Princo™ Model L3610 Null-Kote™ Analog Level Transmitters

Tank Farm Maintenance Procedure

EFFLUENT TREATMENT FACILITY

USQ Not Required – ETF is a <Hazard Category 3 Radiological Facility

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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides a safe, uniform method for calibration of Princo™ Model L3610 Null-Kote™ analog level transmitters.

1.2 Scope

Procedure instructions include steps for the initial setup and calibration check, as well as two methods for calibrating the Princo Model L3610 Null-Kote analog level transmitters: tank level change or capacitance signal input method, and probe manipulation method.

This procedure is applicable to calibration of TEDF pump stations 1 and 2 level transmitters LT-68A-004, LT-68A-030, LT-68B-004, and LT-68B-022.

2.0 INFORMATION

2.1 Terms and Definitions

- TX – Transmitter.

2.2 General Information

Use of the capacitance signal input method has two limitations:

- Capacitance values are unique to each probe and must be obtained by supplying probe serial number to the manufacturer. DA should provide values on data sheet.
- Probe (primary sensor) is not tested. Comparison to level measured by other means should be made after system is restored to prove operability of probe.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

NOTE - Transmitters are powered by 110/220 VAC (see Figure 1).

3.1.1 Making connections to transmitter may cause electrical shock.

3.2 Radiation and Contamination Control

3.2.1 Work in radiological areas will be performed using a radiological work permit following review by Radiological Control per ALARA Work Planning procedure, TFC-ESH-RP_RWP-C-03.

3.3 Environmental Compliance

3.3.1 In the event of a spill/leak/release, notify the SOM/FWS and respond per ETF-ERP-85B-003, Emergency Spill or Release at ETF.
4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

NOTE - M&TE used to collect acceptance criteria data during performance of this procedure shall meet the following requirements:

- Be within its current calibration cycle as evidenced by an affixed calibration label
- Be capable of desired range
- Have an accuracy consistent with state-of-the-art limitations
- Accuracy is equal to or greater than M&TE tolerance specified on PM/S data sheet or is at least four times greater than specified device tolerance.

The following supplies may be needed to perform this procedure:

- CMD
- Capacitance decade box (if capacitance method used)
- Calculator (if tank level change method is used).

4.2 Performance Documents

The following documents may be needed to perform this procedure:

- Vendor information, Princo Null-Kote Analog Level Transmitter, Model L361 Instruction Manual.

4.3 Field Preparation

4.3.1 CONFIRM there is enough water available in the tank/sump to allow for pumping each side up to the high level when using the tank level change, which is the preferred method of calibration.
5.0 PROCEDURE

NOTE - Figure 1 depicts 110 VAC wiring connections and adjustments.

5.1 Initial Set Up and Calibration Check

5.1.1 REMOVE TX cover.

5.1.2 LABEL AND LIFT negative field output wire at TX.

5.1.3 CONNECT CMD (mADC) in series with lifted lead and terminal.

NOTE - Tank Level Change Method

- Station 1 has a low level of 9.5" (4mA) and a high level of 276" (20 mA). Total depth of wet well is 288".
  - Low level may be checked with a tank depth of 9.5 to 63".
  - High level should be checked with a tank depth of 222 to 276".

- High level may be checked at a lower depth with concurrence of DA.

- Station 2 has a low level of 9.1" (4mA) and a high level of 84" (20 mA). Total depth of wet well is 96".
  - Low level may be checked with a tank depth of 9.1 to 27".
  - High level should be checked with a tank depth of 66 to 84". High level may be checked at a lower depth with concurrence of DA.

- See Attachment 1 for Tank Level Calculation Example.

5.1.4 IF using the tank level change method, GO TO Section 5.2.

5.1.5 IF using the capacitance signal input method, GO TO Section 5.3.
5.2 Tank Level Method

NOTE - Outputs may need to be calculated if tank levels were not able to be pumped to high and low levels for true 0 and 100% output readings. The liquid level is calculated by measuring from the top of the wet well down to the liquid surface and subtracting this value from the total wet well depth. Pump Station 1 wet well depth is 288”, Pump Station 2 wet well depth is 96”.

5.2.1 **OBTAIN** measurement from liquid level to top of wet well and as-found output current at high tank level AND **RECORD** on Data sheet.

5.2.2 **VARY** tank to low level and obtain measurement from liquid level to top of wet well and as-found output current AND **RECORD** on Data sheet.

5.2.3 **IF** as-found values are not within specified tolerance per data sheet, **GO TO** AND **COMPLETE** Steps 5.4.1 through 5.4.7,

5.2.4 **IF** as-found values are within specified tolerance, but deemed marginal, and optimization is desired, **GO TO** AND **COMPLETE** Steps 5.4.1 through 5.4.7,

5.2.5 **IF** as-found values are within specified tolerance, **RECORD** as-found values in as-left column of data sheet AND **GO TO** Section 5.5.
5.3 Capacitance Signal Method

5.3.1 DISCONNECT sensor leads in head.

5.3.2 CONNECT capacitance decade box to TX input

5.3.3 VARY capacitance signal input per data sheet AND RECORD as-found output current (CMD).

5.3.4 IF as-found values are not within specified tolerance per data sheet, GO TO AND COMPLETE Steps 5.4.8 through 5.4.14,

5.3.5 IF as-found values are within specified tolerance, but deemed marginal, and optimization is desired, GO TO AND COMPLETE Steps 5.4.8 through 5.4.14,

5.3.6 IF as-found values are within specified tolerance, RECORD as-found values in as-left column of data sheet AND GO TO Section 5.5.
5.4 Calibration (Tank Level Change or Capacitance Signal Input Method)

**Tank Level Change Method**

5.4.1 ADJUST tank level to low level AND CALCULATE output.

Station 1:
Low tank level (( ____ - 9.5) ÷ 266.5 x 16) + 4 = ________ mA

Station 2:
Low tank level (( ____ - 9.1) ÷ 74.9 x 16) + 4 = ________ mA

5.4.2 ADJUST ZERO (coarse and fine) for calculated output.

5.4.3 ADJUST tank level to high level and calculate output.

Station 1:
High tank level (( ____ - 9.5) ÷ 266.5 x 16) + 4 = ________ mA

Station 2:
High tank level (( ____ - 9.1) ÷ 74.9 x 16) + 4 = ________ mA

5.4.4 ADJUST SPAN (coarse and fine) for calculated output.

5.4.5 IF required, REPEAT Steps 5.4.1 through 5.4.4 until both values are within tolerance per data sheet.

5.4.6 VARY tank level per data sheet AND RECORD as-left output current.

5.4.7 GO TO Section 5.5.

**Capacitance Signal Input Method**

5.4.8 ADJUST capacitance signal input to minimum per data sheet.

5.4.9 ADJUST ZERO (coarse and fine) for minimum output per data sheet.

5.4.10 ADJUST capacitance signal input to maximum per data sheet.
5.4 Calibration (Tank Level Change or Capacitance Signal Input Method) (Cont.)

5.4.11 ADJUST SPAN (coarse and fine) for maximum output per data sheet.

5.4.12 IF required, REPEAT Steps 5.4.8 through 5.4.11 until both values are within tolerance per data sheet.

5.4.13 VARY capacitance signal input per data sheet AND RECORD as-left output current.

5.4.14 GO TO Section 5.5.

5.5 Restoration

5.5.1 RESTORE to as-found conditions.

5.5.2 ENSURE alarms are re-set or cleared.

5.5.3 INFORM SOM test is complete and instrument/equipment/system may be returned to service.

5.6 Acceptance Criteria

Acceptance criteria has been met when steps in this procedure have been satisfactorily performed and results are recorded on the data sheet(s).

5.7 Review

5.7.1 INFORM FWS test is complete.

5.7.2 (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.
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.
Attachment 1 - Tank Level Calculation Example

If tank level method is used, outputs may need to be calculated if tank levels were not able to be pumped to high and low levels for true 0 and 100% output readings. The liquid level is calculated by measuring from the top of the wet well down to the liquid surface and subtracting this value from the total wet well depth. Pump Station 1 wet well depth is 288”, Pump Station 2 wet well depth is 96”.

Example for Pump Station 1:

Instead of 9.5”, tank is partially pumped down.

Measurement from the top of the wet well to liquid surface = 262”

4 mA = 9.5” and 20 mA = 276”

276” - 9.5” = 266.5”

20 mA - 4 mA = 16 mA

26” - 9.5” = 16.5”

16.5” ÷ 266.5” = 0.06191 or 6.191%

16 mA x 6.191% = 0.99062 mA

4 mA + 0.99062 mA = 4.99062 mA

Low tank level ((26 - 9.5) ÷ 266.5 x 16) + 4 = 4.99062 mA
Figure 1 - 110 VAC Wiring Connections and Adjustments

STANDARD 110/220 VAC ELECTRICAL CONNECTIONS