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P24B-AL-4957
CONT ON SHEET 2 SH NO. 1

TITLE
PROCESS INSTRUCTIONS
FOR TESTING 250 V RELAY BOARD

FIRST MADE FOR

G-2-4-6

REVISIONS

DEC 18 1970

SCOPE

POWER RELAY BOARD

(A) GENERAL

(B) TEST EQUIPMENT

(C) SET UP

(D) RESISTANCE TEST

(E) CURRENT TEST

(F) SWITCHING TEST

(G) ARC SUPPRESSION TEST

(H) VOLTAGE PROFILE TEST

Problem sheet turned in

5/18/94
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TITLE

PROCESS INSTRUCTIONS
FOR TESTING 250 V RELAY BOARD

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(A) GENERAL

The 250 VDC power relay board consists of * relays each of which contains one N.C. and one N.O. contact. Each set of contacts contains a common lead. The common and N.O. and N.C. contacts are brought out of the P.C. board at a 41 pin connector.

Mercury wetted relays (G.E. dwg. U4039) are used. Since they are operated at approx. 40 or 110 VDC, dropping resistors are seriesed with them. The relays are also operated through the 41 pin connector.

The tests are set up for panel operation; i.e., no probes are applied to the board unless troubleshooting is indicated.

The first test, RESISTANCE TEST, is used to determine whether or not a board is ready for the application of power. Upon satisfactory performance of this test, the relays are energized.

In the "Current Test" the relay is checked for proper current by measuring the voltage drop across a resistor of about 1/10 the circuit resistance.

The switching test uses lamps as indicators of contact performance.

The contatcs of some relay boards (see table) are protected by an RC network across each contact. This is used to jelp protect against contact damage due to breaking of the current path to inductive loads.

When test has been completed and data recorded as required, sign and date the data sheet and furnish Control Engineering with one (1) copy.

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TITLE
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FOR TESTING 250 V RELAY BOARD

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(B) TEST EQUIPMENT

(1) Standard Patch Panel.

(2) Patch Board (Marked: Power Relay Board 250 V).

(3) Oscilloscope, both inputs floating.

(4) Voltmeter, Digital, Hewlett Packard 3440A or equiv.

(5) Ohmmeter, Simpson Multitester or Equiv.

(6) Power Supply, @ $\frac{1}{2}$ amp, Output within 1% no load to full load, ripple less than .03 Volts RMS. Both outputs floating. 50 - 300 VDC variable.

(7) Resistor, 50Ω ± 5% @ 5W (PCR4.5,6)
Resistor 2K ± 5% @ 5W (PCR2,3,8)

(8) Inductor, L, U4039 Relay Coil or Equiv.

(9) CAPACITOR, C, 1 μf.

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(C) SET UP

CAUTION: A resistance test will be run first. The 250 V and 24 volt power must be off when the board under test is plugged in. Failure to follow this will cause damage if there are shorts in the board.

(1) Interconnect patch board and test panel as shown in fig. 1 by using pre-wired patch board.

(2) Connect external 500 Ω /5W or 2K/5W resistor (see Table I) between BP-7 and BP-8.

(3) Connect DVM to BP-7 and BP-8 (+ on BP-7).

(4) Connect external power supply (250 VDC) to BP-1 and BP-2 (+ on BP-1). Be sure power is off.

(5) Connect L to BP-9 and BP-10.

(6) Connect ohmeter to BP-5 and BP-6.

(7) Connect 1 μf capacitor from BP-11 to BP-12.

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PROCESS INSTRUCTIONS
FOR TESTING 250 V RELAY BOARD

FIRST MADE FOR

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(D) RESISTANCE TEST

(1) Remove all power and set SW3 down.

(2) Plug board into PCR-1, PCR-2 or PC3. (see table 1)
(Several shorts exist if plugged into wrong one.)

(3) To test for short between 250 V and 24 V circuits
Set switches as follows:

DOWN	CENTER	UP	STEP SWITCH
SW3			POSITION 1
SW4			
SW5			
SW6			
SW7			
SW8			

Step from 1 to 8 of stepping switch readings greater than 1 Meg. Record lowest reading.

(4) To check resistance of each relay-coil dropping resistor circuit:
SW7 UP
Step from 1 through 8 and record readings.
Readings 8.8 ± 1K (PCR4,5,6) 19.6K (PCR2,3, 8)

(5) To check resistance of lamp circuits.
S5 UP SW6 UP
SW7 UP
Move ohmmeter probe from BP-5 to BP-2
Step from 1 to 8 and record readings.
Reading: Less than 50
Remove ohmmeter

If all resistance readings are normal, proceed to "current test".

Special Note about Step (D-4) Reference figure 1 page 15.

There are two 2K resistors in parallel and in series with the coil. Since the coil resistance is 8600 ohms and the 2 resistors make up another 1000 ohms, that max reading would only be 9600 ohms (9.6K).

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3/17/2012

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(E) CURRENT TEST

The following test will be used to determine the current drawn by each relay circuit.

(1)

DOWN	CENTER	UP	STEP SWITCH
SW8 SW6	SW5	SW3 SW4 SW7	POSITION 1

(2) Apply 250 VDC (BP-1(+), BP-2(-)).

(3) Step from 1 through 8 and record reading.

(4) READINGS: 13.5 ± 2.0 VDC (PCR4,5,6) 25.5 ± 4.0 VDC (PCR2,3, 8)

(5) If these readings are normal, proceed with Switching test.

Special Note about Step (E-3)

There are two 2K resistors in parallel and in series with the coil. Since the coil resistance is 8600 ohms and the 2 resistors make up another 1000 ohms, that max reading would only be 9600 ohms (9.6K).

Because of these changes in coil resistance values described in step (E-3) are not obtainable. We believe this is due to the test setup, but have no way to validate this. Readings in this step read 19.0VDC to 19.8VDC. It is recommended that we used 19.4VDC as nominal value +-2.0VDC.

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3/17/2012

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(F) SWITCHING TEST

This test will check the operation of the relay contacts.

(1)	DOWN	CENTER	UP	STEP SWITCH
	SW4		SW3	POSITION 1
	SW8		SW5	
			SW6	
			SW7	

(2) Apply 24 VDC along with the 250 VDC applied previously.

(3) Step 1 through 8.
Observe that PL-2 light for all 8 steps.
PL-1 should not light.

(4) SW-7 down.

(5) Step 1 through 8.
Observe PL-1 lights for all 8 steps.
PL-2 should not light.

(6) Since, in the above tests, the common leads of the contacts were tied together, it is necessary to check adjacent pins of the plug, on the board, for shorts. This is done as follows:

(7) Press PB-1 and step 1 through 8.
PL-1 should not light in steps 1 and 5.

(8) Press PB-2 and step 1 through 8.
PL-1 should not light in steps 2 and 6.

(9) Press PB-3 and step 1 through 8.
PL-1 should not light in steps 3 and 7.

(10) Press PB-4 and step 1 through 8.
PL-1 should not light in steps 4 and 8.

If arc suppression is included, proceed with test on next page. If the board under test does not have this feature, skip the arc suppression test and perform the low voltage test.

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TITLE
PROCESS INSTRUCTIONS
FOR TESTING 250 V RELAY BOARD

FIRST MADE FOR

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(G) ARC SUPPRESSION TEST

(1) Readjust voltage to 250 VDC.

(2) N.C. Contacts.

DOWN	CENTER	UP	STEP SWITCH	S2
SW4	SW5	SW3 SW6 SW7 SW8	1	1

NOTE: SW8 cuts in "L" between BP-9 and BP-10.

(3) Pressing and releasing of PB-5 will cause the contacts to open and close. Observe scope and note that no spikes of appreciable amplitude exist on contacts associated with the step switch position. Record amplitude of highest spike.

(4) Perform step 3 for step switch positions 1 through 8.

(5) N.O. contacts.

SW6 down SW5 up
Set SW2 to position 2

(6) Perform step 3 for step switch positions 1 through 8.

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TITLE
PROCESS INSTRUCTIONS
FOR TESTING 250 V RELAY BOARD

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(H) VOLTAGE PROFILE TEST

(1) ADJUST EXTERNAL POWER SUPPLY FOR 140 VDC.

(2) Repeat steps 1 through 5 of "SWITCHING TEST". Relays must show proper operation at this reduced voltage.

(3) Remove power.

(4) Remove relay board from socket.

TEST COMPLETE

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273-7
273-2
273-1
273-1
273-1
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REVISIONS

TABLE I

PL	SCHEMATIC	IDENT.	TEST AT
945D884G1	948D886	Power Relay 250 V Comm. Coils No Contact Protection	PCR-3
948D896G1	945D886	250 V Relay Bd. Comm. Coils No Contact Protection	PCR-4
* 114D6067 G4	992D425	250 V Relay Bd. No Comm. Coils No Contact Protection	PCR-2
945D820G1	948D171	250 V Relay Bd. Comm. Coils No Contact Protection	PCR-5
948D169G1	948D170	250 V Relay Bd. No Comm. Coils No Contact Protection Note only 4 relays on this board	PCR-6
114D6069 G4	948D886	250V Relay Brd. Comm. Coils No contact protection	PCR-3
* 114D6069 G3	114D6059	250V Relay Bd. Comm. Coils With contact protection	PCR-3
114D6067 G3	114D6060	250V Relay Bd. No Comm. Coils With contact protection	PCR-2
* 996D957 G2,1,5,6 ~~1411C8324~~ ok 996D957 G3,4,7 141C9680 per PL PB3-5-80		250V Relay Bd. Comm Coils with contact protection	

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PRINTS TO

TABLE III

Note: A to E PIN NUMBERS

PCR-1

A to SSW-1	
Pin	Pos.
10	1
12	2
9	3
37	4
33	5
30	6
29	7
37	8

B to SW-7 Comm	
Pin	Contact
20	SW-7 Comm

C to SSW-2	
Pin	Pos.
8	1
6	2
1	3
4	4
28	5
22	6
25	7
21	8

D to PB	
Pin	PB
14	1
15	2
17	3
18	4
34	1
36	2
39	3
41	4

E to SSW-3	
Pin	Pos.
7	3
5	2
2	3
3	4
27	5
26	6
23	7
24	8

PCR-2

A to SSW-1	
Pin	Pos.
10	1
13	2
16	3
17	4
30	5
33	6
35	7
36	8

B to SW-7 Comm	
Pin	Contact
11	SW-7 Comm
14	" "
21	" "
18	" "
31	" "
34	" "
* 40	" "
37	" "

C to SSW-2	
Pin	Pos.
8	1
6	2
1	3
4	4
29	5
27	6
25	7
23	8

D to PB	
Pin	PB
9	1
15	2
20	3
19	4
32	1
41	2
39	3
38	4

E to SSW-3	
Pin	Pos.
7	1
5	2
3	3
2	4
28	5
26	6
24	7
22	8

PCR-3

A to SSW-1	
Pin	Pos.
10	1
13	2
16	3
17	4
30	5
33	6
35	7
36	8

B to SW-7 Comm	
Pin	Contact
12	SW-7 Comm

C to SSW-3	
Pin	Pos.
8	1
6	2
1	3
4	4
29	5
27	6
25	7
23	8

D to PB	
Pin	PB
9	1
15	2
20	3
19	4
32	1
41	2
39	3
38	4

E to SSW-3	
Pin	Pos.
7	1
5	2
3	3
2	4
28	5
26	6
24	7
22	8

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TITLE
PROCESS INSTRUCTIONS
FOR TESTING 250 V RELAY BOARD

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PCR-4

A to SSW-1		B to SW-7 Comm		C to SSW-2		D to PB		E to SSW-3	
Pin	Pos	Pin	Cont	Pin	Pos	Pin	PB	Pin	Pos
10	1	20		12		13		11	
7	2			9		14		8	
4	3			6		15		5	
3	4			1		16		2	
30	5			32		33		31	
27	6			29		34		28	
24	7			25		35		26	
36	8			21		23		22	

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TITLE
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FOR TESTING 250 V RELAY BOARD

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PCR-5

A to SSW-1		B to SW-7 Comm		C to SSW-2		D to PB		E to SSW-3	
Pin	Pos	Pin	Cont	Pin	Pos	Pin	PB	Pin	Pos
41	1	20	SW-7 Comm	4	1	21	1	5	1
40	2			2	2	25	2	3	2
39	3			6	3	26	3	1	3
38	4			8	4	18	4	7	4
37	5			12	5	28	1	10	5
36	6			14	6	29	2	13	6
35	7			17	7	30	3	16	7
34	8			32	8	31	4	18	8

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FOR TESTING 250 V RELAY BOARD

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1 Delete PCR-1
X-added PCR-7

PCR-6

A to SSW-1		B to SW-7 Comm		C to SSW-2		D to PB		E to SSW-3	
Pin	Pos	Pin	Cont	Pin	Pos	Pin	PB	Pin	Pos
41	1	20	1	4		21		5	
40	2	39	2	2		25		3	
	3								
	4								
	5								
36	6	37		14		29		13	
	7								
34	8	35		32		31		18	

PCR-7

A to SSW-1		B to SW-7 Comm		C to SSW-2		D to PB		E to SSW-3	
Pin	Pos.	Pin	Cont.	Pin	Pos.	Pin	PB	Pin	Pos.
10	1	12	SW-7 Comm.	8	1	9	1	7	1
13	2			6	2	15	2	5	2
16	3			1	3	20	3	3	3
17	4			4	4	19	4	2	4
30	5			29	5	32	1	28	5
33	6			27	6	41	2	26	6
35	7			25	7	39	3	24	7
36	8			23	8	38	4	22	8

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PCR - 8

A to SSW-1		B to SW-7 Comm		C to SSW-2		D to PB		E to SSW3	
PIN	POS	PIN	CONT.	PIN	POS.	PIN	PB	PIN	PB
35	1	41	SW-7 Comm	7	1	8	1	9	1
33	2	39	SW-7 Comm	10	2	11	2	12	2
31	3			13	3	14	3	15	3
29	4			16	4	17	4	18	4
27	5			19	5	20	1	21	5
25	6			4	6	5	2	6	6
37	7			1	7	2	3	3	7
--	8			--	8	--	4	--	8

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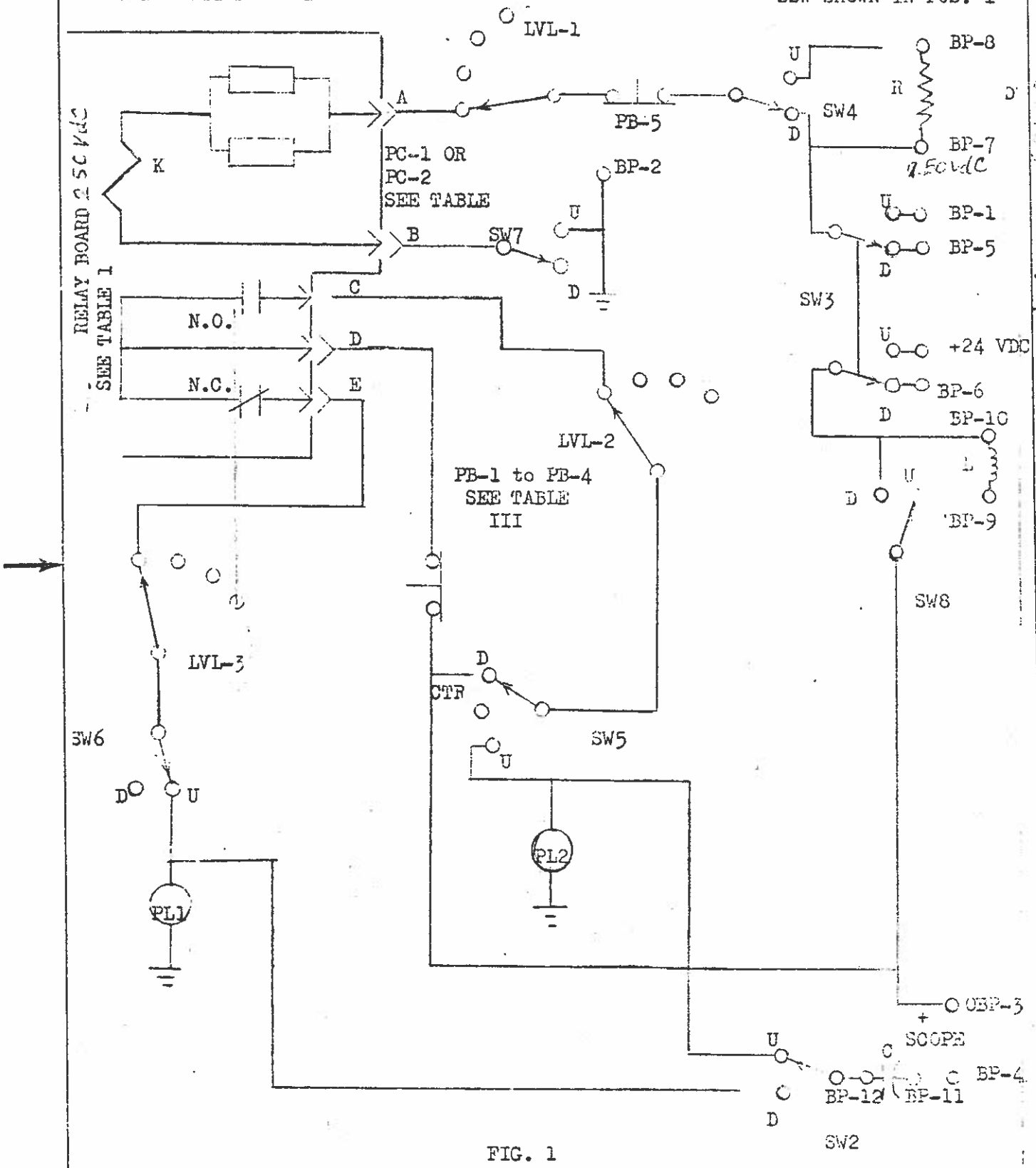

FIG. 1

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PREPARED BY: _____ DATE: _____

B. D. Murphy
Control Design Engineering

APPROVED BY: _____ DATE: April 2 1969

J. Kure-Jensen, Manager
Control Design Engineering

REVIEWED BY: _____ DATE: 4/22/69

R. J. Dellorfano
Control Design Engineering

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