![Frick Industrial Refrigeration logo]

INDUSTRIAL REFRIGERATION

Form 090.610-M (MAY 2016)

MAINTENANCE

File: SERVICE MANUAL – Section 90
Replaces: 090.610 – M (DEC 2012)
Dist: 3, 3a, 3b, 3c

MAINTENANCE

FRICK® QUANTUM™ EVAPORATOR CONTROL PANEL
Version 3.1x

090.610-M (MAY 2016)
Page 2

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

TABLE OF CONTENTS

THE FOLLOWING PUBLICATIONS ARE AVAILABLE FROM THE JOHNSON CONTROLS® WEBSITE jci.com

090.612-O   Frick® Quantum™ LX Evaporator Control Panel Operation
090.610-CS Frick® Quantum™ LX Evaporator Control Panel Communications Setup (setup and wiring for data communica-
                    tion using available protocols)
090.610-M   Frick® Quantum™ LX Evaporator Control Panel Maintenance (repair and troubleshooting)

SECTION 1

INTRODUCTION TO THE QUANTUM™ EVAPORATOR CONTROL SYSTEM

090.610-M (MAY 2016)
Page 4

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

INTRODUCTION TO THE QUANTUM™ LX EVAPORATOR CONTROL SYSTEM

INTRODUCTION

The Quantum™ LX Evaporator system consists of two major control components:

· The Quantum™ LX Evaporator Control Panel
· Evaporator Remote Panel(s)

With the Quantum™ LX Evaporator system version 3.0x and later, a single Evaporator Control Panel can control up to ten remote panels with each remote capable of handling three Evaporator units, for a total possible of thirty units. It is also capable of Ethernet access, which can be viewed remotely through any web browser, or the optional Frick™ Evaporator Operator Interface Panel.

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

QUANTUM™ LX CONTROL PANEL ENCLOSURE

The Frick® Quantum™ LX Evaporator control panel enclosure is configured to make it as standard as possible. Since there are nearly an infinite number of possible configurations and options, this manual will describe the most common features and arrangements. It is always best to refer to the wiring diagrams, panel layouts, and operational documentation that is included with each unit for exact details regarding equipment operation.

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

· **Quantum™ Controller** – Evaporator panels are currently supplied with the Q5 control board, but numerous units with the previous version known as the Q4 board also exist. This manual will include information for both of these boards. Both the Q4 and Q5 boards run a software program that communicates with all Remote Panels, which in turn control the Digital and Analog boards within those panels. This communication allows the controller to read the status of all the I/O boards, and display the data either on its own display, a Web Browser, or the optional Standard Interface Panel. The Quantum™ controller acts on this data, and provides the necessary con-

trol 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 Evaporator package. Interaction to the outside world can be achieved through industry-standard communications protocols. Additional information is located under the Q4 (or Q5) CONTROLLER section found later in this manual. The Quantum™ controller, when loaded with the operating system, is then known as the Quantum™ LX Evaporator system.

EVAPORATOR REMOTE PANEL

The Remote Panel contains the I/O that will control up to three Evaporator units. Up to ten Remote Panels may be connected to the Quantum™ LX Control panel via RS-485 communications, for a maximum total of thirty units.

· **Power Supply** – Provides the necessary operating voltages for the proper operation of all control components. Additional information about the power supply can be 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 signals are used to sense the condition of switches, relay contacts, auxiliary contacts, etc. This board runs an independent software program from the Quantum™ LX to control devices, and communicates the status of all devices back to the Quantum™ LX. Additional information about the Digital Boards is located under the DIGITAL BOARD section found later in this manual.

· **Analog Input / Output Board** – Analog (variable) signals are sent and received by this board. 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™ LX to control devices, and communicates the status of all devices back to the Quantum™ LX. The analog board contains 24 analog inputs, and 8 analog outputs. Additional information about the Analog board is located under the ANALOG BOARD section found later in 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 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 its 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 DC/AC, mA to the hundreds place)
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.

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. The 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 (on CCFT style displays)

· Bad Backlight Fluorescent Tube (on CCFT style displays)

· 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™ LX problem. The actual cause of most problems is usually not with the Quantum™ board itself, but with something external. However, on the rare occasion that the problem has been identified as being the Quantum™ board, use the following section as a guideline for replacing it.

090.610-M (MAY 2016)
Page 6

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

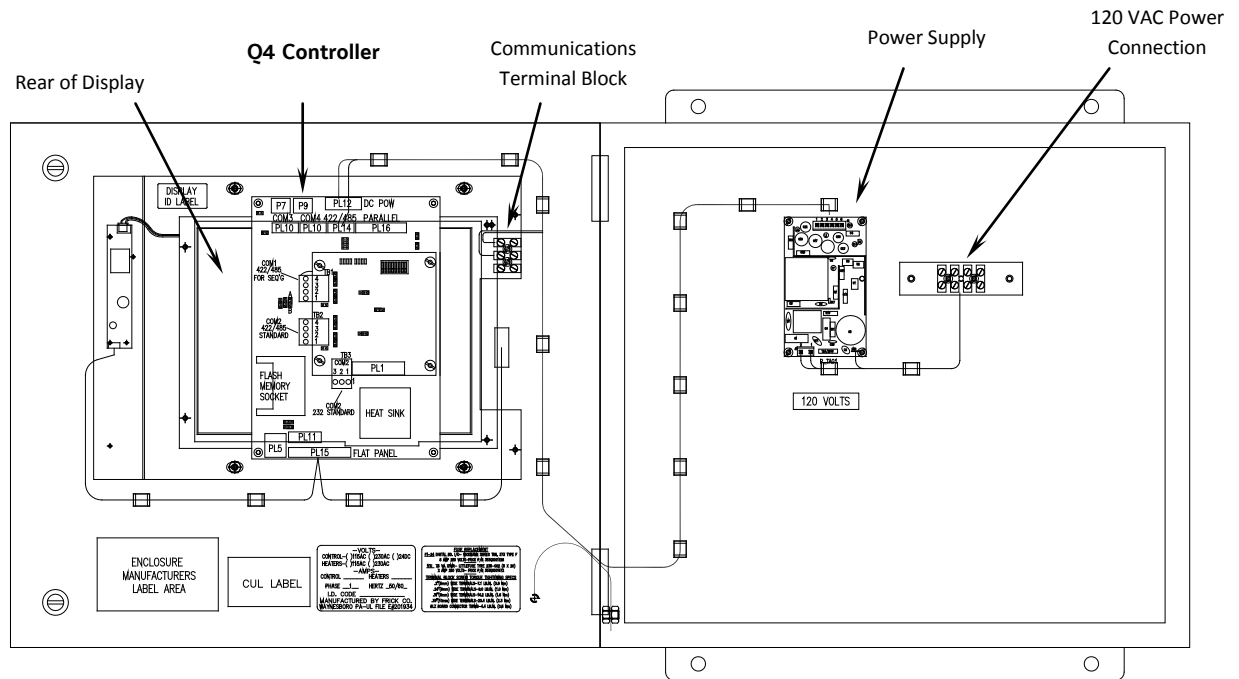## QUANTUM™ EVAPORATOR CONTROL PANEL

The following pictorial shows front the Control Panel portion of the unit, and will appear the same for both a Q4 or Q5 control, and shows the following components:

- Enclosure
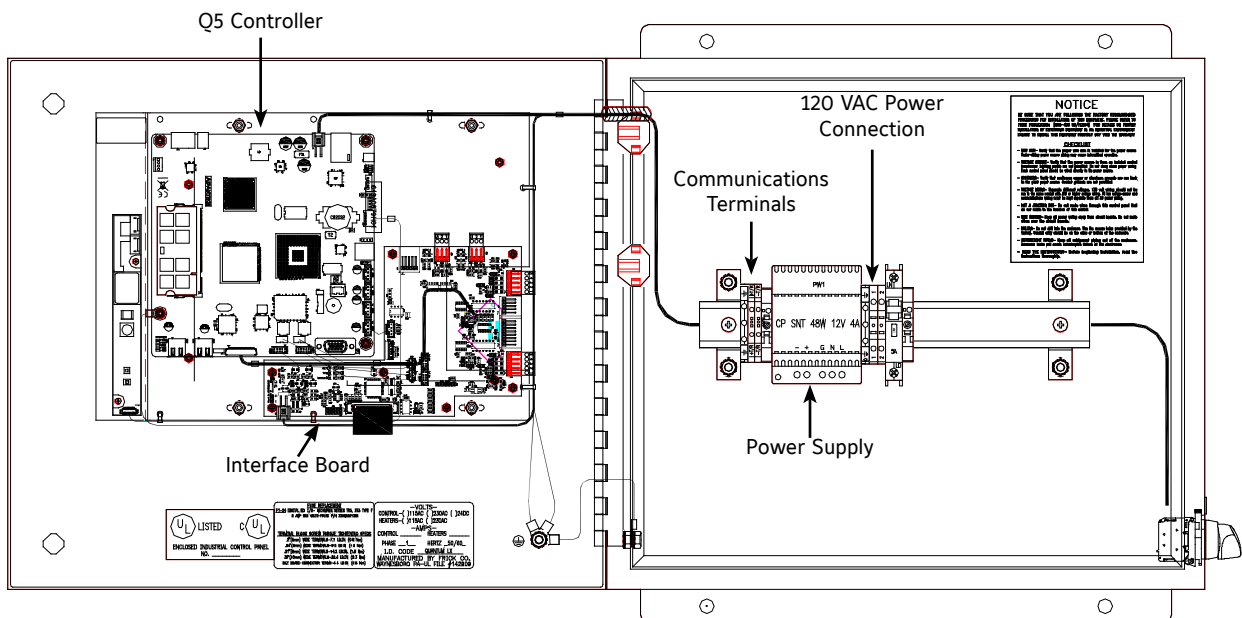- Display
- Keypad
- Control Power Switch
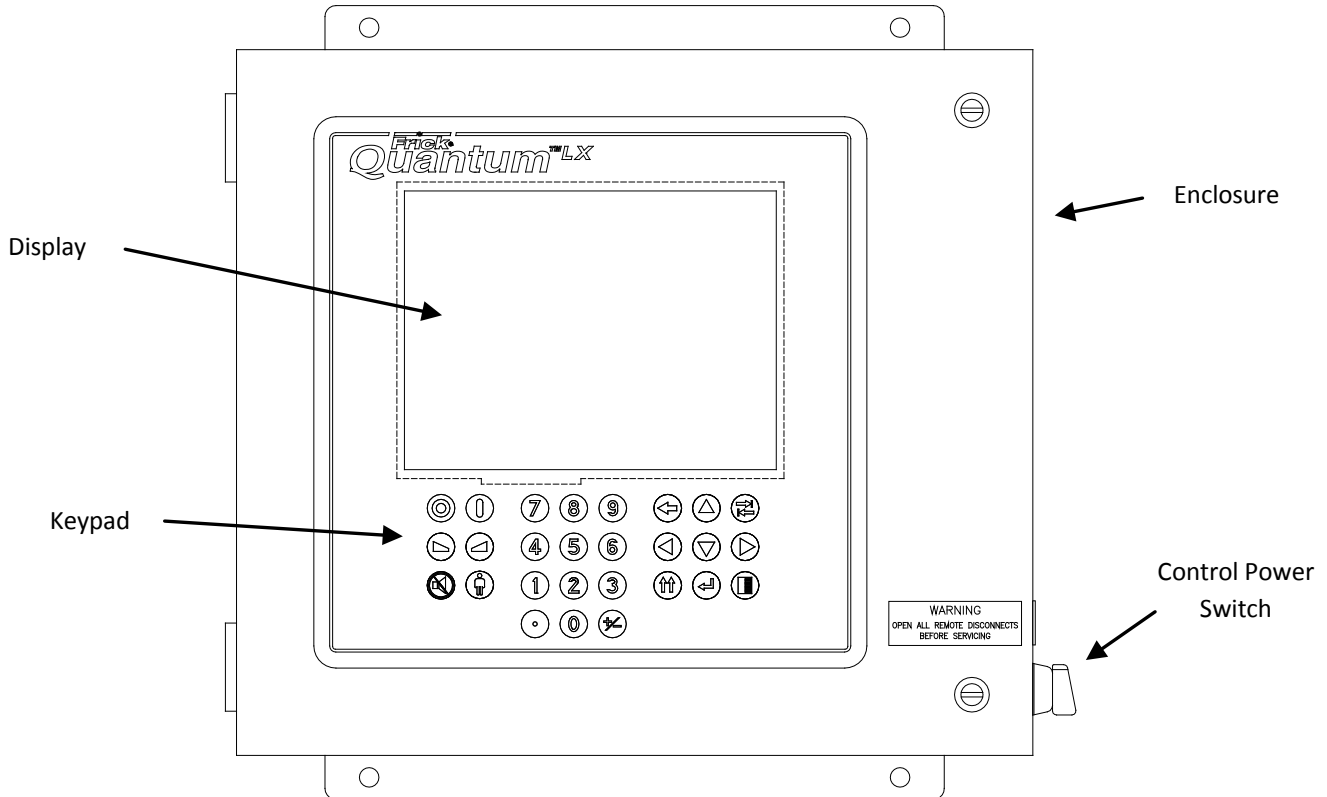
Front of Enclosure

The inside of the panel will vary, depending on whether it is a Q4 or Q5 based controller. The following pictorial shows both versions:

Q4 Panel

Q5 Panel

090.610-M (MAY 2016)
Page 8

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

NOTES:

SECTION 2

REMOTE PANEL

090.610-M (MAY 2016)
Page 10

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

THE EVAPORATOR REMOTE PANEL ENCLOSURE
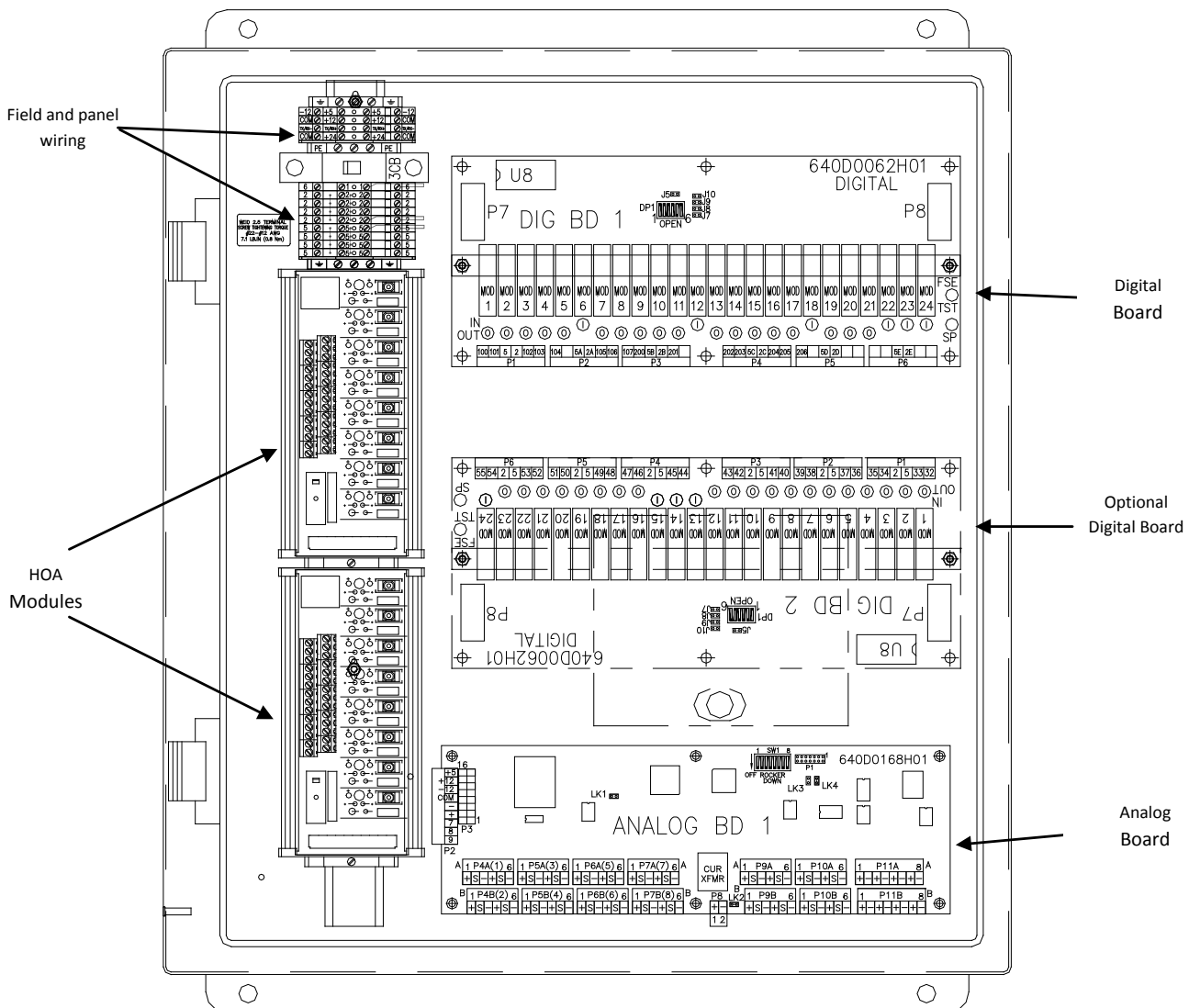
DESCRIPTION

Both versions of the Evaporator control panel, Q4 and Q5, utilize the same Remote panel. With the Quantum™ LX Evaporator system version 3.0x and later, a single Quantum ™ Control Panel can control up to ten remote panels with each remote capable of handling three Evaporator units, for a total possible of thirty units. It is also capable of Ethernet access, which can be viewed remotely through any web browser, or the optional Frick® Evaporator Operator Interface Panel.

The Frick® Quantum™ LX Remote panel enclosure utilizes available space efficiently. The panel is also equipped with the necessary posts and hardware to add options in the field. Each Remote panel is con-figured with one Digital and one Analog board, and a second Analog board may be present depending upon installed options.

There are additionally two HOA (Hands Off Automatic) boards installed, which allow for overriding the auto-matic function of the control by allowing the user to manually operate outputs.

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

POWER SUPPLY FOR THE REMOTE PANEL

DESCRIPTION

CAUTION! Measuring the power supply voltages require the control power to be energized. Extreme care must be observed when taking any readings, as 120 VAC is present within the power supply.
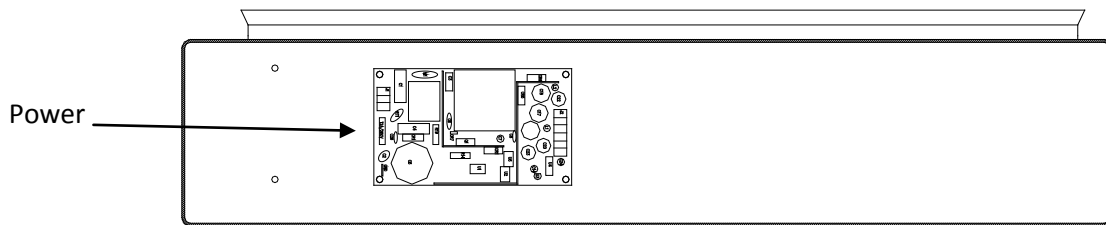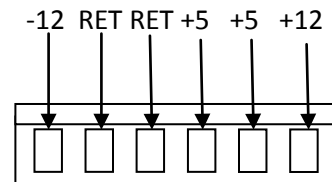
The Remote panel power supply is mounted on the inside at the top of the panel, as shown at the bottom of this page. A three-pin connector provides 120 VAC power to the supply, and a six-pin connector delivers DC power out of the supply. These connections are of a push-on multiple contact connector type. This power supply is not adjustable.
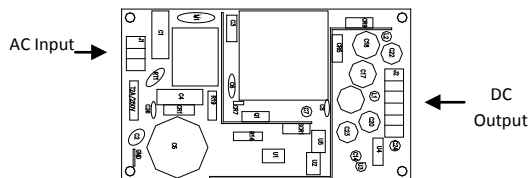
EVAPORATOR REMOTE PANEL POWER

The Evaporator Remote Panel utilizes the +5 VDC, +12 VDC and − 12 VDC voltages from its power supply. To perform measurements on the power supply voltages, use a reliable, calibrated Digital Volt Meter (DVM). The DVM should be accurate to 1/100 of a volt DC. Turn the control power switch to ON.
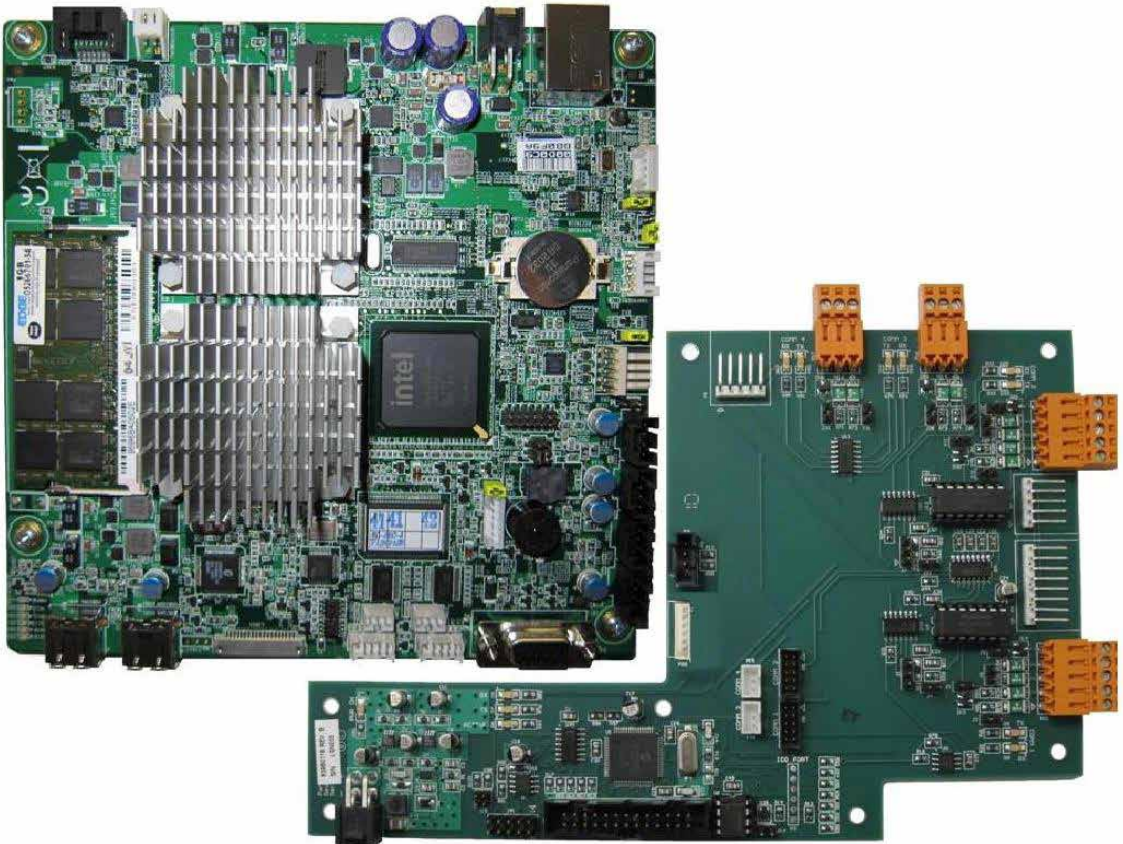
Measure the voltages on the power supply at the DC output connector as shown below.

Power supply is located at the inside top of the Remote Panel

SECTION 3

Q5 CONTROLLER

090.610-M (MAY 2016)
Page 14

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

Q5 CONTROLLER BOARD

INTRODUCTION

Frick® Controls has released the latest version of the Quantum™ LX microprocessor board. This brand will be referred to as the Q5. A photo of this board appears here:

FEATURES

The Q5 board includes the following features:

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

WHAT SHOULD OCCUR WHEN APPLYING POWER

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

- The six LED's in the lower left corner should turn on solid.

- The on-board "buzzer" should "beep" once.

- The display should show several DOS (text) style screens. A penguin image will appear in the upper left corner of the screen as the boot sequence progresses.

- Just before fully booting, a Loading bar will appear at the bottom of the screen, showing the percent of load that has completed.

- The Operating Status screen will appear.

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

- The Analog and Digital I/O boards TX/RX lights should be blinking.

- Each I/O board should have the power LED lighted and the Active LED should be blinking.

- The first thing that should be checked when troubleshooting the Q5 board is its powering up sequence.

WHAT IF THE OPERATING STATUS SCREEN IS NOT SHOWN

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

1. If no LED's are lit, then check AC and DC power. Refer to the Power Supply section.

2. Check if the lighting of the LED's is occurring as described in the What Should Occur When Applying Powering section.

    - If the powering up sequence continues to repeat without displaying the Operating Status screen, then there is a booting problem.

3. Check all plugged connectors for proper seating.

4. Check if an error message is displayed when booting.

    - Be sure to write down any error messages exactly as they appear, as well as the top line on the screen where the message appears.

5. Check that the software is OK:

    - Is the correct software installed?

    - Did you just install new software?

6. Check the display. If the Q5 board is booting but you have no display, check the following:

    · Check the backlight tube. Look very closely at the display to see if any-thing 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 may be with the backlight tube. There is a sticker on the display mounting plate, that 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 dis-play and re-seat it to be sure it is connected properly. Note: This is a small connector and caution should be observed so that it is not dam-aged due to excessive force.

    · Refer to the Operator Interface sec-tion and check that the display, dis-play cable, and software versions are matched correctly.

BATTERY FUNCTION AND REPLACEMENT

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

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

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

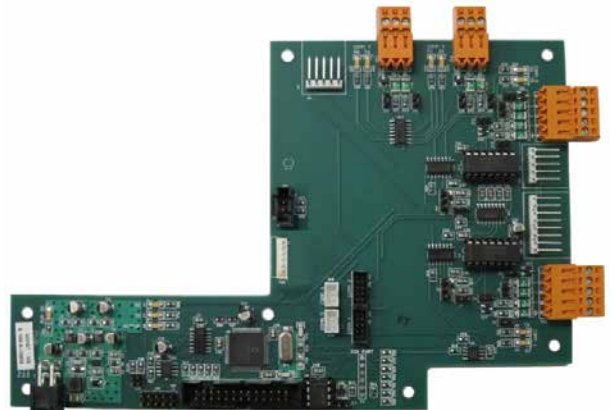Locate the Battery socket, as shown on the following drawing:
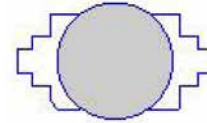
Place your fingernail under the edge of the battery, and gently lift up. The battery should release itself from the socket easily. Take a new battery and place it into the holder in the same orientation as the old battery (the side with the writing must be facing out). Return the Control Power switch back to ON.
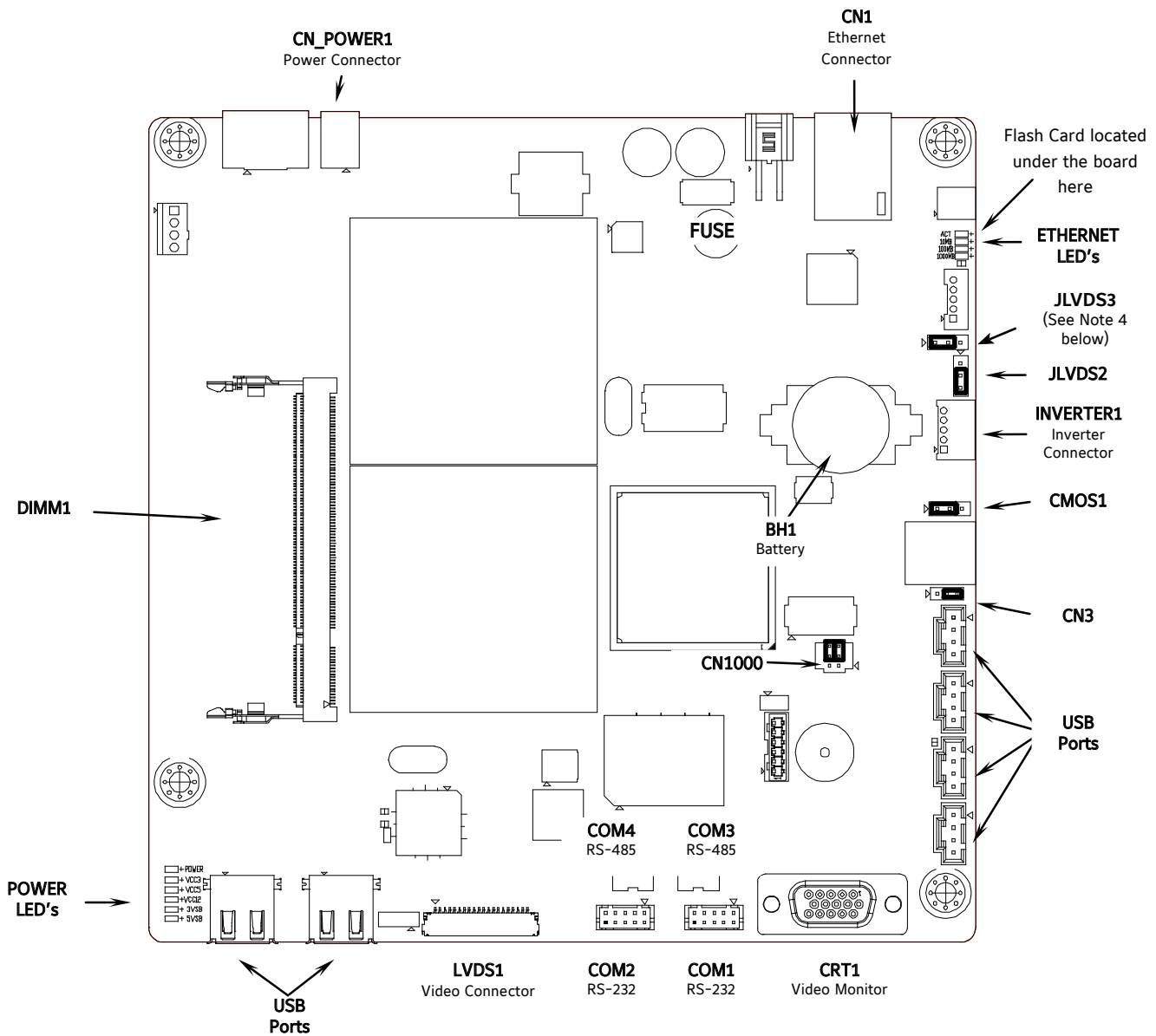
Once the Q5 has rebooted, the correct Date and Time must be set.

Q5 INTERFACE BOARD

An interface board has been developed by Frick con-trols allowing the user to interface exterior connec-tions to the Q5. A photo of this interface board is shown here:
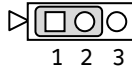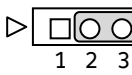
090.610-M (MAY 2016)
Page 16

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

Q5 BOARD

CN_POWER1 Power Connector

CN1 Ethernet Connector

Flash Card located under the board here

FUSE

ETHERNET LED's

JLVDS3 (See Note 4 below)

JLVDS2

INVERTER1 Inverter Connector

CMOS1

CN3

USB Ports

DIMM1

BH1 Battery

CN1000

POWER LED's

+POWER
+VCC3
+VCC5
+VCC12
+3VSB
+5VSB

COM4 RS-485

COM3 RS-485

USB Ports

LVDS1 Video Connector

COM2 RS-232

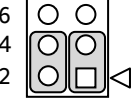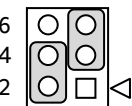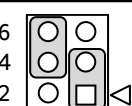**COM1** RS-232

CRT1 Video Monitor

NOTE 1: The triangle symbol (▷) denotes Pin 1 on connectors. Refer to the chart on the following page for jumper settings.
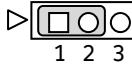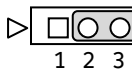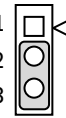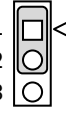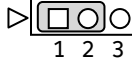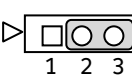
NOTE 2: Do NOT remove the CN4 jumper. Removal of this jumper will cause the processor to not power up.

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

NOTE 4: Ensure that this jumper is installed between pins 1 and 2 if a display is used that requires an inverter board. Install the jumper between pins 2 and 3 for an LED display that does not use an inverter board. See also the jumper table on the next page for JLVDS3.

Frick
INDUSTRIAL REFRIGERATION

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

090.610-M (MAY 2016)
Page 17

Q5 BOARD JUMPERS, LED'S AND CONNECTORS
JUMPER TABLE

Jumper Title	Function	Jumper Setting	
CMOS1 (CMOS Clear)	Normal **(default)**		1 – 2 Closed
	Clear CMOS		2 – 3 Closed
CN1000 (LCD Resolution Selector)	24-bit 800x600		1-3 Closed & 2-4 Closed
	24-bit 1024x768		3-5 Closed & 2-4 Closed
	18-bit 800x600		1-3 Closed & 4-6 Closed
	18-bit 640x480 **(default)**		3-5 Closed & 4-6 Closed

Jumper Title	Function	Jumper Setting	
CN3 (Touch Panel Type Selector)	5-Wire Touch Screen		1-2 Closed
	8-Wire Touch Screen **(default)**		2-3 Closed
JLVDS2 (Backlight Level Selector)	0 – 5V **(default)**		2-3 Closed
	0 – 2.5V		1-2 Closed
JLVDS3 (Backlight Control Mode)	Voltage Mode - use with inverter **(default)**		1-2 Closed
	PWM Mode (Use for LED display - no inverter)		2-3 Closed
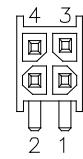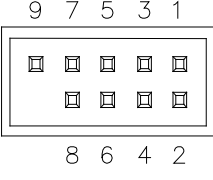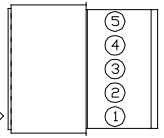
NOTE 1: The triangle symbol (▷) denotes Pin 1 on connectors.
NOTE 2: Jumper CN4 is not shown on this chart, as it must always be installed.

LED DEFINITION TABLE

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

CONNECTOR PINOUT TABLE

Connector Title	Pin	Function	
CN_PWR1 (Power Input)	1	Ground (GND)	
	2	Ground (GND)	
	3	VCC 12V	
	4	VCC 5V	
COM1 & COM2 (RS-232 Communications)	2	Receive (RX)	
	3	Transmit (TX)	
	5	Ground (GND)	
COM3 & COM4 (RS-485 Communications)	1	–RX/TX	
	2	+RX/TX	
	3	Ground (GND)	

090.610-M (MAY 2016)
Page 18

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

Q5 INTERFACE BOARD

Baud Rate Jumpers

J15 Not Installed = 19200 **(Default)**
J15 Pins 1-2 Installed = 38400
J15 Pins 3-4 Installed = 56K
J15 Pins 1-2 and 3-4 Installed = 115K

Do Not Remove J14
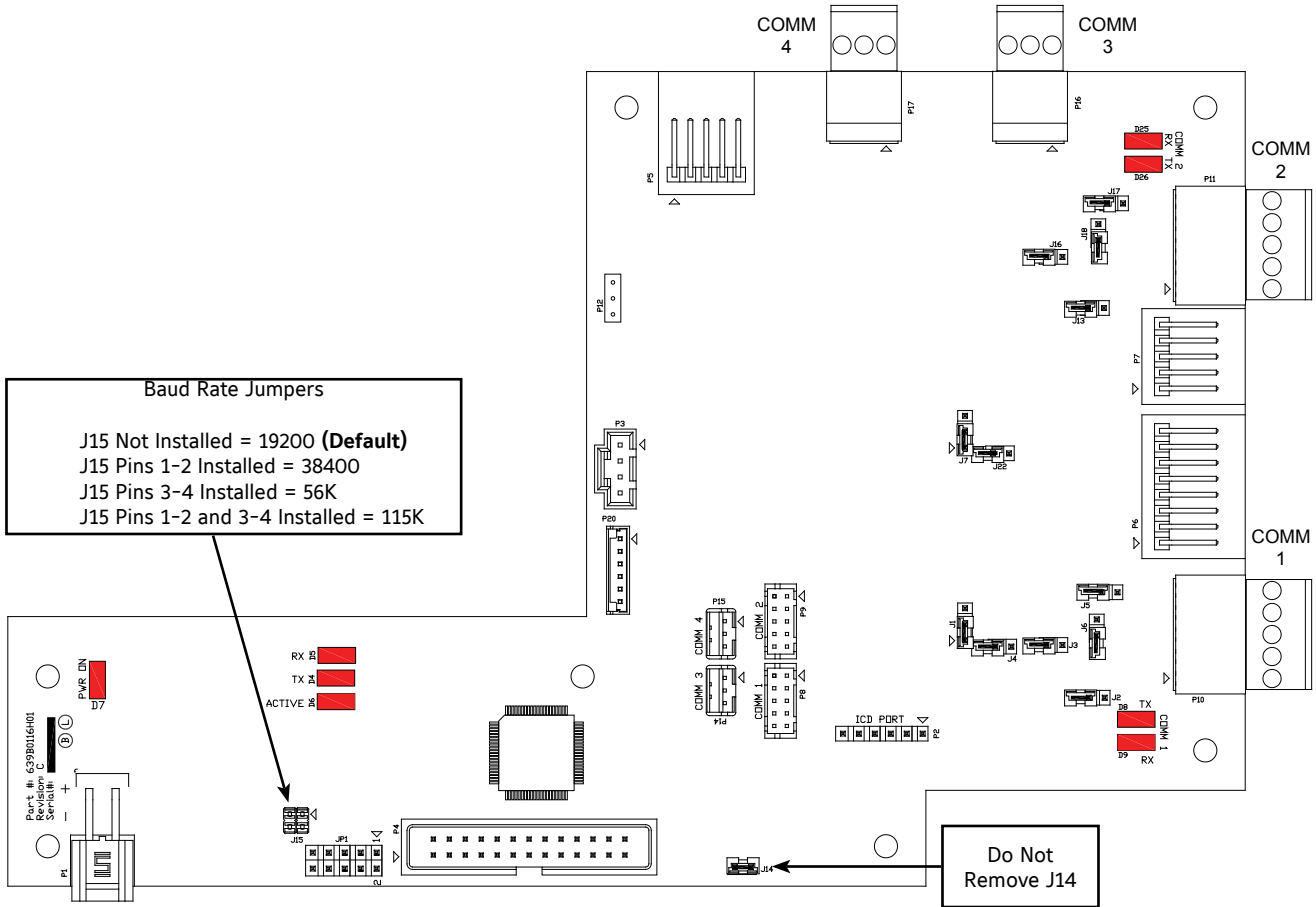
COMM 1 JUMPER SETTINGS

Jumper Title	Function	Jumper Setting	
J1	RS-422 (4-Wire) **Default**		1 - 2 Closed
	RS-485 (2-Wire)		2 - 3 Closed
J2	Pull Down **Default**		1 Pin Only
J3	Pull Up **Default**		1 Pin Only
J5	RS-422 **Default**		1 Pin Only
	RS-485		1 - 2 Closed
J6	RS-422 **Default**		1 Pin Only
	RS-485		1 - 2 Closed
J4	High Speed Target **Default**		1 - 2 Closed

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

COMM 2 JUMPER SETTINGS

Jumper Title	Function	Jumper Setting	
J7	RS-422 (4-Wire) **Default**		1 - 2 Closed
	RS-485 (2-Wire)		2 - 3 Closed
J13	Pull Down **Default**		1 Pin Only
J16	Pull Up **Default**		1 Pin Only
J17	RS-422 **Default**		1 Pin Only
	RS-485		1 - 2 Closed
J18	RS-422 **Default**		1 Pin Only
	RS-485		1 - 2 Closed
J22	High Speed Target **Default**		1 - 2 Closed

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

Q5 INTERCONNECTIONS

The pictorial below depicts the Q5 motherboard, and the necessary interconnects between it and the Interface
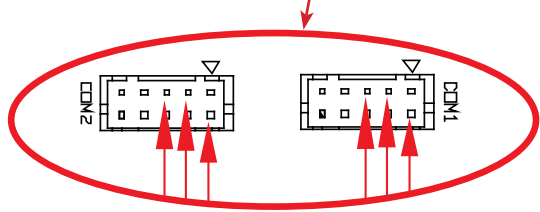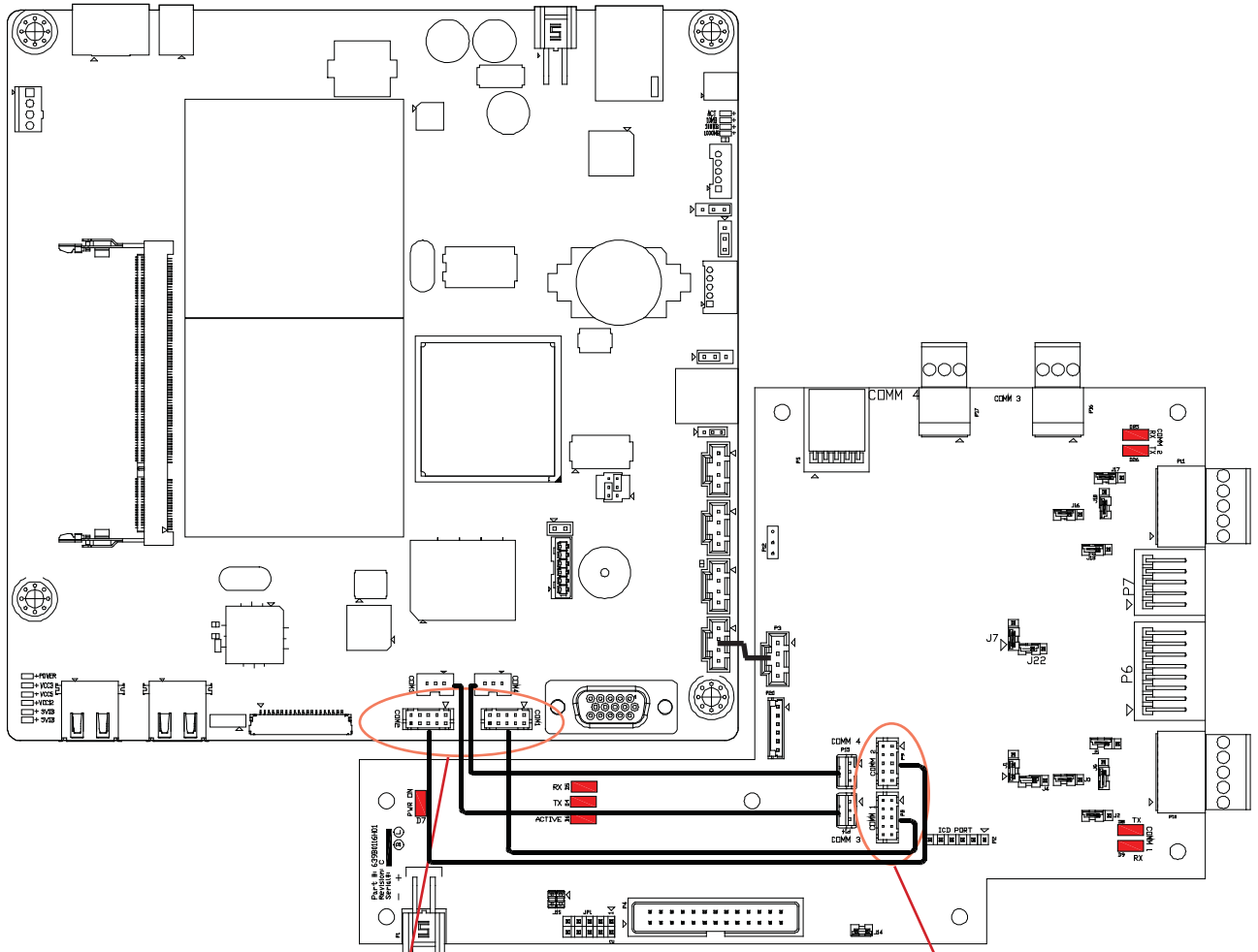
If the harness for either COMM1 or COMM2 is ever removed for either repair, replacement or troubleshooting, ensure that the pinout matches as shown here when plugging the ends back in. All other Interconnection harness ends share the same pinout at both ends.

090.610-M (MAY 2016)
Page 20

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION
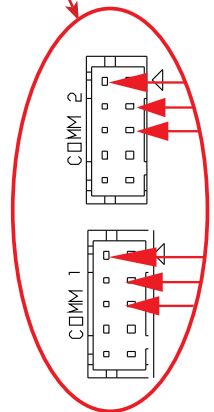
POWER SUPPLY (Q5)

DESCRIPTION

The power supply of the Q5 control panel consists a single, 12 volt DC supply, and is located on the DIN rail at the back of the enclosure.

The supply is adjustable and has an indicator to show that it is powered. Refer to the following page for the location for the adjustment.

Power ON
Indicator

12 Volt DCPower Supply

POWER DISTRIBUTION

12 Volt DC Power is distributed to the Q5 processor board and Interface Board.
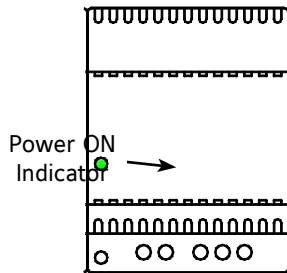
MEASURING VOLTAGES

CAUTION! Measuring and adjusting the power supply voltage requires the control power switch to be energized. Extreme care must be observed when taking any readings, as 120 or 230 VAC (depending on incoming system voltage) will be present next to the DC voltage connector. Adjusting the supply requires the use of a small Philips screwdriver inserted into the supply to access an adjusting potentiometer. **CAUTION: It is possible for the screwdriver (and the person making the adjustment) to come into contact with potentially lethal voltages. Proper Personal Protective Equipment (PPE) measures need to be observed.**

All circuit boards within the Q5 control panel require accurately adjusted DC voltages in order to function properly. Periodic measurement and adjustment of the DC power system is recommended for optimum system operation. Over time, it is possible for temperature, humidity, vibration and component age, to degrade the accuracy of these voltages. When any of the DC voltages begin to stray from their optimum range, mysterious problems can begin to arise.

Even with a perfectly adjusted supply, it is possible for a potential drop in voltage at each connection point. This drop normally is in the millivolt range, but under some conditions, the drop can be much greater (as high as tenths of a volt). Some examples of problems could be:

· Loss of or intermittent communications failures.
· Q5 reboots for no apparent reason.

· LED's on the Q5 are lit, but nothing appears on the display.

To perform measurements and adjustments on the power supply voltage, use a reliable, calibrated Digital Volt Meter (DVM). The DVM should be accurate to 1/100 of a volt DC. With the control power switch turned ON, wait until the Operating Screen appears. This is because the graphics required to create this screen will draw more current than when the screen is showing the normal POST (DOS) 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.

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

ADJUSTMENT

Ensure that the meter is set to the proper range (DC, 0-50 V or equivalent), as well as observing proper wire polarity. The power supply drawing shown on the following page applies to all three power supplies. The adjustment access hole for each supply is located on the lower left of the front of the supplies. If an adjustment is required, use a thin, Philips screwdriver, insert the tip into the access hole for the appropriate voltage potentiometer (refer to the diagram on the following page for adjustment location). **NOTE: Extreme care must be used when adjusting the potentiometer. Adjustment should only be performed by qualified personnel. The use of a non-conductive device is recommended.**

DC   120 VAC
or
240 VAC

Adjustment
Potentiometer
Access
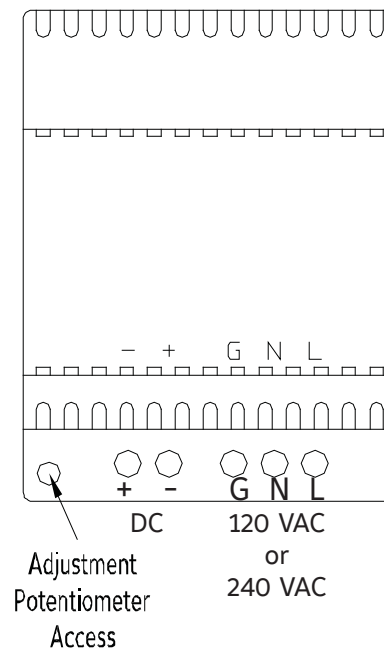
+12 VDC Adjustment

Locate the DC power supply terminals. Place the negative lead on – and the positive lead on +. Verify that the DVM is displaying in the range of +12.10 to +12.20.

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

POWER SUPPLY REPLACEMENT

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

SECTION 4

Q4 CONTROLLER

090.610-M (MAY 2016)
Page 24

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION
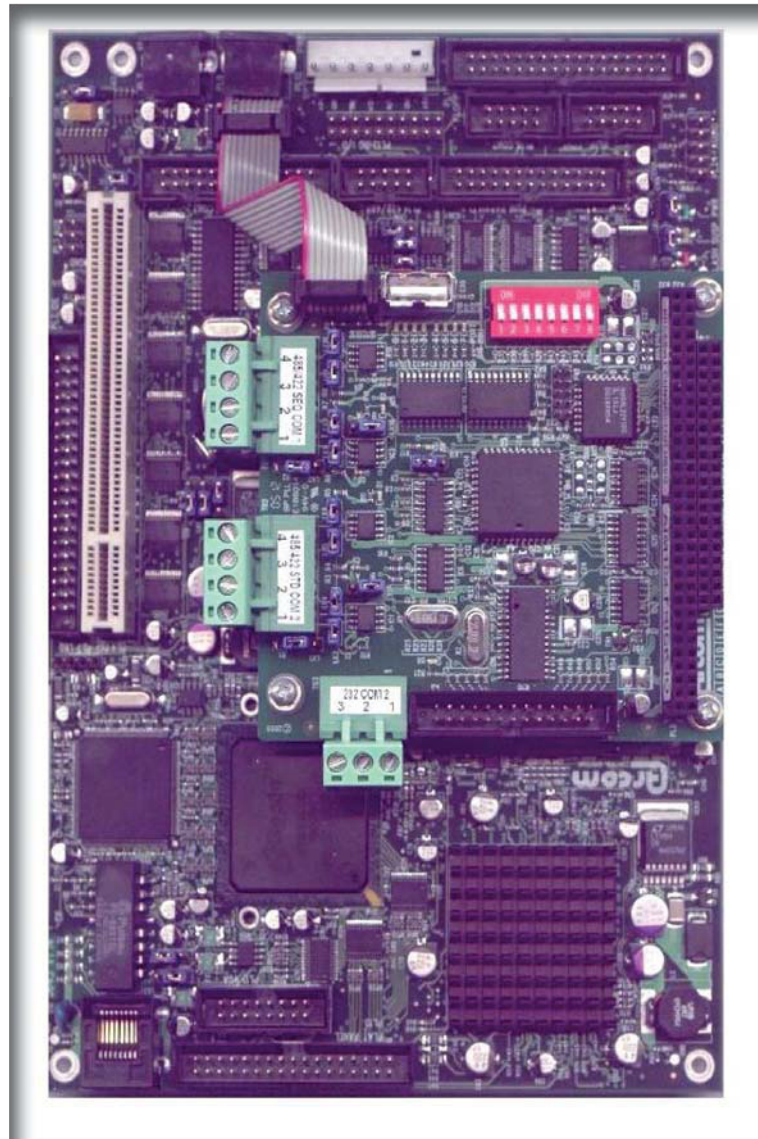
Q4 CONTROLLER BOARD

INTRODUCTION

Frick® Controls has strived to remain on the cutting edge of microprocessor technology and development. Because of the ever-increasing speed, memory features, and power of microprocessors, Frick® will continue to introduce the latest advancement in microprocessor control technology.
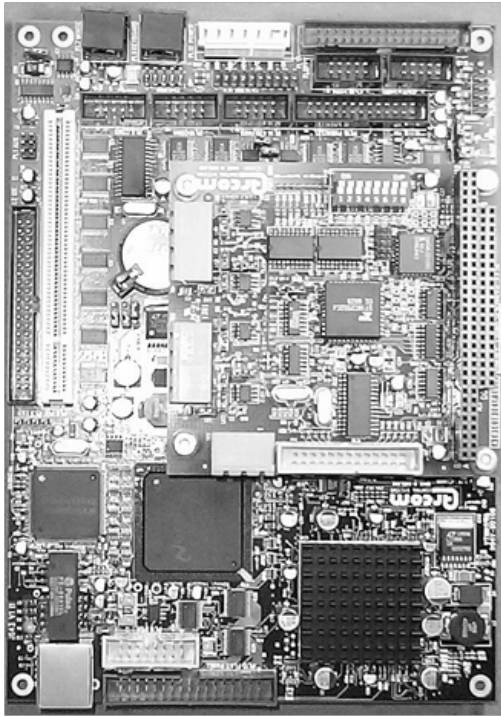
Q4 Board

WHAT SHOULD OCCUR WHEN APPLYING POWER

The first thing that should be checked when trouble-shooting the Q4 board is it's powering up sequence.

When powering up the Q4, the following sequence of events are indicative of a properly working main processor board:

·   Green PWR (Power) LED will turn on solid.

·   Red FLASH LED will flash several times early in the boot sequence. It is normally not lit.

·   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 Q4 has booted. The only time that this flashing rate is interrupted, is when a key is pressed on the keypad.

·   The display should show several DOS (text) style screens. A penguin image will appear in the upper left corner of the screen as the boot sequence progresses.

·   Just before fully booting, a Loading bar will appear at the bottom of the screen, showing the percent of load that has completed.

·   The Operating Status screen will appear.

After the Q4 has properly powered up, the following sequence of events is indicative of proper communication to the analog and digital boards:

·   The Analog and Digital I/O boards TX/RX lights should be blinking.

·   Each I/O board should have the power LED lighted and the Active LED should be blinking.

WHAT IF THE OPERATING STATUS SCREEN IS NOT SHOWN

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

1.   If no LED's are lit, then check AC and DC power. Refer to the Power Supply section.

2.   Check if the lighting of the LED's is occurring as described in the What Should Occur When Applying Powering section.

·   If the powering up sequence continues to repeat without displaying the Operating Status screen, then there is a booting problem.

3.   Check for bad connections.

4.   Check if an error message is displayed when booting.

·   Be sure to write down any error messages exactly as they appear.

5.   Check that the software is OK:

·   Is the correct software installed?
·   Did you just install new software?

6.   Remove Flashcard and reboot. This will cause the Q4 to boot under a pre-LX operating software. If it boots properly under this older software, then trying re-booting from the Flashcard again. If it doesn't boot with the card, then the Flashcard could be corrupted, and needs to be replaced.

7. Check the display. If the Q4 board is booting but you have no display, check the following:

- Check the 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 may be with the backlight tube. On the LG Philips, NEC and Sharp displays this tube is field replaceable. On the Samsung 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 Q4. It may be necessary to remove the video cable from the back of the display and re-seat 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.

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

BATTERY FUNCTION AND REPLACEMENT

The Q4 board utilizes a battery to maintain correct date and time for the purpose of stamping warnings and shutdowns with the date and time that they occurred. If the date and time are not being maintained properly, it may indicate that the battery is not functioning, and should be replaced. The battery may be ordered through Baltimore Parts (P/N 333Q0001786) or may be purchased at most electronic shops (manufacturers P/N CR-2032).

The battery is partially covered by the communications daughter board, and is located directly beneath the COM1 port (it may be necessary to unplug any connector that is plugged into COM1 to fully access the battery).

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

Locate the Battery Release Clip on the following drawing:
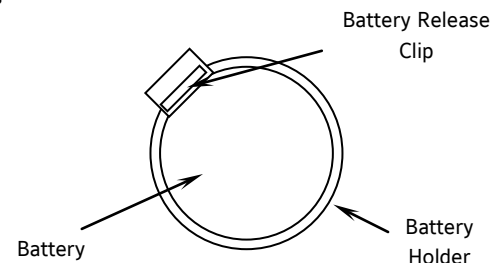
Simply push the clip away from the battery, to release the battery from the holder. Remove the battery, observing the orientation. Take a new battery and place it into the holder in the same orientation as the old battery (the side with the writing must be facing out). Reinstall the COM1 plug (if removed), and return the Control Power switch back to ON.

Once the Q4 has rebooted, the correct Date and Time must be set.

Q4 BOARD
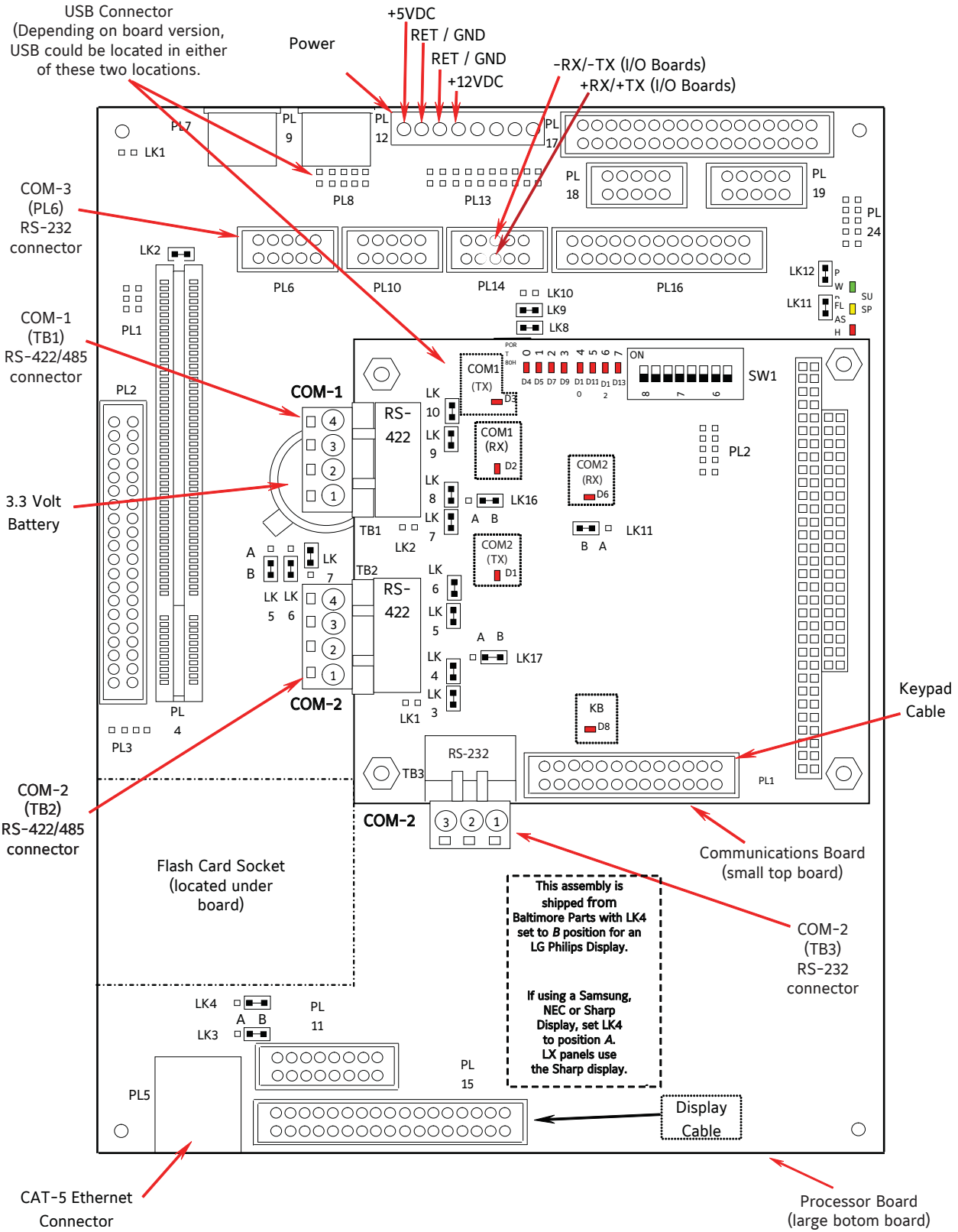
Controller Board Pictorial

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), ensure that you modify the correct link.

Q4 BOARD SETTINGS

Processor Board Jumpers

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

* Standard Setting

Communications Board Jumpers

Com-1 (TB1)

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

* Standard Setting

Com-2 (TB2 - TB3)

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

* Standard Setting

090.610-M (MAY 2016)
Page 28

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION
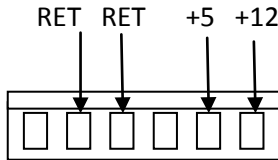
Q4 POWER SUPPLY

EVAPORATOR LX CONTROL PANEL POWER SUPPLY

CAUTION! Measuring the power supply voltages require the control power to be energized. Extreme care must be observed when taking any readings, as 120 VAC is present within the power supply.

The Q4 controller utilizes only the +5 VDS and +12 VDC voltages from the power supply. To perform measurements on the power supply voltages, use a reliable, calibrated Digital Volt Meter (DVM). The DVM should be accurate to 1/100 of a volt DC. Turn the control power switch to ON.
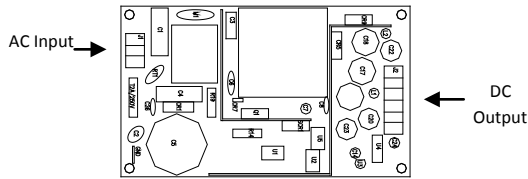
Measure the voltages on the power supply at the DC output connector as shown below:

The following voltage range is considered to be acceptable:

- +5 VDC supply (+5.15 to +5.20 VDC)
- +12 VDC supply (+11.8 to +12.2 VDC)

If the voltages from the power supply are within the acceptable ranges, then measure them at the Q4 control board, as shown below:
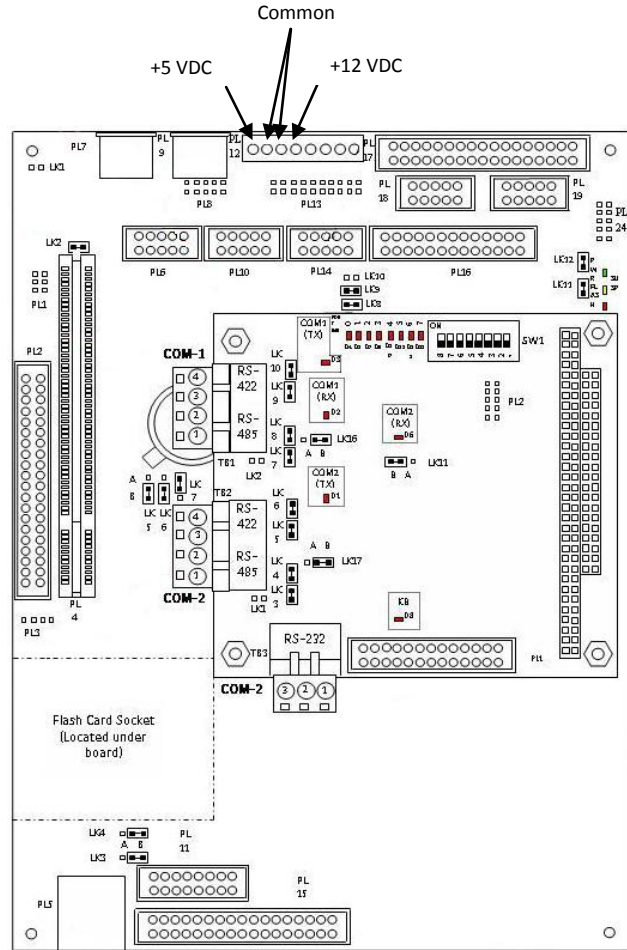
If the voltages from the power supply are within the acceptable ranges, then measure them at the last I/O board in the daisychain, as shown below:
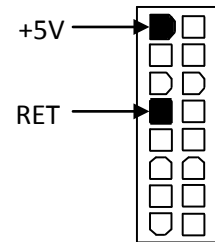
If any of the voltages measure outside of the acceptable range, yet measured correctly at the power supply, then a problem with the wiring harness should be suspected and checked.

REPLACEMENT

If the power supply is found to be bad, or out of adjustment, it will need replacing.

SECTION 5

DIGITAL BOARD

090.610-M (MAY 2016)
Page 30

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

DIGITAL BOARD

INFORMATION

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 Q4/Q5 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™ LX Evaporator Control, some of these I/O channels are dedicated as to their function, through the operating system (software), 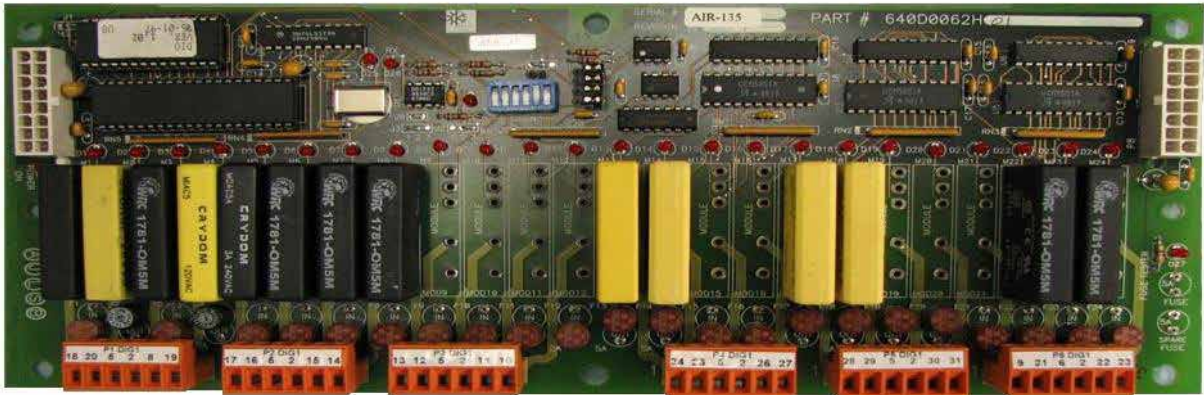enabled options and external wiring. Each channel that is used by the software will have a module plugged into it. A yellow module indicates that it is used for Inputs, a black module is used for Outputs. The standard Quantum™ LX Evaporator Control can have up to two Digital Boards (depending on options).

COMMUNICATIONS LED'S

The 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 Q5 (or Q4) control board, 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 Q5 (or Q4) board is able to serially communicate with each I/O board and provide control signals and data exchange. If these switches are not properly set, the result will be lost or failed communications, or the wrong outputs being energized, or the wrong inputs being received.

CONNECTIONS TO THE QUANTUM™

The Frick® Evaporator control system utilizes up to two Digital, and one Analog Boards. To connect all of these boards together so that the Q4/Q5 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. Upon close examination of this harness, you will notice that each of the connectors have two rows of connections. The wires that are inserted into the positions of one row, are internally daisy-chained 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 daisy-chain, these voltages and signals cannot continue through the daisy-chain 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 Replacement Parts list) must be installed onto the open connector.

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 Remote panel 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:
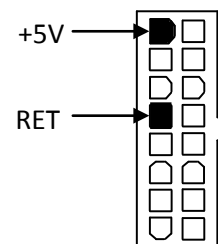
Set the DVM to read DC, and set the proper range. The voltage reading must read a minimum of +5.0 Vdc. The Power-I/O harness will have an associated voltage drop at each board connection. As an example, if you are reading the voltage at the first I/O board in the daisy-chain, and it reads 4.98 Vdc, you 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 power supply may need adjustment (see the section on power supplies).

Frick
INDUSTRIAL REFRIGERATION

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

090.610-M (MAY 2016)
Page 31

·   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 Board(s) 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.

The following pictorial shows a side view of the 120 VAC Input module. The color of an Input module is yellow:
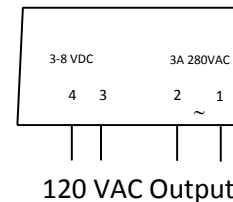

120 VAC
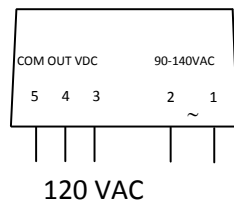
Never plug a 120 Volt Input module into a 240 Volt system, and vice-versa. Never plug an Output module into a position designated for an Input module.

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™ LX software program.

The following pictorial shows a side view of the 120 VAC Output module. The color of an Output module is black:

120 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:
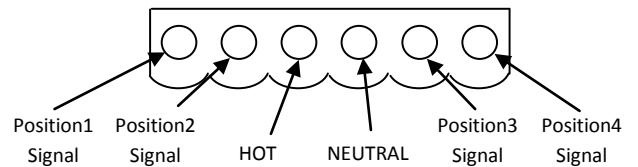
The Digital I/O board's I/O modules are configured by proper module selection, AC or DC, operating voltage, input or output, and moving the fuse to the in or out position. An LED is associated with each module and displays the state of each module. A lit LED represents an Input that is High, receiving a signal or an Output that is On.

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

090.610-M (MAY 2016)
Page 32

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

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.
6. If you are receiving an Alarm or Shutdown from a digital input in which the adjacent LED indicator light is on, check the Digital I/O screen to see if that channel is turning on and off. If so, replace the input module.

REPLACING A DEFECTIVE DIGITAL BOARD

The procedure to replace a Digital board is outlined below:

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 using the old board as a reference (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 User Level 1 or higher, then select the Setpoints Menu, then the Communications Menu. On the Communications Screen is a button labeled as **[Redetect I/O Comms]**. Clicking on the **[Redetect I/O Comms]** button will cause the controller to examine the internal I/O communications of the panel, and initialize all connected 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.

Frick
INDUSTRIAL REFRIGERATION

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

090.610-M (MAY 2016)
Page 33

DIGITAL I/O BOARD PICTORIAL

090.610-M (MAY 2016)
Page 34

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

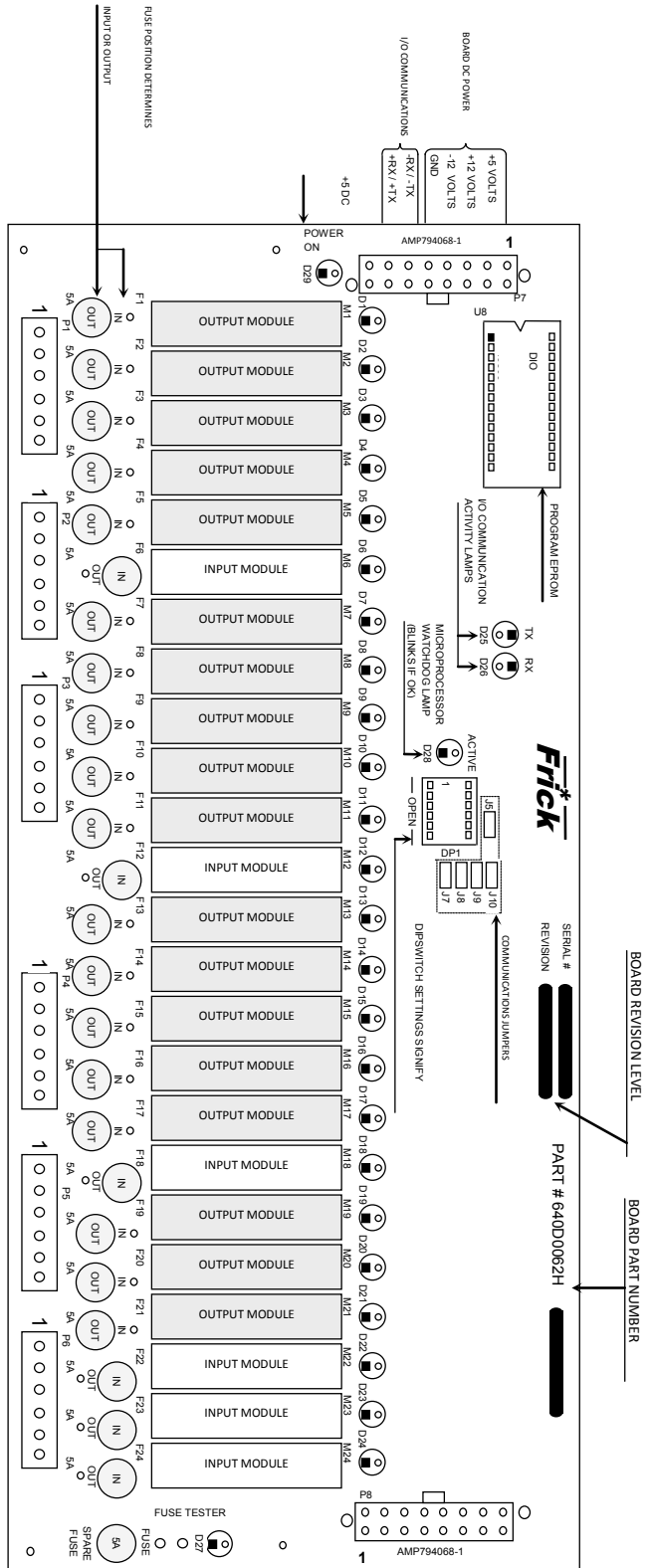# DIGITAL BOARD SETTINGS

COMMUNICATIONS SETTINGS

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

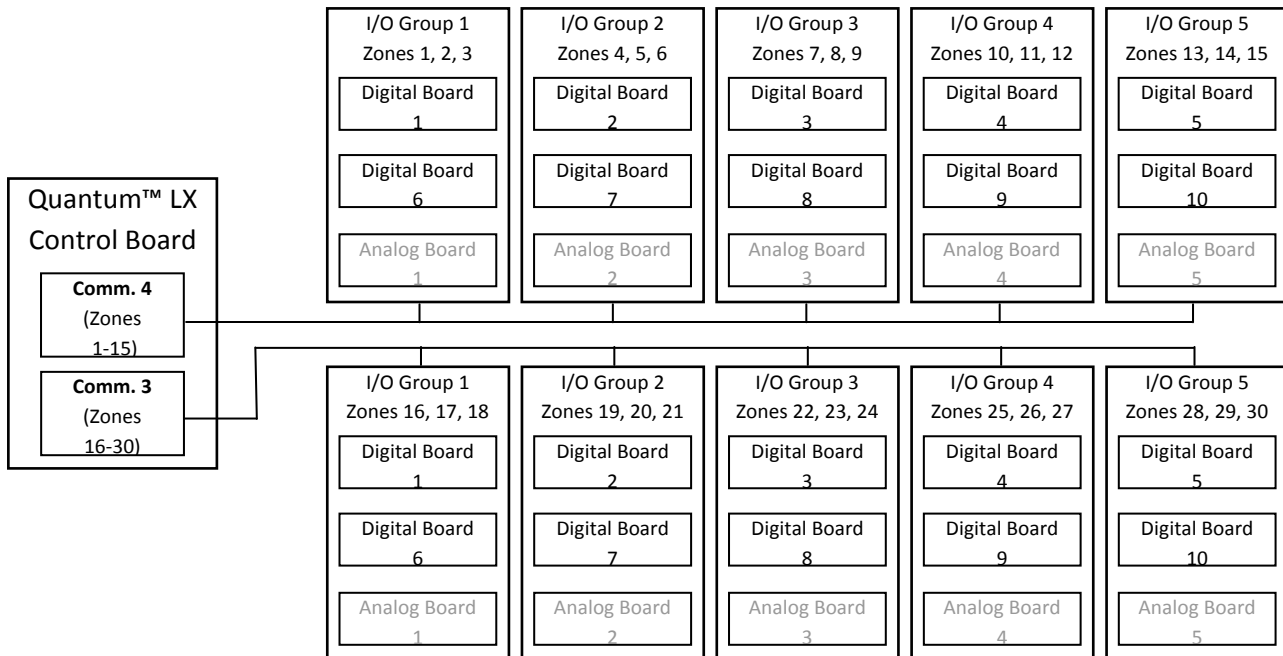| J5	in	120 ohm long communications line termination.
	out*	No termination.
J7	in	RS-422/485 transmit pull-up for long communications lines.
	out*	No pull-up.
J8	in	RS-422 transmit pull-up for long communications lines.
	out*	No pull-up.
J9	in	RS-422/485 receive pull-down for long communications lines.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

* = standard setting

DIPSWITCH SETTINGS

The following table is to be used to set the digital board addresses. Refer to and study the diagram at the bottom of this page to determine the correct board configuration.

Comm. 4 of Quantum™ (Zones 1-15)							
I/O Group	Digital Board #	SW1	SW2	SW3	SW4	SW5	SW6
1	1	On	On	On	On	Off	On
	6	Off	On	Off	On	Off	On
2	2	Off	On	On	On	Off	On
	7	On	Off	Off	On	Off	On
3	3	On	Off	On	On	Off	On
	8	Off	Off	Off	On	Off	On
4	4	Off	Off	On	On	Off	On
	9	On	On	On	Off	Off	On
5	5	On	On	Off	On	Off	On
	10	Off	On	On	Off	Off	On

Comm. 3 of Quantum™ (Zones 16-30)							
I/O Group	Digital Board #	SW1	SW2	SW3	SW4	SW5	SW6
1	1	On	On	On	On	Off	On
	6	Off	On	Off	On	Off	On
2	2	Off	On	On	On	Off	On
	7	On	Off	Off	On	Off	On
3	3	On	Off	On	On	Off	On
	8	Off	Off	Off	On	Off	On
4	4	Off	Off	On	On	Off	On
	9	On	On	On	Off	Off	On
5	5	On	On	Off	On	Off	On
	10	Off	On	On	Off	Off	On

I/O Group 1 Zones 1, 2, 3	I/O Group 2 Zones 4, 5, 6	I/O Group 3 Zones 7, 8, 9	I/O Group 4 Zones 10, 11, 12	I/O Group 5 Zones 13, 14, 15
Digital Board 1	Digital Board 2	Digital Board 3	Digital Board 4	Digital Board 5
Digital Board 6	Digital Board 7	Digital Board 8	Digital Board 9	Digital Board 10
Analog Board 1	Analog Board 2	Analog Board 3	Analog Board 4	Analog Board 5

Quantum™ LX Control Board

Comm. 4 (Zones 1-15)

Comm. 3 (Zones 16-30)

I/O Group 1 Zones 16, 17, 18	I/O Group 2 Zones 19, 20, 21	I/O Group 3 Zones 22, 23, 24	I/O Group 4 Zones 25, 26, 27	I/O Group 5 Zones 28, 29, 30
Digital Board 1	Digital Board 2	Digital Board 3	Digital Board 4	Digital Board 5
Digital Board 6	Digital Board 7	Digital Board 8	Digital Board 9	Digital Board 10
Analog Board 1	Analog Board 2	Analog Board 3	Analog Board 4	Analog Board 5

SECTION 6

ANALOG BOARD

090.610-M (MAY 2016)
Page 36

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION
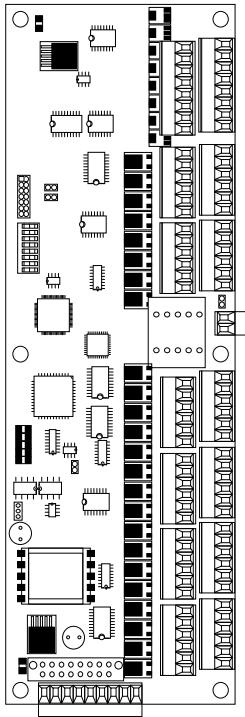
ANALOG BOARD

OVERVIEW

The Frick® Quantum™ LX Evaporator 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 begins 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, or provide a warning. Unlike a digital signal, which is typically either an on or off state, an analog signal can assume a wide range of values, such as a temperature probe's reading a wide range of temperatures.

The method used for receiving (and sending) these signals, is the analog board. The analog devices are wired directly to the board, and the on-board software/ hardware converts the electrical signals received from these devices into data, which is then sent on to the Q4 or Q5 control board via communications, and is monitored by the control software.

GENERAL DESCRIPTION

This board features twenty-four input channels, and eight output channels. The board channels are configured through software, rather than using physical jumpers. A more detailed description of the operation of this board is provided in the sections that follow. A drawing f 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™ Evaporator Control, these I/O channels are dedicated through the software and external wring, as to the function of each channel.

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™ LX, 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™ LX 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™ Evaporator control system utilizes up to two Digital, and one Analog Board. In order 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 manual (see the Power I/O Wiring Harness drawing). This harness has a 6-pin connector at one end that plugs into the Quantum™. Another connector plugs into the power supply. The remaining three connectors (16 pin) will plug into each of the Digital and Analog Boards in the system.

Upon close examination of this harness, you will notice that each of the connectors have two rows of connections. The wires that are inserted into the positions of one row, are internally daisy-chained 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 daisy-chain, 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 Replacement Parts list) must be installed onto the open connector.

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) LED'S

Located on the Analog Board are two power LED's. 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 the 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:
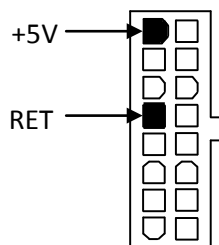
Set the DVM to read DC, and set the proper range. The voltage reading must read a minimum of +4.98 Vdc. The Power-I/O harness will have an associated voltage drop at each board connection. As an example, if you are reading the voltage at the first I/O board in the daisy-chain, and it reads 4.98 Vdc, 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 Remote panel 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 daisy-chain 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 Remote panel 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 Board has an Active LED indicator that blinks when the board's software is running.

If the Active LED is not blinking, it could be an indication that the internal program is not running. Try powering the Remote panel 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.

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).
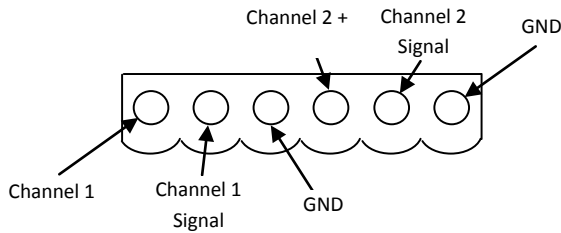
ANALOG OUTPUTS

An Analog Output is the portion of the hardware that the Quantum™ uses to provide control. These outputs are dedicated for a 4-20 mA signal and cannot be changed through the software configuration.

TROUBLESHOOTING THE ANALOG INPUTS AND OUTPUTS

Some problems that may be 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

090.610-M (MAY 2016)
Page 38

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

to ground (GND) of the external device for channel 2, as shown below:

Channel 2 +   Channel 2 Signal   GND

Channel 1   Channel 1 Signal   GND

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. 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 incorrect 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. The third pin on pressure sensors is ground.
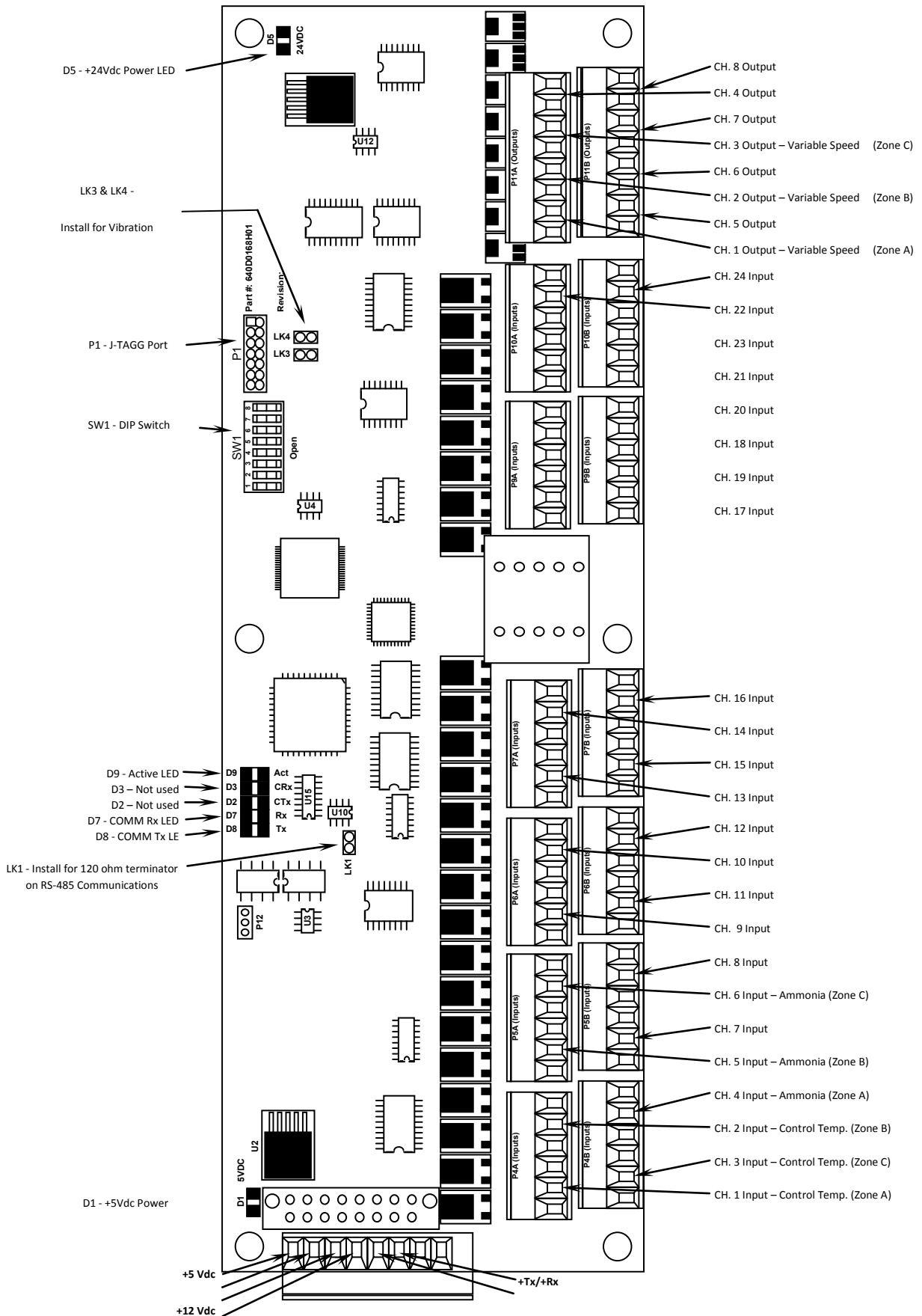
REPLACING A DEFECTIVE ANALOG BOARD

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 unit and remove the new board from its packing and place both on an anti-static surface.
5. Check that all jumpers, dipswitches and components are properly setup on the new board using the old board as a reference (refer to the Analog Settings tables near the end of this section).
6. Install the modified replacement board in the panel.
7. Plug all connectors back in.
8. Turn on control power.
9. After the panel has rebooted, access the Analog Board Configuration Setup screen, 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 be 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 User Level 1 or higher, then select the Setpoints Menu, then the Communications Menu. On the Communications Screen is a button labeled as **[Redetect I/O Comms]**. Clicking on the **[Redetect I/O Comms]** button will cause the controller to examine the internal I/O communications of the panel, and initialize all connected 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.

ANALOG BOARD PICTORIAL

D5 - +24Vdc Power LED

LK3 & LK4 -

Install for Vibration

P1 - J-TAGG Port

SW1 - DIP Switch

D9 - Active LED
D3 – Not used
D2 – Not used
D7 - COMM Rx LED
D8 - COMM Tx LE

LK1 - Install for 120 ohm terminator
on RS-485 Communications

D1 - +5Vdc Power

CH. 8 Output
CH. 4 Output
CH. 7 Output
CH. 3 Output – Variable Speed   (Zone C)
CH. 6 Output
CH. 2 Output – Variable Speed   (Zone B)
CH. 5 Output
CH. 1 Output – Variable Speed   (Zone A)

CH. 24 Input
CH. 22 Input
CH. 23 Input
CH. 21 Input
CH. 20 Input
CH. 18 Input
CH. 19 Input
CH. 17 Input

CH. 16 Input
CH. 14 Input
CH. 15 Input
CH. 13 Input
CH. 12 Input
CH. 10 Input
CH. 11 Input
CH. 9 Input
CH. 8 Input
CH. 6 Input – Ammonia (Zone C)
CH. 7 Input
CH. 5 Input – Ammonia (Zone B)
CH. 4 Input – Ammonia (Zone A)
CH. 2 Input – Control Temp. (Zone B)
CH. 3 Input – Control Temp. (Zone C)
CH. 1 Input – Control Temp. (Zone A)

+5 Vdc
+Tx/+Rx
+12 Vdc

090.610-M (MAY 2016)
Page 40

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

ANALOG BOARD SETTINGS

COMMUNICATIONS

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

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

* default setting

MISCELLANEOUS

LK2	In	Not Used
	Out *	
LK3	In	Not Used
	Out *	
LK4	In	Not Used
	Out *	

* default setting

NOTE: Although LK2, 3 and 4 are not used, they must still be set for the default positions.

DIPSWITCH SETTINGS

The following table is to be used to set the analog board addresses. Refer to and study the diagram at the bottom of this page to determine the correct board configuration.

Comm. 4 of Quantum™ (Zones 1-15)											Comm. 3 of Quantum™ (Zones 16-30)									
I/O Group	Analog Board #	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8		I/O Group	Analog Board #	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
1	1	Off	Off	Off	Off	Off	Off	Off	Off		1	1	Off	Off	Off	Off	Off	Off	Off	Off
2	2	On	Off	Off	Off	Off	Off	Off	Off		2	2	On	Off	Off	Off	Off	Off	Off	Off
3	3	Off	On	Off	Off	Off	Off	Off	Off		3	3	Off	On	Off	Off	Off	Off	Off	Off
4	4	On	On	Off	Off	Off	Off	Off	Off		4	4	On	On	Off	Off	Off	Off	Off	Off
5	5	Off	Off	On	Off	Off	Off	Off	Off		5	5	Off	Off	On	Off	Off	Off	Off	Off

SECTION 7

SERVICE SCREENS

090.610-M (MAY 2016)
Page 42

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

SERVICE SCREENS

SERVICE – Communications Log

DESCRIPTION: This screen allows the technician to view the status of all communications ports.

The following user selectable buttons are provided:

- **[Show Comm1]**
- **[Show Comm2]**
- **[Show Comm3]**
- **[Show Comm4]**

This screen allows the technician to view all of the communications information that the Quantum™ LX is receiving and transmitting, one port at a time. Simply select the button at the upper right side of the screen that corresponds to the port that you wish to view. The selected port name (in this case Comm4) will appear in the upper left side of the screen.

Each time a new command is sent or received, the screen will need to be refreshed by selecting the **[Show CommX]** button (where X is replaced with the comm port number).

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

SERVICE – Communications Loop-Back Test
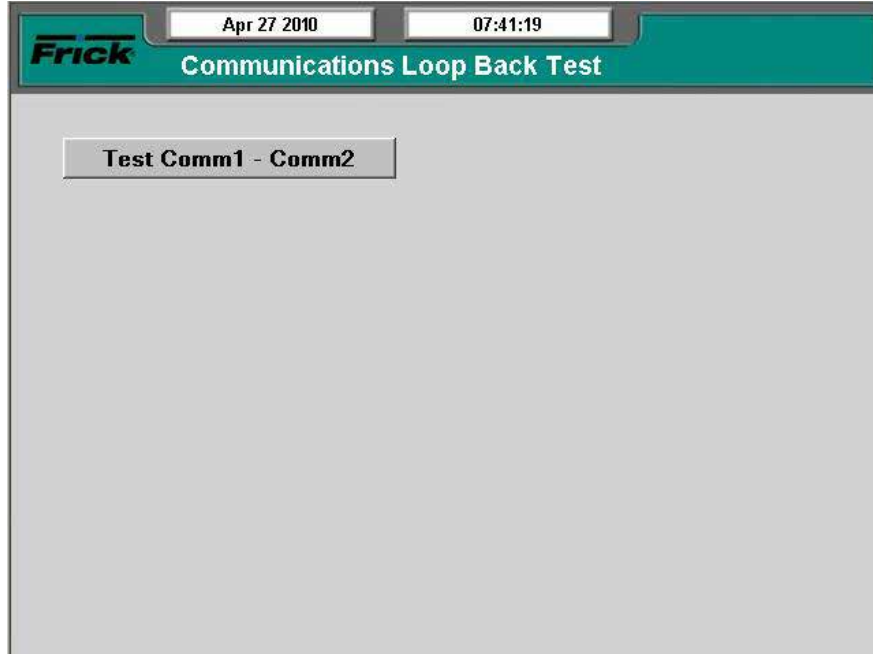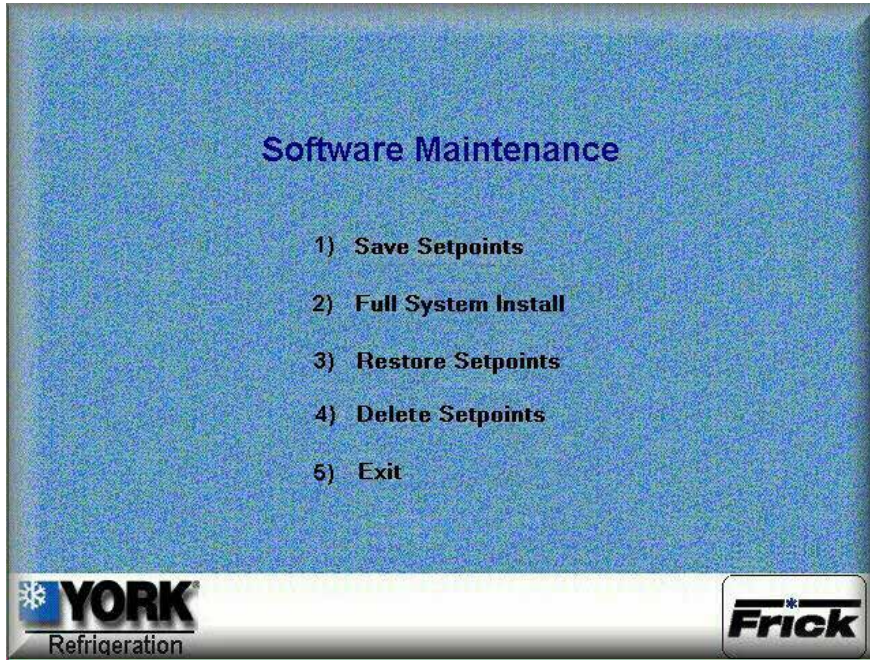

DESCRIPTION: This screen allows the user to test the integrity of each of the communications channels, by using a Loop–Back cable. Refer to the Evaporator Communications Manual (090.610– CS) for specific information about this test.

SERVICE – Diagnostics
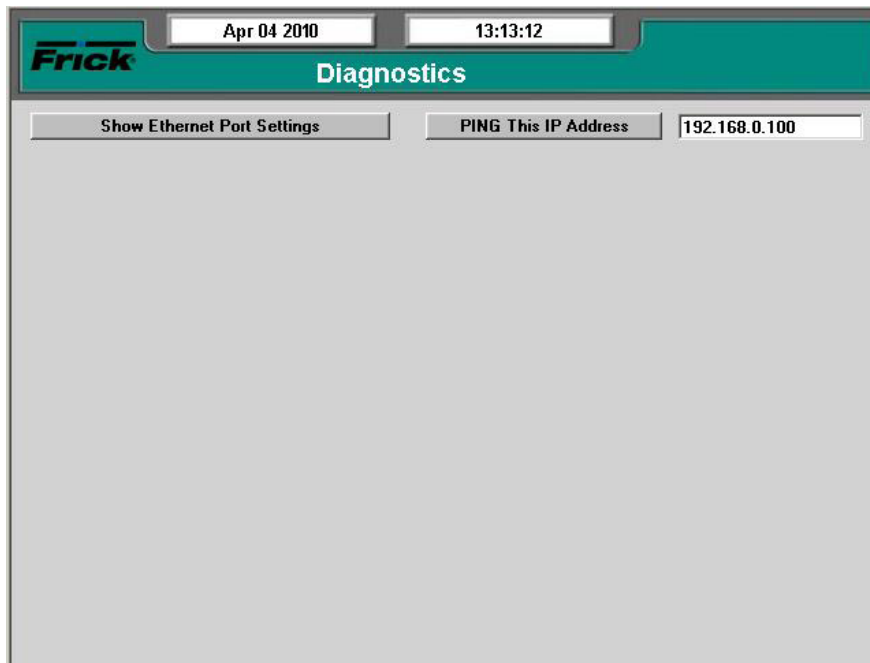
DESCRIPTION: The Diagnostics screen has been provided as a way for the user to test the Ethernet connection. Refer to the Evaporator Communications manual (090.610–CS) for further information on this screen.

SERVICE – Software Maintenance

DESCRIPTION: This screen allows the technician to perform system software maintenance. **NOTE:** Use caution when accessing this screen remotely with a web browser.

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

- Ensure that all setpoint values have been documented as a safety precaution. Install a USB device into the provided connection on the Quantum™.
- With power ON, insert the USB device into the USB port. Ensure that the tabbed key of the drive connector is plugged in as shown in Figure 1 of this section.
- Go to User Level 2. The default password is 20.
- Press the **[Menu]** key.
- Cursor down to Service... and press [**Enter**].
- Cursor down to Software Maintenance and press the **[Enter]** key.

The following selections have been provided:

1) **Save Setpoints** – Use this option to save all setpoints and custom text to a USB device as a form of backup:
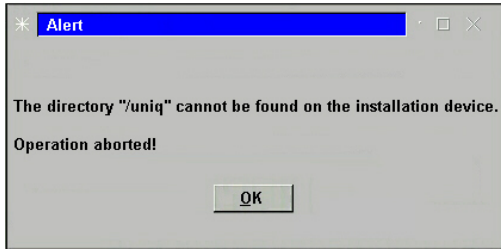
- Press **[1]** to Save Setpoints.
- The program will read the USB device, and the following dialog box will appear:
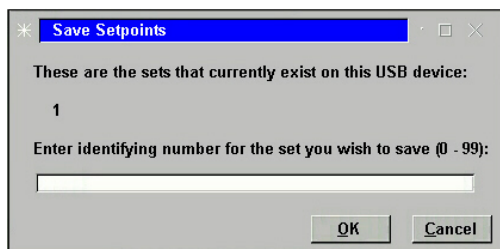
- Any numerals that appear on the center line of this box will represent units that have already been saved (from 0 to 99). If no units have yet been saved, the center line will be blank.
- Enter a number on the keypad that corresponds to the unit number that you wish to save, and then press **[Enter]**. If the unit number has not been saved before, the setpoints will be saved to a file on the USB device (a progress bar will appear asking you to Please Wait... In the future, any time you try to write the setpoints to this number, you will be prompted with a message telling you that the set number already exists – do you wish to overwrite it? Answer by highlighting the Yes button, and pressing **[Enter]** if you wish to overwrite the values. If you enter a number that does not appear on the center line, no such warning will appear.
- After the file has been written, the dialog boxes will disappear, and you can either exit or continue with another function.

2) **Full System Install** – Use this option to install the program:
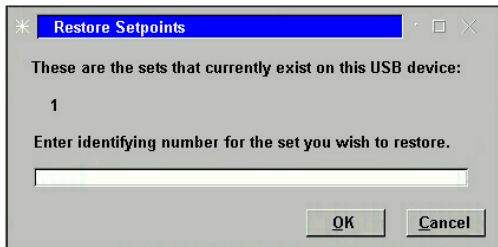
- Ensure that all setpoint values have been documented as a safety precaution.
- Press **[2]** to do a Full System Install.
- If a valid USB device with the operating system loaded on it is plugged in, the software will be loaded. If however, there is no USB device installed, or the device does not contain the operating software, the following dialog box will appear:

090.610-M (MAY 2016)
Page 46

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

Alert

The directory "/uniq" cannot be found on the installation device.

Operation aborted!

OK

·   If the above dialog box appears, you must insert a valid software upgrade USB device.

3) **Restore Setpoints** – Use this option to re-load previously saved setpoints and custom text to the Quantum™.

·   Ensure that all setpoint values have been documented as a safety precaution. Install the previously saved setpoint USB device into the provided connection on the Quantum™.
·   Press **[3]** to Restore Setpoints.
·   The software program will read the USB device, and the following dialog box will appear:

Restore Setpoints

These are the sets that currently exist on this USB device:

1

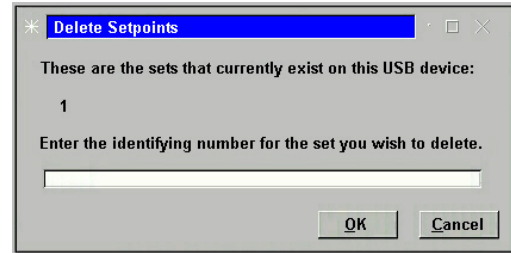Enter identifying number for the set you wish to restore.

OK   Cancel

·   Any numerals that appear on the center line of this box will represent units that have already been saved (from 0 to 99). If no units have yet been saved, the center line will be blank and therefore there are no setpoints to restore.
·   Enter a number on the keypad that corresponds to the unit number that you wish to restore, and then press **[Enter]**.
·   A progress bar will appear asking you to Please Wait...
·   After the file has been written or updated, the dialog boxes will disappear, and you can either exit, or continue with another function.

4) **Delete Setpoints** – Use this option to delete the setpoints and custom text for a particular unit:

·   Ensure that all setpoint values have been documented as a safety precaution. Install the previously saved setpoints USB device into the provided connection on the Quantum™.
·   Press the **[4]** button.

·   The software program will read the USB device, and the following dialog box will appear:

Delete Setpoints

These are the sets that currently exist on this USB device:

1

Enter the identifying number for the set you wish to delete.

OK   Cancel

·   Any numerals that appear on the center line of this box will represent units that have already been saved (from 0 to 99). If no units have yet been saved, the center line will be blank, and therefore there are no setpoints to delete.
·   Enter a number on the keypad that corresponds to the unit number that you wish to delete, highlight the Ok button, and then press **[Enter]**. You will be prompted with a new dialog box which will ask you OK to delete set number (0-99)?
·   Highlight the Yes button, and press **[Enter]**. The dialog box will be updated with a new message stating that Set number (0-99) has been deleted!
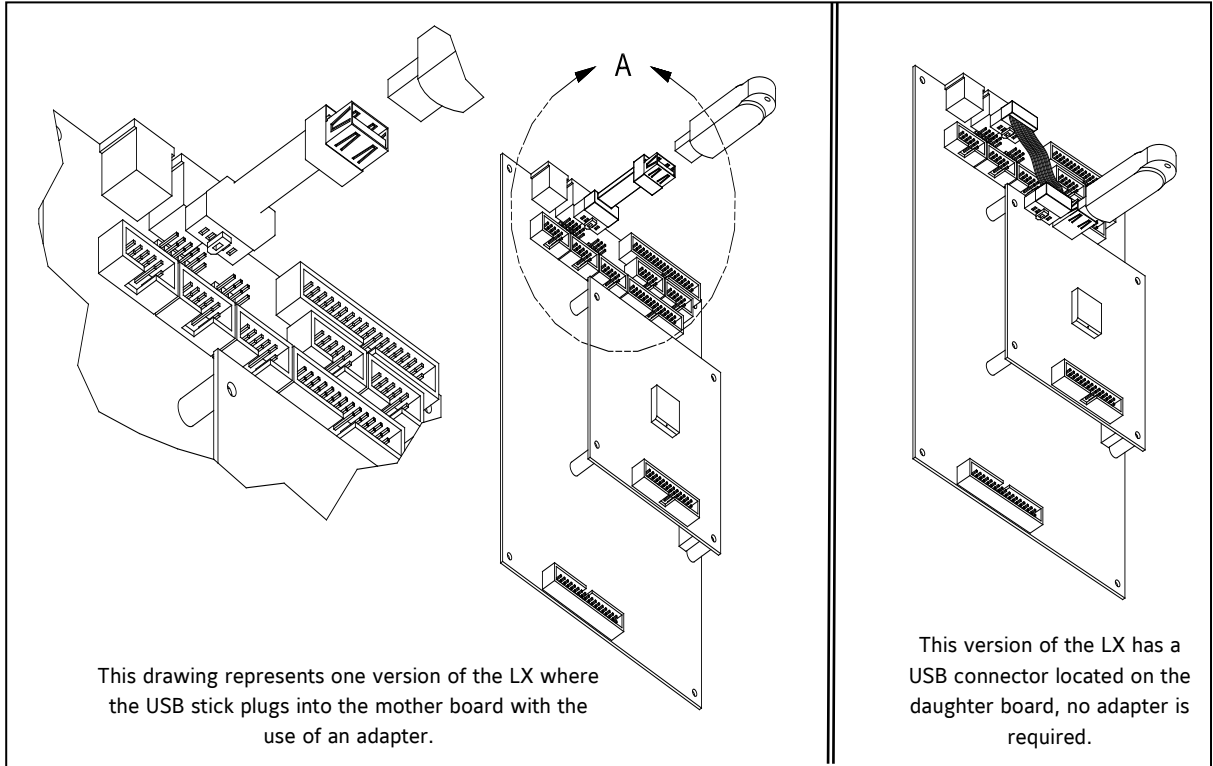·   Press **[Enter]** to return to the Software Maintenance menu.

5) **Exit** – Use this selection to leave this screen:

·   While leaving the USB device plugged in, press **[5]** to Exit.
·   During the reboot of the Quantum™ LX, a message will appear that says, "A System Update file has been detected on the mounted USB device. Do you wish to perform this update?" Select **[Yes]**, and a System Update will be performed.
·   At the conclusion of the System Update, a message will appear that says, "The USB device can now be removed and power should be recycled." Follow these instructions.
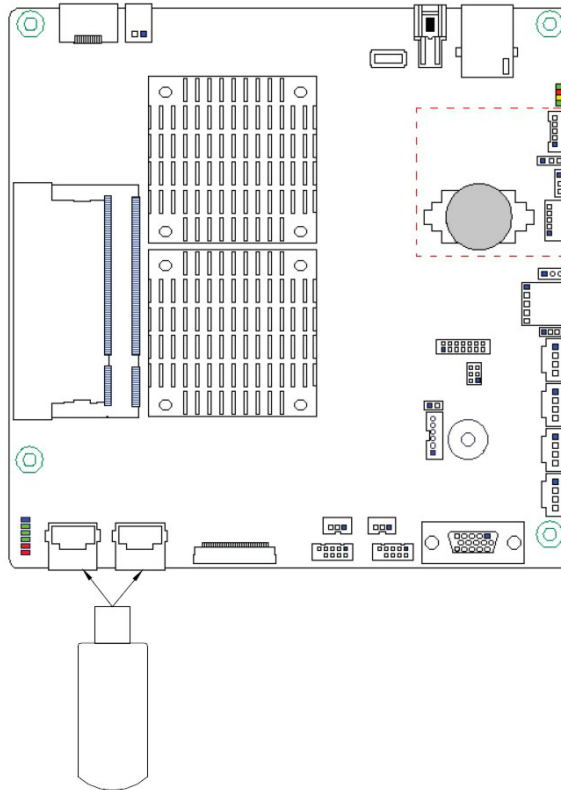
Setpoint Defaults When Performing A Quantum™ LX Software Upgrade

The term software upgrade refers to the whole procedure of Saving Setpoints, Full System Installs, and Restoring Setpoints when on the Software Maintenance screen. They get set to these default values even after a Restore Setpoints is performed, so the individual doing the upgrade must then set them manually to what they need to be if they are critical to the application.

USB Memory Stick Plug-in locations

A

This drawing represents one version of the LX where the USB stick plugs into the mother board with the use of an adapter.

This version of the LX has a USB connector located on the daughter board, no adapter is required.
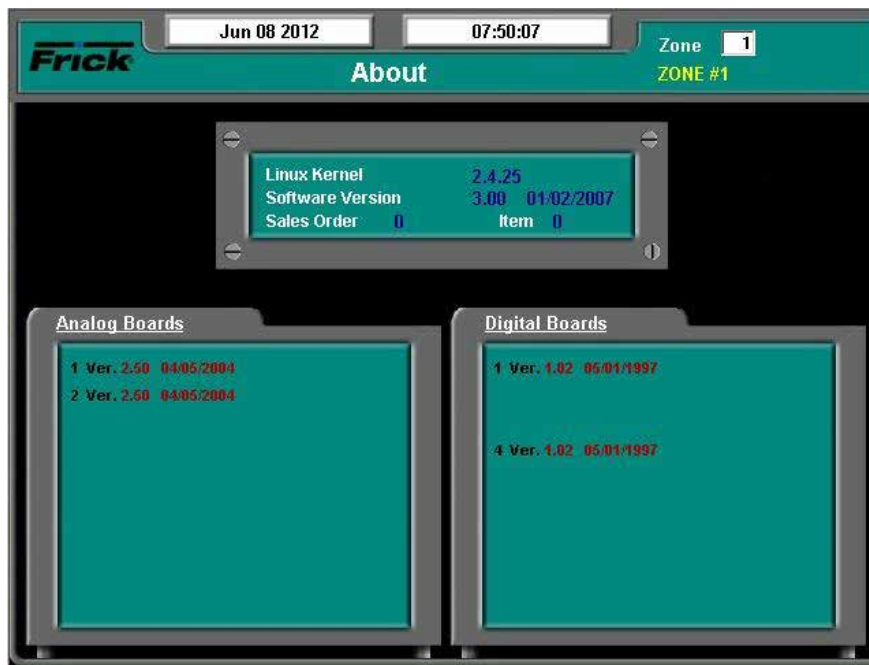
Q4 USB Location

Q5 USB Locations

MISCELLANEOUS MAINTENANCE SCREENS

About

DESCRIPTION: 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 should result in sensor fault shutdown message that is 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.

SECTION 8

TROUBLESHOOTING

TROUBLESHOOTING A PROBLEM THAT APPEARS UNEXPLAINABLE

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

- Is the panel powered by an isolating power source such as a control transformer?

- Is the panel powered from a lighting or utility panel?

- Has the unit ever worked properly?

- If the unit used to work properly, try to determine when the problem first showed up.

- It is important to know if the problem occurs randomly, frequently, or all the time.

- Check what the temperature is at the unit location. Is it very hot or very cold?

- Make sure that a motor is not blowing exhaust air on the control panel.

- 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?

- If it just started to act up, then check if anything was recently changed in the system (i.e. software or hardware.)

- If it just started to act up, then check if any service was recently done to the unit or its electrical system?

- 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.

- 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.)

- If this is an older plant, has the plant wiring been brought up to code?

- Is power wiring mixed with control wiring?

- Is power wiring mixed with sensor wiring?

- Is power wiring mixed with communications wiring?

- Ensure that 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.

- Ensure that 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.

- 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 appropriate channel of the Analog board and then use a DVM and check each white wire to machine ground and each black wire to machine ground.

- 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.

- 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.

- Ensure that there is no AC wiring lying next to any printed circuit boards.

- Unexplainable unit failures are usually indicative of noise due to wiring problems (i.e. incorrect earth grounds, mixed power and control wiring, unsuppressed coils, etc)

- If the unit is unexplainably shutting down, check if the machine shares power with something else.

090.610-M (MAY 2016)
Page 50

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

ERASING THE SYSTEM SETPOINTS

In the event it becomes necessary to erase the systems setpoints, use the following procedure:

1. Ensure that the existing setpoints are documented if possible.
2. Power the controller down.
3. Locate the processor board (located in the Quantum™ LX Evaporator Control Panel).
4. If the processor has the Q4 processor board, locate and temporarily remove LK11 (on the larger of the two boards).
5. Power the unit up.
6. Wait for one minute to allow the processor to fully boot.
7. Power the unit down.
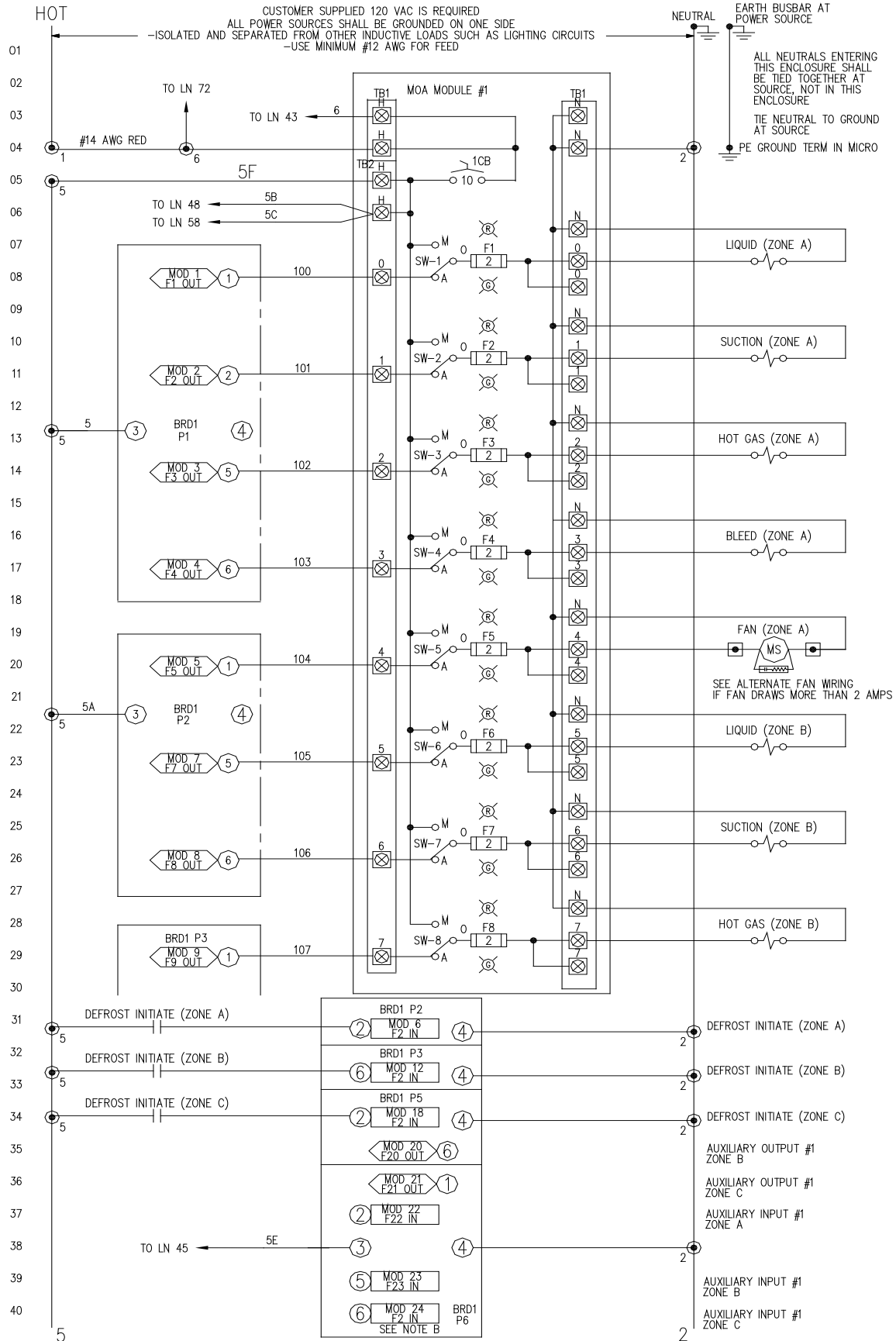8. Replace LK11 if removed for the Q4.
9. Power back up.

SECTION 9

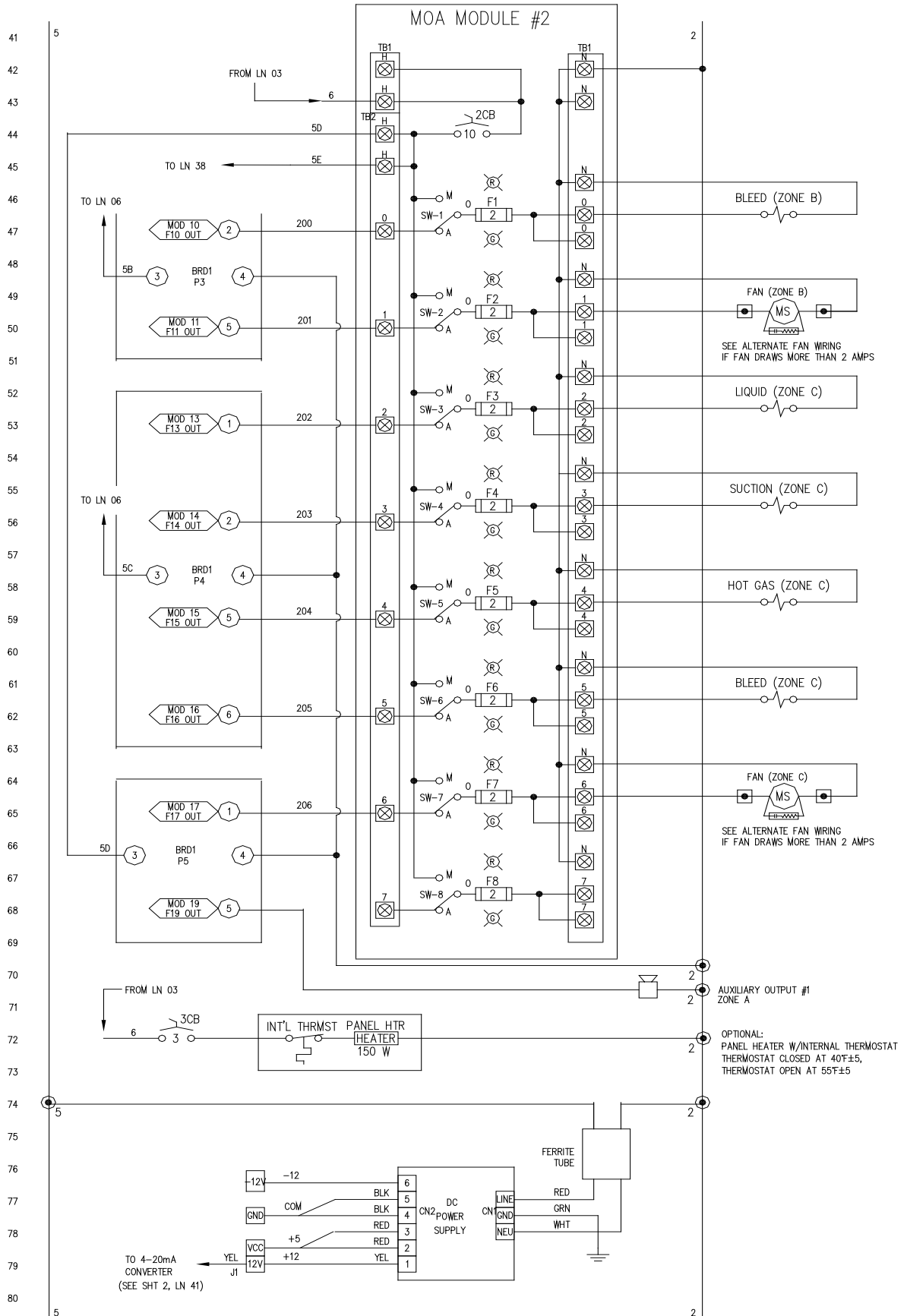# EVAPORATOR CONTROL PANEL AND REMOTE PANEL DRAWINGS

This table lists the numbers for the drawings that appear on the following pages. The drawings shown here is 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.

Wiring Diagrams	Page	Drawing Number
Digital Inputs/Outputs	52 – 54	643D0015 Rev. E
Analog Inputs/Outputs	55 – 57	643D0015 Rev. E
Communications Wiring Diagrams	58	N/A

090.610-M (MAY 2016)
Page 52

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

WIRING DIAGRAMS
Digital Inputs/Outputs (Page 1 of 3)

Digital Inputs/Outputs (Page 2 of 3)

090.610-M (MAY 2016)
Page 54

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

Digital Inputs/Outputs (Page 3 of 3)

NOTE A:
A SURGE SUPPRESSOR OR MOV TO BE INSTALLED ACROSS
ALL INDUCTIVE LOADS IN CONTROL CENTER.

NOTE B:
ALL INPUT MODULE VOLTAGE RATINGS MUST MATCH THE
INCOMING POWER

⊞⎍⎍⎍ SURGE SUPPRESSOR
SUPPRESSOR SPECIFICATIONS:
RC NETWORK CONSISTING OF A .1 MFD CAPACITOR, 600
VDC IN SERIES WITH A 47 OHM RESISTOR.
USE ELECTROCUBE #RG2031-3-6 OR EQUAL.

▱ VARISTOR
METAL OXIDE VARISTOR (MOV) SPECIFICATIONS:
GE #V130LA10A OR EQUAL FOR 120 VOLTS

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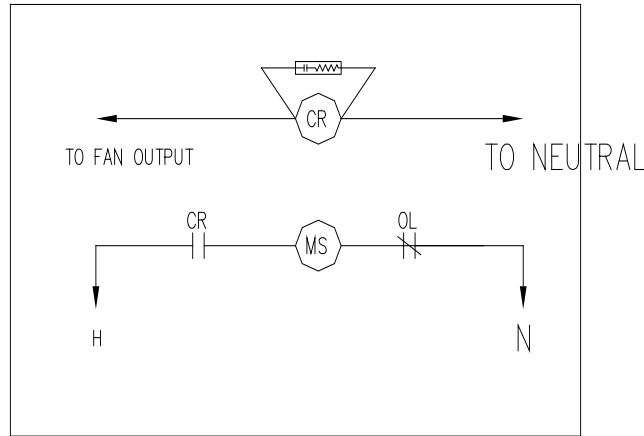
————— WIRING BY OTHERS- ALL WIRING ENTERING CONTROL
CENTER (INCLUDING GROUND & NEUTRAL) TO BE #14
AWG STRANDED WIRES UNLESS SPECIFIED OTHERWISE.

◉ TERMINALS ON BACKPLATE

▣ TERMINALS IN MOTOR STARTER

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

NO SINGLE PHASE OVER 300 VOLTS SHALL ENTER OR LEAVE PANEL

ALL 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 COMPUTER BOARDS AND EPROMS,
SEE MMIB NO. 4.11.10.11

Analog Inputs/Outputs (Page 1 of 3)

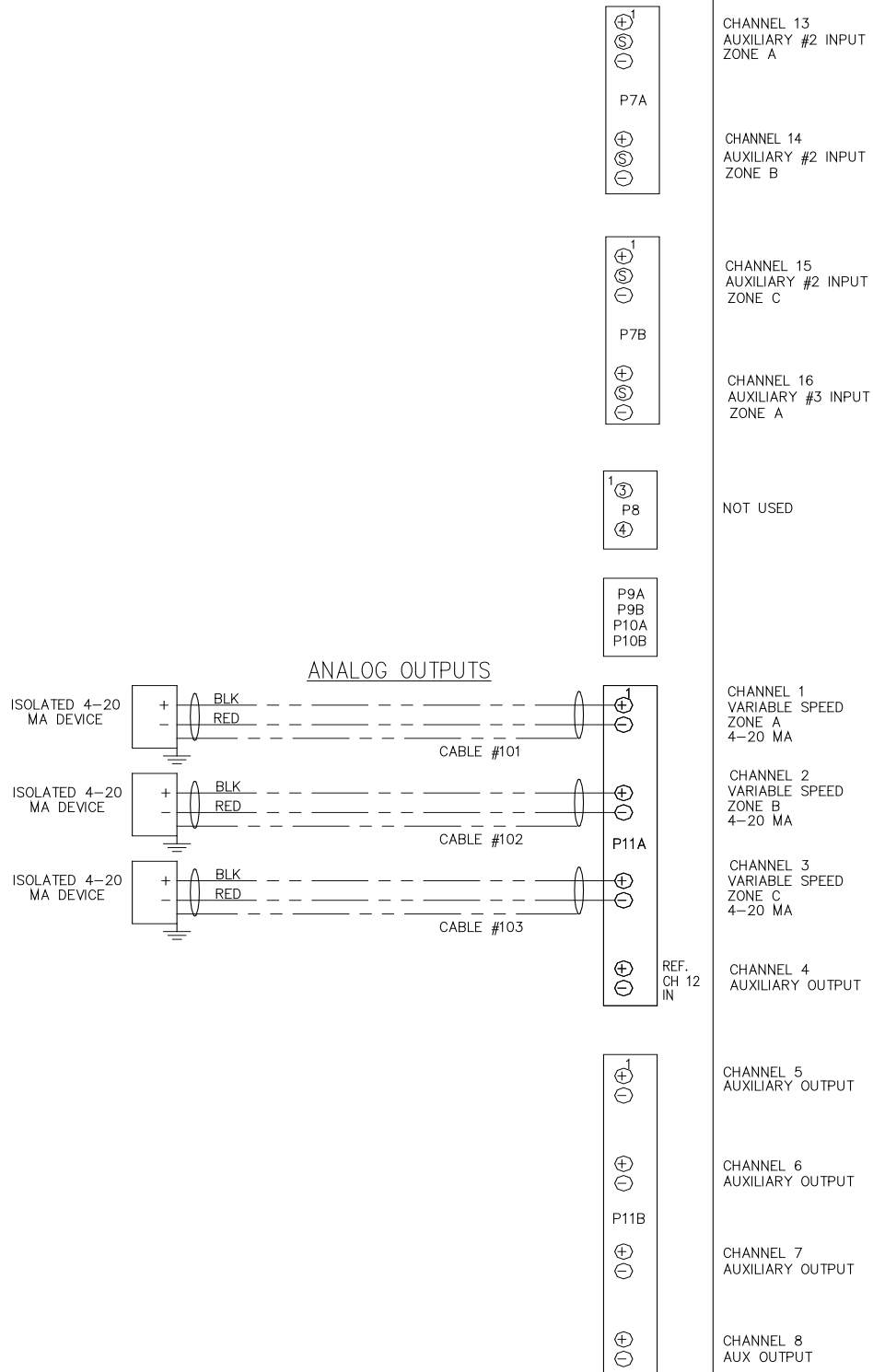## Analog Inputs/Outputs (Page 2 of 3)

5   2

41
42
43

P7A

CHANNEL 13
AUXILIARY #2 INPUT
ZONE A

44
45

CHANNEL 14
AUXILIARY #2 INPUT
ZONE B

46
47
48

P7B

CHANNEL 15
AUXILIARY #2 INPUT
ZONE C

49
50
51

CHANNEL 16
AUXILIARY #3 INPUT
ZONE A

52
53
54

P8

NOT USED

55
56
57

P9A
P9B
P10A
P10B

58

ANALOG OUTPUTS

ISOLATED 4-20
MA DEVICE

BLK
RED

CABLE #101

CHANNEL 1
VARIABLE SPEED
ZONE A
4-20 MA

59
60
61

ISOLATED 4-20
MA DEVICE

BLK
RED

CABLE #102

CHANNEL 2
VARIABLE SPEED
ZONE B
4-20 MA

62

P11A

63

ISOLATED 4-20
MA DEVICE

BLK
RED

CABLE #103

CHANNEL 3
VARIABLE SPEED
ZONE C
4-20 MA

64
65

REF.
CH 12
IN

CHANNEL 4
AUXILIARY OUTPUT

66
67
68

CHANNEL 5
AUXILIARY OUTPUT

69
70

CHANNEL 6
AUXILIARY OUTPUT

71
72

P11B

73

CHANNEL 7
AUXILIARY OUTPUT

74
75

CHANNEL 8
AUX OUTPUT

76
77
78
79
80

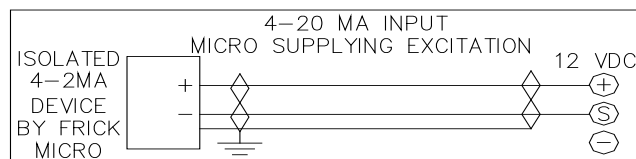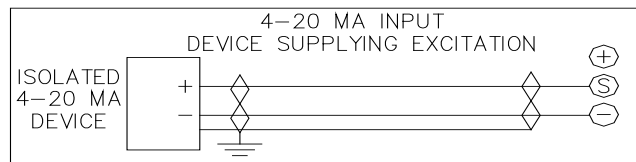5   2

Analog Inputs/Outputs (Page 3 of 3)

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

NOTE 2A:
TEMPERATURE WIRING SPECIFICATIONS:
MINIMUM CABLE SIZE FOR SENSOR WIRING TO BE 22 AWG, TWISTED
PAIR — BELDEN #8762 OR EQUAL 20/2 TWISTED PAIR SUGGESTED
IF CABLE HAS A DRAIN WIRE, GROUND DRAIN WIRE AT ONE END
ONLY AND INSULATE OTHER END.   2000 FT. MAX. DISTANCE

090.610-M (MAY 2016)
Page 58

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION
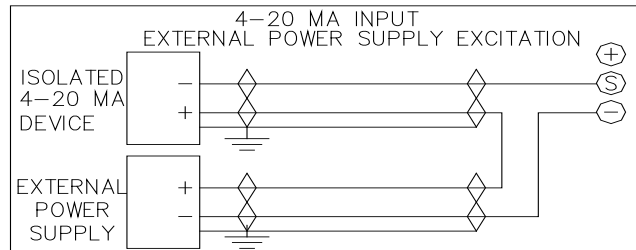
COMMUNICATIONS WIRING DIAGRAMS

TO CUSTOMER REMOTE COMPUTER/DCS
RS-485 COMMUNICATIONS
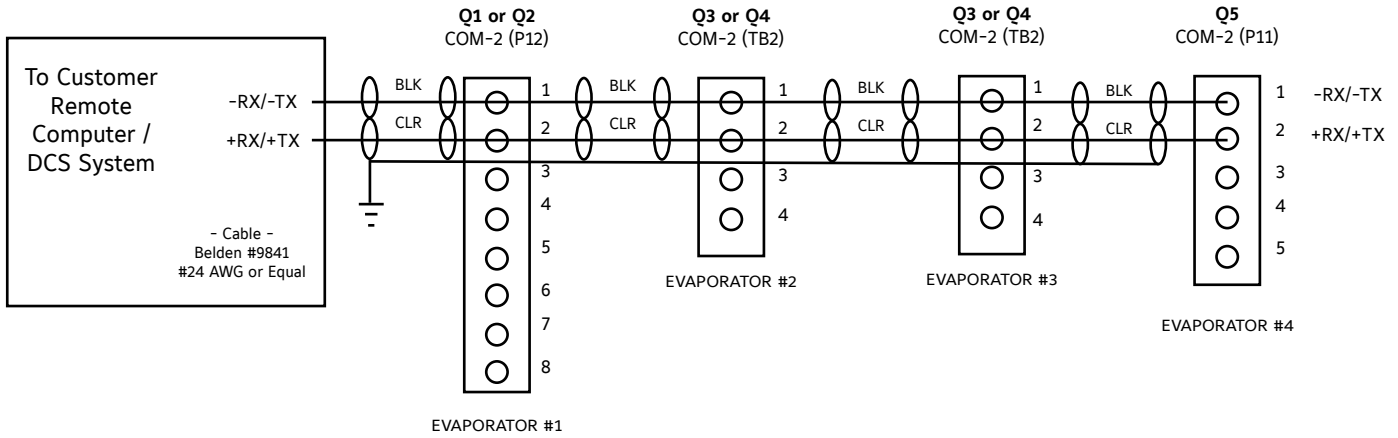
TO CUSTOMER REMOTE COMPUTER/DCS
RS-422 COMMUNICATIONS

SECTION 10

REPLACEMENT PARTS

090.610-M (MAY 2016)
Page 60

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

Frick
INDUSTRIAL REFRIGERATION

QUANTUM™ LX EVAPORATOR REPLACEMENT PARTS (Page 1 of 2)
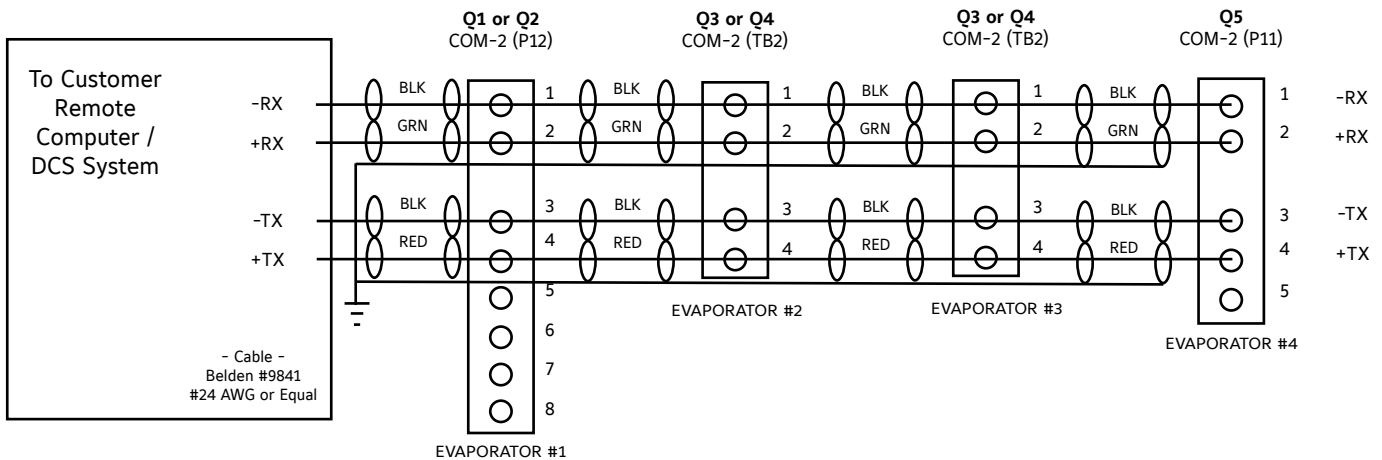### Evaporator Q5 Operator Interface Panel

Frick Number	SAP Number	Description
		Circuit Breakers
639A0206H05	484047	5 Amp circuit breaker
		Control Power
639A0185H10	483963	2-Pos. Selector Switch (Control Power)
639A0185H30	483966	Latch, 3 Across (Attaches contact block to switch mechanism)
		Display
639A0261H01	484329	CCFT inverter
639B0117H01	670741	Display Harness
639C0132H01	484379	Display
639C0143H01	670593	Mounting plate (for Display, CPU and Interface board)
640A0032H02	569676	Plexiglas Fill-piece for display
639A0278H01	548266	Display adapter board (Bat wing)
639B0104H01	552141	Inverter cable
		Flash Cards and Software
649A1112Gxx	901354	Program Flash Card (the xx indicates program version)
649A1063G99	485995	Quantum™ LX Setpoint Saver (USB Drive)
		Harnesses
639D0218H01	850941	DC power and communications harness
639D0191H02	696514	Keypad and Communications cable kit
		Keypads
640D0186H01	484621	Keypad/overlay with Frick® logo (Quantum™ LX)
		Power Supplies
639B0115H02	642308	12 VDC power supply
		Quantum™ Controllers
639C0141G01	686440	Q5 Board (Advantage)
639B0116H01	677556	Q5 Interface Communications Board

QUANTUM™ LX EVAPORATOR REPLACEMENT PARTS (Page 2 of 2)
Evaporator Remote Panels

Part Number	Description
	Analog Board
640C0057G01	Analog Board #1 (Replaces existing 32 channel board #1 only – no hardware)
640C0057G33	Analog Board #1 (Field Upgrade Kit – Includes 32 channel board #1, connectors & hardware.)
	Circuit Breakers (for optional panel heater)
639A0206H03	3 Amp circuit breaker
	Digital Boards
111Q0281061	Output Module, 24-280 volt AC
333Q0000116	Input Module, 120 volt AC
333Q0001326	Fuse, 5 amp, 250 V
640C0024G31	Digital Board #1 (Replaces existing board)
640C0024G32	Digital Board #2 (Replaces existing board)
	Harnesses
639C0124H01	DC power
640B0059H01	AC power
649B0931H01	DC power and communications harness
649D5579H01	AC power and I/O
649D5622H01	AC I/O harness, 2nd Digital board
640B0039H01	Shunting plug (for troubleshooting only)
	Panel Heater (Optional)
333Q0001179	Heater, flex, 120 VAC, 150 W
	Power Supplies
640B0060H01	DC Power Supply
639A0262H01	5 VDC Power Supply
639A0262H02	12 VDC Power Supply
639A0262H03	24 VDC Power Supply
	HOA Modules
639C0123H01	HOA Assembly, Complete DIN Rail Mounted
649B0776H01	HOA Module (no labels)
333Q0001738	HOA Fuse, 2 Amp

QUANTUM™ LX EVAPORATOR CONTROL PANEL
MAINTENANCE

NOTES

NOTES

May 2016 Form Revisions

- Page reformat throughout
- Updated Frick Industrial Refrigeration logo throughout

Johnson
Controls

JOHNSON CONTROLS
100 CV Avenue
Waynesboro, PA 17268-1206 USA
Phone: 717-762-2121 · FAX: 717-762-8624
www.johnsoncontrols.com/frick