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MAINTENANCE

FRICK â COMPRESSOR CONTROL PANEL

VERSION 5.0x

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THE FOLLOWING PUBLICATIONS ARE AVAILABLE FROM THE FRICK® WEBSITE frickcold.com

S90-010 O	Frick® Quantum™ Control Panel Operation
S90-010 CS	Frick® Quantum™ Control Panel Communications Setup (setup and wiring for data communication using available protocols)
E90-010 SPC	Frick® Quantum™ Control Panel Specifications (specs., jumper and dipswitch settings)
S90-010 M	Frick® Quantum™ Control Panel Maintenance (repair and troubleshooting)

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

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

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

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

THE QUANTUM™ CONTROL PANEL ENCLOSURE

The Frick® Quantum™ control panel has over the years included several differently sized control enclosures to house the necessary electrical components required for compressor control.

The enclosure has now been reconfigured to standardize it across the entire compressor package line.

This new panel utilizes the available space more efficiently, allowing it to be downsized. This smaller size allows it to be used on all of our packages. The panel is also equipped with the necessary posts and hardware to add options in the field. They include a second analog and/or digital board, enclosure heater, air-circulating fan, and a step-down transformer for the motor valve used on EZ-Cool™ LIOC.

Dimensions of the new panel are 18x22x10 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 Control Center Assembly drawing 649D5100 for the layout for this standard 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
- -12vdc - PURPLE
- Common/Ground - BLACK
- +RX/TX - BLUE
- -RX/TX - BLUE w/WHITE stripe

The hardware components have not been changed, but simply rearranged. This will not have an impact on the current troubleshooting methods.

INTRODUCTION TO THE QUANTUM™ CONTROL SYSTEM

The Frick® Quantum™ control system consists of five major areas:

- **Power Supply** - Provides the necessary operating voltages for the proper operation of all control components. Additional information about the power supply can be found under the **POWER SUPPLY** section found later in this manual.

- **Quantum™ Controller** - The brains of the system. The Quantum™ runs a software program that communicates with all of the Digital and Analog boards. This communication allows the Quantum™ to read the status of all the I/O boards, and display the data on the interface screen. The Quantum™ 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 the keypad, as well as informational status to the display. Interaction to the outside world is provided through industry-standard communications protocols. Additional information about the Quantum™ can be found under the **QUANTUM™ CONTROLLER** section found later in 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 sinals are used to sense the condition of switches, relay contacts, auxiliary contacts, etc. This board runs an independent software program from the Quantum™ to control devices, and communicates the status of all devices back to the Quantum™. Additional information about the Digital Boards can be found under the **DIGITAL BOARD** section found later in this manual.

- **Analog Input / Output Boards** - Analog (variable) signals are sent and received by these boards. The output signals are used for controlling damper motors, modulated valves, etc., and 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 Quantum™ to control devices, and communicates the status of all devices back to the Quantum™. There are currently two versions of Analog board. The current version has 24 analog inputs, and 8 analog outputs, whereas it's predecessor had 16 analog inputs and 4 analog outputs. Additional information about these two board versions can be found under the **ANALOG BOARD** section found later in this manual.

- **Operator Interface** - This section actually consists of two major components; the Display and the Keypad. The Display is used to show the operator, via a graphical interface, the actual status of all compressor values. Alarms and shutdowns (and history/trending), pressure and temperature values, digital I/O status, setpoints, etc. are viewed on this display. The Keypad is used by the operator to enter data to the Quantum™ controller such as setpoint values, calibration data, etc. Additional information about the Display can be found under the **IDENTIFYING THE TYPE OF DISPLAY** section found later in this manual.

QUANTUM™ CONTROLLER BOARD IDENTIFICATION

INTRODUCTION

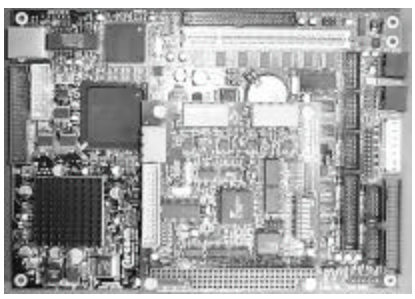
Frick Controls has over the years, strived to remain on the cutting edge of microprocessor technology and development. In addition, because of the ever-increasing speed, memory

Frick Controls has over the years, strived to remain on the cutting edge of microprocessor technology and development. In addition, because of the ever-increasing speed, memory, features, and power of microprocessors, Frick Controls will continue to introduce the latest advancement in microprocessor control technology.

Our microprocessor family has shared the name Quantum" over the past seven years. There are currently four controllers within this family. The first two of these controllers (known as Quantum"1 of microprocessors, Frick Controls will continue to introduce the latest advancement in microprocessor control technology.

Our microprocessor family has shared the name Quantum™, over the past seven years. There are currently four controllers within this family. The first two of these controllers (known as Quantum™ 1 and Quantum™ 2) are no longer in production, and as such, will not be further mentioned in this manual. The Quantum"3, although no longer in production, will still be described here. The only member of the Quantum family in production is the Quantum 4. It is critical to the end user to be able to identify the differences between these controllers. Refer to the section in this manual entitled “Quantum™ 3 Main Board.

Quantum™ 3



Quantum™ 4

TROUBLESHOOTING THE QUANTUM™ CONTROL PANEL

This section contains information on troubleshooting and making corrections to the boards and control circuits of the Quantum™. Reference the drawings at the end of this manual.

GENERAL INFORMATION:

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 when their cables are disconnected 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 (high voltage) side, which can be either 120 volts, or 230 volts, and a DC (low voltage) side. The AC side actuates solenoids, relays, alarms, and other electromechanical functions. The DC side operates the computer and it's various sensors.

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

To troubleshoot the low-voltage side of the control circuits, it is necessary to have the following tools:

1. Accurate digital multimeter (capable of reading to the hundreds of a volt)
2. Small wire stripper
3. Small screwdriver (with insulated shaft)
4. Small snip nose pliers
5. Wrist Grounding strap
6. Static free grounded work surface

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

Some problems that are encountered involve troubleshooting the panels 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 into a DIO connector plug. Position 3 provides power and position 4 is a neutral on the DIO connectors.

WHAT TO DO BEFORE CALLING THE FACTORY

Many times when a suspected Quantum™ problem is called in to the factory, not enough information is provided for the service personnel to assist in solving the problem. This is because the caller most likely is not aware of the type of information that would be useful to factory personnel in helping to identify and correct the problem. An example of this is the statement that the Quantum™ 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 many different problems. Following is a list of possible reasons for no display:

- No power
- Loose or Faulty Display Cable or Inverter Cable
- Bad Display
- Bad Backlight Inverter
- Bad Backlight Fluorescent Tube
- Wrong Combination of Display, Cable, Inverter, or Software
- Faulty CPU Board

Before calling the factory for assistance, review the information on the following pages and try to discover and resolve your Quantum™ problem. The actual cause of most problems is usually not with the Quantum™ itself, but with something external to the Quantum™. However, on the rare occasion that the problem has been identified as being the Quantum™ controller, use the following section as a guideline for replacing it.

REPLACING THE QUANTUM™ BOARD

The Flash Card memory load is done prior to the board to the board shipping. The customer needs to have their settings manually recorded, or saved to a Flash Card, so that the new board can be setup the same as the old one. It is suggested that the operator first record all control setpoints prior to board replacement. **Factory Setup settings will also be lost.** The setpoint data sheets are useful for recording this information. A Maintenance Flashcard may also be purchased that will allow these setpoints to be saved electronically, and may be downloaded at a later time. Make sure that the operator can access Factory Setup to restore all compressor specific settings.

The procedure to replace the main board is outlined below:

1. Shut off control power.
2. Remove the old board from the machine and the new board from its packing and place both on an anti-static surface.
3. Ensure that the jumpers on the new board are set the same as those on the old board.
4. Install the modified replacement board into the panel.
5. If program changes are necessary through a Flash Card download, then follow the directions in the Factory Setup manual (S90-010 FSI) for the procedure to reload a program Flash Card.

QUANTUM™ 3 CONTROLLER

WHAT SHOULD OCCUR WHEN POWERING UP THE PANEL

The first thing that should be checked when troubleshooting the Quantum™ is it's powering up sequence.

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

- The LED's for +5V, +12V, and –12V will turn on solid. (Lower left corner of Main PCB)
- LED KB will begin to blink. (Left side of Main PCB)
- Several initialization screens will appear (these will look very similar to the way the screen of a desktop computer appears when it is booting.
- The last of the initialization screens is the ***System Configuration*** screen.
- Various POST codes will appear.
- The screen will go then show Loading…
- The ***Operating Status*** screen is shown.

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

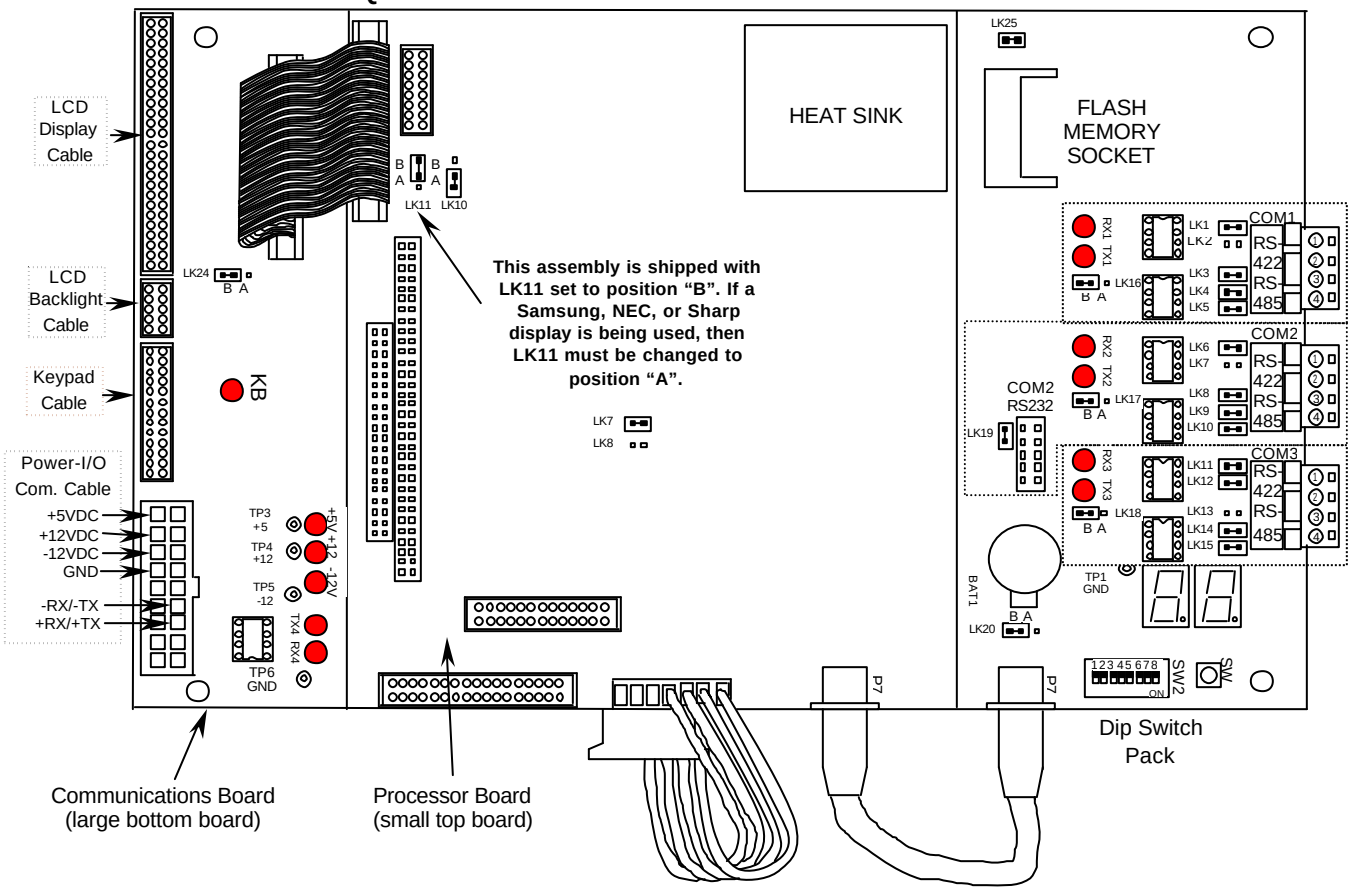
- The TX/RX LED's near the white connector will begin to blink.
- The Analog and Digital I/O boards TX/RX lights should be blinking.
- Each I/O board should have the power LED (next to the white connector) lighted and the "Active" LED (next to the blue Dipswitch) should be blinking.

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 lighted, then check AC and DC power.
2. Check if the lighting of the LED's is occurring as described in the "What Should Occur When Powering Up The Panel" section.
    - If the powering up sequence continues to repeat without displaying the ***Operating Status*** screen, then there is a booting problem.
3. Check if an error message is displayed when booting.
    - Be sure to write down any error messages exactly as they appear.
4. Check that the software is OK:
    - Is the correct software installed?
    - Did you just install new software?
    - If you need to clear the numerical setpoint and calibration areas of memory for any reason, clear the memory as described in the S90-010 FSI publication**. NOTE: This information will be replaced by factory default values, so any setpoint and calibration data values that need to be customized must be reentered.**
5. Check for bad or loose connections.
6. Check the display. If the CPU board is booting but you have no display, check the following:
    - Check the LCD backlight tube. Look very closely at the display to see if anything is visible in the dark screen. Using 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 maybe the LCD backlight tube. On the LG Philips, NEC and Sharp displays this tube is field replaceable. On the Samsung LCD display, it is not available and the display will have to be replaced. There may be a sticker on the display mounting plate. If there is, it will have a part number that describes the type of display. If there is no sticker, you must take the display apart to identify the display manufacturer.
    - Verify that both the display cable and the inverter cable are firmly seated. It may be necessary to remove the video cable from the back of the LCD display and reseat it to be sure it is connected properly. **Note: This is a small connector and caution should be observed so that it is not damaged due to excessive force.**
    - Check the backlight inverter connector (P4). When the Quantum™ board is mounted in the panel, this connector is located at the middle left of the board. The pins on the right side are odd numbered, with pin P(1) at the bottom -pin P(9) at the top. The pins on the left side are even numbered, with pin P(2) at the bottom - pin P(10) at the top. After the Quantum™ has booted, pin P(3) should measure +2.4 Vdc, pins P(4) and P(5) are DC grounds, and pins P(6) and P(7) should measure +12 Vdc. A bad inverter will also cause a dark display.
    - Reference the "Display Assembly Component Replacement Guide" in the "Identifying the Type of Display" section that appears later in this manual, and check that the LCD, LCD cable, and software versions are matched correctly.

QUANTUM™ 3 CONTROLLER BOARD PICTORIAL



Note: There are duplicate numbers for the links on the processor (smaller) board and the communications (larger) board. If you must make a change to a jumper (link), then ensure that you modify the correct link.

QUANTUM™ 3 BOARD SETTINGS

Processor Board Jumpers

LK2	A B *	COM3 IRQ4 COM3 IRQ11
LK3	A B *	COM4 IRQ3 COM4 IRQ10
LK4	in out*	RS-422 Terminated RS-422 Not Terminated
LK5	in* out	RS-485 Receiver Enabled RS-485 Receiver Disabled
LK6	in* out	RS-485 Terminated RS-485 Not Terminated
LK7	in* out	Watchdog timer Enabled Watchdog timer Disabled
LK8	in out*	2 second Watchdog timer timeout 8 second Watchdog timer timeout
LK10	A B *	+5V Backlight Voltage (Samsung, NEC, Sharp) +12V Backlight Voltage (LG Philips Display)
LK11	A B *	+5V LCD Supply (Samsung, NEC, Sharp) +3.3V LCD Supply (LG Philips Display)
LK12	in* out	Bit 1 of 259H "Logic 1" User Application Link Bit 1 of 259H "Logic 0" User Application Link
LK13	in* out	Bit 2 of 259H "Logic 1" User Application Link Bit 2 of 259H "Logic 0" User Application Link

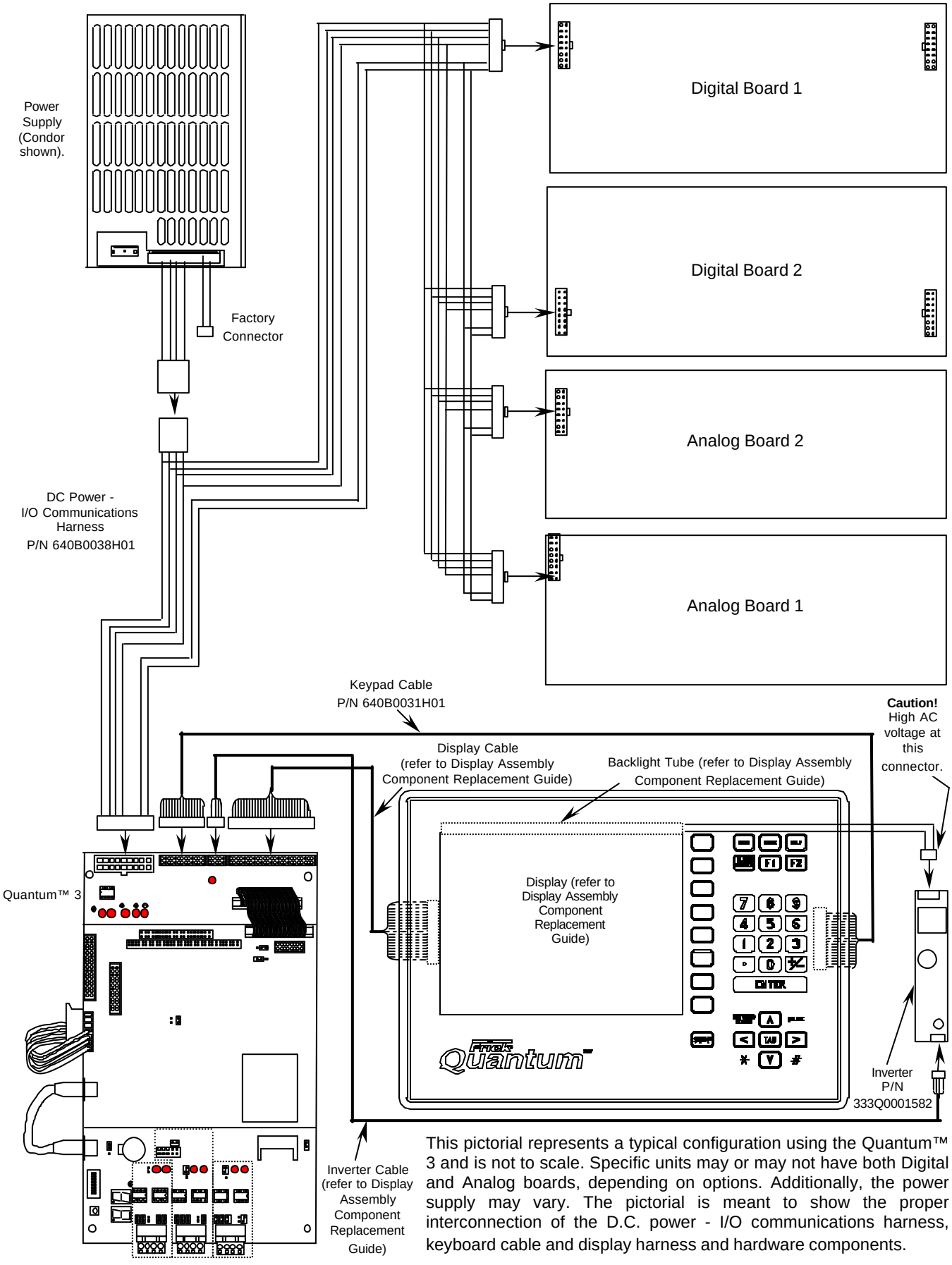
* Standard Setting

Communications Board Jumpers

LK1	in out*	Pull down COM1 No pull down	RS-422/485 (Rx-/Tx-)
LK2	in out*	Terminate COM1 No termination	RS-422/485
LK3	in out*	Pull up COM1 No pull up	RS-422/485 (Rx+/Tx+)
LK4	in out*	Pull down COM1 No pull down	RS-422 (Tx-)
LK5	in out*	Pull up COM1 No pull up	RS-422 (Tx+)
LK6	in out*	Pull down COM2 No pull down	RS-422/485 (Rx-/Tx-)
LK7	in out*	Terminate COM2 No termination	RS-422/485
LK8	in out*	Pull up COM2 No pull up	RS-422/485 (Rx+/Tx+)
LK9	in out*	Pull down COM2 No pull down	RS-422 (Tx-)
LK10	in out*	Pull up COM2 No pull up	RS-422 (Tx+)
LK16	A * B	COM1 RS-485 COM1 RS-422	
LK17	A * B	COM2 RS-485 COM2 RS-422	
LK19	in* out	Select RS-422/RS-485 for COM2 Select RS-232 for COM2	
LK20	A * B	Battery Backup Enabled Battery Backup Disabled (CMOS Cleared)	
LK25	in* out	Select Compact Flash card as master device Select Compact Flash card as slave device	

* Standard Setting

QUANTUM™ 3 FLOW DIAGRAM - D.C. VOLTAGE / COMMUNICATIONS HARNESS



This pictorial represents a typical configuration using the Quantum™ 3 and is not to scale. Specific units may or may not have both Digital and Analog boards, depending on options. Additionally, the power supply may vary. The pictorial is meant to show the proper interconnection of the D.C. power - I/O communications harness, keyboard cable and display harness and hardware components.

QUANTUM™ 4 CONTROLLER

WHAT SHOULD OCCUR WHEN POWERING UP THE PANEL

The first thing that should be checked when troubleshooting the Quantum™ is it's powering up sequence.

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

- Green PWR (Power) LED will turn on solid (upper right corner of main PCB).
- Red FLASH LED will begin to intermittently during the Boot process. It will then go out once the ***Operating Status*** screen appears.
- LED D8 (on the smaller board) will start to blink at the rate of about once per second. It will continue to blink after the Quantum™ has booted.
- Once the screen displays *Loading…,* LED's D4, D5, D7 and D8 will be on solid.
- The ***Operating Status*** screen will appear.
- Once actual data has been displayed on this screen, LED D13 will come on solid and D10, D11, and D12 will start to flash at a quick rate.

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

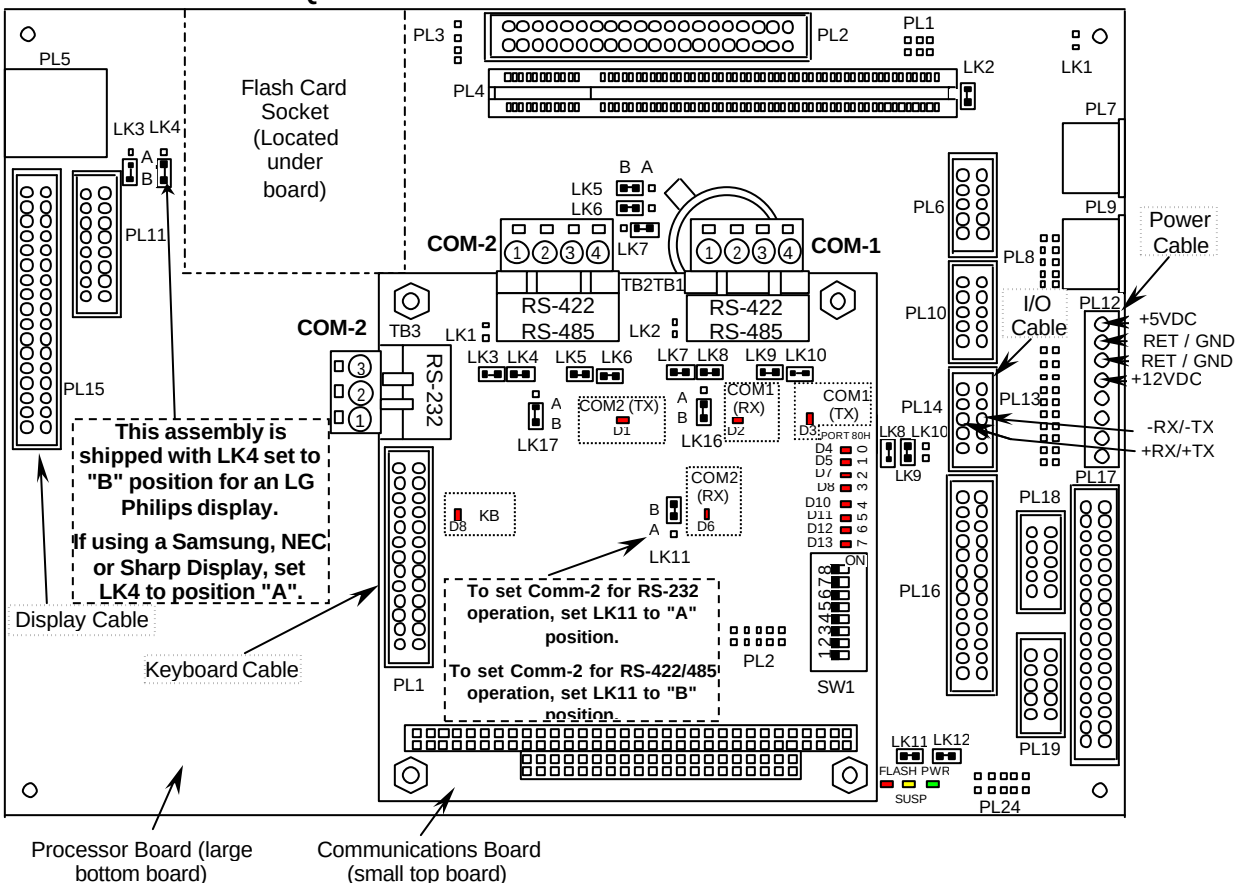
- The TX/RX LED's near the white connector will begin to blink.
- The Analog and Digital I/O boards TX/RX lights should be blinking.
- Each I/O board should have the power LED (next to the white connector) lighted and the *Active* LED (next to the blue Dipswitch) should be blinking.

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 lighted, then check power AC and DC.
2. Check if the lighting of the LED's is occurring as described in the *What Should Occur When Powering Up The Panel* section.
   - If the powering up sequence continues to repeat without displaying the ***Operating Status*** screen, then there is a booting problem.
3. Check if an error message is displayed when booting.
   - Be sure to write down any error messages exactly as they appear.
4. Check that the software is OK:
   - Is the correct software installed?
   - Did you just install new software?
   - If you need to clear the numerical setpoint and calibration areas of memory for any reason, clear the memory as described in the S90-010 FSI publication**. NOTE: This information will be replaced by factory default values, so any setpoint and calibration data values that need to be customized must be reentered.**
5. Check for bad connections.
6. Check the display. If the CPU board is booting but you have no display, check the following:
   - Check the LCD backlight tube. Look very closely at the display to see if anything is visible in the dark screen. Using 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 maybe the LCD backlight tube. On the LG Philips, NEC and Sharp displays this tube is field replaceable. On the Samsung LCD display it is not available and the display will have to be replaced. There may be a sticker on the display mounting plate. If there is, it will have a part number that describes the type of display. If there is no sticker, you must take the display apart to identify the display manufacturer.
   - Verify that both the display cable and the inverter cable are firmly seated. These cables both originate from the same connector on the Quantum™. It may be necessary to remove the video cable from the back of the LCD display and reseat it to be sure it is connected properly. **Note: This is a small connector and caution should be observed so that it is not damaged due to excessive force.**
   - Reference the *Display Assembly Component Replacement Guide* at the end of this section, and check that the LCD, LCD cable, and software versions are matched correctly.

QUANTUM™ 4 CONTROLLER BOARD PICTORIAL



Note: There are duplicate numbers for the links on the processor (larger) board and the communications (smaller) board. If you must make a change to a jumper (link), then ensure that you modify the correct link.

QUANTUM™ 4 BOARD SETTINGS

Processor Board Jumpers

LK1	in out*	2 second Watchdog timer timeout 8 second Watchdog timer timeout
LK2	in* out	Watchdog timer Enabled Watchdog timer Disabled
LK3	A B *	+5V Backlight Voltage (Samsung, NEC, Sharp) +12V Backlight Voltage (LG Philips Display)
LK4	A B *	+5V LCD Supply (Samsung, NEC, Sharp) +3.3V LCD Supply (LG Philips Display)
LK5	A B *	COM4 IRQ3 COM4 IRQ10
LK6	A B *	COM3 IRQ4 COM3 IRQ11
LK7	A * B	Battery Backup Enabled Battery Backup Disabled (CMOS Cleared)
LK8	in* out	RS-485 Receiver Enabled RS-485 Receiver Disabled
LK9	in* out	RS-485 Terminated RS-485 Not Terminated
LK10	in out*	RS-422 Terminated RS-422 Not Terminated
LK11	in* out	Bit 1 of 259H "Logic 1" User Application Link Bit 1 of 259H "Logic 0" User Application Link
LK12	in* out	Bit 2 of 259H "Logic 1" User Application Link Bit 2 of 259H "Logic 0" User Application Link

* Standard Setting

Communications Board Jumpers

Com-1 (TB1)

LK2	in out*	Terminate COM1 No termination	RS-422/485
LK7	in out*	Pull down COM1 No pull down	RS-422/485 (Rx-/Tx-)
LK8	in* out	Pull up COM1 No pull up	RS-422/485 (Rx-/Tx+)
LK9	in out*	Pull down COM1 No pull down	RS-422 (Tx-)
LK10	in out*	Pull up COM1 No pull up	RS-422 (Tx+)
LK16	A B*	COM1 RS-422 (TB1) COM1 RS-485 (TB1)	

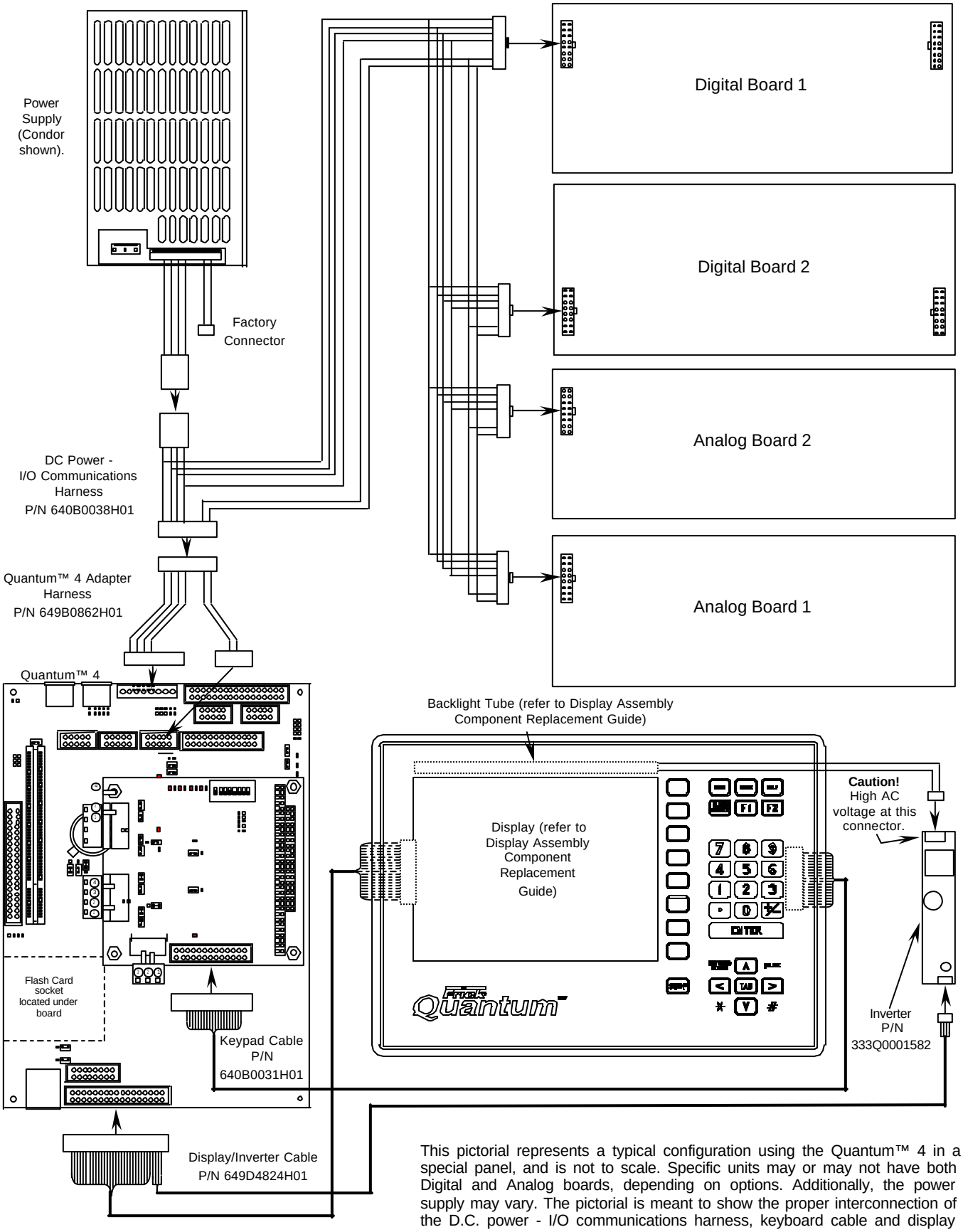
* Standard Setting

Com-2 (TB2 - TB3)

LK1	in out*	Terminate COM2 No termination	RS-422/485
LK3	in out*	Pull down COM2 No pull down	RS-422/485 (Rx-/Tx-)
LK4	in out*	Pull up COM2 No pull up	RS-422/485 (Rx-/Tx+)
LK5	in out*	Pull down COM2 No pull down	RS-422 (Tx-)
LK6	in out*	Pull up COM2 No pull up	RS-422 (Tx+)
LK11	A B*	Select RS-232 for COM2 (TB2) Select RS-422/RS-485 for COM2 (TB3)	
LK17	A B*	COM2 RS-422 (TB2) COM2 RS-485 (TB2)	

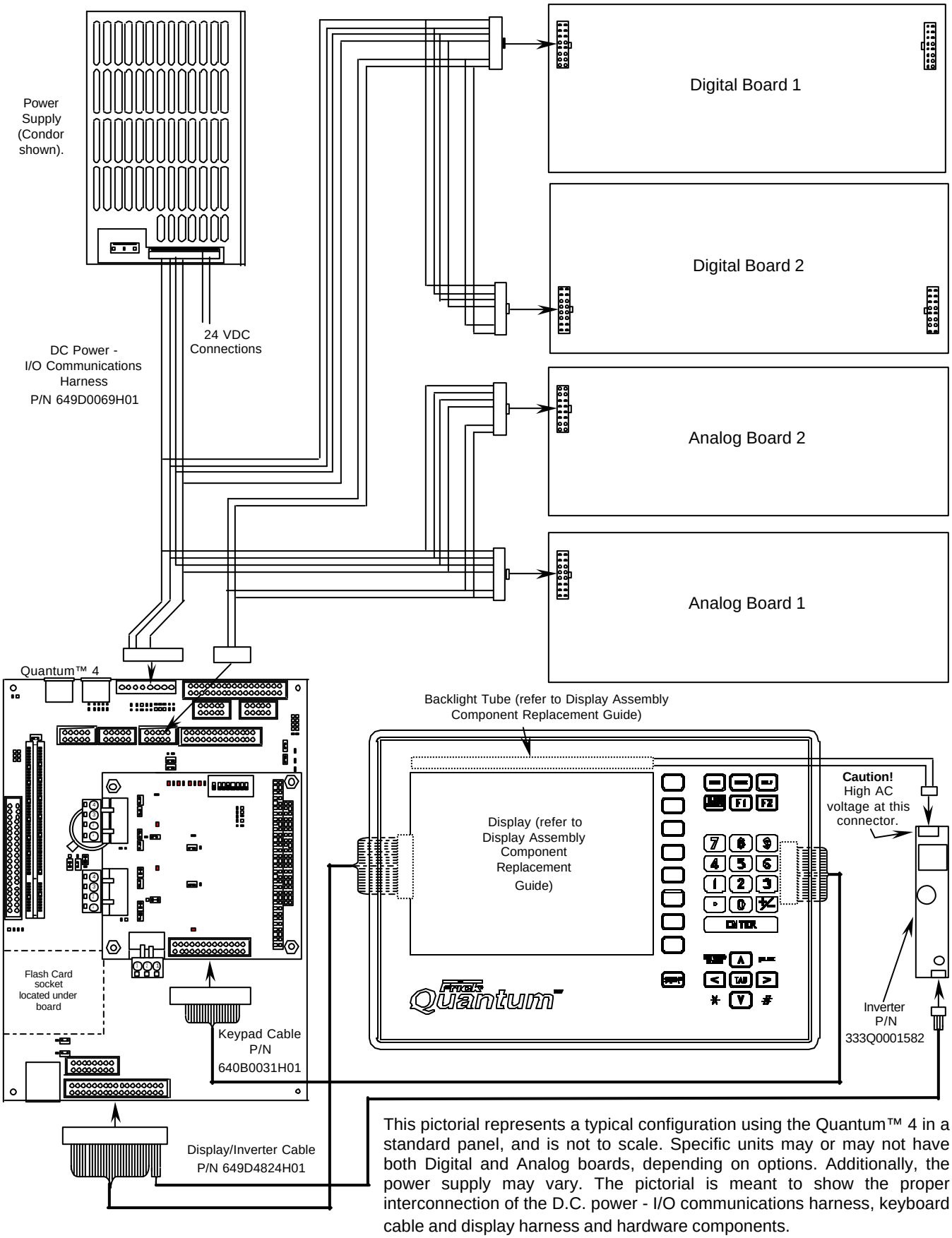
* Standard Setting

QUANTUM™ 4 FLOW DIAGRAM - D.C. VOLTAGE/COMMUNICATIONS HARNESS (SPECIAL)



This pictorial represents a typical configuration using the Quantum™ 4 in a special panel, and is not to scale. Specific units may or may not have both Digital and Analog boards, depending on options. Additionally, the power supply may vary. The pictorial is meant to show the proper interconnection of the D.C. power - I/O communications harness, keyboard cable and display harness and hardware components.

QUANTUM™ 4 FLOW DIAGRAM - D.C. VOLTAGE/COMMUNICATIONS HARNESS (STANDARD)



This pictorial represents a typical configuration using the Quantum™ 4 in a standard panel, and is not to scale. Specific units may or may not have both Digital and Analog boards, depending on options. Additionally, the power supply may vary. The pictorial is meant to show the proper interconnection of the D.C. power - I/O communications harness, keyboard cable and display harness and hardware components.

DIGITAL BOARD

The information that follows in this section can help locate problems that can occur with Digital Input and Output circuit boards, and their interaction with the Quantum™ controller.

Digital Board Description

The Digital Board is actually a small microprocessor board and 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). With the Quantum™ Compressor Control, these I/O channels are dedicated as to their function, through the operating system (software), enabled options and external wiring. Each channel that is used by the software will have 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™ compressor control can have up to two Digital Boards (depending on options).

Communications LED's

The Quantum™ controller is in constant communication with all Digital (and Analog) 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 Quantum™, and the Digital Board that you are looking at, 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 Quantum™ 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 (displayed in the *Communications Status* box on the ***Home*** screen), or the wrong outputs being energized, or the wrong inputs being received.

Connections to the Quantum™

As stated earlier, the Quantum™ standard compressor control system utilizes up to two Digital, and two Analog Boards. To connect all of these boards together so that the Quantum™ 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. Two different harnesses have been used and a diagram of each of these wiring harnesses can be found later in this manual (see the Power I/O Wiring Harness drawings). Depending on the type of panel, the following harness will be used:

- **Special Panel** -This harness has an 18-pin connector at one end that plugs into the Quantum™. Another connector plugs into the power supply. The remaining four connectors (16-pin) will plug into each of the Digital and Analog Boards in the system (up to four total).

  Upon close examination of this harness, you will notice that each of the connectors for both the Quantum™ and the four I/O boards, have two rows of connections. The wires that are inserted into the positions of one row, are internally daisychained on each I/O board, to continue the voltages and signals to the adjacent row. Therefore, any time that a connector is unplugged from the daisychain, these voltages and signals cannot continue through the daisychain to the next board. Whenever a plug is not to be inserted into a board, either for service or if not all boards are present, then a shunting plug (refer to Recommended Spare Parts list) must be installed onto the open connector.

  The four wires that feed from the power supply to the Quantum™ provide all of the necessary D.C. voltage that is required (+5 Vdc, -12 Vdc, +12 Vdc, and Return or Common). The voltages are passed through the connector on the Quantum™, and two new signals are generated by the Quantum™ to be passed on through the daisychain to the I/O boards. These two signals are the RX (receive) and TX (transmit). These signals are the means by which the Quantum™ communicates to the I/O.

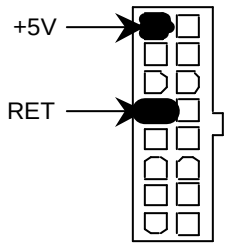
- **Standard Panel** -This harness has a 7-pin connector at one end that plugs into the Quantum™ at PL12, which provides power. A second 10-pin connector plugs into PL14 of the Quantum™, and is used for communications. Another connector plugs into the power supply. The remaining four connectors (16-pin) will plug into each of the Digital and Analog Boards in the system (up to four total). This harness varies from the Special panel harness in that there are two main branches; one feeds the digital boards, the other feeds the analog boards.

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.

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 Quantum™ 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:



Set the DVM to read *DC*, and set the proper range. The voltage reading must read a minimum of +4.98 Vdc. The Power-I/O harness will have an associated voltage drop at each board connection. As an example, if you are reading the voltage at the first I/O board in the daisychain, and it reads 4.98 Vdc, you can be assured that the voltage at the subsequent connections for the remaining boards will be lower yet. The voltage will need to be corrected for proper operation of the system. The cause for a low voltage reading could be:

- The Quantum™ 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 daisychain the signals.**

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

Active LED

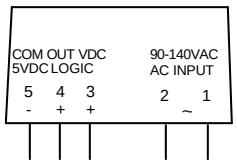
The Digital Boards have an *Active* LED indicator on the board that blinks when the board's software is running.

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.

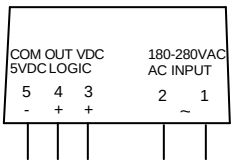
Digital Inputs

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™. The software program within the Quantum™ 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 240 volt controls. Both of these module styles are yellow in color. A side profile of these modules is shown below:



120 VAC Input



240 VAC Input

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.

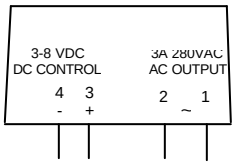
Never plug a 120 Volt Input module into a 240 Volt system, and vice-versa. Never plug an Output module into a position designated for an Input module.

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 plugable 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 Quantum™ is to control (energize). These devices include solenoids, relay coils, and heaters to be energized, based upon the logic within the Quantum™ software program.

There is one variety of Digital Output modules used on standard compressor control packages. This one module will handle both 120 Volt controls, and 240 volt controls. This module is black in color. A side profile of this module is shown below:



120/240 VAC Output

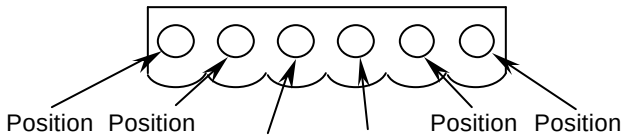
Although this Output module is labeled as 280 VAC on the top, and on the side, it can be used on both 120 and 240 volt applications.

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 plugable variety, and must be plugged into the *OUT* position for an Output module.

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:



The Digital I/O 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*. Each of the sixteen modules has a corresponding software configuration screen.

If a properly configured Digital I/O is not responding correctly, first look at the Digital Board on the "Service Screen" (on page 18) 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, the 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 DIO 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 the Frick® Service Department.
3. If the LED is on when it should be, check for proper panel voltage on the DIO 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 DIO 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 DIO 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.

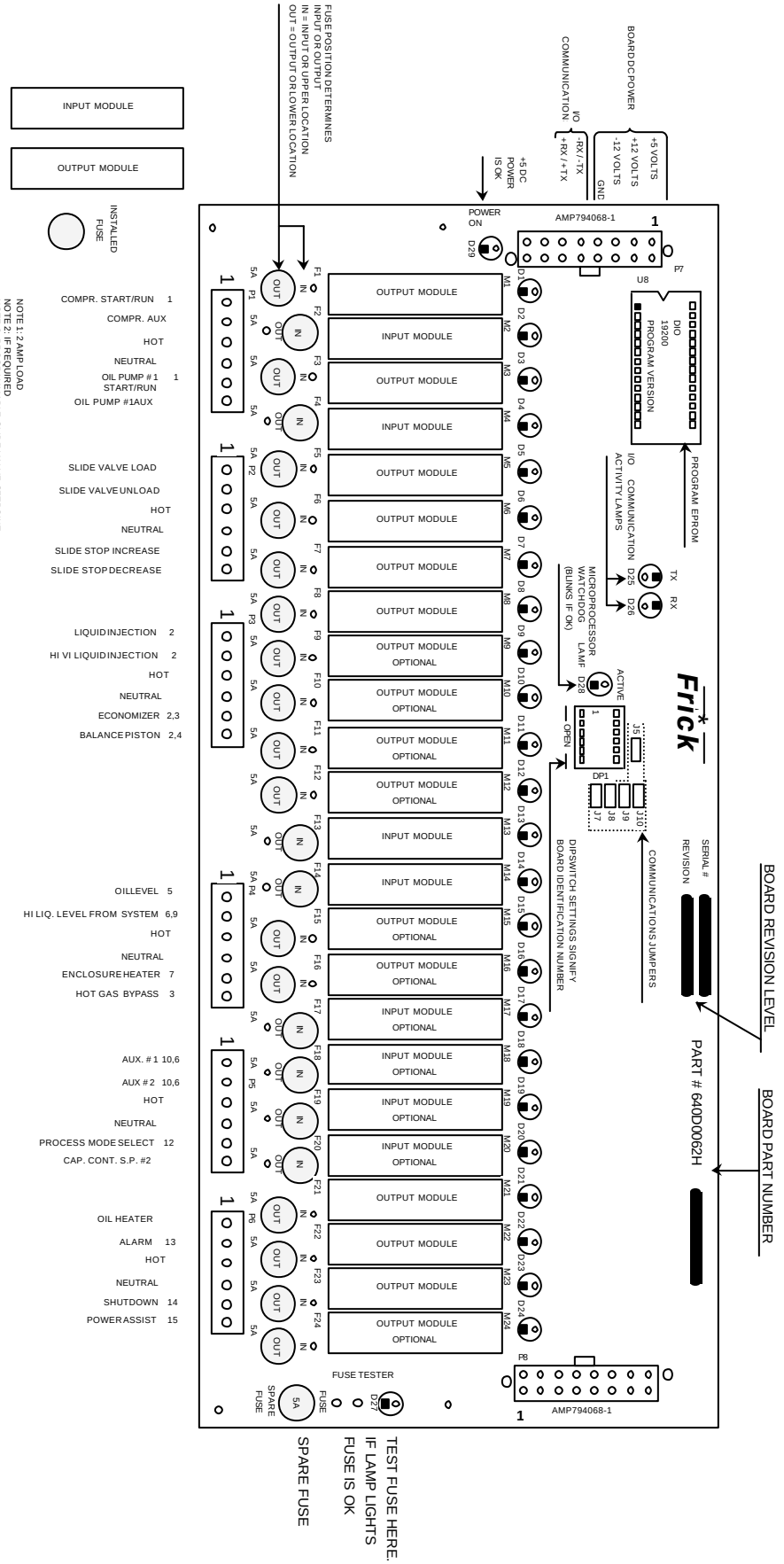
Replacing a Defective Digital Board

The procedure to replace a Digital board is outlined below:

1. Shut off control power.
2. Remove the old board from the machine and the new board from its packing and place both on an anti-static surface.
3. Remove any required chip(s) from the defective board and install them in the replacement board.
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.

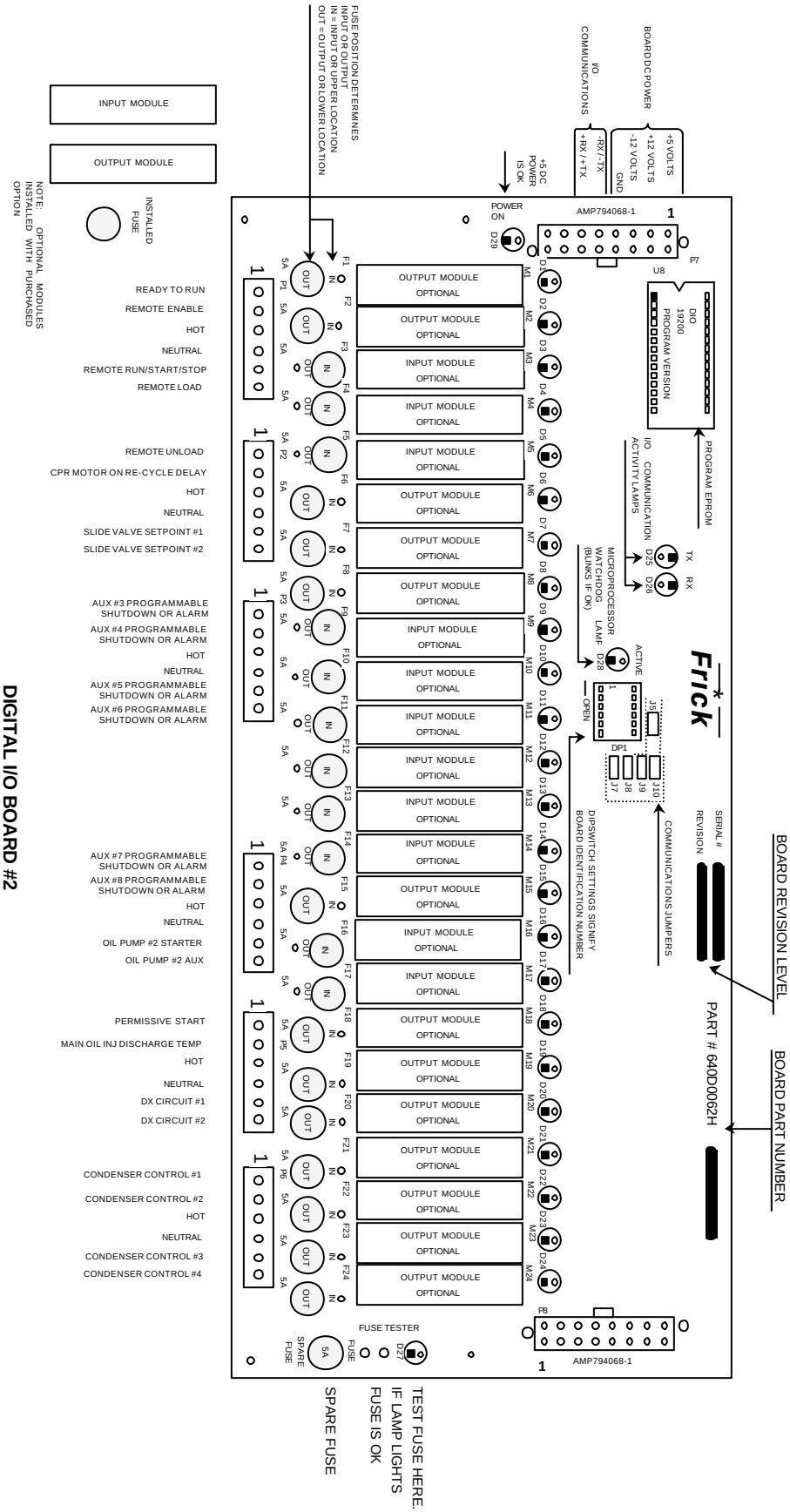
After replacing or installing a Digital Board and powering on the control panel, select **[Detect I/O Boards]** from the ***Change Communications*** screen in Panel Setup (this section appears later in this manual). This selection provides a method to detect all connected Digital and Analog boards. If 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.

DIGITAL I/O BOARD #1 PICTORIAL



DIGITAL I/O BOARD #1
PART # 640D0062H01
REPLACEMENT PART # 640C0024G01

DIGITAL I/O BOARD #2 PICTORIAL



DIGITAL I/O BOARD #2
PART # 640D0062H01
REPLACEMENT PART # 640C0024G02

DIGITAL BOARD SETTINGS

COMMUNICATIONS SETTINGS

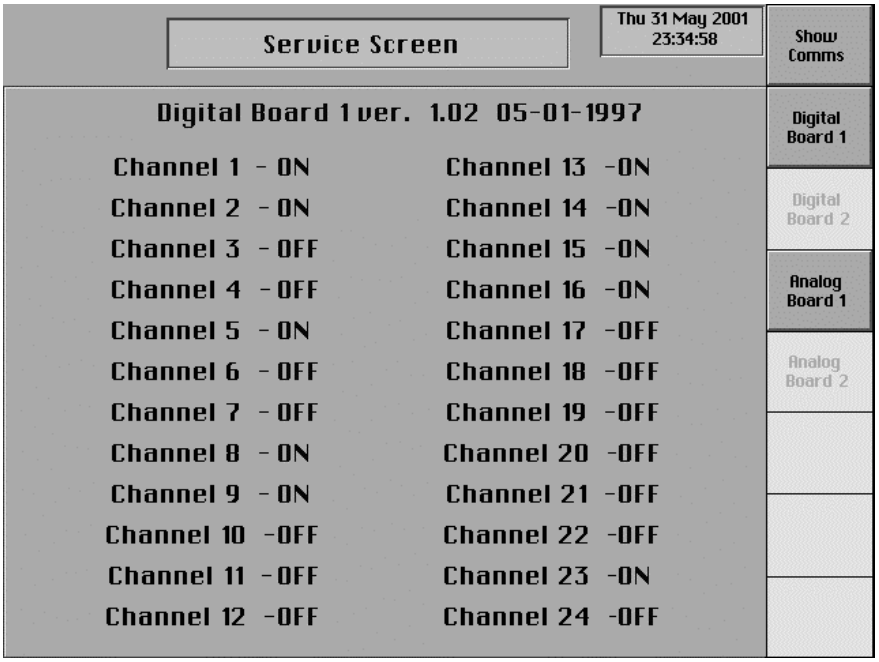
J5	in	120 ohm long communications line termination.
	out*	No termination.
J7	in	RS-422/485 transmit pull-up for long communications lines.
	out*	No pull-up.
J8	in	RS-422 transmit pull-up for long communications lines.
	out*	No pull-up.
J9	in	RS-422/485 receive pull-down for long communications lines.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

* = standard setting

DIPSWITCH SETTINGS

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

Service Screen - Digital Board Inputs and Outputs



The ***Service Screen*** has been provided to view the raw data from a Digital Board. There is a separate screen for each of the Digital Boards that are present. Digital values are shown as ON or OFF.

To access the ***Service Screens*** from the ***Operating Status*** screen, press the **[MENU]** key, then the **[MORE…]** key, and finally the **[SERVICE SCREEN]** key.

ANALOG BOARD

Overview

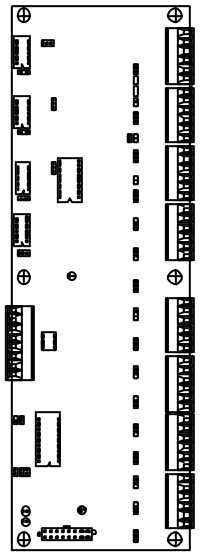
The Frick Quantum™ control panel is capable of reading external analog devices, such as temperature probes and pressure sensors. It uses these input signals for the purpose of monitoring and control. As an example, if an external temperature sensor began to read a higher than expected temperature in 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 recieved from these devices into data, which is then sent on to the Quantum™ control board via communications, and is monitored by the Operating system.

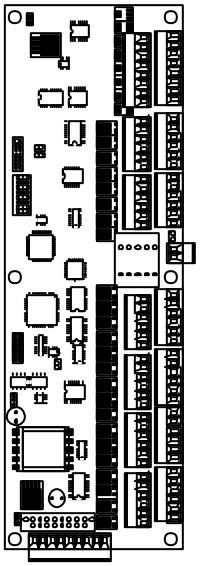
Analog Board Versions

There have been two different varities of Analog Board which have been used:

- **Original** - This board featured sixteen input and four output channels. The board also required jumpers to be manually set for each channel, so that the signal could be properly interpretted by the hardware. This board has been discontinued as of June 2003 and replaced by a newer version, which improves the capabilities and enhances the features. The description in this manual will concentrate on the new (enhanced) analog board design, with occasional mention of the original design as a reference. If additional information is required regarding this earlier version board, please consult S90-010 M Ver. 4.5x and earlier, or contact the factory. A drawing of this board is shown here:



- **Enhanced** - This board replaces the oiginal analog board effective June 2003. It features twenty-four input channels, and eight output channels. Rather than using physical jumpers to configure each channel, this is now done through the software. A more detailed description of the operation of this board is provided in the sections that follow. A drawing of this board is shown here:



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 enhanced board has the capability of 24 independent input channels. With the Quantum™ Compressor Control, these I/O channels are dedicated through the software and external wring, as to the function of each channel. The Quantum™ controller can utilize up to two separate analog boards (Analog Board #1 and #2), depending on the selected options. This can consist of any combination of Original (16 channels) or Enhanced (24 channels) boards (as long as the Quantum™ operating software is version 5.0x or later). For example, board #1 can be of the original design, while board #2 can be of the enhanced design.

For each of the boards that are installed, they will each 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). This allows the operating software to know what channel of which board a signal is being recieved from.

For example, the first channel of Analog Board #1 is dedicated to reading Suction Temperature. By having the dispswitches set correctly, the sowftware will know which of the two possible boards to look at in order to read the correct channel one. NOTE: Although the function of this channel cannot be changed, the type of device wired to it can be.

Communications LED's

The Quantum™ controller is in constant communication with the Analog (and Digital) Board(s). You will notice on each Analog and Digital board, that there is a pair of LED's that are 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 Quantum™, and the 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 section contains the dipswitch settings for addressing the Analog I/O Boards. When these switches are properly set, the Quantum™ 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 can be one of the following:
    - Lost or failed communications (displayed in the *Communications Status* box on the Home screen)
    - The wrong analog input signals being received
    - The wrong analog output signals being sent from the board.

Connections to the Quantum™

As stated earlier, the Quantum™ standard compressor control system utilizes up to two Digital, and two Analog Boards. To connect all of these boards together so that the Quantum™ 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. A diagram of this wiring harness can be found later in this addendum (see the Power I/O Wiring Harness drawing). This harness has an 18-pin connector at one end that plugs into the Quantum™. Another connector plugs into the power supply. The remaining four connectors (16 pin) will plug into each of the Digital and Analog Boards in the system (up to four total).

Upon close examination of this harness, you will notice that each of the connectors for both the Quantum™ and the four I/O boards, have two rows of connections. The wires that are inserted into the positions of one row, are internally daisychained on each I/O board, to continue the voltages and signals to the adjacent row. Therefore, any time that a connector is unplugged from the daisychain, these voltages and signals cannot continue through to the next board. Whenever a plug is not to be inserted onto a board, either for servicing, or if not all boards are present because of the options that are present, then a shunting plug (refer to the Recommended Spare Parts list) must be installed onto the open connector.

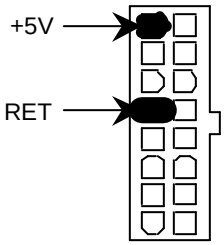
The four wires that feed from the power supply to the Quantum™ provide all of the necessary D.C. voltage that is required (+5 Vdc, -12 Vdc, +12 Vdc, and Return or Common). The voltages are passed through the connector on the Quantum™, and two new signals are generated by the Quantum™ to be passed on through the daisychain to the I/O boards. These two signals are the RX (receive) and TX (transmit). These signals are the means by which the Quantum™ communicates to the I/O.

The Analog Board requires the +5 Vdc for logic, the -12 Vdc for internal voltage reference, and +12 Vdc for external sensors (plus or +) and the Return (common or -). The communications signals (RX & TX) are required by all boards.

Logic Voltage (Power) LEDs

Located on the enhanced Analog Board are two power LEDs. The first of these is D1 LED (+5Vdc), and will be illuminated as long as the Control Power switch is ON, and the proper voltage is present at Analog Board connector P3. 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 an Analog 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 +5V lead, and the black (negative) probe end into the *RET* (Return or Common) lead, as shown below:



Set the DVM to read DC, and set the proper range. The voltage reading must read a minimum of +4.98 Vdc. The Power-I/O harness will have an associated voltage drop at each board connection. As an example, if you are reading the voltage at the first I/O board in the daisychain, and it reads 4.98 Vdc, you can be assured that the voltage at the subsequent connections for the remaining boards will be lower yet. The voltage will need to be corrected for proper operation of the system.

The cause for a low voltage reading could be:

- The Quantum™ 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 (Part # 640B0039H01) must be installed to daisychain the signals.**

The second power LED is D5 (+24Vdc). This +24Vdc voltage is generated on the Analog Board from the +5Vdc supply being fed from the Quantum™ power supply. If the +5Vdc is present as stated earlier, then this LED will illuminate if the on-board +24Vdc supply is functioning properly.

Active LED

The Analog Boards (both styles) have 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 Quantum™ controller 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™. The software program within the Quantum™ 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. For instance, if the digital input for the Oil Level Sensor is energized, and the Oil Separator Temperature sensor signal causes the value to drop below the setpoint, the Separator will determine that the Oil Heater needs to be energized. (Digital Inputs are discussed in the Digital Input section).

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).

Each of the twenty-four analog input channels is board software configurable to select for the following type of input signals:

Enahanced Analog Board Input Configuration Table

Channel	ICTD	0-5Vdc	0-20mA	POT (Potentiometer)	MC 50mA (Motor Current)	Comp Acl (Compressor Acceleration)	Mtr Acl (Motor Acceleration)	MtrB RTD (Motor Bearing RTD)	MtrS RTD (Motor Stator RTD)
1	*	*	*						
2	*	*	*						
3	*	*	*						
4	*	*	*						
5	*	*	*						
6	*	*	*						
7	*	*	*						
8	*	*	*						
9	*	*	*						
10	*	*	*						
11	*	*	*						
12	*	*	*						
13	*	*	*						
14	*	*	*	*					
15	*	*	*	*					
16	*	*	*		*				
PhD 1						*			
PhD 2						*			
PhD 3							*	*	
PhD 4							*	*	
PhD 5									*
PhD 6									*
PhD 7									*
PhD 8									

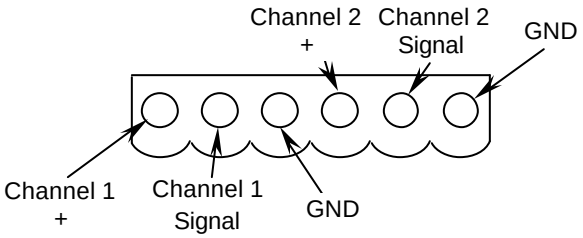
Note: Enahanced Analog Board 2 can utilize channels 17 through 24 for PhD if Analog Board 1 is of the old style. Refer to the section on Software Configuration for specific information on the procedure to set these channels.

Analog Outputs

An Analog Output is the portion of the hardware that the Quantum™ uses to provide control. With the Quantum™, this output is dedicated for a 4-20 mA signal that is outputted to an external device, and cannot be changed through the software configuration. This device is usually a customer specific application, such as to simply receive a signal back from the Quantum™ providing the Slide Valve Position to an external application (perhaps a PLC), as an example.

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:



Each input channel is configurable through the operating software. There are twenty-four analog input channels that can be selected for 4-20 mA, 0-5 Vdc, ICTD, or RTD. Channel #16 will also take the 0-5 Amp motor CT as an input. Besides properly setting the software configuration, 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 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. Ensure that all channel configuration information for the board being replaced has been written down.
2. Shut off control power.
3. Unplug all connectors from the board.
4. Remove the old board from the machine and remove the new board from its packing and place both on an anti-static surface.
5. Check that all jumpers and dipswitches are properly setup on the new board as it was on the old board.
6. Install the modified replacement board in the panel.
7. Plug all connectors back in.
8. Turn on control power.
9. After the Quantum™ has rebooted, access the Analog Board Configuration Setup screen for the board that was replaced (board #1 or #2), and re-enter the correct channel configuration. The default setup of the new board will be loaded to the processor. It is imperative that the channel configuration screen for the board that was replaced (analog board 1 or 2) is accessed to ensure that the channels are configured properly for the application.

After replacing or installing an Analog Board and powering on the control panel, select **[Detect I/O Boards]** from the ***Change Communications*** screen in Panel Setup (this section appears later in this manual). This selection provides a method to detect all connected Analog and Digital 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.

The **[Detect I/O Boards]** key resets the memory of the processor as to which boards it requires communications from. Therefore, it is important to check the **[About]** screen to see which boards have been detected relative to the I/O boards actually in the panel.

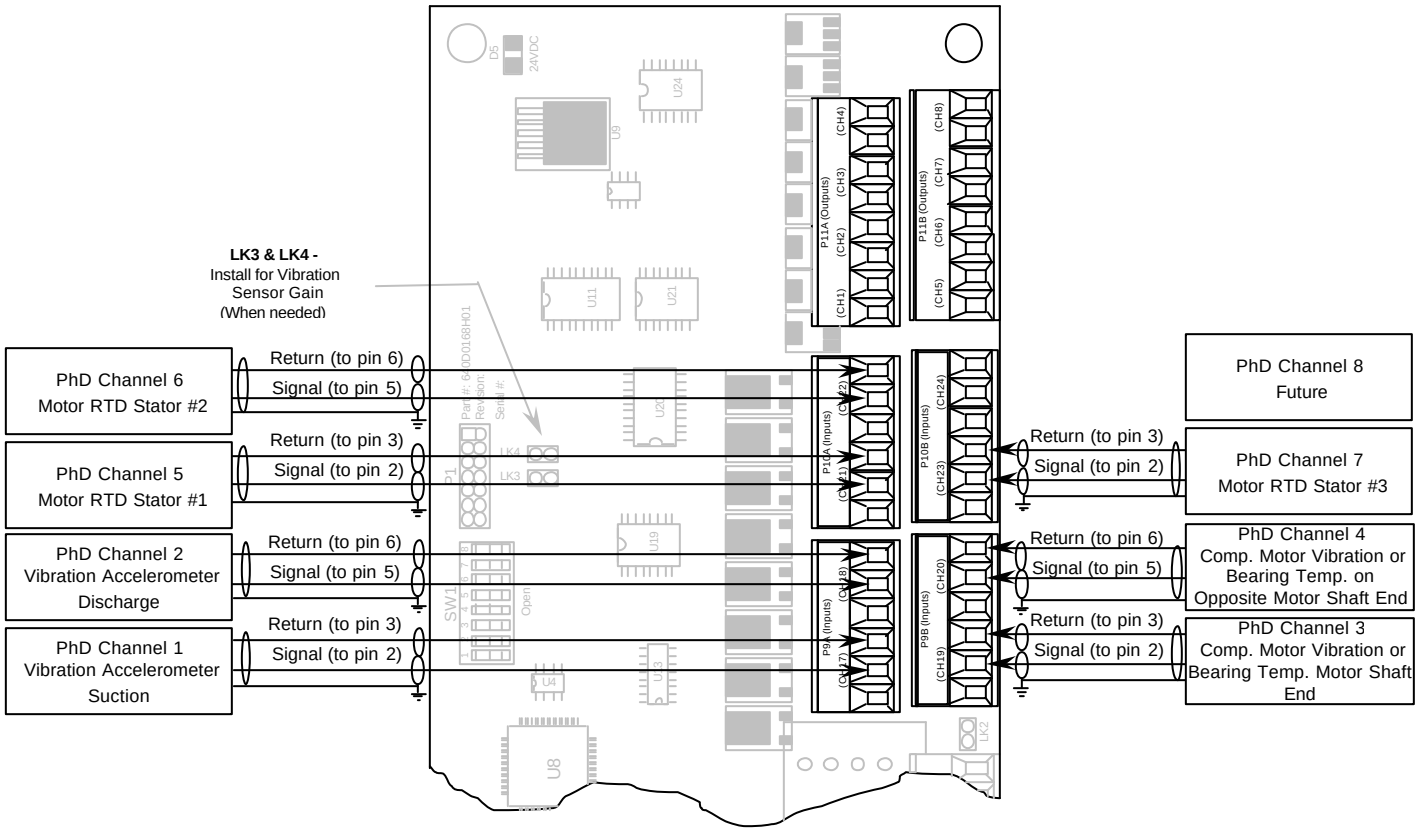
PhD Vibration Analysis

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

Accelerometers transmit continuous signals to the analog board. The Quantum™ software monitors these signals, and can detect any variations in the frequency of the vibration. The vibrations increase over time, predefined setpoint limits will be exceeded, and an alarm will be generated from the Quantum™ to the display screen, warning the operator of the condition. If the alarm is not addressed, a shutdown will occur to prevent damage to the compressor. Likewise, if RTDs are used for bearings, they will measure the temperature of the motor stator, which will increase (due to the failing bearings causing increased friction).

Refer to the drawing at the bottom of this page for the wiring connections of the different possible configurations.

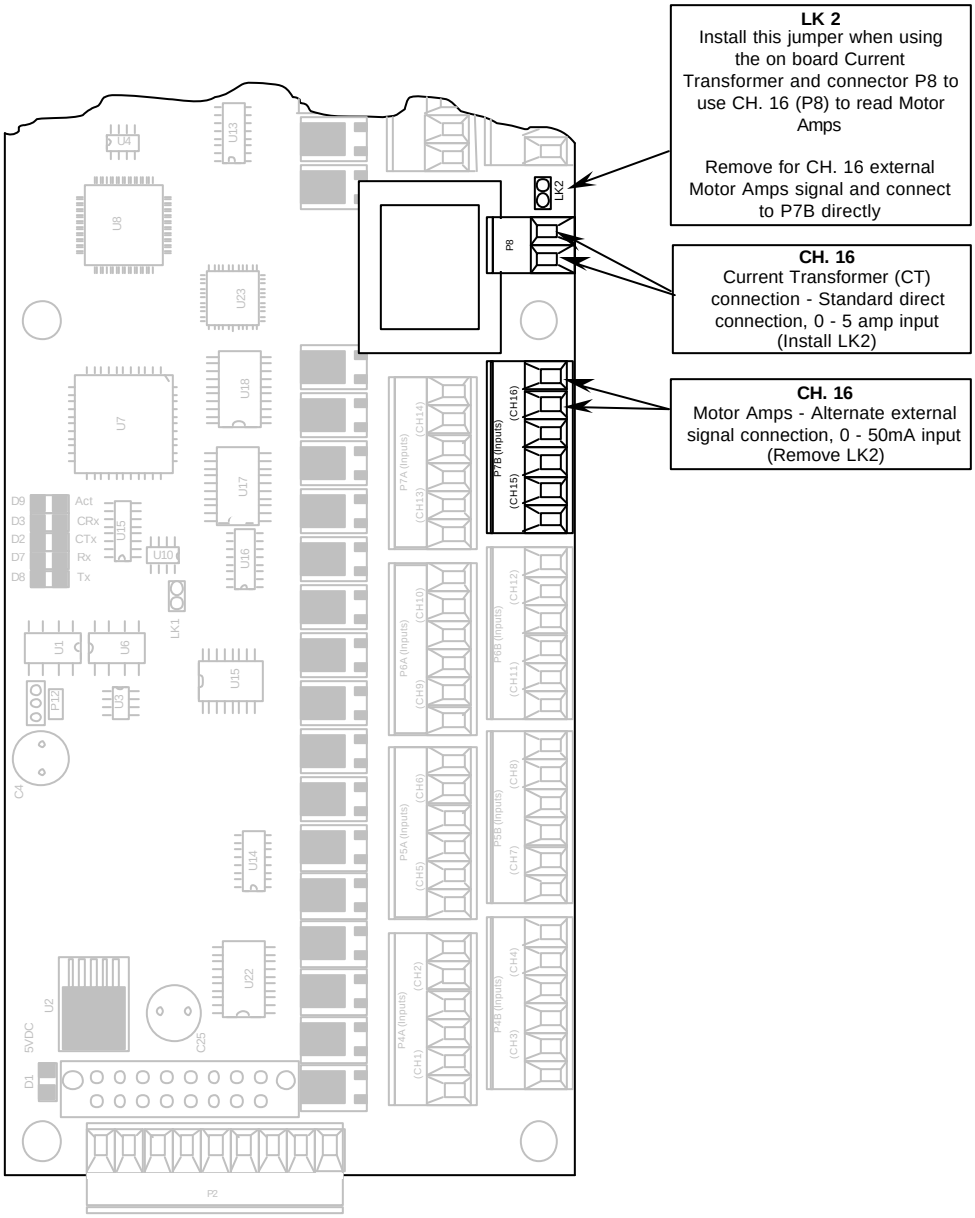
For detailed information about setting the Quantum™ up for PhD monitoring, refer to S90-010 FSI Ver. 5.0x. Additional information on PhD vibration monitoring and theory, may be found in the **PhD Vibration Monitoring System** manual (E70-020 TB).



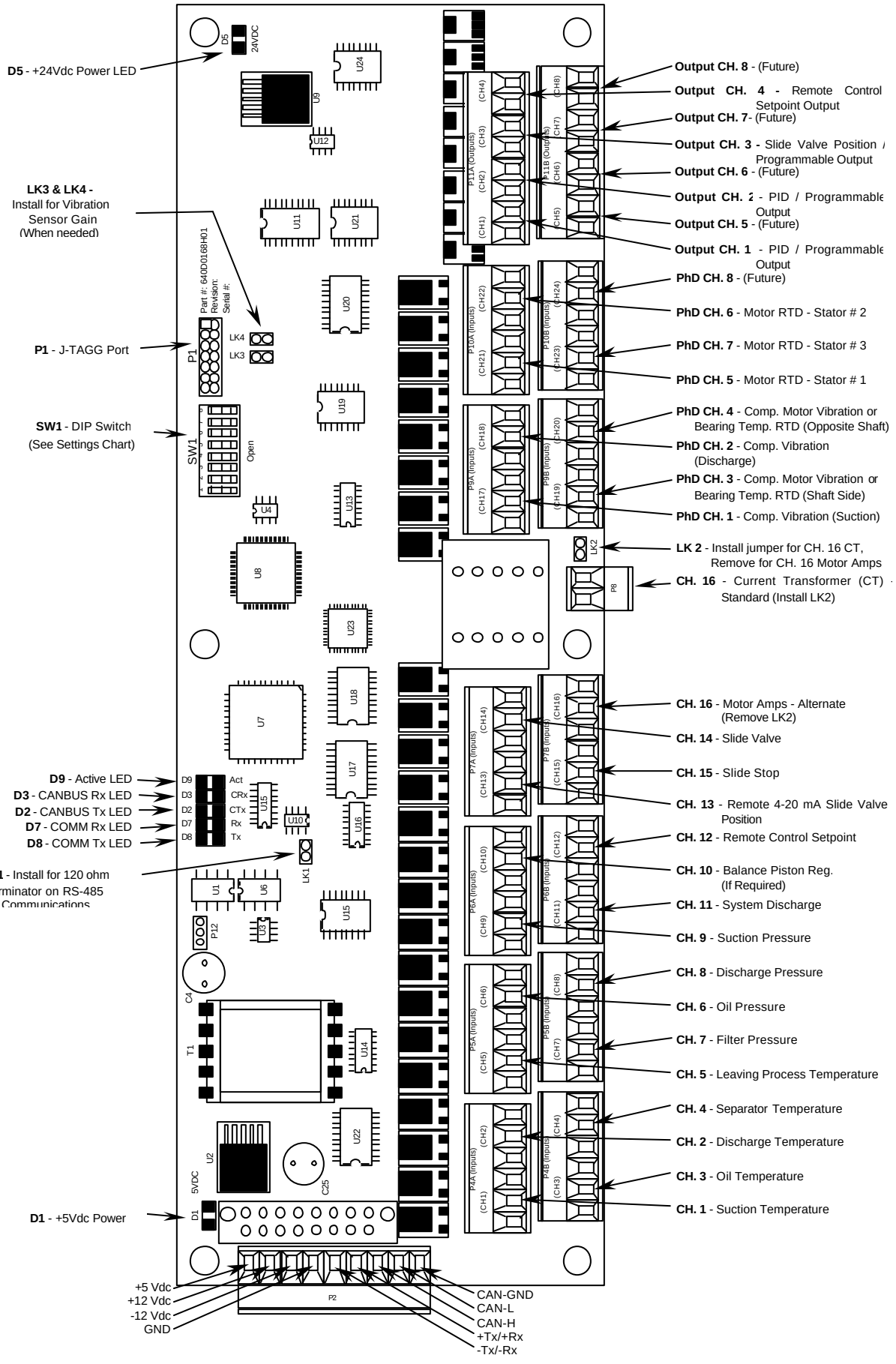
PhD Connections

Current Transformer (Motor Amps)

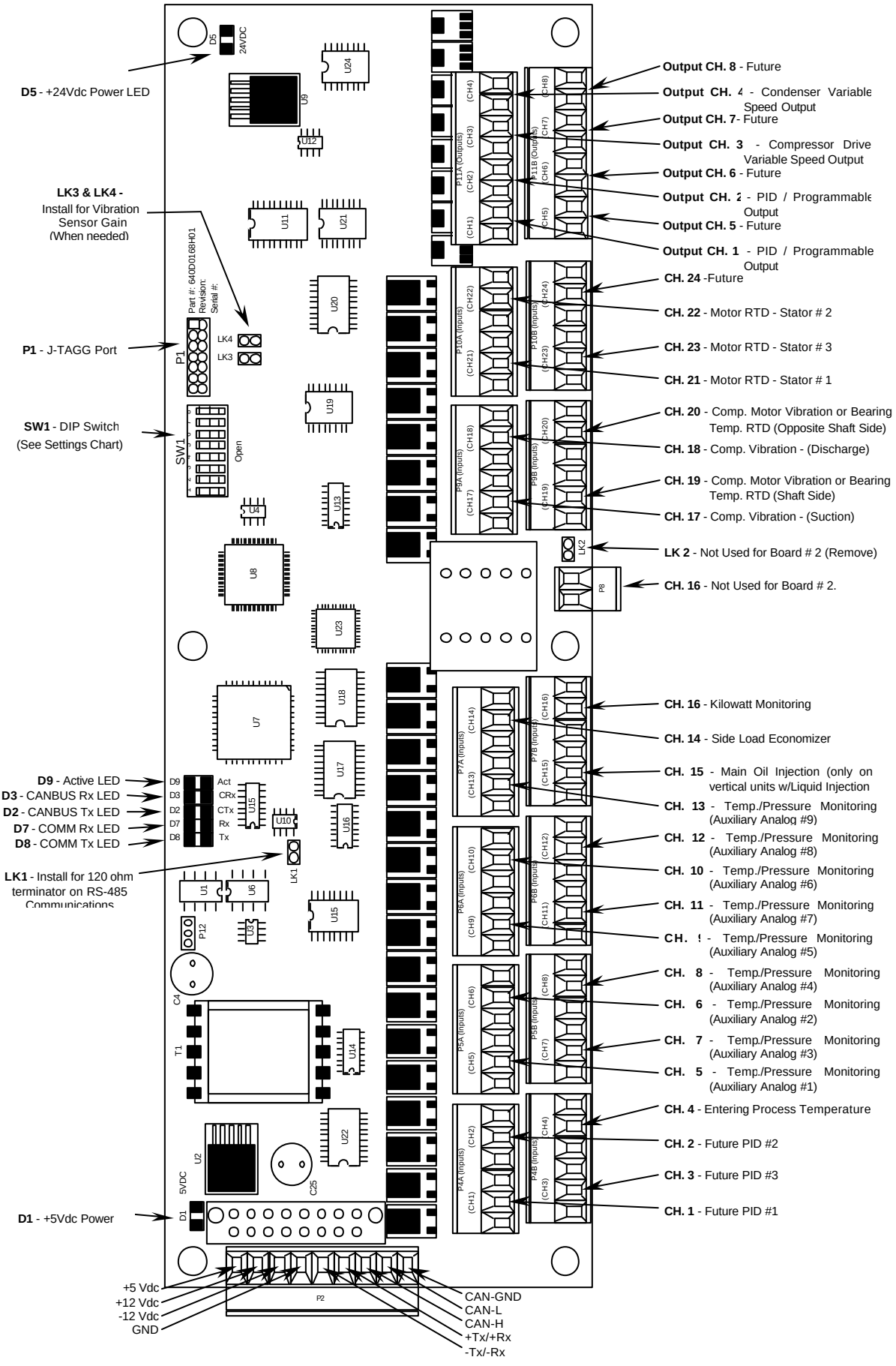
Channel 16 of Analog Board 1 is dedicated to reading motor amps, either through the use of the on board current transformer, or from an external source. When reading motor amps directly, the input signal cannot exceed 5 amps. If you are using an external current transformer, remove the jumper at Link 2, and connect the wiring to connector P8. If you intend on utilizing the on-board current transformer, then install Link 2, and connect the wiring to Channel 16, as shown in the diagram below:



ENHANCED ANALOG BOARD #1



ENHANCED ANALOG BOARD #2



ENHANCED ANALOG BOARD SETTINGS

Communications

LK1	In	120 ohm long communications line termination.
	Out *	No termination.

* default setting

Current Transformer (CT)

Analog Board # 1

LK2	In *	Install for CT (Current Transformer)
	Out	Remove to read Motor Amps.

* default setting

Analog Board # 2

LK2	In	(Must be removed)
	Out *	Remove (Not Used)

* default setting

Vibration

LK3	LK4	Gain Ratio
Out	Out	1 : 1
Out *	In *	11 : 1
In	Out	21 : 1
In	In	31 :1

* default setting

Dipswitch Settings (Used to set the board address)

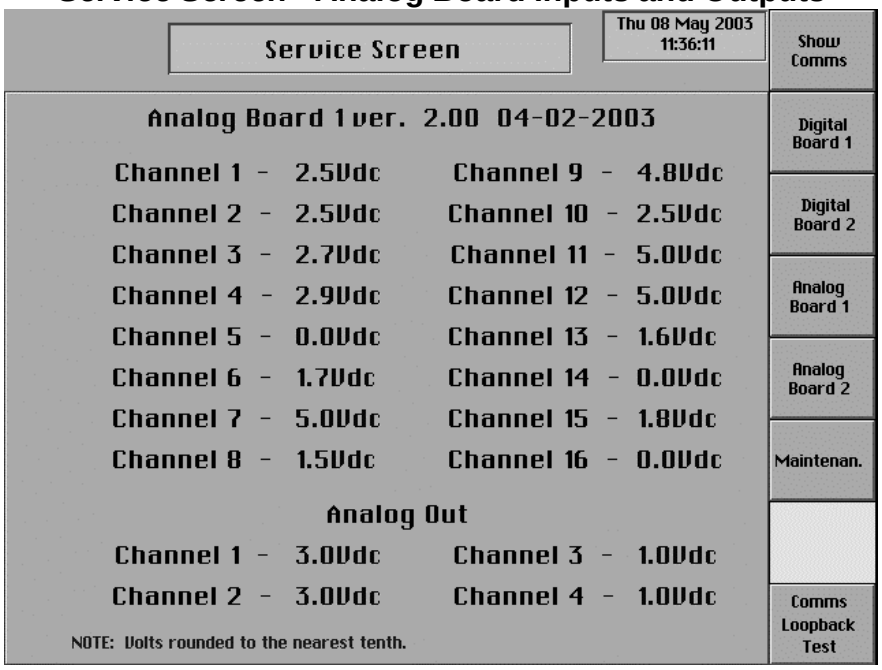
	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
Board #1	Off	Off	Off	Off	Off	Off	Off	Off
Board #2	On	Off	Off	Off	Off	Off	Off	Off

ANALOG BOARD COMPARISION CHART

	Original Analog Board		Enhanced Analog Board	
Input Channels	16		24	
Output Channels	4 (driver chips required)		8 (no driver chips required)	
On Board CT (Current Transformer)	No (external transformer required)		Yes (transformer incorporated on board)	
On Board Vibration Circuit	No		Yes (no external modules required)	
Channel Configuration	Jumpers		Software	
Dimensions	4” x 11”		4” x 11” (fits original board footprint)	
Types of Inputs:				
4-20 mA	Yes		Yes	
0 - 5 volt	Yes		Yes	
1 - 5 volt	Yes		Yes	
ICTD	Yes		Yes	
RTD (100O platinum)	No		Yes (currently for motor RTD inputs only)	
Supported Quantum™ Software Version	Resides on EEPROM/Flash (Ver. 1.xx - 4.xx)		Resides in Flash Memory (Ver. 5.xx)	
Service Dates	Sept. 96 - May, 2003		June 2003 - Present	
Replacement Part Numbers	**Analog Board 1**	**Analog Board 2**	**Analog Board 1**	**Analog Board 2**
Baltimore Parts Replacement	640C0026G01	640C0026G02	640C0057G01	640C0057G02
Field Installation Kit	N/A	640C0072G51	N/A	640C0072G52

SERVICE RELATED SCREENS

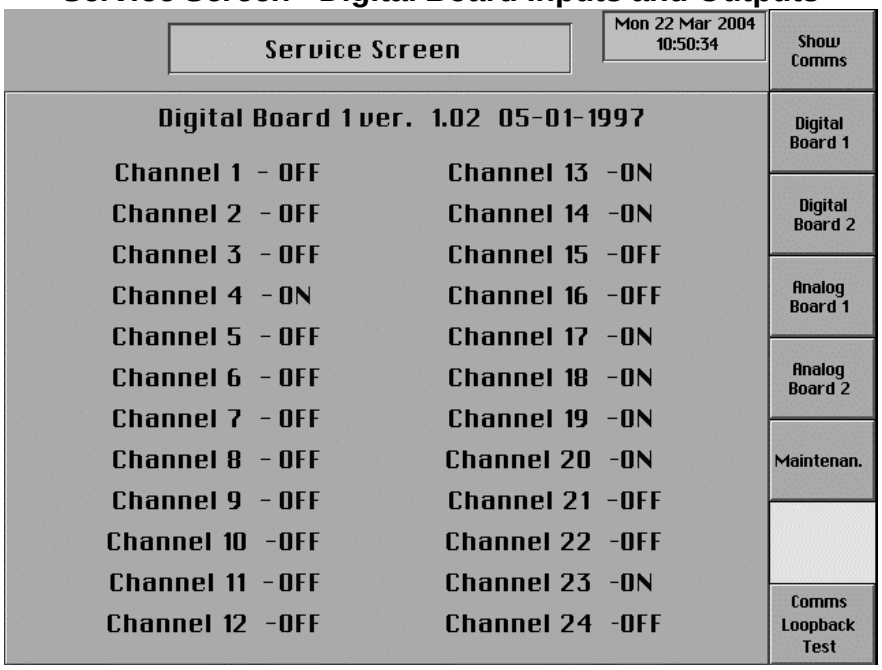
Service Screen - Analog Board Inputs and Outputs



The ***Service Screen*** has been provided to view the raw data from an Analog Board. There is a separate screen for each of the Analog Boards that are present. Analog values are converted from binary to show volts. The error factor is ± .05 volts.

To access the ***Service Screen*** from the ***Operating Status*** screen, press the **[MENU]** key, then the **[MORE…]** key, and finally the **[SERVICE SCREEN]** key.

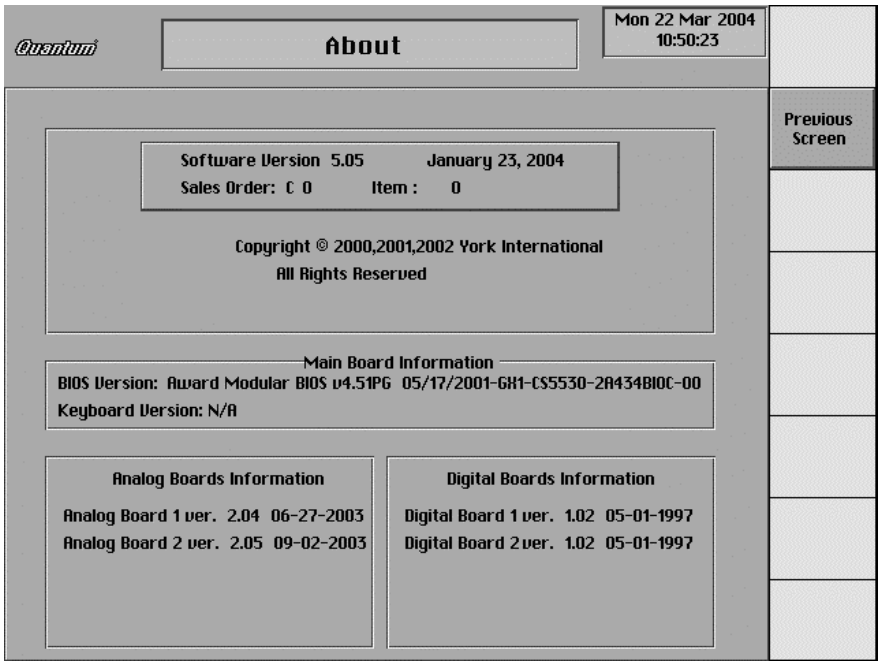
Service Screen - Digital Board Inputs and Outputs



The ***Service Screen*** has been provided to view the ON/OFF state of each I/O point from a Digital Board. There is a separate screen for each of the Digital Boards that are present.

To access the ***Service Screen*** from the ***Operating Status*** screen, press the **[MENU]** key, then the **[MORE…]** key, and finally the **[SERVICE SCREEN]** key.

About Screen

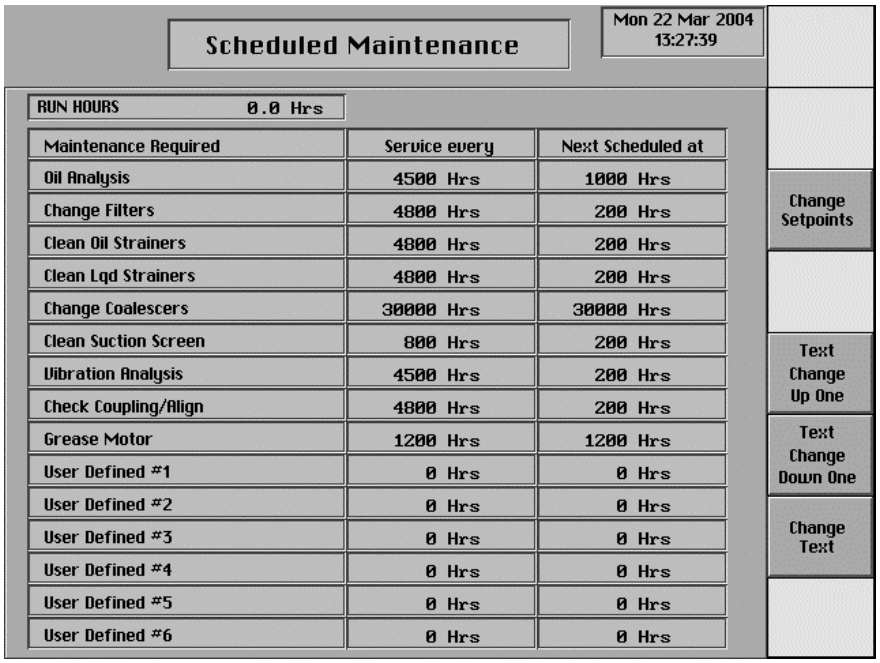


The ***About*** screen shows the Analog and Digital boards that have been detected. If a board has lost communications, a shutdown will be issued. All outputs are turned off on a Digital Board that has lost communications. All inputs will get set to their minimum value range on an Analog Board that has lost communications. A loss of communications to an analog board will probably result in sensor fault shutdown messages that are associated with the sensors on that board.

If the RX LED on the I/O board is blinking but the board was not detected on the ***About*** screen, or an I/O Comm failure occurs, check the address of the board.

To access the ***About*** screen from the ***Operating Status*** screen, press the **[MENU]** key, then the **[ABOUT…]** key.

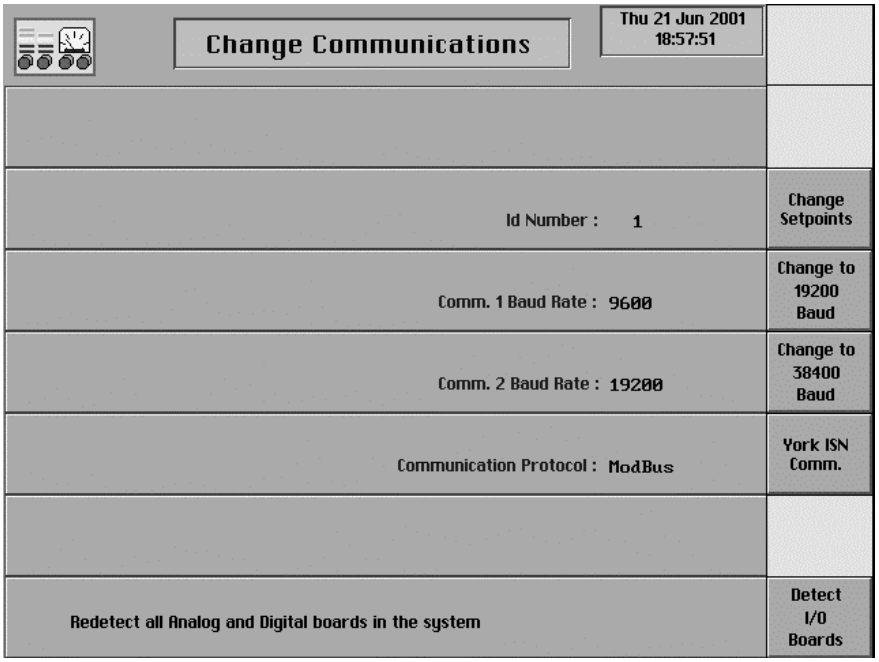
Scheduled Maintenance SCREEN



This screen has been provided to aid the service technician with keeping track of system maintenance, and can be accessed from the service screen. From here, the service technician can view up to fifteen (15) user definable maintenance schedules. Each of the 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.

Refer to S90-010 O (Operation Manual) for additional information about this screen.

Change Communications Screen



This screen is shown here to indicate where the **[Detect I/O Boards]** key is located. This selection provides a method to detect all connected Analog and Digital boards. 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 **Detect I/O Boards**:

- A board has been removed, and power was turned on with the board removed. You would need to replace the board, re-power, then *Detect I/O Boards*.
- A board has failed in such a way that it cannot properly communicate with the Quantum™
- 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.

To access the ***Change Communications*** screen from the ***Operating Status*** screen, press the **[MENU]** key, then the **[Panel Setup]** key, and finally the **[Change Comms]** key.

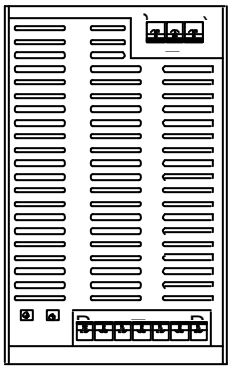
Once you have pressed the **[Detect I/O Boards]** key, you will be prompted with a message asking; *Are you sure you want to redetect the boards*? It it is, press **[OK]**, it it is not, then press **[Cancel]**.

POWER SUPPLY IDENTIFICATION, ADJUSTMENT AND REPLACEMENT

IDENTIFICATION

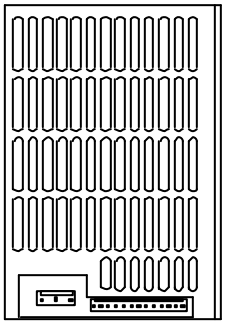
Frick® Controls has used two power supplies in the Quantum™ family. A Power One supply was originally used, primarily with the Quantum™ 1 & 2. With the introduction of the Quantum™ 3, the power supply vendor was changed to Condor. This same Condor supply is also now used with the Quantum™ 4.

Power One - This power supply may be identified by the location of the AC and DC power connections, they will be found at opposite ends of the supply. These connections are of the screw terminal type. Additionally, the lower left hand corner of the front grill will have two access holes. The left most of these holes allows for access to the adjustment potentiometer for the +5 Vdc output voltage, and the rightmost of these holes allows for the potentiometer adjustment of the +12 Vdc output voltage. If the -12 Vdc is out of acceptable range, the power supply will need to be changed. Extreme care must be used when adjusting either of these potentiometers. Adjustment should only be performed by qualified personnel, using an insulated screwdriver.



Power One Power Supply

Condor - This power supply may be identified by the location of the AC and DC power connections, they will be found at the same end of the supply. These connections are of a push-on multiple contact connector type. Additionally, there is the capability of adjusting the +5 Vdc voltage. Refer to the following page for the location of this potentiometer adjustment. Unlike the Power One supply, there is no +12 Vdc adjustment on the Condor. If the +12 Vdc, or -12 Vdc is out of acceptable range, the power supply will need to be changed. Extreme care must be used when adjusting the +5 Vdc potentiometer. Adjustment should only be performed by qualified personnel, using an insulated screwdriver.



Condor Power Supply

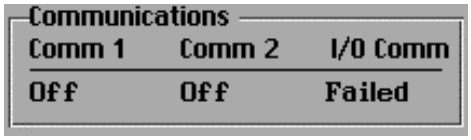
ADJUSTMENT

All circuit boards within the Quantum™ control panel require accurately adjusted DC voltages in order to function properly. These voltages consist of +5 Vdc, -12 Vdc, +12 Vdc and +24 Vdc. Periodic measurement and adjustment of the DC power system is highly recommended for optimum system operation. Over time, it is possible for temperature, humidity, vibration and component age, to degregate the accuracy of these voltages. When any of the DC voltages begin to stray from their optimum range (especially +5 Vdc), mysterious problems can begin to arise.

All four DC voltages originate from the power supply (either Power One or Condor). They are then daisychained to the Quantum™ controller, and then on to all connected Digital and Analog boards. Refer to the Flow Diagrams for the Quantum™ 3 and 4.

Even with a perfectly adjusted supply, it is possible for a potential drop in voltage at each connection point within the daisychain. This drop normally is in the mill-volt 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 daisychain, and all of these potential voltages drops are considered, the combined drop can be such that serious problems can be apparent. Some examples of serious problems could be:

- Loss of, or intermittent communications failures, especially as seen in the I/O Comm. Status box of the ***Operating Screen***. The box could read *Failed* or *Off* as shown:



- An alarm message stating *Digital Board x Reset* (where “x” is replaced by the number of the Digital Board that failed)
- An alarm message stating *Digital Board x Comm. Fail - Shutdown* (where “x” is replaced by the number of the Digital Board that failed)
- An alarm message stating *Analog Board x Comm. Fail - Shutdown* (where “x” is replaced by the number of the Analog Board that failed)
- Numerous sensor fault alarm messages.
- Quantum™ reboots for no apparent reason.
- Improper readings of analog pressures and temperatures.
- LED's on the Quantum™ are lit, but nothing appears on the display.

It must be pointed out that neither the -12 Vdc nor the +24 Vdc are adjustable. Additionally, the +12 Vdc may only be adjusted on the Power One supply (+12 Vdc cannot be adjusted on the Condor). +5 Ddc can be adjusted on both supplies.

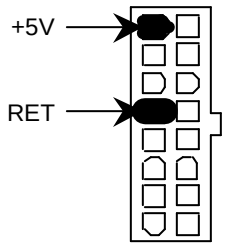
In order to properly measure the DC power, it must be checked at the Quantum™ controller, and verified for acceptable total voltage drop at the end of the daisychain (last I/O board). For the +5 Vdc (on either power supply), if the voltage at the Quantum™ is in the range of +5.04 to

+5.08 (+5.06 is ideal), and the voltage being read at the last I/O board is greater than +4.98 V, it can be assumed that the +5 V power is correctly adjusted. For the +12 Vdc (on either power supply), if the range at the last I/O board is between +11.8 and +12.2 Vdc (+12.00 is ideal), it can be assumed that the +12 V power is correct. The range for this voltage is not critical at the Quantum™, and the reading does not need to be taken there. Remember that the +12 Vdc cannot be adjusted on the Condor.

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) is present within the power supply. Adjusting the supply requires the use of a small screwdriver with an insulated shaft (refer to NS-10-02) inserted into the supply to access an adjusting potentiometer. It is possible for the screwdriver (and the person making the adjustment) to come into contact with potentially lethal voltages.

To perform measurements and adjustments on the power supply voltages, use a reliable 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 showing the normal *POST* style messages during a boot up. 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.

Ensure that the meter is set to the proper range (DC, 0-50 V or equivalent), as well as observing proper wire polarity. Measure the +5 Vdc first. If you have a Quantum™ 3 controller, refer to the pictorial drawing of it on the following page for the exact location of the measurement point. Place the negative lead on the common (return) pin, and the positive lead on the +5 Vdc pin as shown. Verify that the DVM is displaying in the range of +5.04 to +5.08 (+5.06 is ideal). If the reading is outside of this range, then using a thin, flat bladed screwdriver, insert the tip into the access hole for the appropriate voltage potentiometer (refer to the Quantum™ Panel D.C. Power Supply Layouts). While watching the DVM, slowly rotate the screwdriver blade clockwise to increase the voltage or counter-clockwise to decrease. Once the voltage has been adjusted, remove the DVM probes from the Quantum™, and install them into the white connector on the last I/O board in the daisychain, as shown below:



Check the reading on the DVM. If the reading at the Quantum™ has been adjusted properly, then this reading can be no lower than +4.98 DC. If the voltage is less, check all of the daisychain connections on the blue DC-I/O harness. Ensure that all of its connectors are tight. If all connections are good, then go back and start measuring over again, this time beginning at the first board in the daisychain. Continue checking the voltage at each connection, until you locate the point at which the voltage drop is excessive. This will usually indicate a connection that is not being made properly, or the sockets within the connector are weak. In either case, the DC-I/O wire harness may need replacing.

Next, you will want to measure the +12 Vdc. Perform the same steps as with the +5 Vdc measurement, with the exception that you will not need to measure at the Quantum™. Measure directly at the last connection. If the voltage is low, ensure that there is not an excessive voltage drop in the daisychain. If there is not excessive loss, and the power supply is a Power One, then it can be adjusted (refer to the Quantum™ Panel D.C. Power Supply Layouts for adjustment location). If you have the Condor, then the supply itself may need replaced.

The -12 Vdc may be measured the same as the other voltages, however, this voltage is not adjustable on any supply, so if the harness is not the culprit, the supply may need to be replaced.

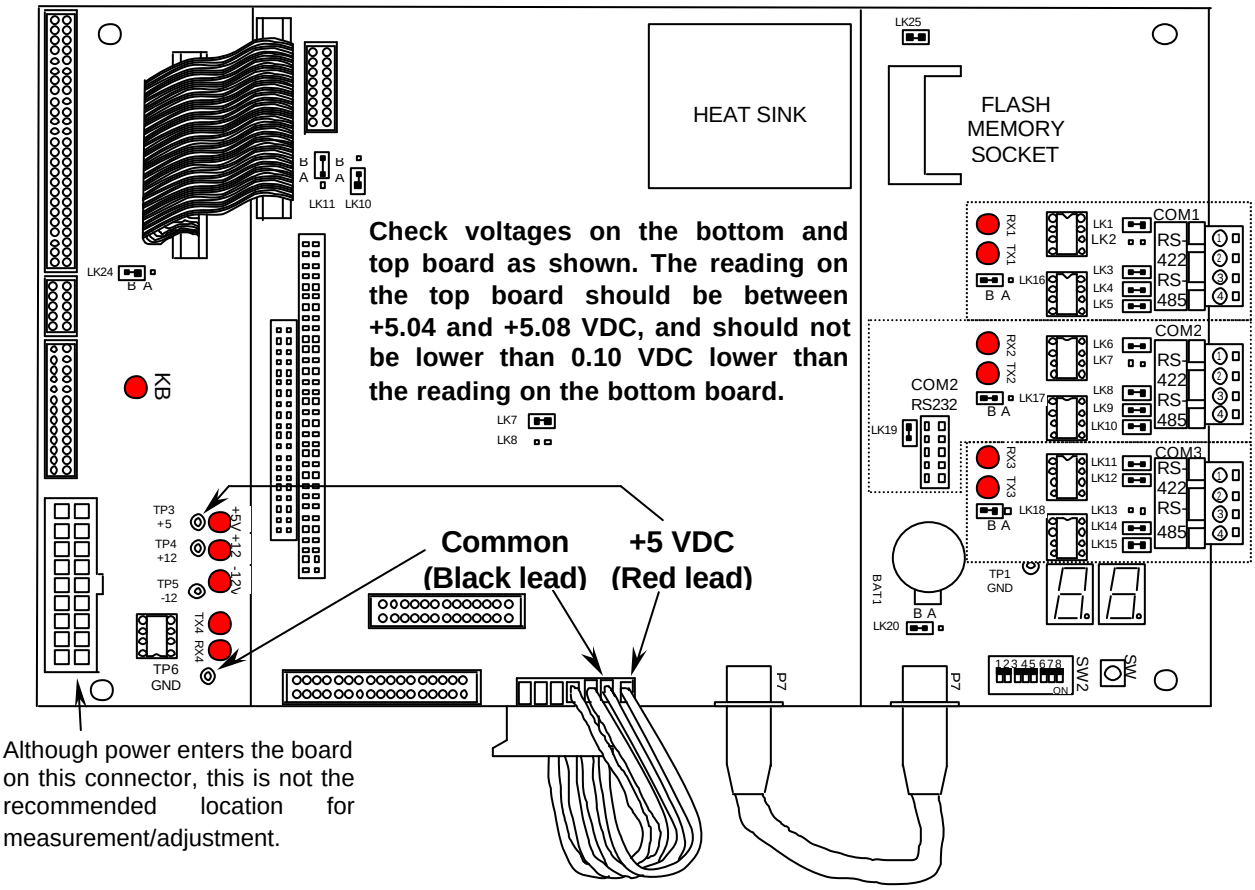
REPLACEMENT

Power One - If the Power One supply is installed, and it is found to be bad, or not capable of acceptable adjustment, it will need replacing. Since the Power One is no longer available from Frick®, an upgrade kit can be ordered that will adapt the Condor supply to the Power One mounting holes. Refer to the Recommended Spare Parts list for the upgrade part number. This upgrade kit will include the following components:

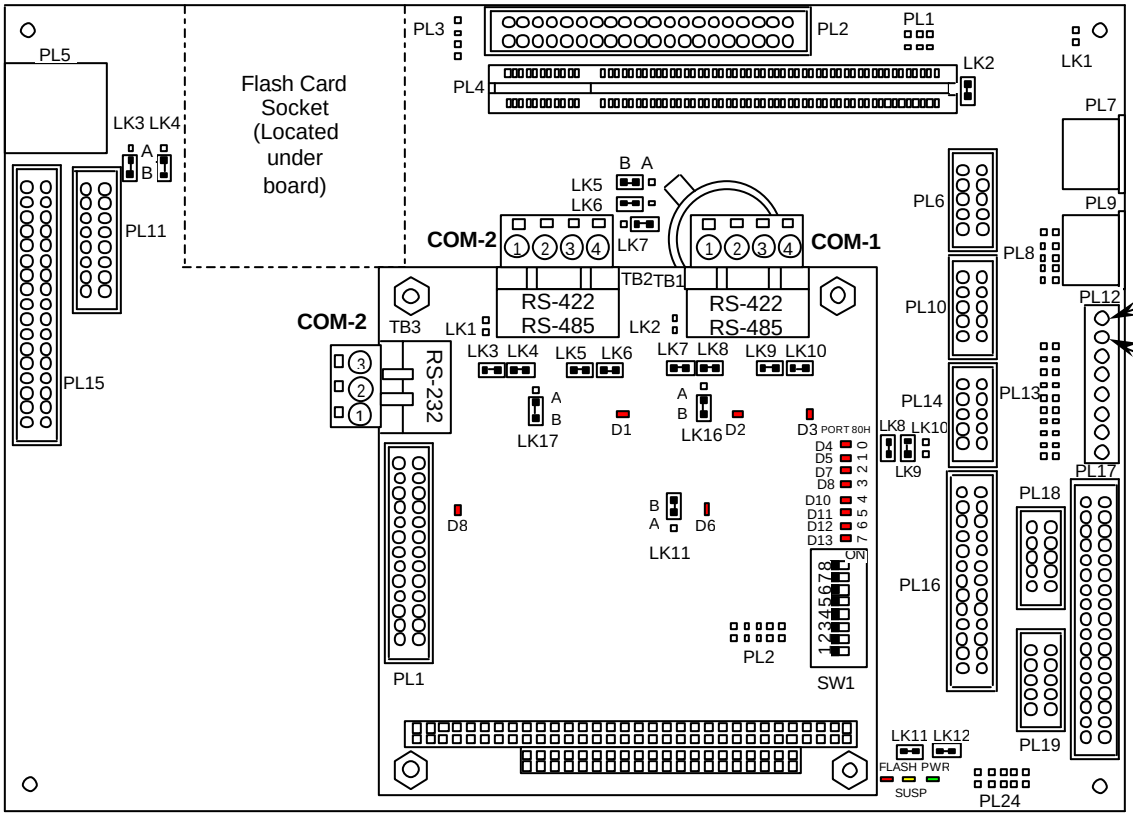
- Tie wrap wire ties
- Adhesive backed tie wrap mounts
- Screws (6-32 x 3/8 flat head)
- Power supply (Condor)
- Mounting plate (adapts Condor to Power One mounting holes)
- AC power cable harness (needed since the Power One supply utilizes screw terminals, and the Condor utilizes connectors)
- DC power cable harness (needed since the Power One supply utilizes screw terminals, and the Condor utilizes connectors)

Condor - If you have the Condor power supply, and it is found to be bad, or not capable of acceptable adjustment, it will need replacing. When ordering this replacement, you will receive an upgrade kit. The purpose of this kit is to allow for the upgrading of the I/O DC power harness, at the same time as replacing the power supply. Refer to the Recommended Spare Parts list for the upgrade part number. This upgrade kit will include the following components:

- Screws (6-32 x 3/8 flat head)
- Power supply (Condor)
- DC power cable harness (this is an improved version of the previous power cable)

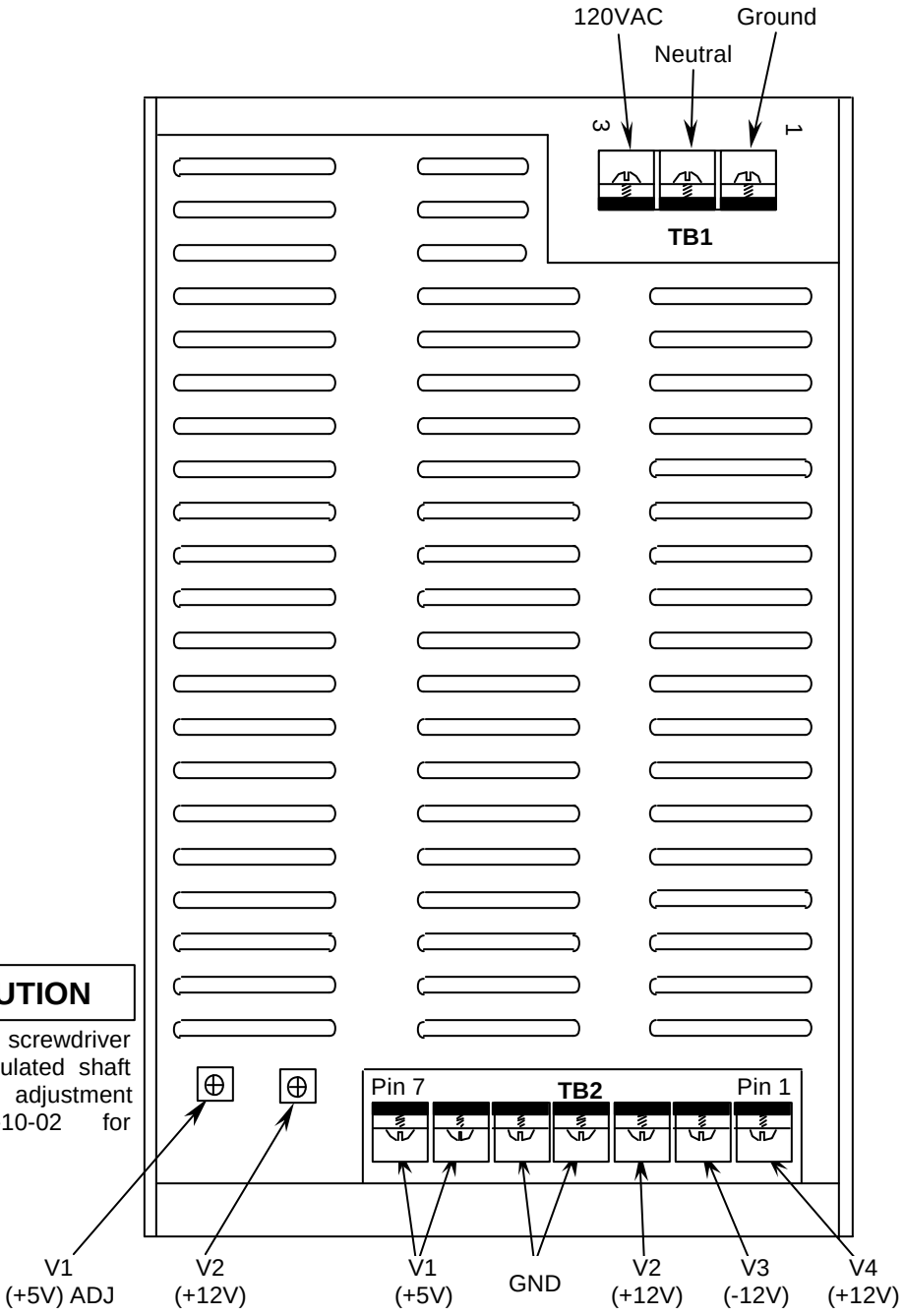


Quantum™ 3 +5 DC Voltage Measurement Location



Quantum™ 4 +5 DC Voltage Measurement Location

QUANTUM™ PANEL D.C. POWER SUPPLY LAYOUT (POWER-ONE)



CAUTION

Use only a screwdriver with an insulated shaft to perform adjustment (see NS-10-02 for details).

INPUT: TB1
SCREW TERMINAL CONNECTIONS:

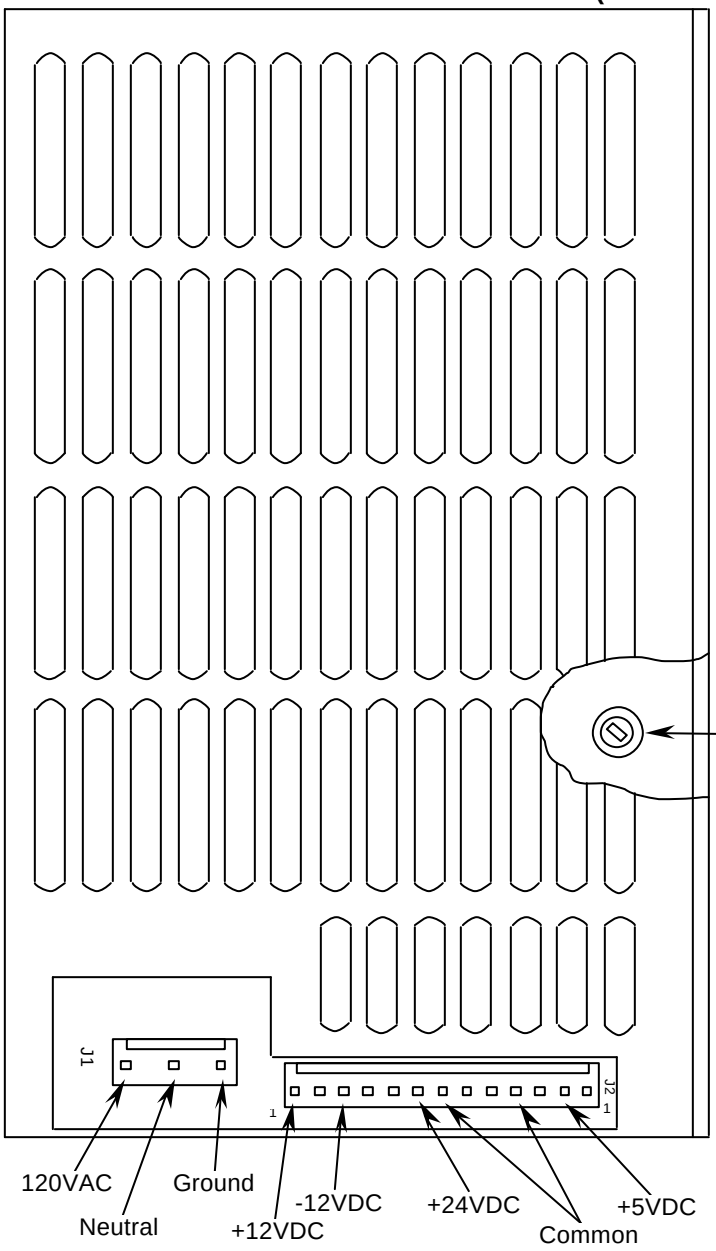
Pin 1	AC GROUND
Pin 3	AC NEUTRAL
PIN 5	AC LINE

INPUT: TB2
SCREW TERMINAL CONNECTIONS

PIN 1	OUTPUT V4 (+12V)
PIN 2	OUTPUT V3 (-12V)
PIN 3	OUTPUT V2 (+12V)
PIN 4	COMMON (GND)
PIN 5	COMMON (GND)
PIN 6	OUTPUT V1 (+5V)
PIN 7	OUTPUT V1 (+5V)

Note: The Power One power supply utilizes screw connections for both the AC and the DC connections. The Condor supply, on the next page, utilizes connectors. Additionally, both the +5 Vdc and the +12 Vdc can be adjusted on the Power One supply, whereas the Condor supply can only be adjusted for +5 Vdc.

QUANTUM™ PANEL DC POWER SUPPLY LAYOUT (CONDOR)



CAUTION

Use only a screwdriver with an insulated shaft to perform adjustment (see NS-10-02 for details).

INPUT: J1

AMP P/N: 640445-5
.312 CTR CONNECTOR, 3 CIRCUITS

Pin 1	AC GROUND
Pin 3	AC NEUTRAL
PIN 5	AC LINE

MATING CONNECTORS: MOLEX

	HOUSING	CONTACT
INPUT	26-03-4050	08-52-0113
OUTPUT	26-03-4131	08-52-0113

INPUT: J2

AMP P/N: 1-640445-3
.156 CTR CONNECTOR, 13 CIRCUITS

PIN 1	OUTPUT #1 (+5.1V)
PIN 2	OUTPUT #1 (+5.1V)
PIN 3	OUTPUT #1 (+5.1V)
PIN 4	COMMON
PIN 5	COMMON
PIN 6	COMMON
PIN 7	COMMON
PIN 8	OUTPUT #2 (+24V)
PIN 9	OUTPUT #2 (+24V)
PIN 10	POWER FAIL
PIN 11	OUTPUT #3 (-12V)
PIN 12	COMMON
PIN 13	OUTPUT #4 (+12V)

Note: The Condor power supply utilizes connectors for both the AC and the DC connections. The Power One supply, on the previous page, utilizes screw connections. Additionally, only the +5 Vdc can be adjusted on the Condor supply, whereas the Power One supply can be adjusted for both +5 Vdc and +12 Vdc.

IDENTIFYING THE TYPE OF DISPLAY

To date, there have been four different manufacturers of displays that the Quantum™ Control Panel has used. It is important to be able to determine the type of display that you are installing, so that it can be properly matched with the version of Quantum™ controller already in place. The reason for this is that each of the manufacturers has their own requirements for both logic voltage, and for backlight voltage for their particular display. Fortunately, the Samsung, NEC, and Sharp displays all share the same voltage characteristics, only the LG Philips display varies from this voltage requirement.

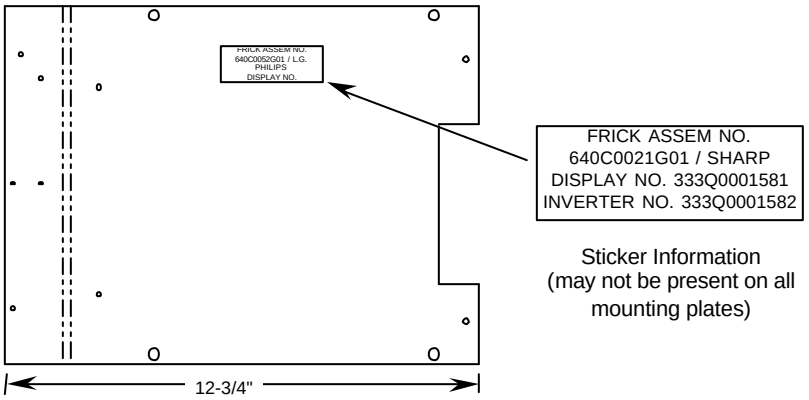
A sticker should be affixed to the top center of the mounting plate. This sticker will give the part number of the assembly, the display (and type of display), and the inverter. If this sticker is not present, or to confirm the sticker information, measure the distance from one end of the white display mounting plate to the other, as shown below. If the distance is approximately 12-3/4", the display that is mounted to the plate is either a Sharp, NEC or Samsung. If the distance is approximately 11-3/4", the display is an LG Philips, as shown below.

Once the type of display is known, you will want to use the chart at the bottom of this page to determine the proper parts compatibility.

You will also need to refer to the jumper settings for the appropriate Quantum™ controller that is installed.

Display Replacement

1. Shut off control power.
2. Remove the defective display.
3. Install the new display.
4. Ensure that all parts (cables, etc.) are compatible per the chart at the bottom of this page.
5. Verify the jumper (link) settings per the table near the bottom of this page.



Display Mounting Plate

Quantum™ 3 Motherboard Display Jumpers (links)
(Refer to "Quantum™ 3 Board Settings" for location of jumpers)

LK10	A	+5V Backlight Voltage (Not used)
	B*	+12V Backlight Voltage (All Displays)
LK11	A*	+5V LCD Supply (Samsung, NEC, Sharp)
	B	+3.3V LCD Supply (LG Philips Display)

* standard setting

Quantum™ 4 Motherboard Display Jumpers (links)
(Refer to "Quantum™ 4 Board Settings" for location of jumpers)

LK3	A	+5V Backlight Voltage (Not used)
	B*	+12V Backlight Voltage (All Displays)
LK4	A*	+5V LCD Supply (Samsung, NEC, Sharp)
	B	+3.3V LCD Supply (LG Philips Display)

* standard setting

DISPLAY ASSEMBLY COMPONENT REPLACEMENT GUIDE

DESCRIPTION		MANUFACTURER			
		SAMSUNG (OBSOLETE)	NEC (OBSOLETE)	SHARP (CURRENT)	LG PHILIPS (OBSOLETE)
Quantum™ 3	10.4" TFT Display	333Q0001180	333Q0001494	333Q0001581	649C1078H01
	Backlight Inverter	333Q0001582 (OR 333Q0001181)	333Q0001495	333Q0001582	333Q0001582
	Cable - CPU to Display	640B0036H01	640B0043H01	640B0045H01	640B0065H01
	Cable - CPU to Inverter	640B0032H01	640B0044H01	640B0032H01	640B0032H01
	Replacement - Backlight	Not Available	333Q0001587	333Q0001588	333Q0001785
	Display Replacement Assy.	640C0021G01	640C0021G01 Rev A	640C0021G01 Rev B	640C0052G01
Quantum™ 4	10.4" TFT Display	333Q0001180	**SEE NOTE "A"**	333Q0001581	649C1078H01
	Backlight Inverter	333Q0001582 (OR 333Q0001181)		333Q0001582	333Q0001582
	Cable - CPU to Display/Inverter	649D4824H01		649D4824H01	649D4824H01
	Replacement - Backlight	Not Available		333Q0001588	333Q0001785
	Display Replacement Assy.	640C0021G01		640C0021G01 Rev B	640C0052G01

NOTE A: When upgrading from a Quantum™ 3 with an NEC Display, to the Quantum™ 4, the display will need to be upgraded also, refer to the Recommended Spare Parts list. The LK4 jumper will need to be in the "A" position.

TROUBLESHOOTING A PROBLEM THAT APPEARS UNEXPLAINABLE

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

1. It is important to know if the unit ever worked properly.
2. If the unit used to work properly, try to determine when the problem first showed up.
3. It is important to know if the problem occurs randomly, frequently, or all the time.
4. Check what the temperature is in the engine room and at the panel. Is it very hot or very cold?
   - Make sure that the motor is not blowing exhaust air on the control panel.
5. If it just started to act up, then check if there was recently a severe lightning storm, fire, flood, or a plant accident. If any of the following conditions are possible, then check for it:
   - Has any water, refrigerant, or oil leaked into the panel or conduit?
   - Does the conduit with the Slide Valve or Slide Stop contain liquid?
   - Does the Slide Stop potentiometer cover contain any liquid?
6. If it just started to act up, then check if anything was recently changed in the system (i.e. software or hardware.)
7. If it just started to act up, then check if any service was recently done to the compressor or it's electrical system?
8. If there is communication wiring connecting the panel to another panel or device, then check the following:
   - If the Quantum™ 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. For dual sequencing machines, the shield should only be tied to ground in one panel, typically the "Lead" machine.
   - Check that you are using the Frick® recommended communications cable. See manual to match proper cable with type of communications (i.e., RS-422, RS-232, RS-485, or some other type of factory communication bus system.)
9. If this is an older plant, has the plant wiring been brought up to code?
10. Do you have power wiring mixed with control wiring?
11. Do you have power wiring mixed with sensor wiring?
12. Do you have power wiring mixed with 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. The two types of transducers you may have are as follows: an older type has an 8 to 10 inch 3-conductor pigtail coming out of the transducer. This type will have the attaching cable's shield cut off and insulated at the transducer end. The shield is then tied to a panel ground terminal in the panel. The newer type has the cable as an integral part of the housing and has the shield crimped to the case at the transducer end. This type of transducer has the cable's shield cut off and insulated in the control panel.
17. Check that the temperature transducers are properly grounded. The temperature probes usually have two short wires coming out of the sensor, and are tied to a shielded cable at the thermal well head. The shield is insulated at the temperature probe and grounded at the panel end.
18. Check if one of the temperature probes has a signal wire shorted to machine ground. To do this, first pull the orange plug from the micro board and then use a DVM and check each white wire to machine ground and each black wire 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 suppressers across them, preferably at the devices and not at the panel end.
20. If the compressor control settings unexplainably change modes, it may be a noise problem affecting the keypad's input circuit. Check if it works OK with the keypad cable disconnected. If it works OK, then check the grounding as described above. If the grounding is OK then replace the keypad.
21. Make sure that you have a continuous ground back to the power source. 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.
22. Make sure that there is no AC wiring lying next to the printed circuit board.
23. 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)
24. 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 â QUANTUM™ CONTROL PANEL (REFER TO WIRING DIAGRAMS)

SYMPTOM	PROBABLE CAUSES and CORRECTIONS
DISPLAY IS INOPERATIVE	Check for power at the panel. See if any of the diagnostic lamps on the Main 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. Shut off power to the panel and first confirm that the display connector is firmly seated . This is a delicate connection and care should be used to reconnect it. Confirm that the connectors at both ends of the backlight inverter are properly connected. Confirm that the display harness (and inverter harness for the Quantum™ 3) are connected properly on the main board. Reference Dwg. No. 640D0070 sheet 2.
OIL PUMP DOES NOT START	The LED (D3) for Output 3 (MOD 3) of Digital I/O Board #1 should be on when Manually On is selected for the oil pump mode. 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. 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.
OIL PUMP IS RUNNING BUT THE COMPRESSOR DOES NOT START	If shutdown message "Compressor Starting, Low Oil Pressure - Shutdown" is displayed, refer to the section in the compressor manual on troubleshooting the oil pump system. 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).
COMPRESSOR AUXILIARY SHUTDOWN	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). 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.

SYMPTOM	PROBABLE CAUSES and CORRECTIONS
OIL HEATERS DO NOT OPERATE	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. 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). 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.
COMPRESSOR DOES NOT LOAD and/or UNLOAD* (Compressor that steps on Capacity)	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. Check that the hydraulic valves feeding the solenoid valve as well as those feeding the unloader pistons are open. Confirm that hydraulic tubing and wiring is properly connected. Check the solenoid valve coil to see if it has been damaged. **NOTE: Verify that the proper capacity control setpoint has been programmed.**
COMPRESSOR WILL ONLY PARTIALLY LOAD* (Compressor that steps on Capacity)	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. Check that the hydraulic valves feeding the first SV as well as those feeding the compressor unloading pistons are open. Inspect the compressor unloading ports for worn or improperly seated parts.
SLIDE VALVE DOES NOT LOAD and/or UNLOAD*	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. 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. **NOTE: Verify that the proper capacity control setpoint has been programmed.**

SYMPTOM	PROBABLE CAUSES and CORRECTIONS
SLIDE STOP DOES NOT INCREASE and/or DECREASE* Some Compressor Models: Slide Stop Increase = Decrease to 3.5Vi Slide Stop Decrease = Decrease to 2.2Vi	Verify that the Slide Stop is in the AUTO mode and that the VI Ratio is calling for a VI increase or decrease. 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. 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.
LIQUID INJECTION SOLENOID DOES NOT ENERGIZE* (Liquid Injection Refrigerant Cutout - LICO)	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 oil temperature equals or exceeds the “Oil Temperature On At” setpoint for the delay time. 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.
HI Vi LIQUID INJECTION PORT SOLENOID DOES NOT ENERGIZE*	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 Vi is at 5.0.**
ECONOMIZER*	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. **NOTE: The economizer output should only be on when the slide valve is at or above the 90% position.**
ALARM CIRCUIT DOES NOT ENERGIZE	Output 22 (MOD 22) controls the Alarm Circuit. The Alarm should turn on only when there is an alarm or shutdown. If the Alarm does not occur when these conditions are found and the LED (D22) for Output 22 (MOD 22) is on, 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.

SYMPTOM	PROBABLE CAUSES and CORRECTIONS
CONTROL PANEL DOES NOT RESPOND TO REMOTE CONTROL SIGNALS	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.** 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). 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). 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).
MOTOR LOAD CONTROL(FORCED UNLOAD) OCCURS AT HIGH MOTOR AMPS	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.
MOTOR LOAD CONTROL(FORCED UNLOAD) OCCURS AT LOW MOTOR AMPS	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.
PRESSURES ON THE OPERATING SCREEN DO NOT APPEAR CORRECT	TEST 1 - Shut down the compressor and allow pressures to equalize. Discharge pressure and oil pressure should have the same reading. TEST 2 - If either oil pressure or discharge pressure read different pressures, one or both transducers are at fault. Valve off the suction transducer from the unit and open the vent valve on transducer manifold to atmosphere. If the suction transducer reads atmospheric pressure, then the transducer in Test 1, which agrees with the suction transducer, is correct. The transducer which disagrees is defective. **NOTE: Reference the Pressure Transducer Conversion Data Chart.**
COMPRESSOR WITH SLIDE VALVE DOES NOT AUTOMATICALLY LOAD OR UNLOAD*	Verify that the Slide Valve Mode **[AUTO]** key has been pressed and AUTO appears under Slide Valve Mode on the "Operating Status" screen. If the problem persists, see the Troubleshooting section SLIDE VALVE DOES NOT LOAD and/or UNLOAD.
COMPRESSOR THAT STEPS ON CAPACITY DOES NOT AUTOMATICALLY LOAD OR UNLOAD*	Verify that the Capacity Mode **[AUTO]** key has been pressed and AUTO appears under Capacity Mode on the "Operating Status" screen. If the problem persists, see the Troubleshooting section COMPRESSOR DOES NOT LOAD and/or UNLOAD.

* If applicable

COMPRESSOR MODEL DIFFERENCES

FRICK® GRAM	RWB, SC GSV, YLC	RXB* GST*	RXF	RDB 3-Step GSB 3-Step	RDB 4-Step	Other
Slide Valve Reading	0-100%	0-100%	0-100%	N/A	N/A	0-100%
Slide Valve Setpoints	Yes	Yes	Yes	N/A	N/A	Yes
Slide Valve Calibration	Yes	Yes	Yes	N/A	N/A	Yes
Capacity Reading	N/A	N/A	N/A	50,75,100	25,50,75,100	N/A
Slide Stop Reading	2.2-5.0	2.2,3.5,5.0	2.2,3.5,5.0	N/A	N/A	N/A
Slide Stop Calibration	N/A	N/A	N/A	N/A	N/A	N/A
DX Circuit Option	Yes	Yes	Yes	N/A	N/A	Yes
Hot Gas Bypass/SV Setpoints Option	Yes	Yes	Yes	N/A	N/A	Yes
Remote Slide Valve Position Option	Yes	Yes	Yes	N/A	N/A	Yes
Sequence by Comp. Sequencing	Yes	Yes	Yes	N/A	N/A	Yes
Forced unload Inhibit load delay setpoint	N/A	N/A	N/A	Yes	Yes	N/A

* Or other variable VI
N/A = Not Applicable

SETPOINT DATA SHEETS

In most cases, updating software on the Quantum™ panel will require clearing the current setpoints and data stored in the nonvolatile memory on the main board. It is suggested that the operator first record all control setpoints prior to performing program chip upgrades. Panel Setup and Factory Setup settings will be lost when software is updated. The setpoint data sheets are useful for recording this information.

FACTORY SETUP

Compressor model:

RWF	RWBII	RXB	RXF	RDB, 4-STEP	RDB, 3-STEP	GSV II	GST	GSB	GRAM/Other

Recip	SC	YLC	YORK S7	YORK S5	Other Var VI	Other Manufacturer

Oil pump:

Demand	No pump	Prelube	Cycling	Full time	Shaft w/Aux	Shaft	Dual

Oil filter:

Yes	No

Refrigerant:

R11		R134a		R717	
R12		R290 - Propane		R1270 - Propylene	
R13		R404a		R744 - CO_2	
R22		R500		R771	
R113		R502		User-Defined	
R114		R503			

K-factor (If User-Defined): _____

Dual discharge control (used for swing machines):

Enabled	Disabled

Liquid injection cooling:

Enabled	Disabled

Main oil injection control (used for close-coupled, 2-stage packages):

Enabled	Disabled

Digital Board 2 Output #18:

Main Oil Injection	User Selected	Disabled

FACTORY SETPOINTS

Volume Ratio (Vi) Range

Low (Range 1.00 to 10.00) (Default 2.20)	High (Range 1.00 to 10.00) (Default 5.00)	Dead Band (Range 0.00 to 1.00) (Default 0.20)	Proportional Band (Range 1.00 to 182.00) (Default 9.10)

Oil Pump (Low Oil Pressure)

Running Alarm (Differential) (Range 10 to 50) (Default 10)	Off Alarm (Differential) (Range 1 to 40) (Default 25)	Alarm Delay (secs.) (Range 0 to 99) (Default 30 sec.)	Running Shutdown (Differential) (Range 5 to 40) (Default 5)	Off Shutdown (Differential) (Range 1 to 45) (Default 30)	Shutdown delay (secs.) (Range 1 to 99) (Default 10 sec.)

NOTE: The default settings are dependent on the type of compressor pump and it's running status as described in the "Control Setup - Oil Setpoints" screen section. These settings rarely need altered and alteration may cause serious consequences.

Slide Valve Travel (Range 0 - 300, Default 196)

Lube Time (Range 0 - 60 Sec., Default 0 Sec.)

Economizer Override When Discharge Pressure < (Suction Pressure x 1.6^k) + (Range = 0.00 - 50.0, Default = 15.0)

Separator Velocity Control:

Reference % (Range 0.0% to 100.0 %, Default 0.0%)	Compression Ratio (Range 1.00 to 30.00, Default 4.00)

Liquid Slugging:

Alarm (Range 0.0 F to 90.0 F, Default 10.0 F)	Shutdown (Range 0.0 F to 90.0 F, Default 20.0 F)

Maximum discharge pressure value: _____ (Range 0 - 380 PSIG, Default 225.0 PSIG)

User Selected Analog Input for Digital Output #18 Control: _____ (Range 1 to 32, Default 21)

Atmospheric Pressure: _____ (Range 0.0 to 100.0 PSIG, Default 14.7 PSIG)

Panel Heat Offset _____ (Range 0.00 to 50.00, Default 11.10)

Sales Order: C_____ Item: _____

Miscellaneous Setup:

Superheat:

Enable	Disable

When starting, a shutdown will occur if TDsat plus _____ (Range 0.0 F to 50.0 F)

is greater than the Separator Temperature

When running, an alarm will occur if TDsat plus _____ (Range 0.0 F to 50.0 F, Default 10.1 F)

is greater than the Discharge Temperature for _____ (Range 10 to 999 sec., Default 60 sec.)

When starting, a shutdown will occur if TDsat plus _____ (Range 0.0 F to 50.0 F, Default 10.1 F)

is greater than the Discharge Temperature for _____ (Range 10 to 999 sec., Default 120 sec.)

Slide Valve Unload Assist:

Enable	Disable

Rate of Change _____ (Range 1.0 % to 5.0 %, Default 2.0%)

Balance Piston Setup:

Enable	Disable	Output On Slide Valve % (Default 70.0 %)	Output Off Slide Valve % (Default 60.0 %)	Ignore Delay (0 - 10) min. default 5	Fail Delay (0 - 10) min. default 2

Oil Log Setup:

Enable	Disable	Fail Delay (15 - 120) sec. default 30

Main Oil Injection Safeties:

Enable	Disable	Actual Setpoint (5.0 - 50.0 PSIG) default 15	Fail Delay (0 - 60) sec. default 30

Ram DBS Starter:

Enabled	Disabled	Using CT

PANEL SETUP

Pressure units:

Psia	Psig	BarA	Bar	Kpaa

Temperature units:

°F	°C

Language:

English	Danish	German	Spanish	Other

Communications:

ID Number: _____ (range: 0 - 99)

Comm. 1 Baud rate:

1200	2400	4800	9600*	19200	38400	76800	115200

*Default

Comm. 2 Baud rate:

1200	2400	4800	9600*	19200	38400	76800	115200

*Default

Communication Protocols:

Frick®*	Allen Bradley	Modbus	York ISN

*Default

Capacity Control Selection:

Select capacity control (2 maximum)
Suction pressure _____
Process temperature _____
Discharge pressure (air compressor mode) _____
User Selectable mode _____

User Selectable Mode:

Enable	Disable	Control Channel	Serial Communications Timeout	Action	
				Forward	Reverse

Selected Options:

Auxiliary 1&2:

Disable	auxiliary 1	auxiliary 2	auxiliary 1 & 2

Power Failure Restart:

Enabled	Disabled

Input module capacity control selection (used with PLC to select capacity control mode):

Enabled	Disabled

Compressor Sequencing:

Disable	Sequence Mode 1	Sequence Mode 2 (Gram)	Compressor Interlock

Condenser Control:

Disable	Digital	Analog	Digital & Analog

Suction Pressure Pull Down:

Enabled	Disabled

Hot Gas Bypass/SV Setpoint:

Enabled	Disabled

Auxiliaries 3-8:

Enabled	Disabled

Pumpdown DX Circuit:

Enabled	Disabled

Kilowatt Monitor Calibration and Setup:

Enabled	Disabled

Auxiliary Analog Temperatures and Pressures:

Enabled	Disabled

Entering Process Temperature:

Enabled	Disabled

Slide Valve Position Control:

Enabled	Disabled

Remote Control Setpoint:

Enabled	Disabled

Permissive Start:

Disable	Always Active	Starting

Remote Enable Energized when in:

Remote Start Only	Remote Start and Remote Slide Valve	Remote Start and Remote Slide Valve (4-20 mA)

Digital Board 2 Module 1 configuration:

Ready to Run	PLC Control

Run Hours: _____

Power Assist:

Enable	Disable	Delay (0-60) sec. default = 15

Screen Color Setting:

Standard	Monochrome	Blue

Screen Saver (10 minutes) _____ (range is 0-60 minutes)

Enabled	Disabled

CALIBRATION

(while in factory setup)

Pressure Transducers and Temperature Sensors:

Pressure Transducer	Transducer High End (default is 485.3 psig**)	Transducer Low End (default is 30.0 hg.)	Sensor Type 1 - 5 Vdc, 0 - 5 Vdc (default = 1 - 5 Vdc)
Suction**			
Discharge			
Oil			
Filter			
System Discharge			
Balance Piston			

** The default High End for the Suction Pressure Transducer is 185.3 psig.

Temperature Sensor	Sensor High End (default is 463.1 O F)	Sensor Low End (default is -459.4 O F)	Sensor Type ICTD 1 - 5 Vdc, 0 - 5 Vdc (default = ICTD)
Suction			
Discharge			
Oil			
Separator			
System Discharge			
Leaving Process			
Entering Process			

Remote Control Calibration:
Capacity Control #1 (CC1): _____
Capacity Control #2 (CC2): _____

Remote Setpoint	Top end Value (20 mA)	Bottom End Value (4 mA)
CC1 Incoming		
CC1 Outgoing		
CC2 Incoming		
CC2 Outgoing		

Calibrate Slide Valve Position Dead Band %: _____ (Default is 1%)

York S7 - Level Position:

Actual Setpoint	Proportional Band	Dead Band

Auxiliary Analog	Text	Units	Sensor High End (default is 485.3 psig)	Sensor Low End (default is 30.0 in hg.)	Sensor Type ICTD, 1 - 5 Vdc, 0 - 5 Vdc (default = 1 - 5 Vdc)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10*					

* = default text is Economizer

Kilowatt Monitor Calibration:

Top End Value (20 mA) kW (Default is 500.0)	**Bottom End Value (4 mA) kW** (Default is 0.0)	Sensor Type

Analog Output Setup:

	Analog Output 1	Analog Output 2	Analog Output 3	Analog Output 5	Analog Output 6
Input Channel to Output					
Top End Value					
Bottom End Value					
Offset					

CAPACITY CONTROL SETPOINTS

SUCTION PRESSURE CONTROL MODE #1

	setting	default	range
Capacity Control Setpoint	_____	20 psig	30" - 135 psig
Upper Proportional Band	_____	4 psig	0 - 20 psig
Upper Dead Band	_____	0.5 psig	0 - 10 psig
Upper Cycle Time	_____	3 sec.	0 - 60 sec.
Lower Proportional Band	_____	4 psig	0 - 20 psig
Lower Dead Band	_____	0.5 psig	0 - 10 psig
Lower Cycle Time	_____	3 sec.	0 - 60 sec.
Autocycle Start Pressure	_____	25 psig	30" - 135 psig
Autocycle Start Delay	_____	1 min.	0 - 60 min.
Autocycle Stop Pressure	_____	15 psig	30" - 135 psig
Autocycle Stop Delay	_____	1 min.	0 - 60 min.
Low Suction Pressure Stop Load	_____	10 psig	30" - 135 psig
Low Suction Pressure Force Unload	_____	5 psig	30" - 135 psig
Low Suction Pressure Alarm	_____	2 psig	30" - 135 psig
Low Suction Pressure Alarm Delay	_____	2 sec.	0 - 60 sec.
Low Suction Pressure Shutdown	_____	0 psig	30" - 135 psig
Low Suction Pressure Shutdown Delay	_____	3 sec.	0 - 60 sec.

SUCTION PRESSURE CONTROL MODE #2

	setting	default	range
Capacity Control Setpoint	_____	20 psig	30" - 135 psig
Upper Proportional Band	_____	4 psig	0 - 20 psig
Upper Dead Band	_____	0.5 psig	0 - 10 psig
Upper Cycle Time	_____	3 sec.	0 - 60 sec.
Lower Proportional Band	_____	4 psig	0 - 20 psig
Lower Dead Band	_____	0.5 psig	0 - 10 psig
Lower Cycle Time	_____	3 sec.	0 - 60 sec.
Autocycle Start Pressure	_____	25 psig	30" - 135 psig
Autocycle Start Delay	_____	1 min.	0 - 60 min.
Autocycle Stop Pressure	_____	15 psig	30" - 135 psig
Autocycle Stop Delay	_____	1 min.	0 - 60 min.
Low Suction Pressure Stop Load	_____	10 psig	30" - 135 psig
Low Suction Pressure Force Unload	_____	5 psig	30" - 135 psig
Low Suction Pressure Alarm	_____	2 psig	30" - 135 psig
Low Suction Pressure Alarm Delay	_____	2 sec.	0 - 60 sec.
Low Suction Pressure Shutdown	_____	0 psig	30" - 135 psig
Low Suction Pressure Shutdown Delay	_____	3 sec.	0 - 60 sec.

PROCESS TEMP CONTROL MODE #1

	setting	default	range
Capacity Control Setpoint	_____	40°F	-238 - 302°F
Upper Proportional Band	_____	4°F	0 - 20 °F
Upper Dead Band	_____	1°F	0 - 10°F
Upper Cycle Time	_____	4 sec.	0 - 60 sec.
Lower Proportional Band	_____	4°F	0 - 20 °F
Lower Dead Band	_____	1°F	0 - 10°F
Lower Cycle Time	_____	4 sec.	0 - 60 sec.
Autocycle Start Temp	_____	45°F	-238 - 302°F
Autocycle Start Delay	_____	1 min.	0 - 60 min.
Autocycle Stop Temp	_____	36°F	-238 - 302°F
Autocycle Stop Delay	_____	1 min.	0 - 60 min.
Low Process Temp Stop Load	_____	35°F	-238 - 302°F
Low Process Temp Force Unload	_____	34°F	-238 - 302°F
Low Process Temp Alarm	_____	33°F	-238 - 302°F
Low Process Temp Alarm Delay	_____	3 sec.	0 - 60 sec.
Low Process Temp Shutdown	_____	32°F	-238 - 302°F
Low Process Temp Shutdown Delay	_____	3 sec.	0 - 60 sec.
Low Suction Pressure Stop Load	_____	10 psig	30" - 135 psig
Low Suction Pressure Force Unload	_____	5 psig	30" - 135 psig
Low Suction Pressure Alarm	_____	2 psig	30" - 135 psig
Low Suction Pressure Alarm Delay	_____	3 sec.	0 - 60 sec.
Low Suction Pressure Shutdown	_____	0 psig	30" - 135 psig
Low Suction Pressure Shutdown Delay	_____	3 sec.	0 - 60 sec.

PROCESS TEMP CONTROL MODE #2

	setting	default	range
Capacity Control Setpoint	_____	40°F	-238 - 302°F
Upper Proportional Band	_____	4°F	0 - 20 °F
Upper Dead Band	_____	1°F	0 - 10°F
Upper Cycle Time	_____	4 sec.	0 - 60 sec.
Lower Proportional Band	_____	4°F	0 - 20 °F
Lower Dead Band	_____	1°F	0 - 10°F
Lower Cycle Time	_____	4 sec.	0 - 60 sec.
Autocycle Start Temp	_____	45°F	-238 - 302°F
Autocycle Start Delay	_____	1 min.	0 - 60 min.
Autocycle Stop Temp	_____	36°F	-238 - 302°F
Autocycle Stop Delay	_____	1 min.	0 - 60 min.
Low Process Temp Stop Load	_____	35°F	-238 - 302°F
Low Process Temp Force Unload	_____	34°F	-238 - 302°F
Low Process Temp Alarm	_____	33°F	-238 - 302°F
Low Process Temp Alarm Delay	_____	3 sec.	0 - 60 sec.
Low Process Temp Shutdown	_____	32°F	-238 - 302°F
Low Process Temp Shutdown Delay	_____	3 sec.	0 - 60 sec.
Low Suction Pressure Stop Load	_____	10 psig	30" - 135 psig
Low Suction Pressure Force Unload	_____	5 psig	30" - 135 psig
Low Suction Pressure Alarm	_____	2 psig	30" - 135 psig
Low Suction Pressure Alarm Delay	_____	3 sec.	0 - 60 sec.
Low Suction Pressure Shutdown	_____	0 psig	30" - 135 psig
Low Suction Pressure Shutdown Delay	_____	3 sec.	0 - 60 sec.

DISCHARGE PRESSURE CONTROL MODE #1

	setting	default	range
Capacity Control Setpoint	_____	150 psig	0 - 350** psig
Upper Proportional Band	_____	5 psig	0 - 20 psig
Upper Dead Band	_____	1 psig	0 - 10 psig
Upper Cycle Time	_____	3 sec.	0 - 60 sec.
Lower Proportional Band	_____	5 psig	0 - 20 psig
Lower Dead Band	_____	1 psig	0 - 10 psig
Lower Cycle Time	_____	3 sec.	0 - 60 sec.
Autocycle Start Pressure	_____	160 psig	0 - 350** psig
Autocycle Start Delay	_____	1 min.	0 - 60 min.
Autocycle Stop Pressure	_____	140 psig	0 - 350** psig
Autocycle Stop Delay	_____	1 min.	0 - 60 min.
Low Suction Pressure Stop Load	_____	10 psig	30" - 135 psig
Low Suction Pressure Force Unload	_____	5 psig	30" - 135 psig
Low Suction Pressure Alarm	_____	2 psig	30" - 135 psig
Low Suction Pressure Alarm Delay	_____	3 sec.	0 - 60 sec.
Low Suction Pressure Shutdown	_____	0 psig	30" - 135 psig
Low Suction Pressure Shutdown Delay	_____	2 sec.	0 - 60 sec.

** based on maximum discharge pressure setting in factory setup.

DISCHARGE PRESSURE CONTROL MODE #2

	setting	default	range
Capacity Control Setpoint	_____	150 psig	0 - 350** psig
Upper Proportional Band	_____	5 psig	0 - 20 psig
Upper Dead Band	_____	1 psig	0 - 10 psig
Upper Cycle Time	_____	3 sec.	0 - 60 sec.
Lower Proportional Band	_____	5 psig	0 - 20 psig
Lower Dead Band	_____	1 psig	0 - 10 psig
Lower Cycle Time	_____	3 sec.	0 - 60 sec.
Autocycle Start Pressure	_____	160 psig	0 - 350** psig
Autocycle Start Delay	_____	1 min.	0 - 60 min.
Autocycle Stop Pressure	_____	140 psig	0 - 350** psig
Autocycle Stop Delay	_____	1 min.	0 - 60 min.
Low Suction Pressure Stop Load	_____	10 psig	30" - 135 psig
Low Suction Pressure Force Unload	_____	5 psig	30" - 135 psig
Low Suction Pressure Alarm	_____	2 psig	30" - 135 psig
Low Suction Pressure Alarm Delay	_____	3 sec.	0 - 60 sec.
Low Suction Pressure Shutdown	_____	0 psig	30" - 135 psig
Low Suction Pressure Shutdown Delay	_____	2 sec.	0 - 60 sec.

** based on maximum discharge pressure setting in factory setup.

USER SELECTABLE CONTROL MODE #1

	setting	default	range
Capacity Control Setpoint	_____	150°F	32 - 482°F
Upper Proportional Band	_____	4°F	0 - 20°F
Upper Dead Band	_____	1°F	0 - 10°F
Upper Cycle Time	_____	3 sec.	0 - 60 sec.
Lower Proportional Band	_____	4°F	0 - 20°F
Lower Dead Band	_____	1°F	0 - 10°F
Lower Cycle Time	_____	3 sec.	0 - 60 sec.
Autocycle Start Temp	_____	160°F	32 - 482°F
Autocycle Start Delay	_____	1 min.	0 - 60 min.
Autocycle Stop Temp	_____	140°F	32 - 482°F
Autocycle Stop Delay	_____	1 min.	0 - 60 min.
Low Suction Pressure Stop Load	_____	10 psig	30" - 135 psig
Low Suction Pressure Force Unload	_____	5 psig	30" - 135 psig
Low Suction Pressure Alarm	_____	2 psig	30" - 135 psig
Low Suction Pressure Alarm Delay	_____	3 sec.	0 - 60 sec.
Low Suction Pressure Shutdown	_____	0 psig	30" - 135 psig
Low Suction Pressure Shutdown Delay	_____	3 sec.	0 - 60 sec.

USER SELECTABLE CONTROL MODE #2

	setting	default	range
Capacity Control Setpoint	_____	150°F	32 - 482°F
Upper Proportional Band	_____	4°F	0 - 20°F
Upper Dead Band	_____	1°F	0 - 10°F
Upper Cycle Time	_____	3 sec.	0 - 60 sec.
Lower Proportional Band	_____	4°F	0 - 20°F
Lower Dead Band	_____	1°F	0 - 10°F
Lower Cycle Time	_____	3 sec.	0 - 60 sec.
Autocycle Start Temp	_____	160°F	32 - 482°F
Autocycle Start Delay	_____	1 min.	0 - 60 min.
Autocycle Stop Temp	_____	140°F	32 - 482°F
Autocycle Stop Delay	_____	1 min.	0 - 60 min.
Low Suction Pressure Stop Load	_____	10 psig	30" - 135 psig
Low Suction Pressure Force Unload	_____	5 psig	30" - 135 psig
Low Suction Pressure Alarm	_____	2 psig	30" - 135 psig
Low Suction Pressure Alarm Delay	_____	3 sec.	0 - 60 sec.
Low Suction Pressure Shutdown	_____	0 psig	30" - 135 psig
Low Suction Pressure Shutdown Delay	_____	3 sec.	0 - 60 sec.

COMPRESSOR SAFETIES

DISCHARGE SAFETIES

	setting	default	range
High Discharge Temp Stop Load	_____	180°F	0 - 249.8°F
High Discharge Temp Force Unload	_____	190°F	0 - 249.8°F
High Discharge Temp Alarm	_____	200°F	0 - 249.8°F
High Discharge Temp Alarm Delay	_____	5 sec.	0 - 60 sec.
High Discharge Temp Shutdown	_____	212°F	0 - 249.8°F
High Discharge Temp Shutdown Delay	_____	5 sec.	0 - 60 sec.
Starting Differential Pressure Below	_____	50 psig	0-380**psig
High Disch Press Mode #1 Stop Load	_____	190 psig	0-380**psig
High Disch Press Mode #1 Force Unload	_____	200 psig	0-380**psig
High Disch Press Mode #1 Alarm	_____	220 psig	0-380**psig
High Disch Press Mode #1 Alarm Delay	_____	2 sec.	0 - 5 sec.
High Disch Press Mode #1 Shutdown	_____	225 psig	0-380**psig
High Disch Press Mode #1 Shutdown Delay	_____	2 sec.	0 - 5 sec.
High Disch Press Mode #2 Stop Load	_____	190 psig	0-380**psig
High Disch Press Mode #2 Force Unload	_____	200 psig	0-380**psig
High Disch Press Mode #2 Alarm	_____	220 psig	0-380**psig
High Disch Press Mode #2 Alarm Delay	_____	2 sec.	0 - 5 sec.
High Disch Press Mode #2 Shutdown	_____	225 psig	0-380**psig
High Disch Press Mode #2 Shutdown Delay	_____	2 sec.	0 - 5 sec.

** based on maximum discharge pressure setting in factory setup.

SUCTION SAFETIES

	setting	default	range
High Suction Pressure Stop Load	_____	120 psig	0 - 200 psig
High Suction Pressure Force Unload	_____	130 psig	0 - 200 psig
High Suction Pressure Alarm	_____	140 psig	0 - 200 psig
High Suction Pressure Alarm Delay	_____	2 sec.	0 - 60 sec.
High Suction Pressure Shutdown	_____	150 psig	0 - 200 psig
High Suction Pressure Shutdown Delay	_____	2 sec.	0 - 60 sec.

ENTERING PROCESS TEMPERATURE

	setting	default	range
Low Entering Process Shutdown	_____	-463°F	-463 - 482°F
Low Entering Process Shutdown Delay	_____	0 sec.	0 - 99 sec.
Low Entering Process Alarm	_____	-463°F	-463 - 482°F
Low Entering Process Alarm Delay	_____	0 sec.	0 - 99 sec.
High Entering Process Alarm	_____	482°F	-463 - 482°F
High Entering Process Alarm Delay	_____	0 sec.	0 - 99 sec.
High Entering Process Shutdown	_____	482°F	-463 - 482°F
High Entering Process Shutdown Delay	_____	0 sec.	0 - 99 sec.

HIGH LEVEL SHUTDOWN DELAY

	setting	default	range
High Level Shutdown Delay	_____	5 sec.	0 - 60 sec.

OIL LEVEL DELAY

	setting	default	range
Oil Level Delay	_____	300 sec.	0 - 600 sec.

MOTOR CONTROL

	setting	default	range
Motor Amps	_____	100	0 - 3000
Volts	_____	480	0 - 5000
Service Factor	_____	1.15*	0.0 - 2.0
Horse Power	_____	100	0 - 3000
CT Factor	_____	100*	0 - 3000
Recycle Delay	_____	20 min.	20 - 255 min.
High Motor Amps Stop Load	_____	100 amps	0 - 3000 amps
High Motor Amps Force Unload	_____	105 amps	0 - 3000 amps
High Motor Amps Alarm	_____	110 amps	0 - 3000 amps
High Motor Amps Alarm Delay	_____	5 sec.	0 - 60 sec.
High Motor Amps Shutdown	_____	115 amps	0 - 3000 amps
High Motor Amps Shutdown Delay	_____	5 sec.	0 - 300 sec.
Low Motor Amps Shutdown	_____	25 amps	0 - 60 amps
Low Motor Amps Shutdown Delay	_____	30 sec.	0 - 60 sec.
Force Unload Inhibit Delay (If Applicable)	_____	120 sec.	10 - 300 sec.

*Blank if Ram DBS Starter

POWER FAILURE RESTART

Time after power failure allowing restart: _____ Hour _____ Minutes (Default 10 min.)

RAM DBS MOTOR STARTER

	setting	default	range
Locked Rotor Current	_____	0.0% FLA	300 - 800% FLA
Stall Time	_____	0 sec.	0 - 60 sec.
Jam Current Level	_____	0.0% FLA	100 - 600% FLA
Jam Run Delay	_____	0 sec.	0 - 60 sec.
Service Factor	_____	0.0% FLA	75 - 125% FLA
Cur. Unbalance Alarm Level	_____	0.0% FLA	2.0 - 25% FLA
Cur. Unbalance Alarm Delay	_____	0 sec.	0 - 240 sec.
RTD Temperature Alarm Level	_____	32.0° F	32 - 500° F
RTD Temperature Trip Level	_____	32.0° F	32 - 500° F

OIL SETPOINTS

	setting	default	range
Low Oil Separator Temp Alarm	_____	55°F	49 - 100°F
Low Oil Separator Temp Alarm Delay	_____	5 sec.	0 - 300 sec.
Low Oil Separator Temp Shutdown	_____	49°F	49 - 100°F
Low Oil Separator Temp Shutdown Delay	_____	5 sec.	0 - 300 sec.
Oil Heater Off Above:	_____	122°F	100 - 150°F
High Oil Temp Alarm	_____	158°F	100 - 230°F
High Oil Temp Alarm Delay	_____	5 sec.	0 - 60 sec.
High Oil Temp Shutdown	_____	167°F	100 - 230°F
High Oil Temp Shutdown Delay	_____	5 sec.	0 - 60 sec.
Low Oil Temp Alarm	_____	55°F	49 - 100 °F
Low Oil Temp Alarm Delay	_____	5 sec.	0 - 600 sec.
Low Oil Temp Shutdown	_____	49°F	49 - 100°F
Low Oil Temp Shutdown Delay	_____	5 sec.	0 - 600 sec.

MAIN OIL INJECTION

On at Discharge Temp. (32 – 212 deg.F) default 150	delay (0-300 sec) default 5

LIQUID INJECTION

On at Oil Temp. (100 – 150 deg.F) default 122	delay (0-300 sec) default 5

FILTER PRESSURE SETPOINTS

	setting	default	range
High Filter Pressure Alarm	_____	25 psig	0 - 60 psig
High Filter Pressure Alarm Delay	_____	10 min.	0 - 5 min.
High Filter Pressure Shutdown	_____	30 psig	0 - 60 psig
High Filter Pressure Shutdown Delay	_____	15 min.	0 - 5 min.

SLIDE VALVE SETPOINTS

	setting	default	range
Highest Slide Valve Position To Allow Starting Of The Compressor:	_____	10%	5 - 100%
Starting Period before Slide Valve will load	_____	0 sec.	0 -999
Stopping Period for Slide Valve Unload	_____	60 sec.	0 - 300
Autocycle Minimum Position	_____	10%	0 - 100%
Hot Gas Bypass Or Slide Valve Setpoint On When Below	_____	0%	0 - 100%
Slide Valve Setpoint 1 On When Below	_____	0%	0 - 100%
Slide Valve Setpoint 2 On When Below	_____	0%	0 - 100%

ECONOMIZER SETPOINTS

	On when above	Off when below
Slide Valve Position		

OPTIONS

SETBACK SCHEDULE

	1st Start Time	1st Stop Time	2nd Start Time	2nd Stop Time
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				
Saturday				
Sunday				

CONDENSER CONTROL SETPOINTS

Condenser Control Setpoint _____ (range: 0 - 350 psig) (default: 0.0 psig)

Active	Not Active

Digital Control

Digital Control Upper Dead Band	_____	(range: 0 - 20 psig)	(default: 0.0 psig)
Digital Control Upper Dead Band Delay	_____	(range: 0 - 60 sec.)	(default: 0.0 psig)
Digital Control Lower Dead Band	_____	(range: 0 - 20 psig)	(default: 0.0 psig)
Digital Control Lower Dead Band Delay	_____	(range: 0 - 60 sec.)	(default: 0.0 psig)
Condenser Output #1 Sequence Order	_____	(range: 0 - 4, 0 = disabled)	(default: 0.0 psig)
Condenser Output #2 Sequence Order	_____	(range: 0 - 4, 0 = disabled)	(default: 0.0 psig)
Condenser Output #3 Sequence Order	_____	(range: 0 - 4, 0 = disabled)	(default: 0.0 psig)
Condenser Output #4 Sequence Order **	_____	(range: 0 - 4, 0 = disabled)	(default: 0.0 psig)

** if only digital was enabled

Analog Control

Analog Control Upper Dead Band	_____	(range: 0 - 20 psig)	(default: 0.0 psig)
Analog Control Lower Dead Band	_____	(range: 0 - 20 psig)	(default: 0.0 psig)
Analog Control Response Time	_____	(range: 1 - 20 (slow - fast))	(default: 10)

PID Setup

		Ch. 1	Ch. 2	Ch. 3	Ch. 4	Range	Default
Action	Forward	☐	☐	☐	☐		
	Reverse	☐	☐	☐	☐		
Control							
Setpoint						Dependant on Input selected	Dependant on Input selected
Deadband						Dependant on Input selected	Dependant on Input selected
Proportional Gain						0.00 - 10000.00	0.00
Integral Gain						0.00 - 1000.00	0.00
Derivative Gain						0.00 - 10000.00	0.00
High Limit						0.0% - 100.0%	100.0%
Low Limit						0.0% - 100.0%	0.0%
Off Value						0.0% - 100.0%	0.0%

COMPRESSOR SEQUENCE SETPOINTS

Activated	De-Activated

Sequence Position A Compressor ID#		(range: 0 - 99, 0 = disabled)	(default: 0.0 psig)
Sequence Position B Compressor ID#		(range: 0 - 99, 0 = disabled)	(default: 0.0 psig)
Sequence Position C Compressor ID#		(range: 0 - 99, 0 = disabled)	(default: 0.0 psig)
Sequence Position D Compressor ID#		(range: 0 - 99, 0 = disabled)	(default: 0.0 psig)

	setting	**default**	**range**
Position A Minimum Slide Valve Position		0%	0 - 100%
Position A Compressor Start Delay		5 min.	0 - 60 min.
Position A Compressor Stop Delay		5 min.	0 - 60 min.
Position A Minimum Compressor Run Time		20 min.	0 - 60 min.
Position B Minimum Slide Valve Position		0%	0 - 100%
Position B Compressor Start Delay		5 min.	0 - 60 min.
Position B Compressor Stop Delay		5 min.	0 - 60 min.
Position B Minimum Compressor Run Time		20 min.	0 - 60 min.

	setting	**default**	**range**
Position C Minimum Slide Valve Position		0%	0 - 100%
Position C Compressor Start Delay		5 min.	0 - 60 min.
Position C Compressor Stop Delay		5 min.	0 - 60 min.
Position C Minimum Compressor Run Time		20 min.	0 - 60 min.
Position D Minimum Slide Valve Position		0%	0 - 100%
Position D Compressor Start Delay		5 min.	0 - 60 min.
Position D Compressor Stop Delay		5 min.	0 - 60 min.
Position D Minimum Compressor Run Time		20 min.	0 - 60 min.
Load Limiting Slide Valve Position		0%	0 - 100%
Load Limiting Duration		0 min.	0 - 60 min.

AUXILIARY INPUTS SETUP

Auxiliary	Disabled	Text	Alarm Check Always *	Alarm Check Running	Shutdown Check Always	Shutdown Check Running	Delay (0-99) sec. (Default 5)
Auxiliary 1							
Auxiliary 2							
Auxiliary 3							
Auxiliary 4							
Auxiliary 5							
Auxiliary 6							
Auxiliary 7							
Auxiliary 8							

*Default

SUCTION PULL-DOWN

	Pressure Band (default 5)	Amount of Time (min.)(default 1)
Suction Pressure Reduction Step		

Suction Pull-Down Enabled	Suction Pull-Down Disabled

	Slide Valve Position (default 5.0 %)	Amount of Time (min.)(default 1)
Pull Down using Slide Valve Position		

AUXILIARY ANALOGS

Auxiliary	Disabled	Text	Check Always	Check Running
Auxiliary 1				
Auxiliary 2				
Auxiliary 3				
Auxiliary 4				
Auxiliary 5				
Auxiliary 6				
Auxiliary 7				
Auxiliary 8				
Auxiliary 9				
Auxiliary 10 *				

Auxiliary	High Shutdown **	High Shutdown delay***	High Alarm **	High Alarm delay***	Low Alarm **	Low Alarm delay**	Low Shutdown **	Low Shutdown delay***
Auxiliary 1								
Auxiliary 2								
Auxiliary 3								
Auxiliary 4								
Auxiliary 5								
Auxiliary 6								
Auxiliary 7								
Auxiliary 8								
Auxiliary 9								
Auxiliary 10 *								

* = Default text is Economizer
** = Pressure range is 30" - 985.3 psig.; Temperature range is -459.4 - 500.0 °F.
*** = 0 - 99 seconds

PUMPDOWN/DX CIRCUITS

Pumpdown on when above (30.0 Hg - 85.3 psig) default 20.0 psig	Delay (0 - 60 min.) default 0 min.

DX Circuit	On when running Always	On when running And at slide valve %	Off when below (0 - 100) % Default (85%)	On when above (0 - 100) % Default (90%)
1				
2				

SCHEDULED MAINTENANCE SETPOINTS

Maintenance Required		Service Every	Next Scheduled At
Default Name	**User Defined Name**		
Oil Analysis			
Change Filters			
Clean Oil Strainers			
Clean Lqd Strainers			
Change Coelescers			
Clean Suction Screen			
Vibration Analysis			
Check Coupling/Align			
Grease Motor			
User Defined # 1			
User Defined # 2			
User Defined # 3			
User Defined # 4			
User Defined # 5			
User Defined # 6			

REAL TIME TRENDING SETPOINTS

Real Time Recording Interval _____

HISTORY TRENDING SETPOINTS

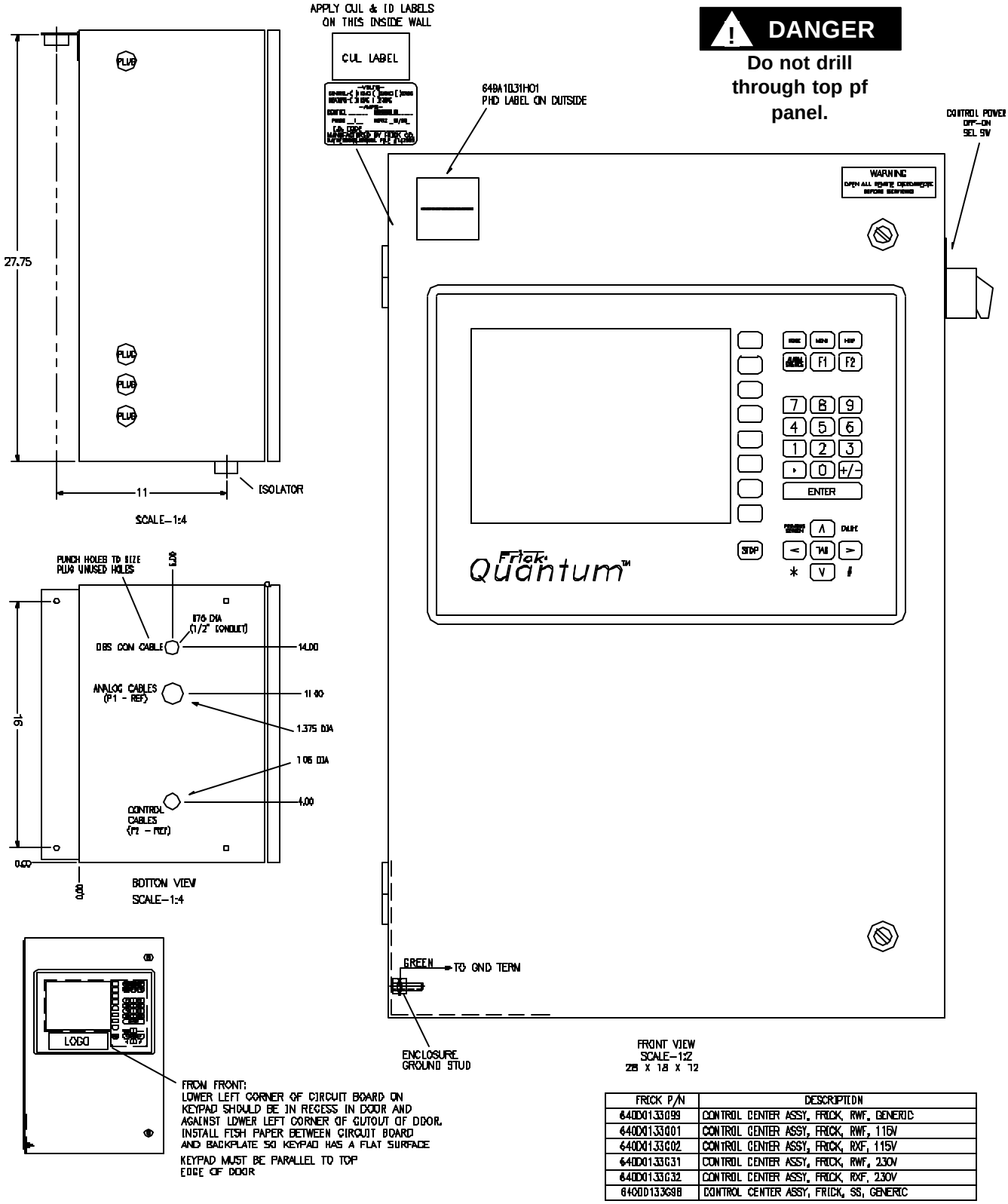
History Recording Interval _____

QUANTUM™ 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.

Control Center Assembly	Drawing Number
RWF & RXF 58-101	640D0133
RXF12-50	649D5100
RXF 12-50 Retro-fit	N/A
RDB	640D0093
RWBII	640D0070
Retrofit RXB / RXF 58-101	640D0091
Wiring Diagrams	**Drawing Number**
RWF	640D0132
RWBII	640D0069
RXF 12-50	649D5093
RXF 58-101	640D0157
RDB	640D0092
Wiring Diagram Phd for Enhanced Analog Board	649D5050
Digital I/O Board 2 (Special)	640D0071
Digital I/O Board 2 (Standard)	649D5101
Analog I/O Board 2 (Special)	640D0072
Analog I/O Board 2 (Standard)	649D5102
Harness Drawing	**Drawing Number**
Quantum™ I/O & D.C. Power Harness (Special Panels)	640B0038
Quantum™ I/O & D.C. Power Harness (Standard Panels)	649D5069
Other Drawings	
Communications Wiring Diagrams	
Point-to-Point Field Wiring Diagram	

RWF / RXF (58 - 101) CONTROL CENTER ASSEMBLY (Sheet 1 of 4)



FRICK P/N	DESCRIPTION
640D0133099	CONTROL CENTER ASSY, FRICK, RWF, GENERIC
640D0133001	CONTROL CENTER ASSY, FRICK, RWF, 115V
640D0133C02	CONTROL CENTER ASSY, FRICK, RXF, 115V
640D0133C31	CONTROL CENTER ASSY, FRICK, RWF, 230V
640D0133C32	CONTROL CENTER ASSY, FRICK, RXF, 230V
640D0133G98	CONTROL CENTER ASSY, FRICK, SS, GENERIC

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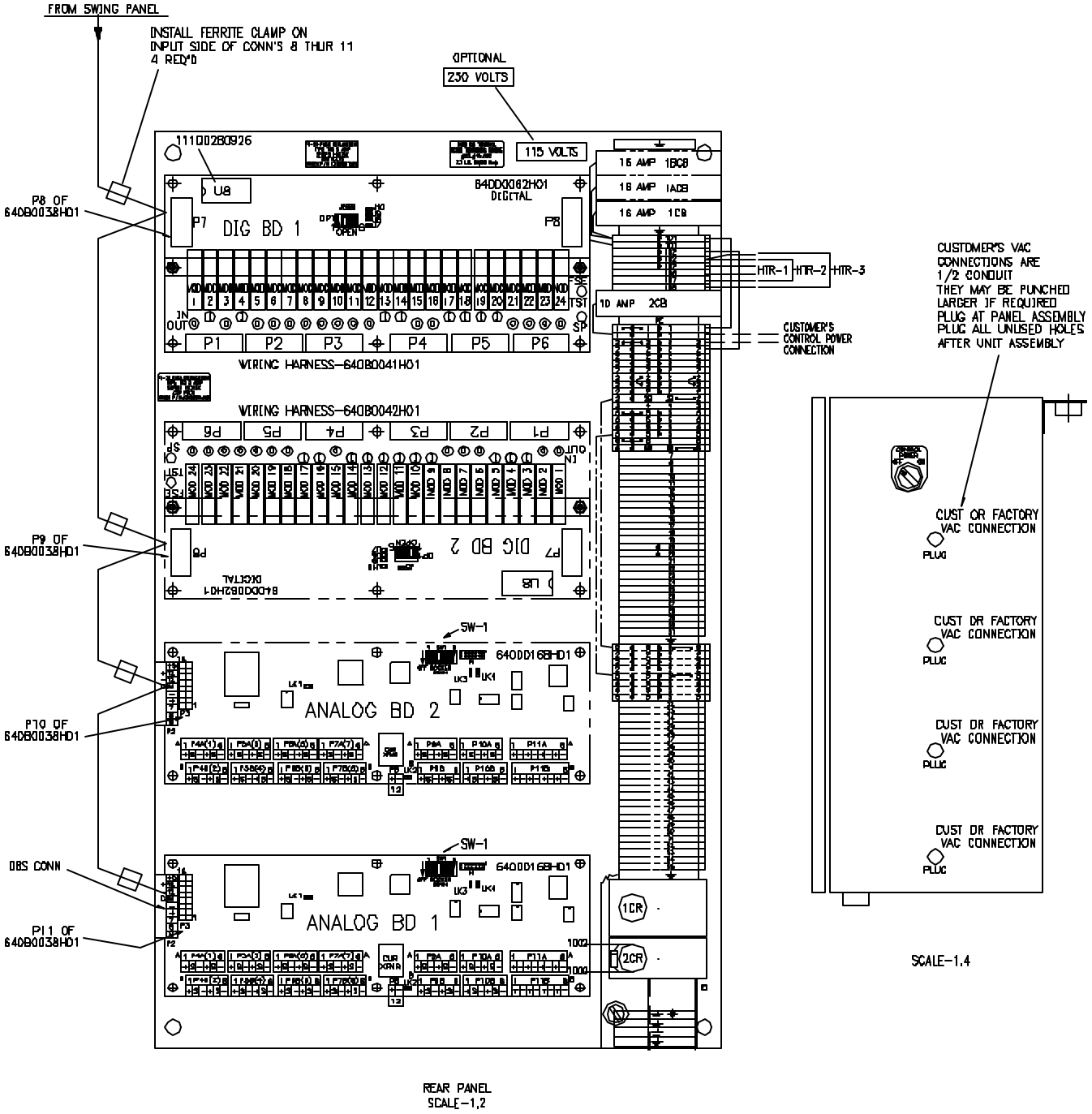
RWF / RXF (58 - 101) CONTROL CENTER ASSEMBLY (Sheet 2 of 4)



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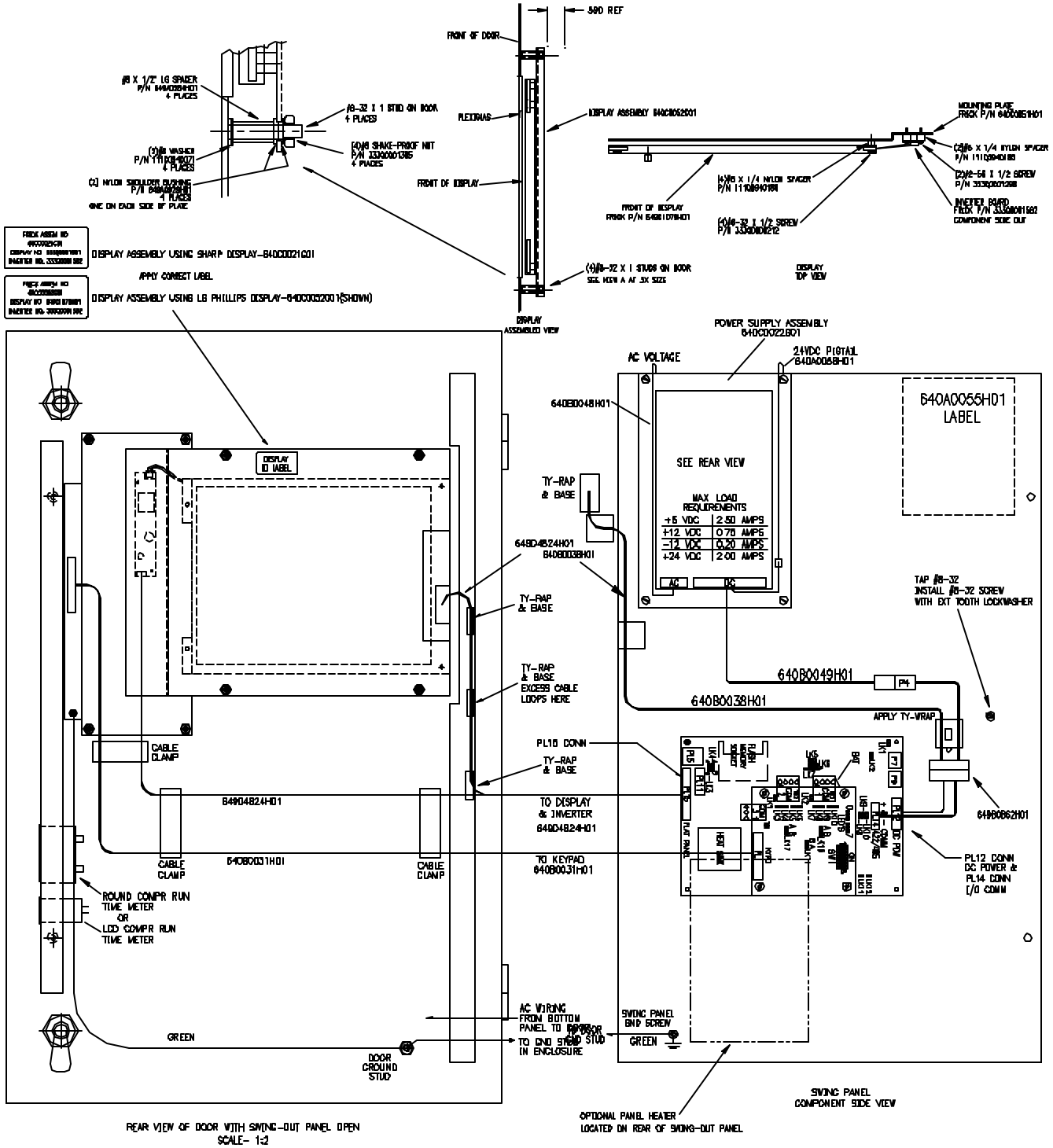
RWF / RXF (58 - 101) CONTROL CENTER ASSEMBLY (Sheet 3 of 4)



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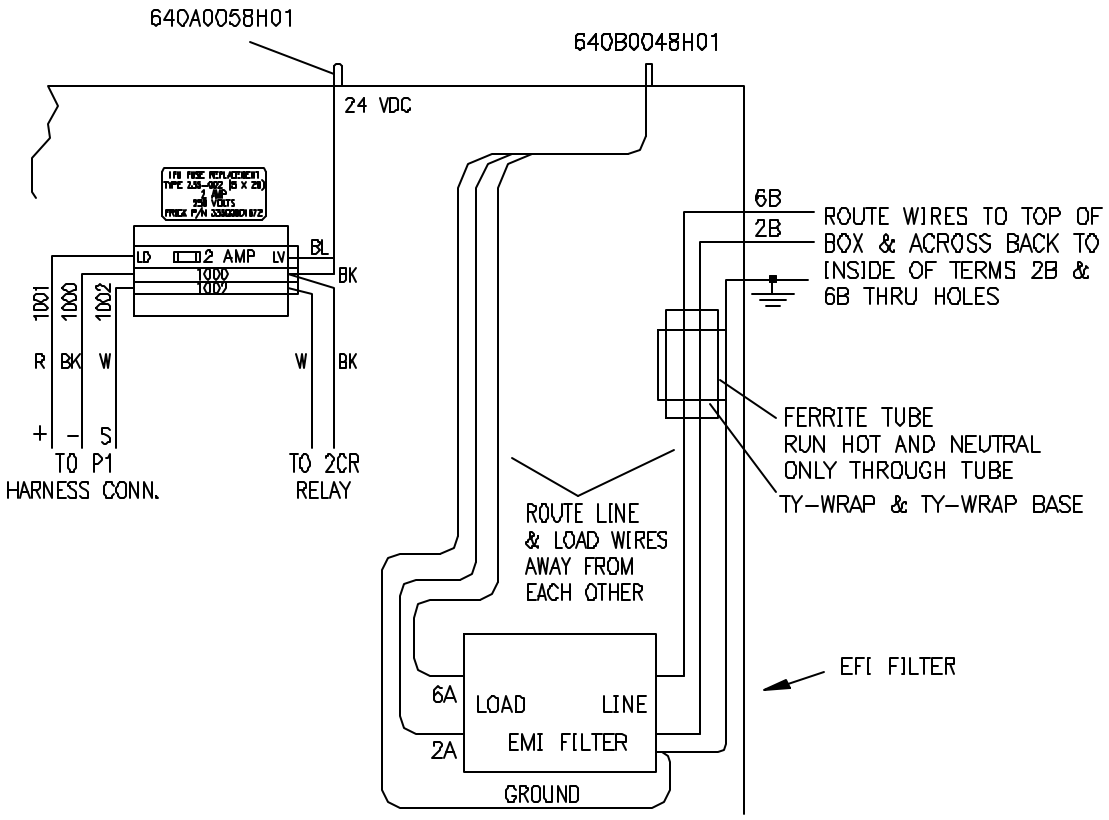
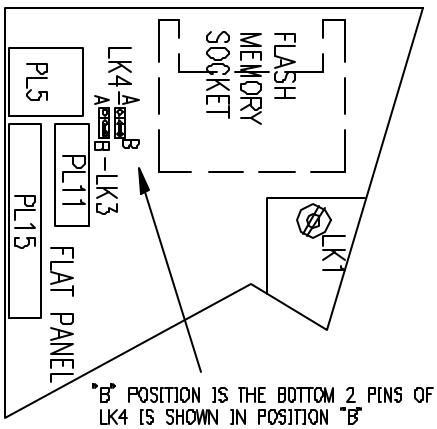
RWF / RXF (58 - 101) CONTROL CENTER ASSEMBLY (Sheet 4 of 4)

REAR VIEW OF POWER SUPPLY WIRING



CAUTION



"B" POSITION IS THE BOTTOM 2 PINS OF LK4
LK4 IS SHOWN IN POSITION "B"

MAKE SURE YOU DO NOT MOVE THE JUMPER ON LK3 IT SHOULD ALWAYS BE IN POSITION "B"

THE QUANTUM IV ASSEMBLY IS SHIPPED WITH LK4 SET TO THE POSITION REQUIRED FOR THE DISPLAY BEING USED WHEN BUILT. IF THE SAME DISPLAY IS NOT SUPPLIED AS A REPLACEMENT, THEN LK4 MUST BE CHANGED TO ACCOMMODATE THE NEW DISPLAY.

WHEN REPLACING THE QUANTUM IV CPU OR THE DISPLAY, YOU FIRST MUST VERIFY WHICH DISPLAY IS BEING USED. LK4 JUMPER ON THE QUANTUM IV CPU MUST BE SET TO BE COMPATIBLE WITH THE DISPLAY THAT IS BEING USED.

DETERMINE THE DISPLAY BRAND BY THE LABEL OR BY THE SIZE OF THE PLATE ITS MOUNTED ON. THE DISPLAY (SHARP) THAT REQUIRES THE "A" POSITION SETTING IS MOUNTED ON A MOUNTING PLATE THAT IS 12 3/4" LONG INCLUDING THE BEND. THE DISPLAY (PHILLIPS) USING THE "B" POSITION SETTING IS MOUNTED ON A MOUNTING PLATE THAT IS 11 3/4" LONG.

REFER TO CHART TO DETERMINE WHICH POSITION TO PUT LK4 JUMPER

LK4 IS LOCATED ON BOTTOM BOARD AT CORNER WHERE DISPLAY CABLE GOING TO DISPLAY AND INVERTER ATTACHES TO CONNECTOR P15

DISPLAY CHART

ASSEMBLY	DISPLAY FRICK P/N- MANUF.	VOLTAGE	CPU LK4 SETTING
640C0021G01	333Q00015B1 (SHARP)	+5 VDC	A
640C0052G01	649C1078H01 (PHILLIPS)	+3.3 VDC	B

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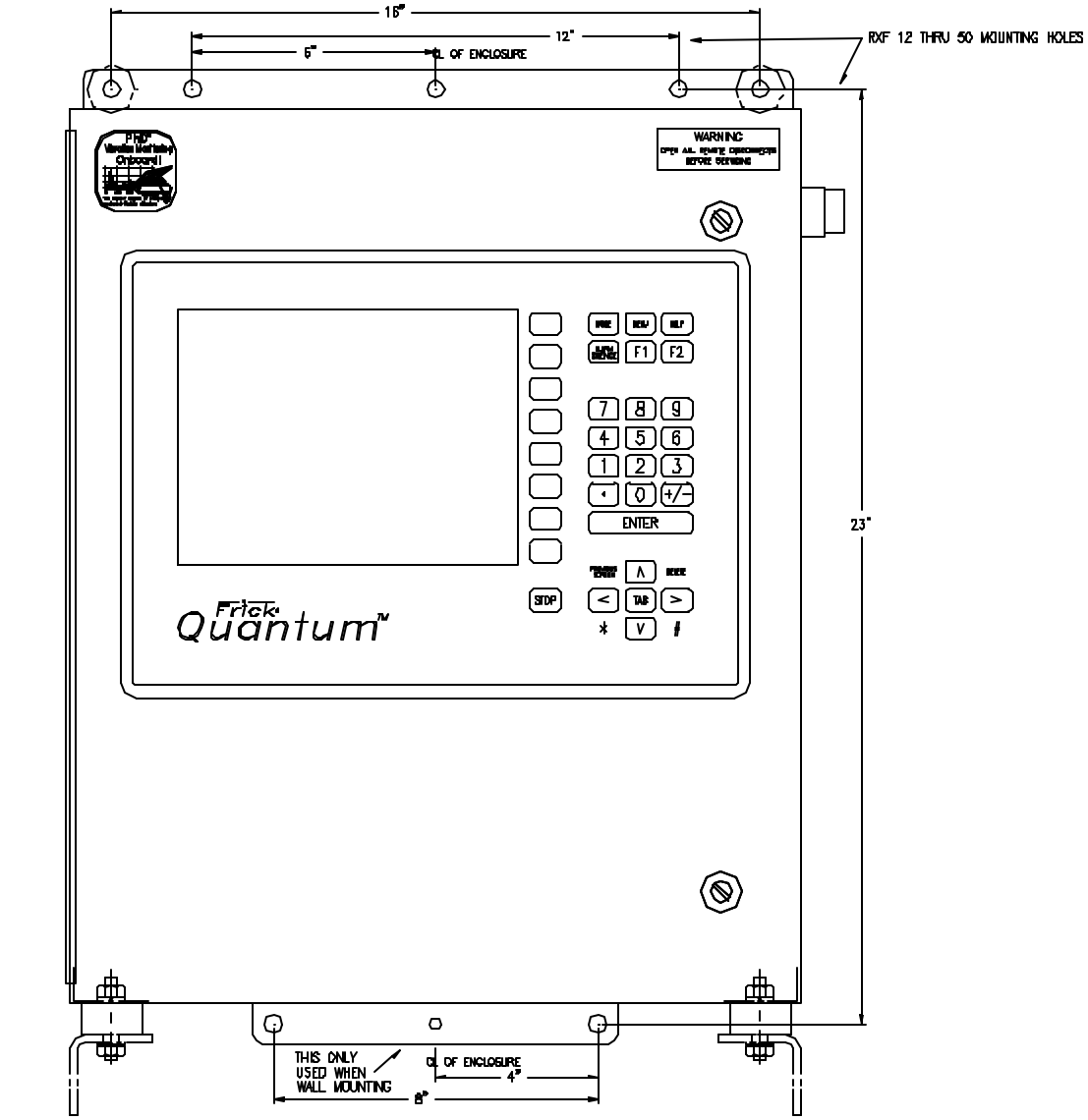
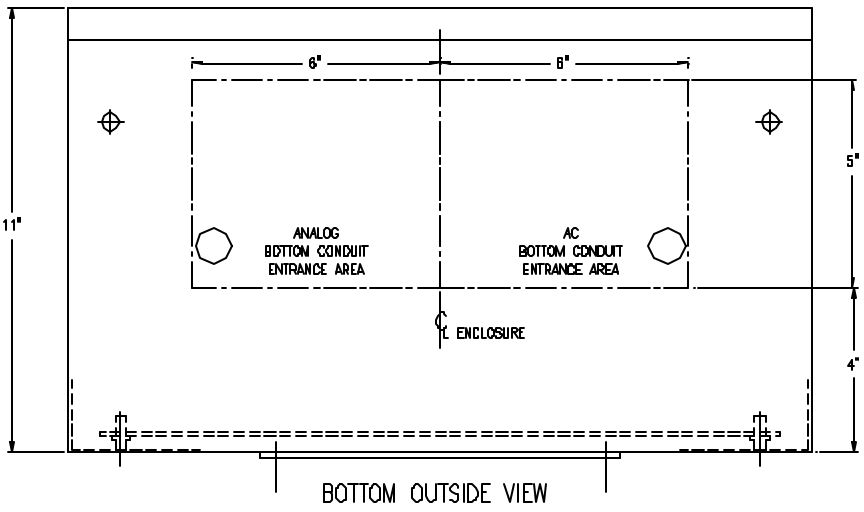
RXF (12-50) CONTROL CENTER ASSEMBLY (Sheet 1 of 5)



FRONT VIEW



BOTTOM OUTSIDE VIEW

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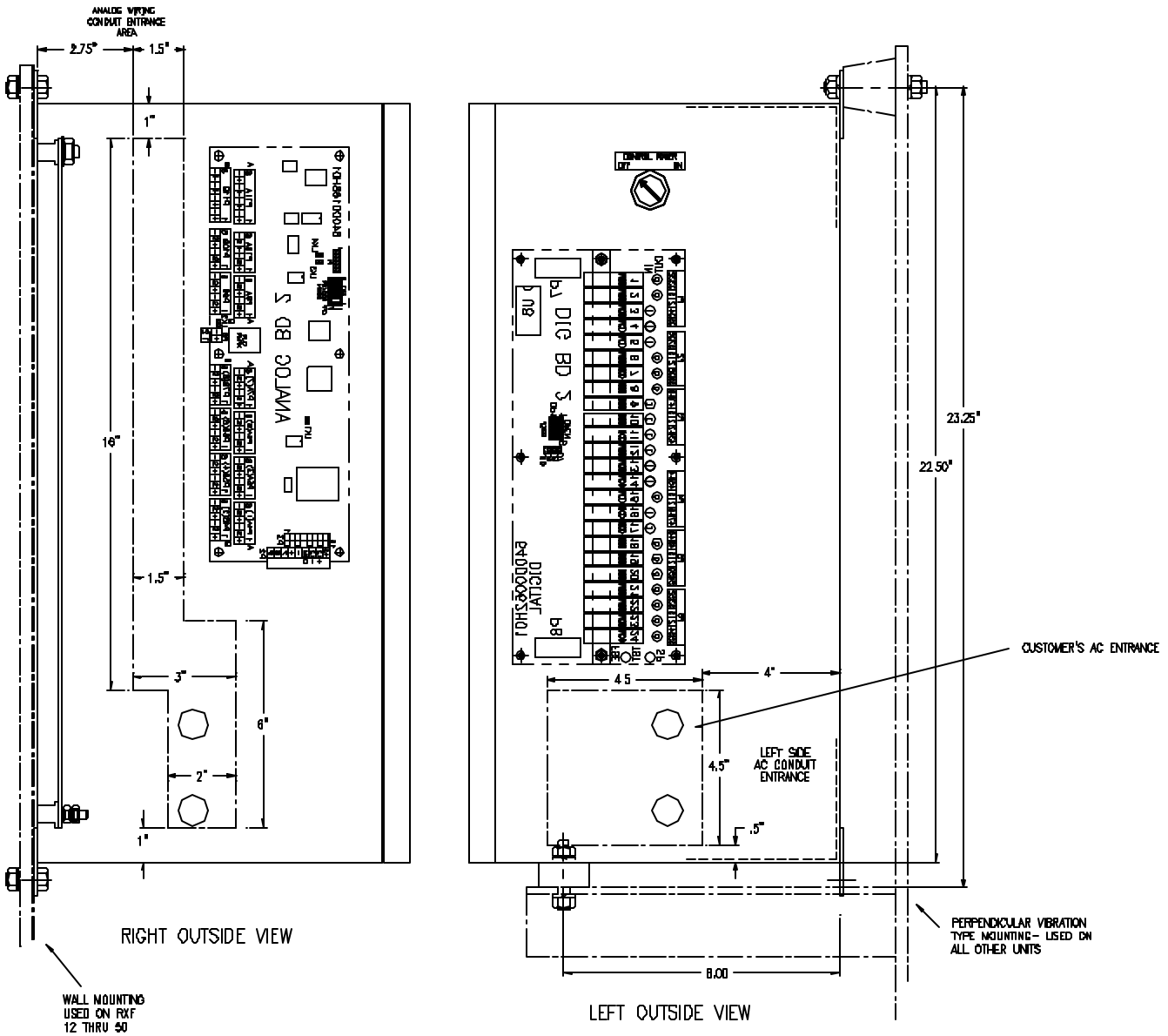
RXF (12-50) CONTROL CENTER ASSEMBLY (Sheet 2 of 5)



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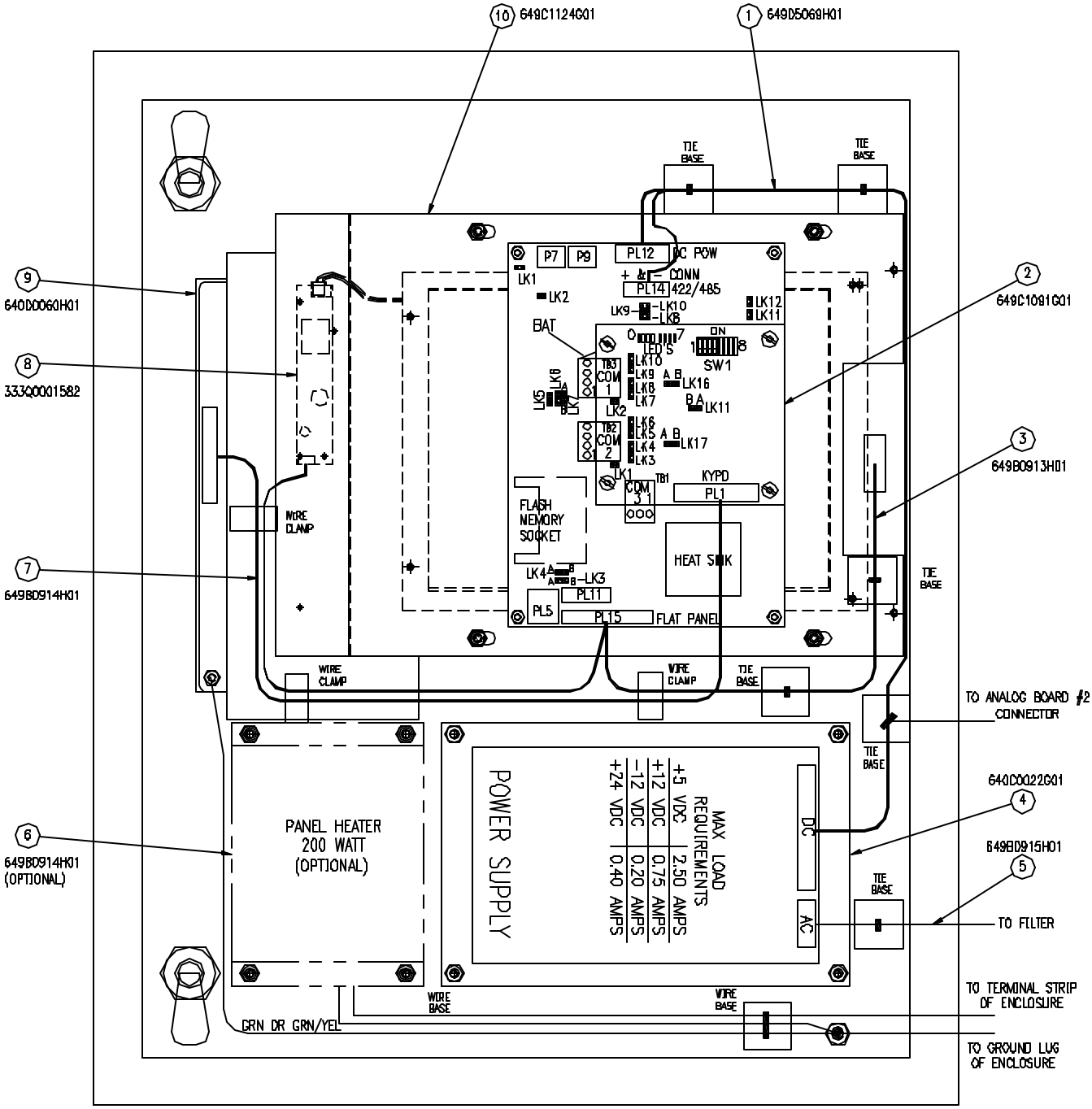
RXF (12-50) CONTROL CENTER ASSEMBLY (Sheet 3 of 5)



INSIDE DOOR VIEW

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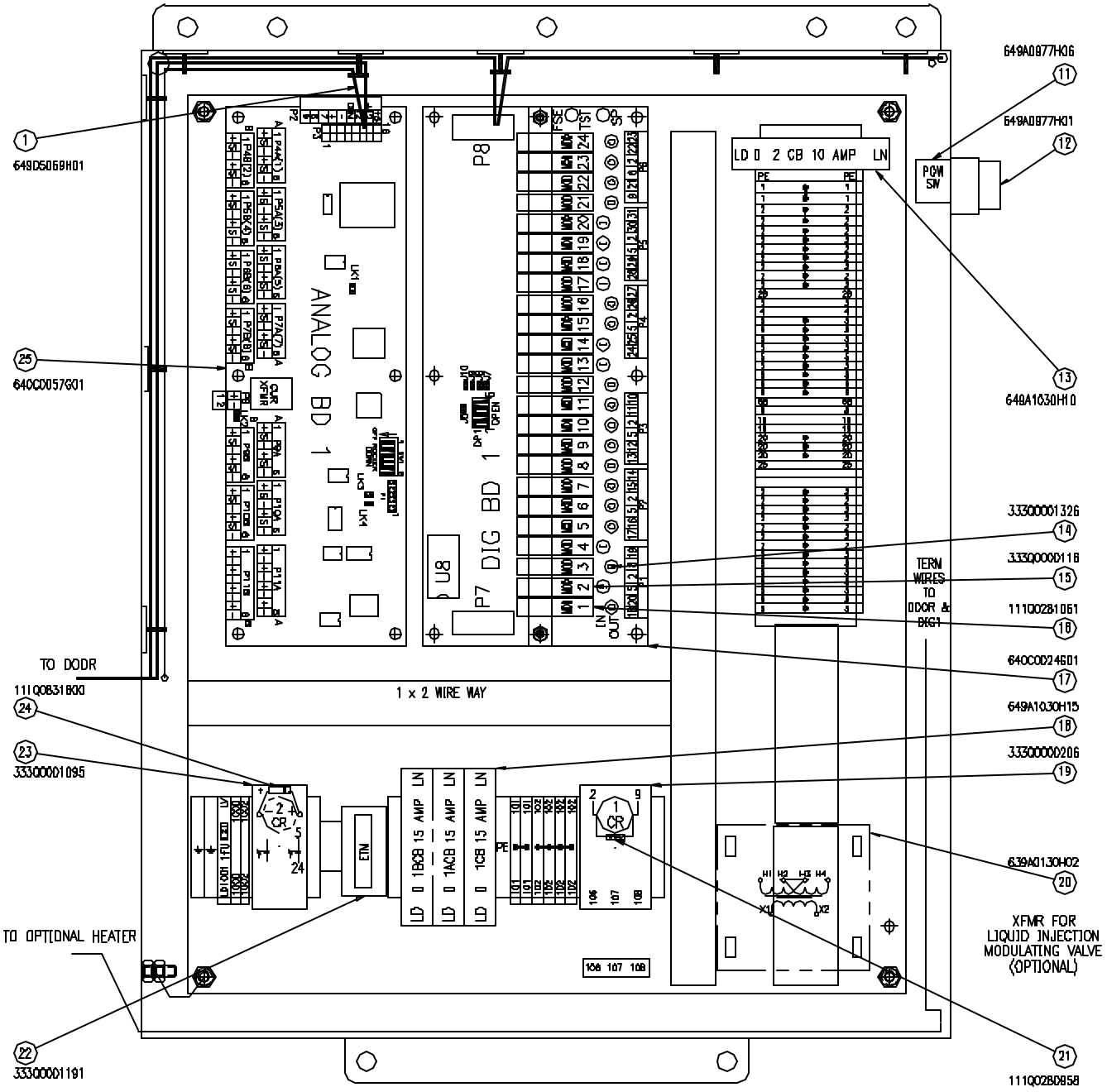
RXF (12-50) CONTROL CENTER ASSEMBLY (Sheet 4 of 5)



CONTROL ENCLOSURE WITH DOOR OPEN

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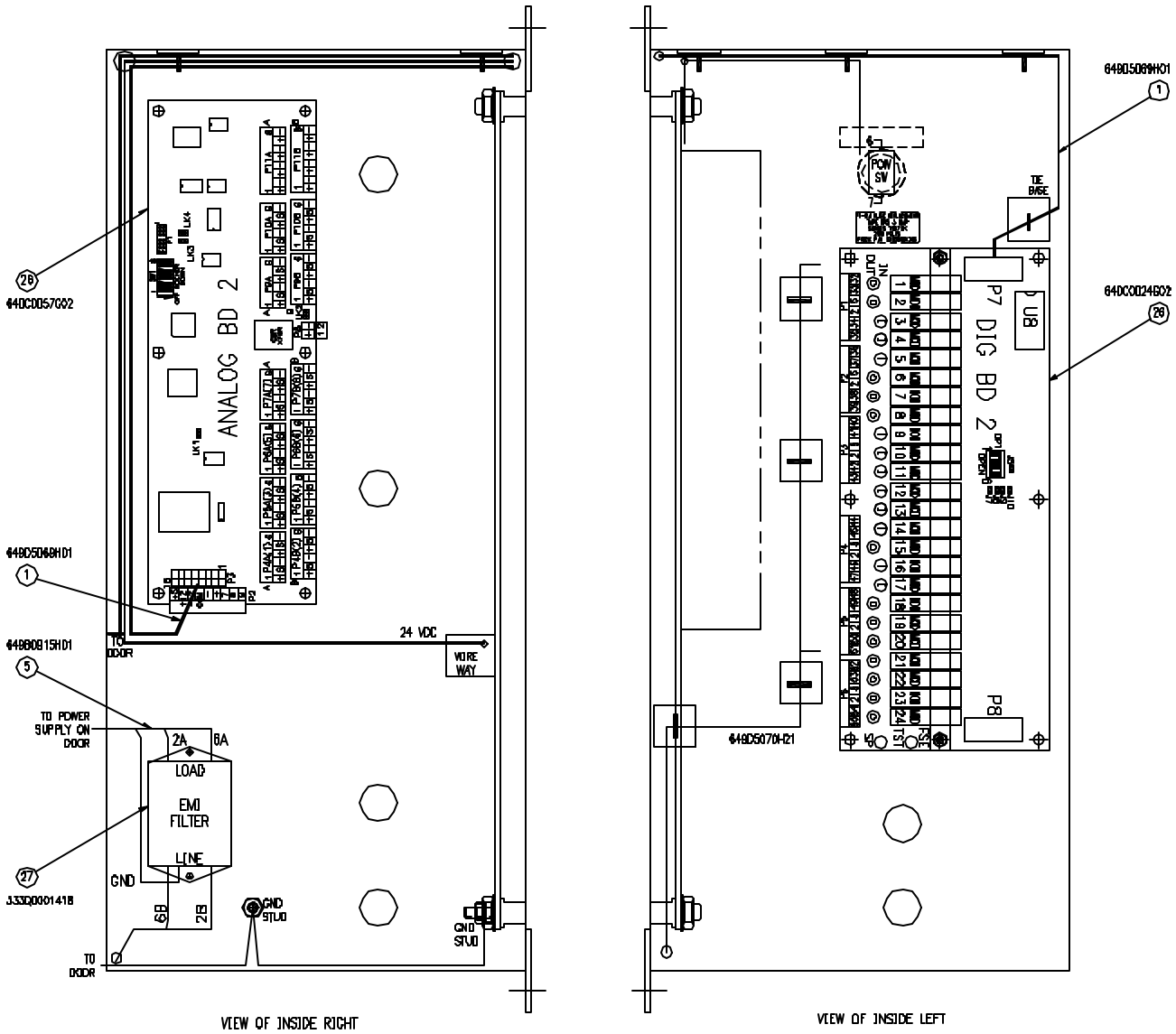
RXF (12-50) CONTROL CENTER ASSEMBLY (Sheet 5 of 5)



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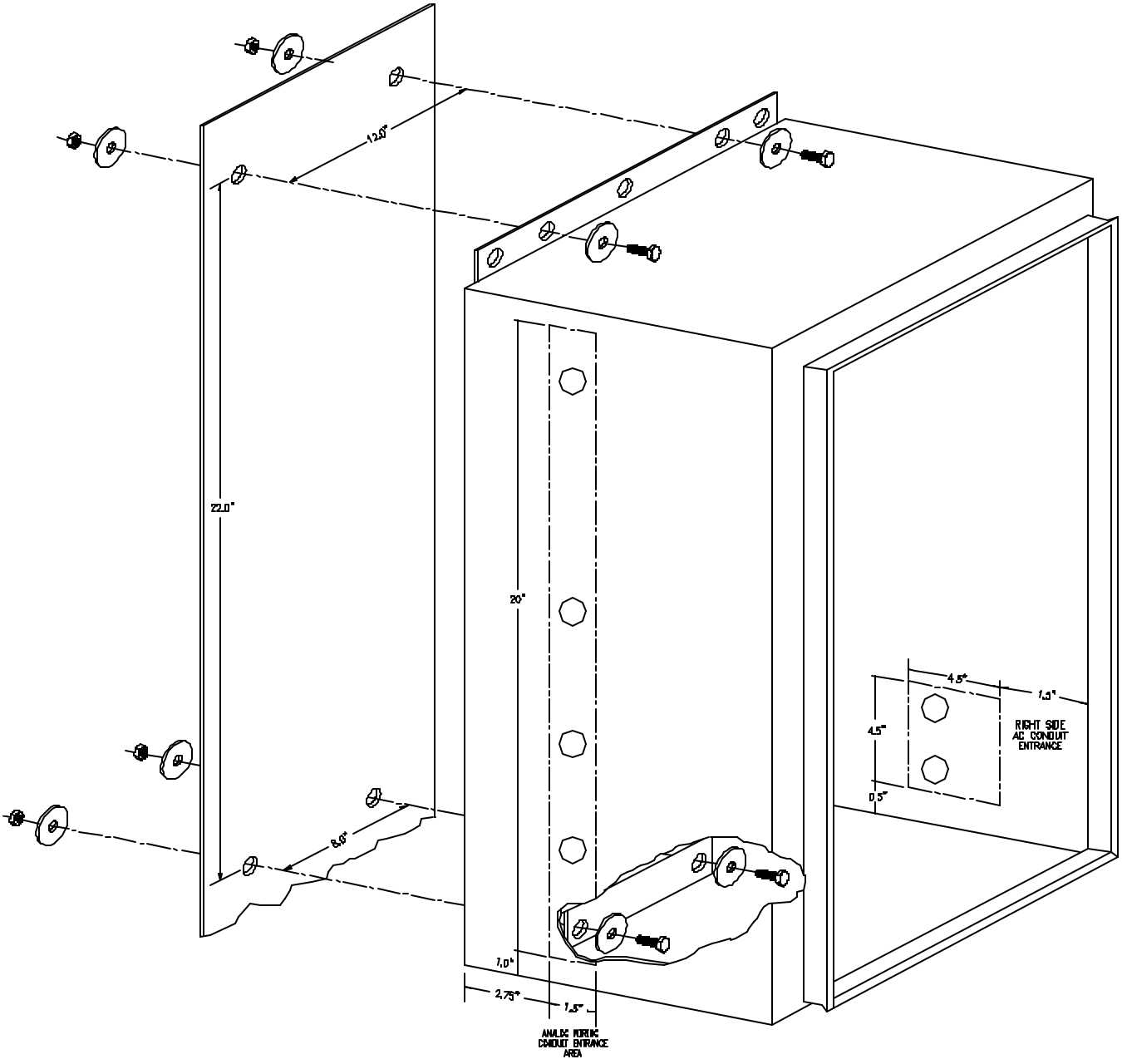
RXF (12-50) RETROFIT MOUNTING



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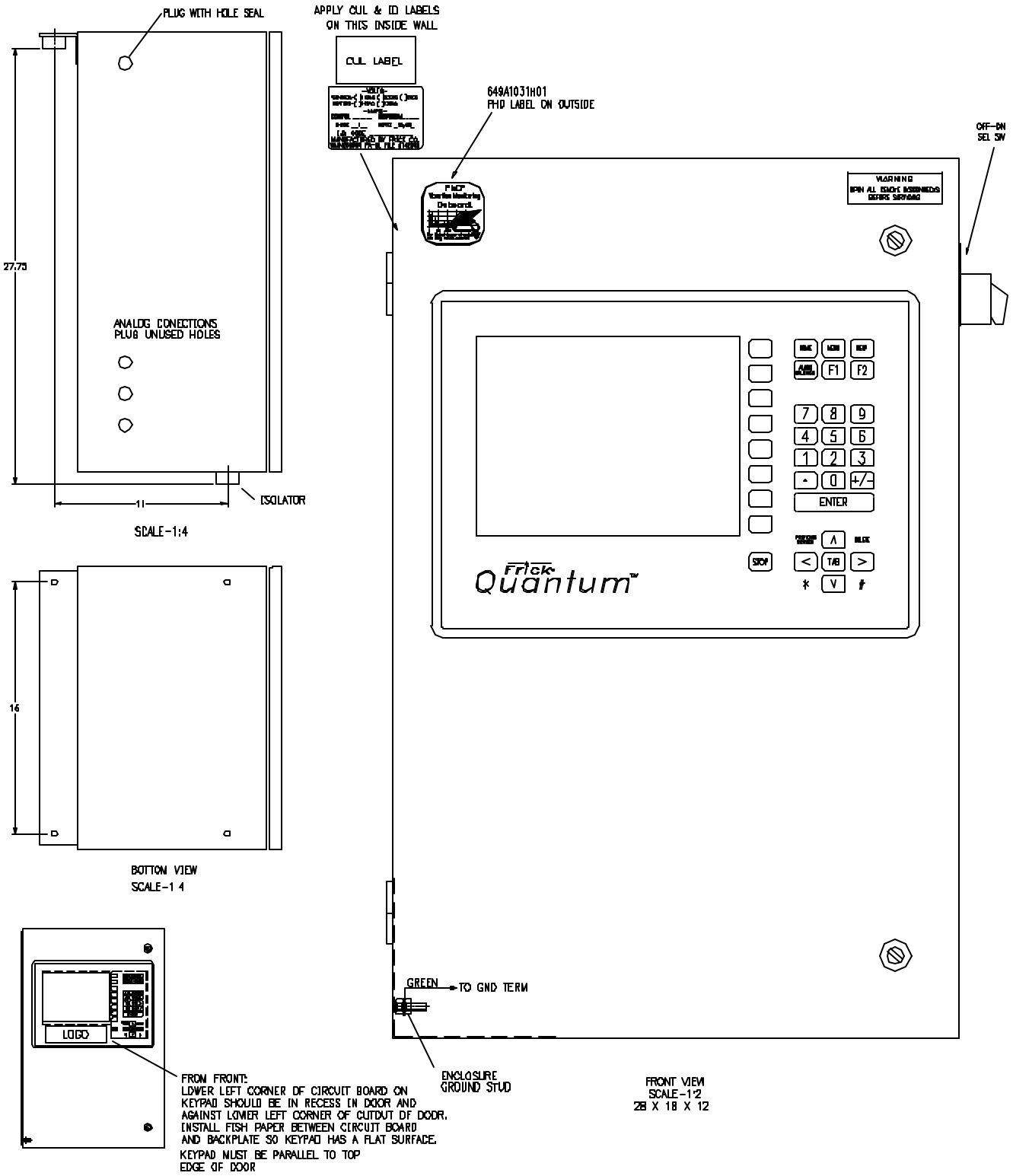
RDB CONTROL CENTER ASSEMBLY (Sheet 1 of 4)



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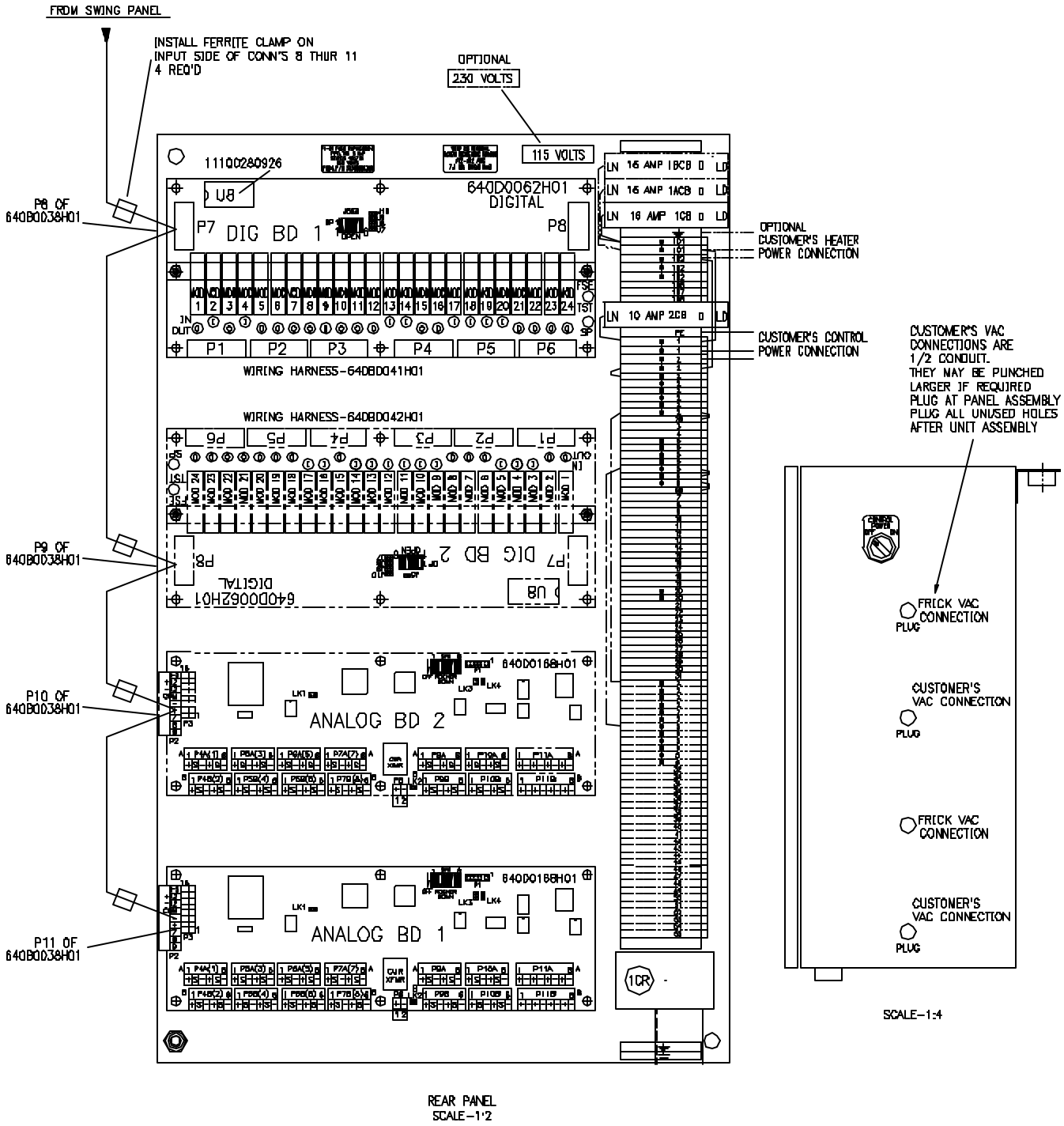
RDB CONTROL CENTER ASSEMBLY (Sheet 2 of 4)



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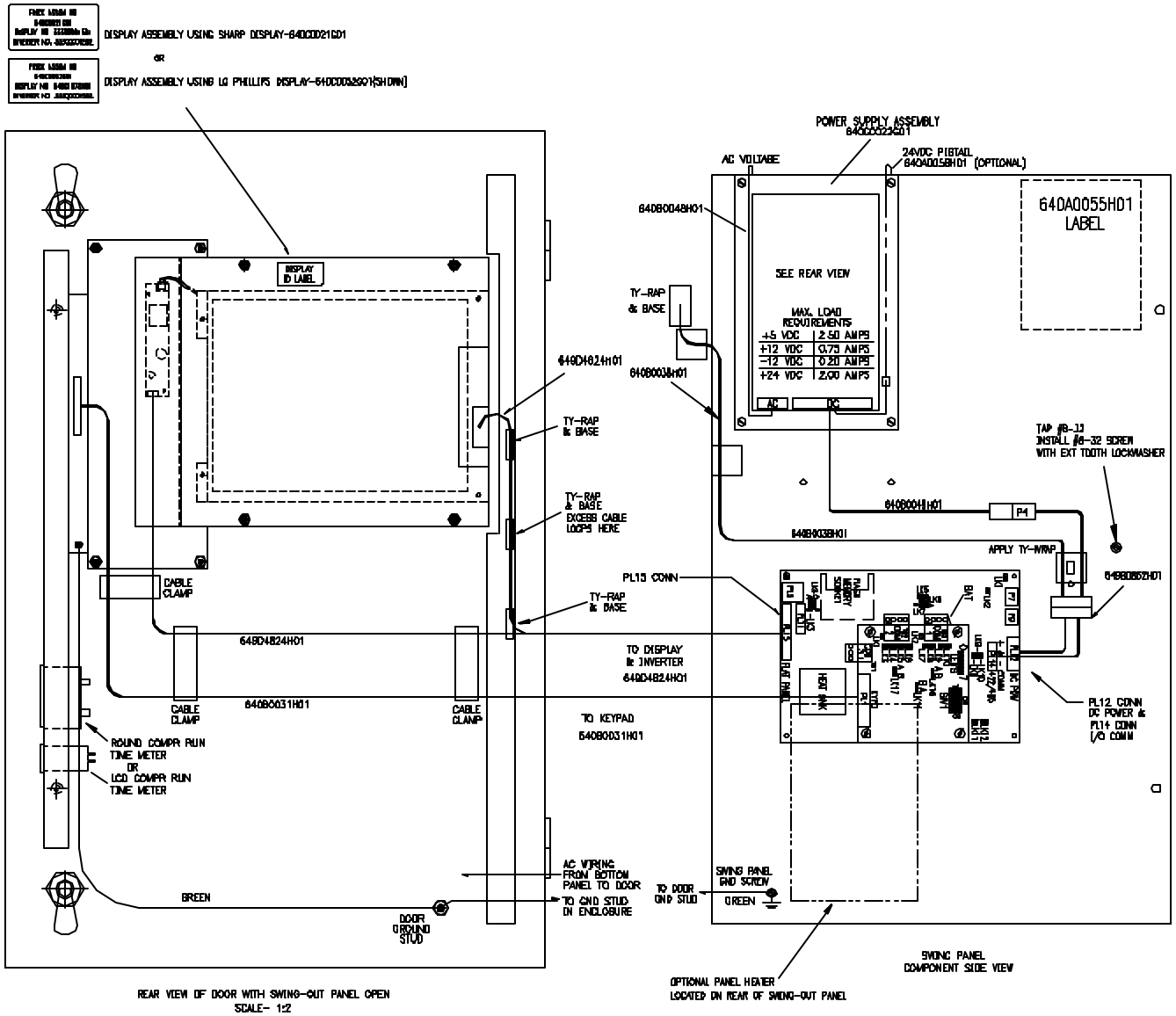
RDB CONTROL CENTER ASSEMBLY (Sheet 3 of 4)



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RDB CONTROL CENTER ASSEMBLY (Sheet 4 of 4)

CAUTION

THE QUANTUM IV ASSEMBLY IS SHIPPED WITH LK4 SET TO THE POSITION REQUIRED FOR THE DISPLAY BEING USED WHEN BUILT. IF THE SAME DISPLAY IS NOT SUPPLIED AS A REPLACEMENT, THEN LK4 MUST BE CHANGED TO ACCOMMODATE THE NEW DISPLAY.

DISPLAY CHART

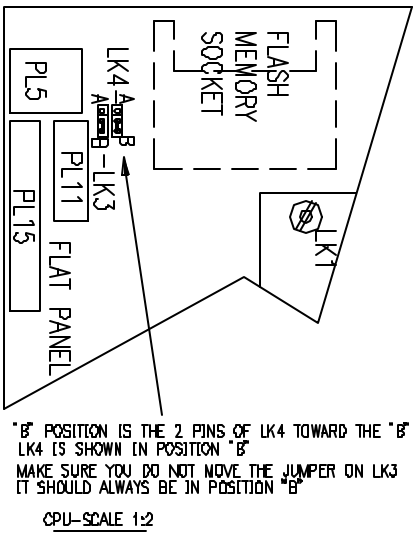
ASSEMBLY	DISPLAY FRICK P/N- MANUF.	VOLTAGE	CPU LK4 SETTING
640CD021G01	J33Q00001561 (SHARP)	+5 VDC	A
640CD052G01	649C1078H01 (PHILLIPS)	+3.3 VDC	B

WHEN REPLACING THE QUANTUM IV CPU OR THE DISPLAY, YOU FIRST MUST VERIFY WHICH DISPLAY IS BEING USED. LK4 JUMPER ON THE QUANTUM IV CPU MUST BE SET TO BE COMPATIBLE WITH THE DISPLAY THAT IS BEING USED.

DETERMINE THE DISPLAY BRAND BY THE LABEL OR BY THE SIZE OF THE PLATE ITS MOUNTED ON. THE DISPLAY (SHARP) THAT REQUIRES THE "A" POSITION SETTING IS MOUNTED ON A MOUNTING PLATE THAT IS 12 3/4" LONG INCLUDING THE BEND. THE DISPLAY (PHILLIPS) USING THE "B" POSITION SETTING IS MOUNTED ON A MOUNTING PLATE THAT IS 11 3/4" LONG.

REFER TO CHART TO DETERMINE WHICH POSITION TO PUT LK4 JUMPER

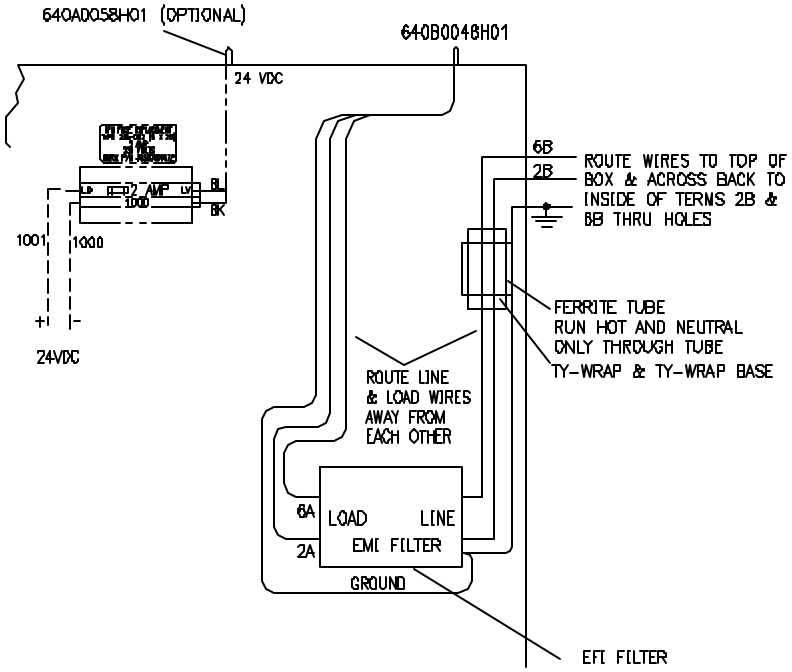
LK4 IS LOCATED ON BOTTOM BOARD AT CORNER WHERE DISPLAY CABLE GOING TO DISPLAY AND INVERTER ATTACHES TO CONNECTOR P15



"B" POSITION IS THE 2 PINS OF LK4 TOWARD THE "B"
LK4 IS SHOWN IN POSITION "B"
MAKE SURE YOU DO NOT MOVE THE JUMPER ON LK3
IT SHOULD ALWAYS BE IN POSITION "B"

CPU-SCALE 1:2

REAR VIEW OF POWER SUPPLY WIRING



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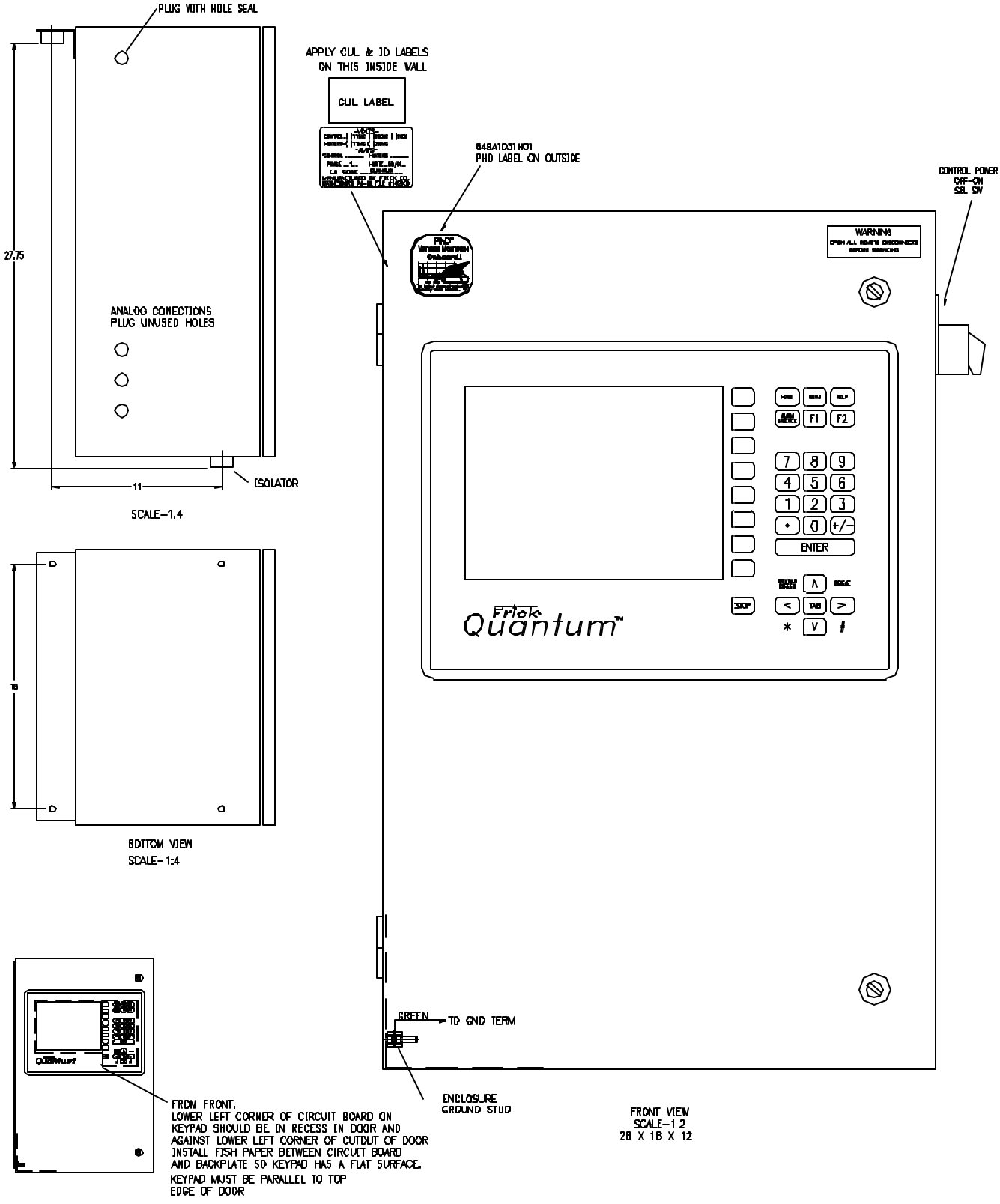
RWBII CONTROL CENTER ASSEMBLY (Sheet 1 of 4)



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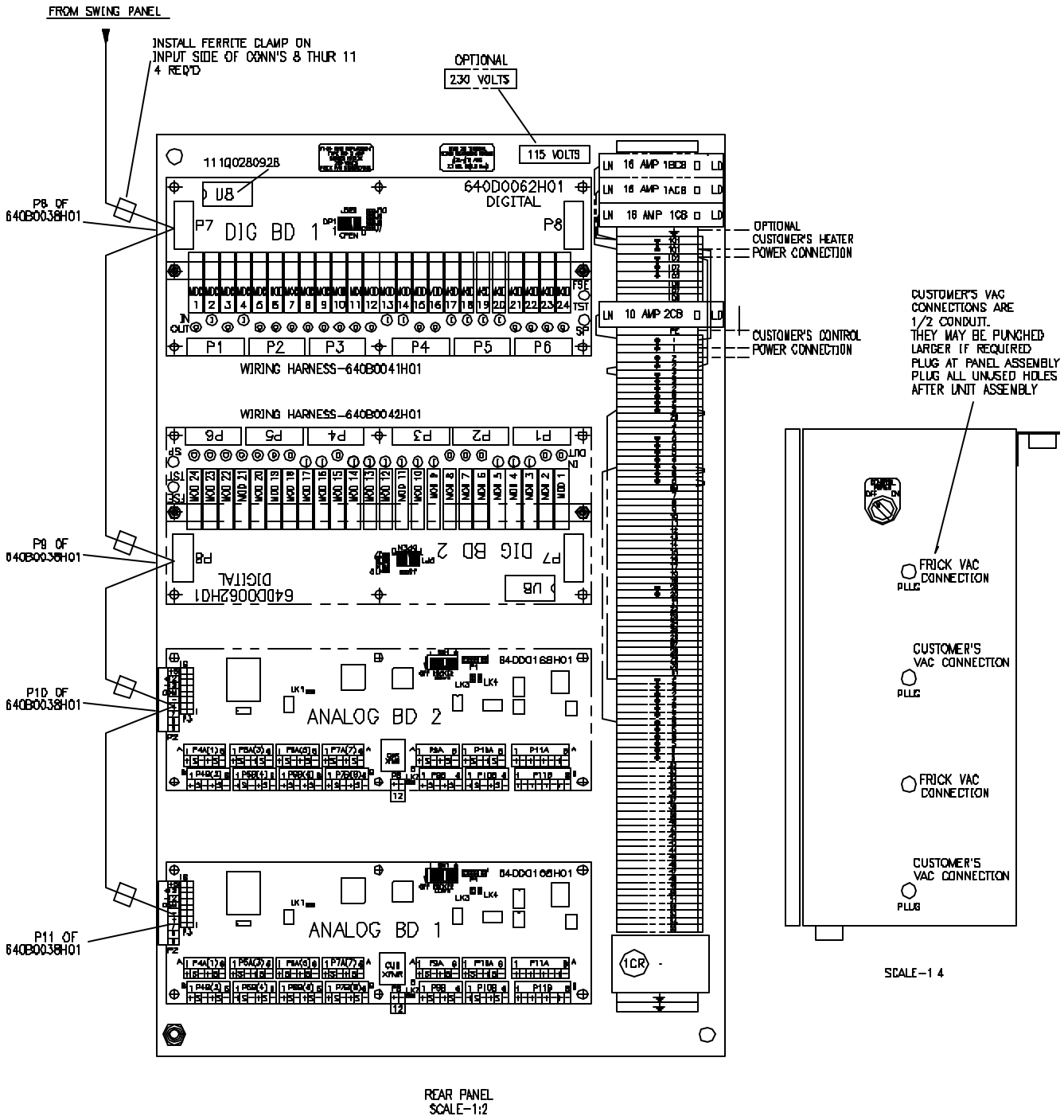
RWBII CONTROL CENTER ASSEMBLY (Sheet 2 of 4)



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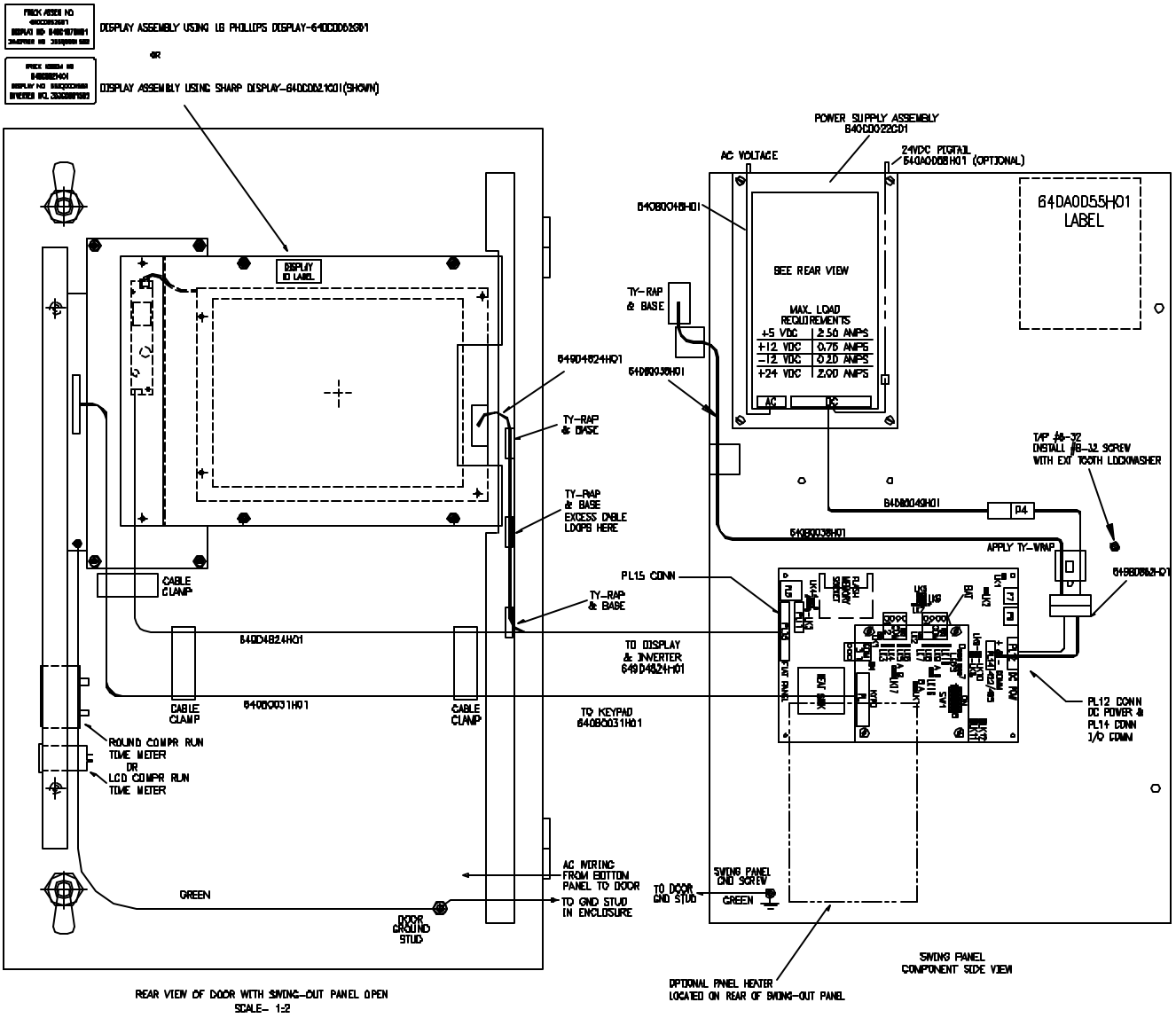
RWBII CONTROL CENTER ASSEMBLY (Sheet 3 of 4)



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RWBII CONTROL CENTER ASSEMBLY (Sheet 4 of 4)

CAUTION

THE QUANTUM IV ASSEMBLY IS SHIPPED WITH LK4 SET TO THE POSITION REQUIRED FOR THE DISPLAY BEING USED WHEN BUILT. IF THE SAME DISPLAY IS NOT SUPPLIED AS A REPLACEMENT, THEN LK4 MUST BE CHANGED TO ACCOMMODATE THE NEW DISPLAY.

WHEN REPLACING THE QUANTUM IV CPU OR THE DISPLAY, YOU FIRST MUST VERIFY WHICH DISPLAY IS BEING USED. LK4 JUMPER ON THE QUANTUM IV CPU MUST BE SET TO BE COMPATIBLE WITH THE DISPLAY THAT IS BEING USED

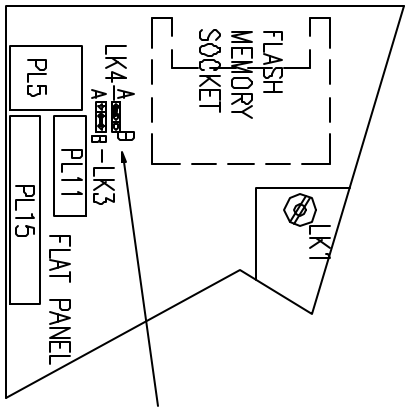
DETERMINE THE DISPLAY BRAND BY THE LABEL OR BY THE SIZE OF THE PLATE ITS MOUNTED ON. THE DISPLAY (SHARP) THAT REQUIRES THE "A" POSITION SETTING IS MOUNTED ON A MOUNTING PLATE THAT IS 12 3/4" LONG (INCLUDING THE BEND). THE DISPLAY (PHILLIPS) USING THE "B" POSITION SETTING IS MOUNTED ON A MOUNTING PLATE THAT IS 11 3/4" LONG.

REFER TO CHART TO DETERMINE WHICH POSITION TO PUT LK4 JUMPER

LK4 IS LOCATED ON BOTTOM BOARD AT CORNER WHERE DISPLAY CABLE GOING TO DISPLAY AND INVERTER ATTACHES TO CONNECTOR P15

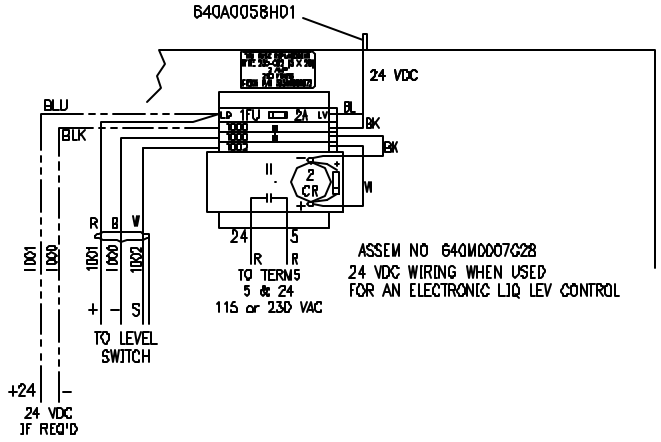
DISPLAY CHART

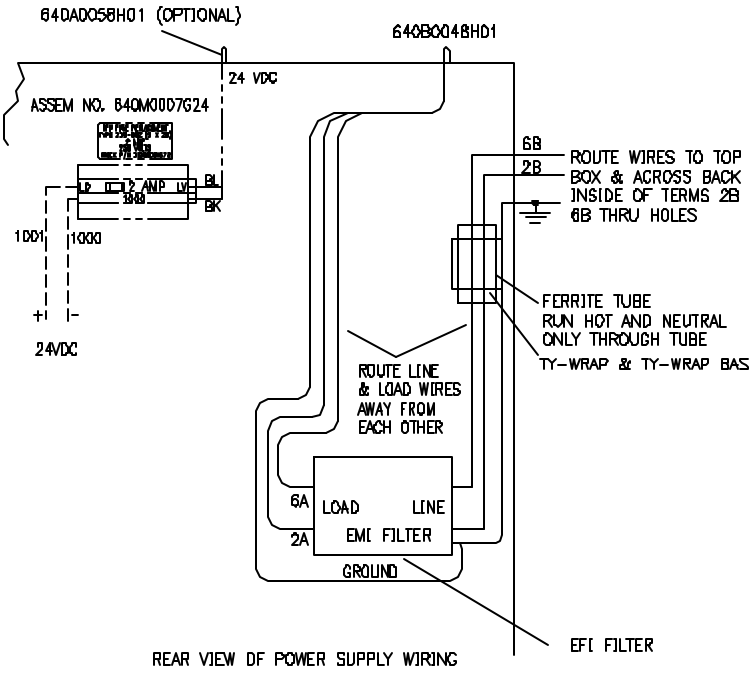
ASSEMBLY	DISPLAY FRICK P/N– MANUF.	VOLTAGE	CPU LK4 SETTING
640C0021G01	333D0001581 (SHARP)	+5 VDC	A
640C0052G01	649C107BH01 (PHILLIPS)	+3.3 VDC	B



"A" POSITION IS THE 2 PINS OF LK4 TOWARD THE "A"
LK4 IS SHOWN IN POSITION "A"
MAKE SURE YOU DO NOT MOVE THE JUMPER ON LK3. IT SHOULD ALWAYS BE IN POSITION "B"

CPU–SCALE 1:2





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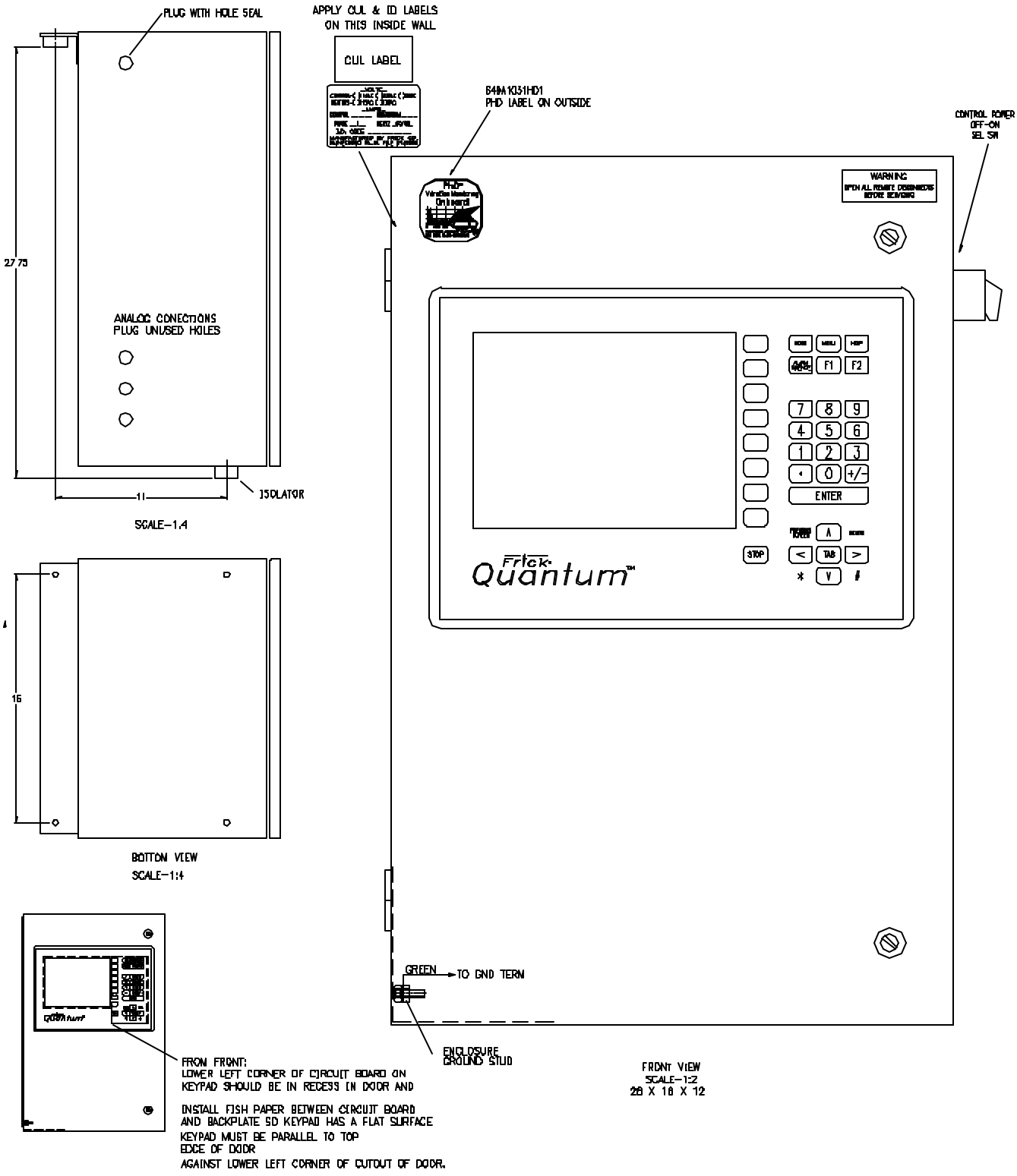
RETROFIT RXB / RXF (58-101) CONTROL CENTER ASSEMBLY (Sheet 1 of 4)



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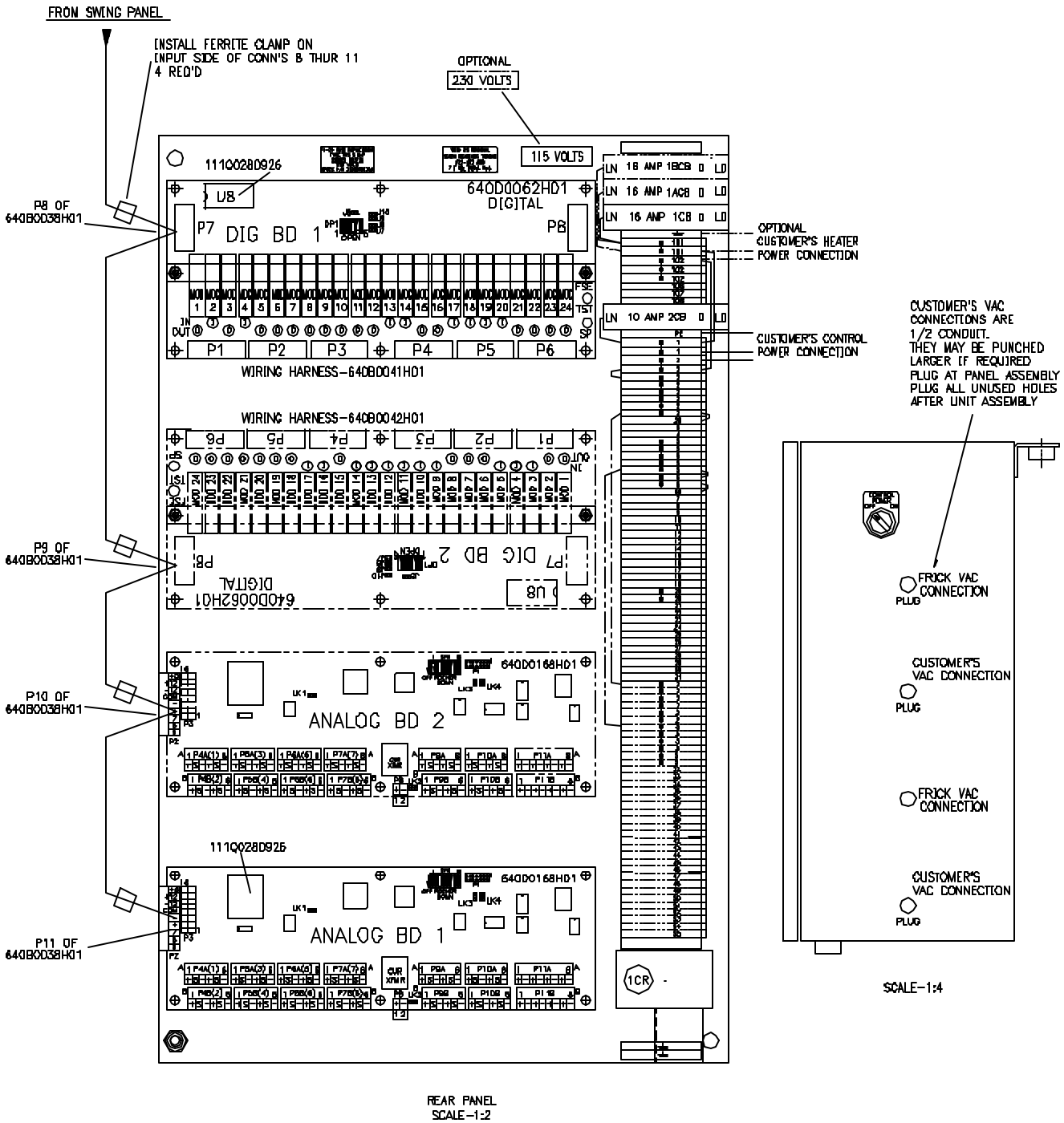
RETROFIT RXB / RXF (58-101) CONTROL CENTER ASSEMBLY (Sheet 2 of 4)



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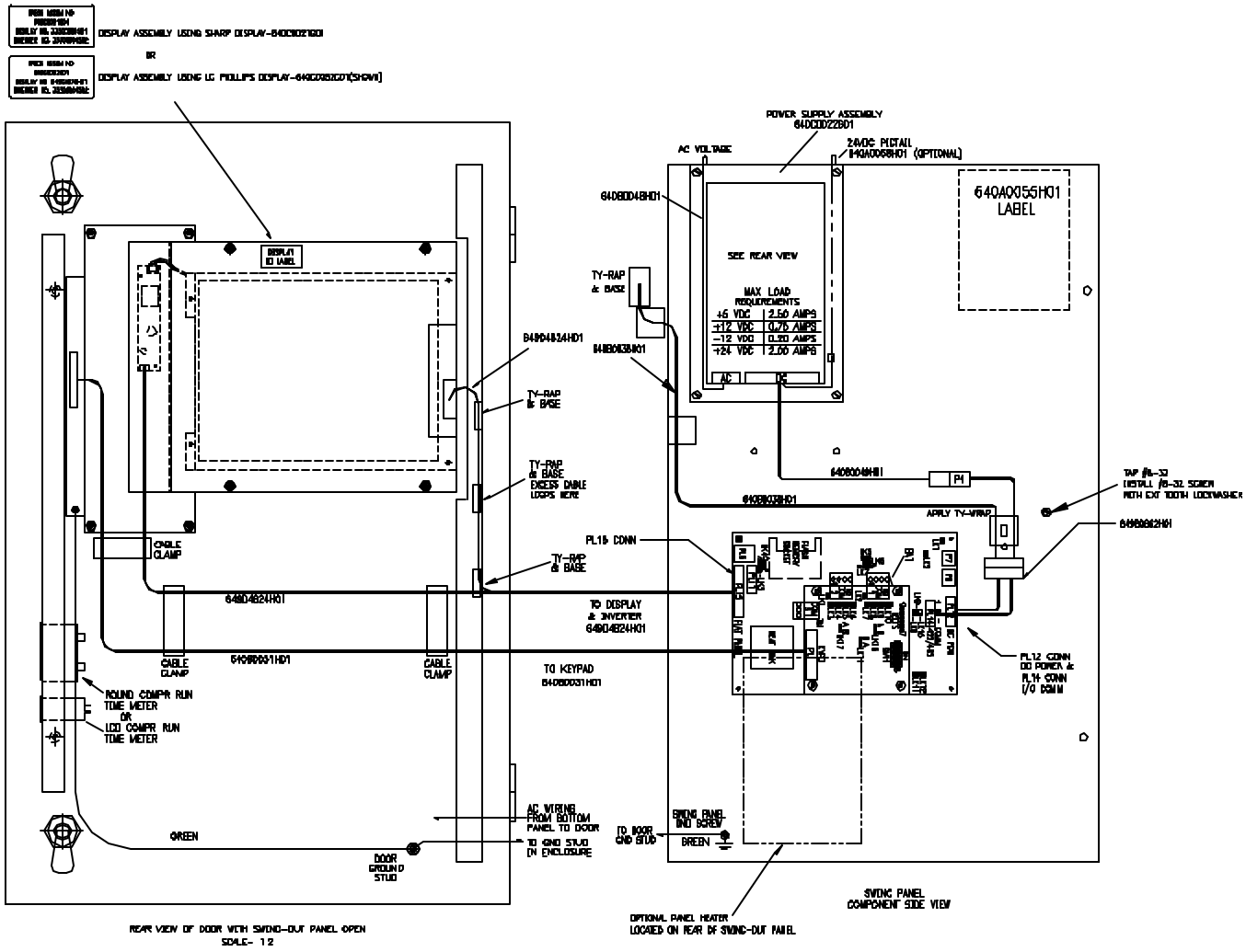
RETROFIT RXB / RXF (58-101) CONTROL CENTER ASSEMBLY (Sheet 3 of 4)



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RETROFIT RXB / RXF (58-101) CONTROL CENTER ASSEMBLY (Sheet 4 of 4)

CAUTION

THE QUANTUM IV ASSEMBLY IS SHIPPED WITH LK4 SET TO THE POSITION REQUIRED FOR THE DISPLAY BEING USED WHEN BUILT. IF THE SAME DISPLAY IS NOT SUPPLIED AS A REPLACEMENT, THEN LK4 MUST BE CHANGED TO ACCOMMODATE THE NEW DISPLAY.

WHEN REPLACING THE QUANTUM IV CPU OR THE DISPLAY, YOU FIRST MUST VERIFY WHICH DISPLAY IS BEING USED. LK4 JUMPER ON THE QUANTUM IV CPU MUST BE SET TO BE COMPATIBLE WITH THE DISPLAY THAT IS BEING USED.

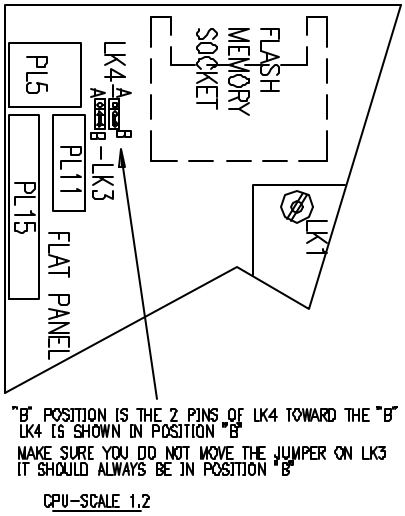
DETERMINE THE DISPLAY BRAND BY THE LABEL OR BY THE SIZE OF THE PLATE ITS MOUNTED ON. THE DISPLAY (SHARP) THAT REQUIRES THE "A" POSITION SETTING IS MOUNTED ON A MOUNTING PLATE THAT IS 12 3/4" LONG INCLUDING THE BEND. THE DISPLAY (PHILLIPS) USING THE "B" POSITION SETTING IS MOUNTED ON A MOUNTING PLATE THAT IS 11 3/4" LONG.

REFER TO CHART TO DETERMINE WHICH POSITION TO PUT LK4 JUMPER

LK4 IS LOCATED ON BOTTOM BOARD AT CORNER WHERE DISPLAY CABLE GOING TO DISPLAY AND INVERTER ATTACHES TO CONNECTOR P15

DISPLAY CHART

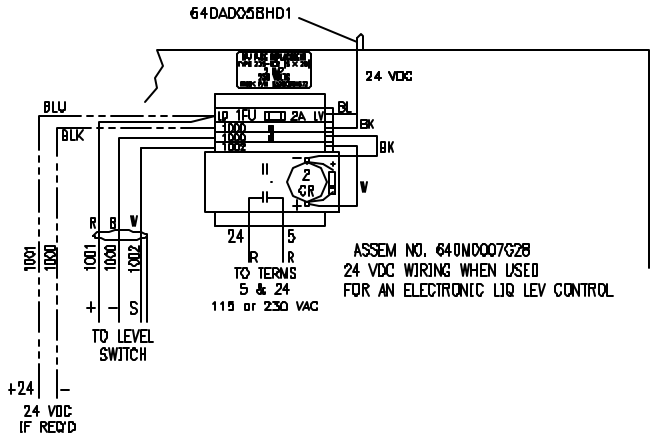
ASSEMBLY	DISPLAY FRICK P/N- MANUF	VOLTAGE	CPU LK4 SETTING
640C0021G01	333Q0001681 (SHARP)	+5 VDC	A
640C0052G01	649C1078H01 (PHILLIPS)	+3.3 VDC	B

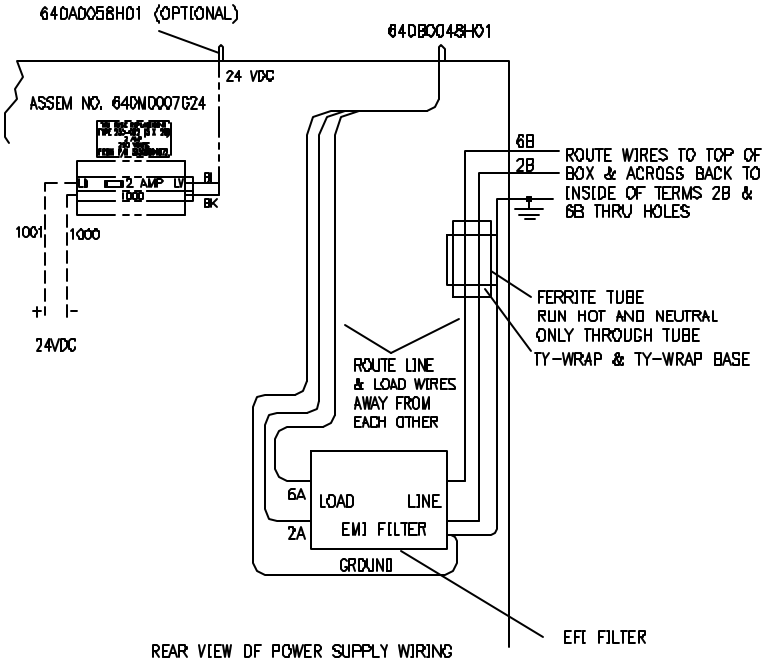


"B" POSITION IS THE 2 PINS OF LK4 TOWARD THE "B"
LK4 IS SHOWN IN POSITION "B"

MAKE SURE YOU DO NOT MOVE THE JUMPER ON LK3 IT SHOULD ALWAYS BE IN POSITION "B"

CPU-SCALE 1.2





REAR VIEW OF POWER SUPPLY WIRING

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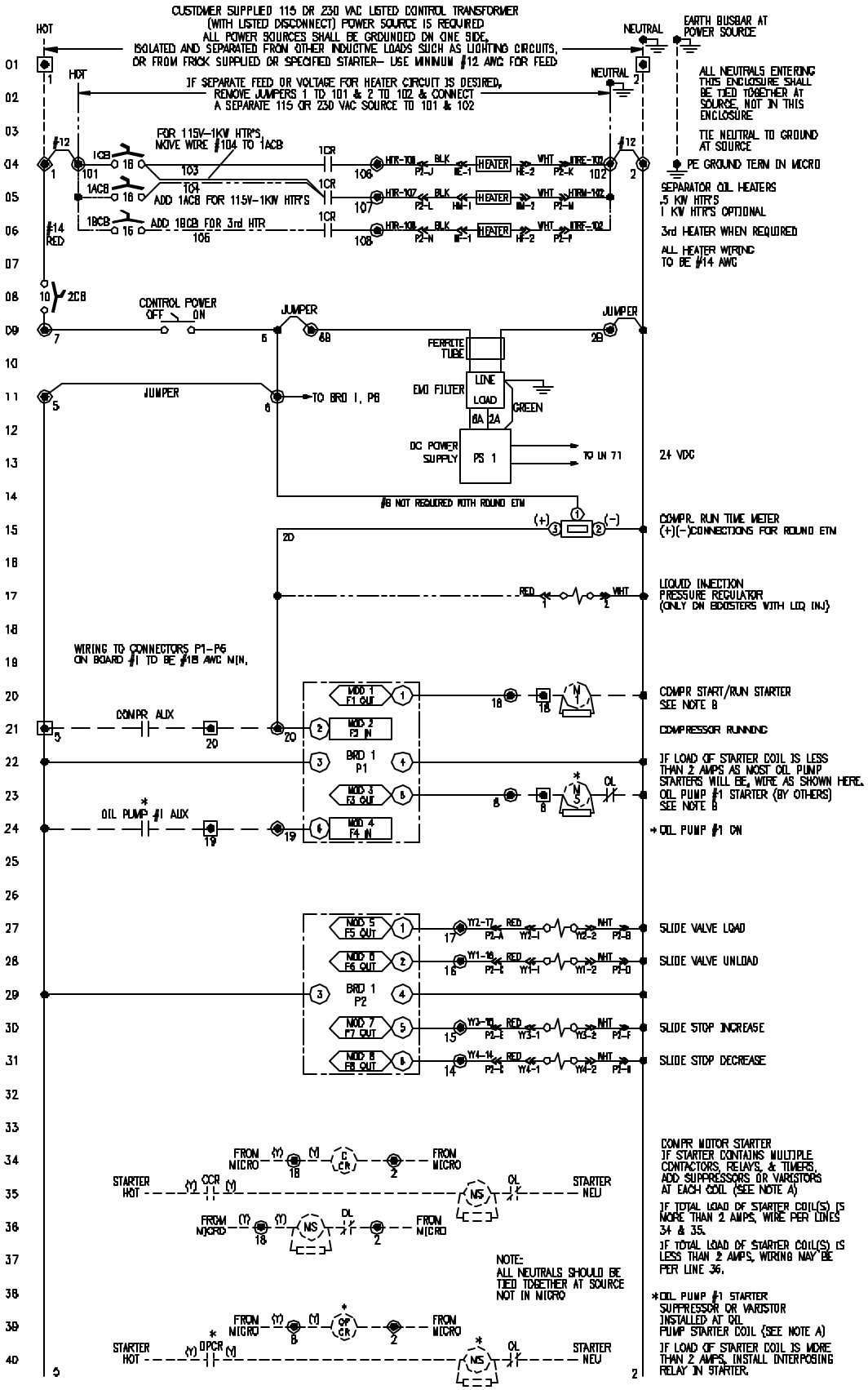
WIRING DIAGRAM – RWF (Sheet 1 of 4)



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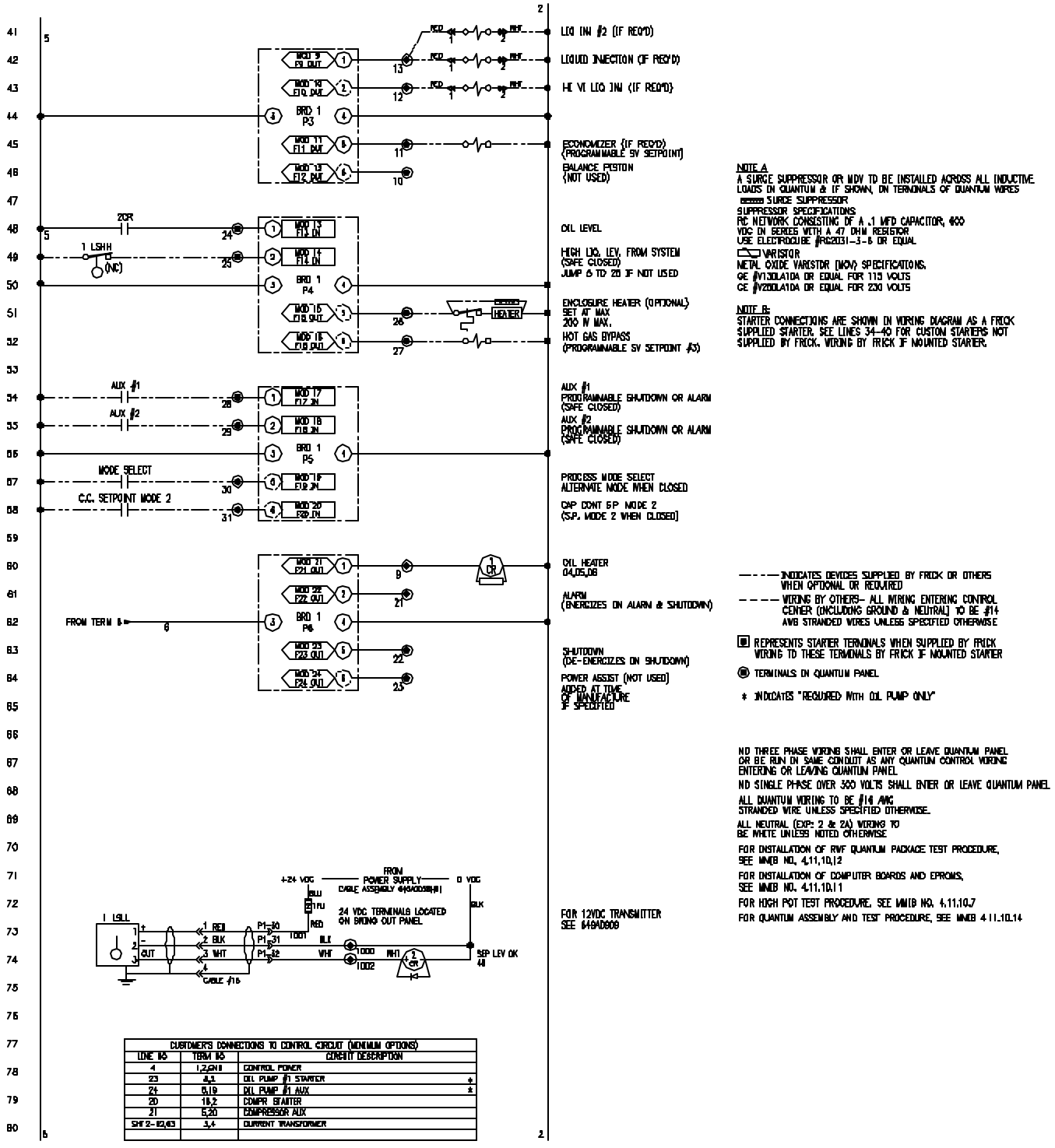
WIRING DIAGRAM - RWF (Sheet 2 of 4)



CUSTOMER'S CONNECTIONS TO CONTROL CIRCUIT (MINIMUM OPTIONS)		
LINE NO.	TERM NO.	CIRCUIT DESCRIPTION
4	1,2,GND	CONTROL POWER
23	8,1	OIL PUMP #1 STARTER *
24	6,19	OIL PUMP #1 AUX *
20	18,2	COMPR STARTER
21	5,20	COMPRESSOR AUX
SHT 2- #2,#3	3,4	CURRENT TRANSFORMER

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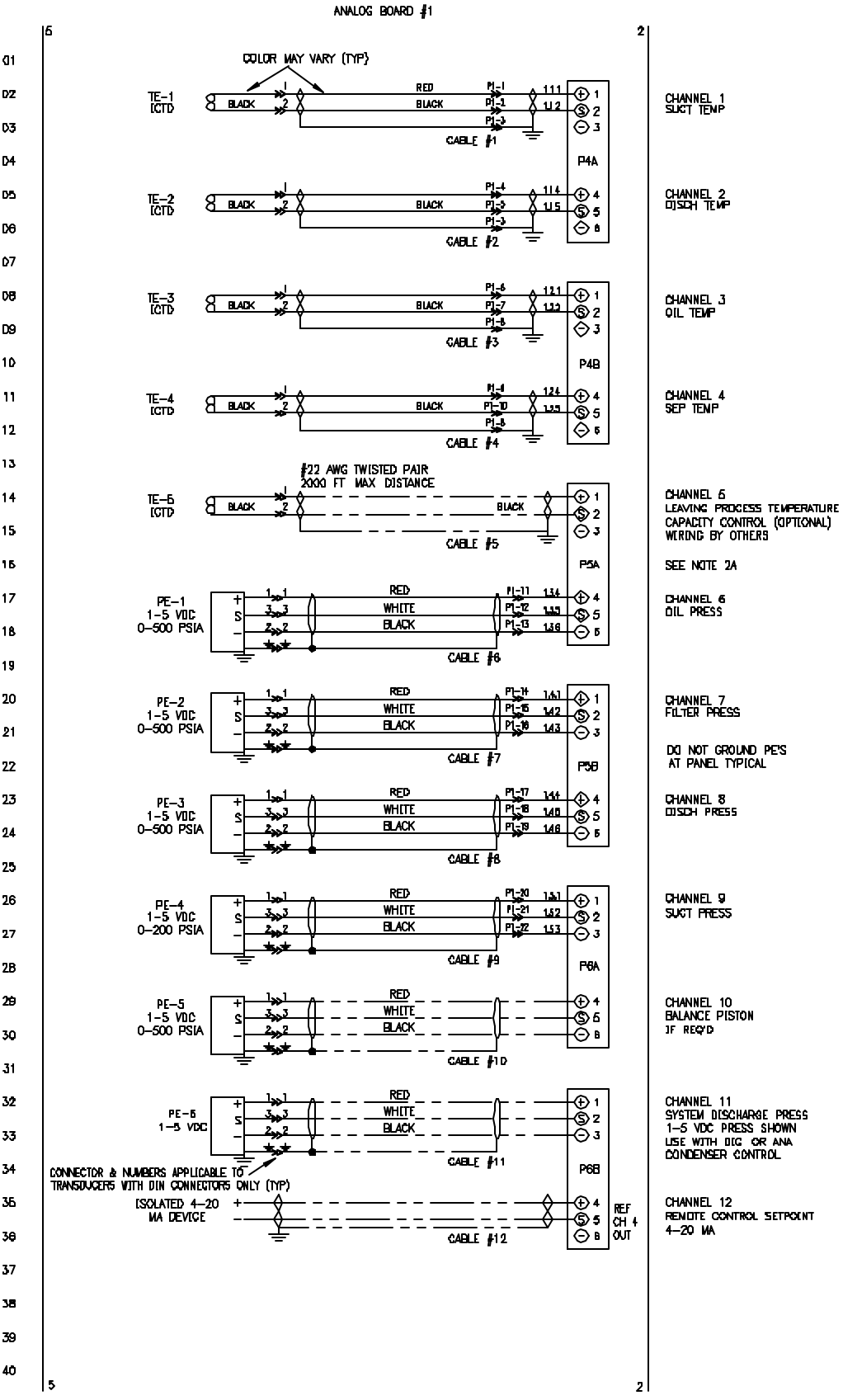
WIRING DIAGRAM - RWF (Sheet 3 of 4)



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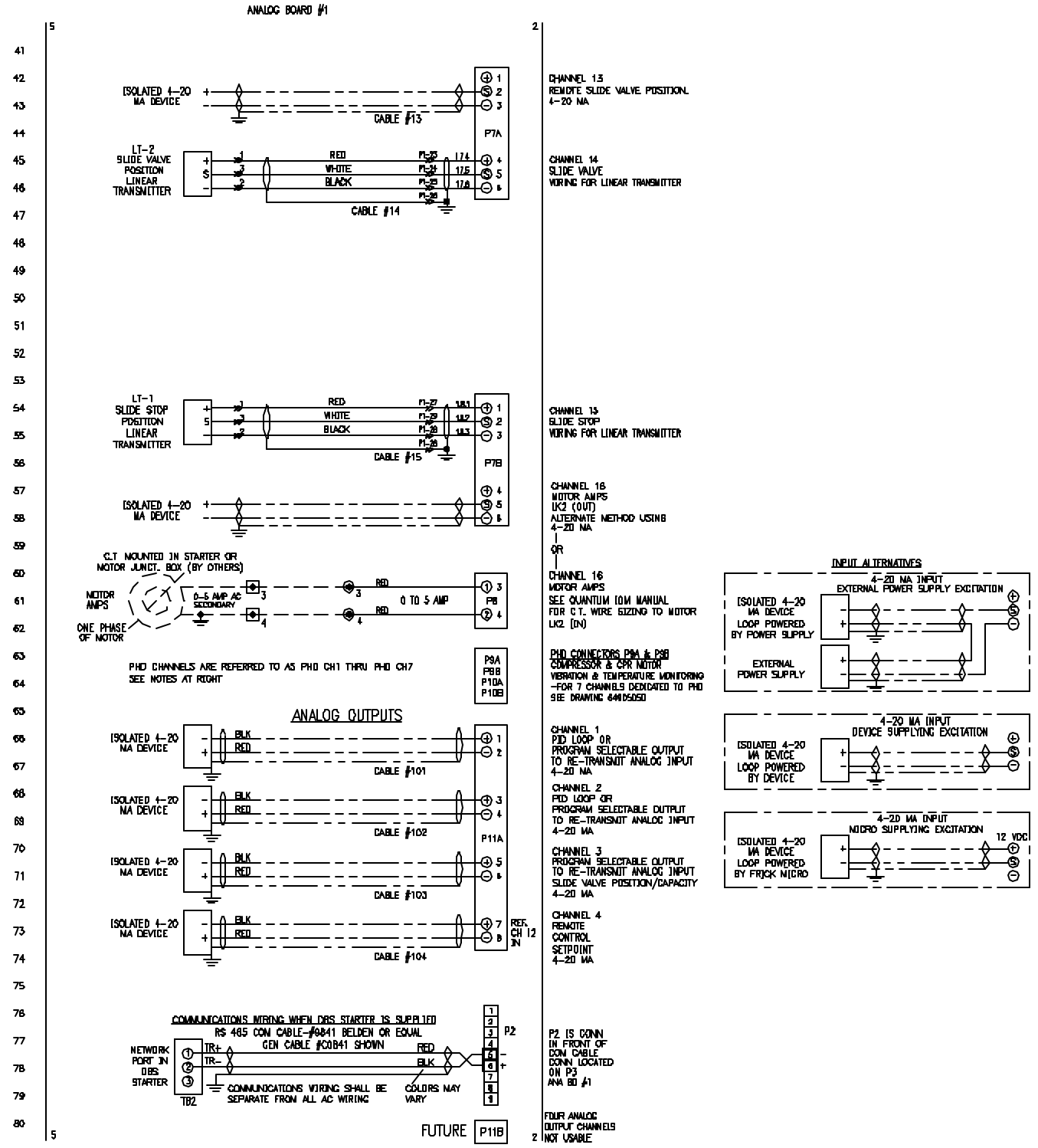
WIRING DIAGRAM - RWF (Sheet 4 of 4)



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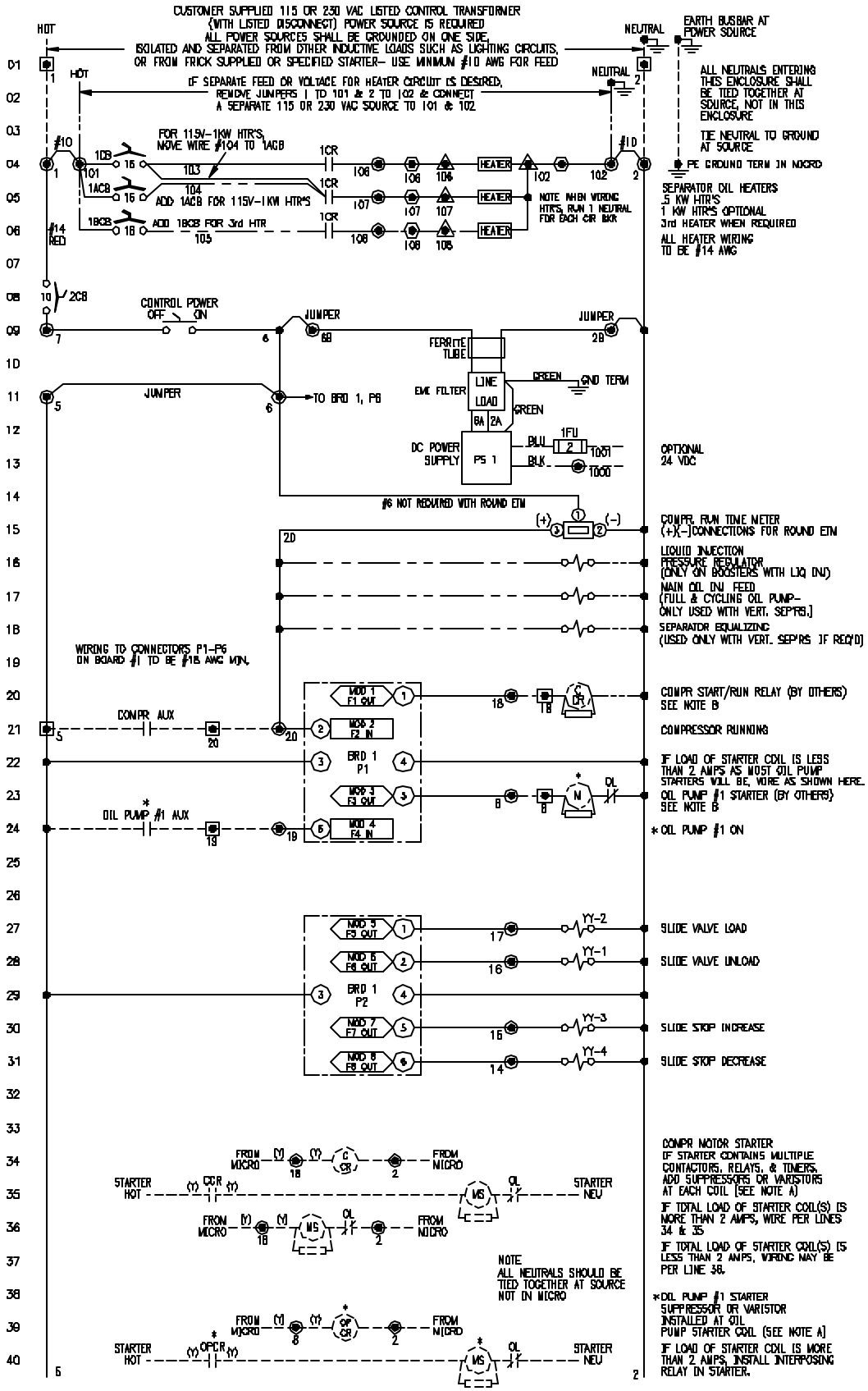
WIRING DIAGRAM – RWB II (Sheet 1 of 4)



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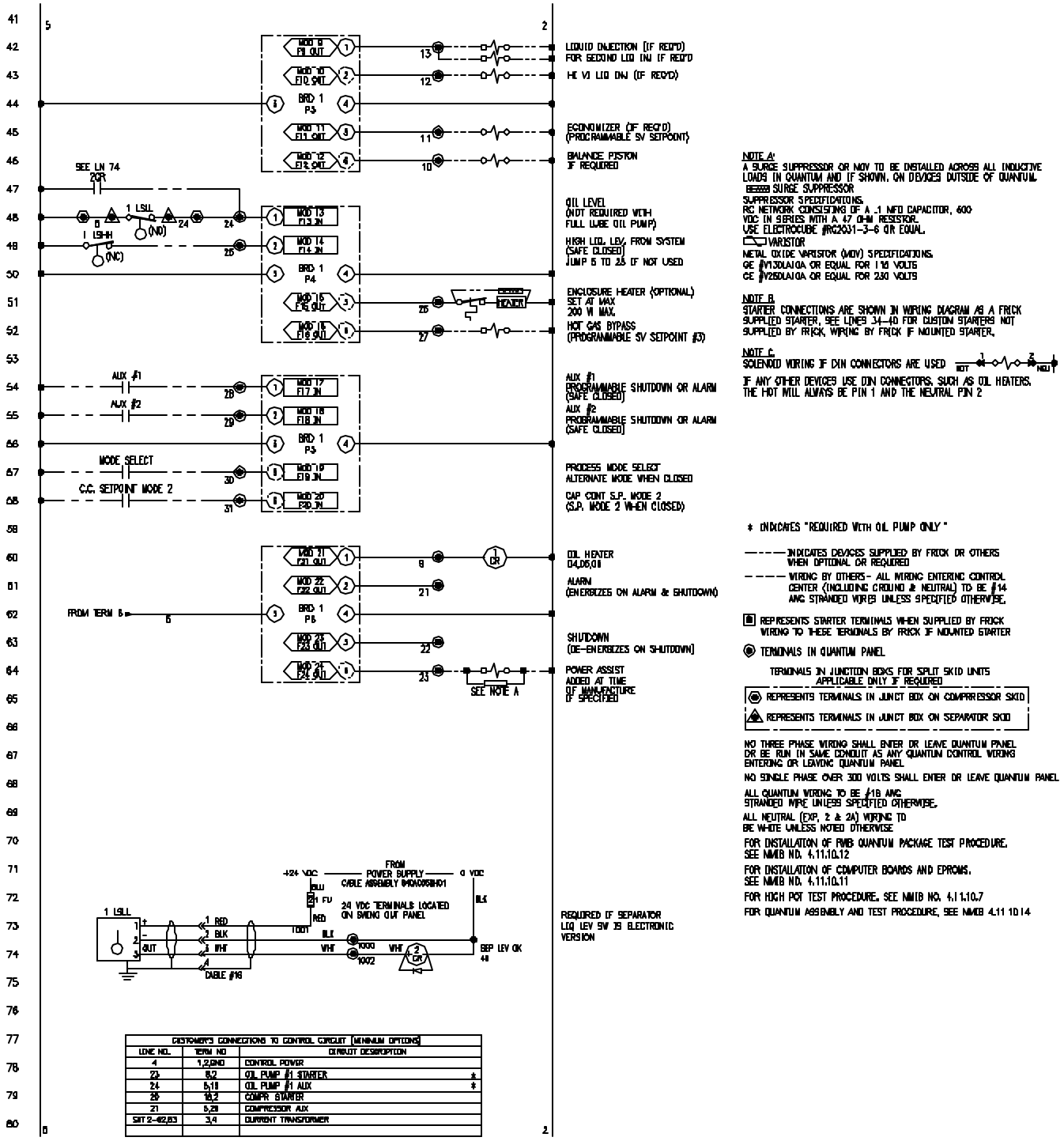
WIRING DIAGRAM – RWB II (Sheet 2 of 4)



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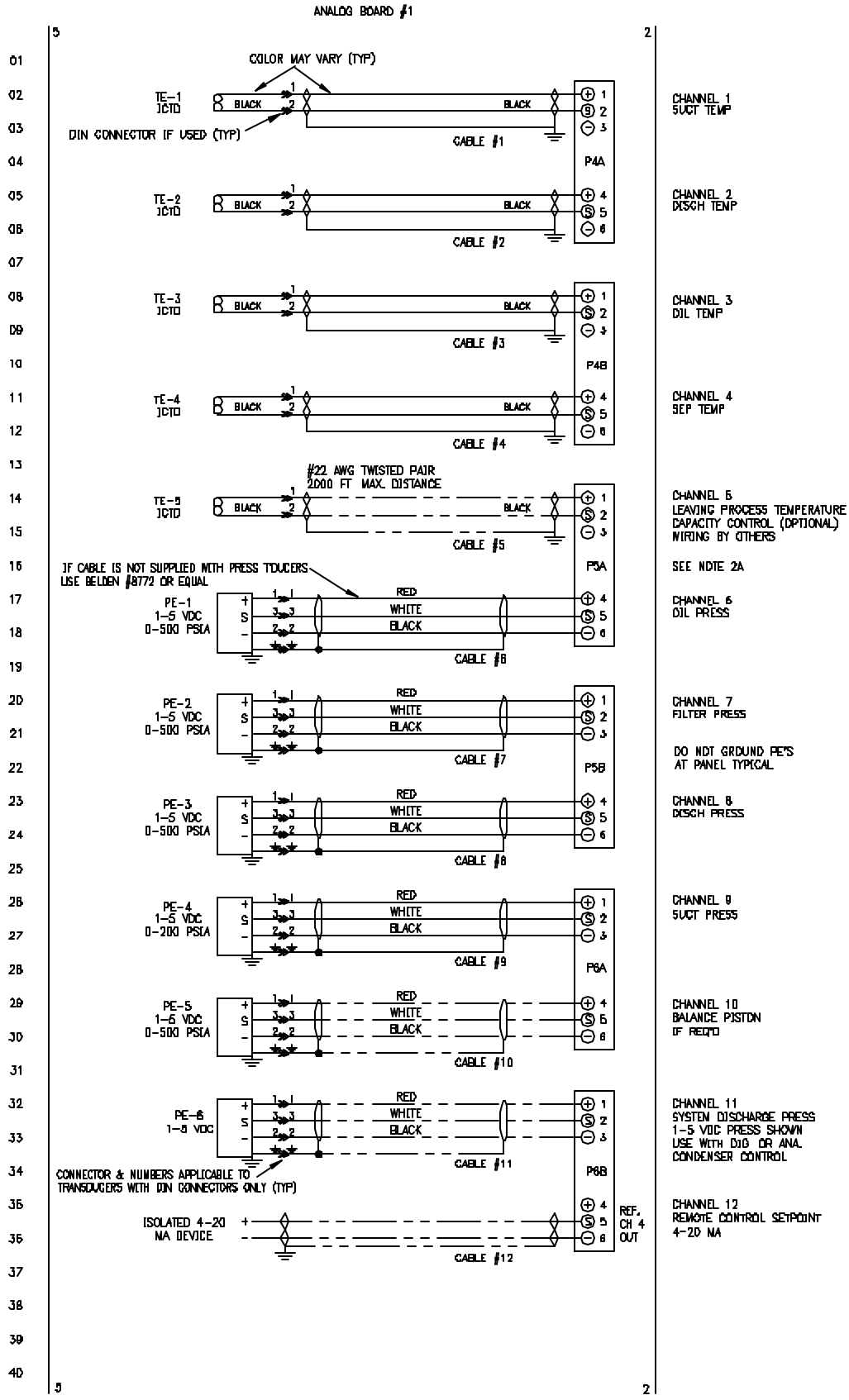
WIRING DIAGRAM – RWB II (Sheet 3 of 4)



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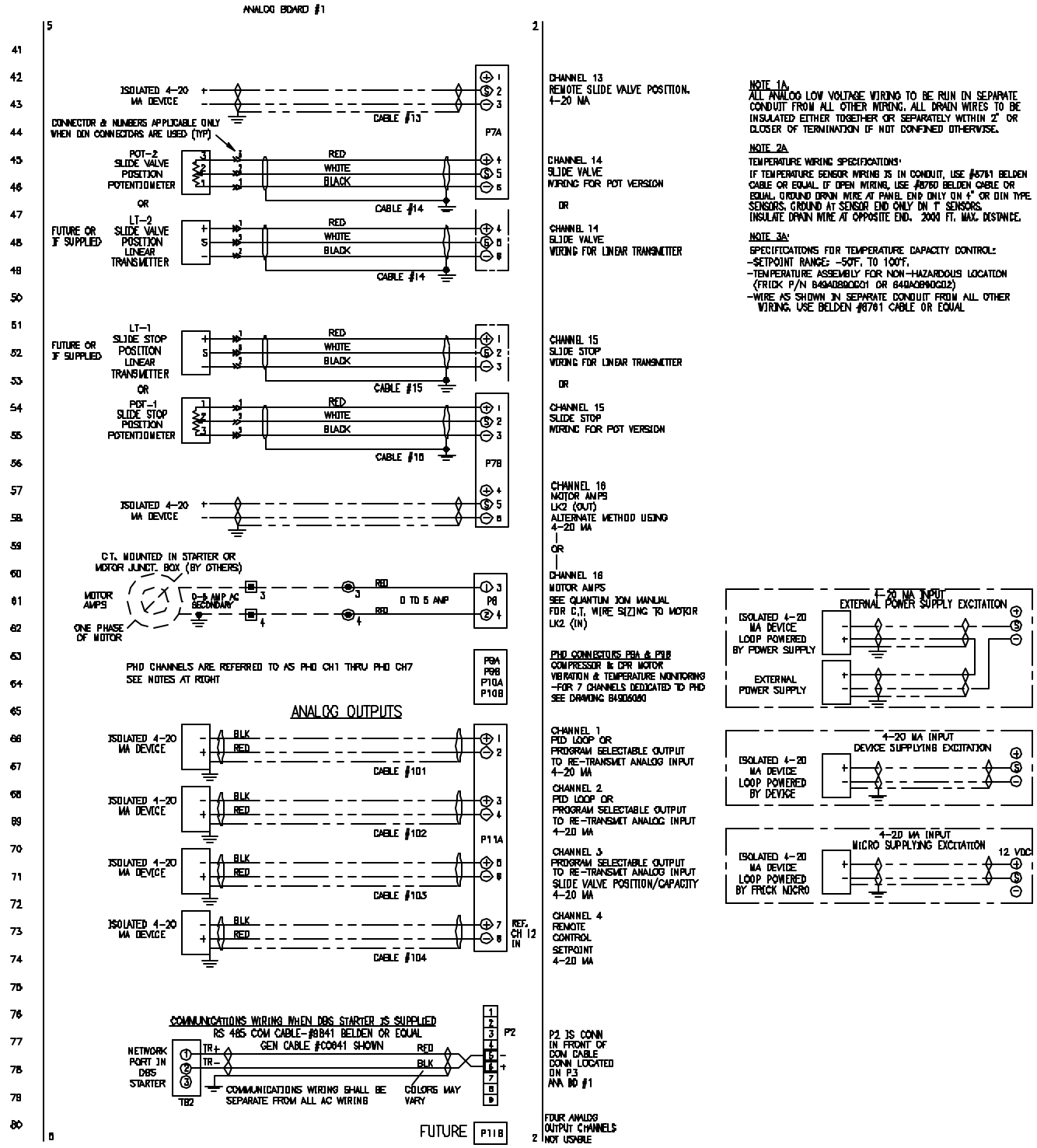
WIRING DIAGRAM – RWB II (Sheet 4 of 4)



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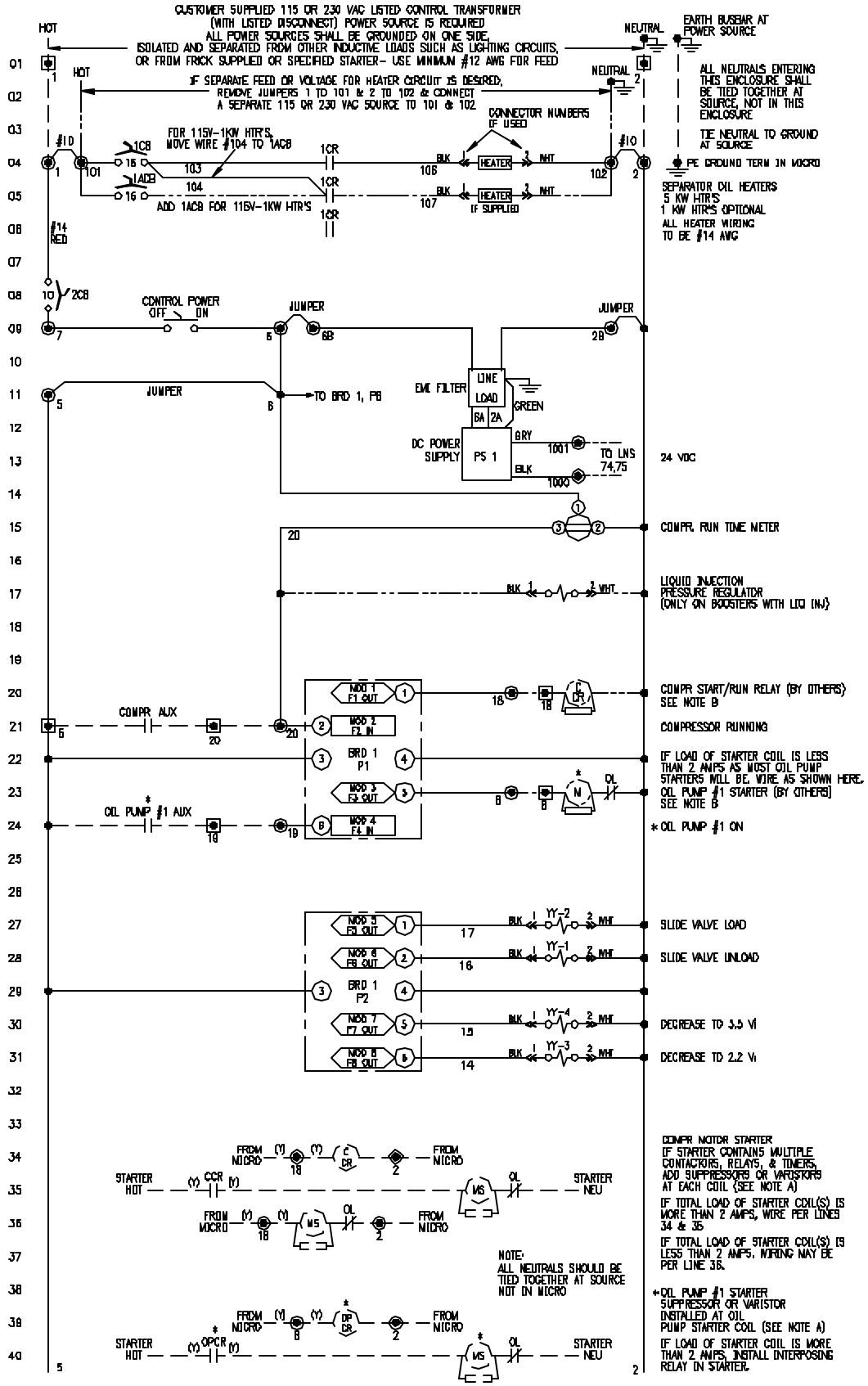
WIRING DIAGRAM – RXF (12-50) - (Sheet 1 of 4)



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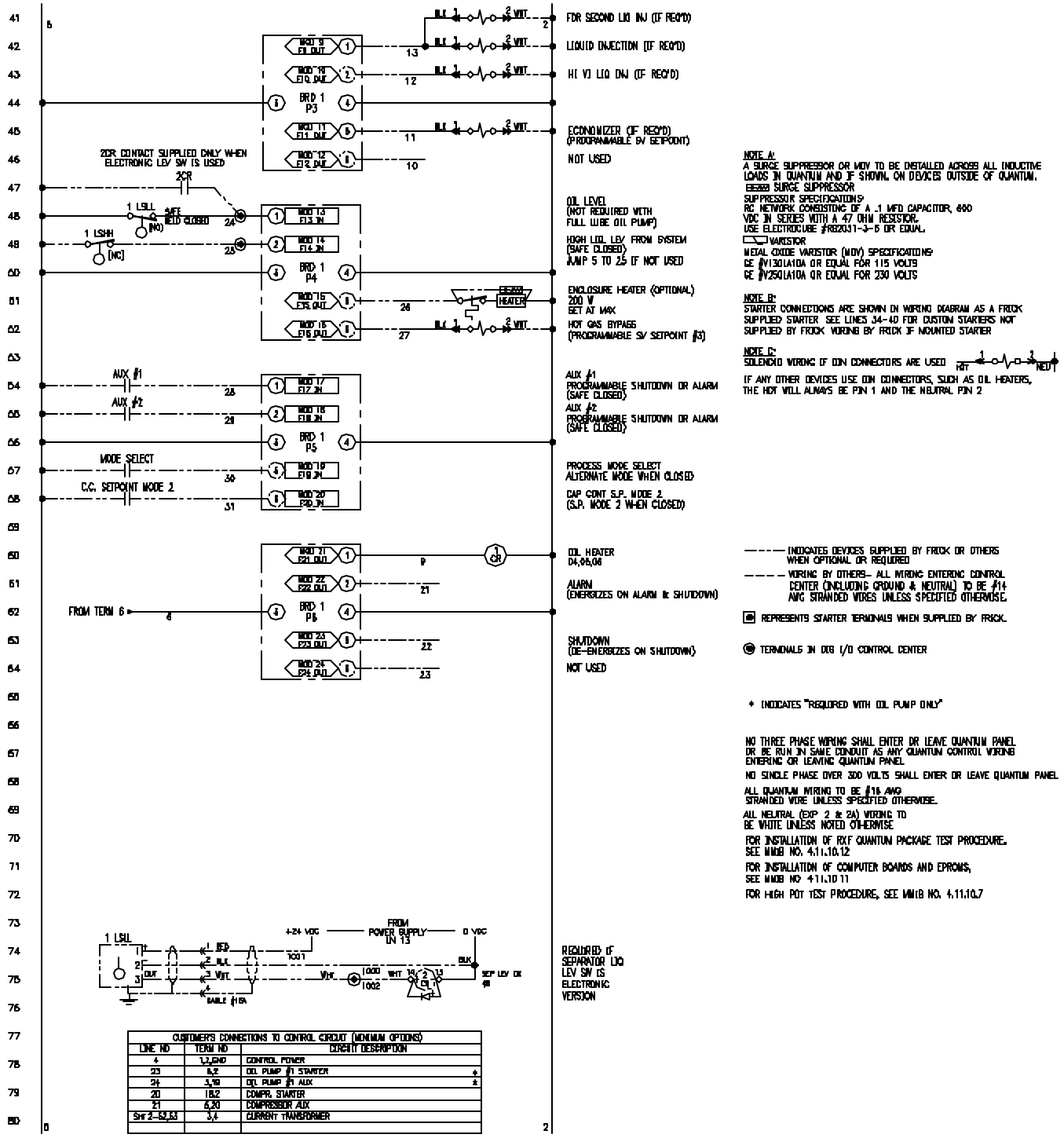
WIRING DIAGRAM – RXF (12-50) - (Sheet 2 of 4)



CUSTOMER'S CONNECTIONS TO CONTROL CIRCUIT (MINIMUM OPTIONS)			
LINE NO	TERM NO	CIRCUIT DESCRIPTION	
4	1,2,END	CONTROL POWER	
23	8,2	OIL PUMP #1 STARTER	*
24	3,19	OIL PUMP #1 AUX	*
20	18,2	COMPR. STARTER	
21	6,20	COMPRESSOR AUX	
Sht 2–52,53	3,4	CURRENT TRANSFORMER	

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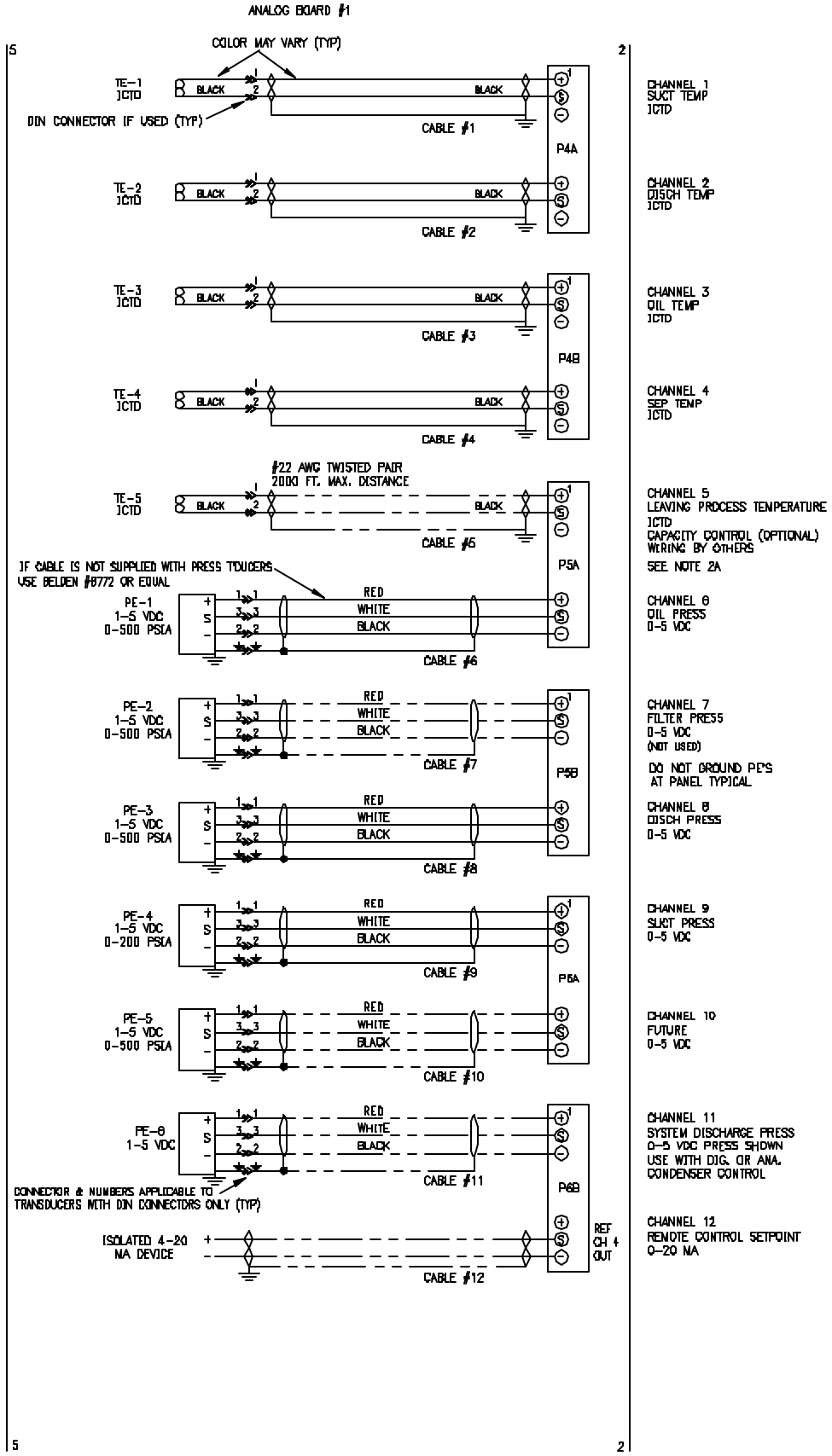
WIRING DIAGRAM – RXF (12-50) - (Sheet 3 of 4)



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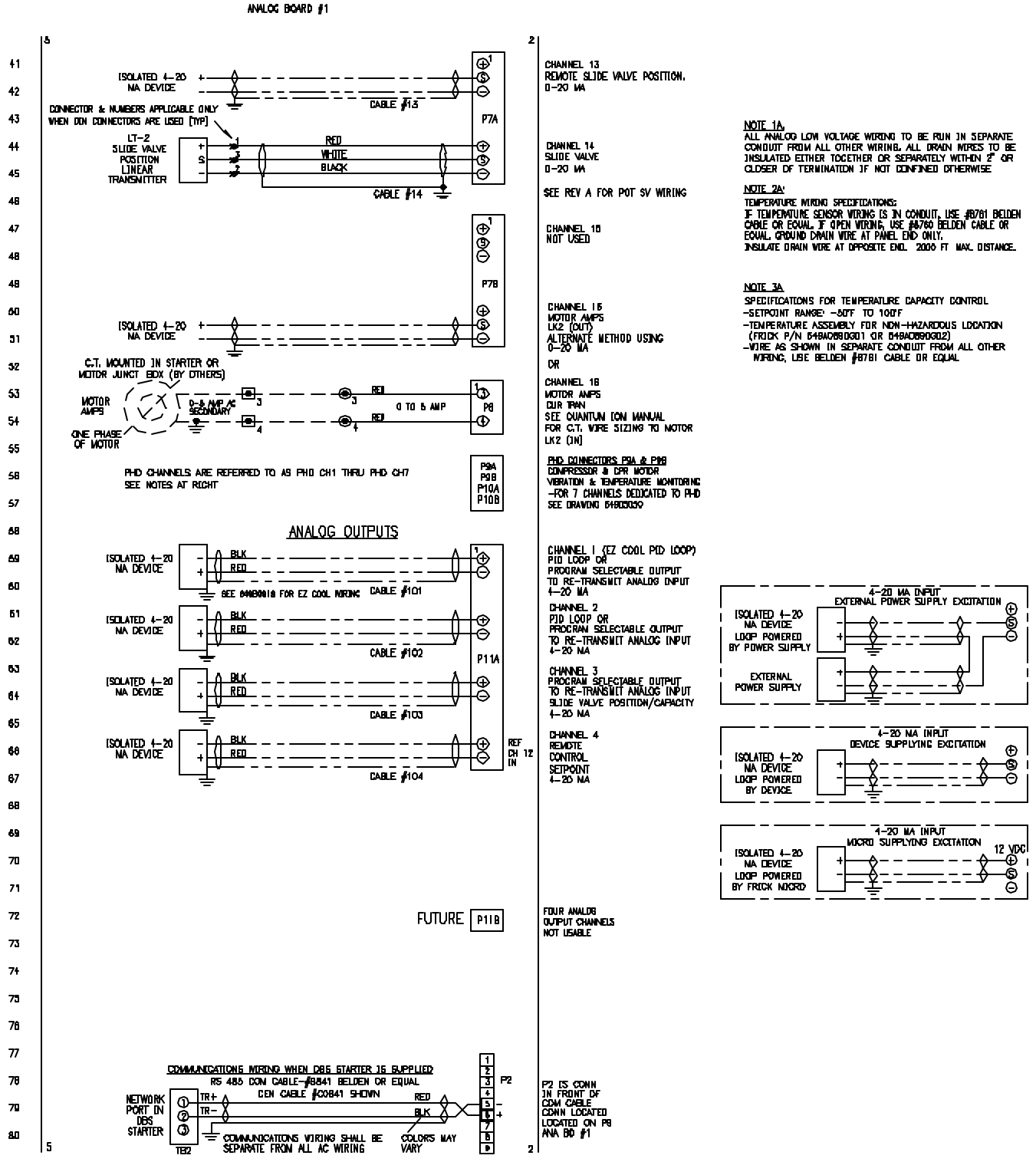
WIRING DIAGRAM – RXF (12-50) - (Sheet 4 of 4)



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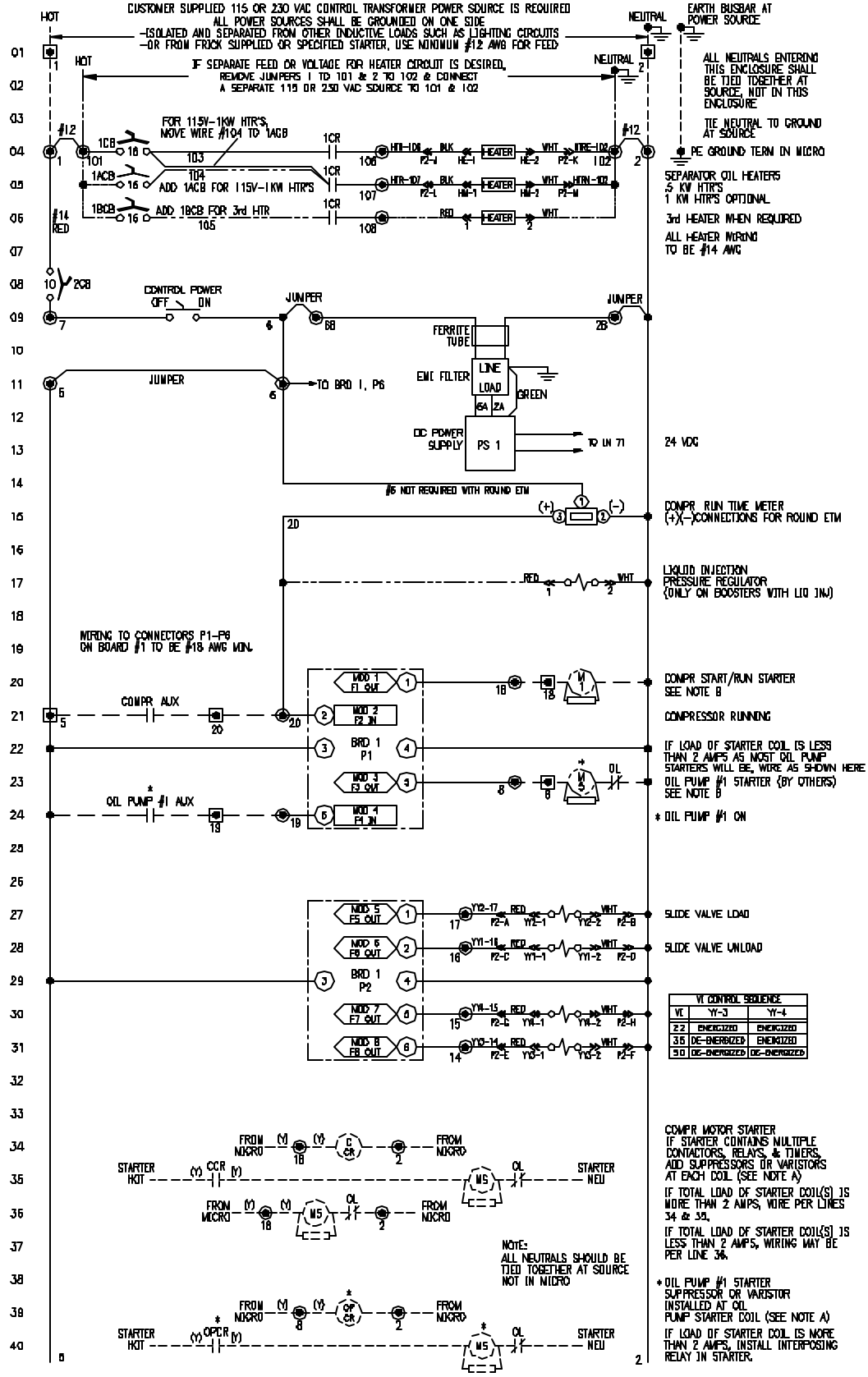
WIRING DIAGRAM – RXF (58-101) (Sheet 1 of 4)



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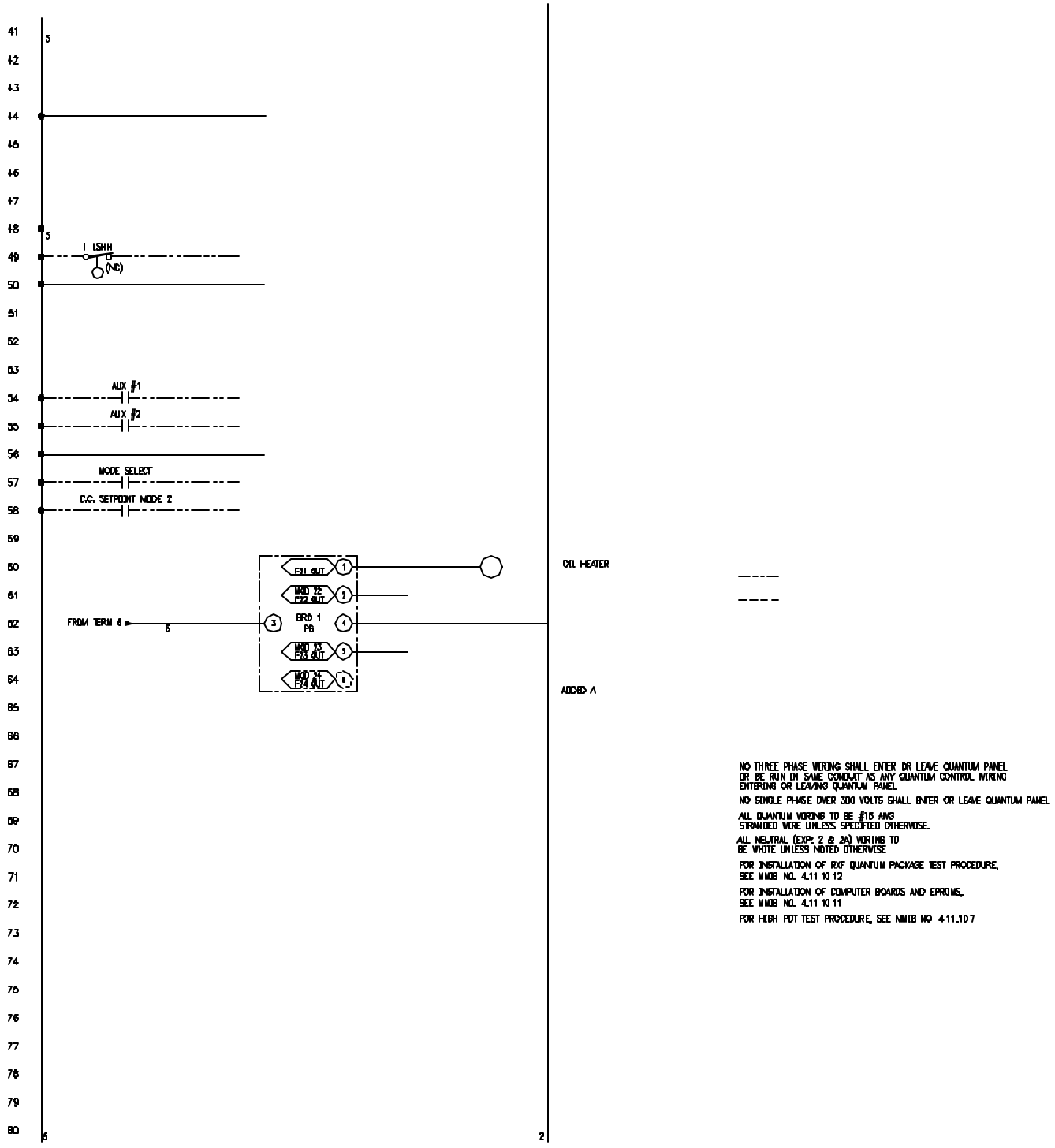
WIRING DIAGRAM – RXF (58-101) (Sheet 2 of 4)



NO THREE PHASE WIRING SHALL ENTER OR LEAVE QUANTUM PANEL OR BE RUN IN SAME CONDUIT AS ANY QUANTUM CONTROL WIRING ENTERING OR LEAVING QUANTUM PANEL.

NO SINGLE PHASE OVER 300 VOLTS SHALL ENTER OR LEAVE QUANTUM PANEL.

ALL QUANTUM WIRING TO BE #16 AWG STRANDED WIRE UNLESS SPECIFIED OTHERWISE.

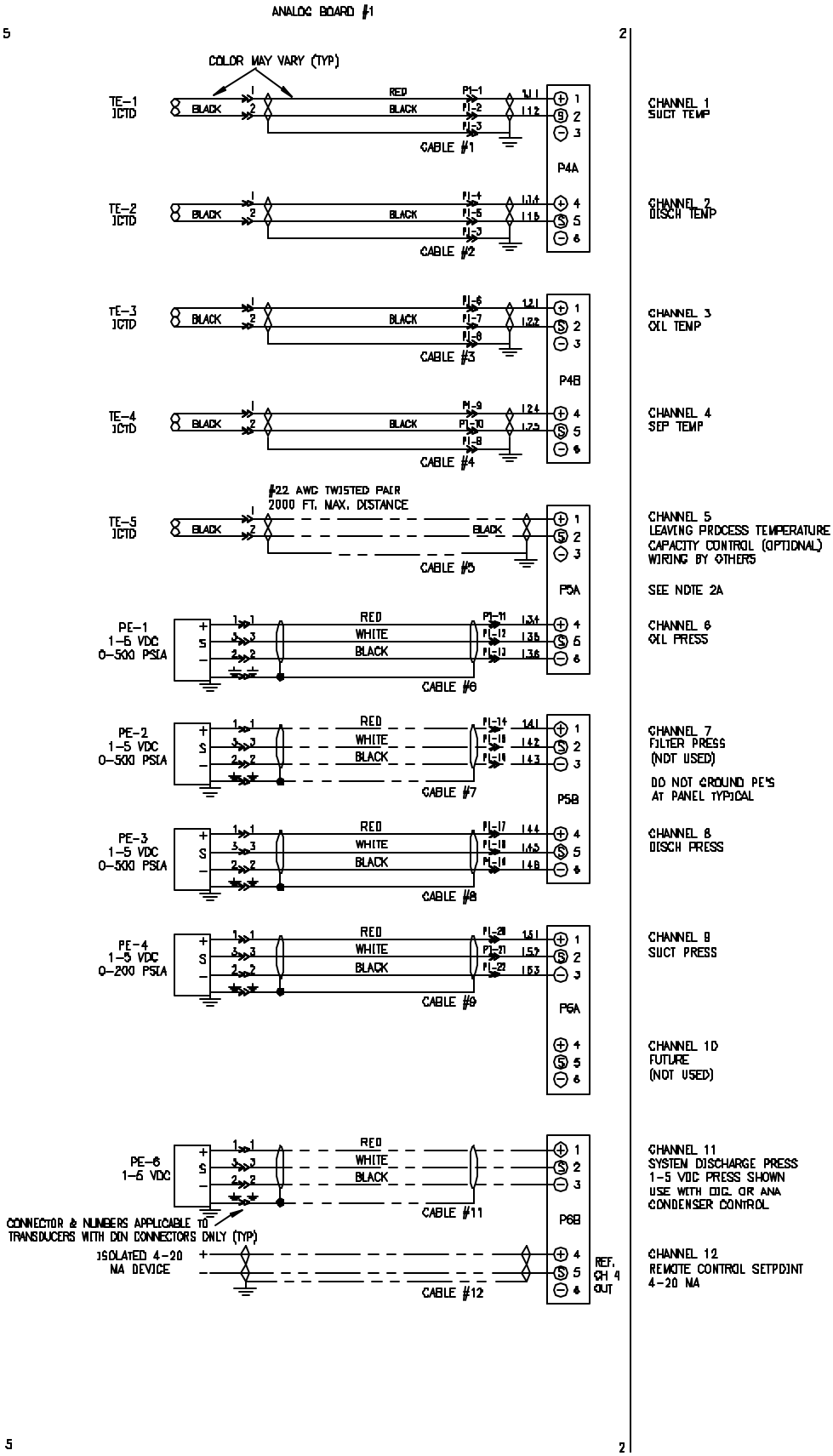
ALL NEUTRAL (EXP: 2 & 2A) WIRING TO BE WHITE UNLESS NOTED OTHERWISE.

FOR INSTALLATION OF RXF QUANTUM PACKAGE TEST PROCEDURE, SEE MMOB NO. 4.11.10.12

FOR INSTALLATION OF COMPUTER BOARDS AND EPROMS, SEE MMOB NO. 4.11.10.11

FOR HIGH POT TEST PROCEDURE, SEE MMIB NO 4.11.107

WIRING DIAGRAM – RXF (58-101) (Sheet 3 of 4)



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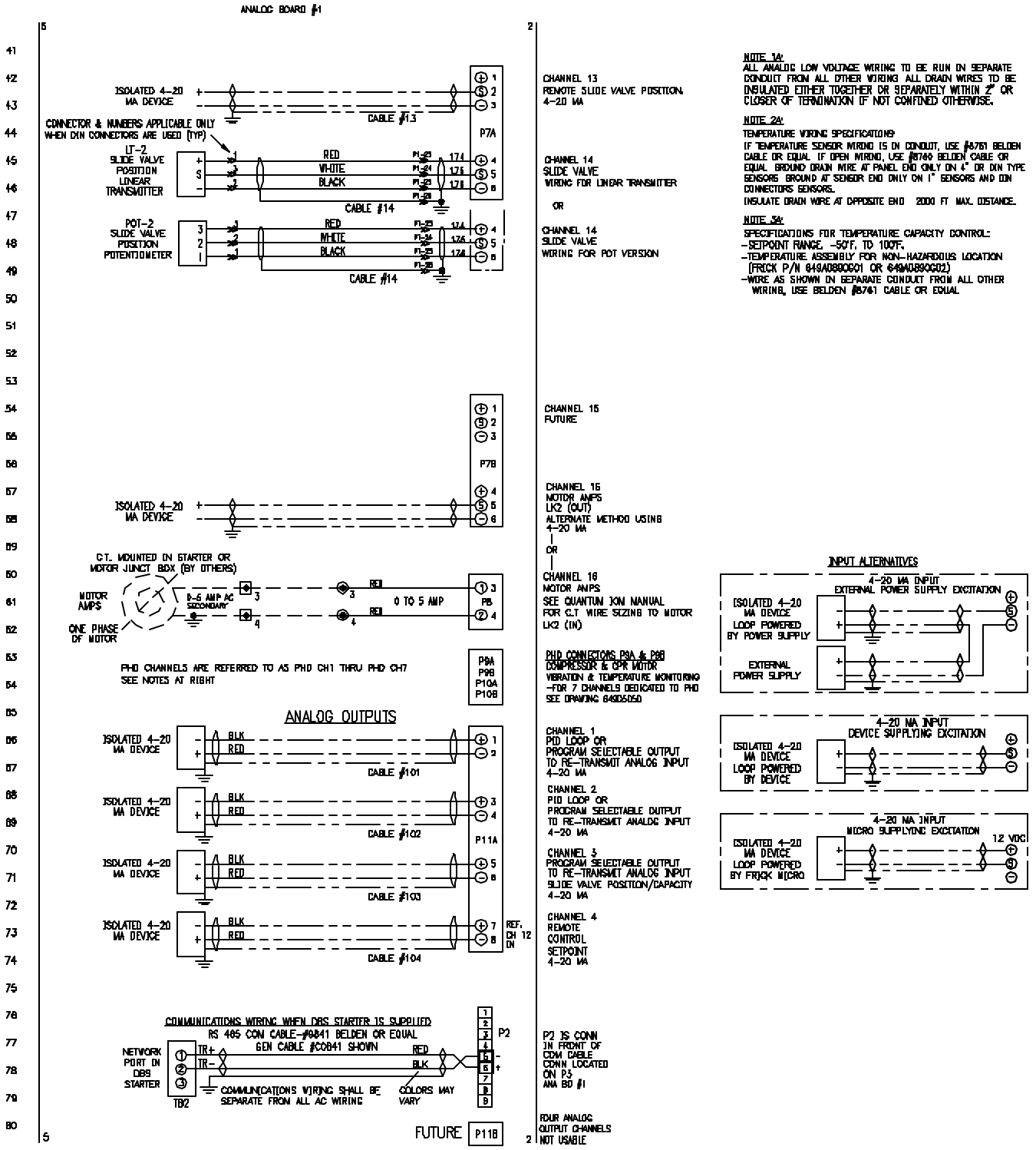
WIRING DIAGRAM – RXF (58-101) (Sheet 4 of 4)



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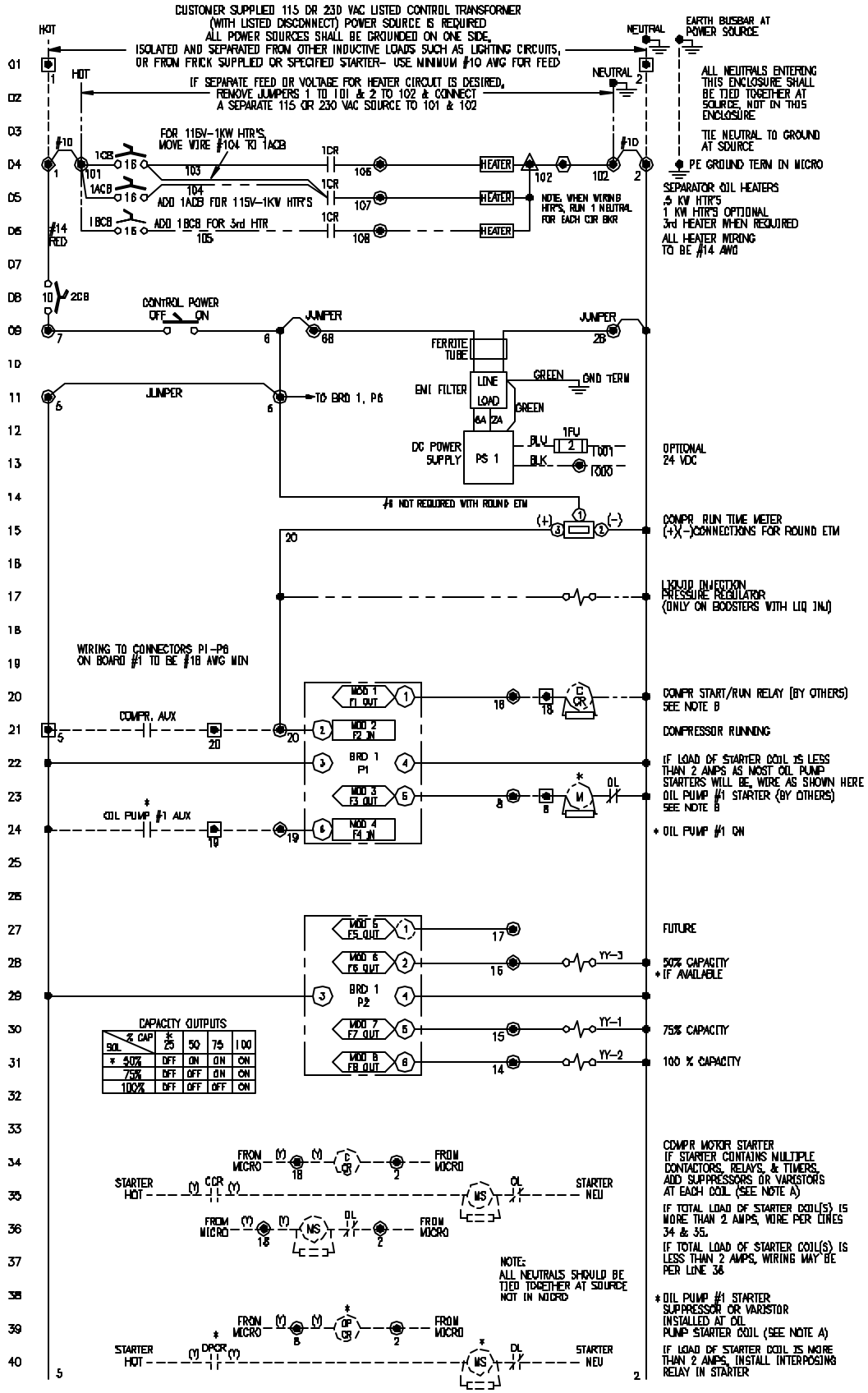
WIRING DIAGRAM – RDB (Sheet 1 of 4)



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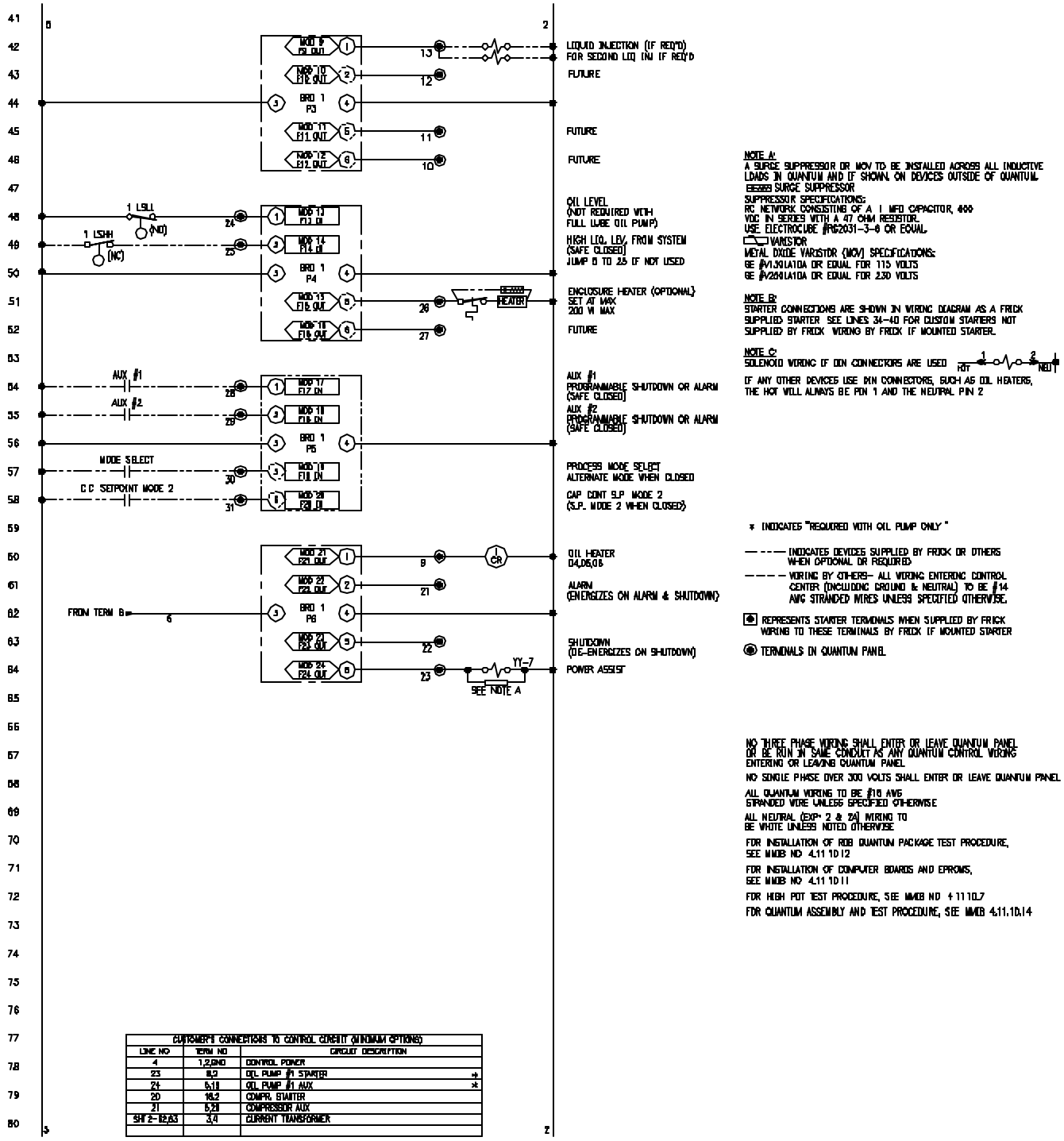
WIRING DIAGRAM – RDB (Sheet 2 of 4)



NOTE A:
A SURGE SUPPRESSOR OR MOV TO BE INSTALLED ACROSS ALL INDUCTIVE LOADS IN QUANTUM AND IF SHOWN ON DEVICES OUTSIDE OF QUANTUM.
SURGE SUPPRESSOR
SUPPRESSOR SPECIFICATIONS:
RC NETWORK CONSISTING OF A .1 MFD CAPACITOR, 400 VDC IN SERIES WITH A 47 OHM RESISTOR.
USE ELECTROCUBE #RG2031-3-R OR EQUAL.
VARISTOR
METAL OXIDE VARISTOR (MOV) SPECIFICATIONS:
GE #V130LA10A OR EQUAL FOR 115 VOLTS
GE #V260LA10A OR EQUAL FOR 230 VOLTS

NOTE B:
STARTER CONNECTIONS ARE SHOWN IN WIRING DIAGRAM AS A FRICK SUPPLIED STARTER. SEE LINES 34–40 FOR CUSTOM STARTERS NOT SUPPLIED BY FRICK. WIRING BY FRICK IF MOUNTED STARTER.

NOTE C:
SOLENOID WIRING IF DIN CONNECTORS ARE USED

IF ANY OTHER DEVICES USE DIN CONNECTORS, SUCH AS OIL HEATERS, THE HOT WILL ALWAYS BE PIN 1 AND THE NEUTRAL PIN 2

* INDICATES "REQUIRED WITH OIL PUMP ONLY"

——— INDICATES DEVICES SUPPLIED BY FRICK OR OTHERS WHEN OPTIONAL OR REQUIRED

– – – – WIRING BY OTHERS– ALL WIRING ENTERING CONTROL CENTER (INCLUDING GROUND & NEUTRAL) TO BE #14 AWG STRANDED WIRES UNLESS SPECIFIED OTHERWISE.

REPRESENTS STARTER TERMINALS WHEN SUPPLIED BY FRICK WIRING TO THESE TERMINALS BY FRICK IF MOUNTED STARTER

TERMINALS IN QUANTUM PANEL

CUSTOMER'S CONNECTIONS TO CONTROL CIRCUIT (MINIMUM OPTIONS)			
LINE NO	TERM NO	CIRCUIT DESCRIPTION	
4	1,2,GND	CONTROL POWER	
23	8,2	OIL PUMP #1 STARTER	+
24	5,11	OIL PUMP #1 AUX	*
20	16,2	COMPR. STARTER	
21	5,21	COMPRESSOR AUX	
SHT 2–82,83	3,4	CURRENT TRANSFORMER	

NO THREE PHASE WIRING SHALL ENTER OR LEAVE QUANTUM PANEL OR BE RUN IN SAME CONDUIT AS ANY QUANTUM CONTROL WIRING ENTERING OR LEAVING QUANTUM PANEL.

NO SINGLE PHASE OVER 300 VOLTS SHALL ENTER OR LEAVE QUANTUM PANEL.

ALL QUANTUM WIRING TO BE #18 AWG STRANDED WIRE UNLESS SPECIFIED OTHERWISE

ALL NEUTRAL (EXP* 2 & 24) WIRING TO BE WHITE UNLESS NOTED OTHERWISE

FOR INSTALLATION OF RDB QUANTUM PACKAGE TEST PROCEDURE, SEE MMDB NO 4.11.10.12

FOR INSTALLATION OF COMPUTER BOARDS AND EPROMS, SEE MMDB NO 4.11.10.11

FOR HIGH POT TEST PROCEDURE, SEE MMDB NO 4.11.10.7

FOR QUANTUM ASSEMBLY AND TEST PROCEDURE, SEE MMDB 4.11.10.14

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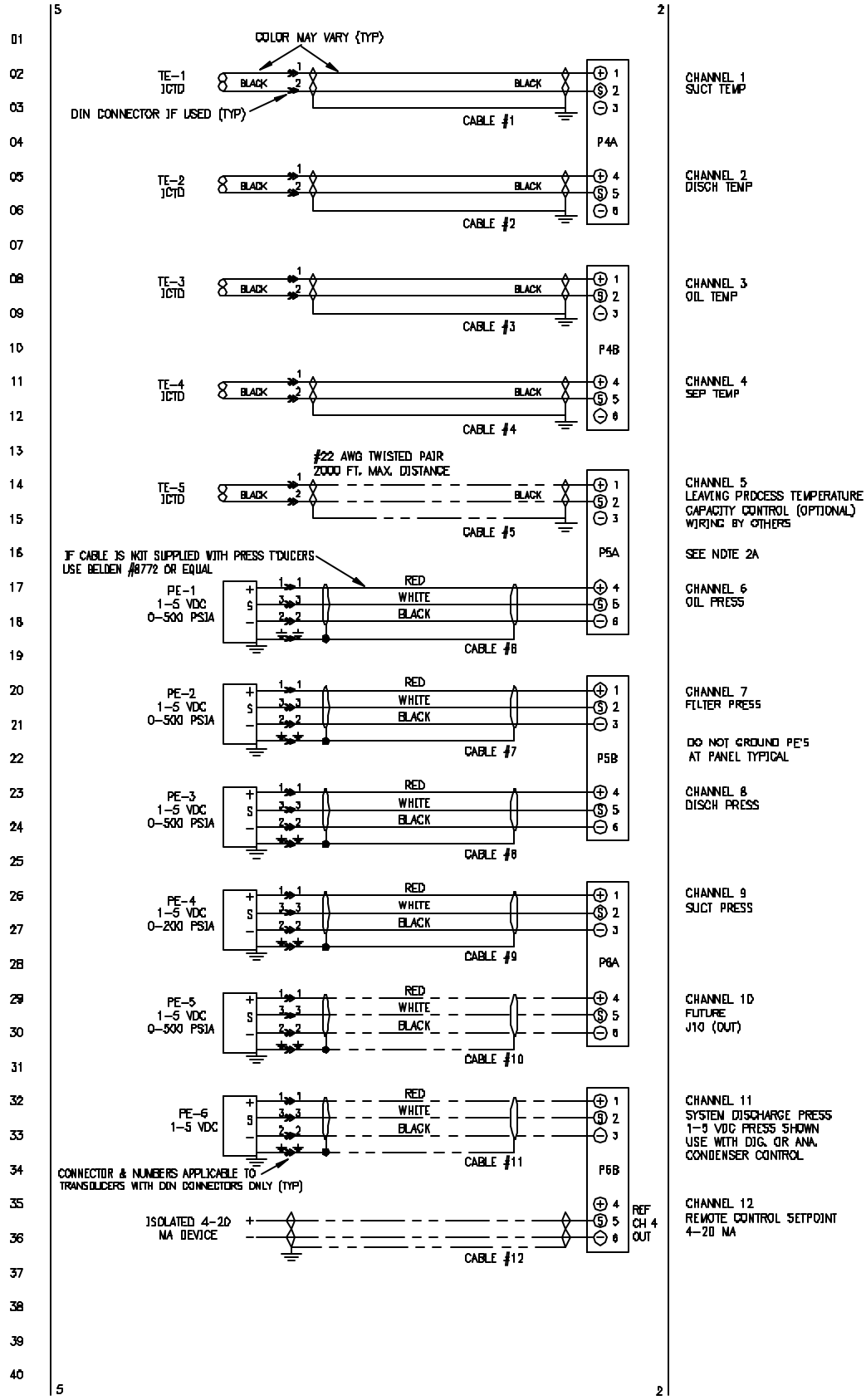
WIRING DIAGRAM – RDB (Sheet 3 of 4)



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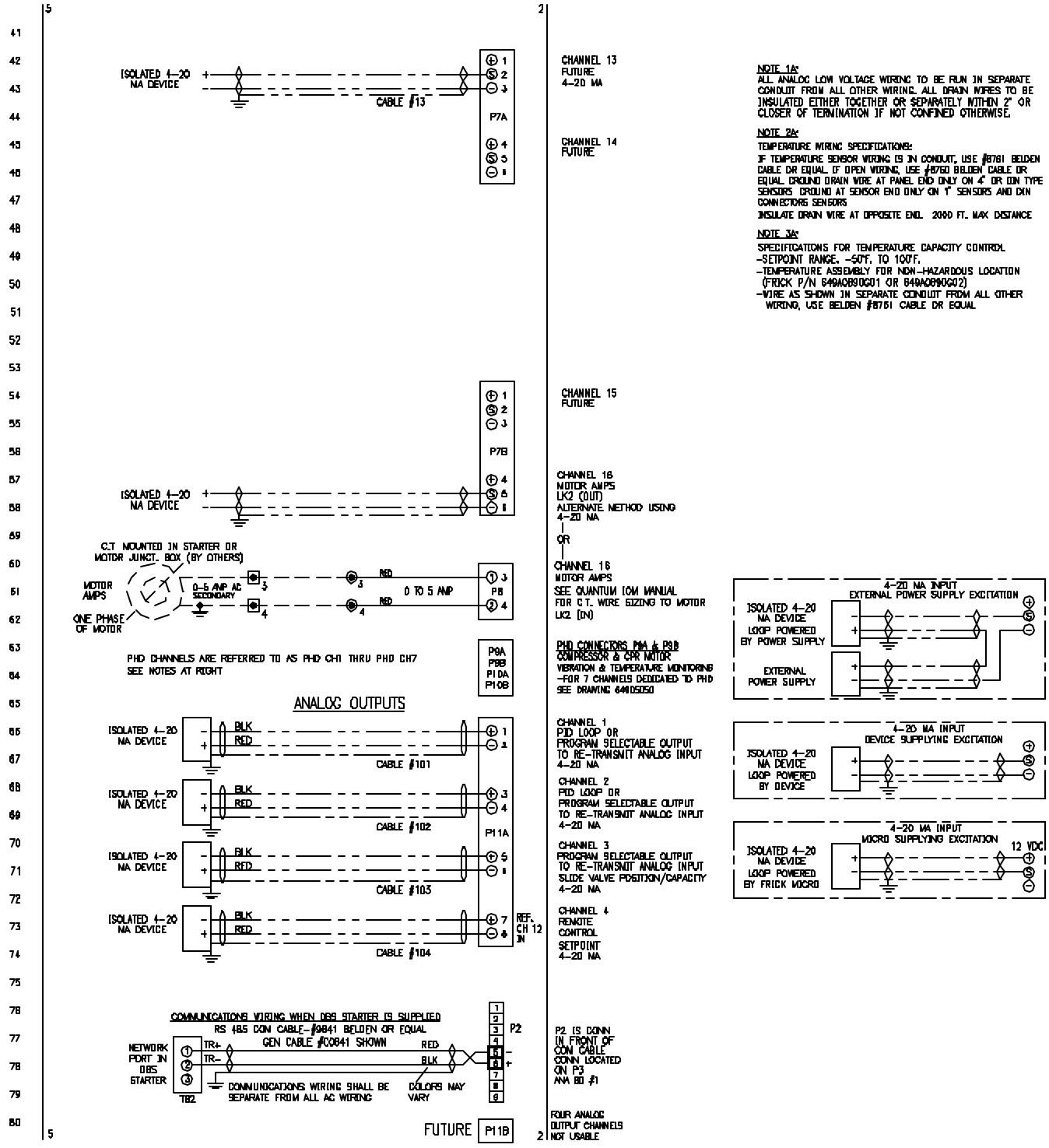
WIRING DIAGRAM – RDB (Sheet 4 of 4)



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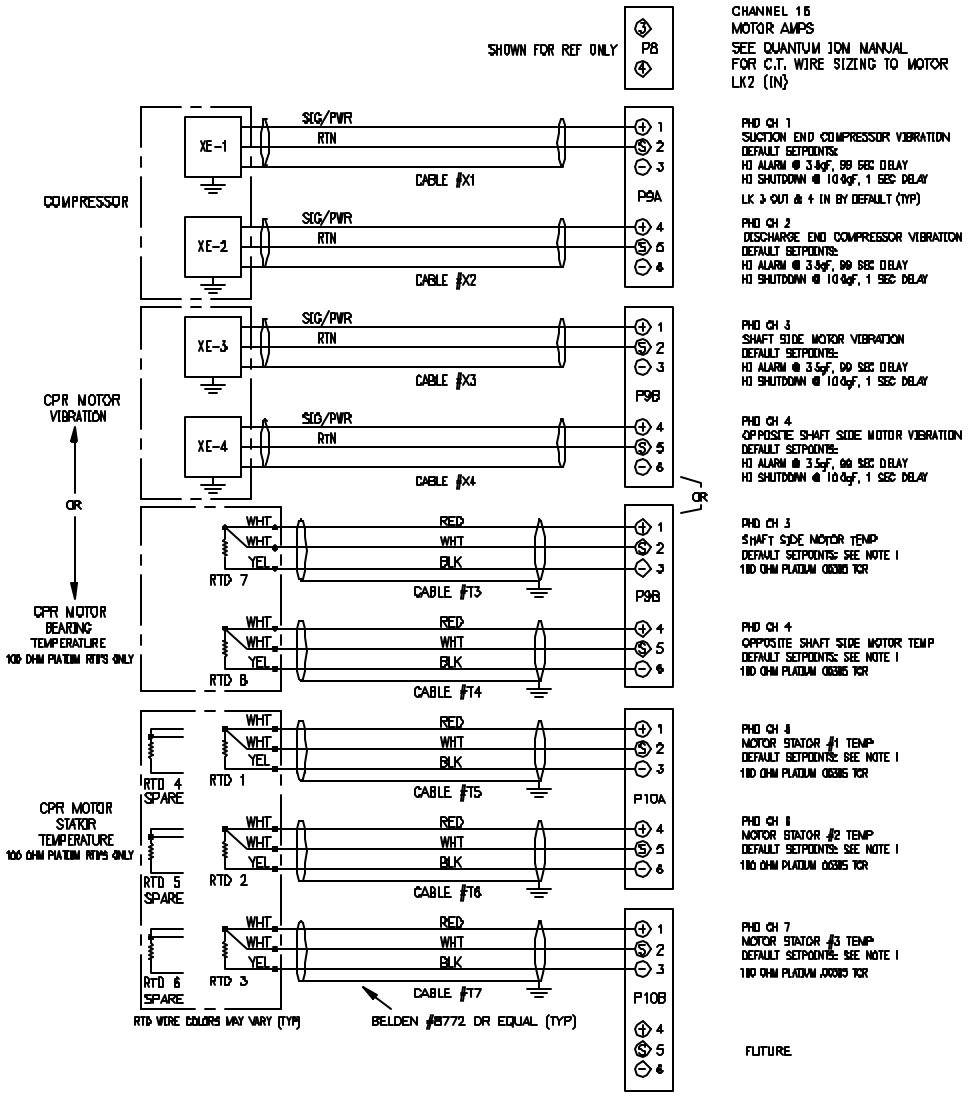
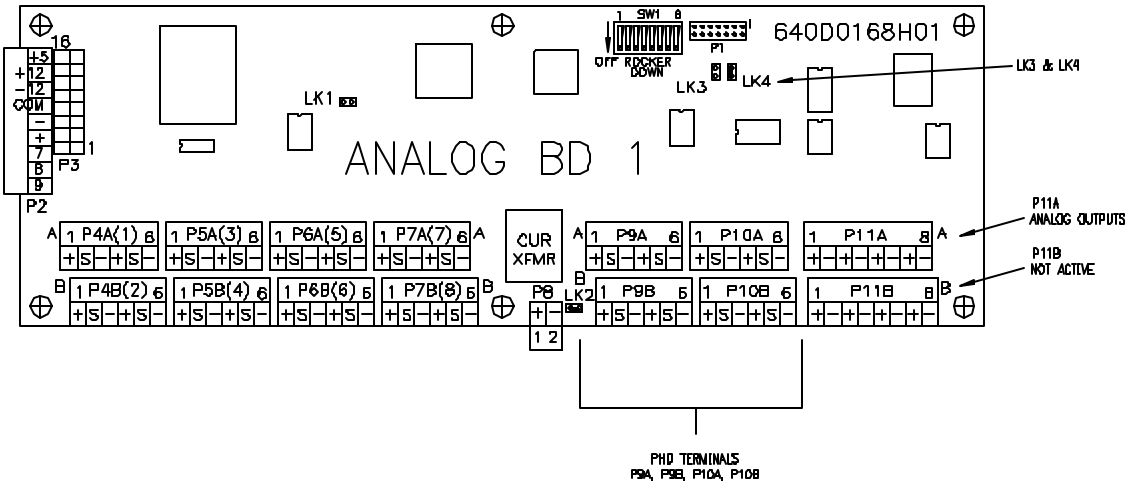
WIRING DIAGRAM PHD (Sheet 1 of 2)





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WIRING DIAGRAM PHD (Sheet 2 of 2)

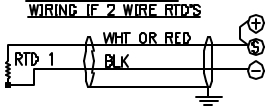
THE SETPOINTS GIVEN FOR ALARM AND SHUTDOWN SERVE AS A STARTING POINT. ONCE THE COMPRESSOR IS RUNNING BASELINE VALUES SHOULD BE MEASURED WITH THE ALARM AND SHUTDOWN VALUES RESET WITH REFERENCE TO THE INITIAL BASELINE READINGS.

ONCE RUNNING MEASURE BASELINE AND ADJUST SET POINTS TO:
BASELINE x 1.5 ALARM
BASELINE x 2.0 SHUTDOWN

ANALOG BOARD SETUP SCREEN
PHD CH 1 CHANNEL TYPE- DISABLED, DR Comp Act (SUCTION END)
PHD CH 2 CHANNEL TYPE- DISABLED, DR Comp Act (DISCHARGE)
PHD CH 3 CHANNEL TYPE- DISABLED, DR Mtr Act, OR MtrB RTD (SHAFT END)
PHD CH 4 CHANNEL TYPE- DISABLED, DR Mtr Act, OR MtrB RTD (OPP SHAFT END)
PHD CH 5 CHANNEL TYPE- DISABLED, DR MtrS RTD
PHD CH 6 CHANNEL TYPE- DISABLED, DR MtrS RTD
PHD CH 7 CHANNEL TYPE- DISABLED, DR MtrS RTD
CHANNEL 8 BLANK & NOT USEABLE

RTD SENSOR SPECS:
100 OHM PLATINUM .00385 TCR
3 WIRE PREFERRED

INPUT ALTERNATIVES
WIRING IF 2 WIRE RTD'S



NOTE 1:
TYPICAL SETTINGS
SEE MOTOR SPEC SHT FOR VERIFICATION OF TEMPERATURE VALUES

MOTOR SHAFT BEARINGS
HI SHUTDOWN: 221 F, 5 SEC DELAY
HI ALARM: 203 F., 5 SEC DELAY

STATOR WINDINGS
HI SHUTDOWN: 311 F., 5 SEC DELAY
HI ALARM: 302 F., 5 SEC DELAY

NOTE RTD NUMBERS ARE SHOWN AS MOST LIKELY NUMBERING. IN ANY CASE, MOTOR DATA PRINTS SHOULD BE REFERRED TO WHEN WIRING.
THERE ARE USUALLY 6 RTD'S FOR MOTOR STATORS (3 USED WITH 3 SPARES) AND 2 RTD'S (IF SUPPLIED) FOR BEARINGS WITH NO SPARES.

NOTE:
PHD INPUTS ARE ONLY AVAILABLE IF ANALOG BOARD #1 (P/N 640DD063H01) IS IN USE (IF ANALOG BOARD #1 IS (P/N 640DD168H01), THEN PHD CONNECTIONS MUST BE MADE TO BOARD #1

ANALOG I/O BOARD IDENTIFICATION
640DD168HD1– 24 CHANNELS IN, 8 OUT REPLACEMENT P/N ANALOG BD #1– 640C0057G01
640DD168HD1– 24 CHANNELS IN, 8 OUT REPLACEMENT P/N ANALOG BD #2– 640C0057G02

649D5050G01– NON-HAZARDOUS PKG WIR, PHD, COMPR BEARING VIB FOR CHANNELS 1 & 2
649D5050G02– NON-HAZARDOUS PKG WIR, PHD, COMPR MOTOR BEARING VIB FOR CHANNELS 3 & 4

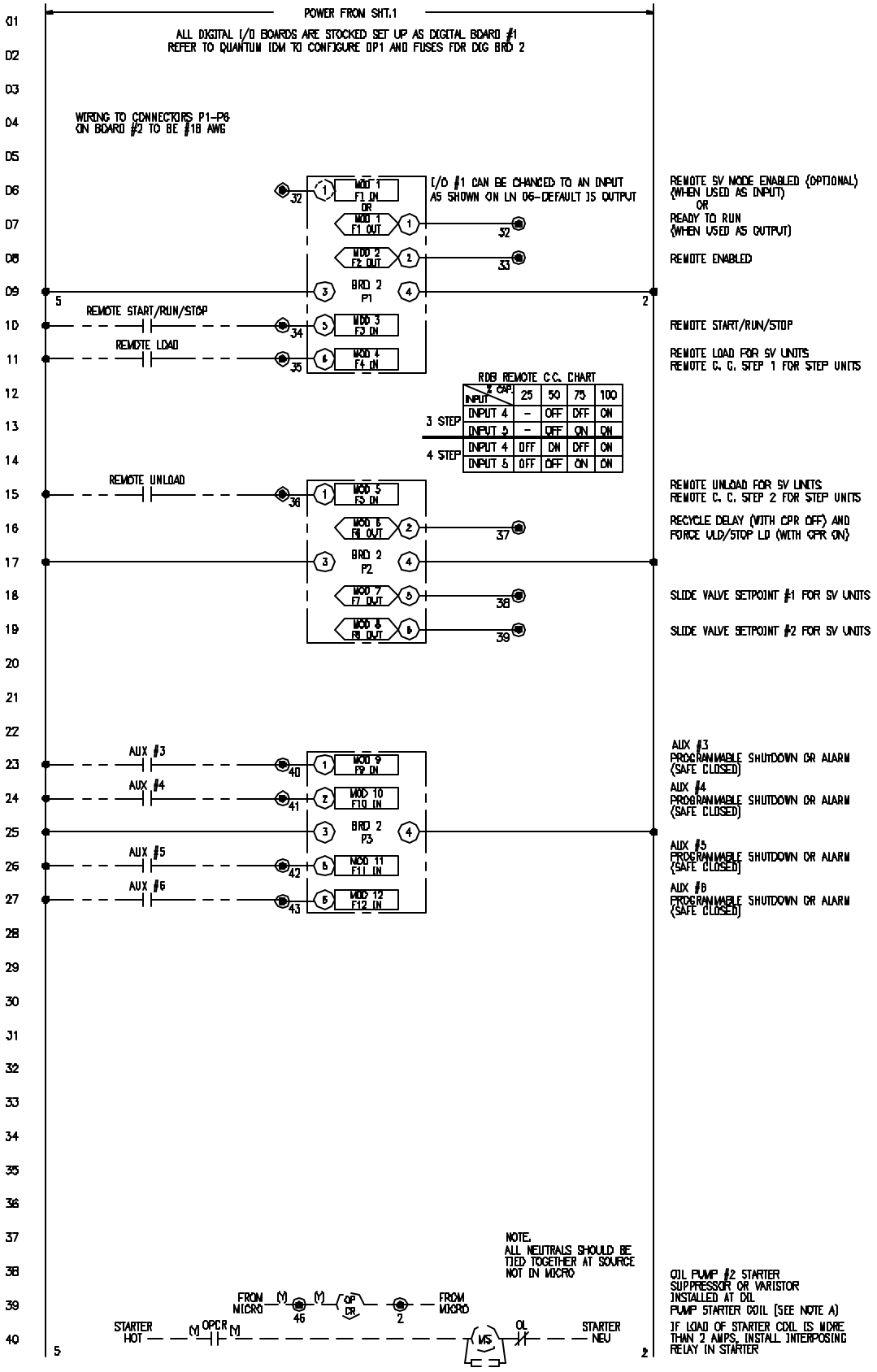
649D5050G11– FM CERT PKG WIR, PHD, COMPR BEARING VIB FOR CHANNELS 1 & 2
649D5050G12– FM CERT PKG WIR, PHD, COMPR MOTOR BEARING VIB FOR CHANNELS 3 & 4

649D5050G21– CSA CERT PKG WIR, PHD, COMPR BEARING VIB FOR CHANNELS 1 & 2
649D5050G22– CSA CERT PKG WIR, PHD, COMPR MOTOR BEARING VIB FOR CHANNELS 3 & 4

649D5050G51– NON-HAZARDOUS PKG WIR, PHD, COMPR MOTOR STATOR TEMP FOR CHANNELS 5, 6, & 7
649D5050G52– NON-HAZARDOUS PKG WIR, PHD, COMPR MOTOR BEARING TEMP FOR CHANNELS 3 & 4

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.

WIRING DIAGRAM - STANDARD DIGITAL I/O BOARD 2 (Sheet 1 of 2)



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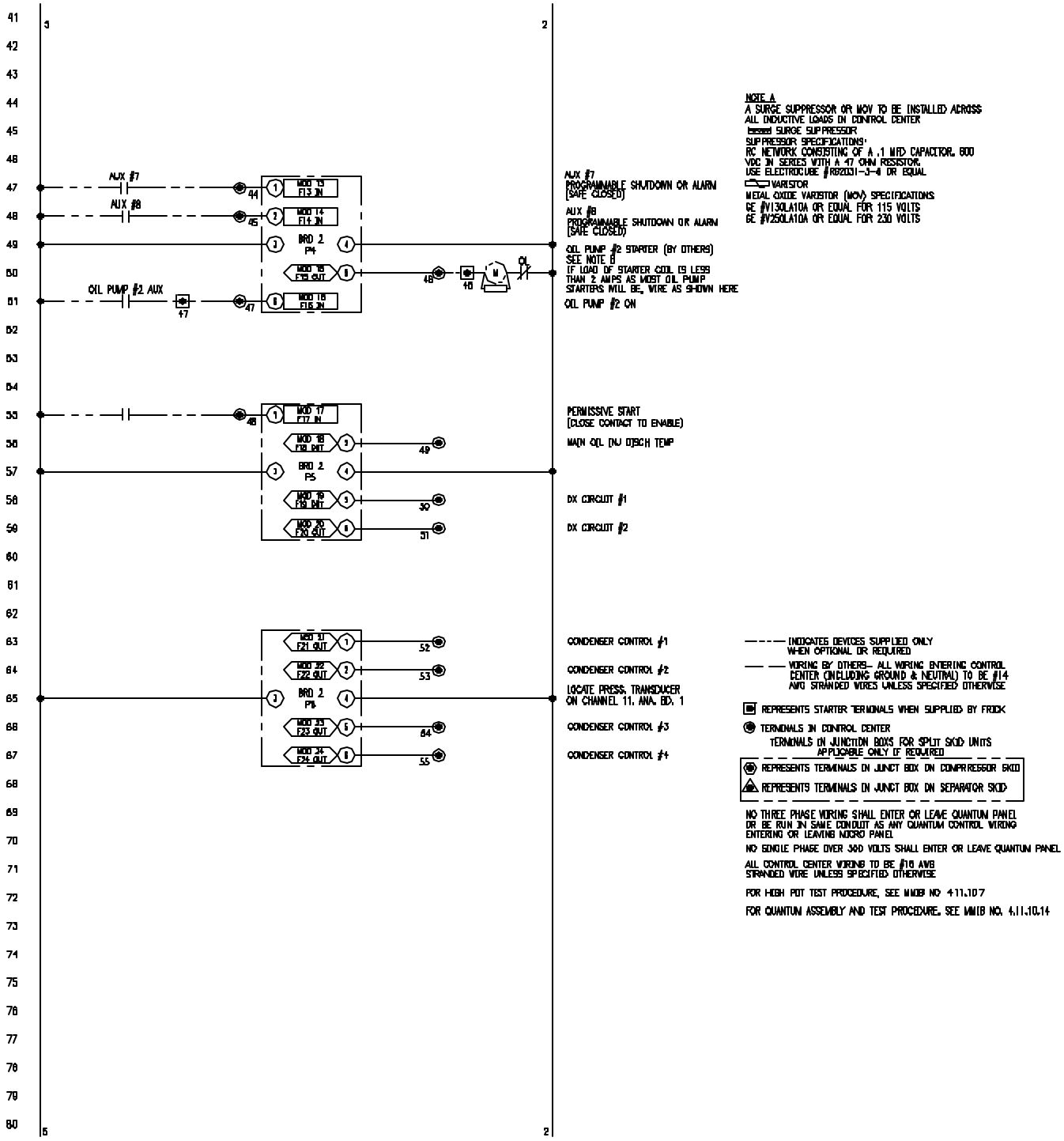
WIRING DIAGRAM - STANDARD DIGITAL I/O BOARD 2 (Sheet 2 of 2)



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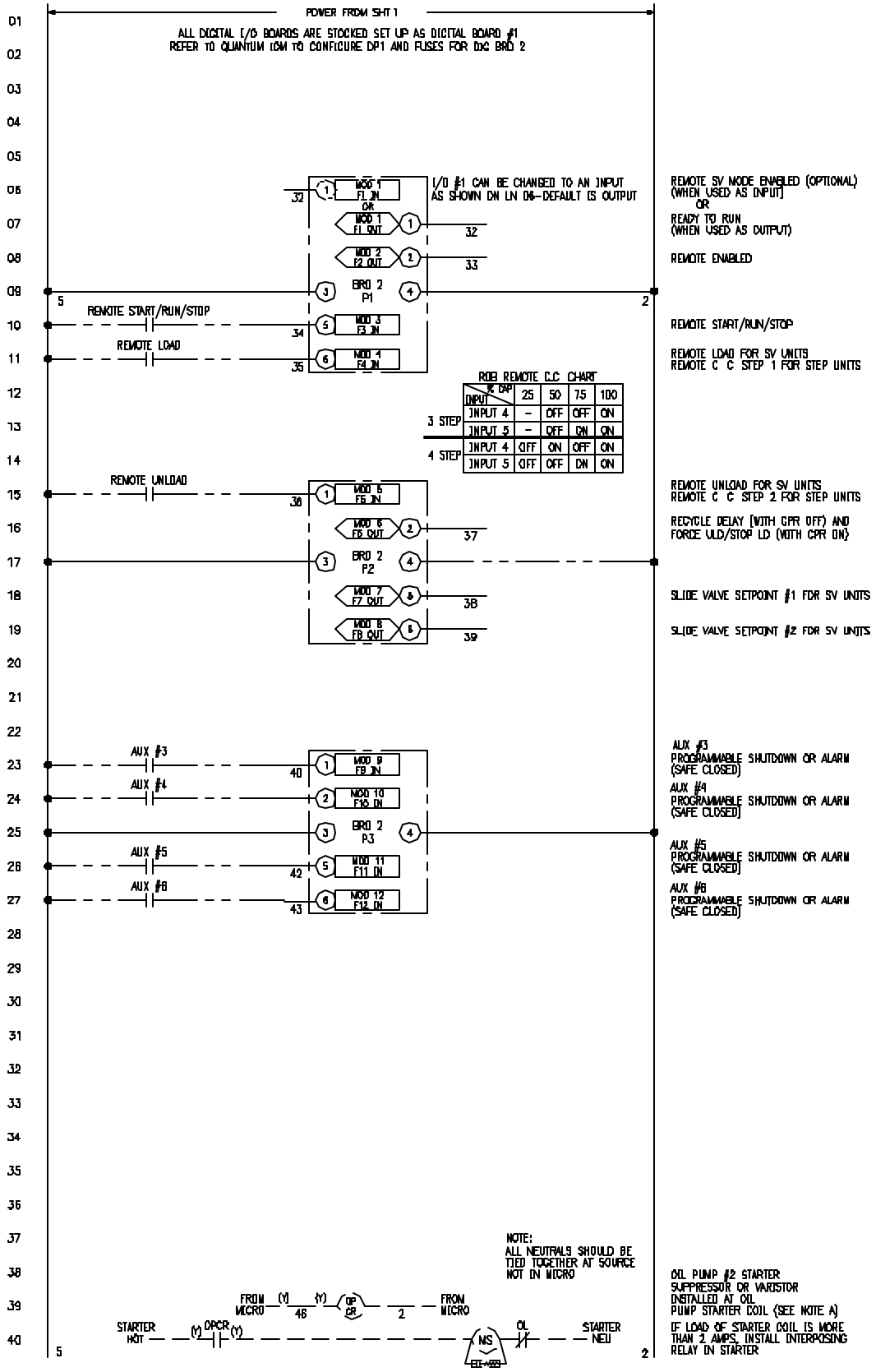
WIRING DIAGRAM - SPECIAL DIGITAL I/O BOARD 2 (Sheet 1 of 2)



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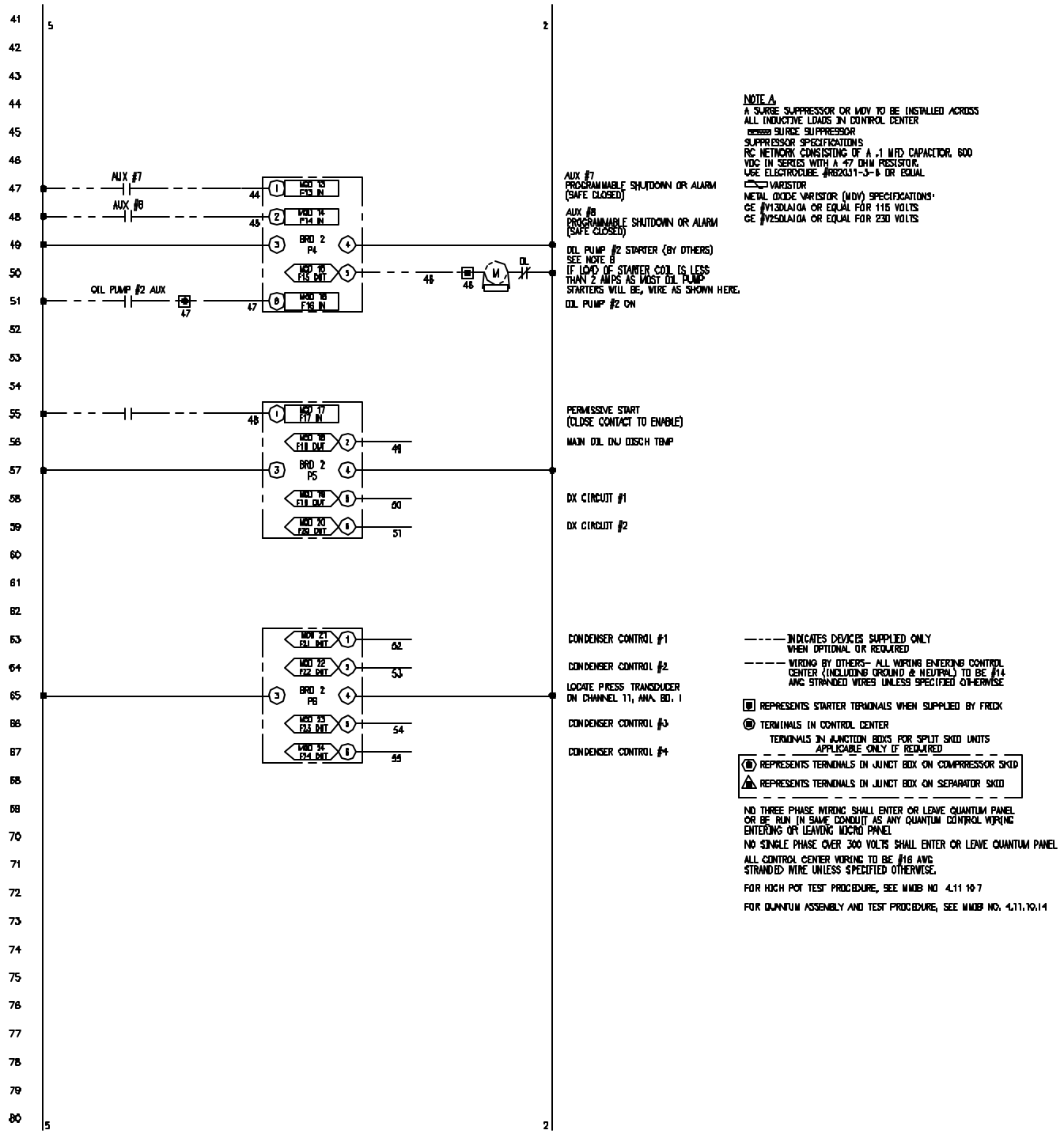
WIRING DIAGRAM - SPECIAL DIGITAL I/O BOARD 2 (Sheet 2 of 2)



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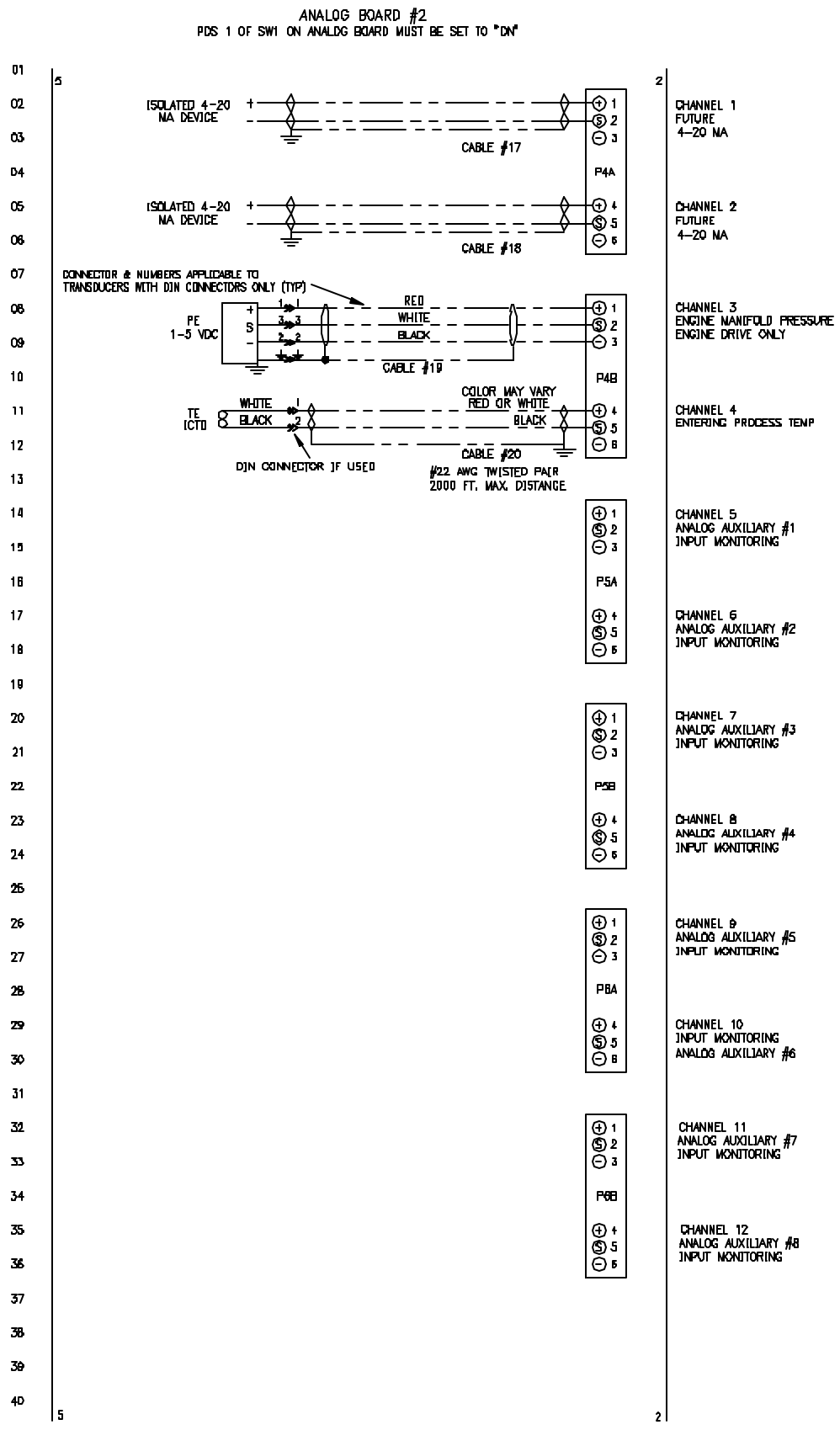
WIRING DIAGRAM STANDARD ANALOG I/O BOARD 2 (Sheet 1 of 2)



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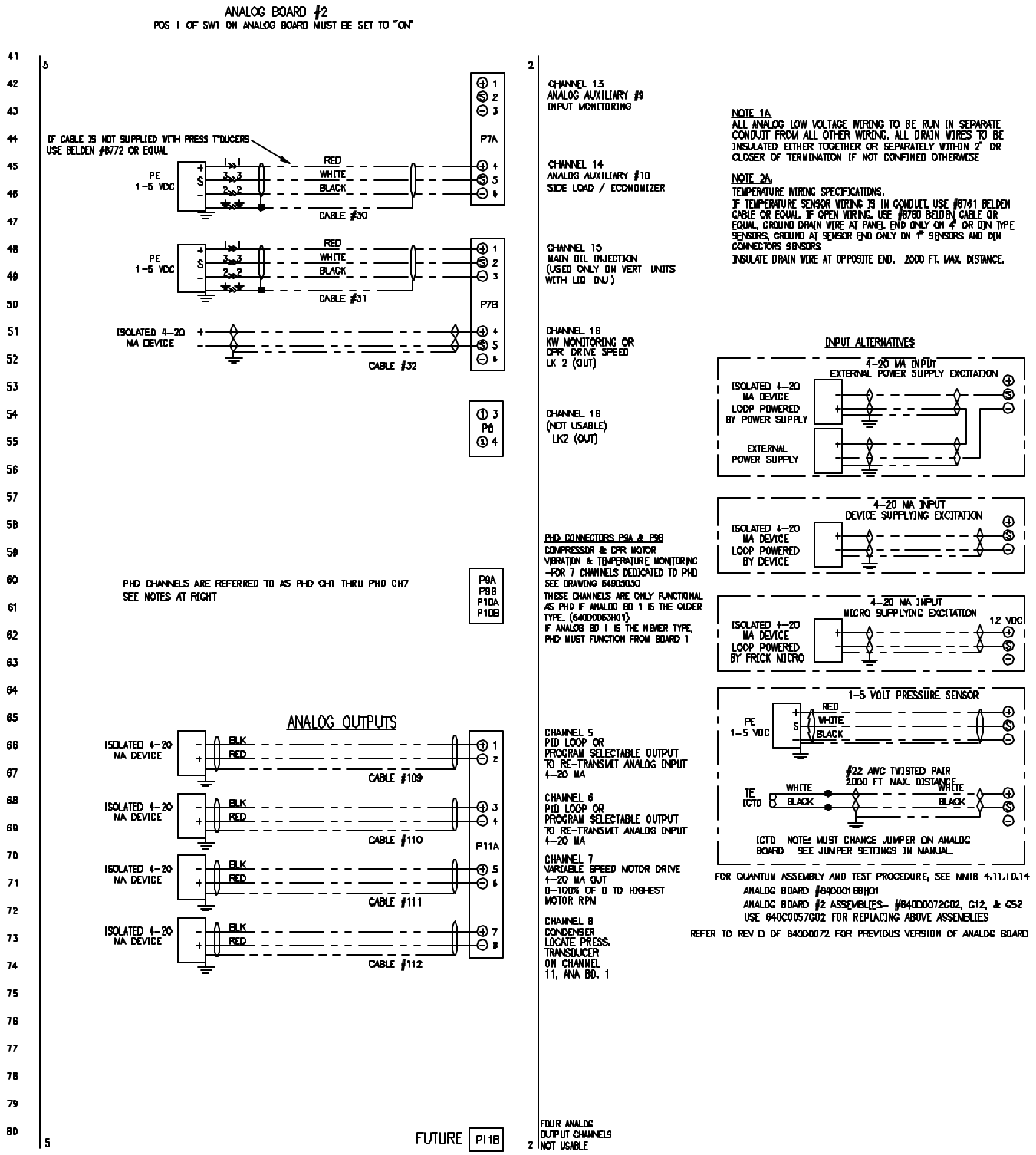
WIRING DIAGRAM STANDARD ANALOG I/O BOARD 2 (Sheet 2 of 2)



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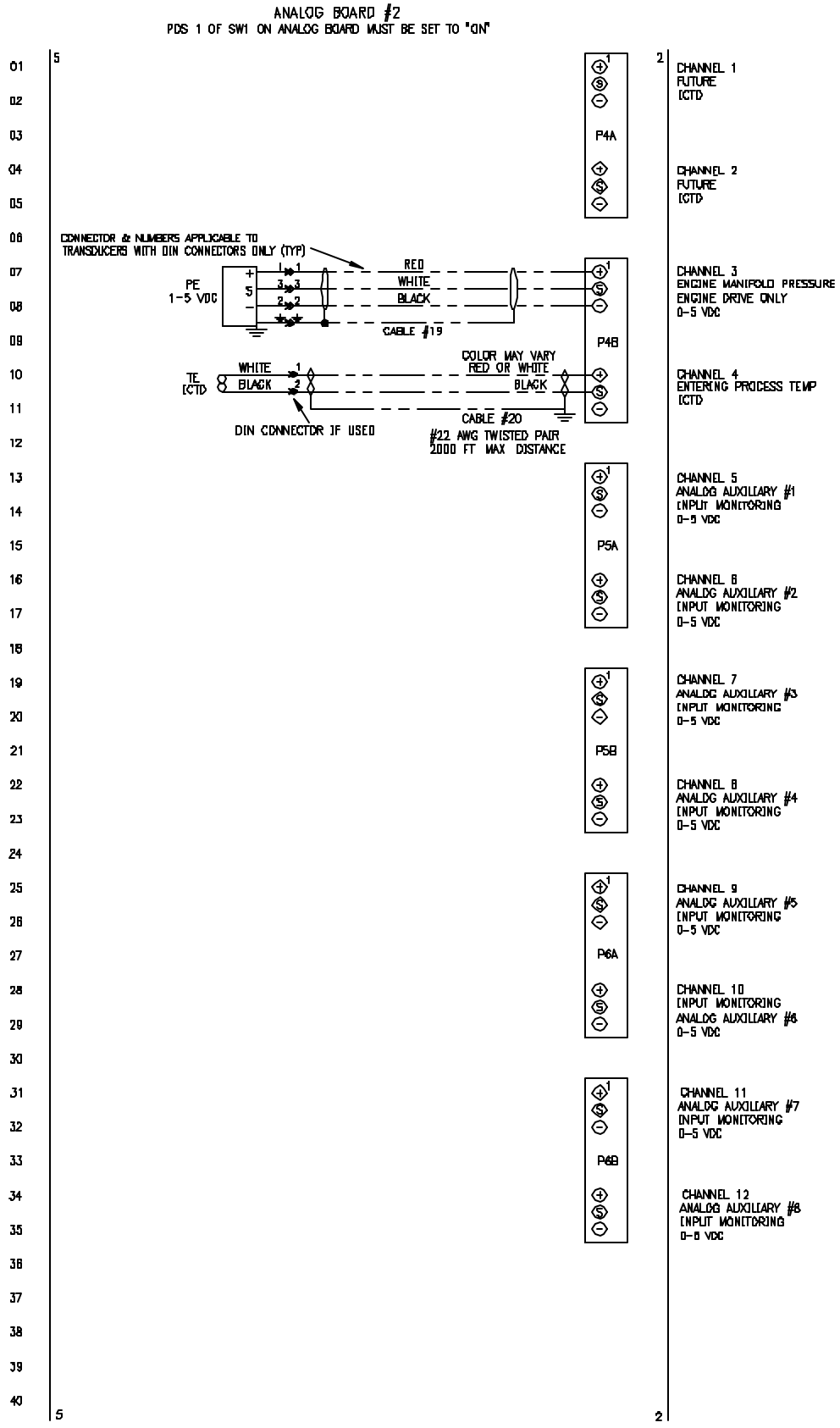
WIRING DIAGRAM - SPECIAL ANALOG I/O BOARD 2 (Sheet 1 of 2)



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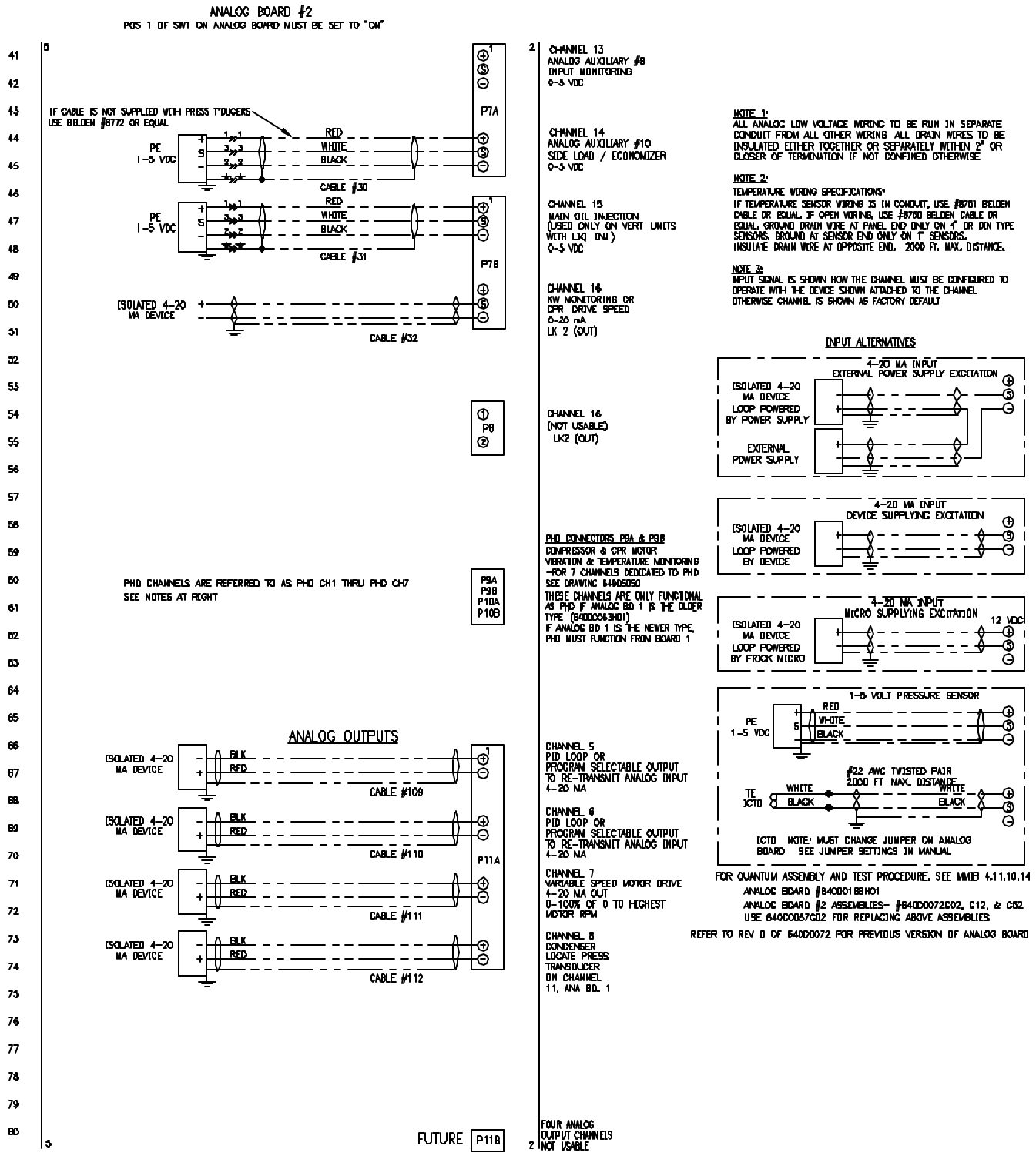
WIRING DIAGRAM - SPECIAL ANALOG I/O BOARD 2 (Sheet 2 of 2)



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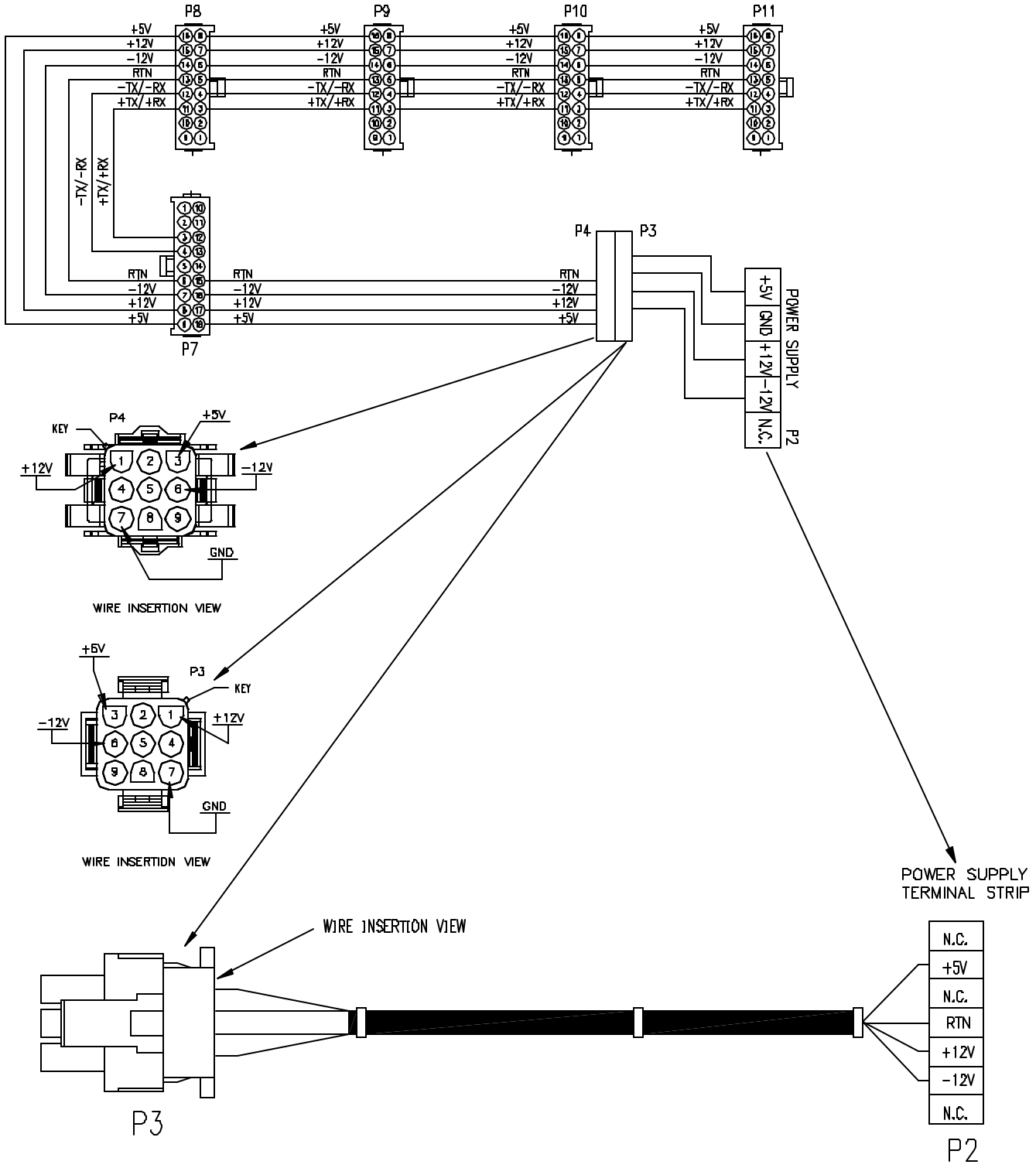
QUANTUM™ I/O & D.C. POWER HARNESS (SPECIAL PANELS)



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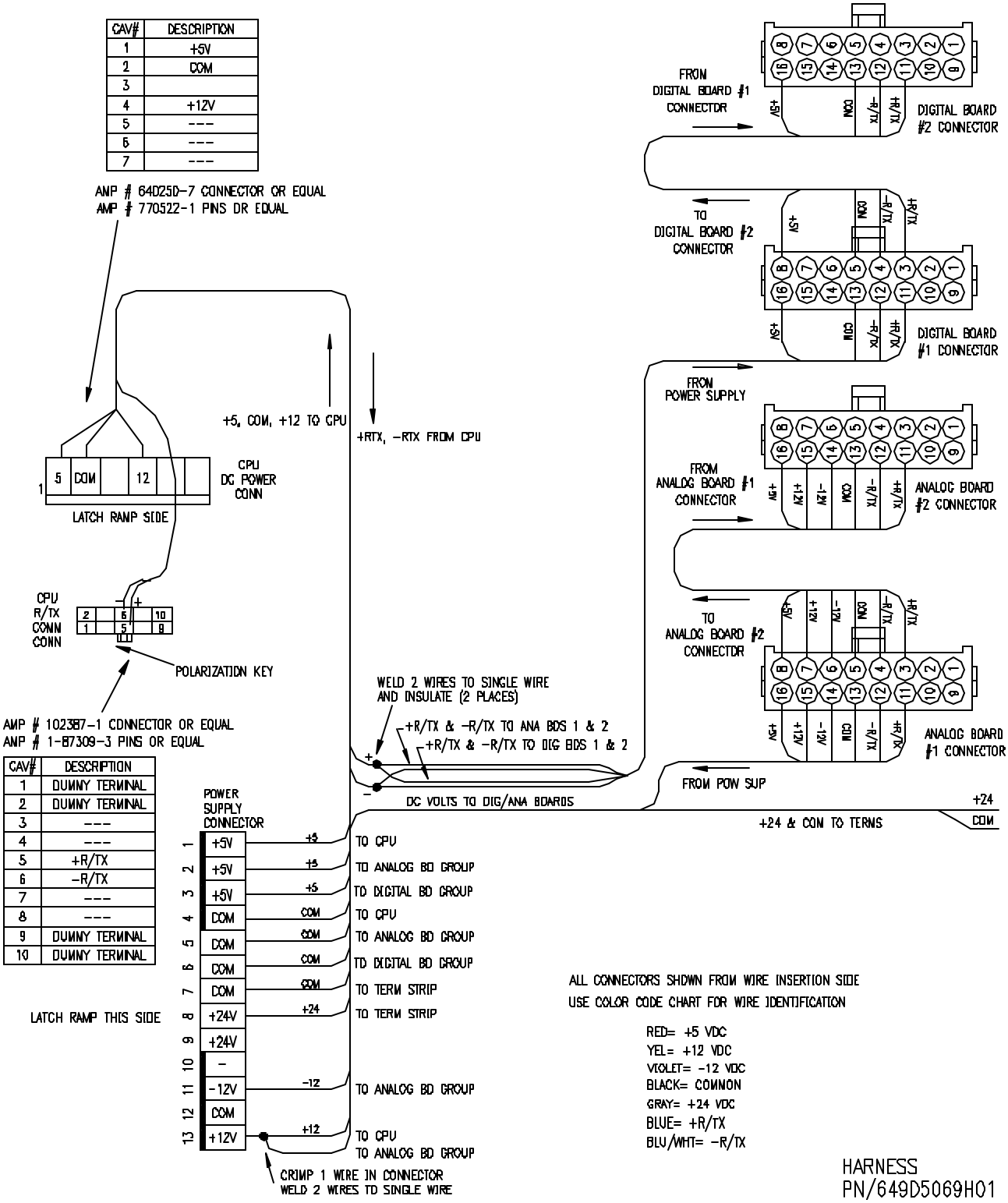
QUANTUM™ I/O & D.C. POWER HARNESS (STANDARD PANELS)



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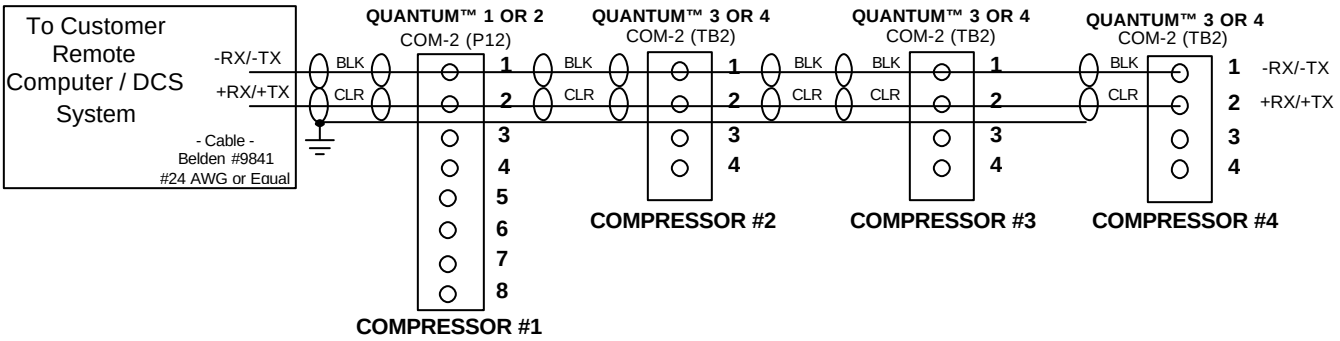
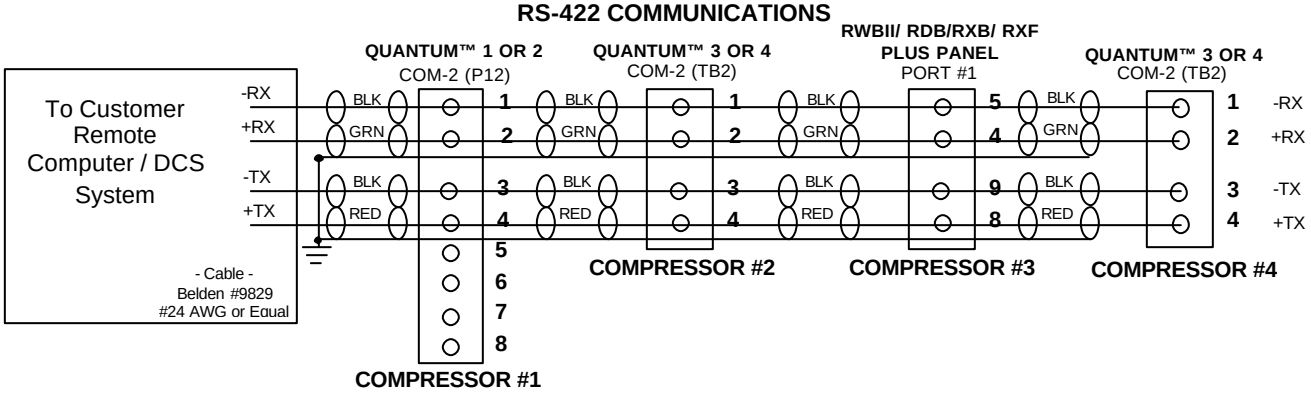
COMMUNICATIONS WIRING DIAGRAMS

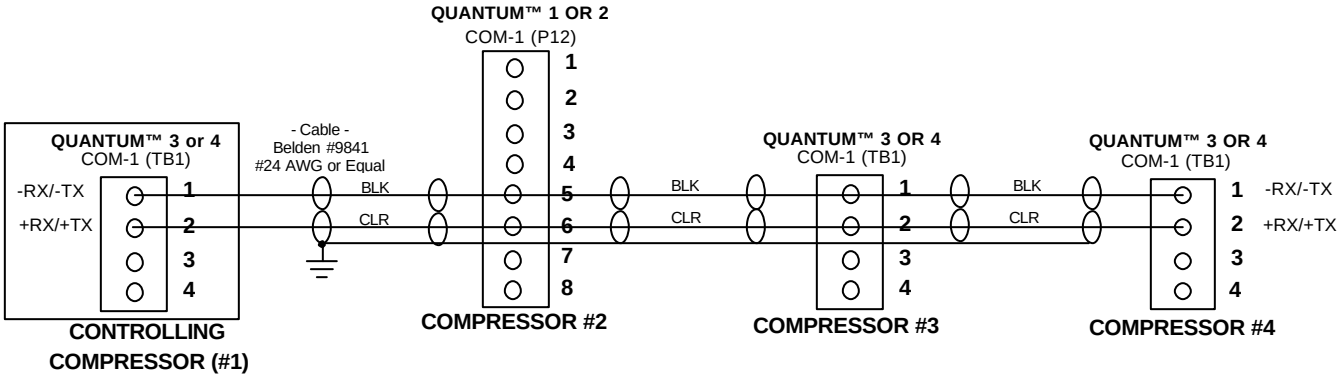
TO CUSTOMER REMOTE COMPUTER/DCS
RS-485 COMMUNICATIONS



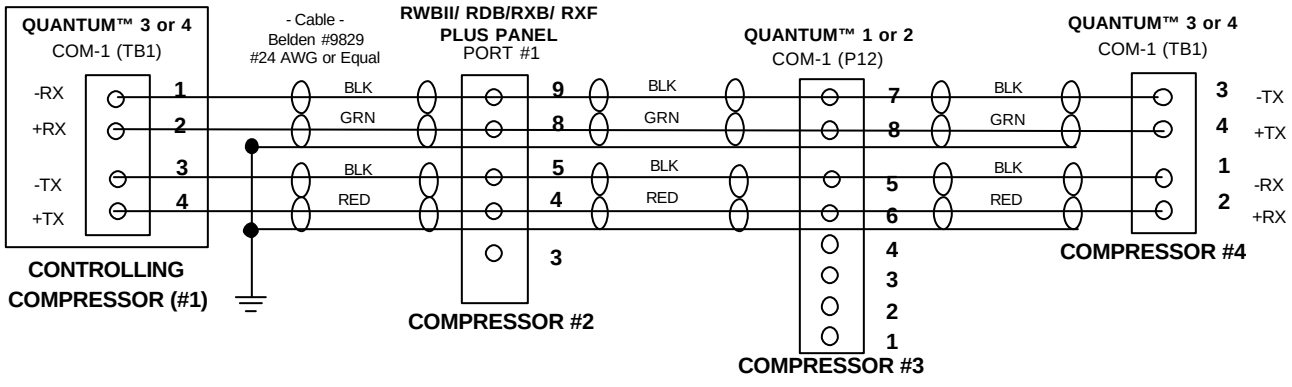
TO CUSTOMER REMOTE COMPUTER/DCS
RS-422 COMMUNICATIONS



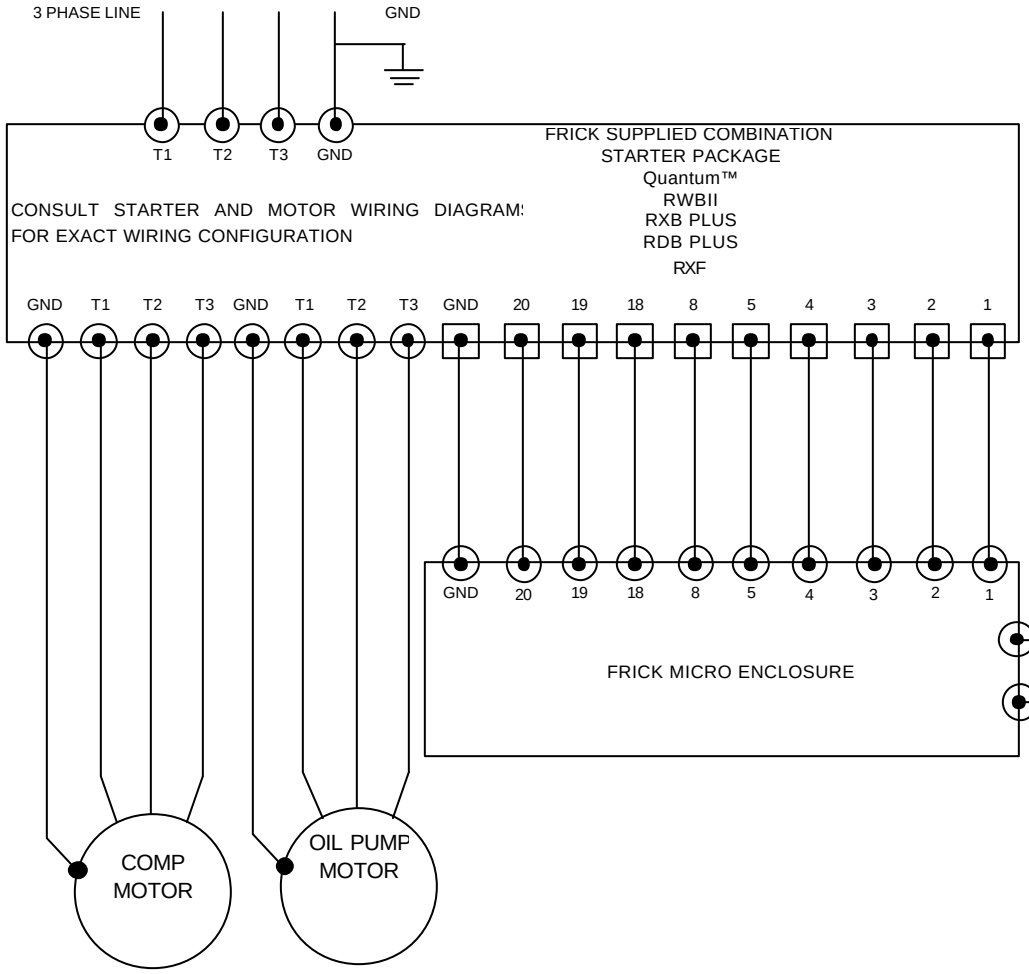
MULTICOMPRESSOR SEQUENCING (LEAD-LAG)
RS-485 COMMUNICATIONS



RWB II / RDB / RXB / RXF MULTICOMPRESSOR SEQUENCING (LEAD-LAG)
RS-422 COMMUNICATIONS



POINT-TO-POINT FIELD WIRING DIAGRAM



NOTES:

1. REFER TO MOTOR NAMEPLATE FOR CORRECT MOTOR CONNECTION.
2. SEPAERATE CONDUIT RUNS FOR CONTROL VOLTAGE WIRING AND MOTOR CONNECTION WIRING.
3. CONDUIT GROUNDS ARE NOT ACCEPTABLE.
4. ALL WIRING MUST BE PER LATEST EDITION OF THE NEC AND LOCAL CODES.
5. ALL CONTROL VOLTAGE WIRING TO BE 14 AWG STRANDED COPPER WIRE.

PRESSURE TRANSDUCER CONVERSION DATA

(Data Instruments Model SA)

Sensor Voltage	100 psi		200 psi		300 psi		500 psi	
	Range - psig*		Range - psig*		Range - psig*		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.**

RECOMMENDED SPARE PARTS

Part Number	Description	Spare-1	Spare-2	Spare-3
	Control Power			
333Q0001194	On/off power switch		yes	yes
333Q0001195	On/off power switch contact block		yes	yes
333Q0001327	Fuse, .25 amp, 250 V (main board)	yes	yes	yes
333Q9991418	Filter, Line			
333Q0000206	Relay, 3 Pole	yes	yes	yes
333Q0000207	Relay base, 3 Pole		yes	yes
333Q0001191	Hour meter			
333Q0001192	2.5V CT. Transformer for motor current step-down.			
111Q0280958	Surge suppresser	yes	yes	yes
	Displays (refer to the chart in *Identifying the type of Display*)			
640C0021G01	10.4"diag. LCD color VGA display assembly with backlight (Sharp)			yes[2]
	CCFT inverter (refer to the chart in *Identifying the type of Display*)			
	Back light inverter cable (refer to the chart in *Identifying the type of Display*)			yes
	Display cable (refer to the chart in *Identifying the type of Display*)			yes
	Harnesses			
640B0038H01	DC power-I/O communications harness (Special panel)			yes
649D5069H01	DC power-I/O communications harness (Standard panel)			yes
640B0039H01	Shunting plug (not needed for standard panel)			yes
649B0862H01	Quantum™ 4 Adapter Harness (not needed for standard panel)			yes
	Power Supplies			
640C0022G01	DC power supply		yes	yes
640C0022G11	DC power supply (Power-One to Condor)		yes	yes
	Digital Boards			
640C0024G01	Digital Input/Output Board #1			yes
640C0024G02	Digital Input/Output Board #2	yes		
111Q0281061	Output Module 120/240 volt AC	yes	yes	yes
333Q0000116	Input Module 120 volt AC	yes	yes	yes
333Q0001326	Fuse, 5 amp, 250 V (I/O board)	yes	yes	yes
	Analog Boards			
640C0026G01	Analog Borad #1 (Original)			yes
640C0026G02	Analog Board #2 (Original)	yes		
640C0057G01	Analog Board #1 (Enhanced)			yes
640C0057G02	Analog Board #2 (Enahnced)	yes		
	Keypads			
640D0060H01	Keypad/overlay Frick®'s			yes
640D0066H01	Keypad/overlay Gram's			yes
640B0031H01	Keypad cable			yes
	Circuit Breakers			
649A0883H10	10 Amp circuit breaker			yes
649A0883H16	16 Amp circuit breaker			yes
	Quantum™ Controllers			
649C1083G01	Upgrade from Quantum™ 1, 2 or 3 to Quantum™ 4			yes [1]
649C1091G01	Quantum™ 4 to Quantum™ 4			yes [1]
649C1092G01	Upgrade from Quantum™ 3 to Quantum™ 4 (in RXF Lite panel)			yes [1]
649C1093G01	Upgrade from Quantum™ 1, or 2 to Quantum™ 4 (in RXF Lite Panel)			yes [1]

Notes:

- **Note 1 – These processor boards are listed for reference. Each Quantum™ Control will have only one of these boards. Order only the replacement board that is applicable to your controller, not both boards.**
- **Note 2 – These displays are listed for reference. Each Quantum™ Control will have only one of these displays. Order only the replacement display that is applicable to your controller.**
- **Spare-1 - Normal spare parts kept on hand. Operation can wait more than 24 hours to receive replacement parts. Plant typically has back-up compressors.**
- **Spare-2 - Additional spare parts kept on hand. Operation must have parts in less than 24 hours. Plant does not have back-up compressors.**
- **Spare-3 - Critical operation. Plant must have continuous operation.**

REMANUFACTURED PARTS

Part Number	Description
649A0985G01	Quantum™3 to Quantum™ 3
649A0985G11	Quantum™4 to Quantum™ 4
649A0985G21	Digital I/O Board
649A0985G31	Analog I/O Board (Original)
649A0985G41	DC Power Supply (Condor to Condor)
649A0985G51	Display Assembly (L.G. Philips to L.G. Philips)
649A0985G61	Display Assembly (Sharp to Sharp)

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