G1-3-5-7

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

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TITLE PROCESS INSTRUCTIONS
FOR TESTING 125 V RELAY BOARD

FIRST MADE FOR 170X337 and 170X325

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(A) GENERAL

The 125 VDC power relay board consists of relays each of which contains one N.C. and a 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 approximately 50 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, ie, 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 contacts of some relay boards (see table) are protected by an RC network across each contact. This is used to help 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 PROCESS INSTRUCTIONS FOR TESTING 125 V RELAY BOARD

FIRST MADE FOR 170X337 and 170X325

(B) TEST EQUIPMENT

(1) Standard Patch Panel

(2) Patch Board (Marked: Power Relay Board 125 V)

(3) Oscilloscope, both inputs floating

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

(5) Ohmmeter, Simpson Multitester or Equiv.

(6) Power Supply, @ ½ amp, Output within 1% no load to full load, ripple less than .03 Volts RMS. Both outputs floating. 50 - 300 VDC variable

* (7) Resistor, 500 Ω ± 5% @ 5W (PCR 1-3)
Resistor 2K ± 5% @ 5W (PCR 4)

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

(9) CAPACITOR, C, 1 μf

REVISIONS: 1 MAR 14 1969; 2 APR 1969; 3; 273-7; 273-2; 273-1; 273-1; 273-1; R2

PRINTS T

FF-6

MADE BY J.W. KOZUBAL Mar. 21, 68

ISSUED MAR 27 1968

APPROVALS

STEAM TURBINE DIV OR DEPT.

SCHENECTADY LOCATION

FF-803-WA (9-66)
PRINTED IN U.S.A.

CODE IDENT

1170

(C) SET UP

CAUTION: A resistance test will be run first. The 125 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 500Ω/5W resistor (PCR1-3) or 2K/5W resistor (PCR4) between BP-7 and BP-8.

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

(4) Connect external power supply (125 VDC) to Bp-1 and BP-2 (+ on BP-1).

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

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

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

(D) RESISTANCE TEST

(1) Remove all power and set SW3 down.

(2) Plug board into PCR-1 or PCR-2 or PCR-3 or PCR-4 (see table 1). (Several shorts exist if plugged into wrong one)

(3) To test for short between 125 V and 24 V circuits
Set switches as follows:

	DOWN	CENTER	UP	STEP SWITCH
	SW3			Position 1
	SW4			
	SW5			
	SW6			
S	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 4.4 ± .5K (PCR1-3) 19.6 ± 2K (PCR-4)

(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 50Ω
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).

C. Wade
3/17/2012

(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 125 VDC (BP-1(+), BP-2(-))

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

(4) READINGS: = 12.7 + 2.0 VDC (PCR1-3) 11.4 ± 2.0 VDC (PCR4)

(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.

C. Wade
3/17/2012

FL6 FL4

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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 125 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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(G) ARC SUPPRESSION TEST

(1) Readjust voltage to 125 VDC.

(2) N.C. Contacts

Down	Center	Up	Step Sw.	S2
SW4	SW5	SW5 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 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 position 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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(H) VOLTAGE PROFILE TEST

(1) ADJUST EXTERNAL POWER SUPPLY FOR 70 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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TABLE I

PL	SCHEMATIC	IDENT.	TEST AT
942D355G1	942D356	Power Relay 125 V Comm. Coils No Contact Protection	PCR-1
947D398G2	947D379	125 V Relay Bd. Comm. Coils No Contact Protection	PCR-3
947D386G1	947D388	125 V Relay Bd. No Comm. Coils With Contact Protection	PCR-2
947D398G1	948D810	125 V Relay Bd. Comm. Coils With Contact Protection	PCR-3
114D6063	114D6-57	125 V Relay Bd. Comm. Coils With Contact Protection	PCR-3
947D386G2	947D389	125 V Relay Bd. No Comm Coils No Contact Protection	PCR-2
* 996D957 G1	141C8324	125V Relay Bd. Comm. Coils With Contact Protection	PCR-4
* 114D6065 G1	114D6058	125V Relay Bd. No Comm. Coils With Contact Protection	PCR-2
* 114D6065 G2	947D389	125V Relay Bd. No Comm. Coils Without Contact Protection	PCR-2

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TABLE III

Note: A to E PIN NUMBERS

PCR-1

A to SSW-1		B to SW-7 Comm		C to SSW-2		D to PB		E to SSW-3	
Pin	Pos.	Pin	Contact	Pin	Pos.	Pin	PB	Pin	Pos.
10	1	20	SW-7 Comm	8	1	14	1	7	3
12	2			6	2	15	2	5	2
9	3			1	3	17	3	2	3
37	4			4	4	18	4	3	4
33	5			28	5	34	1	27	5
30	6			22	6	36	2	26	6
29	7			25	7	39	3	23	7
37	8			21	8	41	4	24	8

PCR-2

A to SSW-1		B to SW-7 Comm.		C to SSW-2		D to PB		E to SSW-3	
Pin	Pos.	Pin	Contact	Pin	Pos.	Pin	PB	Pin	Pos.
10	1	11	SW-7 Comm	8	1	9	1	7	1
13	2	14	" "	6	2	15	2	5	2
16	3	21	" "	1	3	20	3	3	3
17	4	18	" "	4	4	19	4	2	4
30	5	31	" "	29	5	32	1	28	5
33	6	34	" "	27	6	41	2	26	6
35	7	* 40	" "	25	7	39	3	24	7
36	8	37	" "	23	8	38	4	22	8

PCR-3

A to SSW-1		B to SW-7 Comm.		C to SSW-3		D to PB		E to SSW-3	
Pin	Pos.	Pin	Contact	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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1 0 Lic Mod MAR 11 1969

2 0 APR 14 1969

3 0 Del Mod

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TABLE III

Note: A to E PIN NUMBERS

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	Contact	Pin	Pos.	Pin	PB	Pin	Pos.
35	1	41	SW-7 Comm	7	1	8	1	9	1
33	2	39	"	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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GENERAL ELECTRIC

P24B-AL-4816
CONT ON SHEET ~~13~~ 14 SH NO. ~~12~~ 13

REV NO. ~~2~~ 3

P24B-AL-4816
CONT ON SHEET ~~13~~ 14 SH NO. ~~12~~ 13

TITLE PROCESS INSTRUCTIONS
FOR TESTING 125 V RELAY BOARD

FIRST MADE FOR 170X337 and 170X325

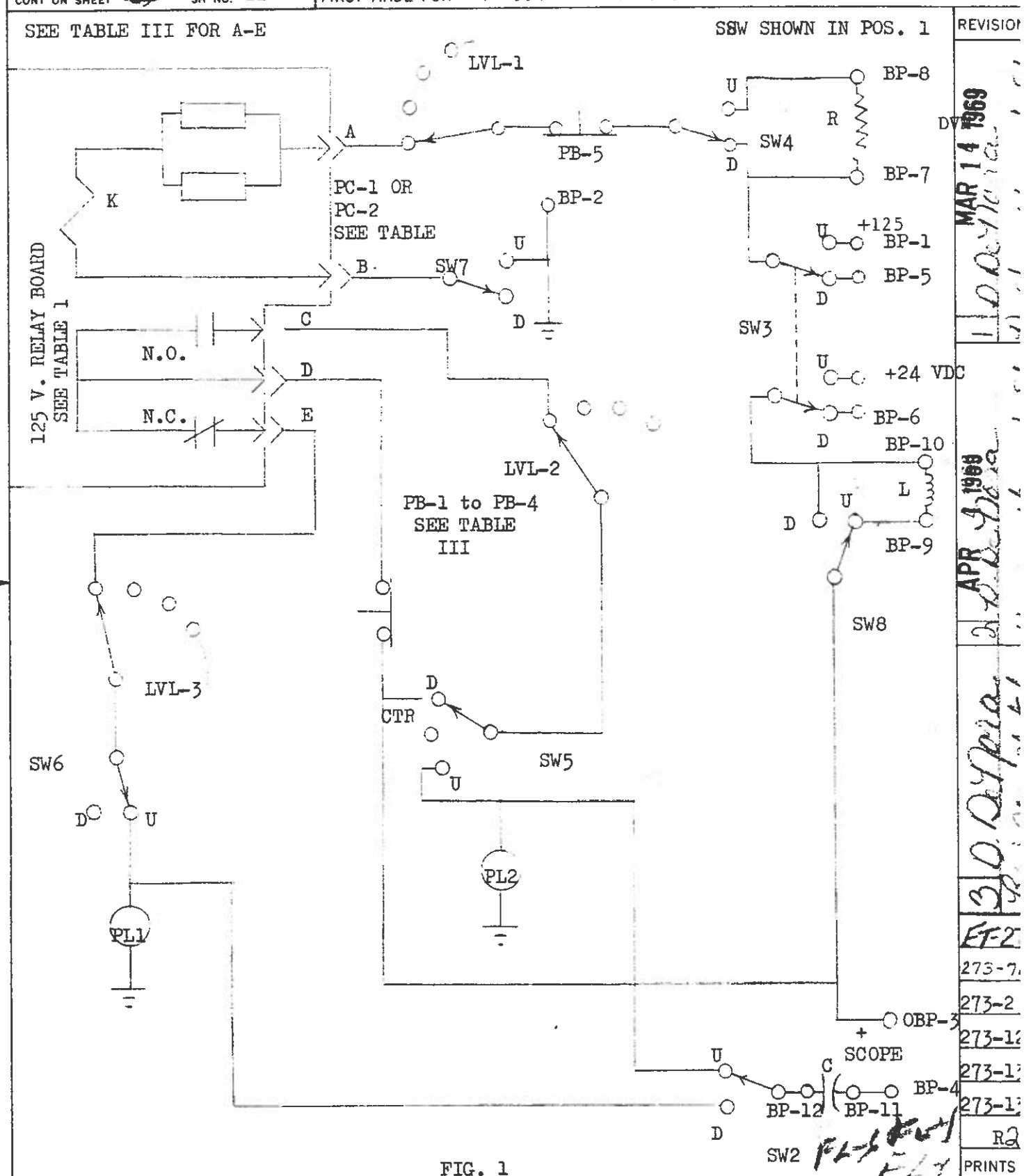

FIG. 1

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PRINTS

MADE BY J.W. KOZUBAL Mar. 21, 68

ISSUED Mar 27 '68

APPROVALS

STEAM TURBINE DIV OR DEPT.

SCHENECTADY LOCATION

P24B-AL-4816
CONT ON SHEET ~~13~~ 14 SH NO. ~~12~~ 13

FF-803-WA (9-66)
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CODE IDENT 11T0

TITLE PROCESS INSTRUCTIONS
FOR TESTING 125 V RELAY BOARD

FIRST MADE FOR 170X337 and 170X325

REVISION

3 Oct 70

Reviewed With : R. DellOrfano / RE Squillace
R. DellOrfano
EHC Manufacturing

Prepared By : RE Squillace
R.E. Squillace
Turbine Control Engineering

Approved By: _____
P.C. Callan, SUPERVISOR
Turbine Control Engineering

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273-12
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R2

FL-6 FL-7

PRINTS

MADE BY D. DePora Sept 9, 1970
ISSUED

APPROVALS

STEAM TURBINE DIV OR DEPT.
SCHENECTADY, NY LOCATION

P24B-AL-4816
CONT ON SHEET ---- SH NO. 14

11T0 CODE IDENT

FF-803-WA (1-70)
PRINTED IN U.S.A.

Data Sheet

Job # _____

Serial # _____

Date _____

Data Sheet for ____996D957G0001_____

Test Procedure ___P24B-AL-4816_____

Burn-in Start _____

Burn-in Stop _____

Technician _____

Test Procedure Step	Nominal	Lower Limit	Pre-Burn in Results	Post Burn in Results	Upper Limit	Pot Values If applicable CW	CCW	Pass/Fail
D3-1	>1M ohm	>1M ohm			>1M ohm	-	-	
D3-2	>1M ohm	>1M ohm			>1M ohm	-	-	
D3-3	>1M ohm	>1M ohm			>1M ohm	-	-	
D3-4	>1M ohm	>1M ohm			>1M ohm	-	-	
D3-5	>1M ohm	>1M ohm			>1M ohm	-	-	
D3-6	>1M ohm	>1M ohm			>1M ohm	-	-	
D3-7	>1M ohm	>1M ohm			>1M ohm	-	-	
D3-8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D4-1	9.6K ohm	7.6K ohm			11.6K ohm	-	-	
D4-2	9.6K ohm	7.6K ohm			11.6K ohm	-	-	
D4-3	9.6K ohm	7.6K ohm			11.6K ohm	-	-	
D4-4	9.6K ohm	7.6K ohm			11.6K ohm	-	-	
D4-5	9.6K ohm	7.6K ohm			11.6K ohm	-	-	
D4-6	9.6K ohm	7.6K ohm			11.6K ohm	-	-	
D4-7	9.6K ohm	7.6K ohm			11.6K ohm	-	-	
D4-8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Special Note: D4-1 thru D4-7, resistances are not attainable due to to change in test circuit. Values will be around 9600K ohms.

3/19/2012

cw

Data Sheet

Job # _____

Serial # _____

Date _____

Data Sheet for ____996D957G0001_____

Test Procedure ___P24B-AL-4816_____

Burn-in Start _____

Burn-in Stop _____

Technician _____

Test Procedure	Nominal	Lower Limit	Pre-Burn in Results	Post Burn in Results	Upper Limit	Pot Values If applicable		Pass/Fail
E4-1	19.4VDC	17.4VDC			21.4VDC	-	-	
E4-2	19.4VDC	17.4VDC			21.4VDC	-	-	
E4-3	19.4VDC	17.4VDC			21.4VDC	-	-	
E4-4	19.4VDC	17.4VDC			21.4VDC	-	-	
E4-5	19.4VDC	17.4VDC			21.4VDC	-	-	
E4-6	19.4VDC	17.4VDC			21.4VDC	-	-	
E4-7	19.4VDC	17.4VDC			21.4VDC	-	-	
E4-8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F3	-	-			-	-	-	
F5	-	-			-	-	-	
F7	-	-			-	-	-	
F8	-	-			-	-	-	
F9	-	-			-	-	-	
F10	-	-			-	-	-	
G4	-	-			-	-	-	
G6	-	-			-	-	-	

Special Note: E4-1 thru E4-7, voltages are not attainable due to to changes in test circuit. Values will be around 19.4VDC +-2VDC.

3/19/2012

cw

Data Sheet

Job # _____

Serial # _____

Date _____

Data Sheet for ____996D957G0003_____

Test Procedure ___P24B-AL-4816_____

Burn-in Start _____

Burn-in Stop _____

Technician _____

Test Procedure Step	Nominal	Lower Limit	Pre-Burn in Results	Post Burn in Results	Upper Limit	Pot Values If applicable CW	Pot Values If applicable CCW	Pass/Fail
E3-1	19.4VDC	17.4VDC			21.4VDC	-	-	
E3-2	19.4VDC	17.4VDC			21.4VDC	-	-	
E3-3	19.4VDC	17.4VDC			21.4VDC	-	-	
E3-4	19.4VDC	17.4VDC			21.4VDC	-	-	
E3-5	19.4VDC	17.4VDC			21.4VDC	-	-	
E3-6	19.4VDC	17.4VDC			21.4VDC	-	-	
E3-7	19.4VDC	17.4VDC			21.4VDC	-	-	
E3-8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F1	-	-	-	-	-	-	-	
F2	-	-	-	-	-	-	-	
F3	-	-	-	-	-	-	-	
F4	-	-	-	-	-	-	-	
F5	-	-	-	-	-	-	-	
F6	-	-	-	-	-	-	-	
F7	-	-	-	-	-	-	-	

Special Note: E3-1 thru E3-7, voltages are not attainable due to to changes in test circuit. Values will be around 19.4VDC +-2VDC.

3/19/2012

cw

Data Sheet

Job # _____

Serial # _____

Date _____

Data Sheet for ____996D957G0003_____

Test Procedure ___P24B-AL-4816_____

Burn-in Start _____

Burn-in Stop _____

Technician _____

Test Procedure Step	Nominal	Lower Limit	Pre-Burn in Results	Post Burn in Results	Upper Limit	Pot Values If applicable CW	CCW	Pass/Fail
D3-1	1M ohm	1M ohm			1M ohm	-	-	
D4-1	9.6K ohm	7.6K ohm			11.6K ohm	-	-	
D4-2	9.6K ohm	7.6K ohm			11.6K ohm	-	-	
D4-3	9.6K ohm	7.6K ohm			11.6K ohm	-	-	
D4-4	9.6K ohm	7.6K ohm			11.6K ohm	-	-	
D4-5	9.6K ohm	7.6K ohm			11.6K ohm	-	-	
D4-6	9.6K ohm	7.6K ohm			11.6K ohm	-	-	
D4-7	9.6K ohm	7.6K ohm			11.6K ohm	-	-	
D4-8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D5-1	<50 ohm	<50 ohm			<50 ohm	-	-	
D5-2	<50 ohm	<50 ohm			<50 ohm	-	-	
D5-3	<50 ohm	<50 ohm			<50 ohm	-	-	
D5-4	<50 ohm	<50 ohm			<50 ohm	-	-	
D5-5	<50 ohm	<50 ohm			<50 ohm	-	-	
D5-6	<50 ohm	<50 ohm			<50 ohm	-	-	
D5-7	<50 ohm	<50 ohm			<50 ohm	-	-	
D5-8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Special Note: D4-1 thru D4-7, resistances are not attainable due to to change in test circuit. Values will be around 9600K ohms.

3/19/2012

cw