

15 VERIFICATION OF PROPOSED HVAC EQUIPMENT

15.1 OVERVIEW

The following manufacturer cut sheets verify that all proposed HVAC and manufacturing equipment meets applicable state and federal emissions requirements.

15.2 ATTACHMENTS

Attachment 15-A – HVAC Equipment Cut Sheets

ATTACHMENT 15-A

HVAC Equipment Cut Sheets

RV-25

CONSTRUCTION FEATURES AND ACCESSORIES

Unit Overview

Model	Supply (CFM)	Outside Air (CFM)	Recirc (CFM)	Exhaust (CFM)	Heating	Cooling	Electrical V/C/P
RV-25-7.5	1,800	1,800	0	0	Indirect Gas	Packaged DX	208/60/3

Features

- Exterior housing constructed of galvanized steel
- Direct-drive backward inclined plenum blowers with factory mounted VFDs
- Ball bearing motors
- Corrosion resistant fasteners
- Internally lined with galvanized steel metal creating a double wall
- Insulated with 2 in. 2.4# R13 density foam insulation
- Internally mounted control center with motor starters, 24 VAC control transformer(s), control circuit fusing
- Stainless steel condensate drain pan and connection.
- Low Sound Condenser Fan Package

Options and Accessories

- UL\cUL1995
- Weatherhood: Downturned Hood
- Supply Filters - 2" Pleated MERV 8, 4-20x20x2
- Roof Curbs - GKD-47.19/94.01-G14"
- Outdoor Air Dampers - Motorized Low Leakage
- Damper End Switch - Outdoor Air Damper
- Painted Exterior - Permatecor Concrete Gray (RAL 7023)
- Microprocessor Controls
- Supply Fan Controls - Constant Volume (on/off)
- Room Sensing - Temperature
- Network Protocol: BACNetIP
- Phase and Brown Out Protection
- Unit Disconnect - Mounted By Factory
- Spare Filter Final, Quantity Set of 2
- Furnace Controls: 4:1 Modulating



Note: Unit is provided with factory mounted and wired disconnect switch.

Note: Verify that the correct Protocol has been selected before ordering.

PERFORMANCE AND SPECIFICATIONS

Description/Arrangement

Model	Qty	Unit Weight (lb)	Outdoor Air Discharge	Outdoor Air Intake	Exhaust Air Discharge	Return Air Intake
RV-25-7.5	1	2,223	Bottom	End	N/A	N/A

Design Conditions

Elevation (ft)	Summer DB (F)	Summer WB (F)	Winter DB (F)
62	88	74	-10

Air Performance

Type	Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor Qty/Size (hp)	Size (in.)/Type
Supply	1,800	0.5	0.775	1632	0.42	Qty 1 (1)	14/Plenum

Electrical/Motor Specifications

V/C/P	Unit MCA (amps)	Unit MOP (amps)	Enclosure	Supply Motor RPM	Supply Efficiency	Exhaust Motor RPM	Exhaust Efficiency
208/60/3	39.6	60	ODP	1750	PE	N/A	N/A

Heating/Cooling Specifications

Heating Type	Gas Type	Input (MBH)	Output (MBH)	LAT (F)	Temp. Rise (F)	Furnace Size	Furnace Control
Indirect Gas	Natural	200.0	160.0	72.3	82.3	200	4:1 Modulating

Cooling Type	Total Capacity (MBH)	Sensible Capacity (MBH)	Compressor Quantity	Lead Compressor Type	Condensing Unit By
Packaged DX	96.2	53.0	1	Digital Scroll	Greenheck

Sound Performance in Accordance with AMCA

Fan	Sound Power by Octave Band								Lwa	dBA	Sones
	62.5	125	250	500	1000	2000	4000	8000			
Supply	67	69	81	73	70	66	63	59	76	65	13.0

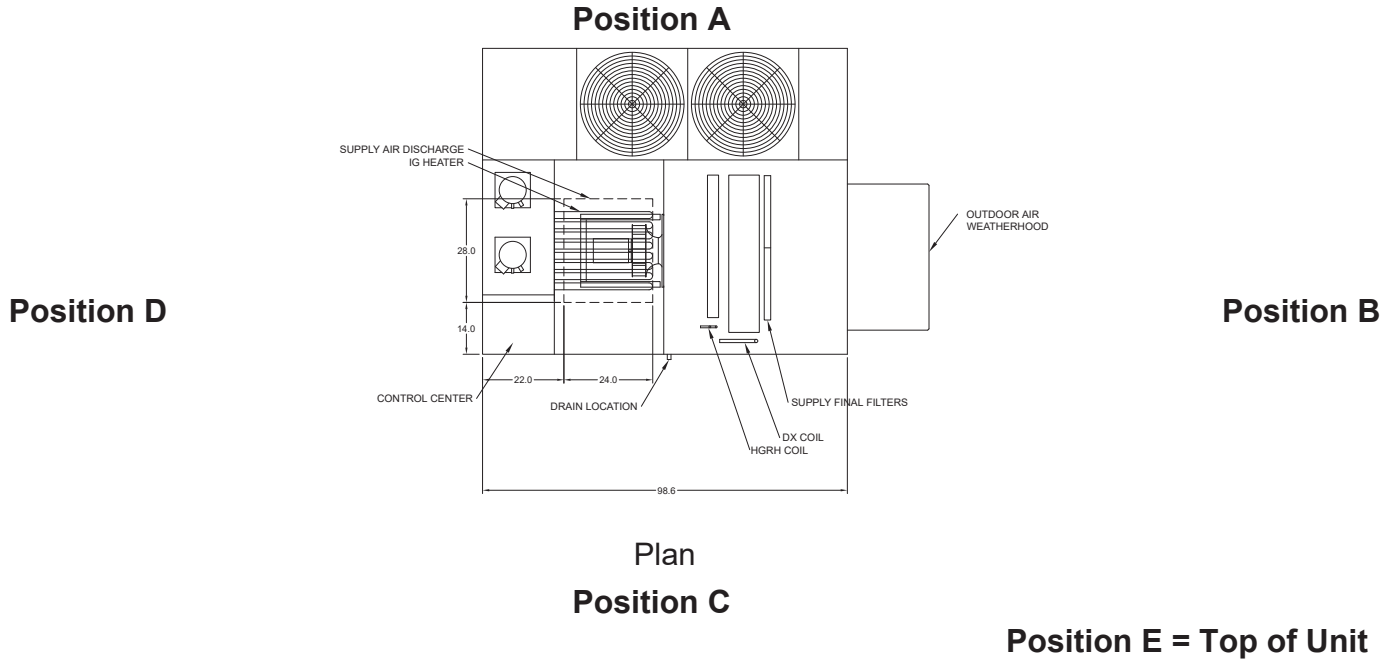
Unit Pressure Drop (in. wg)

Air Stream	Weatherhood	Damper Section	Filter Section	Cooling Section	Heating Section
Supply	0.035	0.014	0.051	0.046	0.118
Exhaust	0	0	0	N/A	N/A

Note: The unit base line performance incorporates the pressure drop of the energy wheel.

Note: Filter pressure drop is based off of clean filters.

RADIATED SOUND



RV-25: Supply Air Flow Nominal, Largest Tonnage Condensing Section Available, PDX units only

Free Field Plane	Octave Band (Sound Power Lw)								Lw	LwA
	1	2	3	4	5	6	7	8		
A	73	85	78	80	81	73	67	62	88	83
B	71	79	69	78	73	68	64	57	83	78
C	79	77	69	76	75	70	60	59	83	78
D	74	77	72	74	74	67	61	58	82	77
E	77	84	78	79	77	72	65	61	87	81
Total	83	89	82	85	84	78	71	67	93	87

AMCA 320-07 - Laboratory Methods of Sound Testing of Fans Using Sound Intensity
 Tests conducted in accordance with this standard.
 Free field measurement plane created 1 foot from unit on all sides and top.
 Sound Intensity measured in Watts/m².
 Sound data converted to Sound Power (Lw) for the chart above.
 A-Weighted Sound Power was determined using AMCA Standard 301-90 Clause 9.1.

COOLING PERFORMANCE

Packaged DX Cooling

Nominal Tonnage	Total Capacity (MBH)	Sensible Capacity (MBH)	Refrigerant Type	Lead Compressor Type	Compressor Quantity	Condensing Unit
7.5	96.2	53.0	R-410A	Digital Scroll	1	By Greenheck

Hot Gas Reheat

Type	Capacity (MBH)	LAT (F)
Modulating	54.4	89.3

Condensing Unit Details

The RV will come equipped with the following components:

- Hermetic scroll type compressors
- Compressors mounted in a compartment to be serviceable without affecting airflow and on neoprene vibration isolation to minimize vibration transmission and noise
- Crankcase heater on compressor
- Thermal expansion valve for refrigerant flow control
- Variable capacity scroll compressor
- Multiple condensing fans to allow fan cycling for head pressure control
- Liquid-Line filter drier
- High pressure manual reset cutout
- Low-pressure auto-reset cutout
- Time delay relays for compressor protection
- Service/charging valves
- Moisture-indicating sight glass
- Direct drive condensing fans with external rotors and molded fan blades
- Condensing coils with 5/16" copper tubes mechanically bonded to aluminum fins

Packaged DX Coil Details

Face Area (ft ²):	11.8
Rows Deep (Evap Coil):	2
Fins Per Inch:	10
Face Velocity (ft/min):	152
Entering Dry Bulb (F):	88.0
Entering Wet Bulb (F):	73.9
Leaving Dry Bulb (F):	61.3
Leaving Wet Bulb (F):	58.7
Cool Coil SP (in. wg):	0.046
Refrigerant Velocity (ft/min):	1,602
Suction Temp. (F):	44.0
Refrigerant:	R-410A
Evaporator Cap. (MBH):	96.2
AHRI 340/360 EER:	12.3
AHRI 340/360 IEER:	12.7
AHRI 920 ISMRE:	6.9
Application EER:	15
Ambient Condenser Temp. (F):	88.0

Compressor and Condenser Details

Compressor 1 RLA (amps):	24
Compressor 1 LRA (amps):	187
Compressor 2 RLA (amps):	25
Compressor 2 LRA (amps):	164
Condenser Fan QTY:	2
Condenser Motor 1 HP:	0.62
Condenser Motor 2 HP:	0.62
Condenser Motor 1 FLA:	1.9
Condenser Motor 2 FLA:	1.9

Note: Digital Scroll is on lead circuit only.

HEATING PERFORMANCE

Indirect Gas Heating

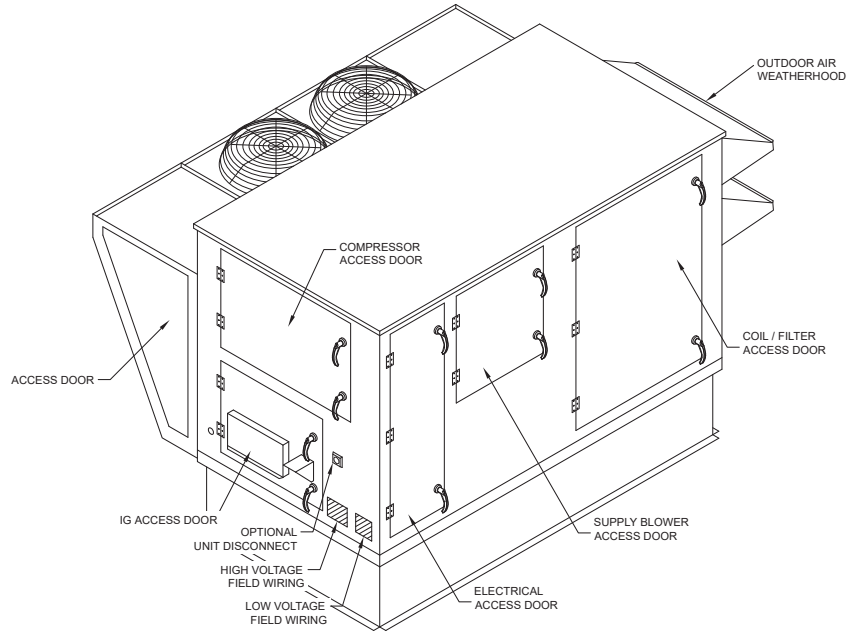
Heating Type	Gas Type	Input (MBH)	Output (MBH)	LAT (F)	Temp. Rise (F)	Furnace Control
Indirect Gas	Natural	200.0	160.0	72.3	82.3	4:1 Modulating

Indirect Gas Unit Details

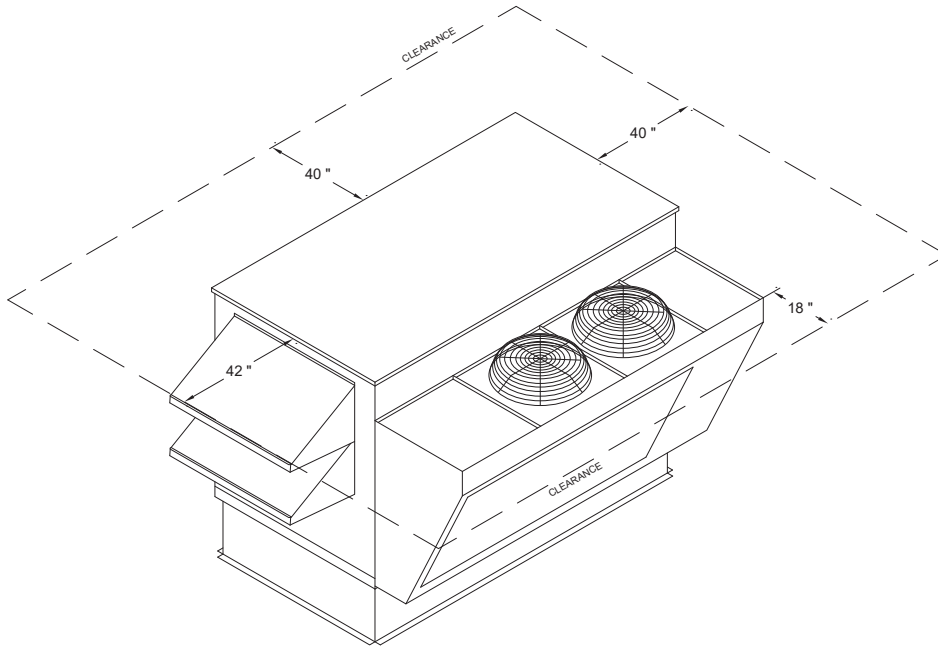
The RV will come equipped with the following:

- Power venting
- ETL listed to ANSI standard Z83.8 and CSA 2.6
- High Thermal efficiency
- Direct spark ignition
- Tubular heat exchanger
- 409 Stainless Steel heat exchange tubes
- 3/4" Gas Connection
- At least 6 in. wg of natural gas pressure (14 in. wg for LP) is required at the units gas connection in order to achieve maximum performance

ISOMETRIC DRAWINGS

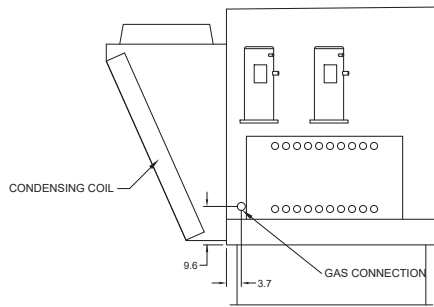
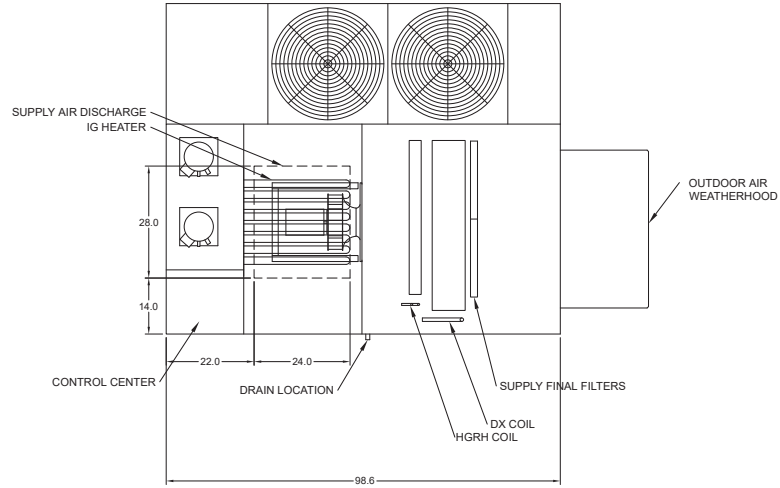


Back Right Isometric

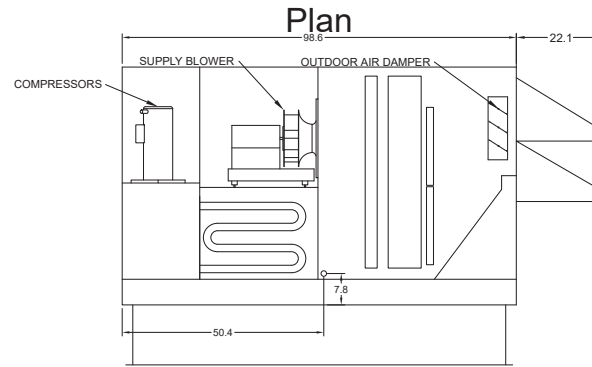


Front Left Isometric

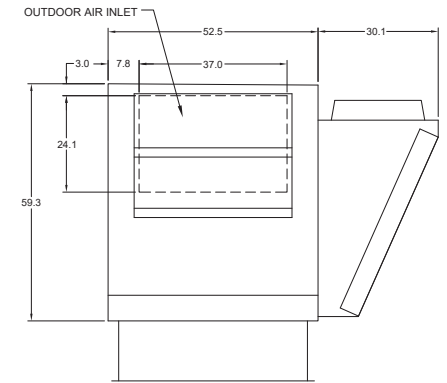
OVERVIEW DRAWINGS



Left End



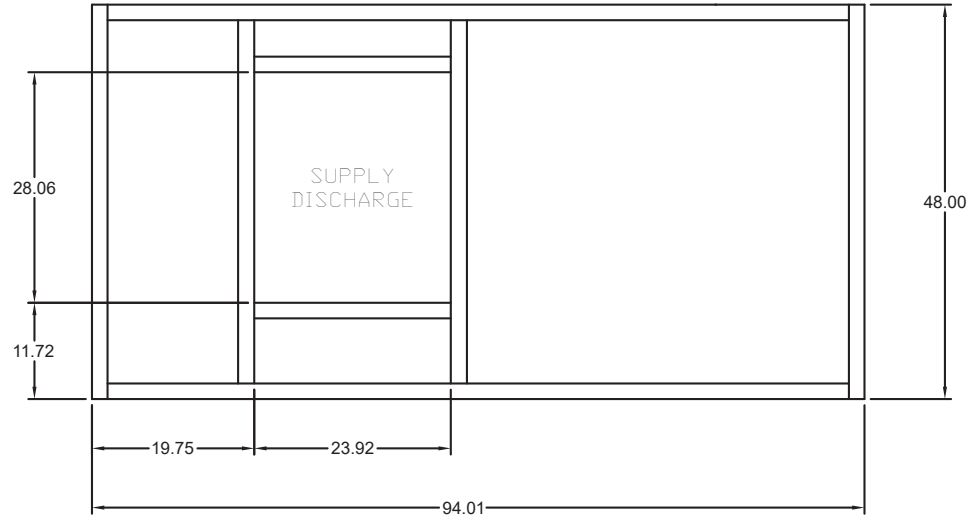
Elevation



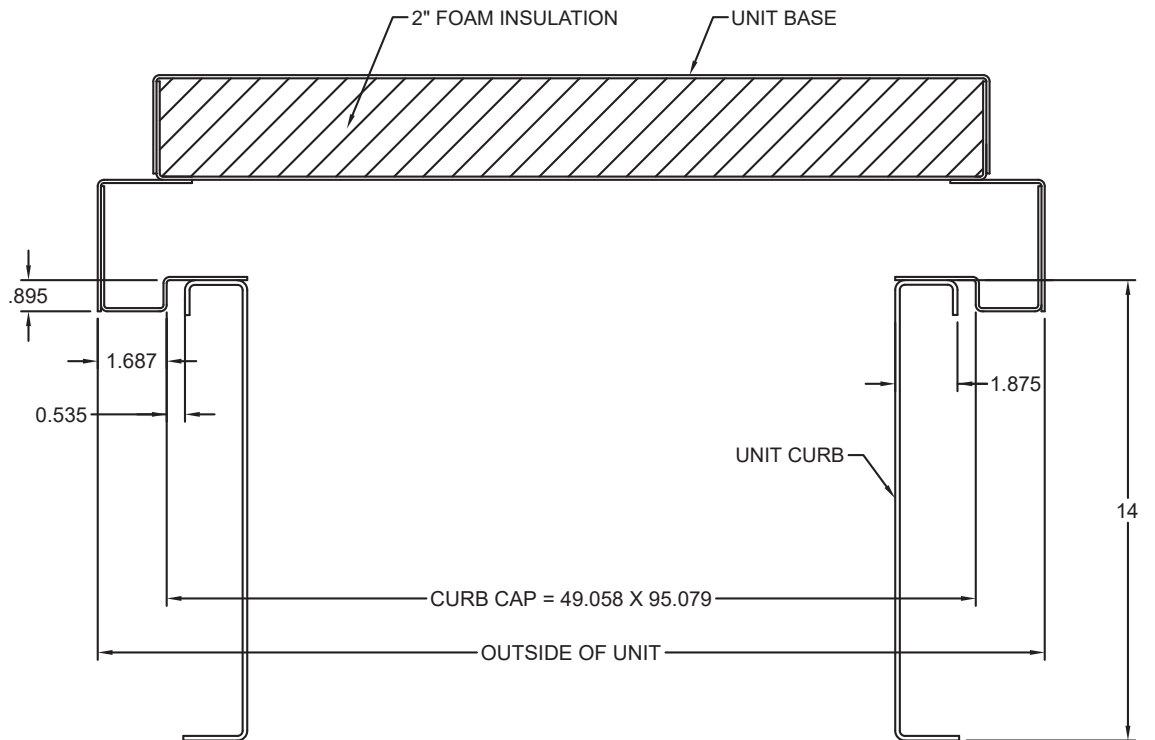
Right End

FOOTPRINT DRAWINGS

**Top View
of Curb**



**Cross-Section
View of Unit
on Curb**



NOTES: All dimensions shown are in units of in.'s
If unit is selected with side or end discharge/return, there will not be bottom connections supplied with the curb.

Curb Weight: 159 lb

Corner Weights

683 lb

711 lb

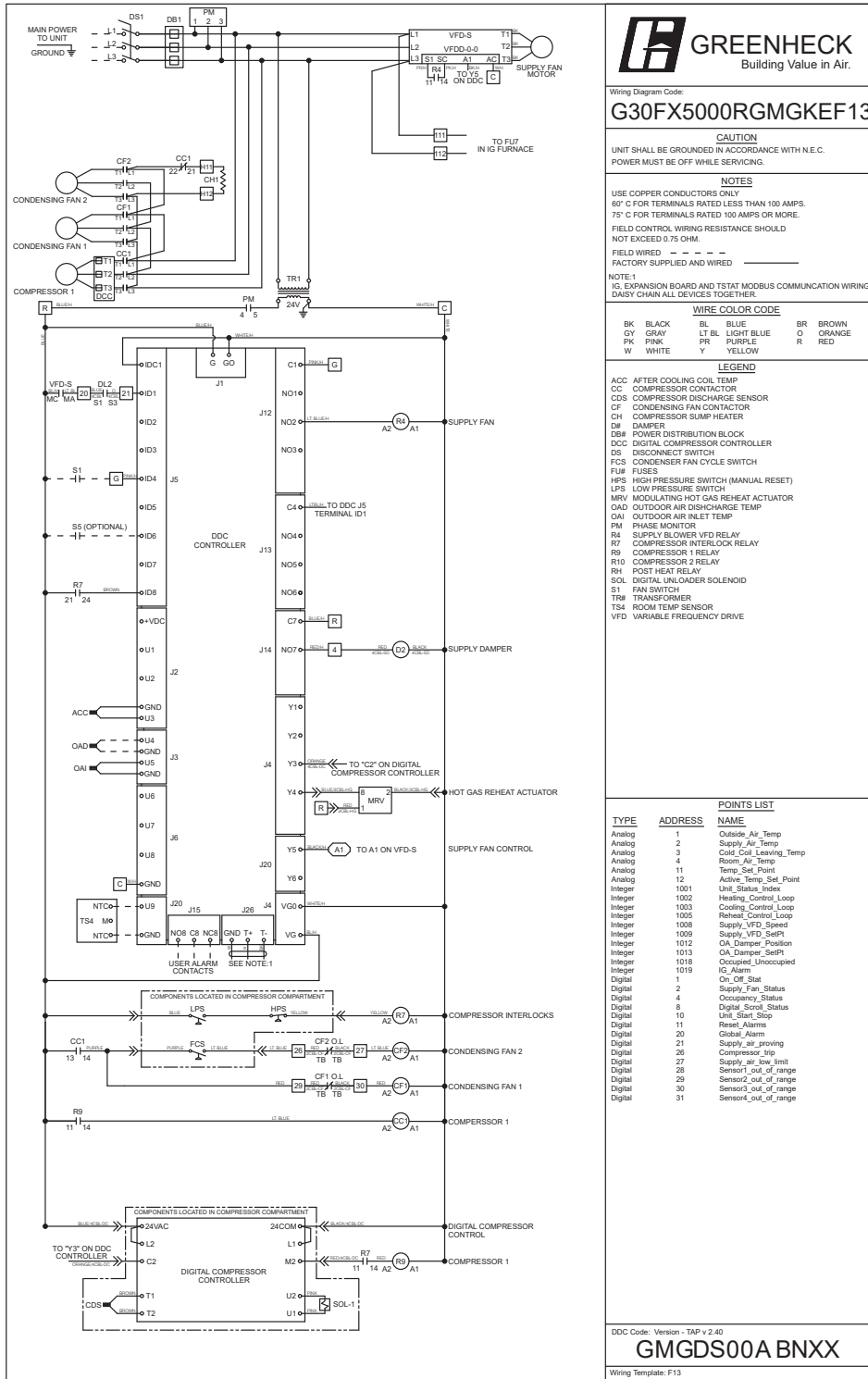


406 lb

422 lb

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

WIRING DIAGRAM



Wiring Diagram Code:
G30FX500RGMGKEF13

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 WIRING RESISTANCE SHOULD NOT EXCEED 0.75 OHM.
FIELD WIRED - - - - -
FACTORY SUPPLIED AND WIRED _____

NOTE 1:
IG, EXPANSION BOARD AND TSTAT MODBUS COMMUNICATION WIRING DASHY CHAIN ALL DEVICES TOGETHER.

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

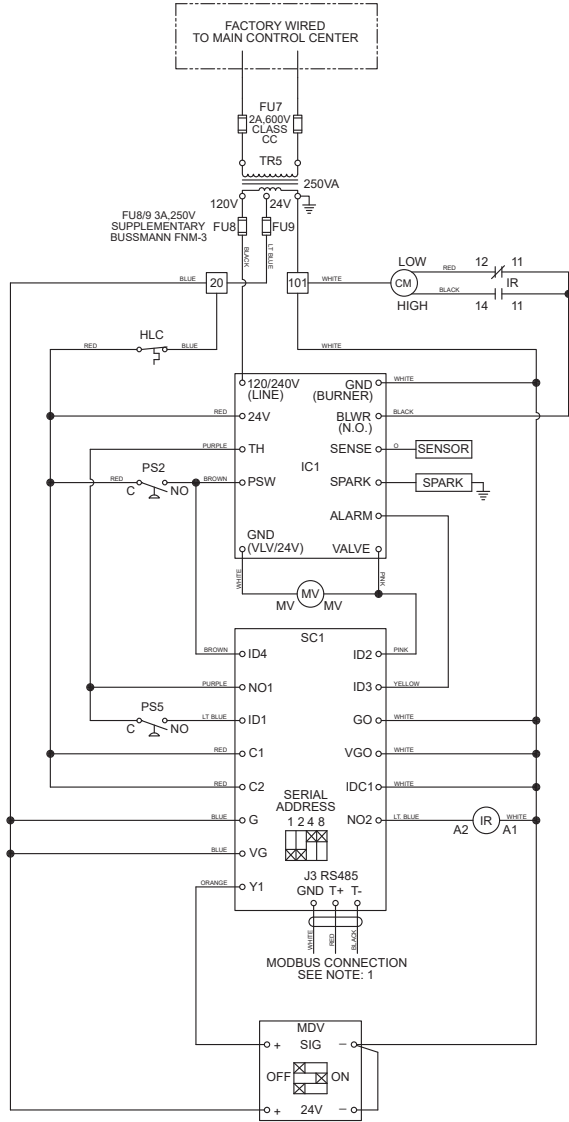
ACC AFTER COOLING COIL TEMP
CC COMPRESSOR CONTACTOR
CDS COMPRESSOR DISCHARGE SENSOR
CF CONDENSING FAN CONTACTOR
CH COMPRESSOR SLUMP HEATER
DM DAMPER
DB1 POWER DISTRIBUTION BLOCK
DCC DIGITAL COMPRESSOR CONTROLLER
DS DISCONNECT SWITCH
FCS CONDENSER FAN CYCLE SWITCH
FUR FUSES
HPS HIGH PRESSURE SWITCH (MANUAL RESET)
LPS LOW PRESSURE SWITCH
MRV MODULATING HOT GAS REHEAT ACTUATOR
OAD OUTDOOR AIR DISCHARGE TEMP
OAI OUTDOOR AIR INLET TEMP
PM PHASE MONITOR
R4 SUPPLY BLOWER VFD RELAY
R7 COMPRESSOR INTERLOCK RELAY
R9 COMPRESSOR 1 RELAY
R10 COMPRESSOR 2 RELAY
RH POST HEAT RELAY
SOL DIGITAL UNLOADER SOLENOID
S1 FAN SWITCH
TR1 TRANSFORMER
TSA ROOM TEMP SENSOR
VFD VARIABLE FREQUENCY DRIVE

POINTS LIST

TYPE	ADDRESS	NAME
Analog	1	Outside_Air_Temp
Analog	2	Supply_Air_Temp
Analog	3	Cold_Coil_Leaving_Temp
Analog	4	Room_Air_Temp
Analog	11	Temp_Set_Point
Analog	12	Active_Temp_Set_Point
Integer	1001	Unit_Status_Index
Integer	1002	Heating_Control_Loop
Integer	1003	Cooling_Control_Loop
Integer	1005	Reheat_Control_Loop
Integer	1008	Supply_VFD_Speed
Integer	1009	Supply_VFD_SetPt
Integer	1012	OA_Damper_Position
Integer	1013	OA_Damper_SetPt
Integer	1018	Occupied_Unoccupied
Integer	1019	IG_Alarm
Digital	1	On_Off_Stat
Digital	2	Supply_Fan_Status
Digital	4	Occupancy_Status
Digital	8	Digital_Scroll_Status
Digital	10	Unit_Start_Stop
Digital	11	Reset_Alarms
Digital	20	Global_Alarm
Digital	21	Supply_air_proving
Digital	26	Compressor_1_Inp
Digital	27	Supply_air_low_limit
Digital	28	Sensor1_out_of_range
Digital	29	Sensor2_out_of_range
Digital	30	Sensor3_out_of_range
Digital	31	Sensor4_out_of_range

DDC Code: Version - TAP v 2.40
GMGDS00A BNXX
Wiring Template: F13

INDIRECT GAS WIRING DIAGRAM FURNACE 1 - 4:1 MODULATING



Wiring Diagram Code:
G4K51P1RX0000S06

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 _____

NOTE: 1
MODBUS COMMUNICATION WIRING. DAISY CHAIN TO ALL MODBUS DEVICES.

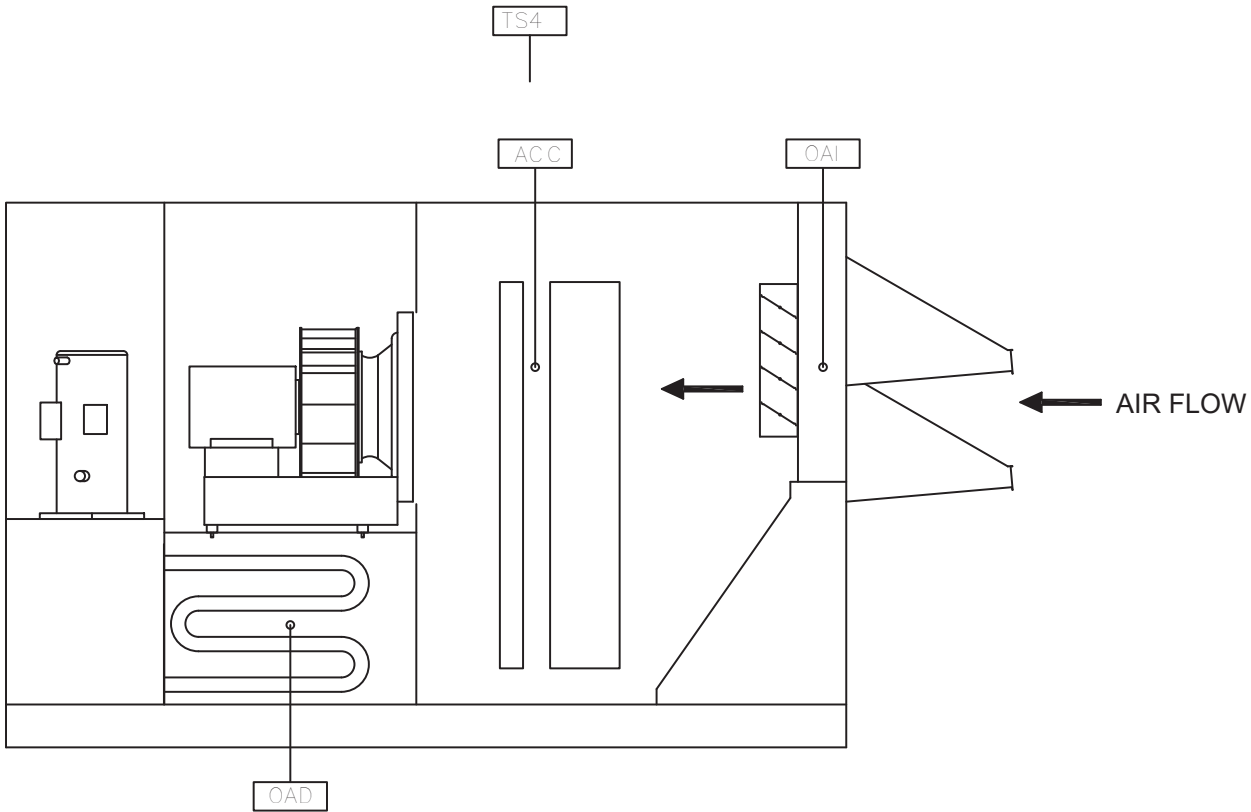
WIRE COLOR CODE

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

CM	COMBUSTION BLOWER MOTOR
FU#	FUSE(S)
HLC	HIGH TEMPERATURE LIMIT CONTROL
IC1	IGNITION CONTROL
IR	INDUCTION RELAY
MDV	MODULATING VALVE
MV	MAIN GAS VALVE
PS2	COMBUSTION AIR PROVING SWITCH
PSS	HIGH SPEED PRESSURE SWITCH
SC1	STAGE CONTROLLER
TR#	TRANSFORMER(S)

MONITORING POINTS



Item	Description	Type
OAI	Outdoor Air Intake Temperature Sensor	10K Ohm NTC (Carel)
OAD	Outdoor Air Discharge Temperature Sensor	10K Ohm NTC (Carel)
ACC	After Cooling Coil Temperature Sensor	10K Ohm NTC (Carel)
TS4	*Room Temp Sensor	10K Ohm NTC (Carel)

*Shipped loose sensor.

Greenheck Network Interface v2.4 Modbus/BACnet Points List

Type	BACnet Device Instance: 77000 (default) Analog = AV, Integer = AV, Digital = BV			Modbus-RTU/TCP/IP Network Address: 1	Read (R) Write (W)	Description	Included	
	Instance	Name	Units	Register				
Analog	1	Outside_Air_Temp	degree F	40002	R/W	Outdoor Air Temp (###.# F)	X	
Analog	2	Supply_Air_Temp	degree F	40003	R	Supply Air Temp (###.# F)	X	
Analog	3	Cold_Coil_Leaving_Temp	degree F	40004	R	Cold Coil Temp (###.# F)	X	
Analog	4	Room_Air_Temp	degree F	40005	R/W	Room AirTemp (if installed) (###.# F)	X	
Analog	5	Outside_Humidity	percent	40006	R/W	Outdoor Relative Humidity (###.##%)		
Analog	6	Room_Humidity	percent	40007	R/W	Room Relative Humidity (###.##%)		
Analog	11	Temp_Set_Point	degree F	40012	R/W	Temperature SetPt (read/write) (###.# F) (See Controller IOM)	X	
Analog	12	Active_Temp_Set_Point	degree F	40013	R	Active Temperature Set Point (###.# F)	X	
Analog	13	Dehumid_Set_Point	percent	40014	R/W	Dehumidification SetPt (read/write) (##.# F, ##.##%) (See Controller IOM)	X	
Integer	1001	Unit_Status_Index	no-units	45003	R	Note 1 (See below)	X	
Integer	1002	Heating_Control_Loop	percent	45004	R	Heater output (0-100%)	X	
Integer	1003	Cooling_Control_Loop	percent	45005	R	Coolingr output (0-100%)	X	
Integer	1004	Energy_Wheel_Speed	percent	45006	R	Energy recovery wheel speed (0-100%)		
Integer	1005	Reheat_Control_Loop	percent	45007	R	Hot gas reheat output (0-100%)	X	
Integer	1006	CO2_Level	ppm	45008	R	CO2 Levels (ppm)		
Integer	1007	CO2_Set_Point	ppm	45009	R/W	CO2 Set Point (ppm)		
Integer	1008	Supply_VFD_Speed	percent	45010	R	Supply Fan VFD Speed (0-100%)	X	
Integer	1009	Supply_VFD_SetPt	percent	45011	R/W	Supply Fan VFD Set Point (0-100%)	X	
Integer	1010	Exhaust_VFD_Speed	percent	45012	R	Exhaust Fan VFD Speed (0-100%)		
Integer	1011	Exhaust_VFD_SetPt	percent	45013	R/W	Exhaust Fan VFD Set Point (0-100%)		
Integer	1012	OA_Damper_Position	percent	45014	R	Outdoor Damper Position (0-100%)		
Integer	1013	OA_Damper_SetPt	percent	45015	R/W	Minimum OA Damper Position (0-100%)		
Integer	1014	Duct_Pressure	no-units	45016	R	Supply Duct Pressure (##.##"WC)		
Integer	1015	Duct_Pressure_SetPt	no-units	45017	R/W	Supply Duct Pressure Set Point (value/100=#.##"WC)		
Integer	1016	Building_Pressure	no-units	45018	R	Building Pressure (value/1000 = 0.###"WC)		
Integer	1017	Building_Pressure_SetPt	no-units	45019	R/W	Building Pressure Set Point (value/1000 = 0.###"WC)		
Integer	1018	Occupied_Unoccupied	no-units	45020	R/W	Occupied/unoccupied command (0=occupied, 1=unoccupied, 2=MMU)	X	
Integer	1019	IG_Alarm	no-units	45021	R	IG Alarm - For alarm detail	X	
			Inactive_Text	Active_Text				
Digital	1	On_Off_Stat	Off	On	10002	R	Unit ON/OFF Status	X
Digital	2	Supply_Fan_Status	Off	On	10003	R	Supply fan status	X
Digital	3	Exhaust_Fan_Status	Off	On	10004	R	Exhaust fan status	
Digital	4	Occupancy_Status	Unoccupied	Unoccupied	10005	R	Occupancy Status (0=Unoccupied 1=Occupied)	X
Digital	5	Stage_Compressor1_Status	Off	On	10006	R	Stage Compressor #1 status	X
Digital	6	Stage_Compressor2_Status	Off	On	10007	R	Stage Compressor #2 status	
Digital	7	Defrost_Mode	Off	On	10008	R	Defrost mode status	
Digital	8	Digital_Scroll_Status	Off	On	10009	R	Digital Scroll status	X
Digital	10	Unit_Start_Stop	Stop	Start	10011	R/W	Unit start/stop command	X
Digital	11	Reset_Alarm	Don't Reset	Reset Alarms	10012	R/W	Reset alarms command	X
Digital	13	Stage_Compressor3_Status	Off	On	10014	R	Stage Compressor #3 status	
Digital	14	Stage_Compressor4_Status	Off	On	10015	R	Stage Compressor #4 status	
Digital	20	Global_Alarm	Off	Alarm	10021	R	Global alarm indication (active when there is at least one alarm)	X
Digital	21	Supply_air_proving	Off	Alarm	10022	R	Supply airflow proving alarm	X
Digital	22	High_Wheel_Pressure	Off	Alarm	10023	R	High wheel pressure (high airflow or dirty wheel)	
Digital	23	Wheel_Rotation	Off	Alarm	10024	R	Wheel rotation alarm	
Digital	24	Exhaust_air_proving	Off	Alarm	10025	R	Exhaust airflow proving alarm	
Digital	25	Dirty_filter	Off	Alarm	10026	R	Dirty filter alarm	
Digital	26	Compressor_trip	Off	Alarm	10027	R	Compressor trip alarm	X
Digital	27	Supply_air_low_limit	Off	Alarm	10028	R	Supply air temperature low limit alarm	X
Digital	28	Sensor1_out_of_range	Off	Alarm	10029	R	Sensor#1 out of range (outside air temperature)	X
Digital	29	Sensor2_out_of_range	Off	Alarm	10030	R	Sensor#2 out of range (supply air temperature)	X
Digital	30	Sensor3_out_of_range	Off	Alarm	10031	R	Sensor#3 out of range (cold coil leaving air temperature)	X
Digital	31	Sensor4_out_of_range	Off	Alarm	10032	R	Sensor#4 out of range (room temperature)	X
Digital	32	Sensor5_out_of_range	Off	Alarm	10033	R	Sensor#5 out of range (room humidity)	
Digital	33	Sensor6_out_of_range	Off	Alarm	10034	R	Sensor#6 out of range (outdoor humidity)	
Digital	34	Sensor7_out_of_range	Off	Alarm	10035	R	Sensor#7 out of range (building pressure sensor)	
Digital	35	Sensor8_out_of_range	Off	Alarm	10036	R	Sensor#8 out of range (duct pressure sensor)	
Digital	36	Sensor#9_out_of_range	Off	Alarm	10037	R	Sensor9 out of range (CO2 sensor)	
Digital	37	Sensor10_out_of_range	Off	Alarm	10038	R	Sensor#10 out of range (auxiliary temp)	

Note: Unit status index: 0=system off; 1=initial delay; 2=opening dampers; 3=exhaust fan starting; 4=supply fan starting; 5=system on; 6=defrost mode active; 7=sys on-economizer; 8=sys on-heating; 9=sys on-cooling; 10=sys on-econ & cooling; 11=sys on-dehumidifying; 12=sys on-dehumidifying & reheat; 13=unocc-unit off; 14=unocc-unit on; 15=unocc-heating; 16=unocc-cooling; 17=unocc-dehumid; 18=unocc-dehumid & reheat; 19=Manual override; 20=remote off; 21=Alarm

Microprocessor Controller Sequence of Operation

MICROPROCESSOR CONTROLLER: Controller shall be provided with required sensors and programming for rooftop unit. Controller shall be factory programmed, mounted and tested. Controller shall have a 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
- Supply fan starts after 10 second delay.
- Tempering options to function as described below.

UNIT STOP COMMAND (OR DE-ENERGIZED):

- Supply fan, exhaust fan and tempering options de-energized.
- Outdoor air damper actuator is spring return close.

OCCUPIED/UNOCCUPIED MODES: Shall be based on a 7-day time clock internal to the controller. The schedule shall be set by the end user. When a user initiates an override input, the controller will switch from unoccupied to occupied mode. The controller will return to the scheduled occupied/unoccupied mode after the override time has expired (60 min, adj.). If internal time clock is disabled, a remote contact or a BMS can control the occupied/unoccupied mode.

Occupied Mode:

- Damper control per below.
- Supply fan ON.
- Heating per below.
- Cooling per below.

Unoccupied Mode (Unit Off): Unit remains off when in unoccupied mode.

- Supply fan OFF
- Tempering OFF
- Outdoor air damper closed.

Morning Warm-up: One hour prior to occupancy, the controller will reference the temperature differential between the current room temperature and the occupied temperature set point. The controller will then look at the amount of time required from the previous days morning warm up sequence and determine how far in advance the unit has to be started to meet the desired occupied set point by the time of occupancy.

SUPPLY BLOWER SEQUENCE: The supply blower is provided with a factory mounted variable frequency drive. The supply blower speed will be controlled with the following sequence.

Constant Volume (on/off): The supply blower will operate at a constant speed set point (adj.) during operation.

BMS Control: The supply blower is modulated based upon a command from the Building Management System.(This Sequence must be field configured.)

COOLING SEQUENCE: The cooling is controlled to maintain the supply temperature set point. The mechanical cooling will be locked out when the outside air is < 55°F - 2°F hysteresis (adj.).

Packaged DX Cooling (Digital Scroll): The controller will provide a modulating signal for cooling. From 10-100%, the digital scroll will be controlled to maintain discharge temperature.

Modulating Hot Gas Reheat Sequence: During dehumidification the modulating HGRH is controlled to maintain the supply temperature set point.

Standard Head Pressure Control: 2 condensing fans will stage on/off based upon condenser pressure.

DEHUMIDIFICATION SEQUENCE: The cooling is controlled to maintain the cooling-coil set point. The dehumidification sequence will be locked out when the OA is <10°F above the cold-coil set point (adj.).

Cold Coil Setpoint Reset Function: The controller will control the cooling to maintain an active set point. The active set point will set to local control (55° F, adj) from the factory and can be field adjusted to the following sequence:

BMS Control: The controller will adjust the cold coil leaving air temperature set point between the minimum (50°F, adj.) and the maximum (55°F, adj.) set points, to satisfy the desired BMS set point for dehumidification.

REHEAT SEQUENCE: While the unit is in dehumidification mode the outdoor air will be reheated via Modulating Hot Gas Reheat for space neutral applications.

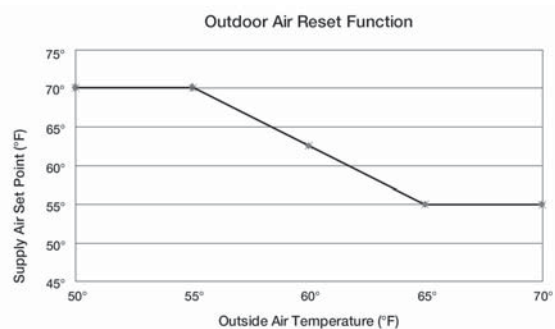
Modulating Hot Gas Reheat: The controller will modulate the hot gas reheat valve with a 0-10 V signal to maintain the supply temperature set point (adj.).

HEATING SEQUENCE: The heating is controlled to maintain the supply temperature set point. The heating will be locked out when the outside air is > 70°F + 2°F hysteresis, (adj.).

Indirect Gas Furnace: The controller will modulate the indirect gas furnace to maintain the supply temperature set point (adj.).

SUPPLY SET POINT RESET FUNCTION. The controller will modulate the heating and cooling to maintain an active set point. The active set point will be set to outdoor air reset from the factory and can be field adjusted to the following sequence:

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



Room Reset: The controller will reset the supply air temperature set point to maintain the room temperature set point (adj.).

Local: The supply set point will be a constant temperature set from the controller (adj.).

BMS Control: The controller will adjust the desired supply temp set point to satisfy the desired BMS set point.

BUILDING FREEZE PROTECTION: If the supply air temperature drops below 35°F (adj.) for 300s (adj.), the controller will de-energize the unit and activate the alarm output.

TEMPERATURE PROTECTION: The controller will enable the supply fan to modulate down to help the unit keep up with heating demand in the event of wheel failure or the unit operating outside design conditions. (This can be enabled under the manufacturer menu in the controller)

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

Building Management System: The controller will send all alarms to the BMS.

Supply Air Alarm: The controller monitors the proving switch on supply blower and sends an alarm in the case of the blower proving switch not engaging for 30s (adj.).

DX Alarm: The controller monitors the refrigerant pressure. In the case of low refrigerant pressure the compressors will shut down until refrigerant pressure returns to normal values and the controller will send a alarm. In the case of high refrigerant pressure the compressors will shut down, requiring a manual reset and the controller will send a alarm.

Temperature Sensor Alarm: The controller sends an alarm in the case of a failed air temperature sensor.

Accessories: The following accessories will be included with the unit to expand the functionality or usability of the controller.

BMS Interfacing: A BMS serial card is provided with the controller for field interfacing with a building management system. Each card is sent out with the default parameters, and the controls contractor must change the appropriate addresses to match the BMS settings.

Phase and Brown Out Protection: Factory mounted and wired component which monitors the main power coming into the unit. If a phase drops out, or if the incoming voltage exceeds the acceptable range, the component will turn off the unit to help protect the electrical systems.

Damper End Switch: Damper end switched will be provided to ensure the supply and exhaust fans do not enable until the dampers are proven open.

Unit Warranty

Limited Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of 1 year(s) from the purchase date. 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.

The warranty does 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.

This warranty is exclusive, and is 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.

Heat Exchanger Extended Warranty

Limited Warranty

Greenheck warrants the stainless steel heat exchanger to be free from defects in material and workmanship for a period of 5 years from the purchase date. Any stainless steel heat exchanger which proves defective during the warranty period will be repaired, or replaced, at Greenheck's sole option when returned to our factory, transportation prepaid.

The warranty does 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.

This warranty is exclusive, and is 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.

Compressor Extended Warranty

Limited Warranty

Greenheck warrants the refrigerant compressor/compressors to be free from defects in material and workmanship for a period of 5 years from the purchase date. Any compressor which proves defective during the warranty period will be repaired, or replaced, at Greenheck's sole option when returned to our factory, transportation prepaid.

The warranty does 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.

This warranty is exclusive, and is 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.



Elite
Heating Boiler



Elite FT Heating Boiler

JOB NAME:

LOCATION:

ARCH. / ENGR.:

WHOLESALER:

MECH. CONTRACTOR:

MODEL NUMBER: EFT-399

TYPE OF GAS: Natural

BTU/HR INPUT LOW - HIGH FIRE: 80,000 - 399,000

NOTES: B-1, B-2

Heat Exchanger

- All Stainless Steel ASME "H" Stamped Construction
- National Board listed
- Low pressure drop, gasketless, vertical tube combustion heat exchanger design – provides maintenance-free operation on internal buildup of material inside the combustion chamber
- 30 PSI Relief Valve, EFT-55 – 199
- 80 PSI Relief Valve, EFT-285 and 399 models

Combustion System

- Modulating burner with up to 5 to 1 turndown
- Up to 96.3% AFUE
- High Grade Burner Design
- Spark Ignition
- Models Available for Natural or LP Gas
- Dual Flame monitoring (Spark and Flame probe)

Integrated Control System

- Digital operating control with 2 line / 20 character LCD text display to program and monitor boiler operation
- Three boiler set point temperature inputs– Boiler Pump – System Pump – DHW Pump / Domestic Hot Water priority with timing
- Programmable settings: Outdoor Reset Curve – DHW Supply Set Point – Step Sequence for delayed response for smart zones – Boost Response - Cascade up to 8 boilers
- Field Connection Board – Line voltage terminal strip with 120 VAC / 60 Hertz power / low voltage terminal strip with multiple contacts - Cascade wiring CAT 5 / CAT 3
- 24 Volt monitoring
- 0-10 VDC input for Building Management System
- Boiler output regulation (Adjustment of boiler output down to 50 percent of rated capacity)
- Low water protection device
- Password Security - Flashing maintenance indicator with optional programmed installer contact information
- Time Clock / Data logging – Last 10 fault codes with date and time
- Customized freeze protection parameters
- Modbus enable through external adapter to monitor or control boiler through BMS system

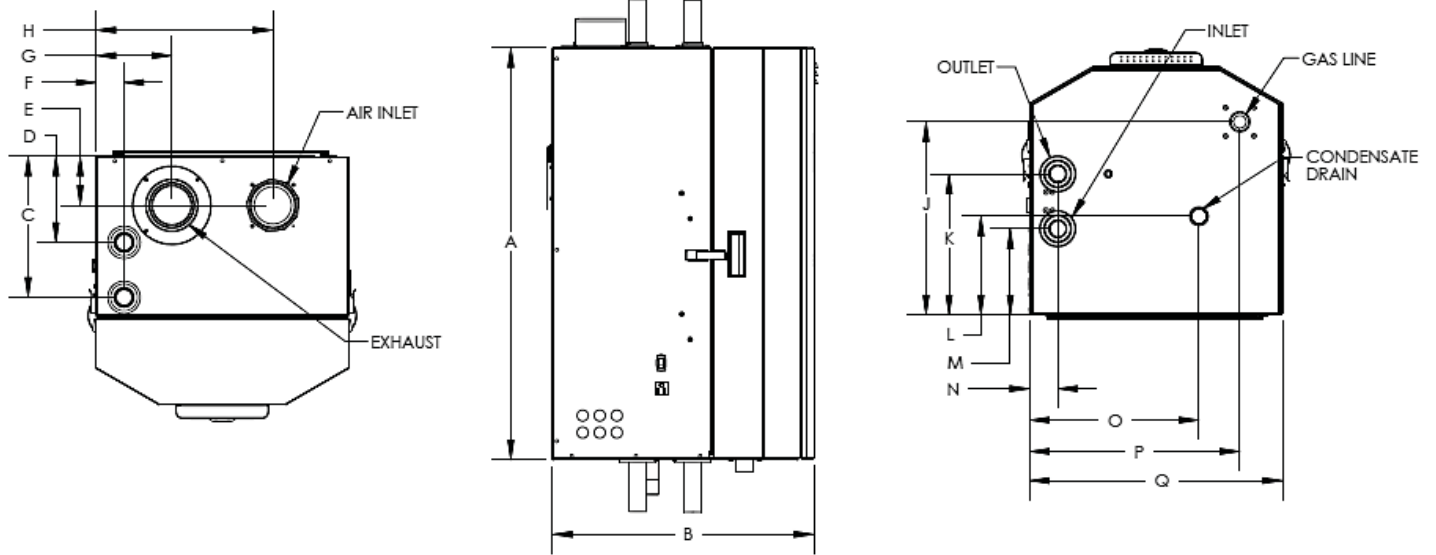
Additional Features

- Superior condensate collection system with overflow protection switch
- Vents in Plastic PVC - CPVC - Stainless Steel – ULC S636 flexible polypropylene vent liner (chimney lining only)
- Vents up to 200 combined equivalent feet
- 12 Year Limited Warranty
- Manual reset high temperature limit
- Dry contact for alarm output
- Included wall mount bracket

Optional

- Condensate Neutralizer (CN4-600)
- System / Pipe Sensor (Part # 7250P-324)
- Modbus (7350P-636)
- U.L. 353 Compliant Low Water Cut-Off Interface Kit w/ Manual Reset (7600P-990 for EFT 155 – 399)

Model EFT-399



MODEL	MAX MBH	MIN MBH	AFUE	HEATING CAP. MBH	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q
EFT-399	399	80	93.2*	367	36-3/8"	23-5/8"	13-5/8"	8-1/2"	4-3/4"	2-3/4"	7-3/8"	18-1/8"	18-3/4"	13-5/8"	9-3/4"	8-1/2"	2-3/4"	16-1/2"	19-1/4"	25-1/2"
MODEL	GAS CONNECTION	WATER CONNECTION	AIR INLET	VENT SIZE	PSI RATING	SHIPPING WT. (LBS)														
EFT-399	1"	1-1/2"	4"	4"	80 PSI	298														

ALL DIMENSIONS ARE APPROXIMATE
* THERMAL EFFICIENCY (NOT AFUE)

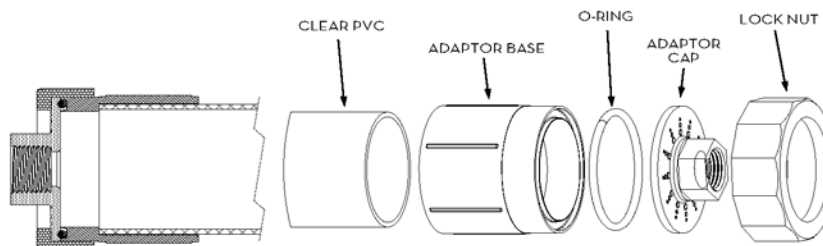
LP-387-K2
07/12/13

Submittal Data Information

Model CN4-600

Job: _____ Engineer: _____ Contractor: _____ Rep: _____

Description	Part #	Included
600 MBH Tube Model	CN4-600	(2) ½" MNPT x ¾" PVC Adaptors
600 MBH Recharge Kit	60RCK	(2) Replacement O-rings



THE CARTRIDGE

An effective condensate neutralizer starts with the cartridge—it should be easy to install and allow easy access not just for replacing the media but for periodic visual inspection. Neutra-Safe® condensate neutralizers also incorporate the exclusive, patent pending integrated unions with O-rings. On either end of the cartridge, these lock rings are designed to allow the service technician to easily replace the media without disturbing the drain piping.

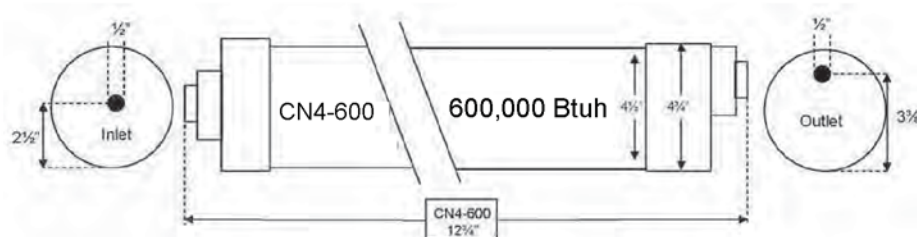


THE MEDIA

Our condensate neutralizers contain clean screened calcite and magnesium oxide. Calcite works by having the acidic aqueous solution come in contact with its surface. It raises the pH by dissolving some of the calcite (calcium carbonate) releasing carbon dioxide and various salts. Some of the salts stay entrained in the aqueous solutions and some may settle to the bottom of the neutralizer. An advantage of calcite is that it is self-limiting and does not over correct causing a high pH condition which is undesirable.



We add granular magnesium oxide (FloMag PWT) to our media for better performance. Calcite and magnesium oxide are used globally in the treatment of potable (drinking) water for raising pH.



All dimensions ± 1/8"