

---

**MRJ 21 Connector System**

---

**1. SCOPE**

## 1.1. Content

This specification covers performance, tests and quality requirements for the TE Connectivity (TE) MRJ 21 Connector System. This system, comprised of a fully shielded board mounted receptacle and a shielded cable assembly, is intended for use in networking applications where density and high performance is required. The receptacle is right angle, thru-hole soldered while the cable connector is designed to terminate to 24 and 27 AWG solid wire and includes a soldered termination. Product with 24 AWG wire is rated for Cat5e performance, product with 27 AWG wire is rated for Gigabit Ethernet Channel performance (Application 1000Base-T).

## 1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

## 1.3. Qualification Test Results

Successful qualification testing on the subject product line was completed on 30Sep04. The Qualification Test Report number for this testing is 501-587. Additional testing was performed on 19Jan07 and 29Jun10. This documentation is on file at and available from Engineering Practices and Standards (EPS).

**2. APPLICABLE DOCUMENTS**

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

## 2.1. TE Documents

- 109-183 Torque Mechanism Strength
- 501-587 Qualification Test Report (MRJ 21 Connector System)

## 2.2. Commercial Standards

- EIA-364 Electrical Connector/Socket Test Procedures Including Environmental Classifications
- EIA/TIA-568-B.1 Commercial Building Telecommunications Cabling Standard

## 2.3. Reference Document

109-197 Test Specification (AMP Test Specifications vs EIA and IEC Test Methods)

**3. REQUIREMENTS**

## 3.1. Design and Construction

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing.

3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable product drawing.

3.3. Ratings

- Voltage: 250 volts AC
- Current: Signal application only, 0.5 ampere
- Temperature: -55 to 85°C

3.4. Performance and Test Description

Product is designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1. Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Initial examination of product.	Meets requirements of product drawing.	EIA-364-18. Visual and dimensional (C of C) inspection per product drawing.
Final examination of product.	Meets visual requirements.	EIA-364-18. Visual inspection.
<b>ELECTRICAL</b>		
Low Level Contact Resistance (LLCR).	$\Delta R$ 10 milliohms maximum.	EIA-364-23. Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage.
Insulation resistance.	1,000 megohms minimum initial. 500 megohms minimum final.	EIA-364-21. Test between adjacent contacts.
Withstanding voltage.	One minute hold with no breakdown or flashover.	EIA-364-20, Condition I. 1,000 volts AC at sea level, contact to contact. 1,500 volts AC at sea level, contact to shield. 2,500 volts DC at sea level, contact to shield, with shortened front shell component.
Insertion loss.	See Figure 3.	EIA/TIA-568-B.2
Return loss.	See Figure 3.	EIA/TIA-568-B.2
Near-End Crosstalk (NEXT).	See Figure 3.	EIA/TIA-568-B.2
Power Sum Near-End Crosstalk (PSNEXT).	See Figure 3.	EIA/TIA-568-B.2
Equal Level Far-End Crosstalk (ELFEXT).	See Figure 3.	EIA/TIA-568-B.2

Figure 1 (continued)

Test Description	Requirement	Procedure
Power Sum Equal Level Far-End Crosstalk (PSELFEXT).	See Figure 3.	EIA/TIA-568-B.2
<b>MECHANICAL</b>		
Solderability, dip test.	Solderable area shall have a minimum of 95% solder coverage.	EIA-364-52, Category 3. Subject contacts to solderability.
Vibration, random.	No discontinuities of 1 microsecond or longer duration. See Note.	EIA-364-28, Test Condition VII, Condition D. Subject mated specimens to 3.10 G's rms between 20 to 500 Hz. Fifteen minutes in each of 3 mutually perpendicular planes.
Mechanical shock.	No discontinuities of 1 microsecond or longer duration. See Note.	EIA-364-27, Method H. Subject mated specimens to 30 G's half-sine shock pulses of 11 milliseconds duration. Three shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks.
Durability.	See Note.	EIA-364-9. Mate and unmate specimens for 500 cycles at a maximum rate of 500 cycles per hour.
Mating force.	66.7 N [15 lb] maximum with jackscrews.	EIA-364-13. Measure force necessary to mate specimens at a maximum rate of 12.7 mm [.5 in] per minute.
Unmating force.	13.3 N [3 lb] minimum without jackscrews.	EIA-364-13. Measure force necessary to unmate specimens at a maximum rate of 12.7 mm [.5 in] per minute.
Screwlock torque.	See Note.	TE Spec 109-183. 0.45 N•m [4 in-lb].
Perpendicular loading.	See Note.	2.26 N•m [20 in-lb] minimum.
Axial loading.	See Note.	177.9 N [40 lb] minimum.
<b>ENVIRONMENTAL</b>		
Thermal shock.	See Note.	EIA-364-32, Test Condition I. Subject specimens to 5 cycles between -55 and 85°C.
Humidity/temperature cycling.	See Note.	EIA-364-31, Method III. Subject specimens to 10 cycles (10 days) between 25 and 65°C at 80 to 100% RH.

Figure 1 (continued)

Test Description	Requirement	Procedure
Temperature life.	See Note.	EIA-364-17, Method A, Test Condition 3, Test Time Condition C. Subject mated specimens to 85°C for 500 hours.
Mixed flowing gas.	See Note.	EIA-364-1000.01, Test Group 4, Option 2. Subject specimens to the following: 1) LLCR per EIA-364-23, mated. 2) Fifty durability cycles per EIA-364-9. 3) Temperature life at 105°C for 72 hours per EIA-364-17, mated. 4) LLCR per EIA-364-23, mated. 5) MFG, Option 2 per EIA-364-65, Class IIA.10 days unmated, 10 days mated. 6) LLCR per EIA-364-23, mated. 7) Ten cycles of thermal disturbance between 15 ± 3 and 85 ± 3°C; ramp time shall be a minimum of 2°C per minute with 10 minute dwell times at temperature extremes; humidity at laboratory ambient. 8) LLCR per EIA-364-23, mated. 9) Three cycles of durability. 10) LLCR per EIA-364-23, mated.

**NOTE**

*Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figure 2.*

Figure 1 (end)

## 3.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)								
	1	2	3	4	5	6	7	8	9
	Test Sequence (b)								
Initial examination of product	1	1	1	1	1	1	1	1	1
Low Level Contact Resistance (LLCR)	3,5,7,9	2,4,6							2,4,6
Insulation resistance				2,6					
Withstanding voltage				3,7(c)				2(c)	
Insertion loss					2				
Return loss					3				
NEXT					4				
PSNEXT					5				
ELFEXT					6				
PSELFEXT					7				
Solderability							2		
Vibration	6								3
Mechanical shock	8								5
Durability	4	3(d)							
Mating force	2								
Unmating force	10								
Screwlock torque						2			
Perpendicular loading						3			
Axial loading.						4			
Thermal shock				4					
Humidity/temperature cycling				5					
Temperature life		5							
Mixed flowing gas			2(e)						
Final examination of product	11	7	3	8	8	5	3	3	7

**NOTE**

- (a) See Paragraph 4.1.A.
- (b) Numbers indicate sequence in which tests are performed.
- (c) Specimens in test group 4 tested at 1000 volts contact to contact and 1500 volts contact to shield. Specimens in test group 8 tested at 2500 volts contact to shield.
- (d) Precondition specimens with 12 durability cycles.
- (e) Subject specimens to the following: 1) LLCR per EIA-364-23, mated. 2) Fifty durability cycles per EIA-364-9. 3) Temperature life at 105°C for 72 hours per EIA-364-17, mated. 4) LLCR per EIA-364-23, mated. 5) MFG, Option 2 per EIA-364-65, Class IIA. 6) LLCR per EIA-364-23, mated. 7) Ten cycles of thermal disturbance between  $15 \pm 3$  and  $85 \pm 3^\circ\text{C}$ ; ramp time shall be a minimum of  $2^\circ\text{C}$  per minute with 10 minute dwell times at temperature extremes; humidity at laboratory ambient. 8) LLCR per EIA-364-23, mated. 9) Three cycles of durability. 10) LLCR per EIA-364-23, mated.

Figure 2

**4. QUALITY ASSURANCE PROVISIONS**

4.1. Qualification Testing

A. Specimen Selection

Specimens shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production. All test groups shall each consist of a minimum of 5 specimens.

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 2.

4.2. Requalification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

4.3. Acceptance

Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.4. Quality Conformance Inspection

The applicable quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.

Frequency (MHZ)	Category 5e, 100 ohm Link Testing Requirements					
	Insertion Loss (dB)	Return Loss (dB)	NEXT Loss (dB)	PSNEXT Loss (dB)	ELFEXT Loss (dB)	PSELFEXT Loss (dB)
1.00	2.1	19.0	>60	>57	58.6	55.6
4.00	3.9	19.0	54.8	51.8	46.6	43.6
8.00	5.5	19.0	50.0	47.0	40.6	37.5
10.00	6.2	19.0	48.5	45.5	38.6	35.6
16.00	7.9	19.0	45.2	42.2	34.5	31.5
20.00	8.9	19.0	43.7	40.7	32.6	29.6
25.00	10.0	18.0	42.1	39.1	30.7	27.7
31.25	11.2	17.1	40.5	37.5	28.7	25.7
62.50	16.2	14.1	35.7	32.7	22.7	19.7
100.00	21.0	12.0	32.3	29.3	18.6	15.6

**NOTE** See EIA/TIA-568-B.1

Figure 3