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AY-AZ Central Valve Alignment and Servo Calibration

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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides calibration and alignment instructions for the AY/AZ Ventilation and Cooling System CENTURA electric valve actuator servo control and position transmitter.

1.2 Scope

The instructions contained in this procedure pertain to Calibration of the Automax Inc. CENTURA ESP2 Electronic Servo Positioner and 4-20mA position transmitter.

2.0 INFORMATION

2.1 General Information

When adjustments are made, (i.e. cam adjustments, switch trip position, over travel switch(s), zero, span, feedback), the actuator cover (w/hand-wheel) must be removed.

2.2 Terms and Definitions

ESP2 - Electronic Servo Positioner

CW - Clockwise is defined as the direction in which the hands of a clock rotate as viewed from the front (Right to Left)

CCW - Counter Clockwise is defined as the “opposite direction” in which the hands of a clock rotate as viewed from the front (Left to Right).
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 Care must be taken not to inadvertently lift manual override shaft. This will remove the override and return the actuator to automatic operation, resulting in potential pinch point.

3.2 Equipment Safety

CAUTION - When placing in manual override, the hand-wheel must be depressed toward actuator cover and slowly turned (not jerked) in desired direction; to avoid equipment damage.

CAUTION - Placing a short circuit to motor leads while motor is connected to ESP2 will result in serious damage to circuit board.

3.3 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:

- Tags and labels for instrument calibration labeling as specified in Work Package
- Milliampere, Millivolt, or Voltage source
- Two Milliampere, Millivolt, or Voltmeter, 4.5 digit, 0.25% accuracy (one for input verification and one for output verification)
- Communication devices (e.g., cellular phone)
- 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:

- H-2-131343, INSTM. K1 Primary Tank Vent Sys Loop Diagram, Sheet 2
- H-2-131331, INSTM. Enclosure AY101K4/AY102K4 Wiring, Sheet 4
- H-14-020106, Ventilation Tank Primary System (VTP) O&M System P&ID, Sheet 1&2
5.0 PROCEDURE

Special Instructions

Safety over-travel switches disconnect the motor if the actuator over travels approximately 5 degrees past the full Clockwise (CW) or Counter Clockwise (CCW) position. On valves with mechanical stops, the safety over-travel switches need to be set so that the motor will disconnect before hitting the mechanical valve stop.

Zero potentiometer is turned CW to move actuator CW for direct acting unit. Standard units are direct acting - low input signal is CW and high input signal is CCW. For reverse acting, jumpers JP2 and JP3 are positioned to "R" positions on ESP2.

5.1 Servo Control and Transmitter Verification

5.1.1 CONNECT 4-20mAdc input signal to TB1 terminals marked + IN and - IN per Data Sheet (see Figure 1).

5.1.2 DISCONNECT transmitter output "+" lead AND

CONNECT milliammeter in series with the lifted lead and the "+" Output Terminal per Data Sheet.

5.1.3 APPLY Minimum input value per Data Sheet and perform the following:

5.1.3.1 OBSERVE if actuator drives to full CW “CLOSED” position and STOPS.

5.1.3.2 RECORD “As-Found” mA output reading on Data Sheet

5.1.4 APPLY maximum input value per Data Sheet AND

PERFORM the following:

5.1.4.1 OBSERVE if actuator drives to full CCW “OPEN” position and STOPS.

5.1.4.2 RECORD “As-Found” mA output reading on Data Sheet

5.1.5 IF actuator movements are correct and mA readings are within tolerances per Data Sheet, RECORD “As-Found” values in “As-Left” column of Data Sheet AND

GO TO Section 5.4, Restoration

5.1.6 IF either actuator movements are not correct or mA readings are not within tolerance per Data Sheet, GO TO Section 5.2, Calibration.
5.2 Calibration

5.2.1 IF actuator does not respond to input signal OR does not travel properly when CW or CCW LED is lit, PERFORM the following:

5.2.1.1 ENSURE proper input configuration and signal polarity connections.

5.2.1.2 MEASURE voltage at test point D referenced to test point G (ground) for 1-5 Vdc (4-20mA) from controller to ensure input signal is received. (Reference Figure 1)

5.2.2 IF actuator does not travel to full CW or CCW positions, CHECK to determine if safety over-travel cam(s) are tripping switch(s) AND ADJUST as follows:

NOTE - By depressing the hand-wheel, the manual override is engaged, electrically disconnecting the motor.

- Pulling the hand-wheel away from the actuator cover electrically re-connects the motor and returns motor to automatic operation.

**CAUTION**

When placing in manual override, the hand-wheel must be depressed toward actuator cover and slowly turned (not jerked) in desired direction; to avoid equipment damage.

5.2.2.1 PRESS hand-wheel towards actuator cover AND SLOWLY ROTATE CW until approximately 5 degrees past standard full CW position.

5.2.2.2 REMOVE actuator cover bolts AND LIFT AND REMOVE actuator cover w/hand-wheel.
5.2 Calibration (Cont.)

5.2.2.3 ADJUST CW cam to trip at this point as follows:

a. PRESS the splined “Quick-Set” cam against the spring AND

   ROTATE to trip at this point

b. ADDITIONALLY for a more precise application, TURN screw inside cam to move tip onto the leaf of micro switch.

5.2.3 WHILE the CW safety over-travel switch is tripped, ENSURE voltage is 0.20Vdc to 0.53Vdc measured from test point A, to test point G, on ESP2. (Reference Figure 1)

5.2.3.1 IF voltage is not between 0.20Vdc and 0.53Vdc, LOOSEN feedback potentiometer drive gear.

5.2.3.2 ADJUST feedback potentiometer for 0.75Vdc AND

   RE-TIGHTEN drive gear.

5.2.4 USE caution during Step 5.2.5 (and sub-steps) not to inadvertently lift manual override shaft which could result in potential pinch-point.

5.2.5 USING a wrench, ROTATE manual override shaft CCW until approximately 5° past the standard full CCW position.

5.2.5.1 ADJUST CCW cam to trip at this point as follows:

a. PRESS splined “Quick-Set” cam against the spring AND

   ROTATE to trip at this point

b. ADDITIONALLY for a more precise application, TURN the screw inside cam to move tip onto the leaf of micro switch.
5.2 Calibration (Cont.)

5.2.5.2 USING a wrench, ROTATE hand wheel CW until the CCW Safety Over-Travel switch resets.

5.2.6 GRASP AND LIFT manual override shift to return to automatic operation.

5.2.7 IF actuator is oscillating, or not responsive to small input changes, while performing Steps 5.2.8 thru 5.2.9.2, GO TO Section 5.3.

5.2.8 APPLY minimum input value per Data Sheet to the ESP2 terminals + IN and — IN AND PERFORM the following:

NOTE - Turning (Z) adjustment CW will move actuator in CW direction.

5.2.8.1 ADJUST zero (Z) potentiometer, until actuator stops at full CW position and CW LED turns off.

5.2.8.2 CONFIRM voltage taken at test point “A” to test point “G” on ESP2 card is approximately 0.75Vdc. (Reference Figure 1)

5.2.8.3 IF voltage taken is not approximately 0.75Vdc, ADJUST feedback potentiometer to 0.75Vdc.

5.2.9 APPLY Maximum input value per Data Sheet to the ESP2 terminals + IN and — IN AND PERFORM the following:

5.2.9.1 ADJUST span (S) potentiometer, until actuator stops at full CCW position and CCW LED turns off.

NOTE - Due to Zero-Span interaction, the actuator will have to be adjusted at both ends (CW to CCW) several times for repeatability.

5.2.9.2 REPEAT Steps 5.2.8 thru 5.2.9.1 (usually 2 to 3 times) until actuator positions repeats at both ends.
5.2 Calibration (Cont.)

**CAUTION**
Placing a short circuit to motor leads while motor is connected to ESP2 will result in serious damage to circuit board.

NOTE - Reference Figure 1 to find Zero and Span adjustment located on 4-20 mA Transmitter Board.

5.2.10 INITIATE actuator to the CCW position AND ADJUST “SPAN” (S) on the 4-20mA Transmitter Board for 20mA output.

5.2.11 INITIATE actuator to the CW position AND ADJUST “ZERO” (Z) on the 4-20mA Transmitter Board for 4mA output.

5.2.11.1 REPEAT Steps 5.2.10 and 5.2.11 until output repeats,

OR

IF unable to get output to repeat, NOTIFY FWS for resolution.

5.2.12 IF no further adjustments are required, REMOVE all test equipment AND RECONNECT any lifted leads.

NOTE - Take care to align hand-wheel coupling with manual override shaft when reinstalling actuator cover.

5.2.13 REPLACE actuator cover w/hand-wheel AND INSTALL AND TIGHTEN bolts.
5.3 Deadband Adjustment

NOTE - If actuator is oscillating or is not responsive to small input changes, re-adjustment is required. Voltage from test point “B” to “G” should measure 0.05Vdc to 0.10Vdc. (Reference Figure 1)

5.3.1 IF actuator is oscillating, or is not responsive to small input changes, PERFORM Steps 5.3.2 and 5.3.3 until desired conditions are obtained,

OR

IF unable to adjust to desired conditions, NOTIFY FWS for resolution.

5.3.2 INITIATE actuator to mid position and perform the following:

5.3.2.1 TURN Deadband, CCW, until both LED’s Energize.

5.3.2.2 IMMEDIATELY TURN Deadband CW until both LED’s De-Energize, THEN

TURN adjustment CW an additional $\frac{1}{4}$ turn.

5.3.3 OPERATE actuator over full range in small increments to check movement AND

REPEAT Deadband adjustments Steps 5.3.2 - 5.3.2.2 if required.

5.3.4 GO TO Step 5.2.8 AND

CONTINUE Zero and Span adjustments.
5.4 Restoration

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

5.4.2 DISCONNECT AND REMOVE test equipment.

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

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

5.4.5 NOTIFY operations that testing is complete and system may be returned to desired configuration.

5.5 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.

5.6 Review

5.6.1 INFORM FWS test is complete.

5.6.2 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.

5.7 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

ESP2 Servo Positioner and 4-20mA Transmitter

4–20 mA TRANSMITTER

Transmitter Output

JP2 – JP3 DIRECT REVERSE ACTING JUMPERS

DEADBAND ADJUST
ZERO ADJUST
SPAN ADJUST
Test Point A
Test Point B
Test Point C
Test Point D
JP1 INPUT JUMPER
Test Point G

Feedback Potentiometer

AUTOMAX ESP-2 ELECTRONIC SERVO POSITIONER

SW1 & SW2 Safety overtravel switches disconnect the motor if the actuator overtravels approximately 5 degrees past the full CW or CCW position.

Manual Override Cut-Out Switch (optional)