Quest Controls, Inc.
Smart Control Solutions for Buildings
www.questcontrols.com

Expansion Board
User's Manual

Specifications are subject to change without notice.

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Section 1 – Introduction

This User's Manual is intended to provide the information needed to add Quest Controls' expansion boards to Quest's Q3™, TELSEC® ESB or QC16 controllers. For information on how to program the controllers, please refer to the respective product User Manual. Contact us at Quest if you have product questions or suggestions for improving this manual.

Section 2 – Product Description

Three different expansion boards can be added to the Quest Controls QC16, Q3™, and TELSEC® ESB monitor and control panels. The Universal Input board (**UIB**) (Figure 1) allows up to 16 individual inputs to be added, these include contact closure and analog inputs as well as an array of sensors and transducers. The Digital Output Board (**DOB**) (Figure 2) and Analog Output Board (**AOB**) (Figure 3) allow for additional control points to be added. The digital board has eight outputs and the analog output board has four.

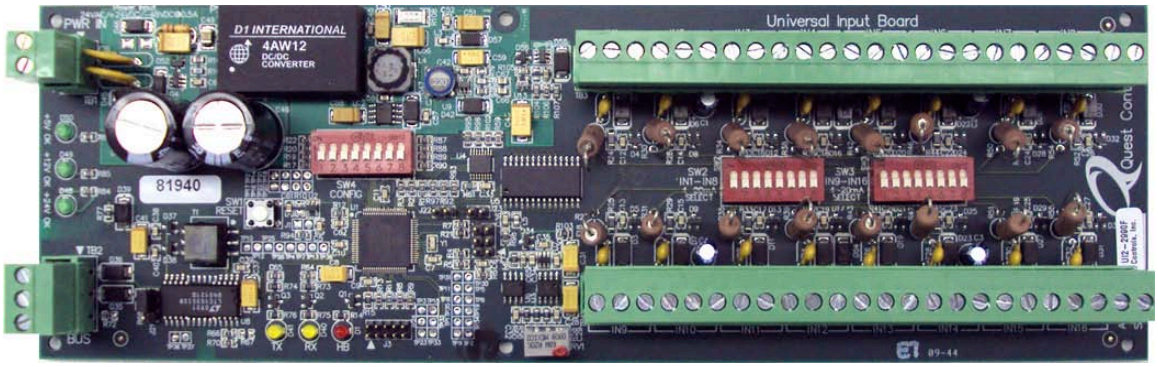

Figure 1: Universal Input Board (UIB) Part Number 130455

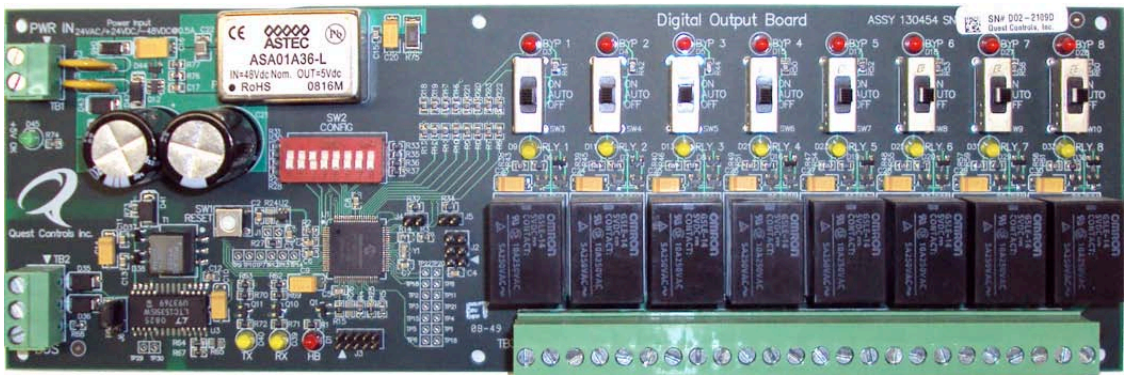

Figure 2: Digital Output Board (DOB) Part Number 130454

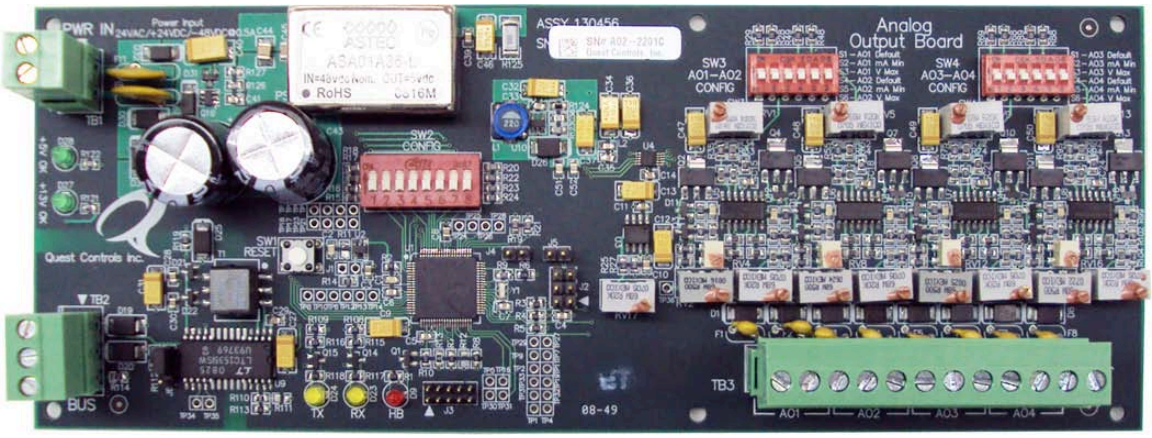

Figure 3: Analog Output Board (AOB) Part Number 130456

2.2 Universal Input Board Specifications

Part Number: 130455

Capacities: 16 separate universal inputs 0-10 VDC, 4-20 mA, or dry contact closures

Accuracy: 12 bit analog-to-digital converter, accurate to 1% of full range

Indicators and Controls:
BUS XMIT: Indicates the board is sending data over the BUS
BUS RECV: Indicates the board is receiving data from the BUS
+5: Indicates +5 volts DC is present
+10: Indicates +10 volts DC is present
+24: Indicates +24 volts DC is present

Switches: Three 8-position dip switches for bus address and board configuration
Termination: Two-piece pluggable terminal strips. Rated @ 250 VAC 15 amp. Terminals provided for M-BUS and power inputs.
Environmental: Operating Temp 32 to 120°F (0 to 49°C) 0-95% RH Non-condensing
Electrical: 20-60VDC**,** 48VDC max. load @ 0.125 amp, 24VDC max. load @ 0.250 amp, 24VAC max. load @ 0.370 amp

Size: 3.25 H x 10 W x 1.3 D in. (83 x 25 x 33 mm)

Weight: 1 lb (454g)

Warranty: One (1) year

2.3 Digital Output Board Specifications

Part Number: 130454

Capacities: Eight (8) Form "C" single pole double throw relay outputs, common, normally open and normally closed. Rated**:** 10A @ 120 VAC and 8.5A @ 28 VDC
Indicators and Controls: Eight (8) relay output state indicators Eight (8)LED for bypass indicators.
BUS XMIT: Indicates the DOB is sending data over the BUS
BUS RECV: Indicates the DOB is receiving data from the BUS
+5: Indicates +5 volts DC is present
Switches: One 8 position dip switch for bus address and board configuration
Termination: Two-piece pluggable terminal strips. Rated 250 VAC @ 15 amp. Terminals provided for M-BUS and power inputs.
Environmental: Operating Temp 32 to 120°F (0 to 49°C) 0-95% RH Non-condensing
Electrical: 20-60VDC**,** 48VDC max. load @ 0.100 amp, 24VDC max. load @ 0.200 amp, 24VAC max. load @ 0.300 amp

Size: 3.25 H x 10 W x 1.3 D in. (83 x 25 x 33 mm)

Weight: 1 lb (454g)

Warranty: One (1) year

2.4 Analog Output Board Specifications

Part Number: 130456

Capacities: Four (4) separate analog outputs 0-10 VDC, 4-20 mA. Accurate to 40 mV, 60 uA. 1k ohm minimum input impedance.

Indicators and Controls
BUS XMIT: Indicates the board is sending data over the BUS
BUS RECV: Indicates the board is receiving data from the BUS
+5: Indicates +5 volts DC is present
+13: Indicates +13 volts DC is present

Switches: One 8 position and two 6 position dip switches for bus address and board configuration
Termination: Two-piece pluggable terminal strips. Rated @ 250 VAC 15 amp. Terminals provided for M-BUS and power inputs.
Environmental: Operating Temp 32 to 120°F (0 to 49°C) 0-95% RH Non-condensing
Electrical: 20-60VDC**,** 48VDC max. load @ 0.050 amp, 24VDC max. load @ 0.095 amp, 24VAC max. load @ 0.160 amp

Size: 3.25 H x 10 W x 1.3 D in. (83 x 25 x 33 mm)

Weight: 1 lb (454g)
Warranty: One (1) year

2.5 Expansion Board Enclosure

Part Number: 150774 (includes 120VAC to 24VDC power supply) or 150775 (requires separate power supply)

Capacity: Houses up to three expansion boards in any I/O configuration

Dimensions: Enclosure 22" H x 15.25" W x 3.5" D (559mm H x 387mm W x 89mm D)

Weight: 20 lb (9kg)

Environmental: Operating Temp 32° to 120°F (0° to 49°C) 0-95% RH Non-condensing
Electrical: (P/N 150774) Input 85-264VAC, 1.5A @ 115VAC. Output 24VDC @ 45W

Warranty: One (1) year

Section 3 – Mounting the Units

The expansion boards should be housed in an external enclosure. Use Quest's TELSEC Expansion Panel, P/N 150775 (requires separate power supply) or P/N 150774 (includes a 120VAC to 24VDC power supply), (Figure 4). Quest's Expansion Board Enclosure can house up to any combination of three (3) I/O boards. Contact Quest Controls for other enclosure options if needed.

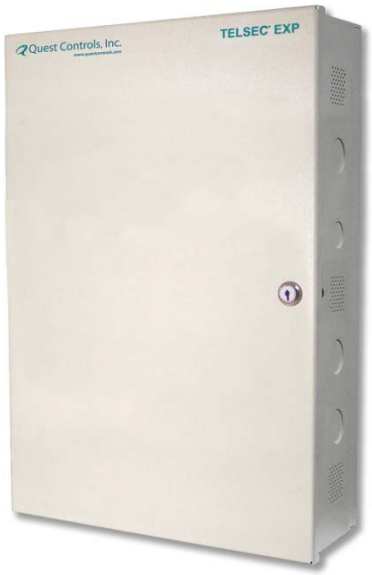

Figure 4: Expansion Board Enclosure

Step 1: Mount the expansion board enclosure on the wall near the item you wish to control.

Step 2: Secure the Expansion Board mounting track (Figure 5) within the Expansion Board Enclosure using sheet-metal screws.

Step 3: Insert the Expansion Board into the mounting track and press down. To release an Expansion Board from the mounting track, spread the edge of Snap Track.

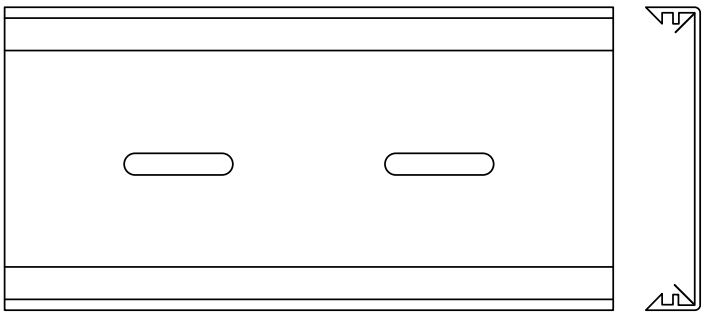

Figure 5: Expansion Board Mounting Track

Section 4 – Connecting the Power

The expansion boards accept 20 to 60 VDC or 24VAC. Refer to the product specifications in section 2 of this manual for current draw. Warning: Do not power these boards from the same transformer providing power to any existing older style boards that uses a 24VAC center tap transformer, damage to the board may occur.

Step 1: Connect an 18AWG wire from the power supply to the PWR+ and PWR- pins (Figure 6) on the expansion board.

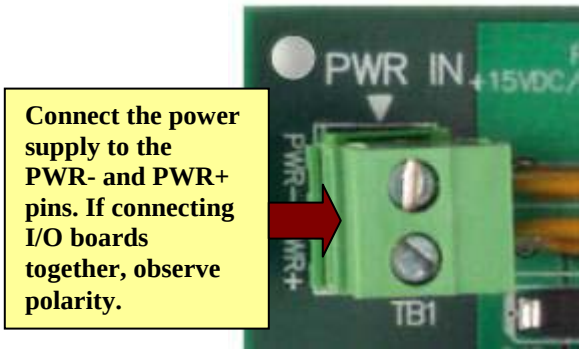

Figure 6: Power Connection on Expansion Boards

For DC Power Input: Observe the proper polarity for DC input power.

For AC Power Input: Use a two-wire 24v AC transformer to power the board. Connect the leads to the PWR+ and PWR- pins. Polarity doesn't matter for AC powered boards.

Step 2: To power multiple boards from the same transformer, daisy chain the boards together connecting all PWR- connections to each other and all PWR+ connections to each other. Refer to table below for power consumption requirements.
Caution: Crossing polarity between boards will cause a direct short to the transformer and may cause damage to the boards.

NOTE: If it is necessary to connect one side of the transformer to the earth/chassis ground then make sure that this is the same power lead that is connected to all of the PWR- pins on the expansion boards. Make this connection as close to the power transformer as possible.

Section 5 – Bus Connection

The expansion boards use a three-wire connection between the main controller and the expansion board for communications. Use Belden 3106A (or equivalent) 3-conductor, 22 AWG shielded twisted pair with drain.

Step 1: Connect the A, B and C BUS Terminal connections on the expansion board to the A, B and C BUS connections on the Q3™, TELSEC® ESB or QC16 (Figure 7). Daisy chain the boards together maintaining the correct polarity on all communication terminals (Figure 7). The type and order of board connection does not matter.

NOTE: Terminal C is the ground reference. Do not tie shield drain wires to this terminal.

Step 2: Carry the shield drains through, tying them together, and only ground at the chassis of the QC16 or Q3™/TELSEC® ESB (Figure 7).

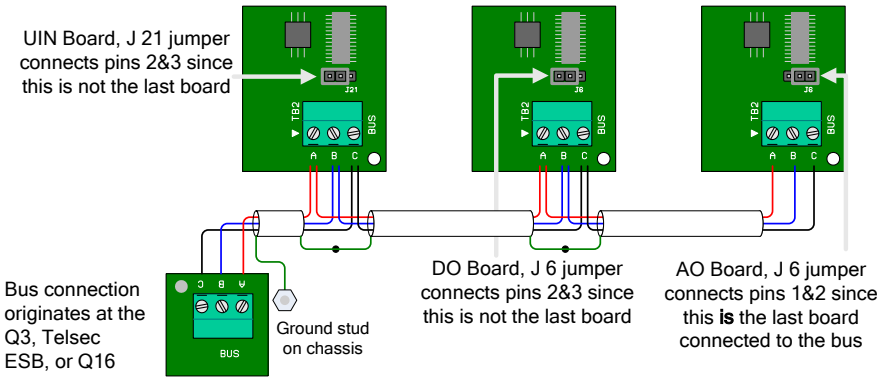

Figure 7: Example of Communication BUS Connection

Step 3: The expansion boards have a terminating resistor that should be enabled for the last board in a chain. Ensure that the jumper is on pins 2 & 3 for all boards except the last one. On the last board connected, jump pins 1 & 2 (Figure 8).

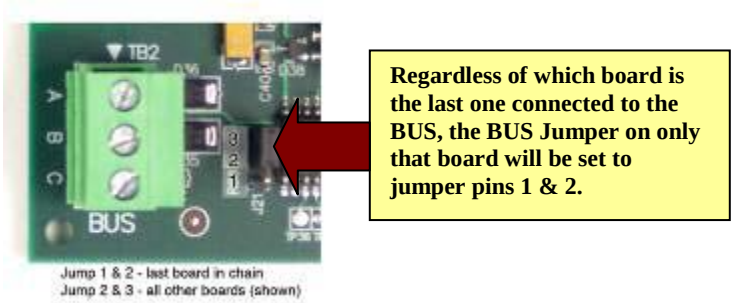

Figure 8: Location of BUS Jumper Pins

Section 6 – LED Status Check

The expansion boards have various status LEDs to denote proper operation. These LEDs will be located on the left side of the board below the power terminals (Figure 9). Each board has one or more green LEDs for the voltages present on the board. Additionally, each expansion board will have transmit and receive LEDs displaying bus communication status and a heartbeat LED to indicate the status of the board.

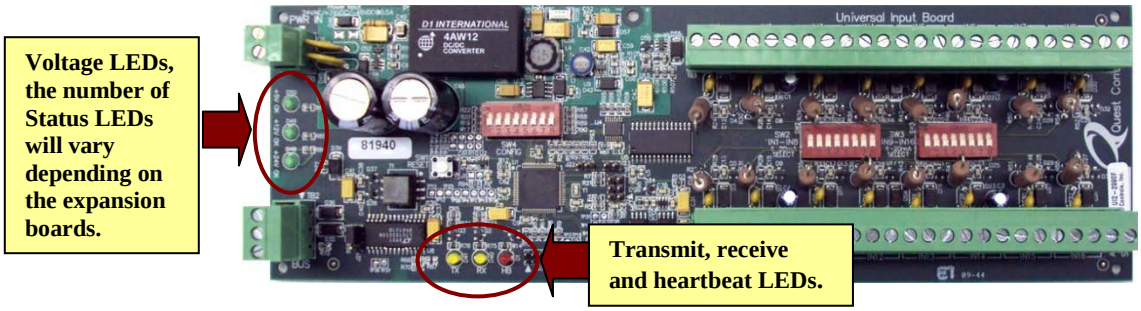

Figure 9: Location of Status LEDs

Step 1: Check that the green LED(s) on the board are illuminated to ensure power is present to the board (Figure 10).

Step 2: Check that the Receive LED is flashing frequently showing that there is traffic on the bus and that the Transmit LED is flashing when data is being sent from the expansion board to the main controller (Figure 10).

Step 3: Check that the heartbeat LED is flashing at approximately one flash per second under normal circumstances (Figure 10).

NOTE: If the board doesn't sense any communications specific to its address, the heartbeat led will begin to beat faster indicating an error condition. After a few minutes, the LED will flash faster indicating that the entire board is being automatically reset. Once normal bus traffic is detected, the Heartbeat LED will go back to normal flashing.

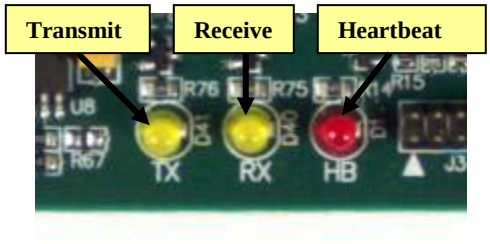

Figure 10: Status LEDs

Section 7 – Configuration Switches and Controls

Each expansion board has an 8-position switch for configuration (Figure 11).

NOTE: When making changes to board configurations, you must press the reset switch for the settings to take affect. A power cycle will also reset the board.

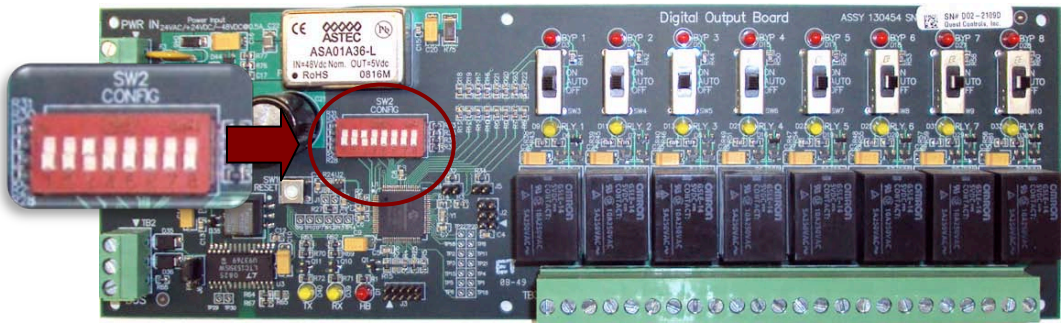

Figure 11: Configuration Switches

7.1 Configuration Switches 1-4: Addressing the Boards

The first four configuration switches set the address for each board. Every board in the network must have a unique address. Set the addresses as shown in Table 1.

Board	Bus Address	Hex #	C-1	C-2	C-3	C-4
DOB 1 (RLY 17-24)	1	00	Dn	Dn	Dn	Dn
DOB 2 (RLY 25-32)	2	01	Dn	Dn	Dn	Up
DOB 3 (RLY 33-40)	3	02	Dn	Dn	Up	Dn
DOB 4 (RLY 41-48)	4	03	Dn	Dn	Up	Up
DOB 5 (RLY 49 – 56)	5	04	Dn	Up	Dn	Dn
DOB 6 (RLY 57 – 64)	6	05	Dn	Up	Dn	Up
UIB 1 (UIN 17-32)	7	60	Dn	Dn	Dn	Dn
UIB 2 (UIN 33-48)	8	61	Dn	Dn	Dn	Up
UIB 3 (UIN 49-64)	9	62	Dn	Dn	Up	Dn
UIB 4 (UIN 65-80)	10	63	Dn	Dn	Up	Up
UIB 5 (UIN 81-96)	11	64	Dn	Up	Dn	Dn
UIB 6 (UIN 97-112)	12	65	Dn	Up	Dn	Up
UIB 7 (UIN 113-128)	13	66	Dn	Up	Up	Dn
AOB 1 (AOP 3-6)	10	70	Dn	Dn	Dn	Dn
AOB 2 (AOP 7-10)	11	71	Dn	Dn	Dn	Up

Table 1: Configuration Addresses

NOTE: When defining bus modules use the Address # for the Q3™/TELSEC® ESB and the Hex # for the QC16. For example on the Q3™/TELSEC® ESB the command is DEFINE BUS 07 where on the QC16 the command would be DEFINE BUS 60.

7.2 Configuration Switches 5 & 6: Settings

Switches 5 and 6 are for future use and must remain in the down position.

7.3 Configuration Switches 7 & 8: Controller Compatibility

The expansion boards are compatible with the communications settings for the QC16 and Q3™/TELSEC® ESB. Set the switches as shown in Table 2.

Controller	C-7	C-8
Q3/TELSEC ESB	Dn	Dn
QC16	Dn	Up

Table 2: Communication Settings

7.4 Expansion DOB

The DOB has relay status LEDs (Figure 12). Each output has an amber LED indicating the relay is energized (normally open contacts are closed when lit). The red LED indicates that switch has been moved into either the ON or OFF state and the corresponding output is not in automatic mode. If the switch is moved into the ON state, the red LED will light indicating the relay is bypassed and the amber LED will light indicating the contacts are closed.

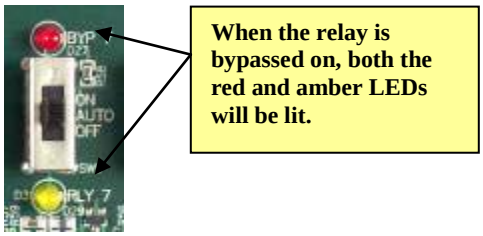

Figure 12: Bypass Switch on DOB

7.5 Expansion UIB

When connected to a Q3™/TELSEC® ESB, this board supports the following types of sensors natively without requiring additional external circuitry:

- Thermistors
- 0-6V sensors
- 0-10V sensors
- 0-20mA sensors
- AD592 temperature sensors
- Dry contact closures

In QC16 compatibility mode the UIN will support the following sensors natively:

- 0-6V sensors
- 0-20mA sensors
- AD592 temperature sensors
- Dry contact closure

To connect a 0-20mA current sensor or transducer, set the DIP switch ON as shown in Table 3 to switch in the on board 250 ohm resistor for that input:

UIB Input #	SW 2	UIB Input #	SW 3
1	1	9	1
2	2	10	2
3	3	11	3
4	4	12	4
5	5	13	5
6	6	14	6
7	7	15	7
8	8	16	8

Table 3: Dip Switch Settings (Up for Current, Down for All Other Sensors)

7.6 Expansion AOB

The AOB has configuration switches for each analog output (AOP) (Figure 13) to customize the control signal. Refer to Table 4 for function and switch location.

Figure 13: AOB Switches

AOP #1		
SW3-1	Down (default)	Output level is minimum value on startup or reset.
	Up	Output level is maximum value on startup or reset.
SW3-2	Down (default)	Minimum output is 0 mA and 0 VDC
	Up	Minimum output is 4 mA and 1 VDC
SW3-3	Down (default)	Maximum voltage output is 10 VDC
	Up	Maximum voltage output is 5 VDC
AOP #2		
SW3-4	Down (default)	Output level is minimum value on startup or reset.
	Up	Output level is maximum value on startup or reset.
SW3-5	Down (default)	Minimum output is 0 mA and 0 VDC
	Up	Minimum output is 4 mA and 1 VDC
SW3-6	Down (default)	Maximum voltage output is 10 VDC
	Up	Maximum voltage output is 5 VDC
AOP #3		
SW4-1	Down (default)	Output level is minimum value on startup or reset.
	Up	Output level is maximum value on startup or reset.
SW4-2	Down (default)	Minimum output is 0 mA and 0 VDC
	Up	Minimum output is 4 mA and 1 VDC
SW4-3	Down (default)	Maximum voltage output is 10 VDC
	Up	Maximum voltage output is 5 VDC
AOP #4		
SW4-4	Down (default)	Output level is minimum value on startup or reset.
	Up	Output level is maximum value on startup or reset.
SW4-5	Down (default)	Minimum output is 0 mA and 0 VDC
	Up	Minimum output is 4 mA and 1 VDC
SW4-6	Down (default)	Maximum voltage output is 10 VDC
	Up	Maximum voltage output is 5 VDC

Table 4: Location and Function of AOP Switches

Section 8 – Troubleshooting, Technical Support and Service

8.1 Troubleshooting

The following section is designed to help you isolate the most likely system malfunctions that may occur. For additional help, contact Quest's Technical Support & Service Center.

PROBLEM

- The boards are not communicating with the Main Controller.

SOLUTION

1) Verify the wiring of the bus.
2) Make sure all power wiring to the boards are correct and all power LEDs are on.
3) Check the address settings and make sure every board has a unique address.
4) Disconnect boards from the bus one at a time until the remaining boards start communicating. Then isolate to the board causing the trouble and replace the board.

PROBLEM

- The sensor readings are inaccurate.

SOLUTION

1) Verify the sensor wiring for the type of sensor being used. Make sure there are no shorts or opens in the wiring.
2) Verify the configuration switch for current sensors is in the proper position.
3) List sensor input (UIN); verify that it is programmed for proper engineering units.
4) Replace the sensor with a known good device.

PROBLEM

- The output won't turn on or off.

SOLUTION

1) Verify that the expansion board is communicating on the bus.
2) Review the relay status to determine if there is any soft (user programmed) or hard bypasses. Clear any bypass condition.
3) Turn on and off the output by using the bypass command or the switches and verify the relay on the board energizes and de energizes.
4) Verify the wiring and control voltage from the board to the device being controlled.

PROBLEM

- The Analog outputs are not working properly.

SOLUTION

1) Verify the AOB is communicating to the main controller.
2) Verify the configuration switches for the various output options are set correctly for your application.
3) Disconnect the output and verify the signal with a digital voltmeter. If the signal is present when disconnected then reconnect the output and verify the control wiring.
4) Verify the input impedance of the device being controlled is within the specifications of the expansion board.

8.2 Technical Support and Service

For questions regarding technical support, service, or repair of a product, contact us at:

Quest Controls
208 9th Street Dr. West
Palmetto, FL 34221
Tel: 941-729-4799

To return defective products in or out of warranty, you must have an RMA#. To get an RMA#, call 941-723-4112.

For more information about our test and repair center, or about customer support services, visit our website at **www.questcontrols.com**.

8.3 Warranty

QUEST warrants products of its manufacture to be free from defects in design, workmanship and material under normal and proper use and service for a period of 12 months starting upon shipment from the **QUEST** factory, with the exception of Software noted below. Products not manufactured by **QUEST** will have a 90-day warranty. Software is warranted to conform to **QUEST's** Software Product Description applicable at the time of order. **QUEST's** sole obligation hereafter shall be to remedy any nonconformance of the software to the Software Product Description during the 90-day period following delivery. This warranty shall not apply to fuses, batteries, or any product or parts subjected to misuse, neglect, accident, Acts of God, or abnormal conditions of operation.

QUEST agrees to repair or replace, at the place of manufacture and without charge, all parts of said products that are returned to the **QUEST** factory within the warranty period, provided the warrantor's examination discloses to its satisfaction that the product was defective and that the equipment has not been altered or repaired other than with **QUEST's** authorization and by its approved procedures. Repair or replacement of **QUEST** products does not extend the original warranty period. A product or board may be deemed beyond repair if **QUEST** determines that it has been subject to misuse, improper maintenance, negligence or accident, damaged or had its serial number or any part thereof altered, defaced or removed. If the failure has been caused by misuse, neglect, accident, or abnormal conditions of operation, or if the warranty period has expired, repairs will be billed at a nominal cost.

This warranty is in lieu of all other warranties expressed or implied, including but not limited to any implied warranty of merchantability, fitness, or adequacy for any particular purpose or use. In no event shall **QUEST** be liable for any special, incidental, or consequential damages, whether in contract, tort, or otherwise.