QUALIFICATION TEST REPORT

Hexadecimal Rotary Switch

501-130 Rev. A

Product Specification:	108-7066, Rev. 0
CTL No.:	CTL4541-001-005
Date:	September 4, 1990
Classification:	Unrestricted
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AMP

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CORPORATE TEST LABORATORY

Qualification Test Report
Hexadecimal Rotary Switch

1. Introduction

1.1 Purpose

Testing was performed on AMP* Hexadecimal Rotary Switch to determine its conformance to the requirements of AMP Product Specification 108-7066, Rev. 0.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the Hexadecimal Rotary Switch, manufactured by the Integrated Circuit Connector Products Division of the Capital Goods Business Sector. The testing was performed between June 1, 1990 and August 31, 1990.

1.3 Conclusion

The Hexadecimal Rotary Switch meets the electrical, mechanical, and environmental performance requirements of AMP Product Specification 108-7066, Rev. 0.

* Trademark

1.4 Product Description

The Hexadecimal Rotary Switches are 16 step and 10 step rotary, 8-4-2-1 binary, with complement, enclosing type and are intended to fit standard 16 pin DIP receptacles. The contacts are copper alloy, with gold over nickel plating. The housings are made from glass filled polyester.

1.5 Test Samples

The test samples were randomly selected from normal current production lots, and the following part numbers were used for test:

Test Group	Quantity	Part Number	Description
1,2,3,4,5,6	4 ea.	54792-1	16 pos. switch
1,2,3,4,5,6	4 ea.	54778-1	10 pos. switch

1.6 Qualification Test Sequence

	Test Groups					
Test or Examination	1	2	3	4	5	6
Examination of Product	1,9	1,8	1,5	1,5	1,3	1,5
Termination Resistance, Dry Circuit	3,7		2,4	2,4		
Dielectric Withstanding Voltage		3,7				
Insulation Resistance		2,6				
Capacitance						2
Electrical Stability						4
Vibration	5					
Physical Shock	6					
Operating Torque	2,8					
Durability	4					
Solderability					2	
Resistance to Soldering Heat						3
Thermal Shock		4				
Humidity-Temperature Cycling		5				
Mixed Flowing Gas			3			
Temperature Life				3		

The numbers indicate sequence in which tests were performed.

2. Summary of Testing

2.1 Examination of Product - All Groups

All samples submitted for testing were selected from normal current production lots. They were inspected and accepted by the Product Assurance Department of the Capital Goods Business Sector.

2.2 Termination Resistance, Dry Circuit - Groups 1, 3, 4

All termination resistance measurements, taken at 100 milliamperes dc. and 50 millivolts open circuit voltage, were less than 100 milliohms initially and 750 milliohms after mechanical testing.

Test Group	No. of Contacts	Condition	Min.	Max.	Mean
1	64	Initial	9.55	14.32	11.865
		After Mechanical	10.00	14.67	12.323
3	64	Initial	10.04	15.25	12.361
		After Mixed Gas	10.30	15.16	12.467
4	64	Initial	9.30	14.28	11.133
		After Heat Age	9.69	15.86	11.596

All values in milliohms

2.3 Dielectric Withstanding Voltage - Group 2

No dielectric breakdown or flashover occurred when a test voltage was applied between adjacent contacts.

2.4 Insulation Resistance - Group 2

All insulation resistance measurements were greater than 1000 megohms.

2.5 Capacitance - Group 6

All capacitance measurements were less than 5.0 picofarads.

2.6 Electrical Stability - Group 6

All samples had a temperature rise of less than 30°C above ambient when a specified voltage of 50 volts, 1.0 ampere dc was applied.

2.7 Vibration - Group 1

No switch discontinuities were detected during vibration. Following vibration, no cracks, breaks, or loose parts on the connector assemblies were visible.

2.8 Physical Shock - Group 1

No switch discontinuities were detected during physical shock. Following physical shock testing, no cracks, breaks, or loose parts on the connector assemblies were visible.

2.9 Operational Torque - Group 1

The minimum force required to turn the switches from one detent to the next was greater than 1.0 inch/ounce.

2.10 Durability - Group 1

No physical damage occurred to the samples as a result of 500 bi-directional shaft rotations.

2.11 Solderability - Group 5

The contact leads had a minimum of 95% solder coverage.

2.12 Resistance to Soldering Heat - Group 6

No physical damage occurred to the samples as a result of exposure to soldering heat.

2.13 Thermal Shock - Group 2

No evidence of physical damage to the switches was visible as a result of thermal shock.

2.14 Humidity-Temperature Cycling - Group 2

No evidence of physical damage to the switches was visible as a result of exposure to humidity- temperature cycling.

2.15 Mixed Flowing Gas - Group 3

No evidence of physical damage to the switches was visible as a result of exposure to the pollutants of mixed flowing gas.

2.16 Temperature Life - Group 4

No evidence of physical damage to the switches was visible as a result of exposure to an elevated temperature.

3. Test Methods

3.1 Examination of Product

Product drawings and inspection plans were used to examine the samples. They were examined visually and functionally.

3.2 Termination Resistance, Low Level

Termination resistance measurements at low level current were made, using a four terminal measuring technique (Figure 1). The test current was maintained at 100 milliamperes dc, with an open circuit voltage of 50 millivolts dc.

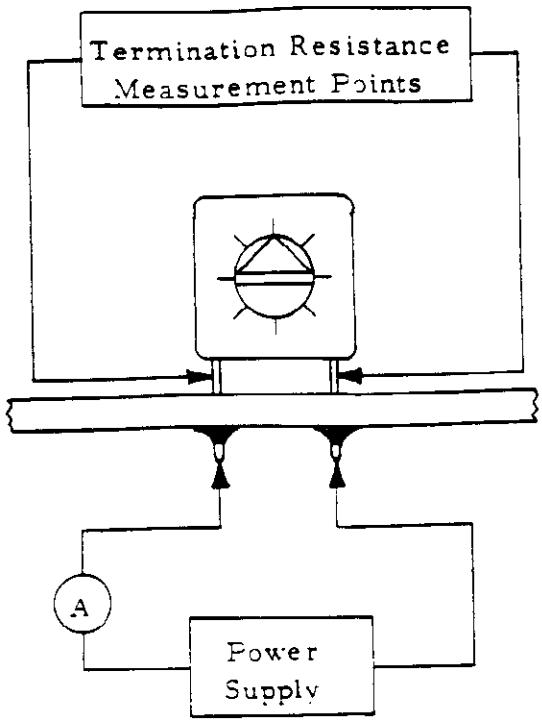

Figure 1
Typical Termination Resistance Measurement Points

3.3 Dielectric Withstanding Voltage

A test potential of 300 vac was applied between the mutually insulated contacts in the "0" position, then in the "F" position. This potential was applied for one minute and then returned to zero.

3.4 Insulation Resistance

Insulation resistance was measured between the mutually insulated contacts in the "0" position, then in the "F" position, using a test voltage of 100 volts dc. This voltage was applied for two minutes, before the resistance was measured.

3.5 Capacitance

Capacitance was measured between the mutually insulated contacts in the "O" position, then in the "F" position, using a test frequency of one megahertz.

3.6 Electrical Stability

Switch temperature was measured, while energized at 50 volts and a specified current of one ampere dc. A thermocouple was attached to the center switch leg to measure temperatures. This temperature was then subtracted from the ambient temperature to find the temperature rise. When three readings at five minute intervals were the same, the readings were recorded.

3.7 Vibration, Sine

Switch assemblies were subjected to sinusoidal vibration, having a simple harmonic motion with an amplitude of 0.06 inch, double amplitude. The vibration frequency was varied logarithmically between the limits of 10 and 500 Hz, and returned to 10 Hz in 15 minutes. This cycle was performed 12 times in each of three mutually perpendicular planes, for a total vibration time of 9 hours. Connectors were monitored for discontinuities greater than ten microsecond, using a current of 100 milliamperes in the monitoring circuit. One switch was in the "O" position, and the others in the "F" position.

3.8 Physical Shock

Switch assemblies were subjected to a physical shock test, having a half-sine waveform of 50 gravity units (g peak) and a duration of 11 milliseconds. Three shocks in each direction were applied along the three mutually perpendicular planes, for a total of 18 shocks. The connectors were monitored for discontinuities greater than one microsecond, using a current of 100 milliamperes in the monitoring circuit. One switch was in the "O" position, and the others in the "F" position.

3.9 Operational Torque

Each switch lever was rotated 360°, with respect to its housing both clockwise and counterclockwise. The force/torque was measured for each detent.

3.10 Durability

Each switch lever was rotated 360°, with respect to its housing both clockwise and counterclockwise. This was done 500 times. Each switch contact was energized with 28 volts dc and a resistive load, which produced a 125 milliampere current flow.

3.11 Solderability

Switch solder tails were subjected to a solderability test by immersing them in an active flux for 5 to 10 seconds, allowed to drain for 10 to 60 seconds, then held over molten solder without contact for 2 seconds. The solder tails were then immersed in the molten solder, at a rate of approximately one inch per second, held for 3 to 5 seconds, then withdrawn. After cleaning in isopropyl alcohol, the samples were visually examined for solder coverage. The solder used for testing was 60/40 tin lead composition and was maintained at a temperature of 245°C.

3.12 Resistance to Soldering Heat

Switches were inserted into PC boards and immersed in a solder bath for 10 seconds. The solder bath was maintained at 260°C. The switch legs were immersed in a type "R" flux before testing.

3.13 Thermal Shock

Two switches in the "0" position, and two switches in the "F" position, were subjected to five cycles of temperature extremes, with each cycle consisting of 30 minutes at each temperature. The temperature extremes were -40°C and 70°C. The transition between temperatures was less than one minute.

3.14 Humidity-Temperature Cycling

Switches were exposed to 4 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25°C and 65°C twice, while the relative humidity was held at 95%.

3.15 Mixed Flowing Gas, Class II

Switches, in the "0" position, were exposed for 20 days to an mixed flowing gas Class II exposure. Class II exposure is defined as a temperature of 30°C and a relative humidity of 70%, with the pollutants of Cl_2 at 10 ppb, NO_2 at 200 ppb, and H_2S at 10 ppb.

3.16 Temperature Life

Two switches in the "0" position, and two switches in the "F" position, were exposed to a temperature of 70°C for 240 hours. Discontinuity was monitored during testing, using a 10 milliampere current flow.

4. Validation

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