Engineering Catalog

CF Series

CF Condensers and Condensing Units

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- Low Sound ECM Condenser Fans

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- Modulating Hot Gas Reheat
- Makeup Air Applications up to 100% Outside Air

Safety

- Phase and Brownout Protection
- Single Point Non-Fused Disconnect Power Switch
- Automatic Low Pressure and Manual Reset High Pressure Safety Cut-outs
- Adjustable Compressor Lockout

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- Isolated Controls and Compressor Compartment
- Access Doors with Full-Length Stainless-Steel Piano Hinges
- Molded Lockable Handles
- Color-Coded Wiring Diagrams
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- Factory Installed Convenience Outlet
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- Remote Start/Stop Terminals
- Liquid Line Sight Glass
- Compressor Isolation Valves

System Integration

- Complete Split System with AAON DX Air Handling Units
- Remote Air-Cooled Condenser Option
- Labeled Split System Piping Stub Outs with Shut-Off Valves
- Flooded Condenser 0°F Low Ambient Controls
- Terminal Block for Thermostat with Isolation Relays
- Constant Air Volume (CAV), Variable Air Volume (VAV), Single Zone Variable Air Volume (SZ VAV), Make Up Air (MUA), and Dedicated Outdoor Air System (DX-DOAS)

Environmentally Friendly

- R-410A Refrigerant
- R-454B Refrigerant

Extended Life

- Optional 5-Year Compressor Warranty
- G90 Galvanized Steel Construction
- 2,500-Hour Salt Spray Tested Exterior Corrosion Protection
- 10,000-Hour Salt Spray Tested Polymer E-Coated Condenser Coils
- Condenser Coil Guards
- Custom Color Paint Options

2. CF SERIES FEATURE STRING NOMENCLATURE

The following is an example of the CF Series Feature String.

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A000DB

CF Series Feature String Description

2.1. CF Model Options Breakdown

GEN	MJREV	SIZE	SERIES	MNREV	VLT	
CF	A	- 015 -	B	- A -	3	- LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C000A000DB

Series And Generation

CF

Major Revision

A

Unit Size

002 = 2-ton Capacity
003 = 3-ton Capacity
004 = 4-ton Capacity
005 = 5-ton Capacity
007 = 7-ton Capacity
009 = 9-ton Capacity
011 = 11-ton Capacity
013 = 13-ton Capacity
015 = 15-ton Capacity
016 = 16-ton Capacity
018 = 18-ton Capacity
020 = 20-ton Capacity
025 = 25-ton Capacity
026 = 26-ton Capacity
030 = 30-ton Capacity
031 = 31-ton Capacity
040 = 40-ton Capacity
050 = 50-ton Capacity
060 = 60-ton Capacity

Series

A = 2-7-ton units
B = 9-15-ton units
C = 16-25 and 30-ton units
D = 26 and 31-60-ton units

Minor Revision

A

Voltage

1 = 230V/1Φ/60Hz
2 = 230V/3Φ/60Hz
3 = 460V/3Φ/60Hz
4 = 575V/3Φ/60Hz
8 = 208V/3Φ/60Hz
9 = 208V/1Φ/60Hz

2.2. CF Model Options Breakdown

		A1	A2	A3	A4	A5		
CFA-015-B-A-3	-	L	A	0	0	N	:	0-00-E0-C0-AN0-D-DE0A-00A0C000A000DB

A1: Compressor Style

0 = *Air-Cooled Condenser* - No Compressors (1 Circuit)
A = R-410A Scroll Compressors
B = R-410A Two Stage Capacity Scroll Compressors
D = R-410A Variable Capacity Scroll Compressors
E = R-410A Tandem Scroll Compressors
G = R-410A Tandem Variable Capacity Scroll Compressors
J = R-454B Scroll two-step Capacity Compressor
L = R-454B Variable Capacity Scroll Compressor
M = R-454B Tandem Scroll Compressor
N = R-454B Tandem Variable Capacity Scroll Comp (Two Circuits)
P = *Air-Cooled Condenser* - No Compressors (2 Circuits)
Q = *Air-Cooled Condenser* - No Compressors (4 Circuits)

A2: Condenser Style

A = Air-Cooled Microchannel Condenser
J = Air-Source Heat Pump (Fin and Tube)

A3: Configuration

0 = Standard

A4: Coating

0 = Standard
E = Polymer E-Coated Condenser Coil

A5: Staging

0 = No Cooling
G = One Two-Step Refrigeration System
H = One Variable Capacity Refrigeration System
J = Two On/Off Refrigeration Systems
K = One Variable Capacity Refrigeration System + One On/Off Refrigeration System
L = Two Variable Capacity Refrigeration Systems
M = Two Two-Step Refrig Systems
N = One Variable Refrig System + One Two-Step Refrig System
R = Four On/Off Refrigeration Systems
T = Two Variable Capacity Refrigeration Systems + Two On/Off Refrigeration Systems
U = Four Variable Capacity Refrigeration Systems

2.3. CF Model Options Breakdown

	1		2A	2B	3A		3B	4		5		6A	6B	6C	
CFA-015-B-A-3-LA00N :	0	-	0	0	-	E	0	-	C	0	-	A	N	0	- C0-AN0-D-DE0A-00A0C000A000DB

Unit Feature Options

1: Unit Orientation

0 = *Vertical Condenser Discharge* - Standard Access
A = *Horizontal Condenser Discharge* - Standard Access

2A: Refrigeration Control

0 = Standard
A = Five Minute Compressor Off Timer + 20 Second Compressor Stage Delay
C = Adjustable Fan Cycling
D = Adjustable Compressor Lockout
G = Option A + Adjustable Fan Cycling
H = Option A + Adjustable Compressor Lockout
W = Option A + Adjustable Fan Cycling + Adjustable Compressor Lockout

2B: Blank

0 = Standard

3A: Refrigeration Options

0 = Standard
A = Hot Gas Bypass Lead Stage [HGB]
B = HGB Lead + HGB Lag
D = HGB Non-Variable Compressors [HGBNV]
E = Modulating Hot Gas Reheat [MHGR]
H = HGB + MHGR
J = HGB Lead + HGB Lag + MHGR
L = HGBNV + MHGR

3B: Blank

0 = Standard

4: Refrigeration Accessories

0 = Standard
A = Sight Glass
B = Compressor Isolation Valves
C = Options A + B
D = One Circuit Flooded Condenser 0°F Low Ambient Controls
E = Options A + D
F = Options B + D
G = Options A + B + D
H = Two Circuit Flooded Condenser 0°F Low Ambient Controls
J = Options A + H
K = Options B + H
L = Options A + B + H
R = Four Circuit Flooded Condenser 0°F Low Ambient Controls
S = Options A + R
T = Options B + R
U = Options A + B + R

5: Blank

0 = Standard

6A: Unit Disconnect Type

0 = Single Point Power Block
A = Single Point Power Non-Fused Disconnect

6B: Disconnect Size

0 = Standard
N = 100 amps
R = 150 amps
V = 250 amps
Z = 400 amps

6C: Blank

0 = Standard

2.4. CF Model Options Breakdown

		7	8A	8B	8C	8D	9	10	11	12	13	
CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0	-	D	D	E	0	A	0	0	A	0	C	00-0A000DB

7: Accessories

0 = Standard
B = Phase & Brown Out Protection
D = Suction Pressure Transducer on Each Refrigeration Circuit
E = Compressor Sound Blanket
L = Options B + D
M = Options B + E
Q = Options D + E
1 = Options B + D + E

8A: Control Sequence

A = Terminal Block for Thermostat w/ Isolation Relays
D = *VAV Unit Controller* - VAV Cool + CAV Heat
E = *CAV Unit Controller* - CAV Cool + CAV Heat
F = *Makeup Air Unit Controller* - CAV Cool + CAV Heat
H = *Constant Volume HP Unit Controller* - CAV Cool + CAV Heat
J = *Makeup Air HP Unit Controller* - CAV Cool + CAV Heat
N = Field Installed DDC Controls by Others with Isolation Relays
Q = DX-DOAS Controls
R = DX-DOAS Controls Heat Pump

8B: Control Suppliers

0 = Standard Terminal Block
E = VCC-X (Main Controller in Air Handling Unit)
J = AAON Refrigeration System Supervisory Controls

8C: Control Supplier Options

0 = Standard

8D: BMS Connection & Diagnostics

0 = Standard
A = BACnet IP
J = BACnet IP with Diagnostics

9: Blank

0 = Standard

10: Blank

0 = Standard

11: Maintenance Accessories

0 = Standard
A = Factory Wired 115VAC Convenience Outlet
B = Field Wired 115VAC Convenience Outlet
C = Service Lights
E = Remote Unit Start/Stop Terminals
F = Options A + C
H = Options A + E
J = Options B + C
L = Options B + E
N = Options C + E
R = Options A + C + E
U = Options B + C + E

12: Code Options

0 = Standard ETL USA Listing
B = ETL USA + Canada Listing

13: Air-Cooled Condenser Accessories

0 = Standard
A = Condenser Coil Guard
C = ECM Condenser Fan Head Pressure Control
E = VFD Condenser Fan Head Pressure Control
G = Options A + C
J = Options A + E
N = Option C + Low Sound Condenser Fan
S = Options A + C + Low Sound Condenser Fan

2.5. CF Model Options Breakdown

	14	15		16	17	18	19	20	21	22
CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C	0	0	-	0	A	0	0	0	D	B

14: Blank

0 = Standard

15: Blank

0 = Standard

16: Electrical Options

0 = Standard 5 kAIC
C = 10 kAIC

17: Shipping Options

0 = Standard
A = Crating
B = Export Crating

18: Blank

0 = Standard

19: Blank

0 = Standard

20: Cabinet Material

0 = Galvanized Steel Cabinet

21: Warranty

0 = Standard
D = Extended Compressor Warranty (2-5 Years)

22: Type

B = Premium AAON Gray Paint Exterior
E = Premium AAON Gray Paint Exterior + Shrink Wrap
X = SPA + Premium AAON Gray Paint Exterior
1 = SPA + Premium AAON Gray Paint Exterior + Shrink Wrap

3. MODEL OPTIONS

3.1. Generation, Major Revision, and Unit Size

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A000DB

Unit size designates nominal gross tons cooling at AHRI conditions for CF Series condensing units. Actual capacities will vary with conditions. Refer to AAON's ECat software for information on the unit's performance and cooling capacities at design conditions.

Table 1: Generation, Major Revision, Unit Sizes, and Cabinet Series

Unit Size	Cabinet Series	Compressors/ Circuits	Discharge
CFA-002	A	1/1	Horizontal
CFA-003			
CFA-004			
CFA-005			
CFA-007			
CFA-009	B	2/2	Vertical
CFA-011			
CFA-013			
CFA-015			
CFA-016	C		
CFA-018			
CFA-020			
CFA-025			
CFA-030			
CFA-026	D	2/2	
CFA-031			
CFA-040		4/2	
CFA-050			
CFA-060			

3.2. Series

CFA-015-**B**-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A000DB

A = *A Cabinet* - Available on sizes 2-7 tons. The *A Cabinet* has a horizontal discharge, with a forklift base on the front and side of the unit. The service access door, for controls and compressors, is on the same side as the discharge air to minimize the clearances on the other sides of the unit. The low-voltage electrical board is a swinging panel. The *A cabinet* is a single circuit unit with one condenser fan. The unit is constructed of G90 galvanized steel panels and coated with 2,500-hour salt spray tested exterior corrosion protection paint.

Figure 1: A Cabinet

B = *B Cabinet* - Available on sizes 9-15 tons. The *B Cabinet* has a vertical discharge, with a forklift base on the front and lifting lugs on both sides of the unit. A single service access door protects the controls and compressors from outside elements. The *B cabinet* is a dual circuit unit with two condenser fans. The unit is constructed of G90 galvanized steel panels coated with 2,500-hour salt spray tested exterior corrosion protection paint.

Figure 2: B Cabinet

C = *C Cabinet* - Available on sizes 16-25 & 30-tons. The *C Cabinet* has a vertical discharge, with a forklift base on the front and lifting lugs on both sides of the unit. Two service access doors protect the controls and compressors from outside elements. The *C cabinet* is a dual circuit unit with two (16-20-ton) or four (25 & 30-ton) condenser fans. The unit is constructed of G90 galvanized steel panels coated with 2,500-hour salt spray tested exterior corrosion protection paint.

Figure 3: C Cabinet

D = *D Cabinet* - Available on sizes 26 & 31-60 tons. The *D Cabinet* has a vertical discharge, with lifting lugs on both sides of the unit. Two service access doors protect the controls and compressors from outside elements. The *D cabinet* is a dual circuit unit with four condenser fans, with tandem compressors on the 40-60-ton units. The unit is constructed of G90 galvanized steel panels coated with 2,500-hour salt spray tested exterior corrosion protection paint.

Figure 4: D Cabinet

3.3. Minor Revision

CFA-015-B-**A**-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A000DB

A = *First Revision* - This digit is used for future product updates and improvements.

3.4. Voltage

CFA-015-B-A-**3**-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A000DB

All units have single point power connections with grounding lugs, 24 VAC control circuits, and branch circuit fusing.

1 = 230V/1Φ/60Hz - Single phase voltages are only available on 2-5, 9, & 11-ton units with two-step compressors
2 = 230V/3Φ/60Hz
3 = 460V/3Φ/60Hz
4 = 575V/3Φ/60Hz
8 = 208V/3Φ/60Hz
9 = 208V/1Φ/60Hz - Single phase voltages are only available on 2-5, 9, & 11-ton units with two-step compressors

3.5. (A1) Compressor Style

CFA-015-B-A-3-**L**A00N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A000DB

0 = *Air-Cooled Condenser - No Compressor (One Circuit)* - Air-cooled condenser without compressors. Condensing coils are factory charged with a nitrogen holding charge. There is one discharge and one liquid refrigerant connection on this unit. This option is available on CF Series 2-7-ton units.

Note: The matching air handling unit must have one circuit.

A = *R-410A Scroll Compressor* - Standard on/off R-410A scroll compressors that provide one stage of capacity. Compressors include crankcase heaters. See Model Option (A5) Staging for the number of refrigeration circuits. There is a suction and liquid refrigerant connection on this unit. See the GENERAL DATA tables for the number of individual compressors in each unit size.

B = *R-410A Two-Stage Capacity Compressor* - The R-410A two-stage scroll compressors provide two stages of capacity, 67% and 100%, for more energy efficient part load operation. Compressors include crankcase heaters. Option is only available on CF Series 2-20-ton units. There is a suction and liquid refrigerant connection on this unit.

D = *R-410A Variable Capacity Scroll Compressor* - The R-410A variable capacity scroll compressors provide 10-100% modulating capacity for load matching cooling and heating, as well as more energy efficient part load operation. This option is not available on CF Series 2-ton units. Compressors include crankcase heaters. This option requires a factory installed controller option or a 1-5 VDC control signal to control compressor capacity modulation. See Model Option (A5) Staging for the number of variable capacity and on/off refrigeration circuits. There is a suction and liquid refrigerant connection on this unit. See the GENERAL DATA tables for the number of individual compressors in each unit size.

E = *R-410A Tandem Scroll Compressors* - The On/Off R-410A scroll compressors are connected in tandem. Compressors include crankcase heaters. This option is only available on CF Series 26 & 31-70-ton units. See Model Option (A5) Staging for the number of refrigeration circuits. There is a suction and liquid refrigerant connection on this unit. See the GENERAL DATA tables for the number of individual compressors in each unit size.

G = *R-410A Tandem Variable Capacity Scroll Compressor* - The R-410A variable capacity scroll compressors are connected in tandem and provide 10-100% modulating capacity for load matching cooling and heating, as well as more energy efficient part load operation. This option is only available on CF Series 26 & 31-70-ton units. Compressors include crankcase heaters. This option requires a factory installed controller option or a 1-5 VDC control signal to control compressor capacity modulation. See Model Option (A5) Staging for the number of variable capacity and On/Off refrigeration circuits. There is a suction liquid refrigerant connection on this unit. See the GENERAL DATA tables for the number of individual compressors in each unit size.

J =*R-454B Scroll 2-Step Capacity Compressor* - The R-454B two-stage scroll compressors provide two stages of capacity, 67% and 100%, for more energy efficient part load operation. Compressors include crankcase heaters. This option is only available on CF Series 2-20-ton units. There is a suction and liquid refrigerant connection on this unit.

L = *R-454B Variable Capacity Scroll Compressor* - The R-454B variable capacity scroll compressors provide 10-100% modulating capacity for load-matching cooling and heating, as well as more energy efficient part load operation. This option is only available on CF Series 3-31-ton units. Compressors include crankcase heaters. Option requires a factory installed controller option or a 1-5 VDC control signal to control compressor capacity modulation. See Model Option (A5) Staging for the number of variable capacity and on/off refrigeration circuits. Refrigerant connections on this unit are suction and liquid. See the GENERAL DATA tables for number of individual compressors in each unit size.

M = *R-454B Tandem Scroll Compressors* – The On/off R-454B scroll compressors are connected in tandem. Compressors include crankcase heaters. This option is only available on CF Series 40-60-ton units. See Model Option (A5) Staging for the number of refrigeration circuits. There is a suction and liquid refrigerant connection on this unit. See the GENERAL DATA tables for the number of individual compressors in each unit size.

N = *R-454B Tandem Variable Capacity Scroll Compressors* - The R-454B variable capacity scroll compressor is connected in tandem with an on/off compressor that provides 10-100% modulating capacity for load matching cooling and heating, as well as more energy efficient part load operation. Compressors include crankcase heaters. This option is only available on CF Series 40-60-ton units. See Model Option (A5) Staging for the number of refrigeration circuits. There is a suction and liquid refrigerant connection on this unit. See the GENERAL DATA tables for the number of individual compressors in each unit size.

P = *Air-Cooled Condenser - No Compressor (Two Circuits)* – An air-cooled condenser without compressors. The condensing coils are factory charged with a nitrogen holding charge. There are two discharge and two liquid-refrigerant connections on this unit. This option is available on CF Series 9-70-ton units.

Note: The matching air handling unit must have two circuits. This option is not available for R-454B units.

Q = *Air-Cooled Condenser - No Compressor (Four Circuits)* – An air-cooled condenser without compressors. The condensing coils are factory charged with a nitrogen holding charge. There are four discharge and four liquid refrigerant connections on this unit. This option is available on CF Series 26 & 31-70-ton units.

Note: The matching air handling unit must have four circuits. This option is not available for R-454B units.

3.6. (A2) Condenser Style

CFA-015-B-A-3-L**A**00N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A000DB

A = *Air-Cooled Microchannel Condenser* – An air-cooled condenser with aluminum microchannel coils. The unit includes a factory installed liquid line filter drier and shut-off valves. This option is for cooling only condensing units.

J = *Air-Source Heat Pump (Fin and Tube)* - This option uses an aluminum fin and copper-tube condenser coil sized for energy efficient heat pump heating and cooling. The following components are factory installed on the condensing unit: reversing valve, TXV with internal or external check valve, bi-flow liquid line filter drier (or filter drier loop), suction line accumulator, liquid line receiver, and shut off valves. This option is for heat pump condensing units.

3.7. (A3) Configuration

CFA-015-B-A-3-LA**0**0N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A000DB

0 = *Standard*

3.8. (A4) Coating

CFA-015-B-A-3-LA0**0**N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A000DB

0 = *Standard*

E = *Polymer E-Coated Condenser Coil* – A polymer e-coating that is applied to the entirety of the condenser coils and casings. The coating is capable of withstanding at least 10,000-hours of salt spray per ASTM B117, yet is only 0.8-1.2 mils thick, and has excellent flexibility. This option is intended for use in coastal saltwater conditions under the stress of heat, salt, sand, and wind, and is applicable to all corrosive environments where a polymer e-coating is acceptable. Coating includes a 5-year warranty, from the date of original equipment shipment from the factory. Refer to the unit Installation, Operation, and Maintenance Manual for specific instructions on coil cleaning, maintenance, and record keeping.

3.9. (A5) Staging

CFA-015-B-A-3-LA00**N**:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A000DB

0 = *No Cooling* - Remote Air-Cooled Condenser without compressors.

G = *One Two-Step Refrigeration System* - Single refrigeration circuit with two-stage capacity control. This option is available on CF Series 2-7-ton units.

Note: The matching air handling unit must have one circuit.

H = *One Variable Refrigeration System* - Single refrigeration circuit with 10-100% variable capacity control. This option is available on CF Series 3-7-ton units.

Note: The matching air handling unit must have one circuit.

J = *Two On/Off Refrigeration Systems* - Two refrigeration circuits with on/off capacity control. This option is available on CF Series 40-60-ton units.

Note: The matching air handling unit must have two circuits.

K = *One Variable Refrigeration System + One On/Off Refrigeration System* - Lead refrigeration circuit includes 10-100% variable capacity control and lag refrigeration circuit with on/off capacity control. This option is available on CF Series 40-60 units.

Note: The matching air handling unit must have two circuits.

L = *Two Variable Refrigeration Systems* - Two refrigeration circuits with 10-100% variable capacity control. This option is available on 9-70-ton units.

Note: The matching air handling unit must have two circuits. This option is not available for R-454B units.

M = *Two Two-Step Refrig System* - Two circuits with two-stage capacity control. This option is available on CF Series 9-31-ton units.

Note: The matching air handling unit must have two circuits.

N = *One Variable Refrig System + One Two-Step Refrig System* - Two refrigeration circuits, one circuit with 10-100% variable capacity control; one circuit with two-stage capacity control. This option is available on CF Series 9-31-tons units.

Note: The matching air handling unit must have two circuits.

R = *Four On/Off Refrigeration Systems* - Four refrigeration circuits with on/off capacity control. This option is available on CF Series 26 & 31-70-ton units.

Note: The matching air handling unit must have four circuits. This option is not available for R-454B units.

T = *Two Variable Refrigeration Systems + Two On/Off Refrigeration Systems* - Four refrigeration circuits with circuits one and three including 10-100% variable capacity control and circuits two and four including on/off capacity control. This Option is available on CF Series 26 & 31-70-ton units.

Note: The matching air handling unit must have four circuits. This option is not available for R-454B units.

U = *Four Variable Refrigeration Systems* - Four refrigeration circuits with 10-100% variable capacity control. Option is available on CF Series 26 & 31-70-ton units.

Note: The matching air handling unit must have four circuits. This option is not available for R-454B units.

4. UNIT FEATURES

4.1. (1) Unit Orientation

CFA-015-B-A-3-LA00N:**0**-00-E0-C0-AN0-D-DE0A-00A0C00-0A000DB

0 = *Vertical Condenser Discharge with End Control Panel* - Condenser fans will discharge air vertically from the unit. Full-length stainless steel piano hinges and quarter-turn, lockable handles provide service access to the compressor and controls compartment. This option is available on CF Series 9-60-ton units.

A = *Horizontal Condenser Discharge with Standard Access* - Condenser fans will discharge air horizontally from the unit. Full-length stainless steel piano hinges and quarter-turn, lockable handles provide service access to compressor and controls compartment. Option is available on CF Series 2-7-ton units.

4.2. (2A) Refrigeration Control

CFA-015-B-A-3-LA00N:0-**0**0-E0-C0-AN0-D-DE0A-00A0C00-0A000DB

0 = *Standard* - This option is selectable on units with no compressors and units that include AAON Controls that feature a 3-minute compressor-off timer & compressor-stage delays.

A = *5-Minute Compressor Off Timer & 20-Second Compressor Stage Delay* - This option includes controls that guarantee 5-minutes of compressor-off time to avoid compressor short cycling. Units with multiple refrigeration circuits, such as CF Series 9-70-ton units, also include a staging-delay timer that requires 20-seconds of delay before an additional cooling stage energizes.

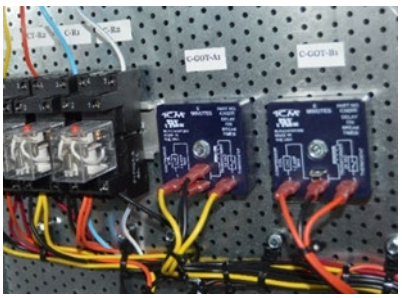

Figure 5: Time Delay Relays

G = *5-Minute Compressor-Off Timer & 20-Second Compressor-Stage Delay + Adjustable Fan Cycling*

H = *5-Minute Compressor-Off Timer & 20-Second Compressor-Stage Delay + Adjustable Compressor Lockout*

W = *5-Minute Compressor-Off Timer & 20-Second Compressor-Stage Delay + Adjustable Fan Cycling + Adjustable Compressor Lockout*

4.3. (2B) Blank

CFA-015-B-A-3-LA00N:0-0**0**-E0-C0-AN0-D-DE0A-00A0C00-0A000DB

0 = *Standard*

4.4. (3A) Refrigeration Options

CFA-015-B-A-3-LA00N:0-00-**E**0-C0-AN0-D-DE0A-00A0C00-0A000DB

0 = *Standard*

A = *Hot Gas Bypass Lead Stage [HGB]* - Field-adjustable pressure-activated bypass valve on the lead refrigeration circuit. The valve is factory set up to divert hot-compressor-discharge gas to the evaporator coil if pressure on the evaporator side of the valve drops below 100 psi for R-454B (34°F at sea level). The bypass valve is at full capacity after six degrees of differential (28°F at sea level). This option helps prevent coil freezing during periods of low air flow or cold entering coil conditions. This option only protects the refrigerant system and cannot be used for cooling capacity modulation.

Note: Hot-gas bypass is required on all VAV and MUA units without variable-capacity compressors. Hot-gas bypass on the lag circuits is recommended on all VAV and MUA units with variable-capacity compressors that are only on the lead circuits.

B = *HGB Lead + HGB Lag* - Field-adjustable pressure-activated bypass valves on the lead and lag refrigeration circuits. The valve is factory set up to divert hot-compressor-discharge gas to the evaporator coil if pressure on the evaporator side of the valve drops below 100 psi for R-454B (34°F at sea level). The bypass valve is at full capacity after six degrees of differential (28°F at sea level). This option helps prevent coil freezing during periods of low air flow or cold entering coil conditions. This option only protects the refrigerant system and cannot be used for cooling capacity modulation.

Note: Hot-gas bypass is required on all VAV and MUA units without variable-capacity compressors. Hot-gas bypass on the lag circuits is recommended on all VAV and MUA units with variable-capacity compressors that are only on the lead circuits.

D = *Hot Gas Bypass Non-Variable Compressors [HGBNV]* - Field-adjustable pressure-activated bypass valve on the non-variable refrigeration circuit. The valve is factory set up to divert hot-compressor-discharge gas to the evaporator coil if pressure on the evaporator side of the valve drops below 100 psi for R-454B (34°F at sea level). The bypass valve is at full capacity after six degrees of differential (28°F at sea level). This option helps prevent coil freezing during periods of low air flow or cold entering coil conditions. This option only protects the refrigerant system and cannot be used for cooling capacity modulation.

Note: Hot-gas bypass is required on all VAV and MUA units without variable-capacity compressors. Hot-gas bypass on the lag circuits is recommended on all VAV and MUA units with variable-capacity compressors that are only on the lead circuits.

E = *Modulating Hot Gas Reheat [MHGR]* - A three-way modulating valve that is factory-installed on the discharge line of the lead refrigeration circuit and a modulating hot gas reheat controller that is mounted in the controls cabinet. The modulating reheat valve diverts a varying percentage of the hot gas entering the condensing coil to the reheat coil to provide the unit with a dehumidification mode of operation. The MHGR option adds a three-way modulating control valve, receiver tank, and modulating hot gas reheat controls. This option requires an additional field piped hot gas line, with drip line, from the condensing unit to the air handler; a field-installed suction line accumulator/subcooler is recommended. An ECM or VFD-controlled condenser fan head pressure control (Feature 13) must be selected on units with MHGR, and the matching air handling unit must include a reheat coil.

Depending on the selected controls, the unit will be factory wired for either priority dehumidification or priority cooling.

1. **Priority dehumidification** - If the controller gets a cooling call and a dehumidification call simultaneously, the unit will run in dehumidification mode until the humidity setpoint is satisfied.

2. **Priority Cooling** - If the controller gets a cooling call and a dehumidification call simultaneously, the unit will run in cooling mode until the cooling setpoint temperature is satisfied. When there is no longer a call for cooling, but there is a call for dehumidification, the compressors will continue to run, and the reheat will be activated.

If the Standard Terminal Block is configured (Feature 8B = 0), the condensing unit will include an MHGRV-X board, and the supply air temperature sensor ships loose in the condensing unit to be installed in the matching air handling unit supply air stream.

- When Feature 8A = A (terminal block for thermostat), the unit is factory wired as priority cooling.
- When Feature 8A = N (field installed DDC controls furnished by others) the unit is factory wired as priority dehumidification.

If the VCCX2 Controls are configured (Feature 8B = E), the condensing unit will include a MHGRV-X board, and the supply air sensor will ship in the matching air handling unit wired to the VCCX2 board to be field-installed in the supply air stream. Priority dehumidification or cooling can be set through the controls in the field.

If AAON Touchscreen Controls are configured (Feature 8B = H), the condensing unit will include a Sporlan IB-G Board, and the supply air sensor will ship in the matching air handling unit wired to the AAON Touchscreen Controller to be field-installed in the supply air stream. Priority dehumidification or cooling can be set through the controls in the field.

H = *HGB Lead* + *MHGR* - Options A + E.

J = *HGB Lead* + *HGB Lag* + *MHGR* - Options B + E.

L = *HGBNV* + *MHGR* - Options D + E.

4.5. (3B) Blank

CFA-015-B-A-3-LA00N:0-00-E**0**-C0-AN0-D-DE0A-00A0C00-0A000DB

0 = *Standard*

4.6. (4) Refrigeration Accessories

CFA-015-B-A-3-LA00N:0-00-E0-**C**0-AN0-D-DE0A-00A0C00-0A000DB

0 = *Standard*

A = *Sight Glass* - The moisture indication sight glass is attached to the refrigeration circuit liquid lines. The moisture indicator shows a green color when the refrigerant is dry, a chartreuse color (green with a yellow tint or bright green) indicates caution, and a yellow color indicates a wet condition. The sight glass is not a charge indicator.

Table 2: Moisture Content in the Refrigerant

Indicator Color	75° F Liquid Line Temperature
Green DRY	Below75 ppm
Chartreuse CAUTION	75-150 ppm
Yellow WET	Above150 ppm

Figure 6: Sight Glass

B = *Compressor Isolation Valves* - These are ball-type service valves mounted on the refrigeration circuit discharge and suction lines, permitting the isolation of the compressor for service or replacement. The valves are located close to the compressors, and work through a quarter turn from open to closed. Teflon seals and gaskets are used with a nylon cap gasket to prevent accidental refrigerant loss. This option reduces the amount of refrigerant that must be recovered during compressor service or replacement.

C = *Sight Glass* + *Compressor Isolation Valves* - Options A + B.

D = *Single Circuit Flooded Condenser Low Ambient Controls* – A factory-installed, flooded condenser, head pressure control option supports the cooling operation down to 0°F ambient, on one refrigerant circuit. When the ambient temperature drops, the condensing temperature drops. A three-way pressure-activated valve allows the discharge gas to bypass the condenser. Mixing the discharge gas with liquid creates high pressure at the condenser outlet, reducing the flow, and causing liquid to back up into the condenser. Flooding the condenser reduces the area available for condensing, resulting in a rise in condensing pressure. This option adds a three-way pressure-activated valve and

receiver tank. An ECM or VFD-controlled condenser fan head pressure control (Feature 13) must be selected on units with Low Ambient Controls.

E = *Sight Glass + Single Circuit Flooded Condenser Low Ambient Controls* - Options A + D.

F = *Compressor Isolation Valves + Single Circuit Flooded Condenser Low Ambient Controls* - Options B + D.

G = *Sight Glass + Compressor Isolation Valves + Single Circuit Flooded Condenser Low Ambient Controls* - Options A + B + D.

H = *Two Circuit Flooded Condenser Low Ambient Controls* - A factory-installed, flooded condenser, head pressure control option supports the cooling operation down to 0°F ambient, on two refrigerant circuits. When the ambient temperature drops, the condensing temperature drops. A three-way pressure-activated valve allows the discharge gas to bypass the condenser. Mixing the discharge gas with liquid creates a high pressure at the condenser outlet, reducing the flow, and causing liquid to back up into the condenser. Flooding the condenser reduces the area available for condensing, resulting in a rise in condensing pressure. This option adds two three-way pressure-activated valves and two receiver tanks. A modulating head pressure control (Feature 13) must be selected on units with Low Ambient Controls.

J = *Sight Glass + Two Circuit Flooded Condenser Low Ambient Controls* - Options A + H.

K = *Compressor Isolation Valves + Two Circuit Flooded Condenser Low Ambient Controls* - Options B + H.

L = *Sight Glass + Compressor Isolation Valves + Two Circuit Flooded Condenser Low Ambient Controls* - Options A + B + H.

R = *Four Circuit Flooded Condenser Low Ambient Controls* - A factory-installed, flooded condenser, head pressure control option supports the cooling operation down to 0°F ambient, on four refrigerant circuits. When the ambient temperature drops, the condensing temperature drops. A three-way pressure-activated valve allows the discharge gas to bypass the condenser. Mixing the discharge gas with liquid creates high pressure at the condenser outlet, reducing the flow, and causing liquid to back up into the condenser. Flooding the condenser reduces the area available for condensing, resulting in a rise in condensing pressure. This option adds four three-way pressure-activated valves and four receiver tanks. A modulating head pressure control (Feature 13) must be selected on units with Low Ambient Controls.

Note: This option is not available on R-454B units.

S = *Sight Glass + Four Circuit Flooded Condenser Low Ambient Controls* - Options A + R.

Note: This option is not available on R-454B units.

T = *Compressor Isolation Valves + Four Circuit Flooded Condenser Low Ambient Controls* - Options B + R.

Note: This option is not available on R-454B units.

U = *Sight Glass + Compressor Isolation Valves + Four Circuit Flooded Condenser Low Ambient Controls* - Options A + B + R.

Note: This option is not available on R-454B units.

4.7. (5) Blank

CFA-015-B-A-3-LA00N:0-00-E0-C**0**-AN0-D-DE0A-00A0C00-0A000DB

0 = *Standard*

4.8. (6A) Unit Disconnect Type

CFA-015-B-A-3-LA00N:0-00-E0-C0-**A**N0-D-DE0A-00A0C00-0A000DB

0 = *Standard Single Point Power Block* – For this option, the unit power is wired into a single-point power block sized in accordance with the unit's MOP.

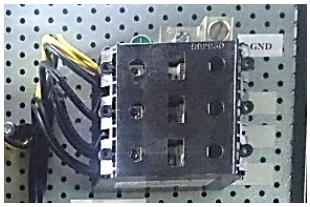

Figure 7: Power Block

A = *Single Point Power Non-Fused Disconnect* - For this option, the unit power is wired into a single-point non-fused disconnect sized in accordance with the unit's MOP.

Figure 8: Non-Fused Disconnect

4.9. (6B) Disconnect Size

CFA-015-B-A-3-LA00N:0-00-E0-C0-A**N**0-D-DE0A-00A0C00-0A000DB

N = 100 amps

R = 150 amps

V = 250 amps

Z = 400 amps

Individual components within the control cabinet are fused and/or internally protected. The disconnect switch is accessible from the exterior of the unit. The switch disconnects high-voltage service to the unit. To add a disconnect switch, select any of the disconnects. After all options have been selected, AAON's ECat software automatically calculates the minimum allowable ampacity and chooses the correct disconnect size.

4.10. (6C) Blank

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN**0**-D-DE0A-00A0C00-0A000DB

0 = *Standard*

4.11. (7) Accessories

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-**D**-DE0A-00A0C00-0A000DB

0 = *Standard*

Figure 9: PBO

B = *Phase and Brown Out Protection* - A voltage monitor which is used to protect the motors and compressors from voltage imbalance, over/under voltage, and phase loss. This option has an automatic reset.

D = *Suction Pressure Transducer All Refrigeration Circuits* - All refrigeration circuits include a pressure transducer on the suction line used to control variable capacity compressors.

E = *Compressor Sound Blanket* – This option includes a high-density insulation sound suppression blanket covering each individual compressor to dampen the radiated sound, and is factory-installed on each compressor in the unit.

L = *Phase and Brown Out Protection + Suction Pressure Transducer All Refrigeration Circuits* - Options B + D.

M = *Phase and Brown Out Protection + Compressor Sound Blanket* - Options B + E.

Q = *Suction Pressure Transducer All Refrigeration Circuits + Compressor Sound Blanket* - Options D + E.

1 = *Phase and Brown Out Protection + Suction Pressure Transducer All Refrigeration Circuits + Compressor Sound Blanket* - Options B + D + E.

4.12. (8A) Control Sequence

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-**D**E0A-00A0C00-0A000DB

A = *Terminal Block for Thermostat with Isolation Relays* – A low-voltage terminal block for use with a thermostat with factory installed isolation relays to prevent a voltage drop in the controls circuit. Isolation relays are strongly recommended on applications where there is a question about the length of control wiring. Power and starting components include a fan motor and compressor contactors, fuses, 5-minute off compressor-time-delay relays, internal fan motor overload protection, and a power terminal block for connection to a remote disconnect switch. Safety and operating controls include 24 VAC control circuit transformers, manual reset high-pressure switches, and automatic reset low-pressure switches. If the unit includes modulating-hot-gas reheat, the unit is factory wired as priority cooling (See Feature 3A for more information).

Note: This option cannot be selected with digital compressors.

D = *VAV Unit Controller VAV Cool + CAV Heat* - Standard VAV controls for cooling operation. During the cooling mode of operation, the supply fan modulates based on the supply duct static pressure, and mechanical cooling modulates based on the supply-air temperature. The heating mode of operation is only available to provide a morning warm up. On split system selections with VCCX controls, the following sensors are shipped loose in the matching air-handling unit: outside-air-temperature sensor, return-air-temperature sensor, supply-air-temperature sensor, space-temperature sensor with setpoint reset and unoccupied override, and a duct-static-pressure sensor are factory-supplied with a controller for field installation. The matching air handling unit must be selected with VCC-X controls. See the Controls section for more information.

E = *CAV Unit Controller CAV Cool + CAV Heat* - Standard Constant Volume controls for non-heat pump systems. Typically, the controlling sensor (the sensor that determines cooling, heating, etc.) is a space-temperature sensor. During the cooling mode of operation, the supply fan provides constant airflow and mechanical cooling modulates based on the supply air temperature. During the heating mode of operation, the supply fan provides constant airflow and heating modulates based on the supply-air temperature. On split system selections with VCCX controls, the following sensors are shipped loose in the matching air handling unit: outside air temperature sensor, supply air temperature sensor, and a space temperature sensor with a setpoint reset and unoccupied override are factory supplied with a controller for field installation. If the unit includes modulating hot gas reheat (Feature 3A), an EBUS space temperature and humidity sensor will be the controlling sensor. During the dehumidification mode of operation, the supply fan provides a constant airflow, the mechanical cooling modulates based on the saturated suction temperature, and the reheat modulates based on supply air temperature. The matching air handling unit must be selected with VCC-X controls. See the Controls section for more information.

F = *MUA Unit Controller* - Standard Makeup Air controls for non-heat pump systems. Typically, the controlling sensor is an outdoor-air temperature sensor. During the cooling mode of operation, the supply fan provides constant airflow and mechanical cooling modulates based on the supply air temperature. During the heating mode of operation, the supply fan provides constant airflow and heating modulates based on the supply air temperature. An outside air temperature sensor and supply-air temperature sensor are factory supplied with a controller for field installation. If the unit includes modulating hot gas reheat (Feature 3A), an EBUS outside air temperature & humidity sensor will be the controlling sensor. During the dehumidification mode of operation, the supply fan provides constant airflow, the mechanical cooling modulates based on the saturated suction temperature, and the reheat modulates based on supply air temperature. The matching air handling unit must be selected with a VCC-X controller. See the Controls section for more information.

H = *CAV Heat Pump Unit Controller CAV Cool + CAV Heat* - Standard Constant Volume controls for heat pump systems. Typically, the controlling sensor (the sensor that determines cooling, heating, etc.) is a space temperature sensor. During the cooling mode of operation, the supply fan provides constant airflow and mechanical cooling modulates based on the supply air temperature. During the heating mode of operation, the supply fan provides constant airflow and heating modulates based on the supply air temperature. On split system selections with VCCX controls, the following sensors are shipped loose in the matching air handling unit: outside air temperature sensor, supply air temperature sensor, space temperature sensor with a setpoint reset, and unoccupied override are factory supplied with a controller for field installation. If the unit includes modulating hot gas reheat (Feature 3A), an EBUS space temperature and humidity sensor will be the controlling sensor. During the dehumidification mode of operation, the supply fan provides a constant airflow, the mechanical cooling modulates based on the saturated suction temperature, and the reheat modulates based on supply air temperature. The matching air handling unit must be selected with VCC-X controls. See the Controls section for more information.

J = *MUA Heat Pump Unit Controller* - Standard Makeup Air controls for heat pump systems. Typically, the controlling sensor is an outdoor air temperature sensor. During the cooling mode of operation, the supply fan provides constant airflow and mechanical cooling modulates based on the supply air temperature. During the heating mode of operation, the supply fan provides constant airflow and heating modulates based on the supply air temperature. On split system selections with VCC-X controls, the following sensors are shipped loose in the matching air handling unit: outside air temperature sensor and a supply air temperature sensor are factory supplied with a controller for field installation. If the unit includes modulating hot gas reheat (Feature 3A), an EBUS outside air temperature and humidity sensor will be the controlling sensor. During the dehumidification mode of operation, the supply fan provides a constant airflow, the mechanical cooling modulates based on the saturated suction temperature, and the reheat modulates based on supply air temperature. The matching air handling unit must be selected with VCC-X controls. See the Controls section for more information.

N = *Field Installed DDC Controls Furnished by Others with Isolation Relays* - Provides an expanded terminal strip to interface with controls by others, with factory-installed isolation relays to prevent a voltage drop in the controls circuit. Isolation relays are strongly recommended on applications where there is a question about the length of control wiring. Power and starting components include: fan motor and compressor contactors, fuses, 5-minute-off compressor time-delay relays, internal fan motor overload protection, and a power terminal block for connection to a remote disconnect switch. Safety and operating controls include 24 VAC control circuit transformers, manual reset high-pressure switches, and automatic reset low-pressure switches. See the Controls Section and Field Controlled Terminal sheet from AAON's ECat software for more information. If the unit includes modulating-hot-gas reheat, the unit is factory wired as priority dehumidification (See Feature 3A for more information).

Q = *DX-DOAS Unit Controller* - Standard DX-DOAS controls for non-heat pump systems. The controlling sensor is an EBUS outdoor air temperature and humidity sensor. During the cooling mode of operation, the supply fan provides constant airflow and mechanical cooling modulates based on the supply air temperature. During the heating mode of operation, the supply fan provides constant airflow and heating modulates based on the supply air temperature. During the dehumidification mode of operation, the supply fan provides a constant airflow, the mechanical cooling modulates based on the saturated suction temperature, and the reheat modulates based on supply air temperature. On split system selections with VCCX controls, the following sensors are shipped loose in the matching air handling unit: an EBUS outside air temperature and humidity sensor, an EBUS supply air temperature, and a humidity sensor are factory supplied with a controller for field installation. The matching air handling unit must be selected with VCC-X controls. See the Controls section for more information.

R = *DX-DOAS Heat Pump Unit Controller* - Standard DX-DOAS controls for heat pump systems. The controlling sensor is an EBUS outdoor air temperature and humidity sensor. During the cooling mode of operation, the supply fan provides constant airflow and mechanical cooling modulates based on the supply air temperature. During the heating mode of operation, the supply fan provides constant airflow and heating modulates based on the supply air temperature. During the dehumidification mode of operation, the supply fan provides a constant airflow, the mechanical cooling modulates based on the saturated suction temperature, and the reheat modulates based on supply air temperature. On split system selections with VCCX controls, the following sensors are shipped loose

in the matching air handling unit: an EBUS outside air temperature and humidity sensor and an EBUS supply air temperature & humidity sensor are factory supplied with controller for field installation. The matching air handling unit must be selected with VCC-X controls. See the Controls section for more information.

4.13. (8B) Control Supplier

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-D**E**0A-00A0C00-0A000DB

0 = *Standard Terminal Block*

E = *VCCX2 Orion Control System (Main Controller in Air Handling Unit)* – An AAON supplied, factory installed, VCCX2 controller in the air handling unit and RSMD or RSMSD board factory installed in the condensing unit. VCCX2 must be selected as a feature in the matching air handling unit. Requires a field installed shielded pair to be wired between the AHU & CU for system control, and an optional additional shielded pair if loop communications is desired. The RSMD or RSMSD (for single digital compressor units) board is configured for the mechanical features selected at end of line testing so the VCCX2 board in the AHU will automatically download the outdoor unit configuration when connected in the field.

J = *AAON Refrigeration System Supervisory Controls* – An AAON supplied, factory installed, supervisory VCCX2 controller and RSMD in the condensing unit controls the compressor and condenser fan operation. Field wiring is required to enable cooling, heating, and dehumidification.

4.14. (8C) Control Supplier Option

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE**0**A-00A0C00-0A000DB

0 = *Standard*

4.15. (8D) BMS Connection & Diagnostics

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0**A**-00A0C00-0A000DB

0 = *Standard*

A = *BACnet IP* - AAON supplied, factory-installed, controller with BACnet IP license.

J = *BACnet IP with Diagnostics* - Option A + Extra sensors (liquid pressure, liquid temperature, and discharge temperature) that provide more refrigerant diagnostic values.

4.16. (9) Blank

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-**0**0A0C00-0A000DB

0 = *Standard*

4.17. (10) Blank

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-0**0**A0C00-0A000DB

0 = *Standard*

4.18. (11) Maintenance Accessories

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00**A**0C00-0A000DB

0 = *None*

A = *115VAC Convenience Outlet Factory Wired* - A factory-wired 2 x 4-inch electrical box with a ground fault interrupter receptacle located within the controls vestibule. The circuit is rated at 12 amps maximum and is factory wired to a step-down transformer, circuit breaker, and outlet disconnect. The circuit is wired to the line side of the unit power block, or power switch, permitting the use of the outlet while power to the unit is shut off.

CAUTION

When the power to the unit is disconnected with the factory-installed unit power switch, the convenience outlet will remain live.

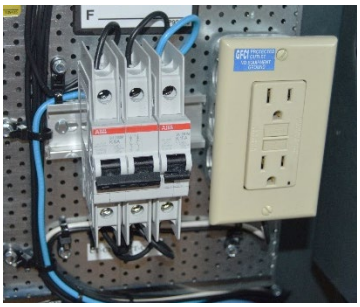

Figure 10: Factory Wired Convenience Outlet

B = *115VAC Convenience Outlet Field Wired* - A field-wired 2 x 4-inch electrical box with a ground fault interrupter receptacle, located within the controls vestibule. The receptacle is rated at 20 amps. The outlet must be field-wired to a 115-VAC power supply. Wiring is not provided by the factory.

Figure 11: Field Wired Convenience Outlet

C = *Service Access Lights* - Standard unit construction with service lights included in the controls and compressor compartment. The light circuit is wired to the line side of the unit power block, permitting the use of the lights while the power to the unit is shut off.

E = *Remote Unit Start/Stop Terminals* - Remote start/stop terminals labeled ST1 and ST2. This option is normally used with a remote time clock, or space type thermostat, with occupied/unoccupied capability. Field supplied contact closure is needed for unit operation. When contacts are open, the low-voltage circuit is broken, and the unit will not operate.

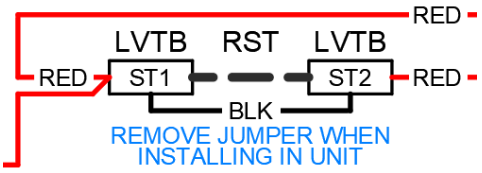

Figure 12: Remote Start/Stop Wiring Example

F = *115VAC Convenience Outlet Factory Wired + Service Lights* - Options A + C.

H = *115VAC Convenience Outlet Factory Wired + Remote Unit Start/Stop Contacts* - Options A + E.

J = *115VAC Convenience Outlet Field Wired + Service Lights* - Options B + C.

L = *115VAC Convenience Outlet Field Wired + Remote Unit Start/Stop Contacts* - Options B + E.

N = *Service Lights + Remote Unit Start/Stop Contacts* - Options C + E.

R = *115VAC Convenience Outlet Factory Wired + Service Lights + Remote Unit Start/Stop Contacts* - Options A + C + E.

U = *115VAC Convenience Outlet Field Wired + Service Lights + Remote Unit Start/Stop Contacts* - Options B + C + E.

4.19.(12) Code Options

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A**0**C00-0A000DB

0 = *Standard ETL US Listing* - All AAON equipment is ETL listed and tested in accordance with the latest revision of UL 1995. If a Special Pricing Authorization (SPA) is applied, there may be additional costs incurred to secure the ETL label.

B = *ETL US and Canada Listing* - Canadian and USA listings for export. The nameplate will be in English and French.

4.20.(13) Air Cooled Condenser

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0**C**00-0A000DB

0 = *Standard*

A = *Condenser Coil Guard* - Condenser coil guards fabricated from galvanized sheet metal, painted, and factory-installed across the condenser coil face.

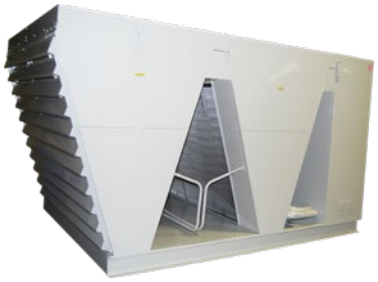

Figure 13: CF with Condenser Coil Guard

C = *ECM Condenser Fan Head Pressure Control* - Low ambient refrigerant head-pressure control option using electronically commutated motors (ECM). The motors either speed up or slow down to adjust air flow to maintain the head pressure setpoint. The head pressure setpoint is field adjustable from 260-400 psi, with a default setting of 340 psi, with a head-pressure control module. This option includes ECMs, condenser head-pressure controllers, and discharge-pressure transducers. Minimum allowable ambient temperature for cooling operation is 35°F. Option available on CF sizes 002 through 040.

E = *VFD Controlled Condenser Fan Head Pressure Control* - Factory provided and programmed VFDs receive inputs from discharge-pressure transducers on each refrigerant circuit and varies the fan speed based on the pressure inputs to maintain a discharge pressure. The standard pressure setpoint is 340 psi for standard air-cooled systems and 400 psi for modulating hot gas reheat air-cooled systems. Option includes VFD-driven motors, VFDs, power supply, and discharge-pressure transducers. If the unit is 575V, this option includes VFD-driven motors, VFDs, a condenser-head pressure controller, and discharge-pressure transducers. Minimum allowable ambient temperature for cooling operation is 35°F. This option is available on CF sizes 013 through 060.

G = *Condenser Coil Guard + ECM Condenser Fan Head Pressure Control* - Options A + C.

J = *Condenser Coil Guard + Three Phase Condenser Fan Motor + VFD Condenser Fan Head Pressure Control* - Options A + E.

N = *ECM Condenser Fan Head Pressure Control + Low-Sound Condenser Fan* - Condenser fans which are specifically designed for reduced and redirected sound emissions. The fans include optimized orifices, guide vanes, and serrated blades. These condenser fans are driven by EC motors, which either speed up or slow down to adjust the airflow in order to maintain the head pressure setpoint. The head pressure setpoint is field adjustable from 260-400 psi, with a default setting of 340 psi, with a head pressure control module. Option includes Low-Sound ECM condenser fans, condenser head pressure controller, and discharge pressure transducers. This option adds nine inches of height to the standard unit. Minimum allowable ambient temperature for cooling operation is 35°F. Option available on CF sizes 009 through 040.

Figure 14: CF With Low Sound Condenser Fans

S = *Condenser Coil Guard + ECM Condenser Fan Head Pressure Control + Low Sound Condenser Fan* - Options A + C + N.

4.21.(14) Blank

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C**0**0-0A000DB

0 = *Standard*

4.22.(15) Blank

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C0**0**-0A000DB

0 = *Standard*

4.23. (16) Electrical Options

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C00-**0**A000DB

0 = *Standard 5 kAIC*

C = *10 kAIC*

4.24. (17) Shipping Options

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0**A**000DB

0 = *Standard*

A = *Crating* - Standard crating includes a wood pallet and a skeleton crate fabricated of dimensional lumber. The B cabinet also has cardboard to protect the paint during shipping, since the crate is tighter for that cabinet size. Crating must be field disassembled and wood pallets must be removed for unit installation. Lockable access doors are shipped with a nut and bolt through the latch. The D Cabinet cannot be crated.

Figure 15: CF C Cabinet Crating

Figure 16: CF B Cabinet Cratin

B = *Export Crating* - Optional crating of the unit with additional supports for overseas shipping. This option includes a wood pallet, and a completely enclosed crate fabricated of dimensional lumber and plywood. The crating must be field disassembled and wood pallets must be removed for unit installation. Lockable access doors are shipped with a nut and bolt through the latch.

The D Cabinet cannot be crated.

4.25. (18) Shipping Options

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A**0**00DB

0 = *Standard*

4.26. (19) Blank

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A0**0**0DB

0 = *Standard*

4.27. (20) Cabinet Material

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A00**0**DB

0 = *Galvanized Steel Cabinet* - Unit construction consists of a galvanized G90 sheet metal interior with a painted exterior.

4.28. (21) Warranty

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A000**D**B

0 = *Standard Warranty* - The standard warranty includes a one-year parts-only warranty. The unit warranty coverage is 12 months from the date of equipment startup, or 18 months from the date of original equipment shipment from the factory, whichever is less.

D = *Extended Compressor Warranty - Years 2-5* - This option extends the warranty coverage of the compressors for the second to fifth years of unit operation. The warranty period begins from the date of original equipment shipment from the factory.

4.29.(22) Paint and Special Pricing Authorizations

CFA-015-B-A-3-LA00N:0-00-E0-C0-AN0-D-DE0A-00A0C00-0A000D**B**

B = *Premium AAON Gray Paint Exterior* - The cabinet exterior is primer-washed then spray-coated with a two-part polyurethane, heat-baked exterior paint. The paint is gray in color and is capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with the ASTM B117-95 test procedure.

E = *Premium AAON Gray Paint Exterior* + *Shrink Wrap* - This includes Option B, as well as, a special heat shrink plastic wrap for supplemental unit protection during shipping and storage before startup.

X = *SPA* + *Premium AAON Gray Paint Exterior* - This includes Option B + the Applications Department must issue a Special Pricing Authorization (SPA) to include a non-standard option.

1 = *SPA* + *Premium AAON Gray Paint Exterior* + *Shrink Wrap* - This includes Option X, as well as, a special heat shrink plastic wrap for supplemental unit protection during shipping and storage before startup.

5. GENERAL DATA

5.1. CF Unit Information

Table 3: 2-5 Ton CF Unit Information

	Model			
	CF-002	CF-003	CF-004	CF-005
Compressor				
Quantity/Nominal tons				
R-410A Two-Stage (TS) Scroll	1/2 TS	1/3 TS	1/4 TS	1/5 TS
Full R-410A Variable Capacity Scroll		1/3 Var.	1/4 Var.	1/6 Var.
Capacity Stages (%)	100/67, or 10-100 with variable capacity scroll compressor			
R-454B Two-Stage (TS) Scroll	1/2 TS	1/3 TS	1/4 TS	1/5 TS
Full R-454B Variable Capacity Scroll		1/3 Var.	1/4 Var.	1/5 Var.
R-454B Capacity Stages (%)	100/67, or 10-100 with variable capacity scroll compressor			
Number of Circuits	1			
Condenser Fan	1			
Discharge	Horizontal			
Quantity/Diameter	1/30"			
Standard fan hp	.33			
ECM fan hp	.33			
Liquid Line Connection	3/8"		1/2"	
Suction Line Connection	3/4"		7/8"	
Discharge Line Connection	1/2"		5/8"	
Hot Gas Bypass Line Connection	1/2"			
Hot Gas Reheat Line Connection	5/8"			

Table 4: 6-11-ton CF Unit Information

	Model			
		CF-007	CF-009	CF-011
Compressor				
Quantity/Nominal tons				
Half R-410A Variable Capacity Scroll			1/4, 1/4 Var.	1/5, 1/5 Var.
Full R-410A Variable Capacity Scroll	1/6 Var.	1/7 Var.	2/4 Var.	2/5 Var.
R-410A Capacity Stages (%)	100 or 10-100 with variable capacity scroll compressor		100/50 or 10-100 with variable capacity scroll compressor	
R-454B Two-Stage (TS) Scroll		1/6 TS	2/4 TS	2/5 TS
R-454B Variable Capacity Scroll + TS Scroll		1/6 Var.	1/4 Var., 1/4 TS	1/5 Var., 1/5 TS
R-454B Capacity Stages (%)	100/67, or 10-100 with variable capacity scroll compressor		100/83.5/67/50/33, or 10-100 with variable capacity scroll compressor	
Number of Circuits	1		2	
Condenser Fan	2			
Discharge	Horizontal		Vertical	
Quantity/Diameter	1/30"		2/30"	
Standard fan hp	.33			
ECM fan hp	.33			
Liquid Line Connections	1/2"		(2) 1/2"	
Suction Line Connections	7/8"		(2) 7/8"	
Discharge Line Connections	5/8"		(2) 5/8"	
Hot Gas Bypass Line Connections	5/8"		(1 or 2) 5/8"	
Hot Gas Reheat Line Connection	5/8"		5/8"	

Table 5: 13-18-ton CF Unit Information

	Model			
	CF-013	CF-015	CF-016	CF-018
Compressor				
Quantity/Nominal tons				
Half R-410A Variable Capacity Scroll	1/6, 1/6 Var.	1/7, 1/7 Var.	1/7, 1/7 Var.	1/8, 1/8 Var.
Full R-410A Variable Capacity Scroll	2/6 Var.	2/7 Var.	2/7 Var.	2/8 Var.
R-410ACapacity Stages (%)	100/50 or 10-100 with variable capacity scroll compressor			
R-454B Two-Stage (TS) Scroll	2/6 TS	2/7 TS	2/7 TS	2/8 TS
R-454B Variable Capacity Scroll + TS Scroll	1/6 Var., 1/6 TS	1/7 Var., 1/7 TS	1/7 Var., 1/7 TS	1/8 Var., 1/8 TS
R-454B Capacity Stages (%)	100/83.5/67/50/33, or 10-100 with variable capacity scroll compressor			
Number of Circuits	2			
Condenser Fan	4			
Discharge	Vertical			
Quantity/Diameter	2/30"			
Standard fan hp	.75			
ECM fan hp	1.0			
Liquid Line Connections	(2) 1/2"		(2) 5/8"	
Suction Line Connections	(2) 7/8"		(2) 7/8"	
Discharge Line Connections	(2) 5/8"		(2) 7/8"	
Hot Gas Bypass Line Connections	(1 or 2) 5/8"		(1 or 2) 5/8"	
Hot Gas Reheat Line Connection	5/8"		7/8"	

Table 6: 20-25 & 30-ton CF Unit Information

	Model		
	CF-020	CF-025	CF-030
Compressor			
Quantity/Nominal tons			
Half R-410A Variable Capacity Scroll	1/9, 1/9 Var.	1/11, 1/11 Var.	1/13, 1/13 Var.
Full R-410A Variable Capacity Scroll	2/9 Var.	2/11 Var.	2/13 Var.
R-410A Capacity Stages (%)	100/50; 100/67 or 10-100 with variable capacity scroll compressor		
R-454B Two-Stage (TS) Scroll	2/9 TS	2/11 TS	2/12 TS
R-454B Variable Capacity Scroll + TS Scroll	1/9 Var., 1/9 TS	1/11 Var., 1/11 TS	1/12 Var., 1/12 TS
R-454B Capacity Stages (%)	100/83.5/67/50/33, or 10-100 with variable capacity scroll compressor		
Number of Circuits	2		
Condenser Fan			
Discharge	Vertical		
Quantity/Diameter	2/30"	4/26"	
Standard fan hp	.75		
ECM fan hp	1.0		
Liquid Line Connections	(2) 5/8"		
Suction Line Connections	(2) 1-3/8"		
Discharge Line Connections	(2) 7/8"		
Hot Gas Bypass Line Connections	(1 or 2) 5/8"		
Hot Gas Reheat Line Connection	7/8"		

Table 7: 26 & 31-40-ton CF Unit Information

	Model		
	CF-026	CF-031	CF-040
Compressor			
Quantity/Nominal tons			
R-410A On/Off Scroll	4/6	4/7	4/9
Half R-410A Variable Capacity Scroll	2/6, 2/5 Var.	2/7, 2/7 Var.	2/9, 2/9 Var.
Full R-410A Variable Capacity Scroll	4/5 Var.	4/7 Var.	4/9 Var.
Half R-410A Variable Capacity Tandem Scroll	3/6, 1/5 Var.	3/7, 1/7 Var.	3/9, 1/9 Var.
Full R-410A Variable Capacity Tandem Scroll	2/6, 2/5 Var.	2/7, 2/7 Var.	2/9, 2/9 Var.
R-410A Capacity Stages (%)	100/50, 100/75/50/25, or 5-100 with variable capacity scroll compressor		
R-410A Number of Circuits	2 or 4		
R-454B Two-Stage (TS) Scroll	2/11 TS	2/12 TS	
R-454B Variable Capacity Scroll + TS Scroll	1/11 Var., 1/11 TS	1/12 Var., 1/12 TS	
R454B Tandem On/Off Scroll			2/9, 2/11
R454B Tandem Variable Capacity Scroll + Tandem On/Off Scroll			1/10 Var, 1/10, 1/9, 1/11
R-454B Capacity Stages (%)	100/83.5/67/50/33, or 10-100 with variable capacity scroll compressor	100/72/50/22, or 10-100 with variable capacity scroll compressor	
R-454B Number of Circuits	2		
Condenser Fan			
Discharge	Vertical		
Quantity/Diameter	4/30"		
Standard fan hp	.75		
ECM fan hp	1.0		
Liquid Line Connections	(2) 5/8" or (4) 1/2" (R-410A only)	(2) 7/8" or (4) 1/2" (R-410A only)	
Suction Line Connections	(2) 1-3/8" or (4) 7/8" (R-410A only)	(2) 1-5/8" or (4) 1-3/8" (R-410A only)	
Discharge Line Connections	(2) 7/8" or (4) 3/4" (R-410A only)	(2) 1-1/8" or (4) 7/8" (R-410A only)	
Hot Gas Bypass Line Connections	(2) 5/8" or (4) 5/8" (R-410A only)	(2) 7/8" or (4) 5/8" (R-410A only)	
Hot Gas Reheat Line Connections	(1) 7/8" or (2) 7/8" (R-410A only)	(1) 1-1/8" or (2) 7/8" (R-410A only)	

Table 8: 50-70-ton CF Unit Information

	Model		
	CF-050	CF-060	CF-070
Compressor			
Quantity/Nominal tons			
R-410A On/Off Scroll	4/11	4/13	4/15
Half R-410A Variable Capacity Scroll	2/11, 2/11 Var.	2/13, 2/13 Var.	2/15, 2/15 Var.
Full R-410A Variable Capacity Scroll	4/11 Var.	4/13 Var.	4/15 Var.
Half R-410A Variable Capacity Tandem Scroll	3/11, 1/11 Var.	3/13, 1/13 Var.	3/15, 1/15 Var.
Full R-410A Variable Capacity Tandem Scroll	2/11, 2/11 Var.	2/13, 2/13 Var.	2/15, 2/15 Var.
R-410A Capacity Stages (%)	100/50, 100/75/50/25, or 5-100 with variable capacity scroll compressor		
R-410A Number of Circuits	2 or 4		
R454B Tandem On/Off Scroll	2/10, 2/15	2/13, 2/18	
R454B Tandem Variable Capacity Scroll + Tandem On/Off Scroll	1/12 Var, 1/13, 1/10, 1/15	1/15 Var, 1/15, 1/13, 1/18	
R-454B Capacity Stages (%)	100/70/50/20, or 10-100 with variable capacity scroll compressor	100/71/50/21, or 10-100 with variable capacity scroll compressor	
R-454B Number of Circuits	2		
Condenser Fan			
Discharge	Vertical		
Quantity/Diameter	4/36"		
Standard fan hp	1.5		
ECM fan hp			
Liquid Line Connections	(2) 1-1/8" or (4) 5/8" (R-410A only)		
Suction Line Connections	(2) 1-5/8" or (4) 1-3/8" (R-410A only)		
Discharge Line Connections	(2) 1-1/8" or (4) 7/8" (R-410A only)		
Hot Gas Bypass Line Connections	(2) 1-1/8" or (4) 5/8" (R-410A only)		
Hot Gas Reheat Line Connections	(1) 1-1/8" or (2) 7/8" (R-410A only)		

6. CONTROLS

6.1. Control Options

6.1.1. Terminal Block

Low-voltage terminal block for field wiring controls

Required Features on CF Series condensing unit

Feature 8A = A or N

Standard Terminals Labels

[R] - 24VAC control voltage
[C] - Common
[Y1], [Y2], [Y3], [Y4] - Cooling stage enables
[W1], [W2], [W3], [W4] - Heating stage enables
[O] - Reversing valve cool enable
[RH] - Humidistat or dehumidification enables input control terminal, used to activate hot gas reheat option
[AI1, COM] - Reheat control 0-10VDC
[DC1+, DC1-] - Variable capacity compressor 1-5 VDC
[SP1+, SP1-] - Suction pressure Signal, 0-5VDC
[P4], [P5], [P6], [SH] - 2nd suction pressure transducer
[C6, C7] - Supply air temperature sensor
[ST1], [ST2] - Remote Start/Stop terminals

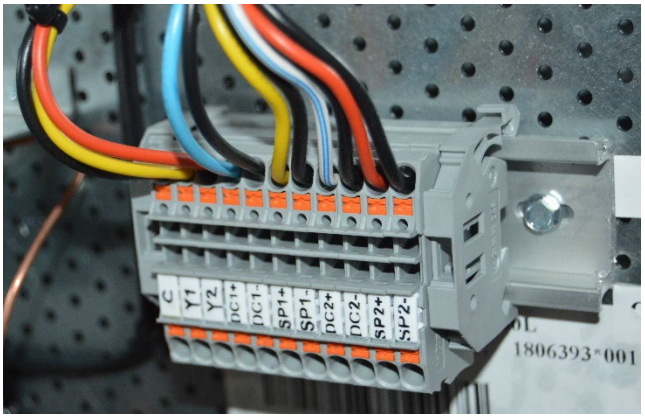

Figure 17: Low Voltage Terminal Block Example

6.1.2. Single Zone Variable Air Volume (Single Zone VAV) Unit Controller

Operation - Variable Air Volume Cooling and Variable Air Volume or Constant Air Volume Heating

With standard AAON Single Zone VAV controls, during the cooling mode of operation, the supply fan modulates based on the space temperature, while mechanical cooling modulates based on the supply air temperature. The space temperature sensor determines whether heating or cooling is enabled. For VAV heating, during the heating mode of operation, the supply fan modulates based on the space temperature and the heating modulates based on the supply air temperature. For constant volume heating, during the heating mode of operation, the supply fan provides constant air flow and heating stages based on the supply air temperature.

Factory-mounted and tested supply fan VFDs or ECMs are used to vary the speed of the supply fans and the amount of supply air. Because of the reduced speed and modulating compressors, Single Zone VAV units can be very energy efficient at part load conditions. AAON's Single Zone VAV units should be applied to only a single zone.

Required Features on CF Series condensing unit

- Feature A1 = D - Variable Capacity Scroll Compressor
- Feature 3A = Hot Gas Bypass Lag Stage - Recommended on all circuits without variable capacity scroll compressors.
- Feature 8A = N - Field-Installed DDC Controls Furnished by Others with Isolation Relays (with SPA from Applications Engineering for Single Zone)
- Feature 13 = ECM or VFD head pressure control

Recommended Features on Matching AAON Air Handling Unit

- VFD or ECM Controlled Supply Fans
- Field-Installed DDC Controls Furnished by Others with Isolation Relays (with SPA from Applications Engineering for Single Zone)
- Modulating Heat Source
- Economizer
- Fully Modulating Damper Actuators
- Modulating Hot Gas Reheat (this requires ECM or VFD condenser head pressure in CU)

Standard Supplied Sensors

- Outside Air Temperature
- Supply Air Temperature
- Space Temperature with Temperature Setpoint Reset and Unoccupied Override

6.1.3. VAV Unit Controller

VAV Operation

VAV controls are for cooling only units where the supply fan modulates to maintain a supply duct static pressure setpoint, while mechanical cooling modulates based on the supply air temperature setpoint. Heating may be activated to provide a morning warm up, whereas the cooling mode supports supply-air tempering. For any other heating requirements, the field provided and installed VAV boxes are used.

Factory-mounted and tested supply fan VFDs or ECMs are used to vary the speed of the supply fans and the amount of supply air. Because of the reduced fan speed, VAV units can be very energy efficient at part load conditions. VAV units can be used to serve multiple spaces with diverse or changing cooling requirements, with only a single unit being required for multiple zones. Each zone will have a field provided and installed VAV box.

Required Features on CF Series condensing unit

- Feature 8A = D - VAV Unit Controller
- Feature 8B = E - VCCX2 (Main Controller in AHU)
- Feature 3A = Hot Gas Bypass is required on the lead refrigeration circuit without variable capacity compressors.

Recommended Features on Matching AAON Air Handling Unit

- VFD or ECM Controlled Supply Fans
- VCCX2 VAV Unit Controller
- Modulating Gas / SCR Electric Heat
- Economizer
- Fully Modulating Damper Actuators
- Constant Volume Outside Air - maintains a minimum volume of outside air ventilation

Standard Supplied Sensors

- Outside Air Temperature
- Supply Air Temperature
- Duct Static Pressure
- Return Air Temperature
- Space Temperature with Temperature Setpoint Reset and Unoccupied Override

6.1.4. CAV (Constant Air Volume) Unit Controller

CAV Operation

Standard AAON Constant Volume controls typically use space temperature control, which means the decision to cool, heat, or vent is made by comparing the measured space temperature to the space temperature setpoint. During the cooling mode of operation, the supply fan provides constant airflow and mechanical cooling modulates based on the cooling supply air setpoint temperature. During the heating mode of operation, the supply fan provides constant airflow and heating modulates based on the heating supply air setpoint temperature.

Space or supply air temperature sensor can be used as the controlling sensor. If the space temperature is used as the controlling sensor, the supply air temperature is used as a temperature lockout. If the supply air temperature is used as the controlling sensor, the space temperature sensor is used for supply air temperature setpoint reset and unoccupied override.

A Constant Volume unit can be used to serve spaces with uniform heating and cooling requirements. Multiple units may be required for multiple zones allowing for redundancy. Constant Volume units can be used in kitchen hood or lab hood applications where when the hood is on, the unit is 100% outside air, and when the hood is off, the unit is 100% recirculating unit. For this application, additional humidity sensors are required (see below).

Required Features on CF Series condensing unit

- Feature 8A = E - Constant Volume (CAV) Unit Controller - for air cooled condenser unit
- Feature 8A = H - Constant Volume Heat Pump Unit Controller - for air source heat pump unit
- Feature 8B = E - VCCX2 (Main Controller in AHU)

Recommended Features on Matching AAON Air Handling Unit

- VCCX2 CAV Unit Controller
- Any Source of Heating - Hot Water Coil, Steam Coil, Electric Heat, Gas Heat
- Economizer
- AAONAIRE® Energy Recovery Wheel
- Fully Modulating Damper Actuators
- Modulating Hot Gas Reheat (this requires ECM or VFD condenser head pressure in CU)

Standard Supplied Sensors

- Outside Air Temperature
- Supply Air Temperature
- Space Temperature with Temperature Setpoint Reset and Unoccupied Override

Additional Required Sensors for Hood-On Operation

- Outside Air Temperature & Humidity Sensor
- Space Temperature & Humidity Sensor

6.1.5. MUA (Makeup Air) Unit Controller

MUA Operation

Standard AAON MUA controls typically use outside air temperature and humidity control, which means the decision to cool, heat, dehumidify, or vent is made by comparing the measured outside air temperature/humidity to the outside air temperature/humidity setpoint. During the cooling mode of operation, the supply fan provides constant airflow and mechanical cooling modulates based on the supply air temperature. During the heating mode of operation, the supply fan provides constant airflow and heating modulates based on the supply air temperature.

Make Up Air units are designed to provide 100% outside air to the system for ventilation purposes. Make Up Air units can improve indoor air quality (IAQ) and also be used to positively pressurize the space.

Required Features on CF Series condensing unit

- Feature 8A = F - Makeup Air Unit Controller
- Feature 8B = E - VCCX2 (Main Controller in AHU)
- Feature 3A = Hot Gas Bypass is required on the lead refrigeration circuit without variable capacity compressors

Recommended Features on Matching AAON Air Handling Unit

- VCCX2 MUA Unit Controller
- Any Source of Heating - Hot Water Coil, Steam Coil, Electric Heat, Gas Heat
- AAONAIRE® Energy Recovery Wheel
- Hot Gas Bypass
- Modulating Hot Gas Reheat (this requires ECM or VFD condenser head pressure in CU)

Standard Supplied Sensors

- Outside Air Temperature
- Supply Air Temperature

6.1.6. DX-DOAS (Dedicated Outside Air System) Unit Controller

DOAS Operation

Standard AAON DX-DOAS controls typically use outside air temperature and humidity control, which means the decision to cool, heat, dehumidify, or vent is made by comparing the measured outside air temperature/humidity to the outside air temperature/humidity setpoint. During the cooling mode of operation, the supply fan provides constant airflow and mechanical cooling modulates based on the supply air temperature. During the heating mode of operation, the supply fan provides constant airflow and heating modulates based on the supply air temperature. During dehumidification mode of operation, the unit modulates the compressors to maintain supply air dew point setpoint.

DOAS units are designed to provide 100% outside air to the system for ventilation purposes. DOAS units can improve indoor air quality (IAQ) and also be used to positively pressurize the space.

Required Features on CF Series condensing unit

- Feature 8A = Q - DX-DOAS Controls
- Feature 8B = E - VCCX2 (Main Controller in AHU)
- Feature A1 = Variable Capacity Compressor option must be selected
- Feature 3A = E - Modulating Hot Gas Reheat
- Feature 13 = Head Pressure Control option must be selected (either ECM or VFD)

Required Features on Matching AAON Air Handling Unit

- Feature 3 = H - DX-DOAS Controls
- Feature 1D = E - VCC-X
- Feature 2 = H - Modulating Hot Gas Reheat
- Feature A1 = 4 - R-454B DX Cooling
- Feature A2 = 6 - 6 row coil

Standard Supplied Sensors

- EBUS Outside Air Temperature & Humidity
- EBUS Supply Air Temperature & Humidity

7. CONTROL VENDORS

7.1. VCCX2 Controls System

The VCCX2 unit controller can be factory provided, and factory installed, in the AAON air handling unit, while the Refrigerant System Module (RSM) board is factory installed in the matching AAON condensing unit. Combined, the boards provide advanced control features, without complexity, in an easy to install and setup package. The VCCX2 controllers can be individually configured, including setpoint adjustment, sensor status viewing, and occupancy scheduling. It can control Single Zone VAV, VAV with optional morning warm-up or supply air tempering, CAV with hood/on operation, MUA, and Space Temperature Control of High Percentage Outdoor Air. Additional features and options can be managed by the controller with the addition of modular expansion I/O boards for the controller. The space temperature sensor included with the VCCX2 controller is used for supply air temperature setpoint reset and unoccupied override.

Figure 18: VCCX2 Controller

The VCCX2 controller can be operated as a Stand-Alone System, connected via modular cable to multiple VCCX2 controllers in an Interconnected System, or connected via modular cable to multiple VCCX2 controllers, VAV/Zone controllers, and Add-On controllers in a Networked System.

The VCCX2 controller has on-board BACnet® port for connection to an MS/TP network. LON is available with a field provided PT-Link.

Figure 19: RSM Board

7.1.1. Required Operator Interfaces

To configure the VCCX2 controller, an operator interface is needed. Available operator interfaces are the Modular Service Tool SD, Modular System Manager SD, System Manager TS-L, and a PC equipped with free Microsoft Windows® based Prism2 software connected via a CommLink 5. With optional USB-Link2, remote connectivity to the controller via Prism2 software can be accomplished.

Figure 20: VCCX2 Controller Operator Interfaces

8. ELECTRICAL SERVICE SIZING DATA

Use the following equations to correctly size the electrical service wiring and disconnect switch for the unit. Electrical data for a specific unit configuration can be found with AAON's ECat software. For further assistance in determining the electrical ratings, contact the Applications Department, or consult U.L. 1995.

The Minimum Circuit Ampacity (MCA) and Maximum Overcurrent Protection (MOP) must be calculated for all modes of operation, which include the cooling mode of operation, the heating mode of operation, and if the unit is a heat pump the emergency heating mode of operation and auxiliary heating mode of operation. The emergency or backup heating mode of operation is when the secondary heater is in operation and heat pump, or compressor heating, is not in operation. The auxiliary or supplemental heating mode of operation is when the heat pump, or compressor heating, is in operation and the secondary heater is also in operation.

To calculate the MCA and MOP, the number of motors and other current drawing devices in operation must be known for each mode of operation. The largest MCA and MOP values calculated from all the modes of operation are the correct values and are also on the unit nameplate.

For example, during the heating mode of operation of an air-cooled DX unit or an air-source heat pump, the supply fans, compressors, and condenser fans are all in operation. During the heating mode of operation of an air-cooled DX unit, or the emergency heating mode of operation of an air-source heat pump, only the supply fans and heater are in operation. During the auxiliary heating mode of operation of an air-source heat pump, the supply fans, compressors, condenser fans, and secondary heater are all in operation. In split systems, the MCA and MOP are calculated separately for each unit. In the last example, the supply fans and secondary heater will be used to calculate MCA and MOP values for the air handling unit, and the condenser fans and compressor will be used to calculate the MCA and MOP values for the condensing unit.

Once it is determined what current drawing devices are operating during each mode of operation, use the equations shown below to calculate the MCA and MOP.

Use Rated Load Amps (RLA) for compressors and Full Load Amps (FLA) for all other motors and electric heaters.

Load 1 = Current of the largest motor/compressor in operation
Load 2 = Sum of the currents of the remaining motors/compressors in operation
Load 3 = Current of electric heaters in operation
Load 4 = Any remaining loads greater than or equal to 1 amp

Electric Heat FLA Calculation

Single Phase

$$FLA = \frac{(Heating\ Element\ kW)\ x\ 1000}{Rated\ Voltage}$$

Three Phase

$$FLA = \frac{(Heating\ Element\ kW)\ x\ 1000}{(Rated\ Voltage)\ x\ \sqrt{3}}$$

Cooling Mode Equations

- MCA = 1.25(Load 1) + Load 2 + Load 4
- MOP = 2.25(Load 1) + Load 2 + Load 4

Heating Mode or Emergency/Backup Heating Mode without Electric Heat Equations

- MCA = 1.25(Load 1) + Load 2 + Load 4
- MOP = 2.25(Load 1) + Load 2 + Load 4

Heating Mode or Emergency/Backup Heating Mode with Less than 50 kW of Electric Heat Equations

- MCA = 1.25(Load 1 + Load 2 + Load 3 + Load 4)
- MOP = 2.25(Load 1) + Load 2 + Load 3 + Load 4

Heating Mode or Emergency/Backup Heating Mode with Greater than or Equal to 50 kW of Electric Heat Equations

- MCA = 1.25(Load 1 + Load 2) + Load 3 + 1.25(Load 4)
- MOP = 2.25(Load 1) + Load 2 + Load 3 + Load 4

Auxiliary/Supplemental Heating Mode without Electric Heat Equations

- MCA = 1.25(Load 1) + Load 2 + Load 4
- MOP = 2.25(Load 1) + Load 2 + Load 4

Auxiliary/Supplemental Heating Mode with Less than 50 kW of Electric Heat Equations

- MCA = 1.25(Load 1) + Load 2 + 1.25(Load 3) + Load 4
- MOP = 2.25(Load 1) + Load 2 + Load 3 + Load 4

Auxiliary/Supplemental Heating Mode with Greater than or Equal to 50 kW of Electric Heat Equations

- MCA = 1.25(Load 1) + Load 2 + Load 3 + Load 4
- MOP = 2.25(Load 1) + Load 2 + Load 3 + Load 4

Fuse Selection

Select a fuse rating equal to the MOP value. If the MOP does not equal a standard fuse rating, select the next lower standard fuse rating. If the MOP is less than the MCA, then select the fuse rating equal to or greater than the MCA.

The standard ampere ratings for fuses, from the *NEC Handbook, 240-6*, shall be considered 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 110, 125, 150, 175, 200, 225, 250, 300, 350, 400, 450, 500, 600, 700, 800 and 1000 amperes.

Disconnect (Power) Switch Size

- DSS $\geq$ MOP

Select the standard switch size equal to the calculated MOP value. If this value is not a standard size, select the next larger size.

9. LITERATURE CHANGE HISTORY

August 2020

Updated AAON controls to 3-minute off timer for compressors. Updated terminal block labels and picture.

October 2021

Added microchannel condenser coil option to Feature A2. Added AAON Refrigeration System Supervisory Controls option to Feature 8B. Added 10kAIC option to Feature 16.

December 2023

Start of new CF only Engineering Catalog. Removed all information about CB unit since it is now obsolete. Added R-454B refrigerant Compressor style options. Removed On/Off options for Feature A5: Staging. Removed AAON Touchscreen Controller options for Feature 8B. Removed Low Sound Condenser Fan option for Feature 13.

September 2025

Edited and Updated Document.

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