

**System, Connector/Header, MTA 156**

**1. INTRODUCTION**

1.1. Purpose

Testing was performed on the Tyco Electronics MTA 156 Connector to determine its conformance to the requirements of Product Specification 108-1051 Rev. H.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the MTA 156 Connector. Testing was performed at the Product Reliability Center, AGAD between 06May96 and 18Dec97. Additional dielectric withstanding voltage testing, conducted by Underwriters Laboratories, was completed on 15Jan98. Reference UL File E28476, Volume 7, Section 42, issued 19Jun90.

1.3. Conclusion

The MTA 156 Connector listed in paragraph 1.5., met the electrical, mechanical, and environmental performance requirements of Product Specification 108-1051 Rev H.

1.4. Product Description

This system is mass terminated using insulation displacement technology on .156 inch centerline and mates with .045 inch square or round posts providing interconnection between wires and posts mounted on printed circuit boards. Terminations are designed for 26 through 18 AWG wire having .070 inch maximum insulation diameter for mass terminations and .095 inch maximum insulation diameter for single terminations. Wires shall be UL approved or specify insulation with temperature rating compatible with specified operating temperatures.

1.5. Test Samples

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

Test Group	Quantity	Part Number	Description
1	5	640426-6	6 position Standard Tin (18AWG)
	5	643191-6	6 position High Force Tin (18AWG)
	5	641217-6	6 position Gold Plated (18AWG)
	10	640383-6	6 position 156 Tin Plated Headers
	5	641208-6	6 position 156 Gold Plated Headers
2	3	1-640430-0	10 position Standard Tin (26AWG)
	3	1-640426-0	10 position Standard Tin (18AWG)
	6	640383-6	6 position 156 Tin Plated Headers
3	5	2-640426-4	24 position Standard Tin (18AWG)
4	5	1-641219-0	10 position Gold Plated (22AWG)
5	6	1-640430-0	10 position Standard Tin (26AWG)
	6	1-640426-0	10 position Standard Tin (18AWG)
6	5	640383-6	6 position 156 Tin Plated Headers

1.6. Environmental Conditions

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

- Temperature: 15 to 35°C
- Relative Humidity: 20 to 80%

1.7. Qualification Test Sequence

Test or Examination	Test Groups					
	1	2	3	4	5	6
	Test Sequence (a)					
Examination of product	1,9	1,9	1,8	1,5	1,3	1,3
Termination resistance	3,7	2,7		2,4		
Insulation resistance			2,6			
Dielectric withstanding voltage			3,7			
Temperature rise vs current		3,8				
Solderability						2
IDC termination tensile strength					2(b)	
Vibration (sinusoidal)	5					
Vibration (random)		6(c)				
Mechanical shock	6					
Durability	4					
Mating force	2					
Unmating force	8					
Thermal shock			4			
Humidity/temperature cycling		4(d)	5			
Temperature life		5				
Mixed flowing gas				3(d)		

**NOTE**

- (a) The numbers indicate sequence in which tests were performed.
- (b) Subject half the samples to parallel tensile test and the remaining half to the perpendicular tensile test.
- (c) Discontinuities shall not be measured. Energize at 18 C level for 100% loadings per Test Specification 109-151.
- (d) Precondition with 5 cycles of durability.

2. SUMMARY OF TESTING

2.1. Examination of Product - All Test Groups

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

## 2.2. Termination Resistance - Test Groups 1, 2 and 4

All termination resistance measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 3.0 milliohms initially and had a change in resistance ( $\Delta R$ ) of less than 5.0 milliohms after testing.

Test Group	Number of Data Points	Condition	Termination Resistance (milliohms)		
			Min	Max	Mean
1(a)	30	Initial	1.24	1.65	1.394
		After mechanical	-0.29	0.11	-0.102
1(b)	30	Initial	1.14	1.33	1.214
		After mechanical	-0.13	0.65	0.003
1(c)	30	Initial	1.27	2.07	1.492
		After mechanical	-0.49	0.12	-0.157
2	30	Initial	1.27	1.56	1.366
		After temperature life	0.12	4.20	1.107
4	60	Initial	1.14	2.42	1.573
		After mixed flowing gas	-0.59	2.75	0.686

**NOTE**

- (a) 6 position standard tin
- (b) 6 position high force tin
- (c) 6 position gold plated

## 2.3. Insulation Resistance - Test Group 3

All insulation resistance measurements were greater than 5000 megohms.

## 2.4. Dielectric Withstanding Voltage - Test Group 3

No dielectric breakdown or flashover occurred.

## 2.5. Temperature Rise vs Current - Test Group 2

All samples had a temperature rise of less than 30°C above ambient when tested using a baseline rated current of 14.24 amperes and the correct derating factor value based on the samples wiring configuration.

## 2.6. Solderability - Test Group 6

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

## 2.7. IDC Termination Tensile Strength - Test Group 5

All tensile values for parallel and perpendicular were greater than the specified minimum.

## 2.8. Vibration

### A. Sinusoidal - Test Group 1

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

B. Random - Test Group 2

No opens were detected while energized at 6.01 amperes DC. Following vibration, no cracks, breaks, or loose parts on the samples were visible.

2.9. Mechanical Shock - Test Group 1

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

2.10. Durability - Test Group 1

No physical damage occurred to the samples as a result of manually mating and unmating the samples 25 times.

2.11. Mating Force - Test Group 1

A. Standard Contact

All mating force measurements were less than 1.75 pounds per contact.

B. High Force Contact

All mating force measurements were less than 6 pounds per contact.

C. Gold Contact

All mating force measurements were less than 1.25 pounds per contact.

2.12. Unmating Force - Test Group 1

A. Standard Contact

All unmating force measurements were greater than .2 pound minimum per contact.

B. High Force Contact

All unmating force measurements were greater than .7 pound minimum per contact.

C. Gold Contact

All unmating force measurements were greater than .1 pound minimum per contact.

2.13. Thermal Shock - Test Group 3

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

2.14. Humidity/temperature Cycling - Test Groups 2 and 3

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

2.15. Temperature Life - Test Group 2

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

2.16. Mixed Flowing Gas - Test Group 4

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

3. TEST METHODS

3.1. Examination of Product

Where specified, samples were visually examined for evidence of physical damage detrimental to product performance.

3.2. Termination Resistance

Termination resistance measurements at low level current were made using a 4 terminal measuring technique (Figure 1). The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

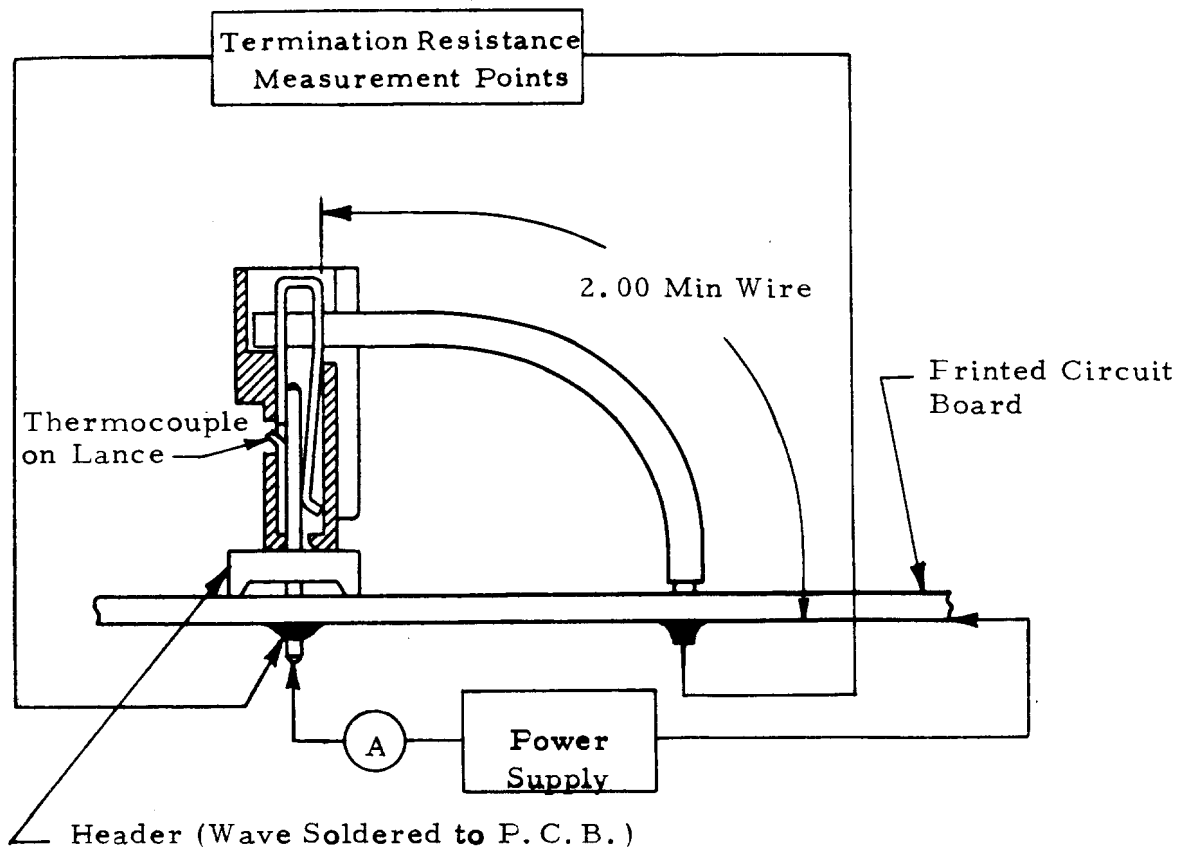


Figure 1  
Typical Termination Resistance Measurement Points

3.3. Insulation Resistance

Insulation resistance was measured between adjacent contacts of unmated samples. A test voltage of 500 volts DC was applied for 1 minute before the resistance was measured.

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### 3.4. Dielectric Withstanding Voltage

A test potential of 2.2 kilovolts AC was applied between the adjacent contacts of unmated samples. This potential was applied for 1 minute and then returned to zero.

### 3.5. Temperature Rise vs Current

Temperature rise curves were produced by measuring individual contact temperatures at a minimum of 5 different current levels. These measurements were plotted to produce a temperature rise vs current curve. Thermocouples were attached to individual contacts to measure their temperatures. The ambient temperature was then subtracted from this measured temperature to find the temperature rise. When the temperature rise of 3 consecutive readings taken at 5 minute intervals did not differ by more than 1°C, the temperature measurement was recorded.

### 3.6. Solderability

Connector assembly contact solder tails were subjected to a solderability test. The soldertails were immersed in a mildly activated rosin 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 1 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  $245 \pm 5^\circ\text{C}$ .

### 3.7. IDC Termination Tensile Strength

The force load was applied to each sample using a tensile/compression device at a constant rate of 1 inch per minute, separating the conductor from the IDC slot.

### 3.8. Vibration

#### A. Sinusoidal (Test Group 1)

Mated samples were subjected to sinusoidal vibration, having a simple harmonic motion with an amplitude of 0.06 inch, double amplitude. The vibration frequency was varied uniformly between the limits of 10 and 55 Hz and returned to 10 Hz in 1 minute. This cycle was performed 120 times in each of 3 mutually perpendicular planes for a total vibration time of 6 hours. Samples were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

#### B. Random (Test Group 2)

Mated samples were subjected to a random vibration test, specified by a random vibration spectrum, with excitation frequency bounds of 5 and 500 Hz. The power spectral density at 5 Hz was  $0.000312 \text{ G}^2/\text{Hz}$ . The spectrum sloped up at 6 dB per octave to a PSD of  $0.005 \text{ G}^2/\text{Hz}$  at 10 Hz. The spectrum was flat at  $0.005 \text{ G}^2/\text{Hz}$  from 10 to 500 Hz. The root-mean square amplitude of the excitation was 3.15 GRMS. This was performed for 15 minutes in each of 3 mutually perpendicular planes for a total vibration time of 45 minutes. Samples were energized at 6.01 amperes DC.

### 3.9. Mechanical Shock

Mated samples 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. Samples were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.10. Durability

Samples were manually mated and unmated 25 times at a maximum rate of 600 cycles per hour.

3.11. Mating Force

The force required to mate individual samples was measured using a tensile/compression device with the rate of travel at .5 inch per minute and a free floating fixture. The maximum force per contact was calculated by dividing the maximum force by the number of circuits in the connector under test.

3.12. Unmating Force

The force required to unmate individual samples was measured using a tensile/compression device with the rate of travel at .5 inch per minute and a free floating fixture. The minimum force per contact was measured by dividing the maximum force by the number of circuits in the connector under test.

3.13. Thermal Shock

Mated samples were subjected to 25 cycles of thermal shock with each cycle consisting of 30 minute dwells at -55 and 105°C. The transition between temperatures was less than 1 minute.

3.14. Humidity/temperature Cycling

Mated samples were exposed to 10 humidity/temperature cycles. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65°C twice while maintaining high humidity. (Figure 2)

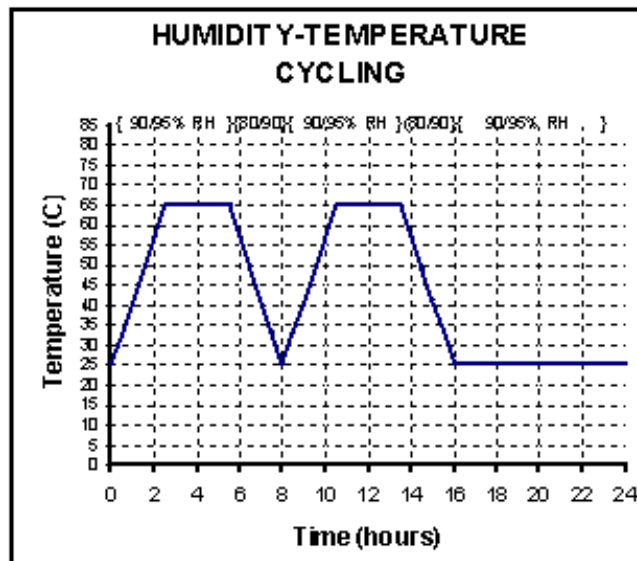


Figure 2  
Typical Humidity/temperature Cycling Profile

3.15. Temperature Life

Mated gold samples were exposed to a temperature of 105°C for 1000 hours. Samples were preconditioned with 10 cycles of durability. Mated tin samples were exposed to a temperature of 85°C for 1000 hours.

### 3.16. Mixed Flowing Gas, Class III

Mated samples were exposed for 20 days to a mixed flowing gas Class III exposure. Class III exposure is defined as a temperature of 30°C and a relative humidity of 75% with the pollutants of Cl<sub>2</sub> at 20 ppb, NO<sub>2</sub> at 200 ppb, and H<sub>2</sub>S at 100 ppb. Samples were preconditioned with 5 cycles of durability.