ERICSSON

Mobile Communications

EDACS™
STARGATE CONTROLLER
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 high-speed data bus with tri-state devices
- Informational, warning and error messages displayed on StarGate Manager (MOM PC)
- LED indicators on each board provide indications of current board status for quick troubleshooting and diagnostic checks

StarGate Manager (MOM PC) Functions

- Reconfigure StarGate Controller on-line with no service interruption

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)	4
Audio Ports	192 full duplex
Network Interface Modules (NIMs)	8
Channels Per NIM	24

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

Control Data Links

Local Connection	9.6k, 19.2k or 38.4k baud RS-232C connection
Remote Connection	Type 3002 data-grade phone line and modems required

PERFORMANCE

Maximum Call Set-Up Time (19.2k baud data link)	230 milliseconds

Processing Speeds

Call Routing Time (NIM input - to - NIM output)	Less than 10 milliseconds
Max. Distributed Multisite Access Time (site-to-site)	750 milliseconds for a non-queued call

Maximum Calls-Per-Second **

To/From A Single IMC	22
Single Channel-to-Single Channel Calls (i.e. all individual calls) With Eight (8) StarGate NIMs	88

Average Call Queues **

10 Calls Per Second	0 %
16 Calls Per Second	4.3 %
18 Calls Per Second	13 %
22 Calls Per Second	58 %

Average Call Delays For Queued Calls **	
10 Calls Per Second	0 millisecond
16 Calls Per Second	11 milliseconds
18 Calls Per Second	45 milliseconds
22 Calls Per Second	60 milliseconds
NIM Queue Size	30

AUDIO PERFORMANCE

Frequency Response	±3 dB from 300 to 3000 Hz
Distortion	Less than 3% from 300 to 3000 Hz
Hum And Noise	At least 50 dB below audio signal
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 And Output Impedances	600 ohms ±10%, balanced line

POWER SUPPLY

Redundant Power Supply Unit (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 7.25 Vdc and +15 Vdc output will not exceed 19.0 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)
Switch-Over Time	Less than 20 milliseconds
Hold-Up Time	Until generator (customer supplied) can be brought on-line

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

** Queue specifications were calculated using Erlang C delay system equations given a 24-channel NIM and an average call duration of 2 seconds; queue delay not to exceed ≅ 0.5 seconds. NIM traffic is assumed to be equal in both directions and NIM control data link is operating at 19.2k or 38.4k baud.

INTRODUCTION

The Ericsson GE EDACS™ **StarGate Controller** adds distributed multisite call capability to EDACS IMC networks. Up to eight (8) IMCs can be linked together via the StarGate Controller. This allows the EDACS wide area system to be greatly expanded to provide extended network communication capability. Each StarGate-to-IMC link can be equipped with up to twenty-four (24) audio channels. Figure 1 is a simplified diagram showing five (5) IMCs interconnected via a StarGate Controller.

CALL TYPES AND FEATURES

The following EDACS call types and features are supported across the StarGate network:

- clear voice individual calls
- clear voice group calls
- clear voice emergency group calls
- confirmed call
- automatic tracking of roaming units
- call arbitration for more than two (2) IMCs
- telephone line (PSTN) originated CTIS call routing
- 750 millisecond maximum access time (typically, most installations are much less)
- transmission trunking operation for standard call types (non-emergency, non-telephone interconnect, etc.)
- LID/GID extended network validation (enable/ disable) at the System Manager
- NIM audio channel configuration from StarGate Manager (MOM PC)
- NIM control data link configuration from StarGate Manager (MOM PC)

Currently, a StarGate network does not support Aegis™ and mobile data communications.

CALL PRIVILEGES

StarGate users must be "extended network enabled" at all System Managers in the StarGate network before distributed multisite calls will be routed. To prevent one-way conversations, individual calls are only routed if both the caller and the callee are extended network enabled. The IMCs must also be tracking the units before StarGate communication can occur.

Each IMC in the StarGate network is equipped with a System Manager. Equipping the StarGate Controller with a System Manager is optional if the StarGate Controller uses firmware V3.0 (and later). All StarGate Controllers using firmware V2.x require a System Manager.

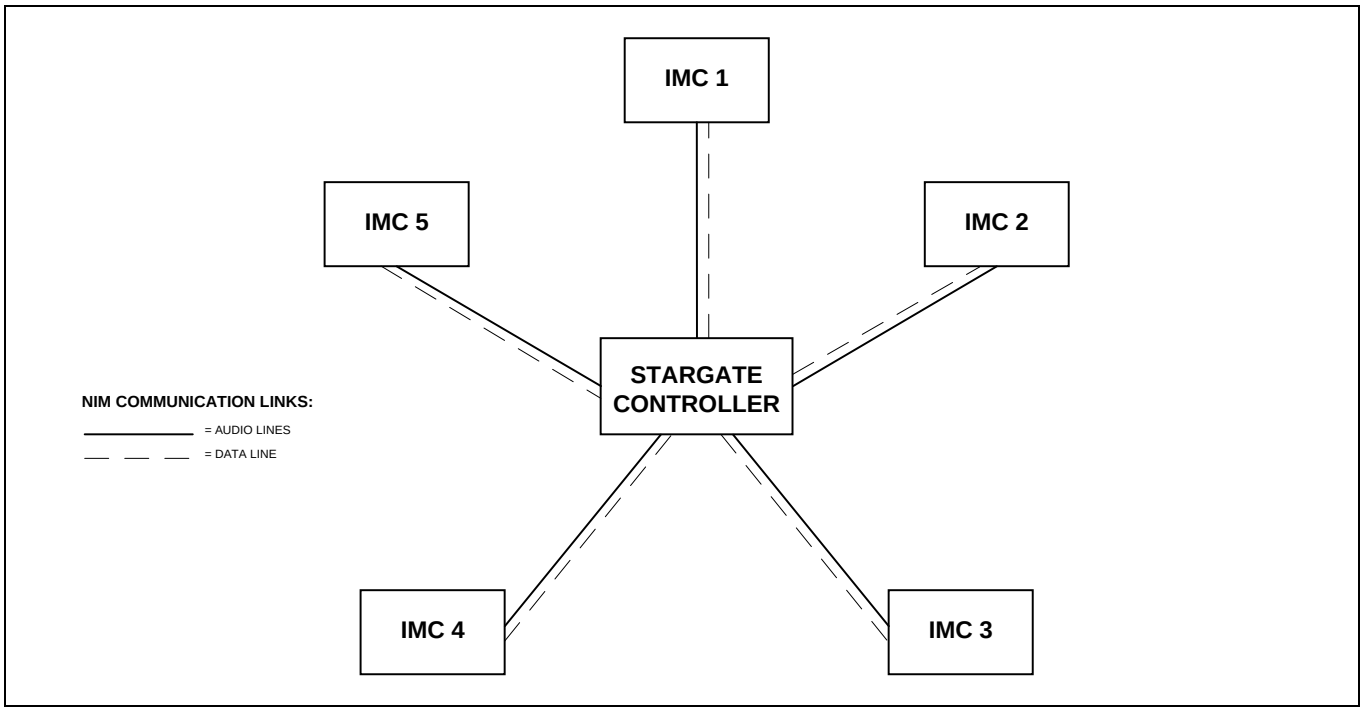

Figure 1 – StarGate Digital Audio Switch Network

Units (individuals) and groups that are not extended network enabled cannot place distributed multisite calls. If necessary, this allows the individual and group IDs of these units to be reused (duplicated) at each IMC within the StarGate network. Only extended network enabled LIDs (Logical IDs) and GIDs (Group IDs) must be specifically defined (not duplicated) throughout the StarGate network.

NOTE

See maintenance manual LBI-38662 for details on the IMC Digital Audio Switch.

CALL LOADING

Each IMC in a StarGate network can be fully equipped. However, the StarGate network cannot be treated as a single "super network". The **NIM** (**N**etwork **I**nterface **M**odule) structure used within the network supports a limited amount of communication traffic. Each IMC user must be granted or denied StarGate network communication privileges based on the extended network enable/disable setting at the System Manager. Additional information on call loading is contained in the specifications listed near the beginning of this manual and in the subsequent sub-section entitled "**NIM Call Capacity**".

DESCRIPTION

A StarGate Controller is formed by a series of **N**etwork **I**nterface **M**odules (**NIM**s) and a **MO**nitor **M**odule (**MOM**). The basic hardware component diagram is shown in Figure 2.

Each NIM within the StarGate Controller communicates with a NIM in the respective IMC. This "NIM pair" provides the audio and serial control data communication link between the StarGate Controller and the IMC.

A NIM within the StarGate Controller can also be linked to an IMC System Manager so the NIM's channel assignments can be monitored at the System Manager location. All NIMs within the StarGate Controller can be linked to System Managers.

The MOM interface module provides the serial interface link to the StarGate Manager (MOM PC) computer. If the StarGate Controller is equipped with its own System Manager, the MOM also provides the serial interface for this computer.

NETWORK INTERFACE MODULE (NIM)

Within the StarGate network, the NIM structure supports communication traffic between the StarGate Controller and the IMCs connected to it. Each NIM is made from a Controller Board and between one (1) and six (6) Audio Boards.

The StarGate Controller is equipped with one NIM for every IMC within the StarGate network. A NIM in the respective IMC completes the communication link – thus a NIM pair is formed. Additional NIMs may be installed in the StarGate Controller for future expansion requirements.

NIM Control Data Links

Control data is transferred between the StarGate Controller and the IMC via an RS-232 serial connection. An RS-232 port at each NIM Controller Board provides the serial interface. The port can be programmed to operate at 9.6k, 19.2k or 38.4k baud.

Generally, a full-duplex modem is required at each NIM since the two (StarGate and IMC) are usually not co-located. Modems and the connecting phone lines/mux links/etc. must support the programmed serial data rate.

As previously stated, a NIM may also be interfaced to a System Manager within the StarGate network so the NIM's channel assignments can be monitored at the System Manager location. This interface also requires an RS-232 interconnection between the System Manager and the NIM in the StarGate Controller. A second RS-232 serial port at the StarGate Controller's NIM furnishes the serial interface for the System Manager. Full-duplex modems are required if the StarGate Controller and this System Manager are not co-located.

NOTE

Controller and Audio Boards are discussed in greater detail within subsequent sections of this manual and in the accompanying manuals.

NIM Audio Channels

Each NIM Audio Board provides up to four (4) full-duplex audio channel trunks between the StarGate Controller and the respective NIM in the IMC.

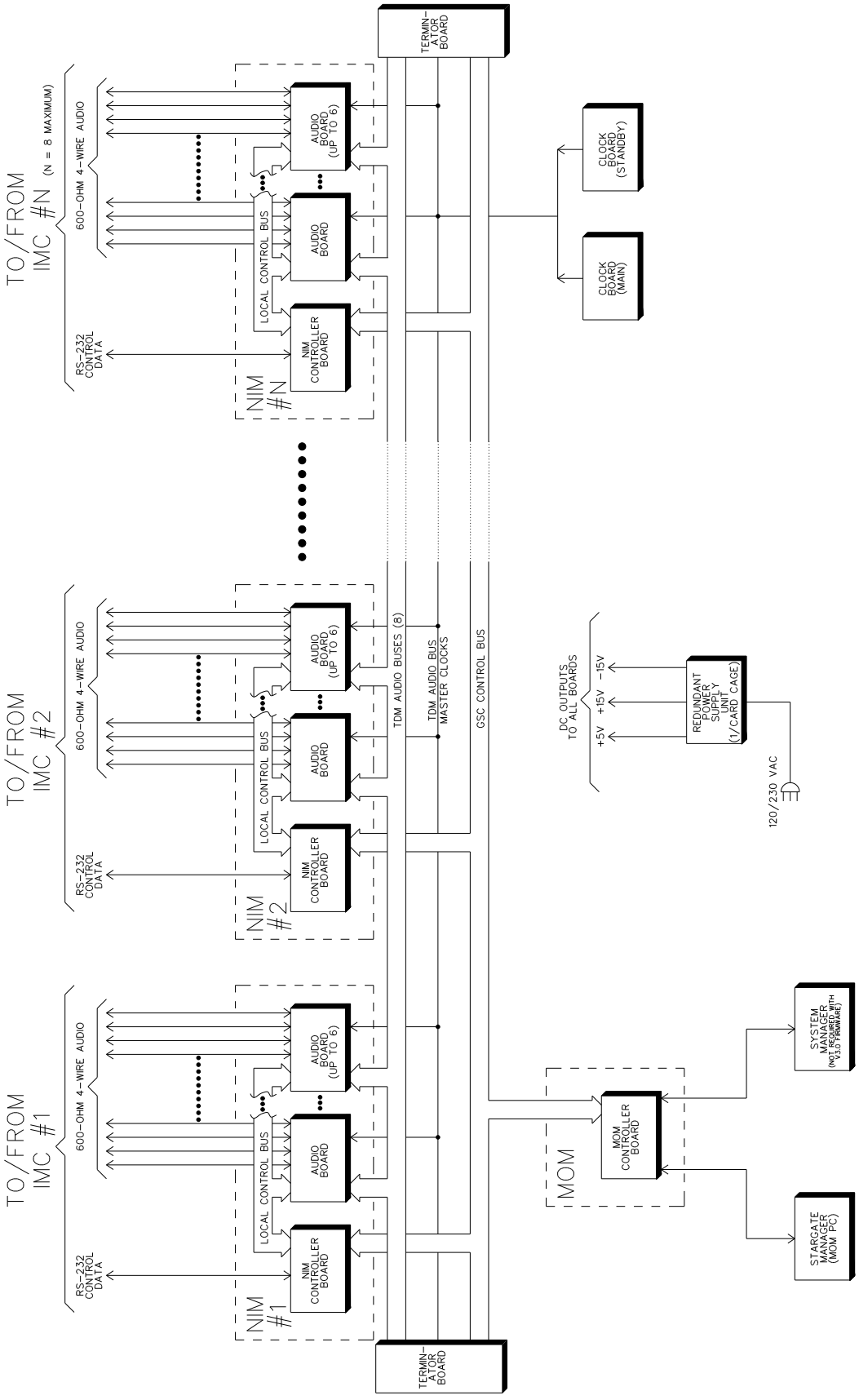

Figure 2 – StarGate Controller Architecture

For transmission trunked calls, NIM channel assignments occur in a simplex fashion. For example, StarGate NIM 1, channel 1 could be receiving a group call from an IMC (via its input line) at the same time it is transmitting an individual call to the same IMC (via its output line). This action nearly doubles the maximum total call traffic capacity between an IMC and the StarGate Controller that would otherwise be achieved if the channels where allocated in full-duplex fashion.

Message trunked calls such as telephone interconnect or emergency calls are assigned full-duplex channels through the StarGate network. The hang-time associated with message trunked calls prevents channel re-assignments between PTTs.

NIM Call Capacity

The maximum call capacity of a NIM pair is primarily limited by the number of audio channels. It is also limited, to a lesser degree, by the control data link baud rate.

A NIM will queue a call if no NIM audio channel is available. Emergency calls are always given top priority in a NIM queue. Each NIM can queue up to thirty (30) calls before overflow will occur. If overflow occurs, overflowed calls are assigned "system busy" status.

In a StarGate network, the queue delays are in series; they "sum" through the input and output NIMs. For example, a call passing through input StarGate NIM 1 with a queue delay of 0.3 seconds and output StarGate NIM 2 with a queue delay of 0.4 seconds will have a total queue delay of 0.7 seconds.

See the following charts and the specifications listed near the beginning of this manual for processing speeds, average queue times, maximum number of calls-per-second and other related specifications.

NOTE

The points on the following charts were calculated using Erlang C delay system equations given a 24-channel NIM and an average call duration of 2 seconds. Queue delays not to exceed approximately 0.5 seconds. NIM traffic is assumed to be equal in both directions.

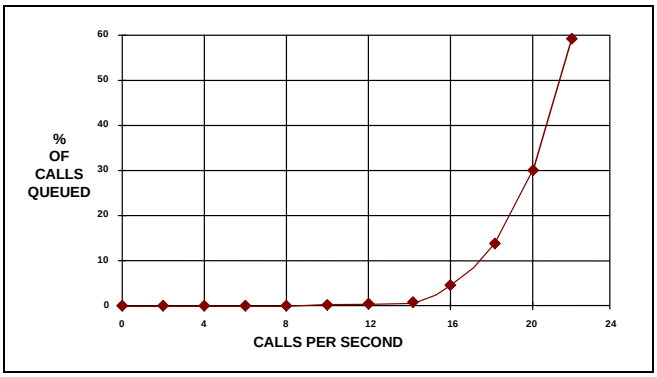

Figure 3 – Percentage Of Calls Queued

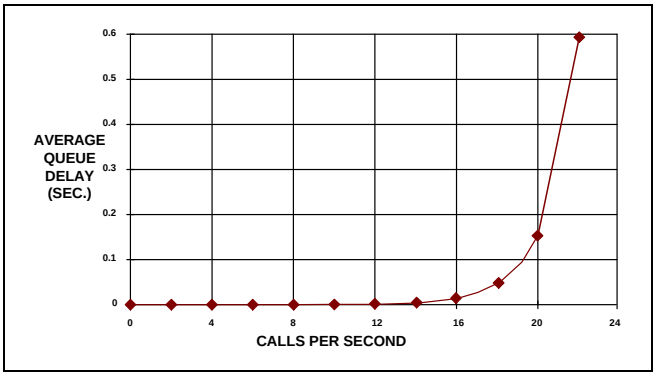

Figure 4 – Average Queue Delay

MONITOR MODULE (MOM) & STARGATE MANAGER (MOM PC)

MOM Interface Module

The MOM interface module within the StarGate Controller provides the RS-232 serial interface port for the StarGate Manager (MOM PC) computer. If the StarGate Controller is equipped with a System Manager, the MOM also provides the RS-232 serial interface for this computer. The StarGate Controller's MOM is simply a Controller Board operating in the "MOnitor Module" mode.

Two RS-232 serial ports at the Controller Board, each programmable to 9.6k or 19.2k baud at the StarGate Manager, provide the serial port connections for the StarGate Manager and the System Manager. Normally, both computers are co-located. Remote connections require high-speed modems and phone lines (or equilivant links) that support the programmed baud rates.

The MOM Controller Board has a special DIP switch setting that sets the "switch assignment number". See the section near the end of this manual entitled "**SPECIAL MOM DIP SWITCH SETTINGS**" for additional details.

StarGate Manager (MOM PC)

The StarGate Manager (MOM PC) is an IBM PC compatible computer running custom software developed by Ericsson GE. It is the window into the StarGate Controller for both the system administrator and service technicians. The following functions are provided by the StarGate Manager:

- view current configurations
- diagnostic checks and monitoring of NIM and MOM statistics – link up/down, HDLC Channel B, etc.
- monitor **GSC** (**G**lobal **S**erial **C**hannel) loading
- configure **TDM** (**T**ime **D**ivision **M**ultiplexed) buses and slots
- configure NIM audio channels – input and output signal levels, channel enable/disable, etc.
- configure NIM baud rates
- configure MOM options – baud rates, enable/disable data logging, enable/disable redundant clocks, etc.

NOTE

StarGate Manager operating procedures are outlined in LBI-39024 (V3.0) and LBI-38911 (V2.11) When this computer is used with a StarGate Controller, many of its functions are not applicable to StarGate Controller operation. Basically, these unused functions are ignored by the StarGate Controller. A few examples include console privilege lists, console user profiles and conventional channel configuration..

NIM control data link baud rate configuration must be done independently at each MOM PC computer. NIM pair baud rates must be set to match at each MOM PC location.

Configuring (or reconfiguring) a NIM's audio channels via the StarGate Manager (MOM PC) will cause the StarGate Controller NIM to send the new channel configuration information to the respective NIM in the IMC. This same action will also occur if an IMC NIM audio channel is (re)configured via the CEC/IMC Manager (MOM PC). It is only necessary to update the NIM pair's audio channel configuration at one MOM PC.

PRIMARY HARDWARE COMPONENTS

Card Cage And Backplane Assembly

The Card Cage and Backplane Assemblies furnish housing and electrical interconnections for the Audio, Controller, Clock and Terminator Boards used in the StarGate Controller. These 6-rack unit (10½-inch) high assemblies are typically called "Card Cages" or "racks". Each one has twenty-one (21) physical slots for board insertion.

A fully-loaded StarGate Controller contains four (4) Card Cages installed in two (2) side-by-side cabinets. Normally, three (3) of the Card Cages are installed in one cabinet and the forth Card Cage is installed in the second cabinet. See the section in this manual entitled "**CABINET RACK-UP SUMMARY**" and the Application Assembly Diagrams near the end of this manual for additional details.

All Backplanes are interconnected or "daisy-chained" together using multi-conductor ribbon cable pairs referred to as "intra-rack" and "inter-rack" cables. This design joins the digital buses (TDM, GSC, etc.) between all Backplanes within the 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.

Other Backplane related cables include the Local Bus Cables, Concentrator Card Cables and the cables delivering power from the **R**edundant **P**ower **S**upply (**RPS**) units.

Audio Board

Audio Boards within the StarGate Controller link the distributed multisite audio signals through the StarGate Controller. The design employs a **T**ime **D**ivision **M**ultiplexed (**TDM**) audio network that digitally transfers voice audio between NIM Audio Board inputs and NIM Audio Board outputs.

Basically, each Audio Board consists of a microprocessor control section and four (4) nearly identical full-duplex audio processing circuits. Each audio circuit converts incoming analog audio (source or input audio) applied to the channel's 600-ohm balanced-line input into mu-law **PCM** (**P**ulse **C**ode **M**odulation) digitized audio signals. These digitized signals are then placed on the TDM audio network at a predefined time slot. Signals from the source channel are applied to all Backplanes in the StarGate Controller so any Audio Board can extract it if needed. The audio extraction process (destination or output audio) uses similar circuitry built into each channel that basically performs the reverse action. As previously described, NIM Audio Board channel assignments occur in a simplex mode for transmission trunked calls and a full-duplex mode for message trunked calls.

The TDM audio network is formed by eight (8) TDM audio buses. Each bus has thirty-two (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 StarGate Controller; however, only 192 time slots are required in a StarGate Controller (8 maximum NIMs × 24 channels per NIM = 192 time slots).

An on-board 80C535 microprocessor controls most of the Audio Board's basic functions. However, the Controller Board provides master Audio Board control via parallel I/O and high-speed HDLC serial data connections. 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 notch filter enable/disable.

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

Controller Board

The microprocessor-controlled Controller Board routes messages and control information between its Audio Board(s), the external devices connected to it, and other Controller Boards within StarGate Controller.

It contains a set of unique "interface module" software personalities that are utilized in StarGate Controllers and CECs/IMCs. Each software personality is designed to interface a particular external device to a StarGate Controller or a CEC/IMC. The NIM personality is the heart of the StarGate Controller and the MOM personality provides the MOnitor Module functions as previously described. Personality selection is accomplished via DIP switches on the board.

An Intel 80C152 microprocessor on the Controller Board is the "communications controller" for the board. The 80C152 architecture includes a high-speed **G**lobal **S**erial **C**hannel (**GSC**) bus that is used to link all Controller Boards within the StarGate Controller together. This GSC link enables NIM and MOM control data to be transferred throughout the StarGate Controller. Peerless CSMA/CD local area network protocol techniques are utilized on the GSC bus.

The 80C152 also directly controls two RS-232/RS-422 serial ports. Within the NIM interface, one of these ports is used for control data transfers between the paired NIMs.

The Controller Board also has an Intel 80C186 microprocessor. **D**ual-**P**ort **R**AM (**DPRAM**) chips are used to transfer data between the 80C186 and 80C152. The 80C186 is the "interface controller" that performs most I/O functions and logical processing for the Audio Boards within its interface module. It switches the TDM audio network by assigning time slots to active channels. Master Audio Board control is accomplished using a high-speed HDLC serial data link and two 8-bit parallel I/O ports. These interconnections between the Controller Board and the Audio Board(s) are referred to as the "local control bus".

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

Controller Boards are labeled in accordance with their interface module on their top extraction handle, either "**NIM**" or "**MOM**", and they are labeled in accordance with their respective device (system) assignment number on their bottom extraction handle. For example, a NIM Controller Board assigned to IMC number 3 is labeled "**NIM**" on the top handle and "**03**" on the bottom handle. See LBI-38667 for detailed Controller Board 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 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 for the Audio Boards. Clock pulse outputs from both circuits are selectively applied to the Audio Boards via the FUTUREBUS transceivers and the Backplane(s). The MOM Controller Board controls A/B clock selection by sending clock select command signals to all NIMs within the StarGate Controller. If any of the selected clock pulses fail, clock monitoring circuitry on the NIM Audio Boards signal the MOM Controller (via their respective NIM Controller Boards) so it can switch to the back-up clock circuit. These alarm signals are sent to the respective NIM Controller Boards via the local control buses. NIM Controller Boards then signal the MOM via the GSC bus.

The initial start-up or default clock circuit is "B". If three (3) or more NIM Controller Boards report a "B" clock circuit problem the MOM will switch clock operation to the "A" clock. Similarly, the MOM will also switch back to the "B" clock if a problem exists with the "A" clock. This redundant clock circuit selection can be enabled and disabled via the StarGate Manager (MOM PC).

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 StarGate Controller so uninterruptible operation can be

achieved when a single Clock Board must be removed for servicing. If two Clock Boards are installed and the redundant clock feature is enabled, the toggle switches are normally set at the factory as follows:

- Clock Board 1 – Clock "A" is turned off and clock "B" is turned on.
- Clock Board 2 – Clock "A" is turned on and clock "B" is turned off.

With the toggle switches set in this manner, clock "B" on Clock Board 1 will be the active clock when the StarGate Controller is powered-up. If a clock failure occurs, the MOM will switch all Audio Boards to the "A" clock and thus the "A" clock on Clock Board 2 will become the active clock. Clock Board 1 can then be removed for service and the "B" clock on Clock Board 2 can be turned on via the toggle switch so redundant clock operation will continue. All NIM audio 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) StarGate Controller, 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 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 – one on each end of the "daisy-chain" Backplane set.

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 in case 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.

Concentrator Cards

Concentrator Cards, mounted on the hinged horizontal panels on the rear cabinet rails, simplify connections into and out of the StarGate Controller. Basically, they provide standard connector hook-up points at the rear of the cabinet for external audio and control data cables.

Audio and Data Concentrator Cards convert and/or interconnect pairs of 24-pin dual-row header connectors on the Backplane to 50-pin Champ-type connectors on the external side of the card. The Champ connectors are then coupled to standard punch blocks (or other signal break-out devices) using 25-pair Telco-style cables. Many signals can be neatly routed between the StarGate Controller and punch blocks using the Concentrator Cards.

The MOM Concentrator Card converts and/or interconnects a 24-pin dual-row header connector at the MOM interface module Backplane point into two (2) DB-9 connectors. These DB-9 connectors provide the RS-232 hook-up points for the StarGate Manager (MOM PC) and the System Manager (if used) computers.

Redundant Power Supply (RPS) Units

Operating power for the StarGate Controller is provided by 380-Watt **R**edundant **P**ower **S**upply (**RPS**) units mounted in the cabinet's lower-most positions. Each RPS unit occupies three rack units (5¼ inches) in the 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 before the power is applied to the respective Backplane. "ORing" diodes on the outputs of each module eliminate catastrophic 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 wiring.

CABINET RACK-UP SUMMARY

StarGate Controller components are housed in 69-inch high standard 19-inch rack mount cabinets. Controllers with three (3) or less Card Cages occupy a single cabinet. Four (4) Card Cage Controllers require a second cabinet for the fourth Card Cage. Each cabinet also contains the RPS units, Concentrator Cards, and the associated interconnecting cables.

The Card Cages are mounted on the front and middle vertical mounting rails. Each assembly occupies six rack units (10½ inches) and will accept twenty-one (21) boards. See the Application Assembly Diagram in this manual for specific hardware requirements.

As previously described, all Backplanes are "daisy-chained" together via the inter-rack cables. Generally, a dual-cabinet StarGate Controller 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.

RPS units are mounted in the lower cabinet positions. Each one occupies three rack units (5¼ 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 StarGate Controller by allowing many signals to be neatly routed between it 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 internal side of the Concentrator Cards. This may be necessary during service and upgrade procedures. The hinge is located on the right rear-most mounting rail as viewed from the rear of the cabinet.

Every cabinet also has a top-mounted cabinet fan and ac outlet strips. The ac outlet strips are horizontally mounted between the middle rails.

CEC/IMC INSTALLATION SET-UP AND TROUBLESHOOTING MANUAL

The *CEC/IMC Digital Audio Switch Installation Set-Up and Troubleshooting* maintenance manual (LBI-38938) is included with this manual set. Refer to this document for:

- installation procedures – floor plan, equipment room grounding, AC power and UPS equipment, in-cabinet cable interconnections and external cable connections
- recommended power-up procedure
- Controller Board live insertion procedure
- initial StarGate Manager (MOM PC) configurations – users, MOM parameters, system time and date
- TDM bus and time slot configurations
- NIM configurations – input and output signal levels, channel equipped, baud rates, etc.
- confirmed call configurations
- WWVB time standard configuration, if equipped (NETCLOCK/2™)
- redundant clock configuration
- troubleshooting

CEC/IMC CUSTOMER-SPECIFIC SYSTEM DOCUMENTATION OVERVIEW MANUAL

The *CEC/IMC Customer-Specific System Documentation Overview* maintenance manual (LBI-38939) is also included with this manual set. Refer to this manual for:

- basic description of the customer-specific system documentation print-outs
- Card Cage slot information
- total allocated audio ports
- Local Bus Cable locations
- Intra-Rack and Inter-Rack Cable connections
- Terminator Board locations
- Backplane-to-Concentrator Card connections
- Concentrator Card Champ connector pin-outs
- expansion requirements

SPECIAL MOM DIP SWITCH SETTINGS

Before StarGate call arbitration will operate correctly, special DIP switch settings are necessary **at all MOM Controller Boards in the StarGate network**. These settings identify each Digital Audio Switch with a unique assignment number. At each MOM, six (6) DIP switch positions are used to assign the IMC or StarGate Controller a "switch assignment number". This number must be different at every Digital Audio Switch in the StarGate network. In addition, each number must be between 33 to 63 (decimal). DIP switch positions are set identically to the MIM site assignment numbers by setting the binary equivalent at SW1 position 8 (LSB = 2^0 = 1 decimal) through SW1 position 4 (2^4 = 16 decimal) and SW2 position 5 (MSB = 2^5 = 32 decimal).

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. Aegis private transmissions may be encrypted utilizing either the DES or VGE algorithms. Currently, StarGate networks do not support Aegis communications.

Audio Board — The 4-channel **Audio Board** routes audio between the StarGate Controller and the IMCs connected to it. 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.

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 for system control.

Controller Board — The **Controller Board** processes control data, holds databases, and provides master Audio Board control.

distributed multisite — **Distributed multisite** refers to communication via two (2) or more IMCs. Up to eight (8) IMCs can be linked together for distributed multisite communication via a StarGate Controller. (Also see **StarGate Controller** and **extended network**.)

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.

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.

extended network — **Extended network** is a System Manager term that refers to distributed multisite communication. Users must be "extended network enabled" before distributed multisite communication can occur.

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.

IMC — **I**ntegrated **M**ultisite and **C**onsole **C**ontroller – The Ericsson GE IMC is a digital audio switch that routes audio, mobile data and Aegis signals between EDACS radio systems and dispatch consoles. It is a second generation multisite controller plus a console controller for the C3 series consoles.

inter- & intra-rack cables — Backplanes used within the StarGate Controller 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.

interface module — The term "**interface module**" is used to refer to a subset of hardware components that permit the StarGate Controller to be connected or linked to an external device. Each interface module is formed by a Controller Board and usually one or more Audio Boards. Interfaces modules within the StarGate Controller architecture include the MOM and NIMs.

message trunked call — A **message trunked call** is assigned a working channel for the duration of the entire communication process, not just a single PTT sequence. This is accomplished by adding hang-time between each PTT. Emergency and telephone interconnect calls operate in a message trunked mode. Also see **transmission trunked call**.

MOM — **MO**nitor **M**odule – The MOM is a interface module that provides serial data connections for the StarGate Manager (MOM PC) and the System Manager computers.

MOM PC — (see **StarGate 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 – A NIM is the primary interface module used by the StarGate Controller. Each NIM within the StarGate Controller provides an audio and control data communication path to its respective IMC. Each IMC is also equipped with a NIM to complete the communication link.

PCM — **P**ulse **C**ode **M**odulation – An audio processing technique used to encode and decode analog signals so they can be transferred digitally.

site — This term normally refers to EDACS radio equipment at a single specific location.

StarGate Controller — A **StarGate Controller** is a digital audio switch specifically configured for distributed multisite operation. It is the central point or "hub" for all distributed multisite communications between EDACS IMC Digital Audio Switches.

StarGate Manager — The **StarGate Manager** (formerly referred to as the "MOM PC") provides monitoring and configuration functions for the StarGate Controller. It is an IBM PC compatible computer running custom software developed by Ericsson GE. It is used by both the system administrator and service technicians.

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. Every IMC requires a System Manager. The early-design StarGate Controllers also required System Managers.

TDM bus — **T**ime **D**ivision **M**ultiplexed **bus** – The TDM bus is a digitally multiplexed bus system used to transfer audio throughout the StarGate Controller. Each signal coming into the StarGate Controller 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 **tracking** of individual radio units as they move from system-to-system. This information is then used by the network to route calls correctly.

transmission trunked call — A **transmission trunked call** is assigned a working channel for the duration of the caller's PTT sequence only. Basically, the call operates with zero (0) hang-time. Individual and group calls are transmission trunked calls. Because EDACS has fast channel access and drop times, transmission trunking is significantly more efficient than message trunking. Also see **message trunked call**.

ERICSSON

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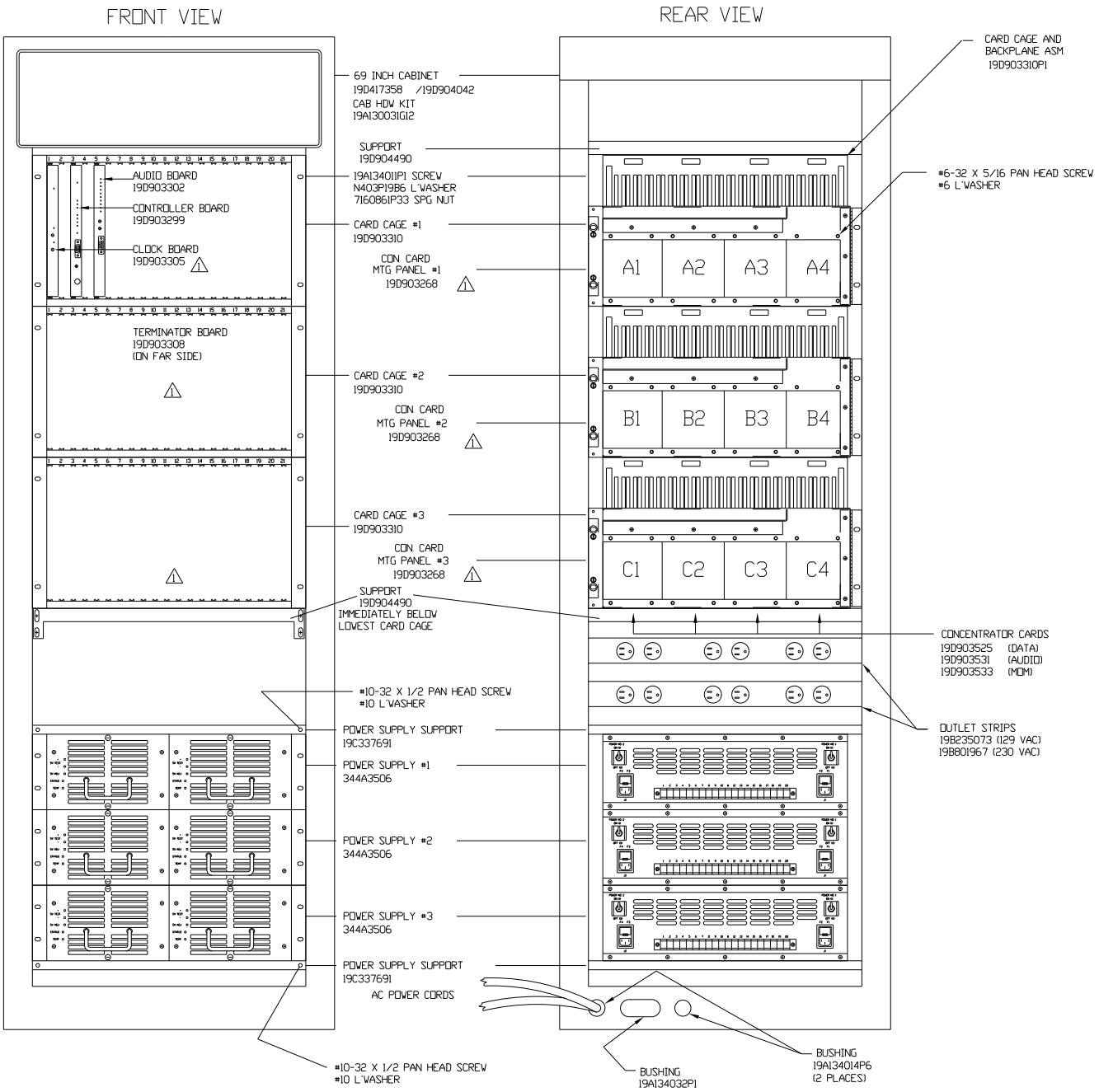
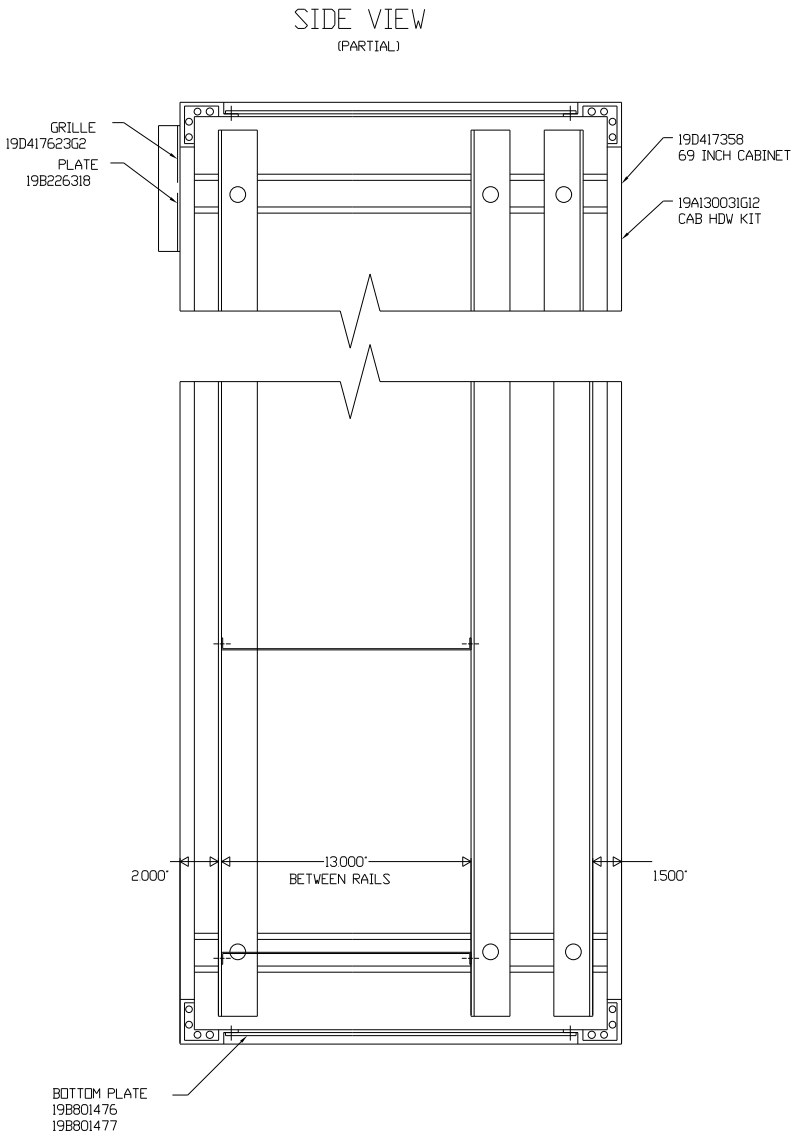


NOTES: ⚠ SEE SYSTEM CONFIGURATION DRAWING FOR SPECIFIC BOARD/CARD PLACEMENTS

STARGATE CONTROLLER CABINET

Sheet 1 of 3 (Front And Rear Views)

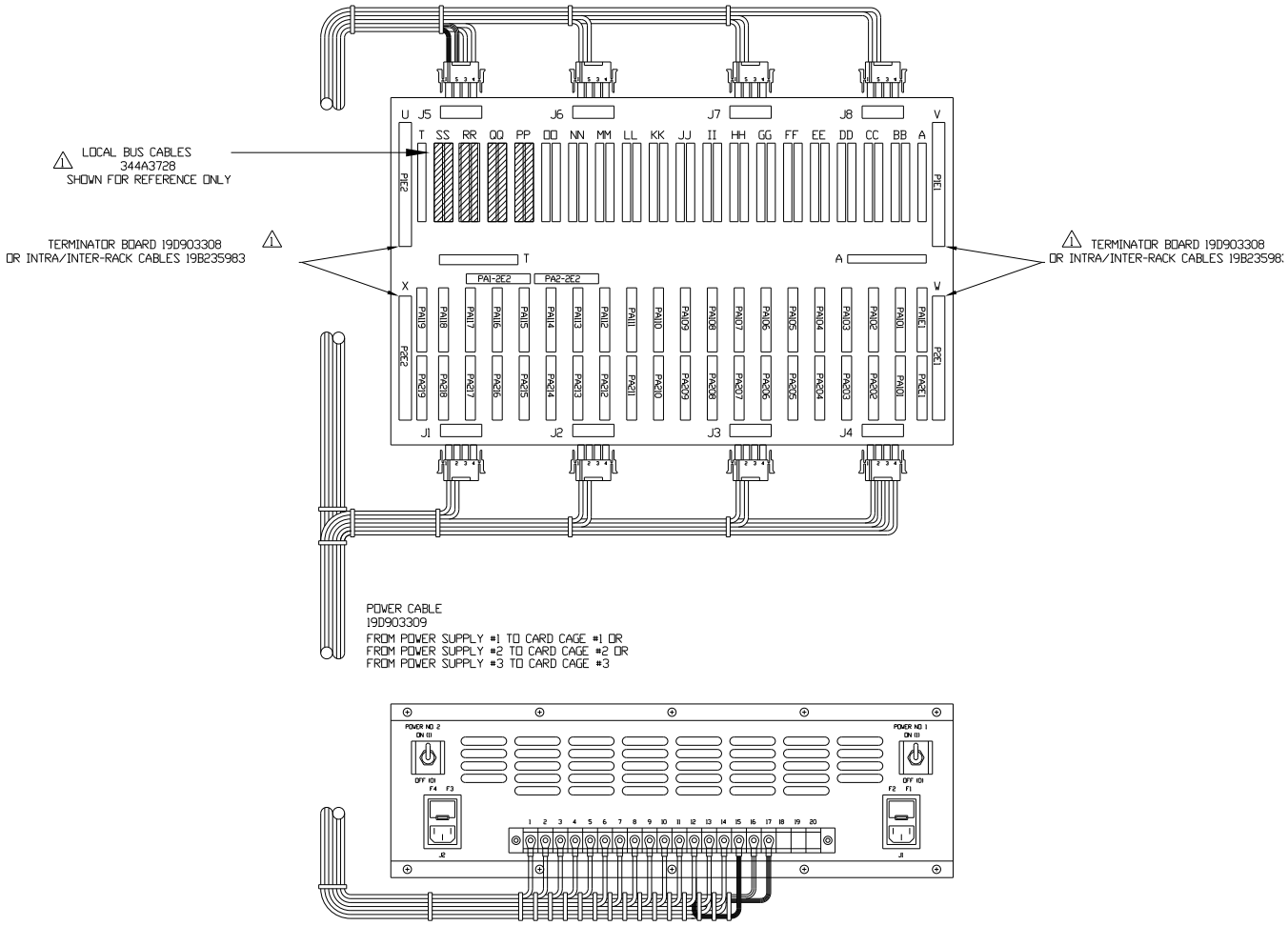
(19D903515, Sh. 1, Rev. 6)



STARGATE CONTROLLER CABINET

Sheet 2 of 3 (Side View)

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



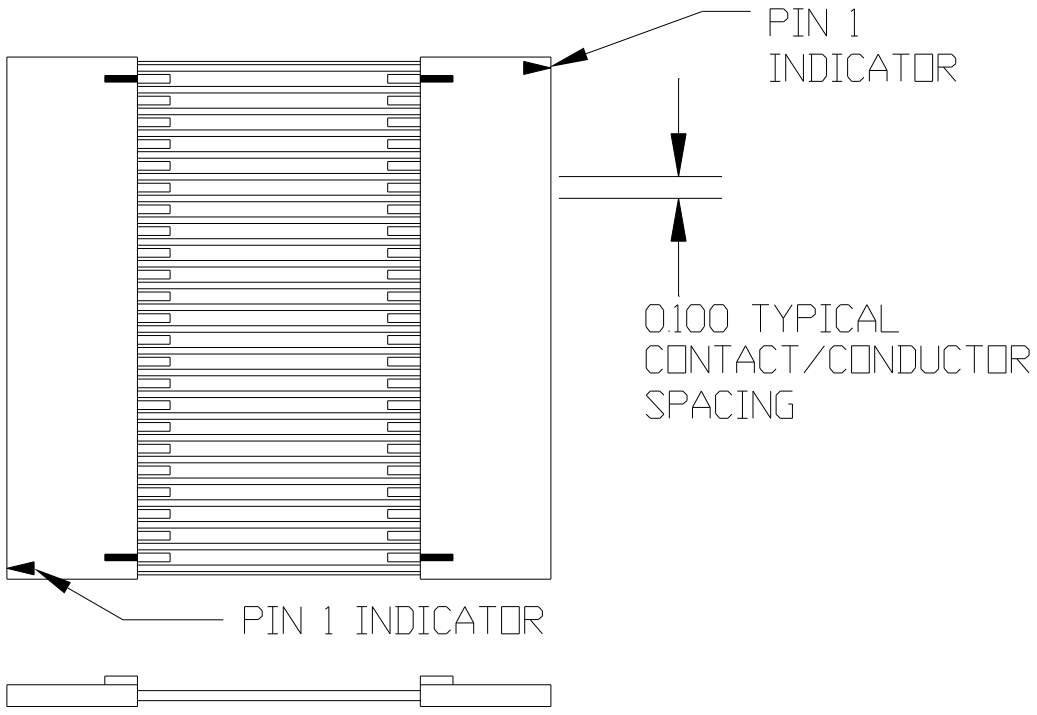
NOTES:

⚠ SEE SYSTEM CONFIGURATION DRAWING FOR BOARD/CABLE PLACEMENT.

STARGATE CONTROLLER CABINET

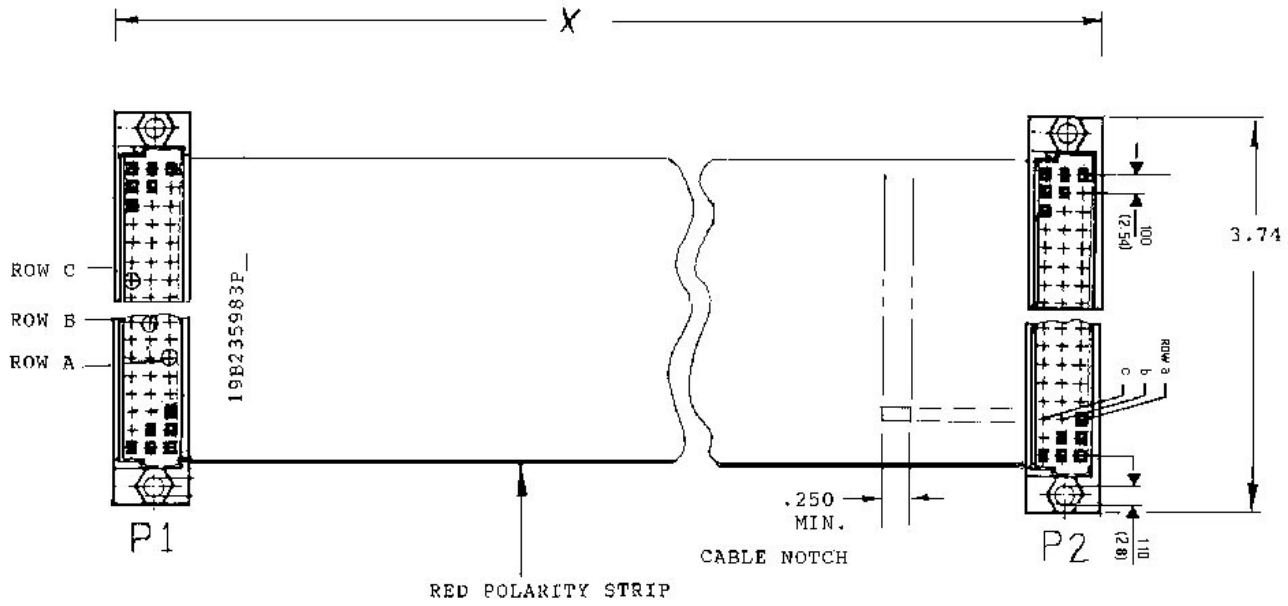
Sheet 3 of 3 (RPS Unit - to - Backplane Connections)

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



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

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



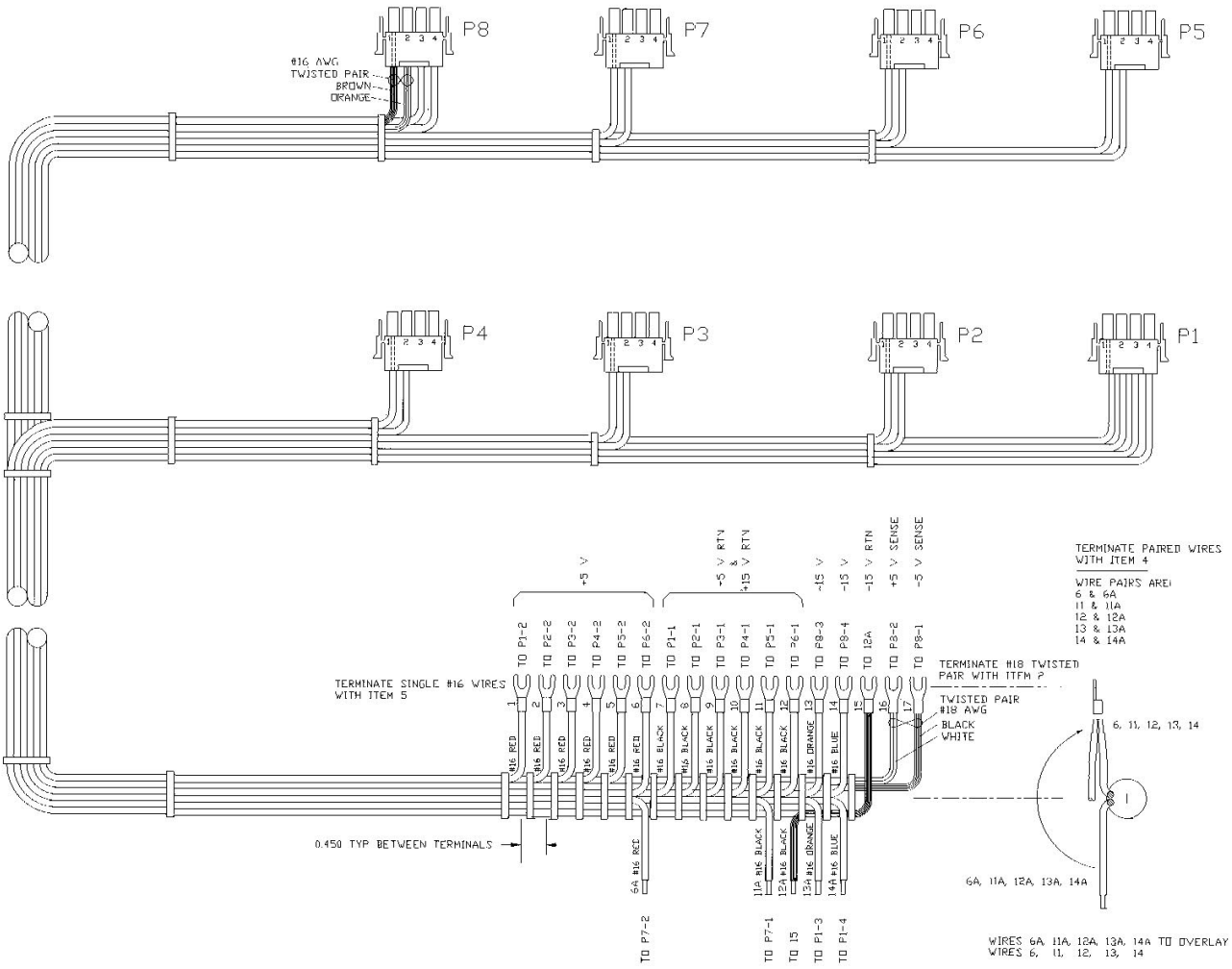
PART	FIGURE	DESCRIPTION

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 CONNECTIONS 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

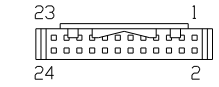
(19B235983, Sh. 1, Rev. 3)
(19B235983, Sh. 2, Rev. 3)



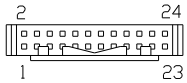
MATERIAL LIST				
ITEM	EGE PART NO.	VENDOR PART NO. (OR EQUIVALENT)	DESCRIPTION	QTY
P1-P8		AMP 1-480702-0	CONNECTOR BODY	8
1		AMP 350536 1 AMP 350550 1	CONTACT, SOCKET, STRIP CONTACT, SOCKET, LOOSE	20
2 3 4 5	19J706152P5	AMP 52949-1 PANDUIT SST-1M AMP 52941-1 AMP 52935-1	FORK TERMINAL (#18) RETAINING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

POWER CABLE
19D903309P1

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



VIEW A
(WIRING SIDE SHOWN)



VIEW B
(WIRING SIDE SHOWN)

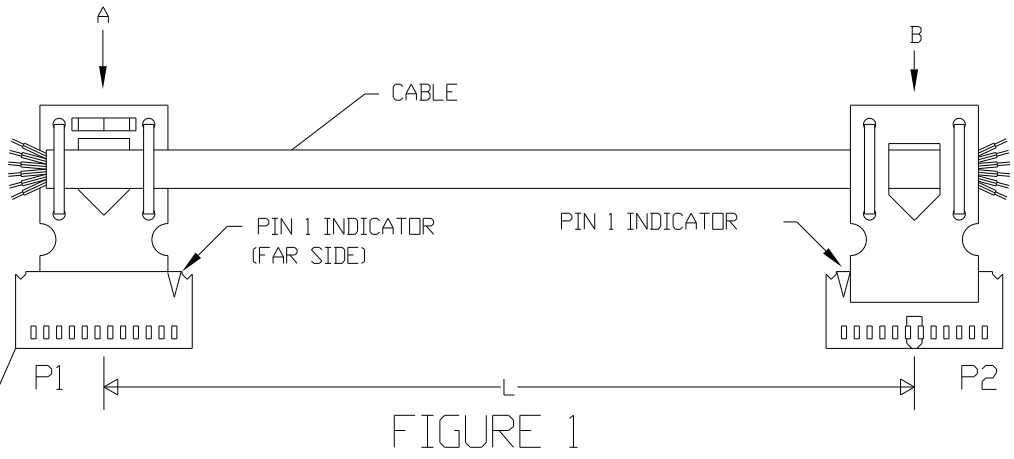
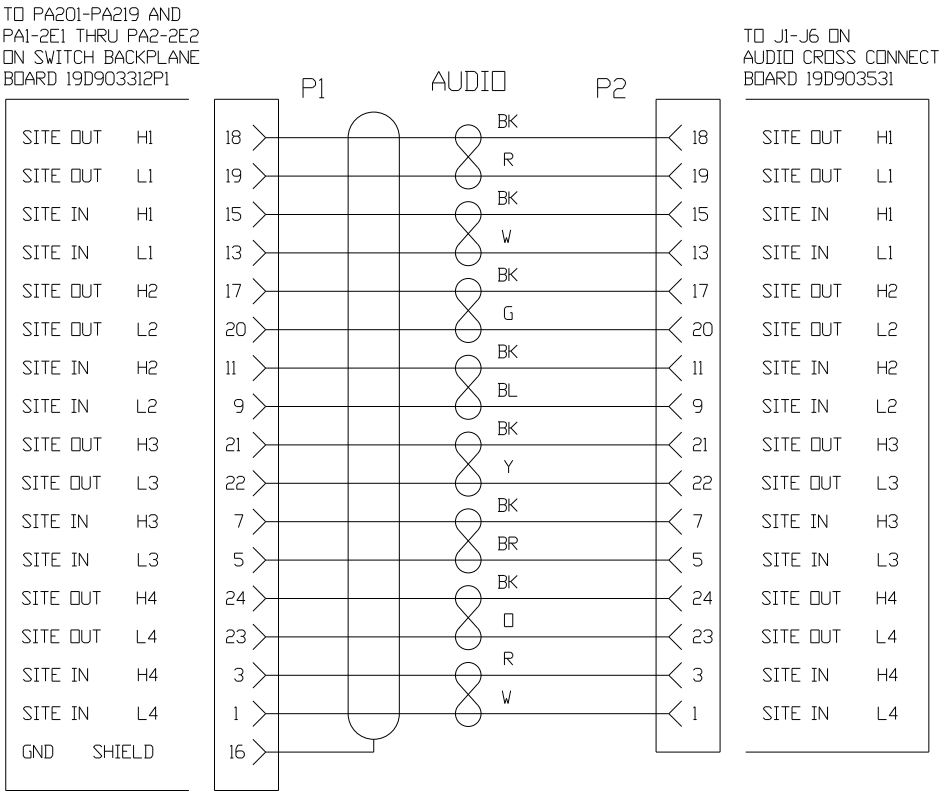


FIGURE 1

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

CONCENTRATOR CARD CABLES
19D903628 (Figure 1)
(19D903628 Sh. 1, Rev. 4)



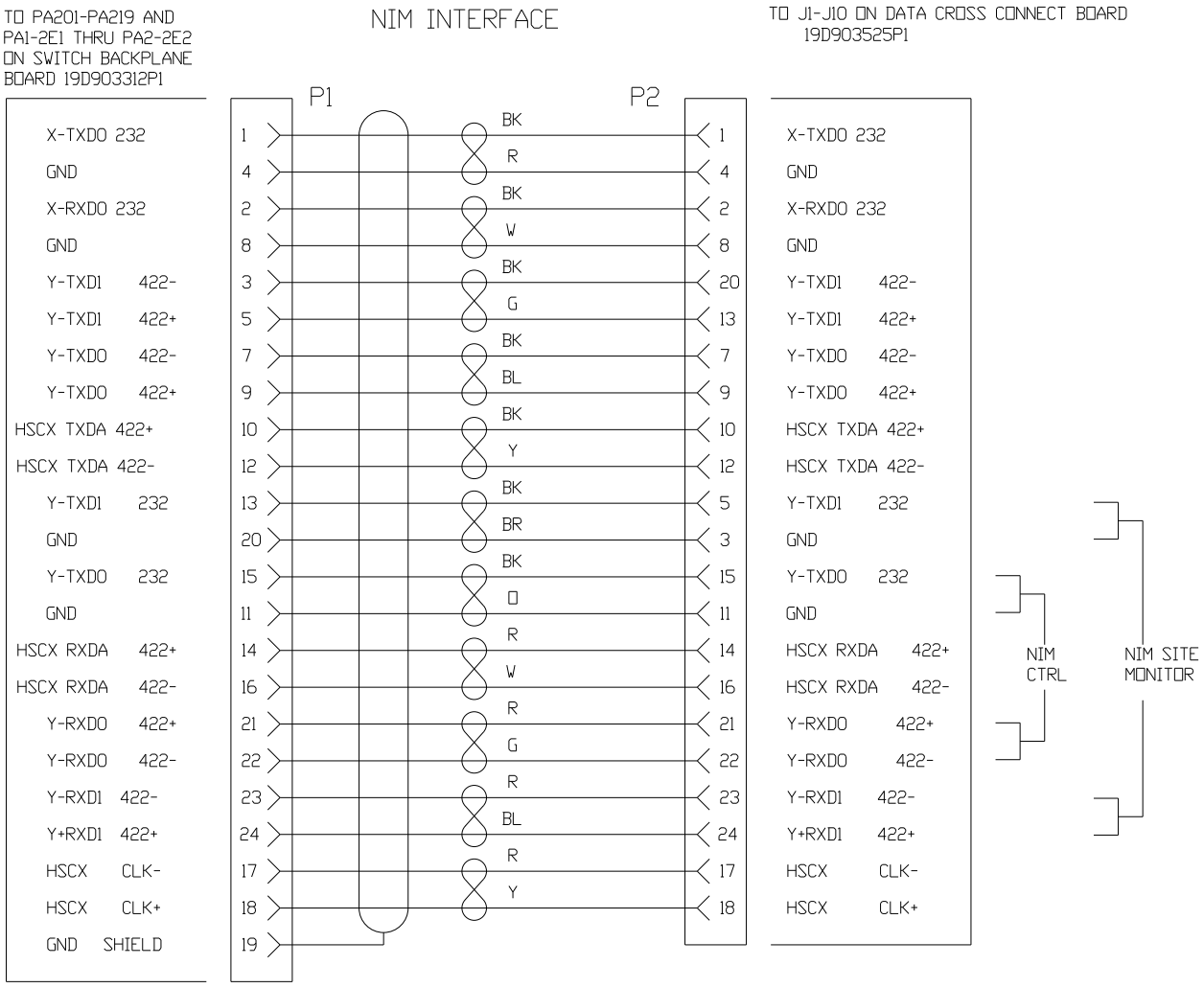
PART (11) ASSEMBLE PER FIGURE 1 L=20.000

PART (12) SAME AS PART 11 EXCEPT L=40.000

PART (13) SAME AS PART 11 EXCEPT L=52.000

CONCENTRATOR CARD CABLES
19D903628P11 - P13 (NIM Audio)

(19D903628 Sh. 1, Rev. 4)



PART 61 ASSEMBLE PER FIGURE 1 L=20.000

PART 62 SAME AS PART 1 EXCEPT L=40.000

PART 63 SAME AS PART 1 EXCEPT L=52.000

CONCENTRATOR CARD CABLES
19D903628P61 - P63 (NIM Control Data)

(19D903628 Sh. 2, Rev. 4)