Title of Document:	HANDLING MANUAL	Issue No. CHM-1-T059	Rev. 2
Customer:	GENERAL	Issue date: October 27, 1998	
Title subject:	LC Connector	Revision date: December 17, 2020	

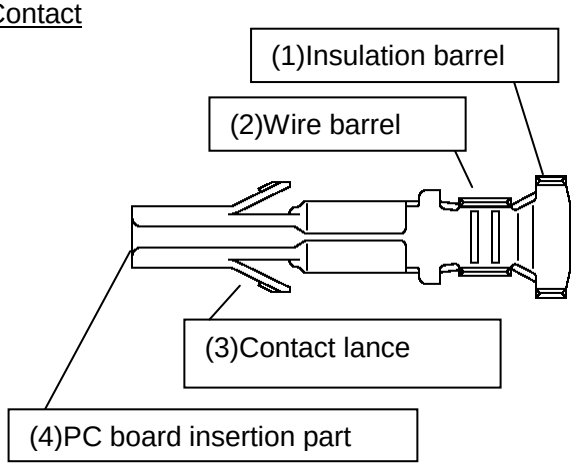
This handling manual describes operation points of crimping and assembling for further reliability and better delivery of LC connector features.

C O N T E N T S

1. Part Name and Parts Identification

LC connector consists of contact, housing and header.
On processing and assembling, understand each structure and name.

Contact



Function of each part

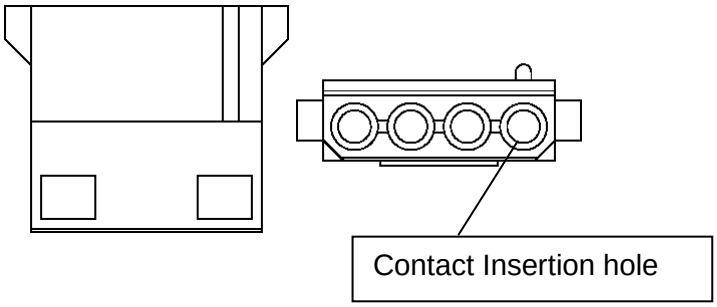
(1) It holds wire insulation.

(2) It crimps wire conductors.

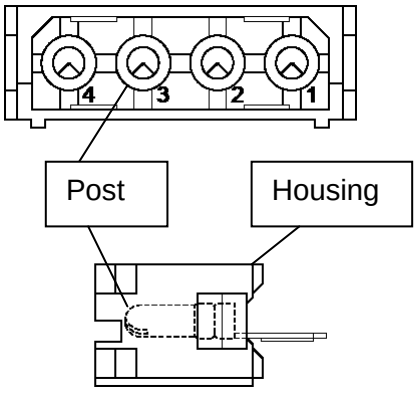
(3) It holds the housing and the contact.

(4) Contacting part with header

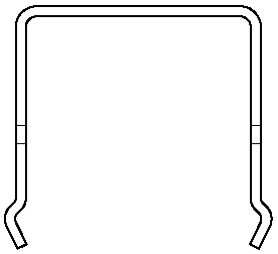
Housing



Header



Clamp (for side entry type)



2. Model Number

Product name			Model No.
Plug	Contact	21 type	SLC-21T-P2.0 SLC-21T-2.0
		22 type	SLC-22T-2.0
	Housing		LCP-04
Header	Top entry type		LC-04T
	Side entry type		LC-04A LC-04B
Clamp			LCC-04

3. Storage

3-1 Connector storage

Recommended storage condition: Temperature: 5 – 35 ˚C, Relative humidity 60 % or less
(Under packaging like the state of JST shipment)

Keep off direct sunlight, places exposing to such corrosive gas as industrial gas (generate from a stove and whatnot) and ammonia gas (generate from a toilet and whatnot), dusty place and condensation.

Note that the resin molding part may break due to transportation and handling, such as processing and mating, under dry or low temperature condition.
After unpacking, return products in the original package to store.

3-2 Storage of the crimped contacts

Not leaving the crimped contact to stand in a place exposed to high humidity and direct sunshine, and not placing them directly on the ground, keep them in a clean storage room,

4. Applicable Wire

4-1 Applicable wire

Wire size and wire insulation outer diameter for SLC-21T-P2.0, SLC-21T-2.0 and SLC-22T-2.0 are as below.

	SLC-21T-(P)2.0	SLC-22T-2.0
Wire size	AWG #22 ~ #18	UL1007 AWG#20 + UL1007 AWG#20 UL1007 AWG#20 + UL1007 AWG#18 UL1007 AWG#18 + UL1007 AWG#18
Wire insulation O.D.	ϕ1.7 mm ~ ϕ2.1 mm	
Conductor spec.	Annealed copper stranded wire with tin-plating	

4-2 Precautions

Special wires such as solid ones, tin-coated ones, shielded ones and other than the above wires cannot be used in principle. When using such special wires, contact JST.

5. Crimping Tool

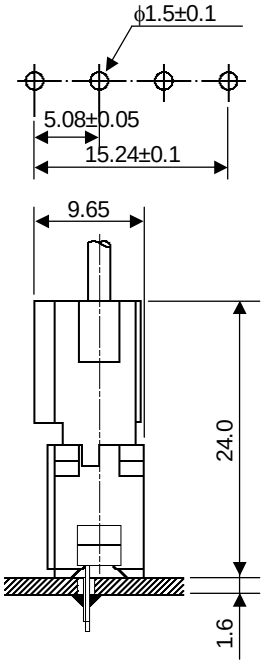
Contact	Crimping machine	Applicator	Die	Applicator with die
SLC-21T-(P)2.0	AP-K2( )	MKS-L	MK/SLC-21-20	APLMK SLC21-20
SLC-22T-2.0			MK/SLC-22-20	SPLMK SLC22-20

Note$_1$: When crimping operation is conducted by using other than above applicator and die set, JST cannot guarantee the performance of connector.

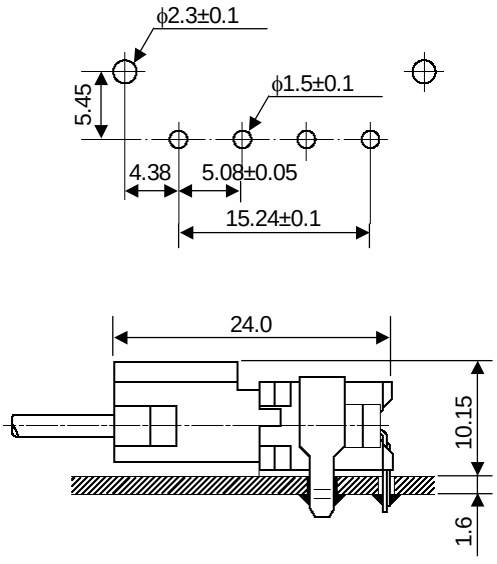
6. Applicable PC Board

6-1 Applicable PC board thickness: 1.6 mm

6-2 PC board layout and assembly layout



Top entry type



Side entry type

Tolerances for PC board size are non-cumulative ±0.05 mm for all centers.

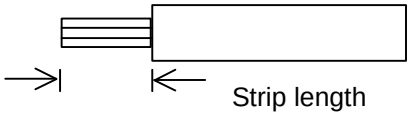
The PC board hole diameter above is a reference value for drill hole.
The hole diameters differ according to piercing method (drill hole, punching hole, etc.) and PC board material (paper-based epoxy resin, glass-based epoxy resin, etc.). Depending on the usage, set it.

7. Crimping Operation

7-1 Wire strip length

When a wire is stripped, do not damage or cut off the wire conductors.
As the wire strip length differs depending on wire type and crimping method, decide the best wire strip length considering the processing condition.

Reference wire strip length:
SLC-21T-(P)2.0: 3.2 mm
SLC-22T-2.0: 3.4 mm

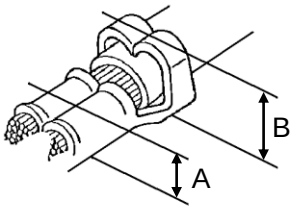


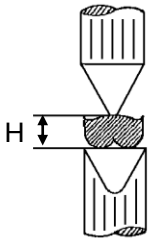
Note$_2$: After stripping wire, do not leave the stripped wire unprotected for long time, because the conductor surface become easily oxidized, which may lead to fluctuation of contact resistance.

7-2 Crimping

Before crimping operation, be sure to check that the combination of the contact, wires, and the crimping die is correct.

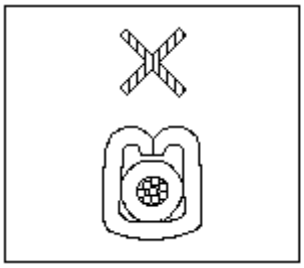
Measurement of crimp height





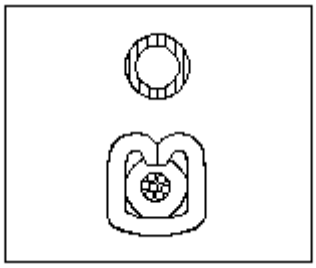
A: Crimp height at the wire barrel should be set to a pre-determined dimensions.
B: Adjust and set the crimp height at the wire insulation barrel as per finished outer diameter and a kind of a wire so that the wire insulation does not come off the contact easily and is not crimped excessively.
H: Measure crimp height at the center of the barrel using a specified micrometer.

Crimping condition at wire insulation barrel part

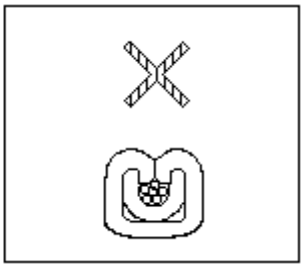


Insufficient crimping
(pressed weak)

When tension is applied to a wire, the wire insulation easily comes off the contact.



Good



Excessive crimping
(pressed excessively)

The barrel bites the wire too much and may damage the wire conductors.

Check of crimping condition at wire insulation barrel

Cut only the wire insulation barrel, remove the wire insulation and check if the wire conductors are not damaged as below.

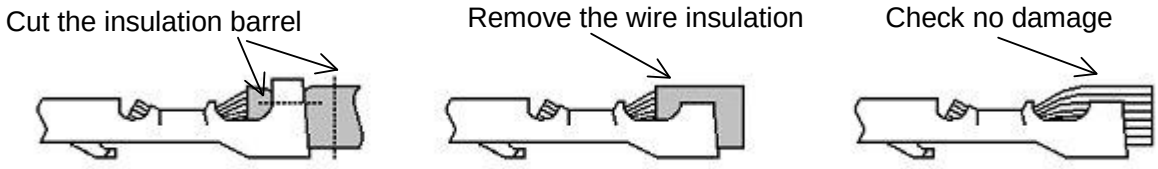


Table of crimp height

SLC-21T-(P)2.0			SLC-22T-2.0		
Wire	Crimp height [mm]		Wire [UL 1571]	Crimp height [mm]	
Wire size	Conductor part	Insulation part (Ref. value)	Wire size	Conductor part	Insulation part (Ref. value)
AWG#22	1.00±0.05	2.2	AWG#20+AWG#20	1.35±0.05	3.2
AWG#20	1.05±0.05	2.3	AWG#20+AWG#18	1.40±0.05	3.2
AWG#18	1.10±0.05	2.4	AWG#18+AWG#18	1.50±0.05	3.4

Note$_3$: The crimp height value at the insulation part on the above table is reference because the crimping condition depends on wire outer diameter and material.
Set the crimp height at the insulation part according to the confirmation method in crimping.

Measurement timing of crimp height

① When operation starts at morning and afternoon, starts after pausing and finishes.
② When the contact reel is exchanged.
③ When the applicator is adjusted. (after trouble-shooting, etc.)
④ When the crimping dies are exchanged.

7-2-1 Tensile strength at crimped part

After adjusting the crimp height, check the tensile strength using the test samples.
In case that the tensile strength greatly differs from the normal tensile strength (actual value), check if there is a defect. The tensile strength may be different even in the same wire size due to the difference in strength of wire itself.

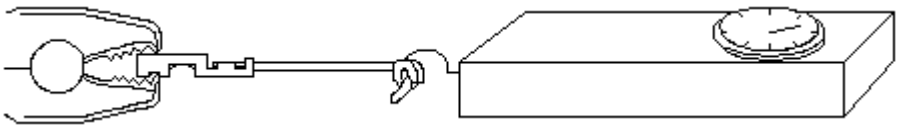
Table of tensile strength at crimped part

UNIT: N

SLC-21T-(P)2.0			SLC-22T-2.0		
Wire size	Req.	Actual value (Ref.)	Wire size	Req.	Actual value (Ref.)
AWG#22	44.1 min.	76 ～ 87	AWG#20+AWG#20	63.7 min.	114 ～ 128
AWG#20	63.7 min.	126 ～ 139	AWG#20 +AWG#18	63.7 min.	93 ～ 129
				78.4 min.	142 ～ 154
AWG#18	78.4 min.	159 ～ 179	AWG#18+AWG#18	78.4 min.	144 ～ 172

Tensile strength test at crimping part:
Remove wire insulation part of specimen which is crimped correctly, and pull specimen with a push-pull gauge as shown below.

Pull specimen gradually so as not to apply abrupt shock.

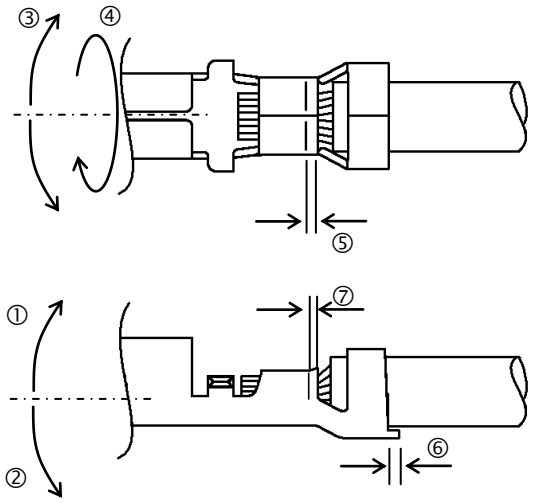


Pull with pliers, etc. Push-pull gauge

7-2-2 Crimping appearance

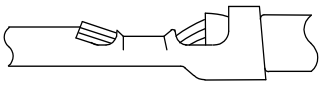
Check the crimping appearance visually for correct crimping with an equipment such as a loupe.

Part name of crimped contact

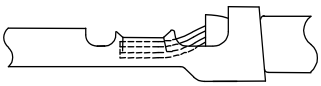


Check item		Reference value
①	Bending up	3° max.
②	Bending down	3° max.
③	Twisting	3° max.
④	Rolling	5° max.
⑤	Bell-mouth	0.1 ~ 0.3 mm
⑥	Cut-off length	0 ~ 0.5 mm
⑦	Wire conductor protruding length	0.5 ~ 1.0 mm

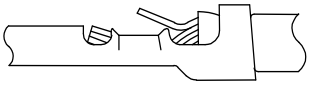
Examples of defective crimping



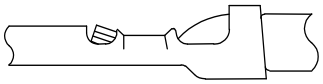
Wire conductor protruding length is long.



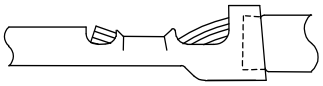
Wire conductor protruding length is short.



Wire conductors come off.

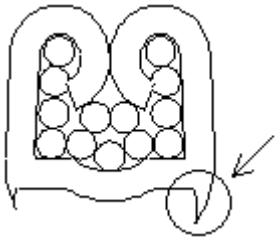


Wire barrel bites wire insulation



Wire insulation is not crimped sufficiently.

There must not be large burr or one-sided burr.



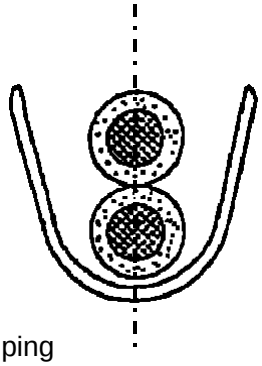
※Bending up/down, twisting and rolling

Note that bending up/down, twisting and rolling may lead to deterioration of the contact insertion and the contact retention force.

7-2-3 Tow-wire crimping

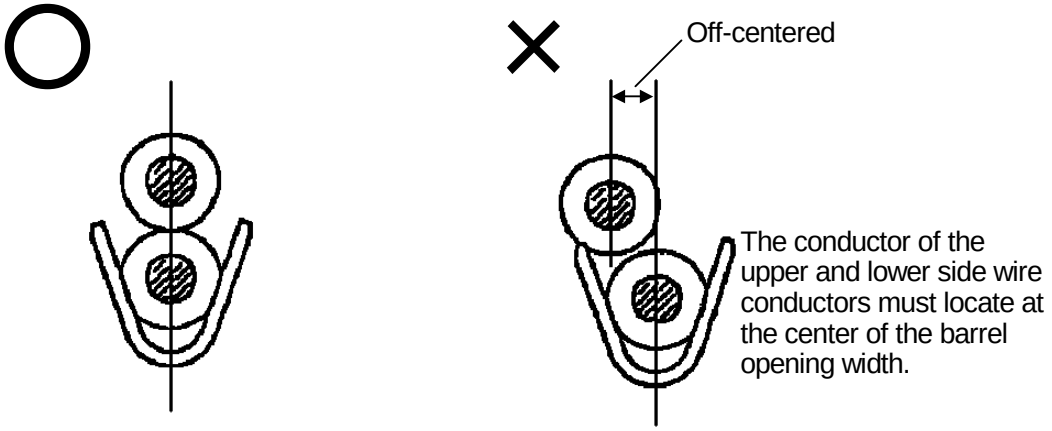
(1) How to set wire into barrel

① Put one wire on the top of the other one as below in crimping.

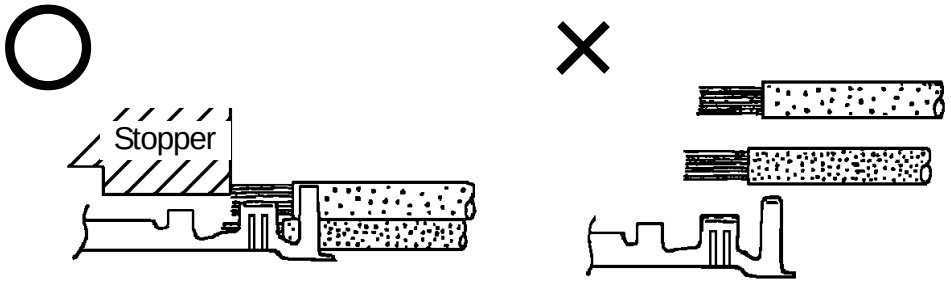


(2) Precautions for crimping

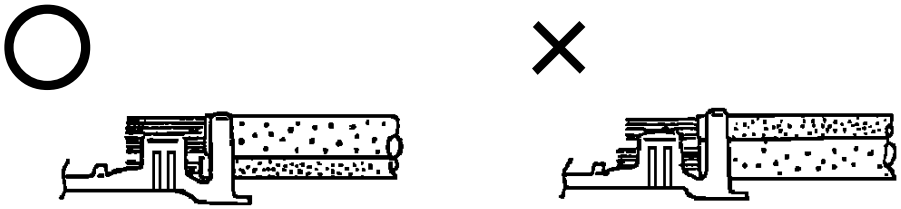
① Put the 2 wires straightly without separating each other.



② Insert the conductor of the lower side wire into wire barrel and touch the tip of the upper side wire conductor to the conductor stopper of applicator.



③ In the case that wire size is different, put the smaller size one to lower side.



④ When conductors are loosen, straighten and twist a little with fingertips.

7-2-4 Precautions for crimping operation

1) Conduct crimping operation properly and inspect the crimping appearance of the crimped product with loupe, etc.

2) Do not conduct empty crimping and crimping twice, because they may cause an outstanding burr at the crimped part and may lead to the abrasion of the crimping die quickly.

3) As cutting residues (powder), etc. adhered to the crimping die part affects the life of the dies, clean the crimping part occasionally and conduct appropriate crimping.

4) As the abrasion of the crimping die and insufficient adjustment of the applicator may cause defective crimping appearance, do not fail to conduct daily inspection.

7-3 Precautions for storage and handling of crimped contact

As the crimped contact before inserting into the housing is subject to deformation, etc. by external forces, pay careful attention to the following 3 points for storage and handling:

1) Protect the contacts by wrapping with thick paper to prevent from the deformation of the mating part and the adhesion of foreign substances, and keep them in an adequate box.

2) Do not stack too much quantity of the crimped contacts nor place anything on them, because the weight of themselves may cause the deformation of the contact and troubles such as defective contacting.

3) When the crimped contact is taken out of the bundle, do not pull wires but hold near the crimped section to take the contact out.

8. Harness Assembly Operation

Harness assembly operation is a very important process to decide the connector performance and the harness quality. Careful operation is required for harness assembly as well as the said crimping operation.

Do not use the improperly crimped contact and the deformed one.

8-1 Precautions before inserting crimped contact into housing

Before inserting the contact into the housing, check the below points:

1) Do not place other things on or near working table and do not conduct any other works on the same working table to prevent from operation mistake.

2) Rough handling of the crimped contacts at bundling may cause the deformation.

3) When the bundled harnesses are loosened, do not pull the crimped contacts by force even if they get entangled.

8-2 Inserting crimped contact into housing

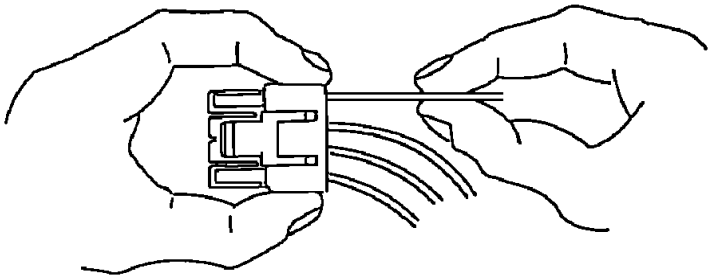
① Hold contact and housing and do insertion operation in parallel with the mating axis as shown below.

- Precautions for inserting contact
  Do not lean contact toward the direction that the lance is pushed or insert contact prying up and down or right and left, because such handling may deform contact lance and mating part.

② Insert contact into housing without stopping to innermost.
When contact is fully inserted into housing, housing lance clicks and there is feeling of response.

8-3 Check after inserting the crimped contact into the housing

Check secure locking per each insertion by pulling wire softly with a force of approx. 10N.



There is a backlash: Good
Contact is pulled out: Defect

Note$_7$: When wire is pulled with too much force, contact lance may be deformed and contact may come off housing.

9. Inspection of Finished Product (Continuity Check)

1) Wiring inspection using an inspection jig

- Use the header applicable to the housing for inspection.
  Do not remove the housing wall of the header. If removed, the contact may be pried easily during the inspection and defective contacting may be caused.
- Use the header free from deformation, damage and stains.
  When they are found, replace with a new one..
  Replace the testing connector periodically for conductivity inspection.
- Carefully conduct mating and unmating connector, holding the housing not to ply..
  When an inspection board is used, consider that mating and unmating works are not difficult.

2) Simple wiring inspection using a tester

- Do not insert a tester stick into the mating part, because the mating part may be damaged, depending on the diameter of the tester stick, the prying insertion, etc.

- Contact a tester stick with the wire insulation side of the contact through the contact entrance of the connector housing, and conduct the inspection.

10. Soldering

1) Flux
Use active type flux.
Do not use the flux which may corrode housing.

2) Dip soldering
Conduct soldering operation in temperature range 245°C ~ 260°C and within 5 seconds.

3) Soldering by hand and soldering modification
When soldering by using soldering iron or soldering repair for bridge, etc. are conducted, note the following points, because deterioration of resin is considered.

Solder temperature:	350℃ max.
Soldering time:	Conduct soldering operation quickly within 3 seconds.
Soldering method:	Do not apply external force such as holding header post with tip of soldering iron during soldering operation.

4) Cleaning operation

In normal flux cleaning, header of LC connector is not affected by cleaning solvent. However, when polluted cleaning solvent by flux is left in header, the residual cleaner may cause defective contacting and other troubles.

11. Control Points of Crimping Operation and Harness Assembly

The operations of crimping and assembly affect the reliability of the connector.
It is recommended that the operations of crimping and assembly and the finished products be controlled concentrating upon the following check points:

Process	Check point	Description	Reference
Crimping	Appearance	① Check that model Nos. of the contact and the applicator are adequate for wires to be used. ② Check that wires are crimped at the normal position. ③ Check that the crimped configuration is normal and excessive burrs do not appear. ④ Check that uncrimped wires are not left behind. ⑤ Check that the contact is not bent, deflected or deformed. ⑥ Check that the contact is free from dirt, scratches, stains or discoloration.	Item 7
	Crimp height	The crimp height is proper.	
	Tensile strength	Check that the tensile strength is proper.	
Harness assembly	Appearance	① Check that the contact is properly inserted into the housing. ② Check that the contact is securely locked with the housing. ③ Check that the housing is free from dirt and foreign matters.	Item 8
Finished product (Harness)	Appearance	Follow all descriptions stated above in “Appearance.”	Item 9
	Continuity	Check that harness passes continuity test.	

12. Precautions for use

1) Handle wires with care so as not to apply tension due to wire bending.

2) Do not mate pin and socket contacts without inserting them into housing to prevent from deformation of contacting part of contact.

13. Handling Precautions

1) Do not stain the contact with household goods, such as oils, detergent, seasoning and fruit juice. If stained, never use the stained contact.

2) Do not spray fumy insecticide in the place where the connector and the harness are stored and harness assembly operation is conducted. Such spray may rust the metal part.

3) Fasten the tip of remaining contact reel with wire, string, etc. to the flange of the reel so as not to unravel, and store it in a carton box.
Leaving the connector outside carton box may cause the deformation, discoloration and dust attachment.