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VALIDATION PROCEDURE FOR THE
FLAME DEFLECTOR CONTROL SYSTEM
(ELECTRICAL) "D" SERIES R & D
SYCAMORE S-2
AZN-27-032

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PREPARED BY A. L. EGGERT
CHECKED BY G. E. KELLEY
CHECKED BY D. V. FENOLBY

APPROVED BY A. D. RISLEY
APPROVED BY A. H. KURILOFF
G. L. BURCH
GROUP LAUNCHING CONTROLS DESIGN

REVISIONS

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SECTION I

INTRODUCTION

This manual provides instructions for validating the Flame Deflector Control System (Electrical), "D" Series, R & D at Sycamore S-2. These instructions are applicable to the system as designed on the date of publication. Design changes may be required during, or after, system installation at the site. If changes are made which affect these instructions, this manual will also be revised.

The only permissible deviations to the procedures outlined in this document are those dictated by site installation difficulties. Such deviations shall be considered interim and must be forwarded to the Launching Controls Design Group for information and concurrence. Approved deviations will be automatically included in the next manual revision.

The test data sheet contained in this manual is a sample copy only and is not intended for actual test recording purposes. Separate copies of the test data sheet are furnished only to those departments whose activities require test data recording. These additional test data sheets are distributed under an identical cover sheet to the one on this manual except for the additional notation of "Test Data Sheet Only". Comparison of this special cover sheet with the one on the procedure correlates the two documents.

Personnel concerned with the use of this validation procedure can contribute to the effectiveness of any revisions by forwarding comments and suggestions to the Launching Controls Design Group, Building 4, Column G2, Montgomery Site, Convair Astronautics.

NOTICE

This document is intended for use as an acceptance validation procedure only. When this control system has been accepted (inspected, bought-off, sold, validated, etc.) no further requirement should exist for this document other than for reference purposes only. Continued checking of accepted systems occurs during the performance of Field Test Procedures, Countdown, Composite System Checkouts, or Testing and Operating Procedures published by Groups having over-all system responsibility.
SECTION II

REQUIREMENTS

2-1 REFERENCE DRAWINGS

27-69034 Panel Control Flame Deflector S-2, "D" Series.
27-69076 Diagram-Wiring, Control, Flame Deflector, S-2 "D" Series.
7-68231 Panel-Calibrating, Recording Meter.

2-2 EQUIPMENT REQUIREMENTS

Firex and Flame Deflector Console Assy
Missile Ground Rectifier (controlled by Missile Ground Power Control System)

2-3 TEST EQUIPMENT

Multimeter
Jumper Wire
0-1000 ohm potentiometer with a duo-dial calibrated to represent 100 ohms per turn.

2-4 OPERATING REQUIREMENTS

28 volts dc supplied by the Missile Ground Rectifier as normal blockhouse power.

NOTE

Where 28 volts dc is specified throughout this publication, the actual voltage output supplied by the Missile Ground Rectifier is intended. This voltage is adjustable and can vary between 26 and 29 volts. Voltage within this range is considered acceptable for system operation.

28 volts dc for the Calibrating Panel operating voltage is supplied by the Instrumentation Power Supply PS-1 and controlled from the Pneumatic-Hydraulic Aux. Rack Assy.
SECTION III

VALIDATION PROCEDURE

3-1 PURPOSE

This procedure determines that the electrical control equipment and circuitry of the Flame Deflector Control System is functioning correctly and properly connected.

NOTE

The Flame Deflector Control Panel meters listed below are not validated by this procedure.

THROTTLE POSITION meter
MAIN PRESSURE meter
MAIN FLOW meter

3-2 PREPARATION

The following system preparations must be accomplished before validation begins.

1. Check that Flame Deflector Control Panel switches are in their center (off) positions.
2. At the Facility Control Panel disconnect and tag the system control wires that originate from TB4 in the Firex and Flame Deflector Console.
3. Check that all Flame Deflector Control Panel indicator lights are off.
4. Check that the CALIB-RUN switch of the Vernier Flame Deflector Calibrating Panel is in the center (off) position, and that the F. S. ADJ (Full Scale Adjust) control is turned fully counter clockwise.

3-3 PROCEDURE

The two columns listed below, OPERATION AND OBSERVATION, show the actions to be performed and the results that should be observed during validation of the electrical control system.
In the following steps of the procedure when switches are specified to be operated to an "UP", "CENTER", or "DOWN" position, these positions are capitalized for clarity only and do not necessarily reflect panel nomenclature.

In the following steps, terminal points of TB14 are used as reference only. Actual connection of jumper wires and measuring devices is to be accomplished at the corresponding wire terminal location on the Facility Control Panel.

**OPERATION**

1.0 Connect a d-c voltmeter across terminals 4 (+) and 1 (-) of TB14.

2.0 Throw the PANEL POWER switch to UP position.

2.1 Check all press-to-test panel indicator lights.

2.2 Connect a d-c voltmeter across terminals 7 (+) and 1 (-) of TB14.

2.3 Connect a d-c voltmeter across terminals 8 (+) and 2 (-) of TB14.

2.4 Connect a d-c voltmeter across terminals 9 (+) and 3 (-) of TB14.

3.0 Connect a d-c voltmeter across terminal 10 (+) of TB14 and negative (-) 28 volts dc. (Maintain this connection during the following step.)

3.1 Throw the WARNER DEFLECTOR switch to UP position. (Return to CENTER position after observing indication.)

**OBSERVATION**

(a) Meter indicates 28 volts dc.

(a) PANEL POWER light comes on.

(a) Each light comes on when pressed and goes off (except PANEL POWER light) when released.

(a) Meter indicates 28 volts dc.

(a) Meter indicates 28 volts dc.

(a) Meter indicates 28 volts dc.

(a) Meter indicates zero volts.

(a) Meter indicates 28 volts dc.

(a) Meter indicates zero volts.
3.2 Install a jumper between terminal 11 of TBU and positive (+) 28 volts dc. (Remove the jumper after observing indication).

4.0 Connect a d-c voltmeter across terminal 12 (+) of TBU and negative (-) 28 volts dc. (Maintain this connection during the following step).

4.1 Throw the MAIN DEFLECTOR switch to UP position. (Return to CENTER position after observing indication).

4.2 Install a jumper between terminal 13 of TBU and positive (+) 28 volts dc. (Remove the jumper after observing indication).

5.0 Connect a d-c voltmeter across terminal 14 (+) of TBU and negative (-) 28 volts dc. (Maintain this connection through step 5.2).

5.1 Throw the SYSTEM READY switch to UP position.

5.2 Throw the SYSTEM READY switch to CENTER position.

6.0 Connect an ohmmeter between terminals 15 and 18 of TBU. (Maintain this connection during the following step).

6.1 Throw the PUMP 5 switch to OFF. (Switch returns to CENTER position upon release).
<table>
<thead>
<tr>
<th>OPERATION</th>
<th>OBSERVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2 Connect an ohmmeter between terminals 16 and 17 of TBL4. (Maintain this connection during the following step).</td>
<td>(a) Meter indicates an open circuit.</td>
</tr>
<tr>
<td>6.3 Throw the PUMP 5 switch to the UP position. (Switch returns to CENTER position upon release).</td>
<td>(a) Meter indicates circuit continuity while switch is actuated.</td>
</tr>
<tr>
<td>6.4 Install a jumper between terminal 19 of TBL4 and positive (+) 28 volts dc. (Remove the jumper after observing indication).</td>
<td>(a) PUMP 5 light comes on. (Light goes off).</td>
</tr>
<tr>
<td>7.0 Connect an ohmmeter between terminals 20 and 23 of TBL4. (Maintain this connection during the following step).</td>
<td>(a) Meter indicates circuit continuity.</td>
</tr>
<tr>
<td>7.1 Throw the PUMP 4 switch to OFF. (Switch returns to CENTER position upon release).</td>
<td>(a) Meter indicates an open circuit while switch is actuated.</td>
</tr>
<tr>
<td>7.2 Connect an ohmmeter between terminals 21 and 22 of TBL4. (Maintain this connection during the following step).</td>
<td>(a) Meter indicates an open circuit.</td>
</tr>
<tr>
<td>7.3 Throw the PUMP 4 switch to UP position. (Switch returns to CENTER position upon release).</td>
<td>(a) Meter indicates circuit continuity while switch is actuated.</td>
</tr>
<tr>
<td>7.4 Install a jumper between terminal 24 of TBL4 and positive (+) 28 volts dc. (Remove the jumper after observing indication).</td>
<td>(a) PUMP 4 light comes on. (Light goes off).</td>
</tr>
<tr>
<td>8.0 Connect an ohmmeter between terminals 25 and 28 of TBL4. (Maintain this connection during the following step).</td>
<td>(a) Meter indicates circuit continuity.</td>
</tr>
<tr>
<td>8.1 Throw the PUMP 3 switch to OFF. (Switch returns to CENTER upon release).</td>
<td>(a) Meter indicates an open circuit while switch is actuated.</td>
</tr>
</tbody>
</table>


**OPERATION**

8.2 Connect an ohmmeter between terminals 26 and 27 of TBL4. (Maintain this connection during the following step).

8.3 Throw the PUMP 3 switch to UP position. (Switch returns to CENTER position upon release).

8.4 Install a jumper between terminal 29 of TBL4 and positive (+) 28 volts dc. (Remove the jumper after observing indication).

9.0 Connect an ohmmeter between terminals 30 and 33 of TBL4. (Maintain this connection during the following step).

9.1 Throw the PUMP 2 switch to OFF. (Switch returns to CENTER position upon release).

9.2 Connect an ohmmeter between terminals 31 and 32 of TBL4. (Maintain this connection during the following step).

9.3 Throw the PUMP 2 switch to UP position. (Switch returns to CENTER position upon release).

9.4 Install a jumper between terminal 34 of TBL4 and positive (+) 28 volts dc. (Remove the jumper after observing indication).

10.0 Connect an ohmmeter between terminals 35 and 38 of TBL4. (Maintain this connection during the following step).

**OBSERVATION**

(a) Meter indicates an open circuit.

(a) Meter indicates circuit continuity while switch is actuated.

(a) PUMP 3 light comes on. (Light goes off).

(a) Meter indicates circuit continuity.

(a) PUMP 2 light comes on. (Light goes off.)

(a) Meter indicates circuit continuity.
10.1 Throw the PUMP 1 switch to OFF. (Switch returns to CENTER position upon release).
   (a) Meter indicates an open circuit while switch is actuated.

10.2 Connect an ohmmeter between terminals 36 and 37 of TBL4. (Maintain this connection during the following step).
   (a) Meter indicates an open circuit.

10.3 Throw the PUMP 1 switch to UP position. (Switch returns to CENTER position upon release).
   (a) Meter indicates circuit continuity while switch is actuated.

10.4 Install a jumper between terminal 39 of TBL4 and positive (+) 28 volts dc. (Remove the jumper after observing indication).
   (a) PUMP 1 light comes on. (Light goes off.)

11.0 Connect a d-c voltmeter across terminal 41 (+) of TBL4 and negative (-) 28 volts dc. (Maintain this connection during the following step).
   (a) Meter indicates zero volts.

11.1 Throw the THROTTLE switch to OPEN. (Switch returns to CENTER position upon release).
   (a) Meter indicates 28 volts dc while switch is actuated.

11.2 Connect a d-c voltmeter across terminal 40 (+) of TBL4 and negative (-) 28 volts dc. (Maintain this connection during the following step).
   (a) Meter indicates zero volts.

11.3 Throw the THROTTLE switch to CLOSE. (Switch returns to CENTER position upon release).
   (a) Meter indicates 28 volts dc while switch is actuated.

NOTE

The following steps validate the VERNIER PRESSURE meter.
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OPERATION

12.0 Substitute the 0-1000 ohm potentiometer (adjusted to zero) at the test stand piping to simulate the Vernier Deflector Pressure transducer.

12.1 At the Auxiliary Rack containing Power Supply PS-1 throw the AC LINE switch to ON position.

12.1.1 At the Pneumatic Control Panel throw the PANEL POWER switch to UP position.

12.1.2 At the Auxiliary Rack containing Power Supply PS-1 throw the OUTPUT switch to ON position.

12.1.3 Connect a d-c voltmeter across terminals 79 (+) and 80 (-) of TBL4.

12.2 Throw the CALIB-RUN switch of the Vernier Flame Deflector Calibrating Panel to RUN.

12.3 Adjust the ZERO ADJ control of the Vernier Flame Deflector Calibrating Panel as required to obtain a zero indication on the VERNIER PRESSURE meter.

12.4 Adjust the 0-1000 ohm potentiometer to 1000 ohms. The VERNIER PRESSURE meter indication increases as resistance is increased.

12.5 Adjust the F. S. ADJ control of the Vernier Flame Deflector Calibrating Panel as required to obtain a full scale deflection on the VERNIER PRESSURE meter.

OBSERVATION

12.1.1 (a) Meter indicates 28 volts dc.
**12.6** Adjust the potentiometer to 500 ohms. The VERNIER PRESSURE meter should indicate approximately half scale after this adjustment.

**12.7** Throw the CALIB-RUN switch of the Vernier Flame Deflector Calibrating Panel to CALIB position.

**12.8** Adjust the CALIB STD. control of the Vernier Flame Deflector Calibrating Panel to obtain an indication of two major divisions less than full scale on the VERNIER PRESSURE meter. Lock the CALIB. STD. control after this adjustment.

**12.9** Return the CALIB-RUN switch to center (off) position, disconnect the 0-1000 ohm potentiometer, throw the OUTPUT switch and AC LINE switch on Power Supply PS-1 to their OFF positions, and throw the PANEL POWER switch on the Pneumatic Control Panel to CENTER position.

**13.0** Disconnect the Console wiring at terminals 42, 43, 82, 83, 84, and 85 of TBL4, and perform a continuity check of wiring between these terminals and their respective termination points in the Facility Control Panel. (Reconnect the wires after observing indication).

(a) Wiring is continuous between termination points of the Console and Facility Control Panel.

**14.0** Perform a verification check of all wiring connections between the Control Console and the Facility Control Panel and system components.

Satisfactory completion of the above procedure indicates that all of the electrical control system of the Flame Deflector Control Panel is valid, except for the meters listed in paragraph 3-1. The remaining meter validation procedures will be incorporated in this document by revision at a later date.

When no further testing is required, restore the system to its secured state.
<table>
<thead>
<tr>
<th>Step No.</th>
<th>Validation Performed</th>
<th>Inspection Stamp</th>
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<tbody>
<tr>
<td>1.</td>
<td>D. C. Ground Power</td>
<td>AVAILABLE</td>
</tr>
<tr>
<td>2.</td>
<td>Panel Power Circuits</td>
<td>SATISFACTORY</td>
</tr>
<tr>
<td>3.</td>
<td>Vernier Deflector Valve Control Circuits</td>
<td>SATISFACTORY</td>
</tr>
<tr>
<td>4.</td>
<td>Main Deflector Valve Control Circuits</td>
<td>SATISFACTORY</td>
</tr>
<tr>
<td>5.</td>
<td>System Ready Circuit</td>
<td>SATISFACTORY</td>
</tr>
<tr>
<td>6.</td>
<td>Pump 5 Circuits</td>
<td>SATISFACTORY</td>
</tr>
<tr>
<td>7.</td>
<td>Pump 4 Circuits</td>
<td>SATISFACTORY</td>
</tr>
<tr>
<td>8.</td>
<td>Pump 3 Circuits</td>
<td>SATISFACTORY</td>
</tr>
<tr>
<td>9.</td>
<td>Pump 2 Circuits</td>
<td>SATISFACTORY</td>
</tr>
<tr>
<td>10.</td>
<td>Pump 1 Circuits</td>
<td>SATISFACTORY</td>
</tr>
<tr>
<td>11.</td>
<td>Main Deflector Throttle Control Circuits</td>
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</tr>
<tr>
<td>12.</td>
<td>Vernier Pressure Meter Circuits</td>
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<td>13.</td>
<td>Wiring Continuity Checks</td>
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<td>14.</td>
<td>System Wiring Connections</td>
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