ERICSSON

Mobile Communications

EDACS™
CONSOLE ELECTRONICS CONTROLLER (CEC) and INTEGRATED MULTISITE AND CONSOLE CONTROLLER (IMC) DIGITAL AUDIO SWITCH

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Maintenance Manual

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SPECIFICATIONS*

FEATURES

Primary Design

Control Type	Multiple distributed microprocessors
Audio Processing	Pulse Code Modulation; 64k baud mu-law quantization
Audio Switching	Time Division Multiplexed bus system

System Reliability

- Single-point failure tolerant
- Redundant options available for key modules
- Redundant high-speed data bus with tri-state devices
- Informational, warning and error messages displayed on CEC/IMC Manager (MOM PC)
- LED indicators on each board provide indications of current board status for quick troubleshooting and diagnostic checks

CEC/IMC Manager Functions

- Reconfigure CEC/IMC on-line with no service interruption
- Program console parameters and permission lists on-line
- Interface with EDACS System Manager to automatically download database changes

GENERAL

Regulatory Data

Complete System	Meets FCC Part 15
Power Supply	Meets UL, CSA and IEC 950 electrical safety standards

Maximum Capacities

Card Cages (racks)	8 (6 CEC/IMC and 2 CIA)
Audio Ports	240 full duplex plus logging recorder and console unselect speaker outputs
IMC EDACS & CNI Systems (up to 20 chan. each)	28
CEC EDACS & CNI Systems (up to 20 chan. each)	6 (1 EDACS plus 5 CNI systems)
CTIS (up to 20 ports)	1
EDACS Data Gateway Interface (up to 8 ports)	1
EDACS Network Interface (up to 24 ports)	1 (32 for StarGate Controller)
Dispatch Consoles	30
Conventional Channels	64
Digital Voice Channels	120
Logging Recorder Outputs	128

Cabinet Characteristics

Dimensions (height x width x depth)	69 1/16 x 24 x 24 inches (175.5 x 61 x 61 centimeters)
Material	16-gauge cold rolled steel
Color	Light gray with black trim

Environmental

Temperature Ranges	
Operating	0 to +40°C
Non-Operating	-20 to +85°C
Maximum Humidity	95% non-condensing
Electro-Magnetic Interference (EMI)	Conforms to FCC Part 15 Class A, EN55022 Class A
Uninterruptible Power Supply (UPS)	Recommended

Processing Speeds

Call Routing Time	Less than 10 milliseconds
Multisite Access Time	Less than 500 milliseconds

* These specifications are intended primarily for the use of the serviceman. See the appropriate Specifications Sheet for complete specifications.

Dispatch Console Link	
Local Connection	4000 feet maximum using at least a 5-pair cable
Remote Connection	User provided private or leased facilities and data modems
Auxiliary Inputs And Outputs	
Auxiliary Inputs	Opto-isolated, balanced input
Impedance	1200 ohms (approximate)
Current	5 mA nominal, 10 mA maximum
Auxiliary Outputs	Form-A and open-collector
Voltage Rating	24 Volts ac or dc (Form-A); 50 Vdc (open-collector)
Current Rating	1 Amp, non-inductive load (Form-A); 20 mA (open-collector)
Redundant Power Supply (per Card Cage)	
Input Voltage	120 Vac ±15% or 230 Vac ±15% (47 to 63 Hz)
Input Voltage Selection	Automatic (no configuration necessary)
Input Power	580 Watts maximum at full dc load
DC Outputs	+5 Vdc, +15 Vdc and -15 Vdc
Total Output Power	380 Watts maximum
Duty Cycle	Continuous
Output Hold-Up Time	20 milliseconds under full load
Status Indicators	All outputs OK and over-temperature
Redundancy	Dual-module design with "n+1" redundancy
Over-Voltage Protection	+5 Vdc output will not exceed 6.5 Vdc ±0.75 Vdc and +15 Vdc output will not exceed 18.0 Vdc ±1.0 Vdc
Short-Circuit Protection	Primary power and primary current limiting
Reverse Voltage Protection	Provided
Thermal Protection	Thermal overload protection enabled at 80°C
Electrical Safety Standards	Meets UL, CSA and IEC 950 standards
UPS Recommendations	
Rating	600 Watts minimum per Card Cage (rack)
Hold-Up Time	until generator (customer supplied) can be brought on-line

END-TO-END SPECIFICATIONS

Audio Performance	
Frequency Response	±3 dB from 300 to 3000 Hz
Distortion	Less than 3% from 300 to 3000 Hz
Hum And Noise	
Transmit	50 dB below rated output
Receive	50 dB below 1 Watt speaker output
Input/Output Level Control	Digital Level Memory (DLM) - gain level stored in digital memory
Input Range	-25 to +12 dBm (adjustable via DLM)
Output Range	-25 to +10 dBm (adjustable via DLM)
Gain Performance	Will not increase in the presence of noise or absence of voice with Automatic Level Control (ALC) disabled
Input/Output Impedance	600 ohms ±10%, balanced line
Control Data Links	
Local Connection	9.6k or 19.2k baud RS-232C connection
Remote Connection	Type 3002 data-grade phone line or equivalent required
Conventional Base Station Controls	
General	2-wire or 4-wire connection
Tone Control Signaling	11 EIA standard function tones from 1050 to 2050 Hz
DC Control Signaling	0, -2.5, ±6 and ±11 mA (135 Vdc maximum)
Hold Tone Dynamic Range	-45 to -20 dBm
E & M Signaling	Provided

INTRODUCTION

The Ericsson GE EDACS™ **I**ntegrated **M**ultisite and **C**onsole **C**ontroller (**IMC**) is a digital audio switch that routes audio, mobile data and Aegis data between EDACS radio systems and dispatch consoles. The IMC supports analog voice, digital data, digital voice and encrypted voice throughout the wide area network and dispatch console systems.

The EDACS™ **C**onsole **E**lectronics **C**ontroller (**CEC**) is based on the same hardware platform as the IMC. Unlike the IMC, the CEC does not perform multisite trunked radio functions. The CEC does offer sophisticated dispatch console features and it can be considered a subset of the IMC. The common hardware of the CEC and IMC digital audio switch has previously been referred to as the "**M**ulti**S**ite **C**oordinator **II**" (**MSC II**).

The CEC/IMC switch is designed in a distributed architectural fashion. This design greatly improves reliability and performance.

Wide-area network communication is accomplished by switching audio, mobile data and Aegis data connections between EDACS radio systems and dispatch consoles using state-of-the-art digital audio switching technology. The flexible design of the network switch allows interfacing to all EDACS levels from Basic EDACS to EDACS Level 4, including simulcast and other multisite network switches. The network switch is also capable of being interfaced to conventional radio systems.

MULTISITE COMMUNICATION

The IMC allows communications between two-way radios located in different geographical areas. Figure 1 shows a simplified example of a typical IMC network. This multiple-site trunked repeater network has three (3) repeater systems (EDACS sites in this example) labeled S1, S2 and S3. Each system provides communications for its area: A1, A2 and A3 respectively. Multisite communication occurs when a unit in one area – for example Unit 1 in A1 – communicates with a unit in a different area – for example Unit 2 in A2.

Unit 1's operator initiates a call to Unit 2 by pressing the mobile radio's **P**ush-**T**o-**T**alk (**PTT**) button. The RF working channel request is then transmitted to S1 on the site's RF control channel. Each EDACS site continuously monitors its control channel for call initiations. When a call is initiated, the site assigns a working channel to the calling radio by instructing it to switch from the control channel to the assigned working channel. This working channel is assigned via the site's control channel and it is applicable only in the area (A1 in this example) covered by the primary site (S1).

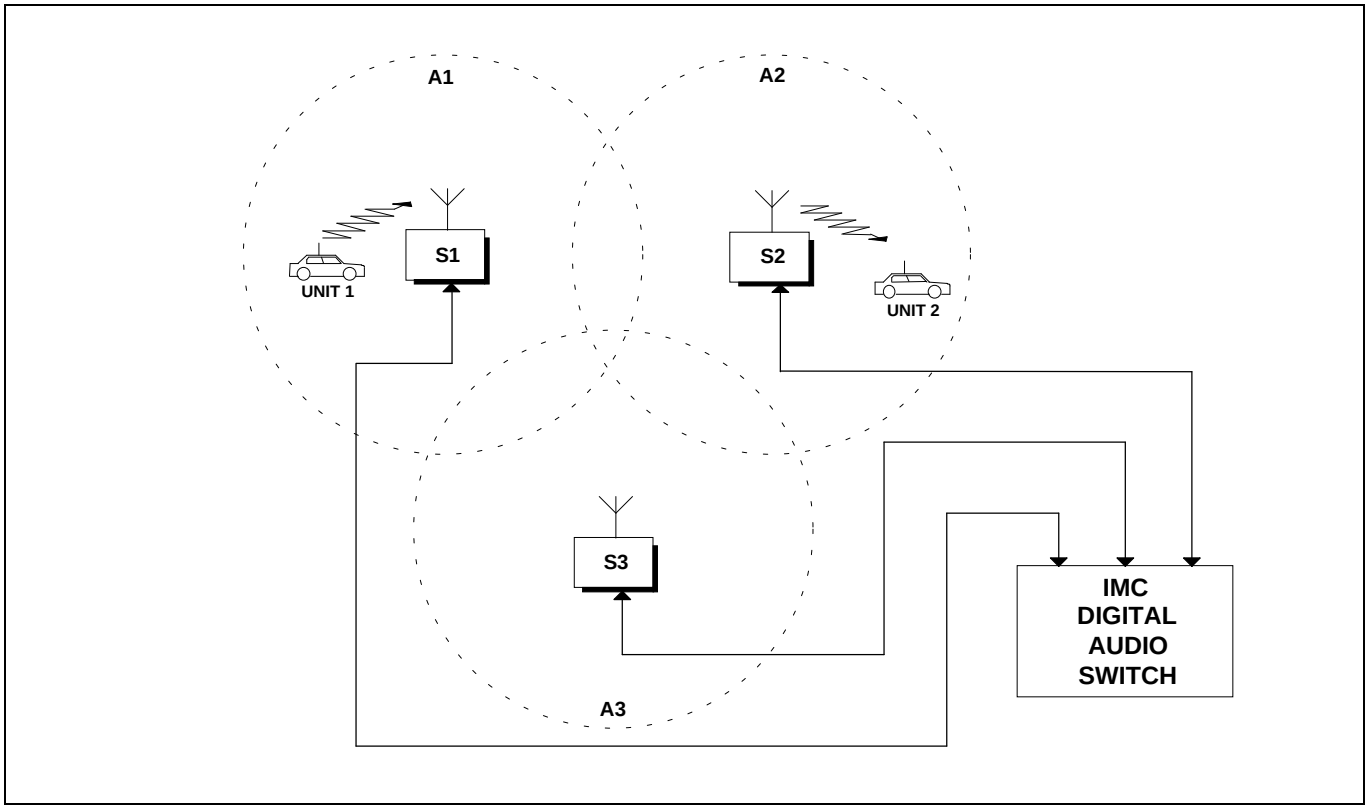

Figure 1 - Typical IMC Network

The primary site also sends the working channel assignment information to the IMC network switch via the downlink control data channel. At this time the IMC assigns an internal digital audio slot to the call and it then sends a channel request to the secondary site (S2 in this example). When the secondary site receives the channel request from the IMC, it assigns a secondary RF working channel for the call. This working channel is assigned to Unit 2 via the secondary site's control channel and it is only valid in the area covered by the secondary site. The secondary site also sends the secondary working channel assignment information back to the IMC. Unit 1 in A1 can now effectively communicate with Unit 2 in A2 via the IMC network switch.

To summarize, the call from the mobile radio is initially transmitted to the primary site, routed through the assigned digital audio slot in the IMC, and then retransmitted by the secondary site to the mobile receiving unit.

When the calling radio ends the call (releases PTT), the primary site deactivates the assigned primary working channel for the call and notifies the IMC that the call has been terminated. The IMC then releases the assigned digital audio slot and sends an "end-of-call" command to the secondary site. This "end-of-call" command instructs the secondary site to release the secondary working channel.

In a multisite network, all EDACS radio units are given a unique logical identification (LID) number that is valid throughout the entire network. This allows the network to not only control group and individual calls, but to also track individual radio units as they move from system-to-system. A radio programmed for automatic login operation will be automatically tracked when it moves to a new system. If the radio is not programmed for automatic login, the operator must press the PTT button before it will log into a new system.

DISPATCH CONSOLE COMMUNICATION

Both the CEC and IMC equipment allow communications between dispatchers located in different areas and between dispatchers and mobile/portable radio units located in different areas. Dispatch consoles are connected to the network switch in a similar manner as the EDACS radio systems and they issue call requests to it in a similar manner.

When a call is made from a mobile or portable radio unit, the switch informs the dispatch consoles and EDACS radio system(s) of the call. This allows a particular dispatch console in the CEC/IMC network to participate in any talk group conversation that it can monitor.

DESCRIPTION

Figure 2 shows the hardware components that form a typical CEC/IMC digital audio switch. Most of the components form "interface modules" that allow the CEC/IMC switch to transfer audio, mobile data and Aegis data between the radio systems and dispatch consoles linked to the switch. Each interface module is made from one or more printed circuit boards. A basic overview of each board is described in the section entitled "**PRIMARY HARDWARE COMPONENTS**". Also see the section entitled "**CEC/IMC INTERFACE MODULES**" for specific interface-level details.

SYSTEM MANAGER

The System Manager contains a common database for multisite network operations. This database stores system and user data for all systems within the CEC/IMC network. Pertinent database information used to control the multisite equipment is downloaded from the System Manager into the CEC/IMC network switch. Group ID, unit ID, and alias information is forwarded to all dispatch positions for call display purposes. This eliminates the need for separate entry and maintenance of this information at the dispatch positions.

If the System Manager is co-located, it is connected to the network switch via a 19.2k baud RS-232 serial interface provided by the **MO**nitor **M**odule (**MOM**) interface module. A remote System Manager-to-CEC/IMC connection also requires a modem at both locations operating at 9.6k or 19.2k baud.

CEC/IMC MANAGER (MOM PC)

CEC/IMC network switch monitoring and configuration functions are provided by the CEC/IMC Manager. This IBM PC compatible computer running custom software developed by Ericsson GE was previously referred to as the "**MO**nitor **M**odule **P**ersonal **C**omputer" (**MOM PC**). It is the window into the CEC/IMC network switch for both the system administrator and the service technicians. Detailed operating procedures for the CEC/IMC Manager (MOM PC) are contained in LBI-38911. The following list highlights some of the features provided by the CEC/IMC Manager:

- view system configuration
- view interface module (MIM, CIM, VMIM, etc.) statistics
- view **G**lobal **S**erial **C**hannel (**GSC**) loading
- configure **T**ime **D**ivision **M**ultiplexed (**TDM**) audio bus slots

- configure console profiles with up to ten (10) shifts per console
- configure C3 Modular/Desktop consoles
- configure trunked channel audio levels
- configure conventional channel audio levels
- configure **MO**nitor **M**odule (**MOM**) interface module
- connects to System Manager to obtain unit, group and system databases
- set CEC/IMC time and date (WWVB time synchronization option available)

The CEC/IMC Manager is also connected to the network switch by an 19.2k baud RS-232 serial link provided by the MOM interface module.

PRIMARY HARDWARE COMPONENTS

Card Cage And Backplane Assembly

The Card Cage and Backplane Assemblies furnish housing and electrical interconnections for all of the primary printed circuit boards used in the network switch. These 6-rack unit assemblies are typically called "Card Cages" or "racks". Each one has twenty-one (21) physical slots for board insertion.

A fully-loaded CEC/IMC network switch contains six (6) primary Card Cages installed in two (2) side-by-side cabinets and a third cabinet which houses two (2) **C**onventional **I**nterface **A**dapter (**CIA**) Card Cages. Alternately, both CIA Card Cages may be housed in the same cabinet as the primary Card Cages if the switch contains four (4) or less primary Card Cages. See the section in this manual entitled "**CEC/IMC CABINET RACK-UP SUMMARY**" for additional details.

All Backplanes (except the CIA racks) are interconnected or "daisy-chained" together using multi-conductor ribbon cable pairs referred to as "intra-rack" and "inter-rack" cables. This daisy-chain design joins the digital buses (TDM, GSC, etc.) between all Backplanes in all primary Card Cages. Intra-rack cables join the Backplanes in an individual cabinet together and inter-rack cables join the Backplanes between cabinets in a dual-cabinet installation.

Audio Board

The Audio Board links audio, mobile data and Aegis data between EDACS radio systems, consoles, or other external devices and the **T**ime **D**ivision **M**ultiplexed (**TDM**) audio network. This TDM audio network digitally transfers voice audio between the Audio Boards within the network switch. It can also transfer mobile data and Aegis modem signals. These modem signals are 16-state (4-level, 4-phase) quadrature amplitude modulated signals that have an effective baud rate of 9.6k.

An Audio Board can provide up to four (4) full-duplex 4-wire audio links or "channels" into and out of the network switch for its respective interface module. Each channel's audio processing circuitry converts incoming source analog audio/modem signals (from the radio system or console) into digitized signals. The digitized signals are then selectively applied to the TDM audio network. Each channel also incorporates audio processing circuitry that extracts selected digitized destination audio/modem signals (to the radio system or console) from the TDM audio network and converts the digitized audio/modem signals back to analog audio/modem signals. The transmit and receive audio processing circuitry uses mu-law **P**ulse **C**ode **M**odulation (**PCM**) processing technology incorporated within **CO**der-**DEC**oder (**CODEC**) chips. The Audio Boards process voice and modem signals identically; the type of signal is transparent to the board.

The TDM audio network is formed by eight (8) TDM audio buses. Each bus has 32 multiplexed time slots that carry a single audio channel. Sixteen (16) time slots are reserved. This design allows simultaneous routing of up to 240 channels through the network switch. 8 buses x 32 slots = 256 total slots - 16 reserved slots = 240 available slots.

An on-board 80C535 microprocessor controls most of the Audio Board's functions. However, the Controller Board provides master Audio Board control via parallel I/O and high-speed HDLC serial data connections. Basic audio routing is controlled by the parallel I/O connections from the Controller Board and the HDLC serial link controls non-critical functions such as tone generation (alert, grant, etc.) and notch filter enabling.

Audio Boards are labeled "**AUDIO**" on their top extraction handle. They are labeled in accordance with their assigned channels on their bottom extraction handle. For example, an Audio Board assigned to channels 5 - 8 is labeled "**05 - 08**" on its bottom handle. See LBI-38664 for detailed Audio Board service information.

Controller Board

Each CEC/IMC interface module is supported by a microprocessor-controlled communications Controller Board. The Controller Board contains a set of unique "interface module" software personalities. Each software personality is designed to interface a particular external device to the CEC/IMC switch. For example, one personality known as a "MIM" interfaces an EDACS radio

system to the switch and another personality know as a "CIM" interfaces a console to the switch. Personality selection is accomplished with DIP switches on the Controller Board. See the section entitled "**CEC/IMC INTERFACE MODULES**" for further details on the interface modules.

As shown in Figures 2 through 4, a Controller Board routes messages and control information between its associated Audio Board(s), the external devices connected to it and/or other Controller Boards within the network switch.

An Intel 80C152 microprocessor on the Controller Board is the "communications controller" for its interface module. Within the network switch, a high-speed **G**lobal **S**erial **C**hannel (**GSC**) control bus links all Controller Boards' 80C152s together enabling control data to be transferred between the boards.This GSC bus utilizes the Peerless CSMA/CD local area network protocol to transfer control data. The 80C152 directly controls two RS-232/RS-422 serial ports that connect the Controller Board to external devices such as a Site Controller (via an uplink GETC) or a CRT console.

The Controller Board also has an Intel 80C186 microprocessor. **D**ual-**P**ort **R**AM (**DPRAM**) chips are used to transfer data between the two processors. The 80C186 microprocessor is the "interface controller" that performs most I/O functions and logical processing for its respective interface module. It switches the audio network by assigning time slots to active channels. This Audio Board control is accomplished using the high-speed HDLC serial data link and two 8-bit parallel I/O ports that interconnect the Controller Board to its respective Audio Board(s).

The 80C186 controls two dual HDLC serial communication controller chips on the board. One HDLC chip provides a full-duplex RS-422 serial link and the other provides a control link to the Audio Board(s) used for non-critical Audio Board control.

Controller Boards are labeled according to their respective interface module on their top extraction handle and they are labeled in accordance with their respective device (system) assignment number on their bottom extraction handle. For example, a MIM Controller Board assigned to EDACS site 3 is labeled "**MIM**" on the top handle and "**03**" on the bottom handle. See LBI-38667 for detailed Controller Board configuration and service information.

Clock Board

The Clock Board generates synchronized clock pulses for the TDM audio network. These pulses, applied to the Audio Boards via FUTUREBUS lines on the Backplane, define time slots in which the digitized audio/modem signals are read and written to the eight (8) TDM audio buses. Two (2) identical but completely separate clock circuits – "A" and "B" – on each Clock Board provide redundant (back-up) clocking capability. Clock pulse outputs from both circuits are applied to the Audio Boards via the on-board FUTUREBUS transceivers and the Backplane(s).

Automatic redundant clock switch-over selection is controlled by the MOM Controller Board (See "**CEC/IMC INTERFACE MODULES**" for MOM details). The initial start-up or default clock circuit is "B". If the "B" clock fails, the MOM will automatically select the "A" clock circuit. This redundant clock circuit selection can be enabled and disabled via the CEC/IMC Manager (MOM PC).

Clock monitoring circuitry on the Audio Boards signal the MOM Controller if any of the selected clock pulses fail. This alarm signal is sent to the respective Controller Board via the local control bus and the Controller Board then signals the MOM Controller Board via the GSC bus.

Panel-mounted toggle switches on the Clock Boards allow independent enable/disable control of the FUTUREBUS transceivers so multiple Clock Boards can be installed. Generally, two (2) Clock Boards are installed per CEC/IMC switch so uninterruptible operation can be achieved when a single Clock Board must be removed for servicing. All audio, mobile data and Aegis data links would be lost if the selected Clock Board was removed for service. Clock Boards are normally installed in the outer-most slots of the center Card Cage. For example, in a three (3) Card Cage (rack) network switch, Clock Boards are installed in the far left and far right positions of the middle Card Cage. See LBI-38668 for detailed Clock Board service information.

Terminator Board

The Terminator Board used in the CEC/IMC switch provides line termination for the FUTUREBUS lines on the Backplanes. These lines include the TDM audio buses, the GSC control bus and the clock lines. Two (2) Terminator Boards are required per "daisy-chain" Backplane set. One is installed on each end of the chain.

The CIA racks are not daisy-chained together. Therefore, each CIA rack requires two (2) Terminator Boards – one is installed on each end of a rack's Backplane.

Each Terminator Board has sixty-three 39-ohm pull-up resistors, with each resistor pulling its line to a 2-volt regulated supply. The design includes a primary and secondary 2-volt regulated supply with the secondary supply providing back-up operation if the primary regulator fails. Relay alarm outputs are provided for both the primary

and the secondary regulators. See LBI-38669 for detailed service information on the Terminator Board.

Conventional Interface Board

Control signal generation and audio exchange for conventional base stations and conventional analog satellite receivers is furnished by the **C**onventional **I**nterface (**CI**) Board. This board is a part of the **C**onventional **I**nterface **A**dapter (**CIA**) rack. The CIA rack is considered a secondary interface because it does not have direct TDM and GSC bus links to the primary CEC/IMC interface modules. Each CIA rack is connected to a VMIM interface module via 600-ohm audio connections and an RS-232 serial control data connection. The VMIM is located in one of the primary CEC/IMC Card Cages.

The CI Board provides four (4) duplex audio channel links for conventional equipment. Eight (8) CI Boards may be included in each CIA rack for a total of thirty-two (32) 4-wire conventional channel links per CIA - VMIM set. Two (2) VMIM - CIA sets may be used per CEC/IMC switch to link up to sixty-four (64) conventional stations to the switch. See the section entitled **CEC/IMC INTERFACE MODULES**" for further details on interface modules.

Every CI Board channel has control signal generation circuitry that can be programmed via the CEC/IMC Manager (MOM PC) for either tone or dc signalling. Transmit audio signals from the Audio Board within the VMIM are summed with the control signal generated on the CI Board (either tone or dc) and the summed signal is passed to the conventional base station via the phone line. E & M signaling capability is provided for microwave (or equivalent) connections.

Voice-**O**perated (**VOX**) and **C**arrier **O**perated **R**elay (**COR**) detection circuitry is incorporated into each conventional channel for receive audio detection. VOX or COR operation is selected on a per channel basis by the CEC/IMC Manager (MOM PC). When receive audio from a base station (or voter) is detected the CIA signals the VMIM of the call. The CI Board transfers receive audio from the base station (or voter) to the respective channel within the VMIM.

An Intel 80C152 microprocessor furnishes control for the CI Board. It links the CI Board to the CCI Controller Board using a local GSC control bus. See LBI-38774 for detailed service information on the Conventional Interface Board.

Concentrator Cards

Concentrator Cards, mounted on the hinged horizontal panels on the rear cabinet rails, simplify connections to the CEC/IMC network switch. All of the cards, except the CEC/IMC Manager (MOM PC) Concentrator Card, convert/interconnect pairs of 24-pin dual-row header connectors on the Backplane to 50-pin Champ-type connectors on the card. The Champ connectors are then coupled to standard punch blocks (or other signal break-out devices) using 25-pair cables. Many signals can be neatly routed between the network switch and punch blocks using the Concentrator Cards.

Each MOM Concentrator Card converts/interconnects a 24-pin dual-row header connector at the MOM interface module Backplane point into two (2) DB-9 connectors. The CEC/IMC Manager (MOM PC) and the System Manager are then individually coupled to the MOM interface module by the RS-232 serial port provided at each DB-9 connector.

Redundant Power Supply (RPS) Units

Operating power for the network switch is provided by 380-Watt **R**edundant **P**ower **S**upply (**RPS**) units mounted in the lower-most positions in each cabinet. Each RPS unit occupies three rack units (5.25 inches) in the standard 19-inch rack mount cabinet. There is an **RPS** unit for every card cage assembly (maximum of three per cabinet).

Each RPS unit delivers +5, +15 and -15 Vdc power to the Backplane from dual independent switching power supply modules. These hot-pluggable slide-in power supply modules feature +5 Vdc remote sensing, status indicators, automatic 120/230 Vac input line voltage selection, thermal shutdown, over-voltage protection and alarm outputs. Each RPS module also has a recessed front panel +5 Vdc output trimmer control.

Outputs from both power supply modules within an RPS unit are paralleled together and connected to its respective Backplane. Output "ORing" diodes within each module eliminate catastrophic CEC/IMC switch failures if a short develops in the output stage of a single module. Remote +5 Vdc regulator sensing built into each module compensates for diode and cable voltage drops in the +5 Vdc line.

CEC/IMC INTERFACE MODULES

The CEC/IMC network switch is a set of "interface modules" which route communications between dispatch consoles, EDACS radio systems, conventional stations and various other communication equipment such as telephone interconnect systems. The following section describes the major interface modules which form the digital audio switch. Also see Figures 2 through 4, and the Application Assembly Diagrams at the end of this manual.

Each interface module consists of a Controller Board and, in most cases, one or more Audio Boards. A back-up

(standby) Controller Board may also be included within the MIM interface module. The CEC/IMC interface modules include:

NOTE

The abbreviations shown in **UPPER CASE BOLD** text in the following list identify the label that is applied on the top extraction handle of the interface module's Controller Board.

- **M**ASTR II/III **I**nterface **M**odule (**MIM**)
- **C**onsole **I**nterface **M**odule (**CIM**)
- C3 Modular/Desktop Console **Translator** (**XLTR**)
- Con**V**entional **M**ASTR II/III **I**nterface **M**odule (**VMIM)**
- **C**onventional **I**nterface **A**dapter Rack (CIA)
- **C**onventional **C**ontroller **I**nterface (**CCI**)
- **MO**nitor **M**odule (**MOM**)
- **R**equest Status Monitor **I**nterface **M**odule (**RIM**)
- **C**entralized **A**ctivity **M**odule (**CAM**)
- **N**etwork **I**nterface **M**odule (**NIM**)
- **C**entralized **T**elephone **I**nterconnect **M**odule (**CTIM**)
- **L**ogging **R**ecorder **I**nterface **M**odule (**LRIM**)
- EDACS **Data** Gateway Interface (**DATA**)
- **D**igital **V**oice **I**nterface **M**odule (**DVIM**)

MASTR II/III Interface Module (MIM)

Interfacing to an EDACS radio system is accomplished with a **M**ASTR II/III **I**nterface **M**odule (**MIM**). Possible radio system types include standard EDACS trunked sites, simulcast systems, voted systems, CNI and SCAT systems. A MIM is identified by an "M" in the CEC/IMC Manager's (MOM PC's) node matrix display. This display is a part of the CEC/IMC Manager's "View System / Diagnostics" screen.

The MIM consists of a Controller Board and up to five (5) Audio Boards for a 20-channel system. An optional standby Controller Board may be used with an EDACS trunked site for redundant downlink operation. (CNI and SCAT systems do not have redundant downlink capability.) The radio system's audio channels are supported by the MIM's Audio Board(s). Each Audio Board can support up to four (4) full-duplex audio channels to the radio system.

Each MIM Controller Board requires a **G**eneral **E**lectric **T**runking **C**ard (**GETC**) to provide the control data communication uplink to its respective radio system downlink. The GETCs are housed in separate 69-inch cabinets.

Audio Boards and the GETC uplinks are connected to the radio system by 600-ohm phone lines or equivalent microwave links. GETC-to-site links require data-grade (type 3002) phone lines. Controller Boards are connected to their respective GETCs by RS-232 serial connections which operate at 19.2k baud. The GETC-to-site link operates at 9.6k baud using 16-state (4-level 4-phase) quadrature amplitude modulation modems built into the GETC.

Console Interface Module (CIM)

EDACS C3 Maestro and C3 Modular/Desktop dispatch consoles are connected to the CEC/IMC network switch using a **C**onsole **I**nterface **M**odule (**CIM**). The CIM consists of a Controller Board and a single Audio Board. CIMs are identified by a "C" in the CEC/IMC Manager's (MOM PC's) node matrix display. The C3 Console Translator is also required to connect a C3 Modular/Desktop console to the network switch. See the following section for Translator details.

The console control data link is provided by an RS-232 or RS-422 connection at the Controller Board. This serial port has "auto-baud" sensing. It automatically sets itself to the correct baud rate (9.6k or 19.2k baud) based on the baud rate received from its respective console. If the console is remotely located, 9.6k baud full duplex modems are required at both locations.

Full-duplex audio support for the console is provided by the CIM's Audio Board. Dual-speaker consoles consume two (2) channels: one 4-wire link for the selected speaker and mic, and a 2-wire link for the unselected speaker. Four-speaker consoles require all four Audio Board channels.

C3 Console Translator (XLTR)

The **XLTR** consists of a single Controller Board. Using protocol conversion techniques, this interface module allows the CEC/IMC network switch to communicate with a C3 Modular/Desktop console via an RS-422 serial control data link operating at 9.6k baud. The XLTR is placed in the control data path between the C3 console and its respective CIM. The CIM Controller Board is linked to the XLTR Controller Board by a 19.2k baud RS-232 connection. Audio support for the C3 console is furnished by the CIM's Audio Board.

ConVentional MASTR II/III Interface Module (VMIM) & Conventional Interface Adapter (CIA) Rack

The **VMIM** interface module and **CIA** secondary interface rack couple conventional tone or dc controlled base stations and conventional voting systems to the CEC/IMC switch. Each VMIM - CIA set can couple a total of 32 full-duplex (4-wire) links to the switch. A switch can support two (2) CIA racks providing a total of sixty-four (64) duplex conventional channel audio links.

The CIA appears to the VMIM as an EDACS radio system. It provides the databasing capabilities that enable conventional channels to be patched or "simul-selected" to trunked groups. Also included within the CIA is the hardware required to communicate with conventional base stations using either tone or dc control signals. E & M signaling capability is also included to support microwave (or equivalent) links.

The VMIM is identified by a "V" in the CEC/IMC Manager's (MOM PC's) node matrix display. The CIA is not identified since it is not a primary component of a CEC/IMC switch.

A VMIM is formed by a Controller Board and up to eight (8) Audio Boards. The CIA secondary interface, located in a separate Card Cage (rack), is formed by a Controller Board configured as a **C**onventional **C**ontrol **I**nterface (**CCI**) and up to eight (8) **C**onventional **I**nterface (**CI**) Boards. Each CI Board is paired with a VMIM Audio Board to provide four 600-ohm 4-wire duplex audio links to conventional stations. This design establishes the thirty-two (32) maximum channels per VMIM - CIA set. VMIM Audio Board channels are connected to the respective CIA CI Board channels using 600-ohm 4-wire connections.

Control data communications between the VMIM and the CIA is accomplished with an RS-232 serial port provided by each interface module's Controller Board. This control data link operates at 19.2k baud.

Monitor Module (MOM)

Control data interfacing to the System Manager computer for system, unit and group database downloads to the CEC/IMC switch and consoles is accomplished with the **MO**nitor **M**odule (**MOM**) interface module. The MOM also interfaces to the CEC/IMC Manager (MOM PC) which stores various centralized databases required by the network switch. This interface module consists of a Controller Board and anAudio Board. The MOM is identified by an "O" in the CEC/IMC Manager's (MOM PC's) node matrix display.

Two RS-232 serial ports at the Controller Board, programmable to 9.6k or 19.2k baud, furnish the control data connections for the System Manager and the CEC/IMC Manager (MOM PC). Normally, the System Manager is connected directly to the switch at 19.2k baud. A remote System Manager-to-CEC/IMC connection requires 9.6k baud modems at both locations.

The MOM's Audio Board generates emergency and ring tones for the consoles. There are no external audio connections at the MOM.

Request Status Monitor Interface Module (RIM)

The **R**equest Status Monitor **I**nterface **M**odule (**RIM)** enables the **R**equest **S**tatus **M**onitor (**RSM**) computer (IBM PC or compatible) to request status information from radios within the network. The RIM is identified by an "R" in the CEC/IMC Manager's (MOM PC's) node matrix display.

A Controller Board is the only RIM component. An RS-232 serial connection operating at 19.2k baud connects RIM to the RSM computer. See TQ-3359 (manual and software only) or TQ-3369 (manual, software and interconnect cables) for RSM installation, set-up and operating details.

Centralized Activity Module (CAM)

The **CAM** consists of a single Controller Board. This interface module provides call activity information to the **C**entralized **A**ctivity **L**ogger (**CAL**) computer. Usage and billing information can be generated with the CAL through the CAM link. The CAM Controller Board is connected to the CAL via a synchronous high-speed HDLC serial control data link. This CAM-to-CAL HDLC link can be set (via DIP switches on the Controller Board) to operate at 60k or 360k baud. The CAM is identified by an "A" in the CEC/IMC Manager's (MOM PC's) node matrix display.

Network Interface Module (NIM)

Two or more IMC networks can be linked together for "distributed multisite" communications using a **N**etwork **I**nterface **M**odule (**NIM**) at each IMC switch. The NIM is identified by an "N" in the IMC Manager's (MOM PC's) node matrix display.

NIM links are communications gateways that support a limited amount of communication traffic between network switches. Users select network operation on a wide area fleet/group basis at the System Manager. A common or central network switch know as a "StarGate Controller" has three (3) or more switches linked to it via NIMs.

A NIM is made from a Controller Board and between one (1) and five (5) Audio Boards. Each Audio Board provides up to four (4) full-duplex audio trunks between the IMC switches.

Control data is transferred between the multisite networks via the RS-232 serial connection provided by each NIM Controller Board. This serial connection is programmable to 9.6k, 19.2k or 38.4k baud. Generally, full-duplex modems are required at each switch since the two switches are usually not co-located.

A NIM may also be interfaced to the System Manager so NIM channel usage can be monitored at the System Manager. This interface requires an RS-232 connection between the System Manager and one of the paired NIMs. In a StarGate network, the NIM RS-232 connection is normally made at one NIM in the StarGate Controller.

Centralized Telephone Interconnect Module (CTIM)

The CTIM consists of a Controller Board and up to eight (8) Audio Boards. This interface module connects a **C**entralized **T**elephone **I**nterconnect **S**ystem (**CTIS**) to the switch so radio users and dispatchers can access landline telephone systems. The CTIM is identified by a "T" in the CEC/IMC Manager's (MOM PC's) node matrix display.

Control data communication to the CTIS equipment is furnished by the CTIM Controller Board's RS-232 serial port. This serial port operates at 19.2k baud.

Each CTIM Audio Board provides up to four (4) duplex audio channels for the CTIS equipment. CTIM channels are connected to the CTIS by 600-ohm 4-wire audio lines or equivalent microwave links.

EDACS Data Gateway Interface Module (DATA)

The EDG interface module is used in conjunction with an **E**DACS **D**ata **G**ateway (**EDG**). This interface module uses a Controller Board and (one or) two Audio Boards to provide up to eight (8) ports for EDG mobile data applications. The Controller Board is labeled "**DATA**" on the top extraction handle.

Digital Voice Interface Module (DVIM)

Aegis™ digital and Aegis private (encrypted) end-to-end communication hardware at the CEC/IMC includes the **D**igital **V**oice **I**nterface **M**odule (**DVIM**) housed in a primary CEC/IMC Card Cage and the **D**igital **V**oice **I**nterface **U**nits (**DVIU**) located in the DVIU cabinet(s).

Each DVIM consists of a Controller Board and up to eight (8) Audio Boards for thirty-two (32) DVIU Aegis channels. The DVIM is the CEC/IMC interface module that couples DVIUs to the switch for digital dispatch and digital CTIS support. DVIMs and DVIUs also allow patching of conventional channels to EDACS Aegis talk groups and they provide decoded/decrypted audio for logging recorders. The DVIU cabinet contains all CEC/IMC Aegis circuitry. Each CEC/IMC switch will support four (4) DVIMs and 120 Aegis channels.

The Aegis encode/encrypt path (CEC/IMC transmit) is as follows: Using one TDM time slot, a clear voice signal from a dispatch console or a CTIS channel is routed to a DVIM channel via the TDM bus. The DVIM channel assigned to the call converts the digitized TDM clear voice signal back to an analog audio signal and applies the analog signal to the respective DVIU channel via a 600-ohm audio connection. The DVIU's Aegis circuitry encodes/encrypts (in accordance with DVIU configuration) the analog audio signal and applies the Aegis digital/private 16-state (4-level, 4-phase) modem signal to the DVIM channel's input line. The DVIM channel digitizes the encoded/encrypted signal and applies the signal to the TDM bus using a second TDM time slot. The encoded/encrypted signal can then be routed to other Audio Boards within the switch and passed to the respective radio system(s).

The Aegis decode/decrypt path (CEC/IMC receive) is basically the reverse of the encode/encrypt process. Each Aegis signal received from a radio system also takes two (2) TDM time slots – one to route the encoded/encrypted voice signal to the DVIM and one to route the decoded/decrypted from the DVIM.

DVIUs may be either "pooled" or "dedicated". Calls are dynamically assigned to pooled DVIUs. This configuration maximizes dispatch console features and operational flexibility while minimizing cost. However, if encrypted, all DVIUs within a particular pool must use the same digital voice algorithm (DES or VGE) and identical cryptographic keys. CTIS channels must be assigned to pooled DVIUs.

Dedicated DVIUs are assigned to specific systems, agencies, fleets or groups. This method allows multi-key operation; each DVIU can be loaded with a different cryptographic key.

Logging Recorder Interface Module (LRIM)

Support for logging recorders is provided by the LRIM interface module. An LRIM consists of a Controller Board and one or more Audio Boards. This interface module is identified by an "L" in the CEC/IMC Manager's (MOM PC's) node matrix display.

The LRIM Audio Board provides four 600-ohm analog audio outputs to the recording equipment. Each output can

be selectively programmed at the CEC/IMC Manager (MOM PC) to supply audio based on groups or individual units within the CEC/IMC switch.

Since the LRIM does not have any external data interfaces, the LRIM Controller Board is only used for Audio Board control.

CEC/IMC CABINET RACK-UP SUMMARY

Because every CEC/IMC network is unique, specific installation requirements can vary greatly from one network to another. For example, a simple switch may occupy only a single 69-inch CEC/IMC switch cabinet and a GETC uplink cabinet, whereas a full-featured network switch may occupy many co-located cabinets.

CEC/IMC Switch Cabinets

Most CEC/IMC switch components are housed in either one or two 69-inch (69") high steel cabinets. Each standard 19-inch rack-mount cabinet can hold a maximum of three (3) Card Cage and Backplane Assemblies, three (3) Redundant Power Supply (RPS) units, up to twelve (12) Concentrator Cards, and the associated interconnecting cables.

The Card Cage and Backplane Assemblies, mounted on the front and middle vertical mounting rails, furnish housing and electrical interconnections for all of the primary printed circuit boards used in the network switch. Each assembly occupies six rack units (10.5 inches) and will accept twenty-one (21) CEC/IMC boards. See the Application Assembly Diagram in this manual for specific hardware requirements.

All Backplanes (except the CIA racks) are interconnected or "daisy-chained" together using multi-conductor ribbon cable pairs referred to as "intra-rack" and "inter-rack" cables. Intra-rack cables join the Backplanes in an individual cabinet together and inter-rack cables join the Backplanes between cabinets in a dual-cabinet installation.

Generally, a dual-cabinet CEC/IMC network switch will have an opening cut in adjacent sides of each cabinet for passage of the inter-rack cables. This procedure allows the inter-rack cable lengths to be minimized.

Each CIA rack uses a single Card Cage and Backplane Assembly with Terminator Boards installed on each end of the Backplane. This rack contains the CCI Controller Board and up to eight (8) CI Boards. Support for two (2) CIA racks is provided per CEC/IMC switch to give a total of sixty-four (64) duplex conventional channel audio links.

There is an RPS unit for every Card Cage and Backplane Assembly (maximum of three per cabinet). The RPS units are mounted in the lower cabinet positions; each one occupies three rack units (5.25 inches). A power cable interconnects the RPS unit to its respective Backplane. See the Application Assembly Diagram for interconnection details.

Concentrator Cards simplify connections to the CEC/IMC switch by allowing many signals to be neatly routed between the switch and punch blocks. As shown in the Application Assembly Diagram, the cards are labeled A1 - A4, B1 - B4 and C1 - C4. Each group of four is mounted on a hinged horizontal panel on the rear cabinet rails. These panels can be swung out to gain access to the rear of the Backplanes and the Concentrator Cards during service and upgrade procedures. The hinge is located on the right rear-most mounting rail as viewed from the rear of the cabinet.

In addition, every cabinet has a top-mounted cabinet fan and ac outlet strips. The ac outlet strips are horizontally mounted between the middle rails.

GETC Uplink Cabinets

Every MIM Controller Board requires a GETC uplink for control data transfer between a MIM and an EDACS radio system. The co-located 69-inch GETC uplink cabinets will each house up to nine (9) GETC main/standby pairs.

Operating dc power for all GETCs within the cabinet is provided by a single 13-volt 30-amp power supply and two (2) fused power distribution panels. These units are mounted at the bottom of the cabinet. See the Application Assembly Diagram for cabinet rack-up details.

DVIU Cabinets

The co-located 69-inch DVIU cabinet can house up to sixteen (16) DVIUs. The DVIUs interface with a DVIM to give the CEC/IMC switch Aegis™ digital and Aegis encrypt/decrypt (private) capability. Each DVIU contains an Aegis module that performs these functions for dispatch console and CTIS support. See the Application Assembly Diagram for cabinet rack-up details.

DISTRIBUTED ARCHITECTURE ADVANTAGES

The CEC/IMC switch is designed with a distributed architecture scheme. Logical functions are shared by the various interface modules and each interface module shares in the computational work-load of the switch. Each interface module is responsible only for its connected device (site, console, etc.).

When compared to a central architecture switch, a distributed architecture switch has several important advantages. They include:

- the ability to continue wide-area calls between other areas after failure of a single interface module
- faster data transfer rates
- more flexible expansion and service capabilities

OPERATION DURING FAILURE OF AN INTERFACE MODULE

Distributed architectural design safeguards against catastrophic failures within the switch and between radio systems. The CEC/IMC switch will not completely fail if one or more interface modules fail. Wide-area communications can continue despite interface module failure. Only the devices (site, console, etc.) connected to the failed interface module will be unable to participate in wide-area calls and other features provided by the switch.

Communications in the area served by the failed interface module are not disabled. For example, failure of a MIM will not disable the EDACS radio system to which the MIM is connected. The radio system continues to operate and communications within the area covered by the radio system are unaffected by the respective MIM failure within the switch.

FASTER DATA TRANSFERS

A distributed architecture multisite switch has much faster data transfer rates than a comparable central architecture multisite switch. Since central computers process data serially, all communications passing through the switch must be serially processed by the CPU; therefore, the CPU in a central architecture switch slows communications, especially during busy times. A distributed architecture multisite switch utilizes parallel processing techniques through the shared computational tasks of many processors. Generally, distributed switches are significantly faster than comparable central switches.

EXPANSION AND SERVICE CAPABILITY

A distributed switch can be easily expanded by adding additional interface modules. Expanding a central switch may require purchasing a larger central computer.

Each CEC/IMC interface module is supported by a Controller Board and, in most cases, one or more Audio Boards. The MIM may also contain a secondary (standby) Controller Board for backup operation. Boards are easily interchangeable between different interface modules since they have the same hardware and software components. DIP switches on the Controller Boards are used to configure its interface module type. This interchange capability reduces service time and the resulting multisite down-time when a board failure occurs. The service shop no longer needs to stock a large variety of replacement boards and the service technician does not need to review many different volumes of manuals on specific circuitry for each interface module.

GLOSSARY

Aegis™ — **Aegis™** is the Ericsson GE's voice scrambling system that employs advanced Digital Signal Processing (DSP) circuitry. Aegis has two primary modes – "Aegis digital" and "Aegis private". Aegis digital mode offers improved weak signal performance and impedance to unauthorized monitoring. Aegis digital transmissions are not encrypted. Aegis private mode also offers improved weak signal performance. In addition, since Aegis private transmissions are encrypted, Aegis private mode provides very secure communications against unauthorized monitoring.

Audio Board — The **Audio Board** routes audio, mobile data and Aegis data between EDACS radio systems, dispatch consoles, logging recorders, etc. The board digitizes analog signals applied to its audio inputs and applies the digitized signals to the TDM bus. It also performs the reverse process for its audio outputs.

C3 Maestro — The **C3 Maestro** is the CRT-type console that is designed to take advantage of the advanced features of EDACS. It consists of a specialized audio "tower" and an IBM PC compatible computer running custom software developed by Ericsson GE.

CAM — **C**entralized **A**ctivity **M**odule – The CAM is a CEC/IMC interface module that provides call activity information to the **C**entralized **A**ctivity **L**ogger (**CAL**) computer. Usage and billing information can be generated with the CAL through the CAM link.

CCI Board — **C**onventional **C**ontrol **I**nterface **Board** – This is a CEC/IMC Controller Board configured for use in the CIA rack. It provides master CI Board control. The control data port that connects the CIA rack to the VMIM is also located on the CCI Board. (Also see **CI Board.**)

CEC — **C**onsole **E**lectronics **C**ontroller – The Ericsson GE CEC is an advanced radio communications controller incorporating time division multiplex digital audio switching technology. The CEC connects dispatch consoles to EDACS and CNI systems.

CEC/IMC Manager — The **CEC/IMC Manager** (formerly referred to as the "MOM PC") provides CEC/IMC switch monitoring and configuration functions. This IBM PC compatible computer running custom software developed by Ericsson GE is the window into the CEC/IMC switch for the system administrator and service technicians.

CIA rack — **C**onventional **I**nterface **A**dapter **rack** – The CIA rack allows conventional tone and dc controlled base stations and voting systems to be connected to the CEC/IMC switch. It is considered a "secondary interface" since it does not have direct TDM and GSC bus connections to the primary CEC/IMC interface modules.

CI Board — **C**onventional **I**nterface **Board** – This board is located in the CIA secondary interface rack. It contains circuitry used to connect conventional tone and dc controlled base stations and voting systems to the CEC/IMC switch.

CIM — **C**onsole **I**nterface **M**odule – The CIM is a CEC/IMC interface module used to connect C3 Maestro (CRT-type) and C3 Modular/Desktop consoles to the CEC/IMC switch. C3 Modular/Desktop consoles also require a C3 Console Translator interface module. (Also see **XLTR.)**

CNI — **C**onventional **N**etwork **I**nterface – A conventional base station can be connected to the CEC/IMC switch via a CNI. The CNI is formed by a GETC shelf located at the conventional station that makes the station appear to a MIM as an EDACS site. In the CNI system, different Channel Guard tones are assigned to different talk groups.

confirmed call — The **confirmed call** function ensures all EDACS radio systems being called have working channels available before the caller is given a channel access (talk permit) tone. This function can be disabled on a per system/group basis.

control data — **Control data** includes any data used by the switch for system control.

Controller Board — The **Controller Board** processes control data, holds databases, and controls the Audio Boards within its respective interface module.

CONV MIM — (see **VMIM**)

CTIM	**C**entralized **T**elephone **I**nterconnect **M**odule – The CTIM is a CEC/IMC interface module used to connect **C**entralized **T**elephone **I**nterconnect **S**ystem (**CTIS**) equipment to the switch so radio users and dispatchers can access land-line telephone systems.
DATA	(see **EDG interface module**)
distributed multisite	Two or more IMC networks can be linked together for **distributed multisite** communication. Audio, mobile data/Aegis data and control data is transferred between the different IMC networks via a NIM at each IMC switch. (Also see **StarGate Controller**.)
DPRAM	**D**ual **P**ort **R**andom **A**ccess **M**emory – These specialized memory chips have two separate data buses that allow two microprocessor chips to quickly and efficiently transfer data between each other.
DVIM	**D**igital **V**oice **I**nterface **M**odule – The DVIM is a CEC/IMC interface module that connects **D**igital **V**oice **I**nterface **U**nits (**DVIU**) to the switch to provide Aegis digital and Aegis private voice operation for dispatch consoles and CTIS equipment.
EDACS radio system	**E**nhanced **D**igital **A**ccess **C**ommunication **S**ystem **radio system** – The term "EDACS radio system" refers to RF equipment that may be interfaced to the EDACS CEC/IMC switch. The RF equipment may be located at a single location, such as an EDACS site or it may be located at several locations, such as in a voting system. Other examples of EDACS radio systems include simulcast, CNI, and SCAT systems.
EDG interface module	**E**DACS **D**ata **G**ateway **interface module** – Mobile data is forwarded to the CEC/IMC switch from the EDG computer equipment via the **EDG interface module**. This module's Controller Board is labeled "**DATA**".
GETC	Ericsson **G**eneral **E**lectric **T**runking **C**ard – The GETC is a microprocessor-controlled shelf that can be configured to perform many different signal processing tasks for Ericsson GE radio communications equipment. In CEC/IMC applications, each GETC is equipped with a 9600 baud modem that provides serial control data communications between different radio systems.
GSC bus	**G**lobal **S**erial **C**hannel **bus** – The GSC bus is a high-speed serial bus that provides packetized control data transfers between Controller Boards in the CEC/IMC switch.
IMC	**I**ntegrated **M**ultisite and **C**onsole **C**ontroller – The Ericsson GE IMC is a digital audio switch that routes audio/mobile data/Aegis data between EDACS radio systems and dispatch consoles. It is a second generation multisite controller plus a console controller for the C3 series consoles.
interface module	The term "CEC/IMC **interface module**" is used to refer to a subset of hardware components within the CEC/IMC switch that permits it to be connected or linked to an external device such as a dispatch console or an EDACS radio system. Each interface module is formed by a Controller Board and usually one or more Audio Boards. This term replaces the term "**subsystem**". Examples of CEC/IMC interface modules include: MIM, CIM, LRIM, VMIM and RIM.
inter- & intra-rack cables	The CEC/IMC Backplanes are interconnected or "daisy chained" together using inter-rack and intra-rack cables. Intra-rack cables join the Backplanes in an individual cabinet together and inter-rack cables join the Backplanes between cabinets in a dual-cabinet installation.
LRIM	**L**ogging **R**ecorder **I**nterface **M**odule – This CEC/IMC interface module provides audio outputs for logging recorders. Each output channel can be programmed to supply audio based on groups or individual units within the CEC/IMC network.
MIM	**M**ASTR II/III **I**nterface **M**odule – The MIM connects an EDACS radio system to the CEC/IMC switch. EDACS radio systems include EDACS sites, simulcast systems, voted systems, CNI and SCAT systems.
mobile data/Aegis data	This includes mobile data, Aegis digitized voice data and Aegis encrypted voice data.
MOM	**MO**nitor **M**odule – The MOM is a CEC/IMC interface module that provides serial data connections for the CEC/IMC Manager (MOM PC) and the System Manager computers.
MOM PC	(see **CEC/IMC Manager**)
multisite	A **multisite** is a network of multiple EDACS radio systems and possibly conventional radio systems all linked together for wide-area communication. In a multisite network, adjacent systems do not use the same radio frequencies.

NIM	**N**etwork **I**nterface **M**odule – Two or more IMC networks can be linked together for distributed multisite communications using a NIM at each IMC switch.
patch	A **patch** is when two or more talk groups are connected together by a dispatcher. This allows the patched groups to communicate as a single group.
PCM	**P**ulse **C**ode **M**odulation – An audio processing technique used to encode and decode analog signals so they can be transferred digitally.
RIM	**R**equest Status Monitor **I**nterface **M**odule – The RIM interface module enables the RSM computer to request status information from radios within the network.
RSM	**R**equest **S**tatus **M**onitor – The RSM is an IBM PC compatible computer running custom software developed by Ericsson GE. It allows the system administrator and/or the dispatchers to view status of EDACS units within the CEC/IMC network. Status information is typically initiated (transmitted) by the radio operator to identify the current condition (in route, at scene, etc.) of the unit.
secondary interface	The term "**secondary interface**" refers to the CIA rack. This rack is considered to be secondary because it is not connected to the primary TDM and GSC buses within the CEC/IMC.
simul-select	A console operator can simultaneously communicate with two or more talk groups by selecting the groups for "**simul-select**" communication. Simul-select communication uses only a single radio channel at each active radio system.
site	This term normally refers to EDACS radio equipment at a single specific location.
StarGate Controller	A **StarGate Controller** is an IMC switch specifically configured for distributed multisite operation. It is the central point or "hub" for all distributed multisite communications.
System Manager	The **System Manager** is a DEC multitasking computer which performs features such as monitoring system operation, generating management reports, individual unit enable/disable and dynamic regrouping.
TDM bus	**T**ime **D**ivision **M**ultiplexed **bus** – The TDM bus in the CEC/IMC switch is a digitally multiplexed bus system used to transfer audio/mobile data/Aegis data throughout the CEC/IMC switch. Each signal coming into the CEC/IMC switch is assigned a TDM time slot and receiving devices extract the digitized signals from the appropriate time slot.
tracking	In a multisite network, all active radios log into their particular system. This login information is databased to allow the CEC/IMC to track individual radio units as they move from system-to-system. The CEC/IMC can then route wide area calls based on this database.
VMIM	Con**V**entional **I**nterface **M**odule – The VMIM couples the CIA secondary interface rack to the primary CEC/IMC switch interface modules. The VMIM - CIA set allows conventional base stations and conventional satellite receiver voting systems to be connected to the CEC/IMC switch.
XLTR	C3 Modular/Desktop Console **Translator** – Using data protocol conversion techniques, this interface module allows the CEC/IMC switch to communicate with a C3 Modular/Desktop console. The XLTR is placed in the control data path between the C3 console and its respective CIM.

ERICSSON
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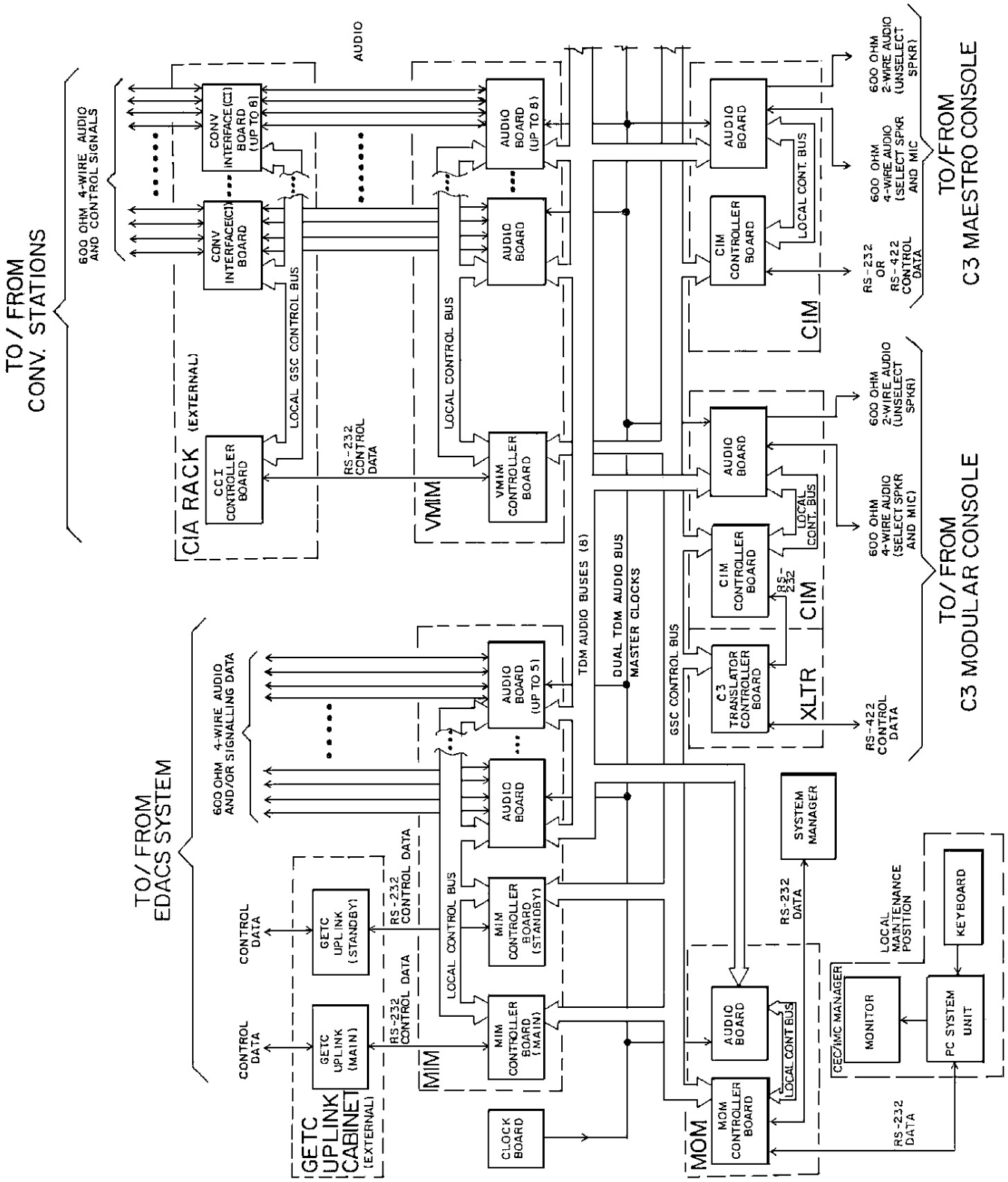


Figure 2A - CEC/IMC Architecture

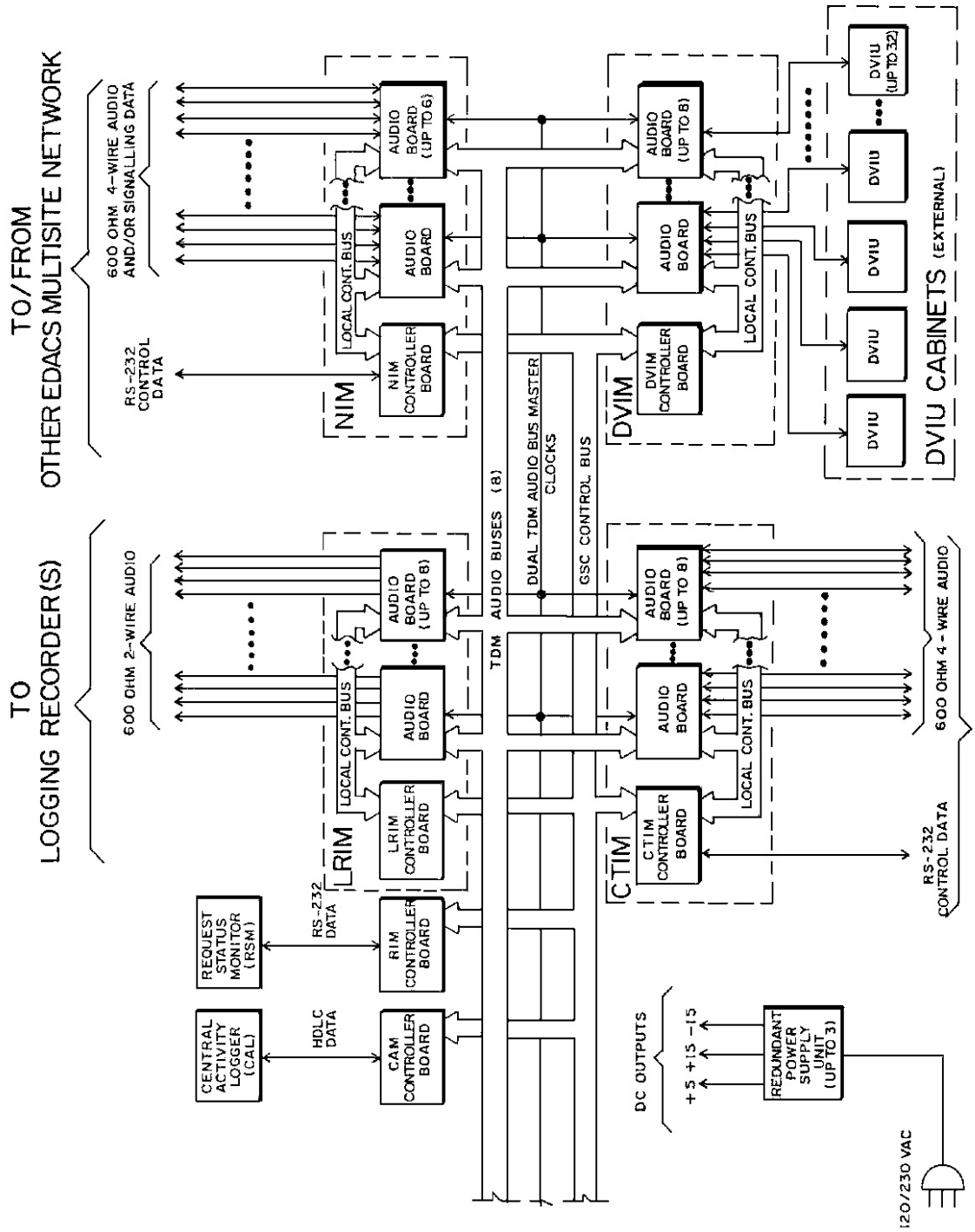


Figure 2B - CEC/IMC Architecture

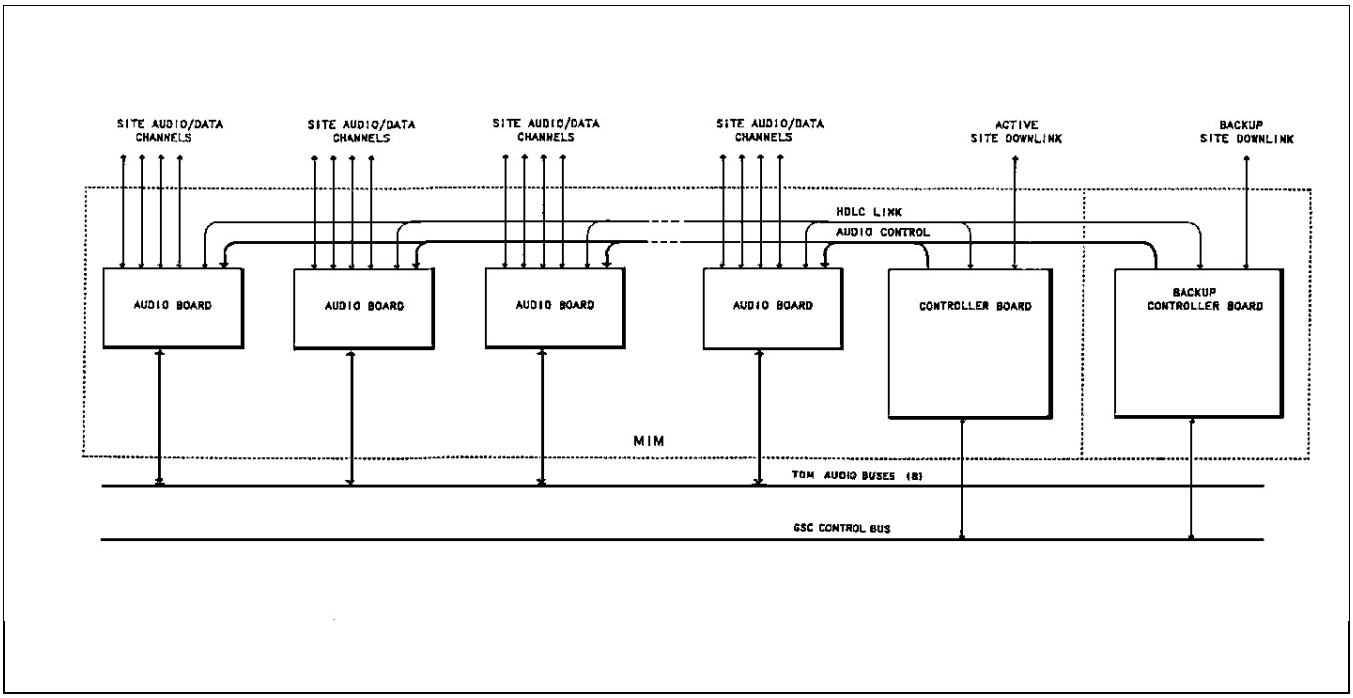


Figure 3 - Interface Module Architecture

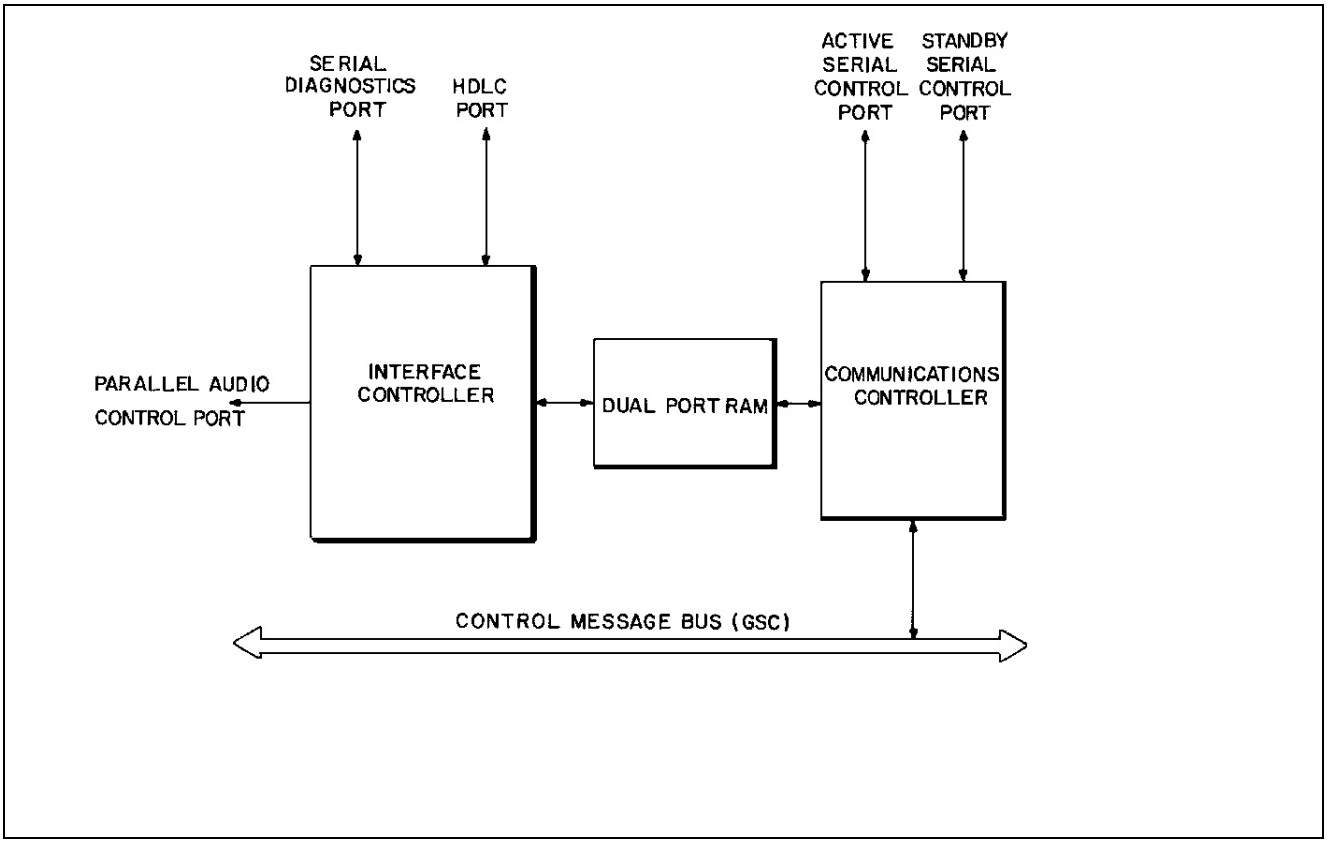
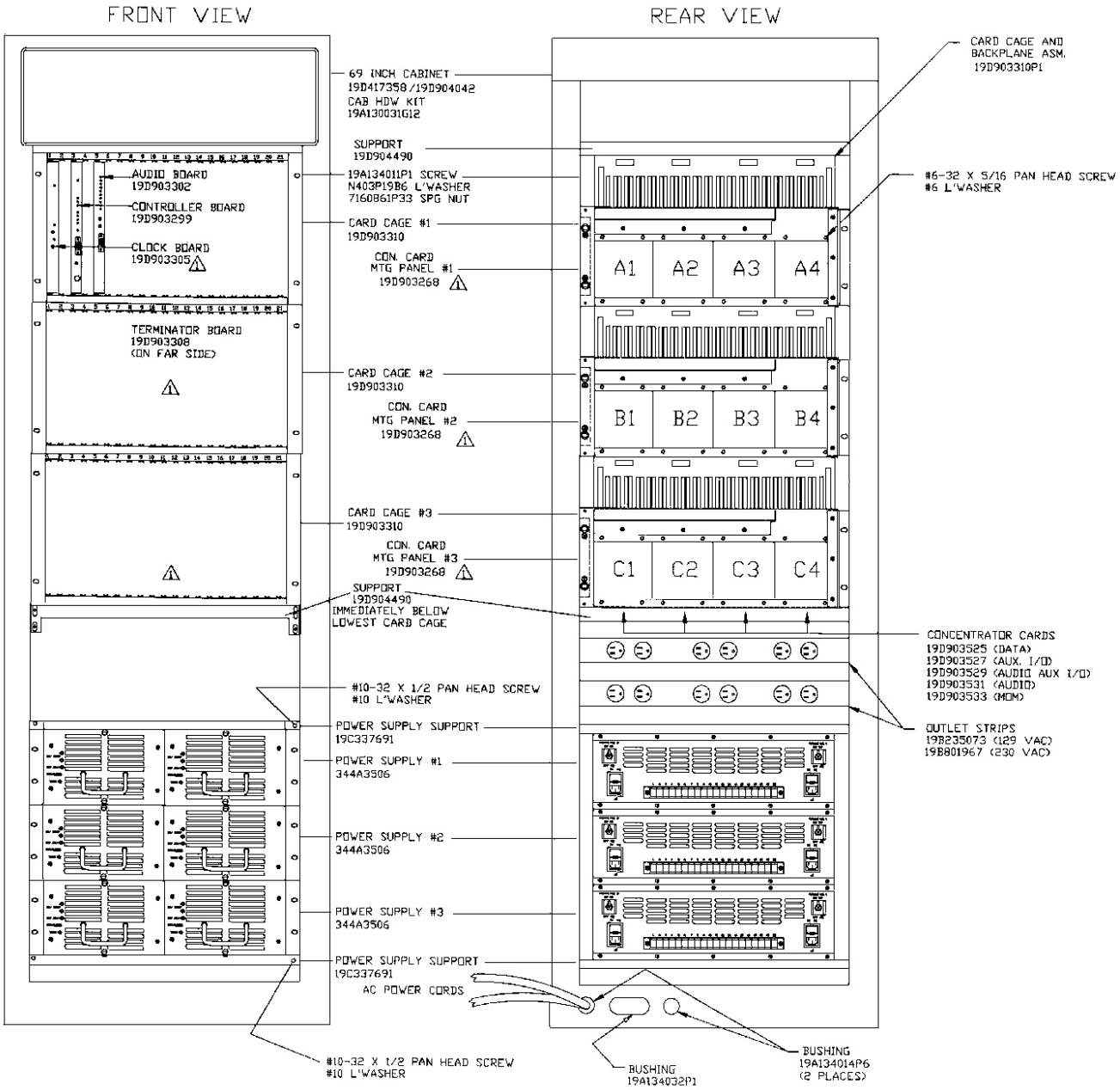


Figure 4 - Controller Board Architecture



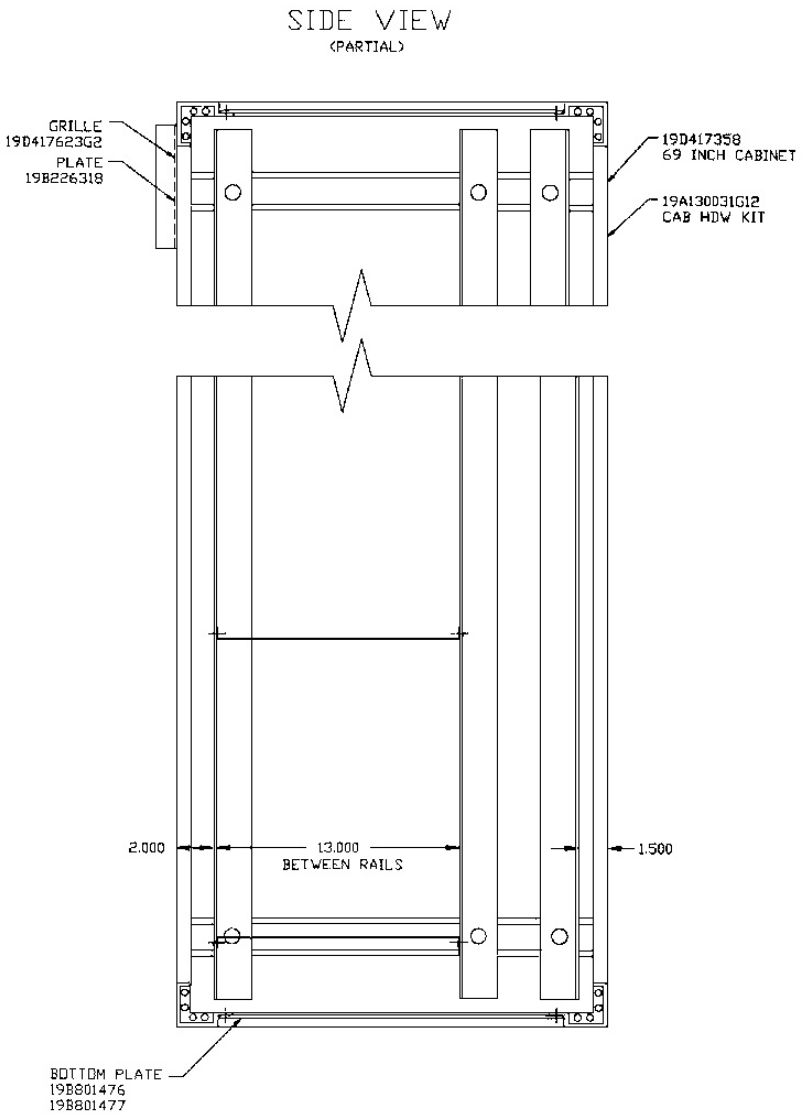
NOTES:

1. SEE SYSTEM CONFIGURATION DRAWING FOR SPECIFIC BOARD/CARD PLACEMENTS

CEC/IMC SWITCH CABINET

Sheet 1 of 3 (Front And Rear Views)

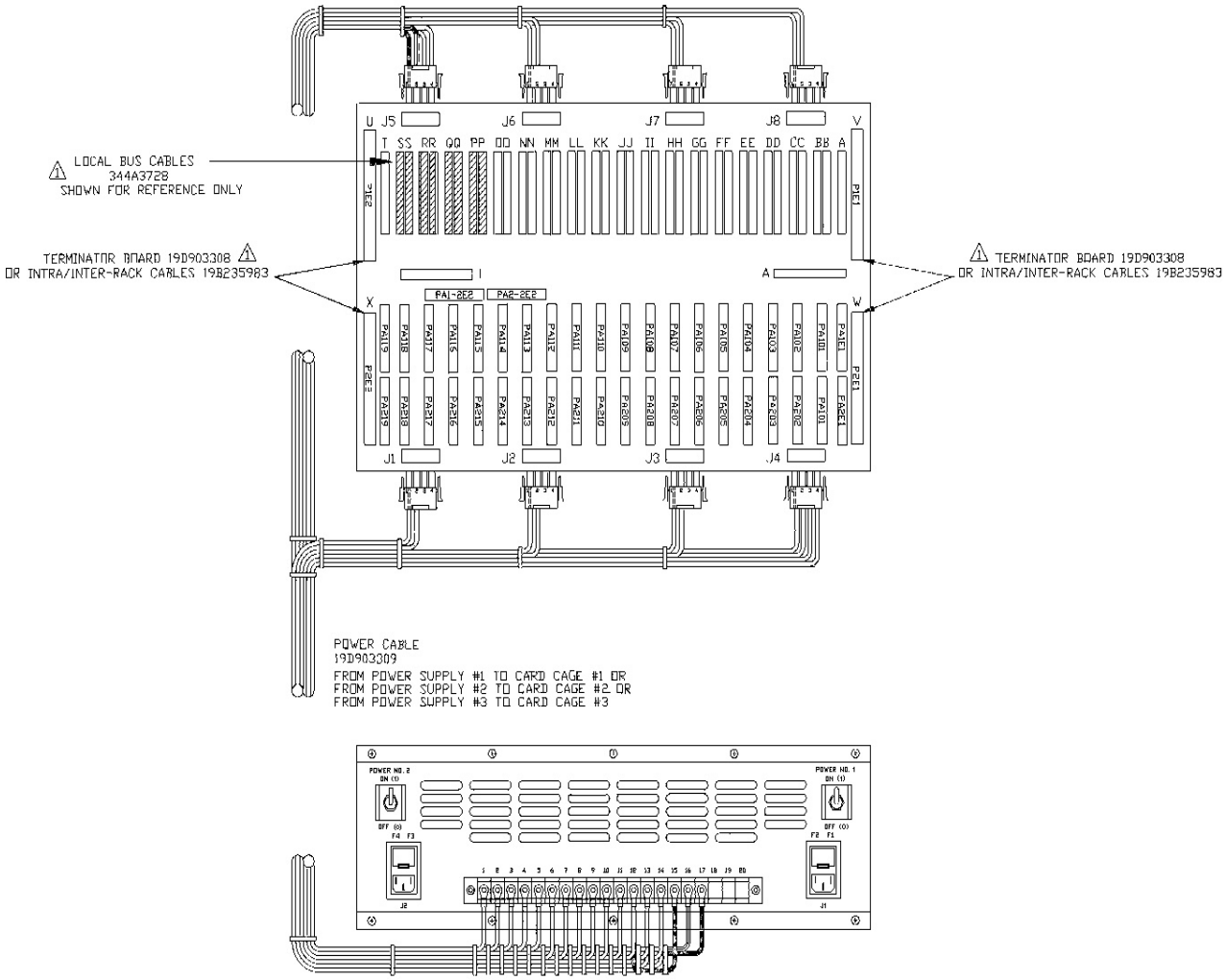
(19D903515, Sh. 1, Rev. 6)



CEC/IMC SWITCH CABINET

Sheet 2 of 3 (Side View)

(19D903515, Sh. 1, Rev. 6)



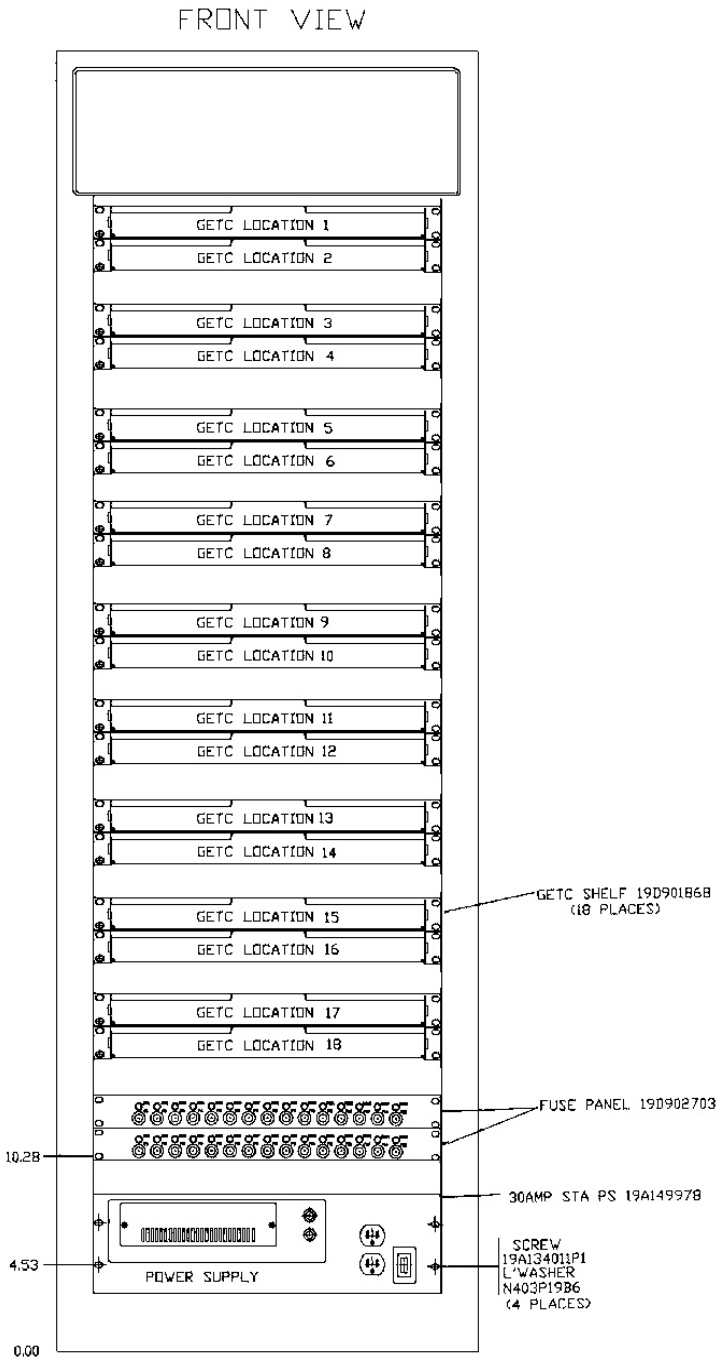
NOTES:

1. SEE SYSTEM CONFIGURATION DRAWING FOR BOARD/CABLE PLACEMENT.

CEC/IMC SWITCH CABINET

Sheet 3 of 3 (Backplane Connections)

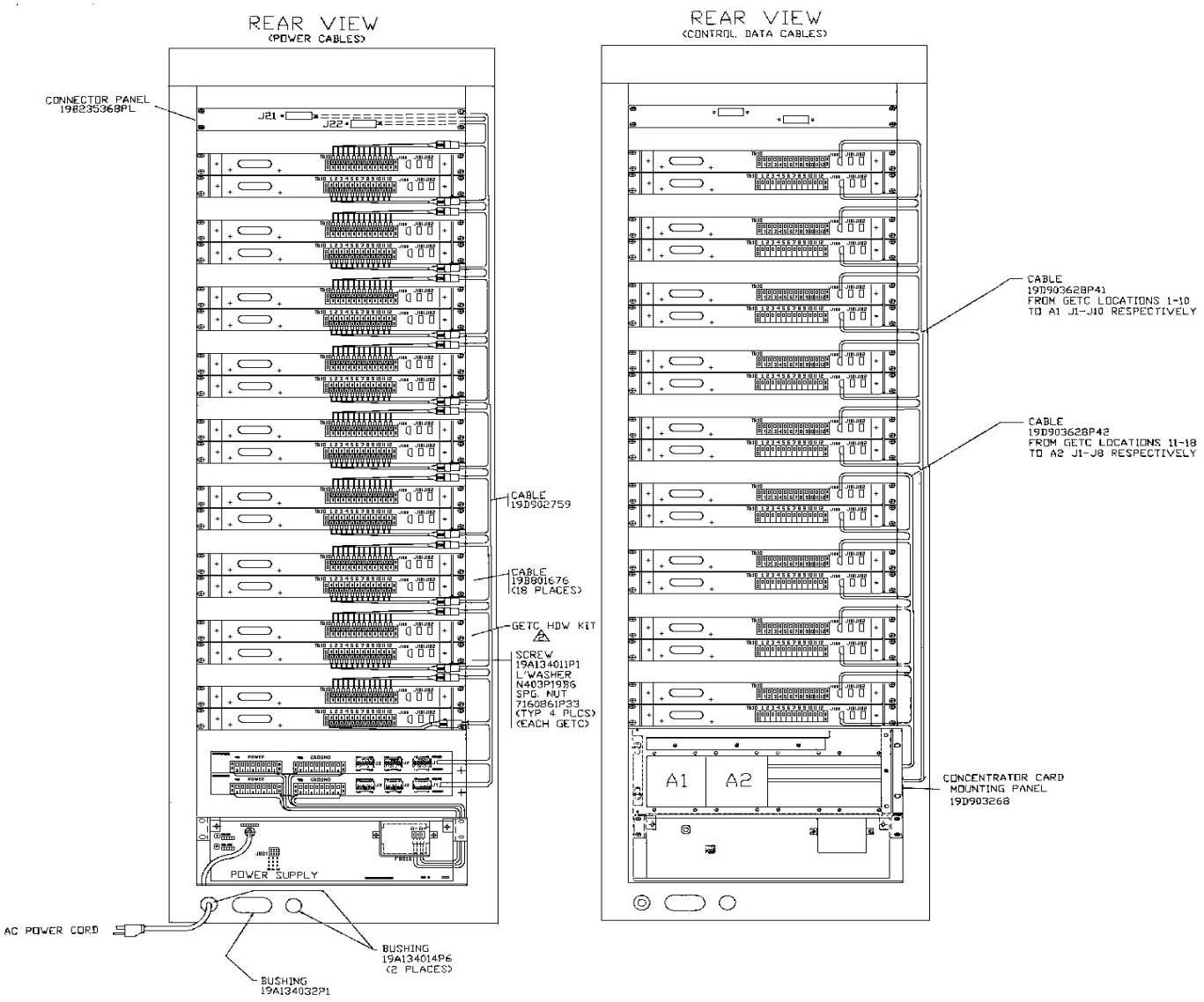
(19D903515, Sh. 2, Rev. 4)



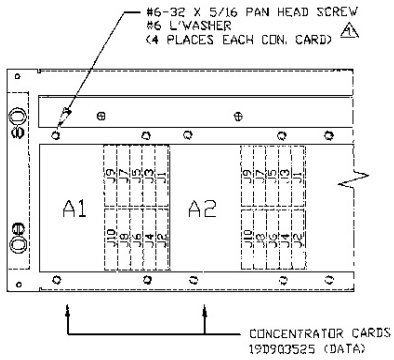
GETC UPLINK CABINET

Sheet 1 of 2 (Front View)

(19D903515, Sh. 4, Rev. 4



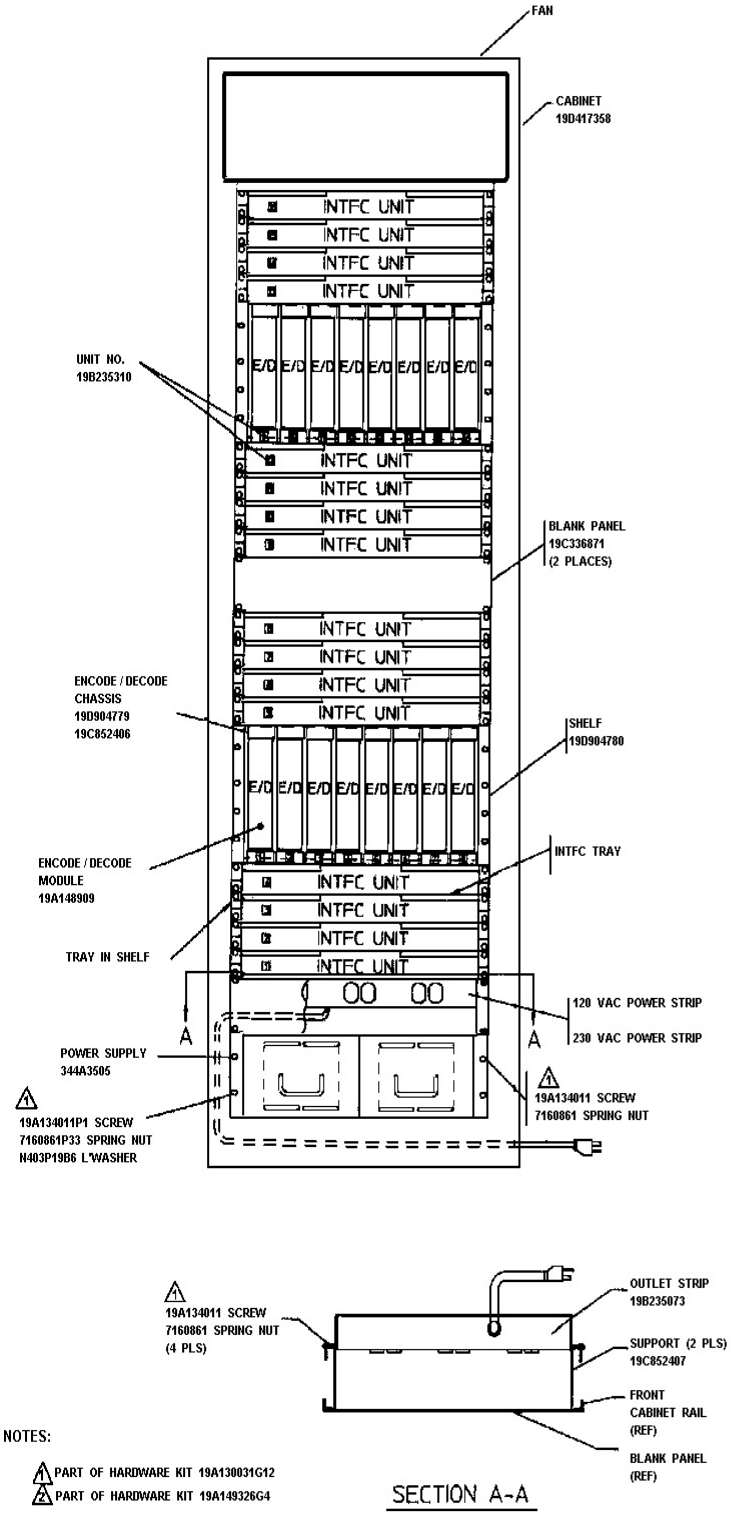
⚠ LINE 19A130031G30 HARDWARE KIT REQUIRED FOR EACH GETC.



GETC UPLINK CABINET

Sheet 2 of 2 (Rear Views)

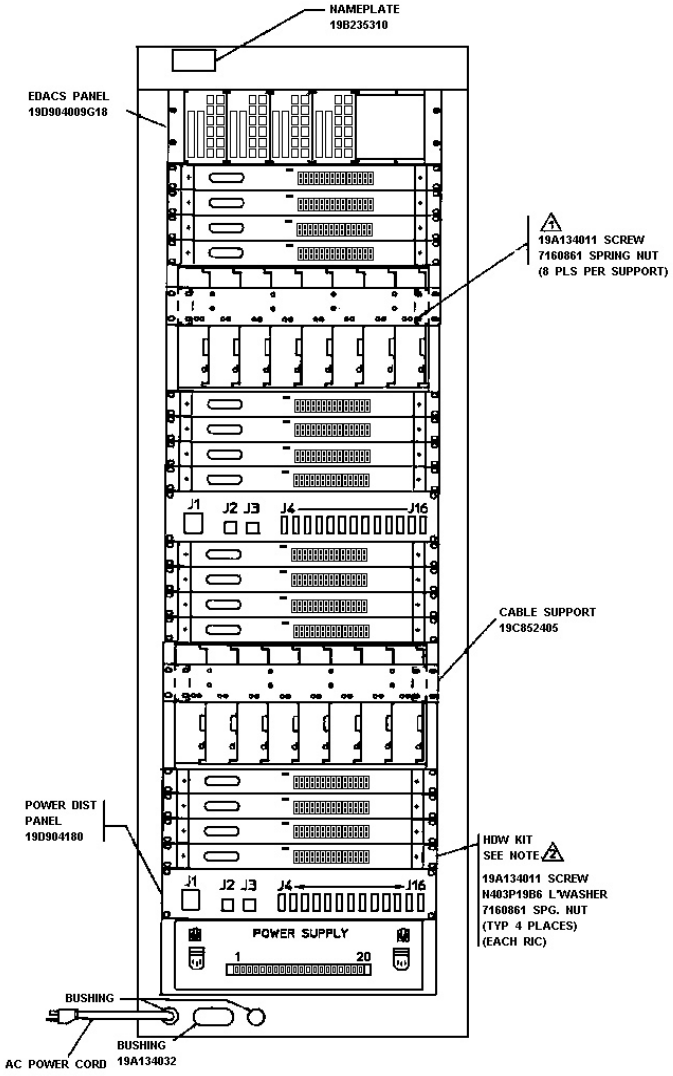
(19D903515, Sh. 4, Rev. 4)



DVIU CABINET

Sheet 1 of 2 (Front View)

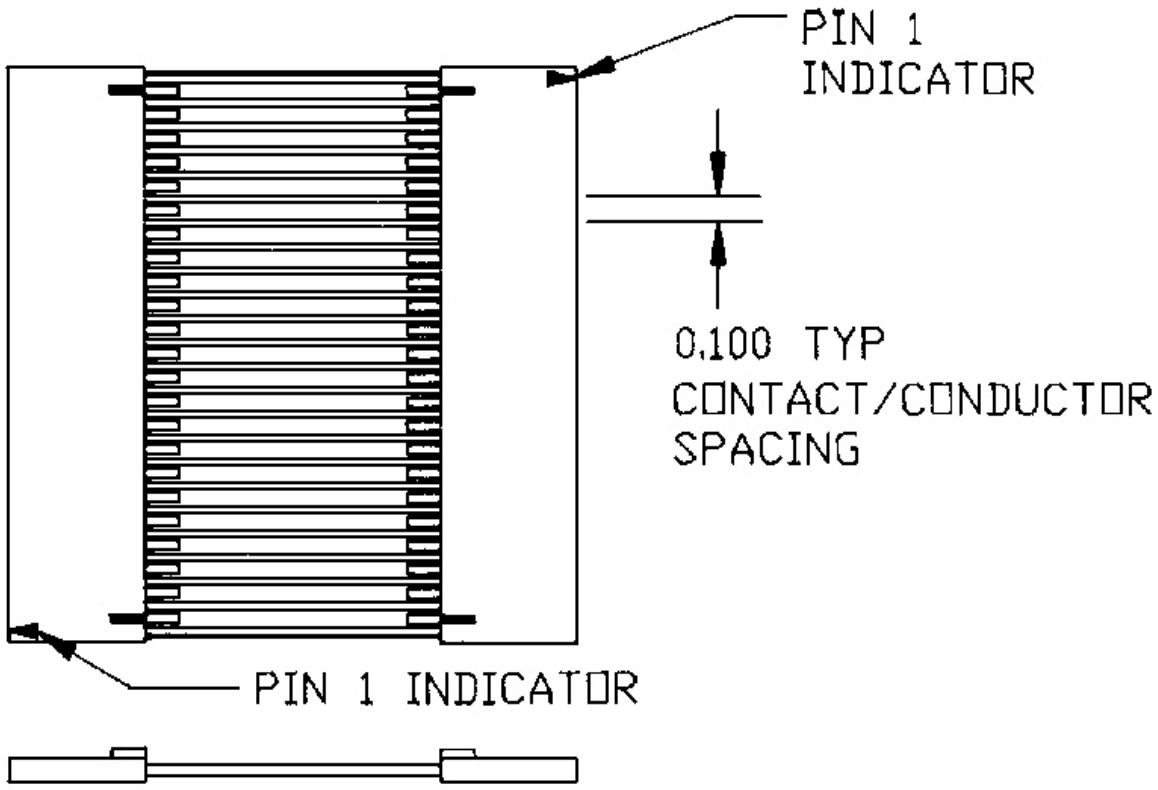
(19D904876, Sh. 1, Rev. 0)



DVIU CABINET

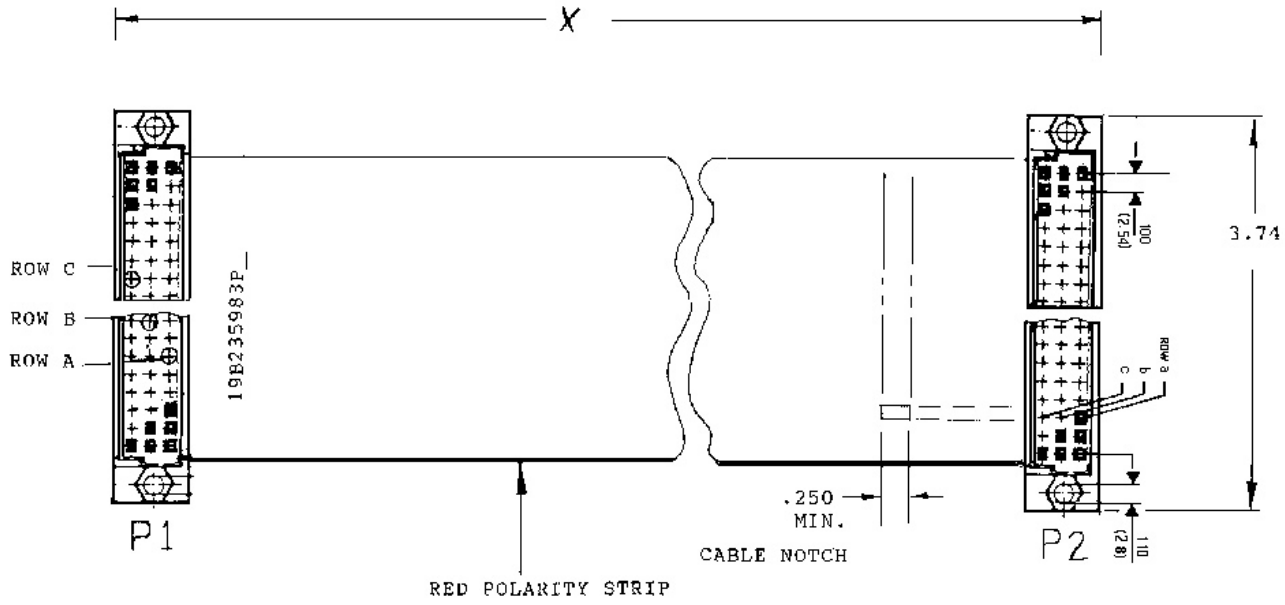
Sheet 2 of 2 (Rear View)

(19D904876, Sh. 1, Rev. 0)



LOCAL BUS CABLES
344A3728P1 (3.25") & P2 (8.00")

(344A3728, Sh. 1, Rev. 2)



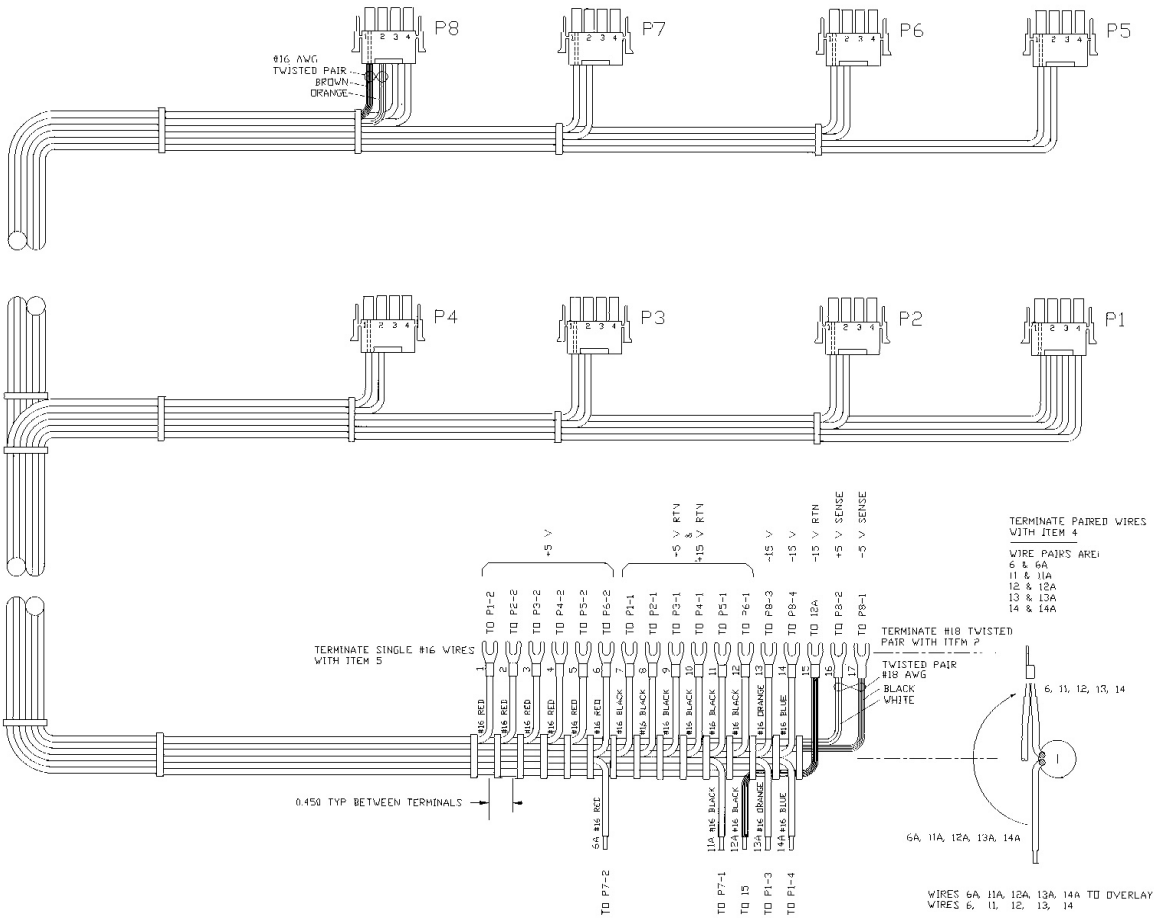
PART	FIGURE	DESCRIPTION

1	1	96 POS TO 96 POS (DIN 41612)
		CABLE SIMILAR TO CARROT COMPONENTS
		CORPORATION CAT # CEG-DIN-100-096
		X=24.0" +/- 2.0"

2	1	SAME AS PART 1 EXCEPT NO CONNECTIONS FROM P1-1C TO P2-1C P1-31C TO P2-31C
3	1	SAME AS PART 1 EXCEPT NO CONNECTIONS FROM P1-1A TO P2-1A P1-27A TO P2-27A P1-29A TO P2-29A P1-31A TO P2-31A
4	1	SAME AS PART 1 EXCEPT NO CONNECTOPNS BETWEEN P1 & P2 ON PINS: 1C,4C,5C,6C,7C,8C,9C,10C,13C,14C,15C,16C, 17C,18C,19C,20C,23C,24C,25C,26C,27C, 28C,29C,30C,31C
5	1	SAME AS PART 1 EXCEPT NO CONNECTIONS BETWEEN P1 & P2 ON PINS: 1A,27A,29A,31A,1B,2B,3B,4B,5B,6B,7B,8B,9B, 10B,11B,12B,13B,14B,15B,16B, 1C,2C,3C,4C,5C,6C,7C,8C,9C,10C,11C,12C,13C, 14C,15C,16C,17C,18C,19C,20C,21C,22C,23C,24C, 25C,26C,27C,28C,29C,30C,31C,32C
6	1	SAME AS PART 4 EXCEPT X=18.0" +/- 2.0"
7	1	SAME AS PART 5 EXCEPT X=18.0" +/- 2.0"

INTRA- & INTER-RACK CABLES
19B235983P3 - P7

(19B235983, Sh. 1, Rev. 3)
(19B235983, Sh. 2, Rev. 3)



MATERIAL LIST				
ITEM	EGE PART NO.	VENDOR PART NO. (OR EQUIVALENT)	DESCRIPTION	QTY
P1-P8		AMP 1-480702-0	CONNECTOR BODY	8
1		AMP 350536 1 AMP 350550 1	CONTACT, SOCKET, STRIP CONTACT, SOCKET, LOOSE	20
2 3 4 5	19J706152P5	AMP 52949-1 PANDUIT SST-1M AMP 52941-1 AMP 52935-1	FORK TERMINAL (#18) RETAINING STRAP FORK TERMINAL (2 #16) FORK TERMINAL (1 #16)	2 30 5 10

CEC/IMC CABINET POWER CABLE 19D903309P1

(19D903309, Sh. 1, Rev. 1)

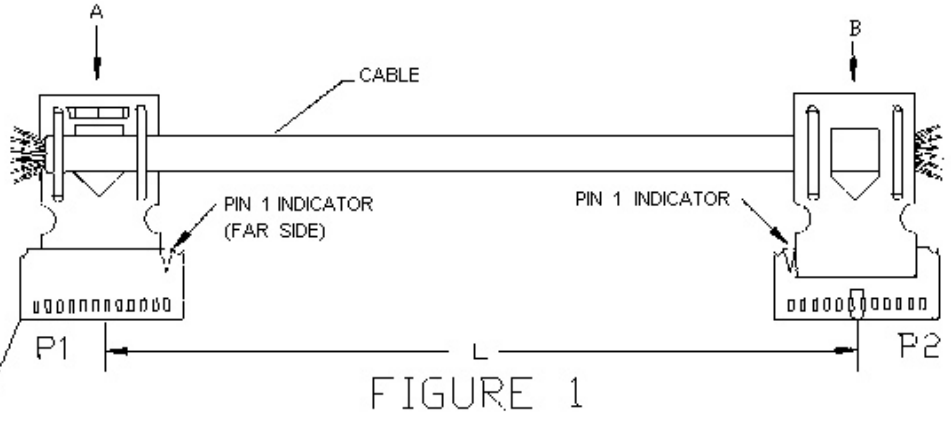


FIGURE 1

HOUSING, 24 CIRCUIT AMP 104810-1 (OR EQUIVALENT) (FIGURE 1 QTY = 2 AT P1 AND P2) (FIGURE 2 QTY = 3 AT P1, P2 AND P3)	CONTACT, FOR #28 AWG AMP 102920-2 (OR EQUIVALENT) (QTY = 1 PER WIRE TERMINATION)

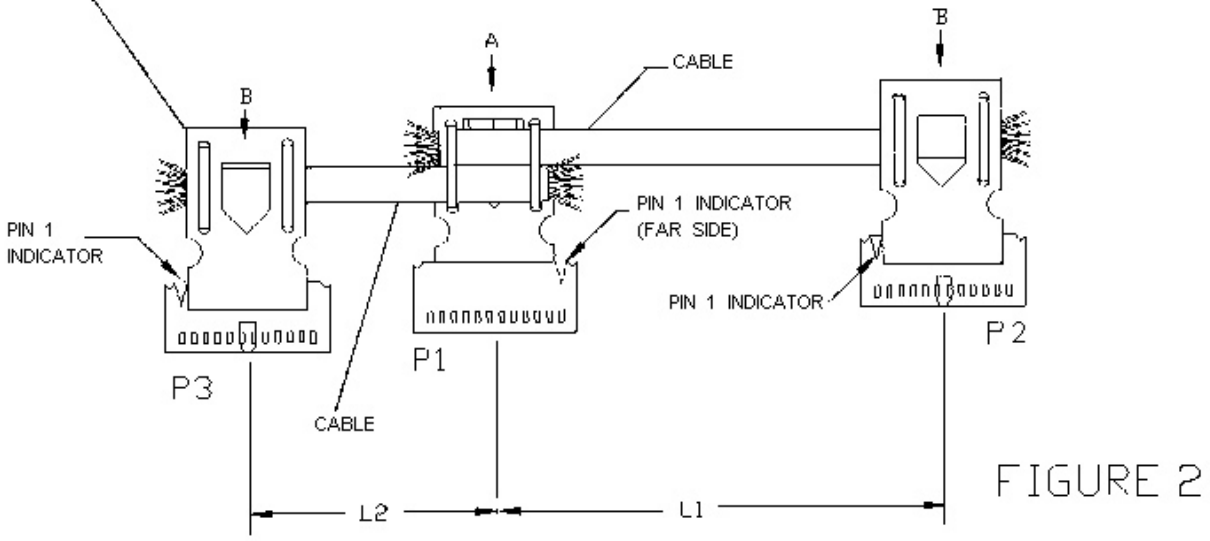
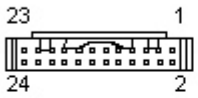
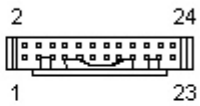


FIGURE 2



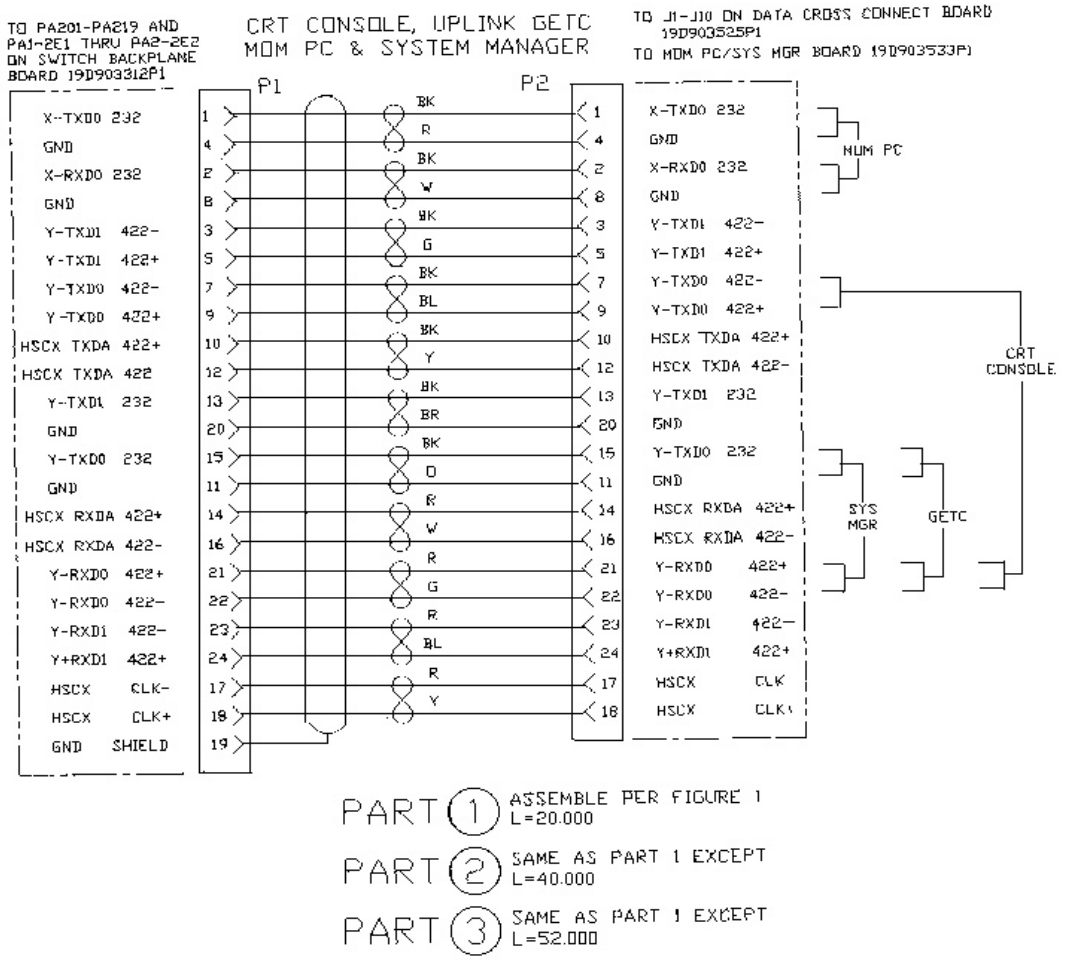
VIEW A

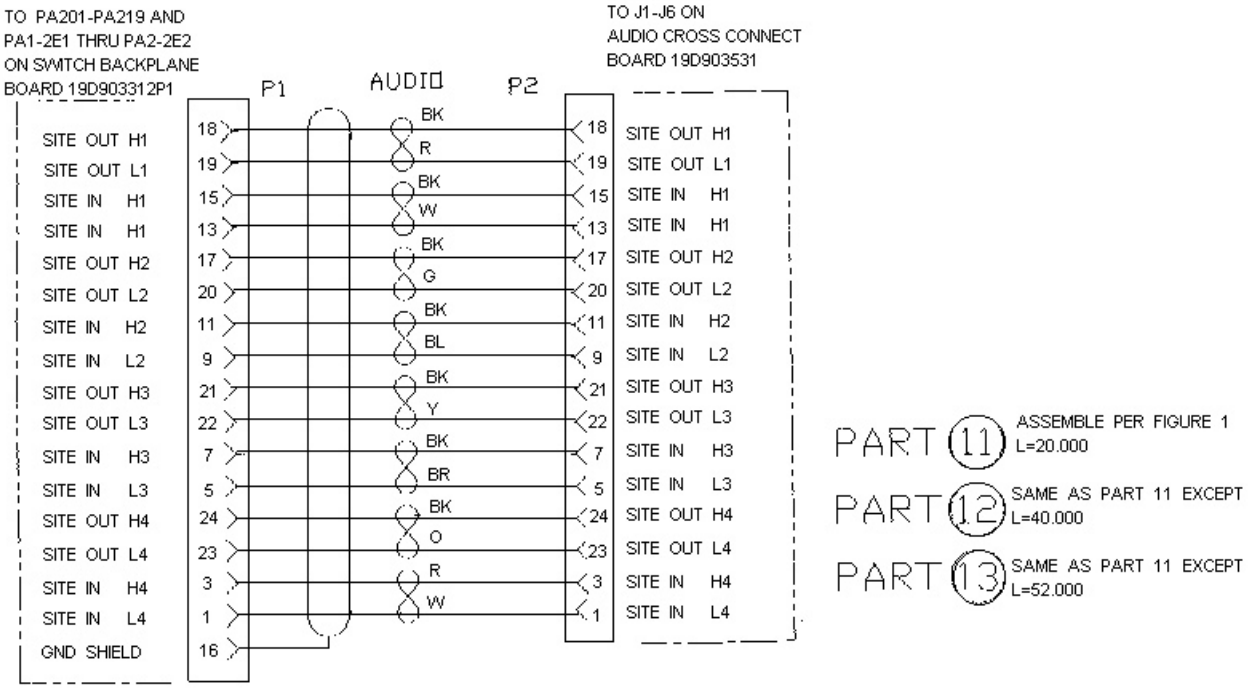


VIEW B

CEC/IMC CONCENTRATOR CARD CABLES
19D903628 (Figures 1 & 2)

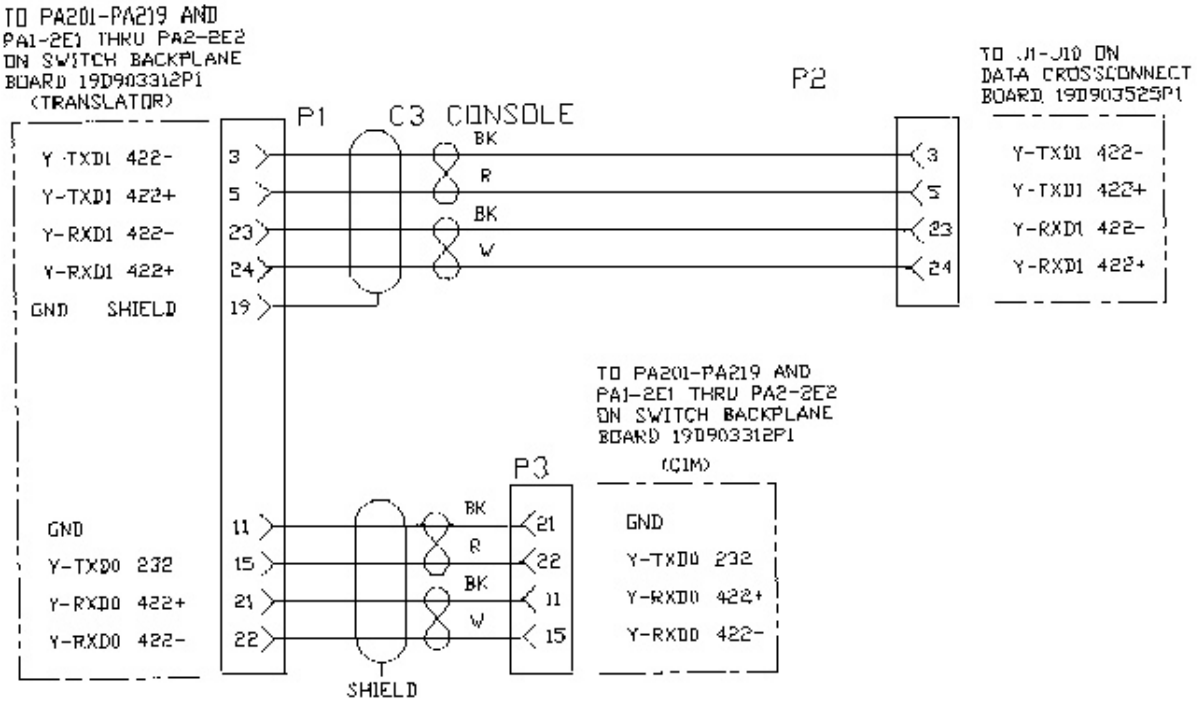
(19D903628, Sh. 1, Rev. 4)





CEC/IMC CONCENTRATOR CARD CABLES
19D903628P1 - P3 (Data) & P11 - P13 (Audio)

(19D903628 Sh. 1, Rev. 4)



PART 21 ASSEMBLE PER FIGURE 2
L1=20.000 L2=4.500

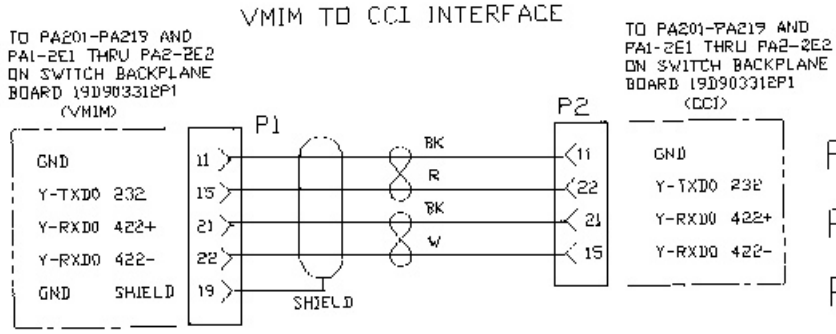
PART 22 SAME AS PART 21 EXCEPT
L1=40.000 L2=4.500

PART 23 SAME AS PART 21 EXCEPT
L1=52.000 L2=4.500

PART 27 SAME AS PART 22 EXCEPT
L2=20.000

PART 28 SAME AS PART 22 EXCEPT
L2=40.000

PART 29 SAME AS PART 22 EXCEPT
L2=52.000



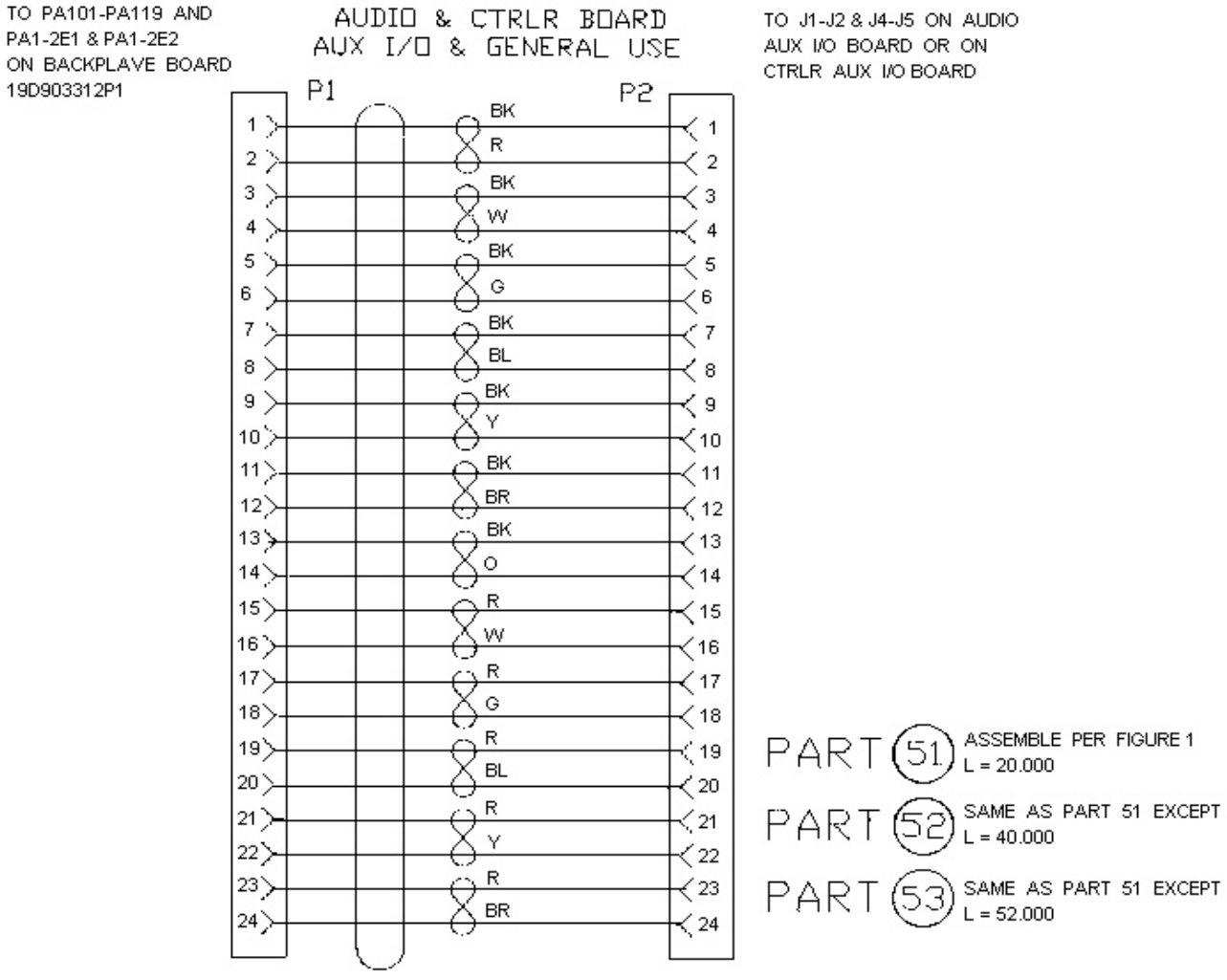
PART 31 ASSEMBLE PER FIGURE 1
L=20.000

PART 32 SAME AS PART 31 EXCEPT
L=40.000

PART 33 SAME AS PART 31 EXCEPT
L=52.000

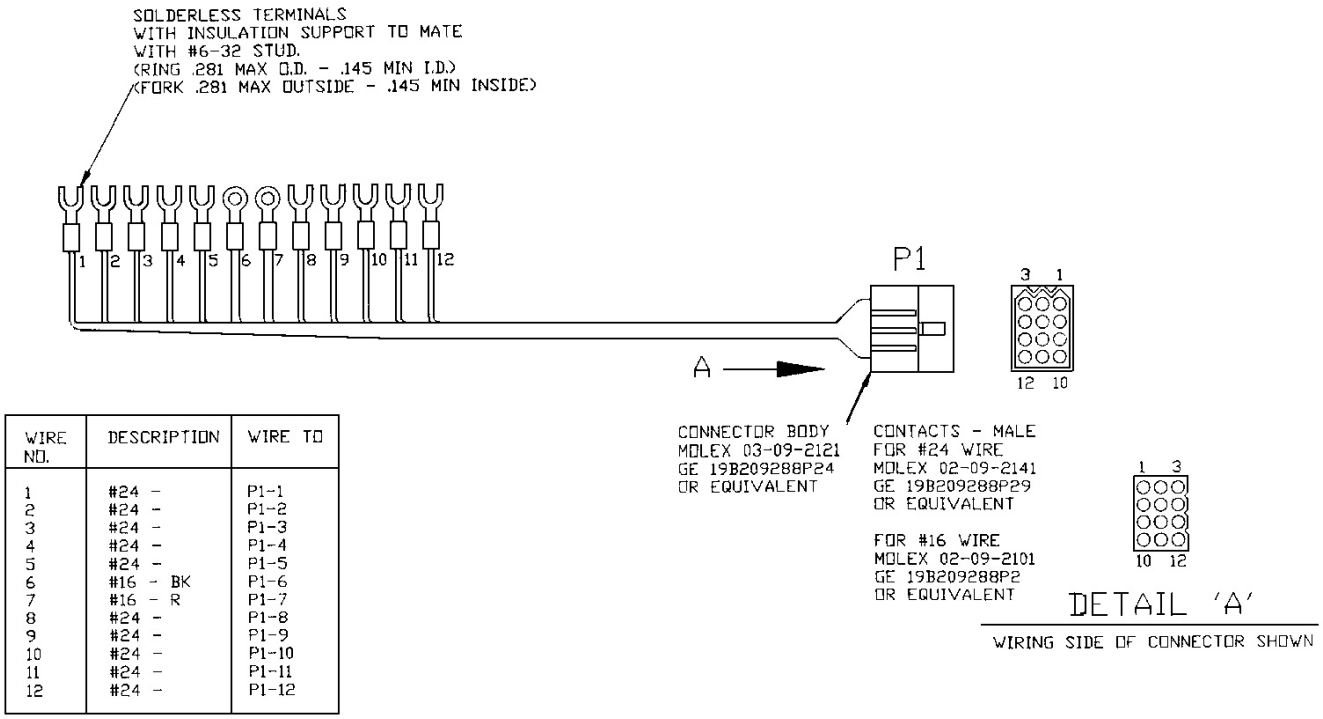
CEC/IMC CONCENTRATOR CARD CABLES
19D903628P21 - P29 (Translator) & P31 - P33 (VMIM)

(19D903628 Sh. 1, Rev 4)



CEC/IMC CONCENTARTOR CARD CABLES
19D903628P51 - P53 (Aux. I/O) & P61 - P63 (NIM)

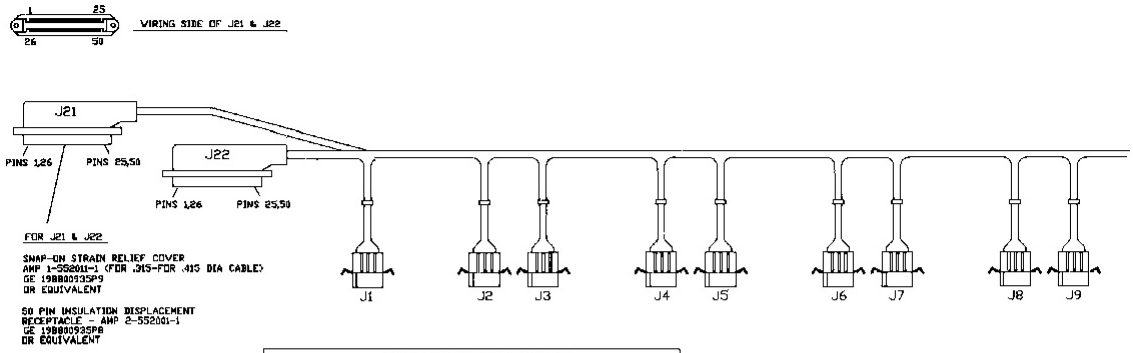
(19D903628 Sh. 2, Rev. 4)



WIRE NO.	DESCRIPTION	WIRE TO
1	#24 -	P1-1
2	#24 -	P1-2
3	#24 -	P1-3
4	#24 -	P1-4
5	#24 -	P1-5
6	#16 - BK	P1-6
7	#16 - R	P1-7
8	#24 -	P1-8
9	#24 -	P1-9
10	#24 -	P1-10
11	#24 -	P1-11
12	#24 -	P1-12

GETC UPLINK CABINET TERMINAL BLOCK CABLE (19B801676P1)

(19B801676, Sh. 1, Rev. 0)

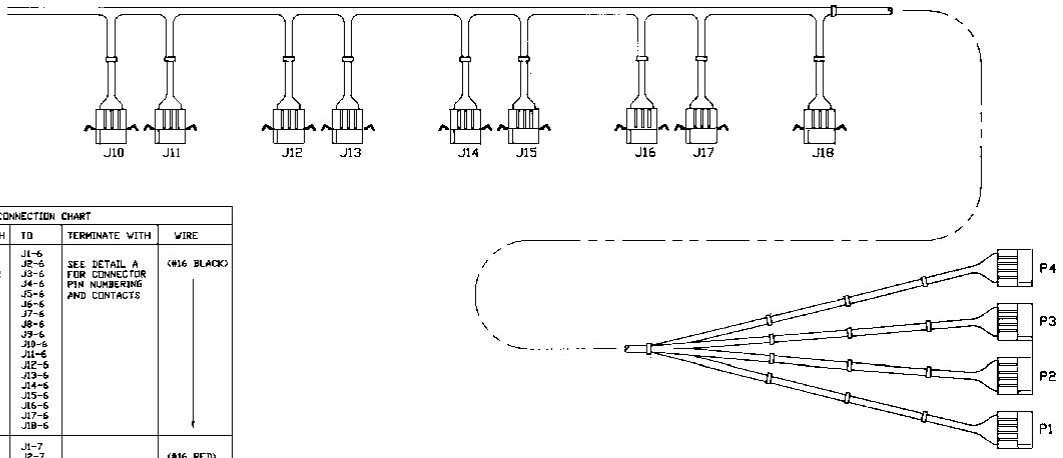


CONNECTION CHART - DATA CIRCUITS

FROM	TERMINATE WITH	TO	WIRE	CIRCUIT NAME	
J1-9	SEE DETAIL A	J21-1	PAIR 1-WIRE 1	DATA OUT (GETC #1)	MAIN
J1-10	FOR CONNECTOR	J21-26	PAIR 1-WIRE 2		
J1-11	PIN NUMBERING	J21-8	PAIR 2-WIRE 1	DATA IN (GETC #1)	MAIN
J1-12	AND CONTACTS	J21-27	PAIR 2-WIRE 2		SITE 1
J2-9		J21-3	PAIR 3-WIRE 1	DATA OUT (GETC #2)	STBY
J2-10		J21-28	PAIR 3-WIRE 2		
J2-11		J21-4	PAIR 4-WIRE 1	DATA IN (GETC #2)	STBY
J2-12		J21-29	PAIR 4-WIRE 2		
J3-9		J21-5	PAIR 5-WIRE 1	DATA OUT (GETC #3)	MAIN
J3-10		J21-30	PAIR 5-WIRE 2		
J3-11		J21-6	PAIR 6-WIRE 1	DATA IN (GETC #3)	MAIN
J3-12		J21-31	PAIR 6-WIRE 2		SITE 2
J4-9		J21-7	PAIR 7-WIRE 1	DATA OUT (GETC #4)	STBY
J4-10		J21-32	PAIR 7-WIRE 2		
J4-11		J21-8	PAIR 8-WIRE 1	DATA IN (GETC #4)	STBY
J4-12		J21-33	PAIR 8-WIRE 1		
J5-9		J21-9	PAIR 9-WIRE 1	DATA OUT (GETC #5)	MAIN
J5-10		J21-34	PAIR 9-WIRE 2		
J5-11		J21-10	PAIR 10-WIRE 1	DATA IN (GETC #5)	MAIN
J5-12		J21-35	PAIR 10-WIRE 2		SITE 3
J6-9		J21-11	PAIR 11-WIRE 1	DATA OUT (GETC #6)	STBY
J6-10		J21-36	PAIR 11-WIRE 2		
J6-11		J21-12	PAIR 12-WIRE 1	DATA IN (GETC #6)	STBY
J6-12		J21-37	PAIR 12-WIRE 2		
J7-9		J21-13	PAIR 13-WIRE 1	DATA OUT (GETC #7)	MAIN
J7-10		J21-38	PAIR 13-WIRE 2		
J7-11		J21-14	PAIR 14-WIRE 1	DATA IN (GETC #7)	MAIN
J7-12		J21-39	PAIR 14-WIRE 2		SITE 4
J8-9		J21-15	PAIR 15-WIRE 1	DATA OUT (GETC #8)	STBY
J8-10		J21-40	PAIR 15-WIRE 2		
J8-11		J21-16	PAIR 16-WIRE 1	DATA IN (GETC #8)	STBY
J8-12		J21-41	PAIR 16-WIRE 2		
J9-9		J21-17	PAIR 17-WIRE 1	DATA OUT (GETC #9)	MAIN
J9-10		J21-42	PAIR 17-WIRE 2		
J9-11		J21-18	PAIR 18-WIRE 1	DATA IN (GETC #9)	MAIN
J9-12		J21-43	PAIR 18-WIRE 2		SITE 5
J10-9		J21-19	PAIR 19-WIRE 1	DATA OUT (GETC #10)	STBY
J10-10		J21-44	PAIR 19-WIRE 2		
J10-11		J21-20	PAIR 20-WIRE 1	DATA IN (GETC #10)	STBY
J10-12		J21-45	PAIR 20-WIRE 2		
J11-9		J21-21	PAIR 21-WIRE 1	DATA OUT (GETC #11)	MAIN
J11-10		J21-46	PAIR 21-WIRE 2		
J11-11		J21-22	PAIR 22-WIRE 1	DATA IN (GETC #11)	MAIN
J11-12		J21-47	PAIR 22-WIRE 2		SITE 6
J12-9		J21-23	PAIR 23-WIRE 1	DATA OUT (GETC #12)	STBY
J12-10		J21-48	PAIR 23-WIRE 2		
J12-11		J21-24	PAIR 24-WIRE 1	DATA IN (GETC #12)	STBY
J12-12		J21-49	PAIR 24-WIRE 2		
J13-9		J22-1	PAIR 1-WIRE 1	DATA OUT (GETC #13)	MAIN
J13-10		J22-26	PAIR 1-WIRE 2		
J13-11		J22-2	PAIR 2-WIRE 1	DATA IN (GETC #13)	MAIN
J13-12		J22-27	PAIR 2-WIRE 2		SITE 7
J14-9		J22-3	PAIR 3-WIRE 1	DATA OUT (GETC #14)	STBY
J14-10		J22-28	PAIR 3-WIRE 2		
J14-11		J22-4	PAIR 4-WIRE 1	DATA IN (GETC #14)	STBY
J14-12		J22-29	PAIR 4-WIRE 2		
J15-9		J22-5	PAIR 5-WIRE 1	DATA OUT (GETC #15)	MAIN
J15-10		J22-30	PAIR 5-WIRE 2		
J15-11		J22-6	PAIR 6-WIRE 1	DATA IN (GETC #15)	MAIN
J15-12		J22-31	PAIR 6-WIRE 2		SITE 8
J16-9		J22-7	PAIR 7-WIRE 1	DATA OUT (GETC #16)	STBY
J16-10		J22-32	PAIR 7-WIRE 2		
J16-11		J22-8	PAIR 8-WIRE 1	DATA IN (GETC #16)	STBY
J16-12		J22-33	PAIR 8-WIRE 2		
J17-9		J22-9	PAIR 9-WIRE 1	DATA OUT (GETC #17)	MAIN
J17-10		J22-34	PAIR 9-WIRE 2		
J17-11		J22-10	PAIR 10-WIRE 1	DATA IN (GETC #17)	MAIN
J17-12		J22-35	PAIR 10-WIRE 2		DOWNLINK
J18-9		J22-11	PAIR 11-WIRE 1	DATA OUT (GETC #18)	STBY
J18-10		J22-36	PAIR 11-WIRE 2		
J18-11		J22-12	PAIR 12-WIRE 1	DATA IN (GETC #18)	STBY
J18-12		J22-37	PAIR 12-WIRE 2		

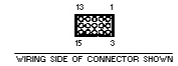
GETC UPLINK CABINET POWER/PHONE LINE CABLE 19D902759P1

(19D902759, Sh. 1, Rev. 1)



		CONNECTION CHART			
	FROM	TERMINATE WITH	TO	TERMINATE WITH	WIRE
A- SITE 1	MAIN P1-3 / STBY P2-3	SEE DETAIL B FOR CONNECTOR PIN NUMBERING AND CONTACTS	J1-6	SEE DETAIL A FOR CONNECTOR PIN NUMBERING AND CONTACTS	(#16 BLACK)
A- SITE 2	MAIN P1-6 / STBY P2-6		J2-6		
A- SITE 3	MAIN P1-9 / STBY P2-9		J3-6		
A- SITE 4	MAIN P1-12 / STBY P2-12		J4-6		
A- SITE 5	MAIN P1-15 / STBY P2-15		J5-6		
A- SITE 6	MAIN P3-3 / STBY P4-3		J6-6		
A- SITE 7	MAIN P3-6 / STBY P4-6		J7-6		
A- SITE 8	MAIN P3-9 / STBY P4-9		J8-6		
A- SITE 9	MAIN P3-12 / STBY P4-12		J9-6		
			J10-6		
			J11-6		
			J12-6		
			J13-6		
			J14-6		
			J15-6		
			J16-6		
			J17-6		
			J18-6		
A+ SITE 1	MAIN P1-1 / STBY P2-1		J1-7		(#16 RED)
A+ SITE 2	MAIN P1-4 / STBY P2-4		J2-7		
A+ SITE 3	MAIN P1-7 / STBY P2-7		J3-7		
A+ SITE 4	MAIN P1-10 / STBY P2-10		J4-7		
A+ SITE 5	MAIN P1-13 / STBY P2-13		J5-7		
A+ SITE 6	MAIN P3-1 / STBY P4-1		J6-7		
A+ SITE 7	MAIN P3-4 / STBY P4-4		J7-7		
A+ SITE 8	MAIN P3-7 / STBY P4-7		J8-7		
A+ SITE 9	MAIN P3-10 / STBY P4-10		J9-7		
			J10-7		
			J11-7		
			J12-7		
			J13-7		
			J14-7		
			J15-7		
			J16-7		
			J17-7		
			J18-7		
	J1-4		J2-4		(#24 YELLOW)
	J3-4		J4-4	SEE DETAIL B FOR CONNECTOR PIN NUMBERING	
	J5-4		J6-4		
	J7-4		J8-4		
	J9-4		J10-4		
	J11-4		J12-4		
	J13-4		J14-4		
	J15-4		J16-4		
	J17-4		J18-4		

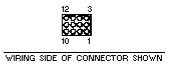
DETAIL 'B'
FOR P1-P4



CONNECTOR BODY
MOLEX 03-09-2154
GE 19B209288P6
OR EQUIVALENT

CONTACTS (MALE)
FOR #16 WIRE
MOLEX 02-09-2101
GE 19B209288P2
OR EQUIVALENT

DETAIL 'A'
FOR J1-J18



CONNECTOR BODY
MOLEX 03-09-1121
GE 19B209288P25
OR EQUIVALENT

CONTACTS (FEMALE)
FOR #24 WIRE
MOLEX 02-09-1141
GE 19B209288P29
OR EQUIVALENT

FOR #16 WIRE
MOLEX 02-09-1101
GE 19B209288P1
OR EQUIVALENT

GETC UPLINK CABINET POWER/PHONE LINE CABLE 19D902759P1

(19D902759, Sh. 1, Rev. 1)

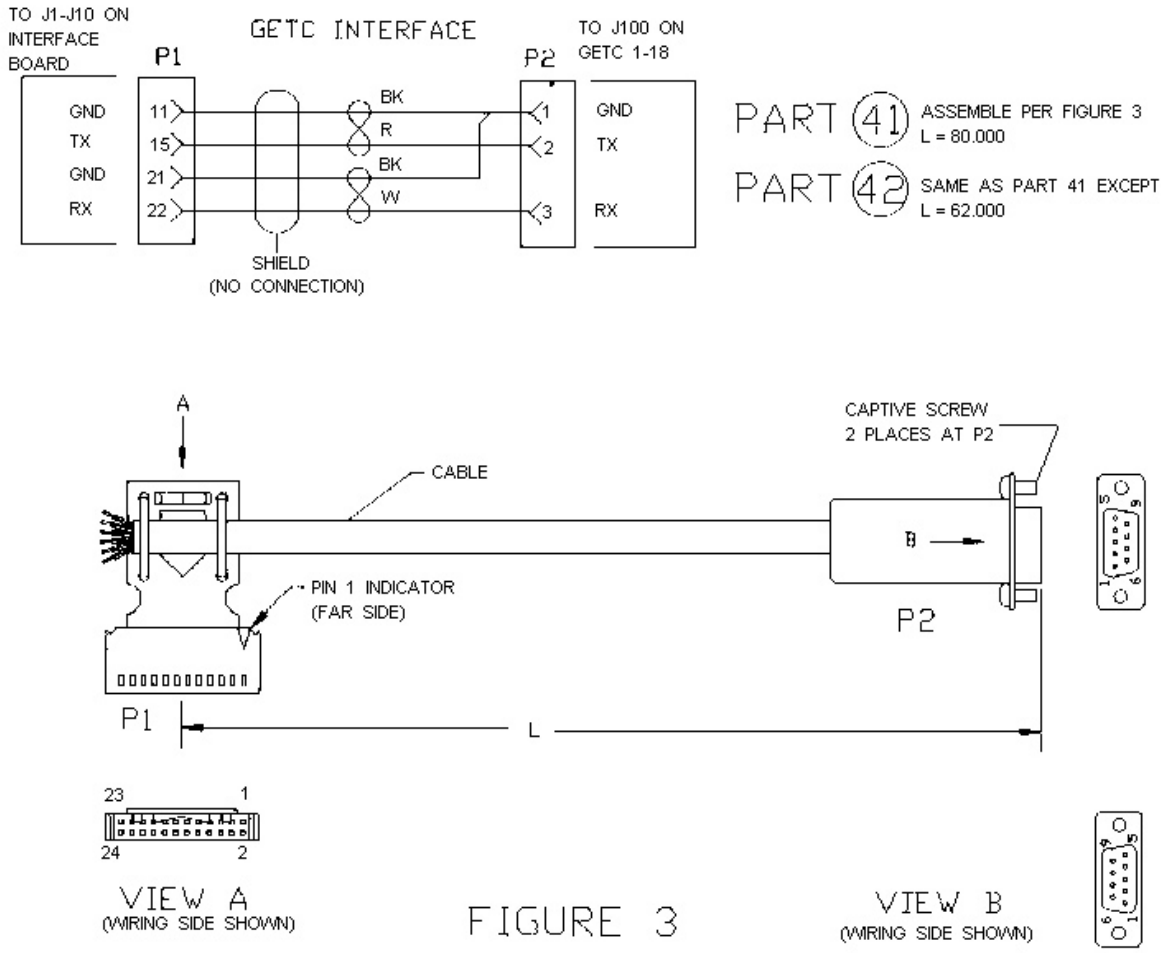


FIGURE 3

MATERIAL LIST				
ITEM	EGE PART NUMBER	VENDOR PART NUMBER (OR EQUIVALENT)	DESCRIPTION	QTY
P1	————	AMP 104810-1	24 CIRCUIT FEMALE HOUSING	1
	————	AMP 102920-2	FEMALE CONTACT (28-24 AWG)	4
P2	19B209727P21	AMP 205204-1	DB9 MALE CONNECTOR HOUSING	1
	————	AMP 66682-8	MALE CONTACT (28-24 AWG) (J2-1 & J2-2)	2
	19B209727P12	AMP 1-66506 0	MALE CONTACT (24-20 AWG) (J2-1)	1
	19B209727P30	AMP 206478-1	SHIELD (9 PIN CONNECTOR)	1
	19B209727P9	AMP 205980-1	#4-40 CAPTIVE SCREW KIT	1

GETC UPLINK CABINET CONCENTRATOR CARD CABLES 19D903628P41 & P42

(19D903628 Sh. 2, Rev. 4)