Tank Farm Maintenance Procedure

USQ # TF-17-0986-S Rev. 1

Change history (≤ last 5 Rev-Mods)

<table>
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<tr>
<th>Rev-Mod</th>
<th>Release Date</th>
<th>Justification</th>
<th>Summary of Changes</th>
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<td>J-2</td>
<td>10/23/2017</td>
<td>Maintenance Request</td>
<td>Add Step 3.4.6 in Section 3.4, Environmental Compliance.</td>
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<tr>
<td>J-1</td>
<td>07/27/2017</td>
<td>Environmental Change</td>
<td>Deleted Step 3.4.6 and Note after Step 3.4.6 and Records Section Update.</td>
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<tr>
<td>J-0</td>
<td>09/14/2016</td>
<td>Periodic Review</td>
<td>RadCon Added two steps 3.3.1 and 3.3.2</td>
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<tr>
<td>I-0</td>
<td>08/01/2013</td>
<td>Periodic Review</td>
<td>Removed vague phrases, added steps to document directions on comments sheet, added clarification where applicable, update to standard, added RL to terms and definitions section, and recorded caution statements.</td>
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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides post installation calibration/initial settings of ENRAF Model 854 Displacer Type Level Gauge and instructions for initial installation of drum and displacer.

1.2 Scope

This procedure applies to post installation calibration/initial settings of ENRAF Model 854 level gauges and initial installation of drum and displacer. Test will verify that gauge has been set up and calibrated according to manufacturer's instructions.

2.0 INFORMATION

2.1 Terms and Definitions

- RL - Reference Level
- PET - Portable ENRAF Terminal.

2.2 General Information

All data will be recorded in the body of procedure during performance of the procedure and transferred to Data Sheet(s) after procedure completion.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 If an energized work permit is required during the performance of this procedure, comply with DOE-0359, Hanford Site Electrical Safety Program.

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

3.1.3 Industrial Hygiene monitoring requirements will be specified in the Industrial Hygiene Sample Plan (IHSP).

3.1.3.1 Contact the facility Industrial Hygienist for the appropriate IHSP.

**WARNING** - An open isolation valve indicates ENRAF internals are exposed to tank environment which could result in radiological hazards.
3.2 Equipment Safety

**CAUTION** - Slight bends in the wire are acceptable but a kink could cause the wire to break.

**CAUTION** - Threads need to be kept free from dirt, failure to do so could damage the threads.

**CAUTION** - When closing, covers should be turned counterclockwise until the threads click into place, failure to do so could damage the cover.

**CAUTION** - If displacer is still not resting on the ball valve before issuing command AR calibration errors will occur.

3.3 Radiation and Contamination Control

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

3.3.1 When performed without a work package, this procedure is limited to radiological areas and work activities permitted by a general radiological work permit.

3.3.2 When work is performed in or when work will result in a high contamination, high radiation, or an airborne radioactivity area, an approved work package or technical procedure must be developed which is reviewed by Radiological Control per the ALARA work planning procedure TFC-ESHQ-RP_RWP-C-03.
3.4 Environmental Compliance

3.4.1 If leak detection equipment failure occurs, a maintenance outage, or in the event that leak detection equipment preventive maintenance or functional testing that will exceed 24 hours downtime, Notify Environmental per Environmental on-call list in accordance with TFC-ESHQ-ENV_FS-C-01.

3.4.2 If waste is generated during the performance of this procedure, dispose of it in accordance with TO-100-052, Perform Waste Generation, Segregation, Accumulation and Clean-up.

3.4.3 Tank farm ventilation systems and exhaust monitoring systems are regulated under Washington State Administrative Code (WAC) chapters 173-400, 173-401, 246-247 and 173-460 and sections of Air Operating Permit (AOP) and Radioactive Air Emission License (FF01). Ensure primary tank HEPA ventilation is operating during the performance of this procedure.

3.4.4 To ensure reporting requirements are met, all unplanned outages of tank farm ventilation, including portable exhausters, and both planned and unplanned outage of exhaust record samplers, must be immediately reported to Environmental On-Call per the On-Call List, in compliance with TFC-ESHQ-ENV_FS-C-01.

3.4.5 In accordance with TFC-ESHQ-ENV_RM-C-04, Water Discharge in Tank Farms, routine maintenance and operation activities may result in small incidental discharge of raw water as long as the below listed limits and conditions are met. Refer to TFC-ESHQ-ENV_RM-C-04, Table2, for the listing of approved incidental discharges.
   - No discharge from a single activity may exceed 60 gallons released to the soil.
   - Appropriate best management practices (BMs) shall be implemented to prevent unnecessary discharges.
   - No ponding of liquid.
   - During pre-job planning, measures to limit soil erosion will be incorporated in the work plan.
   - During performance of the work, all measures to limit ponding and/or erosion will be implemented.

3.4.6 Report work space air samples to WRPS Environmental Protection and appropriate WRPS Shift Office for grab air samples equal to or greater than 10 DAC within the work space AND/OR contamination found during post job radiological surveillance of the posted and controlled radiological boundary area boundary that exceeds the Radiological Work Plan (RWP).
4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

The following supplies may be needed to perform this procedure:

- Calibration unit - Portable ENRAF Terminal Model No. 847
- Replacement gaskets for sight glass window assembly (if required)
- $\frac{3}{16}$" Allen wrench
- 3 mm Allen tee-handle wrench
- Small screwdriver
- Shop stock wire from ENRAF (≥ 12” length)
- Tape
- Other tools, equipment, and supplies as identified by Shift Manager/OE/FWS/User.

4.2 Performance Documents

The following procedures may be needed to perform this procedure:

- TO-040-180, Operate Tank Surface Level Monitoring Devices
- DOE-0336, Hanford Site Lockout/Tagout Procedure.
4.3 Field Preparation

4.3.1 **DURING** performance of this section, **RECORD** all values in spaces provided.

4.3.2 **IF** the gauge is connected to TMACS, **ENSURE** the system operators has been notified (i.e., 373-2618) of intent to perform this procedure.

**NOTE** - For ENRAF gauges used for annulus leak detection, this value will start at 850 inches. This value will change upon completion of calibration of displacer on bottom of annulus.

4.3.3 **FWS OBTAIN** correct reference level (RL) value from ECN **AND** **RECORD** on Calibration Data Sheet, item “I”.

4.3.4 **CONFIRM** that portable ENRAF terminal powers up.

4.3.5 **PRIOR** to beginning performance of this procedure, **ENSURE** release from Shift Manager has been obtained.

4.3.6 **ENSURE** applicable lock and tag, authorized worker tag or Energized Work Permit requirements have been satisfied per DOE-0336, Hanford Site Lockout/Tagout Procedure.
5.0 PROCEDURE

NOTE - This procedure contains a Calibration Data Sheet which may be copied if this procedure is to be performed multiple times.

5.1 Initial Installation of Drum and Displacer

5.1.1 DURING performance of this section, RECORD all values in spaces provided.

5.1.2 IF any step is not required for procedure completion, RECORD “N/A” in the applicable space(s) on the Data Sheet AND DOCUMENT explanation in the Data Sheet’s Comments/Remarks section.

WARNING
An open isolation valve indicates ENRAF internals are exposed to tank environment which could result in radiological hazards.

5.1.3 ENSURE by visual inspection that isolation valve is secured in closed position.

5.1.4 IF isolation valve is not in closed position, STOP WORK AND NOTIFY FWS.

5.1.5 ENSURE by visual inspection that power switch is in "OFF" position or receptacle plug is disconnected.

5.1.6 REMOVE electronic compartment cover.

5.1.7 ENSURE by visual inspection that "motor lock" located at the bottom left corner of electronic compartment, is in locked position (Figure 1).

5.1.8 CONFIRM by visual inspection that approximately first 4 feet of wire on drum to be installed are free of kinks AND RECORD on Calibration Data Sheet (item A).
5.1 Initial Installation of Drum and Displacer (Cont.)

5.1.9 **RECORD** drum circumference value engraved on wire drum on Calibration Data Sheet (item C).

5.1.10 **RECORD** displacer weight shown/tagged on displacer as the New Displacer Weight on Calibration Data Sheet (item D).

---

**CAUTION**

Slight bends in the wire are acceptable but a kink could cause the wire to break.

5.1.11 **IF** during installation of drum or displacer wire becomes kinked, **CONTACT** Engineering for direction.

5.1.12 **REMOVE** drum compartment cover from gauge.

5.1.13 **REMOVE** sight glass cover.

5.1.14 **REMOVE** rubber band or tape from drum.

5.1.15 **WHILE** maintaining tension on reel, **FEED** wire and mounting snap from reel housing to sight glass opening to insert drum into bearings.

5.1.16 **IF** displacer has factory hook, **PULL** wire through sight glass window **AND** **CONNECT** displacer to the wire.

5.1.16.1 **USE** a piece of wire (≥ 12” length), **WRAP** one end around measuring wire as shown in Figure 4.

5.1.16.2 **PASS** other end of wire through hole in tip of displacer hook. **AND** **WRAP** wire several times around hook and through hole to secure displacer (see Figure 4).
5.1 Initial Installation of Drum and Displacer (Cont.)

5.1.17 IF displacer has eye-hook, PULL mounting snap through sight glass window.

5.1.17.1 CONNECT displacer to snap AND VISUALLY ENSURE displacer connection.

5.1.18 PLACE displacer through sight glass by placing bottom end in first while holding wire with other hand or other mechanical means (i.e., tongs or wire hook).

5.1.19 UNTIL it is suspended from the gauge, CONTINUE lowering displacer into sight glass.

5.1.20 CHECK axial free-play by performing the following:

5.1.20.1 PUSH drum toward the magnet cap in such a way that drum shaft meets magnet cap.

5.1.20.2 WHILE checking that drum and drum shaft are free to move towards you, SLIGHTLY MOVE drum in and out.

5.1.20.3 ENSURE drum is in contact with magnetic cap.
5.1 Initial Installation of Drum and Displacer (Cont.)

5.1.21 UNLOCK "motor lock" located at bottom left corner of electronic compartment (Figure 2).

CAUTION

Threads need to be kept free from dirt, failure to do so could damage the threads.

When closing, covers should be turned counterclockwise until the threads click into place, failure to do so could damage the cover.

5.1.22 REPLACE all covers (sight glass, electronic compartment, and drum compartment).
5.2 Drum Circumference Check

5.2.1 **DURING** performance of this section, **RECORD** all values in spaces provided.

5.2.2 **IF** not already connected, **CONNECT** portable ENRAF terminal to gauge to be tested by plugging terminal's optical coupler into socket located on left side of gauge when facing display **AND**

**PRESS** ON/RESET button.

5.2.3 **IF** power to gauge is OFF, **PLUG** in gauge **AND**

**SWITCH** power ON to gauge.

5.2.4 **IF** no error code is displayed, **PROCEED** to step 5.2.6.

5.2.5 **IF** an error code is displayed (e.g. ES553 / ES555), **PERFORM** steps 5.2.5.1 to 5.2.5.5 to synchronize the encoder.

5.2.5.1 **ENTER** command “W2=2”.

5.2.5.2 **ENTER** command “SM”.

5.2.5.3 **ENTER** command “FP” **AND**

**WAIT** approx. 30 seconds.

5.2.5.4 **ENTER** command “SO”.

5.2.5.5 **ENTER** command “EX”.

5.2.6 **ENTER** Command [DC]. (This command displays the programmed drum circumference).
5.2 Drum Circumference Check (Cont.)

NOTE - Portable ENRAF terminal displays drum circumference in scientific notation, which is different from format engraved on the drum. Value displayed by portable ENRAF terminal will look like: "DC=+.33000000E+00". Drum value is given in millimeters. Same value on drum would look like: "330.0000".

5.2.7 CHECK that programmed drum circumference value matches value for drum circumference found engraved on wire drum (item C) AND [DC] programmed drum circumference (As-Left Programmed Value) on Data Sheet (item B) AND IF value does match, RECORD [DC] programmed drum circumference (As-Left Programmed Value) on Data Sheet (item B) AND GO TO Section 5.3.

5.2.7.1 ENTER Command [W2=ENRAF2]. (This command enters protection level 2).

5.2.7.2 ENTER Command [DC=+.xxxxxxxxE+00], where xxxxxxxx is the value engraved on wire drum. (i.e., DC= +.32703900E+00).

5.2.7.3 RECORD [DC] as programmed drum circumference (As-Left Programmed Value) on Calibration Data Sheet (item B).

5.2.7.4 ENTER Command [EX]. (This commands exits protection level 2).
5.3 Displacer Weight Check

5.3.1 **DURING** performance of this section, **RECORD** all values in spaces provided.

5.3.2 **MOVE** displacer at least 8 inches below upper adaptor flange.

5.3.3 **ENTER** Command = [UN]. (This command returns gauge to operational mode. Displacer will rest on closed ball valve).

5.3.4 **WAIT** until gauge stabilizes.

5.3.5 **ENTER** Command = [CA]. (This command raises displacer).

5.3.6 **WAIT** a few seconds to allow displacer to rise a couple of inches.

5.3.7 **ENTER** Command = [FR]. (This command freezes motion of displacer).

5.3.8 **ENTER** Command = [MF]. (This command measures frequency of transducer).

5.3.9 **WAIT** for "FR" to appear in display.

5.3.10 **ENTER** Command = [WQ]. (This command displays as-found displacer weight).

5.3.11 **RECORD** as-found displacer weight on Calibration Data Sheet (item E).

---

**NOTE** - A WQ value that is within tolerance will verify that force transducer is still within calibration.

5.3.12 **CONFIRM** that difference between the weight recorded in Step 5.1.10 (item D) and [WQ] weight (item E) is within ± 6 grams.
5.3 Displacer Weight Check (Cont.)

5.3.13 IF difference verified in Step 5.3.12 is within tolerance, RECORD on Calibration Data Sheet (item F),

OR

IF difference verified in Step 5.3.12 is not within tolerance, RECORD on Calibration Data Sheet (item F) AND

CONTACT Engineering.

5.3.14 ENTER Command = [DW] AND

RECORD on Calibration Data Sheet (item G). (This command displays programmed displacer weight).

5.3.15 IF [WQ] does not match [DW] to within ± 6 grams, PERFORM the following:

5.3.15.1 CONTACT Engineering.

5.3.15.2 RECORD directions on comments/remarks section of procedure.

5.3.15.3 PROCEED as directed.

5.3.16 IF [WQ] matches [DW] to within ± 6 grams, PERFORM the following steps:

5.3.16.1 ENTER Command [W2=ENRAF2]. (This command enters protection level 2).

5.3.16.2 ENTER Command [DW=+.xxxxxxxxE+03] where .xxxxxxxx is [WQ] value recorded above.
5.3 Displacer Weight Check (Cont.)

5.3.17 IF no value is specified on the Calibration Data Sheet, **SUBTRACT** 15 grams from as-found value of [WQ] **AND**

**RECORD** this value as [S1], [S3] and [RM] on Calibration Data Sheet (item H).

**OR**

IF a value other than 15 grams is specified on the Calibration Data Sheet, **SUBTRACT** specified value from as-found value of [WQ] **AND**

**RECORD** this value as [S1], [S3] and [RM] on Data Sheet (item H).

5.3.18 **ENTER** Command \[
\text{[S1=+.xxxxxxxxE+03]}\], where .xxxxxxxx is [S1] value recorded above.

5.3.19 **REPEAT** Steps 5.3.17 and 5.3.18 for [S3] and [RM].

5.3.20 **ENTER** Command \[
\text{[S2=+.05000000E+03]}\].

5.3.21 **ENTER** Command = [EX]. (This command exits protection level 2).
5.4 Calibration Check

5.4.1 **DURING** performance of this section, **RECORD** all values in spaces provided.

5.4.2 **ENTER** Command = [UN]. (This command will return gauge to operational mode. Displacer will rest on closed ball valve).

5.4.3 **WAIT** for level reading to stabilize.

5.4.4 **ENSURE** RL value obtained in Step 4.3.3 has been entered as correct RL value on the Calibration Data Sheet (item I).

5.4.5 **PERFORM** reference level entry.

5.4.5.1 **ENTER** Command = [W2=ENRAF2]. (This command enters protection level 2).

5.4.5.2 **ENTER** Command = [RL=+XXXXX.XX], where XXXXX.XX is the correct RL value **AND**

**RECORD** as programmed RL value on the Calibration Data Sheet (item J).

---

**CAUTION**

If displacer is still not resting on the ball valve before issuing command AR, calibration errors will occur.

5.4.5.3 **ENTER** Command = [AR]. (This command authorizes gauges to accept corrected value for "RL").

5.4.5.4 **ENTER** Command = [EX]. (This command exits protection level 2).

5.4.5.5 **WAIT** until the level reading stops changing **AND**

**RECORD** as the As Left RL Reading (item K).
5.4 Calibration Check (Cont.)

5.4.5.6 **IF** reference level cannot be achieved to ± 0.10 inch for level gauge, **PERFORM** the following:

a. **CONTACT** Engineering.

b. **RECORD** directions on comments/remarks section of procedure.

c. **PROCEED** as directed.

5.4.6 **ENTER** Command = [CA]. (This command raises displacer to ENRAF adapter flange).

5.4.7 **CHECK** by visual inspection that displacer can be seen through sight glass.

5.4.8 **WHEN** displacer reaches ENRAF adapter flange and stops, **PERFORM** the following:

5.4.8.1 **RECORD** level reading displayed on gauge as as-found TT on Calibration Data Sheet (item L).

5.4.8.2 **ENTER** Command = [W2=ENRAF2]. (This command enters protection level 2).

5.4.8.3 **ENTER** Command = [TT=+XXXXX.XX], where +XXXXX.XX is level reading when displacer is at the ENRAF adapter flange **AND**

**RECORD** as programmed TT on the Calibration Data Sheet (item M).

5.4.8.4 **RECORD** level displayed on gauge as as-left TT on Calibration Data Sheet (item N).
5.4 Calibration Check (Cont.)

5.4.8.5 ENTER Command [EX]. (This command exits protection level 2).

5.4.8.6 ENTER command [UN] to lower the displacer 6 to 10 inches before proceeding to the next step.

5.4.9 ENTER Command = [FR]. (This command freezes motion of the displacer).

5.4.10 OPEN isolation valve AND SECURE it.

5.4.11 ENTER Command = [UN]. (This command returns gauge to operational mode).

5.4.12 IF displacer gets caught up either on the PVC flange or on an undersized neoprene gasket, PERFORM the following:

5.4.12.1 ENTER W2 protection mode.

5.4.12.2 USE standard command entry format, CHANGE setpoint (S2) to 50 grams (if not already 50 grams).

5.4.12.3 EXIT W2 protection mode.

5.4.12.4 ENTER command [I2].

5.4.12.5 USE [CA] and [UN] commands to get passed obstruction.

5.4.12.6 WHEN displacer is passed obstruction, ENTER command [I1] to return to normal operation.

5.4.13 WAIT until the level reading stops changing.

5.4.14 IF ENRAF will be used for tank level, GO TO Step 5.4.16.
5.4 Calibration Check (Cont.)

5.4.15 IF ENRAF will be used on an Annulus, PERFORM the following:

5.4.15.1 ENTER Command = [W2=ENRAF2].

5.4.15.2 ENTER Command = [RL=+00000.15].

5.4.15.3 ENTER Command = [AR].

5.4.15.4 ENTER Command = [EX].

5.4.15.5 WAIT until level reading stops changing.

5.4.15.6 IF level is within ±0.04, RECORD the as-left tank annulus bottom reading on Calibration Data Sheet (item O) AND GO TO Section 5.5.

5.4.15.7 IF level is not within ±0.04, PERFORM the following:

   a. CONTACT FWS and Engineer.

   b. RECORD directions on Comments/Remarks section of procedure.

   c. PROCEED as directed.

5.4.16 RECORD as-left tank liquid level reading on Calibration Data Sheet (item O).

5.4.17 ENTER command = [MH]. (This is Motor High limit setting. Travel speed of displacer is slower when above this setting).

5.4.18 CHECK Motor High setting is equivalent to Correct RL value plus 15 inches, ± 1 inch.
5.4 Calibration Check (Cont.)

5.4.19 IF Motor High setting is not correct, PERFORM the following:

5.4.19.1 ENTER command = [W2=ENRAF2].

5.4.19.2 ENTER command = [MH=+xxxxx.xx], where xxxxx.xx equals the Correct RL value plus 15 inches.

5.4.19.3 ENTER command = [EX].
5.5 Restoration

5.5.1 ENSURE all test equipment has been disconnected and removed.

5.5.2 ENSURE M&TE and calibration status are recorded on Data Sheet.

5.5.3 ENSURE instrument enclosure cover is properly reinstalled.

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

5.5.5 TRANSFER all values previously recorded in procedure to Data Sheet.

5.6 Acceptance Criteria

Comparison and verification that data in applicable steps of procedure are within limits (tolerance) of Data Sheet(s) satisfies Acceptance Criteria for this procedure.

5.7 Review

5.7.1 INFORM Shift Manager and FWS the test is complete.

5.7.2 The 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, where required.

5.7.3 FORWARD copies of all data sheets to Engineering.
5.8 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.
# Calibration Data Sheet

**INSTRUMENT TAG NO.:** ____________  |  **LOCATION:** ________________
**DESCRIPTION:** LEVEL GAUGE  |  **MODEL NO.:** SERIES 854 ATG
**MANUFACTURER:** ENRAF INC.  |  **WORK ORDER NO.:** __________

**CALIBRATION SOURCE/MODEL NO.:** PORTABLE ENRAF TERMINAL  /  
**SERIAL NO./DATE TESTED:** __________ / __________

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<th>DESCRIPTION</th>
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<th>DATA</th>
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<td>Drum Circumference</td>
<td>(item B)</td>
<td>As-Left Programmed Value: ________________</td>
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<tr>
<td></td>
<td>(item C)</td>
<td>Engraved Value:</td>
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<tr>
<td>Displacer Weight</td>
<td>(item D)</td>
<td>New Displacer Wt. (Tagged) _______________</td>
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<td>(item E)</td>
<td>As-Found Displ. Wt. (WQ): _______________</td>
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<td>Prog. Displ. Wt. (DW): _______________</td>
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**REMARKS:**

Craft Print (First and Last) Signature/ Date: ____________________________________________
Figure 1 - Motor Lock

MOTOR LOCK
Figure 2 - Motor Unlock
Figure 3 - Side View of ENRAF 854 Level Gauge
Figure 4 - Installing Security Wire