

Ultraflow 150DI 6Pt I/O Board OPERATIONS MANUAL



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Description

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SIX POINT I/O BOARD FOR 150DI SYSTEM

1.0 OVERVIEW

This manual describes the Six Point I/O Board (6PIO) in the UltraFlow 150DI system. The Six Point I/O Board option (P/N 1903-0550-02) is used as a Direct Interface feature in the Ultraflow 150DI where analog output and control signals are required directly from the Transducer Interface Enclosure (TIE) Assembly. The 6PIO is packaged under the Local User Interface (LUI) in the upper right hand corner of the TIE and is accessed by removing the thumb screws on the LUI panel. External connections are made by connecting to TB2 & TB3 on the external interface PC Board. See Appendix B for Wiring Diagram connections and board location.

The configuration of the 6PIO Board is software selectable using the PC to Modbus interface software supplied with the Ultraflow 150DI. (See Figure 1-0-1 below) You must be in the Sixpoint I/O tab. Other selections are made by placement of small jumpers located on the circuit board.

Note: The software provided uses a modified Modbus and is proprietary to TML.

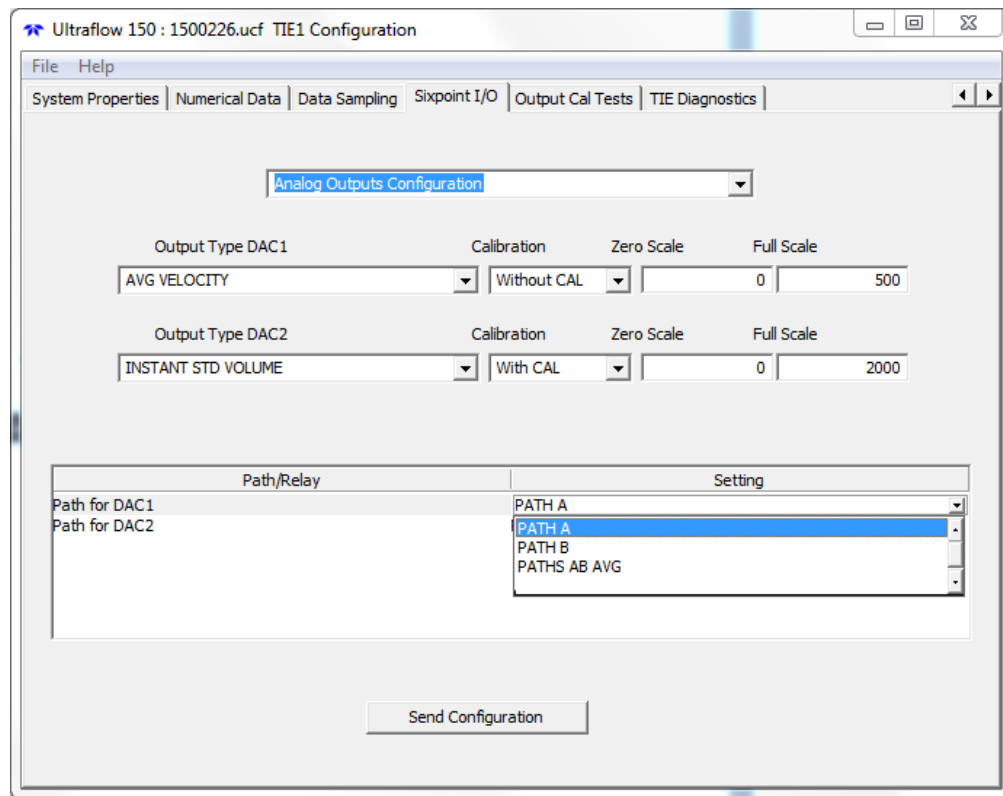


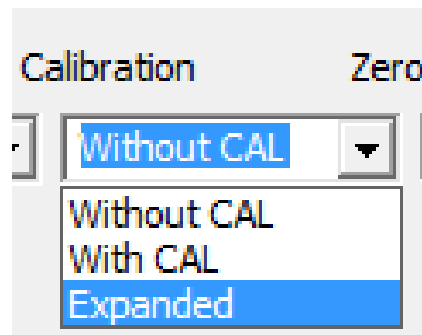
Figure 1-0-1

2.0 ANALOG OUTPUT DESCRIPTION

There are two independently isolated analog outputs, DAC 1 (Channel 1 or Out 1) & DAC 2 (Channel 2 or Out 2). They can be configured for anyone of 30 selections. (See selection types in the Output type pull down menu) The selections can be applied to Path A transducer set, Path B transducer set or Path AB Average. (See Figure 1-0-1)

You can select with calibration or without calibration mode values for DAC1 or DAC2 channels. If With CAL is selected, calibration values will be collected on that channel. Calibration data scaling for Zero, Span Low and Span High will be the same as the Normal mode scaling.

EXPANDED SCALING for Zero: Normal scaling calibration data will be present on the analog output along with Span Low & Span High but Zero scaling will be expanded for better resolution. Zero Mode Scaling will be +/- 10% of the full scale value.

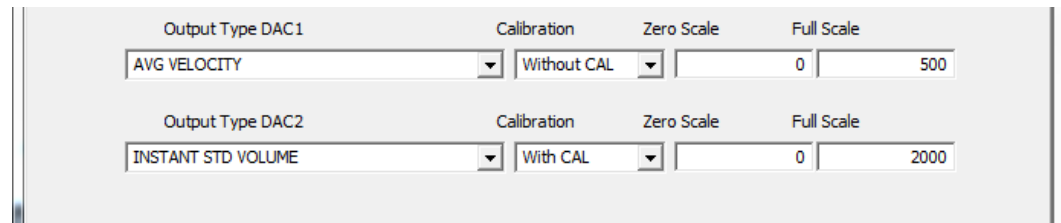


2.1 Zero Scale & Full Scale values

Zero scale-Defines the value that will create an analog output current of 4mA or 0mA (Depnding on JU9 jumper position explained in next section).

Full Scale- Defines the value that will create an analog output current of 20mA.

These values must be representative of the Output Type chosen.



When your selections are complete you must click on the send configuration button.

2.2 Analog Output Current Range Selection

Two output current options are available from the 6PIO Board (either 4 – 20mA or 0 – 20mA). This range will apply to any Output Type selected above.

Both analog channels are configured identically and the current range selected by the placement of jumper JU9 on the 6PIO Board. Placing the removable jumper between the two *leftmost* pins of JU9 (or the “4” position) will select the 4 – 20mA range. Placement of the jumper between the two rightmost pins of JU9 (or the “0” position) will select the 0 – 20mA range. Position 4 is default and allows a live Zero.

Examples 1 and 2 below indicate how the Output type parameter, 6PIO Full Scale parameter and 6PIO jumper interactivity dictate the analog output response to the instrument measurement levels.

EXAMPLE 1:

If INSTANT STD VOLUME is selected **AND** Geometry Units are FT **AND** Flow Volume Units are /Minute **AND** (6PIO Full Scale = 2,000) **AND** (0/4 6PIO Jumper = 4):

4mA = 0 Cubic feet per minute

20mA = 2,000 Cubic feet per minute

EXAMPLE 2:

If AVG VELOCITY is selected **AND** Geometry Units are FT **AND** (6PIO Full Scale = 500) **AND** (0/4 6PIO Jumper = 0):

0mA = 0 FT/SEC

20mA = 500 FT/SEC

2.3 ANALOG OUTPUT ADJUSTMENT

The output current from each channel of the 6PIO may be measured at test points located on the board. The 0 – 20 or 4 – 20mA currents may be measured using a digital voltmeter to read the voltage across a 100Ω resistor at test points TP3 and TP4 for analog channel #1 (DAC1). 2.00 VDC between TP3 and TP4 indicates a 20mA output current. 0.40 VDC corresponds to a 4mA output.

The analog channel #2 (DAC2) output is measured between test points TP10 and TP11. Voltage readings on channel #2 are the same as channel #1.

$$2.00 \text{ VDC} = 20\text{mA}$$

$$0.40 \text{ VDC} = 4\text{mA}$$

Potentiometers are available for adjustment of the analog output current from each channel. Zero and full scale adjustments are made using the potentiometers while monitoring the above mentioned test points or the final external display device.

	TEST POINTS	ZERO ADJUST	FULL SCALE ADJUST
Channel #1 (DAC1)	TP3 – TP4	R11	R10
Channel #2 (DAC2)	TP10 – TP11	R23	R22

**Table 2-3-1
Analog Output Channel Adjustment Details**

2.4 Automatic Calibration Analog Output Sequence

The order of the Automatic Calibration Analog Output Sequence is shown below. The duration of each is programmable in seconds.

Order	Description	Duration
1 st	ZERO Calibration	Selectable in seconds
2 nd	Span low Calibration	Selectable in seconds
3 rd	Span high Calibration	Selectable in seconds

Table 2-4-1
Automatic Calibration Sequence

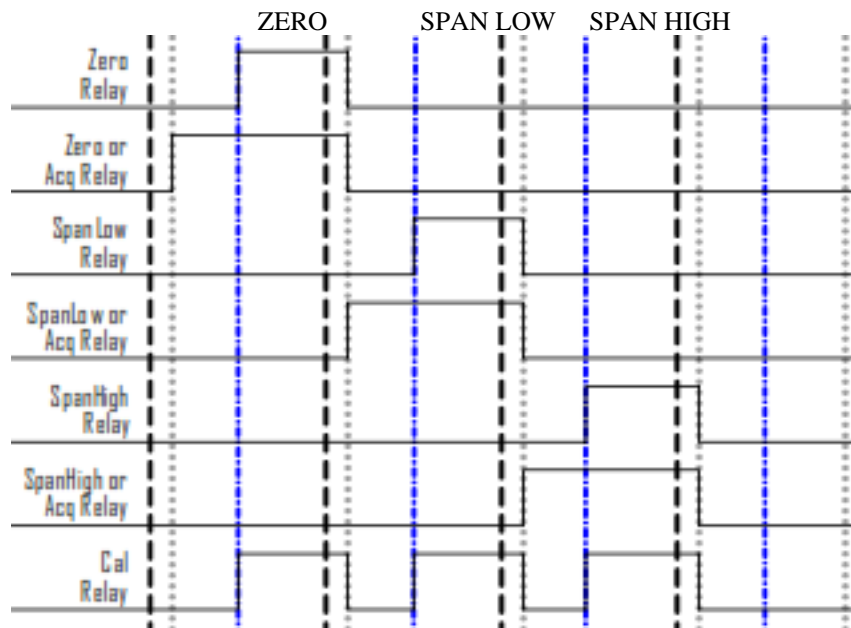


Figure 2-4-2
Analog Output Cal Cycle Sequence

3.0 DISCRETE ISOLATOR INPUTS

There are two discrete isolator inputs on the 6PIO Board. Both can be independently configured to operate from +5Vdc or Dry contacts: Jumper JU5 configures isolator #1 and JU6 configures isolator #2. They are also jumper configurable to perform the following functions:

Jumper Position	Function	Available Isolator
JU7 "A"	SPAN HIGH	ISO1
JU8 "A"	ZERO	ISO2
JU7 "B" or JU8 "B"	CALIBRATION CYCLE	ISO1 or ISO2
JU8 "C"	SPAN HIGH	ISO2
JU7 "C"	SPAN LOW	ISO1

Table 3-0-1
Isolator Configuration Jumpers

3.1 Other Jumpers

- **TEST ZERO SCALE (JU10):** This jumper is used to set both analog outputs to ZERO SCALE when placed in position "Z" (rightmost).
- **TEST FULL SCALE (JU11):** This jumper is used to set both analog outputs to FULL SCALE (20mA) when placed in the "FS" position (rightmost).
- **TEST ZERO SCALE AND TEST FULL SCALE:** When both of these jumpers (JU10 and JU11) are actuated simultaneously, both the analog outputs go to MID SCALE (12mA if the JU9 jumper is set to position "4", 10mA if the JU9 jumper is set to position "0").
- **JU1, JU2, JU3 and JU4:** These jumpers are used to set up internal measurement parameters for the 6PIO Board. These must remain in the positions detailed below for all 6PIO configurations.

Jumper Position	Function
JU9 "0"	Analog Outputs 0-20 mA
JU9 "4"	Analog Outputs 4-20 mA
JU10 "Z"	Test Zero Scale
JU11 "FS"	Test Full Scale
JU10 "Z" and JU11 "FS"	Test Mid Scale
JU1 & JU3 = 0	Internal Ranging (do not move)
JU2 & JU4 = 1	Internal Ranging (do not move)

Table 3-1-1
Other Output Jumper Configuration

4.0 RELAY OUTPUTS

Two relays are available K1 & K2. Contacts are SPDT (Form C). The configuration of the relays is software selectable using the PC to Modbus interface software supplied with the Ultraflow 150DI. (See Figure 4-0-1)

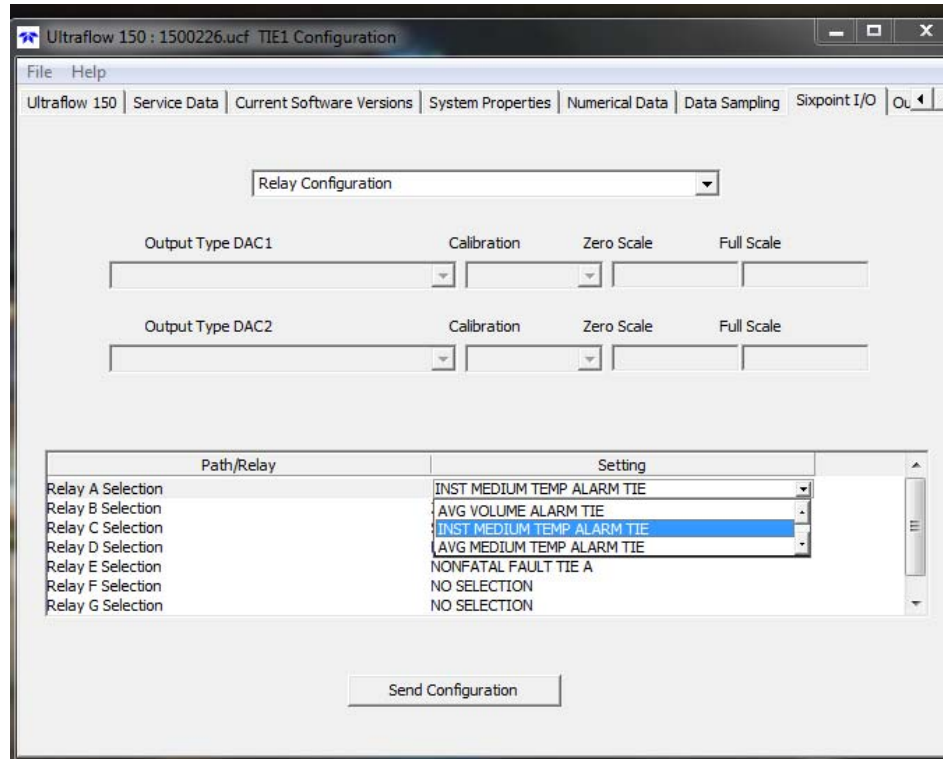


Figure 4-0-1

In the top pull down box you must select Relay Configuration. The lower window will display Path/Relay & Setting menus. In the Path/Relay side the letters A through H represent jumper positions on the 6PT I/O PC Board, K1 (JU12) & K2 (JU13). On the right is where the settings for the jumper positions are selected. There are 42 different selections that can be made (See selection list). In order for a setting to work, for a particular jumper position, the jumper must be in that position.

Example:

K1 (JU12) jumper is in position A: In the settings for Relay A you select PURGE FAIL TIE A. If the purge system fails for TIE A, relay K1 will activate and send the alarm signal to the DAS or recording devices.

K2 (JU13) jumper is in position B: In the settings for Relay B you select CAL FAILURE TIE A. If the calibration fails on TIE A, relay K2 will activate and send the alarm signal to the DAS or recording devices.

NOTE: If both relay jumpers are in the same letter position, both relays will send out the same alarm.

When your selections are complete you must click on the send configuration button.

Table 4-0-2
Relay Function setting list

- NO SELECTION
- INST VOLUME ALARM TIE
- AVG VOLUME ALARM TIE
- INST MEDIUM TEMP ALARM TIE
- AVG MEDIUM TEMP ALARM TIE
- SPAN HIGH ON AO TIE
- SPAN LOW ON AO TIE
- ZERO ON AO TIE
- NORMAL ON AO TIE
- CAL ON AO TIE
- FATAL FAULT TIE A
- NONFATAL FAULT TIE A
- DATA VALID TIE A
- INTERFERENCE TEST TIE A
- PURGE FAILURE TIE A
- CAL FAILURE TIE A
- SN RATIO UPSTREAM ALARM TIE A
- SN RATIO DOWNSTREAM ALARM TIE A
- SN RATIO BOTH ALARM TIE A
- FATAL FAULT TIE B
- NONFATAL FAULT TIE B
- DATA VALID TIE B
- INTERFERENCE TEST TIE B
- PURGE FAILURE TIE B
- CAL FAILURE TIE B
- SN RATIO UPSTREAM ALARM TIE B
- SN RATIO DOWNSTREAM ALARM TIE B
- SN RATIO BOTH ALARM TIE B
- FATAL FAULT TIE A OR B
- NONFATAL FAULT TIE A OR B
- DATA VALID TIE A OR B

- INTERFERENCE TEST TIE A OR B
- PURGE FAILURE TIE A OR B
- CAL FAILURE TIE A OR B
- SN RATIO UPSTREAM ALARM TIE A OR B
- SN RATIO DOWNSTREAM ALARM TIE A OR B
- SN RATIO BOTH ALARM TIE A OR B
- SPAN HIGH OR ACQ ON AO TIE
- SPAN LOW OR ACQ ON AO TIE
- ZERO OR ACQ ON AO TIE
- NORMAL OR ACQ ON AO TIE
- CAL OR ACQ ON AO TIE

The contacts of each relay are jumper configurable for either N.O. or N.C. operation as per the following table.

RELAY	N.O.	N.C.
K1	JU14 "A"	JU14 "B"
K2	JU15 "A"	JU15 "B"

Table 4-0-3
Relay Contact Configuration Jumpers

5.0 INTERFACE CABLES

Two cables are needed to connect the 6PIO to external devices. One is a 4 conductor #20 AWG (0.5 mm²) cable for connecting the contacts from the two relays. The other one Teledyne Monitor Labs recommends is a 6-pair #24 AWG (0.25 mm²) shielded cable for connection to the two analog outputs and two isolators. This would leave two pairs as spares or for future use. See Wiring Diagram in Appendix B for details on external connections to the 6PIO PC Board.

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Appendix A

Six Point I/O Board Specifications

SIX POINT I/O BOARD ANALOG OUTPUTS

Number	2
Isolation Type	<i>Optical & capacitive barriers; channel to channel, channel to circuit common & earth</i>
Minimum Isolation Voltage	<i>500Vpeak*, 500VDC*</i>
Output Type	<i>4-20mA with live 4mA zero, OR 0-20mA w/o live zero</i>
Maximum Load Resistance	<i>900 ohms</i>
Maximum Offset	<i>±0.05% of full scale</i>
Total Output Error	<i>±0.30% of full scale</i>

SIX POINT I/O BOARD DIGITAL INPUTS

Number	2
Modes	<i>Isolated and Non-isolated</i>
Isolated Mode Minimum Isolation Voltage	<i>500Vrms*</i>
Isolated Mode Minimum Actuation Voltage	<i>5VDC (user supplied)</i>
Isolated Mode Maximum Actuation Voltage	<i>24VDC (user supplied)</i>
Isolated Mode Maximum Input Current	<i>50mA @ 24VDC</i>
Non-Isolated Mode Actuation Condition	<i>Dry contact closure</i>
Non-Isolated Mode Internal Operating Voltage	<i>5VDC</i>

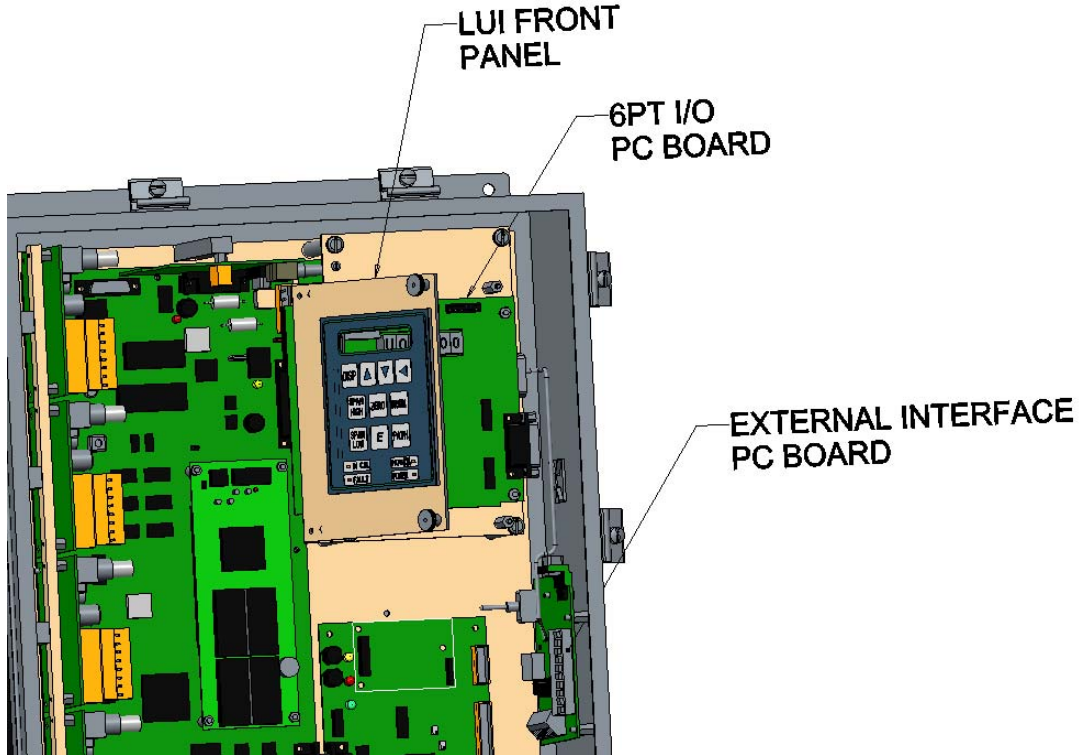
SIX POINT I/O BOARD RELAY OUTPUTS

Number	<i>2 SPST, N.O. (Single Pole Single Throw, Normally Open or Normally Closed [jumper selectable])</i>
Minimum Isolation	<i>500Vrms*</i>
Maximum Contact Voltage	<i>250VAC</i>
Maximum Contact Current	<i>1Amp AC, 1Amp DC</i>

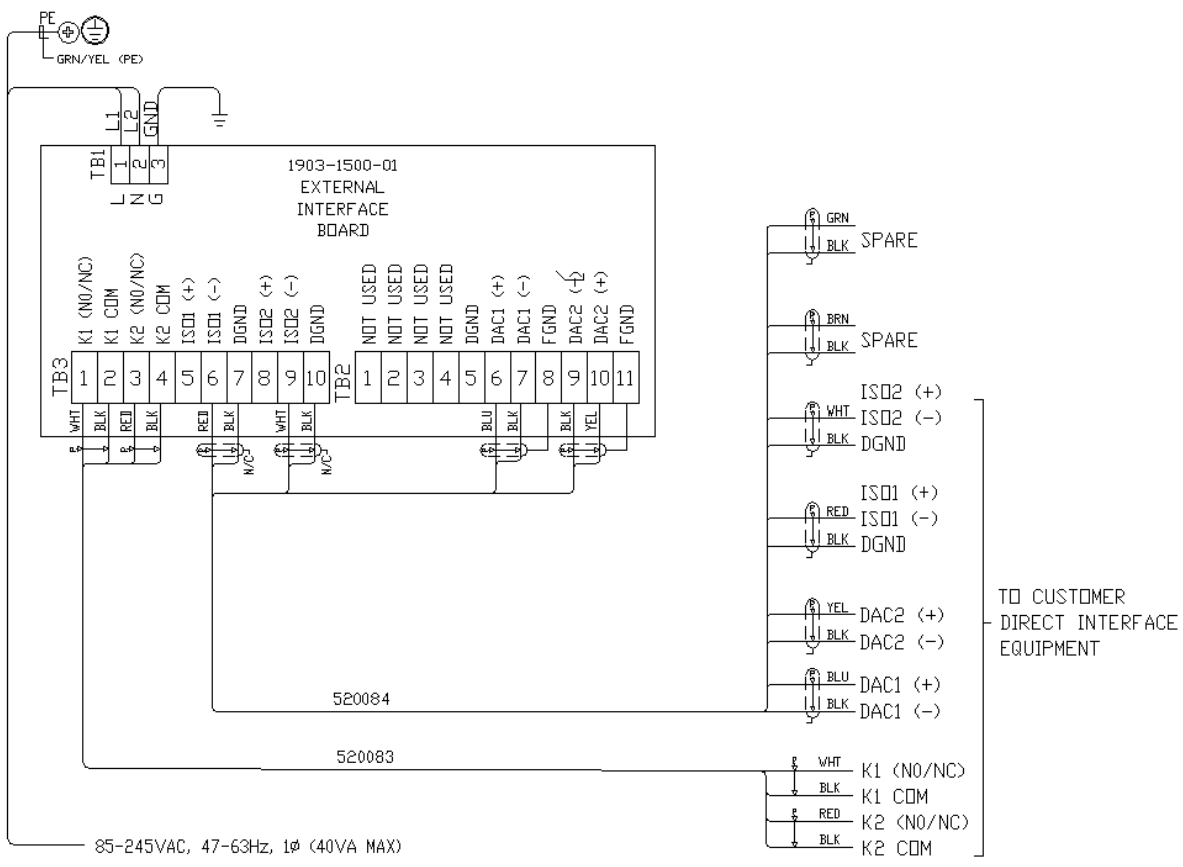
*I/O wires with respect to earth (common mode).

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APPENDIX B
DRAWINGS



6PT I/O PC BOARD LOCATION



6PT I/O WIRING DIAGRAM