

108-5157
Product Specification
Pulse Lock Connector

This specification may change without notice, as a result of product design change and evaluation testing.

1. Scope:

This specification covers product performance requirements and test methods of AMP Pulse Lock Connectors of the part numbers specified in Para. 2.

2. Applicable Product Part Numbers and Descriptions:

2.1 Receptacle Contacts:

Part Numbers: 170352, 170353
172771, 172772

2.2 Housings:

2.2.1 Cap Housings: As shown

2.2.2 Plug Housings: As shown

Cap Housing

Number of Positions	Part Number
52	172319
34	172352
24	172730
30	172491
42	172489

Plug Housing

** denotes for power source circuit.

Number of Positions	Part Number
10**	172315
18	172316
24	172317
10	172353
14	172354
12 **	172492
18 **	172493

3. Definitions of Terms:

For the purpose of this specification, the following terms shall apply.

3.1 Contact:

Contact is a metallic member of connector component, used for electrical connection. Receptacle contact and tab contact are available.

3.2 Housing:

Housing is an electrically insulating plastic member of connector that encapsulates contact. Plug housing that encapsulates receptacle contact, and cap housing that encapsulates tab contact are available.

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A	REVISED FJ00-1980-99	AY	1/16	1/16	DR	Electronics		Kawasaki, Japan	
02	Revised RFA-1481	AY	1/16	1/16	DR	LOC	NO	108-5157	REV
01	Rev. 7.2.2 & 7.2.3	AY	1/16	1/16	DR	J	A		B
0	Released	AY	1/16	1/16	DR	SHEET 1 OF 12			
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3.3 Connector:

A connector is an assembly of housing and wire-crimped contact(s) filled in the cavities of housing in all contact positions. Plug connector, an assembly of plug housing and receptacle contacts, and cap connector, an assembly of cap housing and tab contacts, are available.

4. Material and Finish:

4.1 Contact:

Tab contact is made from brass strip or tinplated brass strip, conforming to Copper Alloy 260 of ASTM B 36.

Receptacle contact is made of phosphor bronze or tinplated phosphor bronze conforming to ASTM B 103.

Two types of contact finish, (tin-plating 0.8 μ m min. and gold plating 0.38 μ m min.) are available.

4.2 Housing:

Housing is made of 10% glass-filled, molded polybuthylene terephthalate resin, conforming to UL 94V-0.

5. Product Design Feature, Construction and Dimensions:

5.1 Contact:

Product design feature, construction and dimensions shall be conforming to applicable customer product drawing(s). All the tab contacts and receptacle contacts shall be mated together regardless of difference of wire sizes applied.

5.2 Housing:

Product design feature, construction and dimensions of housing shall be conforming to applicable customer product drawing(s). Housings shall be provided with polarizing device to prevent from mismatching, and locking device with which the mating of connectors is secured.

6. Performance Rating:

6.1 Temperature Rating:

Temperature rating of connectors shall be within the range of -30 / +105°C.

6.2 Applicable Wire Range:

The wires of the following sizes shall be used for termination.

Product Part NO.	Applicable Wire Range mm ² (AWG)	Insulation Diameter(mm)
170352	0.3 - 0.5 (#22-#20) one wire	1.5 - 2.3
170353	0.5 - 1.25 (#20-#16) one wire	2.1 - 2.8

6.3 Thickness of Applicable Printed Circuit Board:

PCB's having thickness of 1.6 $\pm$ 0.15mm shall be applied for termination.

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7. Performance Requirements and Test Methods:

7.1 Performance Requirements:

When tested in accordance with the test methods specified in Para. 7.2, and test sequence specified in Para. 7.3, the performance requirements specified in Table 1, shall be satisfied.

Test Items	Performance Requirement of Contact	Performance Requirements of Connector	
	Initial	Initial	After Durability Testing (Final)
Appearance (Para. 7.2.1)	Products shall be free of abnormalities such as cracks, breakage, damages, slacking and loose of parts, rust and fusion that are detrimental to connector functions.		
Termination Resistance (Para. 7.2.2)(Low Level)	6 mΩ max.	6 mΩ max.	10 mΩ max.
Termination Resistance (Para. 7.2.3)	6 mV/A max.	6 mV/A max.	10 mV/A max.
Physical Touch/Feeling at Insertion/Extraction of Connectors (Para.7.2.4)	Connector emgagement/disengagement movement must work normally without signs of malfunction such as conflict or slacking touch		
Insulation Resistance (Para. 7.2.5)	—//—	100 MΩ min.	
Dielectric Strength (Para. 7.2.6)	—//—	No abnormalities shall be evident after applying test potential of 1,000V AC for 1 minute.	
Current Leakage (Para. 7.2.7)	—//—	3 mA max.	
Contact Retention Force (Para. 7.2.8)	59N min.		
Crimp Tensile Strength (Para. 7.2.9)	Wire Size mm ²	Tensile Strength	—//—
	0.3	(#22) 49N min.	
	0.5	(#20) 88N min.	
	0.85	(#18) 128N min.	
	1.25	(#16) 177N min.	
Housing Retention Force (Para. 7.2.10)	—//—	98N min.	
Repeated Insertion and Extraction (Para. 7.2.12)	—//—		When tested in accordance with the sequence specified in Table 6, the performance requirements shall be met.
Surface Resistivity (Para. 7.2.21)			
Volume Resistivity (Para. 7.2.15)			
Surface Resistivity (Para. 7.2.16)			
Thermal Shock (Para. 7.2.14)			
Humidity, Steady State (Para. 7.2.13)			

(To be continued)

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Test Items	Performance Requirements of Contact	Performance Requirements of Connector	
	Initial	Initial	After Durability Testing(Final)
Oil Resistivity (Para. 7.2.22)	//		When tested in accordance with the sequence specified in Table 6, the performance requirements shall be met.
Dust and Sand Bombardment (Para. 7.2.23)			
Freezing (Para. 7.2.24)			
Sulfurous Acid Gas Resistivity (Para. 7.2.25)			
Physical Impact (Para. 7.2.26)			
Compound Environmental Atmosphere (Para. 7.2.11)			
Temperature Rising (Para. 7.2.20)			
Overload Current (Para. 7.2.17)			Connector must not start inflammation.
Insertion Force of Contact or Connector (Para. 7.2.18, Contact) (Para. 7.2.19; Connector)	100 - 500 g	Number of Positions	Insertion Force
		10-Pos. ^{For Power} Circuit	63.8 N max.
		18-Pos.	88.3 N max.
		24-Pos.	98 N max.
		10-Pos.	63.8 N max.
		14-Pos.	78.5 N max.
Extraction Force of Contact or Connector (Para. 7.2.18, Contact) (Para. 7.2.19; Connector)	100 - 500 g	10-Pos. ^{For Power} Circuit	7 - 59 N
		18-Pos.	13 - 88 N
		24-Pos.	17 - 98 N
		10-Pos.	7 - 59 N
		14-Pos.	10 - 78 N

Table 1 (End)

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7.2 Test Methods:

7.2.1 Appearance:

Visually and tactually inspect to confirm if the abnormalities such as cracks, breakage, damages, slacking and loose of parts, rust, fusion and deformation that are detrimental to connection, are not present.

7.2.2 Termination Resistance (Low Level):

Apply test current of 50mA maximum at open circuit voltage of 50 mV maximum DC to the contacts in the mated pair of connectors, and measure by probing at the point 75mm apart from the wire crimp (across Y-Y' in Fig. 1). Termination resistance is obtained by calculation after deducting the resistance of the 75mm long wire used for termination. The measurement shall be done by probing the positions one by one respectively.

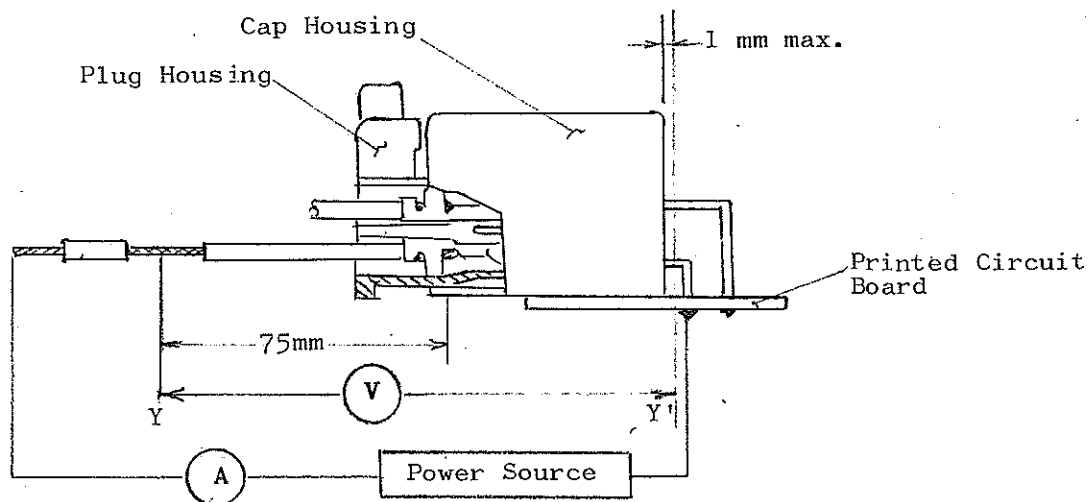


Fig. 1

7.2.3 Termination Resistance (Rated Current):

Apply test current of 1 A at open circuit voltage of 12 V DC to the contacts in the mated pair of connectors, and after the temperature rising of the circuit becomes stabilized, measure the millivolt drop between the probing points 75mm apart from wire crimp (Y-Y' in Fig. 1). Termination resistance is obtained from the measured value by calculation after deducting the resistance of the 75mm long wire used for termination. The measurement shall be done by probing the positions one by one separately.

7.2.4 Physical Touch/Feeling at Insertion/Extraction of Connector:

Tactually inspect the connector by inserting and extracting the paired connector by hands for presence of any conflict or difficulties during the operation.

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7.2.5 Insulation Resistance:

Insulation resistance shall be tested by applying test potential of 500V DC between the adjacent contacts and between the contacts and the ground of the mated pair of connectors shown in Fig. 2. Measurement shall be made by using insulation megohmmeter.

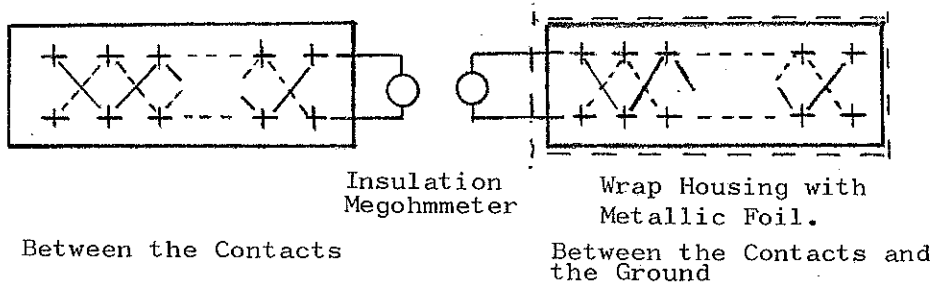


Fig. 2

7.2.6 Dielectric Strength:

Dielectric strength shall be measured by applying test potential of 1,000V AC between the adjacent contacts and between the contacts and the ground for 1 minute. Use commercial frequency for the test potential.

7.2.7 Current Leakage:

After exposing the mated pair of connector sample in the test atmosphere of $60 \pm 5^\circ\text{C}$, with 90/95% R.H. in the test chamber for 1 hour, take out from the chamber and apply test potential of 12 V DC between the adjacent contacts that are connected as shown in Fig. 3. Measure leakage of electric current.

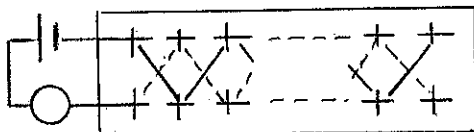


Fig. 3

7.2.8 Contact Retention Force:

Load contacts in housing that are crimped on approximately 100mm long 0.5mm^2 wire. Fasten the housing on the tensile testing machine, and apply an axial pull off load to the crimped wire with the speed at a rate of 100mm a minute. Measure and record the force required to dislodge the contact from the contact position. (See Fig. 4.)

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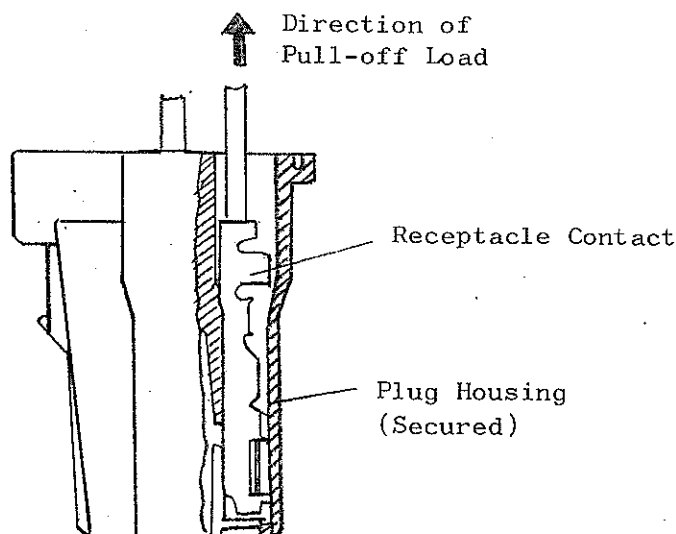


Fig. 4

7.2.9 Crimp Tensile Strength:

Fasten an approximately 100mm long wire crimped contact on the tensile testing machine, and apply an axial pull-off load to the crimped wire by operating the head to travel with the speed at a rate of 100mm a minute uniformly. The force required to pull off the wire from the wire crimp or to break-off the wire shall be measured and recorded.

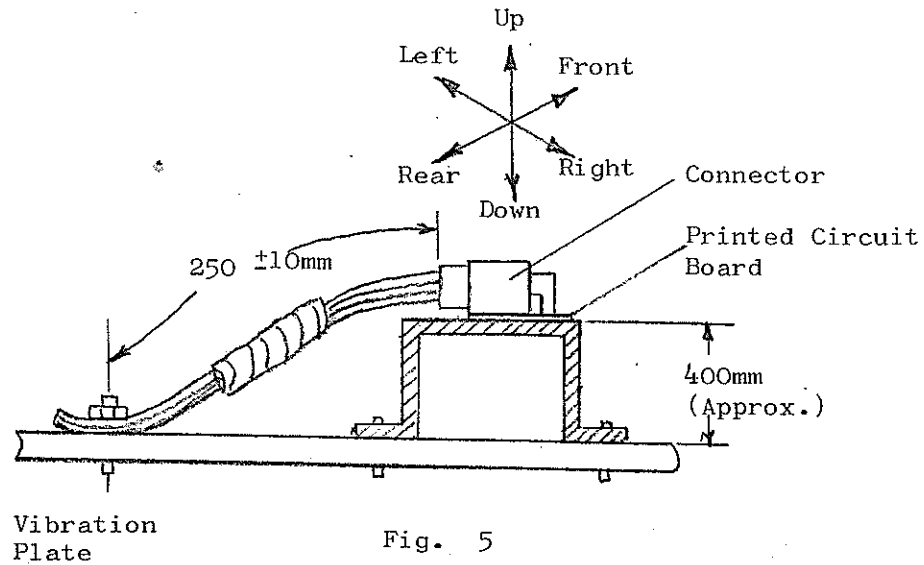
7.2.10 Housing Retention Force:

Fasten a pair of mated connectors on the tensile testing machine, and with one of the connectors securely held, pull the counterpart connector by operating the head to travel with the speed at a rate of 100mm a minute uniformly. The force required to separate the connectors with or without break-off of locking legs of housing, shall be measured and recorded.

7.2.11 Compound (Vibration and Current Cycling) Testing:

Load 1.25mm² wire-crimped contact in power circuit positions, and 0.3mm² wire crimped contacts in signal circuit positions of housings. Mate the connectors, and energize test current of 6A DC to four power circuits in the middle of housing, and 1A for other signal circuits for 45 minutes and deenergize for 15 minutes. Making this a cycle, repeat 20 cycles. During this test, the connectors shall be vibrated on the vibration testing machine, by applying sweeping vibration to change between 20 and 200Hz reciprocating one cycle a minute for 40 hours in up-and-down direction, and for 60 hours in left/right direction, and repeat this for two cycles.

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7.2.12 Repeated Insertion/Extraction:

Securely fasten one of the mated pair of connectors on the tensile testing machine, and apply an axial push-in and pull-off load to the connectors by operating the head to travel with the speed at a rate of 100mm a minute approximately. Repeat insertion and extraction for 50 cycles.

7.2.13 Humidity (Steady State):

Form a circuit in the mated connectors as specified in Fig. 3, and with the test potential of 28V DC applied to the circuit, expose the sample connectors under the atmosphere of $60 \pm 5^\circ\text{C}$, with 90-95% relative humidity in the test chamber for 48 hours. After the test duration, recondition in the room temperature and measure for the subsequent testing.

7.2.14 Thermal Shock:

Mated pair of connectors shall undergo 5 cycles of temperature changes in the sequence specified below. After the conditioning, recondition in the room temperature and measure for the subsequent testing.

Step	Test Conditions
1	$80 \pm 5^\circ\text{C}$ 2 hours
2	Room Temperature 5 minutes max.
3	$-30 \pm 5^\circ\text{C}$ 2 hours
4	Room Temperature 5 minutes max.

Table 2

7.2.15 Heat Resistivity:

Expose the mated pair of connectors under the elevated temperature of 100°C in the test chamber for 2 hours. After the test curation, recondition in the room temperature and measure for the subsequent testing.

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7.2.16 Cold Resistivity:

Expose the mated pair of connectors under the chilling temperature of -50°C in the test chamber for 2 hours. After the test duration, recondition in the room temperature and measure for the subsequent testing.

7.2.17 Overcurrent Loading:

Hold the mated pair of connectors in horizontal positioning, and apply the test current specified in Table 3 to randomly selected contact position, and observe if the housing starts inflammation during energizing for 1 minute.

Wire mm ²	Size (AWG)	Test Current (DC A)
0.3	(#22)	30
0.5	(#20)	50
0.85	(#18)	75
1.25	(#16)	100

Table 3

7.2.18 Contact Insertion/Extraction Force:

Fasten a pair of mating contacts on the tensile testing machine, and operate the head to travel with the speed at a rate of 100mm approximately a minute so that the contacts are made to engage or engaged contacts are made to separate. Measure the force required to mate and unmate the contacts when applying an axial load for testing.

7.2.19 Connector Insertion/Extraction Force:

Fasten a pair of mating connectors on the tensile testing machine, and operate the head to travel with the speed at a rate of 100mm approximately a minute so that the connectors are made to engage or engaged connectors are made to separate. Measure the force required to mate and unmate the connectors when applying an axial load for testing.

7.2.20 Temperature Rising:

- Energize test current of the intensity specified in Table 5 to the four contact positions in the middle of mated pair of connectors, and one half intensity of it to remainder signal contact positions for 2 hours, and measure the temperature of housing by probing on the surface of the middle portion of housing. From the measured value, subtract the room temperature to obtain the net temperature rising. The test shall be performed in the draft-free test chamber.

7.2.21 "Kojiri" Resistivity:

Securely place one of the mated pair of connectors on the sturdy bench, and apply reciprocating force of $196\text{N}\cdot\text{cm(T)}$ torque to the upper part of the free end of connector in the perpendicular direction to connector working axis, at every 1 mm graduation from the fully mated depth until they become unmated. Apply back-and-forth direction until separated. Making one separation a cycle repeat for 50 cycles. After finishing back-and-forth movement, apply right-and-left movement in the same manner for 50 cycles. When use of test machine is not available, perform by manually-controlled operation.

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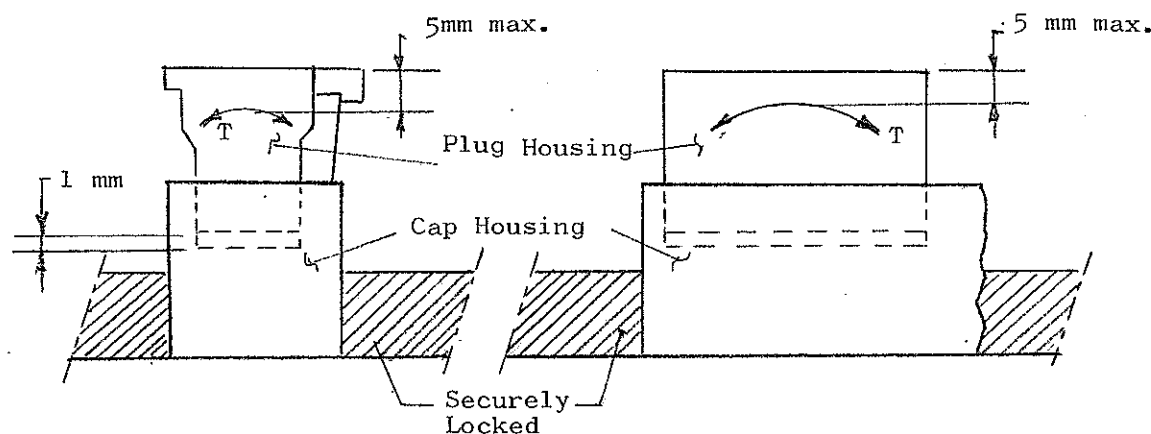


Fig. 6

7.2.22 Oil Resistivity:

Immerse mated pair of connectors in the following test oil, which is controlled at $50 \pm 2^\circ\text{C}$, specified in Table 4.

Type of Oil	Time of Immersion	Sequence of Immersion
Torque Converter Oil	1 hour	1
Transmission Oil	1 hour	3
Engine Oil	1 hour	5
Clutch Oil	1 hour	7
Brake Oil	1 hour	9
Kerosene	5 minutes	2, 4, 6, 8, 10

Table 4

7.2.23 Dust and Sand Bombardment:

Suspend mated pair of connectors with wire entry of plug housing facing upward in the closed test chamber whose dimensions are between 900mm and 1,200mm in width, height and depth, where the connectors are subject to ejection of Portland powdered cement conforming to JIS R 5210 by the aid of compressed air at a rate of 1.5kg within 10 seconds once every 15 minutes. The ejected cement is dispersed with the use of power-driven fan. The test duration must be 1 hour. After completion of test duration, replace the connector sample from the test chamber and measure for the subsequent testing.

7.2 24 Icing:

Immerse mated pair of connectors in the boiling water for 1 hour, and soon after it, place in the test chamber where the chilling temperature of $-30 \pm 5^\circ\text{C}$ is controlled, and expose until the drenching water freezes. After the connectors become frozen, take out of the test chamber and recondition in the room temperature to melt the ice completely. Measure for the subsequent testing.

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7.2.25 Sulfurous Acid Gas Resistivity:

Expose mated pair of connectors under the sulfurous acid gas atmosphere of 10 ppm in room temperature with relative humidity of 90% minimum for 24 hours. After completion of test duration, take out the connector and measure for the subsequent testing.

7.2.26 Vibration, Low Frequency:

Securely fasten a pair of mated connector on vibration testing machine conforming to SAE J 577. The connectors are filled with series wired contacts and closed circuit test current of 0.1A at open circuit voltage of 12V DC is applied flowing through the circuit. The connectors shall be vibrated by 750 cpm, with the cam drop stroke of 3.2mm, suspended by the spring tension ranging between 265N and 314N for 1 hour. During the vibration, the circuit shall be monitored for electrical discontinuity greater than 1 millisecond taking place in the circuit.

Wire mm ²	Size (AWG)	Test Current (A) DC
0.3	(#22)	9
0.5	(#20)	11
0.85	(#18)	14.5
1.25	(#16)	18.5

Number of Positions	Coefficient of Current Loading
10 - 12	0.5
13 & Over	0.4

Table 5

The test current to be loaded for the test is obtained by calculation of the specified intensity designated for the wire size to be used multiplied by the number of positions and coefficient of current loading shown in the above tables.

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7.3 Test Sequence:

The tests shall be performed in the sequence specified in Table 6.

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Test Items	Classification																			
	I				II				III				IV				V			
	I	II	III	IV	V	VI	VII	VIII	IX	X										
Appearance	1	1	1										1	12	1			15	1	
Contact Insertion Force	2																			
Contact Extraction Force	3																			
Connector Insertion Force													2	5	11	2	5	14	2	5
Connector Extraction Force													4	10	4	9	13	4	14	
Termination Resistance (Low Level)													3	7	9	3	8	10	12	3
Termination Resistance (Rated Current)			2	4	6	8														
Physical Touch/Feeling at Insertion/Extraction of Conn.																				
Insulation Resistance																		6	13	
Dielectric Strength																			3	7
Current Leakage																7				
Temperature Rising				7																
Contact Retention Receptacle Contact		2																		4
Contact Retention Tab Contact		3																		
Crimp Tensile Strength	4																			
Housing Retention Force				9																
Repeated Insertion/Extraction																			4	
"Kojiri" Resistivity		3													9		7			
Heat Resistivity					6															
Cold Resistivity					8															
Thermal Shock						6														
Humidity (Steady State)							11													
Oil Resistivity								11												
Dust & Sand Bombardment								9												
Icing									4											
Sulfurous Acid Gas Resistivity									5											
Vibration (SAE J 577)			5																	
Vibration Current Cycling																				3
Overload Current																				5

Table 6

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