ERICSSON

Mobile Communications

EDACS™
CEC/IMC DIGITAL DISPATCH
DVIU EQUIPMENT

TABLE OF CONTENTS

Maintenance Manual

TABLE OF CONTENTS

Copyright© Marrch 1994, Ericsson GE Mobile Communications, Inc.

TABLE OF CONTENTS (Continued)

SPECIFICATIONS*

GENERAL

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
Maximum DVIUs Per Cabinet	16

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

AEGIS™ PERFORMANCE (per DVIU channel)

Operating Modes	Unencrypted Aegis digital encode/decode (digital mode) **or** Encrypted Aegis with DES or VGE algorithm (private mode)
Vocoding Method	Adaptive Multiband Encoding (AME)
Digital Signalling	Continuous (non-packetized)
I/O Digital Data Rate	9600 baud
Decode/Decrypt Bit-Error Correction	Produces intelligible voice at bit-error rates up to 10%

SPECIFICATIONS (Continued)

CRYPTOGRAPHIC (per DVIU channel)

VGE Channels

Encryption Technique	Non-linear product/block transformation
Key Permutations	1.8×10^{19} (effectively 3.4×10^{38} with CUE codes)
Key Storage	EEPROM
Key Storage Location	Within Aegis Module (VGE-9600)

DES Channels

Encryption Technique	DES 64-bit output feedback mode
Key Permutations	7.2×10^{16}
Key Storage	Battery backed-up RAM
Key Storage Location	Within Aegis Module (VG-9600)

CHANNEL SPECIFICATIONS (per DVIU channel)

CEC/IMC Allocation Type	Pooled (dynamic) or dedicated (configurable via CEC/IMC Manager)

Audio Lines

Input And Output Impedances	600-ohm balanced line
Input Level	0 dBm ±3 dBm
Output Level	0 dBm ±3 dBm
Transmit/Receive Mode Switching Control	M-lead (relay contact) signalling from DVIM Audio Board

POWER SUPPLY

Redundant Power Supply Unit

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, +12 Vdc and -12 Vdc
Total Output Power	380 Watts maximum
Efficiency	65%
Duty Cycle	Continuous
Output Hold-Up Time	20 milliseconds under full load
Status Indicators	All outputs good and over-temperature
Redundancy	Dual-module design with "n+1" redundancy
Over-Voltage Protection	+5 Vdc output will not exceed 7.5 Vdc and +12 Vdc output will not exceed 16.5 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
Power Required Per DVIU Channel	23 Watts maximum

Recommendations For UPS Equipment

Rating	600 Watts minimum (with fully-loaded cabinet)
Switch-Over Time	Less than 20 milliseconds
Battery 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.

INTRODUCTION

CEC/IMC PLATFORM

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 digital voice data between radio systems such as EDACS sites. The IMC also interfaces with EDACS™ C3™ series dispatch consoles for advanced dispatch capabilities. An IMC network supports analog voice, digital data, and both unencrypted and encrypted Aegis digital voice data.

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 (wide area) trunked radio functions. The CEC does offer sophisticated dispatch console features and it can be considered a subset of the IMC.

Refer to LBI-38662 for a complete description of the CEC/IMC Digital Audio Switch. A glossary of CEC/IMC related terms is located in LBI-38662. The common hardware of the CEC/IMC Digital Audio Switch has previously been referred to as the "**M**ulti**S**ite **C**oordinator **II**" (**MSC II**).

CEC/IMC RADIO-TO-RADIO AEGIS COMMUNICATIONS

The structure of a CEC/IMC system allows wide area radio-to-radio Aegis™ communications between mobile and portable radios in a CEC/IMC network. Radio-to-radio communications of this type require *no additional equipment* at the CEC/IMC location since no Aegis encoding, decoding, encrypting or decrypting must be performed by the CEC/IMC. Essentially, radio-to-radio Aegis signals pass through the CEC/IMC unchanged. The communication path is shown in a simplified form in Figure 1.

Aegis communications of this type are referred to as "end-to-end" communications because the Aegis signals remain encoded or encrypted from the originating end to the receiving end. No clear voice audio is present on the radio frequency links or the land-line links.

CEC/IMC DIGITAL DISPATCH AEGIS COMMUNICATIONS

Radio-to-console (radio-originated) and console-to-radio (console-originated) Aegis communications *require additional hardware and software equipment co-located with the CEC/IMC equipment.* This equipment performs the Aegis encode/decode or encrypt/decrypt (E/D) functions for the EDACS™ C3™ series dispatch consoles.

The **D**igital **V**oice **I**nterface **U**nit (**DVIU**) fulfills the digital dispatch requirements for Aegis digital dispatch communications. The basic digital dispatch communication path for a radio-to-console call is shown in Figure 2.

Since Aegis functions *are not* local console functions (the DVIU equipment interfaces directly with the CEC/IMC) Aegis signals can also be processed by the DVIUs for

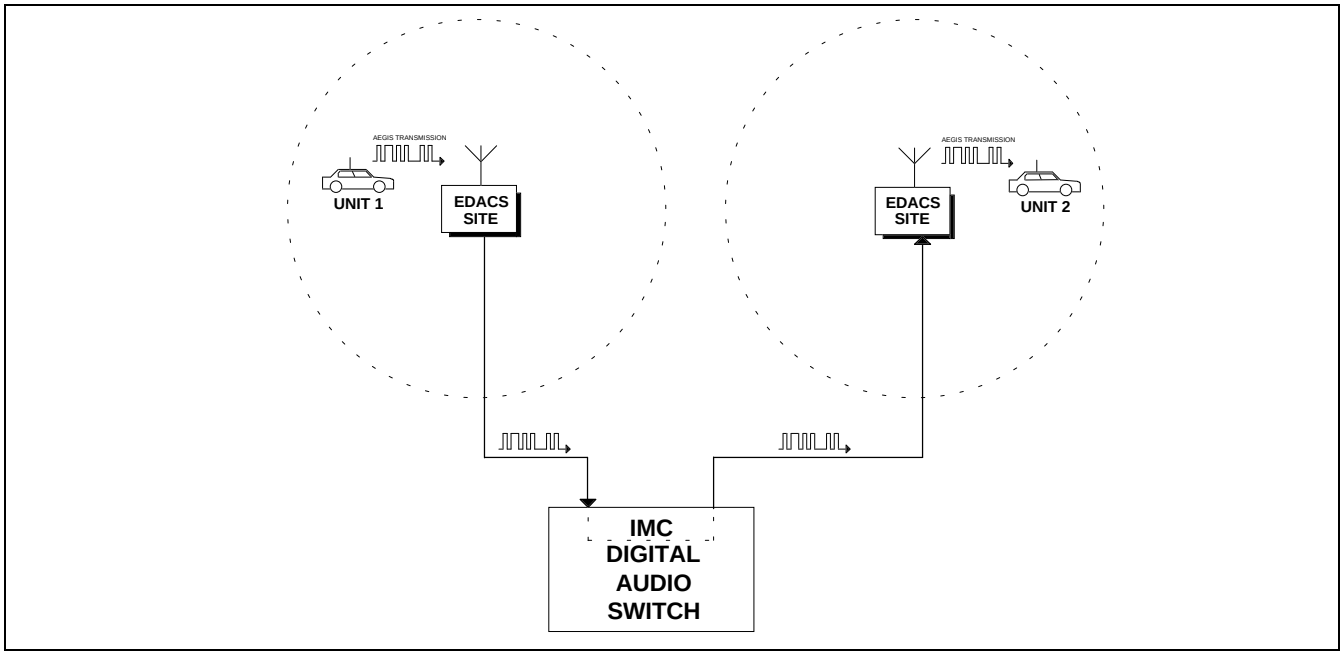


Figure 1 – IMC Radio-To-Radio Aegis Communications

telephone interconnect systems, logging recorders and conventional channels. Therefore, discussions in this manual referring to digital dispatch console communications, in most cases, applies to these systems also. For example, Aegis signals decoded/decrypted by a DVIU can be passed to a console and a conventional channel and a logging recorder channel via the CEC/IMC.

NOTE

A *conventional channel* patched to a trunked group operating in Aegis mode *always operates in clear mode*. Aegis is not supported over a VMIM or CNI conventional interface.

Multiple DVIUs are racked in a 69-inch cabinet commonly referred to as the "DVIU cabinet". Each cabinet can be loaded with up to sixteen (16) DVIUs physically grouped in two sets of eight. As shown on the Application Assembly Diagram in this manual, the first set (DVIUs 1 - 8 = "`1ST DVIU SET`") is located in the lower rack positions of the cabinet and the second set (DVIUs 9 - 16 = "`2ND DVIU SET`") is located in the upper rack positions.

The DVIU cabinet also contains an interface panel, a power supply and, if equipped with nine (9) or more DVIUs, two (2) power distribution panels. The interface panel interconnects audio/modem signals and the relay contact control lines between the CEC/IMC and the DVIU equipment. The power distribution panel and power supply provide dc operating power for all DVIU components in the cabinet. Only one power distribution panel is required if the DVIU has eight (8) or less DVIUs. The power supply is located in the lowest rack position of the cabinet and each power distribution panel is located directly below the DVIU set which it serves.

DVIU CHANNEL BASICS

A fully-loaded DVIU cabinet can provide sixteen (16) DVIU channels for the CEC/IMC. These channels may be referred to as "Aegis channels", "DVIU channels" or "DVIM channels". Each channel is configured for either Aegis "digital mode" operations (encode/decode) **or** Aegis "private mode" operations (encrypt/decrypt). Both modes are considered “digital voice” modes.

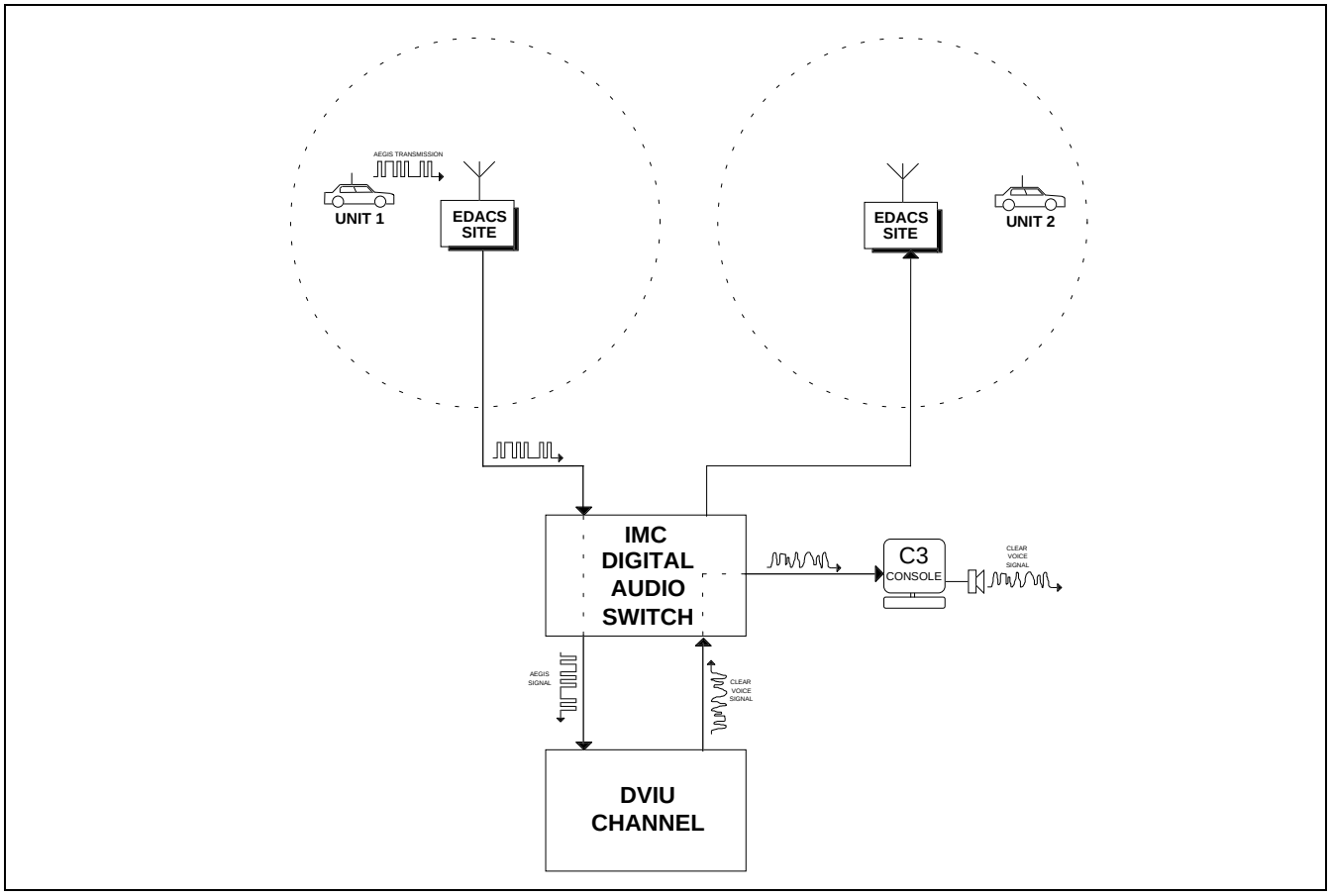


Figure 2 – IMC Digital Dispatch Aegis Communications (Radio-to-Console Shown)

At the dispatch console, a dispatcher can enable and disable digital voice mode as dispatch operations require. With digital voice mode enabled, the dispatcher transmits digital voice signals. With digital voice mode disabled, the dispatcher transmits clear voice signals. Digital voice/clear voice receive selection is automatically controlled by the CEC/IMC.

NOTE

Aegis private mode may also be referred to as "encrypt", "encrypt/decrypt" or "guarded".

Aegis digital mode may also be referred to as "encode", "encode/decode", "unencrypted Aegis", or simply "digital".

Clear voice audio and Aegis modem signals pass between DVIM Audio Boards in the CEC/IMC and the DVIU via 4-wire 600-ohm connections. Specific audio paths will be discussed in greater detail within subsequent sections of this manual and in the accompanying manuals.

The **DVIM** (**D**igital **V**oice **I**nterface **M**odule) is the structure within the CEC/IMC that provides interfacing to DVIU equipment. Each DVIM in the CEC/IMC can control up to thirty-two (32) DVIU channels and a single CEC/IMC can be loaded with up to 120 DVIM channels (four DVIMs). A DVIM consists of a CEC/IMC Controller Board and between one and eight (8) CEC/IMC Audio Boards. Each Audio Board has four (4) full-duplex audio/modem signal channels used for interfacing to four DVIU channels. See the CEC/IMC maintenance manual (LBI-38662) for complete details on the CEC/IMC boards.

The basic digital dispatch communication path for an Aegis radio-to-console call is shown in Figure 2. Figure 3 is a simplified diagram showing the audio/modem signal and relay interconnections between a CEC/IMC and a DVIU cabinet.

During digital dispatch Aegis communications:

- Aegis signals pass between the mobile/portable radio and the trunked radio system (EDACS site, voter receiver, etc.) via the RF path
- Aegis signals pass between the trunked radio system and the CEC/IMC via the land-line, microwave link, etc.
- during radio-to-console calls (radio-originated), encoded/encrypted Aegis signals from the CEC/IMC DVIM are applied to the DVIU for decoding/decrypting; the clear voice signals from the DVIU are then routed back to the DVIM for passage to the console via a CIM
- during console-to-radio calls (console-originated), clear voice console transmit audio from the CEC/IMC DVIM is applied to the DVIU for encoding/encrypting; the encoded/encrypted Aegis signals are then routed back to the DVIM for passage to the radio system(s) via a MIM, NIM,

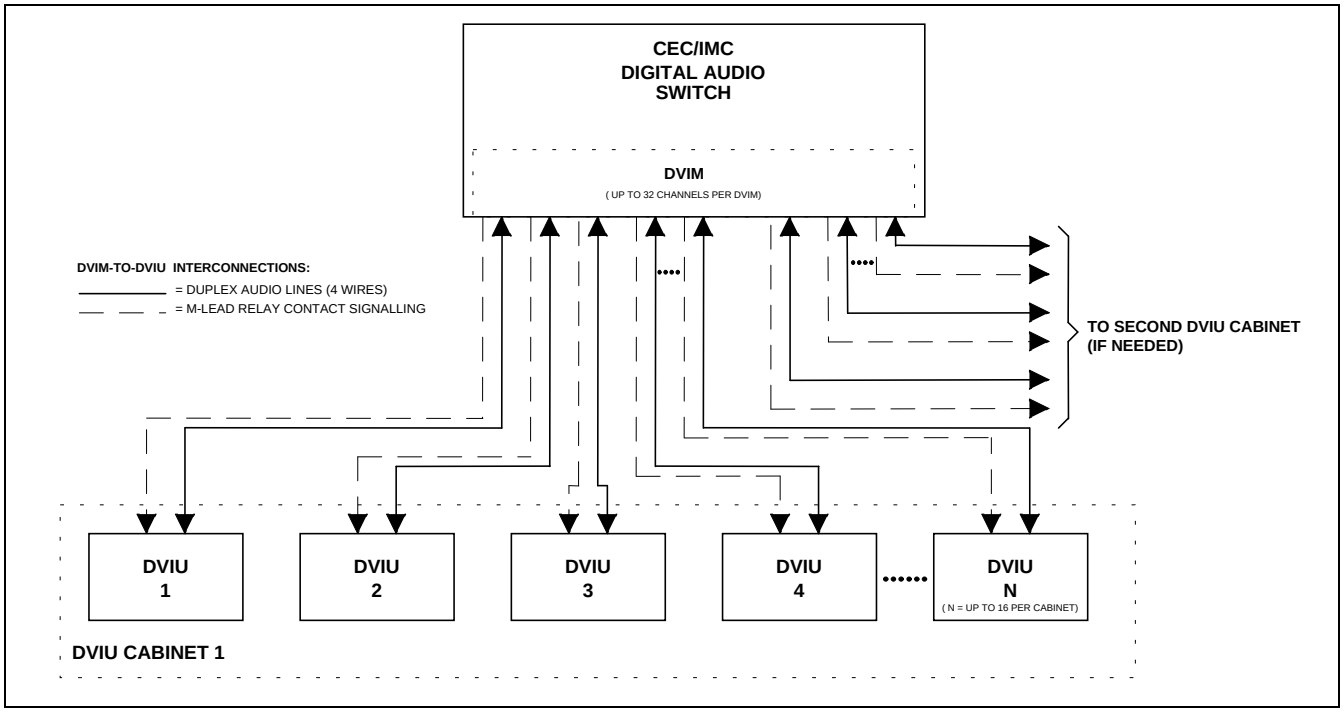


Figure 3 – DVIM-To-DVIU Interconnections

etc.

Transmit/receive mode switching control for each DVIU channel is provided by relay contact connections (M-lead signalling) from the DVIM Audio Board. The board's relay contact for the respective channel closes to place the DVIU channel in transmit mode (Aegis encode or encrypt).

NOTE

Clear transmit (mic) audio from a console operating in clear mode is never routed through a DVIU channel.

A DVIU channel that provides Aegis private mode (encrypt/decrypt) operations employs enhanced circuitry that performs the encryption and decryption functions. Either the Data Encryption Standard (DES) algorithm or the VGE algorithm may be utilized. This enhanced circuitry is contained in the Aegis Module (VG-9600 or VGE-9600) which is a part of the DVIU channel. Any channel equipped for Aegis private mode operations requires the entry of a cryptographic key into the DVIU channel's Aegis Module. This key must be entered before Aegis private mode operation can occur on the channel. Keys are entered or “transferred” into the Aegis Module from a calculator-type device known as a "Keyloader".

Each DVIU channel is configured as a “pooled” channel or a “dedicated” channel. Pooled/dedicated selection is performed at the CEC/IMC Manager (MOM PC).

Calls are dynamically assigned to pooled DVIUs. This configuration maximizes digital dispatch console features and operational flexibility while minimizing cost. However, all DVIUs within a particular pool must use the same digital voice algorithm (DES or VGE or unencrypted Aegis) and identical cryptographic keys (applicable to DES and VGE only). Telephone interconnect (CTIS or Jessica system) channels must be assigned to pooled DVIUs. Individual calls always use pooled DVIU channels.

The DVIM assigns calls to pooled DVIU channels in a “next available” fashion. If all pooled channels are active and an additional pooled call is initiated, the DVIM will report a “no channel available” error to the CEC/IMC Manager’s error log file.

Dedicated DVIUs are assigned to specific systems, agencies, fleets or groups. This method allows multi-key operation; each DVIU’s Aegis Module can be loaded with a different cryptographic key. At the CEC/IMC Manger (MOM PC), a DVIU channel is set for dedicated operation by assigning a talk group (“alias”) to the channel. Each talk group has only one DVIU channel dedicated to it.

DESCRIPTION

The Application Assembly Diagram in this manual shows the rack-up of the DVIU equipment. DVIU channels 1 - 8 form the first DVIU set – labeled "1ST DVIU SET" in the diagram. DVIU channels 9 - 16 form the second DVIU set – labeled "2ND DVIU SET" in the diagram. DVIU cabinets that contain eight (8) or less DVIU channels are not factory equipped with the second DVIU equipment set.

The following primary assemblies form the structure of a *single* DVIU channel. The associated maintenance manuals are shown in brackets:

- Aegis Chassis Assembly 19D904781G1 [LBI-39042]
- Aegis Module (VGE-9600 or VG-9600) 19A148909 (mounts within the Aegis Chassis Assembly) [LBI-31674 or LBI-31665]
- Interface Unit – consists of Interface Shelf 19B802903G1, Interface Tray 19C851553G2, and three (3) printed wire boards mounted on the tray [LBI-39043, LBI-31552 and LBI-33031]
- Interconnect Cable 19B802896P1 - interconnects the Interface Unit to the Aegis Chassis Assembly [LBI-39041]

Aegis Chassis Assemblies and Interface Units are labeled in accordance with their respective DVIU channel number. The Application Assembly Diagram in this manual shows DVIU channels 1 - 16. DVIU systems with greater than 16 channels are labeled in accordance with the customer-specific system-documentation.

Other items within the DVIU cabinet include:

- Shelf 19D904780P1 [LBI-39042]
- Interface Panel 19D904009G19 – includes four (4) Interface Modules (19C852204G1) – [LBI-39044 and LBI-38813 respectively]
- Power Distribution Panels 19D904180G5 [LBI-39045]
- RPS (Redundant Power Supply) Unit 344A3505P1 [LBI-38670]
- Audio Cables (Modular) 19D903880P10 - P15 [LBI-39041]
- Relay Cables (Modular) 344A4677P30 - P34 [LBI-39041]
- Power Cables [LBI-39041]
- Cabinet Hardware [LBI-39041]

AEGIS CHASSIS ASM. 19D904781G1 AND SHELF 19D904780P1

As shown on the Application Assembly Diagram, up to eight (8) Aegis Chassis Assemblies, each with an Aegis Module, are vertically mounted in Shelf 19D904780P1. Each Aegis Chassis Assembly contains a Power Supply Board and an Indicator Board. Although installed in the assembly, the Aegis Module is not a sub-part of the Aegis Chassis Assembly; it must be ordered separately if replacement is required.

Shelf 19D904780P1 is a 19-inch rack-mount 5-rack unit (8.75 inch) shelf which is centered between the eight (8) respective DVIU Interface Units. The Shelf has no electronics but simply provides mechanical support for the Aegis Chassis Assemblies inserted into it. Each Aegis Chassis Assembly slides into a slot or "card guide" in the Shelf and is then locked into place by a captive screw located on the bottom front of the unit.

LBI-39042 contains a complete circuit analysis and parts listings for the Aegis Chassis Assembly and Shelf 19D904780P1.

AEGIS MODULE (VGE-9600/VG-9600)

Each Aegis Module within the DVIU cabinet performs the actual Aegis encode/decode (Aegis digital mode) or Aegis encrypt/decrypt (Aegis private mode) functions for its respective DVIU channel. A DVIU channel can be configured for either Aegis digital mode operation or Aegis private mode operation by installing the proper Aegis Module into the respective Aegis Chassis Assembly and configuring the unit correctly. Table 1 lists Aegis Module part numbers and their respective E/D capabilities. Refer to the "**SET-UP**" sections of this manual and the maintenance manual indicated in Table 1 for configuration information.

INTERFACE UNIT

The Interface Unit interfaces the 600-ohm full-duplex balanced lines from the DVIM channel within the CEC/IMC to the Aegis Module in the Aegis Chassis Assembly. The Interface Unit also provides 4-level 4-phase modem signal conversions and basic transmit/receive mode interfacing for the DVIU structure. It consists of the following components:

- Interface Board 19D438302G1
  (modified per Modification Instruction 19D904876P2)
- Tone Remote Control Board 19A704868P6
  (modified per Modification Instruction 19D904876P2)
- Rockwell Modem 19A705178P1
- Interface Shelf 19B802903G1
- Interface Tray 19C851553G2
- Modification Kit 19A149226G3
- Interconnect Cables

LBI-39043 contains a detailed signal path description and an accompanying signal path block diagram of a DVIU channel. See LBI-39043, LBI-31552 and LBI-33031 for additional details on the Interface Board, Tone Remote Control Board and the Rockwell Modem, respectively. The "**TESTS AND ALIGNMENTS**" section in this manual provides alignment instructions for the level adjustments within this unit.

REDUNDANT POWER SUPPLY (RPS) UNIT

Each DVIU cabinet is equipped with a Redundant Power Supply (RPS) unit similar to the RPS units used in a CEC/IMC cabinet. The primary difference is the DVIU RPS unit provides +5 and ±12 Vdc supplies whereas a CEC/IMC RPS unit provides +5 and ±15 Vdc supplies. As shown in the Application Assembly Diagram, the DVIU's RPS unit is mounted at the bottom of the cabinet.

Like the CEC/IMC RPS units, each DVIU RPS unit has two (2) independent hot-pluggable slide-in power supply modules. Each module is equipped with its own power cord. This design allows connection of the two RPS modules to two (2) separate ac power sources for complete power

TABLE 1 – AEGIS MODULES

MODEL NUMBER	PART NUMBER	MAINTENANCE MANUAL	E/D ALGORITHM	AEGIS MODE CAPABILITY
VG-9600-DR	19A148909P40	LBI-31665*	DES	private
VG-9600-DRW	19A148909P41	LBI-31665*	DES	private
VGE-9600-DRW	19A148909P42	LBI-31674	VGE	private
VGE-9600-DURW	19A148909P43	LBI-31674	(none)	digital

* LBI-31665 is not included with this manual set. Order separately if required.

redundancy.

DC POWER DISTRIBUTION

Power Distribution Panel 19D904180G5 provides dc power interconnections between the Redundant Power Supply (RPS) unit at the bottom of the cabinet and the DVIUs above. A fully loaded DVIU cabinet requires two (2) Power Distribution Panels. Each panel distributes the +5 Vdc and ±12 Vdc power from the RPS unit to the eight (8) DVIUs directly above it. Panel 1 serves DVIUs 1 - 8 ("1ST DVIU SET") and panel 2 serves DVIUs 9 - 16 ("2ND DVIU SET").

The panels mount on the cabinet's rear mounting rails. Refer to the Application Assembly Diagram in this manual for specific rack-up details and see LBI-39045 for servicing information on the panel. A power distribution block diagram for the complete DVIU cabinet is included in LBI-39045. The diagram identifies all power-related cables within the DVIU cabinet and the connectors which they mate with.

INTERFACE PANEL AND INTERFACE MODULES

Interface Panel 19D904009G19 is used in the DVIU cabinet to provide a common point for all audio and relay signalling connections between the DVIUs and the CEC/IMC. In the DVIU cabinet, the panel is mounted on the rear mounting rails at the uppermost rack positions. The panel consists of four (4) Interface Modules mounted on a steel frame. See LBI-39044 for mechanical details on the Interface Panel.

Each Interface Module has twelve (12) telephone-style 6-position 4-conductor modular jacks and two 50-pin Champ-type connectors. Telco cables from the CEC/IMC cabinet mate with the Champ connectors on the Interface Modules. All fourteen connectors on an Interface Module are wired together as shown in LBI-38813. Specific cable interconnections are described in greater detail in the following "**INSTALLATION**" section.

INSTALLATION

FLOOR PLAN

The following list should be observed during the DVIU floor plan design:

- The DVIU cabinet(s) must be co-located with the CEC/IMC cabinet(s).
- Although not specified, a DVIU cabinet should be placed so the lengths of Telco cables that interconnect it to the CEC/IMC cabinet are minimized. Audio/modem signal lines are 600-ohm interconnections and relay contact lines are M-lead signalling interconnections. Table 2 lists the Telco cable lengths which are normally supplied with DVIU equipment.
- Floor plan provisions should be made for any UPS equipment dedicated to the DVIU cabinet.
- Since punch blocks are not needed between the DVIU cabinet and the CEC/IMC cabinet, no floor plan provisions are required for DVIU-related punch blocks.

EQUIPMENT ROOM GROUNDING

Proper grounding techniques should be observed in order to protect the equipment and service personnel from lightening and other sources of electrical surges. All cabinets, lightening arrestors, and associated equipment should be connected to a common grounding point that is provided as a part of the building and/or tower structure. This common grounding point must be within 25 feet of all cabinets (or ground buses) and it should have an impedance of less than 10 ohms to earth ground.

Insulated 6-gauge copper wire should be used between each cabinet and the common ground point or ground bus. If ground busses are used in a multiple cabinet installation, insulated 4-gauge copper wire should be used between each ground buss and the common ground point. All ground bus-to-common ground point connections should be 25 feet or less.

CABINET RACK-UP

Standard DVIU equipment is racked-up as shown on the Application Assembly Diagram. This fully-loaded 69-inch cabinet contains sixteen (16) DVIUs. In a standard installation of this type, no rack-up changes must be made during the installation process.

The as-ordered DVIU cabinet may not be fully-loaded with sixteen (16) DVIUs. If this is the case, it is recommended that other items such as UPS equipment *not* be installed within the DVIU cabinet. This eliminates major equipment re-rack/relocation if additional DVIUs must be installed in the cabinet at a later time.

AC POWER AND UPS EQUIPMENT

Normally, a DVIU ships from the factory with one RPS ac power cord routed directly outside of the cabinet for connection to the first ac power source. In this instance, the

other RPS ac power cord (from the other power module within the RPS) and the cabinet fan power cord are connected to the ac outlet strip located directly above the RPS unit. The ac outlet strip's power cord, also routed out of the cabinet, is connected to the second ac power source. See the power distribution block diagram in LBI-39045 for an illustration of this example.

All DVIU cabinets should be UPS protected. See the specifications at the beginning of this manual for recommended UPS ratings.

AC-line circuit breakers should be located within four (4) feet of the UPS equipment. The breakers can be housed in cable trays above the cabinets or in wall-mounted breaker boxes. Two (2) breakers – one per power source – are required for complete power redundancy.

DC POWER INTERCONNECTIONS

All dc power interconnections are factory-wired. Therefore, changes should not be required unless additional DVIU equipment is added to a non-fully-equipped cabinet.

DVIU-TO-CEC/IMC INTERCONNECTIONS

All interconnections between the DVIU cabinet(s) and the CEC/IMC cabinet(s) are made with 25-pair Telco cables. These cables have 50-pin Champ® (D-style) male connectors on both ends with the connectors' pins wired in a straight-through pin-to-pin fashion – pin 1 to pin 1, pin 2 to pin 2, etc.

In a DVIU system, an individual Telco cable carries either audio/modem signals *or* the M-lead relay contact interconnections. For any given DVIU channel, the audio/modem signal interconnections and the relay contact interconnections *are not* combined within a single Telco cable. Each 25-pair Telco cable can support audio/modem signal interconnections for eight (8) DVIU channels *or* relay contact interconnections for twenty-four (24) DVIU channels. Table 2 lists the Telco cable part numbers available from Ericsson GE. These cables have each pair individually shielded.

Each Telco cable joins a 50-pin Champ female connector in the CEC/IMC cabinet to a 50-pin Champ female connector in the DVIU cabinet. In the CEC/IMC cabinet, the audio/modem signal Champ connectors are located on the Audio Concentrator Cards and the relay contact Champ connectors are located on the Audio Relay Concentrator Cards. In the DVIU cabinet, all Champ connectors are located on the Interface Modules mounted on the Interface Panel at the top of the cabinet. Figure 4 in this manual shows the Telco cable interconnections between the CEC/IMC cabinet and the DVIU cabinet. Figure 4 also shows the in-cabinet audio and relay modular cable interconnections for both cabinets.

TABLE 2 – TELCO CABLE LENGTHS*

PART NUMBER	CABLE LENGTH	NORMALLY SUPPLIED FOR DVIU:
19D903880P120	5 feet	Cabinet 1⇔2 and Cabinet 2⇔3 Relay "Jumpers"
19D903880P121	15 feet	Cabinet 1 Audio, Cabinet 1 Relay
19D903880P122	7 feet	n/a
19D903880P123	10 feet	n/a
19D903880P124	20 feet	Cabinet 2 Audio, Cabinet 2 Relay
19D903880P125	25 feet	Cabinet 3 Audio
19D903880P126	30 feet	n/a
19D903880P127	35 feet	n/a
19D903880P128	40 feet	n/a
19D903880P129	50 feet	n/a

* See Figure 4.

The basic Telco cable wiring pattern is established by the Champ connector pin-outs at the CEC/IMC Concentrator Cards as defined by the customer-specific system documentation print-outs. These print-outs are included with a CEC/IMC Digital Audio Switch when it ships from the factory. See the *CEC/IMC Digital Audio Switch Customer-Specific System Documentation* maintenance manual, LBI-38939, for a complete description on the customer-specific system documentation print-outs.

Figure 4 represents a DVIU system with 48 DVIU channels – 3 fully-loaded cabinets. DVIU systems with greater than 48 channels repeat this basic 48-channel interconnect pattern in 48-channel groups. For example, in a 56-channel DVIU system, (4 full DVIU cabinets) the first 48 channels are wired as shown in the figure to the DVIMs' Audio Boards in the CEC/IMC cabinet. The last 8 DVIU channels (in the fourth cabinet) are wired per the "DVIU CABINET 1" interconnections. These last 8 channels would require the addition of two extra Audio Boards to DVIM 2 within the CEC/IMC cabinet. Also, an extra Audio Concentrator Card, an extra Audio Relay Concentrator Card, and the associated cables would be required. These additional components are not shown in Figure 4.

MODULAR CABLES

Tables 3 and 4 specify the cable lengths for the modular cables that interconnect the Interface Panel to terminal block TB1 at the back of each DVIU Interface Unit. The tables also indicate which DVIU channel number each cable is used with. Under normal circumstances, no changes to these cables should be required at installation. Interconnections are shown in Figure 4B and in the Interconnection Diagram within this manual.

TABLE 3 – MODULAR CABLE LENGTHS (AUDIO)

		USED WITH DVIU CHANNELS:		
PART NUMBER	**CABLE LENGTH**	**CABINET 1**	**CABINET 2**	**CABINET 3**
19D903880P10	36 inches	13 - 16	29 - 32	45 - 48
19D903880P11	54 inches	9 - 12	25 - 28	41 - 44
19D903880P12	60 inches	5 - 8	21 - 24	37 - 40
19D903880P13	76 inches	1 - 4	17 - 20	33 - 36
19D903880P14	87 inches	n/a	n/a	n/a
19D903880P15	97 inches	n/a	n/a	n/a

TABLE 4 – MODULAR CABLE LENGTHS (RELAY)

		USED WITH DVIU CHANNELS:		
PART NUMBER	**CABLE LENGTH**	**CABINET 1**	**CABINET 2**	**CABINET 3**
344A4677P30	36 inches	13 - 16	29 - 32	45 - 48
344A4677P31	54 inches	9 - 12	25 - 28	41 - 44
344A4677P32	60 inches	5 - 8	21 - 24	37 - 40
344A4677P33	76 inches	1 - 4	17 - 20	33 - 36
344A4677P34	87 inches	n/a	n/a	n/a

TELEPHONE LINE REQUIREMENTS FOR DIGITAL VOICE SYSTEMS

Since Aegis signals into and out of the CEC/IMC cabinet are 4-level 4-phase modem signals, full-duplex audio channels to and from equipment not co-located require 4-wire 3002-conditioned phone lines (or equivalent). For example, lines carrying Aegis signals between a CEC/IMC MIM and an EDACS site must be 3002 lines. Lines of this type guarantee low bit-error data transfer rates for the Aegis signals.

3002 Data-Grade Phone Line Specifications

- Frequency Response (1 kHz reference)
  - 300 - 2700 Hz: -2 to +6 dB
  - 500 - 2400 Hz: -1 to +3 dB
- Maximum Frequency Error: ±5 Hz
- Maximum Net Loss: 16 dB
- Group Delay (800 - 2400 Hz): 2000 µS
- Minimum S/N Ratio: 24 dB
- Special Conditioning (C1, C2, C4): not required
- Special Conditioning (D1): not recommended

CEC/IMC SET-UP

DIGITAL VOICE TDM BUS ALLOCATIONS

Within the CEC/IMC, a digital voice time slot must be allocated for each DVIM/DVIU channel. Refer to STEP 5 in the *CEC/IMC Digital Audio Switch Installation, Set-Up And Troubleshooting* maintenance manual (LBI-38938) for specific details. This set-up is accomplished at the CEC/IMC Manager (MOM PC).

NOTE

Since a DVIU cabinet is always co-located with its respective CEC/IMC cabinet, fundamental DVIM channel characteristics such as input/output signal levels and ALC enable/disable are permanently set and cannot be changed via the CEC/IMC Manager (MOM PC).

POOLED/DEDICATED SELECTION

DVIU channels may be either "pooled" or "dedicated". Pooled/dedicated DVIU selection is performed via the CEC/IMC Manager (MOM PC). Each CEC/IMC DVIM channel must be configured as required.

Calls are dynamically assigned to pooled DVIUs. This configuration maximizes digital dispatch console features and operational flexibility while minimizing cost. However, all DVIUs within a particular pool must use the same digital voice algorithm (DES or VGE or unencrypted Aegis) and

identical cryptographic keys (applicable to DES and VGE only). Telephone interconnect (CTIS or Jessica system) channels must be assigned to pooled DVIUs. Individual calls always use pooled DVIU channels.

Dedicated DVIUs are assigned to specific systems, agencies, fleets or groups. This method allows multi-key operation; each DVIU (Aegis Module) can be loaded with a different cryptographic key. At the CEC/IMC Manger (MOM PC), a DVIU channel is set for dedicated operation by assigning a talk group ("alias") to the channel. Each talk group has only one DVIU channel *dedicated* to it.

Refer to STEP 10 in the *CEC/IMC Digital Audio Switch Installation, Set-Up And Troubleshooting* maintenance manual (LBI-38938) and configure each CEC/IMC DVIM channel for *pooled or dedicated* operation as required.

HARDWARE VERIFICATIONS

DVIM Audio Boards

DVIMs within the CEC/IMC must be equipped with 19D903302P3 (or later) Audio Boards. Verify each DVIM Audio Board is a 19D903302P3 (or later) board. The 19D903302P1 Audio Boards will not operate DVIU channels correctly.

DVIM Cables

Verify all Local Bus Cables and all audio and relay Concentrator Card Cables are interconnected in accordance with the customer-specific system documentation print-outs unique to the CEC/IMC. Also refer to Figure 4 in this manual.

DVIU SET-UP

AEGIS MODULE (VGE-9600/VG-9600)

Most of the information on the Aegis Module in this section can be bypassed during normal set-up procedures. This information is primarily presented to indicate the differences between the DVIU Aegis Modules (19A148909P40 - P43) and Aegis Modules used in CIU, station, and mobile applications. *All DVIU Aegis Modules ship from the factory configured as ordered.*

Firmware EPROM U2 Verification

Operating firmware within the Aegis Module is stored in EPROM U2. This EPROM is factory programmed and installed in IC socket XU2 on the Aegis Module's Logic Board. EPROM part numbers for the four versions of the DVIU Aegis Module are given in Table 5. If necessary, verify the required EPROM is installed per DVIU channel requirements.

NOTE

For correct operation, a DVIU Aegis Module's part number **must** correspond to the EPROM and EEPROM part numbers given in Table 5.

Personality EEPROM U12

An Aegis Module's personality is stored in EEPROM U12 located on the Logic Board within the unit. This personality is factory programmed in accordance with Table 6. Table 5 lists the EEPROM part numbers.

If personality programming changes are required (for example – change an VGE Aegis Module to an unencrypted Aegis Module thus making a 19A148909P42 into a 19A148909P43), the unit may be reprogrammed with an IBM PC compatible computer using programming software TQ-3334, RDI and cable TQ-3330, and cable TQ-3345. See TQ-3334 Chapter 4 – the Voice Guard Option section – for specific programming operations.

TABLE 5 – DVIU AEGIS MODULE PROMS

AEGIS MODULE PART NO.	FIRMWARE EPROM U2 PART NO.	PERSONALITY EEPROM U12 PART NO.
19A148909P40	344A4513Gx*	344A3000P240
19A148909P41	344A4513Gx*	344A3000P240
19A148909P42	344A4516Gx*	344A3000P290
19A148909P43	344A4516Gx*	344A3000P490

* x = latest firmware revision number

TABLE 6 – DVIU AEGIS MODULE FACTORY PERSONALITY PROGRAMMING*

PARAMETER NAME	PROGRAMMED VALUE
UNIT TYPE	Console
VG OPTION (DES & VGE units)	VG AME
VG OPTION (unencrypted Aegis units)	UNC. AEGIS
CLEAR TX ALERT	Yes (enabled)
SYSTEM ALARM	Yes (enabled)
TX ATTACK DELAY	10 milliseconds
ADDITIONAL DATA DELAY	0 milliseconds
TX OUTSIDE ADDRESS**	FF (hex)
RX OUTSIDE ADDRESS**	55 (hex)
TX DATA POLARITY	inverted
RX DATA POLARITY	inverted
CUE MASK (VGE units only)	AAAAAAAA AAAAAAAA

* Except for the VG Option and CUE Mask parameters, all DVIU Aegis Module types have identical personality programming.

** EDACS trunked systems do not use Outside Address (OA) selective signalling techniques; however, the hex values listed in this table are necessary for proper Aegis operation.

Remote Mode Select Cable

Since clear transmit (mic) audio *from a console operating in clear mode* is never routed through a DVIU channel, DVIU Aegis Module clear/private transmit mode select switching is not required. In DVIU applications, the Aegis Module is hard-wired to *never* operate in clear transmit mode. This is accomplish via a remote mode select cable (part number 19B234849G1) installed within the Aegis Module and wiring modifications on the Interface Board within the Interface Unit (see Modification Instruction 19D904876P2 in LBI-39043). Inside the Aegis Module, remote mode select cable connects J9 on the Logic Board to J25 on the Analog Board. The front panel mode selector switch, which normally connects to J9 on the Logic Board, is disconnected and thus inoperative in DVIU applications. See LBI-31674 or LBI-31665 for cable details. A DVIU Aegis Module ships from the factory with the remote mode select cable installed.

Analog Board Jumpers/Plugs

A DVIU Aegis Module's jumper/plug settings are factory configured for DVIU applications. Jumpers and plugs are located on the Analog Board within the unit. No changes should be required. See LBI-31674 or LBI-31665 for specific jumper/plug settings.

POWER-UP AND TESTS

This section describes power-up and basic digital voice call test procedures for the DVIU equipment. The procedures should be performed in the order presented. Upon successful completion, the DVIU equipment is considered fully operational and ready for service.

Unless otherwise stated, the procedures assume only one DVIU cabinet is being tested and only one DVIM is in the CEC/IMC. If multiple DVIMs and/or DVIU cabinets are included in the installation, repeat the procedures for any additional DVIMs and/or DVIU cabinets.

Before proceeding, verify all DVIU equipment has been mechanically installed, electrically interconnected and configured in accordance with the previous information in this manual. Also verify CEC/IMC configuration. The test procedures assume the CEC/IMC, the related console equipment and the connected radio systems are fully operational.

RECOMMENDED TEST EQUIPMENT

The following list represents test equipment required for DVIU test and alignment procedures. Test equipment other than that which is listed may be substituted provided it is electrically equivalent or superior in accuracy and operational range to that which is listed.

General

- Aegis EDACS Portable Radio – for example: M-PA or M-RK (If VGE or DES encrypt/decrypt DVIUs will be tested, the radio's E/D algorithm must match the DVIUs' algorithm.)
- HP 204C Audio Signal Generator
- Fluke 87 True-RMS Handheld Multimeter
- Tektronix 2205 Portable 20 MHz Analog Oscilloscope

Cryptographic Keyloader

The following cryptographic keyloader equipment will be required if VGE or DES encrypt/decrypt DVIUs are included in the DVIU installation:

- Keyloader 19A148910P5 (VGE) and/or Keyloader 19A148910P3 (DES)

- Keyloader Interconnect Cable 19A148910P2 – interconnects Keyloader to Aegis Module
- Keyloader Interconnect Cable 19A148910P6 – interconnects Keyloader to M-PA/M-PD Portable Radio

Aegis Module PC Programming

The following equipment will be required if programming changes to any of the Aegis Modules are required:

- IBM XT Computer (or compatible) with 640k RAM, 5 1/4" and/or 3 1/2" disks, 40 Megabyte hard drive
- Programming Software TQ-3334
- RDI and Cable TQ-3330
- Cable TQ-3345

POWER-UP PROCEDURE

1. Verify all cabinets are grounded together and connected to a common grounding point as described in the installation section in this manual.
2. Verify all CEC/IMC audio/modem signal and relay contact interconnections. Refer to the installation section and Figure 4 in this manual for details.
3. Verify the ac power source is connected to the cabinet.
4. Apply power by simultaneously turning both on/off switches on the back of the RPS unit to the *on* position. The RPS unit is located at the bottom of the cabinet.
5. Observe the LED (light-emitting diode) indicators on the front of each Aegis Chassis Assembly. All green LEDs should be lit, indicating the presence of the +5 and ±12 Vdc power sources from the RPS unit. If a problem exists, the power distribution block diagram in LBI-39045 may be beneficial in troubleshooting the problem.
6. Normally, the red LED on the front of an Aegis Chassis Assembly should *not* light. If any are, this most likely indicates the DVIU is a DES-type DVIU and no batteries or defective batteries are installed on the Power Board within the Aegis Chassis Assembly. The red LED will also light on VGE or unencrypted Aegis DVIUs if the jumper on the Power Board is incorrectly set. See LBI-39042 for details.
7. Verify the cabinet fan is running and pulling air up and out of the cabinet.
8. With a heat gun, trip the cabinet fan's thermostat and verify the fan switches to high-speed operation. Thermostat trip point is approximately 110° F. The fan should return to low-speed operation when the thermostat cools to approximately 95° F.

TESTS AND ALIGNMENTS

Verify DVIM Operation

1. Verify the "RUN" LED indicator at the DVIM Controller Board is lit (Controller Board 19D903299P3) or blinking (Controller Board 19D903299P1).
2. Verify the "RUN" LED indicator at each DVIM Audio Board is blinking (approximately 95% on time).
3. From the CEC/IMC Manager's (MOM PC's) "SYSTEM DISPLAY" screen, verify the DVIM Controller Board is active by observing the "D" symbol references in the matrix. This screen is accessed by selecting "View System/Diagnostics" from the main menu.
4. Verify all DVIM Audio Boards are active by viewing the CEC/IMC Manager's "HDLC STATISTICS", "CHANNEL B" screen for the DVIM.

If any of these DVIM checks indicate a problem, refer to the "**TROUBLESHOOTING**" section and the "**INITIAL CHECKS**" sub-section in the *CEC/IMC Digital Audio Switch Installation, Set-up And Troubleshooting* maintenance manual, LBI-38938.

Transfer Cryptographic Keys

Before a DES or a VGE encrypt/decrypt DVIU can be tested, a cryptographic key must be "transferred" from a Keyloader into the Aegis Module. This process transfers a key stored in the Keyloader into the Aegis Module. Unencrypted Aegis DVIUs do not require a cryptographic key.

Refer to the Keyloader's operating manual for details. LBI-31685 is the manual for VGE units and LBI-31541 is the manual for DES units. Transfer a key into all E/D DVIUs that will be tested. The following items should be noted:

- All DVIUs with a particular pool *must* use an identical cryptographic key.
- Each dedicated DVIU *may* be loaded with a different cryptographic key.

- The cryptographic key loaded into the DVIU under test must match the cryptographic key being used in the test radio. If required, transfer the identical key to the test radio. Most Aegis radios can store more than one key; key selection is controlled via personality programming on a group basis.
- The test radio's encrypt/decrypt algorithm must match the algorithm of the DVIU under test. An Aegis VGE radio *cannot* be used to test a Aegis DES DVIU; likewise, an Aegis DES radio *cannot* be used to test an Aegis VGE DVIU.

Place Calls

Radio-Originated Aegis Call

1. If the DVIU channel under test is pooled, *temporarily disable all other pooled DVIU channels*. Perform this from the CEC/IMC Manager's (MOM PC's) "Digital Voice Configuration" screen by setting "Channel Equipped" to "N" (No) *for all other pooled DVIU channels*. The DVIM will not route calls through DVIU channels set to "N". The "UPLOAD Database" option must be selected at the CEC/IMC Manager (MOM PC) after any "Channel Equipped" change so the new setting(s) will be sent to the DVIM. (This step can be bypassed if *all* DVIU channels are dedicated; each DVIU channel can be tested via a different digital voice talk group selection.)
2. Verify the test radio can call a console in clear voice mode.
3. At the test radio, select the necessary digital voice talk group. Again, ensure the talk group uses the same cryptographic key as the DVIU under test (encrypt/decrypt radios only).
4. If necessary, enable private mode (encrypt/decrypt radios only).
5. Verify the console is monitoring the group.
6. Place a group call and verify the Aegis digital voice call is heard at the console.

Console-Originated Aegis Call

1. If the DVIU channel under test is pooled, verify all other pooled DVIUs are still disabled as described in step 1 of the above procedure.
2. At the console, select the correct digital voice talk group for transmission. Set the group for digital voice ("PVT") operation.
3. Set the test radio to monitor the same talk group.
4. Key the console and verify the digital voice group call is heard at the test radio.

Repeat Calls For All DVIUs

1. Test each DVIU channel by repeating the radio-originated and console-originated call procedures for each channel.
2. If necessary, re-enable all DVIU channels disabled in step 1 of the "**Radio-Originated Aegis Call**" procedure.

Alignments

All signal level adjustments for a DVIU channel are located within the Interface Unit. Adjustments include three (3) potentiometers on the Interface Board and two (2) potentiometers on the Tone Remote Control Board. A signal path block diagram of the complete DVIU channel is located in LBI-39043.

Since each DVIU channel is independently adjustable, these alignment procedures should be repeated for each DVIU channel in the system, as required. Alignment changes are not normally required during the check-out of a new DVIU system.

NOTE

See the previous section for test equipment recommendations.

Receive Signal Path (Radio-Originated Call)

1. If the DVIU channel being aligned is pooled, *temporarily disable all other pooled DVIU channels* via the CEC/IMC Manager (MOM PC). See the previous test section entitled "**Place Calls**" for details. This is necessary to ensure the DVIM routes the test call through the DVIU channel under test.
2. For optimum performance, adjust all MIM/VMIM/NIM/etc. line input settings at the CEC/IMC Manager (MOM PC) so the levels applied to the CEC's/IMC's TDM bus are equal from all radio systems. Adjust the input levels from the "SITE CHANNEL CONFIGURATION" screen at the CEC/IMC Manager.
3. With an oscilloscope, monitor TP1 on the Interface Board within the Interface Unit. This test point is located at op amp U2 pin 1. U2 is near transformers T1 and T2. If necessary, see LBI-39043 for outline and schematic diagrams on the Interface Board.

4. Simultaneously monitor the DVIM input pair (line from DVIU to DVIM) with a multimeter set to an ac range. Connect the meter between terminals 3 and 4 of terminal block TB1. TB1 is located on the back of the Interface Unit.
5. At the test radio, select the necessary digital voice talk group to route the test call through the DVIU under test.
6. Key the radio.
7. Adjust R7 on the Interface Board for a 400 mVp-p (average peaks) signal at TP1. This signal is the encoded/encrypted modem signal from the DVIM that is applied to the Rockwell modem's receive audio (RxA) input.
8. Modulate the test radio with a 1 kHz tone. The tone level applied to the mic input of the radio should set to a level to produce full FM deviation.
9. Adjust R23 on the Interface Board for a clear (decoded/decrypted) audio signal level of approximately +6 dBm (1.6 Vrms) on the DVIM input pair (TB1 terminals 3 and 4). The exact level setting of R23 should be such that the digital voice receive audio level at the consoles approximately matches the clear voice receive audio level at the consoles.
10. Unkey the test radio.
11. Re-enable all pooled DVIU channels that were disabled in step 1.

Transmit Signal Path (Console-Originated Call)

Setting the transmit signal levels is accomplished *without* routing a call through the CEC/IMC.

1. Temporally disconnect the DVIM output pair (line from DVIM to DVIU) at TB1 terminals 1 and 2. Maintain the "jumper cable" connections between TB1 terminals 1 and 8 and between TB1 terminals 2 and 9.
2. Connect the audio signal generator to TB1 terminals 1 and 2. Set the generator's output to 1 kHz and set the level across terminals 1 and 2 to -9 dBm (0.275 Vrms) output.
3. Monitor the MIC HI input level to the Aegis Module by connecting the multimeter (set to a low-scale ac range) between J6 pins 1 (MIC HI) and 2 (MIC LO) on the Interface Board.
4. Set R59 on the Tone Remote Control Board to its mid-point.
5. Adjust R60 on the Tone Remote Control Board for a MIC HI level of approximately 30 mV rms. The exact setting of R60 should be such that the digital voice audio level received at the EDACS radios approximately matches the clear voice audio level received at the EDACS radios.
6. Now, short the DVIM M-lead relay contact connections by jumping TB1 terminals 10 and 11 together. This places the DVIU channel in transmit mode.
7. Monitor the DVIM input pair with the multimeter (TB1 terminals 3 and 4).
8. Adjust R9 on the Interface Board for a -0 dBm (0.77 Vrms or 2.2 Vp-p) signal level across TB1 terminals 3 and 4. This signal is the encoded/encrypted Aegis signal.
9. Disconnect the jumper between TB1 terminals 10 and 11, disconnect all test equipment and reconnect the DVIM output pair to TB1 terminals 1 and 2.

ERICSSON
Ericsson GE Mobile Communications Inc.
Mountain View Road • Lynchburg Virginia 24502
Printed in U.S.A.

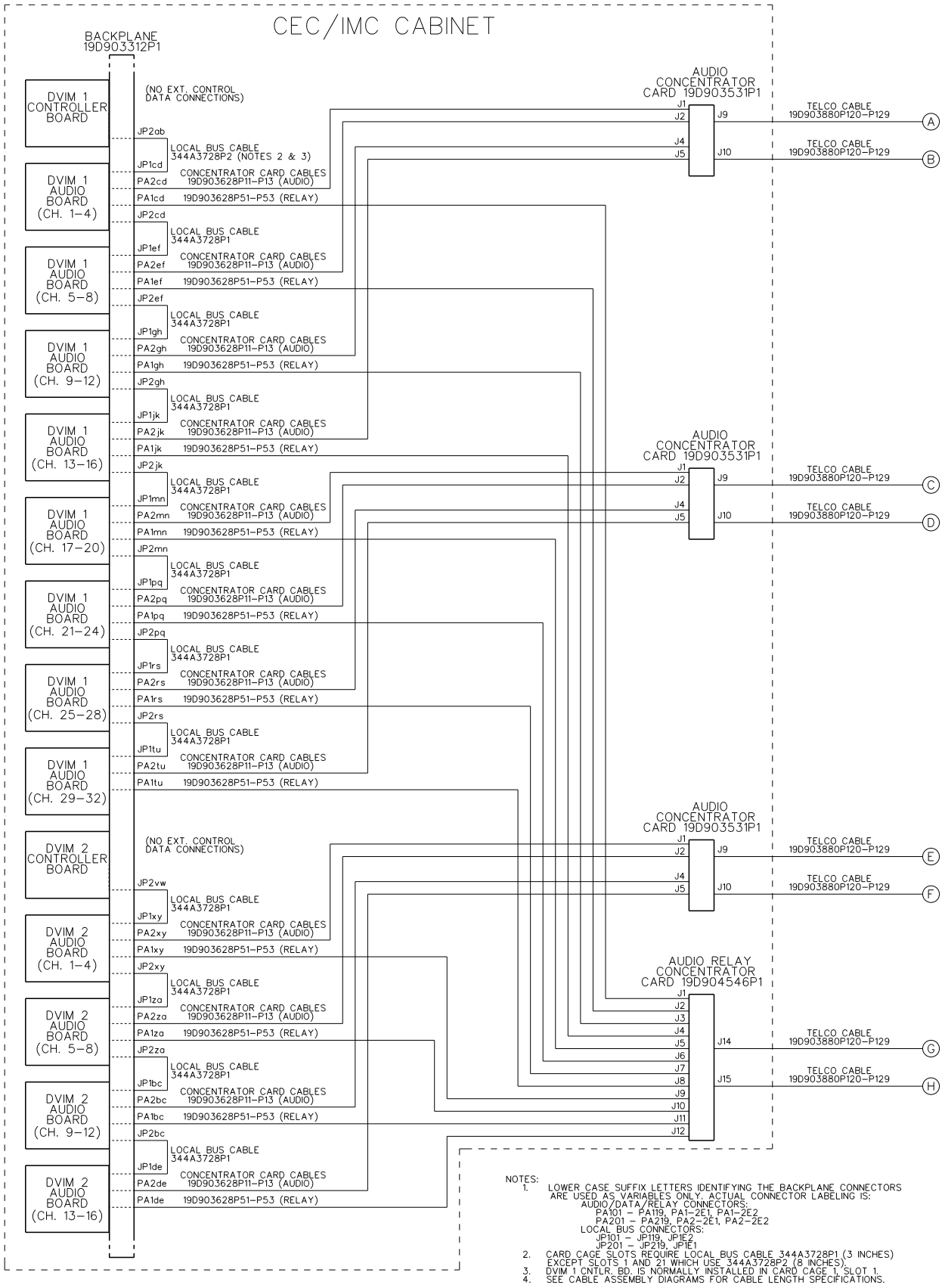
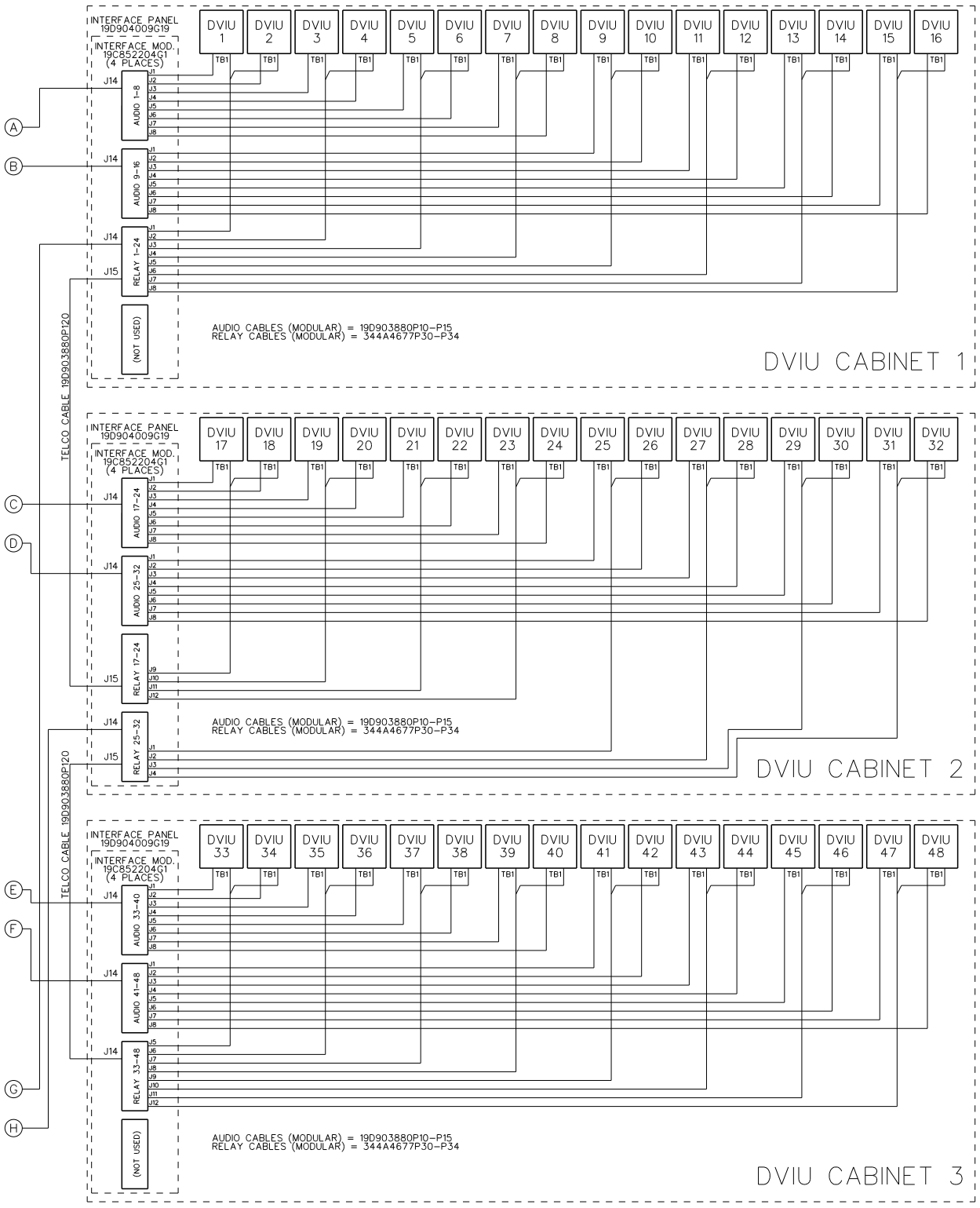


Figure 4A – In-Cabinet and Inter-Cabinet Audio and Relay Cabling (CEC/IMC Side)

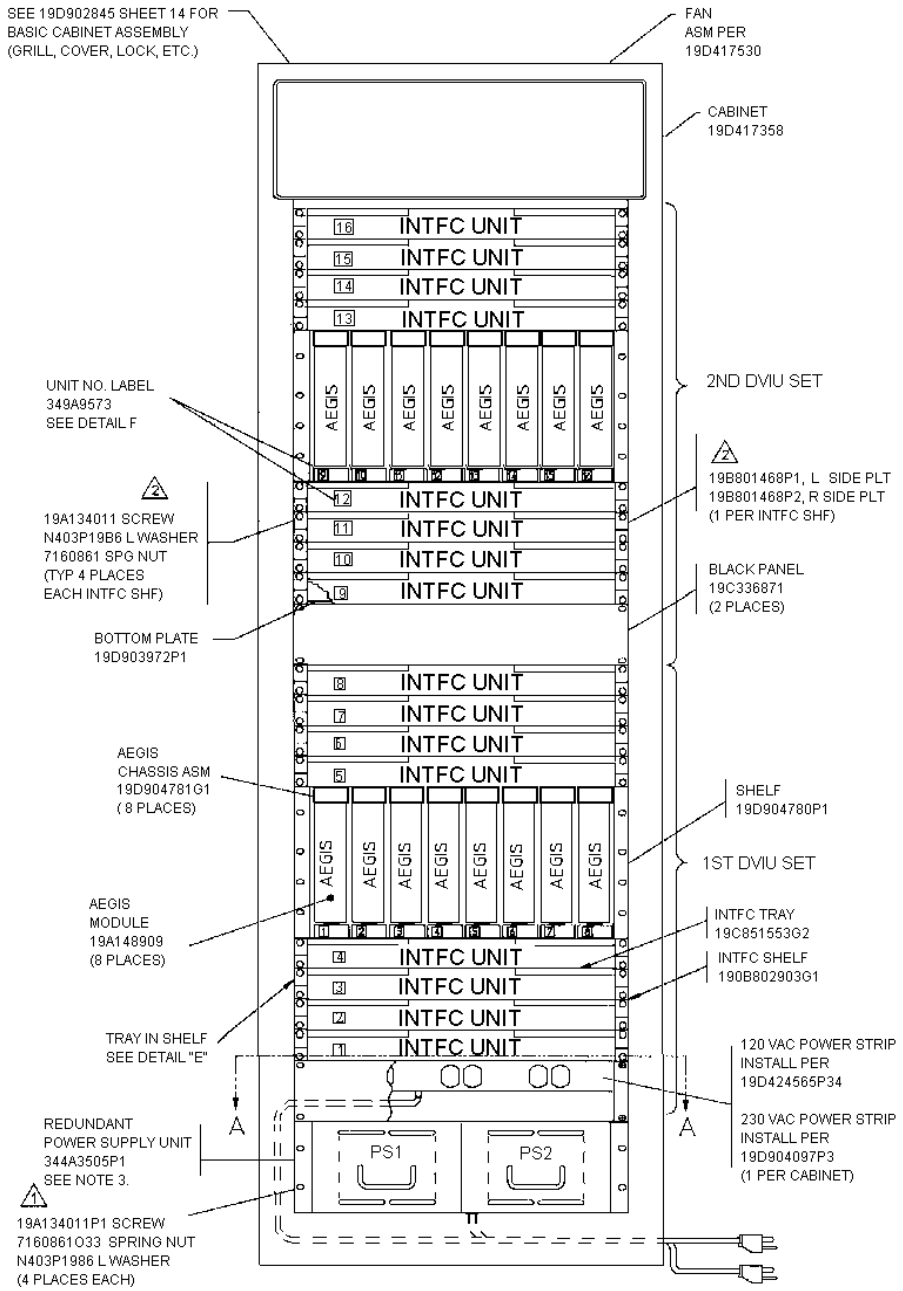


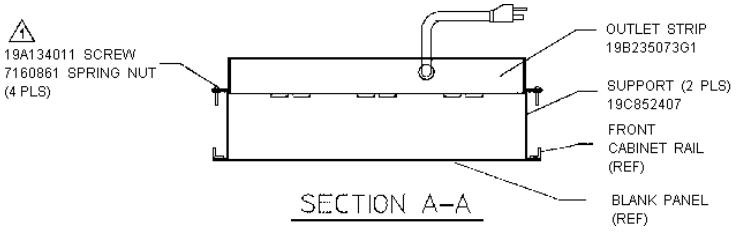
5. TELCO CABLE 19D903880P121 IS NORMALLY SUPPLIED FOR CEC/IMC CABINET-TO-DVIU CABINET INTERCONNECTIONS.
6. SEE CUSTOMER-SPECIFIC SYSTEM DOCUMENTATION OR THE EQUIPMENT INTERCONNECTION DIAGRAMS FOR CONNECTOR PIN-OUT DETIALS.

NOTE

Tables 2 thru 4 identify the cable part numbers and cable lengths normally used with the DVIU equipment.

Figure 4B – In-Cabinet and Inter-Cabinet Audio and Relay Cabling (DVIU Side)





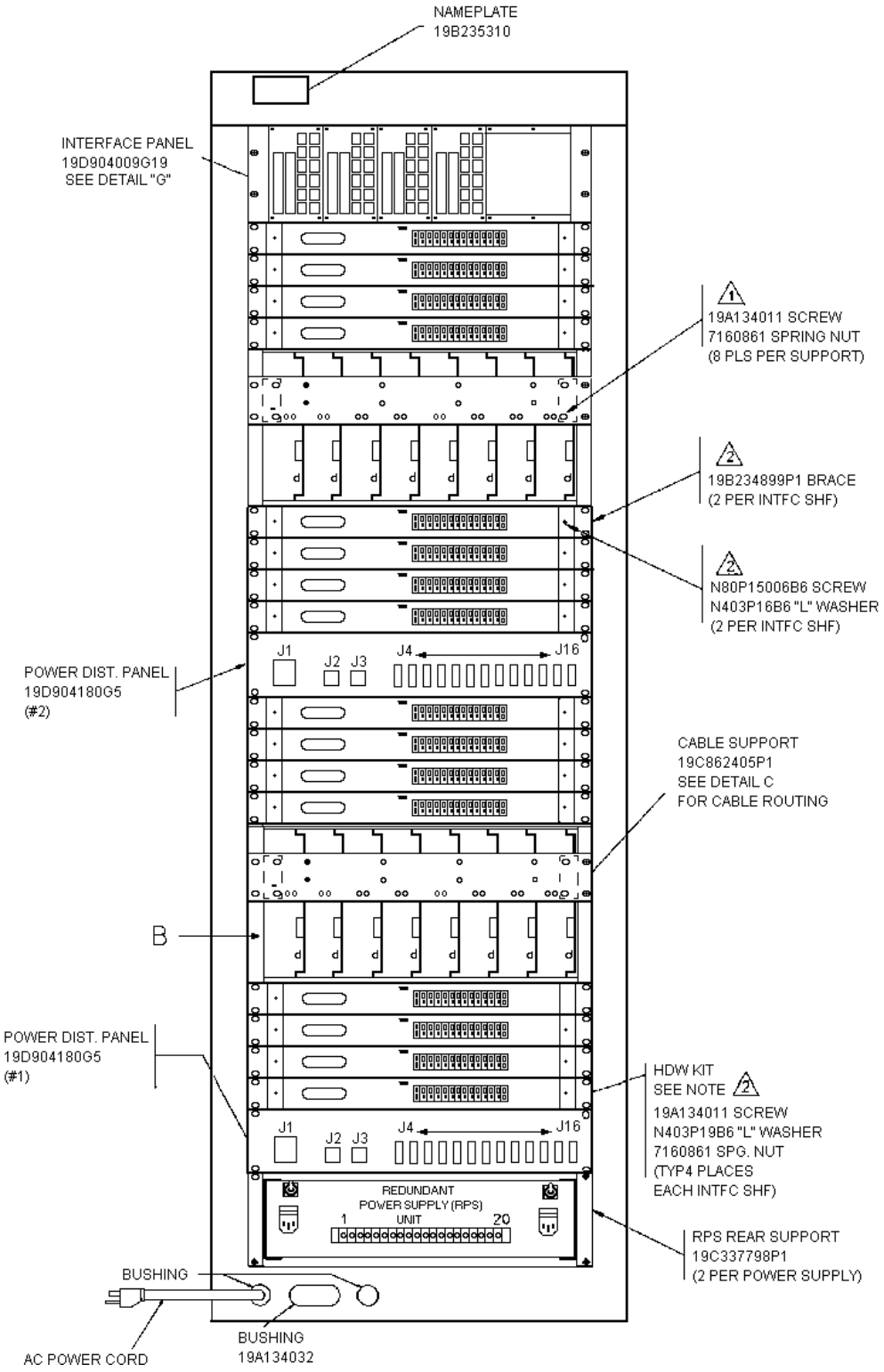
(1) DVIU CABINET
SEE WIRING INSTRUCTION 349A9574

NOTES:
1. PART OF HARDWARE KIT 19A130031G12.
2. PART OF HARDWARE KIT 19A130031G31.
3. CONNECT POWER CORDS FROM PS1 AND FAN TO OUTLET STRIP. CORDS FROM OUTLET STRIP AND PS2 TO BE ROUTED OUT OF CABINET AS SHOWN FOR EXTERNAL HOOKUP.
4. FOR CLARITY, CABLE INTERCONNECTIONS ARE NOT SHOWN. SEE INTERCONNECTION DIAGRAM 19D904636 FOR EQUIPMENT INTERCONNECTIONS.

DVIU CABINET

Sheet 1 of 4 (Front View)

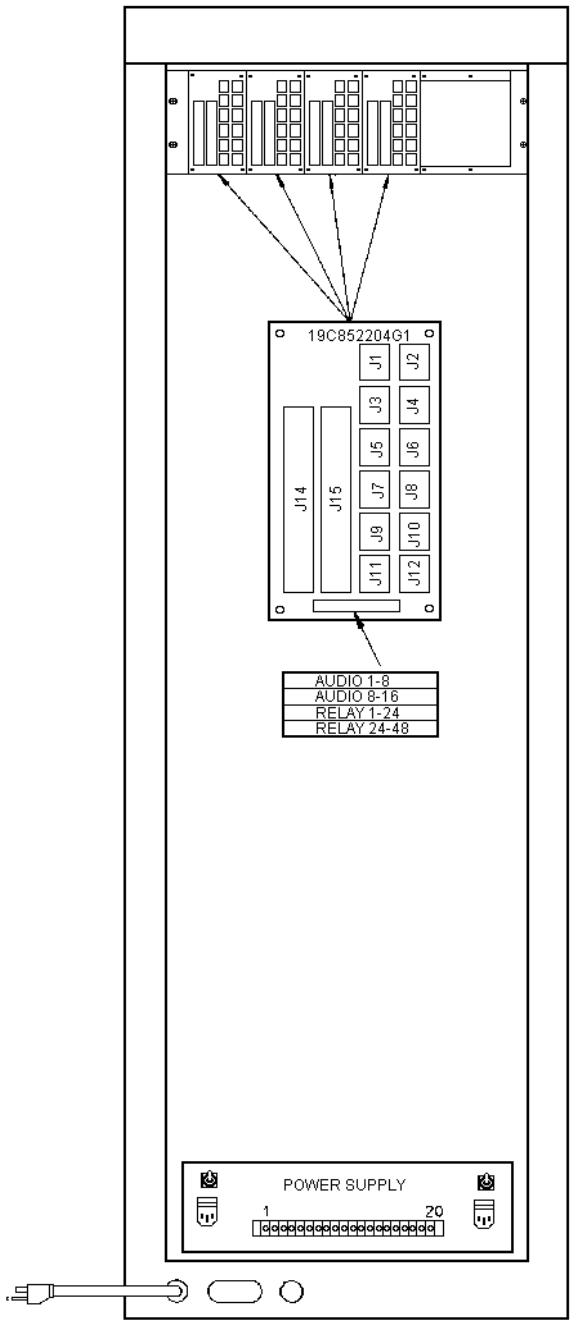
(19D904876, Sh. 1, Rev. 6)



DVIU CABINET

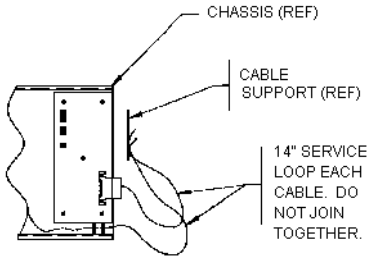
Sheet 2 of 4 (Rear View)

(19D904876, Sh. 1, Rev. 6)



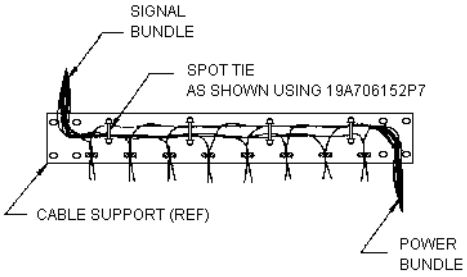
DETAIL G

LABELING OF INTERFACE MODULES
ON INTERFACE PANEL 19D904009G19



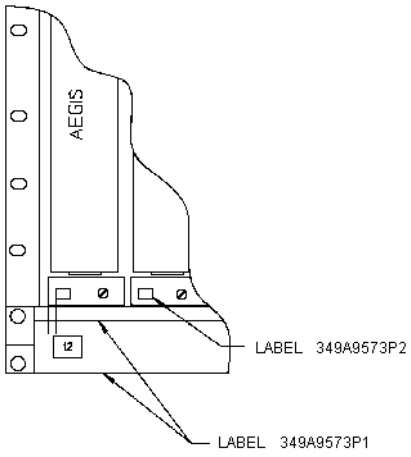
VIEW AT B

CHASSIS SERVICE LOOPS



DETAIL C

ROUTING TO SERVICE LOOPS



DETAIL F

LOCATION OF LABELS

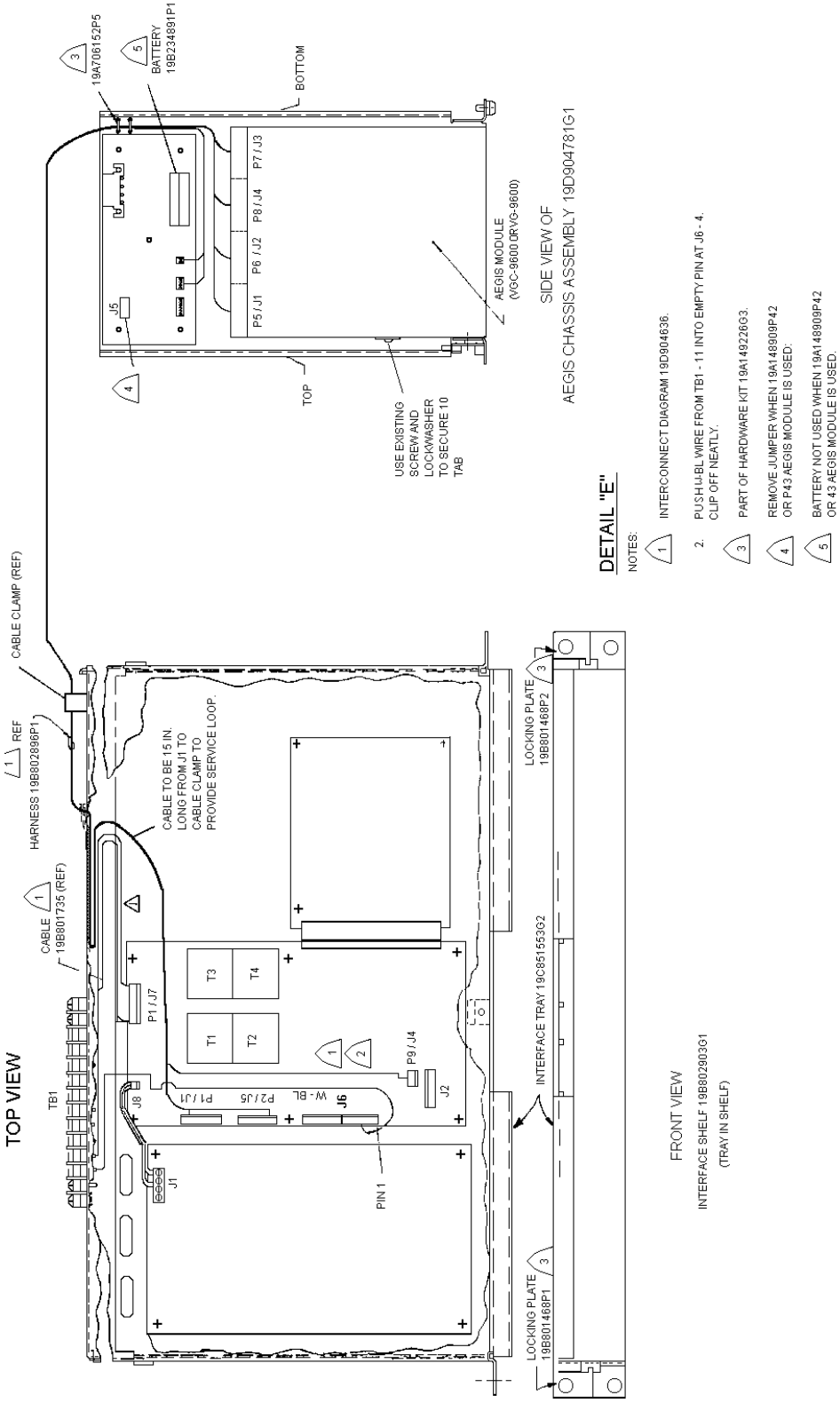
DVIU CABINET

Sheet 3 of 4 (Details B, C, F and G)

(19D904876, Sh. 1, Rev. 6)

NOTE

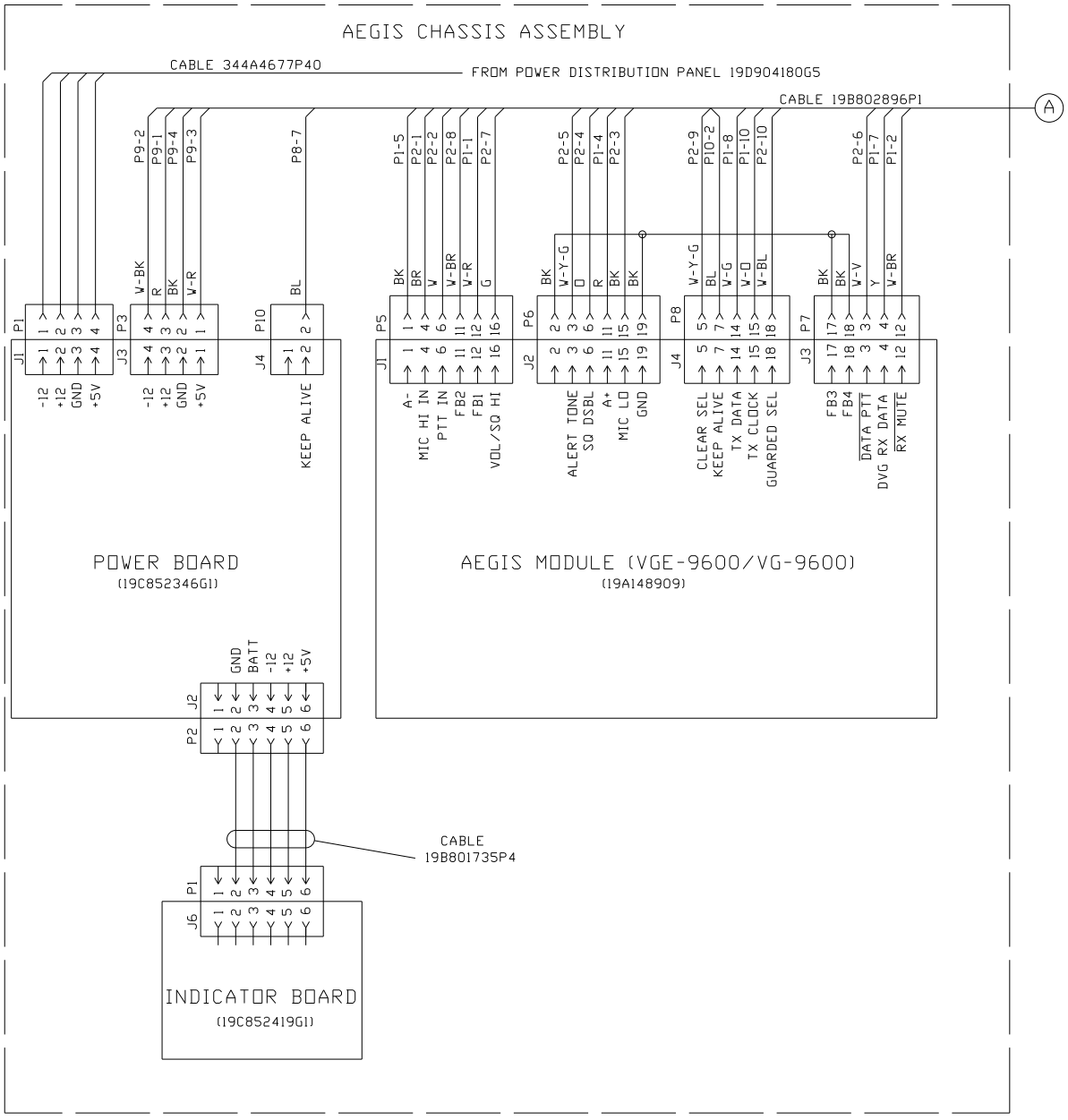
Detail D is shown in LBI-39043.



DVIU CABINET

Sheet 4 of 4 (Detail E)

(19D904876, Sh. 2, Rev. 6)

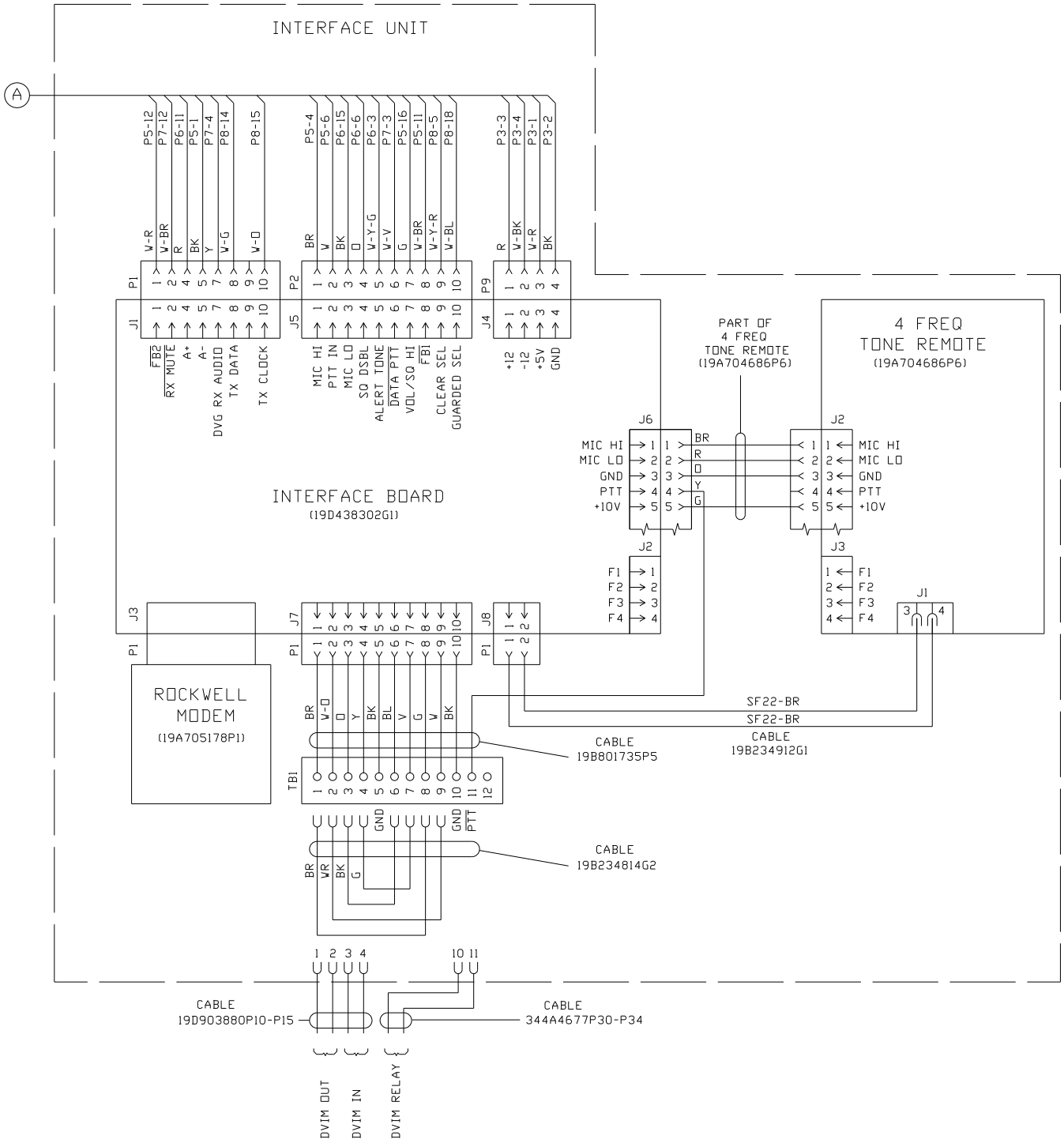


NOTES:
1. ALL WIRES SF24 UNLESS OTHERWISE NOTED.

INTERCONNECTION DIAGRAM

Sheet 1 of 2

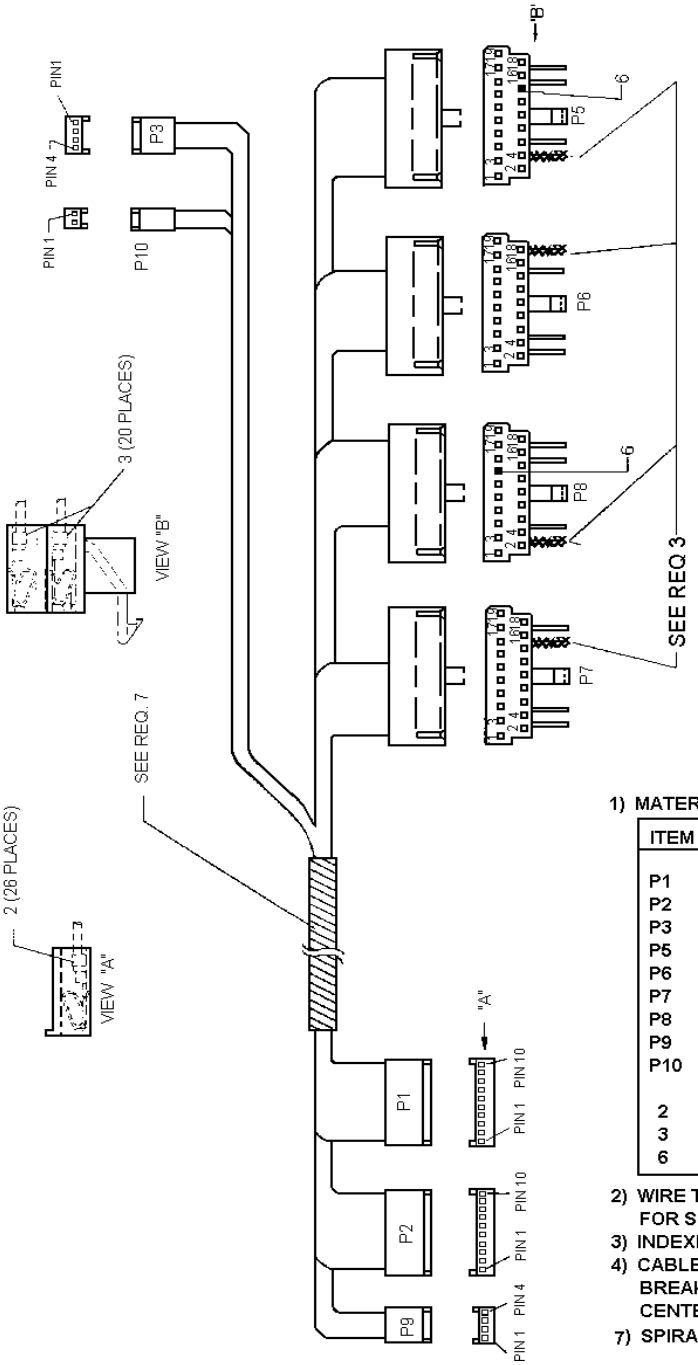
(MADE FROM 19D904636, Sh. 1, Rev. 1B)



INTERCONNECTION DIAGRAM

Sheet 2 of 2

(MADE FROM 19D904636, Sh. 1, Rev. 1B)



CONNECTION CHART

FROM	TO	WIRE
P1 - 1	P5 - 12	W - R
- 2	P7 - 12	W - BR
- 4	P6 - 11	R
- 5	P5 - 1	BK
- 7	P7 - 4	Y
- 8	P8 - 14	W - G
-10	P8 - 15	W - O
P2 - 1	P5 - 4	BR
- 2	P5 - 6	W
- 3	P6 - 15	BK
- 4	P6 - 6	O
- 5	P6 - 3	W - Y - G
- 6	P7 - 3	W - V
- 7	P5 - 16	G
- 8	P5 - 11	W - BR
- 9	P8 - 5	W - Y - R
- 10	P8 - 18	W - BL
P3 - 1	P9 - 3	W - R
- 2	P9 - 4	BK
- 3	P9 - 1	R
- 4	P9 - 2	W - BK
P8 - 7	P10 - 2	BL
P6 - 2	P6 - 19	LOOP
P6 - 19	P7 - 17	TOGETHER
P7 - 17	P7 - 18	BK

1) MATERIAL

ITEM	EGE PART #	DESCRIPTION OR EQUIV.	QTY
P1	19A700041P36	MOLEX 22 - 01 - 2105	1
P2	19A700041P36	MOLEX 22 - 01 - 2105	1
P3	19A700041P30	MOLEX 22 - 01 - 2045	1
P5	19C320257P1		1
P6	19C320257P1		1
P7	19C320257P1		1
P8	19C320257P1		1
P9	19A700041P30	MOLEX 22 - 01 - 2045	1
P10	19A700041P28	MOLEX 22 - 01 - 2025	1
2	19A700041P26	MOLEX 08 - 50 - 0113	26
3	19A116781P4	MOLEX 08 - 50 - 0174	22
6	19B209519P1	METHODE # 3310	2

2) WIRE TO BE SF24 PER EGE DRAWING 19A115871.
FOR SCHEMATIC DRAWING, REFER TO 19D904636.
3) INDEXING TABS TO BE REMOVED FROM P5, P6, P7 & P8 AS SHOWN.
4) CABLE TIES OR LACING TO BE USED ON ENTIRE LENGTH OF CABLE. ALL BREAKOUT POINTS TO HAVE CABLE TIE & TIES TO BE SPACED ON 3" TO 4 CENTERS ON STRAIGHT CABLE SECTIONS.
7) SPIRAL WRAP EGE PART #19A149502P3.

INTERCONNECT CABLE
19B802896P1

(19B802896, Sh. 1, Rev. 2)

HARDWARE KIT
19A130031G12

ISSUE 1

PART NUMBER	DESCRIPTION
7160861P5	Nut, sheet spring: sim to Tinnerman C1505-1032-24D.
7160861P33	Nut, sheet spring: sim to Tinnerman C19640-19AB-600.
19A134011P1	Screw, thread forming: No. 10-16 x .75".
19A134014P6	Bushing, strain relief: sim to Heyco UB-1093.
19A134032P1	Bushing, protective.
19B219744G2	Strain relief assembly.
19A136621G1	Cable, ground: 10 inches long.
N403P13B6	Lockwasher: No. 6.
N403P16B6	Lockwasher, internal tooth: No. 8.
N80P13009B6	Machine screw, panhead: No. 6-32 x 9/16.

HARDWARE KIT
19A130031G31

ISSUE 1

PART NUMBER	DESCRIPTION
7160861P33	Nut, sheet spring: sim to Tinnerman C19640-19AB-600.
19A134011P1	Screw, thread forming: No. 10-16 x .75".
N403P13B6	Lockwasher: No. 6.
N403P16B6	Lockwasher, internal tooth: No. 8.
N403P21B6	Lockwasher, external tooth: No. 12.
N210P13B6	Nut, steel: No. 6-32.
N404P13B6	Lockwasher, internal tooth: No. 6.
N80P15008B6	Machine screw, panhead: No. 8-32 x 1/2.
N80P13008B6	Machine screw, panhead: No. 6-32 x 1/2.
19A701863P19	Clamp, loop: sim to Weckesser 3/8-6.
N402P37B6	Flatwasher: No. 6.
19B234899P1	Brace, steel.
19B801468P1	Locking plate, left side.
19B801468P2	Locking plate, right side.
19A115594P2	Grommet.
344A4109P1	Tape, foam: 1.0 x .375 inches.
19A115729P7	Washer, flat: 1.0 inch OD, .54 inch ID.