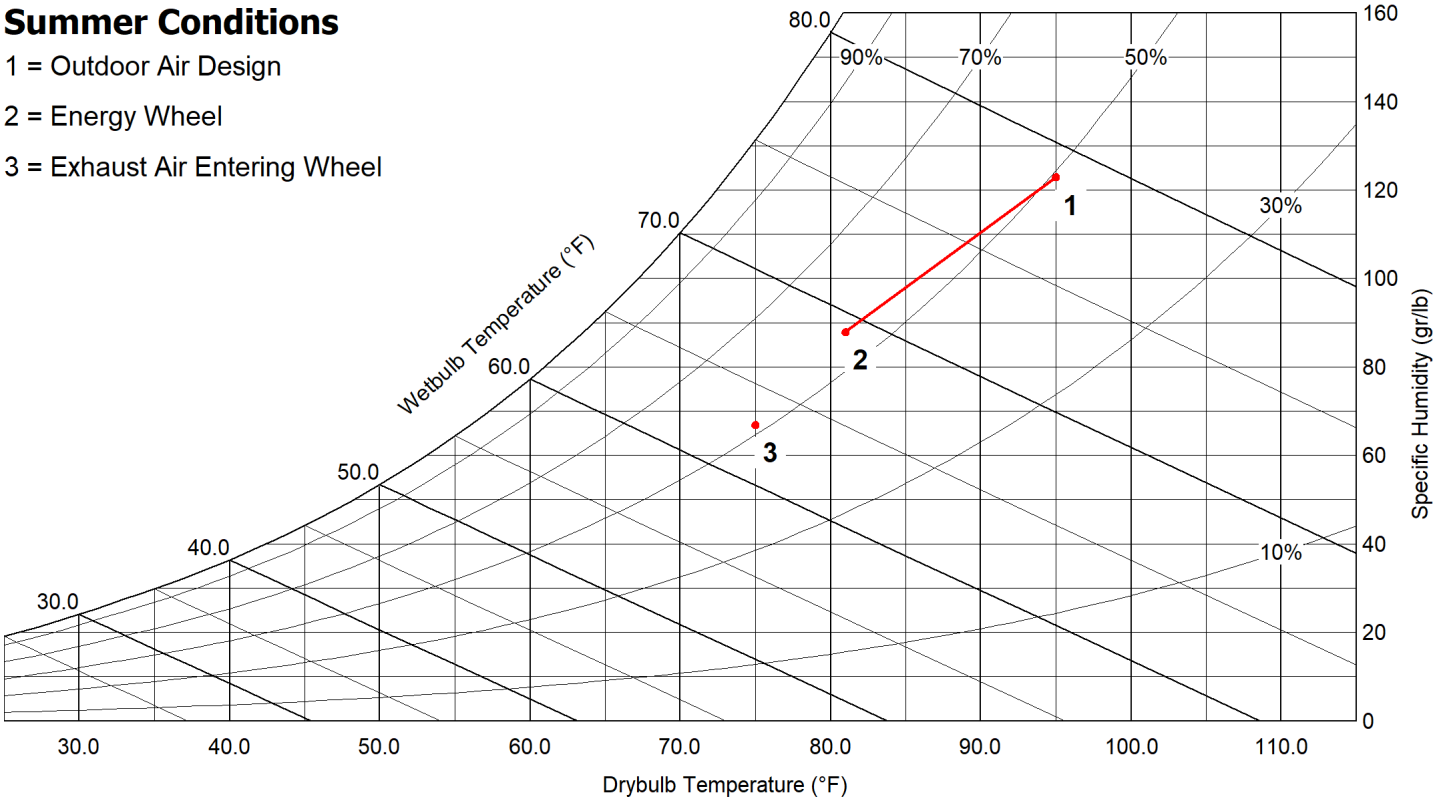
OA Load w/o Energy Recovery		OA Load with Energy Recovery		Equipment Reduction (tons)
(BTU/h)	(tons)	(BTU/h)	(tons)	
200,363.0	16.70	68,738.0	5.73	10.97

Summer Conditions

1 = Outdoor Air Design

2 = Energy Wheel

3 = Exhaust Air Entering Wheel



Energy Recovery Winter Performance

Outdoor Air		Supply Air	
Dry Bulb (F)	11.0	Dry Bulb (F)	50.5
Wet Bulb (F)	8.5	Wet Bulb (F)	41.3
Specific Humidity (gr/lb)	5	Specific Humidity (gr/lb)	25
Enthalpy (BTU/lb)	3.4	Enthalpy (BTU/lb)	16.0
Exhaust Air		**Return Air**	
Dry Bulb (F)	25.7	Dry Bulb (F)	70.0
Wet Bulb (F)	24.2	Rel. Humidity (%)	35
Specific Humidity (gr/lb)	17	Specific Humidity (gr/lb)	39
Enthalpy (BTU/lb)	8.7	Enthalpy (BTU/lb)	22.9

ENERGY WHEEL

Design Air Flow Conditions

OA Volume (CFM)	ASHRAE 90.1 OA Enthalpy Recovery Ratio	EA Volume (CFM)	EA Wheel Effectiveness
3,250	64.4	3,000	71.8

Outdoor Air Heating Reduction

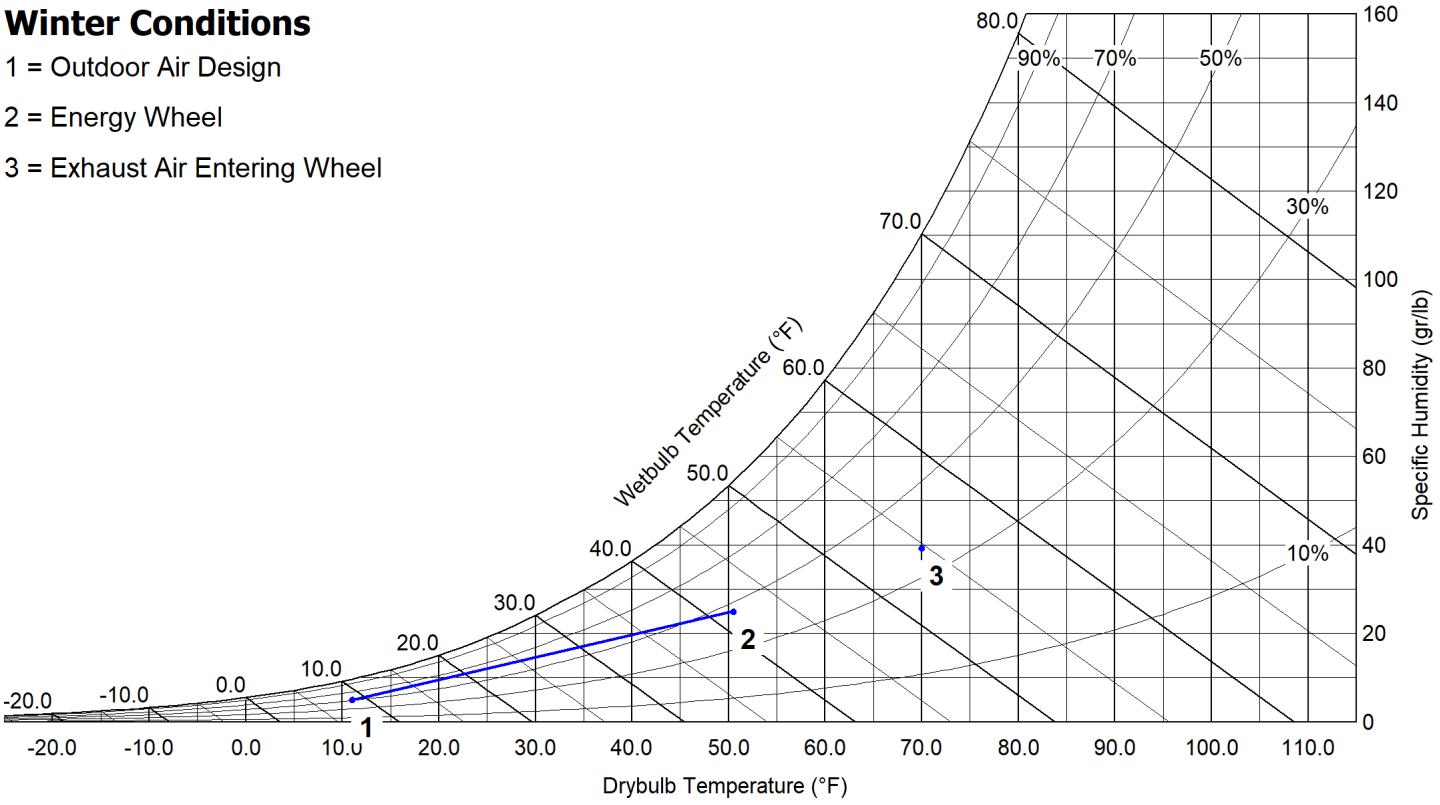
OA Load w/o Energy Recovery (BTU/h)	OA Load with Energy Recovery (BTU/h)	Equipment Reduction (BTU/h)	Sensible Effectiveness (%)
208,816.0	69,015.0	139,801.0	75.3

Winter Conditions

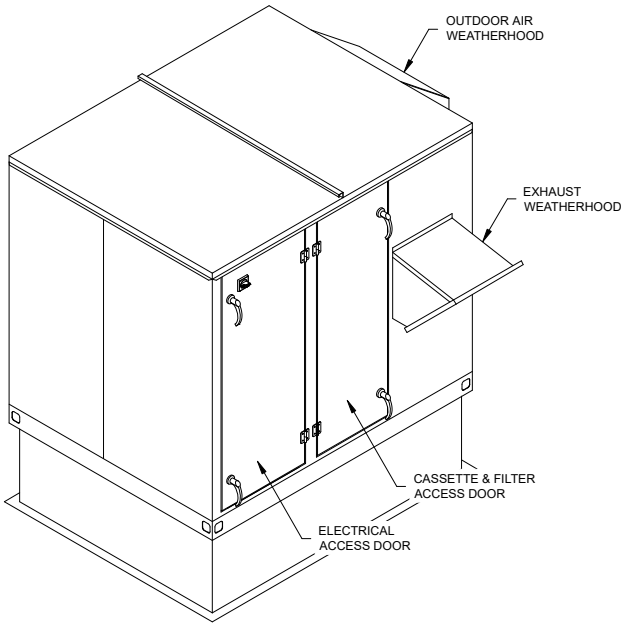
1 = Outdoor Air Design

2 = Energy Wheel

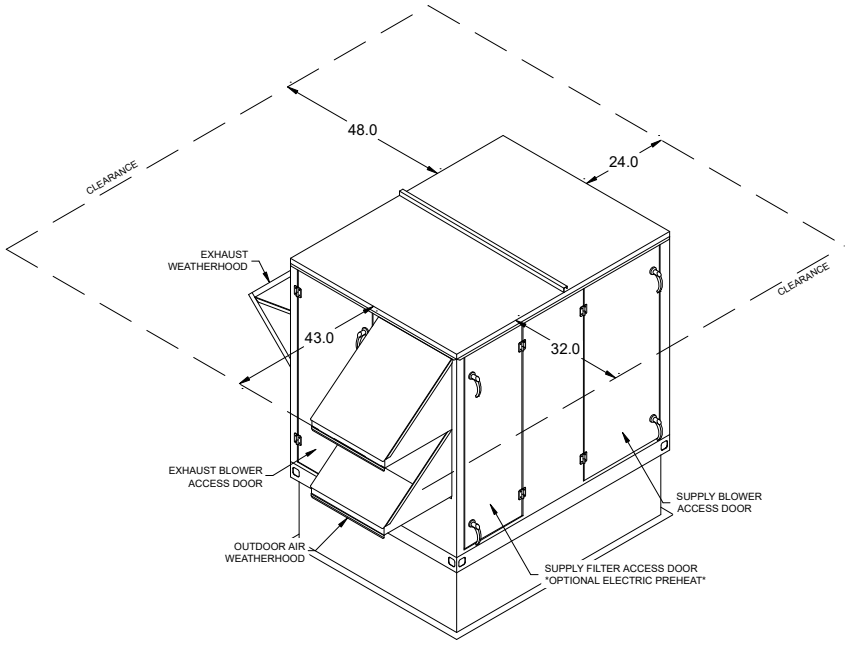
3 = Exhaust Air Entering Wheel



Isometric Drawings

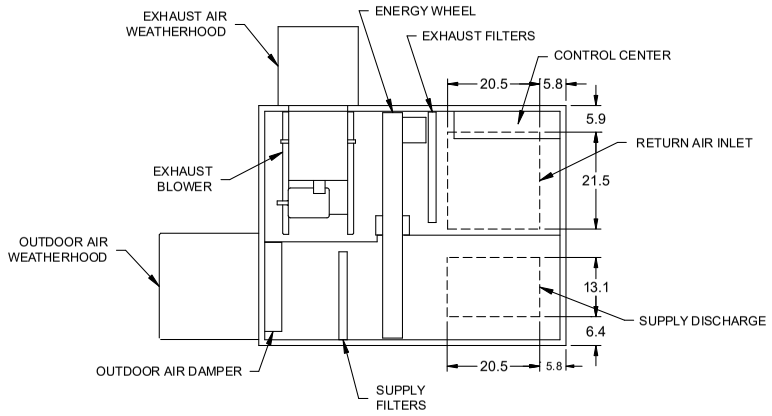


Back Right Isometric

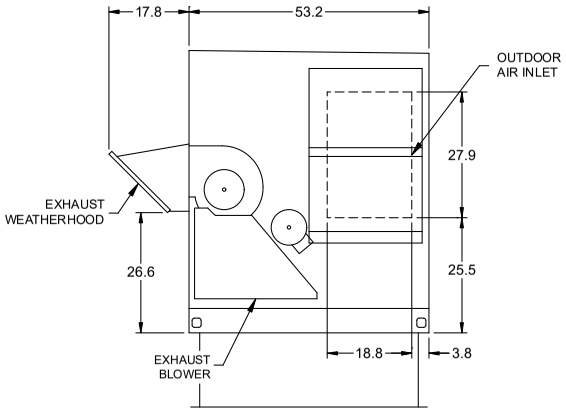


Front Left Isometric

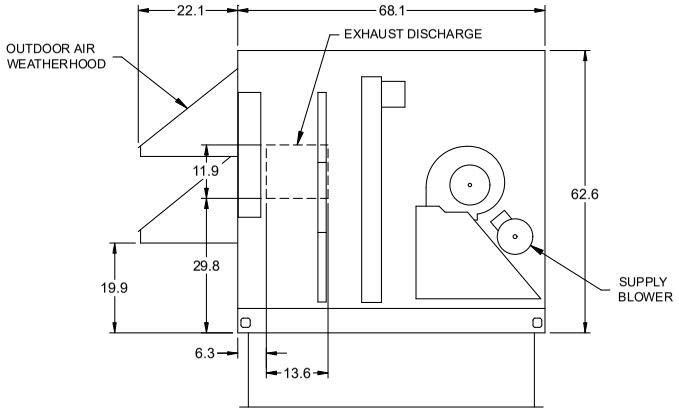
Overview Drawings



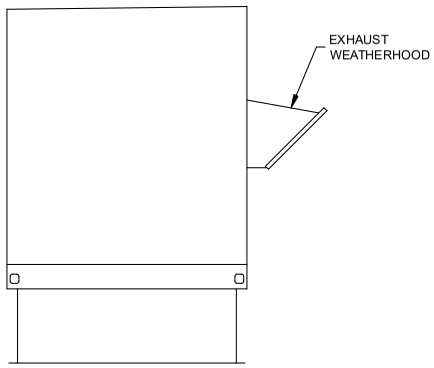
Plan



Left End



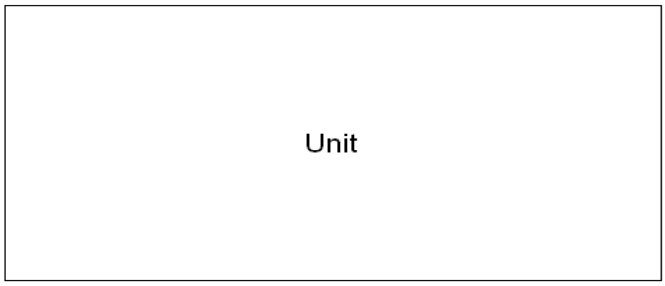
Elevation



Right End

Corner Weights

344 lb 301 lb



332 lb 290 lb

Note

Estimated corner weights are shown looking down on unit and the outside air intake will be on the left. Weights are applied at the base of the unit. Images not drawn to scale.

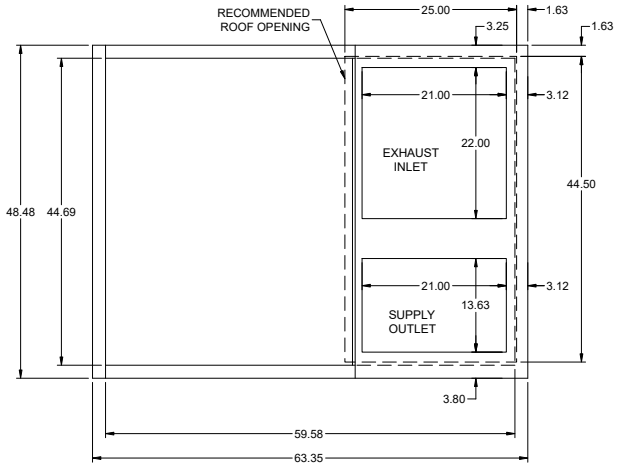
GKD Roof Curb

Model: GKD-48.48/63.35-G18

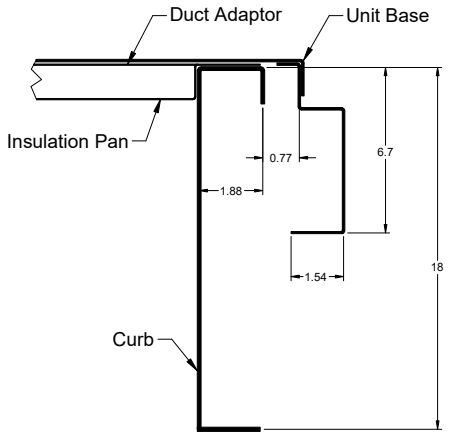
Curb Height (in.)	Curb Length (in.)	Curb Width (in.)	Material	Finish Type	Duct Adapter	Curb Weight (lb)
18	63.35	48.48	Galvanized	Galvanized	Yes	111

Standard Construction Features:
All dimensions shown in inches.
Weight shown is within +/-5%.
If unit is selected with side or end discharge/return, there will not be bottom connections supplied with the curb.
18 gauge galvanized steel (perimeter channels).
18 gauge galvanized steel (interior channels).
Ships knocked down for field assembly.
Curb insulation to be provided by others.

Top View of Curb



Cross-Section View of Unit on Curb



Microprocessor Controller Sequence of Operation

MICROPROCESSOR CONTROLLER

Controller shall be provided with the required sensors and programming for the preconditioner. Controller shall be factory programmed, mounted, and tested. Controller shall have an LCD readout for changing set points and monitoring unit operation.

UNIT START COMMAND (Unit will be enabled to start once a jumper is placed between R to G)

- Factory mounted and wired outdoor air damper actuator is powered.
- Exhaust blower starts after a (adj.) delay.
- Supply blower and energy wheel start after a (adj.) delay.

UNIT STOP COMMAND (OR DE-ENERGIZED)

- Supply blower, exhaust blower, and energy wheel de-energized.
- Outdoor air damper actuator is spring return closed.

SUPPLY BLOWER SEQUENCE

The supply blower speed will be controlled with the following sequence:

0-10 VDC Signal by Others

The supply blower is provided with a factory mounted and wired VFD. The supply blower is modulated based upon a 0-10 VDC signal (field provided) wire directly into the microprocessor. This would operate separately from the controller sequences.

EXHAUST BLOWER SEQUENCE

The exhaust blower speed will be controlled with the following sequence:

0-10 VDC Signal by Others

The exhaust blower is provided with a factory mounted and wired VFD. The exhaust blower is modulated based upon a 0-10 VDC signal (field provided) wire directly into the microprocessor. This would operate separately from the controller sequences.

ECONOMIZER SEQUENCE

When the application requires cooling and the outdoor air conditions are suitable for free cooling, the energy wheel speed will be reduced to minimum speed to reduce energy transfer through the wheel during economizer.

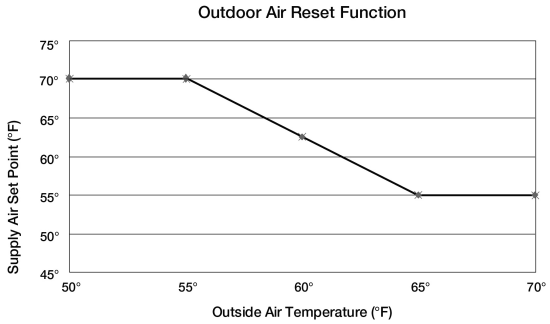
OA Temp. Setpoint

The economizer will be locked out when the outdoor air is less than 50 F (adj.) or greater than 65 F (adj.).

SUPPLY SET POINT RESET FUNCTION

Outside Air Reset

The controller will monitor the outdoor air temperature and will adjust the desired supply temperature set point accordingly. For example, when the outdoor air temperature is below 55 F, the controller will change the supply temperature set point to 70 F. When the outdoor air is above 65 F, the controller will change the supply set point to 55 F. When the outdoor air temperature is between 55 F and 65 F, the supply temperature set point changes according to the OA reset function. A visual representation of this is shown below.



Local (Supply Temp Control)

The supply temperature set point will be a constant temperature that is adjusted through the controller.

ALARMS

The controller will display alarms and have one digital output for remote indication of an alarm condition. Possible alarms include:

AIRFLOW ALARM

The controller monitors the airflow proving switch on each blower. The controller will send an alarm if either of the airflow proving switches are not engaged.

TEMPERATURE SENSOR ALARM

The controller sends an alarm if the temperature sensor fails.

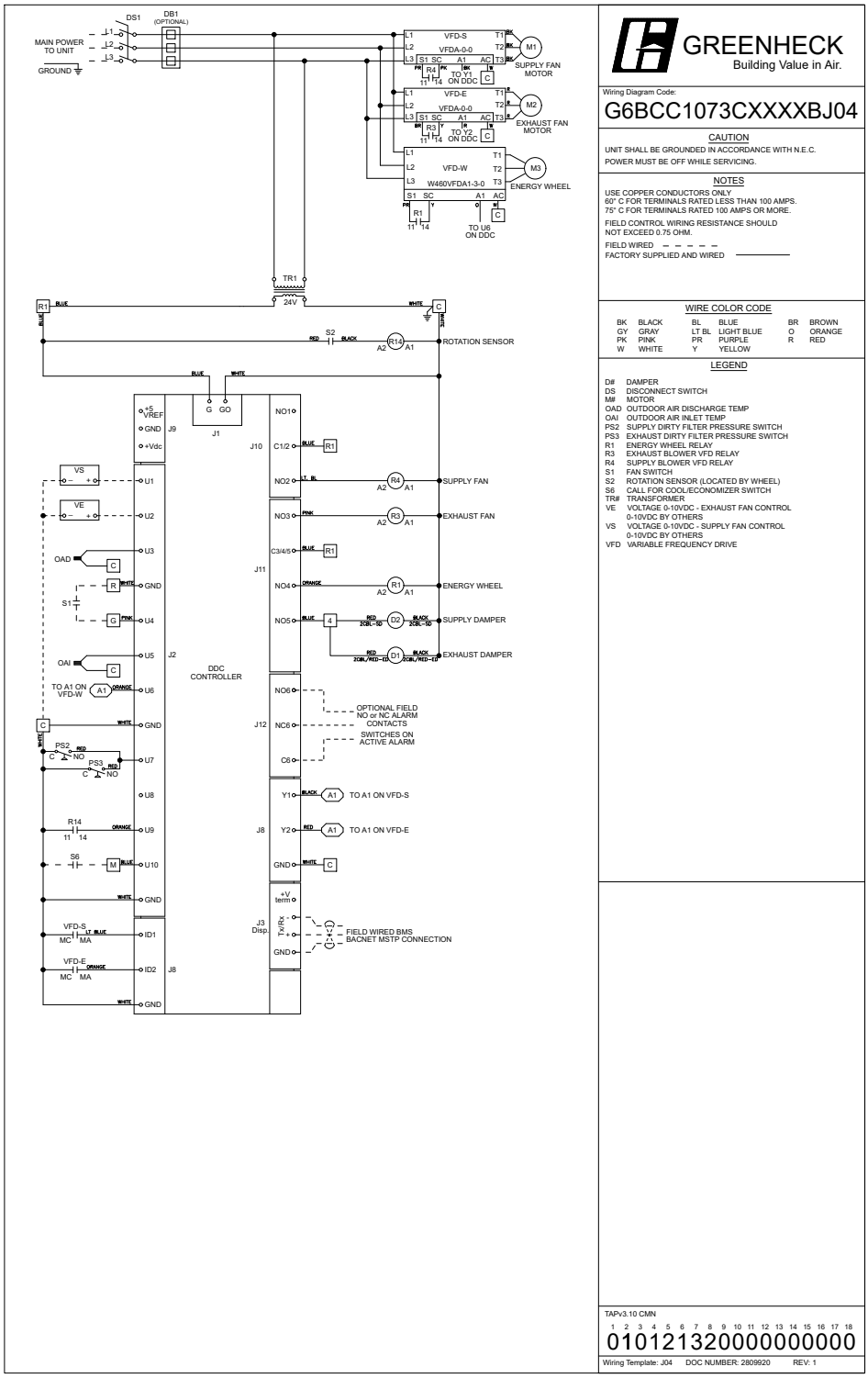
ENERGY WHEEL ROTATION ALARM

The controller monitors wheel rotation. If the wheel does not rotate for a set period of time (adj.), an alarm will generate.

DIRTY FILTER ALARM

A digital signal is sent to the controller indicating an increased pressure drop across the outdoor, exhaust, or supply air filters which must be adjusted in the field during start up. The controller will then provide a dirty filter alarm.

Wiring Diagram



GREENHECK
Building Value in Air.

Wiring Diagram Code:

G6BCC1073CXXXXBJ04

CAUTION

UNIT SHALL BE GROUNDED IN ACCORDANCE WITH N.E.C.
POWER MUST BE OFF WHILE SERVICING.

NOTES

USE COPPER CONDUCTORS ONLY
60° C FOR TERMINALS RATED LESS THAN 100 AMPS.
75° C FOR TERMINALS RATED 100 AMPS OR MORE.

FIELD CONTROL WIRING RESISTANCE SHOULD NOT EXCEED 0.75 OHM.

FIELD WIRED – – – – –
FACTORY SUPPLIED AND WIRED ————

WIRE COLOR CODE

BK	BLACK	BL	BLUE	BR	BROWN
GY	GRAY	LT BL	LIGHT BLUE	O	ORANGE
PK	PINK	PR	PURPLE	R	RED
W	WHITE	Y	YELLOW		

LEGEND

D#	DAMPER
DS	DISCONNECT SWITCH
M#	MOTOR
OAD	OUTDOOR AIR DISCHARGE TEMP
OAI	OUTDOOR AIR INLET TEMP
PS2	SUPPLY DIRTY FILTER PRESSURE SWITCH
PS3	EXHAUST DIRTY FILTER PRESSURE SWITCH
R1	ENERGY WHEEL RELAY
R3	EXHAUST BLOWER VFD RELAY
R4	SUPPLY BLOWER VFD RELAY
S1	FAN SWITCH
S2	ROTATION SENSOR (LOCATED BY WHEEL)
S6	CALL FOR COOL/ECONOMIZER SWITCH
TR#	TRANSFORMER
VE	VOLTAGE 0-10VDC - EXHAUST FAN CONTROL 0-10VDC BY OTHERS
VS	VOLTAGE 0-10VDC - SUPPLY FAN CONTROL 0-10VDC BY OTHERS
VFD	VARIABLE FREQUENCY DRIVE

TAPv3.10 CMN

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
0101213200000000000

Wiring Template: J04 DOC NUMBER: 2809920 REV: 1

Analog Inputs - Read Only

Variable	Description	BACNET (Object Type-AI, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Input, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
Supply_Temp_Analog_Input	Supply Temperature	1	0.1	30031	X
Outside_Air_Temp_Analog_Input	Outside Air Temperature	2	0.1	30033	X
Exhaust_Temp_Analog_Input	Exhaust Temperature	3	0.1	30035	
Outside_RH_Analog_Input	Outside Relative Humidity %	4	0.1	30037	
Space_Static_Pressure_Analog_Input	Space Static Pressure	5	0.1	30039	
Supply_Duct_Static_Pressure_Analog_Input	Supply Duct Static Pressure	6	0.1	30041	
Space_CO2_1_Analog_Input	Space 1 CO2 ppm	7	10	30043	
Exhaust_Fan_Speed_Analog_Input	Exhaust Fan Speed Remote Command Input value (0-10 by others)	8	1	30045	X
Supply_Fan_Speed_Analog_Input	Supply Fan Speed Remote Command Input value (0-10 by others)	9	0.1	30047	X
Space_VOC_1_Analog_Input	Space 1 VOC ppm	10	10	30049	
Aux_In_Customer_1	Customer defined auxiliary input	31	0.1	30051	
Aux_In_Customer_2	Customer defined auxiliary input	32	0.1	30053	
Aux_In_Customer_3	Customer defined auxiliary input	33	0.1	30055	
Aux_In_Customer_4	Customer defined auxiliary input	34	0.1	30057	
Aux_In_Customer_5	Customer defined auxiliary input	35	0.1	30059	
Aux_In_Customer_6	Customer defined auxiliary input	36	0.1	30061	

Analog Values - Read/Write

Variable	Description	BACNET (Object Type-AV, Access-ReadCOV_Commandable)		MODBUS (Register Type-Holding, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
Temperature_Setpoint	Temperature Set point	1	0	40001	
Economizer_Temp_Enable_Setpoint	Economizer Ambient Temp Enable Setpoint. Allow Econ when OAT < Spt	2	0	40003	
Economizer_Enthalpy_Enable_Setpoint	Economizer Enthalpy Enable Setpoint. Allow Econ when OA Enthalpy < Spt	3	0	40005	
Space_Static_Pressure_Setpoint	Space Static Pressure Setpoint	4	0.1	40007	
Supply_Duct_Static_Pressure_Setpoint	Supply Duct Static Pressure Setpoint	5	0.1	40009	
Space_CO2_Setpoint	Space CO2 Setpoint	6	0.1	40011	
Space_VOC_Setpoint	Space VOC Setpoint	7	0.1	40013	
SF_Control_Signal_BMS	BMS to control signal for supply fan speed	8	0.1	40015	
EF_Control_Signal_BMS	BMS to control signal for exhaust fan speed	9	0.1	40017	
Outside_RH_from_BMS	Outside RH from BMS. Used when source selection is set to BMS	10	0.1	40019	
Outside_Temp_from_BMS	Outside Temp from BMS. Used when source selection is set to BMS	11	0.1	40021	X
Space_1_CO2_from_BMS	Space 1 CO2 from BMS. Used when source selection is set to BMS	12	0.1	40023	
Space_Static_from_BMS	Space Static from BMS. Used when source selection is set to BMS	13	0.1	40025	
Space_VOC_from_BMS	SpaceVOC from BMS. Used when source selection is set to BMS	14	0.1	40027	
ER_Control_Signal_from_BMS	ER control signal from BMS. Used when source selection is set to BMS.	15	0.1	40029	
Aux_BMS_Analog_Output_1	BMS Commanded auxilary analog output	101	0.1	40101	
Aux_BMS_Analog_Output_2	BMS Commanded auxilary analog output	102	0.1	40103	
Aux_BMS_Analog_Output_3	BMS Commanded auxilary analog output	103	0.1	40105	
Aux_BMS_Analog_Output_4	BMS Commanded auxilary analog output	104	0.1	40107	

Analog Values - Read Only					
Variable	Description	BACNET (Object Type-AV, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Input, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
Unit_Status_Mode	0: Off/Standby 1: Occupied Start 2: Opening Dampers3: Dampers Open 4: Fan Start Delay 5: Exhaust Fan Starting 6: Supply Fan Starting 7: System On 8: System Disabled 9: Remote Off 10: Shutdown Alarm 19: Fans and Energy Recovery 20: Economizing 21: Defrost Active 22: Overrides Active 23: Expansion Offline	45	0	30001	X
Supply_Temperature_Calculated_Setpoint	Active Supply Temperature Setpoint	46	0.1	30003	
Defrost_Ramp	Defrost Ramp	47	1	30005	
Economizer_Ramp	Economizer Ramp	48	1	30007	
Exhaust_Fan_Space_Static_Pressure_Ramp	Exhaust Fan Space Static Pressure Ramp	49	1	30009	
Exhaust_Fan_Supply_Tracking_Ramp	Exhaust Fan Supply Tracking Ramp	50	1	30011	
Space_CO2_Control_Ramp	Space CO2 Control Ramp	51	1	30013	
Supply_Duct_Static_Pressure_Ramp	Supply Duct Static Pressure Ramp	52	1	30015	
Supply_Fan_Space_Static_Pressure_Ramp	Supply Fan Space Static Pressure Ramp	53	1	30017	
Outside_Dewpoint	Outside Dewpoint	54	0.1	30019	
Outside_Enthalpy	Outside Enthalpy	55	0.1	30021	
Energy_Recovery_Analog_Output	Energy Recovery Analog Output	56	0.1	30023	
Exhaust_Fan_Speed_Analog_Output	Exhaust Fan Speed Analog Output	57	0.1	30025	X
Supply_Fan_Speed_Analog_Output	Supply Fan Speed Analog Output	58	0.1	30027	X

Integer Values - Read Only					
Variable	Description	BACNET (Object Type-IV, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Holding, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
LatestAlm	Most recent alarm. See alarm table	1	1	30101	X

Binary Inputs - Read Only

Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BI, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Discrete)	Included
				OBJECT INSTANCE	HYST	INDEX	
Supply_Fan_1_Status_Digital_Input	Supply Fan 1 Status	Active	Inactive	10	0	10101	X
Exhaust_Fan_1_Status_Digital_Input	Exhaust Fan 1 Status	Active	Inactive	11	0	10102	X
Unit_Enable_Digital_Input	Remote Unit Enable Digital Input Status	Active	Inactive	12	0	10103	X

Binary Values - Read/Write

Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BV, Access-Read_Commandable)		MODBUS (Register Type-Coil)	Included
				OBJECT INSTANCE	HYST	INDEX	
BMS_Watchdog	BMS Watchdog command. Used to determine comm status. Must heartbeat within the watchdog timeout delay to detect comm status	Active	Inactive	1	0	2	X
System_Enable	Master system enable/disable point	Enable	Disable	2	0	3	X
Reset_All_Alarms	Alarm Reset Command	Reset	Normal	3	0	4	X
Outside_RH_Source_BMS	Outside RH Source Selection. True = BMS. False = Local	BMS	Local	4	0	5	
Outside_Temp_Source_BMS	Outside Temp Source Selection. True = BMS. False = Local	BMS	Local	5	0	6	X
Space_1_CO2_Source_BMS	Space 1 CO2 Source Selection. True = BMS. False = Local	BMS	Local	6	0	7	
Space_Static_Source_BMS	Space Static Source Selection. True = BMS. False = Local	BMS	Local	7	0	8	
SF_Control_Source_BMS	Allows the BMS to control supply fan speed. True = BMS. False = Local	BMS	Local	8	0	9	
EF_Control_Source_BMS	Allows the BMS to control exhaust fan speed. True = BMS. False = Local	BMS	Local	9	0	10	
Space_VOC_Source_BMS	Space VOC Source Selection. True = BMS. False = Local	BMS	Local	10	0	11	
Econ_Enable_Source_BMS	Economizer Enable Source Selection. True = BMS. False = Local	BMS	Local	11	0	12	
Econ_Enable_from_BMS	Economizer Enable from BMS. Used when source selection is set to BMS	Enable	Disable	12	0	13	
ER_Control_Source_BMS	ER Economizer Control Signal from BMS True = BMS False = Local	BMS	Local	13	0	15	

Binary Values - Read Only

Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BV, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Discrete)	Included
				OBJECT INSTANCE	HYST	INDEX	
Global_Alarm	General alarm point. Optionally set to indicate any alarm is active, or a shutdown alarm is active	Alarm	Normal	30	0	10002	X
System_Shutdown_Alarm	Shutdown alarm status. When true, System Enable will be set to false and the unit will remain off	Shutdown	Normal	31	0	10003	X
Manual_Override_Active	Indicates that manual overrides are active	Override	Normal	32	0	10004	X
Heat_Wheel_Enable_Digital_Output	Heat Wheel Enable Digital Output	Active	Inactive	33	0	10005	
BMS_Offline_Alarm.Active	BMS Offline Alarm (0=Normal 1=Alarm)	Alarm	Normal	34	0	10006	X
Exhaust_Fan_1_Alarm.Active	Exhaust Fan 1 Alarm (0=Normal 1=Alarm)	Alarm	Normal	35	0	10007	X
Outside_Air_Temperature_Sensor_Alarm.Active	Outside Air Temperature Sensor Alarm (0=Normal 1=Alarm)	Alarm	Normal	36	0	10008	X
Filter_Alarm.Active	Outside Filter Alarm (0=Normal 1=Alarm)	Alarm	Normal	37	0	10009	X
Outside_RH_Sensor_Alarm.Active	Outside RH Sensor Alarm (0=Normal 1=Alarm)	Alarm	Normal	38	0	10010	
Space_CO2_1_Analog_Input_Alarm.Active	Space CO2 1 Analog Input Alarm (0=Normal 1=Alarm)	Alarm	Normal	39	0	10011	
Space_High_Static_Alarm.Active	Space High Static Alarm (0=Normal 1=Alarm)	Alarm	Normal	40	0	10012	
Space_Static_Pressure_Analog_Input_Alarm.Active	Space Static Pressure Analog Input Alarm (0=Normal 1=Alarm)	Alarm	Normal	41	0	10013	
Supply_Air_Temp_Low_Limit.Active	Supply Air Temp Low Limit Alarm (0=Normal 1=Alarm)	Alarm	Normal	42	0	10014	X
Supply_Air_Temperature_Sensor_Alarm.Active	Supply Air Temperature Sensor Alarm (0=Normal 1=Alarm)	Alarm	Normal	43	0	10015	X
Supply_Duct_Static_Pressure_Analog_Input_Alarm.Active	Supply Duct Static Pressure Analog Input Alarm (0=Normal 1=Alarm)	Alarm	Normal	44	0	10016	
Supply_Fan_1_Alarm.Active	Supply Fan 1 Alarm (0=Normal 1=Alarm)	Alarm	Normal	45	0	10017	X
Supply_High_Duct_Static_Alarm.Active	Supply High Duct Static Alarm (0=Normal 1=Alarm)	Alarm	Normal	46	0	10018	
Wheel_Rotation_Alarm.Active	Wheel Rotation Alarm (0=Normal 1=Alarm)	Alarm	Normal	47	0	10019	X
ER_Wheel_High_DP.Active	Energy Recovery Wheel high differential pressure (0=Normal 1=Alarm)	Alarm	Normal	48	0	10020	X
Greentrol_1_Alarm.Active	Greentrol Device Alarm	Alarm	Normal	49	0	10021	
Greentrol_2_Alarm.Active	Greentrol Device Alarm	Alarm	Normal	50	0	10022	

Binary Values - Commandable

Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BV, Access-ReadCOV_Commandable)		MODBUS (Register Type-Coil)	Included
				OBJECT INSTANCE	HYST	INDEX	
Aux_BMS_Digital_Output_1	BMS Commanded auxilary digital output	Active	Inactive	101	0	21	
Aux_BMS_Digital_Output_2	BMS Commanded auxilary digital output	Active	Inactive	102	0	22	
Aux_BMS_Digital_Output_3	BMS Commanded auxilary digital output	Active	Inactive	103	0	23	
Aux_BMS_Digital_Output_4	BMS Commanded auxilary digital output	Active	Inactive	104	0	24	
Aux_BMS_Digital_Output_5	BMS Commanded auxilary digital output	Active	Inactive	105	0	25	
Aux_BMS_Digital_Output_6	BMS Commanded auxilary digital output	Active	Inactive	106	0	26	

Warranty Statement for ERV Preconditioners

Unit Warranty

Greenheck warrants the equipment to be free from defects in material and workmanship for a period of 2 years (based on selection) from the shipment date.

Energy Wheel Warranty

The energy recovery wheel is warranted to be free from defects in material and workmanship for a period of 5 years from the shipment date.

Warranty Notes

Any component which proves defective during the warranty period will be repaired or replaced at Greenheck's sole option when returned to our factory, transportation prepaid. All warranties do not include labor costs associated with troubleshooting, removal, or installation. Greenheck will not be liable for any consequential, punitive, or incidental damages resulting from use, repair, or operation of any Greenheck product. These warranties are exclusive and are in lieu of all other warranties, whether written, oral, or implied, including the warranty of merchantability and the warranty of fitness for a particular purpose. No person (including any agent or salesperson) has authority to expand Seller's obligation beyond the terms of this warranty, or to state that the performance of the product is other than that published by Seller.

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

ERVe-35-15H

Unit Performance

Design Conditions

Elevation (ft)	Summer		Winter DB (F)	Outdoor Air (CFM)	Exhaust Air (CFM)
	DB (F)	WB (F)			
886	95.0	78.0	11.0	3,250	3,000

Unit Specifications

Qty	Weight (lb)	Unit Installation	Unit ETL Listing
1	1,268 (+/- 5%)	Outdoor	UL\cUL 1995

Configuration

Outdoor Air		Exhaust Air	
Intake	Discharge	Intake	Discharge
End	Bottom	Bottom	Side

Energy Recovery Performance

Design Condition	Temperature (F)								Capacity Reduction (BTU/h)
	Outdoor Air		Supply Air		Return Air		Exhaust Air		
	DB	WB	DB	WB	DB	WB/RH	DB	WB	
Summer	95.0	78.0	81.0	68.5	75.0	62.4/50	89.9	73.8	131,625.0
Winter	11.0	8.5	50.5	41.3	70.0	54.2/35	25.7	24.2	139,801.0

Air Performance

Type	Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	FRPM	Fan		
					Qty	Type	Drive-Type
Supply	3,250	0.5	1.234	1508	1	Forward Curve	Belt
Exhaust	3,000	1	1.385	1503	1	Forward Curve	Belt

Motor Specifications

Motor	Qty	Operating Power (hp)	Size (hp)	Enclosure	Efficiency	RPM
Supply	1	2.4	3	ODP	PE	1725
Exhaust	1	2.15	3	ODP	PE	1725

Electrical Specifications

Power Supply	Rating (V/C/P)	MCA (A)	MOP (A)	Fan Power (W/CFM)*
Unit	460/60/3	11.8	15.0	1.042

*Fan Power (W/CFM) = (Supply BHP + Exhaust BHP) / Supply CFM

Construction Features And Accessories

Unit	
UL-1995	Std
Unit Installation - Outdoor	Std
Outdoor Air Filters - 2" MERV 8, 3-16x20	Std
Exhaust Air Filters - 2" MERV 8, 3-16x25	Std
Energy Recovery Device - Polymer Wheel w/ Silica Gel Desiccant	Std
Unit Construction - Double Wall	Std
Insulation - 1 inch 3# R4 fiberglass	Std
Corrosion Resistant Fasteners	Std
Access - Hinged	Std
Unit Finish - Galvanized	Std
Fan VFDs - Modulating	X
Single Point Power	Std
Factory Wired Non-Fused Disconnect Switch	Std
Supply Weatherhood: Downturn	Std
Exhaust Weatherhood: Downturn	Std
Fan Vibration Isolation - Neoprene	Std
Controls	
Unit Controls - Microprocessor	X
Sensors - OAI, OAD	Std
Unit On/Off Control - Microprocessor	X
Sensor Monitoring Package	
Heating Enable - None	
Cooling Enable - None	
Supply Fan Control - 0-10 VDC Signal by Others	X
Exhaust Fan Control - 0-10 VDC Signal by Others	X
Network Protocol - BACNetMSTP	X
Energy Wheel Economizer Control - Modulating Wheel, OA Temp Setpoint w/VFD Wheel	X
Exhaust Only Operation	
Control Accessories	
Remote Display	
CO2 Sensor	
Dirty Filter Sensor(s) - Both	X
Airflow Monitoring - None	
Wheel Rotation Sensor	X

Accessories	
Frost Control	
Service Outlet - 120 VAC GFCI Service Outlet, Shipped Loose	
Spare Filters - Both, Qty: 1 set(s)	X
Spare Energy Wheel Segments	
Spare Fan Belts	X
Shipped Loose Smoke Detectors	
Outdoor Air Damper - Low Leakage	X
Return Air Damper - Low Leakage	X
Damper End Switch	
Roof Curb - GKD - 48.48/63.35-G18	X
Spare Energy Wheel Belt	X
Warranty Options	
Unit Warranty - 2 Yr (Extended)	X
Energy Wheel Warranty - 5 Yrs Less Motor	Std

Standard Option	Std
Not Included	
Included	X

Notes
Outdoor Air Damper supplied is low leakage, motorized VCD-23 (leakage rate of 3 CFM / ft^2 @ 1 in. wg), Class 1A
Return Air Damper supplied is low leakage, motorized VCD-23 (leakage rate of 3 CFM / ft^2 @ 1 in. wg), Class 1A
A backdraft damper is included as an integral part of the exhaust weatherhood assembly.

Supply Fan Charts And Performance

Supply Fan Performance

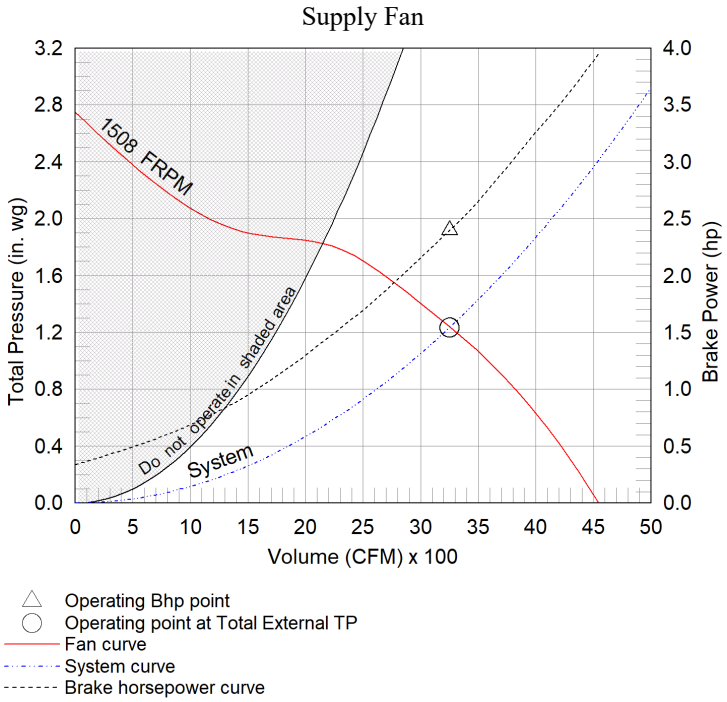
Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor		Fan		
					Qty	Size (hp)	Qty	Type	Drive-Type
3,250	0.5	1.234	1508	2.4	1	3	1	Forward Curve	Belt

Pressure Drop (in. wg)

Weatherhood	Filter	Damper	External	Total
0.324	0.368	0.04	0.5	1.234

Sound Performance in Accordance with AMCA

Sound Power by Octave Band								Lwa	dBA	Sones
62.5	125	250	500	1000	2000	4000	8000			
104.9	101.5	91.2	83.3	80.2	77.9	77.4	73.4	90.2	78.7	38

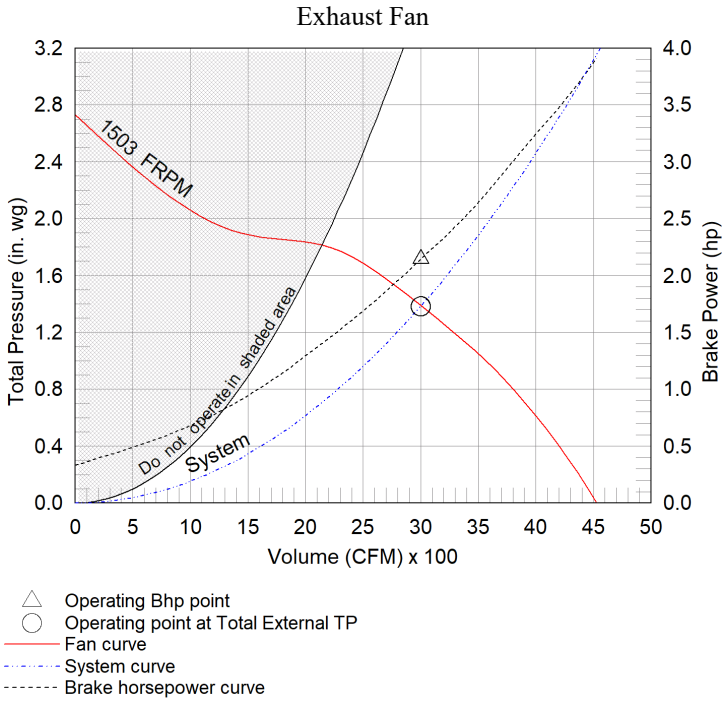


Exhaust Fan Charts And Performance

Exhaust Fan Performance									
Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor		Fan		
					Qty	Size (hp)	Qty	Type	Drive-Type
3,000	1	1.385	1503	2.15	1	3	1	Forward Curve	Belt

Pressure Drop (in. wg)				
Weatherhood	Filter	Damper	External	Total
0.13	0.192	0.063	1	1.385

Sound Performance in Accordance with AMCA										
Sound Power by Octave Band								Lwa	dBA	Sones
62.5	125	250	500	1000	2000	4000	8000			
100.2	98.4	89.1	82.1	79.4	77.1	76.6	72.5	88.1	76.6	31.9



Energy Recovery Summer Performance

Outdoor Air		Supply Air	
Dry Bulb (F)	95.0	Dry Bulb (F)	81.0
Wet Bulb (F)	78.0	Wet Bulb (F)	68.5
Specific Humidity (gr/lb)	123	Specific Humidity (gr/lb)	88
Enthalpy (BTU/lb)	42.2	Enthalpy (BTU/lb)	33.2
Exhaust Air		**Return Air**	
Dry Bulb (F)	89.9	Dry Bulb (F)	75.0
Wet Bulb (F)	73.8	Rel. Humidity (%)	50
Specific Humidity (gr/lb)	103	Specific Humidity (gr/lb)	67
Enthalpy (BTU/lb)	37.8	Enthalpy (BTU/lb)	28.5

ENERGY WHEEL

Design Air Flow Conditions

OA Volume (CFM)	ASHRAE 90.1 OA Enthalpy Recovery Ratio	EA Volume (CFM)	EA Wheel Effectiveness
3,250	65.1	3,000	68.4

Outdoor Air Cooling Reduction

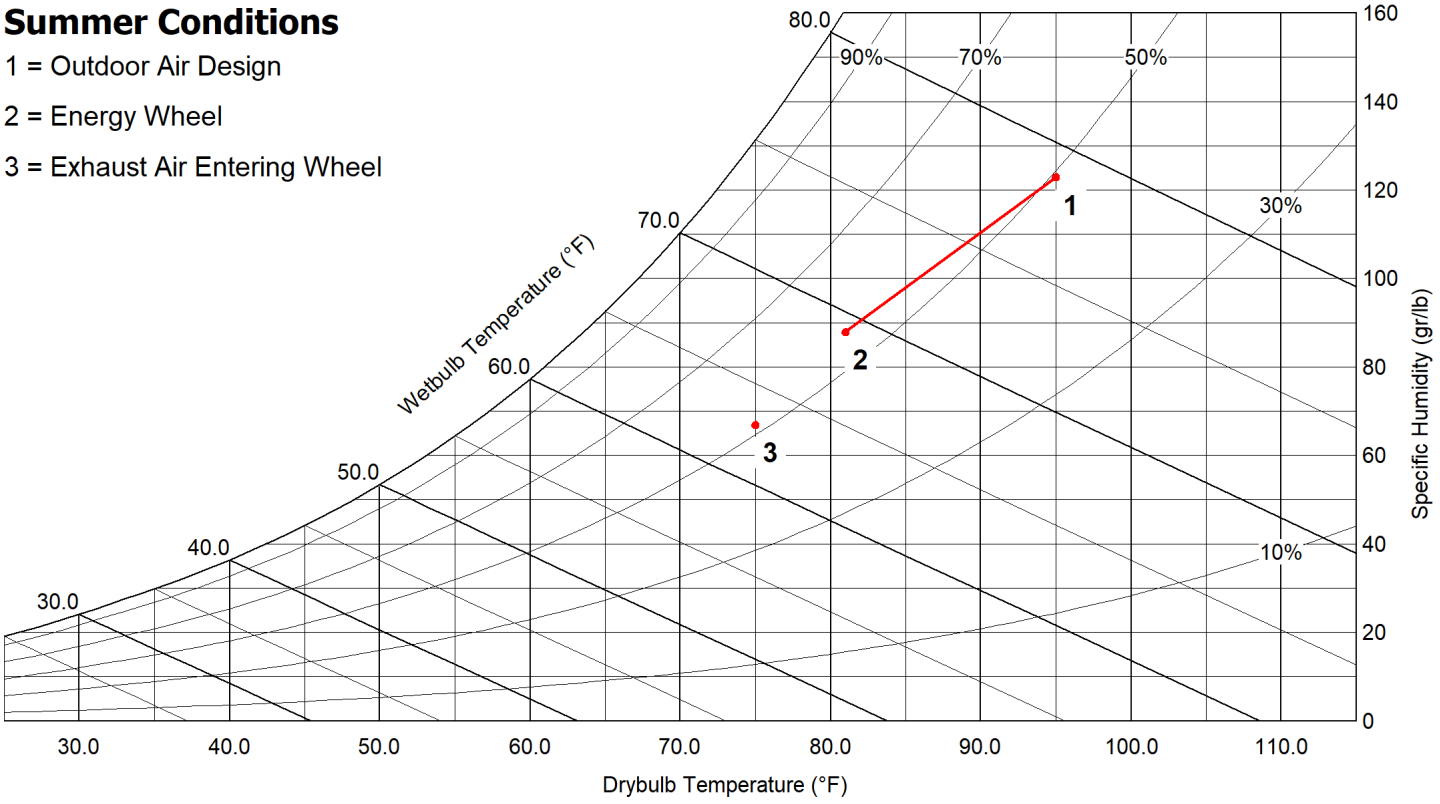
OA Load w/o Energy Recovery		OA Load with Energy Recovery		Equipment Reduction (tons)
(BTU/h)	(tons)	(BTU/h)	(tons)	
200,363.0	16.70	68,738.0	5.73	10.97

Summer Conditions

1 = Outdoor Air Design

2 = Energy Wheel

3 = Exhaust Air Entering Wheel



Energy Recovery Winter Performance

Outdoor Air		Supply Air	
Dry Bulb (F)	11.0	Dry Bulb (F)	50.5
Wet Bulb (F)	8.5	Wet Bulb (F)	41.3
Specific Humidity (gr/lb)	5	Specific Humidity (gr/lb)	25
Enthalpy (BTU/lb)	3.4	Enthalpy (BTU/lb)	16.0
Exhaust Air		**Return Air**	
Dry Bulb (F)	25.7	Dry Bulb (F)	70.0
Wet Bulb (F)	24.2	Rel. Humidity (%)	35
Specific Humidity (gr/lb)	17	Specific Humidity (gr/lb)	39
Enthalpy (BTU/lb)	8.7	Enthalpy (BTU/lb)	22.9

ENERGY WHEEL

Design Air Flow Conditions

OA Volume (CFM)	ASHRAE 90.1 OA Enthalpy Recovery Ratio	EA Volume (CFM)	EA Wheel Effectiveness
3,250	64.4	3,000	71.8

Outdoor Air Heating Reduction

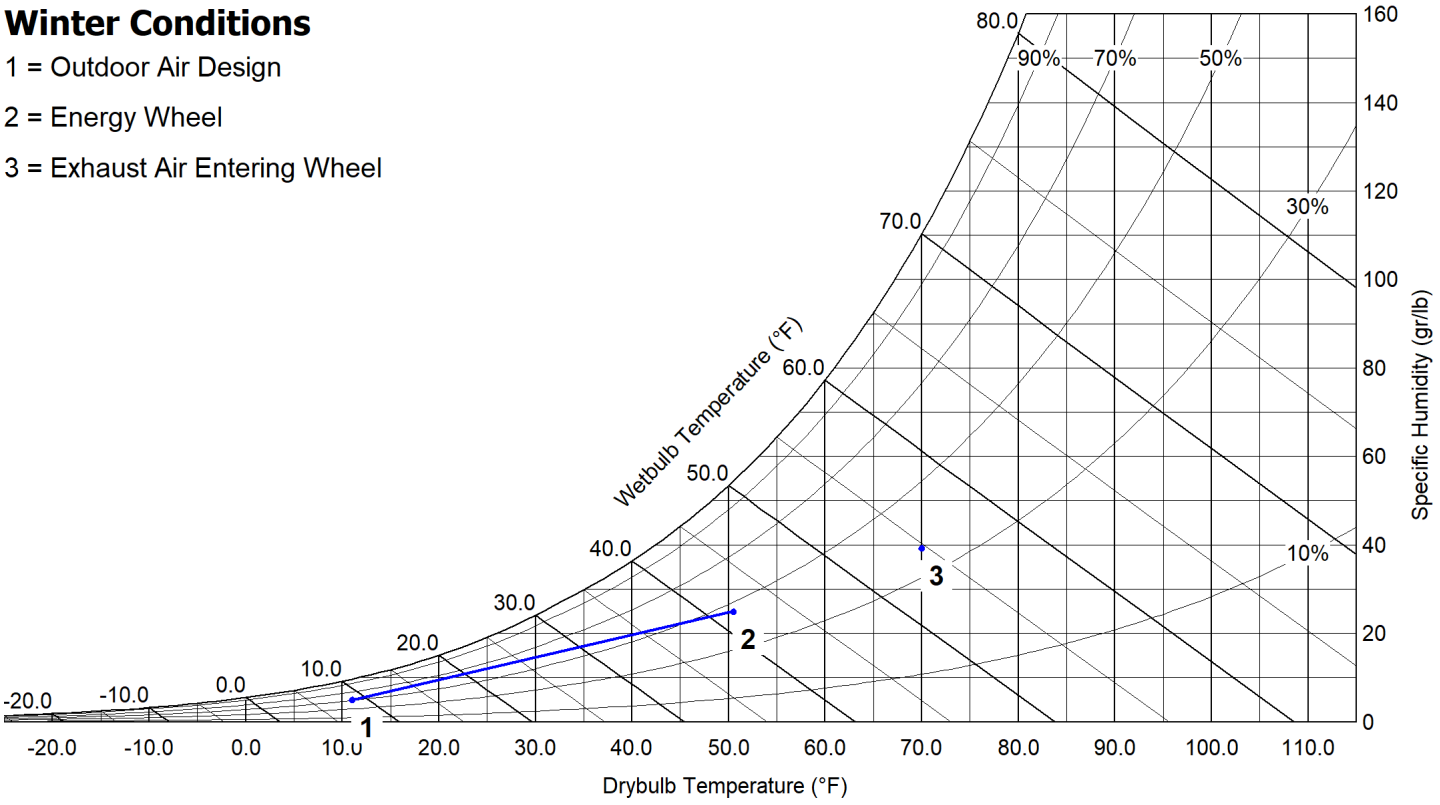
OA Load w/o Energy Recovery (BTU/h)	OA Load with Energy Recovery (BTU/h)	Equipment Reduction (BTU/h)	Sensible Effectiveness (%)
208,816.0	69,015.0	139,801.0	75.3

Winter Conditions

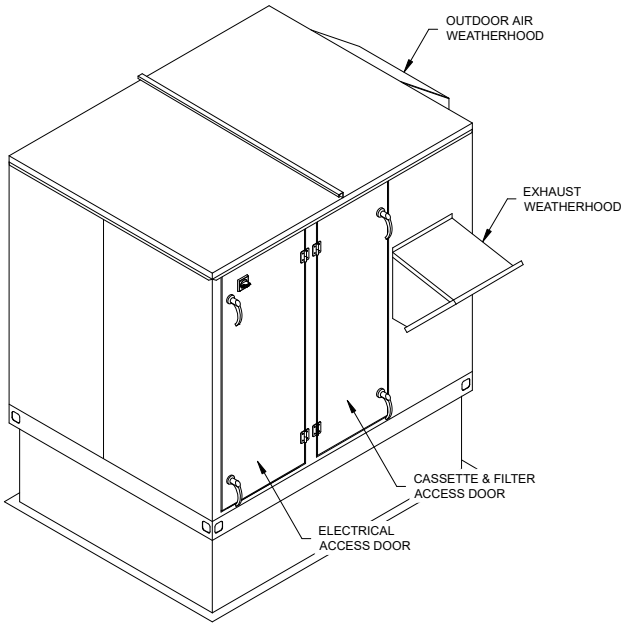
1 = Outdoor Air Design

2 = Energy Wheel

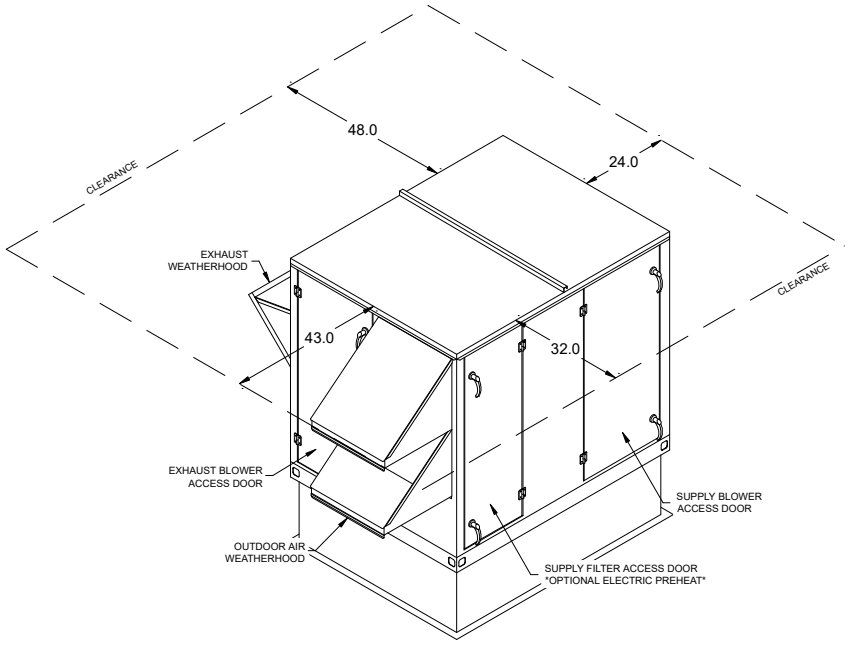
3 = Exhaust Air Entering Wheel



Isometric Drawings

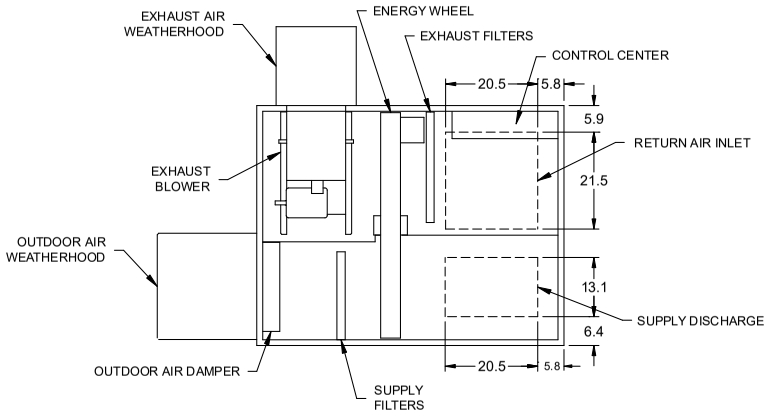


Back Right Isometric

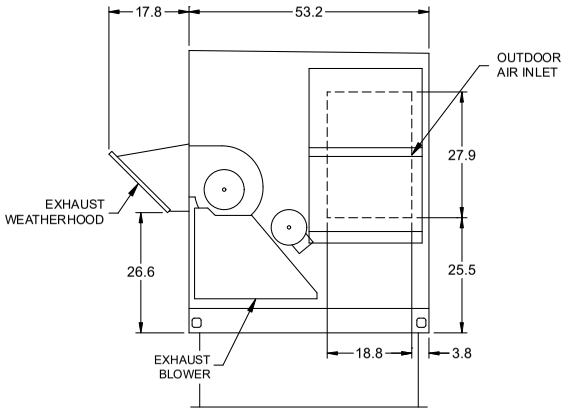


Front Left Isometric

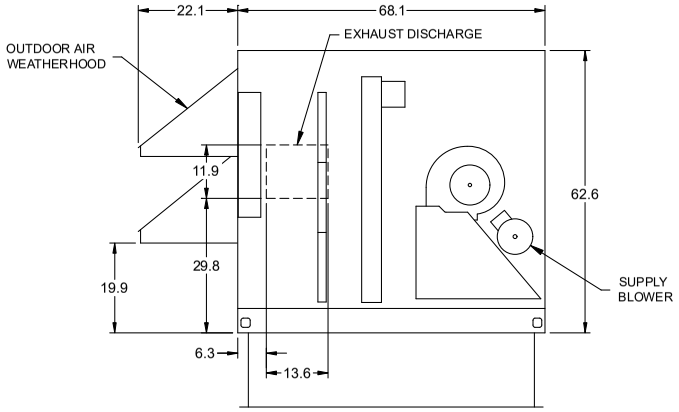
Overview Drawings



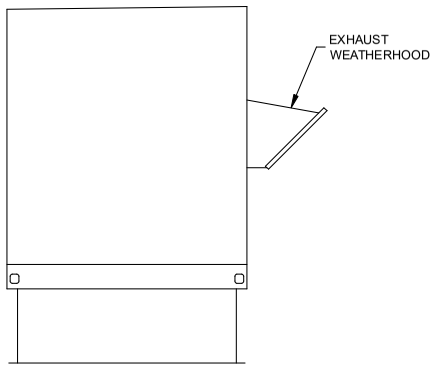
Plan



Left End



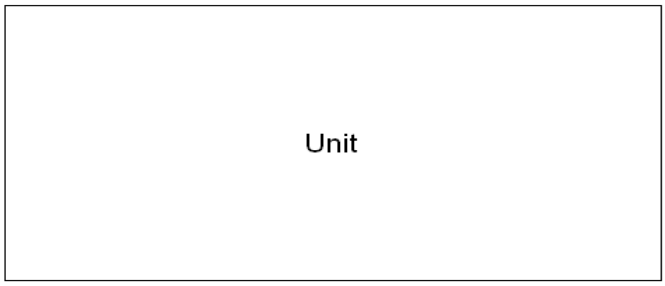
Elevation



Right End

Corner Weights

344 lb 301 lb



332 lb 290 lb

Note

Estimated corner weights are shown looking down on unit and the outside air intake will be on the left. Weights are applied at the base of the unit. Images not drawn to scale.

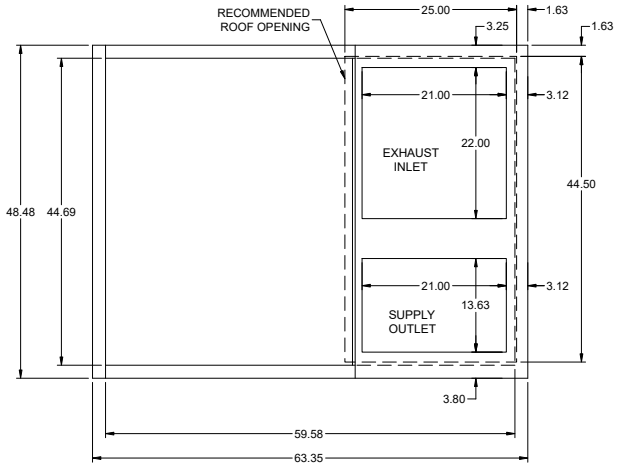
GKD Roof Curb

Model: GKD-48.48/63.35-G18

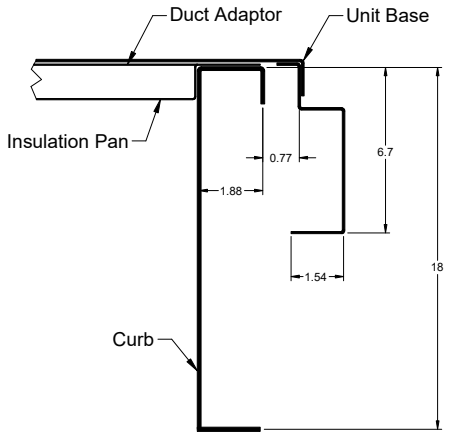
Curb Height (in.)	Curb Length (in.)	Curb Width (in.)	Material	Finish Type	Duct Adapter	Curb Weight (lb)
18	63.35	48.48	Galvanized	Galvanized	Yes	111

Standard Construction Features:
All dimensions shown in inches.
Weight shown is within +/-5%.
If unit is selected with side or end discharge/return, there will not be bottom connections supplied with the curb.
18 gauge galvanized steel (perimeter channels).
18 gauge galvanized steel (interior channels).
Ships knocked down for field assembly.
Curb insulation to be provided by others.

Top View of Curb



Cross-Section View of Unit on Curb



Microprocessor Controller Sequence of Operation

MICROPROCESSOR CONTROLLER

Controller shall be provided with the required sensors and programming for the preconditioner. Controller shall be factory programmed, mounted, and tested. Controller shall have an LCD readout for changing set points and monitoring unit operation.

UNIT START COMMAND (Unit will be enabled to start once a jumper is placed between R to G)

- Factory mounted and wired outdoor air damper actuator is powered.
- Exhaust blower starts after a (adj.) delay.
- Supply blower and energy wheel start after a (adj.) delay.

UNIT STOP COMMAND (OR DE-ENERGIZED)

- Supply blower, exhaust blower, and energy wheel de-energized.
- Outdoor air damper actuator is spring return closed.

SUPPLY BLOWER SEQUENCE

The supply blower speed will be controlled with the following sequence:

0-10 VDC Signal by Others

The supply blower is provided with a factory mounted and wired VFD. The supply blower is modulated based upon a 0-10 VDC signal (field provided) wire directly into the microprocessor. This would operate separately from the controller sequences.

EXHAUST BLOWER SEQUENCE

The exhaust blower speed will be controlled with the following sequence:

0-10 VDC Signal by Others

The exhaust blower is provided with a factory mounted and wired VFD. The exhaust blower is modulated based upon a 0-10 VDC signal (field provided) wire directly into the microprocessor. This would operate separately from the controller sequences.

ECONOMIZER SEQUENCE

When the application requires cooling and the outdoor air conditions are suitable for free cooling, the energy wheel speed will be reduced to minimum speed to reduce energy transfer through the wheel during economizer.

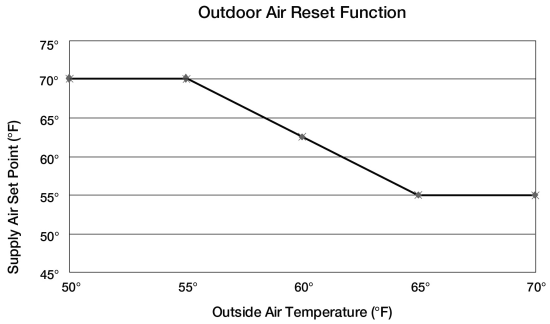
OA Temp. Setpoint

The economizer will be locked out when the outdoor air is less than 50 F (adj.) or greater than 65 F (adj.).

SUPPLY SET POINT RESET FUNCTION

Outside Air Reset

The controller will monitor the outdoor air temperature and will adjust the desired supply temperature set point accordingly. For example, when the outdoor air temperature is below 55 F, the controller will change the supply temperature set point to 70 F. When the outdoor air is above 65 F, the controller will change the supply set point to 55 F. When the outdoor air temperature is between 55 F and 65 F, the supply temperature set point changes according to the OA reset function. A visual representation of this is shown below.



Local (Supply Temp Control)

The supply temperature set point will be a constant temperature that is adjusted through the controller.

ALARMS

The controller will display alarms and have one digital output for remote indication of an alarm condition. Possible alarms include:

AIRFLOW ALARM

The controller monitors the airflow proving switch on each blower. The controller will send an alarm if either of the airflow proving switches are not engaged.

TEMPERATURE SENSOR ALARM

The controller sends an alarm if the temperature sensor fails.

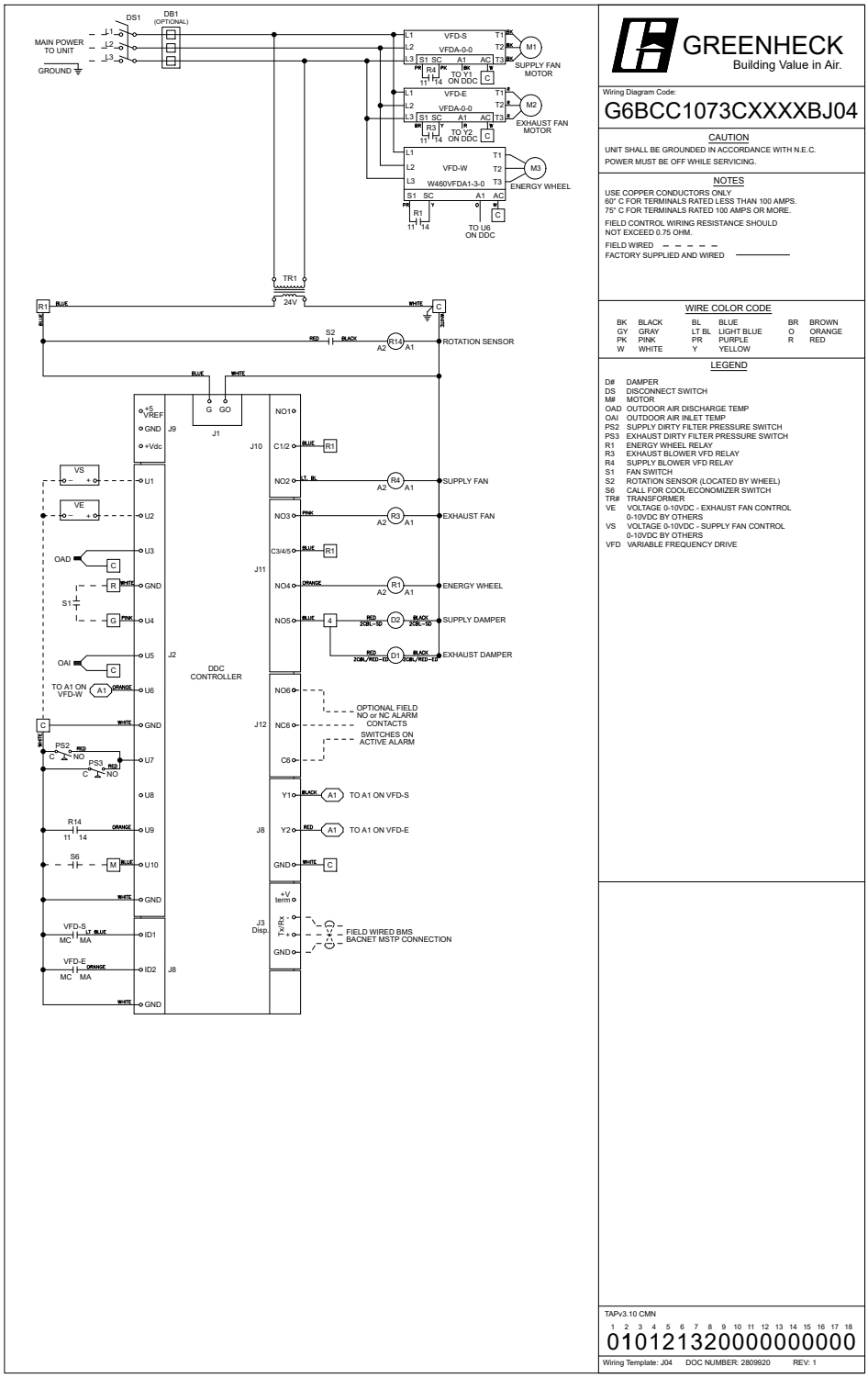
ENERGY WHEEL ROTATION ALARM

The controller monitors wheel rotation. If the wheel does not rotate for a set period of time (adj.), an alarm will generate.

DIRTY FILTER ALARM

A digital signal is sent to the controller indicating an increased pressure drop across the outdoor, exhaust, or supply air filters which must be adjusted in the field during start up. The controller will then provide a dirty filter alarm.

Wiring Diagram



Analog Inputs - Read Only					
Variable	Description	BACNET (Object Type-AI, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Input, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
Supply_Temp_Analog_Input	Supply Temperature	1	0.1	30031	X
Outside_Air_Temp_Analog_Input	Outside Air Temperature	2	0.1	30033	X
Exhaust_Temp_Analog_Input	Exhaust Temperature	3	0.1	30035	
Outside_RH_Analog_Input	Outside Relative Humidity %	4	0.1	30037	
Space_Static_Pressure_Analog_Input	Space Static Pressure	5	0.1	30039	
Supply_Duct_Static_Pressure_Analog_Input	Supply Duct Static Pressure	6	0.1	30041	
Space_CO2_1_Analog_Input	Space 1 CO2 ppm	7	10	30043	
Exhaust_Fan_Speed_Analog_Input	Exhaust Fan Speed Remote Command Input value (0-10 by others)	8	1	30045	X
Supply_Fan_Speed_Analog_Input	Supply Fan Speed Remote Command Input value (0-10 by others)	9	0.1	30047	X
Space_VOC_1_Analog_Input	Space 1 VOC ppm	10	10	30049	
Aux_In_Customer_1	Customer defined auxiliary input	31	0.1	30051	
Aux_In_Customer_2	Customer defined auxiliary input	32	0.1	30053	
Aux_In_Customer_3	Customer defined auxiliary input	33	0.1	30055	
Aux_In_Customer_4	Customer defined auxiliary input	34	0.1	30057	
Aux_In_Customer_5	Customer defined auxiliary input	35	0.1	30059	
Aux_In_Customer_6	Customer defined auxiliary input	36	0.1	30061	

Analog Values - Read/Write					
Variable	Description	BACNET (Object Type-AV, Access-ReadCOV_Commandable)		MODBUS (Register Type-Holding, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
Temperature_Setpoint	Temperature Set point	1	0	40001	
Economizer_Temp_Enable_Setpoint	Economizer Ambient Temp Enable Setpoint. Allow Econ when OAT < Spt	2	0	40003	
Economizer_Enthalpy_Enable_Setpoint	Economizer Enthalpy Enable Setpoint. Allow Econ when OA Enthalpy < Spt	3	0	40005	
Space_Static_Pressure_Setpoint	Space Static Pressure Setpoint	4	0.1	40007	
Supply_Duct_Static_Pressure_Setpoint	Supply Duct Static Pressure Setpoint	5	0.1	40009	
Space_CO2_Setpoint	Space CO2 Setpoint	6	0.1	40011	
Space_VOC_Setpoint	Space VOC Setpoint	7	0.1	40013	
SF_Control_Signal_BMS	BMS to control signal for supply fan speed	8	0.1	40015	
EF_Control_Signal_BMS	BMS to control signal for exhaust fan speed	9	0.1	40017	
Outside_RH_from_BMS	Outside RH from BMS. Used when source selection is set to BMS	10	0.1	40019	
Outside_Temp_from_BMS	Outside Temp from BMS. Used when source selection is set to BMS	11	0.1	40021	X
Space_1_CO2_from_BMS	Space 1 CO2 from BMS. Used when source selection is set to BMS	12	0.1	40023	
Space_Static_from_BMS	Space Static from BMS. Used when source selection is set to BMS	13	0.1	40025	
Space_VOC_from_BMS	SpaceVOC from BMS. Used when source selection is set to BMS	14	0.1	40027	
ER_Control_Signal_from_BMS	ER control signal from BMS. Used when source selection is set to BMS.	15	0.1	40029	
Aux_BMS_Analog_Output_1	BMS Commanded auxilary analog output	101	0.1	40101	
Aux_BMS_Analog_Output_2	BMS Commanded auxilary analog output	102	0.1	40103	
Aux_BMS_Analog_Output_3	BMS Commanded auxilary analog output	103	0.1	40105	
Aux_BMS_Analog_Output_4	BMS Commanded auxilary analog output	104	0.1	40107	

Analog Values - Read Only					
Variable	Description	BACNET (Object Type-AV, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Input, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
Unit_Status_Mode	0: Off/Standby 1: Occupied Start 2: Opening Dampers3: Dampers Open 4: Fan Start Delay 5: Exhaust Fan Starting 6: Supply Fan Starting 7: System On 8: System Disabled 9: Remote Off 10: Shutdown Alarm 19: Fans and Energy Recovery 20: Economizing 21: Defrost Active 22: Overrides Active 23: Expansion Offline	45	0	30001	X
Supply_Temperature_Calculated_Setpoint	Active Supply Temperature Setpoint	46	0.1	30003	
Defrost_Ramp	Defrost Ramp	47	1	30005	
Economizer_Ramp	Economizer Ramp	48	1	30007	
Exhaust_Fan_Space_Static_Pressure_Ramp	Exhaust Fan Space Static Pressure Ramp	49	1	30009	
Exhaust_Fan_Supply_Tracking_Ramp	Exhaust Fan Supply Tracking Ramp	50	1	30011	
Space_CO2_Control_Ramp	Space CO2 Control Ramp	51	1	30013	
Supply_Duct_Static_Pressure_Ramp	Supply Duct Static Pressure Ramp	52	1	30015	
Supply_Fan_Space_Static_Pressure_Ramp	Supply Fan Space Static Pressure Ramp	53	1	30017	
Outside_Dewpoint	Outside Dewpoint	54	0.1	30019	
Outside_Enthalpy	Outside Enthalpy	55	0.1	30021	
Energy_Recovery_Analog_Output	Energy Recovery Analog Output	56	0.1	30023	
Exhaust_Fan_Speed_Analog_Output	Exhaust Fan Speed Analog Output	57	0.1	30025	X
Supply_Fan_Speed_Analog_Output	Supply Fan Speed Analog Output	58	0.1	30027	X

Integer Values - Read Only					
Variable	Description	BACNET (Object Type-IV, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Holding, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
LatestAlm	Most recent alarm. See alarm table	1	1	30101	X

Binary Inputs - Read Only							
Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BI, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Discrete)	Included
				OBJECT INSTANCE	HYST	INDEX	
Supply_Fan_1_Status_Digital_Input	Supply Fan 1 Status	Active	Inactive	10	0	10101	X
Exhaust_Fan_1_Status_Digital_Input	Exhaust Fan 1 Status	Active	Inactive	11	0	10102	X
Unit_Enable_Digital_Input	Remote Unit Enable Digital Input Status	Active	Inactive	12	0	10103	X

Binary Values - Read/Write							
Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BV, Access-Read_Commandable)		MODBUS (Register Type-Coil)	Included
				OBJECT INSTANCE	HYST	INDEX	
BMS_Watchdog	BMS Watchdog command. Used to determine comm status. Must heartbeat within the watchdog timeout delay to detect comm status	Active	Inactive	1	0	2	X
System_Enable	Master system enable/disable point	Enable	Disable	2	0	3	X
Reset_All_Alarms	Alarm Reset Command	Reset	Normal	3	0	4	X
Outside_RH_Source_BMS	Outside RH Source Selection. True = BMS. False = Local	BMS	Local	4	0	5	
Outside_Temp_Source_BMS	Outside Temp Source Selection. True = BMS. False = Local	BMS	Local	5	0	6	X
Space_1_CO2_Source_BMS	Space 1 CO2 Source Selection. True = BMS. False = Local	BMS	Local	6	0	7	
Space_Static_Source_BMS	Space Static Source Selection. True = BMS. False = Local	BMS	Local	7	0	8	
SF_Control_Source_BMS	Allows the BMS to control supply fan speed. True = BMS. False = Local	BMS	Local	8	0	9	
EF_Control_Source_BMS	Allows the BMS to control exhaust fan speed. True = BMS. False = Local	BMS	Local	9	0	10	
Space_VOC_Source_BMS	Space VOC Source Selection. True = BMS. False = Local	BMS	Local	10	0	11	
Econ_Enable_Source_BMS	Economizer Enable Source Selection. True = BMS. False = Local	BMS	Local	11	0	12	
Econ_Enable_from_BMS	Economizer Enable from BMS. Used when source selection is set to BMS	Enable	Disable	12	0	13	
ER_Control_Source_BMS	ER Economizer Control Signal from BMS True = BMS False = Local	BMS	Local	13	0	15	

Binary Values - Read Only

Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BV, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Discrete)	Included
				OBJECT INSTANCE	HYST	INDEX	
Global_Alarm	General alarm point. Optionally set to indicate any alarm is active, or a shutdown alarm is active	Alarm	Normal	30	0	10002	X
System_Shutdown_Alarm	Shutdown alarm status. When true, System Enable will be set to false and the unit will remain off	Shutdown	Normal	31	0	10003	X
Manual_Override_Active	Indicates that manual overrides are active	Override	Normal	32	0	10004	X
Heat_Wheel_Enable_Digital_Output	Heat Wheel Enable Digital Output	Active	Inactive	33	0	10005	
BMS_Offline_Alarm.Active	BMS Offline Alarm (0=Normal 1=Alarm)	Alarm	Normal	34	0	10006	X
Exhaust_Fan_1_Alarm.Active	Exhaust Fan 1 Alarm (0=Normal 1=Alarm)	Alarm	Normal	35	0	10007	X
Outside_Air_Temperature_Sensor_Alarm.Active	Outside Air Temperature Sensor Alarm (0=Normal 1=Alarm)	Alarm	Normal	36	0	10008	X
Filter_Alarm.Active	Outside Filter Alarm (0=Normal 1=Alarm)	Alarm	Normal	37	0	10009	X
Outside_RH_Sensor_Alarm.Active	Outside RH Sensor Alarm (0=Normal 1=Alarm)	Alarm	Normal	38	0	10010	
Space_CO2_1_Analog_Input_Alarm.Active	Space CO2 1 Analog Input Alarm (0=Normal 1=Alarm)	Alarm	Normal	39	0	10011	
Space_High_Static_Alarm.Active	Space High Static Alarm (0=Normal 1=Alarm)	Alarm	Normal	40	0	10012	
Space_Static_Pressure_Analog_Input_Alarm.Active	Space Static Pressure Analog Input Alarm (0=Normal 1=Alarm)	Alarm	Normal	41	0	10013	
Supply_Air_Temp_Low_Limit.Active	Supply Air Temp Low Limit Alarm (0=Normal 1=Alarm)	Alarm	Normal	42	0	10014	X
Supply_Air_Temperature_Sensor_Alarm.Active	Supply Air Temperature Sensor Alarm (0=Normal 1=Alarm)	Alarm	Normal	43	0	10015	X
Supply_Duct_Static_Pressure_Analog_Input_Alarm.Active	Supply Duct Static Pressure Analog Input Alarm (0=Normal 1=Alarm)	Alarm	Normal	44	0	10016	
Supply_Fan_1_Alarm.Active	Supply Fan 1 Alarm (0=Normal 1=Alarm)	Alarm	Normal	45	0	10017	X
Supply_High_Duct_Static_Alarm.Active	Supply High Duct Static Alarm (0=Normal 1=Alarm)	Alarm	Normal	46	0	10018	
Wheel_Rotation_Alarm.Active	Wheel Rotation Alarm (0=Normal 1=Alarm)	Alarm	Normal	47	0	10019	X
ER_Wheel_High_DP.Active	Energy Recovery Wheel high differential pressure (0=Normal 1=Alarm)	Alarm	Normal	48	0	10020	X
Greentrol_1_Alarm.Active	Greentrol Device Alarm	Alarm	Normal	49	0	10021	
Greentrol_2_Alarm.Active	Greentrol Device Alarm	Alarm	Normal	50	0	10022	

Binary Values - Commandable

Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BV, Access-ReadCOV_Commandable)		MODBUS (Register Type-Coil)	Included
				OBJECT INSTANCE	HYST	INDEX	
Aux_BMS_Digital_Output_1	BMS Commanded auxilary digital output	Active	Inactive	101	0	21	
Aux_BMS_Digital_Output_2	BMS Commanded auxilary digital output	Active	Inactive	102	0	22	
Aux_BMS_Digital_Output_3	BMS Commanded auxilary digital output	Active	Inactive	103	0	23	
Aux_BMS_Digital_Output_4	BMS Commanded auxilary digital output	Active	Inactive	104	0	24	
Aux_BMS_Digital_Output_5	BMS Commanded auxilary digital output	Active	Inactive	105	0	25	
Aux_BMS_Digital_Output_6	BMS Commanded auxilary digital output	Active	Inactive	106	0	26	

Warranty Statement for ERV Preconditioners

Unit Warranty

Greenheck warrants the equipment to be free from defects in material and workmanship for a period of 2 years (based on selection) from the shipment date.

Energy Wheel Warranty

The energy recovery wheel is warranted to be free from defects in material and workmanship for a period of 5 years from the shipment date.

Warranty Notes

Any component which proves defective during the warranty period will be repaired or replaced at Greenheck's sole option when returned to our factory, transportation prepaid. All warranties do not include labor costs associated with troubleshooting, removal, or installation. Greenheck will not be liable for any consequential, punitive, or incidental damages resulting from use, repair, or operation of any Greenheck product. These warranties are exclusive and are in lieu of all other warranties, whether written, oral, or implied, including the warranty of merchantability and the warranty of fitness for a particular purpose. No person (including any agent or salesperson) has authority to expand Seller's obligation beyond the terms of this warranty, or to state that the performance of the product is other than that published by Seller.

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.