Right Angle DVI Receptacle Connector

1. INTRODUCTION

1.1. Purpose

Testing was performed on the Tyco Electronics Right Angle Digital Visual Interface (DVI) Receptacle Connector to determine its conformance to the requirements of Product Specification 108-1941 Revision A.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the Right Angle DVI Receptacle Connector. Testing was performed at the Engineering Assurance Product Test Laboratory between 19Nov00 and 31May01. The test file number for this testing is CTL 6477-001. This documentation is on file at and available from the Engineering Assurance Product Test Laboratory.

1.3. Conclusion

The Right Angle DVI Receptacle Connector listed in paragraph 1.5, conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-1941 Revision A.

1.4. Product Description

The DVI Receptacle Connector is designed to meet the industry's requirements for analog and digital computer monitors. The receptacle connector supports host systems that are enabled to transmit both analog and digital video. This is achieved by utilizing two different sets of contacts in one housing.

1.5. Test Specimens

Test specimens were representative of normal production lots. Specimens identified with the following part numbers were used for test:

Test Group	Quantity	Part Number	Description
1	6	440062-1	DVI-I receptacle (integrated) with gold flash contacts
1	6	440062-2	DVI-I receptacle (integrated) with 10μin gold contacts
2,3,4,5	2	440062-1	DVI-I receptacle (integrated) with gold flash contacts
2,3,4,5	2	440062-2	DVI-I receptacle (integrated) with 10μin gold contacts

Figure 1

1.6. Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

- Temperature: 15 to 35°C
- Relative Humidity: 25 to 75%

1.7. Qualification Test Sequence

Test or Examination	Test Group (a)				
	1(b)	2	3	4	5
	Test Sequence (c)				
Initial examination of product	1	1	1	1	1
Dry circuit resistance	2,5,8,11,14	2,5,8			
Shell resistance	3,6,9,12,15	3,6,9			
Insulation resistance				5,7	
Dielectric withstanding voltage				2,4	
Electrostatic discharge					2
Mating force			2,5,8		
Unmating force			3,6,9		
Durability	4		4		
Vibration, random		4			
Mechanical shock, specified pulse		7			
Thermal shock	7			3	
Humidity-temperature cycling (d)	13			6	
Temperature life	10		7		
Final examination of product	16	10	10	8	3

NOTE
(a) See paragraph 4.1.A.
(b) Omit steps 3, 4 and 5 for one-half of the specimens.
(c) Numbers indicate sequence in which tests are performed.
(d) Test group 1 tested to Condition B, test group 2 tested to Condition A.

Figure 2

2. SUMMARY OF TESTING

2.1. Initial Examination of Product - All Test Groups

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance was issued by Product Assurance. Where specified, specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Termination Resistance - Test Groups 1 and 2

All termination resistance measurements taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 20 milliohms initially and had a change in resistance (**Δ**R) of less than 10 milliohms after testing.

Test Group	Number of Data Points	Condition	Termination Resistance (ΔR)		
			Min	Max	Mean
1	132	Initial	2.54	11.32	7.290
	66	After Durability (ΔR)	-2.25	1.39	-0.195
	132	After Thermal Shock (ΔR)	-2.34	3.76	0.510
	132	After Temperature Life (ΔR)	-1.50	6.79	1.061
	132	After Humidity-temperature cycling (ΔR)	-1.23	9.05	1.502
2	88	After Vibration (ΔR)	-7.65	2.88	-0.188
	88	After Mechanical. Shock (ΔR)	-2.87	2.88	-0.047

NOTE *All values in milliohms.*

Figure 3

2.3. Shell Resistance - Groups 1 and 2

All termination resistance measurements taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 50 milliohms initially and had a change in resistance (ΔR) of less than 50 milliohms after testing.

Test Group	Number of Data Points	Condition	Termination Resistance (ΔR)		
			Min	Max	Mean
1	12	Initial	2.30	3.33	2.867
	12	After Durability (ΔR)	-0.71	-0.16	-0.255
	12	After Thermal Shock (ΔR)	-0.59	-0.43	-0.111
	12	After Temperature Life (ΔR)	-0.48	1.04	0.241
	12	After Humidity-temperature cycling (ΔR)	-0.10	5.86	1.646
2	4	After Vibration (ΔR)	-0.09	0.49	0.081
	4	After Mechanical. Shock (ΔR)	-0.07	0.26	0.155

NOTE *All values in milliohms.*

Figure 4

2.4. Insulation Resistance - Test Group 4

All insulation resistance measurements were greater than 1,000 megohms.

2.5. Dielectric Withstanding Voltage - Test Group 4

No dielectric breakdown or flashover occurred.

2.6. Electrostatic Discharge - Test Group 5

No discharges to contact were detected.

2.7. Mating Force - Test Group 3

All mating force measurements were less than 4.5 kgf [10.0 lbf].

2.8. Unmating Force - Test Group 3

All unmating force measurements were between 4.0 and 1.0 kgf [8.8 and 2.2 lbf].

2.9. Durability - Test Groups 1 and 3

No physical damage occurred as a result of mating and unmating the specimens 100 times.

2.10. Vibration - Test Group 2

No discontinuities were detected during vibration testing. Following vibration testing, no cracks, breaks, or loose parts on the specimens were visible.

2.11. Mechanical Shock - Test Group 2

No discontinuities were detected during mechanical shock testing. Following mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible.

2.12. Thermal Shock - Test Groups 1 and 4

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

2.13. Humidity-temperature Cycling - Test Groups 1 and 4

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

2.14. Temperature Life - Test Groups 1 and 3

No evidence of physical damage was visible as a result of exposure to temperature life.

2.15. Final Examination of Product - All Test Groups

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.1. Examination of Product

A Certificate of Conformance was issued stating that all specimens in were produced, inspected, and accepted as conforming to product drawing requirements, and manufactured using the same core manufacturing processes and technologies as production parts.

3.2. Termination Resistance

Termination resistance measurements at low level current were made using a 4 terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

3.3. Shell Resistance

Termination resistance measurements at low level current were made using a 4 terminal measuring technique (Figure 5). The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

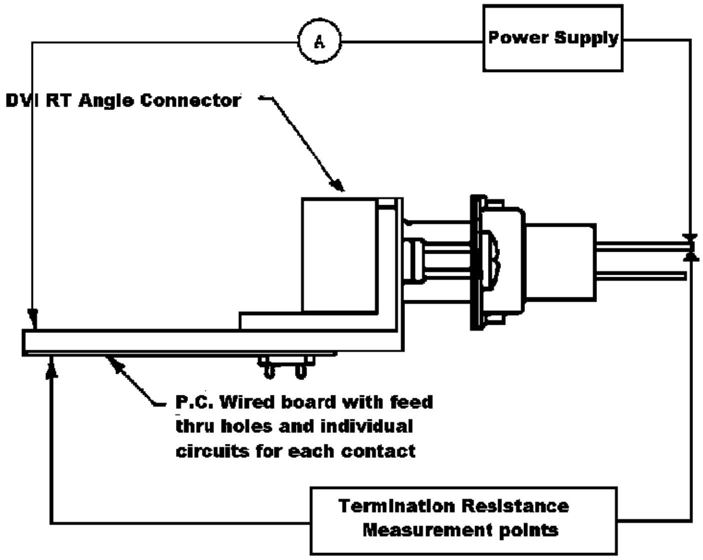

Figure 5
Typical Termination Resistance Measurement Points

3.4. Insulation Resistance

Insulation resistance was measured between adjacent contacts of unmated specimens. A test voltage of 500 volts DC was applied for 2 minutes before the resistance was measured.

3.5. Dielectric Withstanding Voltage

A test potential of 500 volts DC was applied between the adjacent contacts of unmated specimens. This potential was applied for 1 minute and then returned to zero.

3.6. Electrostatic discharge

Each specimen was tested independently. A specimen was mounted in a fixture that was used as a ground plane. This was mounted to a vise to hold the specimen in a vertical position. Each specimen's contacts were wired in series with bus wire and used to connect to the input of an oscilloscope to monitor any discharges to the contacts. he ESD gun was mounted to an X-Y table. The ESD gun was set to discharge at 8kV for 100 pulses. The display of the oscilloscope was monitored to watch for any discharges to the contacts. Each specimen was tested in 3 configurations, air discharge perpendicular to the shell, air discharge at an angle (45 degrees) to the shell, and air discharge to the mating face of the connector.

3.7. Mating Force

The force required to mate individual specimens was measured using a tensile/compression device with the rate of travel at 0.5 inch per minute and a free floating fixture.

3.8. Unmating Force

The force required to unmate individual specimens was measured using a tensile/compression device with the rate of travel at 0.5 inch/minute and a free floating fixture.

3.9. Durability

Specimens were mated and unmated 100 times at a maximum rate of 100 cycles per hour.

3.10. Vibration, Random

Mated specimens were subjected to a random vibration test, specified by a random vibration spectrum, with excitation frequency bounds of 50 and 2000 Hz. The Power Spectral Density (PSD) at 50 Hz was 0.005 G^2/Hz. The spectrum sloped up at 6 dB per octave to a PSD of 0.02 G^2/Hz at 100 Hz. The spectrum was flat at 0.02 G^2/Hz from 100 to 1000 Hz. The spectrum sloped down at 6 dB per octave to the upper bound frequency of 2000 Hz at which the PSD was 0.005 G^2/Hz. The root-mean square amplitude of the excitation was 5.35 GRMS. This was performed for 15 minutes in each of 3 mutually perpendicular planes for a total vibration time of 45 minutes. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes in the monitoring circuit.

3.11. Mechanical Shock, Half-sine

Mated specimens were subjected to a mechanical 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 3 mutually perpendicular planes for a total of 18 shocks. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.12 Thermal Shock

Mated and unmated specimens were subjected to 10 cycles of thermal shock with each cycle consisting of 30 minute dwells at -55 and 85°C. The transition between temperatures was less than 1 minute.

3.13. Humidity-temperature Cycling

Mated and unmated specimens were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65°C twice while maintaining high humidity (Figure 6).

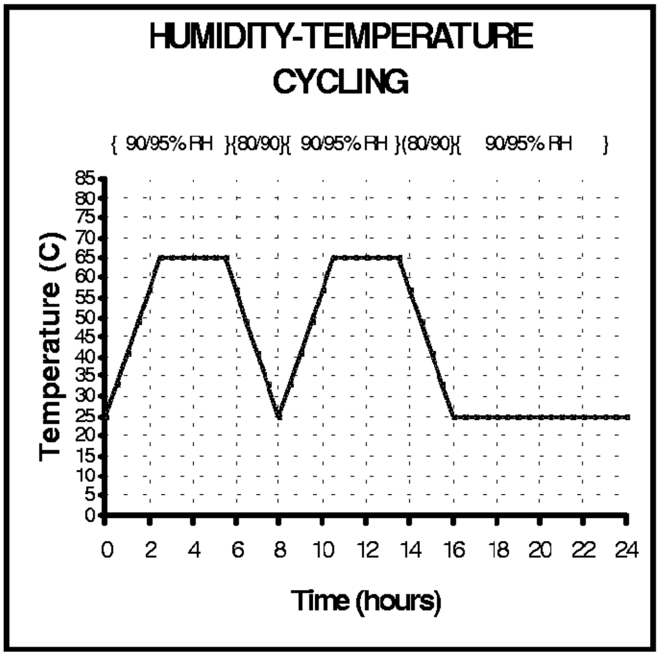

Figure 6
Typical Humidity-Temperature Cycling Profile

3.14. Temperature Life

Mated specimens were exposed to a temperature of 105°C for 250 hours.

3.15. Final Examination of Product

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.