Calibrate K-TEK AT200 Magnetostrictive Transmitter with KM26 Level Gauge

Tank Farm Maintenance Procedure

MAINTENANCE

USQ # Routine Maintenance

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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for calibrating K-TEK® AT200 Magnetostrictive Transmitter with KM26 level gauge and setting/verifying the following switch points per Data Sheet for Skid being tested:

- LAH Level Alarm Hi
- LAHH Level Alarm Hi-Hi
- LAL Level Alarm Low
- LALL Level Alarm Low-Low.

1.2 Scope

This procedure involves K-TEK® AT200 Magnetostrictive Transmitter with KM26 level gauge. Method of calibration uses the faceplate pushbuttons while varying the water column in the sight glass on the following Water Distribution Skids:

- AY102 POR394-RW-RWDD-001 (Figure 3).

2.0 INFORMATION

2.1 General Information

2.1.1 Testing may be performed by the following two methods:

- The preferred method for testing is to connect and use “Test Water Hookup and Fill Assembly” to minimize water usage,

  OR

- Raising and lowering the Tank level per Data Sheet.

2.2 Terms and Definitions

- LRV Lower Range Value
- URV Upper Range Value
- LCD Liquid-Crystal-Display
- LAH Level Alarm Hi
- LAHH Level Alarm Hi-Hi
- LAL Level Alarm Low
- LALL Level Alarm Low-Low.
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 less than 50 volts potential per DOE–0359, Hanford Site Electrical Safety Program.

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

3.1.2 A high pressure water hose must be used (≥ 150 PSI) for the raw water supply for testing at the following skids:

- Skid POR394-RW-RWDD-001 at valve POR394-RW-V-010

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

3.1.4 Failure to use protective equipment when working on or near energized systems could result in serious injury. Job specific protective equipment requirements should be addressed during the pre-job brief and be in accordance with TFC-ESHQ-S-IS-C-02.

3.2 Radiation and Contamination Control

3.2.1 Work will be performed using a Radiological Work Permit.

3.2.2 HPT coverage is required when opening potentially contaminated systems.

3.3 Environmental Compliance

A maximum of sixty (60) gallons of raw water per incidental discharge is allowed in a contamination area per TFC-ESHQ-ENV-STD-01, Water Quality. No pooling of liquid or soil erosion is allowed.
4.0 PREREQUISITES

4.1 Special Tools, Equipment and Supplies

NOTE - POR394-RW-RWDD-001 use ¼” to ½” NPT adapter to attach the ½” Hi Pressure hose to “Test Assembly” fill valve.

The following supplies may be needed to perform this procedure:

- “Test Assembly” Water hook-up (reference Figure 3 as an example for construction/layout)
  - ½ “ Tygon tube, cut “To Fit” (for water level sight tube)
  - ½” Hi pressure hose; (≥150 PSI) length determined by FWS
  - One (1) ½” to ½” NPT adapter (hose connection to H2O source)
  - One (1) ½ inch “4 way connector”, NPT threads
  - Three (3) ½ “ Valves, NPT threads
  - Six (6) sections of ½” pipe, NPT threads; lengths “To Fit”
- 5 gallon bucket(s) to catch test water
- DMM
- Other tools, and supplies as identified by Shift Manager/OE/ FWS/User.

4.2 Performance Documents

The following documents may be needed to perform this procedure:

- K-TEK AT200 Installation and Operations manual AT200- EN Rev L
- AY102 POR394-RW-RWDD-001 P&ID H-14-024306 Sh. 12, latest revision

4.3 Field Preparation

4.3.1 OE/FWS determine which water skid is being worked and place (✔) in box:
- Section 5.1, AY102 POR394-RW-RWDD-001

4.3.2 REFERENCE Figure 3 to construct the “Water Hook-up Test Assembly” referring to parts listed in Section 4.1.

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

4.3.4 REQUEST Operations to perform valve line up and operate water skid so that skid water can be used for testing.
5.0 PROCEDURE

Special Instructions

If performance of any steps in this procedure is not required for procedure completion, steps not performed are to be marked, "N/A" in appropriate Data Sheet signoff space, and explained in comments/remarks section of Data Sheet.

Use Hi-Pressure water hose to connect from Raw Water supply to Test Assembly due to Raw Water pressure up to 150 Psig.

Refer to P&ID drawing H-14-024306 sh. 12, latest rev. for valves and equipment layouts for POR394-RW-RWDD-001 respectively.

5.1 Obtain As-Found Data for AY102 POR394-RW-001 Water Skid

5.1.1 ENSURE Operations has configured system to allow performance of this procedure at AY102 POR394-RW-001 Water Skid.

5.1.2 ENSURE valve POR394-RW-V-012 is closed (ref Figure 3).

5.1.3 LOCATE valve POR394-RW-V-013 AND

PLACE check (✓) in As-Found valve position: [ ] Open [ ] Closed.

5.1.4 IF not already closed, CLOSE valve POR394-RW-V-013.

5.1.5 CONNECT DMM per Figure 4.

5.1.6 HPT PERFORM Contamination Surveys during System breaches.

5.1.7 CONNECT “Test Water Hook-Up and Fill Assembly” to drain valve POR394-RW-V-012 per Figure 3.

5.1.8 CONNECT Tygon tubing (sight tube) to Test Valve 3 AND

TAPE along-side the “Level Indicating Gauge” Figure 3.

5.1.9 ENSURE the following “Test Assembly” valves are closed (Figure 3):

- Test “Fill” Valve #1
- Test “Drain Valve” #2.
5.1 Obtain As-Found Data for AY102 POR394-RW-001 Water Skid (Cont.)

5.1.10 IF using Water Skid AY102 POR394-RW-001 for water supply, PERFORM the following:

5.1.10.1 CONNECT ¼” x ½” adapter to the ¼” Water Filter drain valve POR394-RW-V-010 with the ½” end to Hi-Pressure hose AND

5.1.10.2 ATTACH other hose end to “Test Fill Valve” #1 per Figure 3.

5.1.10.3 SLOWLY OPEN the following “Water Filter” drain valves per Figure 5:

- POR394-RW-V-007
- POR394-RW-V-010.

5.1.11 IF not using Water Skid AY102 POR394-RW-001 for water supply, CONNECT suitable water supply to Test “Fill” Valve #1 per Figure 3.

5.1.12 PLACE bucket under test drain valve to collect any water from gauge AND OPEN the following Valves:

- POR394-RW-V-012
- Test Drain Valve #2.

5.1.13 AFTER level gauge is drained, CLOSE Test Drain Valve #2.

5.1.14 AT HPT direction, SLOWLY DISPERSE water in a slow and controlled manner AND AVOID pooling and soil erosion.

NOTE - If set, to do so, the Transmitter LCD display alternates between reading tank level in inches, and the corresponding mA output.

5.1.15 MONITOR LCD display, Sight Tube and DMM during water fill process (Increasing Level).
5.1 Obtain As-Found Data for AY102 POR394-RW-001 Water Skid (Cont.)

Special Instructions

When “Raising” water level for As-Found values, disregard Low alarms.
When approaching As-Found values per Data Sheet, reduce application rate to prevent overshooting.

5.1.16 CONFIRM “Increasing Level Alarm Point(s)” at HMI AND
CONFIRM Alarm(s) at the Local Display Panel.

5.1.17 AT Test Valve #1, SLOWLY APPLY increasing water level per Data Sheet AND

RECORD the following “As-Found” values on Data Sheet:
- Milliamp values at LCD (local display)
- Milliamp values at DMM
- Level Alarm High set point value at HMI
- Level Alarm High set point value at Tygon sight tube
- Level Alarm Hi-Hi set point value at HMI
- Level Alarm Hi-Hi set point value at Tygon sight tube.

5.1.18 ENSURE Test “Fill” Valve #1 is closed AND

POSITION drain bucket to catch excess water from testing.

5.1.19 MONITOR LCD display, Sight Tube and DMM during decreasing water level process.

NOTE - When approaching Level Alarm Low and Level Alarm Low Low, rate of drain should be reduced to prevent overshooting.

5.1.20 CONFIRM “Decreasing Level Alarm Point(s)” at HMI AND

CONFIRM Alarm(s) at the Local Display Panel.
5.1 Obtain As-Found Data for AY102 POR394-RW-001 Water Skid (Cont.)

5.1.21 **SLOWLY OPEN** Test Drain Valve #2 **AND**

**RECORD** the As Found values on Data Sheet:
- Milliamp values at LCD (local display)
- Milliamp values at DMM
- Level Alarm Low set point at HMI
- Level Alarm Low set point at Tygon sight tube
- Level Alarm Low-Low set point at HMI.
- Level Alarm Low-Low set point at Tygon sight tube.

5.1.22 **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 necessary.

5.1.23 **DRAIN** all the water from the water gauge into drain bucket **AND**

**CLOSE** Test Drain Valve #2.

5.1.24 **AT** HPT direction, **SLOWLY DISPERSE** water in a slow and controlled manner **AND**

**AVOID** pooling and soil erosion.

5.1.25 **IF** there is a deferential of .08 mA or greater between the K-TEK LCD (local display) and M&TE (DMM) reading, at the “As-Found” 4 mA and 20 mA points, **PERFORM** “Setting the DAC Trim” Section 5.2 Prior to Calibration.

5.1.26 **IF** As-Found values are NOT within specified tolerance per Data Sheet, **GO TO** Calibration Section 5.3

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

**OR**

5.1.28 **IF** Re-Calibrated, **RECORD** values in As-Left Column of Data Sheet.
5.1 Obtain As-Found Data for AY102 POR394-RW-001 Water Skid

5.1.29 IF used, CLOSE the following “Water Filter” drain valves per Figure 5:
- POR394-RW-V-007
- POR394-RW-V-010.

5.1.30 IF used, REMOVE ¼” x ½” adapter with Hi-Pressure hose from Water Filter drain valve POR394-RW-V-010 (Figure 5) and “Test Fill Valve” #1 per Figure 3.

5.1.31 GO TO Restoration, Section 5.4.
5.2 Setting the DAC Trim

Special Instructions

Setting the DAC Trim is only performed if there is a deferential of .08 mA or more between the LCD reading and the M&TE (DMM) reading, at the “As-Found” 4 mA and the 20 mA points.

The DAC Trim is used to force the AT200’s 4 mA and 20 mA points to agree with the M&TE reading.

5.2.1 IF working POR394-RW-RWDD-001 REFER to Figure 2 for LCD Menu Operations and DAC Trim.

5.2.2 CHECK DMM is still connected to output per Figure 4.

5.2.3 PRESS DOWN arrow and SELECT buttons together for one (1) second to select 4 mA point.

5.2.4 USE SELECT button to scroll through numbers AND
USE UP and DOWN arrows to adjust the number to agree with M&TE.

5.2.5 PRESS UP arrow and SELECT buttons together for one (1) second to select 20 mA point.

5.2.6 USE SELECT button to scroll through numbers AND
USE UP and DOWN arrows to adjust the number to agree with M&TE.

5.2.7 EXIT DAC Trim menu by using the UP or DOWN arrows to scroll until END appears in LCD.

5.2.8 PRESS SELECT to return AT200 to normal working mode.

5.2.9 GO TO Calibration Section 5.3.
5.3 Calibration

NOTE - This calibration sets the 4mA and 20mA points at the 0% and 100% levels. The Alarm/Switch function is set and controlled by the HMI based on this milliamp output.

5.3.1 ENSURE the drain bucket is set to catch excess water from testing.

5.3.2 FILL water at the level gauge to obtain 0% indication AND CLOSE Test Drain Valve #2.

5.3.3 ENSURE a tank level of 0% is established (4mA point) per Data Sheet.

5.3.4 REMOVE the transmitter face-plate.

Special Instructions

Steps 5.3.5 thru 5.3.10 may be repeated as required to better the calibration due to water fluctuations and other anomalies.

5.3.5 IF working POR394-RW-RWDD-001 Water Skid REFER to Figure 2.

5.3.6 ENTER the calibration mode by pressing the UP and DOWN buttons simultaneously for one (1) second.

5.3.7 PRESS the DOWN button for one (1) second to set the output at 4.00mA.

5.3.8 AFTER the 4mA point is set, ENTER the calibration mode by pressing the UP and DOWN buttons simultaneously for one (1) second.

NOTE - Level should be closely monitored during the water fill process so as not to over-shoot the 100% full indication.

5.3.9 SLOWLY OPEN Test Fill Valve #1 and ESTABLISH 100% level (20mA point) per Data Sheet.

5.3.10 PRESS the UP button for one (1) second to set the output at 20.00mA.

5.3.11 CHECK the drain bucket is set to catch excess water from testing.

5.3.12 DRAIN water from the level gauge AND CLOSE Test Drain Valve #2 when finished.
5.3 Calibration (Cont.)

5.3.13 AT HPT direction, SLOWLY DISPERSE water in a slow and controlled manner AND

AVOID pooling and soil erosion.
5.4 Restoration

5.4.1 WHEN working AY102 Water Skid - POR394-RW-RWDD-001, PERFORM the following:

5.4.1.1 ENSURE valve POR394-RW-V-012 is closed AND PLACE valve POR394-RW-V-013 in As-Found position, ref Step 5.1.3.

5.4.1.2 IF test assembly was used, REMOVE test assembly hook-up and Tygon tube from valve POR394-RW-V-012.

5.4.2 ENSURE Test Equipment has been disconnected/removed and field wire(s) reconnected.

5.4.3 AT HPT direction, SLOWLY DISPERSE water in a slow and controlled manner AND AVOID pooling and soil erosion.

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

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

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

5.4.7 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 FWS 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
- 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.

5.7 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 Record Inventory and Disposition Schedule (RIDS), is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.
Calibrate K-TEK AT200 Magnetostrictive Transmitter with KM26 Level Gauge

Figure 1 – K-TEK Magnetostrictive Transmitter and Level Indicator

Electronics With LCD Display

Figure 1 – K-TEK Magnetostrictive Transmitter and Level Indicator
To access a menu item press the SELECT button.
Use the UP and DOWN buttons to scroll through each menu and change the value of digits and menu entries.

Notes:
1. These items will appear based on the ordered options of the transmitter.
2. LRC and URC will only appear when CCR - Custom Current Ranging is turned ON.
Figure 3 – Water Skid AY102 POR394-RW-RWDD-001 Test Assembly Connection

The span as shown at sight glass is for example only and is not indicative of the actual instrument range.
Calibrate K-TEK AT200 Magnetostrictive Transmitter with KM26 Level Gauge

Figure 4 – DMM Hook-Up
Figure 5 – Water Source for Testing at POR394-RW-RWDD-001

Excerpt from Drawing H-14-024306 Sheet 12

Water Source for Testing