Tandem Spring Shunt Connector

1. SCOPE

1.1. Content

This specification covers the performance, tests and quality requirements for the AMP* Tandem Spring shunt connector. This connector is a separable electrical connection device for mating with two .025 square posts. When used in normal applications the centerline spacing between posts shall be .100 inch.

1.2. Qualification

When tests are performed on the subject product line, the procedures specified in 109-Series Test Specifications shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. 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 Connectivity (TE) Documents

A. 109-1: General Requirements for Test Specifications

B. 109 Series: Test Specifications as indicated in Figure 1.

C. 114-1045: Application Specification

D. E. 501-78: Test Report

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

A. Contact: Phosphor bronze, tin plated or gold over nickel

B. Housing: Nylon, UL 94V-0

3.3. Ratings

A. Current: 3 amperes maximum

B. Temperature:

1. -65 to 105℃ for gold
2. -40 to 85℃ for tin

3.4. Performance and Test Description

Connectors shall be designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1.

3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Examination of Product	Meet requirements of product drawing.	Visual, dimensional and functional per applicable inspection plan.
ELECTRICAL		
Shunt Resistance, Specified current	20 milliohms maximum for gold plated contacts; 30 milliohms maximum for tin plated contacts.	Measure potential drop of mated assembly at 3 amperes, see Figure 3; Test Specification 109-25, calculate resistance.
Shunt Resistance, Dry Circuit	20 milliohms maximum for gold plated contacts; 30 milliohms maximum for tin plated contacts.	Subject mated assembly to 20 mv open circuit at 100 ma maximum, see Figure 3; Test Specification 109-6-6.
Insulation Resistance	1000 megohms minimum.	Test between shunt connectors mated to adjacent header posts; Test Specification 109-28-4.
Dielectric Withstanding Voltage	1000 vac minimum dielectric withstanding voltage. One minute hold.	Test between shunt connectors mated to adjacent square header posts at a rate of 500 v per second; Test Specification 109-29-1.
MECHANICAL		
Vibration, Sinusoidal High Frequency	No discontinuities greater than 1 microsecond. No physical damage.	Subject mated connector to 15 G's, 10-2000 Hz with 100 ma current applied; Test Specification 109-21-3.
Physical Shock	No discontinuities greater than 1 microsecond. No physical damage.	Subject mated connector to 100 G's sawtooth in 6 milliseconds; 3 shocks in each direction applied along 3 mutually perpendicular planes total 18 shocks; Test Specification 109-26-9
Shunt Engaging Force	25 ounces maximum.	Measure force to engage using gage 1, at a rate of .5 inch per minute, as indicated in Figure 4; Test Specification 109-35.
Shunt Separating Force	2.8 ounces minimum.	Measure force to separate using gage 2, at a rate of .5 inch per minute, as indicated in Figure 4; Test Specification 109-35.
Durability	No evidence of physical damage.	Mate and unmate using gage 3, as indicated in Figure 4; Test Specification 109-27.
		Microinches / Cycles 50 gold / 250 30 gold / 200 15 gold / 100 100 tin / 25

Figure 1 (continued)

Test Description	Requirement	Procedure
ENVIRONMENTAL		
Thermal Shock	No evidence of physical damage.	Subject mated shunt connectors to 5 cycles between -65 and 105℃ for gold and -40° and 85℃ for tin; Test Specification 109-22.
Humidity-Temperature	Meet shunt resistance, dry circuit; Insulation resistance final. No evidence of physical damage.	Subject mated shunt connectors to 10 humidity-temperature cycles between 25° and 65℃ at 95% RH; Test Specification 109-23, method III, cond B, less steps 7a and 7b.
Industrial Mixed Flowing Gas	Meet shunt resistance, dry circuit. No evidence of physical damage.	Subject mated shunt connectors to environmental class III for 20 days; Test Specification 109-85-3

Figure 1 (end)

3.6. Connector Qualification and Requalification Tests and Sequences

Test or Examination	Test Group (a)				
	1	2	3	4	5
	Test Sequence (b)				
Examination of Product	1, 8	1, 7	1, 6	1, 6	1
Shunt Resistance, Specified Current	7				
Shunt Resistance, Dry Circuit	2, 6		2, 5	2, 5	
Insulation Resistance		2, 5			
Dielectric Withstanding Voltage		6			
Vibration	4				
Physical Shock	5				
Shunt Engaging Force					2
Shunt Separating Force					3
Durability	3		3	3	
Thermal Shock		3			
Humidity-Temperature Cycling		4	4		
Industrial Mixed Flowing Gas				4	

NOTE

(a) See Para 4.1.A.
(b) Numbers indicate sequence in which tests are performed.
(c) Test group 3 shall consist of tin plated contacts only and shall be mated only with .025 inch square posts
(d) Test group 4 shall consist of gold contacts only.

Figure 2

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Sample Selection

Shunts shall be prepared in accordance with applicable Instruction Sheets. They shall be selected at random from current production. Test groups 1 and 2 shall consist of 30 shunts of each material and plating finish. Test group 3 shall consist of 30 shunts of tin plated material. Test group 4 shall consist of 30 shunts of each gold plated material. Test group 5 shall consist of 25 square header posts for testing. The square header posts were mounted on test printed circuit boards.

B. Test Sequence

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

4.2. Retention of Qualification

If, in a three-year period, no changes to the product or process occur, the product shall be subjected to the testing described in the test sequence, see Figure 2. Justification for exceeding this time limit must be documented andapproved by the division manager.

4.3. Requalification Testing

If changes significantly affecting form, fit, or function are made to the product or to the 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.

4.4. 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. When product failure occurs, corrective action shall be taken and samples resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.5. Quality Conformance Inspection

The applicable AMP quality inspection plan will 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.

4.6. Reliability Estimates

A. Estimated reliability is provided relative to acceptance criteria for specific failure mechanisms using environmental test conditions (Heat Age and Industrial Mixed Flowing Gas) with known acceleration factors. Heat Age testing and IMFG testing have acceleration factors that are generally accepted by industry. Corresponding failure mechanisms are stress relaxation and corrosion. "Estimated reliability" refers to the estimated proportion of product whose values of the performance parameter (e.g., change in interface resistance) will be on the acceptable side of the acceptance criterion.

B. Humidity/temperature testing is performed and estimated reliability relative to the test is provided, but there are no accepted acceleration factors for relating humidity/temperature testing conditions and duration to operating conditions and life. Therefore these estimates of reliability refer only to the specified test conditions, not to the operating conditions, and are for information or comparative purposes only.

C. Product reliability relative to a specified acceptance criterion for a particular performance parameter is estimated from environmental test data using one-sided tolerance limit factors (k-factors) for the normal distribution.

Greatly simplified, the procedure is as follows: Samples of the product are subjected to environmental stress testing, and measurements are taken of some performance parameter such as change in interface resistance for pressure connections, or resistance across a solder joint for surface-mounted devices, etc. The data are tested for goodness of fit to a normal distribution. If the data provide a satisfactory fit to a normal distribution, then the "k-factor" is computed from k = (UL-X)/S, where

UL denotes the specified allowable upper limit, or acceptance criterion, for the performance parameter (measurements greater than UL indicate product failure),

X denotes the average of the sample measurements, and

S denotes the standard deviation of the sample measurements (calculated using a denominator of n-1, where n denotes the sample size)

The calculated value of k is then compared with a table of factors for one-sided tolerance limits for a normal distribution to determine the product reliability and associated "confidence" that may be claimed, based on the test data.

D. The acceptance criterion used is the maximum change in contact resistance permitted in the dry circuit resistance test as determined from contact physics (constriction resistance and super-temperature for high current contacts at rated current). Variables data of change in termination resistance are considered acceptable for making estimates of product reliability if a normal probability plot and appropriate statistical analysis indicate agreement of the data with a normal distribution.

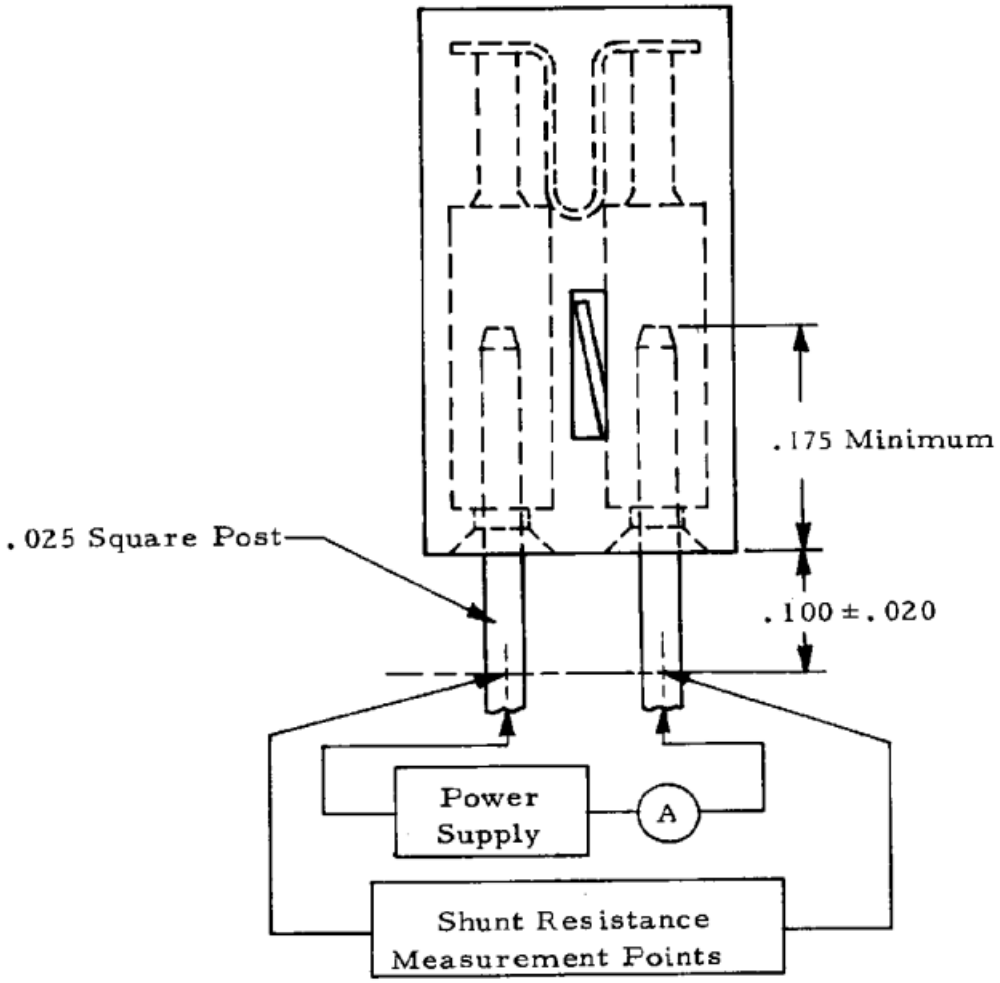
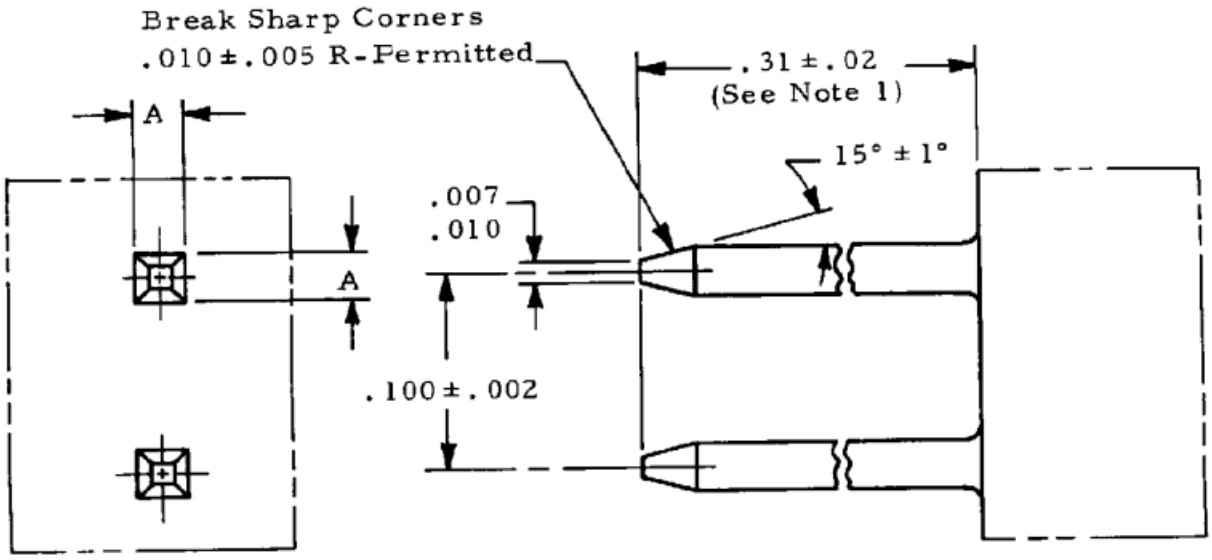


Figure 3

Shunt Resistance Measurement Points



Gage Number	A	
1	.026	+ .0000 - .0001
2		+ .0001 - .0000
3		.025 ± .0001

NOTE

1. *Finish in this area must be 4 microinches on all surfaces.*
2. *Material: Tool Steel*
3. *Heat Treat: Rockwell 60 minimum*

Figure 4
Shunt Post Simulator