## Tank Farm Maintenance Procedure

### Calibration and Field Check of Drexelbrook Level Transmitter

#### USQ # GCX-2

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<tr>
<td>F-1</td>
<td>06/28/2017</td>
<td>Periodic Review</td>
<td>Record Section Update.</td>
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<td>Reword Step 3.1.1, Note prior to 5.1, Steps 5.1.4, 5.1.5, 5.1.8, 5.1.9, 5.1.12 sub-steps 5.3.3, 5.4.2, 5.4.4, 5.4.5 Section 5.7, Struck Warning prior to Step 5.2.2, Added Step 5.1.9.1.a.</td>
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<td>E-3</td>
<td>01/16/2013</td>
<td>DOE Standard</td>
<td>Replaced references to document TFC-ESHQ-S-STD-03, Electrical Safety with DOE–0359, Hanford Site Electrical Safety Program.</td>
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<td>E-2</td>
<td>12/14/2010</td>
<td>Maintenance request additional clarification and instructions.</td>
<td>Added bullet under 4.1 for “Access devices”. Added Note prior to step 4.2.1. Added New Step 5.2.1.</td>
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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for Drexelbrook Level Transmitter performing initial bench cal/setup in a simulated environment and in-service calibration check utilizing Drexelbrook C-box calibrator to simulate vessel level capacitance.

1.2 Scope

This procedure involves calibration of the Drexelbrook Level Transmitter and probe assembly used for Seal Pot and Glycol liquid level measurements.

2.0 INFORMATION

2.1 General Information

2.1.1 New instruments are initially calibrated in shop to determine their milliamp to capacitance equivalency. By varying liquid level in simulator to obtain Zero and Span milliamps, the equivalent “Capacitance” is determined with a Drexelbrook C-Box Calibrator and documented for later use in Field Calibration/Checks.

2.1.2 Per the Drexelbrook Operating manual the C-Box calibrator introduces a “Standing Capacitance of 10 pF with the Range Selector Switch set to the “LOW” Range, and 20 pF of “Standing Capacitance” is added with the Range Switch set to the High Range (“NORM”) position.

EXAMPLE:

With the C-Box switched to “LOW” (low range) position, and the desired output is 40 pF, the C-Box setting would be 30 pF.

With the C-Box is switched to “NORM” (high range) position a Standing Capacitance of 20 pF is added to the Capacitance setting in the same manner as above.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 Energized circuits and leads are connected inside the cabinets. Compliance with DOE–0359, Hanford Site Electrical Safety Program is required.

3.1.2 Use extreme caution when working around live circuits. Failure to follow electrical safety practices as outlined in DOE–0359, Hanford Site Electrical Safety Program could result in serious injury.

3.1.3 If a Lockout/Tagout 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

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.

4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

The following supplies may be needed to perform this procedure:

- Drexelbrook C-Box Model 401-18-20, with input cable
- Digital multimeter
- Access devices
- Seal Pot Level Simulator Test Rig
  OR
- Glycol Level Simulator Test Rig.
4.2 Field Preparation

NOTE - If this is the first time use for a new probe/data sheet, engineering will be required to develop data sheet values and/or instructions.

- This procedure may be performed either in the field or shop (bench cal/setup).
- For transmitters that are not easily accessible, access devices will be needed.

4.2.1 OBTAIN release from Operations Management prior to beginning Sections 5.2 or 5.3 of this procedure.

4.2.2 CONTACT FWS for additional instructions if changing plant conditions affect work or delays in work extend past end of shift.

4.2.3 COMPLY with applicable lock and tag and over-tagging requirements in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure.
5.0 PROCEDURE

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

5.1 Initial Calibration, Data Acquisition, and Documentation

**Immersion Application Calibration**

NOTE - Figure 3 should be referenced for Power/Signal connections.

5.1.1 CONNECT test equipment per Figure 3.

5.1.2 SET Fine Zero and Fine Span to extreme counterclockwise position.

5.1.3 SET Step Span and Step Zero to position 1.

5.1.4 WITH probe uncovered (vessel empty), ADJUST Step Zero control clockwise UNTIL output is just less than the desired (calculated) minimum current (mA) output per data sheet.

5.1.5 ADJUST Fine Zero control clockwise UNTIL output is within the desired output per the data sheet.

5.1.6 FILL Simulator to the designated Maximum liquid level (ref Figure 2 for top of probe) AND CHECK that current output exceeds full scale value.

5.1.7 IF current does not exceed full scale value, LEAVE Step Span control in position 1 AND GO TO Step 5.1.9

5.1.8 IF current does exceed full scale value, ADJUST Step Span Control clockwise UNTIL output is less than full scale.
5.1 Initial Calibration, Data Acquisition and Documentation (Cont.)

5.1.9 ADJUST Fine Span Control clockwise UNTIL output is within the desired output per the data sheet.

5.1.9.1 REPEAT steps 5.1.2 through 5.1.9 up to three (3) times.

a. IF unable to bring into tolerance, NOTIFY FWS for direction AND RECORD those directions on the Work Record or Shift Log.

Capacitance to milliamp Equivalency Determination

5.1.10 DISCONNECT probe wire(s) from Drexelbrook Transmitter AND RECORD probe serial number on Data Sheet, [Item A].

NOTE - The Drexelbrook C-Box calibrator introduces a “Standing Capacitance of 10 pF with the Range Selector Switch set to the “LOW” Range, and 20 pF of “Standing Capacitance” is added when the Range Switch is set to the High Range (“NORM”) position (refer to Step 2.1.2 for example).

5.1.11 CONNECT Drexelbrook Calibrator to probe input terminals as illustrated in Figure 1 (cable provided by Drexelbrook).

5.1.12 USING Drexelbrook Calibrator, PERFORM the following:

5.1.12.1 VARY capacitance input value UNTIL the minimum output is obtained AND RECORD capacitance value on Data Sheet, [Item B].

5.1.12.2 VARY capacitance input value UNTIL the midpoint output is obtained AND RECORD capacitance value on Data Sheet, [Item C].

5.1.12.3 VARY capacitance input value UNTIL the maximum output is obtained AND RECORD capacitance value on Data Sheet, [Item D].
5.2 Check As-Found Readings on Field Equipment

NOTE - Calibration check must be performed in place using Drexelbrook Calibrator to simulate liquid level.

5.2.1 ENSURE work platform is installed for access to transmitter.

5.2.2 DISCONNECT probe wires.

NOTE - The Drexelbrook C-Box calibrator introduces a “Standing Capacitance of 10 pF with the Range Selector Switch set to the “LOW” Range, and 20 pF of “Standing Capacitance” is added when the Range Switch set to the High Range (“NORM”) position (refer to Step 2.1.2 for example).

5.2.3 CONNECT Drexelbrook calibrator to instrument as illustrated in Figure 1 (cable provided by Drexelbrook).

5.2.4 CONNECT digital multimeter as shown in Figure 3 for current reading.

5.2.5 APPLY capacitance input values specified by Data Sheet AND RECORD output reading in As-Found section of Data Sheet.

5.2.6 IF As-Found readings are NOT within tolerance specified by Data Sheet, GO TO Section 5.3 Capacitance Application Calibration

OR

IF As-Found readings ARE within tolerance specified by Data Sheet, RECORD As-Found readings in As-Left column AND GO TO Section 5.4 Restoration.
5.3 Capacitance Application Calibration

5.3.1 **REPEAT** Steps 5.3.1.1 through 5.3.1.5 **UNTIL** outputs are within tolerances specified by Data Sheet **AND GO TO** step 5.3.2.

**NOTE** - The Drexelbrook C-Box calibrator introduces a “Standing Capacitance of 10 pF with the Range Selector Switch set to the “LOW” Range, and 20 pF of “Standing Capacitance” is added when the Range Switch set to the High Range (“NORM”) position (refer to Step 2.1.2 for example).

5.3.1.1 **SET** Drexelbrook C-box range switch to proper range on vernier dial and thumbwheel as specified on Data Sheet.

5.3.1.2 **APPLY** Minimum input value as specified on Data Sheet.

5.3.1.3 **ADJUST** "FINE ZERO" adjustment **UNTIL** output value on digital multimeter reads specified value on Data Sheets.

5.3.1.4 **APPLY** Maximum input value as specified on Data Sheet on the vernier dial.

5.3.1.5 **ADJUST** "FINE SPAN" adjustment **UNTIL** output value on the digital multimeter reads the specified value on Data Sheets.

5.3.2 **APPLY** test input values specified by Data Sheet.

5.3.3 **IF** As-Left readings are NOT within tolerance specified by Data Sheet **NOTIFY** Engineering for direction **AND** **RECORD** those directions in Work Record or Shift Log.

5.3.4 **IF** output readings ARE within specified tolerance, **RECORD** in As-Left section of Data Sheet **AND GO TO** Section 5.4 Restoration.
5.4 Restoration

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

5.4.2 IF not already removed; DISCONNECT AND REMOVE Test Equipment.

5.4.3 RE-CONNECT probe wires to transmitter.

5.4.4 RECORD Test Equipment (M&TE) information and calibration status on Data Sheet.

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

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

5.5 Acceptance Criteria

Acceptance Criteria have 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 that testing is complete.

5.6.2 FWS REVIEW AND ENSURE the following:

- Complete Data Sheets meet the acceptance criteria and are forwarded to Engineering
- 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 Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.
Figure 1 – Drexelbrook Calibrator Test Setup
Figure 2 – Level Probe Test Simulator for Glycol or Seal Pot

NOTE – Due to the difference in lengths of the Glycol and Seal Pot probes, separate Test Simulators must be used to accommodate the different probe lengths.
Calibration and Field Check of Drexelbrook Level Transmitter

Figure 3 – Drexelbrook Power/Signal Wiring

D.C. POWER SUPPLY *
24 Volts DC

DMM

+ 4-20 MA –

GND – +

OBSERVE POLARITY OF SIGNAL WIRES