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Figure 1 — Digital Panel Meters
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Figure 10 – PAXI Jumpers, Dip Switches and Analog Output Wiring
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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions to calibrate Red Lion digital input panel meters.

1.2 Scope

This procedure involves calibration of the following models of Red Lion digital input panel meters:
- PAXD
- PAXT
- PAXP
- PAXDP
- PAXLA
- PAXI.

2.0 INFORMATION

NONE

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 Compliance with DOE–0359, Hanford Site Electrical Safety Program is required when working with this procedure.

3.1.2 If a lock and tag is required during the performance of this procedure, comply with the DOE-0336, Hanford Site Lockout/Tagout Procedure.

3.2 Radiation and Contamination Control

Work in radiological areas will be performed using a radiological work permit following review by Radiological Control per the ALARA Work Planning procedure TFC-ESHQ-RP_RWP-C-03.
3.3 Environmental Compliance

3.3.1 If a ventilation system is breeched during this activity, the following will apply:

3.3.1.1 Equipment with removable contamination and/or work with removable contamination will be contained per the latest revision of the Containment Selection guide, Attachment A, in TFC-ESHQ-RP_RWP-C-02.

3.3.1.2 Pre-job and post job surveys (smears) shall be taken.

4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

The following supplies may be needed to perform this procedure:

- Calibrated current source
- Calibrated Digital Multimeter
- RTD Simulator
- Signal Generator
- Other tools, equipment and supplies as identified by Shift Manager/OE/FWS/User.

4.2 Performance Documents

The following documents may be needed to perform this procedure:

- DOE-0336, Hanford Site Lockout/Tagout Program
- PAXI Vendor manual, Bulletin # PAXICR-G, Drawing # LP0548
- PAXLA Vendor manual, Bulletin # PAXLA-C, Drawing # LP0722
- PAXP/PAXD Vendor Manual, Bulletin # PAXP-D, Drawing # LP0408
- PAXDP Vendor Manual, Bulletin # PAXDP-K, Drawing # LP0578

4.3 Field Preparation

4.3.1 REQUEST Operations to configure system to allow performance of this procedure.

4.3.2 IF removing instrument to shop, ENSURE lockout/tagout and overlocking requirements have been satisfied per DOE-0336, Hanford Site Lockout/Tagout Procedure.
5.0 PROCEDURE

5.1 PAXD, PAXT, PAXP and PAXDP Display/Instrument Calibration

NOTE - Calibration may be performed in place or instrument may be moved to the shop for bench calibration.

Obtain As-Found Values

5.1.1 IF moving Panel Meter to shop for calibration, ENSURE lockout/tagout in accordance with DOE-0336, Hanford Site Lockout/Tagout Program.

5.1.2 REFER to Figure 1, Figure 2, Figure 4, Figure 5, Figure 7, Figure 8, Figure 11, and Figure 12 for jumper selection, programming, wiring and DIP switch settings as applicable.

5.1.3 DISCONNECT existing input leads as needed.

5.1.4 ENSURE Input Range Jumper (Figure 2 for PAXD/PAXP, Figure 8 for PAXT or Figure 11 for PAXDP) is set for the range to be calibrated per Data Sheet.

5.1.5 CONNECT appropriate test equipment to input of indicator.

5.1.6 APPLY input values per Data Sheet AND RECORD the following As-Found readings on Data Sheet.

- Output values per Data Sheet
- If listed, alarm/interlock/setpoint(s) per Data Sheet.

5.1.7 IF As-Found values are not within specified tolerance per Data Sheet, GO TO Step 5.1.8

OR

IF As-Found values are within specified tolerance, but deemed marginal, and optimization is desired, GO TO Step 5.1.8,

OR

IF As-Found values are within specified tolerance, RECORD As-Found values in As-Left column of Data Sheet AND

GO TO Restoration, Section 5.4.
5.1 Calibrate Instrument

5.1.8 ALLOW a 30 minute warm-up period prior to taking readings and/or calibrating instrument.

5.1.9 USE the F1 (▲) and F2 (▼) keys to display Code 48 AND PRESS PAR.

NOTE - "no" and "PAR" can be chosen to exit the “Calibration” mode without any changes taking place.

5.1.10 SELECT the range to be calibrated by USING the F1 (▲) and F2 (▼) keys AND PRESS PAR.

5.1.11 WHEN the zero range limit appears on the display, APPLY minimum input value per Data Sheet.

5.1.12 PRESS PAR and "- - - -" will appear on the display for ≅ 10 seconds.

5.1.13 WHEN the top range limit appears on the display, APPLY maximum input value per Data Sheet.

5.1.14 PRESS PAR and "- - - -" will appear on the display for ≅ 10 seconds.

5.1.15 WHEN "no" appears, PRESS PAR twice.

5.1.16 APPLY inputs as indicated on Data Sheet AND

MONITOR the following for tolerance:
- Output values per Data Sheet
- If listed, alarm/interlock/setpoint(s) per Data Sheet.

5.1.17 IF values are within tolerance per Data Sheet, RECORD As-Left values on Data Sheet AND

GO TO Restoration, Section 5.4.
5.1 PAXD, PAXT, PAXP and PAXDP Display/Instrument Calibration (Cont.)

Calibrate Instrument

5.1.18 IF values are not within tolerance per Data Sheet, REPEAT Steps 5.1.8 through 5.1.17 as applicable until values are within tolerance,

OR

IF unable to bring values into tolerance NOTIFY FWS for resolution.
5.2 PAXLA Lite DC Volt/Current Process Meter Current Calibration

NOTE - Calibration may be performed in place or instrument may be moved to the shop for bench calibration.

**Obtain As-Found Values**

5.2.1 IF moving Panel Meter to shop for calibration, **ENSURE** lockout/tagout in accordance with DOE-0336, Hanford Site Lockout/Tagout Program.

5.2.2 **REFER** to Figure 1, Figure 3, and Figure 6 for jumper selection, programming, wiring and DIP switch settings as necessary.

5.2.3 **DISCONNECT** existing input leads as needed.

5.2.4 **ENSURE** Input Range Jumper (Figure 3) is set for the range to be calibrated per Data Sheet.

5.2.5 **CONNECT** DC Current source to input of indicator.

5.2.6 **APPLY** input values per Data Sheet **AND**

**RECORD** the following As-Found readings on Data Sheet.
- Output values per Data Sheet
- If listed, alarm/interlock/setpoint(s) per Data Sheet.

5.2.7 IF As-Found values are not within specified tolerance per Data Sheet, **GO TO** Step 5.2.8,

OR

IF As-Found values are within specified tolerance, but deemed marginal, and optimization is desired, **GO TO** Step 5.2.8,

OR

IF As-Found values are within specified tolerance, **RECORD** As-Found values in As-Left column of Data Sheet **AND**

**GO TO** Restoration, Section 5.4.
5.2 PAXLA Lite DC Volt/Current Process Meter Current Calibration  
(Cont.)

Calibrate Instrument

NOTE - The positive lead of the current source will remain unconnected until Step 5.2.14.

5.2.8 CONNECT the negative lead of DC Current source to the COMM terminal.

5.2.9 ALLOW a 30 minute warm-up period prior to taking readings and/or calibrating instrument.

5.2.10 WITH the display at Code 48, PRESS PAR button to display “CAL NO”.

5.2.11 PRESS RST button to select range to be calibrated per Data Sheet.

5.2.12 PRESS PAR button so display reads “0.0 A”

5.2.13 PRESS PAR button and "CALC" will appear on the display for \( \geq 8 \) seconds.

5.2.14 WHEN the selected range appears on the display, CONNECT the positive lead of the DC Current source to the current input.

5.2.15 APPLY maximum input value for range selected per Data Sheet.

5.2.16 PRESS PAR button and "CALC" will appear on the display for \( \geq 8 \) seconds.

5.2.17 AFTER calibration completes for the selected range, DISCONNECT the positive lead of the DC Current source from the current input.

5.2.18 REPEAT Steps 5.2.11 through 5.2.17 for each range to be calibrated per Data Sheet.

5.2.19 WHEN "CAL NO" appears on the display, PRESS PAR button to exit calibration.

5.2.20 CONNECT DC Current source to instrument input.

5.2.21 APPLY inputs as indicated on Data Sheet AND

MONITOR the following for tolerance:

- Output values per Data Sheet
- If listed, alarm/interlock/setpoint(s) per Data Sheet.
5.2  PAXLA Lite DC Volt/Current Process Meter Current Calibration (Cont.)

5.2.22  IF values are within tolerance per Data Sheet, RECORD As-Left values on Data Sheet AND

          GO TO Restoration, Section 5.4.

5.2.23  IF values are not within tolerance per Data Sheet, REPEAT Steps 5.2.8 through 5.2.22 as applicable until values are within tolerance,

          OR

          IF unable to bring values into tolerance NOTIFY FWS for resolution.
5.3 **PAXI Milliamp Output Calibration**

**NOTE** - Calibration may be performed in place or moved to the shop for bench cal.

**Obtain As-Found Values**

5.3.1 IF moving Panel Meter to shop for calibration, **ENSURE** lockout/tagout in accordance with DOE-0336, Hanford Site Lockout/Tagout Program.

5.3.2 **REFER** to Figure 1, Figure 5, Figure 9 and Figure 10 for jumper selection, input/outputs, programming, wiring and DIP switch settings as applicable.

5.3.3 **DISCONNECT** input leads as required.

5.3.4 **CONNECT** frequency generator to input of panel meter.

5.3.5 **LIFT** negative Analog Output lead at terminal 19 **AND**

**CONNECT** DMM in series with the current lead (see Figure 10).

5.3.6 **APPLY** input values per Data Sheet **AND**

**RECORD** the following As-Found readings on Data Sheet.
- Output values per Data Sheet
- Alarm/interlock/setpoint(s) per Data Sheet.

5.3.7 IF As-Found values are not within specified tolerance per Data Sheet, **GO TO** Step 5.3.8,

**OR**

IF As-Found values are within specified tolerance, but deemed marginal, and optimization is desired, **GO TO** Step 5.3.8,

**OR**

IF As-Found values are within specified tolerance, **RECORD** As-Found values in As-Left column of Data Sheet **AND**

**GO TO** Restoration, Section 5.4.
5.3 PAXI Milliamp Output Calibration (Cont.)

**Calibrate Instrument**

5.3.8 PRESS the up arrow (▲) as needed to go to Module 8 AND

PUSH PAR.

5.3.9 USE the arrow keys to display Code 48 AND

PRESS PAR button to display “CAL DUE”.

5.3.10 USE the arrow keys to select yes AND

PRESS PAR.

5.3.11 USING the table below,

<table>
<thead>
<tr>
<th>SELECTION</th>
<th>EXTERNAL METER</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0_A</td>
<td>0.00</td>
<td>Adjust if necessary, PRESS PAR.</td>
</tr>
<tr>
<td>4.0_A</td>
<td>4.00</td>
<td>Adjust if necessary, PRESS PAR.</td>
</tr>
<tr>
<td>20.0_A</td>
<td>20.00</td>
<td>Adjust if necessary, PRESS PAR.</td>
</tr>
<tr>
<td>0.0_V</td>
<td>0.00</td>
<td>Adjust if necessary, PRESS PAR.</td>
</tr>
<tr>
<td>10.0_V</td>
<td>10.00</td>
<td>Adjust if necessary, PRESS PAR.</td>
</tr>
</tbody>
</table>

PERFORM the following:

NOTE - Only the first three (milliamp) settings are adjusted.

5.3.11.1 **STEP** through the first three Selections to be calibrated AND

AT each prompt, USE the arrow keys to adjust the output so that the external meter (M&TE) matches the selection being calibrated.

5.3.11.2 **WHEN** the external meter (M&TE) reading matches the Selection value, PRESS PAR.

NOTE - 0.0 V and 10.0 V are not used and will not be adjusted.

5.3.11.3 **WHEN** 0.0 V is displayed, PRESS PAR.
5.3 PAXI Milliamp Output Calibration (Cont.)

Calibrate Instrument

5.3.11.4 WHEN 10.0 V is displayed, PRESS PAR.

5.3.11.5 WHEN Code 50 appears, PRESS PAR twice.

5.3.12 APPLY input values per Data Sheet AND

CHECK output values for tolerance.

5.3.13 IF values are within tolerance per Data Sheet, RECORD As-Left values on Data Sheet AND

GO TO Restoration, Section 5.4.

5.3.14 IF values are not within tolerance per Data Sheet, REPEAT Steps 5.3.8 through 5.3.14 until values are within tolerance

OR

IF unable to bring values into tolerance NOTIFY FWS/OE for resolution.
5.4 Restoration

5.4.1 IF any problems were encountered with calibration, INFORM FWS.

5.4.2 ENSURE that all test equipment has been disconnected and removed.

5.4.3 IF meter was moved to shop for calibration, INSTALL the unit to field location.

5.4.4 RE-LAND lifted leads AND RESTORE equipment to original configuration.

5.4.5 IF lock and tag was hung, REMOVE per DOE-0336, Hanford Site Lockout/Tagout Program.

5.4.6 ENSURE Test Equipment information and calibration status are recorded on Data Sheet.

5.4.7 ENSURE equipment system restoration by observing indications are consistent with expected conditions.

5.4.8 NOTIFY Operations that testing is complete and system may be returned to desired configuration.

5.5 Acceptance Criteria

Acceptance Criteria has been met when Steps in this procedure have been satisfactorily performed and As-Left values meet the specifications and tolerance(s) per the Data Sheet.

5.6 Review

5.6.1 INFORM Operations management and FWS the test is complete.

5.6.2 FWS REVIEW AND ENSURE the following:

- Completed Data Sheets meet the acceptance criteria.
- Comments sections are filled out appropriately.
- Work requests needed as a result of this procedure are identified and generated.
- As applicable, Work request number(s) of any work documents generated as a result of this procedure, are RECORDED in the Comments/Remarks section of the Data Sheet.
5.7 Records

The performance of this procedure generates no records. However, PM Data Sheets associated with the procedure, are records and are maintained in the work package as record material.

The record custodian identified in the Company Level, Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.
Calibrate Red Lion Digital Input Panel Meters

Figure 1 — Digital Panel Meters

Models: PAXD, PAXI and PAXP

Model: PAXLA
Calibrate Red Lion Digital Input Panel Meters

Figure 2 — PAXD and PAXP Jumper Selection

**PAXD INPUT RANGE JUMPER SELECTION**

One jumper is used for voltage/ohms or current input ranges. Select the proper input range high enough to avoid input signal overload. Only one jumper is allowed in this area. Do not have a jumper in both the voltage and current ranges at the same time. Avoid placing the jumper across two ranges.

**PAXP INPUT RANGE JUMPER SELECTION**

The indicates factory setting.
Figure 3 - PAXLA Jumper Selection
Calibrate Red Lion Digital Input Panel Meters

Figure 4 — PAX (PAXD, PAXT and PAXP) Programming Quick Review

PAX PROGRAMMING QUICK OVERVIEW
Figure 5 – PAXI Programming Quick Overview
Figure 7 – PAXD, and PAXP Wiring and DIP Switch Settings

If you are wiring Input B, connect signal to Terminal 6 instead of 5, and set DIP switches 4, 5, and 6 to the positions shown for 1, 2, and 3.
Figure 8 – PAXT Input Signal Wiring and Jumper Selection

4.3 USER INPUT Wiring

Before connecting the wires, the User Input Logic Jumper should be verified for proper position. If not using User Inputs, then skip this section. Only the appropriate User Input terminal has to be wired.

Sinking Logic
Terminal 8-10: Connect external switching device between appropriate User Input terminal and User Comm.

In this logic, the user inputs of the meter are internally pulled up to +5 V with 22 K resistance. The input is active when it is pulled low (< 0.9 V).

Sourcing Logic
Terminal 8-10: + VDC thru external switching device
Terminal 7-: - VDC thru external switching device

In this logic, the user inputs of the meter are internally pulled down to 0 V with 22 K resistance. The input is active when a voltage greater than 3.6 VDC is applied.

PAXT Jumper Selection

RTD Input Jumper
One jumper is used for RTD input ranges. Select the proper range to match the RTD probe being used. It is not necessary to remove this jumper when not using RTD probes.

JUMPER SELECTIONS
The □ indicates factory setting.
Figure 9 – PAXI Input and Setpoint (Alarms) Wiring

Switch position is application dependent. Shaded areas not recommended for counting applications.

<table>
<thead>
<tr>
<th>SETPOINT (ALARMS) WIRING</th>
</tr>
</thead>
<tbody>
<tr>
<td>DUAL RELAY PAXCD510</td>
</tr>
<tr>
<td>20 = COMMON</td>
</tr>
<tr>
<td>21 = RLY1</td>
</tr>
<tr>
<td>22 = RLY2</td>
</tr>
<tr>
<td>23 = RLY3</td>
</tr>
<tr>
<td>24 = RLY4</td>
</tr>
<tr>
<td>QUAD RELAY PAXCD520</td>
</tr>
<tr>
<td>20 = COMM</td>
</tr>
<tr>
<td>21 = RLY1</td>
</tr>
<tr>
<td>22 = RLY2</td>
</tr>
<tr>
<td>23 = RLY3</td>
</tr>
<tr>
<td>24 = RLY4</td>
</tr>
</tbody>
</table>

| QUAD SINKING PAXCD530     |
| 20 = COMMON               |
| 21 = O1 SNK.              |
| 22 = O2 SNK.              |
| 23 = O3 SNK.              |
| 24 = O4 SNK.              |
| QUAD SOURCING PAXCD540    |
| 20 = EXTERNAL SUPPLY      |
| 21 = O1 SRC.              |
| 22 = O2 SRC.              |
| 23 = O3 SRC.              |
| 24 = O4 SRC.              |
| 25 = COMMON                |

<table>
<thead>
<tr>
<th>SOURCING OUTPUT LOGIC CARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 = EXTERNAL SUPPLY</td>
</tr>
<tr>
<td>21 = O1 SRC.</td>
</tr>
<tr>
<td>22 = O2 SRC.</td>
</tr>
<tr>
<td>23 = O3 SRC.</td>
</tr>
<tr>
<td>24 = O4 SRC.</td>
</tr>
<tr>
<td>25 = COMMON</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SINKING OUTPUT LOGIC CARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 = SINK OUT (30 V MAX.)</td>
</tr>
<tr>
<td>21 = COMM.</td>
</tr>
</tbody>
</table>
Calibrate Red Lion Digital Input Panel Meters

Figure 10 – PAXI Jumpers, Dip Switches and Analog Output Wiring

SETTING THE JUMPER

The meter has one jumper for user input logic. When using the user inputs this jumper must be set before applying power. The Main Circuit Board figure shows the location of jumper and DIP switch.

The user input jumper determines signal logic for the user inputs, when they are used with user functions or for input signal direction. All user inputs are set by this jumper.

SETTING THE INPUT DIP SWITCHES

The meter has six DIP switches for Input A and Input B terminal set-up that must be set before applying power.

<table>
<thead>
<tr>
<th>SWITCHES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HI Freq.</td>
</tr>
<tr>
<td>HI Freq.</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td>4</td>
<td>Logic</td>
</tr>
<tr>
<td>SNK.</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>Logic</td>
</tr>
<tr>
<td>Factory Setting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SWITCHES 3 and 6

HI Frequency: Removes damping capacitor and allows max. frequency.  
LO Frequency: Adds a damping capacitor for switch contact bounce. Also limits input frequency to 50 Hz and input pulse widths to 10 msec.

SWITCHES 2 and 5

SRC.: Adds internal 3.9 KO pull-down resistor, 7.3 mA max. @ 28 VDC, \( I_{\text{MAX}} = 30 \) VDC.  
SNK.: Adds internal 7.8 KO pull-up resistor to +12 VDC, \( I_{\text{MAX}} = 1.9 \) mA.

SWITCHES 1 and 4

LOGIC: Input trigger levels \( V_{\text{IL}} = 1.5 \) V max; \( V_{\text{IH}} = 3.75 \) V min.  
MAG: 200 mV peak input (must also have SRC on). Not recommended with counting applications.

USER INPUT WIRING

Before connecting the wires, the User Input Logic Jumper should be verified for proper position. If user input 1 and/or 2 are wired for quadrature or directional counting, an additional switching device should not be connected to that User Input terminal. Only the appropriate User Input terminal has to be wired.

Sinking Logic

Terminals 7 – 9  
Terminal 10

Connect external switching device between the appropriate User Input terminal and User Comm.

User inputs of the meter are internally pulled up to +12 V with 5.1 K resistance. The input is active when it is pulled low (<0.9 V).

ANALOG OUTPUT WIRING

0 – 20 mA ANALOG OUTPUT

+ 18  
– 19
Figure 11 - PAXDP Jumper Selection and Input Signal Wiring

**PAXDP Jumper Selection**

JUMPER SELECTIONS
The △ indicates factory setting.

<table>
<thead>
<tr>
<th>INPUT A</th>
<th>INPUT B</th>
<th>USER INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOLTS/CURRENT</td>
<td>VOLTS/CURRENT</td>
<td>SOURCE (SRC)</td>
</tr>
<tr>
<td>CURRENT (I)</td>
<td>CURRENT (I)</td>
<td>SINK</td>
</tr>
<tr>
<td>VOLTAGE (V)</td>
<td>VOLTAGE (V)</td>
<td></td>
</tr>
</tbody>
</table>

**INPUT A SIGNAL WIRING**

Voltage Signal (self powered)
Terminal 4: +VDC
Terminal 5: -VDC
+18 V EXC UNREG
- COMM
3 4 5
10 VDC MAX.

Current Signal (self powered)
Terminal 4: -ADC
Terminal 5: +ADC
4 COMM
3 5 LOAD
5 WIRE TRANSMITTER

Voltage/Current Signal (3 wire requiring excitation)
Terminal 3: +Volt supply
Terminal 4: -ADC (common)
Terminal 5: +ADC (signal)
18 V EXC UNREG
6 5 COMM
4 3 COMMON

**INPUT B SIGNAL WIRING**

Voltage Signal (self powered)
Terminal 7: -VDC
Terminal 8: +VDC
+18 V EXC UNREG
5 COMM
6 7 8
10 VDC MAX.

Current Signal (self powered)
Terminal 7: +ADC
Terminal 8: -ADC
7 COMM
6 8 LOAD
8 WIRE TRANSMITTER

Current Signal (2 wire requiring excitation)
Terminal 6: +ADC
Terminal 8: -ADC
18 V EXC UNREG
5 COMM
6 7 COMMON
8 COMMON

Voltage/Current Signal (3 wire requiring excitation)
Terminal 6: +Volt supply
Terminal 7: -ADC (common)
Terminal 8: +ADC (signal)
18 V EXC UNREG
5 COMM
6 7 COMMON
8 COMMON