Calibrate Chromalox 2104 Temperature Controller

Tank Farm Maintenance Procedure

CHANGE HISTORY (≤ LAST 5 REV-MODS)

<table>
<thead>
<tr>
<th>Rev-Mod</th>
<th>Release Date</th>
<th>Justification</th>
<th>Summary of Changes</th>
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<tbody>
<tr>
<td>E-0</td>
<td>06/23/2016</td>
<td>Periodic Review</td>
<td>No Changes</td>
</tr>
<tr>
<td>D-1</td>
<td>10/30/2014</td>
<td>CHAMPS Removal.</td>
<td>CHAMPS removal, new records statement.</td>
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<tr>
<td>D-0</td>
<td>05/02/2013</td>
<td>Periodic Review</td>
<td>Updated procedure type, updated warning to step format in two locations and updated implied action in a note to step.</td>
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<tr>
<td>C-1</td>
<td>02/11/2013</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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<tr>
<td>C-0</td>
<td>04/10/2009</td>
<td>Periodic review.</td>
<td>Delete Section 3.3, reformat step 4.2.3, and add sections 5.4 and 5.5.</td>
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Figure 1 – Connection Diagram
1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions to calibrate Chromalox Model 2104 Temperature Controller.

1.2 Scope

This procedure includes Chromalox Model 2104 and associated test equipment necessary for calibration.

2.0 INFORMATION

NONE

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 Energized circuits and leads are contained inside enclosures AZ241-VTA-ENCL-201 and AZ241-VTA-ENCL-301. Compliance with DOE-0359, Hanford Site Electrical Safety Program is required.

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:

Test equipment capable of range and tolerance specified on data sheet for the input and output values.

4.2 Field Preparation

4.2.1 Shift Manager has granted permission to perform this procedure.

4.2.2 Operations has configured system to allow calibration.

4.2.3 IF during the performance of this procedure, any of the following conditions are found, STOP WORK AND NOTIFY supervisor/lead:

- Any equipment malfunction which could prevent fulfillment of its functional requirements
- Personnel error or procedural inadequacy which could prevent fulfillment of procedural requirements.
5.0 PROCEDURE

Special Instruction

Contact supervision for additional instructions if changing plant conditions affect work or delays in work extend past end of shift.

5.1 Record As-Found Data

5.1.1 IF any step is not required for procedure completion, RECORD ”N/A” in the applicable spaces(s) on the Data Sheet AND DOCUMENT explanation in the Data Sheet’s Comment/Remarks Section.

NOTE- Calibration may be performed in-place or instrument returned to shop for bench calibration.

5.1.2 IF accessing enclosures AZ241-VTA-ENCL-201 and AZ241-VTA-ENCL-301, COMPLY with DOE–0359, Hanford Site Electrical Safety Program.

5.1.3 IF performing field calibration, CONNECT test equipment per Data Sheet AND

GO TO Step 5.1.7.

5.1.4 DISCONNECT field wiring.

5.1.5 CONNECT test equipment per Figure 1 – Connection Diagram.

5.1.5.1 CONNECT power supply to terminals 16, 17 and 18.

5.1.5.2 CONNECT input device to input terminals 7, 8 and 9.

5.1.6 APPLY power to unit.

5.1.7 ALLOW unit to normalize with test equipment connected for at least 15 minutes.
5.1 Record As-Found Data (Cont.)

5.1.8 **APPLY** input, including alarm points, interlock points, and reset points, as applicable, per Data Sheet **AND**

**RECORD** "as-found" indication.

5.1.9 **IF** "as-found" data is not within tolerance per Data Sheet, **GO TO** Section 5.2.

5.1.10 **IF** "as-found" data is within tolerance per data sheet, **RECORD** "as-found" indication in "as-left" column of Data Sheet **AND**

**GO TO** Section 5.3.
5.2 Input Calibration

NOTE - Calibration is performed from the front panel with touch control keys (Figure 2 – Operator Controls).

5.2.1 IF accessing enclosures AZ241-VTA-ENCL-201 and AZ241-VTA-ENCL-301, COMPLY with DOE–0359, Hanford Site Electrical Safety Program.

5.2.2 PRESS AND HOLD RESET for at least 3 seconds to display:

```
LocH
xxx
```

5.2.3 SCROLL UP/DOWN (▲ ▼) to display lower window:

```
736
```

5.2.4 SIMULTANEOUSLY PRESS AND HOLD RESET AND SCROLL UP/DOWN (▲ ▼) to display:

```
InPt
PAGE
```
5.2 Input Calibration (Cont.)

5.2.5 PRESS RESET as necessary, to display:

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<td>inLo</td>
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5.2.6 ADJUST input to minimum value per Data Sheet AND
WAIT 30 seconds.

5.2.7 PRESS UP arrow (▲):

NOTE - Controller will perform calibration of minimum value while this lower window is displayed:

| ---- |

NOTE - When minimum value is calibrated, lower window will PROMPT:

| inHi |

5.2.8 ADJUST input to maximum value per Data Sheet AND
WAIT 30 seconds for unit to stabilize.
5.2 Input Calibration (Cont.)

5.2.9 PRESS UP arrow (▲):

NOTE - Controller will perform calibration of maximum value while this lower window is displayed:

----

NOTE - When maximum value is calibrated, lower window will PROMPT:

donE

5.2.10 SIMULTANEOUSLY PRESS AND HOLD RESET AND SCROLL UP/DOWN (▲ ▼) to display:

Ctrl
PAGE

5.2.11 SCROLL UP/DOWN (▲ ▼) to display:

LocH
123

5.2.12 PRESS AND HOLD RESET for at least 3 seconds to return to operating mode.

5.2.13 APPLY input per Data Sheet AND RECORD values in "as-left" column on Data Sheet.
5.3 Restoration

5.3.1 ENSURE all test equipment is disconnected and removed.

5.3.2 IF instrument was field calibrated (in the loop), PERFORM the following:

5.3.2.1 RECONNECT field wiring.

5.3.2.2 RETURN instrument to service as directed by work package.

5.3.2.3 CHECK display values are consistent with system configuration.

5.3.3 INFORM Shift Manager calibration is complete.

5.4 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.

5.5 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, as applicable.

5.6 Records

The performance of this procedure generates no records. However, PM Data Sheets associated with the procedure, are records and are maintained in the work package as record material.

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 – Connection Diagram

DIGITAL INPUT
DIGITAL COMM
+24 VDC OUTPUT
ANALOG OUTPUT
REMOTE SENSOR INPUT
COMMON
SENSOR INPUT

OUTPUT #1
OUTPUT #2
OUTPUT #3 RELAY
OUTPUT #4 RELAY
OUTPUT #5

DIGITAL COMMUNICATIONS

1-5 VDC
0-5 VDC

Thermocouple Input
3 Wire RTD Input
2 Wire RTD Input

Voltage Input
Current Input
Current Input

(self powered)
(self powered)
(loop powered by 2104)

+24 VDC
INST PWR
110/220 AC
12/24 VDC
INST PWR COMMON
SHIELD GROUND
Ext Pwr
Ext Pwr
Ext Pwr

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
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25
26
27

Type
DOCUMENT NO.
REV/MOD
RELEASE DATE
PAGE
REFERENCE
6-TCD-322
E-0
06/23/2016
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Figure 2 – Operator Controls

LEDs indicate Control Output #1 or #2 ON.

LEDs indicate Alarm or Event Output ON.

RESET pushbutton, 
- Reset Latching Alarm 
- Hold for 3 or more sec. to enter or exit Setup Mode 
- Scroll through MENUs in Setup Mode

AUX programmable pushbutton
- PID1/PID2 Toggle Switch 
- AUX Setpoint Enable 
- Remote Setpoint Enable 
- Output Disable 
- Ramp/Soak Operations 
- Auto/Manual Selector

PAGE UP/PAGE DOWN
- Adjust Setpoint in Normal Display Mode 
- Increase/decrease MENU values in Setup Mode 
- Ramp to Setpoint, press once to determine target setpoint 
- For Ramp/Soak Operation:
  - ↑ START 
  - ↓ HOLD

Process variable display in Normal Display Mode.

Alphanumeric Menu display in Setup Mode

LEDs indicate units selected for process variable

LED indicates an Auxiliary function is active.

Active Setpoint Display

PV
OUT 1
OUT 2
OUT 3
OUT 4

SP
PV
SP

Chromalox 2104

RESET
AUX
PAGE
PAGE

Chromalox
2104

F
C

PV
SP

OUT 1
OUT 2
OUT 3
OUT 4
PV
SP
Chromalox
RESET
AUX
PAGE PAGE
AUX
2104
F
C