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MAINTENANCE

FRICK® QUANTUM™ LX AcuAir® CONTROL PANEL

VERSION 3.0x

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

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S90-512 O	Frick® Quantum™ LX AcuAir® Control Panel Operation – Service

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

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

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

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

INTRODUCTION TO THE QUANTUM™ LX AcuAir® CONTROL SYSTEM

The Quantum™ LX AcuAir® panel differs from previous AcuAir® panels. Version 2.0x and earlier used a LCD display and keypad, mounted to a central control panel, which was capable of controlling up to four Air Handlers. The Quantum™ LX AcuAir® version 3.0x and later, utilizes networking capabilities, which greatly increases the total number of Air Handlers that may be connected to the system. This number is technically unlimited. The network can be viewed remotely through any web browser, or the optional Frick® AcuAir® Operator Interface Panel (see S90-512 O for further information).

The Frick® Quantum™ LX control system consists of the following major areas:

- **Control Panel Enclosure** - The Frick® Quantum™ LX AcuAir® control panel enclosure is configured to make it as standardize 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 is located under the ***POWER SUPPLY*** section found later in this manual.

- **Quantum™ 4 Controller** - The Quantum™ 4 board runs a software program that communicates with all of the Digital and Analog boards. This communication allows the Quantum™ to read the status of all the I/O boards, and display the data on either a Web Browser, or the optional Operator Interface Panel. The Quantum™ acts on this data, and provides the necessary control information to the I/O boards to provide the appropriate control of all input and output signals, based upon the configuration of installed features and options of the Air Handler package. Interaction to the outside world can be achieved through industry-standard communications protocols. The combination of the Quantum™ 4 control board, and the specific software program that it runs, is known as the Quantum™ LX. Additional information is located under the ***QUANTUM™ 4 CONTROLLER*** section found later in this manual.

- **Digital Input / Output Boards** - Digital (on/off) signals are sent and received by these boards. The output signals are used for energizing solenoids, valves, contactors, relays, etc., and the input 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.

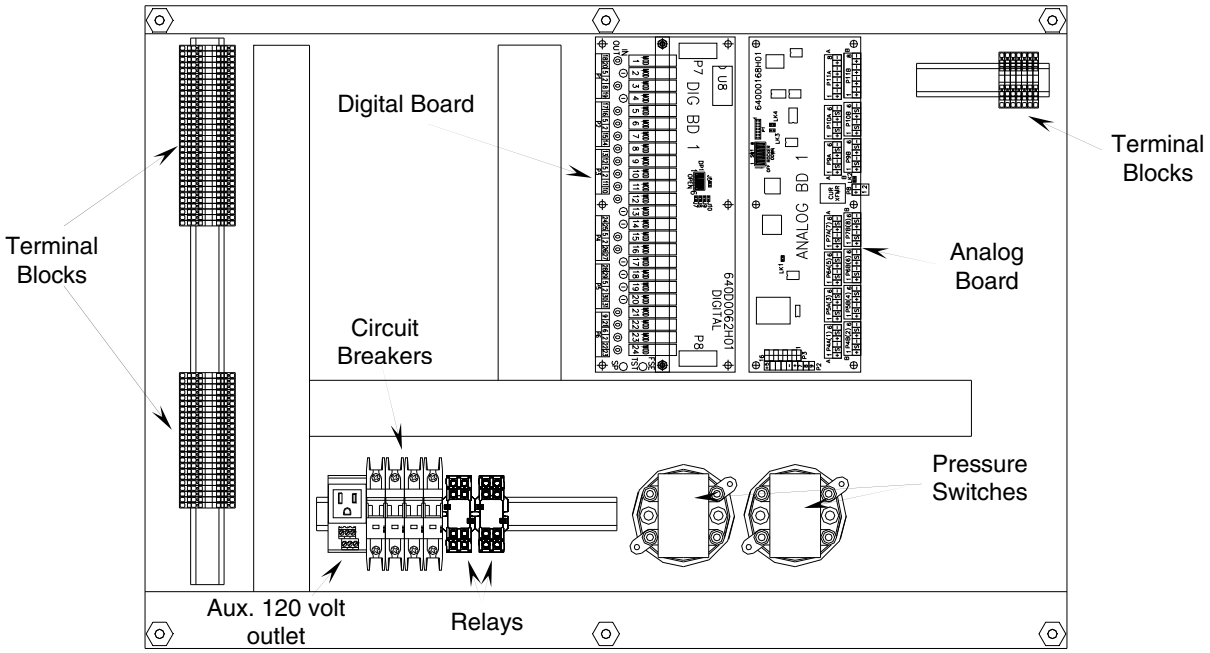
- **Analog Input / Output Board** - Analog (variable) signals are sent and received by this board. The output signals are used for controlling damper motors, modulated valves, etc., and the input signals are used to read the values being sent from pressure transducers, temperature sensors, etc. This 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 these two board versions is located under the ***ANALOG BOARD*** section found later in this manual.

- **Operator Interface** – As defined earlier, the operator can access the control information through two possible methods: a web browser or the optional Operator Interface Panel. Both interface methods perform the same task. They allow the operator to monitor and modify the operating parameters of any attached AcuAir® Air Handling units. With the Web Browser method of interface, the operator uses the keyboard and mouse of the computer that the Web Browser is running on. In the case of the Interface Panel, there is no physical keyboard or mouse, but the display is a touch-screen, which allows the operator to physically touch areas of the screen, and using a finger they can maneuver a mouse pointer around. Data and text are entered through a virtual onscreen keyboard.

CONTROL PANEL ENCLOSURE

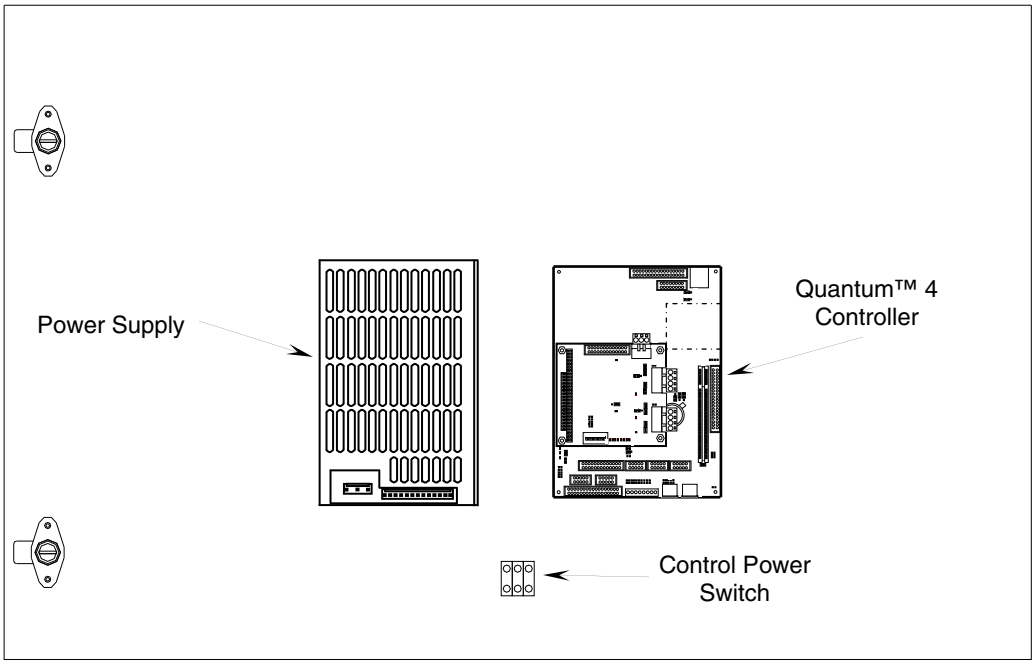
The two pictorials that appear on this page represent the control portion of the unit. The top drawing shows the inside of the top of the enclosure with the door opened, and contains the following components:

- Field and panel wiring terminals
- Digital and Analog control
- Fuses and circuit breakers
- Pressure switches
- An auxiliary 120-volt plug to be used for maintenance purposes.
- Control Relays



The next drawing shows the inside of the door for the top portion of the enclosure. The following components are located here:

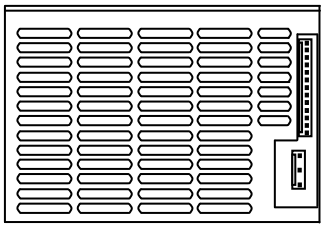
- Quantum™ 4 controller board
- Control Power Switch and contact blocks.
- Power Supply



POWER SUPPLY ADJUSTMENT AND REPLACEMENT

DESCRIPTION

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



Condor Power Supply

ADJUSTMENT

All circuit boards within the Quantum™ 4 control panel require accurately adjusted DC voltages in order to function properly. These voltages consist of +5 Vdc, -12 Vdc, +12 Vdc and +24 Vdc. Periodic measurement and adjustment of the DC power system is highly recommended for optimum system operation. Over time, it is possible for temperature, humidity, vibration and component age, to degrade the accuracy of these voltages. When any of the DC voltages begin to stray from their optimum range (especially +5 Vdc), problems can begin to arise.

All four DC voltages originate from the power supply. They are then daisy-chained to the Quantum™ controller, and then on to all connected Digital and Analog boards. Refer to the Flow Diagrams for the Quantum™.

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

- Loss of, or intermittent communications failures.
- A shutdown message stating *Digital Board x Reset* (where “x” is replaced by the number of the Digital Board that failed)
- An shutdown message stating *Digital Board x Comm. Fail - Shutdown* (where “x” is replaced by the number of the Digital Board that failed)
- An shutdown message stating *Analog Board x Comm. Fail - Shutdown* (where “x” is replaced by the number of the Analog Board that failed)
- Numerous sensor fault shutdown messages.
- Quantum™ LX reboots for no apparent reason.
- Improper readings of analog pressures and temperatures.

NOTE: It must be pointed out that the +12 Vdc, -12Vdc, and the +24 Vdc are not adjustable.

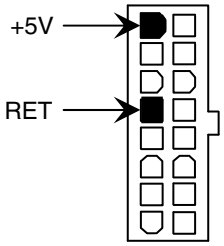
In order to properly measure the DC power, it must be checked at the Quantum™ controller (CPU), and verified for acceptable total voltage drop at the end of the daisy-chain (last I/O board). For the +5 Vdc (on either power supply), if the voltage at the Quantum™ is in the range of +5.15 to +5.20), and the voltage being read at the last I/O board is greater than +5.0 V, it can be assumed that the +5 V power is correctly adjusted. For the +12 Vdc, if the range at the last I/O board is between +11.8 and +12.2 Vdc (+12.00 is ideal), it can be assumed that the +12 V power is correct. The range for this voltage is not critical at the Quantum™, and the reading does not need to be taken there.

CAUTION! Measuring and adjusting the power supply voltages require the control power switch to be energized. Extreme care must be observed when taking any readings, as 120 or 230 VAC (depending on incoming system voltage) is present within the power supply. Adjusting the supply requires the use of a small screwdriver with an insulated shaft (refer to NS-10-02) inserted into the supply to access an adjusting potentiometer. It is possible for the screwdriver (and the person making the adjustment) to come into contact with potentially lethal voltages.

To perform measurements and adjustments on the power supply voltages, use a reliable, calibrated Digital Volt Meter (DVM). The DVM should be accurate to 1/100 of a volt DC. Turn the control power switch to *ON.*

Ensure that the meter is set to the proper range (DC, 0-50 V or equivalent), as well as observing proper wire polarity. Measure the +5 Vdc first. Place the negative lead on the common (return) pin, and the positive lead on the +5 Vdc pin as shown. Verify that the DVM is displaying in the range of +5.15 to +5.20. If the reading is outside of this range, then using a thin, flat bladed, insulated screwdriver, insert the tip into the access hole for the appropriate voltage potentiometer (refer to the Quantum™ Panel D.C. Power Supply Layout). While watching the DVM, slowly rotate the screwdriver blade clockwise to increase the voltage or counter-clockwise to decrease. Once the voltage has been adjusted,

remove the DVM probes from the Quantum™, and install them into the white connector on the last I/O board in the daisy-chain, as shown below:



Check the reading on the DVM. If the reading at the Quantum™ has been adjusted properly, then this reading can be no lower than +5.0 DC. If the voltage is less, check all of the daisy-chain connections on the blue DC-I/O harness. Ensure that all of its connectors are tight. If all connections are good, then go back and start measuring over again, this time beginning at the first board in the daisy-chain. Continue checking the voltage at each connection, until you locate the point at which the voltage drop is excessive. This will usually indicate a connection that is not being made properly, or the sockets within the connector are weak. In either case, the DC-I/O wire harness may need replacing.

Next, you will want to measure the +12 Vdc. Perform the same steps as with the +5 Vdc measurement, with the exception that you will not need to measure at the Quantum™. Measure directly at the last connection. If the voltage is low, ensure that there is not an excessive voltage drop in the daisy-chain. If the voltage is out of range, then the supply itself may need replaced.

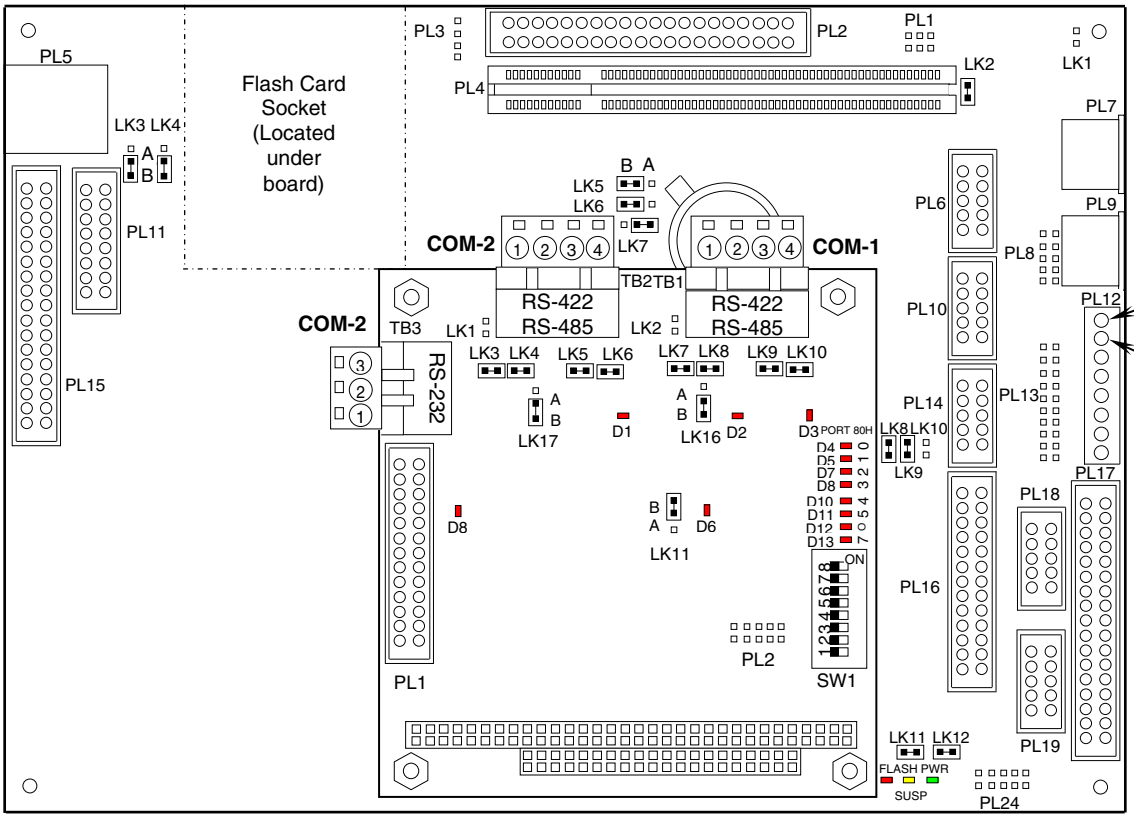
The -12 Vdc may be measured the same as the other voltages, however, this voltage is not adjustable on any supply, so if the harness is not the culprit, the supply may need to be replaced.

REPLACEMENT

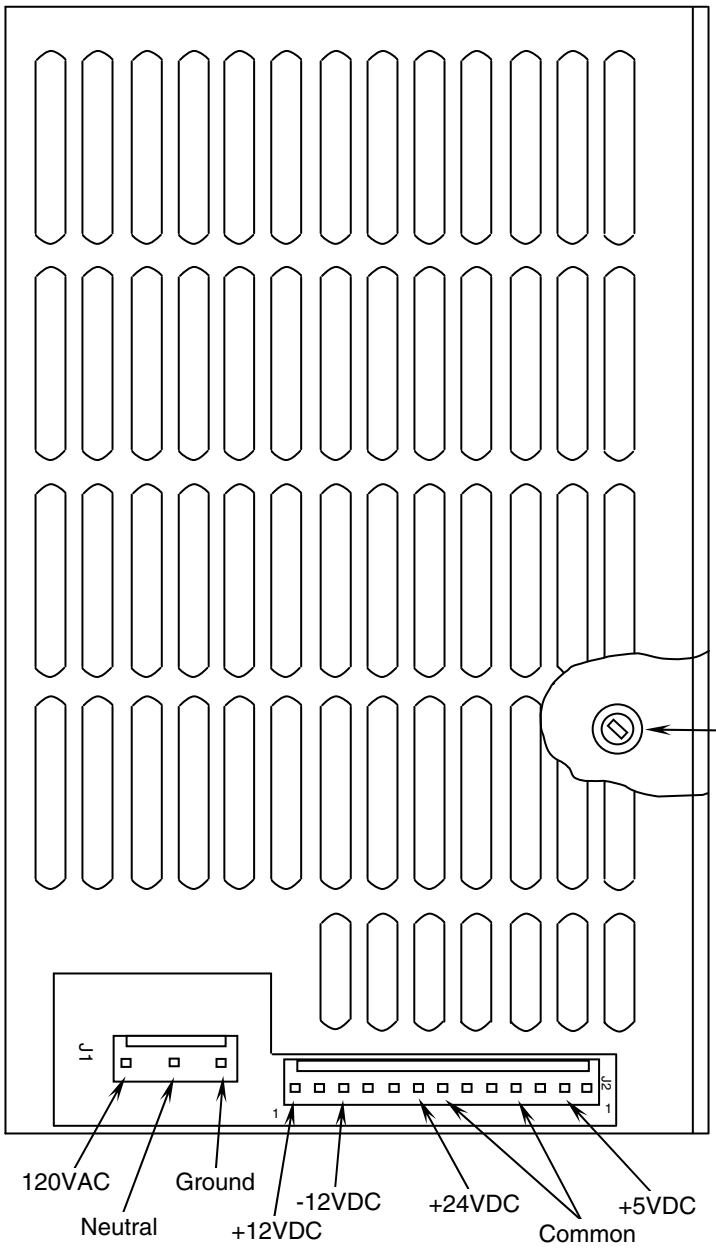
If the power supply is found to be bad, or not capable of acceptable adjustment, it will need replacing. When ordering this replacement, you will receive an upgrade kit. The purpose of this kit is to allow for the upgrading of the I/O DC power harness, at the same time as replacing the power supply.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

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

+5 DC Voltage Measurement Location



DC POWER SUPPLY LAYOUT



CAUTION

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

INPUT: J1
AMP P/N: 640445-5
.312 CTR CONNECTOR, 3 CIRCUITS

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

MATING CONNECTORS: MOLEX

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

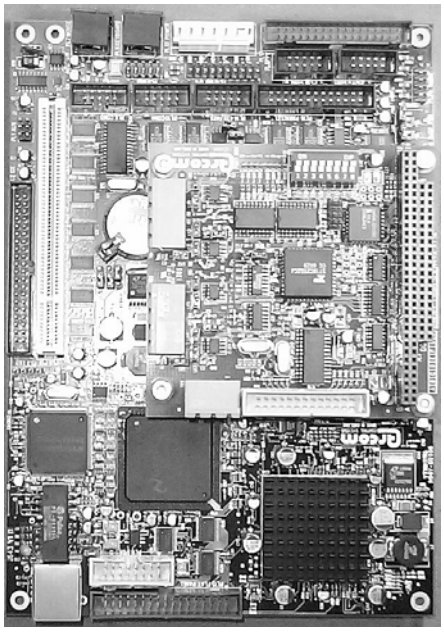
INPUT: J2
AMP P/N: 1-640445-3
.156 CTR CONNECTOR, 13 CIRCUITS

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

QUANTUM™ 4 CONTROLLER BOARD

INTRODUCTION

Frick® Controls strives 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.



Quantum™ 4

TROUBLESHOOTING THE QUANTUM™ CONTROL PANEL

This section contains information on troubleshooting and making corrections to the boards and control circuits of the Quantum™ 4. Refer to the drawings at the end of this manual.

GENERAL INFORMATION

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

1. DO NOT attempt to make corrections to the power supply without shutting off the power to the control panel. Accidental shorts can irreparably damage the processor boards or the display screen.

2. DO NOT HANDLE the panel boards when their cables are disconnected without first attaching a properly grounded wrist ground strap to prevent static electrical discharge from your body.

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

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

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

1. Accurate digital multi-meter (capable of reading 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 volt-age) that has been supplied to the panel, which could be either nominal 120 VAC or nominal 230 VAC (Reference the Control Panel Power Specifications).

Some problems that are encountered involve troubleshooting the panels digital inputs and outputs. The Digital I/O (Input/Output) boards have six Digital I/O (DIO) board connectors labeled P1 through P6. The input and output modules are wired into a DIO connector plug. Position 3 provides power and position 4 is a neutral on the DIO connectors.

WHAT TO DO BEFORE CALLING THE FACTORY

Many times when a suspected Quantum™ problem is called in to the factory, not enough information is provided for the service personnel to assist in solving the problem. This is because the caller most likely is not aware of the type of information that would be useful to factory personnel in helping to identify and correct the problem. An example of this is the statement that the Quantum™ is not booting (the main processor board is not starting). Unfortunately, this description is usually vague and only means that nothing is showing on the web browser or the optional

Operator Interface Panel. The following is a list of possible reasons for the Quantum™ 4 not to boot:

- No power (AC or DC)
- Loose or faulty cables
- Faulty CPU Board
- Tripped circuit breaker

Before calling the factory for assistance, review the information on the following pages and try to discover and resolve your Quantum™ 4 problem. The actual cause of most problems is usually not with the Quantum™ 4 itself, but with something external. However, on the rare occasion that the problem has been identified as being the controller, use the following section as a guideline for replacing it.

REPLACING THE QUANTUM™ 4 BOARD

The Flash Card memory load is done prior to the board shipping. The customer needs to have their settings manually recorded, or saved to a Flash Card, so that the new board can be setup the same as the old one. It is suggested that the operator first record all control setpoints prior to board replacement. **Factory Setup settings will also be lost.** A Maintenance Flashcard may be purchased that will allow these setpoints to be saved electronically, and may be restored at a later time. Make sure that the operator can access Security Level 2 to restore all compressor specific settings.

The procedure to replace the Quantum™ is outlined below:

1. Shut off control power.

2. Remove the old board from the machine and the new board from its packing and place both on an anti-static surface.

3. Ensure that the jumpers on the new board are set the same as those on the old board.

4. Install the flash card from the old board to the replacement board.

5. Install the modified replacement board into the panel.

6. If program changes are necessary through the USB port download, then follow the directions in the Software Maintenance section of this manual for the procedure to reload a program Flash Card (see the section entitled ***Software Maintenance***).

WHAT SHOULD OCCUR WHEN APPLYING POWER

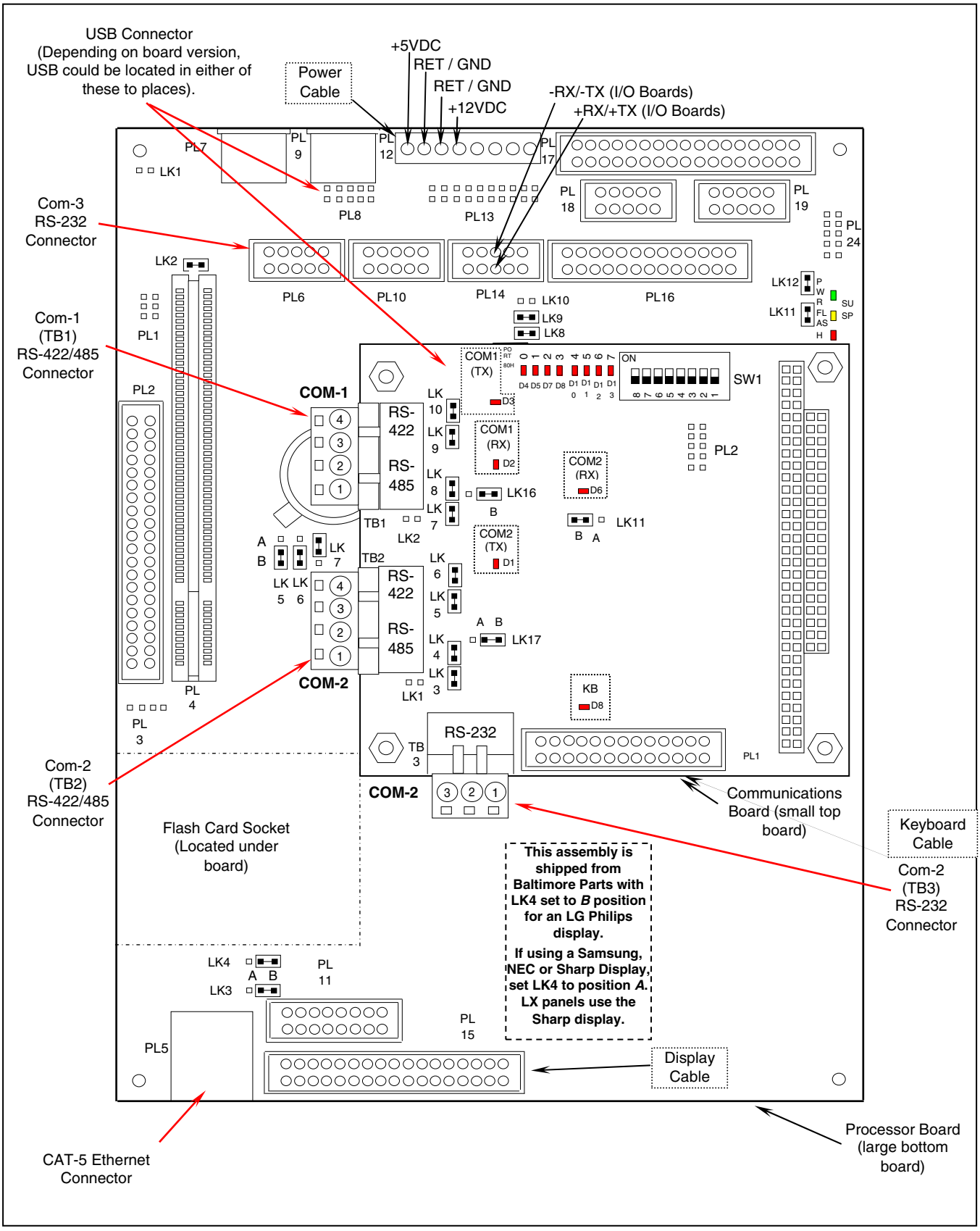
The first thing that should be checked when troubleshooting the Quantum™ 4 is it's powering up sequence.

When powering up the Quantum™ 4 the following sequence of events are indicative of a properly working main processor board:

- Green PWR (Power) LED will turn on solid (upper right corner of main PCB).
- Red FLASH LED will begin to intermittently during the Boot process.
- LED D8 (on the smaller board) will start to blink at the rate of about once per second. It will continue to blink after the Quantum™ 4 has booted.
- LED's D4, D5, D7 and D9 will turn on solid.
- LED D11 and 12 will turn on solid. D4, D5, D7, D9, D10 and D13 will be flashing in random patterns. The flashing of the RX/TX lights of the Analog and Digital boards will also prove a successful boot.

After the Quantum™ 4 has properly powered up, the following sequence of events is indicative of proper communication to the analog and digital boards:

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



Quantum™ 4 Controller Board Pictorial

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

QUANTUM™ 4 BOARD SETTINGS

Processor Board Jumpers

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

* Standard Setting

Communications Board Jumpers

Com-1 (TB1)

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

* Standard Setting

Com-2 (TB2 - TB3)

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

* Standard Setting

DIGITAL BOARD

The information that follows in this section can help locate problems that can occur with Digital Input and Output circuit boards, and their interaction with the Quantum™ 4 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 AcuAir 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 AcuAir 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 Quantum™ 4, and the Digital Board that you are looking at, are properly communicating with each other.

- Reference the *JUMPER AND DIPSWITCH SETTINGS* section later in this manual. This section contains the dipswitch settings for addressing the Digital I/O Boards. When these switches are properly set, the Quantum™ 4 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 AcuAir control system utilizes up to two Digital, and one Analog Boards. To connect all of these boards together so that the Quantum™ 4 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). The harness has an 18-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 (up to three total).

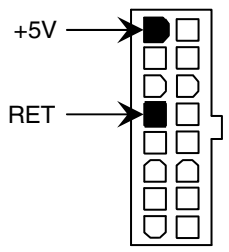
Upon close examination of this harness, you will notice that each of the connectors for both the Quantum™ and the three possible I/O boards, have two rows of connections. The wires that are inserted into the positions of one row, are internally daisy-chained on each I/O board, to continue the voltages 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 Recommended Spare Parts list) must be installed onto the open connector.

The four wires that feed from the power supply to the Quantum™ 4 provide all of the necessary D.C. voltage that is required (+5 Vdc, -12 Vdc, +12 Vdc, and Return or Common). The voltages are passed through the connector on the Quantum™ 4, and two new signals are generated by the Quantum™ 4 to be passed on through the daisy-chain to the I/O boards. These two signals are the RX (receive) and TX (transmit). These signals are the means by which the Quantum™ communicates to the I/O.

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

Logic Voltage (Power) LED

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



Set the DVM to read *DC*, and set the proper range. The voltage reading must read a minimum of +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).
- 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

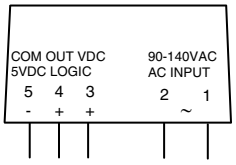
The Digital Board(s) have an *Active* LED indicator on the board that blinks when the board's software is running.

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 Input

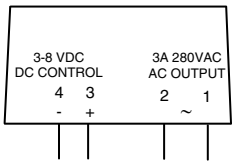
Never plug a 120 Volt Input module into a 240 Volt system, and vice-versa. Never plug an Output module into a position designated for an Input module.

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

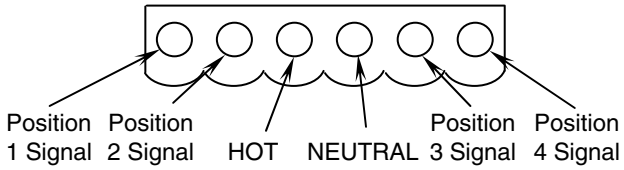
Although this Output module is labeled as 280 VAC on the top, and on the side, it can be used on both 120 and 240 volt applications.

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.

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

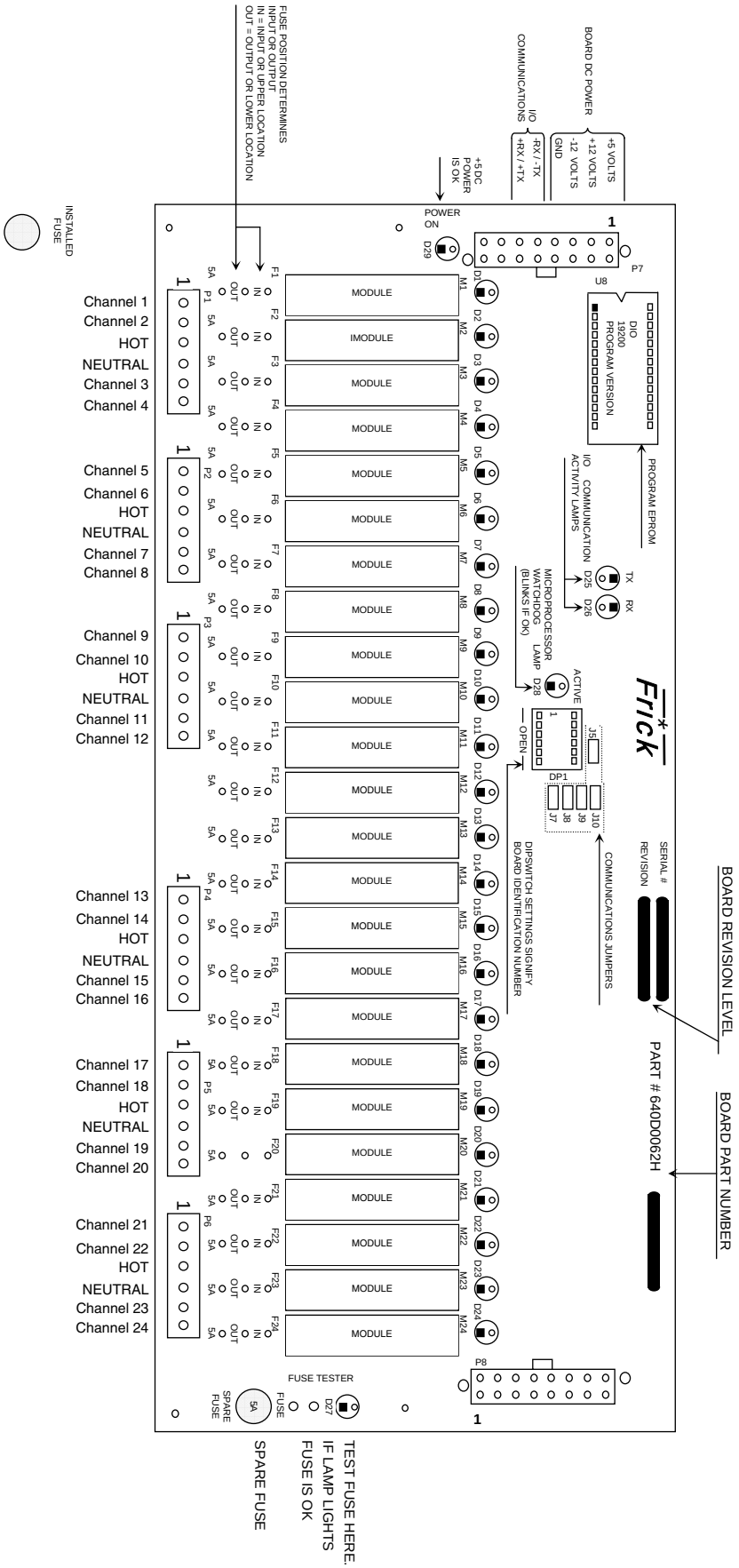
The procedure to replace a Digital board is outlined below:

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.

The **[Redetect I/O Boards]** key will cause the controller to redetect all the I/O boards which are connected to the system. Once the redetect has completed, the controller will manage, and communicate with all the detected boards. Please refer to the ***About*** screen to verify that all I/O boards were correctly identified.

DIGITAL I/O BOARD PICTORIAL



DIGITAL I/O BOARD

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

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

ANALOG BOARD

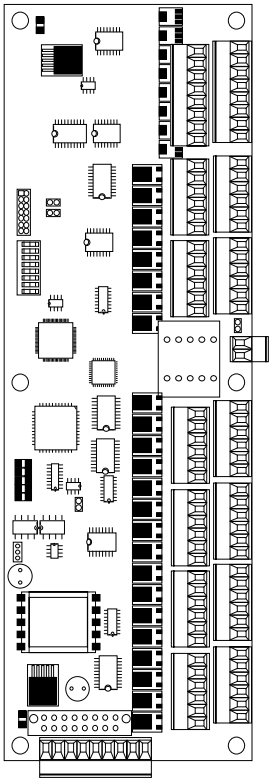
Overview

The Frick Quantum™ LX AcuAir® 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 Quantum™ 4 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 of this board is shown here:



Analog Board Description

The Analog Board is actually a small microprocessor board and is programmed to control analog outputs, or accept analog inputs, from external electrical devices. Each enhanced board has the capability of 24 independent input channels. With the Quantum™ Compressor Control, these I/O channels are dedicated through the software and external wring, as to the function of each channel.

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™ AcuAir® 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 for both the Quantum™ and the I/O boards, 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 Recommended Spare Parts list) must be installed onto the open connector.

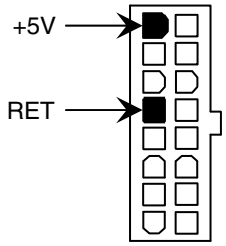
The four wires that feed from the power supply to the Quantum™ provide all of the required D.C. voltages (+5 Vdc, -12 Vdc, +12 Vdc, and Return or Common). The voltages are passed through the connector on the Quantum™, and two new signals are generated by the Quantum™ to be passed on through the daisy-chain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

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

Logic Voltage (Power) 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 Quantum™ power supply may need adjustment (see the section on power supplies).
- The Power-I/O communications harness has a problem (a new harness may be needed).
- A problem may exist with one of the I/O boards (Digital or Analog).
- If the power LED is not lighted, check the cable for proper connectivity. **Note: Each board provides the necessary connections to feed all signals to the following connectors. If the auxiliary Analog or Digital Board is not present then a jumper plug (Part # 640B0039H01) must be installed to 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 Quantum™ LX 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 Quantum™ 4 controller off, then back on to see if the *Active* light starts blinking. If not, a new board may be required.

Analog Inputs

An Analog Input is the portion of the hardware that allows devices such as temperature sensors and pressure transducers, to interface with the Quantum™ 4. The software program within the Quantum™ 4 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.

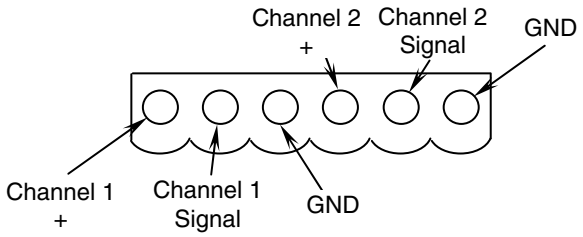
Analog inputs arrive at the board on connectors P4 through P10. Each of these connectors can receive two channels (for a total of twenty-four).

Analog Outputs

An Analog Output is the portion of the hardware that the Quantum™ 4 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 to ground (GND) of the external device for channel 2, as shown below:



Each input channel is configurable through the operating software. There are twenty-four analog input channels that can be selected for 4-20 mA, 0-5 Vdc, ICTD, or RTD. 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

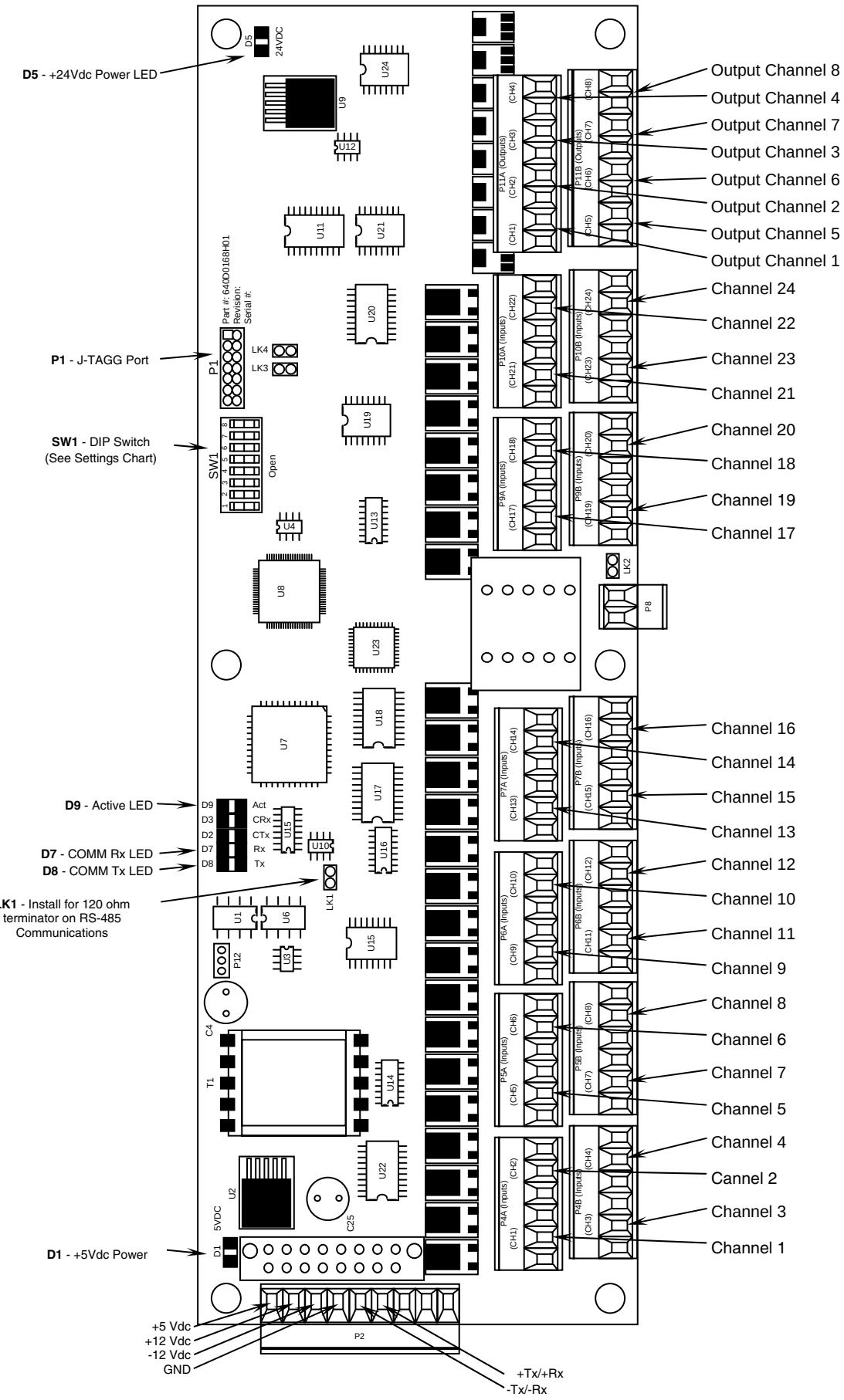
The procedure to replace an Analog board is outlined below:

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.
7. Install the modified replacement board in the panel.
8. Plug all connectors back in.
9. Turn on control power.
10. After the Quantum™ 4 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.

The **[Redetect I/O Boards]** key will cause the controller to redetect all the I/O boards which are connected to the system. Once the redetect has completed, the controller will manage, and communicate with all the detected boards. Please refer to the ***About*** screen to verify that all I/O boards were correctly identified.

ANALOG BOARD PICTORIAL



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

* default setting

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

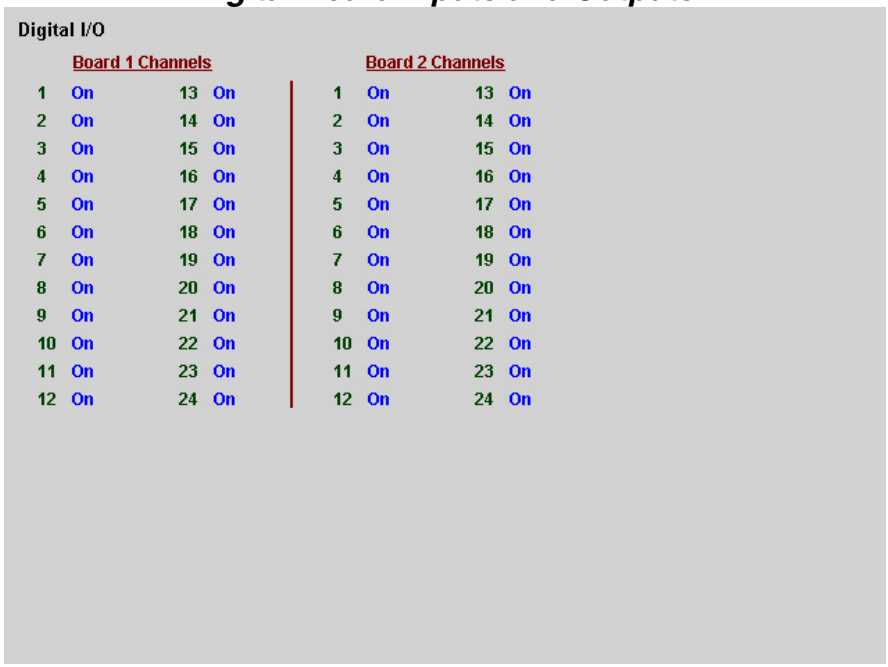
Dipswitch Settings (Used to set the board address)

The following table is to be used to set the analog board address. These switches must be set as shown below:

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

SERVICE SCREENS

Digital Board Inputs and Outputs



SCREEN NAME: ***Digital I/O***.

ACCESSING:  → **Service...** → **Digital**

DESCRIPTION: This Digital ***Service Screen*** has been provided to view the raw data from a Digital Board. All Digital boards that have been installed will appear on this screen. Digital values are shown as ON or OFF

Analog Board Inputs and Outputs

Analog Inputs (data units are Volts DC)

Board 1 Channels

1	3.16	13	4.95
2	2.93	14	4.95
3	3.11	15	0.06
4	2.81	16	0.00
5	3.34	17	5.00
6	1.87	18	4.95
7	0.32	19	4.95
8	0.31	20	4.95
9	0.33	21	0.00
10	4.73	22	4.95
11	4.95	23	4.95
12	4.95	24	4.95

Analog Outputs (data units are Volts DC)

Board 1 Channels

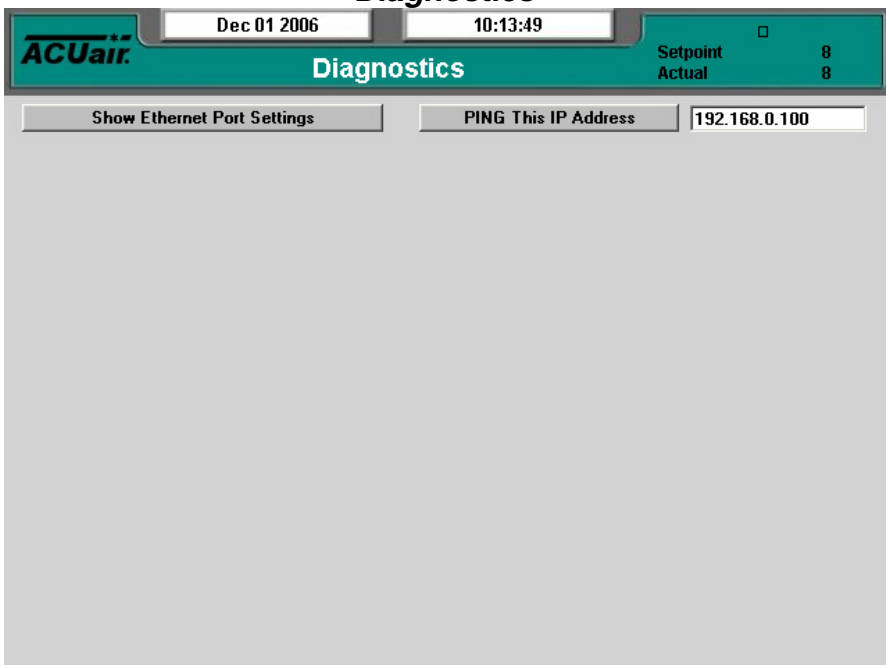
1	1.00	5	1.00
2	1.00	6	1.00
3	1.00	7	1.00
4	1.00	8	0.00

SCREEN NAME: ***Analog I/O.***

ACCESSING:  → **Service…** → **Analog**

DESCRIPTION: The Analog ***Service Screen*** has been provided to view the raw data from an Analog Board. Analog values are converted from binary to show volts. The error factor is ± .05 volts.

Diagnostics

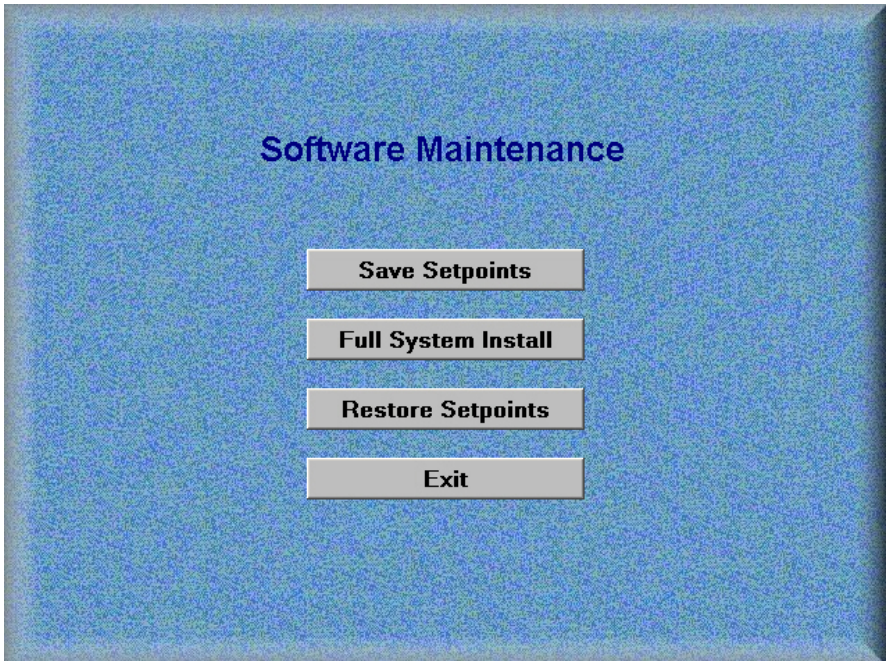


SCREEN NAME: ***Analog I/O.***

ACCESSING: → **Service...** → **Diagnostics**

DESCRIPTION: The Diagnostics screen has been provided as a way for the user to test the Ethernet connection.

Software Maintenance



SCREEN NAME: ***Analog I/O.***

ACCESSING: → **Service…** → **Software Maintenance**

DESCRIPTION: The ***Software Maintenance*** screen has been provided as a way for the user to upload the operating software to their system, to save setpoints or to restore setpoints.

The following selections have been provided:

1) Save Setpoints - Use this option to save all setpoints and custom text to a flash card as a form of backup:

- Ensure that a USB Adapter, flash card reader and flash card have been installed prior to accessing this screen.
- Ensure that all setpoint values have been documented as a safety precaution.
- Click on the **[Save Setpoints]** button.
- The wording on the **[Save Setpoints]** button will be replaced with *Please Wait…*
- When finished, the **[Save Setpoints]** button will return to normal.

2) Full System Install - Use this option to install the entire control system. This function will not overwrite any setpoints or custom text that may have previously been setup:

- Ensure that a USB Adapter, flash card reader and flash card have been installed prior to accessing this screen.
- Ensure that all setpoint values have been documented as a safety precaution.
- Click on the **[Full System Install]** button.
- The wording on the **[Full System Install]** button will be replaced with *Please Wait…*
- When finished, the **[Full System Install]** button will return to normal.

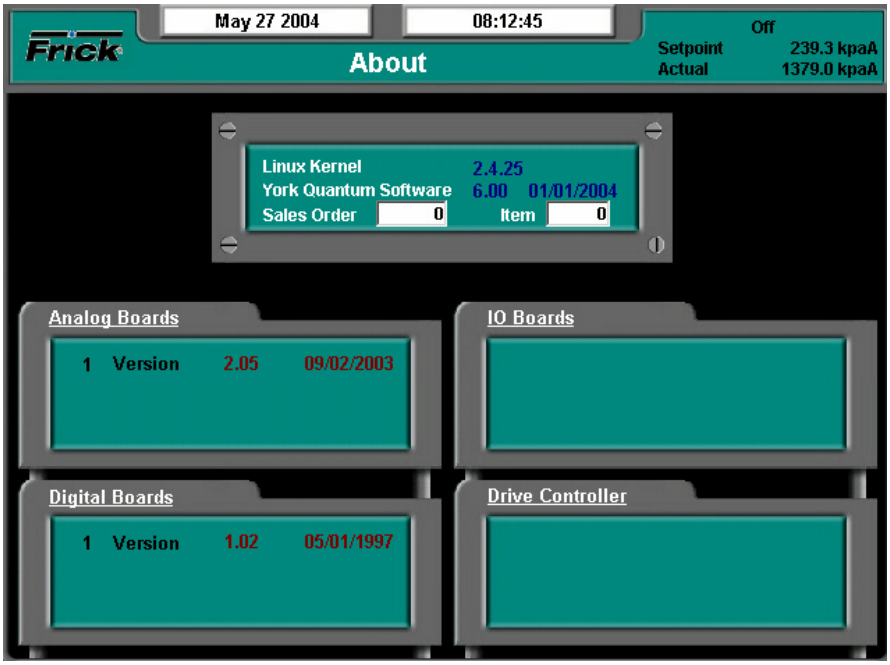
3) Restore Setpoints - Use this option to restore all setpoints and custom text from a flash card to the Quantum™. This would be useful in the event that the original setpoints would need to be reloaded:

- Ensure that a USB Adapter, flash card reader and flash card have been installed prior to accessing this screen.
- Ensure that all setpoint values have been documented as a safety precaution.
- Click on the **[Restore Setpoints]** button.
- The wording on the **[Restore Setpoints]** button will be replaced with *Please Wait…*
- When finished, the **[Restore Setpoints]** button will return to normal.

4) Exit - Use this selection to leave this screen, the panel will reboot and return to the ***Operating Status*** screen.

MISCELLANEOUS MAINTENANCE SCREENS

About

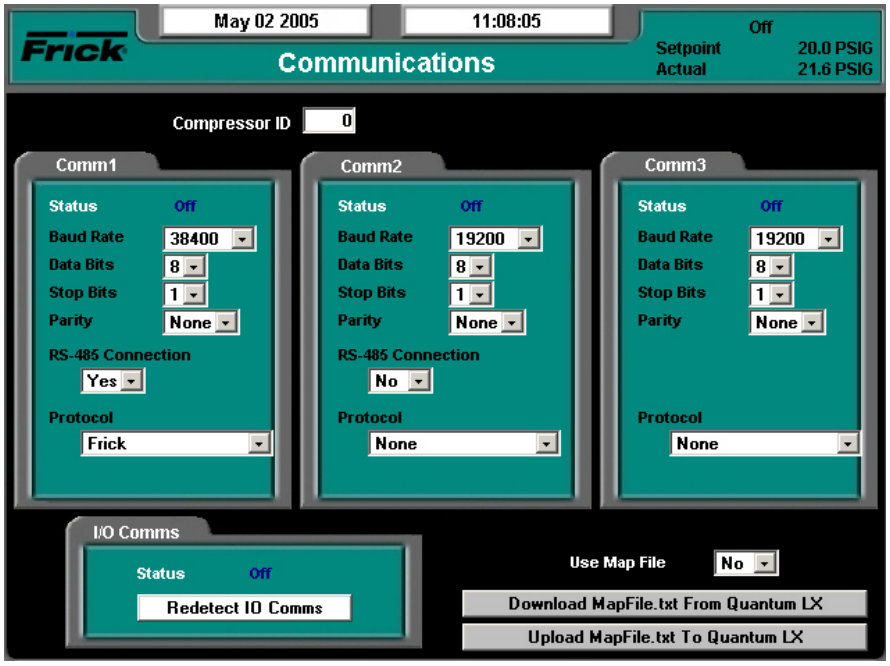


SCREEN NAME: ***Sequencing***.

ACCESSING: → **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.

Communications Screen



SCREEN NAME: ***Maintenance***.

ACCESSING: → **Setpoints...** → **Communications**

DESCRIPTION: The purpose of this screen being shown here is to indicate where the **[Redetect I/O Comms]** key is located. This selection provides a method to detect all connected Analog and Digital boards. For additional information about this screen, refer to S90-020 CS (Communications Manual).

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

- A board has been removed, and power was turned on with the board removed. You would need to replace the board, re-power, then *Detect I/O Boards*.
- A board has failed in such a way that it cannot properly communicate with the Quantum™ 4.
- A failure with the communications cable which is plugged into the end of each board

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

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 there is communication wiring connecting the panel to another panel or device, then check the following:
- ☐ If the Quantum™ is unexplainably shutting down, try disconnecting the communications cable to see if the problem goes away.
- ☐ Check if the communications cable shields are tied to machine ground at only one location. For a PLC or Opto22 based system, the shield should normally be tied only at the PLC or Opto22 panel.
- ☐ 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.

Resetting the IP Address

In the rare occurrence that a local Air Handler loses Ethernet communications with the web browser or Operator Interface Panel, it could be that the unit has an invalid IP address. One way that this could happen would be if the unit has just had a program upgrade, without the setpoints being properly saved then restored (the IP address is stored as a setpoint to the flash card).

In order to correct this situation, perform the following steps:

1. Power down the failing unit.

2. Locate the processor board (located on the inside of the top door).
3. On the processor board (the larger of the two boards), locate and temporarily remove LK12.
4. Power the unit up.
5. Wait for one minute to allow the processor to fully boot.
6. Power the unit down.
7. Replace LK12.
8. Power back up. The IP address will be automatically set to 192.168.0.105. This address is know to work, and should solve the problem. At this point, the unit should show up at the web browser or Operator Interface Panel. If the user wishes, they may now go into the user interface and modify the IP address for the unit in question to the number that they need it to be, or they may leave it alone.

If the above steps fail to bring the unit back into the network, you will need to verify the Ethernet cables, hub or switch, Quantum™ control board, etc.

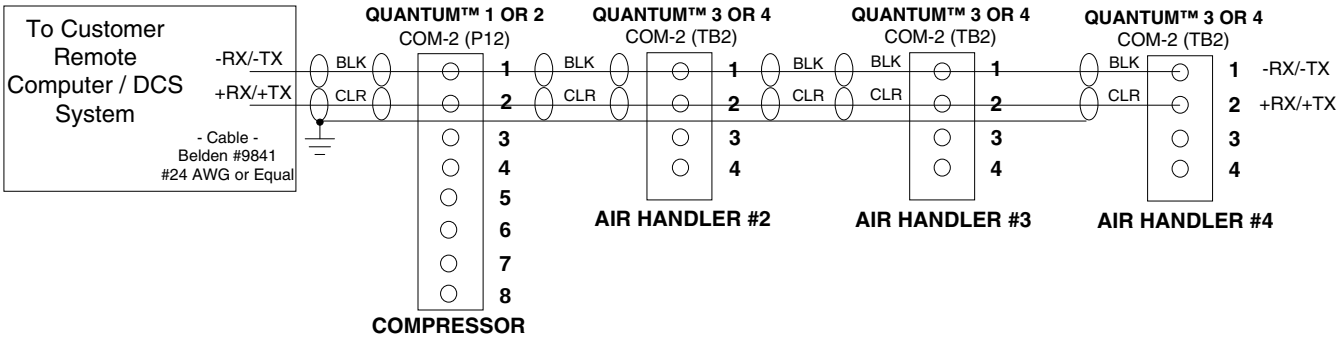
Erasing the System Setpoints

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

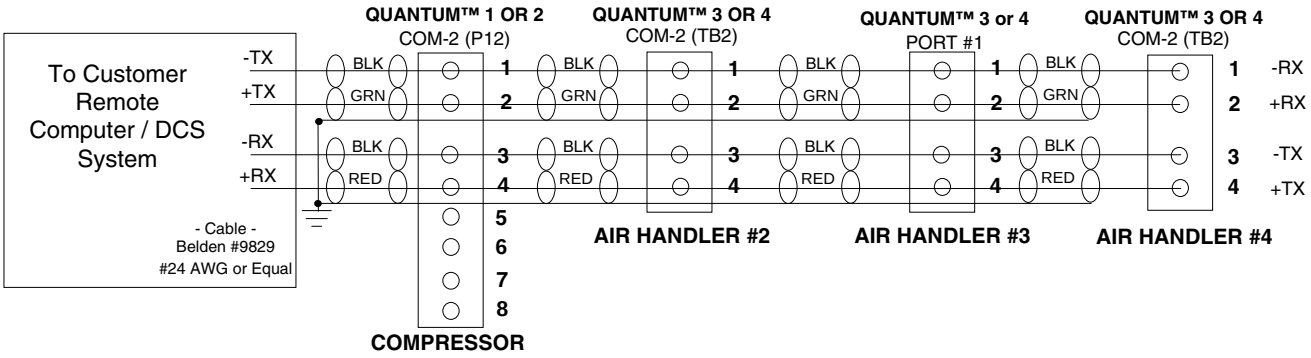
1. Ensure that the existing setpoints are documented if possible.
2. Power the controller down.
3. Locate the processor board (located on the inside of the top door).
4. On the processor board (the larger of the two boards), locate and temporarily remove LK11.
5. Power the unit up.
6. Wait for one minute to allow the processor to fully boot.
7. Power the unit down.
8. Replace LK11.
9. Power back up.

COMMUNICATIONS WIRING DIAGRAMS

TO CUSTOMER REMOTE COMPUTER/DCS
RS-485 COMMUNICATIONS



TO CUSTOMER REMOTE COMPUTER/DCS
RS-422 COMMUNICATIONS



QUANTUM™ LX ACUAIR REPLACEMENT PARTS

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
639A0206H02	2 Amp circuit breaker
639A0206H03	3 Amp circuit breaker *(for optional panel heater)*
639A0206H10	10 Amp circuit breaker
	Connectors
649B0903H01	2-Pole connector *(P8 – Analog Board)*
333Q0001258	6-Pole connector *(P1 through P6 – Digital Board, P4A through P10B – Analog Board)*
333Q0001234	8-Pole connector *(P11A and P11B – Analog Board)*
649B0903H02	9-Pole connector *(P2 – Analog Board)*
	Control Power
111Q0280958	Surge suppresser
333Q0001932	Relay, 2 Pole, 24 VAC
333Q0001095	Relay, 2 Pole, 24 VDC
333Q0000195	Relay base, 2 Pole
111Q0831800	Diode for 24VDC Relay
639A0185H10	2-Pos. Selector Switch *(Control Power)*
639A0185H30	Latch, 3 Across *(Attaches contact block to switch mechanism)*
639A0185H36	Normally Open Contact Block *(for Control Power Switch)*
	Digital Boards
111Q0281061	Output Module, 24-280 volt AC
333Q0000116	Input Module, 120 volt AC
333Q0001326	Fuse, 5 amp, 250 V
333Q0001931	Input Module, 24 volt AC
640C0024G61	Digital Board #1 *(replaces existing board)*
640C0024G62	Digital Board #2 *(replaces existing board)*
	Flash Cards and Software
649A0886Gxx	Quantum LX Program Flash Card *(the xx indicates program version)*
	Harnesses
639D0158H01	DC Wire Harness, Power Supply
639D0161H01	AC Wire Harness, Power Supply
639D0162H01	DC power-I/O communications harness, Digital Board 1
639D0163H01	DC power-I/O communications harness, Digital Board 2
640B0039H01	Shunting plug *(for troubleshooting only)*
	Miscellaneous
333Q0001179	Heater, flex, 120 VAC, 150 W *(optional)*
649A0998H03	Differential Pressure Switch
	Power Supplies
333Q0001637	DC power supply
	Quantum™ Controllers
649C1091G01	Quantum™ 4 *(Arcom GX1)*
639C0130G01	Communications Daughter board only.

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