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REVISIONS				
LTR	ECO	DESCRIPTION	DATE	APPROVED
A		See DCN	3/26/81	ML/

SIGNATURE		DATE
PROD TEST		12-1-80
ENGINEERING		12/1/80
QUAL CONTROL		12-1-80

TITLE
CM249-Q2 Carrier Modulator
Acceptance Test Procedure

NUMBER	REV
ATP440	A

SHEET 1 OF 10

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1.0 SCOPE

This document defines the Acceptance Test Procedure (ATP) for the CM249 Carrier Modulator. The ATP performs functional tests of the CM249 circuit board unmounted, retests insulation resistance and operating characteristics with the CM249 circuit board case-mounted, and retests operating characteristics after burn-in and potting. A sample of the Test Report to be used with this ATP is contained in Appendix A.

2.0 EQUIPMENT REQUIRED

Table 1 lists the test equipment required to perform the ATP.

Table 1. Equipment Required for ATP

Description	Manufacturer	Part No. or Model	Alternate
CM249 Tester	Validyne	T/S-3	None
Test Jig	Validyne	T/S-1	None
Test Jig	Validyne	T/S-2	None
MC1 (Test)	Validyne	--	None
CD19 (CM249-CD19 Tester)	Validyne	--	None
Transducer Simulator	Validyne	TS234 or Equivalent	Commercial Equivalent
Digital Multimeter (DMM)	Keithley	177	Commercial Equivalent
Function Generator	IEC	F-47	Commercial Equivalent
Megohmmeter	General Radio	GR1864	Commercial Equivalent
Voltage Reference	Datel	DVC8500	Commercial Equivalent

3.0 PRELIMINARY PROCEDURE

3.1 Connect MC1 to 115 Vac power receptacle, but do not apply power at this time.

3.2 On CD19, set TEST switch to OUT, HI/LO switch to LO, and 2-ARM/4-ARM switch to 4-ARM; plug CD19 into front panel connector on MC1.

3.3 Connect transducer simulator to input connector on rear panel of MC1; set transducer simulator controls for 0.000 mV/V output, and POLARITY switch to +.

3.4 Press MC1 power switch; observe that power-on indicator lights.

3.5 Connect DMM to MC1 as shown in figure 1.

3.6 Refer to Model CD19 INSTRUCTION MANUAL, section II, paragraph 2-4, and perform step B for the 50 and 25 positions of the CD19 GAIN MV/V switch; observe that DMM indication is 0.000 Vdc.

3.7 Set transducer simulator controls for 35 mV/V output, and CD19 GAIN MV/V switch to 25; adjust CD19 GAIN control until DMM indicates +10.000 (±0.002)V.

3.8 Set transducer simulator controls for 0.000 mV/V output; adjust CD19 R-balance control for DMM reading of 0±0.002V DC.

3.9 Repeat steps 3.7 and 3.8 until no further GAIN and R-balance control adjustments are needed.

3.10 Disconnect test equipment from CD19 and MC1.

4.0 INITIAL TEST SETUP

4.1 Connect test jig T/S-1, CM249 tester, MC1, DMM, and function generator as shown in figure 2.

4.2 Raise clamp of test jig, and position CM249 circuit board, component side up, so that input and output terminal pads (figure 3) are over the corresponding test probes on the test jig; install CM249 into test jig and press clamp down firmly onto the circuit board.

5.0 FUNCTIONAL TESTS

Perform all tests and in the order given.

5.1 Isolation Capacitance

5.1.1 On CM249 tester, set INPUT and OUTPUT switches to 1.

5.1.2 Set function generator for 50 kHz, 10 Vrms, sinewave output, and DMM to 100 uA AC range; the DMM indication should not exceed 50 uA. Record reading on test report.

5.1.3 Multiply DMM reading from step 5.1.2 by 0.318 to obtain isolation capacitance in picofarads; record calculation on test report. (EXAMPLE: 30 (uA) x 0.318 = 9.54 pF)

5.2 Input Resistance

5.2.1 Disconnect function generator from DMM and CM249 tester.

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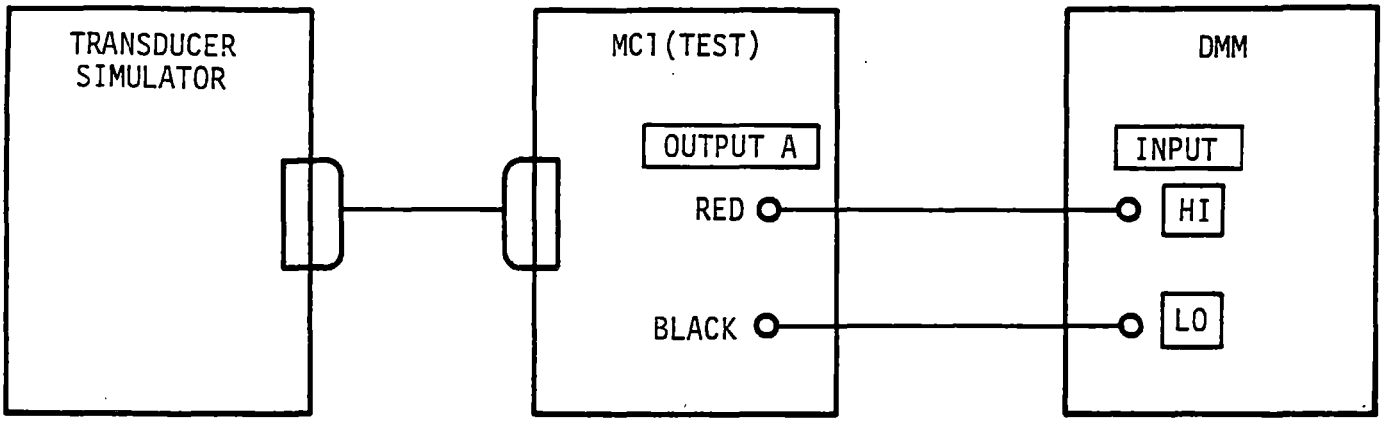

Figure 1. Preliminary Setup

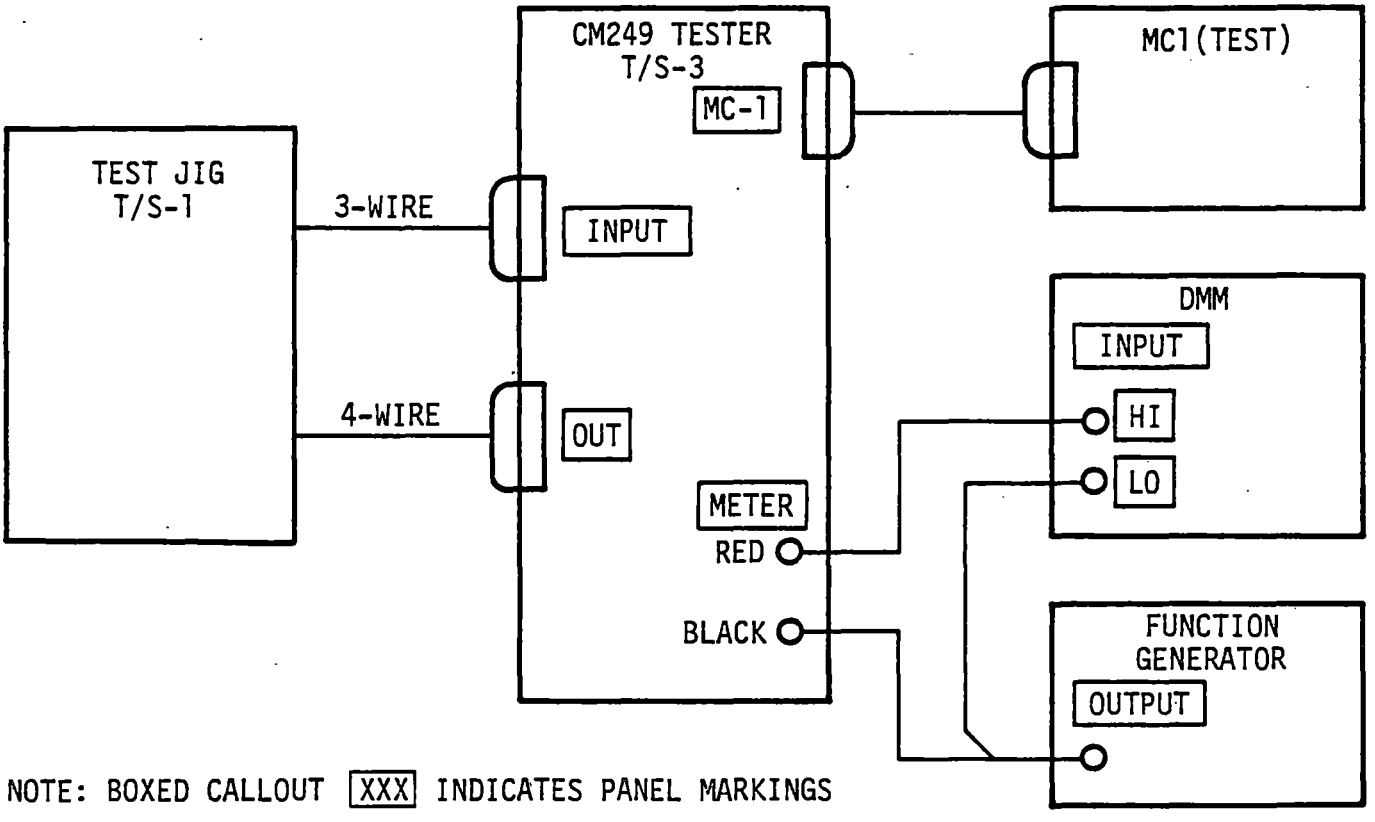

Figure 2. Initial Test Setup

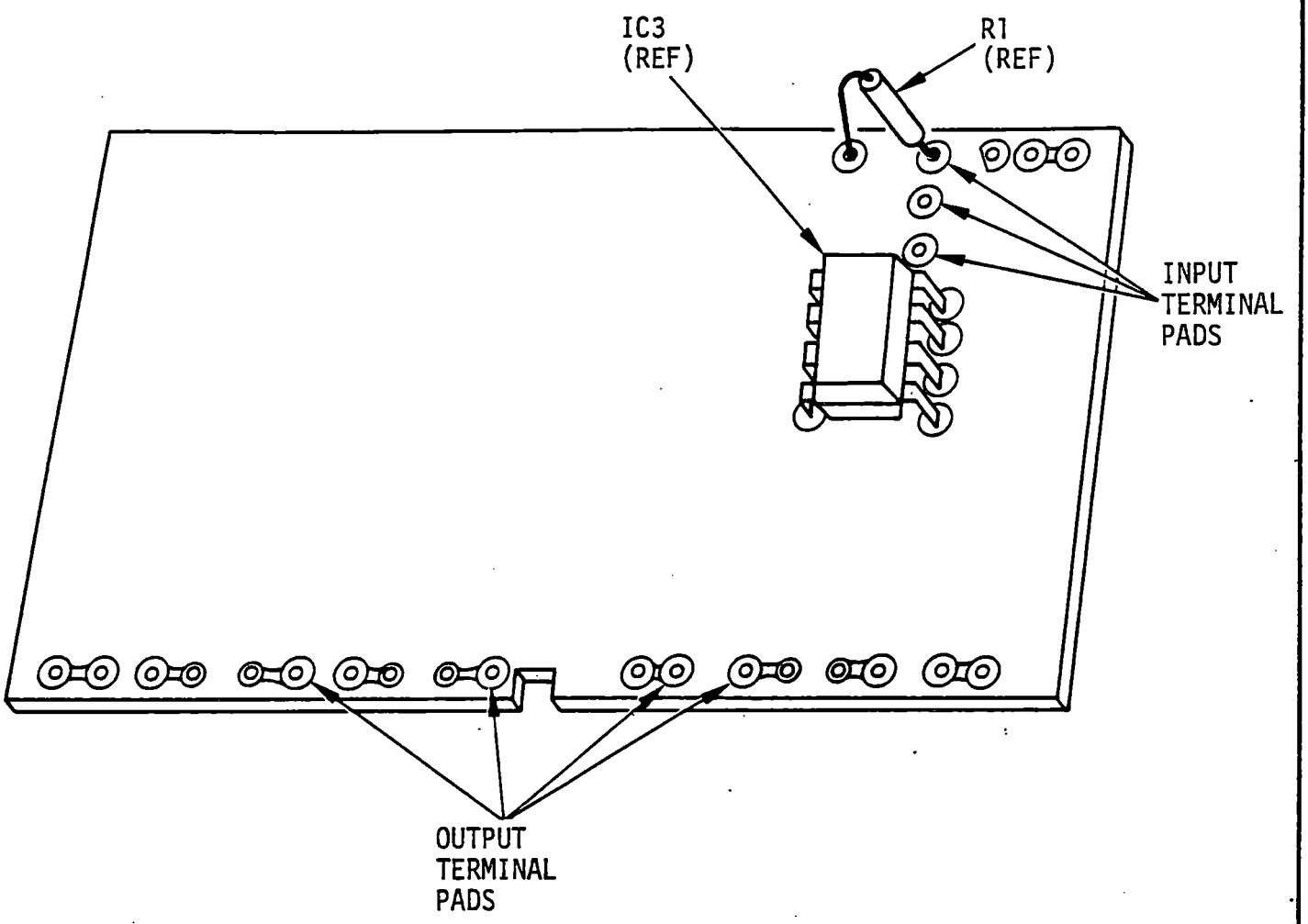

Figure 3. CM249 Circuit Board Orientation

5.2.2 Set DMM to 10 megohm range, and connect DMM LO to METER jack (black) on CM249 tester; set tester INPUT and OUTPUT switches to 2.

5.2.3 With MC1 power on (power-on indicator lit), the DMM indication should exceed 1.95 megohms; record reading on test report.

5.2.4 Press MC1 power switch; observe that power-on indicator goes off.

5.2.5 With MC1 power off, the DMM indication should exceed 1.95 megohms; record reading on test report.

5.2.6 Press MC1 power switch; observe that power-on indicator lights.

5.3 Input Bias Current

5.3.1 Set DMM to 100 mV DC range; observe reading and divide by 1.67 megohms to check for input bias current less than 10 nA. Record calculation on test report. (EXAMPLE: 12 (mV) ÷ 1.67 megohms = 7.18 nA)

5.4 Bias Current

5.4.1 On CM249 tester, set INPUT switch to 3; set DMM to 100 uA DC range.

5.4.2 The DMM indication should be 2(±0.5) uA DC; record reading on test report.

5.5 Carrier Excitation Current

5.5.1 On CM249 tester, set INPUT switch to 4 and OUTPUT switch to 3; set DMM to 10 mA AC range.

5.5.2 The DMM indication should be less than or equal to 5 mA AC; record reading on test report.

5.5.3 Press MC1 power switch; observe that power-on indicator goes off.

5.6 Operating Characteristics

5.6.1 Connect test jig T/S-1, CM249 tester, MC1, DMM, and voltage reference as shown in figure 4.

5.6.2 On CM249 tester, set INPUT switch to 5 and OUTPUT switch to 2; set DMM to 10V DC range, and voltage reference to 0.000V.

5.6.3 Press MC1 power switch; observe that power-on indicator lights.

5.6.4 The DMM indication of CM249 offset should be less than or equal to 0.10V DC; record reading on test report.

5.6.5 On CD19, set TEST switch to IN, and using the AUX R-BALANCE control, null CD19 output to 0.000(±0.005)V DC as indicated on the DMM.

5.6.6 Perform the steps in table 2, to check the linearity and symmetry of the CD249; for each step set input from the voltage reference as indicated, and record the actual DMM indication on test report.

5.7 Insulation Resistance

This test is performed only on case-mounted CM249.

5.7.1 Press MC1 power switch; observe that power-on indicator goes off.

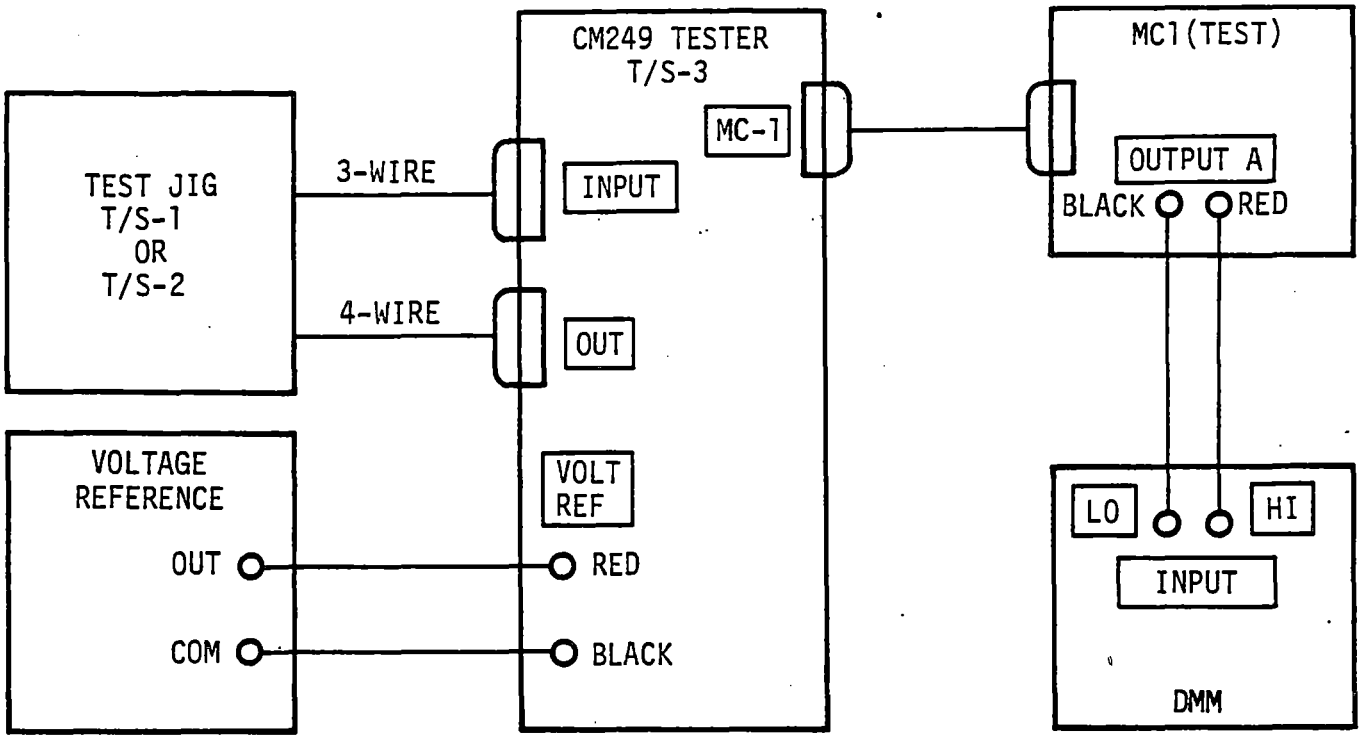

Figure 4. Operating Characteristics Test Setup

Table 2. Linearity and Symmetry Check

Step	Voltage Reference Input (VDC)	DMM Output Indication (VDC)	Specification (VDC)
1	+5.000±0.001	+10.00	±1.00*
2	-5.000±0.001	-10.00	±1.00*; absolute value should also be within ±0.05 of step 1 reading
3	+2.500±0.001	Step 1 reading divided by 2	±0.05
4	-2.500±0.001	Step 2 reading divided by 2	±0.05

* After potting of case-mounted CM249, specification is 10(±1.5)VDC

5.7.2 Raise clamp of test jig and remove CM249 circuit board; have circuit board case-mounted.

5.7.3 Set megohmmeter to 1000V, 10G range.

5.7.4 Connect megohmmeter + lead to any terminal on case INPUT strip, and - lead to any terminal on case OUTPUT strip; the megohmmeter indication should be greater than 10^{10} ohms. Record reading on test report.

5.7.6 Disconnect megohmmeter leads from CM249.

6.0 FINAL FUNCTIONAL TESTS

The final functional tests are performed after burn-in and potting.

6.1 Connect test jig T/S-2, CM249 tester, MC1, DMM, and voltage reference as shown in figure 4.

6.2 After burn-in, place CM249, open side up, on test jig with 3-terminal INPUT strip facing the three test probes, and the 4-terminal OUTPUT strip facing the four test probes; push block with four test probes firmly against terminal strip and push pin down to lock CM249 in place.

6.3 Repeat steps 5.6.2 thru 5.6.6 of Operating Characteristics Test.

6.4 Press MC1 power switch; observe that power-on indicator goes off.

6.5 Remove CM249 from test jig for potting.

6.6 After potting, reinstall CM249 in test jig and repeat steps 5.6.2 thru 5.6.6 of Operating Characteristics Test.

6.7 Press MC1 power switch; observe that power-on indicator goes off.

6.8 Remove CM249 from test jig.

6.9 If CM249 is mounted to a plate after completing Final Functional Tests, perform insulation resistance check in step 6.10.

6.10 Plate-Mounted Insulation Resistance

This test is performed only on a plate-mounted CM249.

6.10.1 Set megohmmeter to 1000V, 10G range.

6.10.2 Connect megohmmeter + lead to plate and - lead to any terminal on case INPUT strip; the megohmmeter indication should be greater than 10^{10} ohms. Record reading on test report.

6.10.3 Connect megohmmeter - lead to any terminal on case OUTPUT strip; the megohmmeter indication should be greater than 10^{10} ohms. Record reading on test report.

6.10.4 Connect megohmmeter + lead to any terminal on case INPUT strip and - lead to any terminal on OUTPUT strip; the megohmmeter indication should be greater than 10^{10} ohms. Record reading on test report.

6.10.5 Disconnect megohmmeter from plate and case.

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APPENDIX A

SAMPLE TEST REPORT

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TEST REPORT

ASSY CM249 Carrier Modulator

S/O _____ CUSTOMER _____

W/O _____ SERIAL NO. _____

Paragraph/Step		Accepted	Specification
5.1	Isolation Capacitance		
5.1.2	DMM Indication	_____	50 uA max.
5.1.3	Isolation Capacitance Calculation	_____	15.9 pF max.
5.2	Input Resistance		
5.2.3	DMM Indication	_____	>1.95 MΩ
5.2.5	DMM Indication	_____	>1.95 MΩ
5.3	Input Bias Current		
5.3.1	Input Bias Current Calculation	_____	<10 nA
5.4	Bias Current		
5.4.2	DMM Indication	_____	2(±0.5) uA DC
5.5	Carrier Excitation Current		
5.5.2	DMM Indication	_____	≤5 mA AC
5.6	Operating Characteristics		
5.6.4	DMM Offset Indication	_____	≤0.10V DC

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TEST REPORT

ASSY CM249 Carrier Modulator

S/O _____ CUSTOMER _____

W/O _____ SERIAL NO. _____

Paragraph/Step			Accepted	Specification
5.6.6	Table 2			
	Step	Indication On		
	1	DMM	_____	+10(±1)V
	2	DMM	_____	-10(±1)V, within ±0.05V of step 1
	3	DMM	_____	Step 1 ÷ 2 ±0.05V
	4	DMM	_____	Step 2 ÷ 2 ±0.05V
5.7	Insulation Resistance			
5.7.4	Megohmmeter Indication			$>10^{10}\Omega$
6.0	Final Functional Tests			
6.3	Table 2 (After Burn-In)			
	Step	Indication On		
	1	DMM	_____	+10(±1)V
	2	DMM	_____	-10(±1)V, within ±0.05V of step 1
	3	DMM	_____	Step 1 ÷ 2 ±0.05V
	4	DMM	_____	Step 2 ÷ 2 ±0.05V

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TEST REPORT

ASSY CM249 Carrier Modulator

S/O _____ CUSTOMER _____

W/O _____ SERIAL NO. _____

Paragraph/Step		Accepted	Specification
6.6	Table 2 (After Potting)		
	Step 1 — Indication On: DMM	_____	+10(±1.5)V
	Step 2 — Indication On: DMM	_____	-10(±1.5)V, within ±0.05V of step 1
	Step 3 — Indication On: DMM	_____	Step 1 ÷ 2 ±0.05V
	Step 4 — Indication On: DMM	_____	Step 2 ÷ 2 ±0.05V
6.10	Plate-Mounted Insulation Resistance		
6.10.2	Plate to Input Resistance	_____	$>10^{10}\Omega$
6.10.3	Plate to Output Resistance	_____	$>10^{10}\Omega$
6.10.4	Input to Output Resistance	_____	$>10^{10}\Omega$

NUMBER	REV
ATP440	A
SHEET 3 OF 3	