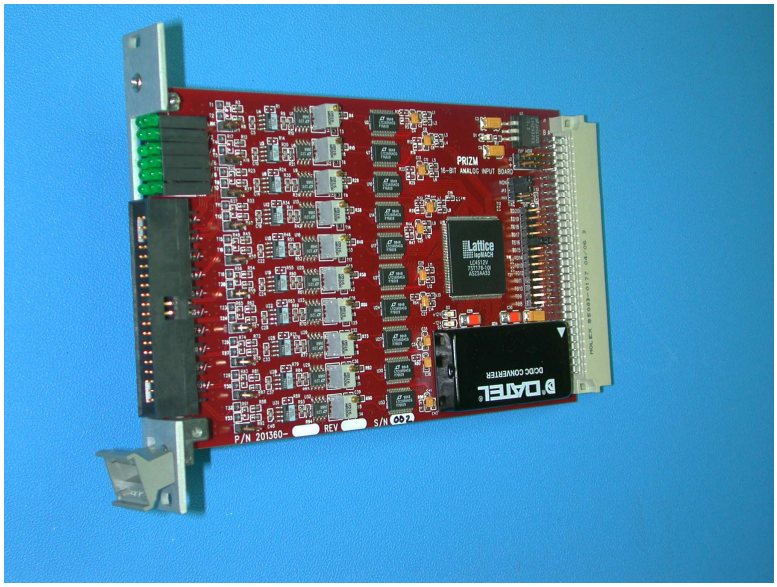
PRIZM™

# 10-Channel 16-Bit Analog Board Set

# User's Manual

# And

# Troubleshooting Guide




## March 16, 2011

## Rev. C

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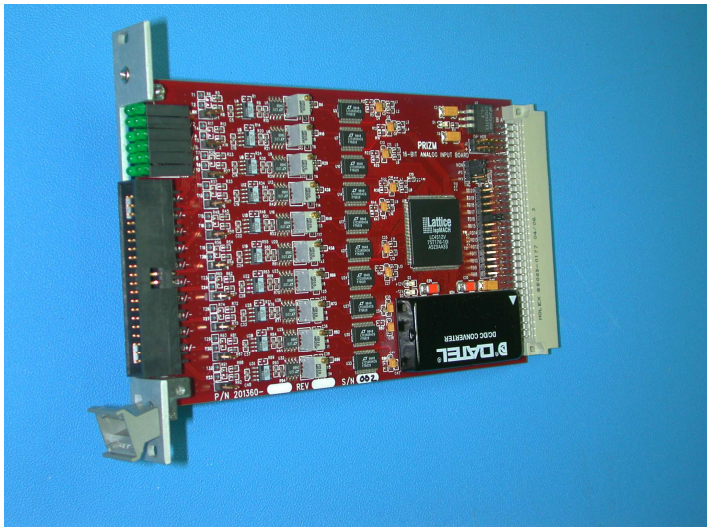
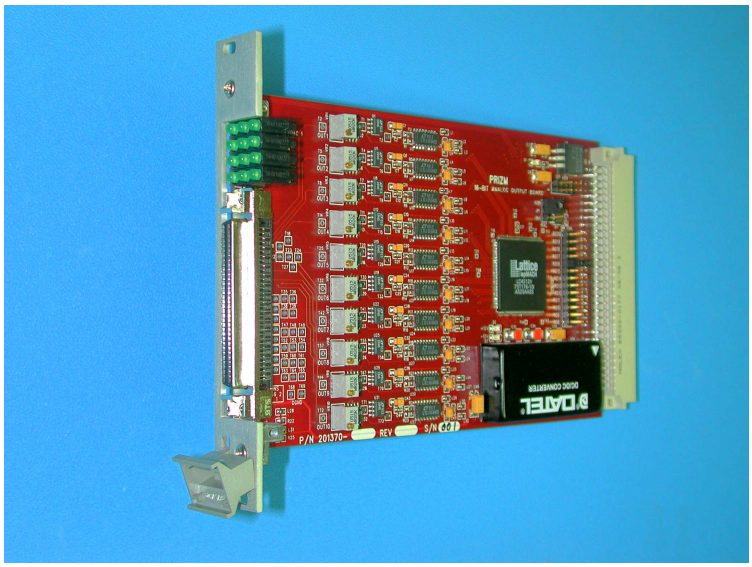
# TABLE OF CONTENTS

# 1 10-Chan16-Bit Analog Board Set

## Part Number - 201360-001A (Input)



## Part Number - 201370-001A (Output)



The Video 3 10-Chan 16-Bit Analog Board Set is a new design to support analog signals. This board set can be used in conjunction with the standard Video Input/Output boards to provide a system with 8 video channels plus the 10 analog channels.

The 10-Channel board set will accept 10 analog inputs, which have a maximum signal level of 20 Volts peak-to-peak (+/-10VDC) with a maximum frequency of 25KHz. For each channel the analog-to-digital quantizing level is 16-bits at a sample rate of 74.6K samples per second (Ksps). This board is typically used for carrying low bandwidth signals from acoustic hydrophones.

**NOTE: DUE TO THE PROGRAMMABLE NATURE OF THE VIDEO 3 10-CHAN 16-BIT ANALOG BOARD SET SET, OTHER CONFIGURATIONS/VERSIONS CAN BE EASILY IMPLEMENTED, CONTACT THE FACTORY FOR DETAILS.**

## 1.1 10-Chan16-Bit Analog Board Set Revision History:

The Video 3 Analog Input board has gone through the following printed circuit board (PCB) and Assembly revisions:

PCB Revision A/Assembly Revision A Original design.

The Video 3 Analog Output board has gone through the following printed circuit board (PCB) and Assembly revisions:

PCB Revision A/Assembly Revision A Original design.

## 1.2 10-Chan16-Bit Analog Board Set Dash (-) Number Definitions:

The Video 3 Analog Input and Output boards have a Dash Number appended to the part number. This Dash Number identifies the specific board configurations:

Video 3 Analog Input board:
-001A 10-Channels of 16-Bit Analog Input

Video 3 Analog Output board:
-001A 10-Channels of 16-Bit Analog Output

## 1.3 Manual Revision History:

The manual has gone through the following revisions:

| | |
|---|---|
| Revision A | Original |
| Revision B | Updated contact information to reflect Moog Components Group |
| Revision C | Corrected Analog Input Board Connector on page 5, corrected sub-heading title on page 6 |

## 1.4 10-Chan16-Bit Analog Board Set Operation:

The Video 3 Analog Input board accepts 10 analog input signals from signal sources via a 40-pin ribbon cable or crimped wire cable. The analog signals are digitized by 16-bit analog-to-digital (ADC) converters. The corresponding Video 3 Analog Output board at the other end of the link accepts the 10 digitized analog signals and converts them back to analog signals via digital-to-analog (DAC) converters. The Analog Output board uses a SCSI-2 type connector (68-pin) for direct connection to a LabView data acquistion board.

The Analog Input board takes the 10 digitized analog signals and combines them into a single high-speed serial link that is carried over the VME backplane to the Modem board.

This single serial link runs at the Video 3 system speed of 62.5Mbps (typically). The Modem board then combines this serial link with the other signals in the system into the 1.5Gbps fiber optic link (typically). At the other end of the fiber link, a Modem board de-multiplexes the signals and routes the appropriate high-speed serial link to the Analog Output board. The Analog Output board takes this serial link and further de-multiplexes the signals into each individual Digital-to-Analog (DAC) converter for conversion back into analog signals.

The analog channels are unidirectional and the direction depends on whether the board is a Video 3 Analog Input or Analog Output board. Video 3 10-Chan 16-Bit Analog Board Sets work in pairs of one input and one output board. More than a single set of Analog Boards can be placed in a Video 3 System, however contact the factory for details and help in correctly configuring your system.

**NOTE: ON THE ANALOG INPUT BOARD, THERE SHOULD BE SINGLE JUMPER SHUNTS PLACED ON JP5 AT ONE OF THE "TDxx" POSITIONS. THE SPECIFIC "TDxx" POSITION WILL BE SPECIFIED BY THE FACTORY AND SHOULD NOT BE CHANGED.**

**NOTE: ON THE ANALOG OUTPUT BOARD, THERE SHOULD BE SINGLE JUMPER SHUNTS PLACED ON JP2 AT ONE OF THE "RDxx" POSITIONS. THE SPECIFIC "RDxx" POSITION WILL BE SPECIFIED BY THE FACTORY AND SHOULD NOT BE CHANGED.**

### 1.4.1 10-Chan16-Bit Analog Board Set Signal Connectors:

**Analog Input Board Connector:**

There is 40-pin dual-row rectangular Amp connector on the on the front of the Analog Input board, labeled J3. PCB connector is AMP 2-103167-2. Mating connector is AMP 4-87631-2.

| Signal Name | Pin | Pin | Signal Name |
|---|---|---|---|
| IN1+ | 1 | 2 | IN1- |
| GROUND | 3 | 4 | GROUND |
| IN2+ | 5 | 6 | IN2- |
| GROUND | 7 | 8 | GROUND |
| IN3+ | 9 | 10 | IN3- |
| GROUND | 11 | 12 | GROUND |
| IN4+ | 13 | 14 | IN4- |
| GROUND | 15 | 16 | GROUND |
| IN5+ | 17 | 18 | IN5- |
| GROUND | 19 | 20 | GROUND |
| IN6+ | 21 | 22 | IN6- |
| GROUND | 23 | 24 | GROUND |
| IN7+ | 25 | 26 | IN7- |

| | | | |
|---|---|---|---|
| GROUND | 27 | 28 | GROUND |
| IN8+ | 29 | 30 | IN8- |
| GROUND | 31 | 32 | GROUND |
| IN9+ | 33 | 34 | IN9- |
| GROUND | 35 | 36 | GROUND |
| IN10+ | 37 | 38 | IN10- |
| GROUND | 39 | 40 | GROUND |

**NOTE: FOR DIFFERENTIAL INPUT SIGNALS CONNECT THE POSITIVE SIGNAL LINE TO "INx+" AND THE NEGATIVE SIGNAL LINE TO "INx-" PIN. SHIELD (IF USED) MAY BE CONNECTED TO THE NEAREST GROUND PIN.**

**NOTE: FOR SINGLE-ENDED INPUT SIGNALS CONNECT THE POSITIVE SIGNAL LINE TO "INx+" AND THE NEGATIVE SIGNAL LINE TO "GROUND". THE "Inx-" PIN MUST BE GROUNDED. SHIELD (IF USED) MAY BE CONNECTED TO THE NEAREST GROUND PIN.**

**Analog Output Board Connector:**

There is 68-pin dual-row SCSI connector on the on the front of the Analog Output board, labeled J3. PCB connector is AMP 787171-7. Mating connector is AMP 748111-6.

| Signal Name | Pin | Pin | Signal Name |
|---|---|---|---|
| OUT1 (AI 0) | 68 | 34 | OUT9 (AI 8) |
| GROUND | 67 | 33 | OUT2 (AI 1) |
| OUT10 (AI 9) | 66 | 32 | GROUND |
| OUT3 (AI 2) | 65 | 31 | T18 (AI 10) |
| GROUND | 64 | 30 | OUT4 (AI 3) |
| T10 (AI 11) | 64 | 29 | GROUND |
| N/C | 62 | 28 | OUT5 (AI 4) |
| T22 (AI 12) | 61 | 27 | GROUND |
| OUT6 (AI 5) | 60 | 26 | T24 (AI 13) |
| GROUND | 59 | 25 | OUT7 (AI 6) |
| T23 (AI 14) | 58 | 24 | GROUND |
| OUT8 (AI 7) | 57 | 23 | T27 (AI 15) |
| GROUND | 56 | 22 | N/C |
| N/C | 55 | 21 | N/C |
| N/C | 54 | 20 | N/C |
| GROUND | 53 | 19 | T36 |
| T35 | 52 | 18 | GROUND |
| T34 | 51 | 17 | T39 |
| GROUND | 50 | 16 | T49 |
| T37 | 49 | 15 | GROUND |
| T38 | 48 | 14 | +5V (N/C) |

| | | | |
|---|---|---|---|
| T40 | 47 | 13 | GROUND |
| T47 | 46 | 12 | GROUND |
| T46 | 45 | 11 | T48 |
| GROUND | 44 | 10 | T54 |
| T50 | 43 | 9 | GROUND |
| T52 | 42 | 8 | +5V (N/C) |
| T51 | 41 | 7 | GROUND |
| T59 | 40 | 6 | T61 |
| T56 | 39 | 5 | T53 |
| T63 | 38 | 4 | GROUND |
| T62 | 37 | 3 | T60 |
| GROUND | 36 | 2 | T65 |
| GROUND | 35 | 1 | T64 |

**NOTE: THE OUTPUT BOARD ONLY PRODUCES SINGLE-ENDED SIGNALS. CONNECT THE POSITIVE SIGNAL LINE TO "OUTx" AND THE NEGATIVE SIGNAL LINE TO TH NEAREST GROUND PIN. SHIELD (IF USED) MAY BE CONNECTED TO THE NEAREST GROUND PIN.**

## 1.4.2 10-Chan16-Bit Analog Board Set Indicator and Controls:

**Analog Input Board Indicators:**

There are twelve LED indicators on the front panel of the Video 3 Analog Input board in six of dual-high LEDs. The top LED is labeled "+5V" and "TLINK". The next 5 dual LEDs light to indicate analog input signal activity on a channel-by-channel basis.

**NOTE: THE ANALOG CHANNEL STATUS LEDS LIGHT WHEN THE INPUT/OUTPUT SIGNALS EXCEED A PRE-SET THRESHOLD (TYPICALLY 4.5Vp-p). BECAUSE OF SLIGHT CHANNEL-TO-CHANNEL GAIN AND OFFSET VARIATIONS, THE SIGNAL LEVEL TO CASE EACH STATUS LED TO LIGHT MAY VARY SLIGHTLY. THESE LEDS ARE FOR GUIDANCE.**

| LED Description | LED Reference Des | Conditions |
|---|---|---|
| "+5V" | LED1, bottom | ON when +5VDC is available to board |
| "TLINK" | LED1, top | ON when board logic is functioning |
| "ADC 1" | LED2, bottom | ON when analog signal on channel 1 |
| "ADC 2" | LED2, top | ON when analog signal on channel 2 |
| "ADC 3" | LED3, bottom | ON when analog signal on channel 3 |
| "ADC 4" | LED3, top | ON when analog signal on channel 4 |
| "ADC 5" | LED4, bottom | ON when analog signal on channel 5 |
| "ADC 6" | LED4, top | ON when analog signal on channel 6 |
| "ADC 7" | LED5, bottom | ON when analog signal on channel 7 |
| "ADC 8" | LED5, top | ON when analog signal on channel 8 |

| | | |
|---|---|---|
| "ADC 9" | LED6, bottom | ON when analog signal on channel 9 |
| "ADC 10" | LED6, top | ON when analog signal on channel 10 |

**Analog Output Board Indicators:**

There are twelve LED power indicators on the front panel of the Video 3 Analog Output board in four triple-high LEDs. The top LED is labeled "+5V", "TLINK" and "DAC 1". The next 3 triple LEDs light to indicate analog input signal activity on a channel-by-channel basis.

**NOTE: THE ANALOG CHANNEL STATUS LEDS LIGHT WHEN THE INPUT/OUTPUT SIGNALS EXCEED A PRE-SET THRESHOLD (TYPICALLY 4.5Vp-p). BECAUSE OF SLIGHT CHANNEL-TO-CHANNEL GAIN AND OFFSET VARIATIONS, THE SIGNAL LEVEL TO CASE EACH STATUS LED TO LIGHT MAY VARY SLIGHTLY. THESE LEDS ARE FOR GUIDANCE.**

| LED Description | LED Reference Des | Conditions |
|---|---|---|
| "+5V" | LED1, bottom | ON when +5VDC is available to board |
| "TLINK" | LED1, middle | ON when output board is linked with input board |
| "DAC 1" | LED1, top | ON when analog signal on channel 1 |
| "DAC 2" | LED2, bottom | ON when analog signal on channel 2 |
| "DAC 3" | LED2, middle | ON when analog signal on channel 3 |
| "DAC 4" | LED2, top | ON when analog signal on channel 4 |
| "DAC 5" | LED3, bottom | ON when analog signal on channel 5 |
| "DAC 6" | LED3, middle | ON when analog signal on channel 6 |
| "DAC 7" | LED3, top | ON when analog signal on channel 7 |
| "DAC 8" | LED4, bottom | ON when analog signal on channel 8 |
| "DAC 9" | LED4, middle | ON when analog signal on channel 9 |
| "DAC 10" | LED4, top | ON when analog signal on channel 10 |

**Analog Input Board Controls:**

The Analog Input board has twelve trimpots for adjusting the analog input signal stage gain.

**NOTE: THESE TRIMPOTS ARE NOT ACCESSABLE FROM THE FRONT PANEL OF THE BOARD. CONTACT THE FACTORY FOR GUIDANCE IF THESE TRIMPOTS MUST BE ADJUSTED.**

Normally this board will be calibrated such that an input signal has a 1:1 gain from the input connector to the signal input to the ADC converter (i.e. a 1.0VDC signal at the connector should be 1.0VDC at the input to the ADC). The trimpot will provide compensation for variations in differential amplifier gain (though slight) and allow for custom calibrations as defined by the customer. Calibration involves inputting a known signal and monitoring the

signal into the ADC with an oscilloscope while adjusting the trimpot. This adjustment must be performed on each of the 10 channels.

**Analog Output Board Controls:**

The Analog Output board has twelve trimpots for adjusting the analog output signal after the DAC converter.

**NOTE: THESE TRIMPOTS ARE NOT ACCESSABLE FROM THE FRONT PANEL OF THE BOARD. CONTACT THE FACTORY FOR GUIDANCE IF THESE TRIMPOTS MUST BE ADJUSTED.**

**NOTE: CONTACT THE FACTORY FOR GUIDANCE ON CALIBRATION TO YOUR SPECIFIC APPLICATION.**

## 1.4.3 10-Chan16-Bit Analog Board Set Specifications:

**Part Number - 201360-001A (Input)**
**Part Number - 201370-001A (Output)**

| | |
|---|---|
| Number of Channels: | 10 analog |
| Analog Sample Rate: | 74.5Ksps typically |
| Analog Bandwidth: | 0-25 KHz typically |
| Analog Quantizing: | 16-bits or 65,536 levels |
| Analog Input Range: | -10VDC to +10VDC (typically) |
| Analog Input Overload/Clip: | Below -10VDC and Above +10VDC |
| Analog Input Coupling: | DC Coupled |
| Analog Input Type: | Single-ended or Differential (jumper selected) |
| Analog Output Range: | -10VDC to +10VDC (typically) |
| Analog Output Type: | Single-ended only (not differential) |

**NOTE: AS THE ANALOG INPUT IS DC COUPLED, ANY INPUT VOLTAGE OUTSIDE OF THE RANGE OF -10VDC TO +10VDC WILL BE CLIPPED BY THE ADC.**

**NOTE: INPUT SIGNALS BEYOND -12VDC TO +12VDC WILL BE CLAMPED BY INPUT PROTECTION DIODES AND DAMAGE TO THE BOARD CIRCUITRY MAY BE SUSTAINED.**

## 1.4.4 10-Chan16-Bit Analog Board Set Dimensions:

VME 3-U format. 100 mm wide x 160 mm long x 20 mm thick
(3.937 in x 6.299 in x 0.80 in)

VME 3-U PCB and faceplate in rack: 20 mm wide x 128 mm high (0.8 in x 5.05 in)

### 1.4.5 10-Chan16-Bit Analog Board Set Power Requirements:

**Analog Input 0.5** 1.0 Amps (2.5 Watts) typically

**Analog Output Board:**
+5 Volts at 0.5 Amps (2.5 Watts) typically
-5 Volts at 0.1 Amps (0.5 Watts) typically

## *1.5 10-Chan16-Bit Analog Board Set Adjustment and Troubleshooting*

**Front Panel LEDs:**
In normal operation the following front panel LED status should be observed on both the Analog Input and the Analog Output boards:

"+5V" LED - Lit green
"TLINK" volts power LED –
On Input board always lit green
Ten channel activity LEDs - Lit green when analog signal is active on that channel

**Board-mounted Surface Mounted LEDs:**
The analog circuitry on both the Analog Input and Analog Output boards require both +12VDC and -12VDC power. This power is normally provided by a board-mounted DC-DC converter. There are two green surface mount LEDs near to the DC-DC converter that will be lit when +12VDC and -12VDC are be generated by this converter.

"+12V" LED (D2 on Input and Output boards) - Lit green
"-12V" LED (D3 on Input and Output boards) - Lit green

The programmable logic device (U18 on both Input and Output boards) is powered from 3.3VDC. This voltage is generated from the backplane +5VDC supply by a linear regulator (U4). A green surface mount LED (D1 on both Input and Output boards) should be lit if +3.3V is available. The front-panel mounted "+5V" LED is actually driven by an output on the programmable logic device and thus will only be lit if BOTH +5VDC and +3.3VDC is functional on the board.

Once a good optical link is established between the vehicle and surface units, an analog signal generator can be used to generate a test signal for display on an oscilloscope. Verify that all available analog channels are active. When the analog input source is connected to one of the 10 channels on an analog input board, a green LED will light on the corresponding channel of the analog output board.

**NOTE: a fiber optic link must be made in BOTH DIRECTIONS for the multiplexer to work properly.**

### 1.5.1 Board Level Testing:

If the "+5V" LED is out:

- Check for +5VDC and -5V DC at the backplane connector.
- Check that "+3.3V" LED (D1) is lit.

If correct power is measured:

- Check "+5V" LED, "3.3V" LED (D1)

If power is not found:

- Check power entry at backplane and test power supply (see power supply section of manual)

If one or more analog channels has a low analog level:

- Adjust the gain on Video 3 Analog Input board to a 1 to 1 gain, utilizing trimpots VR1 - VR10. Access to these trimpots is from the top of the board and will be difficult to access. Contact the Factory for guidance.
- Adjust the gain on Video 3 Analog Output board to a 1 to 1 gain, utilizing trimpots VR1 - VR10. Access to these trimpots is from the top of the board and will be difficult to access. Contact the Factory for guidance.

If one or more analog channels are out:

- Verify that Video 3 Analog Input board is installed on subsea side of link (Usually ROV end) and that Video 3 Analog Output board is installed in the topside of the link (usually the surface unit).
- Inspect signal source, cables, monitor, etc.

If no improvement is noted:

- Replace board with spare, starting at Video Analog Input side first followed by the Analog Output side.