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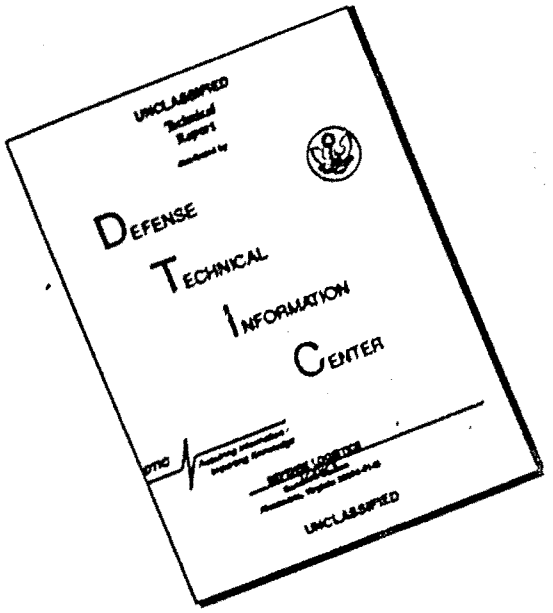

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REPORT NO. AZN-27-007
DATE 17 July 1958
NO. OF PAGES ii + 37

CONVAIR ASTRONAUTICS

CONVAIR DIVISION OF GENERAL DYNAMICS CORPORATION

VALIDATION PROCEDURE FOR THE LIQUID OXYGEN TANKING CONTROL SYSTEM (ELECTRICAL) "D" SERIES R & D

ARB 1-1

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GROUP LAUNCHING CONTROLS DESIGN

REVISIONS

NO.	DATE	BY	CHANGE	PAGES AFFECTED

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SECTION I

INTRODUCTION

This manual provides instructions for validating the Liquid Oxygen Tanking Control System (Electrical), "D" Series R & D, ERB 1-1. 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.

N O T I C E

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, Countdowns, Composite System Checkouts, or Testing and Operating Procedures published by Groups having over-all system responsibility.

SECTION II

REQUIREMENTS

2-1 REFERENCE DRAWINGS

27-69160 Diagram-Schematic, Liquid Oxygen Tanking, ERB 1-1, "D" Series

27-69115 Diagram-Wiring, Control, Liquid Oxygen, "D" Series

27-69118 Diagram-Wiring, Console Assembly, Liquid Oxygen, "D" Series

27-65001 Diagram-Schematic, Propellant-Tanking, Signal Responder Trailer, "D" Series.

27-65000 Diagram-Schematic, Propellant Level, Signal Responder Trailer, "D" Series

7-17119 Schematic-Hot-Wire, Liquid-Gas Detector

7-17120 Assembly-Hot-Wire, Liquid-Gas Detector

2-2 EQUIPMENT REQUIREMENTS

Liquid Oxygen Tanking Control Console (Blockhouse)

Signal Responder Trailer

Missile Ground Rectifier (Blockhouse)

Cabinet-Amplifier Rack (7-68371) Transfer Room

2-3 TEST EQUIPMENT

2 Ohmmeters

2 DC Voltmeters (0-50V DC)

2 Special DC Voltmeters, each consisting of a regular 0-50 Volt DC Voltmeter with a 28 ohm 30 watt resistor connected in parallel with the meter

3 Potentiometers, 10 turn, 0-25 ohms, with calibrated dials

2-4 OPERATING REQUIREMENTS

28 Volts DC supplied by Missile Ground Rectifier

115 Volts, 60 cycles supplied by Facility Power Console

SECTION III

VALIDATION PROCEDURE

3-1 PURPOSE

This procedure determines that the electrical control equipment and circuitry of the Liquid Oxygen Tanking Control System are functioning correctly and are properly connected.

3-2 PREPARATION

The following system preparations must be accomplished before validation begins:

1. Disconnect P115, P19, P129, P12 from J115, J19, J129, J12, respectively. This disconnects Relay Panel and Ground Electrical Box at Terminal Enclosure TBA2.

2. Disconnect P109 and P110 from J109 and J110, respectively. This disconnects the Liquid Oxygen Transfer Unit.

3. Disconnect P42 from J42. This disconnects the Hydraulic Console.

4. Disconnect P201 from J201. This disconnects the Pneumatic Aux. (27-69127)

5. Disconnect P111 from J111 (in the JA1 No. 1 Launcher Box). This disconnects the Purge Local Control Box (27-69172) (Test Stand Area).

6. Disconnect P105 & P106 from J105 & J106. This disconnects the Purge Control Unit (27-69173) (Transfer Room).

7. Umbilical Cable plugs P1005 and P1007 must be connected to the Signal Responder Trailer.

8. Check that system interconnecting cable plugs P71, P72, P73, and P76B are connected to the Liquid Oxygen Tanking Consoles.

9. Disconnect the appropriate plugs to disconnect the Vent Valve Solenoid, the Pressurization Valve Solenoid, and the Vent and Pressurization Limit Switch from the Console.

10. Disconnect P51 & P52 from J51 & J52. This disconnects the Fuel Console.

11. Disconnect the appropriate plug to disconnect the Liquid Nitrogen Supply Vent and Pressure Solenoids (Liquid Oxygen Storage Area) from the Console.

12. Disconnect the appropriate plug to disconnect the Dump Valve (Test Stand Area) from the Console.

13. All switches on the Console Panel and the Propellant Level Panel and Propellant Tanking Panel (Signal Responder Trailer) must be in their OFF or normal CENTER positions.

14. At the Facility Power Control Panel, the following switches must be thrown ON:

    a. Missile Ground Rectifier (28 volts DC)

    b. Blockhouse Equipment Panel (115 volts AC)

    c. At the Pneumatic Aux Console (27-69127), place a jumper between terminals 10 and 12 on TB102. Turn the power switch to ON in the Power Supply One (PS-1) unit.

15. Press all press-to-test lights. Each light should come on when pressed and go off when released.

3-3 PROCEDURE

The two columns below, Operation and Observe, show the actions to be performed and the results to be observed during the validation of the electrical control of the Liquid Oxygen Tanking Control System "D" Series.

	OPERATION	OBSERVE
1.0	Connect a d-c voltmeter across pins k (+) and X (-) of P109 and another d-c voltmeter across pins k (+) and X (-) of P110. (Maintain these connections through step 1.2).	(a) Both meters indicate zero volts.
1.1	Connect an ohmmeter between pins W and X on P71. (Remove after step 1.2).	(a) Ohmmeter indicates circuit continuity.

	OPERATION	OBSERVE
1.2	Throw the PANEL POWER switch to the on position.	(a) PANEL POWER light (green) comes on. (b) Both voltmeters indicate 28 volts dc. (c) Ohmmeter indicates an open circuit.
	Liquid Oxygen Missile Valve Heaters	
2.0	Install a jumper between pin R of P12 and pin F of P115 in Transfer Room. (Remove the jumper after step 2.1).	(a) No panel indication.
2.1	Throw the MISSILE VALVE HEATERS switch to the on position. (Return switch to OFF).	(a) MISSILE VALVE HEATERS ON light (green) comes on. (Light goes off).
2.2	Install a jumper between pins A and F of P115 in Transfer Room. (Remove jumper after observation).	(a) MISSILE VALVE HEATERS ON light (green) comes on. (Light goes off).
2.3	Connect an ohmmeter between pin E of P115 and pin K of P129, pin D of P115 and pin J of P129, pin C of P115 and pin U of P129, pin B of P115 and pin L of P19 in sequence.	(a) Ohmmeter indicates circuit continuity for each connection.
	Vent and Pressurization Valves	
3.0	Throw the PANEL POWER switch to the off position.	(a) PANEL POWER light (green) goes off.
3.1	Connect a Special d-c voltmeter across the pins of the vent valve solenoid connector and another Special d-c voltmeter across the pins of the pressurization valve solenoid connector. (Maintain these connections through step 3.11).	(a) Each meter indicates zero volts.

	OPERATION	OBSERVE
3.2	Apply +28 volts to pin E of P71 (Remove voltage after observation).	(a) VENT VALVE OPEN light (green) comes on. (Light goes off). (b) Meter connected across Vent Valve indicates 28 volts dc. (Meter indicates zero volts).
3.3	Apply +28 volts to pin J of P71. (Remove voltage after observation).	(c) PRESSURIZING VALVE OPEN light (green) comes on. (light goes off). (b) Meter across the Pressurization Valve Solenoid indicates 28 volts dc. (Meter indicates zero volts).
3.4	Throw the STORAGE TANK VALVES switch to the VENT position.	(a) No indication.
3.5	Throw the STORAGE TANK VALVES switch to the PRESSURIZE position. (Return switch to the close (center) position).	(a) No indication.
3.6	Throw the PANEL POWER switch to the ON position.	(a) PANEL POWER light (green) comes on.
3.7	Apply +28 volts to pin E of P71 and pin J of P71. (Remove voltage after observation).	(a) No indication.
3.8	Throw the STORAGE TANK VALVES switch to the VENT position.	(a) VENT VALVE OPEN light (green) comes on. (b) Meter connected across Vent Valve indicates 28 volts dc.
3.9	Throw the STORAGE TANK VALVES switch to the PRESSURIZE position. (Return switch to the close (center) position).	(a) VENT VALVE OPEN light (green) goes off. (b) Meter connected across Vent Valve indicates zero volts.

OPERATION	OBSERVE
	(c) PRESSURIZING VALVE OPEN light (green) comes on. (Light goes off).
	(d) Meter connected across Pressurization Valve indicates 28 volts dc. (Meter indicates zero volts).
3.10 Connect a jumper between terminals 2 and 3 of the VENT VALVE OPEN light. (Remove jumper after observation).	(a) VENT VALVE OPEN light (green) comes on. (Light goes off).
	(b) Meter connected across the Vent Valve solenoid connector indicates approximately zero volts.
3.11 Connect a jumper between terminals 2 and 3 of the PRESSURIZING VALVE OPEN light. (Remove jumper after observation).	(a) PRESSURIZING VALVE OPEN light (green) comes on. (Light goes off).
	(b) Meter connected to the Pressurization Valve solenoid connector indicates approximately zero volts.
Valve Panel Lights	
4.0 Connect one end of a jumper to pin k of P109 at the Liquid Oxygen Transfer Unit and leave connected through the following procedure:	

OPERATION	OBSERVE

Connect the open end of the jumper to the following pins in sequence and observe that the proper indicator light (amber or green) comes on. Lights will go off when jumper is disconnected.

Connector-Pin	Indicator Light
P110-E	PUMP INLET LR-3 OPEN (green)
P110-G	PUMP INLET LR-3 CLOSED (amber)
P109-G	PUMP LA BYPASS OPEN (green)
P109-L	PUMP LA BYPASS CLOSED (amber)
P109-I	PUMP LB BYPASS OPEN (green)
P109-J	PUMP LB BYPASS CLOSED (amber)
P109-D	PUMP LA OUTLET OPEN (green)
P109-E	PUMP LA OUTLET CLOSED (amber)
P109-A	PUMP LB OUTLET OPEN (green)
P109-B	PUMP LB OUTLET CLOSED (amber)
P109-M	COOLER INLET LC-2 OPEN (green)
P109-T	COOLER INLET LC-2 CLOSED (amber)
P109-P	THROTTLE LC-1 OPEN (green)
P109-Q	THROTTLE LC-1 CLOSED (amber)
P109-c	OVERBOARD LM-1 OPEN (green)
P109-f	OVERBOARD LM-1 CLOSED (amber)
P110-L	PUMP OUTLET LR-4 OPEN (green)
P110-I	PUMP OUTLET LR-4 CLOSED (amber)
P110-J	GRAVITY RETURN LR-2 OPEN (gren)
P110-M	GRAVITY RETURN LR-2 CLOSED (amber)
P110-B	PUMP RETURN LR-1 OPEN (green)

4.1 Remove jumper connected in Step 4.0.

(a) No panel indication.

SUPER COOLER LIQUID NITROGEN SUPPLY

5.0 Disconnect the six wires from the terminals marked ten (10) minutes, one (1) hour, and two (2) hours at the Super Cooler (LN/2 Heat Exchanger in the LO/2 storage area). Connect a 0-25 ohm, 10 turn potentiometer (set for zero) to the two leads marked two (2) hours - one lead should be connected to the wiper. This will be

(a) No panel indication.

(b) POWER light (white) comes on (LOX-GOX PANEL).

(c) 2 HOUR light (green) comes on.

	OPERATION	OBSERVE
5.0	(continued) designated as the (A) potentiometer. Short the two leads marked ten (10) minutes. Connect another 0-25 ohm, 10 turn potentiometer (set for zero ohms to the two leads marked one (1) hour. Connect one lead to the zero end and the other lead to the wiper end. This will be designated as the (B) potentiometer. (Leave potentiometers connected). Throw the power switch to the ON position on both the 2 HOURS and 10 MIN Hot-Wire Liquid - Gas Detector amplifiers in the Cabinet-Amplifier Rack (7-68371) in the Transfer Room.	
5.1	Slowly increase the resistance of the "A" potentiometer until the 2 Hour light goes off and the 1 Hour light comes on.	(a) 2 HOURS light (green) goes off. (b) 1 HOUR light (green) comes on. (c) Calibrated dial on the potentiometer indicates approximately 10 ohms.
5.2	Connect the two Special d-c Voltmeters to the LN_2 Supply Solenoid plug. (Liquid Oxygen Storage Area) One meter should be connected across the VENT solenoid pin and -28 volt bus and the second meter should be connected across the PRESS. pin and the -28 volt bus. (Leave meters connected through step 5.5).	(a) Both meters indicate zero volts.

	OPERATION		OBSERVE
5.3	Slowly increase the resistance of the (B) potentiometer until the 1 Hour light goes off and the 10 MIN light comes on.	(a)	1 HOUR light (green) goes off.
		(b)	10 MINUTES light (red) comes on.
		(c)	Calibrated dial on potentiometer indicates approximately 10 ohms.
		(d)	Each meter indicates 28 volts dc.
5.4	Connect a third 0-25 ohm, 10 turn potentiometer (set for zero) to the leads marked ten (10) minutes at the Super Cooler. (Leave potentiometer connected).	(a)	No panel indication.
5.5	Slowly increase the resistance of the potentiometer (step 5.4) until the 10 MIN light goes off.	(a)	10 MINUTES light goes off.
		(b)	Each meter indicates 28 volts dc.
5.6	Disconnect the three potentiometers and two voltmeters. Reconnect wires disconnected in step 5.0.	(a)	No panel indication.
	<u>Dump Valve</u>		
6.0	Connect a Special d-c voltmeter across the positive input pin of the Dump Valve solenoid and the -28 volt bus. (Test Stand Area). (Maintain this connection through step 6.2).	(a)	Meter indicates zero volts.
6.1	Throw the DUMP VALVE switch to the open position. (Momentary type switch will revert to center position when released).	(a)	Meter indicates 28 volts dc.

	OPERATION	OBSERVE
6.2	Throw the DUMP VALVE switch to the close position. (Switch reverts to center position when released).	(a) Meter indicates zero volts.
6.3	Install a jumper between the +28 volt input to the Dump Valve solenoid and the NC limit switch output. (Remove jumper after indication).	(a) DUMP VALVE CLOSED light (amber) comes on. (Light goes off).
6.4	Install a jumper between the positive input pin of the Dump Valve solenoid and the NO limit switch output. (Leave jumper in until step 25.19).	(a) No panel indication.
6.5	Throw the DUMP VALVE switch to the open position. (Momentary type switch will revert to center position when released.	(a) DUMP VALVE OPEN light (green) comes on.
6.6	Throw the DUMP VALVE switch to the close position. (Switch reverts to center position when released).	(a) DUMP VALVE OPEN light (green) goes off).
	<u>Fill & Drain Valve</u>	
7.0	Apply 28 volts dc to pin Y of P105 at the Purge Auxiliary Control Box (27-69173) in the Cabinet-Amplifier Rack (7-68371) in the Transfer Room. (Remove after indication)	(a) FILL & DRAIN VALUE OPEN light (green) comes on. (Light goes off).
7.1	Apply 28 volts dc to pin Z of P105. (Remove after indication).	(a) FILL & DRAIN VALVE closed light (amber) comes on. (Light goes off).
7.2	Apply 28 volts dc to pin P of J111 in the JA1 No. 1 Launcher Box. (Remove after indication).	(a) FILL & DRAIN VALVE OPEN light (green) comes on. (Light goes off.)

	OPERATION		OBSERVE
7.3	Apply 28 volts dc to pin r on J111. (Remove after indication).	(a)	FILL & DRAIN VALVE CLOSED light (amber) comes on. (Light goes off.)
7.4	Install a jumper between pin H of P106 and pin Y of P105. (Remove the jumper after step 7.6)	(a)	No panel indication.
7.5	Throw the FILL & DRAIN VALVE switch to the open position. (Then release).	(a)	FILL & DRAIN VALVE OPEN light (green) comes on.
7.6	Throw the FILL & DRAIN VALVE switch to the close position. (Then release)	(a)	FILL & DRAIN VALVE OPEN light (green) goes off.
7.7	Connect a d-c voltmeter across pin H of P106 and ground. (Maintain this connection through step 7.9).	(a)	Meter indicates zero volts.
7.8	Throw the FILL & DRAIN VALVE switch to the open position. (Then release).	(a)	Meter indicates 28 volts d-c.
7.9	Throw the FILL & DRAIN VALVE switch to the close position. (Then release).	(a)	Meter indicates zero volts.
7.10	Install a jumper between pin H of P106 and pin Y of P105. (Leave jumper in until step 25.19).		
	<u>Operational Power Bus</u>		
8.0	Throw the OPERATIONAL POWER switch to the on position.	(a)	No indication.
8.1	Install a jumper between pins k and A of P110. (Remove after observation).	(a)	VALVE CONTROL PRESSURE ON light (green) comes on. (Light goes off).

	OPERATION	OBSERVE
8.2	Apply +28 volts dc to pin V of P42 at the Hydraulic Console. (Disconnect momentarily, then reconnect. Leave connected until Step 8.6.)	(a) MISSILE PRESSURIZED light (green) comes on. (Light goes off momentarily, then comes back on.)
8.3	Throw the OPERATIONAL POWER switch to the off position.	(a) No indication.
8.4	Install a jumper between pins k and A of P110. (Leave in until Step 8.10.)	(a) VALVE CONTROL PRESSURE ON light (green) comes on.
8.5	(a) Throw the OPERATIONAL POWER switch to the on position.	(a) OPERATIONAL POWER ON light (green) comes on.
	(b) Turn the TEST POSITION switch to the on position (then off).	(b) No indication.
8.6	Disconnect +28 volts dc from pin V of P42 (Step 8.2).	(a) No indication.
8.7	Apply +28 volts dc to pin Y of P201 at the Pneumatic Aux Console. (27-69127).	(a) OPERATIONAL POWER ON light (green) goes off.
		(b) MISSILE PRESSURIZED light (green) goes off.
8.8	Disconnect the +28 volts dc from pin Y of P201 (Step 8.7).	(a) No indication.
8.9	Turn the TEST POSITION switch to the on position.	(a) TEST POSITION ON light (red) comes on.
		(b) OPERATIONAL POWER ON light (green) comes on.
8.10	Remove the jumper between pins k and A of P110 (Step 8.4).	(a) VALVE CONTROL PRESSURE ON light (green) goes off.

	OPERATION		OBSERVE
	Airborne (A-B) Value		
9.0	Apply +28 volts dc to pin T of P105 at the Purge Auxilliary Control Box (27-69173) in the Cabinet-Amplifier Rack (7-68371) in the Transfer Room. (Remove after indication).	(a)	A-B VALUE OPEN light (green) comes on. (Light goes off).
9.1	Apply +28 volts dc to pin U of P105. (Remove after indication).	(a)	A-B VALVE CLOSED light (amber) comes on. (Light goes off).
9.2	Apply +28 volts dc to pin m of P111 in the JA1 NO. 1 Launcher Box. (Remove after indication).	(a)	A-B VALVE OPEN light (green) comes on. (Light goes off).
9.3	Apply +28 volts dc to pin n of P111. (Remove after indication).	(a)	A-B VALVE CLOSED light (amber) comes on (Light goes off.)
9.4	Install a jumper between pin B of P106 and pin T of P105. (Leave jumper in until . . . step 25.19).	(a)	No panel indication.
9.5	Throw A-B VALVE switch to the open position. (Release)	(a)	A-B VALVE OPEN light (green) comes on.
9.6	Throw A-B VALVE switch to the close position. (Release)	(a)	A-B VALUE OPEN light (green) goes off.
9.7	Throw the A-B VALVE switch to the open position. (Release)	(a)	A-B VALVE OPEN light (green) comes on.
9.8	Throw the OPERATIONAL POWER switch to the off position. (Return to the on position after observation)	(a)	OPERATIONAL POWER ON light (green) goes off. (Light comes on).
		(b)	FILL & DRAIN VALVE OPEN light (green) goes off.

	OPERATION		OBSERVE
	Pump Inlet Valve (LR-3)		
10.0	Connect a special d-c voltmeter across pin W (+) and pin X (-) of P109 at the Liquid Oxygen Transfer Unit. (Maintain this connection through step 10.2).	(a)	Meter indicates zero volts.
10.1	Throw the PUMP INLET VALVE switch to the close position. (Momentary type switch returns to center when released).	(a)	Meter indicates 28 volts dc.
10.2	Throw the PUMP INLET VALVE switch to the open position. (Release.)	(a)	Meter indicates zero volts.
10.3	Install a jumper between pin W of P109 and pin G of P110. (Leave jumper in until step 24.19).	(a)	No panel indication.
	Throttle Valve (LC-1)		
11.0	Connect a d-c voltmeter across pin G (+) and pin X (-) of P110 at the Liquid Oxygen Transfer Unit. (Maintain this connection through step 11.4).	(a)	Meter indicates zero volts.
11.1	Connect a d-c voltmeter across pin H (+) of P110 and pin X (-) of P109. (Maintain this connection during the following step.)	(a)	Meter indicates zero volts.
11.2	Throw the THROTTLE VALVE switch to the open position. (Release after observation - switch will return to center position.)	(a)	Both meters (Steps 11.0 and 11.1) indicate 28 volts dc. (Both meters indicate zero volts.)

	OPERATION	OBSERVE
11.3	Connect a d-c voltmeter across pin N (+) of P110 and pin X (-) of P109. (Maintain this connection during the following step.)	(a) Meter indicates zero volts.
11.4	Throw the THROTTLE VALVE switch to the close position. (Release after observation - switch will return to center position.)	(a) Both meters (Steps 11.0 and 11.3) indicate 28 volts dc. (Both meters indicate zero volts.)
11.5	Install a jumper between pin N of P110 and pin Q of P109 and another jumper between pin H of P110 and pin P of P109. (Leave both jumpers in until step 24.19.)	(a) No panel indication.
	Pump LC	
12.0	Install a jumper between terminals TB2 and TB3 (Pump LC) at the Tactical Switch Panel. (Remove the jumper after step 13.10).	(a) No panel indication.
12.1	Throw the THROTTLE VALVE switch to the open position and hold actuated until observations are completed. (Switch returns to center position when released.)	(a) THROTTLE LC-1 OPEN light (green) comes on. (Light goes off.) (b) After approximately 5 seconds, THROTTLE VALVE POWER ON light (green) comes on. (Light goes off.)
12.2	Throw the THROTTLE VALVE switch to the close position and hold actuated until observations are completed. (Switch returns to center position when released.)	(a) THROTTLE LC-1 CLOSED light (amber) comes on. (Light goes off.) (b) After approximately 5 seconds, THROTTLE VALVE POWER ON light (green) comes on. (Light goes off.

	OPERATION		OBSERVE
12.3	Press the PUMP LC START button.	(a)	PUMP LC POWER ON light (green) comes on.
		(b)	THROTTLE VALVE POWER ON light (green) comes on.
12.4	Throw the THROTTLE VALVE switch to the open position and hold actuated until observations are completed. (Switch returns to center position when released.)	(a)	THROTTLE LC-1 OPEN light (green) comes on. (Light goes off.)
		(b)	PUMP LC POWER ON and THROTTLE VALVE POWER ON lights (green) remain on.
12.5	Throw the THROTTLE VALVE switch to the close position and hold actuated until observations are completed. (Switch returns to center position when released.)	(a)	THROTTLE LC-1 CLOSED light (amber) comes on. (Light goes off.)
		(b)	PUMP LC POWER ON and THROTTLE VALVE POWER ON lights (green) remain on.
12.6	Press the PUMP LC STOP button.	(a)	PUMP LC POWER ON light (green) goes off.
		(b)	THROTTLE VALVE POWER ON light (green) goes off.
12.7	Press the PUMP LC START button.	(a)	PUMP LC POWER ON light (green) comes on.
		(b)	THROTTLE VALVE POWER ON light (green) comes on.
12.8	Throw the OPERATIONAL POWER switch to the off position. (After observation, throw switch on again.)	(a)	OPERATIONAL POWER ON light (green) goes off. (Light comes on.)
		(b)	PUMP LC POWER ON and THROTTLE VALVE POWER ON lights (green) go off.

	OPERATION	OBSERVE
	Pumps LA and LB	
13.0	Install a jumper between terminals TB2 and TB3 (Pump LA) and another jumper between terminals TB2 and TB3 (Pump LB) at the Tactical Switch Panel. (Leave both jumpers in until specified during the following procedure.)	(a) No panel indication.
13.1	Press the PUMPS LA AND LB START button.	(a) PUMP LB POWER ON light (green) comes on. (b) After a delay of approximately 5 seconds: PUMP LA POWER ON light (green) comes on.
13.2	Disconnect the jumper (Step 13.0) between TB2 and TB3 (Pump LA) at the Tactical Switch Panel. (Reconnect jumper after next step is complete.)	(a) No panel indication.
13.3	Press the PUMPS LA AND LB START button.	(a) PUMP LB POWER ON light (green) comes on. (After approximately 10 seconds the light goes off.
13.4	Reconnect jumper disconnected in Step 13.2. Disconnect the jumper (Step 13.0) between terminals TB2 and TB3 (Pump LB). (Reconnect jumper after next step is complete.)	(a) No panel indication.
13.5	Press the PUMPS LA AND LB START button.	(a) No panel indication.

	OPERATION		OBSERVE
13.6	Reconnect the jumper disconnected in Step 13.4. Press the PUMPS LA AND LB START button.	(a)	PUMP LB POWER ON light (green) comes on.
		(b)	After a delay of approximately 5 seconds: PUMP LA POWER ON light (green) comes on.
13.7	Press the PUMPS LA and LB STOP button.	(a)	PUMP LB POWER ON light (green) goes off.
		(b)	PUMP LA POWER ON light (green) goes off.
13.8	Press the PUMPS LA and LB START button.	(a)	PUMP LB POWER ON light (green) comes on.
		(b)	After a delay of approximately 5 seconds: PUMP LA POWER ON light (green) comes on.
13.9	Press the PUMP LB START button.	(a)	No panel indication.
13.10	Throw the OPERATIONAL POWER switch to the off position. (After observation, throw the switch on again).	(a)	OPERATIONAL POWER ON light (green) goes off. (Light comes on).
	(Remove the three jumpers at the Tactical Switch Panel that were connected in Steps 12.0 and 13.0.)	(b)	PUMP LB POWER ON and PUMP LA POWER ON lights (green) go off.
	Bypass Valves Switch		
14.0	Connect a special d-c voltmeter across pin R (+) and pin X (-) of P109, and another special d-c voltmeter across pin N of P109 and pin X (-) of P110. (Maintain these connections through step 14.3). (The negative sides of the meters may be left connected to the X pin on P109 and P110 until Step 21.3 is completed).	(a)	Both meters indicate zero volts.

	OPERATION		OBSERVE
14.1	Throw the PUMP BYPASS VALVES switch to the open position.	(a)	Both meters indicate 28 volts dc.
14.2	Throw the OPERATIONAL POWER switch to the off position.	(a)	OPERATIONAL POWER ON light (green) goes off.
		(b)	Both meters indicate zero volts.
14.3	Throw the PUMP BYPASS VALVES switch to the close position.	(a)	Both meters indicate zero volts.
	<u>Outlet Valves Switch</u>		
15.0	Connect a special d-c voltmeter across pin S (+) and pin X (-) of P1C9, and another special d-c voltmeter across pin O (+) of P1C9 and pin X (-) of P11C. (Maintain these connections through step 15.3).	(a)	Both meters indicate zero volts.
15.1	Throw the PUMP OUTLET VALVES switch to the open position.	(a)	Both meters indicate zero volts.
15.2	Throw the OPERATIONAL POWER switch to the on position.	(a)	OPERATIONAL POWER ON light (green) comes on.
		(b)	Both meters indicate 28 volts dc.
15.3	Throw the PUMP OUTLET VALVES switch to the close position.	(a)	Both meters indicate zero volts.
	<u>Cooler Inlet Valve LC-2 Switch</u>		
16.0	Connect a special d-c voltmeter across pin H (+) and pin X (-) of P1C9. (Maintain this connection through step 16.3).	(a)	Meter indicates zero volts.
16.1	Throw the COOLER INLET LC-2 switch to the open position.	(a)	Meter indicates 28 volts dc.

	OPERATION		OBSERVE
16.2	Throw the OPERATIONAL POWER switch to the off position.	(a)	OPERATIONAL POWER ON light (green) goes off.
		(b)	Meter indicates zero volts.
16.3	Throw the CCOLER INLET LC-2 switch to the close position.	(a)	Meter indicates zero volts.
	Pump Outlet Valve (LR-4)		
17.0	Connect a special d-c voltmeter across pin C (+) and pin X (-) of P109. (Maintain this connection through step 17.3).	(a)	Meter indicates zero volts.
17.1	Throw the PUMP OUTLET LR-4 switch to the open position.	(a)	Meter indicates zero volts.
17.2	Throw the OPERATIONAL POWER switch to the on position.	(a)	OPERATIONAL POWER ON light (green) comes on.
		(b)	Meter indicates 28 volts dc.
17.3	Throw the PUMP OUTLET LR-4 switch to the close position.	(a)	Meter indicates zero volts.
	Gravity Return Valve (LR-2)		
18.0	Connect a special d-c voltmeter across pin F (+) and pin X (-) of P109. (Maintain this connection through step 18.3)	(a)	Meter indicates zero volts.
18.1	Throw the GRAVITY RETURN LR-2 switch to the close position.	(a)	Meter indicates 28 volts dc.

	OPERATION	OBSERVE
18.2	Throw the OPERATIONAL POWER switch to the off position.	(a) OPERATIONAL POWER ON light (green) goes off. (b) Meter indicates zero volts.
18.3	Throw the GRAVITY RETURN LR-2 switch to the open position.	(a) Meter indicates zero volts.
	Pump LC Speed Control	
19.0	Throw the OPERATIONAL POWER switch to the on position.	(a) OPERATIONAL POWER ON light (green) comes on.
19.1	Connect a special d-c voltmeter across pin C (+) and pin X (-) of P110. (Maintain this connection through step 19.7).	(a) Meter indicates zero volts.
19.2	Connect a spedial d-c voltmeter across pin F (+) of P110 and pin X (-) of P109. (Maintain this connection through step 19.7).	(a) Meter indicates zero volts.
19.3	Press the PUMP LC SPEED INCREASE button. (Release).	(a) Meter on pin C (Step 19.1) indicates 28 volts dc. (Meter indicates zero volts.)
19.4	Press the PUMP LC SPEED DECREASE button. (Release.)	(a) Meter on pin F (Step 19.2) indicates 28 volts dc. (Meter indicates zero volts.)
19.5	Press both PUMP LC SPEED INCREASE button and PUMP LC SPEED DECREASE button simultaneously. (Release)	(a) Both meters indicate zero volts. (Either meter may deflect momentarily while pressing or releasing switches.)
19.6	Throw the OPERATIONAL POWER switch to the off position.	(a) OPERATIONAL POWER ON light (green) goes out.

	OPERATION		OBSERVE
19.7	Press the PUMP LC SPEED INCREASE button (release). Press the PUMP LC SPEED DECREASE button (release).	(a)	Both meters indicate zero volts at all times.
	Pump Return Valve (LR-1)		
20.0	Connect a special d-c voltmeter across pin Y (+) and pin X (-) of P109. (Maintain this connection through step 20.1).	(a)	Meter indicates zero volts.
20.1	Throw the PUMP RETURN LR-1 switch to the open position. (Return switch to the close position.)	(a)	Meter indicates 28 volts dc. (Meter indicates zero volts.)
	Overboard Valve (LM-1)		
21.0	Connect a special d-c voltmeter across pin K (+) and pin X (-) of P109. (Maintain this connection through step 21.2).	(a)	Meter indicates zero volts.
21.1	Throw OVERBOARD LM-1 switch to the open position.	(a)	Meter indicates 28 volts dc.
21.2	Throw OVERBOARD LM-1 switch to the close position.	(a)	Meter indicates zero volts.
21.3	Install a jumper between pin K and pin ϕ of P109. (Remove the jumper after step 24.19).	(a)	No panel indication.
	Pre-Fill		
22.0	Connect a d-c voltmeter across pin r (+) of P201 at the Pneumatic Aux Console and -28V DC bus. (Maintain this connection through Step 22.3).	(a)	Meter indicates zero volts.

	OPERATION	OBSERVE
22.1	Throw the PRE-FILL switch to the on position.	(a) PRE-FILL light (green) comes on. (b) Meter indicates 28 volts dc.
22.2	Throw the PANEL POWER switch to the off position. (Return to the on position after observations.)	(a) PANEL POWER light (green) goes off. (Light comes on.) (b) TEST POSITION ON light (red) goes off. (Light comes on). (c) PRE-FILL light (green) goes off. (Light comes on). (d) Meter (Step 22.0) indicates zero volts. (Meter indicates 28 volts).
22.3	Throw PRE-FILL switch to off position. (Disconnect + side of meter from P201-r after observations).	(a) PRE-FILL light (green) goes off. (b) Meter indicates zero volts dc.
	Step 3 Permission	
23.0	Connect a d-c voltmeter across pin q (+) of P201 at the Pneumatic Aux. Console and -28 bus. volts dc. (Maintain this connection through step 23.4).	(a) Meter indicates zero volts.
23.1	Throw the STEP 3 PERMISSION switch to the on position.	(a) STEP 3 PERMISSION light (green) comes on. (b) Meter indicates 28 volts dc.

	OPERATION	OBSERVE
23.2	Throw the PANEL POWER switch to the off position. (Return to on position after observations).	(a) PANEL POWER light (green) goes off. (Light comes on.)
		(b) TEST POSITION ON light (red) goes off. (Light comes on).
		(c) STEP 3 PERMISSION light (green) goes off. (Light comes on).
		(d) Meter (Step 23.0) indicates zero volts. (Meter indicates 28 volts.)
23.3	Throw the STEP 3 PERMISSION switch to the off position. (Disconnect meter after observations.)	(a) STEP 3 PERMISSION light (green) goes off.
		(b) Meter indicates zero volts.
23.4	Throw the OPERATIONAL POWER switch to the on position.	(a) OPERATIONAL POWER ON light (green) comes on.

Emergency Circuit

NOTE: Steps 24.0 through 24.5 verify that the jumpers installed in previous steps are still connected.

24.0	Throw the PUMP INLET LR-3 switch to the close position. (Throw to open position and release.)	(a) PUMP INLET LR-3 CLOSED light (amber) comes on. (Light goes off.)
24.1	Throw the THROTTLE LC-1 switch to the close position. (Release.) Throw to open position. (Release.)	(a) THROTTLE LC-1 CLOSED light (amber) comes on. (Light goes off.)
		(b) THROTTLE LC-1 OPEN light (green) comes on. (Light goes off.)

	OPERATION		OBSERVE
24.2	Throw the OVERBOARD LM-1 switch to the open position. (Throw to the close position.)	(a)	OVERBOARD LM-1 OPEN light (green) comes on. (Light goes off.)
24.3	Throw the DUMP VALVE switch to the open position. (Throw to the close position and release.)	(a)	DUMP VALVE OPEN light (green) comes on. (Light goes off.)
24.4	Throw the A-B VALVE switch to the open position. (Throw to the close position and release.)	(a)	A-B VALVE OPEN light (green) comes on. (Light goes off.)
24.5	Throw the FILL & DRAIN VALVE switch to the open position. (Throw to the close position and release.)	(a)	FILL & DRAIN VALVE OPEN light (green) comes on. (Light goes off.)
	NOTE: At this point, all lights lighted under OBSERVE 24.0 through 24.5 should be off.		
24.6	Press EMERGENCY button. (Release.)	(a)	EMERGENCY light (red) comes on.
		(b)	OPERATIONAL POWER ON light (green) goes off.
		(c)	PUMP INLET LR-3 CLOSED light (amber) comes on.
		(d)	THROTTLE LC-1 CLOSED light (amber) comes on.
		(e)	OVERBOARD LM-1 OPEN light (green) comes on.
		(f)	DUMP VALVE OPEN light (green) comes on.
		(g)	A-B VALVE OPEN light (green) comes on.
		(h)	FILL & DRAIN VALVE OPEN light (green) comes on.

	OPERATION	OBSERVE
24.7	Throw the PUMP INLET LR-3 switch to the open position. (Release.)	(a) PUMP INLET LR-3 CLOSED light (amber) goes off.
24.8	Throw the PUMP INLET LR-3 switch to the close position. (Release.)	(a) PUMP INLET LR-3 CLOSED light (amber) comes on.
24.9	Throw the THROTTLE LC-1 switch to the open position. (Release.)	(a) THROTTLE LC-1 CLOSED light (amber) goes off. (Light comes on.)
		(b) THROTTLE LC-1 OPEN light (green) comes on. (Light goes off.)
24.10	Throw the A-B VALVE switch to the close position. (Release.)	(a) A-B VALVE OPEN light (green) goes off. (Light comes on.)
24.11	Throw the FILL & DRAIN VALVE switch to the close position. (Release.)	(a) FILL & DRAIN VALVE OPEN light (green) goes off. (Light comes on.)
24.12	Throw the DUMP VALVE switch to the close position. (Release.)	(a) DUMP VALVE OPEN light (green) goes off.
24.13	Throw the DUMP VALVE switch to the open position. (Release.)	(a) DUMP VALVE OPEN light (green) comes on.
24.14	Press and hold EMERGENCY RESET button.	(a) EMERGENCY light (red) goes off.
		(b) THROTTLE LC-1 CLOSED light (amber) goes off.
		(c) OVERBOARD LN-1 OPEN light (green) goes off.
		(d) A-B VALVE OPEN light (green) goes off.

	OPERATION		OBSERVE
24.15	Release EMERGENCY RESET button.	(a)	OPERATIONAL POWER ON light (green) comes on.
24.16	Throw the PUMP INLET LR-3 switch to the open position. (Release.)	(a)	PUMP LR-3 VALVE CLOSED light (amber) goes off.
24.17	Throw the DUMP VALVE switch to the close position. (Release.)	(a)	DUMP VALVE OPEN light (green) goes off.
24.18	Throw the A-B VALVE switch to the close position. (Release.)	(a)	A-B VALVE OPEN light (green) goes off.
24.19	Remove the following jumpers: P109-M to P110-G (Step 10.3) P109-Q to P110-N (Step 11.5) P109-P to P110-H (Step 11.5) P109-K to P109-e (Step 21.3)	(a)	No indication.

Liquid Oxygen Level Indicators

25.0	Throw the A-B VALVE switch to the open position. (Release.)	(a)	A-B VALVE OPEN light (green) comes on. (Liquid Oxygen Tanking Panel)
25.1	Disconnect plug P102 from the Propellant Level Control Unit (7-43022) in the Cabinet-Amplifier Rack (7-68371) in the Transfer Room. Connect ohmmeters between pins n and k, p and k, u and k, v and k on P102. (Remove after Step 25.4).	(a)	No indications.
25.2	Throw the four LIQUID OXYGEN LEVEL PROBES switches on the Propellant Level Simulator Panel in the Signal Responder Trailer to the LIQUID position.	(a)	All meters indicate 2.. ohms.

	OPERATION		OBSERVE
25.3	Throw the four LIQUID OXYGEN LEVEL PROBES switches to the GAS position.	(a)	All meters indicate 10 ohms.
25.4	Throw the four LIQUID OXYGEN LEVEL PROBES switches to the FAIL position.	(a)	All meters indicate an open circuit.
25.5	Connect ohmmeters between pins x and c, w and c, s and c, r and c on P102. (Remove after Step 25.8).	(a)	No indications.
25.6	Throw the five FUEL LEVEL PROBES switches to the LIQUID position.	(a)	All meters indicate 47 ohms.
25.7	Throw the five FUEL LEVEL PROBES switches to the GAS position.	(a)	All meters indicate 10 ohms.
25.8	Throw the five FUEL LEVEL PROBES switches to the FAIL position.	(a)	All meters indicate an open circuit.
25.9	Apply +28 volts dc to pin J on P102. (Remove after Step 25.16).	(a)	95% light (red) comes on.
25.10	Apply +28 volts dc to pin H on P102. (Remove after Step 25.15).	(a)	OVERFILLED light (red) comes on.
		(b)	95% light (red) goes off.
		(c)	A-B VALVE OPEN light (green) goes off.
		(d)	FILL & DRAIN VALVE OPEN light (green) comes on.
		(e)	DUMP VALVE OPEN light (green) comes on.

	OPERATION		OBSERVE
25.11	Throw the A-B VALVE switch on the liquid Oxygen Tanking Control Console to the open position. (Switch returns to center when released.)	(a)	A-B VALVE OPEN light (green) comes on. (Light goes off when switch is released.)
25.12	Throw the FILL & DRAIN VALVE switch to the close position. (Switch returns to the center position when released).	(a)	FILL & DRAIN VALVE OPEN light (green) goes off. (Light comes on when switch is released.)
25.13	Throw the DUMP VALVE switch to the close position. (Switch returns to center position when released).	(a)	DUMP VALVE OPEN light (green) goes off. (Light comes on when switch is released).
25.14	Press the EMERGENCY button on the Liquid Oxygen Tanking Control Console. (After observations are completed, press the RESET button.	(a)	EMERGENCY light (red) comes on. (Light goes off).
		(b)	TEST POSITION ON light (green) goes off. (Light comes on.)
		(c)	OPERATIONAL POWER ON light (green) goes off. (Light comes on).
		(d)	A-B VALVE OPEN light (green) comes on. (Light goes off).
25.15	Remove +28 volts applied to pin H on P102.	(a)	OVERFILL light (red) goes off.
		(b)	"95%" light (red) comes on.
25.16	Remove +28 volts dc applied to pin J on P102.	(a)	"95%" light (red) goes off.

	OPERATION		OBSERVE
25.17	Throw the FILL & DRAIN VALVE switch to the close position. (Release).	(a)	FILL & DRAIN VALVE OPEN light (green) goes off.
25.18	Throw the DUMP VALVE switch to the close position. (Release).	(a)	DUMP VALVE OPEN light (green) goes off.
25.19	Remove the following jumpers: P106-H to P105-Y (Step 7.10) P106-B to P105-T (Step 9.4) Dump Valve Solenoid to OPEN light (Step 6.4)	(a)	No panel indication.
25.20	By use of a jumper and an ohmmeter, check the continuity of the wires originating from the following pins on P102 to their respective terminating points in the Blockhouse: pins A, B, C, D, E, F, G, L, M, N, O, P, Q, R, S, T, U, V, Y, Z, a.	(a)	Meter indicates circuit continuity in all cases.
25.21	Connect one end of an ohmmeter to pin e of P102 and one end of a jumper to pin m of P52 located in the Fuel Console in the Blockhouse. Connect the other end of the ohmmeter and jumper to the following pins in their respective order. (a) Ohmmeter: f — Jumper pin: k (b) Ohmmeter: X — Jumper pin: n (c) Ohmmeter: W — Jumper pin: p Remove the ohmmeter and jumper.	(a)	Meter indicates circuit continuity for all cases.

	OPERATION	OBSERVE
	Throttle Valve Meter	
26.0	Connect 14 volts dc between pins 1 (+) and X (-) of P109 at the Liquid Oxygen Transfer Unit.	(a) THROTTLE VALVE METER on the Liquid Oxygen Tanking Meter Panel indicates full scale deflection.
26.1	Disconnect the 14 volts (Step 26.0).	(a) THROTTLE VALVE METER indicates zero deflection.
	Storage Tank Pressure Meter	
	In the following steps, if the Lox Storage Tank Pressure Recorder has been removed from the Calibrating system, install a jumper between terminals 3 and 4 on the Calibrating Panel. (Z123)	
27.0	Mechanically adjust the Storage Tank Pressure meter and the Lox Storage Area Pressure Recorder (if available) to zero PSI. (Located in the Blockhouse)	(a) Check gauge at the pressure source.
27.1	Connect the Storage Tank Pressure Transducer (located in the Lox Storage Area) to a pressure signal source and throw the RUN-CALIB switch (located on the Pressure Calibration Panel) to the RUN position.	(a) No panel indication necessary.
27.2	With zero pressure on the Liquid Oxygen Storage Pressure Transducer, rotate the ZERO ADJ. until the Storage Tank Pressure Meter and the Tanking Pressure Recorder (if available) indicate zero PSI.	(a) Meter indicates correct reading.

	OPERATION		OBSERVE
27.3	Adjust the pressure signal source connected to the Storage Pressure Transducer for 50 PSI on the Transducer.	(a)	Check gauge at the pressure source.
27.4	Adjust the FULL SCALE ADJUST control as required while observing the correct meter indications.	(a)	STORAGE TANK PRESSURE meter indicates full scale deflection.
27.5	Throw the RUN-CALIB switch to the CALIB position.	(a)	No panel indication necessary.
27.6	Adjust the CALIB-STD. Control on the Calibrating Panel while observing the correct meter indication. Lock this control after performing the adjustment.	(a)	The LIQUID OXYGEN RECORDER indicates two major divisions less than full scale deflection.
27.7	Throw the RUN-CALIB switch to the OFF position. Disconnect the pressure signal source connected in Step 27.1.	(a)	No panel indication necessary.
	<u>Missile Tank Level Indicator</u>		
28.0	Insert a d-c voltmeter (0-30) into the jacks provided on the Propellant Level panel in the Signal Responder Trailer. Throw the POWER switch on the Propellant Level Simulator Panel in the Simulator Trailer to the ON position. Throw the POLARITY switch (Simulator Panel) to the NEG. position. Turn the NEG. ADJ. control (Simulator Panel) until the voltmeter (Simulator Panel) indicates -20 volts. Connect a d-c voltmeter between pins y and k on P102. (Remove after Step 28.2).	(a) (b)	POWER ON light (green) comes on. Meter indicates 20 volts dc.

	OPERATION		OBSERVE
28.1	Turn the NEG. ADJ. control (Propellant Panel) until the voltmeter (Propellant Panel) indicates zero volts.	(a)	Meter indicates zero volts.
28.2	Throw the POLARITY switch (Simulator Panel) to the POS. position. Turn the POS. ADJ. (Simulator Panel) until the voltmeter (Simulator Panel) indicates +5 volts.	(a)	Meter indicates 5 volts.
28.3	Apply 10V dc to pin K on P102.	(a)	MISSILE TANK LEVEL INDICATOR indicates 50%. (Liquid Oxygen Tanking Meter panel)
28.4	Apply 20V dc to pin K on P102.	(a)	MISSILE TANK LEVEL INDICATOR indicates 100%.
28.5	Apply 22.5V dc to pin K on P102. (Remove voltage after observation).	(a)	MISSILE TANK LEVEL INDICATOR indicates 105%.

NOTE: Potentiometers R13 and P11 in the Liquid Oxygen Tanking meter panel should be adjusted to obtain the indicated observation if necessary.

System Wiring

29.0	Disconnect P102 from J102. (Amplifier Rack Cabinet) Disconnect P76B from J76. (Liquid Oxygen Tanking Control-Meters Console)	(a)	No panel indication necessary.
29.1	Connect an ohmmeter between pins J76-K and J76-G.	(a)	Meter indicates circuit continuity for each connection.

	OPERATION	OBSERVE
29.2	Connect a d-c voltmeter across pins R (+) and X (-) of P110 at the Liquid Oxygen Transfer Unit. Connect a jumper between pins K and D of P76B at the Liquid Oxygen Tanking Controls-Meter Console.	(a) Meter indicates 28 volts dc.
29.3	Connect a voltmeter across pins k (+) and S (-) of P110. Connect a jumper between pins L and E of P76B.	(a) Meter indicates 28 volts dc.

Satisfactory completion of the foregoing procedure indicates that the electrical controls of the Liquid Oxygen Tanking Control System are valid. Return all switches to their normal positions, disconnect all test equipment and jumpers, secure the power sources, and return the system to its normal secured state.

TEST DATA SHEET

Equipment or System: LIQUID OXYGEN TANKING CONTROL CONSOLE
Top Assembly P/N:
Major Components Serial Nos.:

Version No.:
Location:
Inspected By:
Date Inspected:
Inspector Approved By:

Step No.	Validation Performed	Insp. Stamp
	Preparation . . . . . COMPLETE	
1.0	Panel Power . . . . . AVAILABLE	
2.0	Liquid Oxygen Missile Valve Heaters Circuit . . . . . SATISFACTORY	
3.0	Vent and Pressurization Valves Circuit . . . . . SATISFACTORY	
4.0	Valve Panel Lights Circuits . . . . . SATISFACTORY	
5.0	Super Cooler Liquid Nitrogen Supply Circuit . . . . . SATISFACTORY	
6.0	Dump Valve Circuit . . . . . SATISFACTORY	
7.0	Fill & Drain Valve Circuit . . . . . SATISFACTORY	
8.0	Operational Power Bus Circuit . . . . . SATISFACTORY	
9.0	A-B Valve Circuit . . . . . SATISFACTORY	
10.0	Pump Inlet Valve Circuit. . . . . SATISFACTORY	
11.0	Throttle Valve Circuit . . . . . SATISFACTORY	
12.0	Pump LC Circuit . . . . . SATISFACTORY	
13.0	Pumps LA and LB Circuit . . . . . SATISFACTORY	
14.0	Bypass Valves Switch Circuit . . . . . SATISFACTORY	

TEST DATA SHEET

Step No.	Validation Performed	Insp. Stamp
15.0	Outlet Valves Switch Circuit . . . . . SATISFACTORY	
16.0	Cooler Inlet Valves Switch Circuit . . . . . SATISFACTORY	
17.0	Pump Outlet Valve Circuit . . . . . SATISFACTORY	
18.0	Gravity Return Valve Circuit . . . . . SATISFACTORY	
19.0	Pump LC Speed Control Circuit . . . . . SATISFACTORY	
20.0	Pump Return Valve Circuit . . . . . SATISFACTORY	
21.0	Overboard Valve Circuit . . . . . SATISFACTORY	
22.0	Pre-Fill Circuit . . . . . SATISFACTORY	
23.0	Step 3 Permission Circuit . . . . . SATISFACTORY	
24.0	Emergency Circuit . . . . . SATISFACTORY	
25.0	Liquid Oxygen Level Circuit . . . . . SATISFACTORY	
26.0	Throttle Valve Meter Circuit . . . . . SATISFACTORY	
27.0	Storage Tank Pressure Meter Circuit . . . . . SATISFACTORY	
28.0	Missile Tank Level Indicator Circuit . . . . . SATISFACTORY	
29.0	System Wiring Circuits . . . . . SATISFACTORY	