SDL System Connector

1. SCOPE

1.1. Content

This specification covers the performance, tests and quality requirements for the AMP* SDL system. The system consists of a printed circuit board mounted shielded receptacle, shielded plug connector and shielded cable. Receptacle housings are preloaded with contacts and a shield for direct receptacle assembly to a printed circuit board and the mounting panel. Plug housings are preloaded with contacts for mass termination of the plug to the shielded cable. The system is designed to be used in class 2 circuits at voltages as defined by the National Electrical Code Table 725-31 (a) and (b).

1.2. Qualification

When tests are performed on the subject product line, the procedures specified in AMP 109 series 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. AMP Specifications

A. 109-1: General Requirements for Test Specifications
B. 109 Series: Test Specifications as indicated in Figure 1. (Comply with MIL-STD-202, MIL-STD-1344 and EIA RS-364)
C. 114-2081: SDL Top Entry and Side Entry Receptacle
D. 114-2086: Flat Cable SDL Plug, 50 and 36 Series
E. 114-2090: Round Cable SDL Plug, 50 and 36 Series
F. 501-34: Test Report

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2.2. Commercial Specifications

A. UL 498: Attachment Plugs and Receptacles
B. UL Subject 758: Appliance Wire Material

3. REQUIREMENTS

3.1. Design and Construction

Connectors and cables shall be of the design, construction and physical dimensions specified on the applicable product drawing. Printed circuit board and mounting panel dimensions shall be on appropriate Application Specification.

3.2. Materials

A. Contacts:

(1) Receptacle: Phosphor bronze, selective gold over nickel in contact area and bright tin-lead over nickel on P.C. tails
(2) Plug: Phosphor bronze, gold over nickel, selective in contact area

B. Shield: Brass, bright tin lead over nickel or copper

C. Housings:

(1) Receptacle: Polyester, UL 94V-0, 120°C, modified polysulfone, UL 94V-0, 160°C
(2) Plug: Polycarbonate, UL 94V-2, 125°C

D. Cable:

(1) Jacket: Polyvinylchloride, UL VW-1, 80°C
(2) Shield: Aluminum polyester with #28 AWG drain wire(s)
(3) Conductor:

(a) Insulation: Polyvinylchloride, UL VW-1
(b) Conductor: 7 strand tinned copper #28 or 24 AWG

3.3. Ratings

A. Voltage/Current: 30 vac 42.4 vdc at 1.5 amperes maximum, see 3.5.(a)
B. Operating Temperature: -20° to 80°C
C. Shielding Effectiveness: *20 dB minimum reduction from 70 M Hz to 500 M Hz
10 dB minimum reduction from 500 M Hz to 1 G Hz

*Applies to 8 position plug on flat cable with aluminum mylar shield.

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	Meets requirements of product drawing and appropriate Application Specification.	Visual, dimensional and functional per applicable inspection plan.
	ELECTRICAL	
System Resistance, Specified Current	Wire Size, AWG: 28, 24 Test Current, ampere: 1.5, 1.5 Millivolt drop, maximum: 45, 35	Measure potential drop of mated plug and receptacle assembly, see Figure 5; AMP Spec 109-25.
System Resistance, Dry Circuit	Wire Size, AWG: 28, 24 Resistance milliohms maximum, Initial: 25, 20 Resistance milliohms maximum, Final: 30, 25	Subject mated plug and receptacle assembly to 50 mv open circuit at 100 ma maximum, see Figure 5; AMP Spec 109-6-1.
Dielectric Withstanding Voltage	1000 vac (rms) dielectric withstanding voltage, one minute hold.	Test between adjacent circuits of mated plugs and receptacles (unmounted); AMP Spec 109-29-1.
Insulation Resistance	500 megohms minimum.	Test between adjacent circuits of mated plugs and receptacles (unmounted); AMP Spec 109-28-4.
Temperature Rise vs Current (a)	30°C maximum temperature rise at 1.5 amperes.	T-rise at rated current; AMP Spec 109-45-1.
Current Cycling	Wire Size, AWG: 28, 24 millivolt drop, maximum individual: 50, 40	Subject mated plug and receptacle to 500 cycles at 125% rated current (1.88A) for 15 minutes "ON" - 15 minutes "OFF"; AMP Spec 109-51, cond B, test method 2.

Figure 1 (cont)

Test Description	Requirement	Procedure
Surge Test	Meet insulation resistance; dielectric withstanding voltage.	Subject mated plug and receptacle assembly using adjacent circuits, to 5 surges of each polarity at 1 minute intervals; a pulse width of 2 x 10^4 microseconds and a peak amplitude of 1000 volts.
Shielding Effectiveness	Frequency / Effectiveness dB minimum 70 M Hz to 500 M Hz — 20 500 M Hz to 1 G Hz — 10 Note: Results on 8 position flat cable with aluminum/mylar shield. (AMP Part No 520475-1)	Measure radiated response from an unshielded reference (consisting of mated receptacle and plugs with cable, all unshielded) with circuit conductors excited between 70 M Hz and 1 G Hz; repeat procedure using shielded system (consisting of mated receptacle and plugs with cable, all shielded) the difference in response will give effective shielding in dB; AMP Spec 109-90.
MECHANICAL		
Vibration	No discontinuities greater than 1 microsecond. System resistance, dry circuit; shielding effectiveness.	Subject mated plug and receptacle mounted on printed circuit board to random vibration along each of 3 mutually perpendicular axes; each axis shall be subjected to 15 minute duration according to AMP Spec 109-21-5, cond G, Test A. Connector wired in series with 100 ma dc current applied.

Figure 1 (cont)

Test Description	Requirement	Procedure
Mating Force	Mating force values must be noted as "maximum, initial values." 4 position 7.5 lbs 6 position 8.0 lbs 8 position 8.5 lbs 16 position 15.0 lbs	Measure force necessary to mate plug and receptacle connectors; AMP Spec 109-42, cond A.
Unmating Force	Unmating force values must be noted as "maximum; initial values." 4 position 6.0 lbs 6 position 6.5 lbs 8 position 7.0 lbs 16 position 8.0 lbs	Measure force necessary to unmate plug and receptacle connector with locking latches disengaged; AMP Spec 109-42, cond A.
Plug to Receptacle Retention	20 pounds minimum retention.	Apply axial load (at a rate of 2 inches per minute) to plug with latches engaged and mated to appropriate receptacle; AMP Spec 109-30.
Receptacle Retention, to Printed Circuit Board (Without Mounting Screws)	Receptacles shall not dislodge from printed circuit board; before flow solder, 1 pound minimum; after flow solder, 5.5 pounds minimum axially with mounting posts.	Apply a perpendicular load at a rate of 2 inches per minute to the receptacle mated to a .062 or.093 inch thick printed circuit board.
Cable to Plug Tensile	20 pounds minimum with no discontinuities	Determine tensile at a rate of 2 inches per minute with connector wired in series and 100 ma dc current applied; AMP Spec 109-16, record maximum force before discontinuity.

Figure 1 (cont)

Test Description	Requirement	Procedure
Durability	System resistance, dry circuit; shielding effectiveness.	Mate and unmate plug and receptacle assembly to 3000 cycles at a rate of 20 cycles/ minute maximum; AMP Spec 109-27.
Resistance to Soldering Heat	No physical damage.	109-63-3.
	ENVIRONMENTAL	
Thermal Shock	System resistance, dry circuit; insulation resistance; dielectric withstand; shielding effectiveness.	Subject mated connectors to 25 cycles between -55° and 85°C; AMP Spec 109-22.
Humidity-Temperature Cycling	Check insulation resistance within 30 minutes of test completion; system resistance, dry circuit; dielectric withstand; shielding effectiveness.	Subject mated plug and receptacle assembly to 10 humidity-temperature cycles between 5° to 30°C and 95 (+0, -5%) RH; see Figure 2.
Heat Age	Shielding effectiveness; system resistance, dry circuit, see Figure 5.	80°C for 1000 hours.

(a) Maximum rated current that can be carried by this product is limited by maximum operating temperature of cable, which is 80°C, and temperature rise of contacts, which is 30°C. Variables which shall be considered for each application are: wire size, number of circuits, and ambient temperature.

Figure 1 (end)

State of Test	Temperature °C			Time for Changes	For
	From	To	Hold		
1	5	30		2 hours	
2			30		4 hours
3	30	5		3 hours	
4			5		3 hours

The assembled hardware shall be placed at 95 (+0, -5) percent relative humidity at room temperature. Then, while the relative humidity is held at or returned to 95 percent, the temperature shall be reduced to 5°C (41°F) a maximum rate of 15°C (59°F) per hour. The temperature shall then be cycled linearly for ten cycles as specified above with a relative humidity of 95 percent.

Figure 2

Humidity-Temperature Cycling Chart

3.6. Connector Tests and Sequences

Test or Examination	Test Group (a)																
	Test Sequence (b)																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Examination of Product	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
System Resistance, Specified Current								2,6									
System Resistance, Dry Circuit			2,4				2,4		2,4			2,4			2,4		
Dielectric Withstanding Voltage										5	7			5			
Insulation Resistance										2,4	3,5			2,4			
Temperature Rise vs Current								3,5									
Current Cycling								4									
Surge Test										3							
Shielding Effectiveness		2,4				2,4					2,6		2,4				2,4
Vibration						3	3										
Mating Force	2																
Unmating Force	3																
Plug to Receptacle Retention					2												
Receptacle Retention, to P.C.B.				2													
Cable to Plug Tensile				2													
Durability		3	3														
Resistance to Soldering Heat																2	
Thermal Shock											4	3					
Humidity-Temperature Cycling													3	3	3		
Heat Age									3								3

(a) See Para 4.1.A.
(b) Numbers indicate sequence in which tests are performed.

Figure 3

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Sample Selection

Connector housings and contacts shall be prepared in accordance with Application Specification and applicable Instruction Sheets. They shall be selected at random from current production.

Test Group (a)	Terminated Plugs	Receptacles On Board	Receptacle Off Board
3,4,6,7,8,9,10, 11,12,13,14,15,17	10	10	
1,2,5	10		10
16			10

Note:

(a) Test groups 3, 7, 8, 9, 12 and 15 each require submittal of a 16 inch wire sample for equivalent wire length readings.

Figure 4
Test Samples Per Group

B. Test Sequence

Qualification inspection shall be verified by testing samples as specified in Figure 3.

C. Acceptance

(1) The plug housings may exhibit crazing in the contact area.

(2) Test results from development on pre-qualification samples will be used to determine upper and lower one-sided statistical tolerance limits for 99% reliability at 95% confidence, as follows. Let X bar and s denote the sample average and standard deviation, respectively, of the test data. Let k denote the normal distribution one-sided tolerance factor for 95% confidence and 99% reliability. The value of k varies with sample size. Values of k are given in various tables, for example, NBS Handbook 91, Factors for One-Sided Tolerance Limits for Normal Distribution. Suitability of the normal distribution for representing the data shall be verified with normal probability plots, goodness of fit tests, etc.

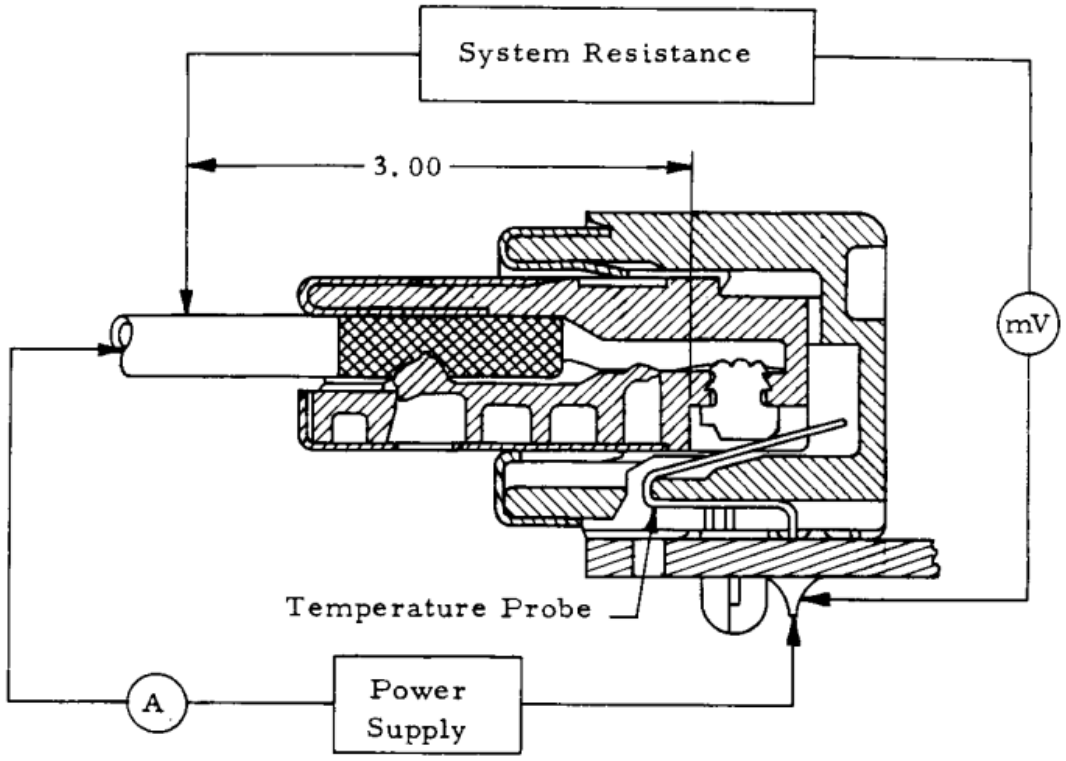
Then the upper one-sided tolerance limit for 99% reliability at 95% confidence is given by X bar + ks. The interpretation of this tolerance limit is as follows: based on the test data, and assuming a normal distribution for the test data, we can be 95% confident that 99% of the population of values represented by the sample data will not exceed X bar + ks. For any test parameter for which there is specified an upper requirement which is not to be exceeded, satisfactory performance of the product is achieved when the value of X bar + ks does not exceed the requirement value.

The lower one-sided tolerance limit for 95% confidence and 99% reliability is given by X bar - ks. This has a similar interpretation and corresponding application to lower requirement values.

(3) 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.

4.2. Quality Conformance Inspection

Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.



Voltage drop due to the 3" equivalent wire length is to be removed from all readings.

Figure 5

System Resistance and Temperature Measurement Points