LF Series
Chillers
Engineering Catalog

AHRI CERTIFIED®
www.ahridirectory.org
Air-Cooled Water Chilling Packages
AHRI Standards 550/590 and 551/591

Table of Contents

Index of Tables and Figures

Tables:

Figures:

V45080 · Rev. A · 200630
(ACP J00427)

AAON LF Series Features and Options Introduction

Energy Efficiency
- AHRI Certified
- Staged or 10-100% Variable Capacity R-410A Scroll Compressors
- High Efficiency Air-Cooled Microchannel Condenser Coils
- VFD Controlled Pumping Packages
- VFD Controlled or ECM Driven Condenser Fans
- Low Sound ECM Condenser Fans
- Waterside Economizer
- Factory Installed EXVs

Outdoor Mechanical Room
- Chilled Water Applications up to 55 tons
- Isolated Controls and Compressor Compartment
- Isolated Evaporator and Pumping Package Compartment
- Factory Engineered Primary Pumping Packages
- Brazed Plate or Shell and Tube Evaporators

Safety
- Phase and Brownout Protection
- Single Point Non-Fused Disconnect Power Switch
- Waterside Thermometer and Pressure Gauge

Installation and Maintenance
- Double Wall Rigid Polyurethane Foam Injected Panel Construction
- Access Doors with Full Length Stainless Steel Piano Hinges
- Molded Lockable Handles
- Factory Installed Convenience Outlet
- Service Vestibule Heating
- Controls Diagnostics
- Liquid Line Sight Glass
- Compressor Isolation Valves
- Color-Coded Wiring Diagrams

System Integration
- Complete System with AAON Chilled Water Air Handling Units
- BMS Connectivity
- Grooved End Water Piping Connections
- Custom Order Paint Options

Environmentally Friendly
- R-410A Refrigerant

Extended Life
- 5 Year Compressor Warranty
- Condenser Coil Guards
- 2,500 Hour Salt Spray Tested Exterior Corrosion Protection
- 10,000 Hour Salt Spray Tested Polymer E-Coated Condenser Coil

Features and Benefits

Flexibility of Design
The AAON LF Series chiller is available from 4 to 55 tons. These capacity ranges make the LF Series chiller suitable for a variety of applications. Multiple smaller capacity chillers can be more economical, practical, and efficient than a single, centralized, chilled water plant. While especially useful in part-load applications, multiple LF Series chillers provide redundancy for scheduled service and maintenance.

For new installations, LF Series chillers can provide any tonnage requirement through a combination of units. For building upgrades or renovations, the LF Series chiller can be added to an existing system for needed capacity. Pumping packages can be factory installed to minimize field installation time and unnecessary complications.

Efficiency
All AAON LF Series chillers are available with load matching variable capacity scroll compressors on each refrigerant circuit. With these compressors, the LF Series chiller can provide part-load to low-load operation without requiring hot gas bypass.

The LF Series chiller is also available with Variable Speed Condenser Fans. By reducing fan speed, the LF Series chiller can operate more efficiently during part-load conditions, low-load conditions, and low-ambient temperatures.

Convenience and Serviceability
The LF Series chiller was designed to make installation, operation, and service of the unit as convenient as possible through the various standard and optional features. The LF Series chiller may be rooftop, platform, or ground-level slab mounted. LF Series A, B, and C cabinet chillers have forklift slots and lifting lugs for installation. LF Series D cabinet chillers have lifting lugs for installation. Water connections are accessed at the back of the cabinet, while remaining components are internal to the unit. The LF Series chiller does not require installation in remote, isolated, or protected areas to limit personnel access.

The access doors on all models have full length stainless steel piano hinges and lockable handles. The controls compartment provides convenient access to compressors, wiring, and control components. The components are labeled and all wiring is color-coded to match the unit wiring diagram, conveniently located on the access door interior.

Prior to shipping, factory installed wiring and piping is tested and inspected. Quality control testing is done through a factory monitored run test.

Figure 1 - Controls Access of LF Series

Reliability
Cabinet panels are constructed of double wall rigid polyurethane foam panel construction which provides the LF Series chiller with strength and rigidity. The condenser coils are available with louvered guards to reduce potential damage. The corrosion resistant paint on the external cabinet surpasses a 2,500 hour salt spray test. Additional corrosion protection is available through a polymer e-coating on the condenser coil. This coating surpasses a 10,000 hour salt spray test. Each chiller is factory inspected and checked for leaks before leaving the factory.

Quiet Operation
Rubber isolation mounts are used to minimize vibrations from each compressor. Variable speed condenser fans reduce energy consumption and noise during low ambient conditions. The low sound ECM condenser fans offer the best sound as they are specifically designed for reduced and redirected sound emission.

Smart Controls
Every LF Series chiller is furnished with an AAON LF Chiller Controller. Despite possible wide ranging operating conditions, the controls can maintain a constant leaving water temperature by modulating the variable capacity scroll compressors. The 2 line by 8 character LCD display with four buttons allows for setting the unit or BACnet® address, and reviewing operation status, sensor values, and alarms. The chiller controls have an internal schedule which may be used to automate chiller operations on a timed basis.

The controller uses a free Windows based graphical interface called Prism2 to allow user to configure and monitor the chiller controls.

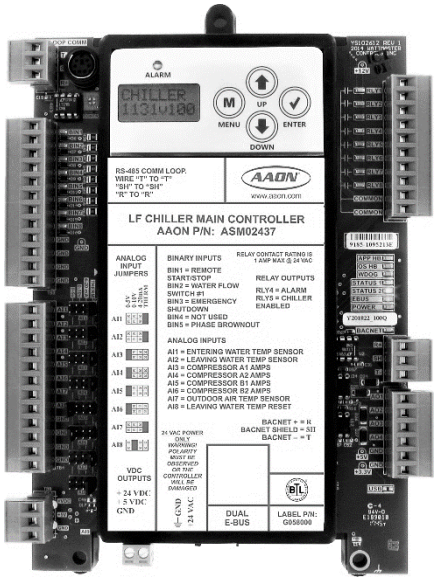


Figure 2 - Control and Display Panel

Factory Installed Pumping Packages
AAON has taken the lead with factory engineered and installed pumping packages that save time and expenses associated with the details of the jobsite construction of the equipment room. The LF Series effectively becomes a packaged outdoor mechanical room. Building owners can reallocate the valuable indoor floor space previously used for pumps.

Factory installed pumping packages are configurable and include a factory mounted inline air purge device. Grooved piping and fittings are furnished as a standard factory installed feature. Pumping packages include butterfly valves, air scoop, suction guide and strainers, ball valves, Armstrong® pump, and a combination valve (isolation, check, and balancing.

Figure 3 - DualArm Pump

For added convenience, selection of pumping packages is handled through the AAON selection software, AAONECat. Refer to AAONECat for further information. Manual selection of pumping package components is not possible due to the many combinations and applications conditions that may be selected. All LF Series chiller sizes can utilize pumping packages. Units 14 tons and above are available with redundant dual arm pumps. After pump selection is made, the AAONECat software will generate a rating sheet, pump performance curves, and a piping diagram.

Application Information

Fluid Temperature Design Conditions
The system can start and pull down with up to 80°F entering water temperature. For continuous operation, it is recommended that the entering water temperature not exceed 65°F. The chiller must not be operated with a leaving water temperature of less than 42°F for a plain water application. When lower leaving fluid temperatures are required, an appropriate glycol solution must be used. The solution must have a freezing point at least 15°F lower than the design leaving fluid temperature. The temperature difference between fluid entering and leaving the chiller must be in the range of 6 to 16°F. The absolute maximum fluid temperature that can be circulated continuously through the heat exchanger is 110°F.

Fluid Volume
Consideration must be given to the total volume of fluid in the system. In close coupled, low volume systems, the leaving fluid temperature will change quickly through large capacity control steps. This is not acceptable if tight temperature control is desired for comfort control or process cooling. If large capacity control steps are used, tight temperature control of the exiting water temperature requires an increase in fluid loop volume.

LF Series chiller models are available with variable capacity compressors. The compressor is designed with a minimum capacity step of 10%. The minimum unit capacity step for the LF-4 to LF-17 and LF-22 to LF-24 is 10%, and the minimum unit capacity step for LF-21 and LF-26 to LF-55 is 5%. Compared to chillers with capacity control through compressor cycling, the variable capacity compressor can result in a significant reduction in required loop volume. Systems with large capacity steps

may require additional water volume through a storage tank, while the LF Series chiller may not.

Use the following example as a guide to determine fluid loop volume from the required leaving water temperature tolerance.

Use the information in Table 1 for units with variable capacity compressors and Table 2 for units with on/off compressors that lists the maximum step of capacity in each model size and a factor for that model.

Note that during startup the variable capacity compressors on each circuit modulate up to 50% capacity.

Loop Volume Example
An LF-15 is rated at 14.1 tons at the operating conditions. It is desired to have no greater than a ± 1°F leaving water temperature variation. The chiller has on/off compressors. What is the minimum water volume required in the chilled water loop?

Solution: Use the following equation to determine the minimum allowable water loop volume.

$$Minimum\ Water\ Loop\ Volume = \frac{Actual\ Tons\ x\ Min\ Volume\ (\frac{Gal - °F\ swing}{Ton})}{Allowable\ °F\ Swing}$$

Allowable $°F_{swing}$ is specified in the problem statement. With a tolerance of ± 1°F, the total allowable swing is 2°F.

Select the value of Minimum Volume from Table 2 for on/off compressors.

For LF-015:

$$Minimum\ Volume = 68\ \frac{Gal - °F}{Ton}$$

Thus, the Minimum Water Loop Volume with the known performance of 14.1 tons of cooling at the application conditions:

$$Min\ Water\ Loop\ Volume = \frac{14.1\ tons * 68\ \frac{Gal - °F}{Ton}}{2°F} = 479\ gallons$$

If this same system had variable capacity compressors with a 30% capacity control step, the Minimum Water Loop Volume (Gal*°F_{swing}/ton) would be 36 from Table 1.

$$Min\ Water\ Loop\ Volume = \frac{14.1\ tons * 36\ \frac{Gal - °F}{Ton}}{2°F} = 254\ gallons$$

This would require 254 gallons of water in the loop. The LF Series chiller could eliminate the storage tank or reduce the required tank size when compared to a unit with on/off compressors.

Notice if this system was selected for a 43°F leaving water temperature, the temperature will vary between 42°F to 44°F (recall the variation tolerance ± 1°F) with the variable capacity compressors at a water loop volume of 254 gallons. The final selection should ensure the leaving water temperature does not drop below 42°F. If the leaving water temperature could go below 42°F, then the loop volume should be increased or glycol should be included with the design.

Table 1 - Minimum Volume (Variable Capacity Compressors)

Model	Maximum % Capacity Step	Minimum Volume (Gal*°F $_{swing}$)/ton
LF-004 to LF-017 & LF-022 to LF-024	30	36
LF-026 & LF-031 to LF-055	15	18

Table 2 - Minimum Volume (On/Off Compressors)

Model	Maximum % Capacity Step*	Minimum Volume (Gal*°F $_{swing}$)/ton
LF-004	100	120
LF-005	100	120
LF-007	100	120
LF-008	56	67
LF-009	100	120
LF-010	56	67
LF-011	57	68
LF-013	57	68
LF-014	57	68
LF-015	57	68
LF-017	58	70
LF-021	31	37
LF-022	56	67
LF-024	57	68
LF-026	31	37
LF-031	32	38
LF-042	33	40
LF-048	33	40
LF-055	33	40

If the fluid loop contains glycol, the above water loop volume should be multiplied by the correction factor in Table 3.

Table 3 - Glycol Correction Factors

% by Weight	Glycol Volume Correction Factor	
	Ethylene	Propylene
10	1.038	1.017
20	1.066	1.033
30	1.100	1.058
40	1.140	1.092
50	1.192	1.142

It may be necessary to install a storage tank in the system to provide the necessary volume for tight temperature control. When this is done, the tank should be installed in the loop between the fluid coming from the building and returning to the chiller. Figure 4 illustrates a proper storage tank usage.

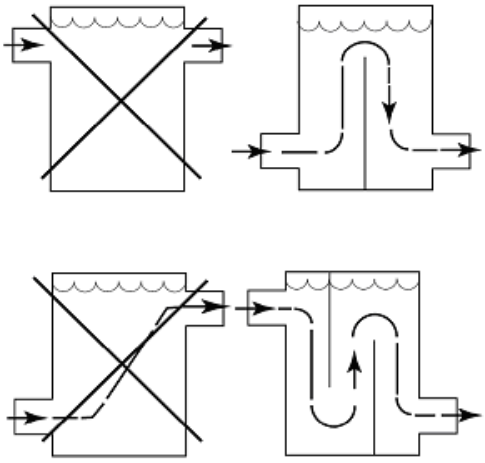


Figure 4 - Storage Tank Usage

Chiller Placement

The AAON LF Series chiller is designed for outdoor applications and mounting at ground level or on a roof. It must be placed on a level and solid foundation that has been prepared to support its weight. When installed at ground level, a one-piece concrete slab should be used with footings that extend below the frost line. The placement relative to the building air intakes and other structures

is critical and must be carefully selected. Consult Figure 5 and Figure 6 for guidance.

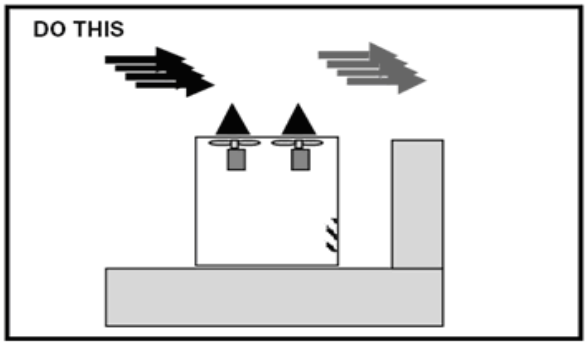


Figure 5 - Proper Chiller Placement

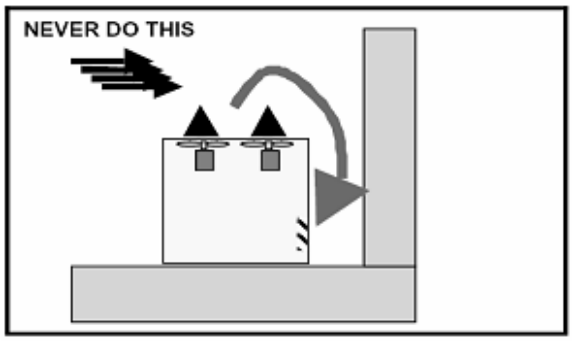


Figure 6 - Improper Chiller Placement

Be sure to observe the dimensions that are on the rating plate of the chiller for operational and service clearances. For proper unit operation, the immediate area must remain free of debris that may be drawn in and obstruct airflow in the condensing section. Table 4 displays the typical clearances found on the rating plate of each unit.

Table 4 - 4-7 & 9 ton Service Clearances

Location	Clearance
Left	42”
Right	36”
Compressor End	30”
Chiller HXC End	30”
Top	Open

Table 5 - 8 & 10-13 ton Service Clearances

Location	Clearance
Left	36”
Right	36”
Compressor End	30”
Chiller HXC End	30”
Top	Open

Table 6 - 14-17 & 22-24 ton Service Clearances

Location	Clearance
Left	42”
Right	36”
Compressor End	36”
Chiller HXC End	30”
Top	Open

Table 7 - 21 & 26-55 ton Service Clearances

Location	Clearance
Left	42”
Right	42”
Compressor End	36”
Chiller HXC End	36”
Top	Open

Remember, there should be no obstruction above the unit that could deflect the discharge air downward where it could recirculate to the inlet of the condensing section. The position of the chiller must provide sufficient side and end clearance to allow air to enter, as well as, to permit the access for any future service. If the low ambient option has been ordered with the equipment then special consideration must be given to snow accumulation when placing the unit. Condenser coils and fans must be free of snow or any other obstructions in order to start and operate properly with a correct amount of airflow.

Access Doors
When planning the placement of the chiller, take into consideration the access doors to the equipment. An access door is provided to the compressor and controls compartment. A separate access door is also provided to the evaporator and pumping package compartment.

Mounting Isolation
For roof mounted applications or anytime vibration transmission may be a factor, vibration isolators may be considered.

Electrical Power Supply
The power and control wiring is brought through the utility entry to the power supply terminal blocks. The DDC controller furnished with the unit is supplied with its own power supply factory wired to the main power of the chiller. The voltage to the chiller must be within plus or minus 10% of the nameplate rating value on the unit.

All LF Series chillers are available with 208V three phase, 230V three phase, 460V three phase, and 575V three phase power inputs.

Electrical Data
When a pumping package is selected, the amp draw of the pump is added to the standard electrical data. This will increase the minimum circuit ampacity (MCA) and the maximum fuse size. Consult the Electrical Service Sizing Data section of this catalog for electrical sizing information.

Dimensional Drawings
AAONECat should be used with all the job application information in order to receive an accurate drawing for a specific model and feature set.

Optional Oversized Heat Exchangers
These heat exchangers are available on all model sizes. They may be selected for improved performance with water or they may be selected for use with systems that contain glycol to aid in offsetting the decreased capacity due to the thermal properties of glycol.

Factory Insulated Evaporator
The brazed plate evaporator is insulated. Since shipping vibrations may loosen connections in the water piping, the water system must be leak tested in the field prior to startup.

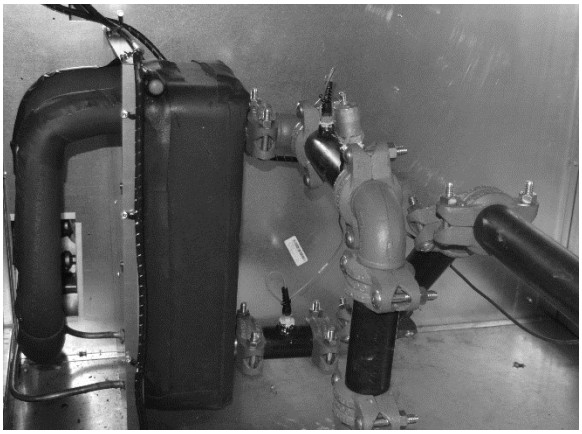


Figure 7 - Insulated Evaporator

Unit Selection

Selection Procedure
Chiller selection will require knowledge of:

Chiller
- Condenser Type
- Compressor Type
- Pumping System Type

Chiller Conditions
- System Load
- Ambient Conditions
- Entering Water/Glycol Temperature
- Leaving Water/Glycol Temperature (or Design Temperature Drop through the Chiller)
- Chiller Flow Rate
- Glycol Percentage
- Water Fouling Factor

Pumping System Conditions
- Building Pressure Drop
- Building Flow Rate
- Minimum/Maximum Loop Temperature
- External Loop Volume

Water Fouling Factor
The standard fouling factor is assumed at 0.0001 ft^2 x hr °F/Btu with AAON ECat. If calculating a solution with an alternative fouling factor, apply the appropriate correction factor shown in Table 10.

Glycol Chillers
A minimum leaving fluid temperature of 42°F is allowed when water is used as a heat transfer fluid to ensure freeze protection and continued operation of the heat exchanger. When lower leaving temperatures are desired, glycol must be added to the circulating fluid. Apply the appropriate correction factor from Table 8 for ethylene glycol, and Table 9 for propylene glycol correction.

Chilled Water Flow Rate
An approximation of the chilled water flow rate in gallons per minute (GPM) is given by the following equation:

$$GPM = \frac{Tons\ x\ 24}{\Delta T\ water}$$

AAON provides a software program, AAON ECat, for unit selection and rating. This is the fastest and easiest method of inputting all the job requirements and making an equipment selection. The software will produce thermal performance data, and additionally, will contain complete specifications and unit drawings for the product selected.

Selection Example 1
An air-cooled condenser scroll compressor chiller is needed that can provide 10 tons of cooling capacity at 105°F DB and 78°F WB ambient air temperature. The leaving water temperature needed is 44°F, with a 10°F ΔT or entering water temperature of 54°F. Assume a standard fouling factor, a standard sized chiller heat exchanger and no glycol.

System Load = 10 tons
Ambient Dry Bulb Conditions = 105°F
Entering Water temperature = 54°F
Leaving Chilled Water Temperature = 44°F
ΔT = 10°F

Solution: The approximate water flow rate is computed from the equation:

$$GPM = \frac{10\ tons\ x\ 24}{10°F} = 24\ GPM$$

Using AAON ECat, the performance of a LF-11 at these specific unit conditions is 10.4 tons of cooling capacity, the associated power input is 12.4 kW, the EER at operating conditions is 10.1, and the total pressure drop is 10.3 ftH_2O.

Table 8 - Ethylene Glycol

% Weight of Ethylene Glycol	Freeze Point ºF	Capacity Factor	Power Factor	Pressure Drop Factor	Flow Factor
10	26	0.998	0.998	1.03	24.9
20	17	0.995	0.997	1.09	25.6
30	5	0.970	0.990	1.15	26.4
40	-10	0.941	0.985	1.23	27.4
50	-32	0.950	0.970	1.31	28.6

Table 9 - Propylene Glycol

% Weight of Propylene Glycol	Freeze Point ºF	Capacity Factor	Power Factor	Pressure Drop Factor	Flow Factor
10	26	0.998	0.996	1.08	24.4
20	19	0.975	0.975	1.21	24.8
30	9	0.960	0.985	1.40	25.4
40	-6	0.921	0.975	1.67	26.2
50	-28	0.910	0.965	1.98	27.4

Table 10 - Fouling Factor

	0.0001		0.00025		0.00075		0.00175	
Chilled Water ΔT (ºF)	Capacity	Power	Capacity	Power	Capacity	Power	Capacity	Power
6	0.990	0.998	0.989	0.996	0.962	0.986	0.920	0.973
8	0.994	0.999	0.991	0.998	0.965	0.988	0.923	0.975
10	1.000	1.000	0.993	0.999	0.970	0.991	0.928	0.978
12	1.005	1.001	0.999	1.000	0.975	0.993	0.933	0.980
14	1.008	1.002	1.005	1.001	0.980	0.996	0.937	0.983
16	1.010	1.003	1.008	1.003	0.984	0.998	0.941	0.985

Selection Example 2
An air-cooled condenser scroll compressor chiller is needed that can provide 15 tons of cooling capacity at 95°F DB ambient air temperature. The leaving water temperature needed is 44°F, with a 10°F ΔT or entering water temperature of 54°F. Assume a standard fouling factor and a standard sized brazed plate heat exchanger. The chiller fluid circuit needs to be protected down to 10°F.
System Load = 15 tons
Ambient Dry Bulb Conditions = 95°F
Entering Water temperature = 54°F
Leaving Chilled Water Temperature = 44°F
ΔT = 10°F

Solution: The approximate 30% propylene glycol water flow rate is computed from the equation:

$$GPM = \frac{15\ tons\ x\ 24}{10°\text{F}} = 36\ GPM$$

16.0 tons of cooling capacity, the associated power input is 18.8 kW, the EER at operating conditions is 10.2, and the total pressure drop is 8.6 ftH_2O.
Consulting Table 8, the correction factors applicable for a 30% ethylene mix are:

Capacity = 0.97
Power = 0.99
Pressure Drop = 1.15
Flow Factor = 26.4

Applying the correction factors to the water performance:

$$Corrected\ Capacity = 16.0\ tons\ x\ 0.97 = 15.5\ tons$$

$$Corrected\ System\ kW = 18.8kW\ x\ 0.99 = 18.6kW$$

$$Corrected\ Flow\ Rate = \frac{15.5\ tons\ x\ 26.4}{10°\text{F}} = 40.9\ GPM$$

The 25.4 is found in Table 9 for 30% propylene glycol.

$$GPM = \frac{15\ tons\ x\ 25.4}{10°\text{F}} = 38\ GPM$$

Using AAON ECat, with a 30% propylene glycol to satisfy the freeze protection requirement down to 10°F (see Table 9), the performance of a LF-17 at these specific unit conditions is 15.7 tons of cooling capacity, the associated power input is 18.8 kW, the EER at operating conditions is 10.1, and the total pressure drop is 12.3 ftH_2O.

Using AAON ECat, with water and a standard sized brazed plate heat exchanger, the performance of a LF-17 at these specific unit conditions is:

LF Series Feature String Nomenclature

Model Options	:	Unit Feature Options

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4		1	2		3A	3B	3C	3D		4A	4B	4C	4D		5A	5B	5C	5D		6	7		8A	8B	8C
LF	**A**	**-**	**031**	**-**	**D**	**-**	**A**	**-**	**3**	**-**	**G**	**A**	**A**	**0**	**E**	**-**	**0**	**0**	**0**	**0**	:	0	J	-	0	0	0	0	-	0	0	0	0	-	0	0	-	0	0	0
		0	-	0	A	0	B	-	0	0	A	0	0	-	0	E	0	0	0	-	0	0	0	0	0	0	-	0	0	0	0	0	0	-	0	0	0	B		

9	10A	10B	10C	10D	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26A	26B	26C	26D	26E	26F	27	28	29	30	31	32	33	34	35

MODEL OPTIONS

SERIES AND GENERATION
LF

MAJOR REVISION
A

UNIT SIZE
004 = 4 ton Capacity
005 = 5 ton Capacity
007 = 7 ton Capacity
008 = 8 ton Capacity
009 = 9 ton Capacity
010 = 10 ton Capacity
011 = 11 ton Capacity
013 = 13 ton Capacity
014 = 14 ton Capacity
015 = 15 ton Capacity
017 = 17 ton Capacity
021 = 21 ton Capacity
022 = 22 ton Capacity
024 = 24 ton Capacity
026 = 26 ton Capacity
031 = 31 ton Capacity
042 = 42 ton Capacity
048 = 48 ton Capacity
055 = 55 ton Capacity

SERIES
A = 4-7 and 9 ton units
B = 8 and 10-13 ton unit
C = 14-17 and 22-24 ton units
D = 21 and 26-55 ton units

MINOR REVISION
A

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

A1: COMPRESSOR STYLE
A = R-410A Scroll Compressors
D = R-410A Variable Capacity Scroll Compressors
E = R-410A Tandem Scroll Compressors
G = R-410A Tandem Variable Capacity Scroll Compressors

A2: CONDENSER STYLE
A = Air-Cooled Microchannel Condenser

A3: EVAPORATOR CONFIGURATION
A = Brazed Plate
B = Oversized Brazed Plate

A4: Coating
0 = Standard
E = Polymer E-Coated Condenser Coil

A5: Staging
0 = Staged On/Off Compressors
E = All Variable Capacity Compressors
G = Half Variable Capacity Compressors

B1: Blank
0 = Standard

B2: Blank
0 = Standard

B3: Blank
0 = Standard

B4: Blank
0 = Standard

LF Series Feature String Nomenclature

Model Options : Unit Feature Options

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4	1	2	3A	3B	3C	3D	4A	4B	4C	4D	5A	5B	5C	5D	6	7	8A	8B	8C
LF	A	031	D	A	3	G	A	A	0	E	0	0	0	0	**0**	**J**	**0**	**0**	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	A	0	B	0	0	A	0	0	0	E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B
9	10A	10B	10C	10D	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26A	26B	26C	26D	26E	26F	27	28	29	30	31	32	33	34	35

UNIT FEATURE OPTIONS

1: Unit Orientation

0 = Standard Access End Water Connections

2: Pumping Style

B = Constant Flow Primary Pumping System
D = Variable Flow Primary Pumping System
J = No Pumping Package - Piping to Connections at Wall Cutouts

3A: Building Pump Configuration

0 = No Building Pumps
A = 1 Pump + High Eff Motor
B = 1 Dual Pump + High Eff Motors
D = 1 Pump + VFD + High Eff Motor
E = 1 Dual Pump + 2 VFD's + High Eff Motors

3B: Building Pump Series and RPM

0 = No Building Pumps
A = 4360 (1,170 nominal rpm)
B = 4360 (1,760 nominal rpm)
C = 4360 (3,520 nominal rpm)
D = 4380 (1,170 nominal rpm)
E = 4380 (1,760 nominal rpm)
F = 4380 (3,520 nominal rpm)
K = 4382 (1,170 nominal rpm)
L = 4382 (1,760 nominal rpm)
M = 4382 (3,520 nominal rpm)

3C: Pump Size

0 = No Building Pumps
A = 1.5B
B = 2B
C = 2D
D = 3D
E = 1.5x1.5x6
F = 2x2x6
G = 3x3x6
H = 4x4x6
J = 6x6x6
K = 1.5x1.5x8
L = 2x2x8
M = 3x3x8
N = 4x4x8
P = 5x5x8
Q = 6x6x8
R = 8x8x8
S = 2x2x10
T = 3x3x10
U = 4x4x10
V = 6x6x10
W = 8x8x10
Y = 4x4x11.5
Z = 5x5x11.5
1 = 6x6x11.5
2 = 8x8x11.5
3 = 4x4x13
4 = 6x6x13
5 = 8x8x13

LF Series Feature String Nomenclature

Model Options : Unit Feature Options

GEN MJREV SIZE SERIES MNREV VLT A1 A2 A3 A4 A5 B1 B2 B3 B4 1 2 3A 3B 3C 3D 4A 4B 4C 4D 5A 5B 5C 5D 6 7 8A 8B 8C

LF A - 031 - D - A - 3 - G A A 0 E - 0 0 0 0 : 0 J - 0 0 0 0 - 0 0 0 0 - 0 0 0 0 - 0 0 - 0 0 0

0 - 0 A 0 B - 0 0 A 0 0 - 0 E 0 0 0 - 0 0 0 0 0 - 0 0 0 0 0 0 - 0 0 0 0 0 - 0 0 0 B

9 10A 10B 10C 10D 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26A 26B 26C 26D 26E 26F 27 28 29 30 31 32 33 34 35

3D: Building Pump Motor Size
0 = No Building Pumps
A = 0.5 hp
B = 0.75 hp
C = 1 hp
D = 1.5 hp
E = 2 hp
F = 3 hp
G = 5 hp
H = 7.5 hp
J = 10 hp
K = 15 hp
L = 20 hp
M = 25 hp
N = 30 hp
P = 40 hp
Q = 50 hp
R = 60 hp
S = 75 hp

4A: Blank
0 = Standard

4B: Blank
0 = Standard

4C: Blank
0 = Standard

4D: Blank
0 = Standard

5A: Blank
0 = Standard

5B: Blank
0 = Standard

5C: Blank
0 = Standard

5D: Blank
0 = Standard

6: Refrigeration Options
0 = None
A = Hot Gas Bypass Non-Variable Capacity Compressor Circuits
B = Hot Gas Bypass - All Circuits

7: Refrigeration Accessories
0 = Standard
A = Sight Glass
B = Compressor Isolation Valves
C = Option A + B
D = Single Circuit Low Ambient (0°F)
E = Option A + D
F = Option B + D
G = Option A + B + D
H = Dual Circuit Low Ambient (0°F)
J = Option A + H
K = Option B + H
L = Option A + B + H

8A: Unit Disconnect Type
0 = Standard Single Point Power Block
A = Single Point Power Non-fused Disconnect

8B: Disconnect 1 Size
0 = Power Block
N = 100 amps
R = 150 amps
V = 250 amps
Z = 400 amps

8C: Blank
0 = Standard

9: Accessories
0 = None
B = Phase & Brown Out Protection
E = Compressor Sound Blanket
M = Option B + E

10A: Unit Control Sequence
0 = Standard Control

LF Series Feature String Nomenclature

Model Options : Unit Feature Options

GEN MJREV SIZE SERIES MNREV VLT A1 A2 A3 A4 A5 B1 B2 B3 B4 1 2 3A 3B 3C 3D 4A 4B 4C 4D 5A 5B 5C 5D 6 7 8A 8B 8C

LF A - 031 - D - A - 3 - E A A 0 0 - 0 0 0 0 : 0 J - 0 0 0 0 - 0 0 0 0 - 0 0 0 0 - 0 0 - 0 0 0

0 - 0 **A 0 0 - 0 0 0 0 0 - 0 J 0 0 0 - 0 0 0 0 0 - 0 0 0** 0 0 0 - 0 0 0 0 0 - 0 D 0 B

9 10A **10B 10C 10D 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26A 26B 26C** 26D 26E 26F 27 28 29 30 31 32 33 34 35

10B: Unit Control Supplier
A = AAON Controls

10C: Control Supplier Options
0 = None

10D: BMS Connection & Diagnostics
0 = None
B = BACnet MSTP
H = No BMS Connection with Diagnostics
K = BACnet MSTP with Diagnostics

11: Blank
0 = Standard

12: Vestibule Accessories
0 = None
C = Vestibule Heating (Electric)

13: Maintenance Accessories
0 = None
A = 115VAC Convenience Outlet Factory Wired
B = 115VAC Convenience Outlet Field Wired

14: Blank
0 = Standard

15: Code Options
0 = Standard ETL U.S.A. Listing

16: Shipping Options
0 = One Piece Unit
B = Crating
C = Export Crating

17: Air-Cooled Condenser Accessories
C = ECM Condenser Fan Head Pressure Control
E = VFD Condenser Fan Head Pressure Control
G = Condenser Coil Guards + Option C
J = Condenser Coil Guards + Option E
N = ECM Condenser Fan Head Pressure Control + Low Sound Condenser Fan
S = Condenser Coil Guards + Option N

18: Blank
0 = Standard

19: Blank
0 = Standard

20: Blank
0 = Standard

21: Blank
0 = Standard

22: Blank
0 = Standard

23: Blank
0 = Standard

24: Chiller Accessories 1
0 = None
A = Glycol chiller
C = Thermometers & Pressure Gauges
G = Option A + C

25: Blank
0 = Standard

26A: Blank
0 = Standard

26B: Blank
0 = Standard

26C: Blank
0 = Standard

LF Series Feature String Nomenclature

Model Options : Unit Feature Options

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4	1	2	3A	3B	3C	3D	4A	4B	4C	4D	5A	5B	5C	5D	6	7	8A	8B	8C
LF	A	- 031	- D	- A	- 3	- E	A	A	0	0	- 0	0	0	0	: 0	J	- 0	0	0	0	- 0	0	0	0	- 0	0	0	0	- 0	0	- 0	0	0
		0	- 0	A	0	0	- 0	0	0	0	0	- 0	J	0	0	0	- 0	0	0	0	0	- 0	0	0	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**-**	**0**	**D**	**0**	**B**
			9	10A	10B	10C	10D	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26A	26B	26C	**26D**	**26E**	**26F**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**

26D: Blank
0 = Standard

26E: Blank
0 = Standard

26F: Blank
0 = Standard

27: Blank
0 = Standard

28: Blank
0 = Standard

29: Blank
0 = Standard

30: Blank
0 = Standard

31: Blank
0 = Standard

32: Blank
0 = Standard

33: Warranty
0 = Standard Warranty
D = Compressor Warranty Years 2-5

34: Cabinet Material
0 = Standard - Double Wall + R-13 Foam Insulation

35: Paint & Special Pricing Authorizations
B = Premium AAON Gray Paint Exterior
E = Option B + Shrink Wrap
X = Special Pricing Authorization + Premium AAON Gray Paint Exterior
1 = Option X + Shrink Wrap

Unit Series, Major Revision, Sizes, Series, and Minor Revision

Example: **LFA-031-D-A**-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

The first number of the model string designates nominal tons of cooling capacity at AHRI conditions for an air-cooled condenser unit with a standard brazed plate. Actual capacities will vary with conditions. Refer to the AAONECat software for performance and cooling capacities at design conditions.

Table 11 - Unit Series, Major Revision, Sizes, Series, and Minor Revision

Series	Major Revision	Unit Size	Series	Minor Revision
LF	A	004	A	A
		005		
		007		
		009		
		008	B	
		010		
		011		
		013		
		014	C	
		015		
		017		
		022		
		024		
		021	D	
		026		
		031		
		042		
		048		
		055		

Voltage

Example: LFA-031-D-A-**3**-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

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

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

Model Option A1 - Compressor Style

Example: LFA-031-D-A-3-**G**AA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

A = *R-410A Scroll Compressors* - Compressorized DX cooling with R-410A refrigerant using scroll compressors. Option is only available on 4-17 ton & 22-24 ton units.
D = *R-410A Variable Capacity Scroll Compressors* - Compressorized DX cooling with R-410A refrigerant using 10-100% variable capacity scroll compressors. See Feature A5 for selection of quantity of variable capacity compressors. A suction pressure sensor will be provided per variable capacity compressor. Option provides the unit with tighter temperature control and energy savings at part load conditions. Option is only available on 4-17 ton & 22-24 ton units.
E = *R-410A Tandem Scroll Compressors* - Compressorized DX cooling with R-410A refrigerant and tandem circuited scroll compressors. Option is only available on 21 ton & 26-55 ton units.
G = *R-410A Tandem Variable Capacity Scroll Compressors* - Compressorized DX cooling with R-410A refrigerant using 10-100% variable capacity tandem circuited scroll compressors. See Feature A5 for selection of quantity of variable capacity compressors. A suction pressure sensor will be provided per variable capacity compressor. Option provides the unit with tighter temperature control and energy savings at part load conditions. Option is only available on 21 ton & 26-55 ton units.

Model Option A2 - Condenser Style

Example: LFA-031-D-A-3-G**A**A0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

A = *Air-Cooled Microchannel Condenser* - Air-cooled condenser coils will be aluminum microchannel tubes.

Model Option A3 - Evaporator Configuration

Example: LFA-031-D-A-3-GA**A**0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

A = *Standard Brazed Plate* - Brazed Plate heat exchanger with grooved piping water connections and 3/4" closed-cell rubberized insulation.
B = *Oversized Brazed Plate* - Brazed Plate heat exchanger with grooved piping water connections and 3/4" closed-cell rubberized insulation.

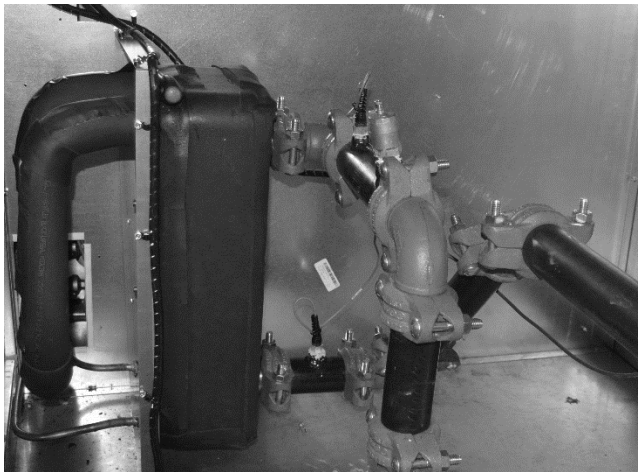


Figure 8 - Insulated Brazed Plate

Model Option A4 - Coating

Example: LFA-031-D-A-3-GAA**0**E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

0 = *Standard*
E = *Polymer E-Coated Condenser Coil* - Polymer e-coating is applied only to the condenser coils. Complete coil and casing are coated. Coating capable of withstanding at least 10,000 hours of salt spray per ASTM B117-90, yet is only 0.8-1.2 mils thick and has excellent flexibility. 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. Instructions coil cleaning, maintenance, and recording keeping must be followed. Refer to the unit Installation, Operation and Maintenance Manual.

Model Option A5 - Staging

Example: LFA-031-D-A-3-GAA0**E**-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

0 = *Staged Compressors* - Two circuits, HGB is recommended on all circuits. LF sizes 4-7 & 9 ton have only one on/off circuit.
E = *All Circuits with Variable Capacity Compressors* - Two circuits, each with one lead compressor with 10-100% variable capacity scroll compressor. LF sizes 4-7 & 9 ton have only one 10-100% variable capacity scroll compressor.
G = *Half Circuits with Variable Capacity Compressor* - Two circuits, the lead circuit will include, one 10-100% variable capacity scroll compressor and a compressor with on/off capacity control. The second circuit will have on/off capacity control. This option is not selectable on LF sizes 4-7 &9.

Model Options B1-B4 - Blank

Example: LFA-031-D-A-3-GAA0E-**0000**:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

0000 = *Standard*

Unit Feature 1 - Orientation Options

Example: LFA-031-D-A-3-GAA0E-0000:**0**J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

0 = *Standard Access End Water Connections* - Water piping connected within the cabinet through piping cutouts on the unit's end.

Figure 9 - End Openings

Unit Feature 2 - Pump Style

Example: LFA-031-D-A-3-GAA0E-0000:0**J**-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

B = *Constant Flow Primary Pumping System* - Select this option if water flow from the chiller to the building is constant.
D = *Variable Flow Primary Pumping System* - Select this option to modulate the flow of water through the chiller and to the building. The variable primary pumping system includes a pressure transducer on each side of the pump.
J = *No Pumping Package - Piping to Connections at Wall Cutouts* - Standard option.

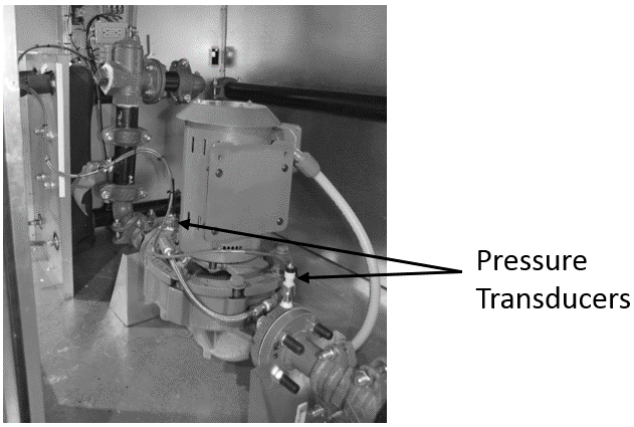


Figure 10 - Variable Primary Pumping System

Unit Feature 3A - Building Pump Configuration

Example: LFA-031-D-A-3-GAA0E-0000:0J-**0**000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

0 = *Standard - No Building Pump*
A = *1 Pump and High Efficiency Motor*
B = *1 Dual Pump and High Efficiency Motors*
D = *1 Pump, 1 VFD, and High Efficiency Motor*
E = *1 Dual Pump, 2 VFD's, and High Efficiency Motors*

AAONECat will select the correct available options for Feature 3A based on unit conditions and the input from the pump selection program. To create a pump configuration select a pump option in Feature 2 and after all other features have been selected, input water conditions into the Unit Conditions window. Next, in the Pump Selection and Rating window, select the quantity and size of pumps, select the quantity and size of motors, select VFDs, and view pump curves.

Unit Feature 3B - Building Pump Series and RPM

Example: LFA-031-D-A-3-GAA0E-0000:0J-0**0**00-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

0 = *No Building Pumps*
A = *4360 (1,170 nominal rpm)*
B = *4360 (1,760 nominal rpm)*
C = *4360 (3,520 nominal rpm)*
D = *4380 (1,170 nominal rpm)*
E = *4380 (1,760 nominal rpm)*
F = *4380 (3,520 nominal rpm)*
K = *4382 (1,170 nominal rpm)*
L = *4382 (1,760 nominal rpm)*
M = *4382 (3,520 nominal rpm)*

AAONECat will select the correct available options for Feature 3B based on unit conditions and the input from the pump selection program. To create a pump configuration select a pump option in Feature 2 and after all other features have been selected, input water conditions into the Unit Conditions window. Next, in the Pump Selection and Rating window, select the quantity and size of pumps, select the quantity and size of motors, select VFDs, and view pump curves.

Unit Feature 3C - Building Pump Size

Example: LFA-031-D-A-3-GAA0E-0000:0J-00**0**0-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

0 = *No Building Pump*
A = *Pump 4360 1.5B*
B = *Pump 4360 2B*
C = *Pump 4360 2D*
D = *Pump 4360 3D*
E = *Pump 4380 1.5x1.5x6*
F = *Pump 4380 2x2x6*
G = *Pump 4380 3x3x6*
H = *Pump 4380/4382 4x4x6*
J = *Pump 4380 6x6x6*
K = *Pump 4380 1.5x1.5x8*
L = *Pump 4380 2x2x8*
M = *Pump 4380/4382 3x3x8*
N = *Pump 4380/4382 4x4x8*
P = *Pump 4380 5x5x8*
Q = *Pump 4380/4382 6x6x8*
R = *Pump 4380 8x8x8*
S = *Pump 4380 2x2x10*
T = *Pump 4380/4382 3x3x10*
U = *Pump 4380/4382 4x4x10*
V = *Pump 4380/4382 6x6x10*
W = *Pump 4380/4382 8x8x10*
Y = *Pump 4380 4x4x11.5*
Z = *Pump 4380 5x5x11.5*
1 = *Pump 4380 6x6x11.5*
2 = *Pump 4380 8x8x11.5*
3 = *Pump 4380 4x4x13*
4 = *Pump 4380 6x6x13*
5 = *Pump 4380 8x8x13*

AAONECat will select the correct available options for Feature 3C based on unit conditions and the input from the pump selection program. To create a pump configuration select a pump option in Feature 2 and after all other features have been selected, input water conditions into the Unit Conditions window. Next, in the Pump Selection and Rating window, select the quantity and size of pumps, select the quantity and size of motors, select VFDs, and view pump curves.

Unit Feature 3D - Building Pump Motor Size

Example: LFA-031-D-A-3-GAA0E-0000:0J-000**0**-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

0 = *No Building Pump*
A = *0.5 hp*
B = *0.75 hp*
C = *1 hp*
D = *1.5 hp*
E = *2 hp*
F = *3 hp*
G = *5 hp*
H = *7.5 hp*
J = *10 hp*
K = *15 hp*
L = *20 hp*
M = *25 hp*
N = *30 hp*
P = *40 hp*
Q = *50 hp*
R = *60 hp*
S = *75 hp*

AAONECat will select the correct available options for Feature 3C based on unit conditions and the input from the pump selection program. To create a pump configuration select a pump option in Feature 2 and after all other features have been selected, input water conditions into the Unit Conditions window. Next, in the Pump Selection and Rating window, select the quantity and size of pumps, select the quantity and size of motors, select VFDs, and view pump curves.

Unit Features 4A-4D - Blank

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-**0000**-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

0000 = *Standard*

Unit Features 5A-5D - Blank

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-**0000**-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

0000 = *Standard*

Unit Feature 6 - Refrigeration Options

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-**0**0-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

0 = *Standard*
A = *Hot Gas Bypass on Non-Variable Capacity Refrigeration Circuits* - Field adjustable pressure activated bypass valve on all non-variable capacity compressor refrigerant circuits factory setup to divert hot compressor discharge gas to the evaporator if the pressure on the evaporator side of the valve drops below 105 psi for R-410A (34°F at sea level). The bypass valve is at full capacity after 6 degrees of differential (28°F at sea level). This option is used to prevent freeze-up during periods of low flow or cold entering heat exchanger conditions. This option is used for refrigerant system protection only and cannot be used for cooling capacity modulation.
B = *Hot Gas Bypass on All Circuits* - Field adjustable pressure activated bypass valve on all refrigerant circuits factory setup to divert hot compressor discharge gas to the evaporator if the pressure on the evaporator side of the valve drops below 105 psi for R-410A (34°F at sea level). The bypass valve is at full capacity after 6 degrees of differential (28°F at sea level). This option is used to prevent freeze-up during periods of low flow or cold entering heat exchanger conditions. This option is used for refrigerant system protection only and cannot be used for cooling capacity modulation.

Unit Feature 7 - Refrigeration Accessories

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-0**0**-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

0 = Standard
A = *Sight Glass* - Moisture indication sight glass attached to the refrigeration circuit liquid lines. The moisture indicator shows a green color when 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.
B = *Compressor Isolation Valves* - Ball type service valves mounted on the refrigeration circuit discharge and suction lines permitting isolation of the compressor for service or replacement. The valves are located close to the compressors and work through a quarter turn from opened to closed. Teflon seals and gaskets are used with a nylon cap gasket to prevent accidental loss. This option reduces the amount of refrigerant that must be recovered during compressor service or replacement.
C = *Sight Glass and Compressor Isolation Valves* - Options A + B
D = *Single Circuit Low Ambient* - Factory installed 0°F low ambient flooded condenser head pressure control on the lead refrigeration circuit.
E = *Single Circuit Low Ambient and Sight Glass* - Options A + D
F = *Single Circuit Low Ambient and Compressor Isolation Valves* - Options B + D

Unit Feature 7 - Refrigeration Accessories Cont.

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-0**0**-000-0-0A0B-00A00-0E000-00000-000000-00000-000B

G = *Single Circuit Low Ambient, Sight Glass, and Compressor Isolation Valves* - Options A + B + D
H = *Dual Circuit Low Ambient* - Factory installed 0°F low ambient flooded condenser head pressure control on the lead and lag refrigeration circuits.
J = *Dual Circuit Low Ambient and Sight Glass* - Options A + H
K = *Dual Circuit Low Ambient and Compressor Isolation Valves* - Options A + B
L = *Dual Circuit Low Ambient, Sight Glass, and Compressor Isolation Valves* - Options A + B + H

Table 12 - Moisture Content in the Refrigerant

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

Unit Feature 8A - Unit Disconnect Type

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-**0**00-0-0A0B-00A00-0E000-00000-000000-00000-000B

0 = *Standard Single Point Power Block*
A = *Single Point Power Non-fused Disconnect Power Switch*

Individual components within the control cabinet are fused. Switch options include molded case, non-fused, disconnect switch externally mounted. The switch is accessible from the exterior of the unit. The switch disconnects high voltage service to the unit.

Unit Feature 8B - Disconnect 1 Size

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-0**0**0-0-0A0B-00A00-0E000-00000-000000-00000-000B

0 = *Standard Power Block*
N = *100 Amp*
R = *150 Amp*
V = *250 Amp*
Z = *400 Amp*

To add a switch, choose any switch and after all options have been selected and the pump program is completed AAONECat will automatically calculate the minimum allowable ampacity and choose the correct size switch.

Unit Feature 8C - Blank

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-00**0**-0-0A0B-00A00-0E000-00000-000000-00000-000B

0 = *Standard*

Unit Feature 9 - Accessories

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-**0**-0A0B-00A00-0E000-00000-000000-00000-000B

0 = *None*
B = *Phase and Brown Out Protection* - Voltage monitor that is used to protect motors and compressors from voltage imbalance, over/under voltage, and phase loss. Reset is automatic.
E = *Compressor Sound Blanket* - Factory provided compressor sound blanket installed on the compressor to help attenuate compressor sound.
M = *Phase and Brown Out Protection and Compressor Sound Blanket* - Options B + E

Unit Feature 10A - Unit Control Sequence

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-**0**A0B-00A00-0E000-00000-000000-00000-000B

0 = *Standard AAON Controls*

Unit Feature 10B - Unit Control Supplier

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0**A**0B-00A00-0E000-00000-000000-00000-000B

A = *AAON Chiller Controls* – the controls maintain the chiller leaving water temperature. The LF Chiller Main Controller and the LF Refrigeration Module boards are both factory installed in all LF chillers. The LF Chiller Main Controller includes a 2 line by 8 character LCD interface with 4 buttons that allow for status of the following: system operation, system setpoints, sensors, and alarms. A BACnet® address can also be set using the screen. For setpoint configuration and occupancy scheduling, a Windows compatible computer with Prism2 software (free to download) must be used. A CommLink 5 or USB Link 2 must be used to connect the computer to the controller.

The controls include a remote unit enable/disable which acts as a master override to disable the unit. The LF Chiller Main Controller is designed with 8 analog inputs, 4 analog outputs, 8 binary inputs, and 8 relay outputs. The LF Refrigeration Module is designed with 7 analog inputs, 4 binary inputs, 5 relays, and 2 analog outputs.

If the unit includes a pumping system in Feature 2, an additional Chiller Pumping module board is factory installed. It provides operational control of all water circuit pumping and is capable of managing building water pressure differential if supplying building water.

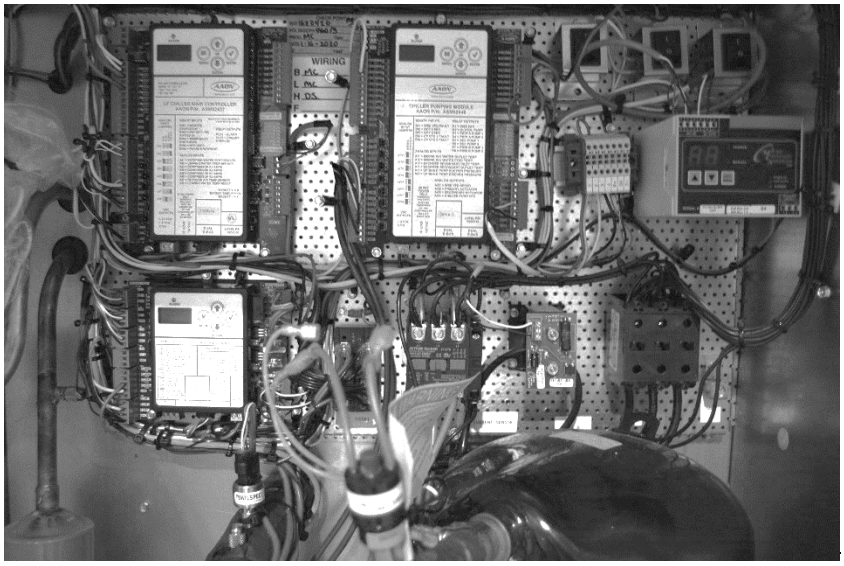


Figure 11 - AAON LF Chiller Controls

Unit Feature 10C - Unit Control Supplier Options

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A**0**B-00A00-0E000-00000-000000-00000-000B

0 = *None*

Unit Feature 10D - BMS Connections & Diagnostic

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0**B**-00A00-0E000-00000-000000-00000-000B

0 = *Standard* - The LF Chiller Main Controller has an on-board BACnet® port for connection to a BACnet® MS/TP BAS network. Includes terminal points for target reset, alarms, and remote start/stop. This feature also includes a run/stop toggle switch, circuit disable switch, water inlet and outlet temperature sensors, suction and discharge pressure sensors, suction temperature sensors, suction superheat, ambient temperature sensor, compressor run proof, and water flow switch. A discharge temperature sensor is also included on systems with digital compressors.

B = *BACnet MS/TP* - The LF Chiller Main Controller has an on-board BACnet® port for connection to a BACnet® MS/TP BAS network. AAON Electrical will alter the wiring diagram to show BMS connections. This feature also includes a run/stop toggle switch, circuit disable switch, water inlet and outlet temperature sensors, suction and discharge pressure sensors, suction temperature sensors, suction superheat, ambient temperature sensor, compressor run proof, and water flow switch. A discharge temperature sensor is also included on systems with digital compressors.

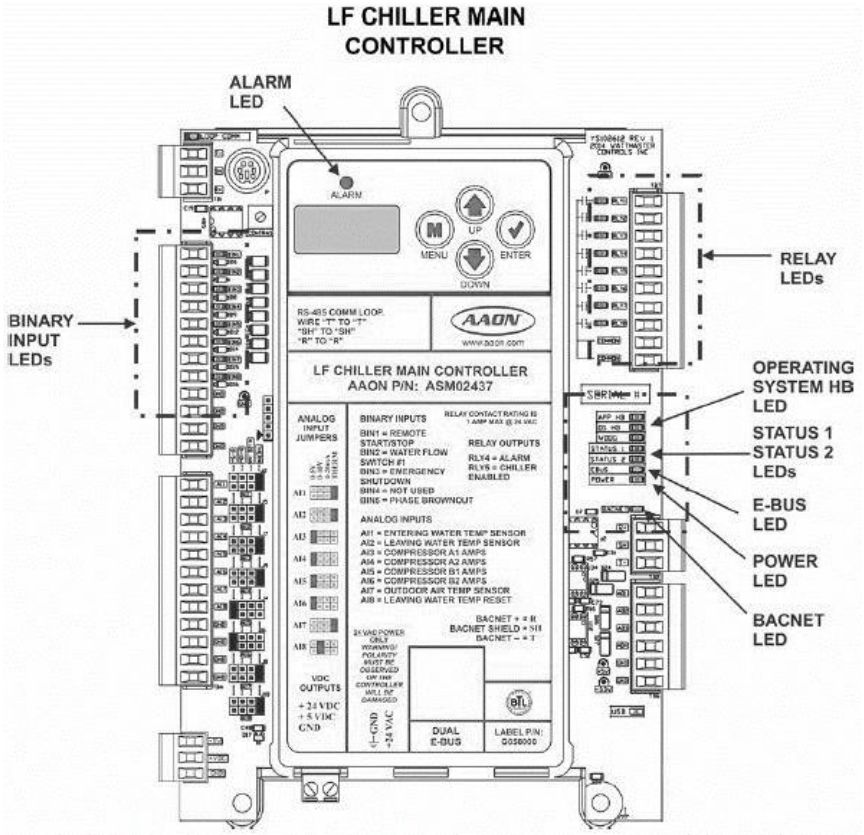
H = *No BMS Connection with Diagnostics* – Option 0 + A diagnostics package that can be used to monitor compressor performance and confirm mode of operation. The diagnostics package includes these additional sensors: compressor current sensor, liquid line temperature and liquid line pressure sensors. The diagnostics will provide the following values in addition to the temperature and pressure readings: suction superheat, discharge superheat (only with digital compressors), liquid sub-cooling, compressor amperage, and VFD fault(s) if applicable.

K = *BACnet MS/TP with Diagnostics* - Option B + A diagnostics package that can be used to monitor compressor performance and confirm mode of operation. The diagnostics package includes these additional sensors: compressor current sensor, liquid line temperature and liquid line pressure sensors. The diagnostics will provide the following values in addition to the temperature and pressure readings: suction superheat, discharge superheat (only with digital compressors), liquid sub-cooling, compressor amperage, and VFD fault(s) if applicable.

Unit Feature 10D Continued - BMS Connections & Diagnostic

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0**B**-00A00-0E000-00000-000000-00000-000B

All the control boards are equipped with LEDs that can be used to verify operation and perform troubleshooting. The LEDs associated with these inputs and outputs allow you to see what is active without using a voltmeter.



Unit Feature 11 - Blank

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-**0**0A00-0E000-00000-000000-00000-000B

0 = *Standard*

Unit Feature 12 - Vestibule Accessories

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-0**0**A00-0E000-00000-000000-00000-000B

0 = *None*
C = *Vestibule Heating (Electric)* - 1kW base board heater mounted in the chiller evaporator compartment.

Figure 12 - Vestibule Heating

Unit Feature 13 - Maintenance Accessories

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00**A**00-0E000-00000-000000-00000-000B

0 = *Standard*
A = *Factory Wired 115V Convenience Outlet* - Factory wired 2x4 inch electrical box with 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, fuse block and outlet disconnect. The circuit is wired to the line side of the unit power block or power switch permitting 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.**

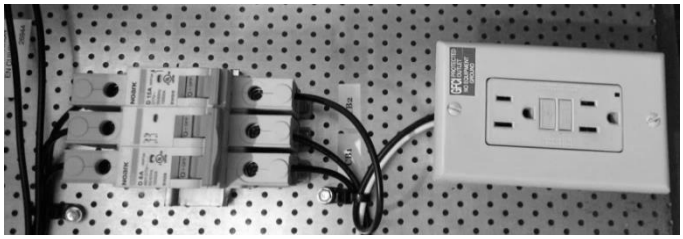


Figure 13 - Factory Wired Convenience Outlet

B = *Field Wired 115V Convenience Outlet* - Field wired 2x4 inch electrical box with ground fault interrupter receptacle, located within the controls vestibule. Receptacle is rated for 20 amps. The outlet must be field wired to a 115 VAC power supply.

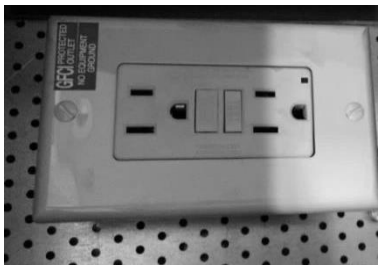


Figure 14 - Field Wired Convenience Outlet

Unit Feature 14 - Blank

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A**0**0-0E000-00000-000000-00000-000B

0 = *Standard*

Unit Feature 15 - Code Options

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A0**0**-0E000-00000-000000-00000-000B

0 = *Standard ETL USA 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.

Unit Feature 16 - Shipping Options

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-**0**E000-00000-000000-00000-000B

0 = *Standard*
B = *Crating*- Standard crating includes a wood pallet and a skeleton crate fabricated of dimensional lumber. Crating must be field disassembled and wood pallet 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.
C = *Export Crating* - Optional crating of the unit with additional supports for overseas shipping. Option includes a wood pallet, and a completely enclosed crate fabricated of dimensional lumber and plywood. Crating must be field disassembled and wood pallet 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.

Unit Feature 17 - Air-Cooled Condenser Accessories

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0**E**000-00000-000000-00000-000B

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 airflow accordingly in order to maintain the head pressure setpoint. The head pressure setpoint is field adjustable from 240-600 psi with a default setting of 340 psi. Option includes ECMs, condenser head pressure controller and pressure transducers. Minimum allowable ambient temperature for cooling operation is 0°F.

Unit Feature 17 - Air-Cooled Condenser Accessories Cont.

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0**E**000-00000-000000-00000-000B

E = *VFD Controlled Fan Head Pressure Control* - VFD controlled variable speed air-cooled condenser fans allow operation down to 0°F ambient.
G = *Condenser Coil Guards and ECM Condenser Fan Head Pressure Control* – Option C + Condenser coil guards fabricated from galvanized sheet metal, painted and factory mounted across the condenser coil face.
J = *Condenser Coil Guards and VFD Controlled Fan Head Pressure Control* - Option E + Condenser coil guards fabricated from galvanized sheet metal, painted and factory mounted across the condenser coil face.
N = *ECM Condenser Fan Head Pressure Control + Low Sound Condenser Fan* – Condenser fans are specifically designed for reduced and redirected sound emission. The fans include optimized orifice, guide vanes, and serrated blades. These condenser fans are driven by EC motors which either speed up or slow down to adjust air flow 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 9 inches of height to the standard unit. Minimum allowable ambient temperature for cooling operation is 35°F. Option available on LF sizes 004 through 031.

Figure 15 - Low Sound ECM Condenser Fan

S = *Condenser Coil Guard + ECM Condenser Fan Head Pressure Control + Low Sound Condenser Fan* - Option N + Condenser coil guards fabricated from galvanized sheet metal, painted and factory mounted across the condenser coil face..

Unit Features 18-20 - Blank

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E**000**-00000-000000-00000-000B

000 = *Standard*

Unit Features 21-23 - Blank

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-**000**00-000000-00000-000B

000 = *Standard*

Unit Feature 24 - Chiller Accessories

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-000**0**0-000000-00000-000B

0 = *Standard*
A = *Glycol Chiller* - Propylene glycol chiller system which does not include city make up water connections. Glycol is selected within the unit conditions window.
C = *Thermometers and Pressure Gauges* - Chilled water system with pumping package and thermometers and pressure gauges factory installed on the pumping package to indicate water temperature and pressure drop of various components.
G = *Glycol Chiller + Thermometers and Pressure Gauges* - Options A + C

Unit Feature 25 - Blank

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-0000**0**-000000-00000-000B

0 = *Standard*

Unit Features 26A-26F - Blank

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-**000000**-00000-000B

000000 = *Standard*

Unit Features 27-31 - Blank

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-**00000**-000B

00000 = *Standard*

Unit Feature 32 - Blank

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-**0**00B

0 = *Standard*

Unit Feature 33 - Warranty

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-0**0**0B

0 = *Standard Warranty*
D = *Compressor Warranty Years 2-5* - Extends warranty coverage of compressors for the second to fifth years of unit operation from date of shipment.

Unit Feature 34 - Cabinet Material

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-00**0**B

0 = *Standard - Double Wall + R-13 Foam Insulation* - Double wall rigid polyurethane foam injected panel construction with service access doors to the controls compartment and evaporator compartment.

Unit Feature 35 - Paint and Special Pricing Authorization

Example: LFA-031-D-A-3-GAA0E-0000:0J-0000-0000-0000-00-000-0-0A0B-00A00-0E000-00000-000000-00000-000**B**

B = *Premium AAON Gray Paint Exterior* - 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 B 117-95 test procedure.
E = *Premium AAON Gray Paint Exterior and Shrink Wrap* - Option B + unit is shrink-wrapped prior to shipment to protect unit during shipment and while in storage awaiting installation.
X = *Special Pricing Authorization and Premium AAON Gray Paint Exterior* - Option B + the Applications Department must issue a Special Pricing Authorization (SPA) to include a non-standard option.
1 = *Special Pricing Authorization, Premium AAON Gray Paint Exterior, and Shrink Wrap* - Option X + the Applications Department must issue a Special Pricing Authorization (SPA) to include a non-standard option.

General Data
Unit Information

Table 13 - 4 to 7 and 9 Ton Unit Information

	Model			
	LFA-004	LFA-005	LFA-007	LFA-009
Compressors				
Quantity/Nominal Tons				
R-410A	1/5	1/6	1/7	1/9
R-410A Lead Variable Capacity Scroll Compressor	1/5 Var.	1/6 Var.	1/7 Var.	1/9 Var.
Capacity Steps (%)	100 or 10-100% with variable capacity scroll compressors			
Quantity of Circuits	1			
Evaporator				
Maximum Water Pressure	125 psig			
Water Connection Sizes	1 1/2” Grooved Schedule 40 Black Pipe			
Brazed Plate				
Quantity	1			
Max GPM	24	30	42	54
Min GPM	4.8	6.0	8.4	10.8
Air-Cooled Condenser Fans				
Quantity	1			
Type	30” Propeller Fan			
Standard Motor Size (hp)			.75	
ECM Motor Size (hp)	.33		1.0	

Table 14 - 8 and 10 to 13 Ton Unit Information

	Model			
	LFA-008	LFA-010	LFA-011	LFA-013
Compressors				
Quantity/Nominal Tons				
R-410A	2/4	2/5	2/6	2/7
R-410A Lead Variable Capacity Scroll Compressor	1/4, 1/4 Var.	1/5, 1/5 Var.	1/6, 1/6 Var.	1/7, 1/7 Var.
R-410A All Variable Capacity Scroll Compressors	2/4 Var.	2/5 Var.	2/6 Var.	2/7 Var.
Capacity Steps (%)	100/50 or 10-100% with variable capacity scroll compressors			
Quantity of Circuits	2			
Evaporator				
Maximum Water Pressure	125 psig			
Connection Sizes	2” Grooved Schedule 40 Black Pipe			
Brazed Plate				
Quantity	1			
Max GPM	48	60	66	78
Min GPM	9.6	12	13.2	15.6
Air-Cooled Condenser Fans				
Quantity	2			
Type	30” Propeller Fan			
Standard Motor Size (hp)			.75	
ECM Motor Size (hp)	.33		1.0	

Table 15 - 14 to 17 and 22 to 24 Ton Unit Information

	Model				
	LFA-014	LFA-015	LFA-017	LFA-022	LFA-024
Compressors					
Quantity/Nominal Tons					
R-410A	2/7	2/8	2/9	2/11	2/13
R-410A Lead Variable Capacity Scroll Compressor	1/7, 1/7 Var.	1/7, 1/7 Var.	1/9, 1/9 Var.	1/11, 1/11 Var.	1/13, 1/13 Var.
R-410A All Variable Capacity Scroll Compressors	2/7 Var.	2/7 Var.	2/9 Var.	2/11 Var.	2/13 Var.
Capacity Steps (%)	100/50 or 10-100% with variable capacity scroll compressors				
Quantity of Circuits	2				
Evaporator					
Maximum Water Pressure	125 psig				
Connection Sizes	2” Grooved Schedule 40 Black Pipe				
Brazed Plate					
Quantity	1				
Max GPM	84	90	102	132	144
Min GPM	16.8	18.0	20.4	26.4	28.8
Air-Cooled Condenser Fans					
Quantity	2			3	
Type	30” Propeller Fan				
Standard Motor Size (hp)	.75				
ECM Motor Size (hp)	1.0				

Table 16 - 21 and 26 to 55 Ton Unit Information

	Model					
	LFA-021	LFA-026	LFA-031	LFA-042	LFA-048	LFA-055
Compressors						
Quantity/Nominal Tons						
R-410A	4/6	4/7	4/9	4/11	4/13	4/15
R-410A Lead Variable Capacity Scroll Compressors	3/6, 1/5 Var.	3/7, 1/7 Var.	3/9, 1/9 Var.	3/11, 1/11 Var.	3/13, 1/13 Var.	3/15, 1/15 Var.
R-410A All Variable Capacity Scroll Compressors	2/6, 2/5 Var.	2/7, 2/7 Var.	2/9, 2/9 Var.	2/11, 2/11 Var	2/13, 2/13 Var.	2/15, 2/15 Var.
Capacity Steps (%)	100/50, 100/75/50/25, or 5-100% with variable capacity scroll compressors					
Quantity of Circuits	2					
Evaporator						
Maximum Water Pressure	125 psig					
Connection Sizes	3” Grooved Schedule 40 Black Pipe					
Brazed Plate						
Quantity	1					
Max GPM	126	156	186	252	288	330
Min GPM	25.2	31.2	37.2	50.4	57.6	66.0
Air-Cooled Condenser Fans						
Quantity	4					
Type	30” Propeller Fan			36” Propeller Fan		
Standard Motor Size (hp)	.75			1.5		
ECM Motor Size (hp)	1.0					

AAON Controls

LF Chiller Controls

The AAON Chiller controller is factory provided on all LF chiller systems. The LF Chiller Main Controller and the LF Refrigeration Module work together to efficiently vary the cooling capacity of the compressors to maintain a leaving water temperature over a wide variety of operating conditions. When pumps are factory installed, an additional Chiller Pumping Module provides operational control of all water circuit pumping and is capable of managing building water pressure differential if supplying building water.

Configuration
The LF Chiller controller can be configured using Prism2 software, a free Microsoft Windows® based software that can be downloaded to a PC connected via a CommLink 5 or USB Link 2 for direct, on-site connection.

Network Capability
The LF Chiller Main Controller has an on-board BACnet® port for connection to a BACnet® MS/TP BAS network.

Diagnostics
Optional diagnostic sensors are available to provide each refrigerant circuit's suction, discharge and liquid temperature and pressure and also monitor each compressor's current. These sensors can be monitored from the Prism2 software or via BACnet® points.

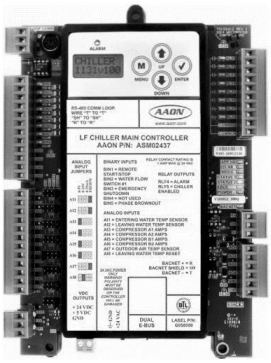


Figure 16 - LF Chiller Main Controller

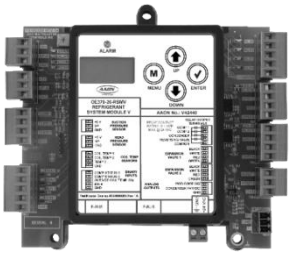


Figure 18 - LF Refrigeration Module

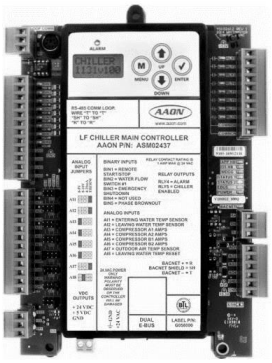


Figure 17 - Chiller Pumping Module

Electrical Service Sizing Data

Use the following equations to correctly size the electrical service wiring and disconnect switch for the unit.

To calculate the correct Minimum Circuit Ampacity (MCA) and Maximum Overcurrent Protection (MOP) values for units use the equations shown below.

MCA = 1.25(Load 1) + Load 2 + Load 3

MOP = 2.25(Load 1) + Load 2 + Load 3

Where:
Load 1 = Current of the largest motor/compressor
Load 2 = Sum of the currents of the remaining motors, including pump motors and compressors
Load 3 = Additional currents

Use Rated Load Amps (RLA) for compressors and Full Load Amps (FLA) for all other motors. Use AAONECat or check the unit nameplate for unit specific values.

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.

Standard Ampere Ratings for Fuses (From NEC Handbook, 240-6)
The standard ratings for fuses 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

To calculate the disconnect switch size use the equation shown below.

DSS $\geq$ MOP

Select the standard switch size equal to the calculated Disconnect Switch Size (DSS) value. If this value is not a standard size, select the next larger size.

Literature Change History

July 2015
Initial version of document.

November 2016
Clarification of feature A1 and A5. Revision of the amp rating of the factory installed convenience outlet in feature 13. Added quantity of circuits to Unit Information tables.

January 2017
Added I/O label descriptions in feature 10D and showed the difference between a selection with diagnostics and without. Changed the LF-D cabinet to lifting lugs only. Added the water connection details in the Unit Information tables.

July 2018
Minor revision changed to "A" because LF is now AHRI certified. Updated e-coating description to include more detailed information about warranty coverage. Changed ECM and VFD controlled variable speed air-cooled condenser fans operation temperature to down to 0°F ambient.

November 2018
Added options B and C to Feature 16. Added options N and S to Feature 17. Changed minimum and maximum flow rates for brazed plates in the Unit Information tables. Updated the selection examples.

June 2019
Updated the e-coating definition for 10,000 hours of salt spray. Revised the AAON recommended entering water temperature of 65ºF or less for continuous operating conditions. Corrected the wording under Option A5 to variable capacity compressors. Added the insulated brazed plate, end openings, variable primary pumping system, vestibule heating, and convenience outlet figures.
.

February 2020
Updated all control information to AAON Chiller Controls and removed MCS controls. Removed reference to heat trace. Removed standard condenser fan options since all chillers must have head pressure control.

June 2020
Revised wording for Feature 10D to clarify the diagnostics options.

AAON
203 Gum Springs Road
Longview, TX 75602-1721
Phone: 903-236-4403
Fax: 903-236-4463
www.AAON.com

LF Series Engineering Catalog
V45080 · Rev. A · 200630
(ACP J00427)

It is the intent of AAON to provide accurate and current product information. However, in the interest of product improvement, AAON reserves the right to change pricing, specifications, and/or design of its product without notice, obligation, or liability.

Copyright © AAON, all rights reserved throughout the world.
AAON® and AAONAIRE® are registered trademarks of AAON, Inc., Tulsa, OK.