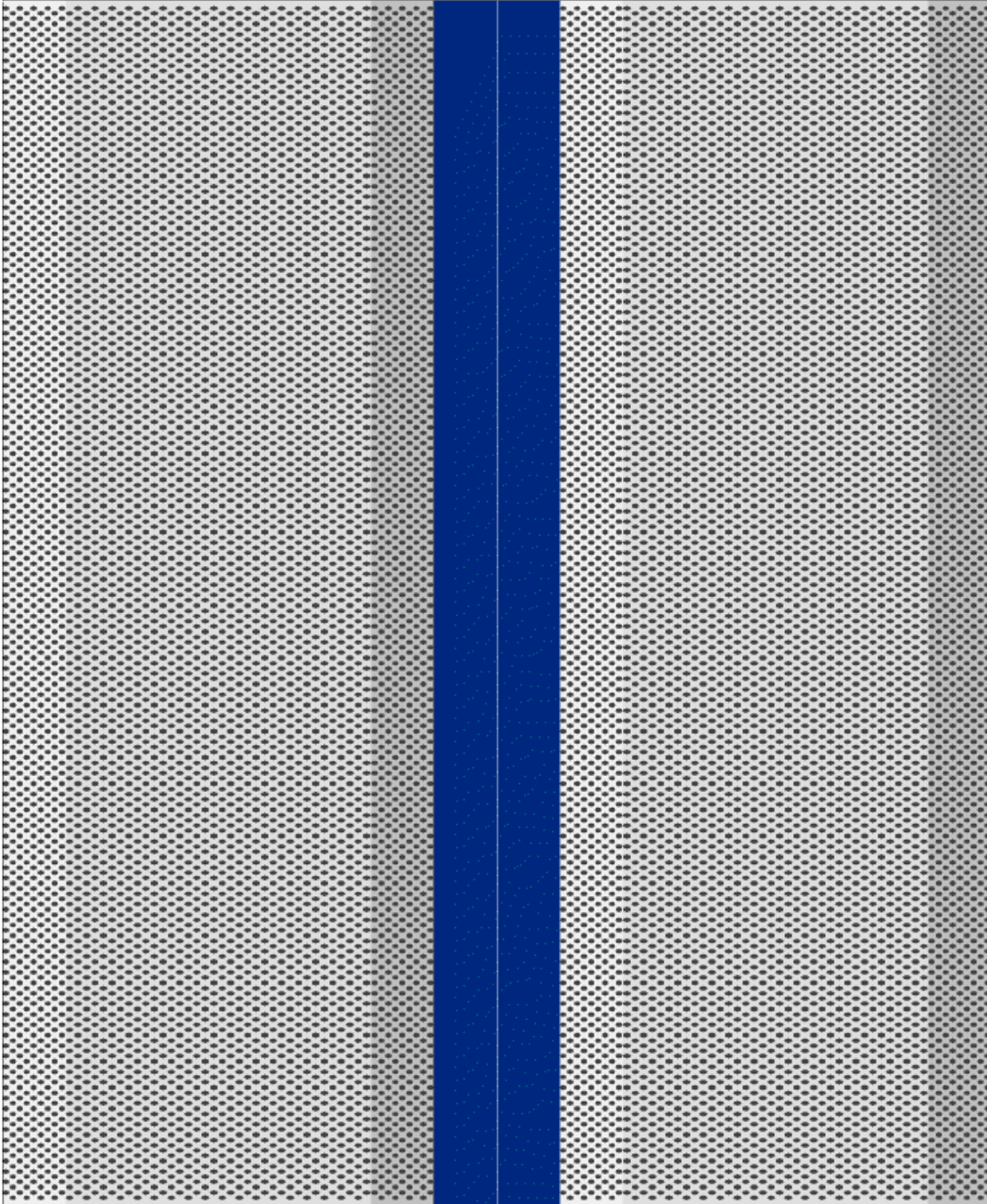


SAMSUNG

CDMA Base Station System



Indoor BTS Installation

CDMA Base Station System Indoor BTS Installation

Introduction

Physical Installation

Cabling

Initial Testing

Completion

Appendix A: Indoor BTS installation required tools

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Scope

This document covers the installation procedures for a single rack Indoor Base Transceiver Station (Indoor BTS).

Note: This installation must be performed by Samsung qualified service personnel only, using only the tools, supplies, and materials listed in this manual. Any deviation will negate the responsibility of Samsung for operation or condition of this equipment.

Note: Access to the Indoor BTS is restricted to Samsung qualified service personnel or other qualified maintenance personnel for internal subassembly or component replacement or any internal adjustment.

Warning: The rear or side panels of any Samsung equipment may be opened only by Samsung qualified service personnel. Samsung is not responsible for injury or harm to persons violating this policy.

This equipment complies with Part 24 of the FCC rules. Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Warning: This product is designed for use with antennas mounted on permanent outdoor structures. Upon installation the potential for RF exposure to persons should be evaluated.

Following completion of the civil construction, the following procedures will be performed:

- ◆ Site preparation and layout
- ◆ BBU installation
- ◆ GPS installation
- ◆ Physical installation of the BTS
- ◆ Cabling the equipment
- ◆ Initial testing of the BTS
- ◆ Completing the installation

A checklist for these procedures is given in Appendix B.

Conventions


All measurements provided in this manual are given in metric units, with US units in parentheses:

- ◆ Unless otherwise specified, lengths are given in millimeters (inches). For example, a length of 600.0 (23.6) means 600.0 mm (23.6 inches).
- ◆ Weights are given in kilograms (pounds). For example, weight of 450 (992) means 450 kilograms (992 pounds).
- ◆ Temperatures are given in degrees Celsius (Fahrenheit). For example: temperature of 37.8 (100) means 37.8 degrees Celsius (100 degrees Fahrenheit).
- ◆ Other dimensions are specified as required.

Required documentation

Before beginning the installation, verify that you have at least the following documents:

- ◆ Site survey check list (customer-provided).
- ◆ Site folder (customer-provided).
- ◆ Samsung *GPS System Installation Manual, v1.0*.
- ◆ *TDI 24VDC Indoor Power Plant Turn Up and Test Manual*.
- ◆ Indoor BTS Installation Record
- ◆ Packing lists (Samsung-provided) An example packing list is shown in the following figure:

PACKING LIST				
DATE 00/02/13			Page 1 Of 3	
PROJECT	0190015275			
SITE	DALLAS, USA			
REMARK	SEDV-BMBR			
A/S(TEL	82-(0546)460-2515			
NO	SEC CODE	DESCRIPTION	QTY	SERIAL NO
01	EP44-00011A	SMPS-SRM;S	001	S22N203231
02	EP75-00133A	MEC-HEAT E	001	S22N203235
03	EP44-00011A	SMPS-SRM;S	001	S22N203230
04	EP44-00011A	SMPS-SRM;S	001	S22N203229
05	EP44-00011A	SMPS-SRM;S	001	S22N203232
06	EP44-00010A	SMPS-ASSY-	001	S22N203233
07	EP44-00012A	SMPS-SDP-A	001	S22N203227
08	EP44-00012A	SMPS-SDP-A	001	S22N203228
09	EP96-01209A	ELA HOU RA	001	S3AN101668
10	EP96-00921C	ELA HOU-CC	001	S22N203253
11	EP96-00921C	ELA HOU-CC	001	S22N203252
12	EP96-00921C	ELA HOU-CC	001	S22N203251
13	EP96-00919C	ELA HOU-AF	001	S22N203247
14	EP96-00919C	ELA HOU-AF	001	S22N203246
15	EP96-00919C	ELA HOU-AF	001	S22N203245
16	EP96-00919C	ELA HOU-AF	001	S22N203248
17	EP96-00919C	ELA HOU-AF	001	S22N203249
18	EP96-00919C	ELA HOU-AF	001	S22N203250
19	EP96-00930A	ELA UNIT-C	001	S22N203243
20	EP92-00741A	PBA MAIN-M	001	S21KC47554

You should study these documents before proceeding.

Required installation materials and tools

For a complete list of installation tools, see "Appendix A: Indoor BTS installation required tools". For a complete list of installation materials, see "Appendix B: Indoor BTS installation materials". Verify that all required tools and materials are present before proceeding to the next section.

Safety precautions

This section specifies the recommended safety precautions to follow when you work with the equipment described in this Installation Manual.

This equipment meets the requirements of NFPA 70 (National Electric Code) and UL 1459 (Telephone Equipment).

Note: The installation of this equipment is to be performed by Samsung qualified service personnel only, using only the tools, supplies, and materials listed in the manual.

Safety guidelines include the following:

Warning

Warning: Warning denotes a danger that may cause loss of life, physical injury or ill health.

Lethal voltage



All work areas containing high voltage must be marked. Any circuits being serviced must display a work tag in areas where the circuit is accessible. Proper grounding is the responsibility of the service technician. Service Technicians should wear appropriate attire and avoid wearing jewelry or polyester materials. Samsung is not responsible for death and/or injury resulting to you and/or coworkers due to improper safety procedures.

- ◆ Potentially lethal voltages are present within this system. Ensure all power supplies are completely isolated by setting all power switches to off, disconnecting all relevant connectors and removing all relevant fuses before attempting any maintenance work. Do not rely on switches alone to isolate a supply.
- ◆ Potentially lethal voltages are present within this system. Ensure high voltage safety requirements are implemented before attempting to work on the system with the power connected.
- ◆ Potentially lethal voltages can be induced if the equipment is not grounded correctly. Ensure all ground connections are secure.
- ◆ Care must be taken when handling all the power cables. There must be no damage of any kind to the insulation of the cables
- ◆ It must be impossible to touch points carrying lethal voltages and make sure the cables are not connected to the power when routing them.

- ◆ Never attempt to install cables or replace surge protectors/rectifiers with power applied. Verify the customer-provided Service Entrance input breakers are OFF. Observe the “two person” rule.
- ◆ Do not disconnect AC and DC power connectors under load.

Lead-acid batteries



A “leak hazard” exists in any area where lead-acid batteries are used. Use caution whenever working in the area to prevent and correct any leaks detected.

Electromagnetic fields and RF power



Ensure the following guidelines are observed when dealing with equipment having electromagnetic fields and emitting Radio Frequency (RF) radiation.

- ◆ This equipment generates electromagnetic fields close to the antenna constituting a hazard to human health. Always keep a safe distance away from the antenna when the transmitter is on. Never walk in front of an active antenna. Keep a minimum distance of 5.2m (17 feet) from an antenna.
- ◆ Do not connect or disconnect the connectors on the transmitter side when the equipment in the base station is powered-up.
- ◆ Turn off the power when maintaining or working close to the antenna.
- ◆ RF radiation from the Base Transmission System (BTS) may also cause interference with cardiac pacemakers, hearing aids, and domestic equipment.
- ◆ RF radiation from the BTS may also cause interference with blasting equipment.

Laser power



Laser radiation may or may not be visible. Avoid eye or skin contact with Laser radiation. Never look directly into a laser. Use proper protection or some type of refraction material to view the laser. SAMSUNG is not responsible for improper safety procedures.

Explosive environment



Use caution whenever working in the area to prevent possible combustion fuel vapors.

- ◆ Do not install or operate in an explosive environment.
- ◆ Do not install or operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.

Sharp edges



Access ports in the racks and ducts have sharp edges where human injury or cable damage can occur during installation and routine maintenance. Use caution whenever working in an area with sharp edges to prevent possible injury to service personnel and damage to cabling.

Caution

Caution: Caution denotes possible damage to equipment but no danger to personnel.

Electrostatic Sensitive Devices



Proper procedures and precautions can prevent damage by ElectroStatic Discharge (ESD). Grounding, storage/transportation materials, and labeling reduce the effects of ESD. All electrostatic sensitive devices must be shipped in ESD approved bags. Electrostatic sensitive devices should not be removed from storage bags unless the unit is being tested or used for service. Ground straps and anti-static surfaces must be used while the electrostatic sensitive devices are exposed. SAMSUNG is not responsible for the damages caused by improper ESD procedures.

An electrostatic sensitive device is an electronic component (e.g. semi-conductor device or integrated circuit) that may be permanently damaged by electrostatic charges encountered in routine handling, testing and transportation.

Complete the following steps to ensure an assembly containing electrostatic sensitive devices can be safely removed without damage:

- ◆ Before handling electrostatic sensitive devices, touch a grounded point with your bare hand to dissipate any static charge that may have developed in your body. A ground point can be any bare metal surface, such as the unpainted surface of a rack, that has been grounded. Ground points are provided on all racks

Note: Do not handle any exposed connector contacts.

- ◆ Use a grounding wrist strap to remain discharged. The grounding wrist strap should be worn around your bare wrist and attached to the ground point until you place the removed assembly in a suitable container.



- ◆ Suitable ESD containers are:
 - Rigid metal containers.
 - Conductive foam-lined containers.
 - Approved anti-static plastic bags.
- ◆ Containers containing electrostatic sensitive devices must be labeled appropriately.

Physical Installation

Unpacking and moving the rack

- Unpacking the rack
- Lifting provisions

Mounting the racks – introduction

Anchoring the rack on a concrete pad

- Lay out and drill the mounting holes
- Anchor the rack

Isolation testing

Anchoring the rack on a raised floor

- Layout and drill the mounting holes
- Anchor the racks

Isolation testing on a raised floor

Leveling the rack

Unpacking and moving the rack

Unpacking the rack

Note: Unpack racks one at a time. Do not unpack any crates until you are ready to use their contents.

Note: Samsung equipment is packed in wooden crates with foam inserts to protect equipment. Remove the crate from the equipment. Do not attempt to remove the equipment from the crate.

Note: Retain packing materials safely until you have completed installing all the equipment.

Note: Verify the width and height of the entry doors and corridor for sufficient space for easy movement. Take special care not to damage or destroy the entry, wall or installation site.

Use the following procedure to unpack each rack:

- 1 Locate and inspect the crate containing the rack. If the crate is damaged, notify the shipper.
- 2 Remove the metal straps from around the crate.
- 3 Remove the lid from the crate.
- 4 Remove the packing foam from inside the crate.
- 5 Cut open the plastic film surrounding the rack, and fold it back over the sides of the crate.
- 6 Stand the rack upright: one person should stand in front of the box to ensure that the unit does not tip over once it is upright.
- 7 "Walk" the rack out of the box. It is more effective if one person holds the crate, and another the rack.

Caution: Racks weigh up to 400 kg. (882 lb.). If using a dolly to transport the rack, Samsung recommends two people tilt and hold the rack while a third person places the dolly.

Lifting provisions

After unpacking the rack, use the following procedure to lift the rack if it is to be lifted to a location higher than the first floor. All personnel participating in this procedure must be certified and follow the requirements of OSHA, FCC, and ANSI standards. The operator in charge of lifting the equipment may at his choice select the method to lift the equipment. The following procedure is one method for lifting the equipment:

Each rack is equipped with eyebolts on its top surface when it is delivered. After unpacking the rack, use the following procedure to lift the rack:

- 1 Before the lift begins, the lift operator and personnel should familiarize themselves with the installation location.

- 2 Take the four eyebolts from the packing material and install onto the rack being lifted.
- 3 Have the operator lower the lifting straps to ground level.
- 4 Snap the hooks of the four straps to the eyebolts. Also fasten guidelines if required.
- 5 Have the operator lift the straps until they are taut.
- 6 Personnel should signal the operator to start the lift after they station themselves at the installation site.
- 7 Allow the operator to lift the crate to the required location. Help to guide the crate as close to the installation location as possible.
- 8 After the crate has been lowered onto the surface, remove the hooks and guidelines from the rack.
- 9 Inspect the rack and report any damage to the crane operator and site manager.

Mounting the racks – introduction

Note: When installing the rack, do not tighten the anchor bolts tightly so leveling can be done.

Note: Anchoring secures the racks to the floor surface in a physically and electrically safe manner. Proper anchoring provides safety against vibration, shock and other stresses. After the equipment is level, secure the rack with the anchor bolts to the mounting surface.

The racks can be mounted on a concrete pad or a raised floor as described below. Before beginning any installation, you must do the following to each rack:

- ◆ Remove the two side-panels from the rack, and store them safely until the rack has been installed.
- ◆ Ground yourself through a wrist-strap, and remove all the modules from the bottom shelf of the rack. Store each module in an ESD protection bag until the rack has been installed.

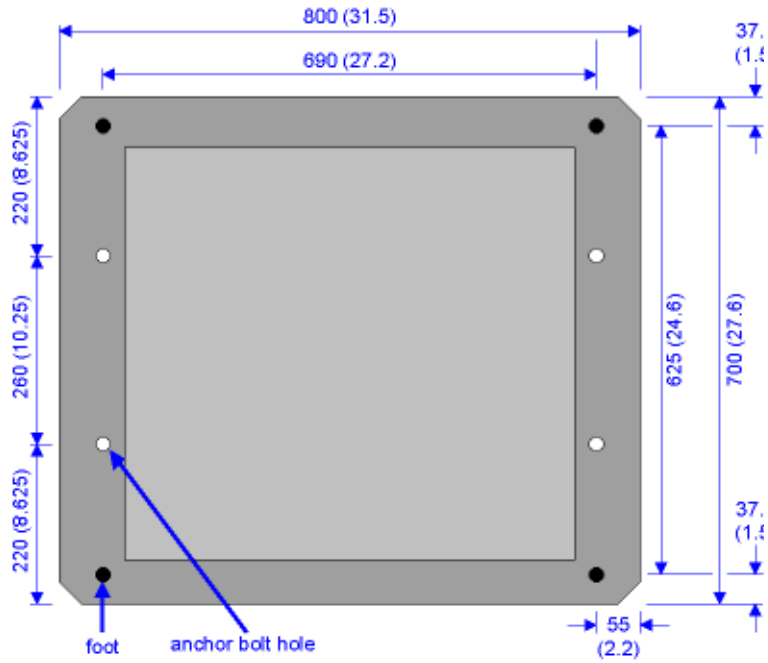


Anchoring the rack on a concrete pad

Lay out and drill the mounting holes

Lay out and drill mounting holes in the concrete pad as follows:

- 1 Determine the number and location of the racks.
- 2 Mark the floor for each rack, using the template shown in the following illustration:



Be sure to mark the locations of both the anchor bolt holes and the feet for each rack.

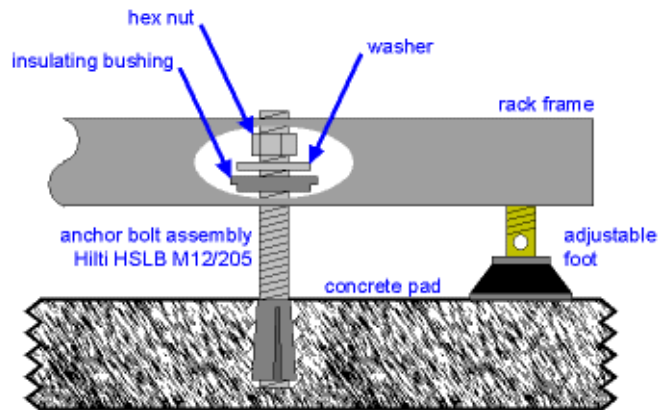
- 3 Drill the anchor bolt holes for each rack to be anchored.
- 4 Clean all debris out of the holes before anchoring the racks.

Anchor the rack

Anchor the rack to the concrete pad as follows:

- 1 Obtain 4 anchor bolt assemblies for each rack from the mounting bracket kits.
- 2 Set the anchors into the concrete.
- 3 Position each rack over the marked locations for the feet, being careful not to damage the feet.

- 4 Install the insulating bushing, washer, and hex nut set for each rack as shown in the following figure:

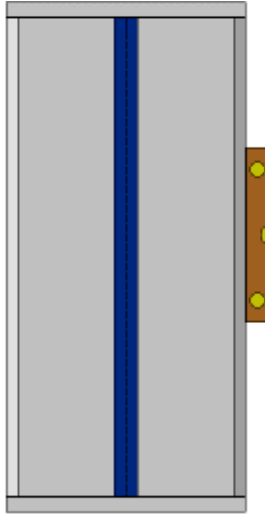


- 5 Insert and tighten an anchor bolt into each of the anchors.
- 6 Hand tighten the nuts until leveling and isolation testing is complete.
- 7 Complete the appropriate boxes in the Indoor BTS Installation Record.

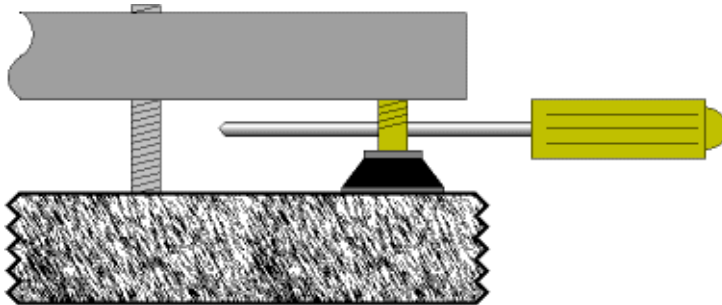
Leveling the rack

Level SBR1 using the following steps:

- 1 Check the level of SBR1, measuring on two adjacent sides (front and side or rear and side):



- 2 Adjust the rack level by inserting a #2 Phillips screwdriver into the hole in the foot at the bottom of the rack:

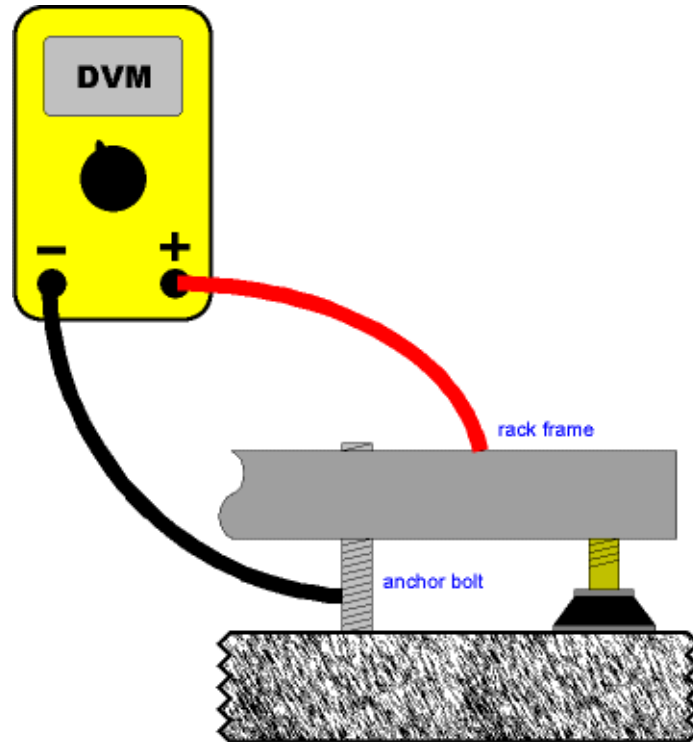


- 3 Turn the foot clockwise or counterclockwise to adjust the rack's height.
- 4 Have someone watch the level of the rack while adjusting the height, or check it using a level placed on top of the rack.
- 5 Repeat the adjustment for each foot until the rack is level.
- 6 Hand-tighten the nuts on the anchor bolts when the rack is level.
- 7 Complete the appropriate boxes in the Indoor BTS Installation Record.

Isolation testing

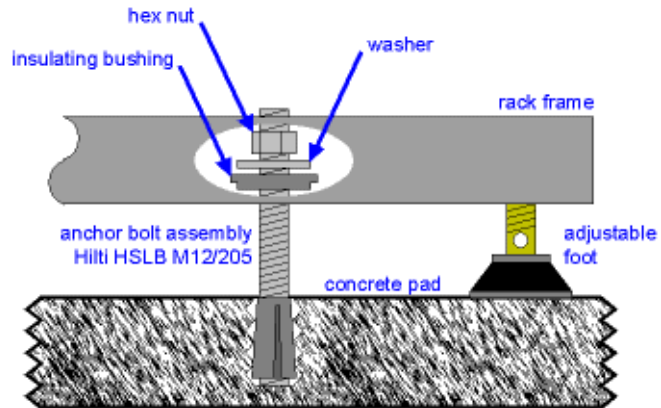
The following isolation test should be done on the SBR1 rack to verify proper frame grounding insulation:

- 1 Connect the negative lead of the DVM to the anchor bolt, and connect the positive lead to an unpainted surface within the rack, as shown in the following figure:



- 2 Measure the isolation resistance.
- 3 The isolation resistance should be higher than 20M ohms (infinite) when it is tested by the DVM.
- 4 If the isolation measurement result shows a value less than 20M ohms, repair or adjust the anchor bolts, fiber mounting spacer, and rack position.

- 5 Position the rack so no contact occurs between the anchor bolts and the base of the rack:



- 6 If contact occurs replace any broken spacers/bushings.
- 7 Tighten the hex nuts to the correct torque while maintaining the level of the rack.
- 8 Repeat steps 1 through 7 for SBR2 and SBR3.
- 9 Complete the appropriate boxes in the Indoor BTS Installation Record.

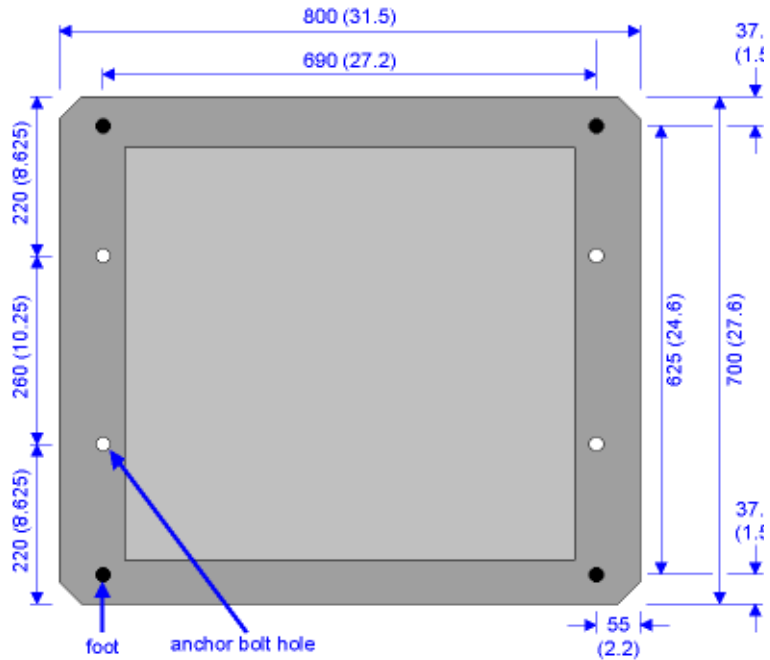
Go on to level the rack as described in the section "Leveling the rack".

Anchoring the rack on a raised floor

Layout and drill the mounting holes

Use the following procedure to install a rack on a raised floor:

- 1 Determine the number and location of the racks.
- 2 Mark the floor for each rack, using the template shown in the following illustration:



Be sure to mark the locations of both the anchor bolt holes and the rack feet.

- 3 Drill the anchor bolt holes for each rack to be mounted at the marked locations using a ½-inch drill bit.

Caution: Floor fragments can clog the return holes in the floor vents, and can seriously damage electronic equipment. Use a small vacuum cleaner to collect these fragments.

- 4 Mark the drilled panels and the adjacent floor so you can easily replace the panels in the correct locations and orientations later.
- 5 Use a glass lifter to remove the floor panels around the installation location.
- 6 Select the correct drill bit for the anchor bolts, and mount it in a drill.

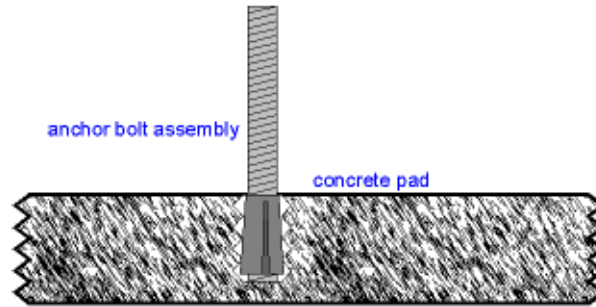
Note: You may need a right-angle drill for drilling under a section of raised floor with equipment already mounted on it.

- 7 Drop a length of threaded rod through one of the drilled holes in the floor surface.
- 8 Use a plumb bob to ensure that the threaded rod is perfectly vertical.
- 9 Mark the concrete with the location of the hole to be drilled.
- 10 Mark the drill bit for a 2-inch drilling depth and drill the hole exactly 2 inches deep.

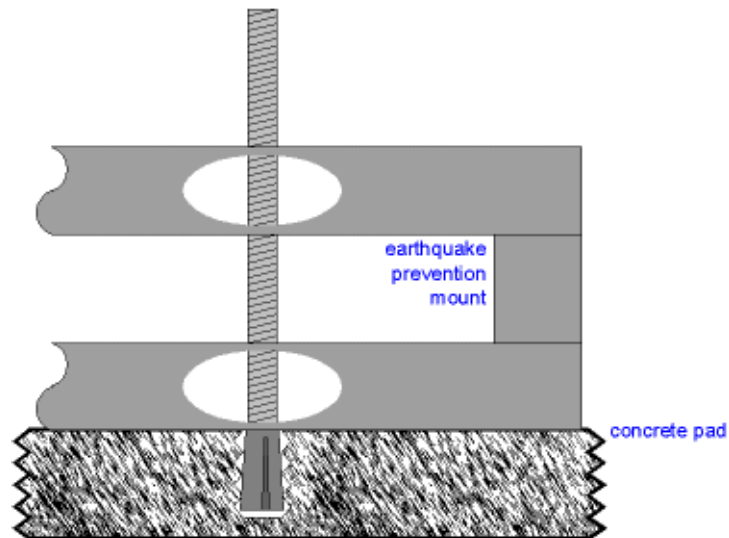
Anchor the racks

Anchor the rack to the concrete pad as follows:

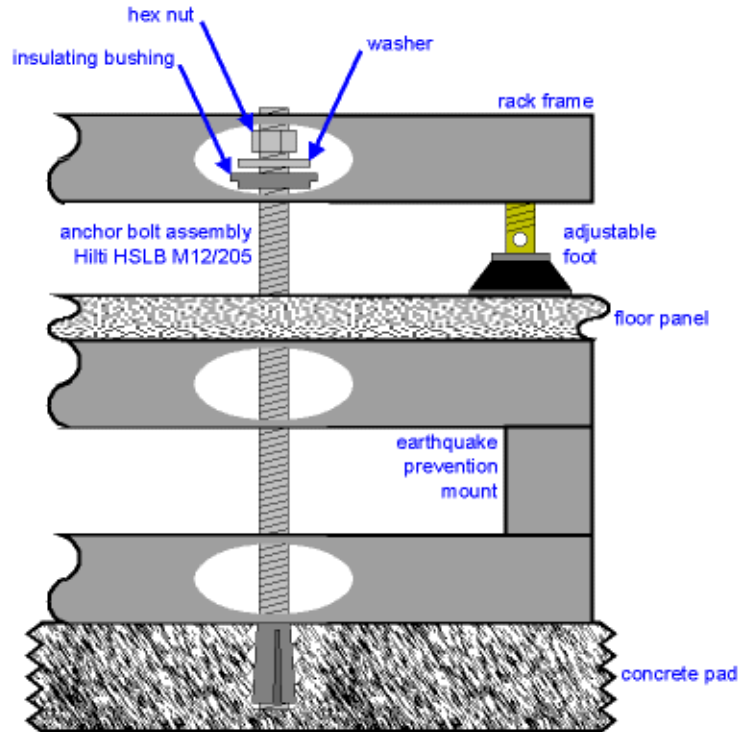
- 1 Drive a concrete anchor into the hole as shown in the following figure:



- 2 Mark and drill the other three holes, and the four holes for each of the other racks in the same way, and drive anchors into all of them.
- 3 Use a Sawzall to cut the threaded rods into lengths approximately 4 inches longer than the distance from the top of the concrete to the top of the raised floor.
- 4 Using a Moto-tool fitted with a grinding wheel, remove burrs from the cut ends of the rods so that nuts screw on and off easily.
- 5 Working carefully, insert a threaded rod into each anchor, and screw it in tightly as shown in the following figure:



- 6 If you removed any drilled floor panels in order to install the anchors, replace those panels now, with the threaded rods projecting through the holes in the floor panels.
- 7 Position each rack over the marked locations for the feet, being careful not to damage the feet or the anchor bolts.
- 8 Install the insulating bushing, washer, and hex nut set for each rack as shown in the following figure:

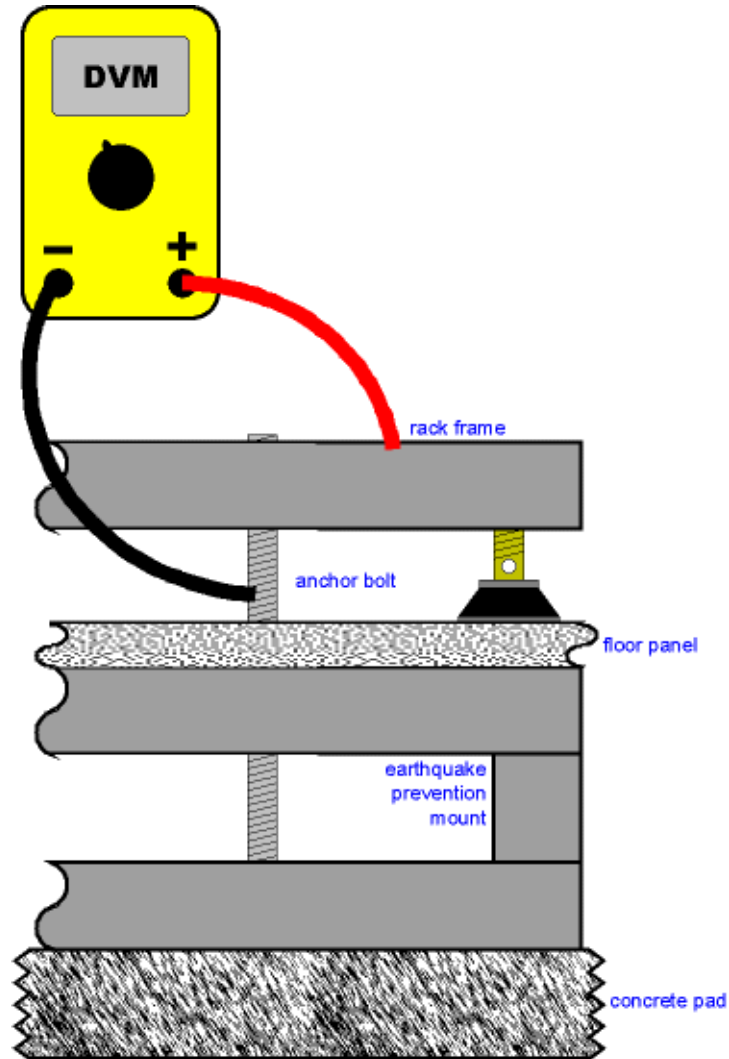


- 9 Hand tighten the nuts until leveling and isolation testing is complete.
- 10 Complete the appropriate boxes in the Indoor BTS Installation Record.

Isolation testing on a raised floor

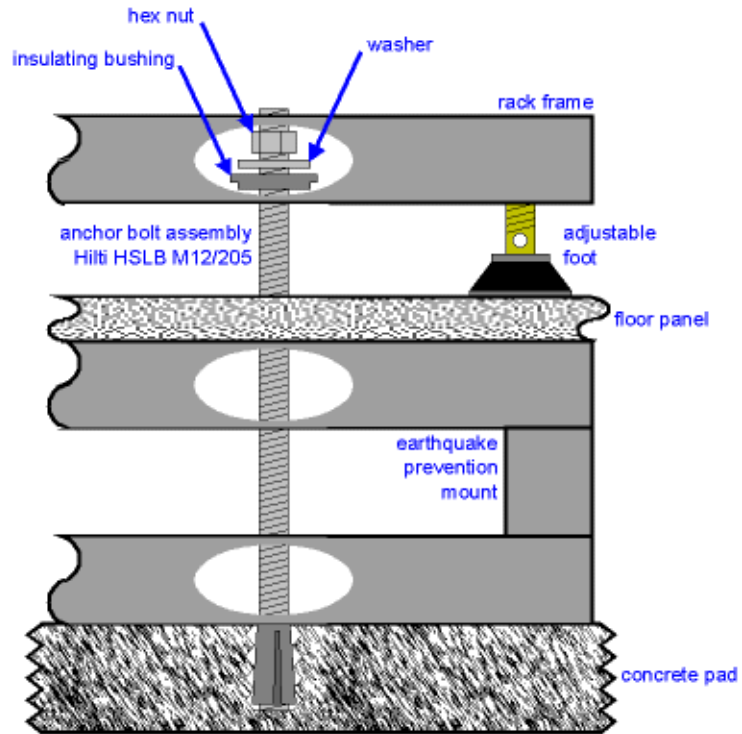
The following isolation test should be done on the SBR1 rack to verify proper frame grounding insulation:

- 1 Connect the negative lead of the DVM to the anchor bolt, and connect the positive lead to an unpainted surface within the rack, as shown in the following figure:



- 2 Measure the isolation resistance.
- 3 The isolation resistance should be higher than 20M ohms (infinite) when it is tested by the DVM.
- 4 If the isolation measurement result shows a value less than 20M ohms, repair or adjust the anchor bolts, fiber mounting spacer, and rack position.

- 5 Position the rack so no contact occurs between the anchor bolts and the base of the rack:



- 6 If contact occurs replace any broken spacers/bushings.
- 7 Tighten the hex nuts to the correct torque while maintaining the level of the rack.
- 8 Repeat steps 1 through 7 for SBR2 and SBR3.
- 9 Complete the appropriate boxes in the Indoor BTS Installation Record.

Go on to level the rack as described in the section "Leveling the rack".

Cabling

Connecting the cables

- Order of installation
- Overview of the external connections

Rack ground

- Grounding the SBR1 rack

Connecting DC power

Unseating the modules

Check DC voltage input

Connecting the T1 cable

Connecting the GPS cables

Connecting the customer alarm cable

Connecting the BBU/rectifier alarm cable

Connecting the RF cables

Connecting the cables

Warning: The installation of cables into the rack must be done in a specific order to avoid damage and electrical shock.

Note: Install power and signaling cables separately from main power cables to prevent electronic induction. Leave a minimum gap of 152.4 mm (6 inches) between the data and the main power cables to avoid spurious emissions.

Order of installation

The order of cable installation and connection is as follows:

- 1 Rack grounding
- 2 DC
- 3 Power-up testing
- 4 T1
- 5 GPS
- 6 Interrack signaling
- 7 Customer alarms
- 8 BBU/rectifier alarms
- 9 RF

After each connection is made, label the cables and complete the appropriate boxes in the Indoor BTS Installation Record.

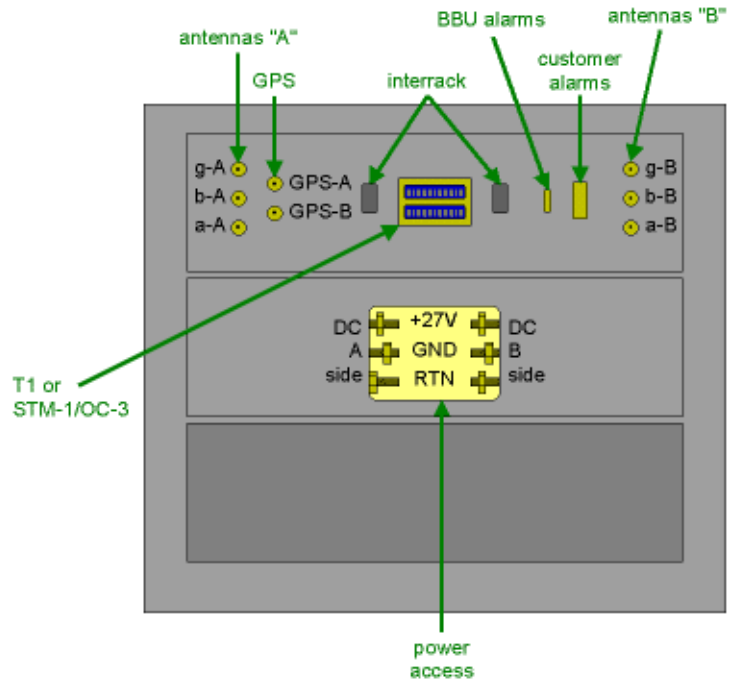
Overview of the external connections

The external connections on SBR1 are as follows:

Cable	Origin	BTS connection
Rack ground	main grounding bar	Top of rack/bottom of rack
T1	Telco Junction Box	T1/E1 (75Ω) Connector*
GPS	GPS system	GPS-A and GPS-B connectors*
RF cables - main TX/RX	RF antenna	α , β , γ -A connectors*
RF cables - diversity RX	RF antenna	α , β , γ -B connectors*
BBU/rectifier alarms	BBU/rectifiers	BBU alarms connector
Customer alarms	Customer demarcation point	Alarm connector*
DC	Battery Back-up	DC noise filters, A branch and B branch
Interrack signaling	SBR2 and SBR3	

*These connectors are provided on SBR1 only. Other connectors appear on all racks in the BTS.

The external connectors on SBR1 are shown in the following illustration:



Rack ground

Warning: Potential loss of life! The installation of cables onto the racks should begin with grounding the racks. It is extremely important that the cables are installed in this order to avoid electrical shock.

Note: If installing more than one rack, ground each rack separately to the main grounding point at the site.

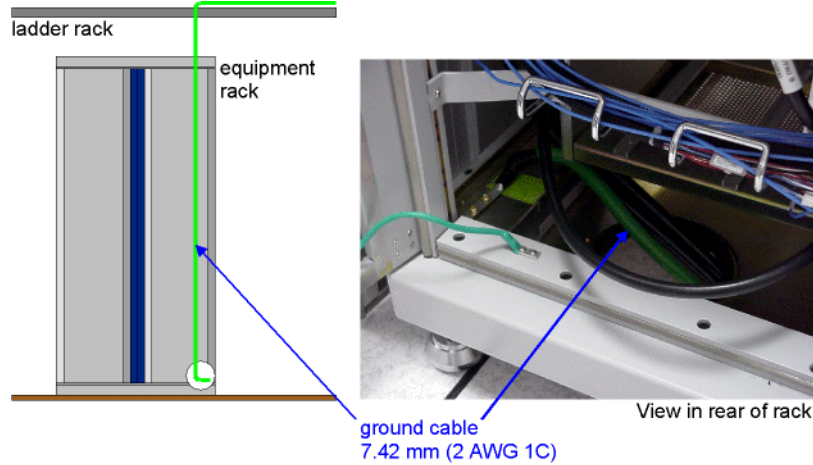
Note: The data and power cables must be installed with a minimum of 152.4 mm (6") separation.

Grounding the SBR1 rack

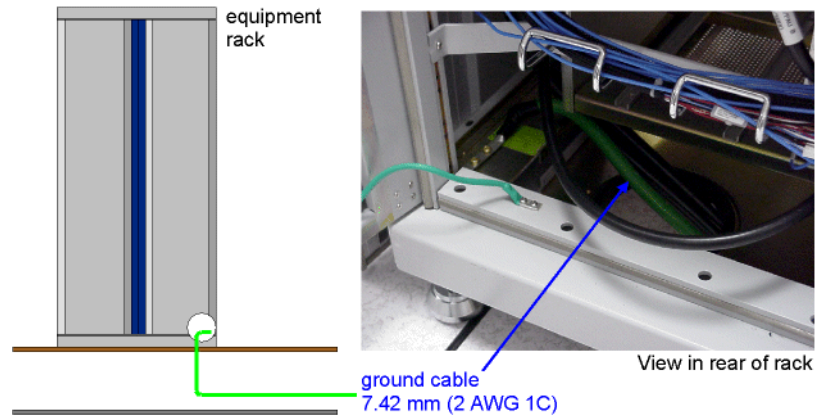
The procedure for grounding the rack is as follows:

- 1 Obtain a suitable grounding lug for the main grounding bar and install at the end of grounding cable.
- 2 Attach the lug of the grounding cable to the main grounding bar.
- 3 Route the grounding cable from the main grounding bar to the rack grounding point.

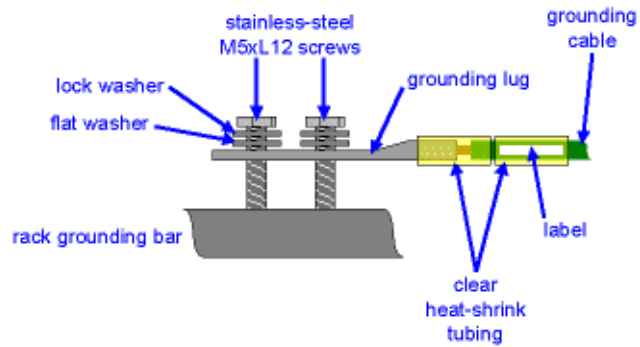
The routing of the grounding cable on an overhead cable tray is shown in the following diagram:



The routing of the grounding cable under the floor is shown in the following diagram:

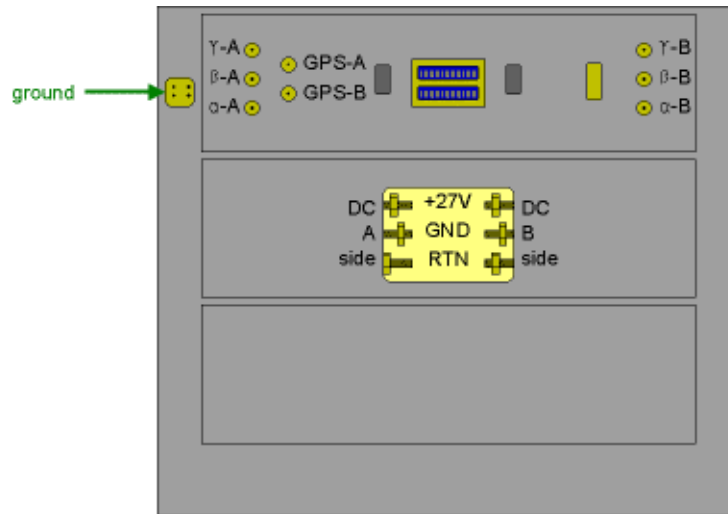


- 4 Cut the grounding cable and install a 2-hole grounding lug to the rack end of the grounding cable as shown in the following figure:



Note: Coat all surfaces and terminals with anti-oxidant compound before making the connections.

- 5 Fasten the grounding lug to the rack grounding point on the bottom of the rack:

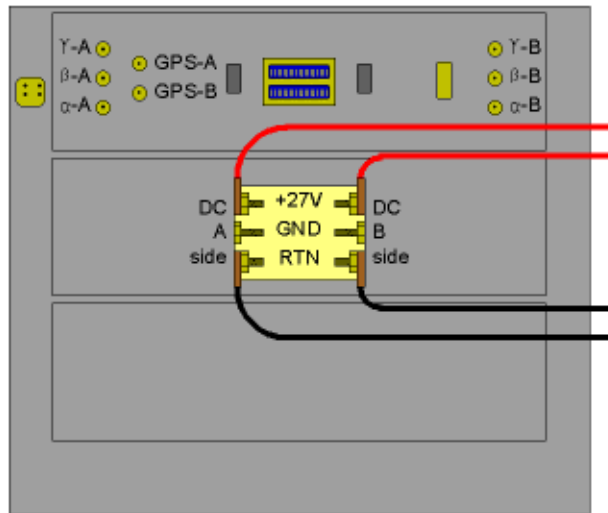


- 6 Label both ends of the grounding cable.
- 7 Complete the appropriate boxes in the Indoor BTS Installation Record.

Connecting DC power

Use the following procedure to connect the DC power cables:

- 1 Verify that the DC power source is off.
- 2 Connect the power cables to the DC input terminal block. Attach compression lugs to the input power cables.
- 3 Check the power switches at the top of the rack to make sure they are switched off.
- 4 Check the switches inside the SPD-T modules to be sure they are in the OFF position.
- 5 Attach the DC power cables to the noise filters on the top of the rack:



- 6 Repeat step 3 for SBR2 and SBR3.
- 7 Label both ends of each cable.
- 8 Complete the appropriate boxes in the Indoor BTS Installation Record.

Unseating the modules

Note: Do not touch the pins or elements on modules.

Note: Foreign substances on modules should be completely removed with detergent.

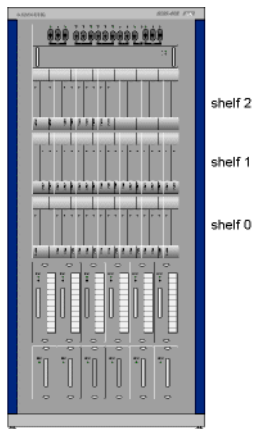
Unseat all the modules in the rack, as follows:

- 1 Put on a wrist strap and connect the other end to a grounding point in the rack:



The wrist strap protects modules from damage from electrostatic discharge.

- 2 Unseat all the modules on the 3 shelves below the power shelves of each rack:



- 3 To unseat a module, pry the ejector handles outward to release the module:



Pry ejector handles outwards
to release the module from its connector

- 4 Apply pressure evenly to the ejectors and pull the module out until you can feel it unplug from the connector.
- 5 Leave the module on the shelf, disengaged from the connector.

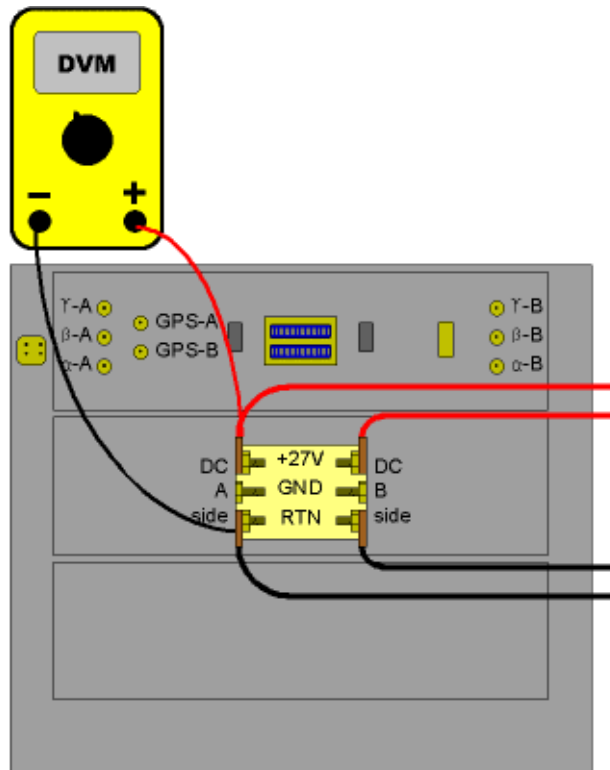
Note: Leave the unseated modules on the shelves, partially out of the rack. Make sure the unseated modules are not contacting the backplane in the rack before performing the power-up procedure.

- 6 Initial and date the appropriate box on the Indoor BTS Installation Record.

Check DC voltage input

Verify that the correct voltages are present in the rack, as follows:

- 1 Make sure all power switches are off on the top power shelf, and on each SPD-T module on all racks.
- 2 Make sure that all modules in all shelves are unseated.
- 3 Apply power to the racks at the DC distribution panel.
- 4 Use a DVM to check the DC power at both the A Side and B Side of the noise filter on each rack. Power should be +24 Vdc to +28 Vdc at each connection:



- 5 Turn off the DC power to the rack.
- 6 Initial and date the appropriate box on the Indoor BTS Installation Record.

Connecting the T1 cable

Use the following procedures to connect a T1 cable to the BTS:

- 1 Run the T1 cable from the customer demarcation to SBR1, securing the cable with tie wraps.
- 2 Attach the 50-pin male connector to the T1 cable.
- 3 The cable and connector are described below:

Cable description	Cable connector	BTS connector
25 pair/24 AWG P/N: N-002524WFZ	50-pin, male P/N: DDK/5730500	50-pin, female

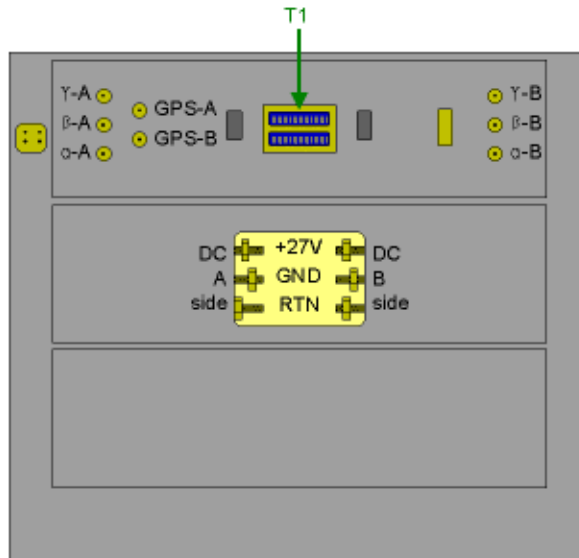
The pinouts on the Samsung standard T1 connector are listed in the following table:

Pair #	Pin #	Base color	Pair Color	Signal Label	Pin #	Base Color	Pair Color	Signal Label
1	1	White	blue	PCMIN_1(-)	26	White	blue	PCMIN_1(+)
2	2		orange	PCMIN_2(-)	27		orange	PCMIN_2(+)
3	3		green	PCMIN_3(-)	28		green	PCMIN_3(+)
4	4		brown	PCMIN_4(-)	29		brown	PCMIN_4(+)
5	5		grey	PCMIN_5(-)	30		grey	PCMIN_5(+)
6	6	Red	blue	PCMIN_6(-)	31	Red	blue	PCMIN_6(+)
7	7		orange	PCMIN_7(-)	32		orange	PCMIN_7(+)
8	8		green	PCMIN_8(-)	33		green	PCMIN_8(+)
9	9		brown	PCMIN_9(-)	34		brown	PCMIN_9(+)
10	10		grey	PCMIN_10(-)	35		grey	PCMIN_10(+)
11	11	n/c			36	n/c		
12	12	n/c			37	n/c		
13	13	n/c			38	n/c		
14	14	Yellow	blue	PCMOUT_1(-)	39	Yellow	blue	PCMOUT_1(+)
15	15		orange	PCMOUT_2(-)	40		orange	PCMOUT_2(+)
16	16		green	PCMOUT_3(-)	41		green	PCMOUT_3(+)
17	17		brown	PCMOUT_4(-)	42		brown	PCMOUT_4(+)
18	18		grey	PCMOUT_5(-)	43		grey	PCMOUT_5(+)
19	19	Black	blue	PCMOUT_6(-)	44	Black	blue	PCMOUT_6(+)
20	20		orange	PCMOUT_7(-)	45		orange	PCMOUT_7(+)
21	21		green	PCMOUT_8(-)	46		green	PCMOUT_8(+)
22	22		brown	PCMOUT_9(-)	47		brown	PCMOUT_9(+)
23	23		grey	PCMOUT_10(-)	48		grey	PCMOUT_10(+)
24	24	n/c			49	n/c		
25	25	n/c			50	n/c		

The pinouts on the Sprint T1 connector are listed in the following table:

Pair #	Pin #	Base color	Pair Color	Signal Label	Pin #	Base Color	Pair Color	Signal Label
1	1	White	blue	PCMIN_1(-)	26	White	blue	PCMIN_1(+)
2	2		orange	PCMIN_2(-)	27		orange	PCMIN_2(+)
3	3		green	PCMIN_3(-)	28		green	PCMIN_3(+)
4	4		brown	PCMIN_4(-)	29		brown	PCMIN_4(+)
5	5		grey	PCMIN_5(-)	30		grey	PCMIN_5(+)
6	6	Red	blue	PCMIN_6(-)	31	Red	blue	PCMIN_6(+)
7	7		orange	PCMIN_7(-)	32		orange	PCMIN_7(+)
8	8		green	PCMIN_8(-)	33		green	PCMIN_8(+)
9	9		brown	PCMIN_9(-)	34		brown	PCMIN_9(+)
10	10		grey	PCMIN_10(-)	35		grey	PCMIN_10(+)
11	11	Black	blue	Not Used	36	Black	blue	Not Used
12	12		orange	Not Used	37		orange	Not Used
13	13		green	Not Used	38		green	Not Used
14	14		brown	PCMOUT_1(-)	38		brown	PCMOUT_1(+)
15	15		grey	PCMOUT_2(-)	38		grey	PCMOUT_2(+)
16	16	Yellow	blue	PCMOUT_3(-)	39	Yellow	blue	PCMOUT_3(+)
17	17		orange	PCMOUT_4(-)	40		orange	PCMOUT_4(+)
18	18		green	PCMOUT_5(-)	41		green	PCMOUT_5(+)
19	19		brown	PCMOUT_6(-)	42		brown	PCMOUT_6(+)
20	20		grey	PCMOUT_7(-)	43		grey	PCMOUT_7(+)
21	21	Black	blue	PCMOUT_8(-)	44	Black	blue	PCMOUT_8(+)
22	22		orange	PCMOUT_9(-)	45		orange	PCMOUT_9(+)
23	23		green	PCMOUT_10(-)	46		green	PCMOUT_10(+)
24	24		brown	Not Used	47		brown	Not Used
25	25		grey	Not Used	48		grey	Not Used

- 4 Connect the T1 cable to the 50-pin female connector shown in the following illustration.



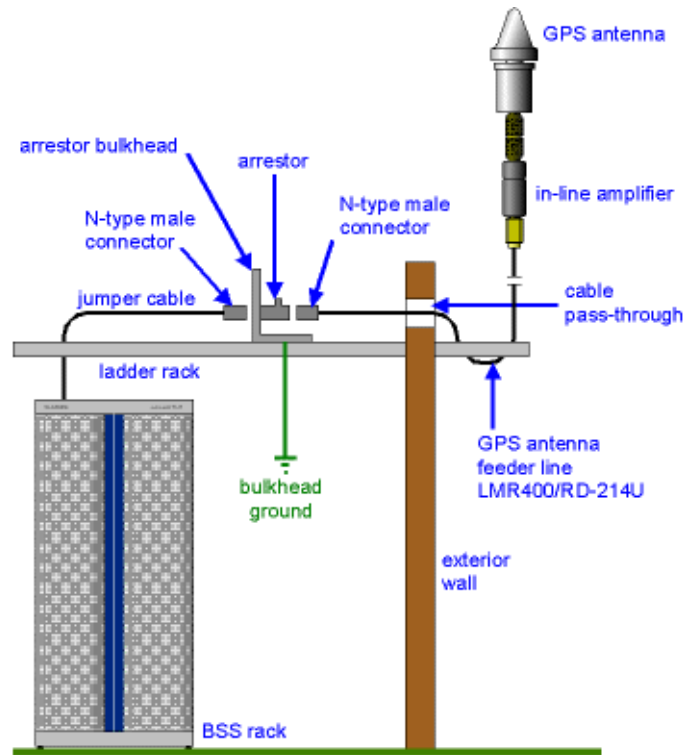
Be sure to secure the male connector with the two spring clips attached to the female connector.

- 5 Label both ends of the T1 cable.
- 6 Complete the appropriate boxes in the Indoor BTS Installation Record.

Connecting the GPS cables

The GPS cables are routed using a combination of cable ladders, cable pass-throughs, and cable trays. Cable ties are applied wherever appropriate.

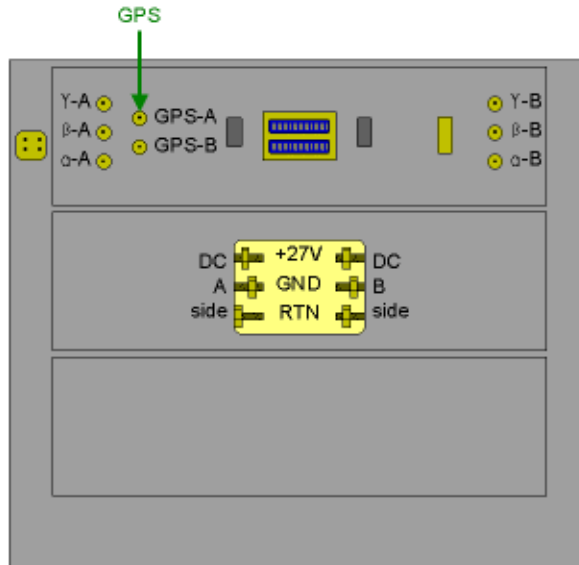
The routing of the overhead cables is illustrated in the following figure:



The procedure for connecting these cables is as follows:

- 1 Ground the EMP bulkhead with 7.42 mm (2 AWG 1C) cable to the Main Grounding Board (MGB).
- 2 Lay the GPS jumper cable between the bulkhead and the Indoor BTS rack.
- 3 Attach N-type male connectors to both ends of the GPS jumper cable.

- 4 The GPS cable connects to the top of the SBR. Connect the GPS jumper cable to the GPS-A N-type female connector shown in the following figure:



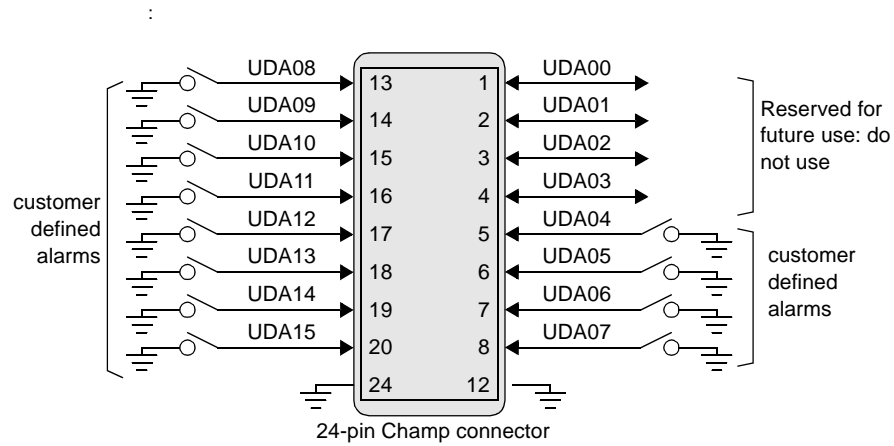
- 5 Label both ends of the GPS jumper cable.
- 6 Complete the appropriate boxes in the Indoor BTS Installation Record.
- 7 If a second (backup) GPS antenna is installed, route and connect a second GPS cable. Follow steps 2 through 6 above, but connect the second GPS jumper cable to the GPS-B connector on the SBR.

Connecting the customer alarm cable

The customer alarm cable is routed using a combination of cable ladders, cable pass-through, and cable trays. Cable ties are applied wherever appropriate. The procedure is as follows:

- 1 Route the customer alarm cable from the customer demarcation point to the top of SBR1
- 2 Attach the 24-pin male Champ connector to the alarm cable according to the customer documentation. The cable type and connector pinouts are shown below.

Cable type	Cable connector	BTS connector
Shielded Type 12 pair P/N: N-001224WAC	24-pin, male PN: DDK/57-30240	24-pin, female



Alarm port:
0 = no alarm
1 = alarm activated

- 3 Label both ends of the cable.
- 4 Complete the appropriate boxes in the Indoor BTS Installation Record.

Connecting the BBU/rectifier alarm cable

The BBU/rectifier alarm cable is routed using a combination of cable ladders, cable pass-through, and cable trays. Cable ties are applied wherever appropriate. The procedure is as follows:

- 1 Route the customer alarm cable from the BBU to the top of SBR1.
- 2 Attach the 9-pin female AMP connector to the BBU alarm cable. The pinouts on this connector are shown in the following diagram



The pin assignments on this connector are as follows:

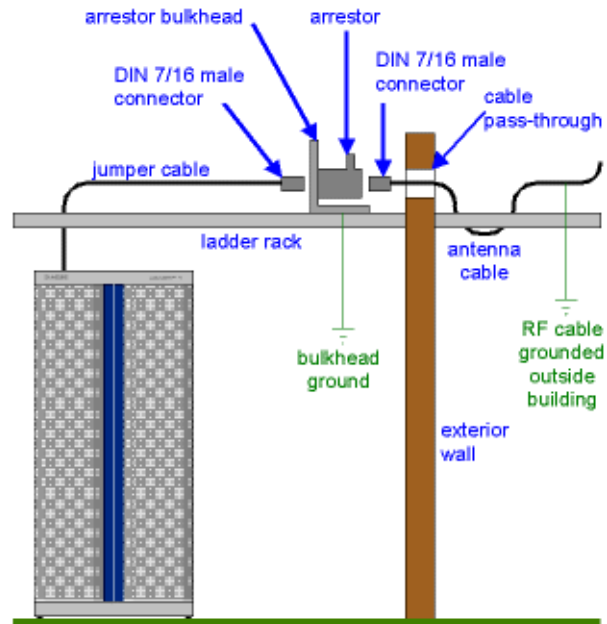
Pin No.	Alarm function
1	PC Tx+
2	PC Tx-
3	ground
4	PC Rx+
5	PC Rx-
6	n.a.
7	n.a.
8	n.a.
9	n.a.

- 3 Label both ends of the cable.
- 4 Connect the BBU/rectifier cable to the BBU alarm connector on the top of the SBR
- 5 Complete the appropriate boxes in the Indoor BTS Installation Record.

Connecting the RF cables

RF cables are routed using a combination of cable ladders, cable pass-throughs, and cable trays. Cable ties are applied wherever appropriate.

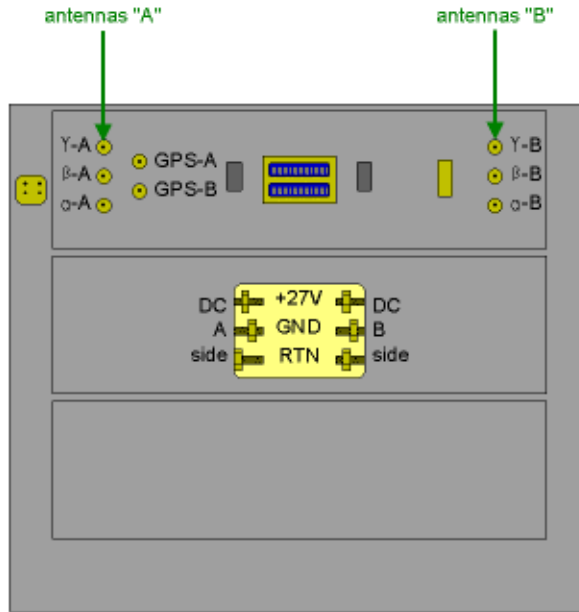
The routing of one of the overhead cables is illustrated in the following figure:



Make sure the RF cables are grounded outside the building, and that they enter the building through arrestors:

- 1 When building an RF cable, identify the FA and the sector using colored tape at both ends of the cable.
- 2 Connect RF cables to the appropriate $\alpha\beta\gamma$ -A and $\alpha\beta\gamma$ -B connectors.
- 3 Attach the 1/2" jumper cables to the bulkhead.
- 4 Route the 1/2" jumper cables to SBR1 securing the cables to the cable-tray.

- 5 Connect the jumper cables to the corresponding $\alpha\beta\gamma$ - A connectors for main TX/RX paths and $\alpha\beta\gamma$ -B connectors for diversity RX paths.



- 6 Label both ends of all cables.
- 7 Complete the appropriate boxes in the Indoor BTS Installation Record.

Initial Testing

Reseating the modules

Power-up the rack

- Power-up the fans
- Power-up shelves SH-0, SH-1, and SH-3
- Power-up the SDP-T modules
- Power-up the GPS modules
- Power-up the PAU modules
- Document the power-up procedure.

Power down procedure

- Power down SBR3
- Power down SBR2
- Power down SBR1

Final power up procedure

Power-up troubleshooting

- Fan power-up problem
- Shelf power problem
- SDP-T module power problem
- GPS module power problem
- PAU module power problem

Reseating the modules



Note: Put on a wrist strap and connect the other end to a grounding point on the rack. The wrist strap protects the modules from damage from electrostatic discharge.



Caution: Never touch the pins or elements on the modules.

Use the following procedure to reseat the modules in the racks before the power up procedure:

Note: Be sure that the procedure to check DC voltage input is completed satisfactorily before reseating modules.

- 1 Make sure that the switch on each SPD-T module is turned off before you reseat the module.

- 2 Reseat modules one at a time. Push each module slightly with both thumbs until it is as far into the shelf as it will go. Then press the ejector handles down until they are flush and the latches click into place:



Press ejector handles downwards and inwards to latch the module into its connector

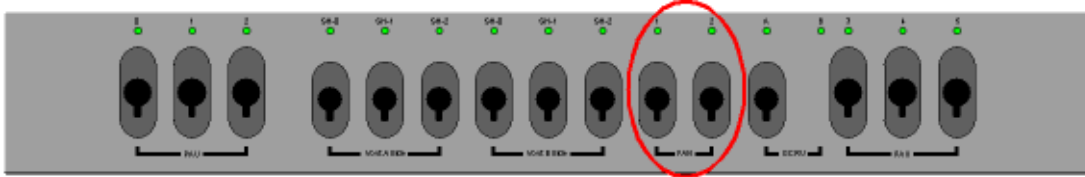
Power-up the rack

Before starting up the system, verify that all the circuit breakers on the power control panel are off, and that the switches on the SDP-T modules are off.

Power-up the fans

First turn on the fans:

- 1 Turn on the two FAN circuit breakers on the power control panel. The green LEDs above the FAN circuit breakers should light:

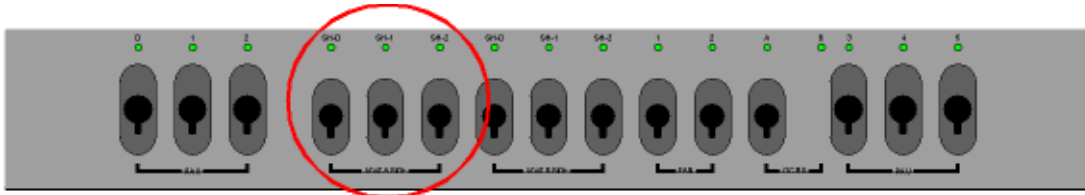


- 2 If the green LED above a FAN circuit breaker does not light, check the troubleshooting procedure at the end of this chapter.
- 3 The green LED on the fan panel should light, and the red fail LED should be off.
- 4 If the green Power LED on the fan panel does not light, or if the red Fail LED lights, check the troubleshooting procedure at the end of this chapter.

Power-up shelves SH-0, SH-1, and SH-3

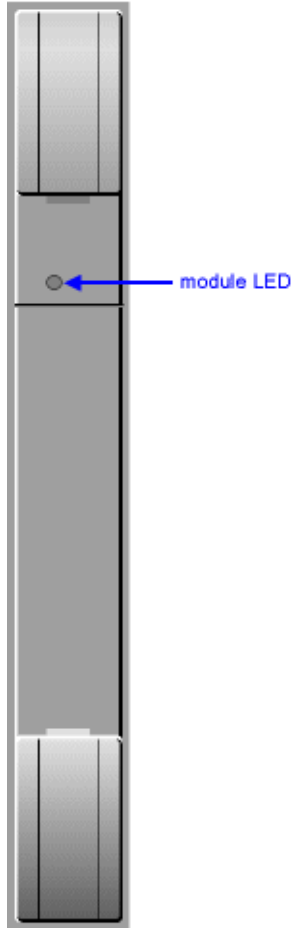
When the fans are up to speed, turn on power to the top three shelves:

- 1 Starting at the left side of the power control panel, turn on the 3 Vout A Side shelf circuit breakers, one at a time, beginning with SH-0. The green LED above each A Side shelf circuit breaker should light:



If the green LED above an A Side shelf circuit breaker does not light, check the troubleshooting procedure at the end of this chapter.

- 2 As you apply power to each shelf, the LED on each module on the left-hand side of that shelf should light:



Note: The LEDs on some modules may stay red, because the BTS is not transmitting yet.

If the LEDs on all the modules do not light, check the troubleshooting procedure at the end of this chapter.

- 3 Turn on the 3 Vout B Side shelf circuit breakers, one at a time, beginning with SH-0. The green LED above each B Side shelf circuit breaker should light:



If the green LED above a B side shelf circuit breaker does not light, check the troubleshooting procedure at the end of this chapter.

- 4 As you apply power to each shelf, the LED on each module on the right side of that shelf should light.

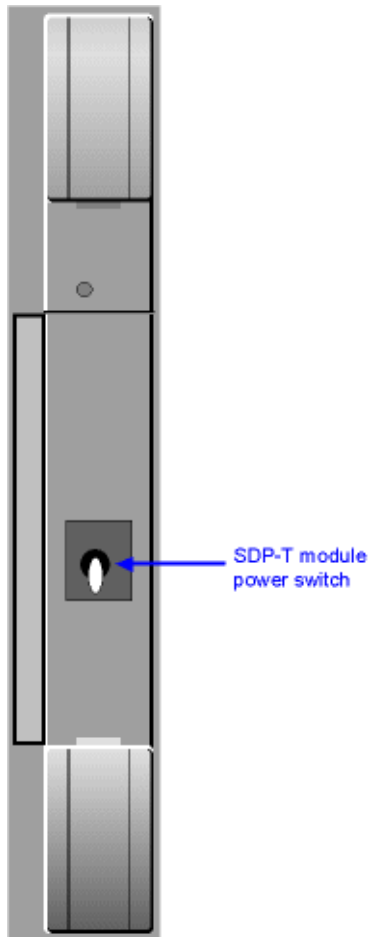
Note: The LEDs on some modules may stay red, because the BTS is not transmitting yet.

If the LEDs on all the modules do not light, check the troubleshooting procedure at the end of this chapter.

Power-up the SDP-T modules

If all is working so far, proceed to turn on the power modules on the shelves:

- 1 Press on the door on the front of the SPD-T module to open the door.

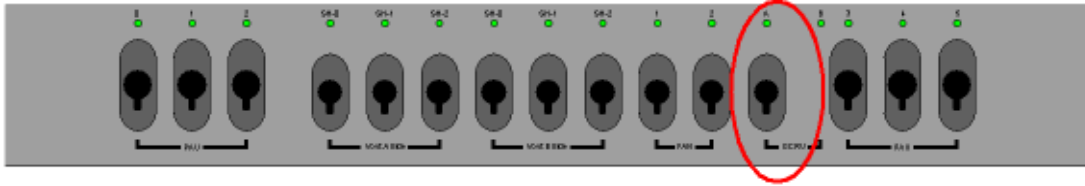


- 2 Turn on the power switch for the module. The green LED at the top of the module should light. If the LED at the top of the module does not light, check the troubleshooting procedure at the end of this chapter.

Power-up the GPS modules

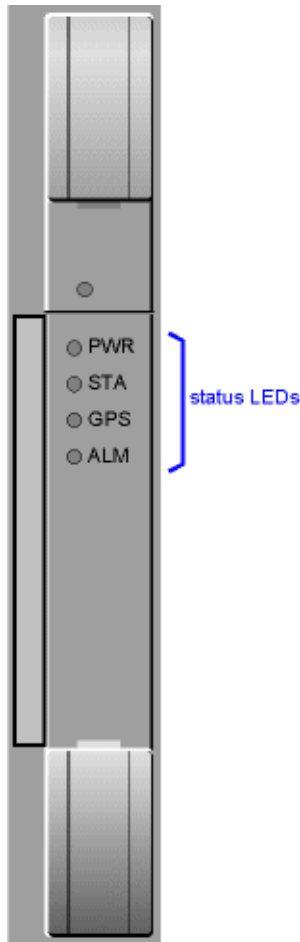
Power-up the GPS modules as follows:

- 1 Turn on the GCRU circuit breaker.



If the green LED above the GCRU circuit breaker does not light, check the troubleshooting procedure at the end of this chapter.

- 2 Check the LED at the top of each of the GCRU-A modules. If any LED does not light, check the troubleshooting procedure at the end of this chapter.
- 3 Press on the door on the front of each GCRU-A module to open the door:

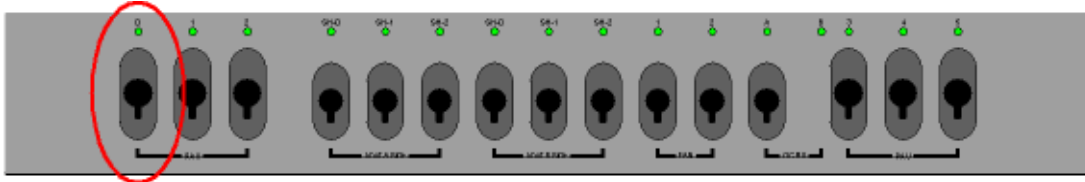


- 4 Check the status LEDs for each module. If a GPS system is installed and operating properly, the GPS status LED on one module should be on, and the ALM status LED on the other GCRU-A module should be on.
- 5 If the GPS status is not correct, check the troubleshooting procedure at the end of this chapter.

Power-up the PAU modules

Install the PAU modules; they are not shipped in the rack, but are packed separately. Then power-up the PAU modules as follows:

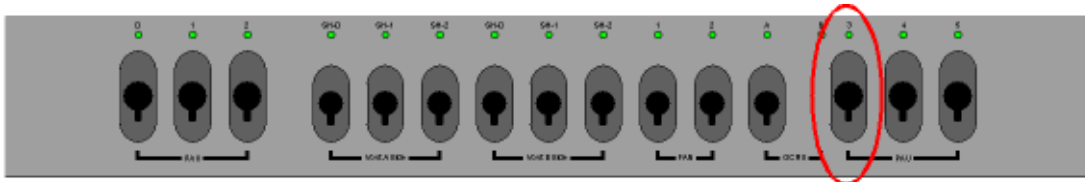
- 1 Starting at the left side of the power panel, turn on PAU circuit breaker 0. The green LED above PAU circuit breaker 0 should light:



If the green LED above PAU circuit breaker 0 does not light, check the troubleshooting procedure at the end of this chapter.

- 2 Check PAU 0. The LED on the module should be lit. If the LED does not light, check the troubleshooting procedure at the end of this chapter
- 3 Continue with PAU circuit breaker 1 and PAU circuit breaker 2, using the same procedure as steps 1 through 2 above.
- 4 Starting at the right side of the power panel, turn on PAU circuit breaker 3. The green LED above PAU circuit breaker 3 should light:

if the green LED above PAU circuit breaker 3 does not light, check



the troubleshooting procedure at the end of this chapter.

- 5 Check PAU 3. The LED on the module should be lit. If the LED does not light, check the troubleshooting procedure at the end of this chapter
- 6 Continue with PAU circuit breaker 4 and PAU circuit breaker 5, using the same procedure as steps 4 through 5 above.

Document the power-up procedure.

If all items have been powered up properly, complete the appropriate boxes in the Indoor BTS Installation Record.

Power down procedure

After all BTS racks have been initially tested, the racks must be powered down to reset the system. Be sure to follow the power down procedure step-by-step. Any deviations may cause damage to the equipment.

Power down SBR3

If there is no SBR3 rack, go to the “Power down SBR2” procedure. If an SBR3 rack is installed, use this power down procedure:

- 1 Turn off the right side PAU power circuit breakers in this order: 5, 4, 3.
- 2 Turn off the left side PAU power circuit breakers in this order: 2, 1, 0.
- 3 Turn off the power switch on each SPD-T module.
- 4 Turn off the shelf power circuit breakers for the 3 Vout B Side in this order: SH-2, SH-1, SH-0.
- 5 Turn off the shelf power circuit breakers for the 3 Vout A Side in this order: SH-2, SH-1, SH-0.
- 6 Turn off the two FAN circuit breakers.
- 7 Complete the appropriate boxes in the Indoor BTS Installation Record.

Power down SBR2

If there is no SBR2 rack, go to the “Power down SBR1” procedure. If an SBR2 rack is installed, use this power down procedure:

- 1 Turn off the right side PAU power circuit breakers in this order: 5, 4, 3.
- 2 Turn off the left side PAU power circuit breakers in this order: 2, 1, 0.
- 3 Turn off the power switch on each SPD-T module.
- 4 Turn off the shelf power circuit breakers for the 3 Vout B Side in this order: SH-2, SH-1, SH-0.
- 5 Turn off the shelf power circuit breakers for the 3 Vout A Side in this order: SH-2, SH-1, SH-0.
- 6 Turn off the two FAN circuit breakers.
- 7 Complete the appropriate boxes in the Indoor BTS Installation Record.

Power down SBR1

Power-down the SBR1 rack as follows:

- 1 Turn off the right side PAU power circuit breakers in this order: 5, 4, 3.
- 2 Turn off the left side PAU power circuit breakers in this order: 2, 1, 0.
- 3 Turn off the power switch on each SPD-T module.
- 4 Turn off the GCRU switch.

- 5 Turn off the shelf power circuit breakers for the 3 Vout B Side in this order: SH-2, SH-1, SH-0.
- 6 Turn off the shelf power circuit breakers for the 3 Vout A Side in this order: SH-2, SH-1, SH-0.
- 7 Turn off the two FAN circuit breakers.
- 8 Complete the appropriate boxes in the Indoor BTS Installation Record.

Final power up procedure

To prepare the Indoor BTS for commissioning, repower all the racks using the procedures described in the section "Power-up the rack" earlier in this chapter. After all racks are powered, complete the appropriate boxes on the Indoor BTS Installation Record.

The Installation Manager must sign-off on the installation at this point.

Then continue with the next chapter, "Completion".

Power-up troubleshooting

Follow the procedures in this section to resolve any problems encountered during initial power-up.

Fan power-up problem Follow this procedure to resolve problems with initial power-up of the fans:

- 1 Did the fan circuit breaker trip (snap back to off)?
 - ◆ If yes, go to step 2.
 - ◆ If no, go to step 9.
- 2 Turn off all input power to the SBR rack.
- 3 Disconnect the two 27 Volt power leads from the rear of the fan rack.
- 4 Turn on input power to the SBR rack.
- 5 Reset fan circuit breaker to on.
- 6 Did the fan circuit breaker trip again?
 - ◆ If yes, go to step 7.
 - ◆ If no, go to step 8.
- 7 A short circuit exists in the power control panel. Resolve fault, or replace power control panel, then go to step 20.
- 8 A short circuit exists in the fan rack. Resolve fault, or replace the fan rack, then go to step 20.
- 9 Is the green LED above the fan circuit breaker on?
 - ◆ If yes, go to step 14.
 - ◆ If no, go to step 10.
- 10 Check main input power to power control panel.
- 11 Is main input power present?
 - ◆ If yes, go to step 12.
 - ◆ If no, go to step 13.
- 12 Problem exists in power control panel. Resolve fault, or replace power control panel, then go to step 20.
- 13 Restore main input power, then go to step 20.
- 14 Is the green Power LED on the fan rack on?
 - ◆ If yes, go to step 18.
 - ◆ If no, go to step 15.
- 15 Check for 27 Volts DC at the two power leads on the rear of the fan rack.
- 16 Is voltage correct?
 - ◆ If yes, go to step 19.
 - ◆ If no, go to step 17.

- 17 Problem exists in power control panel. Resolve fault, or replace power control panel, then go to step 20.
- 18 Is red Fail LED on the fan rack on?
 - ◆ If yes, go to step 19.
 - ◆ If no, go to step 20.
- 19 Problem exists in fan rack. Resolve fault, or replace fan rack, then go to step 20.
- 20 Return to the rack power up section of this chapter and repeat the procedure to power the fan.

Shelf power problem

Follow this procedure to resolve problems with initial power-up of shelves (SH-0, SH-1, or SH-2).

- 1 Did the circuit breaker for the shelf trip (i.e., snap back to off)?
 - ◆ If yes, go to step 2.
 - ◆ If no, go to step 9.
- 2 Turn off all input power to the SBR rack.
- 3 Disconnect the A and B power leads from the shelf backplane.
- 4 Turn on input power to the SBR rack.
- 5 Reset the circuit breaker to on.
- 6 Did the circuit breaker trip again?
 - ◆ If yes, go to step 7.
 - ◆ If no, go to step 8.
- 7 A short circuit exists in the power control panel. Resolve fault, or replace power control panel, then go to step 24.
- 8 A short circuit exists on the shelf. Locate and resolve short circuit on shelf, or replace backplane, then go to step 24.
- 9 Is the green LED above the circuit breaker on?
 - ◆ if yes, go to step 14.
 - ◆ If no, go to step 10.
- 10 Check main input power to power control panel.
- 11 Is main input power present?
 - ◆ If yes, go to step 12.
 - ◆ If no, go to step 13.
- 12 Problem exists in power control panel. Resolve fault, or replace power control panel, then go to step 24.
- 13 Restore main input power, then go to step 24.
- 14 Are the LEDs of *all* modules off (on the side of the shelf that is under test)?
 - ◆ If all LEDs are off, go to step 17.
 - ◆ If some module LEDs are off, and some are on, go to step 15.

- 15 Unseat and reseat any module whose LED is off. If LED does not light after the module is reseated, replace the module.
- 16 Repeat step 15 until all module LEDs are on, then go to step 24.
- 17 Check power output on rear of power control panel for correct voltage output to the shelf.
- 18 Is voltage to shelf correct?
 - ◆ If yes, go to step 19.
 - ◆ If no, go to step 23.
- 19 Check power input connection to shelf backplane for correct voltage.
- 20 Is input voltage to backplane correct?
 - ◆ If yes, go to step 21.
 - ◆ If no, go to step 22.
- 21 Problem exists in backplane power wiring. Resolve backplane fault, then go to step step 24.
- 22 Fault exists in power leads from power control panel to shelf. Resolve fault with power leads, then go to step 24.
- 23 Problem exists in power control panel. Resolve fault, or replace power control panel, then go to step 24.
- 24 Return to the Rack power-up section of this chapter and repeat the procedure to power shelves SH-0, SH-1, and SH-3.

SDP-T module power problem

Follow this procedure to resolve problems with initial power-up of SDP-T modules.

- 1 Turn the power switch of the SDP-T module off, then back on.
- 2 Did the LED of the SDP-T module light?
 - ◆ If yes, go to step 7.
 - ◆ If no, go to step 3.
- 3 Turn the power switch of the SDP-T module off.
- 4 Unseat then reseat the SDP-T module.
- 5 Turn the power switch of the SDP-T module on.
- 6 Did the LED of the SDP-T module light?
 - ◆ If yes, go to step 7.
 - ◆ If no, replace the SDP-T module, then go to step 7.
- 7 Return to the SDP-T module power-up section of this chapter, and continue SDP-T module power-up.

GPS module power problem

Follow this procedure to resolve power problems with initial power-up of GPS modules:

- 1 Did the GCRU circuit breaker trip (snap back to off)?
 - ◆ If yes, go to step 2.

- ◆ If no, go to step 16.
- 2 Turn off all input power to the SBR rack.
- 3 Disconnect all GCRU power leads from the rear of the power control panel.
- 4 Turn on input power to the SBR rack.
- 5 Reset the GCRU circuit breaker to on.
- 6 Did the circuit breaker trip again?
 - ◆ If yes, go to step 7.
 - ◆ If no, go to step 8.
- 7 A short circuit exists in the power control panel. Resolve fault, or replace power control panel, then go to step 25.
- 8 Turn off all input power to the SBR rack.
- 9 Reconnect all GCRU power leads to the rear of the power control panel.
- 10 Unseat both GCRU modules.
- 11 Turn on input power to the SBR rack.
- 12 Reset the circuit breaker to on.
- 13 Did the circuit breaker trip again?
 - ◆ If yes, go to step 14.
 - ◆ If no, go to step 15.
- 14 A short circuit exists in the backplane wiring to GCRU modules.power control panel. Locate and resolve short circuit, or replace backplane, then go to step 25.
- 15 A short circuit exists in one or both GCRU modules. Determine which module is faulty and replace it. Then go to step 25.
- 16 Is the green LED above the circuit breaker on?
 - ◆ If yes, go to step 21.
 - ◆ If no, go to step 17.
- 17 Check main input power to power control panel.
- 18 Is main input power present?
 - ◆ If yes, go to step 19.
 - ◆ If no, go to step 20.
- 19 Problem exists in power control panel. Resolve fault, or replace power control panel, then go to step 25.
- 20 Restore main input power, then go to step 25.
- 21 Do status LEDs on GCRU modules indicate correct status?
 - ◆ If yes, go to step 25.
 - ◆ If no, go to step 22.

- 22 Unseat then reseat the GCRU module with incorrect status indication.
- 23 Do status LEDs on GCRU modules indicate correct status?
 - ◆ If yes, go to step 25.
 - ◆ If no, go to step 24.
- 24 Replace GCRU module with incorrect status indication. Then go to step 25.
- 25 Return to the GPS module power-up section of this chapter, and repeat SDP-T module power up

PAU module power problem

Follow this procedure to resolve problems with initial power-up of PAU modules.

- 1 Did the PAU circuit breaker trip (snap back to off)?
 - ◆ If yes, go to step 2.
 - ◆ If no, go to step 14.
- 2 Turn off all input power to the SBR rack.
- 3 On the rear of the PAU shelf, disconnect the power leads from the power control panel to the PAU with power problem.
- 4 Turn on input power to the SBR rack.
- 5 Reset the circuit breaker for the PAU to on.
- 6 Did the circuit breaker trip again?
 - ◆ If yes, go to step 7.
 - ◆ If no, go to step 8.
- 7 A short circuit exists in the power control panel. Resolve fault, or replace power control panel, then go to step 23.
- 8 step 8A short circuit exists on the PAU shelf, or in the PAU module. Turn off all power to the SBR rack, then reconnect the power leads from the power control panel to the PAU.
- 9 Unseat the PAU.
- 10 Reapply power to the SBR rack, then reset the circuit breaker for the PAU to on.
- 11 Did the circuit breaker trip again?
 - ◆ If yes, go to step 13.
 - ◆ If no, go to step 12.
- 12 A short circuit exists in the PAU module. Replace the module, then go to step 23
- 13 A short circuit exists in the PAU shelf wiring to the PAU module. Resolve the short circuit, then go to step 23.
- 14 Is the green LED above the PAU circuit breaker on?
 - ◆ If yes, go to step 19.

- ◆ If no, go to step 15.
- 15 Check main input power to power control panel.
- 16 Is main input power present?
 - ◆ If yes, go to step 17.
 - ◆ If no, go to step 18.
- 17 Problem exists in power control panel. Resolve fault, or replace power control panel, then go to step 23.
- 18 Restore main input power, then go to step 23.
- 19 Is LED on PAU module on?
 - ◆ If yes, go to step 23.
 - ◆ If no, unseat then reseal PAU module.
- 20 Is LED on PAU module on?
 - ◆ If yes, go to step 23.
 - ◆ If no, check rear of PAU shelf for correct voltage on PAU power input
- 21 Input voltage correct?
 - ◆ If yes, problem is in PAU module. Replace module, then go to step 23.
 - ◆ If no, check rear of power control panel for correct voltage output to PAU.
- 22 Voltage correct?
 - ◆ If yes, a fault exists in power wiring from power control panel to PAU. Resolve wiring problem, then go to step 23.
 - ◆ If no, a fault exists in the power control panel. Resolve fault, or replace power control panel, then go to step 23.
- 23 Return to the PAU module power-up section of this chapter, and repeat PAU module power-up.

Completion

Complete all documentation

Clean-up

Complete all documentation

Before leaving the site, verify that all customer documentation has been properly filled out. Use black or blue ink pen only. If documentation is not properly filled out, the installation crew will be sent back to the site to complete documentation.

Clean-up

Clean-up the work area before leaving.

- ◆ If refuse was present in the work area before you began installation, take the refuse with you.
- ◆ Sweep the floor.

Appendix A: Indoor BTS installation required tools

Hand tools

ID	Tool description	WSD SN#	Manufacture	Manufacture PN#	SN#	Vendor name / part #	Assigned tech.	Unit price	Notes
1	Kit in Xtra Rugged Rota Tough Case / 2023555	H500	Jensen	JTK-96		Jensen Tools / JTK96		\$552.00	
2	Kit in Xtra Rugged Rota Tough Case / 2023555	H501	Jensen	JTK-96		Jensen Tools		\$552.00	
3	Kit in Xtra Rugged Rota Tough Case / 2023555	H503	Jensen	JTK-96		Jensen Tools		\$552.00	
4	16" Metal combination square	H504	Johnson	420EM 40-0544	N/A	Grainger / 2H392			
5	16" Metal combination square	H505	Johnson	420EM 40-0544	N/A	Grainger / 2H392			
6	16" Metal combination square	H506	Johnson	420EM 40-0544	N/A	Grainger / 2H392			
7	1/4" Socket set	H507	Proto Professional Tools	J47206	N/A	Grainger / 5C857			
8	1/4" Socket set	H508	Proto Professional Tools	J47206	N/A	Grainger / 5C857			
9	1/4" Socket set	H509	Proto Professional Tools	J47206	N/A	Grainger / 5C857			
10	1/2" Socket Set	H510	Proto Professional Tools	J54214	N/A	Grainger / 5C907			
11	1/2" Socket Set	H511	Proto Professional Tools	J54214	N/A	Grainger / 5C907			
12	1/2" Socket Set	H512	Proto Professional Tools	J54214	N/A	Grainger / 5C907			
13	High Leverage Cable Cutter	H513	Klien Tools		N/A	Grainger / 4A860			
14	High Leverage Cable Cutter	H514	Klien Tools			Grainger / 4A860			
15	High Leverage Cable Cutter	H515	Klien Tools			Grainger / 4A860			
16	4" Adjustable Wrench	H516	Crescent	AT14V	N/A	Grainger / 6C181			
17	4" Adjustable Wrench	H517	Crescent	AT14V	N/A	Grainger / 6C181			

ID	Tool description	WSD SN#	Manufacture	Manufacture PN#	SN#	Vendor name / part #	Assigned tech.	Unit price	Notes
18	4" Adjustable Wrench	H518	Crescent	AT14V	N/A	Grainger / 6C181			
19	6" Adjustable Wrench	H519	Crescent	AT16V	N/A	Grainger / 6C179			
20	6" Adjustable Wrench	H519	Crescent	AT16V	N/A	Grainger / 6C179			
21	6" Adjustable Wrench	H519	Crescent	AT16V	N/A	Grainger / 6C179			
22	8" Adjustable Wrench	H520	Crescent	AT18V	N/A	Grainger / 6C176			
23	8" Adjustable Wrench	H521	Crescent	AT18V	N/A	Grainger / 6C176			
24	8" Adjustable Wrench	H522	Crescent	AT18V	N/A	Grainger / 6C176			
25	10" Pipe Wrench	H523	Ridgid	47162	N/A	Grainger / 4A498			
26	10" Pipe Wrench	H524	Ridgid	47162	N/A	Grainger / 4A498			
27	10" Pipe Wrench	H525	Ridgid	47162	N/A	Grainger / 4A498			
28	Nested Crimper Color-Keyed	H526	Thomas and Betts	TBM25S	N/A	Jensen / 462-010		\$138.00	
29	Nested Crimper Color-Keyed	H527	Thomas and Betts	TBM25S	N/A	Jensen / 462-010		\$138.00	
30	Nested Crimper Color-Keyed	H528	Thomas and Betts	TBM25S	N/A	Jensen / 462-010		\$138.00	
31	Fox and Hound wire Tracing Set	H529	Triplett Corp	3245	N/A	Jensen / 56-400		\$62.10	
32	Fox and Hound wire Tracing Set	H530	Triplett Corp	3245	N/A	Jensen / 56-400		\$62.10	
33	Fox and Hound wire Tracing Set	H531	Triplett Corp	3245	N/A	Jensen / 56-400		\$62.10	
34	Punch Down Kit	H532	Harris	1-663	N/A	Jensen / 1-663		\$107.10	
35	Punch Down Kit	H533	Harris	1-663	N/A	Jensen / 1-663		\$107.10	
36	Punch Down Kit	H534	Harris	1-663	N/A	Jensen / 1-663		\$107.10	
37	Wire Wrapping Tool	H535	Ok Industries	G100/R3278	N/A	Jensen / 125-109		\$109.25	
38	Wire wrapping Tool	H536	Ok Industries	G100/R3278	N/A	Jensen / 125-109		\$109.25	
39	Wire Wrapping Tool	H537	Ok Industries	G100/R3278	N/A	Jensen / 125-109		\$109.25	
40	Soft Jaw Pliers	H538	Milbar	45Z	N/A	Jensen / 71-045		\$20.00	
41	Soft Jaw Pliers	H539	Milbar	45Z	N/A	Jensen / 71-045		\$20.00	
42	Soft Jaw Pliers	H540	Milbar	45Z	N/A	Jensen / 71-045		\$20.00	
43	Tap and Die Set	H541	Vermont American	21749		Jensen / 146-190		\$113.60	
44	Tap and Die Set	H542	Vermont American	21749		Jensen / 146-190		\$113.60	

ID	Tool description	WSD SN#	Manufacture	Manufacture PN#	SN#	Vendor name / part #	Assigned tech.	Unit price	Notes
45	Tap and Die Set	H543	Vermont American	21749		Jensen / 146-190		\$113.60	
46	Cripper RJ11 and CAT 5	H544	AMP	2-231652-8		Jensen / 80-522		\$111.20	
47	Cripper RJ11 and CAT 5	H545	AMP	2-231652-8		Jensen / 80-522		\$111.20	
48	Cripper RJ11 and CAT 5	H546	AMP	2-231652-8		Jensen / 80-522		\$111.20	
49	System Super Crimp	H547	Sargent Quality Tools	TK4150		Jensen / 685-415		\$200.00	
50	System Super Crimp	H548	Sargent Quality Tools	TK4150		Jensen / 685-415		\$200.00	
51	System Super Crimp	H549	Sargent Quality Tools	TK4150		Jensen / 685-415		\$200.00	
52	DM Test Lead Probes	H550	Jensen	2028S / 8028S		Jensen / 916-202		\$21.56	
53	DM Test Lead Probes	H551	Jensen	2028S / 8028S		Jensen / 916-202		\$21.56	
54	DM Test Lead Probes	H552	Jensen	2028S / 8028S		Jensen / 916-202		\$21.56	
55	Nut Driver Set	H553	Xcelite	4-13MM		Jensen / 3-570		\$48.00	
56	Nut Driver Set	H554	Xcelite	4-13MM		Jensen / 3-570		\$48.00	
57	Nut Driver Set	H555	Xcelite	4-13MM		Jensen / 3-570		\$48.00	
58	Cable Knife Straight	H556	Insulated	70970		Jensen / 194-970		\$12.40	
59	Cable Knife Straight	H557	Insulated	70970		Jensen / 194-970		\$12.40	
60	Cable Knife Striaight	H558	Insulated	70970		Jensen / 194-970		\$12.40	
61	Cable Knife Hooked	H559	Insulated	70971		Jensen / 194-971		\$13.00	
62	Cable Knife Hooked	H560	Insulated	70971		Jensen / 194-971		\$13.00	
63	Cable Knife Hooked	H561	Insulated	70971		Jensen / 194-971		\$13.00	
64	Cable Cutting Pliers	H562	Cementex	P9CC		Jensen / 346-042		\$43.20	
65	Cable Cutting Pliers	H563	Cementex	P9CC		Jensen / 346-042		\$43.20	
66	Cable Cutting Pliers	H564	Cementex	P9CC		Jensen / 346-042		\$43.20	
67	Locking Pliers	H565	Vise Grips	1-131		Jensen / 1-131		\$31.96	
68	Locking Pliers	H566	Vise Grips	1-131		Jensen / 1-131		\$31.96	
69	Locking Pliers	H567	Vise Grips	1-131		Jensen / 1-131		\$31.96	
70	Diagnal Cutters	H568	Cementex	542-8C		Jensen / 66-206		\$22.20	
71	Diagnal Cutters	H569	Cementex	542-8C		Jensen / 66-206		\$22.20	
72	Diagnal Cutters	H570	Cementex	542-8C		Jensen / 66-206		\$22.20	
73	Desolder Tool	H571	Jensen	7874J		Jensen / 983-300		\$9.60	

ID	Tool description	WSD SN#	Manufacture	Manufacture PN#	SN#	Vendor name / part #	Assigned tech.	Unit price	Notes
74	Desolder Tool	H572	Jensen	7874J		Jensen / 983-300		\$9.60	
75	Desolder Tool	H573	Jensen	7874J		Jensen / 983-300		\$9.60	
76	Diagonal Cutters Insulated	H574	Crescent					\$0.00	
77	Diagonal Cutters Insulated	H575	Crescent					\$0.00	
78	Diagonal Cutters Insulated	H576	Crescent					\$0.00	
79	Assorted Bit Set, 118-039	H577	Jensen	950039		Jensen / 118-039		\$31.96	
80	Assorted Bit Set, 118-039	H578	Jensen	950039		Jensen / 118-039		\$31.96	
81	Assorted Bit Set, 118-039	H579	Jensen	950039		Jensen / 118-039		\$31.96	
82	Wire Stripper Insulated	H580	Cementex	WS45-215		Jensen / 346-040		\$26.80	
83	Wire Stripper Insulated	H581	Cementex	WS45-215		Jensen / 346-040		\$26.80	
84	Wire Stripper Insulated	H582	Cementex	WS45-215		Jensen / 346-040		\$26.80	
85	Masonry Bit 5/6" x 13"							\$0.00	

Power tools

ID	Tool description	WSD SN#	Manufacture	Manufacture PN#	Manufacture SN#	Vendor name / part #	Unit price	Date rcvd.	Assigned tech.	Notes
1	Dewalt 12 volt 3/8" (10mm) Heavy-duty cordless right angle Drill	P401	DeWALT	DW965K	75266	Grainger / 4TG96-2		4-21-00	Charles White	Has 2 batteries and 1 charger (extra battery Part# 3MJ66)
2	Dewalt 12 volt 3/8" (10mm) Heavy-duty cordless right angle Drill	P402	DeWALT	DW965K	77945	Grainger / 4TG96-2		4-21-00		Has 2 batteries and 1 charger (extra battery Part# 3MJ66)
3	Dewalt 12 volt 3/8" (10mm) Heavy-duty cordless right angle Drill	P403	DeWALT	DW965K	53479	Grainger / 4TG96-2		4-21-00	Jody Morris	Has 2 batteries and 1 charger (extra battery Part# 3MJ66)
4	DeWalt 18 volt 1/2" (13mm) Cordless Drill / Driver Kit	P404	DeWALT	DW995K-2	229862	Grainger / 4VX32		4-21-00	Charles White	Has 2 batteries and 1 charger
5	DeWalt 18 volt 1/2" (13mm) Cordless Drill / Driver Kit	P405	DeWALT	DW995K-2	229841	Grainger / 4VX32		4-21-00		Has 2 batteries and 1 charger
6	DeWalt 18 volt 1/2" (13mm) Cordless Drill / Driver Kit	P406	DeWALT	DW995K-2	229860	Grainger / 4VX32		4-21-00	Jody Morris	Has 2 batteries and 1 charger
7	Milwaukee Sawzall Plus	P407	Milwaukee	6517-20	917E300110492	Grainger / 5M628-3		4-21-00	Charles White	
8	Milwaukee Sawzall Plus	P408	Milwaukee	6517-20	917E300011507	Grainger / 5M628-3		4-21-00		
9	Master Appliance Proheat Heat gun	P409	Master Appliance	PH-1100	N/A	Grainger / 3W771		4-21-00	Charles White	
10	Master Appliance Proheat Heat gun	P410	Master Appliance	PH-1100	N/A	Grainger / 3W771		4-21-00		
11	Master Appliance Proheat Heat gun	P411	Master Appliance	PH-1100	N/A	Grainger / 3W771		4-21-00	Jody Morris	
12	Milwaukee Sawzall Plus	P412	Milwaukee	6517-20	917C398240433	Grainger / 5M628-3		4-24-00	Jody Morris	
13	Solder Station	P413	Weller	WTCPT		Jensen / 47-045	\$124.65	4-28-00		
14	Solder Station	P414	Weller	WTCPT		Jensen / 47-045	\$124.65	4-28-00		
15	Solder Station	P415	Weller	WTCPT		Jensen / 47-045	\$124.65	4-28-00		

ID	Tool description	WSD SN#	Manufacture	Manufacture PN#	Manufacture SN#	Vendor name / part #	Unit price	Date rcvd.	Assigned tech.	Notes
16	1/2" Hammer Drill	P416	Milwaukee	5378-20	897A700032220	Jensen / 306-378	\$166.50	4-28-00		
17	1/2" Hammer Drill	P417	Milwaukee	5378-20	897A799501852	Jensen / 306-378	\$166.50	4-28-00		
18	1/2" Hammer Drill	P418	Milwaukee	5378-20	897A700020947	Jensen / 306-378	\$166.50	4-28-00		
19	Tool Kit Kart 300lb capacity	P419		800		Jensen / 901-800	\$148.00	4-28-00		
20	Tool Kit Kart 300lb capacity	P420		800		Jensen / 901-800	\$148.00	4-28-00		
21	Tool Kit Kart 300lb capacity	P421		800		Jensen / 901-800	\$148.00	4-28-00		

Miscellaneous tools

ID1	Tool description	WSD SN#	Manufacture	Manufacture PN#	Manufacture SN#	Vendor name / part #	Unit price\$	Assigned tech.	Notes
1	TRIPP LITE 300 Watt Power converter	WSDPS500	TRIPP LITE	PV300	MX3AH				
2	TalkAbout Two-way Radio	WSDWT501	Motorola	TA280SLK	088TZUA142	Hutton / omo p14snz03p2aa	\$99.00		
3	TalkAbout Two-way Radio	WSDWT502	Motorola	TA280SLK	088TZUA167	Hutton / omo p14snz03p2aa	\$99.00		
4	TalkAbout Two-way Radio	WSDWT503	Motorola	TA280SLK	088TZU8764	Hutton / omo p14snz03p2aa	\$99.00		
5	TalkAbout Two-way Radio	WSDWT504	Motorola	TA280SLK	088TZUA140	Hutton / omo p14snz03p2aa	\$99.00		
6	TalkAbout Two-way Radio	WSDWT505	Motorola	TA280SLK	088TZUA159	Hutton / omo p14snz03p2aa	\$99.00	Charles White	
7	TalkAbout Two-way Radio	WSDWT506	Motorola	TA280SLK	088TZUA148	Hutton / omo p14snz03p2aa	\$99.00	Charles White	
8	Triumph 115 pc. Drill bit set	M457	Triumph	99832	N/A	Grainger / 1A522A		Charles White	
9	Triumph 115 pc. Drill bit set	M458	Triumph	99832	N/A	Grainger / 1A522A			
10	Triumph 115 pc. Drill bit set	M459	Triumph	99832	N/A	Grainger / 1A522A			
11	Fluke 21 III Digital Multimeter	M460	Fluke	659422	74461073	Grainger / 4KD92			
12	Fluke 21 III Digital Multimeter	M461	Fluke	659422	74500707	Grainger / 4KD92		Charles White	
13	Fluke 21 III Digital Multimeter	M462	Fluke	659422	74461053	Grainger / 4KD92			
14	North First AID Kit	M466	NORTH	N/A	N/A	Grainger / 4T310		Charles White	
15	North First AID Kit	M467	NORTH	N/A	N/A	Grainger / 4T310			
16	North First AID Kit	M468	NORTH	N/A	N/A	Grainger / 4T310			
17	North First AID Kit	M469	NORTH	N/A	N/A	Grainger / 4T310			
18	2 Wheel 1000lb Dolly	M463	Dayton	6W858G	N/A	Grainger / U813062373			
19	2 Wheel 1000lb Dolly	M464	Dayton	6W858G	N/A	Grainger / U813062373			

ID1	Tool description	WSD SN#	Manufacture	Manufacture PN#	Manufacture SN#	Vendor name / part #	Unit price\$	Assigned tech.	Notes
20	2 Wheel 1000lb Dolly	M465	Dayton	6W858G	N/A	Grainger / U813062373			
21	GFCI Circuit tester	M470	Greenlee	5708	AZU 0109-S/C	Grainger / 3T117			
22	GFCI Circuit tester	M471	Greenlee	5708	AZU 0147-S/C	Grainger / 3T117			
23	GFCI Circuit tester	M472	Greenlee	5708	AZU 0166-S/C	Grainger / 3T117			
24	Cable Check PC Tester	M473	Paladin Tools	1570	N/A	Jensen / 497-300	\$120.00		
25	Cable Check PC Tester	M474	Paladin Tools	1570	N/A	Jensen / 497-300	\$120.00		
26	Cable Check PC Tester	M475	Paladin Tools	1570	N/A	Jensen / 497-300	\$120.00		
27	Manual Hydraulic Crimper Insulated Head	M476	Thomas and Betts	297-31858	N/A	Jensen / 297-31858	\$1,350.00		
28	Manual Hydraulic Crimper Insulated Head	M477	Thomas and Betts	297-31858	N/A	Jensen / 297-31858	\$1,350.00		
29	Manual Hydraulic Crimper Insulated Head	M478	Thomas and Betts	297-31858	N/A	Jensen / 297-31858	\$1,350.00		
33	Fish Tape 100'	M479	Rapid Pak Steel	31-081		Jensen / 600-081	\$52.00		
34	Fish Tape 100'	M480	Rapid Pak Steel	31-081		Jensen / 600-081	\$52.00		
35	Fish Tape 100'	M481	Rapid Pak Steel	31-081		Jensen / 600-081	\$52.00		
36	Mag Lite and Charger Set	M482	Mag-Lite	RX1019		Jensen / 686-008	\$103.00		
37	Mag Lite and Charger Set	M483	Mag-Lite	RX1019		Jensen / 686-008	\$103.00		
38	Mag Lite and Charger Set	M484	Mag-Lite	RX1019		Jensen / 686-008	\$103.00		
39	50' Extention Cord	M485		OJ3502		Jensen / 543-002	\$31.96		
40	50' Extention Cord	M486		OJ3502		Jensen / 543-002	\$31.96		
41	50' Extention Cord	M487		OJ3502		Jensen / 543-002	\$31.96		
42	Extention Cord Reel	M488	Electri-cord	R-5500-020 YW		Jensen / 756-500	\$24.80		
43	Extention Cord Reel	M489	Electri-cord	R-5500-020 YW		Jensen / 756-500	\$24.80		
44	Extention Cord Reel	M490	Electri-cord	R-5500-020 YW		Jensen / 756-500	\$24.80		
45	EYE Protectors	M491	SellStorm	02798 / 79108		Jensen / 546-001	\$1.60		
46	EYE Protectors	M492	SellStorm	02798 / 79108		Jensen / 546-001	\$1.60		
47	EYE Protectors	M493	SellStorm	02798 / 79108		Jensen / 546-001	\$1.60		

ID1	Tool description	WSD SN#	Manufacture	Manufacture PN#	Manufacture SN#	Vendor name / part #	Unit price\$	Assigned tech.	Notes
48	Parts Box (Large)	M494	Infinite Divider System	T900		Jensen / 352-902	\$7.00		
49	Parts Box (Large)	M495	Infinite Divider System	T900		Jensen / 352-902	\$7.00		
50	Parts Box (Large)	M496	Infinite Divider System	T900		Jensen / 352-902	\$7.00		
51	Parts Box (Medium)	M497	Infinite Divider System	T600		Jensen / 352-602	\$4.60		
52	Parts Box (Medium)	M498	Infinite Divider System	T600		Jensen / 352-602	\$4.60		
53	Parts Box (Medium)	M499	Infinite Divider System	T600		Jensen / 352-602	\$4.60		
54	Shipping Container (Domestic) Air weight 102lb	M600		356-780L	N/A	Jensen / 356-780L	\$356.00		
55	Shipping Container (Domestic) Air weight 102lb	M601		356-780L	N/A	Jensen / 356-780L	\$356.00		
56	Shipping Container (Domestic) Air weight 102lb	M602		356-780L	N/A	Jensen / 356-780L	\$356.00		

Appendix B: Indoor BTS installation materials

Part description	Specification	Part #	Qty per site	Responsible party	Notes
GPS equipment					
GPS antenna	58532A (Symmetricomm)		1	STA	
GPS coaxial cable	50ohm,PE,BK,D:10.8mm,RG-214/U	3802-000188	180 ft	SEC	
GPS connector	N-MALE	935 62137AA	4	SEC	
GPS arrestor	3402.17,K,Huber+Suhner,DC-2.5GHZ	G711-10008A	1	SEC	
GPS arrestor capsule	500W,VSWR=1.0,50ohm	G711-10008B	1	SEC	
GPS antenna fixing mast (pole type)	_42 X 1.6T, H : 6.562 FT	G711-10016A	1	SEC	
GPS pole to pole mount		GPS pole to Antenna pole Mount	1	STA	Option #1
GPS pole to wall mount		GPS pole to wall mount	1	STA	Option #2
DC power materials					
DC power cable	CV 600V,2/0-AWG		4 x (30 ft)	STA	additional contract
Ring pressure terminal	YA26L-BOX (Brundy)		12	STA	
BBU alarm materials					
External battery alarm cable	TBD		20 ft	STA	
External battery alarm connector (at the BTS)	TBD		1	STA	
Grounding materials					
Ground cable	2-AWG / E156879	TBD	2 ea (20 ft)	STA	additional contact
Pressure terminal 2-hole	YA2CL2NT14E2 (2 AWG)		8	STA	additional contact
Filter ground	YA2C-L-BOX (2 AWG)		3	STA	
Ground cable	6-AWG / thwn cable		2 EA (20 ft)		

Part description	Specification	Part #	Qty per site	Responsible party	Notes
Pressure terminal 2-hole	YA6CL-2TC14-E2 (6 AWG)		4	STA	additional contract
Earth braid	Wire: 3.5 mm, L:220, 2H (d2:4.5), green	EN75-10853A	8	SEC	
Screw-taptite	Screw-taptite M4X10L PWH + S,C black	6003-000216	34	SEC	
Bulkhead for RF and GPS			1	STA	
RF arrestors	Huber & Suhner (7/16 F to 7/16 F)	3400.41.0119	6	Sprint	
Isolation pad			1	STA	
Bolts, nuts & washer (for MGB)					
Copper-coated hex bolt	M8 X 30L,(HEX,CU PLT)	T851-12015A	18	SEC	additional contract
Copper-coated nut	M8	T853-12004A	18	SEC	additional contract
Copper-coated plain washer	ID : 8.3 CU PLT,PLAIN	T853-16004A	36	SEC	additional contract
Copper-coated spring washer	ID : 8.3 CU PLT,SPRING	T855-17004A	36	SEC	additional contract
Hex bolt (brass)	M8 X 20L	T851-13013A	2	SEC	
Copper-coated bolt (M6 X 20L)	M6 X 20L	T851-12010A	8	SEC	
Copper-coated hex nut (M6)	M6	T853-12003A	8	SEC	
Copper-coated plain washer ID 6.3	ID: 6:3 CU PLT, PLAIN	T853-16003A	8	SEC	
Copper-coated spring washer ID 6.3	ID: 6:3 CU PLT, plain	T855-17003A	8	SEC	
T1 and customer alarm materials					
T1 cable	include connector		1 (50 ft)	Sprint	
Customer alarm cable			1 (50 ft)	Sprint	
Customer alarm connector			1	Sprint	

Anchoring bolts and mounts for 6" thick slab or thicker

Part description	Specification	Part #	Qty per site	Responsible party	Notes
Hilti anchor bolt assembly kit	HSLI M12	Kit # 96901831	1	STA	
Contents of Hiliti kit:					
Threaded rod	M12X125, SLTD, SS, A4-70		4	STA	
Nut, hex	M12, SS		4	STA	
Washer	M12, SS		4	STA	
Sleeve	M12X40, SS		4	STA	
Coll, section	M12		4	STA	
Expansion sleeve	M12, SS		4	STA	
Cone	M12, SS		4	STA	
Plate washer	M12, SS		4	STA	
Hilti bolt Isolation bushing	Bushing for the M12		4	STA	
Mounting plate	3 X 8 1/2 X.25		2		
Anchoring bolts and mounts for 2" thick slab or thinner					
HY 20 adhesive		229631	2 tubes	STA	
Dispenser	MO 2000	229154	1 per team	STA	
HIT-I insert	1/2 X 3 3/16	88998	4	STA	
HIT-S-22	Screen 1/2 x 3 3/8	68615	4	STA	
Bushing	1/2"	97439530	4	STA	
Brush wire	1/2"	255782	1 per team	STA	
Blowout pump		60579	1 per team	STA	
Hit mixer		681556	2 per team	STA	
Threaded rod with nuts and washers	1/2 X 6"		4	STA	
Drill bits	TEC-S 27/32 - 12		3	STA	
Miscellaneous materials					
Hex bolt	BLT, HEX. M16X30L, ZPC3, SM20C	6011-000102	4	SEC	Eye hook
Plain washer	d2:16.3, ZPC3, SM20C	T855-10007A	4	SEC	

Part description	Specification	Part #	Qty per site	Responsible party	Notes
Side cover assembly		EP75-00199B	2	SEC	
	W:543,L:1637,T:18.5,AL,CHROMATE				
Electrical tape (green)		3M Scotch 054007-10851	1 (roll)	STA	
Electrical tape (black)		3M Scotch 054007-06132	1 (roll)	STA	
Electrical tape (red)		3M Scotch 054007-10810	1 (roll)	STA	
Cable tie (black)	7,874 IN		1 (100 ea per pack)	STA	
Cable tie (white)	7.874 IN		1 (100 ea per pack)	STA	
Wrist strap	KS-1058, 9FT	T831-90028A	1	SEC	
Green heat-shrink tubing			1 (roll)	STA	
Black heat-shrink tubing			1 (roll)	STA	
Red heat-shrink tubing			1 (roll)	STA	
Weatherproofing kit	Butyl tape / kit		1 kit	STA	

BSC installation materials (for each BSC 0-11)

Part description	Specification	Part #	Qty per unit	Responsible party	Notes
DC power materials					
DC power cable	CV 600V, 6-AWG		4 ea (160 ft)	STA	
Ring pressure terminal 1-hole (BSC)	YA6CL4-BOX	T831-50012K	5	SEC	
Pressure terminal 2-hole (BBU)	YA6CL-2TC14-E2 (6AWG)		10	STA	
Grounding materials					
Ground cable	2-AWG / E156879	TBD	2 EA (30 FT)	STA	
Ground cable	6-AWG		2 EA (20ft)	STA	EMI filter, rack
Pressure terminal 2-hole	YA2CL2NT14E2 (2 AWG)		18	STA	
Pressure terminal 2-hole	YA6CL-2TC14-E2 (6 AWG)		2	STA	
Earth braid	WIRE: 3.5MM, L:220, 2H (d2:4.5), GREEN	EN75-10853A	8	SEC	
Screw-taptite	Screw-taptite M4X10L PWH + S,C BLACK	6003-000216	32	SEC	4 X 8
Bolts, nuts and washers (for MGB)					
Hex bolt (brass)	M8 X 20L, brass	T851-13013A	2	SEC	Rack F/G
Copper-coated hex bolt	M8 X 30L	T851-12015A	10	SEC	Bulkhead, MGB, BBU
Copper-Copper-coated nut	M8	T853-12004A	10	SEC	MGB

Part description	Specification	Part #	Qty per unit	Responsible party	Notes
Copper-coated plain washer	ID : 8.3	T853-16004A	36	SEC	MGB
Copper-coated spring washer	ID : 8.3	T855-17004A	36	SEC	MGB
Copper-coated bolt	M6 X 20L	T851-12010A	8	SEC	
Copper-coated hex nut	M6	T853-12003A	8	SEC	
Copper-coated plain washer	ID: 6:3 CU PLT, PLAIN	T853-16003A	8	SEC	
Copper-coated spring washer	ID: 6:3 CU PLT, PLAIN	T855-17003A	8	SEC	

T1 materials

T1 cable (MSC-BSC)	25 twisted pair - 24 AWG		10 ea (140 ft)	STA	BSC-MSC
T1 cable (BSC-BTS)	25 twisted pr - 24AWG		8 ea (140 ft)	STA	BSC-BTS
T1 Centronics connector	Amphenol 50-pin		20 ea		

Anchoring bolts and mounting for 6" thick slab or thicker

Hilti anchor bolt assembly kit	HSLI M12	Kit # 96901831	1	STA	
Contents of Hilti kit:					
Threaded rod	M12X125, SLTD, SS, A4-70		4	STA	
Nut, hex	M12, SS		4	STA	
Washer	M12, SS		4	STA	
Sleeve	M12X40, SS		4	STA	

Part description	Specification	Part #	Qty per unit	Responsible party	Notes
Coll, section	M12		4	STA	
Expansion sleeve	M12, SS		4	STA	
Cone	M12, SS		4	STA	
Plate washer	M12, SS		4	STA	
Hilti bolt isolation bushing	Bushing for the M12		4	STA	
Mounting plate	3 X 8 1/2 X.25		2		

Anchoring bolts and mounting for 2" thick slab or thinner

HY 20 adhesive		229631	2 tubes	STA	
Dispenser	MO 2000	229154	1 per team	STA	
HIT-I insert	1/2 X 3 3/16	88998	4	STA	
HIT-S-22	Screen 1/2 x 3 3/8	68615	4	STA	
Bushing	1/2"	97439530	4	STA	
Brush wire	1/2"	255782	1 per team	STA	
Blowout pump		60579	1 per team	STA	
Hit mixer		681556	2 per team	STA	
Threaded rod with nuts and washers	1/2 X 6"		4	STA	
Drill bits	TEC-S 27/32 - 12		3	STA	

Miscellaneous materials

Part description	Specification	Part #	Qty per unit	Responsible party	Notes
Hex bolt	Blt, hex. M16X30L, ZPC3, SM20C	6011-000102	4	SEC	Bottom bracket fixing
Plain washer	d2:16.3,ZPC3,SM20C	T855-10007A	4	SEC	
Door EMI block	86.2 X 1638 X 5T	T813-10055A	2	SEC	Door each fixing, 2 rack
Duct cover	85 X 318 X 2T, ABS	EB72-41015A	4	SEC	Rack & rack block cover
Electrical tape (green)		3M Scotch 054007-10851	1 (roll)	STA	
Electrical tape (black)		3M Scotch 054007-06132	1 (roll)	STA	
Electrical tape (red)		3M Scotch 054007-10810	1 (roll)	STA	
Electrical tape (white)					
Cable tie (black)	7,874 IN		1 (100 ea per pack)	STA	
Cable tie (white)	7.874 IN		1 (100 ea per pack)	STA	
Wrist strap	KS-1058, 9FT	T831-90028A	1	SEC	
Black heat-shrink tubing				STA	
Red heat-shrink tubing				STA	
Green heat-shrink tubing				STA	
Weatherproofing kit	Butyl tape / kit		1 kit	STA	
NO-OX paste			1 tube	STA	
Isolation pads	Pads to go between the floor and the BSC		1 per system	STA	
Interconnections cable	STM-1 / OC-3		2	SEC	
Interconnections cable	For signaling		?	SEC	

SBGR installation materials

Part description	Specification	Part #	Qty per site / per unit	Responsible party	Notes
GPS equipment					
GPS antenna	58532A (Symmetricomm)		2	STA	
GPS mast 'U' bolt assembly (galvanized)	M12x 70L, center:56	D813-10002B	4	SEC	
GPS coaxial cable	50ohm, PE, BK, D:10.8mm, RG-214/U	3802-000188	360 ft	SEC	
GPS connector	N-male	935-62137AA	6	SEC	
GPS arrester	3402.17, K, Huber+Suhner, DC-2.5 GHz	G711-10008A	2	SEC	
GPS arrester capsule	500W, VSWR=1.0, 50ohm	G711-10008B	2	SEC	
GPS antenna fixing mast (pole type)	_42 X 1.6T, H : 6.562 FT	G711-10016A	2	SEC	
GPS pole to pole mount		GPS pole to antenna pole mount	2	STA	
GPS pole to wall mount		GPS pole to wall mount	2	STA	
GPS arrester bracket	1ft X 6 in bracket for arrestors	?	1	STA	
DC power materials					
DC power cable	CV 600V, 6-AWG		4 (160 ft)	STA	
Ring pressure terminal 1-hole (BSC)	YA6CL4-BOX	T831-50012K	5	STA	
Pressure terminal 2-hole (BBU)	YA6CL-2TC14-E2 (6AWG)		10	STA	

Part description	Specification	Part #	Qty per site / per unit	Responsible party	Notes
Grounding materials					
Ground cable	2-AWG / E156879	TBD	2 ea (30 ft)	STA	
Ground cable	6-AWG		2 ea (20 ft)	STA	EMI filter, rack
Pressure terminal 2-hole	YA2CL2NT14E2		6	STA	
Pressure terminal 2-hole	YA6CL-2TC14-E2 (6AWG)		6	STA	
Earth braid	WIRE:3.5MM, L:220, 2H (d2:4.5), GREEN	EN75-10853A	8	SEC	
Screw-taptite	Screw-taptite M4X10L PWH + S,C black	6003-000216	32	SEC	4 X 8
Ground bar	For rack mount		1	STA	
Bolts, nuts and washers (for MGB)					
Hex.bolt (brass)	M8 X 20L, brass	T851-13013A	2	SEC	Rack F/G
Copper-coated hex bolt	M8 X 30L	T851-12015A	10	SEC	Bulkhead, MGB, BBU
Copper-coated nut	M8	T853-12004A	10	SEC	MGB
Copper-coated plain washer	ID : 8.3	T853-16004A	36	SEC	MGB
Copper-coated spring washer	ID : 8.3	T855-17004A	36	SEC	MGB
Copper-coated bolt	M6 X 20L	T851-12010A	8	SEC	
Copper-coated hex nut	M6	T853-12003A	8	SEC	
Copper-coated plain washer	ID: 6:3 CU PLT, plain	T853-16003A	8	SEC	

Part description	Specification	Part #	Qty per site / per unit	Responsible party	Notes
Copper-coated spring washer	ID: 6:3 CU PLT, plain	T855-17003A	8	SEC	
T1 materials					
T1 cable (MSC-BSC)	25 twisted pair - 24 AWG		10 ea (140 ft)	STA	BSC-MSC
T1 cable (BSC-BTS)	25 twisted pair - 24 AWG		8 ea (140 ft)	STA	BSC-BTS
T1 Centronics connector	Amphenol 50 pin		20ea		
Anchoring bolts and mounting for 6" thick slab or thicker					
Hilti anchor bolt ass'y kit	HSLI M12	Kit # 96901831	1	STA	
Contents of Hilti kit:					
Threaded rod	M12X125, SLTD, SS, A4-70		4	STA	
Nut, hex	M12, SS		4	STA	
Washer	M12, SS		4	STA	
Sleeve	M12X40, SS		4	STA	
Coll, section	M12		4	STA	
Expansion sleeve	M12, SS		4	STA	
Cone	M12, SS		4	STA	
Plate washer	M12, SS		4	STA	
Hilti bolt isolation bushing	Bushing for the M12		4	STA	
Mounting plate	3 X 8 1/2 X.25		2		

Part description	Specification	Part #	Qty per site / per unit	Responsible party	Notes
Anchoring bolts and mounting for 2" thick slab or thinner					
HY 20 adhesive		229631	2 tubes	STA	
Dispenser	MO 2000	229154	1 per team	STA	
HIT-I insert	1/2 X 3 3/16	88998	4	STA	
HIT-S-22	Screen 1/2 x 3 3/8	68615	4	STA	
Bushing	1/2"	97439530	4	STA	
Brush wire	1/2"	255782	1 per team	STA	
Blowout pump		60579	1 per team	STA	
Hit mixer		681556	2 per team	STA	
Threaded rod with nuts and washers	1/2 X 6"		4	STA	
Drill bits	TEC-S 27/32 - 12		3	STA	
Miscellaneous materials					
Hex bolt	Bolt, hex. M16X30L, ZPC3, SM20C	6011-000102	4	SEC	Bottom bracket fixing
Plain washer	d2:16.3, ZPC3, SM20C	T855-10007A	4	SEC	
Door EMI block	86.2 X 1638 X 5T	T813-10055A	2	SEC	Door each fixing, 2 rack
Duct cover	85 X 318 X 2T, ABS	EB72-41015A	4	SEC	Rack & rack block cover
Electrical tape (green)		3M Scotch 054007-10851	1 (roll)	STA	

Part description	Specification	Part #	Qty per site / per unit	Responsible party	Notes
Electrical tape (black)		3M Scotch 054007-06132	1 (roll)	STA	
Electrical tape (red)		3M Scotch 054007-10810	1 (roll)	STA	
Electrical tape (white)					
Cable tie (black)	7,874 IN		1 (100 ea per pack)	STA	
Cable tie (white)	7.874 IN		1 (100 ea per pack)	STA	
Wrist strap	KS-1058, 9FT	T831-90028A	1	SEC	
Black heat shrink tubing				STA	
Red heat shrink tubing				STA	
Green heat shrink tubing				STA	
Weatherproofing kit	Butyl tape / kit		1 kit	STA	
NO-OX paste			1 tube	STA	
Isolation pads	Pads to go between the floor and the BSC		1 per system	STA	

BSC installation materials

Part description	Specification	Part #	Qty per site	Responsible party	Notes
Miscellaneous materials					
Side cover assembly	W: 543, L: 1637, T: 18.5, AL, chromate	EP75-00199B	2	SEC	

Appendix C: Indoor BTS Installation Record

Site name: _____

Customer name: _____

Samsung qualified technicians responsible: _____

Date completed: _____

Note: When installing less than 3 racks, mark "N/A" for "Date", and initial in the appropriate space.

Note: Date and initial each step as it is completed.

Task	Description	Date	Initials	Comments
Required documents				
	All required documents present and accounted for.			
Installation tools				
	All required installation tools present and accounted for.			
Transporting and lifting the racks				
SBBR	Damaged goods? <input type="checkbox"/> Yes <input type="checkbox"/> No			
SBER1	Damaged goods? <input type="checkbox"/> Yes <input type="checkbox"/> No			
SBER2	Damaged goods? <input type="checkbox"/> Yes <input type="checkbox"/> No			
BBU	Damaged goods? <input type="checkbox"/> Yes <input type="checkbox"/> No			

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Task	Description	Date	Initials	Comments
Unpacking the racks				
SBBR	Damaged goods? <input type="checkbox"/> Yes <input type="checkbox"/> No			
	All equipment present? <input type="checkbox"/> Yes <input type="checkbox"/> No			
SBER1	Damaged goods? <input type="checkbox"/> Yes <input type="checkbox"/> No			
	All equipment present? <input type="checkbox"/> Yes <input type="checkbox"/> No			
SBER2	Damaged goods? <input type="checkbox"/> Yes <input type="checkbox"/> No			
	All equipment present? <input type="checkbox"/> Yes <input type="checkbox"/> No			
BBU	Damaged goods? <input type="checkbox"/> Yes <input type="checkbox"/> No			
	All equipment present? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Site preparation				
	Site prepared according to the template.			
Install GPS System				
	Installed per the Samsung manual " <i>Installing the GPS System</i> ".			
Install BBU				
	Installed per the Alpha Technologies <i>Alpha 3010G Installation Manual</i> .			
Anchor the racks				
SBBR	Rack placed at installation position.			
	Anchor brackets installed, and rack anchored.			
	Cable pipe installed.			
SBER1	Rack placed at installation position.			

Task	Description	Date	Initials	Comments
	Anchor brackets installed, and rack anchored.			
	Cable pipe installed.			
SBER2	Rack placed at installation position.			
	Anchor brackets installed, and rack anchored.			
	Cable pipe installed.			
Isolation test the racks				
SBBR	Rack isolated from ground.			
SBER1	Rack isolated from ground.			
SBER2	Rack isolated from ground.			
Leveling the racks				
SBBR	Rack level and secured.			
SBER1	Rack level and secured.			
SBER2	Rack level and secured.			
Installing the ducts				
	Arrestor duct installed.			
	Protection duct 1 installed.			
	Protection duct 2 installed.			
Grounding the racks				
SBBR rack ground	Ground wire installed and connected to MGB.			
SBER1 rack ground	Ground wire installed and connected to MGB.			
SBER2 rack ground	Ground wire installed and connected to MGB.			
Connecting SBBR external cables				
Unseat modules	All modules unseated			
DC power cable	Cable installed and connected			
DC power check	DC input voltage correct			
T1 cable	Cable installed and labeled.			
GPS cable	Cable installed and labeled.			
Customer alarm cable	Cable installed and labeled.			
BBU alarm cable	Cable installed and labeled.			
RF cables	Cable installed and labeled			
Connecting SBER1 external cables				
Unseat modules	All modules unseated			
DC power cable	Cable installed and connected			

Task	Description	Date	Initials	Comments
DC power check	Verify correct DC input voltage			
T1 cable	Cable installed and labeled.			
GPS cable	Cable installed and labeled.			
Customer alarm cable	Cable installed and labeled.			
BBU alarm cable	Cable installed and labeled.			
RF cables	Cable installed and labeled			
Connecting SBER2 external cables				
Unseat modules	Verify all modules unseated			
DC power cable	Cable installed and connected			
DC power check	Verify correct DC input voltage			
T1 cable	Cable installed and labeled.			
GPS cable	Cable installed and labeled.			
Customer alarm cable	Cable installed and labeled.			
BBU alarm cable	Cable installed and labeled.			
RF cables	Cable installed and labeled			
SBBR Initial testing				
Reseat modules	ll modules reseated.			
Power-up fans	Fan power-up successful			
Power-up SH-0	SH-0 power-up successful			
Power-up SH-1	SH-1 power-up successful			
Power-up SH-2	SH-2 power-up succesful			
Power-up SDP-T modules	SDP-T modules power-up successful			
Power-up PAU modules	PAU module power-up successful			
SBER1 Initial testing				
Reseat modules	ll modules reseated.			
Power-up fans	Fan power-up successful			
Power-up SH-0	SH-0 power-up successful			
Power-up SH-1	SH-1 power-up successful			
Power-up SH-2	SH-2 power-up succesful			
Power-up SDP-T modules	SDP-T modules power-up successful			
Power-up PAU modules	PAU module power-up successful			
SBER2 Initial testing				
Reseat modules	ll modules reseated.			
Power-up fans	Fan power-up successful			

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Task	Description	Date	Initials	Comments
Power-up SH-0	SH-0 power-up successful			
Power-up SH-1	SH-1 power-up successful			
Power-up SH-2	SH-2 power-up successful			
Power-up SDP-T modules	SDP-T modules power-up successful			
Power-up PAU modules	PAU module power-up successful			
Power down				
SBBR	All modules powered down in correct order.			
SBER1	All modules powered down in correct order.			
SBER2	All modules powered down in correct order.			
Final power up				
SBBR	All modules powered up in correct order.			
SBER1	All modules powered up in correct order.			
SBER2	All modules powered up in correct order.			
Completion				
	All documentation complete			
	Site cleaned up			
	Site Inventory Changes Form complete			
	Network Operations Center notified that site is configured and time logged out			

About this Document

Document history

*Samsung CDMA Base Station System Version 4
Indoor BTS Installation Manual*

Date	Release	Author	Notes
	2.0	AHF/JTC	

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Approvals

Approved by: Bijan Nowroozi, 07 Dec 00

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