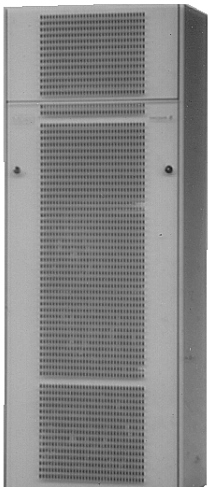
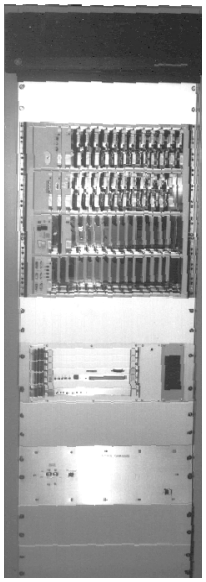
ERICSSON

LBI-39000

Mobile Communications





EDACS™ Jessica PBX Gateway

Systems Manual

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1. OVERVIEW

This manual contains installation and maintenance information for the Enhanced Digital Access Communications System (EDACS) Jessica Private Branch Exchange (PBX) Gateway, known simply as Jessica. Jessica is a communications gateway that connects an EDACS radio system to the local public switched telephone network (PSTN). Jessica works as a centralized subsystem within an EDACS Multisite Network to allow interconnect calls to the PSTN by EDACS users, as well as calls to EDACS users from the PSTN. For calls originating from a telephone, Jessica represents a single point of entry to every site in an EDACS network.

Jessica incorporates the Ericsson MD110 PBX. A default configuration tailored for Jessica is provided; however, those installing Jessica must modify the MD110 configuration to meet the customer's MD110 requirements. A questionnaire on the MD110 (refer to Appendix A of LBI-39039) should be completed by the customer and provided to the installer of the MD110.

Jessica provides common telephone features (such as common speed dialing) to EDACS radio users and those persons calling into EDACS from the PSTN. Standard ringing and busy tones are incorporated on both inbound and outbound calls.

The Jessica subsystem is shown below.

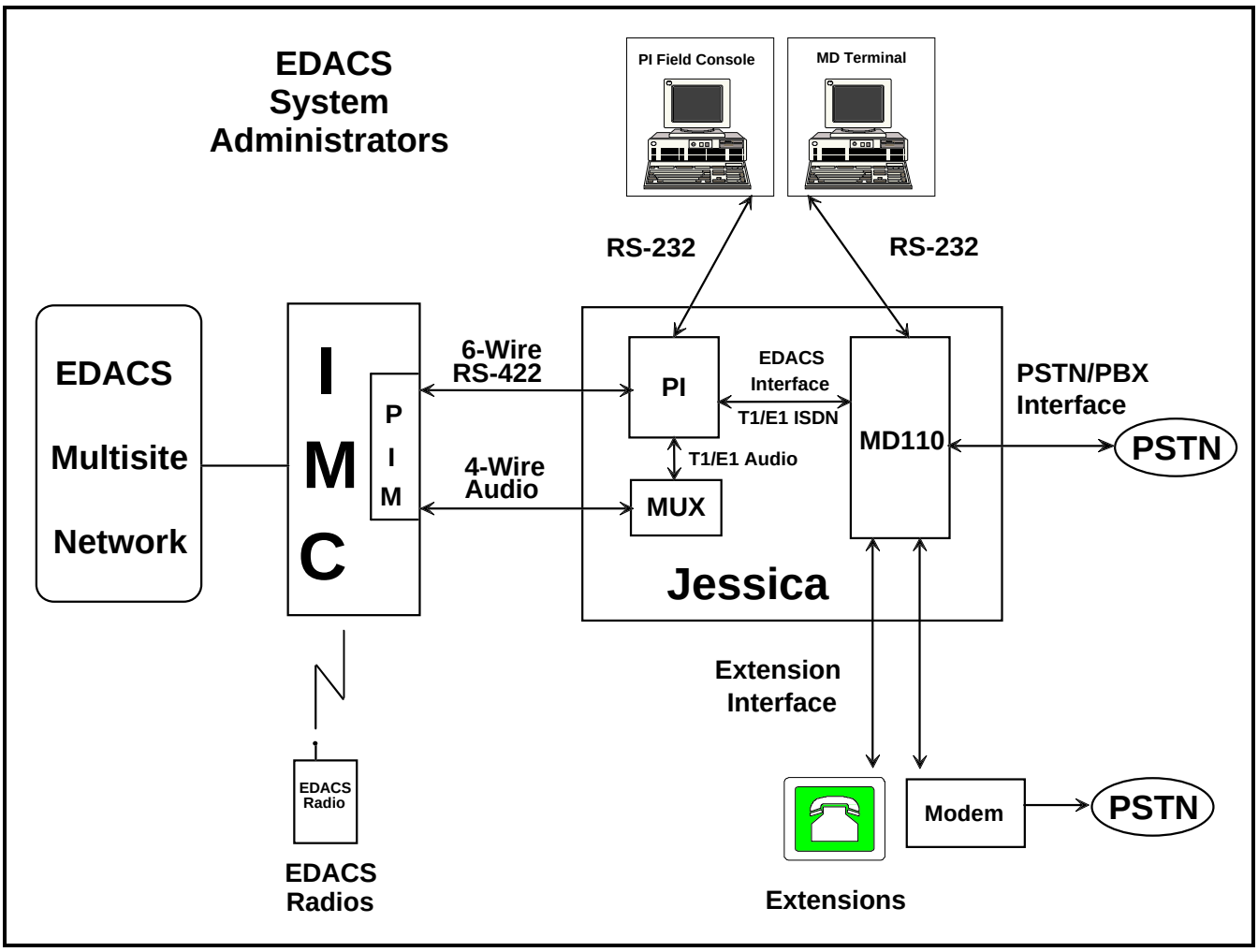


Figure 1 - Block Diagram of Jessica

This manual includes instructions for installing Jessica around the world, so it will contain references to both T1 and E1 signaling (digital telephone signaling protocol) installation procedures. In some places the notation 23/30 is used; the 23 indicates the number of T1 voice channels and the 30 indicates the number of E1 voice channels. The configuration and installation of the MD110 are covered in the Ericsson documentation listed below (documents with the BC number). A section on configuring the MD110 is provided in LBI-39039, and a sample configuration disk is also supplied. Jessica is not a local interconnect system associated with EDACS single-site systems. For information on local interconnect, refer to the subject LBI presented in the list that follows.

The manuals listed below are referenced throughout this document. Some provide additional background information and others may be useful for solving technical difficulties.

- LBI-38894, GETC Maintenance Manual
- LBI-38513, Local Interconnect
- LBI-38938, CEC/IMC Overview
- LBI-38939, IMC Maintenance Manual
- LBI-38985, EDACS Site Controller Maintenance Manual
- LBI-39001, EDACS Jessica PBX Gateway Operator's Manual
- LBI-39039, EDACS Jessica PBX Gateway MD110 Configuration Manual
- LBI-39040, EDACS Jessica PBX Gateway PBX Interface User's Manual
- LBI-39080, EDACS Jessica PBX Gateway Operator’s Manual (Quick Reference Guide)
- LZTU 106 1250, MD110 Technical Product Description, BC6
- LZBU 106 100, MD110 Customer Library -- Small Basic, BC 6
- EN/LZB 103 866, Installation MD110/50
- 62.6929.000.00, Equipment System PCM 30 FXM (ANT BOSCH MUX Manual)
- NECA 365-454-000, Equipment Manual for ND4 Enhanced Digital Channel Bank Equipment

1.1. MAJOR COMPONENTS

Jessica contains three major components: a PBX interface (PI), an MD110 PBX, and a multiplexer (MUX).

PI

The PI provides the interface between the IMC and the MD110. It is responsible for telephone interconnect call management. The PI has a VME bus architecture that includes three primary boards and the miscellaneous equipment below.

- PI Controller (PIC) Board -- a single-board computer that utilizes a CISC 32-bit microprocessor. The PIC is responsible for processing all interconnect calls. It also controls the interfaces to the floppy and hard drives through a small computer systems interface (SCSI) port.

- PI MSC Interface (PMI) Board -- a wide-area network (WAN) server board that provides a high-level data link control (HDLC) link to the PIM controller board within the IMC.

- Primary Rate Interface (PRI) Board -- provides the E1/T1 ISDN interface to the MD110 as well as the E1/T1 audio interface to the IMC. If a T1 link is specified, a PRI-48 is used. If an E1 link is specified, a PRI-64 is used.

- Hard Drive -- drive used for storing the application code, configuration parameters, and call activity.

- Floppy Drive -- a 1.44 Mbyte, 3-1/2" drive for configuration parameter updates and application code upgrades.

- VT100 field terminal -- used to manipulate files on the PI via a pSOS (UNIX-like shell) terminal interface running on the PIC.

MD110

The MD110 is an Ericsson Private Branch Exchange (PBX). Its primary building block is the line interface module (LIM). The LIM performs all call processing functions. One LIM interfaces to the PI and either the Public Switched Telephone Network (PSTN) or another PBX. It contains two to four circuit board cards which connect to a common backplane. The backplane includes a processor bus and a device bus. The processor bus carries control data between the device processors on the individual boards. The device bus carries voice or data to and from device boards.

In addition to the LIM, the standard MD110 has an alarm unit, an Ericsson dial-back modem for remote configuration, a two-hour battery back-up, and up to eight on-premises extensions that allow a telephone to be directly connected to the MD110 for testing purposes. A 386 PC for configuring the MD110 is optional.

The MD110 will also have one or more termination lines to the PSTN or another PBX. All types of digital and analog trunks and tie lines are available based on customer needs. In addition, the MD110 will always have one digital ISDN T1 or E1 trunk for connecting to the PI.

Multiplexer (MUX)

The Multiplexer (MUX), also called a Channel Bank, is used to combine 4-wire balanced audio inputs from the IMC, bound for the Public Switched Telephone Network (PSTN), into a single digitized stream, and vice versa. In North America and Japan the standard is a T1 multiplexer, and in Europe, Asia, and South America the standard is an E1 multiplexer.

A single T1 allows up to 23 voice circuits to be multiplexed together. A single E1 allows up to 30 voice circuits to be multiplexed together. Each voice circuit has its own channel unit within the MUX.

PBX Interface Module (PIM)

Within the IMC, a PBX Interface Module (PIM) provides an audio path and a control signaling interface for Jessica. The PBX Interface Module contains a controller card and up to eight audio cards.

1.2. OPERATION

Telephone interconnect messages can be initiated from an EDACS radio or from a telephone. This section describes the processes that occur when a telephone call is implemented.

Radio-Originated (Outbound) Calls

When a radio user initiates a telephone interconnect call, the radio sends an interconnect request message to the control channel. This message incorporates the digits to be dialed. The system forwards the call request message via the downlink to the IMC. The IMC routes the request to Jessica via the PBX Interface Module in the IMC. Meanwhile, the originating radio is directed to a working channel in preparation for the call connection.

The Jessica PBX Interface receives the call request message and translates it into a telephone call setup. The PI then initiates the call setup using the PRI ISDN interface card. The PRI message is sent to the MD110. The MD110 routes the call to the PSTN or customer-owned PBX. The PSTN then routes the call to the destination telephone. The PSTN indicates to the MD110, which in turn notifies the PI, that the telephone terminal is ringing. The PI notifies the IMC, which in turn generates ringing tones that are sent to the initiating radio.

When the telephone is answered, the PSTN indicates to the MD110, which then indicates to the PI, that the party being called has answered. The connection is now established between the originating radio and the telephone terminal, and the conversation proceeds.

Either the telephone user or the radio user can terminate the call. If the telephone user hangs up first, the PSTN notifies the MD110, which indicates to the Jessica PI that the telephone party has disconnected. The PI sends a drop message to the IMC, and the message is passed to the site where the radio has been assigned a channel.

Alternately, the radio user can terminate a call by pressing the SPC or Clear key. In this case, EDACS sends the call drop message to the IMC, which passes the drop message to the Jessica PI. On receiving the drop message, the PI disconnects the telephone call connection to the MD110.

Telephone-Originated (Inbound) Calls

When the PSTN user dials the telephone number for the Jessica MD110, the PSTN routes the call to the MD110. Once the connection is established, the PSTN user hears a dial tone generated by the MD110. This dial tone is the prompt for the user to enter the access code and identify the desired destination radio or group.

The dialed digits are received by the MD110, which then processes the digits and routes the call to the PI. The PI analyzes the digits passed from the MD110 and signals the IMC to set up an interconnect call to the indicated individual radio or group.

The IMC identifies the site or sites that the individual or group members are logged on to and initiates a channel assignment at those sites. The control channel directs the radio(s) to the assigned working channel. The channel confirmation is passed back to the PI via the IMC. The PI then sends an alerting ringing indication back to the PSTN caller.

The radio user is alerted to the active interconnect call by a ringing tone generated by the IMC. The radio user accepts the call by depressing the PTT button. This message is passed back to the PI, which then indicates to the MD110 and hence the PSTN caller, that the radio has answered. The audio connection is then established and the call proceeds.

The call termination is identical to the process described for radio-originated calls.

1.3. FEATURES

The features of Jessica can be grouped into three classes: system features, telephone user features, and radio user features. A list of the features in each class of calls is given below.

System Features

- Basic centralized telephone interconnect, with inbound and outbound calls supported.
- Up to 30 simultaneous calls for European, Asian, and South American systems with a digital E1 link. Up to 23 simultaneous calls for North American and Japanese systems with a digital T1 link.
- Encrypted voice calls.
- Full duplex telephone calls.
- ISDN interface to the PSTN.
- Automatic line clearing.
- Authorization code disable for inbound calls (optional).
- Activity Reports showing operational statistics collected by the PI. These reports can be spooled to disk or redirected to port 2 of the PI.

Telephone User Features

- Basic telephone tones (ringing and busy).
- Common speed dialing (standard MD110 feature).
- Direct inward dialing (DID).

Radio User Features

- Basic telephone tones (ringing and busy).
- Common speed dialing.
- Least-cost routing (LCR).

Jessica supports:

- Full 16382 EDACS Users
- Full 2048 EDACS Groups
- Failsoft and Site Controller modes
- Up to 30 simultaneous conversations (23 maximum in North America and Japan)
  Jessica is purchased as: 4,8,12,...,23-channel T1
  4, ...,28,30-channel E1

2. SYSTEM REQUIREMENTS

2.1. EDACS SOFTWARE REQUIREMENTS

Release 1.0 of Jessica requires the EDACS software revision levels shown below.

Table 1 - EDACS Component Software Version Requirements

Platform	Minimum Software Version
PBX Interface (PI)	1. PIC Operating System 349A9983G1 2. PI Application 349A9982G1
MD110 (purchased from Ericsson)	1. MD110 Software BC 6.2.1G 2. Configuration File 349A9986G1
CEC/IMC	1. IMC Controller Board U3 344A3565G10 U58 344A3567G10 U59 344A3568G10 U3 344A3565G7, C3 XLTR only U58 344A3569G4, C3 XLTR only U59 344A3570G4,C3 XLTR only 2. IMC Audio Board U99 344A3564G10 3. Conventional Interface Audio Board 19D903324P1 U13 344A3694G10 4. CEC/IMC Manager Disk 344A3630G10
C3 Maestro	1. Disk 344A3922G10 2. CLB U4 344A4245G10
System Manager VAX PDP	 344A4583G3 19A149495G11
Site Controller	344A3265G4

Table 1- EDACS Component Software Version Requirements (Cont.)

Platform	Minimum Software Version
GETC-1E CC/WC Main Board	U2 349A9607G2
Link[1] GETC UL/DL Main Board	U2 344A4895G1
GETC Turbo Board	Disk 344A4414G3
GETC Turbo Loader (PC)	Disk 344A4414G3
SCAT GETC and SCAT/DL	U2 344A3835G1
DVIU VGE	1. 344A4516G4 2. Voice Guard 344A3000P91 Aegis 344A3000P290 Unencrypted Aegis 344A3000P490
DVIU DES	1. 344A4513G3 2. Voice Guard 344A3000P41 Aegis 344A3000P240 Unencrypted Aegis 344A3000P440
M-PA radio	EDACS 344A4614G12 EDACS 19A149863G12 EDACS DES 344A3703G12 EDACS VGE 344A3705G12 EDACS Aegis 344A4415G12 EDACS Aegis DES 344A4419G12 EDACS Aegis VGE 344A4421G12
M-RK radio	M-RK 1 Version 1 hardware 344A4862G11 M-RK 1 Version 3 hardware 349A9842G11 M-RK 2 Version 2 hardware 344A4716G10 M-RK 2 Version 3 hardware 349A9845G10
Orion radio	344A4893G10

[1] Uplink does not use the Turbo board.

2.2. EDACS HARDWARE REQUIREMENTS

Jessica requires the EDACS hardware revision levels shown below to support the software revision levels presented in the preceding section.

2.2.1. System Manager Requirements

Hardware	Hardware Revision
PDP System Manager	NA
VAX System Manager	NA

2.2.2. Site Controller Requirements

Hardware	Hardware Revision
VAX Site Controller	19A149302P8 for Europe 19A149302P5 for US

The PDP Site Controller does not support Jessica.

2.2.3. IMC Requirements

Hardware	Hardware Revision
Controller Board	Rev. G or later for 19D903299P1 on all but the PIM or any rev. for 19D903299P3 on all including the PIM
Audio Board	Rev. H or later for 19D903302P1 or any rev. for 19D903302P3
Clock Board	Rev. E or later N. America may use Rev. D or later
MOM PC	NA

2.2.4. GETC Requirements

The following three GETC categories differ in that not all use the Turbo option, and the three do not share common software.

2.2.4.1. GETC 1-E Control/Working Channel Requirements

Hardware	Turbo	Hardware Revision
Control/Working Channel	Yes	Rev. F or later for 19D902104 or any rev. of 19D904266

2.2.4.2. Link GETC Uplink/Downlink Requirements

Hardware	Turbo	Hardware Revision
Downlink	Yes	Rev. F or later for 19D902104 or any rev. of 19D904266
Uplink	No	Rev. F or later for 19D902104 or any rev. of 19D904266

2.2.4.3. SCAT GETC Requirements

Hardware	Turbo	Hardware Revision
SCAT	Yes	Rev. F or later for 19D902104 or any rev. of 19D904266

2.2.5. Jessica Requirements

2.2.5.1. MD110 Requirements

Please refer to LBI-39039, EDACS Jessica PBX Gateway MD110 Configuration Manual, for MD110 requirements.

2.2.5.2. PI Requirements

The PI requirements are as follows:

T1

- MUX and MD110 connection ports are 100 ohm balanced.

E1

- MUX and MD110 connection ports are 120 ohm balanced.

2.2.5.3. MUX Requirements

The MUX provided with Jessica meets the following requirements:

T1

- 23 channels of balanced 600 ohm 4-wire audio (no signaling required).
- 1.544 Mb/s 100 ohm aggregate interface.
- T1 framing is extended superframe (ESF).
- T1 line coding is B8ZS.
- 120 VAC 50/60 Hz or 240 VAC 50/60 Hz is preferred.
- The unit will mount in a 19-inch rack.
- CCITT: G.703, G.704, G.711 (u-Law), G.733, G.734, and G.824.
- FCC Part 15 Class B approval is required.
- CSA and UL approval are required.

E1

- 30 channels of 4-wire balanced 600 ohm audio (no signaling required).
- 2.048 Mb/s 120 ohm impedance aggregate interface.
- HDB3 line coding.
- CCITT: G703, G704, G711 (A-Law), G732, G736, and G823.
- CISPR22: EN 55022.
- IEC: 801-2, 801-3, 801-5; EN 60950 per 950.
- The unit will mount in a 19-inch rack.

2.2.6. RF Repeater Requirements

The equipment may be EDACS MASTR II, MASTR IIe, or MASTR III.

2.2.7. Radio Requirements

- A radio must support digital interconnect dialing.
- Dual tone multi-frequency (DTMF) tone sending capability, while connected to a called party, is necessary for special functions, such as voice mail access.

Interconnect must be enabled on each particular radio. In addition, the following settings are recommended.

Option	Setting
0-9 (tone length)	50 ms
Start Delay	200 ms
*,# length	100 ms
DTMF pause	500 ms
Interdigit delay	100 ms

2.2.8. Power Requirements for Jessica

AC power (adequate to meet system requirements, environmental control, and digital or voice grade lines) must be available to the site prior to the installation. An unterminated power cord and a standard three-prong ground plug are furnished for the PI cabinet power supply. **Check to be sure that the power outlet complies with local ordinances.**

The equipment should be connected to a good earth ground wire of adequate size. A ground stud is provided for a separate cabinet ground.

	Voltage Requirements	Power Requirements	Power Source
PI	110 VAC 50/60 Hz or 220 VAC 50/60 Hz	150-200W	Cabinet Power Supply
Terminal for PI	110 VAC	70W (estimated)	110 VAC outlet
MD110 (model /10 or /50)	110 VAC 50/60 Hz or 220 VAC 50/60 Hz	300W (typical)	110 VAC or 220 VAC outlet
Optional PC and printer for MD110	110 VAC outlet	500W (estimated)	110 VAC outlet
MUX	-48 VDC	<35W	Cabinet Power Supply

2.2.9. Jessica Space Requirements

Two separate cabinets are required for the three main components of Jessica: PI, MUX, and the MD110.

The PI and MUX are in a deep cabinet with the dimensions 69" x 24" x 24".

The MD110/50 cabinet has the dimensions 62.1" x 27.1" x 13.4".

2.3. EDACS SYSTEM COMPATIBILITY

System Compatibility Matrix

The following matrix lists the EDACS configurations that support Jessica, when used in conjunction with either a Console Electronics Controller (CEC) or Integrated Multisite and Console Controller (IMC).

Level	Definition	Support for Jessica
Basic	Failsoft Trunking	Yes
1	Full-featured Trunking	Yes
2	Dispatch	Yes
3	Digital Dispatch/Telephone Data	Yes
4	Enhanced Radio Coverage Voted System or Simulcast System	Yes Digital Voted is not supported.
CNI	Conventional Network Interface	No CNI only supports group calls, and it does not support digital telephone dialing by radios.
SCAT	Single-Channel Autonomous Trunking	Yes, Clear Voice. No, Digitized Voice.

3. INSTALLATION

Adding the Jessica Subsystem to EDACS is a two-stage process. The first stage is to change the EDACS components at the IMC. The second stage is to change the components at the sites. This section describes the configuration changes and installation procedures needed for Jessica.

CAUTION

All PI, MUX, and MD110 boards are static-sensitive. ESD handling procedures must be followed when replacing or installing boards. Failure to do so may result in board failure or shortened board life.

3.1. INSTALLATION AT IMC

CAUTION

Turn off the power before removing or installing any PBX interface VME bus boards. Removing or reinstalling the boards while the power is on will damage the boards.

3.1.1. IMC

The following additional documents are referenced in the steps of an IMC installation:

- LBI-39039, MD110 Configuration Manual
- LBI-38938, CEC/IMC Overview
- LBI-38939, IMC Maintenance Manual
- LZBU 106 100, MD110 Customer Library -- Small Basic, BC 6

Follow the steps below to connect Jessica to an IMC for the first time.

1. Set up the MD110 configuration per LBI-39039 and the MD110 Customer Library.

2. Connect one end of the cable labeled TSR252 0111/2000 (see E1/T1 Trunk B MD110, Drawing 2203712, on how to put together cable) directly to the PI port labeled "Trunk B -- MD110," starting with the lowest numbered port, and connect the other end to the LFU7 filter board within the MD110.

   The correct connection point at the LFU7 is found as follows: Find the TLU-63/1 or TLU-64/1 in the MD110 that is used for connection to the PI. The cable connector that plugs into the front of the board is labeled. It will be labeled similar to the **example** that follows:

   29A*4R

This indicates where the cable connects in the filter magazine. The filter magazine will contain boards primarily of the LFU type along with SFU and PFU boards.

29	The position the LFU7 occupies in the filter magazine. Each slot in the magazine is numbered.
A	The top half of the LFU7 board. The LFU7 has two connector sections, the top is A and the bottom is B.
4R	The quarter connector position at the rear of the LFU7 where the cable connects. Each connector section A and B is divided into four quarter connectors. Connector 1 is at the top and 4 is the lowest or last quarter connector.

The TSR 252 0111/2000 cable plugs into the front of the LFU7 in slot 29 in the top connector section at the lowest quarter connector position. This is only an example; verify the label on the cable connector at the TLU-63/1 or TLU-64/1.

3. To verify a call, perform the steps below.
   - Ensure that PORT_LOG_CALL is set to TRUE during the configuration file loading (LBI-39040).
   - Observe the terminal. The called radio should appear in the LID or GID field. An example is shown below.

```
CALL:[00003] OUTBOUND DIGITAL LID[06533] [NORMAL_DISCONNECT]:MSC
MSC[01] PBX[01] PHONE[2001]   SITES: O[01] D[01]
DUR: 011.50 DATE: 08/20/93 ST: 09:21:37 CON: 09:21:43 DIS: 09:21:49
```

4. Set the dip switches on a control board as a PIM with the correct site ID (must agree with PI site ID) and insert the PIM control board into the IMC.

SW1

1	2	3	4	5	6	7	8
open	closed	closed	closed	MSB	closed	closed	open

Switch 5 is the MSB of the site ID.

SW2

1	2	3	4	5	6	7	8
open	closed	open	-	-	-	-	LSB

Switches 4 to 8 are used to define the site ID in binary, with switch 8 as the LSB.

5. Insert the appropriate number of audio boards, with the dip switches set to reflect the number of the card. (See IMC LBI-38938, Drawing 19D903515 Sheet 3.)

6. Insert the parallel I/O cable on the IMC backplane (JP1xx or JP2xx) from:
   Control board to first audio board
   First audio board to second audio board
   Continuing through the daisy chain until finished

7. Install the concentrator panel for the PIM control card on the IMC interface panel mounting frame. (Note: A 903531P1 audio concentrator is used for the PIM control card and the audio cards. Refer to Figure 2.)

8. Install the concentrator panels for the PIM audio cards on the IMC interface panel mounting frame.

9. Install Cable 19D903628P7x from the IMC backplane to the PIM control concentrator panel at the IMC. (See Figure 2 or Figure 3 herein for T1 or E1, respectively.) THIS CABLE IS UNIDIRECTIONAL.

10. Install Cables 19D903628P1x from the IMC backplane to the PIM audio concentrator panel at the IMC. (See Figure 2 or Figure 3 herein for T1 or E1, respectively.)

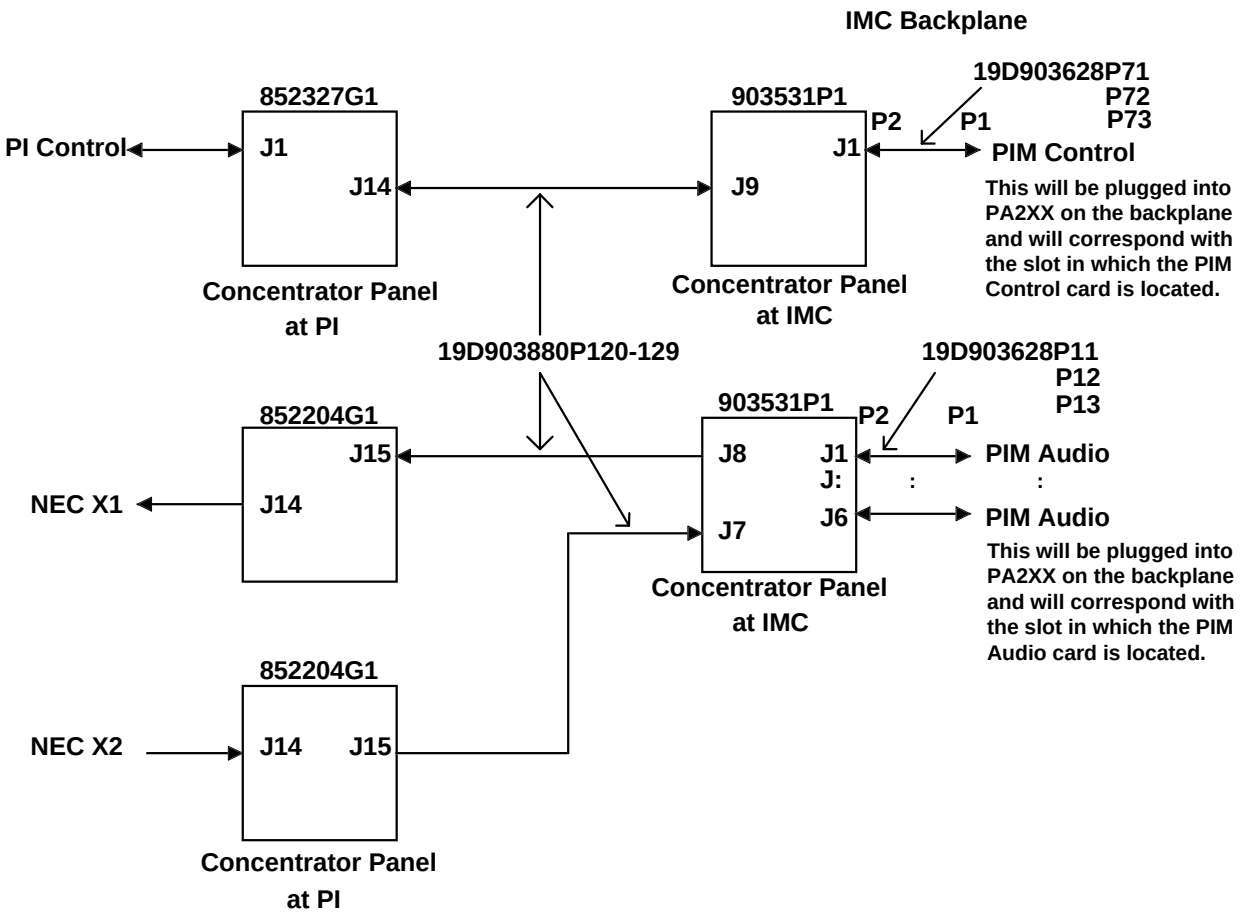
11. Install Cable 19D903880P12x from the PIM control concentrator panel at the IMC to the concentrator panel at the PI. (See Figure 2 or Figure 3 herein for T1 or E1, respectively. This cable is the control link, and there is only one cable to be installed.)

12. Install Cable 19D903880P12x from the PIM audio concentrator panel at the IMC to the concentrator panel at the PI. (See Figure 2 or Figure 3 herein for T1 or E1, respectively. These cables are the audio link, and there are 2 to 4 cables to be installed.)

The following steps must be performed at the CEC/IMC Manager.

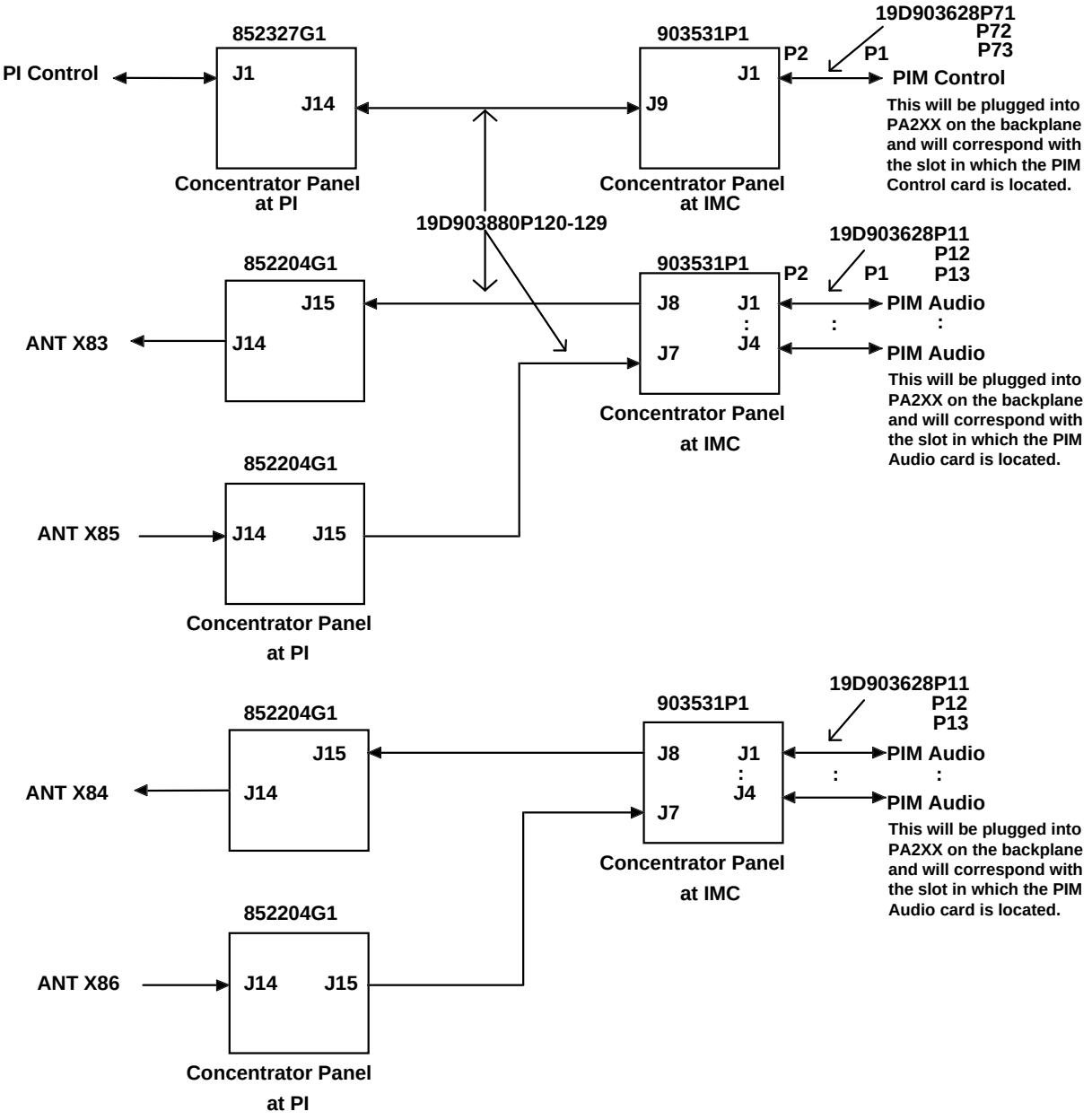
13. To set the number of slots:
    a. Log in to the MOM PC
    b. Select System Audio Configuration
    c. Select TDM Bus and Slot Configuration
    d. Select System Slot Configuration
    e. Select Configure Slots
    f. Select Site Slots
    g. Scroll to the site for Jessica
    h. Set the number of slots to the number of audio channels
    i. Press Escape twice
    j. Select Send Slots
    k. The screen should display the message "Slot Allocation successfully sent to MOM controller"
    l. Press Escape until reaching the main menu

14. To set the audio levels:
    a. From the main menu select System Audio Configuration
    b. Select Trunked Channel Configuration
    c. Select Site ID
    d. Pg Dn to Site ID field and enter the Jessica site number, then press Return
    e. Enter the EDACS IMC configuration for the PIM input and output audio settings with these values
        - PIM Audio (T1 NEC MUX) Audio Out 0 dBm; Audio In -8 dBm.
          PIM Audio (E1 ANT MUX) Audio Out -14 dBm; Audio In +4 dBm.
    f. Press F7 to send values
    g. The screen should display the message "Trunked Channel Configuration received by site <#>"
    h. Press any key
    i. Press F5 to save the values to disk
    j. The screen should display the message "Trunked Channel Configuration Changed. Save to Disk?"
    k. Select Yes
    l. The screen should display the message "Site # Trunked Channel Configuration Data Saved To Disk! --Press <Esc> to Continue--"
    m. Press Escape until reaching the main menu



19D903628	Length	19D903628	Length	19D903880	Length
P71	20'	P11	20'	P120	5'
P72	40'	P12	40'	P121	15'
P73	52'	P13	52'	P122	7'
				P123	10'
				P124	20'
				P125	25'
				P126	30'
				P127	35'
				P128	40'
				P129	50'

Figure 2 - T1 with NEC ND4E MUX



19D903628	Length	19D903628	Length	19D903880	Length
P71	20'	P11	20'	P120	5'
P72	40'	P12	40'	P121	15'
P73	52'	P13	52'	P122	7'
				P123	10'
				P124	20'
				P125	25'
				P126	30'
				P127	35'
				P128	40'
				P129	50'

Figure 3 - E1 with ANT BOSCH MUX

3.1.2. PI

Please refer to LBI-39040, PBX Interface User's Manual.

3.1.3. MUX

The following documents provide additional information on the T1 MUX and the E1 MUX:

- 365-454-000, Equipment Manual for ND4 Enhanced Digital Channel Bank Equipment (NEC ND4E T1 MUX Manual. See Appendix C for a condensed listing of information applicable to the T1 MUX.)
- 62.6929.000.00, ANT Equipment System PCM 30 FXM (ANT BOSCH E1 MUX Manual)

3.1.3.1. E1 MUX Configuration

The ANT BOSCH E1 MUX requires no configuring; however, the steps below must be performed to connect the MUX to the PI and the IMC.

1. X88 ties to -48V for power from the MD110.
2. X87 is the E1 link to the PI (data cable).
3. X85 connects to J7 of the Audio Concentrator (audio out with respect to the MUX).
4. X83 connects to J8 of the Audio Concentrator (audio in with respect to the MUX).

There are two visual indications that the MUX is operating properly:

1. The LED on the front of the MUX is not illuminated (the LED illuminates when the MUX is not working properly).

2. The PI terminal does not display the message “MUX trunk alarm” on the screen. This message is only displayed when the MUX is working improperly.

3.1.3.2. T1 MUX Configuration

The T1 MUX has two digroups: Digroup A (DG-A) and Digroup B (DG-B). Either digroup or both digroups may be connected, depending on the application and the site.

To connect Digroup A, follow the steps below.

1. X2 to J7 of the Audio Concentrator (audio out with respect to the MUX).

2. X1 to J8 of the Audio Concentrator (audio in with respect to the MUX).

To connect Digroup B, follow the steps below.

1. Z2 to J7 of the Audio Concentrator (audio out with respect to the MUX).

2. Z1 to J8 of the Audio Concentrator (audio out with respect to the MUX).

There is a T1 link to the PI for both Digroup A and Digroup B. For power connection, -48V connects to the main and ground connects to ground.

If the MUX was not delivered correctly configured by the manufacturer or if the MUX and/or cards are being replaced, then the MUX should be reconfigured as shown below. The ACU module of the MUX is used to complete work on the first five items. The last three items are performed with switches on the MUX channel cards.

NEC ND4E FPA

- DG-A is enabled.
- DG-B is disabled.
- Framing is ESF.
- Line Coding is B8ZS.
- CLKA is NDDS and LOOP.
- E&M VF channel card TX Attenuation is 16 dBm.
- E&M VF channel card RX Attenuation is 0 dBm.
- E&M VF channel card switch is in BUSY position.

There are two visual indications that the MUX is operating properly:

1. The MAJ and MIN alarm LEDs and the various "Fail" LEDs on the front of the MUX are not illuminated (these LEDs illuminate when the MUX is not working properly).

2. The PI terminal does not display the message "MUX trunk alarm" on the screen. This message is only displayed when the MUX is working improperly.

3.1.3.2.1. Trunk Processing Memory Clear (ND4E only)

This procedure is performed whenever power is cycled to extinguish the blinking green ALM LED on the ACU board. Data stored previously are cleared in order of the occurrence of CGA in the TP memory.

1. Verify that the display on ACU(DS1) indicates either ND4E or SYS:
   If ND4E is indicated, go to step 2.
   If SYS is indicated, go to step 5.
2. Press the right or left arrow key to indicate SYS.
3. Verify that the display on ACU(DS1) indicates SYS:
   If YES, go to step 5.
   If NO, go to step 4.
4. Press the RTN key until SYS is indicated, and go to step 5.
5. Press the ENTR key.
6. Verify that the display on ACU(DS1) indicates EQPT.
7. Press the right arrow key to indicate CONT, and press the ENTR key.
8. Verify that the display on ACU(DS1) indicates TPMC, and press the ENTR key.
9. Verify that the display on ACU(DS1) indicates DG-A or DG-B.
10. Note: DG-A is Digroup A and DG-B is Digroup B.
    Select DG-A or DG-B by using the left or right arrow keys and press the ENTR key.
11. Verify that the display on ACU(DS1) indicates CONT.
12. Press the RTN key to return to SYS.
13. The procedure is completed.

3.1.3.2.2. Carrier Group Alarm (CGA) Counter Reset (ND4E only)

This procedure is used to reset the CGA counter for each digroup. It should be performed after a MUX power cycle.

1. Verify that the display on ACU(DS1) indicates either ND4E or SYS.
   If ND4E is indicated, go to step 2.
   If SYS is indicated, go to step 5.
2. Press the right or left arrow key to indicate SYS.
3. Verify that the display on ACU(DS1) indicates SYS:
   If YES, go to step 5.
   If NO, go to step 4.
4. Press the RTN key until SYS is indicated, and go to step 5.
5. Press the ENTR key.
6. Verify that the display on ACU(DS1) indicates EQPT.
7. Press the right arrow key to indicate CONT, and press the ENTR key.
8. Verify that the display on ACU(DS1) indicates TPMC.
9. Press the right arrow key to indicate RST, and press the ENTR key.
10. Verify that the display on ACU(DS1) indicates CGAA or CGAB.
11. Note: CGAA resets the CGA counter for DG-A and CGAB resets the counter for DG-B. The factory default setting is CGAA.
    Select CGAA or CGAB by using the right or left arrow key, and press the ENTR key.
12. Verify that the display on ACU(DS1) indicates CONT.
13. Press the RTN key to return to SYS.
14. The procedure is completed.

3.1.3.2.3. Enabling Digroup Alarm

The T1 multiplexer contains two independent multiplexers: Digroup A (DG-A) and Digroup B (DG-B).

This procedure describes how to enable each digroup used in the system.

1. Verify that the display on ACU(DS1) indicates either ND4E or SYS:
   If ND4E is indicated, go to step 2.
   If SYS is indicated, go to step 5.
2. Press the left or right arrow to indicate SYS.
3. Verify that the display on ACU(DS1) indicates SYS.
   If YES, go to step 5.
   If NO, go to step 4.
4. Press the RTN key until SYS is indicated, and go to step 5.
5. Press the ENTR key.
6. Verify that the display on ACU(DS1) indicates EQPT, and press the ENTR key.
7. Verify that the display on ACU(DS1) indicates DS1, and press the ENTR key.
8. Verify that the display on ACU(DS1) indicates DG-A or DG-B.
9. Note: DG-A is Digroup A and DG-B is Digroup B.
   Select DG-A or DG-B by using the left or right arrow keys and press the ENTR key.
10. Verify that the display on ACU(DS1) indicates ENBL or DSBL.
11. Note: ENBL enables the alarm monitor in the appropriate digroup and DSBL disables it in the appropriate digroup. The factory default setting is ENBL.
    Select ENBL or DSBL by using the left or right key, and press the ENTR key.
12. Verify that the display ACU(DS1) indicates EQPT.
13. Press the RTN key to return to SYS.
14. The procedure is completed.

3.1.3.2.4. Frame Format

This procedure describes how to set the frame format on the DS1 signal for DG-A or DG-B.

1. Verify that the display on ACU(DS1) indicates either ND4E or LINE.
   If ND4E is indicated, go to step 2.
   If LINE is indicated, go to step 4.
2. Press the right or left arrow key to indicate LINE.
3. Verify that the display on ACU(DS1) indicates LINE, and go to step 4.
4. Press the ENTR key.
5. Verify that the display on ACU(DS1) indicates CLK.
6. Note: DG-A is Digroup A and DG-B is Digroup B.
   Press the right arrow key to indicate DG-A or press the right arrow key twice to indicate DG-B, and press the ENTR key.
7. Verify that the display on ACU(DS1) indicates FRAM, and press the ENTR key.
8. Verify that the display on ACU(DS1) indicates SF or ESF.
9. Note: Super Frame (SF) mode or Extended Super Frame (ESF) mode is selected as the frame format on the DS1 signal. In the SF mode, 1 multi-frame consists of 12 frames. In the ESF mode, 1 multi-frame consists of 24 frames. The factory default setting is SF.
   Select SF or ESF by using the right or left arrow key and press the ENTR key.
10. For Digroup A, DG-A is indicated. For Digroup-B, DG B is indicated.
    Verify that the display on ACU(DS1) indicates DG-A or DG-B, and press the ENTR key.
11. Verify that the display on ACU(DS1) indicates CODE.
12. Return to LINE using the RTN key.
13. The procedure is completed.

3.1.3.2.5. Line Coding

This procedure describes how to set the line code on the DS1 signal for DG-A or DG-B.

1. Verify that the display on ACU(DS1) indicates either ND4E or LINE.
   If ND4E is indicated, go to step 2.
   If LINE is indicated, go to step 4.
2. Press the right or left arrow key to indicate LINE.
3. Verify that the display on ACU(DS1) indicates LINE, and go to step 4.
4. Press the ENTR key.
5. Verify that the display on ACU(DS1) indicates CLK.
6. Note: DG-A is Digroup A and DG-B is Digroup B.
   Press the right arrow key to indicate DG-A or DG-B, and press the ENTR key.
7. Verify that the display on ACU(DS1) indicates FRAM.
8. Press the right arrow key to indicate CODE, and press the ENTR key.
9. Verify that the display on ACU(DS1) indicates ZCS or B8ZS.
10. Note: Zero Code Suppression (ZCS) or Bipolar with 8 Zeroes Substitution (B8ZS) is selected as the line code on the DS1 signal. ZCS suppresses all zeroes by transforming the seventh bit of a channel to 1 when all of the 8-bit data assigned to each channel have changed to zero. B8ZS changes all consecutive zeroes of 8-bit data to the pattern and restores the pattern to all consecutive zeroes of 8-bit data at the receiving side. The factory default setting is ZCS.
    Select ZCS or B8ZS by using the left or right arrow key and press the ENTR key.
11. Note: For Digroup A, DG-A is indicated. For Digroup B, DG-B is indicated.
    Verify that the display on ACU(DS1) indicates DG-A or DG-B, and press the ENTR key.
12. Verify that the display on ACU(DS1) indicates EQL.

13. Return to LINE using the RTN key.
14. Verify that the display on ACU(DS1) indicates either ND4E or LINE.
    If ND4E is indicated, go to step 15.
    If LINE is indicated, go to step 17.
15. Press the → or ← key to indicate LINE.
16. Verify that the display on ACU(DS1) indicates LINE, and go to step 17.
17. Press the ENTR key.
18. Verify that the display on ACU(DS1) indicates CLK, and press the ENTR key.
19. Verify that the display on ACU(DS1) indicates EXTI.
20. Press the → key twice to indicate CLKA, and press the ENTR key.
21. Verify that the display on ACU(DS1) indicates NDDS or DDS.
22. Select NDDS or DDS by using the → or ← key, and press the ENTR key.
    If NDDS is selected, go to step 23.
    If DDS is selected, to step 25.
23. Verify that the display on ACU(DS1) indicates EXT, LOOP, or INT.
24. Note: EXT is applied to use the external clock as the non-DDS clock. LOOP is applied to use the DS1 receive clock as the non-DDS clock. INT is applied to use the internal clock generated by ND4E as the non-DDS clock. The factory default setting is INT.
    Set one clock out of EXT, LOOP, or INT by using the → or ← key, press the ENTR key, and then go to step 25.
25. Verify that the display on ACU(DS1) indicates CLK, and press the ENTR key.
26. Verify that the display on ACU(DS1) indicates CLKB.
27. Return to LINE using the RTN key.
28. The procedure is completed.

3.1.4. MD110

Refer to EN/LZB 103 866, Installation MD110/50, for instructions on MD110 installation.

3.1.5. System Manager

Release 1.0 of Jessica has no direct System Manager interface; however, the following configuration information must be entered at the System Manager.

SYSTEM MANAGER CONFIGURATION
Database

- LID/GID must be wide-area enabled to place or receive PSTN calls.
- LID/GID must be valid for inbound interconnect.
- Site Channels must be wide-area enabled to allow PSTN calls.
- Site Channels should not be interconnect enabled. This is for local interconnect only. Enabling this field for Jessica could result in false alarms.
- The Maximum Interconnect Calls for a site is set based on the maximum number of concurrent interconnect calls appropriate for the site. If the sum of the Maximum Interconnect Calls for all sites on the Multisite Network exceeds 23/30, interconnect calls may be blocked.
- Suggested setting for interconnect hang time is 30 seconds.
- Suggested message conversation time limit is 5 minutes.
- A site does not have to be created for the PI.
- The Centralized Telephone Interconnect default ID is 16, but can be changed to any number under 32 that is not being used.

3.1.6. Subsystem Verification at the IMC

This section provides information on how to verify that the IMC, PI, MUX, and MD110 ISDN subsystems are working correctly.

Verification Test

At the PI:

Ensure that the power is on.
Log in at the console.
At the pSOS prompt (pSH+>), check the system status by typing "Status".
Verify the following:

ISDN Comm Status has Comm Enabled and No Trunk Alarms.
IMC Comm Status has Comm Enabled and Link Up.
Total Channels has the proper number of channels.

At the MOM PC:

Log in to MOM.
Select View System/Diagnostics.
At the System Display, check to ensure that "P" is not blinking.
At the Site Display (use function keys to switch between displays), check to ensure that the Jessica site number is not blinking.
At the Link Status Display (F9), check for "LU," which stands for Link Up.

Call a radio from an MD110 extension while the terminal is connected to port 2 of the PI.

Verify that the call request came into the PI from the MD110 extension.
Note: A similar test to verify the MD110 interface to the PSTN or another PBX should be performed with a phone from the public or private network.

3.1.7. Proper Shutdown

For the MD110:

1. If changes to the configuration have been made since the last "save," execute the following command from the MD110 terminal: DUSYI:DUMP=CHANGES. Wait for the save to complete; this can last up to 40 minutes. Do not remove power while the save is in progress!

2. Remove MD110 power.

For the PI:

1. Execute "shutdn" or "shutdn -i" from the PI terminal. These will prevent new calls from beginning. The "shutdn -i" causes immediate termination of active calls, while "shutdn" allows active calls to terminate normally.

2. After all calls have ended, execute "sync" from the PI terminal.

3. Remove power.

3.1.8. Software and Hardware Upgrades

To install application software upgrades, follow the same steps used for the initial software installation (please refer to LBI-39040, PBX Interface User's Manual).

For ROM operating system software upgrades, follow the steps below.

1. Execute "shutdn" with the PI console.
2. Execute "status" until no calls are active.
3. Execute "sync" with the PI console.
4. Remove power to the PI.
5. Remove the PIC board and use proper ESD protection.
6. Install new ROM U22 and ROM U30.
7. Replace PIC board.
8. Reapply power.

3.2. INSTALLATION AT SITES

3.2.1. Site Controller

Follow the normal installation procedures found in LBI-38985, EDACS Site Controller Maintenance Manual.

The configuration below is required for the EDACS equipment.

SITE CONTROLLER CONFIGURATION
Personality PROM
With System Manager

- Interconnect set to centralized.
- Confirmed CTIS calls.

Without System Manager

- Interconnect set to centralized.
- Confirmed CTIS calls.
- Start up wide-area table specifies LID 16383 and each GID allowed to receive inbound interconnect calls (limit 60 GID).
- Site channels wide-area enabled.
- The Maximum Interconnect Calls for a site is set based on the maximum number of concurrent interconnect calls appropriate for the site.

3.2.2. GETC

Follow the normal installation procedures found in LBI-38894, GETC Maintenance Manual.

The configuration required for use with the EDACS equipment is shown below.

GETC CONFIGURATION
Control Channel/Working Channel, Downlink, and SCAT
Personality PROM

- Enable CONFIRMED CALL for all GETCs except SCAT. If the GETC programmer does not allow for this, it is accomplished by a hex edit of the personality per feature programming instructions 349A9945P1.
- CTIS set to YES.
- Multisite System set to YES.
- Individual channels enabled for interconnect.
- Individual channels enabled for External CIU (digital interconnect) only.
- Maximum Interconnect Calls set to appropriate number for site.
- Recommend Special Call Hang Time of 30 seconds.
- Recommend Message Trunked Timer of 5 minutes.
- SCAT set to YES **for SCAT GETC only!**

3.2.3. Subsystem Verification at Sites

This section provides information on how to verify that the site subsystems are working correctly.

Test	Results
Make a single-site individual call.	**Called LID unconfirmed call** Hear channel access alert tone, then audio is transmitted to the receiving radio. **Called LID confirmed call** Hear queue tone. Hear channel access alert tone, then audio is transmitted to the receiving radio.
Make a multisite individual call.	**Called LID unconfirmed call** Hear channel access alert tone, then audio is transmitted to the receiving radio. **Called LID confirmed call** Hear queue tone. Hear channel access alert tone, then audio is transmitted to the receiving radio.
Make a single-site group call.	**Called GID unconfirmed call** Hear channel access alert tone, then audio is transmitted to the receiving radio. **Called GID confirmed call** Hear queue tone. Hear channel access alert tone, then audio is transmitted to the receiving radio.

Test	Results
Make a multisite group call.	**Called GID unconfirmed call** Hear channel access alert tone, then audio is transmitted to the receiving radio. **Called GID confirmed call** Hear queue tone. Hear channel access alert tone, then audio is transmitted to the receiving radio.

3.2.4. Jessica Verification

This section provides information on how to verify that Jessica is functioning properly.

The following tests are performed for clear voice and digital voice unless the system does not support both.

Test	Results
Make an inbound individual call from a telephone.	Hear ringing at the phone followed by audio after the radio answers. The call will terminate when the radio clears it or when the phone hangs up provided line clearing from the telephone reaches the PI.
Make an inbound single-site group call from a telephone.	Hear ringing at the phone followed by audio after a radio answers. The call will terminate when the phone hangs up provided line clearing from the telephone reaches the PI.
Make an inbound multisite group call from a telephone.	Hear ringing at the phone followed by audio after a radio answers. The call will terminate when the phone hangs up provided line clearing from the telephone reaches the PI.
Make an outbound call to a telephone.	Hear queue tone at the radio, then ringing followed by audio when the telephone answers. The call will terminate when the radio clears it or when the phone hangs up provided line clearing from the telephone reaches the PI.

4. COMPONENTS

4.1. PBX INTERFACE (PI)

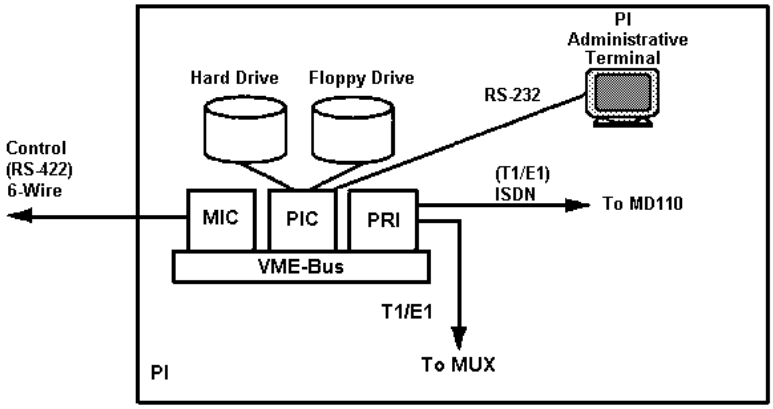


Figure 4 - PBX Interface

4.1.1. PI Component Description

The PI is a multiprocessor system consisting of a general purpose microcomputer board in slot 1 and multiple microprocessor-based intelligent serial communications controllers. These microcomputer boards communicate over an industry standard VME bus backplane. The PI also includes mass storage devices. Slot 2 will be left open and slot 3 will be used for PRI-48/-64. Slot 4 will be used for the Multisite Interface Controller.

4.1.1.1. PBX Interface Controller (PIC)

Using the 68030 microprocessor, the PIC is a general purpose computing board that provides typical computer peripheral interfaces for the PI. These include disk facilities through a Small Computer Systems Interface (SCSI) bus, a Centronics parallel printer connection, IEEE 802.3, and four serial port interfaces for ASCII terminals. The PI does not use the IEEE 802.3 local area network interface during normal operation, and serial port 1 is used for the PI terminal, while port 2 is used for a diagnostics terminal.

In addition to servicing the PI peripherals, the PIC is the central point through which the PRI and Multisite Interface Controller (MIC) boards pass messages. Also, during the startup phase, the PIC reads the configuration files and loads application software and configuration parameters onto other processor boards in the system. Finally, the PIC processes commands from the PI terminal. This board must be in slot 1.

P2 Adapter Board

The P2 Adapter board is a small circuit board that routes the PIC I/O signals and grounds from its concentrated VME bus backplane connector (P2) to the 712M transition module. The board plugs directly onto the rear of the backplane and has two mass termination connectors. Two ribbon cables carry the I/O signals from these connectors to the transition module. Also, the P2 has sockets for SCSI terminating resistors if the SCSI interface of the MVME147 is at the end of the SCSI bus.

712M I/O Transition Module

The 712M is a separate circuit board which receives the PIC I/O lines from the P2 Adapter Assembly ribbon cables and routes them to the appropriate industry standard connector on its front panel. The I/O Transition Module has four DB-25 connectors for serial I/O, a 50-pin SCSI port connector, a DB-15 connector for Ethernet, and a Centronics compatible printer connector. Jumpers on the I/O Transition Module allow the serial ports to be configured as DTE or DCE. The I/O Transition Module has sockets for SCSI terminating resistors.

4.1.1.2. Multisite Interface Controller (MIC)

The Multisite Interface Controller (MIC) allows the PI to communicate over X.25, LAPB, ADCCP, HDLC, or Bit Synchronous connections. The hardware of the MIC consists of a base board and a mezzanine. The model of the mezzanine board determines the electrical interface of the WanServer ports and the number of ports. The mezzanines available are as follows: four port RS-232, four port RS-422, and two port EIA-530.

The firmware of the WanServer fv5310 provides the host processor with a common interface regardless of the port protocols. Only the initial adaptation data provided at power-up are protocol-dependent.

An RS-422 port mezzanine is used in the Jessica application. The MIC provides the communication link between the PI and the PIM in the IMC. The LAPB implementation is used.

4.1.1.3. Primary Rate Interface (PRI)

The PRI-64 ISDN card is a VME bus-compliant E1 interface card optimized for data formatting and transmission in digital switching applications. This card supports two E1 spans: one from the E1 MUX carrying IMC audio channel information, the other from the MD110 ISDN interface. On-board dual port RAM is used to facilitate communication with the PI MIC card via the VME bus.

Each E1 interface supports ISDN primary rate signaling (30B + D, i.e., 30 audio connections plus a control channel). The B channel connections can support HDLC protocols where operated as data links. The PRI card is supplied equipped with all necessary ISDN software to control call functions as defined in layers 1 through 3 of the ISDN specification, i.e., I.430, Q.921, and Q.931. An interface driver is also supplied to provide a comprehensive communication mechanism with the PI application software.

For the North American market, the PRI-48 ISDN card is used, with the corresponding decrease in B channels from 30 to 23.

4.1.2. Mechanical Package

The horizontally oriented VME chassis occupies 4 rack units (RU).

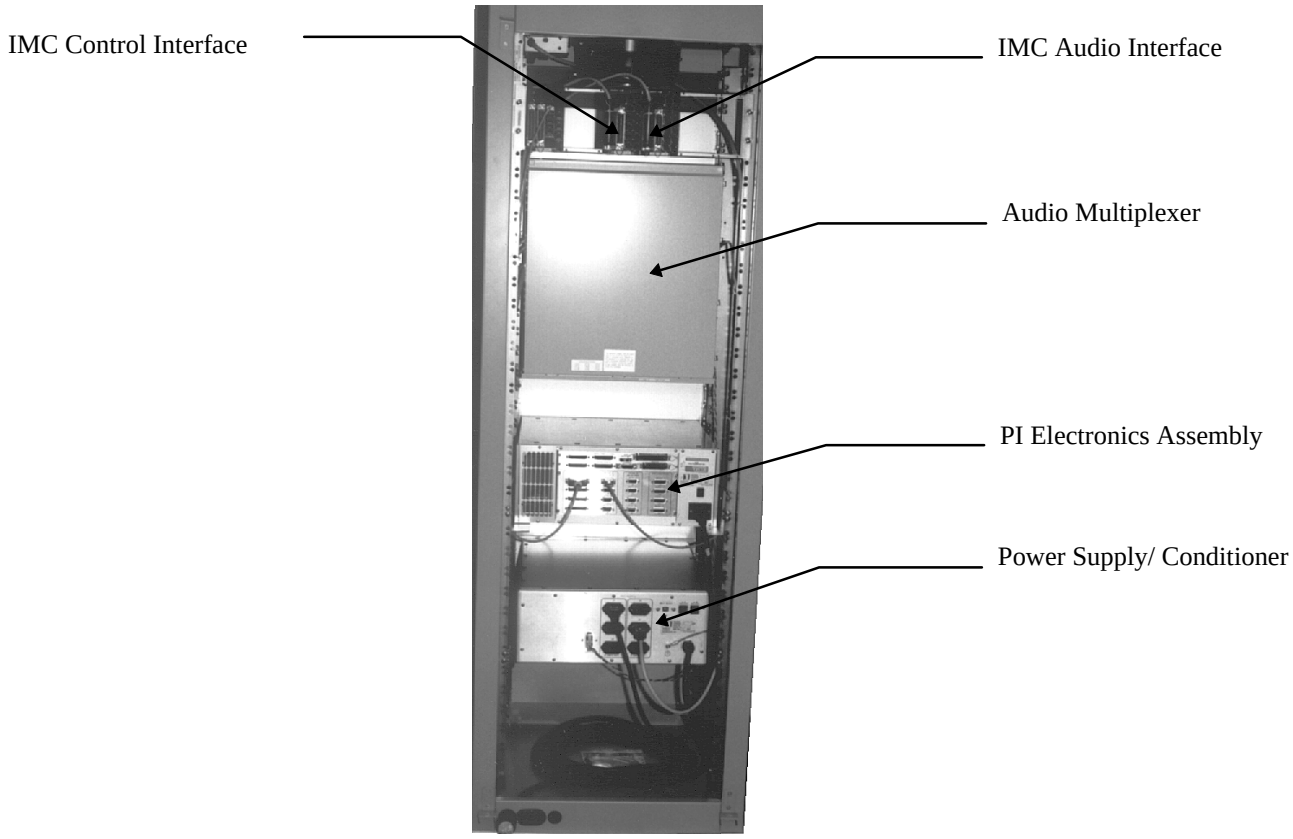


Figure 5 - Rear View of the PI/MUX Cabinet

4.1.3. Hardware Specifications

General Specifications

Interface Types	Centronics parallel printer interface RS-232 serial interface supporting VT100 type terminals
Drives	245 or 290 Mbyte Maxtor fixed disk drive with SCSI 1.44 Mbyte, 3.5" removable diskette DOS drive with SCSI
FCC Regulations	Conforms to FCC Rules Part 15 Class A and EN 55022 Class B

Power Supply

Input Voltage (Autosensing)	90-132 VAC, 47-63 Hz 180-264 VAC, 47-63 Hz
Over Voltage Protection	120 to 130% of nominal output on all channels
Reverse Voltage Protection	
Short Circuit Protection	
Thermal Protection	
Status Indicators	AC "POWER ON" indicator
Duty Cycle	
Redundancy	None

Status Inputs and Outputs

Board LEDs	
General Purpose CPU	FAIL, STATUS, RUN, and SCON
MIC	RUN, FAIL, and STATUS
PRI-48	RUN, FAIL, TRUNK A alarm, and Trunk B alarm
PRI-64	RUN, FAIL, TRUNK A alarm, Trunk B alarm, and 7-Segment Self-Test Display
Drive LEDs	Disk activity lamps on both drives
Fan LED	12 VDC power indicator lamp
Remote Reset Input Connector	Shorting two pins forces a system RESET

Environmental

The operating environment must be free of corrosives or contaminants such as salt water or excessive dust. The following environmental specifications should be met:

Temperature	
Operating	0 to +40°C
Non-Operating	-20 to 85°C
Humidity	20 to 90% noncondensing (except for removable diskette drive)
Storage Temperature	-40 to +85°C
Operating Altitude	< 15,000'
Shipping Altitude	< 50,000'

Diagnostics

Error Detection	Run-time errors logged in a file for viewing or printing
System Configuration	Configuration files can be viewed from the VT100 terminal interface using “config -f”
Controlled Shutdown	System operator can produce a graceful system shutdown so that calls in progress are completed

4.2. AUDIO MULTIPLEXER

4.2.1. T1 MUX Specifications

The NEC MUX will be used for T1 applications. Its specifications are as follows:

T1 - 23 B+D		
Configured w/ 4...23 cards*		
Mechanical Construction		
	19.2" x 19" x 12"	
Weight		
	<59.6 lb	
Power Requirements		
	Voltage	-44 to -56V DC (-48V nominal)
	Power Consumption	34W (0.7A)
Environmental Requirements		
	Temperature	4.4 to 38°C
	Humidity	20 to 55% (without condensations)
*Must have card for each audio line		

4.2.2. E1 MUX Specifications

The ANT BOSCH MUX will be used for E1 applications. Its specifications are shown below.

E1 - 30 B+D		
Configured w/ 4...30 cards*		
Mechanical Construction		
	10.51" x 19" x 12.2"	
Weight		
	<26.4 lb	
Power Requirements		
	Voltage	-19 to -75V
	Power Consumption	23W
Environmental Requirements		
	Temperature	5 to 40°C
*Must have card for each audio line		

4.3. POWER DISTRIBUTION UNIT AND -48V POWER SUPPLY

Power Distribution Unit Specifications

The Power Distribution Unit (PDU) operates within the same environmental specifications as shown for the PI. The operating environment must be free of corrosives or contaminants such as salt water or excessive dust. The following environmental specifications should be met:

Temperature	
Operating	0 to +40°C
Non-Operating	-20 to 85°C
Humidity	20 to 90% noncondensing (except for removable diskette drive)
Storage Temperature	-40 to +85°C
Operating Altitude	< 15,000'
Shipping Altitude	< 50,000'

-48V Power Supply Specifications

Specifications for the -48V power supply are shown below.

AC Input	100/120/220/240 VAC +10%, -13%, 47 to 63 Hz Tolerance for 230 VAC operation is +15%, -10% Derate output current is 10% for 50 Hz operation
DC Output	-48 VDC, adjustment range is ±5% minimum
Line Regulation	±0.05% for a 10% change
Load Regulation	±0.05% for a 50% load change
Output Ripple	3mV +0.05% of output voltage, peak-to-peak maximum, all "3-terminal regulator" outputs: 3mV +0.2% peak-to-peak maximum
Short Circuit Protection	Automatic current limit/foldback
Temperature Rating	0°C full rated, derated linearly to 40% at 70°C

4.4. PI/MUX CABINET

Specifications for the PI/MUX cabinet are shown below.

Height:	69-1/6”
Width:	24”
Depth:	24”
Weight:	~350 lb

PI Cabinet Rack Units (RU):	PI	4 RU		
	T1 MUX	11 RU	or E1 MUX	6 RU
	Power Supply	3 RU		
		18 RU	or	13 RU

4.5. MD110 LIM

The MD110 system requires specific environmental conditions to ensure proper operation. The MD110 should not be installed in a location where water sprinklers are present. As an alternative, Halon is the recommended fire protection system. If static electricity is generated by the floor covering, the floor should be covered with suitable antistatic material to reduce the risk of disturbances to the MD110.

The following normal operating and storage limits must be maintained to ensure proper MD110 operation:

Temperature range:	41 to 104°F (5 to 40°C)
Recommended state:	72 ± 2°F (22.2 ± 1.1°C)
Relative humidity range:	20 to 80%
Recommended state:	50 ± 10%

Before power is applied to an MD110 system, the equipment and the ambient room temperature/humidity must be stable within the operating ranges. Measurements should be taken at least 60 inches above the floor and at least 20 inches from any heat dissipating object. Typical heat dissipation for MD110 cabinets is 300W. This value recognizes that some of the power supplied to the system rectifiers is actually dissipated over cabling and external station equipment.

The type of air filtration required for proper operation depends upon the dust and other particulate matter concentrated in the equipment room. In a high particle-count atmosphere, use of a prefilter and a main filter in the room ventilation intake is required. If salt air, corrosive gases, or other degrading pollutants are present, special filtering is required. Air in the equipment room should circulate to prevent hot spots and to exhaust heated air. To be safe, circulation equipment should change the equipment room air every 5 minutes. The circulating air should contain from 5 to 25% filtered fresh air.

Dimensions of MD110 equipment cabinets are as follows:

Height:	62.1"
Width:	27.1"
Depth:	13.4"

Floor loading is based on a 36-inch deep aisle working space in front of each cabinet and is derived from total cabinet weight. The maximum weight of a fully loaded LIM cabinet is 440 lb. The cabinet floor loading for MD110/50 cabinets is approximately 47.3 lb/sq ft.

5. GLOSSARY

ACU	Alarm Control Unit.
CEC	Console Electronics Controller.
Console Users	Dispatch Operators using EDACS consoles.
CTIS	Centralized Telephone Interconnect System.
C3	Type of Console.
DCE	Data Communications Equipment.
DID	Direct Inward Dial -- Allows callers from the public network to place an individual call to a radio by dialing a single telephone number, instead of one telephone number to call JESSICA and a second series of numbers to indicate the Logical ID. To accomplish this, the LID is mapped to a number. In some cases, the DID number will be the LID.
DTE	Data Terminal Equipment.
EDACS	Enhanced Digital Access Communications System.
EDACS System Administrator	Person(s) responsible for configuring and maintaining EDACS, including configuring the Jessica system to allow both inbound and outbound calls.
Exchange	A switching system which serves a group of telephones in the same geographical area.
Extension	A telephone line connected to a Private Branch Exchange (PBX).
GETC	General Electric Trunking Card.
GID	Group Identification -- radio group identification.
HDLC	High-Level Data Link Control -- data link layer protocol.
Inbound Calls	Phone-originated call to a radio.
ISDN	Integrated Services Digital Network.
IMC	Integrated Multisite Coordinator.
LAPB	Link Access Procedure Balanced -- data link layer protocol.
LBI	Lynchburg Book of Instruction.
LCR	Least-Cost Routing -- A function that allows the system to automatically select the most economical route for an outgoing call. The selected route is based on trunk availability, class of service, time of day, and week.
LID	Logical Identification -- individual radio or console ID.

MD110	Ericsson PBX that provides connectivity to the PSTN.
MIC	Multisite Interface Controller board in the PI.
MUX	Multiplexer -- A device used to combine a number of 4-wire audio signals into a single, high-speed digital stream.
Outbound Calls	Radio-originated call to a phone.
PBX	Private Branch Exchange -- a telephone switch commonly used in business applications.
PI	PBX Interface -- Jessica VME bus chassis that provides connectivity between the IMC and the MD110.
PIC	PBX Interface Controller board in the PI.
PIM	PBX Interface Module in the IMC.
PRI	Primary Rate Interface board in the PI.
pSOS	A real-time operating system.
PSTN	Public Switched Telephone Network.
PTT	Push-To-Talk button on a radio or microphone.
SCAT	Single-Channel Autonomous Trunking.
SCSI	Small Computer Systems Interface.
Trunk	A communications link that connects two switches.

Ericsson GE Mobile Communications Inc.
Mountain View Road • Lynchburg Virginia 24502

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APPENDIX A
CABLE CONNECTIONS

PI Internal Wiring

This section covers PI internal wiring, specifically the VME P2 backplate connector (of the MIC card) to the DB-25 connectors on the backplate.

Table 1. MIC Port 0

VME P2 Connector	DB-25S Connector	Signal Name	Function
A-02	02	XMT-P	Transmit Data
C-03	14	XMT-N	
A-01	03	RCV-P	Receive Data
C-01	16	RCV-N	
C-02	15	TSET-P	Transmit Clock
C-08	12	TSET-N	
C-04	17	RSET-P	Receive Clock
A-06	09	RSET-N	
A-04	04	RTS-P	Request To Send
A-08	19	RTS-N	
A-03	05	CTS-P	Clear To Send
A-05	13	CTS-N	
C-06	06	DCEREADY-P	DCE Ready
A-07	22	DCEREADY-N	
C-05	20	DTEREADY-P	DTE Ready
C-07	23	DTEREADY-N	

Table 2. MIC Port 1

VME P2 Connector	DB-25S Connector	Signal Name	Function
A-10	02	XMT-P	Transmit Data
C-11	14	XMT-N	
A-09	03	RCV-P	Receive Data
C-09	16	RCV-N	
C-10	15	TSET-P	Transmit Clock
C-16	12	TSET-N	
C-12	17	RSET-P	Receive Clock
A-14	09	RSET-N	
A-12	04	RTS-P	Request To Send
A-16	19	RTS-N	
A-11	05	CTS-P	Clear To Send
A-13	13	CTS-N	
C-14	06	DCEREADY-P	DCE Ready
A-15	22	DCEREADY-N	
C-13	20	DTEREADY-P	DTE Ready
C-15	23	DTEREADY-N	

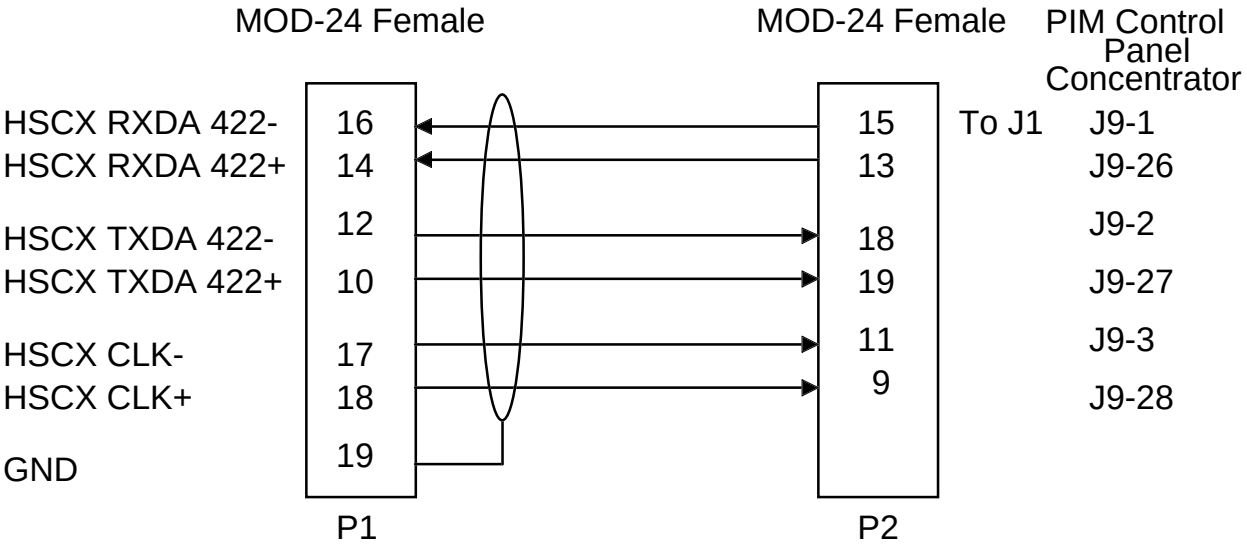
Table 3. MIC Port 2

VME P2 Connector	DB-25S Connector	Signal Name	Function
A-18	02	XMT-P	Transmit Data
C-19	14	XMT-N	
A-17	03	RCV-P	Receive Data
C-17	16	RCV-N	
C-18	15	TSET-P	Transmit Clock
C-24	12	TSET-N	
C-20	17	RSET-P	Receive Clock
A-22	09	RSET-N	
A-20	04	RTS-P	Request To Send
A-24	19	RTS-N	
A-19	05	CTS-P	Clear To Send
A-21	13	CTS-N	
C-22	06	DCEREADY-P	DCE Ready
A-23	22	DCEREADY-N	
C-21	20	DTEREADY-P	DTE Ready
C-23	23	DTEREADY-N	

Table 4. MIC Port 3

VME P2 Connector	DB-25S Connector	Signal Name	Function
A-26	02	XMT-P	Transmit Data
C-27	14	XMT-N	
A-25	03	RCV-P	Receive Data
C-25	16	RCV-N	
C-26	15	TSET-P	Transmit Clock
C-32	12	TSET-N	
C-28	17	RSET-P	Receive Clock
A-30	09	RSET-N	
A-28	04	RTS-P	Request To Send
A-32	19	RTS-N	
A-27	05	CTS-P	Clear To Send
A-29	13	CTS-N	
C-30	06	DCEREADY-P	DCE Ready
A-31	22	DCEREADY-N	
C-29	20	DTEREADY-P	DTE Ready
C-31	23	DTEREADY-N	

PI-PIM control cable



THIS IS A UNIDIRECTIONAL CABLE.

Figure 1 - IMC Backplane to Concentrator Panel -- 19D903628P (-71, -72, or -73)

APPENDIX B
APPLICABLE NEC ND4E INSTRUCTIONS

The Equipment Manual for ND4 Enhanced Digital Channel Bank Equipment, NECA 365-454-000, is presented in 5 volumes. To aid the user, this appendix includes a condensed listing of information applicable to the T1 MUX. This information is subject to change.

Document Number	Title	Subject
365-454-000	Equipment Manual for ND4 Enhanced Digital Channel Bank Equipment	EQUIPMENT MANUAL TITLE
365-454-001	ND4 Enhanced Digital Channel Bank Equipment Documentation Guide	DOCUMENTATION GUIDE
365-454-100	ND4 Enhanced Digital Channel Bank Equipment General Description	GENERAL DESCRIPTION
365-454-200	ND4 Enhanced Digital Channel Bank Equipment Installation, Operation, and Maintenance	INSTALLATION, OPERATION, AND MAINTENANCE
INT-001	Introduction	INTRODUCTION
MIP-050	New Installation (FPA)	INSTALLATION
DLP-950	Shelf Backboard Terminal Location	
DLP-402	Inspection	
DLP-403	Shelf Installation for 19-inch Rack	
DLP-405	Rear Cover Removal	
DLP-406	PCM/EXT CLK Terminal (Y4) Signal Cable Connections	
DLP-407	Alarm Terminal (Y2) Signal Cable Connections	
DLP-410	Channel Line Terminal (X1 Through X7) Cable Connection (Discard pages 15, 16, 19, and 20)	
DLP-411	Channel Line Terminal (Z1 Through Z7) Cable Connection (Discard pages 9, 10, 13, and 14)	
DLP-412	Station Power Terminal (Y1) Cable Connections	
DLP-413	Cable Fixture	
DLP-414	Rear Cover Installation	
DLP-415	Terminal Connections for Wrapping Terminals	
DLP-416	Cable Connections of AMP CHAMP Connector	
IAP-100	New Installation (FPA)	INSPECTION
DLP-500	Shelf Installation Condition Check	
DLP-501	Shelf Outward Appearance Check	
DLP-502	Cable Connection Check for Y1 Terminal	
DLP-503	Cable Connection Check for Y2 Terminal	
DLP-505	Cable Connection Check for Y4 Terminal	
DLP-506	Cable Connection Check for X1 Through X7 Terminals	
DLP-507	Cable Connection Check for Z1 Through Z7 Terminals	
DLP-508	Input Power Voltage Check	
DLP-509	Cable Fixture Check	
EIP-150	Turn-up for Dual or Single DS1 System (FPA)	TURN-UP
DLP-980	Handling	
DLP-550	Power Voltage Measurement for BFU	
DLP-551	Output Voltage Measurement for PCU	
DLP-552	ACU Option Selection	
DLP-553	Unit Insertion	
DLP-554	Unit Removal	

Document Number	Title	Subject
SAP-200	Single DS1 System Acceptance Test (FPA)	TEST
SAP-201	Dual DS1 System Acceptance Test (FPA)	
DLP-940	Local Station Loopback Test (FPA)	
DLP-941	End-to-End Test (FPA)	
DLP-960	System Provisioning Layer (FPA)	PROVISIONING (SYSTEM)
DLP-600	Digroup Alarm Supervision (FPA)	
DLP-601	Trunk Processing (TP) Memory Clear (FPA)	
DLP-602	Carrier Group Alarm (CGA) Counter Reset (FPA)	
DLP-603	Provisioning Item Permission /Inhibitor (FPA)	
DLP-604	Data Input Provisioning (FPA)	
DLP-605	Auto Bipolar Loopback (FPA)	
DLP-961	Line Provisioning Layer (FPA)	PROVISIONING (LINE)
DLP-607	DDS Clock Source (FPA)	
DLP-606	External Clock (FPA)	
DLP-963	External Clock Setting	
DLP-964	External Clock Diagram	
DLP-608	DGA Clock Source (FPA)	
DLP-609	DGB Clock Source (FPA)	
DLP-610	Frame Format	
DLP-611	Line Code (FPA)	
DLP-612	Equalizer (FPA)	
DLP-613	Channel Sequence (FPA)	
DLP-965	Time Slot Interchange	
DLP-962	Maintenance Layer (FPA)	PROVISIONING (MAINTENANCE)
DLP-966	Loopback	
DLP-614	Bipolar Loopback (FPA)	
DLP-615	Line Terminal (FPA)	
DLP-616	Line Loop (FPA)	
DLP-617	Digital MW Output (FPA)	
DLP-618	Forced Trunk Processing (FPA)	
DLP-967	Alarm Layer (FPA)	PROVISIONING (ALARM)
DLP-968	Alarm Description	
TCP-302	Clear ALM LED on ACU (DS1) (FPA)	
DLP-710	Verify CGA Counter Value (FPA)	
DLP-711	CGA Digroup Check (FPA)	
TCP-301	When ERR1 Message is Indicated (FPA)	
TCP-300	When MAJ LED on ACU (DS1) Lights Up (FPA)	
DLP-700	Clear MAJ LED on ACU (DS1) (FPA)	
		PLUG-IN UNITS
365-454-110	Bank Fuse Unit (BFU), X5243	
	General Description	BANK FUSE UNIT
365-454-111	Power Converter Unit (PCU), X5244	
	General Description	POWER CONVERTER UNIT
365-454-112	Clock Interface Unit (CIU), X5250	
	General Description	CLOCK INTERFACE UNIT

Document Number	Title	Subject
365-454-113	Line Interface Unit (LIU), X5247 General Description	LINE INTERFACE UNIT
365-454-114	ND4 Enhanced Digital Channel Bank Equipment Transmitter Receiver Unit (DS1) Unit Description	TRANSMITTER RECEIVER UNIT
365-454-115	Pulse Generator Unit (PGU), X5245 General Description	PULSE GENERATOR UNIT
365-454-116	ND4 Enhanced Digital Channel Bank Equipment Alarm Control Unit (DS1) Unit Description	ALARM CONTROL UNIT
365-454-219	4-Wire E&M (4W E/M), X5260 Description, Installation, and Maintenance	4-WIRE E&M

APPENDIX C
UNPOPULATED VME CHASSIS

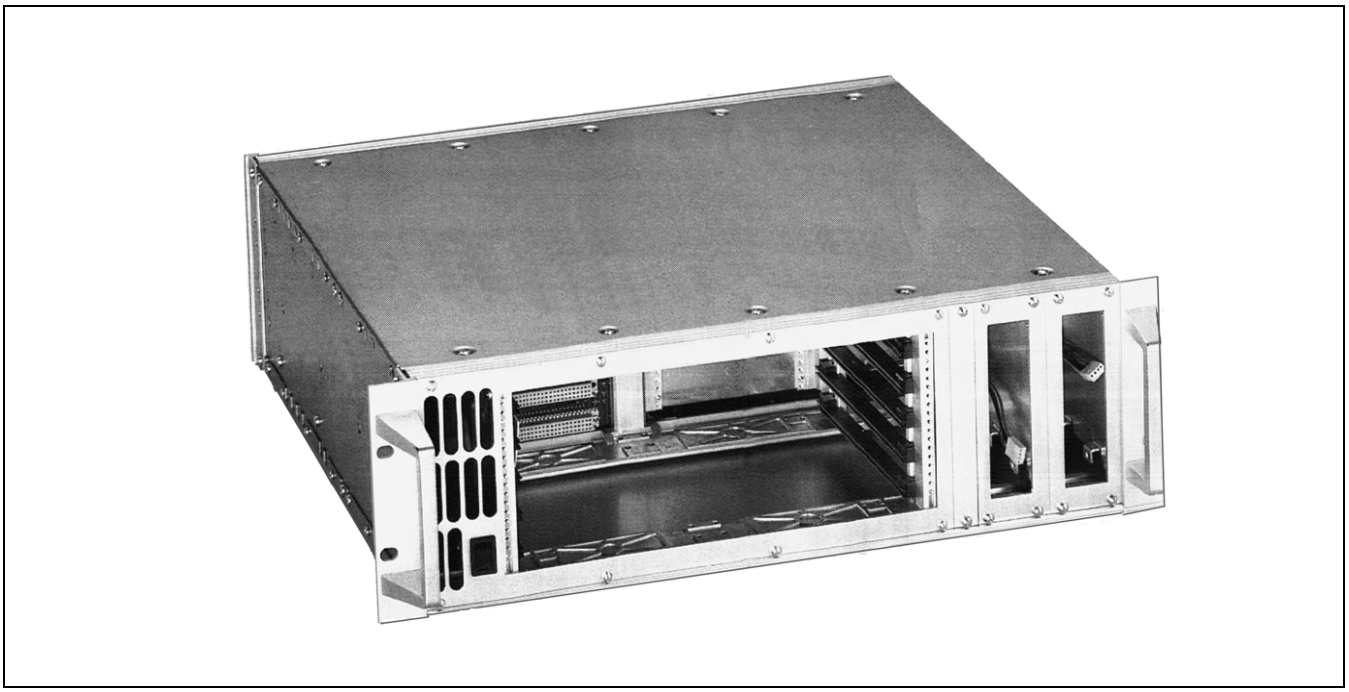


Figure 1 - Unpopulated VME Chassis