Worcester Controls® Series 90 Modular Accessory System

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 Worcester Controls® Series 90 MAS with M2 and P4 options. Model number indicates installed options.

1.2 Scope

This procedure provides instructions for maintaining the Worcester Controls Series 90 MAS with M2 and P4 options.

2.0 INFORMATION

2.1 Terms and Definitions

- MAS - Modular Accessory System.

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-ESH-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:

- CMD capable of accurately measuring 4 to 20 mA
- DMM capable of accurately measuring resistance
- 1/16-inch Allen ball driver
- Bearing grease, Krytox GPL 227 (MSDS/SDS #050991)
- Current source, range 4 to 20 mA.

4.2 Performance Documents

The following documents may be needed to perform this procedure:

5.0 PROCEDURE

Special Instructions

Sections 5.2 through 5.5 are performed dependent upon functional check performed in Section 5.1.

5.1 Functional Check

NOTE - 120 VAC may be present on terminal strips inside housing and should be covered.

5.1.1 ENSURE 120 VAC terminal strips are covered.

NOTE - Valve to be positioned is provided by number on data sheets.

5.1.2 REQUEST CRO position valve to the following values:
•  0%
•  50%
•  100%.

5.1.3 RECORD valve positioning results on data sheet.

5.1.4 IF as-found results are satisfactory and no other adjustments are desired, PERFORM the following:

5.1.4.1 RECORD as-found results in as-left column of data sheet.

5.1.4.2 RECORD NA in all unused sections of data sheet.

5.1.4.3 GO TO Section 5.6, Restoration.

5.1.5 IF valve did not operate properly during functional checks, CONTINUE with Sections 5.2 through 5.5.
5.2 Calibration for “P” or “D” Non-Positioner/Controller and Positioner/Controller Units

5.2.1 SET actuator to full closed position.

5.2.2 IF set screw on potentiometer needs to be loosened, LOOSEN set screw on potentiometer AND

ADJUST potentiometer pinion gear for approximately $\frac{1}{16}$-inch tooth engagement between bevel gear and pinion gear (see Figure 2 - Baseplate and Potentiometer).

5.2.3 TIGHTEN potentiometer set screw.

Special Instructions

Do not apply power to the MAS board during the following measurement step.

5.2.4 CONNECT DMM leads to purple and white leads located on secondary (end) terminal strip (outboard side) AND

MEASURE resistance (ohms) of potentiometer (see Figure 3 - Terminal Strips).

5.2.5 IF as-found value is within 80 to 100 Ω and no adjustment is desired:

5.2.5.1 RECORD as-found value in as-left column of data sheet.

5.2.5.2 REMOVE DMM.

5.2.5.3 GO TO appropriate calibration section (Section 5.3, 5.4, or 5.5).

5.2.6 LOOSEN bevel gear set screw AND

ROTATE bevel gear to obtain resistance on DMM of 80 to 100 Ω (see Figure 2 - Baseplate and Potentiometer).

NOTE - Set screw in bevel gear should be located toward conduit opening in MAS base such that $\frac{1}{16}$-inch Allen ball driver can be inserted between two terminal strips to tighten set screw.

5.2.7 IF set screw is not located toward conduit opening, RAISE bevel gear AND

ROTATE bevel gear independently of potentiometer pinion gear until set screw is properly located.
5.2 Calibration for “P” or “D” Non-Positioner/Controller and Positioner/Controller Units (Cont.)

5.2.8 LOWER bevel gear AND
MEASURE resistance.

5.2.9 READJUST bevel gear for proper resistance value AND
TIGHTEN bevel gear set screw.

5.2.10 IF unit does not have dual potentiometers “D,” REMOVE DMM AND
GO TO Section 5.3, Calibration for “4” (4 to 20 mA Position Indicator) Option.

5.2.11 MEASURE resistance (ohms) of second potentiometer at purple (Terminal 3) and white/black (Terminal 4) leads located on secondary (end) terminal strip.

5.2.12 IF resistance value of second potentiometer is within ± 10 Ω of first potentiometer, GO TO Step 5.2.16.

5.2.13 LOOSEN retaining ring that connects both potentiometers AND
TURN second potentiometer until its resistance value equals resistance value of first potentiometer.

5.2.14 TIGHTEN retaining ring.

5.2.15 MEASURE resistance of both potentiometers.

5.2.16 REMOVE DMM leads from terminal strip.
5.3 Calibration for “4” (4 to 20 mA Position Indicator) Option

5.3.1 APPLY power to the MAS board during the following measurement (Steps 5.3.2 and 5.3.3).

5.3.2 LIFT Terminal 4 lead AND ATTACH DMM in series.

5.3.3 MEASURE current output (4 to 20 mA) of actuator.

5.3.4 SET actuator to full closed (clockwise) position.

5.3.5 RECORD mA output in as-found column of data sheet.

5.3.6 SET actuator to full open (counter-clockwise) position.

5.3.7 RECORD mA output in as-found column of data sheet.

5.3.8 IF as-found values are within tolerance specified on data sheet and no adjustments are necessary, RECORD as-found values in as-left column of data sheet AND GO TO Step 5.3.13.

5.3.9 SET actuator to full closed (clockwise) position AND ADJUST “4 mA” pot (for positioner/controller option) or P1 (for non-positioner/controller option) to indicate 4 mA on DMM.

5.3.10 SET actuator to open (counter-clockwise) position AND ADJUST “20 mA” pot (for positioner/controller option) or P2 (for non-positioner/controller option) to indicate 20 mA on DMM.

NOTE - Adjustment of one potentiometer affects other potentiometer.

5.3.11 REPEAT adjustments of “4 mA” and “20 mA” pots or P1 and P2 to optimize readings.

5.3.12 RECORD adjusted actuator output values on data sheet.

5.3.13 REMOVE DMM leads from terminal strip.

5.3.14 IF unit has no positioner/controller board, GO TO Section 5.6, Restoration.
5.4 Positioner Board - Input Calibration

5.4.1 ENSURE feedback potentiometer is calibrated (Section 5.2).

5.4.2 SET actuator to fully closed position.

5.4.3 ADJUST “ZERO” pot for LED “LD2” to remain lit.

5.4.4 SET actuator to fully open position.

5.4.5 ADJUST “SPAN” pot for LED “LD2” to remain lit.

5.4.6 REPEAT Steps 5.4.1 through 5.4.5 until “ZERO” and “SPAN” adjustments are optimized.

5.5 Positioner Adjustment

5.5.1 ADJUST “GATE” pot so actuator pulses from one to three times to reach final position when operating.

Special Instructions

“ON” pulse time must be long enough to create sufficient differential pressure across actuator pistons to overcome valve rotational torque; “OFF” pulse time must be long enough for actuator to settle into position.

5.5.2 IF “ON” and “OFF” pots require adjustment, ADJUST “ON” and “OFF” pots so actuator stabilizes in position after motion pulse.

NOTE - “Null” pot can normally be left at its mid-travel position. Turning it clockwise will increase circuit's sensitivity to signal change but also make it more susceptible to electrical noise, if present. Turning counter clockwise will have opposite effect.

5.5.3 ADJUST “NULL” pot.

5.5.4 CONFIRM actuator operates properly AND

REPEAT Steps 5.5.1 through 5.5.3 until proper operation occurs.
5.6 Restoration

5.6.1 IF cover was not previously removed and shaft hole lubricant is needed, REMOVE cover AND APPLY light coat of Krytox GPL 227 lubricant (or equivalent bearing grease) to shaft hole in cover.

5.6.2 RESTORE to as-found conditions.

5.6.3 ENSURE alarms are reset or cleared.

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

5.7 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).

5.8 Review

5.8.1 INFORM FWS test is complete.

5.8.2 (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.

5.9 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 - Cover Plate and Cover Bolts
Figure 2 - Baseplate and Potentiometer

1. Potentiometer Nut
2. Potentiometer Lockwasher
3. Potentiometer
4. Potentiometer Mount
5. Baseplate
6. Upper Snap Ring
7. Shaft
8. Spacer
9. Bevel Gear
10. Set Screw
Figure 3 - Terminal Strips

- BASEPLATE
- BASEPLATE (4 PLACES) SCREWS
- SECONDARY (END) LOCATION
- Primary (side) Location