YORK®	Supersedes: 160.54-PW6 (816)	Form 160.54-PW6 (818)
	FIELD CONNECTIONS MODEL YK CHILLERS (STYLE F AND G) WITH VARIABLE SPEED DRIVE	
WIRING DIAGRAM		
CONTRACTOR _____ ORDER NO. _____ YORK CONTRACT NO. _____ YORK ORDER NO. _____	PURCHASER _____ JOB NAME _____ LOCATION _____ ENGINEER _____	
☐ REFERENCE DATE _____	☐ APPROVAL DATE _____	☐ CONSTRUCTION DATE _____

JOB DATA:

CHILLER MODEL NO. YK _____

NO. OF UNITS _____

MOTOR/VARIABLE SPEED DRIVE POWER: 380, 460 OR 575 VOLTS, 3-PHASE, 60 HZ OR 400 OR 415 VOLTS, 3-PHASE, 50 HZ

Issue Date:
August 3, 2018

IMPORTANT!

READ BEFORE PROCEEDING!

GENERAL SAFETY GUIDELINES

This equipment is a relatively complicated apparatus. During rigging, installation, operation, maintenance, or service, individuals may be exposed to certain components or conditions including, but not limited to: heavy objects, refrigerants, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death. It is the obligation and responsibility of rigging, installation, and operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized rigging, installation, and operating/service personnel. It is expected that these individuals possess independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood the on-product labels, this document and any referenced materials. This individual shall also be familiar with and comply with all applicable industry and governmental standards and regulations pertaining to the task in question.

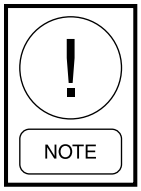
SAFETY SYMBOLS

The following symbols are used in this document to alert the reader to specific situations:

Indicates a possible hazardous situation which will result in death or serious injury if proper care is not taken.

Identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution if proper care is not taken or instructions and are not followed.

Indicates a potentially hazardous situation which will result in possible injuries or damage to equipment if proper care is not taken.



Highlights additional information useful to the technician in completing the work being performed properly.

External wiring, unless specified as an optional connection in the manufacturer's product line, is not to be connected inside the control cabinet. Devices such as relays, switches, transducers and controls and any external wiring must not be installed inside the micro panel. All wiring must be in accordance with Johnson Controls' published specifications and must be performed only by a qualified electrician. Johnson Controls will NOT be responsible for damage/problems resulting from improper connections to the controls or application of improper control signals. Failure to follow this warning will void the manufacturer's warranty and cause serious damage to property or personal injury.

CHANGEABILITY OF THIS DOCUMENT

In complying with Johnson Controls' policy for continuous product improvement, the information contained in this document is subject to change without notice. Johnson Controls makes no commitment to update or provide current information automatically to the manual or product owner. Updated manuals, if applicable, can be obtained by contacting the nearest Johnson Controls Service office or accessing the Johnson Controls QuickLIT website at http://cgproducts.johnsoncontrols.com.

It is the responsibility of rigging, lifting, and operating/service personnel to verify the applicability of these documents to the equipment. If there is any question regarding the applicability of these documents, rigging, lifting, and operating/service personnel should verify whether the equipment has been modified and if current literature is available from the owner of the equipment prior to performing any work on the chiller.

CHANGE BARS

Revisions made to this document are indicated with a line along the left or right hand column in the area the revision was made. These revisions are to technical information and any other changes in spelling, grammar or formatting are not included.

NOTES

1. All field wiring shall be in accordance with the current edition of the National Electrical Code (N.E.C.) as well as all other applicable codes and specifications.
2. 

PROPER GROUNDING IS REQUIRED:
   - Variable Speed Drive (VSD) shall be grounded in accordance with the 2017 NEC (Paragraph 250.118).
   - Ground wires must be copper only and sized per the NEC See Table 250.122.
   - A separate grounding conductor shall be run in each conduit or for each 3 phase bundle within a cable tray. See *Figure 1 on page 4*.
   - Each ground wire shall be connected directly between the supply transformer's secondary ground and the VSD ground lug.
   - Flexible conduit is required for final connection to the VSD for vibration isolation.
   - Conduit is not an acceptable grounding means.
   - See *Table 2 on page 5* for VSD ground lug sizing.
3. Wiring, electrical conduit, junction boxes, fused disconnect switches (FDS), or circuit breakers, starters (M), pushbutton stations (PB), manual-off-automatic switch (S), flow switch (FLS), and control relays furnished by others unless otherwise specified.
4. Items marked * furnished by Johnson Controls.
5. Items marked ** available from Johnson Controls at additional cost.
6. Control power supply 115V - 50/60Hz, 2.0/3.0 KVA capacity for control center only, is supplied by a control power transformer(s) (1T)/(2T) mounted inside the VSD (380V, 60Hz chiller motor code CW-CZ, and CA, ER-EZ, EA or 460V, 60Hz chiller motor code CF-CT, EF-ET, FB-FD or 575V 60Hz chiller motor code CF-CV, EF-EV or 50Hz 5CC-5CM, 5EC-5EM) or outside the VSD (380V, 60Hz chiller motor code EF-EP or 60Hz chiller motor code CU-DB, EU-FB or 50Hz 5CN-5DA, 5EN-5FA) as shown. It is factory wired.

7. Flexible conduit must be used for final connections to VSD. **Multiple conduits shall contain an equal number of wires from each phase in each conduit to prevent overheating per the 2017 NEC (Paragraph 300.20(a)). Use copper conductors only; DO NOT USE aluminum conductors.** See *Table 2 on page 5* and Note 8 for factory furnished VSD terminal lug wire ranges and conduit connection provisions.
8. A removable cover plate with pilot knockouts is supplied for connection of power supply conduits. Refer to *Table 1 on page 4*.

TABLE 1 - POWER SUPPLY CONDUITS

INPUT VOLTAGE/FREQUENCY	OUTPUT VOLTAGE/FREQUENCY	CHILLER MOTOR CODE	NUMBER OF CONDUITS - MAX T
575V/600V/60 Hz	575V/600V/60 Hz	CF-CR EF-ER	(2) 2-1/2 in.
440V/460V/480V/60 Hz	440V/460V/480V/60 Hz	CF-CN EF-EN	
380V/60Hz	380V/60Hz	EF-EK	
415V/50Hz	415V/50Hz	5EC-5EI	
380V/400V/50 Hz	380V/400V/50 Hz	5CC-5CI 5EC-5EI	
575V/600V/60 Hz	575V/600V/60 Hz	CS-CV ES-EV	(2) 3 in.
440V/460V/480V/60 Hz	440V/460V/480V/60 Hz	CP-CT EP-ET	
380V/60Hz	380V/60Hz	EL-EP	
415V/50Hz	415V/50Hz	5EJ-5EM	
380V/400V/50 Hz	380V/400V/50 Hz	5CJ-5CM 5EJ-5EM	
440V/460V/480V/60 Hz	440V/460V/480V/60 Hz	CU-CZ,CA,CB,DA,DB EU-EZ, EA, EB, FA, FB	(4) 3 in.
380V/60Hz	380V/60Hz	ER-EV CW-CZ, CA	
415V/50Hz	415V/50Hz	5CP-5CX 5EN-5EX	
380V/400V/50 Hz	380V/400V/50 Hz	5CN-5CX,5DA 5EN-5EX, 5FA	
440V/460V/480V/60 HZ	575V/60 HZ	FB-FD	(4) 4 in.
380V/400V/415V/50 HZ	575V/60 HZ	FA-FB	

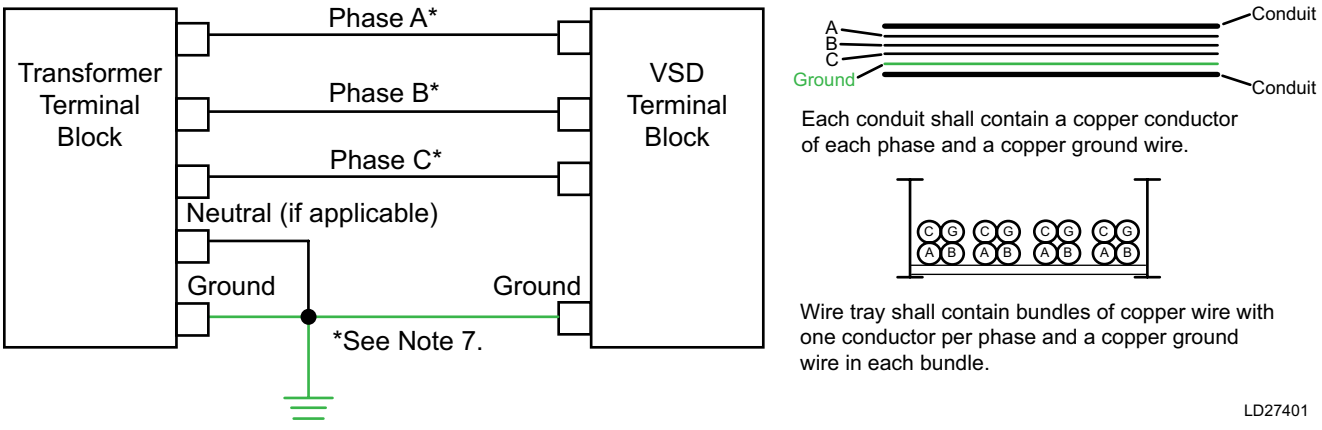


FIGURE 1 - GROUNDING VSD

The following terminal lugs are factory furnished for field wiring supply connections. All lugs are rated AL-9CU.

TABLE 2 - TERMINAL LUGS

INPUT VOLTAGE/ FREQUENCY	OUTPUT VOLTAGE/ FREQUENCY	CHILLER MOTOR CODE AND VSD CIRCUIT BREAKER RATING	LINE SIDE LUGS BBL PER TERMINAL	WIRE RANGE	GROUNDING LUG WIRE RANGE, QUANTITY
575V/600V/60 Hz	575V/600V/60 Hz	CF-CR EF-ER 400A	2	2/0-350 kcmil	#6 AWG to 250 kcmil, two bbl
440V/460V/480V/60 Hz	440V/460V/480V/60 Hz	CF-CN EF-EN 400A			
380V/60Hz	380V/60Hz	EF-EK 400A			
415V/50Hz	415V/50Hz	5EC-5EI 400A			
380V/400V/50 Hz	380V/400V/50 Hz	5CC-5CI 5EC-5EI 400A			
575V/600V/60 Hz	575V/600V/60 Hz	CS-CV ES-EV 600A	2	3/0-500 kcmil	#6 AWG to 250 kcmil, two bbl
440V/460V/480V/60 Hz	440V/460V/480V/60 Hz	CP-CT EP-ET 600A			
380V/60Hz	380V/60Hz	EL-EP 600A			
415V/50Hz	415V/50Hz	5EJ-5EM 600A			
380V/400V/50 Hz	380V/400V/50 Hz	5CJ-5CM 5EJ-5EM 600A			
440V/460V/480V/60 Hz	440V/460V/480V/60 Hz	CU-CZ,CA,CB,DA,DB EU-EZ, EA, EB, FA, FB 1200A	4	3/0-500 kcmil	#4 AWG to 500 kcmil, four bbl
380V/60Hz	380V/60Hz	ER-EZ, EA CW-CZ, CA 1200A			
415V/50Hz	415V/50Hz	5CP-5CX 5EN-5EX 1200A			
380V/400V/50 Hz	380V/400V/50 Hz	5CN-5CX,5DA 5EN-5EX, 5FA 1200A			
440V/460V/480V/60 HZ	575V/60 HZ	FB-FD 1600A	4	500-1000 kcmil	250-500 kcmil, four bbl
380V/400V/415V/50 HZ	575V/60 HZ	FA-FB 1600A			

9. Condenser water pump motor starter (3M) control voltage to be provided by others. The starter control voltage may be interlocked through control panel dry contacts TB2-150/151which close coincident with the start of System run. Contacts are gold-plated silver cadmium oxide rated for 5A maximum.

10. Units shipped knocked down require field connection of harnesses to control center, power wiring between compressor motor and VSD, and oil pump starter to VSD. These harnesses and power wiring are furnished by Johnson Controls for field assembly and consist of proper lengths of flexible conduit with necessary connectors, and contain the wires (shown in Note 13) properly terminated and marked.

11. If control voltage is 120VAC, use #14 AWG copper wire for one way distance less than 175 feet and #12 AWG copper wire for one way distance more than 175 feet, but less than 300 feet.

12. Refer to the following wiring diagrams for additional information:

FORM	DESCRIPTION
160.75-PW3	York Control Center
160.75-PW4	Field Wiring Modifications
160.75-PW6	York Variable Speed Drive
160.75-PW8	

13. The following interconnecting wires are factory supplied when a YORK Variable Speed Drive is used.

    a. VSD to control center – L, 2, 16, 24, 24R, 53. A 3-conductor shielded cable or, fiber optic cable pair for communications.

    b. VSD to oil pump motor starter – 67, 68, 69 GND.

14. 60Hz oil pump motor for compressor is 2 HP. Full load amperes for oil pump drive panel (furnished by Johnson Controls with VSD factory wired) and 3.0 KVA or (2) 2.0 KVA or, (1) 3.0 KVA and (1) 2.0 KVA control power transformer(s) (furnished by Johnson Controls and factory wired) are:

TABLE 3 - OIL PUMP

3-PHASE VOLTAGE	HZ	OIL PUMP DRIVE PANEL (AMPS)	CONTROL POWER TRANSFORMER(S) (AMPS)	MOTOR CODES
575/600	60	2.9	5.2	CF-CV, EF-EV
440/460/480	60	3.6	6.5	CF-CT, EF-ET
380	60	4.3	7.5	EF-EP
380/400/415	50	4.3	7.5	5CC - 5CM, 5EC-5EM
440/460/480	60	3.6	8.7	CU-DB, EU-FB
380	60	4.3	10	ER-EZ, EA CW-CZ, CA
415	50	4.3	10	5CP-5CX, 5EN-5EX
380/400	50	4.3	10	5CN - 5DA, 5EN-5FA
440/460/480	60	3.6	10.8	FB-FD*
380/400/415	50	4.3	7.5	FA-FB*

*575/60 output motor voltage

15. The branch circuit overcurrent protection device for the YORK VSD must be a time delay type with a rating which is the standard fuse/circuit breaker size required to protect the field supply wiring conductors per the N.E.C.

    Motor overload protection is provided by the York VSD according to UL 508C. The York VSD does not have provisions to provide motor temperature sensing, thermal memory, or thermal retention protection for motor overload conditions as a standard offering. If thermal overload protection is desired, an optional motor monitoring board and resistance thermometer devices or thermistors are available.

16. The YORK Variable Speed Drive power supply wiring ampacity shall be calculated as follows.

    Model YK minimum circuit ampacity:

    Ampacity = 1.25 (Job FLA)

    Where 125% factor per 2014 N.E.C. (Para. 440-33).

TABLE 4 - CIRCUIT BREAKER

INPUT VOLTAGE/ FREQUENCY	OUTPUT VOLTAGE/ FREQUENCY	CHILLER MOTOR CODE	VSD CIRCUIT BREAKER RATING (AMPS) @ 600VAC, 60 HZ OR 480 VAC, 60 HZ OR 400 VAC, 50 HZ TRIP		SEMICONDUCTOR FUSE RATING (AMPS) @700 VAC WITHSTAND	GROUND FAULT TRIP (AMPS)
			Trip	Withstand		
575V/600V/60 Hz	575V/600V/60 Hz	CF-CR EF-ER	400	35,000*+	N/A	120
440V/460V/480V/60 Hz	440V/460V/480V/60 Hz	CF-CN EF-EN	400	65,000*+		
380V/60Hz	380V/60Hz	EF-EK				
415V/50Hz	415V/50Hz	5EC-5EI				
380V/400V/50 Hz	380V/400V/50 Hz	5CC-5CI 5EC-5EI				
575V/600V/60 Hz	575V/600V/60 Hz	CS-CV ES-EV	600	50,000*+	N/A	160
440V/460V/480V/60 Hz	440V/460V/480V/60 Hz	CP-CT EP-ET	600	100,000*+		
380V/60Hz	380V/60Hz	EL-EP				
415V/50Hz	415V/50Hz	5EJ-5EM				
380V/400V/50 Hz	380V/400V/50 Hz	5CJ-5CM 5EJ-5EM				
440V/460V/480V/60 Hz	440V/460V/480V/60 Hz	CU-CZ EU-EZ	1200	100,000*+	1100	240
380V/60Hz	380V/60Hz	ER-EV				
415V/50Hz	415V/50Hz	5CP-5CT 5EN-5ET				
380V/400V/50 Hz	380V/400V/50 Hz	5CN-5CS 5EN-5ES				
440V/460V/480V/60 Hz	440V/460V/480V/60 Hz	CA,CB,DA,DB EA,EB,FA,FB	1200	100,000*+	1600	240
380V/60Hz	380V/60Hz	CW-CZ, CA EW-EZ, FA				
415V/50Hz	415V/50Hz	5CU-5CX 5EU-5EX				
380V/400V/50 Hz	380V/400V/50 Hz	5CT-5CX, 5DA 5ET-5EX, 5FA				
440V/460V/480V/60Hz	575V/60 HZ	FB-FD	1600	100,000*+	1800 @650VAC	360
380V/400V/415V/50Hz	575V/60 HZ	FA-FB				

* Per U.L. Listing of VSD

† RMS Symmetrical Amperes

17. The VSD is equipped with a U.L. Listed ground fault sensing circuit breaker sized per the following table. Fast acting semiconductor fuses are employed after the circuit breaker to provide additional protection to the VSD. The ground fault sensor is factory set to trip instantaneously when a ground fault is detected.

18. Control circuit wiring for 3M condenser water pump motor starter is shown for cooling only application.

19. The main power transformer should be adequately sized such that the transformer voltage drop does not exceed 10% during unit start-up. The supply voltage, at VSD input terminals, during start-up must be maintained above 489 volts for 575V/600V, 391 volts for 440V/460V/480V, 323 volts for 380V 60Hz units and 323 volts for 380V/400V, 353 volts for 415V 50Hz units. The allowable supply voltage range during normal operation is 520 to 635VAC, 3-Phase 575V/600V, 60Hz or 414 to 508VAC, 3-Phase, 440V/460V/480V 60Hz or 342 to 423VAC, 3-Phase,380V/400V 50/60Hz, or 374 to 456VAC, 3-Phase, 415 50Hz.

20. Chilled water pump motor starter (5M) control voltage to be provided by others. The starter control voltage may be interlocked through control panel dry contacts TB2-44/45 which close during oil pump prerun, compressor operation and during cycling shutdown. Contacts are gold-plated silver cadmium oxide rated for 5A maximum.

21. Each 115VAC field-connected inductive load, i.e. relay coil, motor starter coil, etc. shall have a transient suppressor wired (by others) in parallel with its coil, physically located at the coil. Spare transient suppressors are factory supplied in a bag attached to the keypad cable clamp in the OptiView Control Center.

22. The Condenser Flow Switch is optional. If not present, a jumper must be installed between TB4-11 and TB4-1.

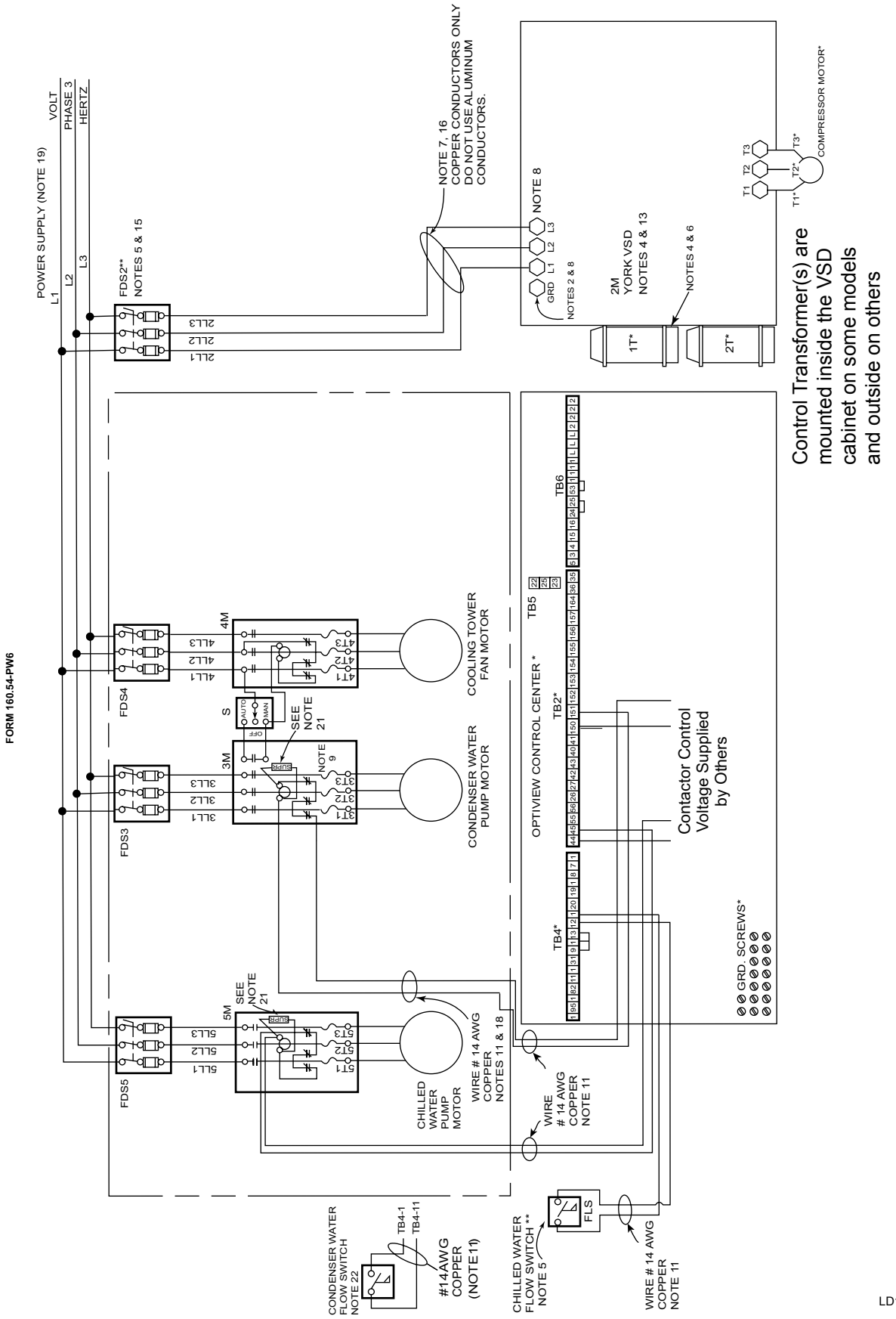


FIGURE 2 - WIRING DIAGRAM – FIELD CONNECTIONS

5000 Renaissance Drive, New Freedom, Pennsylvania USA 17349
800-861-1001
www.johnsoncontrols.com

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