USQ # Routine Maintenance

<table>
<thead>
<tr>
<th>Rev-Mod</th>
<th>Release Date</th>
<th>Justification</th>
<th>Summary of Changes</th>
</tr>
</thead>
<tbody>
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<td>B-1</td>
<td>02/13/2017</td>
<td>Changes required to comply with field conditions.</td>
<td>Step 3.1.4 updated red to white, added lifted/landed to section 4.1, added steps 5.1.1, 5.1.3.1, 5.1.10, and steps 5.1.14 through 5.1.17 modified steps 5.1.3, 5.1.4, 5.1.5, 5.1.10, 5.1.12, 5.1.13, deleted old steps 5.1.3, 5.1.4. Section 5.2 updated its title, modified steps 5.2.1, 5.2.2.1, deleted step 5.2.2. Added attachment 6.</td>
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<td>B-0</td>
<td>05/31/2016</td>
<td>Periodic Review</td>
<td>Added Steps 3.1.4 and 3.1.5 per Safety request. Added LCO 3.4 to Steps 4.3.1 and 5.3.5. Changed two Notes to Special Instructions @ 5.1. Struck last Note @ 5.1 and changed to Special Instructions.</td>
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<td>A-0</td>
<td>04/07/2014</td>
<td>Maintenance request</td>
<td>New procedure.</td>
</tr>
</tbody>
</table>

Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 PURPOSE AND SCOPE</td>
<td>3</td>
</tr>
<tr>
<td>1.1 Purpose</td>
<td>3</td>
</tr>
<tr>
<td>1.2 Scope</td>
<td>3</td>
</tr>
<tr>
<td>2.0 INFORMATION</td>
<td>3</td>
</tr>
<tr>
<td>2.1 Terms and Definitions</td>
<td>3</td>
</tr>
<tr>
<td>3.0 PRECAUTIONS AND LIMITATIONS</td>
<td>4</td>
</tr>
<tr>
<td>3.1 Personnel Safety</td>
<td>4</td>
</tr>
<tr>
<td>3.2 Radiation and Contamination Control</td>
<td>4</td>
</tr>
<tr>
<td>3.3 Limits</td>
<td>4</td>
</tr>
<tr>
<td>4.0 PREREQUISITES</td>
<td>5</td>
</tr>
<tr>
<td>4.1 Special Tools, Equipment and Supplies</td>
<td>5</td>
</tr>
<tr>
<td>4.2 Performance Documents</td>
<td>5</td>
</tr>
<tr>
<td>4.3 Field Preparation</td>
<td>5</td>
</tr>
</tbody>
</table>
5.0 PROCEDURE........................................................................................................................................................................6

5.1 Perform Functional Check..........................................................................................................................................................6

5.2 Perform Field Thermocouple Check..........................................................................................................................................9

5.3 Restoration ..................................................................................................................................................................................10

5.4 Acceptance Criteria....................................................................................................................................................................10

5.5 Review ......................................................................................................................................................................................11

5.6 Records ....................................................................................................................................................................................11

Figure 1 – Controller Display, Layout and Release Tabs ..................................................................................................................12

Figure 2 – Keys and Display Descriptions .........................................................................................................................................13

Figure 3 – EZ-Zone PM Input Terminal Connections ..................................................................................................................14

Figure 4 - EZ-Zone PM Output Terminal Connections..................................................................................................................15

Figure 5 - EZ-Zone PM Power Terminal Connections ..................................................................................................................16

Figure 6 - EIA-485 Wiring .................................................................................................................................................................17

Attachment 1 – Navigating the Operations Page ...........................................................................................................................18

Attachment 2 – Navigating the Setup Page .........................................................................................................................................19

Attachment 3 – Navigating the Factory Page ........................................................................................................................................20

Attachment 4 – Password Security ....................................................................................................................................................21

Attachment 5 – Watlow controller Parameter Setup ......................................................................................................................22

Attachment 6 – Replace Watlow EZ-Zone Controller Field Casing .................................................................................................23
1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for calibrating the Watlow EZ Zone PM8C2FJ-ACEAFAAA Temperature Controller for SY Farm, A-Train.

1.2 Scope

This procedure applies to field and bench calibration of a Watlow EZ Zone PM8C2FJ-ACEAFAAA Temperature Controller for SY Farm, A-Train.

2.0 INFORMATION

2.1 Terms and Definitions

- TC Thermocouple
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 IF working around live circuits, extreme caution should be used. Failure to follow electrical safety practices as outlined in DOE–0359, Hanford Site Electrical Safety Program could result in serious injury.

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

3.1.3 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.

3.1.4 If a white label or no label is present, employees will only enter into cabinets after a qualified electrical worker has placed the cabinet into an electrically safe condition.

3.1.5 Utilize TVIS-SY-001 and the appropriate SEG for work in or on the exhauster. Contact IH for the correct Sample Plan.

3.2 Radiation and Contamination Control

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.

3.3 Limits

HNF-SD-WM-TSR-006, Tank Farms Technical Safety Requirements

- LCO 3.1, DST Primary Tank Ventilation Systems
- LCO 3.4, DST Induced Gas Release Event Flammable Gas Control.
4.0 PREREQUISITES

4.1 Special Tools, Equipment and Supplies

The following supplies may be needed to perform this procedure:
- Digital Multimeter (DMM)
- Two Process Simulators (i.e., Transmation J type TC input or equivalent)
- Load Resistor (125 Ohms, ½ Watt)
- Laptop with RS-485 converter
- “Lifted/Landed Lead Record”
- Other tools, equipment and supplies as identified by Shift Manager/OE/FWS/User.

4.2 Performance Documents

The following documents may be needed to perform this procedure:
- DOE-0336, Hanford Site Lockout/Tagout Procedure
- Watlow EZ Zone PM8C2FJ-ACEFFAA, User’s Manual 0600 0059-0000 Rev. M.

4.3 Field Preparation

4.3.1 REQUEST Operations to configure system to allow performance of this procedure (LCO 3.4).

4.3.2 FWS NOTIFY Shift Manager to initiate time monitoring (LCO 3.1).

4.3.3 IF Lockout/tagout was applied, ENSURE lockout/tagout and overlocking requirements have been satisfied per DOE-0336, Hanford Site Lockout/Tagout Procedure.
5.0 **PROCEDURE**

**Special Instructions**

If during the performance of this procedure the calibrator interferes with open thermocouple detection, the sensor can be set to Sensor Type “SEn” in Setup Page “SEt”, Analog Input Menu "Ai" to millivolt “Mv” instead of Thermocouple “tC” this will avoid interference between the calibrator and open thermocouple detect circuit for the duration of the calibration process.

Sections may be performed concurrently to allow verification of expected output relay status with dual inputs, (i.e. TC and mA inputs).

Contact closures may not be observed until unit is powered from external contactor/controller.

**NOTE** - A description of the controller’s keys and display is presented in Figure 2.  
- Watlow controller navigation instructions are referenced in Attachment 1, Attachment 2, and Attachment 3.

5.1 **Perform Functional Check**

5.1.1 **IF** replacing Watlow EZ-Zone Controller Field Casing, **PERFORM** Attachment 6.

5.1.2 **IF** performing the initial Watlow Controller function check, **GO TO** Step 5.1.4.

5.1.3 **IF** checking calibration in the shop, or replacing internal module, **REMOVE** internal module from field location to shop test set up.

5.1.3.1 **OPEN** door to SY241-VTP-ENCL-401 for access.

5.1.3.2 **REMOVE** controller from case by pressing the release tabs (see Figure 1).

5.1.3.3 **CLOSE** door to SY241-VTP-ENCL-401.

5.1.3.4 **TRANSPORT** from field location to shop.

5.1.3.5 **INSTALL** controller module into shop case for testing.
5.1 Perform Functional Check (Cont.)

5.1.4 CONNECT a process simulator (source °F Thermocouple Type J) to Input 1 (Slot A), terminals S1 (-) and R1 (+) per Figure 3.

5.1.5 CONNECT a process simulator (source °F Thermocouple Type J) to Input 2 (Slot B), terminals S2 (-) and R2 (+) per Figure 3.

5.1.6 CONNECT DMM (mA) to output instrument leads Slot A, terminals H1 (+) and F1 (-) per Figure 4.

5.1.7 CONNECT power leads to Slot C, terminals 98 and 99 per Figure 5.

5.1.8 POWER UP temperature controller.

5.1.9 CHECK the controller’s lower (green) display reads 25°F, which is the sensors set point.

5.1.9.1 IF the controller’s lower (green) display does not read 25°F, ENSURE the controller’s parameters are set according to the Data Sheet. (See Attachment 5 – Watlow controller Parameter Setup for instructions.)

5.1.10 SET Input 1 to 100°F.

5.1.11 SET Input 2 to 90°F.

5.1.12 SLOWLY reduce Input 2 signal until 75°F is reached.

5.1.13 RECORD 25° ΔT results on Data Sheet, (Tables 1 and 2).

5.1.14 SLOWLY reduce Input 2 signal until 60°F is reached.

5.1.15 RECORD 40° ΔT results on Data Sheet, (Tables 1 and 2).

5.1.16 SLOWLY increase Input 2 signal until 80°F is reached.

5.1.17 RECORD 20° ΔT results on Data Sheet, (Tables 1 and 2).

5.1.18 IF recorded As Found values are not within tolerance per Data Sheet, NOTIFY FWS for resolution.
5.1 Perform Functional Check (Cont.)

5.1.19 IF recorded As Found values are within tolerance per Data Sheet, RECORD As Found values in As Left column of Data Sheet AND PERFORM the following:

5.1.19.1 POWER DOWN temperature controller

5.1.19.2 DISCONNECT all M&TE.

5.1.20 GO TO Section 5.2.
5.2 Perform Field Thermocouple Check

5.2.1 IF controller Internal Module was removed for functional check or performing initial installation, INSTALL controller in its field location.

5.2.2 USING a calibrated M&TE, CHECK temperature reading on the following thermocouples:
   - SY241-VTP-TE-432D
   - SY241-VTP-TE-432C

5.2.2.1 RECORD M&TE temperature reading on Data Sheet (Table 3).

5.2.3 RECONNECT TC input leads to the temperature controller.

5.2.4 POWER UP temperature controller.

5.2.5 USING Watlow temperature controller, CHECK temperature reading on the following thermocouples:
   - SY241-VTP-TE-432D
   - SY241-VTP-TE-432C.

5.2.5.1 RECORD As Found temperature readings on Data Sheet.

NOTE - The Calibrated M&TE and Watlow Temperature Controller should be indicating the same temperature readings within tolerance.

5.2.6 CHECK the recorded temperature readings for tolerance per Data Sheet.

5.2.6.1 IF recorded temperatures are within tolerance per Data Sheet, RECORD As Found values in As Left column of Data Sheet AND

GO TO Section 5.3 Restoration.

5.2.6.2 IF recorded temperatures are not within tolerance per Data Sheet, PROGRAM the correct offset value into the Watlow temperature controller using Attachment 1, and the Data Sheet.

   a. RE-PERFORM Steps 5.2.2 through 5.2.6.

OR

NOTIFY FWS for resolution.
5.3 Restoration

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

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

5.3.3 RECORD the Test Equipment information and calibration status on Data Sheet.

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

5.3.5 NOTIFY Operations that testing is complete and system may be returned to desired configuration (LCO 3.4).

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.

5.4.1 IF PM passed calibration NOTIFY Shift Manager to stop time monitoring. (LCO 3.1)
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

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.
Removing the Mounted Controller from Its Case

1. From the controller's face, pull out the tabs on each side until you hear it click.

   Pull out the tab on each side until you hear it click.  

   Grab the unit above and below the face and pull forward.

2. Grab the unit above and below the face with two hands and pull the unit out. On the PM4/8/9 controls slide a screwdriver under the pry tabs and turn.
Figure 2 – Keys and Display Descriptions

**Infinity key**
Press to back up one level, or press and hold for two seconds to return to the Home Page. From the Home Page clears alarms and errors if clearable.

**Lower Display**
Indicates Set Point or output power value during operation, or the parameter whose value appears in the upper display.

**Channel Display**
Indicates the channel for any given EZ-ZONE module.

**Upper Display**
In the Home Page displays the process value, otherwise displays the value of the parameter in the lower display.

**Communications Activity**
Flashes when another device is communicating with this controller.

**Advance Key**
Advances through parameter prompts.

**Up and Down Keys**
In the home page, adjusts the set point in the lower display. In other pages, changes the upper display to a higher or lower value, or changes a parameter selection.
Figure 3 – EZ-Zone PM Input Terminal Connections

Input 1, 2 Thermocouple

- 2K Ω maximum source resistance
- >20 MΩ input impedance
- 3 microampere open-sensor detection
- Thermocouples are polarity sensitive. The negative lead (usually red) must be connected to S1 and/or S2.
- To reduce errors, the extension wire for thermocouples must be of the same alloy as the thermocouple.

Input 1: PM _ [C,R,B*] _____ - _____ (S1/R1)
Input 2: PM _____ - _ [C,R,L] ____ (S2/R2)

*PM(4, 8 and 9) only
Figure 4 - EZ-Zone PM Output Terminal Connections

**Output 1, 3 Universal Process**

- 0 to 20 mA into 800 Ω maximum load
- 0 to 10V (dc) into 1 kΩ minimum load
- scalable
- output supplies power
- cannot use voltage and current outputs at same time
- Output may be used as retransmit or control.

Output 1: (F1,G1,H1)
PM __ [F] __________

Output 3: (F3,G3,H3)
PM __________ [F] __________
Figure 5 - EZ-Zone PM Power Terminal Connections

High Power

- Minimum/Maximum Ratings
- 85 to 264V~ (ac)
- 100 to 240V~ (ac) Semi Sig F47
- 47 to 63 Hz
- 14VA maximum power consumption (PM4, 8 and 9)
- 10VA maximum power consumption (PM6)

PM_ _ [1,2] _ _ _ _ _ _ _ _
Figure 6 - EIA-485 Wiring

Standard Bus EIA-485 Communications

- Wire T/R- to the A terminal of the EIA-485 port.
- Wire T+/R+ to the B terminal of the EIA-485 port.
- Wire common to the common terminal of the EIA-485 port.
- Do not route network wires with power wires. Connect network wires in daisy-chain fashion when connecting multiple devices in a network.
- Do not connect more than 16 EZ-ZONE PM controllers on a network.
- Maximum network length: 1,200 meters (4,000 feet)
- 1/8th unit load on EIA-485 bus
  PM [4,6,8,9] _ _ _ _ _ _ _ _ [8]

* All models include Standard Bus communications (instance 1)

Note:
Do not leave a USB to EIA-485 converter connected to Standard Bus without power (i.e., disconnecting the USB end from the computer while leaving the converter connected on Standard Bus). Disturbance on the Standard Bus may occur.
Attachment 1 – Navigating the Operations Page

The Up and Down button hold times listed to perform the following actions are only approximate times. It is acceptable to extend the button hold times until the expected action occurs.

1. To Program the Offset value, NAVIGATE through the following menus
   a. Operations Page “oPER”
   b. Analog Input Menu “Ai”
   c. Calibration Menu “i.CA”

Navigating the Operations Page

To navigate to the Operations Page, follow the steps below:
1. From the Home Page, press both the Up ☞ and Down ☞ keys for three seconds. [PER] will appear in the upper display and [PER] will appear in the lower display.
2. Press the Up ☞ or Down ☞ key to view available menus.
3. Press the Advance Key ☞ to enter the menu of choice.
4. If a submenu exists (more than one instance), press the Up ☞ or Down ☞ key to select and then press the Advance Key ☞ to enter.
5. Press the Up ☞ or Down ☞ key to move through available menu prompts.
6. Press the Infinity Key ☞ to move backwards through the levels: parameter to submenu; submenu to menu; menu to Home Page.
7. Press and hold the Infinity Key ☞ for two seconds to return to the Home Page.
Attachment 2 – Navigating the Setup Page

The Up and Down button hold times listed to perform the following actions are only approximate times. It is acceptable to extend the button hold times until the expected action occurs.

Navigating the Setup Page

To navigate to the Setup Page, follow the steps below:

1. From the Home Page, press both the Up and Down keys for six seconds. [ ] will appear in the upper display and [ ] will appear in the lower display.
2. Press the Up or Down key to view available menus.
3. Press the Advance Key to enter the menu of choice.
4. If a submenu exists (more than one instance), press the Up or Down key to select and then press the Advance Key to enter.
5. Press the Up or Down key to move through available menu prompts.
6. Press the Infinity Key to move backwards through the levels: parameter to submenu; submenu to menu; menu to Home Page.
7. Press and hold the Infinity Key for two seconds to return to the Home Page.
Attachment 3 – Navigating the Factory Page

The Up and Down button hold times listed to perform the following actions are only approximate times. It is acceptable to extend the button hold times until the expected action occurs.

Navigating the Factory Page

To go to the Factory Page from the Home Page, press and hold both the Advance ◊ and Infinity ◊ keys for six seconds.

- Press the Up ◊ or Down ◊ key to view available menus. On the following pages top level menus are identified with a yellow background color.
- Press the Advance Key ◊ to enter the menu of choice.
- If a submenu exists (more than one instance), press the Up ◊ or Down ◊ key to select and then press the Advance Key ◊ to enter.
- Press the Up ◊ or Down ◊ key to move through available menu prompts.
- Press the Infinity Key ◊ to move backwards through the levels: parameter to submenu; submenu to menu; menu to Home Page.
- Press and hold the Infinity Key ◊ for two seconds to return to the Home Page.
Attachment 4 – Password Security

1. **USING** controller keys, **GO TO** the Factory Page “FCTy” **AND**

   **ENTER** the Unlock menu “ULoC” (See Attachment 3 – Navigating the Factory Page).

   **NOTE** - When Password Security is enabled, the “PAS.A” prompt will not be visible.

2. **PUSH** the Advance key where the Code prompt “CodE” will be visible.

   **NOTE** - A description of the controller’s keys and display is presented in Figure 2.

3. **PUSH** the Advance key one more time where the Password “PASS” prompt will be displayed.

4. **OBTAIN** password from Data Sheet.

5. **ENTER** password by pushing the Up or Down arrow keys.

   **NOTE** - Password “PASS” equals User Password “PAS.A”.

6. **IF** Password “PASS” is accepted, **CONTINUE** with the calibration process.

7. **IF** Attention parameter “Attn” appears in the low display and the sensor failure “----” is displayed in the upper display (error notification), **REPERFORM** this attachment.

   **OR**

   **IF** problem persists, **NOTIFY FWS** for resolution.
Attachment 5 – Watlow controller Parameter Setup

1. **CONNECT** controller to computer with 485 converter per Figure 6.

2. **CONNECT** power leads per Figure 5.

3. **LAUNCH** the EZ-Zone configurator and establish communications.

4. **SELECT** the following:
   a. Factory Page
   b. Unlock
   c. Unlock 1.

5. **ENTER** the password found on Data Sheet.

6. **CLICK** the Finish button.

7. **RE-RUN** the EZ-Zone configurator and establish communications.

8. **SET** the controller parameters as listed in the Data Sheet.

9. **CLICK** Finish to close the configurator.
Attachment 6 – Replace Watlow EZ-Zone Controller Field Casing

1. INSTALL Lock & Tag in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure (120 Vac).

2. OPEN door to SY241-VTP-ENCL-401 for access.

3. DISCONNECT field wiring (Thermocouple(s), Input, Output, and Power leads) from terminals per Figure 3, Figure 4 and Figure 5.
   a. RECORD on “Lifted/Landed Lead Record”.

4. REMOVE existing Field Casing.

5. INSTALL new Field Casing.

6. RECONNECT Field Wiring (Thermocouple(s), Input, Output, and Power Leads) using “Lifted/Landed Lead Record”.

7. IF not previously installed, MOUNT Controller Internals into Field Casing.

8. CLOSE door to SY241-VTP-ENCL-401.

9. REMOVE Lock & Tag in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure.