ENDCAP Alignment

ANALOG INTERFACE BOARD

User's Manual

FNAL – PNPI
2003

1. Introduction

The analog interface board provides a stable 11.3 V voltage for the R-sensors LPX50 and Z-sensors ETI LCP8S-10, connection of the biaxial inclinometer ApGeo 900, R-, and Z-sensors to a voltmeter, cross-connection of temperature (T) sensors, and low voltage distribution for lasers. No control is required for this board.

2. Construction

The analog interface board has seven connectors:

    J1   – 6-port RJ11 jack for connection:
                Port 1 – the biaxial inclinometer
                Port 2 – Z1 sensor
                Port 3 – Z2 sensor
                Port 4 – R1 sensor
                Port 5 – R2 sensor
                Port 6 – T1 sensor

    J2   – 4-port RJ11 jack
                Port 1 – Laser Output (This station)
                Port 2 – Laser Input
                Port 3 – T2 + T3 Input
                Port 4 – T Output (T1 + T2 + T3)

    J3   – RJ11 jack – Laser Output to the next station

    J4, J5   – Low voltage distribution connectors

    J6   – 3M 20-pin header – Output to a voltmeter

    J7   – RJ11 jack – R3 sensor (used for ME1 only)

The analog interface board has four switches performed as pin strips controlled by shunts (jumpers):

    P1   – Select the input voltage for the Z1 sensor
                One shunt is used **always**

    P2   – Connect Z2 input voltage to the output connector J6
                Two shunts are used **simultaneously**. If connection is not required, both
                shunts should be placed to a single pin of the same switch.

P3   – Select the current board laser output
           Two shunts are used **always**

P4   – Select a source for the channel 4 at the output connector J6 (pins 7, 8):
           Z1 reference voltage or R3 sensor.
   Two shunts are used **always**.

3. Circuit Diagram

The analog interface board consists of the low drop output (LDO) voltage regulator and cross-connection circuitry. Voltage regulator is performed in LT1761 U1 integrated circuit with external resistive divider R1, R2 that determines the output voltage as 11.2 V. Red LED indicates a presence of the regulated voltage.
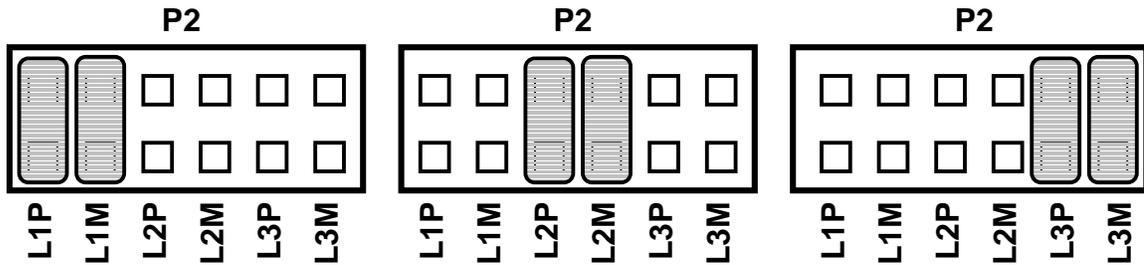
4. Application Notes

1. Admissible positions of shunt at the P1 switch are the following (any other position is prohibited):

P1 | V1 / V2   **P1** | V1 / V2

2. Admissible positions of shunts at the P1 switch are the following (any other position is prohibited):
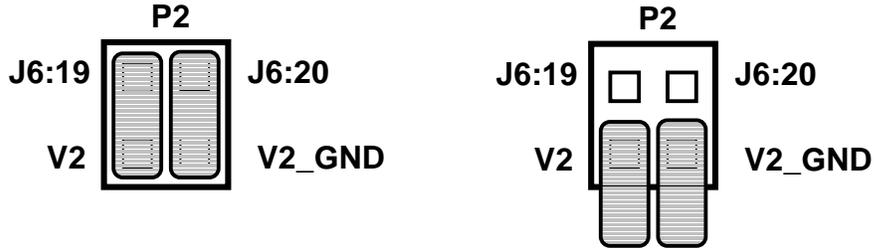
P2

J6:19   J6:20

V2   V2_GND

P2

J6:19   J6:20

V2   V2_GND

3. Admissible positions of shunt at the P1 switch are the following (any other position is prohibited):

P2   **P2**   **P2**

L1P L1M L2P L2M L3P L3M   L1P L1M L2P L2M L3P L3M   L1P L1M L2P L2M L3P L3M

4. Admissible positions of shunt at the P1 switch are the following (any other position is prohibited):

P4   **P4**

R3   Z1VREF   R3   Z1VREF

5. Functioning

The analog interface board is a passive device representing a cross-connection board with internal voltage regulator. It works properly if all settings and connections are correct.

6. Debugging and Testing

Necessary equipment:
- o Digital voltmeter
- o 12 – 15 V power supply
- o Power cable for analog interface board

Properly manufactured analog interface boards do not require any adjustments and should work correct at once.

1. Check the assembled board visually. It must not have visible damages. All components and their values must be in accordance with documents.

2. Connect the analog interface board under test to the power supply 12 – 15 V and turn on it. Check an input voltage after the F1 and F2 fuses; replace them if necessary.

3. Check +11.3V output voltage of the LDO voltage regulator.

4. A complete test of the analog alignment DAQ including the analog interface board must be performed before a final assembly.

7. Troubleshooting and Maintenance

Output voltage of the voltage regulator is wrong.

- Check an input voltage; it should be 12 – 15 V.
- Check a fuse F2; replace it if necessary.
- Check values of the R1 and R2 resistors.
- Check polarity of the C6, C8, and C9 tantalum capacitors (a white band marks a **positive** pad).
- If the previous checks do not discover a reason of failure, replace the U1 LTC11761 integrated circuit.

8. Specification

General

Dimensions of the board	6.7" x 2.9"
Input connector J1	6-port RJ11 jack
Input/output connector J2	4-port RJ11 jack
Output connector J3	RJ11 jack
Power connectors J4, J5	2-pin Molex Sabre 43160-3102
Output connector J6	20-pin 3M header 3428-6002
Switch P1	3-pin single raw strip 3M 929647-09-36-I (modified) with shunt 3M 929957-08
Switch P2	2 x 2 double raw strip 3M 929665-09-36-I (modified) with shunts 3M 929957-08
Switch P3	6 x 2 double raw strip 3M 929665-09-36-I (modified) with shunts 3M 929957-08

Power characteristics

Minimum input voltage	+12 V
Maximum input voltage	+15 V
Output regulated voltage	+11.2 V
Power consumption:	480 mW with entire sensor set

Current consumption:

Inclinometer		7 mA
R-sensors	2 x 1.13 =	2.26 mA
Z-sensors	2 x 11.3 =	22.6 mA

On board power protection:

Two fuses	0.5 A

LT1761 voltage regulator has overcurrent and overtemperature protection

Specification of connectors

Connector J1 port 1 (Inclinometer Input):

Pin	Name
1	V_X
2	GND (V_X)
3	V_Y
4	GND (V_Y)
5	V_{IN}
6	GND

Connector J1 ports 2 – 5 (Z1, Z2, R1, R2):

Pin	Name
1	V_{WIPER}
2	GND (W V_{WIPER})
3	V_{REF}
4	GND (V_{REF})
5	V_{IN}
6	GND

Connector J1 port 6 (T1 Input):

Pin	Name
1	
2	
3	
4	
5	T1-
6	T1+

Connector J2 port 1 (Laser Out):

Pin	Name
1	
2	
3	Laser Output +
4	Laser Output -
5	
6	

Connector J2 port 2 (Laser Input):

Pin	Name
1	Laser 1 Input +
2	Laser 1 Input -
3	Laser 2 Input +
4	Laser 2 Input -
5	Laser 3 Input +
6	Laser 3 Input -

Connector J2 port 3 (T2 + T3 Input):

Pin	Name
1	T2-
2	T2+
3	T3-
4	T3+
5	
6	

Connector J2 port 4 (T Output):

Pin	Name
1	T1-
2	T1+
3	T2-
4	T2+
5	T3-
6	T3+

Connector J3 (Laser Output to the next station):

Pin	Name
1	Laser 1 Output +
2	Laser 1 Output -
3	Laser 2 Output +
4	Laser 2 Output -
5	Laser 3 Output +
6	Laser 3 Output -

Connectors J4, J5 (Low voltage distribution):

Pin	Name
1	PWR
2	GND

Output connector J6:

Name	Pin	Pin	Name
V_X	1	2	GND (V_X)
V_Y	3	4	GND (V_Y)
V_{Z1W}	5	6	GND (V_{Z1W})
V_{Z1R} or V_{R3} *	7	8	GND (V_{Z1R} or V_{R3}) *
V_{Z2W}	9	10	GND (V_{Z2W})
V_{R1W}	11	12	GND (V_{R1W})
V_{R1R}	13	14	GND (V_{R1R})
V_{R2W}	15	16	GND (V_{R2W})
V_{R2R}	17	18	GND (V_{R2R})
<V_{Z2R}> **	19	20	<[GND (V_{Z2R})> **

    *   Selected by P4
   **   If P2 shunts are inserted

Connector J7 (R3):

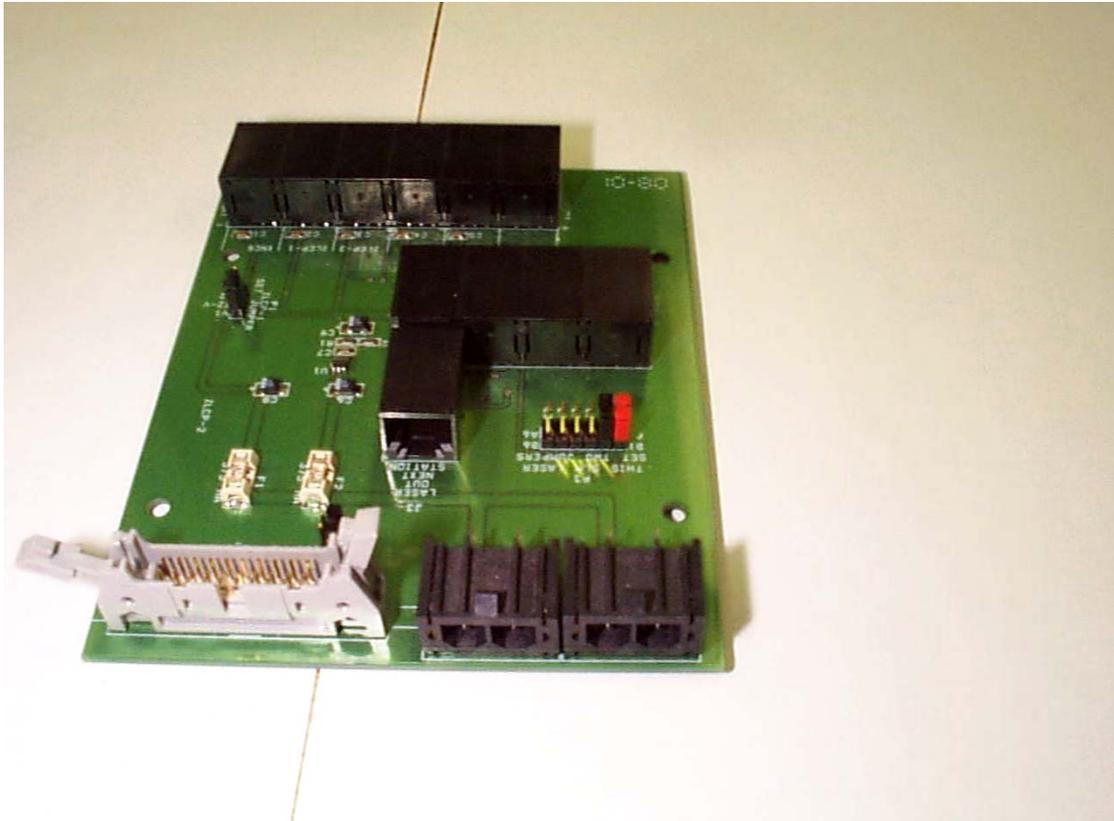| Pin	Name
1	V_{WIPER}
2	GND (V_{WIPER})
3	
4	
5	V_{IN}
6	GND

Fig. 1. The analog interface board