Calibrate REOTEMP ZX RTD Temperature Indicating Transmitter

Tank Farm Maintenance Procedure

MAINTENANCE

USQ # GCX-2

CHANGE HISTORY (≤ LAST 5 REV-MODS)

<table>
<thead>
<tr>
<th>Rev-Mod</th>
<th>Release Date</th>
<th>Justification</th>
<th>Summary of Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-2</td>
<td>02/28/2018</td>
<td>Records</td>
<td>Updated records section</td>
</tr>
<tr>
<td>A-1</td>
<td>06/22/2016</td>
<td>Inconsequential Change</td>
<td>Changed 2.1.1 to reference AY instead of AP.</td>
</tr>
<tr>
<td>A-0</td>
<td>02/11/2016</td>
<td>New Procedure for AY102 Water Skid</td>
<td>New Procedure</td>
</tr>
</tbody>
</table>

Table of Contents

1.0 PURPOSE AND SCOPE.................................................................................................................. 3
  1.1 Purpose................................................................................................................................. 3
  1.2 Scope..................................................................................................................................... 3

2.0 INFORMATION............................................................................................................................. 3
  2.1 General Information............................................................................................................... 3

3.0 PRECAUTIONS AND LIMITATIONS............................................................................................. 4
  3.1 Personnel Safety.................................................................................................................... 4
  3.2 Radiation and Contamination Control................................................................................... 4
  3.3 Environmental Protection....................................................................................................... 4

4.0 PREREQUISITES .......................................................................................................................... 5
  4.1 Special Tools Equipment and Supplies.................................................................................. 5
  4.2 Performance Documents........................................................................................................ 5
  4.3 Field Preparation.................................................................................................................. 5

5.0 PROCEDURE ................................................................................................................................ 6
  5.1 Obtain As-Found Values......................................................................................................... 6
  5.2 Calibrate Temperature Transmitter...................................................................................... 10
  5.3 Restoration............................................................................................................................. 12
  5.4 Acceptance Criteria................................................................................................................ 12
  5.5 Review.................................................................................................................................... 12
  5.6 Records.................................................................................................................................. 13

Figure 1 – Equipment Hook-Up for Field Testing............................................................................ 14
Calibrate REOTEMP ZX RTD Temperature Indicating Transmitter

Figure 2 – Transmitter and Probe with Loop Powered Connections for Bench Test................................. 15
Figure 3 – Testing Set-Up for REOTEMP® Transmitter with LCD Display ........................................ 16
Figure 4 – Test Switch 5 (TS5) Location.................................................................................................. 17
1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for calibrating REOTEMP ZX RTD Transmitter.

1.2 Scope

This procedure provides a method of Calibrating REOTEMP ZX RTD Transmitter used to provide water temperature indication for the AY102 POR394-RW-RWDD-001 Water Skid with the associated High and Low temperature alarms.

2.0 INFORMATION

2.1 General Information

2.1.1 AY102 POR394-RW-RWDD-001 Water Skid is located on the berm just outside the fence next to AY Farm.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 An Energized Electrical Work Permit (EEWP) is NOT required when working energized parts that operate at less than 50 volts potential per DOE-0359, Hanford Site Electrical Safety Program Section 5.7, paragraph 2 “Exemptions to an EEWP”.

The maximum voltage encountered when connecting and disconnecting from terminal strip on transmitter is less than 50 VDC.

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 Protection

The Central Shift Office must be notified in the event of a leak or a spill in accordance with TFC-ESHQ-ENV_FS-C-01, Environmental Notification.
4.0 PREREQUISITES

4.1 Special Tools Equipment and Supplies

The following supplies may be needed to perform this procedure:
- Dri-Block Calibrator or equivalent
- Leather gloves for use with Dri-Block Calibrator
- Current Supply (4-20mA) e.g. Transmation or equivalent
- DMM, 5 ½ digits readout
- 7/8” open end wrench (transmitter removal from thermowell)
- 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:
- REOTEMP Instruments Application Manual
- REOTEMP Instruments Setup Instructions
- H-14-110563 Sh. 9, latest revision
- H-14-024306 Sh. 12, latest revision.

4.3 Field Preparation

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

Special Instructions

If any step is not required for completion, record “N/A” in the applicable space(s) on the Data Sheet and document explanation in the Data Sheet’s Comments/Remarks section.

All valves and equipment identification numbers are prefixed with “POR394-RW-” unless specified otherwise.

5.1 Obtain As-Found Values

Special Instructions

Due to the difficulty of testing/calibrating transmitter in the field, the transmitter will be removed and transported to shop for bench testing.

A calibrated current supply will be used at the skid to apply inputs per Data Sheet and to verify/set alarm set points at HMI per Data Sheet.

5.1.1 REMOVE power from Temperature Indicating Transmitter TIT-004 at skid mounted PLC Enclosure by opening Test Switch TS5 (Figure 4).

5.1.2 REMOVE temperature transmitter from thermowell as follows:

5.1.2.1 UNSCREW window face cover AND

REMOVE display screws (Figure 3).

5.1.2.2 CAREFULLY lift-out display.

5.1.2.3 UNPLUG green connector from display AND

DISCONNECT red wire #1781 from Pos. (+) terminal and black wire #1782 from Neg. (-) terminal (Figure 3).

5.1.2.4 LOOSEN the water-tight wire compression nut on transmitter AND

PULL wiring from transmitter body.
5.1 Obtain As-Found Values (Cont.)

Special Instructions

When the RTD sensor is removed for calibration, it should be returned to the same immersion depth for greatest reliability and accuracy per vendor information.

5.1.3 COUNT the number of threads above probe thermowell AND TAKE Note for later reassembly.

5.1.4 SET ASIDE the display AND UNSCREW transmitter body with RTD probe from thermowell using 7/8” open end wrench.

5.1.5 TRANSPORT the Display and Transmitter back to the shop.

5.1.6 INSTALL Transmitter RTD probe into Dry-Block Calibrator or equivalent.

NOTE - Loop wiring diagram is located on back of transmitter display, Figure 3.

5.1.7 CONNECT wiring for loop power of 10 to 30 Vdc (observing polarity) to green connector per figures Figure 2 and Figure 3.

5.1.8 CONNECT DMM in series with loop power.

5.1.9 PLUG connector into receptacle on back of display.

5.1.10 APPLY input temperature(s) values per Data Sheet using Dri-Block calibrator or equivalent.

5.1.11 IF As-Found mA values are not within tolerance per Data Sheet, GO TO Calibration Section 5.2.

5.1.12 IF As-Found mA values are within tolerance per Data Sheet, RECORD the values in As-Left section of Data Sheet.

5.1.13 REMOVE loop powered hook-up and Test equipment from connector at back of Transmitter Display.

5.1.14 TRANSPORT the Transmitter and Display back to its As-Found location.

5.1.15 SCREW the transmitter housing with RTD probe into the thermowell to the approximate depth Noted in Step 5.1.3.
5.1 Obtain As-Found Values (Cont.)

Special Instructions

A calibrated current source will be used to apply the 4-20 mA signal to HMI due to the difficulty in applying temperature(s) to RTD probe in the field (the temperature transmitter will be Bench Calibrated in the shop prior to re-installation).

5.1.16 CONNECT current source and DMM in series with red wire (Figure 1) #1781 (+) lead (observing polarity) AND

CONNECT other lead of current source to black wire #1782 (-).

5.1.17 CLOSE Test Switch TS5 (Figure 4) that was opened in Step 5.1.1.

NOTE - Low Alarm should be disregarded on increasing input value.

5.1.18 APPLY input values per Data Sheet AND

RECORD the following As-Found values on Data Sheet.
- mA Loop current from DMM
- HMI Temperature Indication
- Local Display Panel Indication
- Temperature Alarm High set point (TAH-004)
- Temperature Alarm Low set point (TAL-004).

5.1.19 IF the mA values are in tolerance, but the Alarm/Switch(s) are out, NOTIFY Engineering of necessary HMI corrections AND

ASSIST Engineering by manipulating Alarm levels as instructed.

5.1.19.1 RECORD the Hi and/or Low alarm values in the As-Left column of Data Sheet.

5.1.20 OPEN Test Switch TS5 (Figure 4).

5.1.21 REMOVE DMM and Current source from field wires.

5.1.22 PULL the field wiring back through the water-tight wire compression nut on transmitter AND

TIGHTEN the compression nut sufficiently to prevent leakage.
5.1 Obtain As-Found Values (Cont.)

5.1.23  **RECONNECT** red wire #1781 to Pos. (+) terminal and black wire #1782 to Neg. (-) terminal on green plug **AND**

**PLUG-IN** connector to the display.

5.1.24  **RE-INSTALL** Display into Transmitter housing **AND**

**SNUG-TIGHT** display screws.

5.1.25  **SCREW** faceplate snugly onto housing.

5.1.26  **CLOSE** Test Switch TS5 (Figure 4).

5.1.27  **GO TO** Restoration Section 5.3.
5.2 Calibrate Temperature Transmitter

Special Instructions

Apply input temperatures to transmitter probe using Dri-Block Calibrator and adjust the mA output by manipulation of the “Faceplate Buttons”.

NOTE - Pressing the and buttons simultaneously will Exit the menu and save settings and can be performed at any time during calibration.

5.2.1 PRESS the “E” button to enter the menu at “Setting the decimal point (DP)”.

5.2.1.1 IF the decimal position is correct, PRESS the “E” button.

5.2.1.2 IF the decimal position is not correct PRESS the OR buttons to change decimal position AND

WHEN complete, PRESS the “E” button.

5.2.2 APPLY Minimum input Temperature value per Data Sheet.

5.2.2.1 IF the output value (4 mA) is correct, PRESS the “E” button.

5.2.2.2 IF the output value (4 mA) is not correct PRESS the OR buttons to set the 4 mA value AND

WHEN complete, PRESS the “E” button.

5.2.3 APPLY Maximum (Span) input Temperature value per Data Sheet.

5.2.3.1 IF the Span value is correct PRESS the “E” button.

5.2.3.2 IF the Span value (20 mA) is not correct PRESS the OR buttons to set the 20 mA value AND

WHEN complete, PRESS the “E” button.

5.2.3.3 CONTINUE to press the “E” button until “Engineering Unit” is displayed.

5.2.3.4 IF the Unit is not °F, PRESS the OR buttons to set to °F.

a. IF the Unit is °F, PRESS the AND buttons simultaneously to Exit the menu and save settings.
5.2 Calibrate Temperature Transmitter (Cont.)

5.2.4 APPLY input temperature(s) values per Data Sheet.

5.2.5 IF output values are within tolerance per Data Sheet, RECORD the values in As-Left section of Data Sheet AND

GO TO Step 5.1.13.

OR

IF output values are not within tolerance per Data Sheet, REPEAT Steps 5.2.1 through 5.2.5,

OR

IF output values are cannot be brought within tolerance per Data Sheet, NOTIFY FWS for resolution.
5.3 Restoration

5.3.1 IF any problems were encountered with calibration, **INFORM** FWS.

5.3.2 IF not already removed, **DISCONNECT AND REMOVE** Test Equipment

5.3.3 **ENSURE** alarms are reset or cleared.

5.3.4 **RECORD** Test Equipment information and calibration status on Data Sheet.

5.3.5 **CHECK** equipment system restoration by observing indications are consistent with expected conditions.

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

5.4 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.

5.5 Review

5.5.1 **INFORM** FWS test is complete.

5.5.2 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.
- 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, as applicable.
5.6 Records

This procedure is performed within a work package, as such, the procedure in its entirety will be maintained as a record per the Work Control process.

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 REOTEMP ZX RTD Temperature Indicating Transmitter

Figure 1 – Equipment Hook-Up for Field Testing

Current Source
4.0 to 20.0 mA

Red wire #1781 (+)

Black wire #1782 (-)

Test Point Temperature
TI 004 = 87.5 °F

HMI (Power Source)
Calibrate REOTEMP ZX RTD Temperature Indicating Transmitter

Figure 2 – Transmitter and Probe with Loop Powered Connections for Bench Test
Calibrate REOTEMP ZX RTD Temperature Indicating Transmitter

Figure 3 – Testing Set-Up for REOTEMP® Transmitter with LCD Display

1. Unscrew window cover and Remove screws.

2. Unplug green connector from display and disconnect field wires from connector.

3. Pull field wiring from housing so unit can be unscrewed from well and removed.

4. After testing is complete, screw unit into well, pull wires into housing and attach to connector. Plug connector into receptacle.
Figure 4 – Test Switch 5 (TS5) Location

Excerpt from Drawing # H-14-110563 Sh. 9