

## SECTION VII

## MAINTENANCE INSTRUCTIONS, LAUNCH CONTROL CONSOLE

7-1. SCOPE OF SECTION.

7-2. This section includes instructions for checkout, trouble analysis, disassembly, cleaning, inspection, repair and replacement, lubrication, and reassembly of the launch control console.

7-3. CIRCUIT DESCRIPTION.

7-4. The launch control console provides the status indicators and controls to initiate command signals to the CCC for target selection, guidance handover, start launch sequence, raise launcher, launch, lower launcher, shutdown, and exercise. The console controls all three launchers within the launch complex.

7-5. BLOCK DIAGRAM ANALYSIS. (See figure 7-1.)

7-6. Indicators with switches and individual indicators are divided into four lamp quadrants. These quadrants include spare lamps that are color-coded to indicate the status of facilities or procedures before and during the launch sequence. The LAMP VERIFY switch on the back panel lights all spare lamps on the launch control console and sends a signal to the CCC that, in turn, lights all remaining lamps to complete the lamp check procedure.

7-7. DETAILED CIRCUIT ANALYSIS.

7-8. TYPICAL SWITCH AND INDICATOR CIRCUIT. The switch in the indicator circuit is not connected directly to the associated indicator. The CCC furnish readiness power to the switch. This momentary-type switch sends a signal to initiate the function at the CCC. The CCC returns a signal to the associated indicator to signify compliance.

7-9. TYPICAL EXERCISE INTERLOCK CIRCUITRY. The exercise circuit permits the missile and the facility to be operated through all the launch sequence operations except missile battery activation, transferring from ground to missile power, firing the engines, or generating the LIFT OFF signal. Exercise is performed by two actuations of the EXERCISE switch; first actuation enables exercise, second actuation enables launch. The EXERCISE indicators and their associated launch sequence indicators light when compliance and status signals are received from the CCC. Malfunction indications displayed during an exercise sequence are the same as malfunctions appearing during an actual launch sequence operation.

7-10. TYPICAL TARGET SELECTION CIRCUIT. (See figure 7-2.) The target selection switch is a pull-to-turn selector switch. It sends a constant signal designating a specific target to the guidance facility. This signal is interrupted only while a new target is being selected. When the target information is received, the guidance station returns a compliance signal to the applicable indicator to signify target selection has been locked in the guidance system.

7-11. TEST SETUP.

7-12. To prepare the launch control console for checkout, proceed as follows:

- a. Obtain the test equipment listed in figure 3-1.

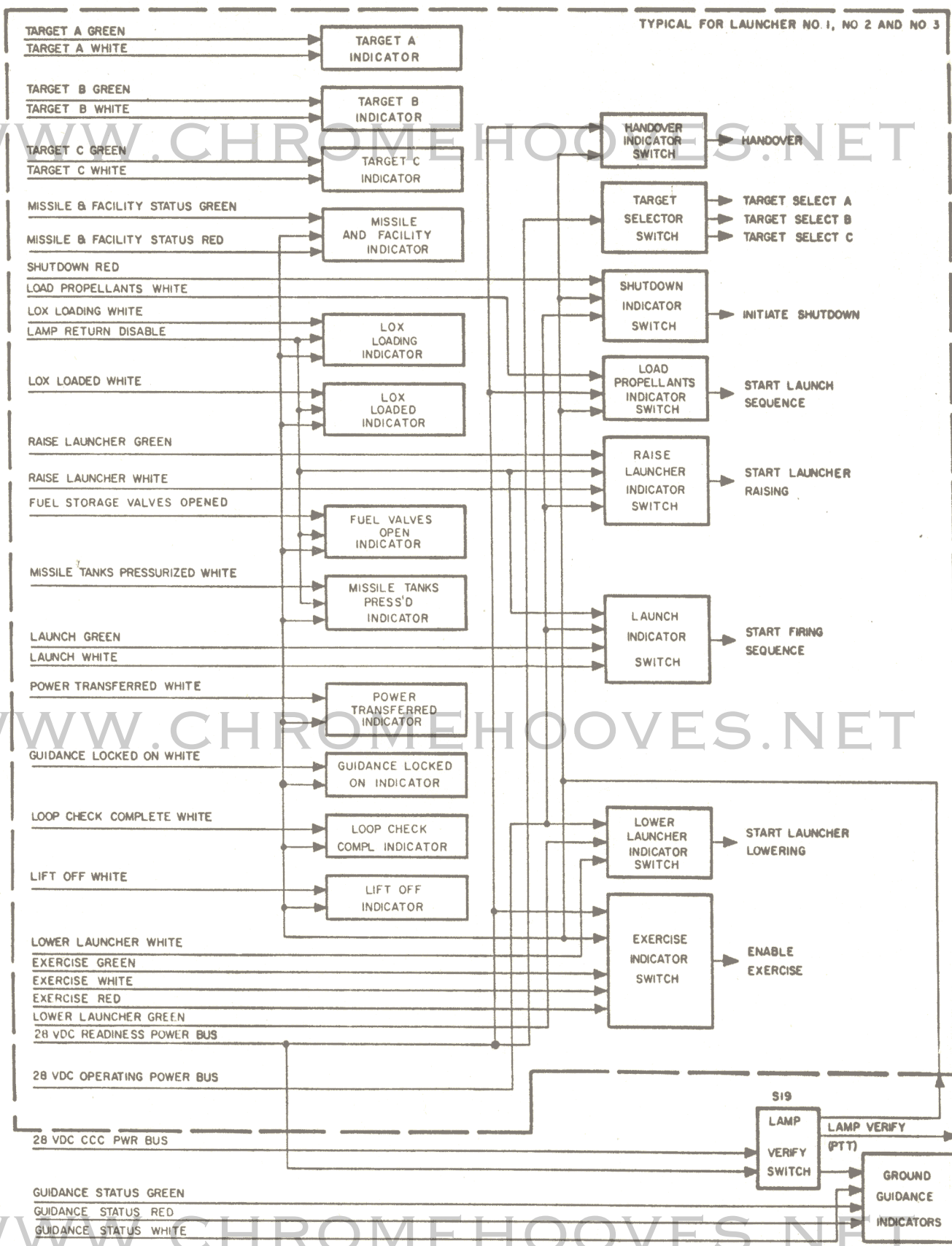
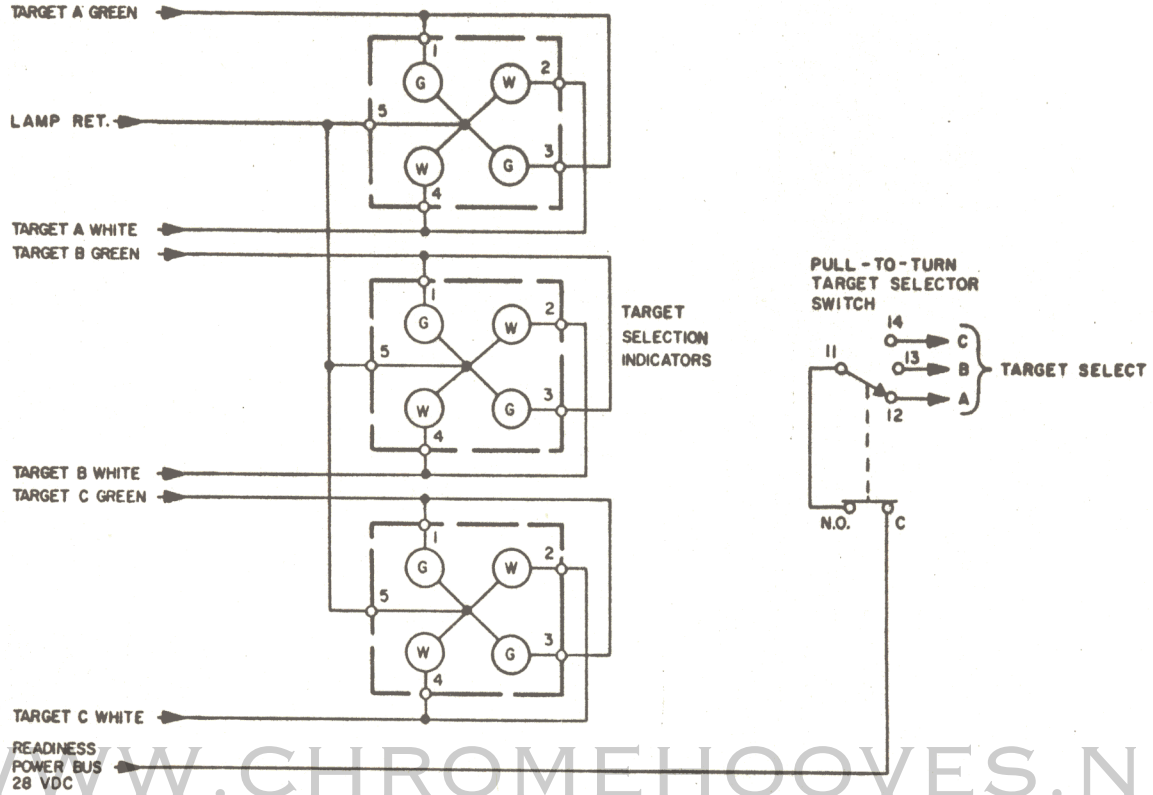


Figure 7-1. Launch Control Console Block Diagram

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Figure 7-2. Typical Target Selection Circuit Schematic

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b. Disconnect all external wiring from control center circuits to terminal boards TB1 through TB7.

c. To ensure proper ground isolation, check for a resistance of 10 megohms or greater between console back panel and TB5-2, -4, -6, and -8.

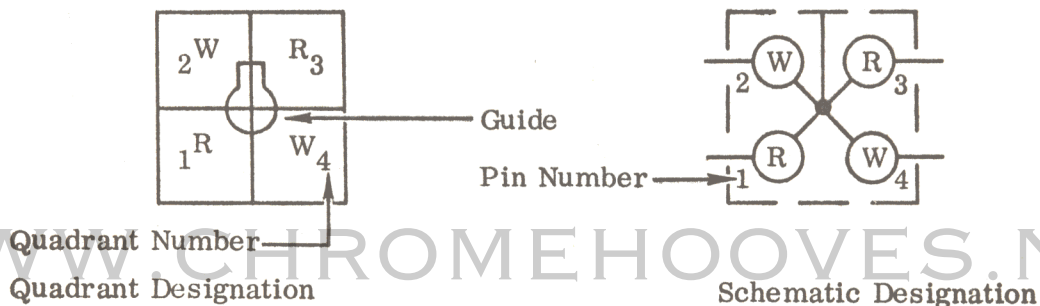
### 7-13. CHECKOUT.

7-14. The table of checkout procedures lists the normal results, and directs the maintenance technician to the applicable trouble analysis procedure for any abnormal results.

7-15. Use the procedure given in figure 7-3 to perform a complete checkout or individual circuit checkout of the launch control console. Perform steps in order given to obtain proper results.

#### Note

A numerical quadrant designation is used to identify lamp position. Quadrant designations of these indicators are relative to the guide position and are identical with corresponding pin numbers as indicated below:



### 7-16. TROUBLE ANALYSIS.

#### WARNING

Remove power from the launch control console before removing any part or assembly. Injury from burns as a result of short circuiting as well as malfunction may occur.

7-17. Trouble can be localized within the launch control console by observing the checkout results or by performing the steps in the trouble analysis table (figure 7-4). This table localizes trouble to a circuit or to a faulty part. If the trouble is in a circuit, the faulty part can then be isolated by following the instructions in the table. While using the trouble analysis table, see figure 7-5. Faulty components can be repaired or replaced by normal techniques or as directed in the corrective action column.

(Text continued on page 7-28.)



STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
	<p style="text-align: center;"><b>CAUTION</b></p> <p>Do not apply more than 30 VDC to any terminal.</p> <p>During the replacement of lamps and lamp modules of pushbutton indicators, use caution when replacing the lens cap to prevent activation of switch. The lens cap should be inserted until a barely audible clicking sound indicates that the locking mechanism has engaged. No additional pressure should be applied as this may activate the switch.</p> <p style="text-align: center;"><b>Note</b></p> <p>Raise front panel prior to starting this procedure. (See figure 1-5 for all lamp quadrant designations.) During checkout power supplied by test equipment is applied to the console terminals. Remove this voltage at the completion of each step unless instructed to do otherwise.</p> <p><b>LAMP VERIFY SWITCH CHECK.</b></p>		
1	<p>Apply 28 VDC to TB5-5. Connect power supply return and negative lead of multimeter to TB5-6. Hold LAMP VERIFY switch to ON.</p>	<p>Check for 28(+2, -3) VDC at TB5-15.</p>	<p>Replace S19.</p>
2	<p><b>GROUND GUIDANCE SPARE LAMP CIRCUITRY.</b></p> <p>Hold LAMP VERIFY switch to ON.</p>	<p>DS22 quadrant 1 white and quadrant 2 green lamps light.</p>	<p>See figure 7-4.</p> <p>Step 1.</p>

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 1 of 19)

STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
3	<p>LAUNCHER NO. 1 SPARE AND HANDOVER LAMP CIRCUITRY.</p> <p>Apply 28 VDC to TB5-1. Connect power supply return to TB5-2 and TB1-15. Hold LAMP VERIFY switch to ON.</p>	<p>DS1 quadrants 1 and 3 red and quadrants 2 and 4 white lamps light.</p> <p>DS5 quadrants 1 and 3 green lamps light.</p> <p>DS6 quadrants 2 and 4 white lamps light.</p> <p>DS7, DS8, DS9, DS11, DS12, DS14, DS15, DS16, and DS17 quadrants 1 and 3 red lamps light.</p> <p>DS20 quadrant 3 white and quadrant 4 green lamps light.</p>	Steps 2 thru 4.
4	<p>LAUNCHER NO. 2 SPARE AND HANDOVER LAMP CIRCUITRY.</p> <p>Apply 28 VDC to TB5-3. Connect power supply return to TB5-4 and TB3-17. Hold LAMP VERIFY switch to ON.</p>	<p>DS23 quadrants 1 and 3 red lamps and quadrants 2 and 4 white lamps light.</p> <p>DS27 quadrants 1 and 3 green lamps light.</p> <p>DS28 quadrants 2 and 4 white lamps light.</p> <p>DS29, DS30, DS31, DS33, DS34, DS36, DS37, DS38, and DS39 quadrants 1 and 3 red lamps light.</p> <p>DS42 quadrant 3 white and quadrant 4 green lamps light.</p>	Steps 5 thru 7.
5	<p>LAUNCHER NO. 3 SPARE AND HANDOVER LAMP CIRCUITRY.</p> <p>Apply 28 VDC to TB5-9. Connect power supply return to TB5-8 and</p>	<p>DS43 quadrants 1 and 3 red lamps and quadrants 2 and 4 white lamps light.</p>	Steps 8 thru 10.

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 2 of 19)

STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
5 (CONT)	TB6-17. Hold LAMP VERIFY switch to ON.  GROUND GUIDANCE OPERATIONAL CIRCUITRY.	DS47 quadrants 1 and 3 green lamps light.  DS48 quadrants 2 and 4 white lamps light.  DS49, DS50, DS51, DS53, DS54, DS56, DS57, DS58, and DS59 quadrants 1 and 3 red lamps light.  DS62 quadrant 3 white and quadrant 4 green lamps light.	
6	Connect power supply return to TB5-6. Apply 28 VDC to TB5-12.	DS21 quadrants 1 and 2 red lamps light.	Replace lamps.
7	Apply 28 VDC to TB5-13.	DS22 quadrant 3 white and DS21 quadrant 4 white lamps light.	Replace lamps.
8	Apply 28 VDC to TB5-14.	DS22 quadrant 4 green and DS21 quadrant 3 green lamps light.	Replace lamps.
9	LAUNCHER NO. 1 OPERATIONAL CIRCUITRY.  Connect power supply return and negative lead of multimeter to TB5-2. Apply 28 VDC to TB5-1.  <p style="text-align: center;"><b>Note</b></p> Before removing 28 VDC from TB5-1, complete steps 10 thru 12.		
10	Set LAUNCHER NO. 1 TARGET SELECTION switch to A.	Check for 28(+2, -3) VDC at TB1-2. Check for no voltage at TB1-3 and -4.	Replace S2.

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 3 of 19)

STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
11	Set LAUNCHER NO. 1 TARGET SELECTION switch to B.	Check for 28(+2, -3) VDC at TB1-3. Check for no voltage at TB1-2 and -4.	Replace S2.
12	Set LAUNCHER NO. 1 TARGET SELECTION switch to C.	Check for 28(+2, -3) VDC at TB1-4. Check for no voltage at TB1-2 and -3.	Replace S2.
13	Connect power supply return to TB5-2 and TB1-15.		
14	Apply 28 VDC to TB1-5.	DS2 quadrants 2 and 4 green lamps light.	Replace lamps.
15	Apply 28 VDC to TB1-6.	DS2 quadrants 1 and 3 white lamps light.	Replace lamps.
16	Apply 28 VDC to TB1-7.	DS3 quadrants 2 and 4 green lamps light.	Replace lamps.
17	Apply 28 VDC to TB1-8.	DS3 quadrants 1 and 3 white lamps light.	Replace lamps.
18	Apply 28 VDC to TB1-9.	DS4 quadrants 2 and 4 green lamps light.	Replace lamps.
19	Apply 28 VDC to TB1-10.	DS4 quadrants 1 and 3 white lamps light.	Replace lamps.
20	Apply 28 VDC to TB1-11.	DS5 quadrants 1 and 3 green lamps light.	Replace lamps, resistor R26, or diode CR7 on TB18.
21	Apply 28 VDC to TB1-12.	DS5 quadrants 2 and 4 red lamps light.	Replace lamps.

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 4 of 19)



STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
22	Apply 28 VDC to TB1-13.	DS6 quadrants 1 and 3 red lamps light.	Replace lamps.
23	Apply 28 VDC to TB1-17.	DS7 quadrants 2 and 4 white lamps light.	Replace lamps.
24	Apply 28 VDC to TB1-18.	DS8 quadrants 2 and 4 white lamps light.	Replace lamps.
25	Apply 28 VDC to TB1-19.	DS9 quadrants 2 and 4 white lamps light.	Replace lamps.
26	Apply 28 VDC to TB2-1.	DS10 quadrants 1 and 3 green lamps light.	Replace lamps.
27	Apply 28 VDC to TB2-3.	DS10 quadrants 2 and 4 white lamps light.	Replace lamps.
28	Apply 28 VDC to TB2-4.	DS11 quadrants 2 and 4 white lamps light.	Replace lamps.
29	Apply 28 VDC to TB2-5.	DS12 quadrants 2 and 4 white lamps light.	Replace lamps.
30	Apply 28 VDC to TB2-6.	DS13 quadrants 1 and 3 green lamps light.	Replace lamps.
31	Apply 28 VDC to TB2-8.	DS13 quadrants 2 and 4 white lamps light.	Replace lamps.
32	Apply 28 VDC to TB2-9.	DS14 quadrants 2 and 4 white lamps light.	Replace lamps.
33	Apply 28 VDC to TB2-10.	DS15 quadrants 2 and 4 white lamps light.	Replace lamps.

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 5 of 19)

STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
34	Apply 28 VDC to TB2-11.	DS16 quadrants 2 and 4 white lamps light.	Replace lamps.
35	Apply 28 VDC to TB2-12.	DS17 quadrants 2 and 4 white lamps light.	Replace lamps.
36	Apply 28 VDC to TB2-13.	DS18 quadrants 1 and 3 green lamps light.	Replace lamps.
37	Apply 28 VDC to TB2-15.	DS18 quadrants 2 and 4 white lamps light.	Replace lamps.
38	Apply 28 VDC to TB2-16.	DS19 quadrant 2 white and DS20 quadrant 1 white lamps light.	Replace lamps.
39	Apply 28 VDC to TB2-18.	DS19 quadrants 4 and 3 red lamps light.	Replace lamps.
40	Apply 28 VDC to TB2-19.	DS19 quadrant 1 green and DS20 quadrant 2 green lamps light.	Replace lamps.
41	<p>Remove power supply return from TB1-15. Connect power supply return and negative lead of multi-meter to TB5-2. Apply 28 VDC to TB5-1.</p> <p style="text-align: center;"><b>Note</b></p> <p>Before removing 28 VDC from TB5-1, complete steps 42 thru 45.</p>		

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 6 of 19)

STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
42	Press to close S1.	Check for 28(+2, -3) VDC at TB1-1.  <p style="text-align: center;"><b>Note</b></p> If meter does not indicate 28(+2, -3) VDC, press S1 again.  DS1 quadrants 2 and 4 white lamps light.  No spare lamps light.	Replace S1.  Steps 11 and 12.  Replace CR1.
43	Press to release S1.	DS1 white lamps go out.	Replace S1.
44	Press to close and hold S4.	Check for no voltage at TB-1.	Replace S4.
45	Release S4.	Check for 28(+2, -3) VDC at TB1-16.	Replace S4.
46	Remove power supply return from TB5-2. Connect power supply return and negative lead of multi-meter to TB5-2. Apply 28 VDC to TB5-7.  <p style="text-align: center;"><b>Note</b></p> Before removing 28 VDC from TB5-7, complete steps 47 thru 54.	Check for no voltage at TB1-16.	Replace S4.
47	Press to close and hold S3.	Check for 28(+2, -3) VDC at TB1-14.	Replace S3.
48	Release S3.	Check for no voltage at TB1-14.	Replace S3.

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 7 of 19)

STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
49	Press to close and hold S5.	Check for 28(+2, -3) VDC at TB2-2.	Replace S5.
50	Release S5.	Check for no voltage at TB2-2.	Replace S5.
51	Press to close and hold S6.	Check for 28(+2, -3) VDC at TB2-7.	Replace S6.
52	Release S6.	Check for no voltage at TB2-7.	Replace S6.
53	Press to close and hold S7.	Check for 28(+2, -3) VDC at TB2-14.	Replace S7.
54	Release S7.	Check for no voltage at TB2-14.	Replace S7.
55	Remove power supply return and negative lead of multimeter from TB5-6 and connect to TB5-2. Apply 28 VDC to TB5-1.		
56	Remove safety wire on EXERCISE 1 switch.		
	<b>Note</b> Before removing 28 VDC from TB5-1, complete steps 57 and 58.		
57	Press EXERCISE 1 switch.	Check for no voltage at TB2-17.	Replace S8.
		<b>Note</b> If meter indicates 28(+2, -3) VDC, press switch again.	
58	Press EXERCISE 1 switch.	Check for 28(+2, -3) VDC at TB2-17.	Replace S8.

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 8 of 19)



STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
59	<p>LAUNCHER NO. 2 OPERATIONAL CIRCUITRY.</p> <p>Connect power supply return and negative lead of multimeter to TB5-4. Apply 28 VDC to TB5-3.</p> <p style="text-align: center;"><b>Note</b></p> <p>Before removing 28 VDC from TB5-3, complete steps 60 thru 62.</p>		
60	Set LAUNCHER NO. 2 TARGET SELECTION switch to A.	Check for 28(+2, -3) VDC at TB3-2. Check for no voltage at TB3-3 and -4.	Replace S11.
61	Set LAUNCHER NO. 2 TARGET SELECTION switch to B	Check for 28(+2, -3) VDC at TB3-3. Check for no voltage at TB3-2 and -4.	Replace S11.
62	Set LAUNCHER NO. 2 TARGET SELECTION switch to C.	Check for 28(+2, -3) VDC at TB3-4. Check for no voltage at TB3-2 and -3.	Replace S11.
63	Connect power supply return to TB3-17 and TB5-4. Apply 28 VDC to TB3-5.	DS24 quadrants 2 and 4 green lamps light.	Replace lamps.
64	Apply 28 VDC to TB3-6.	DS24 quadrants 1 and 3 white lamps light.	Replace lamps.
65	Apply 28 VDC to TB3-7.	DS25 quadrants 2 and 4 green lamps light.	Replace lamps.
66	Apply 28 VDC to TB3-8.	DS25 quadrants 1 and 3 white lamps light.	Replace lamps.

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 9 of 19)

STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
67	Apply 28 VDC to TB3-9.	DS26 quadrants 2 and 4 green lamps light.	Replace lamps.
68	Apply 28 VDC to TB3-10.	DS26 quadrants 1 and 3 white lamps light.	Replace lamps.
69	Apply 28 VDC to TB3-12.	DS27 quadrants 2 and 4 red lamps light.	Replace lamps.
70	Apply 28 VDC to TB3-11.	DS27 quadrants 1 and 3 green lamps light.	Replace lamps, resistor R27 or diode CR8 on TB18.
71	Apply 28 VDC to TB3-13.	DS28 quadrants 1 and 3 red lamps light.	Replace lamps.
72	Apply 28 VDC to TB3-16.	DS29 quadrants 2 and 4 white lamps light.	Replace lamps.
73	Apply 28 VDC to TB3-18.	DS30 quadrants 2 and 4 white lamps light.	Replace lamps.
74	Apply 28 VDC to TB3-19.	DS31 quadrants 2 and 4 white lamps light.	Replace lamps.
75	Apply 28 VDC to TB4-1.	DS32 quadrants 1 and 3 green lamps light.	Replace lamps.
76	Apply 28 VDC to TB4-3.	DS32 quadrants 2 and 4 white lamps light.	Replace lamps.

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 10 of 19)

STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
77	Apply 28 VDC to TB4-4.	DS33 quadrants 2 and 4 white lamps light.	Replace lamps.
78	Apply 28 VDC to TB4-5.	DS34 quadrants 2 and 4 white lamps light.	Replace lamps.
79	Apply 28 VDC to TB4-6.	DS35 quadrants 1 and 3 green lamps light.	Replace lamps.
80	Apply 28 VDC to TB4-8.	DS35 quadrants 2 and 4 white lamps light.	Replace lamps.
81	Apply 28 VDC to TB4-9.	DS36 quadrants 2 and 4 white lamps light.	Replace lamps.
82	Apply 28 VDC to TB4-10.	DS37 quadrants 2 and 4 white lamps light.	Replace lamps.
83	Apply 28 VDC to TB4-11.	DS38 quadrants 2 and 4 white lamps light.	Replace lamps.
84	Apply 28 VDC to TB4-12.	DS39 quadrants 2 and 4 white lamps light.	Replace lamps.
85	Apply 28 VDC to TB4-13.	DS40 quadrants 1 and 3 green lamps light.	Replace lamps.
86	Apply 28 VDC to TB4-15.	DS40 quadrants 2 and 4 white lamps light.	Replace lamps.
87	Apply 28 VDC to TB4-16.	DS41 quadrant 2 white and DS42 quadrant 1 white lamps light.	Replace lamps.
88	Apply 28 VDC to TB4-18.	DS41 quadrants 3 and 4 red lamps light.	Replace lamps.

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 11 of 19)

STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
89	Apply 28 VDC to TB4-19.	DS41 quadrant 1 green and DS42 quadrant 2 green lamps light.	Replace lamps.
90	Remove power supply return from TB3-17 and TB5-4. Connect power supply return and negative lead of multimeter to TB5-4. Apply 28 VDC to TB5-3.  <p style="text-align: center;"><b>Note</b></p> Before removing 28 VDC from TB5-3, complete steps 91 thru 94.		
91	Press to close S10.	DS23 quadrants 2 and 4 white lamps light. Check for 28 VDC at TB3-1.  <p style="text-align: center;"><b>Note</b></p> If meter does not indicate 28(+2, -3) VDC, press switch again.  No spare lamps light.	Steps 13 and 14.   Replace CR3.
92	Press to release S10.	DS23 white lamps go out.  Check for no voltage at TB3-1.	Replace S10.
93	Press to close and hold S13.	Check for 28(+2, -3) VDC at TB3-15.	Replace S13.
94	Release S13.	Check for no voltage at TB3-15.	Replace S13.

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 12 of 19)



STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
95	Leave power supply return and negative lead of multimeter connected to TB5-4. Apply 28 VDC to TB5-11.  <p style="text-align: center;"><b>Note</b></p> Before removing 28 VDC from TB5-11, complete steps 96 thru 103.		
96	Press to close and hold S12.	Check for 28(+2, -3) VDC at TB3-14.	Replace S12.
97	Release S12.	Check for no voltage at TB3-14.	Replace S12.
98	Press to close and hold S14.	Check for 28(+2, -3) VDC at TB4-2.	Replace S14.
99	Release S14.	Check for no voltage at TB4-2.	Replace S14.
100	Press to close and hold S15.	Check for 28(+2, -3) VDC at TB4-7.	Replace S15.
101	Release S15.	Check for no voltage at TB4-7.	Replace S15.
102	Press to close and hold S16.	Check for 28(+2, -3) VDC at TB4-14.	Replace S16.
103	Release S16.	Check for no voltage at TB4-14.	Replace S16.

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 13 of 19)

STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
104	Remove power supply return and negative lead of multimeter from TB5-6 and connect to TB5-4. Apply 28 VDC to TB5-3.  <p style="text-align: center;"><b>Note</b></p> Before removing 28 VDC from TB5-3, complete steps 105 thru 107.		
105	Remove safety wire on EXERCISE 2 switch.		
106	Press EXERCISE 2 switch.	Check for no voltage at TB4-17.  <p style="text-align: center;"><b>Note</b></p> If multimeter indicates 28(+2, -3) VDC, press EXERCISE switch again.	Replace S17.
107	Press EXERCISE 2 switch.  LAUNCHER NO. 3 OPERATIONAL CIRCUITRY.	Check for 28(+2, -3) VDC at TB4-17.	Replace S17.
108	Connect power supply return and negative lead of multimeter to TB5-8. Apply 28 VDC to TB5-9.  <p style="text-align: center;"><b>Note</b></p> Before removing 28 VDC from TB5-9, complete steps 109 thru 111.		

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 14 of 19)

STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
109	Set LAUNCHER NO. 3 TARGET SELECTION switch to A.	Check for 28(+2, -3) VDC at TB6-2. Check for no voltage at TB6-3 and -4.	Replace S21.
110	Set LAUNCHER NO. 3 TARGET SELECTION switch to B.	Check for 28(+2, -3) VDC at TB6-3. Check for no voltage at TB6-2 and -4.	Replace S21.
111	Set LAUNCHER NO. 3 TARGET SELECTION switch to C.	Check for 28(+2, -3) VDC at TB6-4. Check for no voltage at TB6-2 and -3.	Replace S21.
112	Connect power supply return to TB5-8 and TB6-17. Apply 28 VDC to TB6-5.	DS44 quadrants 2 and 4 green lamps light.	Replace lamps.
113	Apply 28 VDC to TB6-6.	DS44 quadrants 1 and 3 white lamps light.	Replace lamps.
114	Apply 28 VDC to TB6-7.	DS45 quadrants 2 and 4 green lamps light.	Replace lamps.
115	Apply 28 VDC to TB6-8.	DS45 quadrants 1 and 3 white lamps light.	Replace lamps.
116	Apply 28 VDC to TB6-9.	DS46 quadrants 2 and 4 green lamps light.	Replace lamps.
117	Apply 28 VDC to TB6-10.	DS46 quadrants 1 and 3 white lamps light.	Replace lamps.
118	Apply 28 VDC to TB6-12.	DS47 quadrants 2 and 4 red lamps light.	Replace lamps.
119	Apply 28 VDC to TB6-11.	DS47 quadrants 1 and 3 green lamps light.	Replace lamps, resistor R28 or diode CR9 on TB18.

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 15 of 19)

STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
120	Apply 28 VDC to TB6-13.	DS48 quadrants 1 and 3 red lamps light.	Replace lamps.
121	Apply 28 VDC to TB6-15.	DS49 quadrants 2 and 4 white lamps light.	Replace lamps.
122	Apply 28 VDC to TB6-18.	DS50 quadrants 2 and 4 white lamps light.	Replace lamps.
123	Apply 28 VDC to TB6-19.	DS51 quadrants 2 and 4 white lamps light.	Replace lamps.
124	Apply 28 VDC to TB7-1.	DS52 quadrants 1 and 3 green lamps light.	Replace lamps.
125	Apply 28 VDC to TB7-3.	DS52 quadrants 2 and 4 white lamps light.	Replace lamps.
126	Apply 28 VDC to TB7-4.	DS53 quadrants 2 and 4 white lamps light.	Replace lamps.
127	Apply 28 VDC to TB7-5.	DS54 quadrants 2 and 4 white lamps light.	Replace lamps.
128	Apply 28 VDC to TB7-6.	DS55 quadrants 1 and 3 green lamps light.	Replace lamps.
129	Apply 28 VDC to TB7-8.	DS55 quadrants 2 and 4 white lamps light.	Replace lamps.
130	Apply 28 VDC to TB7-9.	DS56 quadrants 2 and 4 white lamps light.	Replace lamps.
131	Apply 28 VDC to TB7-10.	DS57 quadrants 2 and 4 white lamps light.	Replace lamps.

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 16 of 19)



STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
132	Apply 28 VDC to TB7-11.	DS58 quadrants 2 and 4 white lamps light.	Replace lamps.
133	Apply 28 VDC to TB7-12.	DS59 quadrants 2 and 4 white lamps light.	Replace lamps.
134	Apply 28 VDC to TB7-13.	DS60 quadrants 1 and 3 green lamps light.	Replace lamps.
135	Apply 28 VDC to TB7-15.	DS60 quadrants 2 and 4 white lamps light.	Replace lamps.
136	Apply 28 VDC to TB7-16.	DS61 quadrants 2 white and DS62 quadrant 1 white lamps light.	Replace lamps.
137	Apply 28 VDC to TB7-18.	DS61 quadrants 3 and 4 red lamps light.	Replace lamps.
138	Apply 28 VDC to TB7-19.	DS61 quadrant 1 green and DS62 quadrant 2 green lamps light.	Replace lamps.
139	<p>Connect power supply return and negative lead of multimeter to TB-5-8. Apply 28 VDC to TB5-9.</p> <p><b>Note</b> Before removing 28 VDC from TB5-9, complete steps 140 thru 143.</p>		
140	Press to close S20.	<p>DS43 quadrants 2 and 4 white lamps light. Check for 28(+2, -3) VDC at TB6-1.</p> <p>No spare lamps light.</p>	<p>Steps 15 and 16.</p> <p>Replace CR5.</p>

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 17 of 19)

STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
141	Press to release S20.	DS43 white lamps go out. Check for no voltage at TB6-1.	Replace S20.
142	Press to close and hold S23.	Check for 28(+2, -3) VDC at TB6-16.	Replace S23.
143	Release S23.	Check for no voltage at TB6-16.	Replace S23.
144	Remove power supply return and negative lead of multimeter from TB5-8 and connect to TB5-6. Apply 28 VDC to TB5-10.  <b>Note</b> Before removing 28 VDC from TB5-10, complete steps 145 thru 152.		
145	Press to close and hold S22.	Check for 28(+2, -3) VDC at TB6-14.	Replace S22.
146	Release S22.	Check for no voltage at TB6-14.	Replace S22.
147	Press to close and hold S24.	Check for 28(+2, -3) VDC at TB7-2.	Replace S24.
148	Release S24.	Check for no voltage at TB7-2.	Replace S24.
149	Press to close and hold S25.	Check for 28(+2, -3) VDC at TB7-7.	Replace S25.
150	Release S25.	Check for no voltage at TB7-7.	Replace S25.
151	Press to close and hold S26.	Check for 28(+2, -3) VDC at TB7-14.	Replace S26.
152	Release S26.	Check for no voltage at TB7-14.	Replace S26.

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 18 of 19)

STEP	PROCEDURE	NORMAL RESULT	TROUBLE ANALYSIS
153	Connect power supply return and negative lead of multimeter to TB5-8. Apply 28 VDC to TB5-9.  <p style="text-align: center;"><b>Note</b></p> Before removing 28 VDC from TB5-9, complete steps 155 and 157.		
154	Remove safety wire on EXERCISE 3 switch.		
155	Press EXERCISE 3 switch.	Check for no voltage at TB7-17.  <p style="text-align: center;"><b>Note</b></p> If multimeter indicates 28(+2, -3) VDC, press switch again.	Replace S27.
156	Press EXERCISE 3 switch.	Check for 28(+2, -3) VDC at TB7-17.	Replace S17.
157	Replace safety wire on EXERCISE 1, 2, and 3 switches.		

Figure 7-3. Table of Checkout Procedures for Launch Control Console (Sheet 19 of 19)

STEP	MALFUNCTION INDICATION	TROUBLESHOOTING PROCEDURES	CORRECTIVE ACTION
<div style="border: 2px dashed black; padding: 5px; display: inline-block; margin-bottom: 10px;"><b>CAUTION</b></div> <p>During the replacement of lamps and lamp modules of pushbutton indicators, use caution when replacing the lens cap to prevent activation of switch. The lens cap should be inserted until a barely audible clicking sound indicates that the locking mechanism has engaged. No additional pressure should be applied as this may activate the switch.</p>			
1	<p>GROUND GUIDANCE SPARE LAMP CIRCUITRY.</p> <p>DS22 white or green lamps remain off.</p>	<p>(See figure 7-3.)</p> <p>LAMP VERIFY switch to ON. Check for 28(+2, -3) VDC at pin 2 of S19.</p> <p>LAMP VERIFY switch to ON. Check for voltage at pin 2 of DS22.</p> <p>Remove 28 VDC from TB5-5. Using multi-meter, check for continuity between TB5-6 and pins 2 and 3 of DS22.</p>	<p>Replace S19.</p> <p>Replace R9.</p> <p>Replace lamp.</p>
2	<p>LAUNCHER NO. 1 SPARE LAMP CIRCUITRY.</p> <p>LAUNCHER NO. 1 spare lamps remain off.</p>	<p>(See figure 7-3.)</p> <p>Check for continuity from terminals -10 to to -11 of LAMP VERIFY switch with switch set to ON.</p>	<p>Replace S19.</p>
3	<p>One spare lamp in any LAUNCHER NO. 1 quadrant remains off.</p>		<p>Replace lamp.</p>

Figure 7-4. Table of Trouble Analysis for Launch Control Console (Sheet 1 of 4)



STEP	MALFUNCTION INDICATION	TROUBLESHOOTING PROCEDURES	CORRECTIVE ACTION
4	Two spare lamps in any LAUNCHER NO. 1 quadrant remain off.  LAUNCHER NO. 2 SPARE LAMP CIRCUITRY	(See figure 7-3.)	Replace lamps, resistor, or diode associated with malfunctioning circuit. Resistors and diodes are located on TB17 or TB18.
5	LAUNCHER NO. 2 spare lamps remain off.	Check for continuity from terminals -7 to -8 of LAMP VERIFY switch with switch set to ON.	Replace S19.
6	One spare lamp in any LAUNCHER NO. 2 quadrant remains off.		Replace lamp.
7	Two spare lamps in any LAUNCHER NO. 2 quadrant remain off.  LAUNCHER NO. 3 SPARE LAMP CIRCUITRY	(See figure 7-3.)	Replace lamps, resistor, or diode associated with malfunctioning circuit. Resistors and diodes are located on TB16 or TB18.
8	LAUNCHER NO. 3 spare lamps remain off.	Check for continuity from terminals -4 to -5 of LAMP VERIFY switch with switch set to ON.	Replace S19.

Figure 7-4. Table of Trouble Analysis for Launch Control Console (Sheet 2 of 4)

STEP	MALFUNCTION INDICATION	TROUBLESHOOTING PROCEDURES	CORRECTIVE ACTION
9	One spare lamp in any LAUNCHER NO. 3 quadrant remains off.		Replace lamp.
10	Two spare lamps in any LAUNCHER NO. 3 quadrant remain off.		Replace lamps, resistor, or diode associated with malfunctioning circuit.  Resistors and diodes are located on TB15 or TB18.
11	LAUNCHER NO. 1 OPERATIONAL CIRCUITRY. (See figure 7-3.) DS1 white lamps remain off; no voltage at TB1-1.	Check for 28(+2, -3) VDC at S1-NC with switch in closed position.  Check for 28(+2, -3) VDC at pins 4 and 2 of DS1.	Replace S1  Replace CR2.
12	DS1 white lamps remain off. LAUNCHER NO. 2 OPERATIONAL CIRCUITRY. (See figure 7-3.)		Replace lamp.
13	DS23 white lamps remain off; no voltage at TB3-1.	Check for 28(+2, -3) VDC at S10-NC with switch in closed position.  Check for 28(+2, -3) VDC at pins 4 and 2 of DS23.	Replace S10  Replace CR4.
14	DS23 white lamps remain off.		Replace lamp.

Figure 7-4. Table of Trouble Analysis for Launch Control Console (Sheet 3 of 4)

STEP	MALFUNCTION INDICATION	TROUBLESHOOTING PROCEDURES	CORRECTIVE ACTION
15	<p>LAUNCHER NO. 3 OPERATIONAL CIRCUITRY.</p> <p>DS43 white lamps remain off; no voltage at TB6-1</p>	<p>(See figure 7-3.)</p> <p>Check for 28(+2, -3) VDC at S20-NC with switch in closed position.</p> <p>Check for 28(+2, -3) VDC at pins 2 and 4 of DS43.</p>	<p>Replace S20.</p> <p>Replace CR6.</p>
16	<p>DS43 white lamps remain off.</p>		<p>Replace lamp.</p>

Figure 7-4. Table of Trouble Analysis for Launch Control Console (Sheet 4 of 4)

(Text continued from page 7-4 .)

7-18. DISASSEMBLY.

7-19. The following paragraphs describe the disassembly procedure for the major sub-assemblies of the launch control console. Figure 7-6 illustrates the parts location of the launch control console. Unless otherwise noted, replacement procedures are the reverse of disassembly.

7-20. BACK PANEL ASSEMBLY DISASSEMBLY.

7-21. The back panel assembly contains 62 indicator lamp assemblies. This panel is removable to facilitate maintenance of lamp assemblies and other parts. Remove the panel as follows:

- a. Release latches on console front panel and raise panel.
- b. Remove screws and washers which fasten back panel assembly to console frame.

**CAUTION**

Withdraw back panel carefully to avoid damaging soldered leads or components.

- c. Withdraw back panel assembly sufficiently to provide access to parts.

7-22. PUSHBUTTON SWITCH DISASSEMBLY. (See figure 7-7.)

7-23. Remove the pushbutton switch assembly as follows:

- a. Unsolder leads from switch terminals (1). Tag all leads.
- b. Unscrew switch (2) from indicator lamp body (4).
- c. Replace defective switch.

7-24. INDICATOR LAMP ASSEMBLY DISASSEMBLY. (See figure 7-7.)

7-25. Disassemble the indicator lamp assembly as follows:

- a. Unsolder leads from indicator lamp terminals (3). Tag all leads.
- b. Remove two screws (11) and washers (12) that hold indicator lamp assembly to console back panel.
- c. Remove lens cap (6) using module extractor (7).
- d. Remove lamp module (8) from indicator lamp body using module extractor.
- e. Withdraw lamps (10) from rear of lamp module.

**CAUTION**

During the replacement of lamps, and lamp modules of pushbutton indicators, used caution when replacing the lens cap to prevent activation of switch. The lens cap should be inserted until a barely audible clicking sound indicates that the locking mechanism has engaged. No additional pressure should be applied as this may activate the switch.

**7-26. TERMINAL BOARD ASSEMBLY DISASSEMBLY.**

7-27. Remove the terminal board assemblies as follows:

- a. Remove screws and washers holding terminal board on back panel.
- b. Unsolder all leads to terminal board. Tag all leads.
- c. Lift terminal board from panel.

**7-28. CLEANING.**

7-29. Use the following general techniques when performing scheduled preventive maintenance or repair of the console:

- a. Use NO. 0000 sandpaper to remove rust and corrosion. Clean parts only when visual inspection shows cleaning is necessary. Use clean, dry, lint-free cloth or dry brush for cleaning. If necessary, clean all parts except electrical contacts with brush or cloth moistened with solvent (Federal Specification P-S-661, Type 1.) After solvent dries, wipe off white film deposit.

**CAUTION**

Do not use trichlorethylene on polystyrene, lucite, or similar plastics.

**WARNING**

Wear goggles and rubber gloves and provide adequate ventilation when using trichlorethylene as a cleaning agent. This solvent is toxic if vapors are inhaled, and repeated contact with skin may produce skin irritation.

- b. Electrical contacts should be cleaned with a cloth moistened with trichlorethylene (Military Specification MIL-T-7003).



**CAUTION**

Do not damage equipment with air blast. When using compressed air, always direct the first blast toward the floor to clear condensed moisture from the line.

c. Use dry compressed air at line pressure no greater than 60 PSIG to remove dust from inaccessible places.

**7-30. INSPECTION.**

7-31. Inspection procedures for the launch control console are given in figure 7-8.

**7-32. REPAIR AND REPLACEMENT.**

7-33. **REPAIR AND REPLACEMENT OF TERMINAL BOARD COMPONENTS.** Remove diodes and resistors from terminal board assemblies by cutting the lead between the components and the terminals. Unsolder remaining pieces of lead from the terminal posts. Solder replacement parts in place. Use a heat sink on all diodes connected to terminals being heated and do not apply heat to the diodes for more than 5 seconds at a time. Do not use old leads.

**7-34. REPAIR AND REPLACEMENT OF INDICATOR LAMP ASSEMBLY.**

- a. Insert lamps into rear of lamp module (figure 7-7).
- b. Insert lamp module into indicator lamp body. Be sure lamp module shaft key (9) is aligned with keyway.
- c. Press lamp module firmly into indicator lamp body.
- d. Secure lamp assembly to sub-panel with screws and washers.
- e. Solder all leads to terminals using Ungar pencil-type soldering iron with maximum power rating of 37.5 watts, or equivalent.
- f. Replace lens cap.

**CAUTION**

During the replacement of lamps and lamp modules of pushbutton indicators, use caution when replacing the lens cap to prevent activation of switch. The lens cap should be inserted until a barely audible clicking sound indicates that the locking mechanism has engaged. No additional pressure should be applied as this may activate the switch.

**7-35. LUBRICATION.**

7-36. The launch control console does not require lubrication.

7-37. REASSEMBLY.

7-38. Reverse the order of disassembly procedures given in paragraph 7-18 to reassemble the launch control console. After reassembly, perform checkout of the console as described in paragraph 7-13.

7-39. ADJUSTMENTS.

7-40. No adjustments are required upon reassembly of the launch control console.

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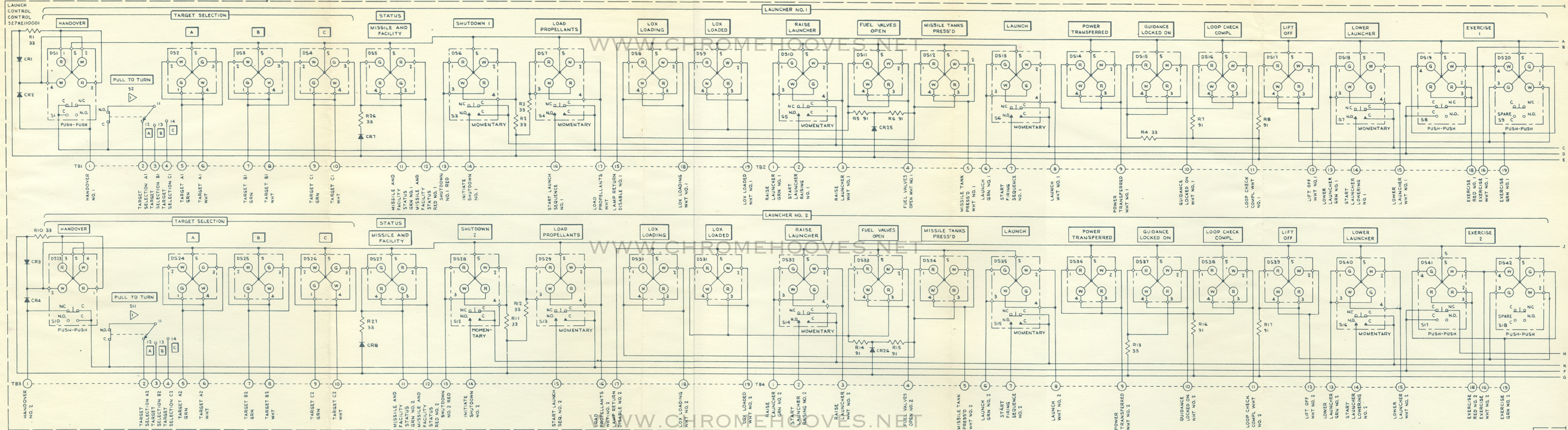
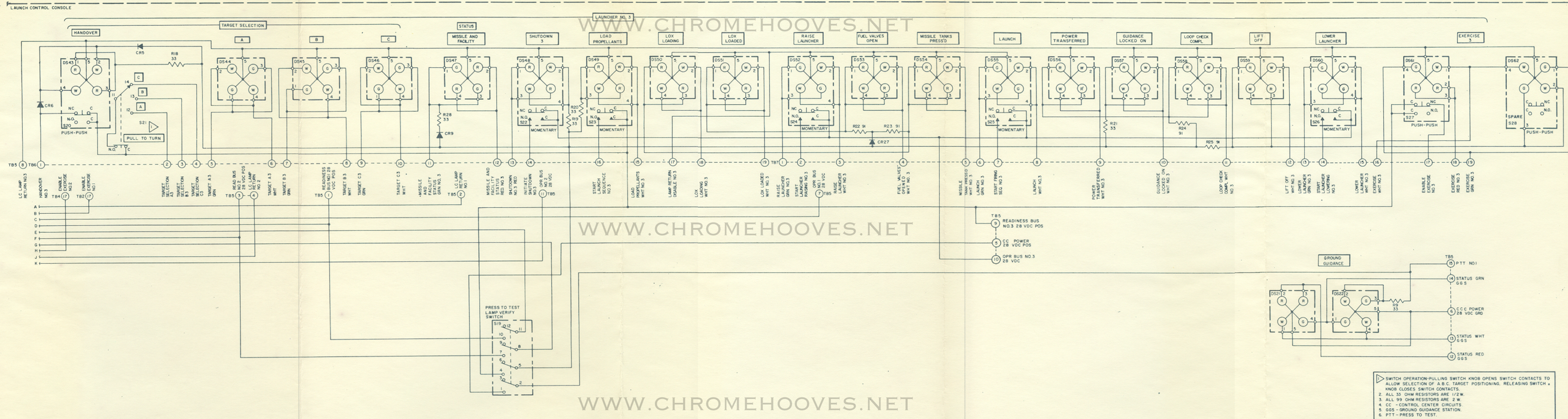


Figure 7-5. Launch Control Console Schematic (Sheet 1 of 2)

5152-3-SI-10





SWITCH OPERATION-PULLING SWITCH KNOB OPENS SWITCH CONTACTS TO ALLOW SELECTION OF A.B.C. TARGET POSITIONING. RELEASING SWITCH KNOB CLOSES SWITCH CONTACTS.

2. ALL 33 OHM RESISTORS ARE 1/2 W.

3. ALL 99 OHM RESISTORS ARE 2 W.

4. CC - CONTROL CENTER CIRCUITS.

5. GGS - GROUND GUIDANCE STATION.

6. PTT - PRESS TO TEST.

Figure 7-5. Launch Control Console Schematic (Sheet 2 of 2)



1. FRONT PANEL
2. COMMUNICATIONS PANEL
3. SUB-PANEL
4. COMMUNICATIONS DIAL
5. COMMUNICATIONS PIGTAIL
6. DRAWER
7. ASH TRAY
8. TB1
9. TB2
10. TB3
11. TB4
12. TB5
13. TB6
14. TB7
15. LEFT ACCESS DOOR
16. TB18
17. TB15
18. SUB PANEL
19. TB16
20. TB17

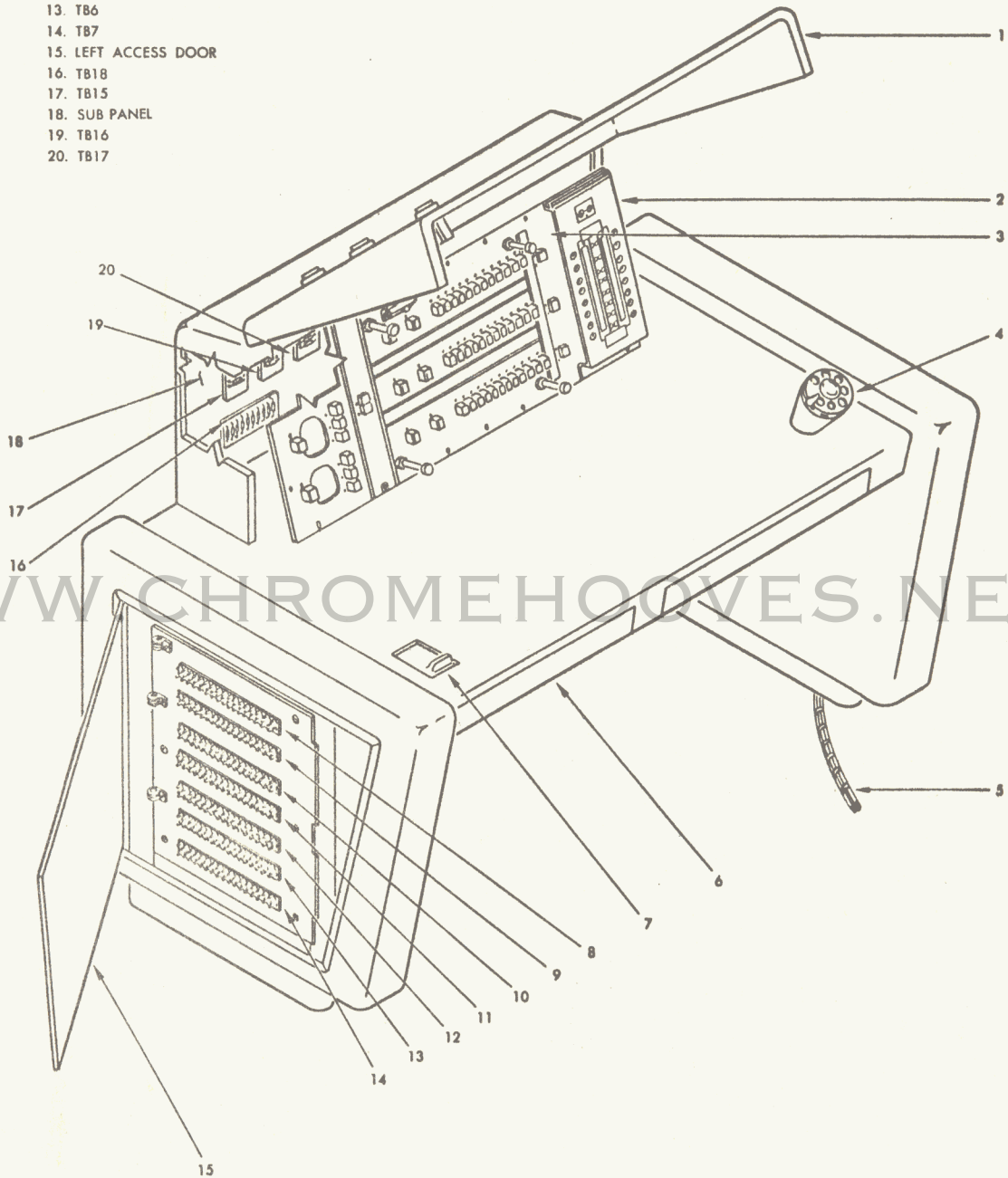


Figure 7-6. Location of Major Components, Launch Control Console



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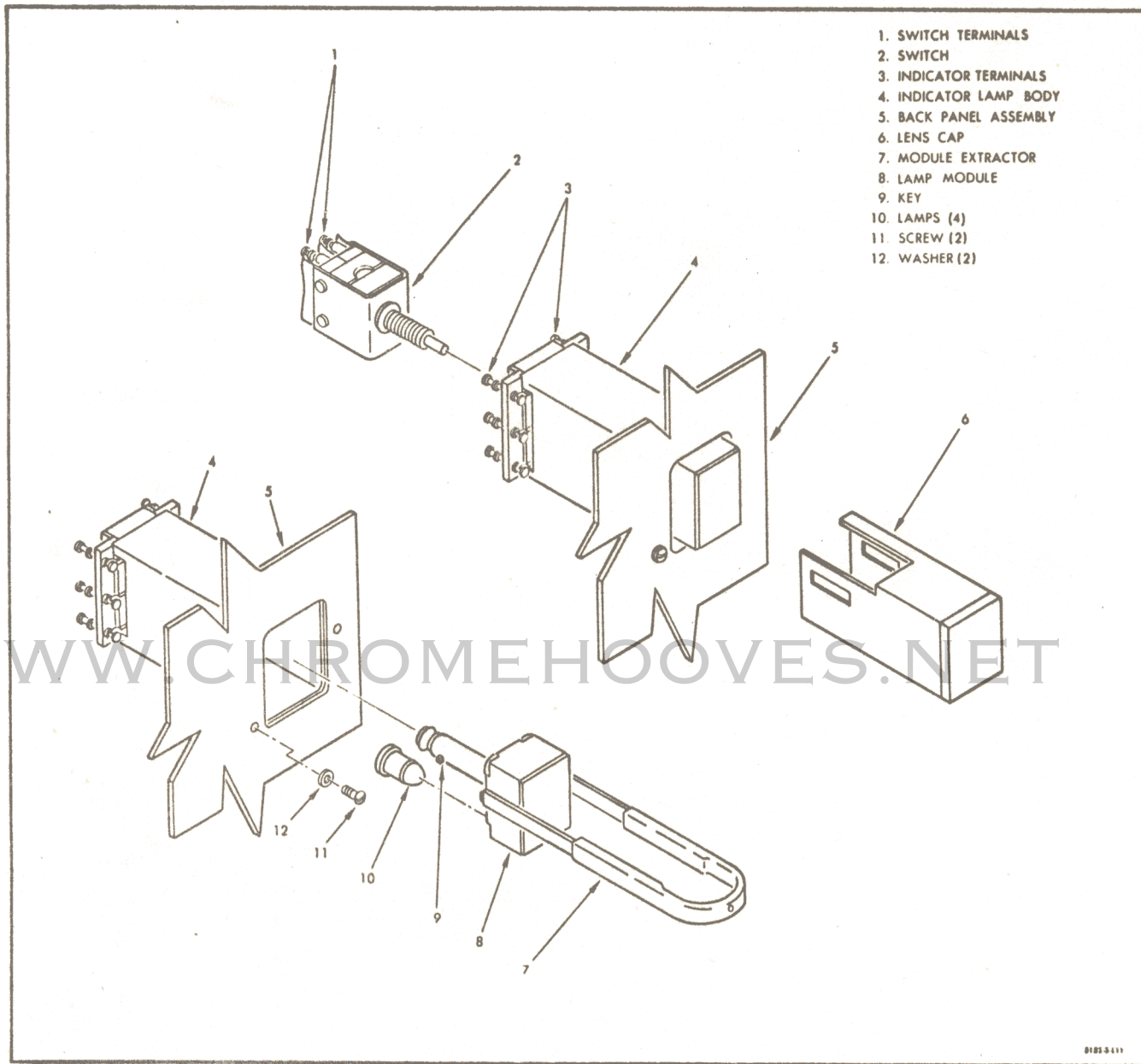
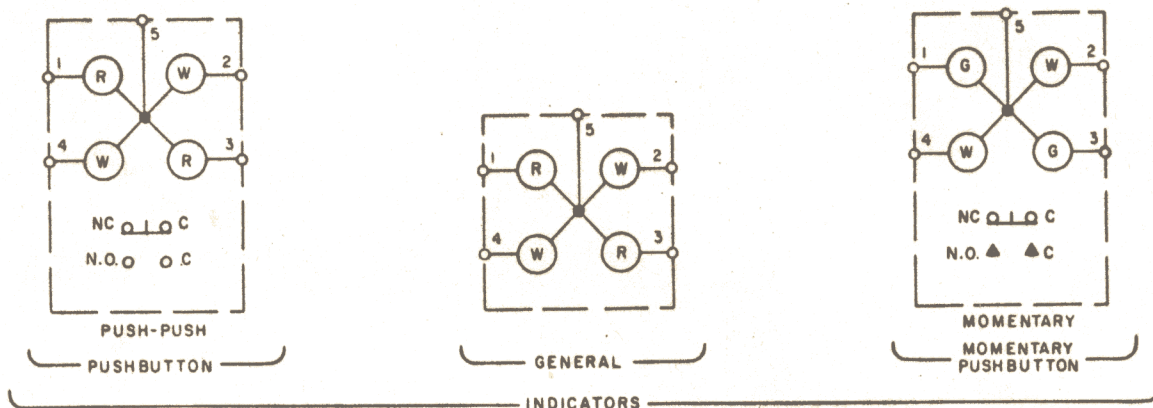


Figure 7-7. Pushbutton Switch Indicator Disassembly

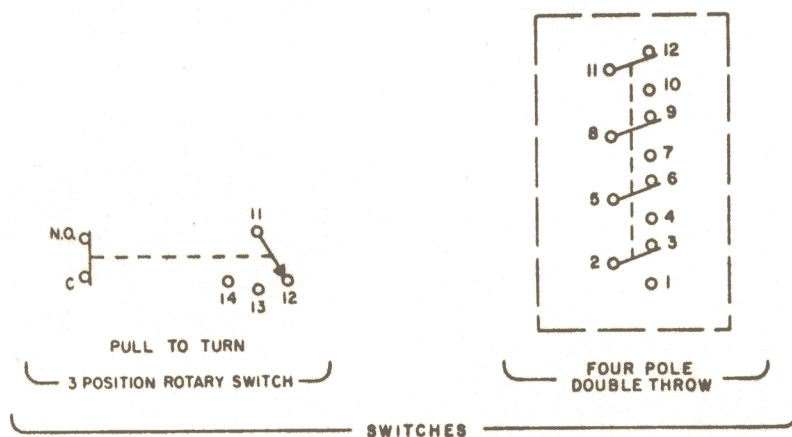
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INSPECTION POINT	EXAMINE FOR	CORRECTIVE ACTION	REF
General	Dust, fungus, corrosion, rust, and scratches. Insecure mountings. Missing or damaged hardware. Poor solder connections.	Clean and repair. Secure. Repair or replace. Resolder.	
Toggle switches	Rough or binding action. Damaged connections or housing.	Replace. Replace.	
Pushbutton switch and indicator lamp assembly	Cracked or broken indicator lamp assembly lens. Rough or binding switch action. Broken or discolored lamps.	Replace indicator lamp assembly. Replace pushbutton switch assembly. Replace lamps.	Paragraph 7-34.
Rotary switch	Rough or binding action, broken insulation, damaged contacts, broken or missing springs.	Repair or replace.	
Cabling and wiring	Breaks, shorts, arcing; faulty insulation or damaged terminal connections; improper clamping, lacing, or tying; poor wire dressing; excessive slack or tension.	Repair or replace.	
Terminal boards	Loose, bent, or broken terminals; cracked or chipped insulation.	Repair or replace.	Paragraph 7-27.
Indicator lamps	Cracked or broken jewel. Broken or discolored lamp.	Replace. Replace.	
Connectors	Damaged shells; cracked inserts; loose, bent, or broken pins.	Repair or replace.	

Figure 7-8. Table of Inspection of Parts.



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Figure 7-9. Military Standard Electrical and Electronic Symbols