

1. In reference to project VA241-12-R-0313, the project scope of work states that we are to replace the (3) 500KVA transformers with new. We are to remove the existing transformers and document legal disposal of the units.

Question 1. Are these PCB filled transformers?

Question 2. When was the last oil test date?

This transformer was installed during the during the period when Polychlorinated Biphenyls (PCB) was used as the Dielectric oil. The oil was changed out post 1979, but must be assumed as PCB contaminated. The oil test records are not available; this work was all accomplished prior to anyone employed in FMS electrical department.

2. In order to size the transformer and the disconnect properly for this project, we need electrical information on the chiller. The impedance specifications are needed to help select the correct style of transformer. Also the Minimum Circuit Ampacity (MCA) is needed to size the transformer and fuses. Is this information available?

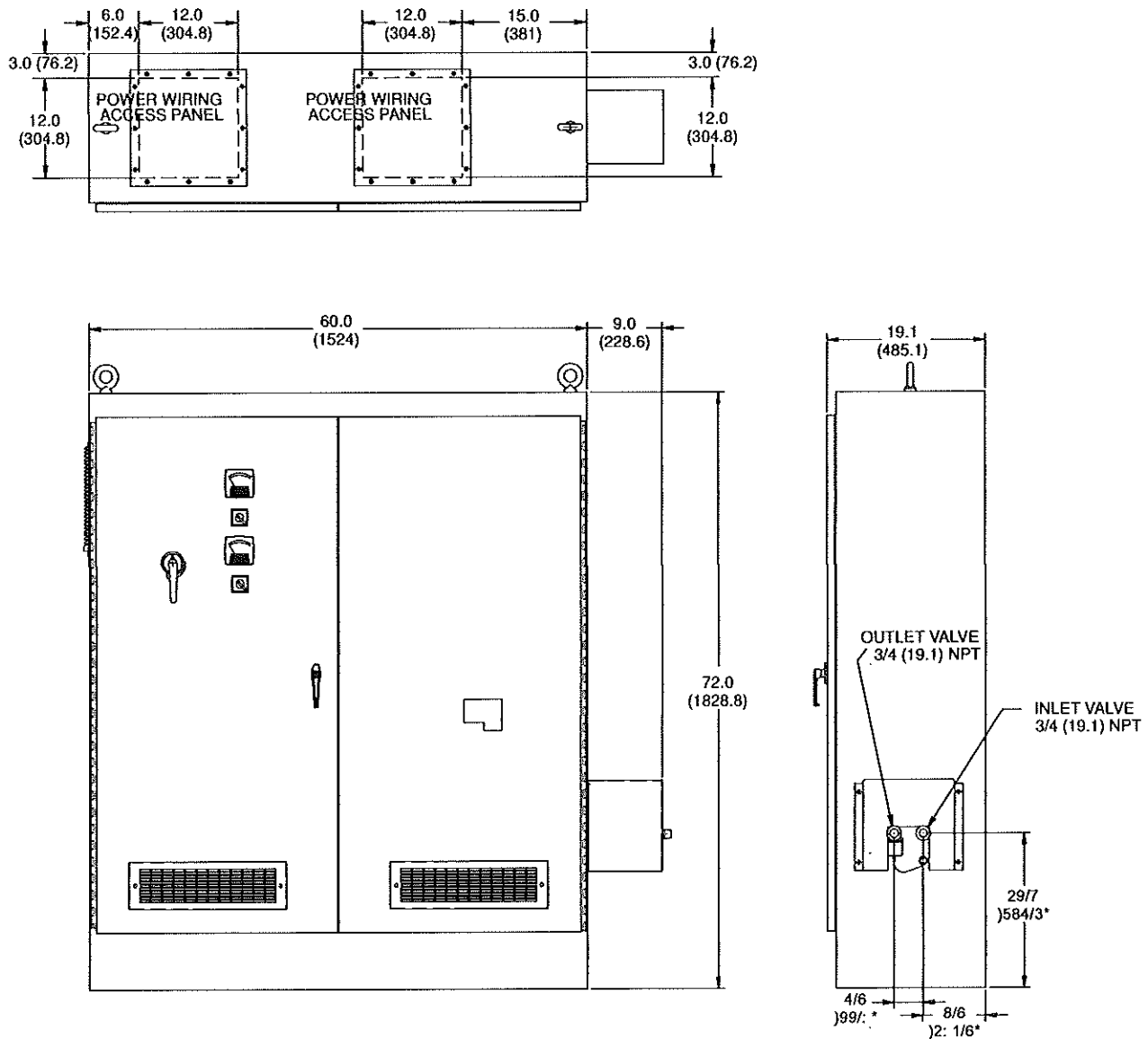
Please find attached the electrical requirements provided by McQuay of the chiller. The contractor shall provide the wire and conduits for drive power and controls from the starter to the VFD072LW new chiller. This work is being done through an awarded contract to McQuay International. The contact number is 203-775-3477.

This is a design build. The contractor's responsibility is to get the available fault current from the utility company (United Illuminating Co.) size the transformer with the lowest x/r ratio to provide low losses while keeping the available fault duty within the withstand value of the switch gear provided. A stamped coordination report is requested as part of the submittal.

This contract shall include cleaning and maintenance for the existing 13.8 Volt switch feeding the new transformers.

Certified Drawing		CD: VFD060/072
Job Name:	WHVA VFD072LW	Group: VFD
Tag / Item No.:		Type: Chiller
		Effective: April 2010

Variable Frequency Drive, VFD 060/072, Free Standing



NOTE: Remove top access panels before drilling to prevent particles from entering the enclosure.

Unit Weights

Model	VFD 060LW	VFD 072LW
Operating Weight lb. (kg)	1272 (577)	1272 (577)
Total Weight lb. (kg)	2521 (1143)	2521 (1143)

How to Monitor Cooling Loop Operation

FX-05 Screen Navigation (see Figure 7)

After power-up the process temperature will be displayed.

Alarms

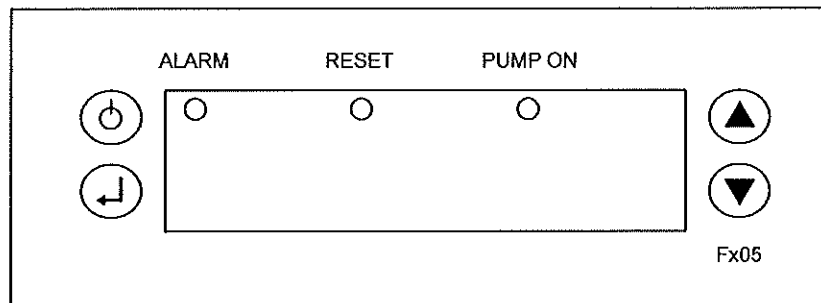
When an alarm is present the alarm LED will blink fast and the error code will flash. The following is a list of the error code.

- E0: OK
- E1: Low Level Fault
- E2: Fluid Over-Temperature Fault
- E3: Fluid Under-Temperature Fault
- E4: Fluid Low Flow Fault

To acknowledge the alarms hold the ϕ key for 3 seconds. The alarm error code will be displayed and the reset led will light while the button is depressed. After the ϕ key is released the process temperature will be displayed.

To view the alarm summary hold both the $\uparrow \downarrow$ keys for 3 seconds. To exit the alarm summary screen press the ϕ key or the screen will automatically time out after 10 seconds.

Figure 7, FX05 Display Panel



Operation

The FX controller controls to a fixed loop water setpoint.

→ Wiring, General

Unit-Mounted: Unit mounted VFDs have factory-wired control wiring plus power wiring from the VFD to the compressor motor terminals. The VFDs only require a power supply. Cable entrance is shown on the dimension drawings beginning on page 29 for LF and page 35 for LF 2.0 models. An exception is on models LF models 090 and 120 and all LF 2.0 models that require some interconnection control wiring from the VFD to the remote cooling module as described in the section beginning on page 14.

→ **Freestanding:** Freestanding units require both field control and power wiring from the VFD to the chiller and, some interconnection control wiring on models 090 and 120.

Wiring Diagram: The control and power wiring diagram is located on page 27

Power Wiring

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 McQuay 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 McQuay technician.

Under no circumstances should a compressor be brought up to speed unless proper sequence and rotation have been established. Serious damage can 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.

Compressor Motor Terminal Insulation

It is the installing contractor's responsibility to insulate the compressor motor terminals (as described below) on units over 600 volts and when the unit is installed in a high humidity location that could cause condensate to form on the motor terminals. The terminals are cooled to 45°F to 50°F as a result of the motor cooling. The required material can be ordered and shipped in as a kit (775123601).

This is to be done after the McQuay start-up technician has checked for proper phase sequence and motor rotation.

Following this verification by the McQuay technician, the contractor should apply the following items.

Materials required (available at most electrical supply outlets)

1. Loctite® brand safety solvent (12 oz. package available as McQuay part number 350A263H72)

2. 3M™ Co. Scotchfil brand electrical insulation putty (available in a 60-inch roll as McQuay part number 350A263H81)
3. 3M Co. Scotchkote™ brand electrical coating (available in a 15 oz. can with brush as McQuay Part Number 350A263H16)
4. Vinyl plastic electrical tape

Application procedure:

1. Disconnect and lock out the power source to the compressor motor.
2. Using the safety solvent, clean the motor terminals, motor barrel adjacent to the terminals, lead lugs, and electrical cables within the terminal 4OX to remove all dirt, grime, moisture and oil.
3. Wrap the terminal with Scotchfil putty, filling in all irregularities. The final result should be smooth and cylindrical.
4. Doing one terminal at a time, brush the Scotchkote coating on the motor barrel to a distance of up to 1/2" around the terminal and on the wrapped terminal, the rubber insulation next to the terminal, and the lug and cable for approximately 10". Wrap additional Scotchfil insulation over the Scotchkote coating.
5. Tape the entire wrapped length with electrical tape to form a protective jacket.
6. Finally, brush on one more coat of Scotchkote coating to provide an extra moisture barrier.

General Wiring Practice

1. Never connect input AC power to the motor output terminals T1/U, T2/V or T3/W.
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. Adhere to local electrical codes.
8. The National Electrical Code and Canadian Electrical Code requires that an approved circuit disconnecting device be installed in series with the incoming AC supply in a location readily accessible to personnel installing or servicing this equipment. If a disconnect switch is not supplied with the starter, one must be installed.
9. Supply lines and motor lines may enter the enclosure from the top, bottom or sides. Wire connections can be determined to best suit specific installations. 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.

Terminal Sizes

Compressor Motor Terminals

Power wiring connections at the motor are “spark plug” type terminals with threaded copper bar, sized per the following table.

Table 8, Chiller Compressor Motor Terminal Sizes

Type/Size	Comp. Size	Terminal Size
Low Voltage to 750 A, to 575V	CE 063-126	0.635-11 UNC-2A, 1.88 in. long

VFD Terminals

For field wiring freestanding VFDs, the outgoing terminals and incoming power block terminals are determined by the VFD size listed in NOTE: (X) is the number of terminals per phase.

Table 10. For factory-mounted VFDs, the outgoing terminals are factory-connected to the compressor motor.

When wiring to a VFD with a disconnect switch or circuit breaker, the incoming lug size is determined by the device size as shown in NOTE: (X) is the number of terminals per phase.

Table 11.

Table 9, LiquiFlo 2.0, Terminal Size Range

VFD Size	Incoming Terminals		Outgoing Terminals
	High Int. CB	Ultra-Hi Int.CB	
VF2037	(3) 3/0 – 400 MCM	(3) 3/0 – 400 MCM	(2) 200 - 500 MCM
VF2055			
VF2080	(4) 500 – 1000 MCM	(4) 500 – 1000 MCM	(4) 200 - 500 MCM
VF2110			

NOTE: (X) is the number of terminals per phase.

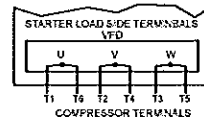
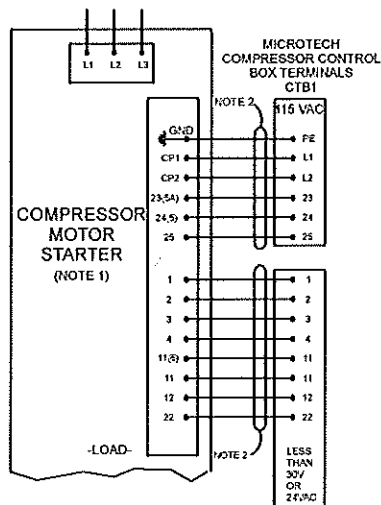
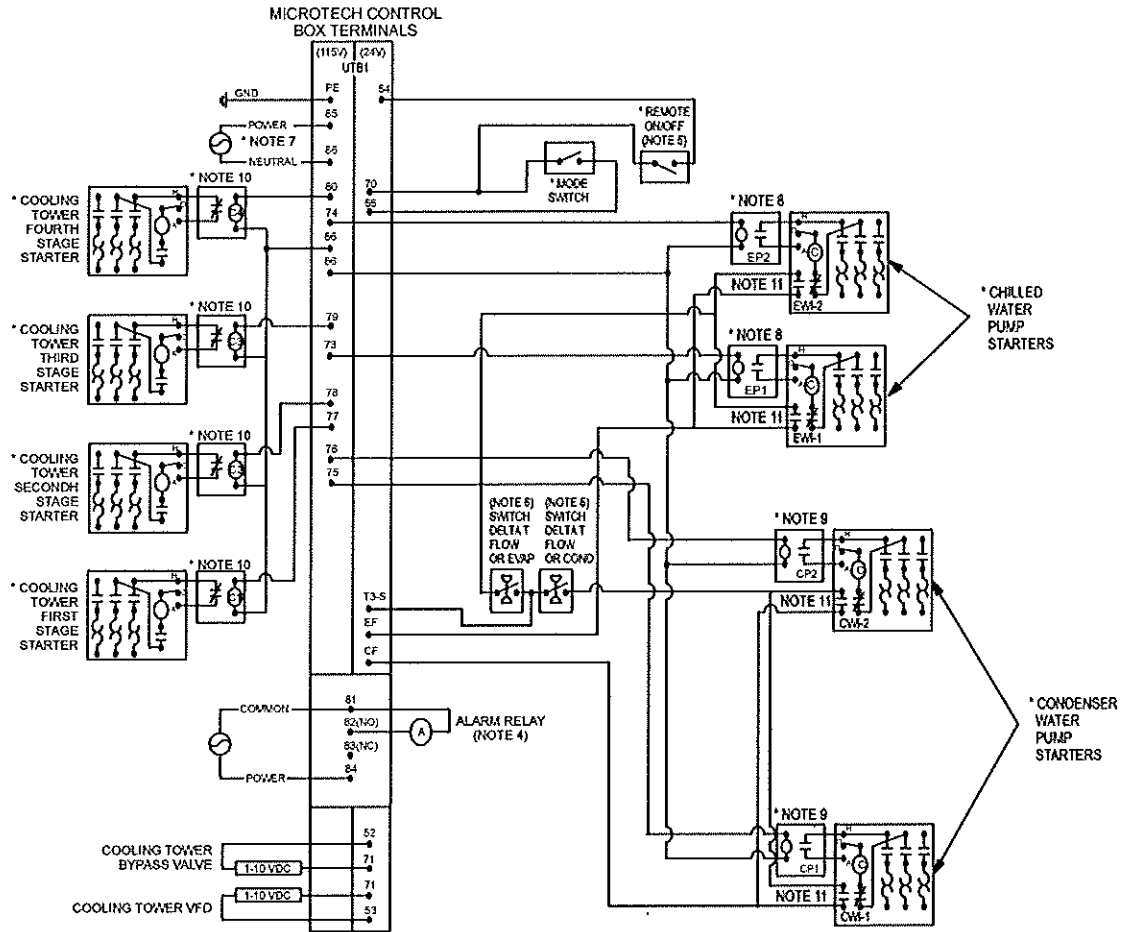
Table 10, Air-Cooled & LiquiFlo, Incoming, Outgoing, Terminal Size Range

VFD Size		Incoming Power Block Connection Range	Outgoing Terminals (Metric Stud Size)
Model	Family		
Air Cooled			
VFD 011	PF755	(1) 14 – 2/0 MCM	Bolt M8X1.25
VFD 014	PF755	(1) 14 – 2/0 MCM	Bolt M8X1.25
VFD 016	PF755	(1) 4 – 500 MCM	Bolt M8X1.25
VFD 022	PF755	(1) 4 – 500 MCM	Bolt M8X1.25
VFD 027	PF755	(1) 4 – 500 MCM	Bolt M8X1.25
VFD 033	PF755	(2) 4 – 500 MCM	Bolt M8X1.25
VFD 037	PF755	(2) 4 – 500 MCM	Bolt M8X1.25
VFD 043	PF755	(2) 4 – 500 MCM	Bolt M8X1.25
Water Cooled			
VFD 060	LF	(2) 3/0 – 350 MCM	2 in. x 1/4 in. bus (1) 9/16 in. hole
VFD 072	LF	(2) 2 – 600 MCM	2 in. x 1/4 in. bus (1) 9/16 in. hole
VFD 090	LF	(4) 4 – 500 MCM	2 in. x 1/4 in. bus (1) 9/16 in. hole
VFD 120	LF	(4) 4 – 500 MCM	2 in. x 1/4 in. bus (1) 9/16 in. hole

NOTE: (X) is the number of terminals per phase.

VFD/Chiller Interconnection Wiring Diagram

Figure 12, Control and Power Wiring Diagram



- COMPRESSOR CONTROL SCHEMATIC 330342201
- LEGEND: 330343001
- * FIELD SUPPLIED ITEM

330387901-0A

See notes on following page.

NOTES for Wiring Diagram

1. Compressor motor VFDs are either factory-mounted and wired, or shipped separate for field-mounting and wiring. VFDs must be provided by McQuay. All line and load side power conductors must be copper.
2. If VFDs are freestanding, then field control wiring between the starter and the control panel is required. Minimum wire size for 115 Vac is 12 GA for a maximum length of 50 feet. If greater than 50 feet, refer to McQuay for recommended wire size minimum. Wire size for 24 Vac is 18 GA. All wiring to be installed as NEC Class 1 wiring system and must be made with copper wire and copper lugs only. All 24 Vac wiring must be run in separate conduit from 115 Vac wiring.
3. Main power wiring between VFD and motor terminals is factory-installed when chillers are supplied with unit-mounted VFDs.
4. Six conductors are used between the VFD and the motor as shown in the wiring diagram. Wiring of free-standing VFDs must be in accordance with the NEC and connection to the compressor motor terminals must be made with copper wire and copper lugs only.
5. LF models VFD 090 and 120 and all LF 2.0 models require field wiring between the VFD and the field mounted cooling module per instruction beginning on page 14.
6. For VFD, Wye-Delta, and solid state starters connected to six (or multiple of six) terminal motors, the conductors between the starter and motor carry phase current and their ampacity must be based on 58 percent of the motor rated load amperes (RLA) times 1.25. Wiring of free-standing starter 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 starter and motor terminals is factory-installed when chillers are supplied with unit-mounted starters.