REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A	ENGINEERING RELEASE		

REV STATUS OF SHEETS	REV																
	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
REV STATUS OF SHEETS	REV																
	SHEET	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

CONTRACT No.:			AMERICAN MICROWAVE CORPORATION FREDERICK, MD 21701		
DRAWN		DATE			
CHECK			ACCEPTANCE TEST PROCEDURE		
APPD.					
ENGR.	M. Mehrabani	4/26/93	MODEL: SW-2000-8AT, OPTION 200 RAYTHEON PART NO: 11473144 MICROCIRCUIT, HYBRID, SP8T RF SWITCH		
PROD.					
QC.					
			SIZE: A	FSCM: 60483	DRAWING No: 100-3104
			REV: A	SCALE: N/A	SHEET 1 OF 15

ACCEPTANCE

TEST PROCEDURE
(ATP)

FOR

RAYTHEON COMPANY MSD

PART NO. 11473144

AMC MODEL NUMBER: SW-2000-8AT OPTION 200

SINGLE POLE EIGHT THROW RF SWITCH

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1.0 SCOPE

The purpose of this document is to provide an electrical testing procedure for the Raytheon Part Number 11473144 Single Pole, Eight Throw PIN-Diode Switch. This document is not a substitute for the American Microwave standard test procedure. This procedure is only to be performed by a test technician experienced in the testing of RF and microwave devices.

2.0 EQUIPMENT LIST

The following equipment are to be used in conjunction with this Acceptance Test Procedure (ATP) provided that all said equipments have displayed a valid calibration notice that can be traced to the National Institute of Standards and Technologies (NIST).

The test equipments referenced to this note are listed as acceptable for measuring required voltages and output power for verification purposes. Sample applications of the equipment are contained in Appendix A for reference and may be applied to measure any specified RF power or DC voltage.

TABLE OF APPROVED TEST EQUIPMENTS

S/N	ITEM	MANUFACTURER	MODEL NUMBER
1	RF Source	Hewlett Packard	8350B
2	Power Meter	Hewlett Packard	436A
3	Power Supply	Hewlett Packard	721A
4	Termination, 50 ohm	Mid-West	2444
5	Network Analyzer	Hewlett Packard	8757A
6	VSWR Bridge	Hewlett Packard	85027E
7	Voltmeter	Beckman	DM25
8	Calibrated Short/Open	Wiltron	
9	Pulse Generator	Hewlett Packard	8013B
10	Oscilloscope	Tektronix	485
11	Signal Generator	Hewlett Packard	618 C
12	Double Balanced Mixer	Vari-L	dBm-1800
13	Spectrum Analyzer	Hewlett Packard	8559A

3.0 SCREENING INSPECTION/TEST

All units shall be subjected to the screening test (steps marked with "*") outlined in Appendix B prior to final electrical testing, inspection, and shipping.

4.0 INSERTION LOSS/LOSS VARIATION

4.1 Normalization of the test measurement system.

4.1.1 Connect the test equipment as in Figure I with swept frequencies from 250 MHz to 500 MHz and RF Power Level to +19 dBm.

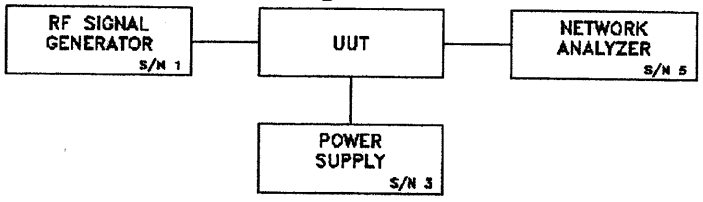
Figure I

4.1.2 Store the through line reference level in the internal memory of the Network Analyzer.

4.2 Measurement of the Unit Under Test (UUT).

4.2.1 Connect the test equipment and the UUT as in Figure II with common port as RF input and any other ports as RF output.

Figure II



4.2.2 Apply the TTL Logic Code to the UUT via the Table II.

Table II
PIN FUNCTION TABLE (CONTROL)

PIN NO.	PIN FUNC	PIN NO.	PIN FUNC	PIN NO.	PIN FUNC
1	N/C GND	10	N/C GND	19	+1
2	+2	11	G1	20	−1
3	−2	12	G2	21	+3
4	+4	13	G3	22	−3
5	−4	14	G4	23	+5
6	+6	15	G5	24	−5
7	−6	16	G6	25	+7
8	+8	17	G7	26	−7
9	−8	18	G8		

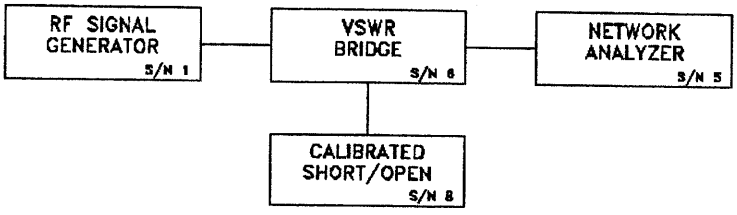
4.2.3 Observe and record on Test Data Sheet I the maximum insertion loss displayed on the Network Analyzer.

5.0 VSWR

5.1 Normalization of the test measurement system.

5.1.1 Connect the equipment as shown in Figure III with the calibrated short connected to the VSWR bridge. Set RF power level to +19 dBm.

Figure III



5.1.2 Connect the equipment as shown in Figure III with the calibrated open connected to the VSWR bridge.

5.1.3 Store the open circuit reference data in the internal memory of the Network Analyzer.

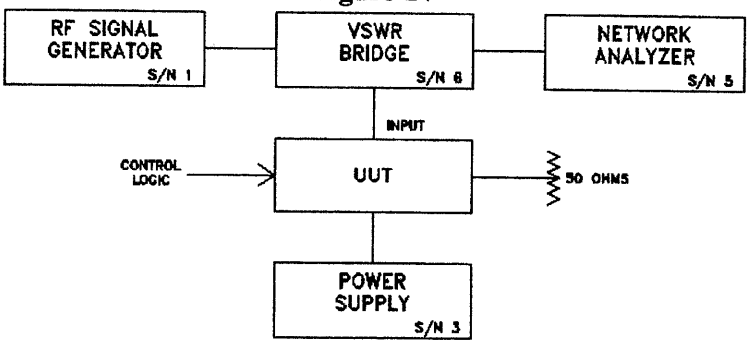
5.1.4 Connect the equipment as shown in Figure III with the calibrated short connected to the VSWR bridge.

5.1.5 Store the short circuit reference data in the internal memory of the Network Analyzer.

5.2 Measurement of the input/output VSWR of the UUT.

5.2.1 Connect the UUT and the equipment as shown in Figure IV with common port as RF input and terminate all output ports into 50Ω load.

Figure IV



5.2.2 Enable the RF path from common port to any output port by applying the proper logic word to the switch.

5.2.3 Observe and record the maximum VSWR shown on Test Data Sheet I to all output paths.

5.3 Measurement of the output VSWR of the UUT.

5.3.1 Connect the UUT and the equipment as shown in Figure IV with RF outputs connected to the VSWR bridge and a 50Ω termination connected to the common port.

5.3.2 Enable the RF path output to the common by applying the proper logic word to the module.

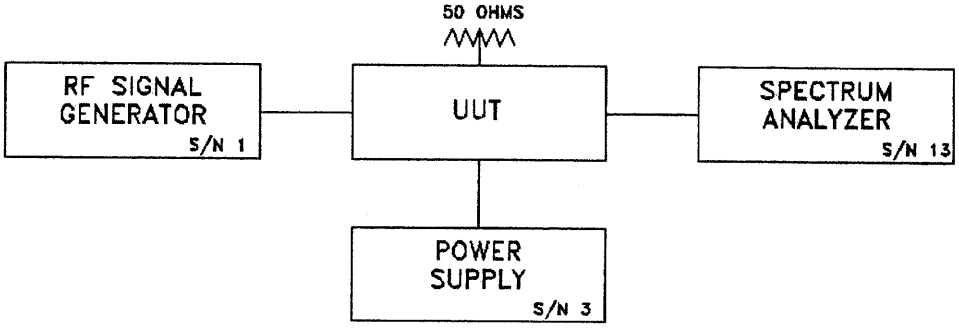
5.3.3 Observe and record the maximum VSWR shown on Test Data Sheet I in RF Path in ON and OFF conditions.

6.0 ISOLATION (RF Signal ON/OFF Ratio)

6.1 Normalization of the test measurement system

6.1.1 Set up the equipment and the UUT as shown in Figure V with common port connected to the RF signal generator set at 500 MHz CW, output connected to the Spectrum Analyzer, and a 50Ω termination connected to any other RF ports of the UUT. Set RF power level to +19 dBm.

Figure V



6.1.2 Enable the RF common path through output by applying the proper logic word to the module.

6.1.3 Select a convenient reference level on spectrum analyzer.

6.2 Measurement of Isolation

6.2.1 Disable the selected path and record the minimum isolation of this selected RF port with respect to any other RF ports in ON or OFF conditions. Record Data on Test Data Sheet II.

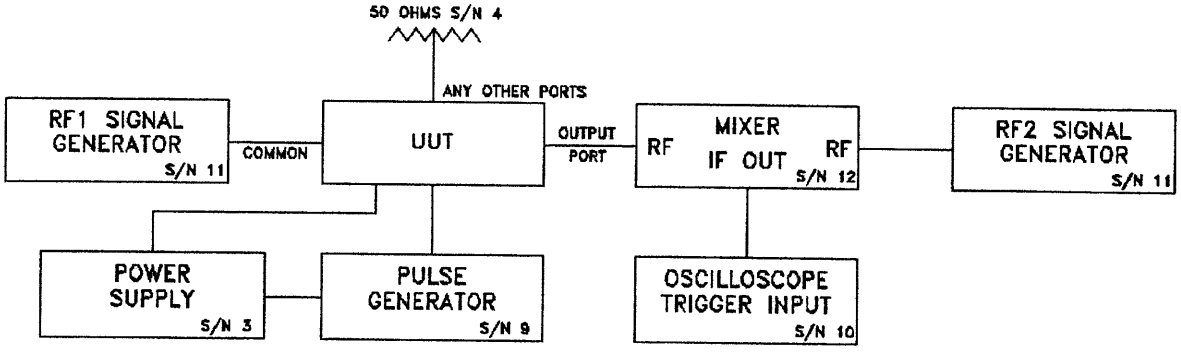
6.2.2 Repeat 6.1.1 through 6.2.1 for all ports.

7.0 SWITCHING SPEED

7.1 Measurement of switching time.

7.1.1 Set up the equipment as shown in Figure VI with common port of UUT connected to RF1 and selected output port connected to the Mixer, RF1 and RF2 are 50 MHz apart CW frequencies in the switch pass-band (Example: RF1 = 500 MHz, RF2 = 550 MHz). Terminate all unused ports in a 50Ω load. Adjust the pulse width on the pulse generator to 1 μsec TTL "high" and 1 μsec TTL "low" (Square pulse).

Figure VI



7.1.2 Pulse from off to on position and vise versa by connecting the pulse generator to the control logic input of the selected RF port.

7.1.3 Measure the IF frequency ON-Time by observing the time delay between the 50% voltage point of the pulsed TTL input to 95% voltage point of the on going IF output signal (i.e. 90% RF power). Record the ON-Time on Test Data Sheet II.

7.1.4 Measure the RF OFF-Time by observing the time delay between the 50% voltage point of the pulsed TTL input to 33% voltage point of the off going IF output signal (i.e. 10% RF power). Record the OFF-Time on Test Data Sheet II.

7.1.5 Repeat 7.1.2 through 7.1.4 for all RF ports.

8.0 HARMONICS

8.1 Normalization of the test measurement system.

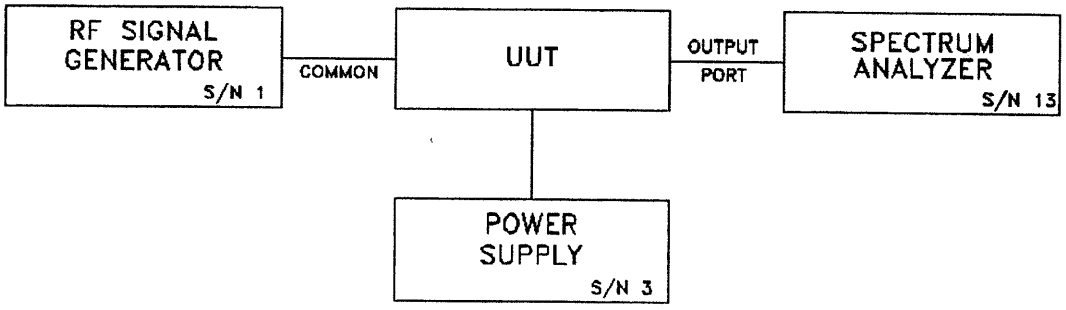
8.1.1 Connect the test equipments as in Figure VII with signal generator set at +9 dBm and 250 MHz CW frequency, calibrate the system for dynamic range of better than 65 dB at 500 MHz and 750 MHz.

Figure VII

8.2 Measurement of the Unit Under Test (UUT).

8.2.1 Connect the test equipment and the UUT as in Figure VIII with common port as RF input and any other ports as RF output. The output port must be in ON condition with all other ports in OFF condition.

Figure VIII



8.2.2 Observe and record on Test Data Sheet III the level of 2nd and 3rd harmonics displayed on the spectrum analyzer.

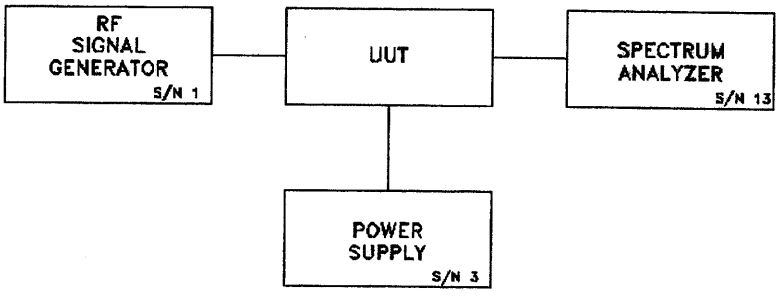
8.2.3 Repeat 8.2.1 through 8.2.2 for all RF ports.

9.0 RF LEAKAGE (CONDUCTIVE & RADIATED)

9.1 Normalization of the Test Measurement System.

9.1.1 Connect the test equip as in Figure IX with signal generator set at +19 dBm and 500 MHz CW frequency with RF path thru UUT in ON position and calibrate the system for dynamic range of better than 80 dB.

Figure IX



9.2 Measurement of RF Leakage.

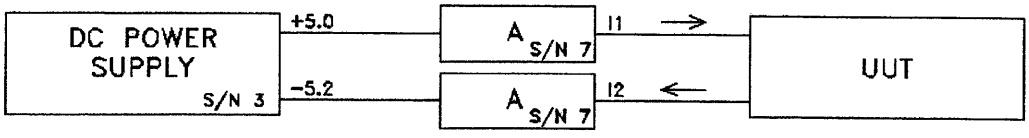
9.2.1 For radiated leakage test, disconnect spectrum analyzer port from test set up of Figure IX and terminate all ports in 50Ω, connect a quarter wave antenna of approximately 5.9 inches to the spectrum analyzer port and move the antenna around the UUT closely with a distance of approximately 1 inch. Record the level of the signal on Test Data Sheet III.

9.2.2 For conductive leakage test, disconnect spectrum analyzer port from test set up of Figure IX and terminate all ports in 50Ω, probe all DC and Control connectors with spectrum analyzer. Record the level of the signal on Test Data Sheet III.

10.0 D.C. POWER MEASUREMENT

10.1 Set up equipments as shown in Figure X.

Figure X



10.2 With all logic combinations applied to the switch control terminals (not any two arms ON at the same time) measure the maximum current I1 and I2. Record the measured maximum currents I1 and I2 on Test Data Sheet III.

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TEST DATA SHEET I

MODEL NO: SW-2000-8AT OPTION NO: 200 JOB NO: _____

CUSTOMER: RAYTHEON SCD NO: 11473144 REVISION: A

TECHNICIAN: _____ DATE: _____ SERIAL NO: _____

QA/QC APPROVAL: _____ DATE _____

INSERTION LOSS

RF PATH ON	MAXIMUM IN-BAND INSERTION LOSS	SPECIFIED MAXIMUM INSERTION LOSS	PASS	FAIL
J9 - J1	dB	2.0 dB MAX		
J9 - J2	dB	2.0 dB MAX		
J9 - J3	dB	2.0 dB MAX		
J9 - J4	dB	2.0 dB MAX		
J9 - J5	dB	2.0 dB MAX		
J9 - J6	dB	2.0 dB MAX		
J9 - J7	dB	2.0 dB MAX		
J9 - J8	dB	2.0 dB MAX		

MAXIMUM INSERTION LOSS VARIATION: _____ dB PASS: _____

SPECIFIED INSERTION LOSS VARIATION: 0.4 dB MAX FAIL: _____

INPUT/OUTPUT VSWR

INPUT/OUTPUT RF PATH	INPUT VSWR PATH ON	OUTPUT VSWR PATH ON	OUTPUT VSWR PATH OFF	SPECIFIED MAX VSWR	PASS	FAIL
J9 - J1	dBR	dBR	dBR	-9.54 dBR		
J9 - J2	dBR	dBR	dBR	-9.54 dBR		
J9 - J3	dBR	dBR	dBR	-9.54 dBR		
J9 - J4	dBR	dBR	dBR	-9.54 dBR		
J9 - J5	dBR	dBR	dBR	-9.54 dBR		
J9 - J6	dBR	dBR	dBR	-9.54 dBR		
J9 - J7	dBR	dBR	dBR	-9.54 dBR		
J9- J8	dBR	dBR	dBR	-9.54 dBR		

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TEST DATA SHEET II

MODEL NO: SW-2000-8AT OPTION NO: 200 JOB NO: _____

CUSTOMER: RAYTHEON SCD NO: 11473144 REVISION: A

TECHNICIAN: _____ DATE: _____ SERIAL NO: _____

QA/QC APPROVAL: _____ DATE _____

ISOLATION

RF PATH ON	MINIMUM IN-BAND ISOLATION	SPECIFIED MINIMUM ISOLATION	PASS	FAIL
J9 - (OTHERS)		-80 dB MIN		
J9 - (OTHERS)		-80 dB MIN		
J9 - (OTHERS)		-80 dB MIN		
J9 - (OTHERS)		-80 dB MIN		
J9 - (OTHERS)		-80 dB MIN		
J9 - (OTHERS)		-80 dB MIN		
J9 - (OTHERS)		-80 dB MIN		
J9 - (OTHERS)		-80 dB MIN		

SWITCHING TIME

RF PATH	ON-TIME	OFF-TIME	SPECIFIED MAX SWITCHING TIME	PASS	FAIL
J9 - J1	nSEC	nSEC	750 nSEC		
J9 - J2	nSEC	nSEC	750 nSEC		
J9 - J3	nSEC	nSEC	750 nSEC		
J9 - J4	nSEC	nSEC	750 nSEC		
J9 - J5	nSEC	nSEC	750 nSEC		
J9 - J6	nSEC	nSEC	750 nSEC		
J9 - J7	nSEC	nSEC	750 nSEC		
J9- J8	nSEC	nSEC	750 nSEC		

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TEST DATA SHEET III

MODEL NO: SW-2000-8AT OPTION NO: 200 JOB NO: _____

CUSTOMER: RAYTHEON SCD NO: 11473144 REVISION: A

TECHNICIAN: _____ DATE: _____ SERIAL NO: _____

QA/QC APPROVAL: _____ DATE _____

HARMONICS

RF PATH ON	2nd HARMONIC	3rd HARMONIC	SPECIFIED HARMONICS	PASS	FAIL
J9 - J1	dBC	dBC	-65 dBC MAX		
J9 - J2	dBC	dBC	-65 dBC MAX		
J9 - J3	dBC	dBC	-65 dBC MAX		
J9 - J4	dBC	dBC	-65 dBC MAX		
J9 - J5	dBC	dBC	-65 dBC MAX		
J9 - J6	dBC	dBC	_65 dBC MAX		
J9 - J7	dBC	dBC	-65 dBC MAX		
J9 - J8	dBC	dBC	-65 dBC MAX		

RF LEAKAGE

SPECIFIED LEAKAGE: 80 dBC MIN.

MEASURED RADIATED LEAKAGE: _____ dBC PASS: _____ FAIL: _____

MEASURED CONDUCTIVE LEAKAGE: _____ dBC PASS: _____ FAIL: _____

DC POWER

SPECIFIED DC CURRENT: +5 +/-0.25VDC @ I1 = 500 mA MAX.
-5.2 +/-0.25 VDC @ I2 = 180 mA MAX.

MEASURED DC CURRENT: I1 = _____ mA PASS: _____ FAIL: _____

I2 = _____ mA PASS: _____ FAIL: _____

APPENDIX A

1.0 SAMPLE RF POWER MEASUREMENT

1.1 Set up equipment as shown in Figure AI

Figure AI

1.2 Adjust the RF Signal Generator power until the power level displayed on the RF Power Meter reads +0 dBm.

1.3 The RF Signal Generator is now calibrated in power. Disconnect the RF power meter.

2.0 MEASUREMENT OF DC VOLTAGE

2.1 Set up equipment as shown in Figure AII.

Figure AII

2.2 Adjust the voltage on the DC Power Supply until the Digital Voltmeter reads the applied voltage value.

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APPENDIX B
PRODUCTION STEPS FLOW CHART

MODEL NO: SW-2000-8AT OPTION NO: 200 JOB NO: _____

PARTS LIST NO: 100-3007 REVISION: A SERIAL NO: _____

CUSTOMER: RAYTHEON SCD NO: 11473144 REVISION: A

KIT PULLED BY: _____ SPECIFICATION: MIL-STD-454

STEP NO:	OPERATIONAL STAGE	ASSY	TEST	QA/QC
1	*ASSEMBLE RF AS PER DRAWING NUMBER 300-3032 MIL-STD-454 (4,9)*		X	X
2	*ASSEMBLE DRIVERS AS PER DRAWING NUMBERS 300-3027 AND 300-2996, MIL-STD-454 (4,9)*		X	X
3	*INSTALL DRIVER AS PER DRAWING NUMBER 300-3068*		X	X
4	*DC CHECK RF AND FINAL ASSEMBLY FOR CONTINUITY AND POSSIBLE SHORTS*		X	X
* 5	*INSPECT RF AND FINAL ASSEMBLY IN ACCORDANCE WITH AMC STANDARD PROCEDURE (CHECK FOR INSTALLATION OF LOCKING INSERTS AS PER AMC DRAWING 400-2991 REV. B)*	X	X	
6	*PRELIMINARY ELECTRICAL TEST AS PER PARAGRAPHS 4.0 - 10.0 OF ATP DRAWING NUMBER 100-3104*	X		X
* 7	*TEMPERATURE CYCLING, -65°C TO 110°C, 4 CYCLES, 1/2 HOUR SOAK TIME MINIMUM*	X		X
* 8	*TEMPERATURE SHOCK, -55°C TO + 85°C, 4 CYCLES, 1/2 HOUR SOAK TIME MINIMUM*	X		X
* 9	*VIBRATION TEST (10G @ 60 Hz FOR 30 SECONDS MINIMUM)*	X		X
10	*POST TEMPERATURE/ELECTRICAL TEST, PARAGRAPH 4.0 AND 5.0 OF ATP DRAWING NUMBER 100-3104*	X		X
* 11	*BURN-IN (DC POWER ON), 48 HOURS @ +110°C*	X		X
12	*PAINT/FINAL PREPARATION*		X	X
13	*FINAL ELECTRICAL TEST IN ACCORDANCE WITH ATP DRAWING NUMBER 100-3104 (RECORD DATA)*	X		X
14	*FINAL INSPECTION/SHIP*	X		X

REWORK

ITEM N0.	STEP NO.	REWORK(S)	ASSY	QA/QC