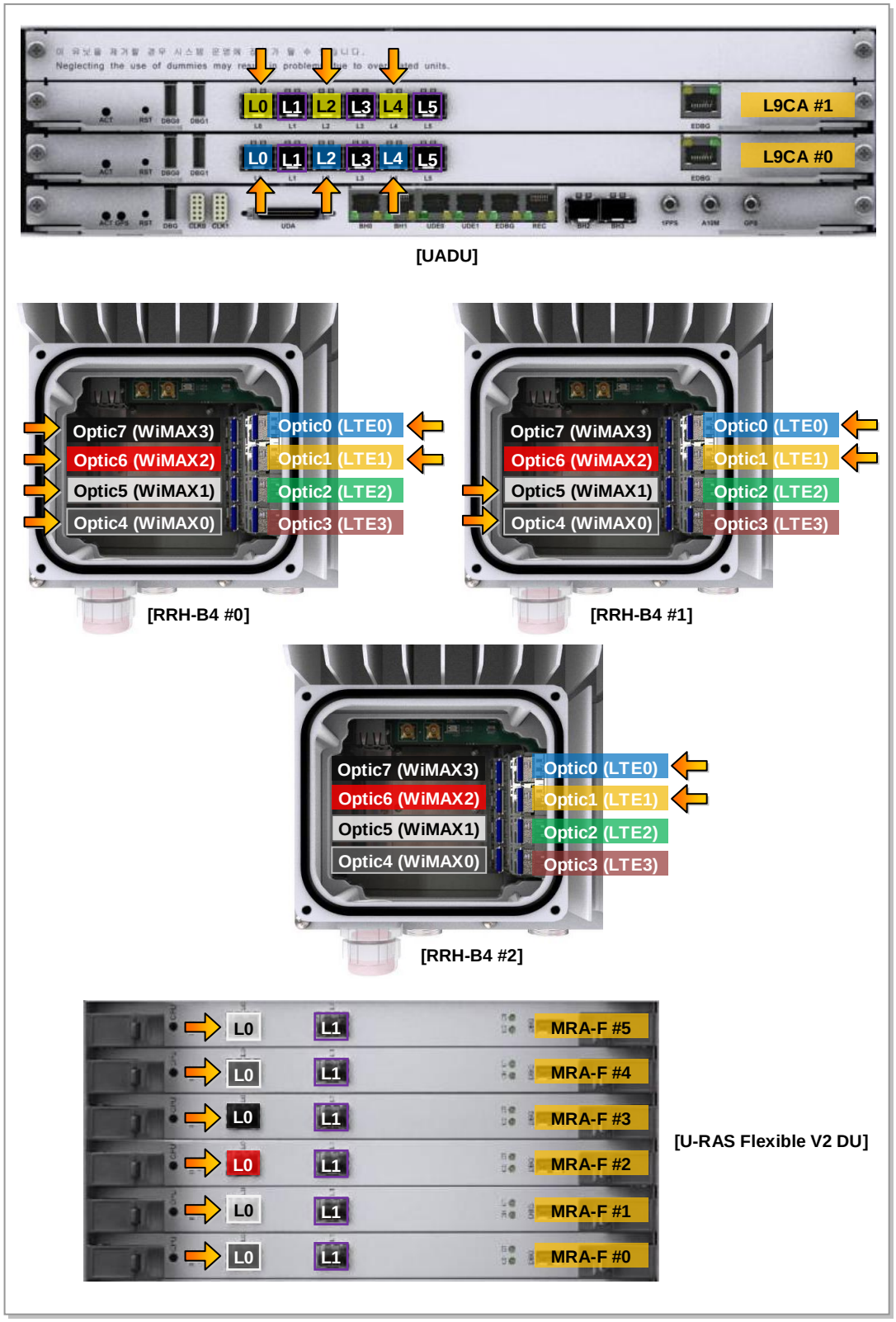


Figure 3.48 CPRI Cable Pin Map (Stacking, Case #3)

1) Install CPRI cables (RRH-B4 interface) between:
   - RRH-B4 and L0, L2, and L4 ports on UADU L9CA #0 and #1
   - RRH-B4 and L0 port on U-RAS Flexible V2 DU MRA-F #0-#5
2) Connect the UADU- and U-RAS Flexible V2 DU-side connectors to the following ports.
   - L0, L2, and L4 ports on UADU L9CA #0 and #1
   - L0 ports on U-RAS Flexible V2 DU MRA-F #0-#5

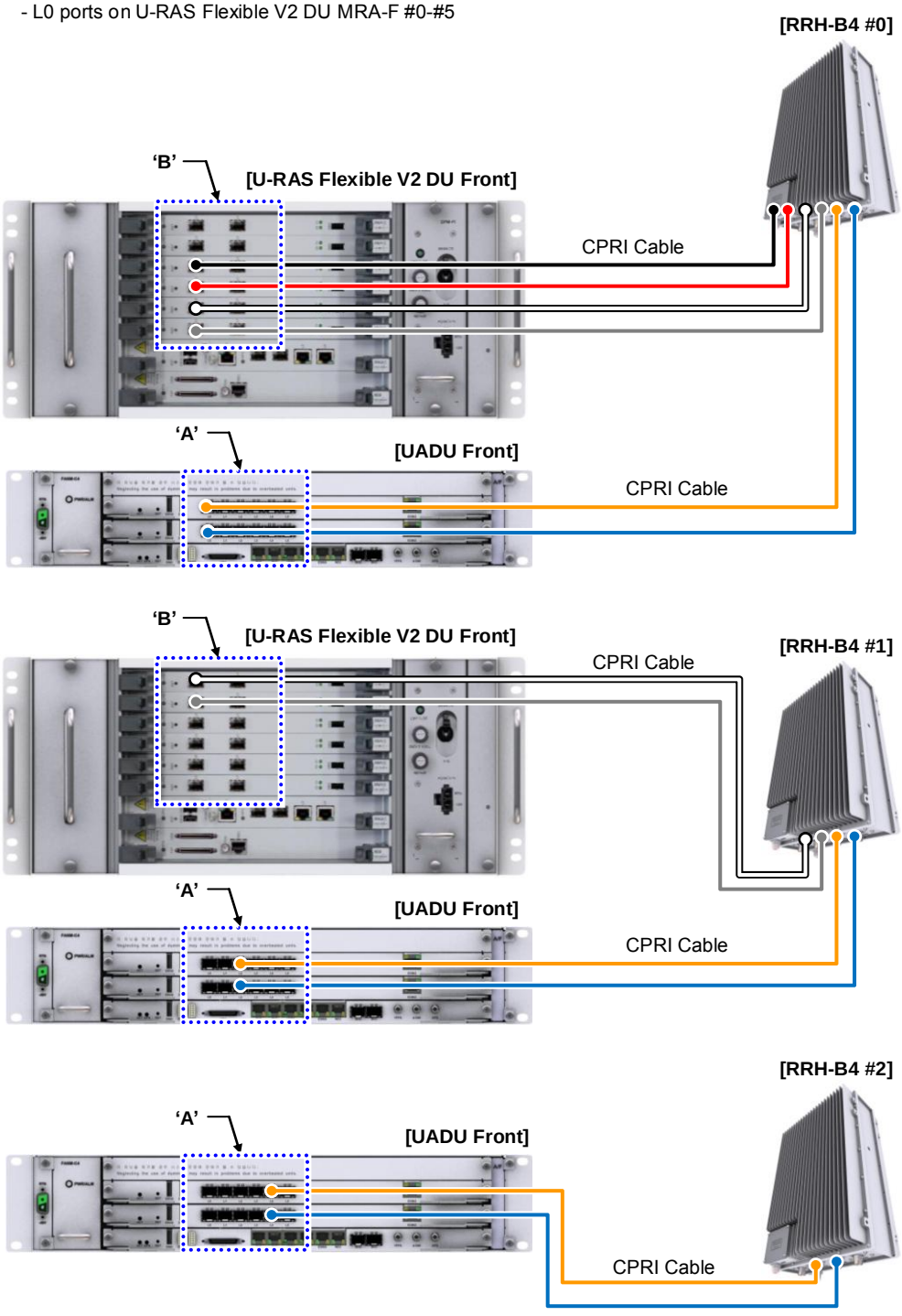


Figure 3.49 CPRI Cable Connection_Stacking, Case #3 (1)

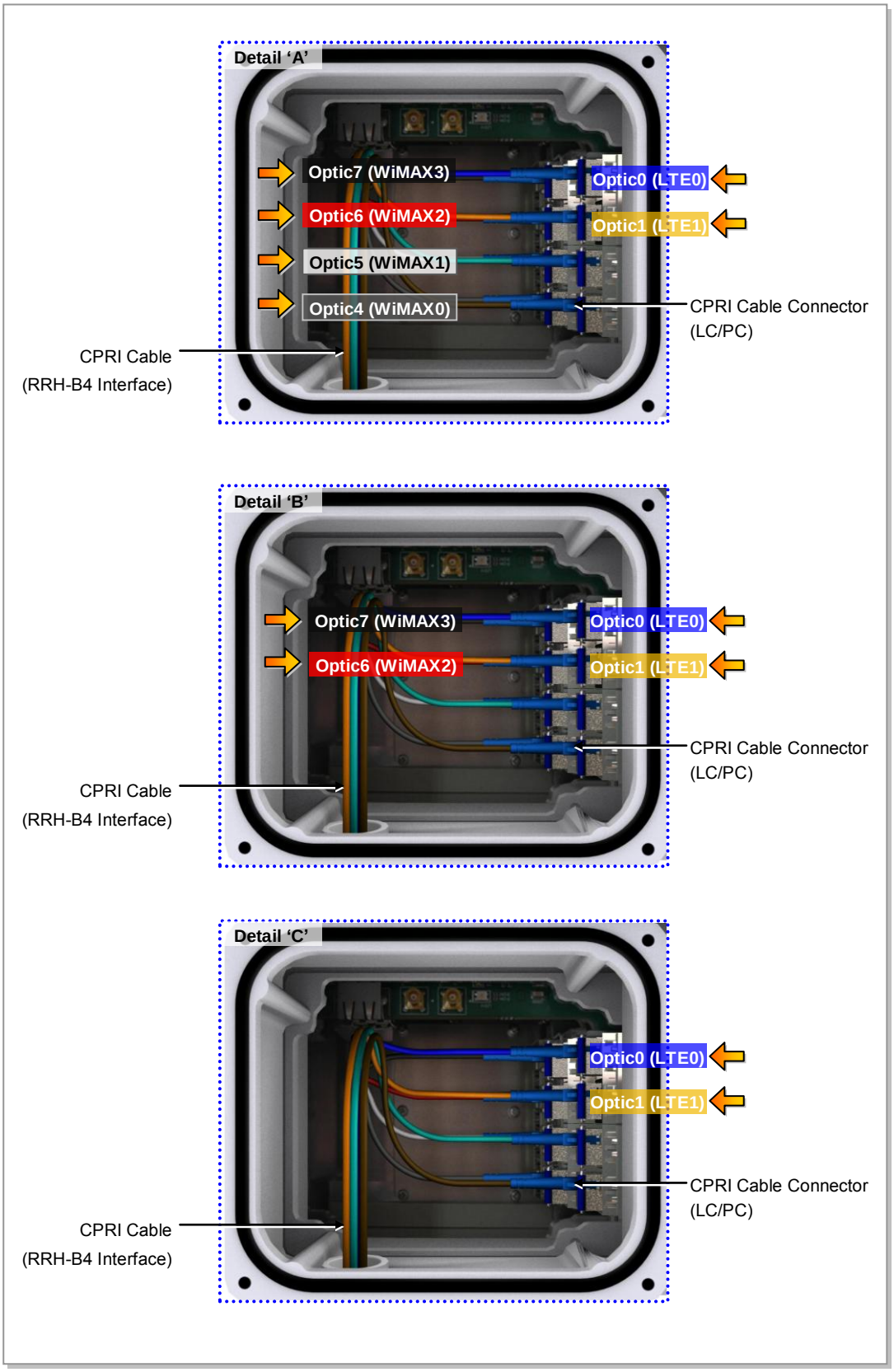


Figure 3.50 CPRI Cable Connection_Stacking, Case# 3 (2)

3.5.2 RET Cable Connection

Follow the steps below to connect the Remote Electrical Tilting (RET) cable to control the antenna tilting angle remotely.

Table 3.15 RET Cable Connection

Classification	Description
Installation Section	RF Antenna~RRH-B4
Cable	RET Cable Ass'y
Connector	RS-485

1) Install a RET cable ass'y from the RF antenna to the RET port of RRH-B4

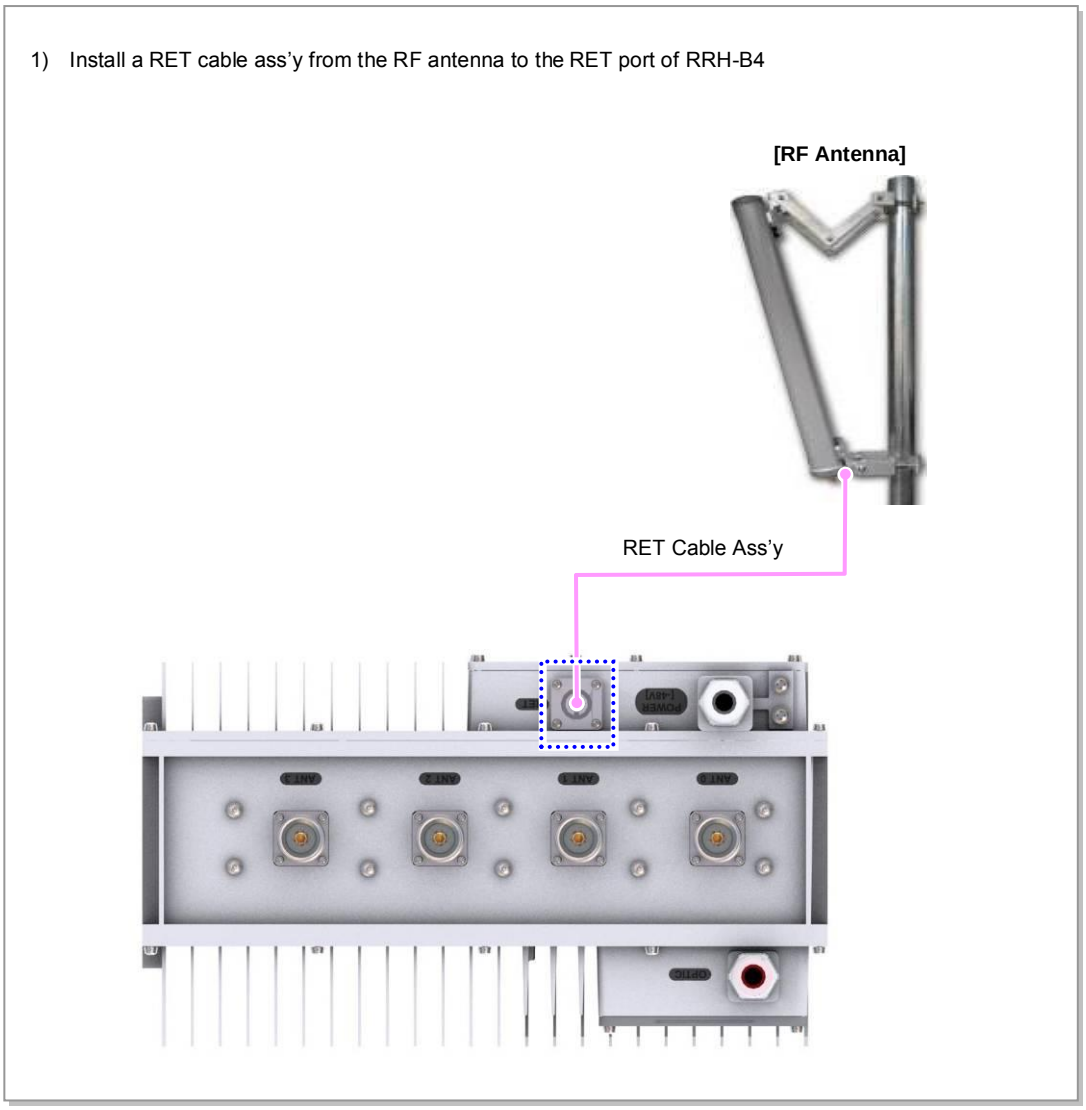


Figure 3.51 RET Cable Connection (1)

2) Connect the RET cable connector to the RET port at the bottom of the RRH-B4

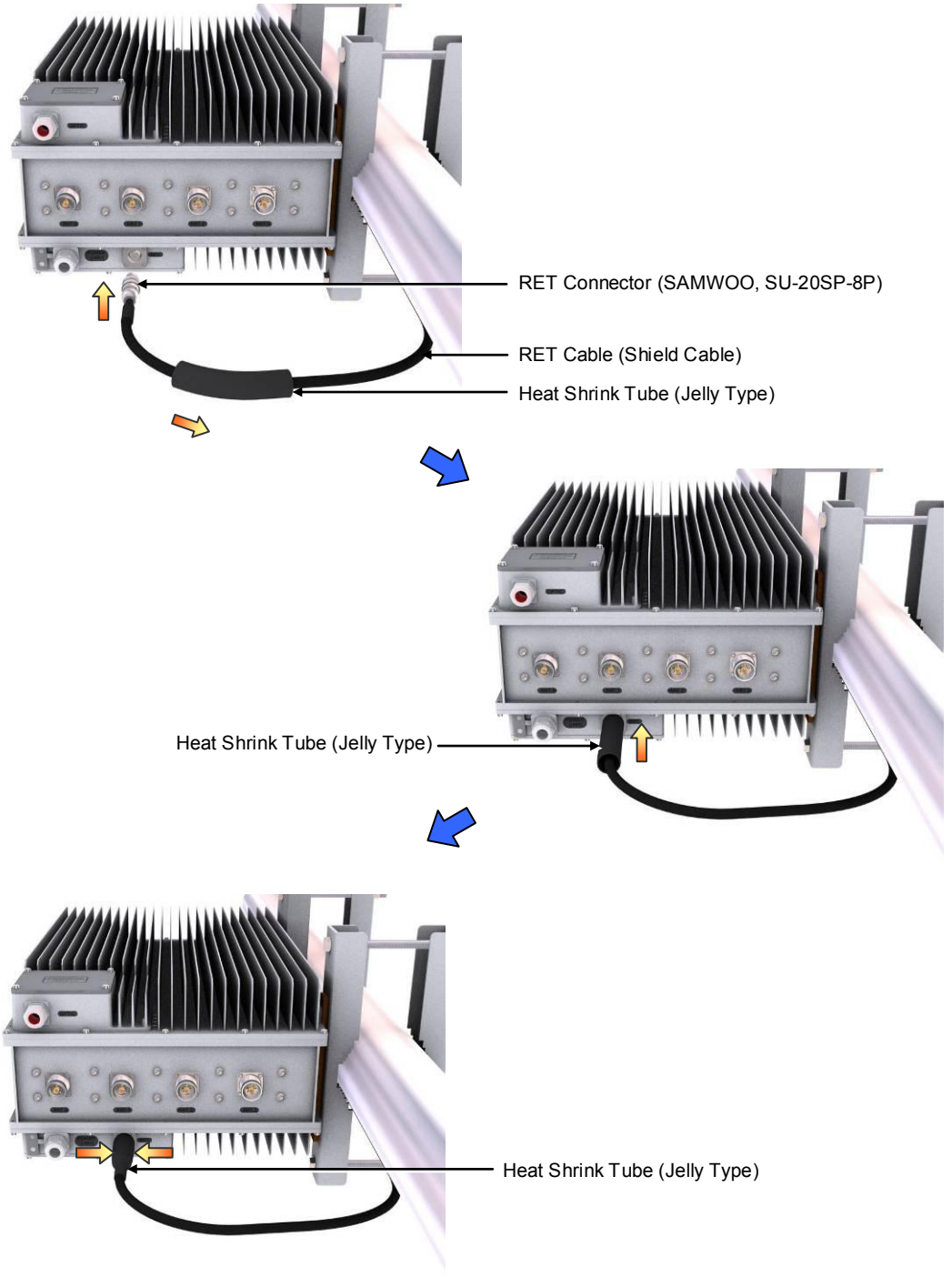


Figure 3.52 RET Cable Connection (2)

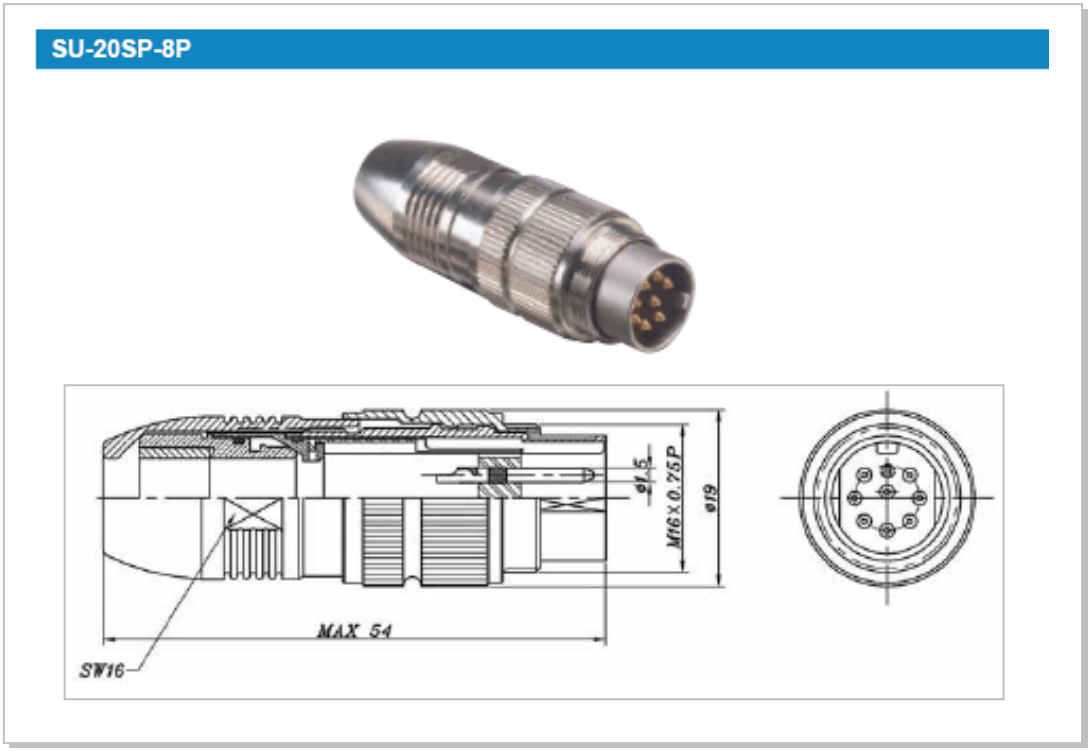


Figure 3.53 RET Cable Connector

Table 3.16 RET Cable Connector Pin Map

RET Connector	Samwoo, SU-20SP-8P	
	Pin	Function
	3	RS485B
	4	DGND
	5	RS485A
	6	+21 V
	7	+21 V RTN
	1, 2, 8	NC

CHECK

RET

- When 21 VDC volts are applied, the current supplied to the RET from RRH-B4 must be 1 A or lower.
- The exterior of the RET connector must be made of metal without vent hole or other UL certified material.

3.5.3 RF Cable Connection

Follow the steps below to connect the RF cable.

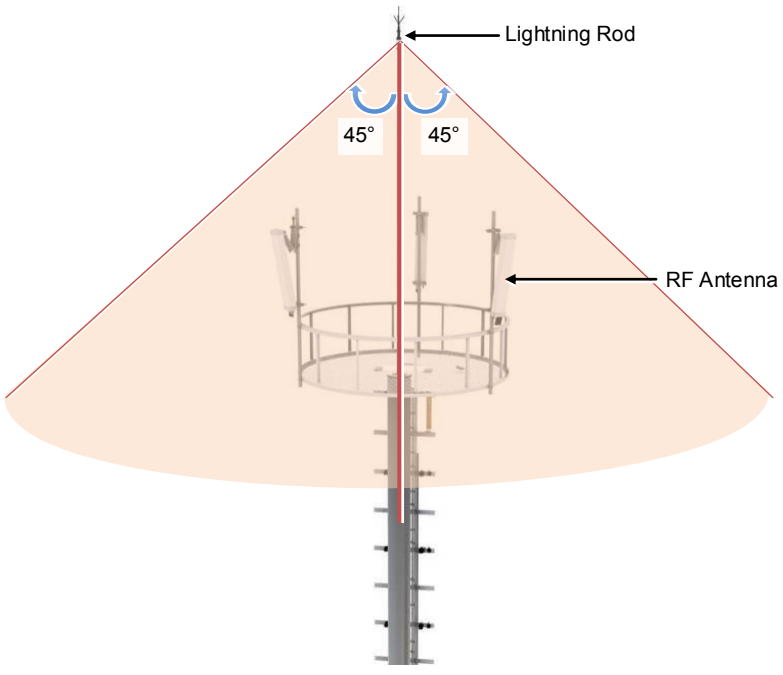
Table 3.17 RF Cable Connection

Classification	Description	
Installation Section	RRH-B4~RF Antenna	
Cable	RRH-B4~RF Antenna	1/2 in. Feeder Line
Connector	RRH-B4	Mini Din Type-Male
	RF Antenna	Din Type-Male
Recommended Torque Value	Mini Din Type-Male	1.45 lbf.ft (20 kgf.cm)
	Din Type-Male	14.50 lbf.ft (200 kgf.cm)
Working Tools	Cable Cutter, Wire Stripper, Nipper, Torque Wrench, Spanner, Knife, Soldering Iron, Lead	

CAUTION

Installing the Antenna

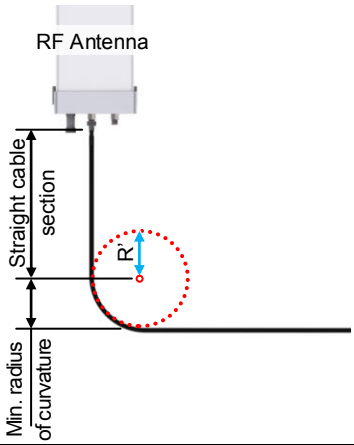
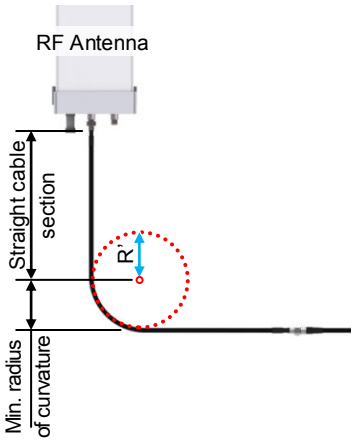
When you install the antenna, the antenna must be within the protective angle (left/right side 45° each from the central axis) to prevent the antenna from lightning damage.



RF Cable Configuration

The RF cable is connected in the following two methods. Prepare and install parts based on the method agreed by a service provider or the site conditions.

Table 3.18 RF Cable Connection at Antenna Connection Area

Case	Description	
Case #1		Connect a 7/8 in. or longer feeder line directly to the RF antenna. - If a space for min. radius of curvature can be secured when a 7/8 in. or longer feeder line is used. - If no excessive force is applied to the connector assembled to the antenna port or cable because the straight cable section is long enough.
Case #2		Connect a 1/2 in. feeder line (jumper cable) to the RF antenna. - If a space for min. radius of curvature cannot be secured when a 7/8 in. or longer feeder line is used. - If excessive force is applied to the connector assembled to the antenna port or cable and it may cause poor contact or damage because the straight cable section is not long enough.

※ 7/8 in. or longer feeder line: 7/8 in./1 1/4 in./1 5/8 in. feeder line, etc.

※ The RF cable must be connected based on the method agreed by a provider or the site conditions.

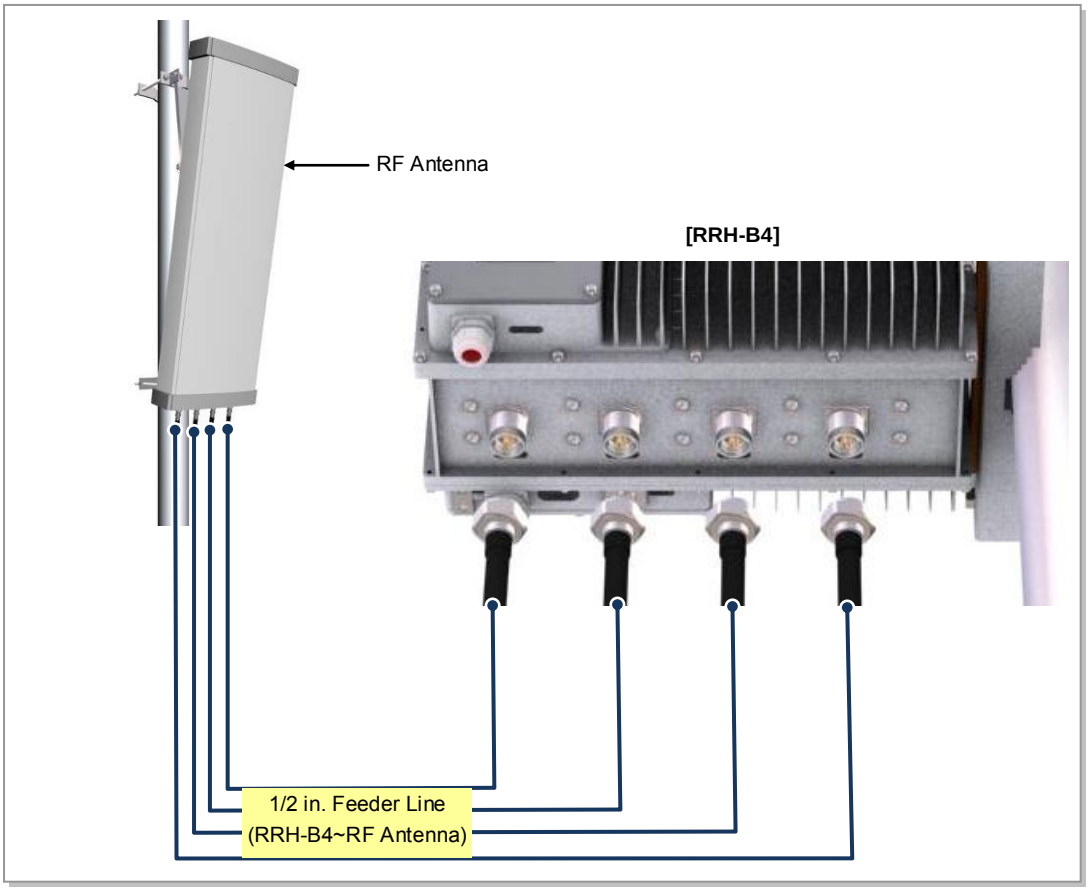


Figure 3.54 RF Cable Configuration

CHECK

RF Antenna Connector

As different connector types may be used depending on the RF antenna type, check the antenna connector before connecting the cable.

RF Cable Identification Tag Installation

Attach the identification tape in the below table to the RF cable.

Table 3.19 RF Cable Identification Tag

Category	Description
Installation position	Attach the identification tag to the both ends of the antenna.
Materials	Use the material of aluminum coated by vinyl for the identification tag.
Fixing method	- Antenna side: Attach the tag to the feeder line using binding strings through the two holes on the tag. - Equipment Side: Cover up the feeder line with the tag and fix it using binding strings through the two holes on the tag.
Identification method	The markings must be prevented from being erased by using relief engraving or coated labels.

RF Cable Connection

Follow the steps below to connect the cable between RRH-B4 and RF antenna.

1) Before connecting the connector to the RF port (Mini Din type-female) at the bottom of RRH-B4, insert a heat shrink tube (jelly type).

2) After connecting the connector, place the heat shrink tube inserted in the previous step at the connecting area and shrink it using a heating gun.

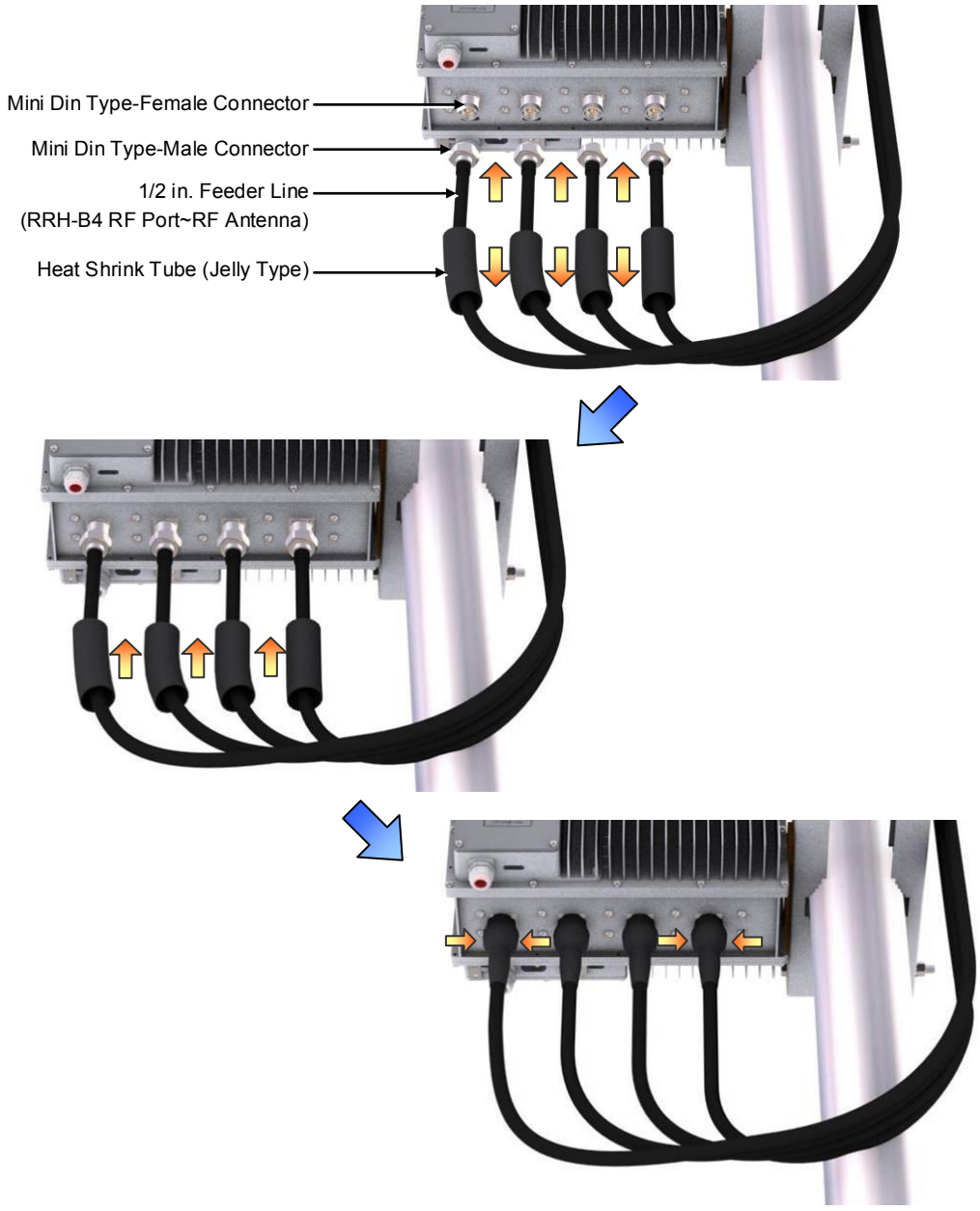


Figure 3.55 RF Cable Connection (1)

3) Insert a heat shrink tube (jelly type) for finishing at the end of the antenna jumper cable (1/2 in. feeder line) with a Din type-male connector installed and then connect to the antenna input port.

4) When the connector is connected completely, insert the heat shrink tube inserted in the previous step up to the connecting area and shrink it using a heating gun.

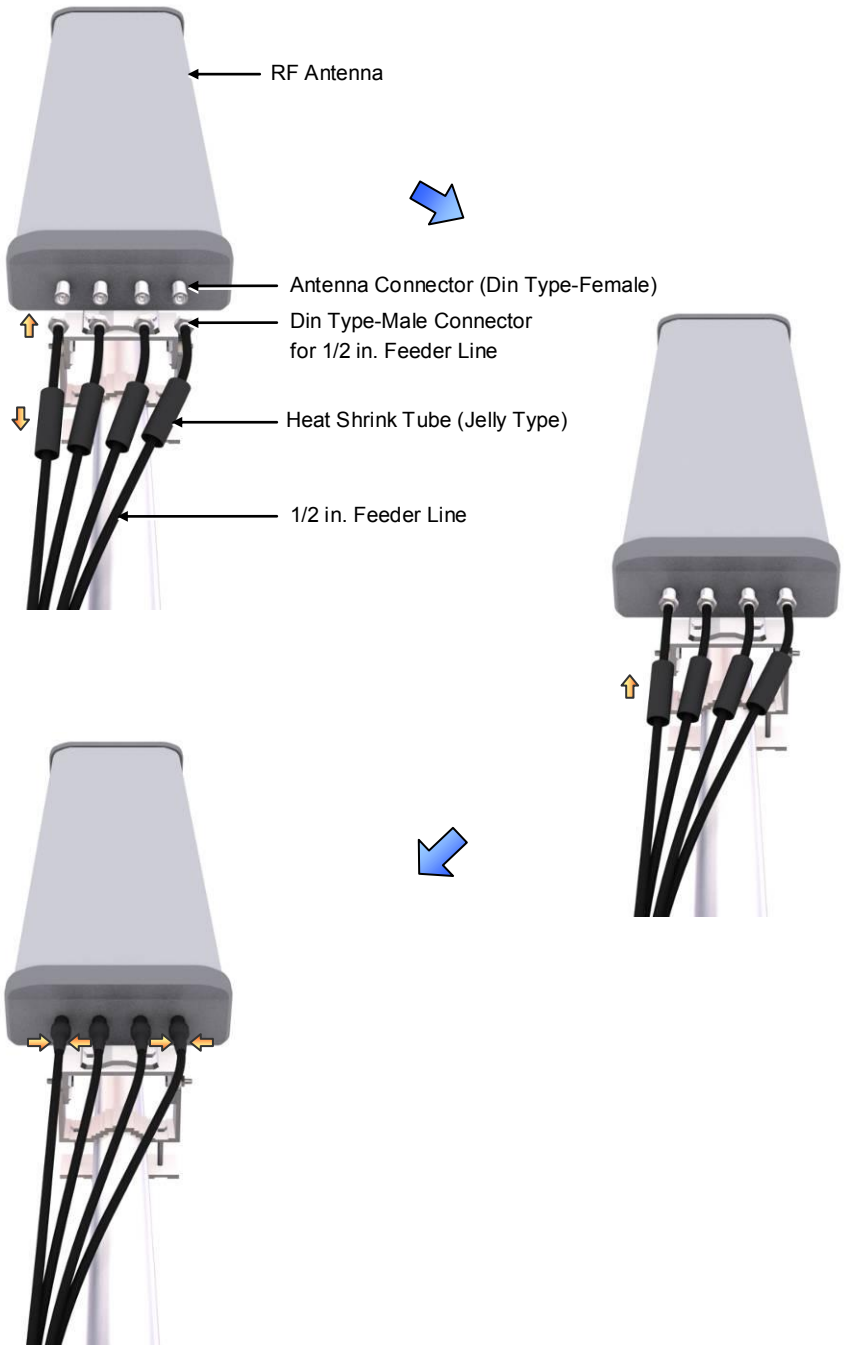
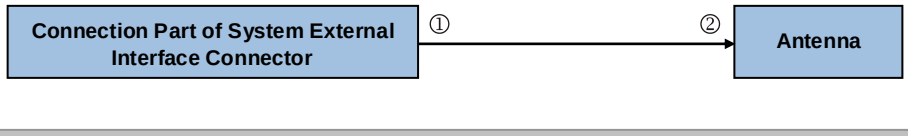


Figure 3.56 RF Cable Connection (2)

Checking RF Cable Connection

After connecting the RF cables, perform the continuity test and feeder cable return loss to check if the RF cable is changed and measure VSWR of antenna and RF cable.



Measure all cables of section ①~②. The measured VSWR should be the specification value or less. If the VSWR exceeds the specification value, disassemble the connector and measure each section separately.

CAUTION

Checking VSWR for Minimum Cable Bend Radius and Length of RF Cable

If the VSWR value for minimum cable bend radius and length of RF cable is not applied, system may not work properly because RF signals cannot transmit or receive smoothly. So, the VSWR value for minimum cable bend radius and length of RF cable must be checked and applied.

CAUTION

Cautions When Measuring VSWR

When measuring VSWR, if you open the antenna port when the transmission output is not completely off, a spike signal may flow into the reception path, which may cause damage to LNA. Make sure the transmission output is completely off when measuring VSWR.

CHECK

Checking the Specifications of Antenna/Arrestor Connector

Depending on the supplier or manufacturer of antenna/arrestor the connector type may be different. Also, the detail specifications of a connector may be different depending on cable type even for the same connector type.
Therefore, check the detail specifications of a connector before preparing parts.

Ex) Din Type-Male: for 1/2 in. Feeder line, for 7/8 in. Feeder Line

CHAPTER 4. Checking Installation Status

4.1 Installation Checking Procedure

Below is the procedure to check installation status.

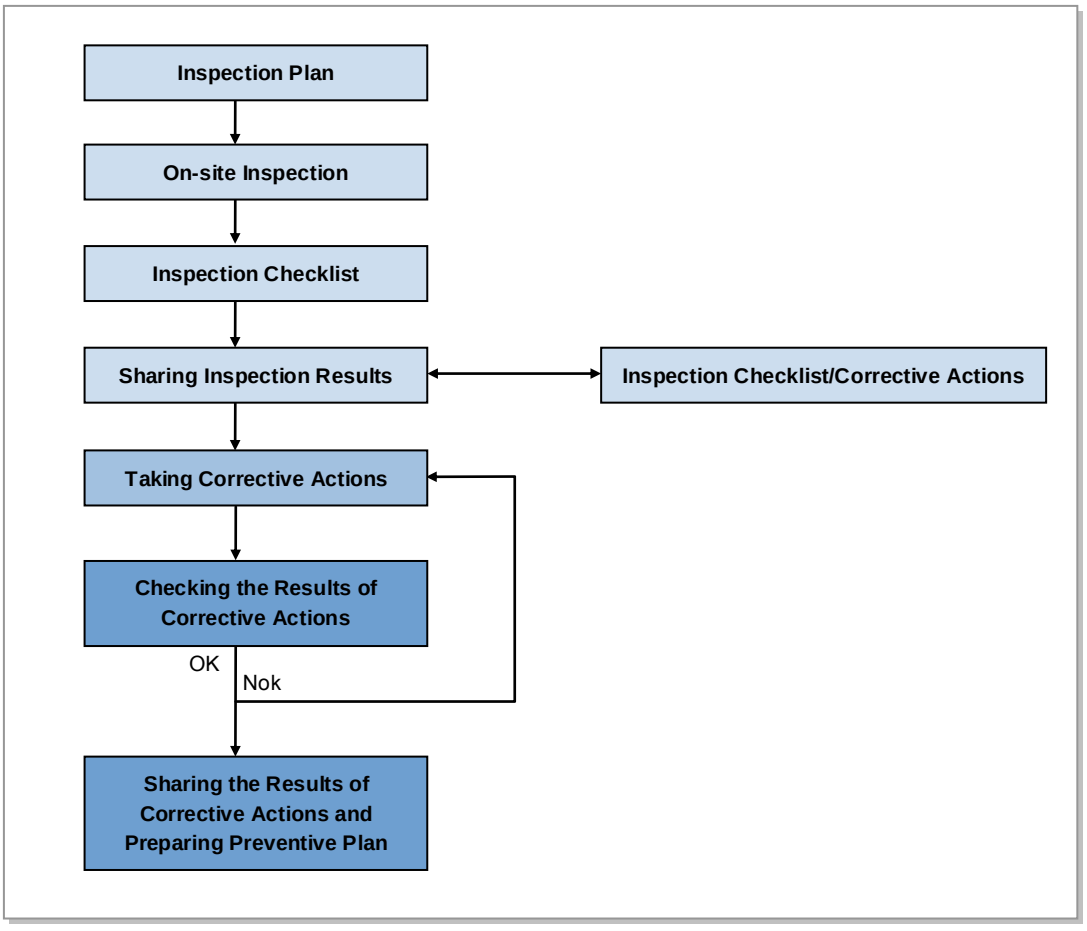


Figure 4.1 Installation Checking Procedure

Inspection Plan

Create an inspection sheet per system and select an inspector to set an inspection schedule per site.

On-site Inspection and Inspection Checklist

The on-site inspection is to perform inspection visually or using instruments for each specification, standard, and installation status, etc. based on the inspection checklist actually at a site where the system ins installed.
The inspector must record the results onto the inspection checklist during or after filed inspection.

Sharing Inspection Results and Taking Corrective Actions

The inspector must share the inspection results (inspection checklist/corrective actions) with a installation operator and the installation operator must take the corrective actions if necessary after reviewing the requirements.

Checking the Results of Corrective Actions

The inspector must check if the corrective actions are properly taken. If they are not sufficient, the inspector must ask the installation operator to take the corrective actions again.

Sharing the Results of Corrective Actions and Preparing Preventive Plan

After the corrective actions are all completed, the inspector must share the results with the installation operator and relevant departments and prepare a preventive plan to prevent the same or similar problems from re-occurring.

Table 4.1 Construction Situation Checklist

Category	Check Items	Criteria	Result	
			Pass	Fail
Installing Equipment	Appearance of equipment and mechanical parts	Equipment damage such as Dent, scratch and crack, etc.		
	Placement of equipment and mechanical parts	Maintenance and horizontal/vertical placement		
	Leveling condition of equipment and mechanical parts	Horizontal/vertical fixing (level, weight, rubber hose, etc.)		
	Validity of status and specifications of tightening bolt/nut/washer, etc.	Visual inspection and magnet check Compliance with tightening torque value		
	Board/blank panel installation status	Checking assembly status		
	Insulation status	Checking electrical contact between insulators (insulation resistance tester)		
	Other works (cable duct installation status, etc.)	Checking position and installation status		

Table 4.1 Construction Situation Checklist (Continued)

Category	Check Items	Criteria	Result	
			Pass	Fail
Grounding	Status of ground bar installation per usage	Checking the separation of communication/power/lightning grounding		
	Cable Size	Checking specifications such as thickness, etc.		
	Cabling and binding status	Cable damage/properness installation route Checking binding interval and the condition of used materials		
	Cable connection	Assembly and tightening condition of a pressure terminal Checking compliance with tightening torque value		
	Installation status of cable tag	Checking position, marking, and tag installation type		
Power	Installation status of power supply and circuit breaker	Power supply capacity/input voltage (tester) Checking circuit breaker type and capacity		
	Cable Size	Checking thickness and length limitation		
	Cabling and binding status	Cable damage/properness installation route Checking binding interval and the condition of used materials		
	Cable connection	Cable damage/properness installation route Checking binding interval and the condition of used materials		
	Installation status of cable tag	Checking position, marking, and tag installation type		
Other data cables	Cable size	Checking cable specifications per usage		
	Cabling and binding status	Checking cable damage/properness installation route, binding distance and condition of used materials		
	Cable connection	Checking cable connection (Pin Map), assembly and tightening status of a connector and compliance with tightening torque value		
	Installation status of cable tag	Checking position, marking, and tag installation type		

Table 4.1 Construction Situation Checklist (Continued)

Category	Check Items	Criteria	Result	
			Pass	Fail
RF	Antenna installation status	Checking specifications, installation position, fixing status, and gap between antennas		
	Installation status of arrestor/line amplifier/splitter, etc.	Checking specifications, installation position, and fixing status		
	Cabling and binding status	Checking cable damage/properness of installation route/binding distance and the condition of used materials		
	Cable connection	Checking cable connection status, connector assembly and tightening status, compliance with tightening torque value, and finishing		
	Installation of cable tag	Checking position, marking, and tag installation type		
Others	Reserved ports and cable inlet status	Finishing (dust cap, etc.)		
	Connection of equipment I/O port (Conduit/Cable Gland)	Checking tightening status		
	Installation of cable installation route	Installation of cable tray and duct, etc.		
	Status of inside/outside of the equipment and system surrounding area	Checking the stocking condition of waste parts, waste materials, packing materials, etc.		
Opinion				

ANNEX A. Sector Antenna Installation

A.1 Cautions when Installing a Sector Antenna

Precautions of antenna installation are as follows.

- Sector antennas should be installed vertically. (±1°)
- Antenna is the precise material, so be careful not to make damage or form change.
- When moving antenna, use the tool suitable to rating. In addition, use the rated carrying device which is at least 200 % or more than antenna considering the stability.
- Be careful not to give too much strength to the antenna.
- If it rains, suspend connecting the feeder cable and antenna.
- Fix it after adjusting the direction of antenna exactly.
- Distance between steel tower and antenna and the distance between send-receive antennas are based on the antenna layout.
- Attach the antenna on the position specified in the drawing.
- Install the antenna not to make a feature change of the antenna considering the direction of the radiation.
- Connect the antenna not making the alien substance flowed so that Passive Inter-Modulation Distortion (PMID) is not affected.
- Measure VSWR of all antennas and the value should be within the regulated value.

A.2 Sector Antenna Layout

The method of sector antenna layout is as follows.

1) Use the transit to adjust the antenna installation direction exactly.
2) Fix the direction of the sector antenna, same as the angle settled when designing the cell after installing the steel tower.
3) Arrange the antennas of each sector to the sector directional angle at right angles by adjusting the distance between antenna and steel tower.
   In the event of the station whose the direction between sectors is not 120°, install it to make the steel tower and antenna direction different being careful of the tilt and azimuth.
4) For circular platform, separate the antenna interval at maximum.

A.3 Sector Antenna Installation

The method of sector antenna installation is as follows.

1) Put up an antenna pole and insert the sector antenna into the antenna pole using a fixing clamp.
2) Set the antenna's up/down tilt to 0° and fix the fixing clamps at the top and bottom.
3) Adjust the tilted angle of the antenna by taking the signal strength into account. The bolts on the upper and lower guide clamps must be loose as to allow angle adjustment of the antenna.
4) After adjusting the antenna angle, tighten up the 4 loose bolts on the upper and lower guide clamps.

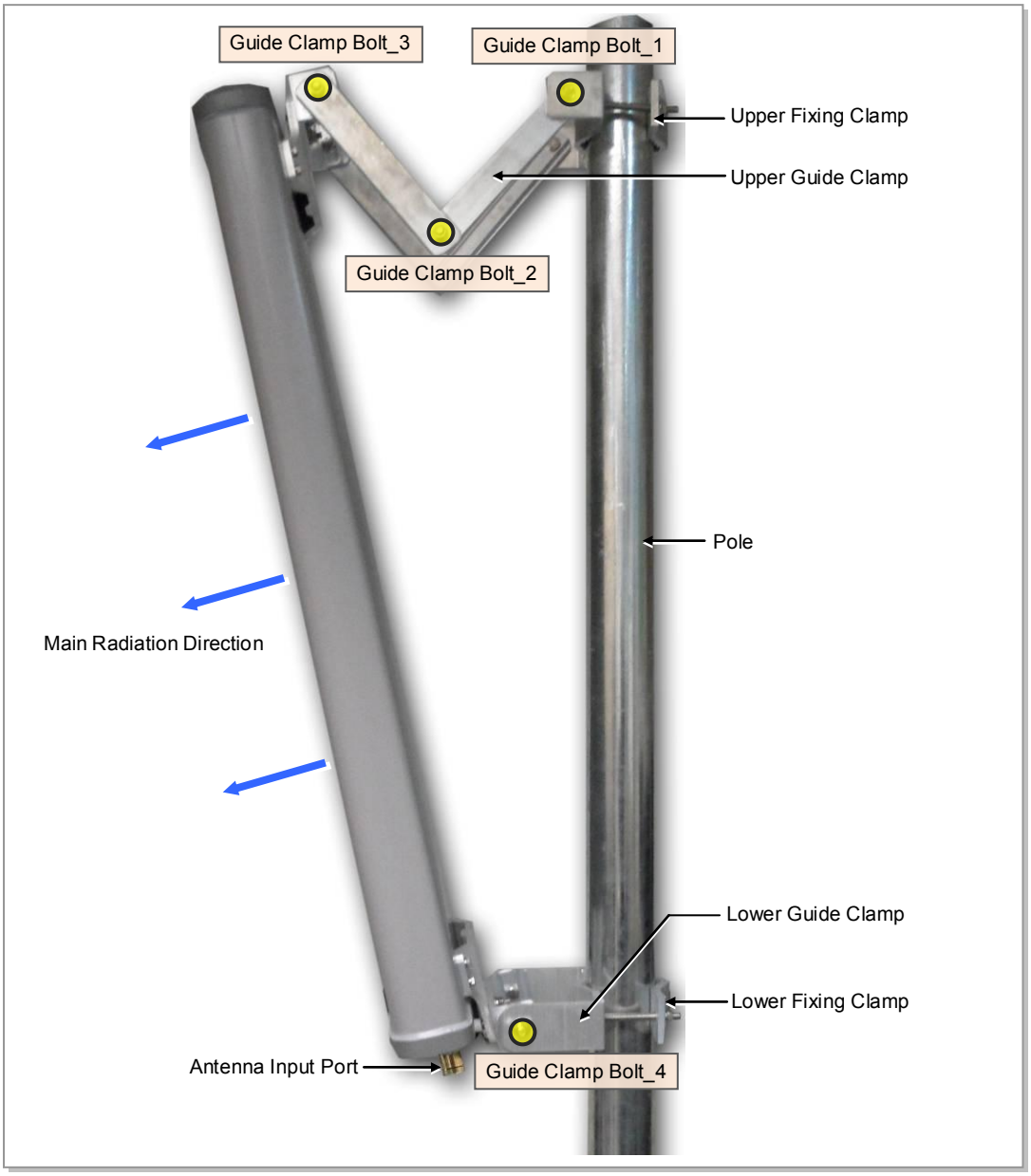
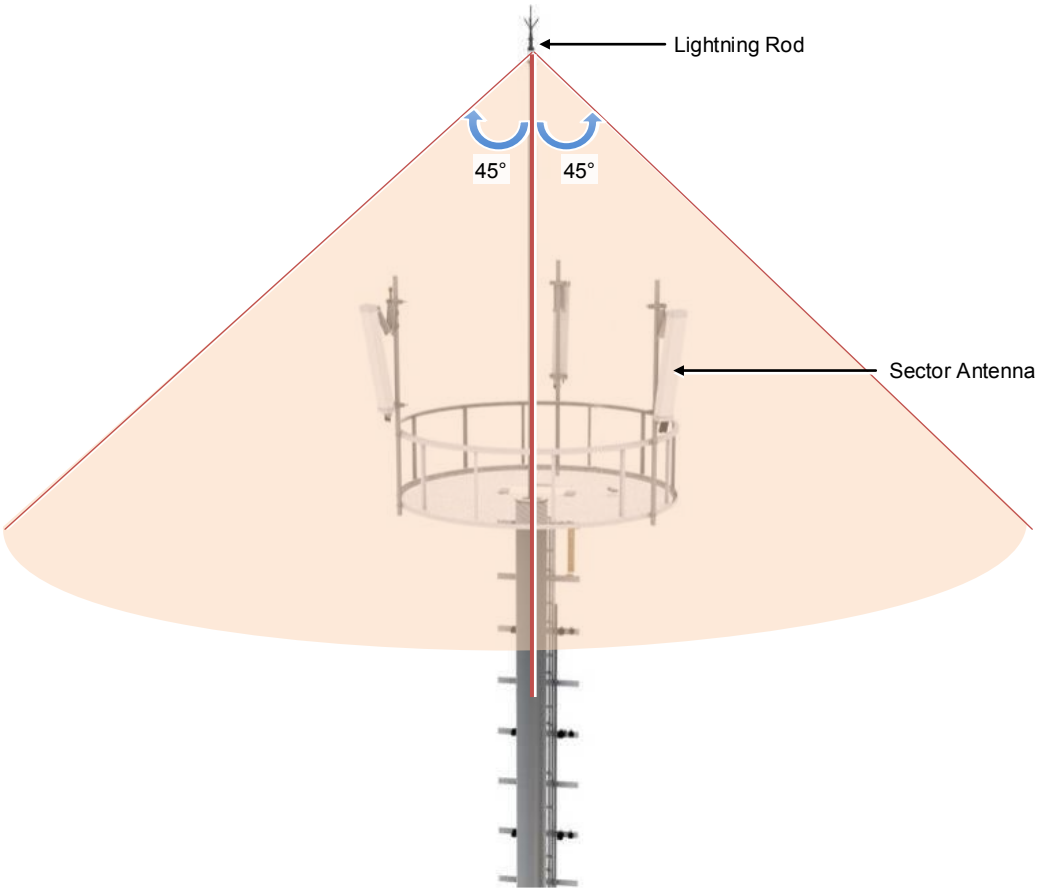


Figure A.1 Sector Antenna

CAUTION

Installing the Antenna

When you install the antenna, the antenna must be within the protective angle (left/right side 45° each from the central axis) to prevent the antenna from lightning damage.



ANNEX B. Installing Feeder Cable

B.1 Cautions When Installing Feeder Cable

When installing the feeder cable (GPS/RF cable), the following cautions shall be considered:

- Put a plate to work not to make damage for the surface of the feeder cable.
  If there is external damage of the feeder cable, cut the damaged part and work wiring.
- After connecting the antenna to the feeder cable, finish the connection part of the contracted pipe using the contracted tube.
- Attach the cognitive tapes to the both ends of the feeder cable, which makes it easy to recognize.
- When connecting cabinet, antenna and lightening arrestor, etc. to the feeder cable, connect strongly to prevent from generating reflected wave.
- The curvature radius should be maximized, keep the minimum curvature radius.

Table B.1 Curvature Radius of Feeder Cable for Outdoor

Specification			Allowed Radius of Curvature	Remark
LS Feeder Line	HFC-12D	1/2 in.	4.02 in. (125 mm)	Outdoor
	HFC-22D	7/8 in.	9.84 in. (250 mm)	
	HFC-33D	1-1/4 in.	14.96 in. (380 mm)	
	HFC-42D	1-5/8 in.	20.08 in. (510 mm)	
RFS Feeder Line	LCF12-50	1/2 in.	4.92 in. (125 mm)	
	LCF78-50	7/8 in.	9.84 in. (250 mm)	
	LCFS114-50	1-1/4 in.	14.96 in. (380 mm)	
	LCF158-50	1-5/8 in.	19.69 in. (500 mm)	

1/2 in. 7/8 in. 1-1/4 in. 1-5/8 in.

Table B.2 Curvature Radius of Feeder Cable for Indoor (Based on LS Feeder Line)

Specification			Allowed Radius of Curvature	Remark
LS Feeder Line	HFSC 6D	1/4 in.	0.98 in. (25 mm)	Indoor
	HFSC 10D	3/8 in.	0.98 in. (25 mm)	
	HFSC 12D	1/2 in.	1.26 in. (32 mm)	
	HFSC 22D	7/8 in.	4.92 in. (125 mm)	
RFS Feeder Line	SCF14-50	1/4 in.	0.98 in. (25 mm)	
	SCF38-50	3/8 in.	0.98 in. (25 mm)	
	SCF12-50	1/2 in.	1.26 in. (32 mm)	
	UCF78-50	7/8 in.	4.92 in. (125 mm)	

Table B.3 Curvature Radius of LMR-400 (Based on Times Microwave System)

Specification	Allowed Radius of Curvature	Remark
LMR-400	1 in. (25.4 mm)	Installation
	4 in. (101.6 mm)	Repeated

CAUTION

Radius of Curvature of Feeder Line

When installing a feeder line, the radius of curvature of the sections where cables bent should be larger than the allowed radius of curvature. If the radius of curvature for the feeder line installation is less than the allowed radius of curvature, it may affect the performance of the system.

- Ensure that the feeder cable does not interfere with steel towers, ladders and in the areas chiefly used by people.
- Connect the connector to the antenna in a straight line and after connecting, do not apply excessive force.
- Use the vinyl tape for electricity and heat shrink tube for the external exposed part of the connector not to avoid leak water.
- Wind the self-bonding rubber tape overlapping (keep a distance as the half size of rubber tape) to the connector connection part and wind the vinyl tape for electricity to the 2 times or more and then cover with the jelly type heat shrink tube.

Connection of Feeder Cable Connector

Connecting the feeder cable connector is critical process, so the qualified workers who finished the related education should perform.

Table B.4 Connector Connection Torque Value

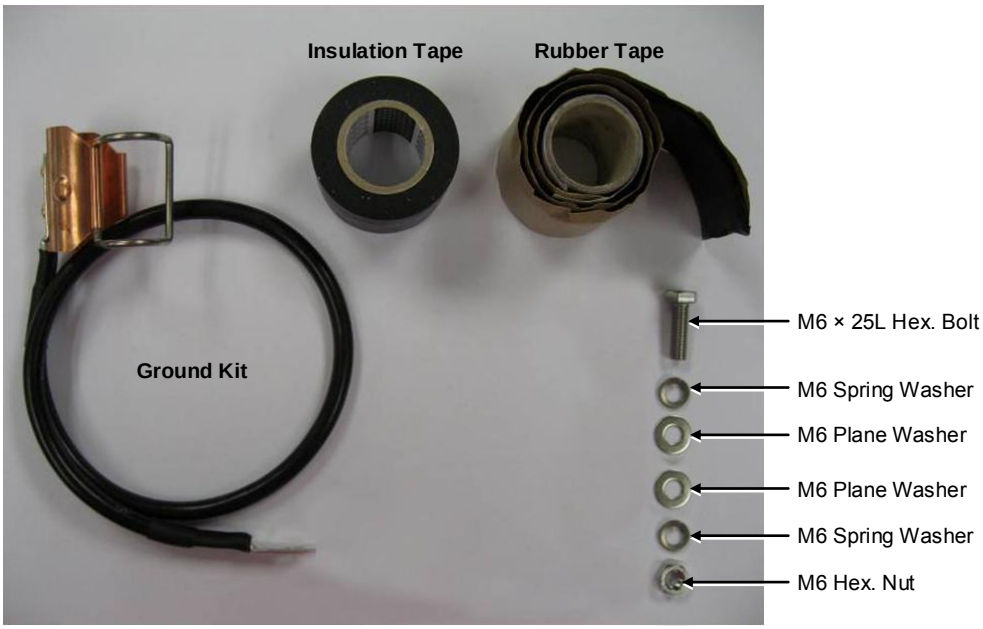
Connector	Torque Value
SMA connector	0.18 lbf·ft (2.5 kgf·cm)
TNC connector	0.65 lbf·ft (9 kgf·cm)
N-type connector	1.45 lbf·ft (20 kgf·cm)
Din-type connector	14.46 lbf·ft (200 kgf·cm)

B.2 7/8 in. Feeder Line Ground

Ground Kit

Ground the 7/8 in. feeder line using the grounding kit located under the Tower Ground Bar (TGB) installed in the lower section of the tower or in the cable duct.

The procedure for connecting the ground kit to the 7/8 in. feeder line is as follows:



1) Remove about 2.17 in. (55 mm) of the sheath of cable when the 7/8 in. feeder line is used.

2) Open it by returning hook of the clamp fixing for Ground kit in the left direction.

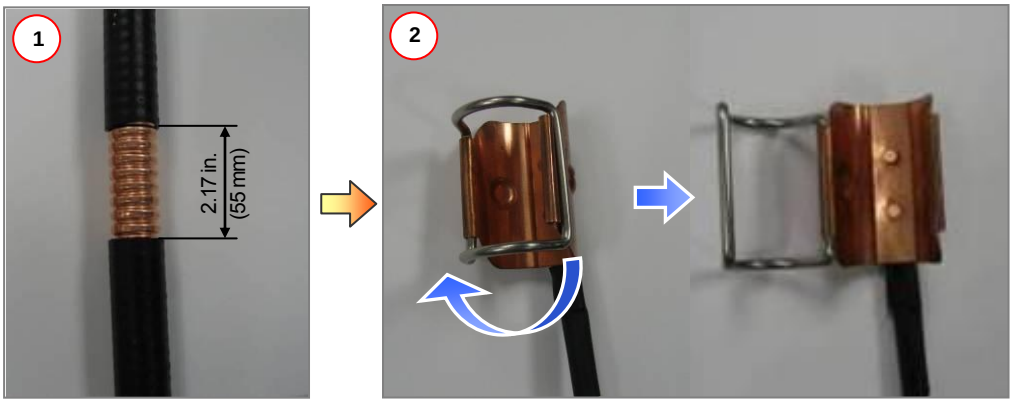


Figure B.1 7/8 in. Feeder Line Grounding (1)

3) Insert the ground kit clamp into the place from which the 7/8 in. feeder line sheath is removed.

4) Pull the clamp lock to the upward so that the lock can be hung on the global protrusion area on the side.

5) Overlap the exposed part of the ground kit clamp using rubber tape (Keep a distance as the half size of rubber tape) and press it with your hands lightly to make rubber tape adhere well.

6) Wrap the part where the rubber tape is attached using insulation tape two times or more. When cutting off the tape, cut it off neatly using a cutting device such as scissors or a knife.

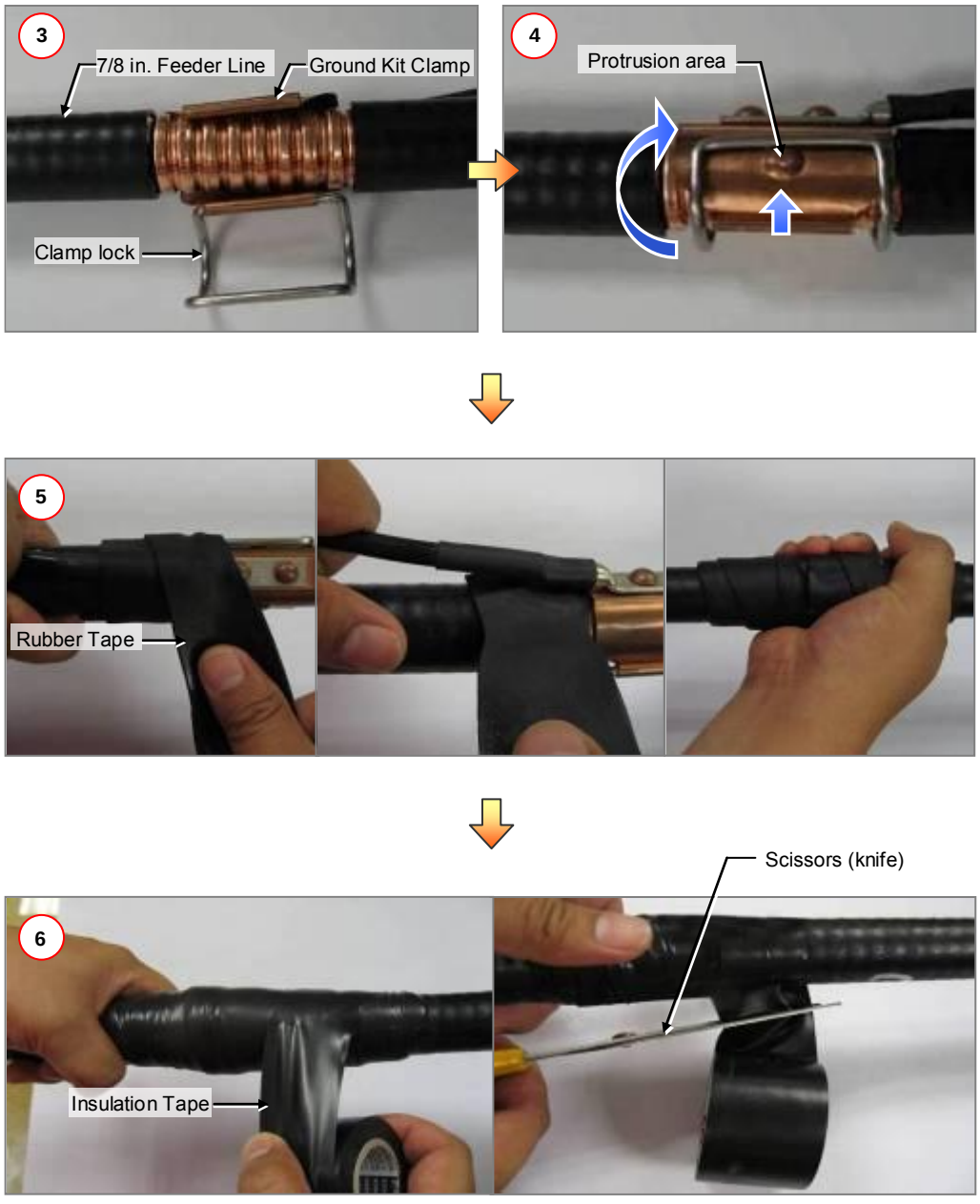


Figure B.2 7/8 in. Feeder Line Grounding (2)

7) Align the heat shrink tube inserted when installing the 7/8 in. feeder line into the fixing part of the ground kit.
- Heat shrink tube: jelly type, Φ 1.65 in., 7.87 in. (Φ 42 mm, 200 mm)

8) Shrink the heat shrink tube by heating gun.

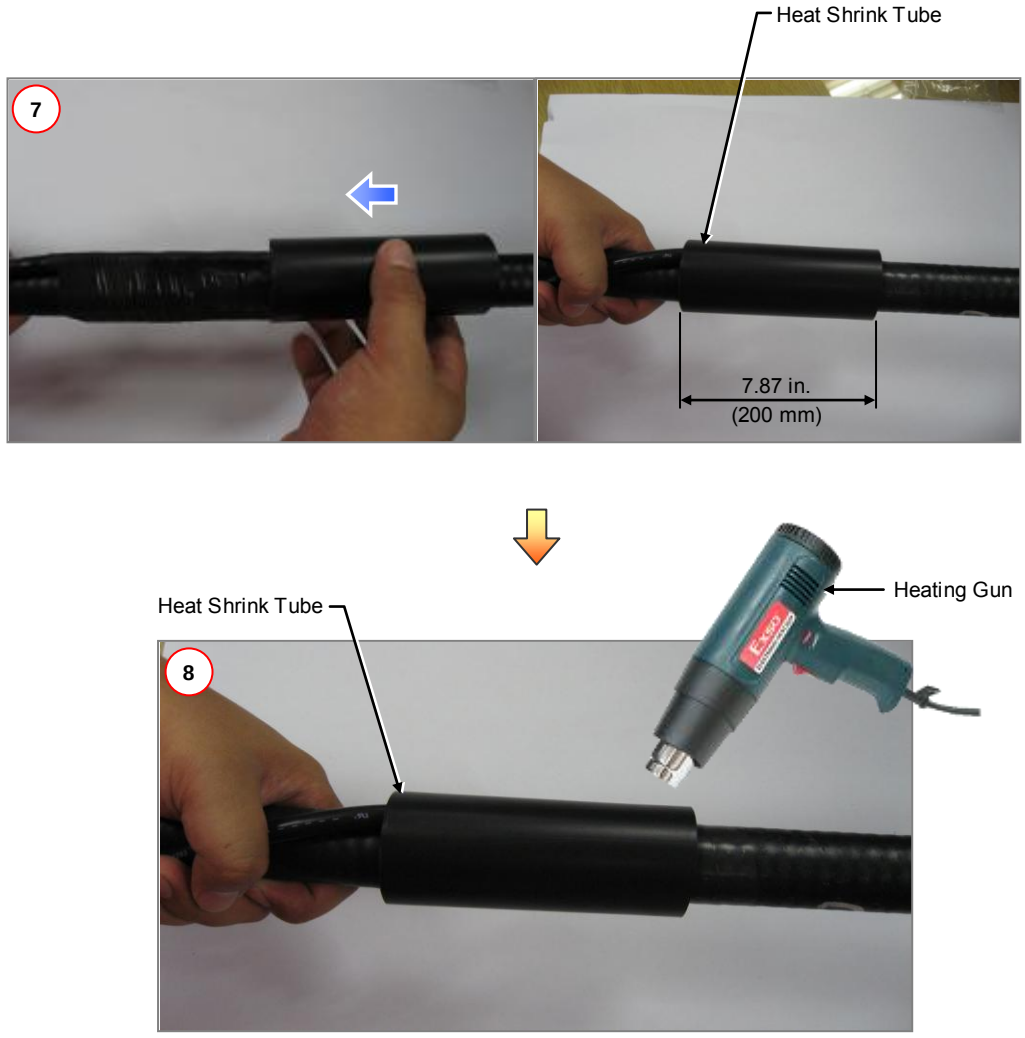


Figure B.3 7/8 in. Feeder Line Grounding (3)

9) After the ground kit has been installed to the 7/8 in. feeder line, attach the pressure terminal (1 hole) of the ground cable connected to the ground kit to the TGB.

10) When attaching the pressure terminal, use M6 × 25L hex. Bolts.

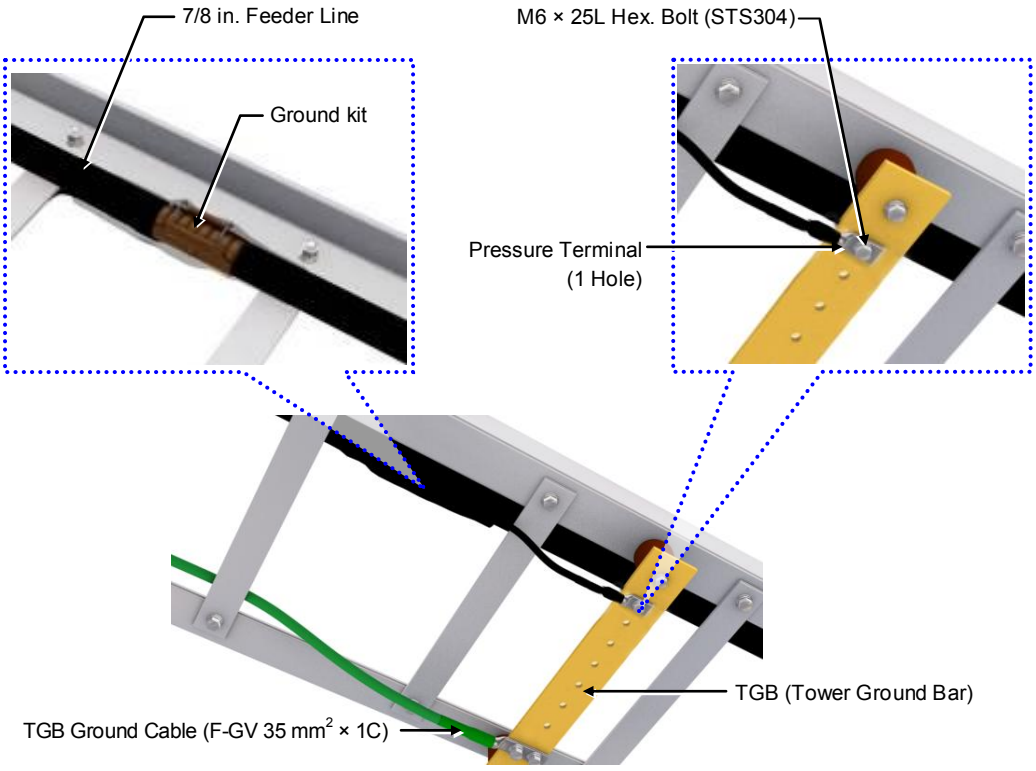


Figure B.4 7/8 in. Feeder Line Grounding (4)

CHECK

Checking the Ground Kit and TGB Specifications

The specifications, clamp, and pressure terminal type of the ground kit and TGB differ depending on manufacturers. Make sure to check the specifications of the ground kit and TGB, and identify the installation method before installing it.

Table B.5 TGB Installation Example

Category	Description
TGB Usage	Earth terminal board for RF cable for grounding in using the feeder line of more than 7/8 in.
TGB Location	Lower section of cable rack in feeder cable duck - Less than 65.62 ft (20 m): 1 (Ex. steel tower lower section) - Exceed 65.62 ft (20 m): 2 or more (Ex. steel tower lower and upper section)
Material	Pure copper
Installation Method	Using the insulator to separate from the steel tower electrically
Connection Method	Extract the GV 35 mm² ground cable to the direction of the floor and weld it to the tower's ground cable.

B.3 Tower Ground Construction

1) Install a Tower Ground Bar (TGB) that will be used to ground a RF cable onto the tower. If the height of the tower is exceeds 65.62 ft (20 m), two or more TGBs should be installed (onto the lower and upper sections of the tower). If the tower is 65.62 ft (20 m) or less, one TGB should be installed. Since the TGB installation location and the number of TGBs to be installed can differ depending on the system environment and provider's standards, consult your service provider.
2) Each TGB should be grounded and separated from other grounds. If there is an existing ground bar or ground cable for TGB, install the TGB by branching from it using a ground cable (GV35 mm^2 × 1C) ground cable. (However, the specification of TGB ground cable can be different, defending on the standard of service provider.)
3) Tighten the Ground Kit (RF cable grounding assembly) to the TGB ground terminal and the tower hole using the pressure terminal hole attached at the end of the ground kit's ground cable.

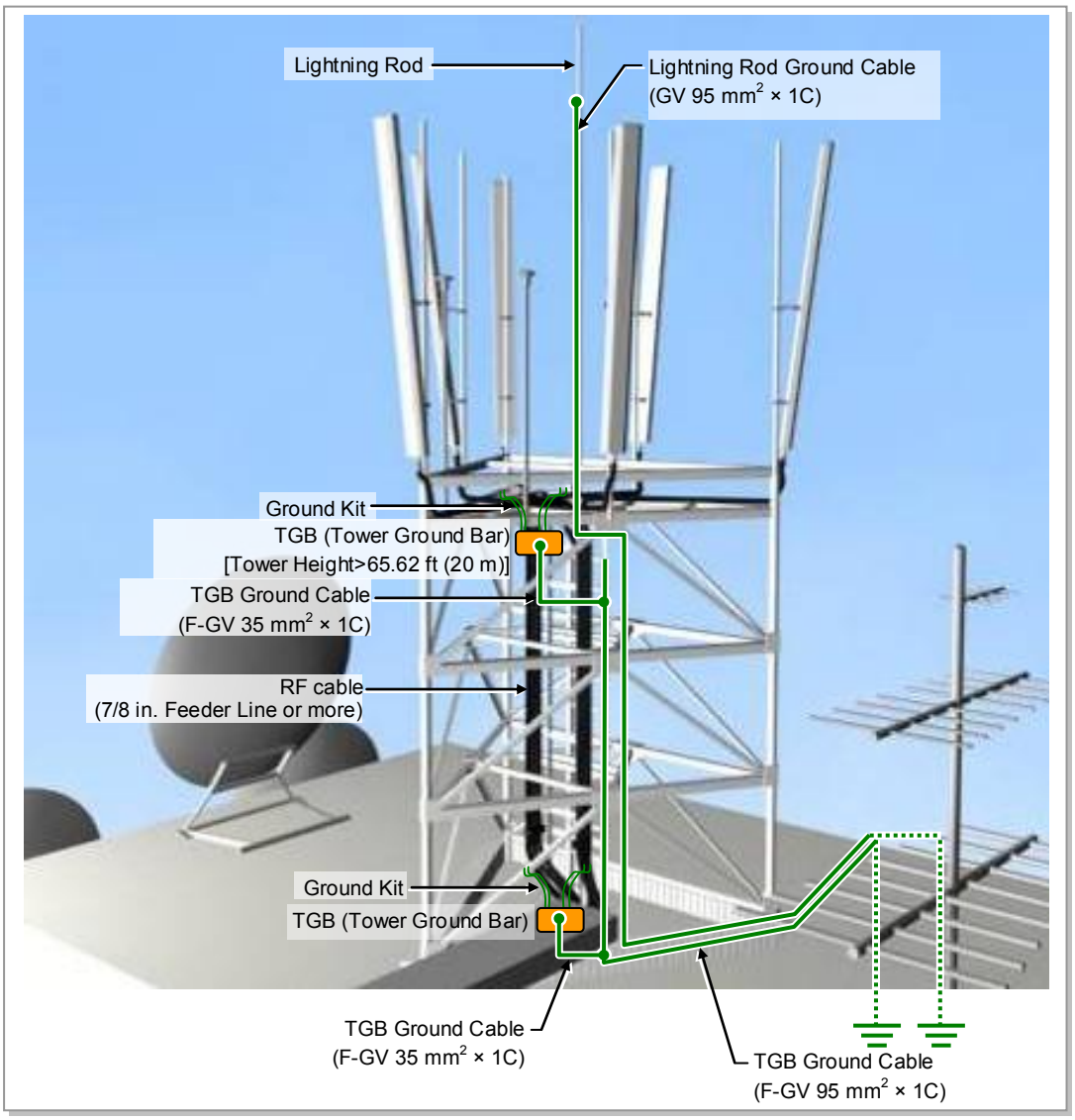


Figure B.5 Connecting the Tower Ground Cable

ANNEX C. Connector Assembly

C.1 RJ-45 (Shield Type)

Procedure that assembles the RJ-45 (shield type) connector is as follows:

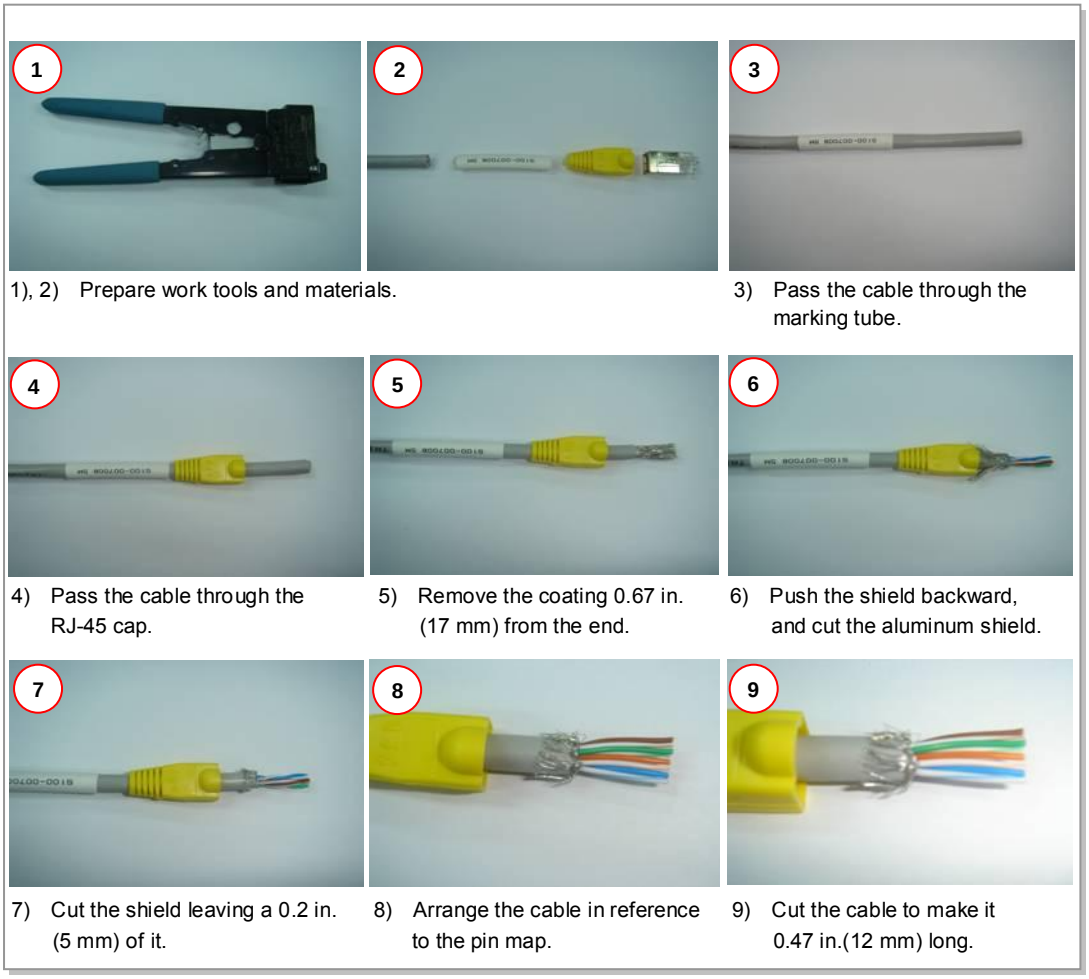
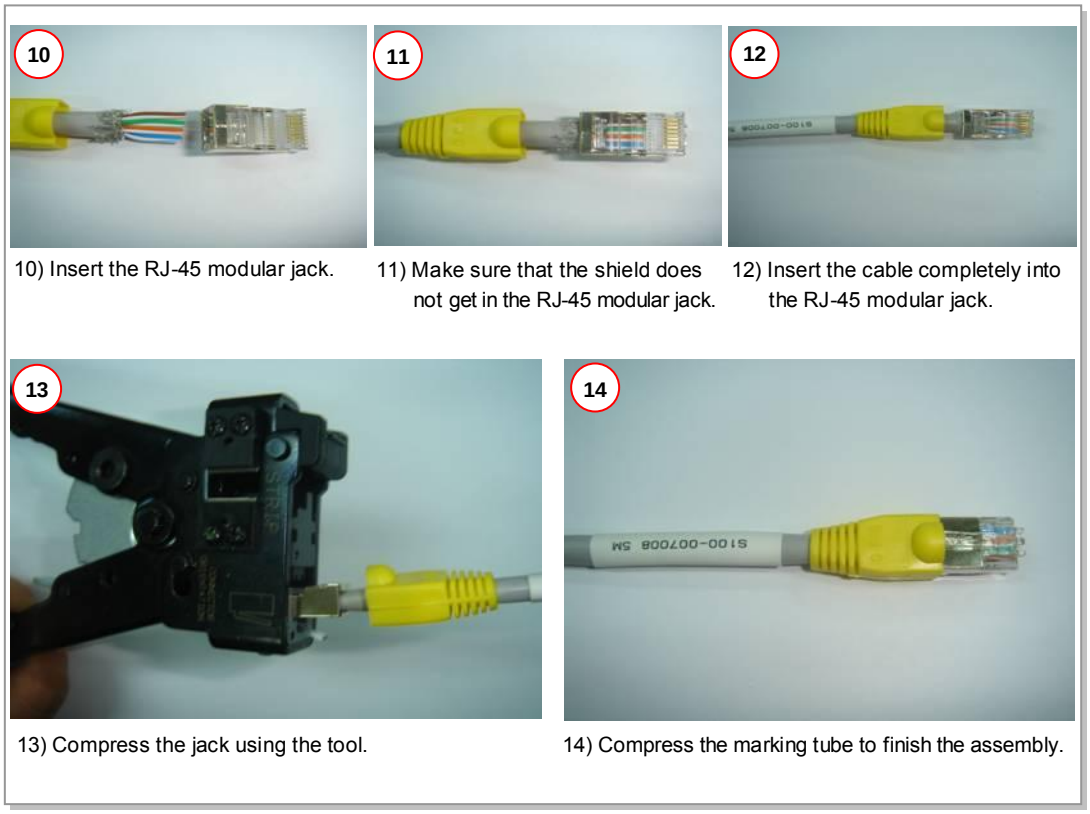


Figure C.1 Assembling the RJ-45 Connector (Shield Type) (1)



10) Insert the RJ-45 modular jack.

11) Make sure that the shield does not get in the RJ-45 modular jack.

12) Insert the cable completely into the RJ-45 modular jack.

13) Compress the jack using the tool.

14) Compress the marking tube to finish the assembly.

Figure C.2 Assembling the RJ-45 Connector (Shield Type) (2)

C.2 RJ-45 (Normal Type)

Procedure that assembles the RJ-45 (normal type) connector is as follows:

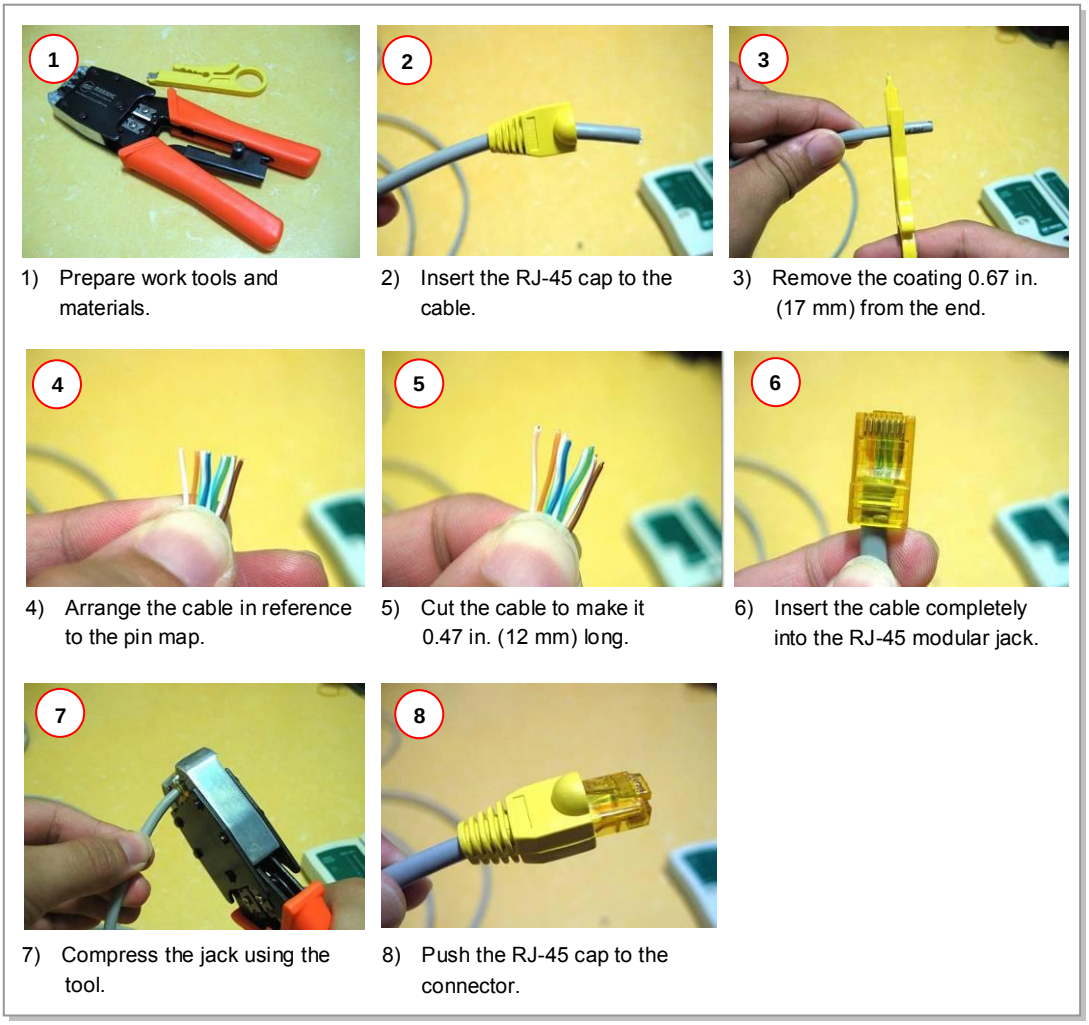
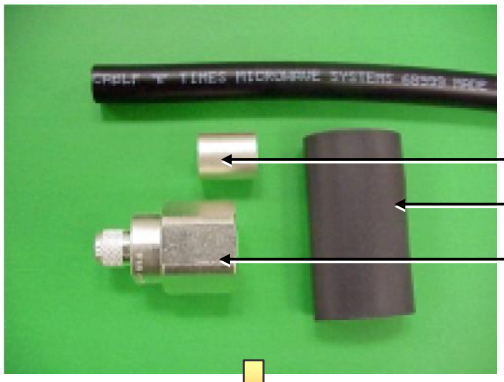


Figure C.3 Assembling the RJ-45 Connector (Normal Type)

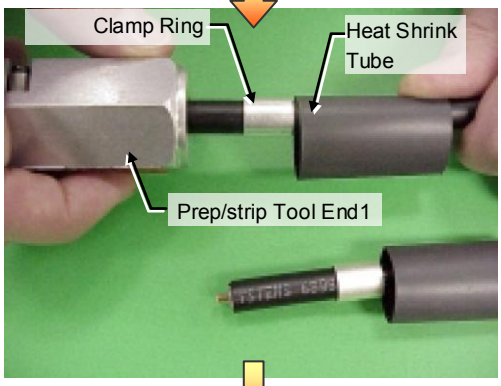
C.3 N type-male (LMR-400)

Below is the procedure for assembling the N type-male cable connector to LMR-400 cable.

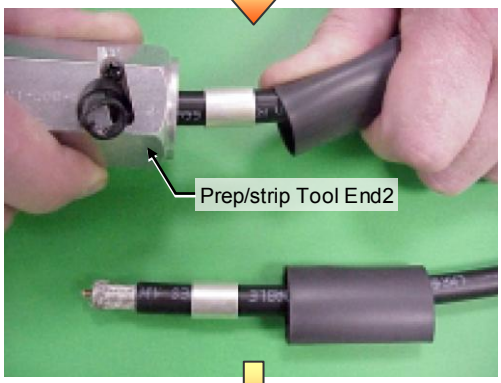


1) The components of the N type-male include N type-male body, clamp ring, and heat shrink tube.

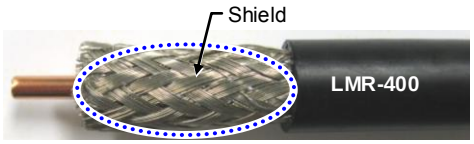
Clamp Ring
Heat Shrink Tube
N type-Male Body

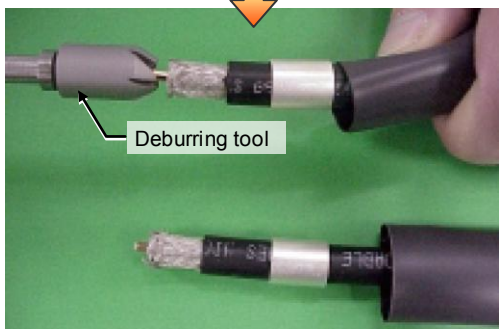


2) Insert a heat shrink tube and clamp ring to the cable, and insert the cable into the 'End1' of the prep/strip tool. Then remove the shield and sheath except for the center conductor at the end of cable by rotating the tool clockwise.



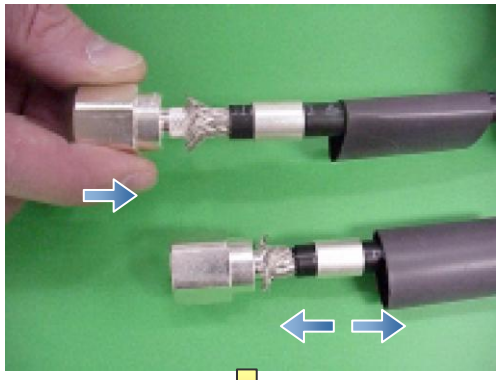
3) Insert the cable into the 'End2' of the prep/strip tool again, and remove the sheath except for the shield by rotating the tool.



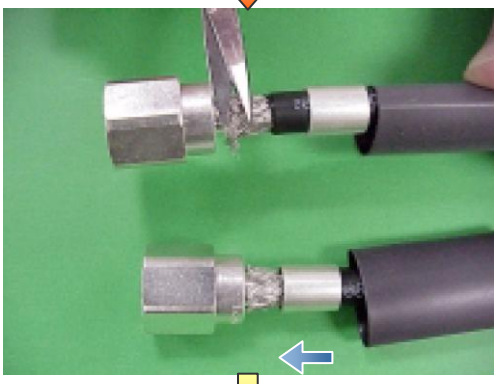


4) Trim the end of the center conductor by using a deburring tool.

Figure C.4 N type-male Connector Assembling (1)



5) Push a connector into the end of the cable.
Then, push it further until the center conductor is firmly inserted into the pin connection part of the N-Type male body.
Make the shield overlap the N-Type male body, pull out the clamp ring, and let it go to its original position so that the remaining length may be folded.



6) Cut off the folded length of the shield using a cutting device so that it does not protrude outside when the clamp ring is inserted.
After arranging the shield, push up the clamp ring toward the connector until the entire shield is covered.

7) Using a compressor and hexagonal dies, pressurize the clamp ring to fix the cable and connector.

8) Lift the heat shrink tube up to the connection point on the connector and shrink the heat shrink tube using a heating gun.

Figure C.5 N type-male Connector Assembling (2)

C.4 TNC-male (LMR-400)

Below is the procedure for assembling the TNC-male cable connector to LMR-400 cable.

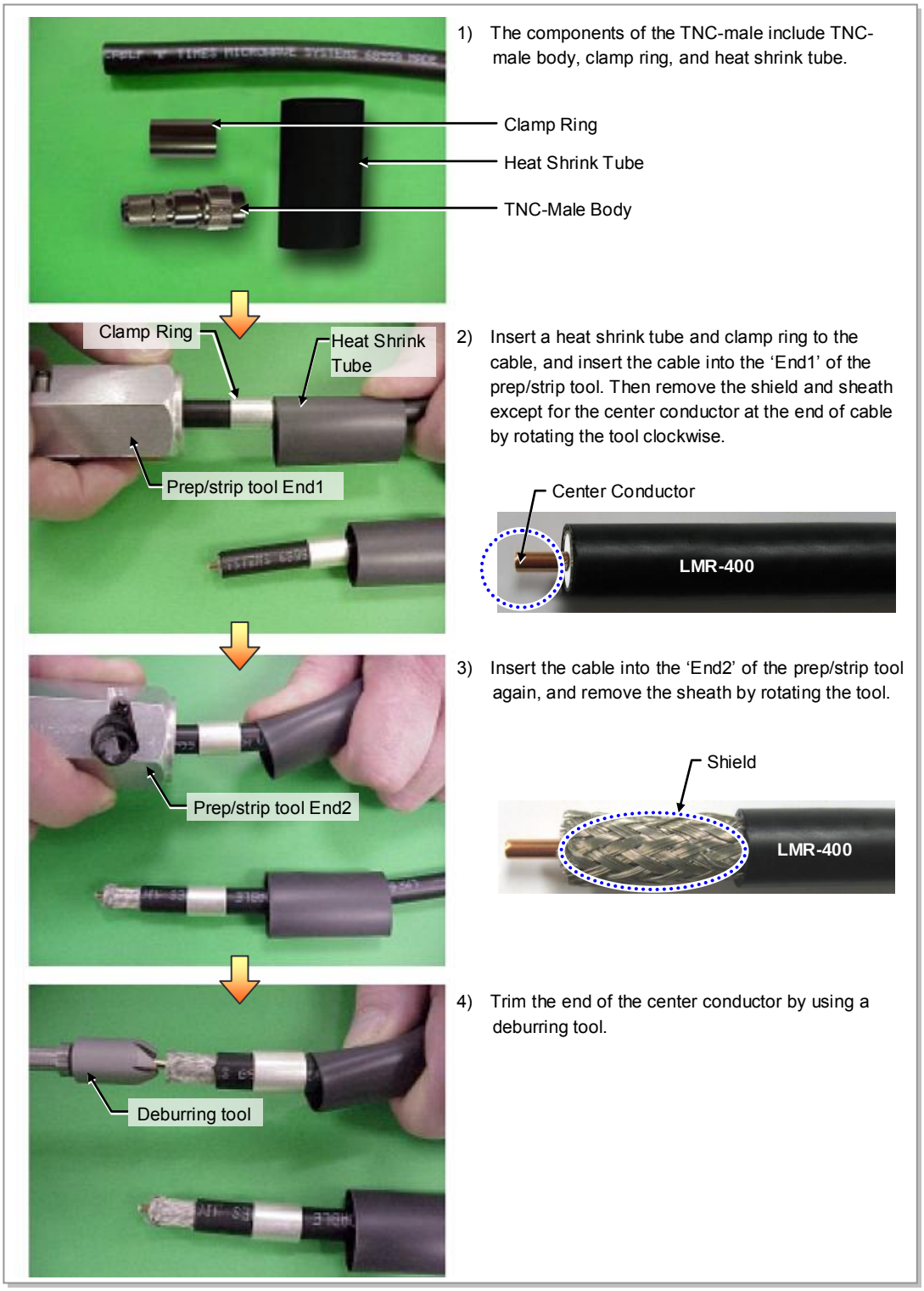
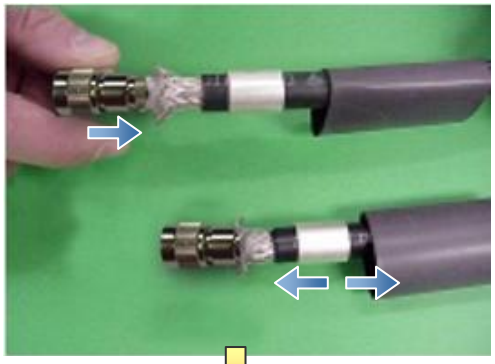
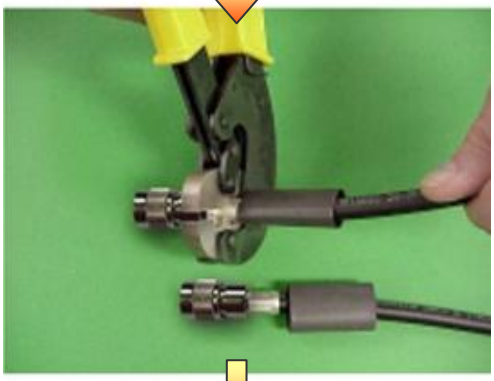


Figure C.6 TNC-male Connector Assembling (1)



5) Push a connector into the end of the cable.
Then, push it further until the center conductor is firmly inserted into the pin connection part of the N-Type male body.
Make the shield overlap the N-Type male body, pull out the clamp ring, and let it go to its original position so that the remaining len1/2 in. be folded.

6) Cut off the folded length of the shield using a cutting device so that it does not protrude outside when the clamp ring is inserted.
After arranging the shield, push up the clamp ring toward the connector until the entire shield is covered.



7) Using a compressor and hexagonal dies, pressurize the clamp ring to fix the cable and connector.

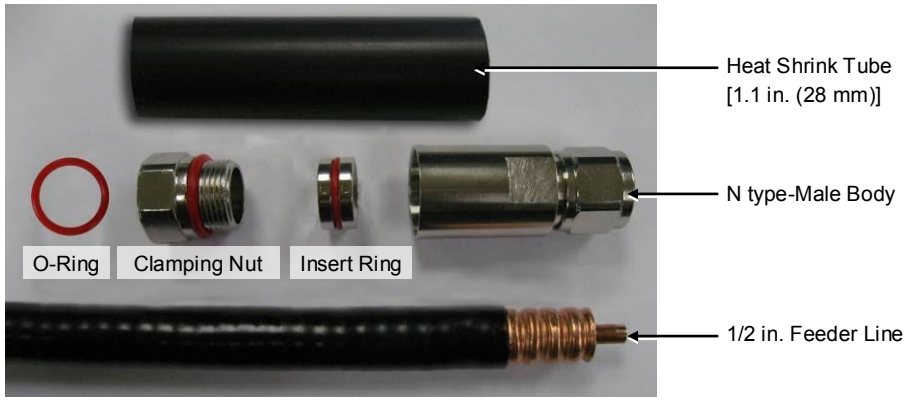
8) Lift the heat shrink tube up to the connection point on the connector and shrink the heat shrink tube using a heating gun.

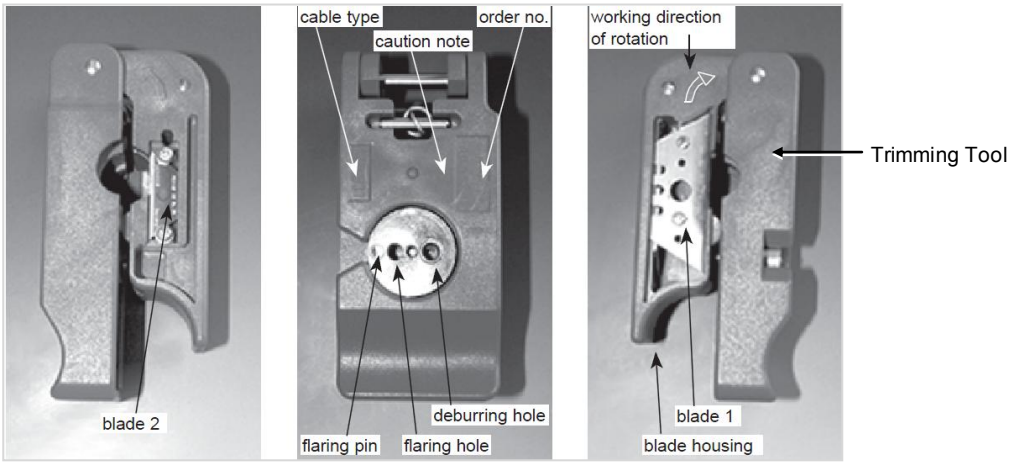
Figure C.7 TNC-male Connector Assembling (2)

C.5 N type-male (1/2 in. feeder line)

Below is the method for assembling the N type-male connector to the 1/2 in. feeder line.

1) The components of the N type-male are an N type-male body, an insert ring, a clamping nut, O-ring, and a heat shrink tube, and it is assembled using the wire stripper, trimming tool, spanner, etc.





2) Using a stripping tool or a knife, strip the 1/2 in. feeder line by 1 in. (25.4 mm) from the end, as shown in the figure below.

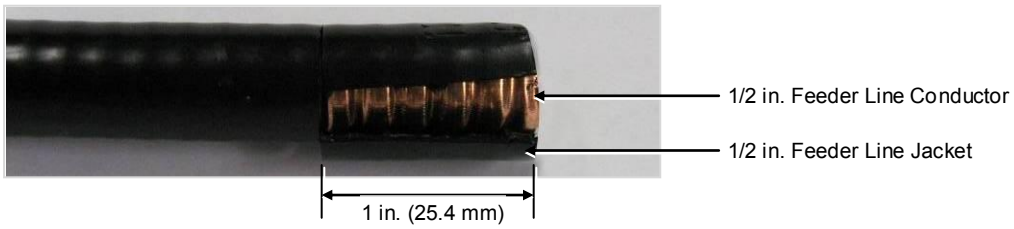
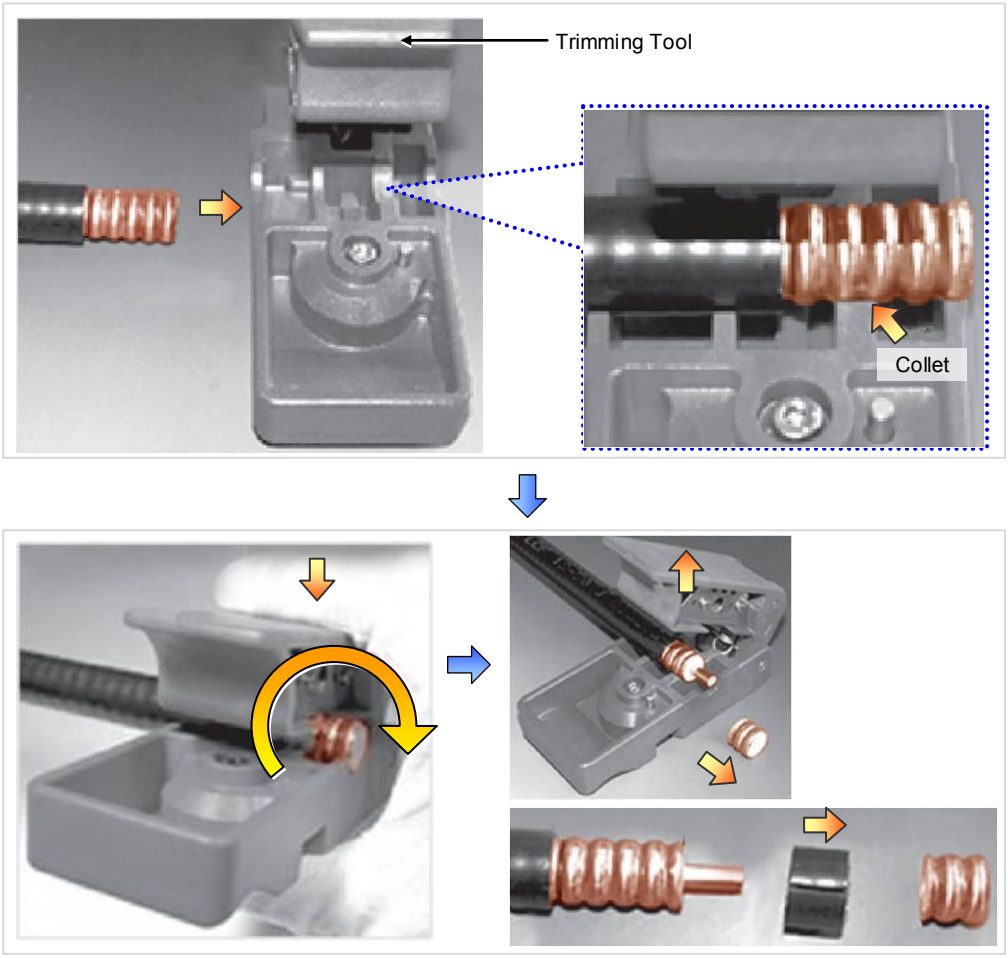


Figure C.8 Assembling the N type-male (1/2 in. Feeder Line) Connector (1)

3) Remove the 0.43 in. (11 mm) of the external conductor end and 0.39 in. (10 mm) of the jacket using a trimming tool.



4) Insert the internal conductor into the deburring hole at the bottom of the trimming tool to trim it.

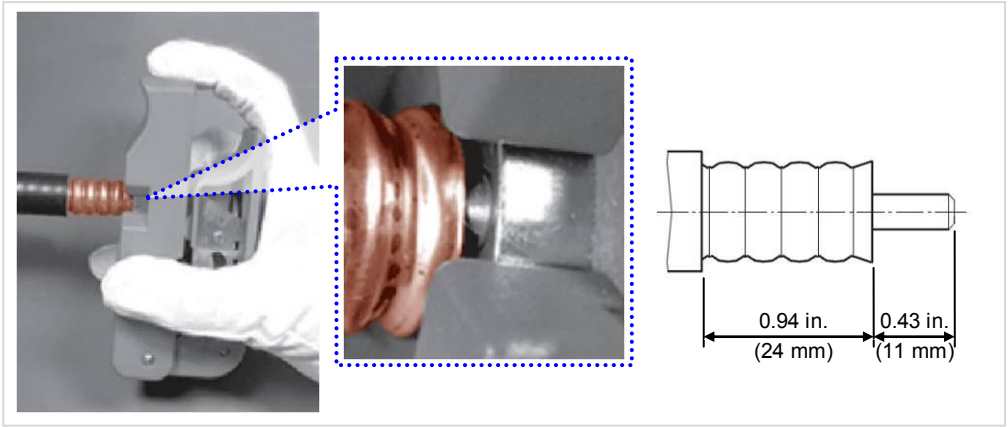


Figure C.9 Assembling the N type-male (1/2 in. Feeder Line) Connector (2)

5) Insert the o-ring, clamping nut, insert ring and N type-male body to the stripped 1/2 in. feeder line in this order. O-ring is inserted into the second groove from inside of outer insulator.

6) Tighten the clamping nut and N type-male body inserted into the 1/2 in. feeder line firmly using a spanner. The recommended torque for tightening the clamping nut and N type-male body is 306~510 lbf·ft (30~50 N.m). (Note that it should only be tightened by rotating the external body with the clamping nut in a fixed and stable position.)

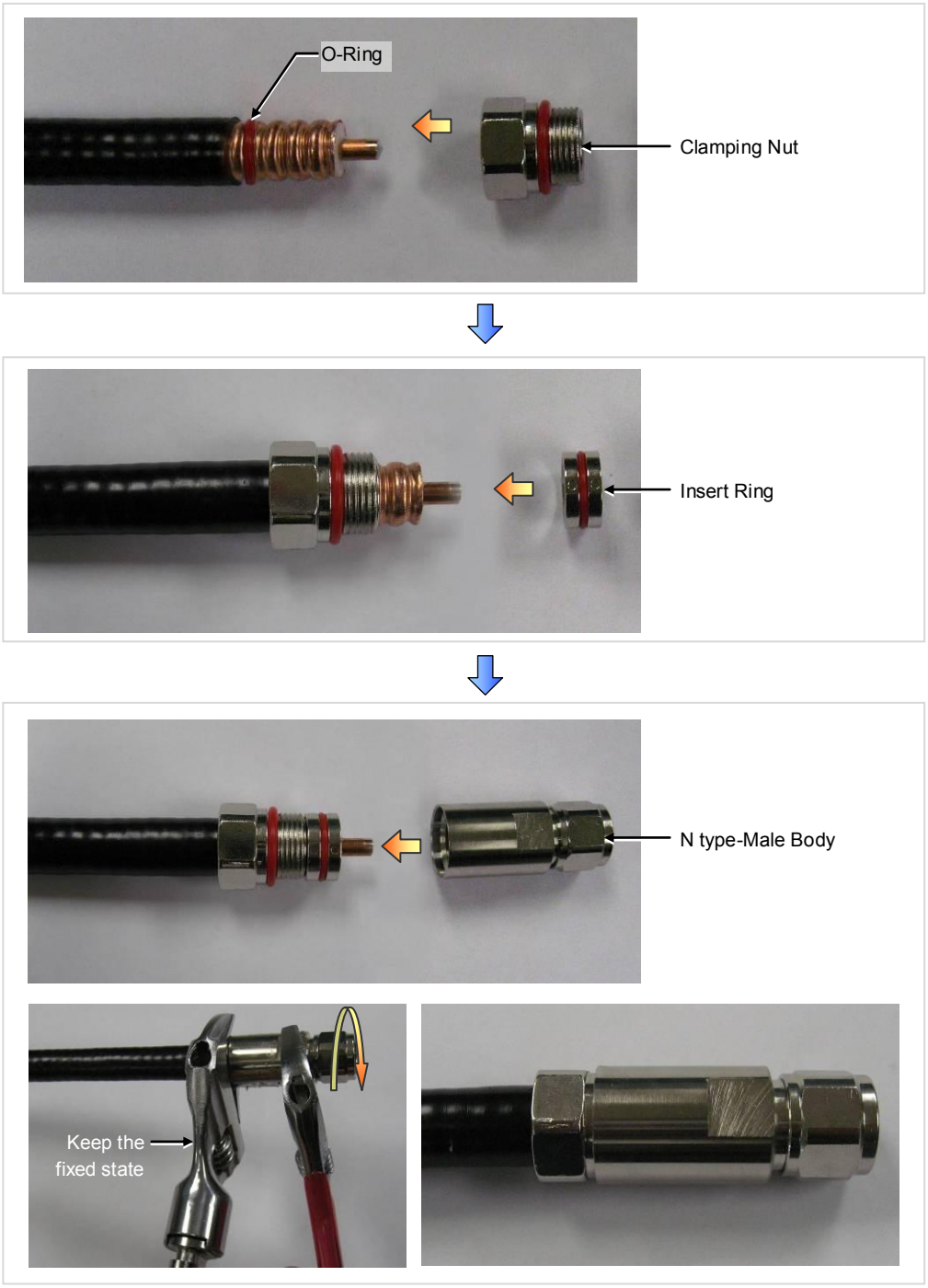


Figure C.10 Assembling the N type-male (1/2 in. Feeder Line) Connector (3)

7) Insert the heat shrink tube into the 1/2 in. feeder line fitted with the N type-male connector as shown in the Figure below.
- Heat shrink tube: Φ 1.1 in., 3.94 in. (Φ 28 mm, 100 mm)

8) Shrink the heat shrink tube inserted into the 1/2 in. feeder line using a heating gun.

Figure C.11 Assembling the N type-male (1/2 in. Feeder Line) Connector (4)

CHECK

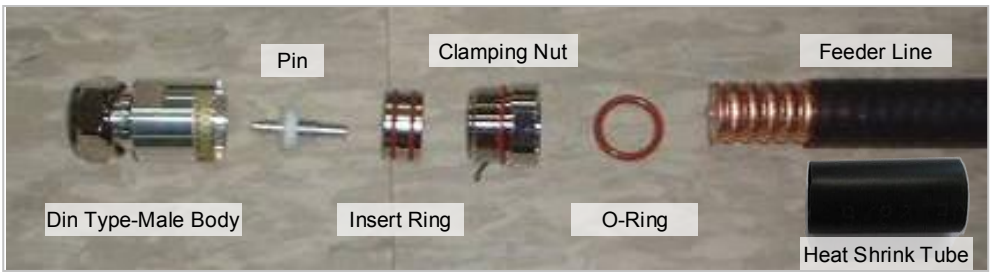
Checking to carry out when assembling the N type-male connector

The shape, tool and assembly method may differ depending on the connector type and manufacturer. Make sure to check the user manual provided by the manufacturer before assembling.

C.6 Din type-male (1/2 in. Feeder Line)

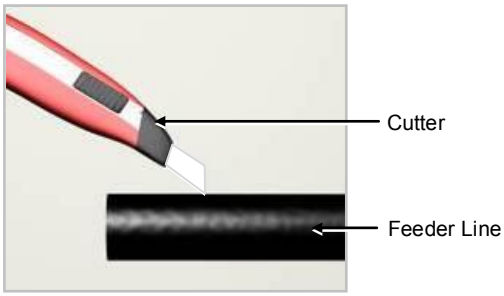
Below is the method for assembling the Din type-male connector to the 1/2 in. feeder line.

1) The components of the Din type-male are an Din type-male body, pin, an insert ring, a clamping nut, o-ring, and a heat shrink tube, and it is assembled using the wire stripper, trimming tool, wrench, etc.



2) Straighten the cable, then, using a suitable tool, strip it to the connector's wire strip length. When cutting the sheath, hold the cable firmly with one hand and cut the cable pulling the cutting tool inwards with the other hand. Gently rotate the tool several times (do not pull it too hard), so that the internal copper line is not damaged.

3) Using a cutter, cut the sheath from the stripped edge to the end of the cable and completely strip the sheath.



4) Insert the o-ring, clamping nut, insert ring, pin and Din type-male body into the stripped feeder line in this order.

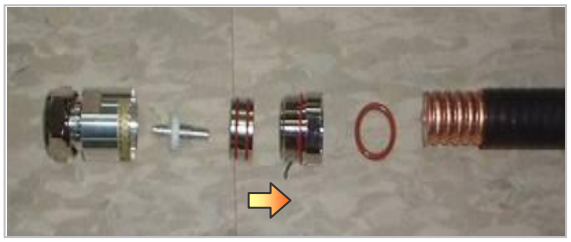
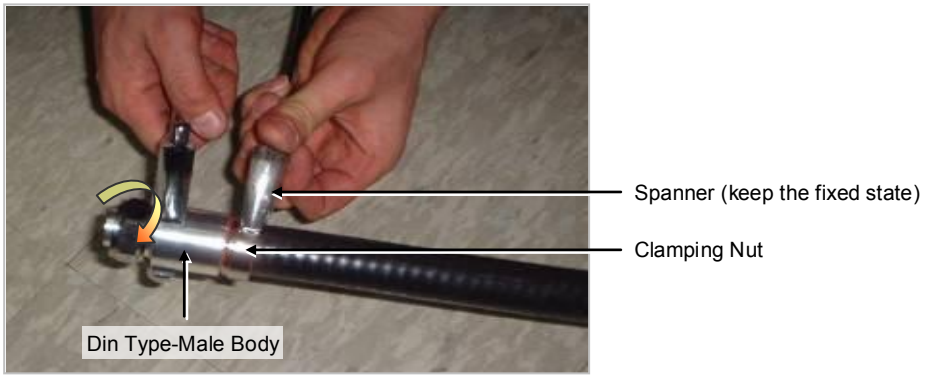


Figure C.12 Assembling the Din type-male (1/2 in. Feeder Line) Connector (1)

5) Tighten firmly the clamping nut and Din type-male body inserted to the 1/2 in. feeder line using a wrench. The recommended torque for tightening the clamping nut and Din type-male body is 30~50 N.m. (Note that it should only be tightened by rotating the external body with the clamping nut in a fixed and stable position.)



6) Insert the heat shrink tube to the 1/2 in. feeder line fitted with the Din type-male connector; and shrink the heat shrink tube inserted into the feeder line using a heating gun.
- Heat shrink tube: Φ 1.1 in., 3.94 in. (Φ 28 mm, 100 mm)

Figure C.13 Assembling the Din type-male (1/2 in. Feeder Line) Connector (2)

CHECK

Checking to carry out when assembling the Din type-male connector

The shape, tool and assembly method may differ depending on the connector type and manufacturer. Make sure to check the user manual provided by the manufacturer before assembling.

C.7 Finishing the Connector Connection Part by Tape

Finishing the connector connection part by tape (insulation tape, rubber tape, etc.) in the outdoor environment is as follows:

1) Overlap the exposed part of the connector connection part using rubber tape (Keep a distance as the half size of rubber tape) and press it with your hands lightly to make rubber tape adhere well.
2) Wrap the part where the rubber tape is attached using insulation tape two times or more. When cutting off the tape, cut it off neatly using a cutting device such as scissors or a knife.
3) Bind the end part of the insulation tape using cable tie to prevent slips.

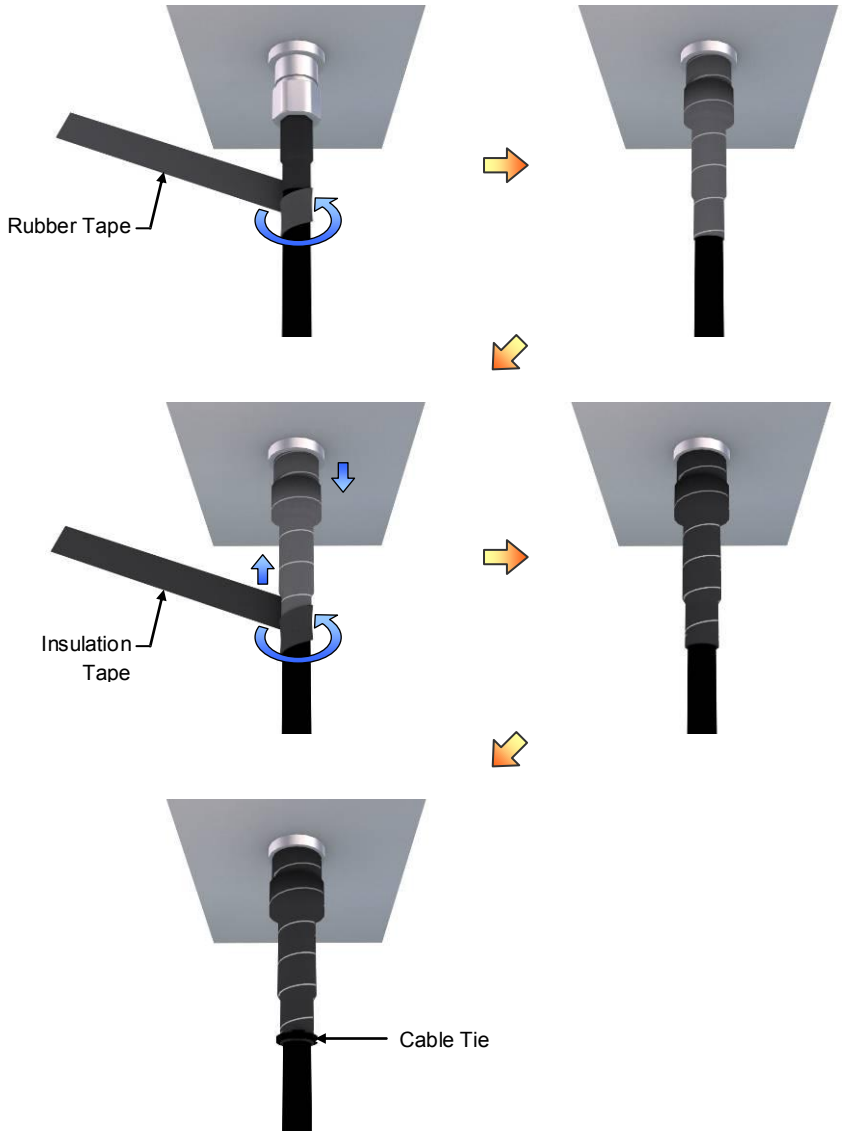


Figure C.14 Finishing the Connector Connection Part by Tape

C.8 How to Shrink the Heat Shrink Tube

C.8.1 When Assembling a Connector to the Feeder Line

Below is the procedure for shrinking the heat shrink tube.

1) Prepare a 1/2 in. feeder line, heat shrink tube, and heating gun to finish the cable using a heat shrink tube.

1/2 in. Connector

Heat Shrink Tube (Jelly Type)
28/6 × 5.9 in. (150 mm)

Heating Gun

2) Insert the heat shrink tube into the 1/2 in. feeder line, and then place the heat shrink tube at the end of the cutting area of the connector where the tool will be used.

Cutting Area

3) Set the heating gun to 482 to 572°F (250 to 300°C).

Figure C.15 Shrinking the Heat Shrink Tube_Feeder Line (1)

4) Holding one end of the heat shrink tube with your hand, apply heat starting from the connector using the heating gun.

5) Rotate the heating gun so that heat is evenly distributed to prevent that bubbles are generated or heat is concentrated to a specific part.

6) Shrink the heat shrink tube until jelly appears at the end part of it (refer the Figure below) and finish it.

Figure C.16 Shrinking the Heat Shrink Tube_Feeder Line (2)

C.8.2 When Connecting a Connector to another Connector

Below is the procedure for shrinking the heat shrink tube.

1) Prepare a 1/2 in. feeder line, 7/8 in. feeder line, heat shrink tube, and heating gun to finish the cable using a heat shrink tube.

2) Inset the heat shrink tube to one end of the feeder line and connect the connector.

3) Insert the heat shrink tube, placing connector part (where 1/2 in. and 7/8 in. feeder line will be connected) in the center, and mark the center part.

Figure C.17 Shrinking the Heat Shrink Tube_Connection between Connectors (1)

4) Set the heating gun to 482 to 572°F (250 to 300°C).

5) Holding one end of the heat shrink tube with your hand, apply heat starting from the marked part at the center using the heating gun.

6) Rotate the heating gun so that heat is evenly distributed to prevent that bubbles are generated or heat is concentrated to a specific part.

Figure C.18 Shrinking the Heat Shrink Tube_Connection between Connectors (2)

7) Shrink the heat shrink tube until jelly appears at the end part of it (refer the figure below) and finish it.

Figure C.19 Shrinking the Heat Shrink Tube_Connection between Connectors (3)

CHECK

Check for Working with the Heat Shrink Tube

- If you work without holding one end of the heat shrink tube, the location of the heat shrink tube may be changed. Therefore, make sure to hold one end of it when applying heat.

- The connector part where 1/2 in. and 7/8 in. feeder line are connected must be the center of the heat shrink tube. After inserting the heat shrink tube, mark the center part.

- If jelly does not appear on the end of the heat shrink tube, it may mean that it is not shrunk properly. Apply heat until jelly appears using a heating gun.

ANNEX D. Cleaning Optic Connector

D.1 Cleaning Optic Connector

When connecting optical cable to the system, performance of system can be decreased or fails can occur if core section of optical connector is dirty due to dust or foreign material. Therefore, worker should clean the optic connector before connecting optic cable to the system to prevent this phenomenon.
This manual describes the method that cleans optic connector when using the IBC™ Brand cleaner.

CAUTION

Caution When Connecting the Optical Cable

Check whether there is dust or foreign material on the cutting section of the connector core before connecting the optic cable, and keep this away from dust or foreign material.
If the cable is soiled with foreign material, do not blow to remove them. Make sure to clean the connector in accordance with the cleaning directions below.

CHECK

When using Optic Connector Cleaner

When using optic connector cleaner, use the products shown in the example below or their equivalents.

Ex) Manufacturer-USCONEC (http://www.usconec.com)
- IBC™ Brand Cleaner (P/N: 9393): For LC-LC and MU Connector Cleaning
- IBC™ Brand Cleaner (P/N: 9392): For SC Connector Cleaning
- IBC™ Brand Cleaner (P/N: 12910): For ODC Connector Cleaning

Manufacturer-TheFibers (www.thefibers.com)
- HuxCleaner 1.25 mm Type: For LC and MU Connector Cleaning
- HuxCleaner 2.5 mm Type: For SC, FC and ST Connector Cleaning

D.2 IBC™ Brand Cleaner

Method that uses IBC™ Brand Cleaner is as follows:

D.2.1 IBC™ Brand Type Cleaner (P/N 9393)

Method that uses IBC™ Brand Cleaner for LC-LC and MU connector is as follows:

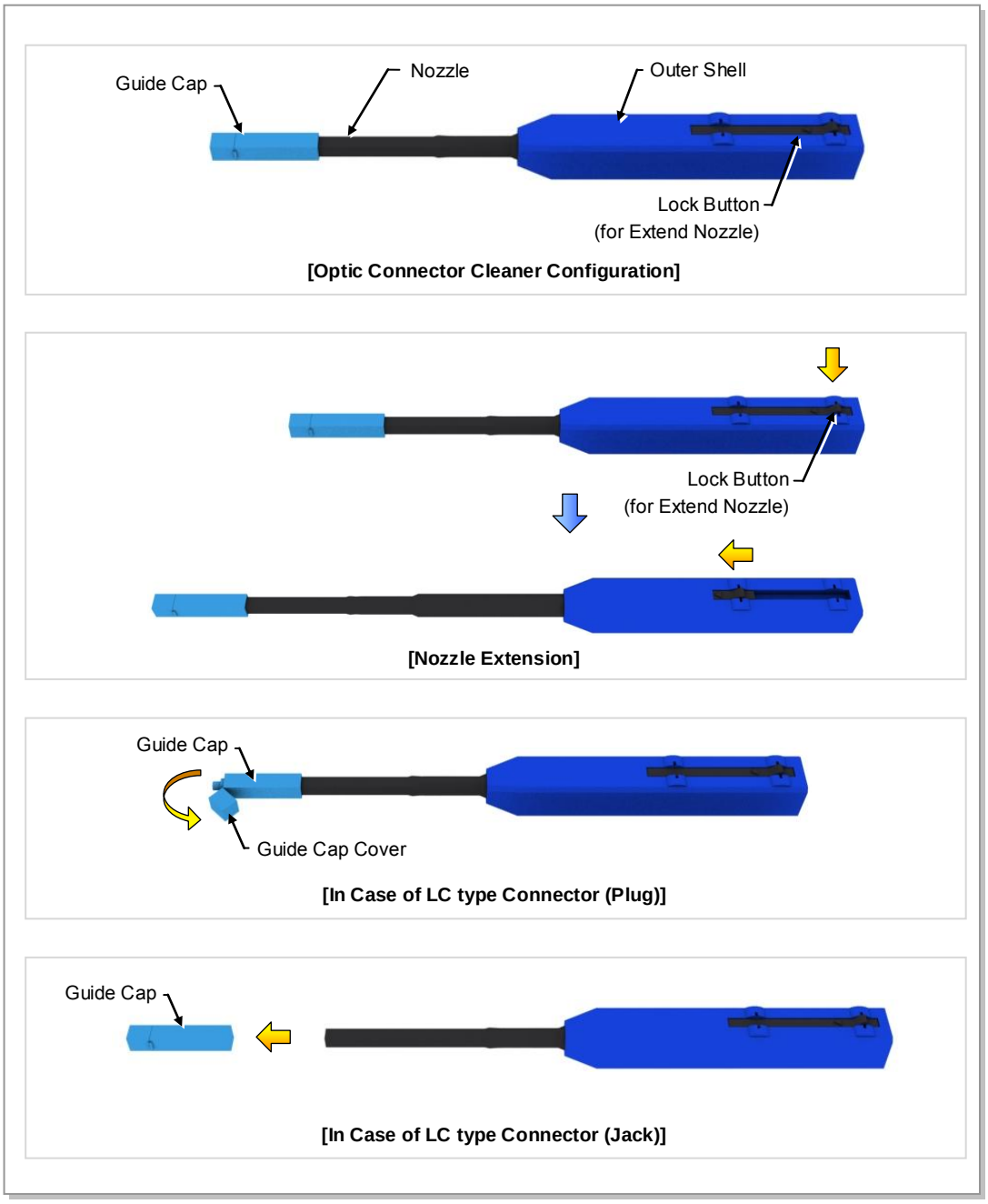
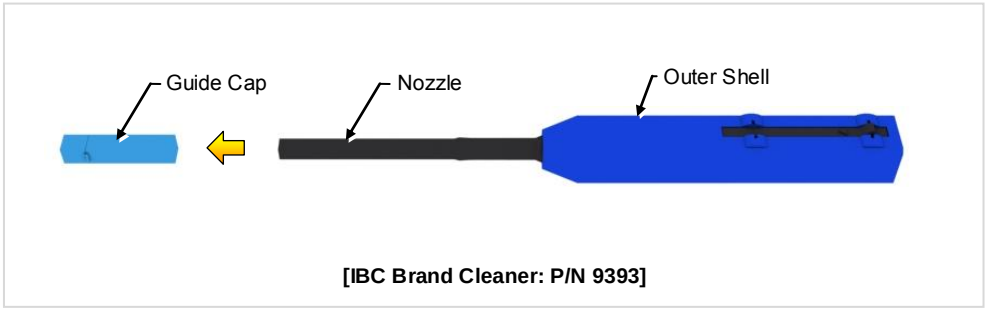


Figure D.1 Optic Connector Cleaner (IBC™ Brand Type Cleaner: P/N 9393)

Optic Module Cleaning (LC Type Jack)

1) To clean the optic module, remove the guide cap from the cleaner (P/N: 9393).



[IBC Brand Cleaner: P/N 9393]

2) Insert a cleaner guide cap to every core of the optic module. Clean it by pushing the outer shell toward the nozzle until you hear the sound of the detergent being sprayed. (Repeat once or twice.)

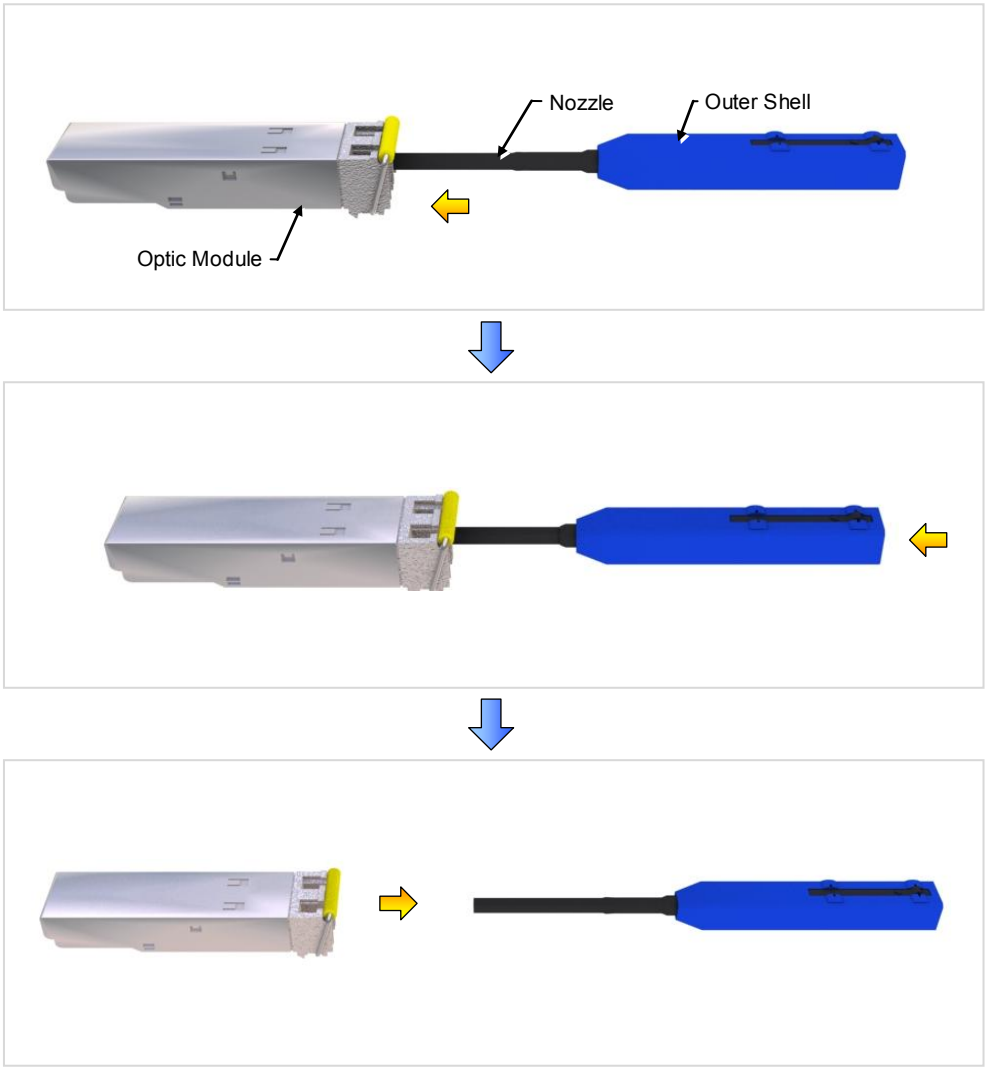
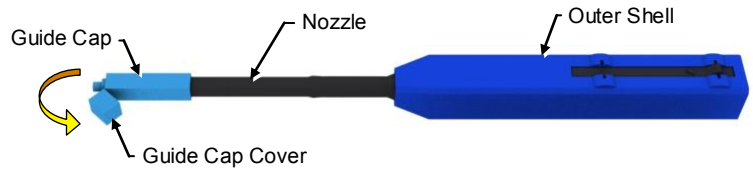


Figure D.2 Optic Module Cleaning (LC Type Jack)

Optic Cable Connector Cleaning (LC Type Plug)

1) To clean the optic cable connector, open the guide cap cover from the cleaner (P/N: 9393).



[IBC Brand Cleaner: P/N 9393]

2) Insert a cleaner guide cap to every core of the optic cable connector. Clean it by pushing the outer shell toward the nozzle until you hear the sound of the detergent being sprayed. (Repeat once or twice.)

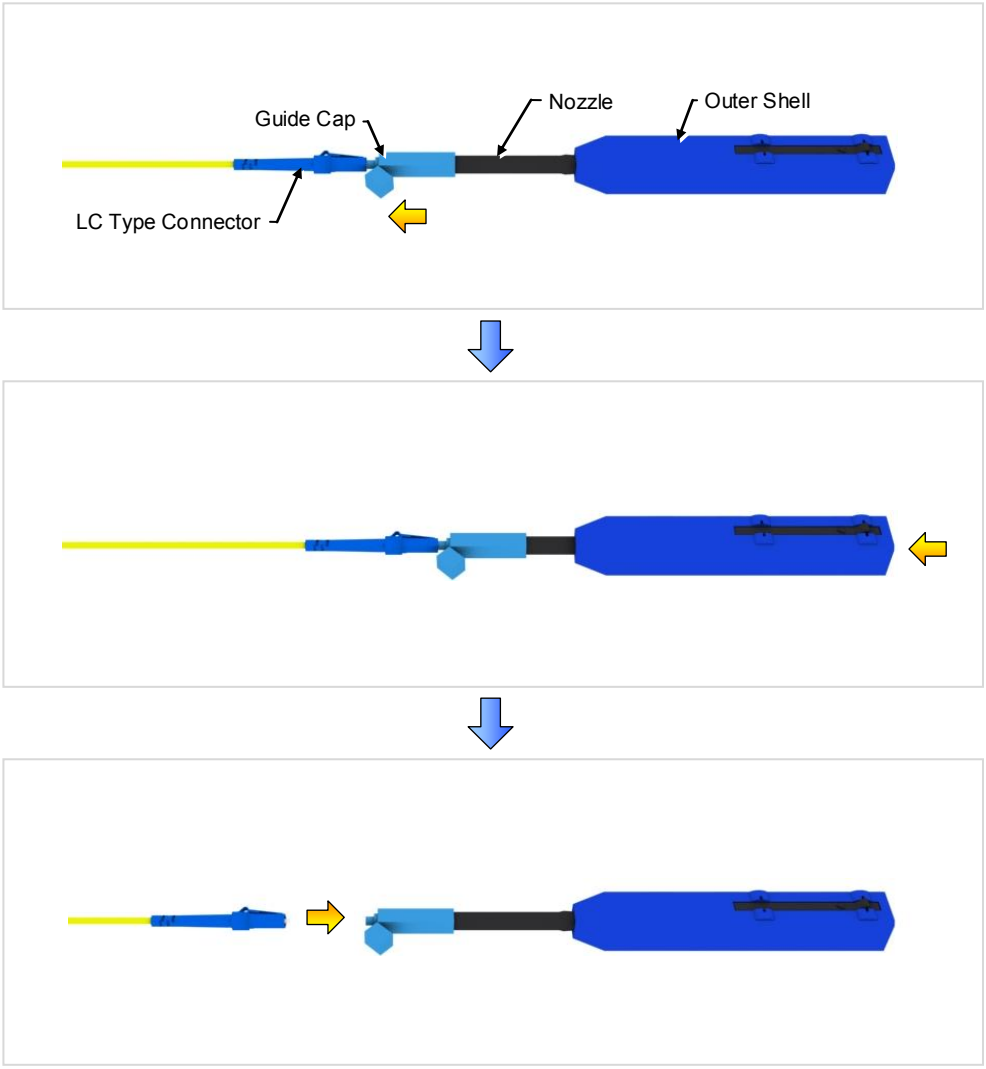


Figure D.3 Optic Cable Connector Cleaning (LC Type Plug)

Measuring the Optical Output and Connecting the Optic Connector

1) Check the optical output again using an optic power meter.
2) If the optical output measurement result meets the reference value, clean the connector again and connect it. If the measurement result does not meet the reference value, discard the cable, replace it with a new cable, and then clean the new one and connect it to the system.

[LC/PC Plug]

[Optic Powermeter]

Figure D.4 Measuring the Optical Output and Connecting the Optic Connector

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ANNEX E. Cable Gland Assembly

CAUTION

Caution When Assembling Cable Gland

If the parts of a cable gland in the system are not correctly installed, outdoor air and moisture may flow into the system and cause corrosion, system fault, or serious fault to the cooling system. Therefore, assemble and finish the cable gland accurately.

CAUTION

Caution When Installing Cable in the Cable Gland

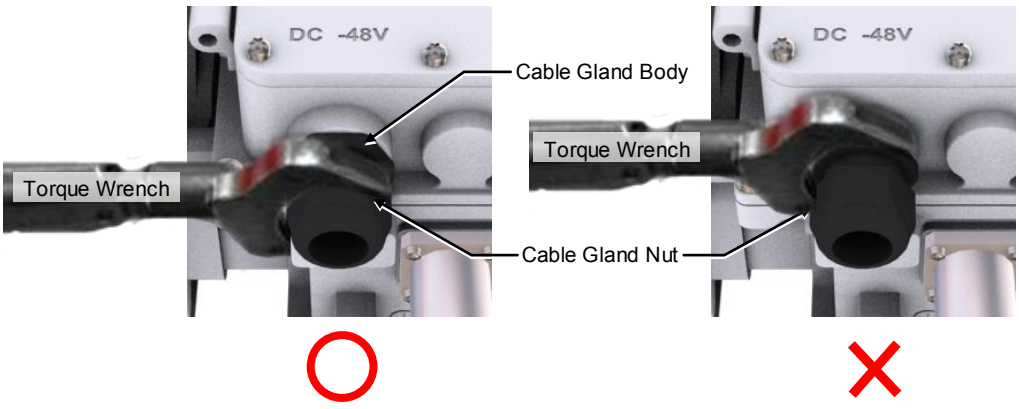
Only one cable of permitted specification (thickness) should be installed in the cable gland.

- The outdoor air or moisture may flow into the system if a cable that is thinner than the specification is used.
- If a cable is thicker than the specification or more than two cables are installed, the cable gland may be damaged.

CAUTION

Caution When Loosening or Tightening Cable Gland Nut

When assembling the cable gland or connecting it to a cable, make sure not to turn other parts (cable gland body) than a gland nut to loosen or tighten the gland. Turning the cable gland body may cause the influx of external air or moisture into the system, which may result in corrosion or system malfunction.



NOTE

Use Torque Wrench When Tightening Cable Gland Nut

Tighten the cable gland nut using a torque wrench with standard torque.

E.1 Cable Gland Components

The components of the cable gland are as follows.

By loosening the gland nuts outside the unit, the cable gland is dissembled into 3 parts as shown in the picture below. (Except for system-side fixing parts)

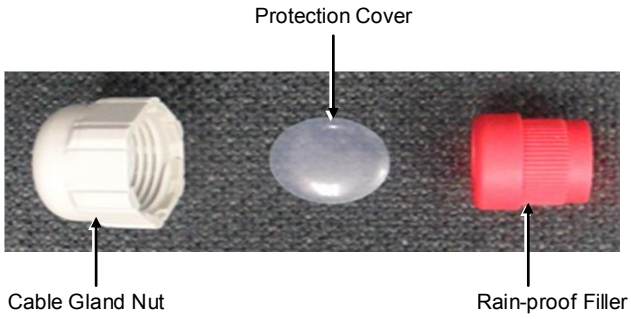


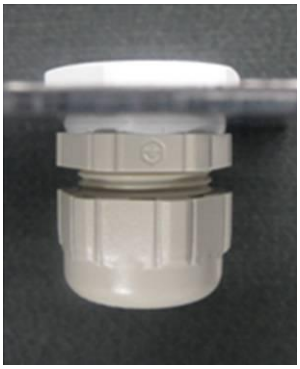
Figure E.1 Cable Gland Components

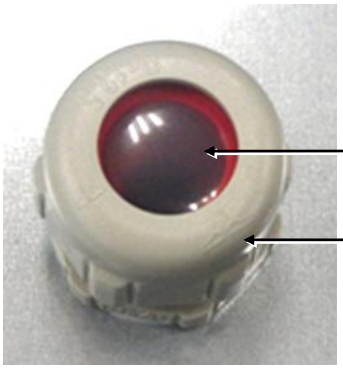
E.2 Cable Gland Assembly and Cabling

When assembling a cable gland, follow the below steps to prevent any moisture or foreign substance from coming in.

1) Check the cable gland built on the unit to see whether it has the protection cover inside the cable gland nut as shown in the picture below (cross-section picture of outer wall of the unit), the same as the original factory configuration.

[Side picture]





2) Separate the cable gland nut by loosening counterclockwise. Here, check the protection cover (circular transparent plate).

[When a cable gland nut is disassembled]

3) Remove the protection cover and keep it carefully.

[When the protection cover is removed]

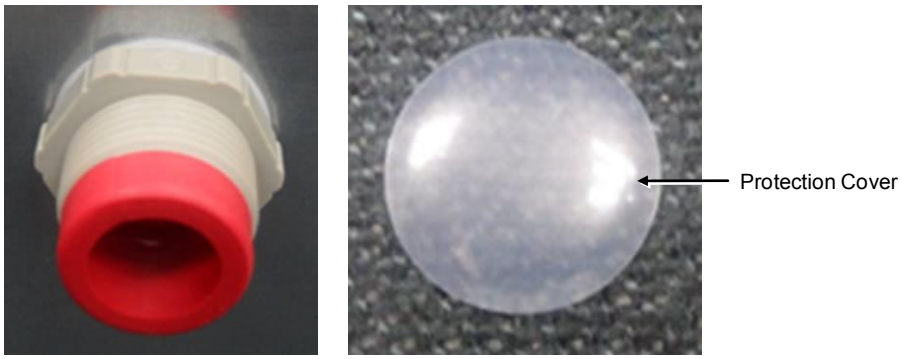
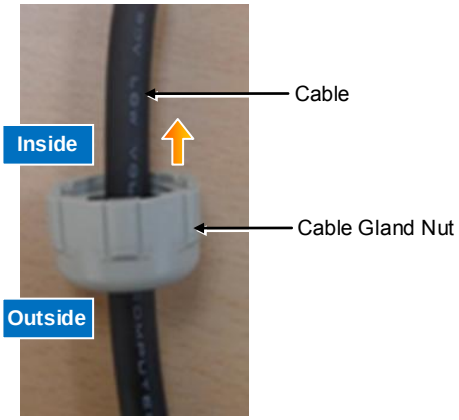


Figure E.2 Cable Gland Assembly and Cabling (1)

4) Separate the waterproof filler from the cable gland body.

[When the rainproof filler is disassembled]

5) Install the cable by passing it through the cable gland nut from outside to inside.



6) After installing the cable through the cable gland body, connect it to the system according to assembling standard and clean up the rest of the cable.

7) Put the rainproof filler on the cable inside the cable gland nut. At this time, widen the waterproof filler and wrap the cable around.

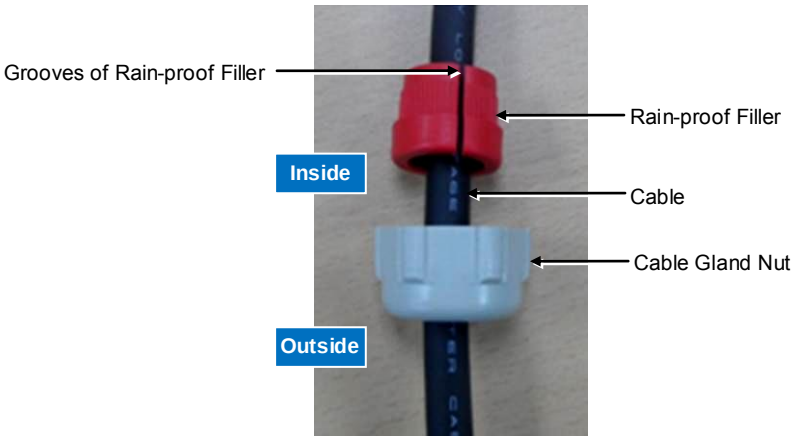
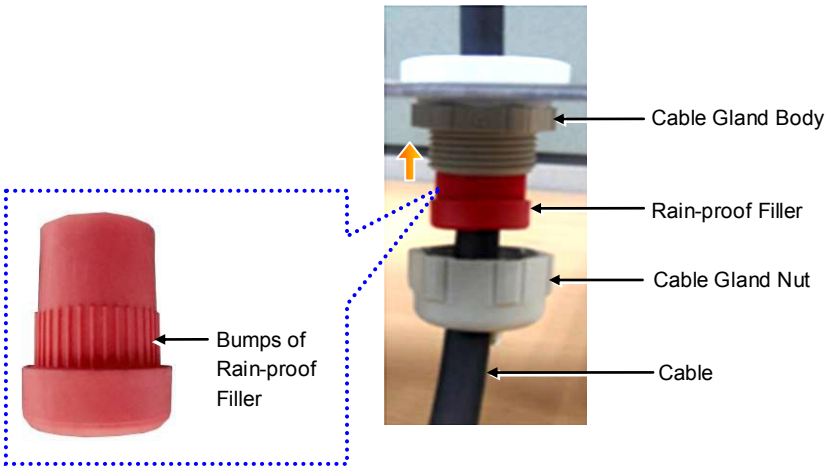
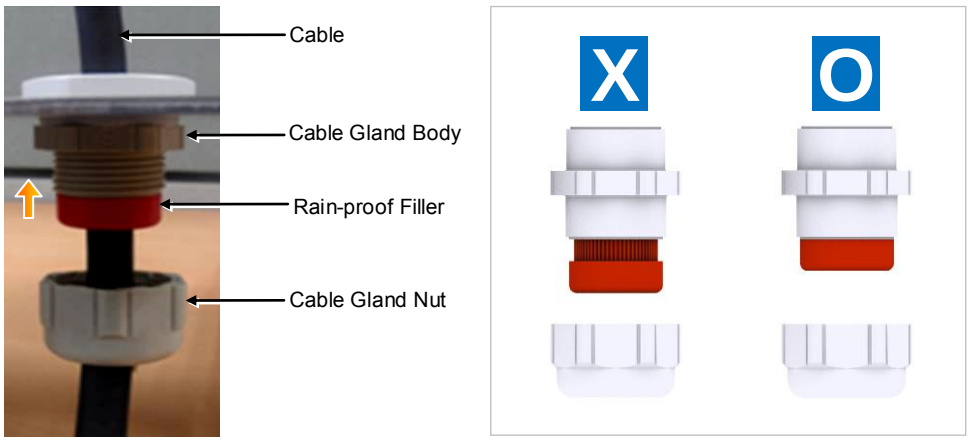


Figure E.3 Cable Gland Assembly and Cabling (2)

8) Push the waterproof filler into the cable gland body. There are bumps inside of a cable gland body and outside of a rainproof filler, which allow easy coupling while preventing slippery rotation. Align the bumps and push the rainproof filler into the cable gland body.



9) Attach the waterproof filler into the cable gland body as shown in the picture below. Make sure it is pushed in completely.



10) Attach the cable gland nut and the cable gland body together and tighten the nut clockwise.

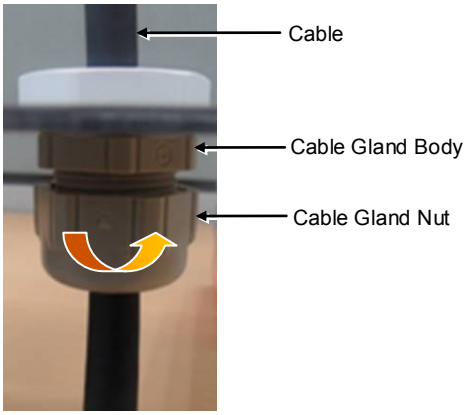


Figure E.4 Cable Gland Assembly and Cabling (3)

E.3 Unused Cable Gland Inspection and Assembly

The unused cable gland should not be disassembled, and be kept in the original factory configuration.
If the cable gland is disassembled, it should be assembled to the factory default by referring to the sequence of ‘Cable Gland Parts Configuration’.

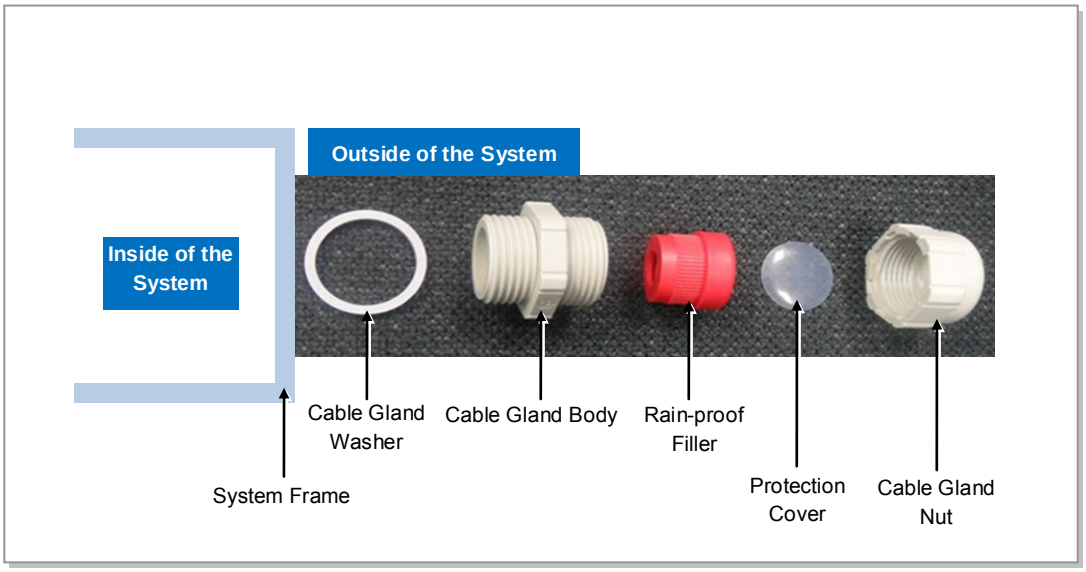


Figure E.5 Unused Cable Gland Inspection and Assembly

CAUTION

Checking Assembly State of the Unused Cable Gland

All components of the unused cable gland must be secured in the original factory configuration. If the cable gland nut is fitted without the waterproof filler or the protection cover in place, reassemble them as illustrated in ‘Unused Cable Gland Inspection and Assembly’.

ANNEX F. Pressure Terminal Assembly

F.1 Preparations

The followings must be prepared to connect a pressure terminal to a cable.

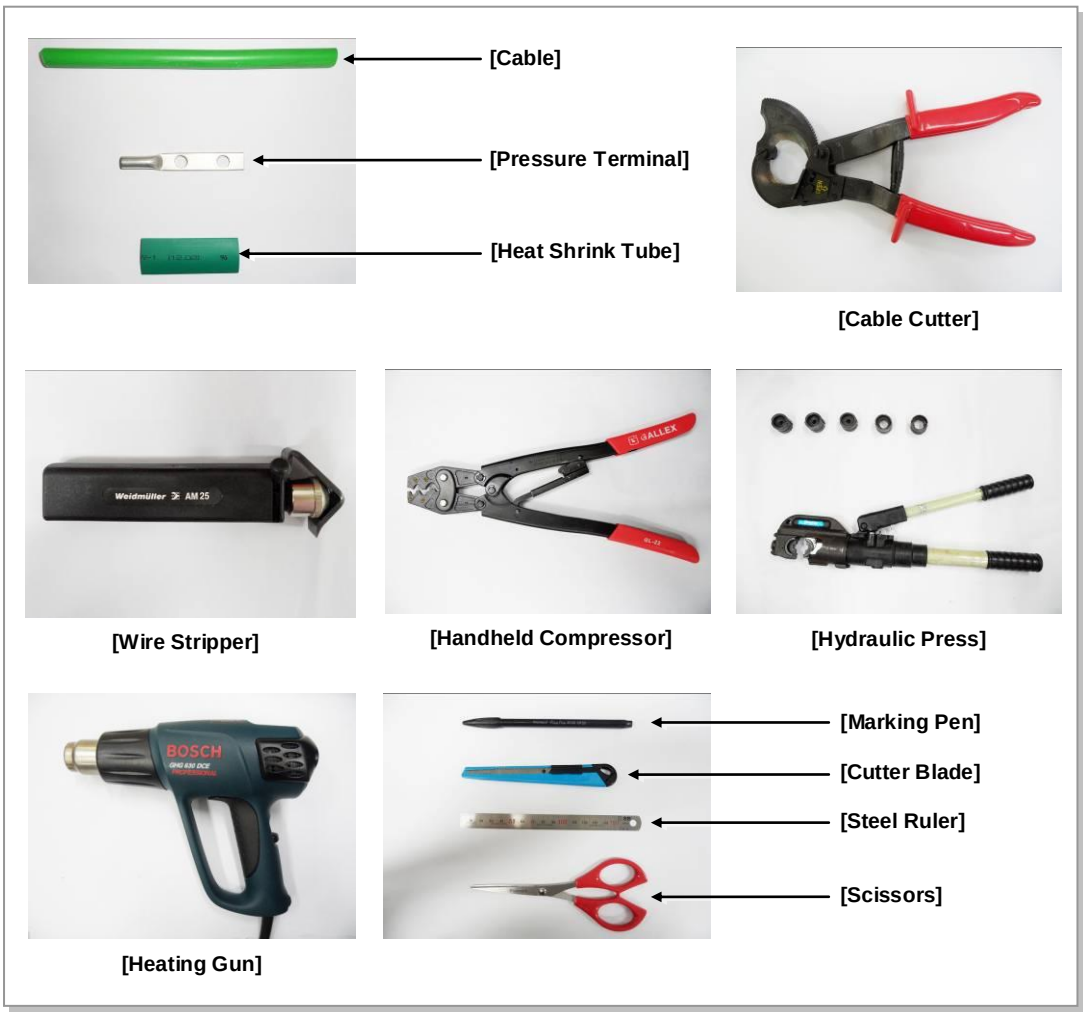


Figure F.1 Preparations

F.2 Pressure Reference Table

The pressure reference table used to assemble a pressure terminal to a cable is shown below.

Table F.1 Pressure Reference Table for Pressure Terminal

Category	Copper tube length of a pressure terminal		Number of pressure points
	mm	In.	
Hand	11 mm or less	0.43 in.	1
Hand	12~15 mm	0.47~0.59 in.	2
Hand	16~23 mm	0.63~0.91 in.	3
Hand	24~32 mm	0.94~1.26 in.	4
Hand	33 mm or more	1.3 in. or more	5
Hydraulic	30 mm or less	1.18 in. or less	2
Hydraulic	31~47 mm	1.22~1.85 in.	3
Hydraulic	48~63 mm	1.89~2.48 in.	4
Hydraulic	64 mm or more	2.52 in. or more	5

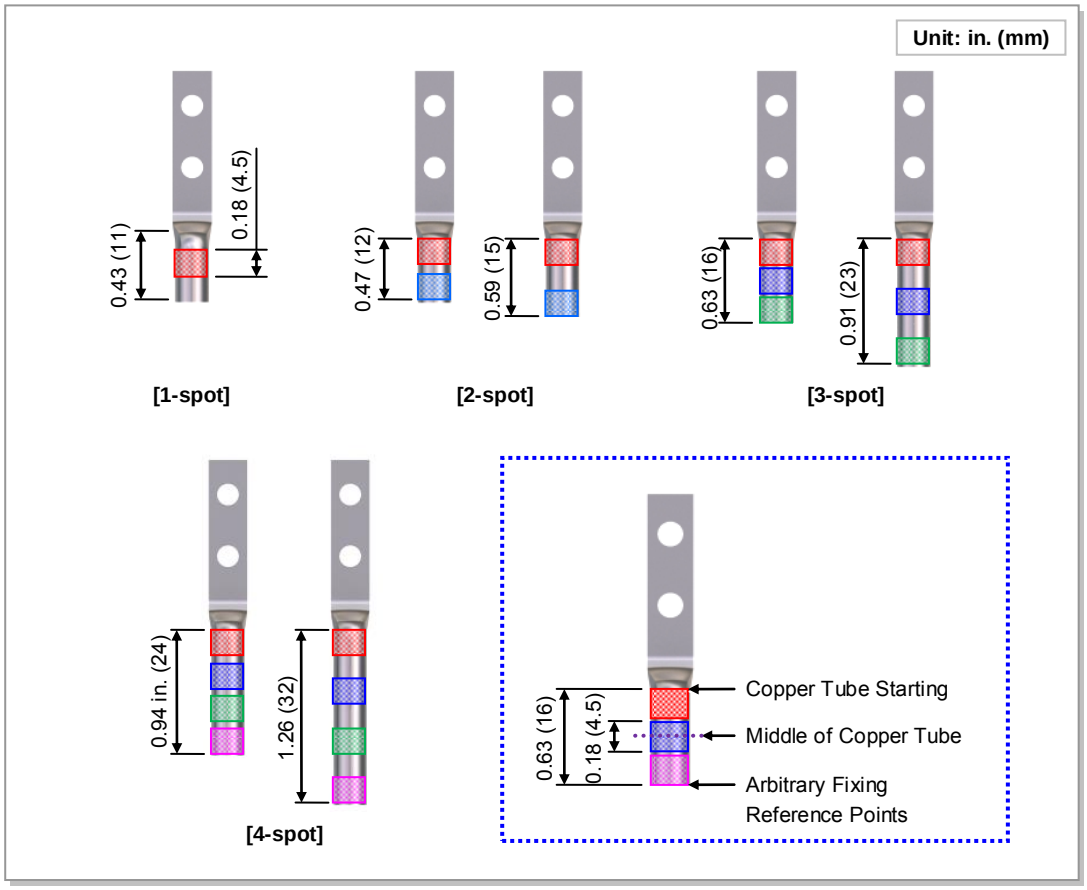


Figure F.2 Pressure Reference Drawing (Handheld Compressor)

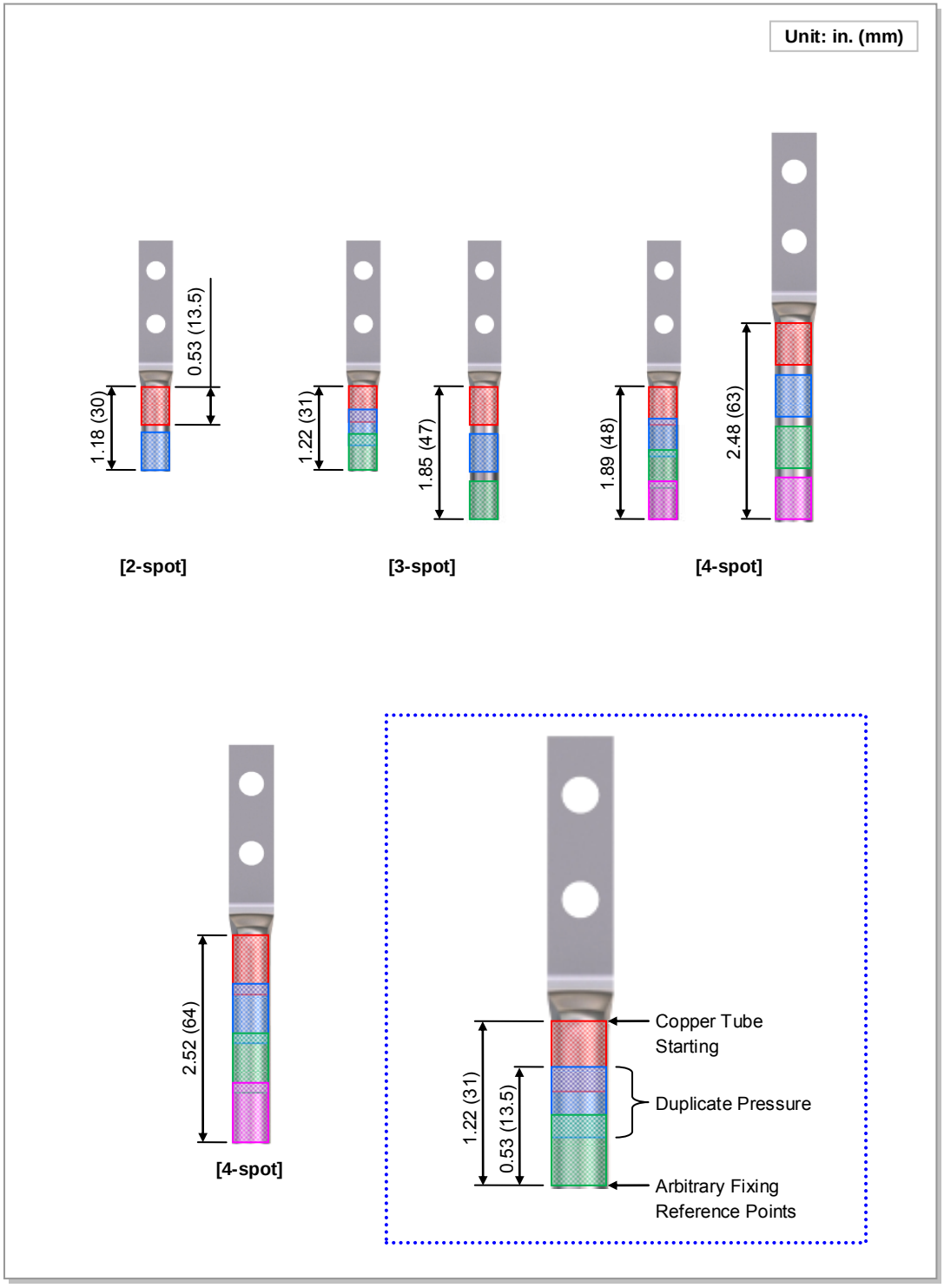


Figure F.3 Pressure Reference Drawing (Hydraulic Press)

Table F.2 Compressor Specifications per Cable Thickness

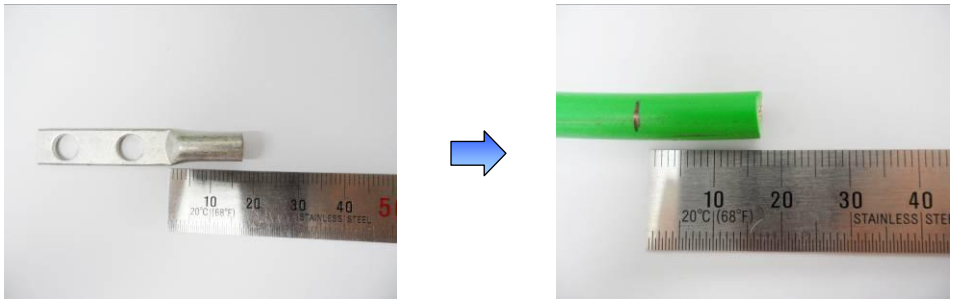
Cable Size (mm^2)	Press Size		
	Small Handheld Press	Large Handheld Press (AK-38, 100)	Hydraulic Press (IZUMI Hexagonal Dies)
2.5	2	X	X
4	2	X	X
6	5.5	X	X
10	8	8	X
16	14	14	16
25	22	22	25
35	38	38	35
50	X	60	50
70	X	80	70
95	X	100	95~300

F.3 Assembling Pressure Terminal

The procedures for assembling a pressure terminal to a cable are as follows:

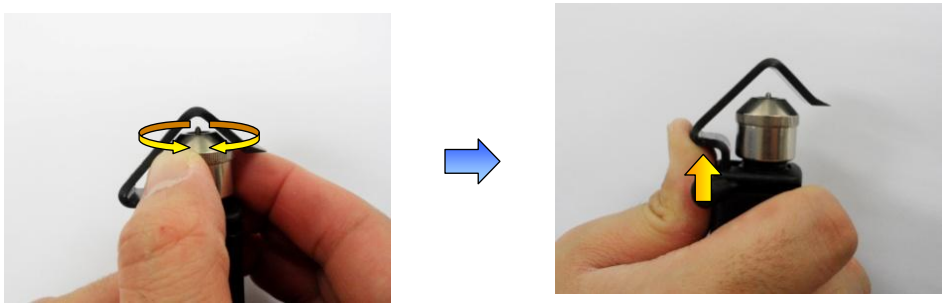
Strip the Cable Sheath

1) After checking the inside length of a pressure terminal, mark the cable.



2) Adjust the length of a cutter blade according to the sheath thickness of the cable.

3) Push the clamp with a thumb a ccording to the cable size to secure a space for the cable.



4) Put a cable into a clamp, locate a blade on a marking position, and push it into the sheath.

5) Align the stripper to be perpendicular to the cable and rotate it more than two laps.

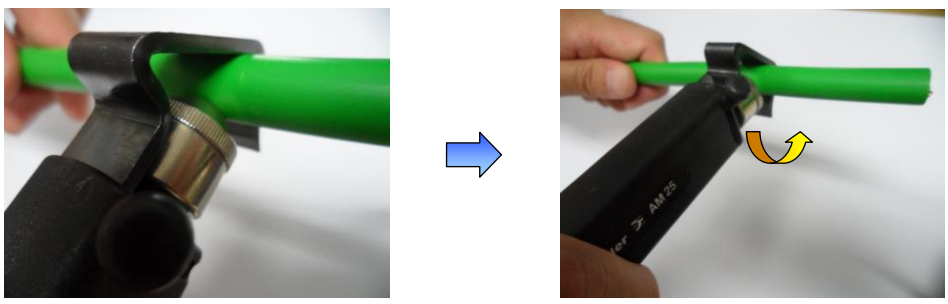
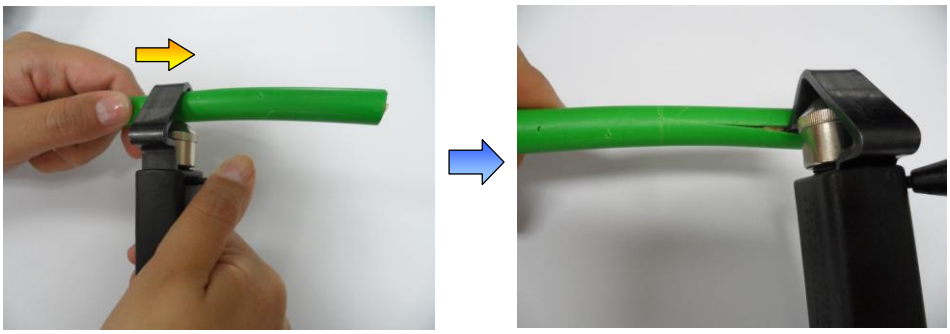


Figure F.4 Stripping Cable Sheath (1)

6) Push the lever of the stripper to the right to turn its blade at 90°.

7) Move the stripper up to the end of cable while maintaining the stripper to be perpendicular to the cable.



8) Remove the sheath.

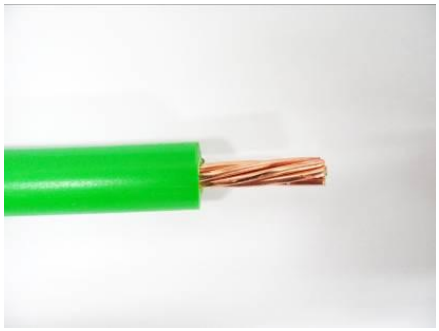


Figure F.5 Stripping Cable Sheath (2)

CHECK

Checking When Using A Wire Stripper

A wire stripper is used differently depending on its manufacturer or type. Therefore, refer to the user manual enclosed with the product.

The specifications and cautions of a wire stripper described in this manual are as follows:

- Vender: Weidmuller
- Model: Weidmuller-AM25 (Order No-9001080000)
- Specifications: For outer diameter 0.24~0.94 in. (6~24 mm) PVC clothing Up to 4.5 mm clothing cutting depth

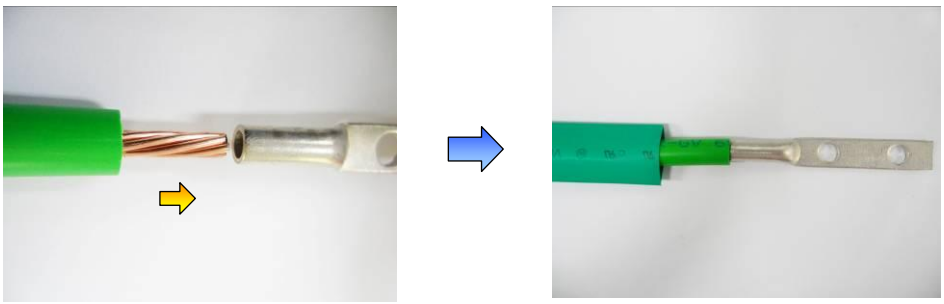
- To prevent the cutter blade of a wire stripper from touching the cable conductor, adjust the length of cutter blade by checking the cable sheath thickness.
- Make sure that the cutter blade goes into the cable sheath completely.
- Rotate the wire stripper perpendicularly to the cable.

[X]

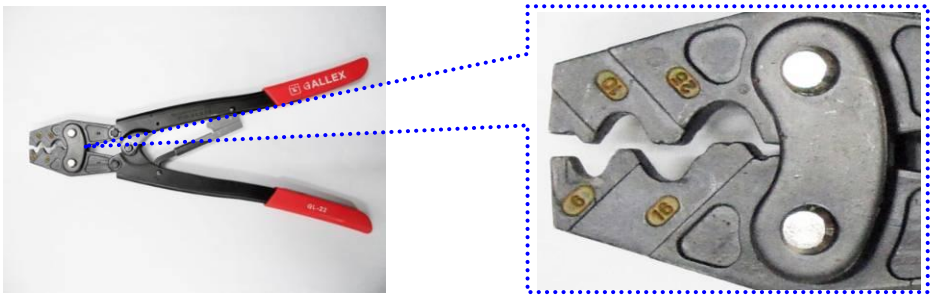
[O]

Fixing Pressure Terminal (Handheld Compressor)

1) Insert the conductor of the cable with the sheath stripped to the internal end of pressure terminal. For a ring type pressure terminal, push it in until the conduct comes out 1 mm from the end of the terminal.



2) From the holes of handheld compressor, select one that fits to the pressure terminal.



3) Insert the pressure terminal to the selected hole.

4) Fix the pressure terminal and cable temporarily so the position can be changed later by pressing the compressor.

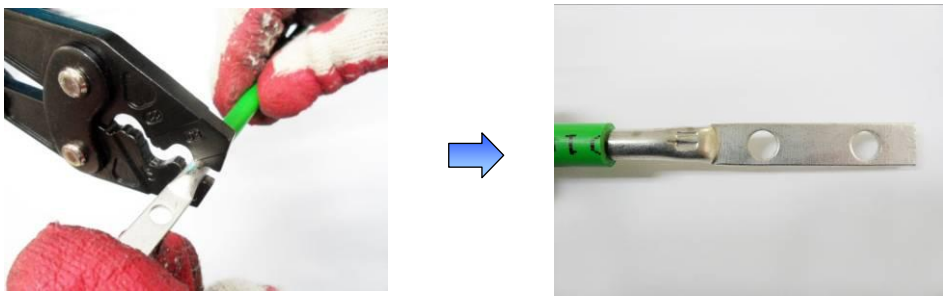
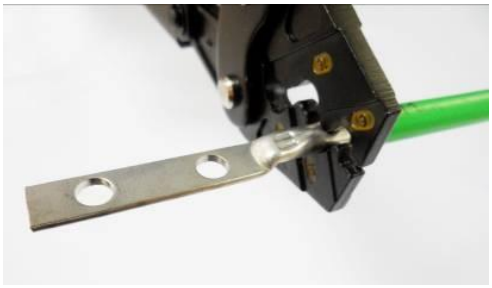


Figure F.6 Fixing Pressure Terminal_Handheld Compressor (1)

5) After complementary of the cable which is temporary fixed, align it to the hole and firmly compress the pressure terminal to secure fix it.



6) Separate the pressure terminal from the handheld compressor. Press down the handle of compressor until a clicking sound is heard to be unlocked.

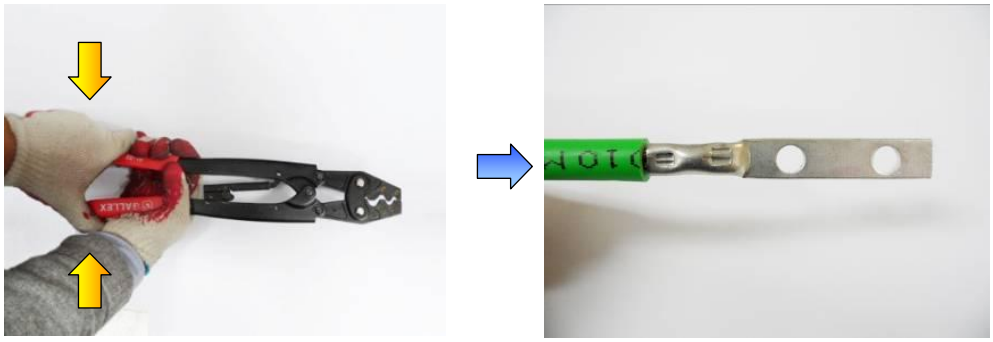


Figure F.7 Fixing Pressure Terminal_Handheld Compressor (2)

CHECK

Checking When Using A Handheld Compressor

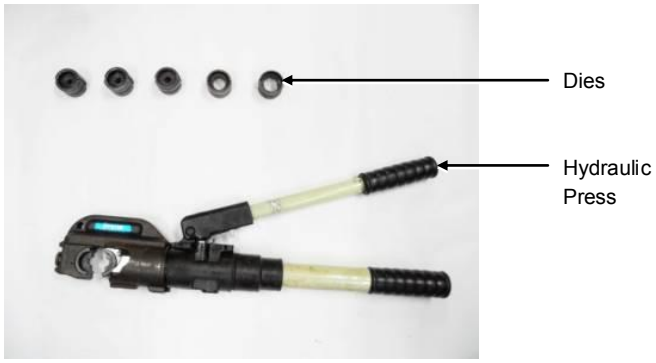
A handheld compressor is used differently depending on its manufacturer or type. Therefore, refer to the user manual enclosed with the product.

The specifications and cautions of a handheld compressor described in this manual are as follows:

- Vender: GALLEX
- Model: GL-2045A-22
- Specification: 5.5 mm^2, 8 mm^2, 14 mm^2, 22 mm^2 (JIS)
  6 mm^2, 10 mm^2, 16 mm^2, 25 mm^2 (DIN)

Fixing Pressure Terminal (Hydraulic Press)

1) Among the dies of the hydraulic press, select one that fits to the pressure terminal.



2) Assemble the dies to the pressing area of the compressor.

3) Insert the pressure terminal into the pressing area and fix it slightly by aligning it to the end of cable sheath.

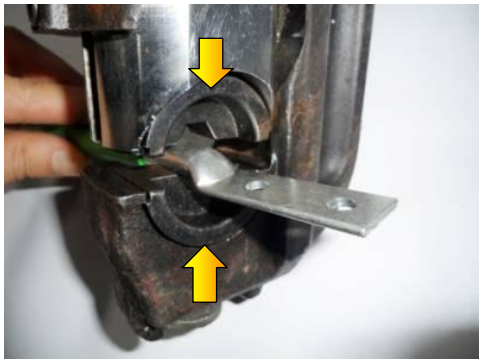
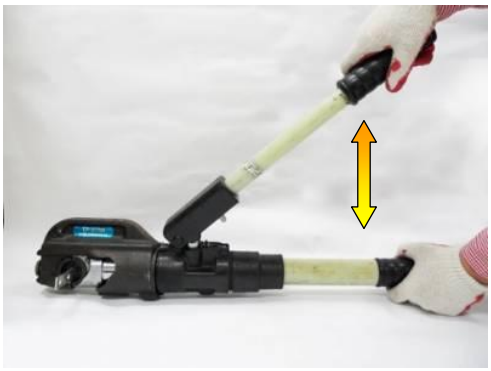


Figure F.8 Fixing Pressure Terminal_Hydraulic Press (1)

4) Move the compressor lever up and down to press the pressure terminal firmly.



5) Turn the top compressing lever clockwise and then push it down. When the pressing area of compressor is loosened, remove the pressure terminal.

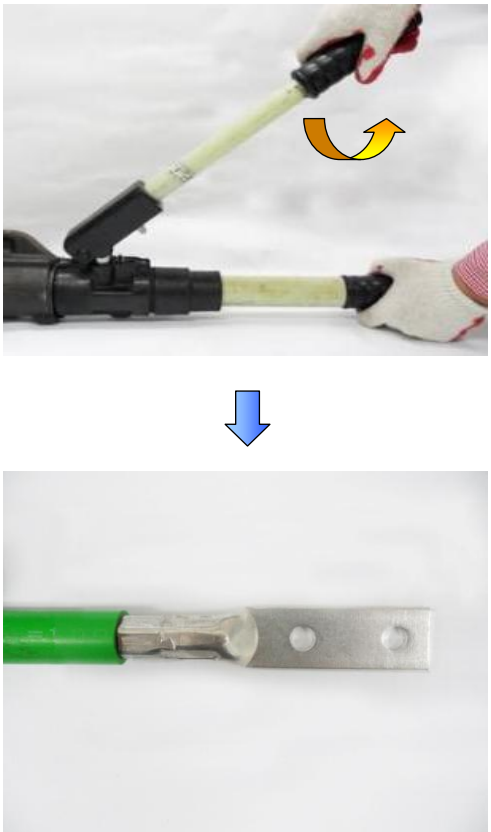


Figure F.9 Fixing Pressure Terminal_Hydraulic Press (2)

CHECK

Checking When Using a Hydraulic Press

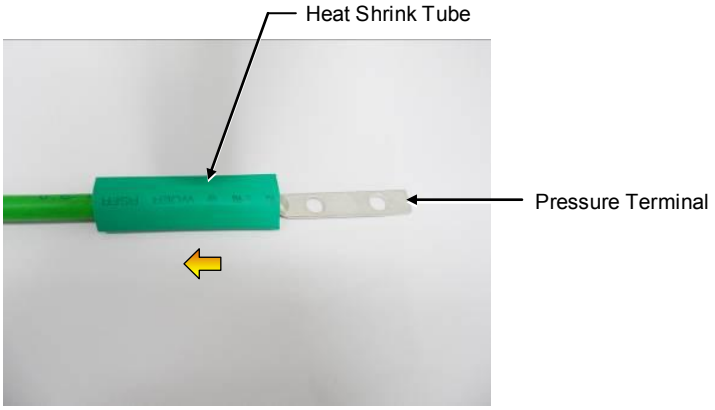
A hydraulic press is used differently depending on its manufacturer or type. Therefore, refer to the user manual enclosed with the product.

The specifications and cautions of a hydraulic press described in this manual are as follows:

- Vender: IZUMI
- Model: IZUMI-EP-510B
- Specification: Circular 32~160 (SQ)
  Hex 14~325 (SQ)

Assembling Heat Shrink Tube

1) After assembling a pressure terminal, move the heat shrink tube, inserted to the cable, to the end of pressure terminal copper tube.



2) Set the temperature of the heat gun to 356-392°F (180-200°C).

3) Locate a heat shrink tube to cover the entire copper tube of the pressure terminal.

4) Rotate a heat gun 360° to apply heat evenly to shrink the tube.
(Because the pressure terminal and the cable is hot due to the heat of a heating gun, be careful not to have a burn.)

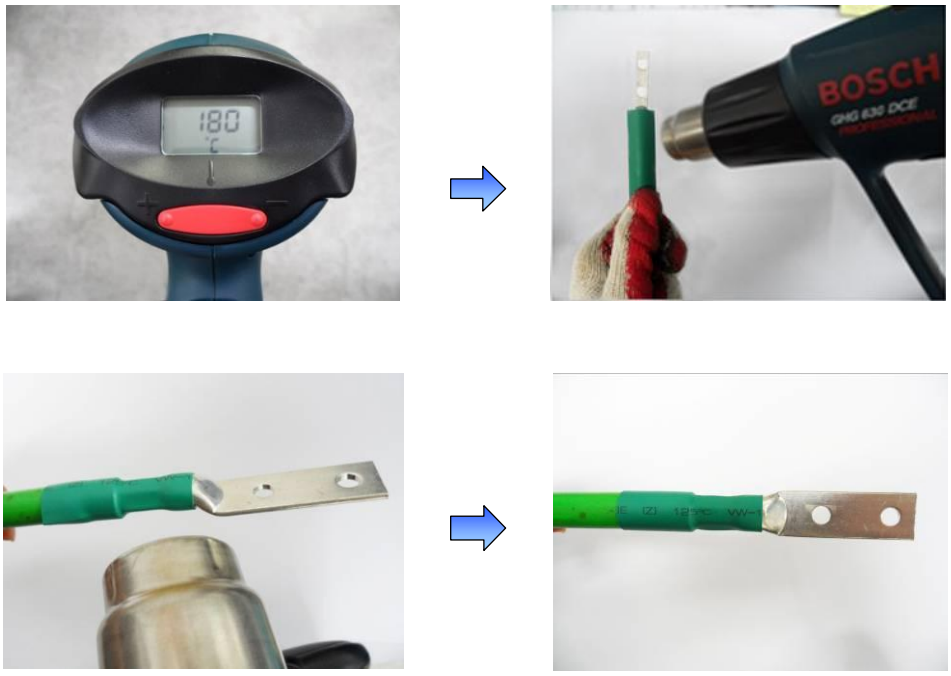


Figure F.10 Assembling Heat Shrink Tube

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ANNEX G. Standard Torque

When you tighten the bolt, refer to the standard torque value below to prevent the equipment and bolt from damage and secure by tightening. When the torque value for each connection part is defined already, refer to the defined value.

Table G.1 Standard Torque Value for Tightening Bolts

Bolt Spec.	Torque Value (kgf.cm)	Torque Value (N.m)	Torque Value (lbf.ft)
M3	4.08~6.12	0.40~0.60	0.29~0.44
M4	9.52~14.28	0.93~1.40	0.69~1.03
M5	20.0~30.0	1.96~2.94	1.45~2.17
M6	33.28~49.92	3.26~4.90	2.41~3.61
M8	82.4~123.6	8.08~12.12	5.96~8.94
M10	166.4~249.6	16.32~24.48	12.03~18.05
M12	292.0~438.0	28.64~42.65	21.11~31.67

Table G.2 Brass Bolts Torque Value

Bolt Spec.	Torque Value (kgf.cm)	Torque Value (N.m)	Torque Value (lbf.ft)
M6	29.98 ± 10 %	2.94 ±10 %	2.17 ± 10 %
M8	64.26 ± 10 %	6.3 ± 10 %	4.16 ± 10 %

Checking Standard Torque Value

Torque value can be different, defending on the material, characteristic and specification of the equipment and fastener. Make sure to check the proper torque value for each specification of the equipment and fastener.

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ABBREVIATION

C

CPRI	Common Public Radio Interface

D

DU	Digital Unit

E

eNB	evolved UTRAN Node-B

L

L9CA	LTE eNB Channel card board Assembly
LTE	Long Term Evolution

M

MGB	Main Ground Bar
MIMO	Multiple-Input Multiple-Output

R

RET	Remote Electrical Tilt
RF	Radio Frequency
RRH	Remote Radio Head

T

TGB	Tower Ground Bar

U

UADU	Universal Platform type A Digital Unit
UAMA	Universal platform type A Management board Assembly

V

VSWR	Voltage Standing Waveform Ratio

MPE Information

	Warning: Exposure to Radio Frequency Radiation The radiated output power of this device is far below the FCC radio frequency exposure limits. Nevertheless, the device should be used in such a manner that the potential for human contact during normal operation is minimized. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna should not be less than 300 cm during normal operation. The gain of the antenna is 17.0 dBi. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Mobile WiMAX/TD-LTE Smart MBS, U-RAS Flexible V2 RRH-B4

Installation Manual

SAMSUNG ELECTRONICS