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5 Installation Check

Upon completion of all hardware installation, check the installation including the following aspects: overall check, power-on check, environment condition check and system commissioning.

5.1 Overall Check

5.1.1 Checking Equipment Installation

- All the equipment should be steady and neat in appearance when installed.
- All the bolts and nuts are fastened. And plain washers and spring washers are applied under all the nuts with the plain washer under the spring washer.
- There should be no missing or damaged parts on the equipment, and all the cables should be intact.
- The rack interior should be cleaned. Fingerprints and smudges left during the installation should be cleaned. There should be no dust in the rack.

5.1.2 Checking Cable Connection

- Power cables should be well connected. The connector should not be loose or damaged. And there should be no scratch or fissure on the power cable skin.
- Check whether the contact of the grounding cable is good.
- Check whether the trunk cable connections are secure and correct.
- All the cables should be secure. Do not over-strain the cables running round the corner. Cables and fibers should run in straight and smooth courses without any cross. Cables and fibers in the same direction should be bundled up. The cable layout should be neat and tidy with the same bundling space. Signal cables cannot be bundled with power cables and grounding cables.
- There should be no damage to the skin of all the cables.

5.1.3 Checking Lightning Protection Grounding

I. Checking outdoor grounding

Outdoor grounding check includes the following aspects:

- Outdoor grounding bar should be connected to the counterpoise with grounding bus. DO NOT connect the outdoor grounding bus to the grounding flat steel of the feeder lightning arrester.

- Check whether there is good electrical connection between the UPS shell and the UPS external box via screws. UPS external box should be grounded.
- Check whether the protection grounding cable of AC lightning protection box or IAFB is directly connected to the protection grounding bar. Make sure the grounding cable is shorter than 1m.
- The AC power cable from the exterior to the BTS should be directly connected to the AC lightning protection box (when AC lightning protection box is available) or to the IAFB (when AC lightning protection box is unavailable). It is not allowed to connect the external power cable to the power distribution terminal in the work box first and then to the AC lightning protection box.
- When E1 cable is used for signal transmission of the BTS, if the E1 cable from the exterior to the BTS is coaxial cable with metal shell (provided by the user), its metal shell should be grounded with grounding clip. The grounding cable from the grounding clip should be directly connected to the protection grounding bar instead of to the grounding bar of the IAFB.
- In BTS outdoor tower installation mode, the shielding covering of the BTS coaxial feeder should be grounded at the tower-top and the front end connecting the BTS. The grounding cable should be connected to the tower body nearby. The protection grounding bar should have separate grounding downlead that is not insulated from the tower body.
- When the feeder is not shorter than 60m, the shielding covering of the coaxial feeder should be grounded at the middle of the tower body.

II. Checking indoor grounding

Indoor grounding check includes the following aspects:

- In BTS indoor installation, there should be indoor grounding bar and outdoor grounding bar that should be led into the counterpoise separately instead of being connected in series directly with grounding cables.
- The grounding cable at the point where the feeder enters the feeder window is connected to the outdoor grounding bar in the direction from the antenna to the BTS.
- The AC lightning protection box provides separate grounding cable to connect to the indoor grounding bar. The grounding cable from the AC lightning protection box or from the IAFB to the indoor grounding bar should be shorter than 1m.
- Check whether there is good electrical connection between the UPS shell and the UPS external box via screws. UPS external box should be grounded.
- When E1 cable is used for signal transmission of the BTS, if the E1 cable from the exterior to the BTS is coaxial cable with metal shell (provided by the user), its metal shell should be grounded with grounding clip. The grounding cable from the grounding clip should be directly connected to the indoor grounding bar instead of to the grounding bar of the IAFB.

- The shielding covering of the coaxial feeder should be well grounded at the tower-top, tower-bottom and the outside of the entrance to the equipment room. When the feeder is not shorter than 60m, the shielding covering of the coaxial feeder should be grounded at the middle of the tower body.
- The outdoor grounding bar and indoor protection grounding bar should share the counterpoise of the equipment room. The outdoor grounding bar should not be connected to the tower counterpoise for grounding.
- The feeder skin should be grounded after the feeder enters the equipment room. The grounding cable from the feeder skin should be directly connected to the indoor grounding bar.

5.2 Power-on Check

- 1) Check whether the voltage of the power supply is normal (normal voltage range: 150VAC~300VAC). If it is normal, turn on the power switch of the BTS and check whether the indicators on the power supply module of the BTS are normal. Please refer to User Manual for indicator descriptions.
- 2) Observe the running of boards and modules. Cut off the power supply immediately in case of any exception. Power on all the boards and modules after the fault is removed.

5.3 Checking Environment Condition

- 1) There should be no sundries inside or on top of the sun-shading cover. The cover should be clean without any smudge or fingerprint.
- 2) There should be no redundant tape or cable tie on the cable.
- 3) There should be no tape, cable tie head, waste paper, or packing bag around the BTS.
- 4) All the things around the BTS should be clean and neat in their original appearance.

5.4 System Commissioning

After the BTS is powered on, if the indicators of all the modules are normal, system commissioning should be performed by starting some basic operations and maintenance and function test. The following briefs the items of system commissioning:

- 1) Location update flow
- 2) MO call flow
- 3) MT call flow
- 4) Handover flow
- 5) MO SM flow
- 6) MT SM flow
- 7) MO packet data flow

- 8) MS packet data flow test (downlink traffic rate).

 **Note:**

System commissioning items can be determined as per the specific situation at the site. The above is the system commissioning item list. For details, please refer to relevant engineering documents.

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A Installing IAFB

There are 3 installation modes for IAFB: Wall installation, metal mast installation ($\phi 60\sim\phi 114$) and pole installation ($\phi 150\sim\phi 350$).

A.1 Installation Flow

Figure A-1 is the installation flow of IAFB.

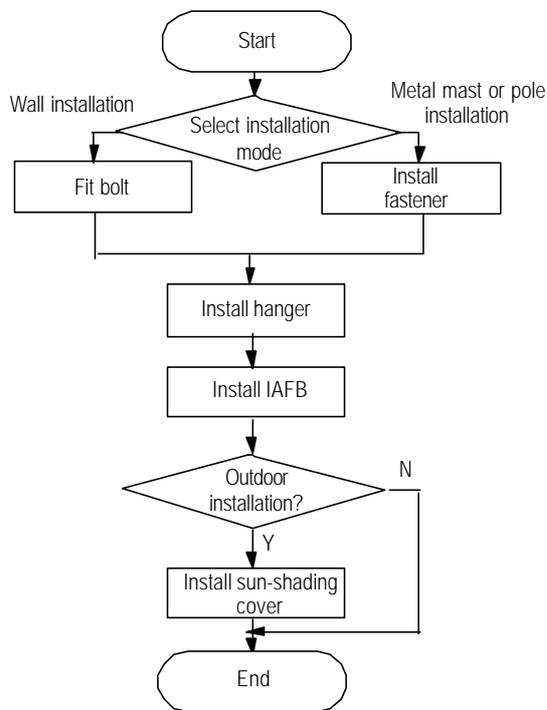
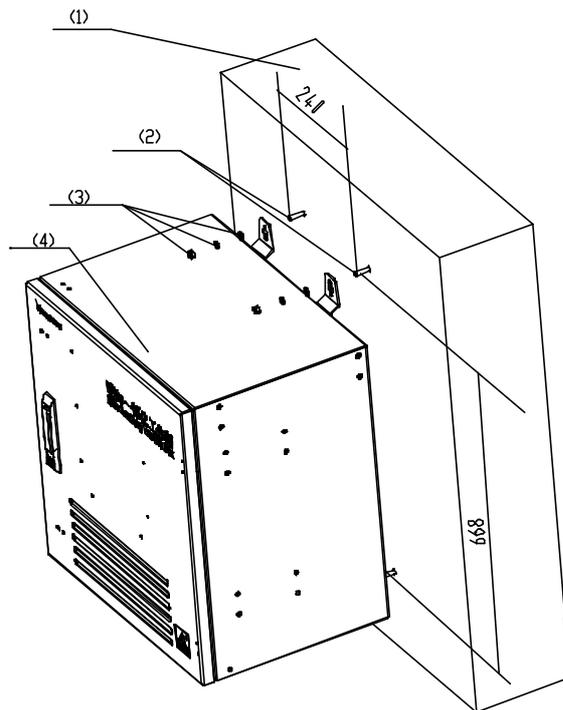


Figure A-1 IAFB installation flow

A.2 Wall Installation

The wall installation procedure of IAFB is as follows:

- 1) Determine a proper installation position on the wall. Mark it with a pencil as the hole for bolt. The hole is the key position for bracket installation, as shown in Figure A-2.



(1) Wall (2) M8x80 exploded expansion bolt (3) Bolt, plain washer, spring washer (4) Box

Figure A-2 Fixing bolts

- 2) Drill a hole with the drill bit of $\phi 10\text{mm}$ at the mark for the bolts, Then mount the exploded expansion M8x80 bolt.

⚠ Caution:

The depth of the hole is 50mm~60mm. It cannot be too deep; otherwise, the installation may be affected by the part of the expansion bolt extended outside the wall. Neither can it be too shallow, otherwise it may affect the reliability of the BTS.

- 3) Determine the other three holes with a plumb line and a ruler and mark them with a pencil.
- 4) The procedure to drill holes and install the expansion bolts is similar to that mentioned above.
- 5) Use combination screw M6x12 to mount the 4 hangers on the back of the box, as shown in Figure A-3.

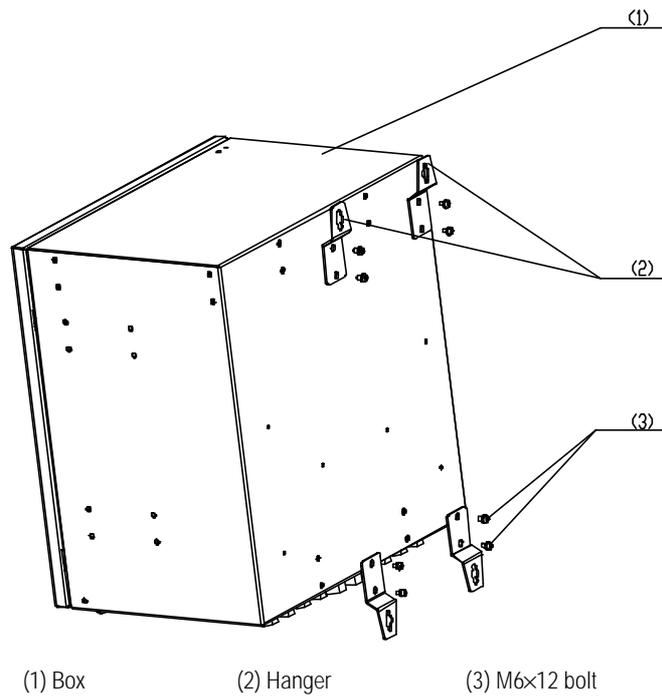


Figure A-3 Installing hanger

- 6) Mount the hangers of IAFB aiming at the four bolts. Mount plain washer, spring washer and nut on the bolt. Then fasten the nut clockwise with an adjustable wrench to fix the bracket on the wall.

⚠ Caution:

The length of the bolt outside the wall should be about 20mm. And the washer should be mounted before the nut is fastened.

- 7) The installation of sun-shading cover is shown in Figure A-4. It is fixed with M12x16 bolt.

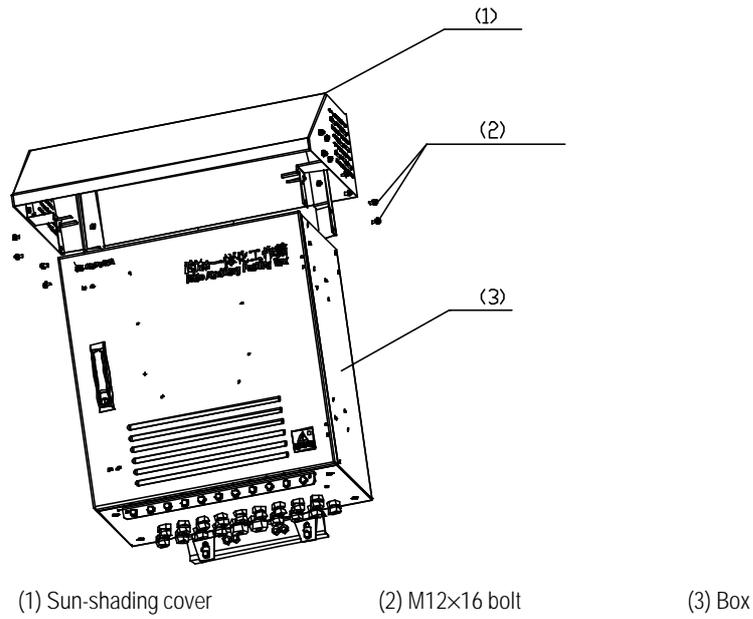


Figure A-4 Installing sun-shading cover

A.3 Metal Mast Installation

The installation procedure of IAFB metal mast is as follows:

- 1) Mount the beam and fastener to the steel pipe with M10 bolt and nut. The pipe is between the beam and the fastener. Then fasten the bolt and nut. See Figure A-5.

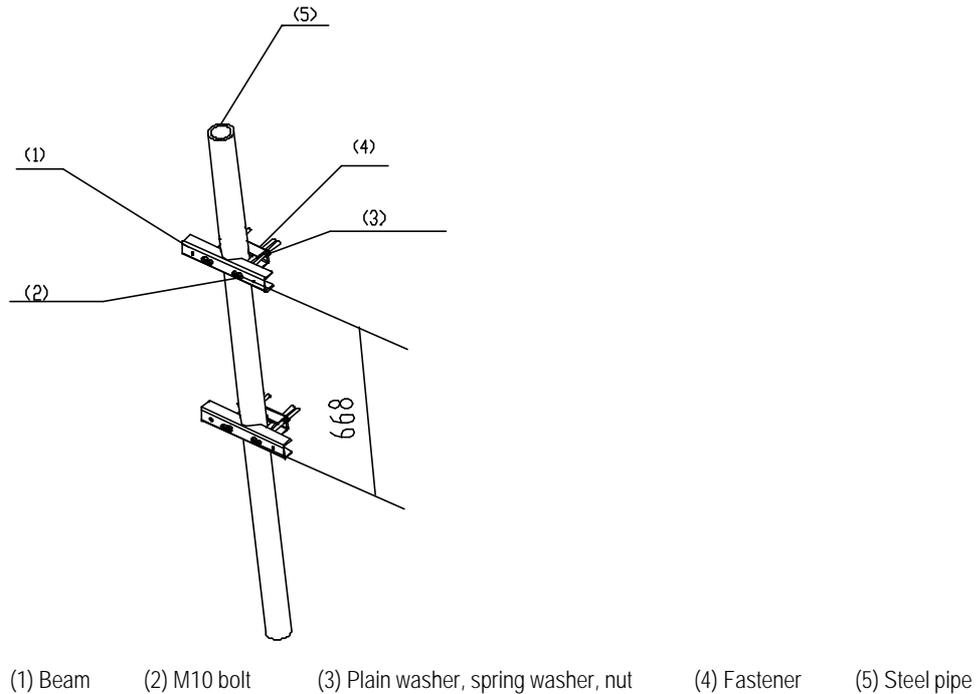


Figure A-5 Installing beam and fastener

- 2) Lean the box of IAFB on the beam and let M8×25 bolt go through the hanger of IAFB. Then fasten the IAFB to the beam. See Figure A-6.

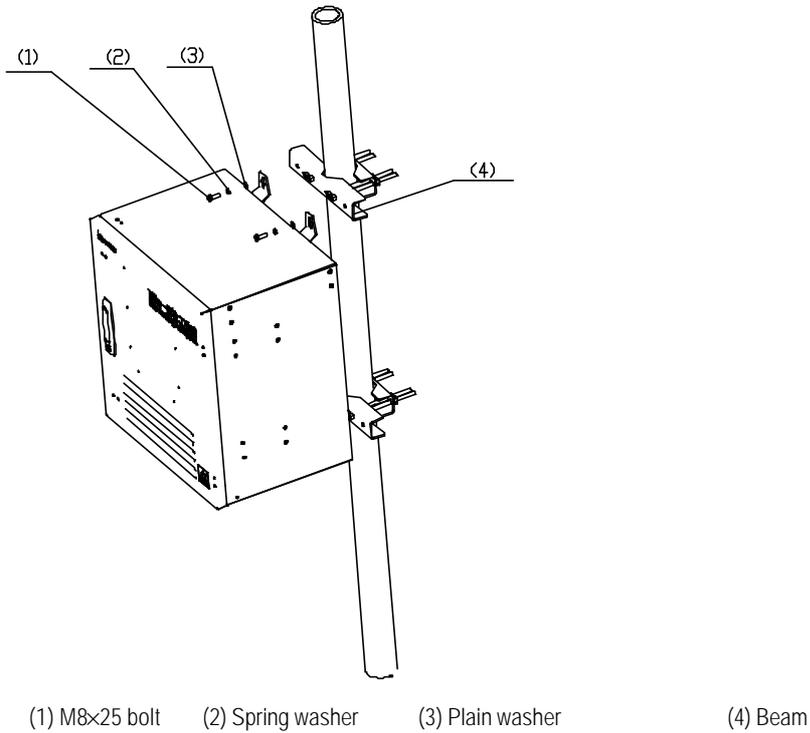
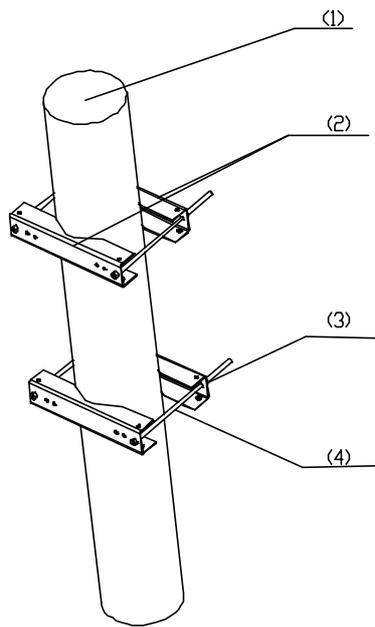


Figure A-6 Fixing IAFB

A.4 Pole Installation

The installation procedure of IAFB pole is as follows:

- 1) Lean the fastener to the pole and fasten the beam to let the pole be in the middle of the pole. Then fasten the beam with bolt and nut. Refer to Figure A-7 below.



(1) Pole (2) Fastener (3) Plain washer, spring washer, nut (4) M12 bolt

Figure A-7 Fixing fastener

- 2) Fix the IAFB to the fastener with M8×25 bolt. Its installation procedure is similar to that on metal mast. See Figure A-6.

A.5 Installation Check

After all the parts are installed, check the installation in the following aspects: parts installation overall check, BTS power-on check and environment check.

I. Overall Check

As a review on the whole foregoing installation process, the overall check includes the following items:

- 1) Fixation check

The IAFB installed should satisfy the following requirements:

- The IAFB should be secure with neat appearance.
 - All the bolts and nuts are fastened with plain washer and spring washer mounted in correct sequence.
 - There should be no missing or damaged parts, and all the cables should be intact.
 - The IAFB should be clean without any smudge, fingerprint or dust.
- 2) Cable connection check
 - Power cables should be well connected. The plugs should not be loose or damaged. And there should be no scratch or fissure on the power cable shell.
 - Check whether the contact of the grounding cables is good.

- All the cables should be secure. Do not over-strain the cables running round the corner. Cables and fibers should run in straight and smooth courses without any cross. Cables and fibers in the same direction should be bundled up. The cable layout should be neat and tidy with the same bundling space.
- There should be no damage to the shell of all the cables.

II. Environment condition check

- 1) There should be no sundries inside or on top of the sun-shading cover. The cover should be clean without any smudge or fingerprint.
- 2) There should be no redundant tape or cable tie on the cable.
- 3) There should be no tape, cable tie head, waste paper, or packing bag around the IAFB.
- 4) All the things around the BTS should be clean and neat in their original appearance.

III. Power-on check

Open the door of the IAFB and check whether the voltage of the power supply is normal. If the power switch is turned on normally, test with the multimeter whether the output voltage is normal.

B Requirements for Antenna Isolation

I. Requirements for isolation of omni antenna

Based on the conditions that antenna gain is 10dBi and isolation is 30dB, the spacing between antennae is required as follows:

- When antennae are installed horizontally, the horizontal spacing between transmit (TX) antenna and receive (RX) antenna should not be less than 5.3m.
- When antennae are installed vertically, the vertical spacing between TX antenna and RX antenna should not be less than 0.2m.
- According to the requirements for diversity receiving of omni RX antenna, the horizontal spacing between RX antennae should not be less than 4m.

II. Requirements for isolation of directional antenna

1) Single polarization antenna

Based on the conditions that antenna gain is 15dBi, isolation is 30dB and half-power angle is 65°, the spacing between antennae is required as follows:

- When antennae are installed horizontally, the horizontal spacing between TX antenna and RX antenna in the same sector should not be less than 3m.
- When antennae are installed vertically, the vertical spacing between TX antenna and RX antenna in the same sector should not be less than 0.2m.
- The horizontal spacing between TX antenna and RX antenna in different sectors should not be less than 0.2m.
- According to the requirements for diversity receiving of directional RX antenna, the horizontal spacing between RX antennae should not be less than 4m

2) Dual polarization antenna

For dual polarization antennae, the spacing between the ports of the RX and TX antennae is 30dB. Therefore, the horizontal spacing may not be considered during horizontal installation. But in vertical installation, the vertical spacing between antennae of different sectors should not be less than 0.2m.

 **Note:**

The antenna isolation requirements in this section are subject to typical applications. They are for reference only. During the actual installation, the antenna isolation should be determined by the relevant engineering design documents.

C Making Connectors

C.1 Overview

Preparation of connectors is a very important job during the installation of antenna and feeder system. Normative and correct operation will directly affect the performance of the antenna and feeder system. In this chapter, we respectively introduce the preparation of the DIN connector and N connector of antenna and feeder for the reference of project installation.

 **Note:**

What described in this section is for reference only. The preparation of connectors for antenna and feeder should be follow the auxiliary installation instruction for connectors in the actual installation.

C.2 Making 7/16 DIN Connector and N Connector for Jumper

 **Caution:**

The following takes the preparation of 7/16 DIN connector as an example. N connector is prepared in the same way.

I. Tools required

Spanners (one is 19mm and the other is 22mm), fast cable cutter, fast cable stripper, safety knife, electric blower, diagonal pliers, nipper pliers, pliers, file, brush and ruler are all required.

II. Making connectors

- 1) Get the required tools ready and put them in a convenient place.
- 2) Cut the jumper to be mounted with a connector to the accurate length.

- 3) Cut the skin of the cable at 28 mm away from the connector with the fast cable cutter and the safety knife, as shown in Figure C-1.
- 4) Strip off the outer conductor at 7 mm away from the connector with the fast cable cutter, and keep the cutting surface smooth, as shown in Figure C-2.

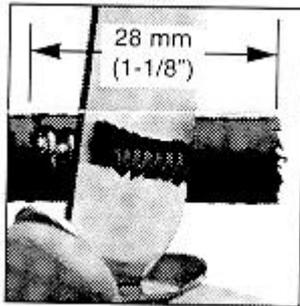


Figure C-1 Cutting cable skin with safety knife

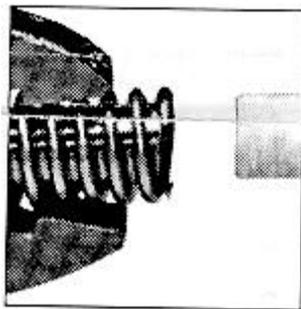


Figure C-2 Stripping off outer conductor

- 5) Remove the foam plastic and the adhesives with the safety knife. Be careful not to damage the inner conductor, as shown in Figure C-3.
- 6) Taper the inner conductor with a file and the nipper pliers, as shown in Figure C-4.

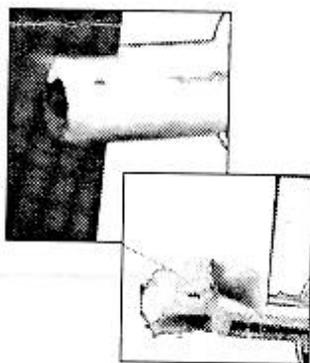


Figure C-3 Removing foam plastic and adhesives

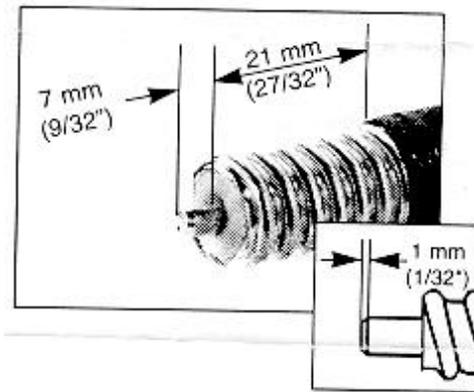


Figure C-4 Tapering inner conductor

- 7) Brush off the residuals, as shown in Figure C-5.

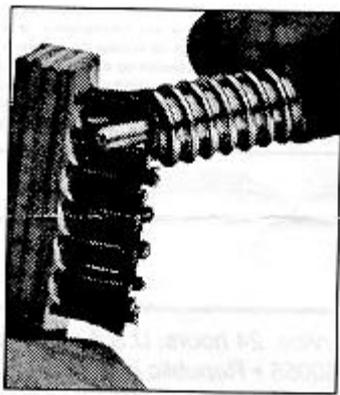


Figure C-5 Brushing off residuals

- 8) Apply grease and mount fixing nut. Place the heat-shrink tube into the cable and then screw the fixing nut to the cable until it is tight, as shown in Figure C-6.

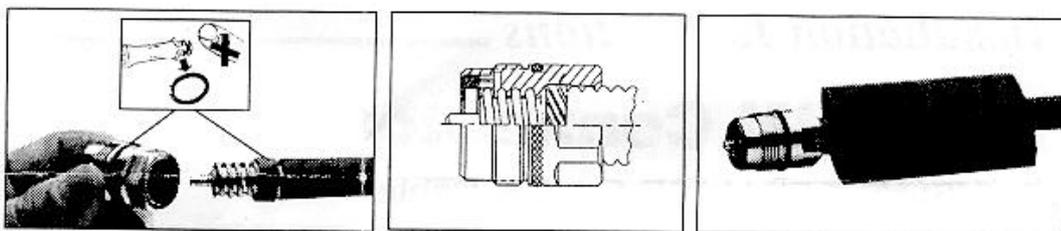


Figure C-6 Screwing fixing nut onto cable

- 9) Mount the connector cap. Screw the connector cap while keeping the fixing nut still, as shown in Figure C-7.

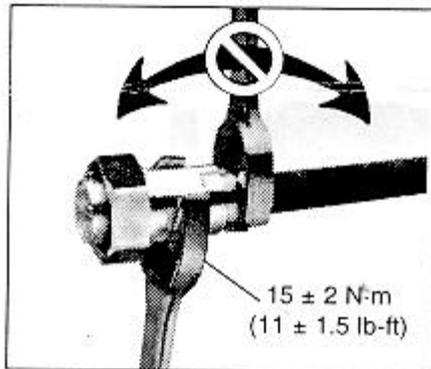


Figure C-7 Mounting connector cap

- 10) Heat up the heat-shrink tube, as shown in Figure C-8.

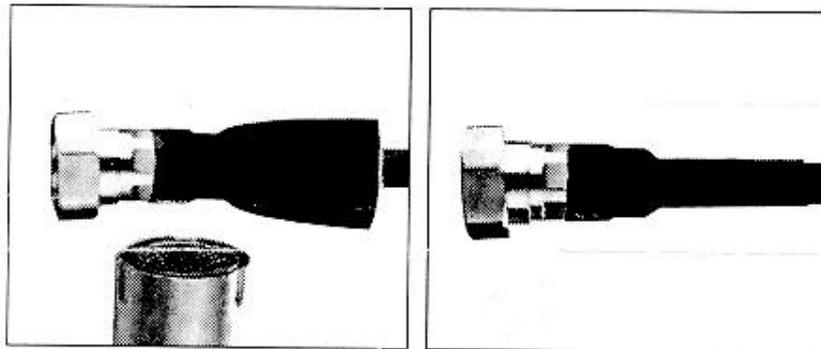


Figure C-8 Heating up heat-shrink tube

- 11) Fit torque, as shown in Figure C-9.

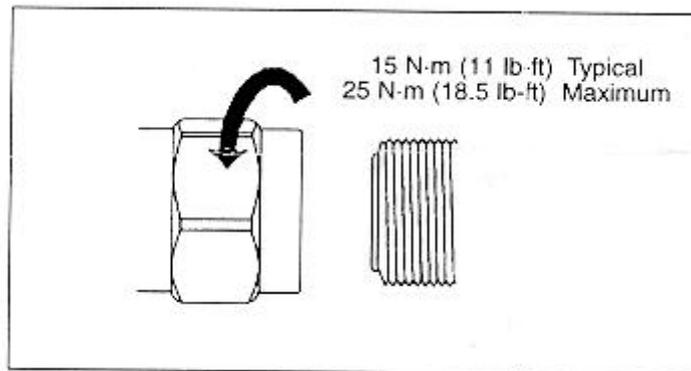


Figure C-9 Fitting torque

- 12) Be sure to test the connector after it is made. It can only be put into use after it passes the test.

 **Caution:**

1. Pay attention to safety during the preparation. Improper operation of sharp-edged tools can cause human injury.
 2. Be sure to clean up the feeder remainders to avoid copper scales from mixing up with the connector, which could adversely affect the performance of the antenna and feeder system.
-

C.3 Making 7/16 DIN Connector and N Connector for 7/8 Feeder

 **Caution:**

The following takes the preparation of N connector as an example. 7/16 DIN connector is prepared in the same way.

I. Tools required

Spanners (one is 19mm and the other is 22mm), fast cable cutter, fast cable stripper, safety knife, electric blower, diagonal pliers, nipper pliers, pliers, file, brush and ruler are all required.

II. Making connectors

- 1) Get the required tools ready and put them in a convenient place.
- 2) Straighten the end of the feeder to be mounted with a connector.
- 3) Cut the feeder with a fast cable cutter. The cutting surface should be smooth.
- 4) Cut the cable skin at 51mm away from the connector with the fast cable cutter and the safety knife, as shown in Figure C-10.
- 5) Add O-ring and apply proper amount of grease on it, as shown in Figure C-11.

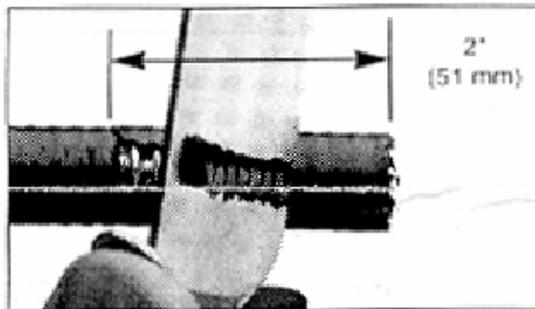


Figure C-10 Cutting cable skin

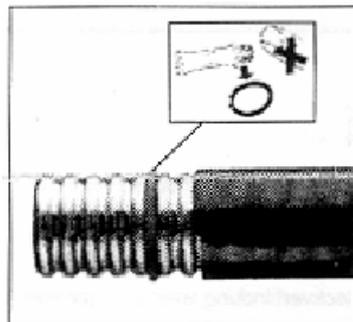


Figure C-11 Adding O-ring and applying grease

- 6) Add fixing nut, as shown in Figure C-12.
- 7) Place spring ring and fix it in the outer conductor trough of the feeder, as shown in Figure C-13.

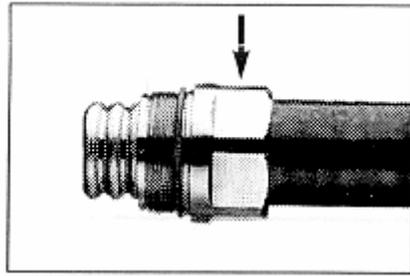


Figure C-12 Adding fixing nut

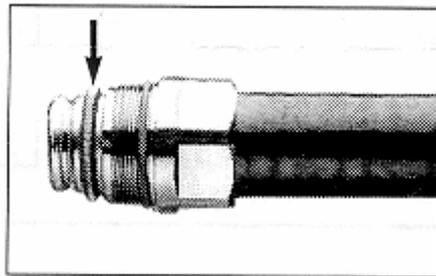


Figure C-13 Adding spring ring

- 8) Adjust the hacksaw and the hacksaw guide (big washer) to cut the cable, as shown in Figure C-14.
- 9) Brush off the burr and residuals, as shown in Figure C-15.

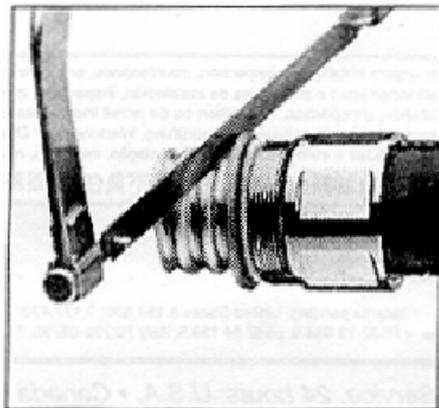


Figure C-14 Cutting cable

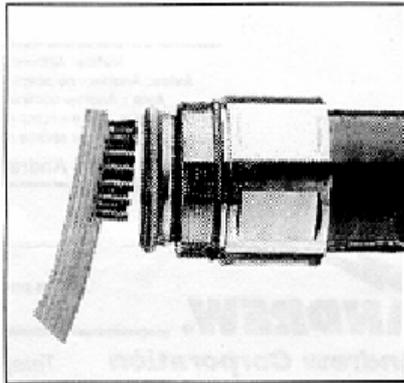


Figure C-15 Brushing off residuals

- 10) Press the foam plastic tightly, as shown in Figure C-16.
- 11) Add O-ring and apply grease to it. Mount the connector body, as shown in Figure C-17.

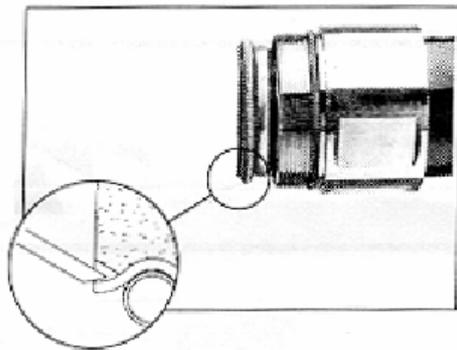


Figure C-16 Pressing foam plastic tightly

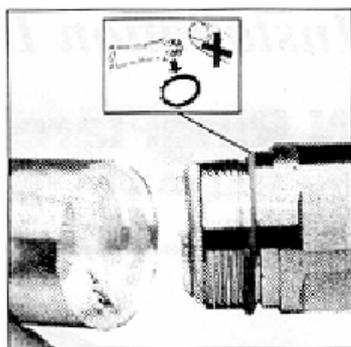


Figure C-17 Mounting connector body

- 12) Expand the outer conductor with a fast cable stripper (fitting the feeder type). Check the stretching surface and clean off the residuals, as shown in Figure C-18.

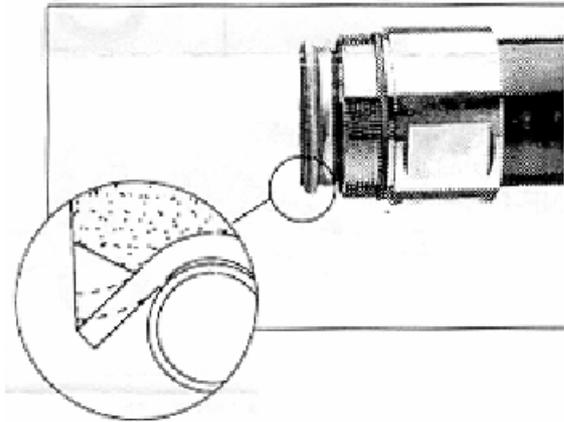


Figure C-18 Stretching outer conductor

- 13) Refit the connector. Never rotate the connector body while installing, as shown in Figure C-19.
- 14) Fit the torque, as shown in Figure C-20.

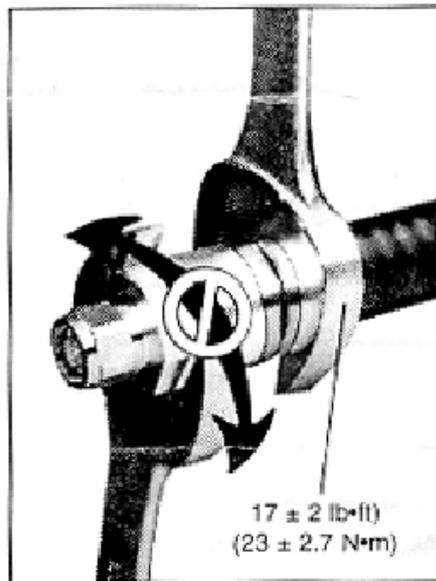


Figure C-19 Fitting connector

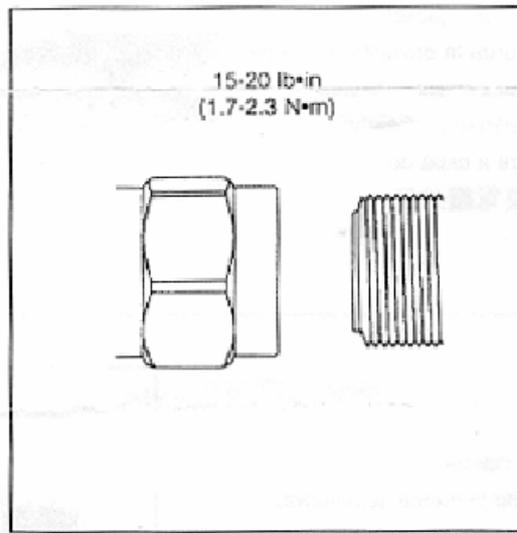


Figure C-20 Fitting torque

D Preparing Grounding Clips

D.1 Overview

During the entire installation, there are many places where grounding clips should be applied. The following is the summary of the places where grounding clips are required.

- 1) Normally, each feeder should be grounded at the following three points at least for lightning-protection:
 - Within 1m's reach behind the place where the feeder is led from the tower platform;
 - Within 1m's reach in front of the place where the feeder is led from the tower body to the outdoor cabling rack;
 - At the outer side of the feeder window before which the feeder is led into (on the spot).

When the length of the feeder along the tower body exceeds 60m, more lightning-protection grounding clips should be added in the middle of the tower body. Typically, one clip is installed for every 20m.

- 2) If the feeder is led into the room after being routed for a stretch of distance on the building-top, and the distance exceeds 20m, a lightning-protection grounding clip is required on the top of the building.
- 3) For the feeder that enters the room from the building-top along the wall, if an outdoor cabling rack is used, the cabling rack should also be grounded.

D.2 Preparation Process

- 1) Prepare the required tools, such as paper cutter, flat screwdriver and nipper pliers, etc.
- 2) Unpack the box and bags containing the lightning-protection grounding clips and put various parts and accessories on clean ground or paper for use, as shown in Figure D-1.



Figure D-1 Installation accessories of lightning-protection grounding clips

- 3) Determine the location for lightning-protection grounding clip installation. Cut the feeder skin according to the clip size to expose the outer conductor, as shown in Figure D-2.



Figure D-2 Striping off feeder skin

- 4) Fix the lightning-protection grounding clip on the feeder. The grounding cable of the clip should be led from the top down with the angle between the feeder and the grounding cable not greater than 15° , as shown in Figure D-3.



Figure D-3 Lightning protection grounding clip fixed on feeder

- 5) Wrap up the lightning protection grounding clip with PVC tape, semi-conductive self-adhesive tape and waterproof tape in turn. When wrapping, do it from the bottom up, then from the top down and finally from the bottom up again. Each turn should be overlapped by the next turn for about one-third of the width as shown in Figure D-4.



Figure D-4 Wrapping lightning protection grounding clip with three layers of tapes

- 6) The sealed lightning protection grounding clip can be connected to the outdoor grounding bar, as shown in Figure D-5, as well as to the well-grounded outdoor cabling rack. The grounding clip in Figure D-4 is connected to the outdoor cabling rack. When the lightning protection grounding clip is connected to the outdoor

cabling rack, the anti-rust paint at the place where the rack is grounded should be removed. When the grounding cables are installed, the place should be covered with anti-rust paint again. Those exposed connector parts should also be painted with anti-rust paint for good grounding, if they are incapable of being wrapped up with insulating tapes.

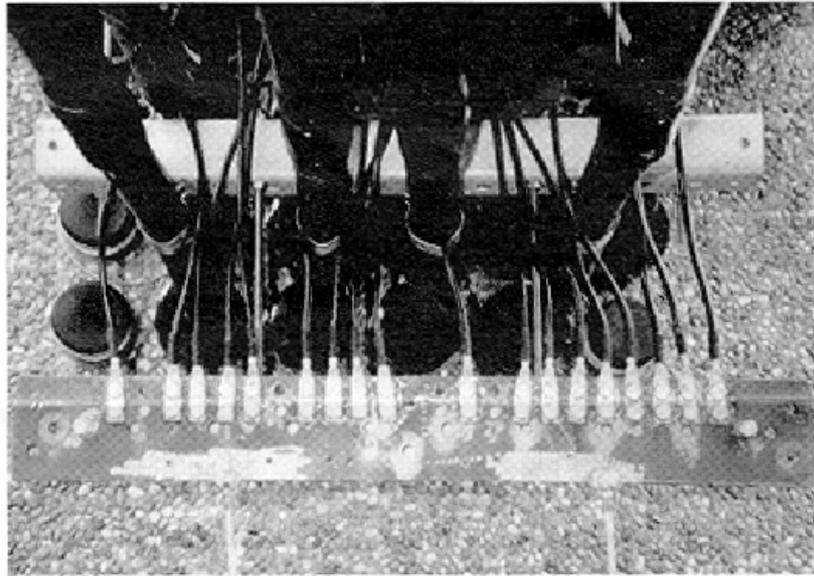


Figure D-5 Lightning protection grounding clip connected to outdoor grounding bar

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4 Installing Satellite Synchronization Antenna and Feeder System

This chapter introduces the installation of satellite synchronization antenna and feeder system taking GPS as an example. In practical installation, it can be performed simultaneously with that of RF antenna and feeder system.

This chapter will not cover the same contents with the installation of RF antenna and feeder system. Instead, it focuses on the differences between the installations of the two systems.

4.1 Installing GPS Antenna and Feeder System

The installation of GPS antenna and feeder system is basically the same with that of RF antenna and feeder system. The major differences lie between the GPS antenna and the RF antenna. In addition, GPS antenna and feeder installation includes the installation of antenna-side and equipment-side lightning arresters. The procedure is:

- 1) Check the installation environment of GPS antenna and feeder system.
- 2) Get familiar with the engineering design documents and determine the installation scheme.
- 3) Install antenna support.
- 4) Install antenna.
- 5) Connect outdoor jumpers.
- 6) Install antenna-side lightning arrester.
- 7) Prepare the connectors of feeders, route the outdoor feeders and attach labels on them.
- 8) Mount grounding clips for feeders.
- 9) Install equipment-side lightning arrester;
- 10) Prepare, route and bind indoor jumpers, and attach labels on them.
- 11) Inspect the project installation.

 **Note:**

The installation of GPS antenna and feeder system can be performed simultaneously with that of RF antenna and feeder system. The specific installation process can be adjusted according to the actual configuration and environment.

4.2 Installing GPS Antenna

4.2.1 Requirements for Installation Position

The installation position of GPS antenna should have a broad vision without high buildings around, and as far as possible from the compact accessory buildings on the building-top. The available area of the plane for installing GPS antenna should be as big as possible. And the antenna should be vertically erected with a visual angle greater than 90° . See Figure 4-1.

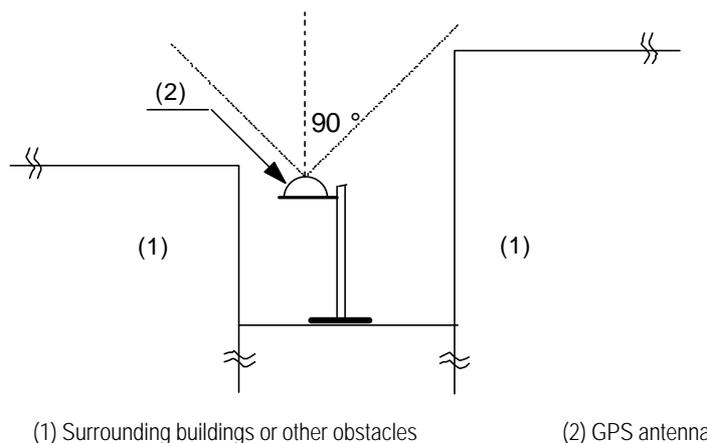


Figure 4-1 Antenna installation position

- Note that the antenna should not be close-range radiated by the front of the main lobe of the mobile communication antenna. In addition, it should not be located at the range of the microwave signal from microwave antenna, not below the high voltage cable, nor under the intense radiation of TV launching tower.
- Considering lightning protection, try the best to install the antenna at the center of the building-top. Do not install it on the stub wall around the building-top. DO not install it at the corner of the building-top as the corner has the greatest possibility of being stricken by lightning.
- The antenna should be installed at the place where there is special lightning arrester or similar facilities such as telecommunication tower around. And the antenna should be located within the valid protection range of the lightning arrester. That is, the included angle between the erect direction and the direction from the antenna RX connector to the lightning arrester or to the tower-top should be less than 30° . If there is no tower or lightning arrester around, the special lightning arrester should be installed to meet the design requirements for lightning protection of the building. The horizontal distance from the lightning arrester to the antenna should be 2m to 3m preferably. And the lightning arrester should be 0.5m higher than that of GPS antenna receive connector.

4.2.2 Installing GPS Antenna Support

In terms of varied installations, there are different supports available.

I. On tower

Figure 4-2 illustrates the support installed on tower.

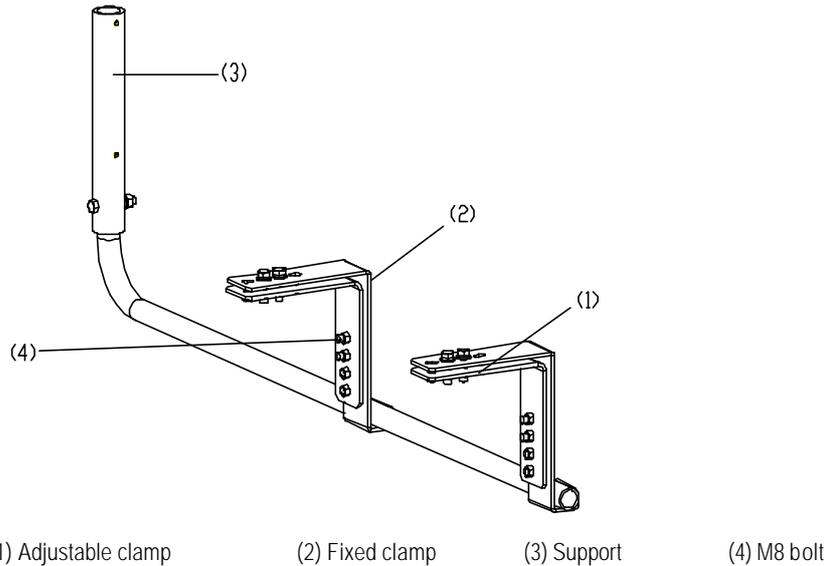


Figure 4-2 Antenna support on tower

Installation procedure is as follows:

- 1) Unscrew the bolts on the fixed clamps and remove the adjustable clamps;
- 2) Place the antenna support in the right position on the tower so that the tower angle steel is between the fixed clamp and the adjustable clamp;
- 3) Fix the support on the tower with fasteners including bolts, plain washers, spring washers and nuts;
- 4) Insert the antenna support lever into the support and put it through the bolt holes. Tighten the bolts to fix the antenna support.

Figure 4-3 illustrates an installed antenna support on tower.

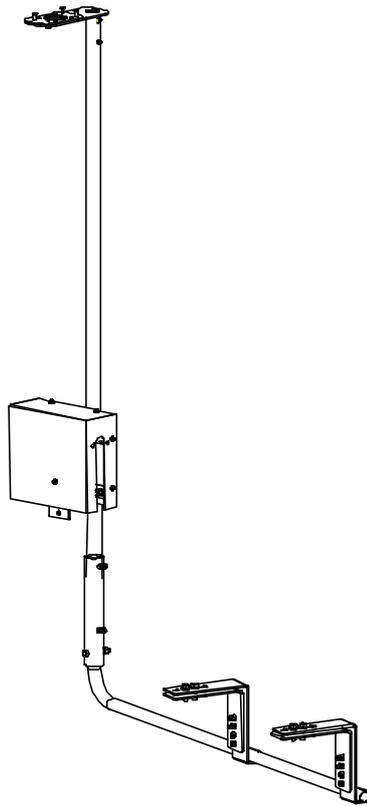


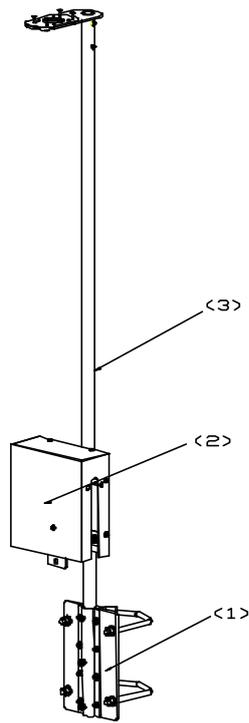
Figure 4-3 Installed antenna support on tower

 **Note:**

For the tower without angle steel, the above mentioned antenna support cannot be used. Antenna support for metal mast can be adopted. Please refer to the section right below for its installation.

II. On metal mast

The antenna support for installation on metal mast is shown in Figure 4-4.

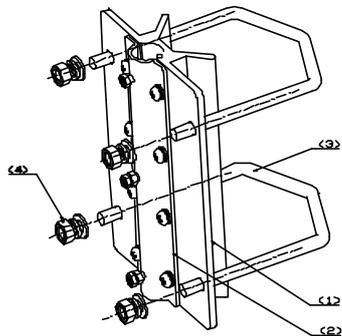


(1) GPS installation anchor ear (2) Lightning arrester enclosure (3) Support

Figure 4-4 Antenna support for installation on metal mast

Installation procedure is as follows:

- 1) Unscrew the fastening bolts on GPS installation anchor ear and remove the anchor ear.
- 2) Round the U-shape clip on the metal mast for GPS antenna. Fasten M10 bolt to fix the GPS installation anchor ear on the metal mast. The structure of GPS installation anchor ear is shown in Figure 4-5.



(1) Front clamp (2) Rear clamp (3) U-shape clip (4) M10 bolt

Figure 4-5 Structure of GPS installation anchor bolt

- 3) Remove the rear clamp on the GPS installation anchor ear. Put the antenna support lever between the front clamp and the rear clamp. Then adjust the direction of the antenna support lever.
- 4) Fasten the rear clamp and the bolts to secure the antenna support lever.

III. On building-top

The GPS antenna support for installation on building-top is shown in Figure 4-6.

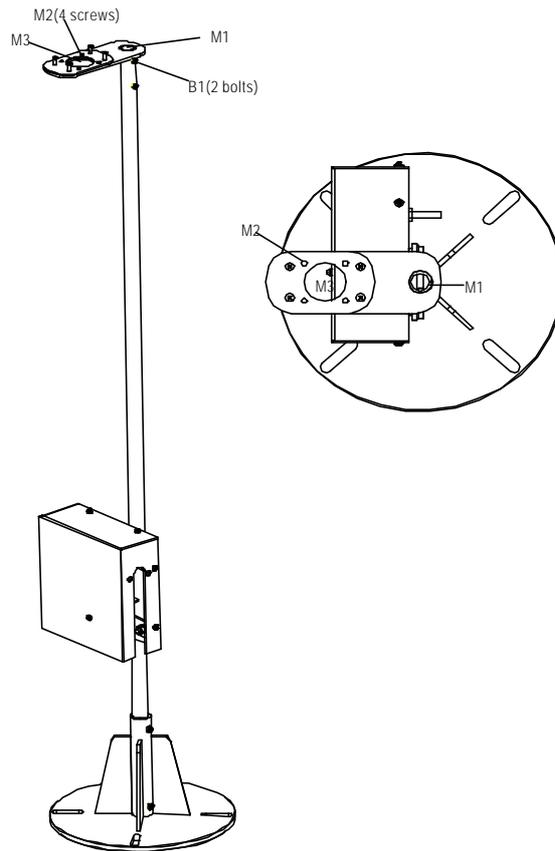


Figure 4-6 Structure of GPS antenna support on building-top

Install procedure is as follows:

- 1) Place the metal base of the antenna support on the concrete base and align the centers. Mark the position of the installation holes with an engineering pen.
- 2) Drill holes at the marks using a drill with the bit of $\phi 12$.
- 3) Install expansion bolts to secure the base. In order to keep the antenna pole erect so as to reach better receiving performance, try to keep the metal base level using washers.
- 4) Insert the support lever into the base to see whether the lever is erect. It is required that the included angle between the support lever and the direction of the plummet be smaller than 5° . If the requirement can not be satisfied, adjust the base.

4.2.3 Installing Antenna

There are various types of antennae. Figure 4-7 and Figure 4-8 show two types of common antennae. The following gives the installation of two types of GPS antennae respectively.



Figure 4-7 GPS antenna of type AT1670-0



Figure 4-8 GPS antenna of type UTONCORE

I. Installing GPS antenna of type AT1670-0

- 1) Insert the jumper connector at the antenna bottom into M3 of the antenna support as shown in Figure 4-6;
- 2) Fasten the four accessory UK-standard bolts at M2;
- 3) Tighten the antenna and the cable connector.

II. Installing GPS antenna of type UTONCORE

- 1) UTONCORE GPS antenna has such auxiliary fixtures as a rubber washer, a metal plain washer and a bolt. During installation, first unfix the bolt at the antenna bottom and install the rubber washer instead. Then insert the antenna into M3 of the antenna support as shown in Figure 4-6;
- 2) Install the metal plain washer on the jumper connector at the bottom of the antenna (with the washer head tightly against the bottom of M3);

- 3) Tighten the antenna connector and the cable socket. Finally reinstall the unfixed bolt. Thus the GPS antenna is fixed on the ellipse holder of the antenna support.



Caution:

- 1) Waterproof treatment should be performed at the antenna connector. Please refer to Section 2.3.6 for waterproof treatment process.
 - 2) Upon completion of installation, cover the antenna support with anti-rust paint, especially the fastening bolts, expansion bolts and the places around the bolt holes.
-

4.3 Installing GPS Feeder

GPS feeder installation includes the installation of jumpers, antenna-side lightning arrester, feeder, equipment-side lightning arrester, etc. The installation and routing of GPS feeder is similar to that of RF feeder. Following gives explanation of points for attention and grounding requirements during the installation.

4.3.1 Routing Feeder

Prior to feeder routing, carefully check the routing environment including the tower and building-top. Determine the routing scheme and sequence as per the engineering drawing.

- In the case of BTS indoor installation, the route leading the feeder from the installation position to the equipment room containing the cabinet and equipment should be clear. It should facilitate fixing the cable properly and meet the routing requirements in the equipment room. In addition, reliable measures should be taken to protect the feeder from rain and corrosion.
- 1.5m jumper should be bound at the outside of the antenna support lever evenly with cable ties. In addition all cable ties should be fastened, with the same spacing of 200mm. The cable tie heads should be toward the same direction, and all the ties should be cut neatly to the end.
- Waterproof elbow should be made at the entrance where the feeder enters the equipment room. The vertical distance from the lowest point of the waterproof elbow to the entrance should not be less than 200mm so as to prevent rain from entering the room.
- In the case of GPS antenna installed on building-top, connectors at both ends of the feeder should be protected with strong materials (such as packing bags for board) to prevent damage to the connectors. The feeder should be fixed with plastic clips attached with steel nails along the root of the parapet on the

building-top. The spacing between plastic clips should be 1m. And the direction of the clip heads should be interlaced regularly. If two feeders are joined, they should be bound together without intersection or curve.

- When routing the feeder, try to expand the feeder roll before routing. Try to avoid bending of it. If it is unavoidable to bend the feeder, the bent radius should not be less than the minimum of the allowed bent radius for the cables so as to avoid damage to the feeder.

 **Caution:**

When the distance from the antenna to the BTS is greater than 100m, 7/8 feeder should be adopted so as to minimize signal loss. If it is unavailable, 1/2 feeder should be adopted, instead.

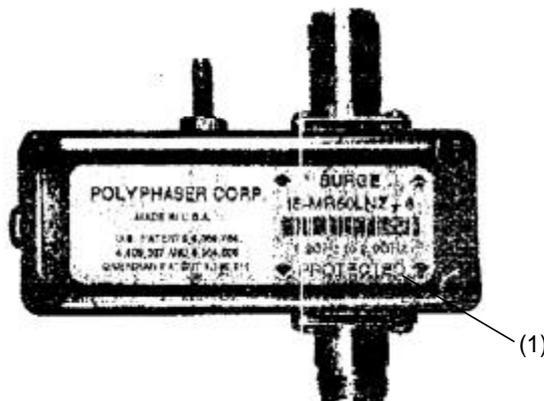
4.3.2 Installing Lightning Arrester

There are two types of lightning arresters for GPS antenna, i.e. antenna-side lightning arrester and equipment-side lightning arrester. The former is used for lightning protection for active GPS antennae, while the latter for the GPS card. The two arresters are of the same model.

Currently there are two types of lightning arresters. The installation procedure for each type is described in detail as follows:

I. Type iS-MR50LNZ+6 lightning arrester

Figure 4-9 illustrates the appearance of Type iS-MR50LNZ+6 lightning arresters.



(1) PROTECTED end

Figure 4-9 Appearance of Type iS-MR50LNZ+6 lightning arrester

Attention:

- 1) GPS antenna-side lightning arrester
 - The "PROTECTED" end of the GPS lightning arrester should face the antenna. That is, the "PROTECTED" end of the arrester is connected with the jumper end.
 - The lightning arrester should not be grounded when it is installed either on the tower or on building-top, but the feeder grounding clip should be as close as possible to the lightning arrester.
 - The lightning arrester is installed inside the lightning arrester box, with its connectors sealed with waterproof adhesive tape and PVC tape in sequence, so as to prevent moisture invasion.
- 2) GPS equipment-side lightning arrester
 - The "PROTECTED" end of GPS lightning arrester should face the BTS. That is, the "PROTECTED" end of the arrester is connected with the GPS port of the BTS.
 - In the case of BTS indoor installation, dual-male conversion connector should be used to connect the lightning arrester directly to the GPS port of MBPM. It is unnecessary to connect the lightning arrester to lightning protection grounding cable.
 - In the case of BTS outdoor installation, dual-male-connector jumper of 0.3m long should be used to connect the lightning arrester to the GPS port of MBPM. The arrester should then be connected to the lightning protection grounding cable that leads to the grounding bar of the BTS. The connector between the arrester and the feeder should be sealed with waterproof adhesive tape and PVC tape in sequence, so as to prevent moisture invasion.

II. Type DGXZ+6NFNM-A lightning arrester

Figure 4-10 illustrates the appearance of Type DGXZ+6NFNM-A lightning arrester.

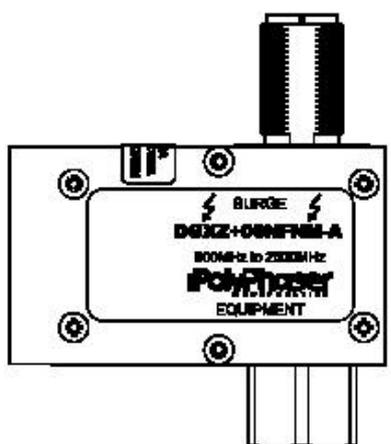


Figure 4-10 Appearance of Type DGXZ+6NFNM-A lightning arrester

Attention:

- 1) GPS antenna-side lightning arrester
 - The connectors on both ends of Type DGXZ+6NFNM-A lightning arrester are male and female respectively. Therefore, jumpers with male and female connectors should be prepared for the installation of the lightning arrester. The male connector of the jumper is connected with the GPS antenna, while the female connector on the other end is connected with the male connector of the lightning arrester.
 - The lightning arrester should not be grounded when it is installed either on the tower or on building-top, but the feeder grounding clip should be as close as possible to the lightning arrester.
 - The lightning arrester is installed inside the lightning arrester box, with its connectors sealed with waterproof adhesive tape and PVC tape in sequence, so as to prevent moisture invasion.
- 2) GPS equipment-side lightning arrester
 - In the case of BTS indoor installation, the lightning arrester may be directly connected to the GPS port of MBPM. And it is unnecessary to connect the lightning arrester to the lightning protection grounding cable.
 - In the case of BTS outdoor installation, a 0.3m jumper with both male and female connectors should be used. Its male connector is connected to the GPS port of MBPM of the BTS, while its female connector to the male connector of the lightning arrester. The lightning arrester should be connected to the lightning protection grounding cable that leads to the grounding body of the BTS. And the connector between the lightning arrester and the feeder should be sealed with waterproof adhesive tape and PVC tape in sequence, so as to prevent moisture invasion.

4.3.3 Grounding Requirement

GPS feeder grounding and routing are conducted simultaneously. The following gives description of feeder grounding points in different installations.

I. BTS outdoor installation (building-top installation excluded)

- Within the range of 1m~2m under the GPS antenna;
- The front end connecting the BTS.



Caution:

If the GPS feeder is not longer than 5m, its shielding covering may be grounded only at the front end connecting the BTS.

II. BTS outdoor installation on building-top

In this installation mode, GPS feeder shielding covering may be grounded only at the front end connecting the BTS.

III. BTS indoor installation with GPS antenna and BTS antenna installed on the same tower or metal mast

- 1) When the outdoor GPS feeder is longer than 20m:
 - Within the range of 1m~2m under the GPS antenna;
 - Within 1m range of the mast or of where the GPS feeder is led from the tower platform;
 - At the outer side of the feeder window where the GPS feeder enters the equipment room (connecting to outdoor protection grounding bar).
 - Close to the indoor protection grounding bar after it enters the equipment room.
- 2) When the outdoor GPS feeder is not longer than 20m:
 - Within the range of 1m~2m under the GPS antenna;
 - At the outer side of the feeder window where the GPS feeder enters the equipment room (connecting to outdoor protection grounding bar).
 - Close to the indoor protection grounding bar after it enters the equipment room.



Caution:

- 1) If the GPS feeder is longer than 60m, feeder grounding clips should be applied in the middle of the feeder, with the clip spacing of 20m.
 - 2) If the GPS feeder is led into the room after being routed for a stretch of distance on the building-top, and the distance exceeds 20m, a feeder grounding clip is required on the top of the building.
 - 3) For the GPS feeder that enters the room from the building-top along the wall, if a cabling rack is used, the cabling rack should also be grounded.
-

IV. BTS indoor installation with GPS antenna not on the BTS tower but separately placed

- The shielding covering of GPS feeder is grounded at the entrance to the building. The grounding point should be the outdoor grounding bar of the mobile equipment room. The grounding cable should adopt the plastic insulation copper core wire of diameter not less than 6mm². It should be black, or yellow and green.
- If the feeder is longer than 60m, feeder grounding clips should be applied in the middle of the feeder, with the clip spacing of 20m.
- Place the GPS feeder close to the indoor protection grounding bar after it enters the equipment room.

 **Caution:**

When the GPS feeder is not longer than 10m, the shielding covering of the coaxial feeder may be grounded at one point indoor only.

4.3.4 Feeder Label

Figure 4-11 illustrates the standard nameplate used as GPS feeder label.

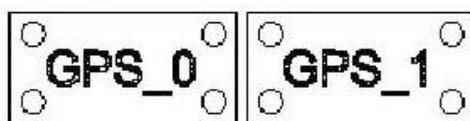


Figure 4-11 GPS feeder label

I. BTS indoor installation

GPS feeder labels can be affixed in three positions:

- 0.3m to the outdoor feeder connector;
- Outside the feeder entrance to the feeder window;
- 0.3m to the indoor feeder connection.

II. BTS outdoor installation

GPS feeder labels can be affixed in two positions:

- 0.3m to the outdoor feeder connector;
- 0.3m to the front end connecting the BTS.

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1 Overview of Software Installation

1.1 Overview of Software Installation

BTS3601C software includes BTS operational software and terminal Operation & Maintenance (O&M) software.

BTS operational software includes BOOT software, Central Processing Unit (CPU) software, and Field Programmable Gate Array (FPGA) logic.

CPU software includes Micro-bts Base-band Processing Board (MBPB) software and Micro-bts Transceiver Board (MTRB) software; while FPGA logic includes MBPB logic and MTRB logic. The actual situation differs from one board type to another.

Terminal O&M software includes Local Maintenance Function (LMF) software (i.e., the local O&M software), and O&M Center (OMC) software (i.e., the remote O&M software).

LMF software comprises PC self-contained Telnet and File Transfer Protocol (FTP) software, while OMC software is composed of BAM software and Client software.

1.1.1 BTS Operational Software

I. BOOT software

BOOT software serves to start the board. Before the delivery of the BTS3601C, the BOOTROM in every board has already been installed with BOOT software. BOOT software upgrade is usually realized by replacing the chip.

II. CPU software

CPU software is the core of system functions. It can be loaded in two ways:

- If there is no old-version software on the board, it is necessary to load the board (in the commissioning mode) with the software through the board network port.
- If there is old-version software on the board, the software can be upgraded through software loading by using local FTP software or remote O&M software.

III. FPGA logic

FPGA logic should be loaded to BTS3601C MBPB/MTRB. The loading mode is the same as that of CPU software.

 **Note:**

The BTS operational software has been installed before delivery, so there is no need to install onsite. However, the operational software needs to be upgraded or re-loaded upon version upgrade. For details, please refer to Chapter 3 BTS Operation Software Installation.

1.1.2 Terminal O&M Software

I. Local O&M software

The local maintenance console is a portable computer installed with Windows9x Operating System (OS), which contains the local O&M software. It includes FTP Client (Ftp.exe) and Telnet Client (Telnet.exe).

The BTS3601C objects, including sites, cells, basebands, carriers, channels, etc., can be maintained with local maintenance commands.

Since the two programs (Ftp.exe and Telnet.exe) are provided by Windows9x OS, there is no need for extra installation.

II. Remote O&M software

Remote O&M software (OMC) of the Base Station Subsystem (BSS) adopts the Client/Server structure.

Through the Client, users can input operation commands, which are then processed by the server (BAM) in a centralized way. After the processing, these commands are transmitted to the foreground (including BSC and BTS), which will then return the operation result (success, failure, timeout, exception, etc.). BAM will record the result and transmit it in a certain report format to the Client.

With OMC, the user can perform remote maintenance and monitoring over all the BTSs that are under his control.

The collected site information can also be used for network planning.

The installation of OMC software involves the installation of BAM server software and the installation of the Client software.

The Client software is divided into three kinds: BSC Client, BTS3612 Client and BTS3601C Client.

This manual describes the installation of BTS3601C Client software only. For the installation of BAM server and other Client software, please refer to the corresponding installation manual.

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3 Installing BTS Operational Software

3.1 Software Media

BTS3601C software has two kinds of media:

- Memory chip
- Disk file

For specific software, their respective media are described as follows:

I. For BOOT software

Boot software includes the fundamental hardware initialization information of boards. Before delivery, BOOTROMs of all boards are pre-installed with BOOT software, which can be upgraded by replacing chips.

II. For CPU software

CPU software is the core of system functions. Before delivery, CPU software has been loaded to the Flash Memory. Once the equipment is powered-on, BOOT software will load the CPU software from Flash Memory to RAM and run it there.

When CPU software should be reloaded or upgraded during the maintenance process, CPU software in disk file format can be loaded to the corresponding Flash Memory through the remote or local maintenance console.

III. For FPGA logic

FPGA logic is responsible for board data exchange. It is loaded in the same way as the CPU software.

3.2 Replacing the Chip

Generally, the BOOT software is updated by replacing the chip. All you need to do is to replace the program chip of the old version software with the chip of the new version.

 **Note:**

- 1) The four angles of the chip correspond to those of the socket one by one. Make sure there is no mistake when replacing the chip. Otherwise, the chip may be burned.
- 2) The chips should be replaced by authorized Huawei engineers.

3.3 Downloading Software

The boot software of BTS3601C system is installed and upgraded by replacing the memory chip, while common board software (including CPU software and FPGA logic) are installed and updated by downloading the software.

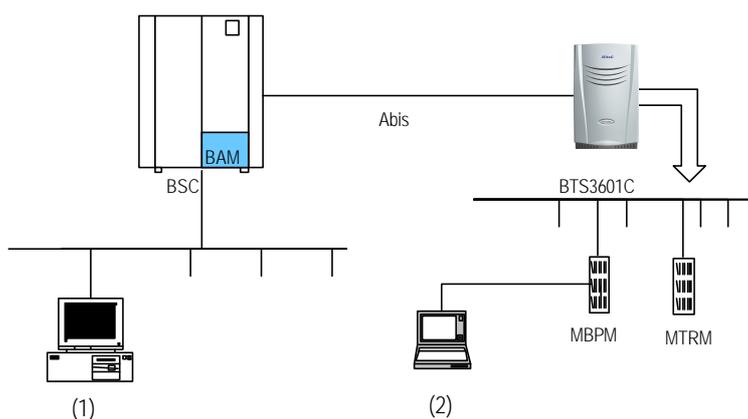
3.3.1 Methods of Software Loading

BTS software loading can be conducted through remote/local maintenance console.

The remote maintenance console is connected to BSC via LAN. Through IP Over ATM (IPOA) link of BSC, it is connected to MBPM of BTS3601C, and through MBPM, it is connected to Micro-bts Transceiver Module (MTRM).

The local maintenance console is connected to MBPM (via the Ethernet port in MBPM maintenance window) through the crossover network cable. Through MBPM, it is then connected to MTRM.

The connection between BTS remote maintenance console and local maintenance console is shown in Figure 3-1.



(1) BTS3601C remote maintenance console

(2) BTS3601C local maintenance console

Figure 3-1 Connection of BTS3601C maintenance consoles

It is quite convenient to load the board software to BTS3601C through remote/local maintenance console.

The processes of software installation and version upgrade for BTS3601C through the local and remote maintenance consoles are almost the same.

In the following text, the remote maintenance console is used as an example to describe the process.

3.3.2 Remote Loading

I. Overview

The system provides the remote loading function to enable the maintenance personnel to load software to the BTS3601C boards through the remote maintenance console.

Software loading includes downloading of software and uploading of BTS configuration data. While the software downloading still comprises two steps:

- 1) Downloading BTS3601C software;
- 2) Activating BTS3601C software.

If the loaded software is MBPB software and when it is activated, the BTS3601C will be reset and MBPB will start the newly-loaded software.

If the loaded software is the MTRB software and when it is activated, MBPB will load the corresponding MTRB software stored in the memory just now to the specific board.

In receipt of the new software, the board will activate the software by resetting itself. The software loading is then completed.

II. Precautions

- 1) Software loading should be carried out based on the actual conditions. According to the version matching table, FPGA software should be loaded first, then the CPU software.
- 2) Since the solidified software is generally loaded by off-line replacing the chip, there is no requirement on the sequence.
- 3) The board software loading should follow the sequence of "MTRB first, MBPB later". While loading software to a specific board, the sequence of "FPGA first, CPU later" should be followed.
- 4) The software version fallback of boards follows the sequence MTRB→MBPB, the fallback sequence of software on a board is CPU first, then FPGA, so the general sequence is like this: MTRB.CPU→MTRB.FPGA→MBPB.CPU→MBPB.FPGA.

III. Trouble shooting

Case One: Failed to activate after successful downloading.

Cause analysis: Incorrect parameter for software downloading command, e.g., wrong software version No., may result in unsuccessful activation after successful downloading.

Case two: Failed to download.

Cause analysis: Check the loading sequence first. If that is fine, check the following:

- Is the BAM FTP server powered on?
- Is the access directory open?
- Are the login user name and password correct?
- Does the access directory/file exist?

IV. Specific process of software downloading

1) Preparing for software downloading

Copy the board software to be downloaded to the BTS3601C software loading directory, which is designated in the BAM. Make sure that the file is writable and readable.

Meanwhile, note down the software version information.

Finally, log in to the BAM through the remote maintenance console after starting the FTP server at BAM side.

2) Adding the software loading information in the remote BTS3610C maintenance system

Run the remote maintenance console software (AirBridge cBSS Client), and select BTS Management in the command tree.

Select Mini-BTS Management\Mini-BTS Loading Management\Add Mini-BTS Loading

Information (**MICRO>ADD BTSLDINFO**). Click  , the shortcut icon of command **Create Input Interface**, and input the following:

- [Board Type]: Select the type of the board whose loading information is to be added.
- [Software Type]: Select the type of board software;
- [Software Version]: Input the version No. (which must meet the related specification) of the software to be downloaded;
- [File Path]: Input the path for the software to be loaded (i.e. the software loading directory in the previous step);
- [File Name]: Input the name (the corresponding file name under the software loading directory in the previous step) of the file to be loaded.

Click , the shortcut icon of **Execute Command**, to add the software loading information of the corresponding board.

3) Downloading software

Run the remote maintenance console software (AirBridge cBSS Client), and select BTS Management in the command tree.

Select Mini-BTS Management\Mini-BTS Loading Management\Download BTS Software or Data Operation (**MICRO>DLD BTSSW**).

Click , the shortcut icon of command **Create Input Interface**, and input the following:

- [BTS Name]: Input the name of the BTS to be downloaded with software (this entry may be omitted);
- [BTS ID]: Input the ID of the BTS to be downloaded with the software;
- [Software Activation Mode]: Select the activation mode for the software to be downloaded;
- [Object Type]: Select the type of the object to which the software is to be downloaded;
- [Software Type]: Select the type of the software to be downloaded;
- [Software Version]: The information that is input here must be consistent with the version No. of the software whose loading information has been added in the system;
- [Board ID]: Select the ID of the MTRB to be downloaded with the software.

Click , the shortcut icon **Execute Command**, to download the software for the corresponding board.

If the software activation mode is set to be "Automatic Activation", the software will be activated automatically after the downloading.

V. Activation of BTS3601C software

Run the remote maintenance console software (AirBridge cBSS Client), and select BTS Management in the command tree.

Select Mini-BTS Management\Mini-BTS Loading Management\Activate Mini-BTS Software/Configuration (**MICRO>ACT BTSSW**).

Click , the shortcut icon of command **Create Input Interface**, and input the following:

[BTS Name]: Input the name of BTS whose software is to be activated (this entry may be omitted);

[BTS ID]: Input the ID of the BTS whose software is to be activated;

[Object Type]: Select the type of the object whose software is to be activated;

[Software Type]: Select the type of the software to be activated;

[Software Version]: Input the version No. of the software to be activated;

[Board ID]: Select the ID of the corresponding board.

Click  , the shortcut icon of **Execute Command**, to activate the corresponding board software/data.

 **Note:**

The activation of the software can be conducted automatically by the system if the [Software Activation Mode] is set as "Automatic" during the setup to download the software.

VI. Uploading of BTS3601C configuration data

Run the remote maintenance console software (AirBridge cBSS Client), and select BTS Management in the command tree.

Select Mini-BTS Management\Mini-BTS Loading Management\Upload BTS Data Operation (**MICRO>ULD BTSCFG**).

Click  , the shortcut icon of command **Create Input Interface**, and input the following:

[BTS Name]: Input the name of BTS whose configuration data is to be uploaded (this entry may be omitted);

[BTS ID]: Input the ID of the BTS whose data is to be uploaded;

[Object Type]: Select the type of the object whose data is to be uploaded.

Click  , the shortcut icon of command **Execute Command**, to upload the corresponding BTS3601C configuration data.

If this operation is successful, BTS3601C will operate by FTP to upload the configuration information of the specified version to the remote BAM, and save it under the file loading path designated when adding the software loading information.

3.3.3 Verifying the Software Version

You can execute a query command through the remote/local maintenance console to get the version information of the running software on BTS3601C boards.

I. Get the version information of board software through the remote maintenance console

Run the remote maintenance console software (AirBridge cBSS Client), and select BTS Management in the command tree.

Select Mini-BTS Management\Mini-BTS Equipment Management\Query Mini-BTS Board Version Information (**MICRO>DSP BTSBRDVER**).

Click  , the shortcut icon of command **Create Input Interface**, and input the following:

[BTS Name]: Input the name of the BTS which is to be downloaded with software (this entry may be omitted);

[BTS ID]: Select the ID of the BTS to be queried;

[Board Type]: Select the type of the BTS board to be queried;

[Board ID]: Select the ID of the BTS MTRB to be queried (if [Board Type] is selected to be Micro-bts Base-band Processing Board (MBPB), this parameter will not appear).

Click  , the shortcut icon of **Execute Command**, to get the query result of BTS board version information in the maintenance window.

II. Query the board version information through the local maintenance console

Start Telnet at the local maintenance console. Input the following command under the prompt character after the login:

DSP BTSBRDVER:BRDTP=<MBPB>,BRDID=<0>

BRDTP is the type of the board to be queried, and BRDID is the ID of the board to be queried.

 **Note:**

- 1) When BRDTP is selected as MTRB, the parameter BRDID (value range: 0-5) must be specified.
 - 2) When BTDTP is selected as MBPB, the parameter BRDID (value: 0) is optional.
-

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2 Installing BTS Terminal O&M Software

2.1 Software Features

BTS3601C terminal O&M software (hereinafter referred to as "terminal O&M software") is classified into two categories: the remote O&M and the local O&M. These two categories differ in the way they are installed.

I. Local O&M software

Local O&M software includes FTP Client (Ftp.exe) and Telnet Client (Telnet.exe). The two programs are both self-contained by Windows9x OS.

To realize the local maintenance, the maintenance console is connected through crossover network cables to BTS via the Ethernet port that is in the Micro-bts Base-band Processing Module (MBPM) maintenance window. The user thus can issue O&M commands through the local maintenance console to maintain the BTS3601C.

II. Remote O&M software

The remote O&M software comprises the software for the BAM server and the Client. Among which, the Client software is composed of three parts: BSC Client, BTS3612 Client and BTS3601C Client. The remote O&M software described in this manual refers to BTS3601C Client.

2.2 Installing Local O&M Software

2.2.1 Operational Environment

I. Hardware environment

Basic hardware configuration of the WS (desk-top computer):

- Pentium 100 CPU
- One 500Mbyte hard disk
- One 8Mbyte memory
- One integrated network card

II. Software configuration

Windows 95 or Windows 98.

2.2.2 Conditions

For the normal operation of the local maintenance console, the following conditions should be met:

- 1) The hardware environment are ready;
- 2) Windows9x OS can operate normally;
- 3) Windows9x installation files and network card driver (provided by the original manufacturer) are furnished.

2.2.3 Network Configuration

This involves the installation and configuration of the network card and the TCP/IP. The configuration is performed through the functional items of "Add new hardware" and "Network" in turn on the "Control Panel" of the computer.

The IP address of the maintenance console should be in the same network segment as that of BTS3601C MBPM network port. In addition, the address should be unique in the IP addresses of the network equipment.

The connection sequence of network cables (crossover cable) at the network port is shown in Figure 2-1.

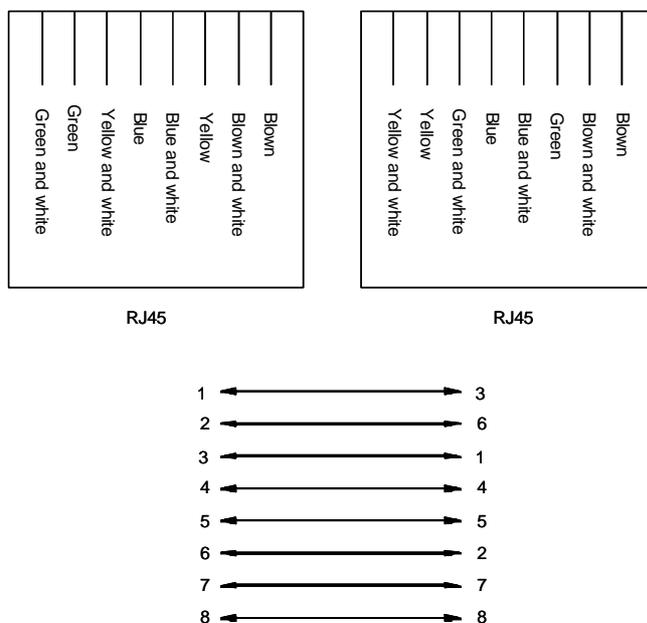


Figure 2-1 Connection sequence of crossover network cables

2.2.4 Software Installation and Instructions

Since Local O&M software (Ftp.exe and Telnet.exe) is self-contained by Windows9x, there is no need for extra installation.

To run Ftp/Telnet, click [Start/Run] in the system menu of the computer, and input "ftp xxx.xxx.xxx.xxx"/"telnet xxx.xxx.xxx.xxx" into the dialogue box of [Run]. "xxx.xxx.xxx.xxx" is the IP address of MBPM network port. Ftp/Telnet is then started for you to log in to the MBPM.

2.3 Installing Remote O&M Software

2.3.1 Operational Environment

The remote O&M software (referring to the BTS3601C Client software here) should be installed to the same computer together with BSC Client and BTS3612 Client.

2.3.2 Conditions

- 1) Make sure the computer is installed with only the software necessary for the system. Otherwise, there may be operational conflicts that may affect the normal operation of the Client software. Moreover, make sure that a nice and stable network hardware environment has been established.
- 2) Obtain from Huawei the complete set of installation files and read-me files, as well as a legal product serial number.
- 3) BTS3601C Client software should be installed only after the corresponding BSC Client and BTS3612 Client have been installed. Before installation, please make sure that the versions of the three kinds of software are consistent.

2.3.3 Software Installation and Instructions

The BSC Client and BTS3612 Client (both are of the matching versions) should have been installed first (for instructions, please refer to the corresponding parts in BSC/BTS3612 installation manuals). After that, to install BTS3601C Client software, the procedures include:

I. Starting SETUP.EXE

After inserting the installation disk into the disk drive, different alternatives are provided for:

- If auto execution has been set for the system, the program will be started then.
- Or, you should click [Start/Run] in the system menu and key in "SETUP" and the corresponding driver icon and path, and press <Enter>.

- You can also click [SETUP.EXE] in the Resource Manager to run the program.
- You can copy the files in the installation disk to the hard disk and run them.

The initial installation interface as shown in Figure 2-2 will then pop up.

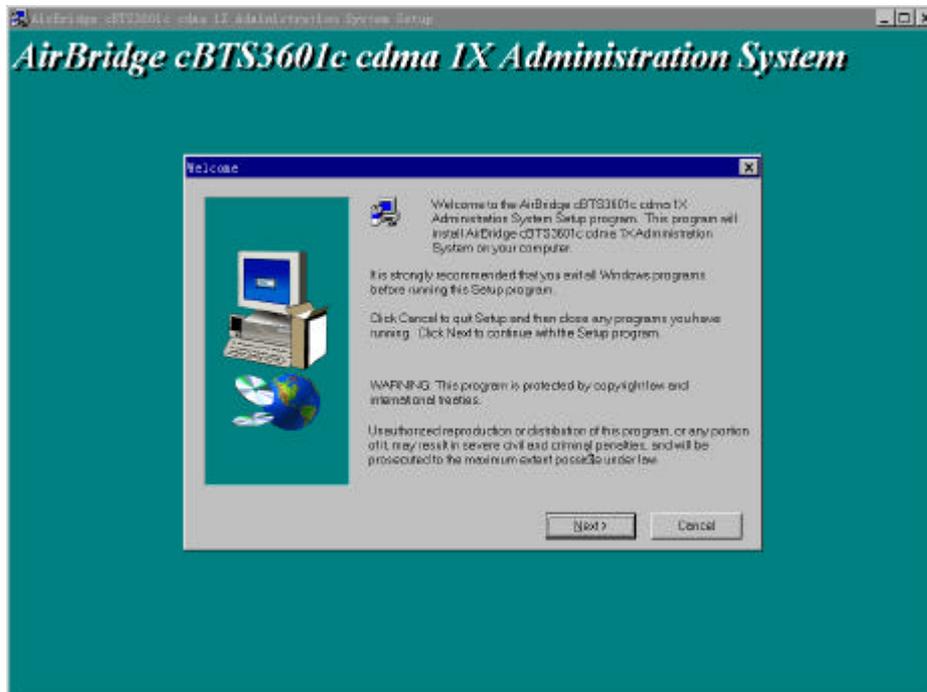


Figure 2-2 Initial installation interface

Click <Next> to continue (or click <Cancel> to exit the installation).

II. License agreement and installation instructions

The [Software License Agreement] will pop up as shown in Figure 2-3. After reading it carefully, click <Yes> to accept it and continue (or <No> to exit the installation).

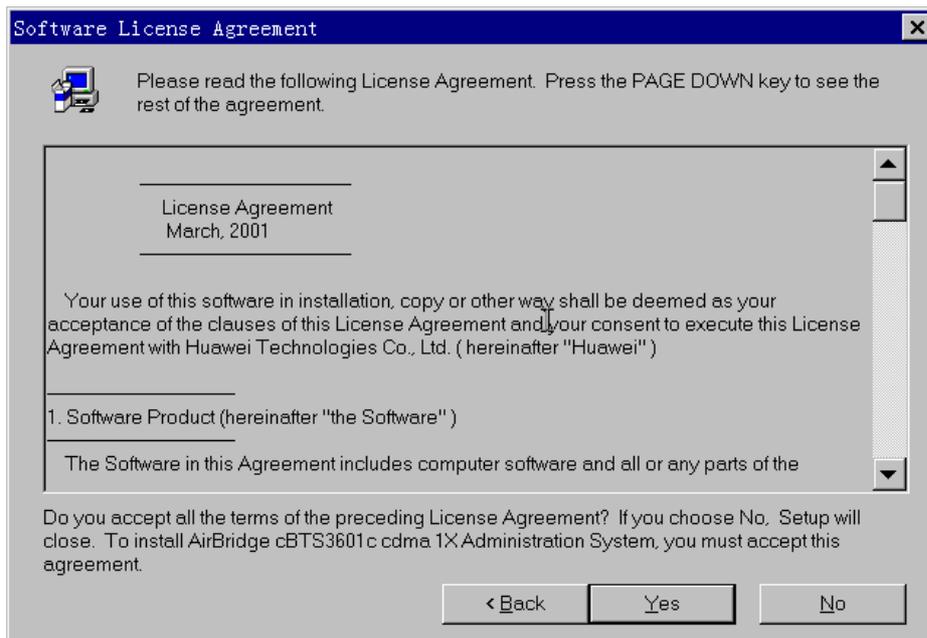


Figure 2-3 Software license agreement interface

The installation wizard will guide you how to install the software step by step, as shown in Figure 2-4. It may contain some latest installation information not given in this manual. Read the information carefully, then click <Next> to continue.

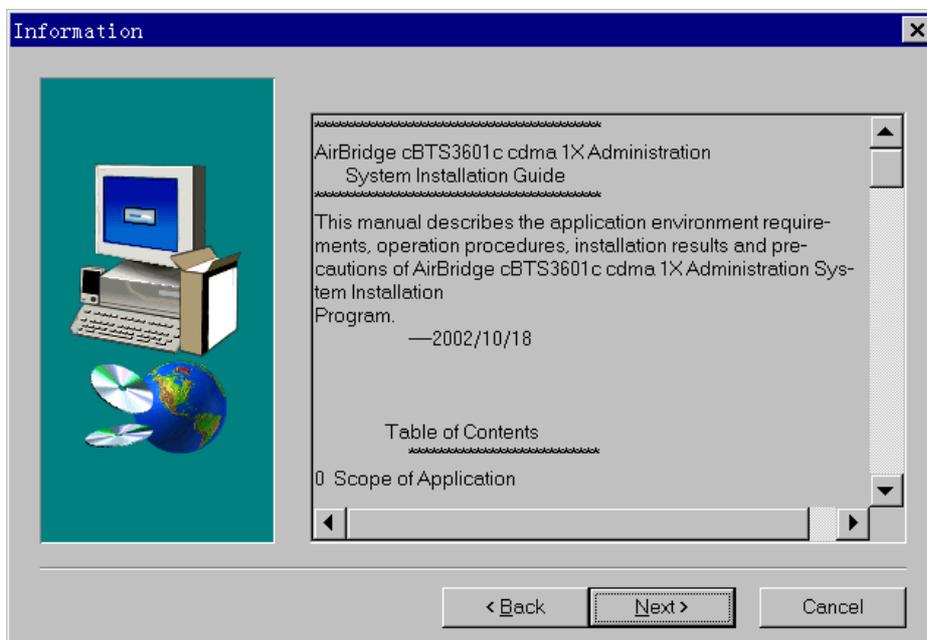


Figure 2-4 Interface of system installation instructions

III. Confirming the installation information

You are required to confirm the installation information as shown in Figure 2-5 before copying files.

If you want to change the installation information, please click <Back> to return to the previous step. Otherwise, click <Next> to continue.

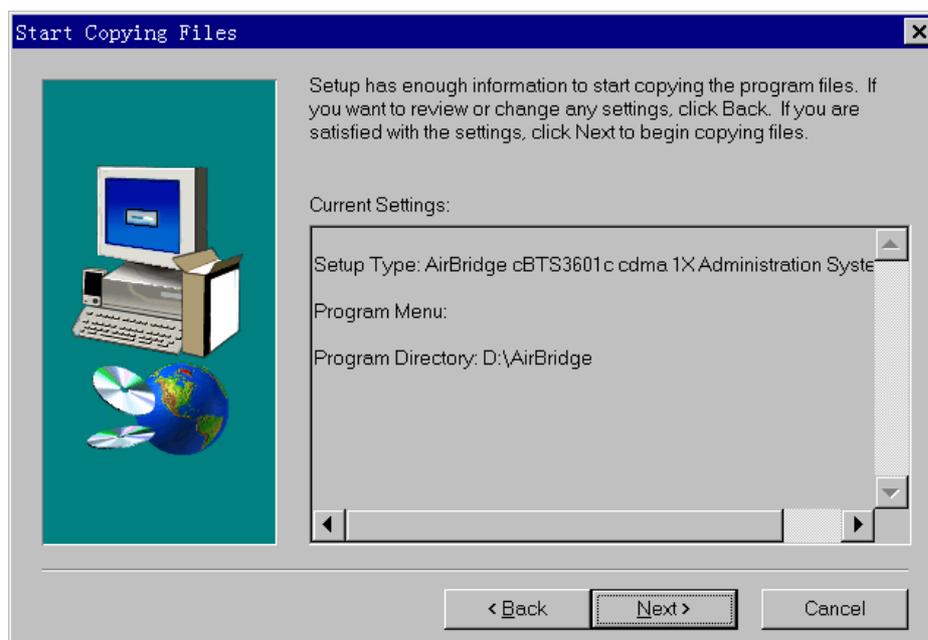


Figure 2-5 Confirming the installation information

 **Note:**

The default installation path for BTS3601C Client software is D:\AirBridge, the same as that of BSC Client and BTS3612 Client. If the installation path of BSC/BTS3612 Client has been changed, the installation program of BTS3601C Client will automatically find the new one.

IV. Completing the installation

After confirming the installation information, the installation program will start copying files. In the process of file copying, the installation program will show such information including overall progress, available disk space, available memory and progress of individual file copying.

Upon the completion of the installation, the window [Setup Complete] as shown in Figure 2-6 will pop up.

Click <OK>, and the system should be restarted to make the Client software valid.

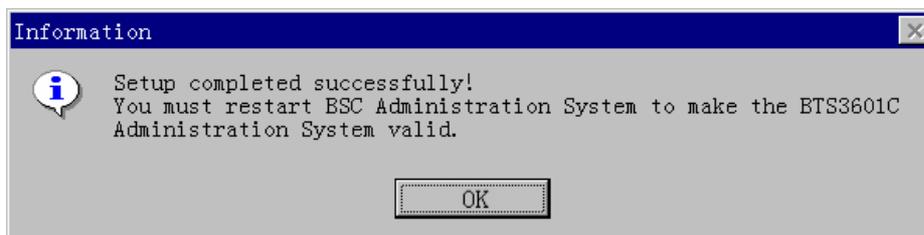


Figure 2-6 End of the installation

That is the end of the installation of BTS3601C Client software.

 **Note:**

The above described installation procedure is the one in normal situation. If abnormality occurs at any installation procedure, please follow the system prompts.

After the installation, click [Start/Program/Airbridge cBSS cdma 1X Administration System/ AirBridge cBSS Client] to start the Client software.

The operation interface is shown in Figure 2-7.

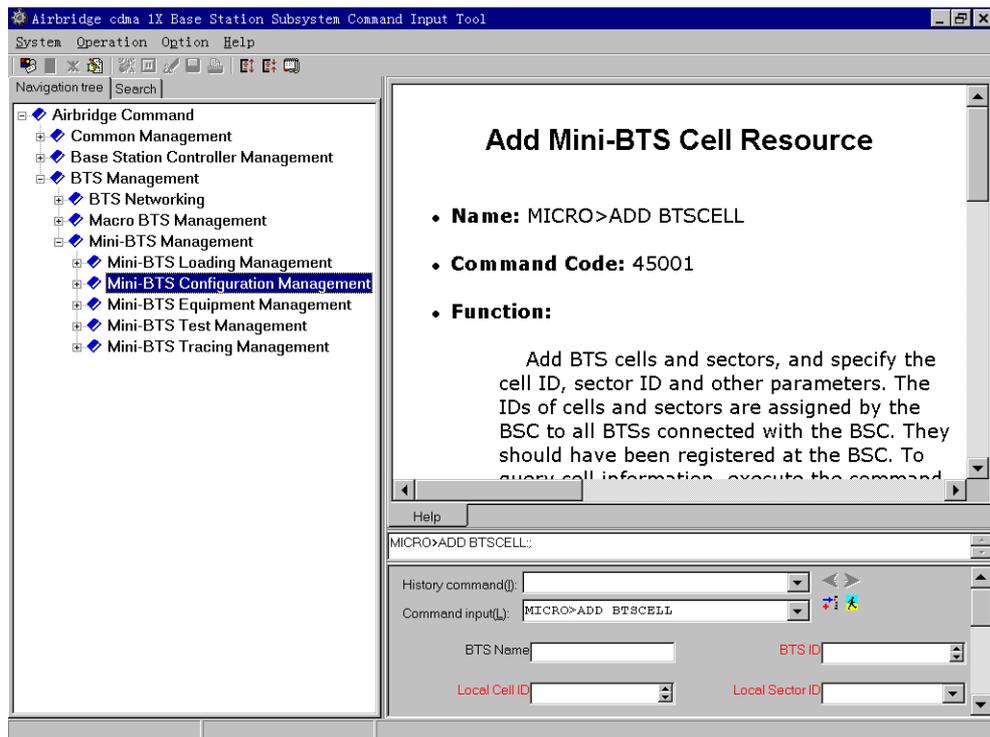


Figure 2-7 Operation interface of remote O&M software

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4 System Commissioning

4.1 Modes of System Commissioning

4.1.1 Local Commissioning

Local commissioning is performed through BTS3601C local maintenance console. The user can log in to the BTS3601C in the Telnet mode, and commission the BTS3601C objects with Man-Machine-Language (MML) commands.

Please refer to the module of "Maintenance Console" in User Manual for details of commissioning commands.

4.1.2 Remote Commissioning

In the remote commissioning mode, the user can input the commissioning command at the OMC Client. After receiving the command, BAM server will process it and send it to the BTS3601C. When the response returns from the BTS3601C, BAM server will record the operation result (success, failure, timeout, abnormality, etc.) and send the returned operation result in a certain report format to the Client.

For specific operations, please refer to *cBSC Operation Manual*.

4.2 Power-on Operation of Software

After the BTS3601C is powered on, the software of various boards will conduct self-test and necessary initialization.

After the system operation becomes stable, MBPB will acquire the basic configuration parameters to set up the Operation & Maintenance Link (OML) for the BTS3601C (The protocol involved is BOOTP, a standard protocol in TCP/IP protocol family, which can be used to obtain IP automatically).

MBPB will also judge whether there are correct configuration data in the BTS3601C Flash Memory. If there are correct configuration data, MBPB will directly send the data to each board for configuration. If there is no correct data, MBPB will request the data from OMC, and send it to the BTS3601C boards for configuration.

The following section briefs the startup and operation of BTS3601C.

4.2.1 Board Startup and Indicator Description

When the BTS3601C is powered-on, BOOT software of each board will start running to transfer CPU software from Flash Memory to Random-Access Memory (RAM), and start the self-test and initialization.

If the initialization is successful, the board will send a request to Operation & Maintenance Unit (OMU) for configuration; otherwise, board will be reset and restarted.

There are three indicators on both the board panels in the maintenance window of MBPM and MTRM respectively. From top to bottom they are: RUN (operation indicator, green), ALM (alarm indicator, red) and ACT (work indicator, green).

The following briefs the statuses of indicators. For details, please refer to chapter "Introduction to Module Maintenance Window" in the User Manual.

- When MBPB/MTRB has no configuration data, all the three indicators will fast flash at the frequency of 4Hz.
- When MBPB/MTRB is downloading the software, indicator RUN will fast flash at the frequency of 4Hz.
- When the board is in normal operation, indicator RUN flashes slowly at the frequency of 0.5Hz, while "ACT" keeps on, and "ALM" is off.
- When alarms occur in the operation of the board, indicator ALM will flash at different frequencies to indicate different alarm levels.

4.2.2 Setting up OML

After the self-test, MBPB will set up OML with OMC first.

OML is set up through the following procedures:

- 1) MBPB in the BTS3601C sends BOOTP request to OMC;
- 2) After receiving BOOTP request from the BTS3601C, OMC will fill the corresponding BOOTP response frame (including the IP address, subnet mask, gateway address, etc. of this BTS3601C) according to BOOTP information of the relevant BTS3601C configured before. OMC will then send the frame to the BTS3601C.
- 3) According to the received BOOTP response frame, BTS3601C will set its own IP address and the related routing data;
- 4) After obtaining IP address and creating the route, the BTS3601C will send to OMC a request to setup TCP link. In receipt of the request, OMC will set up the OML to that BTS3601C.

4.2.3 Setting up Abis Signaling Link

After the configuration of the BTS3601C, MBPB will set up Abis signaling link according to the configured parameters and exchange signaling with the BSC.

4.2.4 Setting up Cells

When Abis signaling link is set up, MBPB will report the configuration status of BTS3601C resources to BSC and ask for logical configuration.

After BSC sends cell configuration data to MBPB, BTS3601C will configure the relevant carrier attributes, set up common channel and update the overall messages. So far the cell has been set up and MSs can access the network and originate calls.

4.2.5 Normal Operational Status

Once the BTS3601C comes into normal operation, MSs can access the network and make calls.

However, sometimes it is found that although MTRM is in normal operation without any critical alarms, MSs cannot access the network and make calls. To solve such problem, the user can take the following measures:

- Check whether MTRM has power output.
- Check whether the system messages are issued normally.
- Trace and locate the fault by using a signaling analyzer or the Abis interface tracing function of the maintenance console.

During the operation, if the board ALM indicator flashes, it indicates that alarms have been generated. In this case, the user can query at the BTS3601C terminal maintenance console for specific alarm description and take the corresponding measures.

4.2.6 Clock Reference Source

The cdma2000 1X is a synchronization system. A precise reference clock should be provided for the BTS3601C.

The BTS3601C can receive the clock signal from multiple clock reference sources, including: GPS clock reference source, GLONASS clock reference source and external clock reference source.

4.3 Commissioning Board Software

4.3.1 Testing Links

The normal operation of communication links is the precondition for the board software to operate normally. By querying alarms, the user can check whether the OMLs between BTS3601C boards and OMU are normal, and whether the signaling links between the boards and the main control Signaling Processing Unit (SPU) are normal.

Besides, users can use the BTS3601C local/remote maintenance console to issue commands to perform loopback test on the boards. In this way, the user can ensure the normal operation of the communication links.

4.3.2 Processing Faults and Alarms

I. Description of alarms

The faults occurred on the modules during BTS3601C operation will be reported to OMU in logs or alarms. After recording and processing, OMU will report them to OMC.

The alarms generated by BTS3601C include the following levels: critical, major, minor and notice.

What follows is the introduction to various module alarms items:

- Common alarm

This alarm item includes the following alarms: 1. Board parameter configuration error alarm; 2. Board temperature abnormal alarm; 3. Board communication link fault alarm; 4. Optical interface no signal alarm. 5. CUP overload alarm.

- MBPB alarm

This alarm item includes the following alarms: 1. OML interrupted alarm; 2. Abis signaling link fault alarm; 3. Satellite antenna feeder system fault alarm; 4. System clock abnormal alarm; 5. Master clock out of lock alarm; 6. UNI link alarm; 7. E1/T1 link local alarm; 8. E1/T1 link remote alarm; 9. ASU fault alarm.

- MTRB alarm

This alarm item includes the following alarms: 1. Receive channel over-activated alarm; 2. Transmit channel clock unlocked alarm; 3. Hardware phase-lock loop unlocked alarm; 4. Software phase-lock loop unlocked alarm; 5. I_0 value abnormal alarm; 6. Digital down-converter alarm. Besides, the related alarms including fan, power amplifier and MLNA alarms are also reported through MTRM.

II. Alarm processing

Boards will report a message to OMU when an alarm is generated or cleared. Accordingly, OMU will set the board availability status and take related measures. OMU will report all the alarms to OMC to facilitate operators locate the fault before further measures can be taken.

4.3.3 Operation and Maintenance

BTS3601C provides convenient O&M function to manage and maintain the BTS3601C equipment. The functions include loading management, configuration management, equipment management, tracing management and testing management.

What follows is the description of some daily maintenance operations from the angle of OMC terminal.

I. Equipment management

1) Querying the operation status of BTS3601C boards

Run the remote maintenance console software (AirBridge cBSS Client), and select BTS Management in the command tree.

Select Mini-BTS Management\Mini-BTS Equipment Management\Query Mini-BTS Board Status (**MICRO>DSP BTSBRDSTAT**).

Click  , the shortcut icon of command **Create Input Interface**, and input the following:

- [BTS Name]: Input the name of the BTS (this entry may be omitted);
- [BTS ID]: Select the ID of the BTS to be queried;
- [Board Type]: Select the type of the BTS board to be queried;
- [Board ID]: Select the ID of the BTS MTRB to be queried (when [Board Type] is selected to be MBPB, this parameter will not appear).

Click  , the shortcut icon of **Execute command**, to display the query result about the corresponding BTS board status in the maintenance window.

2) Querying the version information of BTS3601C boards

Run the remote maintenance console software (AirBridge cBSS Client), and select BTS Management in the command tree.

Select Mini-BTS Management\Mini-BTS Equipment Management\Query Mini-BTS Board Version Information (**MICRO>DSP BTSBRDVER**).

Click  , the shortcut icon of **Create Input Interface**, and input the following:

- [BTS Name]: Input the name of the BTS (this entry may be omitted);
- [BTS ID]: Select the ID of the BTS to be queried;
- [Board Type]: Select the type of the BTS board to be queried;
- [Board ID]: Select the ID of the BTS MTRB to be queried (when [Board Type] is selected to be MBPB, this parameter will not appear).

Click  , the shortcut icon of **Execute command** , to display the query result of BTS board version information in the maintenance window.

3) Resetting BTS3601C boards

Boards can be reset through the BTS3601C remote/local O&M console. OMU issues the board resetting command to the corresponding board. In receipt of the command, the board will reset itself, send the reset report message to and wait for the initialization data from OMU.

Board reset will affect the system operation status. It is recommended that the user use it prudently.

The method to reset BTS3601C boards on the remote BTS3601C maintenance console is as follows:

Run the remote maintenance console software (AirBridge cBSS Client), and select BTS Management in the command tree.

Select Mini-BTS Management\Mini-BTS Equipment Management\Reset Mini-BTS Board (**MICRO>RST BTSBRD**).

Click  , the shortcut icon of command **Create Input Interface**, and input the following:

- [BTS Name]: Input the name of the BTS (this entry may be omitted);
- [BTS ID]: Select the ID of the BTS to be managed.
- [Board Type]: Select the type of the BTS board to be reset.
- [Board ID]: Select the ID of the BTS MTRB to be reset (when [Board Type] is selected to be MBPB, this parameter will not appear);
- [Level of resetting]: Select the level of the reset.

Click  , the shortcut icon of **Execute command**, to reset the corresponding BTS board.

II. Tracing management

1) Starting BTS3601C resource tracing

Run the remote maintenance console software (AirBridge cBSS Client), and select BTS Management in the command tree.

Select Mini-BTS Management\Mini-BTS Tracing Management\Start Mini-BTS Resource Tracing (**MICRO>STR BTSRESTRC**).

Click  , the shortcut icon of command **Create Input Interface**, and input the following:

- [BTS Name]: Input the name of the BTS (this entry may be omitted);
- [BTS ID]: Select the ID of the BTS to be managed;
- [Board Type]: Select the type of the board to be traced;
- [Board ID]: Select the ID of the BTS MTRB to be traced (when [Board Type] is selected to be MBPB, this parameter will not appear);
- [Resource Type]: Select the type of the resource to be traced.

Click  , the shortcut icon of **Execute command**, to display the tracing result of the corresponding BTS3601C board resource in the maintenance window.

2) Stopping BTS3601C resource tracing

Run the remote maintenance console software (AirBridge cBSS Client), and select BTS Management in the command tree.

Select Mini-BTS Management\Mini-BTS Tracing Management\Stop Mini-BTS Resource Tracing (**MICRO>STP BTSRESTRC**).

Click  , the shortcut icon of **Create Input Interface**, and input the following:

- [BTS Name]: Input the name of the BTS (this entry may be omitted);
- [BTS ID]: Select the ID of the BTS to be managed;
- [Board Type]: Select the type of the board no longer to be traced.
- [Board ID]: Select the ID of the BTS MTRB no longer to be traced (when [Board Type] is selected to be MBPB, this parameter will not appear);
- [Resource Type]: Select the type of the resource no longer to be traced.

Click  , the shortcut icon of **Execute command**, to stop tracing the corresponding BTS3601C board resource.

III. Test management

1) Starting BTS3601C loopback test

The loopback test can be conducted on the BTS3601C remote maintenance console to check the status of the BTS3601C MBPB-MTRB OML. The following describes the method to perform the loopback test.

Run the remote maintenance console software (AirBridge cBSS Client), and select BTS Management in the command tree.

Select Mini-BTS Management\Mini-BTS Test Management\Start Mini-BTS Loopback Test (**MICRO>STR BTSLPBACKTST**).

Click  , the shortcut icon of **Create Input Interface**, and input the following:

- [BTS Name]: Input the name of the BTS (this entry may be omitted);
- [BTS ID]: Select the ID of the BTS to be managed;
- [Board ID]: Select the number of the MTRB to be tested.
- [Test Type]: Select the type of the loopback to be conducted.
- [Time of Loopback]: Select or input the number of times that the loopback test will be conducted.

Click  , the shortcut icon of command **Execute command**, to start the loopback test for the corresponding BTS3601C board.

2) Stopping BTS3601C loopback test

Run the remote maintenance console software (AirBridge cBSS Client), and select BTS Management in the command tree.

Select Mini-BTS Management\Mini-BTS Test Management\Stop Mini-BTS Loopback Test (**MICRO>STP BTSLPBACKTST**).

Click  , the shortcut icon of command **Create Input Interface**, and input the following:

- [BTS Name]: Input the name of the BTS (this entry may be omitted);
- [BTS ID]: Select the ID of the BTS to be managed;
- [Board ID]: Select the number of the MTRB on which the loopback test is to be stopped.
- [Test Type]: Select the type of the loopback to be stopped.

Click  , the shortcut icon of **Execute command**, to stop the loopback test on the corresponding BTS3601C board.

3) Starting BTS3601C E1 test

BTS3601C E1 test can be conducted on the remote O&M console to check the BSC-BTS physical transmission link, so as to locate the transmission fault or evaluate the quality of the transmission link.

Run the remote maintenance console software (AirBridge cBSS Client), and select BTS Management in the command tree.

Select Mini-BTS Management\Mini-BTS Test Management\Start Mini-BTS E1 Test (MICRO>STR BTSE1TST).

Click , the shortcut icon of **Create Input Interface**, and input the following:

- [BTS Name]: Input the name of the BTS (this entry may be omitted);
- [BTS ID]: Select the ID of the BTS to be managed;
- [Test Type]: Select the type of the loopback to be conducted;
- [Duration of Test (min)]: Select or input the time that the loopback test will last. This is an optional parameter. By default: 5min.

Click , the shortcut icon of **Execute command**, to start the loopback test on the corresponding BTS3601C E1 link.

4.4 Call Function Test

After the hardware installation, check, software installation and basic commissioning, the user should start the BTS3601C overall function test: service function test.

4.4.1 Test Equipment

I. Abis interface signaling monitoring

Connect the signaling protocol tester (such as K1205 and MA10) to the E1 cables between BSC and BTS. Set the protocol stack as Abis interface, and select the timeslot to be monitored according to BSC configuration.

If no signaling tester is available, the OMC interface tracing function also works.

II. Call generator

It is used to simulate multi-user call setup.

III. Test MS

It is used to test the service functions.

4.4.2 Preparations for Service Function Test

Before the test, make the following preparations:

- 1) Make sure that BSC and BTS3601C are properly connected. BSC and BTS3601C can be connected via E1/T1 or optical fiber. Make sure that the connection is correct before the system is powered on.

- 2) Make sure the O&M and signaling links on Abis interface are connected properly. The connection status of the OMLs and signaling links on Abis interface can be queried through the OMC BAM.
- 3) Make sure cell configuration is correct, and the MS can access the network at the configured frequency.

4.4.3 Service Flow Overview

When switched on, an MS may be either in the idle mode or the dedicated mode. In the idle mode, the MS will monitor the radio surroundings and find a suitable service cell to stay; then the MS will monitor the paging channel in the service cell so as to receive the paging messages from the network side. In the dedicated mode, the MS exchanges signaling and data with the network.

The basic flow is as follows:

- 1) Location update flow
- 2) Mobile Originated Call (MOC) flow
- 3) Mobile Terminated Call (MTC) flow
- 4) Handoff flow
- 5) Mobile originated SMS flow
- 6) Mobile terminated SMS flow
- 7) Mobile originated call packet data flow
- 8) MS packet data flow (downlink service rate)

Flows 1), 2), 3), and 4) are of basic radio connection; while flows 5), 6), 7), and 8) can be independent flows, or be additional part of flows 1), 2), 3), and 4).

I. Location update flow

The MS notifies the network of its current location in the network through the location update flow so that the network can provide service.

In the following situations, MSs will originate the location update:

- When an MS moves into a new location area
- When it is time to perform periodic location registration. The time for periodic location update is designated in the system message received from the network.

II. Mobile originated/terminated call setup flow

These are two basic connection flows of CDMA system. The call may be a speech call, or a data call.

In an mobile originated call, the called party may be a CDMA mobile subscriber, a PSTN subscriber, an ISDN subscriber, a CSPDN subscriber or a PSPDN subscriber.

In the mobile terminated calls, the calling party may be a cdma2000 1X mobile subscriber, a PSTN subscriber, an ISDN subscriber, a CSPDN subscriber or a PSPDN subscriber.

III. Handoff flow

In cdma2000 1X system, handoff has three types: soft handoff, softer handoff and hard handoff.

Soft handoff or softer handoff can ensure MSs the uninterrupted service when they are crossing the cell or sector border; while in the hard handoff, the existing connection has to be cut off before the new connection can be set up.

If the subscriber's current channel suffers from serious interference, the service on it can be handed over to another channel to prevent the interruption. The QoS is thus improved. The handoff flow is an important means for the operators to deal with temporary service overload of cells.

The handoff flow is not independent. It is a part of other basic service flows.

IV. Mobile originated/terminated Short Message Service (SMS) flow

cdma2000 1X supports the point-to-point SMS flow, so that subscribers can send and receive SMS. It is different from the cell broadcast SMS, which is the point-to-multipoint broadcast service.

Mobile originated SMS flow is to send a short message from the MS to the Message Center (MC); on the contrary, mobile terminated SMS flow is to send a short message from the MC to the MS.

V. MS packet data flow

cdma2000 1X supports packet data service flow. It provides the high-speed data service transmission capability of up to 156.3kbit/s.

The MS can be used either as a terminal to run data services such as surfing the internet and sending/receiving E-mails, or as a data channel for other terminals (such as computer and PDA) to run data services.

4.4.4 Test of Location Update Flow

I. Test condition

The test MS has been defined in HLR.

II. Test steps

- 1) Make sure the network data setting is correct.
- 2) Switch on the test MS
- 3) Observe the signaling on Abis interface.

III. Expected test result

By tracing the signaling on Abis interface, the possible results of the location update include:

- 1) The network side accepts the MS location update request;
- 2) The network side rejects the MS location update request.

4.4.5 Test of MOC Flow

I. Test condition

This test should be conducted after a successful location update flow, when the MS should display the current PLMN No. or operator name.

II. Test steps

Call a PSTN subscriber with the MS.

III. Expected test result

In normal cases, the called PSTN subscriber establishes a bidirectional conversation with the MS after ringing and off-hook.

4.4.6 Test of MTC Flow

I. Test condition

This test must be preceded by a successful location update flow. The called MS should reside in the coverage of the tested BTS3601C, and display the current PLMN No. or operator name of the network.

II. Test steps

Call the test MS from a PSTN telephone set.

III. Expected test result

In normal cases, the test MS establishes a conversation with the calling PSTN subscriber after ringing and off-hook.

4.4.7 Test of Handoff Flow

I. Test condition

- 1) This test should be performed after the above three tests and in the area covered by at least two cells. One of cell should be configured with several sectors, so that the test of the softer handoff can be conducted.
- 2) The sectors (or omni cells) that compose the overlapped radio coverage should be configured with different frequencies, so that the hard handoff can be conducted.
- 3) The related handoff data should have been configured;
- 4) Dedicated test MSs;
- 5) Change the IMSI of the MS, and redefine the subscriber. In this way, the MS can access the network by selecting a certain basic frequency or auxiliary frequency in the sector (or omni cell) that is configured with multiple frequencies.

II. Test steps

- 1) Use an MS to call a PSTN subscriber and establish a conversation.
- 2) Move the MS from the source sector to the adjacent sector within the same cell to test the softer handoff performance.

Only when the adjacent sector is also configured with the frequency at which the MS has established the conversation in the source sector, and the frequency is available, can the softer handoff be achieved.

- 3) Move the MS from the source cell to the target cell to test the soft/hard handoff performance.

When the MS establishes a connection at a frequency in the source cell, while the target cell is not configured with this frequency, the hard handoff will occur. If the target cell is configured with this frequency and this frequency is available, the soft handoff will occur.

III. Expected test result

- 1) Soft handoff and softer handoff

Normally, when the MS moves to the adjacent cell/sector, the target pilot channel will be shown in the active set of the MS pilot set.

During the conversation, the mobile subscriber feels no interruption or call drop, and the voice quality is good.

- 2) Hard handoff

Normally, when the MS moves to the adjacent cell or sector, it is visible in the active set of the MS pilot set that the source pilot channel is deleted, and the target pilot channel is added.

The mobile subscriber will feel temporary conversation interruptions.

 **Note:**

If the actual test conditions cannot meet the standard, the test flow can be simplified like this: Make an MOC/MTC, and move the MS repeatedly between the adjacent cells, or between the adjacent sectors in one cell. Whether the handoff flow is normal or not can be judged by observing whether or not there are conversation interruptions, and by the voice quality.

4.4.8 Test of Mobile Originated SMS Flow

I. Test condition

- 1) The test should be performed after the location update flow test;
- 2) The system must be configured with Message Center (MC);

II. Test steps

Use an idle MS to send an short message through the specified MC.

III. Expected test result

In normal cases, the MS that originates the short message will prompt that the short message has been transmitted successfully. The corresponding short message can be queried at the MC.

4.4.9 Test of Mobile Terminated SMS Flow

I. Test condition

Location update flow test is completed.

II. Test steps

Input an short message to MC properly. The receiver of the short message is the test MS that is in the idle status.

III. Expected test result

In normal cases, the called MS will ring to indicate that the MS has received the short message and is ready to display the content of the SM.

4.4.10 Test of Mobile Originated Packet Data Flow

I. Test condition

- 1) A cdma2000 1X MS, a set of BlueRose and a ready FTP server;
- 2) The system adopts dynamic rate allocation.

II. Test steps

- 1) Use the BlueRose to control the process of the test MS logging in to FTP server, and originate the FTP downloading;
- 2) Observe the signaling flow and the status transition of MS on BlueRose;
- 3) Check the channel setup of the sector.

III. Expected test result

- 1) The MS successfully logs in to the FTP server, and transits from the idle status to the downloading status.
- 2) After the Fundamental Channel (FCH) is set up, BTS3601C repeatedly issues the ESCAM message and performs the Supplemental Channel (SCH) setup or SCH extension.

4.4.11 Test of MS Packet Data Flow (Downlink Service Rate)

I. Test condition

- 1) The system adopts dynamic rate allocation;
- 2) A cdma2000 1X MS, a set of BlueRose and a ready FTP server;

II. Test steps

After the MS logs in to the FTP server under the control of the BlueRose, originate the FTP file downloading, and test the downlink rate of a single subscriber under the following conditions respectively:

--The adjacent cell and target sector are not loaded. The MS is stationary, and is within short distance to the BTS3601C.

--The adjacent cell and target sector are not loaded. The MS is stationary, and is within long distance to the BTS3601C.

--The adjacent cell and target sector are not loaded, and the MS is moving (15, 30, 70km/h), and is within short distance to the BTS3601C.

--The adjacent cell and target sector are not loaded, and the MS is moving (15, 30, 70km/h), and is within long distance to the BTS3601C.

--The adjacent cell is 100% loaded. The target sector is 50% loaded. The MS is stationary, and is within short distance to the BTS3601C.

--The adjacent cell is 100% loaded. The target sector is 50% loaded. The MS is stationary, and is within long distance to the BTS3601C.

--The adjacent cell is 100% loaded. The target sector is 50% loaded. The MS is moving (15, 30, 70Km/h), and is within short distance to the BTS3601C.

--The adjacent cell is 100% loaded. The target sector is 50% loaded. The MS is moving (15, 30, 70Km/h), and is within long distance to the BTS3601C.

III. Expected test result

In normal cases, the downlink data service rate keeps stable.



Note:

There are multiple test conditions listed in the test steps. It does not mean that all of them are necessary during the actual test.

4.4.12 Processing of Abnormalities in the Test

In normal cases, the above flows can pass the test. When abnormalities occur in the test, they cannot be all attributed to the fault of BTS3601C.

The service flow test does not only test BTS3601C, but also the whole CDMA 1X system. The parts tested include BTS3612, BTS3601C and BSC6600 of BSS. Besides, also tested are MSC/HLR, HLR, and AUC of the NSS and their interfaces to PSTN and Internet. The fault of any part of the system may result in the failure of the flow. Therefore, the analysis should be made based on the actual conditions when a fault occurs.

BTS3601C is responsible only for the radio transmission. If the MS can access the network and set up the radio service link, then we say the BTS3601C is in normal operation.

Take the location update flow as the example. If a location update request is rejected, basically it is due to the abnormality of the network equipment, or to be more specific, the problem with the data setting of HLR. Based on the rejection reason in the message for the rejected location update, further cause for the rejection can be figured out.