ATTACHING THE SHELVES AND MODULES

These procedures describe how to attach the shelves and modules to the NPM racks.

Table 4.3 shows the actions described in this section.

Table 4.3 Attaching the Shelves and Modules Procedure Summary

Radio Rack Layout

The utility and radio shelves and the GPS clock module slide into their respective bays and bolt directly to the rack using 5/16-inch screws. The recommended torque value for each 5/16-inch screw is 50 inch-pounds.

Figure 4.9 shows the layout of the radio rack.

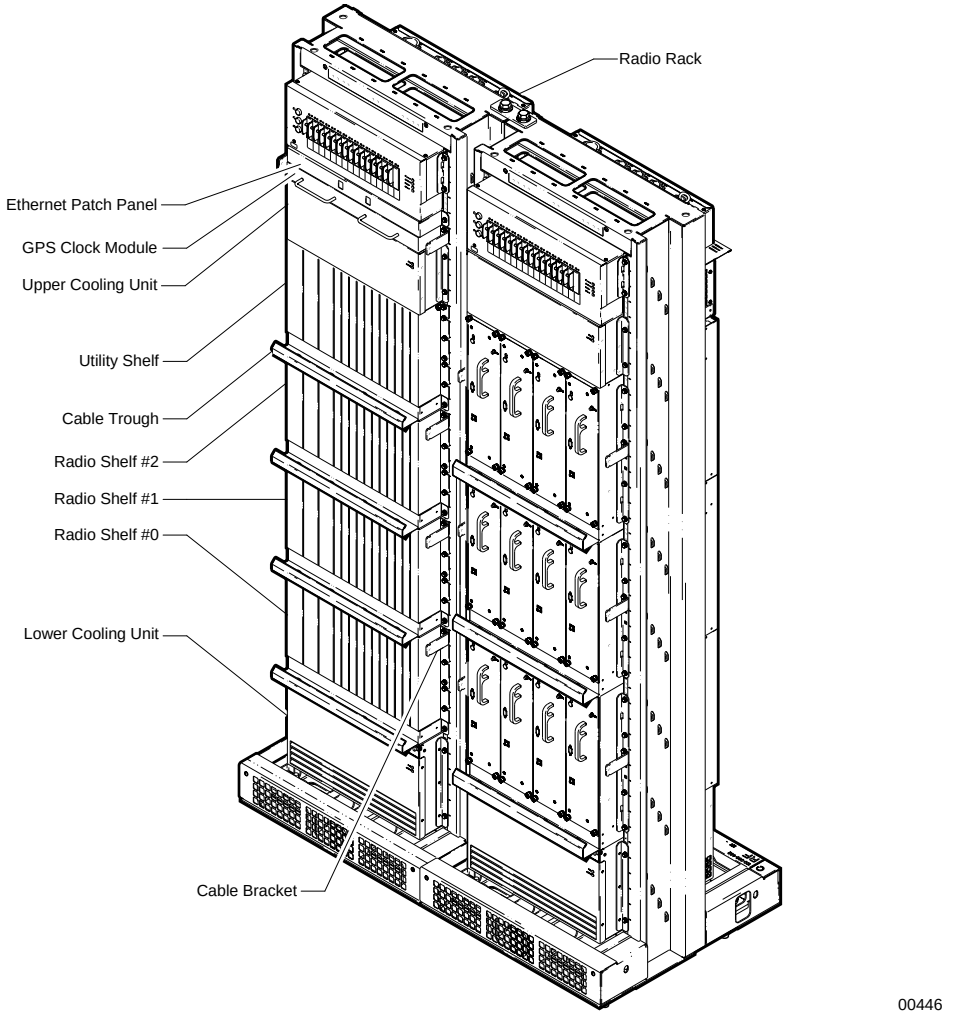

Figure 4.9 Radio Rack Layout

RF Rack Layout

The RFSS modules slide into their respective slots and bolt to each RF shelf using #2 Phillips thumb screws. In NPMs that have less than 12 RFSS modules, the empty slots are covered with filler panels.

Figure 4.10 shows the location of the RFSS modules and filler panels in an NPM that supports three sectors.

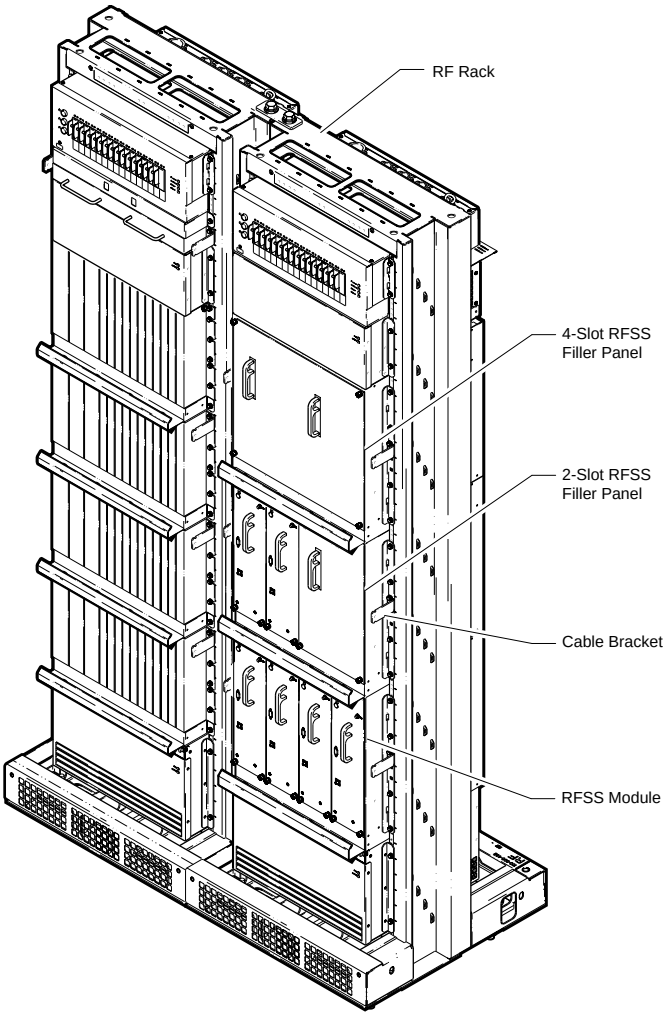

Figure 4.10 RF Rack Layout

Attach the Radio Shelves to the Radio Rack

Depending on the configuration of your NPM, there may be one, two, or three radio shelves that need to be installed. The radio shelves are installed in the bottom three bays in the radio rack. If your NPM uses fewer than three radio shelves, you need to add dummy shelves to the empty bays to ensure the required airflow to the occupied bays.

WARNING: Your NPM may arrive with the utility and radio shelves already populated with cards. If this is the case, ensure that you are properly grounded before handling the shelves. Failure to do so may damage the cards.

To attach the radio shelves to the radio rack

1 Remove the radio shelf from its protective bag.

> **NOTE:** Each shelf weighs approximately 6.3 kg (14 pounds) before it is filled with cards.
>
> You can distinguish the radio shelves from the utility shelf by reading the manufacturer's label on the chassis.

2 Slide the radio shelf into the lowest available radio shelf bay in the radio rack.

If the bay is too tight to accommodate the radio shelf, loosen the 5/16-inch screws that hold the cable troughs to the rack. This should provide enough space for you to slide in the radio shelf.

If any of the cable brackets interfere with the insertion of the radio shelf, remove them. The cable brackets attach to the rack using 5/16-inch screws.

3 Puncture a hole in the grounding tape for each radio shelf screw location.

4 Secure the radio shelf to the rack using eight 5/16-inch screws. Torque each screw to 50 inch-pounds.

5 Reattach any cable brackets you removed.

6 Retighten the 5/16-inch screws on any loosened cable troughs.

7 Repeat steps 1 to 6 for the remaining radio shelves.

Cover Empty Radio Bays

Depending on the configuration of your NPM, there may be empty bays on the radio rack. Your NPM may arrive with the unused radio bays already occupied with dummy shelves. If this is not the case or if the configuration of your NPM has changed, you need to add dummy shelves to any empty bays to ensure the required airflow to the occupied bays.

To cover the empty radio bays

1. Slide the dummy shelf into the lowest empty radio shelf bay in the radio rack. If the bay is too tight to accommodate the dummy shelf, loosen the 5/16-inch screws that hold the cable troughs to the rack. This should provide enough space for you to slide in the dummy shelf.
2. Puncture a hole in the grounding tape for each dummy shelf screw location.
3. Secure the dummy shelf to the rack using eight 5/16-inch screws. Torque each screw to 50 inch-pounds.
4. Retighten the 5/16-inch screws on any loosened cable troughs.
5. Repeat steps 1 to 4 for any remaining empty bays in the radio rack.

Attach the Utility Shelf to the Radio Rack

The utility shelf is installed in the top-most bay in the radio rack.

To attach the utility shelf to the radio rack

1. Remove the utility shelf from its protective bag. You can distinguish the utility shelf from the radio shelves by reading the manufacturer's label on the inside of the chassis.
2. Slide the utility shelf into the top bay in the radio rack.

   If the bay is too tight to accommodate the utility shelf, loosen the 5/16-inch screws that hold the upper cooling unit and the cable trough to the rack. This should provide enough space for you to slide in the utility shelf.

   If any of the cable brackets interfere with the insertion of the radio shelf, remove them. The cable brackets attach to the rack using 5/16-inch screws.
3. Puncture a hole in the grounding tape for each utility shelf screw location.
4. Attach the utility shelf to the rack using eight 5/16-inch screws. Torque each screw to 50 inch-pounds.
5. Reattach any cable brackets you removed.
6. Retighten any 5/16-inch screws on the upper cooling unit and the cable trough.

Install the GPS Clock Module

The Global Positioning System (GPS) clock module consists of a 1U module that contains two plug-in GPS receivers. The GPS clock module requires two GPS antennas. GPS antenna installation is described on page 110.

To install the GPS clock module

1. Remove the GPS clock module from its antistatic packaging.
2. If necessary, attach the plug-in modules and the rack-mount brackets to the GPS clock module using the hardware supplied in the shipping kit.
3. Orient the GPS clock module so that the text on the front panel is right-side up.
4. Slide the GPS clock module into the radio rack directly above the upper cooling unit.

   The GPS clock module is located between the Ethernet patch panel and the upper cooling unit.
5. Puncture a hole in the grounding tape for each GPS clock module screw location.
6. Attach the GPS clock module to the rack using four 5/16-inch mounting screws. Torque each screw to 50 inch-pounds.

Install the RFSS Modules

If the configuration of your NPM does not require a full complement of RFSS modules, some slots may be covered with filler panels.

CAUTION: Each RFSS module weighs approximately 14.1 kg (31 pounds).

To insert the RFSS modules in the RF rack

1. Remove the RFSS module from its protective bag.
2. Orient the RFSS module so that the text on the front panel is right-side up.
3. Slide the RFSS module into the first available RFSS slot. The slots should be filled from bottom to top, left to right.
4. Secure the module in the slot using four #2 Phillips thumb screws, one in each corner. Torque the thumb screws to 12 inch-pounds.
5. Ensure that the RFSS module is secure by grasping the handle on the front panel and pulling lightly. The RFSS module should not move.

   If the RFSS module does move, ensure that the mounting screws are attached to the shelf assembly and that the module is seated correctly. If necessary, remove the module and repeat this procedure.
6. Repeat steps 1 to 5 for the remaining RFSS modules.

Cover Empty RFSS Slots

Any empty slots in the RF shelves should be covered with RFSS filler panels. The RFSS filler panels protect the other RFSS modules from dust and ensure the required air flow to the installed RFSS modules.

To cover unused slots with RFSS filler panels

1. Remove the RFSS filler panel from its protective bag.
2. Orient the filler panel so that the text on the front panel is right-side up.
3. Secure the filler panel over the RFSS slots using four #2 Phillips screws, one on each corner. Torque the screws to 12 inch-pounds.
4. Ensure that the filler panel is secure by grasping the handle on the front panel and pulling lightly. The filler panel should not move.

   If the filler panel does move, ensure that the mounting screws are attached to the RF shelf assembly. If necessary, remove the filler panel and repeat this procedure.
5. Repeat steps 1 to 4 until all the empty slots are covered with filler panels.

POPULATING THE SHELVES

These procedures describe how to install the CompactPCI power supplies and cards into the utility and radio shelves. Table 4.4 lists the actions described in this section.

Table 4.4 Populating the Shelves Procedure Summary

NOTE: Your NPM may arrive with the shelves already populated. If this is the case, ensure that the cards are properly secured in the chassis and proceed to the next section.

Depending on the configuration of your NPM, the exact number and layout of the cards may vary. See your E1 package for the specific layout and cabling.

WARNING: Failure to insert a card in the correct slot may result in damage to or destruction of the card or shelf. Ensure that all the cards are in the correct slots before powering on the shelves.

Shelf Layout

Utility Shelf Layout

Table 4.5 and Figure 4.11 show the layout of the front-facing cards on the utility shelf.

Slot	Front-Facing Card	Slot	Front-Facing Card
0–1	Power supply 0	12	Alarm card 0
2–3	Power supply 1	13	Alarm card 1
4–5	Power supply 2	14	Utility bus controller 1
6	Ethernet switch 0	15–16	Hard disk drive 1
7–8	Hard disk drive 0	17	Application host 3
9	Application host 0	18	Application host 1
10	Utility bus controller 0	19	Ethernet switch 1
11	Application host 2	20	—

Table 4.5 Utility Shelf Layout (Front-Facing Cards)

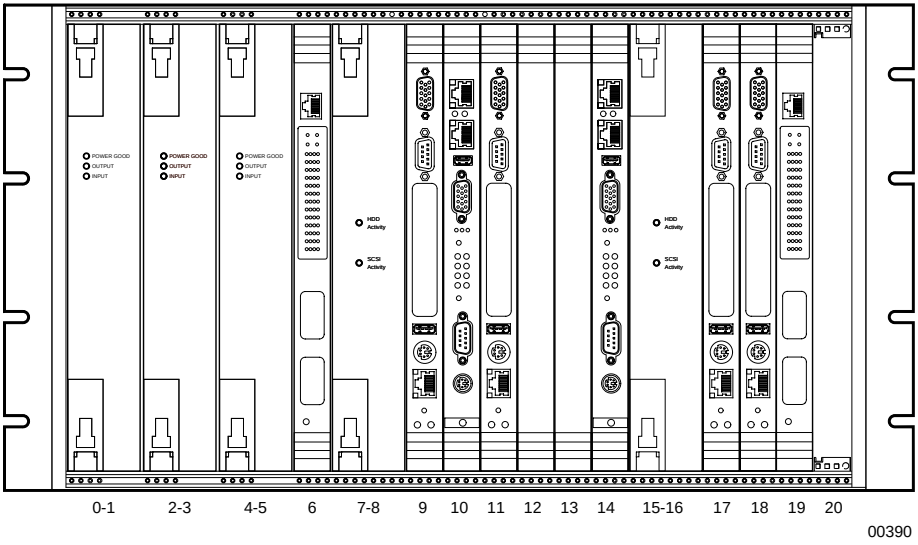

Figure 4.11 Utility Shelf Layout (Front View)

Table 4.6 and Figure 4.12 show the layout of the rear-facing cards on the utility shelf.

Slot	Rear-Facing Card	Slot	Rear-Facing Card
6–7	Ethernet switch rear I/O card	14	Utility bus controller rear I/O card
8	—	15	—
9	Application host rear I/O card	16	—
10	Utility bus controller rear I/O card	17	Application host rear I/O card
11	Application host rear I/O card	18	Application host rear I/O card
12–13	Alarm wiring card	19–20	Ethernet switch rear I/O card

Table 4.6 Utility Shelf Layout (Rear-Facing Cards)

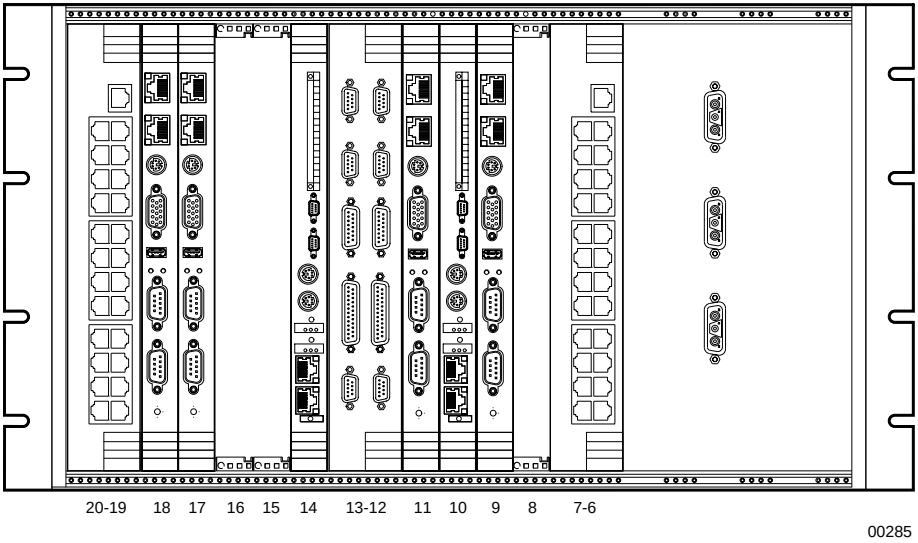

Figure 4.12 Utility Shelf Layout (Rear View)

Radio Shelf Layout

Table 4.7 and Figure 4.13 show the layout of the front-facing cards on the radio shelf.

Slot	Front-Facing Card	Slot	Front-Facing Card
0–1	Power supply 0	12	Radio sector controller
2–3	Power supply 1	13	—
4–5	Power supply 2	14	Radio sector controller
6	Radio modem 3	15–16	IF/RF card
7	Radio modem 2	17	Radio modem 0
8	Radio modem 1	18	Radio modem 1
9	Radio modem 0	19	Radio modem 2
10–11	IF/RF card	20	Radio modem 3

Table 4.7 Radio Shelf Layout (Front-Facing Cards)

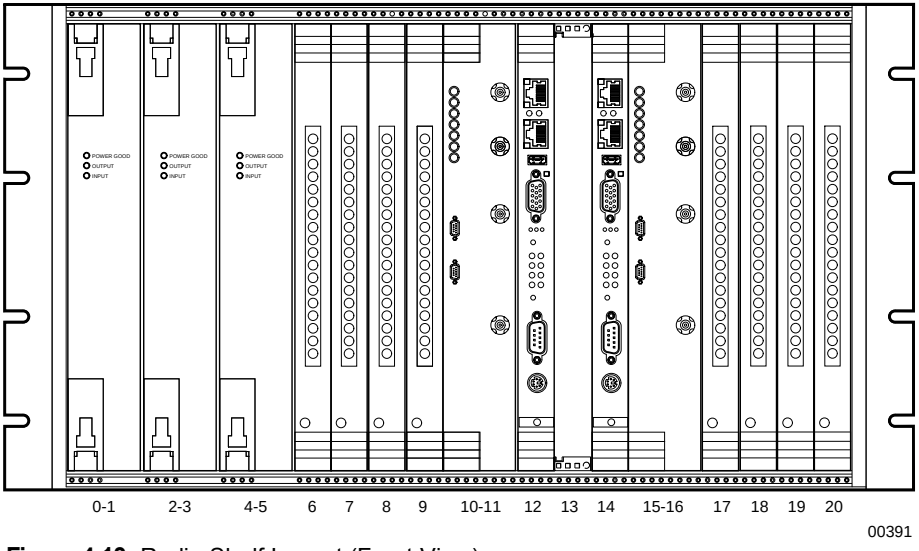

Figure 4.13 Radio Shelf Layout (Front View)

Table 4.8 and Figure 4.14 show the layout of the rear-facing cards on the radio shelf.

Slot	Rear-Facing Card	Slot	Rear-Facing Card
6	—	14	Radio sector controller rear I/O card
7	—	15	—
8	—	16	Clock wiring card
9	—	17	—
10	—	18	—
11	Clock wiring card	19	—
12	Radio sector controller rear I/O card	20	—
13	—		

Table 4.8 Radio Shelf Layout (Rear-Facing Cards)

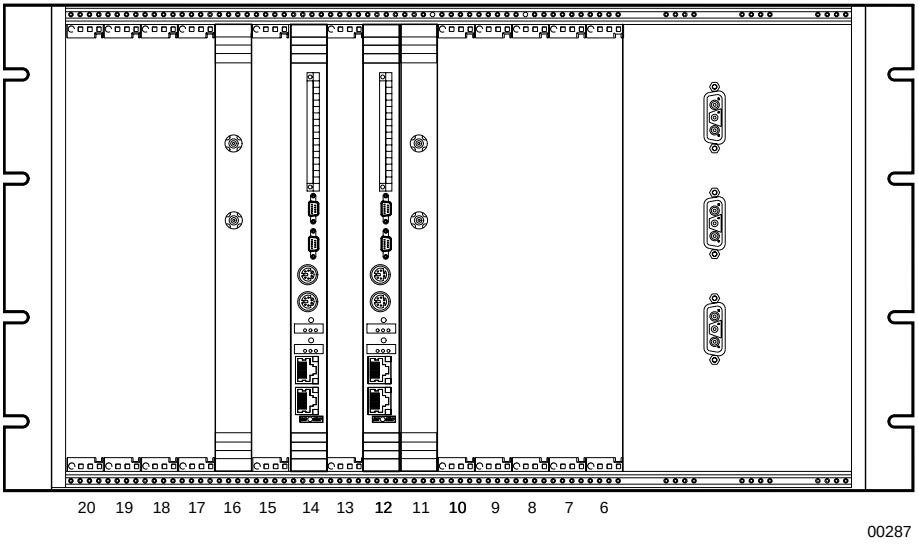

Figure 4.14 Radio Shelf Layout (Rear View)

Insert CompactPCI Power Supplies

The radio and utility shelves each contain two or three identical CompactPCI power supplies. See pages 82 and 84 for the locations of the power supplies.

Utility shelves and completely filled radio shelves use three power supplies each; half-full radio shelves require only two power supplies. This ensures that the shelves will continue to operate should one of the power supplies fail.

WARNING: The power supplies use components that are sensitive to electrostatic discharges (ESD). Make sure you are wearing an approved and regularly tested grounded wrist strap connected to the grounding point on the PDP. When you handle the power supplies, hold them by their handles or edges. Do not touch electrical connections, pins, or soldered surfaces.

To insert CompactPCI power supplies

1. Ensure that there are no obstructions in the slot or on the guide rails.
2. Remove a CompactPCI power supply from its antistatic bag.
3. Set the two ejector handles on the power supply in the open position by turning the handles away from the center of the front panel while pressing the locking tabs located at the end of each handle.

   In the open position, the ejector handles are at an approximately 30° angle from the front panel.
4. Ensure that the two mounting screws located under and beside each ejector handle are withdrawn enough to allow for the insertion of the power supply.
5. Orient the power supply so that the text on the front panel is right-side up.
6. Slide the power supply into the left-most unoccupied power slot. Use the guide rails to ensure the connectors are aligned. Apply sufficient pressure to fully mate the power supply with the chassis.
7. Lock the power supply in the slot by pressing down on the ejector handles until the handles are flush with the front panel.

   You can hear a click when the lock engages.
8. Secure the power supply in the slot using four 2.5-mm mounting screws. Torque each screw to 4 inch-pounds.
9. Repeat steps 1 to 8 for the remaining power supplies.

Test CompactPCI Power Supplies

This procedure describes how to test the CompactPCI power supplies and shelves for electrical faults. Testing the power supplies and shelves before inserting the cards ensures that, in the unlikely event that an electrical fault does occur, no cards will be damaged.

To test CompactPCI power supplies

1. Ensure that your main +24V DC power supply is powered on and is providing a power source that meets the electrical requirements listed on page 27.
2. Power on each power supply in the utility and radio shelves separately. Wait at least 10 s before powering on the next power supply.

WARNING: The red OUTPUT FAIL light on each power supply should turn off within 3 s. If the OUTPUT FAIL light remains on or flickers continuously, power down the chassis immediately and replace the power supply. If the replacement power supply also indicates a fault condition, your chassis may be damaged. Replace the chassis before continuing with the NPM installation.

Table 4.9 shows the circuit breakers for each power supply.

Power Supply	Circuit Breaker
Radio shelf #0 (bottom), left power supply (slots 0–1)	Radio rack PDP, CB 02
Radio shelf #0 (bottom), middle power supply (slots 2–3)	Radio rack PDP, CB 03
Radio shelf #0 (bottom), right power supply (slots 4–5)	Radio rack PDP, CB 04
Radio shelf #1 (middle), left power supply (slots 0–1)	Radio rack PDP, CB 05
Radio shelf #1 (middle), middle power supply (slots 2–3)	Radio rack PDP, CB 06
Radio shelf #1 (middle), right power supply (slots 4–5)	Radio rack PDP, CB 07
Radio shelf #2 (top), left power supply (slots 0–1)	Radio rack PDP, CB 08
Radio shelf #2 (top), middle power supply (slots 2–3)	Radio rack PDP, CB 09
Radio shelf #2 (top), right power supply (slots 4–5)	Radio rack PDP, CB 10
Utility shelf, left power supply (slots 0–1)	Radio rack PDP, CB 11
Utility shelf, middle power supply (slots 2–3)	Radio rack PDP, CB 12
Utility shelf, right power supply (slots 4–5)	Radio rack PDP, CB 13

Table 4.9 Utility and Radio Shelf Power Supply Circuit Breaker Summary

3 Power off all the power supplies in the radio and utility shelves.

4 Power off your main +24V DC power supply.

Insert the Radio and Utility Shelf Cards

See pages 82 to 85 for the location of each card. If the configuration of your NPM does not use a full complement of cards, some slots will be left empty.

WARNING: The cards use components that are sensitive to electrostatic discharges (ESD). Make sure you are wearing an approved and regularly tested grounded wrist strap connected to the grounding point on the PDP. When you handle the cards, hold them by their handles or edges. Do not touch electrical connections, pins, or soldered surfaces.

The pins on the backplane are easily damaged. When inserting cards (especially the hard disk drives), ensure that the connectors are properly aligned before applying sufficient pressure to seat the card. Apply equal pressure to both ejector handles when inserting the card. Failure to do so may result in the pins or connectors being damaged.

Figure 4.15 shows how to properly insert a card into a shelf.

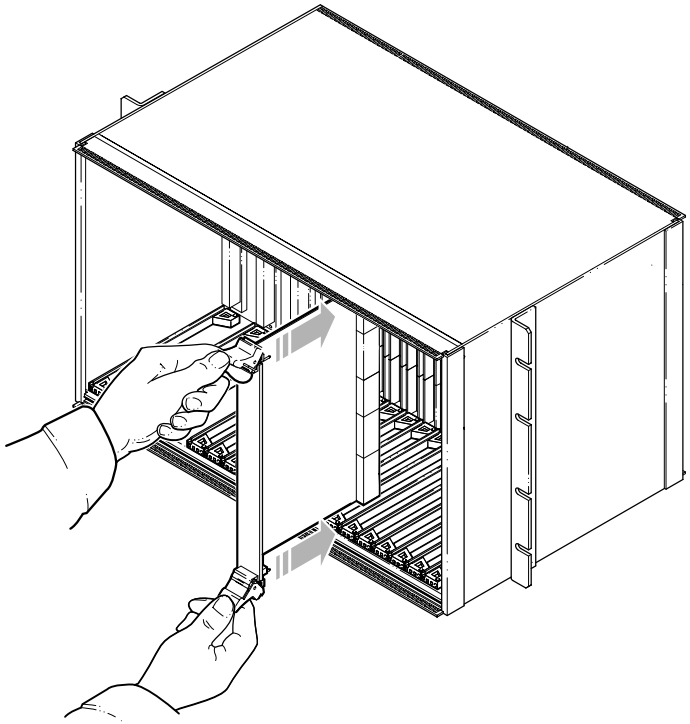

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Figure 4.15 Card Insertion

To insert the cards into the utility and radio shelves

1. Ensure that there are no obstructions in the slot or on the guide rails and check the backplane for bent pins.

   If there are bent pins, the backplane is damaged and requires repair. Report any damaged equipment to your field support coordinator as soon as possible.

2. Remove the card from its antistatic bag.

3. Set the two ejector handles on the card in the open position by turning the handles away from the center of the front panel.

   In the open position, the ejector handles are at an approximately 45° angle from the front panel.

4. Ensure that the mounting screws are withdrawn enough to allow for the insertion of the card.

   Single-slot cards have two mounting screws, one located under each ejector handle. Double-slot cards have four mounting screws, one located under each ejector handle and one located beside each ejector handle.

5. Orient the card so that the text on the front panel is right-side up. The guide pins should be located to the right of the ejector handles.

6. Slide the card into the correct slot. Slot locations are shown on pages 82 to 85. Use the guide rails to ensure the connectors are aligned.

7. Apply sufficient pressure to fully mate the card by pressing on both ejector handles with equal force. If present on the card, the guide pins should slide into the round holes located at the top and the bottom of each slot on the right-hand side.

8. Lock the card in the slot by turning the ejector handles towards the center of the front panel.

   In the lock position, the ejector handles are at a 90° angle from the front panel.

9. Secure the card in the slot by installing the 2.5-mm mounting screws. Torque each screw to 4 inch-pounds.

10. Repeat steps 1 to 9 for the remaining cards.

Cover Unused Card Slots

Any empty slots in the radio and utility shelves should be covered with filler panels. The filler panels ensure airflow to the other cards and protect the cards from dust and electromagnetic interference.

To cover the unused slots with filler panels

1. Remove the filler panel from its protective bag.
2. Set the two ejector handles on the filler panel in the open position by turning the handles away from the center of the front panel.

   In the open position, the ejector handles are at an approximately 45° angle from the front panel.
3. Ensure that the mounting screws are withdrawn enough to allow for the insertion of the filler panel.

   Single-slot filler panels have two mounting screws, one located under each ejector handle. Double-slot filler panels have four mounting screws, one located under each ejector handle and one located beside each ejector handle.
4. Orient the filler panel so that the guide pins are on the right-hand side of the ejector handles.
5. Slide the filler panel into the slot. The guide pins should slide into the round holes located at the top and the bottom of each slot on the right-hand side. Apply sufficient pressure to fully mate the filler panel with the chassis.
6. Lock the filler panel in the slot by turning the handles towards the center of the front panel.

   In the lock position, the ejector handles are at a 90° angle from the front panel.
7. Secure the filler panel in the slot by installing the 2.5-mm mounting screws. Torque each screw to 4 inch-pounds.
8. Ensure that the filler panel is secure by grasping both ejector handles and pulling lightly. The filler panel should not move.

   If the filler panel does move, ensure that the mounting screws are attached to the chassis frame. If necessary, remove the panel and repeat this procedure.
9. Repeat steps 1 to 8 until all the empty slots are covered with filler panels.

CONNECTING THE CABLES

This section describes the cables connecting the different systems in the NPM. Table 4.10 shows the actions described in this section.

Action	Page
Connect the PDP Power Cables	94
Connect the RFSS Signal Cables	98
Connect the Alarm Cables	100
Connect the Ethernet Cables	101
Connect the Clock Cables	103
Connect the RF Cables	105

Table 4.10 Connecting the Cables Procedure Summary

NOTE: The cables are packaged according to their type. Each cable package is labeled with a part number. Use this part number to identify each cable, and refer to the tables provided in this section for its intended origin and termination point.

Depending on the configuration of your NPM, the exact number and layout of the cards may vary. See your E1 package for the specific layout.

Connect the PDP Power Cables

The PDP power cables for each rack are attached to the PDP at the factory. The power cables are already tied to the rack.

The PDP power cables consist of #10, #12, or #16 AWG wire with 3-pin DSUB connectors on each end. The connectors are secured to the racks with 1/8-inch flathead screws.

Component Numbering

When viewed from the back of the NPM, the connectors for the PDP circuit breakers (CB) are labeled from right to left (that is, CB 01 is the right-most breaker and CB 15 is the third breaker from the left).

Each utility and radio shelf has three power supply (PS) connectors: PS2 is the top connector, PS0 is the middle connector, and PS1 is the bottom connector.

The RF shelves are numbered from bottom to top (that is, the bottom shelf is “0” and the top shelf is “2”). When viewed from the front of the NPM, the RFSS modules in each shelf are numbered from left to right (that is, the left module is “0” and the right module is “3”).

Figure 4.16 shows the location of the power connectors on the radio rack. Figure 4.17 shows the location of the power connectors on the RF rack.

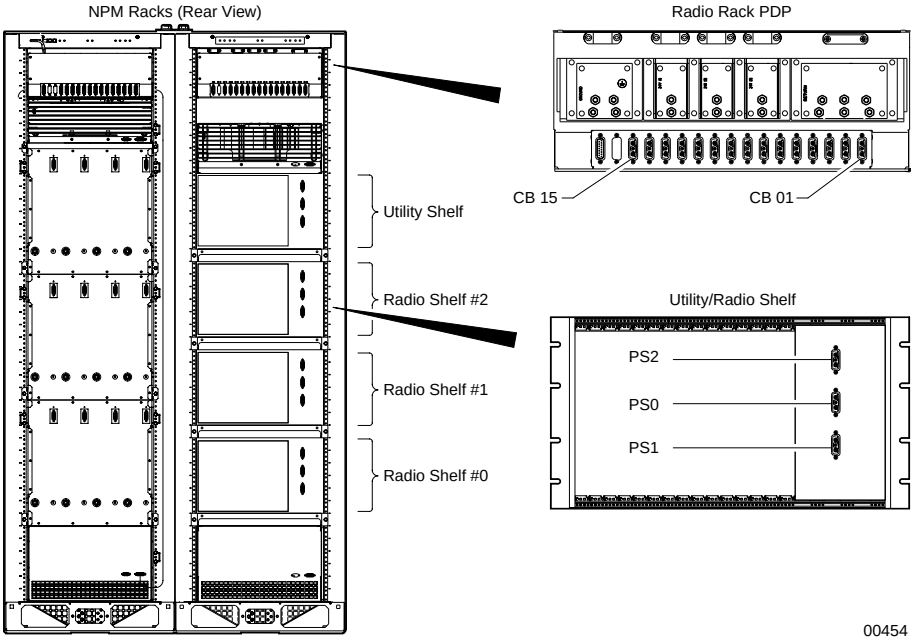

Figure 4.16 Radio Rack Connector Layout

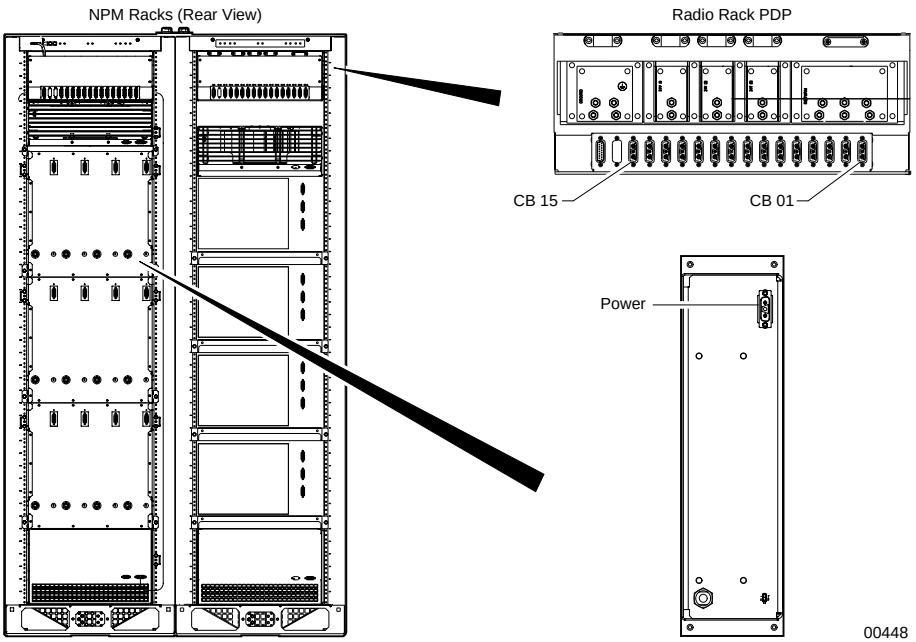

Figure 4.17 RF Rack Connector Layout

To connect the PDP power cables

1 Ensure that each PDP circuit breaker in the radio and RF rack is in the OFF (down) position.

2 Connect each PDP power cable in the radio rack. Table 4.11 shows the origin and termination point of each cable.

Origin	Termination
Radio rack PDP, CB 01	Lower cooling unit
Radio rack PDP, CB 02	Radio shelf 0 (bottom), PS0
Radio rack PDP, CB 03	Radio shelf 0 (bottom), PS1
Radio rack PDP, CB 04	Radio shelf 0 (bottom), PS2
Radio rack PDP, CB 05	Radio shelf 1 (middle), PS0
Radio rack PDP, CB 06	Radio shelf 1 (middle), PS1
Radio rack PDP, CB 07	Radio shelf 1 (middle), PS2
Radio rack PDP, CB 08	Radio shelf 2 (top), PS0
Radio rack PDP, CB 09	Radio shelf 2 (top), PS1
Radio rack PDP, CB 10	Radio shelf 2 (top), PS2
Radio rack PDP, CB 11	Utility shelf, PS0
Radio rack PDP, CB 12	Utility shelf, PS1
Radio rack PDP, CB 13	Utility shelf, PS2
Radio rack PDP, CB 14	Upper cooling unit
Radio rack PDP, CB 15	GPS clock module

Table 4.11 Radio Rack Power Cable Summary

3 Connect each PDP power cable in the RF rack. The power connectors for the RFSS module are located at the back of the NPM. Table 4.12 shows the origin and termination point of each cable.

Origin	Termination
RF rack PDP, CB 01	Lower cooling unit
RF rack PDP, CB 02	RF shelf 0, RFSS module 0
RF rack PDP, CB 03	RF shelf 0, RFSS module 1
RF rack PDP, CB 04	RF shelf 0, RFSS module 2
RF rack PDP, CB 05	RF shelf 0, RFSS module 3
RF rack PDP, CB 06	RF shelf 1, RFSS module 0
RF rack PDP, CB 07	RF shelf 1, RFSS module 1
RF rack PDP, CB 08	RF shelf 1, RFSS module 2
RF rack PDP, CB 09	RF shelf 1, RFSS module 3
RF rack PDP, CB 10	RF shelf 2, RFSS module 0
RF rack PDP, CB 11	RF shelf 2, RFSS module 1
RF rack PDP, CB 12	RF shelf 2, RFSS module 2
RF rack PDP, CB 13	RF shelf 2, RFSS module 3
RF rack PDP, CB 14	Upper cooling unit

Table 4.12 RF Rack Power Cable Summary

Connect the RFSS Signal Cables

The signal cables are serial cables with 9-pin DSUB connectors on each end. The connectors are secured to their receptacles with 1/8-inch flathead screws.

Component Numbering

The RF shelves are numbered from bottom to top (that is, the bottom shelf is “0” and the top shelf is “2”). When viewed from the front of the NPM, the RFSS modules in each shelf are numbered from left to right (that is, the left module is “0” and the right module is “3”).

The radio shelves are numbered from bottom to top (that is, the bottom shelf is “0” and the top shelf is “2”). Each radio shelf contains two IF/RF cards, one in slots 10–11 and one in slots 15–16.

Figure 4.18 shows the location of the RFSS signal connectors.

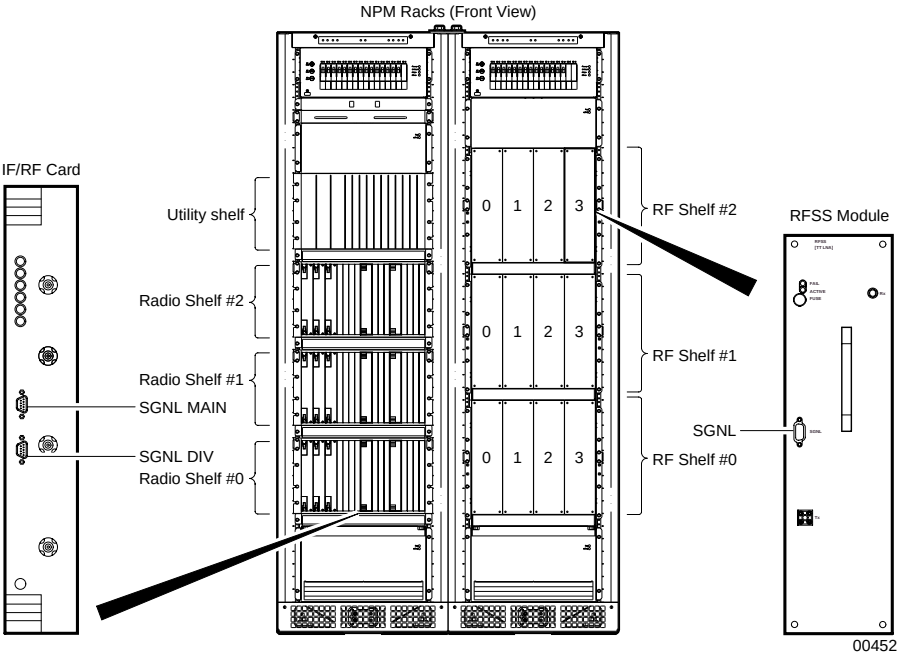

Figure 4.18 RFSS Signal Connector Layout

To connect the RFSS signal cables

1 Connect each RFSS signal cable. Table 4.13 shows the origin and termination point of each cable.

Origin	Termination
RF shelf 0, RFSS module 0, SGNL connector	Radio shelf 0, left IF/RF card (slots 10–11), SGNL MAIN connector
RF shelf 0, RFSS module 1, SGNL connector	Radio shelf 0, left IF/RF card (slots 10–11), SGNL DIV connector
RF shelf 0, RFSS module 2, SGNL connector	Radio shelf 0, right IF/RF card (slots 15–16), SGNL MAIN connector
RF shelf 0, RFSS module 3, SGNL connector	Radio shelf 0, right IF/RF card (slots 15–16), SGNL DIV connector
RF shelf 1, RFSS module 0, SGNL connector	Radio shelf 1, left IF/RF card (slots 10–11), SGNL MAIN connector
RF shelf 1, RFSS module 1, SGNL connector	Radio shelf 1, left IF/RF card (slots 10–11), SGNL DIV connector
RF shelf 1, RFSS module 2, SGNL connector	Radio shelf 1, right IF/RF card (slots 15–16), SGNL MAIN connector
RF shelf 1, RFSS module 3, SGNL connector	Radio shelf 1, right IF/RF card (slots 15–16), SGNL DIV connector
RF shelf 2, RFSS module 0, SGNL connector	Radio shelf 2, left IF/RF card (slots 10–11), SGNL MAIN connector
RF shelf 2, RFSS module 1, SGNL connector	Radio shelf 2, left IF/RF card (slots 10–11), SGNL DIV connector
RF shelf 2, RFSS module 2, SGNL connector	Radio shelf 2, right IF/RF card (slots 15–16), SGNL MAIN connector
RF shelf 2, RFSS module 3, SGNL connector	Radio shelf 2, right IF/RF card (slots 15–16), SGNL DIV connector

Table 4.13 RFSS Signal Cable Summary

Connect the Alarm Cables

The alarm cables are serial cables with DSUB connectors on each end. The DSUB connectors are secured to their receptacles with 1/8-inch flathead screws.

WARNING: Ensure that the main +24V DC power supply for the NPM is powered off before connecting the alarm cables. The PDP alarm cables are hot at all times and are not hot-swappable, even when the circuit breakers in the PDP are powered OFF (down). Failure to power off the main +24V DC power supply may result in damage to the cables and NPM.

To connect the alarm cables

1 Ensure that the main +24V DC power supply is powered off.

2 Connect the alarm cables to the alarm wiring card. Table 4.14 shows the origin and termination point of each cable.

Origin	Termination
Alarm wiring card (slots 12–13), UPPER COOLING RF connector	RF rack, upper cooling unit, SIGNAL connector
Alarm wiring card (slots 12–13), UPPER COOLING RADIO connector	Radio rack, upper cooling unit, SIGNAL connector
Alarm wiring card (slots 12–13), LOWER COOLING RF connector	RF rack, lower cooling unit, SIGNAL connector
Alarm wiring card (slots 12–13), LOWER COOLING RADIO connector	Radio rack, lower cooling unit, SIGNAL connector
Alarm wiring card (slots 12–13), RF PDP connector	RF rack, PDP SGNL connector (left-most connector)
Alarm wiring card (slots 12–13), RADIO PDP connector	Radio rack, PDP SGNL connector (left-most connector)

Table 4.14 Alarm Cable Summary

3 Connect any custom I/O cables. See your E1 package for details.

Connect the Ethernet Cables

The Ethernet cables are CAT5 cables with RJ-45 connectors on each end. The cables connect radio sector controllers (RSC), utility bus controllers (UBC), Ethernet switches (ES), application hosts (AH), and edge routers. The two Ethernet switches are connected together with a cross-over cable; the other cards use straight-through cables.

The Ethernet cabling is done via rear I/O cards. The Ethernet ports on the front-facing cards are used only for debug purposes.

Table 4.15 shows the Ethernet cabling for a fully populated 6-sector NPM.

ES1 Rear I/O Card (Slots 19–20)		ES0 Rear I/O Card (Slots 6–7)	
1 – Edge router	2 – NC	1 – Edge router	2 – NC
3 – UBC0 Eth B (utility shelf, slot 10)	4 – UBC1 Eth A (utility shelf, slot 14)	3 – UBC0 Eth A (utility shelf, slot 10)	4 – UBC1 Eth B (utility shelf, slot 14)
5 – NC	6 – NC	5 – NC	6 – NC
7 – NC	8 – NC	7 – NC	8 – NC
9 – RSC4 Eth B (radio shelf 2, slot 12)	10 – RSC5 Eth A (radio shelf 2, slot 14)	9 – RSC4 Eth A (radio shelf 2, slot 12)	10 – RSC5 Eth B (radio shelf 2, slot 14)
11 – RSC2 Eth B (radio shelf 1, slot 12)	12 – RSC3 Eth A (radio shelf 1, slot 14)	11 – RSC2 Eth A (radio shelf 1, slot 12)	12 – RSC3 Eth B (radio shelf 1, slot 14)
13 – RSC0 Eth B (radio shelf 0, slot 12)	14 – RSC1 Eth A (radio shelf 0, slot 14)	13 – RSC0 Eth A (radio shelf 0, slot 12)	14 – RSC1 Eth B (radio shelf 0, slot 14)
15 – AH0 Eth B (utility shelf, slot 9)	16 – AH1 Eth B (utility shelf, slot 18)	15 – AH0 Eth A (utility shelf, slot 9)	16 – AH1 Eth A (utility shelf, slot 18)
17 – AH2 Eth A (utility shelf, slot 11)	18 – AH3 Eth A (utility shelf, slot 17)	17 – AH2 Eth B (utility shelf, slot 11)	18 – AH3 Eth B (utility shelf, slot 17)
19 – NC	20 – NC	19 – NC	20 – NC
21 – NC	22 – NC	21 – NC	22 – NC
23 – Ethernet patch panel, port B	24 – ES0, port 24 (cross-over cable)	23 – Ethernet patch panel, port A	24 – ES1, port 24 (cross-over cable)

Table 4.15 Ethernet Cable Summary

NOTE: See your E1 package for cabling information specific to your NPM.

To connect the Ethernet cables

1 Connect the Ethernet cables to the Ethernet switches. Table 4.15 shows the origin and termination point of each cable.

- If you are using an edge router configuration without redundancy, connect Ethernet switch 0 to the edge router by connecting port 1 on the right ES rear I/O card (slots 19–20) to the edge router. Use a straight-through Ethernet cable.
- If you are using an edge router configuration with redundancy:

  i Connect Ethernet switch 0 to the edge router by connecting port 1 on the right ES rear I/O card (slots 6–7) to port 0 on the edge router.

  ii Connect Ethernet switch 1 to the edge router by connecting port 1 of the left ES rear I/O card (slots 19–20) to port 1 on the edge router.

Connect the Clock Cables

The GPS clock module receives its timing signals from the GPS antennas via two coaxial cables with male TNC connectors on each end. The clock cables use 0.195-inch coaxial cables with male SMA connectors to distribute the timing signals to the clock wiring cards.

Component Numbering

The radio shelves are numbered from bottom to top (that is, the bottom shelf is "0" and the top shelf is "2"). Each radio shelf contains two rear-facing clock wiring cards, one in slot 11 and one in slot 16.

The GPS clock module outputs are numbered from left to right when viewed from the back of the NPM.

To connect the clock cables

1. Connect the two GPS antenna cables to the Antenna 1 and Antenna 2 ports located on the rear of the GPS clock module.
2. Connect the GPS clock module to the clock wiring cards using the clock cables. Table 4.16 shows the origin and termination point of each cable.

> **NOTE:** The minimum bend radius for clock cables is 2.54 cm (1.0 inch).

Origin	Termination
GPS clock module, FREQUENCY OUT 1	Radio shelf 0 (bottom), right clock wiring card (slot 11), FREQUENCY (bottom) connector
GPS clock module, FREQUENCY OUT 2	Radio shelf 0 (bottom), left clock wiring card (slot 16), FREQUENCY (bottom) connector
GPS clock module, FREQUENCY OUT 3	Radio shelf 1 (middle), right clock wiring card (slot 11), FREQUENCY (bottom) connector
GPS clock module, FREQUENCY OUT 4	Radio shelf 1 (middle), left clock wiring card (slot 16), FREQUENCY (bottom) connector
GPS clock module, FREQUENCY OUT 5	Radio shelf 2 (top), right clock wiring card (slot 11), FREQUENCY (bottom) connector
GPS clock module, FREQUENCY OUT 6	Radio shelf 2 (top), left clock wiring card (slot 16), FREQUENCY (bottom) connector

Table 4.16 Clock Cable Summary

Connect the RF Cables

The RF cables are 0.195-inch coaxial cables with male SMA connectors on each end.

Component Numbering

The RF shelves are numbered from bottom to top (that is, the bottom shelf is “0” and the top shelf is “2”). When viewed from the front of the NPM, the RFSS modules in each shelf are numbered from left to right (that is, the left module is “0” and the right module is “3”).

The radio shelves are numbered from bottom to top (that is, the bottom shelf is “0” and the top shelf is “2”). Each radio shelf contains two IF/RF cards, one in slots 10–11 and one in slots 15–16.

Figure 4.19 shows the layout of the RFSS modules and IF/RF cards.

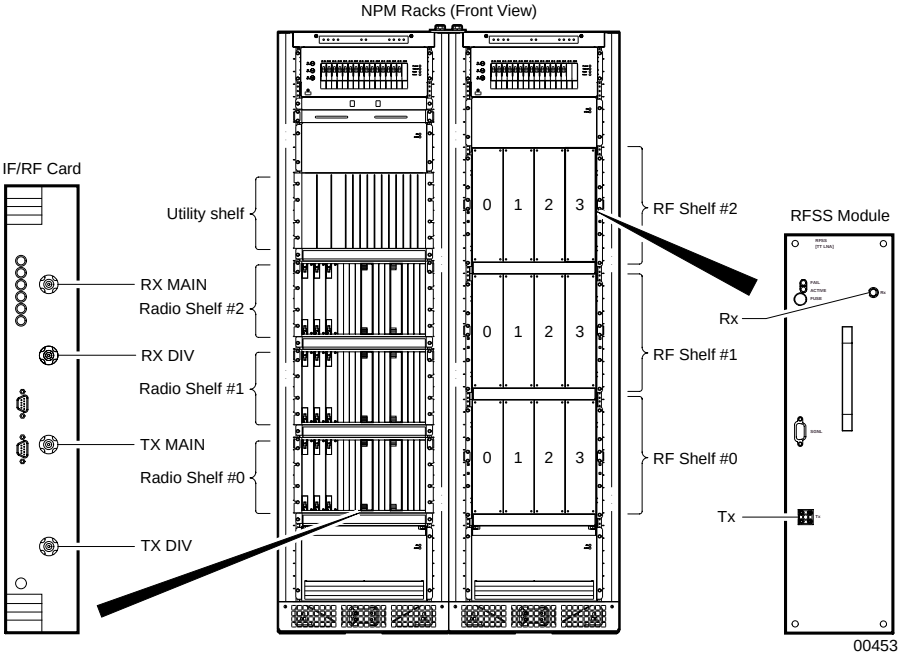

Figure 4.19 RF Connector Locations

To connect the RF cables

1 Connect each RF cable. Table 4.17 shows the origin and termination point of each cable.

NOTE: The minimum bend radius for RF cables is 2.54 cm (1.0 inch).

Origin	Termination
RF shelf 0, RFSS module 0, RX connector	Radio shelf 0, left IF/RF card (slots 10–11), RX MAIN connector
RF shelf 0, RFSS module 0, TX connector	Radio shelf 0, left IF/RF card (slots 10–11), TX MAIN connector
RF shelf 0, RFSS module 1, RX connector	Radio shelf 0, left IF/RF card (slots 10–11), RX DIV connector
RF shelf 0, RFSS module 1, TX connector	Radio shelf 0, left IF/RF card (slots 10–11), TX DIV connector
RF shelf 0, RFSS module 2, RX connector	Radio shelf 0, right IF/RF card (slots 15–16), RX MAIN connector
RF shelf 0, RFSS module 2, TX connector	Radio shelf 0, right IF/RF card (slots 15–16), TX MAIN connector
RF shelf 0, RFSS module 3, RX connector	Radio shelf 0, right IF/RF card (slots 15–16), RX DIV connector
RF shelf 0, RFSS module 3, TX connector	Radio shelf 0, right IF/RF card (slots 15–16), TX DIV connector
RF shelf 1, RFSS module 0, RX connector	Radio shelf 1, left IF/RF card (slots 10–11), RX MAIN connector
RF shelf 1, RFSS module 0, TX connector	Radio shelf 1, left IF/RF card (slots 10–11), TX MAIN connector
RF shelf 1, RFSS module 1, RX connector	Radio shelf 1, left IF/RF card (slots 10–11), RX DIV connector

Table 4.17 RF Cable Summary (1 of 2)

Origin	Termination
RF shelf 1, RFSS module 1, TX connector	Radio shelf 1, left IF/RF card (slots 10–11), TX DIV connector
RF shelf 1, RFSS module 2, RX connector	Radio shelf 1, right IF/RF card (slots 15–16), RX MAIN connector
RF shelf 1, RFSS module 2, TX connector	Radio shelf 1, right IF/RF card (slots 15–16), TX MAIN connector
RF shelf 1, RFSS module 3, RX connector	Radio shelf 1, right IF/RF card (slots 15–16), RX DIV connector
RF shelf 1, RFSS module 3, TX connector	Radio shelf 1, right IF/RF card (slots 15–16), TX DIV connector
RF shelf 2, RFSS module 0, RX connector	Radio shelf 2, left IF/RF card (slots 10–11), RX MAIN connector
RF shelf 2, RFSS module 0, TX connector	Radio shelf 2, left IF/RF card (slots 10–11), TX MAIN connector
RF shelf 2, RFSS module 1, RX connector	Radio shelf 2, left IF/RF card (slots 10–11), RX DIV connector
RF shelf 2, RFSS module 1, TX connector	Radio shelf 2, left IF/RF card (slots 10–11), TX DIV connector
RF shelf 2, RFSS module 2, RX connector	Radio shelf 2, right IF/RF card (slots 15–16), RX MAIN connector
RF shelf 2, RFSS module 2, TX connector	Radio shelf 2, right IF/RF card (slots 15–16), TX MAIN connector
RF shelf 2, RFSS module 3, RX connector	Radio shelf 2, right IF/RF card (slots 15–16), RX DIV connector
RF shelf 2, RFSS module 3, TX connector	Radio shelf 2, right IF/RF card (slots 15–16), TX DIV connector

Table 4.17 RF Cable Summary (2 of 2)

INSTALLING THE ANTENNAS

These procedures describe how to install the main, diversity, and GPS antennas for use with the NPM.

Table 4.18 shows the actions described in this section.

Action	Page
Install the GPS Antennas	110
Install the Main and Diversity Antennas	112

Table 4.18 Installing the Antennas Procedure Summary

Install the GPS Antennas

This procedure describes how to install two Zyfer GPS antennas on top of 1-inch-diameter, hollow pipes using the supplied hardware. Consult your E1 package for any site-specific GPS antenna installation requirements.

The NPM uses two GPS antennas for redundancy purposes—they do not affect each other's operation and they can be installed in close proximity to each other.

Figure 4.20 shows the Zyfer GPS antenna assembly.

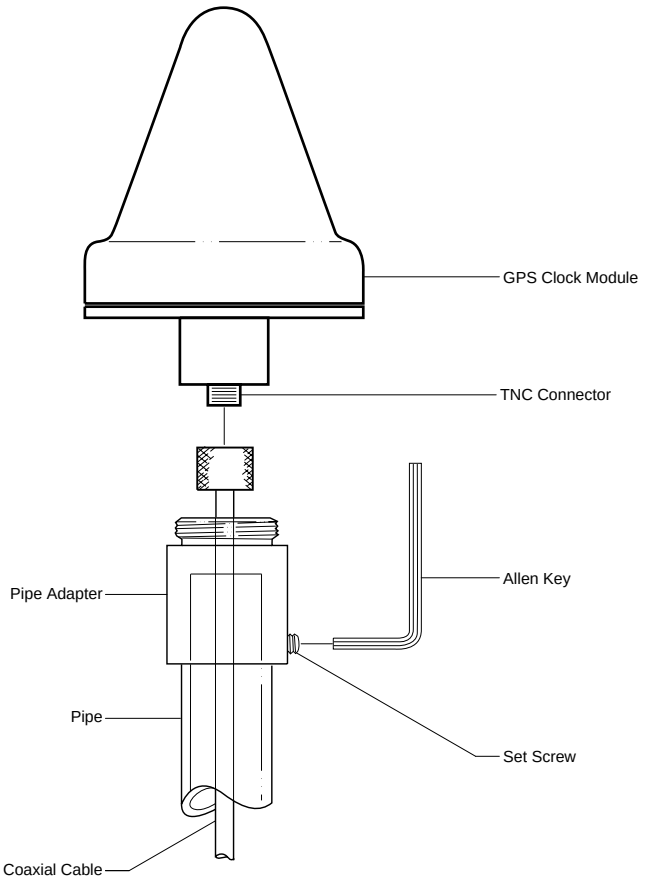

Figure 4.20 GPS Antenna Assembly

Before You Begin

Before you begin to install the GPS antennas:

- Select an installation location away from any objects that might obstruct satellite visibility to 10° of the horizon. Obstructions may cause a degradation of the GPS clock module's performance.
- Ensure that the type and length of cabling used to connect the GPS antenna to the GPS clock module meets your attenuation and shielding requirements.

To install the GPS antennas

1. Run the two coaxial cables supplied with each antenna from the NPM racks to the intended location of the GPS antennas, such as the basestation's roof or tower.

   NOTE: Ensure that the cable remains clear of any sources of potential interference, such as transmitting equipment or power lines.

2. Vertically install two 1-inch-diameter pipes in a location that provides the maximum unobstructed view of the sky.
3. Run a coaxial cable through the center of each pipe.
4. Attach a pipe adapter to the top of each pipe. Ensure that the pipe adapters are connected tightly to the pipes by tightening the set screw. Use a 5/32-inch Allen key to tighten the set screw.
5. Attach a GPS antenna to the end of each coaxial cable.

   The GPS antennas use female TNC connectors.
6. Attach the GPS antennas to each pipe adapter.

Install the Main and Diversity Antennas

This procedure describes the general process for installing the main and diversity antennas. Consult your E1 package for any site-specific antenna installation requirements.

Figure 4.21 shows the configuration of the main or diversity antenna).

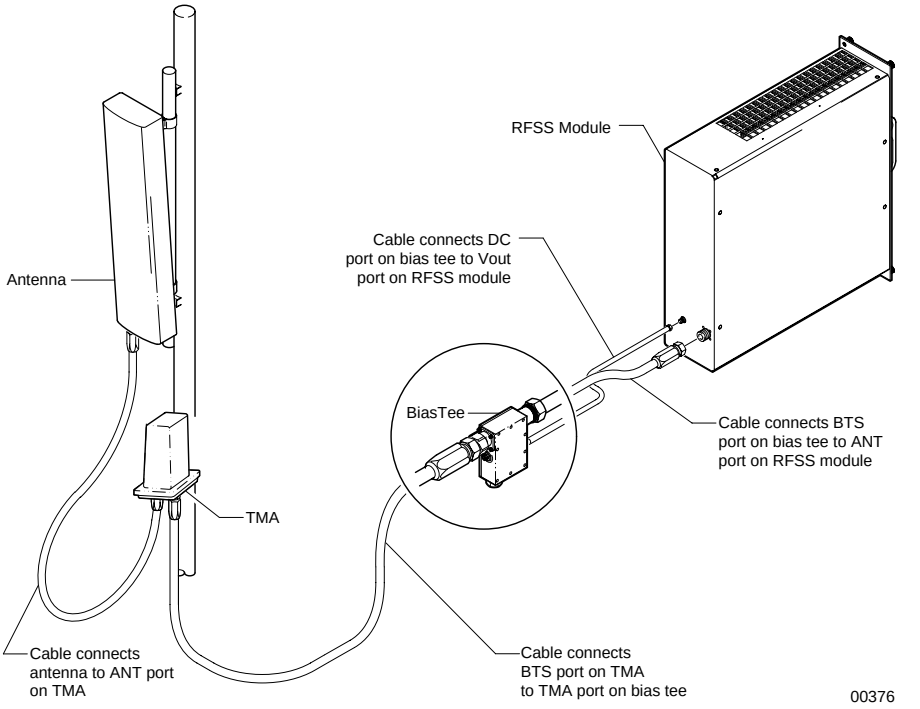

Figure 4.21 RFSS with TMA Antenna Configuration

Before You Begin

Before you install the antennas:

- Select an installation location away from any objects that might obstruct the RF signals. Although the NPM has non-line-of-site RF capability, obstructions may reduce the strength of the transmission or reception signals.
- Ensure that the type and length of cabling used to connect the main and diversity antennas to the RFSS modules meet your attenuation and shielding requirements.

To install the main and diversity antennas

1 Verify that you have the right type of antennas, both in terms of frequency and direction.

2 Run the antenna cable from the NPM racks to the intended location of each antenna. See your E1 package and installation MOP for antenna cable specifics.

> **NOTE:** Ensure that the cable remains clear of any sources of potential interference, such as transmitting equipment or power lines.

3 Attach each antenna to your tower or building using the required mounting hardware.

4 Orient each antenna to the correct azimuth (direction) and tilt. See your E1 package to determine the antenna's correct orientation.

CAUTION: Failure to orient the antennas according to the specifications listed in the installation MOP may seriously affect the performance of your wireless network.

5 Tighten and secure each antenna.

6 Connect the antenna to the RFSS module:

- **i** Install each TMA within 3 m (10 feet) of its antenna. The TMAs should be installed as close to the antennas as possible in order to ensure optimal NPM performance. Consult the documentation that ships with the TMA for the correct mounting procedures.
- **ii** Connect the ANT port on each TMA to its antenna using a suitable coaxial cable. Torque each 7/16 DIN connector to 17 foot-pounds and ensure each connector is properly weatherproofed.

CAUTION: Do not over-tighten connectors. Overtightening the connectors may damage the cable and degrade the RF signal.

- **iii** Install each bias tee (also called a CIN) inside or outside the basestation building, as specified in your E1 package. Connect the ANT port on each bias tee to the BTS port on each TMA. Torque each 7/16 DIN connector

to 17 foot-pounds and ensure each connector is properly weatherproofed.

CAUTION: Do not over-tighten connectors. Overtightening the connectors may damage the cable and degrade the RF signal.

iv Connect the BTS port on each bias tee to the ANT port on each RFSS module. The ANT port is located on the rear side of the RFSS module.

v Connect the CIN port (also called Vout) on the rear side of the RFSS module to the DC port on the bias tee.

Chapter 5

POWER-ON PROCEDURES

This chapter provides step-by-step procedures for powering on the NPM and verifying basic functionality.

Contents

Power On the NPM

The power for the NPM is controlled by circuit breakers in the PDP, located at the top of each rack. Each power supply, RFSS module, cooling unit, and GPS clock module has its own circuit breaker, which means it can be powered on and off independently of the other devices.

To power on the NPM

1. Ensure that your main +24V DC power supply is powered on and is providing a power source that meets the electrical requirements listed on page 27.
2. Power on the upper and lower cooling units. On each rack, set breakers CB 01 and CB 14 to the ON (up) position.

   The fans will start turning. If the fans do not start, ensure that the SGNL port on each cooling unit is connected to the alarm wiring card. The fans will turn only when the alarm cable is present.
3. Power on each power supply in the utility and radio shelves separately.

> **NOTE:** The red OUTPUT FAIL light on each power supply turns off within 3 s. If the OUTPUT FAIL light remains on or flickers continuously, power down the chassis immediately and replace the power supply.
>
> Table 5.1 shows the circuit breakers for each power supply.

Power Supply	Circuit Breaker
Bottom radio shelf, left power supply (slots 0–1)	Radio rack PDP, CB 02
Bottom radio shelf, middle power supply (slots 2–3)	Radio rack PDP, CB 03
Bottom radio shelf, right power supply (slots 4–5)	Radio rack PDP, CB 04
Middle radio shelf, left power supply (slots 0–1)	Radio rack PDP, CB 05
Middle radio shelf, middle power supply (slots 2–3)	Radio rack PDP, CB 06
Middle radio shelf, right power supply (slots 4–5)	Radio rack PDP, CB 07
Top radio shelf, left power supply (slots 0–1)	Radio rack PDP, CB 08
Top radio shelf, middle power supply (slots 2–3)	Radio rack PDP, CB 09
Top radio shelf, right power supply (slots 4–5)	Radio rack PDP, CB 10
Utility shelf, left power supply (slots 0–1)	Radio rack PDP, CB 11
Utility shelf, middle power supply (slots 2–3)	Radio rack PDP, CB 12
Utility shelf, right power supply (slots 4–5)	Radio rack PDP, CB 13

Table 5.1 Utility and Radio Shelf Power Supply Circuit Breaker Summary

4 Power on the GPS clock module by setting CB 15 to the ON (up) position.

The GPS clock module will perform its internal diagnostics and begin to acquire and track satellites. It may take up to 30 min for the GPS receivers to acquire a rough position and time. The accuracy of the receivers improves as the satellites are tracked.

See *AccuSync-R GPS Synchronized Time and Frequency Instrument User's Manual (377-8006),* available from Zyfer Inc., for information about the GPS clock module.

5 Power on each RFSS module in the RF rack separately. Table 5.2 shows the circuit breakers for the RFSS modules.

RFSS Module	Circuit Breaker
RF shelf 0, RFSS module 0	RF rack PDP, CB 02
RF shelf 0, RFSS module 1	RF rack PDP, CB 03
RF shelf 0, RFSS module 2	RF rack PDP, CB 04
RF shelf 0, RFSS module 3	RF rack PDP, CB 05
RF shelf 1, RFSS module 0	RF rack PDP, CB 06
RF shelf 1, RFSS module 1	RF rack PDP, CB 07
RF shelf 1, RFSS module 2	RF rack PDP, CB 08
RF shelf 1, RFSS module 3	RF rack PDP, CB 09
RF shelf 2, RFSS module 0	RF rack PDP, CB 10
RF shelf 2, RFSS module 1	RF rack PDP, CB 11
RF shelf 2, RFSS module 2	RF rack PDP, CB 12
RF shelf 2, RFSS module 3	RF rack PDP, CB 13

Table 5.2 RFSS Module Circuit Breaker Summary

If the NPM has already been configured in the OAMP software, the NPM will automatically start its call processing and enable the SOMA Air Interface. Any SOMAports powered on within the supported sectors will acquire the NPM and establish a connection.

If the NPM has not been configured in the OAMP software, the red error lights on the PDPs and the RFSS modules will light up. The NPM will not enable the SOMA Air Interface.

6 After powering on the NPM, proceed to Chapter 6, “On-Site Software Installation and Configuration Procedures” for procedures on optimizing the cards.

Chapter 6

ON-SITE SOFTWARE INSTALLATION AND CONFIGURATION PROCEDURES

This chapter describes how to optimize the individual cards in the NPM and explains the remaining steps required to make the NPM fully operation.

Contents

Optimize the GPS Clock Module

To ensure accurate timing, you must optimize the operation of the GPS clock module. Optimizing the operation of the GPS clock module involves compensating for the signal delay caused by the length of the GPS antenna wiring.

Consult with your cable manufacturer for the delay characteristics of your cable type. You need to express the delay values in nanoseconds per meter (ns/m).

> **NOTE:** Different lengths and types of cables may be used, as long as the signal loss at 1575 MHz is less than 30 dB.
>
> See the *Zyfer AccuSync-R GPS Synchronized Time and Frequency Instrument User's Manual* for the average delay values of common types of GPS antenna cabling.

In order to use a standard serial cable when connecting a terminal, you require a custom adapter. Figure 6.1 shows the wiring and connections for the custom adapter.

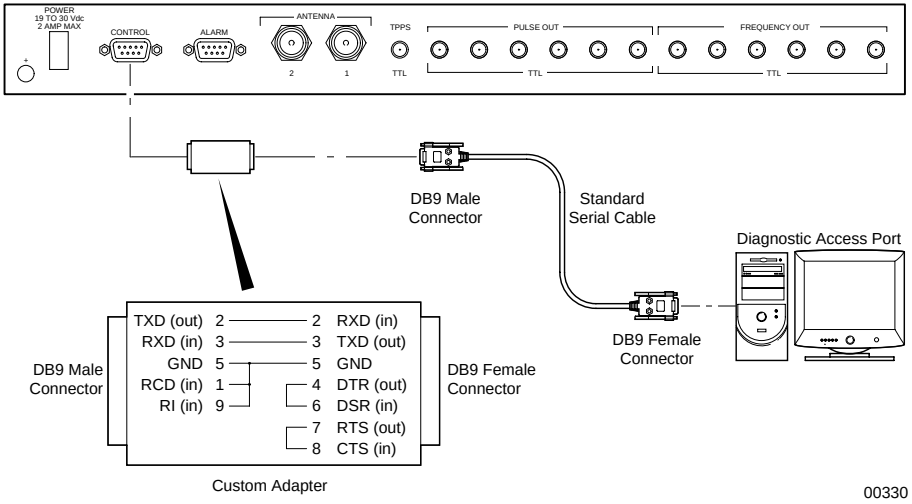

Figure 6.1 GPS Serial Interface Adapter

To optimize the GPS clock module

1 Connect a PC to the GPS clock module using a custom adapter and a standard serial cable.

> **NOTE:** Using a standard serial or null modem cable without a custom adapter will not work.

2 Start a serial terminal session using the settings shown in Table 6.1.

Parameter	Setting
Baud	9600 bits/s
Data bits	8
Parity	None
Stop bits	1
Flow control	None
ASCII setup	Send linefeeds, local character echo on

Table 6.1 GPS Clock Module Serial Port Settings

> **NOTE:** See the *Amosphere NPM Maintenance Procedures* for additional information about connecting a serial terminal to the GPS clock module.

3 Calculate the cable delay by multiplying the total cable length by the delay value. For example, if the delay value of the cable is 4.36 ns/m and there is 15 m of cable, then the cable delay would be 15 m x 4.36 ns/m = 65.4 ns. Round the result to the nearest nanosecond. In this case, the result would be 65 ns.

4 Set the cable delay for the first GPS plug-in module. This example uses a cable delay of 65 ns. Replace the 65 in the following command with your own calculated cable delay value:

```
$ANT1,65*↵
```

5 Set the cable delay for the second GPS plug-in module. Again, replace the 65 in the following command with your own calculated cable delay value:

```
$ANT2,65*↵
```

The GPS clock module briefly enters coasting mode as it recalculates its position.

Configure the Ethernet Switches

In order to operate in the NPM, the Ethernet switches require custom settings. You need to configure the Ethernet switches only once; the configuration is stored in the switch's nonvolatile memory.

You can connect to the Ethernet switch by connecting a custom serial cable with a null modem adapter to the console port located on the front panel.

Figure 6.1 shows the connections for the Ethernet switch serial cable.

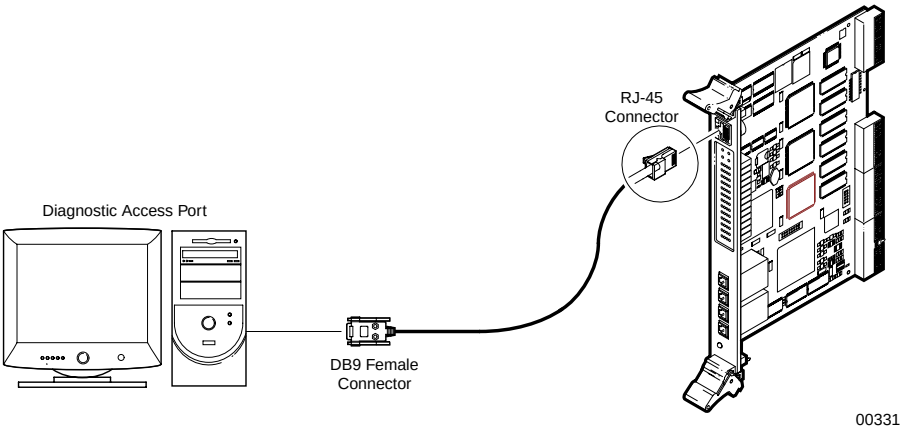

Figure 6.2 Ethernet Switch Serial Cable

Table 6.2 shows the pin assignments for the RJ-45 serial connector.

RJ-11 Pin Number	Signal Name	DCE DB-9 Connector Number Equivalent	DCE DB-9 Connector Number Equivalent
1	—	—	—
2	GND	5	5
3	RX	3	2
4	TX	2	3
5	GND		
6	—	—	—

Table 6.2 Ethernet Switch RJ-45 Serial Connector Pin Assignments

To configure the Ethernet switches

1 Establish a serial connection with the Ethernet switch:

i Connect a PC to the Ethernet switch using the supplied RJ-11 to DB-9 serial cable with a null modem adapter. See Table 6.2 for pin assignments.

ii Start a serial terminal session using the settings shown in Table 6.3.

Parameter	Setting
Baud	9600 bits/s
Data bits	8
Parity	None
Stop bits	1
Flow control	None

Table 6.3 Ethernet Switch Serial Port Settings

2 Log in to the Ethernet switch.

3 Restore the default settings for the Ethernet switch by typing:

```
switch defaults ↵
```

The Ethernet switch reboots.

4 Log in to the Ethernet switch.

5 Configure the switch by typing:

```
port config 1-2 off 100 full false ↵
port config 3-24 off 100 half false ↵
span port enable 1-26 on ↵
span port fast 1-26 on ↵
bootp enable off ↵
dhcp server enable off ↵
dhcp client enable switch_name off ↵
cos queuing algorithm strict ↵
cos queuing map 0 0 ↵
cos queuing map 1 0 ↵
cos queuing map 2 0 ↵
cos queuing map 3 0 ↵
cos queuing map 4 1 ↵
cos queuing map 5 2 ↵
cos queuing map 6 3 ↵
cos queuing map 7 3 ↵
gvrp enable off ↵
ip config switch_name switch_ip_address 255.255.255.0 1 ↵
ip gateway router0-0_ip_address ↵
tftpd sessions 0 ↵
save ↵
```

save ↵
save ↵

where:

switch_name is either sw0 or sw1
switch_ip_address is the IP address of the Ethernet switch
router0-0_ip_address is the IP address of the primary router

6 Reboot the Ethernet switch by typing:

switch reset ↵

7 Repeat steps 1 to 6 for the other Ethernet switch.

Post-Installation Activities

After the installation of the NPM is complete, the following steps may be required in order to make the NPM fully functional:

- **Upgrade the NPM software** – Amosphere NPM software is typically pre-installed at the factory. It may be necessary to upgrade the software to achieve full functionality. See the *Amosphere OAMP Guide* for information about installing new software loads.
- **Commission the NPM in the OAMP software** – The NPM must be added to the Amosphere network in the Configuration Management (CM) tool. Adding the NPM involves configuring the new NPM subnet as well as setting the NPM operating parameters. See the *Amosphere OAMP Guide* for information about using the CM tool to add an NPM.
- **Configure and optimize RF settings** – To permanently enable the SOMA Air Interface, you must configure the RF settings in the CM tool. With the CM tool, you can enable the antennas, select the broadcast frequency, and optimize the output power. See the *Amosphere OAMP Guide* for information.

  For testing purposes during initial deployment, you can use the radio sector controller's `ifcrd_cfg` command to quickly configure and enable the SAI. Changes made with `ifcrd_cfg` are temporary and are lost if the radio sector controller is rebooted or powered off. See the *Amosphere Maintenance Procedures* for more information.

Appendix A

NPM DECOMMISSIONING

This chapter describes how to safely take an NPM out of service.

Contents

Decommissioning an NPM

Decommissioning occurs whenever an NPM is taken out of service or moved to a new location.

WARNING: Ensure that the necessary requirements and procedures have been reviewed prior to the start of any power-related activity. Refer to your power cut-over MOP for procedures specific to your site.

To decommission an NPM

1. Shutdown the radio sector controllers:
   - i. Establish an SSH session with each card, as described in the *Amosphere Maintenance Procedures*.
   - ii. Shutdown each card by typing:

     `shutdown now` ↵
2. Shutdown the application hosts using the procedure described in step 1.
3. Shutdown the standby utility bus controller using the procedure described in step 1.

   A utility bus controller is in standby mode when the USR2 status light is off.
4. Shutdown the active utility bus controller using the procedure described in step 1.

   A utility bus controller is in active mode when the USR2 status light is green.
5. Power off the NPM by setting CB01 through CB14 to the OFF (down) position.
6. Power off the main power supply for the NPM. With most power bays, circuit breakers control the three +24V DC feeds to each NPM rack. Ensure that the main power is removed for both the radio and RF racks.

   See the documentation that accompanies your main power supply for specific instructions on powering off the +24V DC feeds to the NPM.

   After the main power supply is powered off, it is safe to prepare the NPM for shipment or storage.
7. Package the NPM according to the procedures specific to your site. If you remove the cards from their shelves, ensure that the cards are stored in antistatic packaging and that the required documentation is included.

LIST OF ABBREVIATIONS

Abbreviation	Expansion
AH	application host
AWG	American wire gauge
BTU	British thermal unit
CFM	cubic feet per minute
CSU	customer service unit
dB	decibel
DIV	diversity
ES	Ethernet switch
GPS	Global Positioning System
IP	Internet Protocol
modem	modulator–demodulator
MOP	methods of procedure
NC	not connected
NEBS	network equipment-building system
NOC	network operations center
NPM	Network Port Manager
OAMP	operations, administration, maintenance, and provisioning
PDP	power distribution panel
RF	radio frequency
RFSS	radio frequency subsystem
RS	radio shelf

Abbreviation	Expansion
RSC	radio sector controller
RX	receive
TX	transmit
UBC	utility bus controller
WCS	wireless communications services

GLOSSARY

A

air interface
The standards governing radio transmission between two elements of a wireless system, such as an NPM and a SOMAport.

The interface typically specifies the frequency band (for example, PCS), multiple-access scheme (for example, CDMA), modulation scheme and coding (for example, QPSK and rate 1/2), power control mechanisms, and protocols for setting up and managing communications.

attenuation
The reduction of signal magnitude over a medium. Attentuation is usually measured in dB per unit of distance, or as a ratio of input to output magnitude in dB. The less the attenuation, the more efficient the medium.

Attentuation is also called signal loss.

AWG (American wire gauge)
A standard for measuring wire thickness. The thicker the wire, the smaller AWG it has and typically, the higher current it can carry.

B

backhaul
The network or service that connects remote devices, such as basestations, to the central office. In the SOMA Networks implementation, backhaul refers to the wireline link between the NPM and the network core.

basestation
Equipment deployed by service providers at the center of each cell to communicate with wireless devices. In Amosphere, the NPM basestation communicates with wireless subscriber terminals called SOMAports.

BIOS (basic input/output system)
Software, typically stored in nonvolatile memory, that provides a standardized interface between a computer's hardware and the operating system.

bus
An electrical pathway that connects several devices and provides addressing and data-transfer capabilities.

C

CDMA (code-division multiple access)
A cellular technology that divides a frequency into multiple channels by assigning a pseudo-random digital sequence, or code, to each. CDMA does not assign a specific frequency to each user. Instead, every channel uses the full available spectrum.

cellular
A communications system, originally AMPS, that

divides a geographic area into cells, each of which has its own radio transmitters and receivers. Competing digital cellular systems include GSM and CDMA.

central office
A physical voice and data switching center, also called the local exchange, where local loops are connected to the core network.

CompactPCI
An open, industy-standard architecture based on the PCI architecture. Electrically, CompactPCI is superset of PCI. CompactPCI cards use Eurocard form factors and are typically available in 3U and 6U formats.

The CompactPCI standard is controlled the PCI Industrial Computer Manufactor's Group (PICMG).

core network
Generically, the physical infrastructure at the center of a network with a single administrative entity.

See also "network core".

D

dB (decibel)
A logarithmic expression of the ratio of two electrical qualities. To calculate dB, use the formula: $S_{db} = 10 \log (P_2 / P_1)$. *P* represents power, in watts.

E

E1 Package
A SOMA Networks document that provides Amosphere installation and operation instructions for a specific site.

Ethernet
A LAN protocol that uses CSMA/CD and a bus topology to support data transfer at 10 Mbits/s.

A newer version, called Fast Ethernet or 100Base-T, supports data transfer at 100 Mbits/s, and the IEEE has developed a standard for so-called Gigabit Ethernet (IEEE P802.3z).

Ethernet MAC address
A unique, 48-bit number programmed into every LAN card, usually at the time of manufacture.

Destination and source MAC addresses are contained in LAN packets and are used by bridges to filter and forward packets.

G

gateway
A device that connects two networks together. For example, gateways connect the network to the PSTN and the Internet.

GPS (Global Positioning System)
A satellite-based system used to provide precise terrestial and time information to devices equipmented with a GPS receiver.

H

host
A computer on which operating software resides.

I

IF (intermediate frequency)
A radio signal that will be converted to a new frequency prior to transmission.

IP (Internet Protocol)
The packet-transfer protocol used on the Internet. IP specifies the format of the basic unit of data, the datagram, and defines the addressing scheme used for its transfer.

L

LAN (local area network)
A network of computers, workstations, printers, file servers, and other devices that serves a particular group of users and is usually confined to a small geographical area, such as a building or campus.

latency
The amount of time it takes a packet to travel from source to destination. Network latency refers to the delay introduced when a packet is momentarily stored, analyzed, and then forwarded.

LNA (low-noise amplifier)
A device that increases the amplitude of an RF signal without introducing significant amounts of noise.

M

MAC (medium access control) layer
The network layer protocol that controls access to the physical transmission medium. The MAC layer, defined in IEEE 802, is sometimes called a sublayer because it is equivalent to the lower half of the data link layer in the OSI reference model. It mediates between the physical layer and the logical link control sublayer.

MGB (master ground bar)
The MGB is a bus bar that provides an electrical interface between the building's integrated ground plane and an isolated ground plane.

modem (modulator–demodulator)
A device that performs the conversion between digital data and analog signals.

MOP (methods of procedure)
A SOMA Networks document that describes the work to be done at a customer's site.

N

network core
In a SOMA Networks context, the network core is the switching fabric that interconnects all components and transfers bearer traffic, signaling information, embedded control messages, and network management traffic. The network core could be implemented as a single IP router connecting all components in star topology or could be an arbitrary meshed topology with several routers and routes between systems.

NPM
The SOMA Networks wireless basestation. An NPM serves as a wireless gateway for SOMAports. It transfers subscriber voice and data traffic between the SOMAports and the OpenNet network core. In effect, the NPM combines the functions of a wireless basestation, IP QoS-enabled router, Class 5 switch, and element management system.

The NPM relays voice and data between the air interface and the backhaul network.

O

OS (operating system)
The master control program that runs a computer. The OS is the first program loaded when a computer is turned on, controls software access to resources such as the central processing unit, memory, and peripherals, and runs all of the computer's programs.

P

PSTN (public switched telephone network)
The international telephone system for analog voice traffic. The PSTN refers to the original copper wire telephone infrastructure and services.

R

RF (radio frequency)
Any frequency in the electromagnetic spectrum that is used for radio transmission (typically 1 MHz to 300 GHz).

RJ-45 (registered jack-45)
An 8-wire connector used to connect computers to an Ethernet or a token-ring LAN.

router
A device that forwards packets of any type from one LAN or WAN to another. Routers read the information in packet headers and use routing tables and protocols to determine the optimal route between hosts.

S

sector
A wedge of a radio cell used to increase the capacity of the cell. Radio sectors use directional antennas instead of omnidirectional antennas.

The NPM supports up to six sectors, each of which is managed by a radio sector controller.

SOMAport
The SOMA Networks CPE. The SOMAport is the terminal device that connects a subscriber's telephones and personal computers via a wireless link to the NPM.

switch
In networks, a device that filters and forwards packets based on the address in the packet header. Switches operate at the data link layer of the OSI Reference Model.

T

TCP (Transmission Control Protocol)
A protocol that enables two hosts to establish a connection and reliably exchange streams of data over IP-controlled networks. TCP operates at the transport layer of the OSI Reference Model.

TCP/IP (Transmission Control Protocol/ Internet Protocol)
The suite of communications protocols developed by the United States Department of Defense to connect dissimilar systems. TCP/IP is supported by many operating systems and is the protocol of the Internet. It uses IP addresses to route messages over multiple networks.

U

UPS (uninterruptable power supply)
A battery-powered device that provides power to a system in the event of an interruption to the main power.

W

WAN (wide area network)
A physical or logical data network that spans a relatively large geographical area and that typically connects two or more LANs.

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