# Check RTD and Calibrate MINCO TT176 RTD Temperature Transmitter

**Tank Farm Maintenance Procedure**

**MAINTENANCE**

**USQ # GCX-2**

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<td>Periodic Review: updates according to Engineering and Safety, and clarification for field use.</td>
<td>Updated title to reflect two devices, added methods of checking and calibration to scope, removed acronyms within accepted acronym list, reworded warning, added description to items in 4.1, modified document reference in 4.2, removed vague phrases, removed redundant steps, reformatted steps, added warning to correct location, removed steps which were duplicated/redundant and not directly associated with dri-block method, added clarification where applicable, moved important information to step format, moved step in calibration section, added information for restoration when dri-block method is used and updated to correct title block for figure and table.</td>
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<td>Inconsequential Change to Lockout/Tagout references.</td>
<td>Pgs 3, 4, 5, 7, 9: Changed references to read DOE-0336, Hanford Site Lockout/Tagout Procedure.</td>
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Figure 1 – Equipment Hook-Up
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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for checking of RTD and calibration of MINCO TT176 RTD Temperature Transmitter.

1.2 Scope

This procedure applies to checking RTD with either Ice Point Bath or Dri-Block Calibrator and calibrating MINCO TT176 RTD Temperature Transmitters using a decade box.

2.0 INFORMATION

2.1 General Information

Due to the manufacturing process, the MINCO TT176 temperature transmitter span cannot be changed more than ±5 °F from the specified range of -58 °F to 212 °F.

2.2 Terms and Definitions

- RTD - Resistance Temperature Detector.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 An Energized Electrical Work Permit is not required when working energized parts that operate at less than 50 volts potential per DOE-0359.

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

3.1.2 If a lock and tag is required during the performance of this procedure, perform in accordance with 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.
4.0 PREREQUISITES

4.1 Special Tools Equipment and Supplies

The following supplies may be needed to perform this procedure:
- Ice Point (temperature bath)
- Dri-Block Calibrator
- Leather gloves for use with Dri-Block Calibrator
- Decade Box
- Power Supply (24vdc) e.g. Transmation (for Bench Cal only)
- DMM, 5½ digits readout
- 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:
- MINCO TT176 RTD Transmitter 158CAL\158

4.3 Field Preparation

4.3.1 **ENSURE** Operations has configured system to allow performance of this procedure.

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

5.1 Obtain As-Found Values

5.1.1 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.

5.1.1 PERFORM testing by one of the following methods as directed by the FWS:

5.1.1.1 CONFIRM RTD accuracy from 32 °F to 212 °F by removing RTD from temperature well and placing in bath/oven (dri-block calibrator) AND/OR

5.1.1.2 CONFIRM Transmitter accuracy by lifting RTD leads from transmitter and inputting resistance values with Decade Box.

Confirm Output Values for RTD (Using Dri-Block Calibrator and/or Bath)

5.1.2 PERFORM the following to use RTD output obtain As-Found values:

5.1.2.1 ENSURE applicable lockout/tagout and overlocking requirements have been satisfied per DOE-0336, Hanford Site Lockout/Tagout Procedure.

5.1.2.2 IF potential for radiological contamination exists, ENSURE equipment survey prior to removal of equipment or component from its installed location.

5.1.2.3 REMOVE equipment under test from service.

5.1.2.4 REMOVE Resistance Temperature Device (RTD) from well AND INSPECT RTD and wiring for damage.

5.1.2.5 ENSURE RTD is clean AND RECORD any deficiencies found in COMMENTS/REMARKS section of Data Sheet.
Check RTD and Calibrate MINCO TT176 RTD Temperature Transmitter

5.1 Obtain As-Found Values (Cont.)

5.1.2.6 INSTALL RTD into temperature bath/oven (dri-block calibrator).

5.1.2.7 INSERT calibrated test thermometer or temperature indicating device into temperature bath/oven as necessary.

5.1.3 CONNECT DMM in series with negative lead per Figure 1.

NOTE - Sufficient time for test equipment and RTD temperature to stabilize.

5.1.4 WHEN using dri-block calibrator, DON leather gloves.

5.1.5 APPLY input temperature values per Data Sheet. AND RECORD the following As-Found values on Data Sheet.

- As-Found loop current (4-20 mA) from DMM
- Temperature Alarm High set point (TAH-004)
- Programmable Controller/HMI Temperature Indication.

5.1.6 IF As-Found values are out of tolerance due to RTD failure, REPLACE RTD AND RETURN TO Step 5.1.2

OR

IF Alarm setpoint or temperature indication at PC/HMI is out of tolerance, NOTIFY Engineering to perform PC adjustment.

5.1.6.1 AFTER PC adjustment has been made, RETURN TO Step 5.1.2.

5.1.6 IF As-Found values are not within specified tolerance per Data Sheet, GO TO Calibration Section 5.2,

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 5.3.
5.1 Obtain As-Found Values (Cont.)

Confirm Output Values for Temperature Transmitter (Using Decade Box)

5.1.7 PERFORM the following to obtain As-Found values for Temperature Transmitter.

5.1.7.1 ENSURE applicable lockout/tagout and overlocking requirements have been satisfied per DOE-0336, Hanford Site Lockout/Tagout Procedure.

5.1.7.2 IF potential for radiological contamination exists, ENSURE equipment survey prior to removal of equipment or component from its installed location.

5.1.7.3 IF not already removed, REMOVE equipment under test from service.

5.1.7.4 DISCONNECT RTD from MINCO Transmitter terminal block TB1, Terminals 1, 2 and 3 AND CONNECT Decade Box per Figure 1.

5.1.7.5 CONNECT DMM in series with negative lead per Figure 1.

5.1.8 APPLY input resistance values per Data Sheet AND

5.1.9 RECORD the following As-Found values on Data Sheet,

- As-Found loop current (4-20 mA) from DMM
- Temperature Alarm High set point (TAH-004)
- Programmable Controller/HMI Temperature Indication.
5.1 Obtain As-Found Values (Cont.)

5.1.9.1 IF As-Found values are not within specified tolerance per Data Sheet, GO TO Calibration Section 5.2,

OR

IF As-Found values are within specified tolerance, but deemed marginal, and optimization is desired, GO TO Calibration Section 5.2,

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 5.3.
5.2 Calibration of Temperature Transmitter

NOTE - Attachment 1 provides RTD temperature versus resistance table for reference.

5.2.1 APPLY Minimum input resistance value per Data Sheet AND

ADJUST ZERO potentiometer to specified value per Data Sheet.

5.2.2 APPLY Maximum input resistance value per Data Sheet AND

ADJUST SPAN potentiometer to specified value per Data Sheet.

NOTE - A change in the Zero setting affects the whole temperature range; that is if you increase the Zero by 2°C every other reading is increased by that same amount.

5.2.3 REPEAT Steps 5.2.1 and 5.2.2 two to three times or until the unit is within tolerance at both Zero and Span point.

5.2.4 APPLY inputs resistance per Data Sheet AND

CHECK output values for tolerance.

5.2.5 IF values are within tolerance per Data Sheet, RECORD the following As-Left values on Data Sheet:

- As-Left loop current (4-20 mA) from DMM
- As-Left Temperature Alarm High set point (TAH004)
- As-Left HMI Temperature Readout.

GO TO Restoration, Section 5.3.

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

OR

IF values cannot be brought into tolerance, NOTIFY FWS for resolution AND

STOP WORK until further directed.
5.3 Restoration

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

5.3.2 IF RTD was removed from temperature well for testing, INSTALL RTD is returned to well and tighten as necessary.

5.3.3 IF not already removed, DISCONNECT AND REMOVE Test Equipment

5.3.4 ENSURE alarms are reset or cleared.

5.3.5 RECORD Test Equipment information and calibration status on Data Sheet.

5.3.6 IF Lockout/Tagout was installed, REMOVE in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure.

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

5.3.8 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

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.
Check RTD and Calibrate MINCO TT176 Temperature Transmitter

Figure 1 – Equipment Hook-Up

MINCO TT176 Temperature Transmitter

Decade Box may be used in place of RTD for testing.

Test Point Temperature

TI 004 = 87.5 °F

Programmable Controller / HMI
## Check RTD and Calibrate MINCO TT176 Temperature Transmitter

### Attachment 1 – RTD Temperature versus Resistance Chart

**PLATINUM: PD**  
**TCR = 3.85e-3, R0 = 100**  
**A = 0.0039083 B = -5.775E-07 C = -4.183E-12**  
(Values are in Ohms)

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