DECvoice–T1

Hardware Installation

Order Number: EK–DVMLS–IN. C01

Digital Equipment Corporation
Merrimack, New Hampshire

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PREFACE

ABOUT THIS MANUAL

This manual explains how to configure and install the DECvoice-T1 system and how to install DECvoice modules into a system.

For information on the features of the DECvoice-T1 that are currently supported by the software, consult the *DECvoice Software Reference Manual*.

Place this guide in the same binder with other DECvoice-T1 manuals.

INTENDED AUDIENCE

This manual is for Digital Customer Service personnel and approved customer self-maintenance users of the DECvoice-T1 hardware.

NOTE

Digital recommends that a Digital customer service representative install your system hardware.

READER'S COMMENTS

Digital welcomes your comments on this or any other manual.
You can send your comments to Digital in the following ways:

- Internet electronic mail to: *readers_comment@zk3.dec.com*

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ORGANIZATION

This manual is divided into five chapters and two appendixes.

CHAPTER 1, INTRODUCTION – Provides the reader with an overview of the DECvoice-T1 system.

CHAPTER 2, MODULE INSTALLATION PROCEDURES – Describes the procedures to follow for unpacking, configuring, and installing the DECvoice-T1 system and installing and cabling the M3136 or M3135 modules in the system.

CHAPTER 3, TECHNICAL INFORMATION – Provides a technical discussion of the DECvoice-T1 system.

CHAPTER 4, Q-BUS HOST INTERFACE –Discusses the Q-bus interface to the M3136 and M3135 modules.

CHAPTER 5, TROUBLESHOOTING – Lists possible problems and their causes, as well as the appropriate corrective action to correct these problems.

APPENDIX A, CONNECTOR PINOUTS – Lists the signals on the pins of the various connectors.

APPENDIX B, TELEPHONICS AND REGULATORY INFORMATION – Discusses the regulatory information that applies to telephonics.

GLOSSARY – Defines those terms that are used in the DECvoice-T1 documentation and to telecommunication .

CONVENTIONS

The following conventions are used in this document:

NOTE A note calls the reader's attention to any item of information that may be of special importance.

CAUTION A caution contains information essential to avoid damage to the equipment.

WARNING A warning contains information essential to the safety of personnel.

RELATED DOCUMENTATION

Document	Order Number
DECvoice Software Reference Manual	AA–LE86C–TE
DECvoice VOX V2.0 Installation Manual	AA–PB3HA–TE
MicroVAX Systems Maintenance Guide	EK–O01AA–MG
MicroVAX Diagnostic Monitor User's Guide	AA–FM7AE–DN
MicroVAX Hardware Information Kit	ZNAJF–GZ
VMS System Generation Utility Manual	AA–LA30A–TE
AT&T Compatability Bulletin	*#119*

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COMMUNICATION REQUIREMENTS

FCC Requirements – Notice to Users of T1 Service

The following instructions are provided to ensure compliance with Federal Communications Commission (FCC) Rules, Part 68.

1. This device must only be connected to the T1 network connected behind an FCC Part 68 registered channel service unit. Direct connection is not allowed.

2. Before connecting your unit, you must inform the telephone company of the following information:

PORT ID	REN/SOC	FIC	USOC
DECvoice	6.0N	04DU9–B/C	N/A

3. If the unit appears to be malfunctioning, it should be disconnected from the telephone lines until you learn if your equipment or the telephone line is the source of the trouble. If your equipment needs repair, it should not be reconnected until it is repaired.

4. If the telephone company finds that this equipment is exceeding tolerable parameters, the telephone company can temporarily disconnect service, although they will attempt to give you advance notice if possible.

5. Under the FCC Rules, no customer is authorized to repair this equipment. This restriction applies regardless of whether the equipment is in or out of warranty.

6. If the telephone company alters their equipment in a manner that will affect this device, they must give you advance warning so as to give you the opportunity for uninterrupted service. You will be advised of your right to file a complaint with the FCC.

7. The enclosed Affidavit must be completed by the installer.

8. In the event of equipment malfunction, all repairs should be performed by Digital personnel or an authorized agent. It is the responsibility of users requiring service to report the need for service to Digital or to one of our authorized agents.

   To obtain service, contact your authorized Digital customer service representative.

Communications Requirements in Canada

The Canadian Department of Communications (DOC) label on the DECvoice-T1 system identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. The DOC does not guarantee that the equipment will operate to the user's satisfaction.

DOC regulations require that you provide the business office of your local telecommunications company with the following information, before you install the DECvoice-T1 system.

Make: DECvoice

Model: DTCN5–UG

Before you install this equipment, make sure it is permissible to connect it to the telecommunications company's facilities. You must also install the equipment by using an approved connection method. Be aware that complying with the above conditions may not prevent degradation of service in some situations. Telecommunications company requirements do not allow you to connect their equipment to customer provided jacks, except where specified by individual telecommunications company tariffs.

Only authorized Canadian maintenance facilities, designated by the supplier, should repair certified equipment. If you repair or alter certified equipment yourself, or if the equipment malfunctions, the telecommunications company has cause to ask you to disconnect the equipment.

You should ensure (for your own protection) that the electrical ground connections for the power utility, telephone lines, and internal metallic water-pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION

Do not try to make such connections yourself. Contact the appropriate electric inspection authority or electrician.

FCC USER STATEMENT

NOTICE:

This equipment generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such radio frequency interference. Operation of this equipment in a residential area may cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

CHAPTER 1
INTRODUCTION

1.1 SYSTEM OVERVIEW

This chapter provides an overview of the DECvoice-T1 system. The DECvoice-T1 system is an integrated hardware and software product that provides a MicroVAX computer with a voice application platform. The complete system includes hardware and software components. Figure 1 shows functional block diagrams of the DECvoice-T1 system.

DTCN5–UG Upgrade Kit hardware components include:

- M3136 T1 module, used to route voice data to T1
- M3135 voice module, used to process voice data
- TDM bus terminators, bulkhead assembly, TDM bus cables, right-angle cables

DTC05–SA Upgrade Kit hardware components include:

- M3135 voice module, used to process voice data
- Additional TDM bus cable

CK–DTC05–AA Expansion cabinet hardware kit components include:

- TDM bus expansion cable
- DECvoice, TDM bus, expansion bulkhead assembly

This document deals mainly with the hardware. For a detailed description of the DECvoice software components, refer to the *DECvoice DTC05 Software Reference Manual* (AA–LE86C–TE), *DECvoice Software Product Description (SPD),* and *DECvoice Software System Support Addendum* (SSA 31.69.00).

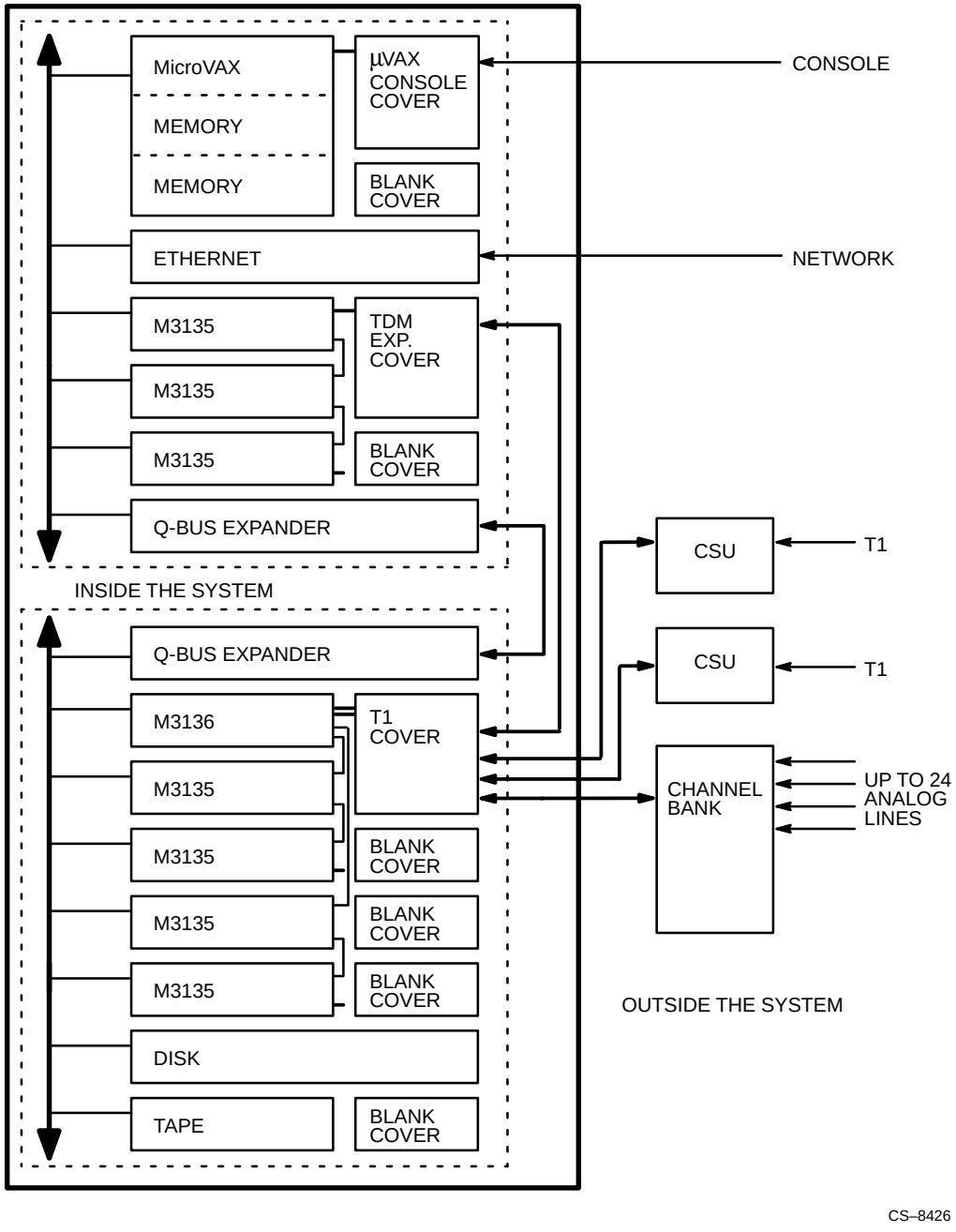

Figure 1 Functional Block Diagram of the DECvoice-T1 System

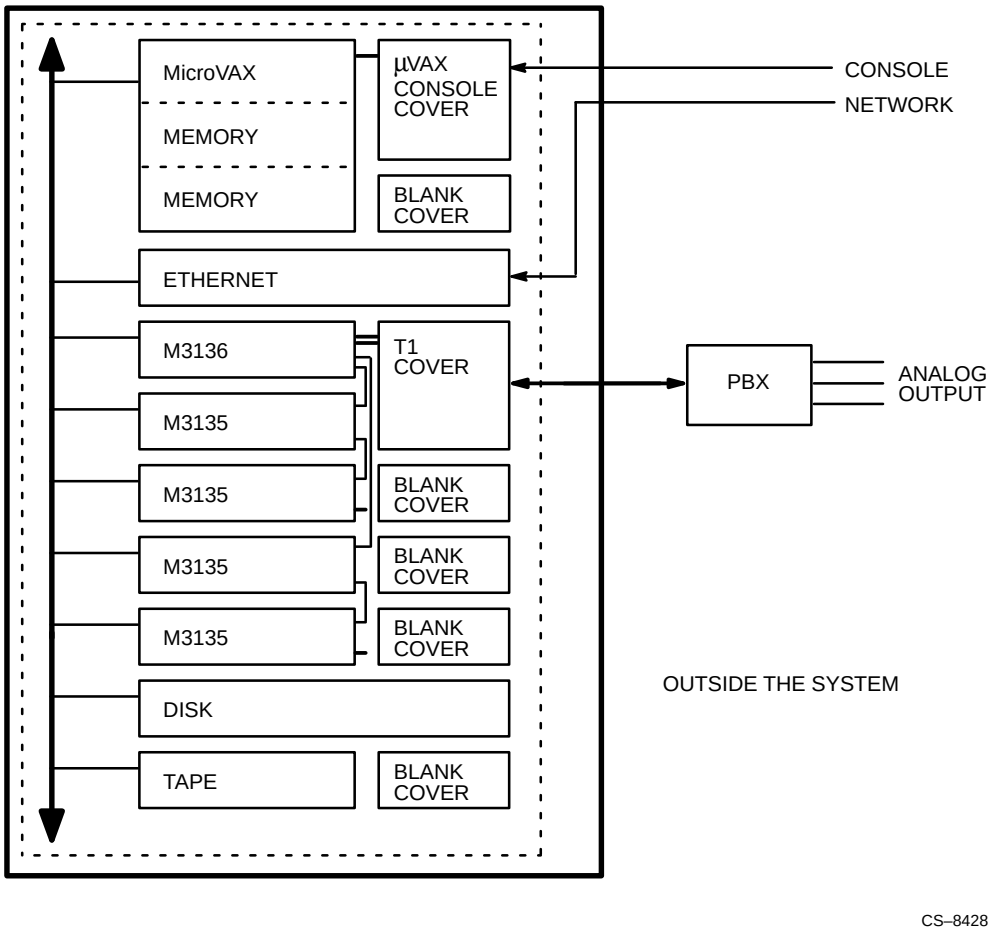

Figure 1 Functional Block Diagram of the DECvoice-T1 System (continued)

1.2 FEATURES

This section describes the features of the M3136 and the M3135 Q-bus modules and the Time Division Multiplex (TDM) Highway interconnect between modules.

1.2.1 M3136 Module

The M3136 module is the master routing module for all Pulse Code Modulation (PCM) data on the DECvoice-T1 system. This module has the following features:

- Connects to three T1 lines through external Channel Service Units (CSU) for connection to Public Switched Telephone Network (PSTN). These can be D3/D4 or an Extended Super Frame (ESF). Can also connect to channel banks for connection to analog phone lines.
- Drives three TDM Highway lines for connection to shelves[1] of M3135 modules.
- Can support be either robbed bit signaling or clear channel.
- Can route any data source (T1, TDM, HDLC) to any data input or output device (T1, TDM, HDLC) using nonblocking switching.
- The T1 transmit clock can free run or be synchronized to the received clock on any T1 line. A single transmit clock is used for all T1 lines.

1.2.2 M3135 Module

The M3135 module is a data processing module for the DECvoice-T1 system. The M3135 module, with associated microcode, functions in either an eight-line mode or single line mode of operation, with the following features.

Eight-Line Mode

- Eight voice channels
- Digitized speech recording and playback, including 32, 24, and 16 Kbps ADPCM data rates
- DTMF tone signal detection
- DTMF dialing
- MF detection
- MF dialing
- Prompt tones

[1] Groups of DTC05 modules are known as shelves and are inserted into contiguous slots; there can be no other intervening modules.

Single-Line Mode

- One voice channel
- Text-to-speech conversion capabilities
- Continuous digit, speaker independent voice recognition of the optional software license
- Isolated word, speaker-independent voice recognition of the numbers 0 through 9, and the words “yes”, “no”, and “oh” (a substitute for zero)
- Speaker-dependent voice recognition of up to 50 words
- DTMF tone signal detection
- DTMF dialing
- Call progress detection
- MF detection
- MF dialing
- Prompt tones

1.2.3 Software Support

For software support, refer to *DECvoice Software Product Description (SPD)* and *DECvoice Software System Support Addendum* (SSA 29.97.02).

1.3 PHYSICAL DESCRIPTION

This section provides a physical description of the M3136 and M3135 modules and the TDM Highway interconnect. Both modules are compatible with BA200 S-box Series System enclosures or other compatible enclosures.

1.3.1 M3136 Module

The M3136 routing module is a quad-height, 25.8 x 20.6 cm (10.5 x 8.4 in.) Q-bus module. This module contains the data routing circuitry for the DECvoice-T1 system. The M3136 module plugs into the MicroVAX Q-bus system.

The following sections discuss the M3136 module connections.

1.3.1.1 Connection to the TDM Highway

The TDM Highway connects to the voice modules using 20-pin connectors. The primary connection is to the bottom connector of the double-stacked, 40-pin IDC. The secondary connection is in a separate 20-pin IDC connector. Both connectors are single keyed and can connect to a voice module.

1.3.1.2 Connection to M3136 Module Cover

The connection to the M3136 module cover comes from the upper-half of the double-stacked 40-pin IDC. This connector is double keyed and has the transmit and receive pairs swapped.

1.3.1.3 Cover Connector

The cover connector includes the transmit and receive pair of wires and status lights.

1.3.2 M3135 Module

The M3135 data processing module is a quad-height, 25.8 x 20.6 cm (10.5 x 8.4 in.) Q-bus module. This module contains the voice processing circuitry for the DECvoice system. The M3135 module plugs into the MicroVAX Q-bus system.

The following sections discuss M3135 module connections.

1.3.2.1 Connection to the TDM Highway

The voice module connects to the TDM highway through a double-stacked, 20-pin connector. The upper connector is double keyed and can connect to a M3136 module or to other voice modules; M3135's. The lower connector passes the TDM highway to other voice modules, or connects to a terminator.

1.3.2.2 Connection to ROM Module

For manufacturing purposes, the M3135 module also has a connection to a ROM diagnostic module.

1.3.3 TDM Highway Interconnect

Each TDM Highway is capable of carrying 32, full-duplex, 64K-bps channels. This corresponds exactly to 32 full-duplex voice ports carrying μ-Law or A-Law PCM data.

The TDM bus is expanded to an expansion cabinet with the expansion cabinet kit CK–DTC05–AA. The TDM bus connections from the M3136 module cover is connected to the TDM bus expansion bulkhead assembly on the expansion box.

1.4 MODULE FUNCTIONAL DESCRIPTION

This section describes how the M3136 and M3135 modules operate.

1.4.1 M3136 Module

A functional block diagram of the M3136 module is shown in Figure 2.

The M3136 module has four major blocks: main processor, memory system, Q-bus interface, and telephonic section. These blocks communicate through registers interrupts and memory windows.

The M3136 module connects between three interface types: a Q22-bus interface that is used for host control, three Time Division Multiplexed (TDM) Highways that are used to connect to the M3135 voice processing modules, and three T1 connections that are made through the T1 connection cover.

1.4.1.1 Main Processor

The main processor section consists of an Intel 80C186 (12 MHz) 16-bit processor. This block has access to the entire 1-Mbyte memory module. There are sites for program Read Only Memory (ROM). These ROMs are not used during normal module operation.

The main processor section performs the following functions:

- Controls communication with the host system
- Controls the routing of PCM data through the system
- Receives/transmits T1 Control and Signaling information
- Provides limited audio capability (busy signal generation)

1.4.1.2 Q22-bus Interface

The Q22-bus interface consists of a slave section and a memory interface section. The slave section contains the control and status registers and the interrupt control circuitry.

The Q22-bus interface is used by the host for loading control or diagnostic programs for the main processor to execute (this is how the main processor can operate without ROMs). It is also used by the host as the command/message interface to the main processor, both for data and for interrupts.

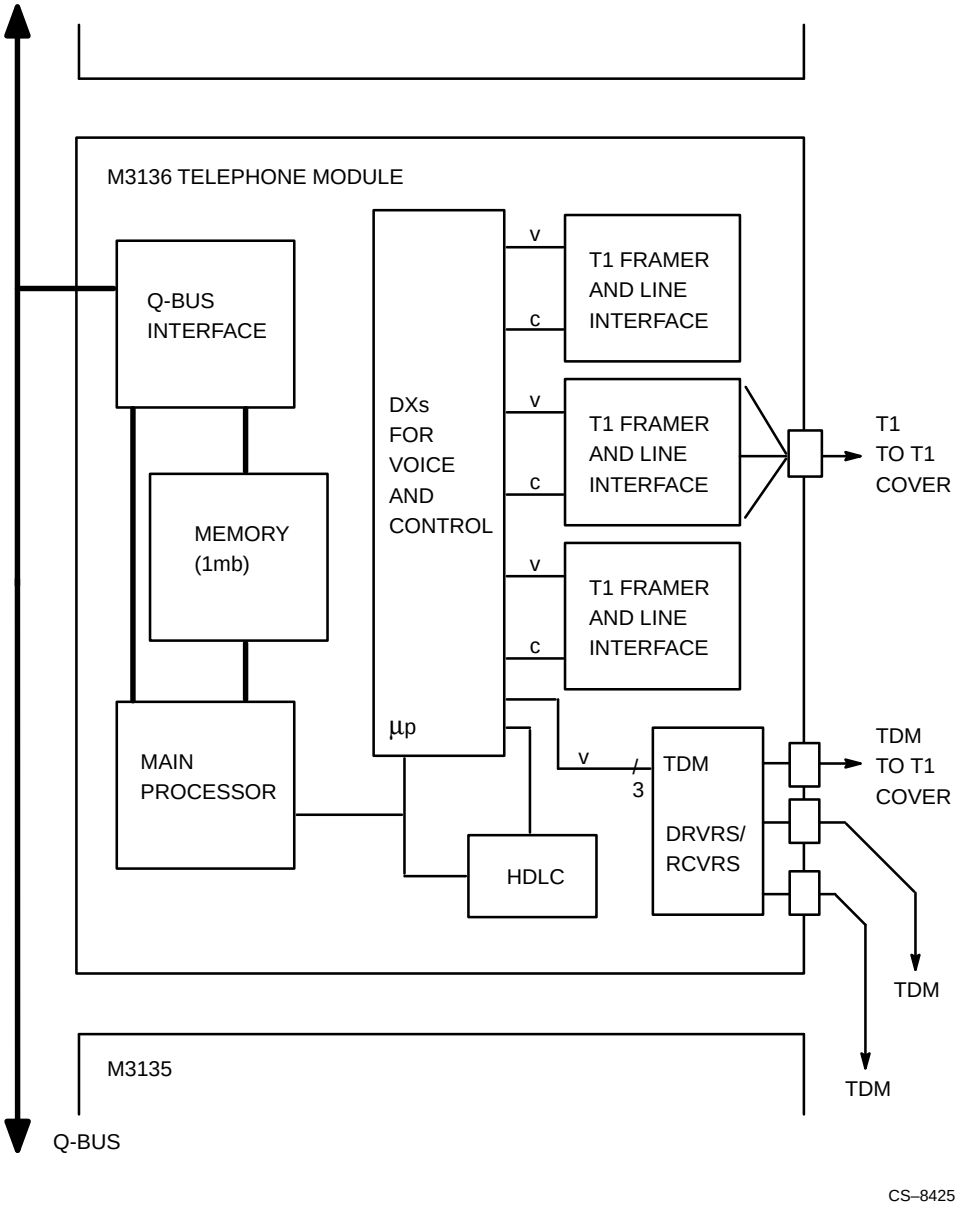

Figure 2 Functional Block Diagram of the M3136 Module

1.4.1.3 Telephonics Section

The telephonic section can be broken down into Digital Crosspoint Switches (DX), T1 framer/line interface, external TDM interconnect, and HDLC. These sections are all connected together by internal TDM highways.

The crosspoint switches are the heart of the telephonic section. These switches provide nonblocking interconnect between any of the internal TDM highways. They can also be set to read and write a TDM channel with control information. There are two sets of crosspoint switches on the module. The first set is used for routing voice data. The second set is used for control of the T1 lines.

There are three sets of T1 framer and line interface parts. The framer and line interface section converts between T1 and internal TDM buses. The incoming T1 is split into a voice TDM bus (connects to the voice crosspoint), and into a control TDM bus (connects to the control crosspoint). The outgoing T1 is synthesized using a voice TDM bus (from the voice crosspoint) and two control TDM buses (from the control crosspoint).

The external TDM interconnect converts between the electrical characteristics of the internal TDM buses and the electrical characteristics of the intermodule TDM buses. This section is mainly line drivers and receivers.

The HDLC section is available to translate a bit-oriented data stream from an internal TDM channel into a packet oriented message for the main processor.

1.4.2 M3135 Module

A functional block diagram of the M3135 module is shown in Figure 3.

The M3135 module, shown in Figure 3, consists of three functional blocks: the main processor, line processor, and Q-bus interface. These blocks communicate through interrupts and 64-KByte windows into the main processor’s 1 MByte memory space.

The M3135 module has two interfaces as viewed at the highest level of its hierarchy. First, the M3135 module connects to the Q22-bus, providing a slave interface with control and status registers and a shared memory port. Second, the M3135 module connects to a cover edge bus known as a Time Division Multiplexed (TDM) Highway. The voice module is known as a TDM slave, while the network module is known as a TDM master. The notation is a matter of convenience when referring to data transfer between modules; the difference is that a TDM master provides timing information, and a TDM slave receives timing information.

The Q-bus section is comprised of a slave interface into the shared memory and a control and status register (two 16-bit words). Within the control and status registers is a 4-bit Q-bus page select field that extends the 16-bit memory address to a full 20-bit physical address on the module.

The main processor section consists of an 80C186 Intel 16-bit processor running at 12 MHz (input clock of 24 MHz), local control and status registers, and the data path into the shared memory. The M3135 module has no on-board ROM.

The remaining section in the M3135 module is the Line Processing Section (LPS). The LPS has a TMS320C25 Digital Signal Processor (DSP) operating at 40.55 MHz as its primary processor. The LPS has a port into the shared memory for interprocessor communication. The LPS section includes the TDM Highway interface and an ADPCM hardware accelerator for compression and expansion of speech.

1.4.2.1 Main Processor

The main processor section consists of an Intel 80C186 (12 MHz) 16-bit microprocessor. This processor has access to all of the 1-Mbyte module memory. This processor does not have ROMs; however, there is a connector that can be used by the factory for temporary access to diagnostic ROMs. The main processor performs the following functions:

- Controls communication with the host system
- Implements the text-to-vocal tract control portion of the text-to-speech translation
- Performs buffer management for speech recording and playback
- Processes that part of speech recognition that is not handled by the signal processor

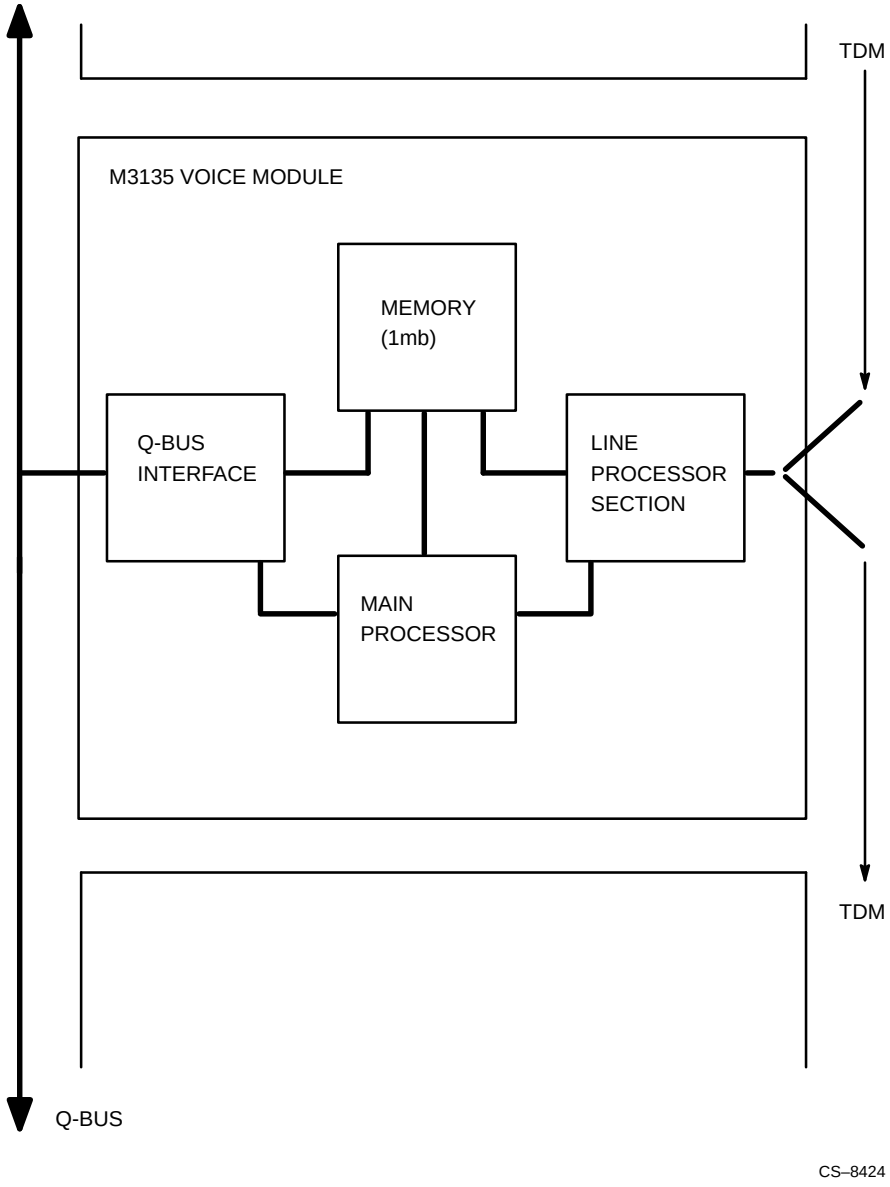

Figure 3 Functional Block Diagram of the M3135 Module

1.4.2.2 Channel Processor

The channel processor section can be further broken down into a primary signal processor section, an ADPCM encoder/decoder and a second signal processor section that is used for TDM interconnect and DTMF detection.

The primary signal processor is a Texas Instrument TMS320C25 (40.55 MHz). This processor has a 64-Kbyte window into the main module memory and has 64 Kbytes of local high-speed static memory. The signal processor performs the following functions:

- Implements the vocal tract model that the text-to-speech system uses
- Compresses and expands speech during record or playback
- Performs the analysis half of the speech recognition system
- Performs the analysis half of call progress detection
- Generates tone dialing

The second signal processor is an AT&T [TM] DSP16A (60 MHz). This processor connects directly to the TMS320C25 and is used for up to eight channels of dual tone detection (either DTMF or MF). It is also used to insert transmit data onto the TDM highway and to receive data from the TDM highway.

The Adaptive Delta Pulse Code Modulation (ADPCM) processor is a hardware accelerator for ADPCM. This is primarily used in eight-channel operation mode.

1.4.2.3 Q22-bus Interface

The Q22-bus interface consists of a slave section and a memory interface section. The slave section contains the control and status registers and interrupt control circuitry. The memory interface section allows communication between the Q22-bus host processor and the module.

The Q22-bus interface provides the slave port interface between a host Q22-bus processor and the module. In support of communications between the host processor and the module's main processor is a bank of control and status registers, interprocessor interrupt capability, and a shared memory system through which blocks of data can be passed.

[TM] AT&T is a registered Trademark of the American Telephone and Telegraph Company

1.5 SPECIFICATIONS

Specifications for the M3136 Module are as follows:

1.5.1 M3136 Module Specifications

Mechanical

Height	25.8 cm (10.5 in.)
Length	20.6 cm (8.4 in.)
Width	1.78 cm (0.7 in.)

Electrical Requirements

+5 Volts	3.17 amp
AC load	3.6

Environmental

Storage Conditions

Temperature	5°C (41°F) to 50°C (122°F)
Relative humidity	10% to 95% with wet bulb temperature 32°C (90°F) and a minimum dew point 2°C (36°F)

Operating Conditions

Temperature	5°C (41°F) to 50°C (122°F)
Relative humidity	10% to 95% with wet bulb temperature 32°C (90°F) and a minimum dew point 2°C (36°F)

1.5.2 M3135 Module

Specifications for the M3135 Module are as follows:

Mechanical

Height	25.8 cm (10.5 in.)
Length	20.6 cm (8.4 in.)
Width	1.78 cm (0.7 in.)

Electrical Requirements

+ 5 Volts	4.0 amp
AC load	3.4

Environmental

Storage Conditions

Temperature	5°C (41°F) to 50° C (122°F)
Relative humidity	10% to 95% with wet bulb temperature 32°C (90°F) and a minimum dew point 2°C (36°F)

Operating Conditions

Temperature	5°C (41°F) to 50° C (122°F)
Relative humidity	10% to 95% with wet bulb temperature 32°C (90°F) and a minimum dew point 2°C (36°F)

CHAPTER 2
MODULE INSTALLATION PROCEDURES

NOTE

The module installation procedures documented in this chapter are *not* required for factory preconfigured DECvoice-T1 systems.

NOTE

The CSR procedures listed in Section 2.4 must be performed on each DECvoice-T1 module. Failure to correctly perform CSR configuration on all devices installed in the system may result in a system where devices cannot be autoconfigured and where the operating system may hang or crash.

CAUTION

Make certain that you are wearing a grounded antistatic wrist strap whenever you handle, remove or install modules.

The individual steps that are required for the installation of DECvoice-T1 modules are numbered.

2.1 INTRODUCTION

When installing DECvoice-T1 module into a MicroVAX or VAX system, the following steps must be performed:

- Checking the System Configuration: Section 2.2
- Unpacking Module Shipments: Section 2.3
- Determining CSR Address Settings: Section 2.4
- Determining Module Placement and Installing Modules: Section 2.5
- Controlling Electromagnetic Interference: Section 2.6

2.2 CHECKING THE SYSTEM CONFIGURATION

Before installing the M3136 and M3135 modules, a system configuration worksheet (for the BA200 or BA400 Series enclosure) must be completed. This step ensures that you will not exceed the system's power and bus loads limits.

To determine the numbers and types of controllers installed in the system, you will need to gain access to the system backplane. Refer to the system documentation for procedures to help you remove any covers and gain access to the modules. To check the system configuration, perform the following steps:

- On the worksheet, list all the controllers previously installed in the system. Each module has an identifying label on the cover.
- Add the devices you plan to install in the system onto the worksheet.
- Fill in the information for each controller, using the data listed in Table 1 or in the documentation for the controller.
- Add up the columns. Make sure the 5 V dc, the ac load and the dc load totals are each within the limits specified for the enclosure. See Table 2 for information about the availability of power in various enclosures.

  Each power supply in the enclosure must have a minimum 5 A load on the 5 V output, to maintain regulation. If a power supply does not meet the minimum load requirements, you must install a M9060–YA load module in one of the open backplane slots powered by that power supply. Otherwise, the power supply enters an error mode and shuts down the system.

  If a power supply meets the minimum load requirements, you should remove the existing load module.

Proceed to Section 2.3.

Table 1 Power and Bus Load Data

		Current (Amps) (Max)		Power (Max)	Bus Loads	
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**
AAV11	A1009–PA	1.8	0.0	9.0	2.1	0.5
ADV11–SA	A1008–PA	3.2	0.0	16.0	2.3	0.5
AXV11	A026–PA	2.0	0.0	10.0	1.2	0.3
CXA16–M	M3118–YA	1.6	0.2	10.4	3.0	0.5
CXB18–M	M3118–YB	2.0	0.0	10.0	3.0	0.5
CXY08–M	M3119–YA	1.8	0.3	12.6	3.2	0.5
DELQA–SA	M7515–PA	2.7	0.5	19.5	2.2	0.5
DEQNA–SA	M7504	3.5	0.50	23.5	2.2	0.5
DESQA						
DFA01	M3121–PA	1.97	0.40	14.7	3.0	1.0
DPV11–SA	M8020–PA	1.2	0.30	9.6	1.0	1.0
DRQ3B–SA	M7658–PA	4.5	0.0	22.5	2.0	1.0
DRV1J–SA	M8049–PA	1.8	0.0	9.0	2.0	1.0
DRV1W–SA	M7651–PA	1.8	0.0	9.0	2.0	1.0
DTC05	M3135	3.17	0.0	15.8	3.4	TBS
DTCN5	M3136	4.0	0.0	20.0	3.6	TBS
DZQ11–SA	M3106–PA	1.0	0.36	9.3	1.4	0.5
IBQ01–SA	M3125–PA	5.0	0.0	25.0	4.6	1.0
IEQ11–SA	M8634–PA	3.5	0.0	17.5	2.0	1.0
KA620–AA	M7478	6.2	0.14	32.7	2.7	1.0
KA630–AA	M7606	6.2	0.14	32.7	2.7	1.0
KA650–AA	M7620–A	6.4	0.14	33.6	2.7	1.0
KA655						
KDA50	M7164	6.93	0.0	34.65	3.0	0.5
KDA50	M7165	6.57	0.03	33.21	0.0	0.0
KDJ11–BF	M8190	5.5	0.2	29.9	2.6	1.0
KLESI–SA	M7740–PA	3.0	0.0	15.0	2.3	1.0
KMV1A–SA	M7500–PA	2.6	0.2	15.4	3.0	1.0
KWV11–SA	M4002–PA	2.2	0.013	11.156	1.0	0.3
DPV11–SA	M8086–PA	1.6	0.0	8.0	1.8	0.5
MRV11–D	M7942	1.6[1]	0.0	8.0[1]	3.0	0.5
M9060–YA	M9060	5.3	0.0	8.0	1.8	0.5

[1]Value is for the unpopulated module only.

Table 1 (cont.) Power and Bus Load Data

		Current (Amps) (Max)		Power (Max)	Bus Loads	
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**
MS630–AA	M7607	1.0	0.0	5.0	–	–
MS630–BA	M7608	1.8	0.0	9.0	0.0	0.0
MS630–CA	M7609	3.1	0.0	9.0	0.0	0.0
MS650–AA	M7621–A	2.7	0.0	13.5	–	–
MS650–BA						
MS670–BA	L4001–BA					
MSV11–JD	M8637–D	3.74	0.0	18.7	2.7	0.5
MSV11–JE	M8637–E	4.1	0.0	20.5	2.7	0.5
MSV11–QA	M7551–AA	2.4	0.0	12.0	2.0	1.0
RA70		3.8	4.2	69.4	–	–
RD53A–EA		0.9	2.5	34.5	0.0	0.0
RD54A–EA		1.3	1.34	22.6	0.0	0.0
RF71						
RQDX3–M	M7555	2.48	0.06	13.1	1.9	0.5
TK50E–EA		1.35	2.4	22.6	0.0	0.0
TK70E–EA		1.3	2.4	35.3	–	–
TQK50	M7546	2.9	0.0	14.5	2.8	0.5
TQK70–SA	M7559	3.5	0.0	32.5	3.0	1.0

Table 2 Enclosure Slots and Power

Enclosure	Q-bus Slots	Supplies	Total Power
BA213	12	2	460
BA215	6	1	230
BA440	7	1	584

2.3 UNPACKING MODULE SHIPMENTS

The basic DECvoice-T1 module shipment consists of the M3136 module, M3135 module, related parts, and the DECvoice-T1 module documentation. A kit that contains a M3135 module and related parts is also available.

1. Check the shipment against the packing list; verify that all items have been received.

   In the event the shipment is damaged, stop unpacking and notify the delivery agent and your Digital sales representative.

   In the event of missing parts, determine the missing part(s) and notify your Digital sales representative.

2. Proceed to the module configuration procedures in Section 2.4.

CAUTION

The M3136 and M3135 modules are shipped in electrostatic protective sleeves. Do not remove the sleeves until you are ready to install the modules. Also, make sure that you protect the modules from static electricity during handling and installation.

Table 3 lists the components included in the DECvoice-T1 System.

Table 3 DECvoice-T1 Components

Part Name	Part Name and Description	Part Number
DTCN5–UG	T1 Voice upgrade Kit	
	M3135 voice module	M3135–02
	M3136 T1 module	M3136–00
	TDM bus terminators (3)	12–33621–01
	Internal short TDM cable	70–27727–01
	Internal medium TDM cable	70–27727–02
	Bulkhead assembly and cables	70–27814–01
	Cable assembly, right-angle D-subminiature connector (3)	17–02903–01
DTC05–SA	Digital encoded voice	
	M3135 voice module	M3135–02
	Internal short TDM cable	70–27727–01
CK–DTC05–AA	TDM expansion cabinet kit	
	DECvoice expansion TDM bulkhead	70–27813–01
	TDM 9 ft expansion cable	17–02849–01

2.4 CONFIGURING DECvoice MODULES-

A unique CSR address must be set on each DECvoice-T1 module to be installed into a MicroVAX or VAX system.

NOTE

When configuring the system using SYSGEN, you must account for all controllers and all KFQSA disks (such as the RF31 or the RF71) that are installed in the target system in order to receive a valid CSR configuration. Failure to specify all controllers and all KFQSA disks will cause SYSGEN to recommend an invalid system configuration — a configuration where devices cannot be correctly configured and where the operating system may hang or crash.

If you are uncertain of your current hardware configuration, please contact your Digital Customer Services representative.

2.4.1 Controller Configuration

The following procedure is necessary to determine the CSR address and where applicable, the proper interrupt vector settings for all controllers installed in the system. The DECvoice-T1 modules have softloaded vector addresses; the DECvoice-T1 device interrupt vectors are set by the DECvoice software.

1. DECvoice-T1 hardware requires a minimum of DECvoice Software VOX version V2.0. VOX V2.0 requires a minimum VMS version of V5.3.

2. Install the DECvoice Software binaries and register the associated "VOX" Product Authorization Key (PAK) on the target system. Software installation instructions and the requisite SYSGEN parameter modifications are documented in the *DECvoice VOX V2.0 Installation Manual.*

   Before attempting the software installation, please print and read the DECvoice software release notes; these are located in the file SYS$HELP:VOX$%%%.RELEASE_ NOTES, where %%% is the latest version installed. *Digital places important information in the release notes.*

   The DECvoice software must be installed and the PAK registered before any of the DECvoice devices can be successfully autoconfigured.

3. Determine the device name and the quantity of each controller[1] installed in the target system. Each controller that was previously installed in the target system must be checked to make certain that it is at the correct CSR address and interrupt vector address after changing the configuration. Also, determine if KFQSA disks are installed on the target system.

   The MicroVAX or VAX processor module and any associated memory modules do *not* affect the configuration procedure; the presence of these modules can be ignored for the purposes of the system configuration.

4. From a running VMS system, use SYSGEN to determine the address and vector configuration of the target system. You *must* enter *all* devices and *all* KFQSA disks that will be coresident on the target system.

   The following commands are an example of the configuration procedure necessary for a system with a KFQSA controller with two RF71 disks, one RA90 off a KDA50 controller, one M3136 and four M3135 controllers.

   ```
   $ RUN SYS$SYSTEM:SYSGEN
   SYSGEN> CONFIGURE
   DEVICE> UDA,3   !two KFQSA RF71 disks, one KDA50 RA90
   DEVICE> DTCN5,1 !one T1 interface
   DEVICE> DTC05,4 !four voice modules
   DEVICE> ^Z
   ```

   SYSGEN will display the list of CSR addresses and vector addresses that all modules installed in the system must be set to.

NOTE

The installation or removal of any controller modules or of any KFQSA disks will normally require changes to the CSR and vector settings of the other controller modules.

5. Make certain that the complete system software is backed up prior to continuing with these procedures.

NOTE

It is the customer's responsibility to perform a software backup.

6. Perform an orderly shutdown of the target system, power the system off and unplug it before removing or inserting any modules.
7. Using appropriate antistatic procedures, remove the modules from the packaging and protective sleeves.
8. Set the specified CSR address into the CSR switchpack for each M3136 module. See Figure 4 for the definition and location of the M3136 CSR switchpack.

   The CSR address displayed by SYSGEN CONFIGURE is encoded into the CSR switchpack by opening and closing the switches as displayed in Figure 5.
9. Set the specified CSR address into the CSR switchpack for each M3135 module. See Figure 6 for the definition and location of the M3135 CSR switchpack.

   For the procedure used to encode a M3135 CSR address setting that is not listed in Figure 7, see Section 2.4.3.

   Each CSR figure, including Figure 6 contains a diagram of the switchpack at the top and a table of additional switch settings. The black area of each switch in the switchpack diagram indicates the direction (*open* or *closed*) toward which the switch has been pressed or slid. The lower portion of the table uses the abbreviation *CL* for *closed* switch and *OP* for an *open* switch.

   The CSR address displayed by SYSGEN CONFIGURE is encoded into the CSR switchpack by opening and closing the switches as displayed in Figure 7.
10. Refer to Section 2.5 for procedures for module placement.

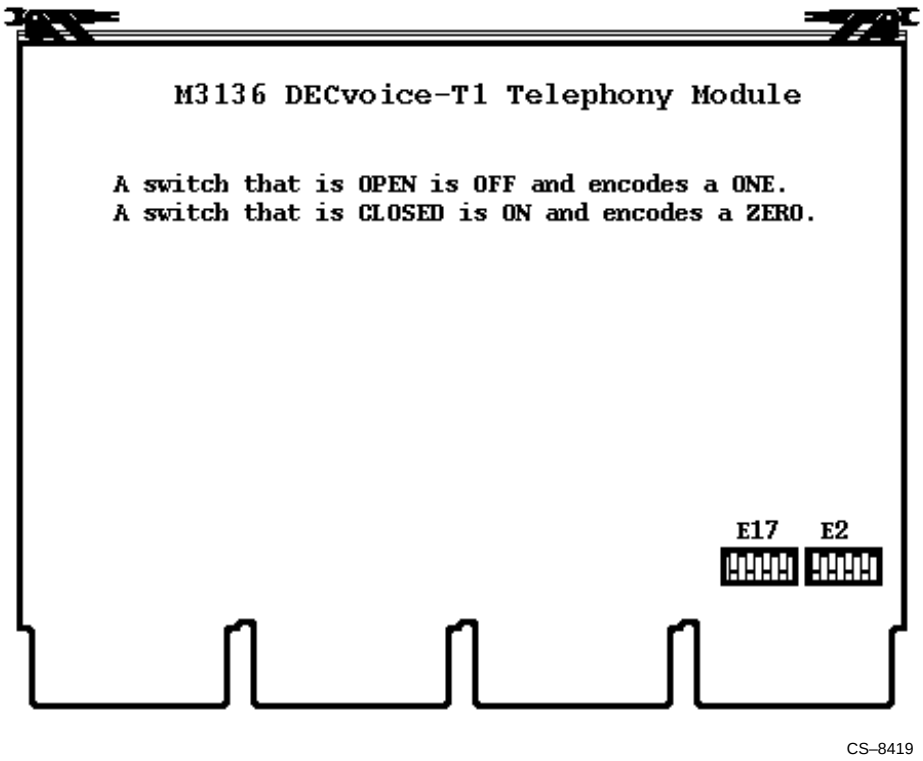

Figure 4 M3136 Module Switchpacks

M3136 CSR Settings

					E2						E17							
	1	1	1	1	1												0	DEVICE
MSB	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0 LSB	ADDRESS
	-	-	-	-	-	0	0	0	1	0	1	0	1	0	1	1	0	-	761254
	-	-	-	-	-	0	0	0	1	0	1	0	1	1	0	0	0	-	761260
	-	-	-	-	-	0	0	0	1	0	1	0	1	1	0	1	0	-	761264
	-	-	-	-	-	0	0	0	1	0	1	0	1	1	1	0	0	-	761270
	-	-	-	-	-	0	0	0	1	0	1	0	1	1	1	1	0	-	761274
	-	-	-	-	-	0	0	0	1	0	1	1	0	0	0	0	0	-	761300
	-	-	-	-	-	0	0	0	1	0	1	1	0	0	0	1	0	-	761304
	-	-	-	-	-	0	0	0	1	0	1	1	0	0	1	0	0	-	761310
	-	-	-	-	-	0	0	0	1	0	1	1	0	0	1	1	0	-	761314
	-	-	-	-	-	0	0	0	1	0	1	1	0	1	0	0	0	-	761320
	-	-	-	-	-	0	0	0	1	0	1	1	0	1	0	1	0	-	761324
	-	-	-	-	-	0	0	0	1	0	1	1	0	1	1	0	0	-	761330
	-	-	-	-	-	0	0	0	1	0	1	1	0	1	1	1	0	-	761334
	-	-	-	-	-	0	0	0	1	0	1	1	1	0	0	0	0	-	761340
	-	-	-	-	-	0	0	0	1	0	1	1	1	0	0	1	0	-	761344
	-	-	-	-	-	0	0	0	1	0	1	1	1	0	1	0	0	-	761350
	-	-	-	-	-	0	0	0	1	0	1	1	1	0	1	1	0	-	761354
	-	-	-	-	-	0	0	0	1	0	1	1	1	1	0	0	0	-	761360

SWITCH OPEN = OFF = PRODUCES A LOGICAL 1

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Figure 5 M3136 Example CSR Settings

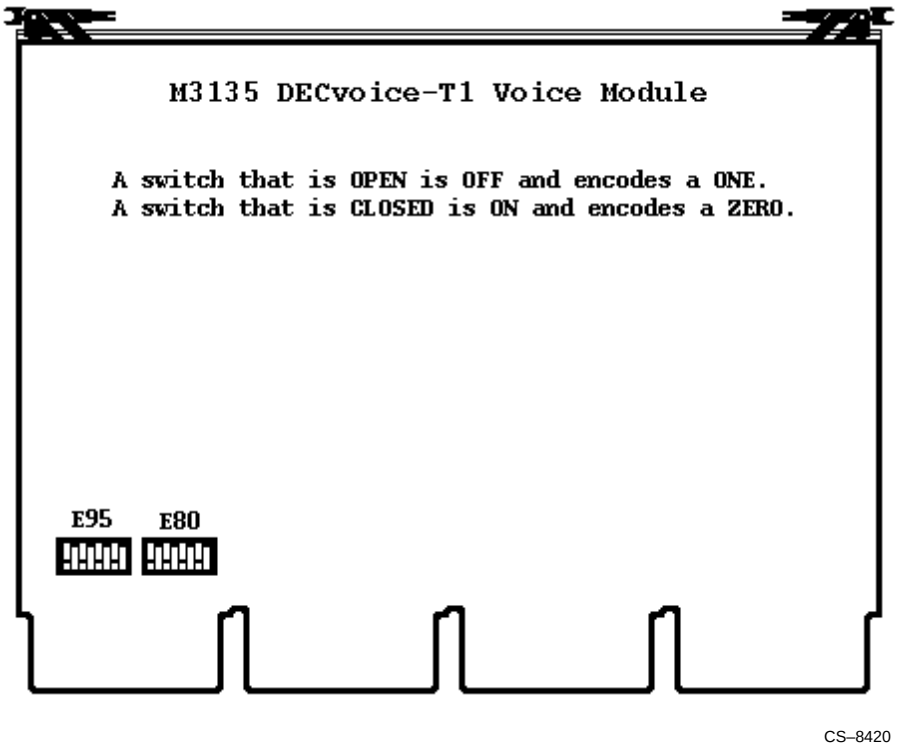
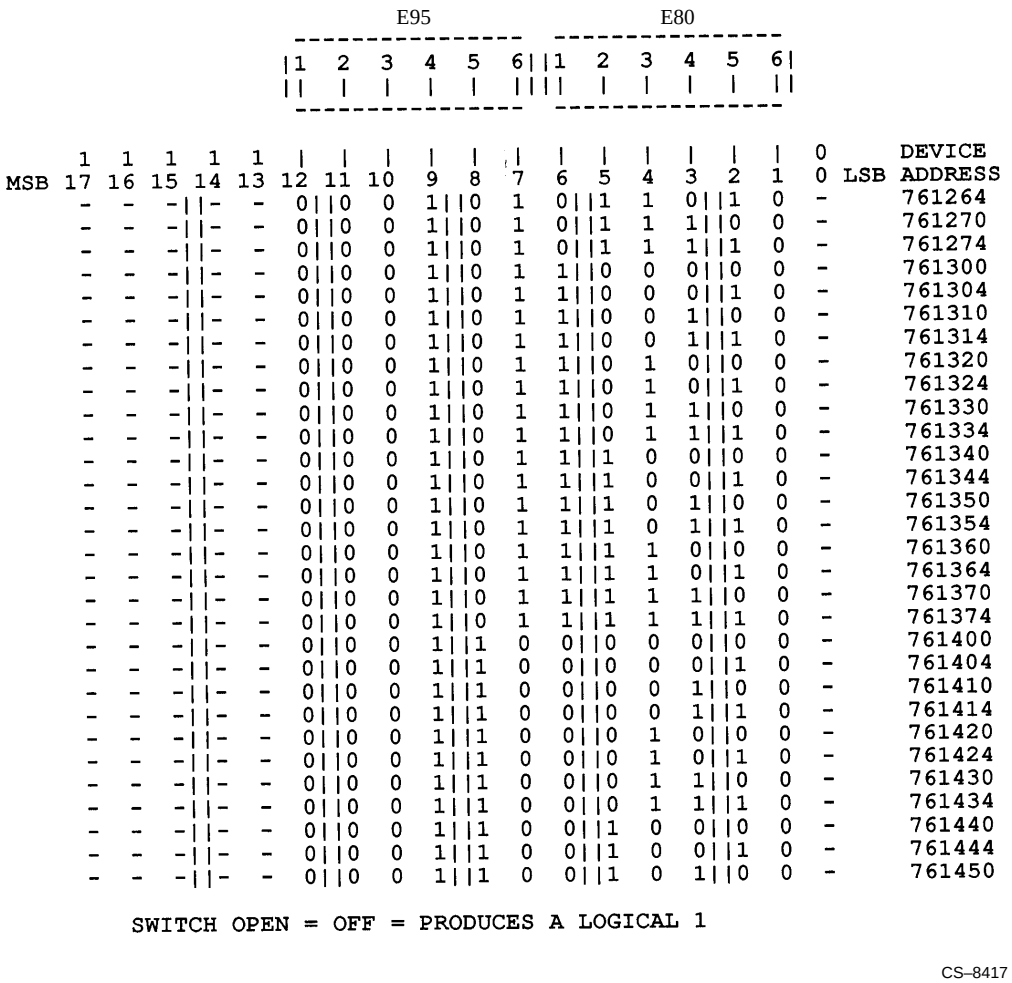


Figure 6 M3135 Module Switchpacks

M3135 CSR Settings



MSB 17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0 LSB	DEVICE ADDRESS
1	1	1	1	1													0	
-	-	-	-	-	0	0	0	1	0	1	0	1	1	0	1	0	-	761264
-	-	-	-	-	0	0	0	1	0	1	0	1	1	1	0	0	-	761270
-	-	-	-	-	0	0	0	1	0	1	0	1	1	1	1	0	-	761274
-	-	-	-	-	0	0	0	1	0	1	1	0	0	0	0	0	-	761300
-	-	-	-	-	0	0	0	1	0	1	1	0	0	0	1	0	-	761304
-	-	-	-	-	0	0	0	1	0	1	1	0	0	1	0	0	-	761310
-	-	-	-	-	0	0	0	1	0	1	1	0	0	1	1	0	-	761314
-	-	-	-	-	0	0	0	1	0	1	1	0	1	0	0	0	-	761320
-	-	-	-	-	0	0	0	1	0	1	1	0	1	0	1	0	-	761324
-	-	-	-	-	0	0	0	1	0	1	1	0	1	1	0	0	-	761330
-	-	-	-	-	0	0	0	1	0	1	1	0	1	1	1	0	-	761334
-	-	-	-	-	0	0	0	1	0	1	1	1	0	0	0	0	-	761340
-	-	-	-	-	0	0	0	1	0	1	1	1	0	0	1	0	-	761344
-	-	-	-	-	0	0	0	1	0	1	1	1	0	1	0	0	-	761350
-	-	-	-	-	0	0	0	1	0	1	1	1	0	1	1	0	-	761354
-	-	-	-	-	0	0	0	1	0	1	1	1	1	0	0	0	-	761360
-	-	-	-	-	0	0	0	1	0	1	1	1	1	0	1	0	-	761364
-	-	-	-	-	0	0	0	1	0	1	1	1	1	1	0	0	-	761370
-	-	-	-	-	0	0	0	1	0	1	1	1	1	1	1	0	-	761374
-	-	-	-	-	0	0	0	1	1	0	0	1	0	0	0	0	-	761400
-	-	-	-	-	0	0	0	1	1	0	0	1	0	0	0	1	0	-	761404
-	-	-	-	-	0	0	0	1	1	0	0	1	0	0	1	0	0	-	761410
-	-	-	-	-	0	0	0	1	1	0	0	1	0	0	1	1	0	-	761414
-	-	-	-	-	0	0	0	1	1	0	0	1	0	1	0	0	0	-	761420
-	-	-	-	-	0	0	0	1	1	0	0	1	0	1	0	1	0	-	761424
-	-	-	-	-	0	0	0	1	1	0	0	1	0	1	1	0	0	-	761430
-	-	-	-	-	0	0	0	1	1	0	0	1	0	1	1	1	0	-	761434
-	-	-	-	-	0	0	0	1	1	0	0	1	1	0	0	0	0	-	761440
-	-	-	-	-	0	0	0	1	1	0	0	1	1	0	0	1	0	-	761444
-	-	-	-	-	0	0	0	1	1	0	0	1	1	0	1	0	0	-	761450

SWITCH OPEN = OFF = PRODUCES A LOGICAL 1

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Figure 7 M3135 Example CSR Settings

2.4.2 Common Devices Names

The Table 4 contains a list of common device names. See the appendix of the SYSGEN reference, *VMS System Generation Utility Manual*, order number AA–LA30A–TE, for additional devices and the appropriate Software Product Descriptions (SPDs) for the lists of supported devices and configurations.

The MicroVAX or VAX processor module and any associated memory modules do not affect the configuration procedure; the presence of these modules can be ignored for the purposes of the system configuration.

Table 4 Common Controller Names

Controller Prefix[1]	SYSGEN Mnemonic[2]	Controller Type[3]	Controller Name[4]
GAA	VCB02	graphics	VCB02, QDSS[5]
MSA	TS11	tape	TS11, TSV05
ONA	DPV11	synch comm	DPV11
PUA	UDA50	disk	KDA50, UDA50, RQDX3, KFQSA[6]
SJA	DSV11	synch	DSV11
TTA	DZ11	serial	DZV11, DZQ11
TUA	TU81	tape	TU81, TU81E, TQK50, TQK70
VCA	VCB02	graphics	VCB02, QDSS[5]
VXA	DTC04	DECvoice	DTC04
VMA	DTC05	DECvoice	DTC05 (M3135)
VNA	DTCN5	DECvoice	DTCN5 (M3136)
XAA	DR11W	synch comm	DRV11
XQA	QNA	ethernet	DELQA, DESQA, DEQNA

[1]The SYSGEN command SHOW/CONFIGURATION can be used to display the list of controller prefixes of the controllers currently installed in the system. Controller prefixes are used by the VMS software.
[2]The SYSGEN mnemonic is the software controller name passed in to SYSGEN during a SYSGEN CONFIGURATION.
[3]The controller type field contains a general description of the function typically performed by the controller.
[4]The controller name is the hardware name; it appears in the hardware documentation.
[5]The QDSS and QVSS controllers show up differently depending on the setting of the SYSGEN WINDOW_SYSTEM parameter. If WINDOW_ SYSTEM is 1, the window system is DECwindows and the controllers will be displayed as some combination of GAA, GBA, GCA, IKA, IMA and INA devices.
*[6]*A KFQSA device controller emulates zero or more KDA50 devices; it will appear as zero or more PUA controllers on a SYSGEN SHOW/CONFIGURATION command. When configuring a system with a KFQSA, You must specify a UDA controller for each RF disk present on the KFQSA. This is in addition to any other UDA device controllers that might be present. RF-series disks that are directly connected to a VAX processor (that is, disks that connect directly to the imbedded DSSI disk controller on the VAX 4000 model 300 or the MicroVAX 3400) and are not connected to a KFQSA on the target system should not be specified as additional UDA controllers when performing the configuration procedures.

2.4.3 SYSGEN CONFIGURE Example

The following example demonstrations the installation of a DTCN5 and four DTC05 modules to a system containing a KFQSA attached to four RF71 disks (the KFQSA emulates four KDA50-type controllers: PUA, PUB, PUC, PUD) and an Ethernet controller (XQA).

```
$ run sys$system:sysgen SYSGEN>  SHOW/CONFIGURATION
System CSR        and Vectors on  6–MAR–1990 14:21:57.48
Name: PUA         Units: 1  Nexus:0    (UBA) CSR: 772150  Vector: 154  Vector2: 000
Name: XQA         Units: 2  Nexus:0    (UBA) CSR: 774440  Vector: 120  Vector2: 000
Name: PUB         Units: 1  Nexus:0    (UBA) CSR: 760334  Vector: 300  Vector2: 000
Name: PUC         Units: 1  Nexus:0    (UBA) CSR: 760340  Vector: 304  Vector2: 000
Name: PUD         Units: 1  Nexus:0    (UBA) CSR: 760344  Vector: 310  Vector2: 000
SYSGEN>  CONFIGURE
DEVICE> dtc05,4
DEVICE> dtcn5,1
DEVICE> qna,1
DEVICE> uda,4
DEVICE> ^Z
Device: UDA     Name: PUA    CSR: 772150     Vector: 154    Support: yes
Device: QNA     Name: XQA    CSR: 774440     Vector: 120    Support: yes
Device: UDA     Name: PUB    CSR: 760334*    Vector: 300*   Support: yes
Device: UDA     Name: PUC    CSR: 760340*    Vector: 304*   Support: yes
Device: UDA     Name: PUD    CSR: 760344*    Vector: 310*   Support: yes
Device: DTCN5   Name: VNA    CSR: 761354*    Vector: 320*   Support: no
Device: DTC05   Name: VMA    CSR: 761364*    Vector: 330*   Support: no
Device: DTC05   Name: VMB    CSR: 761370*    Vector: 340*   Support: no
Device: DTC05   Name: VMC    CSR: 761374*    Vector: 350*   Support: no
Device: DTC05   Name: VMD    CSR: 761400*    Vector: 360*   Support: no
SYSGEN>  ^Z $
```

2.4.4 DECvoice SYSGEN Rank

Table 5 contains the CSR and vector rank assigned to the DECvoice-T1 M3136 and M3135 modules.

Table 5 DECvoice SYSGEN Rank

Controller[1]	Rank	Size[2]	Modulus[2]
DTCN5 CSR	65	2	4
DTCN5 Vector[3]	90	4	10
DTC05 CSR	66	2	4
DTC05 Vector[3]	91	4	10

[1]The information in this table is required for non-standard hardware configurations only. DECvoice modules are what the SYSGEN manual refers to as device type “D”, that is, the modules are installed at CSR addresses and vector addresses that vary according to what other devices are present on the system. The SYSGEN CONFIGURE command is used to determine the correct settings.
[2]The units of the decimal size and the octal modulus fields are words and bytes, respectively.
[3]The DTC05 and the DTCN5 have softloaded interrupt vector addresses; neither device sports a vector switchpack.

2.5 GUIDELINES FOR MODULE PLACEMENT

Bus grant signals pass through each installed module using the “A” connectors, the uppermost set of connectors in each slot. Figure 8 shows the path of the bus grant signals in the BA200 and BA400 Series Q-bus enclosures. To ensure the continuity of this path, use bus grant continuity card, M9047 in the uppermost side of each empty backplane slot.

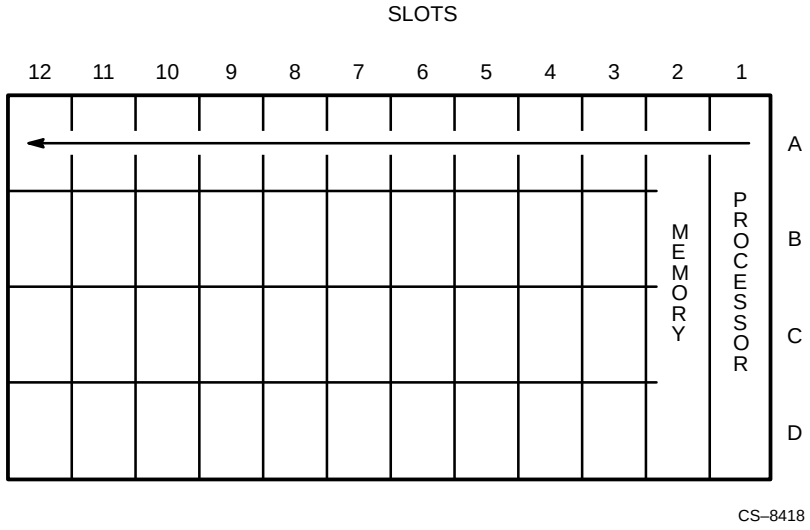


Figure 8 Bus Grant Continuity Path

2.5.1 Module Order

The order of the modules in the backplane depends on several factors:

- Relative use of devices in the system
- Expected performance of each device relative to other devices
- Ability of a device to tolerate delays between bus grant requests and bus grants (delay tolerance)
- Tendency of a device to prevent devices farther from the CPU from accessing the bus
- Amount of power available from the power supply in each section of the Q-bus backplane

Table 6 lists the recommended order of modules in a BA200 or BA400 Series enclosure. Use the table as a guideline when installing modules.

Table 6 Recommended Module Order

Option	Description
KA650/KA655/KA660/KA670[1]	VAX, MicroVAX or VAXserver Processor
MS630/MS650/MS670[1]	Processor Memory
DELQA/DESQA	Ethernet Interface
M3136	DECvoice-T1 Telephony Interface
M3135	DECvoice-T1 Voice Interface
CXA16	Asynchronous Communications Interface
CXB16	Asynchronous Communications Interface
CXY08	Asynchronous Communications Interface
KDA50	DSA Disk Controller
KFQSA	DSSI Disk Controller
KLESI	Storage Interface
TQK50/TQK70	Cartridge Tape Controller
RQDX3	RD Disk Controller

[1]The KA670 and MS670 modules are placed in dedicated slots in the BA440 enclosure. The KA670 and MS670 modules can be installed only in the BA440 enclosure.

2.5.2 Removing and Installing Modules

Refer to Section 2.5.4 for the TDM installation and the restrictions on the placement of the M3135 and the M3136 modules.

Check the recommended module order listed in Table 6 to determine in which slots to install the M3136 or M3135 modules. If you need to relocate modules in the backplane, use the following procedure and keep the modules in their original order.

CAUTION

Make certain that you are wearing a grounded antistatic wrist strap whenever you handle, remove or install modules.

1. Release the two 1/4-turn captive screws that hold the cover to the card cage (see Figure 9). If present, unlock the release levers by simultaneously pulling up on the end of the top lever and pulling down the end of the bottom lever (see Figure 10).
2. Pull the cover away from the card cage and slide the controller module out of the card cage.
3. Note the orientation of any internal cables connected to the module. Some connectors are not keyed. Carefully label and disconnect the internal cables.
4. Confirm the module CSR address and interrupt vector, if applicable. Change the settings if necessary. Documentation on how to perform this is included in the controller hardware documentation. If no changes are necessary, do not alter the settings on any switchpacks.
5. Install the module in its new location by reversing steps in this procedure. Do not fasten the 1/4-turn screws yet.
6. To finish the module installation, proceed to Section 2.6.

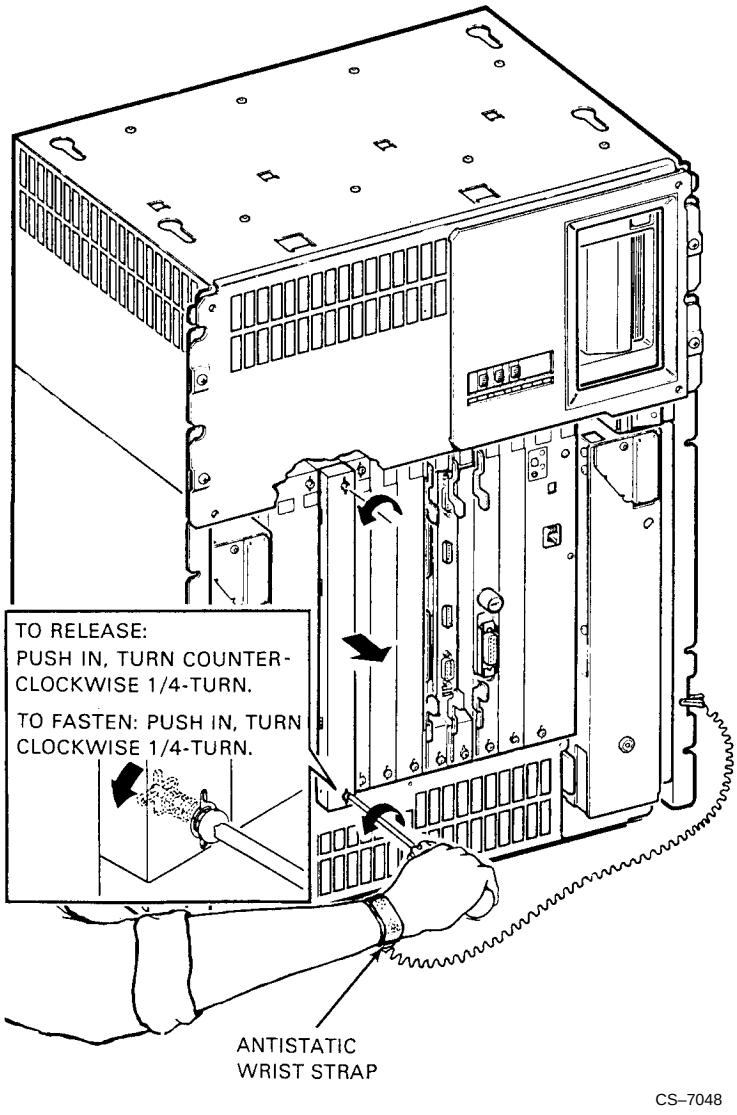
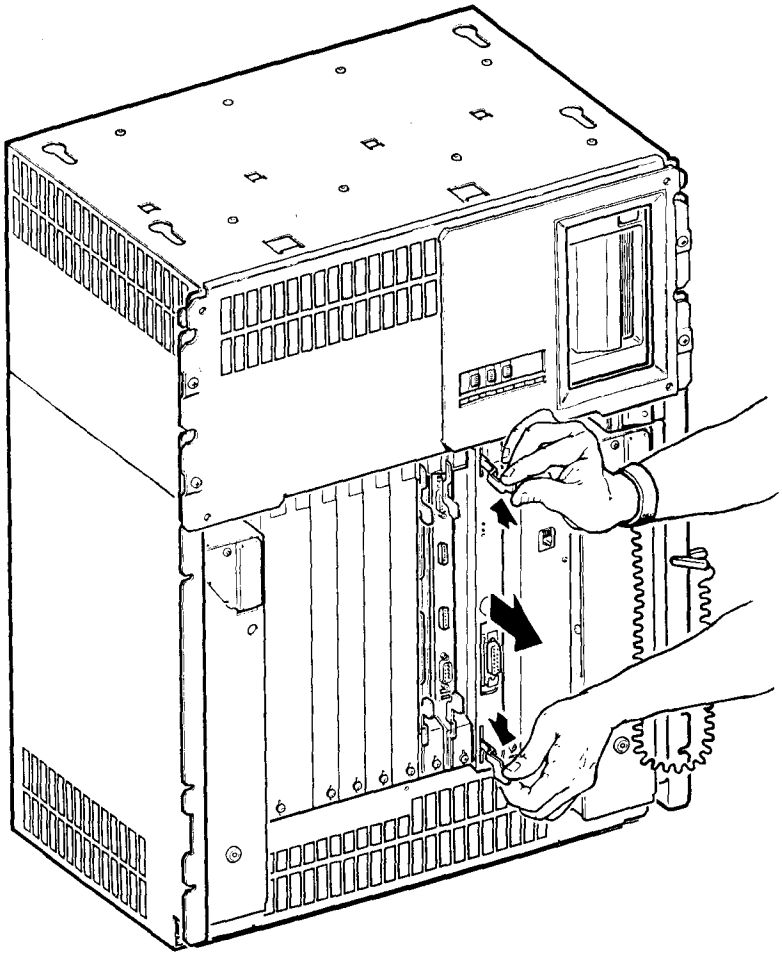


Figure 9 Releasing the Captive Screws



NOTE:

THIS ILLUSTRATION SHOWS HOW TO UNLOCK RELEASE LEVERS ON ALL MODULES WITH ATTACHED HANDLES.

CS–6762

Figure 10 Unlocking the Release Levers

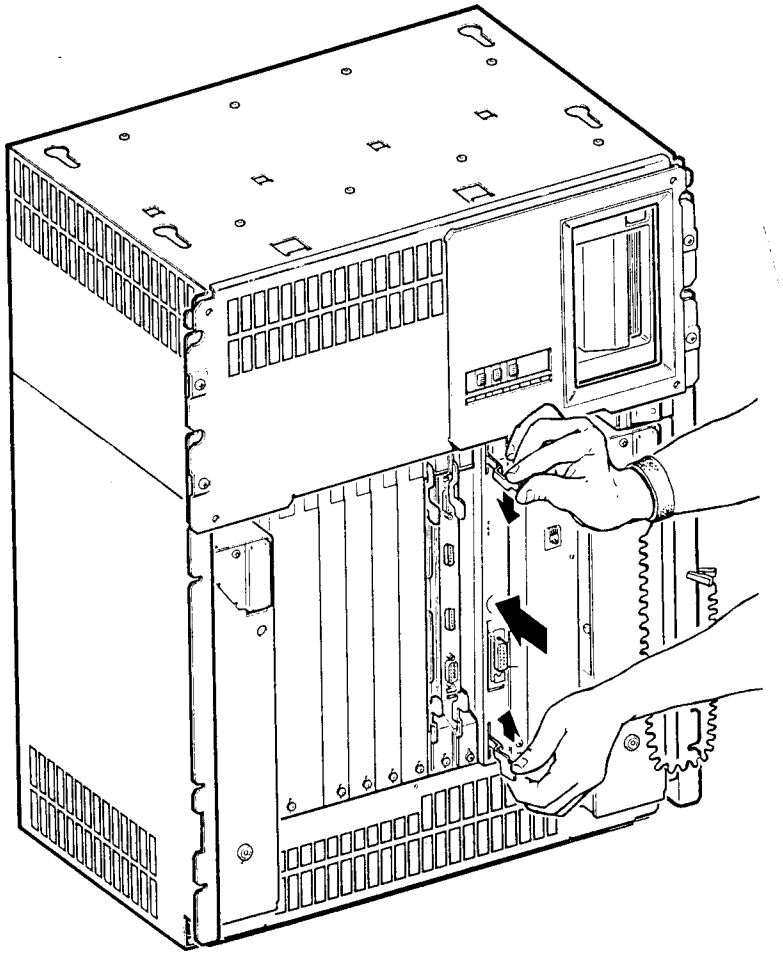
2.5.3 Installing the DECvoice-T1 Modules

CAUTION

Be careful not to snag module components on the card guides or adjacent modules.

1. Insert the M3136 module into the appropriate card slot (see Figure 11). The M3136 module should be placed in the rightmost position of the DECvoice modules. If there is a host and an expansion BA200 or BA400 series enclosure, the M3136 module should be placed in the rightmost available slot in the expansion enclosure. M3135 modules can be placed in either the system or the expansion enclosure. (Refer to Section 2.5.4 for the applicable TDM cabling restrictions.)
2. Insert each M3135 module into a Q-bus slot (see Figure 11). Groups of DTC05 modules are known as shelves and are inserted into contiguous slots; there can be no other intervening modules.

- The first TDM shelf is located in the same enclosure as the M3136, in the Q-bus slots immediately to the left of the M3136 module.
- The second TDM shelf is located in the same enclosure as the M3136, immediately to the left of the first TDM shelf.
- The third TDM shelf is located in the other enclosure, the system enclosure. In the BA200 series enclosure, the third shelf should be located to the left of the Ethernet adapter, or if no Ethernet controller is present, to the left of the memory module. In the BA400 series system enclosure, the third shelf should be located in the rightmost available Q-bus slot in the enclosure.



NOTE:

THIS ILLUSTRATION SHOWS HOW TO LOCK RELEASE LEVERS AND INSERT ALL MODULES WITH ATTACHED HANDLES.

CS–6763

Figure 11 Installing a Module

2.5.4 Connecting the TDM Highways

The M3136 module is connected to up to three TDM highways. Each TDM highway is daisy-chained through a shelf of from 1 to 4 M3135 modules, typically. The last M3135 module in each shelf has a TDM terminator module inserted into the bottom TDM connector.

The following steps are used to connect the TDM in a BA200 or BA400 series system or expansion enclosure.

The following steps also assume that each M3135 module will operate in *eight-line mode*; thus up to four modules[1] can be connected to each TDM highway without saturating the highway.

NOTE

Other combinations of M3135 modules, M3136 and shelves are possible; each is subject to the thirty-two channel limit on the TDM highway for each shelf.

The TDM connector is a 20-pin IDC connector. All DECvoice-T1 modules have a double-stack IDC; the M3136 module has an additional single 20-pin IDC.

1. The M3135 modules installed in the system should be grouped into sets of four (or more) modules, if three or fewer of the modules on a TDM highway will be operating in eight-line mode. Each set of four (or more) M3135 modules [2], known collectively as a shelf, will be interconnected with short TDM cables. The first shelf must always be installed into Q-bus slots that are physically adjacent to a M3136 module.
2. Verify that there are no intervening modules among any of the M3135 modules in any individual TDM shelf.
3. Place a TDM terminator into the lower of the double-stack TDM connector of the leftmost[1] M3135 module in each shelf. If there is only a single shelf, then place the second terminator directly into the single 20-pin TDM connector on the DTCN5 module.
4. Connect the TDM highway within each shelf. Using a short TDM cable, lace the upper IDC of each M3135 module in the shelf to the lower IDC of the M3135 located immediately to the right. Use only short TDM cables for this task.
5. Check the cabling of each TDM shelf by verifying that the upper connector of the first (rightmost) M3135 module is open and that the lower connector of the leftmost M3135 module contains a TDM terminator.
6. Connect the uppermost TDM connector of the rightmost M3135 module of the first TDM shelf to the lower IDC of the double-stack TDM connector on the M3136 module. Use a short TDM cable for this.

7. If a second TDM shelf is present, connect the uppermost TDM connector of the rightmost M3135 module in the shelf to the single TDM connector on the M3136 module. Use the medium length TDM cable.

NOTE

If there is only one TDM shelf, then the single TDM connector (the secondary TDM connector) should contain a terminator.

8. Refer to Section 2.6 to determine if the M3136 cover needs a gap filler assembly. If the M3136 cover does need a gap filler, install it now. This cover is placed over the M3136 and an adjacent M3135 module.
9. Make the two connections from the M3136 module to the M3136 cover. Connect the 40-conductor cable from the M3136 cover to the 40-pin connector on the M3136 module, and connect the 20-pin TDM cable from the M3136 cover to the upper position of the double-stack connector on the M3136 module.
10. If a third TDM shelf is present, connect the uppermost TDM connector of the rightmost M3135 module in the shelf to the M3135 module cover. Cable the M3135 module cover to the M3136 module cover using the external, long, TDM cable.
11. Cover the remaining M3135 modules with blank covers, checking the covers over the leftmost and rightmost modules to determine if either requires a gap filler.
12. Proceed to Section 2.6.

---

[1] Four modules, each operating in eight-line mode, use all available channels on the TDM. Digital recommends that no more than four M3135 modules be placed in a shelf.
[2] The leftmost M3135 module is the module that is electrically furthest from the VAX or MicroVAX processor.

2.6 CONTROLLING ELECTROMAGNETIC INTERFERENCE

To comply with applicable United States regulations on electromagnetic interference (EMI), the bulkhead, blank covers, and gap fillers are designed to reduce EMI.

If you install a module with a blank cover or flush handle next to a recessed-handle module, you must install a gap filler assembly between the modules to meet EMI regulations. Without the gap filler, circuitry on the recessed handle module is exposed.

Two gap filler assemblies (refer to Table 3) are provided with the option kit. Each gap filler assembly includes one gap filler and two screws. Use as many of the assemblies as is necessary for your application.

Check that the ground connections are correctly in place as follows:

1. Check the EMI and EOS clips on the M3136 and M3135 covers for residue or corrosion (see Figure 12). Also, check the EMI clips on any gap fillers. Remove any residue or corrosion with alcohol.
2. Check the backplane to see if any recessed-handle module is next to a module with a blank cover or flush handle.
3. If so, make sure a gap filler assembly is installed on the side of the blank cover or flush handle that is next to the recessed-handle module (see Figure 13). If there are no open spaces, you do not need to install any gap filler assemblies.

NOTE

There must not be any missing clips, gaps or open spaces left between module covers in the enclosure.

4. Make sure the EMI and EOS clips are arched. When you press them slightly, they should return to their original shape.
5. If any EMI or EOS clip is missing or broken, replace it. (refer to Table 3) for the part numbers of the clips.
6. If a gap filler assembly is required, install it as follows:

   a. Fit the gap filler onto the side of the blank cover or flush-handle module that is next to the recessed-handle module. Make sure that the gap filler's tabs fit into the tab indentations on the blank cover or flush-handle (see Figure 14). Use the two screws that come with the assembly to attach the gap filler at the top and bottom.

   b. If you have a blank cover, place the blank cover with the gap filler over the card cage slot.

   If you have a flush-handle module, insert the module into the card cage slot.

   c. Make sure that there is a good ground-that there are no open spaces-between the two modules.

   d. Fasten the 1/4-turn captive screws on all handles and covers in the backplane.

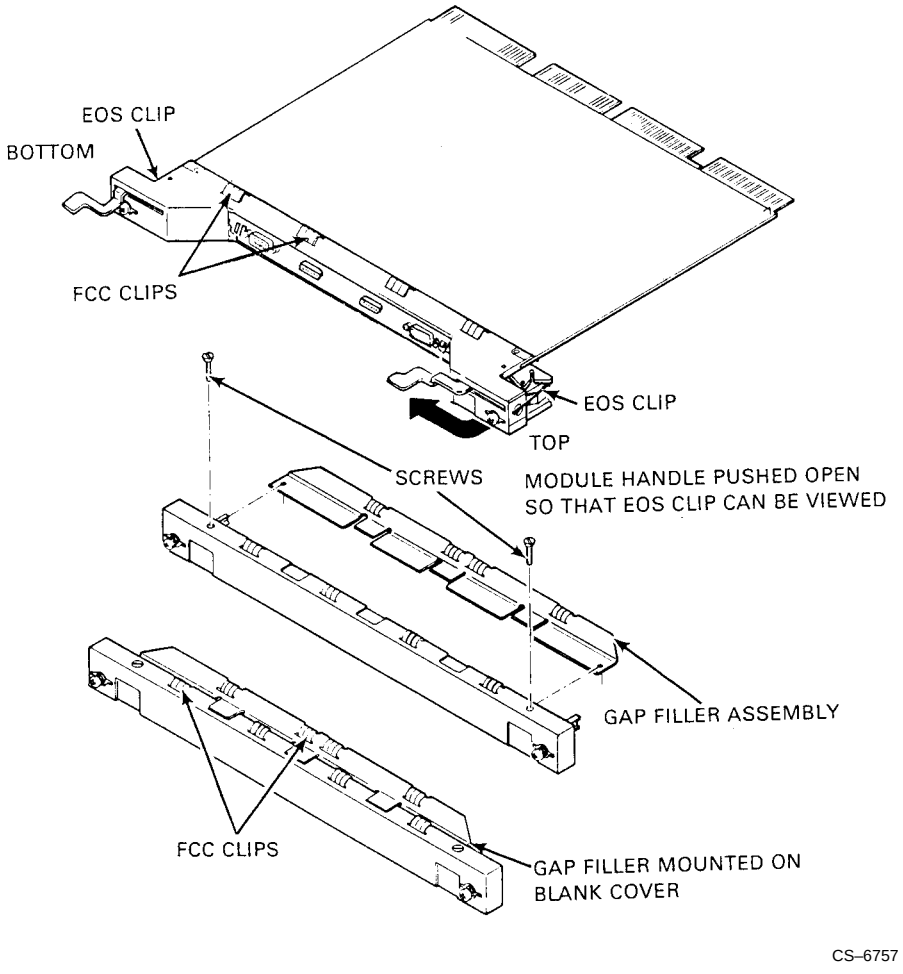


Figure 12 EMI and EOS Clips

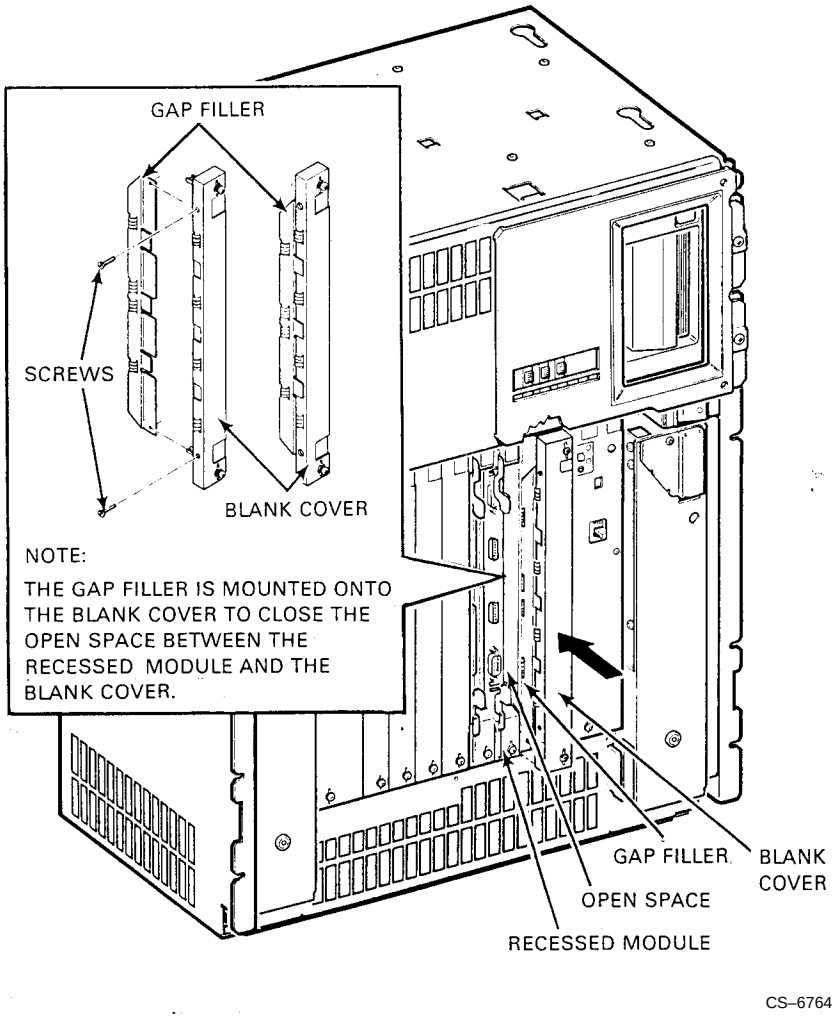


Figure 13 Gap Filler Installation

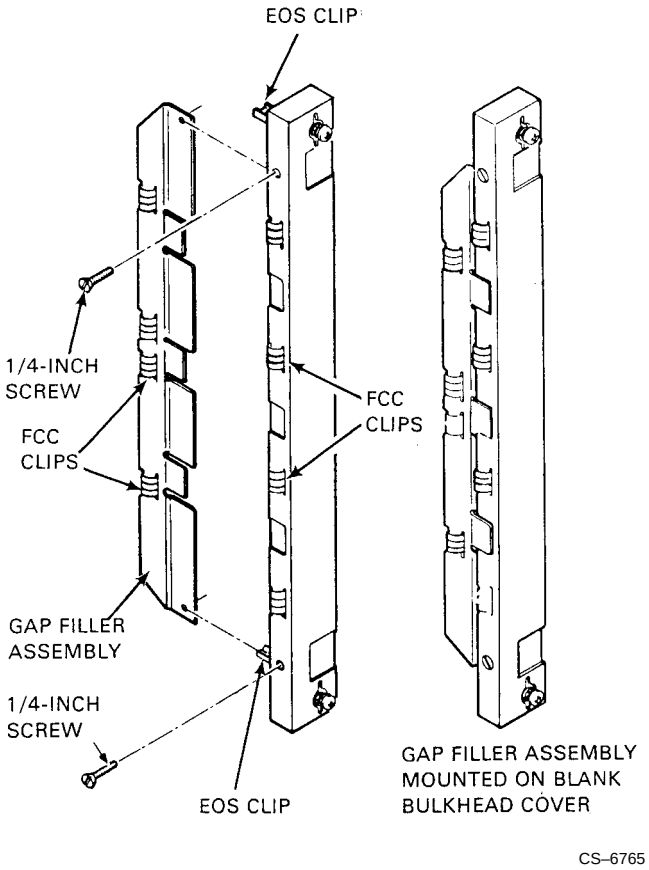


Figure 14 Attaching the Gap Filler Assembly

2.7 MicroVAX DIAGNOSTIC MONITOR PROCEDURES

The DECvoice-T1 system will be supported in Release 135 of the MicroVAX Diagnostic Monitor (MDM). For complete details on the use of MDM, please refer to the *MDM User's Guide*, AA–FM7AE–DN.

2.7.1 MDM Diagnostic Overview

The MDM diagnostic (NADTB) consists of two distinct sections: device tests; exerciser tests. Each of these sections can be run in either the User or Service mode.

The Device Test exercises the Q-bus accessible sections of the modules including the CSRs and the module memory. The Exerciser Tests uses downline load microcode to perform tests on the subsystems of the module. This microcode is executed by the onboard microprocessors that report errors and status to MDM through the Q-bus interface.

In the User mode, the system exerciser performs all tests in internal loopback mode. In the Service mode, however, H3027 loopback connectors (see Figure 15) must be installed on all three T1 bulkhead connectors (located on the M3136 handle cover) in order for the diagnostic to pass successfully.

2.7.2 Interpreting MDM Failure Reports

The MDM diagnostic (NADTB) reports errors on two types of modules – the T1 module (M3136)0 and the Voice module (M3135). Since there are usually more than one Voice module per system, the diagnostic identifies each failing module through the use of a unique "module number". This module number relates to a specific M3135 device in the system.

In order to identify which physical Voice module relates to the reported module number, it is necessary to know the CSRs of all the Voice modules in the system. The module number relates to the device CSRs in a one-to-one relationship. Voice module number 0 is the Voice module with the lowest CSR value. Since all Voice modules in a system should be sequentially addressed, each subsequent module number refers to the Voice module with the next highest address.

For example, in a standard 24-line system, the following module number/CSR mapping would apply:

Part Number	Type	CSR	Diagnostic Module Number
M3136	T1	761254	0
M3135	Voice	761264	0
M3135	Voice	761270	1
M3135	Voice	761274	2

See Figure 16 for an example of the module placement in a standard 72-line DECvoice-T1 system.

NOTE

The numbering shown in Figure 16 is valid only for the configuration shipped from the factory. If any modules have been relocated on the Q-bus, use the rules listed above to identify the failing module.

The following is and example of the diagnostic output:

```
$ RUN VOX$DIAG.EXE
_

                    DECvoice-T1 Diagnostic (Version T1.0)
_

The following modules have been found and will be tested:
                    VNA0: (M3136)
                    VMA0: (M3135)
                    VMB0: (M3135)
                    VMC0: (M3135)
                    VMD0: (M3135)
                    VME0: (M3135)
                    VMF0: (M3135)
                    VMG0: (M3135)
                    VMH0: (M3135)
                    VMI0:   (M3135)
_

                    Currently Selected Test Parameters
_

Error action  . . . . . halt
Disk logfile . . . . . enabled
Status display . . . . . disabled
Error display  . . . . . enabled
TDM loopback . . . . . selected
T1 loopback . . . . . internal
First test  . . . . . 1
Last test  . . . . . 2
Passes to run . . . . . 1
_

VOX$DIAG> start
_

End of pass 1                                   Errors this pass = 0
22–MAR–1991 13:36:39.34                           Total errors = 0
_

VOX$DIAG> exit

DECvoice-T1 Test Exiting
```

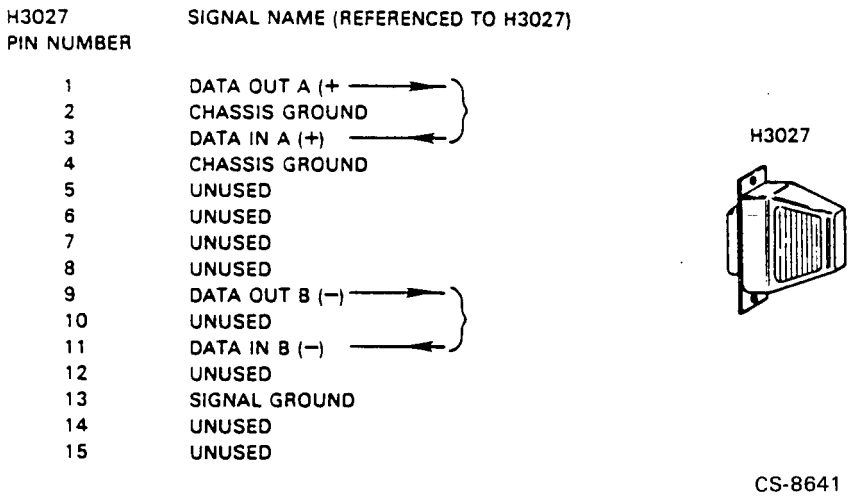


Figure 15 H3027 T1 Loopback Connector

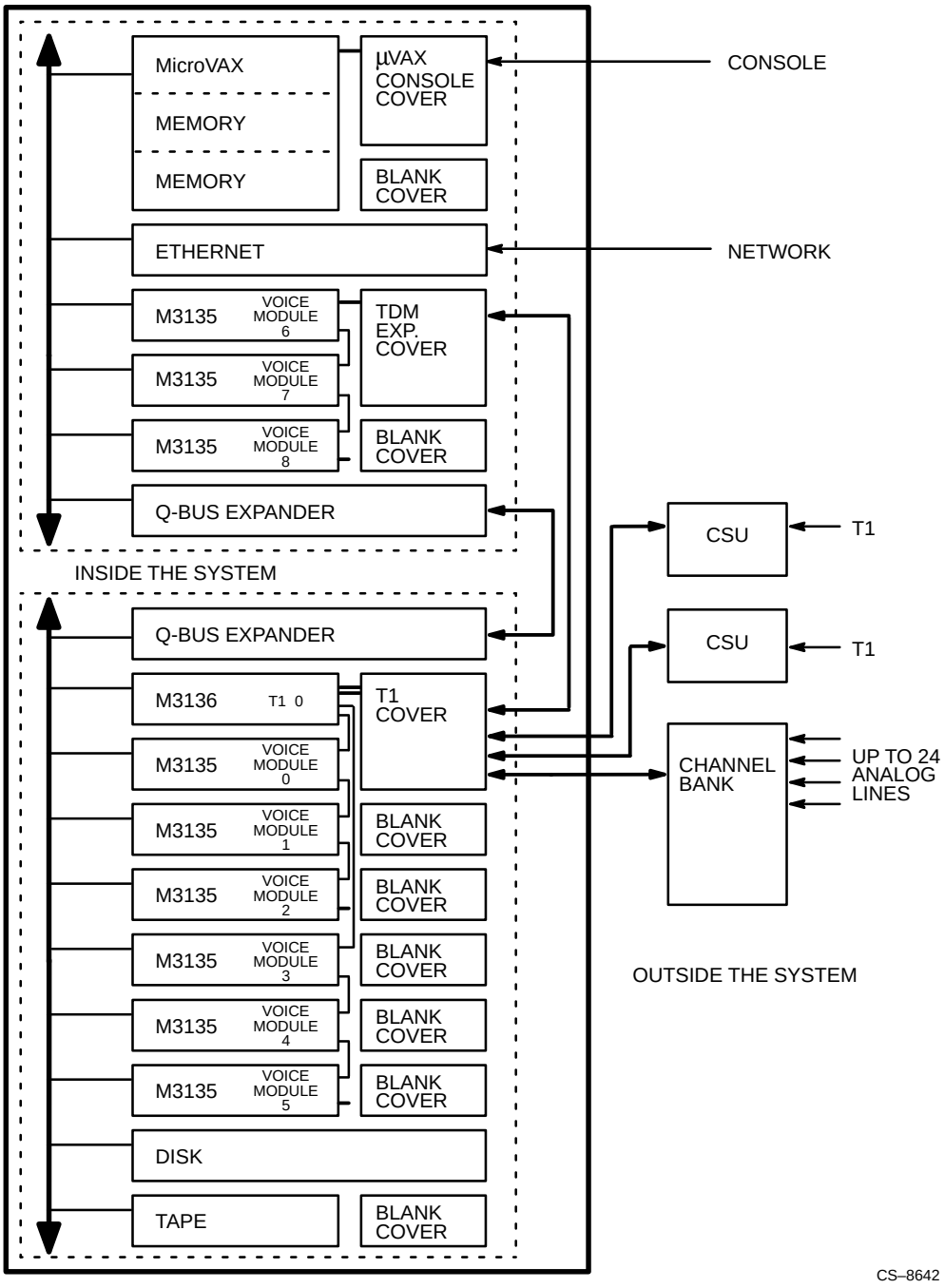


Figure 16 Voice/T1 Module MDM Numbering for 72-Line DECvoice-T1 System

CHAPTER 3
TECHNICAL INFORMATION

3.1 DECvoice-T1 TECHNICAL OVERVIEW

This chapter provides a technical overview of the DECvoice-T1 system.

Based on a VAX or MicroVAX processor, the DECvoice-T1 system provides extensive voice capabilities to applications. The complete DECvoice-T1 system is based on tightly integrated hardware and software components.

Section 3.2 provides a description of the features provided by individual modules; Section 3.3 describes the components physically; Section 3.4 gives an overview of the TDM Highway; Section 3.5 contains more detailed descriptions of individual modules.

The DECvoice-T1 hardware components present in the system include:

- M3135 Q-bus voice module
- M3136 Q-bus telephonics module
- Assorted interconnect cables and bulkheads

This manual covers DECvoice-T1 hardware. For a detailed description of the DECvoice software, refer to Related Documentation in the preface.

Note

Please consult the *DECvoice Software Reference Manual* for the list of the DECvoice-T1 hardware features that are currently supported by the DECvoice Software.

3.2 FEATURES

This section describes the general features provided by each of the individual DECvoice-T1 modules. Also included is a description of the cabling interconnections.

3.2.1 M3136 Telephony Module

The M3136 module is the communications hub of the DECvoice-T1 system; it provides the internal call switching support. All internal Time Domain Multiplexed (TDM) highways and all external T1 lines connect to the M3136 module.

The M3136 telephony module has the following features:

- Is microprogrammed and is completely softloaded; there is no Read-Only Memory (ROM) present. This allows microcode updates to be distributed on ordinary software update kits.
- Can connect to the Public Switched Telephone Network (PSTN) by way of up to three T1 lines; the physical connection to the three T1 lines is made through an an approved external Channel Service Unit (CSU). The communications framing and format used on the three T1 lines is user selectable.
- Can connect to up to three channel banks by way of the T1 lines. Channel banks are used to convert the digital T1 lines to analog telephone lines.
- Can connect to combinations of channel banks and CSU lines.
- Can drive up to three TDM Highways; the TDM highways provide the intrasystem communications links.
- Provides a software controlled 128-line crosspoint switch. This crosspoint switch allows orthagonal, nonblocking, switching among three T1 lines and three TDM highways.
- Host software can request that the M3136 select a free-running T1 transmit clock or that it be synchronized to the received clock on any T1 line. A single transmit clock is used for all T1 lines.

3.2.2 M3135 Voice Module

The M3135 module provides three coprocessor accelerators and dedicated hardware, specifically tailored to signal and voice processing.

The M3135 voice module has the following features:

- Is microprogrammed and is completely softloaded; there is no Read-Only Memory (ROM) present. This allows microcode updates to be distributed on ordinary software update kits.
- Supports a number of different digitization algorithms; including hardware acceleration for eight channels of 32, 24, or 16 Kilobits per second Adaptive Pulse Coded Modulation (ADPCM) encoding per M3135 module. Some signal processing algorithms have hardware acceleration; other algorithms can be softloaded.
- Provides support for MultiFrequency (MF) tone and Dual-Tone MultiFrequency (DTMF) signal detection and generation.
- Supports the generation of prompting tones.
- Provides support for software implemented audio call progress detection (ACPD).
- Can connect to one or more of the 32 lines present on the TDM highway; the selection is made under the control of the host software.
- Provides support for continuous digit, speaker-independent voice recognition with the optional *VOX-C- RECOGNIZER* software license.
- Provides support for isolated word, speaker independent voice recognition of the digits zero through nine, “yes”, “no”, and “oh” (often used as a substitute for zero).
- Provides support and space for up to 125 speaker-dependent voice recognition templates, typically enough for up to 50 discrete utterances.

3.3 PHYSICAL DESCRIPTION

The following sections describe the dimensions, connections and cabling of the M3136 and the M3135 modules.

3.3.1 M3136 Module

The M3136 module is a quad-height, 25.8 x 20.6 cm (10.5 x 8.4 in.) extended Q-bus module. The M3136 module is intended for installation in the BA200 and BA400 series Q-bus enclosures. The M3136 is *not* compatible with the BA23 nor the BA123 series Q-bus enclosures.

3.3.1.1 M3136 Module Connections

Table 7 describes M3136 module connections.

Table 7 M3136 Connectors

Connector	Description
Internal TDM	The M3136 internal TDM Highway uses two 20-pin connectors. The primary TDM connection is made with the bottom connector of the double-stacked 20-pin Insulation Displacement Connector (IDC). The secondary TDM connector uses the single 20-pin IDC. Both of the internal TDM highway IDCs are single keyed.
External TDM	The connection to the M3136 module cover comes from the tertiary IDC, the upper half of the double-stacked 20-pin IDC. This connector is double-keyed. The tertiary TDM connector is normally used in conjunction with the expansion cover, to connect the M3136 to a TDM highway located in a second BA200 or BA400 series enclosure in a double enclosure system.
Cover connector	The M3136 cover connector is the 40-pin IDC. It includes the signalling for the three T1 lines and for the the cover status lights.

3.3.1.2 M3136 Module Cabling

The M3136 telephony module can be connected into the TDM highway using the three 20-pin connectors. Each is cabled, usually through intervening M3135 voice modules, to the TDM terminator.

The primary TDM connector, the lower connector of the doublestacked 20-pin IDC, is cabled to an adjacent M3135 module using the short TDM cable.

The secondary TDM connector, the single 20-pin connector, is cabled to a non-adjacent M3135 module using the medium length TDM cable. This connection must reside within a single Q-bus enclosure.

The tertiary TDM connector, the upper connector in the double-stacked IDC is cabled to the M3136 module handle, by way of the module handle cable hardness or to an adjacent M3136 module by way of a short TDM cable. The M3136 module handle can be (if no external TDM cable is attached and if an external TDM terminator is not present) assumed to terminate the TDM highway

When more than one M3136 module is present in a system, the M3136 module closest to the processor module is the primary module. All M3136 modules must be configured in adjacent, contiguous, Q-bus slots.

See Section 2.5.4 for step-by-step information on connecting the TDM highway.

No other cabling configurations should be attempted.

3.3.2 M3135 Module

The M3135 voice and signal processing accelerator module (M3135) is a quad-height, 25.8 x 20.6 cm (10.5 x 8.4 in.) Q-bus module. The M3135 module plugs into the BA200 or BA400 series of Q-bus enclosures. The M3135 is *not* compatible with the BA23 nor the BA123 series Q-bus enclosures.

3.3.2.1 M3135 Module Connectors

Table 8 describes M3135 module connections.

Table 8 M3135 Connectors

Connector	Description
Incoming TDM	The M3135 incoming TDM connection is made by way of the keyed top connector of the double-stacked 20-pin IDC.
Outgoing TDM	The M3135 outgoing TDM connection is made by way of the keyed bottom connector of the doublestacked 20-pin IDC. The last, empty, outgoing TDM connection must contain the TDM terminator.
ROM connector	The M3135 includes a diagnostic ROM module connection. This connection is used only during manufacturing and testing.

3.3.2.2 M3135 Module Cabling

The M3135 voice module is connected into the TDM highway using the double stacked, 20-pin connector. The upper TDM connector is cabled, possibly through intervening M3135 modules, to the M3135 module. The lower connector is cabled, again possibly through intervening M3135 modules, to the TDM terminator.

The upper TDM connector can be cabled routed from an immediately adjacent M3135 or M3136 or from a more distant M3136; the distant M3136 can be cabled internally by way of the medium-length TDM cable or externally, by way of the handle cover and the external TDM cable.

The lower TDM connector can be cabled to an adjacent M3135 module by way of a short TDM cable, or it can contain the TDM terminator.

See Section 2.5.4 for step-by-step information on connecting the TDM highway.

No other cabling configurations should be attempted.

3.4 MODULE FUNCTIONAL DESCRIPTION

This section provides a description of the components of the M3136 and M3135 modules and how they interoperate.

3.4.1 M3136 Module

A functional block diagram of the M3136 module is shown in Figure 17.

The M3136 module has four major blocks:

- Main processor, an Intel 80186 class processor
- Memory system, a total of one Mbyte
- Q-bus interface
- Telephonics section

These component blocks intercommunicate using internal registers, interprocessor interrupts and shared memory windows.

The M3136 module connects between three interface types:

- A Q22-bus interface, used for host control.
- Three Time Division Multiplexed (TDM) Highways, used to connect to additional M3136 modules or, more commonly, to M3135 voice processing modules.
- Three T1 connections made through the T1 connection cover.

3.4.1.1 Main Processor

The main processor section consists of a 16-bit Intel 80C186 microprocessor operating at 12 MHz. This block has access to the entire one Mbyte of onboard memory. There are two sites for Read Only Memory (ROM). These ROMs are for diagnostics; they are not present during normal module operations.

The main processor section performs the following functions:

- Controls communication with the host system
- Controls the routing of PCM data through the system
- Receives and transmits T1 control and signaling information
- Provides some limited audio capabilities, such as the generation of busy signals

3.4.1.2 Q-bus Interface

The Q-bus interface consists of a slave section and a memory interface section. The slave section contains the control and status registers (CSRs) and the interrupt control circuitry. The memory interface section provides a 64-Kbyte, host-accessible, window into the module memory. Refer to Chapter 2 for information on determining and setting the module CSR. Refer to Chapter 4 for more information on the Q-bus host interface.)

The Q-bus interface is used by the host for loading control or diagnostic programs for the main processor to execute (this is how the main processor can operate without ROMs). It is also used by the host as the command and message interface for the main module processor, both for data transfer and for interrupts.

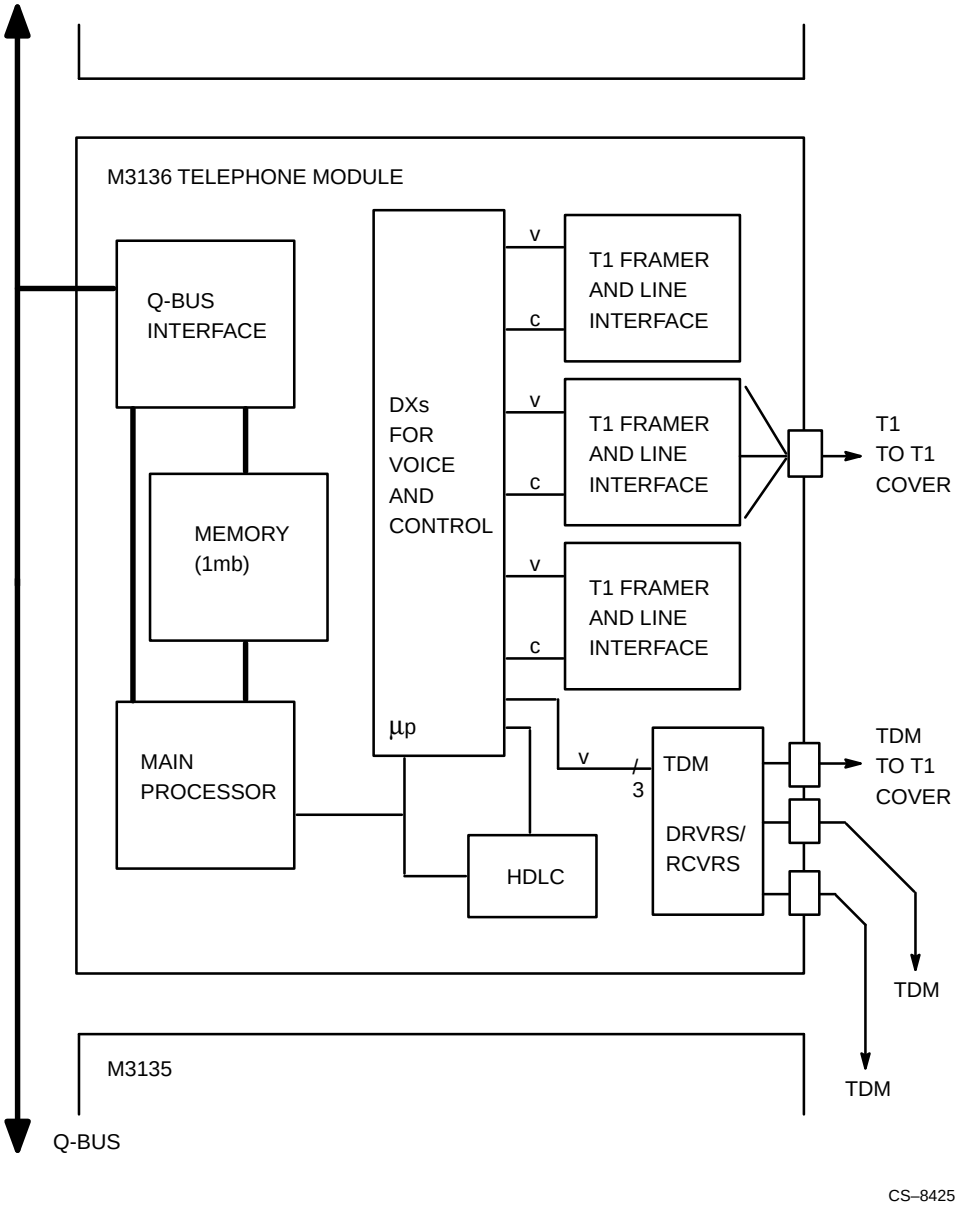


Figure 17 Functional Block Diagram of the M3136 Telephone Module

3.4.1.3 Telephonics Section

The telephonic section can be broken down into the following components:

- Crosspoint switches (DX)
- T1 framer and line interface
- External TDM interconnections
- HDLC support

These sections are all connected together by on-board TDM highways.

The crosspoint switches are the heart of the telephonic section. These switches provide nonblocking interconnect between any of the internal TDM highways. They can also be set to read and write a TDM channel with control information. There are two sets of crosspoint switches on the module. The first set is used for routing voice data. The second set is used for control of the T1 lines.

There are three sets of T1 framer and line interface parts, one for each T1 line. The framer and line interface section provide the interface between the external T1 and the onboard buses.

The T1 line is split within the DTCN5 into a bidirectional voice TDM connection and three serial control connections. The onboard voice and control busses are routed by way of dedicated crosspoints.

The TDM interconnect interface adapts the electrical characteristics of the TDM buses and the electrical characteristics of the onboard DTCN5 buses. This section is comprised primarily of line drivers and receivers.

The HDLC section is available to translate a bit-oriented data stream from an internal TDM channel into a packet oriented message destined for the main processor.

3.4.2 M3135 Module

A functional block diagram of the M3135 module is shown in Figure 18.

The M3135 module consists of three functional blocks:

1. Main processor
2. Line processor
3. Q-bus interface

These blocks communicate through interprocessor interrupts and through 64-Kbyte windows into the one Mbyte of on-board memory.

As viewed at the highest level of its hierarchy, the M3135 module has two interfaces. First, the M3135 module connects to the Q-bus, providing a slave interface with control and status registers and a shared memory port. (Refer to Chapter 2 for information on determining and setting CSRs. Refer to Chapter 4 for more information on the Q-bus interface.) Second, the M3135 module connects to the TDM highway. The M3135 voice module receives clocking from the a TDM, while the M3136 network module provides the clocking.

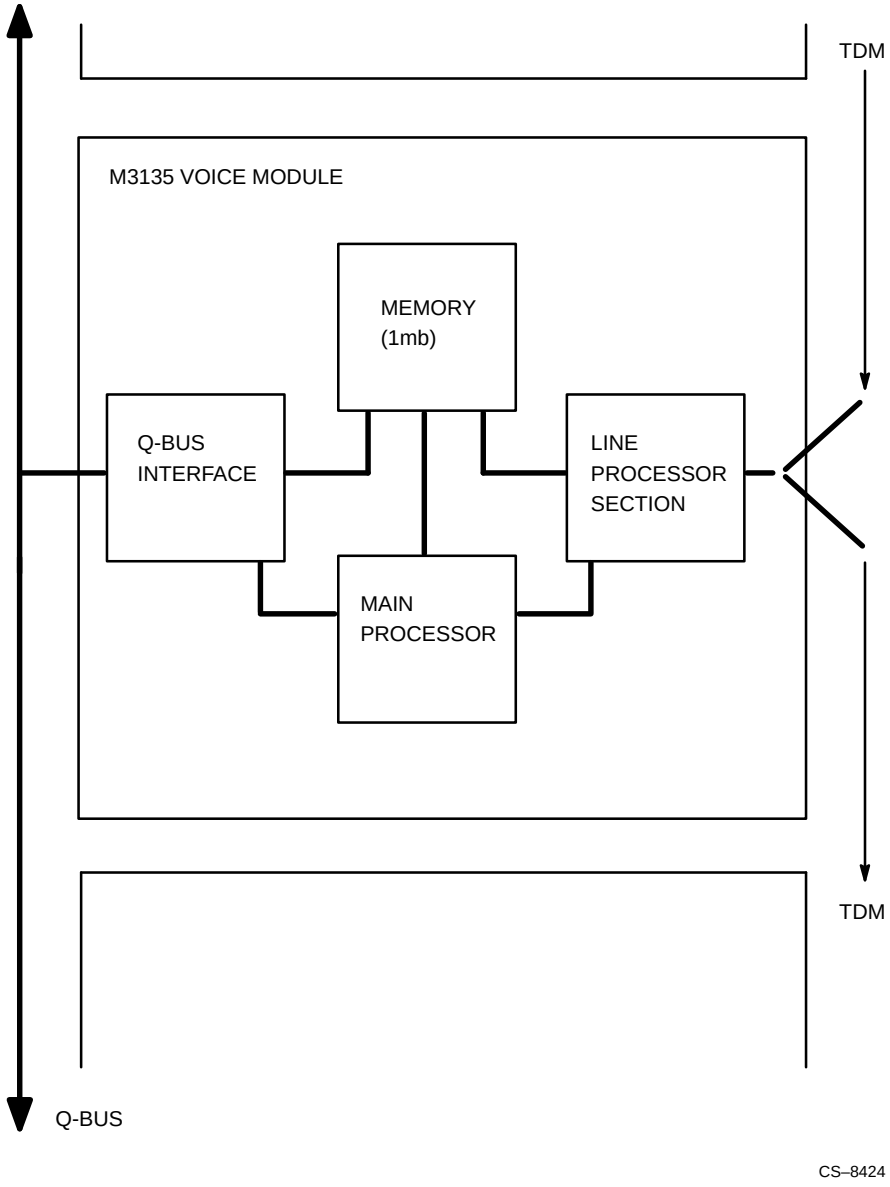


Figure 18 Functional Block Diagram of the M3135 Voice Module

3.4.2.1 Main Processor

The main processor section consists of an 80C186 Intel 16-bit processor running at 12 MHz (divided down from an input clock of 24 MHz), local control and status registers, and the data path into the shared memory.

The M3135 module does not have onboard ROM. There is a ROM connector used for manufacturing and diagnostic tests. The main processor performs the following functions:

- Controls communication with the host system
- Implements the text-to-vocal tract control portion of the text-to-speech translation
- Performs buffer management for speech recording and playback
- Processes that part of speech recognition that is not handled by the signal processor

3.4.2.2 Line Processors

The Line Processing Section (LPS) has a port into the onboard shared memory; this port is used for interprocessor communications. The LPS section includes three processors and acts as the TDM highway interface. The LPS has a Texas Instruments TMS320C25 Digital Signal Processor (DSP) operating at 40.55 MHz as the primary line processor. The TMS320C25 processor has a 64-Kbyte window into the main module memory and has 64 Kbytes of local high-speed static memory. This signal processor performs the following functions:

- Implements the vocal tract model that the text-to-speech system uses
- Compresses and expands speech during record or playback

  Performs the analysis portion of the speech recognition system
- Performs the analysis portion of call progress detection
- Generates DTMF or MF for tone dialing

The second signal processor is an American Telephone and Telegraph DSP16A operating at 60 MHz. This processor connects directly to the TMS320C25 and can be used for up to eight independent, microcode-based, tone detectors (either DTMF or MF). It is also used to insert transmit data onto the TDM highway and to receive data from the TDM highway.

The third processor is an Adaptive Delta Pulse Code Modulation (ADPCM) hardware accelerator. This processor is typically used during *eight-line mode* operations.

3.4.2.3 Q-bus Interface

The Q22-bus interface consists of a slave section and a memory interface section. The slave section contains the control and status registers and interrupt control circuitry. The memory interface section allows communication between the Q22-bus host processor and the module. Refer to Chapter 4 for more information on this interface.

The Q-bus interface is used by the host for loading control or diagnostic programs for the main processor to execute (this is how the main processor can operate without ROMs). It is also used by the host as the command and message interface for the main module processor, both for data transfer and for interrupts.

CHAPTER 4
Q-BUS HOST INTERFACE

4.1 INTRODUCTION

This chapter discusses the Q-bus interface to the M3136 and the M3135 modules.

4.2 M3136 SOFTWARE INTERFACE

The Q-bus section is comprised of a slave interface with two control and status words (CSR words), a 64-Kbyte window into the memory, and interrupt control logic.

The slave interface[1] is used to control the position of the Q-bus memory window within the module memory and to control the position within Q-bus memory. It is also used to control the operation of the device interrupts, can act as as a master on/off switch for the module, and can report the module status.

4.2.1 CSR0

Figure 19 shows the CSR0 format. The various fields shown in this figure are discussed in the subsections that follow.

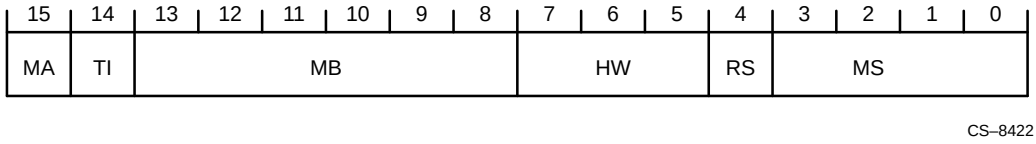


Figure 19 CSR0 Field Definition

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[1] The slave interface is often referred to, collectively, as the CSR. The CSR is the sole host visible portion of the slave interface.

4.2.1.1 Module Status (MS)

The Module Status field conveys information about the module. This field starts out as a zero and is changed to a one for normal operation. A value other than one means that the module is not currently operational. This condition can be a temporary (such as a bootstrap in progress) or a hard failure (such as a checksum failure on the module RAM). The microcode presently loaded into the module determines the meanings of the status field.

4.2.1.2 Run/Stop (RS)

The Run/Stop bit is set to one if the module is running, and zero if the module is reset. If the module has a diagnostic ROM installed, the bit is set to one at power up. Without the diagnostic ROM installed, the bit is set to zero at power up. Start the module by setting the bit to one. Reset the module by setting the bit to a zero, wait one microsecond, and then set the bit back to a one.

Stopping the module main processor halts the module memory refresh.

4.2.1.3 Hardware ID (HW)

The Hardware ID field helps identify variants of the module. One of the bits can be set through the extra switch in the CSR location switchpack. The other two bits go high on separate pullups and may be connected low by using wires or etch.

4.2.1.4 Memory Base (MB)

The Memory Base field identifies where the 64-Kbyte shared memory section is mapped in Q-bus memory space. If the upper six bits of the Q-bus address match the value in the MB field and the memory is enabled, then the memory will reply. Do not set these bits to overlap the bits of another M3136 module unless the other module has the memory matching turned off. The MB field initializes to zero and should be set before memory is enabled (refer to Section 1.3.4 for additional information on the shared memory interface).

4.2.1.5 Timer Interrupt Enable (TI)

The timer interrupt is based on the master clock and runs at frame time. The timer can be set to go off after any number of frames. This timer tracks the master clock on the module, which is normally driven by the input clock on one of the T1 connections; the timer can also be set to free run.

4.2.1.6 Module Alert (MA)

The Module Alert can be set by writing 1. Writing 0 does not change the value. The MA bit remains set until the module acknowledges the interrupt. The protocol for communication between the host and the module is similar to the protocol used on the M7132 DTC04 module. Data is changed in shared memory and the alert is set, if not already set. The alert is cleared before the module examines the changes.

4.2.2 CSR1

Figure 20 shows the CSR1 format. The various fields shown in this figure are discussed in the subsections that follow.

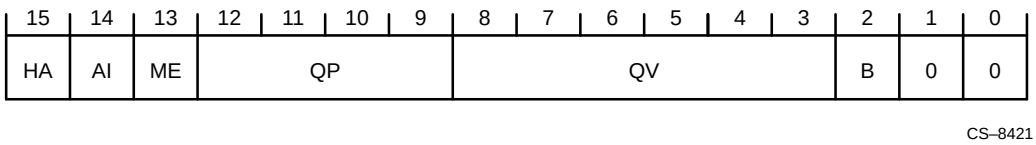

Figure 20 CSR1 Field Definition

4.2.2.1 Zero (0)

The bits zero and one will be read as 0. Writes to these bits are ignored.

4.2.2.2 Request B (B)

Writes to this bit are ignored. Reads from this bit are undefined.

4.2.2.3 Q-bus Vector (QV), B

This field constitutes the rest of the vector. This field is a read/write field and is also used to drive the vector onto the bus when the interrupt is acknowledged. If the timer interrupt is being driven, then B is set. If the alert interrupt is being driven, then B is clear.

Refer to Section 2.4.6 for the CSR and vector rank.

4.2.2.4 Q-bus Page (QP)

This field is the page in module memory that the Q-bus sees when it accesses the shared memory window. In this way, all module memory is visible. The 80C186 I/O space and ROM space are private, but the RAM memory is visible. Refer to Section 4.3.4 for additional information about the shared memory interface.

4.2.2.5 Memory Enable (ME)

This bit must be enabled for the shared memory interface to be used. It is an input to the memory match comparator and must be a one before a match is allowed. This bit powers up as a zero. If a set of modules are double mapped into the same Q-bus memory space, then only one of the ME fields can be enabled. Refer to Section 4.3.4 for additional information about the shared memory interface.

4.2.2.6 Alert Int Enable (AI)

This bit is the interrupt enable for the host alert and is the interrupt from the module to the host processor.

4.2.2.7 Host Alert (HA)

This bit is the interrupt flag for the host alert. This bit is set by the module and is cleared by writing a one into it. The module makes a change to the QCSR0–MS field or to the contents of a buffer in shared memory and then sets the QCSR1–HA bit if it is not already set. The host computer must acknowledge the interrupt by writing a one into the HA field before it can check the MS field or the shared memory. This prevents data from being lost.

4.2.3 Interrupts

The M3136 module supports two interrupts. The first interrupt is used during communication between the host and the main processor. The second interrupt is generated (if enabled) by the integral number of frame interrupts. This can therefore be set at integer multiples 125 microseconds, synchronized to the outbound T1 streams.

4.2.3.1 First Interrupt

The first interrupt is Host Alert. This interrupt is set by the module after a change in the CSR MS field or in a shared memory communication structure. The QCSR1–AI field enables the interrupt and writing a one to the QCSR1–HA field clears the interrupt. If the contents of HA are one, then setting the AI field will cause an interrupt.

When the Q-bus acknowledges the interrupt, the module drives the low nine bits of CSR 1 with the B field set to 0.

As an example, if the QV field is set to 33 (octal), the primary interrupt vector will be driven as 330 (octal).

4.2.3.2 Second Interrupt

The second interrupt is the Timer. The timer interrupt is set by the module at periodic intervals related to a multiple of the master frame time. This flag is enabled by the CSR TI field and does not need to be cleared.

As an example, if the timer interrupt is enabled and the QV field is set to 33 (octal), the setting of the “B” field will cause the secondary interrupt vector to be driven as 334 (octal).

4.2.4 Memory Access

The shared memory interface (see Figure 21) is enabled by the QCSR1–ME bit in the CSR. The interface is designed to allow the VAX host processor to access the module regardless of the module run state.

The QCSR0–MB field is used to locate the Q-bus memory window in the four Mbyte Q-bus memory space. The QCSR1–QP field positions a 64-Kbyte range of module memory into the view of the 64-Kbyte host memory window. In both the MB and QP fields, the memory must be placed on a 64-Kbyte boundary. This results in six bit significant address bits on the Q-bus side and four significant bits for the module memory block.

Module RAM is refreshed only if the module main processor is operating. Any access by the VAX host processor (for the purpose of loading microcode) must be careful to maintain the memory refresh until the module main processor is enabled (by writing a one into QCSR0–RS). This can be achieved without affecting the loading code if the startup occurs within two microseconds. If the loading takes more than two milliseconds, then host-based refresh will need to occur. Softloaded microcode should start with a burst refresh and then drop back to the standard incremental refresh (one row every two milliseconds).

If the M3136 module has diagnostic ROM installed, then access by the module to the upper 64 Kbytes of memory will go to the ROM. Attempts to access the diagnostic ROM from the Q-bus will fail; only the RAM will be visible. Diagnostic ROM access is enabled by installing jumper W3.

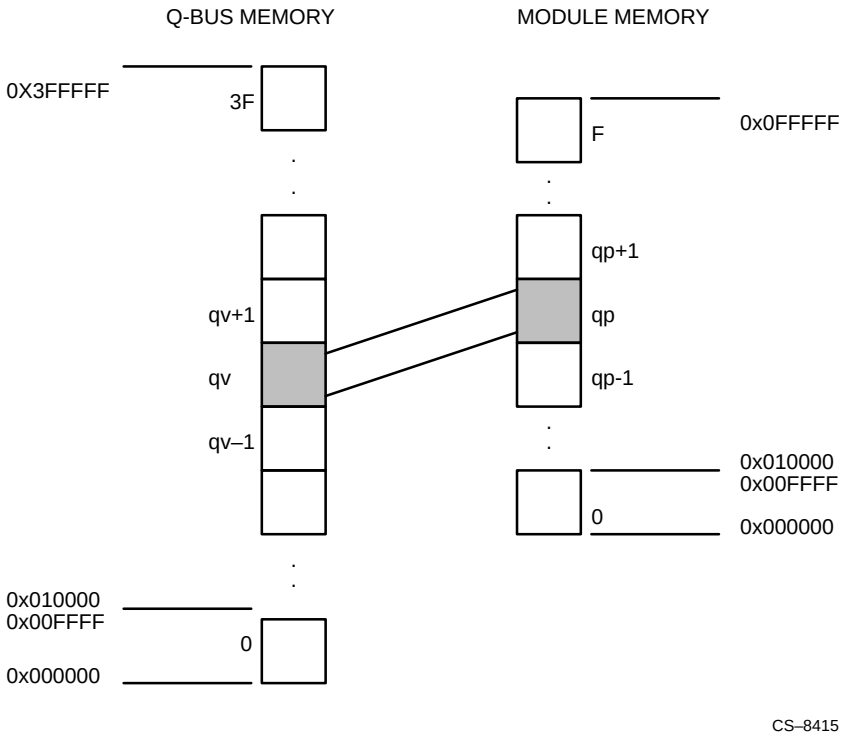

Figure 21 Shared Memory Interface

4.3 M3136 SOFTWARE INTERFACE

The Q-bus section is comprised of a slave interface with two control and status words, a 64-Kbyte window into the memory, and interrupt control logic. The slave interface is used to control the position of the memory window within the 1 megabyte module memory range and within the 4-Mbyte Q-bus memory range. The slave interface also controls the generation of interrupts, can report on the module status, and can control the state of the main module processor.

4.3.1 CSR0

The base CSR (CSR0) is located in the Q-bus I/O space on the base address defined by the switches shown in Figure 22.

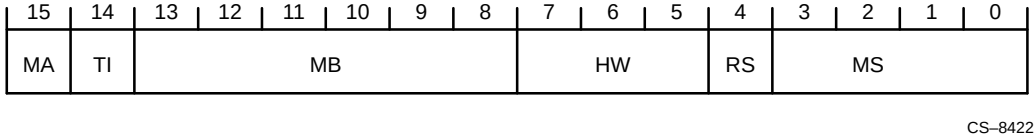

Figure 22 CSR0 Field Definition

4.3.1.1 Module State (MS), [3:0]

The Module State field is used to convey information about the module. MS initializes to zero and is set to one, indicating normal operation once the main processor has been initialized and is operational. An MS value other than one indicates that the module is not currently operational. This condition can be a temporary (such as a bootstrap in progress) or a hard failure (such as a checksum failure on the module RAM). The meanings of the values in the MS field is determined by module microcode.

MS is a read only field by the Q-bus. The main processor CSR is the source for this field. Reset to the main processor section will reset MS.

4.3.1.2 Run/Stop (RS), [4]

The run/stop bit is set to one if the module main processor is running and zero if it is reset. If the module has a diagnostic ROM installed, then it will power up as a one. If the module does not have a diagnostic ROM installed, then it will power up as a zero. To start the module, set the bit to a one. To reset the module, set the bit to a zero, wait one microseconds, and set the bit back to one.

Stopping the module main processor halts the module memory refresh.

NOTE

This bit is not ignored if a ROM module is installed; that is, a Q-bus host can still reset a module with a ROM module.

4.3.1.3 ID (HW), [7:5]

The hardware ID field is used to help identify variants of the module. The M3135 (Rev A1) module is identified by ’001’. HW is unaffected by reset.

4.3.1.4 Memory Base (MB), [13:8]

MB is a read/write field that MB initializes to zero during reset.

The memory base field is used to identify where the 64-Kbyte shared memory section is mapped in Q-bus memory space. If the upper 6 bits of the Q-bus address match the value in this field and the memory is enabled, then the module will respond. The remaining 16 bits of the 22-bit address define an offset into the 64-Kbyte window. The MB field should be initialized as not to overlap with any other memory devices in the Q-bus memory space. This field must be initialized prior to enabling memory (CSR1); otherwise, the potential exists for multiple devices responding to the same address.

4.3.1.5 Timer Int Enable (TI), [14]

TI is a read/write bit. It is initialized by power reset or BINIT. When set, TI enables the second source of interrupts from the module to interrupt the host. The source enabled by TI is the timer output from the 80C186. This enable initializes to zero and must be set to one in order to enable.

4.3.1.6 Module Alert (MA), [15]

MA is a read/write bit. It initializes to zero during reset. This is the doorbell into the module. MA is set by writing a one. Writing a zero into MA leaves the previous value unchanged. The MA bit will remain set until the module acknowledges the interrupt. The protocol for communication between the host and the module is similar to the M7132 protocol. Data is changed in shared memory and the the alert is set if it was not already set. The alert is cleared before the module examines the changes.

4.3.2 CSR1

CSR1 is located at CSRBASE+2 and has the format shown in Figure 23.

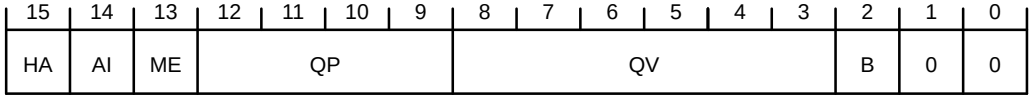

Figure 23 CSR1 Field Definition

4.3.2.1 Bits [1:0]

The two low order bits must be written as zero and will be read as zero.

4.3.2.2 Request B (B), [2]

This reflects the status of the DC003 alternate interrupt request bit. When the interrupt vector is driven onto the Q-bus, this field would be asserted if the “B” source was creating the interrupt. During a CSR read, this field should be considered *undefined*.

4.3.2.3 Q-bus Vector (QV), [8:3]

The QV field is read/write. QV initializes to 0 during reset. QV defines the soft vector used by the module. The vector driven onto the Q-bus during a vector read operation is CSR1 bits, [8:0]. This soft vector permits each M3135 module vector to be set by the host.

Refer to Section 2.4.6 for the CSR and vector rank.

4.3.2.4 Q-bus Page (QP), [12:9]

The QP field is read/write. QP initializes to 0 during reset. This field defines the 64-Kbyte page in module physical memory that the Q-bus sees when it accesses the shared memory window. 20 bits of address are required to address the 1 Mbyte of module memory. This 20-bit address consists of 4 bits of base and 16 bits of offset.

On a Q-bus memory access, QP defines the BASE into module memory. The remaining 16 bits of offset is defined by Q-bus address <15:0>. This allows the entire 1-Mbyte module memory to be visible from the host. The communication protocol involved is specific to the running microcode.

4.3.2.5 Memory Enable (ME), [13]

ME is a read/write bit. ME initializes disabled (0) during reset. The memory base field in CSR0 must be initialized by the host before ME is set. Otherwise there is the potential for multiple modules to respond to the same Q-bus memory address and bus contention will result. When set, ME enables address comparator logic between MB and the Q-bus memory address [21:16].

ME may be used by device drivers to multiply map M3135 modules into the same Q-bus memory space. This has the desirable feature that Q-bus memory space is not consumed at 64 Kbytes per module.

4.3.2.6 Alert Int Enable (AI), [14]

AI is a read/write bit. AI initializes to zero during power reset or BINIT. This is the interrupt enable for the host alert. This is the interrupt from the module to the host processor.

4.3.2.7 Host Alert (HA), [15]

HA is a read/write field. HA initializes to zero during reset. This is the interrupt flag for the host alert. It is set by the module and is cleared by writing a one into it. The module makes a change to the MS field or to the contents of a buffer in shared memory and then sets the HA bit if it is not already set. The host processor must acknowledge the interrupt by writing a one into the HA field before it can check the MS field or the shared memory. The protocol for communication involving HA is microcode dependent.

4.3.3 Interrupts

The M3135 supports two interrupts. The first interrupt's primary use is for synchronization and notification during interprocessor communication. The second interrupt is sourced from a real-time clock in the 80C186. This source can be used for polling drivers desiring to be interrupted based upon a real-time device.

4.3.3.1 Host Alert Interrupt

The first interrupt vector is the Host Alert. It is set by the module after the main processor makes a change in CSR value or in a shared memory communication structure. The AI field enables the interrupt, and writing a one to the HA field clears the interrupt.

The vector that is driven is CSR bits [8:0] with the B field equal to zero.

4.3.3.2 Second Vector

The second interrupt vector is the Timer flag. The main processor can set up one of its timers to cause a periodic interrupt to the host. When the timer reaches the end of an interval, this interrupt is asserted and, upon the corresponding vector read operation, CSR1 bits [8:0] will be driven with the B field equal to one.

4.3.4 Shared Memory

Access to the shared memory from the Q-bus port is controlled by several factors. First, the Q-bus must set the memory's base address in Q-bus space in CSR0 MB field. Second, the memory address comparator logic must be enabled by setting the ME field in CSR1. At this point, any access within the 64-Kbyte region defined by Q-bus address base [21:16] matching MB exactly will reach module physical memory. The module memory array is 1 Mbyte consisting of 16 – 64-Kbyte pages. The Q–bus can access any one of the 16 pages by setting the QP field in CSR1 to the desired page (refer to Figure 24).

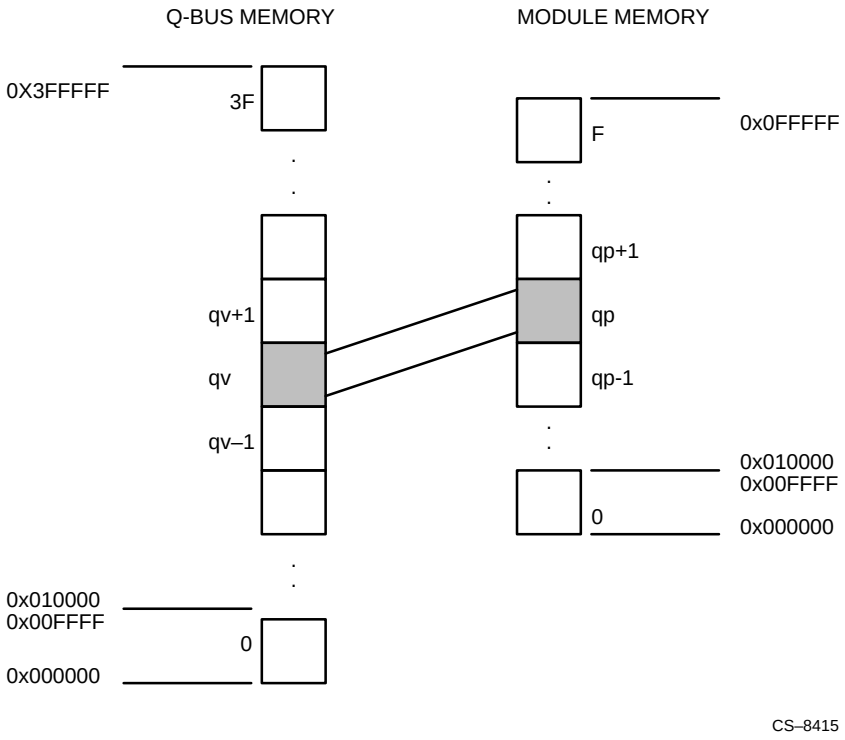

Figure 24 Shared Memory Interface

The main processor has a integral refresh control unit which is only operational when the main processor is initialized and operational. Access to memory when the main processor is not operational requires special consideration and is described in the following section.

4.3.5 Reset Structure

There are multiple levels of reset within the M3135. First there is a “global” reset which is asserted by BINIT or an RC circuit during power-up. This reset affects all sections. Within the Q-bus, it causes certain CSR fields to initialize to their default values.

The next level of reset is the main processor reset. Since this module is ROM-less, the main processor powers up in reset by default. This reset is driven as a function of reset, the RS bit in CSR0, and whether there is a diagnostic module installed. The main processor reset affects MPS and LPS.

The next level of reset is the LPS reset. LPS reset is driven by the MPS CSR and is asserted during MPS reset. LPS reset affects all of the subsystems within LPS.

Within the LPS section, there are two main subsystems that have their reset signals controlled by the LPS CSR and are asserted during LPS reset. The subsystems are the TDM interface and the ADPCM accelerator.

CHAPTER 5
TROUBLESHOOTING

Table 9 provides troubleshooting information in the form of routine problems, their possible causes, and possible corrective action to take in order to correct those problems.

Table 9 Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
DECvoice port devices (VMA0: VNA0: or VXA0:) are not visible.	DECvoice software has not been installed.	Install the DECvoice software. Refer to the *DECvoice Software Installation Guide.*
	SYSGEN parameter STARTUP_P1 is set to “MIN”.	Set SYSGEN parameter STARTUP_P1 to ”” and reboot VMS.
	One or more CSRs is set incorrectly.	Refer to Section 2.4 for information on the CSR.
DECvoice class device (VOX0:) is not visible.	DECvoice software has not been installed.	Install the DECvoice software. Refer to the *DECvoice Software Installation Guide*
	DECvoice software has not been started.	Refer to the *DECvoice Software Installation Guide* for information on the VOX$STARTUP procedure.
	DECvoice startup has detected a system problem.	Refer to the *DECvoice Software Installation Guide* for information on the required system configuration. Also check the system console OPA0: for any errors that might have occurred during or after the system startup.
DECvoice class device (VMA0:, VNA0:, or VXA0:) are visible but are marked as offline.	There are insufficient system page table entries configured.	Refer to the *DECvoice Software Installation Guide* for information on increasing the SYSGEN parameter SPTREQ.
	A hardware problem has been detected by the driver.	Check the system console for driver generated error messages indicating a hardware problem. Contact Digital customer service.

Table 9 Troubleshooting Procedures (continued)

Problem	Possible Cause	Corrective Action
DECvoice devices are not mounted.	DECvoice startup is not being run.	Refer to the *DECvoice Software Installation Guide* for information on the VOX$STARTUP procedure.
	DECvoice software has not been configured.	Refer to the *DECvoice Software Installation Guide* for information on the configuration procedure.
	DECvoice startup has detected a system error.	Refer to the *DECvoice Software Installation Guide* for information on the required system configuration. Also check the system console OPA0: for any errors that might have occurred during or after the system startup.
DECvoice software or the entire VMS system hangs.	Q-bus configuration is invalid.	Refer to Chapter 2 for information on configuring the Q-bus. Check for empty Q-bus slots all such slots should contain Q-bus grant cards.
	DECvoice ACP has detected a problem.	Check for a DECvoice VOX process on the system with ”BUG” in the process name. If such a process is located, reboot the system. If the problem can be reproduced, file a Software Performance Report (SPR). Include a magnetic tape containing the contents of the system dump file whenever possible.
VMS bugchecks.	An unexpected event or a severe software error has occurred.	Submit an SPR, include the commands or subroutines that caused the bugcheck (when known) and include a magnetic tape containing the contents of the VMS system dump file.
Blue, Yellow, or Red Alarms.	T1 line is not connected.	Check the T1 line connections at the M3136 module cover and at the CSU. Make sure that both ends of the cable are firmly connected.
	DECvoice software has detected problems on the T1 line.	Check the system configuration of the T1 line(s); refer to the *DECvoice Software Installation Guide* for information on the configuration procedure.

Table 9 Troubleshooting Procedures (continued)

Problem	Possible Cause	Corrective Action
CSU has failed or is not currently connected to the DECvoice or to the T1 line.	There are problems on the T1 line.	Check the CSU; reconnect the cables or the CSU power if possible. Contact the CSU vendor if the problems persist. Contact the T1 provider.
Garbled or no output from one or more DECvoice devices.	There is a disconnection on the TDM highway. T1 configuration is incorrect.	Refer to Chapter 2; verify the integrity of all TDM highway(s), additionally, check the placement and seating of all TDM terminator(s). Check the system configuration of the T1 line(s). Refer to the *DECvoice Software Installation Guide* for information on the configuration procedure.
%VOX–I–DRVUNIINI, unit initializing: node$ddcu:	Specified device is undergoing initialization.	This is normal and does not indicate an error.
%VOX–I–DRVULDFNF, unable to locate microcode file.	One of the primary bootstrap microcode files cannot be located.	Restore the microcode file VMDRIVER.ULD and VNDRIVER.ULD from a system BACKUP, or reinstall the kit.
%VOX–W–DRVFIXVEC, Device timeout; Fix device vector on: node$ddcu:	The specified device has timed out.	If this is a DECvoice-I DTC04, correct the physical vector setting on the module. *This is an exceedingly common configuration error on the DTC04.* If this is a DECvoice-T1 module, this error indicates either a software problem, or that another controller installed in the system has an incorrect vector setting.
%VOX–W–DRVERR, error on unit: node$ddcu:	A DECvoice device driver is unable to allocate sufficient Q-bus resources. An unexpected error, probably configuration or hardware related, has occurred on the specified device.	Check the system for sufficient SYSGEN SPTREQ setting and for any problems with the other SYSGEN parameter settings. Refer to the list of required values in the *DECvoice Software Installation Guide.* Contact Digital customer service for assistance.

APPENDIX A
CONNECTOR PINOUTS

A.1 TDM CONNECTOR

The TDM connector (J1) has an upper (“IN”) and a lower (“OUT”) connector. J1 is a 40-pin (2x2x10) position connector; it accepts two 20-pin (2x10) IDC connectors, each mating to either the “IN” or the “OUT” position. See Figure 25.

Table A–1 lists the TDM bus connections on connector J1.

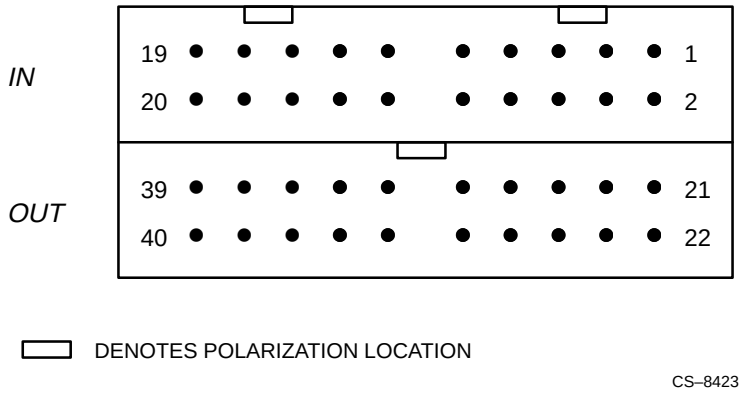

Figure 25 TDM Connector, J1

Table A–1 TDM Bus Connections, J1

J1 Pin	Signal Name	J1 Pin	Signal Name
1	C4L	21	C4L
2	C4H	22	C4H
3	GND	23	GND
4	GND	24	GND
5	F0 L	25	F0 L
6	F0 H	26	F0 H
7	GND	27	GND
8	GND	28	GND
9	TXD H	29	TXD H
10	TXD L	30	TXD L
11	GND	31	GND
12	GND	32	GND
13	RXD H	33	RXD H
14	RXD L	34	RXD L
15	GND	35	GND
16	NC	36	VTREF A
17	SENSE H	37	SENSE H
18	BUS THROUGH 1	38	BUS THROUGH 1
19	BUS THROUGH 2	39	BUS THROUGH 2
20	NC	40	+5 V

A.1.1 M3135 Upper (“IN”) 20-pin IDC Connector

The “IN” connector receives the TDM highway from an adjacent M3135 module[1], the M3135 expansion handle, or directly from an adjacent M3136 module.

A.1.2 M3135 Lower (“OUT”) 20-pin IDC Connector

The “OUT” connector passes the TDM highway onto the next M3135 module or to a termination assembly mounted directly in J1. See Section A.1.3 for information on the TDM terminator.

A.1.3 M3135 TDM Terminator

The terminator is a small component assembly that is used to terminate each differential signal pair on the TDM highway. It also contains a signal loopback that is used by internal routines to determine TDM highway continuity. The terminator assembly will mate with the M3135 “OUT” connector on the double-stack IDC connector.

A.1.4 M3136 Cover Assembly

An expansion cover must be used when connecting a M3136 to a M3135 when the modules reside in different enclosures within a system (that is, the host versus the expansion BA200 or BA400 series enclosure). This cover permits the connection of the external TDM cable to a DB15 connector mounted on the cover. An internal cable assembly joins the handle-mounted DB15 connector with the 40-pin IDC on the M3136 module.

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[1] The adjacent M3135 must be electrically closer to the M3136.

A.2 M3136 T1 Cover Connector

The M3136 module has a 40-pin connector that is used to connect the T1 to the M3136 cover. The signal definitions on this connector are defined in Table A–2.

Table A–2 M3136 T1 CONNECTOR PINOUT

J2 Pin	Signal Name	J2 Pin	Signal Name
1	+5 VF	21	T1_2OBIT1 H
2	+12 VF	22	T1_2OBIT0 H
3	T1_1XMIT H	23	T1_2IBIT1 H
4	T1_1XMIT L	24	T1_2IBIT0 H
5	T1_1RCV H	25	GND
6	T1_1RCV L	26	GND
7	GND	27	T1_3XMIT H
8	GND	28	T1_3XMIT L
9	T1_1OBIT1	29	T1_3RCV H
10	T1_1OBIT0 H	30	T1_3RCV L
11	T1_1IBIT1 H	31	GND
12	T1_1IBIT0 H	32	GND
13	GND	33	T1_3OBIT1 H
14	GND	34	T1_3OBIT0 H
15	T1_2XMIT H	35	T1_3IBIT H
16	T1_2XMIT L	36	T1_3IBIT0 H
17	T1_2RCV H	37	GND
18	T1_2RCV L	38	GND
19	GND	39	+12 VF
20	GND	40	+5 VF

APPENDIX B
TELEPHONICS AND REGULATORY INFORMATION

B.1 INTRODUCTION

The DECvoice-T1 system uses T1) for the telephone interconnect. T1 telephone service is a digital connection as opposed to the analog connections (“Tip and Ring”) that are widely used for routing voice and control signals to single telephones. Each T1) service can provide digitally encoded voice and control for up to 24 telephones.

B.2 PHYSICAL CONNECTION

The following sections relate to the physical connections present on the DECvoice-T1 system.

B.2.1 Connector

The connections are made using a 15-pin male D-subminiature connector. Data is transmitted to the CSU by way of pins 1 and 9. Data is received from the CSU by way of pins 3 and 11. The DECvoice-T1 end of the CSU cable is expected to have a *female* connector.

The CSU connector has slidelock connections. It is intended to be connected directly to either a Channel Bank (CB) or to an approved Channel Service Unit (CSU).

B.2.2 Pulse Shape

The transmitter takes binary data and produces alternate bipolar pulses of appropriate shape. The T1 pulse shape is selectable for line lengths from 0 to 655 feet (as measured from the DECvoice system to the CSU or the channel bank). For each line length selected, the line interface modifies the output pulse to meet the requirements of *AT&T Compatibility Bulletin 119* (for ABAM and PIC cable).

The transmitter can also be set for ECSA T1C1.2 pulse shape or Part 68, Option A pulse shapes.

B.2.3 Clocking

B.2.3.1 Clock Recovery

The receiver extracts data and clock from an Alternate Mark Inversion (AMI) coded signal. The clock and data recovery circuit can tolerate 0.4 unit intervals of jitter between 10 KHz and 100 KHz. The clock recovery circuit will tolerate 300 unit intervals of wander below 10 Hz.

B.2.3.2 Clock Generation

Clock generation uses the 8 KHz frame rate of one of the three input T1 lines as a reference signal for phase lock loops. Two frequencies are locked to this reference; a 1.544 MHz signal used for the output clock, and a 2.048 MHz signal used for the TDM highways.

The digital phase lock loop uses a clock slightly higher than eight times the desired frequency. When the reference is ahead of the generated signal, the clock is used without change. When the reference is behind the generated signal, then the eight times clock is stretched by a half cycle twice in the frame. The frequencies are chosen to allow a lock in range of 1.554 # +/-130 ppm.

B.3 DATA LINK

The following items relate to the telecommunications data link.

B.3.1 Framing

Each T1 line can be individually set for either D3/D4 compatible framing or ESF compatible framing. In the D3/D4 framing pattern, the framing bit alternates between FT and FS. The FT bit is used for frame alignment and the FS bit is used for 12-frame “SuperFrame” alignment. See Table B–1 for the framing pattern.

Table B–1 Default D3/D4 Framing

Frame	FT	FS	Signaling
1	1		
2		0	
3	0		
4		0	
5	1		
6		1	A
7	0		
8		1	
9	1		
10		1	
11	0		
12		0	B

In the Extended Super Frame (ESF) compatible framing, the framing bit alternates between FDL, CRC, FDL, FPS in a 24- frame pattern. The FPS bit is used to determine the framing pattern. The FDL is used as a 4K-bps “Facility Data Link”. The T1 hardware can connect this FDL stream to an HDLC part. The CRC bits are used to verify the signaling pattern. See Table B–2 for the framing pattern.

NOTE

Refer to VOX control program section of the *DECvoice Software Reference Manual,* AA–LE86C–TE, for the commands to change the framing. The default is D3/D4.

Table B–2 ESF Framing

Frame	FPS	FDL	CRC	Signaling
1		X		
2			CB1	
3		X		
4	0			
5		X		
6			CB2	A
7		X		
8	0			
9		X		
10			CB3	
11		X		
12	1			B
13		X		
14			CB4	
15		X		
16	0			
17		X		
18			CB5	C
19		X		
20	1			
21		X		
22			CB6	
23		X		
24	1			D

The T1 will be declared out of synchronization if either two errors out of four FT (or FPS) bits are detected or four errors out of 12 FT (or FPS). This threshold is selectable. Also, the CRC error checking can be turned off during reframes, as can the mimic detection (more than one candidate for D3/D4 framing).

B.3.2 Zero Density

Zero density requirements can be handled by either of two methods. In the first method (bit jamming), bit 7 is forced high in all bytes of all zeros. This method changes the data, but the change will be inaudible. In the second method, B8ZS, a byte of zeros is replaced with a pattern that contains bipolar violations. Normally one bits alternate between a pulse in the positive direction and a pulse in the negative direction. If two consecutive pulses are in the same direction, this is called a bipolar violation. The B8ZS zero code suppression scheme uses a pattern of “0 0 0 V B 0 V B” instead of sending zeros, where V stands for a bipolar violation, and B stands for proper bipolar data.

Each T1 line can be independently set for either B8ZS zero suppression or for jammed bit zero suppression. There should be, at most, 15 consecutive received zero codes. The module will transmit, at most, 15 consecutive zero codes.

NOTE

Refer to VOX control program section of the *DECvoice Software Reference Manual,* AA–LE86C–TE, for the commands to change the framing. The default is bit jamming.

B.3.3 Signaling Mechanism

Each channel in the T1 can be individually set to used robbed bit signaling or to be clear. See the “Signaling” column in Table B–1 and Table B–2. In the frames marked A, B, C, and D, the least significant bit of the data in each channel marked for robbed bit signaling is replaced with a signaling bit. In D3/D4 signaling, two bits are possible. In ESF signaling, four bits can be used.

While these bits are received and inserted by the M3136 hardware, higher level firmware and system software is used to interpret them. Also, the M3135 module can be used for any audio based signaling, again taken care of by module firmware and by system software. See the *DECvoice Software Reference Manual* for more information about VAX/VMS software support for DECvoice.

Also, there is one HDLC Protocol Controller chip available per T1. This can be linked to the Facility Data Link Bits or can be linked to any data channel.

NOTE

Refer to VOX control program section of the *DECvoice Software Reference Manual,* AA–LE86C–TE, for the commands to change the framing. The default is robbed bit.

B.3.4 Alarms and Errors

The M3136 module can detect alarms on each of the T1 lines and can be set to send certain alarms.

A Loss-Of-Signal alarm, occasionally called a *red* alarm, is detected if there are no received one bits in around 175 bit times. This alarm is removed once density of the ones returns to a normal 12.5% (four ones in 32 bit times). The Terminal Framing Bit error count is incremented on every four errors on FT or FPS framing bits. The Bipolar Violation error count is incremented every 256 bipolar violations. The CRC error count is incremented by each Extended Super Frame that has a CRC error (ESF mode only).

A Blue alarm, a keepalive signal, is detected if the receiver has detected two frames of ones and an out of frame condition. It is reset by any 250-microsecond period that contains at least one zero. A Blue alarm can be transmitted by the DECvoice-T1 hardware.

Both D3/D4 Yellow alarms and ESF Yellow alarms can be generated and received. D3/D4 Yellow alarm is a zero in every channel’s bit position 2. ESF Yellow alarm is sent by a sequence of eight ones and eight zeros in the FDL bit positions. A Yellow alarm is used to indicate an error “upstream”, that is, an alarm that is cascading through the telephony network.

B.4 T1 Signaling Requirements

Each T1 channel can independently be set for:

- Audio only, no signaling
- E&M signaling using either wink start or immediate start
- DPO/DPT wink start or immediate start
- FXO/FXS loop start or ground start

Digit reception during call setup can be performed with:

- Pulse dialing
- DTMF dialing
- MF dialing

Digit reception during call setup can have a 0, 1, or 2 digit strings (with length and/or timeout specified). Optional proceed winks can be sent before or after each string.

Digit transmission during outbound call setup is done the same way with 0, 1, or 2 digit strings, with optional winks before or after each string. One string of digits will be directly specified by the application. A second string (if dialed) will be specified through a per-channel database.

More signaling formats or relaxed requirements may be available. Refer to the current *DECvoice Software Support Addendum* for more details about the current available signaling support and requirements.

B.5 TELECOMMUNICATION TERMS

NOTE

The following is a list of telecommunications terms, reprinted with permission, from the Internet TELECOM Digest Archives.

A & B LEADS: Designation of leads derived from the midpoints of the two pairs comprising a 4-wire circuit.

ABBREVIATED DIALING: Preprogramming of a caller's phone system or long distance company's switch to recognize a 2- to 4-digit number as an abbreviation for a frequently dialed phone number and automatically dial the whole number.

Synonym: Speed Dialing.

ACCESS CHARGE: Monies collected by local phone companies for use of their circuits to originate and terminate long distance calls. Can be per minute fees levied on long distance companies, Subscriber Line Charges (SLCs) levied directly on regular local lines, fixed monthly fees for special telco circuits (i.e. WAL, DAL,T–1), or Special Access Surcharge (SAS) on special access circuits.

ACCESS LINE: A telephone circuit which connects a customer location to a network switching center.

AIRLINE MILEAGE: Calculated point-to-point mileage between terminal facilities.

ALL TRUNKS BUSY (ATB): A single tone interrupted at a 120 ipm (impulses per minute) rate to indicate all lines or trunks in a routing group are busy.

ALTERNATE ROUTE: A secondary communications path used to reach a destination if the primary path is unavailable.

ALTERNATE USE: The ability to switch communications facilities from one type to another, i.e., voice to data, etc.

ALTERNATE VOICE DATA (AVD): A single transmission facility which can be used for either voice or data.

ANALOG SIGNAL: A signal in the form of a continuous varying physical quantity, e.g., voltage which reflects variations in some quantity, e.g., loudness in the human voice.

ANNUNCIATOR: An audible intercept device that states the condition or restrictions associated with circuits or procedures.

ANSWER BACK: An electrical and/or visual indication to the calling or sending end that the called or received station is on the line.

ANSWER SUPERVISION: An electrical signal fed back up the line by the local telephone company at the distant end of a long distance call to indicate positively the call has been answered by the called party. Tells billing equipment to start timing the call.

AREA CODE: A three-digit number identifying more than 150 geographic areas of the United States and Canada which permits direct distance dialing on the telephone system. A similar global numbering plan has been established for international subscriber dialing.

Synonym: Numbering Plan Area (NPA).

ATTENDANT POSITION: A telephone switchboard operator's position. It provides either automatic (cordless) or manual (plug and jack) operator controls for incoming and/or outgoing telephone calls.

ATTENUATION: A general term used to denote the decrease in power between that transmitted and that received due to loss through equipment, lines, or other transmission devices. It is usually expressed as a ratio in dB (decibel).

AUDIBLE RINGING TONE: An audible signal heard by the calling party during the ringing-interval.

AUTHORIZATION CODE: A 5- to 14-digit number entered using a touch-tone phone to identify the caller as a customer of the long distance service. Used primarily before Equal Access as a way to verify the caller as a customer and bill calls.

AUTO ANSWER: A machine feature that allows a transmission control unit or station to automatically respond to a call that it receives.

AUTOMATIC CALL DISTRIBUTOR (ACD): A switching system designed to queue and/or distribute a large volume of incoming calls to a group of attendants to the next available "answering" position.

AUTOMATIC DIALING UNIT: A device which is programmed with frequently called numbers. The caller presses one to three digits and the preprogrammed number is automatically dialed into the phone circuit.

AUTOMATIC
IDENTIFICATION OF OUTWARD DIALING (AIOD): The ability of some centrex units to provide an itemized breakdown of charges (including individual charges for toll calls) for calls made by each telephone extension.

AUTOMATIC NUMBER IDENTIFICATION (ANI): On long distance calls, the process by which the local phone company passes a caller's local billing phone number to his/her long distance company when a "1+" or "10-XXX" call is made. With ANI a caller's long distance carrier knows who (what phone number) to bill without requiring the caller to enter any extra digits to be identified.

AUTOMATIC ROUTE SELECTION (ARS): Synonym: Least Cost Routing

BAND: (1) The range of frequencies between two defined limits. (2) In reference to WATS, one of the five specific geographic areas as defined by the carrier.

Synonym: Bandwidth.

BANDWIDTH: See BAND.

BASEBAND: The total frequency band occupied by the aggregate of all the voice and data signals used to modulate a radio carrier.

BAUD: A unit of signaling speed. The speed in Baud is the number of discrete conditions or signal elements per second. If each signal event represents only one bit condition, then Baud is the same as bits per second. Baud does not equal bits per second.

BLOCKED CALLS: Attempted calls that are not connected because: (1) All lines to the central offices are in use; or (2) All connecting paths through the PBX/switch are in use.

BREAK: A means of interrupting transmission, a momentary interruption of a circuit.

Synonym: Wink

BREAKEVEN POINT: Level of usage at which the total cost of a service with a high fixed up-front monthly fee but low minute costs becomes equal to the total cost of another service with low (or zero) monthly fee but relatively high per minute cost. At usage levels higher than breakeven, the service with the high monthly fee is cheaper.

BROADBAND: A transmission facility having a bandwidth of greater than 20 kHz.

BUS: A heavy conductor, or group of conductors, to which several units of the same type of equipment may be connected.

BUSY: The condition in which facilities over which a call is to be transmitted are already in use.

BUSY HOUR: The time of day when phone lines are most in demand.

BUSY TONE: A single tone that is interrupted at 60 ipm (impulses per minute) to indicate that the terminal point of a call is already in use.

BYPASS: The direct connection to customer-premises equipment by an IC. This occurs when an IC connects its own facilities (or facilities leased from a non-BOC entity) directly to an end user's premises, circumventing the use of the BOC network.

CARRIER: A long distance company which uses primarily its own transmission facilities, as opposed to resellers which lease or buy most or all transmission facilities from carriers. Many people refer to any type of long distance company, whether it has its own network or not, as a carrier, so the term is not as restrictive as it used to be.

CARRIER ACCESS CODE (CAC): The sequence an end user dials to obtain access to the switched services of a carrier. Carrier Access Codes for Feature Group D are composed of five digits, in the form 10XXX, where XXX is the Carrier Identification Code.

CARRIER COMMON LINE CHARGE (CCLC): A per minute charge paid by long distance companies to local phone companies for the use of local public switched networks at either or both ends of a long distance call. This charge goes to pay part of the cost of telephone poles, wires, etc.

CARRIER IDENTIFICATION CODE (CIC): The three-digit number that uniquely identifies a carrier. The Carrier Identification Code is indicated by XXX in the Carrier Access Code. The same code applies to an individual carrier throughout the area served by the North American Numbering Plan.

CARRIER SYSTEM: A system for providing several communications channels over a single path.

CELLULAR MOBILE RADIO: A high capacity land mobile radio system in which an assigned frequency spectrum is divided into discrete channels that are assigned to a cellular geographic serving area.

CENTRAL OFFICE (CO): With local telephone companies, the nearby building containing the local telco switch which provides local telephone service. Also the physical point where calls enter the long distance network. Sometimes referred to as Class 5 office, end office, or Local Dial Office.

CENTREX, CO: PBX Service provided by a switch located at the telephone company central office.

CENTREX, CU: A variation on Centrex CO provided by a telephone company maintained "Central Office" type switch located at the customer's premises.

CHANNEL: A communications path via a carrier or microwave radio.

CIRCUIT: A path for the transmission of electromagnetic signals to include all conditioning and signaling equipment. Synonym: Facility.

CIRCUIT SWITCHING: A switching system that completes a dedicated transmission path from sender to receiver at the time of transmission.

CLASS OF SERVICE/CLASS MARK (COS): A subgrouping of telephone customers or users for the sake of rate distinction or limitation of service.

COAXIAL CABLE: A cable with a solid outer shield, a space and then a solid inner conductor. The electromagnetic wave travels between the outer shield and the conductor. It can carry a much higher band width than a wire pair.

CODEC: Coder-Decoder. Used to convert analog signals to digital form for transmission over a digital median and back again to the original analog form.

COMMON CARRIER: A government regulated private company that provides the general public with telecommunications services and facilities.

COMMON CHANNEL INTEROFFICE SIGNALING (CCIS): A digital technology used by AT&T to enhance their Integrated Services Digital Network. It uses a separate data line to route interoffice signals to provide faster call set-up and more efficient use of trunks.

COMMON CONTROL SWITCHING ARRANGEMENT (CCSA): The use of carrier switches under a carrier's control as part of a customer's private network. The carrier's software controls and switches the customer's calls over private lines the customer has rented. Control of the switch and switching functions is done in common for all users using the software and switching system.

CONDITIONING EQUIPMENT: Equipment modifications or adjustments necessary to match transmission levels and impedances and which equalize transmission and delay to bring circuit losses, levels, and distortion within established standards.

CONFIGURATION: The combination of long-distance services and/or equipment that make up a communications system.

CONTROL UNIT (CU): The central processor of a telephone switching device.

COST COMPONENT: The price of each type of long distance service and/or equipment that constitutes a configuration.

CROSS CONNECTION: The wire connections running between terminals on the two sides of a distribution frame, or between binding posts in a terminal.

CROSS TALK: The unwanted energy (speech or tone) transferred from one circuit to another circuit.

CSU (**Channel Service Unit):** The connection point between the carrier telephone network and the customer equipment. A CSU typically permits the carrier to conduct remote diagnostics.

CUSTOMER ACCESS LINE CHARGE (CALC): The FCC-imposed monthly surcharge added to all local lines to recover a portion of the cost of telephone poles, wires, etc., from end users. Before deregulation, a large part of these costs were financed by long distance users in the form of higher charges.

CUSTOMER OWNED AND MAINTAINED (COAM): Customer provided communications apparatus and associated wiring.

CUSTOMER PREMISE EQUIPMENT (CPE): Telephone equipment, usually including wiring located within the customer's part of a building.

CUT: To transfer a service from one facility to another.

CUT THROUGH: The establishment of a complete path for signaling and/or audio communications.

DATA SET: A device which converts data into signals suitable for transmission over communications lines.

DATA TERMINAL: A station in a system capable of sending and/or receiving data signals.

DECIBEL (dB): A unit measurement represented as a ratio of two voltages, currents or powers and is used to measure transmission loss or gain.

DEDICATED ACCESS LINE (DAL): An analog special access line going from a caller's own equipment directly to a long distance company's switch or POP. Usually provided by a local telephone company. The line may go through the local telco Central Office, but the local telco does not switch calls on this line.

DELAY DIAL: A dialing configuration whereby local dial equipment will wait until it receives the entire telephone number before seizing a circuit to transmit the call.

DELTA MODULATION (DM): A variant of pulse code modulation whereby a code representing the difference between the amplitude of a sample and the amplitude of the previous one is sent. Operates well in the presence of noise, but requires a wide frequency band.

DEMODULATION: The process of retrieving data from a modulated signal.

DIAL LEVEL: The selection of stations or services associated with a PBX using a one to four digit code (e.g., dialing 9 for access to outside dial tone).

DIAL PULSING: The transmitting of telephone address signals by momentarily opening a dc circuit a number of times corresponding to the decimal digit which is dialed.

DIAL REPEATING TIE LINE/DIAL REPEATING TIE TRUNK: A tie line arrangement which permits direct trunk to trunk connections without use of the attendant.

DIAL SELECTIVE SIGNALING: A multipoint network in which the called party is selected by a prearranged dialing code.

DIAL TONE: A tone indicating that automatic switching equipment is ready to receive dial signals.

DIALING PLAN: A description of the dialing arrangements for customer use on a network.

DIRECT DISTANCE DIALING (DDD): A basic toll service that permits customers to dial their own long distance call without the aid of an operator.

DIRECT INWARD DIALING (DID): A PBX or CENTREX feature that allows a customer outside the system to directly dial a station within the system.

DIRECT OUTWARD DIALING: A PBX or CENTREX feature that allows a station user to gain direct access to an exchange network.

DROP: The portion of outside telephone plant which extends from the telephone distribution cable to the subscriber's premises.

DRY CIRCUIT: A circuit which transmits voice signals and carries no direct current.

DUAL TONE MULTI-FREQUENCY (DTMF): Also known as Touch-Tone. A type of signaling which emits two distinct frequencies for each indicated digit.

DUPLEX: Simultaneous two-way independent transmission.

DUPLEX SIGNALING: A long-range bidirectional signaling method using paths derived from transmission cable pairs. It is based on a balanced and symmetrical circuit that is identical at both ends. This circuit presents an E&M lead interface to connecting circuits.

ECHO: A signal that has been reflected or otherwise returned with sufficient magnitude and delay to be perceived by the speaker.

ECHO RETURN LOSS (ERL): The loss which must be in the echo path to reduce echo to a tolerable amount.

ECHO SUPPRESSOR: A device which detects speech signals transmitted in either direction on a four-wire circuit, and introduces loss in the direction of transmission.

EITHER END HOP OFF (EEHO): In private networks, a switch program that allows a call destined for an off-net location to be placed into the public network at either the closest switch to the origination or to the destination. The choice is usually by time of day. Uses either Head End Hop Off or Tail End Hop Off.

ELECTRONIC KEY TELEPHONE SETS (EKTS): A generic term indicating key telephones with builtin microprocessors which allow access to PBX-like features as well as access to multiple CO lines, using 2 to 4 pair wiring.

ELECTRONIC SWITCH: Modern programmable switch (often denoted ESS, for Electronic Switching System) used in most BOC telephone companies, many independent telephone companies, and by virtually all new long distance companies. Completely solid state electronics, as opposed to older electro-mechanical switches.

ELECTRONIC SWITCHING SYSTEM (ESS): Used as a station instrument on a PBX. Also a Bell System term for electronic exchange switching equipment.

ELECTRONIC TANDEM NETWORK (ETN): (1) A private network automatically and electronically connecting the calling office to the called office through Tandem-Tie Trunks. The network switches also function as PBXs. (2) An AT&T product name. (3) Used as a generic term for a PBX base network.

ENHANCED PRIVATE SWITCHED COMMUNICATIONS SERVICE (EPSCS): A private network utilizing Bell-provided equipment located in the central office and dedicated to a specific customer.

E&M LEADS: A pair of leads which carry signals between trunk equipment and separate signaling equipment unit. The M lead transmits battery or ground signals to the signaling equipment, and the E lead receives open or ground signals from the signaling equipment.

E&M SIGNALING: An arrangement whereby signaling between a trunk circuit and an associated signaling unit is effected over two leads providing full-time, 2-way, 2-level supervision.

ENTERPRISE NUMBER: A unique telephone exchange number that permits the called party to be automatically billed for incoming calls.

EQUAL ACCESS: Reprogramming of Local Exchange Company (LEC) switches to allow other long distance companies besides AT&T to be the "1+" primary long distance company for users of long distance (by creating a new type of Feature Group access circuit, FGD). Also provides "10-XXX" dialing for secondary and casual calling, generates true hardware Answer Supervision when calls are terminated over FGD circuits, and provides ANI (Automatic Number Identification) on originating calls.

EQUALIZATION: The procedure of compensating for fluctuation in circuit amplitude, delay, or distortion.

ERLANG: A unit of traffic intensity. One Erlang is the intensity at which one traffic path would be continuously occupied, e.g. one call per hour.

ERLANG B TABLE: A widely used table derived from a mathematical formula which allows the determination of the traffic capacity of a given group of circuits.

EXCHANGE: A telephone switching center.

EXCHANGE NETWORK FACILITIES FOR INTERSTATE ACCESS (ENFIA): AT&T's pricing arrangement for local loops offered to OCCs for connecting the OCC's network to the local telephone company's central office.

EXTENDED AREA SERVICE (EAS): Adding expanded local calling areas to a caller's basic local calling area for a (generally) small additional monthly fee. The EAS local calls can be either free (after a small additional monthly fee is paid) or at a cost of reduced per call charges.

FACILITIES: Typically refers to transmission lines or circuits, or long distance services. A caller's facilities are the circuits available to make calls.

FACSIMILE: The transmission of pictures, maps or other documents via communications circuits using a device which scans the original document, transforms the image into coded signals and reproduces the original document at a distant point.

FEATURE GROUP A: Line-side originating and terminating LATA access for which an originating subscriber dials an assigned telephone number that connects to a specific IC. The IC returns a tone to signal the caller to input additional tone-generated digits of the called number.

FEATURE GROUP B: Trunk-side originating and terminating LATA access for which an originating subscriber dials a 950-WXXX number (where W=0,1 and XXX is the Carrier Access Code), which is translated to a specified XXX carrier trunk group. Optional dial service and ANI may be available.

FEATURE GROUP C: Trunk-side LATA access for AT&T, generally, on a direct basis between each EO and an AT&T switching system.

FEATURE GROUP D: Also referred to as "Equal Access," Feature Group D is trunk-side LATA access affording

call supervision to an IC, a uniform access code (10XXX), optional calling-party identification, recording of access-charge billing details, and presubscription to a customer-specified IC.

FEDERAL COMMUNICATIONS COMMISSION (FCC): The United States government agency established by the Communications Act of 1934 which regulates the interstate communications industry.

FIBER OPTICS: High-speed transmission using light to send images (in telecommunications: voice or data) through a flexible bundle of glass fibers.

FOUR WIRE CIRCUITS: Circuits which use two separate one-way transmission paths of two wires each, as opposed to regular local lines which usually only have two wires to carry conversations in both directions. One set of wires carries conversation in one direction, the other in the opposite direction.

FREQUENCY: The number of complete cycles per unit of time.

FREQUENCY DIVISION MULTIPLEXING (FDM): The division of an available frequency range (bandwidth) into various subdivisions, each having enough bandwidth to carry one voice or data channel.

FREQUENCY RESPONSE: The reaction of frequencies to the circuit components.

FULL DUPLEX: A circuit which allows transmission of a message in both directions at the same time.

Synonym: 4-wire.

FULL PERIOD: Relates to private line service, which is rented for the exclusive use of a single customer for an entire month.

FOREIGN EXCHANGE SERVICE (FX): A service which allows a customer to appear to have a local presence in a distant part of town or, a different town altogether, by connecting his/her phone directly to a local business line in a part of town with a different exchange than his/her local calling area over a leased private line, or to a local telco in a distant town through long haul private lines purchased from a long distance carrier.

GRADE OF SERVICE: The probability of a call being blocked by busy trunks, expressed as a decimal fraction, and usually meaning the busy-hour probability.

GROUP: 12 circuits processed as a unit in a carrier system.

HALF DUPLEX: A circuit for transmitting or receiving signals in one direction at a time.

HARDWIRE: To wire or cable directly between units of equipment.

HARMONIC: The full multiple of a base frequency.

HARMONIC DISTORTION: The ratio, expressed in decibels, of the power at the fundamental frequency, to the power of a harmonic of that fundamental.

HEAD END HOP OFF (HEHO): A method of traffic engineering whereby calls are completed by using long distance facilities directly off the switch that serves that location.

HERTZ (Hz): International standard unit of frequency. Replaces, and is identical to, the order unit “cycles-per-second.”

HOMING: Returning to the starting position, as in a rotary stepping switch.

HOOKSWITCH: The device on which the telephone receiver hangs or on which a telephone handset hangs or rests when not in use. The weight of the receiver or handset operates a switch which opens the telephone circuit, leaving only the bell connected to the line.

HOT-CUT: Virtually instantaneous replacement of one line with another.

HYBRID: An electronic circuit which performs the wire conversions necessary for the connection of a local loop with a longhaul facility.

INTERCEPT: To stop a telephone call directed to an improper telephone number, and redirect that call to an operator or a recording.

INTERCONNECT: (1) The arrangement that permits the connection of customer's telecommunications equipment to a communications common carrier network. (2) The industry name for manufacturers, excluding the Bell system, which provide telephone equipment for the customer premises.

INTER-EXCHANGE MILEAGE (IXC): The airline mileage between two cities.

Synonym: Long Haul Mileage.

INTEREXCHANGE PLANT: The facilities between the subscriber switching center and another switching center.

INTERFACE: The junction or point of interconnection between two systems or equipment having different characteristics.

INTERFERENCE: Any unwanted noise or crosstalk on a communications circuit which acts to reduce the intelligibility of the desired signal or speech.

INTER-MACHINE TRUNK (IMT): A circuit which connects two automatic switching centers.

INTER-OFFICE TRUNK (IOT): A direct trunk between local exchange offices.

INTERNATIONAL RECORD CARRIER (IRC): Carriers providing international telecommunications services, including voice, telex, and data communications.

INTERSTATE: Any connection made between two states.

INTRASTATE: Any connection made that remains within the boundaries of a single state.

JITTER: Short term instability of the amplitude and/or phase of a signal. Commonly called PHASE JITTER.

KEYSET: A telephone instrument having an appearance of two or more telephone lines which can be accessed by depressing a button (key) on the face of the set.

KEY SYSTEM: The equipment utilized to provide the features associated with key sets, including keysets, multipair cable, key service unit, distribution frames.

LEASED LINES: Any circuit or combination of circuits designated to be at the exclusive disposal of a given subscriber. Synonym: Private line; Full Period Line.

LEAST COST ROUTING (LCR): A method of automatically selecting the least costly facility for transmission of a call. Synonym: Most Economical Route Selection (MERS); Automatic Route Selection; Flexible Route Selection.

LEVEL: An expression of the relative signal strength at a point in a communications circuit compared to a standard.

LOADING: A system for adding regularly spaced inductance units to a circuit to improve its transmission characteristics.

LOCAL ACCESS AND TRANSPORT AREA (LATA): A geographic area (called "exchange" or "exchange area" in the MFJ) within each BOC's franchised area that has been established by a BOC in accordance with the provisions of the MFJ for the purpose of defining the territory within which a BOC may offer its telecommunications services.

LOCAL AREA NETWORK (LAN): Intraoffice communication system usually used to provide data transmission in addition to voice transmission.

LOCAL EXCHANGE CARRIER (LEC): A local telephone company, either one of the Bell Operating Companies or one of the 1400+ independent local telephone companies.

LOCAL LOOP: The local connection between the end user and the Class 5 central office.

LONG HAUL: Circuits spanning considerable distances.

LOOP BACK: A method of performing transmission tests on a circuit not requiring the assistance of personnel at the distant end.

LOOP SIGNALING: Any of the three signaling methods which use the metallic loop formed by the trunk conductors and the terminating equipment bridges.

MAIN DISTRIBUTION FRAME (MDF): The point where outside plant cables terminate and from which they cross connect to terminal or central office line equipment.

MAIN PBX: A PBX directly connected to a tandem switch via an access trunk group.

MANUAL TIE LINE: A tie line which requires the assistance of an attendant at both ends of the circuit in order to complete a call.

MASTER GROUP (MG): 240 circuits processed as a unit in a carrier system.

MESSAGE TELEPHONE SERVICE (MTS): AT&T's tariffed pricing name for long distance telephone calls.

MESSAGE UNIT (MU): A local toll rate calling plan which is time and distance sensitive.

MICROWAVE (M/W): Radio transmission using very short lengths, corresponding to a frequency of 1,000 megahertz or greater. Synonym: Microwave Radio.

MICROWAVE RADIO: Synonym: Microwave.

MODEM: A device which modulates and demodulates signals on a carrier frequency and allows the interface of digital terminals with analog carrier systems.

MODIFIED FINAL JUDGEMENT (MFJ): The agreement between the U.S. Department of Justice and AT&T governing the breakup of the pre-Divestiture Bell System into AT&T and 22 Bell operating companies and other entities. On August 26, 1982, U.S. District Court Judge Harold Greene accepted, with modifications, an AT&T/Justice Department settlement terminating the government's 1974 antitrust suit against AT&T. Judge Greene's decree did away with the provisions of the 1956 consent decree that had kept AT&T out of competitive, unregulated ventures.

MODULATION Alterations in the characteristics of carrier waves. Usually impressed on the amplitude and/or the frequency.

MONITORING DEVICE: Records data on calls placed through a company's telephone system: number called, length of calls, calling location.

MOST ECONOMICAL ROUTE SELECTION (MERS): Synonym: Least Cost Routing.

MULTIPLEXING: The act of combining a number of individual message circuits for transmission over a common path. Two methods are used: (1) frequency division, and (2) time division.

NETWORK: A collection of switches connected to one another by transmission facilities.

NETWORK NUMBERING EXCHANGE (NXX): The three digit location code representing the central office. "N" may be any number between "2" and "9" and "X" may be any number.

NETWORK TRUNKS: Circuits connecting switching centers.

NNX CODES: The 3-digit code used historically for local Exchange Codes. "N" can be any number from 0 to 2, "X" can be any digit. The current numbering plan allows for more variation in assigning Exchange Codes, and under it Exchange Codes are commonly referred to as "NXXs."

NODE: A major switching center of a network.

NON-BLOCKING: A switching network having a sufficient number of paths such that a subscriber originating a call can always reach any other idle subscriber without encountering a busy.

NUMBERING PLAN AREA (NPA): A geographical division within which no two telephones will have the same 7-digit number. "N" is any number between "2" and "9"; "P" is always "1" or "0"; and "A" is any number excluding "0". Commonly referred to as "area code."

NXX CODES: The current general configuration for Exchange Codes within each Area Code.

See also: "NNX Codes"

OFFERED TRAFFIC: The number of call attempts in any specified period of time.

OFF HOOK: The condition which results when a telephone is lifted from its mounting, allowing the hookswitch to operate.

OFF-NETWORK ACCESS LINE (ONAL): A local exchange (Feature Group access), Foreign Exchange, or WATS line connecting both incoming and outgoing traffic from a long distance company's network to the public switched network. Generally a circuit leased by a long distance carrier to be used by many customers not hooked directly into the long distance carrier's network.

OFF NETWORK CALLING : Telephone calls through a private switching system and transmission network which extend to the public telephone system.

OFF PREMISES EXTENSION (OPX): An extension telephone or keyset that is geographically separated from its associated PBX.

ON HOOK: The condition which results when a telephone handset is placed on its mounting, which causes the hook-switch to open its contacts.

ON NETWORK CALLING: A term used to describe a call that originates and terminates on a private network.

OPERATOR ASSISTED CALLS: Non-DDD calls requiring manual intervention.

ORIGINATING OFFICE: The central office that serves the calling party.

OTHER COMMON CARRIER (OCC): A long distance company other than AT&T having many of its own long distance circuits, either owned or leased. Some people use OCC to refer to all AT&T long distance competitors, including resellers, but this is not technically correct.

OUT-OF-BAND: Any frequency outside the band used for voice frequencies.

OUT-OF-BAND SIGNALING: Use of narrow band filters to place the voice signal on a carrier channel below 3,400 CPS, reserving the 3,400 – 3,700 CPS band for supervisory signals.

OVERBUILD: Adding radio capacity to a telecommunications network.

OVERFLOW: Switching equipment which operates when the traffic load exceeds the capacity of the regular equipment.

PAD: A non-adjustable resistance network used to insert transmission loss into a circuit.

PHASE JITTER: See Jitter

POINT OF PRESENCE (**POP**): A physical location within a LATA at which an IC establishes itself for the purpose of obtaining LATA access and to which the BOC provides access services.

POINT-TO-POINT: A communications circuit between two terminations which does not connect with a public telephone system.

PORT: Entrance or access point to a computer, multiplexor device or network where signals may be supplied, extracted or observed.

POSTAL TELEPHONE AND TELEGRAPH (PTT): Foreign government agencies responsible for regulating communications.

PRIMARY AREA: A customer's local telephone calling area.

PRIMARY INTEREXCHANGE CARRIER (PIC): The IC designated by a customer to provide inter-LATA service automatically without requiring the customer to dial an access code for that carrier.

PRIMARY ROUTING POINT: The switch designated as the control point for a longhaul telephone call.

PRIVATE BRANCH EXCHANGE (PBX): A private phone system (switch) used by medium and large companies which is connected to the public telephone network (local telco) and performs a variety of in-house routing and switching. User usually dial "9" to get outside system to the local lines.

PRIVATE LINE (PL): A full-time leased line directly connecting two points, used solely by purchaser. The most common form is a tie line connecting two pieces of a user's own phone equipment – flat rate billing, not usage sensitive.

PRIVATE USE NETWORK: Two or more private line channels contracted for by a customer and restricted for use by that customer only.

PUBLIC SWITCHED NETWORK (PSN): The pre-Divestiture nationwide network maintained by AT&T and the independent telephone companies which provides nationwide, unrestricted telephone service.

PSTN: Public Switched Telephone Network.

PUBLIC SERVICE COMMISSION (PSC): The state commissions regulating intrastate communications.

PUBLIC UTILITY COMMISSION (PSC): The state commissions regulating intrastate communications.

PULSE CODE MODULATION (PCM): The form of modulation in which the information signals are sampled at regular intervals and a series of pulses in coded form are transmitted representing the amplitude of the information signal at that time.

PULSE-LINK REPEATER: Connects one E&M signaling circuit directly to another.

PULSE MODULATION: The modulation of a series of pulses which represents information-bearing signals. Typical methods involve modifying the amplitude (PAM), width or duration (PWM) or position (PPM). Pulse Code Modulation (PCM) is the most common modulation technique involved in telephone work.

PUSH BUTTON DIALING: Synonym: Dual Tone Multi-Frequency.

QUEUE: A temporary delay in providing service caused by the inability of the system provided to handle the number of messages or calls attempted.

RADIO COMMON CARRIER (RCC): Communications common carrier that provides radio paging and mobile telephone services to the public.

RATE CENTER: A specified geographic location used by the telephone company to determine interchange mileage for rate determination purposes.

REDUNDANCY: Duplicate equipment that is provided to minimize the effect of failures or equipment breakdowns.

REGENERATION: The process of receiving distorted signal pulses and from them recreating new pulses at the correct repetition rate, pulse amplitude, and pulse width.

RE-HOMING: A major network change which involves moving customer services from one switching center to another and establishing the necessary trunking facilities to do so.

REMOTE ACCESS: The ability of transmission points to gain access to a computer which is at a different location.

REPEATER: An electronic device used to amplify signals which have become too weak.

REPEATING COIL: The telephone industry's term for a voice-frequency transformer.

RESELLER: A long distance company that purchases large amounts of transmission capacity or calls from other carriers and resells it to smaller users.

RESTORATION: The re-establishment of service by rerouting, substitution of component parts, or as otherwise determined.

RETARD COIL: A coil having a large inductance which retards sudden changes of the current flowing through its winding.

RINGBACK TONE: Synonym: Audible Ringing Tone.

RINGDOWN: A circuit or method of signaling where the incoming signal is actuated by alternating current over the circuit.

ROUTE DIVERSITY: Two (or more) private line channels (circuits) furnished partially or entirely over two physically separate routes. Serves to prevent total loss of service if one cable gets cut or goes out.

ROUTE OPTIMIZATION: Synonym: Least Cost Routing.

ROTARY HUNT: An arrangement which allows calls placed to seek out an idle circuit in a prearranged multi-circuit group and find the next open line to establish a through circuit.

SATELLITE RELAY: An active or passive repeater in geosynchronous orbit around the Earth which amplifies the signal it receives before transmitting it back to earth.

SELECTIVE CALLING: The ability of a transmitting station to specify by the use of assigned codes which of several stations is to receive a message.

SERVICE AND EQUIPMENT RECORD: A list of equipment billed to customer by type, quantity, monthly charge, location and billing dates.

SINGLE-FREQUENCY SIGNALING (SF): A signaling system which uses a 2,600 Hz in-band signal on the voice path. The tone is on in the idle condition, pulsed for dialing, and off when the circuit is in use.

SHORT HAUL: Circuits designed for use over distances of 10-200 miles.

SIGNALING: The process of transferring information between two parts of a telephone network to control the establishment of communications between long distance carrier terminal points, and customer equipment required for voice grade dedicated circuits.

SIGNALING CONVERTER: A device with input and output signals that contain the same information but employ different electrical systems for transmitting that information. Used at the terminal of a trunk to convert the equipment signals to the system used on the trunk. Examples are: (1) ring down to SF, (2) E&M to SF.

SINGING: A continued whistle or howl in an amplified telephone circuit. It occurs when the sum of the repeater gains exceeds the sum of the circuit losses.

SIGNAL TO NOISE RATIO: Ratio of the signal power to the noise power in a specified bandwidth, usually expressed in dB.

SIMPLEX SIGNALING (SX): A signaling path over a dry talking circuit which uses the two sides of the circuit in parallel, derived by connecting the midpoints of repeating coils or retardation coils which are across the circuit.

SIGNALING, IN-BAND: A type of signaling using an AC signal (usually 2,600 Hz) within the normal voice band. This signal can be transmitted from end to end of a long voice circuit without an intermediate signaling equipment. Since the signaling is audible, the signaling equipment must be arranged for "tone on when idle" operation.

SINGLE SIDEBAND RADIO (SSB): A form of amplitude modulation of a radio signal in which only one of the two sidebands is transmitted. Either of the two sidebands may be transmitted, and the carrier may be transmitted, reduced or suppressed.

SOFTWARE DEFINED NETWORK (SDN): A switched long distance service for very large users with multiple locations. Instead of putting together their own network, large users can get special usage rates for calls made on regular long distance company switched long distance services.

Synonym: Virtual Private Network.

SPECIAL GRADE NETWORK TRUNK: A trunk specially conditioned by providing amplitude and delay equalization for the purpose of handling special services such as medium-speed data (600 to 2400 bps).

SPECIALIZED COMMON CARRIER (SCC): Synonym: Other Common Carrier.

SPEED NUMBER: A one, three, or four digit number that replaces a seven or ten digit telephone number. These numbers are programmed into the switch in the carrier's office or in a PBX.

STATION: Any customer location on a network capable of sending or receiving messages or calls.

STATION MESSAGE DETAIL RECORDING (SMDR): A computer generated report showing internal usage on a telephone system. Usually including extension number, trunk number used, phone number dialed, time of call, duration and operator involvement.

STORE-AND-FORWARD: A technique in which a message is received from the originator and held in storage until a circuit to the addressee becomes available.

STORED PROGRAM CONTROL (SPC): A system whereby the instructions are placed in the memory of a common controlled switching unit and to which it refers while processing a call for instructions regarding class marks, code conversions, routing, as well as for trouble analysis.

SUPERGROUP (SG): 60 circuits processed as a unit in a carrier system.

SUPER MASTER GROUP (SMG): 600 circuits processed as a unit in a carrier system.

SUPERVISION: Synonym: Answer Supervision.

SUPERVISORY SIGNALS: A signal, such as "on-hook" or "off-hook," which indicates whether a circuit or line is in use.

SWITCH: Equipment used to interconnect lines and trunks.

SWITCHED ACCESS: Connection between caller's phone system and switch of chosen long distance carrier when a regular long distance call using regular local lines is made. Also the connection between the switch of caller's long distance carrier in the distant city and the phone being called.

SWITCH HOOK: Synonym: Hookswitch.

SWITCHING: The operations involved in interconnecting circuits in order to establish communications.

SWITCHING CENTER: A location at which telephone traffic, either local or toll, is switched or connected from one circuit or line to another.

SWITCHING OFFICE: A telephone company office which contains a switch.

T-1 : 24 voice channels digitized at 64,000 bps, combined into a single 1.544M bps digital stream (8,000 bps signaling), and carried over two pairs of regular copper telephone wires. Used primarily by telephone companies until 1983. Now used for dedicated local access to long distance facilities, longhaul private lines, and for regular local service. Today, most any 1.544M bps digital stream is called T-1, regardless of its makeup or what the transmission medium is.

T-CARRIER: A time-division, pulse-code modulation, voice carrier used on exchange cable to provide short-haul trunks.

TAIL END HOP OFF (TEHO): In a private network, a call which is carried over flat rate facilities (Intermachine Trunks or IMT) to the closest switch node to the destination of the call, and then connected into the public network as a local call.

TANDEM: A switching arrangement in which the trunk from the calling office is connected to a trunk to the called office through an intermediate point.

TANDEM SWITCHING SYSTEM: Synonym: Tandem Tie Trunk Network.

TANDEM TIE TRUNK NETWORK (TTTN): A serving arrangement which permits sequential connection of tie trunks between PBX/CENTREX locations by utilizing tandem operation.

TANDEM TRUNKING: Trunks which connect two or more switches together.

TARIFF: The published rates, regulations, and descriptions governing the provisions of communications service.

TELCO: Local telephone company.

TELECOMMUNICATIONS: The transmission of voice and/or data through a medium by means of electrical impulses and includes all aspects of transmitting information.

TELEGRAPH: A system employing the interruption of, or change in, the polarity of DC current signaling to convey coded information.

TELEPHONE: A device which converts acoustical (sound) energy into electrical energy for transmission to a distant point.

TELETYPEWRITER: A machine used to transmit and/or receive communications on printed page and/or tape.

TERMINAL: A point at which information can enter or leave a communications network.

TERMINAL EQUIPMENT: Devices, apparatus and their associated interfaces used to forward information to a local customer or distant terminal.

TERMINATION: (1) An item that is connected to the terminal of a circuit or equipment. (2) An impedance connected to the end of a circuit being tested. (3) The points on a switching network to which a trunk or line may be attached.

TIE-LINE: A private leased line linking two phones or phone systems directly. Can ring distant phone automatically when telephone is lifted from its mounting, or when a short code is dialed.

TIME DIVISION MULTIPLEXING (TDM): Equipment which enables the transmitting of a number of signals over a single common path by transmitting them sequentially at different instants of time.

TOLL CALL: Any call to a point outside the local service area.

TOLL CENTER: A central office where operators (human or mechanical) are present to assist in completing incoming toll calls.

TOLL OFFICE: A center for the switching of toll calls.

TOLL PLANT: The facilities that connect toll offices throughout the country.

TOLL RESTRICTION: A restriction in outgoing trunks which counts the first three digits dialed and diverts calls to forbidden codes either to a busy tone, to the operator, or to a recorded announcement.

TOUCH-TONE ADAPTOR: A device that can be connected to a rotary dial telephone to allow for DTMF signaling.

TRAFFIC: Calls being sent and received over a communications network.

TRAFFIC MEASUREMENT AND RECORDING SYSTEMS (TMRS): A computer generated report showing usage information of telephone systems. Usually this includes trunk utilization, outages, queueing time, and the need for additional common equipment.

TRAFFIC SERVICE POSITION SYSTEM (TSPS): A toll switchboard position configured as a push button console.

TRANSMISSION: The electrical transfer of a signal, message or other form of data from one location to another without unacceptable loss of information content due to attenuation, distortion, or noise.

TRANSMISSION LEVEL: The level of power of a signal, normally 1,000 Hz, which should be measured at a particular reference point.

TRANSMISSION SPEED: Number of pulses or bits transmitted in a given period of time, usually expressed as bits per second (bps) or words per minute (wpm).

TRUNK: A telephone circuit or path between two switches, at least one of which is usually a telephone company Central Office or switching center. Regular local CO circuits are called PBX trunks, because there is a switch at both ends of the circuit.

TRUNK GROUP: An arrangement of communications channels into an identical group.

TRUNK TYPE (TT): Trunks that use the same type of equipment going to the same terminating location.

TRUNK UTILIZATION REPORT (TUR): A computer printout detailing the traffic use of a trunk.

TELETYPEWRITER EXCHANGE SERVICE((TWX): A service whereby a customer's leased teletypewriter is connected to a "TWX" switchboard and from there connected over regular toll circuits to a teletypewriter of any U.S. customer who subscribes to a similar service.

TWO-WIRE CIRCUIT: (1) A channel for transmitting data in one direction at a time. (2) A short distance channel using a single send/receive pathway, usually two copper wires, connecting a telephone to a switch.

UNIFORM CALL DISTRIBUTOR (UCD): A device located at the telephone office or in a PABX which distributes incoming calls evenly among individuals.

UNIFORM SERVICE ORDER CODE (USOC): The information in coded form for billing purposes by the local telephone company pertaining to information on service orders and service equipment records.

VALUE-ADDED NETWORK SERVICE (VANS): A data transmission network which routes messages according to available paths, assures that the message will be received as it was sent, provides for user security, high speed transmission and conferencing among terminals.

VIA NET LOSS (VNL): The lowest loss in dB at which a trunk facility can be operated considering limitations of echo, crosstalk, noise and singing.

VOICE CONNECTING ARRANGEMENT: An interface arrangement provided by the telephone company to accommodate the connections of non-carrier provided voice terminal equipment to the public switched telephone network.

VOICE FREQUENCY (VF): Any of the frequencies in the band 300–3,400 Hz which must be transmitted to reproduce the voice with reasonable fidelity.

VOICE GRADE: An access line suitable for voice, low-speed data, facsimile, or telegraph service. Generally, it has a frequency range of about 300–3000 Hz.

VOICE GRADE FACILITY (VGF): A circuit designed to DDD network standards which is suitable for voice, low-speed data, facsimile, or telegraph service.

WIDE AREA TELECOMMUNICATIONS SERVICE (WATS): WATS permits customers to make (OUTWATS) or receive (INWATS) long-distance calls and to have them billed on a bulk rather than individual call basis. The service is provided within selected service areas, or bands, by means of special private access lines connected to the pubic telephone network via WATS-equipped central offices. A single access line permits inward or outward service, but not both.

WIDEBAND: A term applied to facilities or circuits where bandwidths are greater than that required for one voice channel.

WIRE CENTER: The physical structure that houses one or more central office switching systems.

"0" or "0-": Zero minus dialing. Allows a caller to dial zero and nothing else to get the Operator.

"0+": Zero plus dialing. An operator assisted long distance call which is charged to the calling party.

”00+” or “00-”: Double zero dialing. Allows a caller to get an AT&T Operator in areas in which dialing only one zero would connect the caller with the local Operator because AT&T has given Operators back to the local telephone company.

”1+” DIALING: The capability to dial “1” plus the long distance number for calls within the North American Numbering Plan area. Intra-LATA calls are carried by the local telephone company. Inter-LATA calls are carried by the caller’s primary carrier, or by AT&T if equal access has not come to the caller’s area yet.

”10-XXX” DIALING: The ability to send calls over a carrier other than a caller’s primary carrier by dialing “10-XXX” then “1+” the long distance number, where “XXX” is the 3-digit Carrier Code of the alternative long distance company (also called a secondary carrier). Available only to Equal Access customers.

800 SERVICE: The ability of a caller to dial a long distance telephone number without incurring a charge for the call, which is paid for by the party offering the 800 number. Synonym: Inward WATS service.

900 SERVICE: Allows callers to receive information from the service provider via a recorded audio message, which can range from 60 seconds to a continuous live hookup, by calling a 900 number. This service can also be used to enable callers to vote or “make a choice” by dialing one of two 900 numbers. Such 900 calls are typically billed to the caller at $.50 for the first minute of any call and $.35 for each additional minute.

976 NUMBERS: Service which allows callers to listen to recorded messages such as horoscopes, “adult” dialogue, stock market or sports reports by calling 976-xxxx. The local telephone company charges callers a fee which is split between the local telephone company and the service provider.

GLOSSARY

This glossary defines those terms that are used in DECvoice–T1 documentation.

ACNA: Automated Customer Name and Address pronunciation. This is a feature of the DECvoice software.

ACP: An Ancillary Control Process. An ACP is an undocumented VMS mechanism that allows a device driver to perform time consuming or outer mode activities such as RMS.

ACP: See Call Progress Detection

ACPD: See Call Progress Detection

ADPCM: Adaptive Delta Pulse Coded Modulation. An encoding format used by DECvoice modules for voice data.

Algorithm Conversion: The conversion from one voice encoding algorithm to another. The DECvoice RTL supports several voice encoding algorithms including full bandwidth 64-kilobits-per-second A-law, full bandwidth 64-kilobits-per-second A-law, and 16-kilobit-per-second subband compressed encoding.

Blue Alarm: Two frames of ones and an out-of-frame condition. This alarm is used as a keepalive on the circuit.

Call Progress Detection: The monitoring of the call audio to determine if the call was answered, the line was busy, or no one answered (the call timed out). Call progress detection is based on the various frequencies and cadences generated by the telephone network.

Inserting an “X” character in the dial string of a DECvoice RTL VOX$DIAL routine causes the DECvoice to perform Audio Call Progress Detection.

CEPT: CEPT is a European standards body. One of the CEPT standards is a DS1 rate digital telephone service known as CEPT–PCM30, also known as E1. It is roughly analogous to the FCC T1 format. CEPT–PCM30 has 30 DS0 PCM streams, plus one DS0 stream for framing and one DS0 stream for signalling bits.

Channel Bank: A channel bank is a device used to convert a T1 connection to a group of tip-and-ring connections. It can also be used in the reverse fashion; it can convert a group of tip-and-ring lines to a T1 connection.

Cluster Wide License: A Cluster Wide license is a license drawn from units available to all processors in a VAXcluster. This type of license allows the system manager to choose which processors run the licensed product(s) on which processors.

The DECvoice “VOX” license, order number QL–VFUA9–J*, is an example of a Cluster Wide license.

Complex Mode: The term “complex”, as applied to the set of voice functions that are supported on a M3135 voice module when operating in the “complex” mode, typically includes hardware supported encoding algorithms for playback/record and *does* include Text-to-Speech Synthesis, Voice Recognition, Audio Call Progress, and so forth.

Complex stream context: A message context that incorporates more than one message handle. The complex stream context lets applications reposition within a group of messages for record and playback operations. Also, the complex context lets applications smoothly concatenate multiple-stored speech segments.

CPU: Central Processing Unit.

CRC: This stands for Cyclic Redundancy Check. It is an error checking code that is normally appended to a packet of data, or interspersed inside a packet of data. It allows a check on the integrity of a data line.

CSR: A CSR is a Q–bus Control and Status Register. This register is used for communications between a host processor module, such as a KA655 module, and an I/O device, such as a DTC05 module.

CSU: A Channel Service Unit. The connection point between the carrier telephone network and the customer equipment. A CSU typically permits the carrier to conduct remote diagnostics.

Crosspoint Switch: A crosspoint switch allows routing of signals from one point on a telephone network to another part of the telephone network. The DTCN5 contains two crosspoint switches.

D4: T1 framing format that allows for two robbed bits per channel in each direction. These bits (or a decoded version) can be used to drive relays or lights, ring phones, etc.

DECvoice–T1: DECvoice–T1 is a multi–board consisting of zero or more M3135 DTC05 modules and one or more M3136 modules. DECvoice–T1 supports up to eight telephone connections when only the digitized voice capabilities are required. The full set of DECvoice capabilities is supported in single connection operations. DECvoice–T1 supports digitized voice, voice recognition, synthesized voice, and various telephony functions. DECvoice–T1 hooks to one or more T1 connections. See also M3135, M3136.

DECvoice Message: Text and stored voice date in the special internal format that the DECvoice RTL uses. Once voice and text data is in the form of a DECvoice message, DECvoice can perform many different types of operations on the message.

DECvoice Microcode: All the soft–loadable speech functionality available on the DECvoice module. Included in the microcode is the systme, audio, text–to–speech, and word recognition subsystems. The microcode is down–loaded from the host, typically by the DECvoice RTL.

DECvoice RTL: The DECvoice Run–Time Library is a group of routines that let applications program the DECvoice features. The routines provide support for moodule initialization, data manipulation, voice storage and playback, recognition, telephone line control, and various related tasks.

DOC: The Canadian Department of Communications. The body with statutory control over Canadian telephony.

DS0: A single 64-kilobit data stream, usually a portion of line operating at a higher rate.

DS1: In the United States and Canada, this is 24 DS0 streams. In Europe, this is 32 DS0 streams.

DSP: Digital Signal Processing.

DSX-1: DSX-1 is an electrical standard used for digital communications.

DTC05: See M3135, the DECvoice-T1 voice module.

DTCN5: See M3136, DECvoice-T1 telephony module.

DTMF: Dual Tone Multi Frequency. DTMF tones are used for a variety of signaling purposes, including dialing.

DX: Shorthand for Crosspoint switch. A crosspoint switch allows routing of signals from one point on a telephone network to another part of the telephone network. The DTCN5 contains two crosspoint switches.

E1: See CEPT.

Eight–Line Mode: The name eight–line mode (formerly known as ~reduced" mode) is the subset of voice functions that are supported on a M3135 voiice module that is operating in the eight–line mode. Functions supported in eight line mode includes hardware supported encoding algorithms for playback and recording: eight–line mode does *not* support Text–to–Speech Synthesis nor Voice Recognition.

EMI: ElectroMagnetic Interference. A generally undesirable intereaction that can occur between various unshielded devices.

Encoding Algorithm: The voice encoding algorithm that the DECvoice uses to store voice data. The DECvoice RTL supports several voice encoding algorithms.

EOS: Electrical OverStress. A generally undesirable intereaction that can occur between various devices.

ESF: Extended Super Frame; a T1 framing format that allows for four robbed bits per channel, checksum on the data, and an extra channel (Facility Data Link ~FDL") at a low bit rate. This is an extension of D4. The checksum and FDL are woven into the framing bit.

Event: A potentially asynchronous response to a DECvoice RTL routine; used by the DECvoice RTL to communicate with the client application. Applications can use the DECvoice RTL routine VOX$GET_EVENT routine to retrieve events.

FCC: The American Federal Communications Commission. The body with statutory control over American telephony.

FDL: Facility Data Link. This is a 4-kilobit-per-second channel that is composed of every other framing bit on an ESF format T1 line. This link is used by at least one channel bank manufacturer to configure the channel bank. Not to be confused with the VMS File. Definition Language Facility, also known as FDL.

Graphemic mode: A mode where the literal word spelling, rather than phonemic spelling, is presented into the DECvoice Synthesizer for synthesis output.

HDLC: Half Duplex Line Control. A packet protocol often seen with the Facility Data Link (FDL) component of ESF.

Initialization: The process that the host, using the DECvoice RTL, performs on the DECvoice at the beginning of a DECvoice working session. On initialization, the host allocates and assigns a channel to the DECvoice device and sets up communications among the DECvoice device, the DECvoice ACP and the associated device drivers.

IDC: A generic name for an Insulation Displacement Connector. IDC components are a common component of the DECvoice TDM Highway.

ISDN-BASIC: Basic Rate ISDN. This is also called 2B+D and consists of two channels of voice or data and one channel of control.

ISDN-PRI: Primary Rate ISDN. This is a line with DS1 electrical characteristics where one of the voice channels is turned into a common control channel. If based on T1 it is called 23B+D. If based on CEPT then it is called 30B+D. The B stands for a DS0 stream that could be used for voice or data. The D stands for a DS0 stream that is used for call control.

LPS: Line Processor Section; a signal processing subsystem of the DTC05 module.

M3135: The DECvoice-T1 Multi-function, multi-line voice module. Also known as the DTC05–AA module. The module is a quad formfactor Q-Bus module for the S-box (BA200 and BA400 series enclosure) processors. The M3135 module connects to the TDM highway interconnect. See also DECvoice-T1. Contrast with DECvoice-I.

M3136: The DECvoice-T1 telephone network interface module. Also known as the DTCN5–AA network module. The module is a quadform-factor Q-bus module intended for installation in S-box processors. The M3136 provides the connections to three T1 communications lines and up to three shelves of DTC05 modules via the three TDM highway connectors. The M3136 module design supports various numbers and combinations of these connections up to the maximum. Initial system support will be for one M3136 per system. See also DECvoice-T1. Contrast with DECvoice-I.

Message Handle: The identifier of a particular DECvoice RTL stored message. Applications use the message handle to access and reference a particular message. The message handle contains specific information to a message, including the message size, the length, the encoding algorithm, the message reference count, the language, the RTL version number, the creation date, and the date of last modification.

MF: Multi Frequency; signalling tones used and generated in the telephone network.

Network Module: See M3136.

Offhook: A telephonic state where the telephone handset is currently off the switch hook cradle. Depending on the type of telephone line in use, this state can be caused by physically moving the handset, by electrically completing the telephone circuit or by the generating of a digital electronic signal.

Onhook: A telephonic state where the telephone handset is currently on the switch hook cradle. Depending on the type of telephone line in use, this state can be caused by physically moving the handset, by electrically breaking the telephone circuit or by the generating of a digital electronic signal.

One-Line Mode: The name one-line mode (formerly known as “complex” mode) is applied to the subset of voice functions that are supported on an M3135 voice module when operating in the single-line mode. One-line mode includes hardware supported encoding algorithms for playback and recording and includes Text-to-Speech Synthesis, Voice Recognition, Audio Call Progress, etc.

Optional Parameters: Variable arguments that applications can use to change how certain RTL routines execute. By using one or more the optional parameters, an application can tailor the DECvoice RTL to suit a particular environment.

PAK: Product Authorization Key, a piece of paper containing requisite runes required to run software. See LMF.

PBX: A private branch exchange. A telephone switch, typically located at the customer site.

PCM: Pulse Code Modulation. A common name for -Law or A-Law eight bit data encoding.

PLL: Phase Locked Loop. Method or device that synchronizes clock streams. This can be done digitally by stretching a cycle of a clock, or using analog techniques (such as varying the capacitance on crystal leads).

Positive Disconnect: Notification that the remote party has terminated the telephone connection. Positive disconnect is not available on all telephone networks. See Wink.

PSTN: Public Switched Telephone Network. The PSTN is the carrier of all regulated telephone traffic within a country. The United States Federal Communications Commission (FCC) is the regulatory agency that oversees the United States PSTN.

Pulse Dialing: An older method of dial signaling; the signalling used by a rotary telephone. The telephone digits are pulsed, or dialed, at a rate of 10 pulses per second.

Recognition Template: An utterance stored in a template buffer in DECvoice module memory; used by the DECvoice recognition microcode to match against an utterance collected from the telephone line. If the utterance collected from the telephone line is a close match to the template word, the DECvoice RTL informs the application that the match is a good one.

Red Alarm: An alarm indicating a loss-of-signal condition.

Reduced Mode: See Eight-Line Mode.

Repositioning: Moving the active position from one area to another within a message to playback (or record over) different parts of a message. The DECvoice RTL allows both absolute and relative positioning within a message.

Shelf: A Shelf consists of a contiguous bank of M3135 voice modules connected to a unique TDM highway via flat ribbon cables. A Shelf must connect to a M3136 Telephone network module. The TDM source connection on the proximal side (relative to the VAX or MicroVAX processor) must be connected to the M3136 network module.

See TDM.

Stream Context: The information necessary to track the active position of a DECvoice RTL structured message. The stream context includes the following information: module ID associated with the message, length of the message, active position within the message, and the current state of the message (typically either paused or active). Applications can query the stream context for a particular message with the DECvoice RTL VOX$GET_CONTEXT_INFO routine.

Structured message: A message in the internal DECvoice RTL format. In addition to the actual voice data, a structured message contains the creation date, the date of last modification, the encoding algorithm used, the RTL version, and the language the message is in.

Subsystem: A section of microcode that performs certain DECvoice functions. DECvoice has five default subsystems: system, audio, text-to-speech, stored voice, and word recognition.

Switch Hook Flash: Any interruption in the telephone line current; a switch hook flash can be caused by pressing the switch hook on a phone. Used by some telephone switches to control switch-specific options, such as call forwarding and call conferencing.

T1: T1 is a name used in the United States and Canada for a 24-channel, DS1 format. T1 has an extra bit for framing and (optionally) “stolen” bits for control and signalling. The clock rate is determined implicitly by the received data rate; detection uses a Phase Lock Looped (PLL) Circuit. T1 is often physically wired as two twisted pairs, one pair in each direction.

T1 Module: See M3136.

TDM: This actually stands for Time Division Multiplex, and refers to the method used to pack the 32 DS0 streams onto four twisted pairs. Thirty Two DS0 streams with separate wires for framing and clock. This is one twisted pair per direction for data, and a separate twisted pair for framing and clocking (in T1 the framing and clocking are implicit, on the TDM bus they are explicit) . The TDM does not carry control information.

TDM Highway: In the DECvoice-T1, the TDM highway is used as a bus to connect the DECvoice-T1 Q-bus modules, the M3135 and M3136, together into a functioning unit. It is physically a ribbon cable daisy-chained to all M3135 modules in a shelf. On the end of shelf nearest the MicroVAX processor, the TDM connects to the M3136 network module. On the end of the shelf farthest from the MicroVAX processor, the TDM-out plug on the last M3135 module has a TDM terminator plug in place of the keyed ribbon cable.

See Shelf, TDM.

TDM Terminator: A small plug that is inserted into the lower 20-pin IDC connector on a DTC05. This module is used to terminate the TDM highway.

See TDM Highway.

Telephone Line Interface (TLI): That part of the DECvoice hardware and microcode that controls communication between the DECvoice module and the telephone line. On the DECvoice-I the physical portion of the TLI is mounted on the I/O bulkhead.

Termination: Completion and teardown of the connection between the host system, typically the DECvoice RTL, and the DECvoice module. Applications can terminate a DECvoice session with the DECvoice RTL VOX$TERMINATE routine.

Text to Speech: The act of converting written text into speech. The DECvoice text-to-speech subsystem performs all of the text-to-speech tasks including translating text into speech, number parsing, and voice selection.

Often referred to as synthesis.

Tip and Ring Lines: Tip and Ring Lines, named after the electrical connection to the tip and ring on the now-historical operator's plug in the central office, are the most common form of telephone lines. These telephone lines are the most common type in North America.

TLI: See Telephone Line Interface

Tone Dialing: A Dial signalling protocol that utilizes DTMF signalling; the protocol used by non-pulse telephones. Each DTMF tone represents a specific digit in the dial string.

VMDRIVER: The DECvoice port device driver used on the DECvoice-T1 DTC05 voice module. The device driver provides the low-level support between the DECvoice class driver (VODRIVER) and the DECvoice module.

VNDRIVER: The DECvoice port device driver used on the DECvoice-I DTCN5 telephony module. The device driver provides the low-level support between the DECvoice class driver (VODRIVER) and the DECvoice module.

VODRIVER: The DECvoice class device driver used with all DECvoice hardware. The device driver presents the DECvoice RTL with a consistent interface a variety of DECvoice port drivers.

Voice Compression: The encoding of voice data in such a way as to reduce the amount of data necessary to encode the voice. The DECvoice RTL supports the 16 kitlobit per second subband compressed encoding algorithm to record or load voice data. Compressed voice data requires less memory than noncompressed data, but includes a corresponding decrease in the quality of the recorded voice.

Voice Module: See M3135.

Voice Recognition: The interpretation of collected utterances. The DECvoice RTL uses either an isolated word recognition system or an optional continuous word recognition system. The recognition system uses pattern matching. The system collects an utterance from the telephone line, or from message data in memory, then matches the word against a set of stored recognition templates. The DECvoice RTL returns the result of this matching process to the application. The result can be “good,” “fair,” or “poor.”

Voice recording: The digitization and storage of speech collected from the host or the telephone line. Applications use the VOX$RECORD routine to record speech.

VOX$ACP: The DECvoice ancillary control process. The ACP provides support for the DECvoice RTL and the DECvoice device drivers, and includes PSTN-specific regulatory enforcement.

Wink: Either a momentary interruption in line current on a tip and ring line or a signal on a FXO/FXS telephone channel that indicates that the calling party has hung up, or an interruption of signal bit (on Ear and Mouth format T1) that indicates dialing may proceed. Disconnect winks are often configurable on PBX systems; they may not always be present on tip and ring lines or on FXO/FXS telephone channels.

Wink Detection: See Wink

Yellow Alarm: A yellow alarm indicates a cascading alarm condition; an alarm condition that has ocurred “upstream” or “behind” the reporting network node.

Affidavit for the Connection of Customer Premises Equipment to 1.544 Mbps and/or Subrate Digital Services

For work to be performed in the certified territory of

Telco's Name: _____

State of: _____

County of: _____

I, _____, of _____
(Name Authorized Representative) (Customer Name)

_____, _____
(Customer's Address) (Telephone Number)

being duly sworn, state:

I have responsibility for the operation and maintenance of the terminal equipment to be connected to _____ 1.544 Mbps and/or _____ Subrate digital services. The terminal equipment to be connected complies with Part 68 of the Commissions rules except for the encoded analog content and billing protection specifications. With respect to encoded analog content and billing protection:

☞ I attest that all operations associated with the establishment, maintenance and adjustment of the digital CPE with respect to encoded analog content and encoded billing information continuously complies with Part 68 of the FCC's Rules and Regulations.

☞ The digital CPE does not transmit digital signals containing encoded analog content or billing information which is intended to be decoded within the telecommunications network.

☞ The encoded analog and billing protection is factory set and is not under the control of the customer.

ATTESTATION

I attest that the operator(s) maintainer(s) of the digital CPE responsible for the establishment, maintenance and adjustment of the encoded analog content and billing information has (have) been trained to perform these functions by successfully completing one of the following: Check appropriate one(s).

❑ (a) A training course provided by the manufacturer/grantee of the equipment used to encode analog signals; or

❑ (b) A training course provided by the customer or authorized representative, using training materials and instructions provided by the manufacturer/grantee of the equipment used to encode analog signals; or

❑ (c) An independent training course (e.g., trade school or technical institution) recognized by the manufacturer/grantee of the equipment used to encode analog signals; or

❑ (d) In lieu of the proceeding training requirements, the operator(s) maintainer(s) is (are) under the control of a supervisor trained in accordance with _____ above.

I agree to provide _____ with proper documentation to
(Telco's Name)
demonstrate compliance with the information as provided in the proceeding paragraph, if so requested.

_____ (Signature)

_____ (Title)

_____ (Date)

Subscribed and Sworn to before me this _____ day of _____ , 19 _____.

_____
Notary Public

My Commission expires: _____