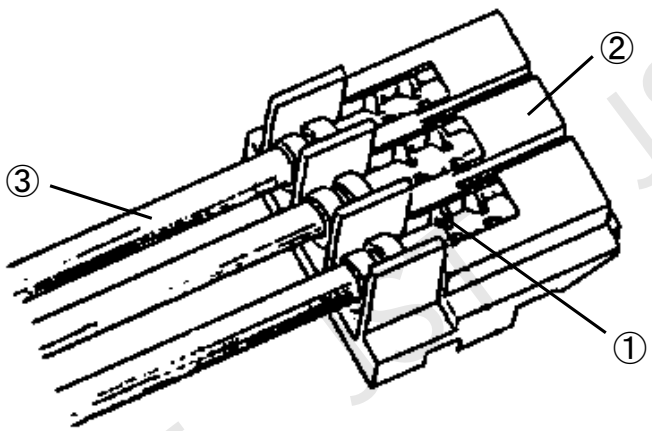
Title of Document: **HANDLING MANUAL**	Issue No. CHM-1-2178	Rev. 2
Customer:	Issue date: April 22, 2002	
Title subject: HR Connector	Revision date: April 17, 2023	

This manual describes points to be noted about harness assembling operation, mounting on PC boards, and the like to enhance the further reliability and exercise the connector feature by using JST's automatic insulation displacement (ID) machine, pneumatic and hand press when using HR connector (insulation displacement type pre-tinplated product)
Make use of this manual together with the one for ID machine main body.

C O N T E N T S

1. Composition and Parts Identification



① Contact
② Housing
③ Wire

Fig.-1

1-1 Contact

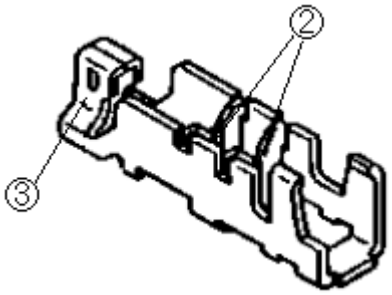


Fig.2

① Beam: Two beams have an individual U slot construction.

② U slot: It cuts wire insulation to contact with wire conductors electrically and mechanically.

③ Contacting part: It contacts with header post.

④ Strain relief: Strain relief retains wire insulation to prevent from that external force loaded on wire affects U slot.

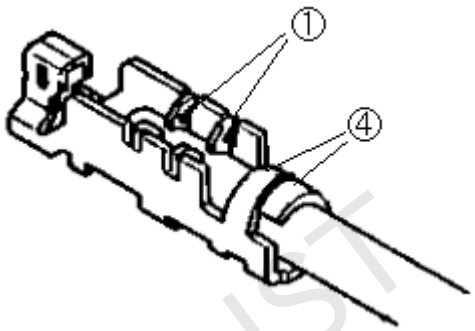


Fig.3

2. Model Number

Connector model number, applicable wire size, marking, color of socket housing

Table 1

Part name		Model number	Applicable wire size	Marking	Housing color (Standard color)
Socket		∗HR-8M-P-N	AWG #28	8	Green
		∗HR-6S-P-N	AWG #26	6	Natural (white)
		∗HR-4K-P-N	AWG #24	4	Black
Header	Loose piece product	B∗B-EH (LF)(SN) S∗B-EH (LF)(SN)	---		
		B∗B-EH-A (LF)(SN) S∗B-EH-A (LF)(SN)	---		
	Radial taping (Radial taping header)	B∗B-EH-TS (LF)(SN) B∗B-EH-TV4 (LF)(SN)	---		

Note$_1$: Figures in "∗" denote the circuit number.
Note$_2$: U slot dimensions of ID connectors vary according to wire size.
Note$_3$: Figures shown in Table 4 are printed on the contact according to wire size so as not to combine an improper wire with the connector (dimensions of twin U slot) by mistake. See fig.4.
Note$_4$: The housing has standard colors applicable to wire size. When you don't specify a color, the color is as Table 1. Check the combination of wires and the connector.

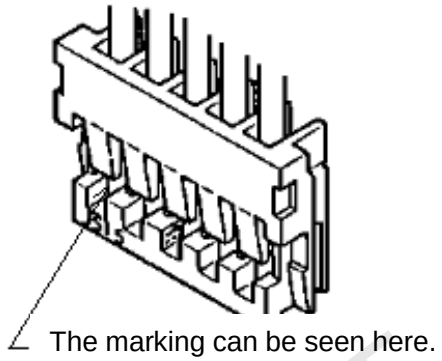


Fig.4

3. Storage

Never spray fumy insecticide in the place where the harnessed product is stored, or harness operation is conducted, because such spray may rust or corrode the metal part.

3-1 Storing the connector

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 Storing the processed products
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

Use the wire we have confirmed the applicability.

4-1 Wire size and wire insulation outer diameter

Table-2

	Wire insulation O. D.
AWG #28 AWG #26 AWG #24	ϕ1.0 ~ ϕ1.5 mm

4-2 UL style:..... Shown in Table-3

Table-3

Wire type	UL style
PVC wire	UL1007, UL1430, UL1095
Lead-free PVC wire	
Halogen-free wire	UL3385, UL3448

Note$_5$: Characteristics of wire insulation differs depending on each wire manufacturer, so that contact JST for checking wires to be used in advance.

4-3 Wire conductor: ..... 7 stranded wires (tin-plated), tin-coated stranded wires

5. Applicable ID Tools

5-1 Hand press and pneumatic press

Table-4

ID tools and model No.	ID applicator model No.
Hand press (Model No.: HPD-M2A)	H2A-HR H2-HR20ED-X
Pneumatic press (Model No.: AP-2and AP-2H)	H2A-HR

Note$_6$: When ID products with other than JST applicable ID tools, we cannot guarantee the connector's performance.

5-2 Automatic ID machine

Contact JST for the model number of automatic ID machines.

Note$_7$: When ID products with other than JST applicable ID tools, we cannot guarantee the connector's performance.

6. PC Board Layout and Assembly Layout

Top entry type

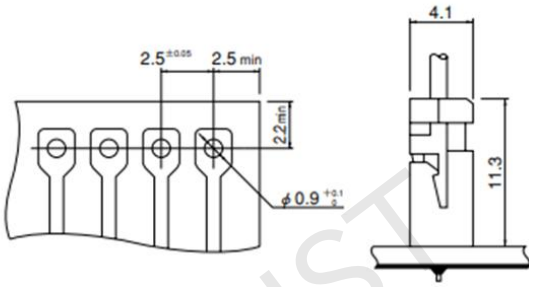


Fig.5

Side entry type

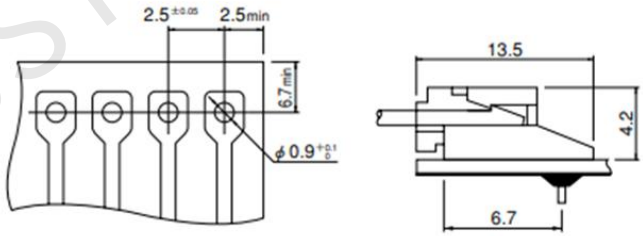


Fig.6

Top entry type on radial tape

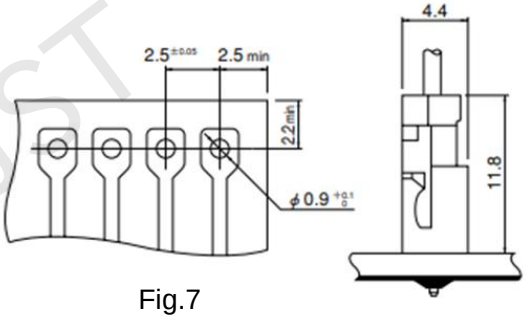


Fig.7

Note8: The above figures show the view from the soldering side.
Tolerances are non-cumulative: ±0.05 mm for all centers
Hole dimensions differ according to the kind of PC boards and piercing method. If the material of PC boards is hard, such as ones with through-holes, set the hole diameter larger.
These dimensions shown above are reference values, so contact JST for the details.

7. Termination Work
Check the following items with care to perform good termination work.

7-1 Check each part of ID machines properly.
Be sure to read the handling manual before the work because there are the ones for each ID machine.

Table 5: Main check points

- **Hand press**
  - ・Check the ratchet works normally.
  - ・Check the connector is set at the proper position.
  - ・Check no wire chips remain on termination punch and the like.
  - ・Conduct periodical cleaning and remove wire cutting residues of wires and connector chips.
- **Pneumatic press**
  - ・Check that connectors are fed to the normal position to be terminated.
  - ・Check that air pressure is normal.
  - ・Conduct periodical cleaning and remove wire cutting residues of wires and connector chips.
- **Automatic ID machine**
  - ・Check operation sequence is normal.
  - ・Check bowl-feeder and straight-chute run normal.
  - ・Check wire tension is appropriate.
  - ・Check Wire measurement is finished to a specified dimension.
  - ・Check that a connector is set to a proper position.
  - ・Check no connectors of different circuit and different size that were used before in bowl feeder and straight feeder.
  - ・Conduct periodical cleaning and remove wire cutting residues of wires and connector chips.

7-2 Termination depth

If a connector is terminated at a proper termination depth, the appearance is as follows.

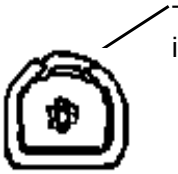


Fig.-8

Wire conditions at terminated part (U slot part)

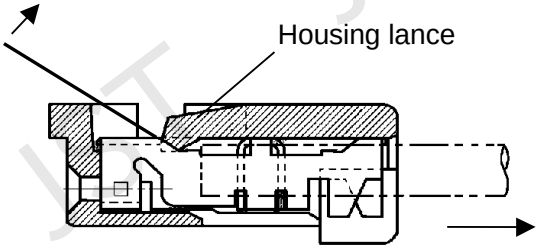
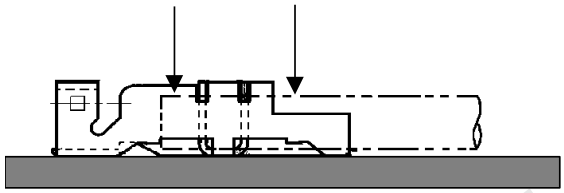


Fig.9



Note: Cut off strain relief before pressing wires.

Fig.10

Lift the housing lance as shown in Fig.9 and pick up the connector contact with terminated wires. Then, carefully take the wires off the contact U slot while holding them as shown in Fig.10.

Check the terminated part of wire at U slot. When termination is conducted properly, wire insulation at terminated part remains as shown in Fig.11

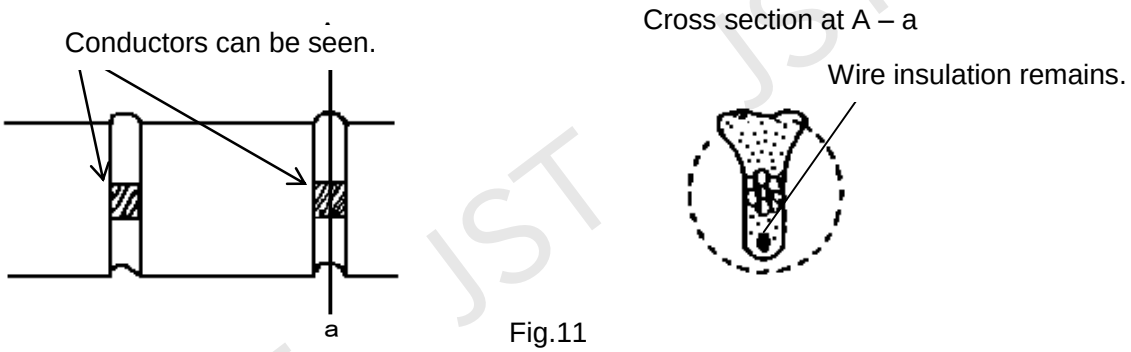


Fig.11

Note$_9$: Conduct observation right after taking wires off the U slots of contact without delay, because it is impossible to judge properly due to elasticity of wire insulation after the lapse of time.

Termination depth dimension (Reference value)

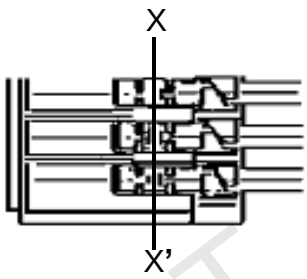


Fig.-12

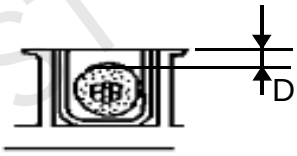


Fig.13

Measure the termination depth dimension “D” in Fig.13 at X-X’ part in Fig.12, where is in the middle part of two U slots and a flattened part pressed by termination punch, and check it satisfies the specified value as Table-6.

Table-6 Termination depth in dimension “D”

Wire size	Wire type
	PVC wire including lead-free wire and halogen-free wire
AWG #28	1.25 + 0.15/-0.05
AWG #26	1.25 + 0.05/-0.15
AWG #24	1.25 + 0.05/-0.15

Note$_{10}$: The termination depth in Table-6 is applied when insulation outer diameter is as follows.

Recommended wire insulation O.D. range: ϕ1.0 mm ~ϕ1.5 mm

The applicable wires shall be limited to ones confirmed by JST. As for wires not being confirmed yet, the termination applicability check is necessary separately.

Refer to the IDC Manual No. TCM-0-002 “Method of Measuring Termination Depth by Dial Depth Gauge” for the measurement of termination depth dimension if necessary.

The termination depth dimension for ID connectors is similar control points to crimp height for crimp type connectors, but it is totally different in principle.
Crimp height for crimp type connectors is one of important control points, because a coefficient of wire conductors greatly fluctuates, having a great impact on electrical and mechanical connection with the connector.
On the other hand, U slot dimensions of ID connectors varies every wire size, and connection between wire conductors and a connector is decided according to U slot dimension.
Therefore, it is good to control where wire conductors are in U slot.
This is the concept of termination depth.

The value of termination depth dimension is a reference value due to the following reason.
The termination depth which is measured at the dimensions between the terminated wire insulation and the housing datum plane is subject to influence by wire hardness and wire outer diameter. Thus, as the value of table 6 differs depending on wires, the value of the termination depth is reference values, not absolute ones.
Exact termination depth is to measure “d” between the bottom of the slot and the position of center core wire of wire conductors as shown in Fig.14; however, it is very troublesome to conduct daily.
Thus, JST specifies termination depth dimension “D” instead of “d” by measuring the conditions of wire conductors in U slot and wire retention force.

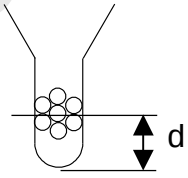


Fig.14

Shallow termination depth……Insufficient termination

When termination is insufficient,
① There is a clearance between wire insulation and strain relief as shown in Fig.15.
② Wire conductors in U slot are hardly seen or not seen at all as shown in Fig.16.

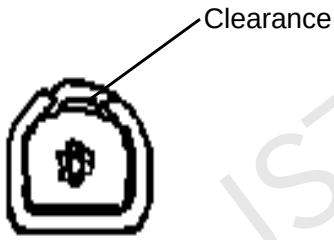


Fig.15

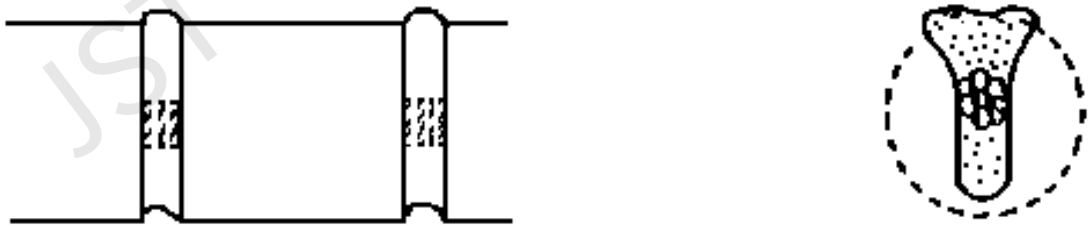


Fig.16

Deep termination depth……Excessive termination

When termination is excessive,
① Wire insulation is cut at the bottom of U slot and wire conductors are seen as shown in Fig.17.
② Punching dents caused by termination punch appear on flange of housing as shown in Fig.18.

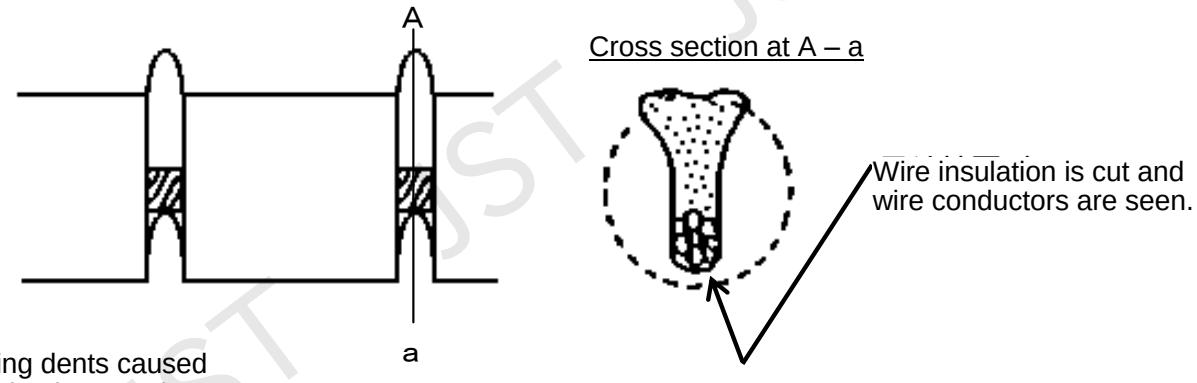
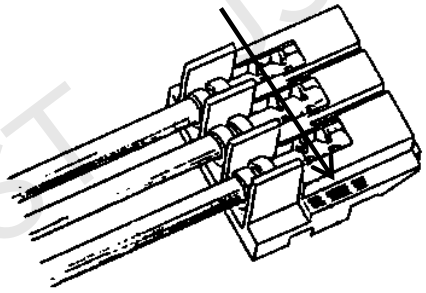


Fig.17

Punching dents caused by termination punch.

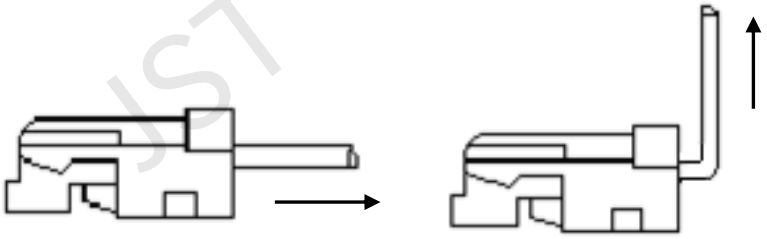


Note$_{11}$: Punching dents are acceptable as far as the state of the aforementioned ① does not appear.

Fig.18

7-3 Wire retention force

Pull a terminated wire one by one in the direction of arrow in Fig.19 and measure the force to separate the wire from the contact by a push-pull gauge. (Wire retention force)
Then, check that the measured wire retention force satisfies the value specified in the following table.
Refer to appendix manual No. TCM-0-005 “Method of Measuring Wire Retention Force” for how to measure the wire retention force.



Parallel direction Perpendicular direction

Fig.19

Table-5: Wire retention force

Wire size	Parallel	Perpendicular
AWG #28	14.7N min.	9.8N min.
AWG #26	19.6N min.	10.8N min.
AWG #24	24.5N min.	11.8N min.

7-4 Termination appearance

Observe the appearance after termination shown below.

Punching dents on housing caused by termination punch……Housing must be free from flaws.
When the connector set position deviates to the pitch direction, scratches and deformation caused by the termination punch may appear at the shaded area of the housing as shown in Fig.20.

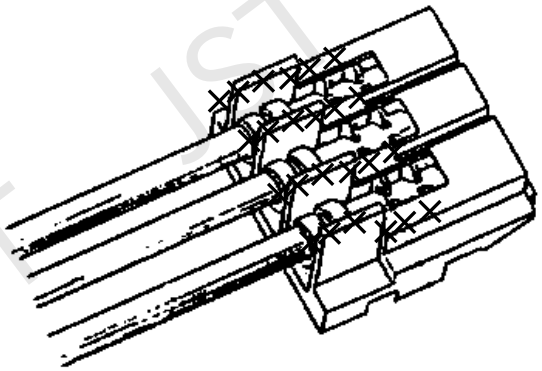


Fig.20

Flaws and deformation at the contact beams……The beams must be free from flaws and deformation.
When the connector set position deviates to the wire axis direction, scratches and deformation caused by the termination punch may appear at the contact beams as shown in Fig.21.
In this case, note that not only the contact but also the termination punch may be damaged.

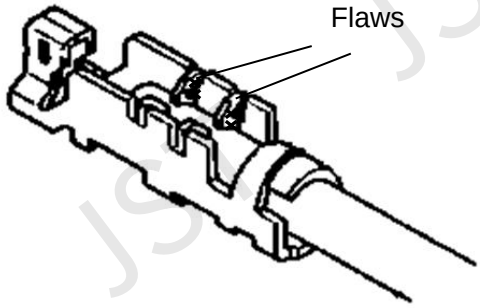


Fig.21

Exposure of wire conductors around beams of contact……Wire conductors must not be exposed.
When conductors must not be exposed in front or back of beams of contact as shown in Fig.22 and Photo-1.
However, exposure of pin hole type wire conductors should be maximum 0.2 mm as shown in Fig.23 and Photo-2.

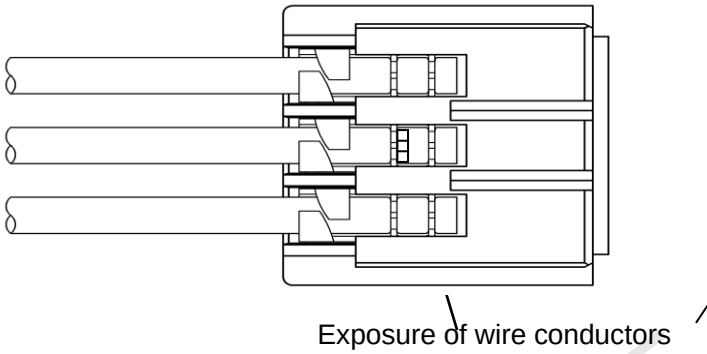


Fig.22

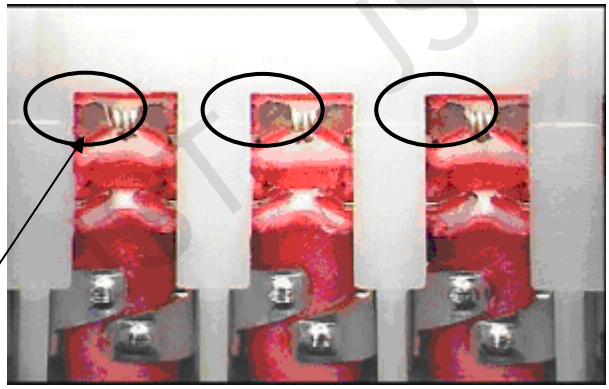


Photo 1

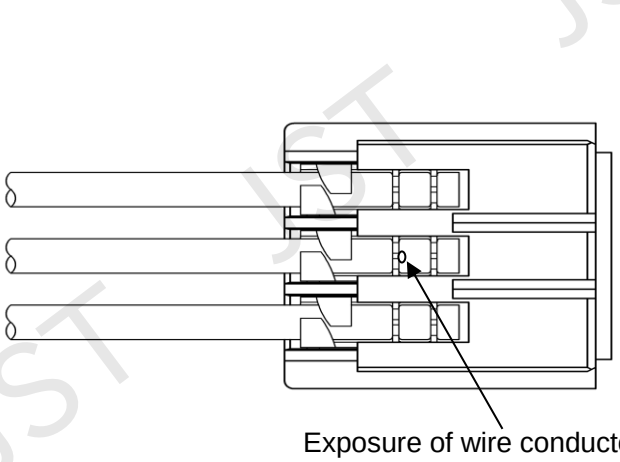


Fig.23

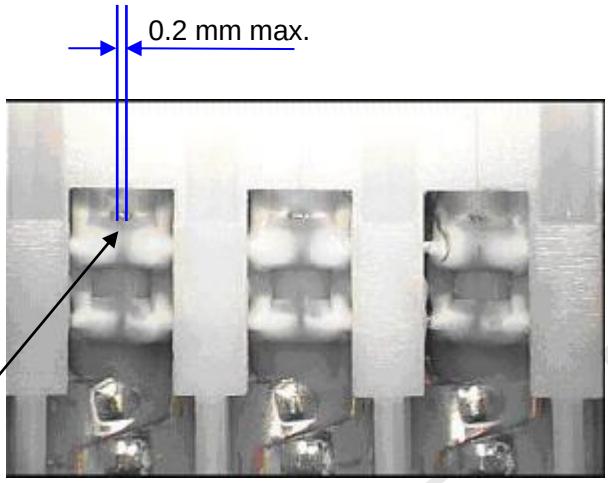


Photo-2

Gap between housing wall and wire tip (Wire protruding length)
Gap “G” between the housing wall and a wire tip in Fig.24 should be 0.3 mm max.

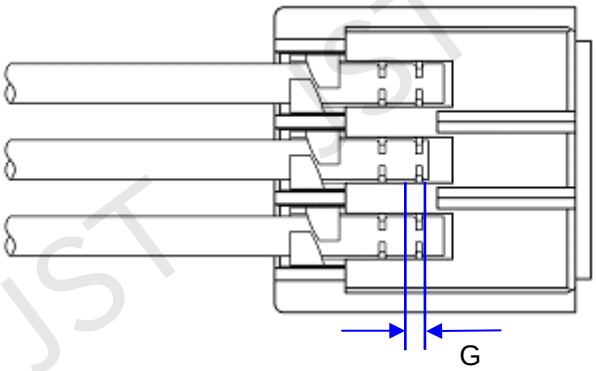


Fig.24

Overrun of wire……Wire must not overrun.
When wire tension is not adequate, overrun of wire may happen as shown in Fig.25.

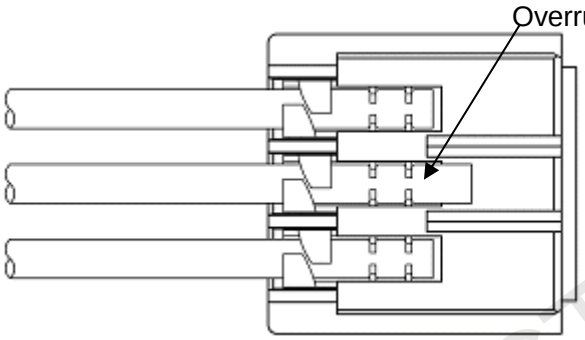


Fig.-25

Deviation of insulation displacement center……Deviation of insulation displacement center must not happen.
When the connector set position or a wire deviates to the pitch direction, termination punch, the wire and U slots do not align, which becomes the deviation state of insulation displacement center as shown in Fig.26.

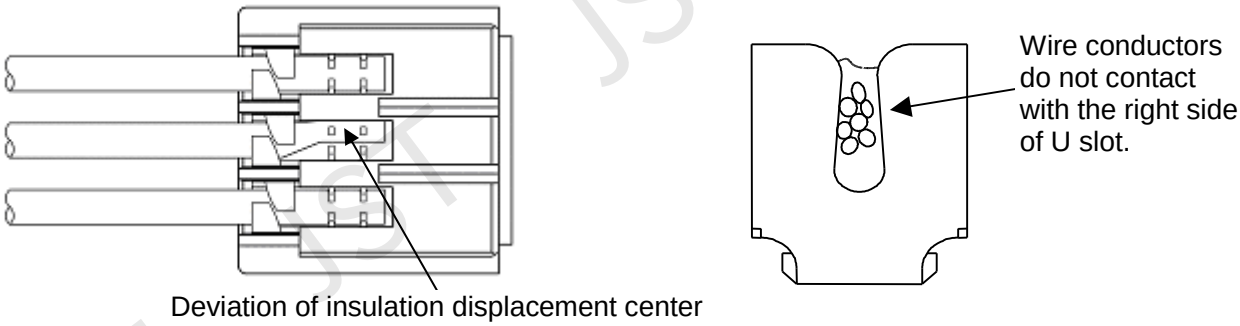


Fig.26

8. Inspection of Harness Products

Inspect the following points.

Table 8

Inspection point		Inspection method	Requirements
(1) • Harness dimensions • Wire strip length		• Verification with drawings • Caliper (or a scale)	• Satisfy drawing dimensions.
(2) Wires to be used • Wire color • Wire size • UL style, etc.		• Verification with drawings • Visual inspection	• Wire colors conform to drawings. • Wire size and UL style conform to drawings.
(3) Termination depth • Wire conditions • Termination depth dimensions		See item 7 Termination Depth.	See item 7 Termination Depth.
(4) Wire retention force		See item 7 Wire Retention Force.	See item 7 Termination Depth.
(5) Termination Appearance	A. Punching dents on housing caused by termination punch.	Observe the appearance of the terminated housing visually or by stereomicroscope. See item 7.	The housing must be free from punching dents caused by termination punch.
	B. Flaws and deformation at beams of contact	Observe terminated contact beams visually or by stereomicroscope. See item 7.	Contact beams must be free from scratches and deformation.
	C. Wire conductors expose around contact beams.	Observe conditions of wire conductors around contact beams visually or by stereomicroscope. See item 7.	• Wire conductors must not be exposed. • Exposure of pin hole type wire condu
	D. Gap between housing wall and wire tip	Measure by a gauge, projector, etc. See item 7.	Gap: 0.3 mm max.
	E. Overrun of wire	Observe the tip of a terminated wire visually or by stereomicroscope. See item 7.	Wires must not overrun.
	F. Deviation of insulation displacement center	Observe the appearance of a terminated wire visually or by stereomicroscope. See item 7.	Deviation of insulation displacement center must not happen.

9. Soldering (Header)

Pay attention to the following points when mounting the connector into a PC board.

① Floating from PC board

The header of the HR connector has a mechanism to prevent it from coming off PC board in insertion. However, when the header floats by an external force or vibration, push the header softly so that the bottom of the header coheres to the PC board surface, and then, solder it.

② Flux

Use rosin type flux.
As inorganic flux may corrode the wafer, do not use it.

③ Dipping soldering

Conduct soldering operation at a temperature range of 245°C - 260°C and within 3 - 5 seconds.

④ Soldering by hand and soldering repair

When soldering by using a soldering iron or soldering repair for bridge are conducted, note the following points, because the header resin may deteriorate due to heating.

Soldering iron:	Use a soldering iron with small heat capacity (40W max.).
Soldering time:	Conduct soldering operation quickly within 3 seconds.
Soldering method:	Do not apply external force by such an operation as pushing the header post with the tip of a soldering iron during soldering operation.

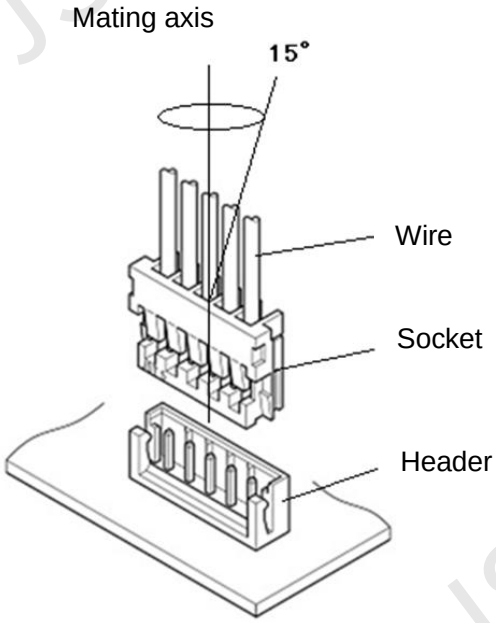
⑤ Cleaning operation

Under normal flux cleaning, the header of HR connector is not subject to cleaning solvent.
However, when polluted cleaning solvent by flux is left in the header, it may cause poor contact and other defect.

10. Handling Precautions

10-1 Mating and unmating work

When the harness product is mated and unmated with the counterpart connector mounted on a PC board, operate it on the mating axis while holding the housing main body.
When it is difficult to hold the housing main body depending on the connector's connection or mounting condition, hold all wires and do the mating and unmating work to apply an even load to wires while supporting the housing main body with your finger.
(Note that the mating and unmating work with a load applied to some wires only may break the connector. Operate it within 15° against the mating axis.)



10-2 Handling of wires

Pay attention to wire handling not to apply an excessive load to some circuits only.

10-3 Packaging of terminated products

① When wire length is long,
Bundle harnesses with a rubber band per unit quantity (example: 50 sets, 100 sets) to prevent them from getting entangled with each other, and put it in a carton box.
(Bundle them with rubber band approx. 30 mm away from connector.)

② When wire length is short,
Package harnesses in a small box per unit quantity and then put small boxes in a carton box.
Harness should be packed in a small box with cushion sheet, etc. to prevent from damage, and so on.

10-4 Others

① Be sure to conduct termination operation under the condition that wires are set in all circuits. When even one wire is not set in termination, the both-sided circuits of the vacant circuit is affected.
If wire-omitted condition is required (pin-omitted condition for crimp type connectors), cut a wire of the relevant circuit after terminating all circuits.
② Do not contaminate the contact with household goods such as oils, detergent, seasoning, fruit juice and insecticide. If contaminated, do not use.