



ADDENDUM No. 1

Park Hill School District 2023-2024 Lakeview HVAC Replacement October 3, 2023

You are instructed to read and note the following described changes, corrections, clarifications, omissions, deletions, additions, approvals and statements pertinent to the Construction Documents.

Addendum No. 1 is part of the general notes and shall govern in the performance of the work:

All necessary work regarding pitch pan for rooftop unit will be responsibility of contractor and should be included in bid.

Any work regarding ceiling grid will be contractor responsibility and should be included in bid.

Electrical work may be completed during District Winter Break
(December 25, 2023- December 29, 2023)

Electrical work may not interrupt equipment operation during this time.

Contractor contact sheet attached.

Equipment submittal attached.

ACKNOWLEDGEMENT: Each Bidder shall acknowledge receipt of Addendum No. 1 on the Acknowledgment Form.

Acknowledgment Form

ACKNOWLEDGEMENT OF ADDENDA

The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:

Addendum No. 1, dated _____

COMPANY _____

ADDRESS _____

PHONE _____ FAX _____

EMAIL _____

PRINT NAME _____

SIGNATURE _____ Date: _____

Contractor Contact Information

C&C Group

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Eddy Staton
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CFM

Thomas Franz
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SUBMITTAL DATA

Order #: **Date:** 09/12/2023
Project: Lakeview Middle School
Project #:

Submitter: Thomas Franz
CFM Distributors Inc
1104 UNION AVE,
KANSAS CITY, Missouri 64101
816-842-5400

Date

09/12/2023

Project Name

Lakeview Middle School

Project Number**Client / Purchaser**

Submittal Summary Page

Qty	Tag #	Model # / Material #	Description
1	RTU-C1	AW15T3CQ4G1CGT66B2	<p>15 Ton, York SunChoice Single Packaged R-410A Air Conditioner, Four Stage Compressor Operation, High Efficiency with variable speed compressor, High Efficiency, Bottom Duct, Natural Gas, Stainless Steel, Modulating Heat- Turndown Ratio 2.85:1, High Heat, 400 MBH Input, 460-3-60, 5 kA Standard SCCR, 3 HP Medium Static Belt Drive Blower</p> <ul style="list-style-type: none"> • IntelliSpeed control of the VFD based on stages of cooling. Provides Single Zone VAV Fan Operation as defined by ASHRAE 90.1 section 6.4.3.10. • Economizer w/Barometric Relief and Power Exhaust with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511) • 2" Pleated Filters (MERV 8) • Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors. BACNet MS/TP, Modbus and N2 Communication Card. • Powered Convenience Outlet (110 VAC / 15 Amp) • HACR Circuit Disconnect • Air Proving Switch • Dirty Filter Indicator Switch • Phase Monitor • Microchannel condenser coils • Copper tube/Aluminum fin evaporator coils • Modulating Hot Gas Reheat • Head Pressure Control • Hinged Access Panel • Louvered Hail Guard • Polyester SMC Drain Pan
1		2EC0406	Single Enthalpy / Reheat Humidity Sensor

Equipment start-up and commissioning by a factory trained technician is recommended.
Contact your supplying distributor or sales representative for additional information & guidance.



WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov

York Single Package R-410A Air Conditioner

Project Name: **Lakeview Middle School**

Unit Model #: **AW15T3CQ4G1CGT66B2**

Quantity: **1** Tag #: **RTU-C1**

System: **AW15T3CQ4G1CGT66B2**

Cooling Performance

Total gross capacity	182.9 MBH
Sensible gross capacity	142.3 MBH
Total net capacity	174.6 MBH
Sensible net capacity	134.0 MBH
Efficiency (at ARI)	12.00 EER
Integrated eff. (at ARI)	20.10 IEER
Ambient DB temp.	95.0 °F
Entering DB temp.	80.0 °F
Entering WB temp.	67.0 °F
Leaving DB temp.	58.0 °F
Leaving WB temp.	57.4 °F
Leaving air temp dew point	57.00 °F
Power input (w/o blower)	13.00 kW
Sound power	89 dB(a)

Refrigerant

Refrigerant type	R-410A
Sys1	15 lb
Sys2	14 lb 8 oz

Reheat Performance

Total capacity	78.5 MBH
Sensible capacity	2.1 MBH
Ambient DB temp.	85 °F
Entering DB temp.	75 °F
Entering WB temp.	67 °F
Leaving DB temp.	74.7 °F
Leaving WB temp.	63.2 °F
Power input (w/o blower)	9.50 kW
Gallons of water per hour	8.72 GPM

Gas Heating Performance

Entering DB temp.	60 °F
Heating output capacity (Max)	324.0 MBH
Stages	Modulating 2.85:1
Supply air	6000 cfm
Heating input capacity (Max)	400 MBH
Leaving DB temp.	110.0 °F
Air temp. rise	50.0 °F
SSE	81.0 %

Supply Air Blower Performance

Supply air	6000 cfm
Ext. static pressure	0.6 IWG
Addl. Unit Losses (Options/Accessories)	0.15 IWG
Blower speed	850 rpm
Max BHP of Motor (including service factor)	3.70 HP
Duct location	Bottom
Motor rating	3.00 HP
Actual required BHP	2.62 HP
Power input	2.44 kW
Elevation	0 ft
Drive type	BELT

Exhaust Air Blower Performance

Supply Air	4093 cfm
Ext. static pressure	0.10 IWG
Blower speed	1044 rpm
Speed tap	Hi
Motor rating	HP
Power input	1.70 kW
Drive type	DIRECT
Unit static resistance	0.15 IWG
Duct location	Bottom

Electrical Data

Power supply	460-3-60
Unit min circuit ampacity	62 A
Unit max over-current protection	80 A

Dimensions & Weight

Hgt 57 in	Len 144 in	Wth 89 in
Weight with factory installed options 2882 lb		

Clearances

Right	42 in	Front	80 in	Rear	36 in
Top	120 in	Bottom	0 in	Left	96 in

Note: Please refer to the tech guide for listed maximum static pressures



15 Ton

- Manufactured at an ISO 9001 Registered Facility and Each Rooftop is Completely Computer-Run Tested Prior to Shipment.

Unit Features

- Four Stage Compressor Operation
- High Efficiency with variable speed compressor
- Two independent refrigerant circuits
- Full Perimeter Base Rails with Built in Rigging Capabilities
- Economizer w/Barometric Relief and Power Exhaust with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511)
- 3 HP Medium Static Belt Drive Blower
- 2" Pleated Filters (MERV 8)
- Replacement Filters: 6 (20" x 25" x 2" or 4"). Unit accepts 2" or 4" wide filters.
- Units are provided with the selected 2-inch or 4-inch filter and can easily be converted in the field to accept either size in the standard filter rack
- Utility Connections - Gas and electrical utility locations are supplied in the unit underside as well as the side of the unit. Utility connections can be made quickly and with a minimum amount of field labor
- Dirty Filter Indicator Switch
- Copper tube/Aluminum fin evaporator coils
- Microchannel condenser coils

Standard Unit Controller: Smart Equipment Control Board

- An Integrated Low-Ambient Control, Anti-Short Cycle Protection, Lead-Lag, Fan On and Fan off Delays, Low Voltage Protection, On-Board Diagnostic and Fault Code Display. Allows all units to operate in the cooling mode down to 0 °F outdoor ambient without additional components or intervention.
- Safety Monitoring - Monitors the High and Low-Pressure Switches, the Freezestats, the Gas Valve, if Applicable, and the Temperature Limit Switch on Gas and Electric Heat Units. The Unit Control Board will Alarm on Ignition Failures, Safety Lockouts and Repeated Limit Switch Trips.

BAS Controller

- Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors. BACNet MS/TP, Modbus and N2 Communication Card.

Warranty

- One (1) Year Limited Warranty on the Complete Unit
- Five (5) Year Warranty - Compressors and Electric Heater Elements
- Fifteen (15) Year Warranty - Stainless Steel Tubular Heat Exchangers



Sun Choice 15-27.5 Ton Package

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York Single Package R-410A Air Conditioner

Project Name: **Lakeview Middle School**

Unit Model #: **AW15T3CQ4G1CGT66B2**

Quantity: **1** Tag #: **RTU-C1**

System: **AW15T3CQ4G1CGT66B2**





Sun Choice 15-27.5 Ton Package

York Single Package R-410A Air Conditioner

Project Name: **Lakeview Middle School**

Unit Model #: **AW15T3CQ4G1CGT66B2**

Quantity: **1** Tag #: **RTU-C1**

System: **AW15T3CQ4G1CGT66B2**

Additional Electrical Data

Power supply	460-3-60
Unit min circuit ampacity	62 A
Unit max over-current protection	80 A
Min Voltage	416 V
Max Voltage	508 V
Comp #1 RLA	24.5
Comp #1 LRA	24.5
Comp #2 RLA	12
Comp #2 LRA	94
Indoor Mtr Voltage	460-3-60
Indoor Mtr FLA	6.1
Outdoor Mtr Qty	2
Outdoor Fan Voltage	460-1-60
OD Fan Mtr FLA (ea.)	2.3
Power Ex Mtr Qty (if applicable)	2
Powered Ex Voltage(if applicable)	460-1-60
Power Ex Mtr FLA (ea) (if applicable)	2.2
Combustion Mtr Qty	1
Combustion Motor Voltage	208/230-1-60
Combustion Mtr FLA (ea)	1.5



Sun Choice 15-27.5 Ton Package

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York Single Package R-410A Air Conditioner

Project Name: Lakeview Middle School

Unit Model #: AW15T3CQ4G1CGT66B2

Quantity: 1 Tag #: RTU-C1

System: AW15T3CQ4G1CGT66B2

Factory Installed Options

AW15T3CQ4G1CGT66B2

Equipment Options		Option(s) Selected
Product Category:	A	York SunChoice Single Packaged R-410A Air Conditioner
Efficiency:	W	High Efficiency, Bottom Duct
Nominal Cooling Capacity:	15	15 Ton
Heat Type:	T	Natural Gas, Stainless Steel, Modulating Heat-Turndown Ratio 2.85:1
Heat Size:	3	High Heat, 400 MBH Input
Blower Option:	C	3 HP Medium Static Belt Drive Blower
Air Volume:	Q	Four Stage Compressor Operation High Efficiency with variable speed compressor IntelliSpeed control of the VFD based on stages of cooling. Provides Single Zone VAV Fan Operation as defined by ASHRAE 90.1 section 6.4.3.10.
Voltage:	4	460-3-60 5 kA Standard SCCR
Outside Air Option:	G	Economizer w/Barometric Relief and Power Exhaust with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511)
Coil Options:	1	Microchannel condenser coils Copper tube/Aluminum fin evaporator coils
Controls:	C	Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors. BACNet MS/TP, Modbus and N2 Communication Card.
Sensor Options:	G	Air Proving Switch Dirty Filter Indicator Switch
Service Options:	T	Powered Convenience Outlet (110 VAC / 15 Amp) HACR Circuit Disconnect Phase Monitor
Refrigeration:	6	Modulating Hot Gas Reheat Head Pressure Control
Additional Options:	6	2" Pleated Filters (MERV 8) Louvered Hail Guard
Cabinet Options:	B	Hinged Access Panel Polyester SMC Drain Pan



Sun Choice 15-27.5 Ton Package

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York Single Package R-410A Air Conditioner

Project Name: Lakeview Middle School

Unit Model #: AW15T3CQ4G1CGT66B2

Quantity: 1 Tag #: RTU-C1

System: AW15T3CQ4G1CGT66B2

Product Generation: 2

Field Installed Accessories

- ☐ 1BD0411 - Burglar Bars (85.0 lbs)
- ☐ 1CV0406 - Concentric Diffuser, Flush Mount, 18X36
- ☐ 1CV0407 - Concentric Diffuser, Flush Mount, 24X28
- ☐ 1CV0415 - Concentric Diffuser, Side Discharge, 18X36
- ☐ 1CV0416 - Concentric Diffuser, Side Discharge, 24X48
- ☐ 1CV0421 - Concentric Diffuser, Specialty, 28X28
- ☐ 1CV0422 - Concentric Diffuser, Specialty, 30X30
- ☐ 1CV0423 - Concentric Diffuser, Specialty, 36X36
- ☐ 1CV0426 - Concentric Diffuser, Specialty, 24X24
- ☐ 1CV0427 - Concentric Diffuser, Specialty, 28X28
- ☐ 1CV0428 - Concentric Diffuser, Specialty, 30X30
- ☐ 1FE0418 - Flue Exhaust Kit (30.0 lbs)
- ☐ 1HA0401 - Natural Gas High Altitude Conversion Kit - For applications between 2000 and 10,000 feet altitude
- ☐ 1RC0444 - 14" Roof Curb (188.0 lbs)
- ☐ 1RC0447 - 24" Roof Curb (260.0 lbs)
- ☐ 1RD0414 - Barometric Relief Damper (40.0 lbs)
- ☐ 2AQ04700524 - CO² Space Sensor - Wall Mount Accessory (5.0 lbs)
- ☐ 2AQ04700624 - CO² Unit Mount Accessory (4.6 lbs)
- ☒ 2EC0406 - Single Enthalpy / Reheat Humidity Sensor (3.0 lbs)
- ☐ 2EC0407 - Dual Enthalpy Sensing (3.0 lbs)
- ☐ 2ET077001124 - Honeywell T7350, 2 Heat / 4 Cool, Auto/Man Changeover, Electronic 7 Day Programmable (2.0 lbs)
- ☐ 2FS0401 - Condensate Overflow Switch (2.0 lbs)
- ☐ 2PE04704946 - Constant Volume Power Exhaust, High CFM, 460V, Belt Drive (450.0 lbs)
- ☐ 2PE04705046 - "Modulating Power Exhaust, High CFM, 460V", Belt Drive
- ☐ 2PE04705146 - "Modulating Power Exhaust, Standard CFM, 460V", Direct Drive
- ☐ 2PE04705246 - Constant Volume Power Exhaust, Standard CFM, 460V, Direct Drive (70.0 lbs)
- ☐ 2SD04702024 - Supply Air Smoke Detector (8.0 lbs)
- ☐ 2SD04703024 - Return Air Smoke Detector (8.0 lbs)
- ☐ 2SD04703124 - Supply & Return Air Smoke Detector (12.0 lbs)
- ☐ S1-03102529000 - Non-Networking Wall Sensor - Allows remote sensing and control from single or multiple zones. (0.2 lbs)
- ☐ S1-03102529004 - Non-Networking Wall Sensor with Over-ride button - Allows remote sensing and control from single or multiple zones. Override allows setpoint to be overridden for 2 hour time period. (0.2 lbs)
- ☐ S1-03102529006 - Non-Networking Wall Sensor with Setpoint Adjustment and Over-ride Button - Allows remote sensing and control from single or multiple zones. Allows setpoint to be adjusted $\pm 5^{\circ}$ F. Override allows setpoint to be overridden for 2 hour time period. (0.2 lbs)
- ☐ S1-03103489000 - Temp sensor, 80mm x 80mm, LCD display, screw terminals, adjustable setpoint, JCI logo (0.1 lbs)
- ☐ S1-03103490000 - Temp sensor w/Economizer FDD, 120mm x 80mm, LCD display, screw terminals, adjustable setpoint, no logo (0.0 lbs)
- ☐ S1-03103516000 - Temp & humidity sensor, 120mm x 80mm, LCD display, screw terminals, warmer/cooler dial, JCI logo (0.4 lbs)
- ☐ S1-03103517000 - Temp sensor, 120mm x 80mm, no display, no dial, screw terminals, no logo (0.4 lbs)
- ☐ S1-03103518000 - Temp & humidity sensor, 120mm x 80mm, no display, modular jack, warmer/cooler dial, JCI logo (0.4 lbs)
- ☐ S1-03103519000 - Network Sensor ,CO₂, No Display (0.2 lbs)
- ☐ S1-MP-PRTKIT-0P - MAP (Multiple Access Portal) Gateway Kit- Replacement MAP gateway protective case, lanyard and communication cable. Use only to replace worn or damaged components. (0.3 lbs)
- ☐ S1-SE-COM1001-0 - Field Installed Communication Card for Simplicity SE control. Can be field configurable for BACnet, N2 or ModBUS MSTP (0.0 lbs)
- ☐ S1-YK-MAP1810-0P - MAP (Multiple Access Portal) Gateway- For use with SimplicitySE Control. (0.2 lbs)
- ☐ S1-YK-MAP1810-0S - Stationary MAP Gateway (Includes MAP Gateway, Field Bus Adapter, Mounting Bracket and 100 to 240 VAC Power Supply). US-compatible counties. (1.9 lbs)

Project Name: Lakeview Middle School

Unit Model #: AW15T3CQ4G1CGT66B2

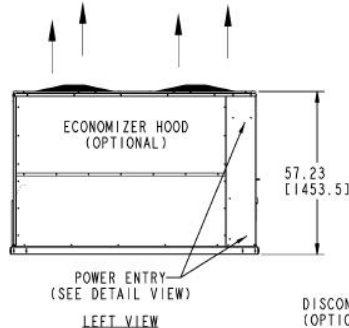
Quantity: 1 Tag #: RTU-C1

Consolidated Drawing

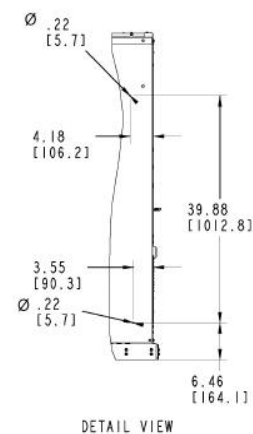
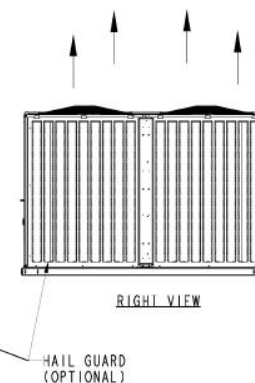
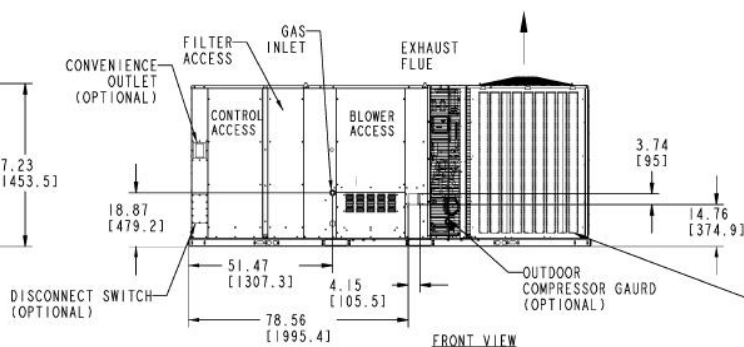
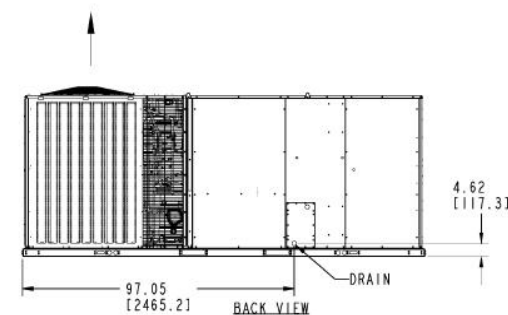
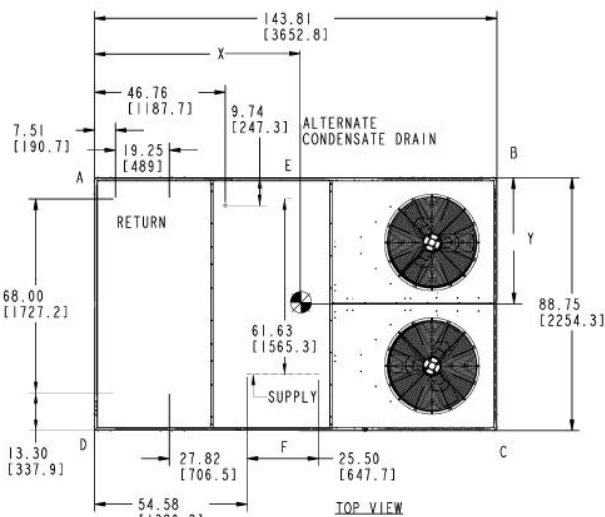
NOTES:

- FOR OUTDOOR USE ONLY.
- WEIGHTS SHOWN ARE FOR COOLING ONLY UNITS.
- SERVICE (S) AND MINIMUM (M) CLEARANCE TO COMBUSTIBLE MATERIAL:
UNIT SIDE
RIGHT (S) 42 [1067]
LEFT, NO ECON OR PE (S) 18 [457]
LEFT, W/ ECON OR PE (S) 96 [2438]
FRONT/HEAT ACCESS (S) 80 [2032]
REAR (S) 36 [914]
TOP (S) 120 [3048]
UNIT-TO-UNIT (S) 120 [3048]
DUCT (M) 0 [0]
FLOOR (M) 0 [0]
FRONT/FLUE (M) 42 [1067]
- FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES CONTACT YOUR APPLICATION ENGINEERING DEPARTMENT.
- DOWNFLOW DUCT DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY. IF UNIT IS MOUNTED SIDE SUPPLY, IT IS RECOMMENDED THAT THE DUCTS ARE SUPPORTED BY CROSS BRACES. AS DONE ON THE ACCESSORY ROOF CURBS.
- MINIMUM CONDENSATION TRAP HEIGHT SHALL BE 1.5 TIMES THE LOWEST NEGATIVE STATIC.
- DIMENSION IN [] ARE MILLIMETER OR KILOGRAMS.
- OPTIONAL COIL GUARDS, GAS HEAT, DISCONNECT SWITCH SHOWN.
- HEAT EXCHANGER IS TYPICAL OF HIGH GAS HEAT OPTION

→ = DIRECTION OF AIRFLOW
● = CENTER OF GRAVITY



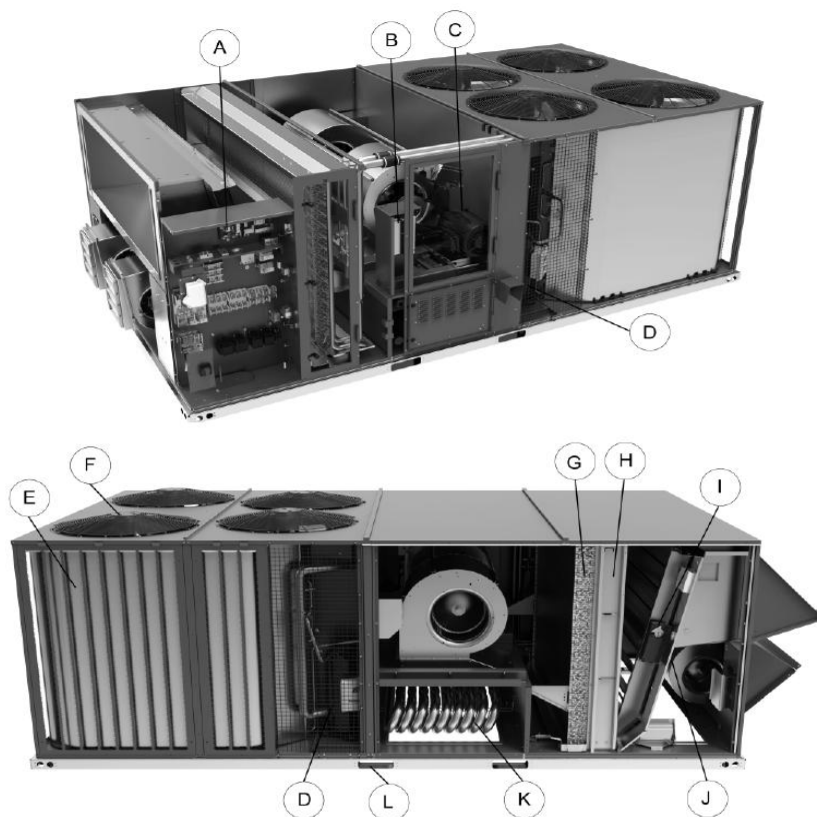
TONNAGE	OPERATING WEIGHT (LBS) (BASE UNIT)	CENTER OF GRAVITY LOCATION (BASE UNIT)		4 POINT CORNER LOADS (LBS) (BASE UNIT)				6 POINT CORNER LOADS (LBS) (BASE UNIT)					
		X	Y	A	B	C	D	A	B	C	D	E	F
12.5	2190 [993]	67.9 [1726]	46.9 [1191]	610 [277]	547 [248]	488 [221]	545 [247]	415 [188]	358 [162]	319 [145]	370 [168]	385 [175]	343 [156]
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Component Location

Unit components

Figure 1: Component location



The previous figure shows the AVXX model. The following table lists the components of the unit.

Table 1: Component location table

Item	Description	Item	Description
A	Smart Equipment™ controls	G	Copper tube/aluminum fin evaporator coil
B	Optional variable frequency drive	H	Filter access, 2-inch or 4-inch filter options
C	Belt drive blower motor with dual centrifugal fan design	I	Optional economizer. Optional manual or motorized outside air dampers not shown.
D	Scroll compressors in various arrangements to produce 2 or 4 stages of cooling depending on the selected model	J	Optional powered exhaust. Optional barometric relief not shown.
E	MicroChannel condenser coils	K	Optional staged or modulating gas heat with aluminized or stainless steel heat exchanger
F	Condenser fans	L	Full perimeter base rails with holes for overhead rigging

Project Name: Lakeview Middle School

Unit Model #: AW15T3CQ4G1CGT66B2

Quantity: 1 Tag #: RTU-C1

Typical Installation

Typical installation

The following figures show the typical installations for the unit.

Figure 14: Roofjack installation

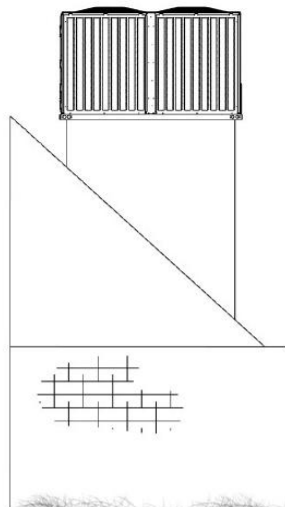
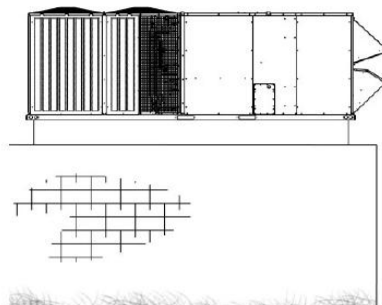


Figure 15: Roof curb installation



Project Name: Lakeview Middle School

Unit Model #: AW15T3CQ4G1CGT66B2

Quantity: 1 Tag #: RTU-C1

Economizer Drawing

Economizer options

Figure 13: Economizer options

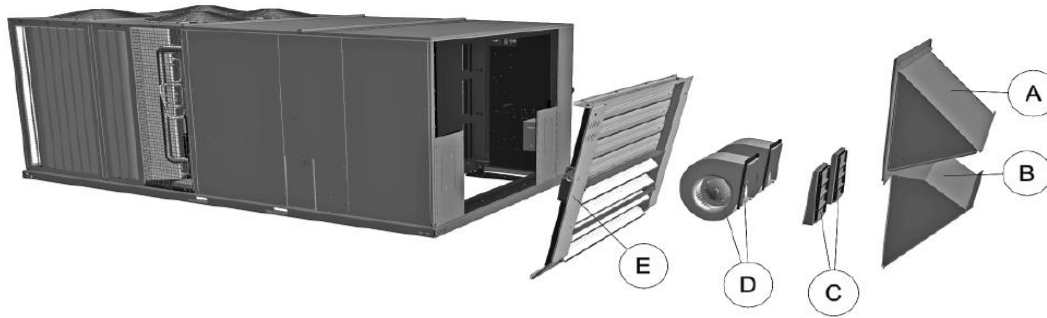


Table 38: Economizer components

Item	Description
A	Fresh air hood
B	Power exhaust hood
C	Power exhaust damper
D	Power exhaust
E	Low leak economizer

Project Name: **Lakeview Middle School**

Unit Model #: **AW15T3CQ4G1CGT66B2**

Quantity: **1** Tag #: **RTU-C1**

Rainhood Drawing

Rain hood dimensions

Figure 8: Rain hood dimensions

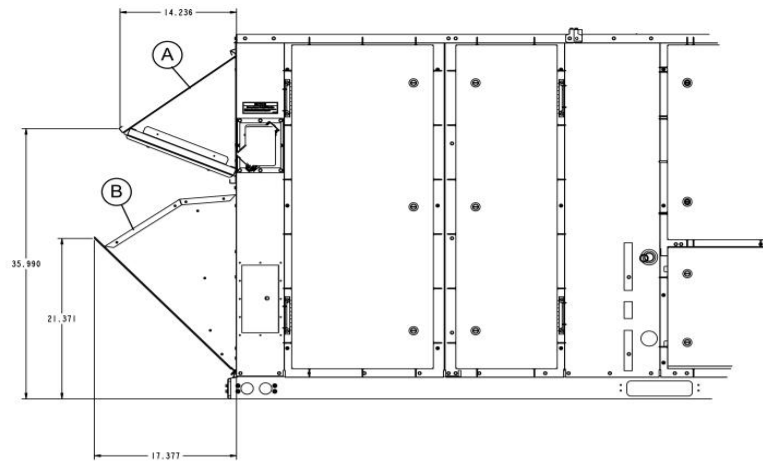


Table 32: Rain hood components

Item	Description
A	Economizer/motorized damper and power exhaust rain hood
B	Air intake hood

Date

09/12/2023

Project Name

Lakeview Middle School

Project Number

Client / Purchaser



Guide Specification Summary Page

Product Series	Models and Unit Tags	
Sun Choice 15-27.5 Ton Package	AW15T3CQ4G1CGT66B2	RTU-C1

**12.5 to 23 Tons Nominal Cooling
178,000 to 324,000 BTUH Nominal Gas Heating Output
25 to 75 kW Electric Heating**

23 06 80 Schedules for Decentralized HVAC Equipment

23 06 80. 13 Decentralized Unitary HVAC Equipment Schedule

23 06 80. 13.A. Rooftop unit schedule

1. Schedule is per the project specification requirements.

23 07 16. HVAC Equipment Insulation

23 07 16. 13 Decentralized, Rooftop Units:

23 07 16. 13.A. Evaporator fan compartment:

1. Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

23 07 16. 13.B. Gas heat compartment:

1. Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

23 07 16. 13.C. Economizer and Control compartment:

1. Shall be Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

23 07 16. 13.D. Partition and Duct Panel:

1. Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

23 07 16. 13.E. Base Pan and Blower Back:

1. Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, foil faced fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13. 23 Sensors and Transmitters

23 09 13. 23.A. Thermostats

1. Thermostat must
 - a. Energize "Y" when calling for cooling and "W" when calling for heating.
 - b. Shall have capability to energize 4 different stages of cooling, and 2 different stages of heating.
 - c. Shall include capability for occupancy scheduling.

23 09 23 Direct- digital Control system for HVAC

23 09 23. 13 Decentralized, Rooftop Units:

23 09 23. 13.A. Simplicity SMART Equipment Control

1. Shall be ASHRAE 62 compliant.
2. Shall accept 20-30 VAC input power, 50/60Hz. 24 VAC nominal.
3. Shall have an operating temperature range from -40°F to 158°F; 10-90% RH (non-condensing UI), and -4°F to 158°F; 10-90% RH (non-condensing), with a storage temperature range from -40°F to 194°F; 5-95% RH (non-condensing).
4. Shall include an option of an Economizer microprocessor controller which communicates directly with the Unit Control Board and has 8 Analog outputs, 2 Analog inputs, 2 Binary outputs, 3 Binary inputs.
5. Controller shall accept the following inputs: space temperature, return air temperature sensor, set point adjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lock- out, fire/smoke

- shutdown, single and dual enthalpy, fan status, remote time clock, Sensor Actuator (SA) Bus communicated temperature/humidity/CO2 values from Network sensors, Field Controller (FC) Bus Network Overrides for space temperature, outdoor air temperature, space humidity, outdoor air quality, Indoor air quality, System purge.
6. Shall accept a CO2 sensor or multiple CO2 sensors networked together in the conditioned space, and be Demand Control Ventilation (DCV) ready.
 7. Shall provide compressor short-cycle protection with minimum compressor runtime set at 3 minutes standard and adjustable from 2 to 7 minutes.
 8. Unit shall provide surge protection for the controller through a circuit breaker.
 9. Shall have open communication protocols with all required points exposed. Protocols supported include: BACnet®, MS/TP, Modbus®, and N2 communication.
 10. Shall have an LCD display on the Unit Control Board to display fault messages as well as navigate the menu structure to review and change set points.
 11. Shall utilize a USB connection to allow for uploading and downloading of data.
 - a. USB shall allow for downloading of “trending data” for analysis of inputs and values on other device such as a PC.
 - b. USB shall allow for uploading of new firmware to the UCB.
 - c. USB shall allow for backing up controller set points and parameters and for uploading of these same parameters to the UCB.
 12. Shall include an RJ-12 port to be used with a Wi-Fi signal transmitting device and allow unit(s) access via any non-proprietary smart device.
 - a. Unit access shall include ability to view and change all adjustable parameters and set points using the same characteristics and values available directly through the UCB joystick and LCD display.
 - b. Unit access shall be configurable at 3 different levels to allow control over parameter and set point changes.
 - c. Wi-Fi transmitting device can be connected by 3 means.
 - 1) RJ-12 port connected directly to UCB.
 - 2) Optional connection port mounted in operating space.
 - 3) Optional connection to building network allowing unit access from any internet browser worldwide.
 13. Shall have the capability to integrate with Verasys zoning controls system.
 14. Shall not require any proprietary software or contractor tool to start-up, commission and troubleshoot unit operation.
 15. Software upgrades will be accomplished by local download via USB port on main Unit Control Board.
 16. Shall be UL Recognized, File E107041, UL 916, Energy management Equipment, UL 60335-2-40, Heating and Cooling Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class B, CSA 22.2 No. 236, Signal Equipment Industry Canada, ICES-003 Recognized, and BTL certified.

23 09 33 Electric and Electronic Control System for HVAC

23 09 33. 13 Decentralized, Rooftop Units:

23 09 33. 13.A. General

1. Shall be complete with self- contained low- voltage control circuit protected by a resettable circuit breaker on the 24- v transformer side. Transformer shall have minimum 75VA capability.
2. Shall utilize color- coded wiring.
3. Shall include a central control terminal board to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, gas controller, economizer, thermostat, DDC control options, and low and high pressure switches.
4. The gas furnace shall be controlled by an integrated gas controller (IGC) microprocessor. See heat exchanger section of this specification.

23 09 33. 23.B. Safeties:

1. Compressor over- temperature and over- current.
2. Low pressure switch and high pressure switch.
 - a. Low pressure switch shall use different color wire than the high pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
3. Automatic reset, motor thermal overload protector.
4. Gas heating section shall be provided with the following minimum protections.
 - a. Primary and auxiliary high temperature limit switches

- b. Induced draft pressure sensor
- c. Flame rollout switch
- d. Flame proving controls
- 5. Electric heat section shall be provided with the following minimum protections:
 - a. Primary, backup and auxiliary high temperature limit switches

23 40 13 Panel Air Filters

- 23 40 13 13. Decentralized, Rooftop Units:
- 23 40 13. 13.A. Standard filter section
 - 1. Shall consist of factory installed, low velocity, disposable 2- in. thick fiberglass filters of commercially available sizes.
 - 2. Units can accept 2" or 4" filters and have a field convertible transition.
 - 3. Filters shall be accessible through an access panel; hinged panel with toolless access is available as described in the Special Features Options and Special Features Options and Accessories section of this specification.

23 81 19 Self- Contained Air Conditioners

- 23 81 19 13. Small- Capacity Self- Contained Air Conditioners
- 23 81 19. 13.A. General
 - 1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic, suction gas cooled, direct drive compressor(s) for cooling duty and gas combustion or nickel chromium elements for heating duty.
 - 2. Factory assembled, single- piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start- up.
 - 3. Unit shall use environmentally sound, R-410A refrigerant.
 - 4. Unit shall be installed in accordance with the manufacturer's instructions.
 - 5. Unit must be selected and installed in compliance with local, state, and federal codes.
- 23 81 19. 13.B. Quality Assurance
 - 1. Unit meets ASHRAE 90.1 minimum efficiency requirements.
 - 2. Unit shall be rated in accordance with AHRI Standards 210/240 or 340/360.
 - 3. Unit shall be designed to conform to ASHRAE 15.
 - 4. Unit shall be CSA tested and certified in accordance with ANSI Z21.47 -2016/CSA 2.3-2016, and CSA C22.2 No. 60335-2-40.
 - 5. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
 - 6. Unit casing shall be capable of withstanding 750- hour salt spray exposure per ASTM B117 (scribed specimen).
 - 7. Roof curb shall be designed to conform to NRCA Standards.
 - 8. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.
 - 9. Unit shall be designed in accordance with CSA C.22.2 NO.60335-2-40, including tested to withstand rain.
 - 10. Unit shall be constructed to prevent intrusion of snow into the control box.
 - 11. 15 – 25 ton units shall be shake tested to Truck 2, ASTM D4169 to ensure shipping reliability.
- 23 81 19. 13.C. Delivery, Storage, and Handling
 - 1. Unit shall be stored and handled per manufacturer's recommendations.
 - 2. Overhead crane can be used to place the units on a roof using rigging holes built into the unit base rails without any additions to the unit.
 - 3. Unit shall only be stored or positioned in the upright position.
- 23 81 19. 13.D. Project Conditions
 - 1. As specified in the contract.
- 23 81 19. 13.E. Operating Characteristics
 - 1. Unit shall be capable of starting and running at 115°F (52°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 or 340/360 at ±10% voltage.
 - 2. Compressor with standard controls shall be capable of operation down to 45°F (7°C), ambient outdoor temperatures. Intermittent cooling shall be operational down 0° F (-17° C).



3. Unit shall be factory configured for vertical supply & return configurations.
- 23 81 19. 13.F. Electrical Requirements
 1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.
- 23 81 19. 13.G. Unit Cabinet
 1. Unit cabinet shall be constructed of galvanized steel with exterior surfaces coated with a non-chalking, powder paint finish, certified at 750 hour salt spray test per ASTM-B117 standards.
 2. Unit cabinet exterior paint shall be: film thickness, (dry) 3.0 MILS minimum, gloss (per ASTM D523, 60°F / 16°C): 80+/- 5, Hardness: H- 2H Pencil hardness.
 3. Unit cabinet shall have gas utility entry holes in the side of the unit and in the unit underside. Entry holes shall not require field setup and shall be capped from the factory to prevent water intrusion when not in use.
 4. Unit cabinet shall have electric utility entry locations marked from the factory with a dimple for accuracy of field drilling. Entry locations shall be available for entry through the side of the unit or from the unit underside.
5. Base Rail
 - a. Unit shall have base rails on all 4 sides.
 - b. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
 - c. Holes shall be provided in the base rail for moving the unit by fork truck.
 - d. Base rail shall be a minimum of 15 gauge thickness.
6. Condensate pan and connections:
 - a. Shall be a multidirectional internally sloped condensate drain pan made of a non- corrosive material.
 - b. Shall comply with ASHRAE Standard 62.
 - c. Shall use a 1" NPT female drain connection through the side of the drain pan. Connection shall be made per manufacturer's recommendations.
 - d. Shall include intentional "overflow notch" and water containment path to guide flow of water where desired in the event of a drain pan overflow.
7. Top panel:
 - a. Shall be a multi piece top panel.
8. Electrical Connections
 - a. All unit power wiring shall enter unit cabinet through a field drilled hole located by a factory provided dimple.
 - b. Through- the- base capability.
 - 1) Standard unit shall have a through- the- base electrical location(s) using a raised, embossed portion of the unit base-pan.
 - 2) No base-pan penetration, other than those authorized by the manufacturer, is permitted.
- 23 81 19. 13.H. Gas Heat
 1. General
 - a. Heat exchanger shall be an induced draft design. Positive pressure heat exchanger designs shall not be allowed.
 - b. Shall incorporate a direct- spark ignition system and redundant main gas valve.
 - c. Gas supply pressure at the inlet to the rooftop unit gas valve must match that required by the manufacturer.
 - d. Burners shall be of the in- shot type constructed of aluminum- coated steel.
 - e. Burners shall incorporate orifices for rated heat output up to 2000 ft. (610m) elevation. Additional accessory kits may be required for applications above 2000 ft. (610m) elevation, depending on local gas supply conditions.
 - f. Each heat exchanger tube shall contain multiple dimples for increased heating effectiveness.
 2. The gas furnace shall be controlled by an integrated gas controller (IGC) microprocessor.
 - a. IGC board shall notify users of fault using an LED (light- emitting diode).
 - b. Unit shall be equipped with anti- cycle protection with one cycle on the unit flame rollout switch, 3 short cycles on the high temperature limit switch, one cycle on the auxiliary limit switch, and one cycle on indoor blower fault detection. Fault indication shall be made using an LED.
 3. Modulating gas heat
 - a. Shall modulate flow of gas through to furnace to allow for incremental change of heating capacity, with capability of adjusting by as little as 1%.
 - b. Shall have a turndown ratio of 2.85 to 1.



- c. Heat exchangers shall be of stainless steel construction.
- 4. Stainless Steel Heat Exchanger construction
 - a. The optional stainless steel heat exchanger shall be of the tubular- section type, constructed of a minimum of 20-gauge type 409 stainless steel.
 - b. Type 409 stainless steel shall be used in heat exchanger tubes and vestibule plate.
- 5. Induced draft combustion motor and blower
 - a. Shall be a direct- drive, single inlet, forward- curved centrifugal type.
 - b. Shall be made from steel with a corrosion- resistant finish.
 - c. Shall have permanently lubricated sealed bearings.
 - d. Shall have inherent thermal overload protection with automatic reset feature.
- 23 81 19. 13.I. Coils
 - 1. Evaporator Coils, Aluminum Fin - Copper Tube:
 - a. Standard evaporator coils shall have aluminum plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
 - b. b. Shall be leak tested to 150 psig, pressure tested to 250 psig, and burst qualified to CSA C22.2 No. 60335-2-40.th edition burst test at 1775 psig.
 - c. Assembled unit shall be pressure tested to 450 psig.
 - 2. Condenser Coils, All Aluminum Microchannel:
 - a. Condenser coils shall have all aluminum microchannel design consisting of aluminum multiport flat tube design and aluminum fin. Coils shall be a furnace brazed design and contain epoxy lined shrink wrap on all aluminum to copper connections.
 - b. Microchannel condenser coils shall be leak tested to 150 psig, pressure tested by supplier to 600 psig, and burst qualified to CSA C22.2 No. 60335-2-40.
 - c. Assembled unit shall be pressure tested to 450 psig.
- 23 81 19. 13.J. Refrigerant Circuits
 - 1. 4 speed IntelliSpeed and Variable Air Volume airflow options shall have 2 independent refrigerant circuits with variable cooling control.
 - 2. Refrigerant circuit shall include the following control, safety, and maintenance features:
 - a. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range.
 - b. Refrigerant filter drier - Solid core design.
 - c. Service gauge connections on suction and discharge lines.
 - 3. Compressors
 - a. Unit shall use fully hermetic scroll compressors for each independent refrigeration circuit.
 - b. Variable capacity models that are 12.5 or 15 tons shall use a variable speed compressor on circuit one and a two stage compressor on circuit two.
 - c. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
 - d. Compressors shall be internally protected from high discharge temperature conditions.
 - e. Compressors shall be protected from an over- temperature and over- amperage conditions by an internal, motor overload device.
 - f. Compressor shall be factory mounted on rubber grommets.
 - g. Crankcase heaters shall be installed in the factory as needed on tandem compressor sets.
- 23 81 19. 13.K. Filter Section
 - 1. Filters access is specified in the unit cabinet section of this specification.
- 23 81 19. 13.L. Evaporator Fan and Motor
 - 1. Evaporator fan motor:
 - a. Shall have permanently lubricated ball-bearings.
 - b. Shall have inherent automatic- reset thermal overload protection.
 - c. The job site selected brake horsepower shall be required to not exceed the motor's nameplate horsepower rating plus the service factor.
 - 2. Evaporator Fan:

- a. Fan shall be a belt drive assembly with an adjustable pitch motor pulley.
 - b. Blower bearings shall have an L10 life of 100,000 hrs
 - c. Shall use sealed, permanently lubricated ball-bearing type.
 - d. Shall use dual blower design consisting of two balanced blower fans on a single shaft.
 - e. Blower fan shall be double- inlet type with forward- curved blades.
 - f. Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.
- 23 81 19. 13.M. Condenser Fans and Motors
- 1. ECM condenser fan motors:
 - a. Shall be a totally enclosed motor.
 - b. Shall use permanently lubricated ball-bearings.
 - c. Shall have inherent thermal overload protection with an automatic reset feature.
 - d. Shall use a shaft- down design.
 - 2. Condenser Fans:
 - a. Shall be a direct- driven propeller type fan.
- 23 81 19. 13.N. Special Features Options and Accessories
- 1. IntelliSpeed staged air volume system:
 - a. Evaporator fan motor:
 - 1) Shall have permanently lubricated bearings.
 - 2) Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating.
 - 3) Shall be Variable Frequency duty and multi-speed control.
 - 2. Variable Frequency Drive (VFD). Available on multi-speed (IntelliSpeed) and VAV indoor fan motor options:
 - a. Shall be installed inside the unit cabinet, mounted, wired and tested.
 - b. Shall contain Electromagnetic Interference (EMI) frequency protection.
 - c. Insulated Gate Bi- Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform.
 - d. Built in LED display and controls. Does not require additional kit or options.
 - e. RS485 capability standard.
 - f. Electronic thermal overload protection.
 - g. All printed circuit boards shall be conformal coated.
 - 3. Low Leak Economizer:
 - a. Integrated, tie-bar driven parallel modulating blade design type capable of simultaneous economizer and compressor operation.
 - b. Damper blades shall be galvanized steel with tie-bar metal linkages. Plastic or composite blades on intake or return shall not be acceptable.
 - c. Damper blades shall be class 1A dampers.
 - d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below set points.
 - e. Shall be equipped with tie-bar driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
 - f. Economizer shall comply with, and be certified to, the AMCA 511 standard.
 - g. Standard leak rate shall be equipped with dampers not to exceed 3 cfm/ft² leakage at 1 in. wg pressure differential.
 - h. Economizer controller shall be the Johnson Controls SE Economizer Controller
 - 1) On- board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, meets the requirements for California Title 24, IECC 2015, and ASHRAE 90.1.
 - 2) Display alarms if the following occur
 - i. Economizer is economizing when conditions do not support
 - ii. Economizer is not economizing when conditions do support
 - iii. Damper Stuck

- iv. Excess Outdoor Air
- v. Failed Sensor
- 3) Automatic sensor detection
- 4) Capabilities for use with multiple-speed indoor fan systems
- 5) Utilize digital sensors: Dry bulb and Enthalpy
- 6) UL, CSA, and ICES-003 recognized and FCC compliant to CFR47
- i. Shall be capable of introducing up to 100% outdoor air.
- j. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements. Barometric relief can be replaced by optional power exhaust.
- k. Shall be designed to close damper(s) during loss- of- power situations with spring return built into motor.
- l. Dry bulb outdoor air temperature sensor shall be provided as standard. Single or dual enthalpy sensing is available as a factory or field installed sensing option. Outdoor air sensor set point shall be adjustable and shall range from 40° to 80°F / 4° to 27°C. Additional sensor options shall be available as accessories.
- m. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.
- n. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.
- o. Dampers shall be completely closed when the unit is in the unoccupied mode.
- p. Economizer controller shall accept a 2- 10 Vdc CO2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.
- q. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.
- 4. MagnaDry Dehumidification System:
 - a. The MagnaDry Dehumidification system is factory installed and provides dehumidification of an occupied space while maintaining temperature control utilizing a hot gas reheat coil.
 - 1) Determination of unit functionality in straight cooling, straight heating, or reheat mode shall come from standard SSE control board.
 - 2) Reheat mode shall utilize a specific reheat coil placed after the evaporator coil to heat the conditioned air back to a neutral temperature when the occupied space requires dehumidification, but the temperature requirements are satisfied.
 - 3) The reheat circuit shall utilize a 3-way electronic controlled valve to modulate the refrigerant between the condenser circuit and reheat circuit.
 - 4) Changeover from cooling mode to reheat mode shall be accomplished in 30 seconds or less.
- 5. Phase Monitor:
 - a. Shall provide protection against phase reversal, phase loss, and phase unbalance.
 - b. Switch shall automatically shut off unit control circuit if any of the above conditions is detected.
 - c. Shall have visual LED indication of operational status.
- 6. Hinged and tool less access panels:
 - a. Cabinet panels shall be hinged.
 - b. Shall provide easy access with toolless latching mechanism.
 - c. Shall be on major panels of: filter, control box, fan motor, and gas or electric heat controls.
- 7. Louvered Hail/Coil Guard:
 - a. Shall cover all external sides of unit condenser coil to prevent damage or tampering.
 - b. Field kit shall contain all materials necessary to field install a coil guard.
 - c. Shall provide protection for the coil and header on the entire exposed surfaces of the outdoor coil.
- 8. Unit-Mounted, Non-Fused Disconnect Switch:
 - a. Switch shall be factory installed, internally mounted.
 - b. National Electric Code (NEC) and UL approved non- fused switch shall provide unit power shutoff.
 - c. Shall be accessible from outside the unit.
 - d. Shall provide local shutdown and lockout capability.



9. Powered Convenience Outlet:
 - a. Outlet shall be powered from main line power to the rooftop unit.
 - b. Outlet shall be factory installed and internally mounted with easily accessible 115- v female receptacle.
 - c. Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - d. Voltage required to operate convenience outlet shall be provided by a factory installed step- down transformer.
 - e. Outlet shall be accessible from outside the unit.
10. Constant Volume Power Exhaust:
 - a. Power exhaust shall be used in conjunction with an integrated economizer.
 - b. Exhaust fans shall be of centrifugal blower design with dual exhaust fans.
 - c. Shall be controlled by economizer controller operation. Exhaust fans shall be energized when dampers open past the 0- 100% adjustable set point on the economizer control.
 - d. Factory installed exhaust and field installed fold out exhaust shall have built in fold out rain hood design to reduce installation time.
 - e. Bolt on field installed exhaust shall be either of same design as factory installed exhaust described above or of bolt on design, per customer selection.
11. Single Enthalpy Sensor:
 - a. The single enthalpy sensor option or kit shall provide a relative humidity sensor to be mounted in the outdoor air stream to provide single enthalpy economizer control.
 - b. The sensor allows the unit to determine if outside air is suitable for free cooling.

Date
09/12/2023
Project Name
Lakeview Middle School
Project Number
Client / Purchaser



Control Summary Page

Control	Models and Unit Tags	
BACnet MSTP,MdbS,N2 COM Card	AW15T3CQ4G1CGT66B2	RTU-C1

23 09 23 Direct- digital Control system for HVAC

23 09 23. 13 Decentralized, Rooftop Units:

23 09 23. 13.A. Unit Control Board

1. ASHRAE 62- 2001 compliant. BTL certified.
2. Shall accept 20-30 VAC input power, 50/60Hz. 24 VAC nominal.
3. Operating temperature range from -40F to 158F; 10-90% RH (non-condensing UI), and -4F to 158F; 10-90% Rh (non-condensing), with a storage temperature range from -40F to 194F; 5-95% RH (non-condensing).
4. Shall include an option of and Economizer microprocessor controller which communicates directly with the Unit Control Board and has 8 Analog outputs, 2 Analog inputs, 2 Binary outputs, 3 Binary outputs.
5. Controller shall accept the following inputs: space temperature, return air temperature sensor, setpoint adjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lock- out, fire/smoke shutdown, single and dual enthalpy, fan status, remote time clock, SA Bus communicated temperature/humidity/CO2 values from Network sensors, FC Bus Network Overrides for space temperature, outdoor air temperature, space humidity, outdoor air quality, Indoor air quality, System purge.
6. Shall accept a single CO2 sensor or multiple CO2 sensors networked together via communication bus in the conditioned space, and be Demand Control Ventilation (DCV) ready.
7. Shall provide the following outputs: economizer, fan, cooling stage 1, cooling stage 2, heat stage 1, heat stage 2, heat stage 3/ exhaust/ reversing valve/ dehumidify/occupied.
8. Unit shall provide surge protection for the controller through a circuit breaker.
9. Shall be Internet capable, and communicate at a Baud rate of 38.4K or faster.
10. Shall have an LED display independently showing the status of activity on the communication bus, and processor operation.
11. Unit shall incorporate a lockout circuit which provides reset capability at the space thermostat or base unit should any of the following standard safety devices trip and shut off compressor. If any of these safety devices trip, the LCD screen will display alarm message indicating the specific safety device that caused the lockout.
 - a. Loss of charge/Low-pressure switch.
 - b. High-pressure switch.
 - c. Freeze condition sensor on evaporator coil.
12. Unit control board must support each usage case:
 - a. Conventional thermostat with low voltage input terminals for easy installation
 - b. Communicating network sensors in the occupied space to provide feedback on space conditions for unit control board to compare with associated setpoints
 - c. Communication via BACnet MS/TP, Modbus RTU, N2 protocols for integration into a building automation/management system
13. Anti-short cycle and low voltage protection features included.
14. Internal occupied/unoccupied scheduling
15. Unit control board shall permit cooling operation down to a selectable value as low as 0 degrees F.
16. Shall allow for start-up, commissioning, troubleshooting, parameter adjustment, setpoint adjustment via onboard display and navigable menu with no additional interface tool or controls technician required.
17. The unit control board shall run a self-test diagnostics algorithm at startup that operated the cooling cycle, heating cycle, fan operation. A status report shall be provided upon completion of the diagnostic self-test.
18. Utilize any wi-fi enabled smart device to access the HVAC or multiple HVAC units if communication wiring between them is present (FC Bus or SA Bus). Remote access shall allow complete ability to perform start-up, commissioning, troubleshooting, parameter adjustment, setpoint adjustment.
19. Local embedded trending and scheduling. Trending data and occupancy scheduling predefined from the factory. Occupancy schedule to be modified via control board joystick menu navigation and remotely using a smart device (cellular phone, laptop, tablet)
20. A menu on the onboard screen shall display the unit status and allow changing parameters where applicable. These include but are not limited to:
 - a. Demand Ventilation Mode – enable or disable
 - b. Operational Setpoint – display current value
 - c. Supply Air Temperature (SAT) – display current value
 - d. Return Air Temperature (RAT) – display current value

- e. Operational Supply Humidity (OprSH) – display current value as provided by a 0-10VDS input, SA Bus Network Sensor, or FC Bus communicated value
 - f. Return Air Humidity (RAH) – display current value
 - g. Operational outdoor Air Temperature (OprOAT) – enthalpy calculated from OAH 0-10VDC input to Economizer board and OprOAT only if economizer is present
 - h. Operational Outdoor Air Humidity (OprOAH) – the buffered outdoor air humidity. May be from economizer boards OAH 0-10VDC input or FC Bus communicated value
 - i. Operational outdoor Air Quality (OprOAQ) – the buffered outdoor air quality in use. May be from economizer boards OAQ 0-10VDC input or FC Bus communicated value
 - j. Operational Indoor Air Quality (OprIAQ) – the buffered indoor air quality in use. May be from economizer board IAQ 0-10VDC input, SA Bus Network Sensor, or FC Bus communicated value
21. A menu shall display and allow modification to the following operations and settings:
- a. HVAC Zone Fan
 - b. Cooling
 - c. Heating
 - d. Economizer
 - e. Demand Ventilation
 - f. Power Exhaust
 - g. Sensors
 - h. Network
22. A menu shall display and allow modification to the following operations and settings:
- a. HVAC Zone – Occupied status
 - b. Indoor Fan status
 - c. Cooling status
 - d. Heating status
 - e. Economizer indication whether free-cooling is available or not
 - f. Enabling or disabling of Demand Ventilation
 - g. Power Exhaust
 - 1) Enable/disable hot-gas reheat if available
 - 2) Warmup/Cooldown
 - 3) Title 24 Load Shed
 - 4) Defrost
23. A menu shall display and allow modification to the following operations and settings:
- a. Firmware version (of UCB, Economizer, other peripheral boards)
 - b. Setting time zone
 - c. Network information
 - 1) Device name that will appear on the FC Bus
 - 2) Selection of communication protocol
 - 3) Operational Baud Rate
 - 4) Device ID
24. A menu shall display and allow modification to the following operations and settings:
- a. Version of firmware
 - b. Ability to Load new firmware
 - c. Create a backup file of the firmware and parameter setting via USB port
 - d. Restore factory default parameter values and setup
 - e. Full and Partial Cloning of parameter setpoints from or to other units
 - f. Data trend exporting
25. A menu shall display and allow modification to the following operations and settings:



- a. Unit serial number, model number and name
- b. Ability to reset Lockouts
- c. Controller name
- d. Displays the current values of all setpoints in use
- e. Displays all current values for the indoor and outdoor zones
- f. Displays current values related to:
 - 1) Indoor Fan
 - 2) Cooling
 - 3) Heating
 - 4) Heat Pump operation
 - 5) Economizer operation
 - 6) Power Exhaust
 - 7) Demand Ventilation
 - 8) Air monitoring station
 - 9) Hot Gas Reheat
 - 10) Smoke Control
- g. Current information for inputs; including
 - 1) Sensors
 - 2) Coil Sensors
 - 3) Thermostat
 - 4) Binary Inputs
 - 5) Unit Protection
 - 6) Network Inputs
 - 7) All outputs (relay and binary)
- h. Self-Test
 - 1) A patented self-test system that runs through a series of algorithms to provide a report of all functioning characteristics of the system at time of startup and commissioning.

23 09 23. 13.B. Auxiliary Control Boards

- 1. ASHRAE 62- 2001 compliant. BTL certified.
- 2. Economizer controller CEC Title 24 Compliant
 - a. Display alarms if the following occur
 - 1) Economizer is economizing when conditions do not support
 - 2) Economizer is not economizing when conditions do support
 - 3) Damper Stuck
 - 4) Excess Outdoor Air
 - 5) Failed Sensor
- 3. Refrigeration Fault Detection & Diagnostics
 - a. There is insufficient refrigerant in any circuit
 - b. There is excessive refrigerant in any circuit
 - c. There is excessive refrigerant flow
 - d. There is insufficient refrigerant flow (restriction)
 - e. Inefficient compressor
 - f. Insufficient High-side heat transfer
 - g. Excessive High-side heat transfer (low ambient control problem, low ΔP)
 - h. Insufficient Low-side heat transfer
 - i. Excessive Low-side heat transfer

- j. Sensor fault- The liquid temperature is greater than the condenser temperature (Could also be triggered if refrigerant level is very low in the system)
- k. Sensor fault- Sensor data is not available
- l. The unit is off
- m. The ambient temperature is too low
- n. The ambient temperature is too high
- o. The return air wet-bulb temperature is too low
- p. The return air wet-bulb temperature is too high
- q. Sensor fault- The condensing temperature is lower than the ambient temperature (Could also be triggered when the condenser is wet)
- r. The suction line temperature is less than the evaporator temperature
- s. The evaporator temperature is greater than the ambient temperature
- t. The liquid temperature is lower than the ambient temperature
- u. Sensor fault- Suction temperature or ambient temperature is invalid
- v. Sensor fault- The return air dry-bulb or wet-bulb temperature is invalid
- w. Sensor fault- The liquid pressure or suction pressure is invalid
- x. Sensor fault- The suction line temperature is invalid
- y. The return air dry-bulb temperature is too low
- z. The return air dry-bulb temperature is too high
- aa. The Efficiency Index is below 75% of ideal
- bb. The Capacity Index is below 75% of ideal

23 09 23. 13.C Remote Accessibility:

1. ASHRAE 62- 2001 compliant. BTL certified.
2. Provide the ability to adjust parameter values, setpoints, limits remotely
3. Connectivity to an Ethernet network via static IP address or Dynamic Name Server (DNS)
4. Allow a maximum of 100 devices on the same FC bus trunk and accessed by one remote device

START-UP & SERVICE DATA INSTRUCTION

COMMERCIAL PACKAGE UNITS

3.0 To 40.0 TONS

START-UP CHECKLIST

Date: _____

Job Name: _____

Customer Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Model Number: _____ Serial Number: _____

Qualified Start-up Technician: _____ Signature: _____

HVAC Contractor: _____ Phone: _____

Address: _____

Contractor's E-mail Address: _____

Electrical Contractor: _____ Phone: _____

Distributor Name: _____ Phone: _____

WARRANTY STATEMENT

Johnson Controls/UPG is confident that this equipment will operate to the owner's satisfaction if the proper procedures are followed and checks are made at initial start-up. This confidence is supported by the 30 day dealer protection coverage portion of our standard warranty policy which states that Johnson Controls/UPG will cover parts and labor on new equipment start-up failures that are caused by a defect in factory workmanship or material, for a period of 30 days from installation. Refer to current standard warranty policy and warranty manual found on UPGnet for details.

In the event that communication with Johnson Controls/UPG is required regarding technical and/or warranty concerns, all parties to the discussion should have a copy of the equipment start-up sheet for reference. A copy of the original start-up sheet should be filed with the Technical Services Department.

The packaged unit is available in constant or variable air volume versions with a large variety of custom options and accessories available. Therefore, some variation in the startup procedure will exist depending upon the products capacity, control system, options and accessories installed.

This start-up sheet covers all startup check points common to all package equipment. In addition it covers essential startup check points for a number of common installation options. Depending upon the particular unit being started not all sections of this startup sheet will apply. Complete those sections applicable and use the notes section to record any additional information pertinent to your particular installation.

Warranty claims are to be made through the distributor from whom the equipment was purchased.

EQUIPMENT STARTUP

Use the local LCD or Mobile Access Portal (MAP) Gateway to complete the start-up.

A copy of the completed start-up sheet should be kept on file by the distributor providing the equipment and a copy sent to:

Johnson Controls/UPG
Technical Services Department
5005 York Drive
Norman, OK 73069

SAFETY WARNINGS

The inspections and recording of data outlined in this procedure are required for start-up of Johnson Controls/UPG's packaged products. Industry recognized safety standards and practices must be observed at all times. General industry knowledge and experience are required to assure technician safety. It is the responsibility of the technician to assess all potential dangers and take all steps warranted to perform the work in a safe manner. By addressing those potential dangers, prior to beginning any work, the technician can perform the work in a safe manner with minimal risk of injury.

WARNING

Lethal voltages are present during some start-up checks. Extreme caution must be used at all times.

WARNING

Moving parts may be exposed during some startup checks. Extreme caution must be used at all times.

NOTE: Read and review this entire document before beginning any of the startup procedures.

DESIGN APPLICATION INFORMATION

This information will be available from the specifying engineer who selected the equipment. If the system is a VAV system the CFM will be the airflow when the remote VAV boxes are in the

full open position and the frequency drive is operating at 60 HZ.
Do not proceed with the equipment start-up without the design CFM information.

Design Supply Air CFM: _____ Design Return Air CFM: _____

Design Outdoor Air CFM At Minimum Position: _____

Total External Static Pressure: _____

Supply Static Pressure: _____

Return Static Pressure: _____

Design Building Static Pressure: _____

Outside Air Dilution: Economizer Position Percentage: _____ CFM: _____

Supply Gas Pressure After Regulator W/o Heat Active _____ Inches _____

ADDITIONAL APPLICATION NOTES FROM SPECIFYING ENGINEER:

REFERENCE

General Inspection	Completed	See Notes
Unit inspected for shipping, storage, or rigging damage	<input type="checkbox"/>	<input type="checkbox"/>
Unit installed with proper clearances	<input type="checkbox"/>	<input type="checkbox"/>
Unit installed within slope limitations	<input type="checkbox"/>	<input type="checkbox"/>
Refrigeration system checked for gross leaks (presence of oil)	<input type="checkbox"/>	<input type="checkbox"/>
Terminal screws and wiring connections checked for tightness	<input type="checkbox"/>	<input type="checkbox"/>
Filters installed correctly and clean	<input type="checkbox"/>	<input type="checkbox"/>
Economizer hoods installed in operating position	<input type="checkbox"/>	<input type="checkbox"/>
Condensate drain trapped properly, refer to Installation Manual	<input type="checkbox"/>	<input type="checkbox"/>
Economizer damper linkage tight	<input type="checkbox"/>	<input type="checkbox"/>
Gas Heat vent hood installed	<input type="checkbox"/>	<input type="checkbox"/>
All field wiring (power and control) complete	<input type="checkbox"/>	<input type="checkbox"/>

Air Moving Inspection	Completed	See Notes
Alignment of drive components	<input type="checkbox"/>	<input type="checkbox"/>
Belt tension adjusted properly	<input type="checkbox"/>	<input type="checkbox"/>
Blower pulleys tight on shaft, bearing set screws tight, wheel tight to shaft	<input type="checkbox"/>	<input type="checkbox"/>
Pressure switch or transducer tubing installed properly	<input type="checkbox"/>	<input type="checkbox"/>

Exhaust Inspection	Powered <input type="checkbox"/>	Barometric Relief <input type="checkbox"/>	Completed	See Notes
Check hub for tightness			<input type="checkbox"/>	<input type="checkbox"/>
Check fan blade for clearance			<input type="checkbox"/>	<input type="checkbox"/>
Check for proper rotation			<input type="checkbox"/>	<input type="checkbox"/>
Check for proper mounting (screen faces towards unit)			<input type="checkbox"/>	<input type="checkbox"/>
Prove operation by increasing minimum setting on economizer			<input type="checkbox"/>	<input type="checkbox"/>

Economizer Inspection	Standard <input type="checkbox"/>	BAS <input type="checkbox"/>	Completed	See Notes
CO ₂ sensor installed Yes <input type="checkbox"/> No <input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
Check economizer setting (Reference SSE Control Board LCD menu location)			<input type="checkbox"/>	<input type="checkbox"/>
Prove economizer open/close through SSE Board Setting			<input type="checkbox"/>	<input type="checkbox"/>

Reheat Mode	Normal <input type="checkbox"/>	or Alternate <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
Humidity Sensor (2SH0401) _____			

Operating Measurements - Air Flow

Fan operates with proper rotation	ID Fans <input type="checkbox"/>	Exh. Fans <input type="checkbox"/>	Cond. Fans <input type="checkbox"/>
Pressure drop across dry evaporator coil (At maximum design CFM) ¹	IWC		
External Static Pressure	IWC		
Return Static Pressure	IWC		
Supply Static Pressure	IWC		
Supply Air CFM Using Dry Coil Chart	CFM		
Final Adjusted Supply Air CFM ²	CFM		

1. Consult the proper airflow to pressure drop table to obtain the actual airflow at the measured pressure differential.
 2. Was a motor pulley adjustment or change required to obtain the correct airflow?
 Was it necessary to increase or decrease the airflow to meet the design conditions?
 If the motor pulley size was changed, measure the outside diameters of the motor and blower pulleys and record those diameters here;
 Blower Motor HP _____ FLA _____ RPM _____
 Pulley Pitch Diameter _____ Turns Out _____ Final Turns Out _____
 Blower Pulley Pitch Diameter _____ Fixed Sheave _____

ELECTRICAL DATA

T1 - T2 _____ Volts T2 - T3 _____ Volts
 Control Voltage _____ Volts T1 - T3 _____ Volts

Device	Nameplate	Measured List All Three Amperages
Supply Fan Motor ^{1, 2}	AMPS	AMPS
Exhaust Motor (Dampers 100%)	AMPS	AMPS
Condenser Fan #1	AMPS	AMPS
Condenser Fan #2 (if equipped)	AMPS	AMPS
Condenser Fan #3 (if equipped)	AMPS	AMPS
Condenser Fan #4 (if equipped)	AMPS	AMPS
Compressor #1	AMPS	AMPS
Compressor #2 (if equipped)	AMPS	AMPS
Compressor #3 (if equipped)	AMPS	AMPS
Compressor #4 (if equipped)	AMPS	AMPS

1. VAV units with heat section - simulate heat call to drive VAV boxes and VFD/IGV to maximum design airflow position.
 2. VAV units without heat section - VAV boxes must be set to maximum design airflow position.

OPERATING MEASUREMENTS - COOLING

Stage	Discharge Pressure	Discharge Temp.	Liquid Line Temp. ¹	Subcooling ²	Suction Pressure	Suction Temp.	Superheat
First	#	°	°	°	#	°	°
Second (if equipped)	#	°	°	°	#	°	°
Third (if equipped)	#	°	°	°	#	°	°
Fourth (if equipped)	#	°	°	°	#	°	°
Reheat 1st Stage	#	°	°	°	#	°	°

1. Liquid temperature should be taken before filter/drier.
2. Subtract 10 psi from discharge pressure for estimated liquid line pressure

Outside air temperature	_____ °F db	_____ °F wb	_____ %RH
Return Air Temperature	_____ °F db	_____ °F wb	_____ %RH
Mixed Air Temperature	_____ °F db	_____ °F wb	_____ %RH
Supply Air Temperature	_____ °F db	_____ °F wb	_____ %RH

REFRIGERANT SAFETIES

Action	Completed	See Notes
Prove Compressor Rotation (3 phase only) by gauge pressure	<input type="checkbox"/>	<input type="checkbox"/>
Prove High Pressure Safety, All Systems	<input type="checkbox"/>	<input type="checkbox"/>
Prove Low Pressure Safety, All Systems	<input type="checkbox"/>	<input type="checkbox"/>

OPERATING MEASUREMENTS - GAS HEATING

Fuel Type: ☐ Natural Gas ☐ LP Gas

Action	Completed	See Notes
Check for gas leaks	<input type="checkbox"/>	<input type="checkbox"/>
Prove Ventor Motor Operation	<input type="checkbox"/>	<input type="checkbox"/>
Prove Primary Safety Operation	<input type="checkbox"/>	<input type="checkbox"/>
Prove Auxiliary Safety Operation	<input type="checkbox"/>	<input type="checkbox"/>
Prove Rollout Switch Operation	<input type="checkbox"/>	<input type="checkbox"/>
Prove Smoke Detector Operation	<input type="checkbox"/>	<input type="checkbox"/>
Manifold Pressure	Stage 1	IWC <input type="checkbox"/>
	Stage 2 (If Equipped)	IWC <input type="checkbox"/>
	Stage 3 (If Equipped)	IWC <input type="checkbox"/>
Supply gas pressure at full fire	IWC	<input type="checkbox"/>
Check temperature rise ¹	<input type="checkbox"/> measured at full fire	°F <input type="checkbox"/>

1. Input X Eff. (BTU output)
1.08 X Temp. Rise

OPERATIONAL MEASUREMENTS - STAGING CONTROLS

Verify Proper Operation of Heating/Cooling Staging Controls	
Create a cooling demand at the Thermostat, BAS System or Simplicity SE Verify that cooling/economizer stages are energized.	<input type="checkbox"/>
Create a heating demand at the Thermostat, BAS System or Simplicity SE Verify that heating stages are energized.	<input type="checkbox"/>
Verify Proper Operation of the Variable Frequency Drive (If Required)	
Verify that motor speed modulates with duct pressure change.	<input type="checkbox"/>

FINAL - INSPECTION

Verify that all operational control set points have been set to desired value Scroll through all setpoints and change as may be necessary to suit the occupant requirements.	<input type="checkbox"/>
Verify that all option parameters are correct Scroll through all option parameters and ensure that all installed options are enabled in the software and all others are disabled in the software. (Factory software settings should match the installed options)	<input type="checkbox"/>
Verify that all access panels have been closed and secured	<input type="checkbox"/>

OBSERVED PRODUCT DIFFICIENCIES & CONCERNS:

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.