

# Test Report

## Industrial Ethernet RJ45 Cable Assembly

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**1. INTRODUCTION**

1.1 Purpose

Testing was performed on RJ45 Robust Connector Plug Module to determine its conformance to the requirements of Design Objective 108-106053, Rev A.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of RJ45 Robust Connector Plug Module.

1.3 Product Description

P/ N(Trade Mark)	Name	Remarks
1983523-1	RJ45 Robust Connector Plug Module	

Fig. 1

1.4 Environmental Conditions

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

Temperature: 15°C to 35°C  
 Relative Humidity 45% to 75%

1.5 Qualification Test Sequence

Test or Examination	Test Group (a)									
	1	2	3	4	5	6	7	8	9	10
	Test Sequence (b)									
Examination of product	1,9	1,7	1,5	1,9	1,3	1,3	1,6	1,5	1,5	1,5
Termination Resistance (Low level)	2,6	2,5		2,8			2,5	2,4	2,4	2,4
Insulation Resistance	3,7	3,6								
Voltage proof	4,8									
Plug insertion Force, Jack-plug interface				3,6						
Plug withdrawal Force, Jack-plug interface				4,7						
Durability, jack-plug interface				5						
Cable pull-out					2					
Lock Strength						2				
Vibration, jack-plug interface							3			
Mechanical shock, jack-plug interface							4			
Temperature Life(Heat Aging)								3		
Thermal shock, jack-plug interface									3	
Insertion Loss			2							
Return Loss Measurement			3							
Near End cross talk (NEXT) Measurement			4							
Humidity- Steady state	5									
Humidity- Temperature Cycling		4								
Mixed Flowing Gas										3

Fig. 2

**\* Notes:**

Numbers indicate the sequence in which the tests are performed.

**2. TEST CONTENT**

Test description	Requirement	Procedure																						
<b>General Inspection</b>																								
Examination of product	Product will be confirmed to the requirements of the applicable product drawing and spec.	Visually, dimensionally and functionally inspected per applicable quality inspection plan																						
<b>Electrical Inspection</b>																								
Termination Resistance (Low level)	100 milliohms Maximum.	IEC 60512-2-1 Subject mated plug and terminated jack to 50millivolts maximum open circuit voltage at 100 milliamperes maximum.																						
Insulation Resistance	500 megohms Minimum.	IEC 60512-3-1 Test voltage of 100 volts DC with 1 minute hold. Test between adjacent contacts of mated plug and terminated Jack.																						
Voltage proof	1 minute hold with no breakdown or flashover.	IEC 60512-4-1 1000 volts AC at sea level. Test between adjacent contacts of mated plug and jack.																						
Insertion Loss	<table border="1"> <thead> <tr> <th>Frequency (MHz)</th> <th>Maximum Loss (dB)</th> </tr> </thead> <tbody> <tr><td>1.0</td><td>3</td></tr> <tr><td>4.0</td><td>3.9</td></tr> <tr><td>8.0</td><td>5.5</td></tr> <tr><td>10.0</td><td>6.2</td></tr> <tr><td>16.0</td><td>7.9</td></tr> <tr><td>20.0</td><td>8.9</td></tr> <tr><td>25.0</td><td>10</td></tr> <tr><td>31.25</td><td>11.2</td></tr> <tr><td>62.5</td><td>16.2</td></tr> <tr><td>100.0</td><td>21</td></tr> </tbody> </table>	Frequency (MHz)	Maximum Loss (dB)	1.0	3	4.0	3.9	8.0	5.5	10.0	6.2	16.0	7.9	20.0	8.9	25.0	10	31.25	11.2	62.5	16.2	100.0	21	ANSI/TIA/EIA-568, Category 5E (Link Performance).
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**Mechanical Inspection**

Plug insertion Force, Jack-plug interface	35 N Maximum	IEC 60512-13-1 Measure force required to mate plug and jack with latch depressed at a maximum rate of 12.7mm/minute.
Plug withdrawal Force, Jack-plug interface	36 N Maximum	IEC 60512-13-1 Measure force required to mate plug and jack with latch depressed at a maximum rate of 12.7mm/minute.
Durability, jack-plug interface	See Note	IEC 60512-9-1 Mate and unmate plug and jack interface with latch inoperative for 750 cycles at maximum rate of 500 (automatic) or 300 (manual) cycles per hour.
Cable pull-out	Plug shall remain mated with no evidence of damage.	Load cable in mated plug with 30N pull in axial direction, rotate plug housing 45degrees from cable axis, remove load.
Lock Strength	Connector must not unmate. No destruction on lock elements. No harmful damage on other part.	Mate connector and make lock mechanism effective. Apply axial load to cable on plug connector. 98N. 1 minute.
Vibration, jack-plug interface	No discontinuities of 1 microsecond maximum. Shall remain mated and show no evidence of physical damage. See Note.	EIA 364-28 0.35mm Magnitude at 10~58Hz, 5G peek at 58~500 Hz; 3axis, 20cycles per axis.
Mechanical shock, jack-plug interface	No discontinuities of 5 microseconds maximum. See Note.	EIA 364-27 Subject mated plug and terminated jack to 50 G's half-sine shock wave of 11 milliseconds duration. 12 shocks in each direction applied along 3 mutually perpendicular planes (3 axis), 72 total shocks.

**Environmental Inspection**

Temperature Life(Heat Aging)	See Note	EIA 364-17 Subject mated plug and terminated jack at 85°C Duration: 96Hours
Thermal shock, jack-plug interface	See Note	IEC 60512-11-9 Subject mated plug and terminated jack to 25 cycles between -40 and 70°C Duration: 96Hours
Humidity- Steady state	See Note	IEC 60512-11-12 Subject mated plug and terminated jack to 55°C and 95% R.H. for 10 days

Humidity- Temperature Cycling	See Note	IEC 60068-2-38 Subject mated plug and terminated jack at Temperature: between 25 and 65°C Humidity: 80~100% R.H. Cycle: 7(cycle time 24 hours) sub-Cold shock -10°C performed
Mixed Flowing Gas	See Note	IEC 60512-11-7, Method 3. Subject mated plug and terminated jack to exposure for 21days.

**NOTE** *Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Re qualification Test Sequence shown in Figure 3.*

**Fig. 3**

**\* Notes**

Product must be without rust, corrosion transformation, crack and discoloration.

**3. TEST RESULT**

## 3-1. Test Group 1

## 3-1-1. Termination Resistance (Low Level)

UNIT: mΩ

	Initial	After Humidity-steady state
Number of sample	6sets	6sets
Max.	39.704	49.861
Min.	28.731	28.946
Ave.	32.259	38.764
Specification	100mΩ MAX	100mΩ MAX
Judgment	Acceptable	Acceptable

## 3-1-2. Insulation Resistance

UNIT: Ω

	Initial	After Humidity-steady state
Number of sample	6sets	6sets
Result	2.1*10 <sup>10</sup> Min.	3.0*10 <sup>9</sup> Min.
Specification	5.0*10 <sup>8</sup> Min.	5.0*10 <sup>8</sup> Min.
Judgment	Acceptable	Acceptable

## 3-1-3. Voltage proof

No breakdown, No flashover

## 3-2. Test Group 2

## 3-2-1. Termination Resistance (Low Level)

UNIT: mΩ

	Initial	After Humidity-Temperature Cycling
Number of sample	6sets	6sets
Max.	41.492	47.461
Min.	29.806	29.132
Ave.	33.170	35.852
Specification	100mΩ MAX	100mΩ MAX
Judgment	Acceptable	Acceptable

## 3-2-2. Insulation Resistance

 UNIT:  $\Omega$ 

	Initial	After Humidity-Temperature Cycling
Number of sample	6sets	6sets
Result	1.2*10 <sup>10</sup> Min.	1.1*10 <sup>10</sup> Min.
Specification	5.0*10 <sup>8</sup> Min.	5.0*10 <sup>8</sup> Min.
Judgment	Acceptable	Acceptable

## 3-3. Test Group 3

## 3-3-1. Insertion Loss Margin

Number of sample	5sets
Max.	20.3dB @ 100MHz
Min.	19.4dB @ 100MHz
Ave.	19.9dB
Specification	21dB MAX @100MHz
Judgment	Acceptable

## 3-3-2. Return Loss (worst case margin)

Number of sample	5sets	
	Main	SR
Max.	7.7dB @ 6.5MHz	7.6dB @ 78.3MHz
Min.	-2.1dB @ 44.3MHz	-2.3dB @ 5.8MHz
Ave.	3.4dB	4.0dB
Specification	19.0dB MAX @8.0MHz 12.0dB MAX @100MHz	
Judgment	Acceptable	

## 3-3-3. Near-End Cross Talk (NEXT) (worst case margin)

Number of sample	5sets	
	Main	SR
Max.	22.9dB @ 1.9MHz	25.9dB @ 1.5MHz
Min.	9.6dB @ 1.0MHz	3.8dB @ 1.0MHz
Ave.	17.2dB	18.1dB
Specification	54.8dB MAX @4MHz	
Judgment	Acceptable	

## 3-4. Test Group 4

## 3-4-1. Termination Resistance (Low Level)

UNIT: mΩ

	Initial	After Durability
Number of sample	6sets	6sets
Max.	49.203	71.598
Min.	30.246	28.514
Ave.	36.275	41.942
Specification	100mΩ MAX	100mΩ MAX
Judgment	Acceptable	Acceptable

## 3-4-2. Plug insertion force/withdrawal force/durability

UNIT: N

	1 <sup>st</sup> Mating	1 <sup>st</sup> unmating	750 <sup>th</sup> mating	750 unmating
Number of sample	6sets	6sets	6sets	6sets
Max.	18.750	11.875	19.594	16.406
Min.	13.750	7.500	10.656	8.219
Ave.	15.833	9.167	17.088	12.849
Specification	35N MAX	36N MAX	35N MAX	36N MAX
Judgment	Acceptable	Acceptable	Acceptable	Acceptable

## 3-5. Test Group 5

## 3-5-1. Cable Pull out

No evidence of damage

## 3-6. Test Group 6

## 3-6-1. Lock strength

No destruction on lock elements, No harmful damage on other part.

3-7. Test Group 7

3-7-1. Termination Resistance (Low Level)

UNIT:mΩ

	Initial	After Vibration/Shock
Number of sample	6sets	6sets
Max.	39.759	42.550
Min.	29.254	28.055
Ave.	33.655	35.998
Specification	100mΩ MAX	100mΩ MAX
Judgment	Acceptable	Acceptable

Note: During physical shock and vibration test, No electrical discontinuity greater than 1μ sec occurred-----Acceptable

3-8. Test Group 8

3-8-1. Termination Resistance (Low Level)

UNIT:mΩ

	Initial	After Temperature Life
Number of sample	6sets	6sets
Max.	40.933	43.911
Min.	30.339	28.332
Ave.	34.854	35.619
Specification	100mΩ MAX	100mΩ MAX
Judgment	Acceptable	Acceptable

3-9. Test Group 9

3-9-1. Termination Resistance (Low Level)

UNIT:mΩ

	Initial	After Thermal Shock
Number of sample	6sets	6sets
Max.	41.253	44.617
Min.	29.123	29.464
Ave.	35.190	37.682
Specification	100mΩ MAX	100mΩ MAX
Judgment	Acceptable	Acceptable

3-10. Test Group 10

3-10-1. Termination Resistance (Low Level)

UNIT:mΩ

	Initial	After Mixed Flowing Gas
Number of sample	6sets	6sets
Max.	40.755	45.540
Min.	28.668	26.944
Ave.	33.514	35.716
Specification	100mΩ MAX	100mΩ MAX
Judgment	Acceptable	Acceptable

#### 4. Conclusion

RJ45 Robust Connector Plug Module conformed to the electrical, mechanical performance requirements of Design Objective 108-106053 Rev A.