Installation, Operation & Maintenance Manual	IOMM 1250-2
	Group: Chiller
	Part Number: IOMM1250-2
	Effective: May 2017
	Supercedes: February 2016

Variable Frequency Drives
Air-Cooled
For Centrifugal Chillers
With MicroTech II™ Control

DAIKIN

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CERTIFICATIONS	
UL508C, CAN/CSA-C22.2	EMC Directive (2004/108E/C
EPRI SEMI F47, IEC 61000-4-34.	TUV Rheinland

Manufactured in an **ISO Certified** facility

Installation Checklist – Variable Frequency Drives
Must be completed, signed and returned to STN.Wty_Startup_Regi@daikinapplied.com

Suggested Startup Points
Checklist

Company name:	
Recommended FSE/DSP	
Assigned FSE/DSP	
FSE/DSP Labor Authorization #	
Field Management Contact	
Scheduled date of service	
Serial # of drive(s)	
Drive Model #	
Daikin Unit/Model Information	

Checklist

- ☐ Equipment is securely mounted using properly sized hardware.
- ☐ Mounting arrangement meets recommended minimum spacing requirements.
- ☐ Expected ambient temperature range is OK (correct ambient temp.) (no dripping water)
- ☐ Drive is sized correctly for site altitude
- ☐ Cooling air is sufficiently clean and free from unacceptable chemical contaminants.
- ☐ Cooling airflow pattern is acceptable (adequate ventilation)
- ☐ All foreign objects have been removed from electrical and mechanical areas
- ☐ All rotating equipment is ready of operation
- ☐ All electrical equipment is properly grounded
- ☐ Short circuit, ground fault, and overload protective devices of the recommended size and type are present
- ☐ Motor cables of a recommended type and acceptable length are correctly installed
- ☐ No power factor correction devices are connected in parallel with drive motors
- ☐ Control cabling is properly routed and separated from all power cables
- ☐ Any motor disconnection equipment present includes drive enable interlocking.
- ☐ All temporary wiring has been removed
- ☐ Line voltage has been confirmed correct for the connected equipment
- ☐ EM1, EM3, F1, and F2 grounding screws are correctly removed / installed
- ☐ All dip switches are correctly set
- ☐ Motor internal wiring connections checked and correct for voltage present

Installation Checklist – Variable Frequency Drives
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- ☐ Drive motor data entry completed and confirmed (Group 99)
- ☐ Drive motor rotation and direction confirmed
- ☐ Correct motor speed and current confirmed
- ☐ PID control adjustments complete and PID operation confirmed (if applicable)
- ☐ Start command, Speed reference, and Safety inputs are connected

Additional comments:

Performed By: _____ Title: _____
PLEASE PRINT

Performed By: _____ Date: _____
SIGNATURE

⚠ DANGER

Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

⚠ DANGER

DC bus capacitors retain hazardous voltages after power has been disconnected. After disconnecting input power to the unit, wait five (5) minutes for the DC bus capacitors to discharge, and then check the voltage with a voltmeter to ensure the DC capacitors are discharged before touching any internal components. Failure to observe this precaution could result in severe bodily injury or loss of life.

⚠ CAUTION

The user is responsible for conforming to all applicable local, national and international codes. Failure to observe this precaution could result in damage to, or destruction of the equipment.

⚠ WARNING

The drive contains printed circuit boards that are static-sensitive. Anyone who touches the drive components should wear an anti-static wristband. Erratic machine operation and damage to, or destruction of, equipment can result if this procedure is not followed.

Failure to observe this precaution can result in bodily injury.

Introduction

This manual covers Air-Cooled 380-480V and 575V Variable Frequency Drives (VFDs) on centrifugal chillers with the current MicroTech II™ controllers. Many operations are the same and are treated in common. Where differences occur, information will be designated as being for a specific VFD or controller model.

General

WSC and WDC single and dual compressor, and WCC dual compressor chillers can be equipped with VFDs. A VFD starts the compressor motor and then modulates the compressor speed in response to load, evaporator pressure, and condenser pressure, as sensed by the chiller microprocessor. Despite the small power penalty attributed to the VFD internal losses, a chiller can achieve outstanding overall efficiency by using a VFD. VFDs are effective when there is a reduced load, combined with a lower compressor lift (lower condenser and/or higher evaporator water temperatures), dominating the operating hours.

The traditional method of controlling centrifugal compressor capacity is by inlet guide vanes. Slowing down the compressor, thereby reducing the impeller tip speed, can also reduce capacity. However, sufficient impeller tip speed must always be maintained to meet the chiller's lift requirements. The speed control method is more efficient than guide vanes by themselves.

In actual practice, a combination of the two techniques is used. The microprocessor slows the compressor (to a programmed minimum percent of full load speed) as much as possible, considering the need for

sufficient tip speed, to make the required compressor lift. Then the guide vanes take over for further capacity reduction. This method provides the optimum efficiency under lower lift conditions.

Operation and adjustment of the VFD involves settings for the VFD and also to the IGV. This manual consists of a section relating to VFD operation common to both chiller controllers and also a separate section for the settings specific to the chiller controllers.

Environmental Conditions

Ambient Temperature	32° to 104°F (0°C to 40°C, derate up to 50°C)
Storage Temperature (Ambient)	32° to 131°F (0°C to 55°C)
Humidity	5% to 95% (non-condensing)

AC line distribution system capacity not to exceed 100,000 amps symmetrical available fault current.

Do not install the drive above 1000 meters (3300 feet) without derating output power. For every 91.4 meters (300 feet) above 1000 meters (3300 feet), derate the output current 1% (with a max derate of 10%).

Standard NEMA 1 type VFDs must be installed indoors in an area that is not exposed to direct water spray. Do not install in areas where the ambient temperature falls below 32°F (0°C) or exceeds 104°F (40°C) unless this was noted at the time of order placement and special precautions were taken to protect against these abnormal temperatures. Contact Daikin Applied Factory Service for operation outside these conditions. VFDs reject heat into the surrounding space as shown below:

380-480V Drives

VFD Model	015ALA 015AMA	018ALA 018AMA	026ALA 026AMA	035ALA 035AMA	045ALA 045AMA	059ALA 059AMA	073ALA 073AMA	081ALA 081AMA	105ALA	145ALA
Watts Heat Loss	2298	2737	4666	5127	6335	8966	10745	11474	18638	23425
RLA	150	182	262	349	451	587	728	809	1046	1453

575V Drives

VFD Model	030ALC 030AMC	033ALC 033AMC	039ALC 039AMC	042ALC 042AMC	053ALC 053AMC	058ALC 058AMC	065ALC 065AMC	073ALC	105ALC
Watts Heat Loss	5127	6326	7133	8855	10806	11522	11441	15088	23550
RLA	298	334	388	424	532	587	651	731	1047

Nomenclature

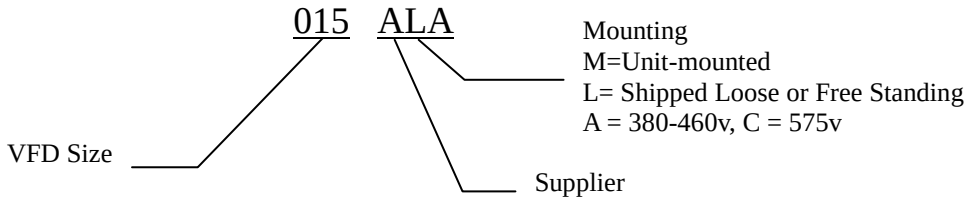


Figure 1, Internal Components, (Models 015ALA, 015AMA, 018ALA, 018AMA, 026ALA, 026AMA, 035ALA, 035AMA)

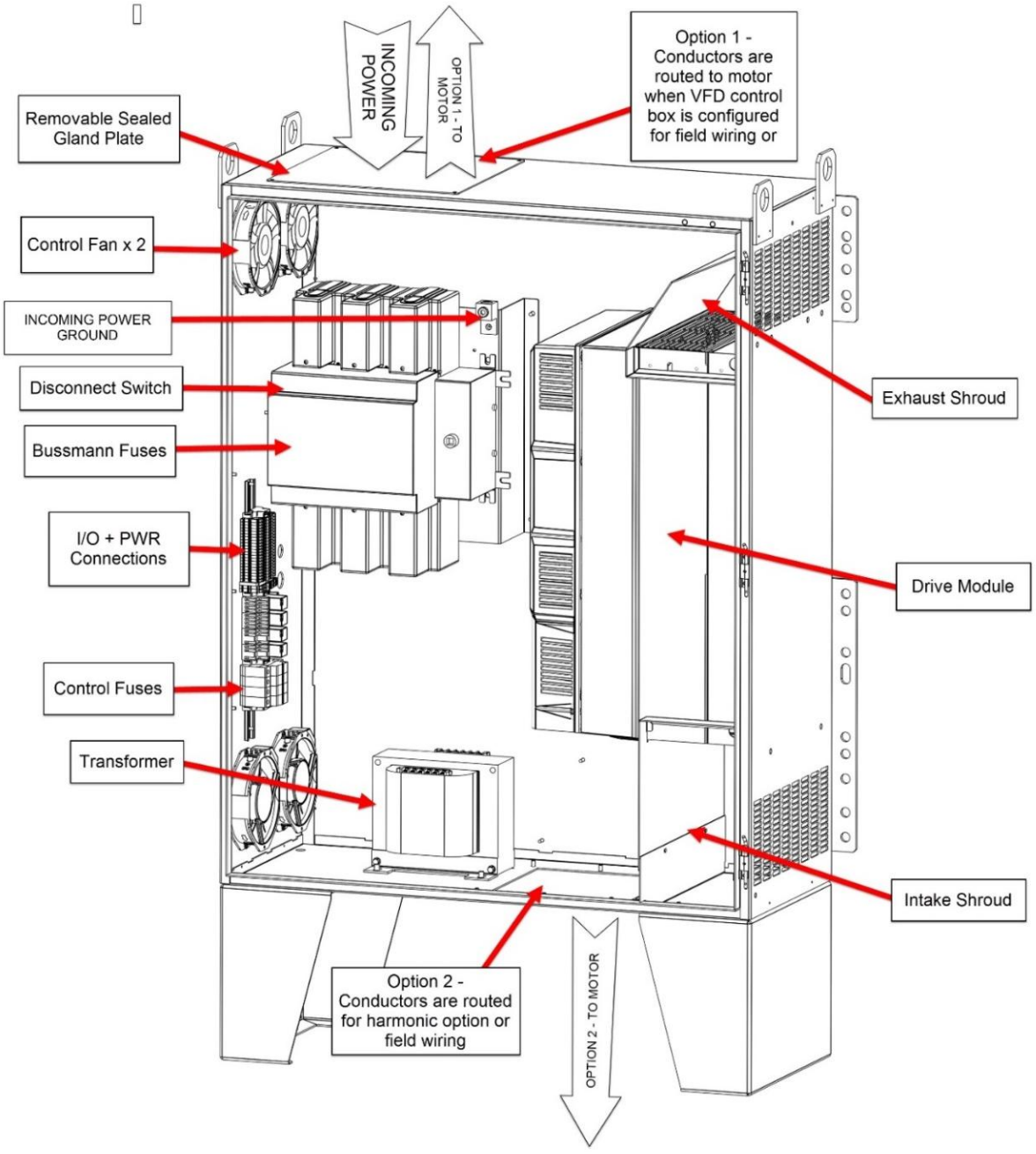


Figure 2, Internal Components, (Models 030ALC, 030AMC, 033ALC, 033AMC, 039ALC, 039AMC, 042ALC, 042AMC, 045ALA, 045AMA, 053ALC, 053AMC, 058ALC, 058AMC, 059ALA, 059AMA, 065ALC, 065AMC, 075ALA, 075AMA, 081ALA, 081AMA)

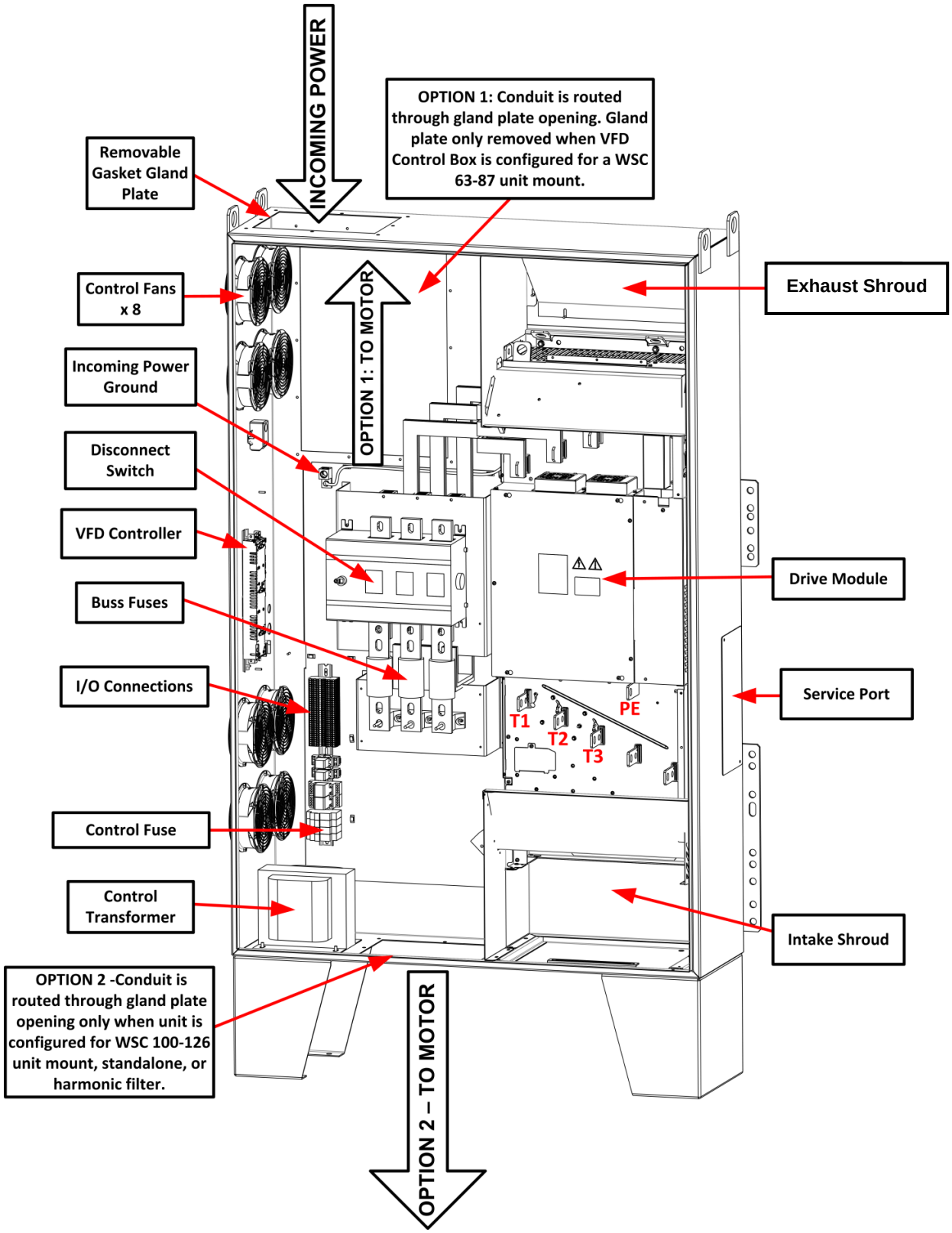
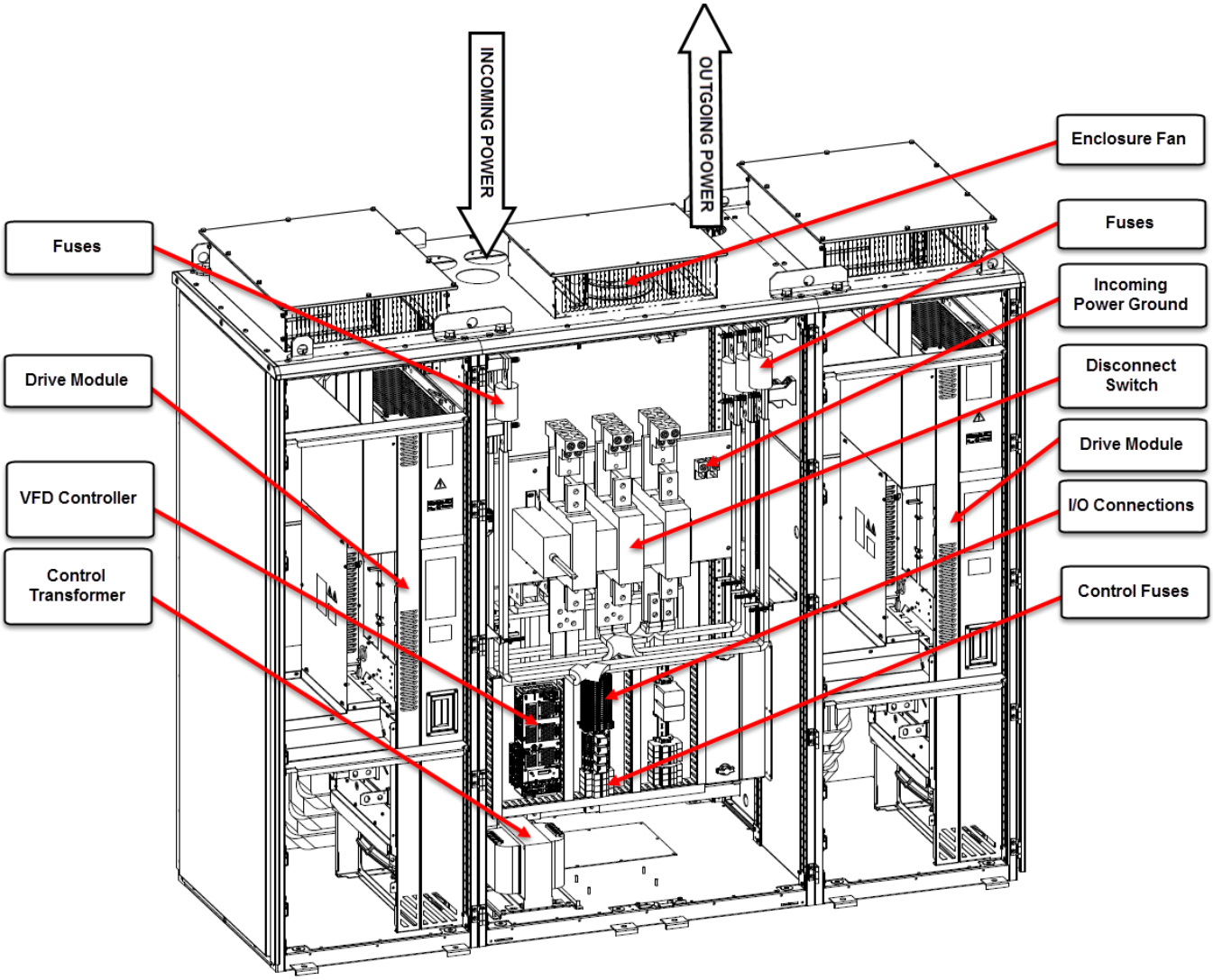


Figure 3, Internal Components, (Models 073ALC, 073AMC, 105ALA, 105AMA, 145ALA, 145AMA)



Installation

Mounting Arrangements

Depending on size and type, VFDs may be factory-mounted with power and control wiring factory-installed or free-standing, requiring field mounting remote from the unit and field-wiring of power and control wiring. Because of dimension restrictions for shipping, some "factory-mounted" VFDs for some large chillers are shipped separate from the unit. Mounting supports are on the unit and preassembled cable kits are provided. Make sure that the floor or structural support is adequate to support the weight of the unit shown on the dimension drawing.

The following types of VFD starters are available:

- Free Standing Starter – Customer is responsible for mounting and wiring the VFD at the jobsite. Final power wiring connections from the VFD to the compressor motor terminals must be completed by Daikin Service. This type of starter must be secured to the floor or wall.
- Field Installed Unit Mounted Starter – Customer is responsible for mounting and wiring the VFD on the unit. Power cables from the VFD to the compressor motor terminals are provided by the factory. Final power wiring connections from the VFD to the compressor motor terminals must be completed by Daikin Service.
- Factory Installed Unit Mounted Starter – VFD is mounted and wired to the compressor by the factory.

Receiving

Since factory-mounted VFDs are mounted and wired at the factory, this section will only apply to free-standing units. The unit should be inspected immediately after receipt for possible damage.

All Daikin centrifugal VFDs are shipped FOB factory and all claims for handling and shipping damage are the responsibility of the consignee.

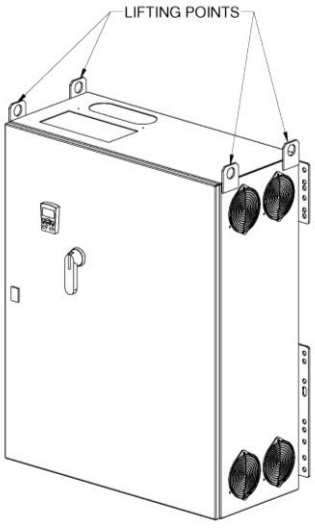
Rigging in Field-Mounted and Free-Standing Units

⚠ CAUTION

Tipping Hazard: Extreme care must be used when rigging the equipment to prevent damage. See the certified dimension drawings included in the job submittal for the center of gravity of the unit. Consult the local Daikin sales office for assistance if the drawings are not available.

Figure 4, Lifting Points for Free-Standing Starter

Cab #1



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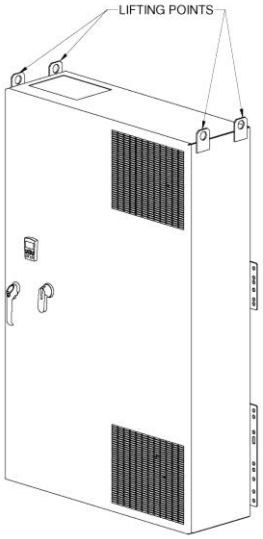

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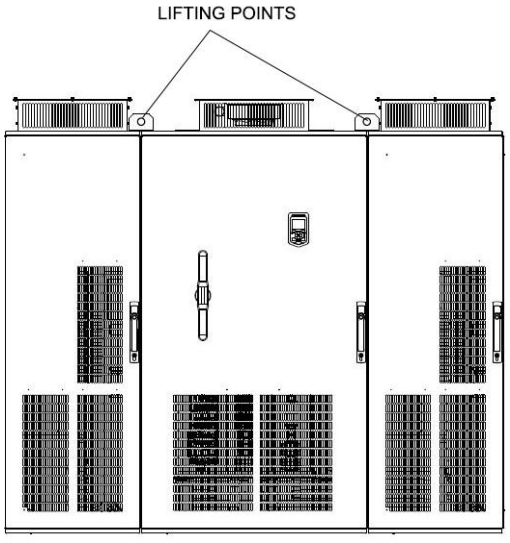


Use the following procedure to lift and mount the drive:

Step 1. Using an overhead or portable hoist (minimum 2 ton rated capacity), attach a free-fall chain to the chain secured to the drive. Take up any vertical slack in the chain.

Step 2. Using the hoist, lift the drive from the horizontal shipping pallet.

Step 3. Position the drive. Ensure proper fastening to floor or wall.

Step 4. Machine or floor-mount the drive enclosure using 1/2-inch bolts, grade 5 or better, with compression washers.

Location

Consider the following guidelines:

- Verify that enclosure drives can be kept clean and dry.
- The area chosen should allow the space required for proper air flow. A minimum of 16-inch clearance is required wherever vents are located.
- Be sure that the enclosure is installed away from oil, coolants, or other airborne contaminants.
- Verify that the drive location meets the environmental conditions specified on page 4.

Clearance

The VFDs must be mounted on a level concrete or steel base and must be located to provide adequate service. Local codes or the National Electric Code (NEC) can require more clearance in and around electrical components and must be checked.

Grounding the Drive

⚠ WARNING

To prevent physical injury, death, increased electromagnetic interference and equipment malfunction:
• Ground the drive, motor and adjoining equipment to ensure personnel safety in all circumstances, and to reduce electromagnetic emission and interference.
• Make sure that grounding conductors are adequately sized as required by safety regulations.
• In a multiple-drive installation, connect each drive separately to protective earth (PE).
• To minimize EMC emissions, make a 360° high frequency grounding of cable entries at the cabinet lead-through in order to suppress electromagnetic disturbances. In addition, connect the cable shields to protective earth (PE) in order to meet safety regulations.

Use the following steps to ground the drive:

Step 1. Open the door of the enclosure.

Step 2. Run a suitable equipment grounding conductor per the NEC from the drive enclosure ground lug to earth ground (See Figure 1). Refer to Table 2 for recommended wiring. Tighten these grounding connections to the proper torque.

Step 3. Close the door of the enclosure.

Safety Precautions

Electrical codes require that all equipment (VFD, motor, operator station, etc.) be properly grounded. An incoming disconnect must be locked in a disconnect position before wiring or servicing the starter, motor, or other related equipment. The equipment must only be serviced by qualified personnel fully trained and familiar with the equipment.

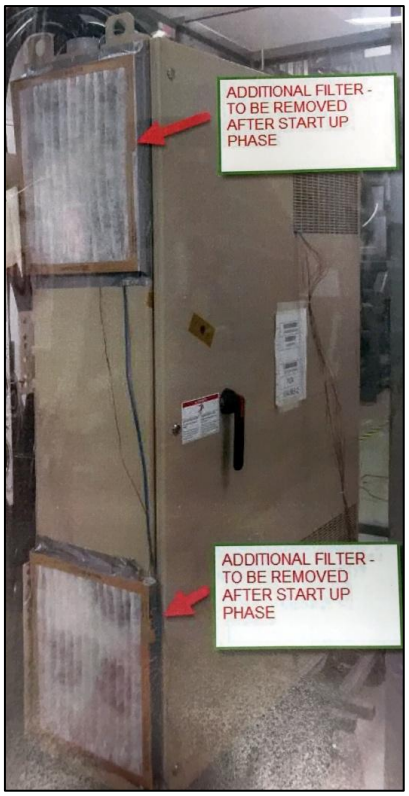
The opening of the branch circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of electrical shock, current carrying parts and other components of the starter should be inspected and replaced if damaged.

Equipment is at line voltage when AC power is connected. Pressing the Stop push-button does not remove AC line potential. All phases must be disconnected before it is safe to work on machinery or touch motor terminals and control equipment parts.

Startup

In the startup mode, all panels can be run up to 80% of the RLA capacity when equipped with two additional air filters. These filters are mounted over the existing intake and exhaust fans and should be cleaned as often as necessary. Overheating may occur if filters are not cleaned or replaced in a timely manner. The "over-temperature" warning will flash on the keypad display and the unit will go through orderly shutdown if not serviced. The extra filters may be removed after the startup phase. Filters are needed on all intake fans, refer to Figure 3 for locations.

Figure 5, Filter Locations on Intake and Exhaust Fans



Power Wiring in Free-Standing and Field-Installed, Unit Mounted VFDs

Wiring, fuse and wire size must be in accordance with local codes and the National Electric Code (NEC).

⚠ CAUTION

Voltage unbalance not to exceed 2% with a resultant current unbalance of 6 to 10 times the voltage unbalance per NEMA MG-1, 1998 Standard. This is an important requirement to avoid excessive motor or drive heating.

⚠ WARNING

Qualified and licensed electricians must perform wiring. Shock hazard exists.

Power wiring to compressors must be in proper phase sequence. Motor rotation is set up for clockwise rotation facing the lead end with phase sequence of 1-2-3. Care must be taken that the proper phase sequence is carried through the VFD to the compressor. With the phase sequence of 1-2-3 and L1 connected to T1 and T6, L2 connected to T2 and T4, and L3 connected to T3 and T5, rotation is proper. See diagram in terminal box cover. The Daikin start-up technician will check the phase sequence.

⚠ CAUTION

Connections to terminals must be made with copper lugs and copper wire.

Care must be taken when attaching leads to compressor terminals.

Note: Do not make final connections to motor terminals until wiring has been checked and approved by a Daikin technician.

Under no circumstances should the compressor be started unless proper sequence and rotation has been established by Daikin Applied Factory Service. Serious damage will result if the compressor starts in the wrong direction. Such damage is not covered by product warranty.

Power Factor Correction Capacitors

Do not use power factor correction capacitors with centrifugal chillers with a compressor VFD. Doing so can cause harmful electrical resonance in the system. Correction capacitors are not necessary since VFDs inherently maintain high power factors.

General Wiring Practice (free-standing models only)

1. Never connect input AC power to the VFD motor output terminals T1/U1, T2/V2 or T3/W3.
2. Power wiring to the motor must have the maximum possible separation from all other wiring. Do not run control wiring in the same conduit; this separation reduces the possibility of coupling electrical noise between circuits. Minimum spacing between metallic conduits containing different wiring groups should be three inches (76 mm).
3. Minimum spacing between different wiring groups should be six inches (152 mm).
4. Wire runs outside of an enclosure should be run in metallic conduit or have shielding/armor with equivalent attenuation.
5. Different wire groups should cross at 90 degrees whenever power and control wiring cross.
6. Different wire groups should be run in separate conduits.
7. 100,000 AIC fused disconnect is provided as standard. Adhere to NEC or local electrical codes.
8. Wiring connections are made either through the top or back of the enclosure. See Figures 1 and 2 for additional information. Wire runs should be properly braced to handle both starting and fault currents. Size power cable per local electrical codes. Long lengths of cable to the motor of over 150 feet must be de-rated.

Table 1: Incoming Lug Sizes for Free-Standing and Unit Mounted Drives

Drive	Lug Part #	Lug Wire Size	Disconnect Size
015ALA 015AMA	OZXA-400/3P	#2- 600MCM	400
018ALA 018AMA	OZXA-400/3P	#2- 600MCM	400
026ALA 026AMA	OZXA-400/3P	#2- 600MCM	400
035ALA 035AMA	OZXA-800/3	(2) #2- 600MCM	600
045ALA 045AMA	OZXA-800/3	(2) #2- 600MCM	600
059ALA 059AMA	OZXA-800/3	(2) #2- 600MCM	800
073ALA 073AMA	OZXA-1200/3	(4) #2- 600MCM	1200
081ALA 081AMA	OZXA-1200/3	(4) #2- 600MCM	1200
105ALA	OZXA-28/3	(4) #2- 600MCM	1600
145ALA	OZXA-28/3	(8) #2- 600MCM	2000
030ALC 030AMC	OZXA-800/3	(2) #2- 600MCM	600
033ALC 033AMC	OZXA-800/3	(2) #2- 600MCM	600
039ALC 039AMC	OZXA-800/3	(2) #2- 600MCM	600
042ALC 042AMC	OZXA-800/3	(2) #2- 600MCM	600
053ALC 053AMC	OZXA-800/3	(2) #2- 600MCM	800
058ALC 058AMC	OZXA-800/3	(2) #2- 600MCM	800
065ALC 065AMC	OZXA-800/3	(2) #2- 600MCM	800
073ALC	OZXA-1200/3	(4) #2- 600MCM	1200
105ALC	OZXA-28/3	(4) #2- 600MCM	1600

Power Wiring for Free Standing Starters

Power wiring connections at the motor are hermetic feedthrough type terminals with threaded posts, sized per the following table. Refer to Figure 5 for typical connections.

Table 2: Recommended Wiring for Grounding and Power (continued on next page)

Wire Size (Gauge)	Supplier	Supplier Part Number	Ground Stud Size	Die Color	Type P(Power) G(Ground)
4	T&B	54106	1/4	Gray	G
4	T&B	54140	3/8	Gray	G
2	T&B	54108	1/4	Green	G
2	T&B	54148	3/8	Green	G
2	T&B	54150	1/2	Green	P
2	Morris Product	11131	5/8	Silver	P
1/0	T&B	54157	1/4	Black	G
1/0	T&B	54110	3/8	Black	G
1/0	T&B	54160	1/2	Black	P
1/0	T&B	256-30695-131	5/8	Black	P
2/0	T&B	54111	3/8	Orange	G
2/0	T&B	54165-TB	1/2	Orange	G,P
2/0	T&B	5416510	5/8	Orange	P

3/0	T&B	54170	½	Purple	P
3/0	T&B	5417010	5/8	Purple	P
4/0	T&B	58165	½	Yellow	P
4/0	T&B	58166	5/8	Yellow	P
250MCM	T&B	58168	½	White	P
250MCM	T&B	5816810	5/8	White	P
350MCM	T&B	58174	1/2	Blue	P
350MCM	T&B	5817410	5/8	Blue	P

Table 3: Recommended Wiring for Grounding and Power

Wire Reference (MTW, Tinned, 600V) VFD to Motor					
Wire Size (Gauge)	**Supplier**	**P/N**	**Outer Diameter**	**Conductor**	**Strands**
6	SouthWire	F06006	0.324	Tinned Copper	133
4	SouthWire	F04053	0.387	Tinned Copper	133
2	SouthWire	F02048	0.472	Tinned Copper	133
1	SouthWire	F01041	0.521	Tinned Copper	259
1/0	SouthWire	F1T043	0.561	Tinned Copper	259
2/0	SouthWire	F2T048	0.66	Tinned Copper	259
3/0	SouthWire	F3T052	0.666	Tinned Copper	259
4/0	SouthWire	F4T030	0.785	Tinned Copper	259
250MCM	SouthWire	F25008	0.835	Tinned Copper	2451
350MCM	SouthWire	52535	.927"	Tinned Copper	3458

Table 4: Recommended Wiring for Grounding and Power

Wire Size	Supplier	P/N	Stud Size	Die Color
4	Panduit	LCA4-14-L	1/4	Gray
4	Panduit	LCA4-38-L	3/8	Gray
4	Panduit	LCA4-14-L	1/4	Gray
2	Panduit	LCAX2-14-E	1/4	Brown
2	Panduit	LCAX2-38-E	3/8	Brown
2	Panduit	LCAX2-12-E	1/2	Brown
2	Morris Product	11131	5/8	Silver
1/0	Panduit	LCAX1/0-14-X	1/4	Pink
1/0	Panduit	LCAX1/0-38-X	3/8	Pink
1/0	Panduit	LCAX1/0-12-X	1/2	Pink
1/0	Panduit	LCAX1/0-58-X	5/8	Pink
2/0	Panduit	LCAX2/0-38-X	3/8	Black
2/0	Panduit	LCAX2/0-12-X	1/2	Black
2/0	Panduit	LCAX2/0-58-X	5/8	Black
3/0	Panduit	LCAX3/0-12-X	1/2	Orange
3/0	Panduit	LCAX3/0-58-X	5/8	Orange
4/0	Panduit	LCAX4/0-12-X	1/2	Purple
4/0	Panduit	LCAX4/0-58-X	5/8	Purple
250MCM	Panduit	LCAX250-12-X	1/2	Yellow
250MCM	Panduit	LCAX250-58-X	5/8	Yellow
350MCM	Panduit	LCAX350-12-6	1/2	Blue
350MCM	Panduit	LCAX350-58-6	5/8	Blue
500MCM	Panduit	LCAX500-12-6	1/2	Pink
500MCM	Panduit	LCAX500-58-6	5/8	Pink

Table 5: Power Wiring from Free Standing VFD Starter to Compressor Motor Terminal

Unit Type	Voltage (C06)	Approved RLA (C09)	Lug Stud Hole Size on VFD Terminals (U,V,W)	Motor Terminal (Lug Hole Size)	Motor Terminal Box PE (Lug Stud Hole Size)	VFD Terminal PE (Lug Stud Hole Size)
WSC 063 to 087	380-460VAC	150	3/8"	5/8"	3/8"	1/4"
	380-460VAC	182	3/8"	5/8"	3/8"	1/4"
	380-460VAC	262	3/8"	5/8"	3/8"	1/4"
	380-460VAC	3/8"	5/8"	3/8"	1/4"	3/8"
	380-460VAC	451	1/2"	5/8"	3/8"	1/2"
	380-460VAC	587	1/2"	5/8"	3/8"	1/2"
	380-460VAC	728	1/2"	5/8"	3/8"	1/2"
	380-460VAC	809	1/2"	5/8"	3/8"	1/2"
	575VAC	298	1/2"	5/8"	3/8"	1/2"
	575VAC	334	1/2"	5/8"	3/8"	1/2"
	575VAC	388	1/2"	5/8"	3/8"	1/2"
	575VAC	424	1/2"	5/8"	3/8"	1/2"
	575VAC	532	1/2"	5/8"	3/8"	1/2"
	575VAC	587	1/2"	5/8"	3/8"	1/2"
	575VAC	651	1/2"	5/8"	3/8"	1/2"
WSC 100 to 126	380-460VAC	150	3/8"	5/8"	3/8"	1/4"
	380-460VAC	182	3/8"	5/8"	3/8"	1/4"
	380-460VAC	262	3/8"	5/8"	3/8"	1/4"
	380-460VAC	349	3/8"	5/8"	3/8"	1/4"
	380-460VAC	451	1/2"	5/8"	3/8"	1/2"
	380-460VAC	587	1/2"	5/8"	3/8"	1/2"
	380-460VAC	728	1/2"	5/8"	3/8"	1/2"
	380-460VAC	809	1/2"	5/8"	3/8"	1/2"
	380-460VAC	1047	1/2"	5/8"	3/8"	1/2"
	380-460VAC	1191	1/2"	5/8"	3/8"	1/2"
	380-460VAC	1453	1/2"	5/8"	3/8"	1/2"
	575VAC	298	1/2"	5/8"	3/8"	1/2"
	575VAC	334	1/2"	5/8"	3/8"	1/2"
	575VAC	388	1/2"	5/8"	3/8"	1/2"
	575VAC	424	1/2"	5/8"	3/8"	1/2"
	575VAC	532	1/2"	5/8"	3/8"	1/2"
	575VAC	587	1/2"	5/8"	3/8"	1/2"
	575VAC	651	1/2"	5/8"	3/8"	1/2"
	575VAC	731	1/2"	5/8"	3/8"	1/2"
	575VAC	1047	1/2"	5/8"	3/8"	1/2"

Figure 6: Wiring Connections

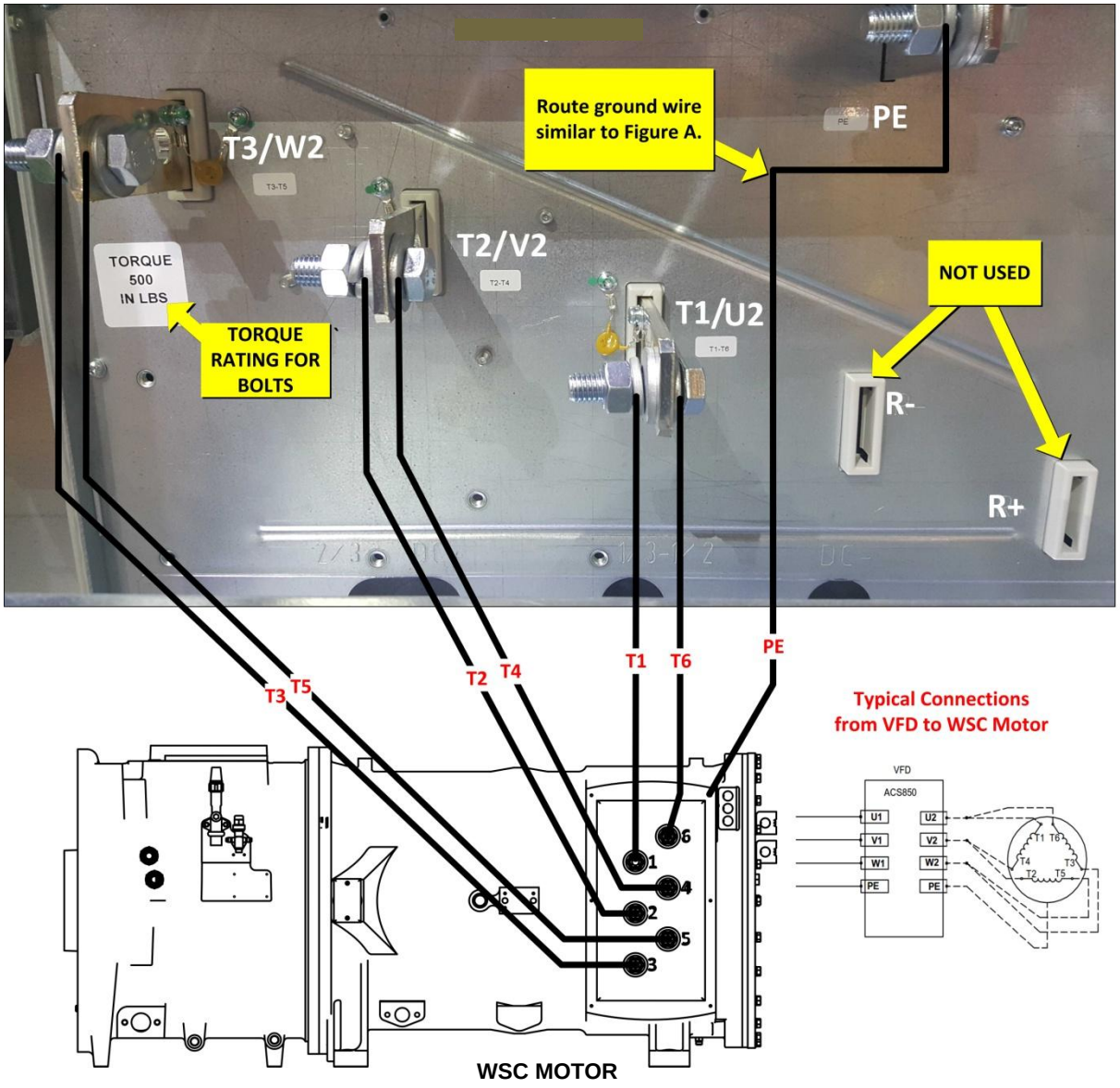


Figure 7: Fuse Locations

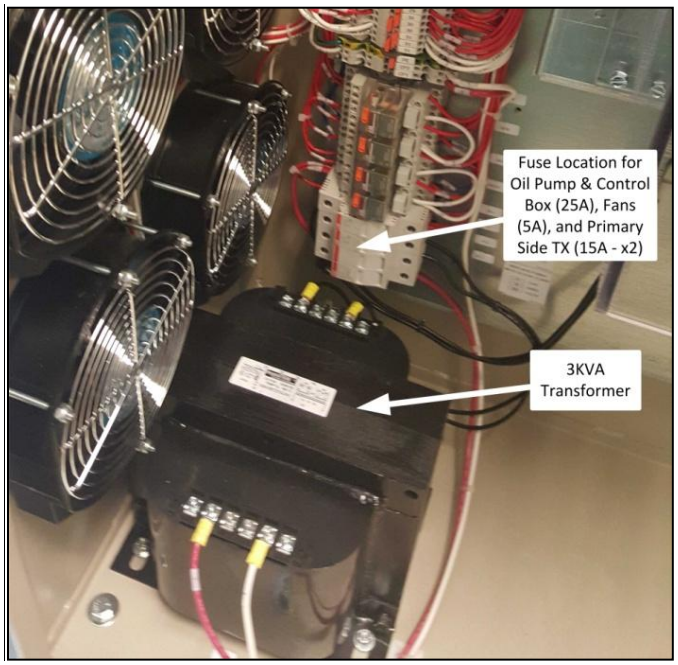
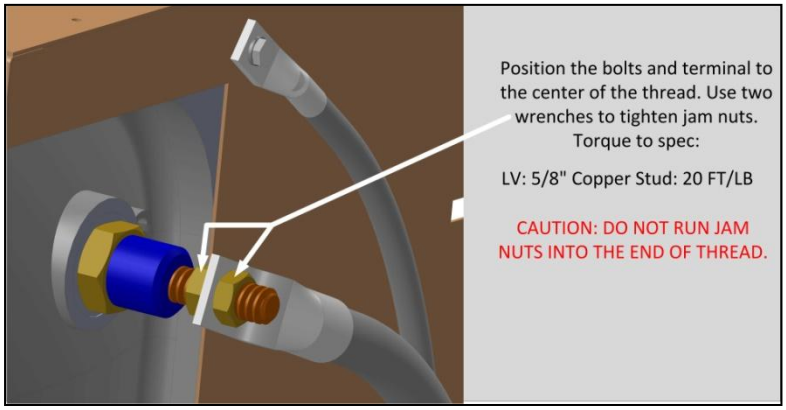


Figure 8: Installation Information and Bus Bar Usage



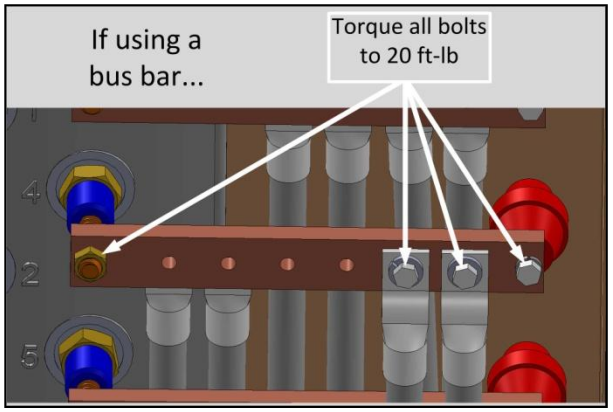


Figure 9: Ground Terminal Instructions

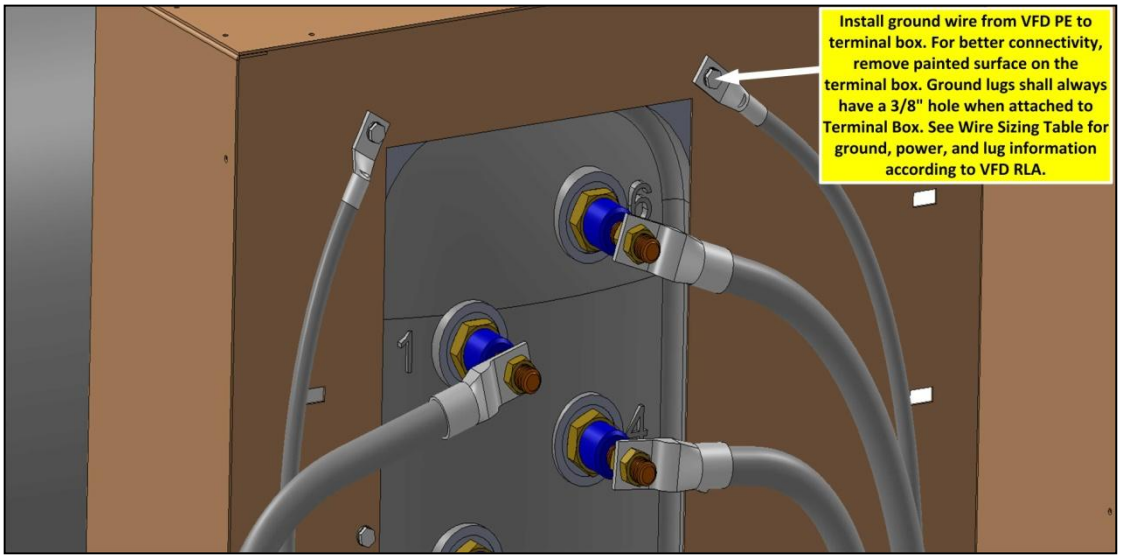
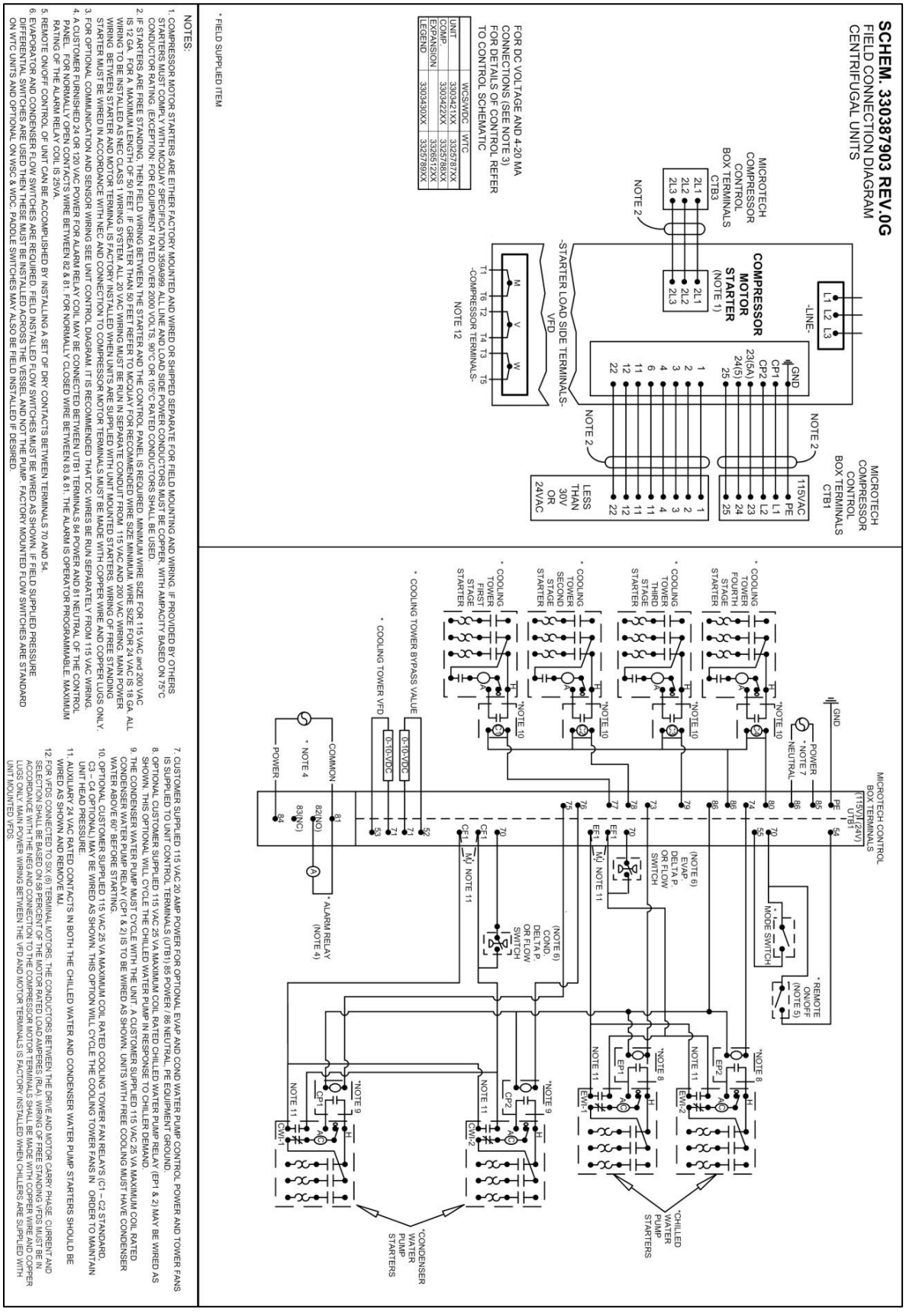


Figure 10: Centrifugal Wiring Schematic



NOTES:

1. COMPRESSOR MOTOR STARTERS ARE EITHER FACTORY MOUNTED AND WIRED OR SHIPPED SEPARATE FOR FIELD MOUNTING AND WIRING. IF PROVIDED BY OTHERS STARTERS MUST COMPLY WITH MCQUAY SPECIFICATION 3594969. ALL LINE AND LOAD SIDE POWER CONDUCTORS MUST BE COPPER, WITH AMPACITY BASED ON 75°C CONDUCTOR RATING. (EXCEPTION: FOR EQUIPMENT RATED OVER 2000 VOLTS, 90°C OR 105°C RATED CONDUCTORS SHALL BE USED.
2. IF STARTERS ARE FREE STANDING, THEN FIELD WIRING BETWEEN THE STARTER AND THE CONTROL PANEL IS REQUIRED. MINIMUM WIRE SIZE FOR 115 VAC and 200 VAC IS 12 AWG. MAXIMUM LENGTH IS 150 FEET. FOR 24 VAC IS 18 GA. MAXIMUM LENGTH IS 50 FEET. WIRING GREATER THAN 50 FEET MUST BE RUN IN SEPARATE CONDUIT FROM 115 VAC POWER WIRING. BETWEEN STARTER AND MOTOR TERMINALS IS FACTORY INSTALLED WHEN UNITS ARE SUPPLIED WITH UNIT MOUNTED STARTERS. WIRING OF FREE STANDING STARTER MUST BE WIRED IN ACCORDANCE WITH NEC AND CONNECTION TO COMPRESSOR MOTOR TERMINALS MUST BE MADE WITH COPPER WIRE AND COPPER LUGS ONLY.
3. FOR OPTIONAL COMMUNICATION AND SENSOR WIRING SEE UNIT CONTROL DIAGRAM. IT IS RECOMMENDED THAT DC WIRES BE RUN SEPARATELY FROM 115 VAC WIRING.
4. A CUSTOMER FURNISHED 24 OR 120 VAC POWER FOR ALARM RELAY COIL MAY BE CONNECTED BETWEEN UTB1 TERMINALS 84 POWER AND 81 NEUTRAL OF THE CONTROL PANEL. THE NORMALLY OPEN CONTACTS WIRE BETWEEN 82 & 84. FOR NORMALLY CLOSED WIRE BETWEEN 83 & 81. THE ALARM IS OPERATOR PROGRAMMABLE. MAXIMUM RATING OF THE ALARM RELAY COIL IS 25VA
5. REMOTE ON/OFF CONTROL OF UNIT CAN BE ACCOMPLISHED BY INSTALLING A SET OF DRY CONTACTS BETWEEN TERMINALS 70 AND 54.
6. EVAPORATOR AND CONDENSER FLOW SWITCHES ARE REQUIRED. FIELD INSTALLED FLOW SWITCHES MUST BE WIRED AS SHOWN. IF FIELD SUPPLIED PRESSURE DIFFERENTIAL SWITCHES ARE USED, THEN THESE MUST BE INSTALLED ACROSS THE VESSEL AND NOT THE PUMP. FACTORY MOUNTED FLOW SWITCHES ARE STANDARD ON WTC UNITS AND OPTIONAL ON WSC & WDC. PADDLE SWITCHES MAY ALSO BE FIELD INSTALLED IF DESIRED.
7. CUSTOMER SUPPLIED 115 VAC 20 AMP POWER FOR OPTIONAL EVAP AND COND WATER PUMP CONTROL POWER AND TOWER FANS IS SUPPLIED TO UNIT CONTROL TERMINALS (UTB1) 85 POWER / 86 NEUTRAL, PE EQUIPMENT GROUND.
8. OPTIONAL CUSTOMER SUPPLIED 115 VAC 25 VA MAXIMUM COIL RATED CHILLED WATER PUMP RELAY (EP1 & 2) MAY BE WIRED AS SHOWN. THIS OPTIONAL WILL CYCLE THE CHILLED WATER PUMP IN RESPONSE TO CHILLER DEMAND.
9. THE CONDENSER WATER PUMP MUST CYCLE WITH THE UNIT. A CUSTOMER SUPPLIED 115 VAC 25 VA MAXIMUM COIL RATED CONDENSER WATER PUMP RELAY (CP1 & 2) IS TO BE WIRED AS SHOWN. UNITS WITH FREE COOLING MUST HAVE CONDENSER WATER ABOVE 60° BEFORE STARTING.
10. OPTIONAL CUSTOMER SUPPLIED 115 VAC 25 VA MAXIMUM COIL RATED COOLING TOWER FAN RELAYS (C1 – C2 STANDARD, C3 – C4 OPTIONAL) MAY BE WIRED AS SHOWN. THIS OPTION WILL CYCLE THE COOLING TOWER FANS IN ORDER TO MAINTAIN UNIT HEAD PRESSURE.
11. AUXILIARY 24 VAC RATED CONTACTS IN BOTH THE CHILLED WATER AND CONDENSER WATER PUMP STARTERS SHOULD BE WIRED AS SHOWN AND REMOVE MJ.
12. FOR VFDS CONNECTED TO SIX (6) TERMINAL MOTORS: THE CONDUCTORS BETWEEN THE DRIVE AND MOTOR CARRY PHASE, CURRENT AND SELECTION SHALL BE BASED ON 58 PERCENT OF THE MOTOR RATED LOAD AMPERES (RLA). WIRING OF FREE STANDING VFDS MUST BE IN ACCORDANCE WITH THE NEC AND CONNECTION TO THE COMPRESSOR MOTOR TERMINALS SHALL BE MADE WITH COPPER WIRE AND COPPER LUGS ONLY. MAIN POWER WIRING BETWEEN THE VFD AND MOTOR TERMINALS IS FACTORY INSTALLED WHEN CHILLERS ARE SUPPLIED WITH UNIT MOUNTED VFDS.

* FIELD SUPPLIED ITEM

Figure 11: VFD Wiring Schematic [Cab #1 and #2]

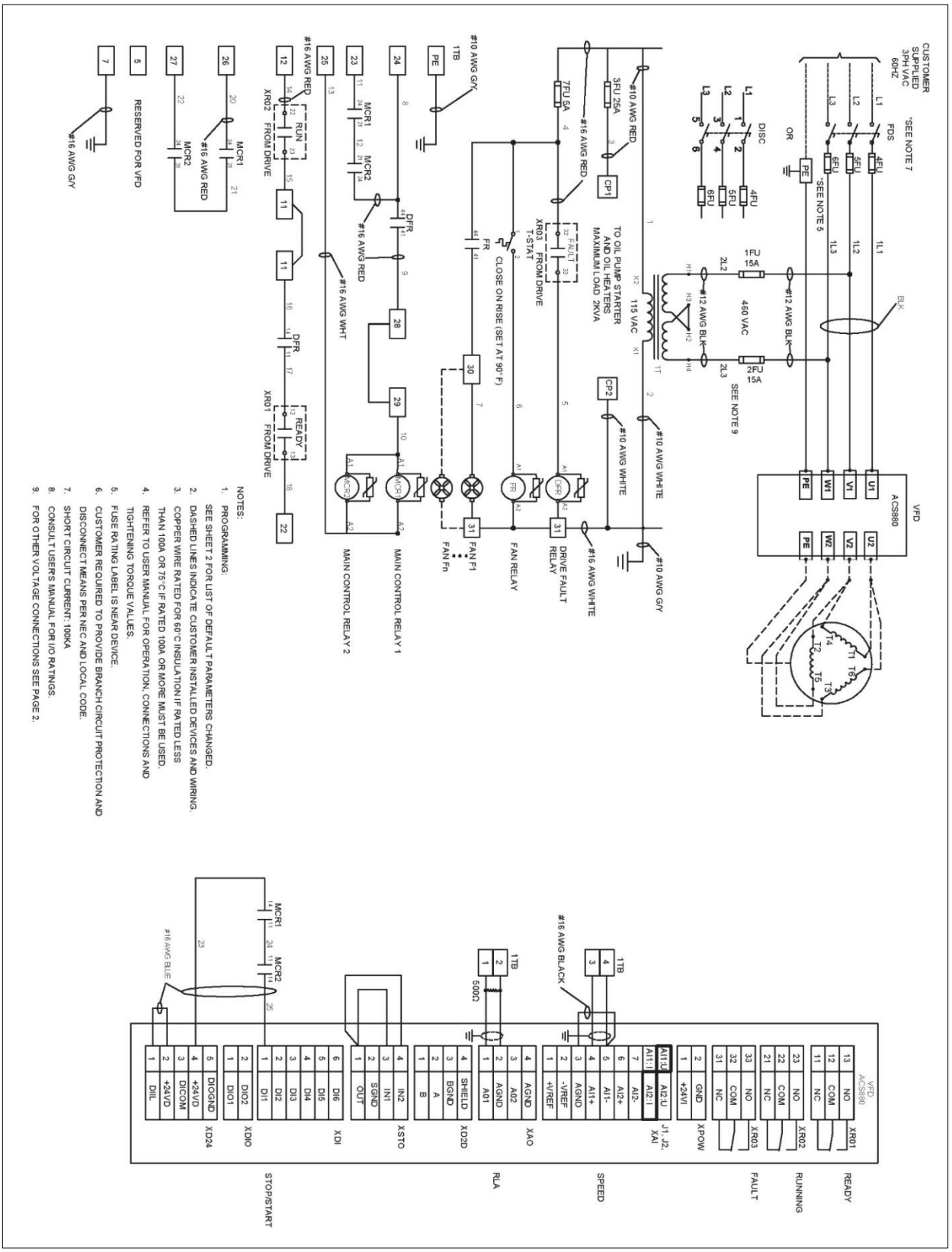
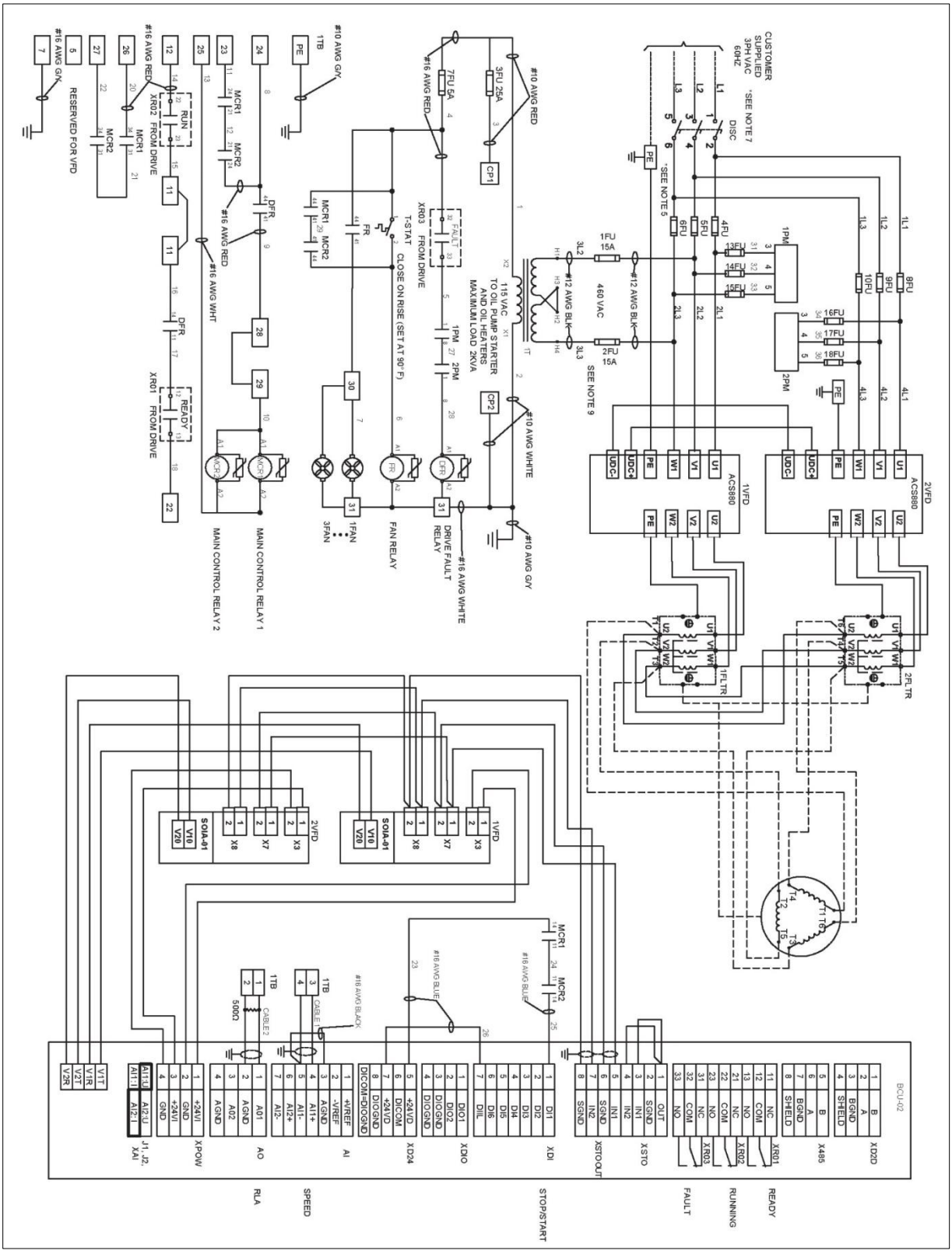
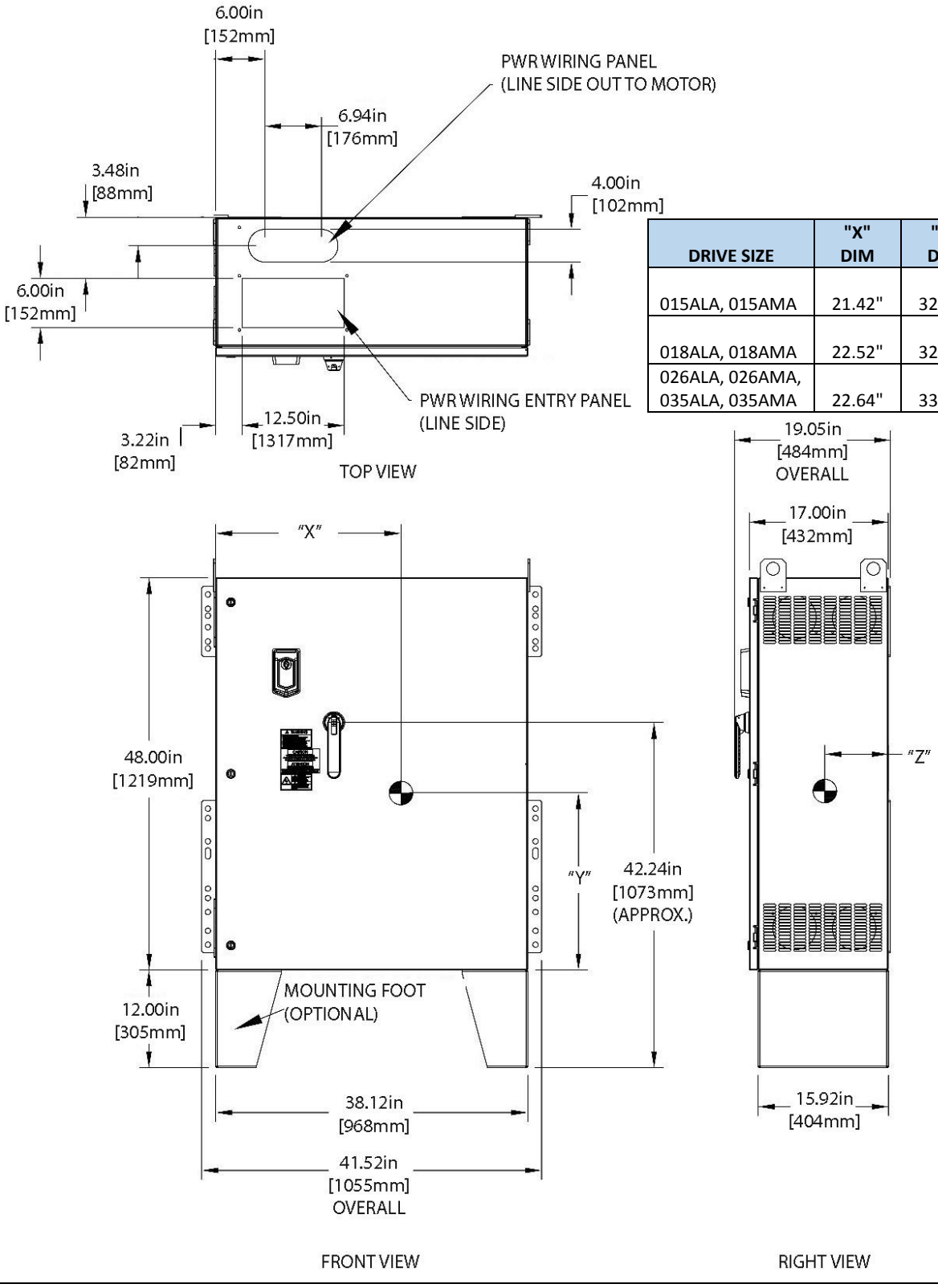


Figure 12: VFD Wiring Schematic [Cab #3]



VFD Dimensions

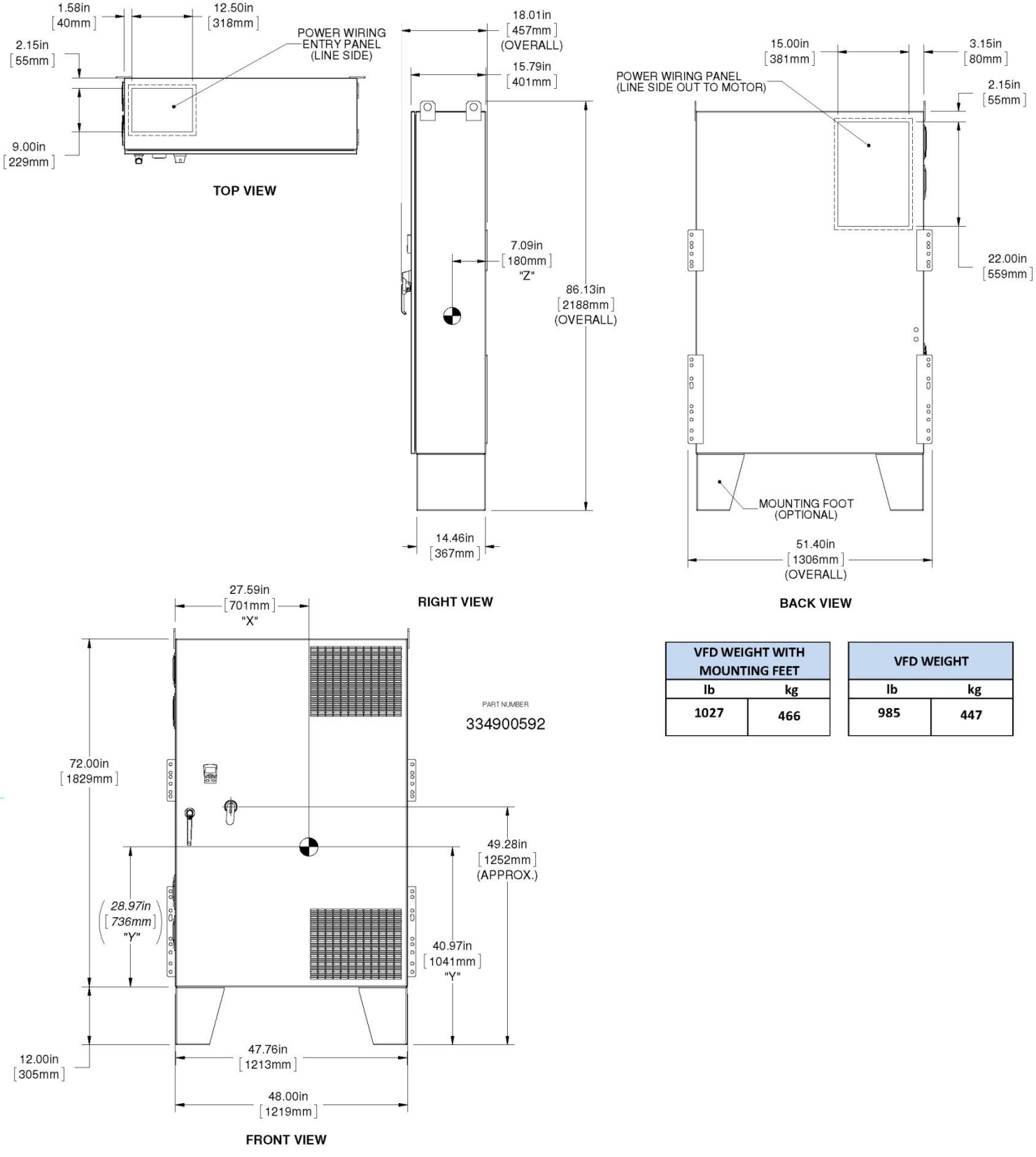
Figure 13, Free Standing VFD Starters (Models 015ALA, 018ALA, 026ALA, 035ALA)



DRIVE SIZE	"X" DIM	"Y" DIM	"Z" DIM	WEIGHT (ALA)*	WEIGHT (AMA)
015ALA, 015AMA	21.42"	32.72"	7.05"	485 lbs (220 kg)	527 lbs (239 kg)
018ALA, 018AMA	22.52"	32.64"	7.09"	517 lbs (235 kg)	559 lbs (254 kg)
026ALA, 026AMA, 035ALA, 035AMA	22.64"	33.62"	7.68"	595 lbs (270 kg)	637 lbs (289 kg)

*Motor leads not included

Figure 14, Free Standing VFD Starters (Models 030ALC, 033ALC, 039ALC, 042ALC, 045ALA, 053ALC, 058ALC, 059ALA, 065ALC, 075ALA, 081ALA)

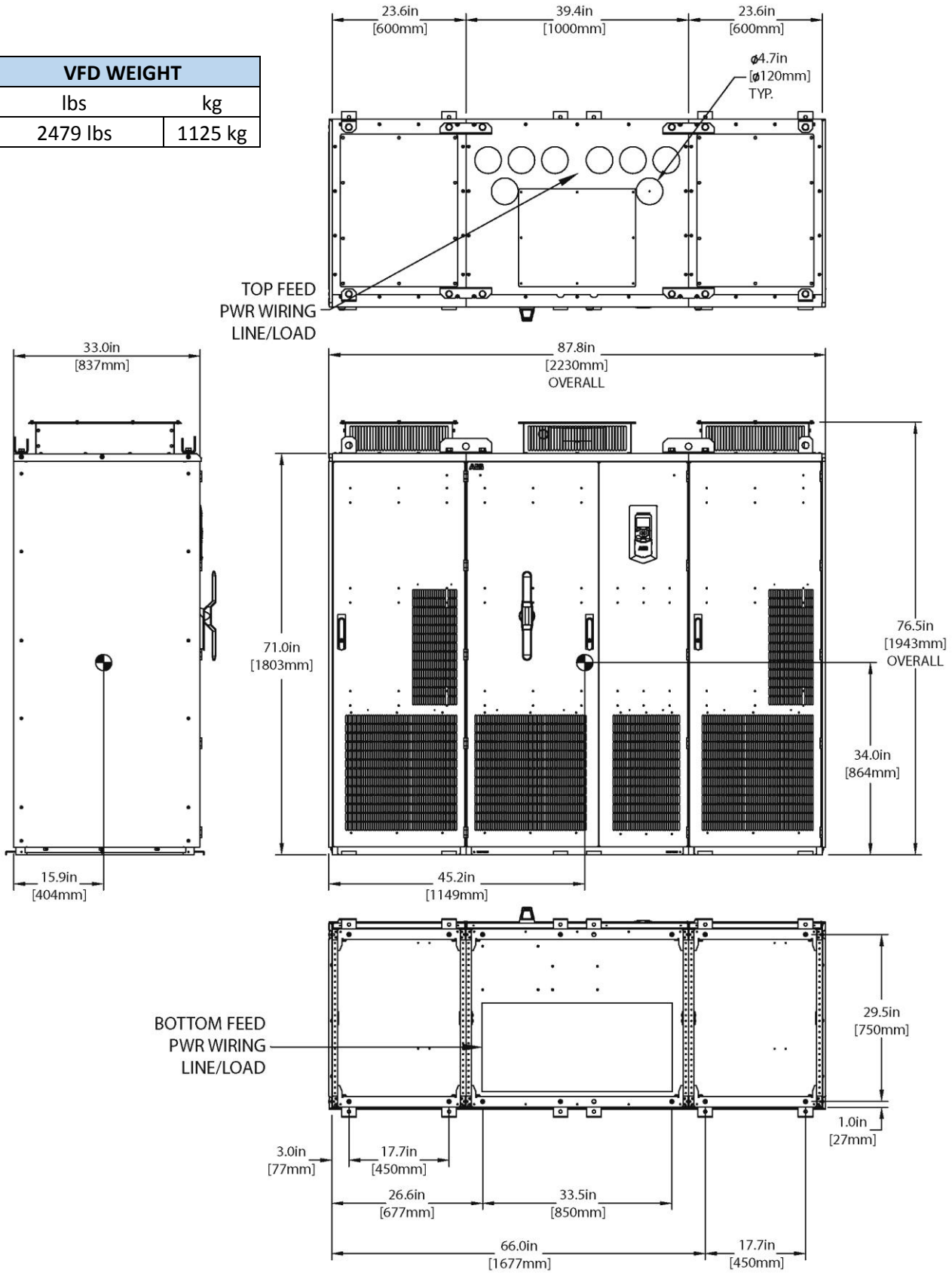


VFD WEIGHT WITH MOUNTING FEET	
lb	kg
1027	466

VFD WEIGHT	
lb	kg
985	447

Figure 15, Free Standing VFD Starters (Models 073ALC, 105ALA, 145ALA)

VFD WEIGHT	
lbs	kg
2479 lbs	1125 kg



Controls

Definition of Terms

Table 7: ACS 880 Parameters

Parameters	Name	Setting	Description
10.24	RO1 source	Ready run	Selects a drive signal to be connected to relay output RO1.
10.27	RO2 source	Running	Selects a drive signal to be connected to relay output RO2.
10.30	RO3 source	Fault(-1)	Selects a drive signal to be connected to relay output RO3.
12.18	AI1 max	10 v	Defines the minimum value for analog input AI1
12.19	AI1 scaled at AI1 min	0	Defines the real internal value that corresponds to the minimum analog input AI1
12.20	AI1 scaled at AI1 max	60/50 Hz-3600/3000	Defines the real internal value that corresponds to the maximum analog input AI1
13.12	AO1 source	Motor current (4)	01.07 Motor current Measured (absolute) motor current in A.
13.16	AO1 filt time	0.100 s	Defines the filtering time constant for analog output AO1
13.20	AO1 out at AO1 src max	20.000 mA	Defines the maximum output value for analog output AO1
13.19	AO1 out at AO1 src min	0.0 mA	Defines the minimum output value for analog output AO1.
13.18	AO1 src max	(2)x rated motor current	Defines the real value of the signal (selected by parameter 15.01 AO1 src)
13.17	AO1 src min	0	Defines the real value of the signal (selected by parameter 15.01 AO1 src)
16.17	Local control disable	Yes	Enables/disables local control (start and stop buttons on the control panel, and the local controls on the PC tool).
20.03	Ext1 in1 source	DI1	Selects source 1 for parameter 20.01 Ext1 commands.
21.03	Stop mode	Coast	Selects the way the motor is stopped when a stop command is received.
22.11	Speed ref1 source	AI1 scaled	Selects speed reference source 1. 12.12 AI1 scaled value
22.13	Speed ref1 function	Ref1	Signal selected by 22.11 Speed ref1 source is used as speed reference 1 as such
23.12	Acceleration time 1	10	Defines acceleration time 1 as the time required for the speed to change from zero to the speed value defined by parameter 19.01 Speed scaling.
30.11	Minimum speed	0 rpm	Defines the minimum allowed speed.
30.12	Maximum speed	60/50 Hz-3600/3000 rpm	Defines the maximum allowed speed.
35.11	Temperature 1 source	Estimated temperature	Selects the source from which measured temperature 1 is read.
35.12	Temperature 1 fault limit	221F	Defines the fault limit for temperature monitoring function 1.

35.51	Motor load curve	108%	When the parameter is set to 100%, the maximum load is equal to the value of parameter 99.06 Mot nom current
35.52	Zero speed load	108%	Defines the maximum motor load at zero speed of the load curve
35.55	Mot therm time	256 sec	The thermal time for a Class 10 trip curve is 350 s, for a Class 20 trip curve 700 s, and for a Class 30 trip curve 1050 s
96.01	Language	English	The keypad setup language
96.16	Unit selection	0001 0101	Selects the unit of parameters indicating power, temperature and torque.
99.03	Motor type	Asynchronous	Asynchronous motor. Three-phase AC induction motor with squirrel cage rotor.
99.04	Motor ctrl mode	Scalar	Scalar control
99.06	Mot nom current	*****	Rated name plate amps. Note: This is the motor full load value from the Daikin motor drawing, not the chiller rating point
99.07	Mot nom voltage	*****	Rated name plate voltage. Note: This is the line side voltage
99.08	Mot nom freq	*****	Rated name plate freq. Note: This is the line frequency, not chiller rating point drive-output freq.
99.09	Mot nom speed	*****	Rated name plate speed, RPM. Note: 3550 for 60 Hz line freq or 2950 for 50 Hz Line freq
99.10	Mot nom power	*****	Rated name plate HP. Note: This is the motor full load value from the Daikin motor drawing, not the chiller rating point
99.16	Motor phase order	U V W	Switches the rotation direction of motor.

Parameters

Throughout this manual, you will see references to parameter names and numbers that identify them for the drive. This manual uses the same format that will be shown on the keypad/display to refer to parameters:

XX.00

Where: XX designates the group number and 00 represents the parameter number

⚠CAUTION

The original parameters values set by the Daikin startup technician must never be changed by anyone not specifically trained and experienced with these VFDs. Damage to the chiller or drive could occur.

MicroTech II™ VFD Control and Operation

General Description:

The following describes the software for centrifugal chillers with variable speed drive and the MicroTech II controller. Complete information on the MicroTech II controller operation is contained in the Operating Manual OM 1153.

Variable Frequency Drive (VFD) Control:

Digital output NO1, (terminal J12) on the compressor controller is wired to the CR relay (Compressor Relay). The CR relay energizes the MCR (Motor Control Relay) which enables the variable frequency drive instead of a standard motor. Analog output Y1 (terminal J4) on the compressor controller provides the speed setpoint signal to the VFD. The output is a 0-10 VDC analog output signal, hard wired to the VFD.

There is no feedback signal required from the variable frequency drive to the MicroTech II controller to indicate the speed of the motor. The actual percent motor speed is within 1% of the analog output signal from the MicroTech II controller.

Figure 16, MicroTech II Operator Interface Panel 2

Digital Input ID9 (terminal J7) on the compressor controller is wired to the Vane Open switch (VO switch) that indicates when the vanes are 100% open. If the switch is open, the status of the vanes is Not Open. If the switch is closed, the status of the vanes is Open.

Or

If the compressor controller pulses a load output for the vanes to load for a cumulative time of 300 seconds (user adjustable), the MicroTech II controller will assume the compressor is fully loaded the same as if the V.O. switch closed (one unload pulse will reset the timer).

Sequence of Operation

Compressor Off:

The VFD is turned off, the speed output is 0%, and the vanes are closed. If the chiller is turned on and if there is a load, the chiller will go through its start sequence. The MCR will be energized, the speed signal will be set to minimum speed, and the VFD will start the compressor. When the compressor starts, it will be in the VFD Running, hold speed, adjust vanes mode.

VFD Running, Hold Minimum Speed, Adjust Vanes:

The VFD remains on, the command speed is held at Minimum Speed, and the vanes are modulated to maintain the Active LEWT Setpoint. As the load increases; if the vane open switch closes or the MicroTech II controller pulses the vanes open for a cumulative 300 seconds (default), and the LEWT is greater than the active setpoint, the mode switches to "VFD Running Adjust Speed, Open Vanes". Otherwise, the controller stays in this mode with the speed at Minimum Speed and the vanes being controlled to satisfy the Active LEWT Setpoint.

VFD Running, Adjust Speed, Open Vanes:

The VFD remains on, the speed output is modulated to maintain the Active LEWT Setpoint, and the vanes are driven to the open position. As the load decreases, if the speed equals the lift temperature control speed and the LEWT is less than the active LEWT setpoint, the mode switches to "VFD Running, Hold Minimum Speed, Adjust Vanes". Otherwise, the controller stays in this mode.

Compressor Shutdown:

The VFD remains on, the speed output remains constant, and the vanes are driven closed (shutdown unload state). This state is used during a routine shutdown of the chiller. If there is a rapid shutdown caused by a fault alarm, the MCR will be immediately de-energized, the speed signal will go to zero, and the compressor state will go directly to Postlube.

WDC, Dual Compressor VFD Operation

The MicroTech II controller has the capability to control a dual compressor VFD chiller or multiple stand alone VFD chillers with interconnecting network communications, including all compressor staging and load balance functions. (See *OMCentrifMicro II* for set up of multiple compressor staging).

General Dual Compressor VFD Operation

The first compressor starts and runs as a single VFD compressor controlling speed and vane position based on LEWT (Leaving Evaporator Water Temperature). When the capacity of the first compressor reaches "Full Load" and LEWT is greater than stage delta, and the slope (pull down rate) is less than the user adjustable minimum rate setpoint, the next compressor will be enabled.

Dual Compressor Unit Stage Down

When "Compressor Capacity" exceeds calculated system load (internal algorithm), the "next off" compressor will be disabled. When the "next off" compressor is disabled, the controller will unload the compressor by closing the vanes (shutdown unload) to unload the compressor. The load balance function will make the other compressor follow. When the shutdown unload timer expires, or the vane close switch closes (whichever occurs first), the MCR will de-energized, and the controller will transition to the post lube sequence. At the end of the post lube timer, the oil pump will be turned off and the controller will transition to the off sequence.

Interface Panel Screens, MT II

NOTE: This section contains the MicroTech II controller and Operator Interface Panel display screens. Figure 10 shows the screen used on the second issue panel (Panel 2) that went into production mid-2005.

Table 8, MOTOR Setpoint Settings

VFD related settings are #9 through #12.

Password: **T** = Technician Level, **M** = Manager Level, **O** = Operator Level

Description	No.	Default	Range	Password	Comments
Nominal Capacity	14	Design	0 to 9999 Tons		Determines when to shut off a compressor
Oil No Start Diff (above Evap Temp)	13	40 °F	30 to 60 °F	T	Minimum Delta-T between oil sump temperature and saturated evaporator temperature
Lift @ Max Speed	12	40 °F	30 to 60 °F	T	Temp lift at 100 % speed (cond sat – evap sat temp)
Speed @ 0 Lift	11	50%	0 to 100%	T	Lift @ min speed as a % of 100 % lift. SP 10 has priority over this setting.
Minimum Speed	10	70%	60 to 100%	T	Min VFD speed, has priority over SPs 11 & 12
VFD	9	No	No, Yes	T	VFD on unit or not
Maximum Rate	8	0.5 °F/min	0.1 to 5.0 °F/min	M	Inhibits loading if LWT change exceed the setpoint value.
Minimum Rate	7	0.1 °F/min	0.0 to 5.0 °F/min	M	Additional compressor can start if LWT change is below setpoint.
Soft Load Ramp	6	5 min	1 to 60 min	M	Time period to go from initial load point (% RLA) set in SP 5 to 100% RLA
Initial Soft Load Amp Limit	5	40%	20 to 100%	M	Initial amps as % of RLA. Used with SP 4 and SP 6
Soft Load Enable	4	OFF	OFF, ON	M	Soft load on (using SP 5 and SP 6) or off
Maximum Amps	3	100%	40 to 100%	T	% RLA above which loading is inhibited (Load Limit) Unloading is forced at 5% above this value.
Minimum Amps	2	40%	20 to 80%	T	% RLA below which unloading is inhibited
Demand Limit Enable	1	OFF	OFF, ON	O	ON sets %RLA at 0% for 4 mA external signal and at 100% RLA for 20 mA signal

NOTE: Shaded settings are VFD related.

Figure 17, MOTOR (VFD) Setpoint Screen

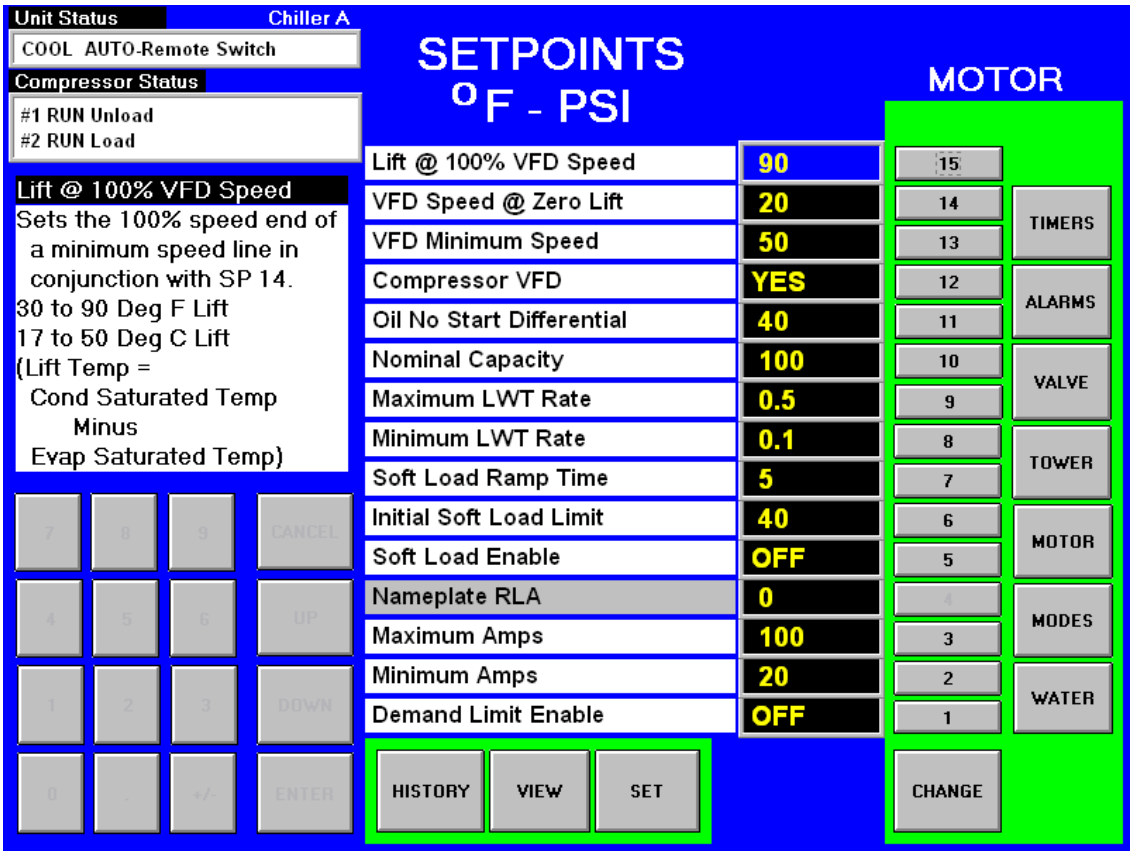


Table 9, MOTOR Setpoint Settings

VFD related settings are #12 through #15.

Password: **T** = Technician Level, **M** = Manager Level, **O** = Operator Level

Description	No.	Default	Range	Password	Comments
Lift @ Max VFD Speed	15	40 °F	30 to 60 °F	T	Temp lift at 100 % speed (cond sat – evap sat temp)
VFD Speed @ 0 Lift	14	50%	0 to 100%	T	Lift @ min speed as a % of 100 % lift. SP 10 has priority over this setting.
VFD Minimum Speed	13	70%	60 to 100%	T	Min VFD speed, has priority over SPs 11 & 12
VFD	12	No	No, Yes	T	VFD on unit or not
Oil No Start Diff (above Evap Temp)	11	40 °F	30 to 60 °F	T	Minimum Delta-T between oil sump temperature and saturated evaporator temperature
Nominal Capacity	10	Design	0 to 9999 Tons		Determines when to shut off a compressor, factory set
Maximum LWT Rate	9	0.5 °F/min	0.1 to 5.0 °F/min	M	Inhibits loading if LWT change exceed the setpoint value.
Minimum LWT Rate	8	0.1 °F/min	0.0 to 5.0 °F/min	M	Additional compressor can start if LWT change is below setpoint.
Soft Load Ramp Time	7	5 min	1 to 60 min	M	Time period to go from initial load point (% RLA) set in SP 5 to 100% RLA
Initial Soft Load Amp Limit	6	40%	20 to 100%	M	Initial amps as % of RLA. Used with SP 4 and SP 6
Soft Load Enable	5	OFF	OFF, ON	M	Soft load on (using SP 5 and SP 6) or off
Nameplate RLA	4	N.A.	N.A.	N.A.	Not used on these chillers
Maximum Amps	3	100%	40 to 100%	T	% RLA above which loading is inhibited (Load Limit) Unloading is forced at 5% above this value.
Minimum Amps	2	40%	20 to 80%	T	% RLA below which unloading is inhibited
Demand Limit Enable	1	OFF	OFF, ON	O	ON sets %RLA at 0% for 4 mA external signal and at 100% RLA for 20 mA signal

Setpoint 14 on Panel 2 sets the % speed at 0 degrees F Lift, point A. Setpoint 15 on Panel 2 sets the lift in degrees F at the 100 % speed point, point B in Figure 11.

Figure 18, Operating Envelope, Setpoints 11 and 12 Settings

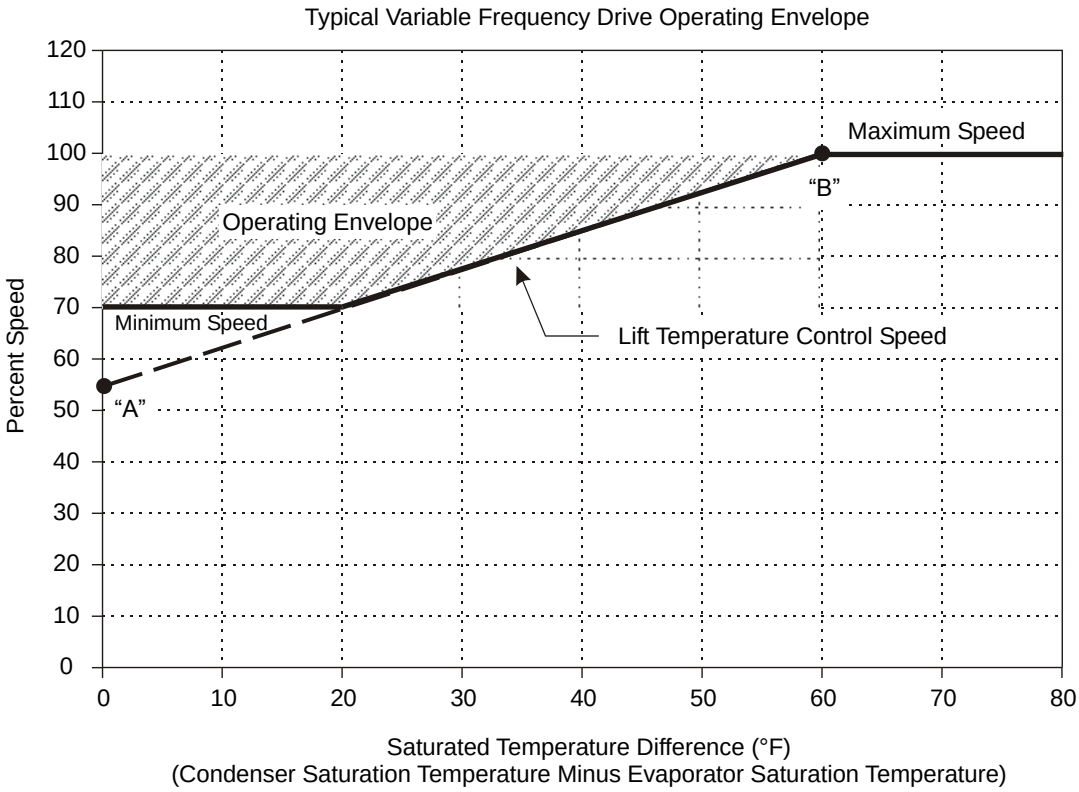


Figure 19, View I/O Screen

The MicroTech II controller View I/O Screen, shown to the right, displays the compressor motor speed, as controlled by the VFD, at the bottom of the screen. This is information only and no settings are made on this screen.

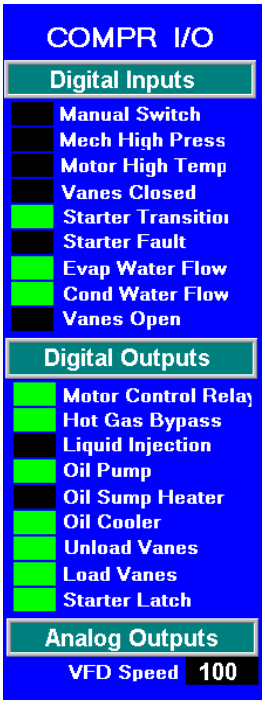


Table 10, MicroTech II, Settings and Ranges (Single Compressor)

MicroTech II VFD	Default Setpoint	Range	Keypad Location	OITS Locations
Motor Current	Comp. Nameplate RLA	N.A.	UC-SC-(4)	N/A
Motor Current Threshold (1)	5%	1 to 20%	UC-SA-(4)	Set-Alarms-(12)
Minimum Amp Setpoint (2)	10%	5 to 100%	UC-SC-(1)	Set -Motor-(2)
Maximum Amp Setpoint	100%	0 to 100%	UC-SC-(1)	Set -Motor-(3)
VFD	Yes	yes/no	UC-SU-(10)	Set -Motor-(9)
Minimum Speed	70%	70 to 100%	UC-SU-(10)	Set -Motor-(10)
Speed	50% (@ 0°F lift, "Y" axis	Setpoint 11 on Panel 1 (setpoint 14 on Panel 2) sets the % speed at 0 degrees F Lift, point A.	UC-SU-(10)	Set -Motor-(11)
Lift	40°F (@100% speed, X axis	Setpoint 12 on Panel 1 (setpoint 15 on Panel 2) sets the lift in degrees F at the 100 % speed point, point B.	UC-SU-(10)	Set -Motor-(12)

NOTES:

1. Motor Current Threshold, current at which a low current fault occurs.
2. Minimum Amp Setpoint, Minimum unloading amp setpoint.
3. The OITS is the preferred place to adjust setpoints. The unit controller is the second choice and the compressor controller should never be used.

Table 11, MicroTech II, Settings and Ranges (Multiple Compressor Includes Duals)

MicroTech II VFD	Default Setpoints	Range	Keypad	OITS Locations
Max Comp. On	2 for Dual	1 to 16	UC-SC-(2)	Modes-(9)
Stage Delta	1°F	0.5 to 5.0°F	UC-SC-(3)	Water-(6)
Nominal Capacity	Unit Design Tons	N.A.	UC-SC-(5)	Motor-(14)
Unload Timer (1)	030 sec	10 to 240 sec.	UC-SC-(6)	Timers-(6)
Min LWT Rate	0.1°F	0.0 to 5.0°F	UC-SU-(7)	Motor-(7)

NOTE: 1. This must be set longer than the mech. vane speed to unload the compressor.

Code: UC = Unit Controller; CC = Compressor Controller; OITS = Operator Interface Touch Screen; V = View Menu Keypad or OITS Screen; A = Alarm Menu Keypad Or OITS Screen; S = Set Menu Keypad or OITS Screen; C = Compressor Menus; U = Unit Menus

Example:

Setpoint location for VFD Minimum speed = UC-SU-(10). The location would be the Unit Controller, Set Unit Setpoints Menu, Screen 10. OITS locations are S = Setpoint screen, "Alarms" or "Motor", and the number of the setpoint on the screen.

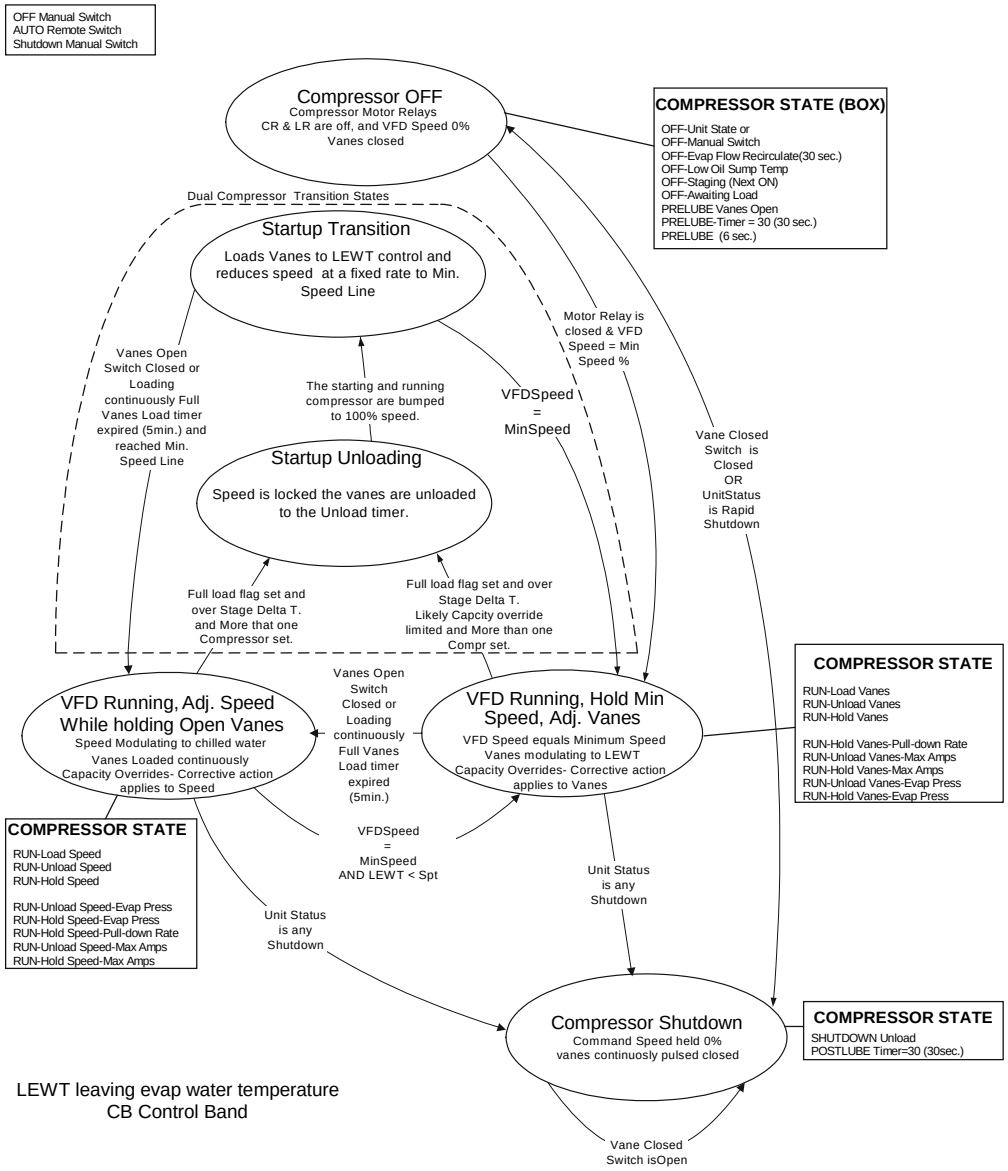
Additional Setpoints, the following two setpoints are at Technician level and are located at UC-SC-(8) and not on the OITS. They are for exclusive use of factory trained service technicians.

VFD Mode = Auto (auto/manual), this allows the VFD speed output signal to be manually controlled for testing, or to be automatic for normal operation. The MicroTech II controller will not allow the speed signal to go below the calculated lift control speed.

VFD Speed Manual Setpoint = 100%. When the unit is started for the first time, and set up for design, or to check the operation and performance of the unit, it is necessary to run the unit at a

constant fixed speed of 100%. To accomplish this, set the VFD Minimum Speed to 100% [UC-SU-(10) or OITS-S-Motor-(10)], then set up and adjust the unit. When testing is complete, set the minimum speed back to the original setpoint. Do not leave the drive minimum speed set to 100%, as it will prevent the controller from providing a speed signal variation for optimum efficiency.

Figure 20, MicroTech II VFD Speed Control State Diagram



Notes:

1. The above pressures must be set at unit design conditions.
2. Low evaporator pressure shutdown alarm setpoint is 26.0 psi (default)
3. If the discharge temperature is higher than 170º F, pulse the load solenoid if the vanes are not fully open.

Notes

Troubleshooting

⚠ DANGER

DC bus capacitors retain hazardous voltages after input power has been disconnected. After disconnecting input power, wait five (5) minutes for the DC bus capacitors to discharge and then check the voltage with a voltmeter to ensure the DC bus capacitors are discharged before touching any internal components. Failure to observe this precaution could result in severe bodily injury or death.

The drive can display two kinds of error codes; alarms and faults, to signal a problem detected during self-tuning or drive operation. The LED status will flash green indicating normal operation. If blinking green, an alarm is active and a red LED indicates a fault is active. When the fault has been removed, the motor can be restarted. If a reset is required, press the RESET key on the control panel or PC tool, or by switching the supply voltage off for short period of time.

Alarm Codes

An alarm condition is signified by a two- or three-letter code flashing on the display. The drive will continue to operate during the alarm condition. The cause of the alarm should be investigated to check that it does not lead to a fault condition. The alarm code remains on the display as long as the alarm condition exists and clears when the condition causing it is corrected. Alarms can be monitored via alarm words *08.05 Alarm logger1 … 08.18 Alarm word4*. Alarm information is lost at power switch off or fault reset.

Table 12, Commonly Used Alarm Codes in Starters and VFDs

COMPR STOP - Motor Current Low	COMPR STOP - Phase Reversal
COMPR STOP - No Starter Transition	COMPR STOP - Line Voltage High
COMPR STOP - Starter Fault	COMPR STOP - Line Voltage Low
COMPR STOP - Current High with Compr OFF	COMPR STOP - Ground Fault
COMPR STOP - Motor Current Overload	COMPR STOP - Compressor Comm Loss
COMPR STOP - Motor Current Imbalance	
COMPR STOP - Phase Loss	COMPR STOP - Starter Comm Loss

Fault Codes

When a fault is detected, it is stored in the fault logger with a time stamp. The fault history stores information on the 16 latest faults of the drive. Full details and help text are available in the logger to assist in making corrective action. Parameters *08.01 Active fault* and *08.02 Last fault* store the fault codes of the most recent faults, stored at the beginning of a power switch off.

Identifying Alarm Codes and Corrections

VFD drive alarm parameters are shown in the Note that the alarm code will only be displayed for as long as the problem exists. Once the problem has been corrected, the alarm code will disappear from the display. Refer to the VFD firmware manual for alarm and fault definitions and corrective actions.

Identifying Fault Codes and Recovering

⚠ DANGER

DC bus capacitors retain hazardous voltages after input power has been disconnected. After disconnecting input power, wait five minutes for the DC bus capacitors to discharge and then check the voltage with a voltmeter to ensure the DC bus capacitors are discharged before touching any internal components. Failure to observe this precaution could result in severe bodily injury or death.

Access the fault blogger for recent faults and actions to correct them. To clear a single fault that has occurred so that the drive can be started again, correct any problems indicated by the fault code and press the STOP/RESET key on the keypad, or assert the fault reset from the selected control source. Because multiple faults can occur and only the first will be displayed, you must access the error log repeatedly in order to view all of the faults that have occurred and correct them. **NOTE**: If extensive troubleshooting or corrective actions are necessary, only properly trained and qualified technicians should be used.

Maintenance

⚠ CAUTION

Take extreme caution in cleaning and replacing all equipment and components to prevent injury or equipment damage.

Prevent dust and debris from entering the drive during installation. For usual cleaning, use a vacuum cleaner with antistatic hose and nozzle. Using a normal vacuum cleaner creates static discharges which can damage circuit boards.

⚠ WARNING

Only qualified electricians are allowed to install and maintain the drive. Never work on the drive, motor cable or motor when main power is applied.

- After disconnecting the input power, always wait for 5 min to let the intermediate circuit capacitors discharge before you start working on the drive, motor or motor cable. Dangerous voltages may still be present before this time.
- Measure with a multimeter (impedance at least 1 Mohm) that voltage between drive input phases U1, V1 and W1 (also terminals UDC+ and UDC-) and the frame is close to 0 V. Ensure no voltage is between the terminals/drive input phases and the ground.
- Do not work on the control cables when power is applied to the drive or to the external control circuits. Externally supplied control circuits may cause dangerous voltages inside the drive even when the main power on the drive is switched off.
- Do not make any insulation or voltage withstand tests on the drive or drive modules.

Cabinet

Cleaning the interior

1. Stop the drive.
2. Ensure that the drive is disconnected from the power line and all other precautions have been taken into consideration as listed above.
3. When necessary, clean the interior of the cabinet with a soft brush and a vacuum cleaner. Figure 14 shows the drive as a stand-alone and not within the enclosure, though the procedure is the same.

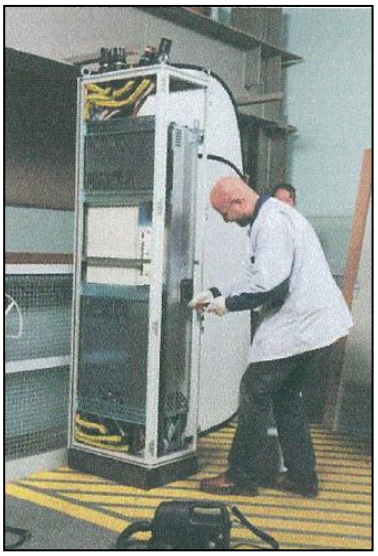
Heatsink

The module heatsink fins pick up dust from the cooling air. The drive runs into "over-temperature" warnings flashing on the display and faults if the heatsink is not cleaned regularly. It is recommended to vacuum and clean the heatsink annually.

Cleaning the interior

1. Stop the drive.
2. Make sure that the drive is disconnected from the power line.
3. Undo the fastening screws of the handle plate of the drive module. This will reveal the service hatch.
4. Remove the service port plate and the service hatch from the drive.
5. Vacuum the interior of the heatsink from the opening.
6. Blow clean compressed air (not humid or oily) upwards from the opening and, at the same time, vacuum from the top of the drive module.

Figure 18, Cleaning the Interior



Fans

The actual lifespan depends on the running time of the fan, ambient temperature and dust concentration. Fan failure can be indicated by increasingly noisy fan bearings and a gradual rise to the heatsink temperature in spite of cleaning. All components should be checked annually for dustiness/corrosion, and the quality of the supply voltage.

Replacing the circuit board compartment cooling fan

1. Stop the drive and remove the drive module out of the cabinet. When handling the boards (located on top of the drive), wear a grounding wrist band.
2. Undo the fastening screw of the fan enclosure.
3. Unplug the power supply cable of the fan.
4. Install the new fan in reverse order to the above.

Replacing the main cooling fans

1. Stop the drive.
2. Remove the drive module out of the cabinet. For easier removal of the main fan, remove lower baffle.
3. Open the support legs of the pedestal.
4. Undo the two screws that fasten the fan assembly plate.
5. Open and lower the swing out frame.
6. Disconnect the power supply wires of the fans.
7. Remove the fan assembly from the drive module.
8. Undo the fastening screws of the fan(s) and remove the fan(s) from the assembly plate.
9. Install the new fan(s) in reverse order to the above.

Standard drive module replacement

- Handle the drive module carefully— Lift the drive module only by the lifting lugs.
- Use safety shoes with a metal toe cap to prevent foot injury.
- To prevent a tip hazard when moving unit to the floor, open the support legs by pressing each leg a little down (1, 2) and turning it aside. Whenever possible secure the module also with chains.
- Do not tilt the drive module (A). It is heavy and its center of gravity is high**.** The module overturns from a sideways tilt of 5 degrees. Do not leave the module unattended on a sloping floor.
    1. Stop the drive.
    2. Remove the clear plastic shrouds on the power cables and parts in front of the drive module (if present).
    3. Disconnect the power cables.
    4. Disconnect the power supply, BGDR and fiber optic cables from the drive module.
    5. Remove the screws that attach the drive module to the cabinet at the top and behind the front support legs.
    6. Attach the extraction ramp to the cabinet base with two screws.
    7. To prevent the drive module from falling, attach its top lifting lugs with chains with chains to the cabinet frame.
    8. Pull the drive module carefully out of the cabinet preferably with help from another person.
    9. Install the new module in reverse order to the above.

NOTE:

- The motor cable terminals on the drive are at a dangerously high voltage when the input power is on, regardless of whether the motor is running or not.
- The brake control terminals (UDC+, UDC-, R+ and R- terminals) carry a dangerous DC voltage (over 500 V).
- Depending on the external wiring, dangerous voltages (115 V, 220 V or 230 V) may be present on the terminals of relay outputs (X2) or Safe torque off (X6).
- The Safe torque off function does not remove the voltage from the main and auxiliary circuits.

Daikin Training and Development

Now that you have made an investment in modern, efficient Daikin Applied equipment, its care should be a high priority. For training information on all Daikin Applied HVAC products, please visit us at www.DaikinApplied.com and click on Training, or call 540-248-9646 to speak to the Training Department.

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