TIA-136 DIGITAL
EAC-2100™ Manual
- - - D R A F T - - -

Order No. xx-xxx-xx

Issue 02/01

MIKOM
AN ALLEN TELECOM COMPANY

HEALTH AND SAFETY WARNINGS

Installer Warning:

Any over-the-air radiated use of this product is intended to be used with either Roof Top (Building-mount) or Pole Mounted (Non-building-mount) Antennas.

Antenna installation must conform within the following guidelines to meet FCC RF exposure limits. Otherwise a environmental evaluation is required if:

Narrowband PCS (subpart D): Non-building-mounted antennas: height above ground level to lowest point of antenna < 10m Radio (Part 24) and total power of all channels > 1000 W ERP (1640 W EIRP).

Building-mounted antennas: Total power of all channels > 1000 W ERP (1640 W EIRP).

Cellular Radiotelephone Service (Part 22, subpart H): Non-building-mounted antennas: height above ground level to lowest point of antenna < 10m Radio (Part 22) and total power of all channels > 1000 W ERP (1640 W EIRP).

Building-mounted antennas: Total power of all channels > 1000 W ERP (1640 W EIRP).

For clarification, please refer to FCC rules, 47 CFR ch. I, part 1.1307

☞ **Note:** **The electrical installation has to be performed in accordance with the safety regulations of the local authorities. Due to safety reasons, the electrical installation must be performed by qualified personnel. Subsequent installation, commissioning and maintenance activities that require the unit to be powered with the cover open shall only be carried out by suitably qualified personnel.**

☞ **Note:** **The grounding of the Unit has to be performed in accordance with local electrical codes. A grounding bolt is provided at the bottom of the cabinet in order to connect the earth bonding cable.**

☞ **Note:** **The Unit weighs 210 lb (95 kg). Make sure that a suitable mounting surface is used if it is to be wall-mounted, or an adequate floor surface to support the weight is available if it is to be pedestal-mounted. Also, make sure that adequate lifting tools are available for placing the unit either on its wall bracket or on the pedestal.**

Field Support

If you need technical assistance with the EAC-2100™, contact **MIKOM US, an Allen Telecom Company** at one of the following telephone numbers:

Extend-A-Cell **HOTLINE**: (800) 800-7465

or (804) 386-5340

LIMITED WARRANTY

MIKOM, an ALLEN TELECOM COMPANY, ("ALLEN TELECOM") warrants, on the terms and conditions hereto set forth, all products manufactured by it to be free under normal use and service from defects in materials and workmanship for a period of one (1) year from the date of shipment, to the first consumer (the "Warranty Period").

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The Limited Warranty shall not be extended beyond its original term with respect to any part or parts repaired or replaced by ALLEN TELECOM hereunder.

The Warranty Period shall not apply to any product which has been repaired or altered in any manner by anyone other than ALLEN TELECOM or an authorized outlet of ALLEN TELECOM, or if the defect, malfunction or failure of the product was caused by damage by lightning, flood or other acts of nature or by power surges, or from unreasonable use, or from improper installation or application, or to any product which has not been maintained or used in accordance with the operating specifications set forth in ALLEN TELECOM's written instructions.

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Some states do not allow limitation on how long an implied warranty lasts, so the above limitation may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

ALLEN TELECOM neither assumes nor authorizes any person to assume for it any obligation or liability other than as herein expressly stated.

1900 MHz
HIGH POWER TRANSLATING CHANNEL SELECTIVE REPEATER for TIA/EIA-136 PCS Networks

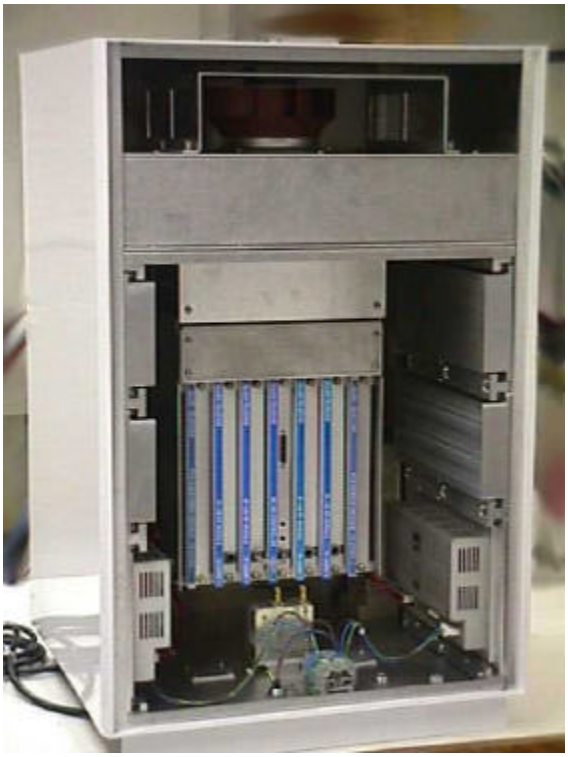
MIKOM's EAC2100 repeater is designed to provide wide area coverage for TIA/EIA-136, 1900 MHz networks.

High power and gain, achievable due to the intelligent F1 to F2 architecture, allow the EAC2100 to provide coverage extension normally available only from macro-cells. Isolation requirements are also minimized due to the translating nature of the repeater. The repeater boosts up to four TIA/EIA-136 carriers with channel selective RF cards. The EAC2100's architecture is frequency agile both on the donor and coverage channels.

The EAC2100 uses state of the art DSP technology coupled with a high speed Power PC processor to decode the TIA/EIA-136 message stream. The EAC2100 fully supports the TIA/EIA-136 Standard and its feature set.

The EAC2100 is software configurable and remotely manageable via a modem dial up link. Call traffic statistics are logged and reported over a rolling weekly window. All setup parameters are software settable via the local port or dial-up link. The repeater is designed for easy installation and outdoor use.

- Frequency Translating Channel Selective Operation
- 2 or 4 Channel Capacity
- High Forward Output Power
  - 12.5 Watts each for 4 Channels
  - 25 Watts each for 2 Channels
- Multiple Cabinets for Up to 8 Channels
- Full TIA/EIA-136 Feature Set including:
  - Extended Battery Life (sleep mode)
  - SMS
  - Calling Line and Party ID
  - Over the Air Activation
  - Authentication
  - Registration
  - Mobile Assisted Hand Off (MAHO)
- Easy Field Upgrades and Maintenance
- Receive Diversity Standard



1900 MHz
HIGH POWER TRANSLATING CHANNEL SELECTIVE REPEATER for TIA/EIA-136 PCS Networks

General Specifications

AC Power / Current Requirements
120/240 VAC 50/60 Hz (Auto-ranging)
10A @ 240 VAC

DC Power / Current Requirements
19-30 VDC (nominal 24 VDC)
Maximum 40A @ 27.6 VDC
Standby 10A @ 27.6 VDC

Battery Backup (customer provided)
4 hours typical using 100 AH batteries

Temperature Range
-30°C to +55°C Operating
-40°C to +75°C Storage

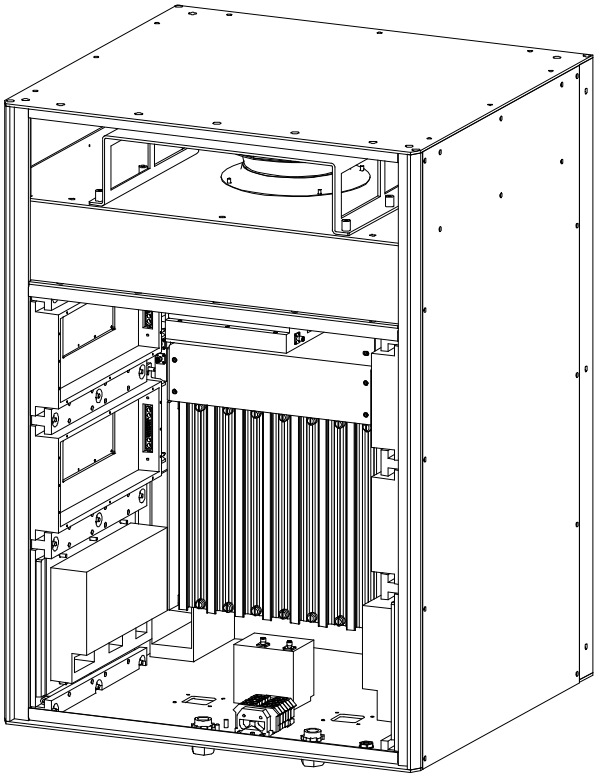
Relative Humidity
95% maximum at +50°C

Antenna Connectors
7/16 DIN, N female remote access

Channel Capacity (2 versions available)
2 or 4 RF Channels

Weight 210 lb./ 95 kg

Cabinet Dimensions (H x W x D)
36" x 21.5" x 23"
91 x 55 x 59 cm



RF Specifications

Gain >120 dB (excluding antenna gain)

Channel Bandwidth (TDMA)
Meets TIA-136-280-B BTS requirements

Programmable Frequency Control

Spacing	30 kHz
Bands:	BDE, CEF
Channels	1-1999

Output Frequency Accuracy
TIA/EIA-136 synchronized to donor

Minimum Input Donor Signal Level
-75 dBm

Rated Output Power at Antenna Connector

Forward:	25W/ch., 2 channel
	12.5W/ch., 4 channel
Reverse:	+20 dBm per channel

Sensitivity (Reverse path)
Meets TIA-136-280-B BTS requirements

RSSI Range

Forward:	-100 to –20 dBm
Reverse:	-120 to –40 dBm

Manufactured under one or more of the following patents: 4,941,200 / 4,849,963 / 4,754,495 4,704,733 / 5,541,979 and/or patents pending or applied for in the United States and Canada

The Federal Communications Commission has not yet approved this device. This device is not, and may not be, offered for sale or lease, or sold or leased until the approval of the FCC has been obtained.

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Programming Initial Parameters (See Sections 4, 5, and 6)

1. Type **SSS <CR>**. (Nothing should show DISABLED. If anything shows disabled, refer to Appendix A, Troubleshooting Guide.)

2. Type **ALA <CR>**. (There should be no alarms. If there are any OUT OF SERVICE or memory alarms, refer to Appendix A.)

3. Type **SET <CR>** and go into submenu C, System Parameters.

4. Enter submenu A and program the site ID.

5. Enter submenu B and program the donor and boosted DCCH channels. Decide how the DCCH control channel is to act when all channels are busy.

6. Enter submenu C and program the boosted DTC RF channel numbers for channels 2–4.

7. Program the donor DTC RF channels into list.

8. Enter the Modem Control submenu D and program the modem mobile MIN that has been assigned. Calls made to and from this number will not be transferred to the booster, but will be trapped-out and handled directly by the donor. Also set the modem mobile power step to the desired level.

9. Use **<CTRL> X** to exit the SET menu completely. Press **<CR>** at the question prompt.

Continued . . .

Programming Initial Parameters (Continued)

12. From the command entry level >, use the **TIM** command to set the date and time.

13. From the command entry level >, enter **DCS=0**, **DCH=0**, and **ALA=0** to reset the report values.

Completing the Installation

1. Connect the antennas. The unit is now operational!

2. Type **SCS <CR>** and make some calls. You will see your MIN displayed on call originations and answers.

3. Connect the handset to the connector on the front of the mobile shelf (see Section 5).

4. Program hand-in/hand-back thresholds as desired (see Section 6).

5. After completing installation and setup, secure the cabinet door.

1. Introduction

1.1 About This Volume

1.1.1 Contents

This volume, pertaining to the TIA/EIA-136 EAC-2100™, contains detailed procedures for installing and operating the EAC-2100. This volume has been divided into a Quick Start Checklist and 12 sections, described below.

Introductory Information

- **Quick Start Checklist:** Brief summary of installation and setup procedures.

- **Section 1. Introduction:** Contents of this volume, key terms, and a general introduction to the TIA/EIA-136 EAC-2100.

- **Section 2. Preliminary Decisions:** Factors to consider before you begin installation.

Basic Installation

- **Section 3. Installing the Hardware:** Procedures for mechanical, electrical, and antenna installation and connection of external alarms or controls.

- **Section 4. Setting Up for Initial Operation:** Procedures for powering up the system, connecting a local terminal, programming parameters, tuning the transmitter combiner, and setting output power.

- **Section 5. Installing the Remote Link:** Procedures for setting up, programming, and checking out the mobile, and testing the remote link.

- **Section 6. Optimizing Performance:** Procedures for setting hand-back and hand-in thresholds to optimize booster performance.

Terminology

Figure 1-1 lists key terms used in this volume. Additional terms and acronyms are defined in the Glossary.

Figure 1-1. Important Terms Used in This Manual

Term	Definition
TDMA	Time Division Multiple Access. Commonly used to refer to the TIA/EIA-136 digital cellular system.
Boost	To receive, amplify, and reradiate signals to fill in weak coverage areas.
Booster	A system that boosts or repeats
Booster Coverage Area	The area where subscribers obtain coverage through the booster.
Donor Cell Site	The cell site in communication with the booster.
Donor DCCH Channel	The DCCH channel used between the cell site and the booster (and all the subscribers in direct contact with the cell site).
Boosted DCCH Channel	The DCCH channel used between the booster and the subscriber in the booster coverage area (a different frequency than the donor DCCH channel).
EAC-2100™	The trademarked name for a booster made by MIKOM US, an ALLEN TELCOM Company.
Forward Path	The path taken by the RF signal transmitted by the donor cell, which is received, amplified, and reradiated by a booster and received ultimately by a subscriber in the booster coverage area.
Repeater	Synonymous with **booster**, usually applied to boosters that translate frequencies. The EAC-2100 is type-accepted as a repeater.
Reverse Path	The path taken by the RF signal transmitted by a subscriber mobile in the booster coverage area, which is received, amplified, and reradiated by a booster and received ultimately by the donor cell site.

1.2 About the TIA/EIA-136 EAC-2100

This section provides a brief overview of how the EAC-2100 operates. For a more detailed discussion, refer to Volume 3, Technical Information.

1.2.1 Use of Boosters

Cellular telephone systems transmit signals in two directions between cell sites and subscriber telephones within the signal coverage area. The signal path from the cell site to the subscribers is called the **forward** path, and the path from subscribers to cell site is the **reverse** path.

If weak signal transmissions occur within the coverage area because of terrain obstructions, a relatively inexpensive way to extend transmission range is to install a signal booster that receives the signal, amplifies it, and reradiates it. (See Figure 1-2.)

1.2.2 Frequency Allocation

TIA/EIA-136 cellular systems use 1850-1910 MHz for reverse and 1930-1990 MHz for forward transmissions. These frequency bands are divided into A, B, C, D, E, & F blocks.

1.2.3 EAC-2100 Operation

The EAC-2100 booster is available in either a two-channel or a four-channel configuration. Each RF channel is capable of handling three full-rate TDMA channels. Therefore, a four-channel EAC-2100 can provide one DCCH channel and 11 DTC DTC channels.

Also, two EAC-2100 boosters may be operated together to provide up to eight RF-channel operation (1 DCCH plus 23 DTC DTC channels). A digital control cable connects the two cabinets together to allow one cabinet to handle the DCCH duties.

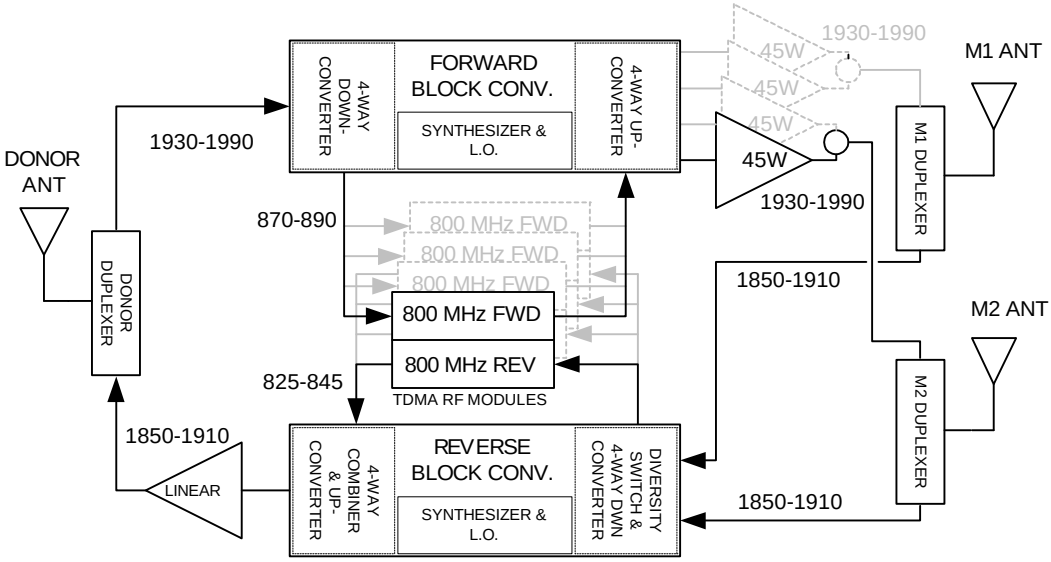
A block diagram of the EAC-2100 is shown in figure 1-2. Up to four 800 MHz TDMA modules are used. These modules are similar to those used in the EAC-2000, with the main difference being that they have a lower output power level in the reverse direction. Like the EAC-2000, these modules provide the frequency translation feature necessary to allow high-gain repeater operation.

Block converters are used to convert the PCS band to the 800 MHz band, and likewise the 800 MHz band to the PCS band. A Forward Block Converter and a Reverse Block Converter is used. Each block converter has its own synthesizer and local-oscillator control for performing the block conversion process.

1.2.3 EAC-2100 Operation (Continued)

The Forward Block Converter converts the 1930-1990 MHz signals from the donor cell site to the 870-890 MHz band. The 870-890 MHz block is fed to the 800 MHz TDMA RF modules for signal processing. The outputs of the 800 MHz modules are individually converted back to the 1930-1990 MHz band for subsequent transmission to the repeater coverage area. Since the PCS band is wider than the 800 MHz tuning range of the 800 MHz RF modules, the Block Converters cover the PCS band in three 20 MHz segments.

Figure 1-2. System Block Diagram



Likewise, the Reverse Block Converter converts the 1850-1910 MHz signals received from the subscribers to the 825-845 MHz band. Operation is similar to the Forward Block Converter except that an RF switching matrix is employed to allow M1/M2 antenna diversity selection. Another difference is that the reverse signal outputs from the 800 MHz modules are linearly combined and then up-converted as a group to the 1850-1910 MHz band.

A 50-watt linear PA is used for each forward PCS carrier. The PAs are paired and combined in two 3-dB hybrid combiners. One hybrid combiner output is connected to the TX port of the M1 duplexer, and the other output is connected to the M2 duplexer.

A 1-Watt composite (20 watts peak) PCS linear power amplifier is used for transmitting the reverse path signals back to the donor.

The EAC-2100 comes in either a low-split or a high-split configuration. The low-split configuration covers the A, D and B bands, while the high-split configuration covers the E, F, and C bands. This is summarized in the table below:

1.2.3 EAC-2100 Operation (Continued)

Model:	**Low Split**	**High Split**
Band:	A, D & B	E, F, & C
Channel Number Range:	1-1167	833-1999
Forward Frequency Range:	1930-1965 MHz	1955-1990 MHz
Reverse Frequency Range:	1850-1885 MHz	1875-1910 MHz

Note that there is some overlap between the low split and high split bands. This is due to the characteristics of the duplexers.

Boosting DCCH Channels. The EAC-2100 monitors the PCS donor DCCH channel to obtain system-specific information. It generates a DCCH data stream and transmits it on a different DCCH channel that is assigned for repeater use. Subscribers that are unable to receive the original channel then lock onto the boosted DCCH channel and communicate with the cell site through the booster. Adding the repeated DCCH channel to the donor's neighbor list will allow subscribers in the repeater coverage area to lock onto the repeater and to receive or place calls.

Boosting DTC Channels. The amplifiers for repeating DTC channels are enabled as needed when digital traffic channel (DTC) activity is detected in the repeater coverage area. The EAC-2100 identifies subscribers in the repeater coverage area by two methods: one for identifying subscribers that place or answer calls from within the repeater coverage area and another for identifying subscribers that enter the area with a call in progress.

When a call is placed or answered from within the repeater coverage area, the following sequence occurs:

1. The subscriber accesses the reverse boosted DCCH channel. The EAC-2100 receives the access, then accesses the reverse donor DCCH channel.

2. The EAC-2100 waits for the corresponding DTC designation message on the forward channel.

3. The EAC-2100 modifies the DTC designation message by substituting one of its boosted DTC RF channels for the donor DTC assignment, thus sending the subscriber to one of the boosted DTC RF channels.

4. A repeat path is set up between the subscriber and the primary donor cell site, with the subscriber operating on the boosted DTC RF channel, the donor operating on the donor DTC, and the EAC-2100 translating and boosting between the two.

To identify subscribers that may drive into the boosted coverage area with a call in progress, the EAC-2100 scans the donor DTC RF channels on a per-time-slot basis and maintains a Received Signal Strength Indicator (RSSI) average for each time-slot. If the average RSSI exceeds a preset threshold, the EAC-2100 hands the subscriber to one of the boosted DTC channels.

1.2.3 EAC-2100 Operation (Continued)

Boosting to Multiple Donor Cells. To provide for situations in which in-progress calls may be linked to various neighboring cell sites (multi-donor operation), the system allows for entry of different donor DTC RF channel lists. **For handing in subscribers, note that the donor antenna system at the EAC-2100 must be specifically designed for multiple donor operation.**

In addition, the MAHO feature of TIA/EIA-136 systems allows the cellular system to hand-off the subscriber to neighboring cells even if the neighboring cell does not have a propagation path to the EAC-2100. No additional hardware is required at these neighboring cells. The only requirement is that these neighboring cells must have their "locate-and-verify" option disabled.

If the booster is adjacent to a single cell site, that cell site is referred to as the **donor cell**, and the DCCH channel of that cell site is the **donor DCCH channel**. The DTC RF channels used in the donor cell may be entered into the donor DTC channel list with the DVCC of that cell site to handle subscribers that drive between the donor and booster with a call up.

If the booster is adjacent to several cell sites and there are donor antennas pointing at these cell sites, the DCCH channel of one of the cell sites is chosen as the donor DCCH channel, and this cell is then referred to as the **primary donor cell**. The DTC RF channels of all the neighboring cells are entered into the scan list with the DVCC of the neighboring cells. **Signal strength at the D1 antenna port must be balanced (to within the cell system hand-off threshold window) from all neighboring cell sites.**

Also, the DCCH channel that is assigned to the EAC-2100 must be included in the DCCH neighbor list that is sent out by the donor. This is necessary to allow the subscriber to quickly find the boosted DCCH channel.

Calls placed or answered from within the booster coverage area (identified by decoding the data streams) are repeated back to the primary donor cell. Calls handed in (identified by channel and time-slot scanning) are repeated back to the cell on which the call was in progress.

Driving away from the Repeater to The Donor. The EAC-2100 monitors for weak subscriber RSSI, and also monitors the MAHO information that is being sent back from the subscriber handset. If the MAHO information indicates that the subscriber is hearing the donor DCCH channel at an adequate level, then the EAC-2100 will send a hand-off message to that subscriber to return him to the donor DTC RF channel.

Driving away from the Donor and the Repeater. For this case, the TIA-136 MAHO feature allows the donor to hand the subscriber to an adjacent cell. The donor determines if the subscriber is a candidate for hand-off by evaluating the DCCH channel levels in the MAHO list. If the subscriber is reporting an adjacent DCCH that is stronger than what it is reporting from the donor DCCH, then the system will issue a hand-off message to that subscriber.

Note that for adjacent cell site handoff to work properly, the system will have to be configured such that:

A. The reverse path signal level from the repeater is set such that it will trigger MAHO requests from the boosted subscribers,
B. The donor site MAHO list must include all cell sites that are within overlapping coverage of the repeater, and
C. Those adjacent cell sites that are within overlapping coverage with the repeater must have any secondary or backup verification feature (such as subscriber locate and verify before allowing handoff) disabled. Secondary verification may be useful in a densely populated system where intermod may false the subscriber's MAHO readings, but is not necessary in the rural environments for which the EAC-2100 is intended.

If there is no adjacent cell site to which the donor can direct the subscriber to, then the EAC-2100 will maintain the boost path for as long as it can.

Ending the Boost. The EAC-2100 will terminate a boosted call under the following conditions:

A. Loss of signal, either from the donor or the subscriber,
B. The subscriber has terminated the call,
C. The land-side or donor has terminated the call, or
D. The EAC-2100 has handed the subscriber to the donor DTC RF channel, or
E. The donor has handed the subscriber (through the boosted DTC RF channel) to an adjacent cell site.

2. Preliminary Decisions

2.1 Introduction

Before the EAC-2100 can be installed, preliminary decisions must be made about the following:

- Use of Multi-hop configuration
- Booster site
- Antenna placement
- DCCH and DTC channels to be used

As an installer, you may be involved in some or all of these decisions. The checklist in Figure 2-1 provides a brief overview of preparations to be made prior to installing the EAC-2100.

Figure 2-1. Pre-Installation Checklist

Checklist

- ❑ 1. Coverage area and distance from base station identified. (Sec. 2.3.1)
- ❑ 2. Distance to donor entered (in kilometers).
- ❑ 2. Electrical service verified for installation site. (Sec. 2.3.2)
- ❑ 3. Site selected in accordance with EAC-2100 weight and space requirements. (Secs. 2.3.3 and 2.3.4)
- ❑ 4. M1, M2, D1 and mobile modem antennas selected and installed. (Sec. 2.4)
  - ❑ Minimum vertical separation of antennas achieved.
- ❑ 5. Antenna isolation and signal levels from the cell site measured. (Sec. 2.4.3)
- ❑ 6. RF channels selected: (Sec. 2.5)
  - ❑ Donor DCCH channel
  - ❑ Boosted DCCH channel
  - ❑ Directed retry channels (at least one of the six directed retry channels should be assigned)

2.2 Use of Multi-Hop™ Configuration or Multi-Donor™ Units

Multi-hop operation involves setting up two or more EAC-2100 units to operate together in a line. This configuration is described in greater detail in Section 7.

Note that no additional equipment is required at neighboring cell sites along the multi-hop path. The MAHO feature of the TIA/EIA-136 system allows the cellular system to hand off a subscriber from the EAC-2100 multi-hop coverage area to any neighboring cell.

If either of these arrangements is to be used, system parameters will need to be set accordingly.

2.3 Site Requirements

The site chosen for the EAC-2100 must meet requirements related to location, electrical service, space, and mounting surface, as described below.

2.3.1 Location

Distance from Donor Cell. If a line-of-sight path between donor cell and booster is maintained and a high-gain dish antenna is used, the EAC-2100 may be placed up to 92 km away from the donor cell.

Distance from Antennas. The unit should be placed as close as possible to the antennas to avoid excessive cable loss. Losses should be kept to 3 dB or less for each antenna cable. In addition, tower-mounted preamplifiers (TMAs) may be used to improve reverse-path sensitivity.

2.3.2 AC Mains Service

The following AC mains service is required:

- 120/240 VAC
- single-phase
- 20-amp minimum service

2.3.3 Space

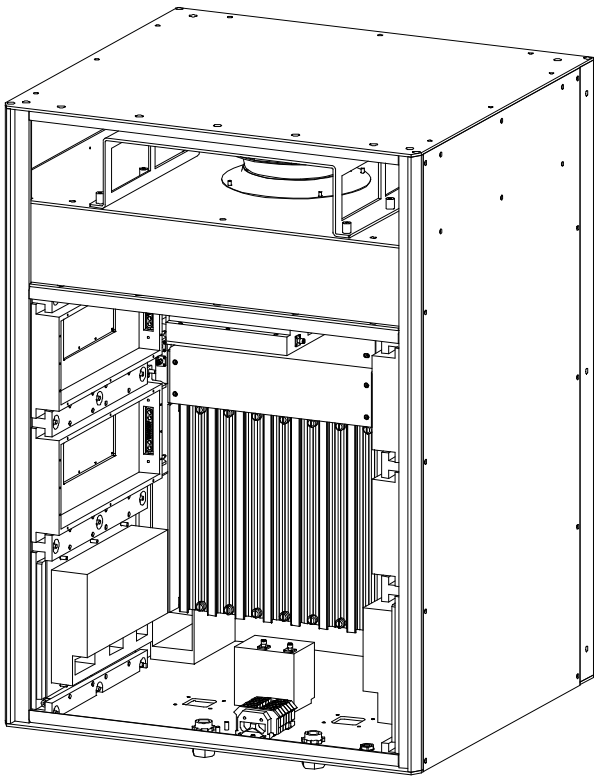
The EAC-2100 unit is approximately 22 in (W) x 23 in (D) x 36 in (H) *(56 cm x 59 cm x 91 cm)*. If it is mounted on a wall bracket, allow an additional 3 in (8 cm) depth. For wall mounted applications, it is recommended the bottom of the cabinet should be at least 12 in (31 cm) above the ground or floor. This will allow easy access to the RF connectors that are on the bottom of the cabinet.

If it is to be mounted on the optional pedestal, allow an additional 12 in (31 cm) to the overall height. Approximately 3 in (8 cm) space must be provided between the rear of the cabinet and any obstructing surface, such as a wall. This is necessary to prevent blocking the heat-exchanger outlet vent. Also, provide enough space on of the two sides to allow access to the antenna connectors underneath the cabinet. This access will be through one of the two filter openings. Enough space should be provided on the other side to allow the filter to be removed and cleaned. Six inches (15 cm) should be adequate for this purpose.

Finally, allow enough space on the front to allow the door to be fully opened (2 ft, or 60 cm minimum).

Figure 2-2. Recommended Space

Put updated 3D drawing showing the door, the pedestal, the hanging bracket, and dimensions here.



2.3.4 Mounting Surface

If the wall hanging bracket is used, make sure that the wall construction and the fastening hardware is adequate for handling at least the 210 lb (95 kg) of the EAC-2100.

If the pedestal mount is to be used, make sure that the floor or concrete surface is adequate for handling approximately 60 pounds per square foot (300 kg per square meter). The pedestal has mounting holes to allow it to be bolted to the floor. Bolting to a surface should be done before the EAC-2100 is placed on the pedestal.

The EAC-2100 may be mounted either indoors or outside. If it is mounted outside, adequate drainage away from the pad should be provided to prevent water from accumulating underneath the cabinet.

2.4 Antennas

The EAC-2100 requires four antennas:

D1 antenna: Primary antenna facing donor cell site(s), used for:
- Reception of DCCH and DTC channel signals from donor cell site(s).
- Transmission of DCCH and DTC signals back to cell site(s).

M1 antenna: Primary antenna facing subscribers in the booster coverage area, used for:
- Transmission of boosted DCCH channel and boosted DTC channels to subscribers.
- Diversity reception from subscribers.
- Transmission of hand-back messages to subscribers.

M2 antenna: Second antenna facing subscribers in the booster coverage area, used for:
- Sending hand-in and grab-back messages to subscribers.
- Diversity reception from subscribers.
- Sending data messages to multi-hop EAC-2100s and Multi-Donor Units.

Data mobile antenna (optional): Antenna for the installed cellular mobile. Used for:
- Receiving and transmitting signals from any cell site in the system.
- In many cases the internal data mobile may be connected to the test port on the donor duplexer. This will allow the data mobile to share the donor antenna for its link back to the donor base station.

Ensure that the proper antenna type and placement have been selected for each antenna.

2.4.1 Type

The antennas for the booster area should be chosen by the same criteria as used for a cell site. A typical installation might use the following antennas:

D1: One high-gain directional antenna pointed toward the donor cell.

M1 and M2: Two identical directional or omnidirectional antennas.

☞ **NOTE:** Regardless of the type of antenna chosen, the M1 and M2 antennas must have identical gain and patterns, and be installed to cover the same area.

Mobile: A low-gain or YAGI base station antenna. Alternatively, a coupler port on the donor duplexer may be used to share the data mobile with the donor antenna.

2.4.2 Placement

Requirements. Antenna locations must meet the following requirements for minimum signal level, physical separation, and isolation.

- **Minimum Signal Level:** The minimum signal level from any cell to be used as a donor must be -75 dBm at the D1 antenna connector on the EAC-2100. The minimum signal level from the donor cell must be at least -100 dBm at the data mobile antenna feed.

> **Multi-hop configurations:** An EAC-2100 not adjacent to the donor requires a forward signal level of at least -70 dBm (at the D1 antenna connector) from the previous EAC-2100 in the chain. Each booster along the path must be able to communicate only with the previous and next booster. They are not required to be able to receive from or transmit back to the donor cell site.

- **Physical Separation:** For diversity operation, the M1 and M2 antennas should be physically separated by at least 10 feet *(3 m)* horizontally or 3 feet *(1 m)* vertically.

☞ **NOTE:** Even if diversity reception is not required, both the M1 and M2 antennas must be installed, since both antennas are used to transmit to the boosted subscribers.

2.4.2 Placement (Continued)

- Isolation: Isolation between the D1 and M1 and between the D1 and M2 antennas must be at least 75 dB. Isolation between the mobile antenna and all of the others must be at least 60 dB.

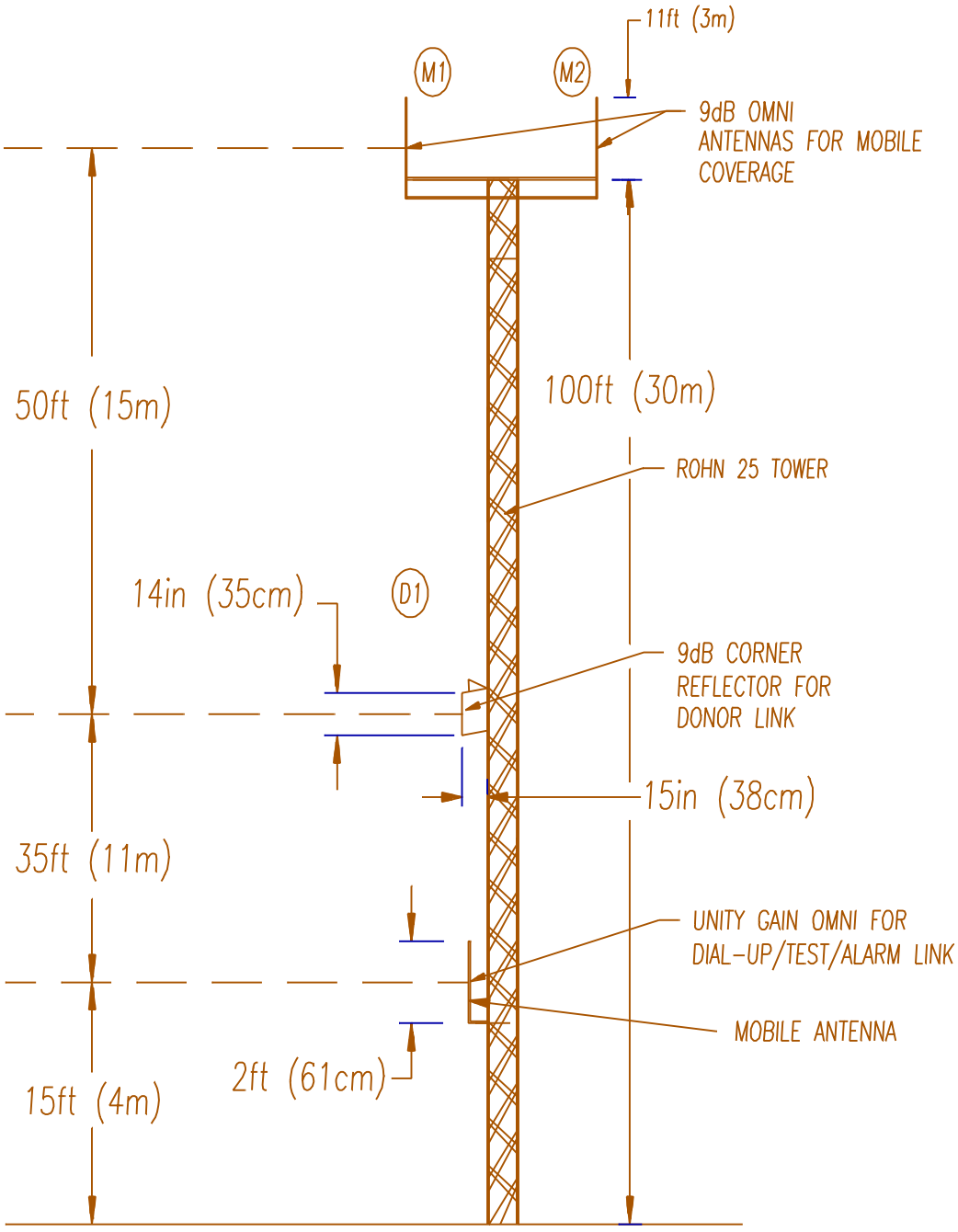
  Figure 2-3 shows a typical installation. M1 and M2 are placed highest on the tower to achieve the best coverage to the boosted area. D1 is placed below M1 and M2. At least 25 feet *(8 m)* of vertical separation is usually needed to meet the isolation requirement.

  ☞ **NOTE:** The isolation achieved at a given separation will vary greatly depending upon the type of antennas, nearby reflections, etc. Twenty-five feet *(8 m)* vertical separation may not be enough in all cases.

  D1 must be placed high enough to receive the required minimum signal level from the donor. The data mobile antenna can usually be placed close to the ground. At least 15 feet *(5 m)* vertical separation between the data mobile antenna and the others is usually needed, however, more may be required in some installations.

2.4.2 Placement (Continued)

Figure 2-3. Typical Antenna Installation



2.4.3 Measuring Signal Level and Isolation

To verify the correct placement and alignment of the antennas, it will be necessary to measure the signal level from the donor cell site (on the selected donor DCCH channel) and the isolation between the various antennas to ensure they meet the required levels.

To measure the donor DCCH signal level:

- Connect a communications service monitor or some other frequency selective measuring instrument to the D1 antenna; monitor the DCCH channel from the donor cell;

- Adjust the orientation of the D1 antenna to peak this reading; at least -75 dBm is required.

To measure antenna isolation:

Antenna isolation can be measured using a spectrum analyzer and a tracking generator. These functions are often combined in cellular communications monitors.

The tracking generator output is applied to the coax connector going to one of the system antennas, while the spectrum analyzer input is connected to one of the other system antennas. The tracking generator output level should be set to maximum (usually about 0 dBm), with the spectrum analyzer set to check both the transmit and receive ends of the band. If a 0 dBm signal is used as the source, the dBm reading on the analyzer will be equal to the amount of isolation achieved between the two antennas.

☞ **NOTE:** Isolation is usually frequency dependent, with several nulls and peaks possible in each band. The highest peak in either band defines the minimum isolation that is achieved with a particular antenna installation.

2.4.3 Measuring Signal Level and Isolation (Continued)

Signals from the cellular system will likely be stronger than the sweep signal received from the tracking generator, and difficulty may be experienced in measuring the actual isolation.

Many spectrum analyzers have difficulty reading signals below -60 to -70 dBm when sweeping a broad bandwidth. In this case, the band may be swept in smaller frequency segments, or a separate signal generator with higher possible output power may be substituted for the tracking generator. The signal generator frequency and amplitude can be manually changed to avoid conflict with existing strong signals from the donor and other cell sites.

The signal generator should be manually swept through both the low split and the high split bands to determine the minimum isolation point.

To measure isolation:

1. Supply a known signal level of about 0 to +20 dBm across the band into one of the antenna feeds (M1, D1, or mobile).

2. Using test equipment, measure the signal level received on the other antenna feeds.

3. Adjust antenna locations and orientations to achieve the desired antenna isolations.

4. Move the signal source to other antennas, and recheck the isolation. Be sure to check both the forward and the reverse bands.

5. If the D1 antenna has been repositioned, recheck the received donor DCCH channel signal level to verify that it exceeds -75 dBm.

6. Record these measurements.

Refer to Appendix B for a more detailed procedure for measuring isolation.

2.5 Selecting Channels

Before beginning to install the hardware, identify the various channels on which the system will operate:

- DCCH channel
- Boosted DCCH channel
- Donor DTC RF channels (primary and neighboring)
- Boosted DTC RF channels
- Directed retry channels

Make note of all selected channels. They will be entered as system parameters during installation (Volume 1, Section 4). DCCH channel parameters are listed under the DCCH Channels Menu, shown here with all available selections. Refer to this menu for sections 2.5.1 through 2.5.5.

Control Channels Menu

```
                                                        Default Values
C  Directed Retry Channels ........................... LIST
D  Back-up DCCH Channel Option ..................….. .DISABLED
E  Revertive DCCH Channel Option. . . . . . . . . . .DISABLED
I  Donor DCCH Channel ................................ 319
J  DCCH Channel State During "All Channels Busy" ..... DIRECTED RETRY
K  BOOSTED DVCC ..................................….. .11
L  Distance from Donor Cell ..........................….. .1 km
```

(NOTE: SETTING OF THE BOOSTED DCCH HAS BEEN MOVED FROM THIS MENU TO THE RF BOARDS MENU. SHOULDN'T THE DONOR AND BOOSTED DCCH CHANNEL ASSGINEMENTS BE IN THE SAME MENU?)

2.5.1 Identifying the Donor DCCH Channel

The donor DCCH channel (selection I, Control Channels Menu) is the control channel of the primary cell site with which the EAC-2100 will communicate.

- **When the booster is adjacent to a single cell site,** the DCCH channel of that cell site is the donor DCCH channel.

- **When the booster is adjacent to several cell sites,** the DCCH channel of the cell site with the most unused channels should be chosen. (This cell is then referred to as the primary donor cell.) Signals from multiple (primary and secondary) donors must be balanced at the EAC-2100 donor antenna be to within the handoff hysteresis window that is programmed into the donor cells. Otherwise, unwanted hand-offs by the cellular system may occur, thereby causing dropped calls.

2.5.2 Selecting a Boosted DCCH Channel

The boosted DCCH channel (Selection 1-4, RF boards menu) is the control channel that will be used in the EAC-2100 coverage area. Select a channel that meets the following requirements:

- Must conform to the DCCH channel plan for the system with which it is to work:
- Must be included in the neighbor list of its donor cell site and any neighbor cells that may be in range of the EAC-2100
    - The boosted DCCH channel may be entered into the switch either as a phantom cell or as a border cell.
    - A DCCH channel that is assigned to a cell site elsewhere in the system should not be "borrowed" as a boosted DCCH channel for the EAC-2100 unless the system has the ability to segregate operational areas. Otherwise, subscribers operating through the EAC-2100 may be viewed by the system as a potential hand-off candidate to the cell from which the DCCH assignment was "borrowed", even if the subscriber is many miles away from that cell.
- Must be different from the DCCH and DTC RF channels used in cells adjacent to the EAC-2100 to avoid interference.

> ☞ There must be at least a 3-channel spacing between any boosted channel and any donor channel.

2.5.3 The Revertive DCCH Channel Option

When the Revertive DCCH Channel Option (selection E, DCCH Channels Menu) is enabled, the EAC-2100 continues to repeat the DCCH channel (forward and reverse) when all of the normal DTC channels become occupied. If another call goes through, the DCCH channel equipment is redesignated to operate as DTC only, and the last candidate is assigned to and boosted by the DCCH channel equipment. If the DCCH channel has a DTC call up on either or both of its available DTC channels, then the revertive operation will be inhibited. Only when no DTC channels are being boosted on the DCCH channel will the EAC-2100 temporarily reassign the DCCH channel for DTC-only service.

When the call on the temporarily reassigned DCCH channel ends, the equipment reverts to repeating the DCCH channel. If another DTC RF channel becomes free (no calls on any of its time slots), then the EAC-2100 will hand-off the subscriber(s) operating on the DCCH channel equipment to the newly available DTC RF channel equipment (this is referred to as call transfer). The DCCH channel equipment then reverts to repeating the DCCH channel.

2.5.4 Selecting the Directed Retry Channels

The Directed Retry Channels parameter (selection C, Control Channels Menu) is probably the best option for most EAC-2100 installations. The parameter is a factory-set default and is one of four options available under selection J (DCCH Channel State During "All Channels Busy") of the Control Channels Menu.

When the EAC-2100 is busy, the boosted DCCH channel (or substitute DCCH channel, if Revertive DCCH Channel Option is enabled) remains on the air. If more accesses or page responses come in, the EAC-2100 sends the subscriber a special "directed retry" message. This message gives the subscriber a list of up to six other DCCH channels on which to attempt the access. These are the **directed retry channels** and are assigned by the customer (selection C, Control Channels Menu).

The list of six channels is sent to the subscriber in the directed retry message. The subscriber will scan this set of channels and try its access on the strongest of the six channels.

☞ **NOTE:** The donor DCCH channel and the DCCH channels of cells adjacent to the boosted coverage area should be entered. The boosted DCCH channel must *not* be in this list.

2.5.5 Selecting Donor DTC Channels

The donor and boosted DTC channels can be accessed from the DTC Channels Menu, shown here with all available selections. Refer to this menu for sections 2.5.5 and 2.5.6.

DTC Channels Menu

```
DTC Channels

 A  Donor DTC Channels List 1
 B  Donor DTC Channels List 2
 C  Donor DTC Channels List 3
 D  Donor DTC Channels List 4
```

Selection A Menu (example)

```
Donor DTC Channels List 1    Channel Type: TDMA     Donor DVCC: 20

  49
 103
 157
 319

A  Add channels to list                T  Change channel Type
R  Remove channels from list           D  Change Donor DVCC
```

The EAC-2100 allows up to four lists of donor DTC RF channels to be entered, each with a different DVCC. The lists are used to identify subscribers that may drive into the booster coverage area with a call already in progress (that is, already on a DTC RF channel). The EAC-2100 scans the DTC RF channels on the lists, looking for RSSI above a preset hand-in threshold in each time-slot. If a subscriber meets the RSSI threshold requirement, then the EAC-2100 will decode that subscriber's MAHO information to determine whether it needs handing in.

2.5.6 Selecting Donor DTC Channels (Continued)

Identify the donor DTC RF channels with the following guidelines in mind:

- All DTC RF channels of the primary donor cell will be entered in the donor DTC RF channel list. List 1 is recommended for the primary donor cell. Also recommended is that the DVCC assigned to the donor also be assigned to the EAC-2100. However, a different DVCC may be assigned to the EAC-2100 if desired.

- The DTC RF channels of neighboring cells should not be entered into the other donor DTC RF channel lists unless the EAC-2100 donor antenna system has been configured for primary and secondary donor operation.

- For a secondary donor cell site to be included in the donor DTC RF channel list, the signal level at the booster from that secondary donor cell site must be balanced to approximately the same as the primary donor (within the "hand-off" hysteresis window). If the antenna installation is such that this criterion can not met for one of the neighboring cell sites, that cell's DTC RF channels should not be entered in the list. An alternative is to widen the handoff hysteresis at the primary and the secondary donor cells to allow operation with different signal levels to these donor cells.

2.5.6 Selecting Boosted DTC Channels

You must select channels for the boosted DTC RF channels. Note that the number of boosted DTC RF channels may be smaller than the number of RF channels on the donor DTC channel lists. For example, the primary donor cell may have six RF channels (1 DCCH & 5 DTC, 17 DTC channels total), and the EAC-2100 may have four RF channels (one DCCH and 3 DTC, a maximum of 11 DTC channels).

Select an unused channel for each channel of equipment that is installed in the EAC-2100, according to the following guidelines:

- Select the boosted DTC RF channels in the same manner as for a cell site. They must conform to the frequency plan in place for the area.

- Consider channel reuse in the system when assigning the boosted DCCH and DTC RF channels.

- Be sure there is at least a 90 kHz separation between any boosted and any donor RF channel.

2.5.7 **Selecting Boosted DTC Channels** (Continued)

The following table illustrates proper channel separation:

If there is only one donor cell with DTC channels...	1, 22, 43...
Closest allowable boosted channel set	4, 25, 47...
Channel sets not recommended	2, 23... 3, 24...

Example:
If there is only one donor cell and it uses DTC channels 1, 22, 43..., then the closest spaced channel set that could be used for boosted DTC channels would be 4, 25, 47.... The channel sets 2, 23... and 3, 24... could not be chosen because they are too close.

3. Installing the Hardware

3.1 Introduction

This section provides instructions for:

- Mechanical installation
- Connecting ac power
- Installing the antennas
- Connecting external alarms/controls (optional)

The checklist in Figure 3-1 presents a brief overview of these installation procedures. For more detailed descriptions of the procedures, refer to Sections 3.2–3.5.

Checklist

- ❑ 1. EAC-2100 uncrated and contents checked. (Sec. 3.2.1)
- ❑ 2. Holes drilled on the wall (for the wall bracket) or in the pad for the pedestal mount (if using expandable anchors). (Sec 3.2.2)
- ❑ 3. Hanging bracket or the pedestal positioned and bolted in place (orient the pedestal for either front or rear RF cable entry, as required)
- ❑ 4. EAC-2100 either hung on the wall bracket or placed on the pedestal, using appropriate lifting aids. (Sec. 3.2.2)
- ❑ 5. With AC service breaker and the EAC-2100 breaker off, ac electrical connections made. (Sec. 3.3)
  - Green or yellow/green to the safety ground
  - Brown to neutral (for 120VAC operation) or one side of 240 VAC service
  - Blue to 120VAC service or the other side of 240VAC service
  - (Note: The power supplies in the EAC-2100 are auto-ranging. The brown and blue wires may be connected to either 120 or 240 VAC service.
- ❑ 5. Antennas connected; signal level and isolation measured/adjusted. (Sec. 3.4)
- ❑ 6. External alarms/controls connected, if required. (Sec. 3.5)

Figure 3-1. Hardware Installation Checklist

Figure 3-2. EAC-2100, Front View

Insert Drawing here

3.2 Mechanical Installation

3.2.1 Uncrating the Equipment

The container includes these items:

- The EAC-2100 unit
- EAC-2100 manual

Remove the shipping material from around the cabinet. Check the contents and take care that no hardware or manuals are misplaced.

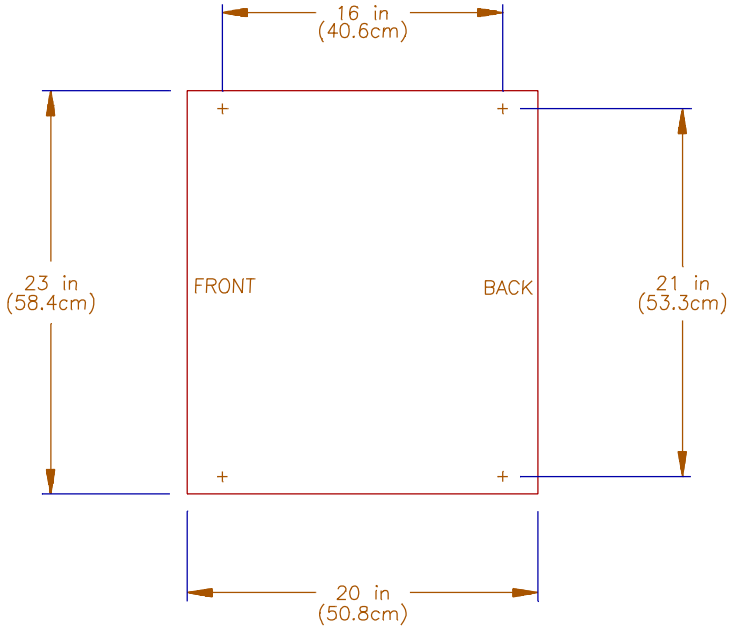
3.2.2 Mounting the Cabinet

The cabinet may be mounted on the wall either by using the wall bracket, or on a concrete or other pad using the pedestal mount.

Four holes are provided in the inside bottom flange of the pedestal for bolting the cabinet to the pad. The preferred mounting method is to drill holes in the pad and use expandable anchors. Alternatively, bolts can be cast into the concrete. Mount the cabinet to the pad as follows:

Figure 3-4. Pedestal Footprint

(UPDATE. Also add mounting dimensions of the wall bracket)



3.2.2.1 Mounting the Cabinet on the Pedestal

1. If using expandable anchors, determine the bolt locations (see Figure 3-4) and drill holes in the pad.
2. Place the pedestal on the pad where it will be installed.
3. Bolt the pedestal to the pad. Be sure to orient the pedestal correctly for RF cable entry through the ROX blocks.
4. Place the EAC-2100 on the pedestal, assemble and bolt the retaining bars to clamp it to the pedestal.

CAUTION: The EAC-2100 weighs 210 pounds (95 kg)! Use appropriate lifting aids to position the unit. Lifting rings on the cabinet are provided for this purpose.

3.2.2.2 Mounting the Cabinet on the Wall Bracket

1. Mount the wall bracket to a flat vertical surface. Make sure the bolts and the structure into which the bolts are fastened are adequate for the weight of the cabinet. Also, make sure the bracket is mounted high enough to allow access to the connectors underneath the cabinet.
2. Place the EAC-2100 onto the wall bracket. If not already in place, insert two CAP screws on upper-rear of the cabinet. Use these two CAP screws to hang the EAC-2100 in place.
3. Secure the remaining holes in the bracket by placing screws in the appropriate holes.

3.2.3 Securing the Door

Later, after all installation steps have been completed (including electrical connections and initial system operation), secure the door as follows:

1. Close the cabinet door.
2. Use the key supplied to lock the upper and lower locks.
3. Place the key in a safe place for later use.

3.3 Installing the Antennas

Antennas should already have been mounted, as described in Section 2.4.2, in locations that meet the following requirements:

- Minimum signal level from any donor cell: -75 dBm or greater at the D1 antenna connector. (See Section 2.4.2 for multi-hop and multi-donor unit variations.)

- Physical separation: M1 and M2 antennas separated at least 10 feet *(3 m)* horizontally or 3 feet *(1 m)* vertically.

- Isolation between D1 and M1, and between D1 and M2:
  – >75 dB

- Modem antenna: Placed so as to minimize interference with the M1, M2, and D1 antennas (minimum 60 dB isolation required). The minimum signal level required for proper operation is -100 dBm. Alternatively, the data radio may be connected to the internal donor duplexer sampling port. However, make sure signal level is enough to make up for the 20 dB coupling loss.

Antenna installation involves connecting the antennas to the EAC-2100, measuring isolation and signal level, and making needed adjustments.

3.3.1 Connecting the Antennas

Connect the antennas to the EAC-2100. All antenna connectors (type 7/6 DIN) are located on the bottom he cabinet, arranged as shown in Figure 3-5.

Figure 3-5. Antenna Connectors

(NOTE: ADD DRAWING OF BOTTOM HERE)

3.4 Connecting External Alarms/Controls (Optional)

The EAC-2100 includes the following inputs and outputs, which may be used to monitor or control non-EAC-2100 equipment:

- 4 digital inputs
- 4 open collector digital outputs
- 4 analog inputs
- 1 +5 Vdc/100 mA source for powering external circuitry

These inputs and outputs are located on the DB15 connector on the front of the controller module. The signals on the pins are controlled and monitored via the local or remote link. Electrical specifications for the pins are shown in Figure 3-7.

(UPDATE)

Figure 3-6. External Alarm/Control Connector Pin Out

Pin	Function	Pin	Function
1	+5 Vdc/100 mA	14	Ground
2	Ext. Digital Output 4	15	Ground
3	Ext. Digital Output 3	16	Ground
4	Ext. Digital Output 2	17	Ground
5	Ext. Digital Output 1	18	Ground
6	Ext. Digital Input 4	19	Ground
7	Ext. Digital Input 3	20	Ground
8	Ext. Digital Input 2	21	Ground
9	Ext. Digital Input 1	22	Ground
10	Ext. Analog Input 4	23	Ground
11	Ext. Analog Input 3	24	Ground
12	Ext. Analog Input 2	25	Ground
13	Ext. Analog Input 1		

3.5 Connecting External Alarms/Control (Optional) (Continued)

Figure 3-7. Electrical Specifications for Inputs and Outputs

Pins	Specifications
Digital Inputs (pins 6,7, 8, 9):	
Load:	> 100 kΩ
Low:	< 2 Vdc
High:	> 4 Vdc max. +28 Vdc
Open Collector Outputs (pins 2, 3, 4, 5):	
	Max. +15 Vdc, 20 mA
	Impedance 733 Ω
Analog input (pins 10, 11, 12, 13):	
Load:	1 M Ω
Range:	0–5 Vdc, 20 mV resolution
+5 Vdc source (pin 1):	+5 Vdc ±5%, 100 mA max.

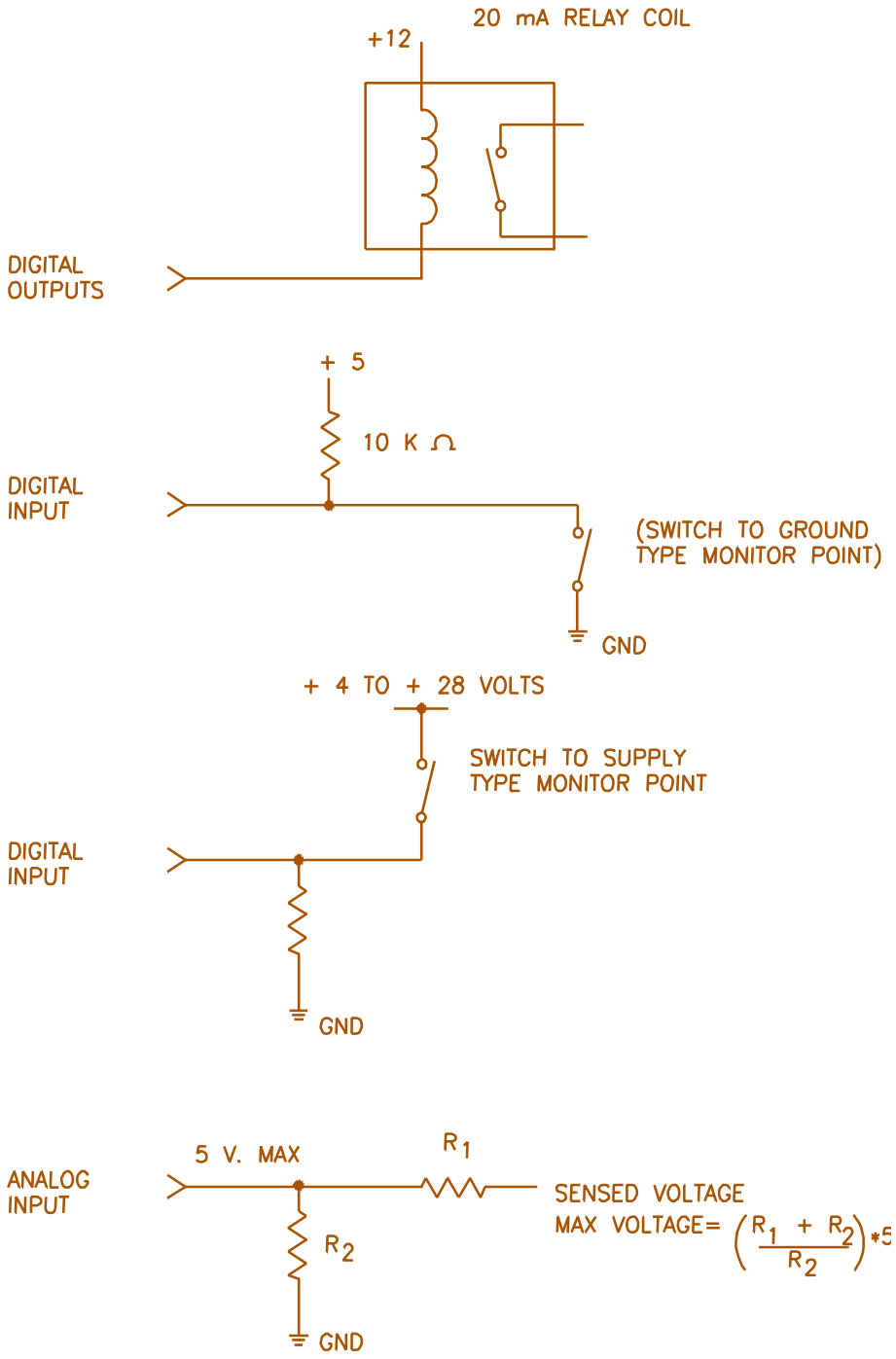
The system designer should have identified any external alarms and controls to be connected. Make external alarm/control connections as follows:

1. Identify the input/output connection to be used for each external alarm/control that is to be installed. Figure 3-8 shows a typical wiring diagram for external alarm input.

2. Make connections using a compatible DB15 male connector (not supplied).

3.5 Connecting External Alarms/Control (Optional) (Continued)

Figure 3-8. Typical Wiring for External Alarm Input



4. Setting Up for Initial Operation

4.1 Introduction

Most of the EAC-2100 operating parameters are under software control and can be changed from either a local terminal or a remote terminal. You will probably have to change some of these parameters to get the system running. After programming channels, you will also need to tune the transmitter combiner and adjust power levels.

This section describes procedures for:

- Powering up and powering down the EAC-2100
- Connecting the local terminal
- Becoming familiar with system commands
- Programming initial parameters
- Tuning the transmitter combiner and setting output power

The checklist in Figure 4-1 presents a brief overview of these procedures. For more detailed descriptions of the procedures, refer to Sections 4.2–4.7. For detailed descriptions of all parameters, refer to Volume 2, Operating Procedures.

Additional instructions for special EAC-2100 configurations and options are provided in Sections 7 through 10. If you have problems during setup, refer to Appendix A, Troubleshooting Guide.

Figure 4-1. Setup Checklist

Checklist

1. Local terminal connected: (Sec. 4.2 and 4.4)
   a. Terminal powered up and set to 9600 baud, even parity, 7 data bits, 1 stop bit, full duplex, all capitals, send carriage return only, auto XON/XOFF and soft scroll disabled.
   b. EAC-2100 powered up and password entered.

2. System status (SSS) and alarm (ALA) report checked; no disabled and no alarms shown. (Sec. 4.6.1)

3. Site ID entered. (Sec. 4.6.2)

4. RF Channels programmed:
   a. Donor DCCH channel programmed. (Sec. 4.6.3)
   b. Boosted DCCH channel programmed. (Sec. 4.6.4)
   c. Donor DTC channels entered in DTC channel lists. (Sec. 4.6.5)
   d. Boosted DTC channels programmed. (Sec. 4.6.6)

5. Alarms and thresholds set (if desired). (Sec. 4.6.7)

6. Modem mobile MIN, mobile power step, and passwords programmed. (Sec. 4.6.8)

7. Reverse path power level adjusted. (Sec. 4.7.3)

8. Clock set. (Sec. 4.7.4)

9. Call history, call statistics, and alarm report reset to 0: (Sec. 4.7.4)
   a. DCH = 0 <CR>
   b. DCS = 0 <CR>
   c. ALA = 0 <CR>

4.2 Powering Up the EAC-2100

One circuit breaker turns the AC power on and off to the EAC-2100.

Figure 4-2. EAC-2100 Breaker

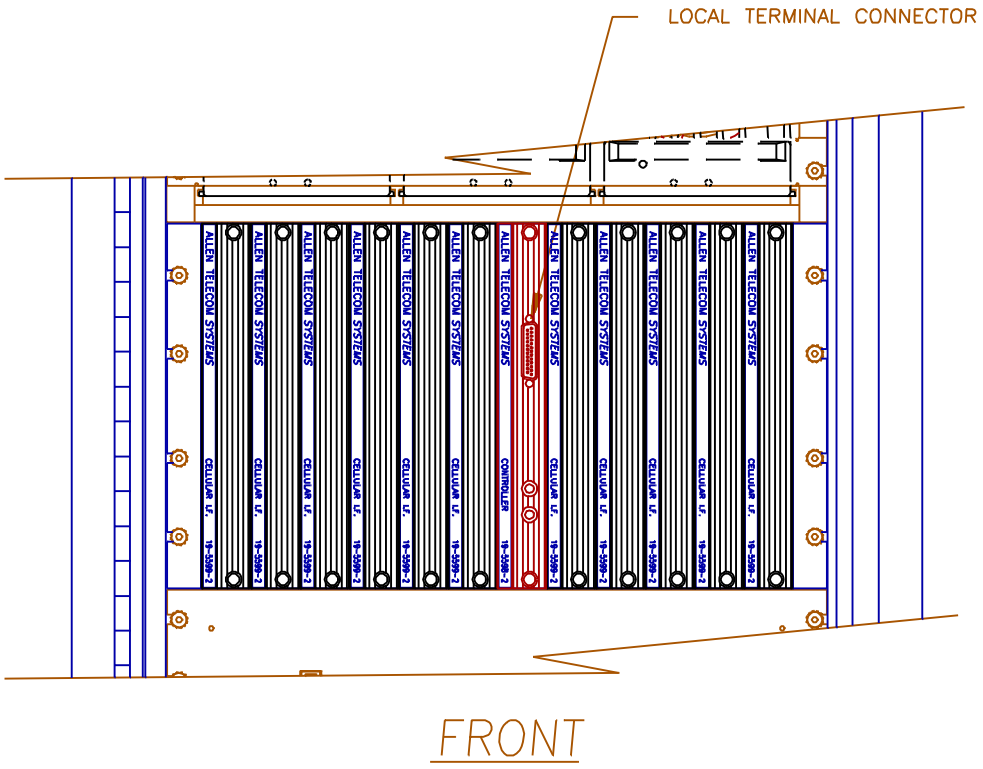
Breaker	Cabinet Location	Controls
Main	Bottom center	ac service to entire cabinet

4.3 Connecting a Local Terminal

The EAC-2100 communicates with a conventional ASCII, RS232 terminal. Connect the terminal as follows.

1. Using the cable provided in the tuck pack, connect the terminal to the 9-pin D-sub connector located on the front of the controller module.

Figure 4-4. Location of Local Terminal Connector



4.4 Connecting a Local Terminal (Continued)

2. Power up the terminal and set it to the following parameters:
   - 9600 baud
   - Even parity
   - 7 data bits, 1 stop bit
   - Full duplex (no local echo)

   If possible, also set the terminal to:
   - All capitals
   - Send carriage return only (no line feed)
   - Disable AUTO XON/XOFF and soft scroll

   If you are using a terminal emulation program, select TTY or VT100. Be aware that some terminal emulation programs generate extraneous characters that may interfere with communicating with the EAC-2100.

3. Power up the EAC-2100. *(After about 2 seconds, the terminal should respond CONSOLE LOCKED.*)

4. Enter **<CR>** (carriage return or enter, depending on the keyboard).*(The terminal should respond with a welcome message and prompt you for a password.)*

   - If something comes up but is illegible, check the terminal setup.

   - If nothing comes up, power down. Recheck the power hookup, the terminal hookup, and the terminal setup.

5. Enter the password, followed by **<CR>**. The default password is 1234. *(The terminal should respond with more salutation and the > prompt.)* The system is ready for you to set parameters.

4.4 Becoming Familiar with System Commands

If you are new to EAC-2100 installation, you should use this section to gain familiarity with basic rules for entering commands, as well as key commands that will be used in setting up the system. If you are already familiar with the system, turn to Section 4.6.

4.4.1 Basic Commands

Figure 4-5 lists definitions of symbols and abbreviations that are used in this section of the manual.

Figure 4-5. Command Definitions

Symbol/ Abbreviation	Definition
>	**Command entry level.** The system uses this prompt character to indicate it is ready to accept commands.
<CR>	**Carriage return** or enter.
<CTRL>	**Control.** The control key is used in combination with other keys. For example, <CTRL> Z means to hold down the control key while pressing the Z key.
ESC	**Escape.** Escape is a single key marked ESC on most keyboards.

Syntax. The system responds to commands that consist of three letters followed by up to three data fields, as follows:

COM [FIELD 1 -] [FIELD 2 =] [FIELD 3] <CR>

In this syntax:

- COM is the particular three-letter command.
- FIELD 1 consists of up to four hex characters followed by a hyphen (-).
- FIELD 2 consists of up to four hex characters followed by an equals (=) sign.
- FIELD 3 consists of up to four hex characters.
- Each command ends with a carriage return (<CR>).

4.5.1 Basic Commands (Continued)

Entering Commands. Very few commands require entry of the data fields. After the initial command has been entered, the system usually prompts for data it needs. If a command does not depend on a certain field, any data entered in that field will be ignored.

When entering commands:

- Spaces may be added to separate the fields, after the first three letters have been entered.
- Leading zeros may be omitted.
- Use DELETE or BACKSPACE to correct mistakes.
- End the command with **<CR>**.

Commonly Used Commands. Figure 4-6 lists the commands you are most likely to use. The most complex command is SET. This command is structured to enable you to enter parameters easily and accurately. The other commands, which are much simpler, require little or no subsequent data input. Their action is complete in a matter of seconds.

☞ **To become familiar with these commands, try each command (except SET) and observe the system's response.**

☞ **NOTE: Use SET and RES with caution!** In an operational system, SET may drop calls if certain parameters are changed. RES will drop all calls currently being boosted. Otherwise, the system commands do not interfere with call processing.

Escaping From Continuous Cycles. Some commands enter a mode in which the program does something continuously. (These commands are indicated by an asterisk (*) in Figure 4-6.) To get out of this mode and return to the command entry level, hit **<ESC>** or type **<CTRL> Z**.

☞ **NOTE:** Entering **<ESC>** or **<CTRL> Z** from the command entry level (>) will cause the characters entered on the line to be erased.

Figure 4-6. System Commands

Command	Meaning	Purpose
HEL	HELp	Gives a list of the primary commands.
SET	SETup	Invokes a menu-driven entry mode used to inspect or change all EAC-2100 operating parameters. (*To exit this command, type* ***<CTRL> X*** *and answer* ***N <CR>****.)*
SSS	Show System Status	Gives a one-page listing of current EAC-2100 parameter settings and conditions of monitored input parameters
SCS*	Show Call Status	Shows current status of each board. Updates listing if status changes (e.g., if a call is set up or taken down) and gives reason for change.
SSR*	Show Scanned RSSI	Shows average RSSIs of channels being scanned
RSS*	RSSI Report	Gives a continuously updated reading of RSSIs on all RF boards.
ALA	ALArm Report	Gives a report of the number of times various alarm conditions have occurred since last system reset.
DCS	Display Call Statistics	Displays various call statistics per board (totals since last DCS=0 command).
DCH	Display Call History	Displays hourly totals of certain call statistics for the last running week.
TIM	TIMe	Displays/changes current clock time and date.
RES	RESet	Resets EAC-2100. Parameters in effect when command is issued will be preserved.
LOC	LOCk	Forces password entry before accepting subsequent commands
PWR*	PoWeR display	Repeatedly lists power readings on all installed PAs.
DVCC*	DVCC report	Repeatedly lists the DVCC readings on the boards
REV	REVision	Displays hardware revisions in the EAC-2100
MIN*	Mobile ID Number	Lists the last five access attempts by subscribers

* To exit this command, hit ESC or type **<CTRL> Z**.

4.5.1 Basic Commands (Continued)

Ending a Session. A session can be ended in three ways:

- **LOC Command:** This command should be used if the session involves only system monitoring or minor parameter changes. It ensures security, but lets alarms and call statistics continue to accumulate.

- **RES Command:** This command should be used if extensive parameter changes have been made during a session. This method:

  - Ensures that all parameter changes take effect, since all hardware is initialized after a reset.
  - Ensures security because the password must be reentered to get back to the command level.
  - Initializes all alarm condition counters to 0.

- **Inactivity Timeout:** An inactivity timer is included in the program with a default inactivity timeout setting of 5 minutes. If a keyboard entry is not detected within the designated period, the system terminates any currently running command (e.g., SET) and simulates the action of LOC. This avoids leaving the EAC-2100 in an insecure state if the remote link is lost before the session is properly ended.

☞ **NOTE:** If a remote terminal is linked by modem to the EAC-2100, LOC, RES or timeout will terminate the link.

4.4.2 Using the SET Menus

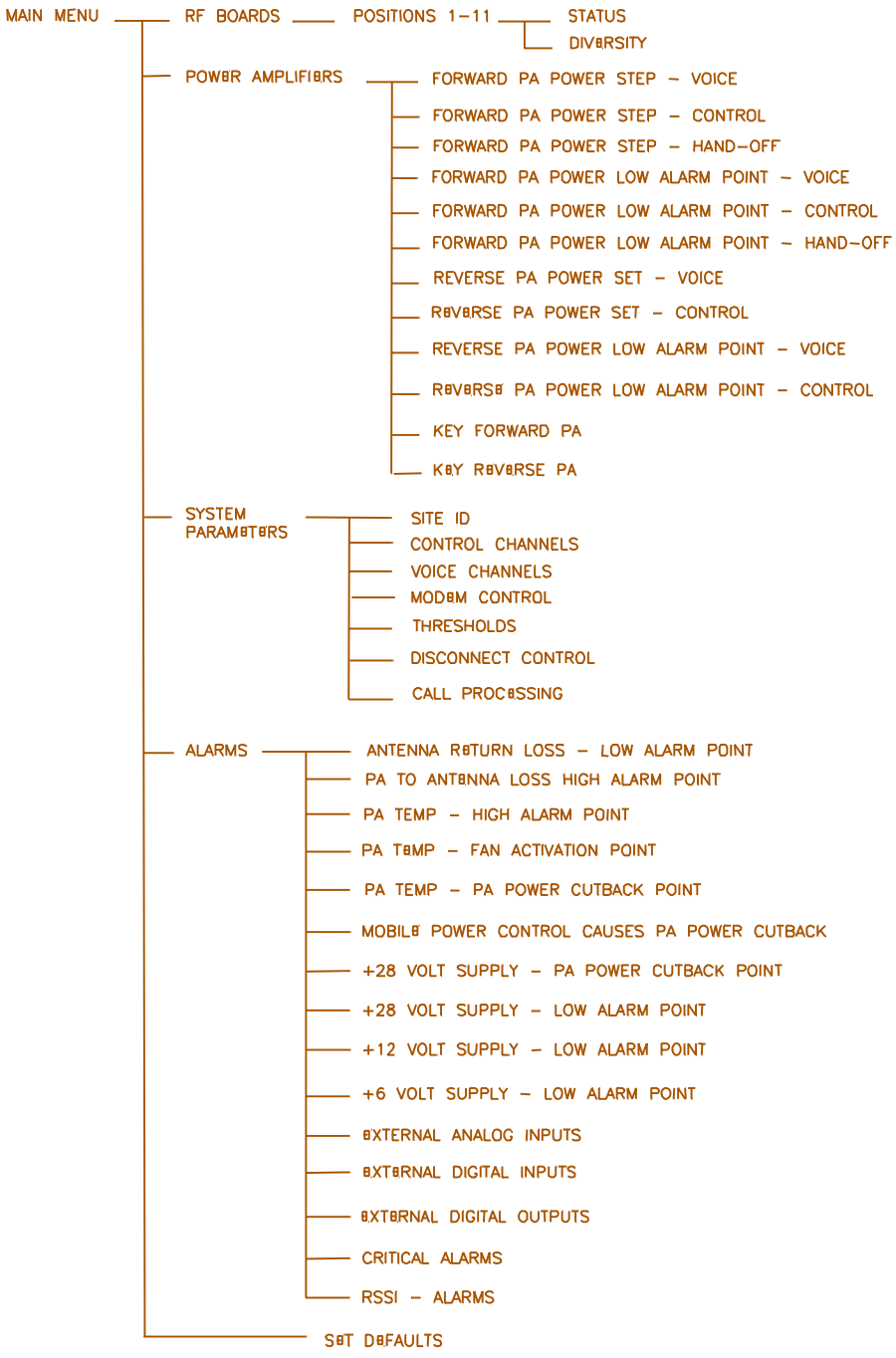
Configuring the EAC-2100 to fill in a coverage area in a specific cellular system is easy, using either the local terminal or a remote terminal. From the command entry level (>), the SET command invokes the setup utility which displays a progression of menus. The menus provide a guided path to each EAC-2100 parameter. Figure 4-7 illustrates the paths to follow through the SET menus to reach each available parameter. For descriptions of all SET menus and commands, see Volume 2, Operating Procedures.

Moving Forward. Each command brings up a menu of items from which to choose, with a character in front of each item. To select an item, type the character and **<CR>**. The next menu (or the parameter to be changed) will be displayed.

Moving Backward. To move backward along a path, type **X <CR>**, or just **<CR>**. (Both entries correspond to the "Done with this menu" selection.) The previous menu will be displayed. Continue in this manner until you have the SET Main Menu.

Exiting. To exit SET, type **<CTRL> X** at any menu level. Or, type **X <CR>** while at the Main Menu level.

Figure 4-7. SET Command Menu Map



4.5 Setting Initial Parameters

Before you can operate the EAC-2100, you must check system status and program the following:

- Site identification
- Donor DCCH channel
- Boosted DCCH channel
- Directed retry channels
- Donor DTC channels
- Boosted DTC channels

You should already have the list of selected channels, as described in Section 2.4. You may also program alarms and thresholds, modem mobile MIN, mobile power step, and passwords at this time.

> If the EAC-2100 is to be used in a **Multi-hop application**, additional parameters must also be set. See Section 7 for procedures.

4.5.1 Checking System Status

Check the system status, as follows, to be sure parameters were returned to default status after factory testing.

1. At the > prompt, type **SSS <CR>**. *(A report will be displayed giving the current state of various parameters for each RF board.)*

2. At the > prompt, type **ALA <CR>**. *(A report will be displayed giving the number of times various alarm conditions have occurred since the last system reset.)*

No alarms should be listed. If there are any *OUT OF SERVICE* or memory alarms, refer to Appendix A, Troubleshooting Guide.

4.5.2 Entering the Site ID

1. At the > prompt, type **SET <CR>** to display the SET Main Menu.

```
Main Menu          A RF Boards
                   B Power Amplifiers
                   C System Parameters
                   D Alarms
                   E Set Defaults
```

2. Type **C <CR>** to display the System Parameters Menu.

```
System Parameters Menu

A  Site ID ..... Identification      Multi-Hop
B  DCCH Channels .....Donor          Boosted          State
C  DTC Channels .....Donor           Donor DVCC       Boosted
D  Modem Control.....Passwords       Console Time-out Auto-Dial Control
                                     Dial-up Phone    Modem Mobile
E  Thresholds.....Hand-In            Hand-Back        Multi-Donor
                  Mobile Power       RSSI Averaging   Hand-In Delay
F  Disconnect Control .....Donor RSSI DVCC Fade Time-out
                  Hand-Back Delay    Hand-Back Attempts
G  Call Processing .....RSSI > Thresh Hand-Back / Grab-Back
```

3. Type **A <CR>** to display the Site ID Menu (shown below with default values).

```
Site ID Menu
                                                    Default Values
A   Site Identification ..... ..... .....Not Assigned
B   Multi-Hop Feature.....DISABLED
```

4. Type **A <CR>** to access the Site Identification parameter.

5. Enter a name (up to 20 characters) that uniquely identifies the site.

6. Type **X <CR>** to back out of the Site ID Menu.

4.5.3 Setting the Donor DCCH Channel

1. From the System Parameters Menu, type **B <CR>** to display the Control Channels Menu.

DCCH Channels Menu

A	**Donor DCCH Channel**	**335**
B	Boosted DCCH Channel	340
C	RF Board To Use For DCCH Channel	1
D	DCCH Channel State During "All Channels Busy"	DIRECTED RETRY
E	Directed Retry Channels	LIST

☞ **NOTE:** This menu represents all selections available on the Control Channels Menu. Not all selections appear at all times. Following are selections that are only available when used in conjunction with other parameters:

- **E - Directed Retry Channels:** Appears only if selection **D** (DCCH Channel State During "All Channels Busy") is set to *Directed Retry*.

4.5.3 Setting the Donor ControDCCH Channel (Continued)

2. Type **A <CR>** to access the Donor DCCH Channel parameter.

3. Enter the channel number (see Section 2.4), then **<CR>**.

4. To return to the Control Channels Menu, type **X <CR>**.

4.5.4 Setting the Boosted DCCH Channel

1. From the Control Channels Menu, type **B <CR>** to access the Boosted DCCH Channel parameter. This parameter establishes the boosted DCCH channel, to which combiner port 1 is tuned.

2. Enter the channel number (see Section 2.4), then **<CR>**.

4.5.5 Setting the Directed Retry Channels

1. From the Control Channels Menu, type **E <CR>** to access the Directed Retry Channels parameter.

2. Enter the DCCH channel numbers of all nearby cells, including the donor. The mobile will be directed to attempt calls on these channels when the EAC-2100 is busy.

3. To return to the System Parameters Menu, type **X <CR>** twice.

4.5.6 Setting the Donor DTC Channels

1. From the System Parameters Menu, type **C <CR>** to display the DTC Channels Menu.

DTC Channels Menu

		Default Values
A	**DTC Channels DVCC List A**	**List**
B	**DTC Channels DVCC List B**	**List**
C	**DTC Channels DVCC List C**	**List**
2	Boosted DTC Channel Position 2	361
3	Boosted DTC Channel Position 3	382
4	Boosted DTC Channel Position 4	403

2. Type **A**, **B**, or **C**, followed by **<CR>**, to access the Donor DTC Channels Menu for the corresponding DVCC.

4.6.6 Setting the Donor DTC Channels (Continued)

3. Enter channels in the list, as described below. A given channel may be entered in only one list. The system will support a maximum of 105 total channels in all four lists (A, B, C, and M).

   A. **To add a channel**, type **A** [channel number] **<CR>**.

   B. **To add multiple channels**, after the **A** enter multiple channel numbers separated by commas or spaces. If you enter a plus (+) sign before a single channel entry, 15 channels will be added, spaced 21 channels apart, starting with the channel entered. You can then delete extra channels as necessary.

   C. **To remove a channel from the list**, type **R** [channel number] **<CR>**.

   D. **To remove multiple channels**, after the **R** enter multiple channel numbers separated by commas or spaces. To remove the entire list, type **ALL**.

4. To return to the DTC Channels Menu, type **X <CR>**.

4.5.7 Setting the Boosted DTC Channels

The DTC Channels menu gives you access to boosted DTC channels 2–4. Boosted channel 1 is normally used to boost the DCHH channel. Program channels 2–4 as follows.

1. Type the channel number (**2** to **4**), followed by **<CR>** to access the desired corresponding Boosted DTC Channel parameter.

2. Enter the channel number, followed by **<CR>**.

3. To return to the DTC Channels Menu, type **X <CR>**.

4. Repeat steps 1–3 for each boosted DTC channel.

4.5.8 Programming Alarms and Thresholds

1. From the SET Main Menu, type **D <CR>** to display the Alarms Menu (shown below with default values).

Alarms Menu

		Default Values
A	M1 Antenna return loss - Low Alarm Point	6 dB
B	M2 Antenna return loss - Low Alarm Point	9 dB
C	PA Temp - High Alarm Point	90 Deg C
D	PA Temp - Fan Activation Point	60 Deg C
E	PA Temp - PA Power Cutback Point	90 Deg C
F	Mobile Power Control causes PA Power Cutback	DISABLED
G	+28 Volt Supply - PA Power Cutback Point	23.0 Volts
H	+28 Volt Supply - Low Alarm Point	23.0 Volts
I	+12 Volt Supply - Low Alarm Point	10.0 Volts
J	+6 Volt Supply - Low Alarm Point	5.4 Volts
K	External Analog Inputs	Alarm Points
L	External Digital Inputs	Alarm States
M	External Digital Outputs	States
N	Critical Alarms	ALARMS REPORTED
O	RSSI - Alarms	ALARM POINTS

4.6.8 Programming Alarms and Thresholds (Continued)

2. Type **D <CR>** to set the fan activation point (the internal temperature that causes the cabinet heat exchanger to be turned on).

   The 60°C default setting is adequate for most installations. Lower the threshold to 50°C if the DCCH channel transmitter output is increased to its maximum (45W) output level.

3. Type **H <CR>** to access the +28 Volt Supply - Low Alarm Point parameter.

   Loss of ac power will cause the EAC-2100 to run on power from the battery plant (if installed). The battery voltage will drop to the low alarm point after a period of time, causing an alarm.

   The default value (23.0 V) will be adequate for most installations. If an external battery plant is used, the low alarm point may be adjusted upward (e.g., to 25–26 V) if desired to provide an immediate alarm in the event of the loss of ac power.

4.6.8 Programming Alarms and Thresholds (Continued)

4. If external analog inputs are connected to the EAC-2100 external alarm/controls ports, type **K <CR>** to access the External Analog Inputs menu.

External Analog Inputs Menu

PA 1–6 Cage:

1	Ext. Analog Input 1 Alarm State	DISABLED; Input Currently 0.0 Volts
2	Ext. Analog Input 2 Alarm State	DISABLED; Input Currently 0.0 Volts
3	Ext. Analog Input 3 Alarm State	DISABLED; Input Currently 0.0 Volts
4	Ext. Analog Input 4 Alarm State	DISABLED; Input Currently 0.0 Volts

PA 7–11 Cage:

5	Ext. Analog Input 1 Alarm State	DISABLED; Input Currently 0.0 Volts
6	Ext. Analog Input 2 Alarm State	DISABLED; Input Currently 0.0 Volts
7	Ext. Analog Input 3 Alarm State	DISABLED; Input Currently 0.0 Volts
8	Ext. Analog Input 4 Alarm State	DISABLED; Input Currently 0.0 Volts

Choose the number of the input(s) connected and program the alarm point. You may specify DISABLED or ABOVE/BELOW a threshold, which may be between 0 and 5 Volts.

☞ **NOTE:** If PA 7–11 Cage is not included in the unit, then the hardware for those inputs is not installed and the alarms should be left as DISABLED.

4.6.8 Programming Alarms and Thresholds (Continued)

5. If external digital inputs are connected to the EAC-2100 external alarm/controls ports, type **L <CR>** to access the External Digital Inputs menu.

External Digital Inputs Menu

PA 1–6 Cage:

1	Ext. Digital Input 1 Alarm State	DISABLED; Input Currently Low
2	Ext. Digital Input 2 Alarm State	DISABLED; Input Currently Low
3	Ext. Digital Input 3 Alarm State	DISABLED; Input Currently Low
4	Ext. Digital Input 4 Alarm State	DISABLED; Input Currently Low

PA 7–11 Cage:

5	Ext. Digital Input 1 Alarm State	DISABLED; Input Currently Low
6	Ext. Digital Input 2 Alarm State	DISABLED; Input Currently Low
7	Ext. Digital Input 3 Alarm State	DISABLED; Input Currently Low
8	Ext. Digital Input 4 Alarm State	DISABLED; Input Currently Low

Choose the number of the input(s) connected and program the alarm state. You may specify DISABLED, HIGH or LOW.

6. If external digital outputs are connected to the EAC-2100 external alarm/controls ports, type **M <CR>** to access the External Digital Outputs menu.

External Digital Outputs Menu

PA 1–6 Cage:

1	Ext. Digital Output 1 State	LOW
2	Ext. Digital Output 2 State	LOW
3	Ext. Digital Output 3 State	LOW
4	Ext. Digital Output 4 State	LOW

PA 7–11 Cage:

5	Ext. Digital Output 1 State	LOW
6	Ext. Digital Output 2 State	LOW
7	Ext. Digital Output 3 State	LOW
8	Ext. Digital Output 4 State	LOW

4.6.8 Programming Alarms and Thresholds (Continued)

Choose the number of the output(s) connected and program the desired state. You may specify:

- Low
- Low if critical alarm exists
- High
- High if critical alarm exists

The "low/high if critical alarm exists" options are provided to allow for connection to external alarm signaling equipment.

7. Type **N <CR>** to review the Critical Alarms Menu, shown here with default values.

Critical Alarms Menu

		Default Values
A	Board Out-of-Service Alarm	CRITICAL
B	Board ROM Alarm	CRITICAL
C	Board Calibration Memory Alarm	CRITICAL
D	Serial Data Link Alarm	CRITICAL
E	Personality Mismatch Alarm	CRITICAL
F	Synthesizer Unlocked Alarm	CRITICAL
G	RVS PA Pwr Low Alarm	CRITICAL
H	RSSI Alarm	LOG ONLY
I	PA Out-of-Service Alarm	CRITICAL
J	PA Temp - High Alarm	LOG ONLY
K	PA Power - Low Alarm	CRITICAL
L	PA to Antenna Loss High Alarm	CRITICAL
N	ROM Alarm	CRITICAL
O	RAM Alarm	CRITICAL
P	NOVRAM Alarm	CRITICAL
R	Power Supply Voltages - Low Alarm	CRITICAL
S	External Analog Input Alarm	LOG ONLY
T	External Digital Input - Alarms	LOG ONLY
Z	Display More Critical Alarms	

☞ **NOTE:** This illustration represents the complete Critical Alarms Menu. In actual application, only half of the Critical Alarms Menu can be viewed at a time due to minimal screen space. To access additional Critical Alarms Menu selections, type **Z <CR>**.

4.6.8 Programming Alarms and Thresholds (Continued)

Critical alarms will cause the EAC-2100 to automatically dial an alarm telephone number when the Auto-Dial feature is enabled. **Log only alarms** will be counted and displayed in the ALA screen, but will not cause the EAC-2100 to dial its programmed alarm number.

The default values shown below will be adequate for most installations.

To change an alarm, type the letter of that alarm and **<CR>**.

To alternate between the two Critical Alarms Menu displays, type **Z <CR>**.

8. Type **O <CR>** at the Alarms Menu to review the RSSI Alarms Menu.

RSSI Alarm Points Menu

		Default Values
A	Donor DCCH Channel RSSI - High Alarm Point	NONE
B	Donor DCCH Channel RSSI - Low Alarm Point	-80 dBm
C	Donor DTC Channel RSSI - High Alarm Point	NONE

B Donor DCCH Channel RSSI - Low Alarm Point is the most critical of these alarm thresholds. This threshold should be set lower (within a range of -85 to -95 dBm), to ensure continued operation, under the following circumstances:

- If the booster is being operated at a minimum (-75 dBm) donor signal level and some fading exists on the donor-to-booster path.

A and C, Donor DCCH/DTC Channel RSSI - High Alarm Points, may be set at a level 10–15 dB higher than the normal signal levels being received from the donor, if desired. This will allow the EAC-2100 to log alarms in the event of IF board failures with their RSSI measuring circuits.

4.5.9 Programming the Modem Mobile MIN, Mobile Power Step, and Passwords

The assigned mobile identification number (MIN) of the mobile and the desired mobile power step should be loaded into the booster. This allows the booster to trap calls to and from the remote link to force operation on the donor DTC channels. By doing so, the remote link does not tie up one of the boosted DTC channels. Passwords may also be programmed now.

1. From the System Parameters Menu, type **D** to display the Modem Control Menu, shown here with default values.

Modem Control Menu

		Default Values
A	Master Password	1234
B	Restricted Password	5678
C	Console Time-out	30 (x 10 Sec)
D	Auto-dial Enable	DISARMED
E	Dial-up Phone Number 1	12163498684
F	Dial-up Phone Number 2	NONE
G	Auto-dial Trials Max	10
H	Delay Between Auto-dial Retries	6 (x 10 sec)
I	Max Auto-dial Trial Period	9 (x 10 sec)
J	Modem Setup	PARAMETERS
K	Modem Mobile MIN	1234567890
L	Modem Mobile Power Step	7

2. Type **K <CR>** to access the Modem Mobile MIN parameter.

3. Enter the 10-digit MIN, followed by **<CR>**.

4. Type **L <CR>** to access the Modem Mobile Power Step.

5. Enter the desired power level step (7 = minimum, 0 = maximum). Enter **<CR>** to record the desired power step.

WARNING!! Use the minimum power step allowable to minimize the possibility of over loading the EAC-2100's reverse input preamplifier.

6. If desired, use menu entries A and B to enter the passwords. (They may be left at the defaults for now if desired.)

4.6 Setting Output Power

4.6.1 Setting Power Levels for Forward PAs 1- 4

1. With the system power **OFF**, connect power measuring equipment to the M1 antenna port for channels 1 and 2, and to the M2 antenna port for channels 3 and 4. Turn the power back on. Output power may be monitored using a through-line wattmeter (or a wattmeter with a built-in load) to monitor output power.

2. From the SET Main Menu, type **B <CR>** to display the Power Amplifiers Menu.

Power Amplifiers Menu

		Default Values
A	Forward PA Power Step - DTC	0
B	Forward PA Power Step - DCCH	0
C	Forward PA Power Step - Hand-off	0
D	Forward PA Power Low Alarm Point - DTC	+40 dBm
E	Forward PA Power Low Alarm Point - DCCH	+40 dBm
F	Forward PA Power Low Alarm Point - Hand-off	+40 dBm
G	Reverse PA Power Set - DTC	+20 dBm
H	Reverse PA Power Set - DCCH	+20 dBm
I	Reverse PA Power Low Alarm Point - DTC	+15 dBm
J	Reverse PA Power Low Alarm Point - DCCH	+15 dBm
K	Key Forward PA	POWER ADJ/COMBINER TUNING
L	Key Reverse PA	POWER MEASUREMENT

3. Type **K <CR>** to key a forward PA.

4. Type **1 <CR>** to key PA 1 and display the forward power output as measured at the sensor.

4.7.1 Adjusting Power Levels for PAs 1- 4 (Continued)

5. Set the desired power level in dBm

   - If using a wattmeter, record the actual power reading (note, there may be small differences between the entered power level and the actual measured power level due to tolerances of the internal power reading circuitry and the external power meter).
   - The power reading at the M1 connector (for channels 1 & 2) or the M2 connector (for channels 3 & 4) should be +40.8 ± 1 dBm (12.5 watts nominal).

4.6.2 Setting Reverse Path Output Power (If Necessary)

The output power in the reverse direction (from booster to donor cell) is +20 dBm per channel. It is set at a much lower level than in the forward direction to prevent reuse interference with other cells that may be in the system. If the minimum received signal requirements are met for the forward direction, then by reciprocity +20 dBm per channel in the reverse direction is sufficient.

☞ **NOTE:** Adjustment of the reverse power level is seldom needed. However, in certain installations the output level may need to be reduced.

The +20 dBm output level can be reduced with the following procedure:

1. From the SET Main Menu, type **B <CR>** to display the Power Amplifiers Menu.

2. Use selections I and J , the reverse PA power for DTC and DCCH channels.

3. Enter the desired level from +5 to +20 dBm.

Another way to remedy this situation is to install pads in increments of 10 dB between the donor antenna and the donor duplexer ANT connector. This method has the added advantage of increasing effective antenna isolation.

4.6.3 Setting PA Power Low Alarm Points

Note that the Power Amplifiers Menu also includes the low power alarm points. The default values are appropriate for PAs set to the factory power levels.

If the power outs have been adjusted lower than this, reduce the alarm points as well. Normally, the alarm point should be set 5 dB lower than the power reported on the terminal while keyed.

4.6.4 Setting Time and Report Values

The EAC-2100 keeps various statistics of calls handled by the booster and alarms that have been logged:

- Running totals of the number and durationof calls handled per board can be displayed using the DCS command.
- Incremental totals of certain call statistics can be displayed using the DCH command.
- Alarms logged since the last system reset can be displayed using the ALA command.

The EAC-2100 clock is used in updating these statistics. To set the clock and reset the report values to 0, complete the following steps:

1. At the > prompt, type **TIM** to access the clock. Enter the current date and time.
2. Type **DCH=0** to reset the Display Call History parameter.
3. Type **DCS=0** to reset the Display Call Statistics parameter.
4. Type **ALA=0** to reset the Alarm Report parameter.

5. Installing the Remote Link

5.1 Introduction

The EAC-2100 normally will be equipped with an Ericsson T18D handset for remote link access. Use of the T18D for remote access will require that the local TIA-136 system have digital data service **to** the handset enabled. This is in addition to the normally available data originate feature available in TIA-136 systems.

An alternative interface may be provided via the PCMCIA interface on the front of the controller card. In this case, a PCMCIA card that has wireless radio capability (either analog or digital) may be plugged into this slot. The PCMCIA front connector will then be used to interface with a compatible handset or mobile.

The PCMCIA slot may also be used with a wire-line type of PCMCIA modem for connection to a telephone line.

When data-terminate capability is enabled in the cellular switch, the T18D handset in the EAC-2100 may be dialed using a remote terminal and compatible modem.

Once the remote link is established, the interface with the system is exactly like that on the local link, but possibly at a different baud rate. If both links are up, characters typed on either terminal are echoed to both, along with the resulting EAC-2100 output. This makes it possible for an experienced operator to exercise the system remotely while someone watches locally, or for the two to exercise the system together.

Procedures. Establishing the remote link involves:

- Setting up service to the handset
- Programming the handset
- Checking out the handset
- Testing the remote link

5.1 Introduction (Continued)

The checklist in Figure 5-1 presents a brief overview of these procedures. For more detailed descriptions of the procedures, refer to Sections 5.2–5.5.

Figure 5-1. Remote Link Installation Checklist

Checklist

1. Service set up with local supplier. (Sec. 5.2)
2. T18D handset programmed: (Sec. 5.3)
3. Handset checked out for proper operation: (Sec. 5.4)
   a. Powering up.
   b. Call originating.
   c. Answering.
4. Remote link tested:
   a. EAC-2100 Answering tested. (Sec. 5.5.1)
   b. EAC-2100 Originating tested. (Sec. 5.5.2)

5.2 Setting Up Service

1. Set up service to the Ericsson T18D handset by contacting the local cellular service supplier. Provide them with the mobile serial number.

2. Obtain from the service supplier the values for the parameters that will be programmed into the handset.

3. Be sure the MIN of the cellular mobile has been loaded into the booster (see Section 4.6.9).

5.3 Programming the Handset

The handset is programmed via its keyboard.

☞ **NOTE:** Procedure for programming the T18D to be provided later.

Once programming and initial testing is complete, the handset should have its interface cable and RF cable connected, and then placed in the bottom of the cabinet. It should be secured via the clamp provided.

5.4 Checking Out the Handset

After the handset has been set up and programmed, check it for proper operation by completing the following steps.

1. With the handset connected, power up the EAC-2100. After a short while, it should indicate that it has service.

   - If the handset does not come into service, check the antenna, the antenna connection and the mobile programming.

2. Make sure the handset can originate and answer calls in the conventional fashion. The handset can be used to communicate with a partner while trying to optimize the booster performance.

3. Dial the handset using another cellular phone. The handset should ring a few times, and then answer.

5.5 Testing the Remote Link

After the remote link has been installed and programmed, you should test its operation. The EAC-2100 should be able to answer calls placed from the remote link. It should also be able (if so programmed) to place calls to a predetermined number when certain alarm conditions exist.

5.5.1 EAC-2100 Answering

The EAC-2100 constantly monitors and answers incoming calls even if it is being exercised via the local link. To test the booster's ability to answer calls from the remote link, complete the following steps.

1. Ensure that the remote link has been installed as required:

   - Conventional ASCII terminal

   - Terminal and modem set to:
     - Appropriate baud rate for the modem (normally 9600 baud)
     - 7 data bits, even parity, 1 stop bit
     - Full duplex (no local echo)

2. Dial the phone number of the handset in the EAC-2100. *(After about one ring, the EAC-2100 will answer and try to set up communication.)*

   - If the modems fail to connect, the modems will terminate the call after a set period of time.

   - If the modems are successful in establishing a link, the remote modem will indicate *CONNECT*.

3. Type **<CR>**. *(The familiar EAC-2100 response should appear.)*

   If there are illegible characters, check the modem/terminal parameter setup.

5.5.2 EAC-2100 Originating

The EAC-2100 constantly monitors and logs several alarm conditions. These conditions can be viewed using the ALA command. They are described in Volume 2, Operating Procedures.

Each type of alarm can be defined as "critical" or "log only" using the SET command. If an alarm defined as critical occurs more than a predetermined number of times, a **critical alarm** is said to exist. The system indicates any critical alarms at the beginning of each communication session.

The system can also be set up to call a predetermined number if a critical alarm exists. (The default setup is **NOT** to place a call when a critical alarm exists.) If the system has been programmed to automatically report alarms, it will attempt to do so only if all of the following conditions exist:

- A critical alarm exists.
- The console is locked.
- The handset is connected and in service.
- The system has not successfully reported an alarm since the "Auto-Dial Enable" parameter was set to ARMED.
- The system has not unsuccessfully tried to report an alarm more than the designated number of times (the Auto-Dial Trials Max parameter) since the Auto-Dial Enable parameter was set to ARMED.

5.5.2 EAC-2100 Originating (Continued)

Successful Call Sequence. When an auto-dial call is made, the following sequence occurs:

1. As the call is auto-dialed, the local console displays *DIALING REMOTE LINK*. (**<CR>** from the local link at this point will abort the attempt.)

2. After the number is dialed, the EAC-2100 waits up to 90 seconds for a remote modem to answer and establish a connection.

3. Five seconds after connect, the EAC-2100 automatically lists the alarm report. The report is echoed locally.

4. If the connection stays up for the duration of the report listing, the attempt is considered successful. The EAC-2100 disarms itself after a successful call to prevent duplicate reports.

5. After the report, the system waits up to 60 seconds for a **<CR>**. If a **<CR>** is received, a normal interactive session begins. Otherwise, the EAC-2100 ends the call.

6. If a second dial-up phone number is programmed, the sequence will be repeated using the second number.

Unsuccessful Call Attempts. The system will abort the call and consider the attempt a failure if either of the following occurs:

- The modems do not connect within a set period of time (the programmed "Max Auto-Dial Trial Period" parameter, default 90 seconds).

- The modems connect, but lose the connection before the entire report is listed.

After a failed attempt, the system will display the message *ORIGINATION ATTEMPT FAILED* on the local console. It will then wait a specified period of time (the programmed "Delay Between Auto-Dial Retries" parameter). If all the conditions for making the call are still in effect, another attempt will be made.

One way to test the call origination feature is to artificially create an alarm by setting the +28 Volt Supply - Low Alarm Point to +35 Volts.

6. Optimizing Performance

6.1 Introduction

After the EAC-2100 has been installed, the system must be checked out to determine if adjustments to the hand-in and handback thresholds are needed to ensure optimum performance.

6.2 Handoff from EAC back to donor – "Handback"

When the subscriber is operating on the EAC 2100 DTC, the donor cell is not aware that the EAC is handling the call. Should the subscriber move towards the donor, the EAC itself must initiate the handoff. To facilitate this, the subscriber unit is directed to make and report MAHO measurements on the donor and all the neighbors of the donor. The EAC looks at two of the RSSI measurements. The MAHO RSSI report for the donor DCCH would be the RSSI at the mobile from the donor, if the donor were to handle the call. The RSSI report for "current" channel is the RSSI at the mobile from the EAC. The EAC will send a handoff message to the portable, directing it back to the donor DTC (same slot) if one of the two following criteria are met:

a) Donor RSSI reported by the mobile's MAHO list is better than the EAC parameter:

"HAND-BACK THRESHOLD – DTC –LOAD SHED LEVEL"

OR

b) Donor RSSI is better than the EAC RSSI reported by the mobile's MAHO list by at least the level set for the EAC parameter:

"HANDBACK THRESHOLD – DTC – MINIMUM IMPROVEMENT".

So, with DTC, the presence of the MAHO information allows the EAC to hand a call back to the donor if the donor can handle it, even if the call would be stronger on the EAC (option a above, load shed level). This allows the EAC to reserve its DTC resources for calls that only it can serve.

Note that either parameter may be set to disabled to disable handback due to that criteria, and if both are set to "disabled" handback by the EAC to the donor will be disabled altogether.

6.3 Handoff from EAC to a cell adjacent to the donor

Handoff from the EAC-2100 to adjacent cells happens almost automatically because of the fundamental role of the subscriber unit in the TDMA handoff process.

When a call is operating on the EAC-2100, the MAHO reports from the subscriber are repeated back to the donor. The donor compares the RSSI reports from the adjacent cells to the "current RSSI". If the RSSI from the adjacent cell is better by a sufficient amount, the donor will do the handoff. The only role the EAC-2100 has is to accurately repeat the MAHO information back to the donor, and it does this. The donor does not realize that the "current RSSI" that the mobile is reporting is really coming from the EAC-2100, however, that does not matter. It is still proper for the call to be handed off to one of the cells adjacent to the donor if that cell can handle the call better than the EAC-2100.

No adjustments or parameters in the EAC-2100 will affect or control this handoff case.

The EAC-2100 does monitor for handoff messages sent by the donor, and these occurrences are reported in the "SCS" screen and in the "DCS" call statistics.

6.4 Handoff from donor to EAC – "Hand-in"

Calls that are operating on a donor DTC channel are handed in to the EAC by the following process:

- The EAC uses an available TDMA board to keep track of the average RSSI from mobiles on donor DTC channels.

- As the subscriber gets closer to the EAC coverage area, the average RSSI will exceed a preset threshold. The EAC will then periodically decode the data coming from the subscriber unit and extract the DVCC and MAHO information.

- If the DVCC is correct, the EAC will attempt to hand-in the mobile when BOTH of the following conditions are met:

The RSSI at the subscriber from the donor must be weaker than the level set in the EAC parameter:

"HANDIN THRESHOLD – DTC – LOAD SHED LEVEL"

AND

The RSSI at the portable from the EAC must be better than the RSSI at the subscriber unit from the donor by:

"HANDIN THRESHOLD – DTC – MINIMUM IMPROVEMENT".

Note that the RSSI that the portable subscriber would experience from the EAC is computed from the average RSSI at the EAC from the portable and the PA power settings.

Once the signal conditions are met, the EAC will attempt a hand-in by using an available RF Module to send a handoff message to the subscriber. If the signal level at the subscriber is at least 3 dB better from the EAC, it will take the handoff message and move to the EAC-2100 DTC channel, and the EAC-2100 will handle the call.

If an idle RF Module is not available for the hand-in process, the EAC-2100 will switch to its "idle-time-slot and hand-in" mode. In this case, the hand-in will performed by the RF Module that is monitoring the hand-in candidate and already has a call up on one of its other time-slot pairs.

6.5 Entering the Donor DTC channels

From the description of the hand-in process, it is clear that the EAC-2100 must know the possible channels that portables might be using when communicating with the donor. To enter the donor channels, use the SET command to navigate to the Voice Channels menu and choose a list not already in use. For example, DONOR VOICE CHANNELS LIST 1 might have been used to enter the donor analog voice channels.

Enter the donor DTC channels into the list, and use the menu options to set the channel Type to TDMA, then set the DVCC to the DVCC of the donor.

> **Note**: If the donor does not use a single DVCC on all the channels, use the "ANY" setting for the DVCC of the list.

Note that this list of donor channels is only required for hand-in operation. For calls that originate or answer while in the EAC coverage area (i.e. calls that are processed through the EAC DCCH), the donor channel information is extracted from the channel assignment message.

6.6 Example Handin and handback threshold settings

Following are some useful combinations of hand-in and handback threshold settings, and a description of the expected functionality that would occur.

Default settings:
HANDIN LOAD SHED LEVEL -100 dBm
HANDIN MINIMUM IMPROVEMENT 5 dB
HANDBACK LOAD SHED LEVEL –90 dB
HANDBACK MINIMUM IMPROVEMENT 2 dB

For calls operating on a donor DTC, hand-in will occur if the signal level from the donor is weaker than -100 dBm AND if the signal level from the EAC would be at least 5 dB better than from the donor. For calls operating on the EAC, handback to the donor will occur if the signal level from the donor is better than –100 dBm. Or, handback will occur if the signal level from the donor is at least 2 dB better than it is from the EAC. The default settings result in 7 dB (5 +2) of hysteresis for minimum improvement criteria and 10 dB for the load shed criteria.

Handin disabled:
HANDIN LOAD SHED LEVEL: DISABLED
HANDIN MINIMUM IMPROVEMENT: DISABLED
(Both must be set to "DISABLED" to disable hand-in.)

Handin if EAC better regardless of absolute signal level from donor:
HANDIN LOAD SHED LEVEL: DISABLED
HANDIN MINIMUM IMPROVEMENT 5 dB

Handback disabled:
HANDBACK LOAD SHED LEVEL: DISABLED
HANDBACK MINIMUM IMPROVEMENT: DISABLED
(Both must be set to "DISABLED" to disable handback.)

Handback if donor better regardless of absolute signal level from donor:
HANDBACK LOAD SHED LEVEL: DISABLED
HANDBACK MINIMUM IMPROVEMENT: 2 dB

Handback due to load shed criteria only:
HANDBACK LOAD SHED LEVEL: -XX dBm
HANDBACK MINIMUM IMPROVEMENT: DISABLED

Negative hysteresis setup for repeated hand-in / handback testing:
HANDIN LOAD SHED LEVEL -40 dBm
HANDIN MINIMUM IMPROVEMENT DISABLED
HANDBACK LOAD SHED LEVEL –100 dB
HANDBACK MINIMUM IMPROVEMENT DISABLED

With the above setup, any subscribers in an area where the signal level from the donor is at least –110 dB and the signal level from the EAC is 3 dB or more better than the from the donor will undergo repeated hand-in to the EAC and handback to the donor. This setup should be used only in strictly controlled circumstances. One way to cause it to happen on a target subscriber unit only is to empty the donor channel list, set up the call, and then enter only the single donor channel.

6.7 Recommendation for settings to avoid repetitive hand -in and handback

From the example settings, it is clear that it is possible to set the parameters such that a repeating hand-in / handback situation occurs.

For operation, the sum of the minimum improvement levels should be at least 7 dB and the handback load shed level should be set at least 10 dB stronger than the handin load shed level.

6.8 Complete list of DTC related parameters

Following is a complete list of the parameters that pertain to DTC operation. Some have been discussed above but for completeness, all are included in this list. Parameters on the "SET" menu that are not in this list are covered in the basic EAC 2000 Manual or the EAC 2000 DCCH Option Manual.

STATUS (RF Boards Menu)

Choices for Status of positions are:

DISABLED
ENABLED TDMA DCCH
ENABLED TDMA DTC

This parameter setting controls the type of boards and PA's the system will expect to detect in the slots and how the boards and PAs will be used, if the proper type is detected.

KEY FORWARD PA (Power Amplifiers Menu)

If a PA with associated board STATUS set to ENABLED TDMA DCCH, DTC or SCAN is keyed, the system prompts for the desired PA power output setting. This is how the IS136 Power Amplifier output power levels are set (there are no pots).

FORWARD PA POWER LOW ALARM POINT - DCCH (Power Amplifiers Menu)

FORWARD PA POWER LOW ALARM POINT - DTC (Power Amplifiers Menu)

Possible settings are either ENABLED (the default) or Disabled. If ENABLED, the EAC looks for PA output power below the desired setting by 3 dB or more. An alarm is logged if this occurs for 3 seconds.

REVERSE PA POWER SET – DCCH (Power Amplifiers Menu**)**

and

REVERSE PA POWER SET – DTC (Power Amplifiers Menu**)**

These settings set the reverse power level that will be transmitted; the default settings of +20 dBm work in most installations. About the only time changes are needed is if the path to the donor is very good. In this case, the signal level from the EAC at the donor may be so high that it triggers power control actions in calls that are being handled by the EAC. These power control messages are not passed on to the subscriber unit, however.

REVERSE PA POWER LOW ALARM POINT – DCCH (Power Amplifiers Menu)

and

REVERSE PA POWER LOW ALARM POINT – DTC (Power Amplifiers Menu)

These parameters may be set to either "ENABLED" (the default) or "DISABLED". If "ENABLED", the system will monitor the reverse power and log alarms if the power falls below the desired setting by 3 dB.

The "DISABLED" setting is useful to temporarily disable the alarm checking and allow a suspicious board to process a call (or a DCCH transaction), even if it otherwise logs alarms.

DONOR DCCH CHANNEL (Control Channels Menu)

This sets the channel number of the DCCH in the Donor cell. See the DCCH Option Manual for more information.

DCCH CHANNEL STATE DURING ALL CHANNELS BUSY (Control Channels Menu)

This parameter determines how the DCCH boosted channel behaves when all analog and TDMA resources in the EAC are busy. See the DCCH Option Manual for more information.

BOOSTED DVCC (Control Channels Menu)

This parameter determines the DVCC used in the EAC 2100 coverage area. This applies to both the boosted DCCH and boosted DTC. Note that the "SAME AS DONOR" option is no longer available. The same DVCC that is in use in the donor cell may be used, but it must be set explicitly.

DISTANCE FROM DONOR CELL (Control Channels Menu)

This parameter is needed for DTC operation to establish the timing advance of the reverse transmissions. The allowable range is 0 to 96 kilometers. This value must be set accurately for proper DTC operation.

MOBILE DYNAMIC POWER CONTROL THRESHOLD – DTC (Thresholds and Power Control Menu)

Default: -60 dBm, Range: -40 to –120 dBm

This sets the RSSI level as measured at the EAC from the subscriber that will cause the EAC to reduce the power level of the subscriber when operating on an EAC DTC. If a portable operating at reduced power subsequently moves away from the EAC, its power will be increased again before it is handed back to the donor. It is recommended that the

"MOBILE DYNAMIC POWER CONTROL THRESHOLD – DTC"

be set no lower than –75 dBm to avoid excessive power control adjustments.

HANDIN- THESHOLD –DTC – MINIMUM IMPROVEMENT – (Thresholds and Power Control Menu)

Default: 5 dB, Range: 0 (disabled) 1 -120 dB

This parameter sets the level of improvement that the EAC calculates will occur before doing a hand-in attempt on a call that is currently operating on one of the donor DTC channels. A complete discussion of hand-in and hand-back for DTC is given above.

HANDIN- THESHOLD –DTC – LOAD SHED LEVEL – (Thresholds and Power Control Menu)

Default: -100 dBm, Range: 0 (disabled) -40 to -120 dBm

This parameter sets the level of the RSSI at a subscriber unit from the donor that will trigger a hand-in attempt by the EAC. That is, the subscriber unit must see this signal or weaker from the donor before the EAC will attempt to take over the call. See above for a complete discussion of hand- in and hand-back for DTC.

NOTE: the Hand-in Load Shed level must be 5 to 10 dB weaker than the hand-back Load Shed level to prevent hand-in / hand-back ping-pong. Hysteresis due to the "minimum improvement" criteria will not by itself prevent ping-pong.

HANDBACK- THESHOLD –DTC – MINIMUM IMPROVEMENT – (Thresholds and Power Control Menu)

Default: 2 dB, Range: 0 (disabled) 1 -120 dB

This parameter sets the level of improvement that the EAC calculates will occur before doing a hand-back on a call that is currently operating on one of the EAC DTC channels. See above for complete discussion of hand-in and hand-back for DTC.

HAND-BACK THESHOLD –DTC – LOAD SHED LEVEL – (Thresholds and Power Control Menu)

Default: -90 dBm, Range: 0 (disabled) -40 to -120 dBm

This parameter sets the level of the RSSI at a subscriber from the donor that will trigger a hand-back by the EAC. That is, when a subscriber is in a call on the EAC, the subscriber must report in its MAHO message that it sees the Load Shed Level of the signal (or stronger) from the donor before the EAC will hand back the call. See above for a complete discussion of hand-in and hand-back for DTC.

NOTE: the Hand-in Load Shed level must be 5 to 10 dB weaker than the hand-back Load Shed level to prevent hand-in / hand-back ping-pong. Hysteresis due to the "minimum improvement" criteria will not by itself prevent ping-pong.

HAND-IN MOBILE POWER LEVEL DTC – (Thresholds and Power Control Menu)

Default: 2, Range: 0-16

This setting is the DMAC attenuation code that will be used initially for DTC calls that are handled on the EAC. Note that this applies if the call is processed through the EAC control channel or if the call is handed in to the EAC. This level determines the initial and maximum operating power level of the portable. Even if power is reduced (due to dynamic power control) and subsequently increased, the operating power level of the portable will never be increased beyond this level.

Level 0 corresponds to +36 dBm, level 1 corresponds to +32 dBm, level 2 is +28 dBm, and so on. Each step is 4 dB. Subscriber units are usually capable of a maximum of +28 dBm. It is permissible to set the HANDIN MOBILE POWER LEVEL DTC to 0 even if subscribers are used because the subscriber unit will operate at +28 dBm even if commanded to power step 0 or 1. The HAND-IN level is also encoded into the EAC transmitted DCCH data stream such that this is the power level that the subscribers use when accessing the EAC on the reverse DCCH channel. Therefore, the HANDIN MOBILE POWER LEVEL – DTC sets the size of the cell, from the standpoint of subscriber talk back range. Level 2 represents maximum talk back, assuming a predominance of subscribers are in use.

HAND-BACK MOBILE POWER LEVEL DTC – (Thresholds and Power Control Menu)

Default: 2, Range: 0-16

This setting is the DMAC attenuation code that will be used for calls that are handed back to the donor. This should be set to the same as is being used for the donor cell. Level 2 represents a maximum size cell, assuming a predominance of subscriber units.

DELAY BETWEEN HANDIN ATTEMPTS – DTC – (Thresholds and Power Control Menu)

Default: 5, Range: 0 to 250 seconds

This setting establishes the minimum time waited after a hand-in attempt is made before another will be attempted. The EAC uses the MAHO RSSI reported by the portable and the RSSI that it is measuring from the subscriber to calculate if the subscriber should be better served by the EAC. If so, the EAC will do a hand-in attempt. However, not all hand-in attempts are successful. Sometimes, the EAC transmits the handoff message to a subscriber, but the subscriber unit does not respond. This may be because of errors, but most often, it is because the signal level from the donor is still on the order of the signal level from the EAC. This causes no problem; the call continues on the donor. In fact, this represents the desired outcome, since the EAC DTC resources will be left free to handle calls that only it can cover. This time delay parameter sets a limit on how often the EAC will attempt to hand-in a call that is operating on the donor.

6.9 SCS command support for DTC operation

The SCS (Show Call Status) command has been changed to show per slot activity for TDMA channels. The possible reasons for DTC call starts are the same as with analog - mobile originate, mobile answer or RSSI > Threshold. New reasons are added to indicate why calls end on DTC channels. Note that for each of the reasons, there is associated DCS call statistic maintained. The possible DTC call end reasons reported are as follows.

MOBILE RELEASE DETECTED– This indicates that a mobile initiated release was detected.

DONOR RELEASE DETECTED– This indicates that a land side initiated release was detected. Note that calls that end due to this reason and to MOBILE RELEASE DETECTED are summed together into a single RELEASE DETECTED statistic.

MOBILE SYNC LOST – This indicates that sync was lost with the mobile after having had sync. This will occur if the subscriber unit travels away from the EAC coverage area towards an area that is not covered by the donor or any of its neighbors.

DONOR SYNC LOST – This indicates that sync was lost with the donor after having had sync.

UNSUCSSFUL SETUP WITH DONOR – This reason is listed if the initial IS136 call setup negotiation fails on the EAC to donor link. The exact events that must take place vary according to if the call is mobile originated, mobile answered, or handed in to the EAC. If this occurs frequently, the Distance from Donor parameter may be set improperly, or there may be a weak link back to the donor.

UNSUCCESSFUL SETUP WITH MOBILE – This reason is listed if the initial IS136 call setup negotiation fails on the EAC to portable link. For mobile originated or mobile answered calls, this indicates a problem. For RSSI>Threshold setups (i.e. where the EAC attempts to handin a call already in progress with the donor), this reason indicates merely that the handin was unsuccessful.

DONOR INITIATED HANDOFF – This reason is listed if the donor issues a handoff message. Most often, this means that the subscriber moved towards a cell adjacent to the donor and that the call was handed off normally. However, if there seems to be many of these relative to the total number of calls (i.e. >10%) check to make sure that the handoffs are not to other channels in the donor cell. Some cellular systems perform an interference check algorithm. The signal level from the EAC may look like it has interference, because the signal will not fit the signal strength versus signal quality profile that the donor usually sees from portables. This situation usually occurs when the link between the donor and the EAC is very good, such that the signal level from the EAC at the donor is high. The problem is easily resolved by merely lowering the reverse transmit level of the EAC, either by adjusting the REVERSE PA POWER OUT – DTC setting or by installing pads in the EAC.

EAC INITIATED HANDOFF – This reason is listed if the EAC issues a handoff message to the subscriber unit. In this case, the handoff will always be back to the donor, and the handoff message will always take (unlike the handin case) since the mobile it communicating on the boosted channel with the EAC.

6.10 SSS and RSS command support for DTC operation

Reverse RSSI readings for 3 slot-pairs will be shown in the SSS command output and also in the RSS command output. Note that, while running the RSS command, you may hit "D" for the donor RSSI line or "M" for the mobile RSSI line. Also, the numbers 1-6 will display the mobile RSSI's for slots 1 through 6.

6.11 SSR command support for DTC operation

When entering the SSR command, each TDMA channel will have 3 RSSIs displayed. These represent the average RSSI in slots 1&4, 2&5 and 3&6. With TDMA channels, a * beside the RSSI indicates that the EAC will not attempt a hand-in on the channel / slot. This could be because of one of several reasons:

- the channel / slot is already being repeated by one of the EAC channels
- the measured DVCC from the subscriber does not match the DVCC in the donor voice channel list
- the MAHO RSSI reported from the subscriber for the donor does not meet the hand-in load shed criteria
- the MAHO RSSI reported and the RSSI received from the subscriber do not meet the minimum improvement hand in criteria
- the EAC has attempted a hand-in on the channel / slot and is waiting the delay between hand-in attempts

6.12 DCS call statistics for DTC

Screens 1-5 have been changed to group the DTC boards and present subtotals for the DTC boards and the analog boards.

Screen 3 contains statistics on calls terminated, and, for DTC boards, the categories labels are appropriate for DTC calls and correspond to the possible reasons listed by SCS for termination of DTC calls.

Screen 4 has been changed to list unsuccessful setups according to whether the failure was in the link to the donor or the link with the mobile.

Screen 6 contains a statistic on the number of power control actions to reduce or increase the mobile power. This is for calls that are on the EAC DTC channels.

6.13 DCH call statistics for DTC

The DCH Hourly call statistics show a weekly rolling usage of the EAC-2100 DTC channels. These statistics should be very helpful in determining the need to add TDMA channels to the EAC.

In the DCH Screens, total calls and total minutes are listed.

One of the DCH screens shows how many requests for digital channels service had to be turned away due to EAC TDMA channels busy.

The last DCH Screen gives a summary of the amount of traffic that could not be handled due to busy EAC resources.