

## 1. Scope:

### 1.1 Contents

This specification covers the requirements for product performance, test methods and quality assurance provisions of .040 series Multi-Lock I/O Connector contacts and housings of the part number showed on Fig.1(including .070 connector for power circuits).

Applicable product description and part numbers are as shown in Fig. 1:

Part No.	Name
173681	.040 Receptacle Contact (AVS 0.3~0.5mm <sup>2</sup> applicable)
175180	.040 Receptacle Contact (CAVUS 0.3~0.5mm <sup>2</sup> applicable)
173708	.070 Receptacle Contact (AVS 0.5~2mm <sup>2</sup> applicable)
174044	8 Pos. Plug Housing
353490	8 Pos. Plug Housing
174045	12 Pos. Plug Housing
353491	12 Pos. Plug Housing
174046	16 Pos. Plug Housing
353536	16 Pos. Plug Housing
174047	20 Pos. Plug Housing
353493	20 Pos. Plug Housing
174060	16 Pos. Plug Housing (Single Row, Low Profile Type)
174147	16 Pos. Plug Housing (.070)
174049	8 Pos. Cap Housing Ass'y (Horizontal Type)
174051	12 Pos. Cap Housing Ass'y (Horizontal Type)
174053	16 Pos. Cap Housing Ass'y (Horizontal Type)
174055	20 Pos. Cap Housing Ass'y (Horizontal Type)
174062	16 Pos. Cap Housing Ass'y (Single Row, Low-Profile Horizontal Type)
174146	36 Pos. Cap Housing Ass'y (Horizontal Type, 16 Pos. plus 20 Pos. )
178460	36 Pos. Cap Housing Ass'y (Horizontal Type, 20 Pos. plus 16 Pos.(.070)
174149	48 Pos. Cap Housing Ass'y (Horizontal Type, 12 Pos. 20 Pos. plus 16 Pos.(.070)
174151	64 Pos. Cap Housing Ass'y (Horizontal Type, 12 Pos. 16 Pos. 20 Pos. plus 16 Pos.(.070)
174971	8 Pos. Cap Housing Ass'y (Vertical Type)
174973	12 Pos. Cap Housing Ass'y (Vertical Type)
174975	16 Pos. Cap Housing Ass'y (Vertical Type)

Part No.	Name
174977	20 Pos. Cap Housing Ass'y (Vertical Type)
174979	28 Pos. Cap Housing Ass'y (Vertical Type)
638230	12 Pos. Cap Ass'y (Horizontal Boardlock Type)

Fig.1 (end)

**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:**

114-5094, 5162	Application Specification,.040 Series Receptacle Contact
114-5019	Application Specification,.070 Series Receptacle Contact
501-5041	Test Report
502-1115	Engineering Report For Boardlock Type

**2.2 Military Standards and Specifications:**

MIL-STD-202	Test Method for Electronic and Electrical Component Parts
208:	Test Method for Soldering of Parts

**2.3 Commercial Standards and Specifications:**

A.	JASO 7002	: Multipole Connector for Automobiles
B.	JASO 7101	: Test Methods for Plastic Molded Parts
C.	JIS C 3406	: Low Voltage Wires and Cables for Automobiles
D.	JIS D 0203	: Method of Moisture, Rain and Spray Test for Automobile Parts
E.	JIS D 0204	: Test Method of High and Low Temperature Test for Automobile Parts
F.	JIS R 1601	: Vibration Test Method for Automobile Parts
G.	JIS R 5210	: Portland Cement
H.	JIS D 5500	: Lighting and Signaling Equipment for Automobile Parts

### 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 Material:

##### A. Contact:

Tab contact- Pre-tinned brass, or plain brass with selective gold plating over Nickel underplate.

Receptacle contact- Pre-tinned phosphor bronze strip, or plain phosphor bronze strip with selective gold plating over nickel underplate.

##### B. Housing :

Polybithylene - terephthalate resin (PBT)

#### 3.3 Temperature Ratings (Mated condition)

-30°C to +105°C(Including temperature rising in addition to the ambient temperature)

#### 3.4 Performance and Test Descriptions:

The product shall be designed to meet the electrical, mechanical and environmental performance requirements specified in Fig.2. All tests shall be performed in the room temperature unless otherwise specified.

#### 3.5 Test Requirements and Procedures Summary:

Para.	Test Items	Requirements	Procedures
3.5.0	Confirmation of Product	Product shall be confirming to the requirements of applicable product drawing and Application Specification 114-5094,-5162,-5109	Visually, dimensionally and functionally inspected per applicable drawings and application specification.
Electrical Requirements			
3.5.1	Termination Resistance (Low Level)	.040 10m $\Omega$ Max.(Initial) 20m $\Omega$ Max.(Final) .070 3m $\Omega$ Max.(Initial) 10m $\Omega$ Max.(Final)	Subject mated contacts assembled in housing to closed circuit current of 10mA max. at open circuit voltage of 20mV max. Fig.3.
3.5.2	Insulation Resistance	100M $\Omega$ Min.(Initial) 100M $\Omega$ Min.(Final)	Measured by applying test potential between the adjacent contacts, and between the contacts and ground in the mated connectors. Fig.4 Condition DC 500 V Fig.4

3.5.3	Dielectric Strength	Connector must withstand test potential of 1 kVAC for 1 minute.	Measured by applying test potential between the adjacent contacts, and between the contacts and ground in the mated connectors. Fig.4
3.5.4	Current Cycling	Termination resistance (low level) .040 20m $\Omega$ max.(Final) .070 10m $\Omega$ max.(Final)	After having a half number of contacts series-wired, apply the following test current for 45 minutes and deenergize for 15 minutes, in ambient temperature of 60, making this a cycle, repeat for 1,000 cycles. .040 – 5A (0.5 mm <sup>2</sup> wire) .070 – 10A (1.25 mm <sup>2</sup> wire)

Fig.2(To be continued)

Para.	Test Items	Requirements	Procedures																							
3.5.5	Temperature Rising vs. Current	30°C, max. under loaded specified current.	After having a half number of contacts series-wired, apply the specified current to the connector in the draft-free test chamber, and after reaching the established temperature, measure the temperature of the wire crimp of the contact. .040 – 5A (0.5 mm <sup>2</sup> wire) .070 – 10A (1.25 mm <sup>2</sup> wire)																							
Physical Requirements																										
3.5.6	Vibration Sinusoidal Low Frequency	No electrical discontinuity greater than 10 microse -cond(s) shall occur. Termination Resistance (Lo -w Level) .040 20mΩ max. .070 10mΩ max.	Connect serially all poles of the Connector, and give vibration after DC 12 V 0.1 A isenergized. Vibration accelation: 66.7m/s <sup>2</sup>  Vibration frequency: 10-50-10Hz Cycle/min.  Duration : Up and down directions for 4 hours as shown in figure 7, and in forward and rearward directions for 2 hours respectively.																							
3.5.7	Connector Mating Force	<table><tr><th rowspan="2">No. of Pos.</th><th colspan="2">Insertion Force(N)</th></tr><tr><th>Lock</th><th>Contact</th></tr><tr><td>8</td><td>49 Max.</td><td>58.8 Max.</td></tr><tr><td>12</td><td>58.8 Max.</td><td>68.6 Max.</td></tr><tr><td>16</td><td>78.4 Max.</td><td>88.2 Max.</td></tr><tr><td>20</td><td>88.2 Max.</td><td>98 Max.</td></tr><tr><td>20 *</td><td></td><td>127.4 Max.</td></tr><tr><td>16 (.070)</td><td>88.2 Max.</td><td>98 Max.</td></tr></table>	No. of Pos.	Insertion Force(N)		Lock	Contact	8	49 Max.	58.8 Max.	12	58.8 Max.	68.6 Max.	16	78.4 Max.	88.2 Max.	20	88.2 Max.	98 Max.	20 *		127.4 Max.	16 (.070)	88.2 Max.	98 Max.	Measure the force required to mate connector using locking latch by operating at 20 mm a minute.       * For 174055-1 only.
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Fig.2(To be continued)

Para.	Test Items	Requirements			Procedures
3.5.8	Connector Unmating Force	No. of Pos.	Extraction Force(N)		Measure the force required to unmate connector without locking latch set in effect, by operating at 20 mm a minute  For 174055-1 only.
		8	58.8 Max.		
		12	68.6 Max.		
		16	88.2 Max.		
		20	98 Max.		
		20 *	127.4 Max.		
		16 (.070)	98 Max.		
3.5.9	Contact Retention Force	49N Min.			Apply axial load to contact by operating at a rate of 100 mm a minute
3.5.10	Contact Engaging Force	.040	0.98~5.88 N		Operate at a rate of 100 mm a Minute
		.070	1.96~7.84 N		
3.5.11	Contact Separating Force	.040	0.98~5.88 N		Operate at a rate of 100 mm a minute
		.070	1.96~7.84 N		
3.5.12	Crimp Tensile Strength	Wire Size		Crimp Tensile (min)	Apply an axial pull-off load to crimped Wire of contact secured on the tester, at a Rate of 100mm a minute.
		mm <sup>2</sup>	AWG	N	
		0.3	#22	58.8	
		0.5	#20	88.2	
		0.85	#18	127.4	
		1.25	#16	166.6	
		2	#14	196	
3.5.13	Durability (Repeated Mate/Unmatin)	Termination Resistance (Low Level) (Final)			Mate and unmate connectors for 50 Cycles.
		.040	20mΩ max.		
		.070	10mΩ max.		

Fig.2(To be continued)

Para.	Test Items	Requirements	Procedures
<b>Environmental Requirements</b>			
3.5.14	Housing Lock Strength	98 N min.	Determine strength fo housing locking mechanism. Operate at a rate of 100 mm a minute.
3.5.15	Solderability	Solderable area shall have solder coverage of 95 % minimum. (However, excepting sheared surface)	After immersing a soldering area of the cap assembly posts in flux (rosineous methanol solution) for 5 to 10 seconds, immerse it in a soldering bath of $230^{\circ}\text{C} \pm 5^{\circ}\text{C}$ (tin 60% lead 40%) for $3 \pm 0.5$ seconds, and then inspect the connector by using approx X10 magnifying glass.
3.5.16	Resistance to Soldering Heat	No physical damage shall occur. Tab retention force 9.8 N min.	Dip between 3 mm and top of solder tab of cap housing assembly into solder bath (tin 60 %, lead 40%) at $250^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for $5 \pm 0.5$ second and lock into appearance and meas tab retention force as bellow. Measurements of tab retention for cut tab at bending area after dipped and measure the force of tab to move when pushing toward the direction by arrow mark. Fig.8
<b>Environmental Requirements</b>			
3.5.17	Humidity , Steady State	Termination resistance (Low Level) .040 20m $\Omega$ max. .070 10m $\Omega$ max. Current Leakage (Final): 1 mA max. Insulation resistance(Final): 100 M $\Omega$ min.	Subject mated connectors to steady state humidity at $40^{\circ}\text{C}$ and 90-95% R.H.96 hours.
3.5.18	Current Leakage	10 $\mu$ A max. (Initial) 1 mA max. (Final)	After exposing mated connector in test chamber ( $60 \pm 5^{\circ}\text{C}$ , 90-95% R.H.) for 1hour, measure by applying DC 13V to the circuit. See Fig.5

Fig.2(To be continued)



Para.	Test Items	Requirements	Procedures
3.5.19	Resistance to "Kojiri"	Termination resistance (Low Level) (Final) .040 20mΩ max. .070 10mΩ max.	Secure one of the connectors and apply reciprocating force to the upper connector in the direction axis to working axis, at every 1 mm graduation from the fully mated depth of the connector until they become unmated. The strokes shall be applied in back/forth direction with approx. 78.4 N force and after repeating for the two steps of the depth shown in Fig.4, extract the connectors. Making this one cycle, repeat for 10cycles.
3.5.20	Temperature Life	Termination resistance (Low Level) (Final) .040 20mΩ max. .070 10mΩ max.	Subject mated connectors to exposure of 100°C for 24 hours.
3.5.21	Resistance to Cold	Termination resistance (Low Level) (Final) .040 20mΩ max. .070 10mΩ max.	Subject mated connectors to exposure of -40°C for 24 hours.
3.5.22	Dust Bombardment	Termination resistance (Low Level) (Final) .040 20mΩ max. .070 10mΩ max.	Subjected mated connectors to a spray of Portland cement (JIS R 5210) propelled By compressed air at a rate of 1.5 kg in 10 seconds in every 15minutes, in a closed chamber of 1,000 mm cube with the sample connector hung 150 mm away the chamber wall. This test must be continued for 1 hour, and after completion of this test, repeat insertion and extraction for 3cycles.

Fig.2(To be continued)

Para.	Test Items	Requirements	Procedures				
3.5.23	Resistance to Oil and Liquid	Termination resistance (Low Level) (Final) .040 20mΩ max. .070 10mΩ max. No abnormalities in the appearance	Kinds	Liquid Temperature	Immersion Duration	Immersion Sequence	
						Group A	Group B
			Mixed Solution of Equal Mixing Ratio of Engine Oil &Kerosene	50°C	2 hrs.	1	
			Motor Gasoline	Room Temp.	10mins		1
			Break Oil	Room Temp.	1hr	3	3
			Coolant Anti-freeze Liquid (5% aqueous solution)	Room Temp.	1hr	5	5
			Cooling Water Anti-Freeze Liquid(50 %aqueous solution)	Room Temp.	1hr	7	7
			Washer Fluid	Room Temp.	1hr	9	9
			Kerosene	Room Temp.	5mins	2.4.6.8	2.4.6.8
			Note: Engine oil: SAE 10W Kerosene: JIS K 2203-No.2 Motor gasoline :JIS K 2202 For other tests, use genuine car manufacture's liquid products.				

Fig.2(To be continued)

Para.	Test Items	Requirements	Procedures			
3.5.24	Fuse Matching Ability	Fusion of the housing or ignition of the connector must not occur.	After having a half number of contacts series-wired, apply the test current " $\alpha$ " for 24 hours, then apply current " $\beta$ " for 1 hour.			
				Current $\alpha$	Current $\beta$	Wire size
			.040	11A	14A	0.5 mm <sup>2</sup>
			.070	22A	27A	1.25 mm <sup>2</sup>

Fig.2(End)

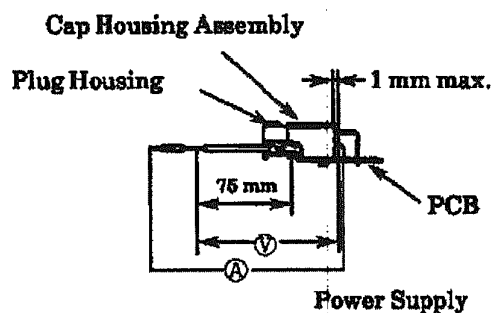


Fig. 3

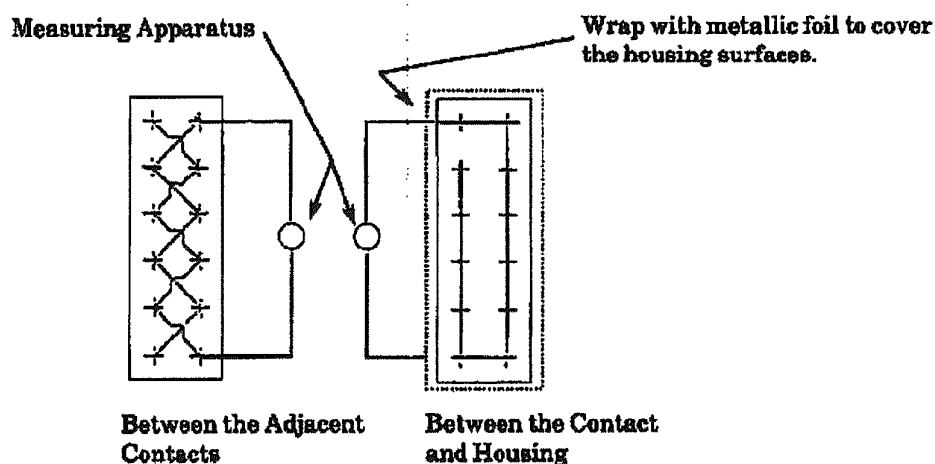
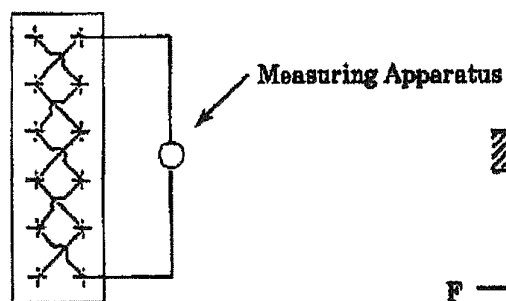


Fig. 4



Between the Adjacent Contacts

Fig. 5

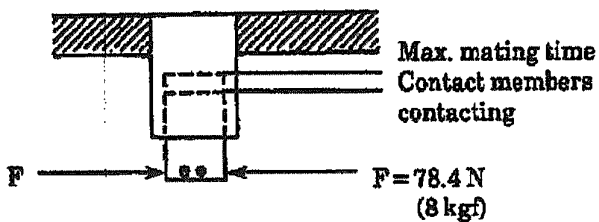


Fig. 6

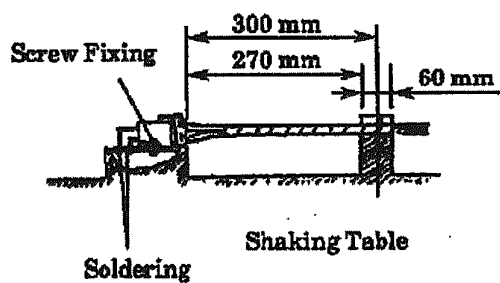


Fig. 7

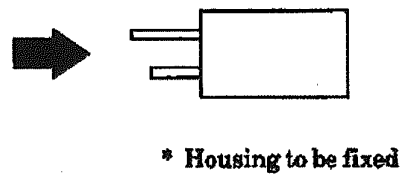


Fig. 8

**4. Quality Assurance Requirement:****4.1 Test Condition:**

Unless otherwise specified, performance tests shall be carried out under the environment as indicated below.

Temperature	15 to 35°C
Relative Humidity	45 to 75 %
Atmospheric Pressure	86.7 to 106.7 KPa

**4.2 Test****a. Test Specimen:**

The specimen to be employed for performance test shall be prepared for the use of normal products, which are crimped in accordance with "114-5094" Application Specification for .040 Series Receptacle Contact", and "114-5019 Application Specification for .070 Series Receptacle Contact". All specimens should not be reused after once tested. Finishing of the testing contact shall be in common, (ie. tin-plated mutually or gold-plated mutually etc.) Never combine differently finished contacts.

**b. Specimen Quantity:**

Quantity of the specimen to be employed for the performance test shall be 10 sets for each item in the case of a contact unit, and shall be more than 2 sets in the case a connector.

**c. Printed Circuit Board:**

The printed circuit board to be employed for the performance test shall be of glass epoxy laminated material of 35  $\mu$ m in thickness with copper clad in one side only. Mounting hole dimensions shall be conforming to the drawings of the relevant cap housing assembly.

## 5. Cautions for handling :

### 5.1 Crimping and Handling:

In order to maintain retention performance of housing and contacts, and contacting performance of connectors, crimping of the connector shall be done in accordance with provisions of "114-5094 Application Specification for .040 Series Receptacle Contacts" and "1194-5109 Application Specification for .070 Series Contact".

### 5.2 Soldering Work for Cap Housing Assembly:

When the cap housing assembly is mounted on the printed circuit board, it shall be soldered after using tapping screws of M3×6 of JIS B1115 or 1122, pan head, Type 2 or Type 4, for 8-pos. to 36-pos. of horizontal type, and M4×6 for 48-pos. to 64-pos. of horizontal type, and M36 panhead Type 2 or Type 4 for vertical type, respectively.

### 5.3 Harness Workability:

In order to maintain optimum mating performance for each connector, taping of wires shall be controlled outside of the range as shown in the figure below.

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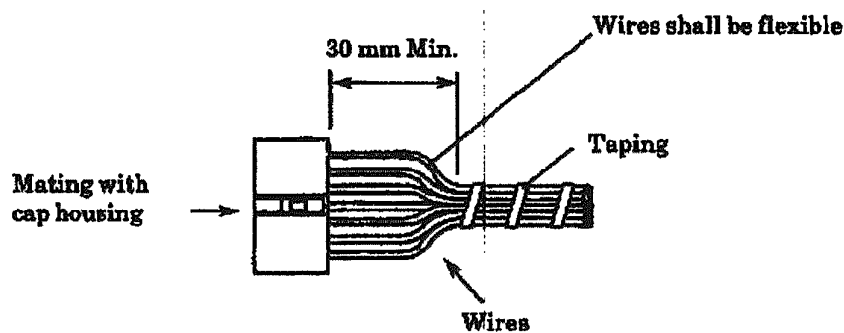


Fig.9