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

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Honeywell Model T678A Temperature Controller

1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides a safe, uniform method for calibration of Honeywell temperature controller, Model T678A.

1.2 Scope

This procedure applies to the Honeywell Model T678A temperature controller on the cooling tower outlet temperature switch, TS-95C-104.

2.0 INFORMATION

None.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Radiation and Contamination Control

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

3.2 Environmental Compliance

3.2.1 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 - Measuring and Test Equipment 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
- 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:

- Thermometer or equivalent, accurate to within 0.5°F, covering temperature range of Honeywell temperature controller, Model T678A per PM/S data sheet
- Portable temperature bath, covering temperature range of Honeywell temperature controller, Model T678A per PM/S data sheet
- DMM, two (2) each
- Calibration wrench, Honeywell part number 801534.
5.0 PROCEDURE

5.1 Initial Setup and Calibration Check

5.1.1 REMOVE sensing element from immersion well.

5.1.2 REMOVE temperature controller instrument cover.

5.1.3 INSERT sensing element and thermometer in temperature bath.

NOTE - Figure 1 displays Honeywell temperature controller, Model T678A.

5.1.4 CONNECT DMM to temperature controller RIGHT switch, between COM (R) terminal and RISE (W) terminal.

5.1.5 CONNECT second DMM to temperature controller LEFT switch, between COM (R) terminal and RISE (W) terminal.

NOTE - Switch contacts make/break at different setpoint temperatures dependent on whether temperature is rising or falling.
- Figure 2 displays Switch 1 and 2 range of operation.
- Right switch breaks R-B and makes R-W at setpoint on temperature rise.
- Left switch breaks R-B and makes R-W at setpoint on continuing temperature rise through interstage differential.

5.1.6 VARY bath temperature per PM/S data sheet AND RECORD as-found values on data sheet.

5.1.7 IF as-found values are not within specified tolerance per data sheet, GO TO Section 5.2, Calibration,

OR

IF as-found values are within specified tolerance, but deemed marginal, and optimization is desired, GO TO Section 5.2,

OR

IF as-found values are within tolerance per PM/S data sheet and need no adjustments, RECORD as-found values in as-left column AND GO TO Section 5.3, Restoration.
5.2 **Calibration**

5.2.1 **SET** bath temperature to temperature controller RIGHT switch setpoint per PM/S data sheet.

5.2.2 **ADJUST** temperature controller switch as follows:

5.2.2.1 **DETERMINE** number of degrees difference between controller bulb temperature and controller dial temperature at which right, R-W, switch contacts make by rotating controller dial to cause right, R-W switch contacts open and close.

5.2.2.2 **REMOVE** temperature controller dial temperature adjustment knob.

5.2.2.3 **SLIP** fingers of calibration wrench into slots of temperature controller dial.

5.2.2.4 **ROTATE** temperature controller dial until fingers of wrench drop into slots of calibration nut under dial **AND**

**NOTE** temperature controller dial indication at this point.

NOTE - Figure 2 displays Switch 1 and 2 range of operation.

- Step 5.2.2.5. Example: move dial from 45°F to 65°F if dial reading in 5.2.2.1 was 45°F and bulb temperature 65°F.

5.2.2.5 **TURN** temperature controller dial and calibration nut up or down scale the number of degrees bulb temperature differs from point at which right switch, R-W switch contacts make (determined from Step 5.2.2.1).

5.2.2.6 **CHECK** accuracy of adjustment by varying temperature controller dial up and down scale around temperature controller right switch setpoint while observing DMM indication of switch contacts making and breaking.

5.2.2.7 **REPEAT** Steps 5.2.2.5 and 5.2.2.6 to bring temperature controller right switch actuation within tolerance per PM/S data sheet.
5.2 Calibration (Cont.)

5.2.2.8 SET bath temperature to temperature controller LEFT switch setpoint per PM/S data sheet.

5.2.2.9 ADJUST Star Wheel located on left side of temperature controller to cause left switch to actuate as indicated by Number 2 DMM.

5.2.2.10 REPEAT Steps 5.2.2.8 and 5.2.2.9 to bring temperature controller left switch actuation within tolerance per PM/S data sheet.

5.2.3 VARY input per PM/S data sheet AND RECORD as-left values on data sheet.

5.3 Restoration

5.3.1 INSTALL temperature controller temperature element to its normal location.

5.3.2 INSTALL temperature controller cover.

5.3.3 RESTORE to as-found conditions.

5.3.4 VERIFY alarms are reset or cleared.

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

5.4 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).
5.5 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.

5.6 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 - Honeywell Model T678A Temperature Controller

- **Controller Dial**: For Switch 1 Adjustment
- **Left Switch**: STAR WHEEL (INTERSTAGE DIFFERENTIAL ADJUSTMENT) FOR SWITCH 2 ADJUSTMENT
- **Right Switch**

1. T678A has 2 spot switches that operate in sequence; left switch operates at a higher temperature than the right switch.
2. Switches break R to B and make R to W on temperature rise; right switch makes R to W first.
Figure 2 - Diagram of Switch No 1 & Switch No 2 Range of Operation

DIFFERENCE BETWEEN THE TEMPERATURES AT WHICH THE 2 SWITCHES MAKE R.W. ADJUSTABLE FROM 3 TO 10 F (1.7 TO 5.6 C) ON STANDARD MODELS OR FROM 3.5 TO 12 F (2.0 TO 5.7 C) ON 95 TO 175 F (35 TO 79 C) MODELS.

2 SPDT SWITCHES OPERATE IN SEQUENCE. EACH SWITCH DIFFERENTIAL IS FIXED AT APPROXIMATELY 3 F (1.7 C) ON STANDARD MODELS OR AT 3.5 F (2.0 C) ON 95 TO 175 F (35 TO 79 C) MODELS PLUS A FEW OTHERS.