



Mobile Advantage Wireless Office (DWOS 1.0)

User Manual

PA9

The contents of this document are subject to revision without notice due to continued progress in methodology, design, and manufacturing.

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1 Introduction

1.1 About This Manual

This user manual describes how to plan, install, configure, test, operate and maintain the Ericsson Mobile Advantage™ Wireless Office. Sections in this manual explain the hardware and software building blocks and the general specifications for the Mobile Advantage system.

This manual is developed and maintained in printable form and filtered into HyperText Markup Language (HTML) outputs suitable for Internet publication, printing, and CD-ROM delivery. In print format, acronyms and abbreviations are expanded when first used. All acronyms and abbreviations are explained in “Appendix B—Acronyms and Abbreviations”, on page 72. In the HTML format, all acronyms and abbreviations are hyper-linked to the appendix and references are linked to the sources.

General information for the configuration and use of TDMA-136 compatible mobile phones that function within the Mobile Advantage environment is provided in this manual. More specific information about compatible products can be obtained on-line on the Ericsson WEB page.

Writer’s Note: **This document will contain generic specifications for the TDMA-136 mobile phones as well as a generic description of how to program a phone for use in DWOS. In the HTML version, there should be a link to the Ericsson WEB site that contains more specific information.**

1.2 Revision History

PA1—Chapters one through three are included in release PA1 for review. Other chapters are in progress but all information is not deemed reliable at this time. Other releases will be issued shortly.

PA2—Chapters one through three updated with specification data for tables. Chapters four and five in progress, Index for cables is in review. (10/27/98).

PA3—Chapters one through three updated after review on 10-30-98, Appendix A updated and reviewed.

PA4—Removed references to rack-mounted cabinet. Combined sections on Post Installation test and Integration and Test. Added version 2 (all software loaded at factory) in Installation section. Added Appendices B, C, D.

PA5—In progress—Editing Troubleshooting section, Recommended Tools.

PA6—All edits included, rewrite of O&M section.

PA7—Contents from formal review conducted 12-04-98 included.

PA8—Includes changes since 12-04-98 formal review.

PA9—Additional updates from 01-06-99 meeting.

1.3 How To Use This Manual

To effectively use this manual, personnel should be certified by Ericsson in the planning, installation, or operation and maintenance (O&M) of the Mobile Advantage system. This manual provides support and reference material for personnel performing the following functions:

- **Mobile Advantage Supplier (System Supplier)**—The Mobile Advantage Supplier plans, delivers, and installs the Mobile Advantage system. The Mobile Advantage Supplier provides the help desk function to the Mobile Advantage Operator for analysis of system faults and system upgrades.
- **Wireless Operator**—The Wireless Operator owns the frequencies used by Mobile Advantage. The Wireless Operator maintains the Mobile Advantage user information in the Public Land Mobile Network (PLMN) HLR. The Wireless Operator can also view and change the frequencies used by Mobile Advantage.
- **Mobile Advantage Operator (System Operator)**—The Mobile Advantage Operator maintains the Mobile Advantage system. The Mobile Advantage Operator manages O&M functions such as fault and performance monitoring, configuration, security, and accounting management.
- **Mobile Advantage User Administrator (System Administrator)**—The Mobile Advantage User Administrator manages the Mobile Advantage user profiles, the addition or deletion of Mobile Advantage users or changing the user profiles.

2 System Description

2.1 Overview

Mobile Advantage functions as an extension of wired communication systems with additional mobile capabilities. Wireless systems provide the same services as most commonly used Private Branch Exchange (PBX), with the advantage of portable telephone capabilities. Mobile Advantage extends normal mobile systems functions to operate inside buildings, factories, and other internal sites.

Mobile Advantage mobile phones operate in either the 850 MHz (Cellular) or 1900 MHz Personal Communications Service (PCS) bands. To function in the Mobile Advantage environment, mobile phones must be compatible with the TDMA-136 standard protocol and have Adaptive Code Excited Linear Prediction (ACELP) speech capability. ACELP is a speech coding and decoding standard for mobile phones. For more information about the TDMA-136 standard see “Appendix B—Acronyms and Abbreviations”, on page 72.

Mobile Advantage users within the Mobile Advantage area use a private numbering plan for calls to other Mobile Advantage users. Mobile Advantage users communicate with public telephones through a PBX link connected to the Public Switched Telephone Network (PSTN).

Mobile Advantage is associated with the Public Land Mobile Network (PLMN) where the users are defined as standard cellular or PCS subscribers in a Home Location Register (HLR). The subscription of users with the PLMN allows Mobile Advantage users to roam outside the Mobile Advantage area as normal cellular phones. The PLMN and the Mobile Advantage authenticate mobile phone users by accessing an HLR connected to the Common Channel Signaling System Number 7 (SS7) Network. To access the HLR, Mobile Advantage is connected to the SS7 Network through a WOS (Wireless Office System) SS7 Gateway link.

The associated PLMN notifies Mobile Advantage when a user is roaming in the network. Mobiles entering or initializing in the system area notify Mobile Advantage with a Private System Identification (PSID). Only mobile phones defined to the Mobile Advantage system can function fully within a Mobile Advantage environment.

Mobile Advantage can be configured to accept and transfer emergency calls, such as E911 calls, from any mobile phone operating within the Mobile Advantage coverage area. The mobile phone making the emergency call must be compatible with TDMA-136 standard protocol and have ACELP speech capability.

Mobile Advantage Operations, Administration, and Maintenance (O&M) functions are performed through World Wide Web (WWW) or host connections. The O&M Client application allows Mobile Advantage System Administrators to receive operational information and administer the system remotely.

The major physical components of the Mobile Advantage system are as

follows:

- **Mobility Server**—The Mobility Server is a commercial server running Ericsson open and scalable software on the Windows NT 4.0 operating system. The Mobility Server connects to the Cellular Radio Exchange (CRE) for configuration and administration of the Radio Infrastructure (RI) and real-time tasks such as call switching.

The Mobility Server also provides the interfaces to the WOS SS7 Gateway and the Internet. The bearer for both interfaces is Transport Control Protocol/Internet Protocol (TCP/IP). The protocol to the SS7 network is ANSI-41 Rev D.

- **Cellular Radio Exchange (CRE)**—The CRE, directed by the Mobility Server, provides the physical interface between mobile phones in the system area and the external PSTN through PBX links. Connections between mobile phones operating in the system area are switched within Mobile Advantage without accessing external networks. Mobile Advantage supports the following PBX links:
 - T1 links to PBXs compatible with the Lucent Technologies 4ESS or 5ESS-2000 switch as specified in Lucent document 235-900-342.
 - T1 links compatibly with AT&T network-side Primary Rate Interface (PRI) as specified in (TR 41 459) protocol.
 - Links to PBXs (for example, the Ericsson MD110) using the QSIG protocol.
- **Radio Heads (RH)**—RHs connect to the CRE for communications with Mobile Advantage mobile phones. RHs are placed at positions within the Mobile Advantage area that provide maximum coverage and capacity. Using multiple redundant RHs in an area will increase call handling capabilities, as well as assuring continued call processing capabilities in the event of a single RH unit failure.
- **Scanners**—Scanners also connect to the CRE and provide frequency information for neighboring PLMN cells to Mobile Advantage. Information obtained by Scanners is used by the system to minimize interference from Mobile Advantage on PLMN frequencies.
- **Mobile Phones**—Mobile Advantage mobile phones are cellular or PCS phones that are compatible with TDMA-136 standard protocol and capable of ACELP speech encoding.

2.2 Mobile Advantage Mobile Phone User Features

Within the Mobile Advantage area, a registered user has access to the following features:

- **Personal Assistant (PA)**—Allows the user the capability to change the personal service profile. PA can be administered from any phone with voice menus or through a WWW interface. If PA is administered from a phone other than the user's phone, a Personal Identification Number (PIN) code must be entered.

- Follow Me—Allows the user to control the transfer of call service. Follow me consists of the following functions:
 - Follow Me Out—The user can select to receive or not to receive calls placed to the user's Direct In Dialing (DID) or DWOS User Number (DUN), after the user leaves the system area and enters the PLMN.
 - Follow Me In—The user can select to receive or not to receive calls placed to the user's Mobile Directory Number (MDN) after the user leaves the PLMN and enters the Mobile Advantage area.
- Call Screening—Allows the user to decide from whom to accept calls.
- Call Forwarding—Allows the user to forward incoming calls to other terminals. The forwarding destination is determined by the Mobile Advantage user's current active profile.
- Caller's Control—Allows the calling party to select a preferred answering treatment from either a terminal or voice mail system.
- Three-Party Call Service—Allows a user to access Inquiry, Refer Back, and Transfer features as follows:
 - Inquiry allows a user who is engaged in a two-party call to initiate a call to a third party.
 - Refer Back allows the controlling party engaged in a three-party call to switch between the active line and the held line.
 - Call Transfer allows the controlling party in a three-party call to transfer the call to the other users and disconnect.
- Call Waiting—Notifies the user engaged in a two-party call that there is an incoming call waiting. The user may do any of the following:
 - Disconnect the active call and accept the incoming call.
 - Place the active call on hold and accept the incoming call.
 - Ignore the incoming call. The incoming call will be forwarded to the answering treatment defined with the PA.
- Calling Line Presentation and Restriction—Allows the calling number to be presented to the user. If the calling party is a Mobile Advantage user calling a Mobile Advantage user within the system area, the DUN is presented. If the called party is outside the system area, the DID number is sent. Mobile Advantage can be configured to substitute a general number or restrict presentation of DID numbers.
- PBX Voice Mail—Allows calls to a user to be forwarded to the PBX voice mail system. Mobile Advantage users can also use the voice mailbox when roaming in the PLMN.

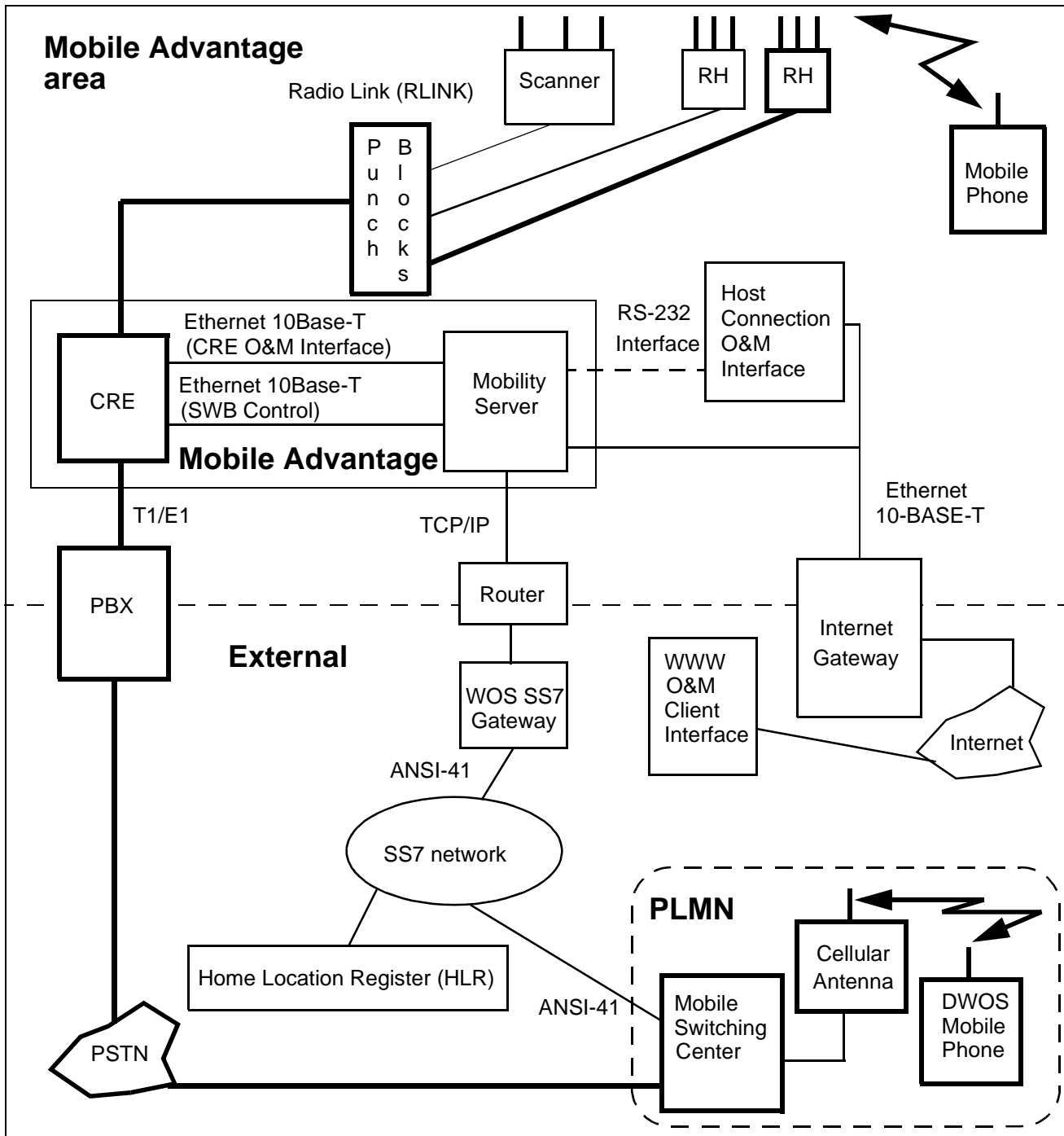
Note: It is recommended the PLMN mailbox not be active when using the Mobile Advantage PBX Voice Mail service.
- Message Waiting Indicator (MWI)—Allows users of the PBX Voice Mail system to be notified with a visual message waiting indicator.

- **Common Answering Position**—Allows the Mobile Advantage Administrator to define a common answering position destination to forward all calls when a user is not available. The destination could be a voice mail box or other service.
- **Short Message Service (SMS)**—Allows users in the Mobile Advantage area to receive SMS messages delivered from the PLMN.
- **Common Abbreviated Dialing**—Allows the Mobile Advantage Administrator to define a set of abbreviated numbers for all users.
- **DTMF Generation**—Allows users to generate Dual Tone Multi-Frequency (DTMF) tones when calling.
- **Concurrent Ringing**—Allows simultaneous ringing of a user's PBX extension and mobile phone when a call is received within the Mobile Advantage area.

2.3 Mobile Advantage Connections

Operations and Maintenance (O&M) of the Mobile Advantage system can be accomplished through Internet, Intranet, or local host connections. Figure 1 illustrates Mobile Advantage O&M and speech path connections. The PBX, WOS SS7 Gateway, and Internet Gateway are connections to external networks, not components of Mobile Advantage. The external networks, represented below the dotted line, are shown for clarity. The bold line indicates the speech path of a call placed by a mobile phone user within the Mobile Advantage area to a user roaming in the PLMN.

Figure 1 Mobile Advantage



2.4 Mobile Advantage Unit Descriptions

2.4.1 Mobility Server

The Mobility Server is based upon a Pentium processor system with redundant drives, fans and power supplies. A four-port Network Interface Card (NIC), two serial ports, and an optional internal modem provide external access and communications. The Mobility Server performs call control, service control, and O&M functions in the Mobile Advantage system.

The Mobility Server is powered by redundant -48 Vdc power supplies. Indications of loss of a single power supply, fan module, or hard drive, and other failures are propagated to the Mobile Advantage Alarm Log and can be configured to signal audibly.

The following redundant Mobility Server units can be hot swapped, which means the Mobility Server does not have to be powered off to replace the units:

- Hard drives
- Power supplies
- Fans

The following Mobility Server host interfaces can also be replaced without powering off the Mobility Server:

- Keyboard
- Monitor
- Mouse

2.4.1.1 Mobility Server connections

The Mobility Server connects to the CRE with two Ethernet interfaces. The following cables are supplied with the system:

- A reverse CAT 5 cable with RJ-45 connectors is the physical link from a Mobility Server NIC port to the RLU board in slot three of the main cabinet.

Note: A reverse CAT 5 cable is designed as a direct link between Ethernet nodes. With a reverse CAT5 cable the receive (RXD) and transmit (TXD) wire pairs are swapped.

- A reverse CAT 5 cable with RJ-45 connectors is also the physical link from a Mobility Server NIC port to the SwitchBoard (SWB) in slots 10 and 11 of the main cabinet.

The Mobility Server supports the following external connections:

- A link to the WOS SS7 Gateway to access HLRs in the PLMN network—The physical interface is standard CAT 5 cable between a Mobility Server NIC port and a gateway in the SS7 network.

- A link to the Internet or Intranet for O&M services— The physical interface is a CAT 5 cable between a Mobility Server NIC port and the Internet gateway.

2.4.2 Cellular Radio Exchange (CRE)

The Mobile Advantage CRE consists of a main cabinet or a main and one auxiliary cabinet. The cabinets are identical and have 11 physical board slots each. A CRE main and one auxiliary cabinet are required to support the maximum simultaneous call capacity. In two-cabinet configurations, the cabinets are interconnected with a ribbon cable between the backplanes. Figure 2 is an example of a CRE main cabinet configuration.

2.4.2.1 CRE Connections

The CRE is connected to the Mobility Server with the two reverse CAT 5 Ethernet 10Base-T cables with RJ-45 connectors, supplied with the system. The cables connect to the RLU board in slot three and the SWB in slots 10 and 11 of the main cabinet.

Note: A reverse CAT 5 cable is designed as a direct link between Ethernet nodes. With a reverse CAT5 cable the receive (RXD) and transmit (TXD) wire pairs are swapped.

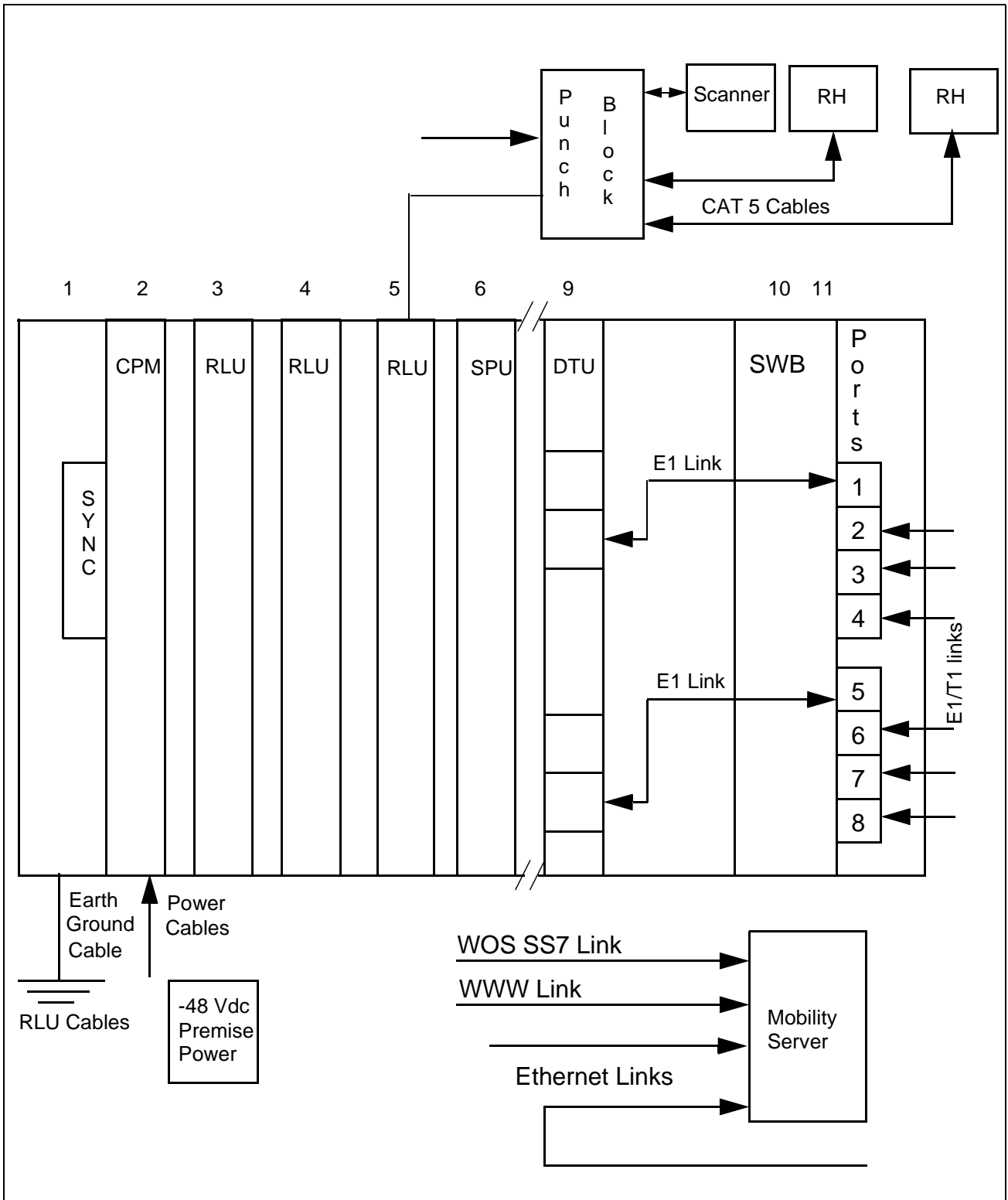
Two internal E1 links connect the SWB to the Digital Traffic Unit (DTU) board in the CRE. The SWB also has connections for a maximum of six external E1 or T1 links to PBXs, Voice Mail, or other systems.

Two RLU telephony cables connect from all RLU boards to punch blocks. CAT 5 cables connect from the punch blocks to the RHs and Scanners.

Note: Do not connect any RLU cables to the RLU board in slot three of the main cabinet. The RLU board in slot three of the main cabinet does not support links to the RHs or Scanners.

The CRE cabinets are individually powered by a -48 Vdc power source. Power is supplied by cables connected to the CRE Power Module (CPM) boards located in slot two of both the main and auxiliary cabinets. The CRE cabinets are also connected to Protective Earth (PE) ground by cables.

Figure 2 CRE Main Cabinet Example



2.4.2.2 CRE Component Descriptions

The component descriptions and slot assignments of the boards in the CRE main and auxiliary cabinets are as follows:

- The CRE backplanes have 11 connecting slots that route signal and power busses to the boards. A ribbon cable connects the backplanes together in two-cabinet installations.
- The Synchronization (SYNC) board is inserted into slot one of the main cabinet. The SYNC board provides system timing to all CRE boards except the SWB. Only the CRE main cabinet requires the SYNC board.
- The CRE Power Module (CPM) boards, located in slot two in both the main and auxiliary cabinets, provide the power to all of the boards in each cabinet. The CPM and SYNC boards have the component side facing left when viewed from the front; all other boards have the component side facing right. The CPM boards convert the -48 Vdc local power input to +5 Vdc and +3 Vdc outputs to the power bus on the backplanes. The CPM boards also supply -48 Vdc to the SWB, SYNC board, and all Radio Link Unit (RLU) boards, except the RLU board in slot three.
- Radio Link Unit (RLU) boards receive clock signals from the backplane and provide clock signal synchronization and data transfer to the Radio Heads (RH) and Scanners. RLUs perform pre-processing of Radio Network Control (RNC) measurements and TDMA-136 formatting.

Each RLU can be connected to a maximum of eight RHs or Scanners. A CRE can be configured with a maximum of four RLUs to support a total of 32 RHs or Scanners. RLUs supply remote power through CAT 5 cables to RHs mounted less than 800 meters (2640 feet) from the CRE. RLUs also provide remote power to Scanners located less than 1200 meters (3960 feet) from the CRE.

- The RLU board, located in slot three of the main cabinet, functions as a central processor, providing Call Control, Radio Network Control, and O&M configuration to the CRE.

Note: Do not attach RLU cables to the connectors of an RLU board when it is inserted in slot three of the main cabinet.

- The Signal Processing Unit (SPU) board performs the Digital Control Channel Handler (DCCH) functions and Digital Traffic Control (DTC) handler functions. The DTC handler establishes and maintains traffic channels. A single SPU can process seven simultaneous calls. Additional SPUs can process eight simultaneous calls each. Using multiple SPU boards provides a pool of time slot handlers that are dynamically allocated to calls in progress. SPU boards also provide the following features:
 - Channel coding and decoding
 - Speech coding and decoding
 - Echo canceling

- The Digital Trunk Unit (DTU) board, in slot nine of the main cabinet, interfaces with two E1 links to the SWB board and decodes the speech and data busses. The two E1 links provide 60 full-duplex voice channels.
- The SWB, in slots 10 and 11 of the main cabinet, connects Mobile Advantage to the local PBX and performs call switching. Up to six links are configurable between the SWB and the PBX. The physical interfaces between the SWB and the PBX are twisted pair, 120 ohm (E1) or 100 ohm (T1) balanced cables.

2.4.3 Radio Heads (RH)

Ericsson recommends vertical mounting of RHs on internal walls in the Mobile Advantage coverage area. Each RH provides five transceivers for air interface communications with mobile phones using the TDMA-136 protocol. In a typical office environment, an RH has a typical coverage radius of 40 meters (132 feet).

RHs are connected with CAT 5 cables through punch blocks to RLU boards in the CRE. RHs receive control, data, and power through the RLU boards if located less than 800 meters (2640 feet) from the CRE. RHs with longer cable runs (up to 1600 meters or 5280 feet) from the CRE, must be provided with a 115 Vac to 24 Vdc power converter.

2.4.4 Scanners

Scanners connect to RLU boards in the CRE and provide neighboring cell PLMN frequency usage information to Mobile Advantage. Information from the Scanners is used by Mobile Advantage to minimize interference on Mobile Advantage and PLMN frequencies.

Scanners are connected with CAT 5 cables through punch blocks to RLU boards in the CRE. Scanners receive control, data, and power through the RLU boards if located less than 1200 meters (3960 feet) from the CRE. Scanners with longer cable runs (up to 1600 meters or 5280 feet) from the CRE must be provided with a 115 Vac to 24 Vdc power converter.

2.4.5 Mobile Advantage Mobile Phones

Mobile Advantage mobile phones are cellular or PCS phones that are compatible with TDMA-136 standard protocol and capable of ACELP speech encoding. Generic instructions for programming the mobile phones to function within the Mobile Advantage environment is provided in this section. More specific information about compatible products can be obtained on-line on the Ericsson WEB page.

Writer's Note: This document will contain generic specifications for the TDMA-136 mobile phones as well as a generic description of how to program a phone for use in DWOS. In the HTML version, there should be a link to the Ericsson WEB site that contains more specific information.

3 Site Planning

Site planning evaluates the capacity needs of the Mobile Advantage system and optimum placement of the components. The Mobile Advantage coverage area is considered to be one cell.

In the planning phase the customer must complete a Site Planning Checklist provided by Ericsson. Alternately, the customer can order a Site Survey to be performed by Ericsson trained personnel to fulfill the following site planning requirements:

- Determine the amount, location, and power requirements of the Mobility Server, the CRE cabinets, Radio Heads, and Scanners.
- Define the external links and protocols required for Mobile Advantage to communicate with the Private Telephone Network (PTN), the Internet, and the Public Land Mobile Network (PLMN).
- Specify all cabling requirements within and external to the Mobile Advantage system. List what components are supplied with the Mobile Advantage system and what components are to be purchased locally.
- List any environmental requirements, distance limitations, and capacity determinations.

3.1 Site Capacity and Reliability

The maximum physical coverage area and simultaneous call capacity requirements determine unit configuration. A fully configured system can process a maximum of 60 simultaneous calls.

Mobile Advantage can process 45 Erlang traffic at a Grade of Service (GOS) of 0.5 percent. A GOS refers to the percentage of calls that could be blocked during maximum traffic times. For example, at a GOS of 0.5 percent, Mobile Advantage can process calls for up to 448 users if traffic for each user is approximately 100 mErlang.

When estimating the maximum capacity in call processing of a Mobile Advantage site, allowances should be made for redundant capacity. For example, the call processing capabilities of SPU boards are added together in the CRE to provide a pool of processing resources. When determining the number of required SPU boards, allowing for extra capacity will, in the event of an SPU board failure, maintain the GOS.

Estimated internal and external traffic requirements will determine the required number of physical links from the CRE to PBXs or other units.

3.2 Mobility Server Planning

The Mobility Server component in Mobile Advantage is specified by Ericsson to support all possible configurations of the system. Site planning for the Mobility Server consists of estimating the power requirements and connections to Mobile Advantage components and external links. All TCP/IP connections information, including IP addresses of the connecting ports, must

be entered in the Site Planning Checklist for use in the Mobile Advantage installation and initialization phases.

The Mobility Server is powered by redundant -48 Vdc power supplies. The type and location of all power requirements must be predetermined during the site planning.

3.2.1 Mobility Server Connections

The following connection information is entered into the Site Planning Checklist during the Mobile Advantage site planning phase:

- To enable remote WWW O&M access to Mobile Advantage, a TCP/IP connection to the Internet on a local LAN, dedicated router, or communications server must be supplied.
- To access the HLR in the SS7 network, a connection must be supplied from the Mobility Server to a WOS SS7 Gateway Server. The protocol is ANSI-41 Rev D; the bearer is TCP/IP on Ethernet.
- Two Ethernet connections are required from the Mobility Server to the CRE main cabinet. Two reverse CAT 5 cables with RJ-45 connectors are supplied with the system. The Ethernet connections are from the Mobility Server to:
 - the RLU board inserted in slot three of the CRE main cabinet, and
 - the SWB inserted in slot 10 and extending over slot 11 of the main cabinet. The SWB board requires two slots spaces.

3.3 Cellular Radio Exchange (CRE) Planning

The CRE for Mobile Advantage is configured in one or two cabinets. The CRE auxiliary cabinet must be installed to the right of the CRE main cabinet. The quantity of cabinets required must be determined in the site planning phase.

Note: When installing single-cabinet systems allocate space to the right of the main cabinet for an expansion cabinet.

In Mobile Advantage a main and one auxiliary cabinet can support the maximum quantity of system boards (SPU and RLU). Site planning determines the optimum quantity of each board. Adding extra SPUs, RLUs, or RHs to Mobile Advantage can provide redundancy in coverage and processing capabilities in event of failure. The maximum number of Mobile Advantage CRE boards are as follows:

- Eight SPU boards—The first SPU board can process seven simultaneous calls. Each additional board can process eight calls except the eighth which can process five calls ($7+8+8+8+8+8+8+5 = 60$). Eight SPU boards provide a processing pool capable of handling a total of 60 simultaneous calls.
- Four RLU boards—Each RLU board can support a maximum of eight RHs. Each RH can process a maximum of 14 simultaneous calls.

Note: The amount of RLU boards configured will determine the amount of punch blocks required. Each RLU board is cabled to one punch block. Placement of the punch blocks is also determined during site planning.

3.3.1 CRE connections

The amount, type, and location of the CRE connections are determined in the site planning phase. The following information is considered when completing the Site Planning Checklist:

- Mobile Advantage supports a maximum of six external T1 or E1 trunk links between the SWB and PBXs.

Note: E1 or T1 cables, 15 meters (50 feet) in length, are supplied with the system for connections to equipment located in the same room as the CRE. The connectors of the cables supplied by Ericsson meet specific shielding requirements to comply with radiated emissions regulations. If the location of PBXs require extensions, they must be connected to the cables supplied by Ericsson, to meet requirements.

- Two standard RLU telephony cables are supplied for use between each configured RLU board and the punch blocks. Each punch block is connected to a maximum of eight RHs or Scanners with standard CAT 5 cables.

Note: When connecting the cables to RLU boards consider whether redundant RH coverage is necessary. When locating an RH near another RH, to provide for redundant coverage in an area, do not connect to the same RLU board. The failure of a single RLU would not cause loss of coverage if redundant RHs are connected to different boards.

- -48 Vdc power cables are supplied for each cabinet.
- A PE ground cable is supplied for each cabinet.
- Two Ethernet connections are required from the Mobility Server to the CRE main cabinet. Reverse CAT 5 cables with RJ-45 connectors are supplied with the system. The CAT 5 cables are connected from the Mobility Server to the following:
 - The RLU board located in slot three of the CRE main cabinet.
 - The SWB in the CRE main cabinet. The SWB is inserted in slot 10 and extends over slot 11 of the main cabinet.

3.4 RH Planning

The number of required Radio Heads is determined by analyzing physical site requirements and user location estimates. Estimating the location and number of RHs is determined using site floor plans. A method of determining the level of external radio interference is used. The level of radio interference measured

during site planning will effect the planned number of RHs, the RH transmitted power, and maximum mobile phone power. Higher external radio interference levels require more RHs.

The number of RHs must be sufficient to perform the following:

- Provide the necessary carrier to noise levels ratio
- Allow low enough transmitted power level to minimize interference to external systems
- Provide call completion without blocking for the estimated number of users in all areas. An RH can be mounted near another RH in areas where large concentrations of users are predicted or redundant coverage is needed.

3.4.1 Estimating Radio Coverage

The customer's desired radio coverage area must be understood before a system quotation can be provided. Radio coverage is provided by the strategic placement of Radio Heads and Scanners. The Mobile Advantage system can support up to 32 Radio Devices: RHs and Scanners. Coverage can be estimated using the following three methods, shown in order of increasing reliability.

1. Square footage estimate

The configuration provides an estimate of how many square feet a given number of Radio Heads will cover. Although it is possible to provide budgetary quotations from square footage alone, this is not recommended.

2. Floor plans

If provided with floor plans, Sales Engineering can formulate a more accurate estimate of how many Radio Heads and Scanners are required to cover a given facility. Quotations based solely upon floor plans must include a provision stating to the customer that the actual number of Radio heads required may vary (higher or lower). Ericsson will not guarantee coverage based solely upon floor plans. If a firm quotation is required, a Site Survey must be ordered from the Ericsson Service Group.

3. Site Survey

A Site Survey is the most accurate way to assess needed radio coverage. Using the TEMS™ radio Site Survey tool, an Ericsson-trained technician will walk through a customer's facility taking measurements to ensure the optimal placement of Radio Heads. A Site Survey will usually be employed in the later stages of the sales process but prior to making any contractual agreements.

3.4.2 RH Connections

RHs are connected by solid wire CAT 5 cables to designated pins on the punch blocks. For more information about RH cabling see "Appendix A—Cabling and Connectors", on page 58.

Note: Local RHs located less than 800 meters (2640 feet) from the CRE receive power from the RLU boards through the CAT 5 cables. RHs located 800 to 1600 meters (2640 to 5280 feet) from the CRE must have a 115 Vac outlet located nearby.

3.5 Scanner Planning

The number and location of required Scanners are determined by analyzing physical site requirements and macro cell interference studies. A minimum of two Scanners are required for each Mobile Advantage system.

3.5.1 Scanner Connections

Scanners are connected by solid wire CAT 5 cables to designated pins on the punch blocks. For more information about Scanner cabling see “Appendix A—Cabling and Connectors”, on page 58.

Note: Scanners located less than 1200 meters (3960 feet) from the CRE receive power from the RLU boards through the CAT 5 cables. Scanners located 1200 to 1600 meters (3960 to 5280 feet) from the CRE are powered by a 24 Vdc converter and must have a 115 Vac outlet located nearby.

4 Site Preparation

This section provides site preparation requirements for Mobile Advantage components.

Note: After following the procedures in Site Preparation go to Chapter 5, “Installation,” on page 27 followed by Chapter 6, “Integration and Test,” on page 36, to complete the Mobile Advantage installation.

4.1 Environmental Requirements

CRE cabinets are to be mounted on an indoor wall on a panel that is secured to wall studs. The premises must comply with the following prerequisites:

- The ambient air must be free of dust, smoke, gases and acid fumes.
- The temperature range where the CRE and Mobility Server are located must be between +5°C and +40°C and relative humidity may vary between 15% and 80%.
- The temperature range where the RHs and Scanners are located must be between 0°C and +55°C with a relative humidity of up to 100% non-condensing.

Note: Sensors within the RHs and Scanners monitor temperature levels and will shut down at elevated levels.

- The relationship between temperature and air humidity in the Mobile Advantage area must not cause condensation.
- The CRE should not be exposed to direct sunlight
- Cables should run into the CRE from below the cabinet to ensure sufficient air flow and space.

If batteries are in the room where Mobile Advantage components are located, they must be of such type that does not produce gases or acid fumes.

Note: Auxiliary cabinets must be installed to the right of the main cabinet (cabinet one). When installing a single-cabinet or a two-cabinet system, leave room to the right for adding expansion cabinets.

4.2 Power Requirements

The following power sources are required.

- The Mobility Server is powered with a -48 Vdc power source. The -48 Vdc power is supplied from the PBX battery regulated supply or from a separate Uninterruptible Power Source (UPS).
- The CRE must be supplied with -48Vdc from the PBX battery regulated supply or from a separate UPS.
- Each RH or Scanner requires a power source. RHs located less than 800 meters (2640 feet) from the CRE, receive power remotely from the RLU boards through the CAT 5 cables. Scanners located less than 1200 meters

(4356 feet) from the CRE, also receive power from the RLU boards. If RHs or Scanners cable distances are longer (up to 1600 meters or 5280 feet) they receive power from a 24 Vdc converter. A 115 Vac outlet must be located nearby to supply power to the converters, if used to power RHs or Scanners.

4.3 RH and Scanner Cable Installation

Before beginning the procedures in this section, print a copy of Chapter 11, “Appendix A—Cabling and Connectors,” on page 58, to use with all installation procedures.

Installing the cables and punch block wiring for the RHs and Scanners can be done before receiving the main Mobile Advantage units. The physical requirements of the Mobile Advantage area and the planned location of the RHs or Scanners from the site planning phase determine the best cable routing.

Note: Cables that are routed through ceilings or plenums must be rated for fire safety. The applicable cable plenum specifications are defined in NEC CMP and CSA PCC FT4/FT6.

4.3.1 Installing Cables From The CRE to RHs or Scanners

Perform the following steps to correctly install the RLU cables from the RLU boards to the punch blocks and CAT5 cables from the punch blocks:

1. Determine the number and location of the RHs, Scanners, punch blocks, and CRE cabinets from the site planning documents.
2. Install the required amount of punch blocks in the correct location. Punch blocks are usually installed on wall-mounted panels or racks.
3. Attach labels to the punch blocks to identify which functional RLU board (for example, RLU1 to RLU4) will be connected to the punch block.

Note: When cabling from the RLU boards to punch blocks, do not connect to the RLU board in slot three of the main cabinet. The RLU board in slot three functions as a central processor and is not connected to RHs or Scanners.

4. If the RLU to punch block cables supplied with the system are available, label and connect them to the designated punch blocks.

Note: The cable from the top telephony connector (DB-37) on each RLU board routes to the telephony connector on the top left side of the designated punch block. The cable from the bottom telephony connector on each RLU board routes to the connector on the bottom right side of the designated punch block.

5. Route the customer supplied CAT 5 cables from the positions of up to eight RHs or Scanners to the designated punch block.

Note: Redundant RHs covering the same area should not be connected to the same RLU board. Connecting redundant RHs to separate punch blocks and RLU boards allows for continuing coverage of an area in case of RLU board failure.

6. Attach identification labels to both ends of the designated CAT 5 cables indicating the connections (for example, RHx through RHy).
7. If the RHs or Scanners are installed, connect the RJ-45 connector ends of the CAT 5 cables.
8. At the punch blocks cut and prepare the CAT 5 cables installed in Step 7.
9. Using Table 10, “RLU CAT 5 Cables From Punch Block to RHs or Scanners Signals and Pins”, on page 63, connect the cut ends of the CAT 5 cables to the correct pins on the designated punch blocks.
10. End of procedure. Upon receipt of the remaining Mobile Advantage system units continue with Chapter 5, “Installation,” on page 27.

5 Installation

5.1 Dangers, Warnings, and Cautions

All cabinets must be grounded to Protective Earth (PE).

The CRE cabinets must be connected to PE according to local regulation and in compliance with IEC publication 364 (or HD 384) “Electrical installations of buildings”. See the diagram in Figure 9, Recommended CRE Power and Grounding, on page 59, for more information.

Work affecting PE or power sources must be inspected or carried out under supervision of an authorized licensed electrician. The following must be considered:

- The risk that a short circuit of a battery negative side to the ground of the building will destroy (burn off) the PE ground.
- The continuity of PE ground cannot be affected by work carried out on parts that do not concern the PE ground.
- The required PE marking symbols must be present on ground cable connections.

5.1.1 Protection against Electrostatic Discharge (ESD)

Mobile Advantage uses components that are sensitive to ESD. To avoid damage caused by ESD, service personnel should be grounded when handling equipment and boards.

To make sure that equipment and parts are well protected during shipment, special packaging materials are utilized. System boards will be shipped in anti-static bags.

5.1.1.1 ESD handling

Figure 3 Handling ESD boards



Observe the following rules when handling system boards and parts.

- Service personnel must ground themselves by using an ESD wrist strap when exchanging system boards. The CRE cabinets are equipped with ground connections, located on the front and back of the cabinet, for ESD straps.
- Keep system boards and other parts in ESD protective packaging until use.
- Do not stack a system board on another system board.
- When returning system boards or parts, use the recommended protective packaging.
- Never underestimate the damage potential of ESD. Be especially careful when temperatures are near freezing, humidity is low, or the temperature exceeds the recommended environmental limits in this manual.

5.2 Installing RHs or Scanners

Execute the following steps to install RHs and Scanners.

1. Place RHs or Scanners in the locations determined in the site planning phase. Use the mounting template provided with the system.
2. Connect power converters to the RHs or Scanners that are located to far from the CRE to receive remote power. RHs located less than 800 meters (2640 feet) from the CRE, receive power remotely from the RLU boards through the CAT 5 cables. Scanners located less than 1200 meters (4356 feet) from the CRE, also receive power from the RLU boards. If RHs or Scanners cable distances are longer (up to 1600 meters or 5280 feet) they receive power from a 24 Vdc converter. A 115 Vac outlet must be located nearby to supply power to the converters, if used to power RHs or Scanners.
3. Connect the CAT 5 cables from the punch blocks to the RHs or Scanners.
4. Verify labeling on all cables at the RJ-45 connector end and at the pinch blocks.

Note: The CAT 5 cables were installed in Chapter 4.3.1, “Installing Cables From The CRE to RHs or Scanners,” on page 25.

5. End of procedure. Do not apply power to the RHs or Scanners at this time. Go to Chapter 5.3, “Installing the Mobile Advantage Mobility Server,” on page 28.

5.3 Installing the Mobile Advantage Mobility Server

The Mobility Server is configured at the factory with all required Ericsson Mobile Advantage software and the Microsoft Windows NT™ operating system. All Licensing software is installed. Remote Access Software (RAS) is installed and configured to the serial interface port. A service laptop is required to interface with the Mobility Server.

1. Connect the Mobility Server to the required power source as shown in the Site Plan. Do not turn ON the Mobility Server at this time.
2. Connect the Mobility Server Network Interface Card (NIC) first Ethernet port to the LAN hub or Server that will provide access to the Internet (WWW).
3. Connect the Mobility Server NIC second Ethernet port to the LAN hub or server that will provide access to the WOS SS7 Gateway.
4. Connect the service laptop computer to the serial port.
5. Turn ON the laptop computer.
6. Turn ON the Mobility Server.
7. Observe the successful initialization of the Mobile Advantage software and NT 4.0 operating system with Service Pack 3. An image of the Mobility Server is mapped to the laptop through the RAS link.
8. Execute the installation wizard (ELWIZ) from the laptop computer. The Mobility Server will start the installation script.
9. Configure the Mobility Server browser and TCP/IP interface to access the Internet and the WOS SS7 Gateway.
Note: The configuration information is obtained from the Site Planning Checklist.
10. Restart the Mobility Server to implement the configuration changes.
11. Obtain the e-mail address assigned to the Mobility Server Administrator from the Site Planning Checklist.
Note: To obtain the Mobile Advantage license the target ID number and the e-mail address of the Mobility Server System Administrator must be sent to Ericsson.
12. Send the license information (target ID number + Administrator's e-mail address) to Ericsson. The license number will be returned for use in the Mobile Advantage initialization procedures.
13. Turn OFF power to the Mobility Server.
14. End of procedure. Go to Chapter 5.4, "Installing a Cellular Radio Exchange (CRE)," on page 29.

5.4 Installing a Cellular Radio Exchange (CRE)

Installing the CRE consists of mounting the cabinet or cabinets in the locations predetermined during the site planning, and attaching all power, ground, and communication cables. This section describes separate procedures for the following CRE installations:

- Installing a single-cabinet (Main) Wall-Mounted CRE go to Section 5.4.1 on page 30.

- Installing a Two-Cabinet (Main and Auxiliary) Wall-Mounted CRE go to Section 5.4.2 on page 32.

When performing the following procedures, use a printed copy of Chapter 11, “Appendix A—Cabling and Connectors,” on page 58 of this manual.

Note: CRE auxiliary cabinets provide only expansion space for additional RLU and Signal Processing Unit (SPU) boards. An auxiliary cabinet requires only cabling for power, PE grounding, and any configured RLU boards.

5.4.1 Installing a single-cabinet (main) Wall-Mounted CRE

Perform the following procedure to install a single CRE main cabinet in the position determined during the site planning . When positioning the cabinet vertically take into consideration that the normal working height above the floor is about 1.30 meters (4.5 feet) from the lower edge of the cabinet.

1. Unpack the CRE main cabinet and observe any indications of damage in shipping. If damage is observed contact Ericsson or the supplier.
2. Inspect the shipping container contents and compare the shipping material lists. Separate cables by part number.
3. Mount a panel secured to the building wall studs to attach the CRE cabinets. To locate wall studs use a commercial stud finder.

Note: The combined weight of the CRE cabinets and boards, defined in Table 15, “CRE Cabinet Specifications”, on page 77, require mounting on panels or racks that are secured to wall studs.

4. Obtain the CRE Cabinet mounting template that was shipped with the system.
5. On the mounting panel, tape the template in place and, using a punch, mark the location of the four screw holes that will be used to mount the main cabinet.
6. Remove the template.
7. Insert two mounting screws, supplied with the cabinet, in the top two marked positions. Leave a space of one-quarter inch between the wall and screw heads to allow the slots in the cabinet case to slip over the screws when mounting.
8. Mount the main cabinet in position by setting the large slotted holes in the back case over the top mounting screws and slowly lowering until the screws slip into the slots.
9. Remove the front cabinet cover.
10. Remove the bottom cabinet cover.
11. Insert the two lower screws and tighten all four cabinet mounting screws.
12. Place the edge of the template against the right side of the main cabinet and tape in place. For future additions to the system, mark the holes to mount an expansion cabinet.

13. Remove the template.
14. Connect the main cabinet case to Protective Earth (PE) as shown in Figure 9, Recommended CRE Power and Grounding, on page 59, using the ground cable provided with the system.
15. Put on an ESD wrist strap and attach it to the ground wire braid on the front of the main cabinet.
16. Connect the RJ-45 connector of a reverse CAT 5 cable, supplied with the system, to the Ethernet connector on the RLU board inserted in slot three of the main cabinet.

Note: The RLU board in slot three of the main cabinet functions as a central processor. The Ethernet connection is the Mobility Server interface link to the CRE.

17. Connect the RJ-45 connector on the other end of the cable installed in Step 16. to the Mobility Server NIC Ethernet third port.
18. Connect the RJ-45 connector of a reverse CAT 5 cable, supplied with the system, to the Ethernet connector on the SWB in slots 10 and 11 of the CRE.
19. Connect the other end of the CAT 5 cable installed in Step 18. to the Mobility Server NIC fourth Ethernet port.
20. Connect an RLU cable from the top telephony connector (DB-37) on the front panel of the first available RLU board (not in slot three) of the main cabinet.
21. The other end of the cable is connected to the top left side connector of the punch block assigned to the RLU board. See Step 3. of the procedure in Chapter 4.3.1, “Installing Cables From The CRE to RHs or Scanners,” on page 25, for more information.
22. Connect an RLU cable from the bottom telephony connector (DB-37) of the RLU board referenced in Step 20.
23. Connect the other end of the RLU cable to the connector on the bottom right side of the designated punch block.
24. Repeat Step 20. through Step 23. for the remaining RLU boards in the CRE main cabinet.
25. Check the internal connections between the DTU board in slot nine and the SWB. The SWB is inserted in slot 10; the PCM ports extend over slot 11 of the main cabinet. The two short E1 links are installed at the factory. The E1 cable from the top PCM connector on the DTU board connects to PCM port one on the SWB. The cable from the bottom PCM connector on the DTU board connects to PCM port five on the SWB.

Note: The PCM ports on the SWB are numbered one through eight starting from the top.

26. Connect the T1 or E1 cables that are going to the PBX, to external T1/E1 PCM ports on the SWB. When using T1 PBX links connect to PCM ports two and six first. For information about T1 or E1 connections see

Table 12, “SWB T1 Signal Names and Pin Numbers” or Table 13, “SWB E1 Signal Names and Pin Numbers”.

27. Connect the -48 Vdc power source cables to the power connector on the front of the CPM board in slot two of the main cabinet. Use Table 7, “Power and PE Ground Cables” for connection information. Do not turn ON power to the CRE at this time.
28. Remove the ESD wrist strap.
29. Replace the cabinet bottom and front covers.
30. End of procedure. Go to Chapter 6, “Integration and Test,” on page 36, to complete initialization of the Mobile Advantage system.

5.4.2 Installing a two-cabinet (Main and Auxiliary) Wall-Mounted CRE

Perform the following procedure to install the two CRE cabinets in the positions determined during the site planning. When positioning the cabinets take into consideration that the normal working height above the floor is about 1.30 meters (4.5 feet) from the lower edge of the cabinet.

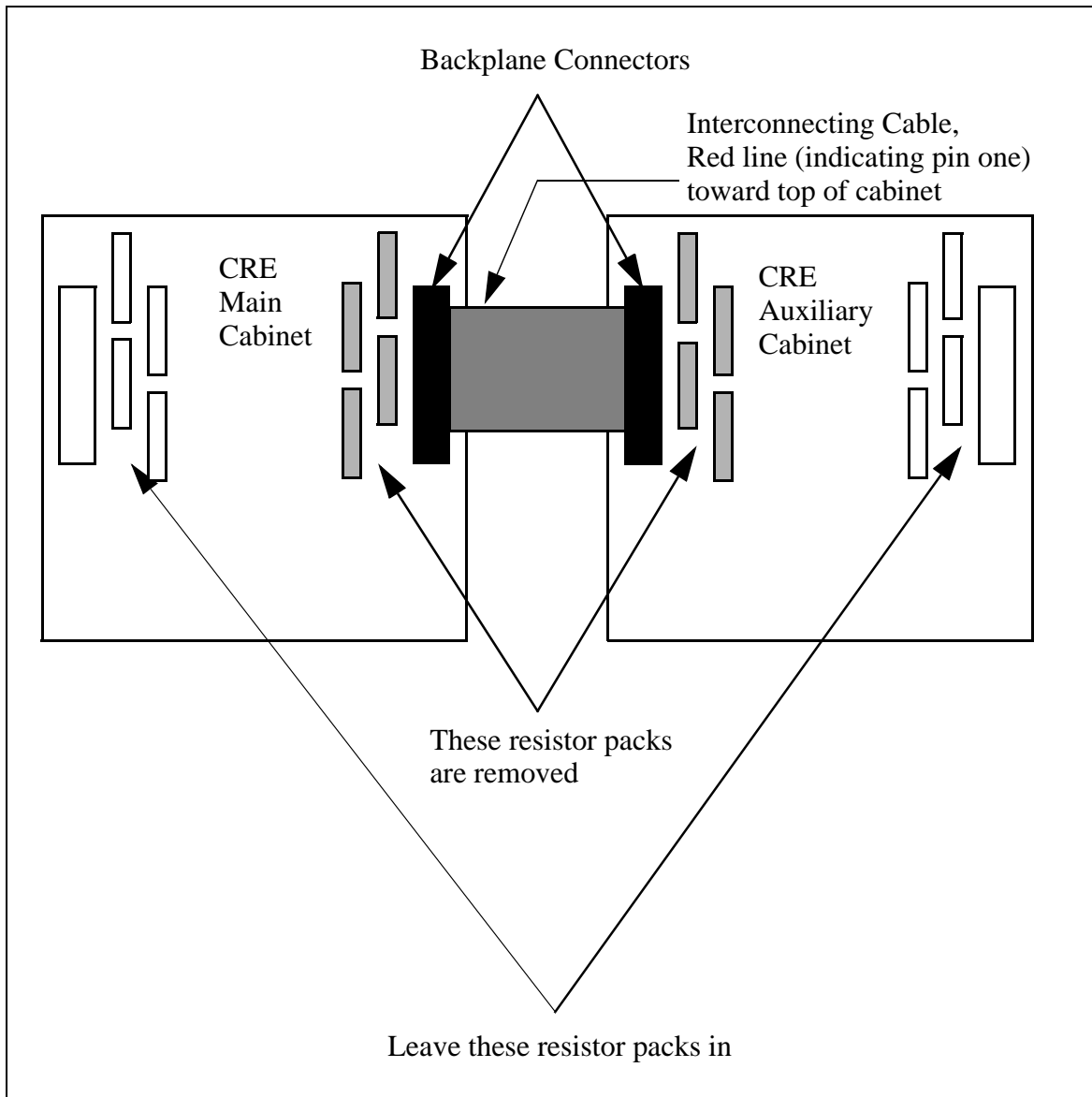
1. Unpack the cabinets and observe any indications of damage in shipping. If damage is observed contact Ericsson or the supplier.
2. Inspect the shipping containers contents and compare the shipping material lists. Separate cables by part number.
3. Mount a panel secured to the building wall studs to attach the CRE cabinets. To locate wall studs use a commercial stud finder

Note: The combined weight of the CRE cabinets and boards, defined in Table 15, “CRE Cabinet Specifications”, on page 77, require mounting on panels or racks that are secured to wall studs.

4. Obtain the CRE Cabinet mounting template that was shipped with the system.
5. On the mounting panel, tape the template in place and, using a punch, mark the location of the four screw holes that will be used to mount the main cabinet.
6. Remove the template.
7. Insert two mounting screws, supplied with the cabinet, in the top two marked positions. Leave a space of one-quarter inch between the wall and screw heads to allow the slots in the cabinet case to slip over the screws when mounting.
8. Mount the main cabinet in position by setting the large slotted holes in the back case over the top mounting screws and slowly lowering until the screws slip into the slots.
9. Remove the main cabinet front cover.
10. Remove the main cabinet bottom cover.

11. Insert the two bottom screws in the main cabinet back case and tighten all four cabinet mounting screws.
12. Place the edge of the template against the right side of the main cabinet and tape in place. Mark the holes to mount the auxiliary cabinet.
13. Insert two mounting screws, supplied with the cabinet, in the top two marked positions. Leave a space of one-quarter inch between the wall and screw heads to allow the slots in the cabinet case to slip over the screws when mounting.
14. Mount the auxiliary cabinet in position by setting the large slotted holes in the back case over the top mounting screws and slowly lowering until the screws slip into the slots.
15. Remove the auxiliary cabinet front cover.
16. Remove the auxiliary cabinet bottom cover.
17. Insert the two bottom screws in the auxiliary cabinet back case and tighten all four cabinet mounting screws.
18. Connect the cabinet cases to Protective Earth (PE) as shown in Figure 9, Recommended CRE Power and Grounding, on page 59, using the ground cable provided with the system.
19. Put on an ESD wrist strap and attach it to the ground wire braid on the front of the CRE main cabinet.
20. Remove the boards in slots ten and eleven of the main cabinet. Place boards individually into ESD protective bags. Do not stack boards.
21. Remove the board in slot two of the auxiliary cabinet. Place the board into the ESD protective bag. Do not stack boards.
22. Connect the backplane interconnecting ribbon cable, supplied with the system, to the designated backplane connectors in the main cabinet. Figure 4 illustrates the backplane cable connections.

Figure 4 CRE backplane interconnecting cables



23. Route the flat ribbon cable through the spring fingers surrounding the feed-through holes.
24. Connect the flat ribbon cable to the designated backplane connector in the auxiliary cabinet.
25. Replace the boards removed in Step 20. and Step 21.
26. Connect the RJ-45 connector of a reverse CAT 5 cable, supplied with the system, to the Ethernet connector on the RLU board inserted in slot three of the main CRE cabinet

Note: The RLU board in slot three of the main cabinet functions as a central processor. The connection is required for the Mobility Server interface link to the CRE.

27. Connect the RJ-45 connector on the other end of the cable installed in Step 26. to the Mobility Server NIC Ethernet third port.
28. Connect the RJ-45 connector of a reverse CAT 5 cable, supplied with the system, to the Ethernet connector on the SWB board inserted in slots 10 and 11 of the CRE main cabinet.
29. Connect the other end of the CAT 5 cable installed in Step 28. to the Mobility Server NIC fourth Ethernet port.
30. Connect an RLU cable from the top telephony connector (DB-37) on the front panel of the first available RLU board (not in slot three) of the main cabinet.
31. The other end of the cable is connected to the top left side connector of the punch block assigned to this RLU board. See Step 3. the procedure in Chapter 4.3.1, “Installing Cables From The CRE to RHs or Scanners,” on page 25
32. Connect an RLU cable from the bottom telephony connector on the front panel of the first available RLU board (not in slot three) of the CRE cabinet.
33. Connect the other end of the RLU cable to the connector on the bottom right side of the designated punch block.
34. Repeat Step 30. through Step 33. for the remaining RLU boards in both main and auxiliary cabinets.
35. Check the internal connections between the DTU board in slot nine and the SWB in the main cabinet. The SWB is inserted in slot 10; the PCM ports extend over slot 11 of the main cabinet. The two short E1 links are installed at the factory. The E1 cable from the top PCM connector on the DTU board connects to PCM port one on the SWB. The cable from the bottom PCM connector on the DTU board connects to PCM port five on the SWB.
Note: The PCM ports on the SWB are numbered one through eight starting from the top.
36. Connect the T1 or E1 cables that are going to the PBX, to external T1/E1 PCM ports on the SWB. When using T1 PBX links connect to PCM ports two and six first. For information about T1 or E1 connections see Table 12, “SWB T1 Signal Names and Pin Numbers” or Table 13, “SWB E1 Signal Names and Pin Numbers”.
37. Connect the -48 Vdc power source cables to the power connector on the front of the CPM board in slot two of both cabinets. Use Table 7, “Power and PE Ground Cables” for connection information. Do not turn ON power to the CRE at this time.
38. Remove the ESD wrist strap.
39. Replace the cabinet bottom and front covers.
40. End of procedure. Go to Chapter 6, “Integration and Test,” on page 36, to complete initialization of the Mobile Advantage system.

6 Integration and Test

Integration of the Mobile Advantage consists of configuring the system and allocating the frequencies to be used. After integration is complete the Mobile Advantage is initialized and can provide call services.

6.1 Integration

The integration phase follows the physical installation of Mobile Advantage and ends when all necessary configuration data is entered. The CRE IP address must be set before O&M tasks can be executed. Configuration data that is not pre-defined is manually entered by the O&M user.

Configuration data entered by the O&M User is divided into the following categories:

- Security Data—User Identification, Password, and Access Level
- Radio Network Data—Radio network frequencies and control parameters
Note: Some parameters cannot be changed by the user, but are only accessible in a configuration file which is managed by the system.
- Call Control Data—PBX Prefix and External Line Prefix
- Network Data—Trunk Line, Routes, and Interface Protocol Timers
- Subscriber Data—Subscriber name, Mobile Identification Number (MIN), DWOS User Number, and Service Profile.
Note: For more information about configuring Mobile Advantage see Chapter 8, “Operations, Administration and Maintenance (O&M),” on page 42.

6.1.1 Initial frequency selection

The initial frequencies allocated to Mobile Advantage are determined by the cellular operator. For site planning Ericsson provides a Site Survey service to identify the best initial frequencies. During normal operation automatic frequency allocation software determines the optimum frequency usage with Scanners.

6.1.2 Mobile Advantage Initialization

The Mobile Advantage system is initialized by executing the following steps:

1. Turn ON the Mobility Server.
2. Obtain the CRE IP addresses and Bootfile name from the Site Planning Checklist.

Note: Configure the fixed SWB IP interface address (IP=172.16.2.50 Subnet Mask=255.255.0.0). The IP address of the RLU board in slot three of the main cabinet is automatically configured when the CRE is turned on if the Mobility Server NIC port is connected.

3. Turn ON power to the CRE. The Mobility Server indicates the CRE status is UP and transfers the Bootfile information.

Note: For information about using other O&M functions after Mobile Advantage is started see Chapter 8, “Operations, Administration and Maintenance (O&M),” on page 42.

4. If there are RHs or Scanners located too far from the CRE to use its power, then the 115 Vac which operates the power converters must be on for those units.

6.1.3 The ANSI-41 Link to the HLR

To access the HLR, Mobile Advantage connects through a WOS SS7 Gateway to the SS7 network. The ANSI-41 link provides administrative and messaging between the Mobility Server and the WOS SS7 Gateway.

Administrative messages include heartbeat and initial configuration messages. Heartbeat messages indicate the state of connections between the Mobility Server and the ANSI-41 system. After configuration is complete the Mobility Server can generate and respond to heartbeat messages.

The Mobility Server configuration message is received from the WOS SS7 Gateway system after initial establishment of the TCP/IP connection. The Mobility Server is a client node to the WOS SS7 Gateway system and has to send the initial connect() message to establish connection.

6.1.3.1 Setting the ANSI-41 TCP/IP Interface

Obtain the WOS SS7 Gateway IP addresses from the Site Planning Checklist. At the selection of ANSI-41 in the “Hardware Resources” service area of the Management System interface, enter the following data:

- The identity or name of the link
- The primary and secondary IP addresses and port numbers of the WOS SS7 Gateway.
- The number of heartbeat failures before the interface between the Mobility Server and the WOS SS7 Gateway is closed.
- The heartbeat time out interval in seconds.
- The link protocol (ANSI-41)

6.2 Post-Installation test

Writer’s Note: This section is to be expanded by TAC.

Post-installation testing of a newly-installed Mobile Advantage system is completed when Mobile Advantage subscribers can originate and receive calls.

7 Numbering Plans

Mobile Advantage provides one-number access to all users whether they are in the system area or roaming in the PLMN. The 10-digit Direct In Dialing (DID) number can access a Mobile Advantage user whether in the system area or roaming in the PLMN. While in the system area, calling users can connect to other users with a four or five-digit DWOS User Number (DUN), a subset of the DID number. When Mobile Advantage mobile phone users in the system area call external numbers the Calling Line Identification Presentation (CLIP) to the called party is the DID number, unless an alternative number is defined.

Administration and billing for Mobile Advantage users is simplified by the one-number access capabilities. The Mobile Advantage and associated PLMN determine system costs; the user is not billed for calls originated from or destined to Mobile Advantage numbers. Although a Mobile Directory Number (MDN) is assigned by the PLMN to all Mobile Advantage phones, it is not recommended for typical usage. Calls originated or destined for MDN numbers are billed directly to the user.

The Mobile Advantage numbering plan uses the following:

- **PBX Extensions**—The PBX extension number defines a physical extension of a Mobile Advantage mobile phone. A PBX Extension number can only be used by subscribers connected to the PBX or Mobile Advantage users while in the system coverage area.
- **DWOS User Numbers (DUN)**—The DWOS User Number defines only Mobile Advantage mobile phones. A DUN is used by subscribers connected to the PBX or within the Mobile Advantage coverage area to call other Mobile Advantage users.
- **PBX Prefix**—The PBX Prefix is the office code of the PBX in the PSTN. The PBX prefix is added to the DUN to make a seven-digit directory number.
- **Numbering Plan Area Code (NPA)**—The NPA identifies the calling code of an area of the country. To make a national call, the NPA Code is added to the seven-digit directory number.
- **Direct In Dialing (DID)**—The DID number is composed of the NPA+PBX Prefix+DUN numbers (for example 919 555 1212). The DID is presented as the CLIP when a Mobile Advantage user calls out of the system area.
- **Country Code (CC)**—The CC identifies the calling code of a country. To make an international call, the CC is added to the ten digit DID.
- **External Line Prefix**—Some PBX systems require dialing a number to access the external networks. For example, dialing a 9 to get an outside line.

7.1 Examples of number usage

In the following examples the features; Follow Me In/Out and Calling Line Identification Presentation (CLIP), of the calling and called phones are active. The following examples describe Mobile Advantage number usage:

- A Mobile Advantage user in the system area calls another Mobile Advantage user's four or five-digit DWOS User Number (DUN). Mobile Advantage then does one of the following:
 - If the called user is also in the system area, Mobile Advantage locates the called mobile phone, completes the call connection, and presents a CLIP consisting of the caller's DUN to the called party.
 - If the called user is not in the system area, Mobile Advantage interrogates the PLMN for the roaming routing number and Temporary Local Directory Number (TLDN) to the called mobile phone. The TLDN is temporarily allocated by a Mobile Services Switching Center (MSC) for call setup and is used to route the call through the PSTN or PLMN networks. Mobile Advantage locates the called mobile phone, completes the call, and presents a CLIP consisting of the caller's Direct In Dialing (DID) number to the called party.
- A Mobile Advantage user not in the system area calls another Mobile Advantage user's DID number. The call is routed through the PLMN and PSTN to Mobile Advantage. Mobile Advantage then does one of the following:
 - If the called user is in the system area, Mobile Advantage locates the called mobile phone, completes the call connection, and presents a CLIP consisting of the caller's DUN to the called party.
 - If the called user is roaming in the PLMN, Mobile Advantage interrogates the PLMN for the roaming routing number and TLDN to the called mobile phone. Mobile Advantage locates the called mobile phone, completes the call, and presents a CLIP consisting of the caller's DID to the called party.
- When a non-Mobile Advantage phone calls a Mobile Advantage user's DID number, the system does one of the following:
 - If the called user is in the system area, Mobile Advantage locates the mobile phone, completes the call connection, and presents a CLIP consisting of the caller's DID number to the called party.
 - If the called user is roaming in the PLMN, Mobile Advantage interrogates the PLMN for the roaming routing number and TLDN to the called Mobile Advantage User. Mobile Advantage locates the called mobile phone, completes the call, and presents a CLIP consisting of the caller's DID to the called party.
- When a Mobile Advantage user in the system area calls an external number the call is connected through the PBX to the PSTN. After call setup, Mobile Advantage sends a CLIP consisting of the caller's DID to the called party.

- When Mobile Advantage mobile phone users are not in the system area, calls to external numbers are routed through the PLMN and billed as normal cellular calls to the user.

The following numbers codes and definitions are used in the examples shown in table 1:

- PBX Prefix: 472
- External Line Prefix: 9
- Numbering Plan Area Code: 919
- Long Distance Code: 1
- User one: a Mobile Advantage mobile phone user with DUN 6600
- User two: a Mobile Advantage mobile phone user with DUN 6601
- User three: a fixed external user with PSTN number 919 456 3434

Note: The PBX to which Mobile Advantage connects must have a Private Number Plan which includes the DWOS User Numbers. The PBX must accept PBX extensions as Called Party IDs from Mobile Advantage.

Table 1 Mobile Advantage call digits example

From	To	Called user two number while in Mobile Advantage area	CLIP from calling user, when user two is in Mobile Advantage area	Called user two number while not in Mobile Advantage area	CLIP from calling user, when user two is not in Mobile Advantage area
User one (6600) calling from inside Mobile Advantage area		6601	6600	6601	919 472 6600
User one (6600) calling from outside Mobile Advantage area		1 919 472 6601	6600	1 919 472 6601	919 472 6600
User three (919 456 3434) external		1 919 472 6601	919 456 3434	1 919 472 6601	919 456 3434

8 Operations, Administration and Maintenance (O&M)

8.1 Overview

Mobile Advantage O&M services are normally accessed using an Internet or Intranet interface to the integrated Management System. Mobile Advantage can also be accessed locally or through an optional dial-up connection. The Mobile Advantage O&M Client supports HyperText Transfer Protocol (HTTP) and Java applications.

Extensive documentation of O&M functions is available in context-sensitive help screens. This section contains general information about the O&M functions of Mobile Advantage. For detailed information about procedures and datafill use the context-sensitive help screens.

8.1.1 Configuration Management

Configurable data can be created, viewed, deleted and modified by accessing the different operations associated with each service area in the O&M interface. System Data for a number of parameters are needed before the CRE can be initialized. The different parameters are:

- CRE IP addresses
 - For the Ethernet link to the central processor board in slot three of the main cabinet.
 - For the Ethernet link to the SWB in slot 10 and 11 of the main cabinet.
- CRE hardware address
- Software boot file name, including the full path
- Mobility Server IP address
- WOS SS7 Gateway IP address and port (Optional secondary IP address and port)

8.2 O&M User Interface

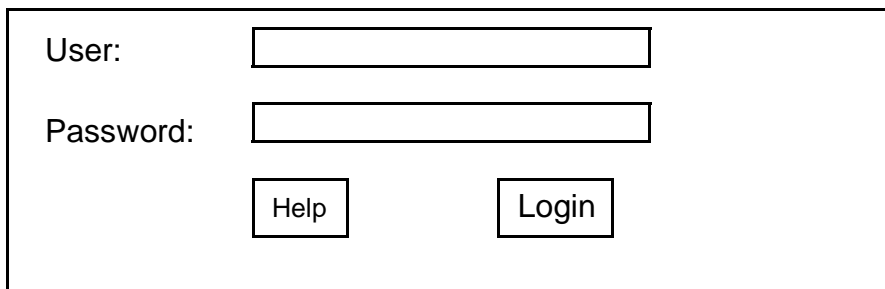
The O&M User enters and views Mobile Advantage management data through on-line forms. The forms are constructed with the HyperText Markup Language (HTML) and Java scripts.

8.2.1 User Login

Before the O&M User can perform any tasks in the Mobile Advantage system, they must be given an identification (ID) and password pair. The Mobile Advantage O&M password is the same as the Terminal User Interface (TUI) password. Passwords can be changed by the Administrator in the Security service area under the sub-menu "Client". An example of the Login

screen is shown in Figure 5.

Figure 5 Mobile Advantage login screen



The diagram shows a login screen with a rectangular border. On the left side, the text "User:" is positioned above a horizontal input field. Below this, the text "Password:" is positioned above another horizontal input field. At the bottom of the screen, there are two rectangular buttons: "Help" on the left and "Login" on the right.

Note: the Logout button is at the bottom of the service areas of the O&M interface screens. User's are automatically logged out after a predetermined period of inactivity.

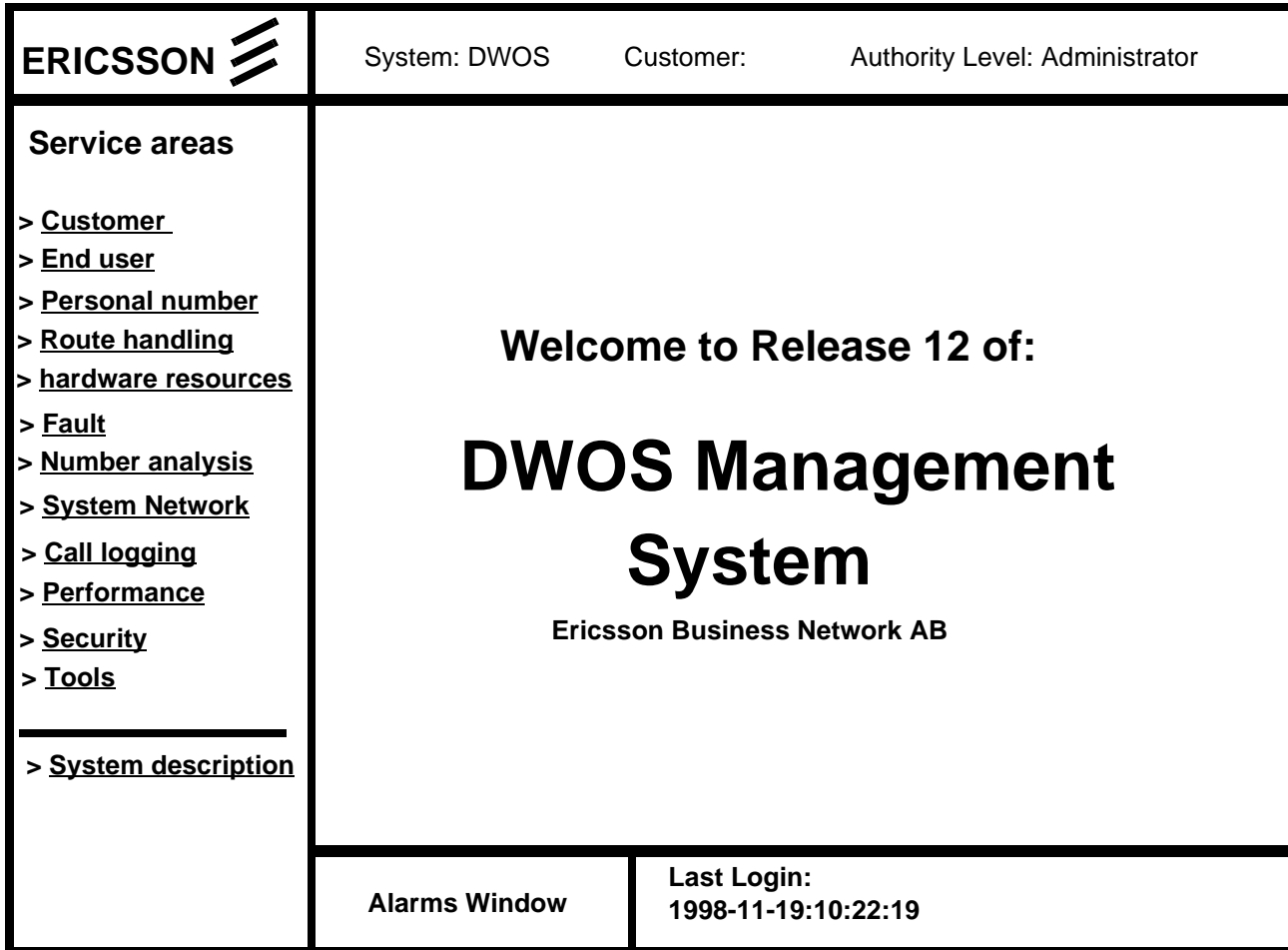
8.2.2 Examples of O&M interface screens

After Login, the Mobile Advantage O&M user is presented with the Mobile Advantage main system screen. The authority level that is presented at the top of the Mobile Advantage main screen displays the security level of the user. Depending on the authority level, users can access different service areas to execute management functions.

The service areas displayed on the left of the O&M screens provide access to sub-menus when selected. For general information, the service area selection "System description" accesses sub-menus that describes a system overview, a map of all managed functions, Mobility Server procedures, and information on using on-line help.

Figure 6, "Mobile Advantage Management System Main Screen", is an example of the Mobile Advantage O&M Client interface. In the service areas section the underlined selections are links to the O&M function areas. To navigate on-line, click the left mouse on the underlined text area. The arrow pointers indicate what area has been selected and also provide an easy method of returning to the previous selection.

Figure 6 Mobile Advantage Management System Main Screen



8.3 Description of Authorities

Operations are performed on physical or logical components in Mobile Advantage. These are identified as Managed Objects (MO). Mobile Advantage allows access to different MOs determined by the authority levels assigned to the user. The different types of users and their corresponding authorities are configurable. For access to the functions that control assignments of authorities and the MOs they can perform functions on, select the service area “Security”.

8.3.1 Access Rights

The following list of user types, each with a separate set of authorities, are defined as the default setup for Mobile Advantage:

- System Manufacturer—allows configuration of data, software, licenses, and initialization of complete Mobile Advantage systems. The System Manufacturer supports the Mobile Advantage Supplier and Operator in resolving engineering issues related to installation and operations.
- Wireless Operator—The Wireless Operator owns the frequencies used by Mobile Advantage. The Wireless Operator maintains the Mobile Advantage user information in the PLMN register. The Wireless Operator can also view and modify the frequencies and customer data in the Mobile Advantage system.
- System Supplier—The Mobile Advantage Supplier plans, delivers and installs Mobile Advantage. The Mobile Advantage Supplier provides the help desk function to the Mobile Advantage Operator for analysis of system faults and system upgrades.
- Operator—The Mobile Advantage Operator maintains the Mobile Advantage system. The Mobile Advantage Operator manages O&M functions such as fault and performance monitoring, configuration, security and accounting management.
- System Administrator—The Mobile Advantage Administrator manages a Mobile Advantage user register and can add or delete Mobile Advantage users or change user profiles.
- Group User—
- User—The Mobile Advantage user has a mobile phone that is subscribed to Mobile Advantage. The Mobile Advantage user can make and receive calls in the Mobile Advantage environment and change their personal profiles.

8.4 Service Areas

The O&M User specifies the different output criteria for operations. Different criteria are, for example, when call information reports should be generated, such as after every call, when call duration exceeds a predetermined time, specific to the calling number, or the dialled number.

In this section, explanations are given for the O&M Client service areas in the order they appear on screen. Examples of datafill for O&M forms are shown. The O&M functions are divided into the following service areas:

8.4.1 Customer

The Mobile Advantage system can provide service to more than one customer. In the Customer service area the following parameters are defined for each customer:

- Customer Name is a unique name of no more than 50 characters. For example, General_Hospital.
- Customer Number series contains sets of four or five-digit DWOS User Numbers (DUN), assigned to this customer. For example, to define the customer number series consisting of the numbers 845 1808 and 845

1809 as a four-digit DUN, the datafill in the field “From” is 1808 and field “To” is 1809. To define a five-digit DUN the datafill in field “From” is 51808 and “To” is 51809. To add other number series use the Modify submenu.

- Public Prefix field is the two or three-digit code prefacing the DUN series, to allow access to Mobile Advantage users from external networks. For example, a three-digit prefix (845) is added to the four-digit DUNs (1808 and 1809).
- Common Answering Position number is either a DUN, within the customer series, or a DID, to direct unanswered calls to.
- Personal Assistant (PA) is a DUN where the Mobile Advantage user can access the personal number settings. Mobile Advantage responds to all calls made to the PA with audio prompts explaining how to control features from a Dual-Tone Multifrequency (DTMF) phone.
- Default Voice Mail address is a DUN used to access the Mobile Advantage user’s voice mail services.
- The Initial Voice is picked from a list of options defining Mobile Advantage user greetings.
- Trunk Call Discrimination (TCD) is used to prevent users from originating calls to certain outgoing numbers.
- Traffic Matrix System (TMC) is similar to TCD, but applies only within the Mobile Advantage area.

8.4.2 End User

Mobile Advantage allows creation of profiles for a single user or a group of users in one operation. If a group of users are defined in one operation all users will have the same name and profile. Default profiles that were defined in the Customer Service area for users can be modified for each Mobile Advantage user. To alter profiles, including changing the user names or numbers use the Modify submenu.

In the End User service area a user’s access to Mobile Advantage can be locked or unlocked and a password set or changed. Mobile Advantage users can be created, modified, or deleted. When creating Mobile Advantage users, the following parameters are defined:

- End user number can be a single DUN (for defining one user), or a range of DUNs, that fall within the set of numbers previously defined for the customer’s use.
- End user name associates a Mobile Advantage user name to a DUN. If a range of DUNs were defined in End user number, all users in the group will have the same name until modified. Creating a group of Mobile Advantage users, then modifying names, results in a group of users with multiple numbers to have the same or similar profiles.
- Trunk Call Discrimination (TCD) is defined for a Mobile Advantage user only if different than the default TCD set in the Customer service area.

- Traffic Matrix Coordinates (TMC) is defined for a Mobile Advantage user only if different than the default TMC set in the Customer service area.
- ID presentation restriction, if set to YES, allows the identification of the DWOS User Number to be presented to the called party. The number presented may be a DID or DUN determined by the Mobile Advantage user's physical location at the time of the call.
- Voice mail address is defined for a Mobile Advantage user only if different than the default Voice mail address set in the Customer service area. The voice mail address is the extension number to access the voice mail service.
- Voice Mail subaddress contains the DID of the voice mail service.
- Features provides a list of Mobile Advantage user features or combinations of features for the Mobile Advantage user to select from.

8.4.3 Personal Number services

Personal Number services allow Mobile Advantage users to control how incoming calls are handled. The Mobile Advantage user can define multiple profiles that determine the sequence of numbers to forward incoming calls, screening of numbers, and call control. An excellent description of personal number services is included in the Mobile Advantage on-line document "Personal Number User Web Guide". This guide is accessed from the Personal Number main screen.

8.4.4 Route Handling

The service area "Route Handling" provides route and trunk definition from lists of available resources and numbering plans. Routes can consist of multiple trunks for traffic loading and redundancy. Before creating routes or trunks physical links need to be created in the service area "Hardware Resources".

8.4.5 Hardware Resources

8.4.6 Fault Management

Fault management is covered in the section on "Troubleshooting", on page 50.

8.4.7 Number Analysis

8.4.8 System Network

8.4.9 Call Logging

The “Call Logging” service area provides an accounting management function which accumulates account information for all internal calls, incoming calls, and outgoing calls. Mobile Advantage generates a call information report for each completed call if the specified output criteria is met. The reports are stored in a file which can be postprocessed outside Mobile Advantage. Examples of call logging scenarios are available on-line by selecting the link “Call Logging Condition Code Guide” at the Call Logging main screen.

8.4.10 Performance

At the “Performance” service area, the available functions consists of measurements, event recording and statistical evaluations. Traffic statistics can be collected from the Mobility Server and the Radio Infrastructure (RI).

Mobility Server performance measurements can be made on extension numbers, routes, or call forwarding transfers. In the sub-menu selection “MobServer Measurements” the user can create, modify, browse, display, and delete performance reports.

RI Measurements includes data collection, and data storage. The data collection part is implemented in the CRE. Although the performance data files are controlled by the CRE the actual files are stored in the Mobility Server and are accessed by the CRE.

Configuration of Radio Network Recording parameters (for example thresholds) is done at the “Radio Network” selection and transferred to the CRE. A fault report is sent to the Mobility Server if a threshold is crossed. The fault will then be treated as an alarm in the Mobility Server. Creating, deleting, or modifying RI measurement reports is accomplished in the “Performance” service area selection, sub-menu “RI Measurements”.

8.4.11 Security

8.4.12 Tools

8.4.13 System Description

8.4.14 Security Management

Mobile Advantage security defines the authority layers of access to the system

and the rights of users to MOs. The Mobility Server can store and retrieve information on O&M user activities for analysis.

8.4.14.1 Storing of Audit Trail Data

In the service area under the “Security” selection the Security Log tracks User access sessions with Mobile Advantage. All logging that take place in Mobile Advantage is done on a first-in-first-out basis. That is, the logging is continuous and the oldest data is deleted when a file is full. The O&M User can define the size of the different log files.

9 Troubleshooting

9.1 General

Mobile Advantage system faults are reported to the Mobility Server. At the Mobile Advantage management interface screen the “Alarm Window” gives a visual indication of active alarms. Access the fault and event logs by clicking on the number displayed under the “Alarm Bell” indicator or by selecting the “Faults” service area.

Writer’s Note: also see Overview student guide page 28.

The Mobility Server treats hardware faults, exceptional software faults and crossing of performance thresholds as Alarm Reports. Software exceptions such as process restarts are treated as Event Reports. An alarm remains active until the fault has ceased, while an Event Report is information about something that has happened and can also be used for reporting software errors.

9.1.1 Start and restart

The CRE will always load a Bootfile from the Mobility Server at start and restart. The CRE sends updated information to the Mobility Server about the hardware when a restart occurs because the hardware configuration may have changed (boards added or removed).

The Mobility Server will clear all active alarms after a restart. Any faults that remain active after the restart will be reported as well as any new faults that are detected.

9.1.2 System Backup

A consistent and periodic backup strategy can decrease system recovery time. To order a backup of configuration data to the Mobility Server hard drive select the “System” service area. The configuration data includes all configurable data in the Mobility Server and the CRE. All configuration data will automatically be restored after a restart of the system.

9.2 Fault Management

Mobile Advantage automatically detects hardware and software faults on replaceable units, links and software modules. Fault reports are stored in the alarm log or event log in the service area “Faults”. After detection Mobile Advantage blocks the operation of faulty units or links. Replaceable hardware units are, for example, RHs and boards in the CRE cabinet. Links are, for example, the connections to the PBX.

Mobile Advantage uses visual system alarms to indicate when a new Alarm Report or a new Event Report is generated. The system also indicates when an existing Alarm Report is updated after correction of the fault. If the user is not logged in to the Management System interface, the alarm or event data

will be stored in the log files. To retrieve information about faults or events, access the “Faults” service area which contains the logged alarm information.

Active alarms are indicated in the Current Alarms section until cleared. After alarms are cleared the alarm histories are stored in the Alarm Log. Events are stored in the Event Log. The following functions are implemented in the Mobility Server regarding current alarms reports.

- Browse Current Alarms
- Modify (add information to) a current alarm report
- Delete Current Alarms

After an alarm is cleared (automatically or manually) the following functions are available to review past alarms in the Alarm Log.

- Browse the Alarm Log
- Delete the Alarm Log

The following functions are implemented regarding the Event Log.

- Browse the Event Log
- Delete the Event Log

The following functions are implemented for all Registered Alarms.

- Browse Registered Alarms
- Modify Registered Alarms

Mobile Advantage automatically blocks faulty units and links. Links are automatically deblocked when the faults have disappeared. The O&M User can also manually block and deblock any units or links to localize faults. For example, to take a link temporarily out of operation.

When a faulty CRE system component is replaced with a new unit and the component is placed into operation, the corresponding Alarm Report is updated automatically.

When severe software faults are detected, Mobile Advantage is automatically restarted. The restart can be on different levels, such as:

- Board
- Radio head or Scanner
- Cellular Radio Exchange (CRE)
- Mobility Server

Note: In the most severe case the complete Mobile Advantage is automatically reloaded with the system data backup.

9.3 Other fault indicators

The Mobile Advantage automatic fault handling operations detect and assist in resolving most faults. Some failures cannot be automatically detected by

the system. To assist in troubleshooting some failures, the CRE boards, RHs, and Scanners have Light Emitting Diodes (LED). The LEDs, located on the front of the boards or units for easy observation, provide indications of unit status. All CRE boards have at least one power LED located at the top of the board. The power LEDs display green when DC power is supplied to the board.

The following tables describe specific LED indications of board and unit statuses.

9.3.1 RH and Scanner LEDs

Visual indicators of RH or Scanner status are shown in Table 2.

Table 2 Radio Head and Scanner LEDs

Radio Head and Scanner Status	LED Indication
Powered on no application running	Red
Booting	Yellow
Working	Green

9.3.2 CRE Boards Common LEDs

Visual indicators common to all RLU, DTU, and SPU boards statuses are shown in Table 3.

Note: The common LED indicators also apply to the RLU board in slot three of the main cabinet. The RLU board in slot three functions as a central processor not a link board.

Table 3 Common CRE Boards LEDs

CRE Board Status (RLU, DTU, and SPU)	Error LED	Status LED	Que LED
No Software loaded (hardware default)	Red		
In Little Boot mode			Yellow
Little Boot Failed	Red		Yellow
In Big Boot mode			Green
Big Boot loading boot parameters		Yellow	Green
Big Boot loading application		Green	Green
Big Boot Failed	Red		Green
Blocked Fault detected	Red	Red	
Board OK no ping (SPU and RLU boards)		Green	
Board OK and pinging (SPU and RLU boards)		Green Flash	

9.3.3 DTU Board LEDs

Visual indicators specific to the DTU board statuses are shown in Table 4

Table 4 DTU Board LEDs

DTU Board Status	LED Number 1	LED Number 4
Powered on	Green	
Loss of Signal (LOS)		Red

9.3.4 SPU Boards LEDs

Visual indicators specific to the Digital Signal Processor (DSP) statuses on each SPU board are shown in Table 5.

Table 5 SPU Board LEDs

DSP Status	LEDs (one for each DSP)
No calls allocated	
Active as DCCH	Yellow
Active as DTC	Green

9.3.5 RLU Boards LEDs

Visual indicators specific to the RLU board statuses are shown in Table 6.

Table 6 RLU Board LEDs

Status	LED (one for each RLINK)
No signal since Boot	
Loss of Signal (LOS)	Red
Out of Frame (OOF)	Red Flash
RLINK OK no pinging	Green Flash
OK and pinging	Green

Note: The RLU board in slot three of the main cabinet does not have RLINK cabling or statuses.

9.3.6 SWB LEDs

10 Software and Hardware Upgrades

Upgrading Mobile Advantage to implement new functions, hardware, or units can require the loading of new software. Mobile Advantage guides the O&M user when loading software.

Note: Always perform the replacement or upgrading of hardware and software during periods of light traffic. When upgrading there is always the possibility the newly installed hardware or software may not function properly with Mobile Advantage. Be prepared to uninstall an upgrade if necessary.

10.1 Hardware Upgrades

The installation of new hardware is typically plug and play (P&P). When new hardware is installed in the CRE, the hardware is automatically detected and activated. Installing most new CRE boards or replacing defective boards can be done while the CRE is powered (hot swapping).

In the service area “Hardware Resources”, the user can create, browse, delete, block, and unblock boards, links, and trunks. The user can also install and modify software releases.

Note: For the SWB only, deactivate (block) the device before physically removing it to prevent misleading traps from being generated.

All cables should be attached to CRE boards after installing. For example, RLU boards should have the cables to the RHs connected after installation. Installing the boards with the cables connected could cause a large current surge to the RHs.

When upgrading or replacing an RH, Scanner, and most units, Mobile Advantage loads new software automatically. The Mobility Server reads the new configuration data from the CRE and activates the new hardware. RHs and Scanners require a warm-up period before operating accurately.

The following Mobile Advantage units cannot be replaced with the plug and play installation method:

- Replacement of the Mobility Server requires reinstallation of Mobile Advantage software. Replacement of redundant units in the Mobility Server can be done in the P&P manner with “hot swapping”. Replacement of boards that are not redundant or capable of “hot swapping” requires shutting down and powering OFF the Mobility Server.
- The SWB has a configurable IP interface which must be initialized. Replacing the SWB requires deleting the defective board and creating a new board. This requires entering the IP address, along with other data, of the SWB in the service area “Hardware Resources” selection “Board”.
- The CRE Power Module (CPM) and SYNC boards are not “hot swappable”. Replacement of the CPM and SYNC boards in the CRE effects all boards. Turn OFF power to the CRE when replacing the CPM and SYNC boards.

10.2 Upgrading From a One-Cabinet to a Two-Cabinet System

When performing the following procedure, use a printed copy of Chapter 11, “Appendix A—Cabling and Connectors,” on page 58 of this manual.

Note: CRE auxiliary cabinets provide only expansion space for additional RLU and Signal Processing Unit (SPU) boards. An auxiliary cabinet requires only cabling for power, PE grounding, and any configured RLU boards.

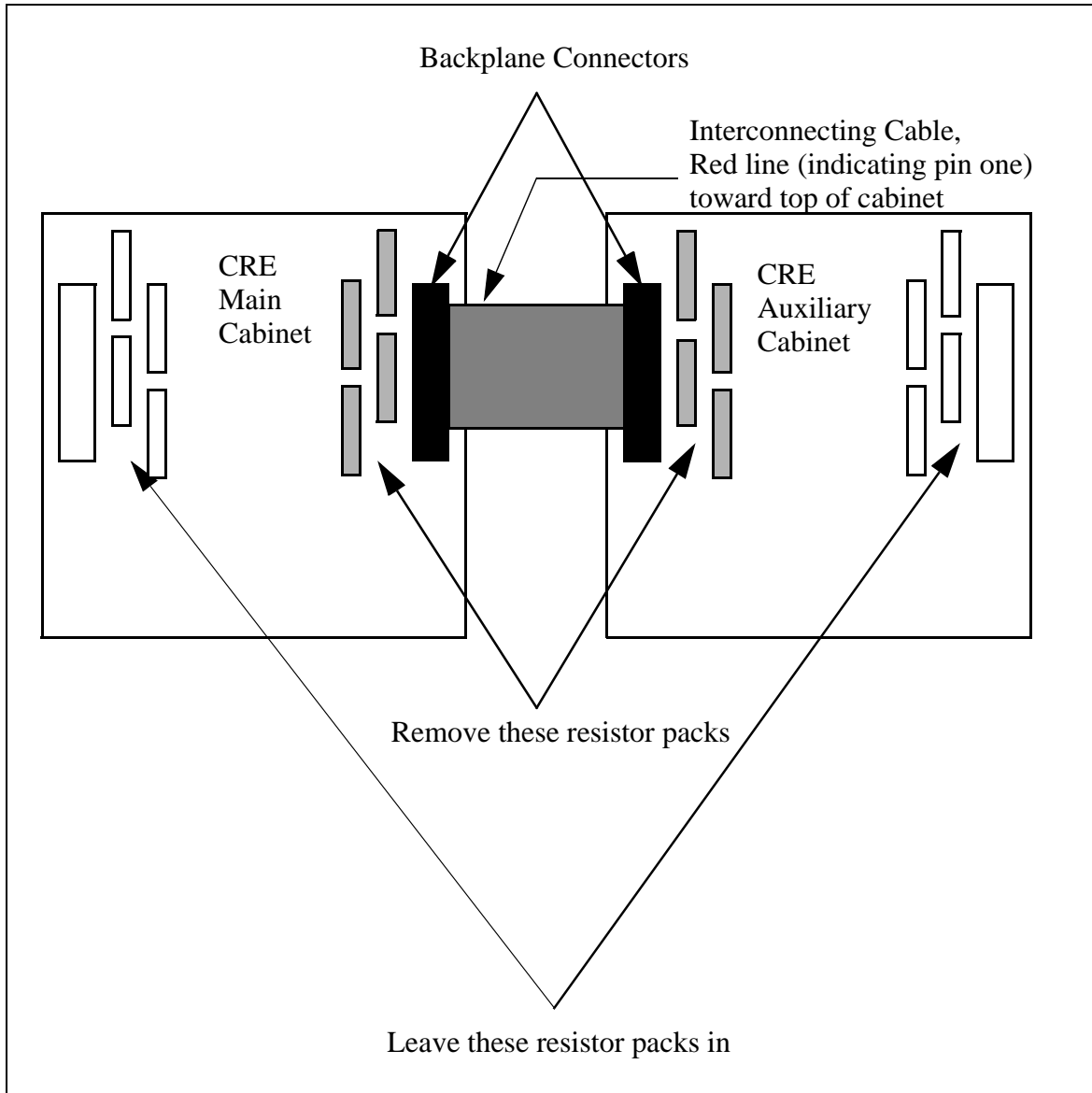
1. Unpack the CRE auxiliary cabinet and observe any indications of damage in shipping. If damage is observed contact Ericsson or the supplier.
2. Inspect the shipping container contents and compare the shipping material lists. Separate cables by part number.
3. Insert two mounting screws, supplied with the cabinet, in the top two marked positions. Leave a space of one-quarter inch between the wall and screw heads to allow the slots in the cabinet case to slip over the screws when mounting.

Note: The position of the mounting screws for a wall-mounted auxiliary cabinet should have been marked when the main cabinet was installed. If the mounting screws positions for the auxiliary cabinet were not marked use the mounting template provided with the system.

4. Mount the auxiliary cabinet on the right side of the main cabinet by setting the large slotted holes in the back case over the top screws and slowly lowering until the studs slip into the slots.
5. Remove the front cabinet covers of the main and auxiliary cabinets.
6. Remove the auxiliary cabinet bottom cover.
7. Insert the two bottom screws in the auxiliary cabinet back case and tighten all four cabinet mounting screws.
8. Connect the auxiliary cabinet case to Protective Earth (PE), using the cables provided, as shown in Figure 9, Recommended CRE Power and Grounding, on page 59.
9. Notify all users and shut down the Mobile Advantage system.
10. Turn OFF power to the main cabinet
11. Put on an ESD wrist strap and attach it to the ground wire braid on the front of the CRE main cabinet.
12. Remove the boards in slots ten and eleven of the main cabinet. Place the boards individually into ESD protective bags. Do not stack boards.
13. Remove the board in slot two of the auxiliary cabinet. Place the board into the ESD protective bag. Do not stack boards.
14. Remove the terminating resistor packs in the backplane as shown in Figure 7, CRE backplane interconnecting cables, on page 56.

Note: When connecting multiple cabinets, bus termination resistors must be installed only at each end of the extended backplane (cabling between cabinets). Resistors are contained in eight, 10 pin, Single in-line pack (SIP) resistor packs.

Figure 7 CRE backplane interconnecting cables



15. Remove the cover plates over the feed-through holes for the backplane interconnecting ribbon cable. Feed-through holes will be on the right side of the main cabinet and on the left side of the Auxiliary cabinets.
16. Install the spring fingers in the feed-through holes. Spring fingers protect the backplane ribbon cable from abrasion in the feed-through holes.
17. Connect the backplane interconnecting ribbon cable, supplied with the system, to the designated backplane connector in the main cabinet.

18. Route the flat ribbon cable through the spring fingers surrounding the feed-through holes.
19. Connect the flat ribbon cable to the designated backplane connector in the auxiliary cabinet.
20. Replace the boards removed in Step 12. and Step 13.
21. If the auxiliary cabinet contains any RLU boards, connect an RLU cable from the top telephony connector (DB-37) on the front panel of the first available RLU board.
Note: The other end of the cable is connected to the top left side connector of the punch block assigned to this RLU board. See Step 3. of Chapter 4.3.1, “Installing Cables From The CRE to RHs or Scanners,” on page 25
22. Connect an RLU cable from the bottom telephony connector on the front panel of the first available RLU board of the auxiliary cabinet.
23. Connect the other end of the RLU cable to the connector on the bottom right side of the designated punch block.
24. Repeat step Step 21. through Step 23. for the remaining RLU boards in the CRE auxiliary cabinet.
25. Connect the -48 Vdc power source cables to the power connector on the front of the CPM board in slot two of the auxiliary cabinet. Use Table 7, “Power and PE Ground Cables”, on page 59, for connection information.
26. Remove the ESD wrist strap.
27. Replace the cabinet bottom and front covers.
28. Turn ON power to the main and auxiliary cabinets.
29. Restart the Mobile Advantage system.
30. End of procedure.

10.3 Software Upgrades

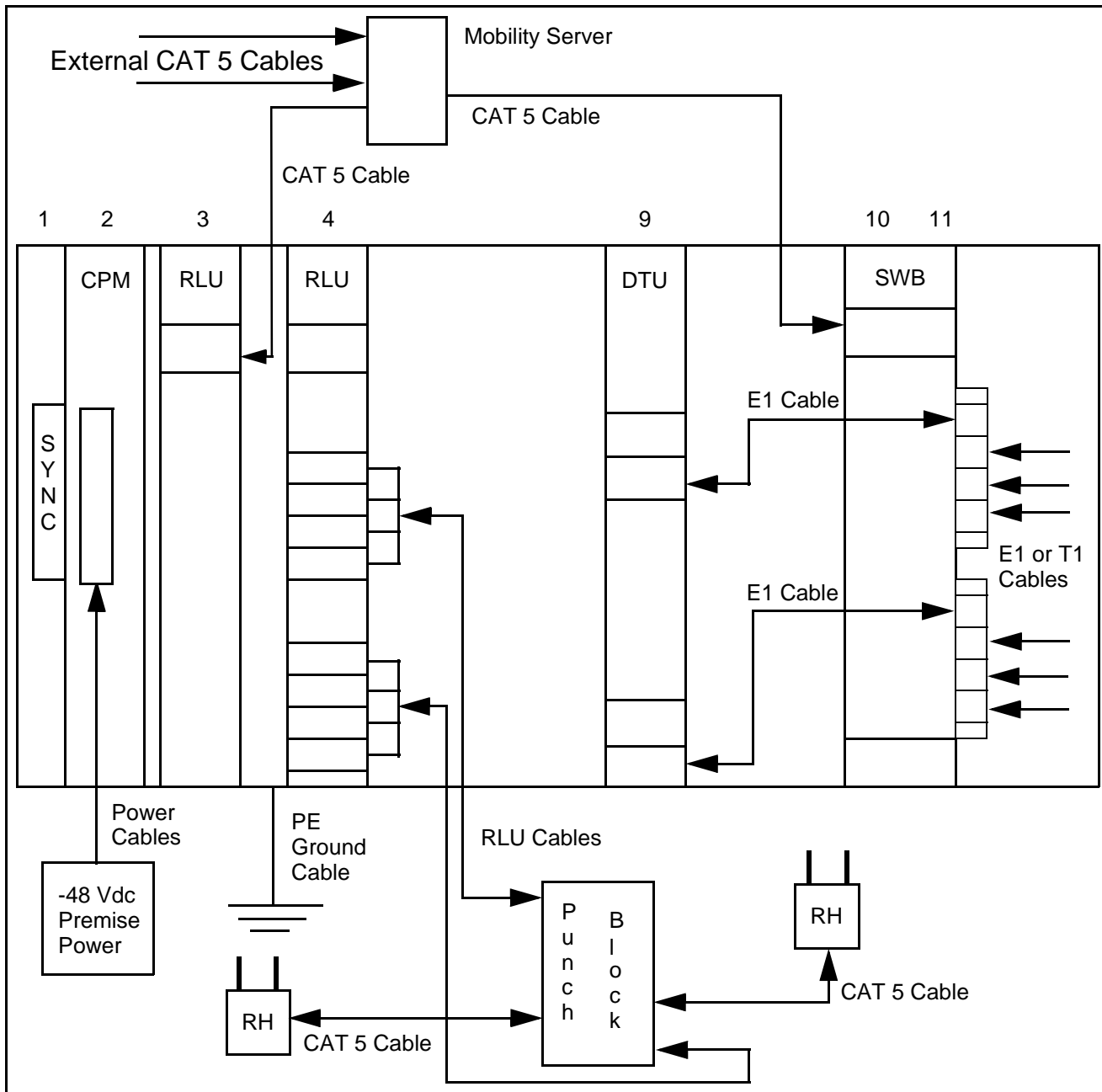
The software loading and backup functions are implemented in the O&M client service areas. For the Mobility Server functions see the sub-menu “Software Release.” For CRE functions see sub-menus “HW Resources,” “Radio Infrastructure,” and “Browse SW Info.” (Copies of all the software are stored in the Mobility Server.)

11 Appendix A—Cabling and Connectors

11.1 Overview

Figure 8, "Mobile Advantage Cables", shows an overview of internal and external cabling for the Mobility Server, Cellular Radio Exchange, and Radio Heads (RH). Scanners use the same cables as RHs. Auxiliary cabinets require only the power, Protective Earth (PE) ground, and Radio Link (RLINK) cabling.

Figure 8 Mobile Advantage Cables



11.2 -48 Vdc Power and Ground Cables

11.2.1 -48 Vdc Power Cables

CRE power (-48 Vdc) is supplied to the power connector on the front panel of the CPM board in slot two of all cabinets. The power cables, supplied with the system, must be used to comply with radiated emissions regulations.

Recommended Power and Grounding connections are shown in Figure 9. Power and PE Grounding cable specifications are listed in Table 7.

Figure 9 Recommended CRE Power and Grounding

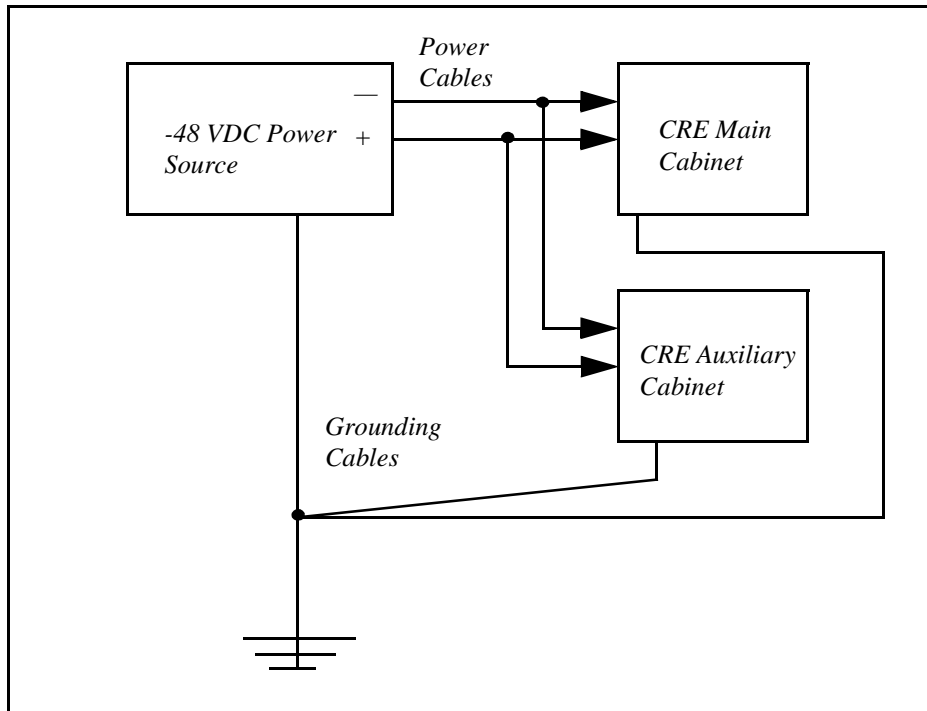


Table 7 Power and PE Ground Cables

Cable Name	Description	Voltage	Length
Power	Black wire	-48 Vdc	5 meters (16.5 feet)
Return	Grey wire	0 Vdc	5 meters (16.5 feet)
Ground	Braided wire	PE Ground	5 meters (16.5 feet)

11.3 Backplane Interconnect Cable for a Two-Cabinet CRE

If the Mobile Advantage CRE configuration requires two-cabinets, use the interconnecting flat ribbon cable supplied by Ericsson to connect the two backplanes. Always use the CRE mounting template provided with the units when mounting cabinets to assure the proper distance between cabinets.

11.4 RLU Ethernet Interface Cable (Slot Three Only)

The RLU in slot three of the main cabinet, functioning as the CRE central processor, requires an Ethernet interface to the Mobility Server. A reverse CAT 5 cable, supplied with the system, connects the RLU in slot three to the Mobility Server. A reverse CAT 5 cable is designed as a direct link between Ethernet nodes. With a reverse CAT5 cable the receive (RXD) and transmit (TXD) wire pairs are swapped. The RLU reverse CAT 5 cable specifications are shown in Table 8.

Note: The Ericsson CAT 5 cables, supplied with the system, must be used to comply with radiated emissions regulations. Install the cable connector end with the exposed shield to the RLU board and the end with the covered shield to the Mobility Server port.

Table 8 RLU Reverse CAT 5 Cable Signals and Pin Numbers (Slot Three Only)

Signal Name at Mobility Server	RJ-45 Pin Number Mobility Server	Suggested Wire Color	Signal Name at RLU Board	RJ-45 Pin Number RLU Board
RXD+	1	Blue	TXD+	3
RXD-	2	White/Blue	TXD-	6
TXD+	3	Orange	RXD+	1
TXD-	6	Orange/White	RXD-	2

11.5 RLU Connections

Power and signal connections between the RHs or Scanners and the CRE are routed through the cabling from RLU boards in slots four, five, seven, and eight. Cabling consists of two parts; the RLU cables connect from the RLU boards to the punch blocks and CAT 5 cables connect from the punch blocks to RHs or Scanners. Two RLU to punch block cables are supplied with the system for each configured RLU board.

11.5.1 Punch Block to Radio Heads (RH) or Scanners Cabling

The CAT 5 cables going to the punch blocks are supplied by the customer. Ericsson recommends using any unshielded, 24-AWG, 4-pair, solid conductor CAT 5 cables. A recommended CAT 5 cable type for this use is shown in Table 9.

Note: Cables that are routed through ceilings or plenums must be rated for fire safety. The applicable cable plenum specifications are defined in NEC CMP and CSA PCC FT4/FT6.

Table 9 Punch Block to RHs or Scanners Cables

Montrose Part Number	Rating	Connector
CBL 8040-4	Non-plenum	RJ-45

Table 9 Punch Block to RHs or Scanners Cables

Montrose Part Number	Rating	Connector
CBL 8041-4	Plenum	RJ-45

Using the recommended cables allow the RHs or Scanners to be located up to 1600 meters (5280 feet) from the CRE. RHs located less than 800 meters (2640 feet) from the CRE receive power from the RLU boards through the CAT 5 cables. For Scanners located up to 1200 meters (3960 feet) from the CRE, the RLU boards also supply the power through the CAT 5 cables.

RHs and Scanners can be located up to a maximum of 1600 meters from the CRE if powered from a 24 Vdc converter. The 24 Vdc converters require 115 Vac outlets nearby.

Note: If necessary, other types of twisted pair cable may be used. However, using lower quality cable will result in shorter distance capabilities. Use of any cable type except those recommended requires an evaluation of that link by Ericsson.

Figure 10 is an overview of RLU cabling from a representative RLU board to RH or Scanners. The central point for connections is the punch block. See Table 10 for connection information and signal names on the CAT 5 cables.

Figure 10 Punch Block cabling overview

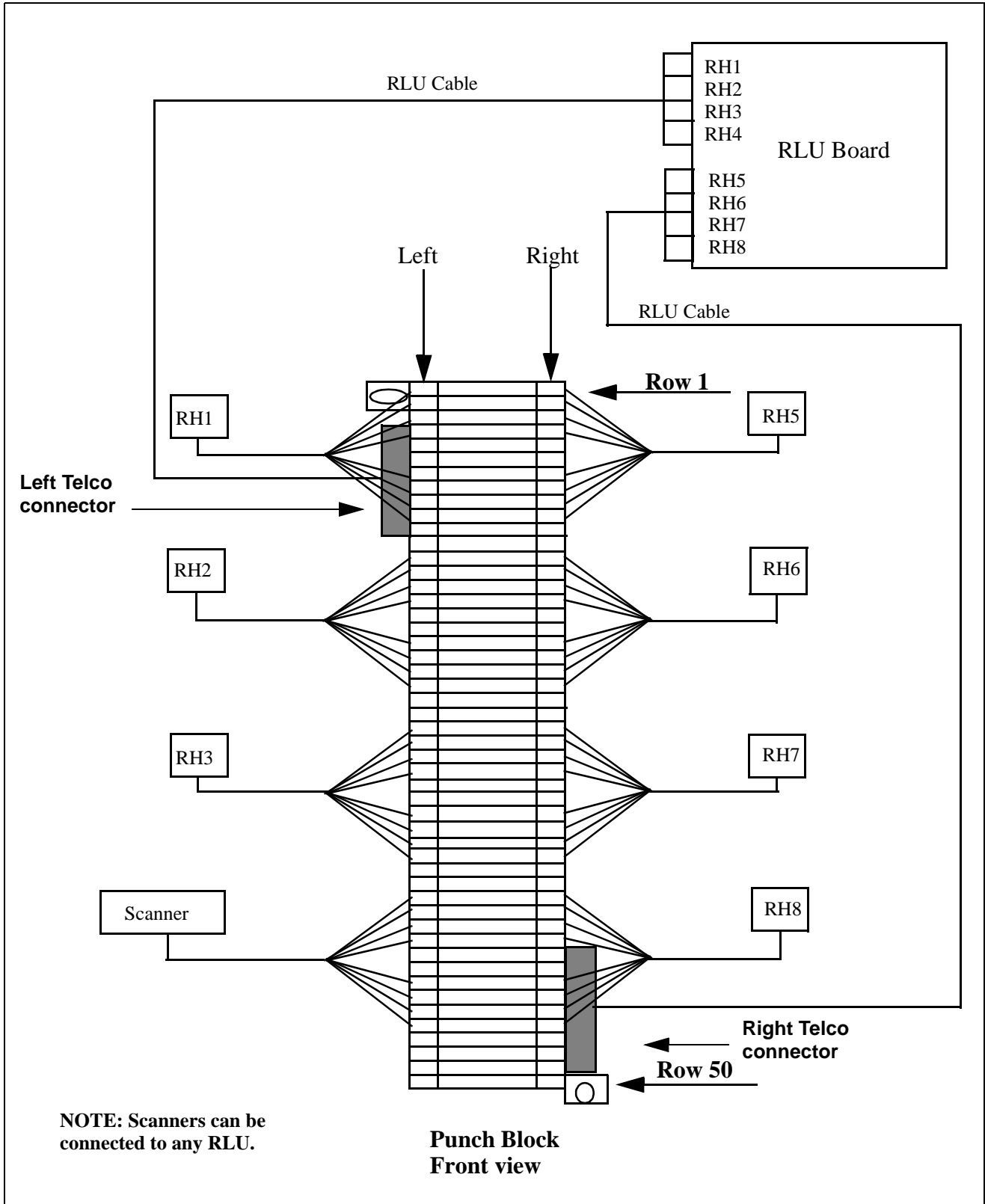


Table 10 RLU CAT 5 Cables From Punch Block to RHs or Scanners Signals and Pins

Radio Head	Signal Name at Radio Head	RJ-45 Connector Pin Number	Punch Block Connection	Suggested Wire Color
1	RLINK_RXRING	1	Left 1	White/Green
	RLINK_RXTIP	2	Left 2	Green
	RLINK_TXTIP	5	Left 3	White/Blue
	RLINK_TXRING	4	Left 4	Blue
			Left 5	
			Left 6	
	main_V-	3	Left 7	White/Orange
	main_V-	6	Left 8	Orange
	main_V-	7	Left 9	White/Brown
	main_V-	8	Left 10	Brown
			Left 11	
			Left 12	
2	RLINK_RXRING	1	Left 13	White/Green
	RLINK_RXTIP	2	Left 14	Green
	RLINK_TXTIP	5	Left 15	White/Blue
	RLINK_TXRING	4	Left 16	Blue
			Left 17	
			Left 18	
	main_V-	3	Left 19	White/Orange
	main_V-	6	Left 20	Orange
	main_V-	7	Left 21	White/Brown
	main_V-	8	Left 22	Brown
			Left 23	
			Left 24	

Table 10 RLU CAT 5 Cables From Punch Block to RHs or Scanners Signals and Pins

Radio Head	Signal Name at Radio Head	RJ-45 Connector Pin Number	Punch Block Connection	Suggested Wire Color
3	RLINK_RXRING	1	Left 25	White/Green
	RLINK_RXTIP	2	Left 26	Green
	RLINK_TXTIP	5	Left 27	White/Blue
	RLINK_TXRING	4	Left 28	Blue
			Left 29	
			Left 30	
	main_V-	3	Left 31	White/Orange
	main_V-	6	Left 32	Orange
	main_V-	7	Left 33	White/Brown
	main_V-	8	Left 34	Brown
			Left 35	
			Left 36	
4	RLINK_RXRING	1	Left 37	White/Green
	RLINK_RXTIP	2	Left 38	Green
	RLINK_TXTIP	5	Left 39	White/Blue
	RLINK_TXRING	4	Left 40	Blue
			Left 41	
			Left 42	
	main_V-	3	Left 43	White/Orange
	main_V-	6	Left 44	Orange
	main_V-	7	Left 45	White/Brown
	main_V-	8	Left 46	Brown

Table 10 RLU CAT 5 Cables From Punch Block to RHs or Scanners Signals and Pins

Radio Head	Signal Name at Radio Head	RJ-45 Connector Pin Number	Punch Block Connection	Suggested Wire Color
5	RLINK_RXRING	1	Right 1	White/Green
	RLINK_RXTIP	2	Right 2	Green
	RLINK_TXTIP	5	Right 3	White/Blue
	RLINK_TXRING	4	Right 4	Blue
			Right 5	
			Right 6	
	main_V-	3	Right 7	White/Orange
	main_V-	6	Right 8	Orange
	main_V-	7	Right 9	White/Brown
	main_V-	8	Right 10	Brown
			Right 11	
			Right 12	
6	RLINK_RXRING	1	Right 13	White/Green
	RLINK_RXTIP	2	Right 14	Green
	RLINK_TXTIP	5	Right 15	White/Blue
	RLINK_TXRING	4	Right 16	Blue
			Right 17	
			Right 18	
	main_V-	3	Right 19	White/Orange
	main_V-	6	Right 20	Orange
	main_V-	7	Right 21	White/Brown
	main_V-	8	Right 22	Brown
			Right 23	
			Right 24	

Table 10 RLU CAT 5 Cables From Punch Block to RHs or Scanners Signals and Pins

Radio Head	Signal Name at Radio Head	RJ-45 Connector Pin Number	Punch Block Connection	Suggested Wire Color
7	RLINK_RXRING	1	Right 25	White/Green
	RLINK_RXTIP	2	Right 26	Green
	RLINK_TXTIP	5	Right 27	White/Blue
	RLINK_TXRING	4	Right 28	Blue
			Right 29	
			Right 30	
	main_V-	3	Right 31	White/Orange
	main_V-	6	Right 32	Orange
	main_V-	7	Right 33	White/Brown
	main_V-	8	Right 34	Brown
			Right 35	
			Right 36	
8	RLINK_RXRING	1	Right 37	White/Green
	RLINK_RXTIP	2	Right 38	Green
	RLINK_TXTIP	5	Right 39	White/Blue
	RLINK_TXRING	4	Right 40	Blue
			Right 41	
			Right 42	
	main_V-	3	Right 43	White/Orange
	main_V-	6	Right 44	Orange
	main_V-	7	Right 45	White/Brown
	main_V-	8	Right 46	Brown

11.6 SwitchBoard (SWB)

11.6.1 SWB Ethernet Interface

The Ethernet connection on the SWB uses a reverse CAT 5 cable with an RJ-45 connector. The reverse CAT 5 cable connects the SWB in the CRE to the Mobility Sever. A reverse CAT 5 cable is designed as a direct link

between Ethernet nodes. With a reverse CAT5 cable the receive (RXD) and transmit (TXD) wire pairs are swapped. The specifications for the cable connecting the SWB to the Mobility Server are shown in Table 11.

Note: The Ericsson CAT 5 cables supplied with the system must be used to comply with radiated emissions regulations. Install the cable connector end with the exposed shield to the SWB and the end with the covered shield to the Mobility Server port

Table 11 SWB to Mobility Server Reverse CAT 5 Cable Signals and Pin Numbers

Signal Name at Mobility Server	RJ-45 Pin Number Mobility Server	Suggested Wire Color	Signal Name at SWB Board	RJ-45 Pin Number SWB
RXD+	1	Blue	TXD+	3
RXD-	2	White/Blue	TXD-	6
TXD+	3	Orange	RXD+	1
TXD-	6	White/Orange	RXD-	2

11.6.2 SWB E1/T1 PCM Interface

The CRE SWB can support six external T1 or E1 connections to PBXs. The specified Ericsson cables, with shielded connectors, are supplied with the system. The Ericsson cables must be used when connecting to the SWB to comply with radiated emissions regulations. Two E1 cables are supplied and connected from PCM ports one and five of the SWB to the DTU. For information about the DTU cables see Table 14, “SWB to DTU E1 Signal Names and Pin Numbers”, on page 71.

The PCM cables in the following list are intended for use when the CRE is located in the same room as a PBX or other system. When the location of a PBX or other system requires extension cabling, the cabling must be connected to the Ericsson supplied cables to comply with radiated emissions regulations.

Note: The T1 or E1 cables supplied by Ericsson are not rated for plenum or ceiling use. When adding any extension cables in ceilings or plenums, the cables must meet fire retardant specifications.

Use the following specifications along with Figure 11, "SWB Interface for T1 or E1 Connections", to determine the signal names, pin numbers, and ports of the Ericsson supplied cables:

- For T1 connections use Table 12, "SWB T1 Signal Names and Pin Numbers". Connect T1 PBX links to the following SWB PCM ports:
 - Connect PBX link one to SWB PCM port two.
 - Connect PBX link two to SWB PCM port six.
 - Connect PBX link three to SWB PCM port three.
 - Connect PBX link four to SWB PCM port seven.
 - Connect PBX link five to SWB PCM port four.
 - Connect PBX link six to SWB PCM port eight.
- For E1 connections use Table 13, "SWB E1 Signal Names and Pin Numbers".

11.6.2.1 SWB T1 Cable Specifications

Table 12 SWB T1 Signal Names and Pin Numbers

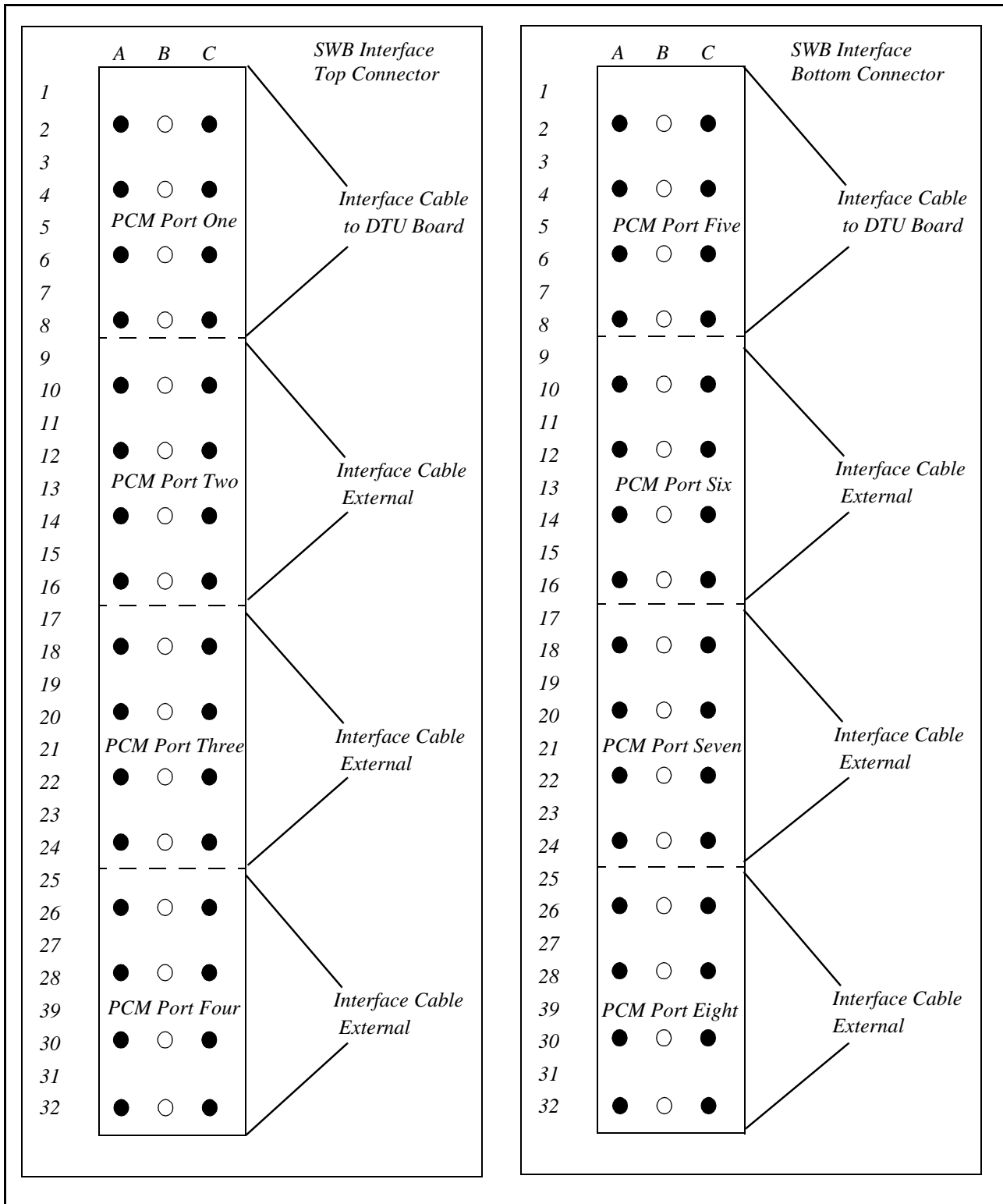
Interface Pin Numbers				Receive (RX) or Transmit (TX)	
1	2	3	4		RJ-45 Pin Number
C02	C10	C18	C26	TX + From SWB	4
C04	C12	C20	C28	TX - From SWB	5
C06	C14	C22	C30	RX + To SWB	1
C08	C16	C24	C32	RX - To SWB	2

11.6.2.2

Table 13 SWB E1 Signal Names and Pin Numbers

Interface Pin Numbers				Receive (RX) or Transmit (TX)	
1	2	3	4		DB-15 Pin Number
C02	C10	C18	C26	TX + From SWB	3
C04	C12	C20	C28	TX - From SWB	11
C06	C14	C22	C30	RX + To SWB	1
C08	C16	C24	C32	RX - To SWB	9

Figure 11 SWB Interface for T1 or E1 Connections



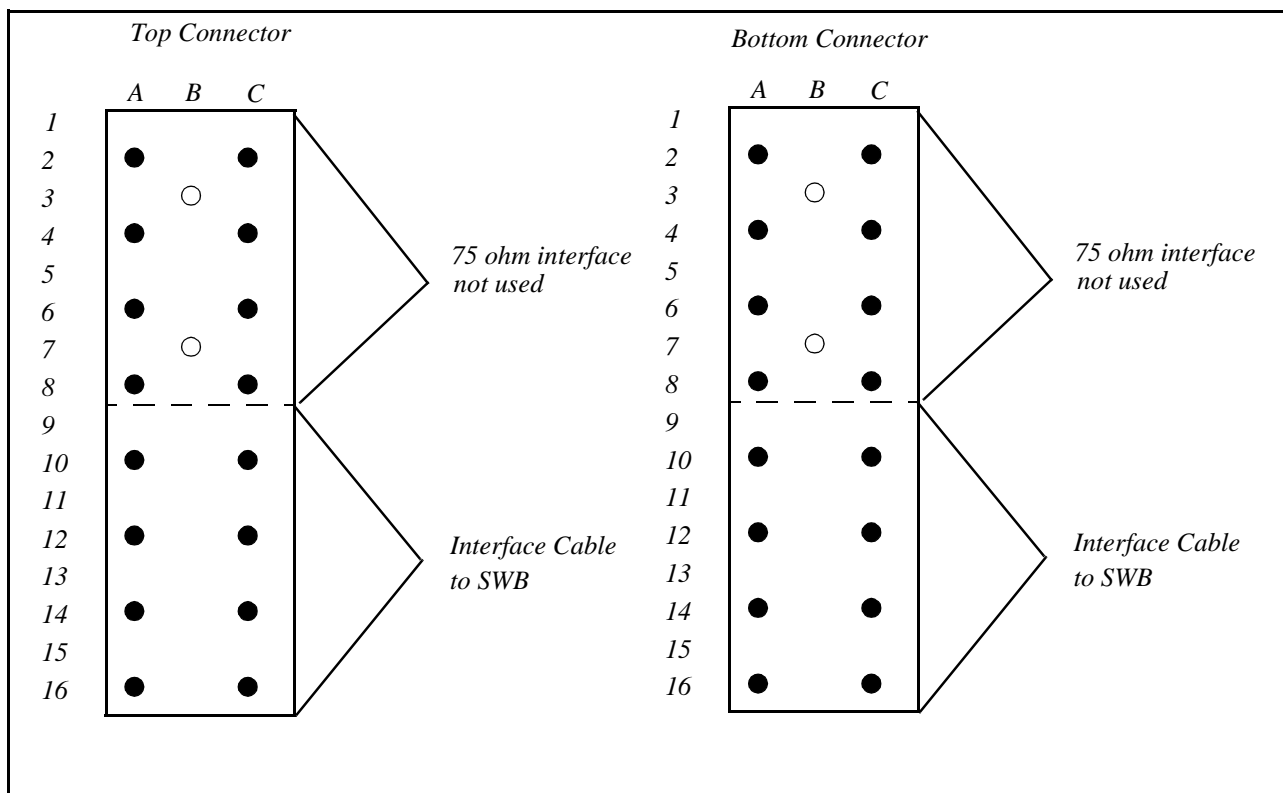
11.6.3 SWB to DTU cables

Two E1 cables are supplied by Ericsson to connect the DTU board, in slot nine of the CRE, to the SWB in slots 10 and 11. The E1 cable from the top connector on the DTU board connects to PCM port one on the SWB. The E1 cable from the bottom connector on the DTU board connects to PCM port five on the SWB. Use the following cable specifications in Table 14, along with Figure 11, "SWB Interface for T1 or E1 Connections", and Figure 12, "DTU E1 Connector Pin Numbers", to determine the signal names and pin numbers.

Table 14 SWB to DTU E1 Signal Names and Pin Numbers

SWB Interface Pin Numbers	Receive (RX) or Transmit (TX) SWB	Receive (RX) or Transmit (TX) DTU	DTU Interface Pin Numbers	Length
C02	TX + From SWB	RX + To DTU	A14	150 mm (6 inches)
C04	TX - From SWB	RX - To DTU	C16	
C06	RX + To SWB	TX + From DTU	A10	
C08	RX - To SWB	TX - From DTU	C12	

Figure 12 DTU E1 Connector Pin Numbers



12 Appendix B—Acronyms and Abbreviations

10BASE-T—10Mbit/s Ethernet system using twisted pair cables. The twisted pair only supports point-to-point connections. To connect several terminals a repeater hub is required.

850 MHz—The hyper band that is called cellular today (defined in TDMA-136.2-A table 2.1.1.1.1-1). The frequency bands at 850 MHz are named a, a', a" and b, b'. Normally one cellular operator owns the license to operate on a-band (including a' and a") or b-band (including b').

1900 MHz—The hyper band called PCS today (defined in TDMA-136.2-A table 2.1.1.1.2-1). The frequency bands at 1900 MHz are named A, B, C, D, E and F. Normally one cellular operator owns the license to operate on one of these bands.

ACELP—The speech coding algorithm used in Mobile Advantage is defined as an alternate speech coder algorithm in TDMA-136.2-A 2.1.3.3.2. (The actual description is in IS-641). The ACELP codec is considered to have a better speech quality than VSELP. Another name for the ACELP coder is EFR.

A-key—The input number that the authentication process uses as one of the input to the Auth_Signature algorithm. See TDMA-136 for details.

Allowed-list—The frequencies that Mobile Advantage is allowed to use. If no allowed-list is entered Mobile Advantage will consider the whole frequency band, except the disallowed-list, as being on the allowed-list. Allowed list + disallowed list = the whole frequency band.

AMPS—Advanced Mobile Phone System. The analog system which operates on 850 MHz.

ANSI-41: Cellular Radio Telecommunications Intersystem Operations, the TIA specification of how the VLR, HLR and MSC communicate.

Barred—The user is not allowed to use the system. In the cellular system this can be used when the user has not paid his bills, but the cellular operator wants to enable calls as soon as the money arrives. In Mobile Advantage we can use this to define a user in the cellular HLR to provide for authentication and voice privacy in Mobile Advantage, but barr him from making calls in the cellular system.

BOOTP—The Bootstrap Protocol, BOOTP, is a UDP/IP based protocol, which allows a booting client to configure itself dynamically and without user supervision. BOOTP provides a means to notify a client of its assigned IP address, the IP address of the boot Server host, and the name of the file to be loaded into the memory and executed.

CAT 5 cable—Category 5 cable for Ethernet and other interfaces. Twisted signal pair, non-shielded, 22 AWG or 24 AWG wire size. Used in Ethernet interfaces and cabling to RHs and Scanners.

CLI—Calling Line Identification

CRE—Cellular Radio Exchange. The central part of the Mobile Advantage radio infrastructure.

D-AMPS—Digital Advanced Mobile Phone System. The digital system described in TDMA-136.

DCCH—Digital Control Channel, as defined in TDMA-136.1.

DID—Direct In Dialing.

Direct in dialing—The possibility to dial the Mobile Advantage user's office number directly from the public network. No attendant is involved in this process.

Disallowed-list—The frequencies that Mobile Advantage is not allowed to use. The analog control channels or the frequencies used in the neighboring cellular sites. If no disallowed list is entered in Mobile Advantage the whole frequency band is considered to be allowed. Allowed list + disallowed list = the whole frequency band.

DTC—Digital Traffic Channel, as defined in TDMA-136.2.

DTMD—Dual Tone Multi Frequency. Tone signaling method used in telecommunications.

DUN—DWOS User Number

DWOS—Digital Wireless Office Services (product unit), sometimes synonymous with Mobile Advantage.

DWOS Mobile Stations—A Mobile Advantage Mobile Station compatible with TDMA-136. Each Mobile Station is defined in one HLR.

Note: Not all TDMA-136 compatible Mobile Stations are fully functional within the Mobile Advantage area.

Encryption—The process of applying a secret sequence to data in order to protect it from eavesdropping (voice privacy as defined in TDMA-136).

Erlang—A measure of traffic in telecommunication systems.

Ethernet—A group of cabling systems for creating a data-bus in Local Area Networks. Ethernet also includes a protocol for handling the transmission on the Ethernet bus. On top of the Ethernet other protocols are used, like the TCP/IP suite. The Mobile Advantage O&M Client can access the Mobility Server using Ethernet in a LAN/WAN.

FTP—File Transfer Protocol, FTP, supports down loading of software files from the O&M Client to the Mobility Server. The O&M Client can fetch the file, containing the measurement data, from the Mobility Server by using FTP. FTP is also used during start up of the RI to transfer configuration information from the Mobility Server to RI.

GOS—Grade of service.

Grade of service—The percent of the call set-up attempts that are blocked due to congestion.

HLR —Home Location register—Each Mobile Advantage mobile phone is defined in one HLR. Some mobile phone data is stored in the HLR, for example, the current location of the mobile phone and its authentication data.

HTTP—The user interface for the O&M functions is WWW pages using

Hyper Text Transfer Protocol as a high level protocol to communicate with the Mobility Server.

IP—The Internet Protocol is used on the network layer to define addresses and locally to address the CRE.

ISDN—Integrated Services Digital Network.

LAN—Local Area Network.

MIN—Mobile Station Identification Number.

MO—Managed Object

Mobile—The name we use when talking about the mobile phone terminals used within Mobile Advantage.

Mobile Advantage coverage area—The area in which the radio signal quality to or from Mobile Advantage is good enough to setup and maintain a connection between the Mobile Advantage system and a Mobile Advantage mobile phone.

Mobile phone—Synonym of mobile.

Mobile terminal—Synonym of mobile.

Mobility Server—A common name for the system entity that consists of the SwitchBoard and the NT-Server.

MobServer—Short for Mobility Server.

MWI—Message Waiting Indicator.

NT-Server—A PC with the Windows NT operating system running on it.

NFS—Network File System. NFS is used by the RI to store and retrieve configuration data, performance measurement data and other data which is stored on the hard disk in the Mobility Server.

O&M—Operation, Administration, and Maintenance. Configurables in Mobile Advantage are handled by the O&M software residing on the Mobility Server.

PBX—Private Branch Exchange. Mobile Advantage is connected to a PBX by a Primary Rate Interface (PRI). The PBX provides routing connections to the PSTN.

PSTN—Public Switched Telephony Network. The PSTN has no direct contact with a Mobile Advantage. The PBX connects external PSTN calls to Mobile Advantage.

PLMN-MS-C—Public Land Mobile Network - Mobile Switching Center. The MSC is not in direct contact with Mobile Advantage but can connect calls through the PSTN.

PSID—Private System Identification. The name allocated to a private system. The license owner allocates a PSID to a Mobile Advantage installation.

Registration—The process of a mobile phone informing Mobile Advantage that the user is now within the Mobile Advantage coverage area.

Reverse CAT 5 cable—A cable designed as a direct link between Ethernet nodes. With a reverse CAT5 cable the receive (RXD) and transmit (TXD) wire pairs are swapped.

RH—Radio Head. The distributed part of the Mobile Advantage radio infrastructure, containing e.g. the RF-parts.

RI—Radio Infrastructure

RLINK—The link between the CRE and a RH or Scanner.

RNC-data—The data containing information necessary for the Radio Network Control algorithms.

Roaming—When the mobile phone is moving between different parts of the cellular system and between different cellular systems connected in a network, or to a Mobile Advantage, and the cellular user still is able to place and receive calls.

RSID—Residential System Identification.

Short Mobile Advantage number—The short number (four or five-digits) that other Mobile Advantage users or PBX users can dial to reach a Mobile Advantage user.

SID—System Identification. The name allocated to the Public System.

Site Survey tool—A tool that helps the installer to plan how many Radio Heads the customers installation requires and where the Radio Heads should be placed.

SMS—Short Message Service.

SNMP—Simple Network Management Protocol. An Internet protocol for managing information on nodes served by agents.

SW—software.

System Entities—The significant parts of the Wireless Office System. I.e. Mobility Server, O&M Server, Cellular Radio Exchange and Radio Heads.

TCP—The Transmission Communication Protocol is used on the transport layer according to the 4-Layer Protocol model.

TCP/IP—Transport Control Protocol/Internet Protocol. A family of protocols developed to allow computers to share resources around a network. Some provide low-level functions needed for many applications. These include IP, TCP and UDP. Other functions are FTP (File Transfer Protocol), TELNET (remote login) and mail.

TDMA-136—The TIA standard which defines the air interface that Mobile Advantage is using.

Terminal—Synonym of mobile phone.

Terminating call set-up—The call is set-up when the Mobile Advantage user answers the phone after having been alerted by a ring signal.

TIA—Telecommunications Industry Association, the organization that defines the TDMA-136.

UDP—User Datagram Protocol. A protocol that runs on top of IP. Like TCP, but with no transmission control or re-sending. Requires much less resources than TCP.

User—Synonym for Mobile Advantage user.

VLR—Visitors Location Register, a register in which information of the status and location of all active mobile phones within the coverage area of the cellular system is stored.

VMS—Voice Mail System

Voice privacy—The process of applying encryption on the voice channel to make it more difficult to eavesdrop a connection.

WOS SS7—Mobile Advantage access to Signaling System 7 network

13 Appendix C—Mobile Advantage Unit Specifications

This section provides specifications, including power and temperature requirements, for Mobile Advantage units. For information about Mobile Advantage cables see, "Appendix A—Cabling and Connectors," on page 58.

13.1 Mobility Server

The Mobility Server is based upon a Microsoft Windows NT™ server with redundant drives, fans and power supplies. A four-port Network Interface Card (NIC), two serial ports, and an optional internal modem provide external access and communications. The Mobility Server performs all call control, service control, and O&M functions in the Mobile Advantage system.

The Mobility Server is powered by redundant -48 Vdc power supplies. Indications of loss of a single power supply, fan module, or hard drive, and other failures are propagated to the Mobile Advantage event log and can be configured to signal audibly.

The temperature range where the CRE and Mobility Server are located must be between +5°C and +40°C and relative humidity may vary between 15% and 80%.

13.2 CRE Specifications

Both the main and auxiliary cabinets have the same part numbers. When an auxiliary cabinet is connected to a main cabinet the slot assignments are automatically configured. For example, Mobile Advantage recognizes slot time in the main cabinet is reserved for the DTU board, but slot nine in the auxiliary cabinet can be used by SPU or RLU boards.

13.2.1 CRE Cabinet Dimensions

Table 15, "CRE Cabinet Specifications", is shown for information only. A template is included with the cabinets for positioning the mounting screws. The weight given is for a maximally equipped cabinet with cables attached.

Note: The weight of a CRE cabinet requires mounting to a panel that is secured to wall studs.

Table 15 CRE Cabinet Specifications

Height	Width	Depth	Weight
432 mm (17.25 inches)	256 mm (10.24 inches)	304 mm (12.16 inches)	17kg (37.4 pounds)

13.2.2 CRE Configuration Example

Table 16 describes an example of a maximally configured CRE with two loaded cabinets. The CRE in this example is configured to process a maximum of 60 simultaneous calls. Other configurations are possible as long

as the board type and slot assignments conform to the requirements listed in Table 17, “CRE board numbers and slot assignments”.

Table 16 Mobile Advantage CRE Maximum Configuration example

Slots Cabinets	1	2	3	4	5	6	7	8	9	10	11
main	SYNC	CPM	RLU	RLU	RLU	SPU	RLU	RLU	DTU	SWB	
Auxiliary		CPM	SPU	SPU	SPU	SPU	SPU	SPU	SPU		

13.2.3 CRE Board Assignments

Table 17, “CRE board numbers and slot assignments”, lists the allowable board configurations for the Mobile Advantage.

Note: *When inserted in slot three of the main cabinet, the RLU board functions as a central processor. No RHs or Scanners can be connected to the RLU in slot three of the main cabinet.

Table 17 CRE board numbers and slot assignments

Board Name	Allowed in slot number in: Main Cabinet (M) Auxiliary Cabinet (A)
SYNC	M— 1
CPM	M— 2 A— 2
RLU	M— 3*, 4, 5, 7, 8 A— 4, 5, 7, 8
SPU	M— 4, 5, 6, 7, 8 A— 3, 4, 5, 6, 7, 8, 9, 10, 11
DTU	M— 9
SWB	M— 10 and 11

13.3 Radio Heads and Scanners

Radio Heads (RH) and Scanners are mounted vertically on internal walls in the Mobile Advantage coverage area. Each RH provides five transceivers for air interface communications with mobile phones using the TDMA-136 protocol. Mounting templates are provided with the system.

Table 18 RH and Scanners Dimensions

Height	Width	Depth	Weight
233 mm (9.32 inches)	362 mm (14.48 inches)	57 mm (2.28 inches)	5kg (11 pounds)

13.4 System power requirements

Power requirement for the Mobility Advantage system can be calculated based on the sum of the individual components in the system. Table 19, “System Power Calculations” lists the power drain for each system unit.

Table 19 System Power Calculations

System unit	Power drain (per unit)	Maximum units allowed
Mobility Server	425 Watts	1
CRE	125 Watts	2 (Main & Auxiliary)
RH/Scanner	37.5 Watts	32

14 Appendix D—Recommended tools

14.1 General

The following list of tools, software, and test equipment are recommended to install and maintain Mobile Advantage. Tools that are part of the conventional installers tool kit, such as soldering irons, are not specified in this section. All tools, software, and test equipment, can be purchased locally or ordered from Ericsson.

Note: Warning: Drilling machines and soldering irons must be double-insulated.

Replacement boards and units should be stored at a central location. The technician should bring the appropriate spare boards and equipment to the customer site based on the type of service call.

- Laptop PC—Minimum specifications:
 - Hardware—Pentium processor; one gigabyte hard drive; RAM size 32 Megabytes; CDROM; 3.5 floppy drive; PCMCIA Modem speed 28 Kilobytes; PCMCIA Serial I/O; PCMCIA Ethernet communications board
 - Software—Windows NT 4.0, Remote Access Software (RAS)
- Remote Access Software (RAS)
- Plastic or cardboard box for temporary storage of boards
- ESD wrist straps with alligator clip connector
- ESD packaging bags for boards (quantity eight)
- Punch tools compatible with punch block types used
- Test cords compatible with punch block types used
- Mobile phone, TDMA-136 compatible