Title of Document:	HANDLING MANUAL	Issue No. CHM-1-2608	Rev. 2
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This handling manual describes points to check for smooth crimping operation of BNI connector.

C O N T E N T S

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1. Part Name and Model Number

Part name			Model number
Socket	Housing	Single row type	BNIRP-∗∗V-( )$_2$-( )$_1$
		Double row type	BNIRP-∗∗V-W-( )$_2$-( )$_1$
	Contact		SBNI-01T-P0.5
Header	Single row type		BM∗∗B-BNI( )$_1$K-( )$_2$-( )$_3$
	Double row type		BM∗∗B-BNI( )$_1$K-( )$_2$-( )$_3$W
Retainer			BNIS-∗∗V

Note$_1$: 2-digit figures in "∗∗" denote the circuit number.
A letter in ( )$_1$ denotes the color.
A letter in ( )$_2$ denotes the polarized key pattern.
A figure in ( )$_3$ denotes the presence of boss. (Nil: With no boss,1: With boss)

2. Storage

2-1 Storing the connectors

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) and dusty place.

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 the products in the original package to store.

2-2 Storing 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.

3. Applicable Wire

3-1 Applicable wire

Model No.	Wire size	Conductor spec.	Insulation outer dia.
SBNI-01T-P0.5	AWG #24 ~ #20	Annealed copper stranded wire with tin plating	ϕ1.3 ~ ϕ2.5 mm

3-2 Precautions

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

4. Crimping Tool

Part name	Applicable crimping tool model number			
	Press	Applicator	Dies	Applicator with dies
SBNI-01T-P0.5	AP-K2( )	MKS-L	MK/ SBNI-01-05	APLMK SBNI01-05

Note$_2$: When crimping operation is conducted by using other than the above applicator and die set, JST cannot guarantee the performance of the connector.

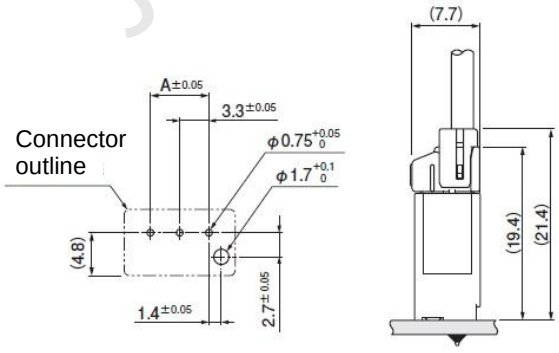
5. Applicable PC Board

5-1 Applicable PC board thickness

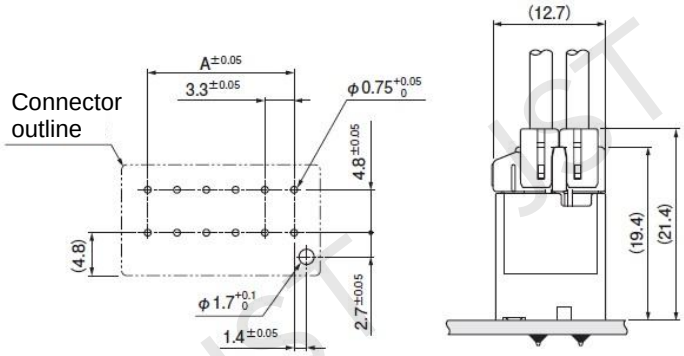
Applicable PC board thickness: 1.6 mm
(We recommend using PC boards with double-sided through-hole in potting.)

5-2 PC board layout and assembly layout

Single row type



Double row type



Single row type		Double row type	
Circuit No.	A (mm)	Circuit No.	A (mm)
2	-	4	-
3	6.6	6	6.6
-	-	8	9.9
-	-	10	13.2
6	16.5	12	16.5

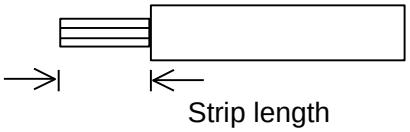
Note$_3$: Tolerances for PC board hole pitch are ±0.05 mm non-cumulative.
The above PC board hole size is a reference value for using glass-base epoxy resin with drilling holes. When taking consideration is sometimes necessary, depending on PC board material, holing way, and the like, set the dimension according to the usage condition.

6. Crimping Operation

6-1 Wire strip length

Referring to the reference value of the wire strip length stated below, conduct wire stripping.
As the wire strip length differs depending on wire type and crimping method, decide the best wire strip length considering the processing condition. When a wire is stripped, do not damage or cut off wire conductors.

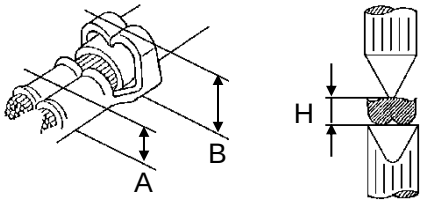
Reference value of wire strip length: Approx. 2.8 mm



6-2 Crimping

Before crimping operation, be sure to check the combination of the contact, a wire to be used and the crimping die are correct.
Check the below points for correct crimping at the beginning and the middle of crimping operation.

① Measurement of crimp height
According to a wire to be used, adjust the dials of the applicator to a proper crimp height.

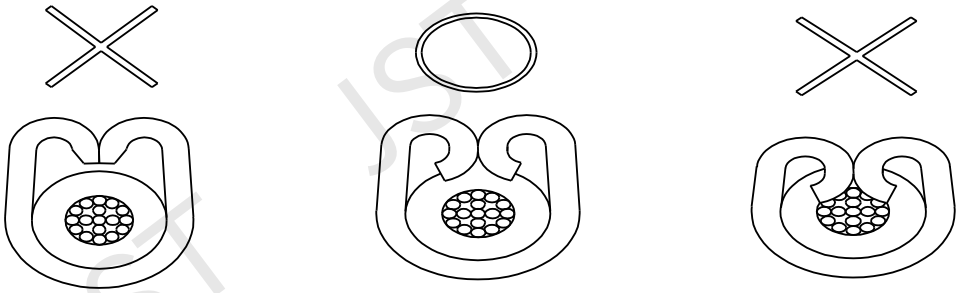


A: The crimp height at the wire barrel should be set to the pre-determined dimensions.

B: Adjust the crimp height at the wire insulation barrel to the extent that the wire insulation is slightly pressed, and set it so that crimping is not excessively.

H: Measure the crimp height at the center of the barrel using a specified micrometer.

② Crimping condition at insulation barrel



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 a wire too much and may damage the wire conductors.

③ Checks of crimping condition at insulation barrel

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

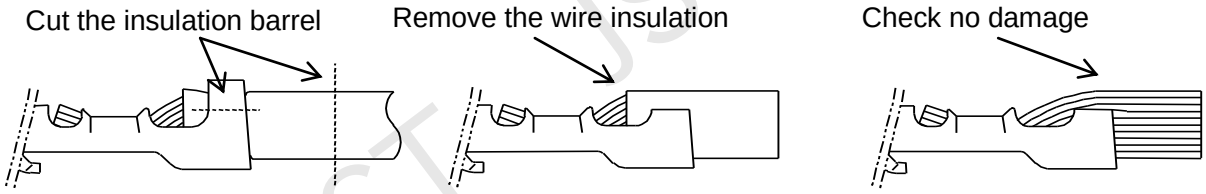


Table of crimp height

Contact	Wire		Crimp height (mm)	
	Type	Size	Conductor part	Insulation part
SBNI-01T-P0.5	UL1007	AWG #24	0.80 ± 0.05	2.4
	UL1007	AWG #22	0.85 ± 0.05	2.4
	UL1007	AWG #20	0.95 ± 0.05	2.5

Note$_4$: The crimp height at the insulation part shown in the above table is a reference value because the crimping condition varies depending on wire outer diameter and material. Set the crimp height at the insulation part in crimping in line with the confirmation method shown above.

Note$_5$: When you use the retainer, crimp the contact by setting the crimp height of the insulation part to 2.4 mm or more.

6-2-1 Tensile strength at crimped part

After adjusting the crimp height, check the tensile strength using the test samples, and then, start continuous crimping operation. In case 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.

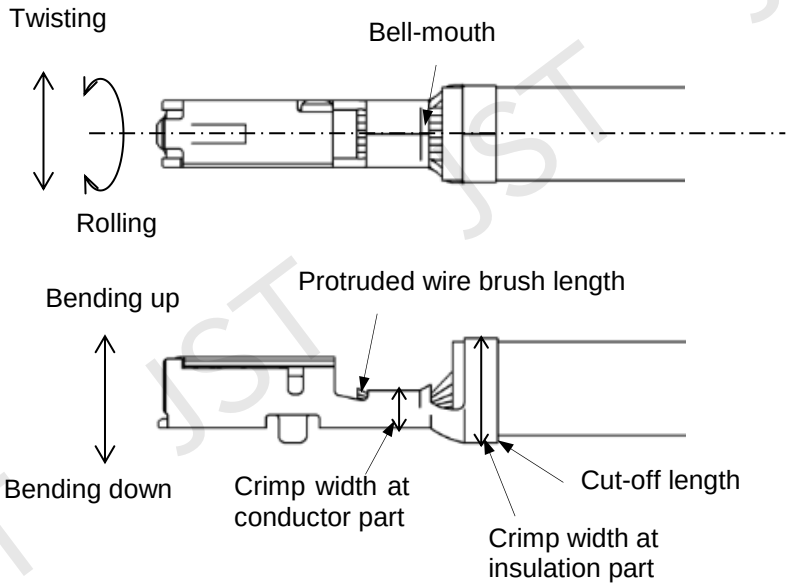
Unit: N

Contact	Wire		Tensile strength (actual value)			Requirement
	Type	Size	Ave.	Max.	Min.	
SBNI-01T-P0.5	UL1007	AWG #24	49.0	53.7	44.7	30 min.
	UL1007	AWG #22	82.2	85.3	79.0	40 min.
	UL1007	AWG #20	124	128	119	65 min.

6-2-2 Crimping appearance

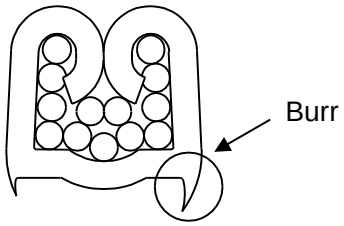
Check the crimping appearance visually with equipment such as a loupe to make sure of proper crimping.

Bending up and rolling

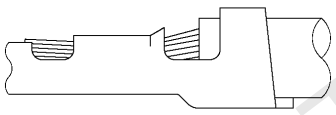


Item	Reference value
Bending up	4° max.
Bending down	5° max.
Twisting	3° max.
Rolling	5° max.
Bell-mouth	0.1 - 0.4 mm
Cut-off length	0 – 0.3 mm
Protruded wire brush length	0.4 – 0.9 mm
Crimp width at conductor part	approx. 1.6 mm
Crimp width at insulation part	approx. 2.7 mm

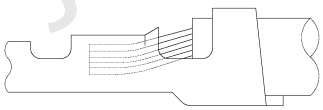
There must not be large burr or one-sided burr.



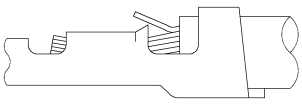
Examples of defective crimping



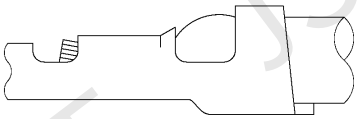
Long protruded wire brush



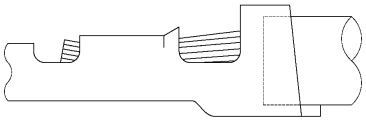
Short protruded wire brush



Stray wire conductor

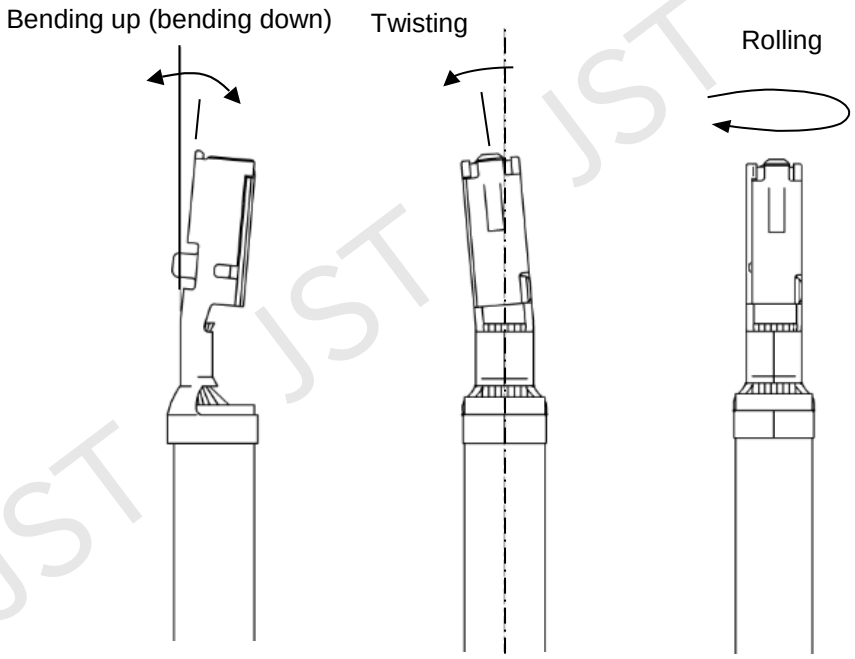


Wire barrel bitten wire insulation.



Poor crimping on wire insulation

Bending up, bending down, twisting and rolling



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 as well as poor crimping.

6-2-3 Precautions for crimping operation

① Conduct crimping operation properly and inspect the crimping appearance of the crimped product with loupe, etc.
Note$_6$: If conductors are not crimped at the center in barrel, the contact may twist slightly.

② Do not crimp with no contact and twice, because they may cause outstanding burrs at the crimped part and may lead to abrasion of the crimping die quickly.

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

④ When chips or excessive roughness are observed on the crimping die, replace it without delay.

⑤ As abrasion of the crimping die and insufficient adjustment of the applicator may cause defective crimping appearance, do not fail to conduct daily inspection.

6-2-4 Precautions for the handling of the crimped contact

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

① Pay attention not to deform the crimped contact or adhere foreign substances on it.
When bundling, limit the number of the quantities not to deform and protect the contact part.
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 other defects.

7. 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 the harness assembly as well as the said crimping operation.

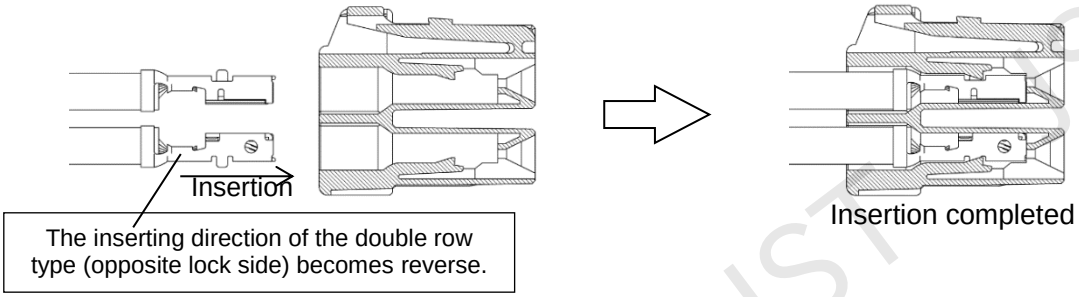
7-1 Before inserting the crimped contact into the housing

① Do not place other things on or near working table, or conduct any other works on the same working table to prevent from operation mistakes.

② Do not use the improperly crimped or deformed contact (including the contact lance, the mating part, and the like).

7-2 Inserting the crimped contact into the housing

① Insert the crimped contact in a straight in the insertion hole of the housing.
(Do not conduct prying insertion and diagonal insertion.)
② Do not use such a pin as an insertion jig, because the tip of the pin accidentally reaches the contact mating part, which may cause poor contact and contact deformation.
③ Insert the contact into the housing without stopping up to the backmost.
When the contact is fully inserted into the housing, the contact lance clicks and you can feel the fit.



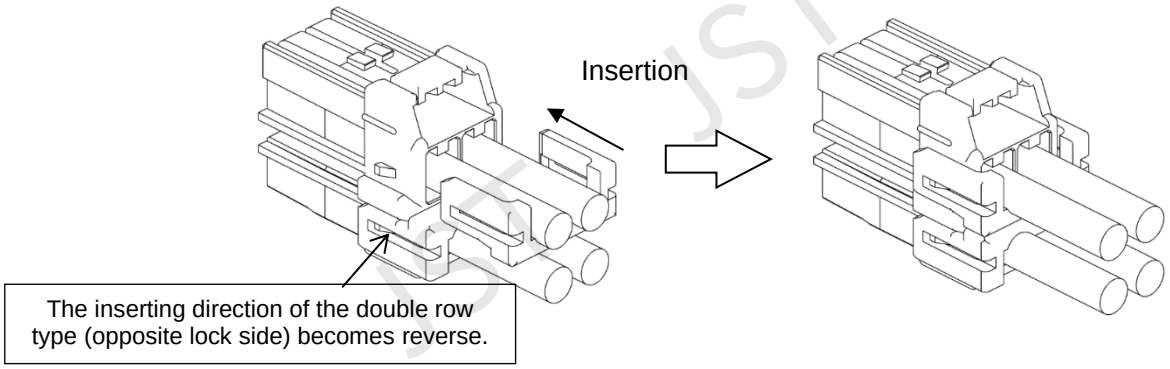
④ Neither lean the contact toward the direction that the contact lance is pressed nor insert the contact prying up and down or right and left, because the contact lance and the mating part may be deformed.

⑤ Check secure locking per each insertion by pulling a wire softly with force of approx. 5N in order to check that the contact does not come off the housing. Besides, check that there is the backlash in the direction of the insertion axis.
(When a wire is pulled with too much force, the contact lance may be deformed, and the contact may come off the housing.)

7-3 Inserting the retainer

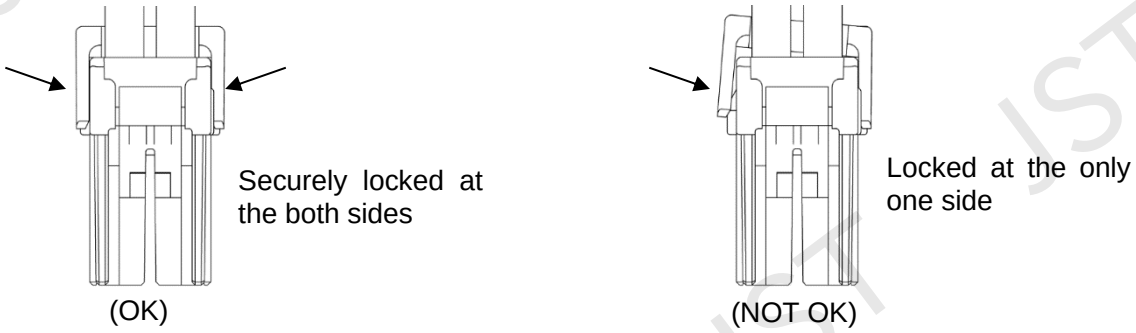
① Insert the retainer after all contacts are completely inserted into all circuits of the housing.
Do not use the retainer for inserting the contact in the housing because the retainer is not the insertion jig.

② Turn the comb part of the retainer to the direction shown in the figure below and insert the retainer without stopping until locking. When locked, there is a click.



③ Parallel the housing and the retainer so that the both sides are locked at the same time and insert the retainer without stopping by pushing the both ends.

④ Visually check that the retainer is securely locked at the both sides.



8. How to Extract Crimped Contact (Retainer) from Housing in Case of Mis-Insertion

When the contact is inserted into an improper circuit hole, conduct the following points:

8-1 Extracting the contact (retainer)

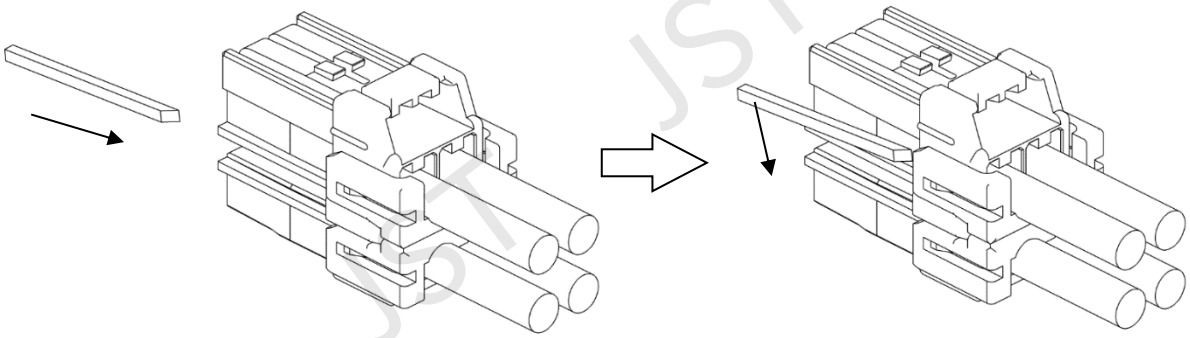
① Do not reuse the housing, the retainer and the contact that have been used once but use new ones.

② When the improperly inserted contact is extracted from the housing and reused due to an inevitable reason:
(The extraction methods of the contact and the retainer from the housing are as below.)

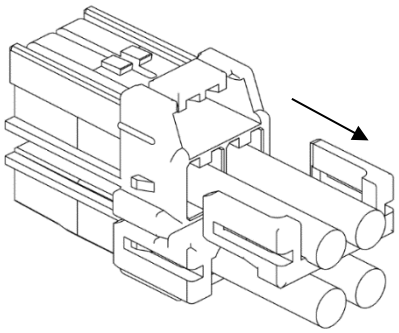
- Only a specified person conducts the operation.
- In case that the contact is reused, the reuse should be once. From twice, use the new contact. (If an abnormality is found on them, replace them with the new ones at once.) Never reuse the housing and the retainer.
- After the repair completes, be sure to check the inserted contact.

8-2 Extracting the retainer

① Insert a sharp-pointed tool such as a jig in the retainer lock part and raise the retainer lock to unlock.

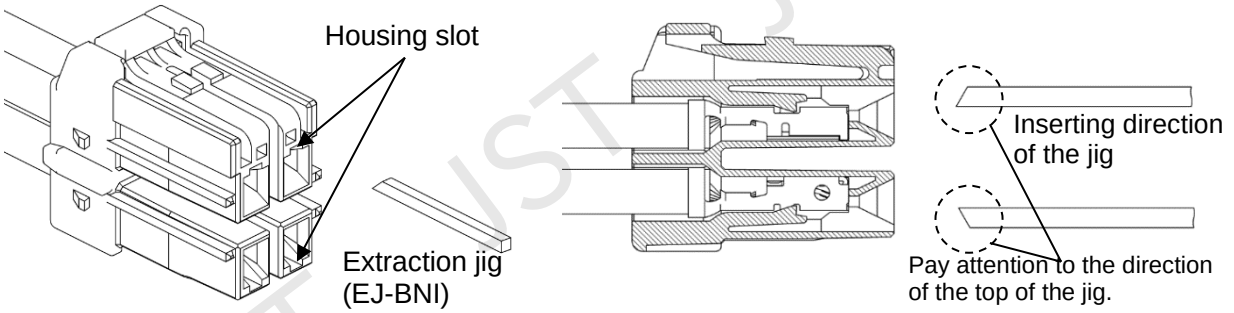


② After releasing the retainer lock, pull out the retainer to remove.



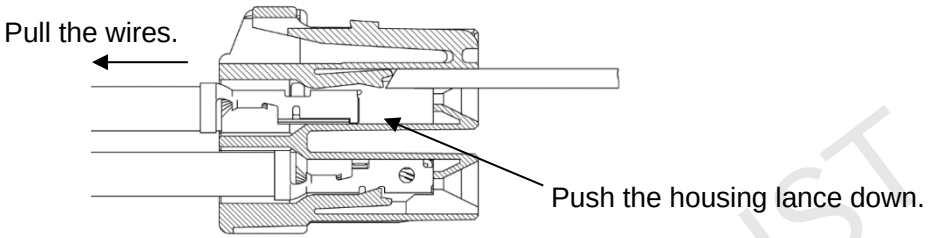
8-3 How to extract the crimped contact from the housing

① Using the contact extraction jig (model No. EJ-BNI), insert the top in the housing slot.
The inserting direction of the double row type (opposite lock side) becomes reverse.



NOTE: The inserting direction of the double row type (opposite lock side) becomes reverse.

② Pull the wires with pushing the housing lance down by using a jig, and the contact can be extracted from the housing.



9. Inspection of Finished Product

Use the header of the BNI connector for electrical continuity inspection of the connector assembly.
Never use such different types of pins as tester pins, because the contact part may be deformed.

- Use the header free from deformation, damage and stains. When they are found, replace with a new one at once. Periodical replacement of the header should be conducted as well.
- Mate and unmate the connector with care, holding the housing so as not to pry.
  When an inspection board is used, design it considering that the mating and unmating work is not difficult.

10. Header

① Floating from PC board
The header of the BNI connector has its coming-off prevention mechanism in inserting it into PC board. However, when the header floats due to an external force, vibration, and the like, push the header softly before soldering so that the bottom of the header fits on the PC board surface, and then, solder the connector.

② Flux
Use rosin type flux.
As inorganic flux may corrode the connector, do not use it.

③ Dip soldering
Do soldering at the temperature range of 245°C ~ 260°C within 5 seconds.

④ Cleaning operation
In normal flux cleaning, the cleaning solvent does not affect the header of the BNI connector.
However, when polluted cleaning solvent by flux stays on the header, note that poor contact and other defects may be caused.

11. Check 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
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 burr does 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.
	Crimp height	① Check that the crimp height is adequate.
	Tensile strength	① Check that the crimp height and the tensile strength are adequate.
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, scratches, stains or discoloration.
Finished product (Harness)	Appearance	① Follow all descriptions stated above in “Appearance.”
	Continuity	① Check that the harness passes continuity test.

Note$_7$: We recommend using a microscope or loupe at the appearance inspection.

12. Handling Precautions

12-1 Mating the connector

Hold the socket housing securely and insert it into the header straight against to the header post until clicking (you feel a click).
Check secure locking per each insertion by pulling a wire softly with a force of approx. 5N in order to check that the contact does not come off the housing.
This BNI connector has an inertia lock mechanism for improving the mating operation, but the mechanism doesn't assure the prevention for short mating.

12-2 Unmating the connector

While pushing the lock-releasing part of the socket housing, hold all the wires together and unmate the connector in a straight on the mating axis with being unlocked completely. (Do not unmate the connector by force without unlocking completely, because the connector may break and cause malfunction.)

12-3 Prying the connector

Do not pry in and out the connector because the header post may be deformed or the connector may be damaged.

12-4 Wire handling

As the BNI connector is secure locking type connector, the breakage of the connector itself such as the soldering part and the lock part, and the breakage of the PC board may occur due to the handling direction of the harness after mating the connector or tensile strength.
In order to prevent such troubles and to bring out fully the connector performance, here are the things you keep in handling the wire harness:

- Do not always apply any external force to the connector other than tension or load generated in normal wire harness operation.
- Provide moderate slack for a wire to make the mating and unmating of the connector easy, and conduct the operation on the mating axis.
- Such a consideration as enough length and fixing of wires is necessary in handling wires so as not to apply a larger external load than wire bucking level to the connector.
- Do not use the BNI connector at the movable part.
  Fasten wires not to conduct directly the movement and the vibration of the wire to the connector contacting part.

12-5 Others

① Stack the housing and the harness with care during the storage and the transportation because the housing may be deformed and broken.
Do not handle the harness bundle roughly after the assembly, because the housing may be deformed and broken.

② Do not contaminate the contact with household goods such as oils, detergent, seasoning or fruit juice. If contaminated, do not use the contact.

③ Do not mate the socket contacts without inserting them into the housing, because the contacting part may be deformed.

④ Conduct the connector assembly work and the mating work at a room temperature as much as possible.