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MAINTENANCE

**FRICK[®] QUANTUM[™] HD UNITY
COMPRESSOR CONTROL PANEL**

Version 10.53

CONTENTS

SECTION 1 - CONTROL SYSTEM	
INTRODUCTION	6
CONTROL PANEL ENCLOSURE	6
GENERAL INFORMATION	6
WHAT TO DO BEFORE CALLING THE FACTORY	7
SECTION 2 - QUANTUM™ HD UNITY OPER. INTERFACE	
DESCRIPTION	10
DISPLAY ASSEMBLY	10
TOUCHSCREEN DESCRIPTION	11
USING AN EXTERNAL USB STYLE KEYBOARD OR MOUSE	11
SECTION 3 - Q6 PROCESSOR BOARD	
INTRODUCTION	14
FEATURES	14
WHAT OCCURS WHEN APPLYING POWER	14
IF THE OPERATING STATUS SCREEN IS NOT SHOWN	14
BATTERY FUNCTION AND REPLACEMENT	15
RESET IP ADDRESS TO DEFAULT	18
SECTION 4 - Q5 PROCESSOR BOARD & INTERFACE	
INTRODUCTION	22
FEATURES	22
WHAT SHOULD OCCUR WHEN APPLYING POWER	22
WHAT IF THE OPERATING STATUS SCREEN IS NOT SHOWN	22
BATTERY FUNCTION AND REPLACEMENT	23
INTERFACE BOARD DESCRIPTION	23
Q5 PROCESSOR BOARD JUMPERS, LED'S AND CONNECTORS	25
RESET IP ADDRESS TO DEFAULT	26
SECTION 5 - POWER SUPPLY	
DESCRIPTION	30
POWER DISTRIBUTION	30
MEASURING VOLTAGES	30
POWER SUPPLY REPLACEMENT	31
SECTION 6 - DIGITAL BOARD	
INFORMATION	34
DIGITAL BOARD DESCRIPTION	34
COMMUNICATIONS LED'S	34
CONNECTIONS TO THE QUANTUM™ HD UNITY	34
LOGIC VOLTAGE (POWER) LED	34
ACTIVE LED	35
DIGITAL INPUTS	35
DIGITAL OUTPUTS	35
SOFTWARE WATCHDOG	35
CHECKING THE DIGITAL INPUTS AND OUTPUTS	35
FUSE TESTING AND REPLACEMENT	36
INPUT AND OUTPUT MODULE TESTING AND REPLACEMENT	36
TROUBLESHOOTING AN OUTPUT	36
TROUBLESHOOTING AN INPUT	36
REPLACING A DEFECTIVE DIGITAL BOARD	36
DIGITAL BOARD SETTINGS	39

SECTION 7 - 614 ANALOG BOARD	
OVERVIEW	42
ANALOG BOARD DESCRIPTION	42
COMMUNICATIONS LED'S	42
CONNECTIONS TO THE QUANTUM™ HD UNITY	42
LOGIC VOLTAGE (POWER) LED'S	42
ACTIVE LED	43
ANALOG INPUTS	43
ANALOG OUTPUTS	44
TROUBLESHOOTING THE ANALOG INPUTS AND OUTPUTS	44
REPLACING A DEFECTIVE ANALOG BOARD	44
PHD VIBRATION ANALYSIS	45
CURRENT TRANSFORMER (MOTOR AMPS)	46
ANALOG BOARD SETTINGS	49
SECTION 8 - SERVICE SCREENS	
SERVICE - MAINTENANCE (FACTORY)	52
SERVICE - MAINTENANCE (USER DEFINED)	53
SERVICE - OIL PUMP	53
SERVICE - COMMUNICATIONS	54
COMMUNICATIONS LOOPBACK TEST	54
SERVICE - DIAGNOSTICS	56
SERVICE - SOFTWARE	57
STATUS - PANEL (MODBUS TCP LOG)	59
STATUS - VYPER INFO	59
STATUS - FILTER INFO	60
STATUS - ANALOG	60
STATUS - DIGITAL	61
STATUS - COMMS 1-3	61
STATUS - I/O COMMS	62
STATUS - COMMS (1-3) LOG	62
STATUS - I/O COMMS LOG	63
STATUS - SSW STARTER INFO	63
STATUS - DBS STARTER INFO	64
CONFIGURATION - DRIVE (MOTOR)	65
ABOUT	66
SECTION 9 - TROUBLESHOOTING	
TROUBLESHOOTING CHART FOR FRICK® QUANTUM™ HD UNITY CONTROL PANEL	68
SECTION 10 - QUANTUM™ HD UNITY DRAWINGS	
QUANTUM™ HD UNITY DRAWINGS	73
SECTION 11 - ADDITIONAL TABLES	
TABLES	119
SECTION 12 - REPLACEMENT PARTS LIST	
CONTROL PANEL REPLACEMENT PARTS LIST	121
REMANUFACTURED PARTS	122

LIST OF FIGURES

Figure 1. LCD Display Assembly & Mounting	10	Figure 23. Current Transformer	46
Figure 2. Q6 Processor Board	14	Figure 24. Analog Board #1	47
Figure 3. Q6 Processor Board Diagram	16	Figure 25. Analog Board #2	48
Figure 4. Q6 Processor Board Mounting	19	Figure 26. Q5 RS-422 Test Harness	54
Figure 5. Q5 Processor Board Photo	22	Figure 27. Comms 1-4 Connectors	55
Figure 6. Interface Board Photo	23	Figure 28. Q6 RS-485 Test Harness A: 3-pin to 3-pin	55
Figure 7. Q5 Processor Board Diagram	24	Figure 29. Q6 RS-422 Test Harness B: 5-pin to 3-pin	55
Figure 8. Interface Board Diagram	26	Figure 30. USB Plug-in Locations	58
Figure 9. Pinouts and Jumper Locations	26	Figure 31. Quantum HD Unity Panel Assembly	74
Figure 10. Q5 Processor Board Interconnections	27	Figure 32. RXF Wiring Diagram (Capacity Slide Transmitter)	78
Figure 11. Q5 Processor Board Mounting	28	Figure 33. RWFII Wiring Diagram (Capacity Slide Transmitter)	84
Figure 12. Power Supplies	30	Figure 34. RXF/RXB Wiring Diagram (Cap. Slide Potentiometer)	90
Figure 13. Power Supply Adjustment	31	Figure 35. RWBII Wiring Diagram (Cap. Slide Potentiometer)	96
Figure 14. Return Lead	34	Figure 36. RDB Wiring Diagram	102
Figure 15. Digital Input Modules - Side View	35	Figure 37. PhD Wiring Diagram	108
Figure 16. Digital Output Module - Side View	35	Figure 38. Digital I/O Board #2 Wiring Diagram	109
Figure 17. Signal Connections	35	Figure 39. Analog I/O Board #2 Wiring Diagram	111
Figure 18. Digital I/O Board #1	37	Figure 40. HD Unity AC Power Harness	113
Figure 19. Digital I/O Board #2	38	Figure 40a. HD Unity AC Power Harness (Digital Board #2)	114
Figure 20. Return Lead	42	Figure 41. Isolater Repeater Module	115
Figure 21. Signal Connections	44	Figure 42. Communications Wiring Diagrams	116
Figure 22. PHD Connections (Analog Board #1)	45	Figure 43. Point-To-Point Field Wiring Diagram	117

LIST OF TABLES

Table 1. Q5 Processor Board Display Jumpers	10	Table 14. Dipswitch Settings	39
Table 2. Keyboard Mapping	11	Table 15. Analog Board Input Configuration Table	43
Table 3. Q6 Board Jumper Settings	17	Table 16. Resistor Values	44
Table 4. Q6 LED Definitions	17	Table 17. Communications	49
Table 5. DIP Switch (J11) Definitions	17	Table 18. Dipswitch Settings (Used to set board address)	49
Table 6. Ethernet Connector (J27) Definitions	18	Table 19. Analog Board Jumper Settings	49
Table 7. Power Connector Pinout (J37)	18	Table 20. Q5 RS-422/485 Test Configuration	54
Table 8. Q5 Board Jumper Settings	25	Table 21. Quantum HD Unity Drawings List	73
Table 9. Q5 Board LED Definitions	25	Table 22. Pressure Transducer Conversation Data	119
Table 10. Q5 Board Connector Pinouts	25	Table 23. Compressor Volume Ratio & Capacity Information	120
Table 11. JP1 System Settings	26	Table 24. Unity Compressor Control Replacements Parts List	121
Table 12. Comms 1 & 2 Jumper Settings	26	Table 25. Remanufactured Parts	122
Table 13. Communication Settings	39		

SAFETY PRECAUTION DEFINITIONS



Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



Indicates a potentially hazardous situation or practice which, if not avoided, will result in death or serious injury.



Indicates a potentially hazardous situation or practice which, if not avoided, will result in damage to equipment and/or minor injury.

NOTICE

Indicates an operating procedure, practice, etc., or portion thereof which is essential to highlight.

SECTION 1

INTRODUCTION TO QUANTUM™ HD UNITY COMPRESSOR CONTROL



Compressor Enclosure QHDU LF_2018.tif

INTRODUCTION TO THE QUANTUM™ HD UNITY CONTROL SYSTEM

INTRODUCTION

The Quantum™ HD Unity panel differs from previous Quantum™ HD panels primarily in the software operating system. The hardware portion has also been upgraded to a 15" color display and touchscreen interface. The Frick® Quantum™ HD Unity control system consists of five major areas:

- **Q5 Processor Board** – The brains of the system. This board will be discussed in Section 3 of this manual.

The combination of the hardware (Q5 Processor Board) and the software program that runs on it creates what we call the Quantum™ HD Unity system. The Q5 Processor Board communicates with each of the Digital and Analog boards. This communication allows the Quantum™ HD Unity 5 to read the status of all the I/O boards, and display the data on the interface screen. The Q5 Processor Board software acts on this data, and provides the necessary control information to the I/O boards to provide the appropriate control of all input and output signals, based upon the configuration of installed features and options of the compressor package. Operator interaction is provided through an intuitive touchscreen interface. Interaction to the outside world is provided through industry-standard communications protocols, such as ModBus TCP and serial RS-422/485. Additional information about the Quantum™ HD Unity can be found under the Q5 Processor Board sections found in Section 3 of this manual.

- **Power Supply** - Provides the necessary operating voltages for the proper operation of all control components. Additional information about the power supply can be found in Section 4 of this manual.
- **Digital Input / Output Boards** - Digital (on/off) signals are sent and received by these boards. The output signals are used for energizing solenoids, valves, contactors, relays, etc., and the input signals are used to sense the condition of switches, relay contacts, auxiliary contacts, etc. This board runs an independent software program from the processor to control devices, and communicates the status of all devices back to the processor. Additional information about the Digital Boards can be found Section 5 of this manual.
- **Analog Input / Output Boards** - Analog (variable) signals are sent and received by these boards. The output signals are used for controlling VFDs, modulated valves, etc., the input signals are used to read the values being sent from pressure transducers, temperature sensors, etc. This board runs an independent software program from the processor to control devices, and communicates the status of all devices back to the processor. The Analog board has 24 analog inputs, and 8 analog outputs. Additional information about the Analog board can be found in Section 6 of this manual.
- **Operator Interface** - This section actually consists of two major components; the Display and the Touchscreen. The Display is used to show the operator, via a graphical interface, the actual status of all compressor values. Warnings and shutdowns (and history/trending), pressure and temperature values, digital I/O status, setpoints, etc., are viewed on this display. The Touchscreen allows the operator to navigate and enter data directly via the display.

Additional information about the Operator Interface can be found in Sections 2 and 7 of this manual.

CONTROL PANEL ENCLOSURE

The Frick® Quantum™ HD Unity control panel enclosure utilizes available space efficiently and the small size allows it to be used on all of our compressor packages. The panel is also equipped with the necessary posts and hardware to add options in the field. They may also include a second analog and/or digital board, enclosure heater and air-circulating fan.

Dimensions of the panel are 24 x 22 x 11 inches (WxHxD) and weighs approximately 75 pounds with all options. Typically the panel will be mounted on the package, but it is also designed for easy wall mounting as well. Refer to the Quantum™ HD Unity Control Panel Assembly drawing 649D5922 that appears later in this manual for the layout of this enclosure.

The DC power/communications harness in this panel is color-coded. This will make wire identification much easier. The coding is as follows:

- +5VDC - RED
- +12VDC - YELLOW
- +24VDC - GREY
- Common/Ground - BLACK
- +RX/TX - WHITE w/RED stripe
- -RX/TX - WHITE w/BLACK stripe

GENERAL INFORMATION

NOTICE

The components within the control panel can be inadvertently damaged by static electricity or mishandling. Only qualified technicians should directly handle these components.

1. **DO NOT** attempt to make corrections to the power supply without shutting off the power to the control panel. Accidental shorts can irreparably damage the processor boards or the display screen.
2. **DO NOT HANDLE** the panel boards without first attaching a properly grounded wrist ground strap to prevent static electrical discharge from your body.

Most problems encountered with the microprocessor and control circuits will be the result of a wiring fault, a blown fuse, faulty I/O module or failure of a peripheral control such as a solenoid coil or a pressure transducer. Faults in the computer, while possible, are unlikely. If a fault develops in the computer, the probability is that all functions will cease and the display screen will go blank. The control system of the compressor consists of an AC side, which can be either 120 volts, or 230 volts, and a DC side. The AC side actuates solenoids, relays, alarms, and other electromechanical functions. The DC side operates the computer and its various sensors.

⚠ WARNING

When working within the panel, the AC side, which can be either nominal 120 VAC or nominal 230 VAC, CAN CAUSE INJURY OR DEATH.

1. To troubleshoot the DC side of the control circuits, it will be necessary to have at least the following tools:
2. Accurate digital multimeter (capable of reading to DC/AC, mA to the hundreds place)
3. Small wire stripper
4. Small screwdriver (with insulated shaft)
5. Small snip nose pliers

NOTICE

Proper panel voltage refers to the AC that has been supplied to the panel, which could be either nominal 120 VAC or nominal 230 VAC (Reference the Control Panel Power Specifications).

NOTICE

When working with and around the various circuit boards inside the control panel, it is recommended to prevent static build-up and discharge to these boards by keeping yourself properly grounded. This can be accomplished by the utilization of the following items:

1. Wrist Grounding strap
2. Static free grounded work surface

WHAT TO DO BEFORE CALLING THE FACTORY

On occasions when a suspected Quantum™ HD Unity problem is called in to a service representative, not enough information is provided for the service personnel to assist in solving the problem. This is most likely because the caller is not aware of the type of information that would be useful to service personnel in helping to identify and correct the problem. An example of this is the statement that the Quantum™ HD Unity is not booting (the main processor board is

not starting). Unfortunately, this description is usually vague and only means that there is nothing on the display. A blank screen could be the result of something else. The following is a list of possible reasons for no display:

- No power
- Loose or Faulty Display Cable or Inverter Cable
- Defective Display
- Wrong Combination of Display, Cable, or Software
- Faulty Q5 Processor Board

Before calling your Frick factor service representative for assistance, you may choose to review the information on the following pages to discover and resolve your issue. The actual cause of most problems will not be with the Q5 Processor Board itself, but with something external. However, on the rare occasion that the problem has been identified as being the Q5 Processor Board, use Section 3 as a guideline for replacing it.

When calling your Frick Factor service representative for assistance, include the Frick Sales Order number and the current Quantum HD Unity software version that is installed in the control panel.

NOTES

SECTION 2

QUANTUM™ HD UNITY OPERATOR INTERFACE



QHDU Compr Panel Display_2018.tif

QUANTUM™ HD UNITY OPERATOR INTERFACE

DESCRIPTION

The Quantum™ HD Unity Operator Interface consists of two components: A color 15" (diagonally measured) graphic display and a resistive touchscreen and a membrane touch overlay. The display is used to view information coming from the Q5 Processor Board controller, while the touchscreen allows the operator to navigate the menus.

DISPLAY ASSEMBLY

The Display assembly consists of a 1024 x 768 resolution LCD screen (which includes LED backlight sticks, and a wiring harness). Refer to the Parts List at the end of this manual for specific replacement part numbers.

NOTICE

Before replacing a display unit, ensure that the symptom is not actually being caused by a bad backlight LED stick, harness or jumper setting.

DISPLAY REPLACEMENT

1. Shut off control power.
2. Carefully unplug the touchscreen connector from the Q5 Processor Board. Ensure that you are familiar with the relocation of each of this connector.
3. Remove the six nuts that mount the display plate to the door.
4. Carefully lay the display plate down on a table or bench, with the display side up.
5. Loosen the four screws located on the display plate as shown in detail A that follows.
6. Once all four screws have been loosened, carefully slide the display out of the slotted mounting holes.
7. Remove the four screws and washers located at the sides of the display.
8. Reinstall the new display by reversing steps 7 and 6, in that order. Use the tool marks left by the hardware to position the new display.
9. Reinstall the display plate back into position on the panel door, and loosely reinstall the six hex nuts, do not tighten yet.
10. Carefully reconnect the display and backlight connectors on the back of the display.
11. Look at the display from the front of the panel door. Ensure that the display is centered in the display opening. Once centered, tighten the six nuts. Re-centering the display may be necessary after these steps have been completed.
12. Verify the Q5 Processor Board Display jumper settings per the table shown at the bottom of this page.

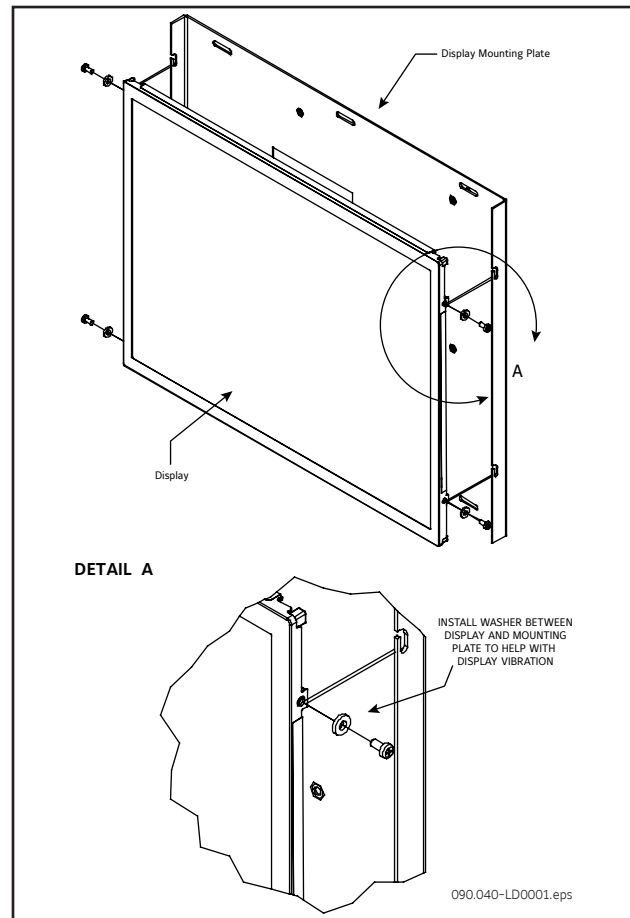


Figure 1. LCD Display Assembly & Mounting

Table 1. Q5 Processor Board Display Jumpers

Jumper Title	Function	Jumper Setting		
CN1000 (LCD Resolution Selector)	18-bit 1024x768 (default)	6 4 2	5 3 1	3-5 Closed & 2-4 Closed
JLVDS2 (Backlight Level Selector)	0- 5V (default)	1 2 3		2-3 Closed
JLVDS3 (Backlight Control Mode)	PWM Mode (default)		1 2 3	2-3 Closed

(Refer to Section 5 for location of jumpers)

TOUCHSCREEN DESCRIPTION

The Quantum™ HD Unity utilizes an 8-wire resistive touch-screen interface to facilitate operator interaction. It consists of a transparent sheet of glass, which covers the entire display area, and has numerous rows and columns of micro wires embedded into its surface. Touching anywhere on the glass will cause an adjacent row and column of these micro wires to sense the pressure, and signals the control electronics that a connection has occurred, and converts the signal to a cursor location. The action is very similar to the way a computer mouse would be utilized, in that manipulating a mouse moves a cursor around on the screen, but in the case of a touchscreen, a finger tip causes the cursor to move. The touchscreen allows the operator to simply touch active areas of the display for the purpose of changing setpoints, selecting menus, and accessing other operational features.

TOUCHSCREEN CALIBRATION

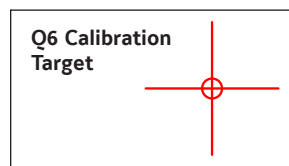
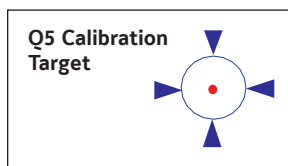
For the touchscreen to be used reliably, it must be accurately calibrated. The symptom of an improperly calibrated screen would be that an area of the screen that the user is touching is not being recognized, or an adjacent picture element is being activated instead of the intended one. It is also advisable to perform a calibration at unit commissioning.

There are two methods that may be used to access the Calibration feature:

1. As the Quantum™ HD Unity is powering up, a prompt will appear for 5 seconds, allowing access to the Screen Calibration feature.
2. After the Quantum™ HD Unity has been booted, the Screen Calibration feature may be accessed by logging into the service level, then press **[Menu]**. Once the Menu appears, press **[Service]**. After the Service screen appears, locate the tab that is labeled **[Calibrate Touch Screen]** and select it.

The display screen will be replaced with an all white screen.

With a Q6 processor, the referenced target appears in the upper left quadrant of the screen. Touch this target to initiate calibration. Continue and complete the screen calibration by touching each of the remaining 3 targets.



With a Q5 processor the referenced target appears in the upper left corner of the screen. Touch this target to initiate calibration. Continue and complete the calibration by touching each of the remaining 15 targets.

Once complete, the boot will finish or you will return to the screen calibration page.

USING AN EXTERNAL USB STYLE KEYBOARD OR MOUSE

NOTICE

Always be aware of the presence of live AC voltage within the control enclosure!

TO USE A USB COMPATIBLE COMPUTER KEYBOARD:

Open the control panel door, then use the following instructions:

Locate the two USB connections on the Q5 Processor Board, and plug the USB end of the keyboard cable into either one.

The external USB based keyboard is now active and ready to use. To navigate using the external USB style keyboard using keyboard mapping, refer to the following chart for special functions:

Table 2. Keyboard Mapping

Keyboard Key	Function
F2	Screen Calibration
F3	Stop Load
F4	Stop Unload
F5	Home
F7	Load
F8	Start Compressor
F9	Unload
F11	Alarm Silence
F12	Stop Compressor

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TO USE A USB COMPATIBLE COMPUTER MOUSE:

If using a mouse, note that by moving it, the on-screen cursor will track its movement. Simply navigate the cursor using the mouse to simulate a finger tip. Click on the screen areas that you wish to access by pressing the left hand mouse button. Use the on-screen data and keyboard entry boxes that appear to enter values and text.

FOR QUANTUM™ HD PANELS WITH KEYPAD

When the Quantum™ HD was first introduced, and for several years afterward, the front panel Touchscreen overlay included a keypad below the display. The keypad portion of this overlay has been eliminated in current models. In the event that a new Touchscreen overlay would need to be ordered, a field replacement kit has been provided. The part number for this kit is 649D6101G01 (SAP #1032704). This kit comes with replacement instructions and spacers that allow the new overlay to be aligned properly with the cutout opening in the panel door.

NOTES

SECTION 3

Q6 PROCESSOR BOARD



Q6 Processor Board.tif

Q6 PROCESSOR BOARD

INTRODUCTION

Frick Controls has released the latest version of the Quantum HD Unity Control System. The redesigned microprocessor, referred to as the Q6 Processor Board, is the brains of the system. The Q6 Processor Board combines the functions of the Q5 Processor Board and the Interface Board into a single board.



Figure 2. Q6 Processor Board

Q6 Processor Board.tif

FEATURES

The Q6 Processor Board includes the following features:

- 4 USB ports
- 10/100/1000 Mbps Ethernet port
- 1 RS-422 port
- 3 RS-485 ports (2 dedicated, 1 available)
- External HDMI video monitor port
- LED indicators to verify proper operation of on-board systems (power, serial communication, Ethernet, etc)
- 4 GB of RAM memory
- Battery to maintain date and time

External serial communications previously made possible through the Frick Controls Interface Board are now directly supported by the Q6 processor board.

WHAT OCCURS WHEN APPLYING POWER

When powering up, the following sequence of events are indicative of a functioning Q6 processor board:

- All LEDs turn on solid, excluding the CFAST, SATA, and SATA Host LEDs
- Active, User 1, User 2, and SD Card LEDs turn off
- Rx and Tx LEDs for COM1-COM4 turn off
- CFAST and SATA Host LEDs will blink rapidly to indicate activity
- The display shows a black screen with a graphic
- The display changes to a white screen with the text "Open Embedded" and a loading bar
- The display changes to a blue screen with the text "Quantum HD Loading"
- The Active LED (blue) begins to blink slowly
- Ethernet port LEDs turn on to indicate network link speed (if used)
- The display now shows the Operating Status (Home) screen

After the Q6 Processor Board has properly powered up, the following sequence of events is indicative of proper communication to the analog and digital boards:

- Rx and Tx LEDs for COM4 on the Q6 Processor Board will blink rapidly to indicate activity
- Analog and Digital I/O board's Rx and Tx lights will blink rapidly to indicate activity
- The Power LED on each I/O board will be on solid, and the Active LED will blink slowly

This power-up sequence is the first thing that needs checked when troubleshooting the Q6 Processor Board.

IF THE OPERATING STATUS SCREEN IS NOT SHOWN

If the Operating Status screen is not shown, check the following items:

1. If no LED's are lit, then check AC and DC power. Refer to the Power Supply section.
2. Check if the lighting of the LED's is occurring as described in the What Should Occur When Applying Power section.
 - If the power-up sequence continues to repeat without displaying the Operating Status (Home) screen, then there is a booting problem.

3. Check all plugged connectors for proper seating.
4. Check for any error messages displayed while booting.
 - Write down any error messages exactly as they appear (taking a picture with a mobile device is also useful.)
5. Check that the software is OK:
 - Is the correct software installed?
 - Was new software just installed?
6. Check the display. (If the Q6 Processor Board appears to be booting properly and the display is not illuminated):
 - If only a portion of the display looks darkened, one of the backlights has failed
 - If the entire display is dark, use a beam-type light source such as a flashlight to look for a ghost-type image (something is displayed on the screen but it is very dark)
 - If a ghost-type image is present, the display backlight cable is improperly seated, the display backlight has failed, or the Q6 Processor Board has failed
 - Verify that both the LVDS display cable and the backlight cable are firmly seated (it may be necessary to remove the LVDS display cable from the back of the display and re-seat it to ensure it is connected properly)

 **WARNING**

This is a small connector. Observe caution when unplugging and re-plugging this cable to avoid any damage due to excessive force.

BATTERY FUNCTION AND REPLACEMENT

The Q6 Processor Board utilizes a battery to maintain correct date and time for the purpose of date and time stamping warnings and shutdowns as they occur. If the date and time are not being maintained properly, this may indicate the battery is not functioning, and should be replaced. The battery may be ordered through Baltimore Parts or may be purchased at most electronic shops.

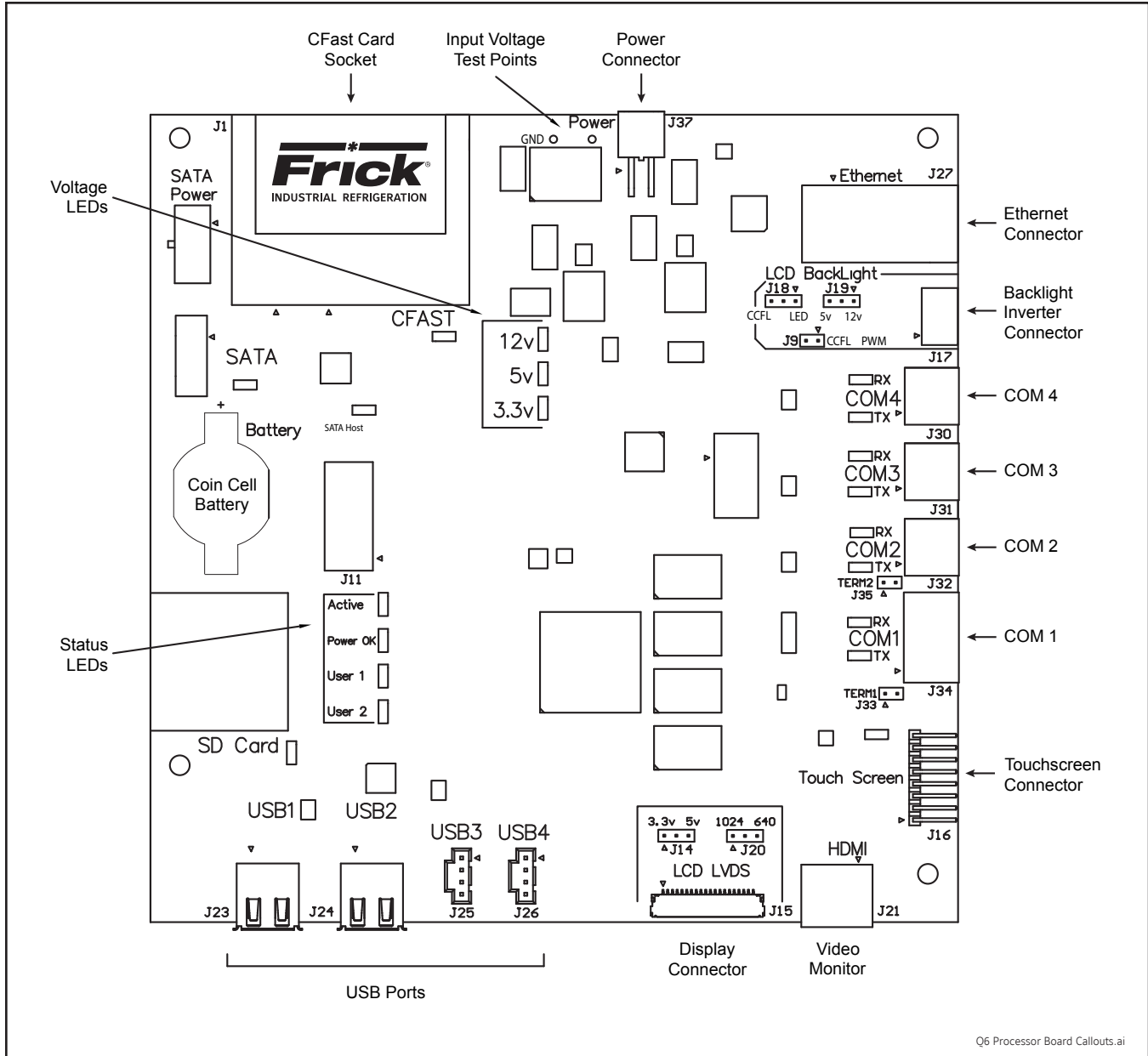
Manufacturer's numbers:

BR2032 · Up to 80°C Operating Temperature or
CR2032 · Up to 60°C Operating Temperature.

The battery is fully accessible, but is surrounded by sensitive electronic components, so care should be taken when replacing the battery.

Replace the battery per the following procedure:

1. Power off the panel
2. Don an anti-static wrist band and connect it to the ground wire in the lower left corner of the processor board
3. Locate the battery socket (shown on the below drawing of the Q6 Processor Board)
4. Place your fingernail under the edge of the battery and gently lift up (the battery will release easily)
5. Place the new battery into the socket in the same orientation as the old battery (the side with writing facing out)
6. Power up the panel and wait until the Quantum HD application has loaded
7. Navigate to the Panel settings page to set the correct date and time.



Q6 Processor Board Callouts.ai

Figure 3. Q6 Processor Board Diagram

NOTE: The triangle symbol (▷) denotes Pin 1 on connectors. Refer to the chart on the following page for jumper settings.

Do not change jumpers J13 (not shown), J38 (not shown), J40 (not shown) and J43* (pins 1&2 and 1&2). Changing these jumpers to any configuration other than this will prevent the processor from booting.

*double jumper.

Table 3. Q6 Board Jumper Settings

JUMPER TITLE	FUNCTION	JUMPER SETTING	
LCD Backlight			
J19 (Backlight Type)	LED (default)		1 - 2 Closed
	CCFL		2 - 3 Closed
J18 (Backlight Voltage)	12v (default)		1 - 2 Closed
	5v		2 - 3 Closed
J9 (CCFL PWM)	Disabled (default)		1 Pin Only
	Enabled		1 - 2 Closed
LCD LVDS			
J14 (LCD Voltage)	3.3v (default)		1 - 2 Closed
	5v		2 - 3 Closed
J20 (LCD Resolution)	HD (default)		1 - 2 Closed
	LX		2 - 3 Closed
COM2 & COM1			
J35 (COM2 Resistors)	Disabled (default)		1 Pin Only
	Enabled		1 - 2 Closed
J33 (COM1 Resistors)	Disabled (default)		1 Pin Only
	Enabled		1 - 2 Closed

NOTE: The triangle symbol (▷) denotes Pin 1

Do not change jumpers J13 (removed), J38 (removed), J40 (removed) and J43* (pins 1&2 and 1&2). Changing these jumpers to any configuration other than this will prevent the processor from booting.

*double jumper.

Table 4. Q6 LED Definitions

LABEL	COLOR	FUNCTION
Power LEDs		
D35	Green	12V Power OK
D36	Green	5V Power OK
D37	Green	3.3V Power OK
Status LEDs		
D4	Blue	Quantum Software OK
D5	Green	Processor Power OK
D6	Amber	(Future Use)
D7	Amber	(Future Use)
Serial Communication Activity LEDs		
D20	Green	COM4 Rx Activity
D21	Green	COM4 Tx Activity
D23	Green	COM3 Rx Activity
D24	Green	COM3 Tx Activity
D26	Green	COM2 Rx Activity
D27	Green	COM2 Tx Activity
D29	Green	COM1 Rx Activity
D30	Green	COM1 Tx Activity
Touchscreen Activity LED		
D8	Green	Touch Detected
SATA Activity LEDs		
D1	Green	SATA Bus Activity
D2	Green	CFast Card Activity
D3	Green	Auxiliary SATA Activity
SD Card Activity LED		
D19	Green	SD Card Activity

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Table 5. DIP Switch (J11) Definitions

POSITION	ENABLE STATE	FUNCTION
1	On	Restore Default Setpoints
2	On	Reset Default IP Address
3	On	(Future Use)
4	On	(Future Use)
5	On	(Future Use)
6	On	(Future Use)
7	On	(Future Use)
8	On	(Future Use)

090.070-TB0010.indd

Table 6. Ethernet Connector (J27) Definitions

LINK SPEED	AMBER LED	GREEN LED	LINK STATE
Standby	Off		No Link Established
1000 Mbps (Gigabit)	On	Off	No Activity
	Blinking		Activity
100 Mbps	Off	On	No Activity
		Blinking	Activity
10 Mbps	On		No Activity
	Blinking		Activity

090.070-TB0011.indd

Table 7. Power Connector Pinout (J37)

Pin	Function	
1	Ground (GND)	
2	Ground (GND)	
3	9-28v (VCC)	
4	9-28v (VCC)	

090.070-TB0012.indd

RESET IP ADDRESS TO DEFAULT

Reset a panel IP address to a known default per the following procedure:

1. Power off the panel
2. Set DIP switch (J11) number 2 to the ON position
3. Power up the panel and wait until the panel restarts
4. Set DIP switch (J11) number 2 to the OFF position

After the procedure above, the IP address is reset to the default address for the corresponding Unity product:

Compressor:	192.168.0.170
Condenser/Vessel:	192.168.0.171
Evaporator:	192.168.0.172
Engine Room:	192.168.0.173

The following pictorial shows the location of the Q6 Processor Board and how it mounts to the back of the display plate:

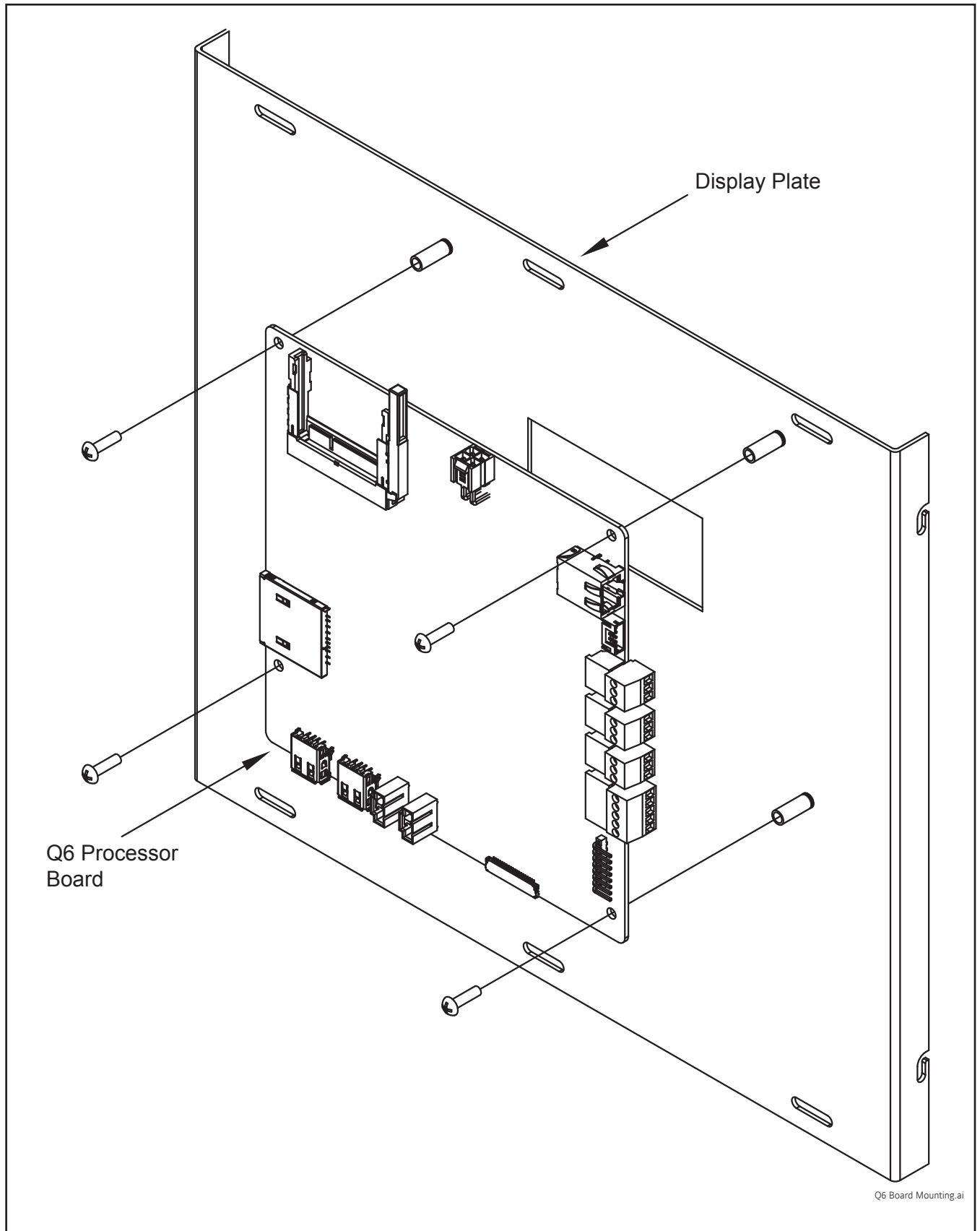
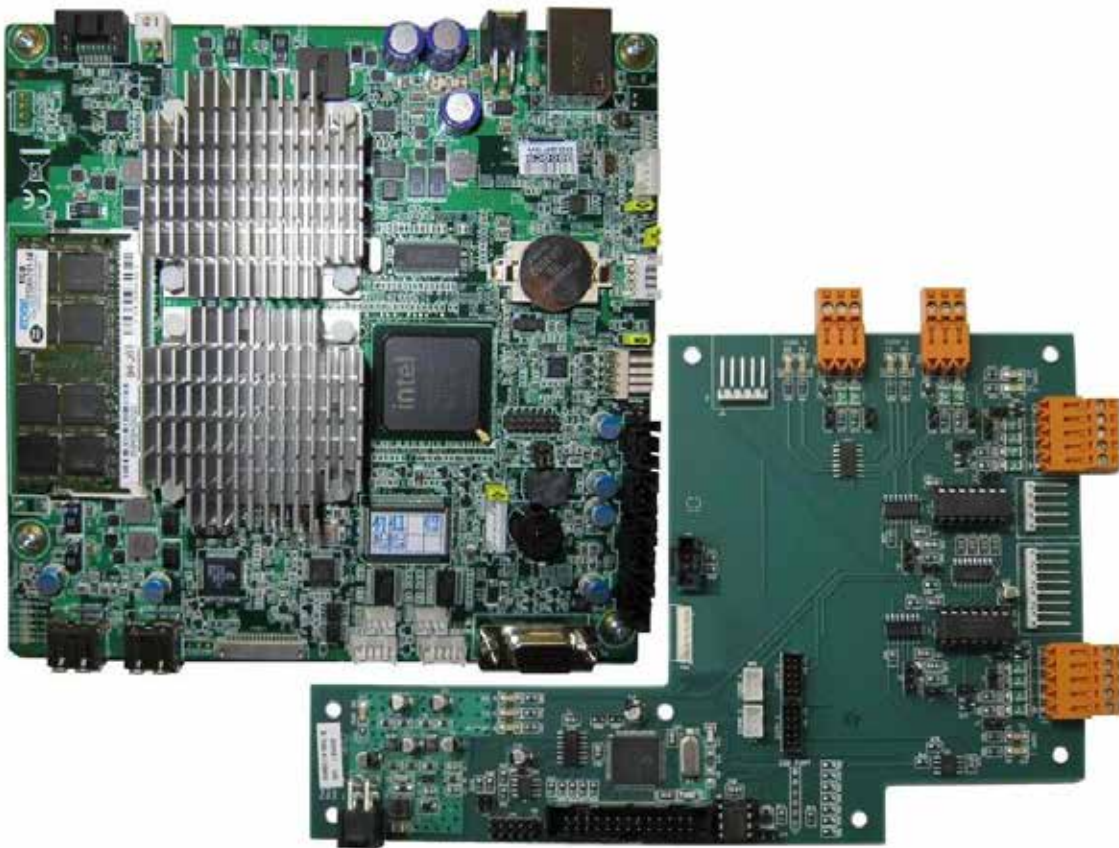


Figure 4. Q6 Processor Board Mounting

SECTION 4

Q5 PROCESSOR BOARD & INTERFACE



Q5 PROCESSOR BOARD

INTRODUCTION

Frick® Controls has released the latest version of the Quantum™ HD Unity Control System. The micro-processor is the brains of the system and is referred to as the Q5 Processor Board. A photo of this board appears here:



090.040-PH0004.tif

Figure 5. Q5 Processor Board Photo

FEATURES

The Q5 Processor Board includes the following features:

- 6 total USB ports (4 are dedicated, 2 are available)
- 10/100/1000 Mbps Ethernet Connection
- 2 RS-422 ports
- 2 RS-485 ports
- External Video monitor connection
- LED indicators to verify proper operation of various on board areas (power, communications, Ethernet connectivity, etc.)
- 2 GB RAM memory
- Battery to maintain date and time

WHAT SHOULD OCCUR WHEN APPLYING POWER

When powering up, the following sequence of events are indicative of a properly working main processor board:

- The six LED's in the lower left corner should turn on solid.
- The on-board "buzzer" should "beep" once.
- The display should show several DOS (text) style screens. A status bar will appear at the bottom of the screen and displays Fedora 15 as the boot sequence progresses.

- A Windows style screen with the letters HD will appear. The Operating Status (Home) screen will appear.
- A Loading bar will appear at the bottom of the screen, showing the percent of load that has completed, this is followed by additional DOS style text.

After the Q5 Processor Board has properly powered up, the following sequence of events is indicative of proper communication to the analog and digital boards:

- The Analog and Digital I/O boards TX/RX lights should be blinking.
- Each I/O board should have the power LED lighted and the Active LED should be blinking.
- The first thing that should be checked when troubleshooting the Q5 Processor Board is its powering up sequence.

WHAT IF THE OPERATING STATUS SCREEN IS NOT SHOWN

If the Operating Status screen is not shown, check the following items:

1. If no LED's are lit, then check AC and DC power. Refer to the Power Supply section.
2. Check if the lighting of the LED's is occurring as described in the What Should Occur When Applying Powering section.
 - If the powering up sequence continues to repeat without displaying the Operating Status screen, then there is a booting problem.
3. Check all plugged connectors for proper seating.
4. Check if an error message is displayed when booting.
 - Be sure to write down any error messages exactly as they appear, as well as the top line on the screen where the message appears.
5. Check that the software is OK:
 - Is the correct software installed?
 - Did you just install new software?
6. Check the display. If the Q5 Processor Board is booting but you have no display, check the following:
 - Check the LED backlight sticks. Look very closely at the display to see if anything is visible on the screen. If only a portion looks darkened, it may be that one of the backlights has failed. If the entire screen is dark (and it is not in sleep mode), use a beam type source of good lighting, such as a flashlight, look for any ghost type image. If it appears that there is something on the screen but very dark, the problem may be with either the backlight harness, the display or the Q5 Processor Board. Check to ensure that both ends of the backlight harness is plugged in securely. There is a sticker on the display mounting plate, that will have a part number that describes the type of display.
 - Verify that both the display cable and the backlight cable are firmly seated. It may be necessary to remove

the video cable from the back of the LCD display and re-seat it to be sure it is connected properly.

⚠ WARNING

This is a small connector. Caution should be observed so that it is not damaged due to excessive force.

- Refer to the Operator Interface section and check that the LCD, LCD cable, and software versions are matched correctly.

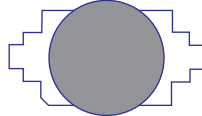
BATTERY FUNCTION AND REPLACEMENT

The Q5 Processor Board utilizes a battery to maintain correct date and time for the purpose of stamping warnings and shutdowns with the date and time that they occurred. If the date and time are not being maintained properly, this may indicate that the battery is not functioning, and should be replaced. The battery may be ordered through Baltimore Parts (P/N 333Q0001786) or may be purchased at most electronic shops (manufacturers P/N CR-2032).

The battery is fully assessable, but is surrounded by sensitive electronic components, so care should be taken when changing.

To replace the battery, ensure that the Control Power switch has been turned OFF.

Locate the Battery socket, as shown on the following drawing:



Once a static wrist band is properly donned, place your fingernail under the edge of the battery, and gently lift up. The battery should release itself from the socket easily. Take a new battery and place it into the holder in the same orientation as the old battery (the side with the writing must be facing out). Return the Control Power switch back to ON.

Once the Q5 Processor Board has rebooted, the correct Date and Time must be set.

INTERFACE BOARD DESCRIPTION

An interface board has been developed by Frick controls allowing the user to interface external serial communications connections to the Q5 Processor Board.

These connections consist of:

- Comm 1 (RS-422/485)
- Comm 2 (RS-422/485)
- Comm 3 (RS-485)

A photo of this interface board is shown here:



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Figure 6. Interface Board Photo

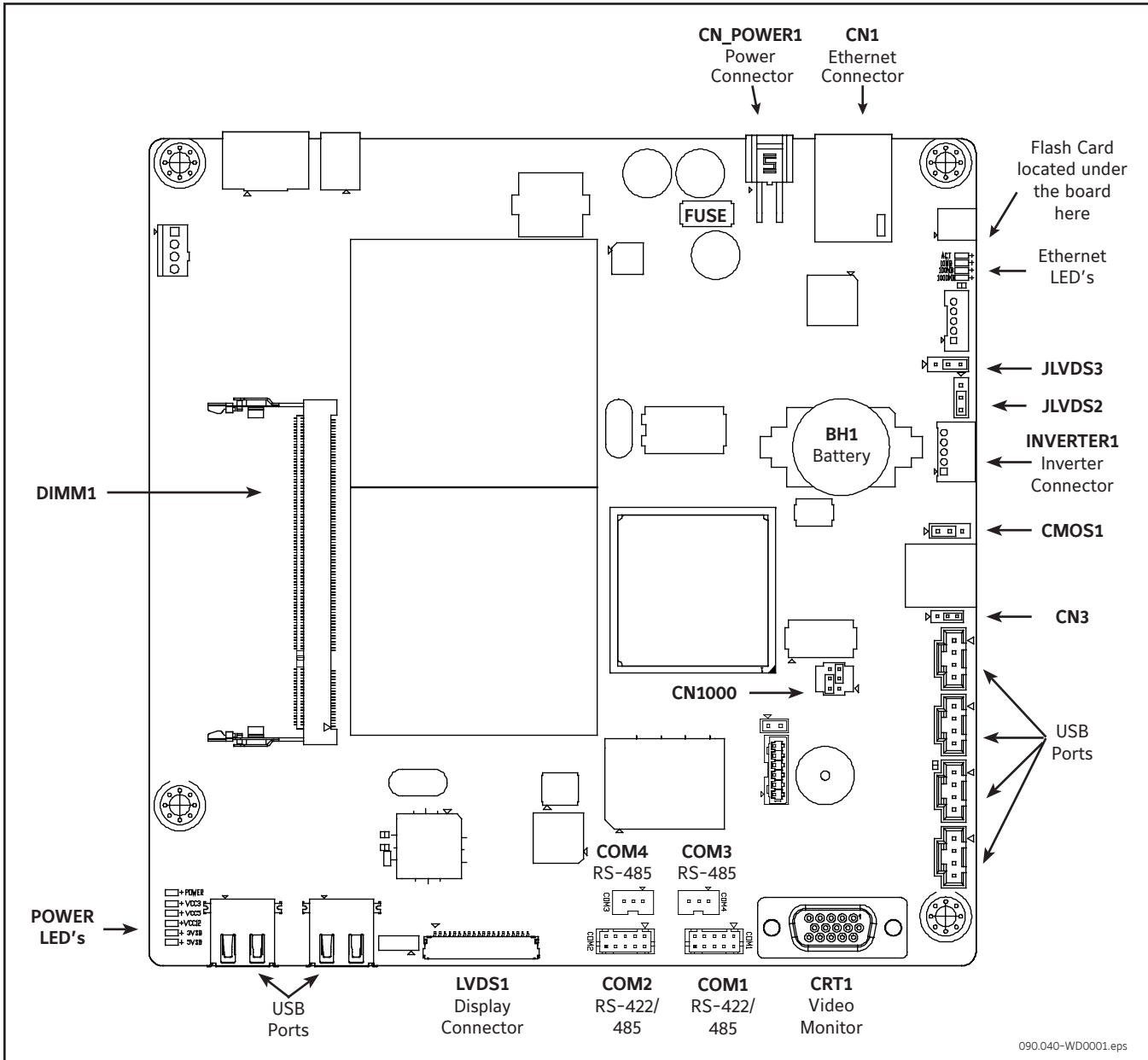


Figure 7. Q5 Processor Board Diagram

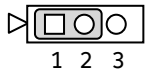
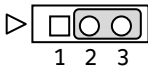
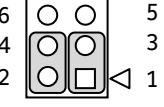
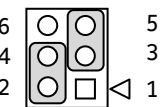
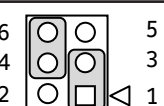
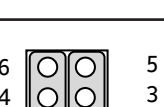
NOTE 1: The triangle symbol (\triangleright) denotes Pin 1 on connectors. Refer to the chart on the following page for jumper settings.

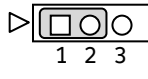
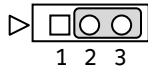
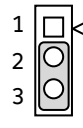
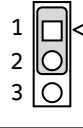
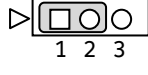
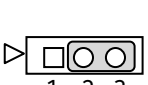
NOTE 2: Do NOT remove the CN4 jumper. Removal of this jumper will cause the processor to not power up.

NOTE 3: Although the Q5 Processor Board is the main controller, most of customer connections will be to the Interface board, as shown later.

Q5 PROCESSOR BOARD JUMPERS, LED'S AND CONNECTORS

Table 8. Q5 Board Jumper Settings

JUMPER TITLE	FUNCTION	JUMPER SETTING	
CMOS1 (CMOS Clear)	Normal (default)		1 - 2 Closed
	Clear CMOS		2 - 3 Closed
CN1000 (LCD Resolution Selector)	24-bit 800x600		1-3 Closed & 2-4 Closed
	24-bit 1024x768 (default)		3-5 Closed & 2-4 Closed
	18-bit 800x600		1-3 Closed & 4-6 Closed
	18-bit 640x480		3-5 Closed & 4-6 Closed

JUMPER TITLE	FUNCTION	JUMPER SETTING	
CN3 (Touch Panel Type Selector)	5-Wire Touch Screen		1-2 Closed
	8-Wire Touch Screen (default)		2-3 Closed
JLVDS2 (Backlight Level Selector)	0- 5V (default)		2-3 Closed
	0 - 2.5V		1-2 Closed
JLVDS3 (Backlight Control Mode)	Voltage Mode		1-2 Closed
	PWM Mode (Pulse Width Modulation) (default)		2-3 Closed

NOTE 1: The triangle symbol (▷) denotes Pin 1 on connectors.

NOTE 2: Jumper CN4 is not shown on this chart, as it must always be installed.

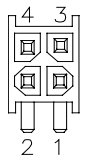
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Table 9. Q5 Board LED Definitions

LED Title	Label	Color	Function
Power LED's	LED1	Red	5VSB
	LED2	Red	3VSB
	LED3	Green	VCC 12V
	LED4	Green	VCC 5V
	LED5	Green	VCC 3V
	LED6	Blue	Power On OK Status
CN1000 (LCD Resolution Selector)	1000MB	Green	Giga - LAN Speed
	100MB	Yellow	100MB - LAN Speed
	10MB	Red	10MB -LAN Speed
	ACT	Green (Blinks)	LINK Activity

090.040-TB0004.indd

Table 10. Q5 Board Connector Pinouts

Connector Title	Pin	Function	
CN_PWR1 (Power Input)	1	Ground (GND)	
	2	Ground (GND)	
	3	VCC 12V	
	4	VCC 12V	

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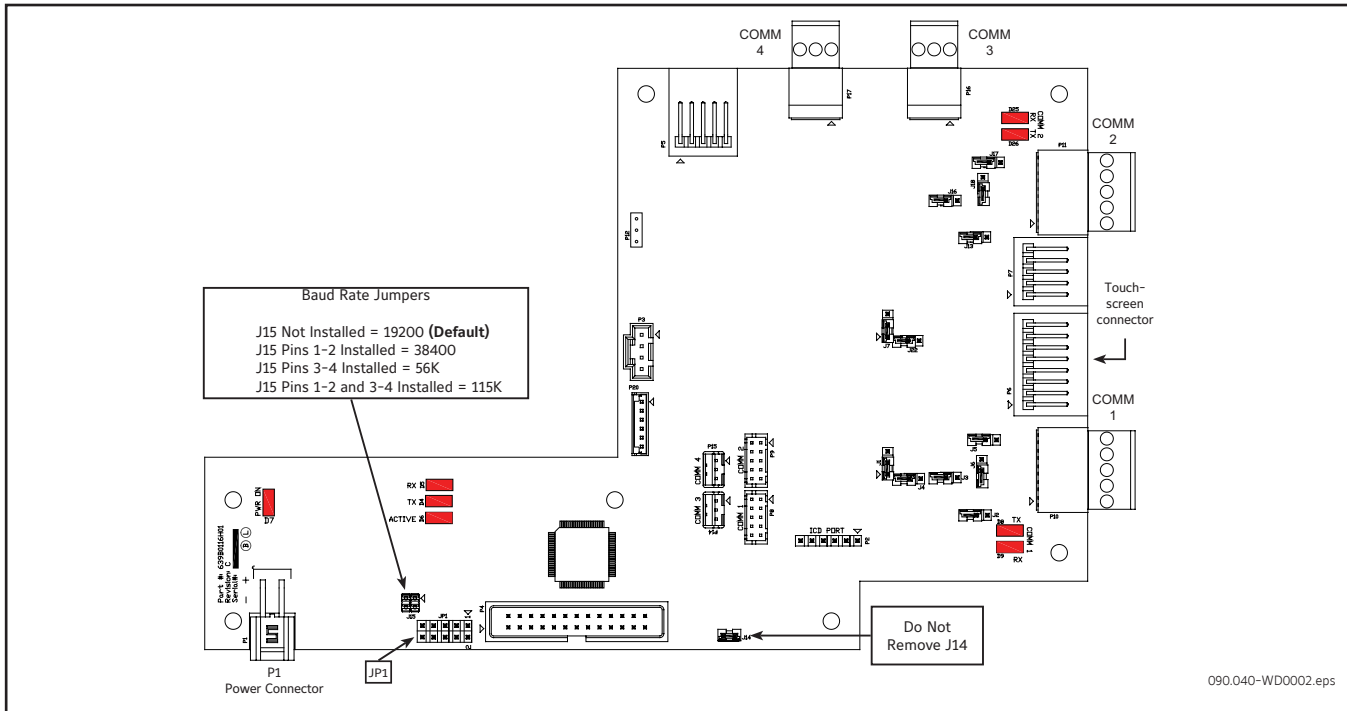


Figure 8. Interface Board Diagram

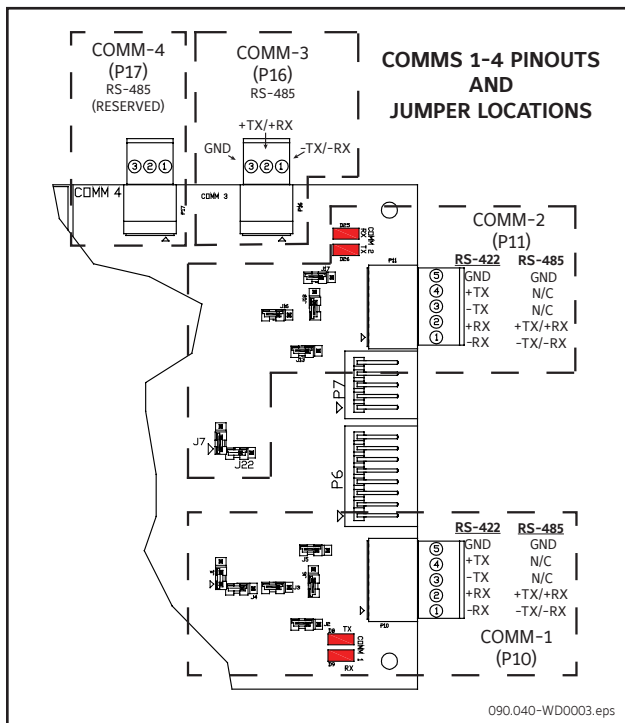


Figure 9. Pinouts and Jumper Locations

Table 11. JP1 System Settings

Jumper JP1	Function	Jumper Setting	Jumper Setting
1 - 2	Not Used		Not Installed
3 - 4	Reformat E2Prom		Installed
5 - 6	Erase Setpoints (at boot-up)		Installed
7 - 8	Reset IP Address		Installed
9 - 10	Disable Watchdog		Installed

Table 12. Comms 1 & 2 Jumper Settings
(Comms 3 and 4 have no jumpers)

Comm 1	Comm 2	Function	Jumper Setting	Jumper Setting
J1	J7	RS-422 (4-Wire) Default		1 - 2 Closed
		RS-485 (2-Wire)		2 - 3 Closed
J2	J13	Pull Down Default		1 Pin Only
J3	J16	Pull Up Default		1 Pin Only
J5	J17	RS-422 Default		1 Pin Only
		RS-485		1 - 2 Closed
J6	J18	RS-422 Default		1 Pin Only
		RS-485		1 - 2 Closed
J4	J22	High Speed Target Default		1 - 2 Closed

NOTE: The triangle symbol (<) denotes Pin 1 on connectors.

RESET IP ADDRESS TO DEFAULT

Reset a panel IP address to a known default by installing a jumper on pins 7-8 of JP1. Follow this procedure:

1. Power off the panel
2. Install a jumper on pins 7-8 on JP1
3. Power up the panel and wait until the panel automatically reboots
4. Remove the jumper

After the procedure above, the IP address is reset to the default address for the corresponding Unity product:

Compressor:	192.168.0.170
Condenser/Vessel:	192.168.0.171
Evaporator:	192.168.0.172
Engine Room:	192.168.0.173

The pictorial below depicts the Q5 Processor Board, and the necessary interconnects between it and the Interface board. Each of the interconnecting harnesses must be installed as shown for proper operation.

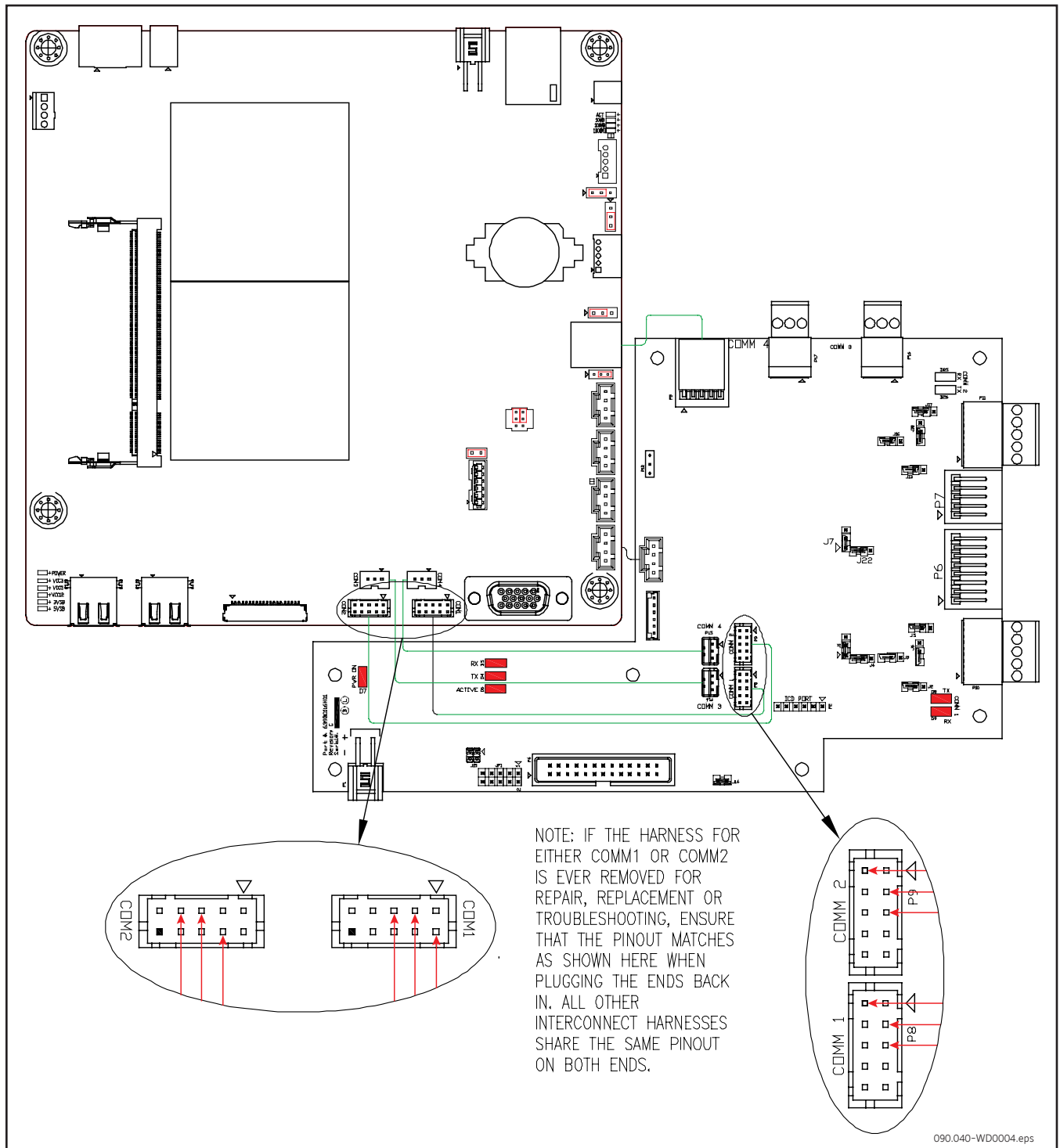


Figure 10. Q5 Processor Board Interconnections

The following pictorial shows the locations of the Q5 Processor Board and the Interface board and how they mount to the back of the display plate.

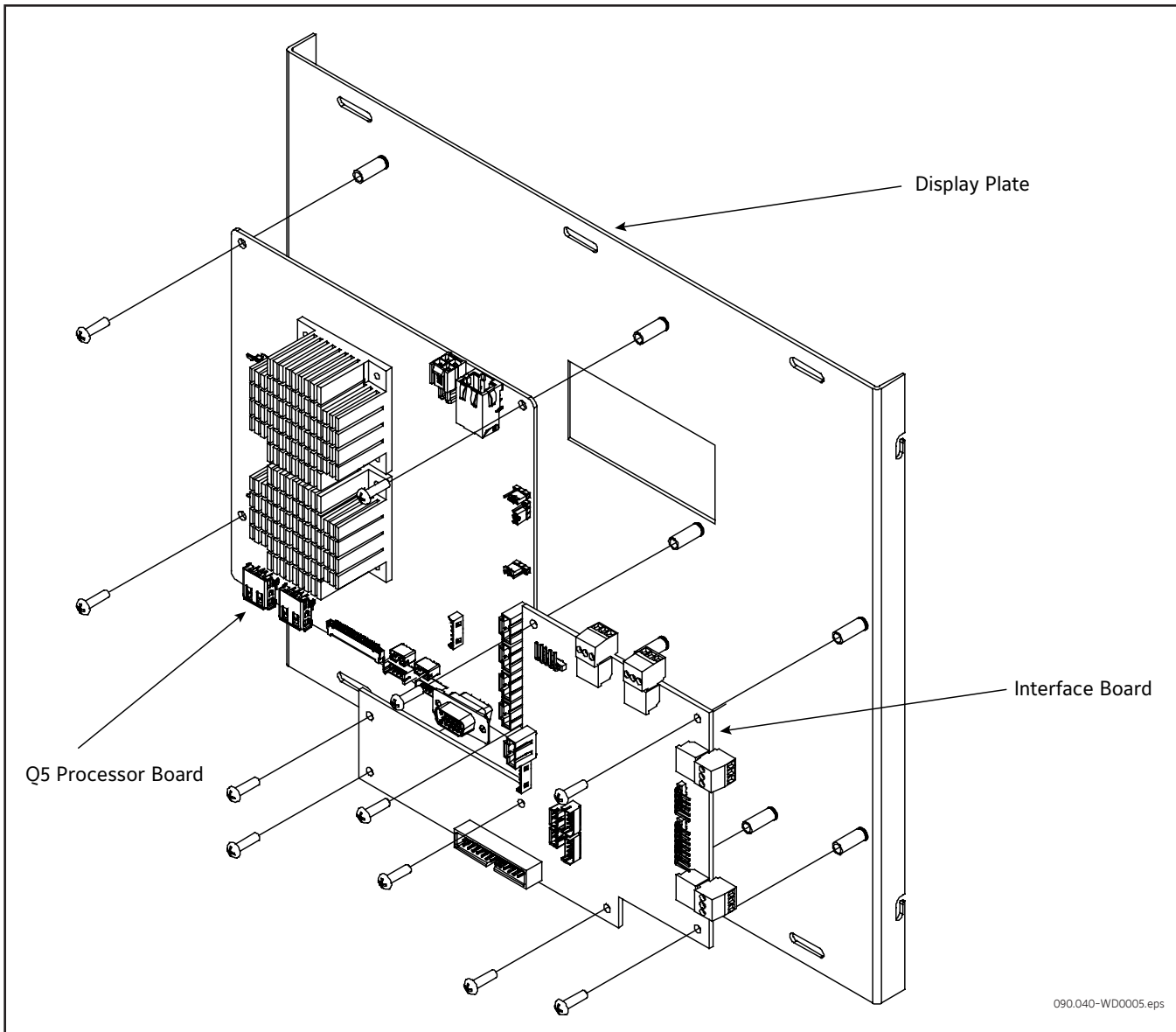
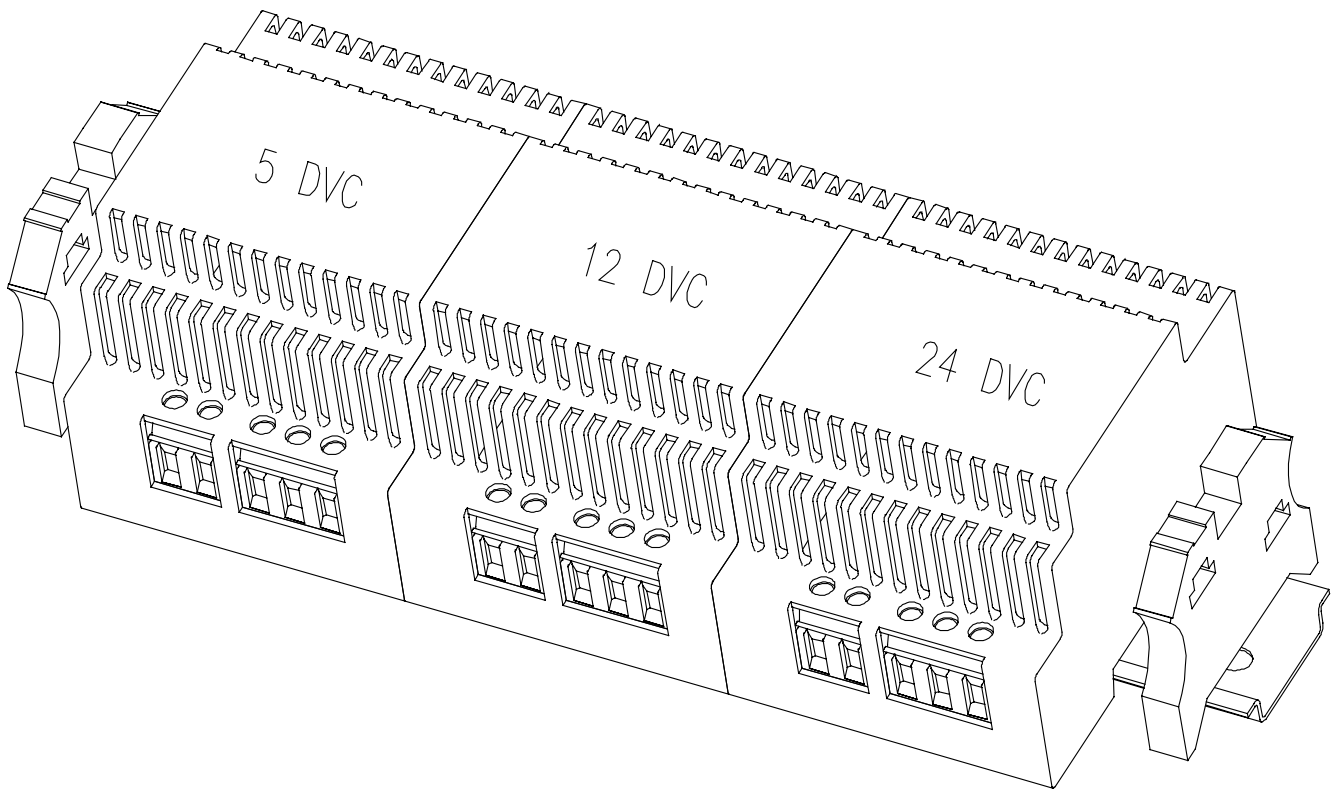


Figure 11. Q5 Processor Board Mounting

SECTION 5 POWER SUPPLY



POWER SUPPLY

DESCRIPTION

The power supply of the HD Unity control panel consists of three independent supplies, and are located on the inside of the front door below the Interface board. They supply the following DC voltages:

- +5 VDC Output 5A / 25W
- +12 VDC Output 4A / 48W
- +24 VDC Output 2A / 48W

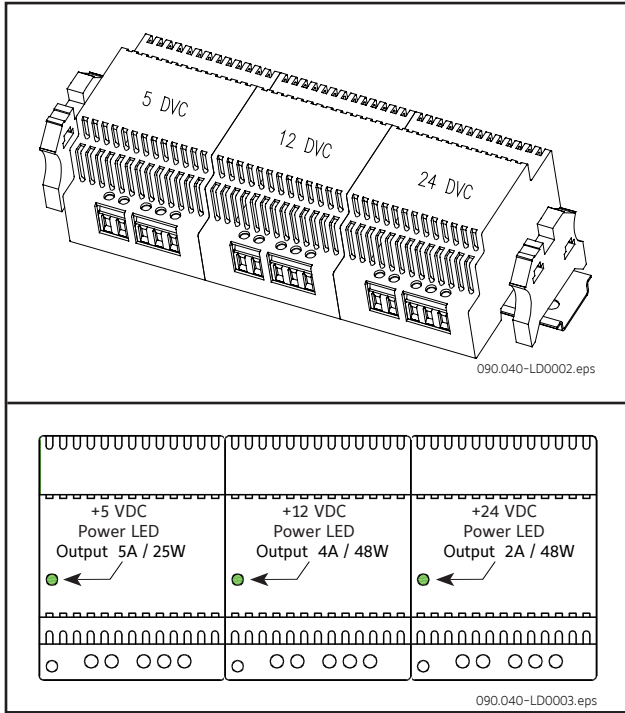


Figure 12. Power Supplies

All three supplies are adjustable and each has a green LED indicator to show that they are powered. Refer to the following page for the location for the adjustment.

POWER DISTRIBUTION

DC power from the power supplies is wired directly to a series of terminal blocks. The terminals for these voltages are labeled as follows:

- Common (1000)
- +24 VDC (1004)
- +5 VDC (1001)
- +12 VDC (1002)

+12 VDC power is then distributed to the Q5 Processor Board, Interface Board. +5 VDC is for the Digital board(s), and +24 VDC is for external as needed control.

+24 VDC is used to power the 614 analog boards and other external devices. Total load on this supply cannot exceed 2A / 48W.

+12 VDC is used to power the display, processor and interface boards. Total load on this supply cannot exceed 4A / 48W.

+5 VDC is used to power the digital boards. Total load on the supply cannot exceed 5A / 25W.

MEASURING VOLTAGES

⚠ CAUTION

Measuring and adjusting the power supply voltages require the control power switch to be energized. Extreme care must be observed when taking any readings, as 120 or 230 VAC (depending on incoming system voltage) will be present next to the DC voltage connector. Adjusting the supplies requires the use of a small insulated Philips screwdriver inserted into the supply to access an adjusting potentiometer.

⚠ CAUTION

It is possible for the screwdriver (and the person making the adjustment) to come into contact with potentially lethal voltages. Proper Personal Protective Equipment (PPE) measures need to be observed.

All circuit boards within the Quantum HD Unity control panel require accurately adjusted DC voltages to function properly. Periodic measurement and adjustment of the DC power system is recommended for optimum system operation. Over time, it is possible for temperature, humidity, vibration and component age, to degrade the accuracy of these voltages. When any of the DC voltages begin to stray from their optimum range, mysterious problems can begin to arise.

Even with a perfectly adjusted supply, it is possible for a potential drop in voltage at each connection point. This drop normally is in the millivolt range, but under some conditions, the drop can be much greater (as high as tenths of a volt). By the time the voltage reaches the last board in the daisy chain, and all of these potential voltage drops are considered, the combined drop can be such that problems can be apparent. Some examples of problems could be:

- Loss of or intermittent communications failures.
- A shutdown message stating Digital Board x Reset (where "x" is replaced by the number of the Digital Board that failed).
- An shutdown message stating Analog Board x Comm. Fail - Shutdown (where "x" is replaced by the number of the Analog Board that failed).
- Numerous sensor fault shutdown messages.
- Q5 Processor Board reboots for no apparent reason.
- Improper readings of analog pressures and temperatures.
- LED's on the Q5 Processor Board are lit, but nothing appears on the display.

To perform measurements and adjustments on the power supply voltages, use a reliable, calibrated Digital Volt Meter (DVM). The DVM should be accurate to 1/100 of a volt DC. With the control power switch turned ON, wait until the Operating Screen appears. This is because the graphics required to create this screen will draw more current than when the screen is not fully booted. If the screen never appears however (possibly due to a voltage problem), you will need to proceed regardless of what is or is not displayed.

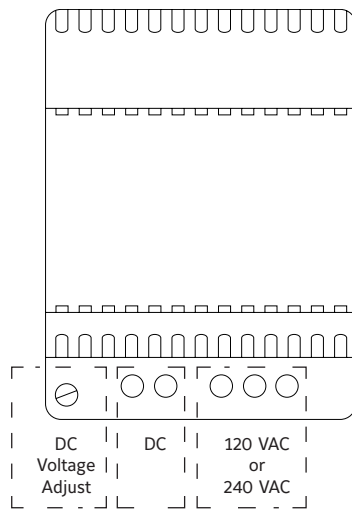
In order to properly measure the DC power system, it must be checked at the DC power terminal strip.

Ensure that the meter is set to the proper range (DC, 0-50 V or equivalent), as well as observing proper wire polarity. The acceptable range for each supply is as follows:

- 5 Volt Supply (+5.10 to +5.20 Vdc)
- 12 Volt Supply (+12.10 to +12.20 Vdc)
- 24 Volt Supply (+24.2 to +24.50 Vdc)

ADJUSTMENT

If any of the voltages shown above are out of the acceptable range(s) shown, adjustment is required. Locate which of the supplies require adjustment. The adjustment access hole for each supply is located on the lower left of the front of the supplies. If an adjustment is required, use a small insulated Philips screwdriver, insert the tip into the access hole for the appropriate voltage potentiometer (refer to the following diagram for adjustment location).



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Figure 13. Power Supply Adjustment

NOTICE

Extreme care must be used when adjusting the potentiometer. Adjustment should only be performed by qualified personnel. The use of a non-conductive device is recommended.

+5 VDC ADJUSTMENT

Locate the DC power terminal strip. Terminal 1001 is the +5 VDC, and 1000 is common (COM). Place the negative lead on 1000, and the positive lead on 1001. Verify that the DVM is displaying in the range of +5.10 to +5.20.

If adjustment is required, locate the adjustment access hole on the +5 VDC supply, as previously shown. While watching the DVM, slowly rotate the screwdriver blade clockwise to increase the voltage or counter-clockwise to decrease until the voltage is correctly adjusted.

+12 VDC ADJUSTMENT

Locate the DC power terminal strip. Terminal 1002 is the +12 VDC, and 1000 is common (COM). Place the negative lead on 1000, and the positive lead on 1002. Verify that the DVM is displaying in the range of +12.10 to +12.20.

If adjustment is required, locate the adjustment access hole on the +12 VDC supply, as previously shown. While watching the DVM, slowly rotate the screwdriver blade clockwise to increase the voltage or counter-clockwise to decrease until the voltage is correctly adjusted.

+24 VDC ADJUSTMENT

Locate the DC power terminal strip. Terminal 1004 is the +24 VDC, and 1000 is common (COM). Place the negative lead on 1000, and the positive lead on 1004. Verify that the DVM is displaying in the range of +24.20 to +24.50.

If adjustment is required, locate the adjustment access hole on the +24 VDC supply, as previously shown. While watching the DVM, slowly rotate the screwdriver blade clockwise to increase the voltage or counter-clockwise to decrease until the voltage is correctly adjusted.

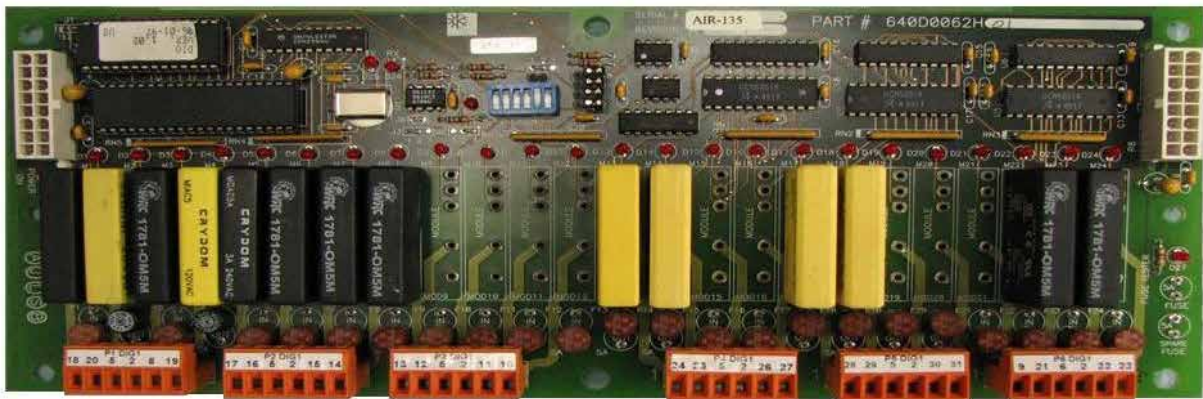
POWER SUPPLY REPLACEMENT

If any of the power supplies are found to be bad, or not capable of acceptable adjustment, the failing supply will need replacing. Refer to the Recommended Spare Parts list for the appropriate part number.

NOTES

SECTION 6

DIGITAL BOARD



DIGITAL BOARD

INFORMATION

The information that follows in this section can help locate problems that can occur with Digital Input and Output circuit boards.

DIGITAL BOARD DESCRIPTION

The Digital board is a small microprocessor board and is programmed to control discrete outputs, or accept discrete inputs, from external electrical devices. Each Digital board has the capability of 24 independent channels or I/O (Input/Output). Each channel that is used needs a module plugged into it. A yellow module indicates that it is used for Inputs. A black module is used for Outputs. The standard Quantum™ HD Unity compressor control can have up to two Digital boards (depending on options).

COMMUNICATIONS LED'S

The Q5 Processor Board is in constant communication with all Digital (and Analog) Boards. You will notice on each Digital and Analog board, there are a pair of LED's labeled as RX and TX. These letters represent Receive (RX) and Transmit (TX). These LED's should be flashing at a high rate during normal operation. This indicates that the Q5 Processor Board, and the Digital board are properly communicating with each other.

- Reference the JUMPER AND DIPSWITCH SETTINGS section later in this manual. This section contains the dipswitch settings for addressing the Digital I/O boards. When these switches are properly set, the main board is able to serially communicate with each I/O board and provide control signals and data exchange. If these switches are not properly set, the result will be lost or failed communications, or the wrong outputs being energized, or the wrong inputs being received.

CONNECTIONS TO THE QUANTUM™ HD UNITY

As stated earlier, the Quantum™ HD Unity standard compressor control system utilizes up to two Digital, and two Analog boards. To connect these boards together so that the Quantum™ HD Unity can control them, they must be connected with a wiring harness that provides all of the necessary D.C. voltage requirements, as well as the communications capabilities.

The Digital boards only require the +5 Vdc voltage and the Return (or common) for logic power. The communications signals (RX & TX) are required by all boards.

A harness distributes power and communications from the terminal blocks to the various logic boards. The harness splits into two branches, each ends with two 16 pin connectors. The branch that supplies power and communications to the Digital board(s) utilizes red and black wires for +5Vdc power and Common, and white/black and white/red wires for serial communications.

LOGIC VOLTAGE (POWER) LED

Located on the Digital Board is a Power LED. This LED will be illuminated as long as the Control Power switch is ON, and the proper voltage is present at the power supply. The power supply generates the +5 Vdc voltage and passes it on through the Power-I/O harness. This LED does not indicate however that the proper voltage is necessarily present at the board, only that the voltage is enough to energize the voltage sensing circuitry. If a voltage related problem is suspected with regard to a Digital Board, the only way to actually determine this is to read the voltage on a Digital Voltage Meter (DVM). This may be accomplished by locating the white power / communications connector on the board. Notice that the Digital Board has one of these connectors on both ends of the board. The associated power / communications harness will only be plugged into one of these connectors. Take the red (positive) probe of the DVM and carefully insert the end into the "+5V" lead, and the black (negative) probe end into the "RET" (Return or Common) lead, as shown below:

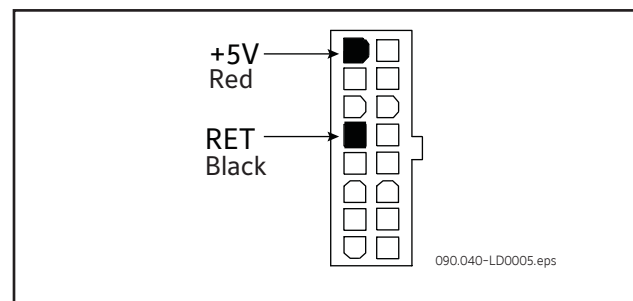


Figure 14. Return Lead

Set the DVM to read DC, and set the proper range. The voltage reading must read a minimum of +5.0 Vdc. The Power-I/O harness will have an associated voltage drop at each board connection. As an example, if you are reading 5.20 Vdc at the first I/O board in the daisy chain, the voltage at the subsequent connections for the remaining boards may be lower. The voltage will need to be corrected for proper operation of the system. The cause for a low voltage reading could be:

- The power supply may need adjustment (see the section on power supplies).
- The Power-I/O communications harness has a problem (a new harness may be needed).
- A problem may exist with one of the I/O boards (Digital or Analog).
- If the power LED is not lighted, check the cable for proper connectivity. Note: Each board provides the necessary connections to feed all signals to the following connectors. If the auxiliary Analog or Digital Board is not present then a jumper plug (see Recommended Spare Parts List) must be installed to daisy chain the signals.

The most common symptom that is exhibited by a low +5 Vdc voltage to the Digital Boards is an alarm message that reads Digital Board Reset Shutdown.

ACTIVE LED

The Digital Boards have an Active LED indicator on the board that blinks when the board's software is running.

If the Active LED is not blinking, check to ensure that the EPROM is installed properly. The EPROM is located in chip slot U8, next to the power connector.

DIGITAL INPUTS

A Digital Input is the portion of the hardware that allows devices such as limit switches, relay contacts, and level switches, to interface with the Quantum™ HD Unity. The software program within the Quantum™ HD Unity is constantly looking at these Input channels, via communications, and based upon whether a control voltage is present or not, will provide the necessary control for an associated Output channel. For instance, if a control voltage is present on the Oil Level Sensor input, the software will determine that the Separator has sufficient oil level for the oil heaters to be energized (if the temperature of the oil is also sensed to be low. Temperature sensing will be discussed in the Analog Input section).

There are two possible varieties of Digital Input modules used on standard compressor control packages. One is for 120 Volt controls, and the other is for 230 volt controls. Both of these module styles are yellow in color. A side profile of these modules is shown below:

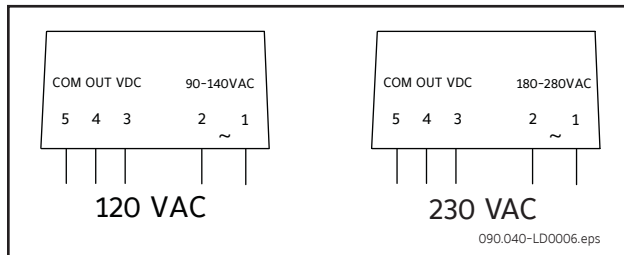


Figure 15. Digital Input Modules - Side View

These Input modules, can be identified as to their operating voltage by looking at either the side, as shown above, or from the top. You will notice the module operating voltage printed on the top, and the voltage range printed on the side.

Never plug a 120 Volt Input module into a 230 Volt system, and vice-versa. Never plug an Output module into a position designated for an Input module.

You will notice that when a module is plugged into the Digital board, there is a fuse located directly adjacent to the module. This fuse is of the pluggable variety, and must be plugged into the IN position for an Input module.

DIGITAL OUTPUTS

A Digital Output is the portion of the hardware that the Q5 Processor Board is to control (energize). These devices include solenoids, relay coils, and heaters to be energized, based upon the logic within the Quantum™ HD Unity software program.

The Digital Output module used on standard compressor control packages will handle both 120 Volt controls, and 230 volt controls. This module is black in color. A side profile of this module is shown in the next Figure.

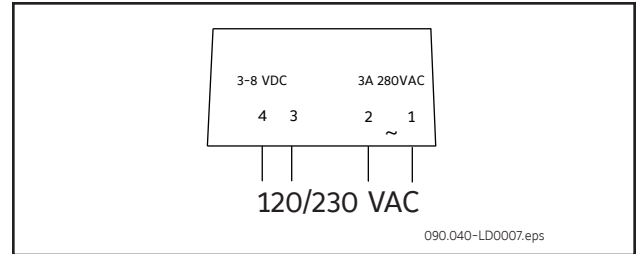


Figure 16. Digital Output Module - Side View

Although this Output module is labeled as 280 VAC on the top, and on the side, it can be used on both 120 and 230 volt applications.

Never plug an Input module into a position designated for an Output module.

You will notice that when a module is plugged into the Digital Board, there is a fuse located directly adjacent to the module. This fuse is of the pluggable variety, and must be plugged into the OUT position for an Output module.

SOFTWARE WATCHDOG

The digital board has a "software watchdog" feature. If there is no communication from the panel for a pre-defined period of time, all of the outputs on the board turn off. The pre-defined times for the various applications are as follows:

Compressor:	10 seconds
Engine Room:	10 seconds
Condenser/Vessel:	30 seconds
Evaporator:	120 seconds

CHECKING THE DIGITAL INPUTS AND OUTPUTS

Some problems that may be encountered involve troubleshooting the digital inputs and outputs. The Digital I/O (Input / Output) Boards have six Digital I/O (DIO) board connectors labeled P1 through P6. The Input and Output modules are wired to a DIO connector plug. Position 3 provides power and position 4 is a neutral on the DIO connectors. Positions 1, 2, 5, and 6 are signal connections, as shown below:

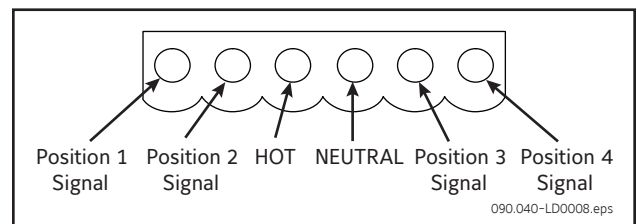


Figure 17. Signal Connections

The Digital board's I/O modules are configured by proper module selection, AC or DC, operating voltage, input or output, and moving the fuse to the in or out position. An LED is associated with each module and displays the state of each module. A lit LED represents an Input that is High, receiving a signal or an Output that is On.

If a properly configured Digital I/O is not responding correctly, first look at the Digital Board on the Service Screen and check if the module is on. If it is not on, check if the LED on the Digital Board is also not lit. If the LED is not lit, then check the fuse. If the fuse is OK, then check the module.

FUSE TESTING AND REPLACEMENT

1. Power off the panel.
2. Open the panel door.
3. Remove the questionable fuse.
4. Place the questionable fuse into the fuse tester at the one end of each Digital I/O Board (refer to the Digital Board drawings at the end of this section for exact fuse tester location).
5. Power on the panel.
6. Check the LED on the tester. If the LED is lit, the fuse is OK.
7. Power off the panel.
8. If the fuse is faulty, check for external shorts on the corresponding circuit, then replace the fuse with a new plug-type fuse (refer to Recommended Spare Parts list).

INPUT AND OUTPUT MODULE TESTING AND REPLACEMENT

1. Power off the panel.
2. Open the panel door.
3. Replace the questionable module.
4. Power on the panel.
5. If it is an Output module, check for proper panel voltage on the orange connector plug. Check the voltage between position 4 (neutral) and the associated position to the Output module.
6. If it is an Input module, check if the associated LED is on when power is applied to the module.

TROUBLESHOOTING AN OUTPUT

1. Make sure the LED associated with the Output is on when power is applied to the module.
2. If the LED is not on when it should be and there is no operating condition preventing it, contact your Frick® factor for service.
3. If the LED is on when it should be, check for proper panel voltage on the white connector plug. Check the voltage between the position 4 (neutral) and the associated position to the Output module.
4. If the voltage is OK, check for proper panel voltage between the associated position to the Output module on the orange connector and the associated position on the terminal strip.
5. If the voltage is OK, check the wiring external to the panel.
6. If voltage is not OK, check the fuse.
7. If the fuse is OK then check the module.
8. If the module is OK, check for proper panel voltage on the orange connector plug between position 3 (Hot) and position 4 (neutral).

TROUBLESHOOTING AN INPUT

1. Make sure the LED associated with the Input is on when power is applied to the module.
2. If the LED is on then the fuse and Input module are good.
3. If the LED is on and there is no input voltage, replace the Input module.
4. If the LED is not on when power is applied, check the fuse.
5. If the fuse is good, replace the Input module.
6. If you are receiving an Alarm or Shutdown from a digital input in which the adjacent LED indicator light is on, check the Service Screen to see if that channel is turning on and off. If so, replace the input module.

REPLACING A DEFECTIVE DIGITAL BOARD

The procedure to replace a Digital board is outlined below.

NOTICE

Use an anti-static wrist band for this procedure.

1. Shut off control power.
2. Remove the old board from the panel.
3. Remove the new board from its packing and place both on an anti-static surface.
4. Check that all jumpers, dipswitches and components are properly setup on the new board as it was on the old board (refer to the Digital Settings tables near the end of this section).
5. Install the modified replacement board in the panel.

After replacing or installing a Digital Board and powering on the control panel, select **[Re-detect I/O Boards]** from the **Menu > Service > Communications** screen. This selection provides a method to detect all connected Digital and Analog boards. If a board has been removed, a communication error shutdown will be issued until this key is selected. The About screen will show what was detected.

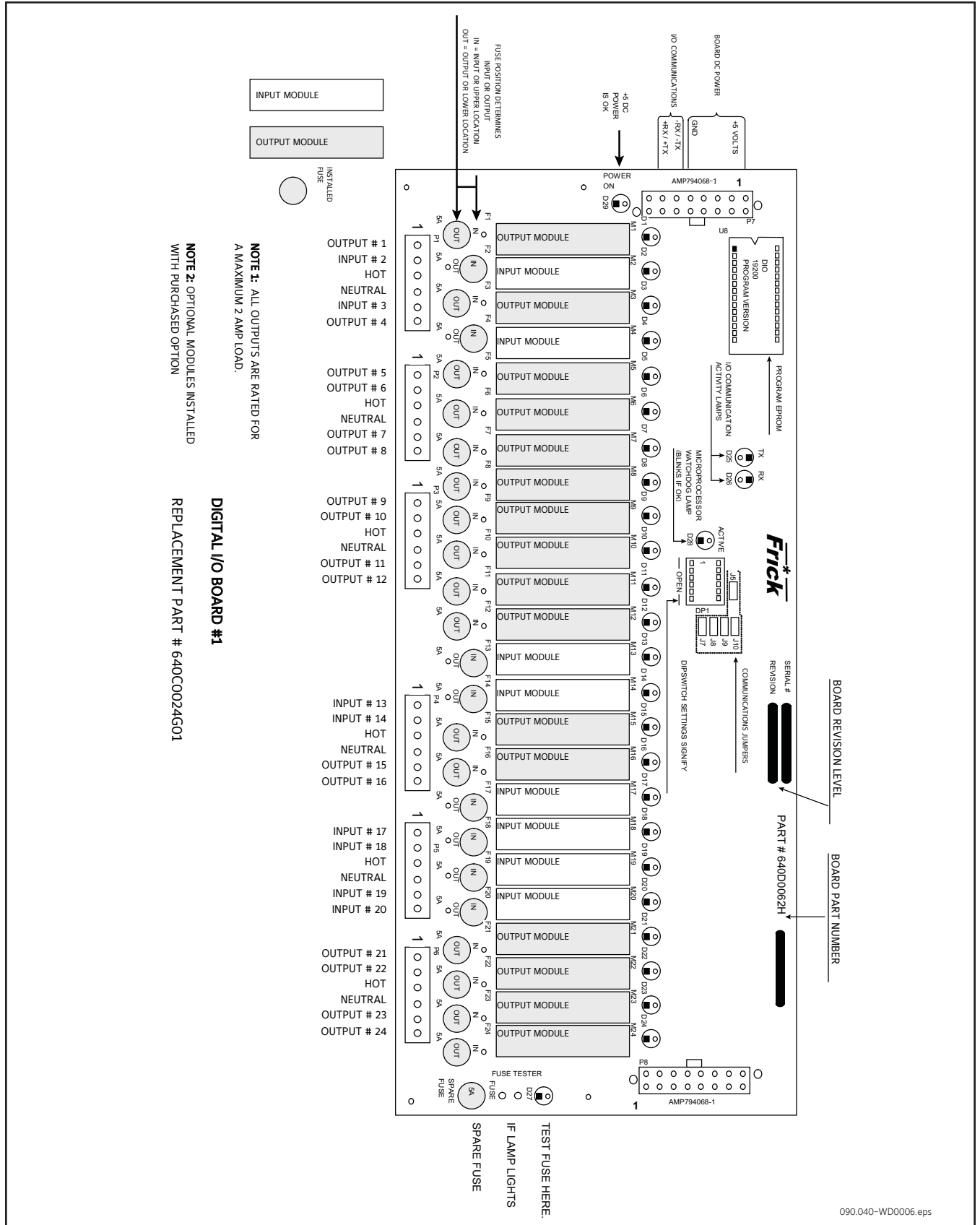


Figure 18. Digital I/O Board #1

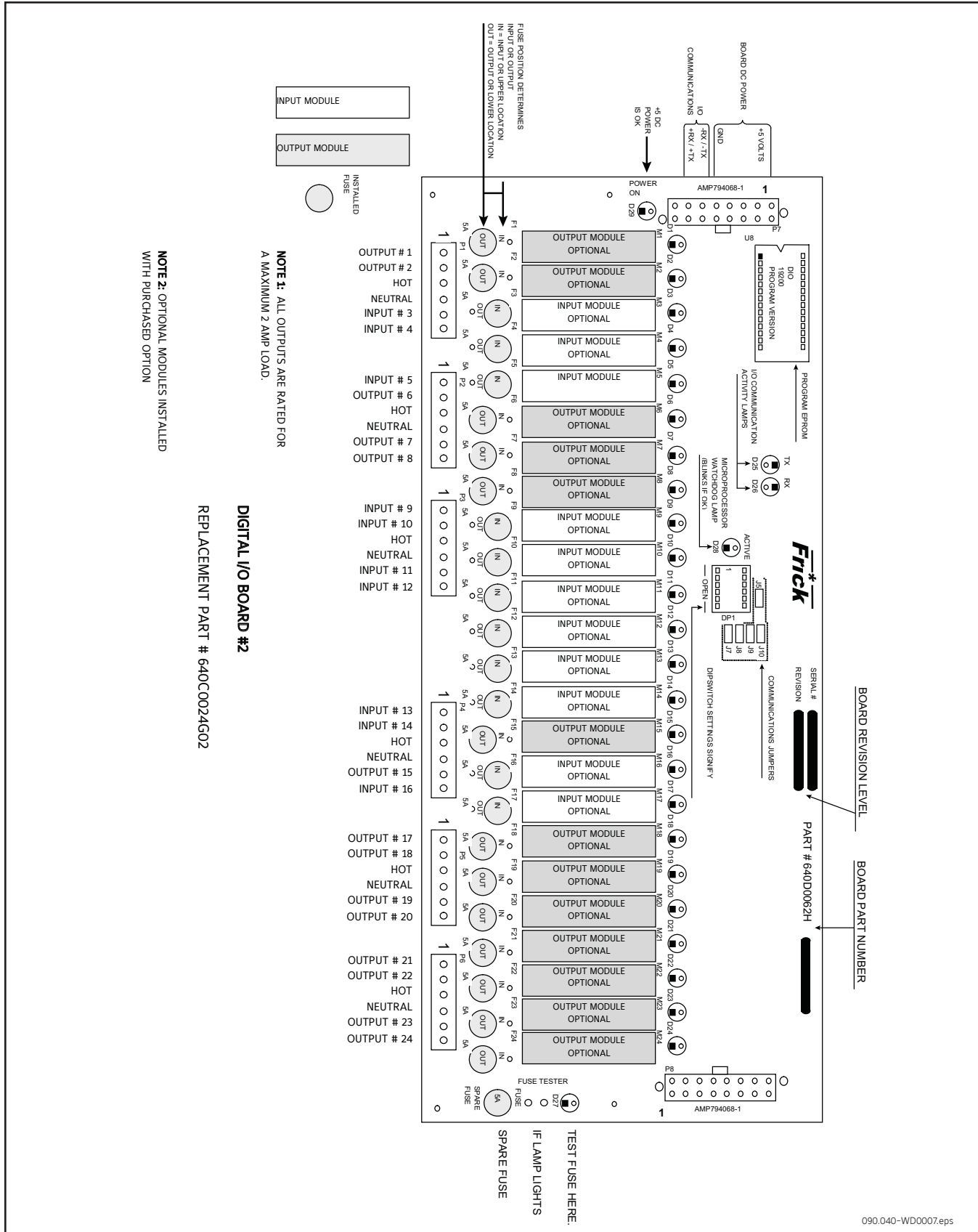


Figure 19. Digital I/O Board #2

DIGITAL BOARD SETTINGS

The following table is to be used when configuring the Quantum™ HD Unity for external communications.

Table 13. Communication Settings

J5	in	120 ohm long communications line termination.
	out*	No termination.
J7	in	RS-422/485 transmit pull-up for long communications lines.
	out*	No pull-up.
J8	in	RS-422 transmit pull-up for long communications lines.
	out*	No pull-up.
J9	in	RS-422/485 receive pull-down for long communications lines.
	out*	No pull-down.
J10	in	RS-422 receive pull-down for long communications lines.
	out*	No pull-down.

* = standard setting

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The following table is to be used to set the digital board addresses. If there is only one board installed, it should be set as board #1, if there are two boards they each need to be set according to the wiring diagrams.

Table 14. Dipswitch Settings

	SW1	SW2	SW3	SW4	SW5	SW6
Board #1	on	on	on	on	off	on
Board #2	off	on	on	on	off	on

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NOTES

SECTION 7

614 ANALOG BOARD



ANALOG BOARD

OVERVIEW

The Frick Quantum™ HD Unity control panel is capable of reading external analog devices, such as temperature probes and pressure sensors. It uses these input signals for the purpose of monitoring and control. As an example, if an external temperature sensor began to read a higher than expected temperature in some area, the controller would sense this change, and provide the necessary output control signal to remedy the situation. Unlike a digital signal, which is typically either an on or off state, an analog signal can assume a wide variety of states, such as a temperatures probe reading a wide range of temperatures.

The method used for receiving (and sending) these signals is the analog board. The analog devices are wired directly to the board, and the on-board software/hardware converts the electrical signals received from these devices into data, which is then sent on to the Q5 Processor Board via communications.

It features twenty-four input channels, and eight output channels. Rather than using physical jumpers to configure each channel, this is done through the software. A more detailed description of the operation of this board is provided in the sections that follow.

ANALOG BOARD DESCRIPTION

The Analog Board is actually a small microprocessor board and is programmed to control analog outputs, or accept analog inputs, from external electrical devices. Each board has the capability of 24 independent input channels. With the Quantum™ HD Unity Compressor Control, these I/O channels are dedicated through the software and external wiring, as to the function of each channel. The Quantum™ HD Unity 5 controller can utilize up to two separate analog boards (Analog Board #1 and #2), depending on the selected options.

For each of the boards that are installed, they will have specific I/O (Input / Output) functions. For the operating software to distinguish board #1 from #2, each board must be properly addressed as #1 and #2 using the dipswitches on each board (see Analog Board Dipswitch Settings chart for this information).

COMMUNICATIONS LED'S

The main board is in constant communication with all Analog (and Digital) Boards. You will notice on each Digital and Analog board, that there are a pair of LED's labeled as RX and TX. These letters represent Receive (RX) and Transmit (TX). These LED's should be flashing at a high rate during normal operation. This indicates that the main board, and the Digital board that you are looking at, are properly communicating with each other.

- Refer to the JUMPER AND DIPSWITCH SETTINGS section later in this section. This table contains the dipswitch settings for addressing the Analog I/O boards. When these switches are properly set, the main board is able to serially communicate with each I/O board and provide control signals and data exchange. If these switches are not properly set, the result will be lost or failed communications, or the wrong outputs being energized, or the wrong inputs being received.

CONNECTIONS TO THE QUANTUM™ HD UNITY

As stated earlier, the Quantum™ HD Unity compressor control system utilizes up to two Digital, and two Analog boards. To connect these boards together so that the Quantum™ HD Unity can control them, they must be interconnected with a wiring harness that provides all of the necessary D.C. voltage requirements, as well as the communications capabilities.

Analog boards only require the +24Vdc voltage and the Return (or common) for logic power. The communications signals (RX & TX) are required by all boards.

A harness distributes power and communications from the terminal blocks to the various logic boards. The harness splits into two branches, with each branch ending with a 16 pin connector. The branch that supplies power and communications to the Analog board(s) utilizes gray and black wires for +24Vdc power and Common, and white/black and white/red wires for serial communications.

LOGIC VOLTAGE (POWER) LED'S

Located on the Analog Board are two power LED's. The first of these is D65 PG LED (+24Vdc), and will be illuminated as long as the Control Power switch is ON, and the proper +24Vdc voltage is present at Analog Board connector P3. This LED does not indicate that the proper voltage is necessarily present at the board, only that the voltage is enough to energize the voltage sensing circuitry.

If a voltage related problem is suspected with regard to a Board, the best way to actually determine this is to read the voltage on a DVM (Digital Volt Meter). This may be accomplished by locating the white power / communications connector on the board. Notice that the Analog Board has only one of these connectors. The associated power/communications harness plugs in to it. Take the red (positive) probe of the DVM and carefully insert the end into the +24Vdc lead, and the black (negative) probe end into the RET (Return or Common) lead, as shown below:

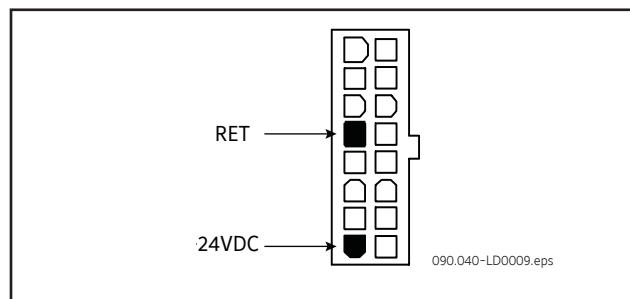


Figure 20. Return Lead

Set the DVM to read DC, and set the proper range. The Ideal voltage setting for the +24Vdc power is 24.2 - 24.5Vdc.

The cause for a low voltage reading could be:

- The power supply may need adjustment (see the section on power supplies).
- The Power-I/O communications harness has a problem (a new harness may be needed).

- A problem may exist with one of the I/O boards (Digital or Analog).
- If the power LED is not lighted, check the cable for proper connectivity.

ACTIVE LED

The Analog Board has an Active LED indicator that blinks when the board's software is running.

If the Active LED is not blinking, it could be an indication that the internal program is not running. Try powering the Q5 Processor Board off, then back on to see if the Active light starts blinking. If not, a new board may be required.

ANALOG INPUTS

An Analog Input is the portion of the hardware that allows devices such as temperature sensors and pressure transducers to interface with the Quantum™ HD Unity. The software program within the Quantum™ HD Unity is constantly looking at these Input channels, via communications, and based upon what the voltage or current level of the channel is, will provide the necessary control for an associated action.

Analog inputs arrive at the board on connectors P4 through P10. Each of these connectors can receive two channels (for a total of twenty-four).

Refer to the following chart for a listing of possible input channel configurations.

Table 15. Analog Board Input Configuration Table

Channel	ICTD	0-5Vdc	0-10Vdc	0-20mA	POT (Potentiometer)	CT (Motor Current)	Accelerometer (Vibration Monitoring)	RTD (Motor Protection Only)
1	*	*	*	*				*
2	*	*	*	*				*
3	*	*	*	*				*
4	*	*	*	*				*
5	*	*	*	*				*
6	*	*	*	*				*
7	*	*	*	*				*
8	*	*	*	*				*
9	*	*	*	*				*
10	*	*	*	*				*
11	*	*	*	*				*
12	*	*	*	*				*
13	*	*	*	*				*
14	*	*	*	*	*			
15	*	*	*	*	*			
16	*	*	*	*		*		*
17	*	*	*	*			*	*
18	*	*	*	*			*	*
19	*	*	*	*			*	*
20	*	*	*	*			*	*
21	*	*	*	*			*	*
22	*	*	*	*			*	*
23	*	*	*	*			*	*
24	*	*	*	*			*	*

ANALOG OUTPUTS

An Analog Output is the portion of the hardware that the Quantum™ HD Unity uses to provide control. With the Quantum™ HD Unity, this output is typically a 4-20 mA signal that is outputted to an external device. This device is usually a customer specific application, such as to simply receive a signal back from the Quantum™ HD Unity providing the Slide Valve Position to an external application (perhaps a PLC), as an example. The output can be set as a 0-20mA signal in the calibration of the output by accessing Menu > Calibration > Output.

The 4-20mA signal can be altered if necessary to a Vdc signal by using a resistor at the input of the device being controlled. Refer to the following chart for values:

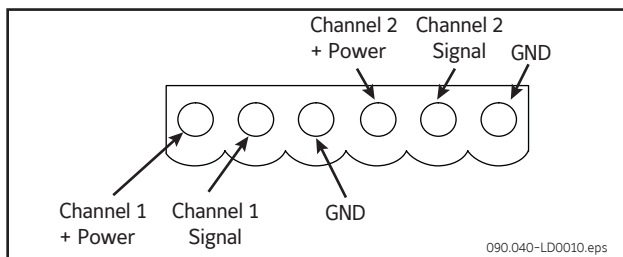
Table 16. Resistor Values

Original signal	Desired signal	Resistor to use
4-20mA	1-5Vdc	250 ohm, 1%, 1/4 watt
4-20mA	2-10Vdc	500 ohm, 1%, 1/2 watt
0-20mA	0-5Vdc	250 ohm, 1%, 1/4 watt
0-20mA	0-10Vdc	500 ohm, 1%, 1/2 watt

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TROUBLESHOOTING THE ANALOG INPUTS AND OUTPUTS

Some problems that are encountered involve troubleshooting the Analog inputs and outputs. The Analog Board has twelve Analog I/O board connectors labeled P4 through P10. The external Analog devices are wired to a connector plug. Position 1 connects to the plus (+) of the external device for channel 1, position 2 connects to the signal (SIG) of the external device for channel 1 and position 3 connects to ground (GND) of the external device for channel 1. Position 4 connects to the plus (+) of the external device for channel 2, position 5 connects to the signal (SIG) of the external device for channel 2 and position 6 connects to ground (GND) of the external device for channel 2, as shown below:



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Figure 21. Signal Connections

Each channel is setup through software calibration for the proper transducer type and range, and each transducer must

be calibrated through the appropriate sensor calibration screen. Improper setup of either the hardware or software will result in improper operation or range.

The most common fault associated with the improper reading of the analog channels other than hardware or software setup problems fall into one of the following categories:

- Sensor fault
- Wiring problem
- Improper grounding of system

An open wire, shorted or shunted wire, or faulty sensor will usually give a reading at either the minimum or maximum end of the range scale. An erratic reading or a reading that seems to float up and down is usually indicative of a grounding problem. When a single transducer or cable is shorted to earth (or system) ground, this can show up as a whole assortment of problem channels. The easiest way to find a short to earth problem is to disconnect all the sensor plugs and ohm out each plug screw terminal to earth for open (infinite) impedance. All sensors should read open to earth with the exception of the CT motor current channel. One side of the CT is grounded in the Motor Control Center (MCC). (The third pin on pressure sensors is ground.)

REPLACING A DEFECTIVE ANALOG BOARD

The procedure to replace an Analog board is outlined below:

1. Shut off control power.
2. Unplug all connectors from the board.
3. Remove the old board from the machine and remove the new board from its packing and place both on an anti-static surface.
4. Check that all jumpers and dipswitches are properly setup on the new board as it was on the old board.
5. Install the modified replacement board in the panel.
6. Plug all connectors back in.
7. Turn on control power.
8. After replacing or installing an Analog Board and powering on the control panel, the processor will start to communicate to the new board automatically. If this does not occur power down the panel and check the dipswitch settings. If correct re-power the panel.

If an I/O board is removed for any reason an I/O Comms fail message for that board will occur. It will be necessary to do a **[Redect I/O Comms]** to reset the processor memory as to which boards it is communicating to. Always check the about screen after a Redetect to be sure that all boards are accounted for.

PHD VIBRATION ANALYSIS

The Frick™ 32 channel analog board has the built-in capability to directly receive signals from vibration accelerometers, and motor stator RTDs (100 Ω platinum) which are mounted on the compressor housing and/or the motor/shaft. The purpose of these devices is to monitor compressor plus motor/bearing vibration and/or motor bearing plus motor stator temperature.

Accelerometers transmit continuous signals to the analog board. The Q5 Processor Board software monitors these signals, and can detect any variations in the frequency of the vibration. If the vibration levels increase over time, predefined setpoint limits may be exceeded, resulting in a warning from the Quantum™ HD Unity notifying the operator of the condition. If the alarm is not addressed, a shutdown

will occur to prevent damage to the compressor. Likewise, if an RTD is used for bearings, it will measure the temperature of the motor bearings and stator, which may increase (due to lack of lubrication).

Typically, all PHD related connections will be to Analog Board # 1. However, if monitoring of both motor bearing vibration and temperature is required, the temperature sensors will be wired to Analog board #2, channels 19 and 20. Refer to the drawing at the bottom of this page for the wiring connections of the different possible configurations.

The full wiring diagram may be found later in this manual in the Quantum™ HD Unity Drawings section. Additional information on PHD vibration monitoring and theory may be found in the Phd Vibration Monitoring System manual (E70.020-TB).

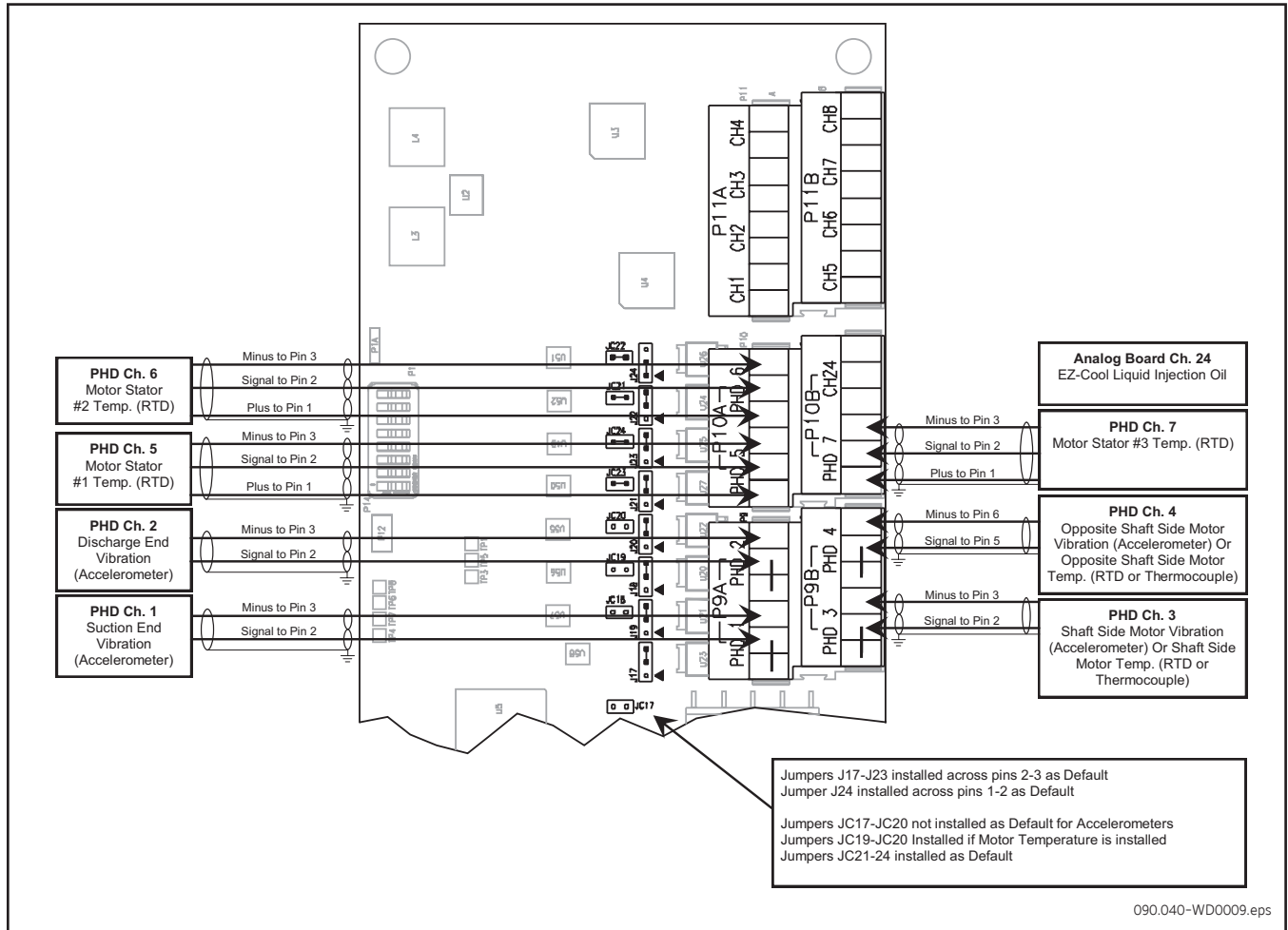


Figure 22. PHD Connections (Analog Board #1)

CURRENT TRANSFORMER (MOTOR AMPS)

Channel 16 of Analog Board 1 is dedicated to reading motor amps, either through the use of the on board current transformer when using a 0-5 amp CT, or from an external source. When reading motor amps directly at the P8 terminal strip

from a CT, the input signal cannot exceed 5 amps. An external DC Ma or voltage device, may be used as an alternate method of reading motor amps. Connect the wiring to connector P7B as shown in the diagram below:

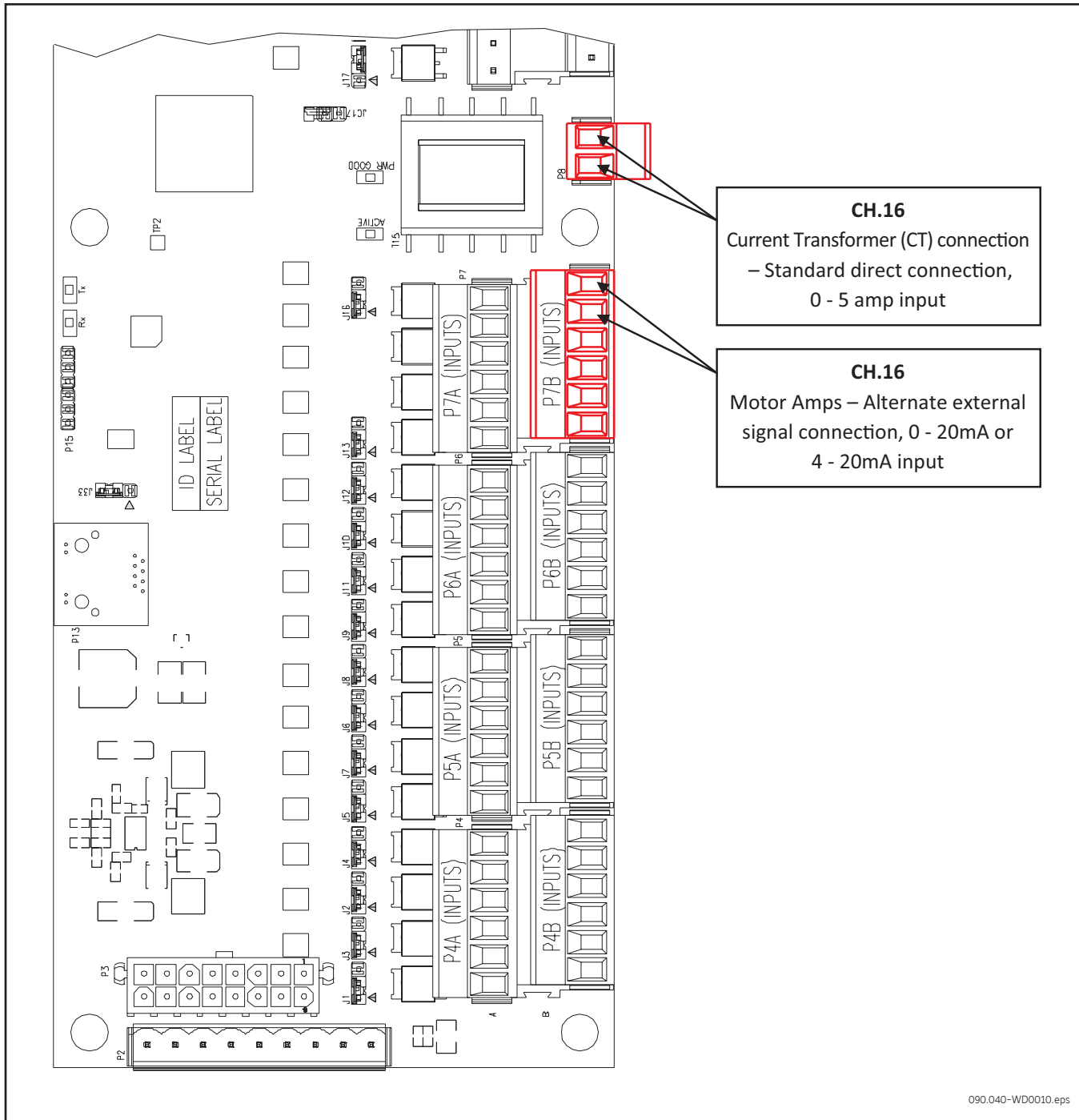


Figure 23. Current Transformer

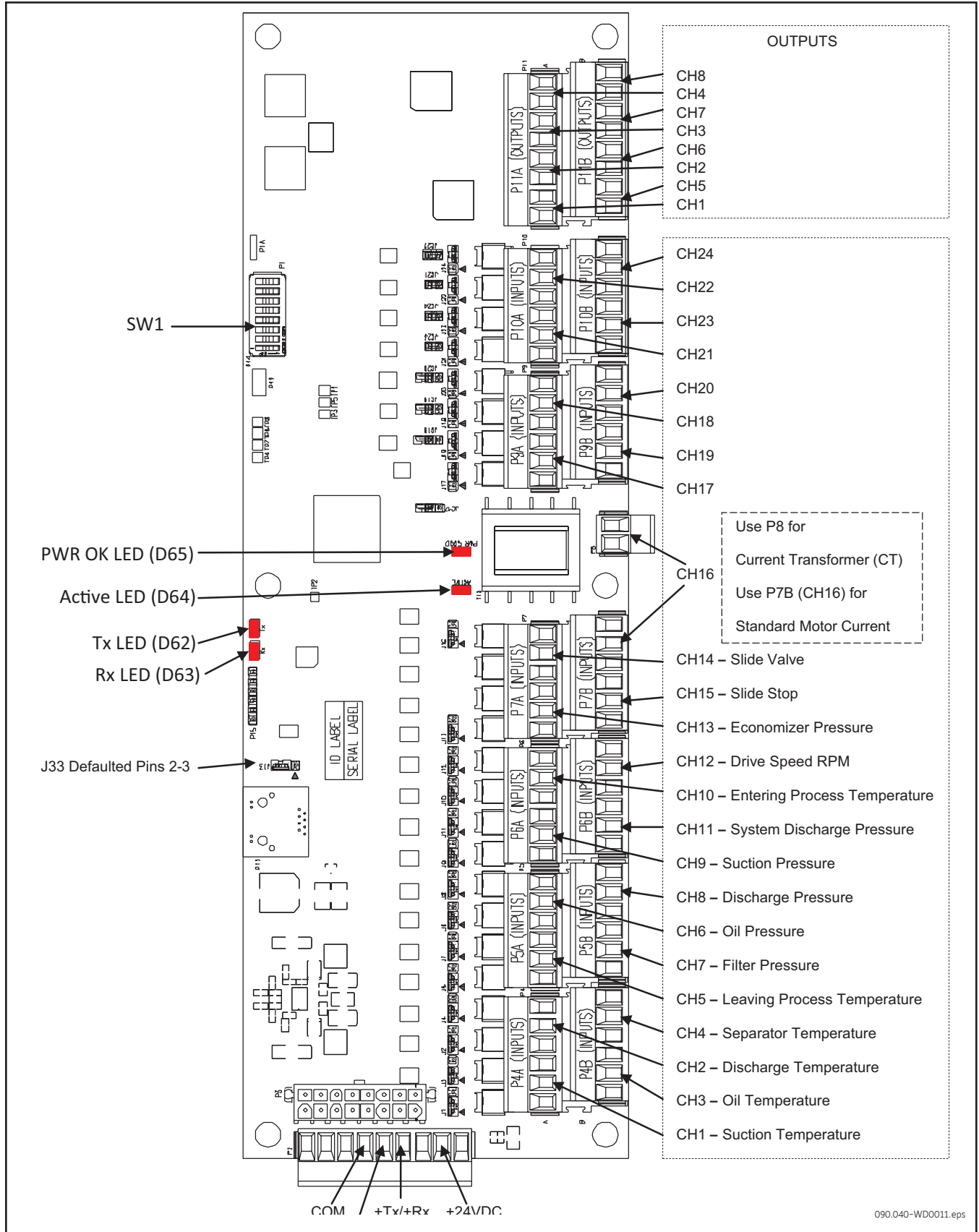


Figure 24. Analog Board #1

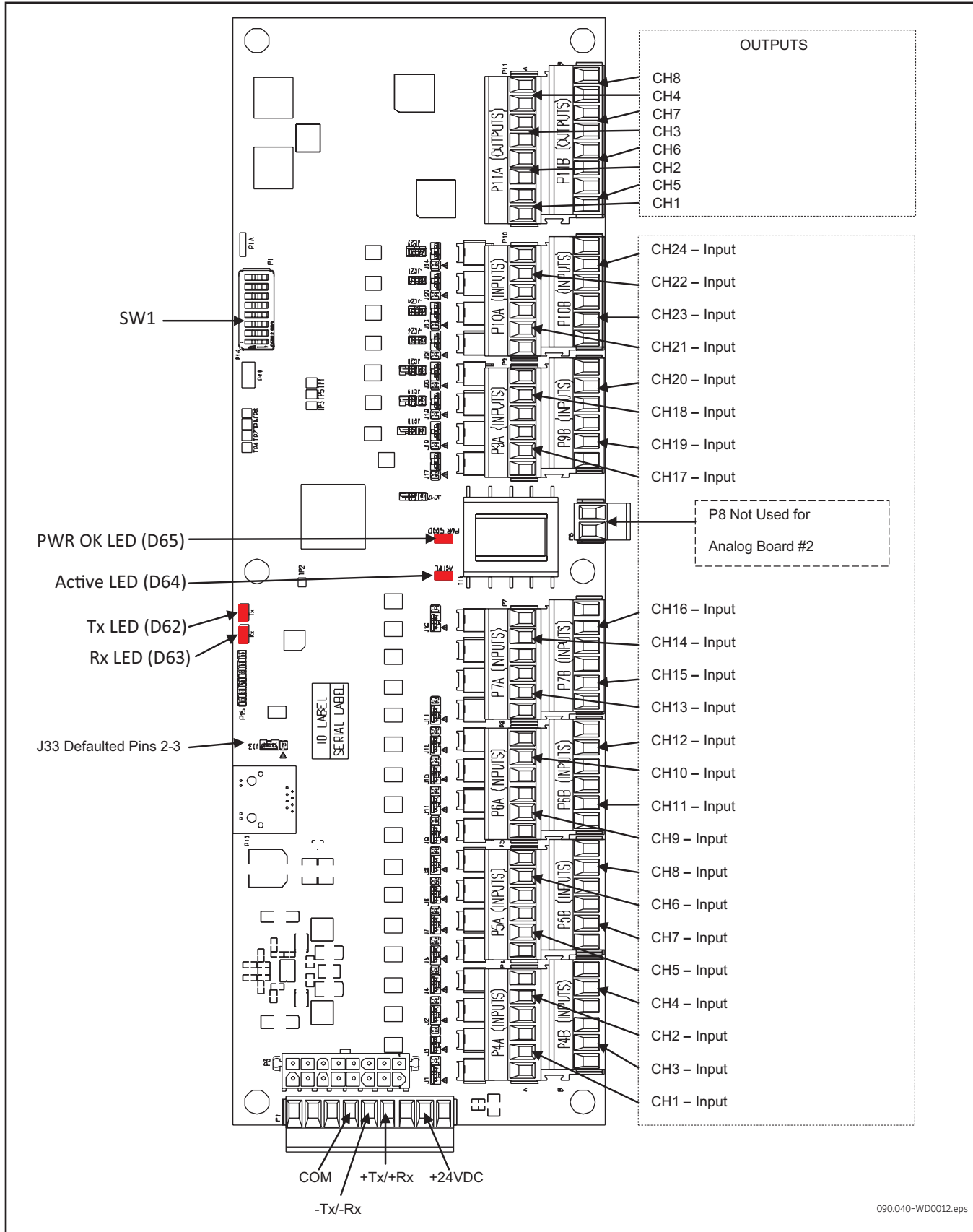


Figure 25. Analog Board #2

ANALOG BOARD SETTINGS

Table 17. Communications

The following table is to be used when configuring the Quantum HD for external communications.

J33	Pins 1-2	120 ohm long communications line termination.
	Pins 2-3 *	No termination.

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Table 18. Dipswitch Settings (Used to set board address)

The following table is to be used to set the analog board addresses. If there is only one board installed, it should be set as board #1, if there are two boards they each need to be set according to the wiring diagrams.

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
Board #1	Off	Off	Off	Off	Off	Off	Off	Off
Board #2	On	Off	Off	Off	Off	Off	Off	Off

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Table 19. Analog Board Jumper Settings

Jumpers shown are the default jumper settings per analog board. See wiring diagrams for correct jumper settings.

	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12
Analog Bd #1	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2
Analog Bd #2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2

	J13	J16	J17	J18	J19	J20	J21	J22	J23	J24
Analog Bd #1	1-2	1-2	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3
Analog Bd #2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2

	JC17	JC18	JC19	JC20	JC21	JC22	JC23	JC24
Analog Bd #1	OUT	OUT	OUT	OUT	IN	IN	IN	IN
Analog Bd #2	IN	IN	IN	IN	IN	IN	IN	IN

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PINS 1-2 ARE FOR 30mA MAX SENSOR POWER (ie. ICTD, PRESSURE TRANSDUCER, PRESSURE TRANSMITTERS, LINEAR TRANSMITTERS, ANY DEVICE THAT REQUIRES 9-28VDC POWER)

PINS 2-3 ARE FOR 3mA MAX SENSOR POWER (ie. RTD'S [PT100], ACCELEROMETERS)

NOTES

SECTION 8

SERVICE SCREENS

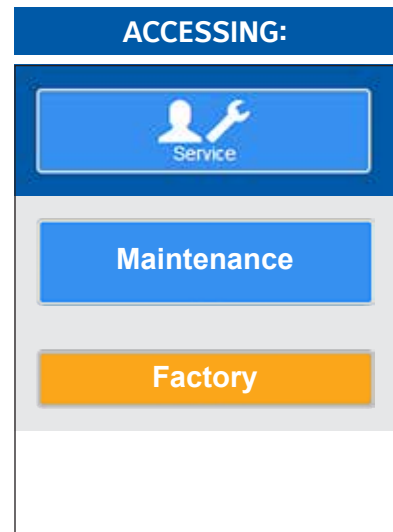
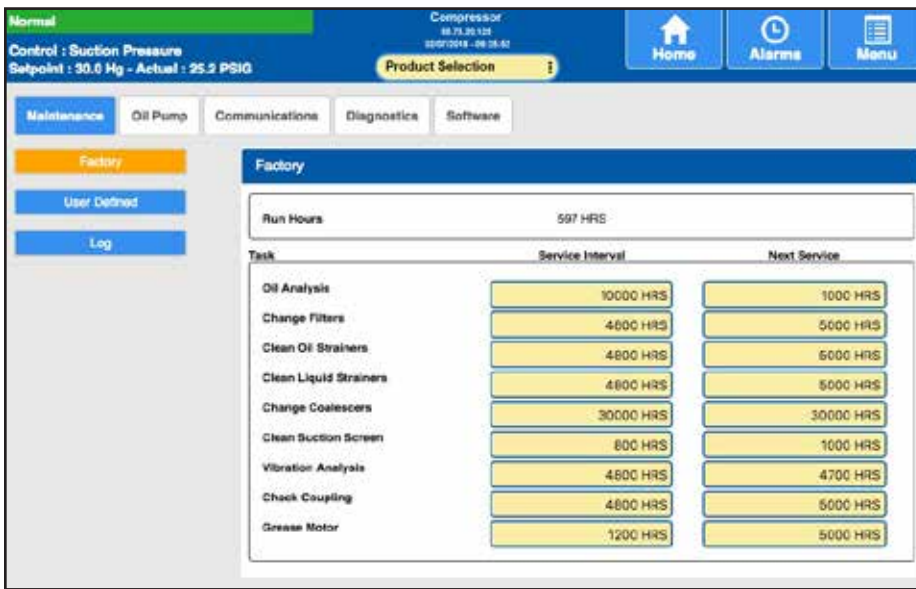
The screenshot displays the maintenance service screens for a Quantum HD Unity Compressor. The interface includes a status bar at the top with 'Normal' and 'Control : Suction Pressure Setpoint : 30.0 Hg - Actual : 25.2 PSIG'. A navigation menu includes 'Home', 'Alarms', and 'Menu'. The main content area is titled 'Factory' and shows 'Run Hours' at 597 HRS. A table lists various maintenance tasks with their respective service intervals and next service times.

Task	Service Interval	Next Service
Oil Analysis	10000 HRS	1000 HRS
Change Filters	4800 HRS	5000 HRS
Clean Oil Strainers	4800 HRS	5000 HRS
Clean Liquid Strainers	4800 HRS	5000 HRS
Change Coalescers	30000 HRS	30000 HRS
Clean Suction Screen	800 HRS	1000 HRS
Vibration Analysis	4800 HRS	4700 HRS
Check Coupling	4800 HRS	5000 HRS
Grease Motor	1200 HRS	5000 HRS

SERVICE SCREENS

The Quantum™ HD Unity panel features numerous Service related screens, which will facilitate troubleshooting and general maintenance. Some of these screens are located in the main Menu under Service, and others are located in Status, Configuration and About screens. The following pages describe these screens, and can be accessed by selecting the SERVICE, STATUS, CONFIGURATION or the ABOUT icons from the main MENU.

SERVICE – MAINTENANCE (FACTORY)



DESCRIPTION: Using this screen, the user can view up to nine (9) pre-programmed maintenance schedules. This screen is based upon the Maintenance Schedule that is provided in the IOM manual for the specific compressor package.

FACTORY

The above screen shows a row labeled as Oil Analysis in the Task column. The next column (Service Interval) on the same row has a value of 10000 Hrs. The last column (Next Service) of this row has a value of 1000 Hrs. When the compressor is running, this time value is being clocked. After 1000 hours of compressor run time, a message will be generated and placed on the Event screen. This particular message will read Maintenance -- Oil Analysis. This is to notify the operator that it is time to have the Oil checked. At this point, the operator should notify the proper maintenance personnel that the appropriate maintenance be performed. The user should access the Event Screen on a regular basis (perhaps once per week) to review the information provided there.

Once the message has been entered in the Event Log, the values for the row will be automatically updated, with new values as predetermined by an internal programmed maintenance schedule, based upon the type of compressor. The values for the Next Service column are based upon the Compressor Run Time hours (shown at the top of this screen).

Modifying numerical values

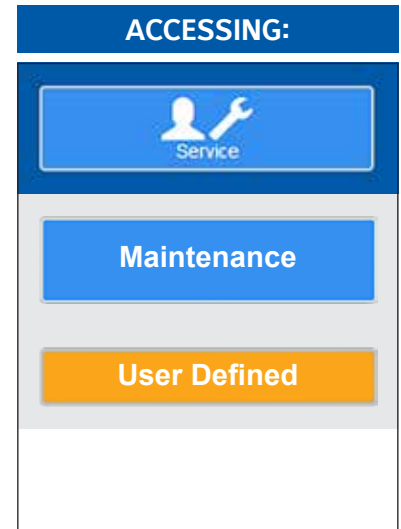
When using the touchscreen, simply touch the box that you wish to change, and enter the new value into the setpoint box, then press **[Enter]**.

When using the physical keypad, simply use the **[Tab]** key to scroll down the lists, or the **[Left Arrow]** key to scroll up the lists. When the box that you wish to change is highlighted, you may enter the new value using the numerical keys, then press the **[Enter]** key to accept the value.

The following additional information is provided on this screen:

Run Hours – The value shown here is the total number of hours that the compressor motor has actually been in the running state. This value can be reset (or changed to any value from 0 to 1,000,000 Hours) from the Panel screen.

SERVICE – MAINTENANCE (USER DEFINED)



DESCRIPTION: Using this screen, the user can view up to eight (8) user definable maintenance schedules. Each of the user defined schedules may be custom named. This screen is based upon the Maintenance Schedule that is provided in the IOM manual for the specific compressor package. The function of this screen is exactly the same as already described on the previous page (Maintenance – Factory), with the exception that the user can custom name events here.

USER DEFINED

Modifying numerical values

When using the touchscreen, simply touch the box that you wish to change, and enter the new value into the setpoint box, then press **[Enter]**.

When using the physical keypad, simply use the **[Tab]** key to scroll down the lists, or the **[Left Arrow]** key to scroll up the

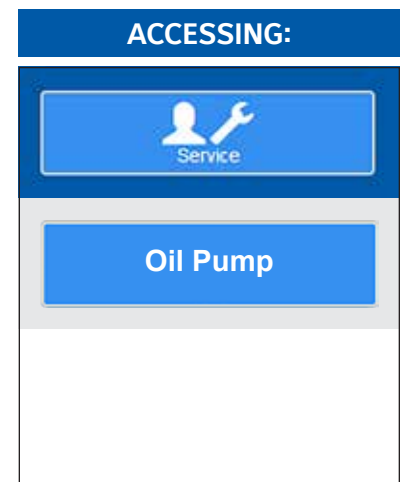
lists. When the box that you wish to change is highlighted, you may enter the new value using the numerical keys, then press the **[Enter]** key to accept the value.

Modifying Text (User Defined) Boxes

When using the touchscreen, simply touch the box that you wish to change, and enter the new name using the pop-up keyboard, then press **[Enter]**.

To modify any of the text boxes on this screen, simply use the **[Tab]** key to scroll down the lists, or the **[Left Arrow]** key to scroll up the lists. Once the box that you wish to change is highlighted, use the **[Up Arrow]** key. A new screen (Alpha) showing a numerical keypad will appear. Refer to the Alpha screen description for information on entering text messages. Press the **[Enter]** key to accept the text. The user may type in a custom name up to 20 characters long.

SERVICE – OIL PUMP



DESCRIPTION: Using this screen, the user can set the operation of the Oil Pump, if installed.

OIL PUMP

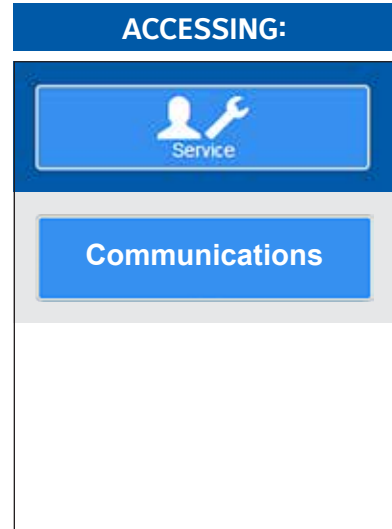
Oil Pump – A Pump On/Off indicator (blue text) is provided here to alert the user as to the actual status of the Oil Pump (if applicable). A drop down menu is also provided, and there are two states that can be selected for oil pump operation, they are:

Manual – The user has control over the running of the pump. To run the pump, simply observe the blue text indica-

tor to ensure that the pump is not already running, and if not, then press the **[On/Off]** toggle button. The blue text indicator will change from Off to On. To stop the pump, press the toggle button again, and the pump indicator will change to Off.

Automatic – If the pump is set to Automatic mode, the Quantum™ HD software program is controlling the pump operation. In this mode, if the toggle key is pressed, the mode will be changed from Automatic to Manual Mode, and the current state of the pump (digital output 3) will toggle also.

SERVICE – COMMUNICATIONS



DESCRIPTION: This screen allows the technician to perform system checks on serial communications. This section provides hardware setup and Communications Loopback Testing instructions. Please refer to Section 2 of Frick publications 090.040-CS (Communications Setup) for additional information.

The following buttons are provided:

- Test Comm1 - Comm2 - Test checks the hardware of both ports.
- Test Comm2 - Comm3 - Test checks the hardware of both ports.
- Test Comm 3 - Comm1 - Test checks the hardware of both ports.
- Redetect I/O Comms - This selection provides a method to detect all connected Analog and Digital boards. For additional information about this screen, refer to 090.040-CS (Communications Manual).

The following are some of the things that can occur that would cause an I/O board to stop communicating with the Quantum™, and would require that you Redetect I/O Comms:

- A board has been removed, and power was turned on with the board removed. You would need to replace the board, re-power, and then select [Redetect I/O Comms].
- A board has failed in such a way that it cannot properly communicate with the Quantum™ HD.
- A failure with the communications cable which is plugged into the end of each board

If any of these things occur, a communications error shutdown will be issued until this key is selected. You should always view the *About* screen to see what has been detected.

COMMUNICATIONS LOOPBACK TEST

Verifying the proper operation of the following communications ports:

- Comm-1 (P10) and Comm-2 (P11): RS-422/485
- Comm-2 (P10) and Comm-3 (P16): RS-485
- Comm-1 (P11) and Comm-3 (P16): RS-485

By utilizing a loopback test harness (as explained in the following text), the technician has the ability to locally test the Quantum™ HD communications hardware and jumper configuration.

HARDWARE SETUP FOR TESTING RS-422

To create the communications loopback harness for RS-422 testing, use the following example(s):

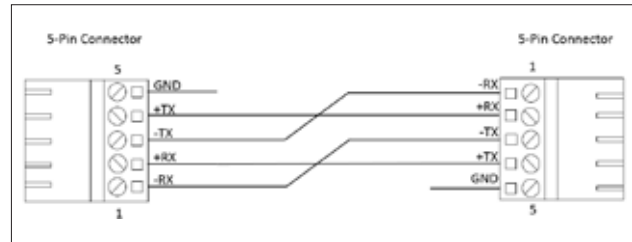


Figure 26. Q5 RS-422 Test Harness

Set the communications jumpers as follows for RS-422:

Comm 1	Comm 2	Function	Jumper Setting
J1	J7	RS-422 (4-Wire) Default	1 - 2 Closed
		RS-485 (2-Wire)	2 - 3 Closed
J2	J13	Pull Down Default	1 Pin Only
J3	J16	Pull Up Default	1 Pin Only
J5	J17	RS-422 Default	1 Pin Only
		RS-485	1 - 2 Closed
J6	J18	RS-422 Default	1 Pin Only
		RS-485	1 - 2 Closed
J4	J22	High Speed Target Default	1 - 2 Closed

NOTE: The triangle symbol (◁) denotes Pin 1 on connectors.
(Comms 3 and 4 have no jumpers)

090.040-TB0007.indd

Table 20. Q5 RS-422/485 Test Configuration

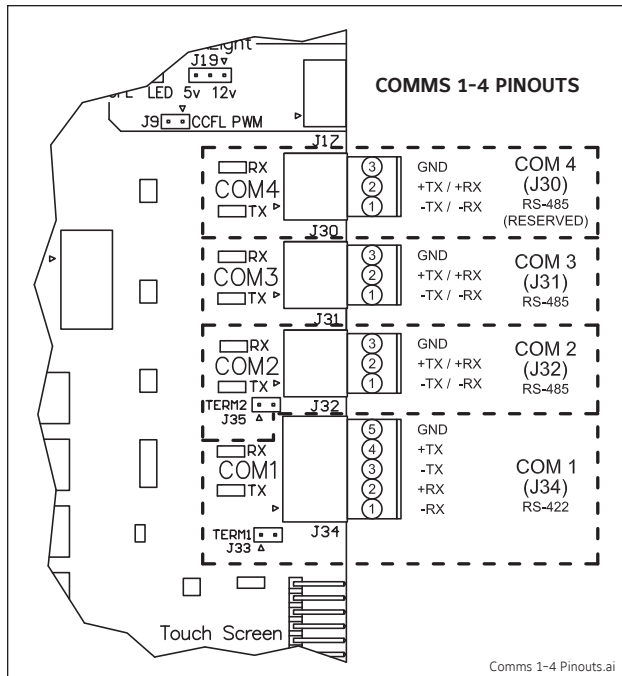


Figure 27. Comms 1-4 Connectors

PERFORMING THE COMMUNICATIONS LOOPBACK TEST

NOTE: The user must be logged in as a Service Level user to access this feature.

Navigate to the Service - Communications screen as seen on the previous page.

Ensure that the proper test harness is installed and the associated jumpers are in their correct positions for the particular test to be performed. (Per the Hardware Setup section)

Pressing the appropriate test key will initiate the test. While the test is running the screen will dim and a loading circle will appear.

- If the test passed a dialogue box will appear with the message, "Loop Back Test Passed"
- If the test failed a dialogue box will appear with the message, "Loop Back Test Failed"

HARDWARE SETUP FOR TESTING RS-485

To create the communications loopback harness for RS-485 testing, use the following example(s):

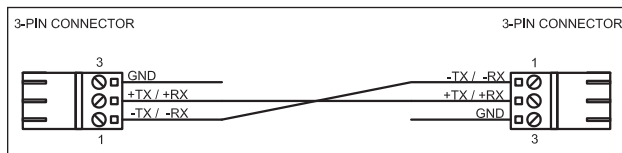


Figure 28. Q6 RS-485 Test Harness A: 3-pin to 3-pin

Set the communications jumpers as follows for RS-422:

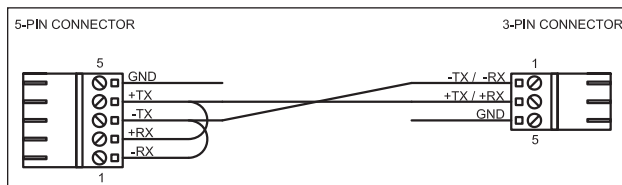


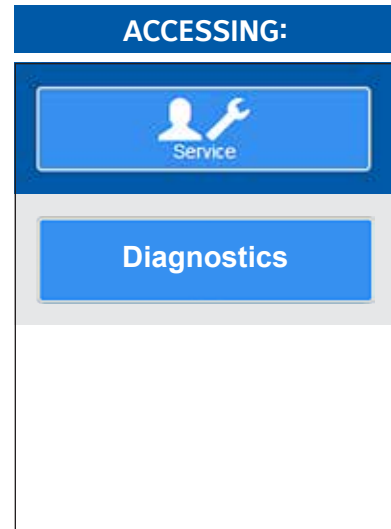
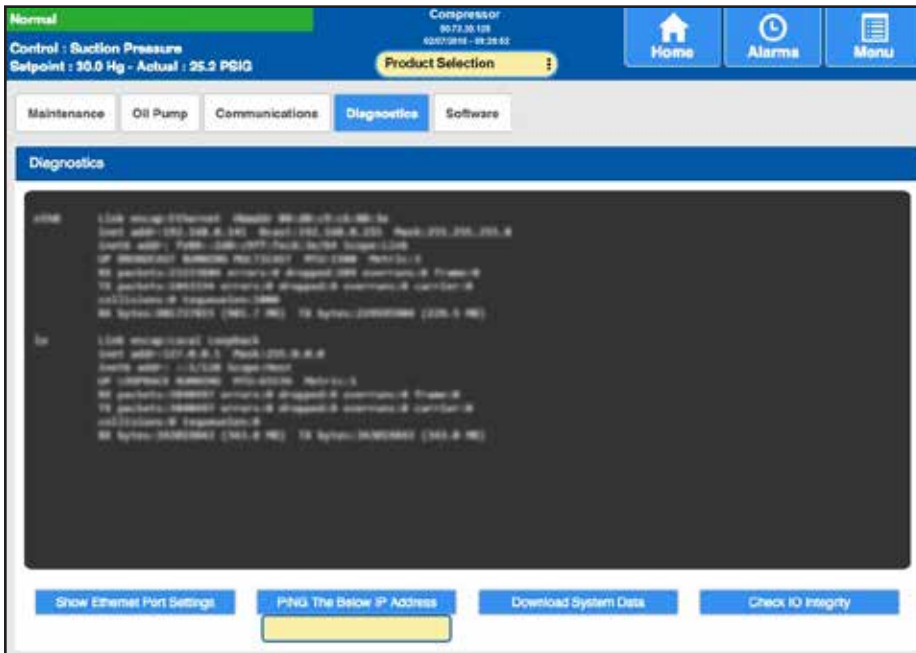
Figure 29. Q6 RS-422 Test Harness B: 5-pin to 3-pin

Set the communications jumpers to RS-485, as seen in the Q5 RS-422/485 Test Configuration

Comm1 – Comm2 Test: Plug in the 485 Test Harness A between Comm-1 and Comm-2

Comm1 – Comm3 Test: Plug in the 485 Test Harness B into Comm-1 and Comm-3

SERVICE – DIAGNOSTICS



DESCRIPTION: This screen allows the technician to perform system checks on Ethernet communications. Refer to the Communications Manual (090.040-CS) for specific information about this test.

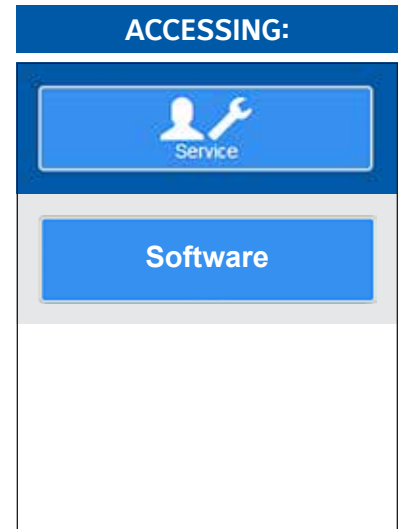
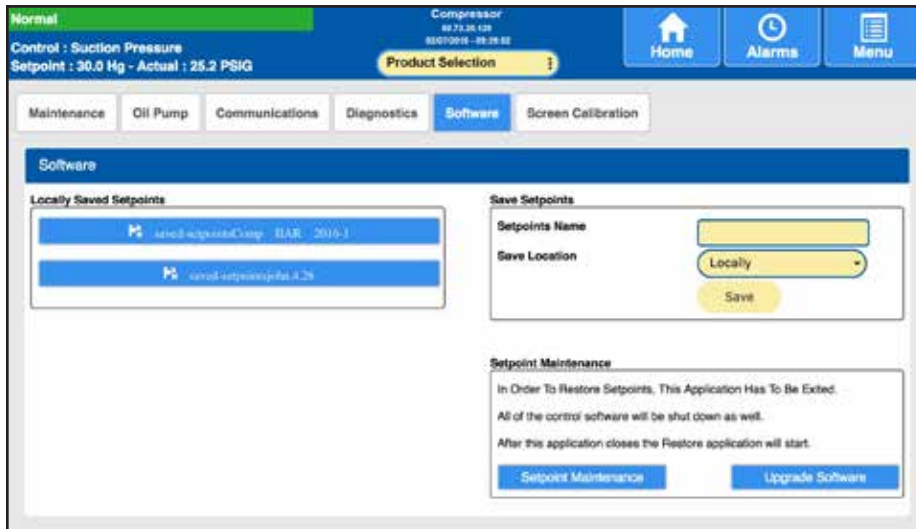
- Show Ethernet Port Settings - Pressing this button will cause the Ethernet Port Settings to be shown.
- Ping the Below IP Address - There is a setpoint box located below this button. Select this box to call up a numeric keypad. Enter the IP address that you wish to PING, then press the [PING The Below Address] button. The results of the PING will be shown.
- Download System Data - Selecting this button will allow numerous system information and data to be downloaded to a USB thumbdrive device (2GB minimum recommended).

When this button has been selected, a message box will appear on the screen asking if a USB drive has been installed. Once the USB device has been plugged in and the prompt has been answered, a message will appear notifying the operator that a System Save is running. It is at this point that the necessary data is collected and saved to the USB device. Once the files have been saved, the message box will disappear, and the normal screen will be shown.

Remove the USB device, and plug it into an available USB port on a computer. Using Windows Explorer, locate the device and open it. You will notice a file named *system-data.zip*. Clicking on the system-data.zip file will show the following files saved under it:

- Historical_trending.zip (file) - This zip file when opened, will contain at least one .csv file, and possibly more. Approximately every two weeks a trending file is automatically created and named with a time/date stamp type of name, such as 2013-12-20 07:21:00.csv. This file name will indicate the date and time that the file was created. Opening each shown .csv file will cause the contents of the file to be shown in a formatted Excel spreadsheet with the values of each analog channel at the time the data was collected. After about two weeks, another file will be created with a new time/date stamped name. Older files are maintained.
- System-data.xls (file) - Opening this file will cause a formatted Excel spreadsheet to be shown. Multiple tabs exist within the spreadsheet, and are labeled as follows:
 - Events
 - Alarms
 - User Actions
 - Real Time Trending
 - DF command (linux)
 - Running Processes

SERVICE – SOFTWARE



DESCRIPTION: This screen has been provided as a way for the user to save and restore setpoints, and to upgrade software.

NOTICE

Before accessing this screen, it is recommended that a USB drive device (P/N 649A1063G99) be plugged into a USB port of the Q5 Processor Board. Refer to the pictorial on the next page for USB port locations.

Perform the following steps to prepare the Quantum™ HD Unity for software maintenance:

- Ensure that all setpoint values have been documented as a safety precaution.
- Stop the compressor.
- With power ON, insert the USB device into a provided USB port of the Q5 Processor Board (see above).
- Access the main **[Menu]**.
- Select the **[Service]** Icon.
- On the Service screen, select the Software tab.

The following Save Setpoint selections are provided:

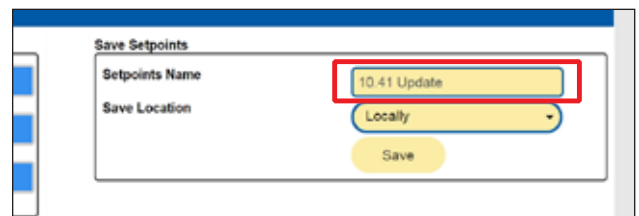
Setpoints Name - Enter a custom name here. This is similar in function to a file name. It cannot be blank.

Save Location - This is defaulted to Locally.

Save - Use this button to save all setpoints and custom text locally or to a USB device as a form of backup.

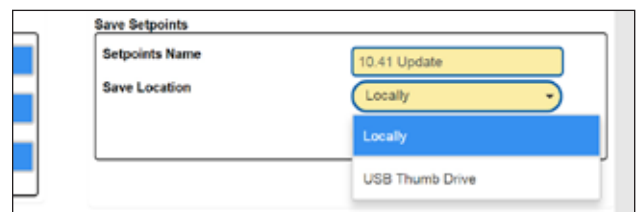
Saving Setpoints: To save setpoints the user must be logged into the Service level. Press the Menu button and select Service then select the **[Software]** at the top of the screen as shown below:

In order to save a setpoints file, it must first be named. To save setpoints touch the **[Setpoints Name]** button to activate the keypad. Enter the desired name and press enter.



Save Setpoints Name.jpg

The setpoints can be saved either Locally (default) to the flashcard on the processor or to a USB Thumb Drive that is inserted into the USB port of the Quantum HD Unity processor. Select **[Save Location]** to choose the location to which the setpoints will be saved.

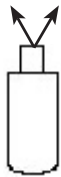


Save Setpoint Location.jpg

The same thumb drive that is being used for the program update can be used to save the setpoints of the controller prior to doing the update. It is recommended that all locally saved setpoints be backed up to a USB thumb drive and stored in a safe, secure location.

Once the setpoints are named, and a location is selected, press Save to save the setpoints to the selected location.

If the setpoints are saved Locally, the file name, date and time will be listed on the left side of the screen. Multiple setpoint files can be saved.



Q6 Processor Board USB Plug-in locations

Figure 30. USB Plug-in Locations

Upgrade Software - Updating the Operating Software on a Quantum HD Unity is easy and free. Some enhancements may require additional hardware.

NOTICE

Before upgrading the software, save the setpoints for the controller being updated. **The update will reset all setpoints to default values.** After the update, the setpoints are restored from the saved file for that controller.

Once the setpoints are saved, the Operating Software can be updated.

Use the steps described below to download the software upgrade file and upload it to your Quantum HD Unity controllers.

To save the Operating Software Upgrade file, right click on the file and save to a USB Thumb Drive. Save to the Top Level, Root Directory only. Saving to a sub-folder will prevent the upgrade file from being read by the Quantum HD Unity processor. The file can also be saved to a computer hard drive for future access.

Once you have downloaded the update to a USB thumb drive, it can be used to update an infinite number of Quantum HD Unity Controllers.

Plug the USB drive with the update into the USB port of the processor board. Select the Upgrade Software button.



After the Upgrade Software button is pushed, the screen will display HD Loading and then the Install page will appear.

To install, touch the Full System Install button. To abort the upgrade, touch the Exit button.

Once the update is finished the Please Wait message will appear and then Operation Complete. Touch the OK button, then Exit.

Once the Exit button is touched you will be prompted "Are You Sure". Touch the button for the appropriate response. When exiting, the HD Loading screen will appear briefly. After several seconds, the Quantum HD Unity home screen will reload.

Restore Setpoints - Use this option to restore the setpoints only for a particular unit (custom text that has already been changed will not be affected):

- Ensure that all setpoints have been documented as a safety precaution. Install the previously saved setpoints USB device into the provided connection on the Quantum HD Unity.

It is necessary to Login to the service level to restore the saved setpoints and calibration data.

Once logged in, go to Menu, select Service then select the Software tab as before. Once on the software page select the **[Restore Setpoints]** button.

Once Restore Setpoints is selected the available files on the flash card (locally saved) and/or on the USB device (Thumb Drive) will display. Use the keypad to select the associated number for the setpoints and calibration data file you wish to restore. Touch OK.

You will be prompted to Restore Calibration Data. If the setpoints were saved from this compressor, press Yes, and if the setpoints were saved from another compressor, press No. Pressing No means that the Calibration Data will be defaulted and will need to be redone.

Once the setpoints are restored another screen will appear. Press Exit to finish this process. Press Yes that you wish to exit. The HD Loading... screen will appear briefly. In several seconds the Quantum HD Unity home screen will reload. The Operating Software Upgrade and Setpoints Restore operations are complete.

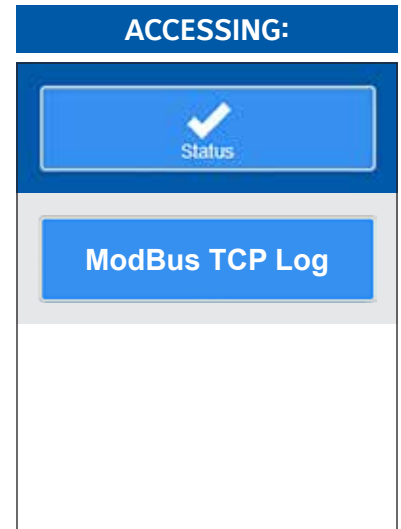
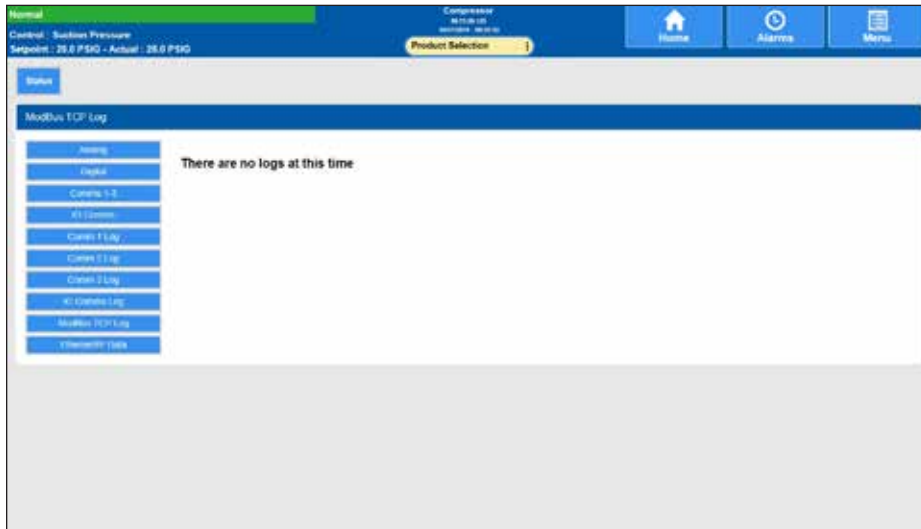
NOTICE

Due to various changes in software versions, certain setpoints may not save and restore correctly. In these cases, the setpoint value will need recorded and entered manually.

Setpoints that do not restore properly:

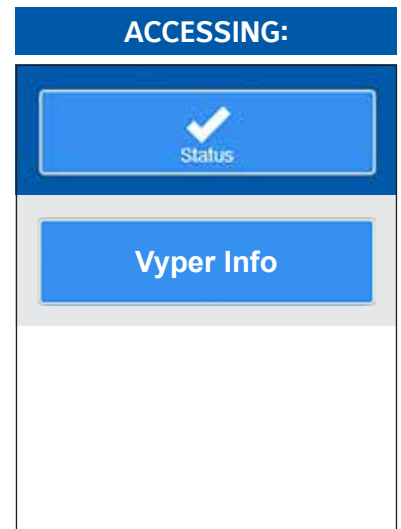
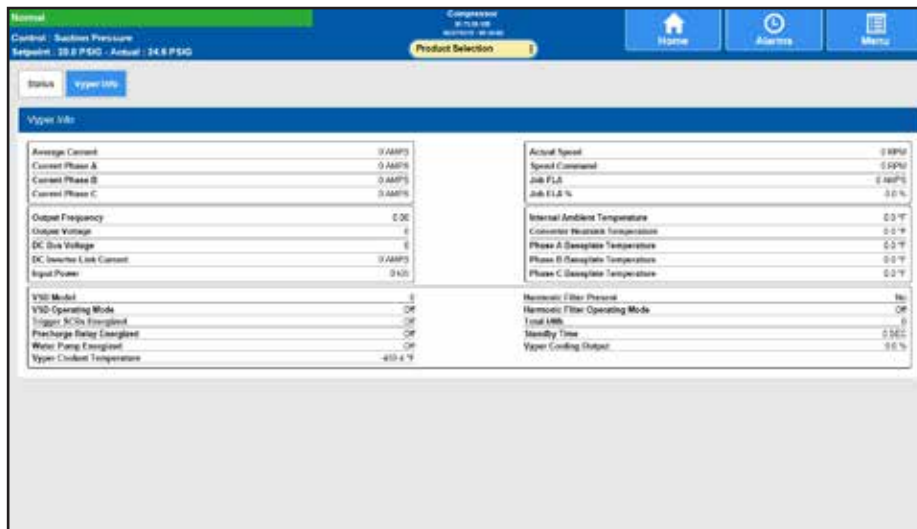
- Email Notification (Quantum HD & Unity)
- Liquid Injection Setup (Quantum HD & Unity)
- Network settings (Unity)
- Compressor Name
- 2nd Digital and Analog Board Status
- Existing Quantum LX to Quantum LX list

STATUS – PANEL (MODBUS TCP LOG)



DESCRIPTION: This screen allows the technician to view the status of all ModBus TCP communications. Refer to the Communications manual for detailed information on this screen (090.040-CS).

STATUS – VYPER INFO



DESCRIPTION: This screen is used to view specific operating values of the Vyper™ drive. These values are received via communications directly from the Vyper™ drive, and populated here.

STATUS – FILTER INFO

Normal Compressor 06.73.39.139 02/07/2018 - 06:28:52

Control : Suction Pressure
Setpoint : 30.0 PSIG - Actual : 24.6 PSIG

Product Selection

Status Vyper Info **Filter Info**

Harmonic Filter Info

	Leg 1	Leg 2	Leg 3
Total Harmonic Distortion	0.0 %	0.0 %	0.0 %
Total Demand Distortion	0.0 %	0.0 %	0.0 %
Filter Current	0 AMPS	0 AMPS	0 AMPS
Supply Line Side Current	0 AMPS	0 AMPS	0 AMPS
Phase Rotation Direction - ADC			

L1-N Voltage 0
L2-N Voltage 0
L3-N Voltage 0
L1-L2 Voltage 0
L2-L3 Voltage 0
L3-L1 Voltage 0

VSD Low Converter Heatsink Temp Fault 0
Run Command Signal Status 0
No Faults Signal Status 0
Run Command Relay Status 0
Run Acknowledge Relay Status 0

VSD Version 0

Baseplate Temperature 0.0 °F
DC Bus Voltage 0
Total Supply KVA 0
Total Power Factor 0.00
Precharge Contactor Energized 0
Supply Contactor Energized 0

CP To VD Timeout Errors 0
HF To VD Timeout Errors 0
VD To HF Receive Errors 0
HF To VD Checksum Errors 0
Software Reboots 0

VSD Model / Build 0

ACCESSING:

Filter Info

DESCRIPTION: This screen is used to view specific operating values of the Vyper™ drive harmonic filter. These values are received via communications directly from the Vyper™ drive, and populated here.

STATUS – ANALOG

Normal Compressor 06.73.39.139 02/07/2018 - 06:28:52

Control : Suction Pressure
Setpoint : 30.0 PSIG - Actual : 24.6 PSIG

Product Selection

Status

Analog I/O Status

Analog Board #	Input Channel	Output Channel
1	2131	13
2	2033	14
3	2536	15
4	2637	16
5	2193	17
6	1936	18
7	1888	19
8	1882	20
9	1883	21
10	2204	22
11	1921	23
12	327	24
Modbus TCP Log	Output Channel	Output Channel
1	0	5
2	0	6
3	1021	7
4	819	8

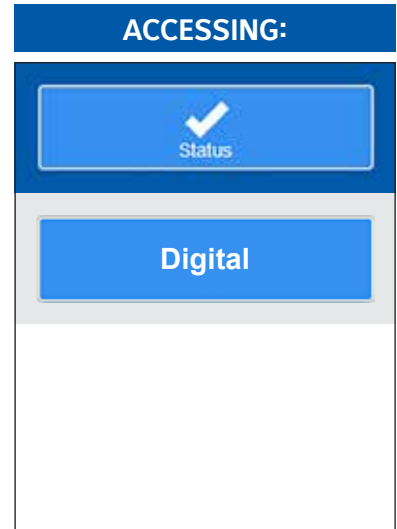
ACCESSING:

Analog

STATUS:
The Status page displays the real time status of the analog and digital I/O, serial comm. ports 1-3, I/O comms., Modbus TCP and Ethernet I/P.

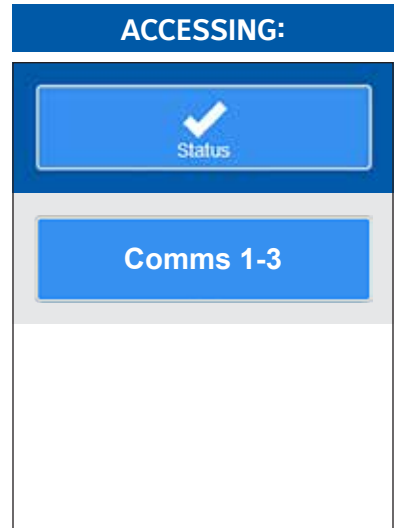
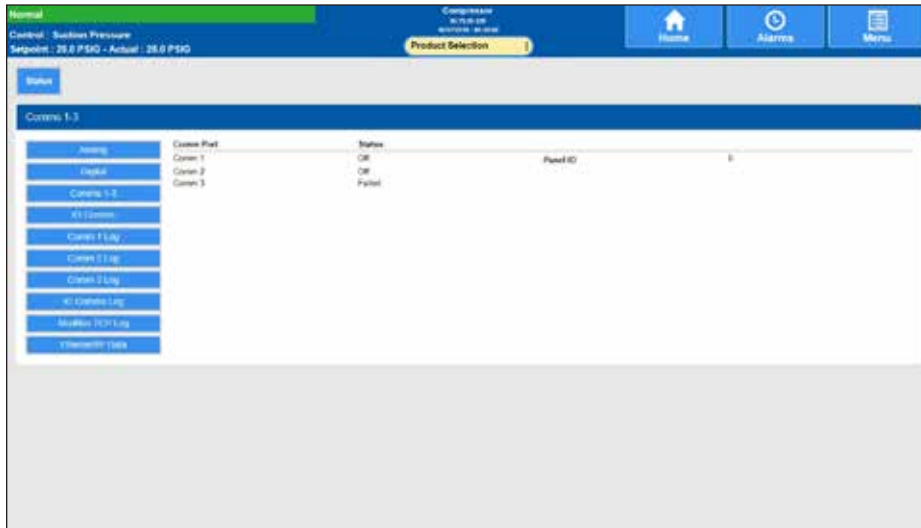
DESCRIPTION: This screen allows the technician to view the status of all installed analog board inputs and outputs. The top section of this screen shows the analog inputs. A value displayed next to each available channel indicates a raw count that can be calculated to a DC voltage that is present as an input. The lower half of the screen shows the analog outputs. A value displayed next to each available channel indicates a raw count that can be calculated to a DC voltage that is present as an output.

STATUS – DIGITAL



DESCRIPTION: This screen allows the technician to view the status of all installed digital board inputs and outputs. An OFF status indicates that the associated input or output is not energized. An ON status indicates that the associated input or output is energized.

STATUS – COMMS 1-3

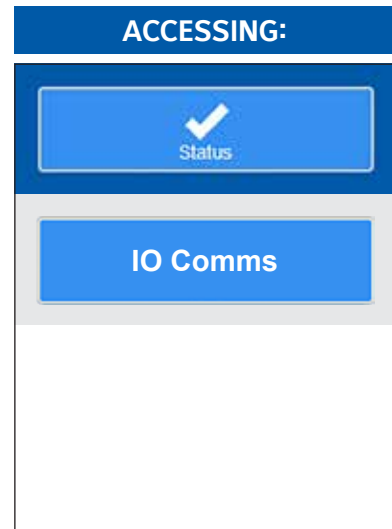


DESCRIPTION: This screen shows the current communications status of the three serial communications ports. The Panel ID number is shown at the right side of the screen:

Panel ID - This setpoint box allows for a distinctive number to be entered that will identify this unit. A number that is used by an external communications application, to converse to individual compressors. On interconnected systems, this number must be unique. Valid values are 0 - 99.

Comm1	Comm2	Comm3
• Off	• Off	• Off
• Active	• Active	• Active
• Failed	• Failed	• Failed

STATUS – I/O COMMS



DESCRIPTION: This screen shows the currently active I/O boards that have been detected, as well as the software version of the board, and it's current communication status: **I/O COMMS (Current status is shown)**

Analog Boards

Shows all analog boards that were detected through communications at the last power up. If a board is detected, the software version of the program running on that board will be shown, as well as the current status for that board.

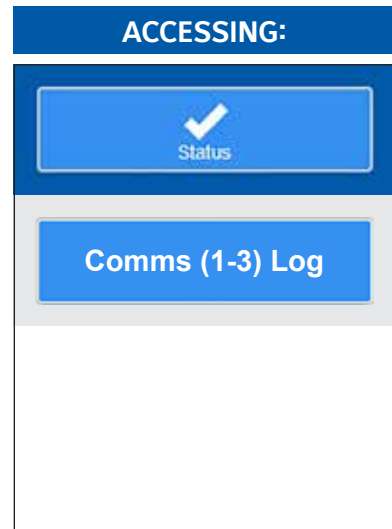
Digital Boards

Shows all digital boards that were detected through communications at the last power up. If a board is detected, the software version of the program running on that board will be shown, as well as the current status for that board.

Interface Board

Shows the software version of the program running on the Interface Board board, as well as the current status for the board.

STATUS – COMMS (1-3) LOG



DESCRIPTION: These screens allow the technician to view all of the serial communications information via these logs that the Quantum™ HD has received and transmitted.

COMM 1 (2, 3) LOG

Simply select the Comms 1 Log, Comms 2 Log or Comms 3 Log buttons on the left side of the screen that corresponds to the port that you wish to view. The selected port name (in this case Comm 1 Log) will appear in the blue status bar. Each time a new command is sent or received, the screen will refresh automatically.

This screen will display all data that is coming through the selected Communications (Comm) port. The top line of data is the most recent activity. At the left of each line, you should see whether the data is IN or OUT (Receive or Send), and the actual data (in Hexadecimal format). This information can be used to compare against the data being sent and received at the other end of the communications link, to verify proper operation.

STATUS – DBS STARTER INFO

DBS Starter Info	
DBS Software Version	0.00
Current Phase A	0.400PS
Current Phase B	0.400PS
Current Phase C	0.400PS
Average Current	0.400PS
Full Load Amps	0.400PS
Starter Wiring	Inline
Starter Size	
Starting Mode	
DBS Current	0.00 A
Heatsink Temperature	30.0 °F
RTD Temperature	30.0 °F
Thermal Capacity	0.0 %
DBS Recycle Delay Thermal	0.00 S
Upgrade Time	0.00 S
Ramp Time	0.00 S
Constant Current Level	0.0 %
Thermal Overload Status	Disabled

ACCESSING:

Status

DBS Starter Info

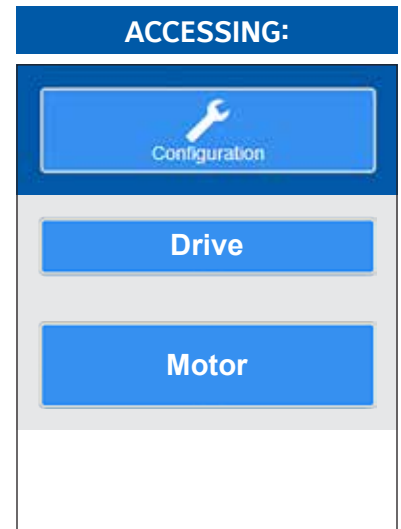
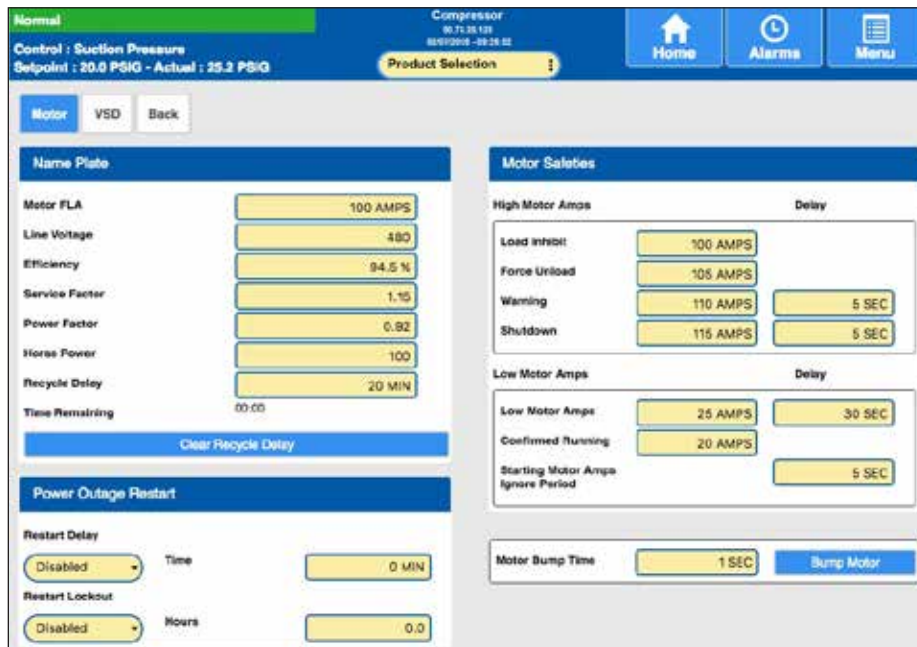
DESCRIPTION – The information shown on this screen is received directly from the DBS via communications, and represents the operational status of the DBS. These items are:

- **DBS Software Version** – If the DBS and Quantum™ HD are communicating properly, a value other than zero should be displayed here. This represents the current version of software that is running the DBS. A value of zero may indicate a communications error.
- **Current Phase (A, B, C)** – When the DBS is running, the actual current value for each of the three phases will be shown here.
- **Average Current** – This is a calculated value that represents the average current from all three phases.
- **Full Load Amps** – Motor Full Load Current (Amps) has been factory set using a switch within the DBS main control board. This switch is set based on starter size.
- **Starter Wiring** – This value is read from a switch within the DBS, and will show one of two possible types of wiring, either Delta or Inline. This is set at installation and is shown here for informational purposes only.
- **Starter Size** – This value is read from a switch within the DBS, and will show the size of the starter that is being used to control the motor. This is set at installation and is shown here for informational purposes only.
- **Starting Mode** – This value is read from a switch within the DBS, and will show whether the starter is set to run at Constant Current, or is set to Step Ramp. This is set at installation and is shown here for informational purposes only.
- **Heatsink Temperature** – This will display the value of a heatsink thermostat that is located on the DBS control board. If this thermostat opens (at 85°C), a fault will occur, and the motor will shutdown. The unit will only be able to re-start when this thermostat resets (after be allowed to cool) at 60°C.
- **RTD Temperature** – An RTD (resistive) temperature sensor is located on the DBS starter. This value is compared against the RTD Temperature Warning Level and RTD Temperature Trip Level setpoints and if the value shown exceeds either of these setpoints, either a warning or a trip will occur.
- **Thermal Capacity** – The allowable amount of thermal energy that can be absorbed before damage may occur to the motor. This value is based upon an internal calculation.
- **DBS Recycle Delay Timeout** – The motor has exceeded its Thermal Capacity and will not be allowed to start until enough time has elapsed to allow the motor to cool.
- **Bypass Time** – When the controller is set for Constant Current, a 10-position switch (SW3) on the main control board of the DBS, (adjustable from 3-30 seconds) sets the bypass time. The bypass time for Step Ramp mode is 5 seconds, plus Ramp time.
- **Ramp Time** – A 10-position switch (SW3), on the main control board of the DBS, is adjustable from 3-30 seconds and sets the time in seconds in which the current rises in the Step Ramp mode from its initial Current Step level to 500% FLA.
- **Constant Current Level** – A 10-position switch (SW2), located on the main control board of the DBS, sets the initial current step of the controller in either Constant Current or Step Ramp mode. This switch is adjustable from 200-425% FLA for smooth acceleration. When the controller is set for Constant Current, this switch sets the maximum current limit for the motor in this mode of operation. This current is maintained until the motor reaches full speed. When the controller is set for Step Ramp, this switch sets the initial current limit, and then allows the controller to continue its ramp to 500% FLA.
- **Thermal Overload Status** – If this feature has been enabled, then a trip will occur if the thermal energy stored in the motor exceeds 100% of motor Thermal Capacity. The estimated temperature of the motor windings is calculated based on the highest phase current. The overload trip level is computed based on the following setpoints: Full Load Amps, Locked Rotor Current, Stall Time, and Service Factor. A start will not be allowed until the motor has sufficiently cooled.

NOTICE

Contact Schneider Electric at 800-220-8697 with any further questions concerning the setup and operation of the RAM DBS.

CONFIGURATION – DRIVE (MOTOR)



DESCRIPTION: Use this screen to set the specific Drive safeties information for a constant speed electric drive motor. These safeties are important for the safe operation of the compressor and motor.

The information that appears on this screen will also be repeated for most other types of motor drives. The following pull-down menus and setpoint boxes are shown here. This information should be recorded from the motor nameplate:

NAME PLATE

- **[Motor FLA]** – Enter the value from motor nameplate.
- **[Line Voltage]** – Enter the value from motor nameplate.
- **[Efficiency]** – Reference the motor nameplate.
- **[Service Factor]** – Not required if using RAM DBS.
- **[Power Factor]** – Consult motor manufacturer for this value. PF = % of real power (W or kW) to apparent power (kVA). Value will not impact unit performance, and is used for energy monitoring only.
- **[Horse Power]** – Enter the value from motor nameplate.
- **[Recycle Delay]** – Each time the compressor is started this value will be loaded into the Recycle Delay timer. This time must elapse prior to allowing the compressor to restart. The timer will time out while the compressor is running or stopped since the Recycle Delay is a start-to-start protection. The Recycle Delay time is intended to prevent damage to the motor from successive restarts.

NOTICE

Consult Motor Manufacturer for the recommended duration of the Recycle Delay.

- **[Clear Recycle Delay]** – This selection will clear the remaining delay time, allowing the motor to be re-started immediately.

⚠ WARNING

Selecting Clear Recycle Delay may cause damage to the compressor motor.

CT Factor – The Current Transformer Factor is printed on the current transformer in the compressor motor starter. Note: Not required if using RAM DBS.

To verify proper CT sizing, use the following equation:
 $CTF = FLA \text{ (Full Load Amps)} \times \text{Service Factor} \times 1.1 = \text{Recommended CT (Round up to next highest 100 Amps)}$
 EXAMPLE: FLA = 182 Amps & SF = 1.15
 $CTF = (182 \times 1.15 \times 1.1) = 230.23 >$
 Round up to 300 [use 300:5 CT]

POWER OUTAGE RESTART

Restart Delay – Will stagger the starting of compressors after power is restored to prevent multiple compressors from starting at the same time.

- Disabled
- Enabled
- Time

Restart Lockout – Prevents compressor from starting after a power outage that lasts longer than the setpoint.

- Disabled
- Enabled
- Time

MOTOR SAFETIES

High Motor Amps (Considering a 1.15 SF):

- **[Load Inhibit]** – The compressor slide valve will be prevented from loading until the Motor Amps is less than this setpoint.

TYPICAL SETTING: Motor Amps Stop Load = FLA x 100%

- **[Force Unload]** – When the Motor Amps is greater than or equal to this setpoint, the compressor Slide Valve will be forced to unload.

TYPICAL SETTING: Motor Amps Force UnLoad = FLA x 105%

- **[Warning]** – If the Motor Amps is greater than or equal to this setpoint, for the warning time delay, a warning occurs.

- **[Warning Delay]** – The minimum time in seconds that the Motor Amps is greater than or equal to the High Motor Amps Warning setpoint before notification of the warning.

- **[Shutdown]** – If the Motor Amps is greater than or equal to this setpoint, for the shutdown time delay, the compressor will shut down.
 - **[Shutdown Delay]** – The minimum time in seconds that the Motor Amps is greater than or equal to the High Motor Amps Shutdown setpoint before the compressor will shut down.

Low Motor Amps:

- **[Low Motor Amps Shutdown]** – This setpoint is used to determine if the coupling has broken. If the Motor Amps is less than or equal to this setpoint, for the shutdown time delay, the compressor will shut down.
- **[Low Motor Amps Shutdown Delay]** – The minimum time in seconds that the Motor Amps is less than or equal to the [Low Motor Amps] Shutdown setpoint before the compressor will shut down.

- **[Confirmed Running Motor Amps]** – The measured Motor Amps must be greater than or equal to this setpoint before the compressor will transition from Starting to Running.
- **[Starting Motor Amps Ignore Period]** – After the compressor is commanded to start, this setpoint indicates the period during which the High Motor Amps Load Inhibit and Force Unload checks are not performed.

The following selection will allow the technician to manually energize, or bump, the compressor motor for the purpose of determining motor rotation.

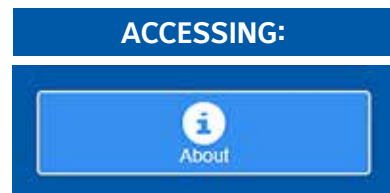
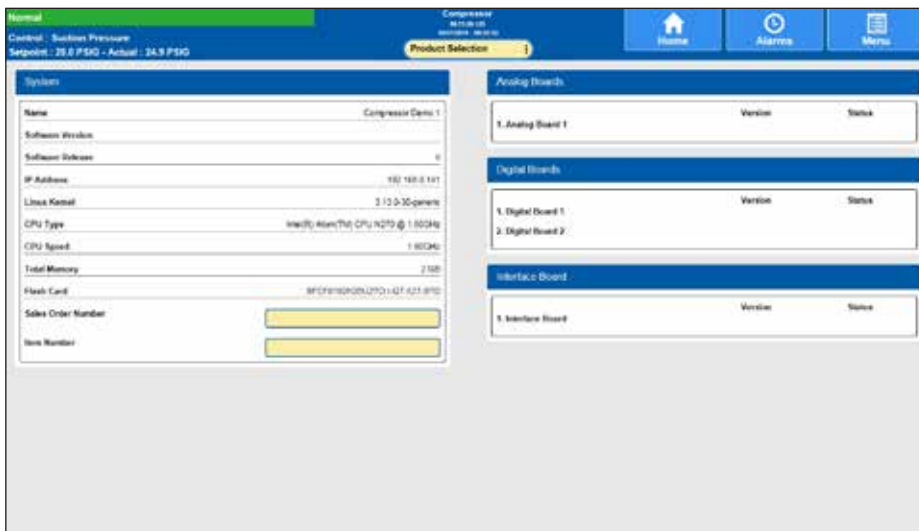
The following setpoint box has been provided:

- **[Motor Bump Time]** – Set this value to the length of time that you wish to have the compressor motor energized, or “bumped”. The range is 0.0 to 15.0 seconds.

The following user selectable buttons are provided:

- **[Bump Motor]** – When this button is selected, the compressor motor will be energized, or “bumped” for the period of time as set in the Motor Bump Time setpoint box.

ABOUT



ABOUT:

The “About” page lists the software and firmware version for the processor, interface, analog and digital boards. It also lists the Sales Order and Item numbers.

DESCRIPTION: This screen shows all I/O boards that have been detected by the Quantum™ HD, as well other related software information and consists of four sections:
SYSTEM

- Name – A customized name for that has been assigned for this panel.
- Software Version – The version of the software program that does the actual control of the compressor. It runs in the Linux environment.
- Software Release – The date that the software was released for use.
- IP Address – The value shown here represents the IP (Internet Protocol) address that has been assigned to this panel.
- Linux Kernel – The Quantum™ HD controller runs on a Linux programming architecture (rather than Microsoft Windows). This is the software version number for the main Linux Kernel.
- CPU Type – The information that is shown here describes the CPU micro-chip that is installed on the Q5 control board.
- CPU Speed – This indicates the clock rate at which the CPU can perform at.
- Total Memory – This shows the total amount of on-board memory that is installed on the Q5 control board.

- Flash Card – This value is a manufacturers identifier.
- Sales Order Number – A six digit numerical value that has been assigned to a specific compressor package by Frick Company. It is very important to have this number available when calling the factory for assistance or parts ordering.
- Item Number – This is actually an extension of the Sales Order number. It would potentially be used for a multiple compressor site, where the same Sales Order number was assigned for all compressors. The Item Number would be different for each compressor.

ANALOG BOARDS

Shows all analog boards that were detected through communications at the last power up. If a board is detected, the software version of the program running on that board will be shown.

DIGITAL BOARDS

Shows all digital boards that were detected through communications at the last power up. If a board is detected, the software version of the program running on that board will be shown.

INTERFACE BOARD

Shows the software version of the program running on the Interface Board board.

SECTION 9

TROUBLESHOOTING

When there is a problem that makes no sense due to unexplainable things happening, check the following:

1. Were the recommendations for Electrical Installation followed? (See Frick publication 090.400-SB).
2. Is the panel powered by an isolating power source such as a control power transformer in the motor starter panel?
3. Verify that the panel is not powered from a lighting or utility panel.
4. Did the unit ever work properly?
 - If the unit used to work properly, try to determine when the problem first showed up.
5. It is important to know if the problem occurs randomly, frequently, at the same time everyday or all the time.
6. Check what the temperature is in the engine room and at the panel. Is it very hot (>110°F) or very cold (<32°F)?
 - Make sure that the motor is not blowing exhaust air on the control panel.
7. If the problem just started occurring, was there recently a severe lightning storm, fire, flood, or a plant accident?
 - Has any water, refrigerant, or oil leaked into the panel or any conduit?
8. If the problem just started occurring, then check if anything was recently changed in the system (i.e. software or hardware.)
9. If the problem just started occurring, then check if any service was recently done to the compressor or its electrical system?
10. If there is communication wiring connecting the panel to another panel or device, then check the following:
 - If the Quantum™ HD Unity is unexplainably shutting down, try disconnecting the communications cable to see if the problem goes away.
 - Check if the communications cable shields are tied to machine ground at only one location. For a PLC or Opto22 based system, the shield should normally be tied only at the PLC or Opto22 panel.
 - Check that you are using the Frick recommended communications cable.
11. Is the plant wiring up to code? (See Frick publication 090.400-SB)
12. Do you have power wiring (>50V) mixed with control, sensor or communications wiring?
13. Check that the starter panel is grounded to the plant transformer. There are usually four wires: 3 for the 3 phases and 1 for plant ground.
14. Check that the motor is grounded to the starter panel. There are usually four wires: 3 for the phases and 1 for ground.
15. Ensure that one side of the motor current transformer is grounded in the motor starter panel. The wire to the control panel terminal #2 is usually the only one grounded.
16. Check that the pressure transducers are properly grounded.
17. Check that temperature transducers are properly grounded.
18. Check to see if one of the temperature probes have a signal wire shorted to machine ground.
19. Check that all inductive loads (i.e. coils, solenoids, or relays, etc.) connected to the I/O output modules have surge suppressors across them, preferably at the devices. The larger factory installed inductive loads will have surge suppressors as well.
20. Make sure that you have a continuous ground back to the power source (plant transformer). The ground connection must be aluminum or copper. A conduit ground will not work. Do not drive a ground stake at the compressor since extraneous currents will be attracted to the compressor.
21. Make sure that there is no AC wiring lying next to any printed circuit board.
22. Unexplainable compressor auxiliary failures are usually indicative of noise due to wiring problems (i.e. incorrect earth grounds, mixed power and control wiring, unsuppressed coils, etc)
23. If the compressor is unexplainably shutting down, check if the machine shares control transformer power with something else. Make sure each compressor has its own isolation transformer in the motor control center off the three-phase bus with the secondary properly grounded.

**TROUBLESHOOTING CHART FOR FRICK® QUANTUM™ HD UNITY CONTROL PANEL
(REFER TO WIRING DIAGRAMS)**

SYMPTOM	PROBABLE CAUSES and CORRECTIONS
DISPLAY IS INOPERATIVE	<p>Check for power at the panel. See if any of the LED's on the Q5 Processor Board are blinking or any lights are blinking on the other boards. If no lights are blinking, make sure the control power switch is switched on. If there are still no lights, then check the circuit breaker (2CB). If the breaker is not tripped, check for power into 2CB. If there is no power, check the external power being supplied. If power from 2CB, check power supply for input AC and output DC level.</p> <p>Shut off power to the panel and first confirm that the display connector is firmly seated. Care needs to be taken when checking and reconnecting or reseating this connection. Confirm that the connectors at both ends of the backlight inverter are properly connected. Confirm that the display harness is connected properly on the main board. Refer to Section 3 of this manual for more information.</p> <p>Check the display with a flashlight. If characters are visible, the display is good, but the LED backlight stick is not on and may need replaced.</p>
OIL PUMP DOES NOT START	<p>The LED (D3) for Output 3 (MOD 3) of Digital I/O Board #1 should be on when pump is called on to run. If the pump does not start when the LED is on, check for the proper panel voltage between position 4 and 5 on the P1 DIO connector on Digital I/O board #1. If the proper voltage is not found, check the fuse (F3) and if the fuse is OK, check the output module (MOD 3). If the voltage was OK, check for the proper voltage between position 5 on the P1 DIO connector and position 8 on the terminal strip. If voltage is OK, check for the proper voltage between position 8 and 2 on the terminal strip. If the voltage is OK, check at the oil pump starter. If all of this is OK, then check the Digital Status screen to see if channel 3 is ON.</p> <p>The Oil Pump #1 Auxiliary Contact switches voltage to Input 4 (MOD 4) of Digital I/O Board #1 when the auxiliary contacts are closed. If the input does not turn on, check if the LED (D4) is lit when it should be. If it isn't, check the fuse (F4) and if the fuse is OK, check the input module (MOD 4). Check the voltage between positions 4 and 6 of the P1 DIO connector. If the LED is ON, check channel 4 on the DIO of Digital Board 1, at the Digital Status screen.</p>
OIL PUMP IS RUNNING BUT THE COMPRESSOR DOES NOT START	<p>For compressor models with a slide valve: Verify that the Slide Valve has unloaded to or below the Highest Slide Valve Position to allow starting the compressor setpoint. If the slide valve has not unloaded, troubleshoot the hydraulic system. Compressor will not start until the Slide Valve is unloaded. Output 1 (MOD 1) of Digital I/O Board #1 controls the motor starter. If the motor does not start when the LED (D1) is on, check for the proper panel voltage between position 4 and 1 on the P1 DIO connector on Digital I/O board #1. If the proper voltage is not found, check the fuse (F1) and if the fuse is OK, check the output module (MOD 1). If the voltage was OK, check for the proper voltage between position 1 on the P1 DIO connector and position 18 on the terminal strip. If voltage is OK, check for the proper voltage between position 18 and 2 on the terminal strip. If the voltage is OK, check the interposing relay (By others).</p> <p>Output 1 controls the Compressor Start Relay (By others). If the compressor does not start and the LED (D1) for Output 1 (MOD 1) is on, check for the proper panel voltage between position 4 and 1 on the P1 DIO connector on Digital I/O board #1. If the proper voltage is not found, check the fuse (F1) and if the fuse is OK, check the output module (MOD 1). If the voltage was OK, check for the proper voltage between position 1 on the P1 DIO connector and position 18 on the terminal strip. If voltage is OK, check for the proper voltage between position 18 and 2 on the terminal strip. If the voltage is OK, check the interposing relay (By others).</p> <p>The Compressor Starter Auxiliary Contacts turn on Input 2 (MOD 2) of Digital I/O Board #1 when they are closed. These contacts are located on the Compressor Starter. If the input does not turn on check if the LED (D2) is lit when it should be. If it isn't, check the fuse (F2) and if the fuse is OK, check the input module (MOD 2). Check the voltage between positions 2 and 4 of the P1 DIO connector.</p>
COMPRESSOR AUXILIARY SHUTDOWN	

* If applicable

SYMPTOM	PROBABLE CAUSES and CORRECTIONS
OIL HEATERS DO NOT OPERATE	<p>The oil heaters should operate only when the compressor is NOT running and the oil separator temperature is not greater than or equal to the Oil Heater Off Above setpoint, and that the Oil Level input is made.</p> <p>If the oil heaters do not work and the LED (D21) for Output 21 (MOD 21) is on, check for the proper panel voltage between position 4 and 1 on the P6 DIO connector on Digital I/O board #1. If the proper voltage is not found, check the fuse (F21) and if the fuse is OK, check the output module (MOD 21). If the voltage was OK, check for the proper voltage between position 1 on the P6 DIO connector and position 9 on the terminal strip. If voltage is OK, check for the proper voltage between position 9 and 2 on the terminal strip. If the voltage is OK, check the Oil Heater Relay (1CR).</p> <p>If the problem hasn't been located, check the circuit breaker (1CB). If the breaker is not tripped, check power into 1CB. If OK check between Wires 103 and 106. If the Oil Heater Relay (1CR) is closed, check for proper panel voltage between wires 106 and 102. If OK, check the Oil Heater.</p>
COMPRESSOR DOES NOT LOAD and/or UNLOAD* (Compressor that steps on Capacity)	<p>For a 4-Step compressor, verify that the 50% SV (Solenoid Valve) is energized BEFORE the 75% SV is energized. For a 3-Step compressor, verify that 75% SV is energized BEFORE the 100% SV. Feel hydraulic tubing to the compressor unloading pistons. If tubing is hot, inspect the unloader pistons for worn parts or improper seating.</p> <p>Check that the hydraulic valves feeding the solenoid valve as well as those feeding the unloader pistons are open.</p> <p>Confirm that hydraulic tubing and wiring is properly connected.</p> <p>Check the solenoid valve coil to see if it has been damaged.</p> <p>NOTE: Verify that the proper capacity control setpoint has been programmed.</p>
COMPRESSOR WILL ONLY PARTIALLY LOAD* (Compressor that steps on Capacity)	<p>With the first SV (solenoid valve) properly energized, verify that the second SV energizes and then check the third SV if there is one for this compressor model.</p> <p>Check that the hydraulic valves feeding the first SV as well as those feeding the compressor unloading pistons are open.</p> <p>Inspect the compressor unloading ports for worn or improperly seated parts.</p>
SLIDE VALVE DOES NOT LOAD and/or UNLOAD*	<p>Verify that the Slide Valve is in the AUTO mode and that capacity control is calling for load and/or unload. Output 5 (MOD 5) controls the Slide Valve Load Solenoid. If LED (D5) for Output 5 (MOD 5) is on, check for the proper panel voltage between position 4 and 1 on the P2 DIO connector on Digital I/O board #1. If the proper voltage is not found, check the fuse (F5) and if the fuse is OK, check the output module (MOD 5). If the voltage was OK, check for the proper voltage between position 1 on the P2 DI O connector and position 17 on the terminal strip. If voltage is OK, check for the proper voltage between position 17 and 2 on the terminal strip. If the voltage is OK, check the solenoid valve.</p> <p>Output 6 (MOD 6) controls the Slide Valve Unload Solenoid. If the LED (D1) for Output 6 (MOD 6) is on, check for the proper panel voltage between position 4 and 2 on the P2 DIO connector on Digital I/O board #1. If the proper voltage is not found, check the fuse (F6) and if the fuse is OK, check the output module (MOD 6). If the voltage was OK, check for the proper voltage between position 2 on the P2 DIO connector and position 16 on the terminal strip. If voltage is OK, check for the proper voltage between position 16 and 2 on the terminal strip. If the voltage is OK, check the solenoid valve.</p> <p>NOTE: Verify that the proper capacity control setpoint has been programmed.</p>

SYMPTOM	PROBABLE CAUSES and CORRECTIONS
SLIDE STOP DOES NOT INCREASE and/or DECREASE*	<p>Verify that the Slide Stop is in the AUTO mode and that the VI Ratio is calling for a VI increase or decrease.</p> <p>Output 7 (MOD 7) controls Slide Stop Increase Solenoid. If the LED (D7) for Output 7 (MOD 7) is on, check for the proper panel voltage between position 4 and 5 on the P2 DIO connector on Digital I/O board #1. If the proper voltage is not found, check the fuse (F7) and if the fuse is OK, check the output module (MOD 7). If the voltage was OK, check for the proper voltage between position 5 on the P2 DIO connector and position 15 on the terminal strip. If voltage is OK, check for the proper voltage between position 15 and 2 on the terminal strip. If the voltage is OK, check the solenoid valve.</p> <p>Output 8 (MOD 8) controls the Slide Stop Decrease Solenoid. If the LED (D8) for Output 8 (MOD 8) is on, check for the proper panel voltage between position 4 and 6 on the P2 DIO connector on Digital I/O board #1. If the proper voltage is not found, check the fuse (F8) and if the fuse is OK, check the output module (MOD 8). If the voltage was OK check for the proper voltage between position 6 on the P2 DIO connector and position 14 on the terminal strip. If voltage is OK, check for the proper voltage between position 14 and 2 on the terminal strip. If the voltage is OK, check the solenoid valve.</p>
LIQUID INJECTION SOLENOID DOES NOT ENERGIZE* (Liquid Injection Refrigerant Cutout - LICO)	<p>Verify that the Liquid Injection TXV is modulating properly and not feeding excessive liquid to LICO the compressor. This solenoid SHOULD be de-energized when the compressor is off. This solenoid should be energized if the Discharge temperature equals or exceeds the "Discharge Temperature On At" setpoint for the delay time.</p> <p>Output 9 controls the Liquid Injection Solenoid. If the LED (D9) for Output 9 (MOD 9) is on, check for the proper panel voltage between position 4 and 1 on the P3 DIO connector on Digital I/O board #1. If the proper voltage is not found, check the fuse (F9) and if the fuse is OK, check the output module (MOD 9). If the voltage was OK, check for the proper voltage between position 1 on the P3 DIO connector and position 13 on the terminal strip. If voltage is OK, check for the proper voltage between position 13 and 2 on the terminal strip. If the voltage is OK, check the solenoid.</p>
HI VI LIQUID INJECTION PORT SOLENOID DOES NOT ENERGIZE*	<p>Output 10 controls the Hi Vi Liquid Injection Port solenoid. If the LED (D10) for Output 10 (MOD 10) is on, check for the proper panel voltage between position 4 and 2 on the P3 DIO connector on Digital I/O board #1. If the proper voltage is not found, check the fuse (F10) and if the fuse is OK, check the output module (MOD 10). If the voltage was OK check for the proper voltage between position 2 on the P3 DIO connector and position 12 on the terminal strip. If voltage is OK, check for the proper voltage between position 12 and 2 on the terminal strip. If the voltage is OK, check the solenoid. NOTE: For an RXB and a GST compressor model, this output should only be on when the Compressor is running and the Vi is at 5.0.</p>
ECONOMIZER*	<p>Output 11 (MOD 11) controls the Economizer Solenoid Valve. If the LED (D11) for Output 11 (MOD 11) is on, check for the proper panel voltage between position 4 and 5 on the P3 DIO connector on Digital I/O board #1. If the proper voltage is not found, check the fuse (F11) and if the fuse is OK, check the output module (MOD 11). If the voltage was OK, check for the proper voltage between position 5 on the P3 DIO connector and position 11 on the terminal strip. If voltage is OK, check for the proper voltage between position 11 and 2 on the terminal strip. If the voltage is OK, check the solenoid.</p> <p>NOTE: The economizer output will be on based on the Economizer On/Off setpoint.</p>
ALARM CIRCUIT DOES NOT ENERGIZE	<p>Output 22 (MOD 22) controls the Alarm Circuit. The Alarm should turn on only when there is a warning or shutdown. If the Alarm does not occur when these conditions are found and the LED (D22) for Output 22 (MOD 22) is off, check for the proper panel voltage between position 4 and 2 on the P6 DIO connector on Digital I/O board #1. If the proper voltage is not found, check the fuse (F22) and if the fuse is OK, check the output module (MOD 22). If the voltage was OK, check for the proper voltage between position 2 on the P6 DIO connector and position 21 on the terminal strip.</p>

SYMPTOM	PROBABLE CAUSES and CORRECTIONS
CONTROL PANEL DOES NOT RESPOND TO REMOTE CONTROL SIGNALS	<p>Digital I/O Board 2, Inputs 3 through 5 can be used to operate the compressor from a remote location. NOTE: Check the Operating display to verify that the compressor and the Slide Valve are in REMOTE I/O.</p> <p>If the Input 3 (MOD 3) does not turn on, check if the LED (D3) is lit when it should be. If it isn't, check the fuse (F3) and if the fuse is OK, check the input module (MOD 3).</p> <p>If the Input 4 (MOD 4) does not turn on, check if the LED (D4) is lit when it should be. If it isn't, check the fuse (F4) and if the fuse is OK, check the input module (MOD 4).</p> <p>If the Input 5 (MOD 5) does not turn on, check if the LED (D5) is lit when it should be. If it isn't, check the fuse (F5) and if the fuse is OK, check the input module (MOD 5).</p>
MOTOR LOAD CONTROL(FORCED UNLOAD) OCCURS AT HIGH MOTOR AMPS	<p>The current transformer is used to convert the AC motor amps to a DC voltage signal for the microprocessor. If the %FLA reading from the Operating display is incorrect, contact the Frick® Service Department.</p>
PRESSURES ON THE OPERATING SCREEN DO NOT APPEAR CORRECT	<p>1st – Check the range and sensor type in the setup of the panel. If this is correct:</p> <p>2nd – Open transducers that can be isolated from the system and opened to atmosphere, these would be Suction, Oil and Filter (if present). Set these transducers to 0g pressure or atmospheric pressure if your readings are in absolute. Close the transducers from atmosphere and reopen to the system/package. After these pressures have settled down, set the Discharge to match the Oil pressure.</p> <p>NOTE: Reference the Pressure Transducer Conversion Data Chart.</p>
COMPRESSOR WITH SLIDE VALVE DOES NOT AUTOMATICALLY LOAD OR UNLOAD*	<p>Verify that the Slide Valve Mode [AUTO] has been set and AUTO appears under Slide Valve Mode on the Home Status screen.</p> <p>If the problem persists, see the Troubleshooting section SLIDE VALVE DOES NOT LOAD and/or UNLOAD.</p>
COMPRESSOR THAT STEPS ON CAPACITY DOES NOT AUTOMATICALLY LOAD OR UNLOAD*	<p>Verify that the Capacity Mode [AUTO] has been set and AUTO appears under Capacity Mode on the Home screen.</p> <p>If the problem persists, see the Troubleshooting section COMPRESSOR DOES NOT LOAD and/or UNLOAD.</p>

NOTES

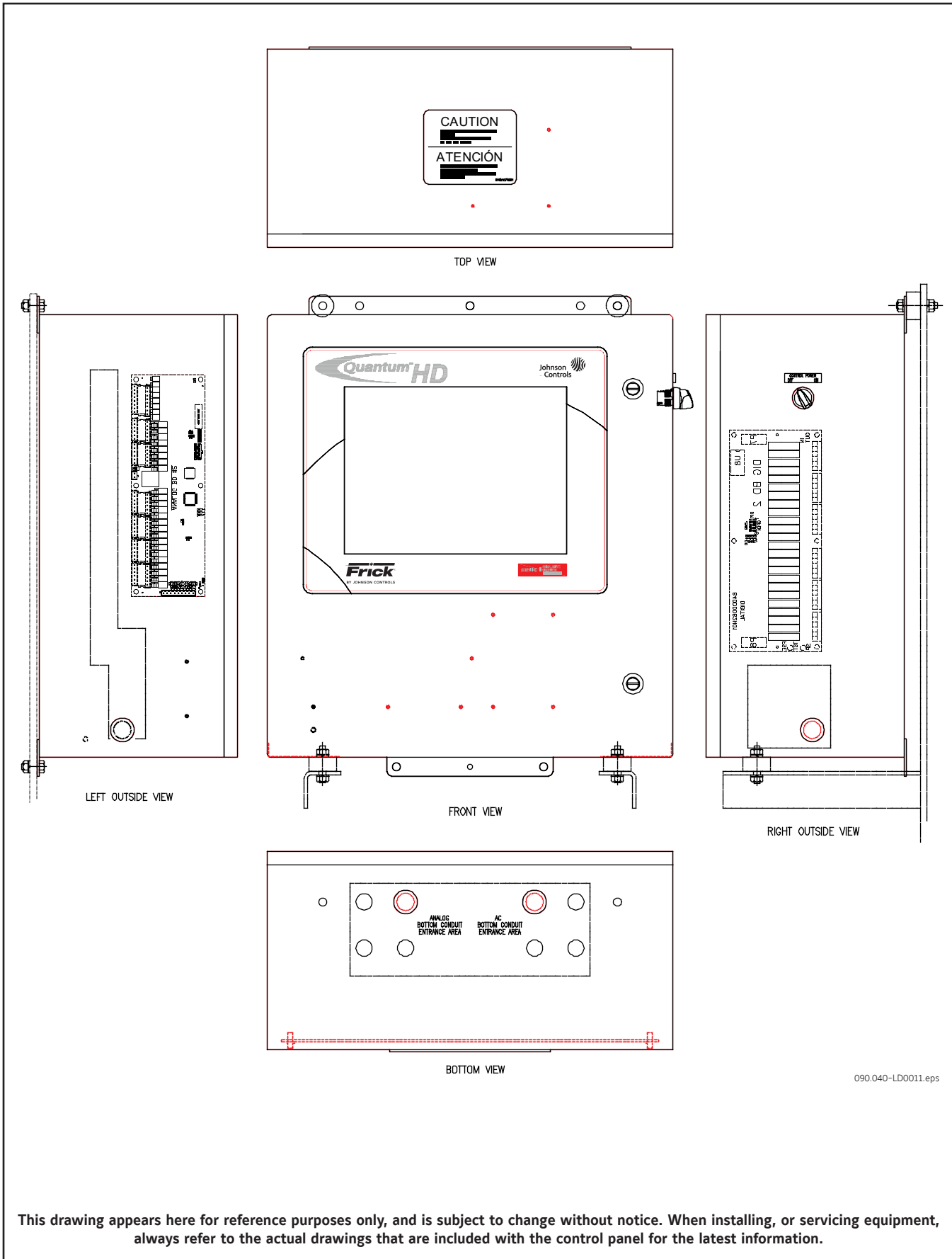
SECTION 10

QUANTUM™ HD UNITY DRAWINGS

This table lists the numbers for the drawings that appear on the following pages. The drawings shown here are the latest revision as of the printing of this manual. These drawings appear here for reference purposes only, and are subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

Table 21. Quantum HD Unity Drawings List

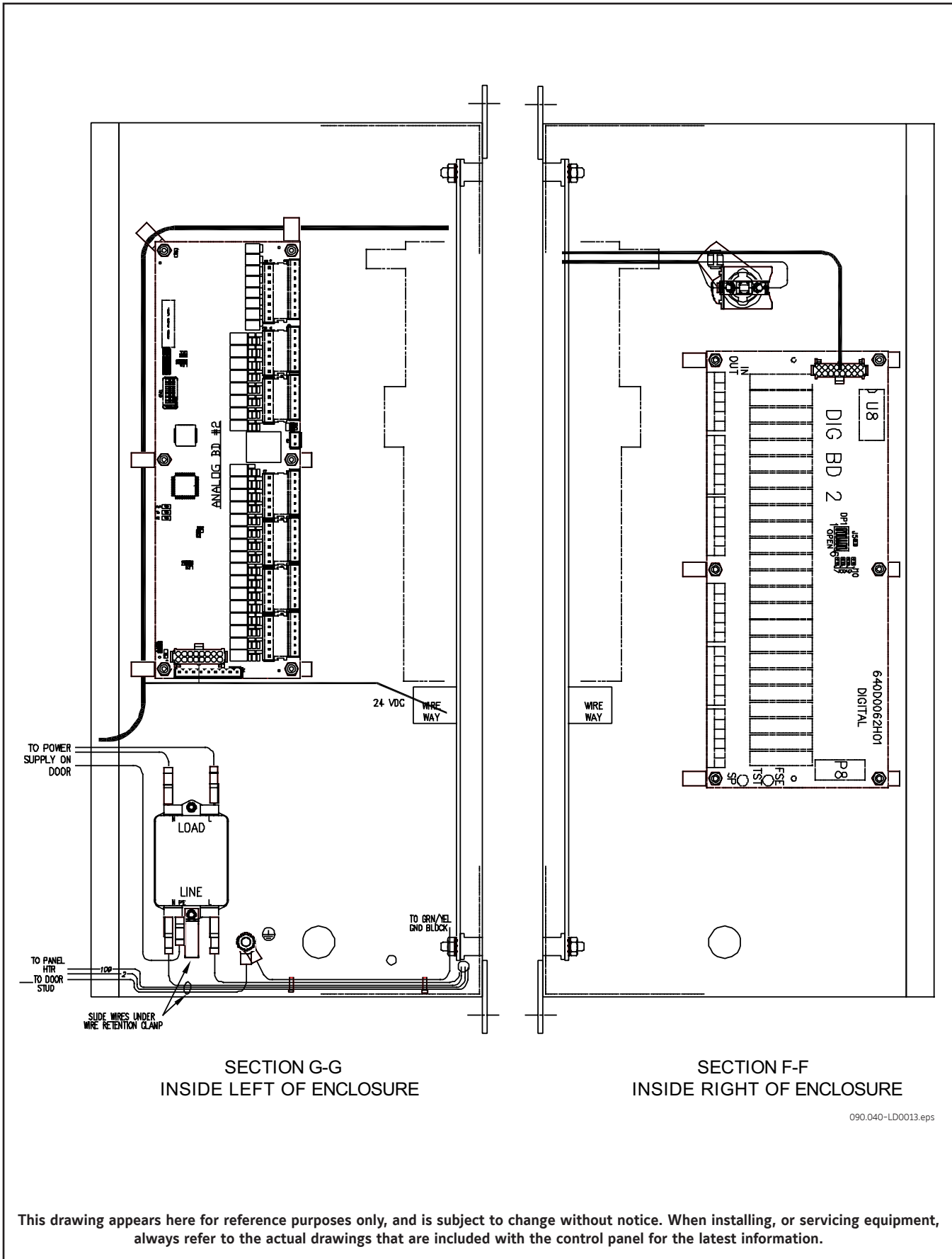
Wiring Diagrams	Page	Drawing Number
HD Panel Center Assembly	66 - 69	649D5922 Rev. D
RXF With Capacity Slide Transmitter	70 - 75	649D5943 Rev. -
RWFII With Capacity Slide Transmitter	76 - 81	649D5944 Rev. -
RXF / RXB With Capacity Slide Potentiometer	82 - 87	649D5945 Rev. -
RWBII With Capacity Slide Potentiometer	88 - 93	649D5946 Rev. -
RDB	94 - 99	649D5947 Rev. -
PhD for 32 channel Analog Board	100	649D5050 Rev. D
Digital I/O Board 2	101 - 102	649D5948 Rev. -
Analog I/O Board 2	103 - 104	649D5949 Rev. -
Other Drawings	Page	Drawing Number
DC Power and Communications Harness	105	639D0204 Rev. A
AC I/O Harness for Digital Boards 1 and 2	106	639D0203 Rev. -
Isolater Repeater Module (Isolates Communications Signals)	107	639C0133 Rev. A
Communications Wiring Diagrams	108	N/A
Point-to-Point Field Wiring Diagram	109	N/A
Vyper (up to 565 amps) to Q5 HD Wiring Connections	Contact Frick Service	649D6002 Rev. -
Vyper (over 565 amps) to Q5 HD Wiring Connections	Contact Frick Service	649D6003 Rev. -
Enhancer to Q5 HD Wiring Connections	Contact Frick Service	649D6004 Rev. -



090.040-LD0011.eps

This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

Figure 31. Quantum HD Unity Panel Assembly (1/4)

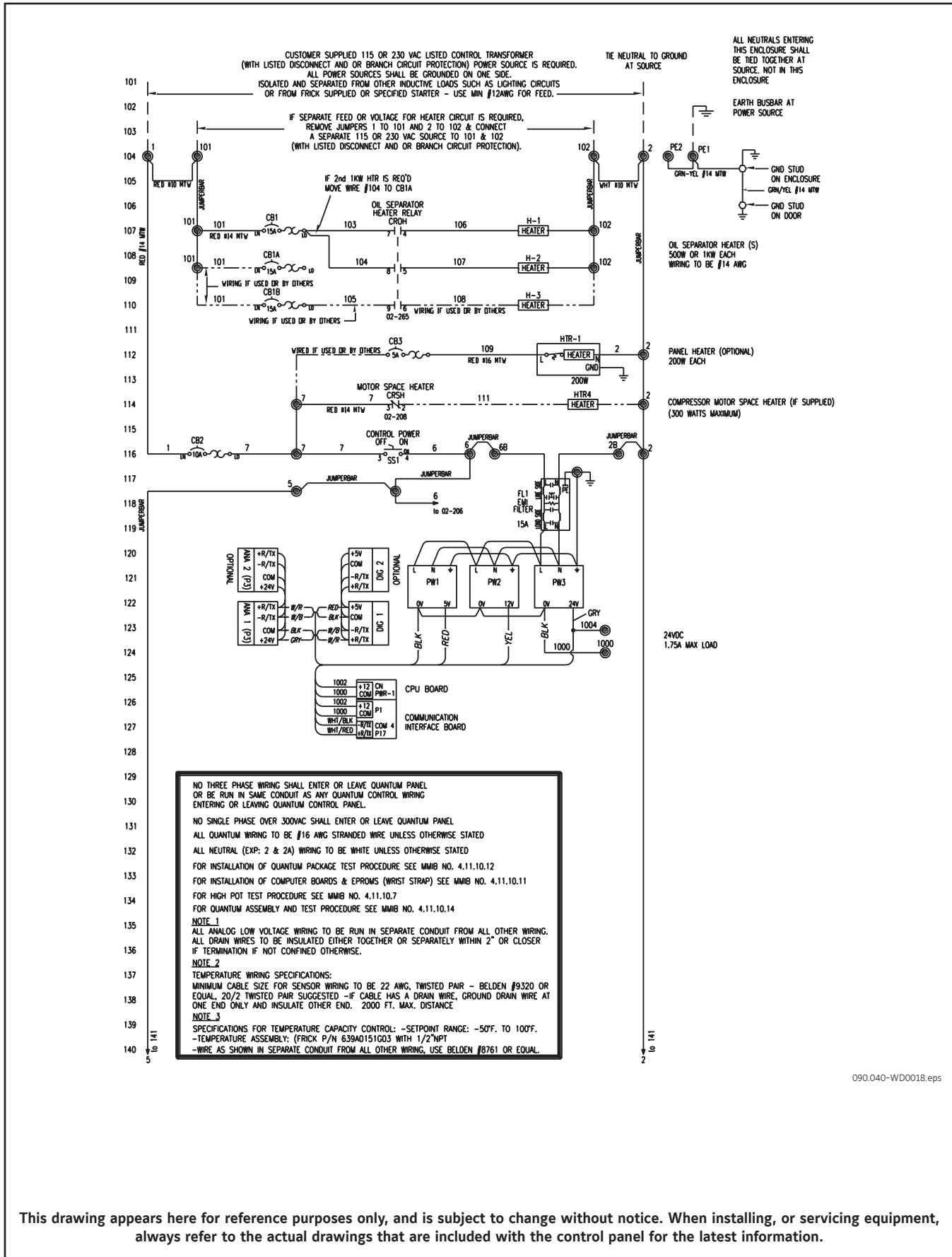


090.040-LD0013.eps

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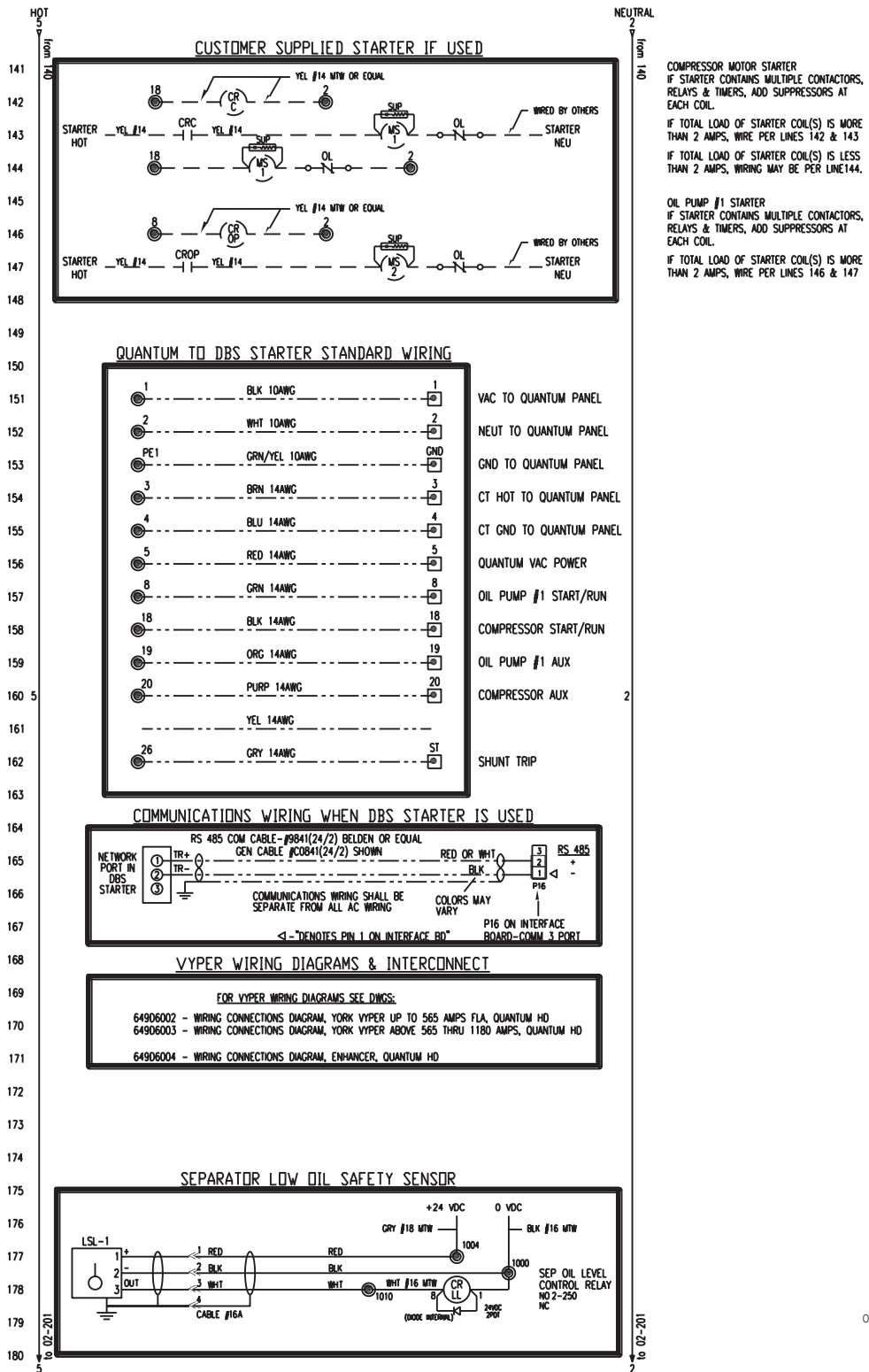
Figure 31b. Quantum HD Unity Panel Assembly (3/4)

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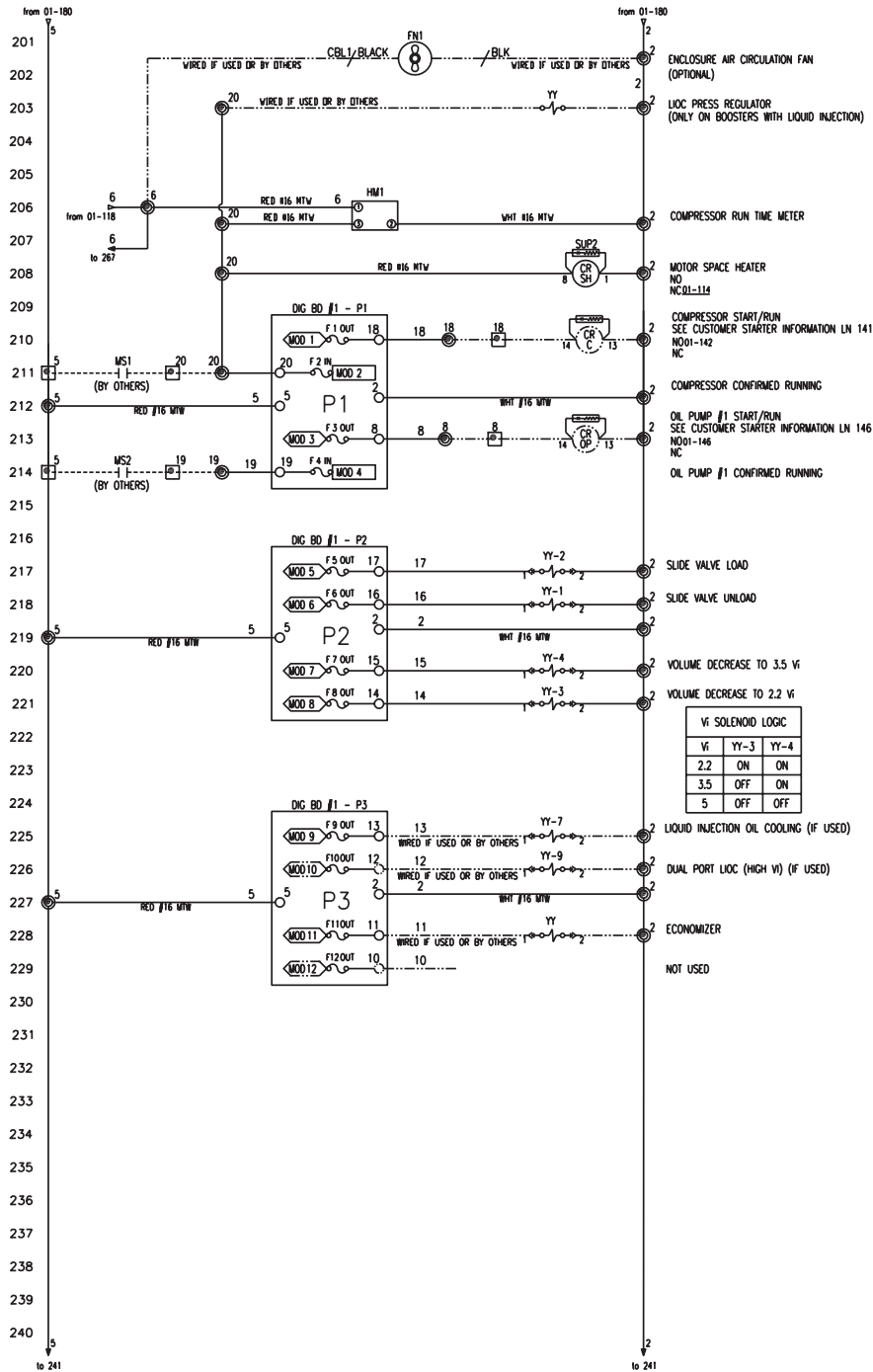
Figure 32. RXF Wiring Diagram (Capacity Slide Transmitter) (1/6)



090.040-WD0019.eps

This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

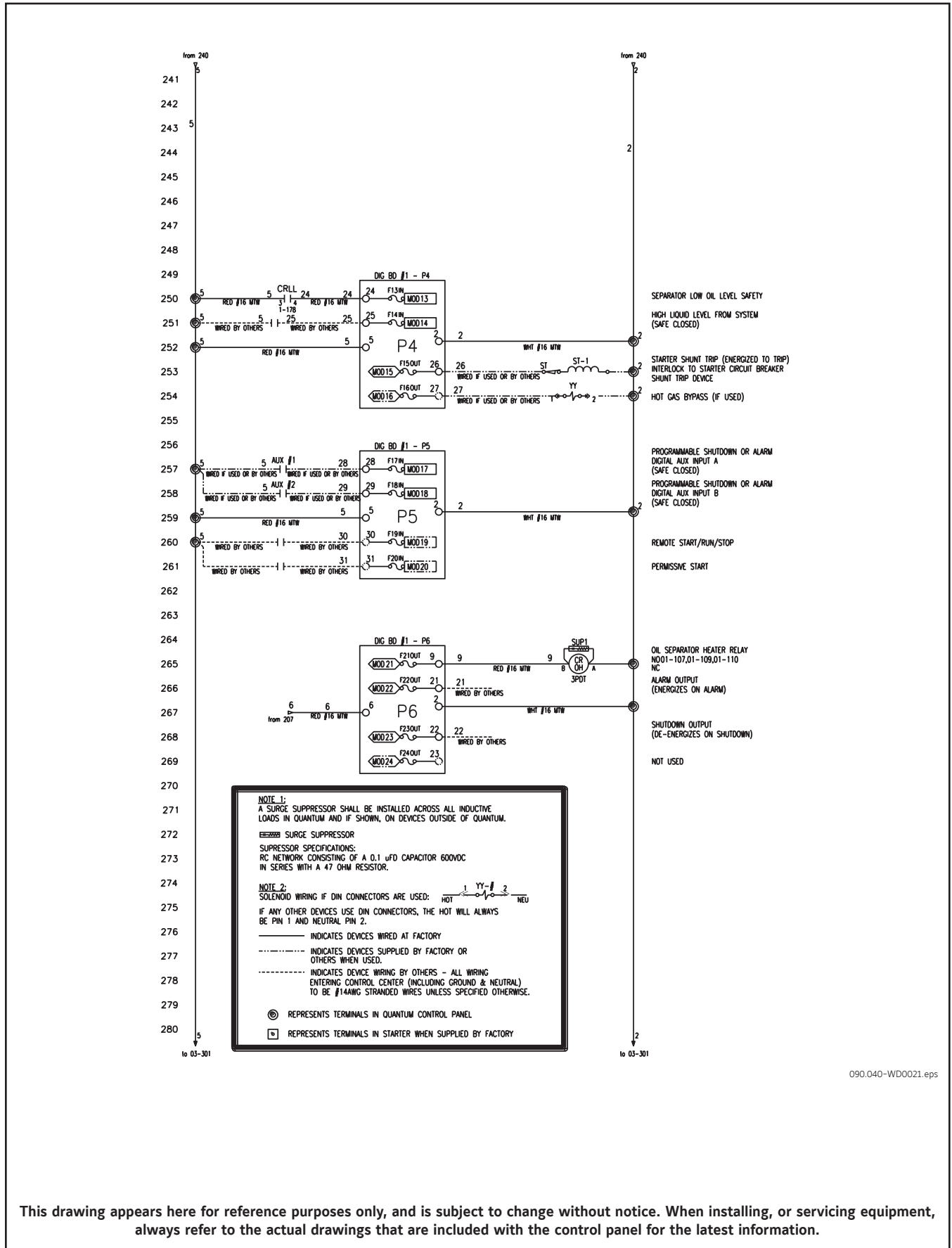
Figure 32a. RXF Wiring Diagram (Capacity Slide Transmitter) (2/6)



090.040-WD0020.eps

This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

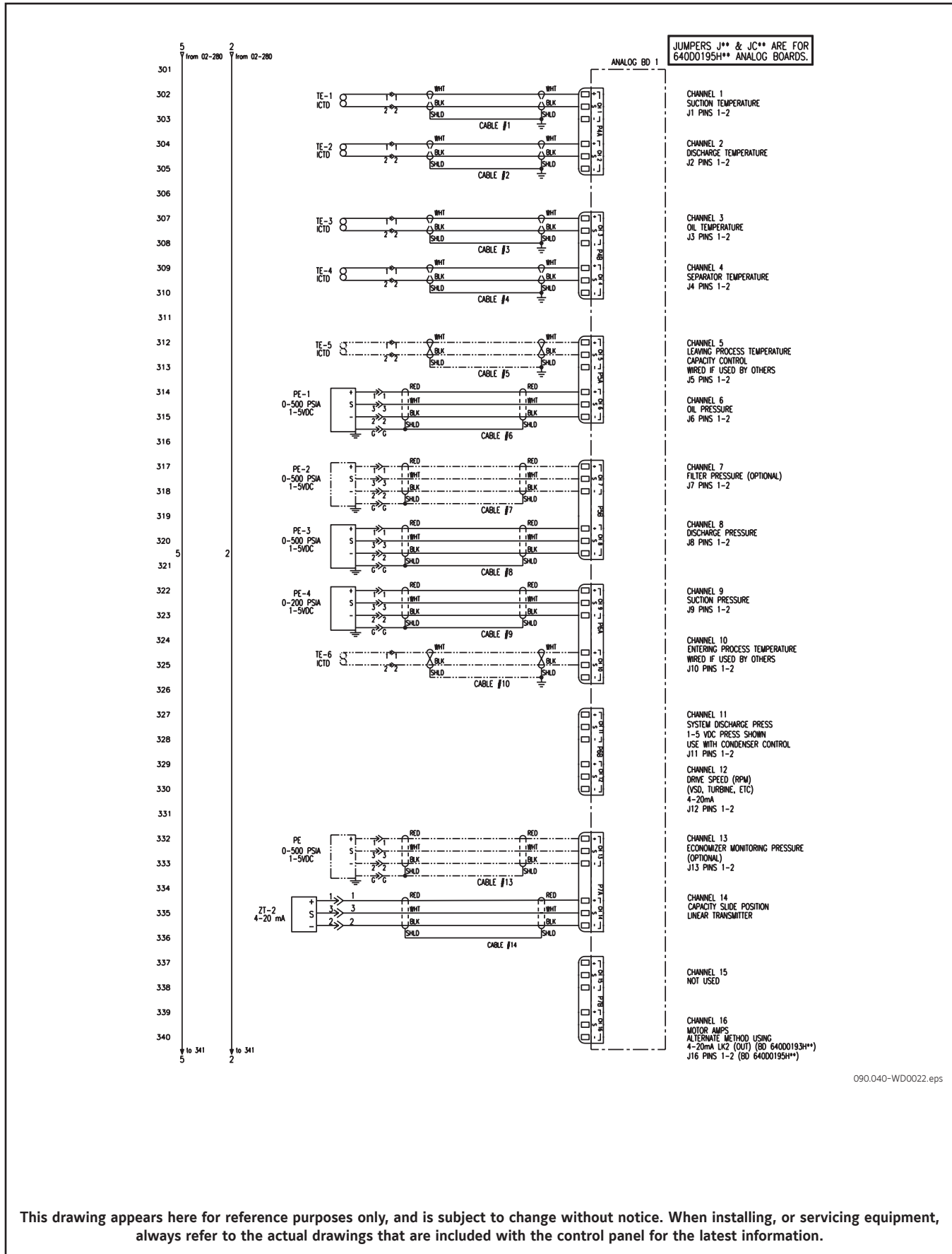
Figure 32b. RXF Wiring Diagram (Capacity Slide Transmitter) (3/6)



090.040-WD0021.eps

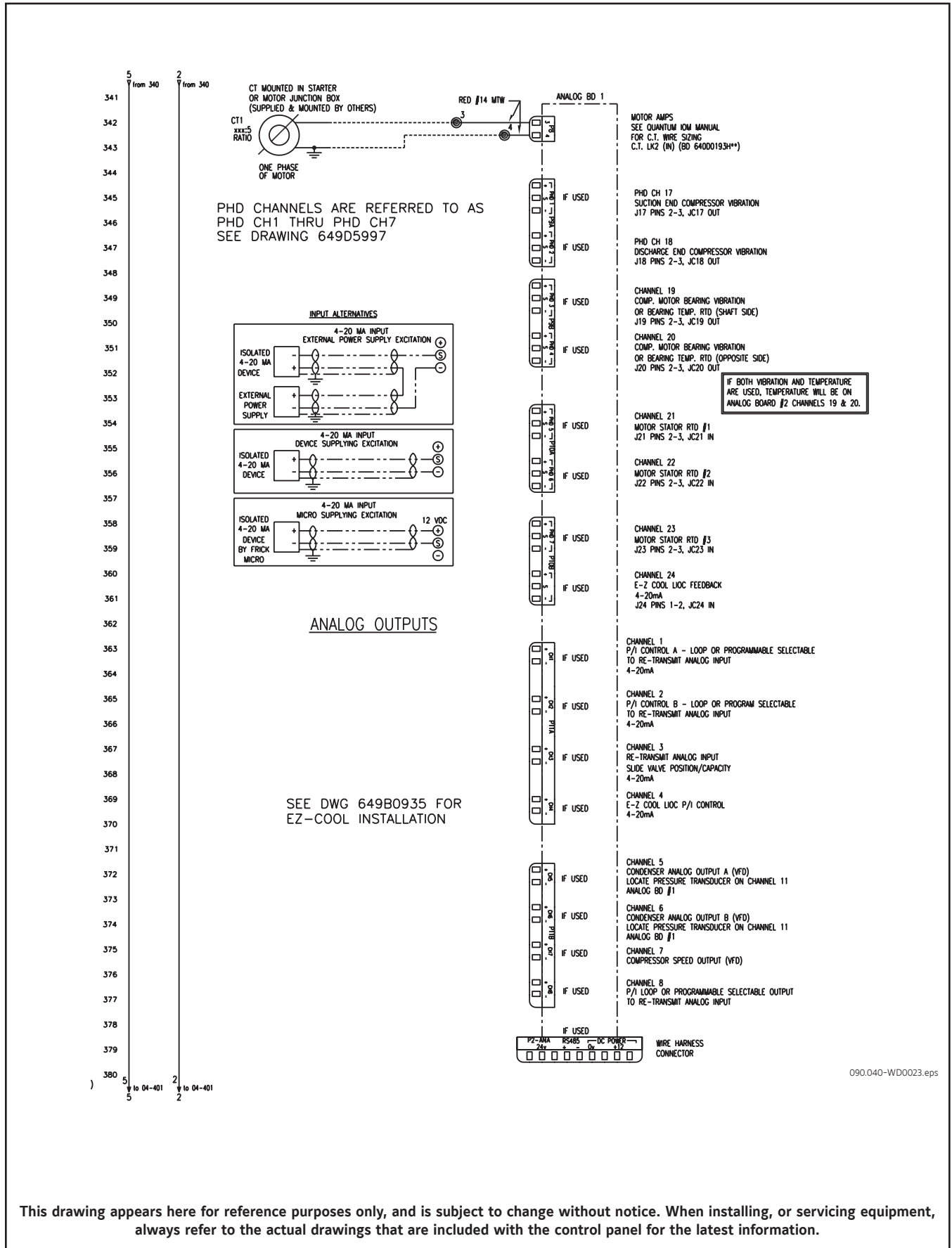
This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

Figure 32c. RXF Wiring Diagram (Capacity Slide Transmitter)(4/6)



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Figure 32d. RXF Wiring Diagram (Capacity Slide Transmitter) (5/6)

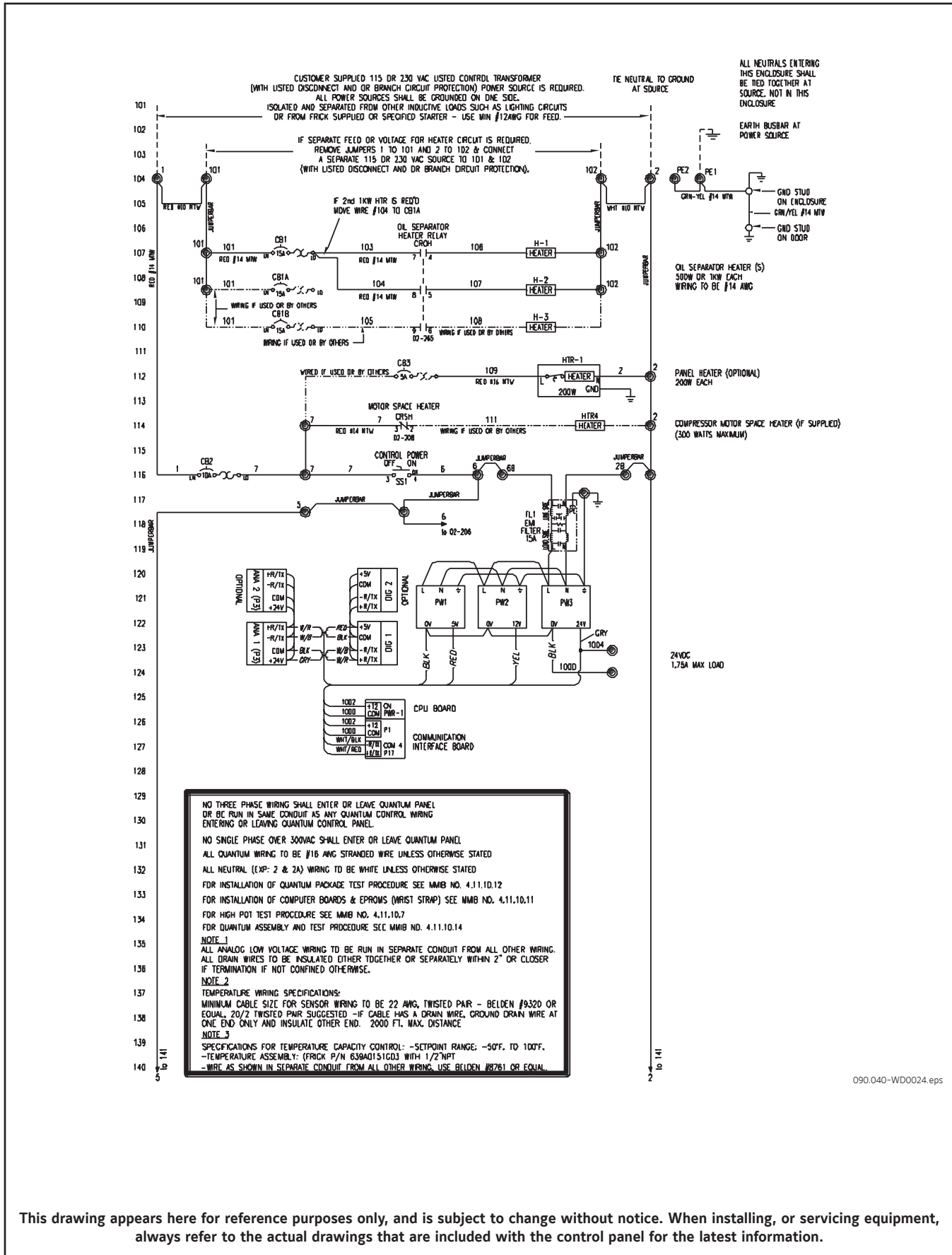


090.040-WD0023.eps

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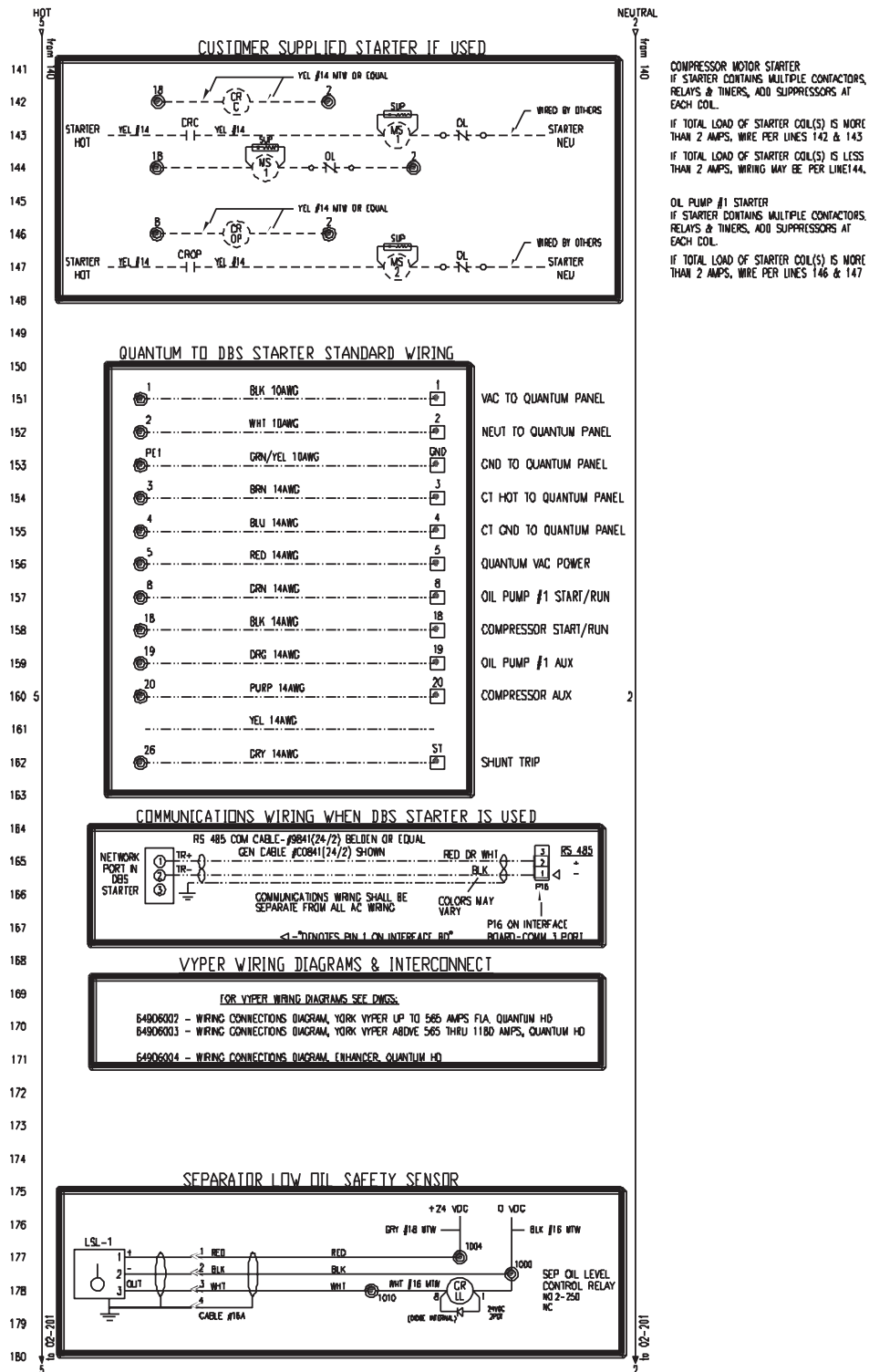
Figure 32e. RFX Wiring Diagram (Capacity Slide Transmitter) (6/6)

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Figure 33. RWFII Wiring Diagram (Capacity Slide Transmitter) (1/6)



COMPRESSOR MOTOR STARTER
IF STARTER CONTAINS MULTIPLE CONTACTORS, RELAYS & TIMERS, ADD SUPPRESSORS AT EACH COIL.

IF TOTAL LOAD OF STARTER COIL(S) IS MORE THAN 2 AMPS, WIRE PER LINES 142 & 143

IF TOTAL LOAD OF STARTER COIL(S) IS LESS THAN 2 AMPS, WIRING MAY BE PER LINE 144.

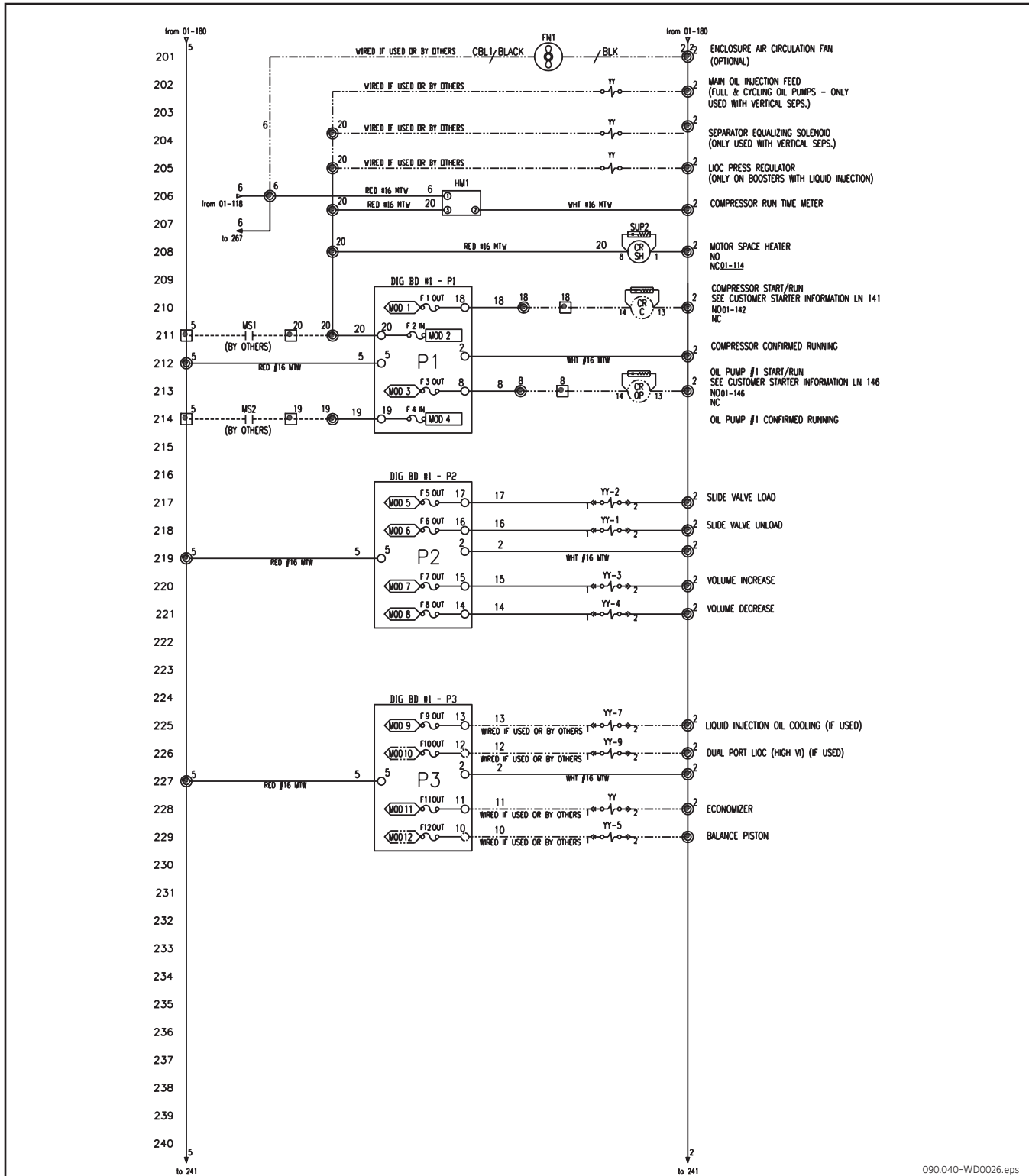
OIL PUMP #1 STARTER
IF STARTER CONTAINS MULTIPLE CONTACTORS, RELAYS & TIMERS, ADD SUPPRESSORS AT EACH COIL.

IF TOTAL LOAD OF STARTER COIL(S) IS MORE THAN 2 AMPS, WIRE PER LINES 146 & 147

This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

Figure 33a. RWFII Wiring Diagram (Capacity Slide Transmitter) (2/6)

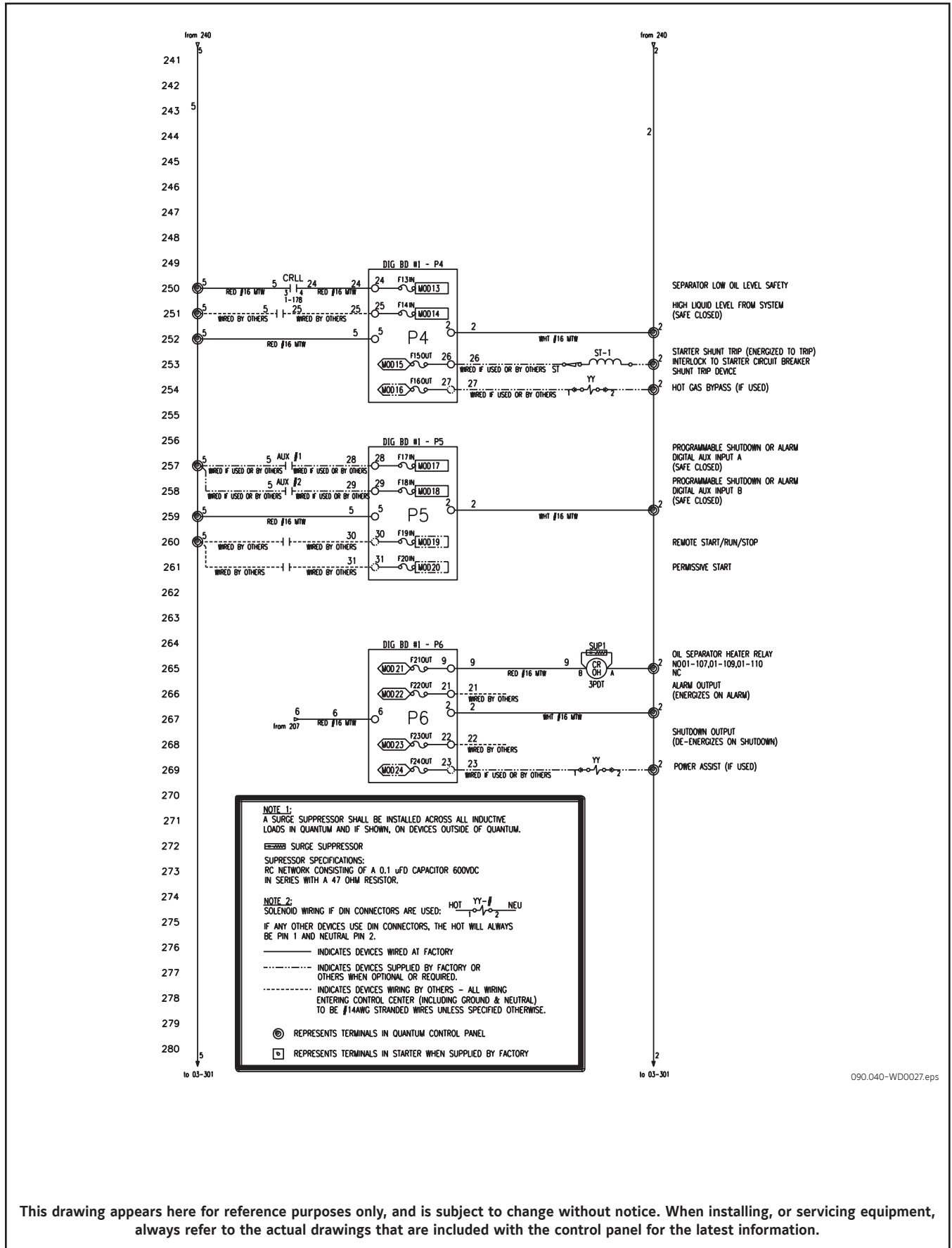
QUANTUM™ HD UNITY COMPRESSOR CONTROL PANEL
MAINTENANCE



090.040-WD0026.eps

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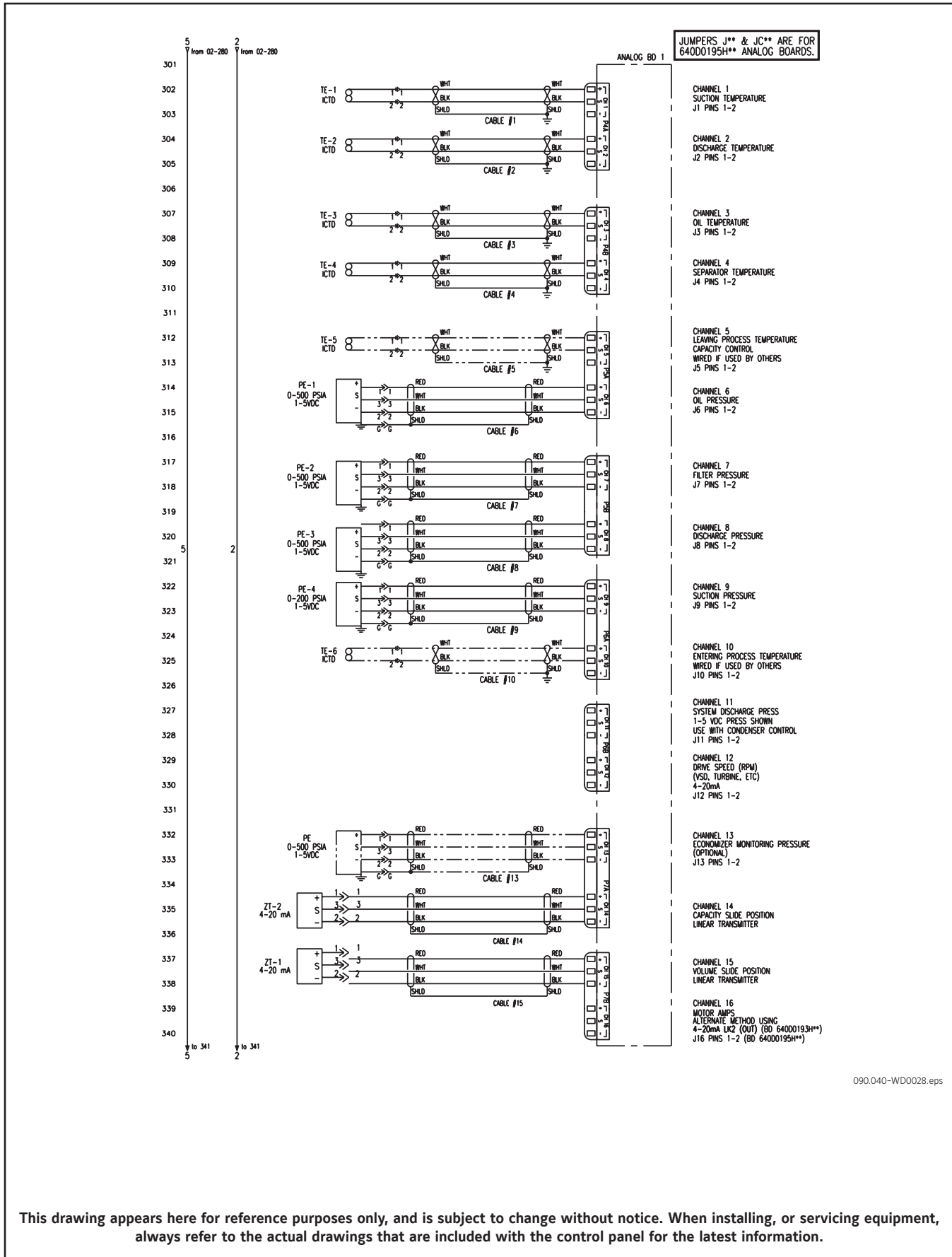
Figure 33b. Wiring Diagram – RWFII with Capacity Slide Transmitter (3/6)



This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

Figure 33c. Wiring Diagram – RWFII with Capacity Slide Transmitter (4/6)

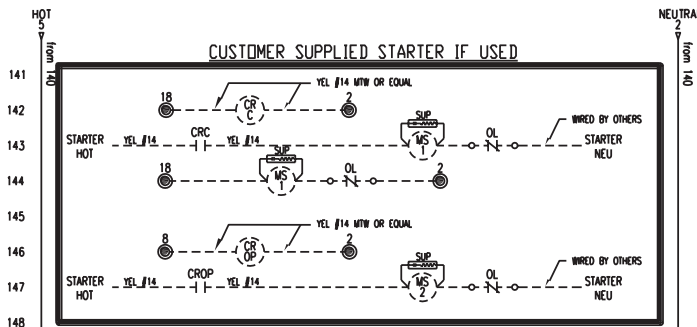
QUANTUM™ HD UNITY COMPRESSOR CONTROL PANEL
MAINTENANCE



090.040-WD0028.eps

This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

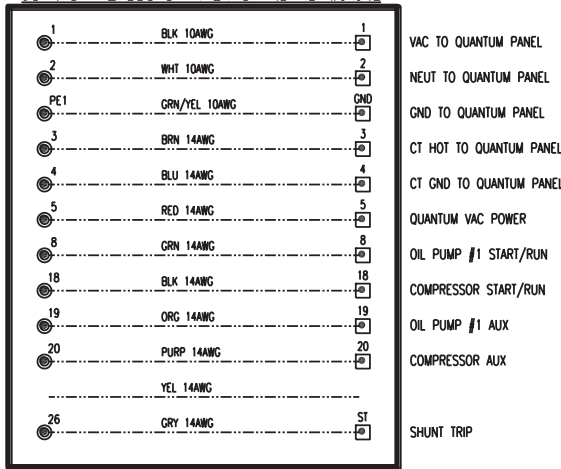
Figure 33d. Wiring Diagram – RWFI with Capacity Slide Transmitter (5/6)



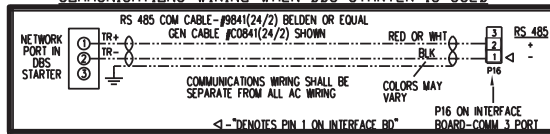
COMPRESSOR MOTOR STARTER
IF STARTER CONTAINS MULTIPLE CONTACTORS,
RELAYS & TIMERS, ADD SUPPRESSORS AT
EACH COIL.
IF TOTAL LOAD OF STARTER COIL(S) IS MORE
THAN 2 AMPS, WIRE PER LINES 142 & 143
IF TOTAL LOAD OF STARTER COIL(S) IS LESS
THAN 2 AMPS, WIRING MAY BE PER LINE144.

OIL PUMP #1 STARTER
IF STARTER CONTAINS MULTIPLE CONTACTORS,
RELAYS & TIMERS, ADD SUPPRESSORS AT
EACH COIL.
IF TOTAL LOAD OF STARTER COIL(S) IS MORE
THAN 2 AMPS, WIRE PER LINES 146 & 147

QUANTUM TO DBS STARTER STANDARD WIRING



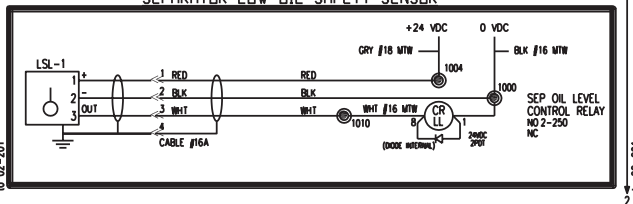
COMMUNICATIONS WIRING WHEN DBS STARTER IS USED



VYPER WIRING DIAGRAMS & INTERCONNECT

FOR VYPER WIRING DIAGRAMS SEE DWGS:
64906002 - WIRING CONNECTIONS DIAGRAM, YORK VYPER UP TO 565 AMPS FLA, QUANTUM HD
64906003 - WIRING CONNECTIONS DIAGRAM, YORK VYPER ABOVE 565 THRU 1180 AMPS, QUANTUM HD
64906004 - WIRING CONNECTIONS DIAGRAM, ENHANCER, QUANTUM HD

SEPARATOR LOW OIL SAFETY SENSOR



This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

Figure 34a. RXF / RXB Wiring Diagram (Capacity Slide Potentiometer) (2/6)

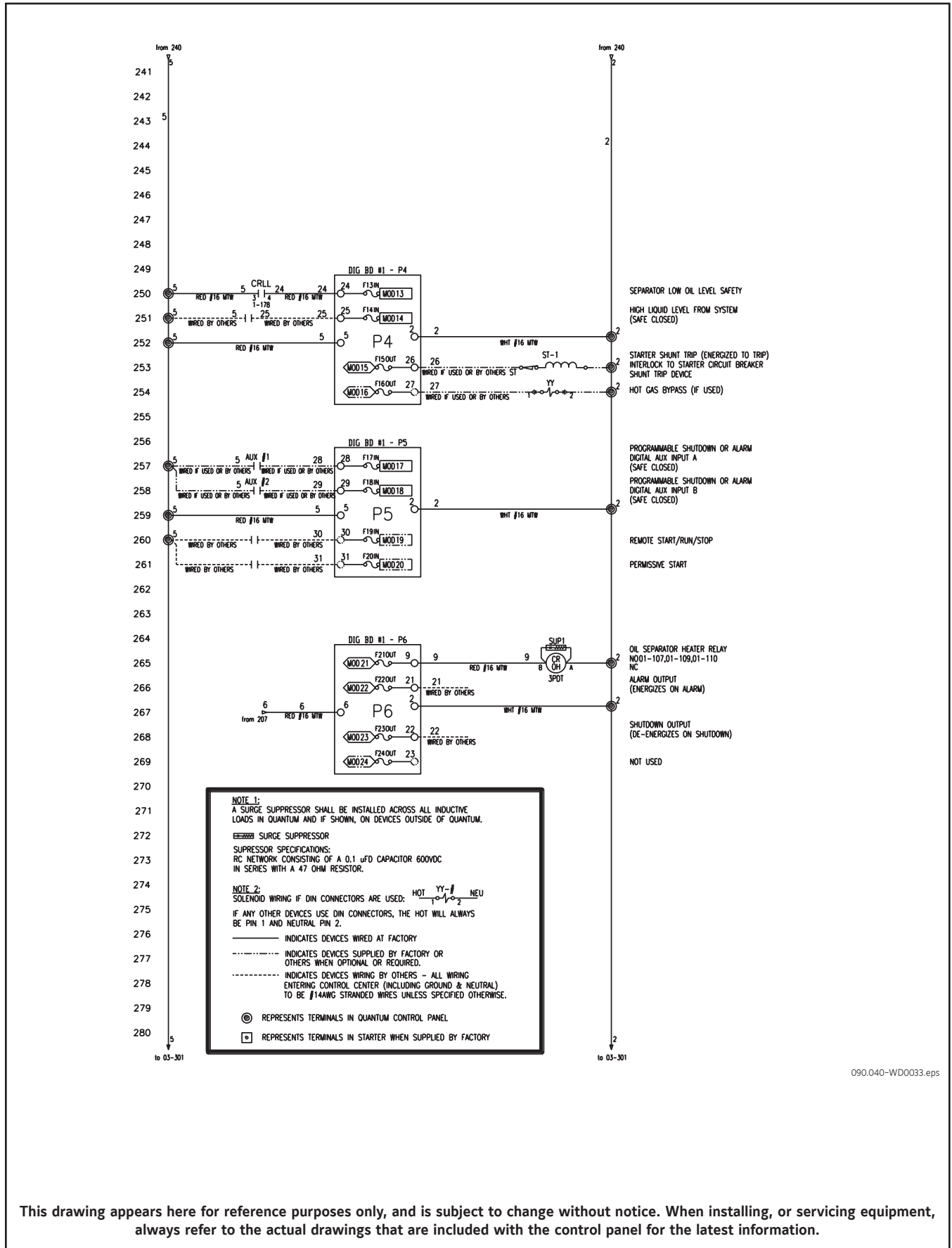
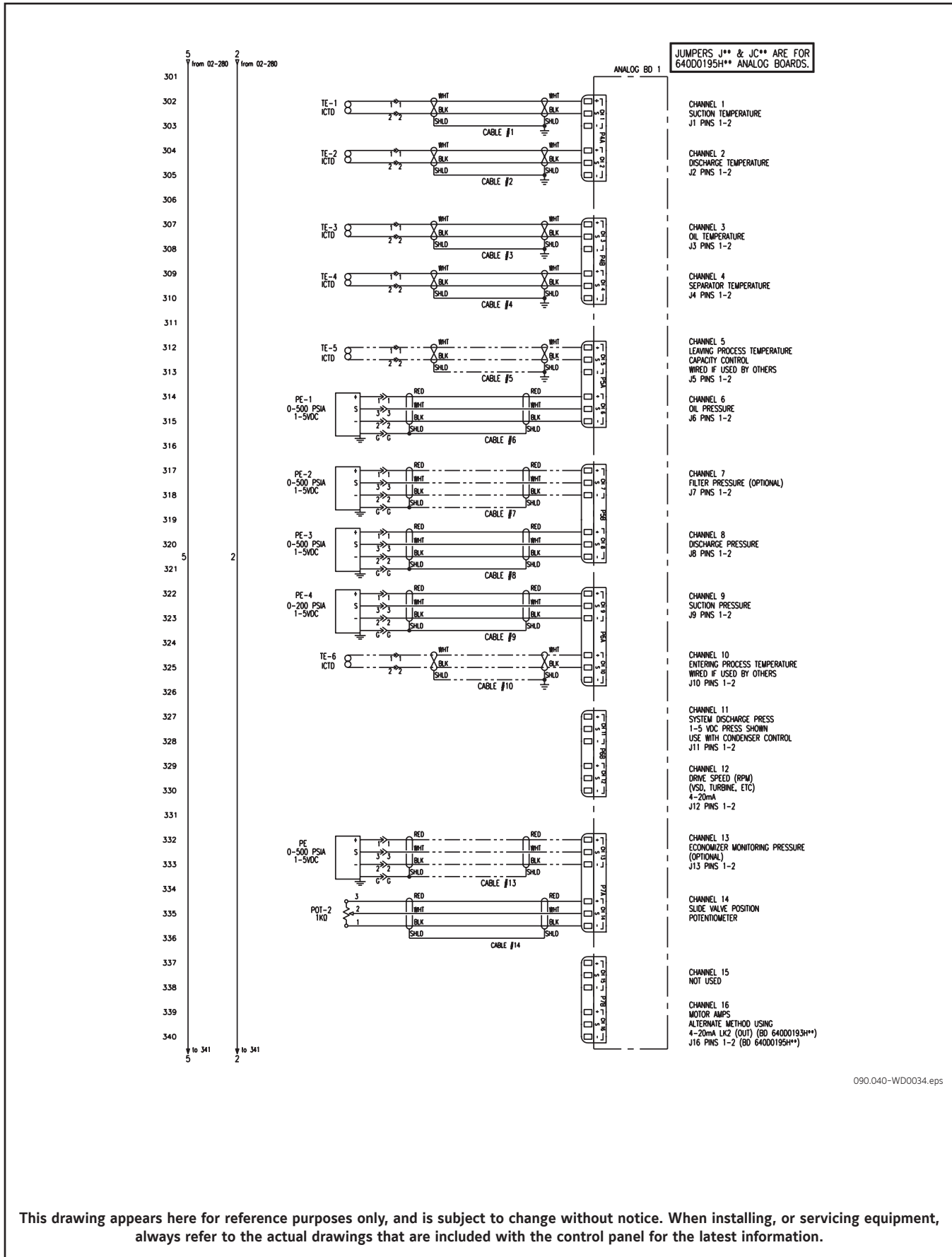


Figure 34c. RXF / RXB Wiring Diagram (Capacity Slide Potentiometer) (4/6)

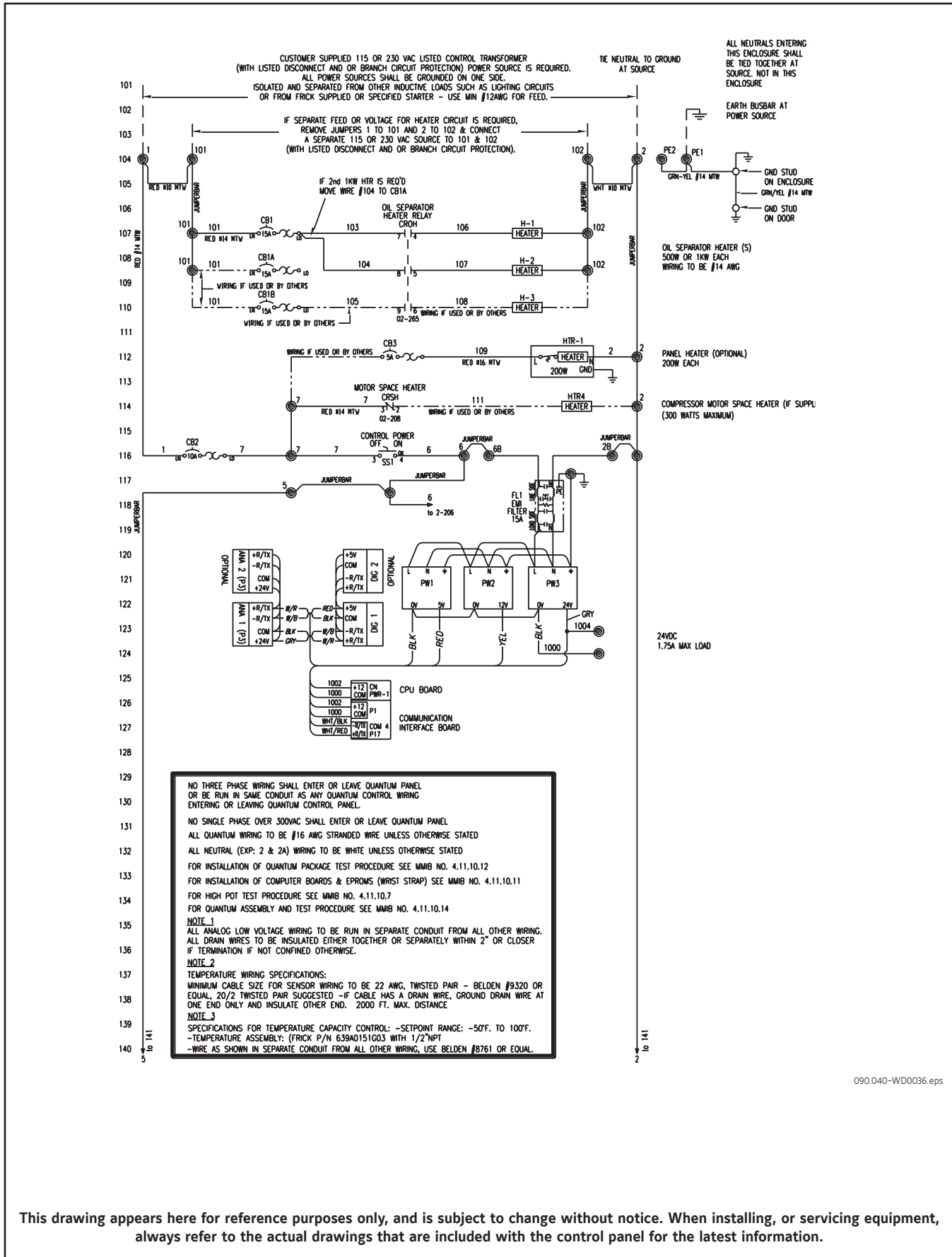


090.040-WD0034.eps

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Figure 34d. RXF / RXB Wiring Diagram (Capacity Slide Potentiometer) (5/6)

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090.040-WD0036.eps

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Figure 35. RWBII Wiring Diagram (Cap. Slide Potentiometer) (1/6)

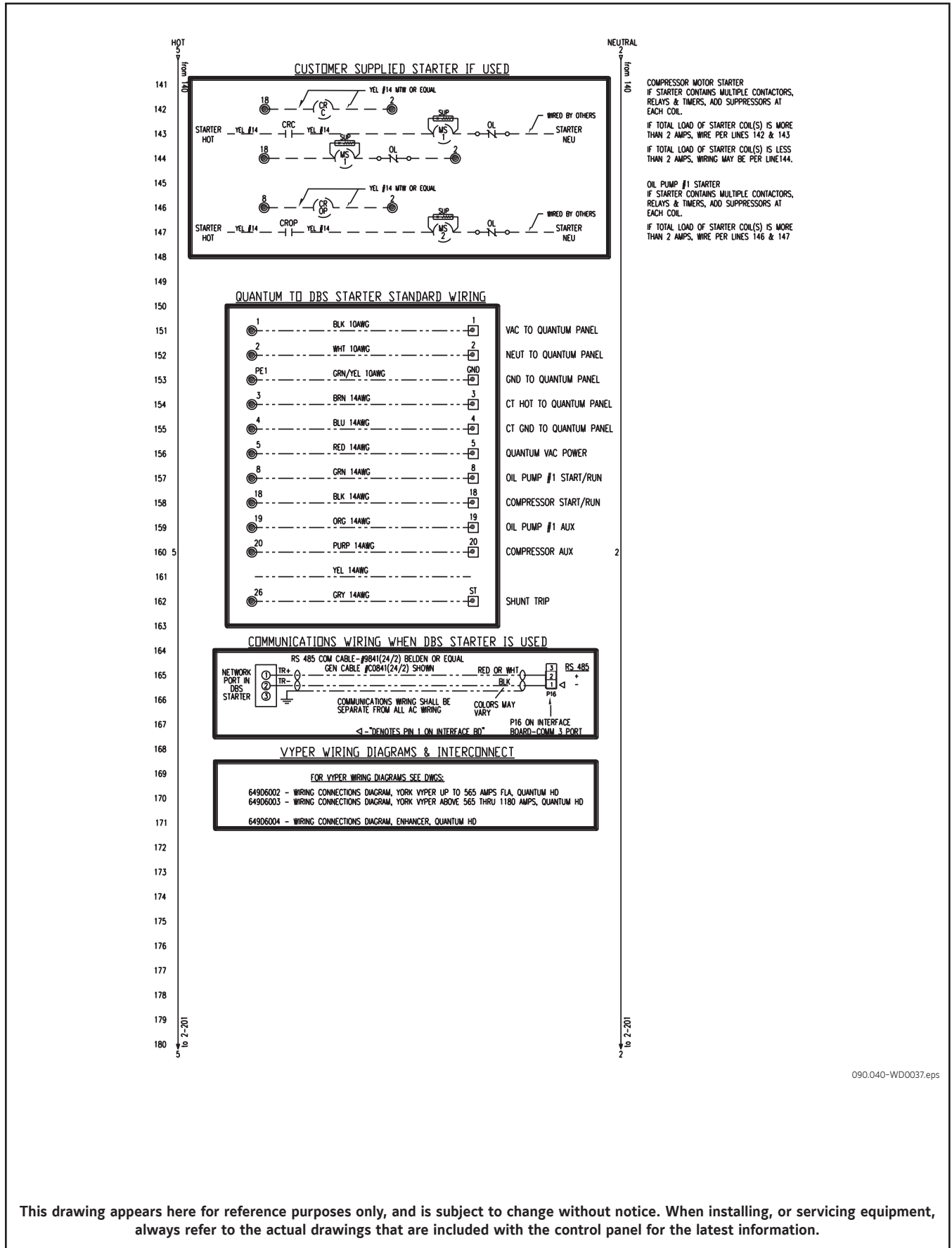
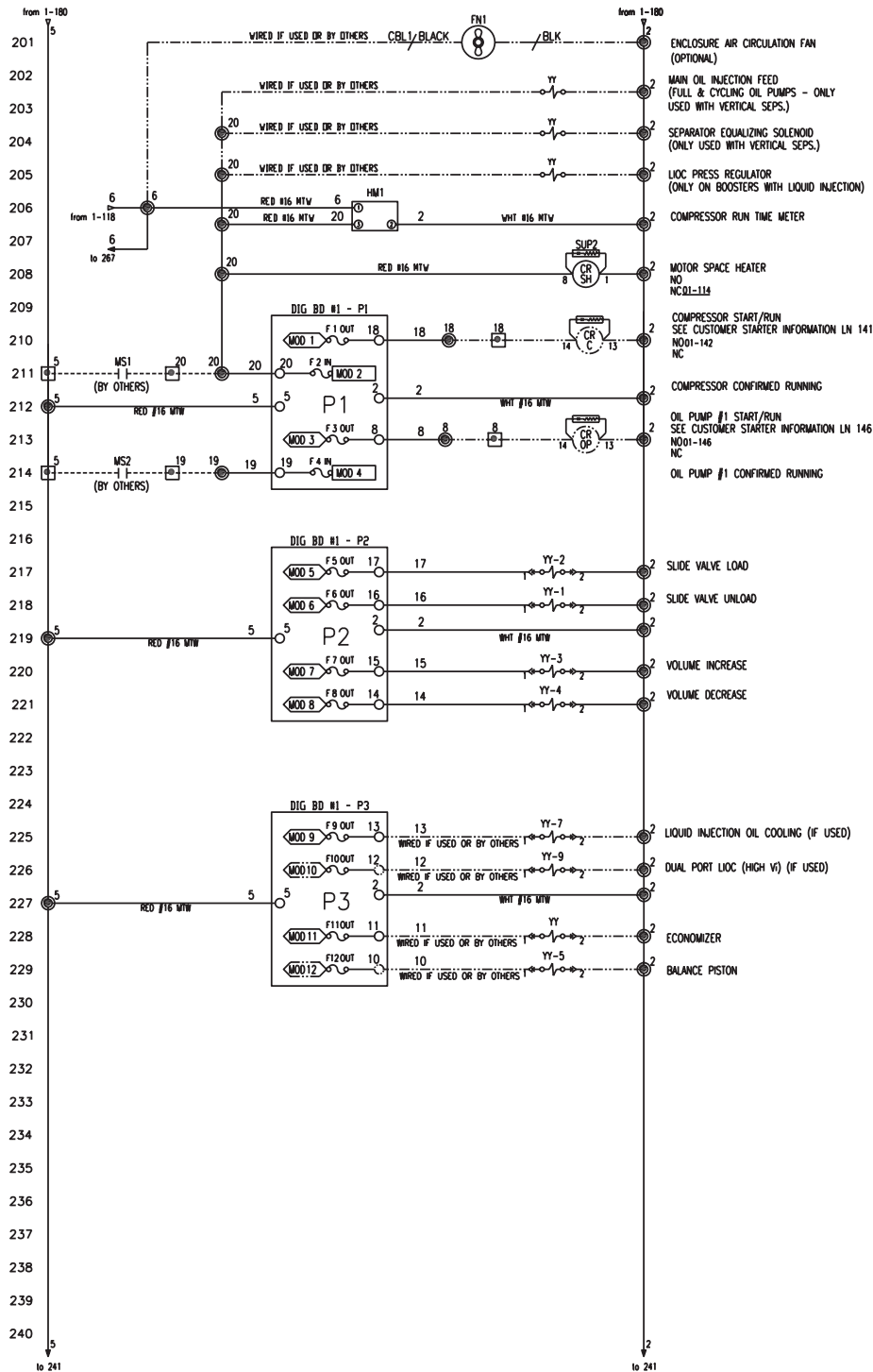


Figure 35a. RWBII Wiring Diagram (Capacity Slide Potentiometer) (2/6)

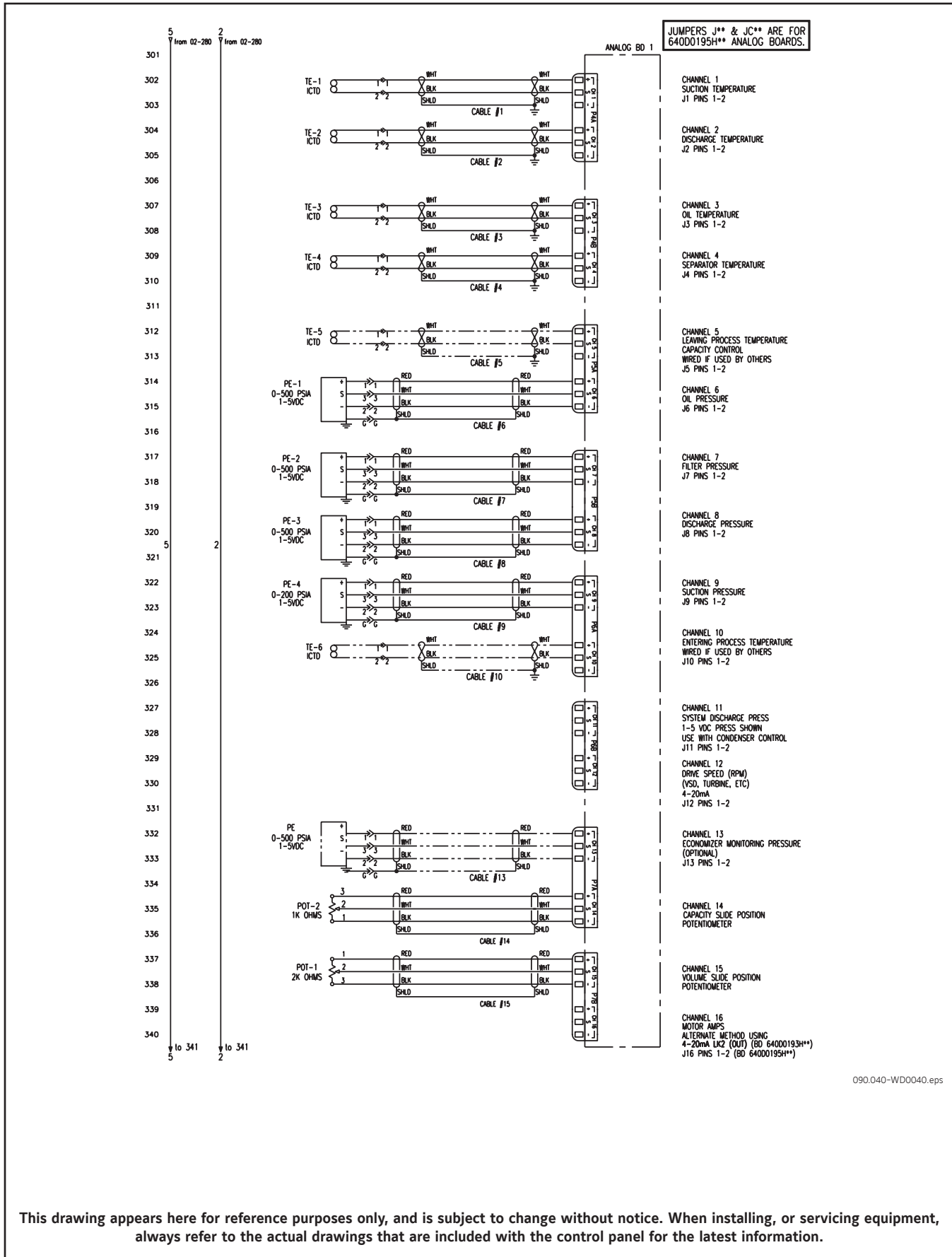
QUANTUM™ HD UNITY COMPRESSOR CONTROL PANEL
MAINTENANCE



090.040-WD0038.eps

This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

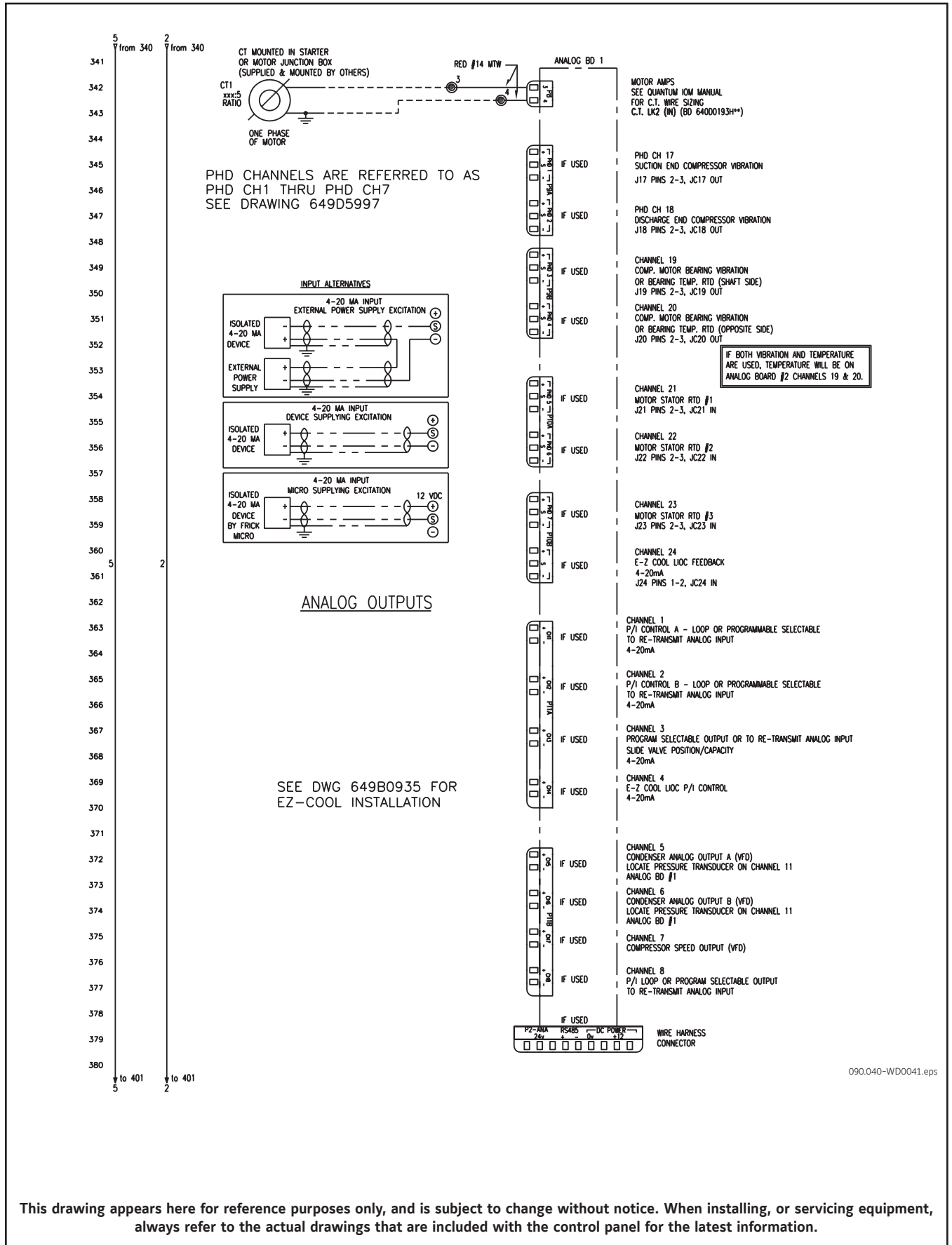
Figure 35b. RWBII Wiring Diagram (Capacity Slide Potentiometer) (3/6)



090.040-WD0040.eps

This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

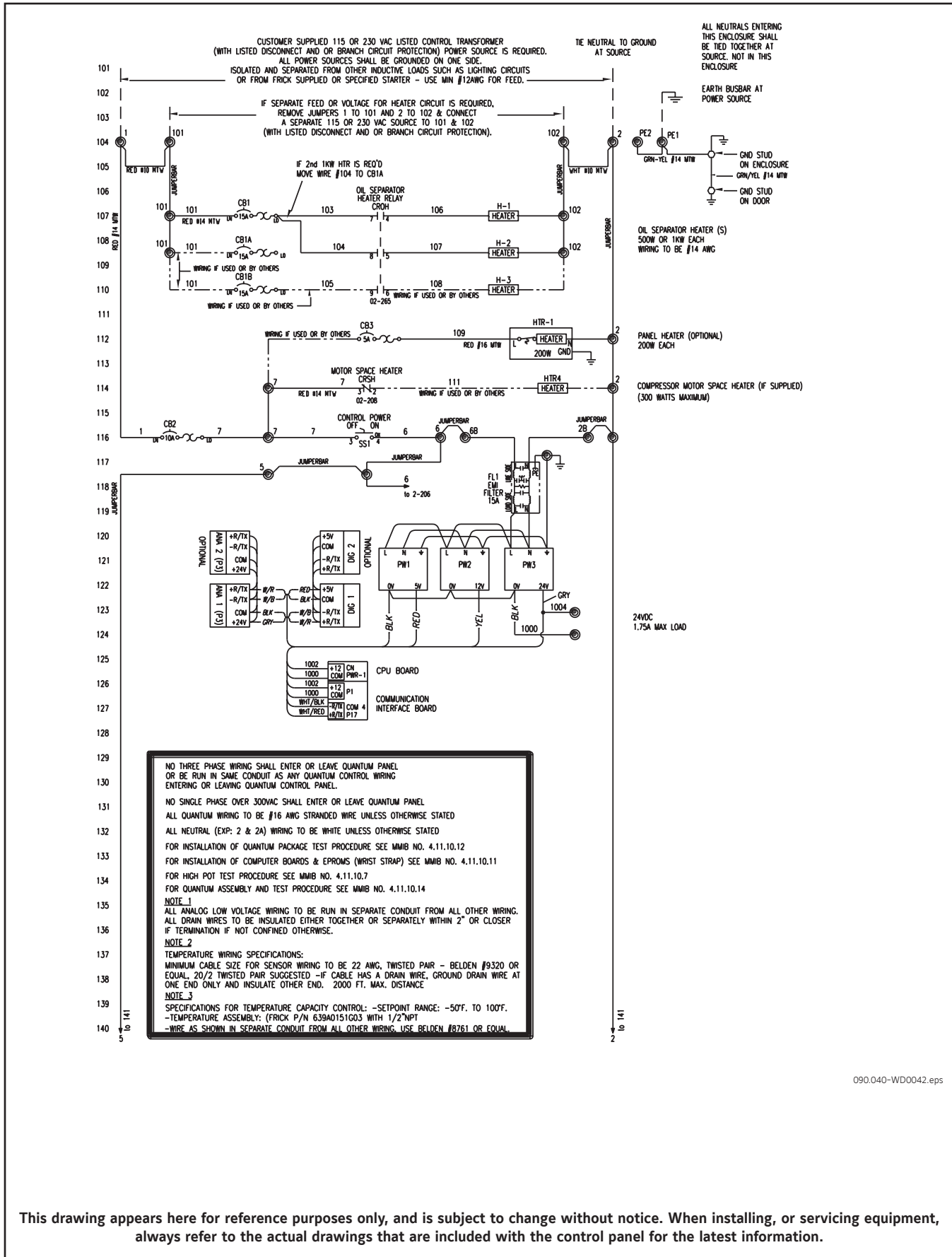
Figure 35d. RWBII Wiring Diagram (Capacity Slide Potentiometer) (5/6)



090.040-WD0041.eps

This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

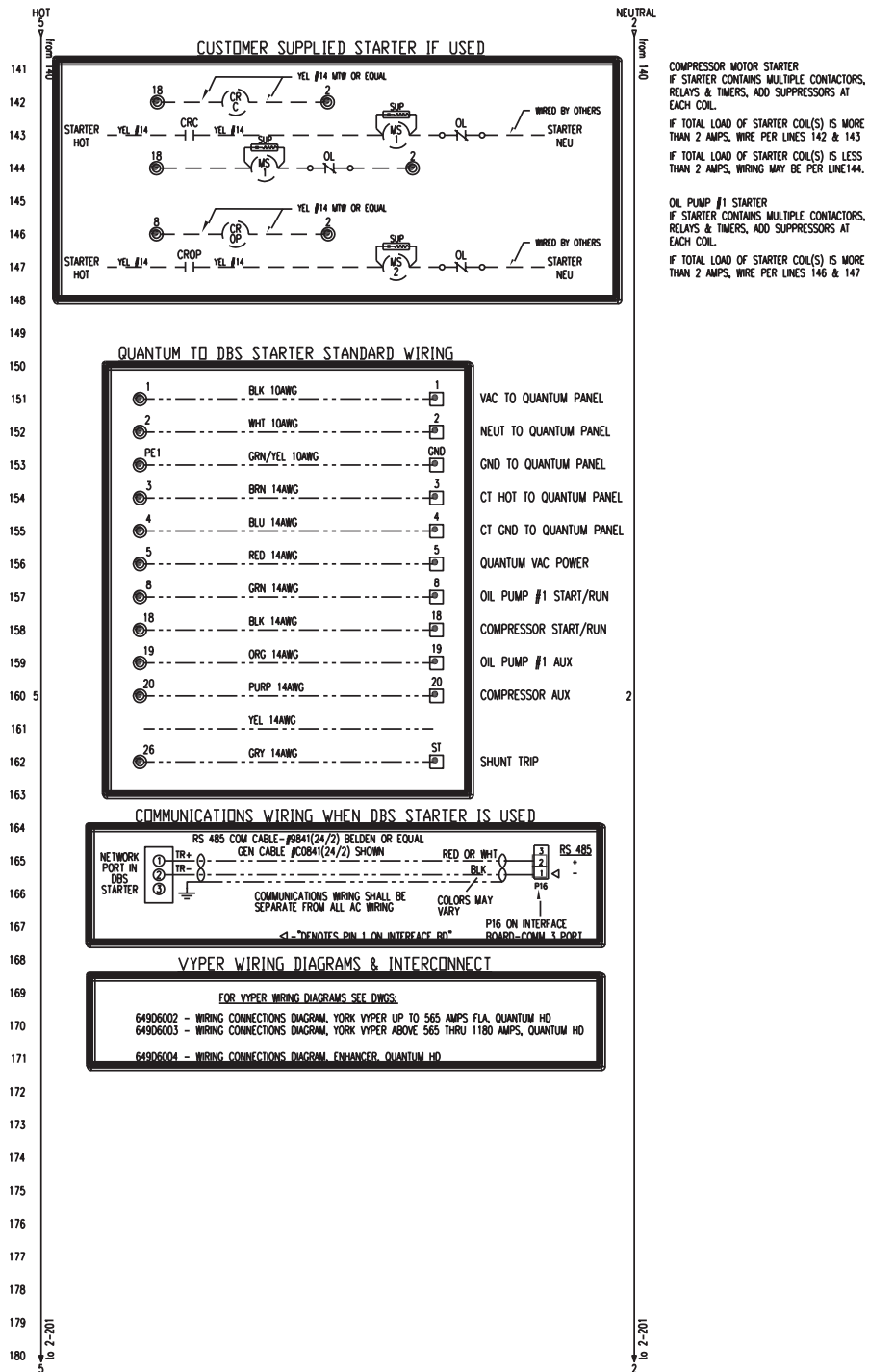
Figure 35e. RWBII Wiring Diagram (Capacity Slide Potentiometer) (6/6)



090.040-WD0042.eps

This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

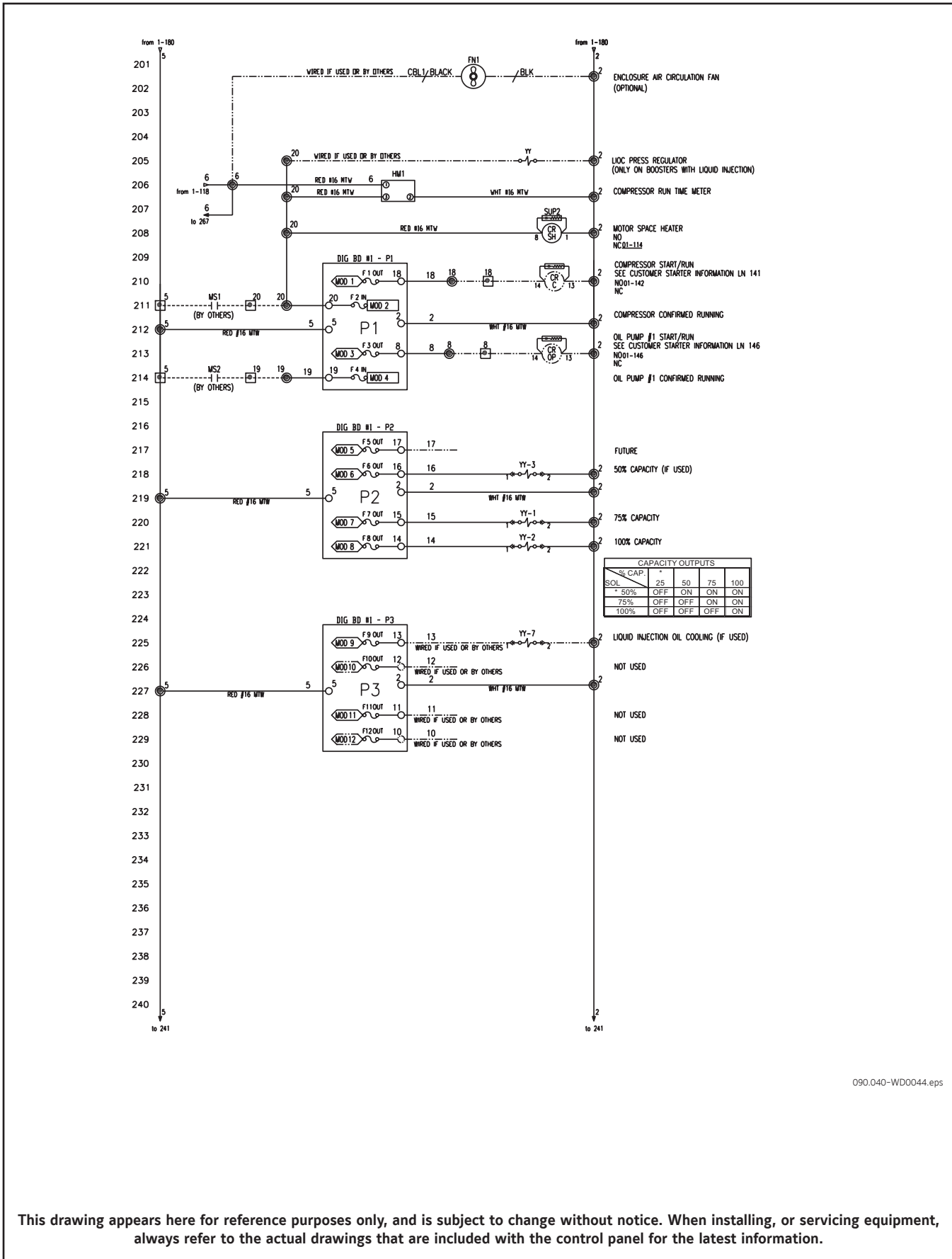
Figure 36. RDB Wiring Diagram (1/6)



This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

Figure 36a. RDB Wiring Diagram (2/6)

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090.040-WD0044.eps

This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

Figure 36b. RDB Wiring Diagram (3/6)

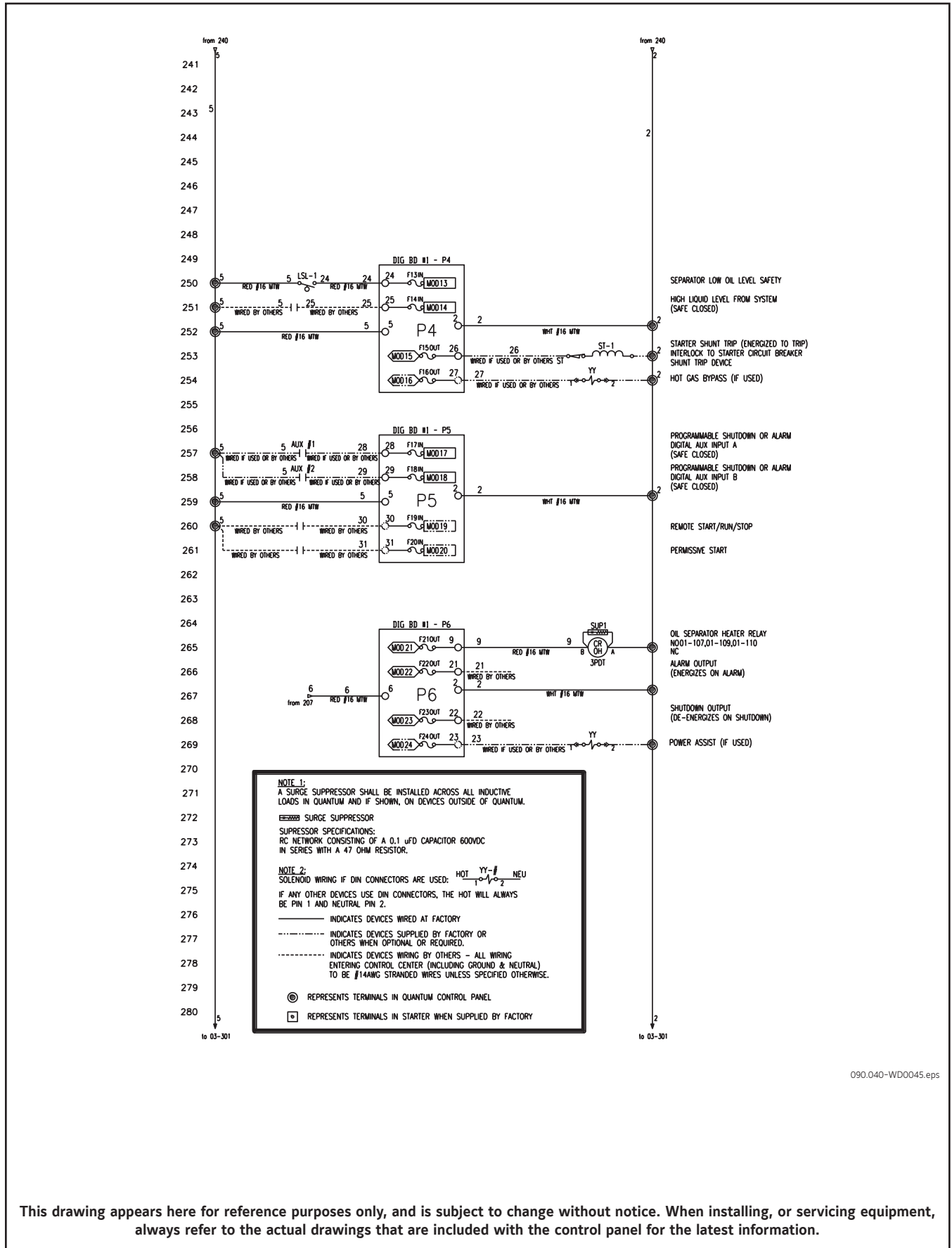
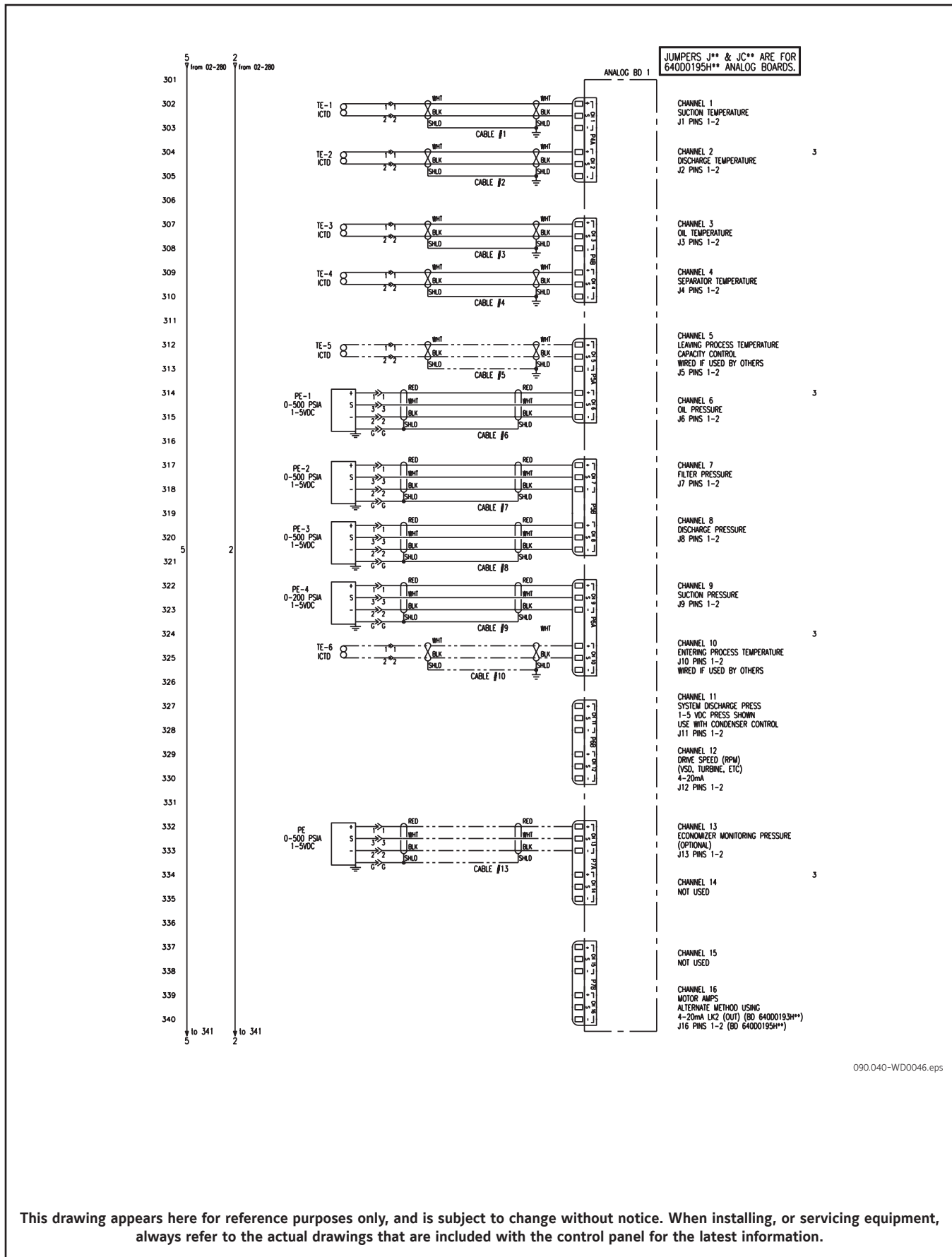


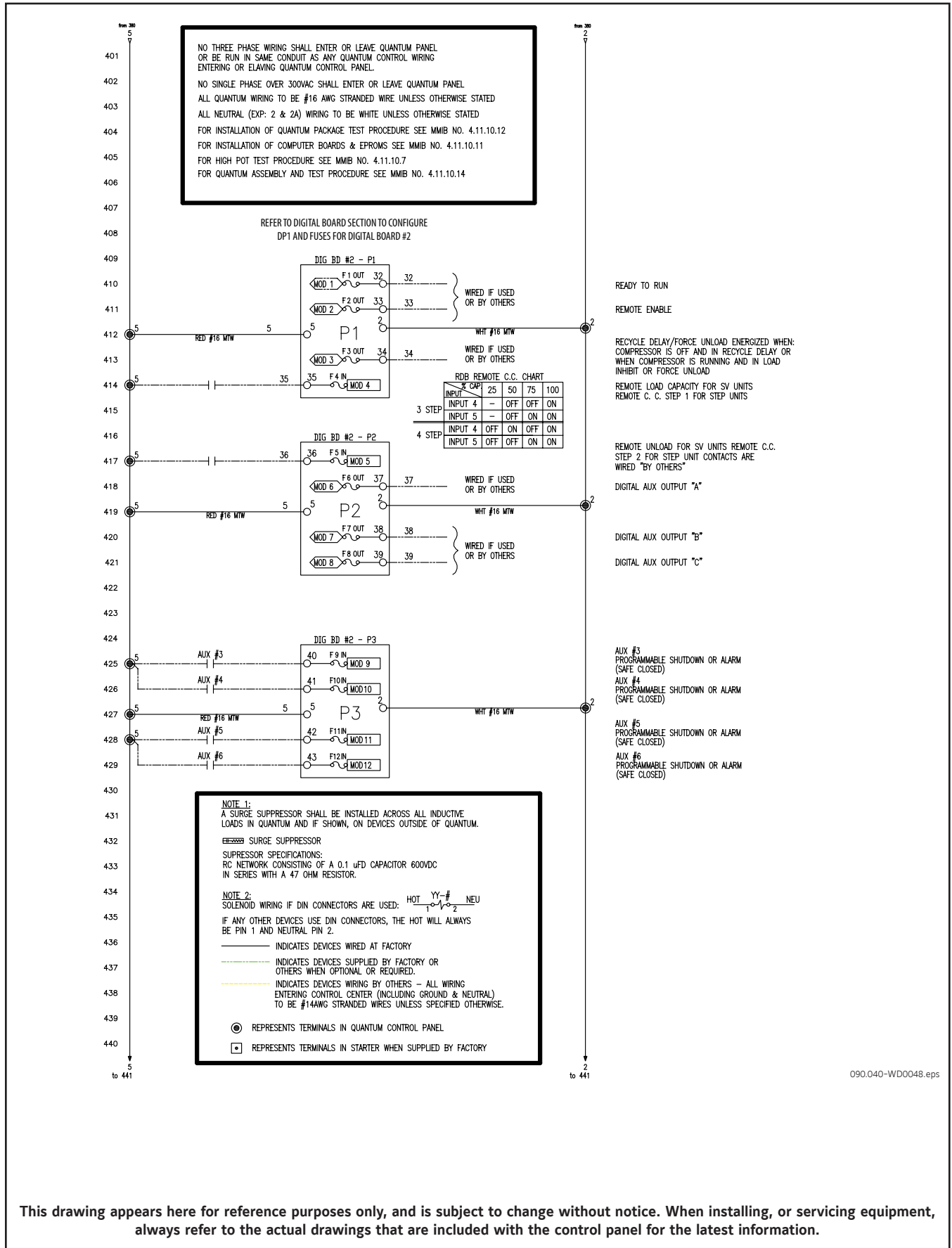
Figure 36c. RDB Wiring Diagram (4/6)



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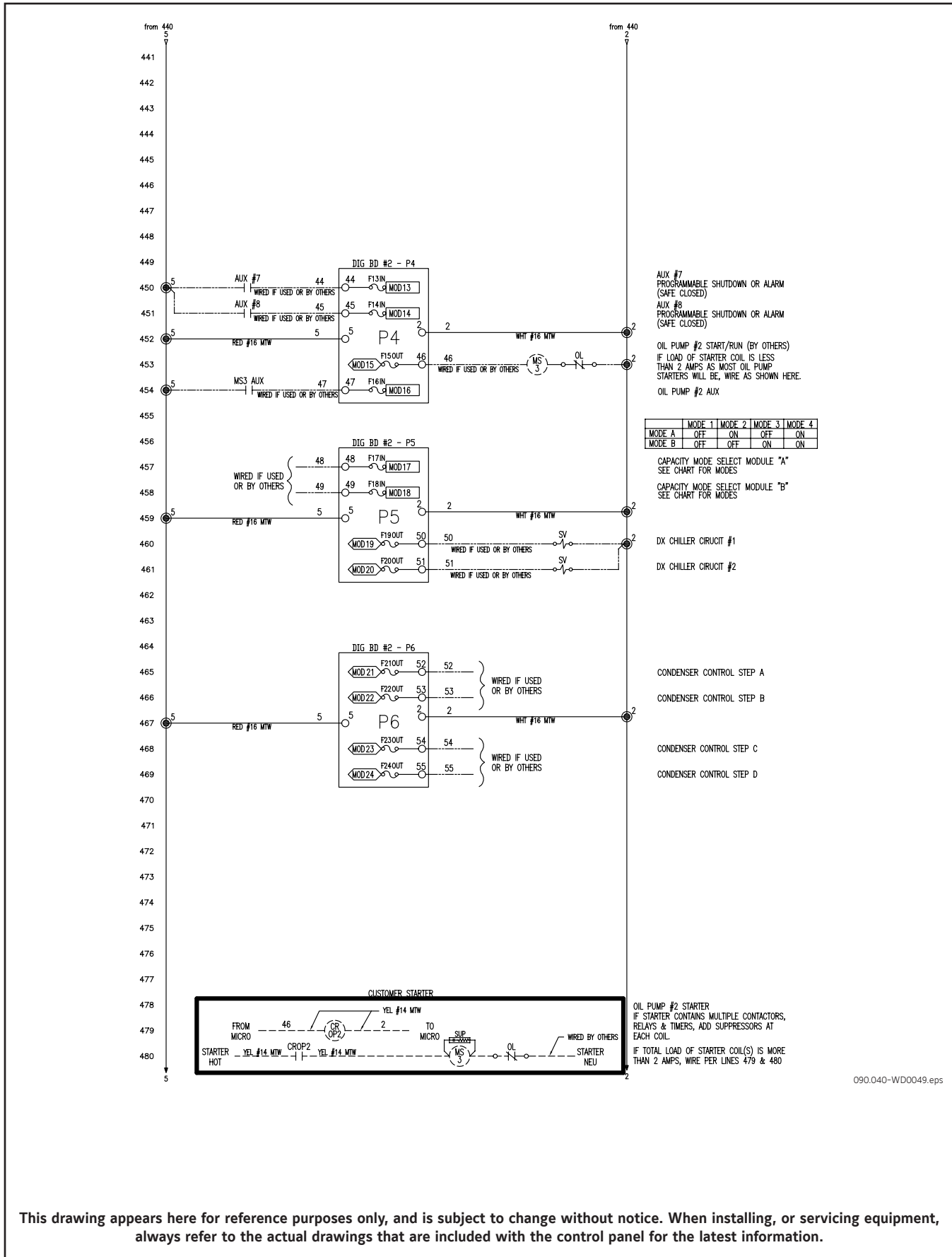
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Figure 36d. RDB Wiring Diagram (5/6)



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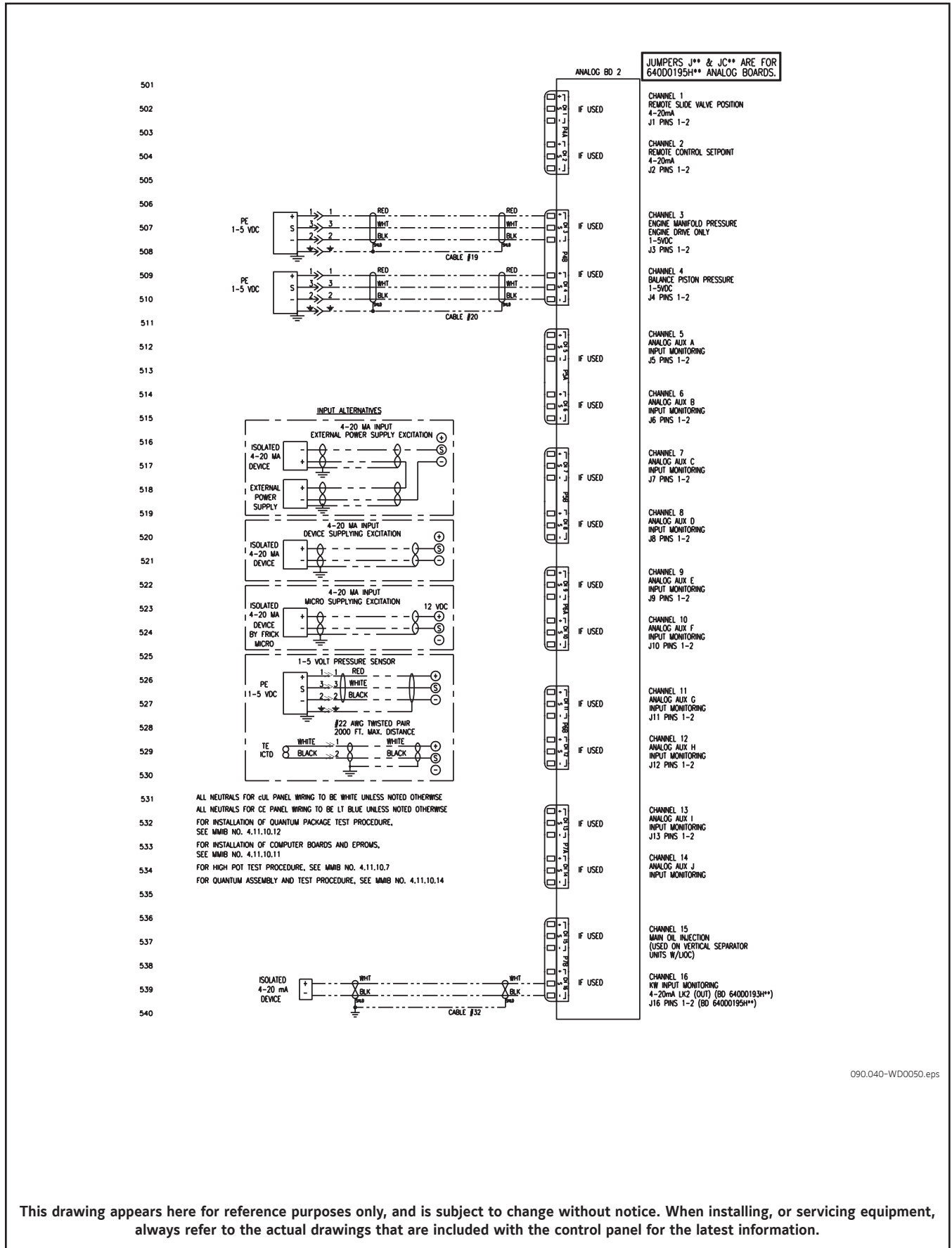
Figure 38. Digital I/O Board #2 Wiring Diagram (1/2)



090.040-WD0049.eps

This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

Figure 38a. Digital I/O Board #2 Wiring Diagram (2/2)



This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

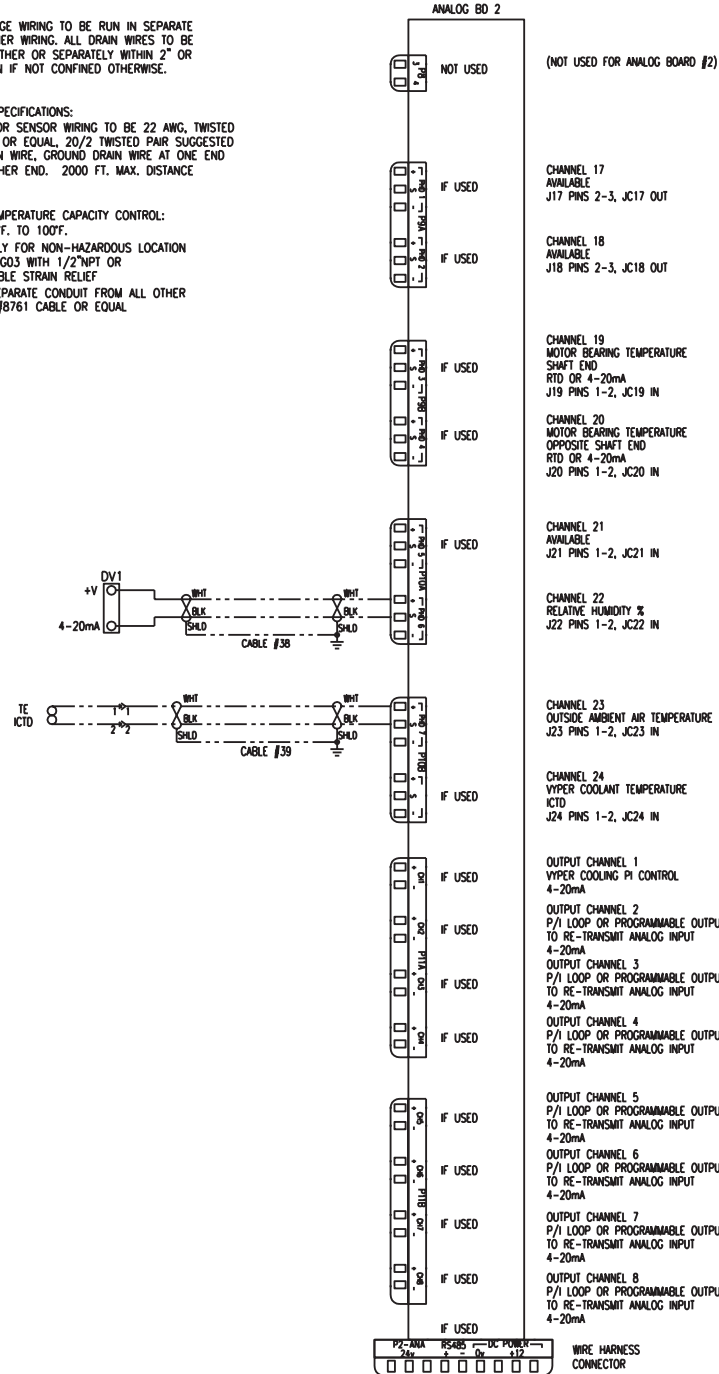
Figure 39. Analog I/O Board #2 Wiring Diagram (1/2)

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NOTE 1
ALL ANALOG LOW VOLTAGE WIRING TO BE RUN IN SEPARATE CONDUIT FROM ALL OTHER WIRING. ALL DRAIN WIRES TO BE INSULATED EITHER TOGETHER OR SEPARATELY WITHIN 2" OR CLOSER OF TERMINATION IF NOT CONFINED OTHERWISE.

NOTE 2
TEMPERATURE WIRING SPECIFICATIONS:
MINIMUM CABLE SIZE FOR SENSOR WIRING TO BE 22 AWG, TWISTED PAIR - BELDEN #9320 OR EQUAL, 20/2 TWISTED PAIR SUGGESTED -IF CABLE HAS A DRAIN WIRE, GROUND DRAIN WIRE AT ONE END ONLY AND INSULATE OTHER END. 2000 FT. MAX. DISTANCE

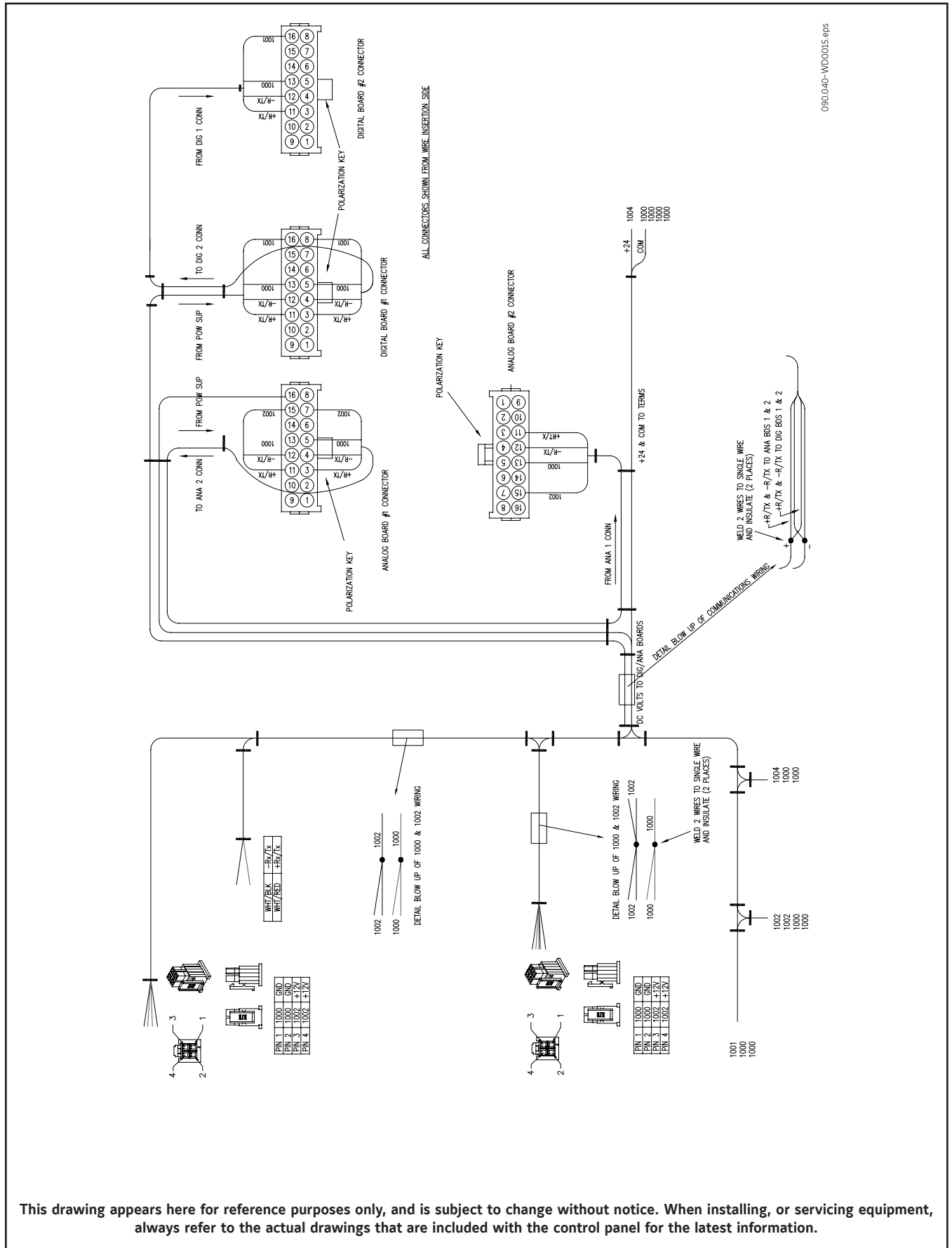
NOTE 3
SPECIFICATIONS FOR TEMPERATURE CAPACITY CONTROL:
-SETPOINT RANGE: -50°F. TO 100°F.
-TEMPERATURE ASSEMBLY FOR NON-HAZARDOUS LOCATION (FRICK P/N 639A0151G03 WITH 1/2" NPT OR 639A0151G02 FOR CABLE STRAIN RELIEF
-WIRE AS SHOWN IN SEPARATE CONDUIT FROM ALL OTHER WIRING. USE BELDEN #8761 CABLE OR EQUAL



090.040-WD0051.eps

This drawing appears here for reference purposes only, and is subject to change without notice. When installing, or servicing equipment, always refer to the actual drawings that are included with the control panel for the latest information.

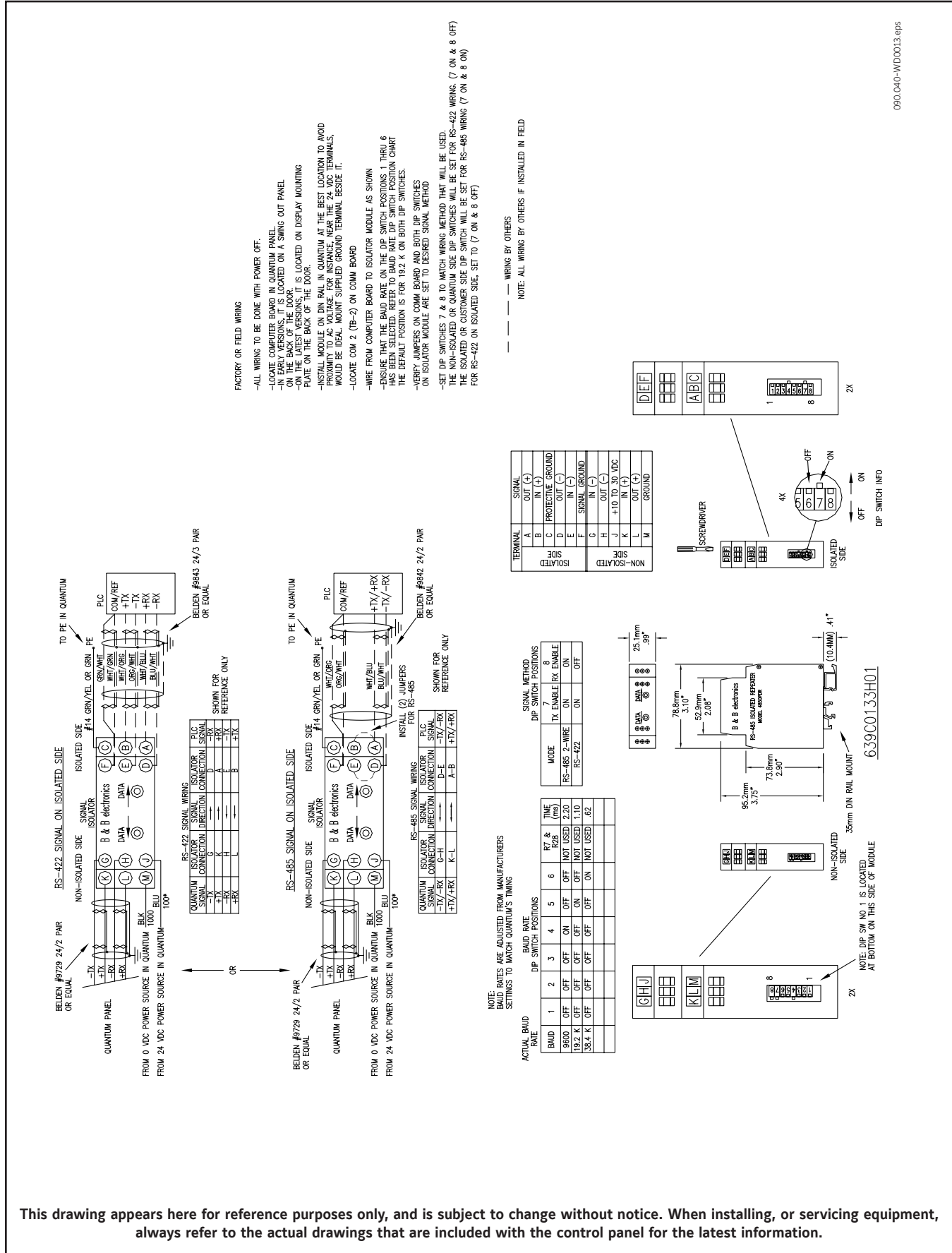
Figure 39a. Analog I/O Board #2 Wiring Diagram (2/2)



090.040-WD0015.eps

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Figure 40. HD Unity AC Power Harness

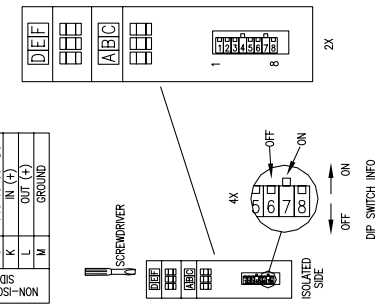


FACTORY OR FIELD WIRING

- ALL WIRING TO BE DONE WITH POWER OFF.
- LOCATE COMPUTER BOARD IN QUANTUM PANEL.
- IN EARLY VERSIONS, IT IS LOCATED ON A SWING OUT PANEL ON THE BACK OF THE DOOR.
- THE COMPUTER BOARD IS LOCATED ON DISPLAY MOUNTING PLATE ON THE BACK OF THE DOOR.
- INSTALL MODULE ON DIN RAIL IN QUANTUM AT THE BEST LOCATION TO AVOID PROXIMITY TO AC VOLTAGE. FOR INSTANCE, NEAR THE 24 VDC TERMINALS, WOULD BE IDEAL. MOUNT SUPPLIED GROUND TERMINAL BESIDE IT.
- LOCATE COM 2 (TB-2) ON COMM BOARD
- WIRE FROM COMPUTER BOARD TO ISOLATOR MODULE AS SHOWN
- ENSURE THAT THE BAUD RATE ON THE DIP SWITCH POSITIONS 1 THRU 6 HAS BEEN SELECTED. REFER TO BAUD RATE DIP SWITCH POSITION CHART
- THE DEFAULT POSITION IS FOR 19.2 K ON BOTH DIP SWITCHES.
- VERIFY JUMPERS ON COMM BOARD AND BOTH DIP SWITCHES ON ISOLATOR MODULE ARE SET TO DESIRED SIGNAL METHOD
- SET DIP SWITCHES 7 & 8 TO MATCH WIRING METHOD THAT WILL BE USED.
- THE NON-ISOLATED OR QUANTUM SIDE DIP SWITCHES WILL BE SET FOR RS-422 WIRING. (7 ON & 8 OFF)
- THE ISOLATED OR CUSTOMER SIDE DIP SWITCH WILL BE SET FOR RS-485 WIRING (7 ON & 8 ON)

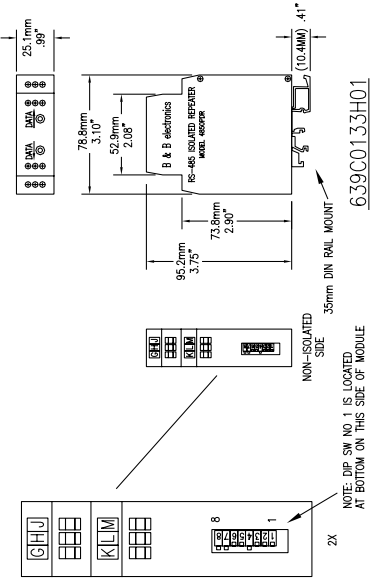
--- WIRING BY OTHERS
NOTE: ALL WIRING BY OTHERS IF INSTALLED IN FIELD

TERMINAL	SIGNAL
A	IN (+)
B	OUT (+)
C	PROTECTIVE GROUND
D	OUT (-)
E	IN (-)
F	SIGNAL GROUND
G	OUT (-)
H	IN (+)
I	+10 TO 30 VDC
J	OUT (+)
K	IN (+)
L	OUT (+)
M	GROUND



MODE	TX ENABLE	RX ENABLE
RS-485 2-WIRE	ON	ON
RS-422	ON	OFF

BAUD RATE	DIP SWITCH POSITIONS	7	8	TIME (ms)
9600	OFF	OFF	NOT USED	2.20
19.2 K	OFF	OFF	NOT USED	1.10
38.4 K	OFF	OFF	NOT USED	.62



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Figure 41. Isolater Repeater Module (Isolates Communication Signals)

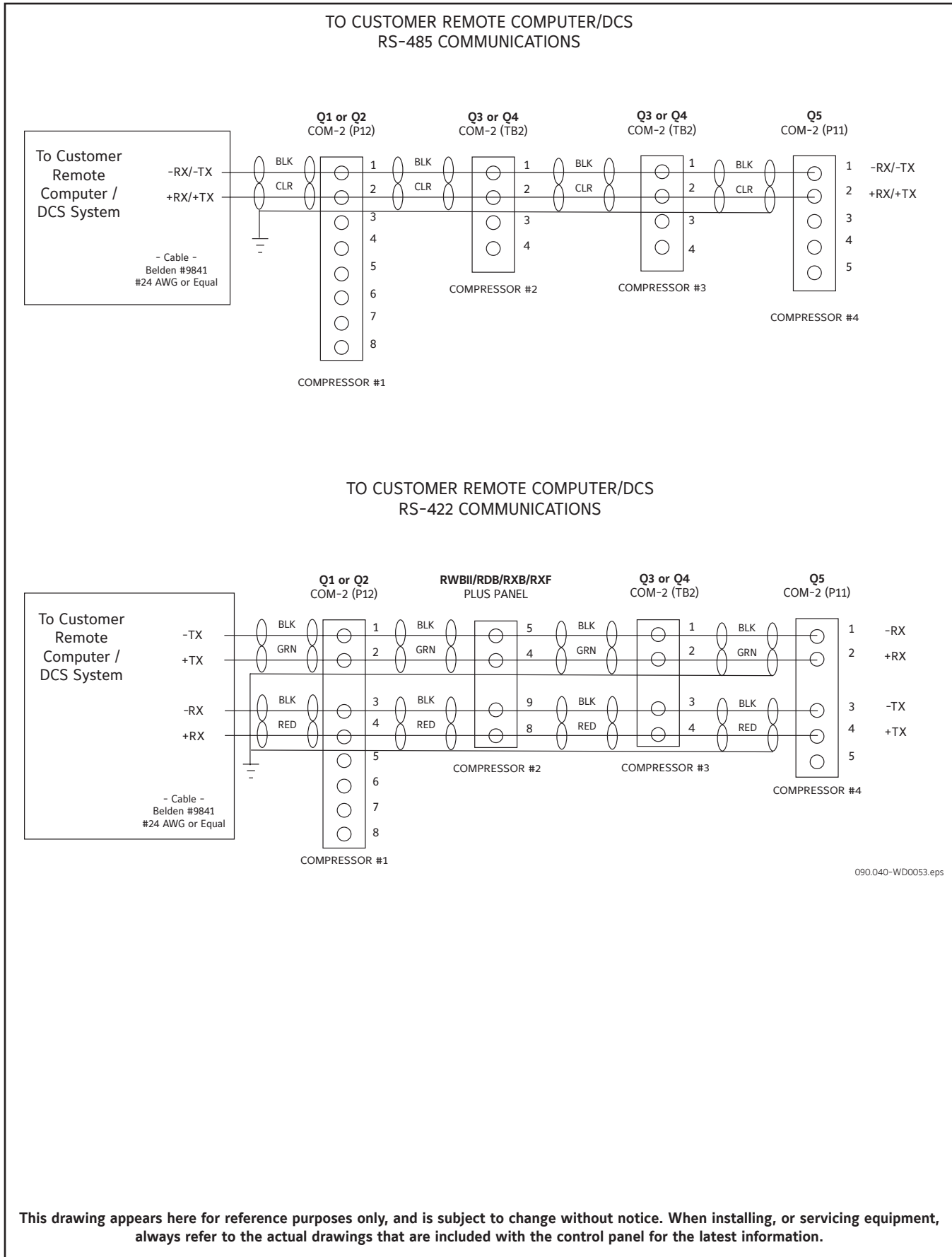


Figure 42. Communications Wiring Diagrams (RS-485 & RS-422)

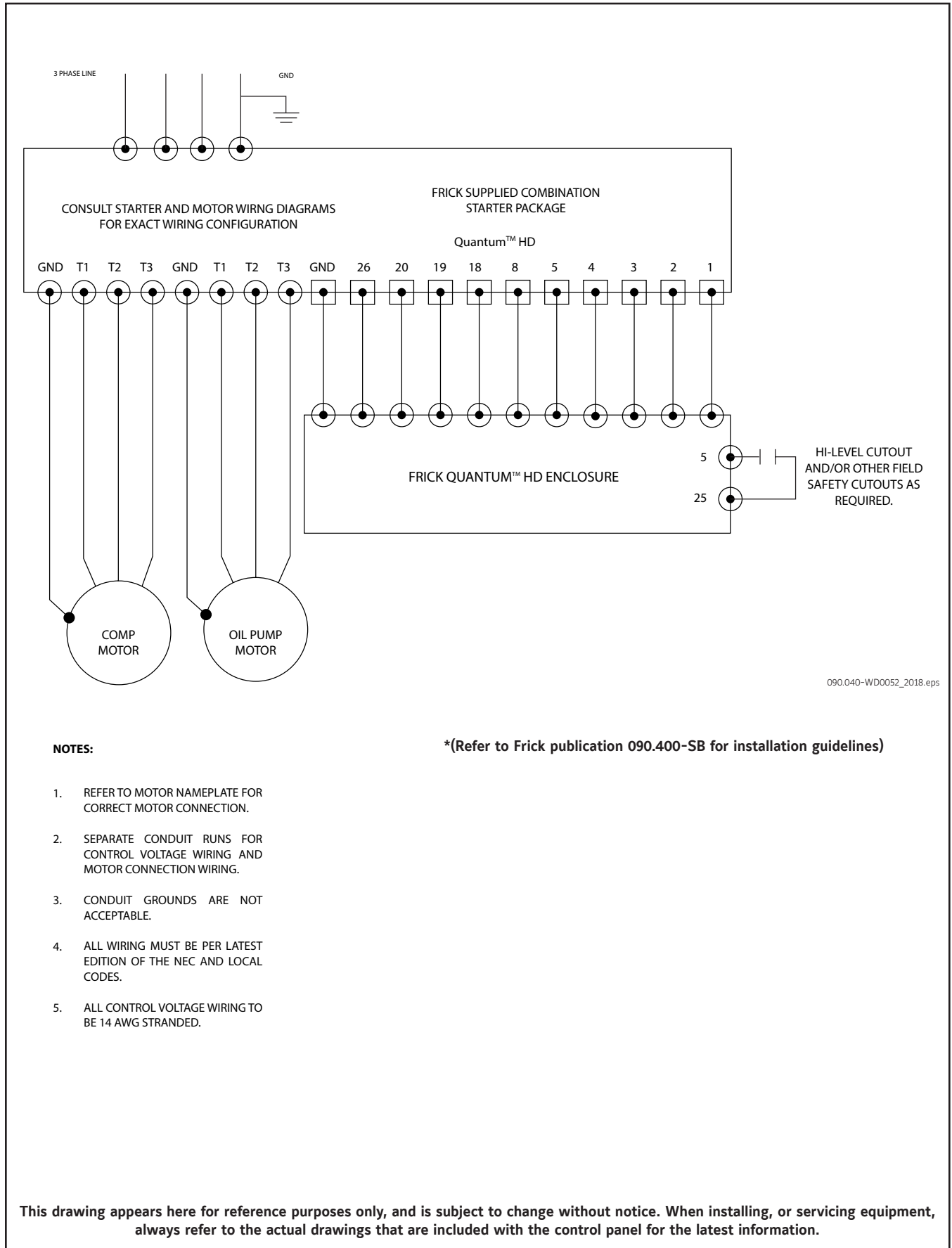


Figure 43. Point-To-Point Field Wiring Diagram

NOTES

SECTION 11

ADDITIONAL TABLES

Table 22. Pressure Transducer Conversation Data (Data Instruments Model SA)

Sensor Voltage	100 psi Range - psig*		200 psi Range - psig*		300 psi Range - psig*		500 psi Range - psig*	
	Low	High	Low	High	Low	High	Low	High
1.0	29.92"	19.74"	29.92"	9.57"	29.92"	7.0"	29.92"	4.1
1.1	29.92"	14.65"	29.92"	0.3	29.92"	4.1	29.92"	16.6
1.2	29.92"	9.57"	29.92"	5.3	22.3"	11.6	17.1"	29.1
1.3	24.83"	4.48"	19.74"	10.3	7.0"	19.1	4.1	41.6
1.4	19.74"	0.3	9.57"	15.3	4.1	26.6	16.6	54.1
1.5	14.65"	2.8	0.3	20.3	11.6	34.1	29.1	66.6
1.6	9.57"	5.3	5.3	25.3	19.1	41.6	41.6	79.1
1.7	4.48"	7.8	10.3	30.3	26.6	49.1	54.1	91.6
1.8	0.3	10.3	15.3	35.3	34.1	56.6	66.6	104.1
1.9	2.8	12.8	20.3	40.3	41.6	64.1	79.1	116.6
2.0	5.3	15.3	25.3	45.3	49.1	71.6	91.6	129.1
2.1	7.8	17.8	30.3	50.3	56.6	79.1	104.1	141.6
2.2	10.3	20.3	35.3	55.3	64.1	86.6	116.6	154.1
2.3	12.8	22.8	40.3	60.3	71.6	94.1	129.1	166.6
2.4	15.3	25.3	45.3	65.3	79.1	101.6	141.6	179.1
2.5	17.8	27.8	50.3	70.3	86.6	109.1	154.1	191.6
2.6	20.3	30.3	55.3	75.3	94.1	116.6	166.6	204.1
2.7	22.8	32.8	60.3	80.3	101.6	124.1	179.1	216.6
2.8	25.3	35.3	65.3	85.3	109.1	131.6	191.6	229.1
2.9	27.8	37.8	70.3	90.3	116.6	139.1	204.1	241.6
3.0	30.3	40.3	75.3	95.3	124.1	146.6	216.6	254.1
3.1	32.8	42.8	80.3	100.3	131.6	154.1	229.1	266.6
3.2	35.3	45.3	85.3	105.3	139.1	161.6	241.6	279.1
3.3	37.8	47.8	90.3	110.3	146.6	169.1	254.1	291.6
3.4	40.3	50.3	95.3	115.3	154.1	176.6	266.6	304.1
3.5	42.8	52.8	100.3	120.3	161.6	184.1	279.1	316.6
3.6	45.3	55.3	105.3	125.3	169.1	191.6	291.6	329.1
3.7	47.8	57.8	110.3	130.3	176.6	199.1	304.1	341.6
3.8	50.3	60.3	115.3	135.3	184.1	206.6	316.6	354.1
3.9	52.8	62.8	120.3	140.3	191.6	214.1	329.1	366.6
4.0	55.3	65.3	125.3	145.3	199.1	221.6	341.6	379.1
4.1	57.8	67.8	130.3	150.3	206.6	229.1	354.1	391.6
4.2	60.3	70.3	135.3	155.3	214.1	236.6	366.6	404.1
4.3	62.8	72.8	140.3	160.3	221.6	244.1	379.1	416.6
4.4	65.3	75.3	145.3	165.3	229.1	251.6	391.6	429.1
4.5	67.8	77.8	150.3	170.3	236.6	259.1	404.1	441.6
4.6	70.3	80.3	155.3	175.3	244.1	266.6	416.6	454.1
4.7	72.8	82.8	160.3	180.3	251.6	274.1	429.1	466.6
4.8	75.3	85.3	165.3	185.3	259.1	281.6	441.6	479.1
4.9	77.8	87.8	170.3	190.3	266.6	289.1	454.1	491.6
5.0	80.3	90.3	175.3	195.3	274.1	296.6	466.6	504.1
At zero psig	1.388 V	1.788 V	1.094 V	1.494 V	1.046 V	1.346 V	0.968 V	1.268 V

* Below 0 psig measured in inches of mercury.

Table 23. Compressor Volume Ratio & Capacity Information

Bare Model	Package Model	Bare Model Serial Number	Standard Slide Valve		Low Vi Slide Valve		Theoretical Minimum Capacity	Micro Slide Valve Travel	Micro Slide Stop Travel
			Min. Vi	Max. Vi	Min. Vi	Max. Vi			
XJS/XJF 95	RXB/RXF 12, 15, 19	all	2.2, 3.5, 5.0		n/a	n/a	25%		
XJS/XJF 120	RXB/RXF 24,30, 39, 50	all	2.2, 3.5, 5.0		n/a	n/a	25%		
XJF/XJB 151 & 151X	RXF 58, 68, 85, 101	all	2.2, 3.5, 5.0		n/a	n/a	21%		
TDSH 163S	RWB-II 60	all	2.2	5.0	n/a	n/a	12%	195.6	76.2
TDSH 163L	RWB-II 38, 76	all	2.2	5.0	n/a	n/a	12%	195.6	76.2
TDSH 193S	RWB-II 100	all	2.2	5.0	1.7	n/a	12%	195.6	76.2
TDSH 193L	RWB-II 134	all	2.2	5.0	1.7	n/a	12%	195.6	76.2
TDSH 233S	RWB-II 177	all	2.2	5.0	1.7	n/a	12%	195.6	76.2
TDSH 233L	RWB-II 222	all	2.2	5.0	1.7	n/a	12%	195.6	76.2
TDSH 233XL	RWB-II 270	all	2.2	5.0	1.7	n/a	23%	158.6	76.2
TDSH 283S	RWB-II 316	all	2.2	5.0	1.7	n/a	12%	195.6	76.2
TDSH 283L	RWB-II 399	all	2.2	5.0	1.7	n/a	12%	195.6	76.2
TDSH 283LY	YS chiller (S7 compressor)	all	n/a	n/a	1.7	2.5	8%	194.1	56.5
TDSH 283SX	RWB-II 480	all	2.2	4.2	1.7	2.7	23%	165.5	64.8
TDSH/TDSB 355S	RWB-II 496	0153L / 0011SBS and lower	2.2	5.0	1.7	3.0	18%	185.6	76.2
TDSH/TDSB 355S	RWB-II 496	0154L / 0012SBS and higher	2.2	5.0	1.7	3.0	12%	213.9	76.2
TDSH/TDSB 355L	RWB-II 676	0222K / 0025SBL and lower	2.2	5.0	1.7	3.0	18%	185.6	76.2
TDSH/TDSB 355L	RWB-II 676	0223K / 0026SBL and higher	2.2	5.0	1.7	3.0	12%	213.9	76.2
TDSH/TDSB 355XL	RWB-II 856	0109XL / 0052SBXL and lower	2.2	5.0	1.7	3.0	30%	146.5	76.2
TDSH/TDSB 355XL	RWB-II 856	0110XL / 0053SBXL and higher	2.2	5.0	1.7	3.0	18%	184.6	76.2
TDSB 355U	RWB-II 1080	all	2.4	4.5	1.7	2.6	26%	141.5	58.0
TDSH 408S	RWH-II 852	all	2.2	5.0	1.7	3.0	12%	193.0	76.2
TDSH 408L	RWH-II 1179	all	2.2	5.0	1.7	3.0	12%	193.0	76.2
TDSH 408XL	RWH-II 1395	all	2.2	4.3	1.7	2.7	15%	183.9	66.4
API 408S		all	2.2	5.0	1.7	3.0	12%	193.0	76.2
API 408L		all	2.2	5.0	1.7	3.0	12%	193.0	76.2
API 408XL		all	2.2	4.3	1.7	2.7	21%	163.4	66.4
SGC 1913	RWF 100	all	2.2	5.0	1.7	3.0	12%	195.6	76.2
SGC 1918	RWF 134	all	2.2	5.0	1.7	3.0	12%	195.6	76.2
SGC 2313	RWF 177	all	2.2	5.0	1.7	3.0	12%	195.6	76.2
SGC 2317	RWF 222	all	2.2	5.0	1.7	3.0	12%	195.6	76.2
SGC 2321	RWF 270	all	2.2	5.0	1.7	3.0	12%	195.6	76.2
SGC 2813	RWF 316	all	2.2	5.0	1.7	3.0	12%	195.6	76.2
SGC 2817	RWF 399	all	2.2	5.0	1.7	3.0	12%	195.6	76.2
SGC 2821	RWF 480	all	2.2	5.0	1.7	3.0	12%	213.9	76.2
SGC 2824	RWF 546	all	2.0	4.1	n/a	n/a	18%	185.6	76.2
SGC 3511	RWF-II 496	all	2.2	5.0	1.7	3.0	12%	213.9	76.2
SGC 3515	RWF-II 676	all	2.2	5.0	1.7	3.0	12%	213.9	76.2
SGC 3519	RWF-II 856	all	2.2	5.0	1.7	3.0	18%	184.6	76.2
SGC 3524	RWF-II 1080	all	2.4	4.5	1.7	2.6	26%	141.5	58.0
NGC 100		all	2.2	5.0	1.7	3.0	12%	195.6	76.2
NGC 150		all	2.2	5.0	1.7	3.0	12%	195.6	76.2
NGC 200		all	2.2	5.0	1.7	3.0	12%	195.6	76.2
NGC 250		all	2.2	5.0	1.7	3.0	12%	195.6	76.2
NGC 300		all	2.0	4.1	n/a	n/a	15%	197.3	76.2
NGC 400		all	2.2	5.0	n/a	n/a	12%	213.9	76.2
NGC 450		NGC 450E0001Z only	2.0	3.3	n/a	n/a	26%	141.5	58.0
NGC 450		All NGC 450 except E0001Z	2.2	3.9	n/a	n/a	26%	141.5	58.0

NOTE: For 95, 120, and 151mm compressors, the slide stop travel value in parentheses is the travel from Vi=2.2 to Vi=3.5.

SECTION 12

CONTROL PANEL REPLACEMENT PARTS LIST

Table 24. HD Unity Compressor Control Replacements Parts List

Frick Number	SAP Number	Description
Analog Boards⁽¹⁾		
640C0062G01	1107799	Analog Board #1 (Replaces existing "614" analog board only - no hardware)
640C0062G02	1107800	Analog Board #2 (Replaces existing "614" analog board only - no hardware)
640C0062G11	1108061	Analog Board #1 Field Upgrade Kit (Requires HD software version 10.16 or later and 24 VDC)
640C0062G12	1108062	Analog Board #2 Field Upgrade Kit (Requires HD software version 10.16 or later and 24 VDC)
(1) Note: If replacing an older style analog board, contact Frick Service for details.		
Circuit Breakers		
639A0206H05	484043	5 Amp circuit breaker
639A0206H10	484050	10 Amp circuit breaker
639A0206H15	484053	15 Amp circuit breaker
Connectors		
649A1027G14	643440	2- Pole connector (P8 - Analog Board)
649A1027G11	485874	Connector kit for Input Ch. 1-16 (Analog Board)
649A1027G21	643460	Connector kit for Input Ch. 17-24, and Output Ch. 1-8 (Analog Board)
649A1027G31	643461	Connector for Power/Communications for Analog Board
Control Power		
333Q0001418	467096	Filter, Line
333Q0001191	467024	Hour meter
639A0185H10	483963	2-Pos. Selector Switch (Control Power)
639A0185H30	483966	Latch, 3 Across (Attaches contact block to switch mechanism)
639A0185H31	483967	Normally Open Contact Block (for Control Power Switch)
639B0120H51	680313	Socket, Guarded, DPDT
639B0114H51	580348	Socket, Guarded, 3PDT
639B0114H98	580349	Spring Clip Hold Down
639B0120H01	680049	Relay, Control 24VDC, DPDT
639B0120H11	680311	Relay, Control 120VAC, DPDT
639B0120H21	680312	Relay, Control 240VAC, DPDT
639B0114H02	580342	Relay, Control 24VDC, 3PDT
639B0114H12	580345	Relay, Control 120VAC, 3PDT
639B0114H22	580347	Relay, Control 240VAC, 3PDT
639A0243H02	817257	Surge suppresser
Digital Boards		
333Q0001172	467015	Output Module, 24 VDC
111Q0281061	455056	Output Module, 24-280 VAC
333Q0001171	467014	Input Module, 24 VDC
333Q0000116	466842	Input Module, 120 VAC
333Q0000789	466949	Input Module, 230 VAC
333Q0001326	467073	Fuse, 5 amp, 250 V
640C0024G01	484494	Digital Board #1 (Replaces existing board only - no hardware)
640C0024G02	484495	Digital Board #2 (Replaces existing board only - no hardware)
649D5948G01	826167	Digital Board #2 (Field Upgrade Kit- adds a second digital board)

* Based upon system voltage

Frick Number	SAP Number	Description
Display Accessories		
639D0199H01	703164	15" Color Display (Indoor)
639D0199H11	845829	15" Color Display (Outdoor)
649D6101G01	1032704	Field Replacement Touchscreen glass w/overlay of Frick logo (Keypad has been eliminated)
Fans		
649A0906G13	509129	Internal Circulation Fan, Field Install, 24 VDC
649A0906G11	485514	Internal Circulation Fan, Field Install, 115 VAC
649A0906G12	N/A	Internal Circulation Fan, Field Install, 220 VAC
Flash Cards and Software		
649A1131Gxx	5239192	Quantum HD Unity Program Flash Card (Version 10.xx, the "xx" indicates program revision)
649A1063G99	485995	Quantum HD Setpoint Saver (USB Drive)
Harnesses		
639D0204H01	716617	DC power-I/O Comms harness
639D0203H01	716615	AC harness for digital board # 1
639D0203H02	716616	AC harness for digital board # 2
639B0118H01	670744	Display Harness
639B0126H01	884854	LED Inverter Harness
639D0191H03	696516	Harness Kit, Q5 to Interface Board Interconnect
Miscellaneous		
333Q0001786	886046	Battery, 3V (located on Q5 board)
639C0143H01	670593	Q5 mounting plate (hardware not included)
Panel Heaters		
640M0007G16	484626	200 W, 115 VAC
640M0007G18	484627	400 W, 115 VAC
640M0007G27	484632	200 W, 220 VAC
640M0007G21	484629	400 W, 220 VAC
Power Supply		
639B0115H01	642307	DC power supply - 5 VDC
639B0115H02	642308	DC power supply - 12 VDC
639B0115H03	642309	DC power supply - 24 VDC
Q5 Board		
639B0116H01	677556	Interface Board (Does not include interconnect harness kit)
Q6 Board		
649C1171G01	5496570	Q5 processor to Q6 processor (compressor)
649C1170G01	5509665	Q6 processor to Q6 processor (compressor)

090.070-TB0018_Q6.indd

Table 25. Remanufactured Parts

Frick Number	SAP Number	Description
640C0024S01	N/A	Digital I/O Board

090.040-TB0019.indd

NOTES

March 2018 Form Revisions

- p.11 - Added Q5 & Q6 screen calibration differentiation
- p.13 - Added Q6 processor board section
- p.55 - Updated Comms and harness graphics to Q6
- p.63 - Added SSW starter information section
- p.75 - Updated panel interior diagram to Q6 version
- p.117- Added wiring point 26 information
- p.121- Updated circuit breaker Frick part numbers

- p.15 - Updated battery information
- p.16 - Updated jumper configuration info for clarity
- p.17 - Updated COM2 & COM1 header in Table 3
 - Updated jumper configuration info for clarity

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