

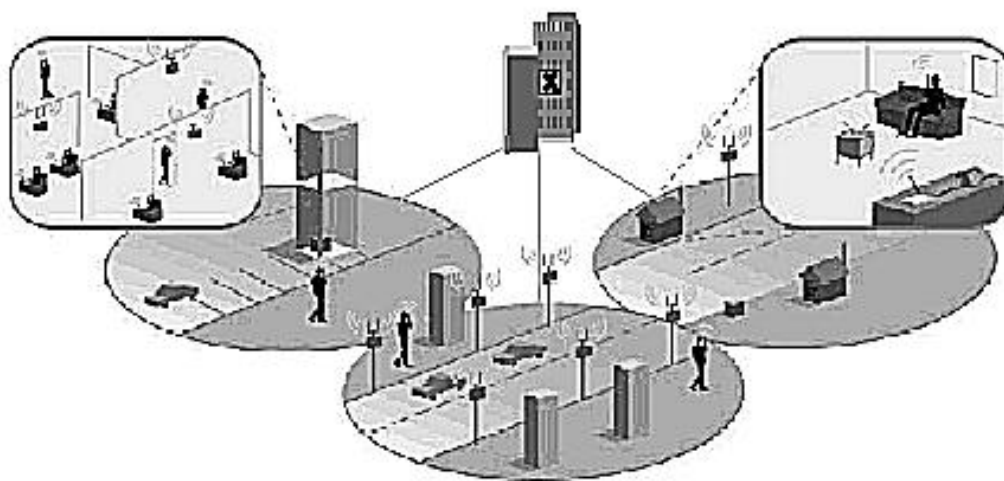


Wireless Local Loop

RPC/RP Installation & Configuration Manual

WLL-RPC/RP-IN/UM-1.0

June 19, 2000



Compiled by (Joseph) Guangping Zhang

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Important Safety Instructions

Safety Information:

Installer and User WARNING

The device is to be installed and operated at a “fixed location”. The term “fixed location” means that the device is physically secured at one location and is not able to be easily moved to another location.

It must be located - (for indoor RPs) up on or near the ceiling away from users or bystanders – (for outdoor RPs) on the roof top site, pole, building, or traffic light away from users or bystanders. It must be mounted in a manner to ensure that a minimum separation distance of 20cm is normally maintained between all users, bystanders and the antenna (including any radiating structure).

The installer may be required to perform an MPE evaluation and an Environmental Assessment (EA) of the location at the time of licensing per CFR 47 Part 1.1307. Fixed mounted antennae that are co-located with other antennae must satisfy the co-location requirements of Part 1.1307.

Limits:

The limit for general population/uncontrolled environment exposures is 1 mW/cm^2 for the band 1500-100,000 MHz.

MPE evaluation:

The following calculations are provided for the more restrictive limit: uncontrolled environment/general population.

The calculated minimum safe distance, Radii(cm), is approximately 10 times lower than the minimum required installation distance of 20 cm per Part 2.1091.

Therefore, the transmitter model numbers EA7H74B and EA7H75B complies with the MPE requirements by providing a safe separation distance between the antenna (including any radiating structure) and any persons.

The calculations were performed using formulas found in OET Bulletin 65 Edition 97-01(1997).

Transmitter Specifications:

Antenna Type	Gain (dBi)	Output power EIRP (dBm)	Output Power (dBm)	Base stations M/N	Minimum Installation Distance (cm)
Built-in	2.4	21.4	19 dBm (Peak)	EA7H74B	20
	2.4	12.4	10 dBm (avg)	EA7H74B	20
Omni-Directional	7	26	19 dBm(Peak)	EA1H75B	20
	7	17	10 dBm (avg)	EA1H75B	20

MPE Radii (m) For general population/uncontrolled environment

Power P(W) Max. Peak	Antenna G numeric	Radii(cm)	Base stations M/N
0.08	1.7	1.5	EA7H74B
0.08	5.0	2.5	EA1H75B

General Safety Instructions:

- The sign on the top right corner is intended to alert the user the presence of important operation and maintenance (service) instructions in the literature accompanying the product. Also notice warnings such as “WARNING!” or “CAUTION.”
- When installing, operating, or maintaining the system, please follow the basic safety procedures in order to reduce the risk of fire, electric shock, and injury to persons, as listed below:
- Read and understand all instructions.
- Follow all warnings and instructions marked on this product.
- For information on proper mounting instructions, consult the Installation Manual provided with this product.
- Install only equipment identified in the Installation Manual provided with this product. Use of other equipment may result in improper connection of circuitry leading to fire or injury to persons.

- The telecommunication interfaces should not leave the building unless connected to telecommunication devices providing primary and secondary protection, as applicable.
- This product should only be operated from the type of power source indicated on the marking label.
- This equipment must be provided with a readily accessible disconnect device as part of the building installation.
- Installation must include an independent frame ground drop to building ground. Refer to installation instructions.
- Do not use this product near water, for example in a wet basement.
- Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.
- Use caution when installing or modifying telecommunications lines.
- Never install telecommunications wiring during a lightning storm.
- Never install telecommunications in wet locations.
- Never touch uninsulated telecommunications wires or terminals unless the telecommunications line has been disconnected at the network interface.
- Never touch uninsulated telecommunications wires or terminals carrying direct current or ringing current or leave this wiring exposed. Protect and tape such wiring and terminals to avoid risk of fire, electric shock, and injury to service personnel.
- Never push objects of any kind into this product through slots as they may touch dangerous voltage points or short-out parts that could result in a risk of fire or electrical shock. Never spill liquids of any kind on this product.
- Slots and openings in the unit are provided for ventilation, to protect it from overheating. These openings must not be blocked or covered. This product should not be placed in a built-in installation unless proper ventilation is provided.
- To reduce the risk of an electrical shock, do not disassemble this product. Service should be performed by trained personnel only. Opening or removing covers and/or circuit boards may expose you to dangerous voltages or other risks. Incorrect re-assembly can cause electrical shock when the unit is subsequently used.

- This equipment is intended for installation in restricted access locations where access is controlled or where access can only be gained by service personnel with a key or tool. Access to this equipment is restricted to qualified service personnel.

Save These Instructions!

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Introduction

1

1.1 Purpose

This manual describes the installation and configuration procedures for the Radio Port Controller (RPC) and Radio Port (RP). It is intended for the following customer personnel who participate in the engineering, installation, operations, and maintenance of the system.

- Equipment Engineers and outside plant engineers
- Installation, Operation, and Maintenance Personnel
- System Administrators
- Training Personnel

1.2 Organization

Listed below is the brief description of each chapter in this manual:

Introduction - Describes the contents of this manual and the conventions used.

RPC Installation - Details the steps necessary to install the Radio Port Controller.

RP Installation - Represents the procedures to install the Radio Port.

RPC/RP Configuration - Explains the configuration process for both the RPC and the RP.

Appendix A: Specifications – Describes the RPC/RP specifications and Champ connector pin assignments.

Appendix B: Glossary – Lists the meaning of the acronyms used in this manual.

Appendix C: Editor's Note – Provides the notice to the customers, customer service office addresses, and feedback form.

1.3 Documentation Conventions

Certain conventions are used in this document to denote types of information, such as commands, screen titles, options, and so on. The table below defines these conventions.

Style	Used For:	Example
<i>Italics</i>	Cited titles of books, chapters, and sections in the literature	<i>Performance Management</i>
Bold	Window and dialog box names, icon names, and field names	Netman Database Window
<u>Bold and Underlined</u>	Menu names	<u>Configuration</u>
<i>Bold and Italics</i>	Menu options, command, and button names	<i>Configure DLC</i>
 followed by <i>italic text</i>	Notes, cautions, and warnings	 NOTE: <i>This feature does not apply to RPC nodes.</i>
Initial Capital Letters	Names of functions, window tabs, and directory and file names	Double click the E1 Port Index field.
<Angled Brackets with Bold and Italicized Contents>	Variable sytem output	The status displayed is COMM <DLC#>

Table 1-1: Documentation Conventions

RPC Installation

2

2.1 General Description

The Radio Port Controller (RPC) functions as the controller and power distributor for the Radio Ports (RPs). It is also the concentrator of the speech paths and the protocol converter for the PHS protocol and the Q.931 protocol. It has Dual Tone Multi Frequency (DTMF) senders for dialing to the Local Exchange (LE) through the Central Office Terminal (COT). In addition, the RPC synchronizes the associated RPs by extracting the synchronous clock from the E1 line connected to the COT and distributing it to all of the associated RPs.

RPCs can be co-located with a COT or located remotely and communicate with the COT using E1 transmission over:

- High Density Subscriber Loop (HDSL)
- Fiber Optic Transmission (FOT)
- Digital microwave radio

Figure 2-1 presents an overview of the RPC and RPs in the WLL system.

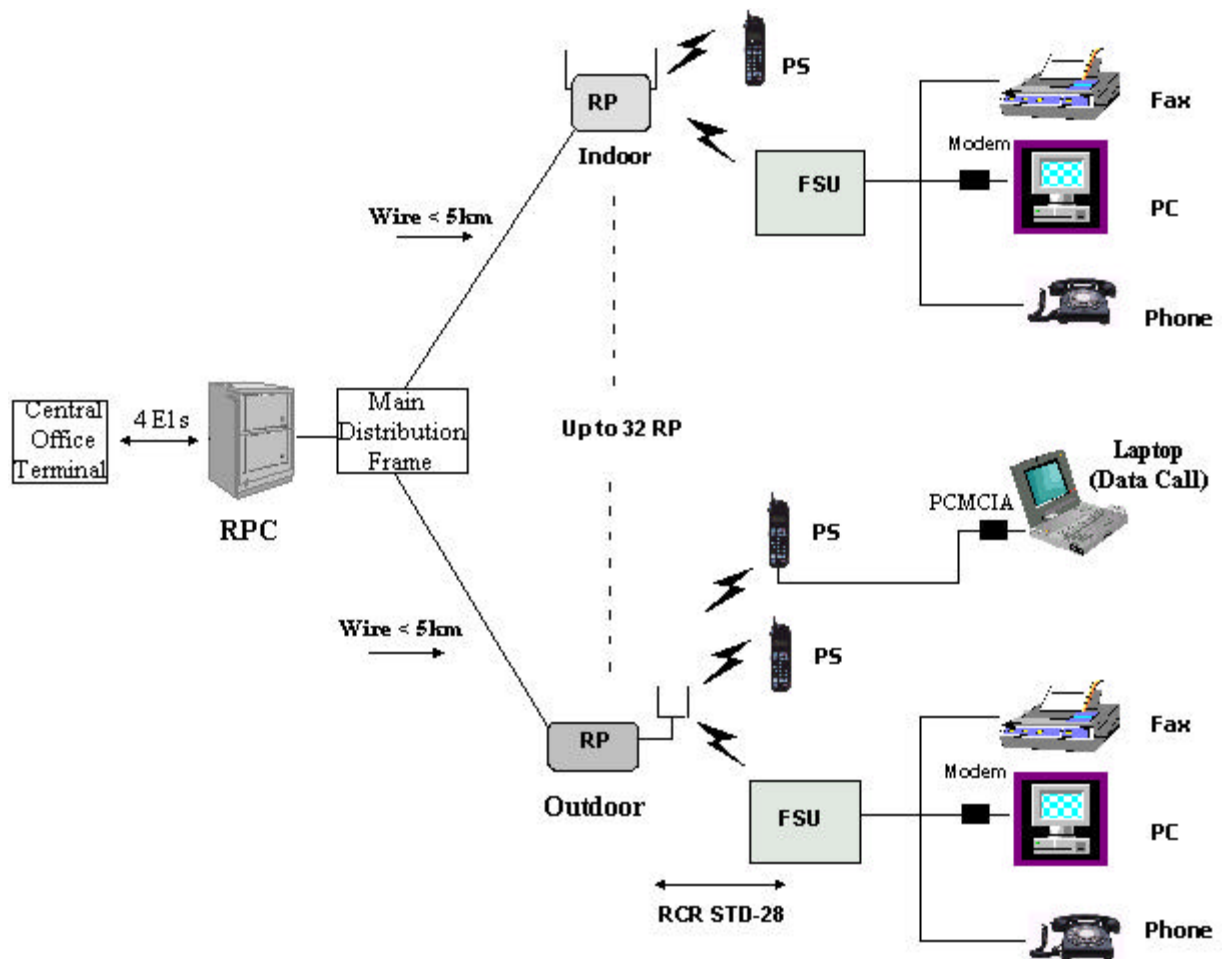


Figure 2-1: RPC in the WLL System

2.1.1 Main RPC Features

An RPC consists mainly of four types of function modules:

- One ECNT (Enhanced Control) module
- Up to four E1IF (E1 Interface) modules
- Up to eight RPIF (RP Interface) modules
- One APL (Application Software Loading) module - Optional

Figure 2-2 displays the four types of the function modules in the RPC.

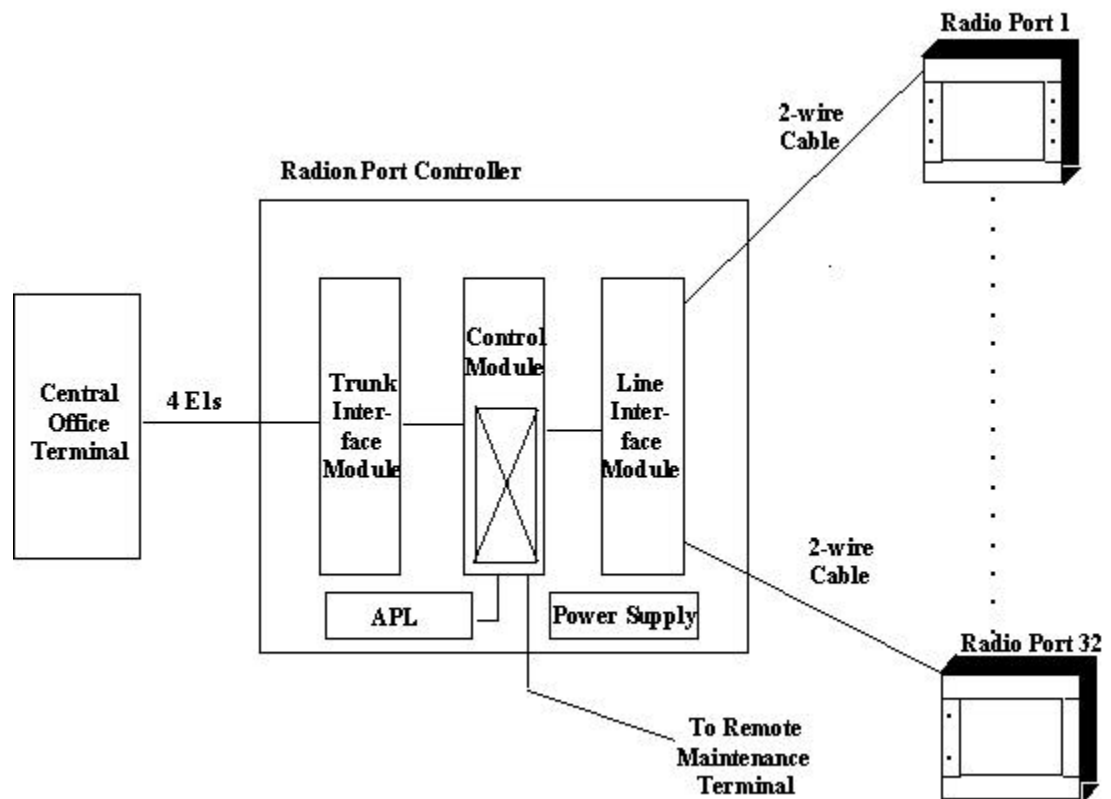


Figure 2-2: Function Modules inside the RPC

Each RPC can handle traffic loads of up to 120 simultaneous telephone calls. Four E1 trunks connect to the COT side and support 30 subscriber channels each. In normal traffic conditions, a single RPC can service approximately 1000 subscribers.

The RPC is monitored and controlled from the network management system connected to the COT. With this setup the program data, the operation data, and the system parameters can be changed and the alarm information and traffic data can be gathered easily.

2.1.2 RPC Module Descriptions

The following sections describe the RPC component modules, including the physical configuration, Light Emitting Diodes (LEDs), and switch operations.

2.1.2.1 Enhanced Control Module

The ECNT module provides the Operation, Administration and Maintenance (OA&M) support for the RPC. In addition, it provides the time slot cross connect switch for communications between the E1IFs and the RPIFs. Figure 2-3 represents the ECNT functions.

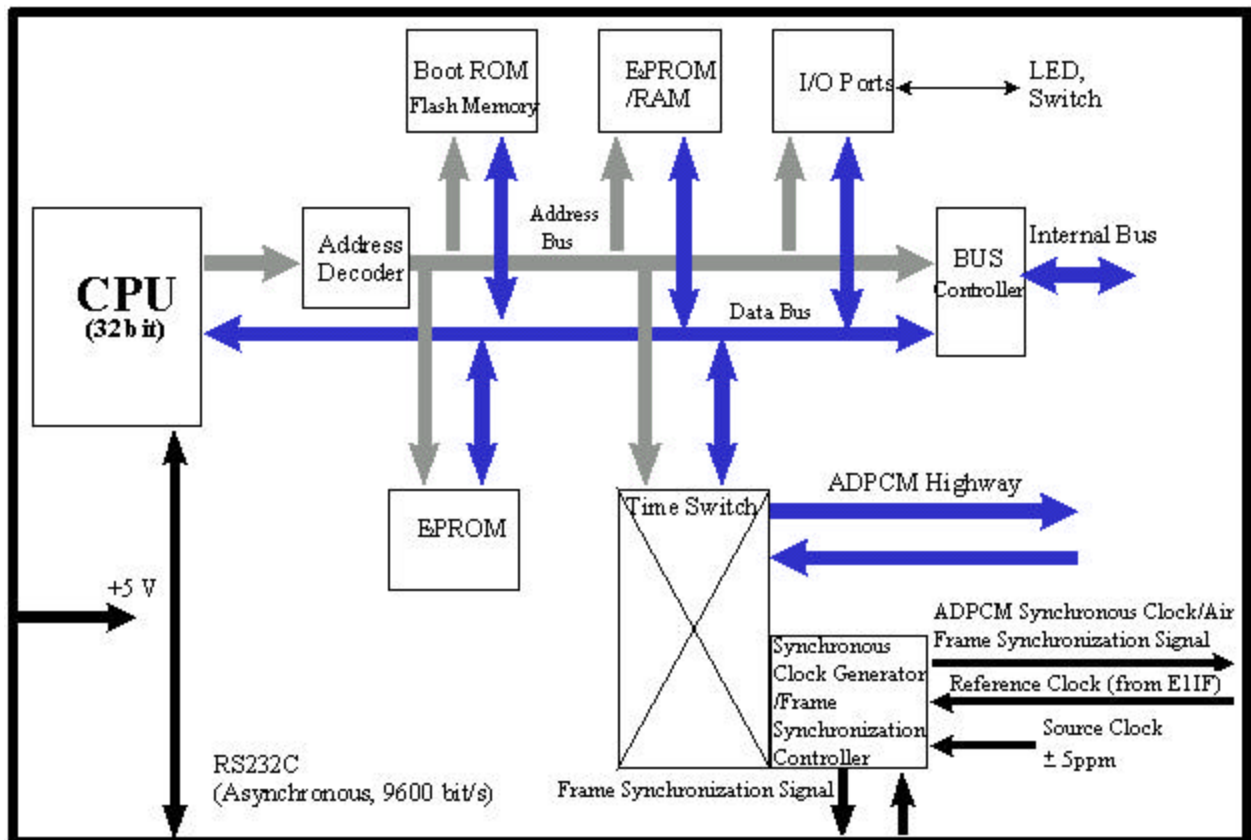


Figure 2-3: ECNT Block Diagram

The ECNT module performs the clock synchronization by generating a synchronized clock from the extracted clock signal from the E1 line on the E1 interface card and delivers it to the RP lines on the RP interface cards.

The RPC uses a control bus via the ADPCM highway on the mother board to synchronize the system. The Control Bus is an 8-bit mixed bus address with data and First-in First-out (FIFO) type bus. The main CPU on the ECNT card, the local CPUs on E1 Interface cards and the RP-interface cards are all connected by this bus. The main CPU on the ECNT card controls the bus.

Figure 2-4 shows the module's physical configuration and describes the function of the LEDs and the reset switch.

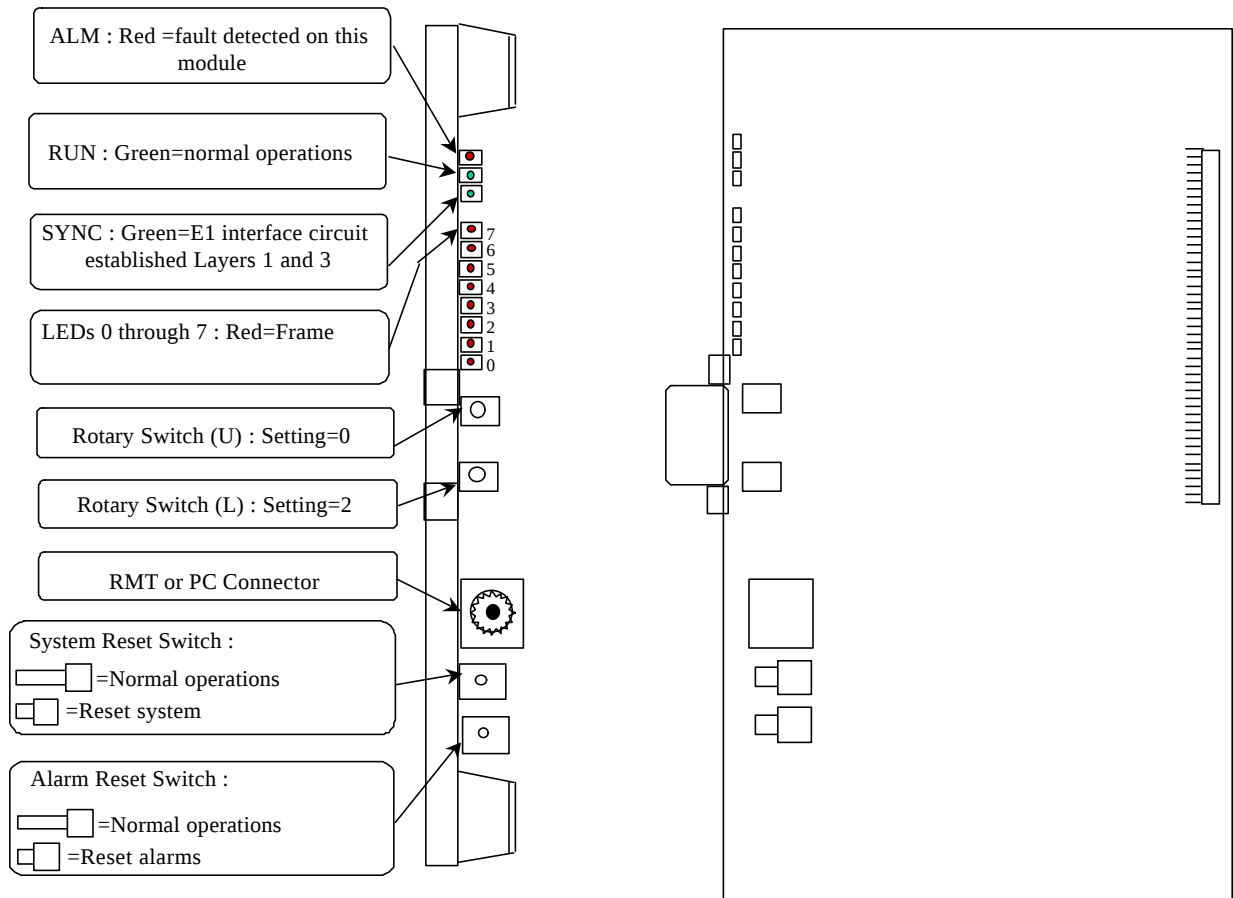


Figure 2-4: ECNT Module Layout

2.1.2.2 E1 Interface Module

The RPC connects to the COT through a 2.048 Mbps E1 Interface that carries all the control and voice channels, that is, PCM encoded voice or voice band data, between the COT and the RPC. The E1 Interface (E1IF) module communicates externally with the COT through 1 G.703 E1 interface and uses Q.931 non-facility associated signaling protocol.

Transmission between the RPC and RP is based on a proprietary, echo-canceled transmission standard, which is similar to the recognized G.961 ISDN standard. The E1IF provides the speech coding conversion between A-law PCM from the COT and Adaptive Differential Pulse Code Modulation (ADPCM), which is ITU-

Rec.726 compliant, from the RP. It supports 32 kbps channel signaling for encoded voice and voice band data calls.

In addition, the E1IF communicates internally with the Radio Port Interface (RPIF) module for interfacing RPs through the backplane busses and the switch in the ECNT module.

The E1IF module is an E1 module (E1M) that provides 4 E1 connections to the E1 network. The E1 module has the following functions:

- Originates/terminates 4 G.703/G.704 2.048 Mbps E1 interface
- Provides 75 ohm unbalanced interface
- Provides LEDs for module and port status and alarms
- Performs CRC-4 on the E1 line according to G.706
- Monitors performance of each E1 line
- Detects errors and alarms on the E1 lines.

Figure 2-5 depicts the processing of the E1IF module

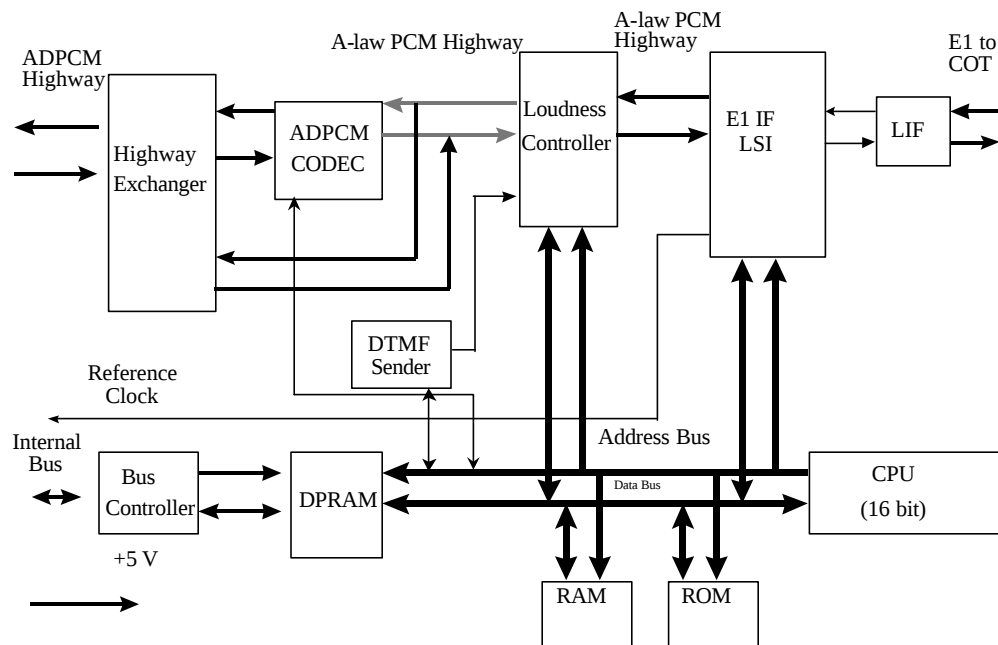


Figure 2-5: E1 Interface (E1IF) Module Block Diagram

Figure 2-6 shows the module's physical configuration and describes the function of the LEDs and the reset switch.



Figure 2-6: E1IF Module Layout

2.1.2.3 Radio Port Interface Module

Each RPC controls and feeds a maximum of 32 RPs. The RPC connects to the RPs through a 2-wire proprietary interface. Line power feeding from the RPC provides a power source of 116V DC to the RPs.

The RPC controls the RPs via 8 RPIF modules. Each RPIF module provides an ISDN Basic Rate interface to 4 RPs. The RP is extended from the RPC to a maximum distance of 5.0km using a pair of $\phi 0.5$ wires and approximately 3.5 km using a pair of $\phi 0.4$ wires.

The Radio Port Interface (RPIF) module communicates externally with four RPs through ISDN Basic Rate Interfaces (BRI). In addition, it communicates

internally with the E1IF through the backplane busses and the switch in the ECNT module. Refer to Figure 2-7 for a block diagram of the RPIF module's processing.

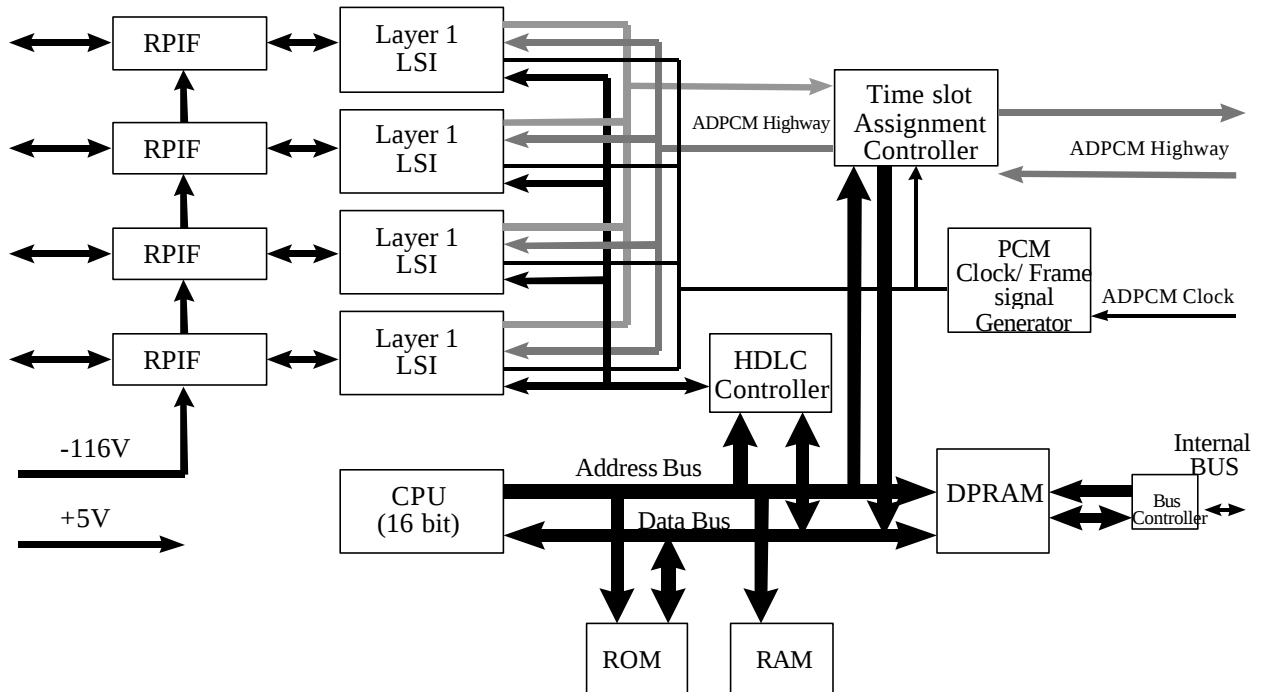


Figure 2-7: RPIF Module Block Diagram

Figure 2-8 shows the module's physical configuration and describes the function of the LEDs and the reset switch.

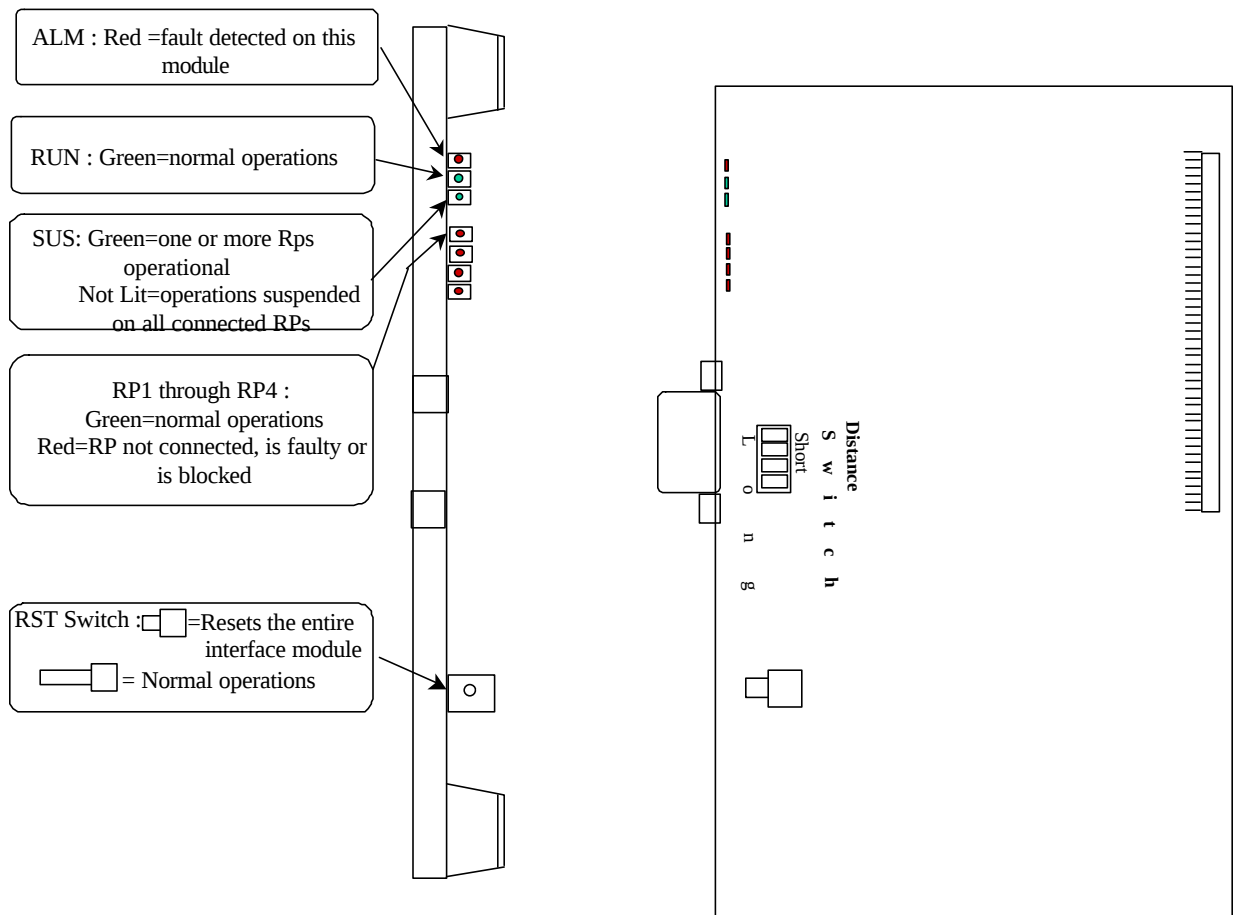


Figure 2-8: RPIF Module Layout

2.1.2.4 Application Software Loading Module

The Application Software Loading (APL) Module facilitates the downloading of software in the event there is a problem in loading software. It permits the upgrading of the ECNT module firmware. In addition, any software upgrades can be downloaded remotely from a PC to an RPC. The APL module is installed only when the software or firmware needs to be upgraded or downloaded. It is not intended to remain in the system during the normal operations.

Figure 2-9 demonstrates the module's physical configuration:

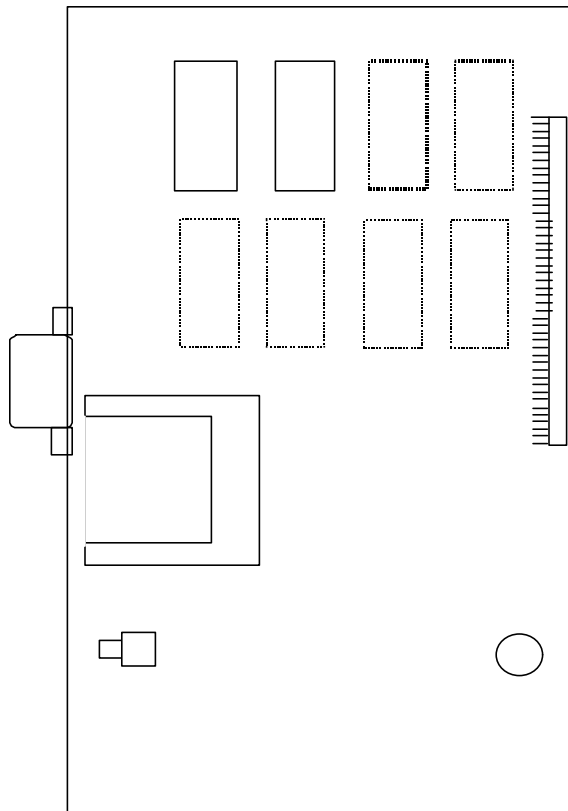


Figure 2-9: Application Module Layout

2.1.2.5 ADPCM Highway

The ADPCM (Adaptive Differential Pulse Code Modulation) highway is the synchronous time multiplex digital voice/data path, and consists of up-stream and down-stream for Time Switch on the ECNT card. Time Switch and the digital voice and data paths on the E1IF cards and the RPIF cards are connected by the ADPCM highway.

There are 8 ADPCM highways in an RPC. Half of them are assigned for E1IF cards, and the rest are assigned for RPIF cards. The bit rate of an ADPCM highway is 2048 kbps, and the frame repetition rate is 8 kHz.

2.2 System Construction

An RPC has two types of installation scenarios:

- Rack mount
- Stand-alone

Figure 2-10 shows the physical configuration of the rack mount type RPC.

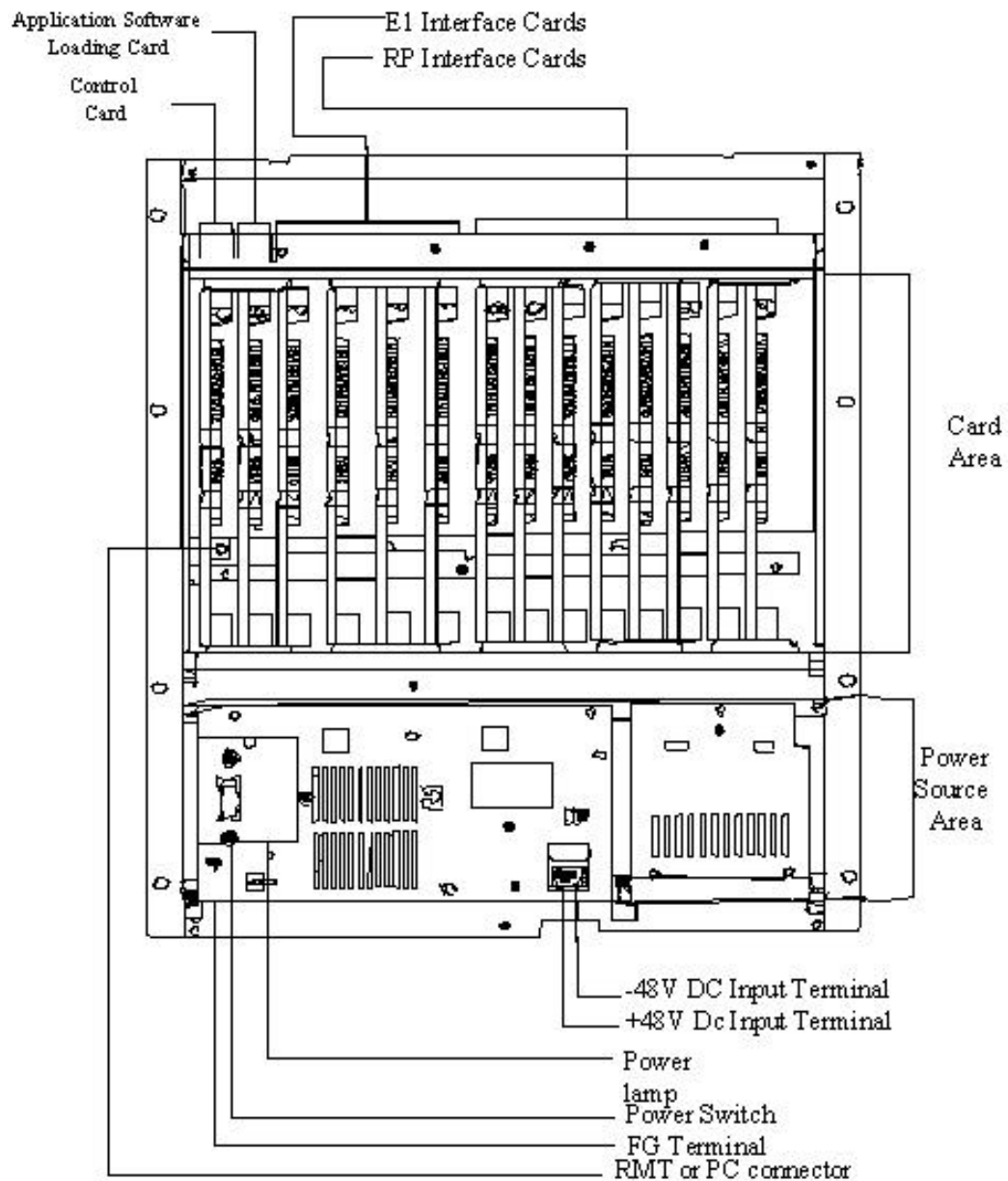


Figure 2-10: Layout of Rack Mount Type RPC

The RPC is 532.6mm high, 482.6mm wide, and 265mm deep.

2.3 Installation

This section provides the instructions for installing an RPC. The flow chart in Figure 2-11 depicts the steps involved in the installation.

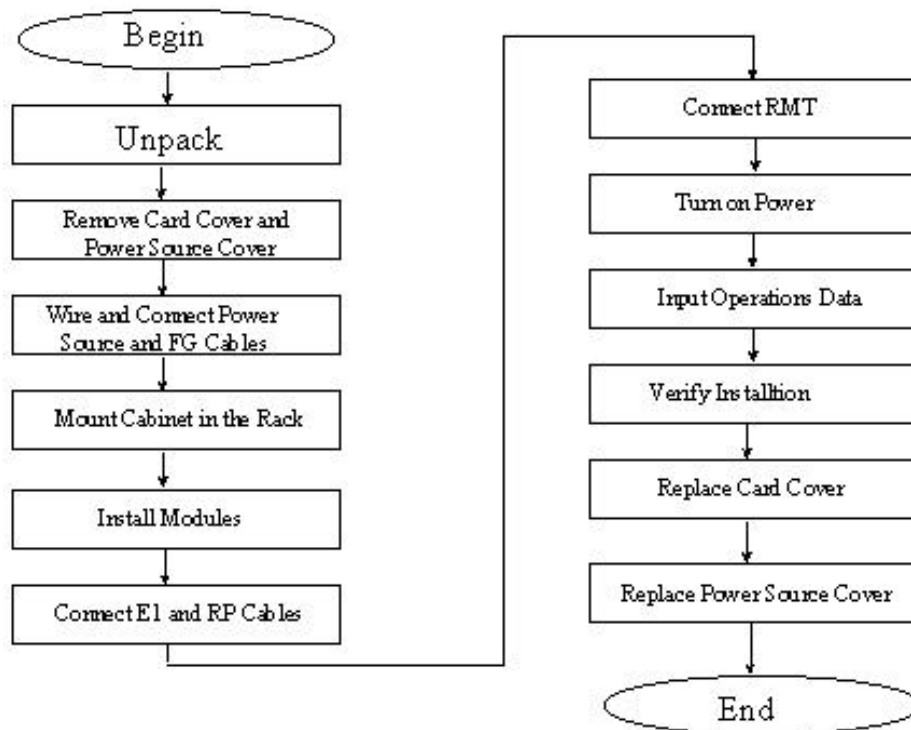


Figure 2-11: RPC Installation Flow Chart

2.3.1 Before Beginning

To ensure that the RPC installation goes smoothly, it is necessary to do adequate planning prior to the installation, including:

- Location of the RPC
- Tools required
- Number of people needed to complete an installation.

2.3.2 RPC Site Selection

The RPC needs an environment that is relatively dust and moisture free. Make sure the location meets the following requirements:

- Not in direct sunlight
- Free from extremes of heat, cold, and moisture
- 0° to 40° C ambient temperature

2.3.3 Tools Required

Be sure to have the following necessary tools:

- Screwdrivers
- Soldering iron and solder
- Tie bands for cabling

2.3.4 Installation Instructions

Follow the steps below to install the RPC:

1. Carefully unpack the RPC and the accessories and make sure that they are in good condition. Accessories include 2 connectors for the RP connection cables. Refer to Figure 2-12 for unpacking.

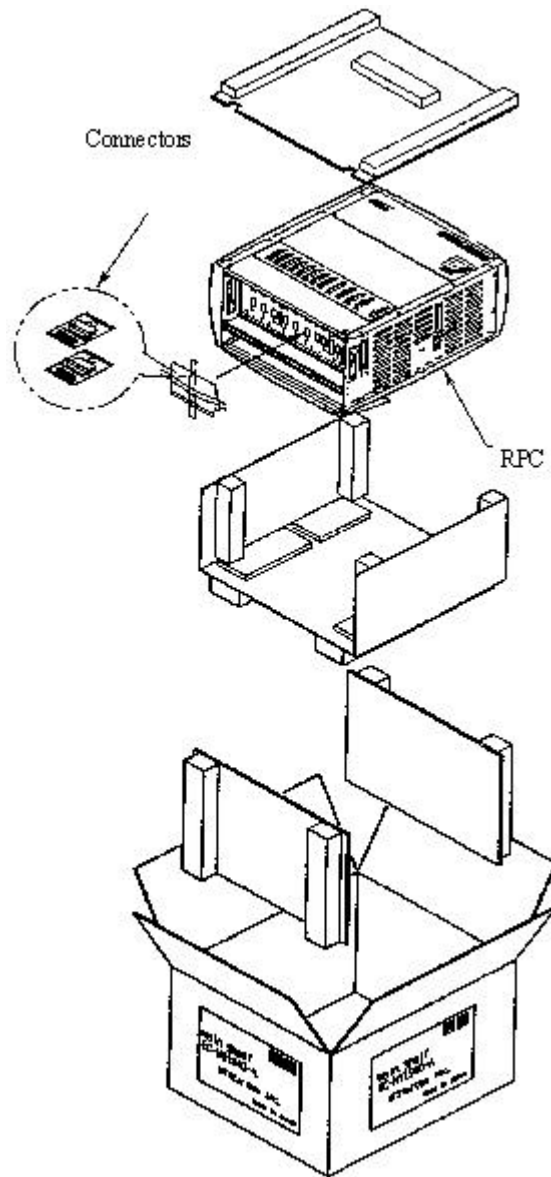


Figure 2-12: Unpacking the RPC and Accessories

2. Before installing the RPC in the rack, make sure to remove the card cover and the power source cover.



CAUTION: *Do not take a photo with a flash once the card cover has been removed. RPC may not operate.*

3. Loosen the thumbscrews. Tilt open the cover and slide it out as shown in Figure 2-13.



CAUTION: *The card cover cannot hold itself when opened. Be sure to detach it from the cabinet.*

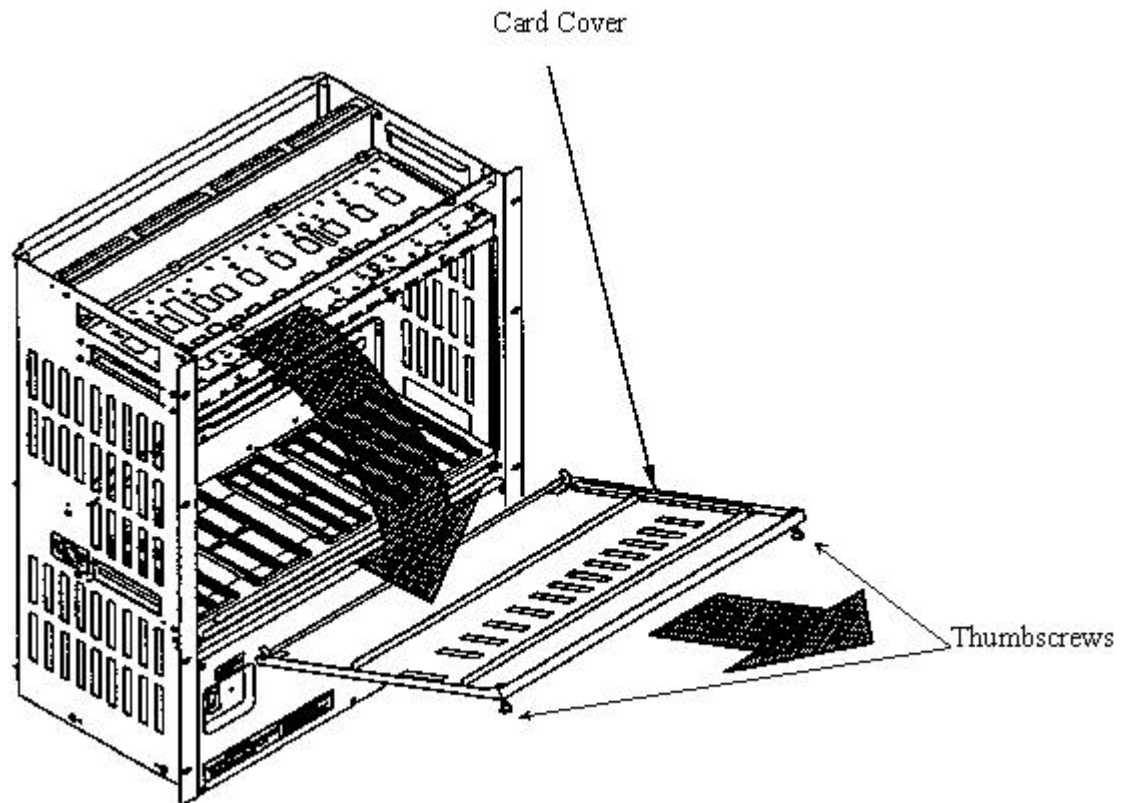


Figure 2-13: Removal of the Card Cover

4. Remove the 5 M3 screws in the power source cover and remove it, as illustrated in Figure 2-14.

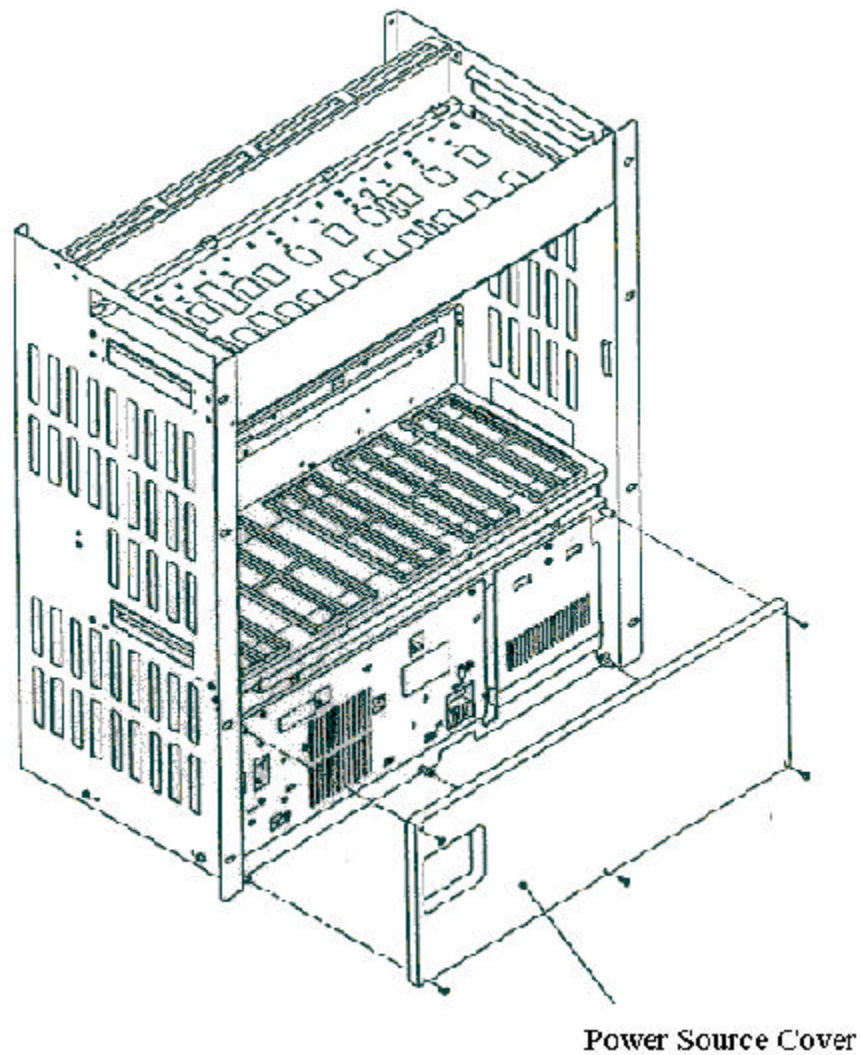


Figure 2-14: Removal of the Power Source Cover



CAUTION: *When inserting and removing each component, make sure to follow the proper electro-static discharge (ESD) procedures.*

5. Connect and wire the power source and FG cables, as shown in the figure below.

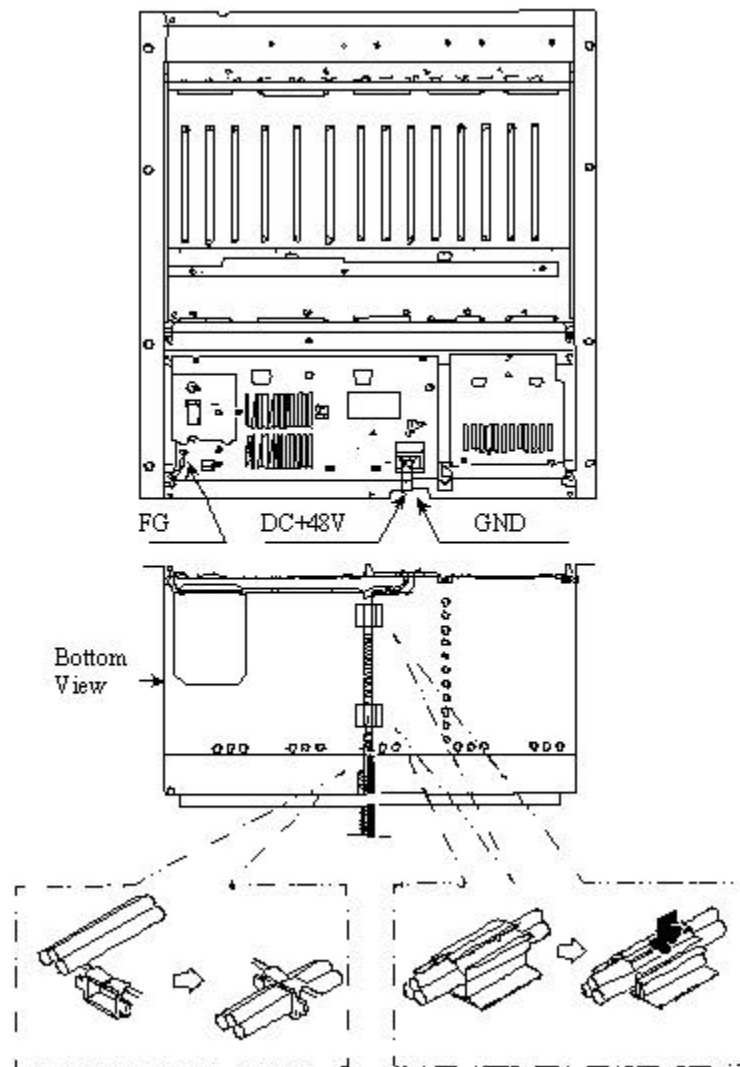


Figure 2-15: Power and FG Cable Connectors

6. Insert the RPC in the rack and fasten to the rack with 8 screws as indicated in Figure 2-16.



CAUTION: Make sure the RPC is firmly mounted in the rack. Serious injury could occur if the RPC fell out of the rack.

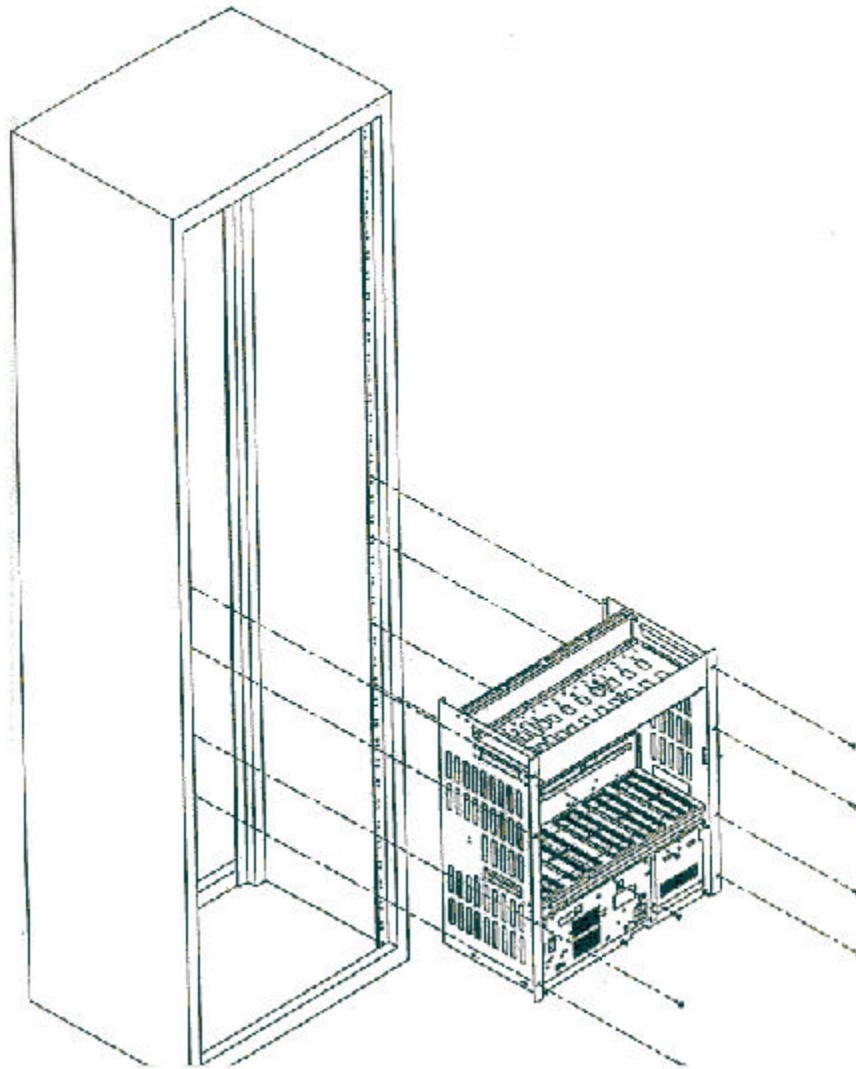


Figure 2-16: Mounting the RPC in the Rack

7. After installing the RPC in the rack, affix the wiring as indication in Figure 2-17. Redirect the support according to the direction of the wiring, as shown in Figure 2-17.

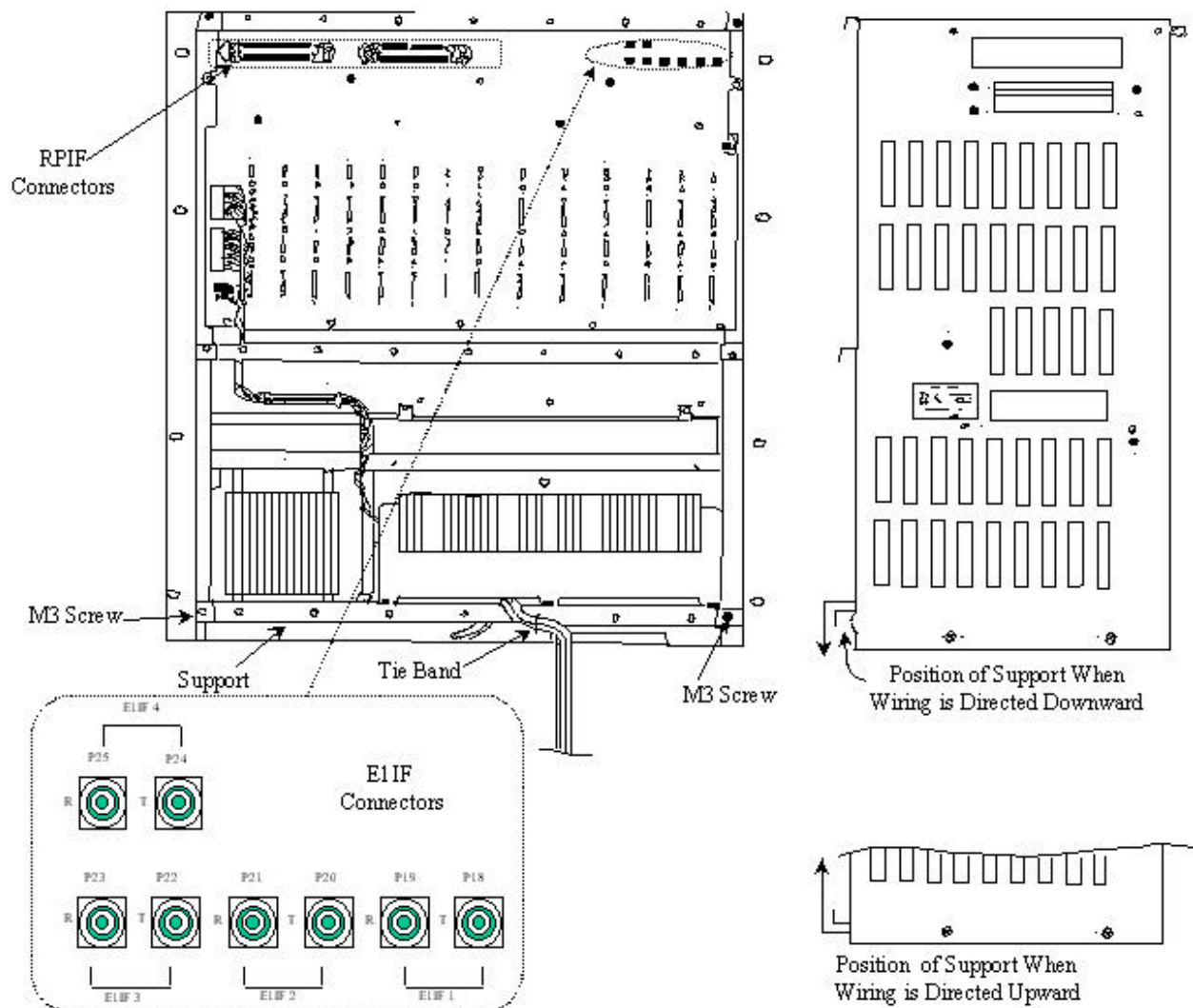


Figure 2-17: Wiring – Back of RPC

8. Connect the coaxial cable with an SMB coaxial cable plug having an impedance of 75 ohms into the E1IF connectors on the back of the RPC, as shown in Figure 2-17
9. Connect the cable with a Champ plug to the RPIF connector on the back of the RPC. Refer to Figure 2-17. Table 2-1 provides the maximum cable lengths between the RPC and the RP for 2 different wire gauges. Refer to *Appendix A* for the description of the 2 Champ RPIF connector pin assignments.

Wire Guage	Maximum Cable Length
$\phi 0.4$ m	3.5Km
$\phi 0.5$ m	5.0Km

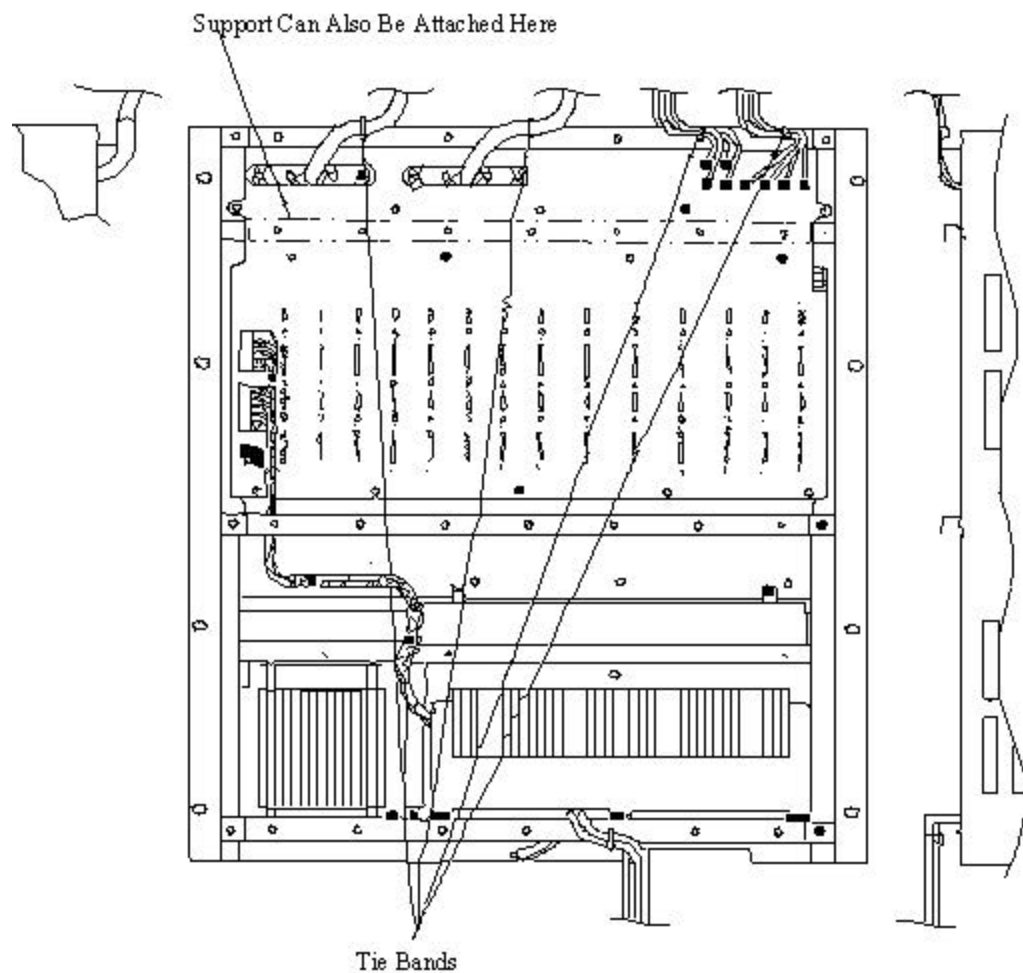
Table 2-1: Maximum RP Cable Length

NOTE: Be sure to use a twisted pair cable or a 2 pair twisted cable. Avoid any 2 pair twisted cable splits before connecting cables.

10. When the RP and E1 cables are connected, attach the cabling to the supports with tie bands. Refer to Figure 2-18.



NOTE: Tie Bands are to be prepared on-site.

**Figure 2-18: Cabling Example**

11. Install the modules in the RPC slots according to the labels on the cabinet.
Refer to Figure 2-19 for the slot assignment.



NOTE: The APL module is installed only when the software upgrades are unsuccessful without it. It is not intended to remain in the system during normal operations.

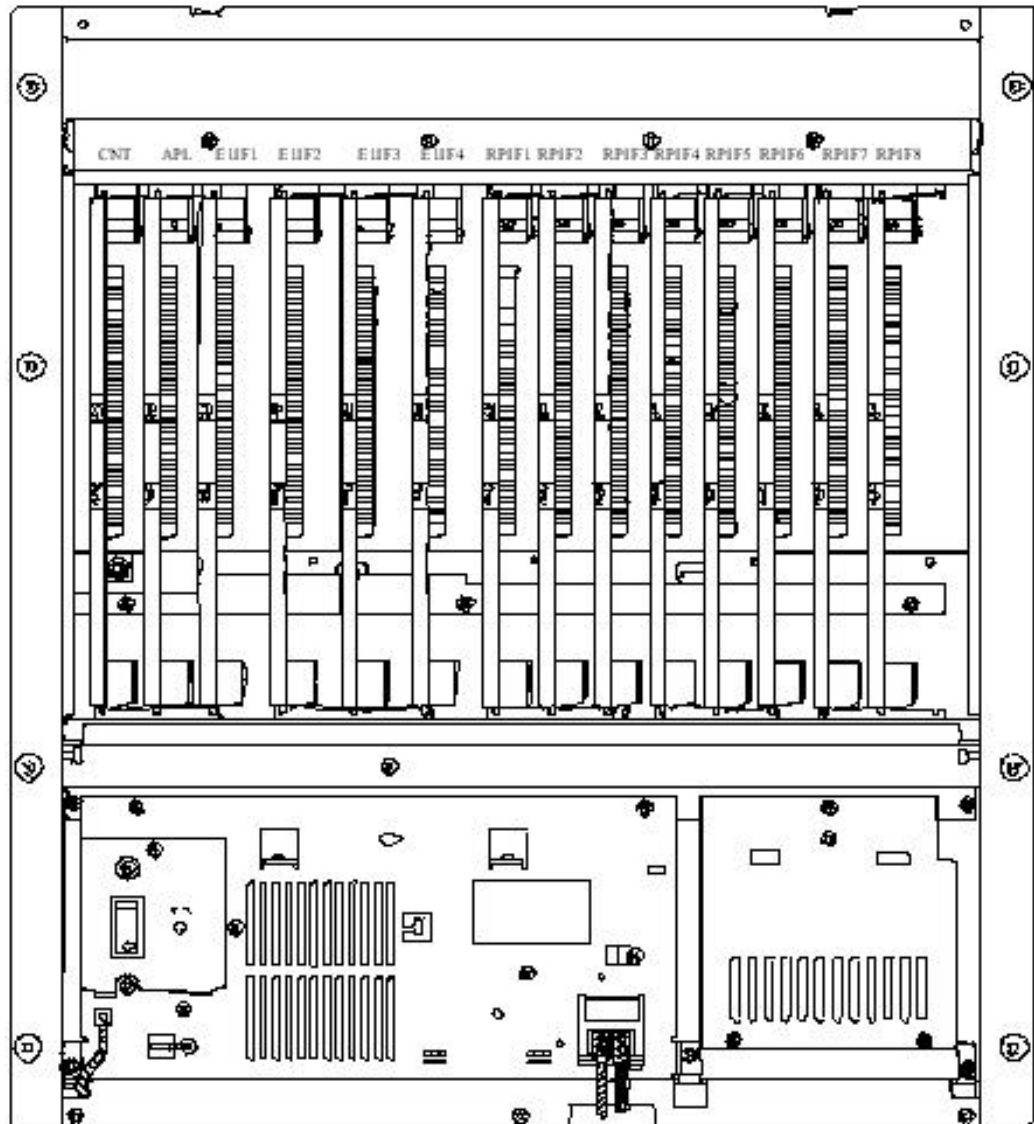


Figure 2-19: RPC Slot Assignment

12. Make sure that the rotary switches on the ECNT module are correctly set before applying power. The correct switch settings are shown in Table 2-2.

Switch Name	Setting
Rotary Switch (U):S4	0
Rotary Switch (L):S5	2

Table 2-2: Rotary Switch Settings

13. Slide the card into the RPC shelf using the upper and lower slot guides. When properly seated, the lower edge of the card is recessed from the outer edge of the lower slot guide. And the upper edge of the card is flush with the outer edge of the upper card guide. Refer to Figure 2-20.