GDC 036R603-V220
Issue 4, December 1996

Operation Manual

TMS-3000 Controller

Software version GTS V2.2.0

General DataComm

Table of Contents

Antistatic Precautions

Electrostatic discharge (ESD) results from the buildup of static electricity and can cause computer components to fail. Electrostatic discharge occurs when a person whose body contains a static buildup touches a computer component.

The equipment may contain static-sensitive devices that are easily damaged and proper handling and grounding is essential. Use ESD precautionary measures when installing parts or cards and keep the parts and cards in antistatic packaging when not in use. If possible, use antistatic floorpads and workbench pads.

When handling components, or when setting switch options, always use an antistatic wrist strap connected to a grounded equipment frame or chassis. *If a wrist strap is not available, periodically touch an unpainted metal surface on the equipment.* Never use a conductive tool, like a screwdriver or a paper clip, to set switches.

Safety Guidelines

The following symbols are used when unsafe conditions exist or when potentially hazardous voltages are present: *Caution statements identify conditions or practices that can cause damage to the equipment or loss of data. Warning statements identify conditions or practices that can result in personal injury or loss of life.*

Always use caution and common sense. *To reduce the risk of electrical shock, do not operate equipment with the cover removed.* Repairs must be performed by qualified service personnel only.

- Never install telephone jacks in a wet location unless the jack is designed for that location.
- Never touch uninsulated telephone wires or terminals unless the telephone line is disconnected at the network interface.
- Use caution when installing telephone lines and never install telephone wiring during an electrical storm.

FCC Part 68 Compliance

Connection of data communications equipment to the public telephone network is regulated by FCC Rules and Regulations. This equipment complies with Part 68 of these regulations which require all of the following.

All connections to the telephone network must be made using standard plugs and telephone company provided jacks or equivalent. Connection of this equipment to party lines and coin telephones is prohibited. A label on the back of the front panel of data communications equipment and on the underside or rear panel of other equipment provides the FCC Registration number and the Ringer Equivalence Number (REN) for the unit. If requested, give this information to the telephone company.

If the unit causes harm to the telephone network, the telephone company may discontinue your service temporarily and if possible, you will be notified in advance. If advance notice is not practical, you will be notified as soon as possible and will be advised of your right to file a complaint with the FCC. The telephone company may change its communication facilities, equipment, operations and procedures where reasonably required for operation. If so, the telephone company will notify you in writing. You must notify the telephone company before disconnecting equipment from 1.544 Mbps digital service. All repairs or modifications to the equipment must be performed by General DataComm. Any other repair or modification by a user voids the FCC registration and the warranty.

Canada DOC Notification

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

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of 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.*Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.*

Deutschland

Installations Anweisungen: Installieren Sie die Telefonleitungen nicht während eines Gewitters. Installieren Sie die Telefonleitungen nicht in einem feuchten Raum, außer die Dose entspricht den Vorschriften für Feuchträume. Berühren Sie unisolierte Telefonleitungen oder Einrichtungen nicht, außer diese sind vom Telefonnetz getrennt. Vorsicht bei der Installierung oder Änderung von Telefonleitungen. *Achtung:* Es gibt keine durch den Benutzer zu wartende Teile im Gerät. Wartung darf nur durch qualifiziertes Personal erfolgen.

Registration Status	**Port ID**	**SOC**	**FIC**	**USOC**

Preface

Scope

This manual describes how to configure and use a TMS Controller (usually referred to as the *Controller*), a personal computer (PC) which is used for monitoring and configuring a TMS network. It is written for network and system managers and assumes a working knowledge of installing network and communications devices.

TMS-3000 Overview

The TMS-3000 (Transport Management System 3000) is an intelligent communications platform designed for provisioning digital circuits and frame-based services, and for the internetworking of corporate enterprise computing and communications resources.

The TMS-Family includes the OCM-1000, OCM-2000, TMS-3000, the TMS-4000 Network Management System, Network Termination Devices, and the XL series of multiprotocol routers.

NOTE

Although these options appear on the TMS Controller, the TPP and OPP cards do not support: TPP Redundancy, Microcell, SNA/SDLC, or PIR.

Please refer to the appropriate version of the TPP and OPP release notes.

The TMS-3000 internetworking platform can incorporate the following functions into a single homogeneous network:

- LAN routing and bridging for high performance Ethernet, and Token Ring.
- Frame Relay for provisioning, switching, routing, and terminating high capacity frame relay services.
- Advanced circuit routing for non-stop, protocol transparent, circuit bandwidth in almost any network topology.
- Public network multiplexing for standards compliant service provisioning and access to public services, for integrated T1/E1 network access, and for data transport and switching.
- High efficiency subrate and superate multiplexing for low delay video, data, voice, and LAN internetworking.
- ITU-T (formerly CCITT) compliant X.50 subrate multiplexing for adherence to international subrate multiplexing standards.
- ISDN PRI (23B+D) for network restoral and on-demand frame relay and LAN internetworking.
- 2B1Q interface for provisioning high capacity digital services (digital channels, Frame Relay, LAN interconnection) over standard twisted pair wiring.
- Standard interfaces for support of virtually all electrical interface requirements (E1/T1, V.24, RS-232, RS-422, V.11, V.35, G.703, MIL-188-114A, etc.).
- Analog interfaces for support of virtually all analog voice interface requirements (2-wire FXS, 2-wire FXO, 4-wire E&M, battery, ring generation, etc.).

- Analog and digital voice compression for high efficiency transport of telephone and fax traffic.
- Comprehensive digital data compression to minimize backbone bandwidth usage between connected nodes.
- Comprehensive open network management for open, standards-based network management of the TMS family.
- Virtual network partitioning to provide the economic advantage of a single integrated network while allowing different organizations or individuals to manage their portion of the network.

The TMS family of products is complementary to the APEX family of ATM products, providing circuit, packet, and frame concentration prior to delivery to broadband ATM services.

Revision History of Manual

This manual has been updated for the GTS (General DataComm TMS Software) Operating System (Version 2.2.0) that is used to configure and control a TMS (Transport Management System)-3000 network. The GTS Operating System is a set of XENIX-based software, resident on a personal computer (PC).

The following new features are included in the GTS Version 2.2.0 software package:

- BQM (2B1Q LIM/Single Channel)
- OCM DPV (Dual Private Voice) Channel card
- Finer Backplane Granularity – ACC/TPP
- Four TPPs per Node
- Non-disruptive download to OCM (Redundancy required)
- OCM Clear Channel – High Speed Data and OPP

Issue 2, September 1996 - Revisions were made to Chapter 18: Table 18-5 from Issue 1 was deleted. New tables 18-5 through 18-7 were added. These tables are on the subjects of signaling and conditioning.

Issue 3, October 1996 - Revisions were made to Chapter 9, page 9-6. Definitions of *Declare Local, Declare Remote,* and *Declare Restoral* were revised.

Issue 4, December 1996 - Revisions were made to Chapters 8, 18, and 27 to reflect the TPP **non-support** of *TPP redundancy, Microcell Transport, HDLC, external DB-25 interfaces, and Token-Ring*. In Chapter 9, the definition of *Declare Restoral* was revised.

NOTE

Throughout this manual references made to the name Transport Management System are abbreviated as TMS-3000 or TMS. The General DataComm TMS software is referred to as GTS or gts.

Organization

The TMS-3000 Version 2.2.0 manual is available in both printed and disk-based formats. A disk-based manual is stored on the Controller hard disk. Using a designated function key (**F8**), you can display information relevant to operating Version 2.2.0 software on the Controller screen.

A disk-based manual ensures up-to-date information. The disk-based manual should cover the current revision level of software except that if you should receive a supplemental software release, it will be covered by relevant release notes.

This manual has 44 chapters. The information is arranged as follows:

- *Chapter 1 - System Startup* describes procedures for powering on and off a TMS-3000 system. You obviously cannot read this information on the screen until after XENIX, INFORMIX, and TMS-3000 software have been loaded into the Controller.

  This chapter also describes a procedure for creating and modifying network configurations and for downloading new configurations to the network. You should read this information before attempting to modify the network in any way.

- *Chapters 2-19* - These chapters describe the operating routines available through the *Examine and Modify Configuration* selections in the TMS-3000 Main Menu.
- *Chapter 20 - IAR Data and Circuit Routing* describes the routines that allow you to see the on-line network routing of circuits and aggregates after execution of an IAR test. The procedure used to create an IAR (Intelligent Automatic Routing/Rerouting) test script that simulates a network disaster scenario is described. Other routines allow execution/ renaming of the IAR test script and examination of circuit bandwidth usage.
- *Chapter 21 - Controller Mail* describes the use of the controller mail routine'
- *Chapters 22-37 - Status and Diagnostics* describe the operating routines available through the Status and/or Diagnostics selections in the TMS-3000 main menu.
- *Chapter 38 - Alarms* describes the operating routines available through the Alarms selection in the TMS-3000 main menu.
- *Chapter 39 - Software Integrity* describes the use of the Software Integrity routine, which checks for integrity of network software, and configuration data.
- *Chapter 40 - Download* describes the operating routines available through the Download selection in the TMS-3000 main menu.
- *Chapter 41 - Network Maintenance* describes the Delete, Rename, Copy Network, Format and Identify a floppy disk operating routines available through the Network Maintenance selection in the TMS-3000 main menu. This chapter also allows you to restore, save and document the network configuration files.
- *Chapter 42 - Controller Maintenance* describes the methods for shutting down network controller(s) or rebuilding a corrupted system that was improperly shut down. This chapter also allows you to configure the serial and parallel I/O ports for the Controller, examine the software versions, load a software release, set the date and time for the system, and identify a floppy disk.
- *Chapter 43 - Dial Backup* describes the dial backup routines that are used to establish and terminate switched network connections between the Controller and a remote node.
- *Chapter 44 - Status Line Messages* defines various messages that appear in the status line of the TMS-3000 display. The listing of the actual messages is found only in the printed version of the manual.

Document Conventions

Level 1 paragraph headers introduce major topics.

Level 2 paragraph headers introduce subsections of major topics.

Level 3 paragraph headers introduce subsections of secondary topics.

`This typewriter font shows output that is displayed on the screen` .

`This bold font shows specific input that you type or select at the keyboard`.

`This bold italicized font shows variable input that you type at the keyboard`

NOTE

Notes present special instructions, helpful hints or general rules.

Disk-Based Manual Format

For ease of cross reference, the disk based manual corresponds to the printed manual, i.e., Chapter 5 of the printed manual is also Chapter 5 of the disk-based manual.

When you need to look at a figure, you will be referred to the appropriate figure number in the printed version of the manual. In most cases, this is also true for tables.

You reach each chapter by stepping through two levels of menus. The first menu level is the `Disk Based Manual` main menu. It lists each chapter within the Disk Based Manual. When you select an entry from the main menu, a menu of topics within that chapter appears. When you select a topic, the pages of information stored for that topic appear.

These chapters provide specific information about the Controller routines.

Many operating routines are listed as menu topics. For example, if you wanted to obtain information about the Display Alarms routine, you would select the Display Alarms topic from the `Alarms` chapter menu. In some cases, two or more operating routines may be described under one topic.

A routine that requires a great deal of information may also be broken into several subroutines or subtopics. For example, the `MAINTAIN TOR/DRR OPTIONS` routine is described by the following subroutines:

`Maintain TOR/DRR Configurations`

`Modify TOR Selection`

`Create/Modify DRR Strategies`

`Assign DRR/TOR Configurations`

`Define DRR Scenarios`

How to Operate

Specific requirements for the PCs that may be used as Controllers are covered in the *Installation and Operation manual for TMS-3000, GDC 036R303-000*.

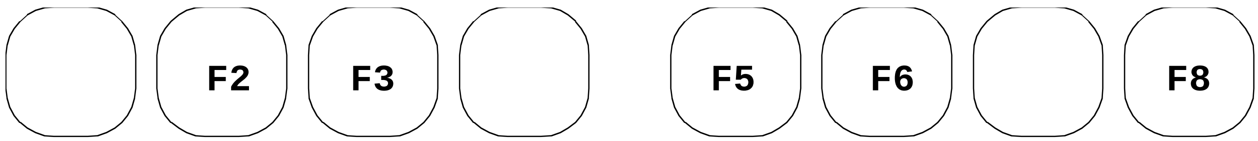
The keys used to step through the disk-based manual are the same keys used to operate the Controller.

The up or down arrow keys move the cursor to a desired menu item, and you press `Enter` to select that menu item.

The topics in the disk-based manual are arranged in screen-sized pages. To move from one page to the next, press the Advance Page key, **F6**.

Press **F6** now to move to the next page.

The following illustration shows the function keys used to manipulate the disk-based manual.



The **F5** (Backup Page) function key steps you backward through the screen pages. Press **F5** once, then **F6**, to step back to the previous page, and then return to this page. Press **F6** again to move to the next page.

The **F3** (Back Display) key steps you back to the previous menu level from which you selected a topic. Press **F3** again to return you to the `Disk Based Manual` main menu. In general, **F3** is used as an exit key, whether you are exiting from this manual or a TMS-3000 operating routine. In most cases, you may return to the top-level TMS-3000 menu by pressing **F3** repeatedly.

The **F2** (Key Help) function key provides a series of help screens that describe the function keys and other special Controller keys. Key Help may be selected only when the Controller is expecting input from the operator (in a menu display, or when the cursor is positioned at an operator-selectable parameter in a routine).

Now you should be accustomed to using the **F5** and **F6** keys to move backward and forward through the screen pages of the disk-based manual.

Another way to select pages in a topic is to enter the page number directly. The cursor is always positioned at the current page number at the upper left corner of the screen. If you enter a number within the range of pages of the topic and press `Enter`, the display jumps directly to that page. For example, if the screen reports that you are on `page 4 of 6`, you may move directly to page 1 by pressing the number **1** key, and then pressing `Enter`.

Another way to access topics in the disk-based manual is through the **F8** (Help Screen) key. When you press the **F8** key, the Controller determines which operating routine you are currently using, and then displays the disk-based manual topic that is most relevant to the current operating routine.

Publication Numbers

GDC publication numbers (e.g., *GDC 032R163-000*) are used to track and order technical manuals. Publication numbers use the following format: GDC NNNRnnn-000 or GDC NNNRnnn-Vnnn.

- NNN identifies the product family (e.g. TMS).
- R denotes a technical publication.
- nnn a number assigned by Technical Publications.
- 000 identifies a hardware product and does not change.
- Vnnn is the software version associated with a product and may be updated periodically.

The issue number on the cover only changes when a hardware manual is revised or when a manual is reprinted for some other reason; it does not automatically change when the software is updated. A new Software Version is usually Issue 1. Other specialized publications such as Release Notes or Addenda may be available depending on the product.

Related Publications

The following documents have additional information that may be helpful:

GDC Number	Product	Type of Manual
	Transport Management System	Product Portfolio
035R009-000	GPS-8B Power Supply	Installation and Operation
036R302-A7	TMS Packet Processor (TPP)	Addendum
036R303-000	TMS-3000	Installation and Operation
036R304-000	TMS-3000	Technical Overview
036R305-000	Quad Stat Mux Channel	Installation and Operation
036R340-000	OCM-2000, OCM-1000	Installation and Operation
036R342-000	OCM Packet Processor (OPP)	Installation and Operation
036R452-000	Sync Status Module	Instruction
S-036R042-001	Sync Status Module with Enhancements	Addendum
036R475-000	VLBRV	Installation and Operation
036R477-000	T1-DS0	Installation and Operation
036R478-000	Digital Bridging Card	Installation and Operation
036R479-000	Turbo Data Channel	Installation and Operation
036R480-000	CELP Channel	Installation and Operation
036R483-000	Turbo Data Channel-2, -5	Installation and Operation
036R485-000	T1-FT1	Operating and Installation
036R610-000	TMS-3000 Maintenance Console	User Guide
036R611-000	OCM Maintenance Console	User Guide
036R903-V220	GTS V2.2.0	Release Notes

Glossary of Terms

ACM

The ACM (ADPCM Compression Module) provides the means for a single DS1 (CEPT) line, containing 24 (30) PCM voice circuits, to be brought into the TMS-3000 node and compressed via GDC proprietary ADPCM compression techniques. The compressed signal is then transported across a trunk.

ADPCM

Adaptive Differential Pulse Code Modulation (See *ACM*)

Aggregate

A connection between two TMS nodes where the entire trunk carries a single bundle carrying the data originating from the TMS channels. This term has conventionally been used to define the Aggregate Control Card trunk of the TMS. Also, see *Subaggregate.*

Aggregate Control Card (ACC)

This module interfaces the 16.896 MHz Fast Bus with a full duplex aggregate trunk connected to a remote node. It buffers data from the Fast Bus and reforms it according to the transmit frame by adding overhead and frame sync bits. Piggyback Cards on board the Aggregate Control Card then prepare the data to comply with transmission standards (EIA or ITU-T). The receive section locates the frame sync bits in the receive aggregate data stream, and, using these bits as a reference, disassembles the remainder of the data stream into channel data, channel controls, and overhead bits.

Aggregate Trunk

A full duplex communication line which transports data between two nodes.

Alarms

These are raised when a malfunction is detected in the system. Major alarms need immediate attention. Minor alarms are not immediately detrimental to the working of the system. Major alarms indicate that hardware on a Common Module is malfunctioning. Minor alarms indicate that the malfunction is in one of the Data or Voice Channel Cards.

Anisochronous

The essential characteristic of a time-scale or a signal such that the time intervals between significant instants do not necessarily have the same duration or durations that are integral multiples of the shortest duration.

Auto Routing

During the process of downloading configuration parameters from the Controller, the operator will only need to specify a circuit point of origin, parameters, and point of termination. The Auto Routing Software will determine the actual circuit routing through the nodes.

Backplane

This is the back panel of TMS Shelves. It holds the external connectors used by all the modules and covers the Main Harness Card.

Base Card

A board that can have one or more cards called "piggybacks" plugged into it. It can be tested, removed, and replaced as a unit independent from the piggyback card(s).

B8ZS (Bipolar Eight Zero Suppression)

Timing is critical in a digital T1 network. If too many consecutive zeros are in the aggregate data stream, the system may lose synchronization. B8ZS is a method used to meet the "ones density" constraints by taking strings of zeros, converting them to ones and zeros, and placing them back into the aggregate bit stream.

Blue Alarm

A blue alarm indicates all ones are being sent on the T1 line. This implies an Alarm Indication Signal (AIS) has been sent out on the network. The principle error conditions for this type of alarm are: CRC, bipolar violations, frame alignment error and multiframe alignment errors. A blue alarm is considered a network alarm and applies to ACM and CDA modules.

bps

Bits per second transmitted or received.

BQM

An OCM card, utilizing 2B1Q technology, that may be used as a LIM or a channel. 2B1Q (2 Binary 1 Quaternary) is a line encoding format that is supported on 2-wire interfaces.

Bridge

A device for connecting similar LANs using the data link layer MAC source and destination addresses contained in the data frames of all LAN traffic.

Bundle

A sequentially ordered group of DS0s that have a common termination point.

Card

An assembly of components that can be tested, removed, and replaced as a unit. A card usually refers to a single unit without piggybacks connected to it, although in this manual "card" is usually used interchangeably with "module."

CCM

OCM-2000 (OCM*TMS) Common Control Module.

CDA Module

The CDA-T1 (Combined Digital Aggregate) Module allows the TMS-3000 using DS1 framing to operate on a DACS Network (byte-oriented). Also available in a ITU-T 2.048 Mbps version (CDA-E1)

CELP

The CELP Channel Module provides Codebook Excited Linear Prediction (CELP) voice encoding algorithms that maximize voice channel bandwidth utilization. The voice is compressed at rates of 4.8 Kbps, 6.4 Kbps, or 9.6 Kbps.

CEPT

Comite European de Poste et Telegraphe (European Conference of Postal and Telecommunications Administrations), an intergovernmental organization.

Channel

Endpoint of a circuit path. The channel is the card at each end of the path.

Channel Module

This Voice or Data Channel Module plugs into an Expansion Shelf, TMS Compact, MEGAMUX Plus or OCM. For TMS-3000 and TMSC, it interfaces external equipment (via cables) to a Channel Interface Card.

Channel Interface Card

This card interfaces with Channel Modules and the 16.896 MHz Fast Bus. It contains all the circuitry necessary to control, frame, multiplex, and demultiplex up to 64 channels onto the Fast Bus. Channel Card connections to the Channel Interface Card are made via a pair of ribbon cables that run from the backplane of the Expansion shelf, holding the channel cards, to the Main Shelf Backplane where the Channel Interface Card is located.

Circuit

An end-to-end data or voice path which can pass through several entities in a communication system. A circuit is described or referred to by the node/channel names which identify the endpoints of the circuit.

Channel Associated Signaling

Channel Associated Signaling (CAS) is used in conjunction with the ACM/E1 and CDA-E1 Modules. It is a bit-oriented signaling process specified in ITU-T specification G.704 and transferred on timeslot 16 of the frame.

Common Channel Signaling

Common Channel Signaling (CCS) is supported as a transparent circuit for processing by remote customer equipment. One or more channels (64 Kbps DS0) can be handled in this way; CCS is configurable on a per channel basis. All background signaling bits for a CCS transparent circuit are forced to mark, in order to conserve priority control bandwidth throughout the TMS network and enable faster byte synchronization.

Common Module or Common Card

A generic term for any module that, when removed, will cause a major alarm. This includes all modules housed in the main TMS shelf plus the Expansion Modules located on each TMS Expansion Shelf.

Control Data

Control characters that are sent serially along with data. These characters cause functions such as framing, addressing, synchronization, and error checking to be performed. Control data are also used to indicate handshaking protocol.

Controller

See *TMS Controller*.

CSU

Channel Service Unit.

DACS Network

DACS (Digital Access Cross-connect System) is a byte oriented (DS0) digital T1 network service.

DCE

Data Communications Equipment.

Dial Backup

A feature that provides a direct node to controller link if normal supervisory communication between the TMS node and the Controller is disrupted. Dial Backup establishes the link using an external modem.

Digital Bridging

A function that provides for a single channel to broadcast to multiple channels and for those channels to respond to the single channel. In TMS-3000, the Digital Bridging Card (DBC) is used for this function.

Diversity

The term for two aggregate trunk lines between the same nodes if one trunk is operational and the other is in stand-by in case the first goes down. Both lines are monitored for serviceability by firmware on the Aggregate Control Card. Switching of the line is controlled independently at both ends by the Aggregate Control Card.

DS0 (Digital Signal Level 0)

A single 64 Kbps channel. The data stream is divided into 8-bit bytes. DS0 is a byte-oriented environment.

DS1 (Digital Signal Level 1)

A combination of 24 DS0 channels and 8000 framing bits into a 1.544 Mbps data stream.

DSU

Data Service Unit.

DTE

Data Terminal Equipment.

Dual Private Voice (DPV)

A Dual Private Voice Module used in the OCM (Office Communications Manager). A dual channel card.

ESCC

Enterprise System Control Card. A card that is installed in the TMS shelf to monitor and control the activities other cards in the shelf. The ESCC is responsible for several functions: Permanent storage of software programs for all of the common cards in the TMS-3000 network, communications with other ESCCs in neighboring nodes, communications within the node, communications with the Controller if locally connected, and control of all customer traffic within the node.

ESF (Extended Superframe)

A modified D4 framing format. The basic D4 framing structure contains 1 frame bit followed by 24 eight-bit time slots or a 193 bit frame. An ESF contains 24 193-bit frames. ESF allows a greater amount of access to digital network services (See "Superframe").

Ethernet

LAN for connecting devices within the same building, operating over twisted-pair wire or coaxial cable at speeds up to 10 Mbps.

Expansion Shelf

A shelf that connects to a CIC in a TMS-3000 shelf and holds up to 16 Channel Modules and 2 Expansion Modules (one primary, one redundant). Since one Channel Interface Card can interface up to 64 channels, at maximum a Channel Interface Card is connected to 4 Expansion Shelves.

Fan

A type of full-duplex circuit topography typified by multiple terminations on one end and a single termination on the other end.

Fast Bus

The Fast Bus carries controls and data between the Channel Interface and the other common modules in the node. One bit of data is conveyed by every clock bit on this bus. Physically, it spans across the Main Harness Card.

Foreign Exchange

A telephone line arrangement where calls into the switched network from a customer location enter the network through a Central Office other than the one that normally serves the customer location. In communications systems, a service in which a user end device can be connected to a user end device in another country.

Frame Relay

Frame Relay is a local interface protocol which provides high speed statistical transport of date packets. Like X.25, Frame Relay is a connection-oriented data service. But, unlike X.25, the packets are not acknowledged at each switching node. It is a technique for fast transmission of LAPD frames where only three elements are utilized: the frame delimiters (flags), a two-octet address, and the frame check sequence (FCS). An integral number of user data bytes are contained between the address field and the FCS. This user data is passed transparently by the network. Frames with incorrect FCSs or frames which cannot be queued are discarded. It is left to the end-to-end higher level protocols to determine if a frame is missing and take appropriate action. Such techniques are optimized for reliable digital networks.

Frame Switching Network (FSN)

A set of core services provided to packet switching applications within the TMS-3000. Its fundamental purpose is to transfer a network frame from a source node to a destination node. The source node is the node where the frame is introduced into the network, and the destination node is specified by information contained in the frame.

FX

See *Foreign Exchange.*

HDLC

High-level Data Link Control.

Hertz

Cycles per second transmitted or received. Abbreviated Hz.

Hz

See *Hertz*.

IAC Module

ISDN Aggregate Control Card

IMA

Intelligent Media Adapter. A token ring LAN or Ethernet LAN media adapter plug-in module.

IMBE

Improved Multiband Excitation. A proprietary speech compression algorithm which was developed by and is owned by Digital Voice Systems, Inc. (DVSI). IMBE is used on the OCM DPV (Dual Private Voice) card.

IMS

Internetworking Management System. An advanced network management system that allows you to monitor and manage network devices (e.g. TPP and OPP) from a single workstation. IMS runs on a PC and is a Windows-based application that uses the standard window, menu and button design to provide an easy-to-use network management interface.

Intelligent Automatic Rerouting (IAR)

A Controller function that automatically determines proper routing of circuits around any failed node or facility.

ISDN

Integrated Services Digital Network. Same functionality as CDA with the addition of ISDN support.

Isochronous

A method for transmitting asynchronous data by synchronous means. A transmission format where the asynchronous characters (i.e., those delineated with Start and Stop bits) are sent with a clocking connection between the transmitter and receiver.

ITU-T

International Telecommunications Union - Telecommunications Standardization Sector. A committee that sets international communications standards.

LAN

Local Area Network.

LAN*TMS

Local Area Network Transport Management System. A network-managed system for integrating multiple local area networks (LANs) into a single communications network.

LIM

OCM-2000 *Line* Interface Module (In the APEX ATM family of products, LIM is the *Link* Interface Module).

Link

A transmission path between two stations, channels or parts of a communications system.

MAC

Media Access Control. This is a unique six byte address assigned to the LAN network interface. All LAN packets contain a source address field and a destination address field in the frame header.

Main Harness Card

This assembly is covered by the back panel of the Main Shelf. It contains the external connectors used by all the modules in the Main Shelf. Three buses on the Main Harness Card enable the modules to communicate with each other. These three buses are the Fast Bus, the MP Bus (or Communication Bus), and the Clock Bus.

Maintenance Console

A software package that allows you to interact with the TMS-3000 on a local level. This software is designed to work with any terminal that runs at 1200 to 9600 baud ASCII on an EIA/TIA-232-E interface. The terminal is connected to the TMS-3000 main shelf backplane.

MicroCell Transport

A mechanism for communicating between multiple TPP modules in a single TMS-3000 node shelf via the Fast Bus, allowing for the efficient transfer of packets or blocks of information. This feature requires an optional plug-in card for the TPP module.

Module

An assembly which has definable performance characteristics so that it can be tested, removed, and replaced as a unit. In a TMS-3000 system, each card on the Main Shelf and Expansion Shelves is a module. A module can have other cards called "piggybacks" or "plug-ins" installed on it. In most cases, in this manual, the terms "module" and "card" are used interchangeably. For example, Channel Interface Card and Channel Interface Module refer to the same component.

MP or Microprocessor Bus

Also known as the Communications Bus, it is used to convey configuration, diagnostic, and alarm information between the Enterprise System Control Card and all other modules in the node.

Multidrop

A circuit with 1 polling master and multiple end points (drops).

Network

A group of nodes that are connected together with aggregate trunks. Not all the nodes in a network will necessarily be TMS-3000 nodes.

Node

Any addressable location within a network capable of carrying a TMS-3000 circuit. In a network, a TMS Compact in Philadelphia or an OCM-2000 in Boston are nodes (also see *Tail Node*).

OCM-2000

Office Communications Manager. A feeder multiplexer that is used as a node in a TMS-3000 network. The OCM-2000 modules (CCM, LIM, OPP and channel cards) are installed in an OCM-2000 Enclosure or OCM-2000 Shelf that is separate from the TMS shelf. The OCM-2000 multiplexes data from a variety of analog and digital devices, then transfers that data to the TMS for further routing. It can also send data directly to non-TMS network devices (e.g., X.50, 2B1Q). The OCM-2000 may also be referred to as TMS-2000 or OCM*TMS.

OCM*TMS

See *OCM-2000.*

OPP

OCM Packet Processor. A module installed in an OCM-2000 Enclosure or Shelf that interfaces externally with public frame relay networks or frame relay devices such as LAN bridges, routers and frame relay PADs. OPP is the OCM counterpart to the TPP.

Packet

A sequence of data, with associated control elements, that is switched and transmitted as a whole. Refers mainly to the field structure and format defined within the CCITT X.25 recommendation; multiple packets may be required to carry one complete document or a lengthy block of information.

Packet Switching

A data transmission technique wherein user information is segmented and routed in discrete data envelopes called packets, each with its own appended control information for routing, sequencing, and error checking; a transmission technique that allows a communications channel to be shared by many users, each using the circuit only for the time required to transmit a single packet; a network that operates in this manner.

Piggyback Card

A card that plugs into a base card. The piggyback is a separate assembly that can be tested, removed, and replaced as a unit.

PLL

Phase Lock Loop.

Port

Any switchable entity. A port may be a logical entity that is not necessarily realized through a physical connector. For example, a single Frame Relay interface can support many Frame Relay ports. Traditionally, this has referred to a physical and electrical interface point on a TMS network interface card.

Printed Circuit Board (pcb)

See *Card.*

Red Alarm

A network alarm that is produced by the receiver to indicate that it has lost its input signal, frame alignment, loss of sync, or error rate exceeding a predetermined level. A red alarm is considered a network alarm and applies to the following TMS-3000 modules only: ACM and CDA.

Redundant Controller

In the TMS-3000, a network can contain more than one Controller. Software allows the use of multiple PC controllers. One master controller serves as the point of control for the entire network. All other controllers (subordinate) function as backups and as additional access points into the network. The responsibility of the master controller is to synchronize its data base (only for the current network configuration data portion) with all subordinate controllers. Software allows up to five subordinate and one master controller.

Route

A logical path through a network from the transmitting equipment to the receiving equipment. The path can go through several nodes.

Router

A device for connecting LANs and other communications media using higher level protocols than the data link layers. Various higher level protocols require their own specific routing protocols, such as IP (Internetworking protocol suite) routing, IPX (Novell protocol suite) routing, Appletalk routing, and various international standard routing mechanisms.

A router system is made up of one router module, or multiple router modules that are connected internally and function together as one large router. In the TPP/OPP family of products, router module and router system are synonymous, since the card assembly contains a single router module. In the TPP/OPP family of products, a router system refers to multiple router modules that operate together as a larger internetworking system.

SDLC

Synchronous Data Link Control. A bit-oriented synchronous communications protocol developed by IBM where the message may contain any collection or sequence of bits without being mistaken for a control character. SDLC is used in IBM's System Network Architecture (SNA).

SNA

Systems Network Architecture

Streaming

A failure condition of a branch that interferes with other branches.

Subaggregate

A collection of data channels and supervisory communications and frame synchronization information routed to a single destination. One or more subaggregates may be carried on a single physical aggregate and routed to different destinations via a DACS network. Subaggregates can be of different types:

> TMS - This type carries TMS proprietary data which includes overhead of synchronization and supervisory communication as well as channel data.
>
> Network - This type carries network (DS0) compatible data. This data originates from a non-TMS device and terminates on a non-TMS device.
>
> X.50 - This type is considered as a network type subaggregate by CDAs and IACs, but as a TMS subaggregate to the OCM.

Superframe

A D4 frame consists of 1 frame bit followed by 24 eight-bit time slots. A D4 superframe contains 12 consecutive 193-bit frames.

Supervisory Data

Information which travels from the Enterprise System Control Card via the MP Bus. It does not have any immediate bearing on the data being multiplexed. Instead, it keeps supervisory software in various parts of the system up to date.

Supervisory Pass Through

A feature that establishes a supervisory data path to several TMS or TMS Compact nodes at a local site. This allows an increase in transmission capability from a site by generating more aggregate trunks.

Tail Node

A node that does not hold its own configuration and at which a circuit can only terminate (not pass through). In a TMS-3000 system, an example of a tail node is the Universal MM+ V4

TMS Controller

A computer that is connected to the Enterprise System Control Card in a TMS-3000 node via an external connection on the Main Harness Card. It performs configuration and framing calculations for the entire network, as well as other status, diagnostics, and alarm functions. A Maintenance Console is not classified as a Controller because it has limited control over only one node.

TPP

TMS Packet Processor. A module installed in a TMS-3000 main shelf that interfaces externally with public frame relay networks or frame relay devices such as LAN bridges, routers and frame relay PADs. It also has internal access to the Fast Bus, allowing it to transfer frame relay, HDLC and SDLC data to other TPP modules in the shelf or to modules such as CIC, CDA, ACC and IAC.

TPP Pathway

A TMS circuit between any of the following: a synchronous data channel and a TPP module; two TPP modules; a TPP module and an OPP module; two OPP modules. This circuit is unique as it is destined to a TPP/OPP module within the TMS-3000/2000, rather than to an external interface.

Trunk

Defines a connection between a TMS port and a Network port (or another TMS port). See *Aggregate Trunk.*

UI

Un-numbered Information frame.

Universal Voice Card

Provides full duplex voice communication capabilities in a TMS-3000. Pulse Code Modulation (PCM), Adaptive Differential Pulse Code Modulation (ADPCM) and Advanced Speech Processing (ASP) card configurations are available.

UVC

See *Universal Voice Card.*

VLBRV

Very Low Bit Rate Voice Module. An analog voice channel card for TMS-3000, TMS Compact, Universal MM+ V4, MINIMUX, and OCM-2000 TDMs. Maximizes voice channel bandwidth utilization while offering low bit rate values of 9.6, 4.8, and 2.4 Kbps.

X.50

An ITU-T multiplexing standard for a gross bit rate of 64 Kbps.

XNET

XNET, also referred to as Cross-Net, allows connection between two independently operating TMS-3000 networks. Supervisory communication does not pass between networks, maintaining independent control of each network. A network operator will be allowed to configure an XNET node and aggregate. The operator can then configure circuits to traverse the XNET aggregate. The operator running the other network must also configure a matching XNET node, aggregate and circuits. XNET allows limited diagnostic tests (loopbacks) to be performed.

Yellow Alarm

A network alarm that is returned to the transmitting terminal to report a loss of frame alignment at the receiving terminal. A yellow alarm is considered a network alarm and applies to the following TMS-3000 modules only: ACM and CDA.

1 System Startup

Overview

The **TMS-3000** (Transport Management System 3000) is an intelligent communications platform designed for provisioning digital circuits and frame-based services, and for the internetworking of corporate enterprise computing and communications resources. Under most circumstances, TMS-3000 systems are shipped and installed containing an initial system configuration. Check the initial configuration before placing the **network** (a group of **nodes** that are connected together with **aggregate trunks**) into operation. A node is an addressable location within a network capable of carrying a TMS-3000 circuit. You may need to change details of the configuration before the network begins normal operation. An aggregate is a connection between two TMS nodes where the entire trunk carries a single bundle carrying the data originating from the TMS **channels**. An aggregate trunk is a full duplex communication line which transports data between two nodes. The channel is the card at each end of the circuit path.

There may be circumstances in which you must create a new configuration and download it to unconfigured equipment. In this situation, complete all aspects of configuration before beginning the download process.

The **TMS Controller** (also referred to as the **Controller**) is a computer that is connected to the Enterprise System Control Card in a TMS-3000 node via an external connection on the Main Harness Card. It performs configuration and framing calculations for the entire network, as well as other status, diagnostics, and functions. The Controller checks every aspect of a configuration for validity during the configuration process. By creating the entire configuration, you are less likely to download unworkable configurations to the network.

A **Maintenance Console** is a software package that allows you to interact with the TMS-3000 on a local level. This software is designed to work with any terminal that runs at 1200 to 9600 baud ASCII on an EIA/TIA-232-E interface. The terminal is connected to the TMS-3000 main shelf backplane, but is not classified as a Controller because it has limited control over only one node.

Alarms are raised when a malfunction is detected in the system. Major alarms need immediate attention. Minor alarms are not immediately detrimental to the working of the system. Major alarms indicate that hardware on a common module is malfunctioning. Minor alarms indicate that the malfunction is in one of the Data or Voice **Channel Cards**.

The Channel Card plugs into an Expansion Shelf, TMS Compact, MEGAMUX Plus or OCM. For TMS-3000 and TMSC, it interfaces external equipment (via cables) to a **Channel Interface Card** (**CIC**).

The CIC interfaces with channel cards and the 16.896 MHz **Fast Bus** and contains all the circuitry necessary to control, frame, multiplex, and demultiplex up to 64 channels onto the **Fast Bus**. **Digital Bridging** is a function that provides for a single channel to broadcast to multiple channels and for those channels to respond to the single channel.

The Fast Bus carries controls and data between the CIC and other common modules in the node. One bit of data is conveyed by every clock bit on this bus. Physically, it spans across the **Main Harness Card**.

The Main Harness Card is covered by the back panel of the Main Shelf. It contains the external connectors used by all the modules in the Main Shelf. Three buses on the Main Harness Card enable the modules to communicate with each other.

Topics covered in this chapter are:

- Controller Keyboard
- Screen Colors
- Network Access
- Software Upgrades/Patch Installation/Software Download
  - Software Updates
  - Software Upgrade/Download Procedures
- Controller Shutdown
- Controller Bootup After Shutdown
- Corrupt Configuration Files

NOTE *If you are doing a complete installation (hardware and/or software), refer to the Operation and Installation manual for TMS-3000, GDC 036R303-000, Issue 6 or a later version.*

Controller Keyboard

The keys on the Controller keyboard are classified as follows:

- Function Keys
- Editing Keys
- Cursor Position Keys
- Alphanumeric/ASCII Keys
- Enter Key (generally referred to in this manual as `Enter`)
- Control Keys

Press the **`F2`** key to obtain on-line Help screens that describe all function keys and editing keys. Once you are in the Help facility, select a Help screen for a key by pressing the key.

If you are not familiar with the use of the Controller keyboard, read the detailed descriptions which are found in *Chapter 4 of GDC 036R303-000*.

Screen Colors

Colors in the Controller screen display reflect the type of information provided by the Controller or the type of entries required by the Controller. The screen may display text presented in a single color or in a combination of a highlighted field color and a text color.

The color arrangements used on TMS-3000 Controller displays are:

- White Text on Blue Field — Display Headers
- Blue Text on White Field — Limited Range Entry
- Black Text on Blue Field — String Entry
- Black Text on White Field — Cursor Selection (Pokepoint)
- Red Text — Indicates failure condition for alarms, status, or diagnostics
- Green Text — Indicates normal operating condition for alarms, status, or diagnostics
- Yellow Text — Indicates warning (potential problem) condition for alarms, status, or diagnostics

Detailed information about the screen format, messages, and colors is found in *Chapter 4 of GDC 036R303-000.*

Network Access

The first screen that appears on the Controller after bootup is the `TMS Control System` screen. In the top center of the screen, the GTS software version is identified (e.g., `GTS V2.2.0`). While this screen is showing, if you press F4, the `Network Access` menu appears. Its purpose, other than selecting the disk-based manual, is to enable you to modify configurations without affecting the currently operating network. The sequence for selecting an on-line network also allows you to change the node location of the Controller without changing configuration parameters.

Figure 1-1 shows the TMS Main Menu for both off-line and on-line networks. An example of the Controller hierarchical screen format is presented in *Figure 1-2 and Figure 1-3*. These illustrations show the routines that appear under the TMS-3000 Main Menu for off-line and on-line networks and list the features available in Version 2.2.0 software.

In most cases, a network has already been created and configured on your Controller. Select `Access Off-Line Network` and use the `Examine Configuration` routines to check configuration. GDC supplies the default passwords for initial entry into the network.

If no networks have been created in your system, begin by creating a network. Select `Create Off-Line Network` and enter a network name of no more than 16 characters in length.

Then use the `Modify Configuration` routines to create the configuration. The Configuration routines are described in *Chapters 2* through *19* of this manual.

Once your network is completely configured, return to the `Network Access` menu, and select **`Access On-Line Network`**. Select your network and enter **`user name`** and **`password`** when requested. If requested, enter the **`node name`** at which the Controller is currently located (the "connected" node). Note that this is not requested if you are already connected to a running node.

```
TMS Main Menu                 Off-Line Net                  05-APR-1996 10:56:59

               Examine Configuration         Modify Configuration
               Examine IAR Data              Modify IAR Data
               Controller Mail               Alarms
               Network Maintenance           Controller Maintenance
```

```
TMS Main Menu                 On-Line Net                   05-APR-1996 10:58:55

               Examine Configuration         Modify Configuration
               Examine IAR Data              Modify IAR Data
               Examine Current Routing       Dial Back Up
               Status                        Diagnostics
               Software Integrity            Download
               Controller Mail               Alarms
               Network Maintenance           Controller Maintenance
```

Figure 1-1 TMS Main Menu

In the TMS-3000, after loading and/or selecting new software files a background download of your network and configuration data occurs. *Refer to Software Upgrades/Patch Installation/Software Download, later in this chapter, as well as Chapter 40*, for information on downloading a configuration to all nodes of the network.

If you maintain more than one network configuration, take care when selecting **`Access On-Line Network`** from the `Network Access` menu. Make sure that you select the network that is currently on-line, unless you intend to place a different network on-line.

When you are about to switch to a new network, select the network through **`Access On-Line Network`**; the new configuration is automatically downloaded by IAR.

NOTE

Never leave the Controller in an on-line network that does not match the actual on-line network at each node.

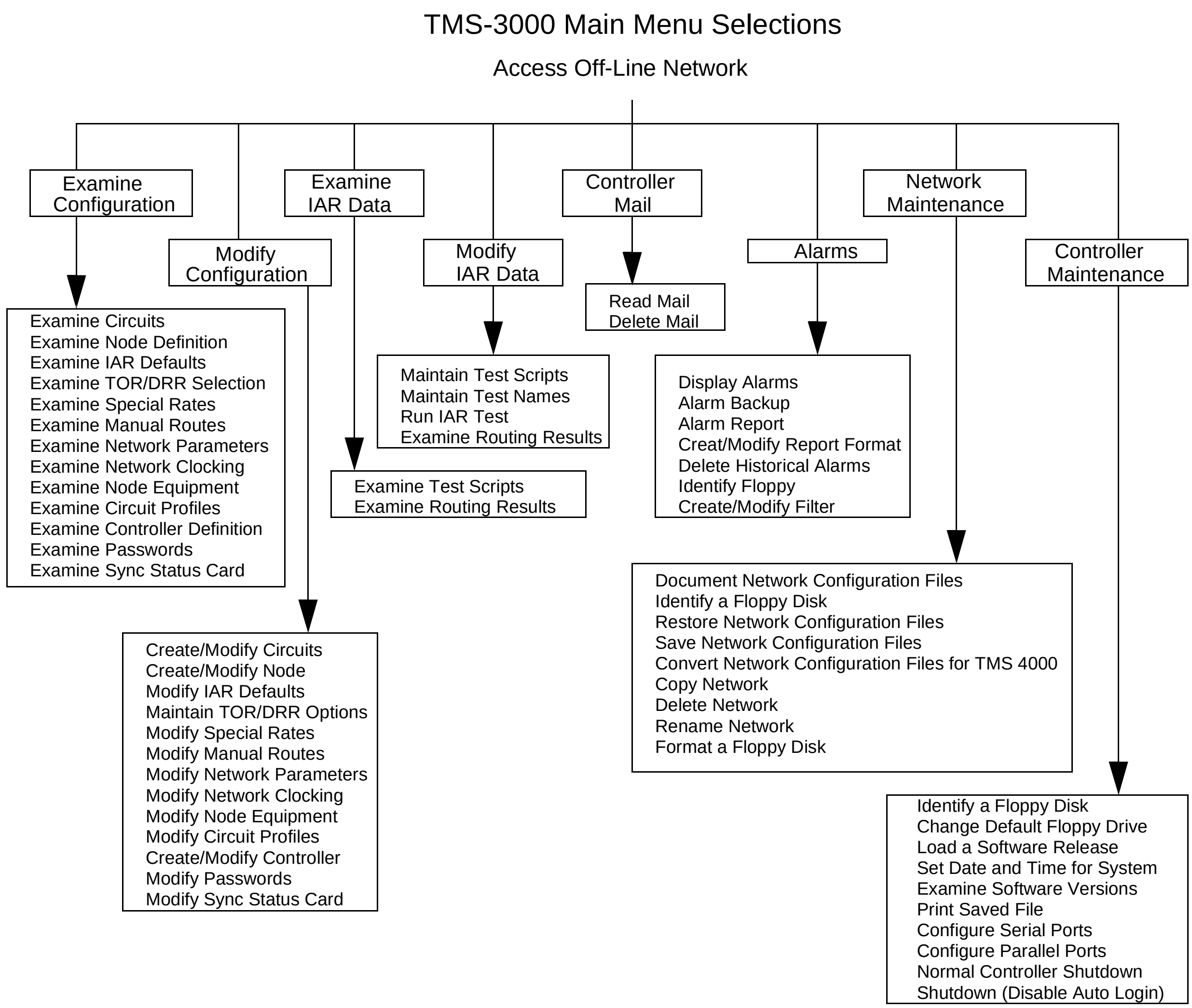


Figure 1-2 Hierarchical Format of GTS Version 2.2.0 Software (Off-Line Network)

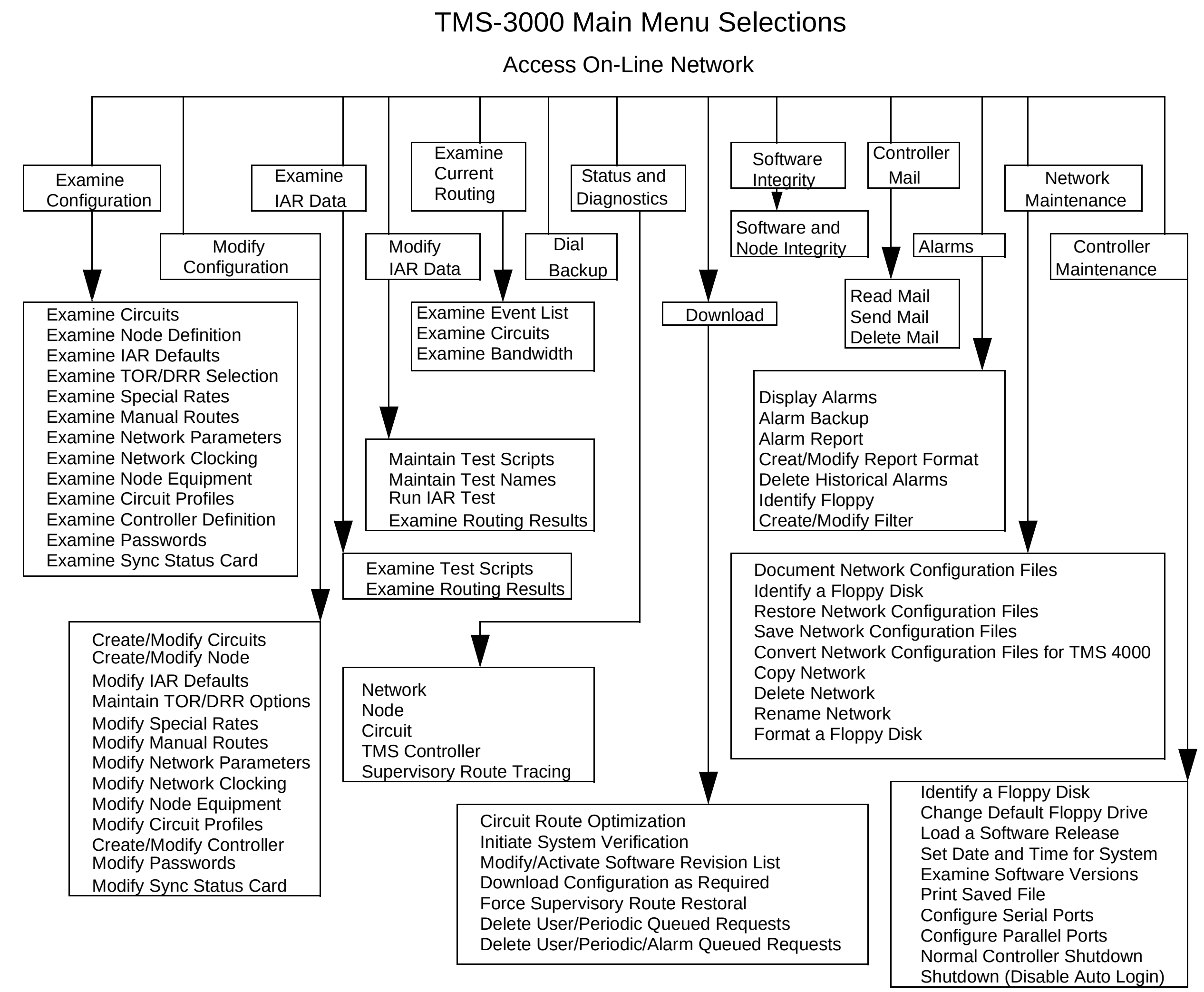


Figure 1-3 Hierarchical Format of GTS Version 2.2.0 Software (On-Line Network)

Software Upgrades/Patch Installation/Software Download

This section describes the procedures for installing software. The first part of the section describes the general operation of your software in a GTS V2.2.0 system. The later section, *Software Upgrade/Download Procedures*, describes the procedures to follow to upgrade your software to GTS V2.2.0 from an earlier software version.

Two types of information are downloaded from the Controller to the local node in the system:

- System Software (also referred to as mux software)
- Configuration Data

NOTE *Certain card types have their own non-volatile memory in which they can store their own software. These cards are known as NVCCs (Non-Volatile Common Cards), and are identified in Table 1-1 and Table 1-2 below. The advantage of a card holding its own software is that if the card is removed and re-inserted, or if a power failure occurs at the node, these cards do not lose their software and, therefore, don't require a download from the ESCC.*

There is system software for each of the following modules at a TMS node (*See Table 1-1*):

Table 1-1 System Software, TMS-3000

File	Card Type		NVCC
ACM	ACM	ADPCM Compression Module	Yes
CDA-E1	CDA-E1	Combined Digital Aggregate-E1 Module	Yes
CDA-T1	CDA-T1	Combined Digital Aggregate-T1 Module	Yes
DPV-CMN*	DPV	Dual Private Voice Card (OCM)	Yes
DPV-IMBE*		Voice Algorithm	
DPV-FAX*		FAX Algorithm	
EACC	ACC	Aggregate Control Card	No
ECIC	CIC	Channel Interface Card/Digital Bridging Card	No
ESCM	ESCC	Enterprise System Control Card	Yes
ESCS			
IAC-ATT	IAC-T1	ISDN Aggregate Control-T1 Module	Yes
IAC-CCITT	IAC-E1	ISDN Aggregate Control-E1 Module	Yes
IAC-NTT	IAC-NTT	ISDN Aggregate Control-NTT Module	Yes
OCM*	CCM	Common Control module (OCM)	Yes
* The CCM and DPV software files are OCM files stored on the ESCC only for the purpose of downloading to connected OCMs. IMBE = Improved Multiband Excitation.			

There is system software for each of the following modules at an OCM (Office Communications Manager) node (*See Table 1-2*):

Table 1-2 System Software, OCM

File	Card Type		NVCC
CCM	CCM	Common Control Module	Yes
DPV-COMMON	DPV	Dual Private Voice Card (OCM)	Yes
DPV-IMBE		Voice Algorithm	
DPV-FAX		FAX Algorithm	

If not previously defined, *Table 1-3* provides brief descriptions of the equipment listed in Tables 1-1 and 1-2. More detailed descriptions are in the glossary.

Table 1-3 Card Descriptions

File or Card Type	Description
ACM	Provides the means for a single DS1 line, containing 24 (30) PCM voice circuits, to be brought into the TMS-3000 node and compressed via GDC proprietary ADPCM (Adaptive Differential Pulse Code Modulation) compression techniques.
CDA	The CDA-T1 Module allows the TMS-3000 using DS1 framing to operate on a DACS Network (byte-oriented). Also available in a ITU-T 2.048 Mbps version (CDA-E1).
IAC	Same functionality as CDA with the addition of ISDN support.
DPV	A voice module used in the OCM (Office Communications Manager). A dual channel card.
ACC	This module interfaces the 16.896 MHz Fast Bus with a full duplex aggregate trunk connected to a remote node. It buffers data from the Fast Bus and reforms it according to the transmit frame by adding overhead and frame sync bits. Piggyback Cards on board the ACC then prepare the data to comply with transmission standards (EIA or ITU-T). The receive section locates the frame sync bits in the receive aggregate data stream, and, using these bits as a reference, disassembles the remainder of the data stream into channel data, channel controls, and overhead bits.
ESCC	A card that is installed in the TMS shelf to monitor and control the activities of other cards in the shelf. The ESCC is responsible for several functions: Permanent storage of software programs for all of the common cards in the TMS-3000 network, communications with other ESCCs in neighboring nodes, communications within the node, communications with the Controller if locally connected, and control of all customer traffic within the node.
CCM	OCM counterpart to the ESCC.
OCM	Used as a node in a TMS-3000 network. The OCM-2000 modules are installed in an OCM-2000 Enclosure or OCM-2000 Shelf that is separate from the TMS shelf. The OCM-2000 multiplexes data from a variety of analog and digital devices, then transfers that data to the TMS for further routing. It can also send data directly to non-TMS network devices (e.g., X.50, 2B1Q).
IMBE (Improved Multiband Excitation)	A proprietary speech compression algorithm which was developed by and is owned by Digital Voice Systems, Inc. (DVSI). IMBE is used on the DPV card.

All TMS software and the CCM and DPV software of the OCM is held as Stored files in non-volatile memory on the ESCC (on both ESCCs when redundant). Stored files on the in-service ESCC are available for distribution to cards in that node, as well as to the rest of the network. ESCCs also hold `Active` versions of files for distribution to cards, but only for non-NVCCs.

NOTE

NVCCs (such as CDAs) must have their Active software version pre-loaded, or it must be crossloaded from a same type card in the same node, or their Stored software must be activated.

If an NVCC with no software were to be inserted into a node which had no other same card types while the Active and Stored software versions for that card type were still different (as in the middle of an upgrade procedure), there would be no way for that card to acquire Active software.

Cards in this state (no software) display a sequence of asterisks (********) in the Software Integrity screen under the column labeled `In/Out-of-Service ESCC/SW Files/Active`*. This indicates that the ESCC does not hold a copy of the Active code for those cards.*

The `Active` versions of the software files are held on each of their respective types of cards. For any given redundant pair of cards, the `Active` software is present on both cards, but only running on the in-service card.

Under normal operating conditions, the `Active` and `Stored` files should be of the same revision. During the upgrade/download process, however, the `Active` files are the old revision, while the `Stored` files become the new revision.

TMS-3000 software files running on a node are referred to as the `Active` files on that node. GTS 2.0 and later versions of GTS software have the capability of non-disruptively downloading some TMS nodal system software in the background to files known as the `Stored` Files on the nodes. This allows for the feature of upgrading a network by downloading new versions of software files (either an entire new set of software, a patch with specific files, or a single selected file) in a non-disruptive manner.

Once the entire network has been downloaded with the new file(s) in the background, you may issue a single command which tells the entire network to Activate (switch over to the new software), resulting in minimal interruption.

After system software is downloaded to a node or the network, configuration data automatically downloads, whether or not the configuration has changed. Pertinent configuration data also downloads automatically whenever you modify the network configuration.

GDC recommends that you complete all configuration changes before bringing the network online. Do not configure a node and download to that node until the rest of the network configuration is complete. This helps to ensure that the network is not operating with mismatched parameters. Note that if you restore configurations created with MSO V3.0.1 or GTS V2.0.0, all X.50 termination circuits are deleted; an improved procedure for defining X.50 circuits has been added to the GTS V2.2.0 release. Other features not supported are listed below. These unsupported features are deleted or converted during upgrade if you have not completed the appropriate configuration changes. If you need assistance in this area, please Contact General DataComm Service, and refer to the *GTS V2.2.0 Release Notes, GDC 036R903-V220*.

- Bell I/O card. If support for this application is needed, replace with a Digiboard I/O card.
- Netview PC. No action required. Netview support is available through GDC MEGAVIEW.
- TDM 1258 Multiplexer. May be replaced with OCM or Universal MEGAMUX Plus V4.
- MEGAMUX Plus Multiplexers earlier than Universal MEGAMUX Plus V4. May be replaced with OCM or Universal MEGAMUX Plus V4.
- Bell 303 Aggregate Interface. Reconfigure to appropriate interface option.
- Bell T1/D4E Aggregate Interface. Reconfigure to appropriate interface option.
- Circuit types: ADPCM, PCM, and PCM-T.

The Download Configuration as Required (*Refer to the Download/Activate screen*) routine downloads the present configuration to TMS nodes which have an invalid configuration. This selection is provided for use in the unlikely event that a TMS node remains with an invalid configuration after the automatic download process has completed.

Use the Software Integrity routine to determine the success of a configuration and/or software download. When the network has a consistent set of software and configuration data, all indicators appear in green. Any mismatched software or data is reported in red or yellow (Refer to the chapter on Software Integrity for more details).

Software Updates

GTS software is occasionally updated to add new features and enhance existing software. When you receive updated software in the form of a new software release, you should also receive specific instructions on procedures for the system upgrade.

NOTE

If you are upgrading your network to GTS V2.X.X from MSO V3.X.X, you must first load MSO V3.0.1, followed by Patch #27. If this is the case, you should have also received Patch #27 with the MSO V3.0.1 software.

If you are upgrading your network to GTS V2.2.0 from GTS V2.1.0, you must first load GTS V2.1.0, Patch 23.

Software updates occur in the form of patches. Some patches, which contain Controller software only, need only be loaded via the **`Load A Software Release`** pokepoint in the `Controller Maintenance` menu. If, after loading a patch, a Controller re-boot is required, that is specified in the patch installation procedure. If the patch contains mux software files, then the basic software upgrade procedures below should be followed.

In certain circumstances, it is desirable to change the running software version on a particular card type. To do this, follow the steps related to selecting, downloading, and activating software files.

Enterprise System Control Card (ESCC)

Starting with software release GTS V2.0.0, the ESCC provides the platform for non-disruptive software upgrade in the TMS-3000. The ESCC holds the software files for all equipment types; by transferring those files to neighboring nodes in background mode, the ESCC provides for software upgrade with minimum network down-time. *Table 1-4* describes the interaction of ESCC front panel LEDs. During the software update process, referring to this table may be helpful.

Common Control Module (CCM)

Starting with software release GTS V2.2.0, the CCM provides the platform for non-disruptive software upgrade in redundant OCM-2000s. The out-of-service CCMs will receive and hold the new `Stored` software files and switch into service when the new system software is activated in upgrades from GTS V2.2.X to future software releases. Because TMS nodes now hold the OCM software, each is able to upgrade any connected OCMs through multiple simultaneous downloads.

NOTE

If an OCM code download is disrupted, that OCM remains in the INIT state until the other OCMs connected to the same CDA finish downloading.

In OCM nodes with non-redundant CCMs, there is some disruption while the CCM is receiving the new software as part of the activation of the TMS network. Each CDA can simultaneously download up to four of this OCM type. The non-redundant OCMs automatically receive the new software revision lists. If new CCM software is required, this download is disruptive; therefore, the CCM download occurs later upon network activation.

OCM nodes with redundant CCMs receive the new Software Revision Lists, and initiate requests for any new software files, as necessary. New CCM software downloads to the out-of-service CCM, while other NVCC software downloads to a `Stored` file section on those cards. These OCM software downloads occur non-disruptively.

In OCMs having redundant or non-redundant CCMs, other NVCC files (e.g., DPV) are downloaded non-disruptively before activation. Note that for the DPV to receive a download, it must be configured.

OCM downloadable voice channel cards also support non-disruptive download. These cards receive and hold the `Stored` software while running the `Active` software.

No matter what older software version an ESCC is running, a newly loaded Controller can always communicate sufficiently to execute and monitor the software upgrade process. A newer version of software can always load over an older version.

When upgrading from GTS V2.1.0 or later to a higher version of software, a version Fallback feature allows you to switch back to the previously running version of software if the new version has failed an acceptance test. But to have this capability, the entire network must be equipped with redundant ESCCs, and the network-wide **`Out-of-Service ESCC Update`** option (selectable option in the `Software Revision List` screen) must be disabled *before* beginning the upgrade procedure.

Table 1-4 ESCC Front Panel Indicator Interaction

Indicators			Status
Init	**Stand By**	**File State**	
on	off	off	ESCC is powering-up, running its internal self test, but has yet to determine the state of its file system.
off	off	off	The ESCC has determined that its file system is correct (according to the version information received from the Controller) and it is executing its full feature software. This is the normal operating state.
off	off	on	Although the ESCC is able to execute its full feature software, the Controller has informed the ESCC that a download of new and/or additional files is required.
off	off	flashing	Although the ESCC is able to execute its full feature software, the Controller has informed the ESCC that a download of new and/or additional files is required and that downloading is in progress.
on	off	on	ESCC is in boot and lacks valid full feature ESCC software.
on	off	flashing	ESCC is in boot and lacks valid full feature ESCC software; the ESCC is currently downloading the required software.
off	on	off	ESCC is redundant and out-of-service. It has the software necessary for operation, the software matches what is required by the Controller and the ESCC is executing valid full feature software.
off	on	on	ESCC is redundant and out-of-service. It has software necessary for operation, but lacks newly downloaded files contained in the in-service ESCC.
off	on	flashing	ESCC is redundant and out-of-service. It has software necessary for operation and is crossloading the newly downloaded files contained in the in-service ESCC.

Software Upgrade/Download Procedures

In addition to the specific procedures in the release notes provided with a software release or patch, use the following guidelines when you load new software.

Cold Network Starts

Normally, a system is shipped from GDC with software and configurations already loaded. Nevertheless, occasions may arise when you may need to download system software and configuration data to a system with no software or configuration (such as when individual components are ordered, rather than an entire system). Downloading of system software may be necessary, for example, when equipment is modified or replaced at a node. Follow these guidelines in a cold start situation:

- Create a complete configuration on the Controller before bringing the network on-line.
- For a successful download, aggregates must be functional. Since the aggregates have not been configured, you may have to initialize nodes (other than the local node connected to the Controller) using the Maintenance Console. See *Appendix C of GDC 036R303-000* or *GDC 036R610-000* for the procedures to operate the Maintenance Console.
- The Controller must have a set of Active files selected in the Revision List. If starting with no configuration in the Controller, you need to select a set of Stored Files and then activate to copy those files from Stored to Active in the revision List. Do this when not physically connected to the local node.
- With the Controller connected, code downloads to the local node. Once code download is complete (verify using Software Integrity), perform a System Verification. This downloads

the configuration to the local node. At this point, the local node should begin to download to its connected nodes. Depending on your network configuration, it may be necessary to select System Verification more than once.

Normal Procedures

NOTE

Always start by saving your existing configurations on diskettes. Use the Save Network Configuration Files routine in Network Maintenance to perform the save. You may not need to reload the configuration, but you are protected against system failure.

Prior to backing up the configuration, it is advisable to disable IAR. Later, when restoring the configuration, this prevents IAR from prematurely reacting to potentially unstable network conditions.

Backing up a configuration does not save the Controller I/O port configurations and alarm settings. These should be recorded and then reconfigured after an mninstall installation of a new software release.

There are three basic procedures for software upgrade. These procedures are described briefly here and then explained in more detail.

Non-Disruptive Software Download **-** Load and distribute new software files to all TMS nodes as a background function while still running the current version. Wait until the network is entirely downloaded and stable, as determined in the Software and Node Integrity screens.

Controller Software Upgrade - Disconnect all Controllers, and load the new software release (if applicable). Restore the appropriate configuration onto the Controller, and ensure that the correct software file versions are selected. When this is done, reconnect the Controller.

Activation - Simultaneously activate the new software files in all nodes.

Non-Disruptive Software Download: Load and distribute new software files to all TMS nodes as a background function while still running the current version. Wait until the network is entirely downloaded and stable, as determined in the Software and Node Integrity screens.

1. Planning the Upgrade - Though the download portion of an upgrade to GTS V2.2.0 is non-disruptive to TMS nodes, there is still a window of vulnerability between the start of a download and the software activation. During this window of time, the old software files for NVCCs (Non-Volatile Common Cards) are no longer resident in the in-service ESCCs, and therefore are not available for downloading to adjacent nodes or unique NVCCs within the same node. Once downloading of new software is complete, activate the new software as soon as possible in order to minimize this window.

   The vulnerability period can be eliminated if every node with an NVCC has more than one of that NVCC type in the node (redundancy may accomplish this). The vulnerability is eliminated by the ability of the ESCC to retrieve NVCC software from like-NVCCs in the same node, and "crossload" to the card (or cards) in the same node which may need that software.

2. Stabilize the network - Do not initiate a software file download when troublesome equipment or links (A **link** is a transmission path between two parts of a communications system.) exist in the network. If a network has been exhibiting problems before a planned software upgrade, then the problem should be corrected prior to initiating the upgrade. The software file transfer system has many checks and retries, and is designed to succeed during various types of failures. But the software file download itself places a strain on the network, and may impede troubleshooting or recovery efforts. Download time/performance may also degrade significantly in adverse situations.

3. Software Integrity - Check that Network Status and Software Integrity displays are all green on the Controller. This should include the integrity of the out-of-service ESCCs as well. If you are running GTS V2.1.0, note that per the V2.1.0 release notes, you are required to go to the Node Integrity screen for each node because the Software Integrity screen summary information is unreliable.

4. Load the Mux Software from the new release onto the Controller - To do this, you must be logged onto an on-line network as a full (unrestricted) access user. Select **`Load a Software Release`** in the `Controller Maintenance` menu. Load the nodal software files from floppy disks as prompted by the Controller. For a full release (e.g., GTS V2.2.0), this means loading the files from the two ESCC diskettes in the software distribution. For a required patch release, load only the disk(s) that contain the mux software. For all other patches, load the entire patch. In either case, be sure to follow the instructions provided in the patch release notes. Note that, at this time, the Controller is still running its original software version. In a **Redundant Controller** situation, all controllers may remain attached to the network. Note that GTS software allows the use of multiple controllers. One controller is designated as Master and serves as the point of control for the entire network. Other controllers are designated as Subordinate and provide additional access points into the network.

NOTE *If you are loading a full release set of software, and the release you are loading has a required patch, then, at this time, load any patch diskette (from that required patch) that contains mux software. For example, if GTS V2.2.0 required Patch 6, after you load the two GTS V2.2.0 ESCC diskettes, load the mux software diskette for Patch 6. Loading required patch mux software at this time avoids the necessity of going through the download process twice.*

5. Create the `Stored` file list - Bring up the `Software Revision List` screen (*See Figure 1-4*) by selecting **`DOWNLOAD`** from the `TMS Main Menu` and then selecting **`Modify/Activate Software Revision List`** from the `Download/Activate` screen.

- Select the set of software files/revisions for your `Stored` files (i.e., files to be downloaded non-disruptively in the background). The `Software Revision List` screen (*See Figure 1-4*) provides for manual editing of software file version information.
- Upon entering this screen, the `Stored` and `Active` columns display the current revision level of the software files (Unless in the middle of an upgrade, the `Stored` and `Active` software files of each `Stored/Active` pair should generally be the same as each other).

```
Software Revision List    ESCC 2.X                    21-APR-1996 15:40:26
File Type         Revision List        File Type        Revision List
                  Stored    Active                      Stored      Active
  ACM             2.2.0A    2.1.0A     CDA-E1           2.2.0A      2.1.0A
  CDA-T1          2.2.0A    2.1.0A     DPV-CMN          2.2.0A      2.1.0A
  DPV-FAX         2.2.0A    2.1.0A     DPV-IMBE         2.2.0A      2.1.0A
  EACC            2.2.0A    2.1.0A     ECIC             2.2.0A      2.1.0A
  ESCM            2.2.0A    2.1.0A     ESCS             2.2.0A      2.1.0A
  IAC-ATT         ------    2.1.0A     IAC-CCITT        ------      ------
  IAC-NTT         ------    ------     OCM              2.2.0A      2.1.0A

   Out-Of-Service ESCC Update:   DISABLE               << Fallback >>
   <<Select Stored Files Revisions>>   <<Activate Stored Software Files>>
```

Figure 1-4 Software Revision List

Described next are two ways to select files:

- To modify the list of desired file revisions for each equipment type, you can manually enter the revision string for any software file loaded and present on the Controller. (Check the software release notes provided with your software for any potential compatibility problems). In the example above, you are preparing to upgrade from GTS 2.1 to GTS 2.2, and have chosen to de-select the IAC software, by blanking out all three of the IAC `Stored` revision list items.

NOTE

For IAC cards, no more than one type may be selected. For example, if IAC-ATT is selected, you must not select any other type of IAC. If more than one type is selected, you must de-select until only one type is shown.

GDC recommends that you de-select any software files which do not need to be downloaded to the network (such as files for which there are no cards configured in the network); these files remain in the Controller, but download performance is improved by not having to download unnecessary files.

A software file is de-selected when the Revision List fields are blank. To de-select when the fields are not blank, type spaces over previously existing information to blank out the field.

Described next is another method to select files. This method may be preferable to the method just described because you do not have to manually type in the file selection.

- To facilitate selection/de-selection of the desired `Stored` revision levels, choose the **`Select Stored Files Revisions`** option. This brings you to the `File Selection List` screen.

The currently selected revision for each file type is displayed in green. Use the arrow keys to position the highlighted cursor on top of the desired file(s), and press `Enter` to make that selection. The Controller acknowledges your selection with a message in the following format:

```
Revision 2.2.0B selected for type ESCM
```

To de-select a file, highlight `none` and press `Enter`. The Controller acknowledges your de-selection with a message in the following format:

```
Software type ESCM is de-selected
```

When finished, return to the `Software Revision List` screen, which now reflects your selections.

NOTE

The following step (6) does not apply if you are upgrading from MSO V3.0.1. MSO V3.0.1 does not support Out-of-Service ESCC Update.

6. `Out-of-Service ESCC Update` (**`Enable/Disable`**) - When this field is set to **`ENABLE`**, it means that the revision lists and software on the out-of-service ESCC are updated by the in-service ESCC. But if the capability of using Software Version Fallback is desired, this field must be set to **`DISABLE`** before beginning the actual download. The setting of this option has no effect on the download of configuration.

7. Initiate revision list and software download - Exit the `Software Revision List` screen, saving the `Stored` list. The Controller then non-disruptively downloads the new Software Revision Lists to all TMS and OCM nodes in the network. Each node compares the revisions of the files it currently has with the revisions it should have based on the new list. If new TMS files are now required, the TMS nodes initiate requests for those files to neighboring nodes and/or the Controller (*Refer to Chapter 40, Download*). OCMs do not request new files until after the Activation step.

8. Check status reports - Use the `Software` or `Node Integrity` screens to monitor the progress of the `Stored` file transfers. The older version of software, still running throughout the system, always supports these checks. Eventually, all of the `Stored` files are completely propagated throughout the network.

   If upgrading from MSO V3.0.1, all fields should display in green on the Software and Node Integrity screens for both TMS and OCM nodes.

   If upgrading from GTS V2.1.0, more manual checking is required. As indicated in the V2.1.0 release notes, view the Node Integrity screen for each TMS node individually. Page 1 of the screen should be all green except for the `TMS Controller-Rev Lists-Stored column`, which should be all yellow. This indicates that the Stored files match the Controller Stored file list, but don't match the Active files list and are awaiting activation. The ESCC Active Rev List and SW File entries for DPV are blank.

   OCM nodes display all fields in green in both the Software and Node Integrity screens. This is because the OCM nodes are still running GTS V2.1.0 and have no stored code. New Active code is not downloaded until Activation. In the meantime, the running Active code matches what it should match.

NOTE

If this is a full software release upgrade, do not activate the new software until after you load and boot the new controller software on the Controller.

If the current (old) Controller version is MSO V3.0.1, initiating the **`Download as Required`** *function from the* `Download` *screen causes the Stored software revisions to be moved to the active areas, thereby becoming the operational software prematurely. This is not desirable because, at this time, the Controller software that is running is not fully compatible, and there may be significant delays in the upgrade process.*

9. Abort-1 - At this point you still have the ability to abort the download process and restore or change the `Stored` file sets, without causing any network disruption. This is accomplished by simply editing the Nodal Software Revision List and selecting the previous (or another) set of software files/revisions. To abort after this point requires additional procedures, and may result in some degree of disruption (See Abort-2 and Abort-3 later in this procedure).

Controller Software Upgrade: Disconnect all Controllers, and load the new software release (if applicable). If necessary, restore the appropriate configuration onto the Controller, and ensure that the correct software file versions are selected. When this is done, reconnect the Controller.

NOTE

Before loading the Master Controller, disconnect all other controllers from the network. Since you have selected GTS V2.2.X files to be stored, your configuration has changed. Therefore, it is important to re-save your configuration on diskette before continuing with Controller Software Upgrade.

If upgrading from MSO V3.0.1, Controller communications to OCM nodes are interrupted after the Controller software is loaded until Activation is performed. If upgrading from V2.1.0, incompatibilities between the running V2.1.0 mux software and the V2.2.0 Controller software result in unreliable OCM Integrity information. Therefore, prior to continuing with this step, use Status, Diagnostics, and Software Integrity to stabilize the network, as per step 8 in the preceding section.

1. Loading the Controller - For a full software upgrade, the next step is to load the new Controller software onto the Controller. In the case of a non-required patch release, this occurred in *Non- Disruptive Software Download, Step 4*. For a required patch, at this time, load only the disk(s) containing the Controller software.

   If you load the new Controller software via **`Load a Software Release`** on the same Controller which was running the old software, the information in the "Nodal Software Revision List" remains in the Controller. The Controller is inoperable while software is being loaded and then for several minutes as it reinitializes itself with the new software. Obviously, IAR is not functional during this period.

   If, instead, you load the new Controller software via the mninstall method (potentially on a separate backup controller), the "Nodal Software Revision List" can be transferred to the new controller when you restore the network configuration that was saved before starting the Controller Software Upgrade. This procedure should be done at this time. Be sure to reconfigure I/O ports. *The mninstall procedure is found in GDC 036R303-000, Chapter 5, the subsection called Loading GTS Software.*

NOTE

IAR should be disabled during the activate portion because Link downs, etc., are triggered (normal at that time).

2. Window of vulnerability - For the next few steps (until the Software Activation is complete) certain areas of the Controller software may be incompatible with the nodal software. Therefore, IAR, status reports, or diagnostics may be rendered inoperable, or unreliable information may be displayed.

   In addition, some actions may be taken internally. For example, take the situation where the Controller is running new software while the network is still running the previous version, and the configuration data base is incompatible between the two versions. The Controller detects the data base format difference, and automatically downloads configuration to the background configuration area of each node. If the configuration data bases are compatible between the Controller and the nodes, the Controller instead directs the configuration downloads to the foreground configuration area.

3. TMS Integrity check after loading new Controller Software - Reconnect your Master Controller that has the newly loaded software. All software integrity checks should have been completed and verified in the preceding step, before the loading of new software onto the Controller.

If you upgraded from MSO V3.0.1 or GTS V2.1.0 using the pokepoint load, TMS nodes on the Software Integrity screen should show yellow configuration fields for `Name`, `NUR`, and `O` (redundant ESCCs). The `PC REV LST` field should also be yellow, but all remaining Revlist and Software fields should be green.

If you loaded using the mninstall procedure in *GDC 036R303-000*, expect yellow configuration fields and green `REV LST` and software fields, but a red `PC REV LST` field. Red indicates that the active V3.0.1/V2.1.0 files specified in the `PC REV LST` are no longer resident on the Controller, having been removed as part of the mninstall process.

At this point, OCM information is useless. If upgrading from V3.0.1 to V2.2.0, software incompatibilities preclude communication to OCM nodes. If upgrading from V2.1.0 to V2.2.0, software incompatibilities result in false OCM information.

NOTE

If upgrading from MSO V3.0.1, the Software Integrity screen should show green for all slots, and the first page of the Node Integrity screen should show CDA, ACM, and IAC cards with red conditions. At this time this is normal; the Controller defaults to selecting no file for these cards and is awaiting activation of the newly stored files.

If anything else in the Integrity screen is shown in red, investigate this before continuing. *Refer to Chapter 39* to resolve the problem. You may find it necessary to initiate a **`System Verification`** from the `Download/Activate` screen. When the relevant integrity information is yellow, continue to Software Activation in *Activation, Step 1*.

4. Abort-2 - You may still abort the download process at this point without any network disruption, but in order to do so, you must disconnect and reload the Controller with the previous version of software (or reconnect a different Controller which already has the previous version still loaded on it). You must also check that the `Active` and `Stored` software files in the revision list are correct before connecting the reloaded Controller.

Activation: Simultaneously activate the new software files in all nodes.

1. Software Activation - Select **`Activate`** `Stored` **`Software Files`** in the `Software Revision List` screen (described above). This initiates the software activation sequence. Nothing happens for about two minutes while the network is synchronizing the activation. Then the network is inoperable for several minutes. During this time, the ESCCs implement the `Stored` code as their new `Active` code, and "download" (or crossload) the files to the cards within their nodes. ACC and CIC cards return to normal operation momentarily. NVCC cards (such as CDAs, IACs, and ACMs) take longer to receive their files from the ESCC, and remain inoperable for somewhat longer.

   Once the CDAs have recovered, software download to the OCMs begins, taking another few minutes.

   OCMs with non-redundant CCMs have already received the new Software Revision Lists, and any new non-CCM NVCC software files in the background. The network activation causes the non-redundant OCMs to initiate requests for the download of any new CCM software, which is disruptive. Upon completion of the CCM file download, the OCM activates all new files.

   Once the entire process is completed, check the `Software Integrity` screen. If the `Out-of-service ESCC Update` option has been in the **`DISABLE`** mode during the download process, then the `PC REV LST`, `Active` and `Stored I` (In-Service) columns should be green, and `O` (Out-of-Service) columns should be yellow. If the `Out-of-service ESCC Update` option has been in the **`ENABLE`** mode, then all five columns (`Active`, `Stored`, `I`, `O`, and `PC R/L`) should be green.

2. Execute Acceptance Test - When normal operation resumes after the software activation, updating the out-of-service ESCC does not automatically occur if you have previously (as recommended in Non-Disruptive Software Download, step 6) set the `Out-of-Service ESCC Update` option to **`DISABLE`**. This allows you to perform an acceptance test, and still retain the ability to fall back to the previous software revisions if necessary.

   After completing and passing the acceptance test of the new software, manually re-enable Out-of-Service ESCC Updating from the `Software Revision List` screen. This allows the in-service ESCC to crossload its new, verified software to the out-of-service ESCC, at which point full ESCC redundancy is restored. Network operation is unaffected if you do not do this, but an alarm occurs after several hours warning you that this option is still disabled, and is therefore effectively disabling your ESCC redundancy.

3. Reconnect Subordinate Controllers - If the acceptance test is successful, reconnect any subordinate controllers after ensuring that they are updated to the new Controller software revision level.

NOTE

Prior to reconnecting a subordinate controller, ensure that the files in the Modify SW Revision screen reflect the network and what's in the Master Controller.

4. Abort-3 - If your acceptance test fails, and the Out-of-service ESCC Update option is disabled, then you can select to perform a coordinated fallback to the out-of-service ESCCs in the network which contain the previous software and configuration load. To do this, the Software Version Fallback procedure can be invoked. Note that this procedure is available only when falling back to an earlier GTS software release. You cannot fall back to an MSO software release. The fallback procedure is not possible if the network is not fully ESCC redundant, or if any nodes have become inaccessible, or if any ESCC in the network has executed a redundant switch (Check for Redundant Swap alarms). Additionally, in *Non-Disruptive Software Download* , *Step 6*, you must have ensured that the `Out-of-Service ESCC Update` was set to **`DISABLE`**. To execute Software Version Fallback, the following steps must be taken:

   a. Select **`Fallback`** in the `Software Revision List` screen. Three things occur:

      - The `Active` Software Revision List is cleared. This must occur to prevent a download of the new software from restarting when the out-of-service ESCC (with the old software) comes into service.
      - Special toggle commands are sent to all nodes. The nodes delay (to allow toggle-command propagation), and then toggle. This puts the ESCCs with the old software in service.
      - Out-of-Service ESCC Update is automatically enabled. This causes the old code and configuration to crossload from the now in-service ESCCs, replacing the new software and configuration on the now out-of-service ESCCs which failed the acceptance test.

   b. Revert to the previous version of Controller software. There are two ways to do this: (1) disconnect and reload the on-line Controller with the previous software version, or (2) switch over to a different controller that is still loaded with the previous version. For either choice, be sure to first edit the `Stored Revision List` to ensure the proper revisions. After reconnecting the Controller, activate the `Stored` list.

A "double fallback" is not supported. If, after executing a fallback, you wish to switch back to the new software, the new software must be re-downloaded.

NOTE

Since channel cards are naturally non-redundant, any software downloadable channel card is exempt from participating in fallback. What this means is that if the rest of the TMS network has just gone through a fallback sequence, then software downloadable channel cards may be running an incorrect software version. This is seen in the Software Integrity screens. Such cards have to be re-downloaded.

Controller Shutdown

The Controller must be properly shut down.

NOTE

Never shut down the Controller by simply turning it off. If you do, disruption of the XENIX file system may occur.

From the `TMS Main Menu`, highlight `Controller Maintenance and press Enter`. The menu that appears contains a `Normal Controller Shutdown` routine which should be followed for proper shutdown. This routine terminates XENIX. Once you perform a shutdown, after you reboot, access to the TMS software is accomplished by using the Xenix386! login name (or Auto Login automatically reboots the system). Refer to Controller BootupAfter Shutdown for directions on rebooting the Controller. Once the shutdown is complete, you may turn off power to the Controller.

During the shutdown, the hard disk (fixed disk) and floppy disk drives are "parked." You may move a Controller that has been properly shut down.

If you accidentally lose power to your Controller, the XENIX operating system recognizes the improper shutdown and automatically performs a cleaning of the file system. In most cases, the GTS software automatically reruns, but you may need to enter the GTS login name to return to the TMS-3000 operating software.

If the Auto Login option is installed in your system, the Controller automatically reboots GTS after a power loss or disruption on the line. The first screen that appears is the `TMS Control System` (GDC logo).

Two shutdown routines are available. One routine disables autologin allowing use of two features upon restart. These features are:

- Reinstall TMS
- Allow Remote Login

This shutdown routine disables the Auto Login function. With Auto Login disabled, you can either install TMS using the mninstall routine or run TMS from a remote (non-console) terminal. *Refer to Chapter 42* for more information on the Shutdown routine.

Contact General DataComm Service (see Preface) if you cannot reenter GTS software after a power loss.

Controller Bootup After Shutdown

After a Controller has been shut down, it must be rebooted to return to the TMS-3000 operating routines. Follow this procedure to reboot the controller. The Controller can reboot automatically if specified in the Controller Shutdown procedure.

In this procedure, any characters you must type appear in boldface.

1. Make sure that the disk drive is empty.
2. When the controller has been shut down, the terminal displays:

   `Press Enter to reboot:`

3. Press `Enter`. The screen now displays alternative bootup sources (hd program, etc.), followed by:

   `Press Enter for default: hd (40) xenix`

4. Press `Enter`. (If you wait for more than a minute, the controller automatically boots up hd (40) xenix).

   If the system has been shut down incorrectly, the screen reports:

   ```
   The system was not shut down properly, and the root file system
   should be cleaned.
   ```

   `Proceed with cleaning (y/n)?`

   Enter **y** to the `Proceed with cleaning?` prompt to continue normal bootup. In either case, the screen then displays:

   ```
   Type Control-d to proceed with normal startup (or give root password
   for system maintenance):
   ```

5. Press the **Ctrl** and **D** keys simultaneously. The screen asks for time and date; press `Enter`. The controller checks file system integrity and then displays:

   `Xenix386! login:`

   NOTE

   If you have the Auto Login option installed in your system, the Controller automatically reboots the GTS operating system.

   Enter **gts** (or your login), and press `Enter`. If a XENIX password has been created for your system, you are prompted for a password. Type the password and press `Enter`.

6. The controller now enters the TMS-3000 operating routines.

Corrupt Configuration Files

During system operation, a failure may cause a corruption of TMS-3000 configuration data. For this reason, you should back up configuration data onto a diskette on a regular basis. This ensures that you do not lose your network configuration.

If the configuration is corrupted, the system recognizes the file corruption and deletes the corrupted data base. Messages report the corruption problem.

Depending on the nature of the corruption, you may be given limited access to operating routines so that you may examine, but not modify, configuration files. In this case, you must select Controller Maintenance from the Main Menu. If the password files are corrupt, you are forced to go directly to Controller Maintenance. In either case, a three-item menu is presented with the following choices:

1. `Rebuild System (No Configuration Files)` — This choice creates a new, unconfigured TMS-3000 system. During the process it deletes all configuration data for all networks and so deletes the corrupted configuration files.
2. `Normal Controller Shutdown` — You may shut down the controller and request assistance from GDC before proceeding further.

NOTE

Attempting to restart the system at this point, without assistance, may result in loss of configuration data.

3. `Shutdown, reinstall GTS or allow remote login`.

This menu appears only if corrupt configuration files are detected.

Once you have performed this action, you are allowed into the normal TMS-3000 operating menus. You may then select the Restore Configuration Files routine from the Network Maintenance menu and load saved configuration files from diskette onto the fixed disk. Your network configuration is then restored.

Summary

In this chapter we covered the guidelines and procedures for system configuration, downloads, and upgrade of system software. Also provided were the steps for shutting down the Controller, booting up after a Controller shutdown, and the procedure to follow if your configuration files become corrupted.

What's Next?

Chapter 2 provides an introduction to the tools that you need for configuring your network. The network hierarchy and its importance to configuration is explained. The Configuration Main Menu is explained. Finally, you are taken through the steps for creating and/or modifying a node.

2 General Configuration Overview

Overview

The Configuration routines provide all the necessary tools to configure a TMS-3000 network. The **`Examine Configuration`** routines present existing configurations in a display-only mode. The **`Modify Configuration`** routines create and change a network. In most chapters, although we refer to *Examine/Modify*, the discussions are about *Modify*.

This chapter is an introduction to configuration and describes the procedures to follow for creating a network and the nodes in your network. *Chapters 3* through *20* describe all of the configuration routines that are available to you from the `Configuration Main Menu` and the associated sub-menus.

Normally, the Controller is loaded with a network configuration before the controller is shipped. When the system is installed, check the node and **circuit** configurations to ensure that configurations have been created properly. A circuit is an end-to-end data or voice path which can pass through several entities in a communication system. After installation of the system, Configuration routines are used to modify the system and to add new equipment to the system.

Topics covered in this chapter are:

- Network Access
- Temporary Configuration Files
- Specific Configuration
- Network Timing
- Configuration Changes
- Network Hierarchy
- Examine/Modify Configuration
    - Examine Node Definition
    - Create/Modify Node

Network Access

More than one network configuration may be created. This enables you to modify a network or prepare for expansion of the network while maintaining an operating TMS-3000 system. Most modifications should be made using the **`Access Off-Line Network`** menu selection. Only use the **`Modify Configuration`** routines available through the **`Access On-Line Network`** selection for rapid modifications of the on-line system.

Once changes have been made to the network, select **`Access On-Line Network`** The download process automatically sends the configuration changes to all nodes of the system. After the download process is completed, a System Verification check is automatically performed to ensure that the download was successful at all nodes.

Temporary Configuration Files

When you enter the **`Modify Configuration`** routines, the Controller creates a temporary copy of the configuration files. Changes made to any configuration are made to the temporary file. They do not become permanent changes until you exit the **`Modify Configuration`** routine; at that point, you are asked:

```
Do you wish to save your configuration? [Default continue? (Y/N/C)]
```

If you answer yes (**`Y`**), the modified configuration is transferred to the data base. If you are making the changes in an on-line network, the changes are made to the network at this time. If you answer no (**`N`**), the previous network configuration is restored.

You may also choose to continue (**`C`**) within the **`Modify Configuration`** routines.

Specific Configuration

The Controller maintains a single active configuration for the main shelf equipment at a node [Aggregate Control Card (ACC), ADPCM Compression Module (ACM), Combined Digital Aggregate (CDA) Module, ISDN Aggregate Control (IAC) Module, Channel Interface Card (CIC), and Digital Bridging Card (DBC), and **TPP** (TMS **Packet** Processor)]. This is because the nodal equipment arrangement is not changed on a regular basis. Equipment reconfiguration on that scale is performed by modifying a network off-line. The TPP is a TMS-3000 card that interfaces externally with public frame relay networks or frame relay devices such as LAN bridges, routers and frame relay PADs. It also has internal access to the Fast Bus, allowing it to transfer frame relay, HDLC and SDLC data to other TPP modules in the shelf or to modules such as CIC, CDA, ACC and IAC. A packet is a sequence of data, with associated control elements, that is switched and transmitted as a whole. Packet refers mainly to the field structure and format defined within the ITU-T X.25 recommendation; multiple packets may be required to carry one complete document or a lengthy block of information.

Some elements of the network can be reconfigured on a daily or weekly basis. Circuits, for example, may be switched in and out of operation to support "day" and "night" operations. Other aspects of the configuration change in response to system failures. **Routes** (logical paths through a network from the transmitting equipment to the receiving equipment) may be changed to avoid aggregate failures or to utilize aggregate bandwidth more efficiently. Network timing may be redistributed if a primary clock source fails.

Up to sixteen separate configurations may be created and stored for a network. The TMS-3000 allows you to create configurations for Time Oriented Reconfigurations (TOR) that enable or disable circuits and links based on the time of day. Disaster Recovery and Reconfiguration (DRR) is a feature which activates corresponding configurations in the event of one or more link failures.

The configuration routines for circuits are entered through the **`Examine/Modify Circuits`** in the `TMS Main Menu`. Each configuration may be assigned a symbolic name (using the **`Modify Configuration Names`** routine).

Only one TOR configuration may be active in network nodes. The configurations that are not stored at a node must be downloaded to the network before they may be activated. The **Intelligent Automatic Routing (IAR)** routine performs a partial download of a configuration in the event of a link failure, a Time Oriented Reconfiguration, or if you delete or modify circuits in the network. IAR is a Controller function that automatically determines proper routing of circuits around any failed node or facility.

The `Modify Activation Times` routine sets times for a configuration to be downloaded and activated automatically or lets you activate a configuration immediately.

Network Timing

As part of the configuration process, you should select timing sources for each node in the network. TMS-3000 nodes can detect timing failures and independently switch to alternate timing sources. Fallback timing configurations may be created to guide nodes in a search for other timing sources. The `Modify Network Clocking` routine selects network fallback timing levels.

Configuration Changes

A TMS-3000 network comprises many elements. When some of these elements are changed, effects of the changes can ripple through the network causing temporary disruption of some circuits.

To minimize these effects, you should try to keep the scale of modifications as small as possible. Avoid unnecessary changes.

Some guidelines to follow are:

- Using Off-Line Configuration routines, plan your network carefully. If you recognize potential problems before entering configurations, you do not have to delete and reconfigure to correct mistakes.
- Try to maintain numerical order. Try to match channel numbers on each end of a circuit and configure circuits in the order of channel numbers. Group circuits by data rate and circuit function. Configure these groups in an orderly manner.
- *Always start any modification with a copy of the existing network*. If you are creating a new configuration, start by copying the existing configuration. Then make only the changes and additions that are necessary.

Network Hierarchy

When configuring a network or a section of the network, keep the hierarchical nature of the TMS-3000 network in mind. First define and configure each node and create **Aggregate Trunks** (a full duplex communication line which transports data between two nodes) that connect each node. You are allowed to create circuits without defining the routes that carry the circuits. But these circuits cannot become active in the network until they are assigned to routes. Route assignment is accomplished by the Autopath function (*described in GDC 036R304-000*). Further modification of circuit routing occurs in the event of failures/restorals and is accomplished by the IAR/DRR tasks. You may create manual routes through the nodes to function as the preferred routing for a circuit.

The hierarchical structure of the network must also be considered if you delete any network component. Since each network element is tied to the elements above and below it in the network hierarchy, deletion of a network component can disconnect part of the network.

For example, if you delete an aggregate trunk in a network, the routes that pass through that aggregate are deleted. Circuits on those routes are changed to automatic routing if manually routed. *Use caution when deleting network components and consider all consequences before taking any action.*

Follow these guidelines whether you are creating a new system or modifying an existing system:

- Plan your network carefully before using Configuration routines. If you recognize potential problems before entering configurations, you do not have to delete and reconfigure to correct mistakes.
- Always start any modification with a copy of the existing network. If you are creating a new configuration, start by copying the existing configuration. Make only the changes and additions that are necessary. Never enter a circuit, route, or aggregate that already exists in a previous configuration. It is a waste of time and can disrupt the unchanged part of the configuration.
- Follow the hierarchical nature of a TMS-3000 network; configure all elements at one level before beginning the next level. Perform configuration in this order:
  1. Nodes
  2. Node Equipment (ACC, ACM, CIC, TPP, CDA, IAC Modules)
  3. Network Timing
  4. Aggregates/Bundles [A **Bundle** is a sequentially ordered group of DS0s that have a common termination point. A **DS0** (Digital Signal Level 0) is a single 64 Kbps channel.]
  5. Manual Routes (optional)
- Try to maintain numerical order. Try to match channel numbers on each end of a circuit. Configure circuits in the order of channel numbers at the start node. Group circuits by data rate and circuit function, and then configure these groups in an orderly manner. Try to give meaningful names to the circuits, routes, links, etc.
- You may create manual routes for certain network requirements and place any circuits on routes. Routes other than manual routes are created and implemented automatically.

Examine/Modify Configuration

`Examine Configuration` presents all of the Configuration screens that are created and modified by the **`Modify Configuration`** routines. By using this "display-only" mode of configuration, you avoid the possibility of unintended changes in the configuration.

Operating methods for the **`Examine Configuration`** routines are the same as those for the equivalent **`Modify Configuration`** routines. For example, in the **`Examine Node Equipment`** routine, you use the **`F5`** and **`F6`** keys to step between the screen for equipment slots 1-8 and the screen for equipment slots 9-16.

NOTE

Reminder — When using the Controller, you may access on-line help (disk-based manual) by pressing the ***`F8`*** *key.*

Figure 2-1 shows the `Configuration Main Menu` when **`Examine Configuration`** is selected from the `TMS Main Menu` and when **`Modify Configuration`** is selected from the `TMS Main Menu`.

```
Configuration Main Menu           Net1                     05-APR-1996 10:42:13

     Examine Circuits                             Examine Network Clocking
     Examine Node Definition                      Examine Node Equipment
     Examine IAR Defaults                         Examine Circuit Profiles
     Examine TOR/DRR Selection                    Examine Controller Definition
     Examine Special Rates                        Examine Passwords
     Examine Manual Routes                        Examine Sync Status Card
     Examine Network Parameters
```

```
Configuration Main Menu          Net1                      05-APR-1996 10:44:10

     Create/Modify Circuits                     Modify Network Clocking
     Create/Modify Node                         Modify Node Equipment
     Modify IAR Defaults                        Modify Circuit Profiles
     Maintain TOR/DRR Options                   Create/Modify Controller
     Modify Special Rates                       Modify Passwords
     Modify Manual Routes                       Modify Sync Status Card
     Modify Network Parameters
```

Figure 2-1 Configuration Main Menus

Examine Node Definition

This routine allows you to examine the parameters of an existing node. You may use the routine to verify node type and address as well as other configuration information.

After you log into a network, the first screen to appear is the `TMS Main Menu`. Highlight `Examine Configuration` and press `Enter`. Next, highlight `Examine Node Definition` in the `Configuration Main Menu`. Press `Enter`.

You are prompted for a node name. Enter the node name or press `Enter` to bring up a list of nodes from which to select. Selecting a node brings up the `Node Definition` screen which provides you with information such as node type and address information. You are asked if you want to examine this node or another node. Selecting **`Examine Current Node`** brings up the `Node Configuration` screen which provides you with a list of slots for the main shelf. Highlighting a slot number for a card and pressing `Enter` brings up other information. The type of information varies depending on the type of card that is installed in the slot you selected. For example, if you select a slot containing a CDA card, you can examine port and bundle information.

Create/Modify Node

This routine creates a node in the system or modifies an existing node. Its purpose is to establish a node as a logical entity in the Controller data base.

After you log into a network, the first screen to appear is the `TMS Main Menu`. Highlight `Modify Configuration` and press `Enter`. Next, select `Create/Modify Node` from the `Configuration Main Menu`. Press `Enter`.

To create a new node, enter a symbolic name for the node (if you want to modify an existing node, type in the name of that node). This name is equated to the node address; it is used to select the node and any functions related to it. Press `Enter`. If creating a new node, you are asked:

```
Create New Node? [Default: YES (Y/N)]
```

Press `Enter`, and the `Node Definition` screen appears. Once you have defined a node name, you must fill in the specific characteristics of the node using the `Modify Node Equipment` routine.

A name, node address, and node type are first assigned. These simple steps are of primary importance in the configuration process because they establish the existence of a logical node in the system. A number of entries are also provided for location, contacts, phone numbers, etc. This information is for reference use and does not affect system functions.

The following is a description of each parameter on the `Node Definition` screen:

Type (Cursor Position Entry)

If the `Type` selection is highlighted with the cursor and you press `Enter`, the node equipment types are displayed on the `Node Type Selection` screen (*See Figure 2-2*).

```
Node Type Selection          NET1                         05-APR-1996 11:38:06
Node Name  NODE 1            Type    TMS-3000                Address  001
 ----------------------------------------------------------------------
               TMS-3000                          TMS COMPACT
               XNET                              UNIV.  MM+ V4
               OCM SHELF                         OCM ENCLOSURE
```

Figure 2-2 Node Type Selection Screen

Place the cursor on the desired node type, and press `Enter`. Depending on the selection, you may be queried about continuing. There are differences in the equipment supported by each node type. If a node has been created and configured as one type, the configuration parameters may be partially or totally invalid for another type. For this reason, converting between some node types causes deletion of some or all of the configuration stored for the original node. After selection of node type, you are returned to the `Node Definition` screen.

The following rules apply for changing node types:

- Changing from a `TMS-3000` or `TMS COMPACT` (TMSC) to any `UNIV. MM+ V4`, `OCM SHELF`, or `OCM ENCLOSURE` node type causes deletion of the entire configuration. Changing from any `UNIV. MM+ V4` or `OCM` to `TMS-3000` or `TMSC` has the same effect.
- Changing from `TMS-3000` to `TMSC` deletes all common equipment not relevant to the Compact.

As an option, the TMS-3000 incorporates an internetworking feature that allows connection between two independently operating TMS networks. Access from one network to another via **supervisory data** paths is not allowed. Supervisory data is information which travels from the ESCC via the **MP Bus**. It does not have any immediate bearing on the data being multiplexed. Instead, it keeps supervisory software in various parts of the system up to date. The MP (Microprocessor) Bus, also known as the Communications Bus, is used to convey configuration, diagnostic, and alarm information between the ESCC and all other modules in the node.

Address (Numerical String Entry)

The TMS node address ranges between `1` and `126`, and uniquely identifies every node in the network. For an OCM (Office Communications Manager), the address is an alphanumeric designation, `F0001` to `F9999`. At the TMS or TMSC node, the Enterprise System Control Card (ESCC) has a switch set with the address number. This switch must be set with the correct address to enable communication between the Controller and the node. *Once an address has been entered and saved on the Controller, it cannot be modified.* For an OCM, assignment of an address is for your convenience only and is strictly under the control and management of the Controller. There is no way to physically address an OCM node.

NOTE

If a controller is connected to GDC MEGAVIEW, the local node address of the Controller should not be greater than 58. If its local node address exceeds 58, the Controller does not send alarms to the MEGAVIEW.

The middle of the `Node Definition` screen contains several fields for the node address, telephone numbers, and contacts. This information is for reference only and is not used by the Controller. Several functions can be selected by cursor position. They are described below:

Rename Current Node

This function is used to change the name of an existing node. When you select **`Rename`**, you may enter a new name as a string entry. The system changes the data base, so that all references to the name are revised.

Modify/Create Another Node

This function creates a new node. When you select this function, you then enter a node name. If the node name entered is not that of an existing node, the system asks:

```
Create New Node?
```

If you respond with **`n`**, the `Node Definition` screen is cleared, and you may configure another node. If the node name you selected is an existing node, you access the `Node Definition` screen for that node.

Delete Current Node

This function deletes the currently displayed node. You are given a chance to reconsider (by answering **`n`** to the `Are You Sure?` prompt). If you answer **`y`**, the node is deleted from the data base. You are then prompted for a node name. You may select another existing node or create a new node simply by entering a new name.

Before you delete a node, consider carefully the effect that the deletion will have on the network because all aggregates, routes, and circuits that involve the node are deleted from the data base.

During the deletion, messages displayed on line 22 describe each specific effect of the deletion.

Configure Node Equipment

This function moves you directly to the `Modify Node Equipment` routine, where you may configure ACC, ACM, CIC, CDA, IAC, TPP, and OCM cards, along with the supervisory and modem ports in the equipment slots of the node (*Refer to Chapters 3* and *4*). If configuring an ACC, CDA, or IAC Module, the configuration includes specification of a destination node. You cannot configure an aggregate or **subaggregate** trunk until you configure the remote node that it communicates with. A subaggregate is a collection of data channels and supervisory communications and frame synchronization information routed to a single destination. One or more subaggregates may be carried on a single physical aggregate and routed to different destinations via a DACS network.

Summary

The Configuration routines provide all the necessary tools to configure a TMS-3000 network. The Examine Configuration routines present existing configurations in a display-only mode. The Modify Configuration routines create and change a network.

In this chapter we introduced you to configuration and described the procedures to follow for creating a network and the nodes in your network.

What's Next?

Chapters 3 through 19 describe all of the configuration routines that are available to you from the Configuration Main Menu and the associated sub-menus. *Chapter 3*, specifically, describes the procedures for configuring and/or modifying the node equipment for TMS-3000 and TMSC nodes.

3 Examine/Modify Node Equipment TMS-3000 and TMS Compact

Overview

This chapter provides the procedures for configuring the individual cards in the main shelf of a TMS-3000 node and a TMSC node (*For OCM-2000, refer to Chapter 4*). Tail node types are configured when the connecting trunks are configured. A Tail Node is a node that does not hold its own configuration and at which a circuit can only terminate (not pass through).

Topics covered in this chapter are:

- Node Configuration
  - TMS-3000 Node Slot Configuration
  - TMSC Node Slot Configuration
- Common Configuration Parameters, TMS-3000 and TMSC
  - Channel Interface Card
  - Destination Node/Aggregate
  - Supervisor/Modem Port Configuration

Node Configuration

Proceed to the `Configuration Main Menu`. Highlight either `Examine` or `Modify Configuration` and press `Enter`.

When you select the routine from the `Configuration Main Menu`, you can enter the desired node name or press `Enter`. A list of each configured node in the system appears. Position the cursor at the desired node and press `Enter`. Page 1 of the `Node Configuration` screen appears (*See Figure 3-1*).

```
Node Configuration          Net1                29-MAR-1996 08:18:31
Page 1 of 2      Node Name   T55       (055)  Node Type TMS-3000

        Equipment       Max          Destination Node     Aggregate
Slot Type & Mode        Ckts  Type    Name  Address  Slot   Name

01  ACC /N.REDUNDANT   128  TMS     T53  053       1   T53-1/T55-1
02    undefined slot

03  IAC /N.REDUNDANT   256
04    not available

05  ACC /N.REDUNDANT   128  TMS     T56  056       5   T53-5/T56-5
06    undefined slot

07  CDA-T1 /N.REDUNDANT256
08    not available

System Control Card   NON-REDUNDANT
```

Figure 3-1 Node Configuration Screen, TMS-3000

For TMS-3000, enter configuration information for the modules and I/O ports on the TMS-3000 or TMSC main shelf. In particular, you must perform the following configuration tasks:

1. Enter operating mode, destination node, and aggregate trunk information for each Aggregate Control Card (or redundant pair of cards) in the shelf. Configure the aggregate interface port for the card.

   Enter the operating mode for each Channel Interface Card (or redundant pair of cards) in the shelf. Select the controller rate (for the Fast Bus interface) for each Channel Interface Card. The Fast Bus carries controls and data between the Channel Interface and the other **Common Modules** in the node. One bit of data is conveyed by every clock bit on the Fast Bus. Common Module (or Card) is generic term for any module that, when removed, will cause a major alarm. This includes all modules housed in the main TMS shelf plus the Expansion Modules located on each TMS Expansion Shelf. Enter the redundant or non-redundant mode of the ESCC(s) at the node.

NOTE

Unless otherwise specified, the term CDA represents CDA-T1 and CDA-E1, and IAC represents IAC-T1.

2. For the CDA and IAC Module, define the `Equipment Type & Mode` and `Max Ckts` (maximum number of circuits) for the module. Both Ports A and B may have different destinations. To configure the link information, use the cursor key to highlight the slot number and press **`Enter`**. A `CDA` or `IAC Port Configuration screen` allows you to further define the port interface characteristics.

3. A `CDA` or `IAC Bundle Configuration` screen further defines the link bundle types for ports A and B. Detailed information about configuring the CDA or IAC Modules, including ports and bundles, is found in *Chapter 7*.

4. For a TPP module, define the Equipment Type & Mode and Max Ckts (maximum number of circuits) for the module. TPP Port Configuration is found in *Chapter 8*.

5. Define the application of the SVR (supervisor) port (connector J20 on TMS, J6 on TMSC) and the MDM (modem) port (connector J42 on TMS, J8 on TMSC). Set Destination Node information for any port configured for **Supervisory Pass Through** (feature that establishes a supervisory data path to several TMS or TMS Compact nodes at a local site, allowing an increase in transmission capability from a site by generating more aggregate trunks). Highlight SVR (or MDM) and press Enter to display the next screen and set the data rate and other configuration items for each port. Destination Node and Aggregate Name information is entered in the Node Configuration screen. The entries required can vary, depending on whether the node is a TMS-3000 or TMSC. The following paragraphs describe each entry in the Node Configuration screen.

A single page in the Node Configuration display shows the configuration for eight slots. Use the **F5** key (Backup Page) and the **F6** key (Advance Page) to switch between the page for slots 1-8 and the page for slots 9-16, the supervisory and modem ports.

For each configured module or port, there is a configuration screen that defines the interface characteristics for that device. To enter the screen for a module or port, move cursor to the slot number or port identifier for the device and press **Enter**.

An alternative method is to move the cursor to the row for the slot or port and press the **F4** (Next Display) key. Configuration procedures are described in *Chapters 2* through *19*.

For a slot containing an ACC, you define the trunk that connects an ACC to an ACC at another node. You must enter:

1. The name of the destination node
2. The slot number of the remote ACC at the destination node
3. The aggregate name of the trunk that connects the two nodes

The trunk is then defined between the two nodes. This information is the basis for the Intelligent Automatic Routing routine and the Manual Route definition.

The detailed characteristics of the trunk (data rate, overhead, timing source, etc.) are then entered in the Aggregate Configuration screen. A separate screen exists for tail-end nodes, showing existing bandwidth. For a slot containing a CIC, you define the redundant or non-redundant operating mode. You must then move to the Channel Interface Configuration screen to select the amount of node bandwidth assigned to the CIC.

NOTE *Bandwidth is explained in more detail in GDC 036R304-000.*

TMS-3000 Node Slot Configuration

Equipment Type & Mode (Limited Range Entry) — This selection defines the type of module in the slot (CIC, ACC, ACM, CDA, IAC, or TPP module) and the mode (Redundant or N.Redundant). For each type of module, there are several modes of operation. You select the module type and the mode simultaneously. The number shown with the mode indicates the maximum number of circuits that the module supports when operating in that mode.

There are different node configuration screens for a TMS-3000 node and a TMSC node. The differences represent the number of slots available for ACC, ACM, CIC, CDA, or IAC Modules. A TMS-3000 node has 16 slots available for each of these modules.

A TMSC node has three assigned slots for ACC, ACM, CDA, or IAC Modules and two assigned slots for CICs.

The equipment types and modes for a TMS-3000 node are as follows:

`undefined slot` — Before initial configuration of a slot, all slots are undefined. Once a slot is configured, returning it to an undefined status is equivalent to deletion of the associated common module. `CIC/N.REDUNDANT 64` — Select this mode for a non-redundant CIC [or non-redundant Digital Bridging Card (DBC)] in the slot. The even slot of the pair is not available for another CIC (or DBC) even if it is non-redundant.

`CIC/REDUNDANT 64` — Select this mode for a redundant pair of Channel Interface Cards (or redundant pair of DBCs) in the redundant pair of slots.

`ACC/REDUNDANT 128` — Select this mode for a redundant pair of ACCs in the redundant pair of slots.

`ACC/N.REDUNDANT 128` — Select this mode for a non-redundant ACC in the slot.

`ACC/DIV./N.REDUND. 128` — Select this mode for a non-redundant ACC in the slot, if the card supports **diversity**. In this mode, the adjacent slot is not available because the two connectors associated with this pair of slots are both allocated to the pair of diverse aggregate trunks. Diversity provides two aggregate trunk lines between the same nodes; one trunk is operational and the other is in stand-by in case the first goes down. Both lines are monitored for serviceability by firmware on the ACC. Switching of the line is controlled independently at both ends by the ACC.

`ACC/DIV./REDUNDANT 128` — Select this mode for a redundant pair of ACCs in the redundant pair of slots if the redundant pair supports aggregate trunk diversity.

`ACM/REDUNDANT` — Select this mode for a redundant pair of ACMs in the redundant pair of slots.

`ACM/N.REDUNDANT` — Select this mode for a non-redundant ACM if the redundant slot next to this is left empty.

`CDA-T1/N.REDUND. 256` — Select this mode for a non-redundant CDA-T1 Module.

NOTE

GDC recommends that a non-redundant 256 CDA or IAC card be plugged into the primary slot. Regardless of which slot is used, another card should never be plugged into the empty slot.

`CDA-T1/REDUNDANT 256` — Select this mode for a redundant pair of CDA-T1 Modules in the redundant pair of slots.

`CDA-T1/N.REDUND. 128` — Select this mode for a non-redundant CDA-T1 Module in the slot if another CDA-T1 Module with different destinations resides in the adjacent slot of the pair. In this mode, only 127 circuits may be configured through the CDA-T1 Module.

`CDA-E1/N.REDUND. 256` — Select this mode for a non-redundant CDA-E1 Module (See note above).

`CDA-E1/REDUNDANT 256` — Select this mode for a redundant pair of CDA-E1 Modules in the redundant pair of slots.

`CDA-E1/N.REDUND. 128` — Select this mode for a non-redundant CDA-E1 Module in the slot if another CDA-E1 Module with different destinations resides in the adjacent slot of the pair. In this mode, only 128 circuits may be configured through the CDA-E1 Module.

`IAC/N.REDUND. 256` — Select this mode for a non-redundant IAC Module if the redundant slot next to this is left empty (See note above).

`IAC/REDUNDANT` — Select this mode for a redundant pair of IAC Modules in the redundant pair of slots.

`IAC N.REDUND. 128` — Select this mode for a non-redundant IAC Module in the slot if another IAC Module with different destinations resides in the adjacent slot of the pair. In this mode, only 128 circuits may be configured through the IAC Module.

`TPP-FR/N.REDUND. 64` — Non-redundant TPP/FR **Frame Relay** module with 64 **TPP pathways**. This module occupies one slot.Frame Relay is a local interface protocol which provides high speed statistical transport of date packets. Like X.25, Frame Relay is a connection-oriented data service. But, unlike X.25, the packets are not acknowledged at each switching node. A TPP pathway is a TMS circuit between any of the following: a synchronous data channel and a TPP module; two TPP modules; a TPP module and an OPP module; two OPP modules. This circuit is unique as it is destined to a TPP/OPP module within the TMS-3000/2000, rather than to an external interface.

`TPP-FR/REDUNDANT 64` — Redundant TPP/FR Frame Relay module with 64 TPP pathways. This module occupies two slots (one slot pair).

`TPP-LAN/N. REDUND 64` — Non-redundant TPP/LAN module with 64 TPP pathways. This module occupies two slots (one slot pair).

`TPP-LAN/REDUNDANT 64` — Redundant TPP/LAN module with 64 TPP pathways. This module occupies four slots (two slot pairs).

NOTE

Some versions of the TPP do not support redundancy. Check the appropriate release notes for details.

Note that for TPP cards you can install four TPPs in a TMS-3000 common shelf. Each TPP occupies from one or two slots, depending on what type it is. Each TPP supports up to 64 TPP pathways and, optionally, up to four LAN interfaces. For configuration of the TPP pathways, refer to *Chapter 18*. The LAN interfaces are configurable by the **IMS** (Internetworking Management System). IMS is an advanced network management system that allows you to monitor and manage network devices (e.g. TPP and OPP) from a single workstation. IMS runs on a PC and is a Windows-based application that uses the standard window, menu and button design to provide an easy-to-use network management interface.

In addition, there are other consequences when reconfiguring a node slot, for example, elements lower in the hierarchy may be deleted (e.g., circuits and routes).

The Controller displays prompts that warn of the consequences of changing slot configurations and gives you a chance to reconsider the action.

TMSC Node Slot Configuration

The TMSC has fixed locations for all modules in the main shelf, including the Aggregate Control, ACM, Channel Interface, CDA and IAC Module. The equipment screen presented below for a TMSC node lists each slot location and the type of module that belongs in that slot. *Figure 3-2* is an example of the Node Configuration screen for the TMSC.

```
Node Configuration  Net1                                 29-MAR-1996 08:47:09
Page 1 of 1     Node Name   TMSC    (057)   Node Type   TMS COMPACT

  Equipment                      Destination Node          Aggregate
Slot Type & Mode        Type    Name     Address  Slot       Name

PRI1  ACC /REDUNDANT   TMS     A       001       3       A3-E1

B/U   Aggregate

PRI2  ACC /REDUNDANT   TMS     B       002       1       B1-E3


CH-S  CIC /REDUNDANT
CH-P  CIC /REDUNDANT


SVR  unused port
MDM  Pass Through MDM  TMSC    D       004    SVR     DE-SVR/MDM

System Control Card   NON-REDUNDANT
```

Figure 3-2 Node Configuration Screen, TMS Compact

`PRI1` (Primary Slot 1) — Aggregate Control, ACM, CDA or IAC Module

`B/U` (Backup Slot) — This slot holds the single redundant backup Aggregate Control, ACM, CDA or IAC Module in the shelf. If used, this module can provide redundant backup for either or both primary cards. The mode selected for the Aggregate Control, ACM, CDA or IAC Modules (described below) determines the configuration of the backup aggregate.

`PRI2` (Primary Slot 2) — Aggregate Control, ACM (Non-redundant), CDA, or IAC Module.

NOTE

If the Backup Card (B/U) is switched into service for the ACC which it is not already set to back up, a short link down may be generated (2-5 seconds).

Primary Slot Modes

(Limited Range Entry) — The operating modes that may be selected for Primary 1 and 2 are determined by the TMSC node characteristics, especially the "1 of 2 redundancy" arrangement. If `PRI-1` and `PRI-2` are both configured as redundant ACCs, CDAs, or IACs, one common module can be configured as a priority aggregate, which gives it override access to the backup common module. The other common module (if one exists) receives nonpriority status. The primary slot operating modes are:

`ACC WITH PRIORITY` — Use this to assign an ACC with redundancy and priority. A copy of an aggregate with priority is also stored in a backup ACC. If the aggregate with priority fails, the backup card can immediately switch into service to replace that aggregate card. If both Aggregates 1 and 2 fail, the backup Aggregate Control Card replaces the aggregate with priority. When there are redundant ACCs at a TMSC node, configure one as ACC WITH PRIORITY.

`ACC/REDUNDANT` — Use this to assign a redundant ACC that does not have priority access to the backup ACC.

If an aggregate with ACC/REDUNDANT fails, the ESCC must download the configuration of this card to the backup card.

The backup card may then switch into service to replace the failed ACC. Configuration data is then downloaded to it. Note that the ACC configured as ACC WITH PRIORITY always has priority access to the backup ACC, even if the backup card has already switched into service to replace the ACC/REDUNDANT Card.

`ACC/N.REDUND.` — Use this to assign an ACC without redundant backup.

`ACM/REDUND` — Use this when using a redundant ACM in the TMSC. This mode is allowed for ACMs occupying slots 1 PRI-1 only.

`ACM/N.REDUND` — Use this when using a non-redundant ACM Module in the TMSC. This mode is allowed for ACM modules occupying slots PRI-1 and/or PRI-2. When an ACM N.REDUN is selected in PRI-1, the B/U slot is not available.

`CDA-T1 WITH PRIORITY` — Use this to assign a CDA-T1 Module with redundancy and priority. This module always has priority access to the backup CDA-T1 module even if the backup module is in service.

`CDA-T1/REDUNDANT` — Use this when using a redundant pair of CDA-T1 Modules in the TMSC.

`CDA-T1/N.REDUND.` — Use this when using a non-redundant CDA-T1 Module in the TMSC.

`CDA-E1 WITH PRIORITY` — Use this to assign a CDA-E1 Module with redundancy and priority. This module always has priority access to the backup CDA-E1 module even if the backup module is in service.

`CDA-E1/REDUND` — Use this when using a redundant CDA-E1 Module in the TMSC.

`CDA-E1/N.REDUND` — Use this when using a non-redundant CDA-E1 Module in the TMSC.

`IAC/N.REDUND` — Use this when using a non-redundant IAC Module in the TMSC.

`IAC/REDUND` — Use this when using a redundant IAC Module in the TMSC.

Common Configuration Parameters, TMS-3000 and TMSC

Following are the parameters which are common to both TMS-3000 and TMSC nodes.

Channel Interface Card

(Limited Range Entry) The CIC at a TMS-3000 or TMSC node may be redundant or non-redundant. The TMSC shelf slots are designated as CH-S (secondary CIC) and CH-P (primary CIC). Place the CIC in the primary Channel Interface slot. The DBC is also installed in the Channel Interface slot.

Destination Node/Aggregate

For any slot (TMS-3000 or TMSC) defined as an aggregate, you must define the destination node for the aggregate trunk, destination slot number, and the name of the aggregate trunk. The following parameters must be entered:

`Destination Node Name` (String Entry) – This is the name of the destination node (16 characters). The node type and node address are automatically filled in by the system.

NOTE

Be sure to define this node using the Create/Modify Node routine before you use the Destination Node Name.

`Destination Slot` – The slot number of the ACC, CDA, or IAC Module where the trunk terminates at the destination node is entered here [Numerical String Entry (Limited Range Entry for TMSC Slots)].

`Aggregate Name` (String Entry) – This is the name of the aggregate trunk between the two nodes (16 characters). Once you enter the destination node and aggregate trunk information, this information is automatically included in the node configuration data base of the destination node. You do not have to repeat this configuration step for the destination node.

`System Control Card` (Limited Range Entry) – There is either a single non-redundant ESCC or pair of redundant ESCCs at the node. Select the redundancy mode that corresponds to the actual node configuration.

Supervisor/Modem Port Configuration

The `SVR` (Supervisor) port and `MDM` (Modem) port must be configured appropriately. The selection for each port depends on the network topology and the type of **dial backup** (if any) used for the network. Port configuration selects operating characteristics for the Modem and Supervisor ports of the Controller and enters the telephone numbers and passwords for dial backup. Dial backup is a feature that provides, via an external modem, a direct node to controller link if normal supervisory communication between the TMS node and the Controller is disrupted.

On the TMS-3000 **backplane** (Back panel of TMS shelves. It covers the Main Harness Card.) , the SVR port is designated as connector `J20` and is labeled `NETCON/PRINTER` . The MDM port is designated as connector `J42` and is labeled `MODEM PORT` .

On the TMSC backplane, the SVR port is designated as connector J6. The MDM port is designated as connector `J8` and is labeled `MODEM PORT` .

These ports may be thought of as communications ports for controller supervisory data. The Modem port is a **DTE** (Data Terminal Equipment) -type interface whereas the Supervisor port is a

DCE (Data Communications Equipment) -type interface. Each port may be configured for particular applications:

The `Port Configuration` screen is selected from the `Node Configuration` screen. Move the cursor to the port designation for the port (`SVR` or `MDM`) that you wish to configure, or press the **`F4`** (Next Display) key while the cursor is located anywhere in the row associated with that port.

SVR Port

The contents of the display depend on the function assigned to the port in the Node Configuration screen. The Supervisor port has two distinct functions or is unused:

- Network Controller
- Pass-through SVR

Each configuration parameter for the SVR port is described in the following paragraphs.

Network Controller

This provides the interface between the controller and the local node (the "connected node"). To complete the connection between a controller and the local node, use the `Modify Controller` screen. This configuration applies to the Supervisor port only and is used when the Supervisor port is directly connected to the Controller. Synchronous/Asynchronous Communications and Data Rate (limited range entry) are the only parameters that can be changed. The following asynchronous (Async) data rates may be selected: `1200 Hz` , `2400 Hz` , `4800 H` z, and `9600 Hz`. The following synchronous(Sync) data rates may `be selected: 19.2 kHz` , `38.4 KHz`, `and 64 KHz.` Hz (Hertz) = cycles per second.

NOTE

Select 9600 Hz async or, if possible 19.2 K Hz sync.

The data format for the port in this mode is also displayed. Format for async communication is:

`Parity Enable`	`On`
`Parity`	`Even`
`Data Bits`	`8`
`Stop Bits`	`1`
`Security`	`LRC`

The format for sync communication is:

`Parity Enable`	`Off`
`Data Bits`	`8`
`Security`	`CRC16`

Pass-Through SVR

Selected as a pass-through port to extend the supervisory data channel between adjacent nodes at the same site.

When either port is configured for pass through, a destination node and port must be entered (this specifies the other end of the pass-through connection). You must also assign a name to the pass-through link.

Destination node and link name provide information for the Intelligent Automatic Route Calculation. Supervisory routes then use the pass-through link as part of the route.

The pass-through links are included in supervisory route displays.

The following variations of pass-through connections between nodes are possible:

- SVR port to SVR port
- SVR port to MDM port
- MDM port to SVR port
- MDM port to MDM port

Perform the following to configure the Pass-Through SVR:

1. Enter the `Destination Name` on the node configuration screen. The destination node type and address should appear on the screen.
2. Configure the `Destination Slot` as either **`MDM`** or **`SVR`**.
3. Select an `Aggregate Name f` or the SVR link (the name must be unique for the Pass-Through SVR).

`Data Rate` (limited range entry) is the only parameter that can be changed. The following data rates may be selected: `1200Hz`, `2400Hz` , `4800Hz` , 9600Hz, and 19200Hz.

The data format for the port in this mode is also displayed. The format is

```
Parity Enable     On
Parity            None
Data Bits         8
Stop Bits         1
Security          LRC
```

Unused Port

Select if the SVR port is not to be used either as a pass-through SVR port or a Network Controller.

MDM Port

The MDM port has two distinct functions (or is unused):

- External Modem
- Pass-Through Modem

Note that if unused port is selected, you are not allowed to select the **`MDM`** pokepoint.

The configuration displays for the MDM port are described in the following paragraphs.

External Modem

Select this entry when an external modem is connected to the MDM port. The modem becomes part of a dial backup link between the Controller and the node to which the modem is connected. Using a modem provides for increased security on the modem link. One of the following data rates may be selected: `300Hz`, `1200Hz`, `2400Hz`, `4800Hz`, `9600Hz`, and `19200Hz`.

Data format for the port is displayed:

Parity	None
Parity Enable	Off
Data Bits	8
Stop Bits	1
Security	CRC

You also have the option of setting and using or of not using a password.

If you are configuring the port for external modem, the phone numbers for the node must be entered. These selections are described below:

`Modem` – States whether the MDM port is configured as an external modem.

`Password` – Passwords are created and deleted using the Generate New Password and Delete Password functions displayed at the bottom of the screen.

To create a new password, move the cursor to `Generate New Password` and press **`Enter`**. Each time you press **`Enter`**, a new password is generated. The actual password is not displayed; `With Password` and the time and date of password creation (which are unique for each password) appear. To delete a password, move the cursor to `Delete Password` and press **`Enter`**. `No Password` appears on the screen. If you do not use the Generate New Password function, a default No Password state remains.

`Dial Backup Number`(String Entry) – This is the telephone number of the modem at the node. Up to 24 alphanumeric characters may be entered, including punctuation marks. The modem ignores most nonnumeric characters when dialing the number (for example, a dash, as in 555-4332, would have no effect in the dialing). But certain characters supported by the AT modem command set may also be used to insert delays or select other effects in the dialing sequence. *Table 3-1* lists the special characters that may be used in this entry.

`Dial Out from Node By`– (Limited Range Entry) — You may select either tone or pulse dialing. Highlight the field and press `Enter` to change. The requirements of the local telephone network serving the site of the node determines the selection.

The Controller must call the node and provide:

- A password
- The phone number of the modem connected to controller Serial Port 1

To configure the port, create a password, and enter the phone number.

NOTE

The Controller phone number is defined on the Controller Configuration screen using the Create/Modify Controller routine (Refer to Chapter 12).

Data format for the port is displayed:

Parity	None
Parity Enable	Off
Data Bits	8
Stop Bits	1
Security	CRC

Pass-Through MDM

Selected as a pass-through modem to extend the supervisory data channel between adjacent nodes at the same site.

Perform the following to configure the Pass-Through Modem:

1. Enter the `Destination Node Name` on the `Node Configuration` screen. The destination node `Type` and `Address` appear automatically.
2. Configure the `Destination Node Slot` as either **`MDM`** or **`SVR`**.
3. Select an `Aggregate Name` for the MDM link (the name must be unique for the Pass-Through MDM).
4. Select **`MDM`**. The `Port Configuration` screen appears.

NOTE

In this application, a cable extends between the SVR or MDM port at one node and the SVR or MDM port at another node. Refer to the Operating and Installation Manual for TMS-3000, GDC 036R303-000, or the Instruction Manual for TMS Compact, GDC 036R320-000, for information on cabling requirements for pass-through supervisory communications.

`Data Rate` (limited range entry) is the only parameter that can be changed. The following data rates may be selected: `1200 Hz`, `2400 Hz`, `4800 Hz`, `9600 Hz`, and `19200 Hz`.

Data format for the port is displayed:

Parity Enable	On
Parity	Even
Data Bits	8
Stop Bits	1
Security	LRC

Refer to Chapter 43 for more information on dial backup applications.

Table 3-1 Special Modem Dial Characters

Characters	Usage
,	The comma causes the modem to insert pauses between numbers during the dialing process. This feature is typically used when dialing through a PBX, to allow for delay in dialing into the public telephone switched network. For example, the following number would insert a pause between the 9 and 5 digits: 9,555-7623. The length of the pause is a function of the pause value programmed in the modem. The typical default length is 2 seconds.
W/@	The characters W and /@ may be used to insert additional pauses between numbers during the dialing process. These characters are useful if the external modem has been programmed with different delay lengths; the delays may then be used to allow for specific lengths of delay in a PBX dialing process. For example, the following number would insert a pause between the 9 and the 5 digits: 9/@555-7623. Refer to the manual supplied with your external modem to determine what delays are obtained through use of these characters.
!	When the ! character is included in the phone number entered, the modem "hook flashes" for a half-second on the telephone line. This feature is useful if a PBX requires a "hook flash" as part of the dialing sequence. For example, the following number would cause a hook flash between the 8 and 9 digits: 8!9555-7623. Refer to the manual supplied with your external modem for more information on the use of this feature.

Summary

In this chapter we provided the procedures for configuring the individual cards in the main shelf of the TMS-3000 and TMSC. Procedures that are common to both TMS-3000 and TMSC nodes were covered.

What's Next?

Chapter 4 covers similar information for OCM-2000 nodes.

4 Examine/Modify Node Equipment, OCM

Overview

This chapter provides the procedures for configuring the individual cards in an OCM-2000 node. Topics covered in this chapter are:

- Node Configuration
  - X50 DSOs
  - LIM Configuration/BQM Channel Configuration
  - OPP Configuration
- Examine/Modify Network Parameters
  - Password
  - Port Declaration
  - Buffer Slips Threshold
  - Network MAC Address ID

Node Configuration

Proceed to the `Configuration Main Menu`. Highlight either `Examine` or `Modify Configuration` and press `Enter`.

When you select the Examine/Modify Node Equipment routine from the `Configuration Main Menu`, you can enter the desired node name or press `Enter` to bring up a list of each configured node in the system (`Node Selection` Screen). Position the cursor at the desired OCM node and press `Enter`. The `Node Configuration` screen appears.

For OCM shelves, the Power Supply field may be set to **`96`**, **`192`**, **`288`**, or **`384`** Watts. `96` watts is allowed only in a single-shelf node. For OCM enclosures, the field shows `100` Watts and cannot be changed.

If you have a selected OCM Enclosure, a listing of the ten slots is shown along with the equipment type in that slot. For example, you may see the following:

```
01      CCM/REDUNDANT
02      CCM/REDUNDANT
03      channel
04      channel
05      channel
06      channel
07      OPP
08      not available
09      LIM/REDUNDANT
10      LIM/REDUNDANT
```

(**LIM** is the OCM Line Interface Module.)

The **OPP** (OCM Packet Processor) is a module installed in an OCM-2000 enclosure or shelf that interfaces externally with public frame relay networks or frame relay devices such as LAN bridges, routers, and frame relay PADs. OPP is the OCM counterpart to the TPP.

If you select OCM Shelf, the screen shows 32 slots along with the equipment type. *Figure 4-1* is an example of the `Node Configuration` screen for an OCM Shelf.

```
Node Configuration  Net1                          29-MAR-1996 09:11:42
Node Name F2            (F0002) Node Type  OCMS
Power Supply   96 Watts
Slot  Equipment  Type                    Slot    Equipment  Type
01    CCM /NONREDUNDANT                  17      undefined slot
02    undefined slot                     18      undefined slot
03    OPP                                19      undefined slot
04    not available                      20      undefined slot
05    LIM /REDUNDANT                     21      undefined slot
06    LIM /REDUNDANT                     22      undefined slot
07    OPP                                23      undefined slot
08    not available                      24      undefined slot
09    LIM /REDUNDANT                     25      undefined slot
10    LIM /REDUNDANT                     26      undefined slot
11    OPP                                27      undefined slot
12    not available                      28      undefined slot
13    channel                            29      undefined slot
14    undefined slot                     30      undefined slot
15    OPP                                31      undefined slot
16    not available                      32      undefined slot

                                X50 DS0s
```

Figure 4-1 Node Configuration Screen, OCM Shelf

NOTE *The OCM is also available in a split-shelf version which allows two independent nodes to occupy the same physical shelf. The shelf is divided into slots 1 - 8 for the left node and 9 - 16 for the right node with slots 1 and 9 reserved for CCMs. Refer to GDC 036R340-A5 for more information about the OCM split-shelf.*

X50 DS0s

An additional pokepoint on the OCM Node Configuration screen is **`X50 DS0s`**. X.50 is an **ITU-T** multiplexing standard for a gross bit rate of 64 Kbps. X.50 DS0s are internal destination points for ITU-T X.50 interface type circuits and network circuits from an X.50 device. ITU-T (International Telecommunications Union - Telecommunications Standardization Sector) is a committee that sets international communications standards. If you highlight `X50 DS0s` and press `Enter`, the `X.50 DS0s Configuration` screen appears. As a destination point for a network circuit, an X.50 DS0 is analogous to a DTEC bundle, and the use of this screen is similar to the `Bundle Configuration` screen. The screen has some additional fields necessary for configuring specific X.50 DS0 attributes such as loopback status op codes. Options for configurable items are:

- `DS0 Type` : jog field (OPEN, X50d2, X50d3)
  `OPEN` is a default value.
  `X50d2` stands for X50 interface division 2.
  `X50d3` stands for X50 interface division 3.
- `DS0 Cnt` :
  input field: **`1`** through **`30`** for `OPEN` DS0 type.
  Information field: `1` for all the other types.
  The total count can not exceed **30**.

- `Loopback Status Opcodes` , `Local` and `Remote` :
  Hexadecimal numbers **`0`** through **`3F`** .
  `3C` is a default value for the Remote Loopback Status Opcode.
  02 is a default value for the Local Loopback Status Opcode.
  These fields are not present for `OPEN` DS0s.

LIM Configuration/BQM Channel Configuration

For CCM and LIM slots, you can toggle the equipment type to select redundancy or non-redundancy. If non-redundant, the associated even numbered slot may show `undefined slot` or `channel` . But the associated even slot could be configured with a `LIM/NONREDUNDANT` or an `OPP`. **BQM** is an OCM card, utilizing 2B1Q (2 Binary 1 Quaternary) technology, that may be used as a LIM or a channel. 2B1Q is a line encoding format that is supported on 2-wire interfaces. The `BQM Channel Configuration` screen is covered in this section because that screen is nearly identical to the `LIM Configuration` screen. Channel configuration is covered later in this chapter. To modify the configuration of a LIM, use the **`F4`** key while the cursor is anywhere in the screen line of the LIM or highlight the slot number of the LIM that you wish to reconfigure and press `Enter` . The `OCM LIM Configuration` screen appears. See *Figure 4-2.*

The top of the screen shows `Node Name` , `Addr` (address), `Slot` and `Type`. For non-redundant LIMs, the `type` can be changed to any one of the following: **`CSU`** (Channel Service Unit), **`V.11`**, **`V.35`**, **`CEPT`**, **`DSX1`**, **`BQM`**, **`SUBR`** (Subrate), or **`SUPR`** (SuperRate). For redundant LIMs, the choices are **`CSU RED`**, **`V.11 RED`**, **`V.35 RED`**, **`CEPT RED`**, **`DSX1 RED`**, **`BQM RED`**, **`SUBR RED`**, or **`SUPR RED`**. CEPT is Comite European de Poste et Telegraphe (European Conference of Postal and Telecommunications Administrations), an intergovernmental organization.

The remainder of this description of the `OCM LIM Configuration` screen is separated into three distinct explanations because of the differences between the LIMs. The three major subdivisions are the DSX1, V.35, and BQM.

NOTE *LIMs are described in detail in GDC 036R340-000.*

DSX1

For the DSX1 type of LIM to be configured, possible selections for LIM `Type` are one of the following: **CSU**, **CSU RED**, **DSX1**, **DSX1 RED**, **CEPT**, **CEPT RED**. Example screens are shown for the **DSX1** type (*See Figure 4-2 through Figure 4-4*)

```
OCM LIM Configuration          Net1                    29-MAR-1996 09:47:01
Node Name             Addr     Slot     Type
F3                    F0003     2       Dsx1
------------------------------ << Bundle >>----------------------------------
Destination     Line Operating Environment      Interface       Node Clocking
Type            Encode              Format      Clocking        Availability    Pref
REMOTE CDA-T1   B8 Zero Suppression T1D4        NODE            FACILITY        HIGH
Link       DS0          Bundle     ESF
Rate      Count         Count      Mode
1.536MHz    1             1        ATT
```

Figure 4-2 OCM LIM Configuration Screen

- `Destination Type` : This selection describes the type of connection between the CDA and the OCM. For DSX1 or CSU, the selections are **DACS Network** or **Remote CDA-T1**. For CEPT, the selections are **ACE Network** or **Remote CDA-E1** DACS (Digital Access Cross-connect System) is a byte oriented (DS0) digital T1 network service.
- `Line Operating Environment` : This option allows you to select the mode of frame format and line coding. The T1/E1 interface is a digital transmission line that multiplexes time slots into a serial link. This is performed using a time-repeating framing structure which contains multiple frames. The line coding is the coding of the data into an electrical transmission signal. Options for DSX1 and CSU for `Encode` are **B8ZS** (Bipolar Eight Zero Suppression) or **AMI B7 Channelized**. For `Format` the choices are **T1D4** or **ESF** (Extended Superframe). ESF is a modified D4 framing format. The basic D4 framing structure contains 1 frame bit followed by 24 eight-bit time slots or a 193 bit frame. An ESF contains 24 193-bit frames. Options for CEPT are not selectable, and for `Encode` are forced to `HDB3`, for `Format` as `E1`.
- `Interface Clocking` : This field is for configuring interface clocking. Choices are **NODE** and **RCV**.

  NODE — The node supplies the timing signal for transmit data. This timing signal is phase locked to the selected node timing source. *Refer to Chapter 10* for more information on node timing sources.

  RCV (Receive Clock) — The timing signal derived from the aggregate receive data is selected.
- `Node Clocking` — The Node Clocking option allows the configuration of the availability and preference of the node clocking.

  `Availability` : This parameter categorizes the aggregate trunk as a timing source. An aggregate trunk such as DDS (in the U. S.) that supplies a master timing signal should be set for **FACILITY**. An aggregate trunk that is unreliable as a timing source should be set as **NOT AVAILABLE**.

  `Pref` : `Pref` is the preference of the aggregate trunk as the timing source. The choices are **HIGH** or **LOW**. When two LIMs are present, this option is used to determine which LIM should provide node clocking if it is available.

- Link Rate : Displays the aggregate trunk link rate for this LIM. For DSX1 or CSU type LIMs, the default is 1.536 MHz , and for CEPT type LIMs, the default is 2.048 MHz .
- DS0 Count/Bundle Count : Displays the number of bundles of DS0s configured on the LIM Bundle Configuration screen. You can configure a maximum of two TMS-type bundles per LIM and a maximum of two TMS-type bundles per node. These LIMs can also be configured for Network-type bundles and DTECs.
- ESF Mode (not applicable for BQM, CEPT, ANSI, or ATT).

For **CEPT** type LIMs, in addition to the above, the following fields are displayed:

- Line Delay Buffering : Allows the selection of the line delay type. Choices are Land Line or Satellite.
- Decode Enable : This field is not selectable and is fixed at DISABLE .
- Signaling Type : This field configures the aggregate signaling type to be Channel Associated Signaling (**CAS**) or normal signaling access method (**NoCAS**). CAS is a bit-oriented signaling process specified in ITU-T specification G.704 and transferred on timeslot 16 of the frame.
- CRC4 **Enable**: This option allows the CRC4 bits to be calculated and transmitted to the far end.

V.35

On the second version of the LIM Configuration screen, choices for LIM Type are **V35**, **V35 RED**, **V11**, or **V11 RED**.

- Interface Clocking : This field is for configuring interface clocking as described earlier for the DSX1 type LIM.
- Node Clocking : This field allows the configuration of the availability and preference of the node clocking as described earlier.
- <<Backup Link>> : This selection allows you to display the Backup Link Configuration screen. For V35 type LIMs this option is available to identify another aggregate to perform a backup function in the event a failure occurs. A compatible IAC card is needed in the affected node, and the OCM must have compatible LIMs without permanent links assigned to be a viable backup link.

  The following paragraphs provide a brief description of each field on the Backup Link Configuration screen.

  Source Node Name — The name of the node in which the LIM is currently residing. The node name is defined through the Create/Modify Node Equipment routine.

  Node Address — The node address in which the LIM is currently residing. The node address is defined through the Create/Modify Node Equipment routine.

  Slot — The slot number in the OCM in which the LIM is currently residing. The slot number is defined through the Create/Modify Node Equipment routine.

  Port — Not applicable.

  Interface Type — This field displays the interface the ISDN network is using. The interface field was defined in the IAC Port Configuration screen and is fixed at PRI.

  Add Link — This field allows you to input a name for the new back-up link. Once it has been added it is displayed on the screen.

— The identification number of the backup link.

D — Deletes the link if selected.

Link Name — The name of the link that was defined in the Add Link field on this screen appears here.

Type — The selection allows for the configuration of the back-up subaggregate to accommodate the various types of channels used in the ISDN networks. At the bottom of the Configure Backup Link screen, a legend defines each type. B-channels use one DS0. H0 channels use six DS0s.

Node Name — The destination node name for the backup link.

Node Address — The destination node address for the backup link.

Slot — The destination node slot number in the TMS-3000 or TMSC main shelf for the backup link. The destination must be an IAC card.

Port — The destination node port number in the destination IAC Module.

Caller Type — Specifies the caller type for a LIM port. The selections are **Origination** or **Destination**. This field is used to identify which side of the link actually originates the ISDN-PRA call. An indication of ORG-DST in this field shows that the node indicated at the top of this screen is the originator of the call setup. The OCM side must always be the "DST" side. Therefore, from the V.35/V.11 Backup Link Configuration screen, it always shows DST-ORG .

- Link Rate : Displays the link rate of the aggregate. This is calculated by multiplying the DS0 rate by the number of DS0s.
- N By: This field is to select the DS0 rate. The choices are 64K or 56K.
- Line Delay Buffering : Allows the selection of the line delay type. Choices are Land Line or Satellite.
- DS0 Count : Displays the number of DS0 channels allocated to this LIM.
- Bundle Count : Displays the number of bundles of DS0s configured on the LIM Bundle Configuration screen. There is either 0 or 1 bundle for each LIM. You can have a maximum of one permanent link on a V.35/V.11 LIM. You can have a maximum of 30 backup links on a V.35/V.11 LIM. The OCM has the capacity for only a total of two TMS-type bundles between both LIMs.
- BU DS0 Count : For the backup link of this LIM. Displays the number of DS0 channels allocated to this LIM.
- BU Link Count : For the backup link of this LIM. Displays the number of bundles of DS0s configured on the Configure Backup Links screen. This is up to 30 bundles for each LIM. But you cannot have both a permanent link and backup links on the same V.35/V.11 LIM.

BQM LIM

The BQM (2B1Q Module) can be used as a LIM or a channel. This is selected by a switch on the module. When used as a LIM, it provides one or two TMS subaggregates or network circuits at 64 **Kbps** (kilo bits per second) or one TMS subaggregate or network circuit at 128 Kbps. When used as a channel, it provides support for passing up to three DS0s as transparent network circuits when connected to another OCM using a 2B1Q LIM, a DataComm 610 or 612, or a foreign 2B1Q device.

For BQM type LIMs, the following fields are displayed:

- `Destination Type` : `DACS Network` (display only). This describes the type of connection between the CDA and the OCM. When configuring a CDA to OCM-E1 link, the destination type is `DACS/ACE` regardless of whether a DACS or a cable provides the connection between the CDA and the OCM. This is because the "Grooming Box" OCM acts as a DACS, thus the TMS link for comms and the DTEC bundles for the BQ network circuit are configurable.
- `Line Operating Environment` : `Interface Type` is `Network Termination` (display only). `Format` is `2B1Q` (2B1Q line encoding format, display only). This is the mode of frame format and line coding.
- `Interface Clocking` : `RCV` (display only). This field is the interface clocking (timing signal derived from the aggregate receive data).
- `Node Clocking` : The `Node Clocking` option allows the configuration of the availability and preference of the node clocking.

  `Availability` : This parameter categorizes the aggregate trunk as a timing source. An aggregate trunk such as DDS (in the U.S.) that supplies a master timing signal should be set for **`FACILITY`**. An aggregate trunk that is unreliable as a timing source should be set as **`NOT AVAILABLE`**

  `Pref` : `Pref` is the preference of the aggregate trunk as the timing source. The choices are **`HIGH`** or **`LOW`**. When two LIMs are present, this option is used to determine which LIM should provide node clocking if it is available.
- `Link Rate` : `160 KHz` (display only). Displays the aggregate trunk link rate for this LIM.
- `DS0 Count/Bundle Count` : `1` or `2` (display only), Displays the number of bundles of DS0s configured on the `LIM Bundle Configuration` screen.
- `Port Error Threshold` (Local/Remote): range 10^{-3} – 10^{-6}; default is `OFF`.

BQM Channel

To configure a BQM Channel, while in the `Node Configuration` screen, highlight the slot number of the BQM Channel that you wish to configure and press `Enter`. The BQM `Channel Configuration` screen appears.

- `Destination Type` : OCM, DC 610/612.
- `Line Operating Environment` : `Interface Type` is `Network Termination` or `Line Termination`. `Format` is `2B1Q`.
- `Interface Clocking` : `Node` (for Line Termination) or `Receive` (for Network Termination). Display only.
- `Link Rate` : `160 Kbps`. Displays the aggregate trunk link rate for this LIM. Display only.
- `DS0 Count` : `1` or `2` for `Destination Type` = OCM. `1`, `2` or `3` for `Destination Type` = `DataComm 610` or `DTEC`. Display only.
- `Port Error Threshold` (Local/Remote): range 10^{-3} – 10^{-6}; default is `OFF`.

Additional information on the BQM channel is found in *Chapter 18.*

LIM Bundle Configuration

Bundles for each LIM type are configured at the next sub level screen (*See Figure 4-3*) which is accessed by the **F4** key or by highlighting **<<Bundle>>** and pressing Enter .

```
LIM Bundle Configuration                 Net1            29-MAR-1996 09:55:08
Page 1 of 1
Node Name: F3   Type: OCME  Slot: 2   Destination: REMOTE CDA-T1

Bundle     DS0    DS0           Destination Node                       Bundle
ID  Type  Start  Cnt   Type      Name            Addr     Slot  Pt  DS0  Name

 1  LINK   1      1    TMS        N55           055      7     A    1    FFFF
 2  OPEN
```

Figure 4-3 LIM Bundle Configuration Screen

Configurable parameters on this screen are:

- Bundle Type — A group of DS0s having a common termination point. Selections are **OPEN** and **LINK**. For DSX1, CSU, CEPT and BQM LIMs, you can also configure the **DTEC** bundle type if the card Destination Type is configured to be **DACS** or **ACE Network**.

  OPEN is a space holder of open DS0s that provide flexibility for future configurations or changes.

  LINK bundle types define a destination point from one CDA Module to an OCM.

- DS0 Cnt — You can specify the number of DS0 channels allocated to this bundle.

  For CDA-T1 the range is from **1** to **24**. For CDA-E1 the range is from **1** to **31**. For IAC, the choices are **B** (1 DS0) or **H0** (6 DS0s).

  When configuring from this end [LIM (V.11/V.35)], initially the LIM does not know if the destination is a CDA or IAC. For example, if the DS0 Count (DS0 Cnt) is set to **1**, when the Destination Node is selected and the address is for an IAC, the DS0 Count automatically changes to **B** (representing 1 DS0).

- Destination Node Name, Slot, Pt, DS0 — The name, slot, port, DS0 of the destination node in the network.

- Bundle Name — A unique name given to this group of DS0s used to identify this connection in the rest of the system.

LIM Bundle Details

If you highlight the `Bundle ID` field and press `Enter`, the `LIM Bundle Details` screen appears. You can also go to this screen by pressing the **F4** key when the cursor is anywhere in the screen line of the bundle.

```
LIM Bundle Details               Net1                      29-MAR-1996 10:10:38
Link Name  FFFF                                                    Page 1 of 2

-------------------------------------------------------------------------------
        Local Node        Slot                    Remote Node      Slot      DS0
Name              Addr          DS0             Name          Addr       Port
F3                F0003    2    01              N55            55    7     A    01

Destination      Bundle                         Conditioning            Error
Type                     Type            Circuit         Signaling       Threshold
REMOTE CDA/OCM           TMS             No Conditioning                 OFF

Aggregate       Overhead        IAR Event Delay Timer   IAR/DRR         SVR
Sync Rate       Comm             Initiation  Restoral   Enable          Enable
200Hz           9600Hz             10 sec    10 sec     Enable          Enable

        Backup Link      Link            Error           Percentage
           Name          Delay           Rate            Available
                         0 ms            1.0 E-9          100%

                                         Next Page
```

```
LIM Bundle Details               Net1                      29-MAR-1996 10:10:50
Link Name  FFFF                                                    Page 2 of 2
-------------------------------------------------------------------------------
        Local Node        Slot                    Remote Node      Slot      DS0
Name              Addr          DS0             Name          Addr       Port
F3                F0003    2    01              N55            55    7     A    01

                Link Attributes            Link Qualifiers
            Category        Value        Category        Value

Link Enable/Disable Status (4 TOR/DRR Configurations)
CO1     Enable    CO2        Enable    CO3    Enable    CO4  Enable

                                         Previous Page
```

Figure 4-4 LIM Bundle Details Screen

Configurable parameters on this screen are:

- `Bundle Type` : For DSX1, CSU, CEPT, and BQM LIMs, if it is a LINK bundle, you can configure the Bundle Type to be **`TMS`**, **`TMS/Network`**, or **`Network`**.
- `Conditioning` : This field allows you to determine when to implement line conditioning for the bundle. Choices are **`Mux Out of Sync`** or **`No Conditioning`** for V35 type LIMs. For CSU, DSX1, or CEPT, the default is determined by the type of bundle.
- `Error Threshold` — This field allows you to set an error threshold limit on the aggregate, so that when that limit is reached an alarm is raised. You may choose from: **`1.0 E-6`**, **`1.0 E-5`**, **`1.0 E-4`**, **`1.0 E-3`**, or **`OFF`**.

- `Aggregate Sync Rate` : **200**, **400**, **800**, or **1600 Hz** (`None` if Bundle Type is `Network`).
- `Overhead Comm` : **1200**, **4800**, **9600**, or **19200 Hz** (`None` if Bundle Type is `Network`).
- `IAR Event Delay Timer` , `Initiation` and `Restoral` Times — You can set two timer values to allow the Controller to test for link stability before initiating an IAR recovery. They are referred to as the `Initiation` delay and the `Restoral` delay respectively.

  After a link failure is reported, the initiation timer is started. Only after the initiation delay has passed without the link recovering is the IAR link failure processing initiated. Similarly, on a link recovery, the restoral timer is initiated. Only after the restoral delay has passed without the link failing again is the IAR link recovery processing initiated.

  In addition, if a link fails and recovers quickly, a mechanism exists to declare the link down. If a link fails 10 times without ever recovering for a period equal to the restoral delay, and these rapid link failures and recoveries persist for a time greater than the initiation delay, the IAR link failure algorithm is invoked.

  Initial default settings are: Initiation Delay — `20 sec`

  Restoral Delay — `60 sec`

  Range of possible values is **0** to **2400** seconds. The default timer settings may be changed on the `IAR Defaults` screen. The value for the specific TMS aggregate of a CDA/IAC bundle also may be changed on this screen.

  `IAR/DRR Enable` — This selection allows you to enable or disable IAR from responding to a failure of this link.
- `SVR Enable` — This selection allows you to enable or disable a supervisory route from being allocated on this aggregate.
- `Backup Link Name` : This field contains the symbolic name of the link that is to be used as a backup in the event of a failure of the LIM bundle that is being configured. To make an entry in this field, a backup link must have previously been configured.
- `Link Delay` : This field informs the network of known link delay times between nodes. In the presence of long link delay (e.g., a satellite hop), this information is used to calculate needed network parameters (e.g.,. system clock). The value of the link delay is in milliseconds, and the default is 0 ms.
- `Error Rate` : This is the error threshold limit for the backup link. Options are **1.0E-02** to **1.0E-09** (10^{-2} to 10^{-9}).
- `Percentage Available` : This field configures the percentage of time that the bundle is, on average, expected to be operational. Options are **0** to **100%**.
- `Link Enable/Disable Status, Page 2 of 2` : Allows you to enable or disable IAR circuit routing on this bundle in each TOR/DRR configuration.

OPP Configuration

The TMS-3000 supports OCM Packet Processor (OPP) modules. To configure an OPP, while still in the `Node Configuration` screen, move your cursor to highlight the slot number of the slot which contains the OPP module. Press `Enter`. The `OPP Port Configuration` screen (*See Figure 4-5*) appears. The top of the screen contains information such as `Node Name`, `Addr`, `Slot`, and `Network` **MAC** `Address`. MAC (Media Access Control) Address is a unique six byte address assigned to the LAN network interface. All LAN packets contain a source address field and a destination address field in the frame header.The `Network MAC Address` is described later in this chapter (*See Examine/Modify Network Parameters*).

```
OPP Port Configuration     TTG                    11-MAR-1996 11:51:47

Node Name       Addr             Slot          Network MAC Address
 Dallas         F0001             5             0A-C0-64-10-00-10

------------------------------------Port A---------------------------------
Type        Rate       Mode        Encoding          Xmit/Recv Clock
HDLC      9.600K   FULL DUPLEX       NRZ                  INT-INT

Control Type         CTL1         CTL2        UIO SIP
No Controls                                      Fixed

Transmit           RTS       -
EIA               F-On      F-On
```

Figure 4-5 OPP Port Configuration Screen

Type

(Limited Range Entry) — This parameter defines the type of data traffic connected to the external DB-25 interface. The choices are:

- **`None`** — Not connected (When you select None, the fields for all other parameters are blank)
- **`HDLC`** — HDLC (High-level Data Link Control) pass-through
- **`SDLC`** — SNA/SDLC pass-through (SDLC=Synchronous Data Link Control. SNA = Systems Network Architecture)
- **`FR-DTE`** — Frame relay traffic
- **`NODAL`** — Internodal link to a TPP or OPP in another **FSN** (Frame Switching Network) node, or to a **LAN*TMS** via a CIC. FSN is a set of core services provided to **Packet Switching** applications within the TMS-3000. Its fundamental purpose is to transfer a network frame from a source node to a destination node. The source node is the node where the frame is introduced into the network, and the destination node is specified by information contained in the frame. LAN*TMS (Local Area Network Transport Management System) is a network-managed system for integrating multiple LANs into a single communications network. Packet Switching is a data transmission technique that segments and routes user information in discrete data envelopes called packets, each with its own appended control information for routing, sequencing, and error checking.

Rate

(Cursor Position Entry) — This parameter defines the synchronous data rate of the external DB-25 interface. To display the list of rates, press `Enter`. If you wish to select a new rate, move the cursor to highlight the desired rate and press `Enter`.

Mode

(Limited Range Entry) — This parameter defines whether data transmission is half-duplex or full-duplex. If you need to use TMS-3000 control signals, select **HALF DUPLEX**. When you set Type to either F**R-DTE** or **NODAL**, this parameter is set to FULL DUPLEX .

Encoding

(Limited Range Entry) — Defines whether data encoding is **NRZ** (non-return to zero) or **NRZI** (non-return to zero inverted).

Xmit/Recv Clock

This parameter defines the transmit and receive timing sources for each end of the circuit. It is set at **EXT-EXT** (External Transmit/External Receive Timing) for an external DB-25 interface. **INT-INT** is also selectable. Both transmit and receive timing are received from equipment connected to the OPP.

Control Type

This field displays the state of TMS-3000 control signals. It is either No Controls (when you set Mode to **FULL DUPLEX**) or Priority Ctls (when you set Mode to **HALF DUPLEX**). If **HALF DUPLEX** is selected, you also have the option of setting CTL1 and CTL2 to **Enable** or **Disable**.

UIO SIP

(Limited Range Entry) — This parameter defines the electrical interface characteristics of the I/O module installed on the OPP for each of the external DB-25 interfaces. The choices are **Fixed**, **V.35**, **EIA-422**, and **EIA-232**. Select **Fixed** when an interface-specific I/O module is installed on the OPP. Select the desired interface from the other choices when a Universal I/O Single Inline Package (SIP) is installed

Be sure that you configure the slot to match the installed hardware.

Transmit EIA

(Limited Range Entry) — These parameters define whether EIA control signals RTS (Request to Send) and CTS (Clear to Send) are forced On (F-On), forced Off (F-Off) or passed through unchanged (---). On the screen, CTS appears as a "–". If you set Mode to **HALF DUPLEX** and set CTL2 to **Enable**, RTS and CTS are set to pass-through. If you set CTL2 to **Disable**, RTS is set to pass-through, and you can set CTS to **F-On** or **F-Off**. If you set Mode to **FULL DUPLEX**, you can select **F-On** or **F-Off**.

Examine/Modify Network Parameters

Select **Examine/Modify Network Parameters** from the Configuration Main Menu to bring up the Modify Network Parameters screen. The parameters defined on this screen apply to all OCM nodes in the given network. They are Password for Dial Backup and Maintenance, Port Declaration time for port Failure time and Restoral time, Buffer Slip Threshold Per Day and Hour, and Network MAC Address ID (TPP/OPP).

Password

You may set your own password for both Dial Backup and Maintenance in alphanumeric characters. Default password is FMUX.

Port Declaration

Failure Time and Restoral Time are set in increments of 50 ms (.05 seconds) with the default value being 2.00 sec and 10.00 sec respectively.

Buffer Slips Threshold

Buffer slips Per Day and Per Hour are selectable from **1** through **15** with 4 and 2 respectively being the default values.

Network MAC Address ID

The Controller creates a 48-bit MAC address for each TMS-3000 node which contains a TPP and each OCM-2000 node which contains an OPP. Part of this address is the Network MAC Address ID (element T), a unique number you assign to each controller-based TMS-3000 network within an FSN. Its value is between **0** and **15**. *Figure 4-6* shows the format of a MAC Address.

Other information for individual OCM nodes is defined in other screens as discussed in other parts of this manual.

```
P Q - C 0 - 6 4 - S T - NN-N I
```

I is the interface number, of the binary form, where:
a = the ACP number or 0 for the node, and iii =
the interface number on the ACP or 0 for the node.

NN-N is the TMS-3000/2000 node number.

T is the network MAC Address ID, from 0 to 15.

S is the slot number of the TPP/OPP or 0 for the node address.
(Interface 0 on ACP 0 in slot 0 can have the same 0 value as
the node address.

C0-64 is GDC’s unique identifier.

Q is of the binary form tx10, where:
t = 0 for a TMS-3000 node, or 1 for an OCM-2000,
x = an unknown value, and
10 = a locally administered number.

P is the protocol identifier.

Figure 4-6 Format of a GDC MAC Address

Summary

In this chapter we explained the procedures for configuring cards in OCM nodes. LIMs, BQMs, and X50 DS0s were discussed. We also covered the Examine/Modify Network Parameters routine.

What's Next?

Chapter 5 covers the procedures for configuring the parameters on the Aggregate Configuration screen.

5 Aggregate Configuration

Overview

This chapter provides the procedures for configuring the ACCs at each end of the aggregate trunk. The `Aggregate Configuration` screen shows the local-to-remote node connection made by the aggregate and lists the operating mode selected for the aggregate.

Topics covered in this chapter are:

ACC Configuration

- Interface Type
- Out-of-Sync Delay
- Diversity Timer
- Interface Clocking
- Node Clocking
- Clock Generator Digital/Analog
- Backup Link Name
- Effective Data Rate
- N By
- Allocated Bandwidth
- Allocated Overhead
- Remaining Node Bandwidth
- Ones Density
- Error Threshold
- IAR Event Delay Timer
- IAR/DRR Enable
- SVR Enable
- Link Delay
- Percentage Available
- Error Rate
- Link Attributes and Link Qualifiers
- Link Enable/Disable Status

ACC Configuration

While in the `Node Configuration` screen, move the cursor to the slot number for the Aggregate Control Card slot that you wish to configure and press `Enter`. You may also press **F4** (Next Display) while the cursor occupies any field in the row associated with that slot.

Sets of operating parameters are shown for the Aggregate Control Cards at each end of the aggregate trunk. The left side of the screen represents the Aggregate Control Card currently being configured. The right side of the screen represents the Aggregate Control Card at the opposite end of the aggregate trunk.

The row of parameters below the split screen determine the allocation of node and aggregate bandwidth for the Aggregate Control Card. The `Node Bandwidth Available` figure applies only to the node being configured. All other information (and all changeable parameters) applies to both ends of the aggregate trunk. (Each bandwidth parameter is discussed in detail in the paragraphs below.)

Some aggregate interface parameters are determined by the interface type shown in the leftmost field of each side of the screen. For example, if `Bell T1` is the interface type, the aggregate rate shown is `1.544 MHz`, since that is the standard T1 data rate.

The typical requirements for an interface type determine the aggregate parameters associated with that interface type. For `Bell T1`, the `1.544 MHz` rate is fixed, since that is the only possible rate. If you select EIA RS-422 as the interface, many aggregate rates are possible.

The `Aggregate Configuration` screen (*See Figure 5-1*) allows you to select a data rate on the aggregate link. Depending on the interface type, you can position the cursor at the `Effective Data Rate` field and press `Enter`. On the next screen, select the desired rate by positioning the cursor in the data rate field. Press `Enter`.

For some interface types, it is possible to specify a different interface type at the opposite end of an aggregate trunk. With any of the interfaces in *Table 5-1*, it is possible to select any other interface in the list for the opposite-end Aggregate Control Card. The table lists the local node interfaces and the available remote node choices. Note that you must have the proper aggregate interface **piggyback** [a card that plugs into a base card (e.g., ACC)] cards mounted on each ACC. Base cards and piggyback cards are separate assemblies that can be tested, removed, and replaced individually.

```
Aggregate Configuration      TTG                            11-MAR-1996 11:55:40
 Aggregate Name N53-1/N55-1                                         Page 1 of 2
--------------------------------------------------------------------------------
        Local Node      Slot            |       Remote Node     Slot
Name               Addr     Mode        |  Name           Addr     Mode
N55                 55   1  ACC NRED    |  N53             53   1  ACC NRED
Interface    Out of Sync    Diversity   |  Interface    Out of Sync    Diversity
Type            Delay         Timer     |  Type            Delay         Timer
CCITT V.35      02.00 sec      n/a      |  CCITT V.35      02.00 sec      n/a
Interface       Node Clocking           |  Interface           Node Clocking
Clocking    Source  Availability Pref   |  Clocking     Source  Availability Pref
XMIT         RECEIVE REMOTE NODE   4    |  XMIT          RECEIVE REMOTE NODE   4

Effective   N   Allocated  Remaining       Allocated   Ones      Backup Link
Data Rate   By  Bandwidth  Node BW         Overhead    Density    Name
25.00K      N/A 1.056MHz   5.028MHz        9.6KHz       n/a
Error     IAR Event Delay  IAR/DRR     SVR      Link     Error    Percentage
Threshold    Init    Rest    Enable     Enable  Delay    Rate     Available
OFF         3 sec  10 sec   Enable     Enable   0 ms    1.0 E-9     100%

---------------------<< Next Page for IAR Link Parameters >>---------------------
```

Figure 5-1 Aggregate Configuration

The aggregate interface types, default interface clocking and node clocking sources for a TMS-3000 node appear in *Table 5-2*.

As you select any of these interface types, notice that the interface type is duplicated for the remote end node. This parameter duplication occurs only when the interface type is changed. If you make changes to aggregate interface parameters without changing the interface type, the changes are not duplicated in the opposite-end aggregate interface. When making changes to an aggregate interface configuration, check to make sure that changes are made at both ends.

When initially configuring an aggregate interface, select the proper interface type for the aggregate. Step through the screen and select each aggregate parameter as required. For many interface types, you do not need to make any further selections. Nevertheless, be sure that the displayed parameters are correct for the application.

Interface Type

(Limited Range Entry) — The `Interface Type` is determined by the aggregate trunk that connects the Aggregate Control Card to another node.

A piggyback card is mounted on each Aggregate Control Card to convert data and timing logic signals to the signal type required by the aggregate trunk. As you step through the interface types, you see the other aggregate parameters change to the normal values for that interface.

Table 5-1 Aggregate Interface Choices

Local Node	Remote Choices
64KHz Co-dir'l	64KHz Co-dir'l
64KHz Contra'l	64KHz Contra'l
Bell T1	Bell T1 CCITT V.35 MIL 188-114 EIA-422 (V.11)
Bell T1-D4	Bell T1-D4
CCITT 2.048 MHz	CCITT 2.048 MHz CCITT V.35 MIL 188-114 EIA-422 (V.11)
CCITT G704	CCITT G704 T1D4/DS0 T1D4/FT1 CCITT V.35 MIL 188-114 EIA-422 (V.11) EIA-423 (V.10)
CCITT V.35	CCITT V.35 MIL 188-114 EIA-422(V.11) EIA-423 (V.10) EIA-232 (V.24) CCITT G704 T1D4/DS0 T1D4/FT1 Bell T1 CCITT 2.048 MHz

Local Node	Remote Choices
EIA-232 (V.24)	EIA-232 (V.24) CCITT V.35 MIL 188-114 EIA-422 (V.11) EIA-423 (V.10)
EIA-422 (V.11)	EIA-422 (V.11) EIA-423 (V.10) EIA-232 (V.24) CCITT G704 T1D4/DS0 T1D4/FT1 Bell T1 CCITT 2.048 MHz CCITT V.35 MIL 188-114
EIA-423 (V.10)	EIA-423 (V.10) EIA-232 (V.24) CCITT G704 T1D4/DS0 T1D4/FT1 CCITT V.35 MIL 188-114 EIA-422 (V.11)
MIL 188-114	MIL 188-114 EIA-422 (V.11) EIA-423 (V.10) EIA-232 (V.24) CCITT G704 T1D4/DS0 T1D4/FT1 Bell T1 CCITT 2.048 MHz CCITT V.35
NTT	NTT
T1D4/DS0 and T1D4/FT1	T1D4/DS0 T1D4/FT1 CCITT V.35 MIL 188-114 EIA-422 (V.11) EIA-423 (V.10)

Table 5-2 Aggregate Interface Types and Clock Sources

Aggregate Interface Type	Default Interface Clocking	Default Node Clocking Source
CCITT V.35	Node	Receive
T1D4/DS0	Node	Receive
T1D4/FT1	Node	Receive
Bell T1	Node	Receive
MIL -STD-188-114	Node	Receive
CCITT 2.048 MHz	Node	Receive
EIA-422 (V.11)	Node	Receive
CCITT G.704	Node	Receive
EIA-423 (V.10)	Node	Receive
NTT	Node	Receive
EIA/TIA-232-E	Node	Receive
64-KHz Codirectional	Node	Receive
Bell T1-D4	Node	Receive
64 KHz Contradirectional	Node	Receive

Out-of-Sync Delay

When an Aggregate Control Card loses synchronization, an Out-of-Sync alarm is generated. You may select an `Out of Sync Delay` value which affects the timing between the loss of synchronization and the reporting of an alarm message. This delay value can prevent excessive reports of short synchronization losses.

Select a small delay value for precise synchronization alarm reports. Select a long value for major synchronization loss reports. The value can range from 0 to 25 seconds in 0.2-second increments. The default value is set at `2.0` seconds.

The out-of-sync filtering function actually integrates the out-of-sync indicator from the hardware. If the real out-of-sync is fluttering, then the average out-of-sync should be higher to generate an alarm when the filter value is set higher.

Redundant and diversity switchovers are affected by this filter value, since a switch does not occur until an Out-of-Sync alarm is generated at the node. You may use this timer to delay a diversity or redundant switch-over. This allows for transient aggregate problems such as very severe bursts (VSB) which may disrupt an aggregate trunk for up to 2.5 seconds, but then clear the line. In such a situation, it may be advantageous to wait a few seconds before initiating a switch-over.

Diversity Timer

The diversity timer is displayed for aggregates that have diversity enabled. This timer is not selectable. The value displayed is 0.5 seconds higher than the Out-of-Sync delay. This value indicates that a diversity switchover occurs 0.5 seconds after an Out-of-Sync alarm is generated (See Out-of-Sync delay above).

Interface Clocking

(Limited Range Entry) – This parameter selects the source of timing for aggregate data transmitted to the destination node. The Interface Clock may be:

XMIT (Transmit) – The transmit clock is the external transmit clock signal received by the Aggregate Control Card. This signal is only available for those interface types which include a transmit clock signal from the aggregate trunk.

NODE – The node supplies the timing signal for transmit data. This timing signal is phase locked to the selected node timing source (*Refer to Chapter 10* for more information on node timing sources).

RCV (Receive) – The timing signal derived from the aggregate receive data is selected.

For most applications, the default settings for the interface type are appropriate. But, if a modem or similar device is used on the aggregate trunk, you must check the timing carefully.

Node Clocking

These parameters report the availability of the aggregate trunk as a timing source. Any aggregate trunk that can supply node timing must be set as **REMOTE NODE** if the node is ever to select timing from that aggregate.

The following information must be entered:

- Source — This specifies either the **RECEIVE** clock or the **TRANSMIT** clock as the timing signal from the aggregate interface device [usually a modem or DSU (Data Service Unit)]. **RECEIVE** is the normal selection. **TRANSMIT** is for specific applications such as satellite, and a special cable would be required.
- Availability — This parameter categorizes the aggregate trunk as a timing source. An aggregate trunk, such as DDS in the U.S. or NTT in Japan, that supplies a master timing signal should be set for **FACILITY**. An aggregate trunk that can supply a timing signal from some other node should be set as **REMOTE NODE**. An aggregate trunk that is unreliable as a timing source should be set as **NOT AVAILABLE**.
- Preference — Specifies a value from **1** to **4** that enables you to establish which link is preferable for node clocking. A value of **1** is the highest preference. The TMS does not switch links for clocking if the current preference value is good.

Clock Generator Digital/Analog

When configuring a Universal MM+ V4 TDM (tail node) at the end of an ACC link, the clock generator field on the Aggregate Configuration screen allows you to select either **DIGITAL** or **ANALOG**.

The Digital Clock Generator Module is the standard timing module for the Universal MM+ V4 TDM. The Analog Clock Generator Module provides improved timing stability and a greater selection of clock frequency rates for the Universal MM+ V4 TDM network. It also allows correct configuration and operation of special aggregate rates to the Universal MM+ V4 node.

To select either the Analog or Digital Clock generator, move the cursor to highlight the field. Press Enter. Note that this selection merely identifies the hardware option installed in the Controller software.

Backup Link Name

This is the name of the backup link. The backup link is used in the event of a failure on the current link. Should that occur, the backup link is activated by the IAR .

Effective Data Rate

(Cursor Position Entry) — This field reports the aggregate data rate. For some rates there is a difference between the data rate on the aggregate trunk and the data rate of the aggregate data from the Aggregate Control Card; the difference allows for overhead information that is required by the aggregate trunk. For example, the Bell T1D4 aggregate trunk data rate is 1.544 MHz, but 8 KHz of that amount is required for D4 framing. Therefore, the effective rate is 1.536 MHz.

A second rate, 1.472 MHz, is available for T1D4. This is a special application rate that leaves 64 KHz available for overhead requirements.

Some interface types have only one possible rate and do not allow rate selection (the fixed rate is displayed). For interfaces with more than one possible rate, the available aggregate rates appear on the selection screen.

In the case of the T1D4/DS0, T1D4/FT1, and G704 aggregate interfaces, selecting the effective data rate is equivalent to selecting the number of DS0 channels (N). It is not necessary to change the switches on these interfaces to select "N" since the ACC has software control of this selection which overrides the switch settings for "N."

To select a rate:

1. Position the cursor at the `Effective Data Rate` field and press `Enter`. An `Aggregate Configuration` screen with a rate table appears.
2. Use the arrow keys to position the cursor at the desired aggregate rate.
3. Press **`F3`** to return to the previous screen. The new rate appears in the `Effective Data Rate` field.

N by

This software control feature applies only to the T1D4/DS0, T1D4/FT1, and G.704 aggregate interface. For this interface, there are two choices, **`56K`** and **`64K`**. The **`64K`** selection means that all 64 KHz of bandwidth of each DS0 is available for user data. Selecting **`56K`** means that 56 KHz of bandwidth is available for user data. The remaining 8 KHz of bandwidth is used to transmit marks in order to satisfy ones density requirements (every eighth bit is a mark).

Allocated Bandwidth

This parameter determines the amount of backplane bandwidth allocated to the Aggregate Control Card. This figure may be **`66.00KHz`**, **`132.0KHz`**, **`264.0KHz`**, **`528.0KHz`**, **`1.056MHz`**, **`1.584MHz`** or **`2.112MHz`**, and is determined by the aggregate link rate plus overhead bandwidth, plus ones density bandwidth across the backplane.

To select a new bandwidth, highlight the `Allocated Bandwidth` field and press `Enter`. A `Node Alloc Bandwidth` screen appears, allowing you to select a new bandwidth. Highlight the new figure and press `Enter`. The `Aggregate Configuration` screen reappears, and the new bandwidth value is displayed in the `Allocated Bandwidth` Field.

1.056 MHz may be assigned even if the aggregate data rate is greater than 1.056 MHz. For example, if a T1/D4 aggregate trunk is being configured, and the sum of all circuit bandwidth (including controls) is less than 1 MHz, you may allocate only 1.056 MHz of node bandwidth to the aggregate trunk. The actual data rate of the aggregate trunk is 1.544 MHz, but only 1.056 MHz of node bandwidth is required to transfer circuit data to and from the Aggregate Control Card at the node.

NOTE *ACC bandwidth is explained in more detail in GDC 036R304-000.*

Allocated Overhead

(Limited Range Entry) — The overhead rate is the data rate of supervisory data exchanged across the aggregate trunk. The aggregate bandwidth assigned as overhead is not available for transmission of channel data.

The requirements for the overhead rate are determined by the application of the aggregate trunk in the network. In a complex network, some aggregate trunks may carry supervisory data for several downstream nodes, and therefore require more bandwidth reserved for overhead. Conversely, a low-speed aggregate should have a low overhead rate to leave as much bandwidth as possible for channel data.

The automatic supervisory route calculation preferentially selects high overhead rate links for use in supervisory routing. The overhead rates available are:

Aggregate rates < 16 KHz: Overhead rates are `300`, `1.2KHz` — Default is `1.2KHz`.

Aggregate rates < 24 KHz: Overhead rates are `300`, `1.2KHz`, `4.8KHz` or `9.6KHz` — Default is `9.6KHz`.

Aggregate rate ≥ 24 KHz: Overhead rates are `300`, `1.2KHz`, `4.8KHz` or `9.6KHz` or `19.2KHz` — Default is `9.6KHz`.

NOTE *If you attempt to select an overhead rate of 300 Hz for an effective data rate of 153.6 KHz or higher, a warning that supervisory link communications may be degraded appears at the bottom of the screen. But you are allowed to make that selection.*

The supervisory channel rates supported in the TMS-3000 are shown in *Table 5-3*.

Table 5-3 Supervisory Channel Rates

Supervisory Channel Rate	Aggregate Control Card	CDA Module
300 Hz	Yes*	Yes*
1.2 KHz	Yes	Yes
4.8 KHz	Yes	Yes
9.6 KHz	Yes	Yes
19.2 KHz	Yes	Yes
* Warning displayed if effective data rate is 1.536 KHz or higher.		

Remaining Node Bandwidth

This is the node bandwidth remaining after configuration is completed.

Ones Density

(Limited Range Entry) — If the aggregate trunk is a T1 line, or some other high-speed link which does not allow many consecutive zeros (spaces) in the aggregate data stream, you may select a ones density rate. This inserts a "dummy channel," composed solely of ones (marks), into the aggregate data stream. The dummy channel, when mixed into the aggregate data stream, prevents violation of the ones density (sixteen zeros) rule by ensuring that ones are present in the data stream.

For applications not requiring a ones density selection, `n/a` appears in the field.

ACC T1/D4 Ones Density Rate Requirements

When using an Aggregate Control Card with the Bell T1 or Bell T1/D4 aggregate interface piggyback card, a quick ones density rate rule is not possible, due to various carrier requirements, and ones density of the data. Several pieces of information must first be obtained and estimated.

Certain applications may require ones density to be maintained (e.g., an Aggregate Control Card with an EIA RS-422 interface to a satellite modem). Some T1 applications may not require ones density (e.g., a T1/D4 aggregate interface connected to an encryption device). Other T1 facilities have a low ones density requirement (e.g., some radio or microwave links require only 1/64 of the bandwidth to maintain clocking stability).

The minimum ones density rate for an Aggregate Control Card configuration is determined by gathering the following information:

1. The worst case line requirements
2. Ones density of users channels
   a. High ones density circuits
      - Polling circuits
      - Half-duplex circuits
      - Human-interface circuits
      - Encrypted circuits
      - Universal voice channel circuits

b. Low ones density circuits
   - CAD screen updates

3. ACC bandwidth utilization
   a. Remaining bandwidth
      - Low ones density rate for several channels

NOTE

A 192 KHz one's density rate is recommended when a large amount of remaining bandwidth is available (greater than 512 KHz).

If you have a large number of high density circuits using most of the bandwidth, the 192 KHz rate may be reduced. The best estimates are taken from test data. You would then select the next available ones density rate.

Four rates are selectable for ones density. The rate reflects the number of bits per second allocated to the dummy channel. The bandwidth allocated to ones density is not available for use by circuits. The highest rate, 192 KHz, guarantees compliance with ones density requirements. The lower rates leave more bandwidth available for circuits but reduce the certainty of avoiding ones density violations. The ones density rates are 192 KHz, 144 KHz, 96 KHz, and 48 KHz.

The applications of these rates depend on the aggregate trunk equipment used and the type of data on the trunk. Newer T1 equipment can accept a certain level of one's density violations.

In addition, some data streams (especially voice data) have an inherently continuous content of ones and therefore require less adjustment for ones density.

If you use a reduced ones density rate (less than 192 KHz) on an aggregate trunk with ones density requirements, make sure that the rate selection does not have adverse effects on line quality. A ones density rate that is too low can create timing and synchronization problems on the aggregate trunk and in multiplexing equipment.

For all aggregate trunks that have no ones density requirement, n/a is selected (ones is not selectable in this case).

During Aggregate Configuration, the following displayed parameters allow you to manually enter the data pertaining to characteristics of the aggregate. This data is used in the Intelligent Automatic Routing (IAR) routine to create circuits.

Error Threshold

This field allows you to set an error threshold limit on the aggregate, so that when that limit is reached an alarm is raised. Select **`1.0E-6`**, **`1.0E-4`**, **`1.0E-3`** (10^{-6}, 10^{-4}, 10^{-3}) or **`OFF`**.

IAR Event Delay

You can set two timer values to allow the Controller to test for link stability before initiating an IAR recovery. They are referred to as the `Init` (Initiation) Delay and the `Rest` (Restoral) Delay respectively.

After a link failure is reported, the initiation timer is started. Only after the initiation delay has passed without the link recovering is the IAR link failure processing initiated. Similarly, on a link recovery, the restoral timer is initiated. Only after the restoral delay has passed without the link failing again is the IAR link recovery processing initiated.

In addition, if a link fails and recovers quickly, a mechanism exists to declare the link down. If a link fails 10 times without ever recovering for a period equal to the restoral delay and these rapid link failures and recoveries persist for a time greater than the initiation delay, the IAR link failure algorithm is invoked.

The initial default settings of the timers are:

`Init` — `3 sec` for TMS aggregates, `10 sec` for CDA/IAC bundles

`Rest` — `60 sec` for TMS aggregates and CDA/IAC bundles

The default timer settings may be changed on the IAR defaults screen. The value for the specific TMS aggregate of a CDA/IAC bundle also may be changed on this screen.

IAR/DRR Enable

Allows you to enable or disable IAR to respond to a failure of this link.

SVR Enable

Allows you to permit or inhibit a supervisory route from being allocated on this aggregate.

Link Delay

Expressed in milliseconds and is equal to the aggregate round trip delay divided by 2. Default is `0 msec`. Ranges from `0` to `999 msec`.

Percentage Available

Represents the amount of time the aggregate is expected to be up and running. Expressed as a percentage, with 100% as the highest value. Default is `100%`. Ranges from 0 to 100% in 1% increments.

Error Rate

By setting an error rate value, determined by the historical performance of the link, you provide IAR information that is used to determine routing preferences. Expressed in terms of < 1 error in 10^n, where n is a value from 2 to 9. Circuits are routed on the best link for the application.

Link Attributes and Link Qualifiers

`Link Attributes` and `Link Qualifiers` appear on Page 2 of the `Aggregate Configuration` screen. These are defined in the `Circuit Profile` screen which is covered in *Chapter 16*. Within that screen, you define the relationship between the group or circuits with that profile and the link attribute. The following options are available:

- **`Mandatory`** — Only links possessing this attribute (Yes) are used by IAR to route circuits.
- **`Desirable`** — If possible the IAR algorithm attempts to route circuits with this profile only on links possessing this attribute.

- **`Undesirable`** — If possible, the IAR algorithm attempts to route circuits with this profile only on links not possessing this attribute.
- **`Not Allowed`** — Only links not possessing this attribute (No) are allowed to compare a segment of this circuit path.
- **`Don't Care`** — Possession of this attribute on a particular link does not affect routing decisions for circuits using this profile.

On this screen you define whether the attribute is possessed by this aggregate.

Link Attributes and Link Qualifiers identify a relationship between a circuit and the link it traverses. The circuit passes across the aggregate if it meets these conditions:

- If the attribute and the qualifier are the same
- If the qualifier is **`Don't Care`**
- If the attribute is **`All`**

The setting of the link qualifier is chosen on this screen.

Link Enable/Disable Status

If the Aggregate Control Card is to be allowed to carry circuits in a designated TOR/DRR configuration, then the Aggregate Control Card must be enabled on Page 2 of the `Aggregate Configuration` screen. The configuration names appear on the screen. To enable this aggregate for operation in a TOR/DRR configuration, highlight the `Enable/Disable/BU.Dsbl` (Backup Disable) field and press `Enter` until `Enable` appears. To disable the configuration, press `Enter` until `Disable` appears.

The `BU.Dsbl` choice in this same field is used in conjunction with the diversity dial backup mode that is used with Sync Status Modules. If **`BU.Dsbl`** is selected, dial backup connections are prevented, including dial backup connections for IAC backup links. The **`Disable`** selection also prevents any dial backup connections. *Refer to Chapter 17* for more information on this feature,

Summary

The `Aggregate Configuration` screen shows the local-to-remote node connection made by the aggregate and lists the operating mode selected for the aggregate. In this chapter we covered the procedures for configuring ACCs at each end of an aggregate trunk. All parameters on the Aggregate Configuration screen were covered.

What's Next?

In Chapter 6 we cover Channel Interface Configuration, including the Digital Bridging Card.

6 Channel Interface Configuration

Overview

A Channel Interface Card is the node Fast Bus interface for up to 64 local channel cards (58 for TMSC). It multiplexes and demultiplexes data from Channel Cards onto a high-speed 16.896 MHz Common Equipment Bus. This bus allows communication to all Common Modules installed in the node.

The CIC is also responsible for frame calculation, channel control, and communication with the ESCCs and RCCs. If a CIC is not installed in the main shelf, channel data cannot be routed.

Topics covered in this chapter are:

- Channel Interface Configuration
  - Card Type
  - Allocated Bandwidth
  - Remaining Node Bandwidth
  - Effective Data Rate
  - Allocated Overhead
  - Bandwidth
  - Configuration Name
  - Channel BW Used
  - Channels Used
  - Bandwidth Remaining
- Channel Interface Configuration (Digital Bridging Card)
  - Shelf
  - Channel Number
  - Digital Bridge
  - Channel Type
  - Data Lockout
  - Anti-Streaming
  - Configuration Procedure, Fan

Channel Interface Configuration

With the cursor, highlight the Channel Interface Card in the Node Configuration screen. Press the **`F4`** key. The `CIC Configuration` screen (*See Figure 6-1*) appears. Alternatively, you may highlight the slot number and press `Enter` to bring up the screen.

The `CIC Configuration` screen shows the configured mode for the Channel Interface Card and the important characteristics of the interface.

```
CIC Configuration            NET1                   29-MAR-1996 13:41:36
Local Node        Addr          Mode
N55                55         CIC /N.REDUND.  64     << Bandwidth >>
--------------------------------------------------------------------------------
Card      Allocated     Remaining       Effective     Allocated
Type      Bandwidth    Node Bandwidth   Data Rate     Overhead
CIC       1.056MHz     5.280MHz          1.024MHz     32.00KHz
```

Figure 6-1 CIC Configuration Screen

Each screen item is described below.

Card Type

This is one of the selectable parameters for the Channel Interface Card. Either **`CIC`** or **`DBC`** (Digital Bridging Card) can be selected. If the digital bridge function is required, **`DBC`** should be selected. If not, **`CIC`** should be selected. **`CIC`** is the default selection. Digital bridge configuration is covered later in this chapter.

NOTE

The DBC is installed in the CIC slot. If CIC is selected as the card type, the DBC performs normal CIC functions. Digital bridging functions are available only if a DBC is installed in the CIC slot <u>and</u> DBC is selected as the card type.

Allocated Bandwidth

This selection determines the amount of backplane bandwidth allocated to the Channel Interface Card. This figure is either `2.112 MHz` or `1.056 MHz` and is determined by the amount of node bandwidth required to support all circuits passing through the aggregate trunk. If any configuration requires more than 1.056 MHz of bandwidth, **`2.112 MHz`** should be selected or circuits are deleted. If no configuration requires more than 1.056 MHz of bandwidth, **`1.056 MHz`** may be selected.

Remaining Node Bandwidth

The `Remaining Node Bandwidth` figure indicates how much bandwidth is available for configuration of additional circuits through the Channel Interface Card.

Effective Data Rate

The `Effective Data Rate` represents the `Allocated Bandwidth` less the `Allocated Overhead`. This is a display-only field.

Allocated Overhead

Allocates the overhead bandwidth required by the Channel Interface Card. The overhead includes bandwidth for the multiplexing of control and synchronization information from each channel.

Bandwidth

If you highlight `Bandwidth` and press `Enter`, you bring up the `CIC Bandwidth` screen (*See Figure 6-2*). The maximum node bandwidth that is supported is 16.896 MHz. You cannot save changes in the Controller if the node bandwidth is exceeded.

```
CIC Bandwidth           NET1                              29-MAR-1996 13:41:36
Local Node   Addr       Mode
N55               55         CIC /N.REDUND.  64 << Bandwidth >>
--------------------------------------------------------------------------------
Config     Channels      Bandwidth     Config     Channels        Bandwidth
Name      Used  BW Used   Remaining      Name     Used  BW Used     Remaining

C01        0        0Hz   1.024MHz      CO2        0      0Hz       1.024MHz
C01        0        0Hz   1.024MHz      CO2        0      0Hz       1.024MHz
```

Figure 6-2 CIC Bandwidth Screen

NOTE *CIC bandwidth is explained in more detail in GDC 036R304-000.*

The following items are shown on the CIC Bandwidth screen:

Configuration Name

The name of the TOR/DRR configurations you configured.

Channel BW Used

Represents the amount of voice or data bandwidth used by this Channel Interface Card for this TOR/DRR configuration.

Channels Used

Specifies the number of channels used by this Channel Interface Card for this TOR/DRR configuration.

Bandwidth Remaining

For each specific configuration, a `Bandwidth Remaining` figure is presented. This number is based on those circuits configured with an end channel module communicating through the displayed Channel Interface Card. The sum of the bandwidths of those circuits and their priority control requirements is subtracted from the Controller Rate, along with a standard amount for overhead.

Channel Interface Configuration (Digital Bridging Card)

If you previously selected **DBC** for the `Card Type`, the `CIC Configuration` screen contains additional information: `Shelf`, `Channel Number`, `Digital Bridge`, and `Channel Type` (*See Figure 6-3*).

```
CIC Configuration          NET1                          29-MAR-1996 13:41:36
Local Node        Addr        Mode
N55                55         CIC /N.REDUND.  64 << Bandwidth >>
--------------------------------------------------------------------------------
Card     Allocated       Remaining        Effective     Allocated
Type     Bandwidth      Node Bandwidth    Data Rate     Overhead
DBC      1.056MHz        5.280MHz          1.024MHz      32.00KHz

Shelf    Channel         Digital          Channel         Channel    Data     Anti
         Number          Bridge            Type            Rate     Lockout  Streaming
1A       01-08            DISABLE
1B       09-16

2A       17-24            ENABLE           SYNC            9.600K    ENABLE    65 Sec.
2B       25-32                             NOT USED

3A       33-40            ENABLE           NOT USED
3B       41-48                             NOT USED

4A       49-56            ENABLE           NOT USED
4B       57-64                             NOT USED
```

Figure 6-3 CIC Configuration Screen (Digital Bridging Card)

Shelf

In the Shelf column are the fan designations, i.e. `1A`, `1B`, `2A`, `2B`, etc.

Channel Number

The channel numbers are in groups of 8, each group representing 1 fan. For example, fan `1A` is channels 01 – 08 (1 common and 7 branches)

Digital Bridge

Selectable choices of **DISABLE** or **ENABLE** are available. Default value is **DISABLE**. When **ENABLE** is selected for a particular fan, all the fans in higher numbered shelves are enabled. The fans are disabled in pairs, to accommodate up to 16 additional physical channels for each fan pair, or 1 **Expansion Shelf** (A shelf that connects to a CIC in a TMS-3000 shelf and holds up to 16 Channel Modules and 2 Expansion Modules (one primary, one redundant).

Channel Type

Channel type is selectable, the choices being **NOT USED**, **SYNC**, **ASYNC**, **U-ADPCM**, **CELP**, and **ACM-UVC**. The default selection is **NOT USED**. As soon as a choice other than NOT USED is selected, 3 additional columns appear: Channel Rate , Data Lockout , and Anti-Streaming . The CELP (Codebook Excited Linear Prediction) Channel Module provides voice encoding algorithms that maximize voice channel bandwidth utilization. The voice is compressed at rates of 4.8 Kbps, 6.4 Kbps, or 9.6 Kbps. The UVC (Universal Voice card) provides full duplex voice communication capabilities in a TMS-3000. Pulse Code Modulation (PCM), Adaptive Differential Pulse Code Modulation (ADPCM) and Advanced Speech Processing (ASP) card configurations are available

Data Lockout

Choices are **ENABLE** and **DISABLE**. Data Lockout is enabled for voice circuits. For ***Multidrop*** *without Data Lockout* (**DISABLE** selected), the polling collision control is externally controlled by the customer equipment. Only the polled station should respond. Multidrop refers to a circuit with 1 polling master and multiple end points (drops).

A second method, *Multidrop with Data Lockout* (**ENABLE** selected), is used in a control based environment. In this method, Request-to-Send is confirmed by the common channel returning Clear-to-Send to the requesting branch. This method is the slower of the two methods.

Controls for voice channels are handled similarly to *Multidrop without Data Lockout* except that Control 2 (Remote Out of Sync) and Control 4 (Force M Busy) are only passed in one direction, from the branches to the common.

Anti-Streaming

The Anti-Streaming function is an automatic diagnostic that is required to detect streaming channels which, when using digital bridging, affect other channels in the system (Streaming is a failure condition of a branch that interferes with other branches.). Anti-Streaming operates by detecting a condition of RTS ON and the bridge locked to 1 branch for an extended period of time.

The Anti-Streaming timeout is selectable at **5**, **15**, **25**, **35**, **45**, **55**, or **65** seconds or **DISABLE**. For *Multidrop with Data Lockout*, Anti-Streaming detection operates by detecting a condition of RTS ON and a fan locked to 1 branch for a period of time greater than the selected period. Once detected, RTS, from the streaming branch, is forced off, and an alarm is sent to the Controller. The RTS input is then tested. If the channel is released, the Anti-Streaming Force-On is removed. For *Multidrop without Data Lockout,* the Digital Bridge Card assumes a Mark-Idle environment and monitors all branches for a condition of constant spaces in the data for a period of time greater than the selected period.

For U-ADPCM and ACM-UVC, the Anti-Streaming function is automatically disabled. Anti-Streaming may also be disabled for applications such as dial up circuits where RTS is always on.

Configuration Procedure, Fans

First, the number of fans is selected (A fan is a type of full-duplex circuit topography typified by multiple terminations on one end and a single termination on the other end). This is done by enabling shelves. The DBC contains up to 8 fans. Each fan contains one master and seven drops. The DBC can, optionally, contain local channels. Up to 64 local channels are available per DBC. The trade-off of local channels to fans is made by enabling/disabling Expansion shelves, i.e., groups of 16 channels. Two fans equal one Expansion shelf. Expansion shelves may not be enabled/disabled in sections. Each group of 16 channels may be configured as either two 7:1 fans, or as an Expansion Shelf with 16 physical channel cards.

NOTE

DBCs are enabled from the bottom up. That is, if you want only one shelf enabled for digital bridging, it must be the fourth Expansion Shelf. If you want to enable two shelves for digital bridging, it is shelves three and four. If you try to enable from the "top down," the shelf you enabled and all lower shelves also become enabled.

Digital Bridging circuits are configured in the same way as other circuits. Circuit configuration is covered in Chapter 18.

Fan options:

Each fan can be `ENABLED` or `DISABLED`.

`Channel Type` (**SYNC**, **ASYNC**, **U-ADPCM**, **CELP**, **ACM-UVC**, or **NOT USED**) is selectable for each enabled fan.

Each enabled fan can be selected for `Data Lockout`; **ENABLED** or **DISABLED**.

`Anti-Streaming` can be **ENABLED** or **DISABLED** for each enabled fan.

If `Anti-Streaming` is enabled, various detection times are available.

Summary

In this chapter we provided the procedures for configuring the Channel Interface Card. The CIC interfaces with channel cards and the 16.896 MHz Fast Bus. Configuring the Digital Bridging Card was also covered in this chapter. Digital Bridging allows a single channel to broadcast to multiple channels and for those channels to respond to the single channel.

What's Next?

In Chapter 7, we cover CDA and IAC Port and Bundle configuration.

7 CDA and IAC Port and Bundle Configuration

Overview

This chapter provides the procedures for configuring **ports** for CDA and IAC cards. A port is any switchable entity. A port may be a logical entity that is not necessarily realized through a physical connector. For example, a single Frame Relay interface can support many Frame Relay ports. Traditionally, port has referred to a physical and electrical interface point on a TMS network interface card.

Configuring IAC backup links and configuring bundles is also covered. The chapter is organized so that configuration items which are common to both CDA and IAC cards are covered first and then specific procedures for the individual card types are covered. For TPP and ACM Port Configuration *refer to Chapters 8 and 9.*

Topics covered in this chapter are:

- CDA and IAC Port Configuration
    - Common Port Configuration (CDA and IAC)
    - CDA-T1 Specific Port Configuration
    - CDA-E1 Specific Port Configuration
    - IAC-ATT Specific Port Configuration
- Bundle Configuration (CDA and IAC)
    - Bundle Configuration Screen
- Configure Backup Links (IAC)
    - Configure Backup Links Screen
- Backup Link Alarm Suppression
- Common Bundle Detail (CDA and IAC)
    - Bundle Details Screen
- CDA Specific Bundle Detail
- IAC Specific Bundle Detail

CDA and IAC Port Configuration

The following sections cover the common configuration procedures for CDA and IAC cards. Following the common procedures are specific procedures for CDA-T1, CDA-E1, and IAC/ATT cards.

Common Port Configuration (CDA and IAC)

The `CDA/IAC Port Configuration` screen shows the port interface characteristics. The following paragraphs describe the common port characteristics possessed by all CDA (T1 and E1) and IAC cards. The equivalent LIM (Line Interface Module) configuration screens which were discussed in *Chapter 4* are very similar to the screens shown here for CDA.

NOTE *When downloading software to a CDA/IAC module, only port A of the CDA/IAC can receive downloaded code. When downloading configuration to a node with no configuration through a CDA/IAC port, only port A can receive downloaded information.*

Specific information such as the port destination, port and bundle information for the CDA/IAC Module is configured by positioning the cursor at the CDA/IAC Module slot number position on the `Node Configuration` screen. Then, press `Enter` or use the **F4** (Next Display) key. Subsequent screens are displayed in a similar fashion. To configure Port A specific bundles, press the **F4** key while the screen cursor is on any point of the `Port A` portion of the `CDA Port Configuration` screen (*See Figure 7-1*). To configure Port B specific bundles, press the **F4** key while the screen cursor is on any point of the `Port B` portion of the `CDA Configuration` screen. `Enter` can be used when the cursor is positioned at the Port A or Port B headings.

When configuring a CDA/IAC Nonredundant 128 in adjacent slots, each CDA/IAC Module Input/Output ports uses different pins of the same DB25 connector. They are split externally through a "Y-cable" (*GDC 027H316*) attached to the TMS rear backplane. The CDA Module in the primary slot uses the upper connector and the CDA Module in the secondary slot uses the lower connector. For more information on configuring the Y-cable and the pin connectors, refer to *GDC 036R303-000.*

NOTE *Port A and Port B of the even-numbered slot comes out on the upper and lower connectors, but Port A and Port B of the odd-numbered slot comes out on alternate pins of these connectors. The different ports are then split externally using the Y-cable.*

The ISDN Aggregate Control (IAC) Card is a high speed aggregate I/O for TMS-3000. The IAC can be configured for network type ATT.

```
CDA-T1 Port Configuration      Net1                          30-MAR-1996 09:49:01
Node                      Allocated    Currently    Remaining    Comm    Groups
Name             Slot     Bandwidth    Used BW       Node BW      Chans    Used
C                9        2.048MHz     384.0KHz       0Hz          2        2
--------------------------------------------------------------------------------
---------------------------------   PORT A  ------------------------------------

Destination       Line Operating Environment         Interface    Node Clocking
Type               Encode               Format        Clocking     Availability   Pref
REMOTE CDA/OCM   B8 Zero Suppression  T1-D4         NODE        REMOTE NODE    4
Link     Line Delay  DS0    Bundle  Declare   Declare   Allowable Slip Error
Rate     Buffering   Count  Count   Failure   Restoral  PerHour  PerDay  Threshold
1.536MHz  Land Line   1       1      2.00sec   10.00sec    2        4     1.0 E-5

---------------------------------   PORT B  ------------------------------------

Destination      Line Operating Environment         Interface     Node Clocking
Type              Encode               Format        Clocking      Availability   Pref
DACS NETWORK   B8 Zero Suppression  T1-D4         NODE        NOT AVAILABLE  4
Link      Line Delay  DS0    Bundle  Declare   Declare   Allowable Slip Error
Rate      Buffering   Count  Count   Failure   Restoral  PerHour  PerDay  Threshold
1.536MHz  Land Line     5      1     2.00sec   10.00sec    2        4     1.0 E-5
```

Figure 7-1 CDA-T1 Port Configuration Screen

Node Name/Slot

The name of the node and main shelf slot number in which the module is currently residing.

Allocated Bandwidth

This determines the amount of bandwidth allocated by the node for the module.

The CDA or IAC Module uses 16 or 32 backplane selects. This corresponds to a maximum bandwidth of 992 KHz or 2.048 MHz.

The default bandwidth is `2.048MHz`. The allocated backplane bandwidth is selectable by jogging this field. Reducing the bandwidth would leave more bandwidth for the rest of the node. Reducing bandwidth is possible only if the current bandwidth usage is less than 992 KHz.

NOTE *CDA and IAC bandwidth is explained in more detail in GDC 036R304-000.*

Currently Used Bandwidth

The number displayed is not selectable. It reports the current backplane bandwidth used per DS0 channel. It is calculated as follows:

Currently Used Backplane BW = 64k times number of TMS or TMS/network DS0s.

Remaining Node Bandwidth

The total remaining backplane-select bandwidth.

Comm Chans

Number of communication channels used on the card — Each port configured as ESF (T1 only) uses a communication channel as does each TMS or TMS/network bundle. *A number greater than four indicates that the CDA/IAC is multiplexing communications.*

Groups Used

Groups are used by TMS or TMS/Network Bundles and by IAC D channels. Also, all network circuits share a single group; up to 32 groups are allowed.

For CDA, the Port A and Port B configurations are located on the top and bottom half of the screen. For IAC, the two ports each occupy their own screen. To switch between ports, choose the Next Port Screen option. Regardless of type, the operational characteristics of the port screens are the same.

Port A or Port B

When the screen cursor is positioned on either of these fields and `Enter` is pressed, the `Bundle Configuration` screen for that port appears.

Interface Clocking

(Limited Range Entry) — This parameter selects the source of timing for aggregate data transmitted to the destination node. The Transmit Clock may be:

> **`NODE`** — The node supplies the timing signal for transmit data. This timing signal is phase locked to the selected node timing source. (*Refer to Examine/Modify Network Clocking Chapter 10* for more information on node timing sources).
>
> **`RCV`** (Receive Clock) — This timing signal is derived from the aggregate receive data.

Node Clocking

Node timing for the CDA/IAC Module is configured through the Controller software. Each CDA/IAC Module has two aggregate ports (Port A/B) from which timing is derived. Several node timing configurations for each CDA port are possible.

To configure node timing, you must first select the link destination type. The link destination types are discussed in the card specific sections below.

Next, the interface clocking and node clocking options are determined. The interface clocking parameters select the timing source for the transmission of aggregate data to the destination node.

A selection for the `Node Clocking` selection option must also be determined.

> **`FACILITY`** — The port is connected to non-TMS equipment (e.g., network) which supplies the clock to the node.
>
> **`REMOTE NODE`** — The port is directly connected to another CDA which can supply the clock to the node. This selection is not valid if the remote node is an OCM because the OCM cannot provide timing for the CDA.
>
> **`NOT AVAILABLE`** — This port cannot be used for the node timing source.

The `Pref` (preference) option allows you to assign a priority to the selected node clocking option. The priority preference is used by the Controller to select the node clock source. Preference values range from **1** to **4**, **1** being the highest.

Link Rate

The aggregate data rate for the line. This value is `1.536MHz` for CDA-T1 and IAC-T1 and `2.048MHz` for CDA-E1. For IAC-NTT, this rate depends on the port interface type selected. For primary rate interface, the link rate is `1.536MHz`. For basic rate interface, the link rate is `144.0kHz`.

Line Delay Buffering

This feature buffers data from the port to compensate for wander in a satellite network. Select **Land Line** if the CDA/IAC port is used for terrestrial transmission. Select **Satellite** if the transmission uses a satellite uplink in the network.

DS0 Count

This is the number of DS0s that are configured in bundles on this port.

Bundle Count

This is the number of bundles that are configured on this port. Bundles on either port can be configured by pressing the **F4** key while occupying any field on that port and continuing with the `CDA/IAC Bundle Configuration` screen. Bundles are configured on this screen. Circuits and some subaggregates are routed across a CDA/IAC Bundle.

Declare Failure

This is a definable selection which indicates the time an out-of-sync condition must exist before an alarm is generated. This field ranges from **2.00sec** to **3.00sec** with increments of 50 milliseconds. The declare failure state is set for this particular port and is reported separately from those to be found in the subaggregate set-up. The default value is `2.00sec`.

Declare Restoral

This is the amount of time that the port must be in synchronization before it is placed back in service. This field ranges from **10.00sec** to **20.00sec** with increments of 50 milliseconds. The default value is `10.00sec`.

Allowable Slip

The number of data slips that are allowed before an alarm is generated. This setting is adjustable by the day and hour. The range of frame slips that can occur in a day is **0** to **31**. The range of frame slips in an hour is **0** to **7**.

Error Threshold

This value is selectable from **1.0 E-5** to **1.0 E-9** (10^{-5} to 10^{-9}) The default value is `1.0 E-5`. When the error threshold is reached, an alarm is raised.

CDA-T1 Specific Port Configuration

In addition to the common fields discussed previously, the `CDA-T1 Port Configuration` screen contains the following fields:

Destination Type

This selection allows you to designate the specific application to which the port is being assigned. You can select either **Remote CDA/OCM** (opposite end node communication through a CDA or LIM-DSX1 Module), **DACS Network** (AT&T Digital Access Cross-connect), **DTE Device** (D4 Channel bank), or **No Port** (disables port).

Changing any saved options may require deletion of existing bundles. When this occurs, you are prompted with messages to confirm the action.

When **No Port** is selected for a port, the activity on this port is disabled for the T1 network. (The No Port option is not valid for Port A.)

Line Operating Environment Encode

Selections are **B8 Zero Suppression** (default), **AMI B7 Channelized**, and **AMI AS-DS**. If B7 encoding is selected, 8K of bandwidth from each DS0 is used to ensure ones insertion, resulting in an effective data rate of 56K on each DS0. Only odd subaggregates are selected to run across a link. For ASDS, only odd DS0s are used by the network for transporting data.

Line Operating Environment Format

This selects three types of framing used on the CDA Module, **T1-D4**, **ESF** (Extended Superframe), and **ESF-NDL** (No Data Link). These methods of framing exist in a **DS1** (A combination of 24 DS0 channels and 8000 framing bits into a 1.544 Mbps data stream.) data stream. A D4 frame consists of twelve 193-bit frames called a Superframe. An Extended Superframe (ESF) retains the structure of D4, but consists of twenty-four 193-bit frames instead of 12. ESF-NDL and ESF support the ESF structure. In all cases the CDA collects statistical information and reports this to you via the TMS Controller status and diagnostics screens.

ESF-NDL is recommended when connecting to an ESF network with a CDA that is multiplexing communications (more than four communication channels used).

CDA-E1 Specific Port Configuration

In addition to the common fields discussed previously, the `CDA-E1 Port Configuration Screen` contains the following fields:

Destination Type

This selection allows you to designate the specific application to which the port is being assigned. You can select either **Remote CDA/OCM** (opposite end node communication through a CDA-E1 or LIM-E1 Module), **ACE Network**, **DTE Device** (channel bank), or **No Port** (disables Port).

Changing any saved options may require deletion of existing bundles. When this occurs, you are prompted with messages to confirm the action.

When **No Port** is selected for a port, the activity on this port is disabled for the network. The **No Port** option is not valid for Port A.

Line Encode

Specifies what method is used for line encoding. Line encoding for CDA-E1 is always `HDB3`.

Frame Format

Specifies what method is used for CDA-E1 frame formatting. Frame format for CDA-E1 is always `E1` (CEPT).

Decode Enable

This field refers to the decoding of the national/international bits in time slot zero. At present, this feature is disabled (`DISABL`).

Signal Type

Selects whether **`CAS`** (Channel Associated Signaling) or **`NO CAS`** is used.

NOTE

*No CAS is not equivalent to **CCS** (Common Channel Signaling). CCS is **not** currently supported. CCS is supported as a transparent circuit for processing by remote customer equipment. One or more channels (64 Kbps DS0) can be handled in this way; CCS is configurable on a per channel basis. All background signaling bits for a CCS transparent circuit are forced to mark, in order to conserve priority control bandwidth throughout the TMS network and enable faster byte synchronization.*

CRC4 Enable

Selects whether `CRC4 Enable` (Cyclic Redundancy Check) is **`ENABLED`** or **`DISABLED`**.

NOTE

It is important that, during configuration, the Signal Type and CRC4 options match the switch settings of the E1 I/O cards.

IAC-ATT Specific Port Configuration

In addition to the common fields discussed previously, the IAC/ATT Port Configuration Screen contains the following fields:

Destination Type

This selection allows you to designate the specific application to which the port is being assigned. You can select either **`ISDN NETWORK`** or **`NO PORT`**.

Changing any saved options may require deletion of existing bundles. When this occurs, you are prompted with messages to confirm the action.

When **`NO PORT`** is selected for a port, the activity on this port is disabled for the network. The **`NO PORT`** option is not valid for Port A.

Reconnection Interval

Displays the number of seconds that the IAC Module waits before it retries a call setup. The range is selectable from **10 sec** to **600 sec**.

Reconnection Attempts

Displays the number of times that the IAC Module retries a call setup before reporting a link failure. Highlight this field and press Enter until the desired number of attempts (**1** to **10**) is selected.

Access Provider

This field allows you to select alternate service providers. When ISDN expands with alternate carriers, the access provider and carrier may be different. In such cases, the first point of connection to the ISDN switch determines the proper entry for this and the next field. Valid selections are **AT&T**, **Sprint**, **MCI**, and **RBOC**.

Switch Type

This field indicates the type of central office switch used by the access provider for ISDN services. The Switch Type governs what size of bundles may be configured. Valid selections are **ATT4ESS**, **ATT5ESS**, **DMS-250**, **DMS-100**, **DMS-200**, **DMS-300**, and **None**. ATTnESS type switches accommodate B (1 DS0) or H0 (6 DS0) bundles. NTI (DMS-nnn) type of switches accommodate Nx64 bundle sizes which may be 1 to 23 DS0s.

Carrier Provider

This is where the carrier providing the ISDN PRI service is recorded. Various carriers are selectable. In this field, the system may be set for tariffed services that may vary even when the ISDN switches are identical, allowing differentiation beyond the basic switch type. Valid selections are **AT&T**, **Sprint**, **MCI**, and **RBOC**.

Line Encoding

This selection specifies the line encoding format used for this particular IAC-T1 port. Line encoding options are **B8ZS** (B8 zero suppression) or **AMI/B7** Channelized.

Frame Format

Specifies what method is used for IAC frame formatting. Selections available are **T1D4** or **ESF** (Extended Superframe).

Port Interface

The port interface type for the network, 23B+D.

Primary Links

When this field is selected from the IAC port configuration screen and Enter is pressed, the IAC Bundle Configuration screen appears. This screen allows you to configure the bundle types and their destinations. The fields on this screen are described later in this chapter.

Backup Links

When this field is selected from the IAC port configuration screen and `Enter` is pressed, the `Configure Backup Links` screen appears. This allows you to configure backup links. The fields on this screen are described later in this chapter.

Bundle Configuration (CDA and IAC)

The following sections provide the procedures for configuring CDA and IAC Bundles.

Bundle configuration allows you to group one or more DS0s in a bundle, to specify the type of the bundle, and to define other characteristics. *See Figure 7-2.*

```
CDA-T1 Bundle Configuration          Net1                      30-MAR-1996 10:45:08
Page 1 of 1
Node Name: C           Type: TMS     Slot: 9        Destination: REMOTE CDA/OCM

Bundle      DS0    DS0             Destination Node                Bundle
ID   Type  Start  Cnt    Type  Name        Addr   Slot  Pt  DS0   Name

 1   LINK  1       1     TMS     B         002      9    A    1    B9A-C9A
 2   OPEN  2       23
```

Figure 7-2 CDA-T1 Bundle Configuration Screen

NOTE

The numbering system for CDA-E1 is 0-based; CDA-T1 and IAC-T1 are 1-based. But DS0 is reserved and not available for user configuration.

Bundle Configuration Screen

The following parameters appear on the `Bundle Configuration` screen.

Bundle ID

A unique number (the starting DS0 number of that bundle) that identifies the specific link that is being configured. Pressing `Enter` while occupying this field accesses the `Bundle Details` screen (described later in this chapter) which configures the subaggregate information for this bundle.

Bundle Type

A group of DS0s having a common termination point. Selections are **OPEN**, **LINK**, **CLR**, **DTEC**, and **X50S**.

OPEN is a space holder of open DS0s that provide flexibility for future configurations or changes.

LINK bundle types define a destination point from one CDA Module to another CDA or LIM Module.

DTEC is selected for bundles that end at a termination point, typically a channel bank or subrate multiplexer.

CLR defines a terminating point of a bundle, and is used only for configuring clear channels. This selection is not available for OCM connections.

X50S - The TMS-3000 CDA can switch X.50 type subrate circuits. These circuits are carried in up to 32 X.50 type frames. The total number of circuits cannot exceed the total CDA card limit of 256 channels for CDA-256 and 126 channels for CDA-128.

The following chart shows applicability of the selections to the particular module type:

Type	OPEN	LINK	DTEC	CLR	X50S
CDA-T1	*	*	*	*	*
CDA-E1	*	*	*	*	*
IAC-T1	*	*	*	*	
LIM (DSX1 type)	*	*	*		
LIM (V.35 type)	*	*			
BQM LIM	*	*	*		

For link type bundles the following interconnections are allowed:

IAC-T1 to other IAC-T1 bundles

IAC-T1 to OCM LIM V.11, V.35

IAC-T1 to CDA-T1

IAC-T1 to CDA-E1

CDA-T1 to CDA-T1 or CDA-E1 bundles

CDA-T1 to IAC-T1

CDA-T1 to OCM LIM V.11, V.35

CDA-T1 to OCM LIM-DSX1

CDA-T1 to OCM LIM CSU

CDA-T1 to OCM LIM BQM

CDA-E1 to CDA-T1 or CDA-E1 bundles

CDA-E1 to IAC-T1

CDA-E1 to OCM LIM-E1

CDA-E1 to OCM LIM-DSX1

CDA-E1 to OCM LIM CSU

CDA-E1 to OCM LIM V.11, V.35

CDA-E1 to OCM LIM BQM

DS0 Start

Specifies the starting DS0 time slot for this bundle. This number is used as a reference throughout the system to specify this group of DS0s.

NOTE

If the only communications to a remote node is via a CDA subaggregate, and a new configuration changes that subaggregate DS0 start position, communications may be lost to that node. To recover communications, access that node via dial backup or clear the configuration of the remote CDA. This is not a problem with the IAC.

DS0 Count

You can specify the number of DS0 channels allocated to this bundle. For CDA-T1 the range is from **1** to **24**. For CDA-E1 the range is from **1** to **31**. For IAC-T1, the choice is **B** (1 DS0) or **H0** (6 DS0s) for ATT5ESS and ATT4ESS. For DMS-100, 200, 250, and 300, the choice is **Nx64** (1 to 23 DS0s).

If configuring from the LIM (V.11/V.35) side, initially the LIM does not know if the destination is a CDA or IAC. For example, if the DS0 Count (DS0 Cnt) is set to **1**, when the Destination Node is selected and the address is for an IAC, the DS0 Count automatically changes to B (representing 1 DS0).

If **LINK** is selected, the following fields must be entered:

Destination Node Name

The name of the destination node in the network.

Destination Node Slot

The slot number of the destination CDA/IAC/LIM card location in the main shelf.

Destination Node Port

The port where the defined bundle terminates at the destination node. Port selection is either **A** or **B** (displayed as * if the destination is a LIM).

Destination Node DS0

The starting DS0 number at the destination node.

Bundle Name

(For Link and X.50 Switching type bundles only. A unique name given to this group of DS0s used to identify this connection in the rest of the system.

Caller Type (IAC/LIM)

Specifies the caller type for an IAC/LIM port. The selections are **ORG** (Origination) or **DST** (Destination) or **Dedicated**. This field is used to identify which side of the ISDN link actually originates the ISDN call or whether the bundle is a CDA to CDA dedicated bundle type for fractional T1 use. An indication of ORG-DST in this field shows that the node indicated at the top of this screen is the originator of the call setup.

The originator of the call setup is designated as ORG (originator), and the receiver of the call setup is designated as DST (destination). The first three characters indicate the call setup capabilities of the local end of the bundle on the port listed at the top of the screen. The second group of three characters indicate the call setup capabilities of the other end of the bundle.

	ORG-ORG	ORG-DST	DST-ORG	DST-DST	Dedicated
IAC-T1	No	Yes	Yes	Yes	No
LIM	No	No	Yes	No	No
CDA	No	No	No	No	Yes

For clear type bundles on IAC-ATT, only **`DST-***`** and **`ORG-***`** are available as caller type choices.

The following fields are shown, but do not permit an operator entry:

Destination Node Type

`TMS`, `TMSC`, `OCMS`, `OCME` (OCM Shelf, OCM Enclosure).

Destination Node Address

The address of the destination node in the network.

Configure Backup Links (IAC)

Backup Links can be configured for IAC cards. The following procedure provides you with a procedure to configure an alternate link for primary links in the event of link failure.

Configure Backup Links Screen

When **`Backup Links`** is selected from the `IAC Port Configuration`, the `Configure Backup Links` screen appears (LIM backup links were covered in *Chapter 4*). The following paragraphs provide a brief description of each field on this screen.

Source Node Name

The name of the node in which the IAC Module is currently residing. The node name was previously defined through the `Create/Modify Node` routine.

Node Address

The node address in which the IAC Module is currently residing. The node address was previously defined through the `Create/Modify Node` routine.

Slot

The slot number in the TMS-3000 or TMSC shelf in which the IAC Module is currently residing. The slot number was previously defined through the `Create/Modify Node` routine.

Port

Defines the port (`A` or `B`) of the IAC Module for which you are configuring backup links.

Interface Type

This field displays the interface the ISDN network is using. The interface field was previously defined in the IAC Port Configuration screen.

Add Link:

This field allows you to input a name for the new back-up link. Once it has been added the name is displayed on the screen (e.g., NX-NZ).

— The identification number of the backup link.

D — Deletes the link if selected.

Link Name

Name of the link defined in the Add Link: field appears here.

Type

The selection allows for the configuration of the back-up subaggregate to accommodate the various types of channels used in the ISDN networks. At the bottom of the Configure Backup Links screen, a legend defines each type. B-channels use one DS0 (B - 1 DS0). H0 channels use six DS0s (H0 - 6 DS0s) and H11 channels use 24 DS0s (H11 - 24 DS0s). For IAC-T1, band H0 channels are supported. B and H0 are supported for ATT type switches. Nx64 is supported for DMS type of switches.

Node Name

Destination node name for the backup IAC link.

Node Address

Destination node address for the backup IAC link.

Slot

Destination node slot number in the TMS-3000 or TMSC main shelf for the backup IAC link.

Port

Destination node port indicator in the destination IAC Module.

Caller Type

Specifies the caller type for an IAC port. The selections are ORG (Origination) or DST (Destination). This field is used to identify which side of the link actually originates the call. An indication of ORG-DST in this field shows that the node indicated at the top of this screen is the originator of the call.

Backup Link Alarm Suppression (CDA/OCM)

Backup Link Alarm Suppression allows CDA/OCM `TMS` or `TMS/Network` bundles to be designated and used as backup links.

To designate a bundle as a CDA backup, enter the name of the bundle in the `Backup Link` field of the `Bundle Details` screen of some other link or links. CDA backups can back up any link type: ACC, IAC, CDA. On the `Bundle Details` screen of the backup bundle, the `Backup Link` field is filled with asterisks (`*`). These bundles also display `Backup` instead of `Permanent` in the LIM or CDA `Sub-Aggregate Summary` screen (Node Diagnostics). A bundle ceases to be treated as a CDA backup link when the name is removed from the `Backup Link` field of all links that it had been backing up. When CDA backup links are present in the configuration, four new IAR status line messages may appear (Examples are shown below). All of these messages are informational only.

```
Initializing backup link: node 5, slot 12, subagg A-1
Deconfiguring backup link: node 5, slot 12, subagg A-1
Activating backup link: node 5, slot 12, subagg A-1
Deactivating backup link: node 5, slot 12, subagg A-1
```

`Initializing` indicates that the given bundle has just been named as a CDA backup link.

`Deconfiguring` is similar, and indicates that the named bundle is no longer receiving special treatment as a backup.

`Activating` means that IAR has learned of a link down condition on one of the primary links, and is now treating the backup as active.

`Deactivating` indicates a transition to idle.

These messages also appear on slave controllers, once they have received the relevant events from the master controller. In each TOR/DRR configuration, all links can be selected as `Enable`, `Disable`, or `BU.Dsbl`. These settings affect CDA backup links as follows: For the backup link, **`Enable`** is the normal setting. **`Disable`** causes the backup to activate and deactivate, but an activated, disabled backup link does not receive circuits. A **`BU.Dsbl`** backup bundle is permanently idle while that TOR/DRR config. is active. For the backed-up link, **`Enable`** and **`Disable`** selections operate normally; **`BU.Dsbl`** indicates that the failure of this link, while in this configuration, does not cause the backup link to activate. But the backup may still be activated by link down events on other links it backs up.

Common Bundle Detail (CDA and IAC)

After information is correctly entered on the Bundle Configuration screen, you must enter more specific details on the `Bundle Details` screen (LIM bundle configuration is covered in *Chapter 4*).

Bundle Details Screen

To enter this screen (*See Figure 7-3*), move the cursor to highlight Bundle Id # on the `Bundle Configuration Screen` and then press `Enter` or **`F4`**. A `Bundle Details` screen appears. This screen displays the pathway of the bundle from the local node to the destination node, its addresses, ports, bundle type, and any other specific operating environment parameters.

```
CDA-T1 Bundle Details            Net1                       30-MAR-1996 11:10:38
Link Name  B9A-C9A                                                 Page 1 of 2
--------------------------------------------------------------------------------
     Local Node        Slot       DS0        Remote Node       Slot       DS0
Name            Addr         Port           Name          Addr      Port
C                3       9     A   01          B             2     9    A    01

Destination             Bundle                 Conditioning         Error
Type                    Type             Circuit        Signaling    Threshold
REMOTE CDA/OCM          TMS               No Conditioning / Free     OFF

Aggregate       Overhead        IAR Event Delay Timer      IAR/DRR       SVR
Sync Rate       Comm             Initiation  Restoral      Enable        Enable
200Hz           9600Hz             10 sec    10 sec        Enable        Enable

        Backup Link      Link             Error            Percentage
           Name          Delay            Rate             Available
                         0 ms             1.0 E-9           100%

                                          Next Page
```

```
CDA-T1 Bundle Details              Net1                       30-MAR-1996 11:10:50
Link Name  B9A-C9A                                                     Page 2 of 2

--------------------------------------------------------------------------------
     Local Node        Slot       DS0        Remote Node       Slot       DS0
Name            Addr         Port           Name          Addr      Port
C                3       9     A   01          B            2     9    A    01

                Link Attributes            Link Qualifiers
            Category         Value       Category        Value

Link Enable/Disable Status (16 TOR/DRR Configurations)
CO1     Enable   CO2        Enable    C03   Enable    C04  Enable
CO5     Enable   CO6        Enable    C07   Enable    C08  Enable
CO9     Enable   CO10       Enable    C11   Enable    C12  Enable
CO13    Enable   CO14       Enable    C15   Enable    C16  Enable

                                          Previous Page
```

Figure 7-3 Bundle Details Screen

The following fields of the `Bundle Details` Screen are common to the CDA-T1, CDA-E1, and IAC versions of the `Bundle Details` screen.

Error Threshold

This field enables you to set an error rate threshold limit on the subaggregate such that when that error limit is reached an alarm is raised. This value is selectable from 1.0 E-3 through 1.0 E-6 (10^{-3} through 10^{-6}). You can also disable `Error Threshold` by selecting **`OFF`**. The alarm indirectly triggers IAR if IAR is enabled. For X50S, this field is set to **`OFF`**.

Conditioning (Circuit/Signaling)

This field selects the type of conditioning used in the network. The conditioning is set by the network and this field must match the circuit conditioning for the network. In the case of a direct CDA/IAC connection, this conditioning is determined by the type of circuits routed over this connection. The conditioning is applied by the CDA/IAC module during a subaggregate out-of-sync condition. This field must match the circuit conditioning for the circuits routed in this bundle. The choices for Network Bundles are **Mux Out-Of-Sync**, **Trouble Code**, **Trouble Code A0/1+B0/1**, **Trouble Code A0+B0**, **Trouble Code A0+B1**, **Trouble Code A1/0+B1** and **No Conditioning**. For TMS/Network Bundles you can select **Mux Out of Sync**, **Subaggregate/None** and **Mux Out of Sync/Subaggregate**. For TMS Bundles, the choices are **Mux Out of Sync** and **Subaggregate**. For CDA-T1, **No Conditioning** is allowed for a network connection. Circuit conditioning for direct remote conditioning is free, which means that the card generates appropriate conditioning based on the circuits that are routed across the bundle. For X50S, this field is `Channel Mark Hold` .

Figure 7-4 is an example of the `Bundle Details` screen for X50S.

```
CDA-E1 Bundle Details             X50SW                        16-MAY-1996 14:10:12
X50 Switching Subaggregate Name F2A

--------------------------------------------------------------------------------
                Local Node  Slot        DS0
Name                  Addr       Port
 A                     1     3     A     04

Subagg           Conditioning                      Error        Aggregate
Type             Circuit      Signaling            Threshold    Sync Rate
X50d2              Channel Mark Hold                 OFF          7200 Hz

                              Examine Bandwidth
```

Figure 7-4 Bundle Details Screen (X.50 Switching)

Subaggregate Conditioning (CDA only) – **Subaggregate** is another choice for circuit conditioning type and is available as a bundle configuration parameter for voice and data circuits. Its purpose is to squelch noise bursts that may occur on a voice circuit when a subaggregate loses synchronization. Note that subaggregate conditioning should only be used on TMS subaggregates and is normally not an option for TMS/Network bundles; if used for TMS/Network bundles, it is used only for TMS subaggregates and Network subaggregates use the optional conditioning.

Aggregate Sync Rate

This field is only valid for TMS and TMS/ Network bundle types. This allocates bandwidth for the subaggregate synchronization information. The choices are **200Hz**, **400Hz**, **800Hz**, and **1600Hz**. For X50S, the values are `7200 Hz` for `X50d2`, `7600 Hz` for `X50d3`.

NOTE

X50d2 refers to X.50 Division 2. The X50d2 frame consists of 80 envelopes.
X50d3 refers to X.50 Division 3. The X50d3 frame consists of 20 envelopes.
Rates below 2400 can terminate on X50d2 bundles only.

Overhead Comm

This field is only valid for TMS and TMS/Network bundle types. This allocates the amount of bandwidth reserved for supervisory communications in the network. Choices are **300Hz**, **1200Hz**, **4800Hz**, **9600Hz**, and **19.2KHz**.

Table 7-1 and Table 7-2 provide guidelines for selecting overhead communication rates. Determine the minimum communications rate based on the number of TMS/OCM subaggregates and ESF ports.

ESF is used only on T1 cards; for E1, the number of ESF ports is 0. If ESF is required, consider using the **ESF-NDL** (ESF-No Data Link) option on the port (See Port Configuration screen). This is the same as ESF except the card does not respond to the central office requests via the ESF data link. **ESF-NDL** has no adverse effect on communications.

These numbers are guidelines. The Controller permits configurations with more subaggregates than are recommended, but long term communication stability may suffer. If problems do occur, the number of subaggregates must be decreased or the communication rates increased.

Communication problems are in the form of:

- Spurious SAGG DOWN alarms, usually occurring during reconfigurations. If this alarm persists longer than the IAR Initiation Timer and IAR is enabled, the alarm causes an IAR. To avoid the IAR, the IAR Initiation Timer for the subaggregates should be 20 seconds or longer. If you need to reset this timer, refer to *Chapter 15*.
- Degradation of IAR performance.
- User Reset alarms and/or IN-OP BUSY alarms.

Table 7-1 Maximum Number of TMS/OCM Subaggregates per IAC Card

		Communications Overhead Rate				
		300 Hz	1200 Hz	4800 Hz	9600 Hz	19200 Hz
Number of ESF Ports	**0**	4	4	8	16	32
	1	3	3	4	8	16
	2	2	2	2	2	2
	300 Hz should be used only on tail nodes.					

Table 7-2 Maximum Number of OCM Subaggregates per CDA Card

		Communications Overhead Rate			
		1200 Hz	4800 Hz	9600 Hz	19200 Hz
Number of TMS Subaggs. with Comms.	0	32	32	32	32
	1	24	28	29	30
	2	16	24	26	28
	3	8	20	23	26
	4	0	16	20	24
	5	x	12	17	22
	6	x	8	14	20
	7	x	4	11	18
	8	x	0	8	16
	9	x	x	5	14
	10	x	x	2	12
	11	x	x	1	10
	12	x	x	1	8
	13	x	x	1	6
	14	x	x	1	4
	15	x	x	1	2
	16	x	x	1	1
	17 - 31	x	x	x	1
	32	x	x	x	0

"x" indicates that the mixture of subaggregates is beyond the reliable limits of the CDA card.

Bundle Type

You may specify three types of bundles: **`Network`**, **`TMS/Network`** and **`TMS`**. A Network bundle contains no overhead or sync rates. It can contain network circuits only. The Network type bundle comprises single or multiple DS0 time slots, and carries multiple circuits. The allowable circuit types are **`Switched Msg/Private Line`**, **`Switched Special Foreign Exchange`**, **`Transparent Voice`**, **`Data`**, **`E1 Voice Non-transparent`**, and **`E1 Data Non-transparent`**. Certain channel types are only permitted over certain conditioning options. Foreign Exchange (FX) is a telephone line arrangement where calls into the switched network from a customer location enter the network through a Central Office other than the one that normally serves the customer location. In communications systems, FX is a service in which a user end device can be connected to a user end device in another country.

The TMS bundle can be used to transmit TMS data (i.e., data framed in GDC proprietary format), so only TMS circuits can be routed over this bundle. The Network bundle, however, can be used to transmit non-TMS data (i.e., data not framed in GDC proprietary format). Only network circuits can be routed over this bundle. Only TMS or TMS/Network bundles carry CDA to CDA overhead communications as well as synchronization information. Both types comprise single or multiple DS0 time slots and can carry multiple circuits.

You should be aware of a side effect of the use of TMS/Network bundles. If an IAR occurs which changes the total number of network DS0s, then all circuits or all circuits/bundles are bumped for up to several minutes. This is avoided by using network bundles.

For network diagnostic purposes, each network circuit placed by IAR within a link bundle is allocated its own subaggregate whereas all TMS-3000 channels within a link bundle are allocated to a single subaggregate.

IAR Event Delay Timer

You can set two timer values in the `IAR Event Delay Timer` to allow the Controller to test for link stability before initiating an IAR recovery. They are referred to as the `Initiation` Delay and the `Restoral` Delay respectively.

After a link failure is reported, the initiation timer is started. Only after the initiation delay has passed without the link recovering is the IAR link failure processing initiated. Similarly, on a link recovery, the restoral timer is initiated. Only after the restoral delay has passed without the link failing again is the IAR link recovery processing initiated.

In addition, if a link fails and recovers quickly, a mechanism exists to declare the link down. If a link fails 10 times without ever recovering for a period equal to the restoral delay, and these rapid link failures and recoveries persist for a time greater than the initiation delay, the IAR link failure algorithm is invoked.

The initial default settings of the timers are:

`Initiation` — `3` seconds for TMS aggregates, `20` seconds for CDA/IAC bundles.

`Restoral` — `60` seconds for TMS aggregates and CDA/IAC bundles.

The default timer settings may be changed on the `IAR Defaults` screen (*Refer to Chapter 15*). The value for the specific TMS aggregate of a CDA/IAC bundle also may be changed on this screen.

IAR/DRR Enable

The ability to disable the reaction of IAR/DRR to failure events on this bundle. To disable this function, highlight **`Enable`** and press `Enter`. Dial backup connections are prevented when **`Disable`** is selected.

SVR Enable

This field indicates whether or not the link may be used for supervisory routing. If **`Disable`** is selected, the link is never used for supervisory routing.

Link Delay

Expressed in milliseconds and amounts to the aggregate round trip delay divided by two. The default value is `0`. The range is from `0` to **`999`** `ms`.

Error Rate

By setting an error rate value, determined by the historical performance of the link, you provide IAR information that is used to determine routing preferences. Expressed in terms of < 1 error in 10^n, where n is a value from 2 to 9. Circuits are routed on the best link for the application.

Percentage Available

The amount of time the aggregate is expected to be up and running. It is expressed as a percentage with 100% as the highest value. The default value is `100%`. The range is from 0 to 100% in 1% increments.

Backup Link Name (IAC, LIM V.11/V.35)

This field is to be used to specifically identify a particular backup bundle link to be set up when this link fails. The backup bundle name is entered here.

Link Attributes

Link Attributes are defined in `Modify IAR Defaults` (*Refer to Chapter 15*). That routine provides you with the ability to define restrictions for each circuit. The following options are available:

- **`Mandatory`** — Only links possessing this attribute (Yes) are allowed to comprise a segment of this circuit path.
- **`Desirable`** — If possible the IAR algorithm attempts to route circuits with this profile only on links possessing this attribute.
- **`Undesirable`** — If possible, the IAR algorithm attempts to route circuits with this profile only on links not possessing this attribute.
- **`Not Allowed`** — No links possessing this attribute (No) are allowed to comprise any segment of this circuit path.
- **`Don't Care`** — Possession of this attribute on a particular link does not affect routing decisions for circuits using this profile.

If Link Attributes were previously defined, on this screen (`Bundle Details`) you select whether each attribute is possessed by this bundle. If you need to define Link Attributes, *refer to Chapters 15* and *16*.

Link Qualifiers/Circuit Attributes

Used to identify a relationship between a circuit and the link it traverses. The circuit passes across the link if it meets any of these conditions:

- The circuit attribute and the link qualifier are the same
- The link qualifier is `Don't Care`
- The circuit attribute is `All`

If Link Qualifiers were previously defined, on this screen (`Bundle Details`) you select whether each qualifier is possessed by this bundle. If you need to define Link Qualifiers, *refer to Chapters 15* and *16*.

TOR/DRR Configuration

If the CDA/IAC bundle is to be allowed to pass data in a designated TOR/DRR configuration, then the CDA/IAC bundle must be enabled. The Configuration names appear on the screen. To enable this bundle for operation in a TOR/DRR configuration, highlight the `Enable/Disable/BU.Dsbl` field and press `Enter` until **`Enable`** appears To disable the configuration, press `Enter` until **`Disable`** appears. The **`BU.Dsbl`** choice in this same field is used in conjunction with the diversity dial backup mode that is used with Sync Status Modules. If **`BU.Dsbl`** is selected, dial backup connections are prevented, including dial backup connections for IAC backup links. The **`Disable`** selection also prevents any dial backup connections.

For backup links, enabling the link in an TOR/DRR configuration causes the call to be set up when the TOR/DRR configuration is active.

CDA Specific Bundle Detail

A `CDA/IAC Channel Bandwidth` screen appears if you press the **`F4`** key while configuring a `DTEC` or `CLR` type bundle. This displays bandwidth information specific to this `DTEC` or `CLR` bundle. Presented below is information that describes the fields in the `CDA Channel Bandwidth` screen.

Node Name

Name of the node in the network.

Addr.

Address of the node in the network.

Slot

Slot number of the selected CDA Module in the main shelf.

Port

Which port (`A` or `B`) is configured with this DTEC type bundle.

DS0#

Starting DS0 number of this bundle.

Size

Number of byte-oriented DS0s in this bundle.

Config Name

Name of the TOR configuration.

Total Available Bandwidth

Amount of bandwidth available to configure Network circuits terminating on this bundle.

Number of Channels Used

Number of circuits terminating on this bundle.

Total Channel Bandwidth Used

Amount of Channel Bandwidth consumed by circuits terminating on this bundle.

Bandwidth Remaining

For each specific configuration, a `Bandwidth Remaining` figure is displayed. This number is based on those circuits configured with an end channel module communicating through the displayed CDA Module. The sum of the bandwidths of those circuits is subtracted from the Controller Rate, along with a standard amount for overhead. The `Bandwidth Remaining` figure indicates how much bandwidth is available for configuration of additional circuits through the CDA Module.

Enable Status

Indicates whether the selected link is either enabled or disabled.

IAC Specific Bundle Detail

In addition to the common fields discussed previously, the IAC-T1 version of the screen contains the following fields (LIM bundle configuration is covered in *Chapter 4*):

Telephone Number – Local

The dial number for the local end of the link. This is defined by the ISDN service provider. This field should be identified before any attempt can be made at assigning subaggregates to the IAC/LIM. A maximum of 16 digits can be entered in this field.

Telephone Number – Remote

This is the dial number assigned to the subaggregate remote termination point. The destination number, like the source number, must be obtained from the ISDN service provider. A maximum of 16 digits can be entered in this field.

Numbering Plans Local/Remote

This selection indicates the specific numbering plan to be used for calls. The numbering plan structure allows for up to 17 digits in the dial number and is varied as applicable. The structure and digits of the numbering plan are defined by the ISDN service provider. The choices are **UN-KNOWN**, **ISDN/TELEPHONY**, and **PRIVATE**.

Numbering Types Local/Remote

This field allows you to add a customized call routing in addition to the basic ISDN Dial Number for the source and destination telephone numbers. This can provide forms of private call routing between TMS-3000 nodes, or can be used for specialized local, national, or international call routing.

The choices are **UNKNOWN**, **INTERNATIONAL**, **NATIONAL**, and **LOCAL**.

Phone Number Check

Two fields, `Local` and `Remote` are displayed. The Remote field enables/disables the option of validating the telephone number of an incoming call. Choices are **ON** and **OFF**. The Local field is not changeable and is set at `ON`.

Selecting **Next Page** gets you to the next screen of `IAC Bundle Details` which is the same as the screen for CDA Bundle Detail.

Summary

The CDA Module provides the TMS-3000 compatibility with a DACS (Digital Access Cross-connect) network, while providing the capability to place TMS-3000 channels onto a DS1 aggregate under a DS0 (byte-oriented) frame format. The IAC module has the same functionality as the CDA with the addition of ISDN signaling support.

In this chapter we covered the procedures for configuring ports for CDA and IAC cards. Configuring IAC backup links and configuring Bundles was also covered.

What's Next?

In Chapter 8, we cover TPP Port configuration.

8 TPP and OPP Port Configuration

Overview

The TMS Packet Processor (TPP) and OCM Packet Processor (OPP) allow the consolidation of LAN and Frame Relay traffic from hundreds of remote locations using packet processing technology.

TPP and OPP Port Configuration is covered in this chapter.

NOTE

Although these options appear on the TMS Controller, the TPP and OPP cards do not support:

TPP Redundancy
Microcell
SNA/SDLC
PIR

Please refer to the appropriate version of the TPP and OPP release notes.

TPP and OPP Port Configuration

While in the `Node Configuration` screen, highlight the slot number for the TPP or OPP card and press `Enter`.

Be sure that you configure the slot to match the installed hardware.

TPP and OPP Port Configuration Screens

The Controller displays the Port Configuration screen (*See Figures 8-1 and 8-2*), which includes the parameters described below.

NOTE

The TPP does not support the external DB-25 interfaces, Port A and Port B. The OPP supports only Port A.

Node Alloc Bandwidth (TPP Only)

(Limited Range Entry) — This parameter defines the amount of bandwidth allocated to this TPP (*See Figure 8-3*). It is the sum of data rates for all TPP pathways allocated to this TPP, and is limited to 7.656 MHz, not including the two external DB-25 interfaces. As you change this parameter, the `Effective Node BW` field displays the effective bandwidth of the node.

Node BW Remaining (TPP Only)

This field displays the amount of bandwidth remaining in the node.

```
 TPP Port Configuration       Net1                          11-MAY-1996 11:51:47
Node                                 MicroCell    Alloc    Node BW  Effective
 Name           slot    MicroCell    Bandwidth  Bandwidth Remaining  Node BW
 TPP 1            5      Disable      n/a        1.056MHz  5.280MHz  1.024MHz
Network MAC Address
02-C0-64-xx-xx-xx
                           << Examine Bandwidth >>
--------------------------------- PORT A -----------------------------------
 Type         Rate    Mode         Encoding    CRC Size    Xmit/Recv Clock
 None
 Control Type                      UIO SIP

 Transmit         RTS      -
 EIA
--------------------------------- PORT B ----------------------------------
 Type         Rate    Mode         Encoding    CRC Size    Xmit/Recv Clock
None
 Control Type                      UIO SIP

 Transmit         RTS      -
 EIA
```

Figure 8-1 TPP Port Configuration Screen

```
OPP Port Configuration       Net1                          11-FEB-1996 11:51:47

Node Name        Addr    Slot    Network MAC Address
OPP 1            F0001    7      0A-C0-64-60-00-10

--------------------------------- PORT A -----------------------------------
 Type         Rate    Mode         Encoding    CRC Size    Xmit/Recv Clock
None         9.600K  FULL DUPLEX    NRZI        CRC-16       INT-INT
 Control Type                      UIO SIP
 NO CONTROLS                        Fixed
 Transmit         RTS      -
 EIA              F-On    F-On
```

Figure 8-2 OPP Port Configuration Screen

Effective Node BW (TPP Only)

This field displays the effective node bandwidth, which is the node total allocated bandwidth less overhead.

NOTE *TPP bandwidth is explained in more detail in GDC 036R304-000.*

Network MAC Address

The Network MAC Address ID is a unique number assigned to each controller-based TMS-3000 network within an FSN (Frame Switching Network). *Network MAC Address is covered in detail in Chapter 4.*

Examine Bandwidth (TPP Only)

This accesses the `TPP Bandwidth` screen (*See Figure 8-4*), which displays the fields described below for each configuration that you have set up.

`Config Name` – Displays the names of the active and inactive configurations.

`Channels-`

`Used` – Displays the number of channels used by the TPP for each configuration.

`BW Used` – Displays amount of bandwidth used by the TPP for each configuration.

`Bandwidth Remaining` – Displays the amount of bandwidth available for configuring additional circuits for each configuration.

```
Node Alloc Bandwidth           Dallas                   12-JUN-1996 08:03:48
Node Name N62                Node Address    62       Slot 1
------------------------------------------------------------------------------
None       66.00KHz   132.0KHz   198.0KHz   264.0KHz   330.0KHz   396.0KHz   462.0KHz
528.0KHz   594.0KHz   660.0KHz   726.0KHz   792.0KHz   858.0KHz   924.0KHz   990.0KHz
1.056MHz   1.122MHz   1.188MHz   1.254MHz   1.320MHz   1.386MHz   1.452MHz   1.518MHz
1.584MHz   1.650MHz   1.716MHz   1.782MHz   1.848MHz   1.914MHz   1.980MHz   2.046MHz
2.112MHz   2.178MHz   2.244MHz   2.310MHz   2.376MHz   2.442MHz   2.508MHz   2.574MHz
2.640MHz   2.706MHz   2.772MHz   2.838MHz   2.904MHz   2.970MHz   3.036MHz   3.102MHz
3.168MHz   3.234MHz   3.300MHz   3.366MHz   3.432MHz   3.498MHz   3.564MHz   3.630MHz
3.696MHz   3.762MHz   3.828MHz   3.894MHz   3.960MHz   4.026MHz   4.092MHz   4.158MHz
4.224MHz   4.290MHz   4.356MHz   4.422MHz   4.488MHz   4.554MHz   4.620MHz   4.686MHz
4.752MHz   4.818MHz   4.884MHz   4.950MHz   5.016MHz   5.082MHz   5.148MHz   5.214MHz
5.280MHz   5.346MHz   5.412MHz   5.478MHz   5.544MHz   5.610MHz   5.676MHz   5.742MHz
5.808MHz   5.874MHz   5.940MHz   6.006MHz   6.072MHz   6.138MHz   6.204MHz   6.270MHz
6.336MHz   6.402MHz   6.468MHz   6.534MHz   6.600MHz   6.666MHz   6.732MHz   6.798MHz
6.864MHz   6.930MHz   6.996MHz   7.062MHz   7.128MHz   7.194MHz   7.260MHz   7.326MHz
7.392MHz   7.458MHz   7.524MHz   7.590MHz   7.656MHz
```

Figure 8-3 Node Allocated Bandwidth Screen

```
TPP Bandwidth              NET1                        14-MAY-1996 11:08:14
Local Node        Addr    Mode
TPP 2               2     TPP-FR /N.REDUND.64
________________________________________________________________________________
Config      Channels        Bandwidth    Config       Channels        Bandwidth
Name       Used  BW Used    Remaining    Name        Used  BW Used    Remaining

CO1         11    652.8KHz    1.395MHz    CO2          10    524.8KHz    1.523MHz
CO3         10    524.8KHz    1.523MHz    CO4          11    588.8KHz    1.459MHz
```

Figure 8-4 TPP Bandwidth Screen

Type (OPP only)

(Limited Range Entry) — This parameter defines the type of data traffic connected to the external DB-25 interface.

NOTE

Although `Type` *appears on both the TPP and OPP Port Configuration screens, the external DB-25 ports are supported only for OPP.*

Choices are:

- **`None`** — Not connected (When you select **`None`**, the fields for all other parameters are blank.)
- **`HDLC`** — HDLC pass-through
- **`SDLC`** — SNA/SDLC pass-through
- **`FR-DTE`**, **`FR-DCE`** — Frame relay traffic
- **`NODAL`** — Internodal link to an OPP in another FSN node, or to an XL router via a CIC

Rate

(Cursor Position Entry) — This parameter defines the external DB-25 interface synchronous data rate. To display the list of rates, press `Enter`. If you wish to select a new rate, move the cursor to highlight the desired rate and press `Enter`. On the `TPP Port Configuration` screen, this field is blank.

Mode

(Limited Range Entry) — This parameter defines whether data transmission is half-duplex or full-duplex. If you need to use TMS-3000 control signals, select **`HALF DUPLEX`**. When you set `Type` to either **`FR-DCE`**, **`FR-DTE`**, **`FR-NNI`**, or **`NODAL`**, `Mode` is set to **`FULL DUPLEX`**. You can only set the `Mode` when the `Type` is `HDLC` or `SDLC`. On the `TPP Port Configuration` screen, this field is blank.

Encoding

(Limited Range Entry) — This parameter defines whether data encoding is non-return to zero (**`NRZ`**) or non-return to zero inverted (**`NRZI`**). NODAL and FR_NNI types can only be `NRZ`. On the `TPP Port Configuration` screen, this field is blank.

CRC Size

(Limited Range Entry) — This parameter defines whether the Cyclic Redundancy Check algorithm uses a 16-bit field (CRC-16) or 32-bit field (CRC-32). On the `TPP Port Configuration` screen, this field is blank.

Xmit/Recv Clock

(Limited Range Entry) — This parameter defines the transmit and receive timing sources for each end of the circuit. It is set at **`EXT-EXT`** (External Transmit/External Receive Timing) for an external DB-25 interface. **`INT-INT`** is also available. Both transmit and receive timing are received from equipment connected to the OPP. On the `TPP Port Configuration screen`, this field is blank.

Control Type

This parameter displays the state of TMS-3000 control signals. It is either `No Controls` (when you set `Mode` to **`FULL DUPLEX`**) or `Priority Ctls` (when you set `Mode` to **`HALF DUPLEX`**). On the `TPP Port Configuration` screen, this field is blank.

CTL1 (OPP only)

`CTL1` (EIA control signal RTS), is set to `Enable` when you set `Mode` to **`HALF DUPLEX`**. When `Mode` is set to **`FULL DUPLEX`**, this parameter is removed from the screen.

CTL2 (OPP only)

`CTL2` (EIA control signal CTS), is set to `Enable` when you set `Mode` to **`HALF DUPLEX`**. When `Mode` is set to **`FULL DUPLEX`**, this parameter is removed from the screen. `CTL2` can also be disabled as noted below. On the `TPP Port Configuration` screen, this field is blank.

Transmit EIA

(Limited Range Entry) — These parameters define whether EIA control signals RTS and CTS are Forced On (**`F-On`**), Forced Off (**`F-off`**) or passed through unchanged (`---`). If you set `Mode` to **`HALF DUPLEX`** and set `CTL2` to **`Enable`**, `RTS` and `CTS` are set to pass-through. If you set `CTL2` to **`Disable`**, `RTS` is set to **`---`**, and you can set `CTS` to **`F-On`** or **`F-Off`**. If you set `Mode` to **`FULL DUPLEX`**, you can set either to **`F-On`** or **`F-Off`**. On the `TPP Port Configuration` screen, this field is blank.

UIO SIP

(Limited Range Entry) — This parameter defines the electrical interface characteristics of the I/O module installed on the TPP for each of the external DB-25 interfaces. The choices are **`Fixed`**, **`V.35`**, **`EIA-422`**, and **`EIA-232`**. Select **`Fixed`** when an interface-specific I/O module is installed on the TPP. Select the desired interface from the other choices when a Universal I/O Single Inline Package (SIP) is installed. On the `TPP Port Configuration` screen, this field is blank.

Summary

The TPP and OPP allow the consolidation of LAN and Frame Relay traffic from hundreds of remote locations using packet processing technology.

In this chapter, we covered the port configuration procedures for the TPP and OPP cards.

What's Next?

In Chapter 9, we cover ACM Port configuration.

9 ACM Port Configuration

Overview

This chapter provides the procedures for configuring ports for ACM cards. The material is organized into the common procedures that apply to both ACM/T1 and ACM/E1 cards; Following the common procedures are procedures specific to the individual card types.

Topics covered in this chapter are:

- ACM Configuration
    - ACM Port Configuration
    - Common Port Configuration (ACM/T1 and ACM/E1
    - ACM/T1 Specific Port Configuration
    - ACM/E1 Specific Port Configuration
    - ACM bandwidth

ACM Port Configuration

This chapter describes how to use the Controller for ACM Port Configuration. ACM redundant operation is also covered.

ACM circuit configuration is described in *Chapter 18*.

NOTE

Attempting to configure options available in hardware revs -003 or later on a card rev less than 3 results in a configuration error on the card.

ACM Port Configuration Screen

The `Port Configuration` screen is used to configure ACM ports. This screen is accessed from the `Node Equipment` screen after selecting **`ACM`** as the desired slot equipment, placing the cursor on the slot number and pressing `Enter`.

Two port configuration screens are provided:

- T1 (for T1 line formats T1-D4, T1-ESF/ATT, or T1-ESF/ANSI)
- E1

The Port Configuration screen format varies depending on the Line Format selection (**`T1-D4`**, **`T1-ESF/ATT`**, **`T1-ESF/ANSI`** or **`E1`**). The portion of the screen above the dashed line is common to all Line Formats; the portion below the dashed line differs between the T1 and E1 versions of the screen. The example screens in this chapter are for the E1 version.

Before actually describing the port configuration procedure, background information concerning conditioning and signaling is provided to help you understand the configuration procedure.

Conditioning

The following are ACM user selectable options for `Unused Cr` (Circuit) `Conditioning` .

`A0` — 'A' bit steady low ("State 0," idle, on-hook).

`A1` — 'A' bit steady high ("State 1," busy, off-hook).

`A0/1` — 'A' bit low for 2.5 sec, followed by 'A' bit high for the duration of the failure (on-hook for 2.5 seconds to hang-up the call, then off-hook/busy to prevent usage of the circuit).

`A1/0/1` — 'A' bit high for 2.5 sec, followed by 'A' bit low for 80 ms, then 'A' bit high for the duration of the failure.

`A0+B0` — The on-hook (idle) condition is sent for 2.5 sec (to drop active calls), then remains on-hook and prevents ringing.

`A0+B1` — The on-hook condition is sent for 2.5 sec (to drop active calls), then remains on-hook (to prevent false ringing).

`A0/1+B0/1` — The on-hook condition is sent for 2.5 sec (to drop active calls), then changes to off-hook (to prevent seizure).

`A1/0/1+B1/0/1` — The off-hook condition is sent. After a delay of 2.5 sec, the circuit goes on-hook for 80 ms, then returns off-hook. This disables the alarm at the PBX.

`A1+B1` — Busy with no ringing (off-hook).

`Freeze` (Freeze Controls) — When detecting a loss of frame due to loss of synchronization, the on-hook and off-hook states presented to the channel units are maintained in the state that existed before detection of the out of frame condition. The signaling state is not changed until ACM regains synchronization or declares a Carrier Failure Alarm (CFA).

Signaling

Signaling refers to a means of conveying voice channel call setup and termination information between the PBX or channel bank equipment. On-hook (idle), off-hook (busy), and ring, are examples of signaling messages. In order to maintain compatibility in domestic and international public networks, ACM supports two basic types of network signaling, Robbed Bit Signaling (RBS) and Channel Associated Signaling (CAS). Common Channel Signaling (CCS) can also be supported as a passive pass-through application.

Because of the various requirements of different types of customer equipment, and to allow for a wide range of network configurations, several different methods for transporting signaling are required. The following types of signaling are supported at the ACM port level.

Channel Associated Signaling

Bit-oriented Channel Associated Signaling (CAS) is transferred on time slot 16 (DS016) and is performed by the ACM E1 I/O piggyback card.

Robbed Bit Signaling

Robbed Bit Signaling (RBS) is performed by the ACM T1 I/O piggyback card. If Robbed Bit Signaling is selected, ACM passes the AB (T1/D4) or ABCD (T1/ESF) bits through the system. If Robbed Bit Signaling is disabled, one of the following signaling systems must be enabled.

Inband Signaling

Inband Signaling (INB), uses tones (e.g., SF or MF) for both line and register signaling (the ACM forces the internal ABCD bits to 1s and performs no conditioning of signals).

Message Oriented Common Channel Signaling

Message oriented Common Channel Signaling (CCS) can be supported by configuring it as a pass-through circuit to permit processing by the remote DPBX equipment. For ACM/E1 version, one channel (64K-DS0, TS16) can be handled in this way (up to two channels if rev ≥ 3). All background signaling bits for a CCS transparent circuit are forced to mark in order to conserve priority control bandwidth throughout the TMS network and enable faster byte synchronization. If rev ≥ 3, a bundled channel of 5 DS0s – 320K, TS14 – 18 is also available for CCS.

Bit oriented Channel Associated Signaling (CAS) is transferred on time slot 16 (DS0#16) and is performed by ACM E1 I/O piggyback card.

Signaling Types

The following types of channel signaling are supported by ACM.

> ABCD — Forced to mark for inband or Common Channel Signaling
>
> two-state Signaling — A (E/M) for ACM or UVC
>
> four-state Signaling — A, B for ACM only (C=A, D=B)
>
> 16-State Signaling — A,B,C,D for ACM only (not available with D4)

NOTE

The ACM does not offer two-to-four state signaling conversions.

Different types of channel signaling can be selected for each channel based on specific needs of the existing equipment at the channels termination point.

As mentioned before, signaling is disabled for channels configured for inband signaling (SF, MF, DTMF, etc.) or Common Channel Signaling. If **`INB`** or **`CCS`** is chosen for a DS1 interface, Robbed Bit Signaling is disabled, and 8-bit PCM is always in use. For UVC and E1, the unused E&M(A) and ABCD bits may be forced to a desired state (1s or 0s). Two-State Signaling (A bit only) can be enabled for any or all channels and is required for proper operation by some DPBX equipment, and by the UVC. When two-state signaling is required, only the "A" bit is needed, but for ACM terminations "BCD" to the I/O interface is generated. In the U.S. T1 environment, when two-state signaling is enabled the "B," "C," and "D" bits are set equal to the "A" bit for network compatibility with T1-ESF links.

Four-state Signaling can be enabled for any or all ACM channels which terminate on another ACM, but cannot be used if the termination point is UVC. When four-state signaling is enabled, the "C" bit is set equal to "A," and the "D" bit equal to "B" for network compatibility with T1-ESF links. In the ITU-T environment, "CD" bits are set to "01."

Sixteen-State Signaling is only used in DPBX to DPBX (ACM E1 to ACM E1), applications. Sixteen-State signaling allows all four bits to change independently of the other three bits.

NOTE

Each ACM uses 800 Hz of control bandwidth for sending the A,B signaling bits to the Fast Bus. This is done by sampling the signaling of each ACM channel regardless of the ACM or channel configuration. This amounts to 800 Hz (E1/T1) per circuit.

Common Port Configuration (ACM/T1 and ACM/E1)

The following fields of the Port Configuration screen are common to both the ACM/T1 and ACM/E1 versions of the screen (*See Figure 9-1*).

Node Name

The 1 to 16 character name for the node where ACM is installed.

Slot

The number of the slot (`1` to `16`) in the main shelf of the TMS-3000 or TMSC node where ACM is installed.

Line Format

Selects the format of the aggregate link: **`T1-D4`**, **`T1-ESF/ATT`**, **`T1-ESF/ANSI`**, and **`E1`**. **`T1-D4`** is the default selection.

```
ACM Port Configuration          NET3                          12-APR-1996 10:01:42

Node                            Line      Signaling     Alloc         Node BW
Name            slot            Format      Mode      Bandwidth      Remaining
Cairo            5               E1         CAS      1.056MHz        0.0000Hz

Interface     Node Clocking      Declare Failure    Declare    Unused     Unused Cr
Clocking   Availability   Pref   Local   Remote   Restoral  Ch Code  Conditioning
 NODE    NOT AVAILABLE    4     2.5sec  2.5sec   15.0sec     D5           A1+B1

----------------------------- Examine Bandwidth --------------------------------

Frame Resync           International      National      CRC4    Remote Alarm
 Criteria                Bit Select       Bit Select    Disable    Passthru
  Fixed                    Fixed          Fixed                      NO

CAS Multiframe         CAS Multiframe
Sync Criteria          Resync Criteria              Transmit Frame Alignment
   Fixed                   Fixed                         CAS with Frame
```

Figure 9-1 ACM/E1 Port Configuration Screen

Signaling Mode

Selects the desired signaling mode. **RBS** (Robbed-Bit), **CCS**, and **INB** may be selected for T1 lines, while **CCS** and **CAS** may be selected for E1 lines. **RBS** is the T1 default selection and **CAS** is the E1 default. Since any ACM (E1/T1) time slot is available at 64 KHz, any time slot could potentially be used to transport common channel signaling. This essentially allows a mix of signaling modes (e.g., T1 configured for RBS or a time slot configured for an ACMD pass common channel signaling).

NOTE

In order to ensure that voice channels are not routed without signaling, CCS channels should be given the highest priority.

Allocated Bandwidth

Selects the amount of node backplane bandwidth allocated for ACM. The default selection is **2.112MHz**. This may be reduced to **1.056MHz** to allow more bandwidth to be available to the rest of the node; but reducing the bandwidth after circuits have been configured causes circuits to be dropped if the backplane bandwidth is reduced below the total ACM channel bandwidth.

NOTE

ACM Bandwidth is explained in more detail in GDC 036R304-000.

Node BW Remaining

Indicates the amount of bandwidth available to the node for configuring additional circuits through the ACM. Node BW Remaining is equal to the allocated backplane bandwidth minus the channel rates that are already configured. This field is for informational purposes only.

Interface Clocking

Selects the source of timing (either node or receive) for the aggregate data transmitted to the destination node. If **NODE** timing (the default selection) is selected, the node ESCC supplies the timing signal to the ACM for transmit data. If **RECEIVE** timing is selected, the timing signal is recovered from the ACM aggregate received data.

Node Clocking Availability

Determines the availability of the ACM aggregate as a node timing source. If the aggregate trunk supplies a master timing signal (such as DACS), the selections are **FACILITY** and **NOT AVAILABLE**. If the aggregate trunk does not supply a master timing signal or supplies an unreliable master timing signal, select **NOT AVAILABLE**.

Preference

Selects the aggregate link (**1** to **4**) that is preferable for node clocking. The highest preference is **1** and the lowest preference is **4**, which is also the default selection. (TMS-3000 does not change aggregate links for clocking if the current aggregate selection is functioning properly, regardless of the preference.)

Declare Failure Local

Allows you to set the integrated time for which the port must be out of synchronization before a network required alarm is generated and the port is taken out of service. For AT&T, this is a RED alarm, and the time must be set to `2` to `3` seconds (*PUB 43801 para 6.4.2*). Range is `0` to `20` seconds in 0.5 second increments with `2.5` seconds as the default.

Declare Failure Remote

Allows you to set the time for which the port must be detecting a Yellow Carrier Failure Alarm (CFA) before it declares a yellow alarm. Range is `0` to `20` seconds in 0.5 second increments with `15` seconds as the default. For CEPT, default is `2.5` seconds.

Declare Restoral

Allows you to set the integrated time for which the port must be in synchronization, after a failure, before a network required alarm is removed and the port is returned to service. For AT&T, this is the removal of a RED alarm, and the time must be set to `10` to `20` seconds(*PUB 43801 para 6.5.5*). Range is `2.5` to `20` seconds in 0.5 second increments with `15` seconds as the default.

Unused Ch Code

Inserts **`7F`** hexadecimal or **`FF`** hexadecimal as the unused channel code for T1 port configurations (**`7F`** is the default selection). The code is inserted into the time slots at the other end that have no channels in order to produce a near 0 analog signal. For E1 port configurations, the unused channel code is always `D5`.

Unused Cr Conditioning

The selected value is used to condition all unused circuit channels.

Examine Bandwidth

Selecting this field causes the Controller to display the `ACM Bandwidth` screen . This screen indicates `Total Available Bandwidth` , `Total Channel Bandwidth Used` , `Number of Channels Used` , and `Bandwidth Remaining` on a per configuration basis as delineated under the `Config Name` field.

ACM/T1 Specific Port Configuration

The following fields of the Port Configuration screen are unique to the T1 version of the screen.

Zero Suppression Mode

Selects the desired zero suppression mode: either **`B8ZS`** (Binary Eight Zero Suppression) or **`B7`** (Bit 7) Stuffing. **`B7`** is the default selection. **`B8ZS`** is used on clear channel links only and provides 64k per 64k DS0 for customer data. **`B7`** is used on links that are not clear channel and provides 56k per 64k DS0 for customer data.

Yellow Alarm Mode

Selects either the **`S-BIT`** position in Frame 12 or **`BIT-2`** in all DS0 channels. **`BIT-2`** in all channels is the default selection. A Yellow Alarm occurs when a carrier failure is transmitted to the remote node equipment. **`S-BIT`** and **`BIT-2`** are used on non-ESF links, which transmit a 16-

bit Yellow Alarm code in the 4k data link. The Yellow Alarm applies only to ACM and CDA modules.

Synchronization Time

Selects either **10 F-bit** or **24 F-bit** (consecutive F-Bits qualified as the synchronization time). **10 F-bit** is the default selection.

Synchronization Criteria

Selects the desired synchronization criteria. For T1-D4 aggregates, you can select **Ft then Fs** (synchronize to the FT pattern then to the FS pattern) or **Ft and Fs** (cross-couple the FT and FS patterns). For T1-ESF aggregates, you can select **Normal Sync** or **Align w CRC** (validate new alignment with CRC). **Ft and Fs** is the default selection for T1-D4 lines, **Normal Sync** for T1-ESF lines.

ACM/E1 Specific Port Configuration

The following fields of the ACM Port Configuration Screen are unique to the E1 version of the screen.

Frame Resync Criteria

Selects either **Fixed** or **Additional** frame resynchronization criteria. **Fixed** is the default selection.

International Bit Select

Selects either **Fixed** or **Passthru** international bit. When **Fixed**, the default selection, is chosen, the outgoing bit is a mark (unusable). When **Passthru** is chosen, the international bit is passed through the ACM.

NOTE

Time slot 0 must *be configured for the pass-through of the International and National bits. Otherwise these bits are fixed at "1" automatically.*

National Bit Select

Selects either **Fixed** or **Passthru** national bit. When **Fixed**, the default selection, is chosen, the outgoing bit is a mark (unusable). When **Passthru** is chosen, the national bit is passed through the ACM.

CRC4

Enables or disables CRC4. **Enable** is the default selection.

Remote Alarm Passthru

Allows or disallows remote alarms to pass through. In CEPT mode with ACM-ACM circuits, you can pass the Remote Alarm Bit from one PBX to the remote PBX. This allows one PBX to respond directly to the RMA bit from the other. To use this option in CAS mode, time slot 0 must be configured for bypass. In CCS mode, double bypass of time slots 0 and 16 must be configured. Choices are **NO** and **YES**.

CAS Multiframe Sync Criteria

Selects either **Fixed** or **Delay** CAS multiframe synchronization criteria. When **Fixed** is chosen, synchronization is declared when the criteria is met (**Fixed** is the default selection). When **Delay** is selected, synchronization is declared after a delay of two multiframes (This field appears only if CAS is selected as the signaling mode).

CAS Multiframe Resync Criteria

Selects either **Fixed** or **Additional** CAS multiframe resynchronization criteria. When **Fixed** is chosen, resynchronization is declared when the criteria is met (Fixed is the default selection). When **Additional** is selected, resynchronization is declared after a delay of two multiframes (This field appears only if CAS is selected as the signaling mode).

Transmit Frame Alignment

Selects either **CAS with Frame** or **Unaligned CAS** transmit frame alignment. When **CAS with Frame**, which is the default selection, is chosen, CAS multiframes (TS16) begin with the frame containing a frame alignment signal. When **Unaligned CAS** is selected, CAS multiframes (TS16) do not begin with the frame containing a frame alignment signal. (This field appears only if CAS is selected as the signaling mode.)

ACM Bandwidth

Selecting `Examine Bandwidth` in the `ACM Port Configuration` screen causes the Controller to display the `ACM Bandwidth` screen. The following fields are displayed:

`Config Name` – Indicates the names of the active and inactive configurations.

`Total Available Bandwidth` – Indicates the total amount of bandwidth available for configuring additional circuits in each configuration of the ACM.

`Total Channel Bandwidth Used` – Indicates the amount of voice bandwidth used by the ACM for each configuration.

`Number of Channels Used` – Indicates the number of channels used by the ACM for each configuration.

`Bandwidth Remaining` – Indicates the amount of bandwidth available for configuring additional circuits for each configuration.

Summary

The ADPCM Compression Module (ACM) provides the means for a single DS1 (E1) line, containing 24 (30) PCM voice circuits, to be brought into the TMS-3000 and compressed via GDC ADPCM compression techniques. After compression, these circuits are transported across a T1 aggregate via an ACC or framed into a TMS-3000 subaggregate, in bit format, of a CDA Module.

In this chapter we covered the procedures for configuring ports for ACM cards.

What's Next?

In Chapter 10, we cover Network Clocking, including clock level configuration guidelines and how to configure clock levels.

10 Network Clocking

Overview

This chapter covers the procedures for setting the primary and fallback clocking sources for the network. Clock levels, hop counts and configuration guidelines are covered.

Topics covered in this chapter are:

Clock Level Configuration Guidelines

Some things you should consider when configuring clock levels are:

- When planning clock levels other than level 1, base your planning on the assumption that a failure has eliminated the clock level 1 master timing sources. Determine whether the fallback clock levels are configured logically, that is, whether timing from a fallback master reaches remaining nodes if the expected failure occurs.
- Nodes that are centrally located in a network are better timing sources because they are "closer" (in terms of intermediate aggregate trunks) to all other network nodes. This minimizes the number of times timing is regenerated through nodes.
- *Figure 10-1* shows a network with two central nodes, B and E. This network uses an internal master node as master timing source. The preferable timing configuration is to select nodes B and E as master nodes in clock levels 1 and 2, since timing from either node could reach any other node with no more than two hops (intermediate aggregate trunks).

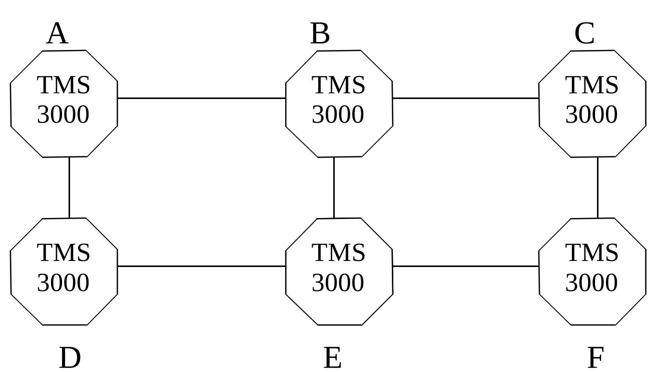


Figure 10-1 Network with Centrally Located Nodes

Examine/Modify Network Clocking

To display the network clocking, go to the `TMS Main Menu` . Highlight **`Examine`** or **`Modify Configurations`** and press `Enter`. Next, select **`Examine`** or **`Modify Network Clocking`** from the `Configuration Main Menu` . Press `Enter`. The `Net Clock Configuration` screen is displayed.

You may configure up to 31 clock levels for a network. The levels form a hierarchy of alternative timing configuration. Each clock level defines a timing source for every node in the network.

In a normally operating network, all nodes use timing sources defined by Clock Level 1.

If a network failure removes all Level 1 master timing sources, each node falls back independently to Clock Level 2 and attempts to regain stable timing. Each node continues a clock search and fallback cycle until it becomes a stable master timing source or phase locks to a stable master timing source.

Refer to *Autoclocking in GDC 036R304-000* for a detailed description of Autoclocking and the fallback process.

At each clock level, each node must be configured for one of the following states:

- Master/Internal — A node with this designation generates timing internally, and supplies timing for the network. All other nodes must receive timing from the internal master via aggregate trunks.
- Master/External — This is a node whose timing is phase locked to an external timing signal. The signal is received via the external timing connector J18 located on the TMS-3000 backplane. Other nodes then phase lock to timing from the external master node received through aggregate trunks. A clock level may include more than one external master. But the external timing source for each node must be phase locked, so that each external master node is phase locked.

NOTE

For specific information on option selection to select balanced or unbalanced clock on J18, refer to GDC 036R303-000.

When a node is configured as an external master, the data rate of the external timing signal must be specified. The rate must be one that the Controller is capable of phase locking to. You select the rate from a list of valid rates presented during the node configuration.

- Master/Aggregate — Some aggregate trunk services (DDS, for example) provide timing to the TMS-3000 nodes connected to them. In this case, the aggregate trunk is considered the master timing source. Other TMS-3000 nodes in the network obtain timing from the TMS-3000 nodes connected to the aggregate masters.

  This type of aggregate trunk is called FACILITY. You can only select an aggregate master if the aggregate interface configuration for the aggregate specifies it as **`FACILITY`**. There may be more than one aggregate master in a clock level, as long as timing from all aggregate masters is synchronized.

- Slave — A node designated as slave receives timing through one of its aggregates from some other node in the network. The node selects the aggregate to accept timing from. An aggregate must be configured as **`REMOTE NODE`** in the aggregate interface configuration to serve as a timing source.

Internal, external, and aggregate masters may be mixed in a clock level. Once again, the timing signals from all masters in a clock level must be phase locked.

The initial network clock summary lists all nodes that are configured as masters at any configured clock level. The display includes node names, addresses, each level at which the node is a master, and the type of master at that level. For external masters, the data rate of the external timing signal is also listed.

Clock levels are configured through the three functions displayed at the top of the clock summary display. Each function is selected by moving the cursor to the function and pressing `Enter`. A discussion of these functions follows.

Insert Clock Level

If a clock level does not already exist, it must be created before a timing configuration may be entered. After selecting **`Insert Clock Level`**, you must enter the number of the clock level that you are creating.

You may insert a clock level immediately below the lowest existing level (if Level 4 is the lowest existing level, you may insert Level 5).

You may also insert a new level between two existing levels. All lower levels are then pushed down one number (if you insert a new level between levels 2 and 3, the new level becomes Level 3; the previous Level 3 becomes Level 4, and so on). Once you specify a clock level number, a display with all configured nodes is generated. All nodes are initially configured for slave timing. You must configure at least one node as a master timing source.

The following parameters in the display are selectable:

Master/Slave

(Limited Range Entry) — This defines the node as a **`Master`** or **`Slave`** with respect to timing.

Clock Source

(Limited Range Entry) — A master node must be configured as an **`External`**, **`Internal`**, or **`Facility`**. The following rule applies to this selection — If a node has aggregate trunks that are defined as **`Facility`**, that node must be an aggregate master at some level.

This means that a node can be a master in no more than three clock levels and must be a different master type in all three.

Clock Rate

(Cursor Position Entry) — When you configure a node as an **`External`** master, you must specify the clock rate of the external timing signal to which the node is phase-locked. To change the rate, move the cursor to the displayed rate and press `Enter`. The `Net Clock Configuration` screen changes to provide you with a table: `Selectable Data Rates for External Clock Sources`. Move the cursor to the desired rate and press `Enter`. You are returned to the previous display and the new rate is shown in the `Clock Rate` column.

Modify Clock Level

This routine changes the timing configuration in an existing clock level. Once you select the clock level, the choices to be made are the same as those described for Insert Clock Level.

When using **Modify Clock Level** you may not be able to change the configuration of some master nodes. The rules described above for selecting master clock sources can restrict changes, because those rules would be violated when certain changes are made. For example, if a node is configured as **Facility**, **Internal**, and **External** at different clock levels, you may only change the status of that node to **Slave**. To modify master status, either change the master status to slave at each of the clock levels and then make the desired changes, or delete and re-insert clock levels.

Clock Switch Per Hop Count

When this field is highlighted , you can either **Enable** or **Disable** this feature by pressing `Enter`.

When a link fails, autoclocking may select an alternate timing source that is farther away (more hops) than the original master timing source. If a particular link periodically fails and recovers, it may not be desirable to have autoclocking continually switch timing sources based on the proximity (hop count) of timing sources. This can be avoided by disabling `Clock Switch Per Hop Count`.

If the `Clock Switch Per Hop Count` is enabled, the autoclocking sequence includes searching for the closest timing source.

If the `Clock Switch Per Hop Count` is disabled, the autoclocking sequence does not consider hop count as a criterion for switching to another clock source.

Delete Clock Level

If you select Delete Clock Level you are prompted:

```
Enter Clocking Level:
```

After entering the number of the clock level that you want to delete and pressing `Enter`, the selected clock level is deleted.

Summary

In this chapter we covered the procedures for setting the primary and fallback clocking sources for the network. Clock levels, hop counts and configuration guidelines were covered.

What's Next?

In Chapter 11, we cover how to create and modify manual routes.

11 Examine/Modify Manual Routes

Overview

Normally, routing of a TMS network is done automatically. It is not necessary for you to use the following procedure unless you specifically want to create customized routes.

Manual Route Definition creates customized routes between any nodes in the network, across any configured aggregate trunks. A manual route is a set of aggregate trunks that you link together to form a path between two end nodes you select.

Topics covered in this chapter are:

- Examine/Modify Manual Routes
  - Create/Modify Manual Route
  - Examine Manual Route by Names
  - Examine Manual Route at Node
  - Examine Manual Route Between Nodes

Examine/Modify Manual Routes

The **`Modify Manual Routing`** routine allows you to create a route manually and examine or modify the manual route by its name, node, or between nodes.

You create a route by adding aggregate trunks in a "connect the dots" procedure until the desired route is complete.

For example, in *Figure 11-1*, a manual route is created by entering start node A, and then entering aggregate trunks A-B, B-C, and C-D.

Since these trunks are already configured, the Controller can automatically list each node along the route. Before a manual route is configured, all nodes and aggregate trunks intended for that route must be configured.

This routine is used to create routes for circuits (user data) in the TMS-3000 network.

You cannot use the **`Modify Manual Route`** routine to modify or delete routes created by Intelligent Automatic Routing. You can, however, create a manual route that parallels a route created in the IAR process.

The **`Examine/Modify Manual Route`** screens display the manual routing information in a TMS-3000 network. Selections are:

```
Create/Modify Manual Route
Examine Manual Route by Names
Examine Manual Route at Node
Examine Manual Route Between Nodes
```

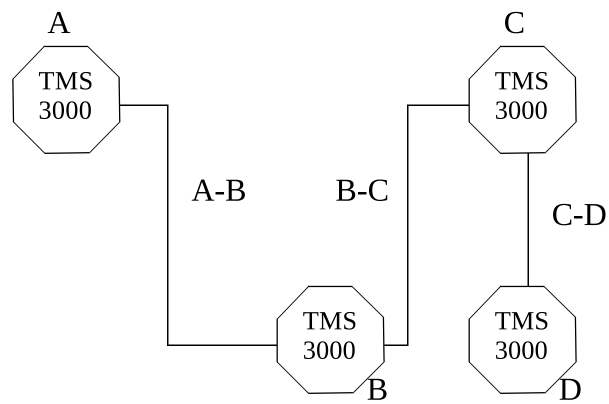


Figure 11-1 Manual Route Example

Create/Modify Manual Route

The **Create/Modify Manual Route** selection allows you to perform the same functions as in **Examine Manual Route** with the addition of creating a manual route.

To create a new manual route, select **Modify Manual Routes** from the Configuration Main Menu and press Enter. The Network Routing screen appears. Next, select **Create/Modify Manual Route** and press Enter. The following prompt appears:

```
Enter Manual Route Name or press Enter for list:
```

If you want to modify the manual route enter the route name in this field. If you are unsure of the route name, press Enter. The Route Numbers screen appears showing all manual routes and route names for the node.

Select the manual route number and press Enter. The Route Definition screen (*See Figure 11-2*) appears. Three fields appear at the top of the Route Definition screen: New Route, Modify Route and Delete Route (described below).

In the middle portion of the Route Definition screen, the Number, Name, Type and Link Entries for the route are displayed.

Specific information on this manual route is further detailed: The origination and destination NODE Name, Adr (address), Sl (slot number), P (port for CDA/IAC) and Bd (bundle number) are shown. The LINK Name appears for the manual route.

New Route

A new route is created with this function. To build a route, you enter an end node of the intended route, and then enter the aggregate link that links that node with another node.

You continue to add links to create the route. The Controller automatically fills in the destination node and equipment slot each time a new link is entered. When the last link is added to the route, the end node is filled in by the Controller, and the route is complete.

To indicate route completion press Enter or the **F3** key. The screen then asks if the route is complete; answer **y** to indicate completion.

```
Route Definition                  NET3                           11-APR-1996 06:50:00
Page 1 of 1
                        New Route       Modify Route      Delete Route

Number  1               Name  53-55      Type  User Data   Link Entries  1

       NODE                             LINK                NODE
Name         Adr  Sl  P  Bd       Name             Name           Adr  Sl  P  Bd
N53          053   13  A   1      N53/54            N54           054  13  A   1


        Adr  Address     Sl  Slot        P  CDA Port      Bd CDA Bundle
```

Figure 11-2 Route Definition Screen

To create a new route, perform the following. Highlight the `New Route` field and press `Enter`. The following prompt appears:

`Enter Manual Route Name or press ENTER for list:`

Since you are creating a new route, enter a route name (up to eight characters). The next prompt appears:

`Create New Manual Route [Default Yes (Y/N)]:`

Press `Enter`. The `Route Definition` screen appears. The next prompt appears:

`Enter First Node Name for the Route:`

Enter up to 16 characters.

As the node name is entered, the information appears on the `Route Definition` screen. The next prompt appears:

`Enter Next Link OR press ENTER for List OR press F3 if done:`

If you know the name of the next link in the route, enter it here, or press `Enter` to bring up the `Link Selection` screen. Enter the name of the link, then press `Enter`. The previous prompt (`Enter Next Link . . . .`) repeats until you have finished entering links.

When completed press **F3**. The following prompt appears:

`Is the route definition completed? [Default Yes (Y/N)]:`

Press `Enter`. The new route is now completed. If you desire to modify or delete a route, the `Route Definition` screen allows you to select: **`Modify Route`** or **`Delete Route`**. These functions are described below.

Modify Route

This function deletes and/or adds aggregate links to a route. To delete an aggregate in a route, you must delete the remainder of the route. This is done by entering the name of the last link name in the portion of the route to be saved. You then add new links as required to complete the route.

If you do not need to delete any part of a route, simply enter the last link in the existing route. You may then add new aggregate trunks to the route. When you have completed the route, press the `Enter` or **F3** key. The screen then asks if the route is complete; answer **y** to indicate completion.

Delete Route

An entire route is deleted by this function. You first select the display for that route. When you select the delete function within that display, the route is deleted, and you return to the `Network Routing` menu.

When you delete a manual route, all circuits that use that route are changed to automatic routing.

Examine Manual Route by Names

When **`Examine Manual Route by Names`** is selected, the `Route Numbers` screen appears. Move the cursor to a particular route number and press `Enter` or the **F4** (Next Display) key to bring up the `Route Information` screen. This screen looks the same as the `Route Definition` screen, but you are not allowed to make any changes on the `Route Information` screen.

Examine Manual Route At Node

When **`Examine Manual Route at Node`** is selected, you are prompted for a Node name. Once a node is selected, the `Routes at Node` screen appears. This screen shows each manual route that passes through a node. Pressing `Enter` brings up the `Route Information` screen.

Examine Manual Route Between Nodes

When **`Examine Manual Route Between Nodes`** is selected, you are prompted for a Node name. After the node is selected, you are prompted for the second node name. After the second node is selected, the `Routes Between Nodes` screen appears. This screen shows each manual route that passes between the two selected nodes. Pressing `Enter` brings up the `Route Information` screen.

Summary

Normally, routing of a TMS network is done automatically. But you can manually define routes. Manual Route Definition creates customized routes between any nodes in the network, across any configured aggregate trunks. A manual route is a set of aggregate trunks that you link together to form a path between two end nodes you select.

What's Next?

In Chapter 12, we cover the procedures for creating new controllers and modifying existing controllers.

12 Controller Definition

Overview

This chapter covers the procedures for creating new controllers and for modifying parameters for existing controllers.

Examine Controller Definition

This routine is selected by selecting **`Examine Configuration`** from the `TMS Main Menu`, and then selecting **`Examine Controller Definition`** from the `Configuration Main Menu`. The `Controller Configuration` screen provides information on each Controller assigned in the network. The `Controller Name`, `Connected Node Name/ Addr`, `Controller Priority`, and the `Dial Backup (DBU) Phone Number` of each controller is identified on this screen.

A controller may not be defined until the SVR port in Node Equipment is defined as attached to a network controller.

NOTE

The procedure for starting up a network with redundant controllers is found in GDC 036R303-000.

Topics covered in this chapter are:

- Examine Controller Definition
- Create/Modify Controller
  - Controller Name
  - Connected Node Name
  - Connected Node Addr
  - CNTLR Priority
  - Dial Backup (DBU) Phone Number/Type
  - Delete Controller
  - Mastership Detection Time

Create/Modify Controller

Selecting **Create/Modify Controller** from the Configuration Main Menu brings up the Controller Configuration screen. This routine allows you to create new controllers and to modify existing parameters as described below:

Controller Name

Name of the Controller in the network. Up to 16 characters are allowed.

Connected Node Name

Name of the node that connects with this controller. This information can be obtained from the Node Configuration screen.

Connected Node Addr

Address of the node that connects with this controller. This information is supplied for informational purposes.

CNTLR Priority

Each controller is assigned a numerical value that decides the order in which a controller becomes the next master controller. This may happen when the current master or subordinate controller becomes isolated in the network. The value is from **1** to **10** and **PS** (permanent subordinate). The smaller the value, the higher the priority.

When the Permanent Subordinate option is set, it forces a subordinate controller in the network to remain as a subordinate. Use the following guidelines when configuring a Permanent Subordinate:

A Permanent Subordinate controller cannot become a master under any condition and is not allowed to modify the on-line network. But it is allowed to modify any off-line network. You can input the switchover command on the Permanent Subordinate controller, but the mastership is not allowed to be transferred to the Controller.

The switchover priority value of the master cannot be changed to PS while the master is on-line. The master controller cannot change to another on-line network while on-line if the master is configured as a permanent subordinate in the new network.

Dial Back Up (DBU) Phone Number/Type

The phone number and dialing mode for this controller is entered here. These parameters are used when invoking the dial backup facility. This feature is explained in *Chapter 43*. You may specify either pulse (rotary) or tone dialing.

Delete Controller

This routine removes a controller from the network. Highlight Delete Controller and press Enter. The system then prompts you to Enter Controller Name: and follows with a Deleting Controller (name) are you SURE? prompt. A **Y** response to this message actually deletes this controller.

Mastership Detection Time

Specifies a time period of isolation from the Master Controller after which the subordinate attempts to become the master controller. Default value is fixed at `210 Sec.` , but can be set at **`50`** to **`900`** seconds in 10 second increments.

Summary

In this chapter we covered the procedures for creating new controllers and for modifying parameters for existing controllers.

What's Next?

In the next chapter, we cover the procedures for establishing controlled access to the Controller routines through the use of passwords.

13 Passwords

Overview

Passwords are used to control access to the Controller operating routines and to a TMS-3000 network. In this chapter we cover the Examine/Modify Password routine.

Examine/Modify Password

You select a `Login Name` and `Password`, each of which is necessary to gain access to the system operating routines. Each `Login` Name and `Password` is granted or denied permission to perform nine system functions. These functions are:

SPS Set Passwords

CCF Modify Cnfg

ECF Examine Cnfg

PRU Primary User

DIA Diagnostics

STA Status

ALR Alarms

MUT Maintenance Utility

DLD Download

The routine provides flexibility in controlling access to the network. For example, a display-only access level is created by granting access to `Examine Cnfg`, `Status`, and `Alarms` only. If you have Primary User access, you have the ability to switch mastership between redundant controllers. Maintenance-level access is granted by permitting entry to all functions except `Modify Cnfg` and `Set Passwords`. A supervisory level is granted access to all functions. Selecting Modify Passwords from the `Configuration Main Menu` brings up the `Set Passwords` screen which allows you to set passwords for allowing limited access of specific functions in a TMS-3000 system.

The combination of `Login Name` and `Password` permits control over the granting of access to individuals. For example, Login Names may be assigned according to a first name of a person. A password may then be granted that defines the limits of system access. The Set Passwords list may then be reviewed periodically and revised as required for continued operation of the TMS-3000.

To select a Login Name and Password, move the cursor to the appropriate field, and enter a name and a password as separate string entries. Then move the cursor to the columns to the right of the name and password. Each column contains a limited entry field for one of the system functions. Press Enter to select Yes or No. Yes provides access to that system function to anybody logged in under the Login Name and Password and No denies access to that function.

Summary

Passwords are used to control access to the Controller operating routines and to a TMS-3000 network.

In this chapter we covered the procedures for establishing passwords, so that you can control access to the network.

What's Next?

The next chapter covers the procedures for TOR (Time Oriented Reconfiguration) and DRR (Disaster Recovery and Reconfiguration).

14 TOR and DRR

Overview

The process of activating different configurations according to a time schedule is known as TOR (Time Oriented Reconfiguration). A TOR switch usually alters network characteristics to serve different shift operations of an organization. DRR (Disaster Recovery and Reconfiguration) is designed to re-route circuits to alternative destinations when a network location (e.g., a major data center) becomes inaccessible. In this chapter we cover the TOR/DRR screen options and configuration procedures.

Topics covered in this chapter are:

- Maintain TOR/DRR Options
  - Maintain TOR/DRR Configurations
  - Modify TOR Selection
  - Create/Modify DRR Strategies
  - Assign TOR/DRR Configurations
  - Define DRR Scenarios

Maintain TOR/DRR Options

When Maintain TOR/DRR Options is selected from the `Configuration Main Menu`, the following screen selections appear on the `TOR/DRR Main Menu`:

`Maintain TOR/DRR Configurations`

`Modify TOR Selection`

`Create/Modify DRR Strategies`

`Assign TOR/DRR Configurations`

`Define DRR Scenarios`

Maintain TOR/DRR Configurations

This routine creates new TOR/DRR configurations and assigns configuration names to identify each type.

To reach the `TOR/DRR Cnfg Maintenance` screen, select **`Modify Configuration`** on the `TMS Main Menu`, **`Maintain TOR/DRR Options`** on the `Configuration Main Menu`, and **`Maintain TOR/DRR Configurations`** on the `TOR/DRR Main Menu`. Two functions, **`Copy TOR/DRR Configuration`** and **`Delete TOR/DRR Configuration`**, manipulate the configurations in a network. To select one of these functions, move the cursor to the function and press `Enter`. Each function is described in the following paragraphs:

Copy TOR/DRR Configuration

This function copies the data base of an existing configuration to another new/existing configuration. This allows you to create several configurations that can be activated at different time periods or under failure conditions. The name can be up to eight alphanumeric characters long.

When you select the function, specify the source configuration for the copy. Either enter the configuration name or press `Enter` to obtain a list of existing configurations. Move the cursor to the desired source configuration and press `Enter`.

You are then prompted for the destination configuration (the configuration that receives the copied data base). Specify the destination configuration in the same way that the source configuration is selected. If there is only one existing configuration name in the list, enter the symbolic name. Messages report the completion of the copy operation.

Delete TOR/DRR Configuration

This function deletes a configuration from the data base. All circuits that were enabled only in that configuration are deleted.

When you select the delete function, you are prompted to enter the configuration you wish to delete. Enter the configuration name or press `Enter`. Move the cursor to the configuration that you wish to delete and press `Enter`. The screen then warns you that all configuration data will be destroyed and gives you a chance to reconsider. If you answer **`Y`**, the deletion proceeds.

Configuration Name Change

You may change the configuration name by moving the cursor to the name and using the editing keys to change the name.

Modify TOR Selection

Selecting **`Modify TOR Selection`** in the `TOR/DRR Main Menu` brings up the `TOR Selection` screen. This screen is used to set time schedules for activation of one of the specific configurations.

If TOR is enabled, the Controller sends out a reconfiguration command at the time specified by these schedules. The nodes then switch in unison to the circuit, routing, and enabled aggregate configuration selected by the schedule.

NOTE

GDC recommends that TOR not be used to drop ACM circuits because circuits in the previous configuration that are deleted after TOR will have no conditioning provided.

If a TOR or DRR is initiated by the Controller, the IAR performs a partial download. In this sense, TOR/DRR and IAR are interactive with each other. Other factors that initiate a partial download are the addition or modification of circuits or detection of a link failure.

A TOR configuration allows you to enable and disable circuits and links. You can enable or disable TOR by positioning the cursor at the top line of the display, `Time Oriented Reconfiguration` **`Enabled`** (or **`Disabled`**), and pressing `Enter` to obtain the appropriate state.

If TOR is disabled, the configuration remains in the current configuration unless changed by DRR or manually.

NOTE

TMS-3000 software allows you to switch to any TOR/DRR configuration on command from the IAR system default screen (Examine/Modify IAR Defaults). TOR must be disabled in the TOR selection screen and DRR must be disabled in the IAR defaults screen.

For example, aggregate bandwidth that carries many low-speed terminal channels during the daytime may be allocated for a few high-speed batch transfer channels at night. Separate holiday reconfiguration schedules provide the chance to modify the network as required when holidays alter a normal work schedule.

To display TOR selections, go to the `Configuration Main Menu`. Highlight **`Examine TOR/DRR Selection`** or **`Maintain TOR/DRR Options`** and press `Enter`. Select **`Examine`** or **`Modify TOR Selection`** from the `TOR/DRR Main Menu`. Press `Enter`. Assume that you have selected **`Modify TOR Selection`** The `TOR Selection` screen appears.

There are four different schedules:

- Daily Schedule
- Weekend Schedule
- Holiday 1 Schedule
- Holiday 2 Schedule

Daily/Weekend Schedules

The seven days of the week are divided between the daily schedule and the weekend schedule.

The default division is Monday through Friday in the daily schedule, and Saturday and Sunday in the weekend schedule. On Monday through Friday, time oriented reconfiguration takes place according to the daily schedule. On Saturday and Sunday, TOR occurs according to the weekend schedule. The XENIX operating system automatically takes care of the current day of the week.

You may distribute the days between the daily and weekend schedule as required. The daily schedule has Add Day of Week and Delete Day of Week functions that are used to add or remove days from the daily schedule. Days that are deleted from the daily schedule are added to the weekend schedule. Any days added to the daily schedule are deleted from the weekend schedule.

When you select the Add or Delete functions in the daily schedule, all seven weekdays are displayed. Type in the day that you wish to add or delete, and press `Enter`.

Holiday Schedules

You may designate up to 24 days under each holiday schedule. On those days, reconfiguration occurs according to the selected holiday schedule.

Any date selected for one holiday schedule is excluded from the other holiday schedule.

You specify a date in the DD-MMM-YY format (Day-Month-Year). For example, July 28th, 1990 is entered as **`28-Jul-90`**. Be sure to include the dashes (-) in the date entry.

Time Zones

TOR occurs based on a time zone that you select. A standard limited selection field (`TOR`) allows the time zone difference from Greenwich Mean Time to be entered. This feature allows a TOR to occur at the same absolute time with multiple controllers located in different time zones. Note that the Controller time zone difference from the Greenwich Mean Time is supplied for informational purposes.

The `Local` field value is the difference in hours from the Greenwich Mean Time to the time where the Controller is located. This field is not selectable and is determined by the XENIX Operating System (when the Time Zone was selected). If a value of `05:00` is displayed in the `Local` field, the Controller is operating five hours from Greenwich Mean Time.

For example, suppose local New York time is 5 hours west of Greenwich Mean Time and TOR time is based on California time (8 hours west of Greenwich Mean Time). A TOR change scheduled for 6 A.M. would occur at 9 A.M. New York time.

The TOR value allows reconfiguration to take place simultaneously across all Controllers in the network regardless of the time zones in which they are operating.

The `TOR` field value ranges from ±12 hours in 30-minute increments. To change the `TOR` field, highlight the field and use `Enter` to step through the field in 30 minute increments until the proper time is shown.

Reactivation Times

Each schedule is based on a 24-hour day display (*See Figure 14-1*). In each schedule you may specify up to five activations of any of the configurations. A 24-hour bar display represents the 24-hour period starting at 12:00 A.M. Each of the configurations is represented on the display by a different color.

The time that a particular configuration remains active is reflected by a band of the appropriate color from the time of reactivation to the time that the next configuration is activated.

For example, if TOR 1 is active from 9:00 A.M. to 5:00 P.M., and TOR 2 is active from 5:00 P.M. to 9:00 A.M., a light blue band extends from 9:00 to 17:00, and a white band extends from 17:00 to 9:00. If a third TOR configuration is active from 18:00 to 22:00, then a dark blue bar extends from 18:00 to 22:00.

If a fourth TOR configuration is active from 22:00 to 24:00, then a red color bar appears from 22:00 to 24:00 on the display. The name of the configuration is highlighted with the color associated with it.

To set a reactivation time, select one of the five reactivations positioned below the bar display. You are then asked to select one of the configurations (you may remove an existing reactivation time by selecting **`D`** for disable either by entering the configuration name or by selecting from a list). The reactivation time must then be entered in the HH-MM format (Hours-Minutes). For example, 5:00 P.M. would be entered as **`17:00`**. Once you have entered this information, the display includes the appropriate activation information.

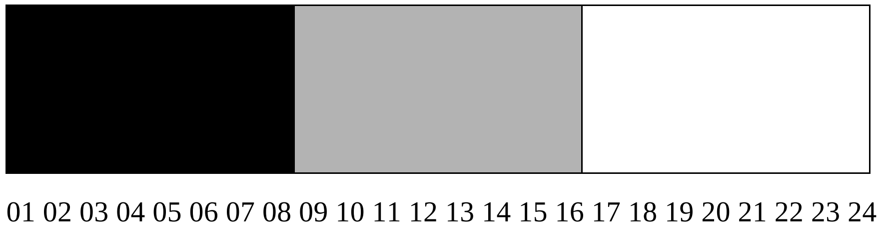


Figure 14-1 Activation Bar Display

Create/Modify DRR Strategies

As mentioned earlier, DRR is designed to re-route circuits to alternative destinations when a network location becomes inaccessible (*See Figure 14-2*). Part *A* of the figure shows a normal network configuration where data flows from remote locations to Data Center 1 and Data Center 2. Data Center 2 is also a backup for Data Center 1. In the event of communications failure at Data Center 1 due to hardware failure or other reasons, a TMS-3000 recognizes that Data Center 1 is isolated and automatically re-routes traffic to Data Center 2 as shown in Part B of the figure. This is a simple example based on one scenario and a corresponding strategy. With DRR, you can create up to 16 strategies, a strategy being an alternate configuration based on the nature of the disaster and the time at which it occurred.

If you select **`Create/Modify DRR Strategies`** from the `TOR/DRR Main Menu`, you are provided with two choices — **`Create Strategy`** and **`Delete Strategy`**. You are also provided with a list of current DRR strategies as well as their priority and type. If you want to create a new strategy, highlight **`Create Strategy`** and press `Enter`. You are asked for a name. Type in a name and press `Enter`. Your selected name is added to the list of strategies. You should then select a priority (The priority must be different from the others) and a type (**`Default`** or **`Failure`**). Only one choice is allowed to be a default.

Assign TOR/DRR Configurations

When you select **`Assign TOR/DRR`** Configurations from the `TOR/DRR Main Menu`, the `Assign TOR/DRR Configs` screen shows you the definition of the TOR and DRR configurations. In the following example, when the network is functioning properly, during TOR 1, CNFG2 is operational, during TOR2, CNFG3 is operational, etc. In the event of a LINKXX DOWN condition (as defined by a DRR), during TOR1, CNFG5 is operational, during TOR2, CNFG2 is operational, etc. If you highlight a CNFG selection and press `Enter`, you can select a different configuration for a TOR.

	TOR1	TOR2	TOR3	TOR4
SYSTEM O.K.	CNFG2	CNFG3	CNFG4	CNFG1
LINKXX DOWN	CNFG5	CNFG2	CNFG7	CNFG1

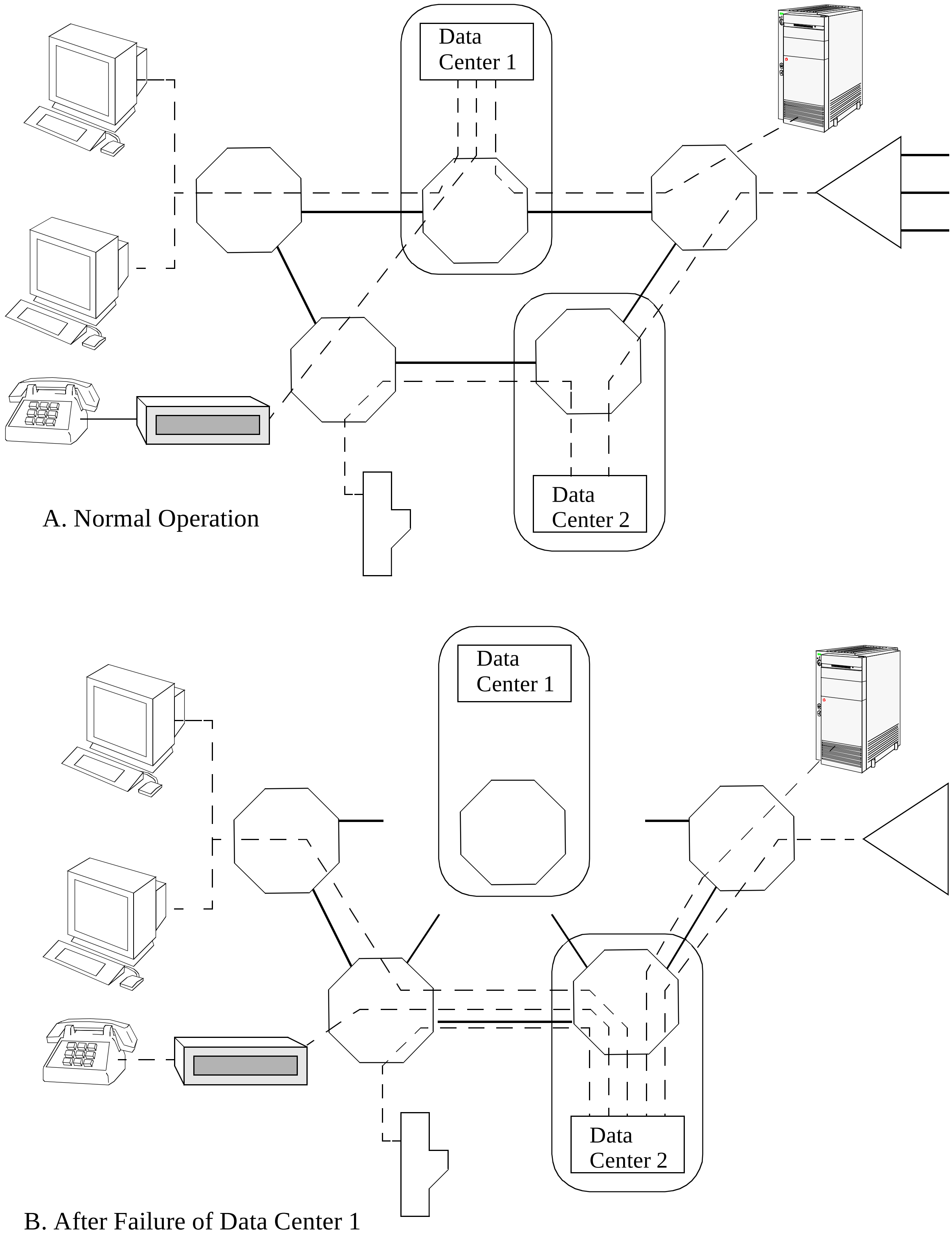


Figure 14-2 Example of Rerouting During DRR

Define DRR Scenarios

Selecting **`Define DRR Scenarios`** from the `TOR/DRR Main Menu` prompts you for `Strategy name` or to press `Enter` for a list of strategies. Enter the name of the strategy and press `Enter` to bring up the list. Select a strategy from the list, and press `Enter`. The `Define Scenarios` screen appears. This screen shows you the particular scenario — the link or links that must be down to implement the relevant DRR strategy. If you wish, you can make changes to the scenario. If you highlight the **`Sel`** pokepoint and press `Enter`, the `Link Selection` screen appears, providing you with a list of links. Highlighting a particular link and pressing `Enter` enters that link into your strategy. Rather than using the **`Sel`** pokepoint, you can also type in the link name. Your particular scenario can include many link downs, but the strategy is only implemented if all of them occur. You may define up to ten scenarios for a designated strategy. Active scenarios are displayed on the Controller screen. If the requirements for any one of the scenarios is met, the strategy is implemented.

Summary

The process of activating different configurations according to a time schedule is known as TOR (Time Oriented Reconfiguration). A TOR switch usually alters network characteristics to serve different shift operations of an organization. DRR (Disaster Recovery and Reconfiguration) is designed to re-route circuits to alternative destinations when a network location becomes inaccessible.

In this chapter we covered the various procedures needed to establish and modify TOR configurations. Similarly, we covered the procedures for the creation and modification of DRR strategies and configurations.

What's Next?

The next chapter covers the IAR (Intelligent Automatic Routing) routine.

15 IAR Defaults

Overview

The IAR (Intelligent Automatic Routing) routine automatically creates data paths for each circuit in the system.

Intelligent Automatic Routing consists of initial circuit routing as well as restoral from aggregate link and node failures. You have the ability to set attributes and assign parameters to each aggregate in the system. The IAR feature allows a circuit profile that defines restrictions for each circuit. Routing and rerouting then become automatic based on your definitions. Manual routing, control of IAR recovery, and routines for visibility into routing configuration are available.

In a normal operating network, configuration, status, and diagnostic data travel across supervisory routes between each Controller and each node in the system.

Primary and Secondary Supervisory Routes are automatically calculated during the Intelligent Automatic Routing process. Supervisory Routing is considered to be a background (transparent) function. If you change the backbone configuration of the network, the supervisory routes change automatically. In the TMS-3000, you can examine the active supervisory routes by entering the diagnostic `Supervisory Route Tracing`.

Topics covered in this chapter are:

- Examine/Modify IAR Defaults
  - System Defaults
  - Priority Defaults
  - Default Link Parameters/Attributes
  - Circuit Attributes/Link Qualifiers
  - IAR Routing Weights

Examine/Modify IAR Defaults

The IAR Default screens serve two purposes:

- To create routing parameters which are used when defining links (CDA aggregates/subaggregates), circuits, and circuit profiles.
- To define default values for trunk and circuit parameters.

Once a circuit profile, link, or circuit is created, changing the defaults do not affect the IAR parameters. The defaults are used only at system element creation time.

To view the IAR Defaults, go to the `TMS Main Menu`. Select **`Examine`** or **`Modify Configuration`**. Press `Enter`. Next, select either **`Examine`** or **`Modify IAR Defaults`** from the `Configuration Main Menu`.

The `Examine` or `Modify IAR Defaults` screen is divided into five sections:

`System Defaults`

`Priority Defaults`

`Default Link Parameters/Attributes`

`Circuit Attributes/Link Qualifiers`

`IAR Routing Weights`

During configuration of each aggregate, screens allow you to manually enter data pertaining to characteristics of the aggregate. This data is later used in auto-routing and in IAR to create circuits.

System Defaults

The following is a list of system defaults.

IAR

Ability to enable the reaction of IAR to alarm failure events. To enable this function, use the **`Enable/Disable`** pokepoint to select **`Enable`**.

IAR Restoral

Ability to enable the reaction of IAR to alarm clear events. To enable this function, use the **`Enable/Disable`** pokepoint to select **`Enable`**.

DRR

Ability to enable the reaction of DRR to alarm failure events. To enable this function, use the **`Enable/Disable`** pokepoint to select **`Enable`**.

DRR Restoral

Ability to enable the reaction of DRR to alarm clear events. To enable this function, use the **`Enable/Disable`** pokepoint to select **`Enable`**.

Load Balancing

If you enable this operation, the system attempts to load balance aggregates as it performs the initial circuit routing. If **`Disable`** is selected, the system disregards bandwidth loading in its decision making process until an aggregate becomes very heavily loaded. To enable this function, use the **`Enable/Disable`** pokepoint to select **`Enable`**.

Alternate SRR Strategy

Normally, SRRs (Supervisory Route Restorals) are given priority processing over other IAR restoral activities. Sometimes, it may be desirable to perform restorals without this priority, in order that IAR may handle a wider variety of tasks in an active network. Enabling the **`Alternate SRR Strategy`** removes the normal high priority from SRR tasks in the event queue. The alternate strategy may be useful in times of intense network activity in large networks. In most cases, this function is disabled. If you choose to enable this function, you must respond to a warning message before continuing.

Default TOR Configuration

This feature allows you to switch to any TOR configuration on command from the `IAR System Defaults` screen. TOR must be disabled in the `TOR Configuration` screen before you can activate it.

Scheduled Optimization

IAR restorals may result in underutilization of bandwidth in the network. You can optimize bandwidth usage at certain pre-scheduled times during the day/night and schedule optimization of routing. In the event that all aggregate failures in the system are restored, optimization results in returning to the original configuration. This feature minimizes circuit disruption during peak usage hours by allowing for the scheduling of disruption during times of non-peak usage. To enable this function, use the **`Enable/Disable`** pokepoint to select **`Enable`**.

Optimization Scheduled For

You must enter a prescheduled time to optimize bandwidth usage if `Scheduled Optimization` is enabled. Enter this time in HH:MM (24-hour format).

Optimize After IAR Restoral

After a link is recovered and a set time passes, optimization takes place automatically if this option is enabled.

Delay Before Optimization

Allows you to set the time delay described in the previous screen item.

Hours West of Greenwich Mean Time

Provides information on your time zone and the time zone where TOR is operating. You can modify the TOR time base in the `TOR Selection` screen.

Priority Defaults

This screen allows definition of default priorities. The priority values may be changed on a per circuit basis on the circuit definition screen. On a per system basis, you assign default priorities within rate ranges independently and for voice and data circuits. The screen allows you to define the data rate ranges and assign a priority for the initial routing as well as for auto rerouting. The initial defaults produce data circuits with the highest rate having the highest priority.

Rate Range

This is the range of voice and data rates for each circuit that IAR is monitoring. The range of rates is selectable by highlighting the rate and pressing `Enter` until the desired rate is displayed. The range of rates is from `0 to 1.024MHz`. A **`MAX`** selection is available for higher rates.

Routing Priority

Used only for initial circuit routing to resolve bandwidth contention between circuits.

Preemption Priority

Used for decision making following an aggregate or node failure when rerouting is required. This value determines whether unaffected circuits are bumped to accommodate higher priority circuits.

A circuit is bumped only if its preemption priority is lower than the priority of the circuit being rerouted. The preemption priority of a circuit is always equal to or better than its routing priority. This avoids a circuit bumping another circuit with identical parameters.

A priority of **`1`** is the highest (best) priority, whereas **`10`** is the lowest (worst) value. Highlight this item and press `Enter` until the desired priority number appears.

Default Link Parameters/Attributes

All default link parameters/attributes are used when creating aggregates and subaggregates and can be modified within the specific aggregate/subaggregate screens. When modifying the default parameters, only links created after modifying the defaults are affected. Pre-existing aggregates/subaggregates are unchanged.

Link Parameters

The link parameters are `Delay`, `Error Rate`, and `Availability`.

`Delay` — Expressed in milliseconds, equals the aggregate round trip delay divided by 2. Default value is `0`. Range is from `0` to `999` msec.

`Error Rate` — By setting an error rate value, determined by the historical performance of the link, you provide IAR information that is used to determine routing preferences. Expressed in terms of < 1 error in 10^n, where n is a value from 2 to 9. Circuits are routed on the best link for the application.

`Availability` — Represents the amount of time the aggregate is expected to be up and running. It is expressed as a percentage with 100% as the highest value. The default value is 100%. The range is from `0` to `100%` in 1% increments.

User Programmable Time Delays

You can set two default timer values to test for stability of the aggregate before performing the IAR recovery for a failed aggregate, as well as to determine when an aggregate can be used after it is restored. The times are referred to as the `Initiation Time` and `Restoral Time`, respectively.

Initiation Timer Aggregates

Defines a delay between the time a link failure is detected and IAR acts to re-route circuits.

Initiation Timer CDA Subaggregates

Defines a delay between the time a subaggregate failure is detected and IAR acts to re-route circuits.

Restoral Timer Aggregates

Defines the delay between the time a link is restored and IAR acts to re-route circuits. When the Restoral Time expires, an IAR restoral is triggered, which may cause circuits to route over the aggregate. The default setting of the Restoral timer is 60 seconds for TMS-3000 aggregates.

Restoral Timer CDA Subaggregates

Defines the delay between the time a subaggregate is restored and IAR acts to re-route circuits. When `Restoral Time` expires, an IAR restoral is triggered, which may cause circuits to route over the subaggregate. The default setting of the Restoral timer is `60` seconds for TMS-3000 subaggregates.

You can change the Initiation and Restoral time defaults. The range is **`0`** to **`2400`** seconds. Changing the defaults allows the utilization of bandwidth from recovered aggregates by IAR.

Link Attributes

IAR uses link attributes to make decisions about the generation of routes as well as the assignment of circuits to those routes.

Attributes are definable. Four entry fields each allow up to 16 characters. If an aggregate is a satellite link, you could enter "satellite" as an attribute.

The circuit profile screen allows five methods for specifying satellite as either **`DON'T CARE`**, **`NOT ALLOWED`**, **`MANDATORY`**, **`DESIREABLE`** or **`UNDESIREABLE`** for the specific circuit in question. For each aggregate bundle you must specify this attribute as being present (**`Yes`**) or absent (**`No`**).

Within the circuit profile screen, you must define the relationship between the group of circuits with that profile and the link attribute. The following options are available:

- **`MANDATORY`** — Only links possessing this attribute (**`Yes`**) are allowed to comprise a segment of this circuit path.
- **`DESIREABLE`** — If possible the IAR algorithm attempts to route circuits with this profile only on links possessing this attribute.
- **`UNDESIREABLE`** — If possible, the IAR algorithm attempts to route circuits with this profile only on links not possessing this attribute.
- **`NOT ALLOWED`** — Only links not possessing this attribute (**`No`**) are allowed to comprise a segment of this circuit path.
- **`DON'T CARE`** — Possession of this attribute on a particular link does not affect routing decisions for circuits using this profile.

Within the aggregate or bundle screen you define if the attribute is possessed by each link.

Circuit Attributes/Link Qualifiers

This function allows you to define four ASCII fields (`Attribute 1 – 4`) with labels for the system. These fields allow additional controls to be incorporated with initial routing and automatic routing calculations. Specifically, this function allows a subset of circuits to require or disallow the use of specific aggregates in the system. This capability is paired with `Link Qualifiers`. For example, you define a label as **`Region:`** and the field as **`UK`**. Now you define a circuit profile with the attribute **`UK`**. Any ASCII string characters (up to 16 characters in length) may be used.

The **`MANDATORY`** option disqualifies all circuits not possessing this attribute from traversing links that contain this qualifier. If you specified a different UK aggregate as **`DON'T CARE`**, then any circuit could use this aggregate.

In general, the following rules hold for circuit attributes and link qualifiers. The rules are listed in order of priority.

- If the circuit profile attribute for a given circuit is **None**, then that circuit may traverse only links possessing the link qualifier **DON'T CARE**.
- If the circuit profile attribute for a given circuit is **All** then that circuit may traverse any link.
- If the link qualifier for a particular link is **DON'T CARE**, then any circuit may traverse that link.
- If the link qualifier for a particular link is an option different from the circuit attribute of a given circuit, that circuit may not traverse that link.
- If the link qualifier for a particular link is an option identical to the circuit attribute of a given circuit, that circuit may traverse that link.

Link qualifiers and circuit attributes are used to identify a relationship between a circuit and the link it traverses. The circuit passes across the aggregate if it meets these conditions:

- If the circuit attribute and the link qualifier are the same
- If the link qualifier is **DON'T CARE**
- If the circuit attribute is **All**

Currently, a Link Qualifier offers 16 enterable options per classification.

IAR Routing Weights

You may decide to weight any of the following factors as more or less important to the IAR routing calculation than their defaults. Any change made to these weighing factors is considered a backbone configuration change, and a complete IAR recalculation is performed.

The IAR algorithm can be fine-tuned in this screen. In some cases, the comparative weightings of different IAR features may not be correct in their applications. You may feel that making a satellite link **UNDESIREABLE** should be of greater weight than one additional hop. This screen allows you to adjust the IAR weighting values for the following fields:

Availability

IAR weighting values range from `0 to 50`. The `Default Value` is `5`. A `Current Value` field shows the value the Controller is using.

Error Rate

IAR weighting values range from `0 to 50`. The `Default Value` is `5`. A `Current Value` field shows the value the Controller is using.

Delay

IAR weighting values range from `0 to 50`. The `Default Value` is `5`. A `Current Value` field shows the value the Controller is using.

Load Balancing

IAR weighting values range from `0 to 50`. The `Default Value` is `5`. A `Current Value` field shows the value the Controller is using.

Avoid Bumping

IAR weighting values range from `0 to 50`. The `Default Value` is `5`. A `Current Value` field shows the value the Controller is using.

Hop Count

IAR weighting values range from `1 to 50`. The `Default Value` is `10`. A `Current Value` field shows the value the Controller is using.

Link Attributes

Up to four fields display the link attribute names. IAR weighting values range from `0 to 50`. The `Default Value` is `5`. A current value field shows the value the Controller is using.

Summary

IAR automatically creates data paths for each circuit in the system. IAR consists of initial circuit routing as well as restoral from aggregate link and node failures. You have the ability to set attributes and assign parameters to each aggregate in the system. The IAR feature allows a circuit profile that defines restrictions for each circuit. Routing and rerouting then become automatic based on your definitions. Manual routing, control of IAR recovery, and routines for visibility into routing configuration are available.

In this chapter we covered the procedures for modifying the IAR defaults.

What's Next?

The next chapter covers Circuit Profiles.

16 Circuit Profiles

Overview

On a TMS-3000, you can define restrictions for each circuit using the `Modify Circuit Profiles` routine.

A circuit profile contains information required to make routing decisions for one or more circuits.

The advantage in this feature is that rather than typing the information for each circuit, you specify only the profile name. A maximum of 16 circuit profiles are allowed for the TMS-3000 system.

Topics covered in this chapter are:

- Examine/Modify Circuit Profiles
  - Profile Name
  - Default Profile
  - Delay
  - Error Rate
  - Availability
  - Link Attributes
  - Circuit Attributes

Examine/Modify Circuit Profiles

To view the circuit profiles from the TMS-3000 Main Menu, select either **`Examine`** or **`Modify Circuit Profiles`** Press `Enter`. You are prompted for a profile name or to press `Enter` to give you a list of names of the existing profiles. If you press `Enter`, a list of circuit profiles appears. Use the cursor key to highlight the desired profile. Press `Enter`. The `Circuit Profiles` screen appears.

The parameters for this screen are defined as follows:

Profile Name

You can enter up to an eight-character entry in this field. This name defines the circuit profile.

Default Profile

This entry says `Yes`, if the currently displayed profile is the default profile. The default profile is assigned to each created circuit but may be changed during circuit configuration (*Refer to Chapter 18*).

Delay

You can optimize on low network delay by selecting one of two options: **`Don't Care`** or **`Optimize`**.

Error Rate

You can optimize on low bit error rate by selecting one of two options: **`Don't Care`** or **`Optimize`**.

Availability

You can optimize on high reliability by selecting one of two options: **`Don't Care`** or **`Optimize`**. When **`Optimize`** is selected, routing calculations use weighting factors to attain the desired results.

Link Attributes

The IAR algorithm uses link attributes to make decisions about the generation of routes as well as the assignment of circuits to those routes. The attributes are defined in the IAR parameter screen.

The `Circuit Profiles` screen allows you to specify a link with a given attribute as either **`UNDESIREABLE`**, **`DESIREABLE`**, **`DON'T CARE`**, or **`NOT ALLOWED`** for the specific circuit in question. Specifying **`DON'T CARE`** for a given attribute allows you to ignore the field for circuit routing (*Refer to IAR Defaults, Chapter 15*).

Circuit Attributes

This function defines ASCII fields with labels for the system. These fields allow additional controls to be incorporated with initial routing and automatic rerouting calculations. Additionally, it provides the function to match a subset of circuits to require or disallow the use of specific aggregates in the system. This capability is paired with Link Qualifiers (*Refer to IAR Defaults, Chapter 15*).

For example, you define a label as **`Region`** and the field as **`UK`**. Then you define a circuit profile with the attribute **`UK`**. This results in circuits with this profile traversing the link. If you specify a different aggregate as **`DON'T CARE`**, any circuit could use this aggregate.

The `Circuit Profiles` screen also allows you to create/modify, rename, or delete a profile from the menu. These features are described below.

- **`Modify/Create Another Profile`** — To create a new profile highlight this selection and press `Enter.`

  The system prompts you with :

  ```
  New Profile ? [Default NO (Y/N)]:
  ```

Enter **y**, if this is a new profile. To verify, press the **F3** key to return to the Circuit Profile menu.

- **Rename Current Profile**— the current name of a profile can be changed by highlighting this selection and pressing `Enter`. Input the new profile name (up to 16 characters). Press `Enter`.
- **Delete Current Profile**— Deletes the current profile name and information presented on the Circuit Profiles Menu. Before you do this, the system asks you:

  `Are you Sure? [Default NO, (Y/N)]:`

Summary

You have the ability to define restrictions for each circuit. A circuit profile which you can define contains information required to make routing decisions for one or more circuits. In this chapter we covered the procedures for modifying circuit profiles.

What's Next?

The next chapter covers configuration procedures for the Sync Status Card.

17 Sync Status Card

Overview

This routine creates the required node configuration for a Sync Status Module (SSM). In many networks, cryptographic equipment is used to encrypt aggregate data streams before transmission across an aggregate trunk and decrypt aggregate data from other nodes. The contents of the aggregate data stream is thus protected from unauthorized access during transmission.

The SSM provides a status signal to cryptographic equipment, indicating the In Sync or Out of Sync condition of a selected aggregate trunk.

It can also receive a status signal from the cryptographic equipment and display the On/Off condition of that signal through a front panel indicator.

The SSM also supports dial backup applications of diverse ACC links and distinct ACC links. It detects an out of sync condition of the primary ACC link and uses its output signal to connect the backup link.

An SSM plugs into a channel slot of a TMS-3000 or TMSC node. The purpose of the `Modify Sync Status Card` routine is to associate the card in that slot with a particular aggregate trunk. Once the Sync Status configuration is complete, the node transfers a sync signal from the selected ACC to the SSM in the same way that data is transferred to a channel module in a channel slot.

Topics covered in this chapter are:

Examine/Modify Sync Status Card

- CIC
- Channel
- DB Div
- Auto Rest

Examine/Modify Sync Status Card

To display the Sync Status Card configuration, from the `TMS-3000 Main Menu`, highlight **`Examine`** or **`Modify Configuration`** Press `Enter`.

The `Configuration Main Menu` appears. Highlight **`Examine`** or **`Modify Sync Status Card`**. Press `Enter`.

You are prompted to either enter the desired node name or press `Enter` to see all nodes. If you enter the desired node name, the `Sync Status Configuration` menu appears.

For each slot containing an ACC, the destination node and slot for the aggregate trunk also appear, followed by blank fields under the headings `CIC` and `Channel`.

The Channel Interface and channel address of the SSM that monitors synchronization for that aggregate must be entered as follows:

CIC

(Limited Range Entry) — To enter the slot number of the CIC associated with the SSM, highlight the `CIC Slot` entry and press `Enter` until the correct slot number appears. Only slot numbers for configured CICs may be entered.

Channel

(Limited Range Entry) — Enter the slot number of the channel slot occupied by the SSM. Once the CIC slot and channel number have been entered, the next three fields become active.

The following selections of **`DB Div`**, **`Auto Rest`**, and **`Delay Timer`** apply only to the ACC diversity dial backup operation and are not used in cryptographic applications.

DB Div

The DB Div (Diversity Dial Backup) feature is configurable from the Controller. Unlike standard ACC diversity, link A of the diverse ACC is favored, and link B is the dial backup link. The SSM supplies a control signal which connects to a terminal adapter to initiate and terminate calls for link B. For the card to properly accept commands from the CIC, an option switch on the SSM must be properly set for use with GTS software (i.e., optioned for MSO V3.0.0 or greater). The SSM enters this mode through its interface to the CIC and then ignores all other option switches and the front panel reset switch. The SSM does not use the raw hardware sync signal for switching its output, but uses a software filtered sync signal received from the ACC via the CIC. Diversity Dial Backup has two modes, AUTO (automatic) and MANU (manual).

Auto Rest

When ON is selected for `DB Div`, the `Auto Rest` (Automatic Restoral) field becomes active, the choices being **`AUTO`** (automatic) and **`MANU`** (manual). If **`MANU`** is selected, the SSM latches its output when there is an out-of-sync condition transition of the software filtered sync signal. The ACC uses existing diversity control mechanisms to force itself to link B. This self-imposed state is reported in the ACC Diagnostics screen in yellow as `Forced Diverse B` as if it were selected by you. This indicates that the dial backup link is latched in-service. That state remains until you are satisfied that link A has recovered. Then Force to Link A diversity can be set via the diagnostic menu selection. The diversity switch to link A occurs if the `Link A Fail` condition has cleared. When `Forced Diverse A` and `Link A Active` are reported back to the Controller, AUTO diversity can be selected in order to resume normal Diversity Dial Backup operation. Whenever diversity is using link A, the SSM control signal is reset. This mode is manual since you must intervene via the Controller to switch back to link A.

You may also configure an automatic mode of the Diversity Dial Backup feature (**`AUTO`** selection). In this mode, the CIC commands the SSM to reset its control signal after the ACC has determined that the main link of the diverse pair is good again. There is a configurable timer value used by the ACC to make this determination. This value is in the range of **`0`** to **`15`** minutes in 1 minute increments and is configurable through the network controller. If you select **`10`** minutes, the primary link must be good for 10 minutes before the SSM is told to reset its control signal. `Link A fail` is reported by the ACC to the Controller until this timer expires even if the `Link`

A fail hardware status is clear. The ACC always reports filtered link status, and in this case the filter times can be much longer.

The determination that the out-of-service diverse link is good is not based on ACC sync information since that is only available for the in-service link. The ACC monitors the Link A fail hardware status to make this determination. This status is good if the ACC recognizes data transitions on the link. But data transitions are not a guarantee that the link has actually recovered. If you do not think that data transitions are reliable enough to determine that the link is good, then the **MANU** mode should be selected.

Diversity control selections from the ACC diagnostic menu can always be used to override any other diversity switching states. This may prove useful when using the Diversity Dial Backup feature if you want to temporarily disallow switches to the dial backup link. The **Force to Link A** accomplishes this. You should **Force to Link A** prior to software downloads since the ACC and CIC boot firmware cannot support the control of the dial backup link. If you would like to verify that the dial backup works without failing link A, then **Force to Link B** should be selected.

When Diversity Dial Backup is active and everything is operating normally, the SSM is continuously updated with sync information from the CIC. But if the time without an update exceeds a pre-defined interval (for example, a CIC or ACC has failed or has been removed), then the SSM is uncertain of the state of its output. Therefore, if the SSM does lose communications with the CIC for more than 30 seconds, the SSM enters the hardware mode selected by its option switches (for example, "latch" mode) until commands from the CIC resume.

It is also possible to disable the Diversity Dial Backup mode (manual and automatic) under TOR control. On page 2 of the ACC Configuration screen under Link Enable/Disable Status, there are three options: **Enable**, **Disable**, and **BU.Dsbl** (backup disable). If **Disable** or **BU.Dsbl** is selected, dial backup connections are prevented.

Summary

In many networks, cryptographic equipment is used to encrypt aggregate data streams before transmission across an aggregate trunk and decrypt aggregate data from other nodes. The contents of the aggregate data stream is thus protected from unauthorized access during transmission. The SSM provides a status signal to crypto-graphic equipment, indicating an in sync or out of sync condition of a selected aggregate trunk. It can also receive a status signal from the cryptographic equipment and display the On/Off condition of that signal through a front panel indicator.

In this chapter we covered the procedures for modifying the parameters of the SSM.

What's Next?

The next chapter covers circuit configuration.

18 Circuits

Overview

A circuit is an end-to-end data or voice path which can pass through several entities in a communication system. A circuit is described or referred to by the node/channel names which identify the endpoints of the circuit.

The `Create/Modify Circuits` routine allows you to define a circuit between two channel ends in a TMS-3000 system and to modify existing circuits.

Topics covered in this chapter are:

- Examine/Create/Modify Circuits
  - Circuit Selection
  - Create/Modify Circuit Configuration
- TMS-3000 Circuits
  - TMS Class Circuits
  - Network Class Circuits
  - TMS/Network Circuits

Examine/Create/Modify Circuits

After selecting this routine from the `Configuration Menu`, you are prompted to enter the circuit name or press `Enter` for a list of all circuits. If you are modifying an existing circuit and know the circuit name, type the name in the field and press `Enter`.

If you are creating a new circuit, you create the circuit name by entering it. You may explicitly assign an extension or, after you enter the name, the system assigns a three-digit extension number, as in:

`BOSTON.001`

This enables you to create many different circuits with the same name or automatically duplicate a range of circuits.

Circuit Selection

When a circuit is selected the `Circuit Selection` screen (*See Figure 18-1*) appears.

You create or modify circuits using the first three menu selections. The last two menu choices place restrictions on circuits.

```
Circuit Selection            Net1                          04-Apr-1996 12:03:53

Select ONE of the following:

All Circuits

Terminating at Node:   ---------------------    Slot: ---- Port: ---- DS0: ----
                             Select Node

Circuits Between Nodes:                ----------------    ----------------
                                         Select Node        Select Node

Limit Selection Above By Circuit Name:  -----------------------------------

Additional Limit On Selection Above:    No Limit
```

Figure 18-1 Circuit Selection Screen

When `Terminating at Node` field is highlighted and you press `Enter`, a prompt appears asking you to enter the **`Node`** name and **`Slot`** number in the main shelf. If the circuit is from a CDA, IAC or LIM module, you must also enter the **`Port`** and **`DS0`** numbers. The port designations are `A-B` (`*` for a LIM). DS0 numbers range from `1-24` for a CDA-T1/LIM (`1-31` for CDA-E1/LIM).

When the `Limit Selection Above by Circuit Name` field is highlighted, several rules govern the proper use of syntax in a circuit name.

1. A circuit name and extension number should follow this format.

   `FULL_NAME := NAME.EXT`

Listed below is a legal set of characters that can be used for the circuit name and extension (including any wild card characters):

Legal Name Characters — Any ASCII character except , / [ ] ? _ * . " \

Name length— 16 legal name characters (not counting the .nnn extension)

Ext — 3 decimal digits

2. The following wild-card characters may be used in place of other characters in the string:

`*` matches zero or more characters

`?` matches any single character

[`....`] matches any of the enclosed characters

[`x-y`] matches any ASCII character between X and Y.

For example, in a TMS-3000 these following circuit names are valid:

`ABCD.003`

`AB.002`

`ACB.001`

```
ASDB.001
ASDB.002
ASDF.001
AZB.001
A.001
A.002
B.001
```

The rules for circuit name expansion are as follows:

- Both the name and extension number may be expanded if the patterns provided match a fixed-length set of names (i.e., the `*` wild-card character is not present). If this holds true, then the name component is padded with the "space" character while the extension number is pre-padded with the `0` character.
- If no "`.`" character is present in the provided pattern, the extension `*` is appended.
- Use the wild-card characters when making a circuit selection. You can type these abbreviated forms to select or modify an existing circuit.
- In this case would match

In this case	would match
A.1	**A.001**
A	**A.001 or A.002**
A*.*	**all of the circuits listed except B.001**
A*B.001	**ACB.001, ASDB.001 and AZB.001**
A*B	**AB.002,ACB.001,ASDB.001 and ASDB.002**
A?B	**ACB.001 and AZB.001**
A[QRSTUVWXYZ]B	**AZB.001**
A [Q-Z]	**AZB.001**

To display or change an existing circuit, enter the name and the three-digit extension number assigned to it to gain access to the correct circuit screen.

The `Additional Limit On Selection Above` feature allows you to place additional criteria on circuit selection. Those criteria are:

- Enabled in TOR/DRR configuration — selects only those circuits enabled in the selected TOR/DRR configuration.
- Differing Between Configurations — selects only those circuits having differences between two TOR/DRR configurations.
- No Limit — No limitations are imposed on any circuits.

If there are several pages of circuits, you may select a page number using the **F5** (Backup Page) or **F6** (Advance Page) keys. The page number may also be entered as a numerical string entry when the cursor is positioned at the page number field.

Create/Modify Circuit Configuration

A circuit is overlaid on an existing route between the beginning and end nodes of the circuit. A circuit may be configured without being assigned to a route. One exception to this is a local circuit, where both ends of the circuit are located at the same node. No route is permitted for a local circuit.

Once a circuit is created and selected, it is automatically routed by the Intelligent Automatic Routing routine, as permitted by aggregate bandwidth on the route. Routes pass between TMS-3000, TMSC, and OCM-2000 nodes only. They do not extend to Universal MM+ V4 or XNET nodes. If a circuit terminates at a Universal MM+ V4 or XNET node, you may assign a route for the sections of the circuit that pass between TMS-3000, TMSC, or OCM-2000 nodes.

A circuit is defined by the channel module and CIC that terminate the circuit at either end, or, in the case of an OCM, just the channel module. The node location, slot number of the associated CIC, and the slot number of the channel module form an address for each end of the circuit.

In an OCM, a slot can hold either a single or dual voice channel card; or a single or dual data channel card. The dual voice channel card is called DPV (Dual Private Voice). To support the dual card type, the channels are referred to by the numbers 2A, 2B, 3A, 3B, etc. For example, in an OCM Enclosure (ten physical slots), a dual data channel card in Slot 2 would contain Channels 2A and 2B, Slot 3 would contain Channels 3A and 3B, etc. Note that for X.50 channel cards, which support up to four circuits, the channels for Slot 2 would be 2A, 2B, 2C, and 2D. For single channel cards, the channel number is the slot number. Slot 1 on both shelves and enclosures is reserved for a CCM (In the case of redundant CCMs, slot 2 is also reserved for a CCM). Both enclosures must also use at least 1 slot for a LIM. This leaves 30 remaining slots in an OCM Shelf [maximum of 60 (120 for X.50) circuits using dual channel cards] and eight remaining slots in an OCM Enclosure (maximum of 16 circuits using dual channel cards). In addition to the shelf physical capacity, power consumption of the cards must also be considered when determining the total number of cards that may be installed. This is determined by load numbers. Each card type is assigned a load number based on the card power consumption. For an enclosure, the maximum load value is 10. For a shelf, the maximum load value is 16. The total load ratings of your cards cannot exceed these values. Contact General DataComm Service if you have questions about load values.

The characteristics of the channel ends (channel modules) must also be defined. The entries made depend on the following applications:

- Circuit transfers data or voice.
- Type of channel module used to terminate the circuit ends.
- Specific characteristics of the voice or data interface.

For example, a Data III channel, Data IV channel, UDC module, or Data Channel Module (DCM) may be configured for synchronous, asynchronous, **isochronous**, or **anisochronous** data. Isochronous is a method for transmitting asynchronous data by synchronous means. It is a transmission format where the asynchronous characters (i.e., those delineated with Start and Stop bits) are sent with a clocking connection between the transmitter and receiver. Anischronous is the essential characteristic of a time-scale or a signal such that the time intervals between significant instants do not necessarily have the same duration or durations that are integral multiples of the shortest duration.

If the circuit is synchronous, you must define the timing sources for each channel end. If the circuit is asynchronous, you must define the asynchronous character format of the data.

There are six function selections for the `Circuit Configuration` routine. Each is selected by moving the cursor to the function and pressing `Enter`. These functions are available at the bottom of the `Circuit Configuration` screen (*See Figure 18-2*).

NOTE

There are several versions of the Data Channel Module that are available for the TMS-3000. One version is identified as the Data II Channel Module, the second version is the Data III Channel Module, the third version is the Data IV Channel Module, and the fourth version is the Universal Data Channel (UDC) Module. The UDC Module is scheduled to replace the existing Data II, III, and IV Channel Modules. A fifth type, based on the UDC, is the G.703 Data Channel.

In most respects, all versions operate identically. The difference is that the Data III Channel Module supports multi-drop polling applications, while the Data II Channel module, without a polling piggyback card, does not. The Data IV and UDC modules contain a special Sync LSI chip that prevents lockup situations that can occur when using either card in multi-drop polling applications. In addition, the Data IV and UDC modules contain several options that are configured through software. The G.703 Data Channel supports 64 KHz, 128 KHz, or 256 KHz co-directional interfaces, the rate depending on the version of the card (s) installed in your system.

As mentioned earlier, there are two basic data channel modules available for OCM-2000, the single circuit and dual circuit versions. Additionally, for the OCM, an X.50 Data Channel card is available which supports up to four circuits per card and has the capability of terminating X.50 type circuits. The X.50 format is an ITU-T multiplex standard for a gross bit rate of 64 KHz.

Throughout this manual, all versions are implied when the Data Channel module is discussed. A detailed explanation of the differences between modules is given where applicable.

```
Circuit Configuration             Net1                     04-APR-1996 12:18:15
Name TMSCKT     .001    Class     TMS           Type    SYNC        Interface     CTB1
Rate    75               Set Downrate     Disabled

Xmit/Recv Clock      INT-INT                     |    INT-INT
Control Type         Slow Controls

                  RTS/ALM     -      -      DTR |  RTS/ALM     -      -     DTR
Transmit EIA      F-On   D      ---    ---    F-On | F-On  D      ---    ---    F-On

End Node Name     A                (001)      SEL | D                (004)     SEL
End Node Type    TMS-3000                       | TMS COMPACT
End Equip Slot    13                             |    05
End Channel Num   11                             |    01
Profile       DEFAULT           Routing Priority     3        Preemption Pri     3
Routing    Automatic
TOR/DRR    C01       D  C02       D  C03      D  C04      D  C05       D  C06      D
Configs    C07       D  C08       D  C09      D  C10      E  C11       D  C12      D
           C13       D  C14       D  C15      D  C16      E
             Create by Default       Modify Another           Delete
             Create by Template      Duplicate                Rename
```

Figure 18-2 Circuit Configuration Screen for Synchronous Data Circuit

Create by Default

This selection validates and saves the current circuit, and prompts you for another circuit name. Once you enter the name, a new circuit display is generated with the default channel characteristics. The end node and route information must be entered for the new circuit.

Each circuit created is enabled by default in all of the configurations created. A circuit can be enabled or disabled in a particular configuration by moving the cursor to the configuration and making the enable or disable selection.

Modify Another

When this selection is highlighted, you return to the `Circuit Selection` screen. This allows you to select another circuit.

Delete

This selection deletes the circuit that is displayed.

Create by Template

This selection validates and saves the current circuit, and prompts you for another circuit name. Once you enter the name, a new circuit screen is generated with the channel characteristics of the previous circuit. The end node and route information must be entered for the duplicated circuit.

Duplicate

This selection lets you transfer the characteristics of a current circuit to a new circuit or circuits. The range of circuits all receive the same name as the original circuit.

The three-digit extension number is incremented by one for each successive circuit copy. Route and Channel Interface Card assignments may be duplicated within operating limits (discussed below).

To perform a multiple duplication, you first create or select the circuit configuration to be copied from, then select this function through cursor position. A prompt lets you select the number of consecutive circuits to create. Since all duplicated circuits have the same end nodes and Channel Interface Cards, no more than 63 duplications may be made.

Several other potential limits are checked by the system during the duplication process. On a per configuration basis, these include:

- Do other circuits with the same name already exist?
- Are consecutive unconfigured channel modules available to support the range of channels?
- Is there sufficient Channel Interface Card bandwidth to support all duplicated circuits?
- Is the circuit a digital bridge circuit? Duplication is allowed only within a DBC fan. Duplication of the fan common is not allowed.

The screen reports any limits that are exceeded during the duplication process and prompts for corrections to the process.

Any further circuits are copied without route assignment. You may check the assignment of routes in the circuit list displayed at the entry to these routines.

Rename

A circuit that has been completed and saved may be renamed. When you select the function, you are prompted to enter the new name, then press `Enter`. The new name is assigned to the currently displayed circuit.

TMS-3000 Circuits

There are three classes of circuits in the TMS-3000: TMS, Network, and TMS/Network.

The TMS types are classified as standard voice and data types used between TMS-3000 nodes containing Channel Interface Cards or ACMs and/or OCM-2000 nodes. The network type circuits are those configured to enter and exit on CDA or IAC and follow network standard protocols. A TMS/Network class, network channel circuit allows you to convert a DS0 data stream into a TMS bit multiplexed data stream.

TPP Pathways are also supported in the `Circuit Configuration` screen. TPP pathways include those associated with TPPs as well as OPPs. You can install four TPPs in a TMS-3000 common shelf and each TPP supports up to 64 TPP pathways and, optionally, up to four LAN interfaces. You can install two OPPs in a TMS-2000 Enclosure and four OPPs in a TMS-2000 Shelf. Each OPP occupies two slots and supports one external DB-25 interface, one TPP pathway and one LAN interface. TPP configuration on this screen is only for the TPP pathways: For configuration of the OPP external DB-25 interface, refer to the `OCM LIM Configuration` screen (for OPP modules). The LAN interface is configurable by the IMS.

Physical connectivity for the TPP pathways is via standard TMS-3000 or OCM-2000 synchronous data channel modules (i.e., the equipment cable is connected to a data channel module backplane connector).

NOTE

Although these options appear on the TMS Controller, the TPP and OPP cards do not support:

TPP Redundancy
Microcell
SNA/SDLC
PIR

Please refer to the appropriate version of the TPP and OPP release notes.

The `Class` field in the `Circuit Configuration` screen is highlighted when the screen comes up. Press `Enter` if you wish to change the class. Other changes also occur in the screen when you change the class. When the desired choice is highlighted, press `Enter`. If this is attempted on an existing circuit, the following prompt appears:

```
Changing Circuit Class deletes circuits? [Default NO (Y/N)]:
```

Pressing `Enter` does not delete this circuit. If No (**`N`**) is selected or `Enter` is pressed, the original circuit type appears.

TMS Class Circuits

The TMS types are classified as standard voice and data types used between TMS-3000 nodes containing Channel Interface Cards or ACMs and/or OCM-2000 nodes.

Common Configuration Fields, TMS Circuits

The following describes each TMS circuit configuration field that is common to all TMS class circuits.

`Name` (String Entry) — This is the symbolic name of the circuit which you enter when you initially create the circuit. Up to 16 characters may be included in the name (not including the three-digit extension number). A three-digit extension number follows the name, separated by a period. The extension number enables circuit duplication. If you duplicate a number of circuits with the same name, the controller assigns consecutive extension numbers to each circuit. If you do not assign an extension number, the Controller assigns the next available number (if no other circuits with the same name exist, .001 is assigned).

`Class` (Limited Range Entry) — This defines the class of circuit as TMS.

`Type` (Limited Range Entry) — This defines the data or voice type of the circuit. For voice circuits, the type is synonymous with the type of channel module terminating the circuit. For data circuits, several data types are selectable for each type of data channel module. The channel modules and associated channel types are presented in *Table 18-1*. For ACM, *see ACM Circuit Configuration* later in this chapter. For an X50S, CDA to CDA circuit (i.e., not terminating in a TMS/OCM channel card), the data circuit is fully transparent, and the `Type` field does not have any particular meaning.

Note that for Digital Bridging, all circuits of a fan must be the same type.

`Interface` (Limited Range Entry, for data circuits only) — This selects a particular control signal arrangement for the interface between the channel module at each circuit end and the equipment communicating through the circuit. For data circuits, the Interface Type is determined by the application of the circuit and the type and requirements of equipment at each channel end.

The `Interface` type is supported by a program plug on the TMS data channel module, which routes control signals to the proper interface connector pins. Refer to *GDC 036R303-000* for more information on program plugs.

If using an interface type other than `CTB1`, be aware of the following considerations:

- Interface types other than `CTB1` are used for channels that require the toggling of EIA controls.
- Channel controls are passed from end-to-end using all aggregate bandwidth that is not dedicated to channel data or multiplexer overhead requirements.
- If `Priority Ctls` (Priority Controls) are not selected for each channel that uses an interface other than CTB1, only minimal aggregate bandwidth is reserved.
- GTS software uses polls per second and characters per poll to determine how much aggregate bandwidth is reserved to ensure the proper transmission of EIA control state changes. Provide this information (`Max Polls/Sec` and `Min Chars/Poll`) when configuring the interface type during `Circuit Configuration`.
- Using interface types other than CTB1 requires that `Priority Ctls` be set to **`Enable`**

  unless the application has the unique characteristic of toggling controls only during initial session startup and

  to ensure proper channel operation regardless of circuit routing.
- Improper configuration of `Priority Ctls` causes unstable channel operation that is dependent upon the exact path used for a circuit to traverse the TMS network.

- Erroneous reports of `Channel Fail/Rmt Loopback` are the result of channel controls not passing through the network properly because of the improper configuration of channel controls.

A display is generated for the interface type at each channel end. The display shows which interface control signals are supported by the interface type, and which signals are switched On or Off by the interface. You can step through the display and set any signal On (**`F-On`**) or Off (**`F-Off`**). The `/ALM` which is associated with a control, for example `RTS/ALM`, is used to enable (**`E`**) or disable (**`D`**) reporting of an alarm for loss of that particular control signal. *See Table 18-2.*

If three dashes (`---`) are shown, the signal state supplied through the program plug is transmitted through the system.

A TMS Class circuit with an X.50 Interface is to deliver data from an X.50 DS0 to an OCM X.50 channel card for termination. X.50 DS0 channels are numbered according to the frame configuration for special frames and 1 through the max available number consecutively, starting with the first channel of phase 1 for X54 compatible frames.

Table 18-1 TMS Class Circuits

Module	Channel Type
Data	
Data III, Data IV, UDC, or DCM	Synchronous (Sync) Asynchronous (Async) Isochronous (Isoc) Transition-Encoded (T-Enc)
G.703	Sync
TID-III Data Channel Module	TID
X.50 Data Channel Card (OCM)	Sync, Async
High Speed Data Channel (OCM)	Sync, Async, Isoc, T-Enc
Dual Data Channel (OCM)	Sync, Async, Isoc, T-Enc
TPP or OPP Module	TPP
Voice	
Voice II/CVSD Channel Module	CVSD
Voice II/ASP Channel Module or UVC ASP	ASP (for 16 KHz ASP mode)
UVC/ADPCM Voice Channel Module or VCM	U-ADPCM
VLBRV Voice Channel Module or VCM	VLBRV
UVC ADPCM Module, UVC PCM (or VCM)	ACM-UVC
ACM to ACM	ACM-V ACM-D
CADM Module	CADM
TOR Module	TOR
CELP Voice Channel Module	CELP
Dual Private Voice (OCM)	IMBE
TPP or OPP Module	TPP
Video	
TPP or OPP Module	TPP

`DCD/Alarm` – You can enable or disable this alarm (data channels only). When enabled, an alarm is generated upon loss of Control 1.

`SigType` (Limited Range Entry, for Voice and ACM Voice circuits only).

For TMS/TMS and TMS/OCM circuits —> **`2 state`** (E & M signaling) only.

For OCM/OCM circuits —> **`2 state`** (E & M signaling), **`4 state`** (A & B bit signaling).

For **`ACM-UVC`** type circuits: **`2 state`**, **`CCS/INB`**; **`4 state`** (ACM/T1-UVC) for FXS/LS

For **`ACM-V`** type circuits: **`2 state`**, **`4 state`**, **`16 state`** (E1/E1 only), **`CCS/INB`** (INB when CCS on ACM only)

For **`VLBRV`**, **`CELP`**, and **`IMBE`**: **`2-state`**; **`4 state`** (OCM to OCM)

Table 18-2 Interface Types for Data Channels

Control Inputs	CTL1 2 3 4	1 2 3 4
CTA1 (CPU to Terminal)	RTS /ALM – – DTR - - - D - - - - - - - - -	RTS /ALM – – DTR - - - D - - - - - - - - -
CTB1 (CPU to Terminal — DCD/DSR Forced On)	RTS /ALM – – DTR F-On D - - - - - - F-On	RTS /ALM – – DTR F-On D - - - - - - F-On
CTC1 (CPU to Terminal — DSR Forced On)	RTS /ALM – – DTR - - - D - - - - - - F-On	RTS /ALM – – DTR - - - D - - - - - - F-On
CPL1 (CPU to Private Line Modem)	RTS /ALM – – DTR - - - D - - - - - - - - -	DCD /ALM – – DSR - - - D - - - - - - - - -
CPM2 (CPU to Modem — Polling)	RTS /ALM CTS – DTR - - - D - - - - - - - - -	DCD/ALM CTS – DSR - - - D - - - - - - - - -
CPT2 (CPU to Terminal — Polling)	RTS /ALM CTS – DTR - - - D - - - - - - - - -	RTS /ALM CTS – DTR - - - D - - - - - - - - -
CDM3 (CPU to Dial-Up Modem)	RTS /ALM OOS – DTR - - - D - - - - - - - - -	DCD/ALM CTS RI DSR - - - D - - - - - - - - -
DMC3 (Dial-Up Modem to CPU)	DCD/ALM CTS RI DSR - - - D - - - - - - - - -	RTS /ALM OOS – DTR - - - D - - - - - - - - -
54M8 (V.54 Modem to Modem)*	CD/ALM RL LL TM - - - D F-Off F-Off - - -	CD RL LL TM - - - F-Off F-Off - - -
X50S	S-bit F-On	S-bit F-On
X50 (X.50 Device to OCM)	With X.50 termination (OCM only), there are four receive EIA fields, CL1, CL2, CL3, and CL4. Only one transmit control is allowed, CL1. CL1 can be forced or passed through. CL2, CL3, and CL4 can be forced only.	
* RL and LL are normally in the F-OFF position. If ON is selected, a V.54 loopback is automatically initiated.		

`Rate` (Limited Range Entry): This selects the data rate for the circuit. Highlight this field and press `Enter`. The `Circuit Rate Selection` screen appears listing all data rates which are valid for the channel type selected. Using the cursor, highlight the desired rate, and press `Enter`. Note that CADM voice channels have a fixed rate of `16 KHz` and require no selection in this field. Additionally, a G.703 channel card operates at 64, 128, or 256 KHz and does not support Downrate. On the OCM X.50 channel card, channels A, B, C, D can be configured and circuits are not down-speedable.

NOTE

In the TMS-3000, TOR with rates of 8 KHz or 16 KHz and CADM with a rate of 16 KHz are digital voice channels used for foreign applications. This circuit type should not be used for domestic applications.

For Digital Bridging, all of the circuits of a fan must be configured for the same rate.

UVC/ADPCM and VCM/ADPCM (U-ADPCM) Voice Channel Modules support several different modes of operation. The mode is selected as a `Rate` entry.

The modes for U-ADPCM are discussed as follows:

`CC32K` — This 32 KHz mode complies with the former ITU-T standard G.721, dated March 1984. This mode is required only for compatibility with existing Voice II/ADPCM channel cards — in other words, if an ADPCM Universal Voice Card is used at one end of a circuit and a Voice II/ADPCM channel card is used at the other end of the circuit, select this mode.

`A32K` — This 32 KHz mode complies with the draft version of the ANSI ADPCM standard, dated March 1985. This mode should be used only if a specific application requires adherence to the draft ANSI standard.

`NA 32K` — This 32 KHz mode complies with the current ADPCM joint standard provided by ITU-T G.721 and ANSI committee T1Y1.2. This mode is preferable for voice applications. It provides superior performance in an idle channel situation. Use this operating mode for 32 KHz voice channels unless a specific application dictates otherwise.

`64K PCM` — This mode is used when down-speeding is desired, allowing for downrate to an ADPCM rate.

`32K` — This 32 KHz mode uses a proprietary GDC algorithm for ADPCM encoding. It is intended for modem applications, where a modem analog signal is transmitted through the TMS-3000 network using the ADPCM voice channel. Modems may operate at 4800 Hz or less using this mode. This mode provides improved signal-to-noise performance over the other 32 KHz modes (when used in modem applications). Do not select this mode for voice applications.

`24K` — This 24 KHz mode uses a proprietary GDC algorithm to provide high quality voice transmissions at a lower data rate. Modem analog signals of 2400 Hz or less may also be transmitted in this mode.

`16K` — This 16 KHz mode uses a proprietary GDC algorithm to provide quality voice transmission at a lower data rate. This mode may not be used to transmit modem analog signals.

`Set Downrate` – If the circuit is unable to be routed at full rate due to limited bandwidth, the circuit data rate can be decreased with this option. You can enter a rate lower than the selected data rate on the screen. To set this option, highlight `Set Downrate` and press `Enter` to **`Enable`**, move the cursor to the `Downrate` field and press `Enter` again to bring up the `Circuit Rate Selection` screen; select the desired rate, and press `Enter`. Note that the `Downrate` field only appears on the screen when `Set Downrate` is **`Enabled`**.

NOTE

CELP-FAX transactions are supported at 9.6 and 6.4 KHz. Setting the Set Downrate option to 4.8 KHz disables CELP-FAX transactions.

All Digital Bridging circuits should be configured with Downrate DISABLED.

For TID-III circuits, this field is always `Disabled` .

NOTE

IAR may still choose to drop circuits instead of down-speeding them, due to backplane control bandwidth constraints or frame considerations.

`End Node Name` (String Entry) – Node names of each end point of the circuit. Note that for X.50 termination, the circuits are internal to an OCM node; and therefore, there is no routing information on the screen, and only one node name can be selected.

`End Node Type` – Name of the node type at each end of the circuit, for example, `TMS-3000` .

`End Equip Slot` – Slot number of the CIC, TPP, OPP or channel card can be selected (by pressing `Enter` to jog the field) for each end node. You may only enter slot numbers that have been configured for CICs, TPPs, OPPs, or channel cards. In an OCM, this field does not apply (*See Table 18-3*).

If you have entered **`UNIV. MM+ V4`** unit as a node, the Controller automatically enters `1` as the Equipment Slot number, since there is no Channel Interface Card in a Universal MM+ V4 unit. Similarly, XNET circuits display `1`.

`End Channel Num` (Numerical String Entry) – The slot number of the channel module that terminates the circuit at an end node must be entered. This number is the channel number at the selected node. This is a *poke point* for a CDA end of the circuit, an *input field* for the TMS end.

All the channels of a Digital Bridging fan terminate into the Fast Bus, not the channel card bus. Therefore, the common and desired drops are configured to terminate at the desired channel card (be it at a local or remote node).

Table 18-3 Determining End Channel Numbers

Node Type	Shelf No./Type	Channel No.	Description
TMS-3000	CIC* First Exp. Shelf Second Exp. Shelf Third Exp. Shelf Fourth Exp. Shelf	 Channels 1-16 Channels 17-32 Channels 33-48 Channels 49-64	End Channel Slot number may be 1 through 64. The slot number is determined by the position of a channel module in the Expansion Shelf (each shelf holds 16 channel modules) and whether the shelf is the first, second, third, or fourth Expansion shelf associated with the Channel Interface Card as determined by a strap on each shelf's Expansion card.
TMS Compact	CIC* Main Shelf First Exp. Shelf Second Exp. Shelf Third Exp. Shelf	Channels 1-10 Channels 17-32 Channels 33-48 Channels 49-64	End Channel Slot number may be 1 through 10 or 17 through 64. Slot number is determined by position of channel module in the Main Shelf (which holds 10 channel modules), or in an Expansion Shelf (each shelf holds 16 channel modules) and whether the shelf is the main shelf or the first, second, or third Expansion shelf associated with the Channel Interface Card. Note that Channel Slot numbers 11-16 are not used in the TMSC.
OCM-2000	OCM Shelf Main Shelf Exp. Shelf Split Shelf OCM Enclosure	 Channels 2-16 Channels 17-32 Channels 2-8 (left node) Channels 10-16 (right node) Channels 2-10	There are three enclosures available: OCM Shelf, OCM Split-Shelf (rackmount) and OCM Enclosure (standalone). Slot 1 is reserved for the CCM (1 and 9 in the Split-Shelf). The remaining slots can be either LIMs, or data/voice channels. Slot 2 is used for redundant CCM applications. Dual data cards provide 2 data (voice for DPV-IMBE) circuits per card and are designated as 2A, 2B, 3A, 3B — 10B (or 32B). Quad cards provide 4 circuits e.g., 2A, 2B, 2C, 2D.
Universal MM+V4	Top Main Shelf Lower Main Shelf Upper Exp. Shelf Lower Exp. Shelf	Channels 1-11 Channels 12-22 Channels 23-38 Channels 39-54	For a channel in a Universal MM+V4 and XNET node, the End Channel Slot number may be between 1 and 54. The slot number is determined by the position of a channel module in the Universal MM+V4 Main Shelf, or in an Expansion Shelf.
* If the DBC function is being used, *see Figure 18-3* for the channel numbering scheme.			

Note that digital bridging circuits are configured the same as other circuits. But the channel numbers of the fan common and its drops are pre-assigned on the DBC to specific numbers. These numbers are as follows and also illustrated graphically in *Figure 18-3*:

Expansion Shelf Number	**Fan Number**	**Common Drop Channels**
1	1A	1, 2, 3, 4, 5, 6, 7, 8
	1B	9, 10, 11, 12, 13, 14, 15, 16
2	2A	17, 18, 19, 20, 21, 22, 23, 24
	2B	25, 26, 27, 28, 29, 30, 31, 32
3	3A	33, 34, 35, 36, 37, 38, 39, 40
	3B	41, 42, 43, 44, 45, 46, 47, 48
4	4A	49, 50, 51, 52, 53, 54, 55, 56
	4B	57, 58, 59, 60, 61, 62, 63, 64

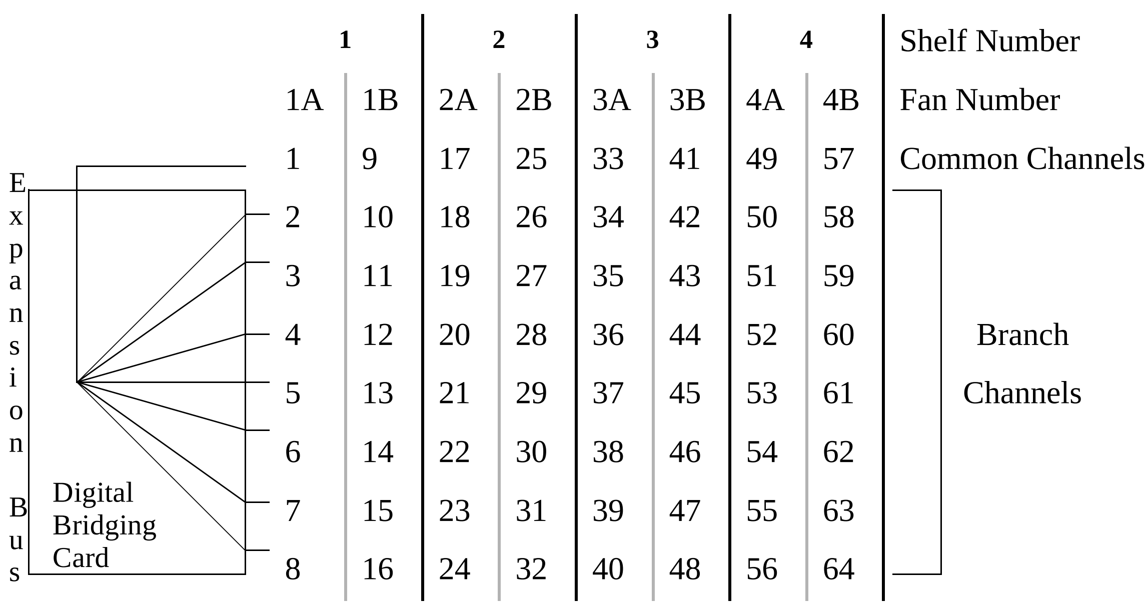


Figure 18-3 Digital Bridging Card Functional Diagram

When a DBC is used in the TMSC and DBC is enabled, the channels are numbered as follows:

Main Shelf: Channels 1-16 (Fans 1A, 1B) See note below.

First Expansion Shelf: Channels 17-32 (Fans 2A, 2B)

Second Expansion Shelf: Channels 33-48 (3A, 3B)

Third Expansion Shelf: Channels 49-64 (4A, 4B)

NOTE

If the Digital Bridge selection for the Main Shelf is DISABLE, the normal TMSC channel numbering remains for that shelf (1-10).

When routing DBC circuits, you should select the highest priority for the common channel since; if the common channel is dropped, the branch channels cease to function. Under some conditions, IAR is unable to route the common channel, causing this to occur.

To ensure that voice circuits are not routed without signaling, CCS circuits on ACM should be given the highest priority.

`Profile` (limited range entry) – The name of the circuit profile for the circuit that is being configured (*See Examine/Modify Circuit Profiles, Chapter 16*).

`Routing Priority` (limited range entry) – This selection is used only for initial circuit routing to resolve bandwidth contention between circuits. Highlight this value and press `Enter` until the desired priority number appears (*See Examine/Modify IAR Defaults, Chapter 15*).

To provide the capability of selectively routing circuits, ten levels of priority are used. A priority of **`1`** is the highest (best) priority while **`10`** is the lowest (worst) value.

`Preemption Pri` – This selection is used for decision making following an aggregate or node failure when rerouting is required. It must be no greater than the Routing Priority.

This value helps determine whether unaffected circuits are "bumped" to accommodate higher priority circuits. In order to determine whether a currently routed circuit is to be "bumped" by an unrouted circuit, the routing priority of the unrouted circuit is compared to the preemption priority of the currently routed circuit. Highlight this value and press `Enter` until the desired priority number appears.

`Routing` – When this field is selected, three choices of circuit routing are available:

`Automatic` enables the circuit to be routed each time an IAR is performed. This circuit is then routed over the network.

`Manual Preferred` routes a circuit over the defined path if possible. If a trunk in the path is down or there is insufficient bandwidth, the circuit is routed over an alternate route through the network.

`Manual Required`, when possible, routes a circuit over the defined path. But if a link is down, or there is insufficient bandwidth, the circuit is not routed. GDC recommends that you use Manual Required for test circuits only.

If you are routing the circuit manually, you must have previously defined possible routes. Select either **`Manual Preferred`** or **`Manual Required`** When either one is selected, the following fields appear:

`Route Name`

`Select`

Enter desired Route Name and press `Enter`. If you are not sure which route to enter, use the Select function to display the available routes and the aggregate trunks in each route. To do this, highlight **`Select`** and press `Enter`. A `Circuit Route Selection` screen appears. At the lower portion of this screen, you see the message:

`Press Enter to Select Route, F4 for Route Information`.

Move the cursor to the desired route name. If you press `Enter`, this becomes the manual route for this circuit. If, instead, you press **`F4`**, route information appears, showing the nodes, link names, and node addresses through which the manual route passes.

`TOR/DRR Configs` – This field provides the names of the various TOR/DRR configurations and the ability to enable (**`E`**) or disable (**`D`**) the current circuit in each.

Data Circuits, Specific Configuration Fields

Configuration information that is specific to the type of circuit previously selected appears in the center portion of the screen. These fields are described below.

`RTS/CTS Loop` (**`Enable`**/**`Disable`**) (OCM/TMS and OCM/OCM circuits only) – When enabled, RTS from a DCM is locally looped back as CTS.

`Xmit/Recv Clocks` (Limited Range Entry - for Sync Circuits Only) – This entry selects the transmit and receive timing sources for each channel end of the circuit. For X.50 circuit termination (OCM only), **`INT-INT`** and **`EXT-EXT`** are the only available selections. Note that this field is meaningful only for the TMS channel termination end of the circuit.

- **`INT-INT`** (Internal Transmit/Internal Receive Timing). Both transmit and receive clocks are derived from the node clock generation circuitry (not for use with G.703 channel card).
- **`EXT-INT`** (External Transmit/Internal Receive Timing). Transmit timing is external, received from equipment connected to the channel module. Receive timing is internal, derived from the node clock generation circuitry. This selection is normally made for tail circuits and other applications and may only be used when the device supplying the timing is synchronized to the same timing source as the TMS-3000 network.
- **`EXT-EXT`** (External Transmit/External Receive Timing). Both transmit and receive timing are received from equipment connected to the channel module. This selection may only be used when the device supplying the timing is synchronized to the same timing source as the TMS-3000 network.

`No. Data and Stop Bits` (Limited Range Entry — for Async Circuits Only) — This entry selects the number of data and stop bits in the asynchronous character format of asynchronous data transmitted through the circuit. The start bit is not counted. For X.50 circuit termination (OCM only), the default value is 8 data bits, 1 stop bit.

Possible selections are:

`5:1.5` (5 data bits, 1.5 stop bits)
`6:1.0` (6 data bits, 1 stop bit)
`6:2.0` (6 data bits, 2 stop bits)
`7:1.0` (7 data bits, 1 stop bit)
`7:2.0` (7 data bits, 2 stop bits)
`8:1.0` (8 data bits, 1 stop bit)
`8:2.0` (8 data bits, 2 stop bits)
`9:1.0` (9 data bits, 1 stop bit)

`Control Type` (T-ENC, SYNC, ASYNC, ISOC, TPP) — This entry allows you to provide for proper allocation of bandwidth for polling applications. Three types of controls are available:

- Slow Controls
- No Controls
- Priority Controls

To enable the controls, highlight the `Control Type` field and press `Enter` until the desired control appears.

NOTE

If Data Lockout is disabled for a fan, Slow Controls should be enabled on the circuits of that fan.

If Data Lockout is enabled for a fan, Priority Controls may need to be enabled. Priority Controls must be used for DBC circuits routed across CDA or IAC links. If slow controls have been determined to be inadequate, refer to Priority Control Bandwidth in GDC 036R304-000 for bandwidth calculation procedures.

Selecting priority controls increases bandwidth usage of Aggregate Control, Channel Interface and CDA Modules.

When Priority Controls is selected, the following fields appear:

- `CTL 1` — **`Enable`** or **`Disable`**
- `CTL 2` — **`Enable`** or **`Disable`**
- `Max Polls/Sec` — This specifies the maximum number of polls a polling circuit attempts. Default value is dependent on the channel rate selected.

  Total data bandwidth available on certain common cards over which the circuit passes decreases when a larger Max/Polls/Sec value is selected. This parameter affects Channel Interface and Aggregate Control Cards only.
- `Min Chars/Poll` — This specifies the minimum number of characters per poll a polling circuit attempts. When this field is highlighted, you can enter a number from **`0`** to **`99`**. A large value decreases the amount of bandwidth needed to support the polling. Min Chars/Poll value affects the total bandwidth for CDA and IAC Modules only. A formula to calculate total bandwidth is located in *Chapter 7, CDA/IAC Port and Bundle Configuration*.

`Transmit EIA` – The EIA transmit control signals `RTS` (Request To Send), `DTR` (Data Terminal Ready), `DCD` (Data Carrier Detect), `DSR` (Data Set Ready), `CTS` (Clear to Send), `OOS` (Out-of-Sync) and `RI` (Ring Indicator) are offered and set to initial values, based on the `Interface` type previously selected. The individual controls can then be manually forced or allowed to pass through. To enable (**`E`**) or disable (**`D`**), highlight the field under `RTS`, `DTR`, `DCD`, `DSR`, `CTS`, `OOS`, or `RI` and press `Enter` (The `/ALM` which is associated with a control, for example `RTS/ALM`, is used to enable or disable the alarm for that particular control signal).

Three selections are available: **`F-On`** is Forced On, **`F-Off`** is Forced Off, and **`---`** is passthrough. When `---` is selected, a control signal from external equipment connected to this channel is passed through the system (the control signal is unchanged). For an X50S circuit, **`F-On`** is the only available state.

With X.50 termination (OCM only), there are four fields, `CL1`, `CL2`, `CL3`, and `CL4`. Only one transmit control is allowed, `CL1`. Four receive controls are used. `CL1` can be forced or passed through. `CL2`, `CL3`, and `CL4` can be forced only.

For X.50 switching, the S-bit is always `F-On`. Note that the only available routing is `Automatic`. *Figure 18-4 and Figure 18-5* are two examples of the Circuit Configuration screen for X50S.

```
Circuit Configuration             X50SW                 16-APR-1996 14:20:12
Name AB   .001    Class  TMS       Type  SYNC      Interface X50S
Rate  9.600K
Xmit/Recv Clock   INT-INT
                         S-bit                       CL1
Transmit EIA             F-On                        F-On

End Node Name            A            (001)    SEL    B           (002)     SEL
End Node Type            TMS-3000                     TMS-3000
End Equip Slot         03                            15
End CDA Port             Port A                       ******
End DS0 Num             02                            **
End Channel Num         03                            05

Profile    DEFAULT       Routing Priority     2       Preemption Pri   2
Routing    Automatic
TOR/DRR    CNFG1      E
Configs
                Create by Default            Modify Another          Delete
                Create by Template           Duplicate               Rename
```

Figure 18-4 Termination on a TMS Channel

```
Circuit Configuration             X50SW                 16-APR-1996 15:25:12
Name AB   .001    Class  TMS       Type  SYNC      Interface X50S
Rate  9.600K
                    S-bit                            S-bit
Transmit EIA        F-On                             F-On

End Node Name       A           (001)    SEL      B            (002)    SEL
End Node Type       TMS-3000                      TMS-3000
End Equip Slot     03                             05
End CDA Port        Port A                        Port B
End DS0 Num        02                             01
End Channel Num    03                             01

Profile    DEFAULT       Routing Priority     2       Preemption Pri   2
Routing    Automatic
TOR/DRR    CNFG1      E
Configs
             Create by Default            Modify Another           Delete
             Create by Template           Duplicate                Rename
```

Figure 18-5 Termination on a CDA X.50

The `Channel St Pos Selection` (Channel Start Position Selection) screen (*See Figure 18-6*) is accessible from the `Circuit Configuration` screen once the CDA `End Channel Num` poke point has been highlighted and you press `Enter`. Using the cursor movement keys, you can select the channel start position in the X.50 subaggregate frame. Only valid start positions are displayed on the screen, and only available ones are selectable. Frame positions occupied by the channel are dynamically shown on the bottom of the screen. In the case of multiple distribution algorithms existing for the same rate (e.g., 19.20K), the poke point `Select Distribution` appears on the screen and is used to change the channel framing distribution.

The example below is for a 9.6 K channel.

```
Channel St Pos Selection          X50SW                    16-APR-1996 15:45:12
Name  X50SW1     .001     Class   TMS     Type   SYNC    Interface  X50S   Node CDA
Rate    Name      Adr     Slot    Port    DS0
9.6K     A       (001)     03      A      02

------------------------Channel Start Positions-------------------------

                             01    02   03   04   05


 Selected Channel    01 occupies envelopes:   1,6,11,16,21,26,31,36,
41,46,51,56,61,66,71,76
```

Figure 18-6 CDA Channel Start Position Selection

X.50 Data Channel, Specific Configuration Fields

Configuration information that is specific to the X.50 Data Channel card (OCM) is described below.

`Sw/Term Ch Num` – The OCM channel number for termination.

`End X50 DS0 Num` – The DS0 number of the end X50 DS0.

`X50 DS0 Ch Num` – The X.50 channel number.

TID Circuits, Specific Configuration Fields

The TID-III Module serves as a single time independent data channel interface within a network that may include synchronous, asynchronous, time independent, or encoded voice channels.

To configure TID-III circuits, highlight the `Type` field on the `Circuit Configuration` screen and press `Enter` until `TID` appears in that field.

The following highlights the areas where configuring the TID-III is different from configuring other TMS-3000 channels:

`TID User Rate` – Specifies the actual available data rate. The `TID User Rate` is automatically set when the `Rate` is selected. Note that this rate always appears lower than the selected data rate. The TID user rates for channels appear below:

`1.200K`, `2.400K`, `3.200K`, `4.800K`, `6.400K`, `9.600K`, `12.00K`, `19.20K`, `38.40K`, `72.00K`, `76.80K`, `100.0K`, `120K`, `153.6K`, `224.0K`, `288.0K`, `576.0K`, `1.152M`.

`TID Mode` – This field configures the TID-III application modes. The selections are defined below (TID2 refers to TID-III, mode 2, Cnt = Count, Lmt = Limit).

> **`TID2 w/Hi Accuracy`**— This mode is used for extremely accurate input clock rates and when you desire to track and output the clock rate with lowest possible offset. In this mode, the TID-III Module tracks an input clock with accuracy's to as high as ± .006% depending upon the input rate.

TID2 w/Cnt Lmt ± 2, **TID 2 W/Cnt Lmt ± 4**, and **TID 2 W/Cnt Lmt ± 6** — These modes allow you to program the TID-III to control signal input and output rate offsets and data delays within specified ranges and thereby optimize communications for variable external clock characteristics.

TID2 w/Input Rate Tracking — This mode is similar to the ECH-11 emulation mode. This mode allows you to support communications where the input frequencies may vary ± 1.5 % from the reference frequency because of external clock inaccuracies. When input clock inaccuracies are expected to exceed this threshold, you should select TID1 operation mode.

TID1 — This mode is applicable when the remote end of the communications link is a TID-I (ECH-11) Module, or when you require TID-I performance characteristics over a communications link between two TID-III Modules. The TID1 mode should be selected when the channel input rate offsets are expected to be in excess of ± 1.5 % from the reference frequency because of clock inaccuracies or instability.

Auto Rate Tracking — Operation in the automatic mode supports communications where input rates are subject to change in response to system configuration requirements. To operate in the automatic mode, you first select a maximum predetermined input rate, and the TID-III module supports all channel rates up to this preselected maximum.

TID Delay – Compensates for end-to-end channel delay in the TID-III. When **384** is selected, the FIFO Buffer Delay is set to 384 bits. When **96** is selected, the delay is set to 96 bits.

Refer to GDC 036R303-000 and GDC 036R469-000 for information on TID-III hardware.

Voice Circuits, Specific Configuration Fields

The following highlights the areas where configuring Voice Circuits is different from configuring other TMS channels.

Echo Suppression — For **VLBRV**, Echo Suppression can be enabled or disabled (For **IMBE**, this field appears on Page 2 of the Circuit Configuration screen, but is not configurable).

XMT VF dB Levels (Limited Range Entry) – For **IMBE**. Output level of the voice signal is adjusted at each channel end of a voice circuit. For E&M/4W, the adjustment ranges from **–6.0 dB** to **+1.5 dB** in **0.5 dB** steps. For other signaling types, the range is **-6.0 dB** to **0 dB**.

RCV VF dB Levels (Limited Range Entry) – Output level of the voice signal is adjusted at each channel end of a voice circuit. For E&M/4W, the adjustment ranges from **–6.0 dB** to **+1.5 dB** in **0.5 dB** steps. For other signaling types, the range is **-6.0 dB** to **0 dB**.

VCM (or DPV) Signaling (IMBE, U-ADPCM, VLBRV, CELP) – Displays the type of signaling or signaling piggyback to be installed: FXS/LS, FXO/LS, E&M/2W, E&M/4W. The field applies only when one or both ends of the circuit are on an OCM. When the field is not active, *** is shown.

NOTE

When configuring an OCM dual channel card where both the a and b channels are used, the signaling type is copied from the first configured channel of the a-b pair to the second channel. Once the second channel of the a-b pair is configured, the signaling type cannot be changed until one of the pair is deleted.

Similarly the Country Code *(see below) must be the same for each half of the DPV card. Attempting to change this item after the other half of the card is configured results in an error message. To change the country code after the channel pair is configured, you must delete one of the circuits and reconfigure with the new code. Table 18-5 shows the Ring, Ringback, and Reorder requirements for the US, UK, and Germany.*

Table 18-4 Ring, Ringback, and Reorder Requirements

Country	Supervisory Tones (Hz) Reorder	Supervisory Tones (Hz) Ringback	Ring Cadence (sec)	Reorder Cadence (sec)	Ring Frequency (Hz)
US	480+620	440+480	2 on, 4 off	.3 on, .2 off	20
UK	400	400+450	.4 on, .2 off, .4 on, 2 off	.4 on, .35 off, .225 on @ +6dB, .525 off	25 +10 –20%
Germany	425+450	425+450	1 on, 4 off	.24 on, .24 off	25 ± 2 Hz

Notes: In the UK, for FXS to FXS connections, the nominal gain must be -12dB.
All tones are output at a level of -15 dBm.
A diagnostic tone of 1004 Hz @ -15 dBm is supported for all countries.

`VCM` (or `DPV`) `Conditioning` (IMBE, U-ADPCM, VLBRV, CELP) – Conditioning defines how the card reacts during an out of sync condition. The conditioning options available for any given card depend on the signaling type of the selected card and the signaling type and conditioning selection of the other end of the circuit. This field applies only when one or both ends of a circuit are on an OCM. *Table 18-5, Table 18-6, and Table 18-7* show the possible conditioning/ signaling options.

Signaling

The signaling function in a voice channel is used for setting up telephone calls. This includes on-hook, off-hook, ringing, and dialing information.

Two-state signaling uses a single bit which can have one of two states (on or off).

Four-state signaling uses two bits which can define one of four combinations or states.

`Send Signaling` (M-Lead Control) – All types of voice circuits can be either **`---`** (pass-through) or **`F-On`** (forced on). When **`F-On`** is selected, the M-Lead signal for the remote channel end should change to the On state. When **`---`** is selected, the M-Lead signal from the local external equipment is passed through the system to the remote channel end.

`Recv Signaling` (E-Lead Control) – All types of voice circuits can be either **`---`** (pass-through) or **`F-On`** (forced on) or **`F-Off`** (forced off). The E-Lead changes to the selected state and is passed from the channel to the external equipment.

The following are for IMBE only and appear on Page 2 of the `Circuit Configuration` screen:

`Bulk Delay` — N/A

`Encoding Type` — N/A

`Echo Suppression` – N/A

`Echo Canceller` – **`Enabled`** or **`Disabled`**

`FAX Algorithm` — **`No FAX`** or **`FAX`**

`Country Code` — **`USA`**, **`U.K.`**, **`Germany`**, etc.

`Trunk Condition` — **`Reorder`** or **`Quiet`** when **`FXS/LS`** signaling is set.

`Trunk Condition` — When E&M signaling is set, the following additional fields appear on the screen:

`Base Rx dB Level` - `0.0 dB` for **`E&M/2W`**, **`0.0 dB`** or **`7.0 dB`** for **`E&M/4W`**

`Base Tx dB Level` - `0.0 dB` for **`E&M/2W`**, **`0.0 dB`** or **`–16.0 dB`** for **`E&M/4W`**

`A-Bit Invert` - `Normal` for **`E&M/2W`**, **`Normal`** or **`Invert`** for **`E&M/4W`**

Table 18-5 DPV and VCM Signaling Conditioning Options

Voice Card Type	Options	
	Screen Display	Description
FXS/LS	Freeze A0+B1	Freezes signaling condition Not Ring
FXS/GS	Freeze A1+B1 A1/0+B1	Freezes signaling condition Tip Open Tip Open then ground
FXO/LS	Freeze A0+B0 A0/1+B0/1	Freezes signaling condition Steady On-Hook On-Hook then Off-Hook
E&M	Freeze A0 A0/1	Freezes signaling condition Steady Idle Idle then Busy

Table 18-6 ACM Signaling Options

ACM Configuration	Options	
	Screen Display	Description
ACM (2-state)	A0 A0/1 A1 A1/0/1 Freeze	Idle or On-Hook; A-bit steady low On-Hook for 2.5 seconds (drops call) followed by Off-Hook (Busy) Busy or Off-Hook; A-bit steady high Busy for 2.5 seconds, Idle 2.5 seconds then Busy Freezes signaling
ACM (4-state)	A0+B0 A0+B1 A0/1+B0/1 A1+B1 A1/0/1+B1/0/1 A1/0+B1 Freeze	On-Hook (drops call) On-Hook - no ring On-Hook for 2.5 seconds (drops call) then Off-Hook (prevent seizure) Busy with no ringing (Off-Hook) Off-Hook for 2.5 seconds, On Hook for 80 ms then Off-Hook Off-Hook for 2.5 seconds then On-Hook - no ring Freezes signaling

Table 18-7 Voice Card End to End Compatibility

Signaling Type	End to End Compatible With:
FXS-LS	FXS-LS FXO E&M ACM (VCM ADPCM only)
FXS-GS	ACM
FXO	FXS-LS
E&M	FXS-LS E&M ACM

ACM Circuits, Conditioning

For an ACM-T1, end channel numbers **`1`** through **`24`** may be selected, while for E1, end channel numbers **`1`** through **`31`** (except 16) may be selected.

In ACM E1 CCS mode, the bypassing of the ACM compression and conversion functions of either TS0, TS16, or both is allowed. If both are desired, ACM Part No. 036M335 (ACM II) is required, and TS31 is not available for either voice or data. The maximum number of voice channels in this case is 29. This constraint is based on the physical limitation of the ACM hardware to be able to frame no more than 31 total channels.

Before actually describing the circuit configuration procedure, background information concerning conditioning is provided to facilitate configuration.

The purpose of conditioning is to react to a disruption of the communication network (the T1 or E1 trunk) in a manner that minimizes the impact to the circuit user. Conditioning achieves this by managing signal and data outputs in a way that is compatible with the requirements of the T1 or E1 provider. The type of conditioning that is selectable depends on the type of circuit that you are configuring and the type of signaling you have selected for each circuit.

`Conditioning` – In general, when a T1 link failure occurs in either direction, the DPBX or ACM are signal-conditioned to minimize the chance of dropping active calls and to prevent attempts to use the link for new calls (causing busy channels).

Signal conditioning also prevents the seizure of terminating end switching by sending an on-hook signal toward the terminating end for the duration of the failure, thus preventing continuous ringing.

The following are the available selections for signal `Conditioning` .

`A0` — 'A' bit steady low ("State 0," idle, on-hook).

`A1` — 'A' bit steady high ("State 1," busy, off-hook).

`A0/1` — 'A' bit low for 2.5 sec, followed by 'A' bit high for the duration of the failure (on-hook for 2.5 seconds to hang-up the call, then off-hook/busy to prevent usage of the circuit).

A1/0/1 — 'A' bit high for 2.5 sec, followed by 'A' bit low for 80 ms, then 'A' bit high for the duration of the failure.

A0+B0 — The on-hook (idle) condition is sent for 2.5 sec (to drop active calls), then remains on-hook and prevents ringing).

A0+B1 — The on-hook condition is sent for 2.5 sec (to drop active calls), then remains on-hook (to prevent false ringing).

A0/1+B0/1 — The on-hook condition is sent for 2.5 sec (to drop active calls), then changes to off-hook (to prevent seizure).

A1/0/1+B1/0/1 — The off-hook condition is sent. After a delay of 2.5 sec, the circuit goes on-hook for 80 ms, then returns off-hook. This disables the alarm at the PBX.

A1+B1 — Busy with no ringing (off-hook).

A1/0+B1 — Upon detection of a failure, the signaling state is forced off-hook (busy) for 2.5 sec, followed by 'A' bit going to State 0 (on-hook, no ringing).

Freeze (Signal Freezing) — Upon detection of a loss of frame due to loss of synchronization, the on-hook and off-hook states presented to the channel units are maintained in the state that existed before detection of the out of frame condition.

The signaling state is not changed until ACM regains synchronization or declares a Carrier Failure Alarm (CFA).

Data Conditioning – During a link failure, data on the link could be disrupted. Data conditioning prevents the reception of unacceptable data patterns. "Fail Codes" are presented to the channels (instead of the unacceptable data), thus suppressing the voice outputs. ACM can send different Fail Codes in each direction if different types of interfaces exist at the termination points. Fail Codes for voice channels represent a near 0 voltage level ("digital squelch").

The following `Fail Codes` are options for PBX voice channel data conditioning (ACM-V types). All of the fail codes are represented by hexadecimal numbers.

7F for encoded Mu-LAW PCM data (T1) (near zero voltage coding).

FF for encoded Mu-LAW PCM data (T1) (near zero voltage coding).

D5 for encoded A-LAW PCM data (E1) suppression coding.

54 for encoded A-LAW PCM data (E1) suppression coding.

E4 for T1 DACS voice trouble coding (E4 is not selectable towards UVC circuit ends. Only the proper suppression codes are selectable).

The following Fail Codes are options for data channel data conditioning (ACM-D types).

FF for E1 circuit fail coding.

FE for T1 Control Mode Idle (CMI) coding.

36 for T1 Circuit Out-of-service (COOS) coding.

1A for T1 Multiplexer Out of Sync (MOOS) coding.

In general, the guidelines specified in *Table 18-8* should be followed to configure the ACM circuits to react properly to circuit outages. Also refer to the following note.

NOTE

Two-state signaling uses only the A bit, while four-state signaling uses the A and B bits. When two-state signaling is selected, the B bit follows the A bit at the DTE end.

Idle (on-hook) hangs up all existing calls.

Busy (off-hook) busies out all unused circuits with no impact to existing active calls.

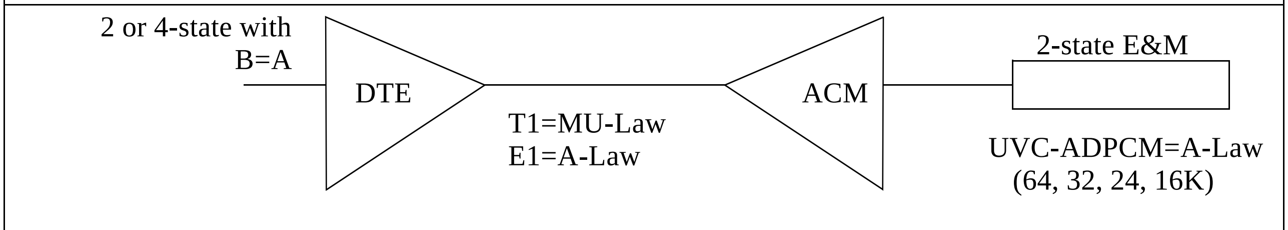
State selection of "None" is used when in-band signaling (SF, MF, DTMF) or CCS is used. For T1 circuits, the RBS that uses bit 8 of the signaling frames does not transport signaling bits. Instead, these bits are used for data.

No Signaling is required or defined for ACM-D circuits. An ACM-D type circuit is used to transport non-voice channel data, such as CCS message-oriented signaling, which is typically used in E1 networks but may be seen on T1 facilities using CCS.

ACM-D Circuit type transports DTE "data channel" data as well. Data is not compressed or converted when ACM-D channel types are selected. Selecting ACM-D prevents the ACM from converting the 8-bit byte into ADPCM codes. Any or all DS0s can be optioned as an ACM-D channel type.

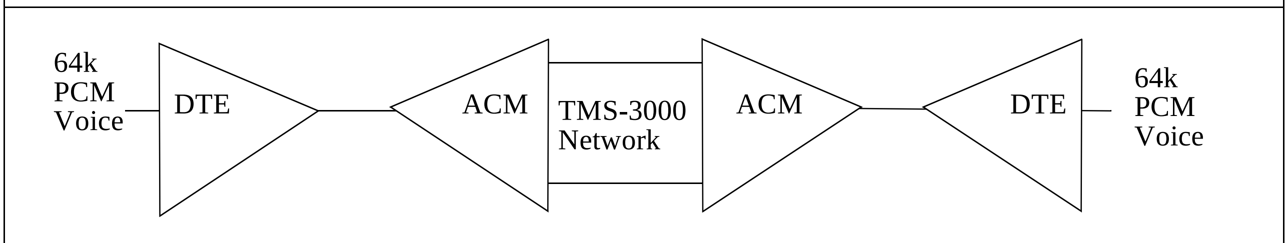
Table 18-8 ACM Conditioning Selection Guidelines

ACM-UVC Channel Type



DTE Channel Service Type	DTE Channel Circuit Type	Circuit Reaction	E & M State Selection	Signaling Selection
Switch Special Foreign Exchange	2-wire, FXO, Loop Start	Idle (on-hook)	2-State	A0
		Busy (off-hook)	2-State	A1
Switch Message Telephone/ Private Line	2- and 4-wire, E &M	Idle for 2.5 sec, then busy	2-State	A0/1
		Busy for 2.5 sec, idle for 80 ms, then busy	2-State	A1/0/1
		Channel holds to last state	2-State	Freeze Control

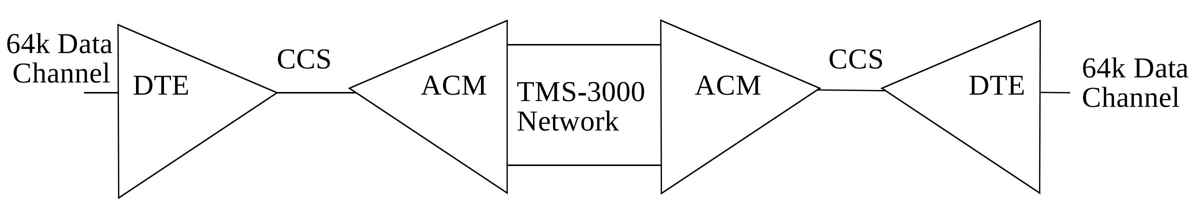
ACM-V Channel Type



DTE Channel Service Type	DTE Channel Circuit Type	Circuit Reaction	E & M State Selection	Signaling Selection
Switch Special Foreign Exchange	2-wire, FXO, Loop Start	Idle (on-hook)	2-State	A0
		Busy (off-hook)	2-State	A1
			4- or 16- State	A1+B1
Switch Message Tele-phone/ Private Line	2-wire, FXO, FXS, FXSDN, 2- and 4-wire, E &M	Idle for 2.5 sec, then busy	2-State	A0/1
		Busy for 2.5 sec, idle for 80 ms, then busy	2-State	A1/0/1
		Channel holds to last state	2-State	Freeze Control
	2-wire,FXO, FXS, FXSDN,	Idle for 2.5 sec, then busy	4- or 16- State	A0/1+B0/1
Switch Special Foreign Exchange (DACS #1 or 2 ESS)	2-wire, FXO, Loop Start	Idle (on-hook)	4- or 16- State	A0+B0

ACM-V Channel Type (Cont.)				
DTE Channel Service Type	**DTE Channel Circuit Type**	**Circuit Reaction**	**E & M State Selection**	**Signaling Selection**
Switch Special Foreign Exchange(DACS)	2-wire, FXS, FX-SDN, Ground Start	Busy for 2.5 sec, then idle, no ringing	4- or 16- State	A1/0+B1
	2-wire, FXS, FX-SDN, Loop Start or 2-wire, FXO, Ground Start	Idle, no ringing	4- or 16- State	A0+B1
		Busy for 2.5 sec, idle for 80 ms, then busy	4- or 16- State	A1/0/1+ B1/0/1
		Channel holds to last state	4- or 16- State	Freeze Control
Data or Voice with In-Band or CCS Selected	—	Busy	None (T1)	ABCD=1
		Idle	None (T1)	ABCD=0
SSR1 (ITU-T)	—	ABC = 0 D = 1	None (E1)	ABC=0 D=1 Enforced control = Busy
		ABD = 1 C = 0	None (E1)	ABD=1 C=0 Enforced control = Disconnected
		Busy/Connected	None (E1)	ABC=0 D=1
		AD = 1 BC = 0	None (E1)	AD=1 BC=0 Enforced control = Idle/Release
SSR2 (ITU-T)		Disconnect/ Blocked	4- or 16- State	A1+B1
			16-State(E1)	A1+B1+C1+D1

ACM-D Channel Type



ACM Circuit Configuration

The following types of circuits can be configured for ACM operation.

ACM-UVC — A circuit with an ACM at one end and a UVC at the other end.

ACM-V — A circuit with an ACM at both ends that transfers only non-TMS-3000 voice channels.

ACM-D — A circuit with an ACM at both ends that transfers only non-TMS-3000 data channels and signaling information.

NOTE

If operating under E1 alone, a special ACM-D circuit of rate 320 K can be configured to allow transferring data in five continuous time slots. This type of circuit is referred to as "Bundled ACM-D Circuit," and the normal 64K rate circuit as "Non-Bundled ACM-D Circuit." Note that bundling is available only if you have the ACM-II.

In ACM E1 CCS mode, the bypassing of the ACM compression and conversion functions of either TS0, TS16, or both is allowed. If both are desired (ACM-II is required), TS31 is not available for either voice or data. The maximum number of voice channels in this case is 29. This constraint is based on the physical limitation that the ACM hardware is unable to frame more than 31 total channels. The passing of the 30th channel also requires the ACM-II.

The following fields in the `Circuit Configuration` screen are used to configure a non-TMS-3000 voice channel to ACM. This also highlights the areas where configuring ACM Circuits is different from configuring other TMS-3000 channels.

`VCM: Interface` – Indicates the type of control signaling that is selected at the interface of the VCM. This field appears for ACM-UVC only (UVC is on an OCM).

`Send Signaling` – This field appears only for ACM-UVC type circuits and only when **2-state** Signaling Type is selected. Selects the send signaling value, either **---**, **F-On**, or **F-Off** (F-Off not selectable on UVC side of the circuit). The default is **---**. These inputs are applied toward the Fast Bus. The selection toward the Fast Bus at one end automatically becomes the same selection toward the port at the other end of the circuit. This field does not appear when CCS/INB is selected for `SigType`.

`Recv Signaling` – This field does not appear for ACM-D type circuits, or if **CCS/INB** is selected as the signaling type. Selects the receive signaling type, either **---**, **F-On** or **F-Off**. The default selection is **---**.

NOTE

If 16-State has been selected as the signaling type, C/D bits cannot be forced off at the same time in E1 circuits.

`PASS` or `INV` – This field appears only for ACM-UVC and ACM-V type circuits and only when **2-state** Signaling Type is selected. This selection provides for the A-bit (M lead) signaling value to be either unchanged or inverted. Two options are provided — **PASS** (Pass-through) and **INV** (Invert). You can select the E and/or M lead to or from a UVC/PCM to be inverted ('A' signaling bit). Signaling inversion for the E and M leads is optional to increase flexibility when connecting digital PBXs to analog PBXs or remote stations via the ACM and UVC.

NOTE

Selecting the INV option on an ACM Part No. 036M330 (ACM I) causes a configuration error. The INV option is only supported on ACM Part No. 036M335 (ACM II).

`Conditioning` – This field is used to select the ACM-UVC two-state conditioning type, either **A0**, **A1**, **A0/1**, **A1/0/1**, or **Freeze.** **A0** and **A1** are the default selections for T1 and E1 circuits, respectively. For ACM-C type circuits, if **4-State** or **16-State** (E1 only) has been selected as the signaling type, either **A0+B0**, **A1+B1**, **A0/1+B0/1**, **A1/0+B1**, **A0+B1**, **A1/0/1+B1/0/1**, or **Freeze** may be selected with **A0+B0** and **A1+B1** as the default selections for T1 and E1 circuits, respectively. For 16-state signaling, the conditioning type of **A1+B1+C1+D1** is also available. The `Conditioning` field does not appear if **CCS/INB** is selected as signaling type.

`Enforced Control` – This option is supported for "INB" (T1) and "CAS" (E1) ACM port signaling only. This field is used to select the desired enforced control, **None** for T1 circuits, **Idle/Release**, or **Disconnected** for E1 circuits with **Busy** as the default selection for both T1 and E1 circuits. This field appears only if **CCS/INB** is selected as the signaling type, and it always appears for ACM-D circuits. Enforced control conditioning states are generated into time slot 16, multiframe channel signaling bits A, B, C, D.

`Fail Code` – For ACM-UVC and ACM-V circuits, this field is used to select the desired Fail Code, either **Suppress (7F)**, **Suppress (FF)**, or **Trouble Code (E4)** for **Mu-LAW** or **Suppress (D5)** or **Suppress (54)** for **A-LAW**. **Suppress (7F)** and **Suppress (D5)** are the default selections for Mu-LAW and A-LAW, respectively. For ACM-D, this field is used to select the desired Fail Code for T1 circuits, either **CMI (FE)**, **COOS (36)**, or **MOOS (1A)**. **CMI (FE)** is the default selection. **AIS (FF)** is always the default selection for E1 circuits. Fail codes are generated into 8-bit time slot bytes.

`Encoding Type` – This field is used to select the desired encoding type, i.e., the coding being used for the information received and transmitted at the port. Choices are **Mu-LAW** and **A-LAW**, which are the default selections for T1 and E1 circuits, respectively.

`RCV VF dB Level` (ACM-UVC circuits) – This field represents the nominal output level of the voice signal at each end of a voice circuit (at the physical channel connector), which is set by means of an option jumper on the UVC (0 or +7 dBm). This field is used to increase or decrease that level by **+1.5** to **–6.0 dB** in 0.5 dB increments, which provides a range of –6.0 to 1.5 dBm (0 dBm jumper setting) or +1 to +8.5 dBm (+7 dBm jumper setting).

With reference to the `Conditioning`, `Fail Code`, and `Encoding Type` fields, the input received from the screen at one end of the circuit is applied toward the port at the same end. The selection toward the port at one end of the circuit becomes the same selection toward the Fast Bus at the other end of the circuit.

TPP Pathways, Specific Configuration Fields

The following highlights the areas where configuring TPP Pathways is different from configuring other TMS circuits.

`Subtype` (Limited Range Entry) – This parameter defines the type of data traffic connected to the TPP pathway. The choices are:

- **`HDLC`** — HDLC pass-through (not supported by TPP)
- **`NODAL`** — Internodal link to a TPP or OPP in another FSN node, or to an XL Router, TPP or OPP via a CIC
- **`FR-DCE`** or **`FR-DTE`** — Frame Relay traffic
- **`SDLC`** — SNA/SDLC pass-through
- **`FR-TPP`** — Frame Relay link for a TPP-TPP circuit, using some form of network to network implementation

`Mode` (Limited Range Entry) — This parameter defines whether data transmission is half-duplex or full-duplex. If you need to use TMS-3000 control signals, select **`HALF DUPLEX`**. When you set `Type` to either **`FR-DCE`**, **`FR-DTE`**, **`FRR-TPP`**, or **`NODAL`**, the Mode parameter is set to `FULL DUPLEX`.

`Encoding` (Limited Range Entry) – This parameter defines whether data encoding is non-return to zero (`NRZ`) or non-return to zero inverted (`NRZI`).

`Invert` (Limited Range Entry) – This parameter defines whether the polarity for the TPP pathway destination common card is inverted (**`Yes`**) or normal (**`No`**).

`Xmit/Recv Clock` (Limited Range Entry) – This parameter defines the transmit and receive timing sources for each end of the circuit. It is fixed at `EXT-EXT` (External Transmit/External Receive Timing) for a TPP pathway. Both transmit and receive timing are received from equipment connected to the TPP/OPP.

Network Class Circuits

The Network type circuits are those configured to enter and exit on CDA, IAC, or LIMs and follow network standard protocols. They are selected by choosing **`Network`** in the `Circuit Class` field. A BQM can be configured as a network class circuit, and an X.50 circuit can be terminated on an OCM X.50 channel card. A network circuit can be used to pass network traffic from a DS0 bundle to a High Speed Data Channel (HSDC) or an OPP channel. An X.50 device has to be connected to a DTEC bundle configured either on a CDA or LIM card. To deliver the whole X.50 DS0 (X.50 pipe) to an OCM you have to configure a network circuit from that DTEC to an X.50 DS0 on the OCM. Then the X.50 pipe is broken into separate channels for termination on X.50 channel cards.

Figure 18-7 and Figure 18-8 are examples of the Circuit Configuration screen for Network Class circuits. *Figure 18-9 and Figure 18-10* are examples of the configuration procedures for a BQM channel and an HSDC.

For BQM channels, network class circuits are allowed to the OCM with the following limitations:

`DS0 Time Slots` : `1 - 3`

`Service Type` : `Data` is the only compatible type.

`Circuit Type` : `Full Transparent` .

The default service and circuit type are the above values. If you attempt to make any other selection, you are warned of incompatibility.

`End Equip Slot` : For X.50, one of two destination points must be X.50 DS0s; the other one can be either a CDA or an OCM DTEC bundle. For the BQM, this can be another BQM channel or a LIM.

For network circuits with TPP and OPP, the following combinations are allowed:

TPP to CDA DTEC
OPP to CDA DTEC
OPP to LIM DTEC (same node only)
TPP to TPP (different nodes)
OPP to OPP (different nodes)

NOTE *When a TPP network circuit is configured, a similar circuit must be configured in a remote node. If the circuit type on one end is Network and on the other end is TMS/Network, the circuit will not come up. A TPP Network type circuit can only be configured to connect to another TPP Network type circuit.*

Circuit Name

The name of the network class circuit. The name follows the same syntax as that of a TMS type circuit.

Rate (TPP Network Circuits only)

If you highlight the `Rate` field and press `Enter`, you can select up to 2.048 MHz in increments of 64 KHz using the `Circuit Rate Selection` screen.

DS0 Time Slots (non-TPP Network Circuits)

(Limited Range Entry) — This defines the bandwidth of the circuit by specifying the number of 64 KHz DS0 time slots (**`1-24`** for CDA-T1 and **`1-31`** for CDA-E1).

Circuit Class

This field displays `Network`.

```
Circuit Configuration           Net1                   04-APR-1996 13:31:10
Name NETCKT          .001     Class  Network        DSO Time Slots        1
Service Type  Data
Circuit Type  Full Transparent               Conditioning  No Conditioning

                                CDA                                 CDA
End Node Name      A               (001)      SEL | D                  (004)    SEL
End Node Type    TMS-3000                     | TMS-3000
End Equip Slot     13                           |    05
End CDA Port       Port A                       |    Port A
End DS0 Timeslot   3                            |    1

Profile      DEFAULT            Routing Priority     3        Preemption Pri     3
Routing     Automatic

TOR/DRR     C01      E   C02      E   C03      E   C04      E

         Create by Default       Modify Another           Delete
         Create by Template      Duplicate                Rename
```

Figure 18-7 Circuit Configuration Screen, Network Class Circuits

```
Circuit Configuration           Net1                       04-APR-1996 14:20:13
Name HSDC1          .001     Class  Network         DSO Time Slots        1
Service Type   Data
Circuit Type   Full Transparent/Rate Adapt          Conditioning  No Conditioning

Network Channel Rate  128.0K

                         HSDC                                 LIM
End Node Name      OCM 1          (F0001)    SEL | OCM 1            (F0001)    SEL
End Node Type    OCM SHELF                   | OCM SHELF
End Equip Slot     15A                         |    06
End CDA Port       ******                      |    ******
End DS0 Timeslot   **                          |    2

Profile     DEFAULT            Routing Priority     3        Preemption Pri    3

TOR/DRR    CNFG1       E  CNFG2      E

                  Create by Default       Modify Another           Delete
                  Create by Template      Duplicate                Rename
```

Figure 18-8 Circuit Configuration Screen, High Speed Data Channel

Service Type

The type of service being provided over a DACS network. Currently six selections are available: Switched MSG Telephone/Private Line, Switched Special Foreign Exchange, Transparent Voice, Data, E1 Voice Non-Transparent, and E1 Data Non-Transparent.

Circuit Type

The type of voice and data circuits available for transmission across the network. These selections are affected by the `Service Type` (*See Table 18-9*).

Subtype (TPP circuits only)

`Subtype` is the type of data traffic connected to the TPP pathway. Choices are:

- **`HDLC`** — HDLC pass-through (not supported by TPP)
- **`SDLC`** — SNA/SDLC pass-through
- **`FR-DTE`**, **`FR-DCE`** — Frame relay traffic
- **`NODAL`** — Internodal link to a TPP or OPP in another FSN node, or to an XL Router via a CIC
- **`FR-TPP`** — Frame Relay link for a TPP-TPP circuit using some form of network to network implementation

Mode (TPP circuits only)

`Full Duplex`

Encoding (TPP circuits only)

`NRZI` for OPP, `NRZ` or `NRZI` for TPP

Conditioning

Line conditioning is necessary for proper transmission of a channel over a DACS network. This field shows the line conditioning.

The field varies with the service type of transmission. *Table 18-9* shows the types of line conditioning and their interaction with the `Service Type` and `Circuit Type`.

End Node Name

(String Entry) — Node locations of each end of the circuit.

End Node Type

Node type of each end of the circuit.

End Equip Slot

(Limited Range Entry) — The slot number of the CDA Module that carries the circuit must be entered for each end node. You may only enter slot numbers that have been configured for CDA Modules.

End CDA Port

End CDA Port for the CDA Module.

End DS0 Time Slot

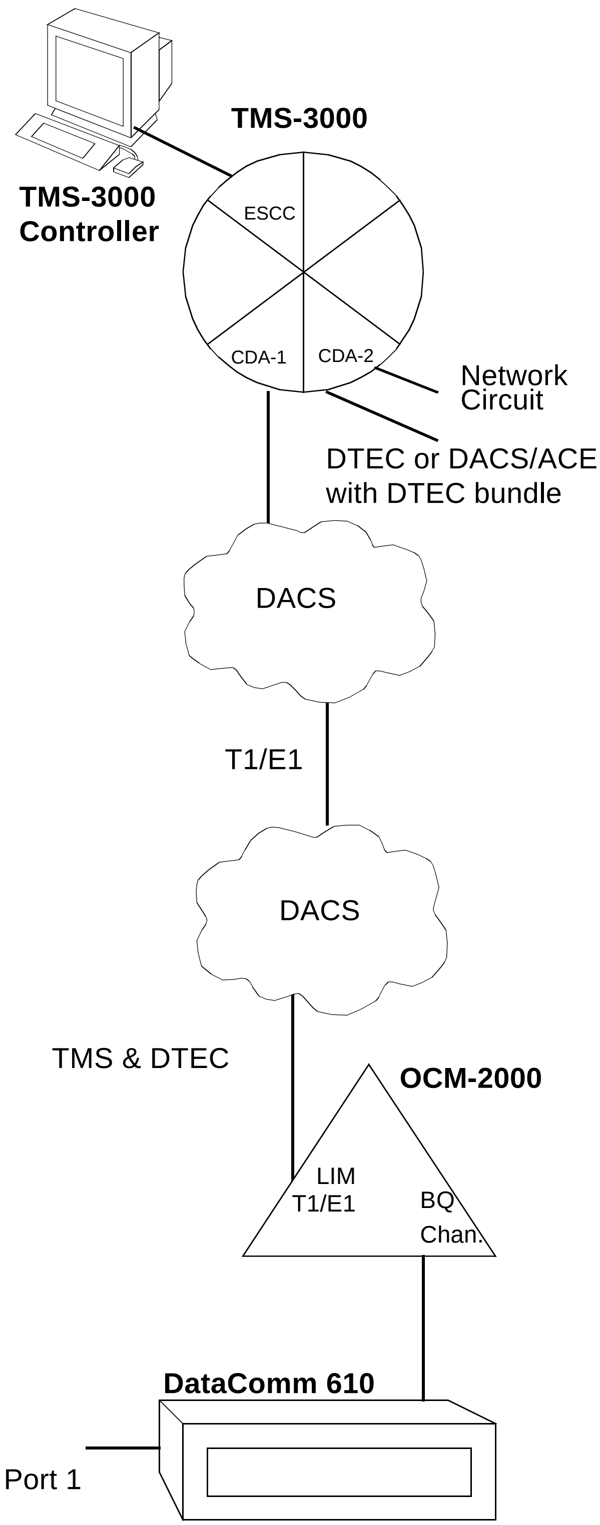
End DS0 for the CDA Module.

Other Fields

The procedures for configuring the `Profile`, `Routing Priority`, `Preemption Pri`, `TOR/DRR` configuration **E**/**D** (Enable/Disable) fields are similar to the configuration procedures for a TMS type circuit.

Table 18-9 Network Circuit Configuration

Service Type	Conditioning	Circuit Types
Switched Msg Telephone/Private Line	A0/1+B0/1 A0/1+B0/1 A0/1+B0/1 A0/1+B0/1 A0/1+B0/1	Voice: 2 wire - FXO Voice: 2 wire - FXS Voice: 2 wire - FXSDN Voice: 4 wire - E & M Voice: 2 wire - E & M
Switched Special Foreign Exchange	A0-B0 A0-B1 A0-B1 A0-B1 A1/0-B1 A1/0-B1	Voice: Loop Start: 2 wire-FXO Voice: Loop Start: 2 wire-FXS Voice: Loop Start: 2 wire-FXSDN Voice: Ground Start: 2 wire-FXO Voice: Ground Start: 2 wire-FXS Voice: Ground Start: 2 wire-FXSDN
Transparent Voice	Trouble Code	Voice Transparent
Data	Mux-OOS Mux-OOS Mux-OOS Mux-OOS No Conditioning No Conditioning No Conditioning No Conditioning No Conditioning No Conditioning	DDS / 2.4 k DDS / 4.8 k DDS / 9.6 k DDS / 56 k DS0DP / 64 k DS0DP / SRDM Full Transparent (Network Channel) Full Transparent/Rate Adapt. Rate Adapt/56K TPP
E1 Voice Non-Transparent	Suppress/A1-B1	Voice Non-Transparent
E1 Data Non-Transparent	AIS	Data Non-Transparent



1. Configure TMS-3000

   a. `CDA-2 Port Configuration` screen: Configure `Port B` as a DTEC termination. Alternatively, you can configure the port `Destination Type` as DACS/ACE with a DTEC termination bundle starting at DS01, which is 1, 2 or 3 DS0s wide (configured during Bundle configuration).

   b. CDA-1 `Port Configuration` screen: Configure `Port A Destination Type` as DACS/ACE.

2. Configure OCM-2000

   a. `OCM LIM Configuration` screen: Configuration the `Destination Type` as DACS/ACE.

   b. `OCM BQM Channel Configuration` screen: Configure the `Destination Type` as DataComm 610 and the `Interface Type` as Line Termination.

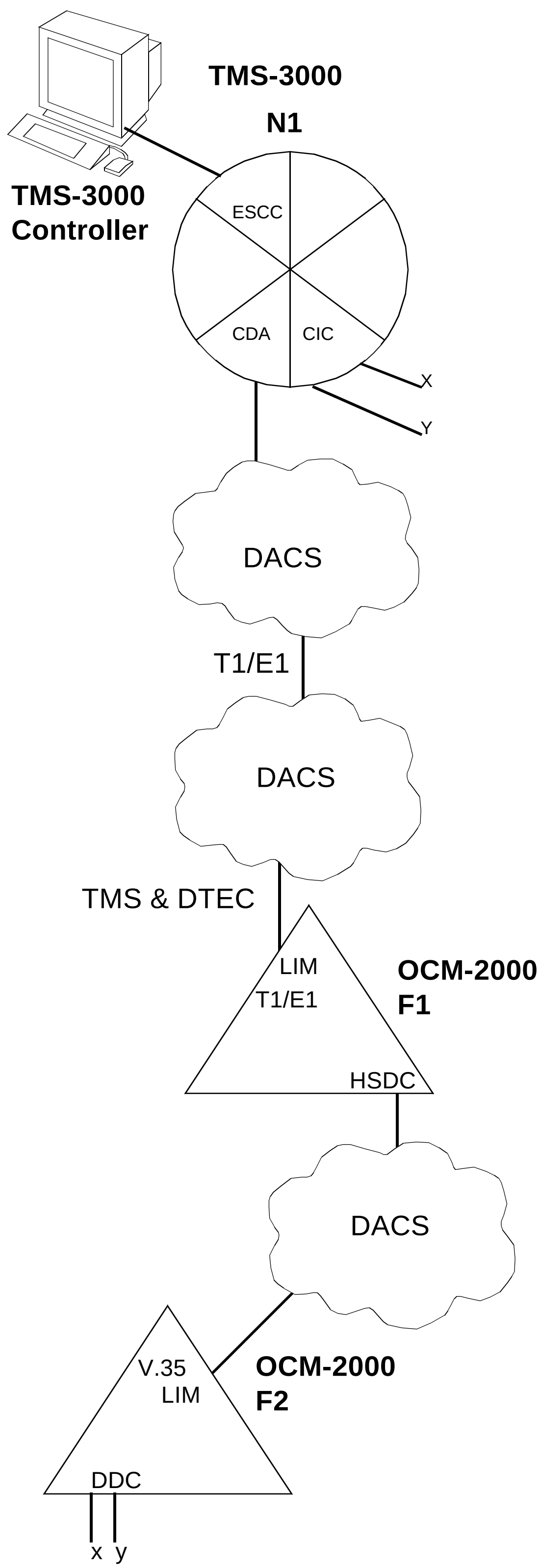
3. Configure bundles from TMS-3000

   `CDA-1 Port A Bundle Configuration` screen: Configure a Link type bundle between the TMS-3000 node and the OCM-2000 node, starting at DS01, which is 2, 3, or 4 DS0s wide. On the `Bundle Detail Configuration` screen, select a bundle type of TMS/Network. The first DS0 of this bundle is a TMS subaggregate and provides a path between the TMS-3000 and the OCM-2000 for supervisory communications as well as for channel data. The remaining DS0s (available for network subaggregates) provide a path for 2B1Q data passing from the OCM-2000 to the TMS-3000.

4. Configure Network Circuits

   `Circuit Configuration` screen: For one B-channel of data, configure a 1-DS0 wide Network `Class` circuit from the OCM-2000 BQM channel starting at DS01 and ending at the CDA T1/E1 Port B, DS0 1. This defines the circuit between the two outermost endpoints: the BQM channel termination to the DataComm 610 and the CDA termination into the network.

Figure 18-9 Transparent Network Circuit on Local OCM



1. Configure TMS-3000 Node N1.

   CDA `Port Configuration` screen: Configure port A `Destination Type` as **`DACS/ACE`**.

2. Configure OCM-2000 Node F1.

   OCM LIM-T1/E1 `Port Configuration` screen: Configure the `Destination Type` as **`DACS/ACE`**.

3. Configure OCM-2000 Node F2.

   OCM LIM V.35 `Port Configuration` screen: Configure the Destination Type as **`DACS/ACE`**.

4. Configure bundles from Node F1.

   N1 CDA Port A Bundle Configuration screen: Configure a Link type bundle between N1 and F1 starting at DS01 which is 1 DS0 wide. Go to the Bundle Detail Configuration screen and select a bundle type of TMS. This TMS subaggregate defines the TMS communications and channel data path from N1 to F1.

   On the same `Bundle Configuration` screen, configure a 1 DS0 wide Link type bundle between N1 and F2, which goes from DS0 2 on N1 to DS0 1 on F2. On the Bundle Detail Configuration screen, select a bundle type of TMS. This TMS subaggregate defines the TMS communications and channel data path from N1 to F2.

5. Configure bundles from Node F1.

   F1 LIM T1/E1 `Bundle Configuration` screen: Configure a DTEC type bundle starting at DS0 2 which is 1 DS0 wide. This DS0 aligns with the TMS subaggregate from N1 heading for F2.

6. Configure Network Circuits.

   `Circuit Configuration` screen: Select Class Network, Service Type Data, Circuit Type Full Transparent/Rate Adapt. Select Network Channel rate 64 K. Configure the circuit between DS0 2 on F1 LIM T1/E1 and the HSDC on the same LIM whose port is used to connect to F2. This ties the LIM T1/E1 and the V.35 LIM together, providing a path for TMS supervisory communications and channel data between N1 and F2.

7. `Circuit Configuration` screen: Configure a TMS Class circuit between the F2 Dual Data Channel (DDC) card and N1 CIC channel card.

Figure 18-10 OCM High Speed DataChannel

Network Channel Circuits

In general, a TMS/Network class, network channel circuit allows you to convert a DS0 data stream into a TMS bit multiplexed data stream.

The T1 line connects to the CDA Module which demultiplexes the DS0s into individual DS0s. These DS0s are then converted to a bit format and placed onto the Fast Bus. The destination CIC, Universal MM+ V4, or XNET aggregate removes the bit formatted DS0s from the Fast Bus and places them on designated channel cards. You should be aware that the data coming from the CDA card is inverted, so the MIL188 switch on the data channel card must be turned on.

The following describes a specific application of the network channel feature. *Refer to Figure 18-11 and Figure 18-12.* In *Figure 18-12*, circuits created in the Universal MM+ V4 are framed into 64 KHz aggregate frames. The network treats these 64 KHz aggregate frames as 64 KHz network channel DS0s and byte multiplexes them into the T1 line.

Using special cables, the channel card outputs are wired into the aggregate cards. The aggregate card demultiplexes the 64 KHz stream to TMS channel levels and transmits them into the Fast Bus and finally back to the selected CIC which acts as the TMS channel termination.

In this example, a 64 KHz network channel circuit should be configured as two unconnected subsystems. Use the following procedure:

1. Configure the Universal MM+ V4 and its channels to their destination channels. Next, configure the Universal MM+ V4 aggregates as connected to the Aggregate Control Cards on the TMS-3000.
2. Configure the local Network/TMS channels initiating on CLR bundles connected to the CDA and terminating at the first CIC.

These subsystems are not connected within the network management system. The Network/TMS channels are seen as a transport mechanism for the basic Universal MM+ V4 to TMS aggregate and could have been part of a completely separate network.

A similar application allows you to groom a single CDA to connect to multiple remote OCMs in cases where a DACS network is not available.

```
Circuit Configuration            Net1              04-APR-1996 14:11:10
Circuit Name CLRCKT           .002               Circuit Rate   64K
Circuit Class TMS/Network       Circuit Type Network Chan

CIC Xmit/Rcv Clock
Data  Invert
                    TMS Channel                       CDA/IAC Slot
End Node Name      MMP1            (001)     SEL | D                (004)    SEL
End Node Type    UNIV. MM+ V4                    | TMS 3000
End Equip Slot     **                             |    05
End CDA Port       *****                          |    Port A
End CH/DS0 Num     01                             |    1

Profile     DEFAULT            Routing Priority     3        Preemption Pri     3
Routing    Automatic
TOR/DRR    C01       E  C02      E  C03      E  C04      E

         Create by Default          Modify Another         Delete
         Create by Template         Duplicate              Rename
```

Figure 18-11 Circuit Configuration Screen, Network Channel Circuits

56/64K X N Hz Network Channel Circuit Configuration

Use the following guidelines when configuring a 56 K or 64 K X N Hz network channel circuit:

1. Define a **CLR** Bundle in the `CDA Bundle Config` screen. Then exit that screen.
2. In the `Circuit Configuration` screen, select **TMS/Network** as the `Class`. The screen should appear with the fields listed below.
3. Complete the circuit definition.

The following fields appear at the top of the `Circuit Configuration` screen:

`Circuit Name` – The name of the circuit

`Circuit Rate` – This selects the data rate for the circuit. A table showing available circuit rates appears when this field is highlighted and you press `Enter`. You can select either 56 KHz or multiples of 64 KHz.

NOTE *When using AMI-B7 stuffing, you cannot select 64k rates for Network Channel circuits. Only 56k is available.*

`Circuit Class` – `TMS/Network` is displayed.

`Circuit Type` – The circuit type is `Network Chan` for a network channel circuit or `TPP` if configuring a TPP or OPP as a network channel.

`CIC Xmit/Rcv Clock` – **INT-INT**, **EXT-INT**, **EXT-EXT** (Note that this field does not appear if configuring TPP/OPP network channels.

- **INT-INT** (Internal Transmit/Internal Receive Timing). Both transmit and receive clocks are derived from the node clock generation circuitry.
- **EXT-INT** (External Transmit/Internal Receive Timing). Transmit timing is external, received from equipment connected to the channel module. Receive timing is internal, derived from the node clock generation circuitry. This selection is normally made for tail circuits and other applications and may only be used when the device supplying the timing is synchronized to the same timing source as the TMS-3000 network.
- **EXT-EXT** (External Transmit/External Receive Timing). Both transmit and receive timing are received from equipment connected to the channel module. This selection may only be used when the device supplying the timing is synchronized to the same timing source as the TMS-3000 network.

`Data` (non TPP/OPP network circuits) – Choices are **Invert** or **Normal**. If the UDC card jumper is set to MIL-188, `Data` should be set to **Invert**. If the UDC is not set to MIL-188, or a Turbo card is installed, this selection should be **Normal**.

`SubType` (TPP/OPP only) – This parameter defines the type of data traffic connected to the TPP pathway. The choices are:

- **HDLC** — HDLC pass-through (not supported by TPP)
- **SDLC** — SNA/SDLC pass-through
- **FR-DTE**, **FR-DCE** — Frame Relay traffic
- **NODAL** — Internodal link to a TPP or OPP in another FSN node, or to an XL Router via a CIC

- **`FR-TPP`** — Frame Relay link for a TPP-TPP circuit using some form of network to network implementation

In the middle of the screen the CIC/TPP and CDA parameters are defined.

`End Node Name` – These are the node locations of each end of the circuit.

`End Node Type` – This is the type of node at which the circuit is terminating.

`End Equip Slot` – The slot number of the CIC/TPP/CDA Module that carries the circuit must be entered for each end node. You may only enter slot numbers that have been configured for CIC/TPPs on the left side of the screen, or as CDA modules on the right side.

`End CDA Port` – Specifies the end CDA Port number for the CDA Module.

`End CH/DS0 Number` – Specifies the channel number (for the CIC/TPP side) or the DS0 (for the CDA side).

The procedures for configuring the `Profile`, `Routing Priority`, `Preemption Pri`, `TOR/DRR` configuration **`E/D`** (Enable/Disable) fields are similar to the configuration procedures for a TMS type circuit.

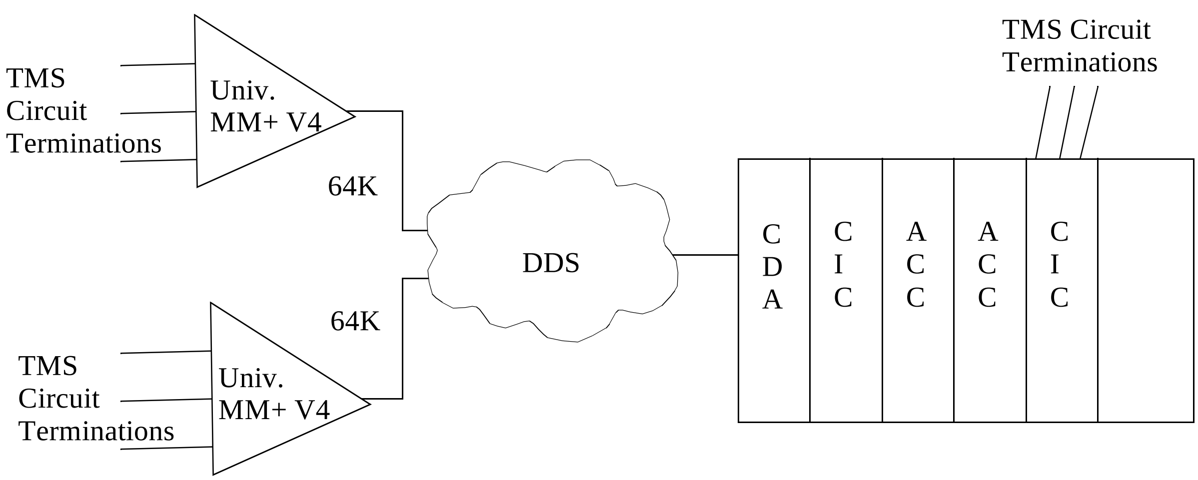


Figure 18-12 64 K Network Channel Circuit

Summary

A circuit is an end-to-end data or voice path which can pass through several entities in a communication system. A circuit is described or referred to by the node/channel names which identify the endpoints of the circuit.

In this chapter we covered the procedures for defining and configuring circuits between two channel ends in a TMS-3000 network. We also covered the procedures for modifying existing circuits. We covered common procedures for all circuits as well as specific procedures for the various types of data and voice circuits. We also covered the three classes of circuits: TMS, Network, and TMS/Network.

What's Next?

In the next chapter we cover Special Rates.

19 Special Rates

Overview

The Controller contains a special rate display that allows you to configure special aggregate or channel rates not available in the standard system. Up to 10 special rates are available.

Topics covered in this chapter are:

Examine/Modify Special Rates

Rate ID

Rate in Hz

Rate Usage

Require Clock Bus

Percent Jitter

Universal MM+ V4 Compatibility

Examine/Modify Special Rates

Several restrictions apply when establishing the special rates.

- The minimum aggregate rate is 56K on a Universal MM+ V4 aggregate.
- The minimum aggregate rate is 2400 Hz on a TMS-3000 or TMSC aggregate.
- All special rates must be even multiples of 25 Hz.

To select special rates, highlight `Modify Special Rates` from the `Configuration Main Menu`. Press `Enter`. The special rate display contains the following information:

Rate ID

Rate numbers from 01 to 10. Rates can be entered.

Rate in Hz

Enter the desired rate from **`0`** to **`2048000`** in multiples of 25 Hz. If the system cannot use the rate, a prompt at the bottom of the screen alerts you to this fact. Only rates only are displayed.

Rate Usage

Usage of the rate, either for **`channel`** or **`channel/aggregate`**.

Required Clock Bus

This option shows whether the ESCC programmable clock bus 6/7 (hardware option on card) must be set in the TMS-3000 or TMSC to generate the desired rate. Clock buses 6 and 7 are used for certain normal data rates. They *may not be used* on a given node if they have been used for special rates. For more information on setting clock buses 6 and 7, refer to *GDC 036R303-000* or the *Instruction Manual for TMS Compact, GDC 036R320-000*.

Percent Jitter

The tolerance specification by which the special rate frequency can vary.

Universal MM+ V4 Compatibility

For special rate compatibility on Universal MM+ V4/TMS aggregate connections, information must be entered on the Universal MM+ V4 terminal. This is required to allow the Universal MM+ V4 and TMS to originally sync up so that download is allowed. Note that the download then overwrites the manually entered data.

Table 19-1 describes the data which needs to be entered in the Compatibility field of Universal MM+ V4 terminal.

Table 19-1 Universal MM+ V4 Compatibility Field

Character	Description
1	Record Number 0-9
2-7	ASCII Representation of the Rate
8-16	ASCII Hex Representation of the Rate
14	Primary Rate Divider (0-20) (Used for Channel Only)
15	Root Frequency Select (1-7) (Used for Channel Only)
16-17	Secondary Root Divider (00-CC) (Used for Channel Only)
18-21	Universal MM+ V4 Frequency Measurement Unit

You cannot phase lock to several of the special rates. The Controller does not warn you of these rates. *Table 19-2* lists these rates.

Table 19-2 Non-Phase-Lockable Special Rates

Non-Phase-Lockable Special Rate Values (Hz)
25, 50, 100, 125, 200, 250, 375, 400, 500, 625, 750, 800, 875, 900, 1000, 1125, 1200, 1250, 1400, 1500, 1600, 1750, 1800, 2000, 2250, 2500, 2800, 3125, 4825, 9650, 19300, 24125, 38600, 48250, 77200, 96500

NOTE

When using special rates over an XNET link, for either link rate or circuits, the rates must have the same rate index in both networks, i.e., if a rate is defined as special rate number 3 in one network, it must be defined as special rate 3 on the other network because the TMS aggregates use the rate index to compare the configuration on each side (different indices cause a Remote Configuration Mismatch).

Summary

A TMS-3000 may be configured to operate with special aggregate or channel rates that you can enter from the Modify Special Rates menu selection on the TMS Controller.

In this chapter, we covered the procedures for configuring special aggregate or channel rates.

What's Next?

In the next chapter we cover IAR (Intelligent Automatic Rerouting)

20 IAR Data and Circuit Routing

Overview

The Modify IAR (Intelligent Automatic Rerouting) Data routine allows you to write a test script to simulate and plan for disaster scenarios on an aggregate or node level anywhere in the network. A test script is a line-by-line failure simulation you program into the Controller. Once activated, this off-line simulation allows you to test and monitor changing conditions and their impact on network communications.

You create network models typifying network failures and determine the viability of recovery strategies without affecting network operation. After hours network testing is not required. Network models may be stored or printed out for hard copy reference. A disaster contingency plan is a tested, rather than "best guess," approach to effective network planning.

The off-line test simulates the actual results if the specified scenario were to occur on-line. IAR and DRR only function if they are enabled. For example, if the scenario specifies a link failure, but IAR is disabled, then no `IAR Link Failed` event appears in the event history.

Through menu driven selections you can create an aggregate failure. This invokes the IAR routine which determines optimum channel routing from the quality based parameters but does not download the changes into the network. Simulation does not affect the active configuration data base.

You can display or print out the circuit routing as a result of the test. Re-route scenarios may be analyzed for disaster contingency planning. Simulation results are stored within the Controller. Test results are archived for later analysis to support "what if" disaster planning.

Topics covered in this chapter are:

- Examine/Modify IAR Data
  - Examine/Maintain Test Scripts
  - Maintain Test Names
  - Run IAR Test
  - Examine Routing Results/Examine Current Routing

Examine/Modify IAR Data

To display the IAR Data, go to the `TMS Main Menu` and select either **`Examine`** or **`Modify IAR Data`**. Highlight the selection and press `Enter`. The `IAR Tests/Results` screen appears. For Modify IAR Data there are four options:

- `Maintain Test Scripts`
- `Maintain Test Names`
- `Run IAR Test`
- `Examine Routing Results`

The `IAR Tests/Results` screen for Examine IAR Data contains two options:

- `Examine Test Scripts`
- `Examine Routing Results`

Submenu routines are presented along with a brief description of each field displayed. These submenus provide the capability to change IAR Data parameters to allow for possible problems that may occur in the network.

Examine/Maintain Test Scripts

The `Maintain Test Scripts` routine allows you to make changes in any script to customize your IAR test plan. When `Enter` is pressed, the following prompt appears:

```
Enter Script Name Or Press Enter For a List of Scripts.
```

Note that if no scripts are present, you are asked:

```
Enter name of script to create
```

If `Enter` is pressed, all currently created script names appear on the `Script Selection` screen. Highlight the desired script name and press `Enter`. The `Edit Script` screen appears showing more detailed script information.

To configure an existing script, bring the cursor key to the top of the # field. Highlight this field and press `Enter`. The following prompt appears:

```
Insert a new line [Default Yes (Y/N)]
```

To insert a new line, answer **`y`**. Next, move the cursor to the `Command` column. Press `Enter` until the desired option appears. The commands (tests) are:

LINK UP/LINK DOWN

This command simulates the recovery/failure of a specific link. If DRR is enabled, it checks to see if a configuration change should occur and trigger one if necessary. At the same time (if IAR is enabled), an IAR link up/down event is initiated to re-route the circuits.

NOTE

Prior to an optimization, only `LINK DOWN`, `CARD DOWN`, and `PORT DOWN` are allowed. The system assumes that all system elements not explicitly noted as failed are operational.

CARD DOWN/ PORT DOWN

This command simulates the failure of a card/port. This event marks the port(s) as failed and all links on the port(s) as failed (if IAR is enabled). If DRR is enabled, it checks to see if a configuration change should occur, and triggers one if necessary. At the same time, if IAR is enabled to re-route circuits, an IAR failed event is initiated.

CARD UP/ PORT UP

This command simulates the recovery of a card/port. This event marks the port(s) as up. Note that the port status is used in determining the initial link status of a backup link when it is activated. If the port on which the backup link resides is failed at activation, the link is marked as failed for IAR/DRR. *A Card/Port UP event does not cause any link up events.*

SET TIME/DATE

This command simulates the changing of the time on the Controller. When this event is encountered in the test scenario, the time is updated, and the configuration is checked to see if a configuration change is required (i.e. due to TOR). If so, the configuration change is simulated.

OPTIMIZE

This command simulates a circuit route optimization.

Note that after selecting the **`LINK UP`**/**`DOWN`**, **`CARD UP`**/**`DOWN`**, or **`PORT UP`**/**`DOWN`** tests for a link, you must also specify the name of the link and node on which you want the test to execute.

When you reach the end of the script, the last line should say `END-OF-SCRIPT` .

To run this script you must go to `Run IAR Test` under the `Modify IAR Data` submenu. Before running the test script, you must create a test name. This test name provides a location for saving test results.

Information on each field in the `Edit Script` screen is detailed below:

— The line number of the script. As many as 14 lines of a script may be displayed per screen page.

`Command` — The command is one element in the IAR simulation script.

`Sel` (Select Name) — When this block is highlighted, a list of relevant network elements is provided. A selection from this list provides the entry for the `Link or Node Name` entry.

`Link or Node Name` — The name of a link (aggregate) or the node name on which you would like the script to execute the command line.

`Slot` — If a CDA, IAC, ACC, or LIM Module is specified in the script, you must enter its slot number position in the main shelf.

`Port` — If a CDA or IAC Module I/O Port is specified in the script, then Port `A` or Port `B` must be specified.

`N` (Names Missing) — If a script is missing names of links or nodes, a red `*` appears here. The number of missing names is reported on the lower portion of the `Script Selection` screen.

`D` (Dates Out of Order) — If a script contains dates that are out of order, a red `*` appears here. This may occur when configuring a script line and entering the wrong date or time. The number of dates that are out of order is reported on the lower portion of the `Script Selection` screen.

`Date/Time` — You have the ability to enter the date and time for the line in the script to become active. Highlight the `Date/Time` field and enter the proper time and date. Follow the same syntax as appears on the `Script Selection` screen. The date/time selection allows simulation of TOR events and delays in processing.

An option to check the integrity of the script is available at the top of the `Script Selection` screen. Highlight **`Check Integrity`** and press `Enter`. This check validates the script you created by checking for wrong node names, links, or bad dates inserted into the script. Another option allows the existing script to be copied under a new name.

A **`Delete`** function allows you to remove an existing script from the TMS-3000 data base.

Maintain Test Names

When this routine is selected, the `Test Name Maintenance` screen appears. You are allowed to create a test name, copy a test name, or delete a test name. This is used to store the IAR Test results. You select the desired function with the cursor keys to highlight the area.

A default IAR name is always present in the Controller and is present even if you do not specify a name for IAR Data. This name is designated `CURRENT` and holds the current network routing information.

Create Test Name

You may create a name under which to store the results of an IAR test script simulation. When this routine is selected, you must enter the name of the configuration (up to 8 characters). Press `Enter` and the name should appear under the IAR name field. When a test script has been executed and stored in a configuration file, the TOR/DRR configuration current on completion of running the test scenario appears.

Copy to Test Name

You may copy either the current network routing or IAR Test simulation results. When this routine is selected, a message prompts you:

```
Enter Source Name or press Enter for list.
```

Pick a name from the list of IAR names and press `Enter`, or manually type in the correct name and press `Enter`. A prompt appears asking you to enter the destination name or press `Enter` for list. You cannot copy into the current network routing.

Delete Name

You can delete an IAR Test script in the Controller. When this field is highlighted, you are prompted to enter the name you want to delete or press `Enter` for a list. Next, enter the test name on the `Test Name Maintenance` screen. Note that the `CURRENT` name cannot be deleted.

The following prompt appears:

```
All configuration data will be destroyed.  Are you sure? [Default No
(Y/N)].
```

If you enter Yes (**Y**), the selected configuration selected is destroyed.

IAR Name

Displays the test names stored in the Controller.

TOR/DRR Configuration Name

Displays the current TOR/DRR Configuration at the completion of the test script.

Run IAR Test

This routine runs an existing script and configuration. Highlight **Run IAR Test** and press Enter. The Run IAR Test screen appears. The procedure to run the IAR test follows:

1. Enter the script name (up to 16 characters) or highlight **Select Script Name**. Press Enter.
2. Enter the IAR Test Name (up to 8 characters) or highlight **Select Test Name**. Press Enter.
3. After this information is selected, the script name and test name appear on the screen. Move the cursor to highlight **Run Test**. Press Enter.

Depending on the script size and configuration, the test may take up to several hours. To display the results of the IAR test, press **F3** to return you to the IAR Tests/Results screen, select **Examine Routing Results**, and press Enter.

Examine Routing Results/Examine Current Routing

These routines allows you to examine circuit routing parameters after an IAR or a test script has been executed. These parameters include IAR routing of circuits, aggregates on which the circuits were routed, and the total bandwidth consumed through all links.

Examine Routing Results is selected from the IAR Tests/Results screen that is displayed after selecting **Modify IAR Data** from the TMS Main Menu. **Examine Current Routing** is selected from the TMS Main Menu.

When **Examine Routing Results** is selected, the IAR Name Selection screen appears with the available IAR name. Select the IAR name of your choice by highlighting it. Press Enter. The Routing menu appears. Selecting **Examine Current Routing** takes you directly to the Routing menu without selecting an IAR name. Three choices are available:

```
Examine Event List

Examine Circuits

Examine Bandwidth
```

The **Examine Current Routing** routine allows you to examine routing parameters for an active network after an IAR or a test script has been executed. These parameters include IAR routing of circuits, the trunks on which the circuits were routed, and the total bandwidth consumed through all links. **Examine Current Routing** is available through the on-line network menu only.

Each Routing Menu selection is detailed in the following paragraphs:

Examine Event List

When **Examine Event List** is highlighted and Enter pressed, the Examine Event History screen appears.

You are provided with a list of events associated with the test simulation or current routing results depending on the selected IAR test scenario.

Examine Circuits

Permits you to examine circuit paths taken after IAR has been executed.

When **`Examine Circuits`** is selected, from the `Routing` screen, the `Circuit Selection` screen (*See Figure 20-1*) appears allowing you several choices of viewing circuit routing conditions:

```
Circuit Selection   NET1                                    15-APR-1996 04:55:37

Select ONE of the following:

        All Circuits                 Order by    Route/Hops

        Terminating At Node:  ..................    Slot:---- Port:---- DSO:----
                                 Select Node

        Routed Through Node:  ..................    Slot:---- Port:---- DSO:----
                                 Select Node

        Between Nodes:        ..................     .................
                                 Select Node              Select Node


 Limit Selection Above by Circuit Name:
```

Figure 20-1 Circuit Selection Screen

The `Order by` selection allows you the following choices. Use `Enter` to step through the selections.

`Alphabetical`

`Last Route Time/Route/Hops`

`Last Route Time/Route/Alphabetical`

`Last Route Time/Alphabetical`

`Route/Hops`

`Route/Alphabetical`

`Route/Last Route Time`

On the `Select Node` lines, you may type in the node names, or if you highlight **`Select Node`** and press `Enter`, a `Node Selection` screen appears. Highlight the appropriate Node Name and press `Enter`. This returns you to the `Circuit Selection` screen. You may be prompted to input the node number or the slot number. When you have completed your selections, pressing **`F4`** brings up another `Circuit Selection` screen that provides a list of the circuits that met your criteria. Circuits that are currently active in this configuration are displayed according to the order previously chosen in your `Order by` selection.

If a circuit is routed, `ROUTED` appears in the `Status` column. Other possibilities are `NOT ROUTED` (in red) or `FAILED` (in yellow) in the `Status` column. `NOT ROUTED` means that no route exists because there is not enough bandwidth, the link is down, or no compatible link is available. `FAILED` means that the route over which a circuit was routed has gone down. This occurs only if the circuit is not re-routed (e.g., manual routing). For a failed route, if you highlight the circuit name and press `Enter` , the `Route Information` screen shows you what the route would be if the route was up. This is not shown for a `NOT ROUTED` circuit (You are not allowed to advance to the `Route Information` screen).

Highlight one of the circuit names and press `Enter` . A `Route Information` screen appears, providing you with current IAR circuit routing conditions for the on-line network or simulation results.

NOTE *When you examine circuits that have been routed in a TMS network that has disconnected nodes, you may see that circuits have been routed to the disconnected nodes. When the Controller is unable to communicate to the nodes at both ends of the link, it assumes that the link is up and the Controller routes circuits over it. This is a normal characteristic of the GTS software.*

Examine Bandwidth

Examine Bandwidth allows you to see specific information on the ACC, ACM, CIC, CDA, IAC, LIM, and TPP Modules after IAR has been executed. You can examine the link name, equipment type, available bandwidth, channel bandwidth used, channels available, bandwidth remaining, and link status.

Highlight **`Examine Bandwidth`** on the `Routing` screen and press `Enter` . You are prompted for a node selection. After the desired node is selected, the `Link Bandwidth` screen (TMS-3000 and TMSC) or `LIM Bandwidth` screen (OCM) appears, containing the following information for each field:

`Slot` — The slot numbers (1 – 16 for TMS, PRI1, B/U, PRI2 for TMSC) of the configured module in the main shelf. If an OCM node was selected, the LIM Bandwidth screen shows the LIM slot information.

`Equipment Type` (TMS-3000 and TMSC) — Whether the slot is configured as an ACC, ACM, TPP, CIC, CDA, or IAC Module.

`St DS0` (OCM only) — Starting DS0.

`Num DS0` (OCM only) — Number of DS0s.

`Link Name` — Link name for ACCs.

`Available Bandwidth` — Amount of bandwidth left across link before circuits are routed.

`Circuit BW Used` — The amount of voice or data bandwidth used by the referenced module for this IAR configuration.

NOTE *Because TPP circuits do not terminate on a CDA, the Circuit BW Used figure does not include bandwidth used by TPPs.*

`Num Chns Used` — The number of channels used by the referenced modules for this IAR configuration.

`Bandwidth Remaining` — Bandwidth currently available for the referenced module.

`Link Status` — Displays `Enable` if the ACC, ACM, TPP, CIC, CDA, IAC, or LIM Module is functional after IAR has executed. Displays `Disable` if the module is not currently operational.

If the slot # is highlighted and `Enter` is pressed for a CDA or IAC, or an OCM was selected during node selection, a `CDA`, `IAC`, or `LIM Bandwidth` screen appears. This screen provides bandwidth information on the CDA, IAC, or LIM bundles. The top part of the screen displays `Node Name`, `Node Type`, `Node Address`, `Node Slot` and `Card Type`.

The lower portion of the screen displays the `Port` indicator, `St DS0` (starting DS0 number), `Num DS0` (number of DS0s), `Link Name`, `Available Bandwidth`, `Num Chns Used` (number of circuits), `Circuit BW` (bandwidth) `Used`, `Bandwidth Remaining`, and `Link Status`.

Note that only circuit bandwidth passing end to end is indicated in this screen. In the case of an ACM, an additional 800 Hz of bandwidth per circuit is used to pass control information to the local node destination slot (typically an ACC slot). This additional bandwidth (800 Hz/Circuit) is not reflected in the ACC Bandwidth screen. It may prevent circuit routing in some cases. The additional bandwidth affects only the ACC backplane bandwidth and *not* the ACC link bandwidth.

NOTE *Only 48 KHz per DS0 is available for circuits on an X.50 switching bundle.*

Summary

In this chapter, we covered the Modify IAR Data routine which allows you to write a test script to simulate and plan for disaster scenarios on an aggregate or node level anywhere in the network.

What's Next?

Chapter 21 covers the Controller Mail routine. This procedure permits the exchange electronic mail between redundant controllers.

21 Controller Mail

Overview

The TMS-3000 allows redundant controllers in the network to communicate with one another through the Controller Mail routine. The Controller Mail screen allows you to read mail sent from a subordinate or master controller in the network. Also, the Controller Mail screen contains a selection that allows removal of mail stored on the hard disk drive.

Topics covered in this chapter are:

Controller Mail

Read Mail

Send Mail

Delete Mail

Controller Mail

The procedure for displaying the `Controller Mail` screen is as follows:

1. On the `Network Access` menu, select **`Access-On Line Network`**, and log into an on-line network to display the `TMS Main Menu`. If already logged into a network, use the **`F3`** key to proceed to the `TMS Main Menu`.
2. Use the cursor keys to highlight **`Controller Mail`** Press `Enter`.

Each item of the `Controller Mail` screen is defined below:

Read Mail

This selection allows you to read mail sent from another controller in the network. If no messages are present, the system responds with:

```
There are no mail messages.
```

If a message is present, the status line displays the following:

```
Controller Mail message received from X.
```

To read the message, select **`Read Mail`** from the `Controller Mail Selection` menu and press `Enter`.

The `Read Control Mail` screen appears, listing the date and time stamp and the subject of the message. To read a message from another controller, use the cursor key to highlight the desired message and press `Enter`.

The one-line message appears on the next screen. Other fields on this display contain the message destination (To), the subject, where the message originated (From), and the date the message was sent out.

Send Mail

This selection, available only when you are on-line, allows you to send mail to another controller in the network. You are allowed to make the following selections:

To — Specify where messages should be sent in the network. You can choose between all remote controllers or a single controller. To change the destination controller, highlight this field and press Enter until the desired controller name appears.

Subject — Define the title of the message. One line of text (up to 40 characters) can be entered into this field. Place the cursor to highlight this field and enter the text. If desired, the field can be left blank.

Text — Enter the actual message into this field. One line of text (up to 40 characters) can be entered into this field. Place the cursor to highlight this field and enter the text.

Send Message — This routine sends the message across the network to the controllers. When the message is complete, highlight this field and press Enter.

Clear Message — If a communication error exists in the network, or you do not want to transmit a mail message, highlight this field and press Enter. This clears the message from the Send Controller Mail screen.

If **Clear Message** is selected, the Controller prompts you with the following:

```
This message will be discarded.  Are you sure? [Default Yes Y/N]:
```

Delete Mail

This selection is used to delete any mail stored on the Controller hard disk drive. To delete messages, select **Delete Mail** from the Controller Mail Selection menu. Press Enter. The next screen displayed is the Delete Controller Mail screen. Highlight each message using the cursor key and press Enter. The word deleted should appear under the From field.

When finished deleting messages, press the **F4** key. The following prompt appears:

```
All deleted messages will be purged. Are you sure? [Default YES (Y/N)]:
```

Answering **Y** clears all selected messages from the Controller.

Summary

Redundant controllers can communicate with one another through the Controller Mail routine.

In this chapter we covered the procedures for reading, sending, and deleting Controller mail.

What's Next?

Chapter 22 provides an overview of Status and Diagnostic procedures for the TMS-3000.

22 Status/Diagnostics Overview

Overview

The TMS-3000 Status screens provide a current report on the operating condition of any TMS-3000 component. Selecting TMS-3000 Status or Diagnostics from the main menu provides various tools (as well as regular status information) to help evaluate system operation and locate and diagnose system failures.

NOTE

The Status and Diagnostics routines can only be selected in the on-line version of the TMS Main Menu.

The Controller requests status reports from each node in the network on a regular basis. The information received is organized into status displays. While you are viewing a display, the Controller may update the information. The status information is always current. Specific alarm/status conditions are described in the tables in *Chapters 24 through 37.*

Topics covered in this chapter are:

Diagnostic Tools

Status Displays

Entering Status or Diagnostics

Network Status/Diagnostics

Diagnostic Tools

Selecting Diagnostics from the main menu provides the following tools (and regular status information) to help evaluate system operation, locate, and diagnose system failures.

- Alarm Cut Off — ACO (Alarm Cut Off) can be applied to a component, typically after a problem with that component has been identified. This prevents the problem component from sending alarm messages to the Controller. ACO also disallows faults from contributing to the major and minor ESCC LEDs and relay outputs. You can still observe the presence of alarm conditions on problem components from the status summary fields and by selecting **`Display Status Detail`** on the `Equipment Status Detail` screens.

NOTE *The actual title of the screen that displays the status detail varies depending on how the routine was entered.*

When ACO has been applied to an OCM component, any alarms that existed on that component at the time are now reflected in the `ACO` column (as `Maj` or `Min` in yellow) rather than the `Alarm` column. If a new alarm occurs on that component, the alarm is also reflected in the `ACO` column. New alarms on non-ACO components continue to be reflected in the `Alarm` column.

- Data Path Tests — Data loopbacks may be initiated for aggregates, subaggregates, channel interfaces, and circuits. At the circuit level, built-in pattern generators may be used to transmit test data through a data path. Pattern comparators analyze returned test data for errors. For voice circuits, specialized tests (such as 1 KHz tones and gain adjustments) may be applied to locate specific voice-related problems. Additionally, V.54 loopbacks can be performed, but they are performed from the `Control State Test` screen.

NOTE *Diagnostic forcing has priority over configuration forcing of options.*

The structure of the Status/Diagnostics routines supports the TMS-3000 hierarchy. Network level status displays report the condition of the entire network. You may then select a node from the network display and obtain a general status/diagnostic display for that node.

NOTE *In most cases, the structures of Status and Diagnostics are identical, and they are discussed simultaneously. Where differences occur, they are explained (e.g., diagnostic testing).*

Status Displays

A status display may be generated for any TMS-3000 component. Displays report configuration information for the component selected as well as the status of conditions critical to proper network/component operation. Both summarized and detailed status displays are provided. The color of a status item reflects the state of its condition.

Green — normal operating condition

Red — failure or problem of some kind

Yellow — condition that is other than normal operation, but not critical

White — information from the data base in the Controller

Status Detail — If a problem is indicated by a status summary display, status detail messages provide detailed information about the problem. These messages appear on a subscreen that is displayed when **`Display Status Detail`** is initiated.

Entering Status or Diagnostics

To enter a Status or Diagnostics routine, the configuration must be active and the network on-line. Display the `TMS Main Menu` . Highlight **`Status`** or **`Diagnostics`**. Press `Enter` . The `Status` or `Diagnostics Main Menu` appears.

You may move directly to the status screen for a component by selecting the **`Equipment`** Status/Diagnostics or **`Channel`** Status/Diagnostics routines from the `Node Status` or `Diagnostics Selection` menu, and entering/selecting the appropriate address information (e.g., the component slot number).

You may select a node component from the `General Node Status` or `Diagnostics` screen and obtain a detailed display of the current operating condition of that node component (e.g., an IAC card).

Network Status/Diagnostics

This routine lists all nodes in the network (except XNET nodes), listing their names, addresses, types, and status. It serves as a convenient entry point to the node diagnostics routines. The following defines each status item in the `Network Status/Diagnostics` screen.

- `Type` — This item indicates the node type: TMS-3000, TMSC, UNIV. MM+ V4, OCM SHELF, or OCM ENCLOSURE.
- `Alarm` — Reports the presence of an alarm condition somewhere on the node. Major or Minor alarms can be reported. A minor alarm indicates a failure that can disrupt only a single circuit. Typically, a minor alarm reflects a channel module failure or a failure of the circuit in between the two channel ends.

  A Major Alarm indicates a failure that may disrupt an aggregate trunk or a group of channels. The presence of a Major Alarm masks the presence of a Minor Alarm. Normally, such a failure involves an aggregate trunk or an Aggregate Control, ACM, CDA, IAC, ESCC, or Channel Interface Card in the main TMS shelf, or a CCM or LIM in an OCM-2000 shelf.
- `ACO` — Reports the state of ACO (alarm cutoff) for the node as a whole; it does not summarize or indicate the ACO state for any individual components within the node. It is reported as `On` or `Off`. For OCMs, alarms which existed when ACO is turned on, alarms are displayed in this column as `Maj` or `Min`.
- `Diag` — Indicates whether there are any diagnostic tests currently running in the node. `Yes` indicates that a diagnostic is running. `No` indicates that no diagnostic test is running.
- `Mode` — Indicates whether the Maintenance Console is being used at a node. `Normal` indicates that it is not being used. `Maintenance` indicates that the Maintenance Console is in the maintenance mode of the TMS-3000, TMSC, or OCM-2000 node.
- `Owner` — Reports which Controller owns this particular node. `C-0` indicates that node ownership has not been claimed by any Controller. `C-n` indicates the node is owned by the Controller located at node address `n`.
- `Access Port` — Indicates the current source of supervisory communications at each node.

  `PortN-Lcl` is reported for the node that is currently connected directly to the Controller.

  `PortN-Rmt` is reported for all nodes communicating through aggregate trunks or supervisory pass-through ports. OCM nodes report `Port0-Rmt` .

  `Port1-Lcl` is reported for a node that is connected directly to the Controller through a modem link.

  `Port1-Rmt` is reported for any nodes communicating through the node involved in the modem link.

To select Status or Diagnostics screens for one of the nodes listed, move the cursor to that node and press `Enter`. The `Status` or `Diagnostics Selection` menu appears. The node address and type are shown as well as the following choices:

`Node`

`Equipment`

`Channel`

`Set Node ACO` (Diagnostics only)

If you selected an OCM-2000 node, the choices are:

`Node`

`Slot`

`Set Node ACO`

`Node Self Test`

Summary

TMS-3000 Status screens provide a current report on the operating condition of any TMS-3000 component. Selecting Status from the TMS Main Menu provides status information to help evaluate system operation and locate and diagnose system failures.

Selecting Diagnostics from the TMS Main Menu provides additional tools (and regular status information) to help evaluate system operation, locate, and diagnose system failures.

In this chapter we provided an introduction to Status and Diagnostics. We described the status displays, and we covered Network Status and Diagnostics.

What's Next?

Chapter 23 provides an explanation of the procedures for node status and diagnostics.

23 Node Status/Diagnostics

Overview

The following sections describe the node level status and diagnostics screens for TMS-3000, TMSC, Universal MM+V4, and OCM-2000 nodes.

Topics covered in this chapter are:

Node Status/Diagnostics

TMS-3000
TMSC
OCM
Universal MM+ V4

Accessing Module Status Diagnostics Screens

Node Status/Diagnostics

The `General Node Status` or `Diagnostics` screen is organized differently for the different node types. From this screen, you can select any card in currently selected node. Each type of screen is described in the following sections.

TMS-3000

To see a status screen for a specific node, select **`Status`** from the `TMS Main Menu`, select **`Network`** or **`Node`**, select the node, and then select **`Node`** from the `Status` or `Diagnostics Selection` menu. The `General Node Status` or `Diagnostics` screen appears, showing you a status display of each module in the TMS-3000 Main Shelf at the node.

Equipment Type/Mode

The equipment type and mode is reported for each module in the TMS-3000 Main Shelf. The following types/modes are shown (*See Figure 23-1*):

```
ACC/NRED
ACC/RED
ACM/NRED
ACM/RED
CDA-T1/NRED
CDA-T1/RED
CDA-E1/NRED
CDA-E1/RED
CIC/NRED
CIC/RED
IAC/NRED
IAC/RED
TPP-LN
TPP-FR
System Controller
```

```
General Node Diagnostics         NET1                      06-APR-1995 11:53:53

Node:  A                        Addr:  001         Type:  TMS

     Equip    Dest        Status              Equip    Dest        Status
Num  Mode     Node   Alarm ACO Diag Serv Num  Mode     Node   Alarm ACO Diag Serv

01   IAC N256                        09  Undefined
02   Not Available                   10  ACC NRED  TMS

03   ACC NRED TMSC                   11  TPP-FR R128
04   Undefined                       12  TPP-FR R128

05   DIV RED  TMS                    13  CIC RED
06   DIV RED                         14  CIC RED

07   Undefined                       15  CIC RED
08   ACC NRED UM+4                   16  CIC RED

System Controller

                Note that Status Messages are displayed here.
```

Figure 23-1 General Node Diagnostics Screen, TMS-3000

Status Items

For ACC, ACM, CIC, CDA, IAC, TPP and System Controller, the screen reports the type of equipment in each slot, the operating mode that it is configured for in the currently active configuration (`RED` if redundant or `NRED` if non-redundant), and the destination node type (if applicable). Status items are reported for each module in the shelf. Note that in Slots 5 and 6 of the above example, `DIV RED` represents ACCs with redundancy and diversity. In the `Node Configuration` screen, these slots are shown as `ACC /DIV/REDUNDANT` . The following defines each item:

- `Alarm` — Reports the presence of an alarm condition for the associated component or any of its subcomponents. Major or Minor alarms are reported. A minor alarm indicates a failure that can disrupt only a single channel. Typically, a minor alarm reflects a channel module failure. A major alarm indicates a failure that may disrupt an aggregate trunk or a group of channels. Normally, such a failure involves an aggregate trunk or an Aggregate Control, ACM, CDA, IAC, ESCC, or Channel Interface Card in the main shelf. The presence of a Major Alarm may mask the presence of a Minor Alarm.
- `ACO` — Summarizes the state (`On` or `Off`) of ACO for the individual component and/or any of its subcomponents.
- `Diag` — Reports whether any diagnostic tests are currently running on the individual component or any of its subcomponents. `Yes` indicates that a diagnostic test is running. `No` indicates that no diagnostic test is running.
- `Serv` — Reports which module of a redundant pair is in service. `In` indicates that the module is currently in service; `Out` indicates that the module is not in service. For the ESCC, `PRI` or `SEC` is displayed to indicate the primary and secondary cards, respectively. For non-redundant modules, this item is not displayed.

Status for the TPP module is displayed like other system modules. Service status display for a module usually is either in service (`In`) in green or out-of-service (`Out`) in red. But for TPP/OPP modules there are other status possibilities in the `Serv` column. `Dis` appears in yellow if the module has been disabled via Diagnostics. If the module is redundant, then `Act` appears in green for the one that is active and `B/U` in green for the backup module.

Select detailed status displays for any card in this display by moving the cursor to that card and pressing `Enter`. The `Equipment Status` screen for that component appears. Later chapters describe Equipment Status screens for the specific cards.

If you selected Diagnostics from the `TMS Main Menu`, when you reach the Diagnostics Selection menu, there are four choices for TMS-3000 and TMSC nodes: `Node`, `Equipment`, `Channel`, and `Set Node ACO`. For OCM nodes, the four choices are `Node`, `Slot`, `Set Node ACO`, and `Node Self Test`.

TMSC

Upon entering the General Node Status/Diagnostics routine, you are presented with a status display of each common module in the TMSC (*See Figure 23-2*).

```
General Node Diagnostics          NET1                       06-APR-1996 11:57:06

Node:  DALLAS            Addr: 004       Type: TMSC

                                Equipment              Dest                  Status
                          Slot     Type      Mode      Node    Alarm  ACO  Diag  Service

                          PRI1     CDA-T1    Non-Redun

                          B/U                Not Available
                          B/U                Not Available

                          PRI12    IAC       Non-Redun

                          CH-S      CIC      Redundant
                          CH-P      CIC      Redundant

                           System Controller
```

Figure 23-2 General Node Diagnostics Screen, TMS Compact

Slot Definition

The `Equipment Slot` represents the pre-defined function of each slot in the shelf. In the TMSC, the slots are defined as follows:

`PRI1` — Primary Slot 1 (ACC, CDA, IAC, ACM)

`B/U` — Backup Slot (ACC, CDA, IAC, ACM)

`PRI2` — Primary Slot 2 (ACC, CDA, IAC, ACM)

`CH-S` — Secondary Channel Interface Card

`CH-P` — Primary Channel Interface Card

`System Controller` — Enterprise System Control Card

Equipment Type/Mode

The equipment type and mode is reported in the TMSC Main Shelf. The following types/modes are shown for each module in the `PRI-1` slot:

```
ACC/Non-Redun
ACC/Redundant
ACC with Priority
ACM/Non-Redun
ACM/Redundant
CDA-T1/Non-Redun
CDA-T1/Redundant
CDA-T1 with Priority
CDA-E1/Non-Redun
CDA-E1/Redundant
CDA-E1 with Priority
IAC/Non-Redun
IAC/Redundant
```

The backup slot contains either an ACC, ACM, CDA, or IAC Module. This is dependent on the type of module installed in either `PRI-1` or `PRI-2`. There are two lines for the backup slot; the first line indicates the backup connection with `PRI-1`, and the second line indicates the backup connection with `PRI-2`.

`Not available` appears in a `B/U` slot indicator if a non-redundant module is present in the slot for which the indicator is showing backup.

The following types/modes are shown for each module in the `PRI-2` slot:

```
ACC/Non-Redun
ACC/Redundant
ACC with Priority
ACM/Non-Redun
CDA-T1/Non-Redun
CDA-T1/Redundant
CDA-T1 with Priority
CDA-E1/Non-Redun
CDA-E1/Redundant
CDA-E1 with Priority
IAC/Non-Redun
```

ACC, ACM, CDA, IAC, CIC, and ESCC modules are reported with redundant or non-redundant status.

Status Items

Alarm, ACO, Diagnostics, and In Service/Standby status are reported for each module. These items are identical to the items reported for a TMS-3000 node.

If a redundant module failure has caused the backup module to switch into service, the backup module is reported as `In service`. The module that it has replaced is reported as `Out-of-service`. A backup module can backup only one of the primary aggregates at any one time; that is, it cannot backup both simultaneously. When an aggregate goes out-of-service, the backup goes in service for that aggregate. If the backup is in service for an ACC without priority, and an ACC with priority goes out-of-service, the backup card switches to back up the priority ACC and leaves the non-priority card out-of-service without a backup.

OCM

Select **`Node`** from the `Status` or `Diagnostics Selection` screen. The `General Node Status/Diagnostics` screen appears. Identifying information appears (`Node`, `Addr`, `Type`) and equipment status information appears for CCMs, LIMs, OPP cards, and channel cards.

Equipment Num

The physical slot location in the OCM Shelf or OCM Enclosure.

Mode

The type of card in the slot, e.g., `LIM RED`.

Alarm

Reports the presence of an alarm condition. `Major` or `Minor` may be reported.

ACO

Reports the state (`On` or `Off`) of ACO for the component. It summarizes or indicates the ACO state for any individual components within the node. For OCMs, alarms which existed when ACO is turned on, alarms are displayed in this column as `Maj` or `Min`.

Diag

Reports any diagnostic tests currently running in a component. `Yes` indicates that a diagnostic test is running. `No` indicates that no diagnostic test is running.

Service/Routed

For CCM and LIM cards, `*` appears in this column, color coded (*See Status Displays in Chapter 22*) to indicate status. For OPP and DCM cards, `U` (unused), `R` (routed), `N` (not routed) or `F` (failed) may be reported. The routing information, although displayed as a status item in color, is *not* updated after it is first displayed.

Universal MM+V4

Upon entering the General Node Status/Diagnostics routine, you are presented with a status display for the `Common Set`, `Auto Frame`, `Power Supply`, and `Channels`. Alarm, ACO, and Diagnostics information (as defined previously) is presented.

Accessing Module Status/Diagnostics Screens

When you select Status or Diagnostics from the TMS Main Menu, the first screen that appears is the `Status` or `Diagnostics Main Menu`. Module status may be examined by selecting a node, which brings up the `Status` or `Diagnostics Selection` menu and gives you choices of **`Node`**, **`Equipment`**, **`Channel`**, and **`Set Node ACO`**.

For example, if you select **`Equipment`**, you are prompted for a slot number which brings up a screen of the selected module (or redundant pair of modules). The top of the screen reports the node name, address, node type, and slot number of the aggregate. The configured operating mode of the aggregate is also displayed. This information is obtained from the Controller data base.

Alternatively, module status may be accessed from the `General Node Status` or `Diagnostic` screen by moving the cursor to the desired slot and pressing `Enter`. The following *Chapters 24 through 31* discuss status and diagnostics for the various TMS-3000 cards.

Summary

In this chapter we covered node level status and diagnostics screens for the TMS-3000, TMSC, Universal MM+V4, and OCM-2000.

What's Next?

Chapter 24 covers the status and diagnostics procedures for the Aggregate Control Card (ACC).

24 ACC Status/Diagnostics

Overview

This chapter describes the items which are found on the ACC Status and Diagnostics screens.

Topics covered in this chapter are:

Aggregate Control Card Status/Diagnostics

The status items displayed below the configuration fields reflect the operating conditions of the Aggregate Control Card at the node and the link to which it is connected. Some status items are common to all aggregate displays; some items are unique to a particular aggregate operating mode.

The Controller determines status by polling the node for the current status of the module on a regular, frequent basis. The items reflect:

- Card type and firmware revision
- The position of redundancy and diversity jumpers on the card
- The operating status of the card and the link to which it connects

If the card status field(s) for a non-redundant module (or both redundant modules) indicates `not in slot`, then all other status fields (except `ACO`) are blank.

ACC Equipment Status/Diagnostics Screen

The following defines each item on the ACC `Equipment Status/Diagnostics` screen (*See Figure 24-1*):

Aggregate Name

Name of the aggregate.

Interface Type

Type of interface, e.g., `Bell T1-D4`, `ITU-T V.35`, etc.

Link Rate

Data rate of the module in the currently active configuration.

Ones Density

This field, if present, indicates that ones density is enabled. If this item is enabled (for an AT&T T1 trunk only), a "dummy channel," comprising only marks, is framed by the ACC. The ACC configuration determines the data rate of the dummy channel. This keeps the aggregate data stream within specifications for the "sixteen zeros" rule, as required by AT&T. No dummy channel is framed when ones density is disabled.

Overhead

Configured value of `300Hz`, `1.2KHz`, `4.8KHz`, `9.6KHz` or `19.2KHz`. The amount of bandwidth reserved for supervisory communications over this link.

Local

When `Local In Sync` is reported, the ACC is synchronized with the aggregate data stream received from the ACC at the other end of the trunk. When `Local Out of Sync` is reported, the module is not synchronized with aggregate receive data from the opposite-end module. In that situation, any circuits passing through that aggregate trunk are disrupted.

Remote

When `Remote In Sync` is reported, the opposite-end ACC is synchronized to data transmitted from this ACC. When `Remote Out of Sync` is reported, the opposite-end module cannot synchronize to aggregate data transmitted by this aggregate module (or is not receiving any data). In that situation, any circuits passing through this aggregate trunk are disrupted. This field is blank if the local ACC is out-of-sync.

```
Equipment Diagnostics          NET1                      06-APR-1996 12:43:44
Node:  A               Addr:  001      Type:  TMS   Mode: DIV RED   Slot: 03

Aggregate Name: A3-E1
Interface               Link                    Ones
Type:  EIA-422 (V.11)   Rate: 1.544MHz          Density: None     Overhead: 9.6KHz

Local                                           Error Rate:
Remote
Diagnostics

In Service                      Redundancy Mode
Pri Status                      ACO     Equip           FW       Red      Div
Sec Status                      ACO     Equip           FW       Red      Div
--------------------------------------------------------------------------------

                Display Status Detail     Local Loopback
                Set Primary Card ACO      Remote Loopback
                Set Secondary Card ACO    Terminate Loopback
                Redundancy Control        Failure Simulation
                Diversity Control
```

Figure 24-1 Equipment Diagnostics Screen, Redundant ACCs with Diversity

Diagnostics

If the ACC is in normal operating condition, `None` is reported. If a loopback exists at the ACC, the remote ACC or at any point in between, then `Local/Remote Loopback` , `Remote Agg In Lpbk` , or `External Lpbk` is reported.

Error Rate

This field provides an indication of link quality to the Controller. The ACC calculates link errors over a period of 15 minutes and gives you an indication of link quality. TMS software uses the overhead communications system and loss of sync to calculate errors.

When the error rate exceeds 1 bit error in 10^4 bits (displayed in yellow), then a major alarm for the link is generated which is observable at network, node, and equipment status/diagnostic levels.

Link A

This item is reported only for aggregates configured for diversity. If the primary link (trunk) is in normal operating condition, `O.K.` is reported. If the primary link cannot pass data, `Fault` is reported.

Link B

This item is reported only for aggregates configured for diversity. If the secondary link (trunk) is in normal operating condition, `O.K.` is reported. If the secondary link cannot pass data, `Fault` is reported.

In Service

This item reports redundancy status for a pair of Aggregate Control Cards. `Primary` means that the primary module (Slots 2,4,6...16) is active (in service). `Secondary` means that the secondary module (Slots 1,3,5...15) is active (in a redundant pair, the module not reported in service is either in standby mode or not in slot). If the module is non-redundant, no redundancy status is reported.

Pri and Sec Status

This is a status summary of the primary and secondary status of a pair of redundant modules (for a non-redundant module, only the single status is reported).

- `O.K.` indicates normal operating conditions for the ACC.
- `Fault` indicates that a problem has been detected within the ACC or on the aggregate link. The Display Status Detail function reports details of the failure conditions.
- `Not In Slot` indicates that no module is in the selected slot.

For a TMSC node, the primary card is reported by `PRI Status` . Backup card status is reported by `B/U Status` .

Redundancy Mode

Indicates whether the card is in `Automatic` or `Forced` redundancy mode.

ACO

State of ACO is reported as `On` or `Off`. You may change the state of ACO using **`Set ACO`**.

Equip

Indicates the card type actually in slot. This is shown in red if it doesn't match the configuration.

FW

Indicates the revision of the firmware installed on the card. If incompatible with the current software, this item is shown in red.

Red

For TMS, the redundancy strap for an Aggregate Control Card must be set to comply with the configuration of the link, whereas on a TMSC node, it should always be set for `RED` operation. An incorrect strap setting is displayed in red. This item reports the state of that jumper (X8). The following table shows how to set the strap:

TMS	**N/R**	**RED.**
Redundant 128		*
Non-redundant 128	*	
TMS Compact		
Redundant 128		*
Non-redundant 128		*

Div

Diversity for an Aggregate Control Card must be enabled or disabled by the setting of a jumper (X9) on the module. This item reports the setting and is displayed in red if it doesn't match the configuration.

Aggregate Control Card Status Functions

At the lower portion of the status screen is **`Display Status Detail`**, which, when selected, allows you to monitor detailed alarm conditions of the ACC. To select this function, highlight **`Display Status Detail`** and press `Enter`. This function displays detailed status alarm conditions for the selected ACC.

These messages, which give detailed information concerning any module problems (even cards in ACO) are displayed in the lower portion of the screen. For definitions of each alarm condition, *see Table 24-1*.

Aggregate Control Card Diagnostic Functions

At the lower portion of the diagnostic screen you find several diagnostic functions (including the Display Status Detail function described above) which allow you to monitor and test an ACC. To select a function, highlight the desired field and press `Enter`. You are prompted for any further entries, if necessary.

Set ACO or Set Prim/Sec ACO

`Primary/Secondary ACO` appears only for redundant configurations. You may select the state of ACO for the selected primary or secondary card each time you select the routine.

When ACO is on, no alarm scan messages are reported to the ESCC at the node. This prevents filling the alarm buffer with unnecessary alarm messages. When ACO is off, all alarm scan messages are received by the ESCC and forwarded to the Controller. In either case, current alarm conditions can be viewed by selecting **`Display Status Detail`**

Local Loopback

This function loops transmit data to the receive data inputs of the ACC at a relay on the local ACC. Data for all circuits traveling on the aggregate return to the originating channel modules. Before initiating a local loopback, make sure that you take precautions for all circuits that are disrupted by the loopback. You should also consider the possibility of fragmenting your network by disrupting supervisory communications.

A typical circuit data path for a local aggregate loopback is illustrated in *Figure 24-2*. In this diagram, only a local channel, channel interface, and aggregate are shown. When you select a local loopback you are prompted to enter the duration of the loopback in minutes; 1 to 120 minutes can be selected. You can use external test equipment to inject a test signal into a data channel that passes a circuit through the aggregate to evaluate returned data.

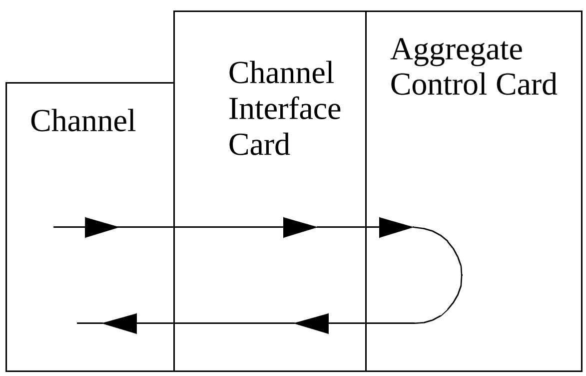


Figure 24-2 Aggregate Local Loopback

Redundancy Control

This option only appears for redundant configurations. If the specified Aggregate Control Card is redundant, this function lets you force either the primary module (the even slot number of the pair, or the secondary module (the odd slot number of the pair) into service. You can select one of three modes for the redundant pair by entering the letter or pair of letters shown:

- **A** — (Automatic). This is the normal redundant state. A redundant switchover occurs automatically when failure symptoms are detected in the aggregate.
- **FP** — (Force to Primary). The primary module is forced into service. The secondary module is forced into a standby condition.
- **FS** — (Force to Secondary). The secondary module is forced into service. The primary module is forced into a standby condition.
- **T** — (Toggle). Switches the out-of-service module into service, and vice-versa, while remaining in the automatic mode.

The redundant pair of modules remain in the mode that you select, until the mode is changed again through this diagnostic function. When you force either primary or secondary into service, redundancy is disabled until you select automatic mode again. There is one exception: If you force redundancy to an inoperative module or an empty slot, the other module remains in service until the forced module is operational. Note that a forced redundancy mode reverts to the automatic mode after you change the equipment type or delete equipment.

Table 24-1 Aggregate Alarm Conditions

Alarm Condition	Definition
Not in Slot	There is no module in the designated shelf slot at the node.
Board Failure	A hardware failure has occurred on the selected ACC.
Configuration Not Loaded	The last configuration download did not successfully reach the selected ACC.
Diagnostics Not Loaded	Diagnostic routine was not successfully downloaded to the ACC.
Software Not Loaded	The last software download did not successfully reach the selected ACC.
Configuration Error	Card other than ACC occupies the slot designated for the selected ACC or the redundancy/diversity jumpers are improperly set.
Remote Address Error	The configured destination of this ACC does not match the actual destination.
ACC Clock Failure	The system controller was unable to phase lock to the clock supplied by this card.
Link A Fail	Aggregate Port A has failed because no transitions were detected in 1000 clock cycles.
Link B Fail	Aggregate Port B has failed because no transitions were detected in 1000 clock cycles.
Card Down	A non-redundant module or both cards of a redundant pair have requested to be switched out-of-service.
Link Down	The customer data path is down for any of several possible reasons: • Out-of-Sync longer than specified filter value • Supervisory communications down • No software downloaded • ACC module failed or out of slot • Remote ACC (or node) in INIT • Loopback present (due to diagnostics or an external selection)
Remote Configuration Mismatch	Remote data frame does not match the local data frame.
Remote Node Needs Software	Remote Node ESCC is in INIT (Running in the Boot).
In Service for PRIn	[The B/U card, in a TMSC, is] Active/In Service for the primary card PRIn.
Overhead Communication Failure	ISO Level 2 supervisory communications across the link have failed.
Incompatible Firmware	Firmware installed on the card is not compatible with the TMS software.

Alarm Condition	Definition
Local Out Of Sync	The selected ACC cannot synchronize with aggregate receive data from the remote ACC.
Remote Out Of Sync	The remote ACC cannot synchronize with aggregate data sent from the selected ACC.
Channels Dropped	Channels configured to pass through the selected ACC have been dropped from that aggregate frame because bandwidth is not available to support the channel.
Transmit Clock Failure	The transmit clock signal of the selected ACC is not active (no transitions).
Receive Clock Failure	The receive clock signal of the selected ACC is not active (no transitions).
Transmit Control Scan	A hardware failure has disrupted transmission of EIA **Control Data***.
Bad Data Frame	The ACC could not calculate a valid data frame.
Note that for redundant aggregates, an indication of `Primary`, `Secondary`, or `B/U` module is included in the alarm message. * Control characters that are sent serially along with data. These characters cause functions such as framing, addressing, synchronization, and error checking to be performed. Control data are also used to indicate handshaking protocol.	

Remote Loopback

A remote aggregate loopback routes aggregate data received from the aggregate trunk at the ACC back to the aggregate trunk, returning the aggregate data stream to the originating aggregate. This test allows you to evaluate an aggregate trunk between nodes.

Data for all circuits traveling on the aggregate are returned to the originating channel modules. Before initiating a remote loopback, make sure that you take precautions for all circuits that are disrupted by the loopback.

A typical remote aggregate loopback data path for a single circuit on the aggregate is illustrated in *Figure 24-3*. The application shown is a point-to-point two-node network.

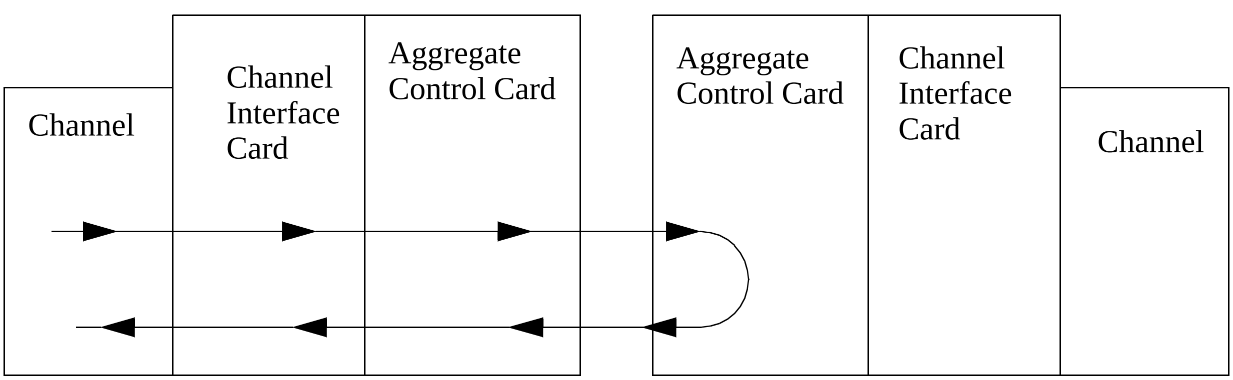


Figure 24-3 Aggregate Remote Loopback

When you select a remote loopback, you are prompted to enter the duration of the test in minutes. You can select **`1`** to **`120`** minutes. You can use external test equipment to inject a test signal into a data channel that passes a circuit through the aggregate to evaluate the returned test signal.

Terminate Loopback

This function is used to end a currently running aggregate loopback test before its timer expires.

Failure Simulation

This function disables the specified ACC and the aggregate trunk for a period of 1 to 30 minutes. The failure simulation may be used as a test for network clock configurations or IAR recovery.

When you select **`Failure Simulation`**, you are prompted to enter the timeout value (that is, the length of time that the aggregate is to be disabled). Select **`1`** to **`30`** minutes.

Once you enter the timeout value, the aggregate is forced to an out-of-sync state for the time period specified. This disrupts all communication (including supervisory communication) through that aggregate trunk. You may then evaluate the network response to the failure.

This is a disruptive test. This routine disables the actual aggregate trunk selected. Data traffic passing through this trunk is interrupted for the selected time period when you initiate this function. If the disabled aggregate is the only possible path to one or more nodes, communication to those nodes is disrupted for that period of time.

Diversity Control

If the specified ACC is configured for diversity, this function lets you force either link A or link B into service.

You may select one of three modes for the pair of links:

- **`A`** — (Automatic). This is the normal diversity state. The ACC switches between link A and B if synchronization failures persist for a significant length of time.
- **`FA`** — (Force to Link A). The ACC receives data on link A.
- **`FB`** — (Force to Link B). The ACC receives data on link B.

This function affects the ACC at both ends of the link.

The ACC remains in the mode that you select until the mode is changed again through this function. When you force one link or the other into service, diversity is disabled until you select automatic mode again.

Summary

In this chapter we covered the items which are found on the ACC Status and Diagnostics screens. Diagnostic procedures which are available for the ACC were also covered.

What's Next?

Chapter 25 covers the status and diagnostics procedures for the Channel Interface Card (CIC).

25 CIC Status/Diagnostics

Overview

This chapter describes the items which are found on the CIC Status and Diagnostics screens. Diagnostic procedures which are available for the CIC, including the DBC are also covered.

Topics covered in this chapter are:

Channel Interface Card Status/Diagnostics

CIC Equipment Status Screen

Channel Interface Status Functions

Channel Interface Diagnostic Functions

Channel Interface Card Status/Diagnostics

The top of the `Equipment Status` screen for the selected CIC (or redundant pair of cards) reports `Node`, `Addr`, `Type`, and `Slot` of the CIC. The configured operating `Mode` of the channel interface is also displayed. This information is obtained from the Controller data base.

The status items displayed depend on the configured operating mode of the CIC.

A non-redundant channel interface reports a single card status. A redundant channel interface reports primary and secondary status separately.

The Controller determines the status of a CIC by polling the node periodically for its current status. If a non-redundant card (or both redundant cards) is not in the slot, some status items are left blank.

CIC Equipment Status Screen

The following paragraphs define each item on the `Equipment Status` screen for a CIC.

Selected Rate

Rate at which data from the channel interface is selected for transfer to aggregate interface cards or other channel interface cards at the node. The rate, which is selected as part of the configuration for the slot, may be `1.056MHz` or `2.112MHz`.

Channels

Displays `O.K.` if all channels associated with this CIC are alarm free. Displays `Fault` if one or more channels have alarms.

Diagnostics

If the CIC is in normal operating condition, `None` is reported. If a loopback exists at the card, or if any of its channels are running diagnostics, `Loopback` or `Channel Diagnostics` is reported respectively.

In Service

Reports the redundancy status for one of a pair of CICs. `Primary` means that the primary card is active. `Secondary` means the secondary card is active [in a redundant pair, the card not reported in service is in the standby mode, or is not in slot (as with ACC)].

Pri and Sec Status

This is a status summary of the primary and secondary cards in a redundant pair (for a non-redundant card, only a single status is reported).

- `O.K.` indicates normal operating conditions at the node.
- `Fault` indicates a problem with the CIC. Selecting Display Status Detail reports details of the failure condition.
- `Not In Slot` indicates that no card is in the slot.

ACO

State of ACO for the card is reported as `On` or `Off`. You may change the state of ACO by selecting Set ACO.

Redundancy Mode

Redundancy mode for the CIC (`Automatic` or `Forced`).

Equip

Indicates the card type actually in slot. This is shown in red if it doesn't match the configuration. If a DBC is in a slot configured for a CIC, the card type displays in yellow.

FW

Indicates the revision of the firmware installed on the card. If incompatible with the current software, this item is shown in red.

Channel Interface Status Functions

At the lower portion of the `Equipment Status` screen, you find `Display Status Detail` and `Display Channel Summary`.

Display Status Detail

This function allows you to monitor detailed alarm conditions of the CIC. To select this function, highlight **`Display Status Detail`** and press `Enter`. The function displays detailed status alarm conditions for the selected CIC.

These messages, which give detailed information concerning any card problems (even cards in ACO), are displayed in the lower portion of the screen. For definitions of each alarm condition, *see Table 25-1*.

Display Channel Summary

This function presents a general status summary display for the channel cards that communicate through the selected CIC. The display reports several possible states for cards in each of the 64 (TMS) or 58 (TMSC) possible channel slots.

These states include:

- `Unrouted` — The slot is configured, but the circuit unrouted.
- `Unconfigured` — The slot is not configured in the currently active configuration.
- `Unused` — A card occupies the slot, but is not configured in the current configuration.
- `Sync Status` — This slot contains a Sync Status Module; therefore, normal channel status does not apply.
- `Not in Slot` — The slot is configured in the current configuration, but there is no card in the slot.

For a card that is both configured and present in the slot, the screen reports the presence or absence of alarms, its ACO state (displayed whether or not the channel card is in slot), and any diagnostics running in a channel card. If a channel is routed, you may enter the detailed circuit status/diagnostic screens for the channel by positioning the cursor at the desired channel and pressing `Enter`.

Channel Interface Diagnostic Functions

Several diagnostic functions may be used to monitor and test a CIC (*See Figure 25-1*). To select a function, position the cursor at the desired field located at the lower portion of the `Equipment Diagnostic` screen and press `Enter`. You are prompted for any further entries, if necessary.

```
Equipment Diagnostics           NET1                      07-APR-1995 12:41:24
Node:  A              Addr:  001       Type:  TMS   Mode: CIC RED   Slot: 13

Selected Rate: 2.112MHz

Channels
Diagnostics

In Service  Primary     Redundancy Mode
Pri Status  O.K.        ACO Off    Equip CIC     FW CH_D
Sec Status  O.K.        ACO Off    Equip CIC     FW CH_D
--------------------------------------------------------------------------------

                Display Status Detail      Local Loopback
                Set Primary Card ACO       Terminate Loopback
                Set Secondary Card ACO
                Redundancy Control
                Display Channel Summary
```

Figure 25-1 Equipment Diagnostics Screen, Redundant CICs

Set ACO or Set Primary Card/Secondary Card ACO

`Primary` and `Secondary` appears only for redundant configurations. You may select the state of ACO for the selected primary or secondary module each time you select this function. When ACO is on, no alarm scan messages are reported to the ESCC at the node. This prevents the alarm buffer from filling up with unnecessary alarm messages. When ACO is off, all alarm messages are received by the ESCC and forwarded to the Controller. In either case, current alarm conditions can be viewed by selecting **`Display Status Detail`**

Redundancy Control

`Redundancy` appears only for Redundant configurations. If the specified Channel Interface Card is redundant, this function lets you force either the primary module (the rightmost of the pair) or the secondary module (the leftmost of the pair) into service. You may select one of three modes for the redundant pair by entering the letter or pair of letters shown:

- **`A`** — (Automatic). This is the normal redundant state. A redundant switch-over occurs automatically when a failure is detected in the in-service module.
- **`FP`** — (Force to Primary). The primary module is forced into service. The secondary module is forced into a standby condition.
- **`FS`** — (Force to Secondary). The secondary module is forced into service. The primary module is forced into a standby condition.
- **`T`** — (Toggle). Switches the out-of-service module into service and vice-versa while remaining in the automatic mode.

The redundant pair of modules remain in the mode that you select until the mode is changed through this diagnostic function. When you force either primary or secondary into service, redundancy is disabled until you select automatic mode. There is one exception: If you force redundancy to an inoperative module or an empty slot, the other module remains in service until the forced module is operational.

Loopback Test

The Loopback Test for a CIC routes all transmit data back to the originating channel modules at the node site. A channel interface loopback is illustrated in *Figure 25-2* (two channel modules are shown). You must use external test equipment to generate test signals and evaluate results for this test. Typically, a channel module provides the connection point for test equipment. A channel interface loopback continues until the **`Terminate Loopback`** function is selected.

When you select this test, the prompt:

```
This will disrupt all circuits on this card-Continue?[Default No(Y/N)]
```

appears. If you are sure that you want to do this, type **`Y`** and press `Enter`.

Terminate Loopback

This function ends a loopback condition in the CIC, restoring the normal data paths through the module.

Table 25-1 Channel Interface Alarm Conditions

Alarm Message	Definition
Not in Slot	There is no module in the designated shelf slot at the node.
Board Failure	A hardware failure has occurred on the selected CIC.
Software Not Loaded	The last software download did not successfully reach the selected CIC.
Diagnostics Not Loaded	The diagnostic routine was not successfully downloaded to the CIC.
Configuration Not Loaded	The last configuration download did not successfully reach the selected CIC.
Configuration Error	Some module other than a CIC occupies the slot designated for the selected CIC.
Transmit Data Scan	A hardware failure has disrupted transmission of data.
Clock Failure	The clock signal of the selected CIC is not active (no transitions).
Transmit Control Scan	A hardware failure has disrupted transmission of EIA control data.
Receive Scan	A hardware failure has disrupted operation of the Frame RAM within the selected Channel Interface Card.
Channels Dropped	One or more of the channels configured to originate at the selected CIC have been dropped from the frame of that module because bandwidth is not available to support the frame.
Multiple Channels Not in Slot	One or more channels are not in the designated expansion shelf slot(s) in the node.
Multiple Channel Config Error	One or more channels in the expansion shelf have a configuration error (jumper or Config. Error or DIP switches set incorrectly).
Multiple Channels Failed	One or more channels in the expansion shelf have a hardware failure.
Multiple Channel Out-of-Sync	One or more channels in the expansion shelf cannot synchronize to data sent from the CIC.
Multiple Channel Rcv Clk Alarm	One or more channels in the expansion shelf have an alarm due to an error in the receive clock signal.
Multiple Channel Xmt Clk Alarm	One or more channels in the expansion shelf have an alarm due to an error in the transmit clock signal.
Incompatible Firmware	Firmware installed in the card is not compatible with the TMS software.
Note that for redundant Channel Interface Card pairs, an indication of `Primary` or `Secondary` is included in the alarm message.	

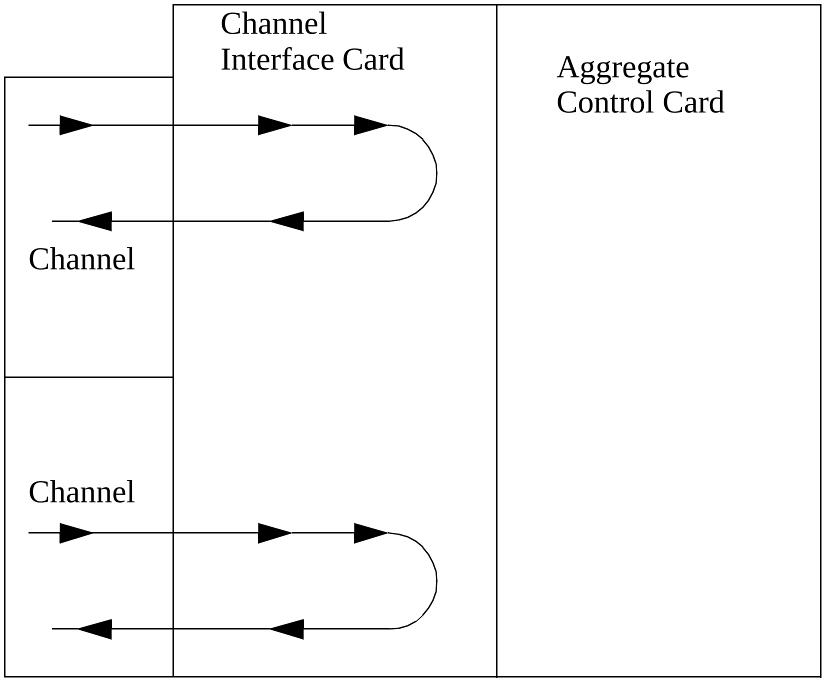


Figure 25-2 Channel Interface Loopback Data Path

Summary

In this chapter we covered the items which are found on the CIC Status and Diagnostics screens. Diagnostic procedures which are available for the CIC and DBC were also covered.

What's Next?

Chapter 26 covers the status and diagnostics procedures for the Line Interface Module (LIM).

26 LIM Status/Diagnostics

Overview

This chapter describes the items which are found on the OCM-2000 Status and Diagnostics screens for LIMs.

Topics covered in this chapter are:

LIM Status/Diagnostics

The top of the `Equipment Status` screen for the selected LIM reports `Node`, `Addr`, `Type`, `Mode`, and `Slot` of the selected LIM.

LIM Status/Diagnostics Screen

The following paragraphs define each item on the `LIM Status/Diagnostics` screen (*See Figure 26-1*):

Destination Type

The LIM destination: `Remote CDA` or `DACS Network`.

Link Rate

The data rate of the module in the currently active configuration.

Line Format

Indicates line format: `T1-D4`, `T1-ESF/ATT`, `T1-ESF/ANSI`, or `E1`.

Line Encoding

`AMI` or `B8 Zero Suppression`.

Alarm

Reports the presence of an alarm condition. `Major` or `Minor` may be reported. *Table 26-1* is a list of LIM Alarm Conditions.

ACO

The state of ACO for the card is reported as `On` or `Off`. You may change the state of ACO using the Set ACO diagnostic function.

Diagnostics

This item reports any diagnostic tests currently running in a component. `Yes` indicates that a diagnostic test is running. `No` indicates that no diagnostic test is running.

Serv

This item reports which module of a redundant pair is in-service. `In` indicates that the module is currently in service; `Out` indicates that the module is not in service.

Redundancy Mode

Redundancy mode for the LIM (`Automatic` or `Forced`).

Buff Slip Cnt (LIM DSX1/CSU/E1 only)

A running count of frame buffer slips. This can be reset during Diagnostics.

```
LIM Diagnostics              NET1                      07-APR-1996 13:50:50

Node:  F10            Addr:  F0010     Type: OCMS   Mode: DSX1 RED   Slot: 09
                                                                 W-Dog     Redund
Destination Type     Link Rate     Line Format      Line Encoding
DACS NETWORK          1.536M       T1D4             B8 Zero Suppression

                        Alarm             ACO     Diagnostics           Serv
Primary LIM              O.K.             Off        None               In
Secondary LIM            O.K.             Off        None               Out
Port                     O.K.             Off        None
Subaggregate             O.K.             Off        None

Redundancy Mode  Auto                    Buff Slip Cnt
--------------------------------------------------------------------------------
        Display Status Detail            Port Datapath Tests
        Display Card HW/FW Detail        Terminate Diagnostic
        Set ACO                          Reset Buffer Slip Count
        Self Test                        Display Port Statistics
        Redundancy Control
        Sub-Aggregate Summary
```

Figure 26-1 LIM Diagnostics Screen, Redundant LIMs

LIM Status/Diagnostics Functions

Several status/diagnostic functions are used to monitor and test a LIM. To select a function, position the cursor at the desired field located at the lower portion of the `LIM Status/Diagnostic` screen and press `Enter`. You are prompted for further entries, if needed.

The functions **`Display Status Detail`**, **`Display Card HW/FW Detail`**, **`Sub-Aggregate Summary`**, and **`Display Port Statistics`** are available in both Status and Diagnostics. Other routines are available as part of Diagnostics only.

Display Status Detail

At the lower portion of the `Equipment Status/Diagnostics` screen is the **`Display Status Detail`** function, which enables you to monitor detailed alarm conditions of the LIM. To select this function, position the cursor on **`Display Status Detail`** and press `Enter`. This function displays detailed status alarm conditions for the selected LIM (*See Table 26-1*).

These messages, which give detailed information concerning any card problems (even cards in ACO), are displayed in the lower portion of the screen.

Display Card HW/FW Detail

When viewing HW/FW Detail and HW options on the Controller screen, be aware of the color scheme as described in the following chart.

Color	Definition
Green	The hardware and configuration match for the option.
Red	The hardware and configuration do not match for the option.
Yellow	No configuration has been received, or the base card and/or piggyback card do not match the configuration; no comparisons can be made. Card and/or strap readings may be inaccurate.

While the `LIM Status/Diagnostics` screen is displayed, you may select **`Display Card HW/FW Detail`** to see card hardware (`feature #`) and firmware revision (F/W rev.) levels for the base card and up to four piggyback cards (`A`, `B`, `C`, `D`).

NOTE *In the following step, for a BQM, if the card is strapped incorrectly (i.e., configured for a channel but strapped as a LIM), you are not allowed to display the hardware options.*

After selecting **`Display Card HW/FW Detail`**, you may also select **`Display H/W options`** and the screen provides the card switch settings as shown below.

- DSX1 LIM
  ESF Mode - `ATT/ANSI`
  Framing Format - `ESF/D4`
  Line Encoding - `B8ZS/AMI`
  Line Length (ft) - `0-133`, `133-266`, `266-399`, `399-533`, `533-655`
- CSU LIM
  ESF Mode - `ATT/ANSI`
  TX Line Buildout - `0 dB`, `7.5 dB`, `15.0 dB`, `22.5 dB`
  Line Equalizer Gain - `36 dB/26 dB`
  Framing Format - `ESF/D4`
  Line Encoding - `B8ZS/AMI`

- V.11/V.35 LIMs
  Transmit Timing - `Node/Receive`
  Line Rate
  Line Rate Multiple - `Nx56K/Nx64K`

- E1 LIM
  Signaling - `CAS/No CAS`
  CRC4 Multiframe - `CRC4/No CRC4`
- BQM LIM
  Operating Mode - `LIM` or `Channel`
  Interface Type - `LT` (Line Termination) or `NT` (Network Termination)

Sub-Aggregate Summary

When you select this function, the `Subaggregate Summary` screen appears. This screen provides a summary of the status, ACO, and diagnostics of all subaggregates on the selected port. While in this screen, if you press `Enter`, the `Sub-Aggregate Status/Diagnostics` screen appears, providing status, ACO and diagnostics information for a specific subaggregate. These screens operate identically to the subaggregate screens described in *Chapter 30.*

Display Port Statistics

When **`Display Port Statistics`** is selected from the `LIM Status/Diagnostics` screen, the `LIM Port Statistics` screen appears. This feature allows you to monitor error events that occur on a link. The data displayed is the port statistics of the past 24 hours and can be displayed in two different views. See *Type of Data* below.

An error event is defined as one or more of the following:

- Bipolar violation
- Out-Of-Frame State
- Loss of Synchronization

The following is a description of each of the fields in the `LIM Port Statistics` screen.

`Current Interval ( x /900 secs., y pct)` – The number of seconds into the current 15-minute interval during which data has been collected. This value is also expressed as a percentage of the current 15-minute (900-second) interval.

`24-hour Totals` – The total number of ES, UAS, BES, SES, and LOFC (defined below) that have occurred in the preceding 24-hour time period.

`Cum. Error Events: (x) Since (date/time)` – The total number of error events recorded since the last time the cumulative error events counter was reset. The counter is reset when the Reset Cumulative Counter field is selected or when the LIM was installed in the slot. A reset of this counter places the counter back to zero and resets the `Since` value. The maximum error value for this counter is 65, 535.

Error fields – The ES, UAS, BES, SES, and LOF counts for each interval displayed on the page. The `LIM Port Statistics` screen contains four pages, each page displaying error counts for 24 15-minute intervals (six hours), for a total of 96 intervals (24 hours). For each interval, the interval number is displayed, followed by the error count values for ES, UAS, BES, SES, and LOFC for that interval. The intervals are displayed in order, with interval 1 being the most recently completed 15-minute interval. When the "current" interval completes its 15 minutes, it becomes the most recently completed interval, and its values are placed at interval 1, bumping the values of all other intervals down one interval.

Errors are displayed in five fields:

- ES (Errored Second) – An ES is one during which one or more error events have occurred.
- UAS (Unavailable Seconds) – Count of one second intervals during which service is unavailable.
- BES (Bursty Errored Second) – A second with more than one, but less than 320 error events.
- SES (Severely Errored Second) – An SES is a second with 320 or more error events.
- LOFC (Loss of Frame Count) – Count of loss of frame events.

Type of Data – Select this field when you want to change the type of data being displayed. The choices are **GDC Statistics** and **Network Statistics**.

GDC Statistics can be reset. Network Statistics are for use by the carrier; you cannot reset Network Statistics.

LIM Diagnostics

The following functions are available on the LIM Diagnostics Screen.

Set ACO

You may select the state of ACO for the selected primary or secondary module. When ACO is on, no alarm scan messages are reported to the CCM at the node. This prevents the alarm buffer from filling up with unnecessary alarm messages. When ACO is off, all alarm messages are received by the CCM and forwarded to the Controller. In either case, current alarm conditions can be viewed by selecting **Display Status Detail**.

Redundancy Control

Redundancy appears only for Redundant configurations. If the specified LIM is redundant, this function lets you force either the primary module (the rightmost of the pair) or the secondary module (the leftmost of the pair) into service. You may select one of three modes for the redundant pair by entering the letter or pair of letters shown:

- **A** — (Automatic). This is the normal redundant state. A redundant switchover occurs automatically when a failure is detected in the in-service module.
- **FP** — (Force to Primary). The primary module is forced into service. The secondary module is forced into a standby condition.
- **FS** — (Force to Secondary). The secondary module is forced into service. The primary module is forced into a standby condition.
- **T** — (Toggle). Switches the out-of-service module into service and vice-versa while remaining in the automatic mode.

The redundant pair of modules remain in the mode that you select until the mode is changed through this diagnostic function. When you force either primary or secondary into service, redundancy is disabled until you select automatic mode. There is one exception: If you force redundancy to an inoperative module or an empty slot, the other module remains in service until the forced module is operational.

Self Test

Self Test commands the specified card or node to perform a self test. This tests for the general functionality of the card or of all cards in the node. To perform a self test on the LIM, select **`Slot`** from the `Diagnostics Selection` screen. You are prompted for a slot number. After selecting the slot, a new screen (e.g., `CCM Diagnostics screen`) appears, allowing you to initiate the test. To initiate either a the card self test, press **`F7`** while `Requesting: Self Test` is shown. To observe a node self test results, toggle to `Requesting: Self Test Results` and press **`F7`**. For a card self test, the results appear just above the `Requesting Self-Test` line. If a card fails, try reseating it and run the test again. If it fails after several tries, replace the card. If a card is part of a redundant pair, you can choose to test either the primary or secondary card.

Port DataPath Tests

Port Datapath Tests, when selected allow the initiation of local and remote loopbacks of the port. You can also choose between the line interface and bus interface for the test.

Terminate Diagnostic

Ends a previously initiated test.

Reset Buffer Slip Count

Resets the running count of frame buffer slips since the last reset. It only applies to LIM DSX1/CSU/E1.

Display Port Statistics

If, while in Diagnostics, you select **`Display Port Statistics`** and then select to view **`GDC Statistics`**, you have the following two options available:

`Reset Cumulative Counter` – Select this field to reset the Cumulative Error Events counter back to zero. Highlight the field with the cursor, and press `Enter`. The `Cum. Error Events` field is reset to zero, and the `Since` field displays the time that the reset occurred. Note that this option appears only when the current type of data being displayed is `GDC Statistics`.

`Reset Performance Counters` – Select this field to reset the current ES, UAS, BES, SES, and LOFC counters, reset the 24-hour ES, UAS, BES, SES, and LOFC counters, and reset all ES, UAS, BES, SES, and LOFC counters for all intervals (on all pages) back to zero. Highlight this field with the cursor, and press `Enter` to perform the reset. The result is that all of the fields mentioned above are reset to zero. Note that this option only appears when the current type of data being displayed is `GDC Statistics`.

Table 26-1 LIM Alarm/Status Conditions

Common	
Message	**Definition**
Not In Slot	The specified module is either not in its slot or is not making proper contact with the backplane connectors.
F/W Rev Error	Firmware revision level of the basecard and/or one or more of the piggyback cards is not valid for the loaded software (applicable to CCM, LIM, VCM, and BQM).
Feat. Rev Error	Feature revision level for the basecard and/or one or more piggyback cards is not valid for the loaded software.
P/B Missing	One or more required piggyback cards are not present.
Card Down	Both cards of a redundant pair have requested to be switched out-of-service, or a non-redundant card has requested the same.
Board Failure	Module cannot be programmed or has failed the Power-On or Full Feature self test.
RAM Failure	RAM failure has been detected (does not apply to LIM/CSU, LIM/V11, LIM/V35 or LIM/DSU).
No Configuration	Card does not currently have a configuration.
Config Not Loaded	Card does not currently have a configuration.
Diag Config Mismatch	One or more configuration parameters have been altered (probably by a diagnostic command) such that they no longer match their configured values.
<Option> Mismatch	The configuration does not match the card's switch/strap/jumper setting for the option.
Cnfg Error	The actual module in the specified slot does not match the module type (PCB type) in the currently active configuration, or options are missing for the configuration.
LIM	
LIM Failure	A non-redundant card or both cards of a redundant pair have requested to be switched out-of-service.
Out of Net Sync	The D4 frame is out of synchronization.
Out-of-service	One or more DS0s on a subaggregate are out-of-service.
Abnormal Statn	Abnormal Station Code indicates remote end has a problem.
LIM Sagg Down	Subaggregate has lost communications or remote end is in boot.
Sagg Threshold	The subaggregate exceeds the specified threshold rate.
Sagg Out Of Sync	A loss of synchronization pattern has occurred over a user specified period of time.
LIM Link Down	Specified LIM is not communicating with its remote counterpart.
LIM AutRed Swap	LIM AUTO REDUNDANT SWAP indicates the LIM card switched out-of-service automatically.
LIM ManRed Swap	LIM MANUAL REDUNDANT SWAP indicates the LIM card is switched out-of-service manually, either by Controller diagnostics command or by use of the DSBL button.
Network Loopback	Indicates that a network-initiated remote loopback is in progress. Applies to LIM/CSU and LIM/DSU. Does not apply to LIM/DSX1, LIM/V.11, or LIM/V.35.
Error Threshld Exceeded	Number of errors detected on the link exceeds the user defined bit error ratio (BER).
Red Alarm*	Caused by error threshold exceeded, loss of carrier, or a remote alarm. Does not apply to LIM/V.11 or LIM/V.35.
Loss of Carrier	Caused by detection of no signal on the line. Clears after signal returns.
Remote Alarm	Yellow alarm. Caused by detection of remote alarm on the line. Indicates a problem at the remote end. Does not apply to LIM/V.11, LIM/V.35 or LIM/DSU.
Failed Signal Alarm	Occurs when ten consecutive SESs (severely errored seconds) have occurred or loss of carrier alarm has been detected. Does not apply to LIM/V.11, LIM/V.35, or LIM/DSU.

* Red Alarm is a network alarm that is produced by the receiver to indicate that it has lost its input signal, frame alignment, loss of sync, or error rate exceeding a predetermined level. A red alarm is considered a network alarm and applies to the following TMS-3000 modules only: LIM, ACM, and CDA.

LIM (Cont.)	
Message	**Definition**
Alarm Indicator Signal	***Blue alarm**. Indicates a problem upstream of the local terminal. Alarm determination is made by the remote terminal. Does not apply to LIM/V.11, LIM/V.35, or LIM/DSU.
Out-of-service Code	No signal has been detected at the OCU from the OCM. Applies only to LIM DSU.
Abnormal Station Code	Same as out-of-service for DDS-II secondary channel or 64 KHz clear channel applications. No signal is detected at the OCM from the feeder mux.
T-Ref Failure	The CCM was unable to phase lock to the clock supplied by this card. Does not apply to LIM/V.11 or LIM V.35
Buffer Slip (Daily/Hourly)	The hourly or daily buffer slip threshold has been met or exceeded. Buffer slips are detected when the hardware status register on the base card indicates a data exchange alarm has occurred and the slips are accumulated until the threshold is met.
Out of Frame Code	A failure has occurred in the higher order digital facilities. Applies only to LIM DSU.
User State Change	For redundant cards only, forced redundancy is selected.
BQM LIM	
Port Down	The out of frame bit on the port interface is set (or clear) consistently over the port failure (or restoral) time.
Local Block Error Threshold Exceeded	The near end block error rate exceeds the port error threshold.
Remote Block Error Threshold Exceeded	The far end block error rate exceeds the port error threshold.
Network Quiet Mode Diagnostics	A BQM LIM is undergoing network initiated metallic loop tests.
Insertion Loss Measurements Diagnostics	A BQM LIM is undergoing network initiated line transmission tests.
* A blue alarm indicates all ones are being sent on the T1 line. This implies an Alarm Indication Signal (AIS) has been sent out on the network. The principle error conditions for this type of alarm are: CRC, bipolar violations, frame alignment error and multiframe alignment errors. A blue alarm is considered a network alarm and applies to LIM, ACM and CDA modules.	

Loopback Tests

Local Loopback routes transmit data back to the receive data inputs of the selected port. Data for all circuits traveling on the aggregate return to the originating source. Before initiating a local loopback, make sure that you take precautions for all circuits that are disrupted by the loopback .

When you select a local loopback, you are prompted to enter the duration of the loopback, in minutes. Select from 1 to 240 minutes (*See Figure 26-2*).

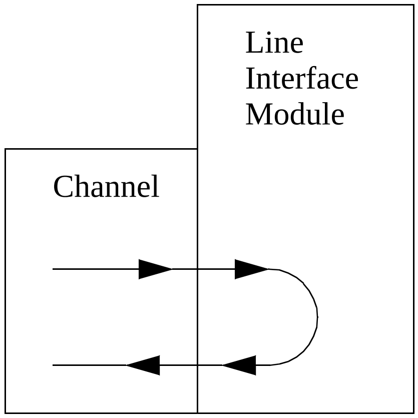


Figure 26-2 OCM LIM Local Loopback

You may use external test equipment or the internal BERT on OCM-2000 channels to inject a test signal into a data channel that terminates a circuit and to evaluate returned data.

A remote test evaluates the performance of the entire network segment associated with that circuit (*See Figure 26-3*).

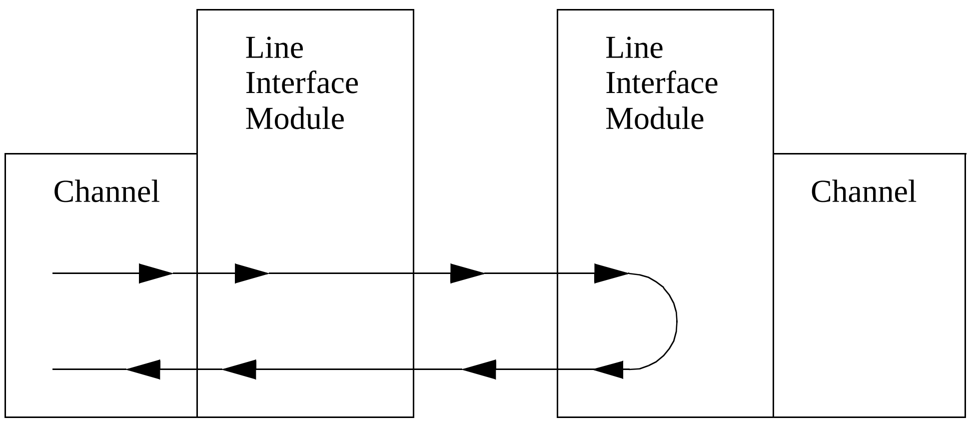


Figure 26-3 OCM LIM Remote Loopback

NOTE

Any active loopback test is terminated when a configuration change that affects the module occurs.

Summary

In this chapter we covered the items which are found on the OCM-2000 Status and Diagnostics screens for LIMs. Diagnostic procedures were also covered.

What's Next?

Chapter 27 covers the status and diagnostics procedures for the TMS Packet Processor (TPP) and the OCM Packet Processor (OPP).

27 TPP and OPP Status/Diagnostics

Overview

This chapter describes the items which are found on the Status and Diagnostics screens for TPP and OPP cards.

Topics covered in this chapter are:

TPP/OPP Status/Diagnostics

Equipment Status Screen

TPP/OPP Diagnostics

TPP/OPP Status/Diagnostics

The `General Node Status/Diagnostics` screen displays general status for every module on the main shelf in the TMS-3000 node or the OCM node. Information for a specific module can be quickly located in the screen by the slot number it associates with. To obtained detailed information for the TPP or OPP, highlight the slot number of the desired module, and press `Enter`. The `Equipment Status/Diagnostics` screen appears.

Equipment Status Screen (upper)

The **`Equipment Status/Diagnostics`** screen (*See Figure 27-1*) provides detailed information on the status for an individual module on a local base. To enter this screen, select **`Node`** on the `Diagnostic Selection` screen. Highlight a TPP or OPP card on the `General Node Diagnostics` screen and press `Enter`. In general, the screen is divided into two parts: the upper part, which is above the dashed line, and the lower part, which is below the dashed line. Information shown in the upper portion of the screen is identifying information such as `Node` (name) and `Addr` (address), `Type`, `Slot` (number), and `Mode` (Mode refers to the equipment type in the slot, such as `TPP-FR N64`). Other fields in the upper part of the screen are explained below:

MicroCell (TPP only)

`Disabled`.

NOTE

TPP does not support the external DB-25 interfaces, Ports A and B.

DB25 Port Conn. Type A: B:

This displays physical plug-in types at the external DB-25 interface port A and B (OPP cards only have one DB-25 port). `Not Present` is displayed in yellow and all other values in green if they match the configuration data. For other conditions, red is used.

IMA Type Top: Bottom: (TPP only)

Displays the types of **IMA** (Intelligent Media Adapter) daughterboards situated on the top and bottom positions of a TPP module. `Not Present` is displayed in yellow and all other values in green. These fields appear only for Frame Relay TPP cards, (e.g., `TPP FR`). IMA is an **Ethernet** LAN media adapter plug-in module. Ethernet is a LAN for connecting devices within the same building, operating over twisted-pair wire or coaxial cable at speeds up to 10 Mbps.

Interfaces (TPP only)

Displays the working conditions for all channels handled by the TPP module. If every configured channel works properly, then `O.K.` is displayed; otherwise, `Fault` is shown. More status information about an individual channel can be seen by selecting **`Display Port/Channel Summary`**. This is explained later when the subsequent screen is discussed.

Diagnostics

Displays what diagnostics are currently performed on the module either at the port level or at the channel level, if any. If diagnostics are running at both levels then only the port level diagnostic is shown by `Diagnostics`. But if `None` is shown, it indicates there is no diagnostic running at either level. Currently, there are only two diagnostics available at the module level; they are `Self Test` and `Disable`/`Enable` the module, and `None` at the channel level.

Status

Displays the operating mode of the module.

ACO

Displays the setting of the alarm cutoff at the module level. If the alarm cut-off is set, then `On` is displayed, otherwise `Off` is shown.

Equip

Information is displayed in the following order: module type, existence of a MicroCell Interface module, and circuit mode plug-in type. This information is stored in the ESCC. For an operational TPP module, the module type should display `TPP-LN` or `TPP-FR` in green if it matches what is configured for the slot. Likewise, an OPP module should display `OPP-E` or `OPP-R` in green if it matches what is configured for the slot. Otherwise, the display is in red. The existence of a MicroCell Interface module is indicated by `B`. Otherwise, the field is left as blank.

Op Mode

Displays the redundancy operation mode.

Equipment Status Screen (lower)

Below the dashed line are commands which are used to call up additional status information and to initiate other procedures.

Display Status Detail

If more status information is needed at the module level, then select **`Display Status Detail`**, and additional information is displayed in the area below the dashed line.

When detailed status information is requested, the error information is extracted from the TPP/ OPP status report and displays each error in red color on a separate line in the screen. If no error exists, the screen displays `No Active Alarms` in green. The following is a list of all errors detected at the port level:

```
Cfg error
No (incomplete) download
Card down
Board fail
Not in slot
Temperature alert
Circuit congestion
Circuit errors
MicroCell Transport Fail
```

The lower portion of the screen gets changed if Display Status Detail is entered from the equipment screen. All significant status information is reported under the dashed line and errors, if any, are displayed on a separate line. If no errors are detected in the respective TPP module, `No Active Alarms` is displayed.

```
Equipment Diagnostics          NET3                        07-APR-1996 13:16:30

Node: N60             Addr: 010      Type:TMS    Mode: TPP-FR N64   Slot: 13

MicroCell: Disabled
DB25 Port Conn. Type A:                           B:
IMA Type Top:                        Bottom:

Interfaces
Diagnostics

Status                          ACO        Equip        Op Mode

--------------------------------------------------------------------------------
   Display Status Detail                Enable/Disable/Reset Card
   Display Channel Summary              Set card ACO
```

Figure 27-1 Equipment Diagnostics Screen, TPP

Display Channel Summary (TPP only)

The Channel summary screen is selected with **`Display Channel Summary`** on the `Equipment Status` or `Diagnostics` screen.

There are up to 64 channels for a TPP module and two channels for OPP. The last channel number on the OPP is for the DB-25 interface. Note that, physically, an OPP occupies two slots.

The status of each individual channel is displayed in a condensed format in the channel summary screen. Status is shown under headings of `Alarm`, `ACO`, and `Diag`. If more information is required for a particular channel, then another level of status screen called `TMS Circuit Status` is provided. The circuit status screen is entered by selecting the desired channel. Channel summary status may be displayed as `Unavailable` at certain channel numbers. This is dependent upon the characteristic of the module in the slot (*Refer to Chapter 18, Circuits*).

`Alarm` - Displays whether the module is detecting any operation error at the respective channel. If a fault condition exists, `Alarm` is shown. Otherwise, it displays `Clear`.

`ACO` - Displays the alarm cut-off setting for the respective channel. If ACO is enabled, `On` is displayed. Otherwise, `Off` is shown.

`Diag` - Displays whether there is a diagnostic running on the respective channel. `Yes` is displayed if a diagnostic test is running. Otherwise, `No` is displayed. Note that no diagnostic tests are available for an OPP channel.

Display Card HW/FW Detail (OPP only)

Select **`Display Card HW/FW Detail`** to see card hardware (`Feature #`) and firmware revision (`F/W Rev.`) levels for the base card and up to four piggyback cards (`A`, `B`, `C`, `D`).

```
                     Card HW/FW Detail
          Base            Piggyback Card
          Card       A      B      C      D
Card Type  OPP
Feature #  1
F/W Rev.   D-05
```

Display Circuit Detail (OPP only)

Selects the `Circuit Diagnostics` screen for the associated OPP circuit.

TPP/OPP Diagnostics

The following diagnostic functions are found only on the `Equipment Diagnostics` screen.

Set Card ACO

You may select the state of ACO for the selected primary or secondary module each time you select this function. When ACO is on, no alarm scan messages are reported to the node. This prevents the alarm buffer from filling up with unnecessary alarm messages. When ACO is off, all alarm messages are received and forwarded to the Controller. In either case, current alarm conditions can be viewed by selecting **`Display Status Detail`**

Note that for redundant configurations, there are two choices: `Set Primary Card ACO` and `Set Secondary Card ACO`.

Enable/Disable/Reset Card

The `Enable/Disable/Reset Card` command has the same effect as the front panel switch on other TMS common cards. It is used to enable or disable the card from the TMS Fast Bus. This is supported in TPP release V2.3. If you suspect the TPP MicroCell operation is causing problems on the TMS Fast Bus for other common cards, the Enable/Disable toggle allows you to remotely disable the TPP card. For OPP, `Enable/Disable Card` is available.

Select **`Reset`** to initiate a self test of the TPP. During the self test, the following sequence occurs on the Controller screen:

1. `Status Fault` `Equip Invld` (Card is not recognized.)
2. `Status Failure` (Card is awaiting download.)
3. `Status OK` `Equip OK` (Card has successfully received download.)

If the card is down, selecting **`Enable`** also initiates a self test. But if the card is in normal operation, `Enable` has no effect. For a complete evaluation, use the TMS Maintenance Console.

Self Test (OPP only)

Selecting **`Self Test`** initiates a self test on the OPP card. `Pass` or `Fail` is displayed when the test is complete. If the card fails, reseat the card and run the test again. If failure persists, replace the card.

Display LAN Interface Status (TPP-LAN only)

LAN Interface Status is not supported in GTS V2.2.0. If you select **`Display LAN Interface Status`**, the message:

```
This test is not yet supported.
```

appears.

Summary

In this chapter we covered the items which are found on the Status and Diagnostics screens for TPP and OPP cards. Diagnostic procedures were also covered.

What's Next?

Chapter 28 covers the status and diagnostics procedures for the Enterprise System Control Card (ESCC).

28 ESCC Status/Diagnostics

Overview

This chapter describes the items which are found on the Status and Diagnostics screens for the ESCC card.

Topics covered in this chapter are:

ESCC Status/Diagnostics

ESCC Status Screen

ESCC Status Functions

ESCC Diagnostic Functions

ESCC Status/Diagnostics

These routines supply status information and diagnostic functions for the ESCC(s) at a node. Use the cursor key to select the `System Controller` field (only available from the `General Node Status/Diagnostics` screens), press `Enter`.

A `System Controller Status/Diagnostics` display of the ESCC (or redundant pair) is generated (*See Figure 28-1*). The top of the screen reports the `Node`, `Address` and `Type`. If there is a redundant pair of modules at the node, both are reported. The Controller determines the status of an ESCC by polling the node. If the module does not respond or is not in the slot, some items are left blank.

The ESCC performs all node communication tasks. If the Controller cannot communicate with the ESCC, communication is cut off for the entire node.

Status is reported for the node power supplies, the on-board modem, the supervisor port, and the ESCC(s).

ESCC Status Screen

The following is a list of status items on the `System Controller Status` screen.

Status

A status summary for the ESCC(s), on-board modem port, and node power supplies is presented. The following may be reported:

- `O.K.` indicates that the device is in normal operating condition.
- `Fault` indicates a failure in the specified device. Select the Display Status Detail function to obtain detailed information about the problem.

- `Not in Slot` is only reported for the primary or secondary ESCC; it indicates there is no ESCC in the designated slot.

ACO

State of ACO is reported as `On` or `Off.` You may change the state of ACO for a ESCC, modem, or power supply, using one of the diagnostic functions.

Diag

Displays whether there is a diagnostic running on the respective card or displays `N/A` for SVR/MDM Ports and power supplies.

Equip

Displays the actual card type in the slot.

FW Rv

Indicates the revision of the firmware installed on the card. If incompatible with the current software, this item is shown in red.

BaseRv

Base card hardware revision level.

MemRv

Memory card hardware revision level.

ESCC Status Functions

At the lower portion of the `Equipment Status` screen is the Display Status Detail function, which enables you to monitor detailed alarm conditions of the ESCC. Position the cursor at the pokepoint and press `Enter`. Detailed status alarm conditions for the selected ESCC are displayed.

These messages, which give detailed information concerning any module problems (even modules in ACO), are displayed in the lower portion of the screen. For definitions of each alarm condition, *see Table 28-1*.

Select **`Display Switch Settings`** to show `ESCC Switch Settings` in the lower half of the screen (*See Figure 28-2*). These are the settings of the ESCC option switches. The options are explained in *GDC 036R303-000.*

Settings which are in error, such as Front Panel Disable, Watchdog Disable, a TMSC ESCC in a TMS 3000 node, or a mismatch in settings between redundant ESCCs, are displayed in red.

NOTE

Four GPS-8 units act as one power supply because they are all wired to the same point (PS 1 Alarm Bus). The other bus, PS 2, exists but has nothing attached to it. Should anything be attached to PS 2 which provides a voltage, `ALM 2` *is reported.*

```
System Controller Status           NET2                     25-APR-1996 08:51:40
Node: N7                  Addr: 007        Type: TMS       In Service: Secondary

Equipment       Status   ACO    Diag     Equip    FW Rv    BaseRv   MemRv
Primary Card    O.K.      Off    None      ESCC     ES _D     1        2
Secondary Card  O.K.      Off    None      ESCC     ES _D     1        2
SVR/MDM Ports   O.K.      Off    N/A       N/A      N/A      N/A     N/A
Power Supply #1 O.K.      Off    N/A       N/A      N/A      N/A      N/A
Alarm  #2       O.K.      Off    N/A       N/A      N/A      N/A      N/A
-----------------------------------------------------------------------------
        Display Status Detail
        Display Switch Settings
```

Figure 28-1 System Controller Status Screen

```
System Controller Status           NET2                     25-APR-1996 08:51:40
Node: N7                  Addr: 007        Type: TMS       In Service: Secondary

Equipment       Status   ACO    Diag     Equip    FW Rv    BaseRv   MemRv
Primary Card     O.K.     Off    None      ESCC     ES _D     1        2
Secondary Card   O.K.     Off    None      ESCC     ES _D     1        2
SVR/MDM Ports    O.K.    Off    N/A       N/A      N/A      N/A       N/A
Power Supply #1  O.K.     Off    N/A       N/A      N/A      N/A     N/A
Alarm  #2        O.K.    Off    N/A       N/A      N/A      N/A      N/A
-----------------------------------------------------------------------------
                            ESCC Switch Settings

Primary:    Node Type   TMS      Watchdog  Enabled      Monitor Port  Front
            Clock Bus 6 1.536 MHz     Ext. Timing Source Impedance   Balanced
            Clock Bus 7 1.344 MHz     Front Panel Enable/Disable     Enabled
Secondary:  Node Type   TMS      Watchdog  Enabled      Monitor Port  Front
            Clock Bus 6 1.536 MHz     Ext. Timing Source Impedance   Balanced
            Clock Bus 7 1.344 MHz     Front Panel Enable/Disable     Enabled
```

Figure 28-2 ESCC Switch Settings

ESCC Diagnostic Functions

The following is a list of diagnostic functions on the `System Controller Diagnostics` screen. *See Figure 28-3.*

Set Primary/Secondary ACO

You may select the state of ACO for the selected primary or secondary module each time you select this function.

Set Power Supply #1/Alarm #2

ACO may be set for Power Supply #1 and Alarm #2.

Set SVR/MDM ACO

Sets ACO for the SVR (Supervisor) and MDM (Modem) port.

When ACO is On, no alarm scan messages are reported to the ESCC at the node. This prevents the alarm buffer from filling up with unnecessary alarm messages. When ACO is Off, all alarm messages are received by the ESCC and forwarded to the Controller. In either case, current alarm conditions can be viewed by selecting Display Status Detail described above.

ESCC Redundancy Toggle

Allows the redundant ESCC to be placed in service in the case of a suspected problem.

Table 28-1 ESCC Alarm Conditions

Alarm Message	Definition
Card Not in Slot	There is no module in the designated shelf slot at the node.
Address Error	The ESCC address switches do not match the configuration.
Internal Phase Lock Fail	Clock generator circuits of the specified ESCC are not operating properly.
External Phase Lock Fail	The ESCC cannot phase lock properly to the external timing signal supplied to it through connector J18 on the main shelf backplane.
Modem DSR Off	The Data Set Ready signal of the on-board modem is in an Off condition. This indicates that the modem is not prepared to operate due to a problem within the modem.
Power Supply in Alarm	The power supply has experienced a failure: normally a low voltage or no voltage condition. Examination of front panel indicators reveals which power supply has failed.
TMS-ESCC In TMSC Node	An ESCC with a TMS configuration was inserted into a TMSC node.
TMSC-ESCC In TMS Node	An ESCC with a TMSC configuration was inserted into a TMS node.
Out-of-service ESCC Link Down	The communications link between the in-service and out-of-service ESCCs is down.
SVR Port: Link Level Down	ISO Level 2 communications are down on Port J20 (J6 on TMSC) while it is configured for supervisory pass-through.
MDM Port: Link Level Down	ISO Level 2 communications are down on Port J42 (J8 on TMSC) while it is configured for supervisory pass-through.
RCC Fail or Out of Slot	Failure of RCC, or RCC is not installed.
Incompatible Firmware	Firmware installed on the card is not compatible with TMS software.
Note that for redundant ESCCs, an indication of `Primary` or `Secondary` module is included in the alarm message.	

```
System Controller Diag              NET2                    25-APR-1996 08:58:44

Node: N7                      Addr: 007       Type: TMS       In Service: Primary

Equipment        Status       ACO       Diag     Equip    FW Rv    BaseRv     MemRv
Primary Card      O.K.        Off       None      ESCC    ES_D       1          2
Secondary Card   O.K.        Off       None      ESCC     ES_D       1          2
SVR/MDM Ports    O.K.       Off        N/A       N/A      N/A      N/A        N/A
Power Supply #1  O.K.       Off      N/A       N/A      N/A      N/A        N/A
Alarm #2          O.K.       Off      N/A       N/A      N/A      N/A        N/A

-----------------------------------------------------------------------------

        Display Status Detail                 Set SVR/MDM ACO
        Set Primary ACO                       Set Power Supply #1 ACO
        Set Secondary ACO                     Set Alarm #2 ACO
        Display Switch Settings
```

Figure 28-3 System Controller Diagnostics Screen

Summary

In this chapter we covered the items which are found on the Status and Diagnostics screens for the ESCC. Diagnostic procedures are also covered.

What's Next?

Chapter 29 covers the status and diagnostics procedures for the Common Control Module (CCM).

29 CCM Status/Diagnostics

Overview

This chapter describes the items which are found on the OCM-2000 Status and Diagnostics screens for CCMs.

Topics covered in this chapter are:

CCM Status/Diagnostics

The top of the `Equipment Status` screen for the selected CCM reports `Node`, `Addr`, and `Type` of the OCM in which the CCM is installed.

CCM Status Screen

The following paragraphs define each item on the CCM Status screen (*See Figure 29-4*).

Alarm

Reports the presence of an alarm condition. `Major` may be reported. *Table 29-1* is a list of CCM alarm conditions.

ACO

State of ACO for the card is reported as `On` or `Off`. You may change the state of ACO using the Set ACO diagnostic function.

Diagnostics

Reports any diagnostic tests currently running in a component. `Yes` indicates that a diagnostic test is running. `No` indicates that no diagnostic test is running.

Serv

Reports which module of a redundant pair is in service. `In` indicates that the module is currently in service; `Out` indicates that the module is not in service. For non-redundant modules, this item is not displayed.

W-Dog Timer

Off indicates that the watchdog timer has been disabled by the corresponding strap setting. This timer should always be On (enabled) during normal operation.

Redund Setting

Redundancy jumper setting for the CCM. An incorrect setting displays in red.

Power Supply

Displays a major alarm if the total power supply output is different than its configured value.

Node ACO

On indicates that ACO is set for the entire node. No alarms are generated by components in that node.

Redundancy Mode

Redundancy operation mode of the CCM (Automatic or Forced).

Power Watts

96W, 100W (for enclosure), 192W, 288W, or 384W

```
CCM Diagnostics                NET1                             07-APR-1996 13:43:51

Node:  F2                 Addr:  F0002       Type:  OCME
                                                                    W-Dog      Redund
                          Alarm     ACO    Diagnostics   Serv      Timer      Setting
Primary CCM                O.K.      Off      None       Out        On         Redund
Secondary CCM              O.K.      Off      None       In         On         Redund
Power Supply               O.K.      Off      N/A        N/A        N/A        N/A

Node ACO          Off      Power 100 Watts

Redundancy Mode   Auto
--------------------------------------------------------------------------------
                  Display Status Detail
                  Display Card HW/FW Detail
                  Set ACO
                  Self Test
                  Redundancy Control
```

Figure 29-4 CCM Diagnostics Screen, Redundant CCMs

CCM Status/Diagnostics Functions

Several status/diagnostic functions may be used to monitor and test a CCM. To select a function, position the cursor at the desired field located at the lower portion of the CCM Status/Diagnostic screen and press Enter . You are prompted for any further entries, if necessary.

The functions Display Status Detail and Display Card HW/FW Detail are available in both Status and Diagnostics. Set ACO , Self Test , and Redundancy Control are available in Diagnostics only.

Display Status Detail

On the lower portion of the screen is `Display Status Detail`, which lets you monitor detailed alarm conditions of the CCM. To select this function, position the cursor at the poke-point and press `Enter`. Detailed status alarm conditions for the selected CCM are displayed.

These messages, which give detailed information concerning any card problems (even cards in ACO), are displayed in the lower portion of the screen.

Display Card HW/FW Detail

Select **`Display Card HW/FW Detail`** to see card hardware (`Feature #`) and firmware revision (`F/W Rev.`) levels for the base card and up to four piggyback cards (`A`, `B`, `C`, `D`). *See Figure 29-5.*

`96W`, `100W` (for enclosure), `192W`, `288W`, or `384W`

```
CCM Diagnostics              NET1                                07-APR-1996 13:44:54

Node:  F2                Addr:  F0002       Type:  OCME
                                                                     W-Dog      Redund
                         Alarm     ACO    Diagnostics   Serv       Timer      Setting
Primary CCM               O.K.      Off      None       Out         On         Redund
Secondary CCM             O.K.      Off      None       In          On         Redund
Power Supply              O.K.      Off      N/A        N/A         N/A        N/A

Node ACO        Off      Power 100 Watts

Redundancy Mode   Auto
--------------------------------------------------------------------------------
            Primary             Card HW/FW Detail                    Secondary
            Base         Piggyback Card        |  Base        Piggyback Card
            Card    A      B      C       D    |  Card   A        B      C      D
Card Type   CCM    25A66   N/A    N/A     N/A  |  CCM    25A66    N/A    N/A    N/A
Feature #   1                                  |  1
F/W Rev.    D-05                               |  D-05
```

Figure 29-5 Display Card HW/FW Detail

CCM Diagnostics

The following functions are available on the CCM Diagnostics Screen.

Set ACO

You may select the state of ACO for the selected primary or secondary module each time you select this function. When ACO is on, no alarm scan messages are reported to the CCM at the node. This prevents the alarm buffer from filling up with unnecessary alarm messages. When ACO is off, all alarm messages are received by the CCM and forwarded to the Controller. In either case, current alarm conditions can be viewed by selecting Display Status Detail described above. When ACO is on, alarm conditions are summed to the higher level summary screens as `MAJ` in the ACO columns.

Table 29-1 CCM Alarm/Status Conditions

Common	
Message	**Definition**
Not In Slot	The specified module is either not in its slot or is not making proper contact with the back-plane connectors.
F/W Rev Error	Firmware revision level of the basecard and/or one or more of the piggyback cards is not valid for the loaded software (applicable to CCM, LIM, VCM, and BQM).
Feat. Rev Error	Feature revision level for the basecard and/or one or more piggyback cards is not valid for the loaded software.
P/B Missing	One or more required piggyback cards are not present.
Card Down	Both cards of a redundant pair have requested to be switched out-of-service, or a non-redundant card has requested the same.
Board Failure	Module cannot be programmed or has failed the Power-On or Full Feature self test.
RAM Failure	RAM failure has been detected (does not apply to LIM/CSU, LIM/V11, LIM/V35 or LIM/DSU).
Config Not Loaded	Configuration data has not yet been downloaded to the card.
Diag Config Mismatch	One or more configuration parameters have been altered (probably by a diagnostic command) such that they no longer match their configured values.
Cnfg Error	The actual module in the specified slot does not match the module type (PCB type) in the currently active configuration, or options are missing for the configuration.

CCM	
CCM Clk Fail	The clock generator circuits of the specified CCM are not operating properly.
Faulty Supply	Power available on the node does not match what is configured.
Mdm Link Level	Link level communications over the modem link has been lost.
CCM AutRed Swap	CCM card has switched out-of-service automatically.
CCM ManRed Swap	CCM card has been switched out-of-service manually, either by Controller diagnostics command or by using the DSBL button.
CCM Bus Error	CCM has detected a problem and isolated itself from the bus.
CCM Lost Alarms	Alarms have been lost due to an alarm queue being full.
Download Error	A command from the Controller cannot be obeyed because the configuration, file, or record numbers specified are not valid.
S/W Not Loaded	The operating program has not yet been loaded by the CCM.
DSR Off	Configured for dial-in and the DSR lead is off.
External PLL Failure	CCM has failed to phase-lock to an external clock source.
Power Supply Config Error	The node has fewer power supply units installed than are configured.
User State Change	For redundant cards only, redundancy has been forced.

Self-Test

Commands the specified card to perform a self test. This tests for the general functionality of the card. After you select Self Test, a submenu appears at the bottom of the same screen, allowing you to initiate the test. To initiate a card self test, press **`F7`** while `Requesting: Self Test` is shown. For a card self test, the results appear just above the `Requesting Self-Test` line. If a card fails, try reseating it and run the test again. If it fails after several tries, replace the card.

NOTE *You cannot perform a self-test on an in-service CCM card.*

Redundancy Control

`Redundancy Control` appears only for redundant configurations. If the specified CCM is redundant, this function lets you force either the primary module (the rightmost of the pair) or the secondary module (the leftmost of the pair) into service. You may select one of three modes for the redundant pair by entering the letter or pair of letters shown:

- **A** — (Automatic). This is the normal redundant state. A redundant switchover occurs automatically when a failure is detected in the in-service module.
- **FP** — (Force to Primary). The primary module is forced into service. The secondary module is forced into a standby condition.
- **FS** — (Force to Secondary). The secondary module is forced into service. The primary module is forced into a standby condition.
- **T** — (Toggle). Switches the out-of-service module into service and vice-versa while remaining in the automatic mode.

The redundant pair of modules remain in the mode that you select until the mode is changed through this diagnostic function. When you force either primary or secondary into service, redundancy is disabled until you select automatic mode. There is one exception: If you force redundancy to an inoperative module or an empty slot, the other module remains in service until the forced module is operational.

Summary

In this chapter we covered the items which are found on the OCM-2000 Status and Diagnostics screens for CCMs. Diagnostic procedures were also covered.

What's Next?

Chapter 30 covers the status and diagnostics procedures for the Combined Digital Aggregate (CDA) module and the ISDN Aggregate Control (IAC) module. LIM subaggregate diagnostics are also discussed.

30 CDA and IAC Status/Diagnostics

Overview

This chapter describes the items which are found on the Status and Diagnostics screens for CDA and IAC cards. Diagnostic procedures are also covered. In the following sections, in most cases, these cards are referred to as CDA/IAC. Where necessary, differences are indicated. The Controller screens, in most cases, specifically refer to CDA-T1, CDA-E1, and IAC. Additionally, *LIM, including BQM, subaggregate diagnostics are covered in this chapter*because they are the same as the CDA/IAC subaggregate diagnostics.

Topics covered in this chapter are:

CDA and IAC Status/Diagnostics

The status items displayed below the top line of the `CDA/IAC Status` screen reflect the operating conditions of the CDA/IAC Module(s) at the node. Some status items are common to all screens. Some items are unique to a particular CDA/IAC operating mode. The top of the screen reports the `Node`, `Addr` and `Slot` of the CDA/IAC Module. The configured operating mode of the CDA/IAC Module is also displayed. This information is obtained from the data base of the Controller.

CDA/IAC Status Screen

The `CDA/IAC Status` screen items are briefly explained below:

Destination Type

Specific application that was assigned to the port, e.g., `DACS Network` or `Remote CDA`.

Link Rate

Data rate of the module in the currently active configuration.

Format (CDA Only)

Type of framing used on the CDA.

Line Encoding (CDA Only)

`B8 Zero Suppression`, `AMI B7 Channelized`, or `AMI ASDS`.

Port A/B Summary

A status summary of port A and port B. The following fields appear: `Diagnostic`, `Alarm`, `ACO`, `Serv`, and `Subaggregates`.

- `Diagnostic` – If the CDA/IAC Module is in normal operating condition, `No` is reported. Currently, no module level diagnostics exist for CDA/IAC.
- `Alarm` – Reports the presence of an alarm condition. `Major` or `Minor` may be reported. *Table 30-1 is a list of CDA/IAC Alarm Conditions*.
- `ACO` – The state of ACO for the card is reported as `On` or `Off`. You may change the state of ACO using the Set ACO diagnostic function.
- `Serv` – This item reports redundancy status for one pair of CDA/IAC modules. `Primary` means that the primary module (Slots 2,4,6...16) is active (in service). `Secondary` means that the secondary module (Slots 1,3,5...15) is active. `Neither` indicates that neither card of a pair is in service. In a redundant pair, the module not reported in service is either in standby mode or not in slot.
- `Subaggregates` – This item reports the state of the subaggregate, either `O.K.` or `Fault`. `Fault` indicates that one or more links or bundles has an alarm.

Pri/Sec Status

This is a status summary for the primary and secondary modules in a pair of redundant CDA/IAC Modules (for a non-redundant module, only a single status is reported).

Four fields appear next to the Primary/Secondary Status:

- `ACO` – indicates the state of ACO (Alarm Cutoff). It is reported as On or Off. You may change the state of ACO using one of the Set ACO diagnostic utilities.
- `Equip` – This field specifies the type of equipment actually in the specified slot.
- `FW` - Indicates the revision of the firmware installed on the card. If incompatible with the current software, this item is shown in red.
- `RED` - Redundancy must be enabled or disabled by the X15 jumper setting on the module. For TMS, the redundancy strap for the module must be set to comply with the configuration of the link whereas on a TMSC node, it should always be set for `RED` operation. An incorrect strap setting is displayed in red. This item reports the state of that jumper. The following table shows how to set the strap:

TMS	**RED.**	**NON RED.**
Redundant 256	*	
Non-redundant 256	*	
Non-redundant 128		*
TMS Compact	**RED.**	**NON RED.**
Redundant	*	
Non-redundant	*	

For a TMSC node, the primary module is reported by CDA/IAC Card Status. The backup module status is reported by B/U Card Status.

CDA/IAC Status Functions

The status functions for the Combined Digital Aggregate (CDA) or ISDN Aggregate Control (IAC) are listed on the lower half of the Status Detail screen. To select a function, position the cursor at the function and press Enter. You are prompted for any required input.

Display Status Detail

Selecting Display Status Detail displays status for the selected CDA/IAC (or redundant pair of modules). Detailed status alarm conditions for the selected CDA/IAC are displayed in the lower portion of the screen. Information is displayed in red if the configured equipment does not match the actual equipment in place. This information is obtained from the Controller data base.

Display Port A/B Statistics

When Display Port A/B Statistics field is selected, the Port Statistics screen appears. This feature allows you to monitor error events that can occur on a link. Data displayed is a view of the past 24 hours' statistics.

An error event is defined as one or more of the following:

- Bipolar violation
- Out-Of-Frame State
- Loss of Synchronization

Errors are displayed in two fields (ES and FS) for T1; for E1, four fields are displayed: ES, SES, FS and DM. These are defined below.

- ES (Errored Second) is a second during which one or more error events have occurred.
- SES (Severely Errored Second) is a second with 320 or more ESF error events.
- FS (Failed Second) is declared when ten consecutive SESs occur.
- DM (Degraded Minutes) is the number of one minute intervals with a BER (Bit Error Rate) > 10^{-6}.

Once there are ten consecutive seconds each having 320 or more error events (SES), the ES count stops incrementing, and the FS count starts incrementing. In the first second that has less than 320 error events, FS stops incrementing and ES (or clear seconds) begins.

The screen is divided into several columns. For CDA-T1, INT. (interval period), ES and FS columns are shown. For CDA-E1, the SES and DM columns are also included. Note that the interval periods range from 1 to 48 on the first page for T1, 1 to 24 on the first page for E1. Interval 1 contains the data from the most recently completed 15-minute interval and these data sink down one interval every 15 minutes. Each of these intervals is a 15-minute period. On Page 1 you can see the number of errors for a period of 12 hours (T1) or 6 hours (E1). If you want to see the statistics for a previous time, press the **F6** key and Page 2 appears. On this page, the interval number follows sequentially from where the numbers left off on the previous page.

A description of other fields in the CDA/IAC Port Statistics screen follows:

- Current Interval Seconds (pct) – The number of seconds during which data has been collected, during the current 15-minute interval in this CDA/IAC link. This value is also expressed as a percentage of the current 15 minute interval.

- `24-Hour Total` – The total number of ES, FS (for T1), SES (for E1) and DM (for E1) that have occurred in the preceding 24-hour time period.
- `Cum Err. Events Since` – The total cumulative number of error events recorded since the cumulative counter was reset (or the CDA/IAC Module was plugged into the slot). The maximum error value of this counter is 65,535. A reset of the cumulative counter places it back at zero and resets the `Since` value to the time that the reset occurred.

  For CDA and IAC cards, `Since` is set to no reference upon entering the `Port Statistics` screen. LIMs always display an actual time. This value is seen because the Controller cannot determine how long the module has been in service collecting data and counting errors. Once the cumulative counter is reset, the Controller keeps track of the error count from that point in time. When you exit the screen, the Controller loses that reference time.
- Reset Performance Counter (Diagnostics Only) – Select this field when you want to reset all ES and FS (T1) or ES, SES, FS, and DM (E1) counters (on all pages) back to zero. Use the cursor keys to highlight this selection. Next, press `Enter` to perform the reset.
- Reset Cumulative Counter (Diagnostics Only) – Select this field when you want to reset the cumulative counter (on all pages) back to zero. Use the cursor keys to highlight the selection, and press `Enter` to perform the reset. The time of day in the `Since` field is reset to the present time.

Port A or Port B Sub Aggregate Summary

When you select this function, the `Subaggregate Summary` screen for Port A or B appears. You can observe a summary of the status, ACO, and Diagnostics of all sub-aggregates on the selected port. This also provides access to the detailed subaggregate diagnostics. If Port B is not configured, access is denied.

The `Subaggregate Summary` Screen is described in more detail later in this chapter.

CDA/IAC Diagnostic Functions

Diagnostics functions for the CDA/IAC Port are listed on the lower half of the CDA/IAC Card `Diagnostics Detail` screen. To select a function, position the cursor at the function and press `Enter`. You are prompted for the entry, if any.

Set ACO or Set Prim/Sec ACO

`Primary` and `Secondary` appears only for redundant configurations. You may select the state of ACO for the selected primary or secondary module each time you select this function.

When ACO is on, no alarm scan messages are reported to the ESCC at the node. This prevents the alarm buffer from filling up with unnecessary alarm messages. When ACO is off, all alarm messages are received by the ESCC and forwarded to the Controller. In either case, current alarm conditions can be viewed by selecting Display Status Detail. A summary of the alarm conditions for a *CDA/IAC Module, port, and subaggregates appears in Table 30-1.*

Set Port A ACO

This function allows you to set ACO on or off for Port A. If ACO is on, no alarms are reported.

Set Port B ACO

This function allows you to set ACO on or off for Port B. If ACO is on, no alarms are reported.

Set Card ACO or Set Primary/Secondary Card ACO

Set Card ACO turns ACO on or off for a non-redundant CDA. When ACO is on, no alarms are reported from the CDA. When a CDA failure has been detected, this function may be turned on to disable further alarms from that CDA, thus making memory available for other alarms.

Set Primary/Secondary Card ACO turns ACO on or off for a primary or secondary redundant CDA.

Port A/Port B Local Loopback

Local loopback routes DS1 transmit data back to the receive data inputs of the selected CDA port. Data for all circuits traveling on the aggregate return to their originating sources. Before initiating a local loopback, make sure that you take precautions for all circuits that are disrupted by the loopback. Supervisory communications may also be affected.

When you select a local loopback, you are prompted to enter the duration of the loopback, in minutes. Select from 1 to 240 minutes.

You must use external test equipment to inject a test signal into a data channel that terminates a circuit on the aggregate to evaluate returned data.

NOTE

Any active loopback test on a CDA/IAC Module is terminated when a configuration change affecting the module occurs.

Port A/Port B Terminate Loopback

This function ends a DS1 loopback test in the selected CDA Module, restoring the normal data paths through the module.

Redundancy Control

This option appears only when configured for redundant operation. If the specified CDA/IAC Module is redundant, this function lets you force either the primary module (the odd slot number of the pair) or the secondary module (the even slot number of the pair) into service. You can select one of four modes for the redundant pair, by entering the letter or pair of letters shown:

- **A** — (Automatic). This is the normal redundant state. A redundant switchover occurs automatically when failure symptoms are detected in the aggregate.
- **FP** — (Force to Primary). The primary module is forced into service. The secondary module is forced into a standby condition.
- **FS** — (Force to Secondary). The secondary module is forced into service. The primary module is forced into a standby condition.
- **T** — (Toggle). Switches the out-of-service module into service and vice-versa while remaining in the automatic mode.

The redundant pair of modules remains in the mode that you select until the mode is changed again through this diagnostic function.

When you force either primary or secondary into service, redundancy is disabled until you select automatic mode again. There is one exception: If you force redundancy to an inoperative module or an empty slot, the other module remains in service until the forced module is operational.

Refer to GDC 036R304-000 for more information on redundancy.

Subaggregate Status/Diagnostics Summary

When the Subaggregate Summary field is selected from the CDA/IAC/LIM/BQM Status/ Diagnostics screen, the Subaggregate Summary screen appears (if subaggregates are configured on the module). This allows access to a detailed view of any configured subaggregates on the selected port of the selected module.

BQM subaggregate diagnostics are the same as diagnostics for CDA-T1 subaggregates.

The following paragraphs explain the function of each field in the Subaggregate Summary screen:

At the top of the screen, Node, Addr, Type, Slot and Port appears. The configuration type (CDA/IAC), and whether the module is in a redundant or non-redundant mode, appears below the slot number.

In the middle of the screen several more fields appear:

Sub-Agg ID

This is an identification number of the subaggregate provided by the Controller.

Sub-Agg Type

LK/TMS appears if this is a TMS subaggregate. Network appears for network subaggregates. TMS/Network appears for TMS/Network subaggregates. LK/TMS is the only possible type for a LIM subaggregate.

DS0 Start

Specifies the starting DS0 number of each subaggregate.

DS0 Cnt

The number of DS0s within each subaggregate.

Alarm

Indicates the presence of an alarm condition for the subaggregate. Major alarms are reported. A major alarm indicates a failure that may disrupt a subaggregate. Normally such a failure involves the subaggregate or the module in the main shelf.

ACO

Reports the state On or Off of ACO for each subaggregate.

Diag

This item reports whether any diagnostic tests are currently running on each subaggregate. Yes indicates that a diagnostic test is running. No indicates that no diagnostic test is running.

Subaggregate Name

A unique name for each subaggregate. In the case of network subaggregates, the subaggregate name is the same as the name of the circuit that passes through it. For a TMS subaggregate, the name is specified in the Controller configuration.

Permanent or Backup

If this is a permanent (primary) subaggregate, then `Permanent` appears in this field. If this is a backup subaggregate, then `Backup` appears in this field.

Subaggregate Status/Diagnostics Detail

The only field which can be selected in the `Subaggregate Summary` screen is the SubAgg ID/Type field. When this field is highlighted press `Enter`. The `Subaggregate Status/ Diagnostics` screen appears.

This screen is divided into two parts. At the top portion of the screen, the `Node`, `Type`, `Address`, `Slot`, `Port`, `DS0 Start`, `DS0 Count`, `Sagg Type` and `Sagg Name` appears as well as `Status`, `ACO` and `Diagnostics`. The lower portion of the screen features several tests that can be performed on the subaggregate.

Subaggregate Status Functions

At the lower portion of the `Equipment Status Screen` is `Display Status Detail`, which enables you to monitor detailed alarm conditions of the module. To select this function, position the cursor at the pokepoint and press `Enter`. Detailed status alarm conditions for the selected module are displayed.

These messages, which give detailed information concerning any module problems (even modules in ACO), are displayed in the lower portion of the screen. For definitions of each alarm condition, *see Table 30-1*.

Subaggregate Diagnostic Functions

The following paragraphs explain the diagnostic functions that are found in the `CDA/IAC/LIM Diagnostics` screen:

Set Subaggregate ACO

You may select the state of ACO for the selected subaggregate each time you select the routine.

When ACO is on, no alarm scan messages are reported to the ESCC (or Common Control Module for OCM) at the node. This prevents filling the alarm buffer with unnecessary alarm messages. When ACO is off, all alarm scan messages are received by the ESCC or CCM and forwarded to the Controller. In either case, current alarm conditions can be viewed by selecting `Display Status Detail`, described above.

Datapath Tests

Loopback routes DS0 transmit data back to the receive data inputs of the selected subaggregate. Data for all circuits traveling on the subaggregate return to the originating source. Before initiating a loopback, make sure that you take precautions for all circuits that are disrupted by the loopback. You should also be aware of the potential for supervisory route disruption.

When this field is selected, the following appears:

```
Origin Point:   (Node Name/Slot No./Port No./DS0 No.)
Loopback Point: (Node Name/Slot No./Port No./DS0 No.)
```

Pressing `Enter` on either the origin or loopback fields toggles their corresponding values. This allows you to select the loopback point and the direction of the loopback.

Once the loopback origin and destination are established, you must press **F7** to start the test.

The following prompt appears:

```
Input Loopback interval (1-240, time in min):
```

Enter a time between **1** and **240** minutes.

The following prompt now appears:

```
May affect supervisory communications: Continue? [Default YES (Y/N)]:
```

Select **Y** to continue the test. If **N** is selected, the loopback test is not initiated.

To evaluate returned data, you must use external test equipment to inject a test signal into a data channel that passes a circuit through the subaggregate.

NOTE *Any active loopback test on a CDA/IAC Module is terminated when a configuration change affecting the selected CDA occurs in the network.*

Terminate Loopback

This function ends a DS0 loopback test in the selected CDA/IAC Module, restoring the normal data paths through the module.

.

NOTE *Via the network controller, an Embedded Operations Channel (EOC) may be used to initiate diagnostics from the BQM channel configured as LT to the remote 2B1Q device and to configure the DataComm 610 or 612. BQM devices configured as NT are comply with standard T1.601 commands issued from foreign 2B1Q devices. The T1.601 command set for standard EOC diagnostics provides only one command for terminating diagnostics: Return to Normal. This command terminates any loopbacks in progress. Therefore, it is not possible to individually terminate subaggregate loopbacks, should multiple subaggregate loopbacks be in progress concurrently. For example, if B1 and B2 loopbacks are initiated, and B1 loopback is terminated by the network controller, or by a timer, then the B2 loopback is terminated at that time.*

Table 30-1 CDA and IAC Alarm Conditions

Alarm Message	Definition
CDA and IAC Card Alarm Conditions	
Card Not in Slot	There is no module in the designated shelf slot at the node
Low Power Mode	The CDA or IAC front panel switch has put the card in the low power mode.
Software Not Loaded	The last software download did not successfully reach the selected CDA or IAC Module.
Board Failure	A hardware failure has occurred on the selected CDA or IAC module.
Configuration Not Loaded	The last configuration download did not successfully reach the selected CDA or IAC Module.
Diagnostics Not Loaded	The diagnostic routine was not successfully downloaded to the CDA or IAC Module.
Configuration Error	Common card in slot does not match configuration (e.g. slot configured for CDA has CIC in the slot, or Redundancy jumper set incorrectly, or CDA in the backup slot of a Compact does not have correct basecard revision to back up PRI1/2).
CDA-T1 CDA-E1 or IAC Clock Failure	The system controller was unable to phase lock to the clock supplied by this card.
Card Down	The module cannot communicate with its remote counterpart. This may be due to a hardware failure.
Activate w/o Calc	A specified configuration has not been calculated.
Channels Dropped	The autoframe software was unable to frame one or more channels and dropped them from the configuration.
Download Error	A configuration number, file number, or record numbers downloaded by the Controller is invalid.
Incompatible Firmware	Firmware installed on the card is not compatible with the TMS software.
RAM Fail	A section of memory on the CDA or IAC Module has failed during self test.
Port Not Configured	Port on CDA/IAC Module not properly configured.
Port Out Of Sync	Generated for the port after an integration period on loss of synchronization at the D4/ESF level. It is cleared after an integration period of being in synchronization.
Remote Alarm	Generated for the link after integrating on the detection of the remote alarm signal on the line. This indicates a problem at the remote end. The alarm is cleared after integrating on the removal of a Yellow alarm signal.
Loss Of Carrier	Generated after an integration period of detecting no signal on the line. The alarm is cleared after integrating on the return of the signal.
Alarm Indication Signal	Detection of this signal on an incoming link indicates that a problem exists upstream of the local node. Alarm determination is made by the remote node. The alarm is cleared when the removal of the signal from the indicated link has been detected.
Failed Signal Alarm	The line is in a failed signal state. This information is related to the D4/ESF error rate. The alarm is cleared after an integration period during which the number of error events is less than a preset threshold.
Port Performance	Failed signal state, port out-of-service, or port performance has degraded due to buffer slips or loss of carrier.

Alarm Message	Definition
CDA and IAC Port Alarm Conditions	
Buffer Slip Threshold (daily)	The daily buffer slip threshold has been met or exceeded. Buffer slips are detected when the hardware status register on the base card indicates a data exchange alarm has occurred. These accumulate until a threshold is met. The alarm is cleared after an integration period during which the number of buffer slips per day is less than the threshold.
Buffer Slip Threshold (hourly)	The hourly buffer slip threshold has been met or exceeded. Buffer slips are detected when the hardware status register on the base card indicates a data exchange alarm has occurred. These accumulate until a threshold is met. The alarm is cleared after an integration period during which the number of buffer slips per hour is less than the threshold.
Note that for redundant CDA/IAC, `Primary` or `Secondary` (TMS) or `CDA-T1`, `IAC`, or `B/U` (TMSC) are indicated as part of the message.	
Subaggregate Alarm Conditions (Including OCM)	
Card Fault	There is a module level alarm while on subaggregate level screen.
Not Part of Currently Running Config	This subaggregate is not enabled in the current configuration.
Out-Of-Sync	A TMS-3000 subaggregate is out-of-sync. The alarm is cleared after an integration period of being in synchronization.
Error Rate Exceeded	The user-defined threshold for subaggregate error rate is met or exceeded. The alarm is cleared after an integration period during which the number of errors is less than the error limit.
Overhead Communication Failure	The overhead communication task is unable to get a response from the specified subaggregate. This alarm is cleared when it has been detected that overhead communications can be resumed.
Remote CDA-T1, CDA-E1, IAC-T1, IAC-E1, OCM in Boot	The remote CDA/IAC is in boot or requires a software download.
The following do not apply to OCM.	
Subaggregate Down	Overhead communications are down, or the remote CDA/IAC is in boot.
Remote Configuration Mismatch	Some subaggregate configuration parameter(s) (such as circuit types, channel rates, etc.) do not match at each end of the aggregate link.
Reconnect Attempt Failure	Repeated attempts to place a call through the ISDN network have failed for this subaggregate (IAC only).
Note that subaggregate alarm messages report `Local` for the subaggregate on the left side of the screen and `Remote` for the subaggregate on the right side of the screen.	

Summary

In this chapter we covered the items which are found on the Status and Diagnostics screens for CDA and IAC cards. Diagnostic procedures were also covered including subaggregate diagnostics (CDA/IAC/LIM).

What's Next?

Chapter 31 covers the status and diagnostics procedures for the ADPCM Compression Module (ACM).

31 ACM Status/Diagnostics

Overview

In this chapter we cover the `ACM Status/Diagnostics` screen which provides detailed information on the status for individual cards. The portion of the screen above the dashed line displays various aspects of the status of the card.

The portion of the screen below the dashed line provides pokepoints (options) that allow you to obtain more detailed information or provide diagnostic capabilities. In a redundant ACM, the screen indicates which of the redundant ACMs is in service and if the in-service card is forced in service.

Topics covered in this chapter are:

- ACM Status/Diagnostics
  - Equipment Status Screen
  - ACM Status Functions
  - ACM Channel Summary Screen
  - ACM Channel Statistics
  - ACM Diagnostic Functions

ACM Status/Diagnostics

The following paragraphs describe ACM status, channel summary, channel statistics and diagnostic functions

Equipment Status Screen

The following is a description of the fields in the `Equipment Status` Screen.

Equip Mode

Indicates the equipment mode for ACM (`ACM RED` for redundant and `ACM NRED` for non-redundant).

Line Format

Indicates ACM line format (`T1-D4`, `T1-ESF/ATT`, `T1-ESF/ANSI` or `E1`).

Link Rate

Indicates ACM link rate, either `1.544` or `2.048 MHz`.

Port Summary

Indicates the present synchronization status of the link; either `In Sync`, if link communication is synchronized, or `Out of Sync`, if link synchronization is a problem. `O.K.` indicates proper operation and `Fault` indicates a problem.

Channels

Indicates whether all ACM channels are or are not working properly. `O.K.` indicates proper operation and `Fault` indicates a problem. (Refer to the Channel Status Screen for more detailed information concerning individual channels.)

Diagnostics

Indicates what tests, if any, are being performed at the port or channel level of ACM (only the port level is displayed if tests are running at both port and channel levels). `None` indicates that no tests are running at either level.

Status

Indicates if any major alarms exist. `O.K.` indicates none exist and `Fault` indicates one or more major alarms exist. If ACM is redundant, the major alarm status of each redundant ACM is displayed separately under the `Primary Status` and `Secondary Status` fields.

Card In Service

If redundant, indicates which redundant ACM is in service. `Primary` indicates that the primary (even slot) ACM is in service, `Secondary` indicates that the secondary (odd slot) ACM is in service, and `Neither` indicates that both redundant ACMs are on standby (out-of-service).

Redundancy Mode

If redundant, indicates the redundancy mode, either `Auto Redundant`, `Force Primary`, or `Force Secondary`.

ACO

Indicates whether ACO is on or off. If ACO is on, alarms are not reported, and if ACO is off, alarms are reported normally.

Equip

Indicates the type of card in slot. For an operational ACM, it should display `ACM` or `ACM-I` in green. It also indicates the current I/O type, `E1` or `T1` (red indicates a configuration error). In addition, `X-30` or `X-24` is shown to indicate the transcoder type, the X indicating either `A` or `B`. `A` indicates an older ACM card type, and `B` indicates the new card type (Hardware rev 3), which supports bundling and double bypass.

FW

Indicates the revision of the firmware installed on the card. If incompatible with the current software, this item is shown in red.

Red

Indicates whether the redundancy option jumper on the card is set for redundancy, as indicated by `Ena`, or nonredundancy, as indicated by `Dis`. If red, it indicates a configuration error.

ACM Status Functions

If more detailed status information for a card is desired, use the following:

Display Status Detail

At the lower portion of the `Equipment Status` screen is the Display Status Detail function, which enables you to monitor detailed alarm conditions of the ACM module. To select this function, position the cursor at the pokepoint and press `Enter`. This function displays detailed status alarm conditions for the selected ACM module. Active faults are displayed in red below the dashed line. If no faults are active, `No Active Alarms` is displayed in green.

ACM alarms are divided into several categories: Hardware, Port, and Channel failure alarms. Major alarms are generated by the ESCC and operate independently of the ACM. ACM Port Failure alarms result in the generation of an alarm report to the ESCC and a status update in the ACM. Channel Alarms are generated on a per channel basis. *Table 31-1* lists the ACM Alarm Conditions.

ACM Channel Summary Screen

If channel status information is desired, select Display Channel Summary, and the `Channel Summary` screen appears.

For ACM/T1, channels numbered `1` through `24` are displayed with channel `1` corresponding to the channel at time slot 1. For ACM/E1, numbers `0` through `31` are displayed with 0 corresponding to time slot 0. Select the appropriate time slot of the channel to be displayed.

`Unused` is displayed if the corresponding channel is not configured. `Bundled` is displayed if the corresponding channel is bundled. `Unavailable` is displayed if the corresponding channel is not allowed to be configured.

The following pertinent fields are displayed in the `Channel Summary` screen.

Alarm

Indicates whether an alarm is or is not present on the channel. For ACM, this field refers to minor alarms. `Alarm` indicates that one or more alarms are present and `Clear` indicates that none are present.

ACO

Indicates whether ACO is on or off for the channel. If ACO is on, alarms are not reported, and if ACO is off, alarms are reported normally.

Diag

Indicates that a test is being performed on the channel.

ACM Channel Statistics

The purpose of the Channel Statistics selection is to provide you with a non-invasive tool which you can use as an aid in determining network performance from the channel level. This function operates continuously on every configured ACM channel. Normal voice traffic and/or data is not affected. Channel error statistics are continuously accumulated and compared to the time interval over which those errors occurred. You can display the information at any time (ACM-II only).

ACM Diagnostic Functions

The following describes how to use the Controller to test the ACM. The following diagnostic functions may be performed at the port level for ACMs.

Bulk Fast Bus Loopback

Verifies the entire ACM up to the Fast Bus of the TMS-3000 node to isolate backplane problems. There is no conditioning towards the Fast Bus during this loopback.

Line Loopback

Occurs at the I/O interface of the ACM. During Line Loopback, any data received from local or remote data terminal equipment (DTE) is looped back to the originating DTE. During this loopback, conditioning occurs on a per channel basis away from the link towards the Fast Bus (type of conditioning depending on the channel configuration type).

Local Internal Loopback

Occurs at the I/O interface of the ACM to test the data path through the entire card for locally generated data.

Redundancy Control

Allows you to force a primary or secondary redundant ACM into or out-of-service, or return to automatic redundancy mode.

Set Card ACO or Set Primary/Secondary Card ACO

`Set Card ACO` allows you to turn ACO on or off for a non-redundant ACM. When ACO is on, no alarms are reported from ACM. When an ACM failure has been detected, this function may be turned on to disable further alarms from that ACM, thus, making memory available for other alarms.

`Set Primary/Secondary Card ACO` allows you to turn ACO on or off for a primary or secondary redundant ACM.

Only one of these functions may be selected depending on configuration.

Terminate Loopback

When a port level loopback test is invoked, it automatically terminates any previously selected port level loopback test. To manually terminate a loopback test, select **`Terminate Loopback`** field.

Diagnostic functions may also be performed at the channel level for ACMs. Refer to *Circuit and Channel Status/Diagnostics, Chapter 32*.

Table 31-1 ACM Alarm Conditions

Hardware Failure	
Status Detail Alarm Message	**Definition**
Driver Performance Monitor	If set, indicates that the T1 driver is no longer operational.
I/O Frame Slip	A Transmit/Receive Slip has occurred in the Payload Loopback FIFO section.
Frame Counter Fault	The frame counter has counted through its entire memory without seeing an End of Frame bit.
Transmit FIFO	Out-of-step condition has occurred in transmit control FIFO.
Receive FIFO	Out-of-step condition has occurred in receive control FIFO.
Transmit Signaling RAM Parity Fault	A parity error has been detected by the hardware in the transmit signaling RAM.
Receive Signaling RAM Parity Fault	A parity error has been detected by the hardware in the receive signaling RAM.
Port Failure	
Port Out of Sync (Red Alarm)	This alarm is generated for the link after integrating on loss of synchronization at the D4/ESF level.
Remote Alarm (Yellow Alarm)	This alarm is generated for the link after integrating on the detection of the remote alarm signal on the line.
Loss of Carrier (LOC)	This alarm is generated after an integration period of no signal on the line.
Failed Signal State	The line is in a failed signal state. Occurs when 10 consecutive SESs (Severely Errored Seconds) have occurred or Loss of Carrier alarm is detected.
Link Out-of-service (Future Use)	Occurs when the number of errors detected on the link exceeds the bit error ratio (BER) defined by the user.
Alarm Indication Signal (Blue Alarm)	Detection of this signal on the incoming link indicates a problem upstream of the local terminal.
Facility Loopback	
Facility Local Loopback	This alarm is generated when the facility requests that a line loopback be initiated or terminated.
Facility Payload Loopback	This alarm is generated when the facility requests that a payload loopback be initiated or terminated.
Port Performance	
Port Out-of-service (Future)	Generated when an error rate on the line is exceeded.
Failed Signal Alarm	Alarm is generated when the number of error events on port exceeds a BER of 10^{-3} for ten consecutive 1-second periods. This alarm cannot be detected if T1-D4 is selected as Line Format during ACM Port Configuration.
Channel Failure	
Channel Failure Alarm	Alarm occurs when a single channel is declared out of sync after an appropriate integration period. It is due to a FIFO overflow/underflow of data from the fast bus or when one channel has had a FIFO crash (underflow or overflow) of data from the port, indicating a receive clocking problem.
Group Channel Failure	Within a predefined time period, five or more channels have had a Receive Clock error or have become out of sync.

Summary

In this chapter we covered the items which are found on the Status and Diagnostics screens for ACMs. Diagnostic procedures were also covered.

What's Next?

Chapter 32 covers the status and diagnostics procedures for circuits and channels.

32 Circuit and Channel Status/Diagnostics

Overview

The circuit and channel, status and diagnostic routines monitor and test circuits or individual channel modules.

Most tests and screens operate at the circuit level. Screens report status for both channel ends of the circuit. Circuit tests may involve one channel end, or test both ends of the circuit and the data path between them, or extend to V.54 modems attached to channel cards. The range of these tests is usually determined by selecting an origin point (the channel end where a test signal originates) and a loopback point (the channel or V.54 modem end where the signal is looped back to the origin point).

In an end-to-end test, test signals are sent from one end of the circuit to the other. Depending on the nature of the test, they may or may not be looped back to the point of origin.

The signals are then evaluated to determine if the system can accurately pass data or voice through the system.

In a local circuit test, the origin and loopback points are the same channel module, so that test signals pass through a single channel module only.

When a self test is initiated on a dual card, both channels are affected.

A remote circuit test evaluates the performance of the entire network segment associated with that circuit.

A V.54 local loopback test evaluates the performance of the entire network segment associated with that circuit up to and including the local V.54 modem.

Topics covered in this chapter are:

Circuit and Channel Status/Diagnostics

There are several entry points for circuit/channel status/diagnostics. They are:

- `Status/Diagnostics Main Menu.` Once you select Circuit, you may enter the name of the circuit you wish to test, or press `Enter` to get a list of circuits based on criteria you might enter.
- `Diagnostic Selection menu.` Once you select Channel, for TMS only, you must specify a channel module location by entering the slot number of the associated

Channel Interface Card (CIC) followed by the channel number (1 - 64; refer to Expansion Shelf in *GDC 036R303-000* for details on channel numbering).

- `Channel Summary` function in the `Equipment Status/Diagnostics` screen for a Channel Interface Card or ACM, or from an Aggregate Control Card connected to an XNET node. To select circuit status/diagnostics from the Channel Summary screen, move the cursor to the appropriate channel number and press `Enter`.

Circuit Diagnostics Screen

The following defines each status item on the `Circuit Diagnostics` screen:

Node

Node location of the module at each end of the circuit.

Slot Num

Displays the slot number of the slot where the respective module (for TPP circuits this means either a TPP module or a CIC) is situated on the main shelf in the corresponding node.

Chnl Num

Number of the channel module or the number of the time slot for the ACM. *Refer to GDC 036R303-000* for more information on channel numbering.

Type

Current configuration of the module. The configuration determines the operating mode of the channel in the circuit application. Some channel modules (*See PCB type below*) may support several different configurations. Refer to Data Channel Modules and Voice Channel Modules in *GDC 036R303-000* for more information on configuration types and PCB types.

Rate

Configured data rate of the circuit.

Interface

Type of interface selected for the channel modules at one or both ends of the circuit. The control signals supported by the interface type are shown in the `Send EIA` and `Recv EIA` fields as described below (This field is not shown for ACM circuits).

X50 DS0

Appears only for X.50 type circuits. An X.50 DS0 number and an X.50 channel number are reported.

PCB Type

Reports the actual type of channel module (printed circuit board).

Status

Current operating condition of the circuit or channel, including any error condition of the corresponding channel. If any alarm (error) exists, `Fault` is displayed in red, otherwise `O.K.` in green is displayed. If the channel is conditioned but not due to an alarm, it displays `O.K.` but in yellow. Further status information of a respective channel can be displayed by selecting Display Status Detail. Detailed status for both channels are displayed in the area below the dashed line.

If alarms are present, each alarm is listed on a separate line, and the channel from which the alarm is detected is indicated in brackets. If no alarms are present, `No Active Alarms` is displayed. The detailed status also indicates which channel is conditioned, if any. Each listed alarm is followed by a channel identification.

ACO

Reports if the ACO is enabled or disabled for the circuit.

Send EIA

Indicates the state of the signaling controls toward the Fast Bus at each circuit end. On an ACM end of the circuit, if the channel is conditioned, this status item is displayed in yellow. If an ACM circuit is not configured to pass signaling controls, then this field is not displayed.

Recv EIA

Indicates the state of the signaling control toward the port at each circuit end. On an ACM end of the circuit, if the channel is conditioned, this status item is displayed in yellow. If an ACM circuit is not configured to pass signaling controls, then this field is not displayed. No control status is reported for a TPP or OPP module.

Diagnostics

Reports any diagnostic test running on the circuit. If no diagnostic test is running, `None` is reported. If a test is running, the test type is displayed.

In the case where the two ends of a circuit wind up in a state where they don't agree as to what diagnostic test is running, the test (or question marks) is shown in red. This situation is most likely to occur as the result of a test being initiated by a Maintenance Console at one of the two ends, while the Controller operator is also running tests.

When a test is running, an error count or other possible results are displayed in an `Error:`, `Results:`, or `Energy:` field. The origin of a test signal and the loopback point of the test signal (if any) are also reported.

Circuit/Channel Status Functions

At the lower portion of the `Equipment Status` screen is the Display Status Detail function, which enables you to monitor detailed alarm conditions of the module. To select this function, position the cursor at the pokepoint and press `Enter`. This function displays detailed status alarm conditions for the selected module.

The messages, which provide detailed information concerning any module problems (even modules in ACO), are displayed in the lower portion of the screen. For definitions of each channel alarm condition, *see Table 32-1*.

Table 32-1 Channel Alarm/Status Conditions

Alarm Message	Definition
TMS	
No Info from CIC	CIC is not providing current status for specified channel.
Receive Clock Alarm	A timing failure has caused a loss of receive data in the specified channel module.
Transmit Clock Alarm	A timing failure has caused a loss of transmit data in the specified channel module.
Channel Fail /Remote Loopback	The data written to the channel module is not consistent with what is read from the channel module. Remote Loopback is detected, but no diagnostics are running.
Filtered Alarm (x-yy-zz)	x = card type, yy = common card slot, zz = channel slot
ACM	
Out of sync (end point)	Indicates that the ACM has detected an out of sync condition on that channel, i.e., one end of the circuit is out of sync with the other end.
XMIT clock error (UVC)	Indicates that the transmit data in the channel has been disrupted by a timing-related failure.
RECV clock error (UVC)	Indicates that the receive flow in the channel has been disrupted by a timing-related failure.
RECV clock alarm (ACM)	Indicates that the receive flow in the channel has been disrupted by a timing-related failure.
DBC	
DBC streaming alarm	For *Multidrop with Data Lockout,* Anti-Streaming detection operates by detecting a condition of RTS ON and a fan locked to one branch for a period of time greater than the selected period. For *Multidrop without Data Lockout,* the DBC assumes a Mark-Idle environment and monitors all branches for a condition of constant spaces in the data for a period of time greater than the selected period.
OCM Channel Module Alarms	
Chn Rcv Clock	Receive data flow in the module has been disrupted by a timing related failure.
Chn Xmt Clock	Transmit data flow in the module has been disrupted by a timing related failure.
Chn DCD Alarm	Alarm occurs when the Data Carrier Detect Lead drops on a channel configured with the DCD Alarm option.
Local Out of Sync (VCM)	The channel module in the specified channel slot cannot synchronize with its remote counterpart.
Remote Out of Sync (VCM)	The channel module in the specified channel slot cannot synchronize with its remote counterpart.
S/W Not Loaded (VCM)	The operating program has not yet been loaded by the VCM.
User State Change	User has changed controls/signaling, dB level, or Echo Canceller from the configured value.

Alarm Message	Definition
BQM Channel	
Port Down	Port Down indicates that the out of frame bit on the port interface is set (or clear) consistently during the port failure (or restoral) time.
Local Block Error Threshold Exceeded	Local Block Error Threshold Exceeded indicates that the near end block error rate exceeds the port error threshold.
Remote Block Error Threshold Exceeded	Remote Block Error Threshold Exceeded indicates that the far end block error rate exceeds the port error threshold.
Remote Configuration Mismatch	Remote Configuration Mismatch indicates that the actual and configured remote device types are not the same type.
Network Quiet Mode Diagnostic	Network Quiet Mode Diagnostic indicates that a BQM channel configured as NT is undergoing network initiated metallic loop tests.
Insertion Loss Measurement Diagnostic	Insertion Loss Measurement Diagnostic indicates that a BQM channel configured as NT is undergoing network initiated line transmission tests.
TPP and OPP Alarms	
TPP Cnfg Error	TPP CONFIGURATION ERROR occurs when the module type configured for the slot does not match the module occupying the slot.
Board Failure	TPP BOARD FAILED occurs when a problem exists within the module in the specified slot.
TPP Not In Slot	TPP NOT IN SLOT means the specified module is either not in its slot or is not making proper contact with the backplane connectors.
TPP Card Disabld	TPP CARD DISABLED means the specified card has been disabled using the special dual-port RAM location.
TPP Partial S/W	TPP PARTIAL S/W occurs if the module is unable to get a complete program download.
TPP Temp Alert	TPP TEMPERATURE ALERT occurs when the module detects that the board is overheating.
Chn/DB25 Fail	TPP CHN/DB25 FAILURE occurs when the channel is unable to pass data normally.
DB25 Xmt/Rcv	TPP DB25 XMT/RCV occurs when the DB25 transmit or receive timing signal has failed significantly enough to interrupt data flow or cause buffer overflow.
DB25 Xmt Clk	TPP DB25 XMT CLK occurs when the DB25 transmit data flow has been disrupted by a timing-related failure or loss of external receive clock.
DB25 Rcv Clk	TPP DB25 RCV CLK occurs when the DB25 receive data flow has been disrupted by a timing-related failure or loss of external receive clock.
Chn/DB25 Perf	TPP CHN/DB25 PERFORMANCE occurs when the ability of the channel to pass data, while not lost, is seriously compromised.
Channel Congestion	TPP CIRCUIT CONGESTION occurs when a TPP circuit has an excessive number of frames being discarded due to sustained congestion.
TPP/OPP Cfg Err	TPP/OPP CONFIGURATION ERROR occurs if not all the required plug-in modules are present, or jumpers are incorrectly set.
TPP Lost Alarms	TPP LOST ALARMS occurs when the module has an alarm which it was not able to insert.

Circuit/Channel Diagnostic Functions

All channel module tests are diagnostic functions that are selected from the `Circuit Diagnostic` screens.

A data path test may be applied to a single channel module, or to the entire circuit. The scope of most data path tests may be varied depending on the originating node and the loopback node.

The channel module at the originating node generates the test signal or is connected to a user-provided test signal generator. The channel module at the loopback node creates a loopback in the signal path to return the signal to the point of origin. You may also select None for a loopback point for voice circuit tests. The test then runs from the originating node channel module to the channel module at the opposite end of the circuit without looping back.

If the same node is selected as the originating node and loopback node, the test path remains within the channel module at that node. This test path is commonly called a local loopback. *Figure 32-1* shows the local loopback path for a TMS channel. *Figure 32-2* is the local loopback path for an OCM channel. *Figure 32-3* illustrates a channel local and remote loopback test path for a BQM channel.

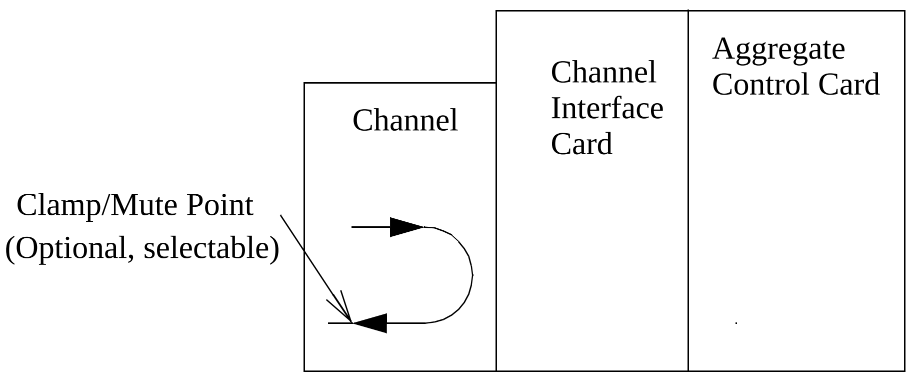


Figure 32-1 TMS Channel Local Loopback Test Path

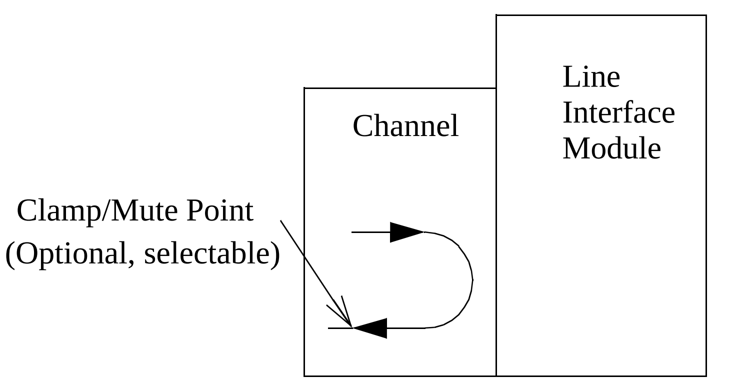


Figure 32-2 OCM Channel Local Loopback Test Path

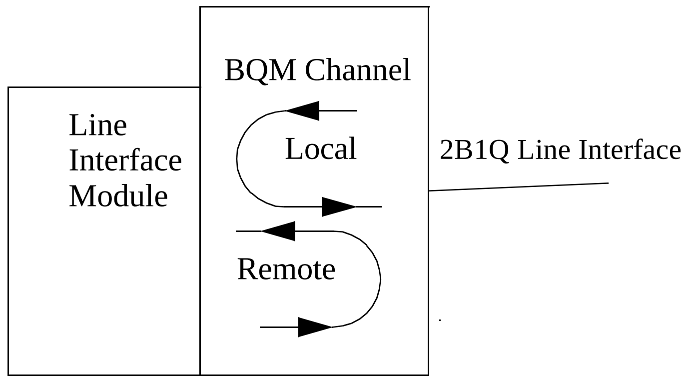


Figure 32-3 BQM Channel Local and Remote Loopback Test Paths

If the two different end nodes of the circuit are selected as the originating node and loopback node, the test signal travels from the originating node channel module across the entire circuit, is looped at the loopback node channel module, and returns to the originating node channel module. This test is commonly called a Remote Loopback. *Figure 32-4 and Figure 32-5* illustrate a channel remote loopback.

NOTE

If channel diagnostics are running when a different configuration is activated, the test remains running under most circumstances.

When a local loopback is initiated on one channel of an OCM dual-channel card, both channels on the card are looped back.

When Self Test is initiated on a dual card, both channels are affected.

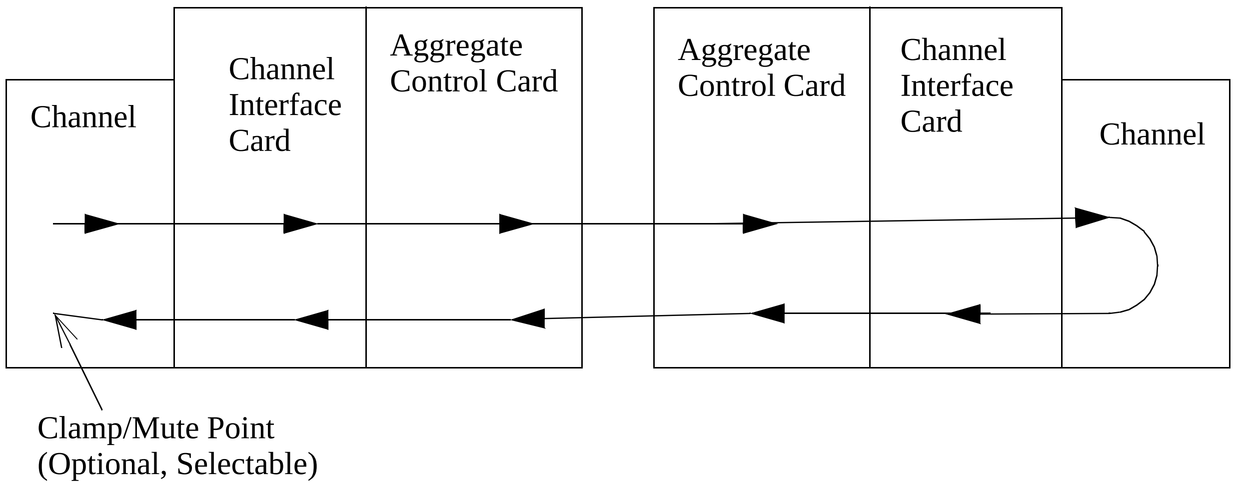


Figure 32-4 TMS Channel Remote Loopback Test Path

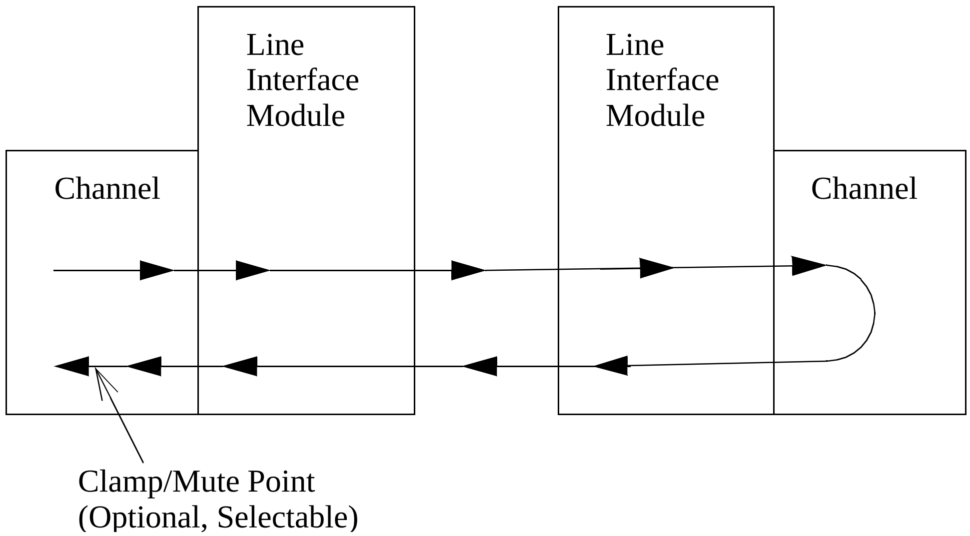


Figure 32-5 OCM Channel Remote Loopback Test Path

The test condition is terminated only if:

- The circuit type changes from data channel to voice channel or voice channel to data channel.
- The circuit is removed from the configuration.
- You terminate the test in question.

The Set ACO function sets ACO on or off for the selected channel module. Once ACO is on, no alarm conditions are reported from that channel module. When a failure is detected in a channel module, you may set ACO on to prevent any more alarm messages from being reported. This leaves more buffer and display room for unexpected alarm messages. The Set ACO function also disallows the channel to contribute to ESCC module minor alarm LED and relay output. Note that you cannot set ACO on an OPP card.

Diagnostic alarm messages are still available via the `Circuit Diagnostics` screen, Display Status Detail selection, regardless of the state of ACO.

There are four different sets of circuit/channel tests: data channel tests, voice channel tests, ACM channel tests, and Digital Bridging (DBC) channel tests.

Refer to Data Channel Diagnostic Functions for information on the data channel and DBC tests. Refer to Voice Channel Diagnostic Functions for information on the voice channel diagnostic tests. Refer to the ACM Channel Diagnostic Functions for information on circuits where one or both ends terminate in an ACM.

Data Channel Diagnostic Functions

The data channel diagnostic functions are a set of tests and other diagnostic functions designed to detect and isolate problems in a data circuit or a channel module at either end of the circuit. The results from the tests can also supply valuable information about other intermediate segments in the TMS-3000 network.

You must specify the origin node and loopback node for most tests (refer to Circuit and Channel Diagnostics for more information on origin and loopback nodes). Once started, these tests continue to run until you select Terminate Diagnostic to end the test.

You may exit and enter the `Circuit Diagnostics` screen for different channels without interfering with other currently running tests. This enables you to test several channels simultaneously. Simultaneous tests are allowed for TMS-3000, TMSC and OCM nodes only. For any circuit that terminates at a Universal MM+V4 node, only one circuit at the Universal MM+V4 node may be tested at one time.

A new test may be started on a circuit that is already running a test without terminating the first test.

The following describes the diagnostic functions for data channels:

Data Path Test

Selecting **`Data Path Test`** from the `Circuit Diagnostics` screen brings up the following:

- `Origin Point/Lpbk Point` — When highlighted, this feature allows you to select the originating and loopback points by toggling `Enter`. In some cases, an option of **`None`** can be selected for a loopback point. in that case, the test data is sent to external equipment rather than being looped back.
- `Test Pattern` — When highlighted, this feature allows you to select a test pattern by toggling `Enter`. RP BERT, 511/2047 BERT (OCM-2000 only) and User Data are the selectable test pattern types.

  `RP BERT` (TMS-3000 and TMSC only) — The RP (Reversals Pattern) BERT (Bit Error Rate Test) causes the selected channel to generate a test data pattern of alternating ones and zeros (known as a "reversals pattern"). The test data is sent through the selected loopback path and is evaluated upon return for any errors. The diagnostic status displays report the number of errors detected in the returned test pattern. The results may be:

  - **`None`** (no errors found)

- **`1-65534`** errors found (the exact count in that range is displayed)
- **`Overflow`** (More than 65,535 errors have occurred, or more than 32 bit errors occurred during a 100-ms period on a TMS data card, or more than 255 bit errors occurred during a 1-second period on an OCM data card)

`511/2047 BERT` (OCM-2000 only) — These function the same as RP BERT, generating industry standard 511 and 2047 bit patterns.

`User Data` — When User Data Test is initiated, the appropriate loopback test path is set up, but no test data pattern is transmitted. Test equipment must be connected to the channel connector on the data channel of the originating node. The test equipment then generates the test data pattern and analyzes the returned data.

NOTE

If a User Data Test is run using remote loopback, a receive clock alarm may occur if RTS is turned off. To turn off the alarm, turn RTS on in the Control State Test selection.

`Origin Data Clamping` - **Yes/No** — When Yes is selected, the receive data output of the channel module is clamped, so that no receive data leaves the module. This prevents equipment connected to the originating channel from receiving the test data.

NOTE

For OCM nodes, in the case of some tests where results are given such as error counts, gain levels, etc., a poke point "Reset Results" is available to allow you to reset parameters such as BERT error counts back to 0.

Control State Test

The Control State Test is typically used to evaluate the ability of the system to transfer channel control signals from the Bus Interface at one channel end of a circuit, through the network, to the Bus Interface at the other channel end. When a circuit is configured with a 54m8 Interface, Control State Test may alternatively be used to initiate V.54 local and remote loopbacks. While much of the description which follows applies to both uses (passing of controls, as well as the initiation of V.54 loopbacks), additional details regarding V.54 loopbacks are included later in this sub-chapter.

When the test is selected, a subscreen displays the current `Send` and `Recv` control signal states for each channel end of the circuit. Another row (labeled `New`) is included above the current-state displays for selection of `New Send Controls` for each channel end. The default settings displayed for the `New Send Controls` when first entering the `Control State Test` subscreen are based on the circuit configuration within the Node. If new control settings have been saved to a circuit Controller configuration, and the `Control State Test` subscreen is re-accessed before the new configuration has been downloaded to that circuit, then the default `New Send Controls` display is based on the old configuration. In this case, when Control State Test is selected, the following prompt appears:

```
Current information may be out-of-date; Continue? [Default NO (Y/N)]
```

The `New Send Controls` can be selected to be F-On (forced on), F-Off (forced Off), or --- (Pass Through) by toggling through the valid options with `Enter`. When --- is selected, the control signal state from connected channel equipment passes through the system unchanged. Note that for an OCM X.50 channel, only CTL1 (RTS) is available to send.

When a Send setting has been changed via diagnostic command to a state other than as-configured, the Send indication is displayed in yellow. On OCM channel ends only, if no other tests are running, USER STATE CHANGE appears on the diagnostic line and in the Status Detail for the card. When you change a Send signal state by forcing a control signal on or off, the current Recv signal for the opposite channel end (diagonally across on the screen) should also reflect the selected state. If the Recv signals do not follow the associated Send signals within a few seconds, a channel control problem is indicated and the Recv indication is displayed in red rather than green.

On OCM channel ends only, the Recv setting at the Line Interface (not the Bus) can be set via the New Recv line. This feature does not test the ability of the network to pass control states across the network, but rather forces the control states being presented to the connected channel equipment.

Note that the Current Recv values displayed are at the Line Interface , and reflect what is being received from the network; they should match the other end Current Send values. Diagnostic changes to the Recv controls are presented at the Line Interface , to the equipment which is connected to the channel end where the changes are made.

Likewise, when initiating V.54 loopbacks, F-On should be selected under LLB (for a V.54 Local Loopback) or under RLB (for a V.54 Remote Loopback). The corresponding label on the other end Recv display should indicate an ON condition. If the selected V.54 modem successfully implements the test, TM (V.54 Test Mode) should indicate ON at the side connected to the modems.

Each time a new control state setting is desired, select the new values and press F7 to effect the new settings. When the Control State Test is complete, press F3 to exit the subscreen. The following prompt appears:

```
Restore Sig.  Cntl bits to previous state? [Default NO (Y/N)]:
```

Upon answering Y, the settings that were in effect prior to entering the subscreen are restored, and no other prompts follow.

If N is answered, then the control states that are in effect as a result of new control state changes remain. This is then followed by a prompt which asks if the Control Settings should also be saved permanently in the Controller data base for the currently active configuration:

```
Save new control state to config? [Default Yes (Y/N)]:
```

If Y is answered, the circuit configuration on the Controller is modified with the new control settings, making the change permanent. (In other words, answering yes here is effectively the same as going into the configuration screen for the circuit, and configuring the same control state settings). This is followed by a partial download from the Controller.

If N is answered, the Controller configuration does not change, and the control states remain at the new settings until a new configuration is downloaded/activated.

Terminate Diagnostic

This selection ends a previously initiated test on the circuit or channel.

Digital Bridge Channel Diagnostic Functions

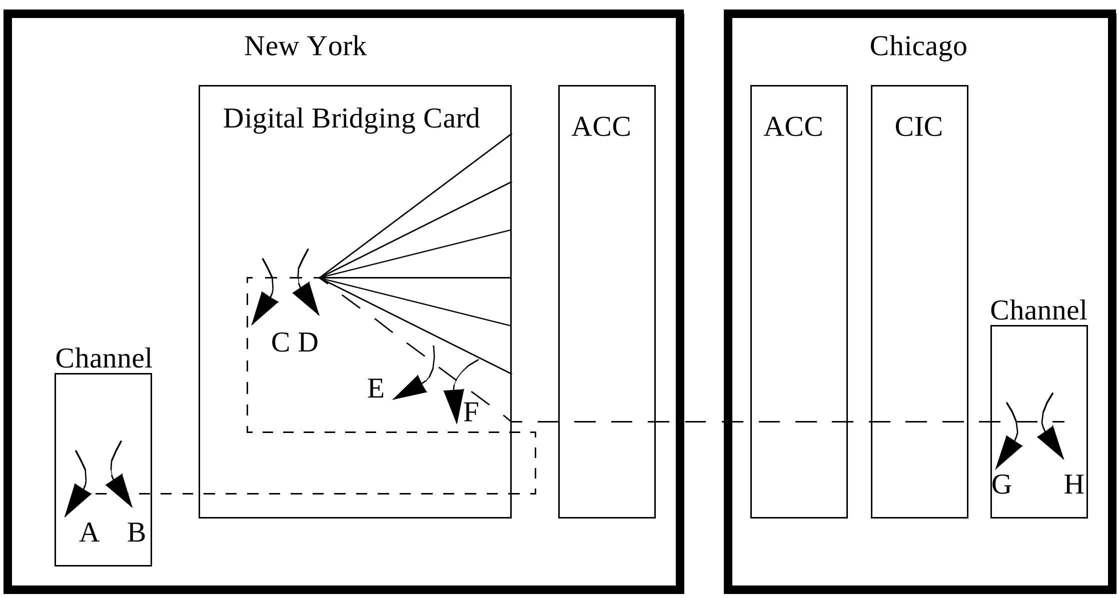
511 BERT – One DBC circuit at a time (1 per DBC) may be selected to run a 511 BERT test. The direction of the transmit 511 BERT data is toward the Fast Bus and away from the confluence of the fan.

The 511 BERT pattern is a standard pseudo-random 511 bit pattern which conforms to ITU-T Q.295A and O.153.

No Loopback – For any Data Path test that originates on a DBC circuit, None may be selected as the `Lpbk Point` . This selection is useful when a loopback is being performed farther downstream, external to the TMS. This is also useful for testing bidirectionally using the 511 BERT pattern and an external BERT set to 511 pattern.

The ESCC retains knowledge of DBC circuit loopbacks, allowing this information to be passed to a newly installed DBC.

The various loopback points are shown in *Figure 32-6.*



Common Circuit

Drop Circuit

A - Local common loopback at the channel
B - Remote common loopback at the channel
C - Local common loopback at the fan
D - Remote common loopback at the fan
E - Local drop loopback at the fan
F - Remote drop loopback at the fan
G - Remote drop loopback at the channel
H - Local drop loopback at the channel

Figure 32-6 Digital Bridge Loopbacks

Voice Channel Diagnostic Functions

The voice channel diagnostic functions are a set of tests and other diagnostic functions designed to detect and isolate problems in a voice circuit or channel module at either end of the circuit. The results from the tests can also supply valuable information about other intermediate segments in the TMS-3000 network.

NOTE

Diagnostics are not valid for any voice card that is running in FAX mode (e.g., CELP, DPV).

A voice channel module consists of two sections. An analog section controls voice signal levels and performs the voice-to-data/data-to-voice conversions. A digital section controls the multiplexing of the data signal into the TMS-3000 network. Voice channel loopback points are placed in both the analog and digital sections of the module to allow precise testing of the entire voice signal path.

Some older version PCM and ADPCM voice channel modules require an E&M piggyback module to run the following voice channel tests:

- RCV dB
- Gain Test
- 1 KHz
- VF Test

If you select diagnostics for a circuit or channel which uses PCM or ADPCM modules without E&M piggybacks, then these tests respond with appropriate warning messages.

Data Path Test

You must specify the origin node and loopback node for most tests (refer to Circuit and Channel Diagnostics for more information on origin node and loopback node). You are allowed to select **`None`** as a loopback point. This initiates an end-to-end test, with test signals generated at the origin node channel module, and evaluated at the remote end of the circuit.

Once started, these tests continue to run until you terminate the test.

NOTE

Some local voice channel diagnostics can cause "Out-of-Sync" errors at the remote channel end.

You may exit and enter the test routine for different channels without interfering with other tests currently running, enabling you to test several channels simultaneously. Simultaneous tests are only allowed for TMS-3000, TMSC, and OCM-2000 nodes. If a circuit terminates at a Universal MM+V4 node, only one circuit at the Universal MM+V4 node may be tested at one time.

A new test may be started on a circuit that is already running a test without terminating the first test.

NOTE

In the case of some tests where results are given such as error counts, gain levels, VF monitor readings (OCM voice only), etc., a poke point "Reset Results" is available to allow you to reset parameters such as BERT error counts back to 0.

`Origin Point/Lpbk Point` — When highlighted, this feature allows you to select the originating and loopback points by toggling `Enter`. In some cases, an option of **`None`** can be selected for a loopback point in which case the test data is sent to external equipment rather than being looped back.

`Test Pattern`: The following are selectable test pattern types: 1 kHz Tone, User Data, VF Idle, and Digital 511.

- **`1 kHz Tone`** — This test sends a 1.004 KHz tone through the test path and evaluates the amplitude of the returned signal.

  This test may be applied to any voice channel module except TMS U-ADPCM at rates ≤ 32 KHz. It reports the output level of the voice module at each end of the circuit by displaying that the energy level is either high or low. On VCM, the peak level is displayed in dBm.

  The channel module at the origin node generates a 1.004 KHz tone. This tone is then digitized and sent through the selected path.

  In a loopback test, the origin node channel module measures the amplitude of the returned signal. If there is no loopback, the remote node channel module performs the measurement.

  In a circuit remote loopback test, the 1.004 KHz signal loops back at the analog section of the remote module. In a channel local test, the signal loops back in the digital section of the local module. The channel and circuit tests evaluate analog and digital sections of the channel module.

  On TMS channels, the Diagnostic Status display reports the energy level detected. If the signal amplitude is found to be at or below normal levels for the channel module, Low is reported. If the signal amplitude is found to be above normal levels, Hi is reported. The 1.004 KHz tone may be monitored by connecting external test equipment to the VF Out front panel test point of any channel module involved in the test.

  On OCM channels, the Diagnostic Status display reports the peak signal level in dBm. External test equipment is not required except when doing a User Data Test.

  The TMS CELP and VLBRV Channel Modules generate the 1.004 KHz tone but do not measure it. The OCM CELP, DPV and VLBRV channel modules can generate and measure the 1.004 KHz tone.

- **`User Data`** — The User Data Test creates a test path for use with external test equipment.

  When the User Data Test is selected, the appropriate test path is created, but no test signal is transmitted. In a local loopback test, signals loop within the digital section of the local module. In a remote loopback test, signals loop within the analog section of the remote module. Test equipment must be connected to the appropriate channel connector at the origin or remote node or at some other test interface external to the TMS-3000 network. The test equipment generates test signals and evaluates the signals returned from the test path.

- **`VF Idle`** — The VF (Voice Frequency) Idle Test evaluates the noise level in a voice channel module or circuit.

  The analog input of the origin node channel module is grounded. In an end-to-end loopback test, a loopback point is established in the analog section of the loopback node channel module. In a local channel loopback test, a loopback point is established in the digital section of the loopback node channel module.

The origin node channel module (in a loopback test) or the remote module (in a non-loopback test) evaluates the returned signal for errors (an error in this test is a significant deviation from ground in the returned VF signal). For TMS channels, the display reports Idle, indicating that noise in the channel is at a low level, or Non-Idle, indicating an unacceptable noise level in the channel. For OCM channels, peak level is reported in dBm.

The VF Idle Test is not allowed on TMS VLBRV and CELP Channel Modules.

NOTE

The VF-idle test sometimes fails due to propagation delays over CDA and IAC links of the controls needed for the test. To work around this, restart the test (or on VCM reset the results) without terminating it. This resets the failure without interrupting the test.

- **`Digital`** — This test evaluates the digital section of a voice channel module or circuit. TMS circuits display Digital while OCM circuits display Digital RP or Digital 511 selections.

  A digital "reversals pattern" is generated by the origin node channel module (for CVSD channels this is a "quiet" pattern). A loopback point is established in the digital section of the loopback node channel module.

  The origin node channel module evaluates the returned signal for errors in the returned digital signal. The display reports an error count.

  This test is intended for use with the VF Test in isolating failures in the digital or analog section of a voice channel module. If the VF Test indicates a high noise level in a circuit or channel module, this test determines whether the noise problem originates in the digital section of the voice circuit or channel.

`Origin Mute` — The `Origin Mute` (Yes/No) option allows the muting of audio at the received end origin point.

`Signal Cond'ing` — The `Signal Cond'ing` (As Is/As Configured) option allows signal conditioning at the origin point.

`Echo Cancel` — `Echo Cancel` (As Is/On/Off) provides the capability of reconfiguring the Echo Canceller option, allowing you to override circuit board switch settings.

Calibration Test (Voice CVSD only)

This test may be applied only to CVSD voice channels. The Calibration Test sets the voice output level of the CVSD voice channel modules at each end of the circuit.

A 1.004 KHz tone is generated by each channel module in the circuit and is transmitted to the opposite-end channel module.

Each module receives the digitized 1.004 KHz signal and steps through the voice output level adjustment range (–6 dB to +1.5 dB) until the voice output is within 0.5 dB of the nominal output level of the module (the nominal level is selected by switches on the module). The display reports the adjustment level reached at each channel module. If the nominal level cannot be attained, Failed is reported.

Gain Test (TMS)

This test may be applied to any TMS voice channel module except CVSD and U-ADPCM at rates ≤ 32 KHz. It sets the nominal voice output level of the voice module at each end of the circuit.

A 1.004 KHz tone is generated by each voice channel module in the circuit and is transmitted to the opposite-end channel module.

Each module receives the digitized 1.004 KHz signal and steps through the voice output level adjustment range (–6.0 dB to +1.5 dB) until the voice output is within 0.5 dB of the nominal output level of the module (the nominal level is set by switches on the module). Results of pass or fail are then reported for each channel module.

Control State Test

This test evaluates the ability of the system to transfer channel control signals from one channel end of a voice circuit to the other channel end.

When the test is selected a display of the current E and M signals is generated for the circuit. An extra row is included above the current state display for new M-Lead controls for each channel end. On OCM four-state signaling type circuits, the A and B signaling bits are displayed.

You may move the cursor to each M-Lead signal, and set the new state to **`F-On`** (forced on) or **`F-Off`** (forced off — this state is allowed for CVSD or VCM voice channels only). On OCM channel ends only, if no other tests are running, `USER STATE CHANGE` appears on the diagnostic line and in the Status Detail for the card. When three dashes (`---`) are displayed for a control, the M-lead signal from equipment connected to the channel is passed through the system.

When you change an M-Lead signal state by forcing it on or off, the E-Lead signal for the opposite channel end should change to the selected state. The E-Lead signal diagonally across from the M-Lead signal shows the change. If the E-Lead signal does not follow the associated M-Lead signal within a few seconds, a channel control problem is indicated.

On the VCM, receive controls can be forced directly at the VF interface. Forced receive controls are not displayed on the Controller screen. The received controls displayed on the Controller represent the signal received from the network.

Set dB Level

This test adjusts the output level of the selected channel module. You must select the circuit end where the output is to be adjusted.

The nominal level is set by a switch on the channel module. You may adjust that level +1.5 to –6.0 dB in 0.5 dB steps. All selections are made by moving the cursor to each field and pressing `Enter` until the appropriate channel end location or voice output level appears.

Press **`F7`** `to put the` displayed level into effect.

On OCM channel ends only, if no other tests are running, `USER STATE CHANGE` appears on the diagnostic line and in the Status Detail for the card.

Upon exiting the dB Level Test subscreen, a prompt asks if the dB level should be saved in the data base for the currently active configuration. This prompt appears below:

```
Permanently save new dB level to config? [Default Yes (Y/N)]:
```

Select **`Y`** to change the circuit configuration on the Controller to the new dB level, making the level change permanent. If you answer **`N`**, the configuration does not change. But the voice output level remains at the new level until another configuration is activated. This adjustment is the same as the Rcv VF dB Level setting made when selecting a circuit configuration.

The following prompt now appears:

```
Restore dB to previous level ?  [Default Yes (Y/N)]:
```

If you want to restore the previous receive dB level the configuration was using, enter **Y** (`previous` refers to the value that was in use when you entered the subscreen).

On OCM voice modules, the Transmit offset level may also be adjusted. Additionally, the Tx and/or Rx TLP may be adjusted for 4-wire E&M type modules (it is fixed at 0 dB for two-wire modules). Note that these additional adjustments are for diagnostic use only and cannot be saved to the active configuration.

Terminate Diagnostic

This selection ends a previously initiated data path test on the circuit.

Set ACO

This function sets ACO on or off for a channel module. When ACO is on, no alarm conditions are reported from that channel module. When a failure is detected in a channel module, you may set ACO On to disable alarm messages. This leaves more buffer and display room for unexpected alarm messages. Diagnostic Alarm messages are still available via Circuit Diagnostics Display Status Detail selection, regardless of the state of ACO.

Display Card HW/FW Detail (OCM)

While the TMS Circuit Diagnostics screen is displayed, you may select `Display Card HW/FW Detail` to see card hardware (`Feature #`) and firmware revision (`F/W rev.`) levels for both base cards and piggyback cards.

A field identifying the type of basecard such as VLBRV or CELP is shown. For the piggyback card, four fields are shown: `A`, `B`, `C`, `D`. For example, column A may identify the piggyback as a signaling piggyback, such as `FXS`, `FXO`, or `E&M`, and column B may show piggyback options such as `w/FAX` or `No FAX` or `w/EC` or `No EC`.

NOTE

If, on the Controller, you have configured a CELP card differently from the actual card that is physically installed (e.g., a 6.4K CELP configured for 9.6K), a `Card` *or* `Piggyback Config Error` *is displayed under* `Status Detail`*, and the* `HW/FW Detail` *item for the piggyback is displayed in red (e.g.,* `W/FAX`*).*

Select **`Display H/W options`** (VCM) to display the card switch settings:

```
  * Trunk Cond.  (Reorder/Quiet)
  * Start (Loopstart/Groundstart)
*** PCM Coding (A Law/Mu Law)
    Decfg Cond (Busy/Idle)                      * Battery (Int/Ext)
 ** Signaling (Type 1-5)                       ** 2w/4w (2 wire/4 wire)
```

  * FXS only

 ** E&M type module

*** not available on CELP and VLBRV

Self Test (OCM)

Select this poke point to place the OCM card in self test. After you select Self test, a submenu appears at the bottom of the screen, allowing you to initiate the test. The screen displays the test result as `pass` or `fail`.

Echo Canceller (OCM)

Used to control the echo canceller options on ADPCM and VLBRV card types only. Displays status of base card echo canceller, residual suppresser and hybrid balancer (where applicable), dip switches S1-2 through S1-5, S1-7, and S1-6 respectively. Permits you to override dip switch settings for each option by selecting that field. On OCM channel ends only, if no other tests are running, `USER STATE CHANGE` appears on the diagnostic line and in the Status Detail for the card.

VF Monitor (OCM)

The VF Monitor diagnostic function monitors peak power in dBm from the bus interface at the node originating the test.

This function is automatically activated when you select a 1 KHz or VF Idle datapath test. It can also be activated by using the VF Monitor selection independently from a datapath test to monitor idle channel noise or to monitor external voice signals for overload. But if the VF monitor is selected on an OCM node which is originating a datapath test, then the VF monitor supersedes the datapath test.

For best results, you should manually reset the results and collect a few samples.

ACM Channel Diagnostic Functions

The following tests are applicable to ACM circuits.

Data Path Test

`Test Pattern:` The following are selectable test pattern types (*See Table 32-2*).

- **`User Data`** — This selection creates a test path for use with external test equipment. The test can be started at either the ACM or UVC end.

  When User Data selected, the appropriate test path is created, but no internally-generated test pattern is transmitted. In a loopback test, signals loop within the digital section of the module. Test equipment must be connected to the appropriate channel connector at the origin or remote node or at some other test interface external to the TMS-3000 network. The test equipment generates test signals and evaluates the signals returned from the test path. You may select the loopback and data origin points.

- **`Digital`** — This test is run on the channel module. The nature of the test is exactly the same as described earlier for Voice Channel Diagnostics.

- **`VF Idle`** — The VF Idle Test evaluates the noise level in a voice channel module. Refer to the VF Idle Test in the Voice Channel Diagnostics described earlier in this chapter.

- **Channel Remote Loopback with Clamp** — The purpose of this diagnostic is to test the ACM channel remote loopback capability. Since ACM is considered a circuit termination point (because the Controller cannot "see" beyond ACM), the Channel Remote Loopback with Clamp function is able to create a remote circuit loopback (i.e., towards the network and back to the channel source) for testing purposes. This is similar to one of the User Data Tests except that the data toward the port is clamped to the configuration fail code. At the I/O port of ACM, each channel is 64 KHz network-compatible PCM. Therefore, the individual remote circuit loopbacks always loop back 64 KHz PCM. But at the Fast

Bus or remote UVC, a looped channel is at a variable rate (64.8 KHz through 16.8 KHz). The implementation of Channel Remote Loopback With Clamp triggers data conditioning out of the ACM link. Signal conditioning occurs prior to implementation of loopback (terminate calls) but is removed at the point of loopback implementation. The type of signal conditioning is based on the channel type conditioning selection that is stored in the configuration data base.

- **Channel Local Loopback with Clamp** — This diagnostic runs on the ACM and takes received data of a specific circuit from the port and loops it back in the Loopback Convert RAM to the transmit side of the port, clamping the data toward the fast bus. This is particularly useful because the Circuit Fast Bus Loopback is not allowed.

Control State Test

The Control State Test, evaluates the ability of the system to transfer channel control signals from one channel end of a voice circuit to the other channel end. If the circuit is configured for no signaling, then the Control State Test is not available.

When the test is selected for ACM-UVC circuits, a display of the current E and M signaling is generated for the circuit. An extra row is added above the current state display for new M-lead controls for each channel end. You may move the cursor to each M-lead signal and set the new state to F-On (forced on) or F-Off (forced off, which is allowed for UVC voice channels only). If three dashes (`---`) are displayed for a control, the M-lead signal from the equipment connected to the channel is passed through the system.

The Controller allows you to save the states of the Control State test in one direction only. The other direction is lost.

When you change an M-lead by forcing it on or off, the E-lead signal for the opposite channel end should change to the same state. (The E-lead signal displayed diagonally across from the changed M-Lead signal shows the change.) If the E-lead signal state does not follow the associated M-lead signal state within a few seconds, a channel control problem is present.

After selecting Control State Test, the lower half of the `Circuit Diagnostic` screen changes to allow you to select different signaling control states for both sides of the circuit. On the ACM side, you select the signaling control towards the Fast Bus and towards the port, while on the UVC side, the signaling control towards its Fast Bus only is selected. On the ACM side, you also may select F-On, F-Off, or Pass-through, while on the UVC side, F-On or Pass-through may be selected.

The `Send EIA(crnt)` and `Recv EIA(crnt)` fields display the current control settings toward the port and Fast Bus at each end of the circuit, respectively, while the `Send EIA(new)` and `Recv EIA(new)` fields display the new control settings toward the port and the Fast Bus, respectively. `On`, `Off`, `F-On`, `or F-Off` may be displayed in these fields.

If the `Recv EIA` field at one end of the circuit matches the `Send EIA` field at the other end of the circuit, the fields are displayed in green (matching the "normal" configuration). If the fields do not match, the `Recv EIA` field is displayed in red. ACM may be configured contrary to the "normal" configuration because controls toward its local port may be set so they do not match controls received from the remote end of the circuit. In this case, the local setting towards the port prevails.

After new control levels are selected and the test executed, the result is displayed in the `Send EIA` and `Recv EIA` fields in the upper half of the screen and in `Send EIA(crnt)` and `Recv EIA(crnt)` fields in the lower half of the screen.

Before exiting the Control State Test, you are asked to save current control signal settings as part of the ACM configuration. If you choose not to save the settings, you are asked to restore the control signal settings back to their state prior to testing. If a reconfiguration occurs prior to saving, the Control State Test settings return to a default setting. The reconfiguration in this case takes priority over the control state settings. For ACM-V circuits, you only can save the control signal setting towards the port, i.e., the `Recv EIA(new)` setting. For ACM-UVC circuits, you only can save the control signal setting towards the Fast Bus, i.e., the `Send EIA(new)` setting.

Set Channel ACO

Allows you to turn ACO on or off for the respective channel. When ACO is on, no alarms are reported from that channel. When a channel failure has been detected, this function may be turned on to disable further alarms from that channel, thus making memory available for other alarms.

Channel Statistics

In addition to other diagnostics, the ACM-II also provides Channel Statistics. This information may be used to derive an approximate error rate for the route the circuit follows. The error rate is monitored at the ACM end. In the cases of ACM to UVC or ACM-II to ACM-I, the information is available in one direction. When the circuit is ACM to ACM, the information is available in both directions.

Table 32-2 ACM Circuit Test Origin/Loopback Points

Circuit	Test		Origin Point	Loopback Point
ACM-UVC and ACM-PCM	User Data Test, Remote Loopback with Clamp		UVC	ACM
	VF Idle Test		UVC	UVC
			UVC	ACM
	Digital Test		UVC	UVC
	User Data Test,	Local Loopback without Clamp	UVC	UVC
		Remote Loopback without Clamp	UVC	ACM
		Remote Loopback without Clamp	ACM	UVC
	User Data Test, Local Loopback with Clamp		ACM	ACM
ACM-V and ACM-D	User Data Test, Remote Loopback without Clamp		ACM1	ACM2
			ACM2	ACM1
	User Data Test, Remote Loopback with Clamp		ACM1	ACM2
			ACM2	ACM1
	User Data Test, Local Loopback with Clamp		ACM1	ACM1
			ACM2	ACM2

Summary

In this chapter we covered circuit and channel, status and diagnostic routines; these routines monitor and test circuits or individual channel modules. Various test were covered including local and remote loopback, end-to-end, and self tests.

What's Next?

Chapter 33 covers the status and diagnostics procedures for XNET.

33 XNET Status/Diagnostics

Overview

XNET is a feature that allows the network to pass virtual voice and data circuits between two or more autonomous networks. Supervisory communications does not pass between networks, preserving independent control of each network. You a re allowed to configure an XNET node and trunk and then configure circuits to traverse the XNET trunk. The operator running the other network must also configure the XNET node, trunk and circuits.

Topics covered in this chapter are XNET Status and Diagnostics.

XNET Status/Diagnostics

On an XNET link, several diagnostic tests cannot be performed because there are no supervisory communication channels over an XNET link, and status from the channel-end in the other network is not available. When testing a data channel on XNET, the following diagnostic tests may be performed: `User Data` (with local or remote loopback), `BERT and BERT with Clamp` (with local or remote loopback), and the `Control State Test` (you cannot observe the results of the Control State Test). *These tests are further described in Chapter 32.*

When testing a voice channel on XNET, the following diagnostic tests may be performed: `User Data` (with local or remote loopback), `1 KHz tone` test (with local, remote or no loopback), `Control State test` , `Receive dB level` test and the `Digital` test. *These tests are further described in Chapter 32.*

When performing circuit diagnostic functions on an XNET link, the following restrictions apply:

- The XNET channel module cannot be the origin point for any tests.
- The VF Idle and Gain (Calibrate on CVSD) tests cannot be performed.
- The db level (at the XNET end) cannot be displayed.
- When performing the Digital test, you cannot use None as a loopback point.
- When performing the 1 KHz tone test, and if no loopback point (None) is selected, no display of test results is available.
- On the upper portion of the TMS Diagnostics screen, there is no E and M-Lead status for an XNET channel (on the XNET side of the screen).

When performing the Control State test on a non-CVSD voice channel, the selection point for toggling the M-Lead is located on the XNET side of the screen. The local channels E-Lead is affected and the local M-Lead state cannot be toggled. The status of the remote E-Lead or M-Lead cannot be displayed.

On ACM-UVC channels, when performing the Control State test, the selection point for toggling the M-Lead is located on the ACM-UVC side of the screen. The local channels E-Lead is affected and the local M-Lead state can be toggled. The status of the remote E or M-Lead cannot be displayed.

Summary

In this chapter we covered the status and diagnostics procedures for XNET.

What's Next?

Chapter 34 covers the status and diagnostics procedures for the Universal MEGAMUX Plus V4 (Univ. MM+ V4) multiplexer.

34 Universal MM+ V4 Status/Diagnostics

Overview

The Universal MM+ V4 is a GDC single-aggregate multiplexer with a limit of 54 channels.

Topics covered in this chapter are:

Universal MM+V4 Status/Diagnostics

You may select status/diagnostic screens for a Universal MM+V4 node in a TMS-3000 system. A Universal MM+V4 node may be selected from the Network Status/Diagnostic menu; you may then select a `Node Status/Diagnostics` screen for the entire node and select individual Universal MM+V4 component screens.

Node Status

At the top of the screen are the following:

`Node:` the node symbolic name is displayed.

`Addr:` the node address of the Universal MM+V4 node. The address reflects the node address of the TMS-3000 or TMSC node that communicates with the Universal MM+V4 node, followed by the ACC slot number to which the Universal MM+V4 is attached [The slot number is displayed as -P1 or -P2 (for PRI-1/PRI-2) on a TMSC].

`Type:` The node type (UM+4) is displayed, along with the revision number of the firmware in the AUTO FRAME module at the node.

The Node Status screen for a Universal MM+V4 node reports status for the following components:

- `Common Set (TR/CK/EX)` — These are the Transmit/Receive Logic Module, the Clock Generator Module, and the Expansion Module, respectively.
- `Auto Frame`
- `Channels`
- `Power Supply`

The following status items are reported:

Alarm

Reports the presence of an alarm condition. `Major` or `Minor` may be reported.

ACO

ACO may be `On` or `Off`. If ACO is `On`, no alarm messages are reported for the component. Status displays for the component, including diagnostic alarms, may still be selected.

Diagnostics

This item reports any diagnostic tests currently running in a component. `Yes` indicates that a diagnostic test is running. `No` indicates that no diagnostic test is running.

You may move the cursor to any of the components displayed and select a detailed status display for that component. Channel status displays and diagnostics are the same for TMS-3000 or Universal MM+V4 channels. *Refer to Circuit and Channel Diagnostics in Chapter 32* for information on channel diagnostics. The following information is displayed for the Common Set, AUTO FRAME cards, and the power supplies.

Primary/Secondary In Service

This item reports redundancy status for the common set and the AUTO FRAME module (the redundancy status reported is for the Transmit/Receive Logic Module only). `Primary` means that the primary module is active; `Secondary` means that the secondary module is active.

Status

This item is a status summary. `OK` indicates that no problems are detected for the component. `Fault` indicates that some problem exists. When `Fault` appears, you should select the Display Status Detail function for the component. Revision Error may be reported for the AUTO FRAME module. This indicates that an incorrect version of firmware is installed on the AUTO FRAME module.

Status/Diagnostics Functions

At the lower portion of the Equipment Status Screen is the Display Status Detail function, which enables you to monitor detailed alarm conditions of Universal MM+V4 components. To select this function, position the cursor at the pokepoint and press `Enter`. This function displays detailed status alarm conditions for the Universal MM+V4 components.

These messages, which give detailed information concerning any module problems (even modules in ACO) are displayed in the lower portion of the screen. For definitions of each alarm condition, *see Table 34-1*.

Diagnostic Functions

The diagnostic functions for Universal MM+V4 components are listed in the lower half of the diagnostic status screen for each component. To select a function, position the cursor at the function and press `Enter`.

Set ACO

You may set the state of ACO for a component by selecting this function. When ACO is On, no alarm messages for the component are reported by the Alarm Scan (See the Data and Voice Channel Alarms section later in this chapter).

Redundancy Toggle

Allows the redundant AUTO FRAME card to be placed in service in the case of a suspected problem.

Table 34-1 Universal MM+V4 Alarm Conditions

Component	Alarm Message	Description
Common Set	Common Set Failure	A hardware failure has occurred on the Transmit/Receive Logic Module or the Clock Generator Module.
	Local Out-of-Sync	The local Transmit/Receive Logic Module cannot achieve synchronization on receive aggregate data.
	Remote Out-of-Sync	The remote Transmit/Receive Logic Module cannot achieve synchronization on receive aggregate data.
AUTO FRAME	Node Type Mismatch	The firmware on the AUTO FRAME is not compatible with the configured revision given in node definition.
	Primary AUTO FRAME Failure	A hardware failure has occurred on the primary AUTO FRAME Module. The module may be out-of-slot.
	Secondary AUTO FRAME Failure	A hardware failure has occurred on the secondary AUTO FRAME Module. The module may be out-of-slot.
Data/Voice Channel	Minor Channel Alarm	This alarm appears on a data/voice channel if a Channel Out-Of-Sync or Transmit/Receive clock failure occurs. The Minor Channel Alarm ceases when all channel faults are cleared (or ACO'd). The alarm generator persists up to sixty seconds preventing sporadic alarms from flooding the system. Possible effects of a Minor Channel Alarm are: 1. Channel faults which already generate an alarm (e.g., out-of-slot or configuration error) generate two alarms assuming no other faults already existed. 2. If an ACO is activated, the fault generated is cleared. Clearing an ACO when a fault already exists generates an alarm. 3. An alarm does not clear until sixty seconds after all faults are clear or an ACO is performed. Refer to Data and Voice Channel Alarms in this chapter for more information on Minor Channel Alarms.
Power Supply	Power Supply Failure	At least one power supply at the node is in a failure condition, i.e., a low voltage or no voltage output. Examination of front panel indicators reveals which power supply has failed.

Data and Voice Channel Alarms

On the Universal MM+V4 TDM, a single `Chn Minor` alarm message is generated when a channel fault is detected on one or more channel cards. The alarm is sustained for a period of one minute after the condition(s) clear(s) to prevent alarm "bouncing" or "flooding." The Chn Minor alarm is cleared by removing the faults or, contrary to the way ACO typically works on TMS-3000 components, enabling the ACO.

Setting the ACO on all channels with faults contributing to the Chn Minor alarm causes an unsolicited `Chn Minor Clear` message (after one minute). Resetting the ACO while a channel fault exists can generate an unsolicited `Chn Minor` alarm.

In Universal MM+V4 version 4.10 software, an individual "filtered alarm" indicator is generated for each channel. The filtered alarm is a detailed status indicator and not an unsolicited alarm. When a channel fault is detected, a filtered alarm indicator is established for that channel and sustained for one minute.

When using Universal MM+V4 version 4.10 software in conjunction with MSO version 2.0.6 (or later) software or GTS versions of software, and if an unsolicited minor channel alarm appears on the Controller, you can go to the reported Universal MM+V4 diagnostic screen and easily trace the fault to that particular channel. This channel may not report a particular alarm (e.g., transmit clock failure), but the filtered alarm indicator remains on for one minute while you select the appropriate diagnostic screen. If the fault occurs more than once a minute, the filtered alarm indicator remains on.

On the circuit diagnostic screen, you can monitor the filtered alarm indicator until the actual detailed alarm type (e.g., transmit clock failure) appears. As a consequence, a Universal MM+V4 channel fault that has already generated an alarm may actually generate two unsolicited alarms (e.g., an out-of-slot alarm may accompany a minor channel alarm).

Summary

In this chapter we covered status and diagnostic procedures for the Universal MM+V4. Both node and channel status/diagnostics were covered.

What's Next?

Chapter 35 covers the status and diagnostics procedures for clocking.

35 Clocking Status/Diagnostics

Overview

This chapter describes the items which are found on the Clocking Status and Diagnostics screens. Diagnostic procedures which are available for network clocking are covered.

Topics covered in this chapter are:

Clocking Status/Diagnostics

Clocking Status/Diagnostics Screen

Clocking Diagnostic Functions

Clocking Status/Diagnostics

This menu item generates a display of node timing sources for each node in the network. The information displayed is based on the network timing configuration entered through `Modify Network Clocking` (one of the configuration routines). The display reports the master or slave status and other relevant information for each master or slave node.

Clocking Status/Diagnostics Screen

Some columns of information are left blank, depending on the node status as a master or slave node and its timing source. For more information, refer to Autoclocking in *GDC 036R304-000* and *Chapter 10, Network Clocking,* in this manual.

Master/Slave

The current status of the node, either `Master` or `Slave` (with respect to timing), is displayed. This status is determined by the clocking `Level` number at which the node is currently operating. The network clocking configuration determines the master/slave status of a node for each configured clocking level.

Clock Source

This item defines the source of the timing signal to which the node is phase locked. `Internal` indicates that this node is internally generating the timing signal. `External` indicates that the node is receiving a master timing signal from some external device. The timing signal is received through external timing connector J18 on the TMS-3000 backplane. Aggregate indicates that the node is receiving timing from the aggregate trunk in the slot designated by the slot item.

For any node whose clock source emanates from the aggregate trunk, this item identifies the main shelf slot number of that trunk.

Clock Rate

For all clock sources except internal, this item reports the data rate of the timing signal to which the node is phase locked.

Source Node

This item indicates the master timing node that supplies timing to each node in the list. A master timing node reports its own address as source node. Slave nodes report the master node that supplies their timing through aggregate trunks.

Hops

This number represents the number of aggregate trunks through which a master timing signal travels to reach the specified node. For a master node, the number of hops is zero.

Level

This is the clocking level at which the node is currently operating. Each node has the capacity to drop independently through configured clocking levels in response to timing failures.

If a node drops through all configured levels and becomes an automaster, `Auto` is reported. Refer to *Autoclocking in GDC 036R304-000* for more information on automasters.

Failures

If a node detects a timing failure that persists for five seconds, none of the above items is displayed. Instead, `Not Locked` is reported for the node. This indicates that the node has begun the search for new clock sources, as described in Autoclocking.

Clocking Diagnostic Functions

NOTE

The functions, Reset Clock Source and Force Clocking, are not available for OCM-2000.

Reset Clock Source

This function is intended for TMS-3000 networks with external timing sources. At a node, the failure of an external timing signal can be detected. But, the node cannot detect when the external timing source is restored. After the failure occurs, the node does not attempt to phase lock with the external timing signal again until it receives an External Clock Failure Reset message from the Controller.

If the node contains two ESCCs, then the out-of-service module monitors the state of the external clock. In this case, the Reset Clock Source feature is automatic. If an external timing failure occurs, and is subsequently corrected, you may initiate the external clock reset by moving the cursor to `Reset Clock Source` and pressing `Enter`.

The Controller then transmits the reset message to all nodes, instructing them to search for a new clock source. Any node with an external timing source can phase lock with that source. The network eventually phase locks with the highest level clock source.

Force Clocking

This selection is found immediately below `Reset Clock Source`. It allows you to force a node to phase lock to a specific slot (1-16) and port. When clocking is forced to a slot, the clocking decisions normally made by the auto-clocking algorithm are overridden by the Force Clocking selection. Select **`Force Clocking`**, and you are prompted for a node name. You then choose between enabling a new Force Clocking command on the node or disabling an existing Force Clocking. If the former is selected, you can jog to the appropriate slot and port for which you desire Force Clocking (the slot must be configured for a proper equipment type and proper node clocking, and the card must be in slot). The Network Controller warns you before sending the command that data and communications may be disrupted. The command is then sent to the specified node. If disabling an existing Force Clocking command, slot and port selection are not necessary since the command is simply telling the node to turn off any existing Force Clocking command.

When Force Clocking is enabled, it is reported on the Clocking Diagnostics screen. `Force` is shown in yellow under the `Level` heading for the nodes which have Force Clocking enabled. It is also reported on the Network Controller diagnostics screen. If Force Clocking is enabled for the specified node, then `Force Clocking` is displayed in yellow. If Force Clocking is not enabled, then `None` is reported in green.

Summary

In this chapter we covered Clocking Status and Diagnostics. Diagnostic procedures which are available for network clocking were covered.

What's Next?

Chapter 36 covers the status and diagnostics procedures for the Controller.

36 Controller Status/Diagnostics

Overview

This chapter describes the items which are found on the Controller Status and Diagnostics screens.

Topics covered in this chapter are:

TMS Controller Status/Diagnostics

This routine is selected from the `Status/Diagnostics Main` menu (by cursor position selection). It displays the current status of all Controllers in the on-line network. It also accepts mastership switchover commands from primary users. The Controller status is updated every 40 seconds. Refer to *GDC 036R303-000* for instructions on setting up a network of multiple Controllers.

The Controller downloading activities are visible to the primary/secondary user for either the master or subordinate controller in the TMS `Controller Diag’s` screen. This screen is divided into two portions. The upper portion of the screen contains information on the master controller. In this portion, you see on-going controller download activities related to all subordinate controllers. In the lower portion (subordinate controller) of the TMS `Controller Diag’s` screen, you see only the download activity pertinent to its own controller.

The following information is displayed whenever a download occurs: Download Type, Update Date/Time associated with the download, the time download began, the event line number, and the percentage of completion of the files being transmitted/received by the subordinate controller.

Status/Diagnostic Screen

In the TMS Controller Status or Diagnostics screen, a yellow `E` may appear under `Num. of Missing Updates` for the subordinate controller. The `E` appears when an event history mismatch takes place between the subordinate and master controller even though their configurations match. A description of the fields in the screen follows:

Controller Name

Shows the name of each controller that is configured in the on-line network. If `**` appears, then the respective controller is not yet known to this Controller. Since the name of each controller in the network is stored, this occurs if the Controller is logged into the dummy on-line network and is receiving downloads from the Master.

Master, Subordinate, Negotiating, Failure to Communicate

Shows the state of each respective controller. If `M` appears, the Controller is a Master. If `S` appears, the Controller is a Subordinate. If `?` appears, the Controller is negotiating with other controllers in order to determine whether it should become a Master or a Subordinate. If `D` appears, the Controller is unable to communicate with the Master.

Master Node Addr

Shows the address of the node of the Master Controller to which the respective controller is subordinated.

Last Update Date/Time Stamp

Shows the date/time stamp of the last update to the network configuration of the Controller.

Last Communication Down Time

While communications to this controller are down, this field shows the date and time that the controller went down. When communications are up, the field is filled with a series of dashes (-).

Login User Name

Shows the name of the user who is currently logged on to the respective controller in the on-line network.

Num. of Missing Updates

Shows the number of updates that have been missed since the last update to the network configuration for the respective controller. A zero (`0`) indicates the configuration of the Controller is up to date. A red dash (`–`) indicates the last update of the Controller has not been recognized by the master, and therefore, a complete data base download is expected to occur. If `*` appears, then the number of missing updates exceeds 253.

The lower portion of the screen contains the following fields:

Controller Name

Shows the name of each controller that is configured in the on-line network. A blank space appears under the Controller Name if download is not occurring.

Dnld Type

A letter appears in this field indicating the type of download occurring at the Controller.

- `C` — A complete download is taking place.
- `D` — Delta, a download is taking place.
- `E` — Event Messages associated with an IAR Test Script.
- `EF` — Event File associated with an IAR Test Script.
- `G` — General Download
- `I` — IAR Download

Update Date/Time

Date and time stamp associated with the download.

Dnld Started

Specifies the time that downloading started.

Line

An event line number is displayed only if the download type is in the form of an event message. Each line number indicated corresponds to an event with the same line number in the Examine Event History screen.

% Completed

Indicates, as a percentage, how much of the download process to each controller has been completed.

If you want to switch mastership among the Controllers, highlight the `Switch Controller Mastership` field and press `Enter.` You are prompted to enter the name of the Controller that is to become the Master. If the controller name that you enter is a valid candidate for Mastership, the Mastership change occurs. Otherwise, an explanatory message appears.

Summary

In this chapter we covered Controller Status and Diagnostics.

What's Next?

Chapter 37 covers the Dynamic Supervisory Route Tracing (DyRT) routine.

37 DyRT Status/Diagnostics

Overview

Dynamic Supervisory Route Tracing (DyRT) provides an accurate and up-to-date indication of TMS supervisory routes.

Topics covered in this chapter are:

Dynamic Supervisory Route Tracing

Dynamic Supervisory Route Tracing

To initiate DyRT, select **`Status`** or **`Diagnostics`** from the `TMS Main Menu` , then select **`Supervisory Route Tracing`** Enter a `Source Node Name` and a `Destination Node Name` for the route you want traced. You can do this by typing in the name or by selecting **`Sel`** to bring up a list of nodes and then selecting the node. For `Tracing Enable` , select **`ENABLE`**. You see a message in green near the top of the screen indicating that route tracing is in progress between the nodes you selected.

Once the tracing is complete, the results are provided on the same screen.

DyRT is only available when the network is on-line. You may not be able to see the secondary routes between nodes. The status response only shows the exact path that is currently being used, and that path may be a combination of primary and secondary routes. If the current path requires some backtracking to find secondary routing possibilities, the response shows that backtracking. Backtracking occurs when a failed port is found along a path and the packet is sent backwards, looking for a secondary option.

NOTE

More than one screen page may be required to show a particular route. If you are examining page 2, after expiration of the retrace interval (operator selectable 10 - 255 seconds), the Controller automatically returns you to page 1. To disable this screen refresh function, after the route tracing is completed, select DISABLE for the Tracing Enable option.

If a route tracing is performed for a route which terminates at an OCM, the results may not be valid if an IAR is in progress. The information eventually updates.

The Controller shows the node name and address, main shelf slot numbers (with CDA port and bundle if applicable) going in and out of the node, link name, and nodal route status. *Table 37-1* lists the routing status items which may be reported from the network, the display color, and the meaning of each.

Table 37-1 Route Status Code Table

Status	Color	Meaning
Primary	Green	Proceeding normally along a primary route.
Secondary	Green	Proceeding normally along a secondary route.
Success	Green	Destination node successfully reached.
Back-Primary	Yellow	Backtracking along a primary route.
Back-Secondary	Yellow	Backtracking along a secondary route.
Loop Detected	Red	Route caused a 2-node echoing packet loop.
Trace Full	Red	Maximum size of tracer packet reached.
Max Hop Count	Red	Maximum allowable number of forward hops has been reached (31).
Route Failed	Red	All routing possibilities end in failure.
Node Undefined	Red	No routing table entry for the selected destination node.
Port n	Green	Route passes through Controller during Dial Backup
Layer-3 Compatibility Error	Red	Software incompatibility in the network.
Primary (OCM)	Green	Proceeding normally along a primary route to the OCM.

Summary

Dynamic Supervisory Route Tracing (DyRT) provides an accurate and up-to-date indication of TMS supervisory routes.

In this chapter covered Supervisory Route Tracing Status and Diagnostics.

What's Next?

Chapter 38 covers the alarm routines and also provides a list of alarm messages with their definitions.

38 Alarms

Overview

The TMS-3000 Alarm routines provide an up-to-date report on network problems. Alarm messages report network failures within seconds of problem occurrences. They report changes in failure characteristics and when the problem has been corrected. Alarm messages are time-stamped with the time of alarm occurrence at a TMS-3000 node. The time that the alarm condition clears at a node is also reported.

When a failure occurs at a TMS-3000, TMSC, or OCM-2000 node, the ESCC (CCM at OCM-2000 node) at the node reports an alarm condition to the Controller. This report is generated spontaneously by the ESCC (or CCM) and does not require a status request from the Controller.

Some filtering of alarm messages occurs at the TMS-3000, TMSC, or OCM-2000 node and the Controller. Since a single failure (such as an aggregate trunk failure) can create alarm conditions in many different modules, failure conditions are counted and alarm reports are issued based on the numbers and types of alarm conditions. For example, if many channel modules report the same alarm simultaneously, a group channel alarm is reported instead of individual channel alarms. This method prevents an overwhelming number of alarm messages from filling up alarm lists and provides a better picture of the degree of failure at the node.

There are several options for logging and/or reporting alarms. These options are described later in this chapter in Modify Alarm Handling.

Topics covered in this chapter are:

- Alarm Messages
- Alarm Routines
    - Display Alarms
    - Alarm Report
    - Verify Alarm Database
    - Alarm Restoral
    - Delete Historical Alarms
    - Create/Modify Filter
    - Modify Alarm Handling
    - Create/Modify Report Format
    - Active Alarm Update
    - Alarm Backup
    - Identify Floppy

Alarm Messages

The Controller receives alarm messages and stores them in the alarm data base in chronological order, according to the time that the alarm report was received by the Controller.

Line 22 reports active counts for major and minor alarms. Alarm messages are reported on lines 23 and 24 of the Controller screen. The alarm message reports the node component that reported the alarm condition, the type of failure involved, and the current status of the alarm condition. An alarm condition that continues to exist is `active` (in red); when an alarm condition no longer exists, its status is changed to `cleared` (in green). A yellow `change` indicates that the fault still exists, but that the state of the fault has changed. It is currently used only for Controller to nodal communications alarms. Momentary alarms (reported as `Mom` in green) are alarms that do not have an active or clear state; they are informational. Node reset alarms are reported as momentary.

Table 38-1 lists and defines all alarm messages displayed by the Alarm routines.

A standard message format is used by all Alarm routines. The format is:

```
<Date> <Time> <Address> <Failure Type> <Status>
```

- Node Date/Time — This is the time and date when the TMS-3000 node detected the failure and sent the alarm message.
- Physical Location Address — This specifies the network component that generated the alarm message. For a TMS-3000 node, the node address is reported in brackets. If the component is a common module, the slot number occupied is reported. If the component is an ESCC or a power supply, no slot number is reported. If the component is an ACM, CDA, or IAC module, the port number and subaggregate number are reported.

Alarms from a Universal MM+V4 node are identified in terms of the TMS-3000 node and Aggregate Control slot that communicates with the Universal MM+V4 node. For example, a channel clock alarm for a Universal MM+V4 node might be represented as:

```
Node Address [1]-15-<MM+-12 TX/RX Clock
```

This message means that an alarm exists at the Universal MM+V4 node connected to TMS-3000 node 1 via the aggregate in slot 15 of the TMS-3000 node. The failure (a timing problem) is in channel 12 of the Universal MM+V4 node.

Two sets of alarm messages report very specific communication failures between the Controller and TMS-3000 nodes. Messages addressed as link level report failures with the link between the Controller and the local TMS-3000 node connected to it. Messages addressed as packet level report communications failures between the Controller and any specified TMS-3000 node in the network.

Specific alarm messages are generated for the following TMS-3000, TMSC, OCM-2000, and Universal MM+V4 components:

- TMS ACC, ACM, TPP, CDA, IAC, CIC, and ESCC
- TMS Data and Voice Channel Modules
- TMS On-board modem
- TMS Power Supplies
- Universal MM+V4 AUTO FRAME
- Universal MM+V4 T/R Logic Module

- Controller to Node Communications Link
- OCM-2000 CCM, LIM and OPP
- OCM-2000 Data and Voice Channel Modules
- OCM-2000 On-board modem
- OCM-2000 Power Supply

Alarm Routines

The alarm messages may be displayed with one of several alarm routines, depending on the type of alarm analysis required. To view alarms, log into a network or use the **F3** key to display the `TMS Main Menu`. Select **`Alarms`** and press `Enter`. The following options are offered.

- `Display Alarms` provides a snapshot of those alarm messages based on criteria specified in a filter.
- `Alarm Report` allows you to retrieve alarms and send them to a printer or floppy.
- `Verify Alarm Database` (on-line only) checks the status of all alarms in the system.
- `Alarm Restoral` (on-line only) allows you to restore alarms from a floppy.
- `Delete Historical Alarms` deletes all historical non-active alarms in the system.
- `Create/Modify Filter` is used to determine which alarms are selected and displayed, based on your selection of certain criteria.
- `Modify Alarm Handling` (on-line only) allows you to select particular activities to be performed for alarms. For example, printing, audible alarms, terminal beep, setting the maximum number of alarms, etc., can be enabled or disabled.
- `Create/Modify Report Format` allows you to specify the items which you wish reported in an alarm report and the order in which they are reported.
- `Active Alarm Update` (on-line only) displays all currently active alarms.
- `Alarm Backup` saves alarms to a floppy.
- `Identify Floppy` provides information about a disk that is installed in the floppy drive.

When new alarm messages appear in the alarm lists, you should use the status displays (in Diagnostics and Status) to obtain more information on indicated failures. The status displays provide further details concerning the current conditions at a node.

Display Alarms

This routine displays all alarms currently stored by the Controller.

An active alarm is one that currently exists in a TMS-3000 component. The active condition is indicated by the presence of a red `<Act>` or `<Rac>` in the status column of the screen. The Alarm Display includes address information that indicates the component experiencing an alarm condition.

When you enter the routine, you are asked to enter TEMP or a Filter Name or to press `Enter` to obtain a list of filters. TEMP is a filter that is made available when entering the alarm user interface and can be used for the alarm retrieval. TEMP can be created for the duration of the current display and cannot be saved. Therefore, it is not available from the Filter Select screen. If you select TEMP, the Alarm Display appears, showing specified alarms. The TEMP filter is useful on the slave controller; you can't create any other filters on the slave, but you can still select certain alarms. If you press `Enter`, the `Filter Select` screen appears. There are two default filters: `ALL ACTIVE ALMS` and `ALL HISTORICAL ALMS`. These filters cannot be modified. The former allows retrieval of all active alarms, and the latter allows retrieval of all alarms.

After you select the filter, the `Alarm Display` screen appears, providing you a list of alarm messages. The alarm messages are organized by page. One screen page holds 15 alarm messages. The top of the active alarm display lists the number of current active alarms and the number of pages.

- `Failure Type` — This column gives specific information about a failure condition within the specified component. A set of alarm messages is associated with each TMS-3000 component. *Table 38-1* lists alarm messages by component.
- `Status -` The following may be reported in this column:

  `<Act>` (Active) is reported in red and indicates that the alarm condition exists at the node.

  `<Clr>` (Cleared) is reported in green and indicates that the alarm condition has cleared.

  `<Rac>` is reported in red and indicates an active alarm found during alarm regeneration.

  `<Rcl>` is reported in green and indicates a cleared alarm found during alarm regeneration.

  `<Chg>` is reported in yellow and indicates that a fault still exists, but the precise state of the fault has changed. It is currently used only for Controller to nodal communication alarms.

  `<Mom>` (Momentary Alarm) is reported in green and is merely informational. It does not have active or clear states.
- `Node Date/Time` — This reports the date and time when the alarm condition cleared at the node. No date/time is reported in this column for an active alarm, so the Display Historical Alarms routine is the only alarm routine that reports in this column. Lines 23 and 24 at the bottom of the screen also report this date/time for a cleared alarm.

If the data base contains a large number of active alarms, the retrieval process may take several minutes. To abort the retrieval, simply press the **F10** key. No alarms appear.

There are two methods of stepping through the active alarm display pages:

1. Enter the page number that you wish to display and press `Enter`. The page number may be any number within the range of pages shown in the top right-hand corner of the display.
2. The Backup Page (**F5**) and Advance Page (**F6**) keys step the display forward or backward through all pages in the active alarm list. At the last page, **F6** returns to the first page. At the first page, **F5** returns to the last page.

Alarm Report

Selecting Alarm Report allows you to retrieve alarms and send them to a printer or floppy. You are asked for a `Filter Name` and `Report Format Name`. You can type these in or use a `(Select)` function to bring up a list. You can also select `Generate Report`, `Define Printer`, or `Print Existing File`.

Verify Alarm Data base

Selecting Verify Alarm Database (on-line only) allows you to check the status of all alarms in the system. Any alarms which are listed as Active in the Controller data base, but are no longer active, are cleared (denoted as `Rcl`). Any active alarms lost from the Controller data base are identified and generated (denoted as `Rac`). On slave controllers, `Verify Alarm Database` is used to synchronize the active network alarms (alarms not generated by the Controller) with the master controller.

Select **`Verify Alarm Database`** from the `Alarms Main Menu`. You are asked:

```
Are you sure you wish to initiate Alarm Regeneration?
```

Once you answer **Y**, the routine is initiated. Any previously unknown alarms that are identified as still active are indicated as `Rac`.

On a slave controller, this routine is used to synchronize the active network alarms (alarms not generated by the Controller) with the data base of the Master Controller.

Alarm Restoral

This routine allows you to restore alarms that have been saved on a floppy disk. After selecting the routine, you are prompted to insert the floppy disk.

Delete Historical Alarms

This routine is used to delete all historical non-active alarms for the selected on-line network. Upon entering this routine, you are asked for a `Filter Name`, or `TEMP`, or to press `Enter` to show the list. For a full description of the `TEMP` filter, refer to Display Alarms earlier in this chapter.

Once you have made a selection, you are asked

```
Are you sure?
```

If you respond yes, the non-active historical alarms are deleted.

Create/Modify Filter

Upon entering this routine, you are asked for a `Filter Name`, or `TEMP` or to press `Enter` to show the list. For a full description of the `TEMP` filter, refer to Display Alarms earlier in this chapter. To create or modify, type in the name of the existing filter or the name of the filter you wish to create. After pressing `Enter`, the `Modify Alarm Filter` screen appears. Note that if you happen to have selected one of the default filters, you are not allowed to make changes. The only selections you can make on that screen are Select Alms or Delete Alms. If you did select a default filter, go back and make another choice. The `Modify Alarm Filter` screen appears (*See Figure 38-1*). Unlike the screen display for a default filter, you can step through this screen and enter/select information.

NOTE

When entering information in the screen, enter only information that applies to the particular card type you are concerned with. For example, in the Channel/Subaggregate block, do not enter anything unless it relates to the particular equipment type in the slot that you specified.

The following describes the fields in *Figure 38-1*:

`Alarm Mode` — indicates if the alarm is generated from the network/Controller (`Current`) or if it was restored from a floppy (`Backup`) or both (`All`).

`Alarm Class` — indicates if the alarm is considered active or historical.

`Alarm Level` — indicates the severity level of the alarm (`Major`/`Minor`/`Warning`).

`Equipment Type` — the type of equipment that generated the alarm (for example: `Channel Card`).

`Alarm Type` — the specific alarm that was generated by the equipment type.

`Start Active Date Time` — the earliest possible time that the alarm became active. If not specified, the value for this field would be `01-01-70-00:00:00`.

`End Active Date Time` — the latest possible time that the alarm became active. If not specified, the value for this field would be the current time.

`Start Clear Date Time` — the earliest possible time that the alarm was cleared. If not specified, the value for this field would be `01-01-70-00:00:00`.

`End Clear Date Time` — the latest possible time that the alarm became cleared. If not specified, the value for this field would be the current time.

`Minimum Duration` — This value is stored in the data base as the number of seconds. If retrieving alarms, cleared alarms having a minimum duration of this value are retrieved.

`Node` — Alarms generated by the specified node are selected. This can be a selected name (use the Select pokepoint), or the name or address can be typed in. If the name is typed in, the corresponding address is also displayed. Similarly, if the address is typed in, the corresponding node name is also displayed. If a node is deleted from the configuration, alarms from that node can be deleted/displayed by specifying the node address (node name would not be displayed).

`Equipment Slot` — indicates a specific card slot which generated an alarm (if a node has been specified).

`Port` — the specific port on a specific node and slot which generated the alarm. This field applies only to CDA and IAC cards. If this field is not applicable, do not specify anything in it (to avoid incorrect alarm retrieval).

`Channel/Subaggregate` — the specific channel or subaggregate on which the alarm occurred. If the channel/subaggregate is not related to the equipment type on the slot, do not enter anything in this field (to avoid incorrect alarm retrieval).

`Circuit Name` — This name can be selected (with the Select pokepoint), or the name can be typed in. Alarms at each end of the circuit are selected.

`Link/Bundle Name` — This name can be selected (with the Select pokepoint), or the name can be typed in. Alarms at each end of the link are selected.

`Save As/Delete Filter` — allows you to copy this filter to another filter or allows you to delete the current filter.

`Select Alarms` — allows alarms to be selected and displayed based on the criteria specified in the filter. It allows you to use a filter for alarm selection without storing the filter in the data base.

```
Modify Alarm Filter
Filter Name            Filter Example
Alarm Mode             All/Current/Backup        Display Order          Newest to Oldest
Alarm Class            Active

Alarm Level            Major YES  Minor  YES     Warning  YES

Equipment Type         ALL                       Alarm Type   ALL

St Active DateTime     MM-DD-YY-HH:MM:SS         End Active DateTime    MM-DD-YY-HH:MM:SS
St Clear DateTime      MM-DD-YY-HH:MM:SS         End Clear DateTime     MM-DD-YY-HH:MM:SS
Minimum Duration       HH:MM:SS

Node                   (              )          Equipment Slot  ____
                       (Select)
Port                   ___                       Channel/Subaggregate   ____

Circuit Name                                     Link/Bundle Name
                       (Select)                                         (Select)

Save As                Delete Filter             Select Alarms
```

Figure 38-1 Alarm Filter

Modify Alarm Handling

After selecting this routine, you see the Modify Alarm Reception menu. You can select any or all of the following functions to occur when an alarm is received.

```
Store Alarms in Database
Send Alarms to Printer
Send Alarms to User Screen
Send Alarms to Netview
Send Alarms to Megaview
Sound Audible Alarms
Terminal beep
Send Alarms to Controller
Maximum Alarms
```

For all the above items, except `Send Alarms to Controller` and `Maximum Alarms`, you are given individual **`Yes`** or **`No`** choices for alarm level cutoffs (Major, Minor, Warning). For `Send Alarms to Controller`, the choice is all **`Yes`** or all **`No`**. For the `Maximum Alarms` field, you may type in any integer from *100* to *64000*.

Although each of the above can be selected individually, if `Store Alarms in Database` is disabled (No selected), the alarm is not sent to MEGAVIEW, NetView, the active alarm display screen, or slave controllers.

The `Send Alarms to Controller` option applies to all alarm cutoff levels (individual cutoff selection is disallowed). This option allows or disallows the Controller to download alarms that it receives from the network to other controllers. This feature is useful during a major disaster when many IAR events may be occurring. In such a scenario, disabling this option speeds up the propagation of IAR events to the slave controllers. The option can be enabled later to allow the Controller to distribute the alarms (that occurred during the event) to other controllers.

The `Maximum Alarms` field allows you to input the greatest number of alarms that the system can handle. If you do not select a value, the default value is `3000`.

Create/Modify Report Format

This routine allows you to specify items for an alarm report and the order in which they will be reported. Select this menu item and you are prompted to enter **`TEMP`**, or a `Report Format Name`, or to press `Enter` for a list of formats. For a full description of the TEMP filter, refer to Display Alarms earlier in this chapter. Upon entering the report format name, you call up the following screen (*See Figure 38-2*).

Report Format Name	NEW FILTER		Character Count (Up	to 132)
Field	Default No. Characters	Default Order	No. Characters	Order
Active DateTime	15	01	YES/NO	
Clear DateTime	15	02	YES/NO	
Alarm Duration	11	03	YES/NO	
Node Name	16	04	YES/NO	
Node Address	07	05	YES/NO	
Equipment Slot	12	06	YES/NO	
Port	01	07	YES/NO	
Subaggregate/Chan	03	08	YES/NO	
* Link/Circuit/etc.	28	09	YES/NO	
Alarm Type	15	11	YES/NO	
Alarm Level	05	12	YES/NO	
Alarm Status	03	13	YES/NO	
Controller Addr	04	13	YES/NO	
Standard Format	28	14	YES/NO	
Save As		Delete Report	Format	

* Report of Link Name, Circuit Name, or description of Audit Trail Alarm.

Figure 38-2 Report Format

You can make selections of **`YES`** or **`NO`** for a particular field. When you select **`YES`**, the `No. Characters` (character count) is updated, and the `Order` is shown. You can modify `Character Count` (maximum of **`132`**) and `Order` (order of fields printed in the report).

You can **`Save As`** (you are prompted for a name), or you can **`Delete Report Format`** in which case, the current report format prints from the data base.

Active Alarm Update

This routine displays active alarm messages as they are received by the Controller. Each new alarm message is then displayed as soon as the Controller receives the alarm information.

`Active Alarm Update` provides continual monitoring of the network. The Controller may be left unattended (overnight, for example). System problems are presented in chronological order as alarm messages. When you select this routine, the `Alarm Update Menu` is displayed.

If more than 15 alarms exist while the alarm update routine is running, the alarm messages are paged, with 15 alarm messages to a page. When a new page is about to be generated (due to a new alarm message), the Controller generates a message warning that a new page is about to occur and displays the page 10 seconds later. The display is limited to a maximum of 20 pages.

There are two methods for stepping through the alarm update display pages:

1. You may type in the desired page number and press `Enter`. The page number may be any number within the range of pages shown in the top right-hand corner of the display.
2. The Backup Page (**F5**) and Advance Page (**F6**) keys step the display backward or forward through all pages in the active alarm list. At the last page, **F6** returns to the first page. At the first page, **F5** returns to the last page.

If you are displaying a page other than the last (latest alarms) page, and new alarm information is received by the Controller, a warning message is issued; after a short delay, the last page is displayed on the screen with the new alarm message.

If the mode is set to `Active Only`, the active alarm is removed from the display when it is cleared. If the mode is set to `Active and Clear`, the active alarm is displayed as cleared (`Clr`, `Rcl`, or `Mom` – in green).

Alarm Backup

This routine allows you to save alarms to a floppy disk. Upon entering this menu item, you are prompted to enter **TEMP**, or a `Filter Name`, or to press `Enter` for a list of filters. For a full description of the TEMP filter, refer to Display Alarms earlier in this chapter. Once you have made a selection, you are prompted to insert a formatted floppy disk for the backup.

Identify Floppy

This routine provides information about a floppy disk that is in the drive. Depending on what is on the disk, the screen display varies. *Figure 38-3* is an example for a disk that contains release disk information.

```
Software Release Disk                         GTS1            30-APR-1996 11:24:31

       System Version:                                GTS V220

       Date and Time Stamp:                           20-AUG-1995 11:21:09

       Disk in Set                                    1 of 13

       Disk Type                                      GTS SETUP
```

Figure 38-3 Identify Floppy

Table 38-1 TMS-3000 Alarm Messages

Alarm Message	Definition
Aggregate Control Card	
ACC Cnfg Error	The module type configured for the slot does not match the module occupying the slot or the jumpers are set incorrectly.
Board Failure	A problem exists within the module for the specified slot.
ACC Not in Slot	Either no module occupies the specified slot or module connector pins are not making proper contact with the shelf backplane.
Dropped Channel	A configuration problem (generally due to lack of aggregate or channel interface bandwidth) has caused the module to exclude a channel from service. You should immediately check the configuration display for the module to determine what has caused the channel to be dropped from the multiplexing frame of the module.
ACC Logic Fault	A failure in multiplexing/demultiplexing data or controls has occurred. This could signify a hardware problem, timing problem, or aggregate trunk deterioration.
ACC Lost alarm	ACC alarm queue is full.
Link Down	The specified aggregate module has been unable to communicate with its remote counterpart for a length of time. This may be due to an aggregate module or trunk failure.
Link Fail A	No activity detected on the link.
Link Fail B	No activity detected on the link.
ACC Out of Sync	The specified aggregate module cannot synchronize with the aggregate receive data from its remote counterpart (The configuration for the aggregate determines the delay between the start of the Out-of-Sync condition and the alarm reporting by the node).
Backup Failed	This occurs when the aggregate trunk currently not in service has not passed supervisory data for a length of time (Diversity Aggregates only).
ACC Performance	ACC configured error threshold has been exceeded.
Channel Interface Card and Digital Bridging Card	
CIC Cnfg Error	The module type configured for the slot does not match the module occupying the slot.
Board Failure	A problem exists within the module for the specified slot.
CIC Not in Slot	Either no module occupies the specified slot or module connector pins are not making proper contact with the shelf backplane.
Dropped Channel	A configuration problem (generally due to lack of aggregate or channel inter-face bandwidth) has caused the module to exclude a channel from service. You should immediately check the Configuration display for the module to determine the cause.
CIC Logic Fault	A failure in multiplexing/demultiplexing data or controls has occurred. This could signify a hardware or timing problem.
CIC Lost alarm	CIC alarm queue is full.
Grp Not In Slot Grp Cnfg Err Grp Fail/Lpbk Grp Out Of Sync Grp Rcv Clock Grp Xmt Clock Grp DCD	These alarms report failures on channel modules that communicate through the specified Channel Interface Card. Five or more channel modules must experience the alarm condition before this "group" alarm is reported. Each alarm condition is defined under Channel Modules below. If you receive one of these alarms, use the Channel Status displays (in Diagnostics and Status) to determine which channel modules are experiencing alarm conditions.

Alarm Message	Definition
Channel Interface Card and Digital Bridging Card (Cont.)	
Grp Not In Slot Grp Cnfg Err Grp Fail/Lpbk Grp Out Of Sync Grp Rcv Clock Grp Xmt Clock Grp DCD	These alarms report failures on channel modules that communicate through the specified Channel Interface Card. Five or more channel modules must experience the alarm condition before this "group" alarm is reported. Each alarm condition is defined under Channel Modules below. If you receive one of these alarms, use the Channel Status displays (in Diagnostics and Status) to determine which channel modules are experiencing alarm conditions.
DBC Streaming	For *Multidrop with Data Lockout,* Anti-Streaming detection operates by detecting a condition of RTS ON and a fan locked to one branch for a period of time greater than the selected period. For *Multidrop without Data Lockout,* the DBC assumes a Mark-Idle environment and monitors all branches for a condition of constant spaces in the data for a period of time greater than the selected period.
CDA and IAC Module Alarms	
CDA or IAC Cnfg Error	The module type configured for the slot does not match the module occupying the slot, or CDA in the backup slot of a TMSC does not have the proper basecard revision to Backup of PRI-2
Board Failure	The CDA or IAC Module does not respond to the ESCC. This alarm can occur for a variety of reasons, such as a download failure, a hardware failure, or an EEPROM error during normal operation.
RmtCfg Mismatch	Some of the subaggregate configuration parameters do not match at each end of the link.
CDA or IAC Not In Slot	Either no module occupies the specified slot or module connector pins are not making proper contact with the shelf backplane.
CDA or IAC Card Down	The specified CDA or IAC Module is not able to pass data. If there is a redundant card, then both cards cannot pass data
Dropped Channel	A configuration problem (generally due to lack of bandwidth) has caused the module to exclude a channel from service.
Lost Alarms	This is generated by the CDA or IAC Module when alarm module is unable to report some alarms because of buffer depletion. When the CDA or IAC recovers from this situation, this alarm report is generated.
Port Failure	A Port Failure Alarm is generated under the following conditions (These only occur through the Status routine): Condition 1 — Out of Sync (Red Alarm) This alarm is generated after an integration period on Loss of Sync at the port level. It is cleared after an integration period of being in synchronization. This alarm operates the red LED. Condition 2 — Remote Alarm Detected (Yellow Alarm) A remote terminal has lost synchronization. This indicates a problem at the remote end. The alarm is sent after integrating a Yellow Alarm condition on the line (e.g., a Red alarm has been declared at the remote terminal). The alarm is cleared after integrating the removal of a Yellow alarm condition (e.g., remote terminal has removed its Red alarm condition). This alarm operates the Yellow LED.

Alarm Message	Definition
CDA and IAC Module Alarms (Cont.)	
Port Failure (Cont.)	Condition 3 — Alarm Indication Signal Detected (Blue Alarm) Detection of this signal on the incoming port indicates a problem upstream of the local terminal. The alarm determination is made by the remote terminal. Alarm is cleared when the removal of the signal from the indicated port has been detected. When this alarm is active, both red and yellow LEDs are on. Condition 4 — Loss of Carrier This alarm is generated after integrating when a line signal is absent (e.g., a complete line failure for at least 0.1 second). The alarm is cleared when the signal returns. This alarm also operates the red LED.
Port Performance	This alarm can be generated for one of four reasons: 1) Port Out-of-service – Selectable error rate to detect degrading performance of the line before out-of-sync condition occurs has been exceeded. 2) Buffer Slip Threshold Exceeded – When the CDA or IAC Module is connected to a PBX and both clocks are running at different rates, a buffer can slip. These buffer slips are accumulated for designated time periods and compared to their respective threshold values. Thresholds are set to defaults or specified by the user. When the number of buffer slips exceeds an hourly or 24 hour threshold, an alarm is generated. The alarm is cleared when the amount of buffer slips are below the threshold. 3) Failed Signal Alarm – The number of errors meets or exceeds a bit error rate of 10^{-3} for ten consecutive 1-second periods. The alarm is cleared when the error events are below the bit error rate. This condition is detected before the link degrades to an out-of-sync condition. 4) Loss of Carrier
Sagg Threshold	You can set an error threshold limit on the subaggregate which generates an alarm when the error limit is reached. The error limit is in terms of 10^{-x} errors per bit. Exponent x ranges from –3 through –6. The alarm is cleared after an integration period when the number of errors is less than the error limit. An option is available to shut off the subaggregate error threshold.
Sagg Down	This alarm is generated by a CDA or IAC module. The communication overhead task does not receive a response from the specified subaggregate, or the remote CDA or IAC is in boot.
Sagg OutOfSync	A TMS-3000 subaggregate is out-of-sync with its report counterpart. The alarm is cleared after an integration period of being in synchronization.
ACM Alarms	
ACM Not in Slot	Either no module occupies the specified slot or module connector pins are not making proper contact with the shelf backplane.
Board Failure	A hardware failure has occurred on the selected ACM.
ACM Cnfg Error	A different type of module (ACC, CIC, CDA, IAC, or TPP) occupies the slot designated for an ACM.
Chn Failure	An ACM Minor alarm is generated if one of two conditions occurs. This alarm operates the Minor Alarm LED. Condition No. 1 — Channel Out-Of-Sync An alarm generated when a single channel is declared out-of-sync after an appropriate integration period. Condition No. 2 — Channel Receive Clock Error Generated when a receive clock error for a single channel exists.

Alarm Message	Definition
ACM Alarms (Cont.)	
Port Failure	An ACM Port Failure Alarm is generated under the following conditions, and note that these occur only through the Status routine: Condition No. 1 — Out Of Sync (Red Alarm) This alarm is generated after an integration period on Loss-of-Sync at the D4/ESF level. It is cleared after an integration period of being in synchronization. This alarm operates the red LED. Condition No. 2 — Remote Alarm Detected (Yellow Alarm) A remote terminal has lost synchronization. This indicates a problem at the remote end. The alarm is sent after integrating a Yellow Alarm condition on the line [e.g., a Red alarm has been declared at the remote terminal or all circuits at the remote are out-of-sync (E1 only)]. The alarm is cleared after integrating the removal of a Yellow Alarm condition [e.g., remote terminal has removed its red alarm condition or one or more circuits at the remote are in sync (E1 only)]. This alarm operates the yellow LED. Condition No. 3 — Alarm Indication Signal Detected (Blue Alarm) Detection of this signal on the incoming port indicates a problem upstream of the local terminal. The alarm determination is made by the remote terminal. The alarm is cleared when the removal of the signal from the indicated port has been detected. When this alarm is active, both red and yellow LEDs are on. Condition No. 4 — Loss Of Carrier This alarm is generated after integrating on the absence of a line signal. The alarm is cleared when the signal returns. This alarm also operates the red LED.
Grp Chn Failure	When five or more channels with the same type of fault occur within a predefined time period. Condition No. 1 — Channel Out-Of-Sync Condition No. 2 — Channel Receive Clock Error
I/O Frame Slip	Port Clock Slipping
Hardware Fail	Receive Signaling, Receive FIFO, Transmit Signaling, Transmit FIFO, Driver Performance Fault — See Status.
Port Performance	Failed Signal State. This should rarely occur because the Port Failure Alarm overrides this.
Enterprise System Control Card	
Self Test fail	A problem, usually hardware, exists on the specified ESCC.
ESCC Not In Slot	The specified ESCC is not in its slot or is not making proper contact with the backplane connectors.
RCC Not in Slot	The RCC has failed or is out of its slot.
Internal Clock fail	The clock generator circuits of the specified ESCC are not operating properly.
External Clock Fail	The ESCC cannot phaselock to the external timing signal supplied to it through the main shelf backplane.
Local Address Error	The ESCC address DIP switch does not match the configuration data downloaded from the Controller.
ESCC Configuration Mismatch	The ESCC type does not match the configuration data downloaded from the Controller.
ESCC High-Speed Communications Error	The ESCC is not equipped for high speed communications.

Alarm Message	Definition
Enterprise System Control Card (Cont.)	
EEPROM Not Upgraded	The ESCC is not equipped with the necessary EEPROM upgrade.
ESCC Redundant Switch	The ESCC has just come into service via a redundant swap.
ESCC Lost Alarms	Alarms are lost due to an alarm queue being full.
ESCC Reset	ESCC has reset itself. Communications to the node may be affected, but customer data is not.
Node Reset	The node has undergone a power up.
ESCC Out-of-service Link Down	The link to the out-of-service ESCC is not operational.
ESCC Files Too Large	The files in the currently selected software revision list exceed the storage space available.
ESCC Out-of-service Update Disabled	The out-of-service ESCC update has been disabled for more than six hours following a software activation.
TMS Data or Voice Channel Modules or DBC Channels	
Chn Not In Slot	The specified channel module is either not in its expansion shelf slot, or is not making proper contact with the backplane connectors.
Chn Cnfg Error	The module type configured for the channel slot does not match the module occupying the specified slot.
Chn Xmt/Rcv Clock (Universal MM+V4 channels only)	The transmit or receive timing signal of the channel module has failed significantly enough to interrupt data flow within the channel module or caused buffer overflow.
Chn Xmt Clock	Transmit data flow in the channel module has been disrupted by a timing-related failure or loss of external transmit clock.
Chn Rcv Clock	Receive data flow in the channel module has been disrupted by a timing-related failure.
Chn-Out-of-Sync	(PCM/ADPCM/ASP voice channels only) Voice channel module in specified channel slot cannot establish synchronization with its remote counterpart.
Chn DCD alarm	Control 1 (DCD) is off on data channel that has its Control 1 alarm enabled.
DCD Failed	This occurs when Control 1 drops on a channel configured with the DCD fail option. It normally indicates a tail circuit failure.
Fail/Rcv Lpbk	Operating parameters stored in the channel module do not match parameters received from the ESCC. This usually indicates a channel module failure.
Rmt Loopback	A remote loopback has been detected, but no diagnostic is running.
Streaming Error	A DBC fan has locked to a branch for a period of time in excess of the configured anti-streaming time-out.
TPP and OPP Alarms	
TPP Cnfg Error	The module type configured for the slot does not match the module occupying the slot.
Board Failure	A problem exists within the module in the specified slot.
TPP Not In Slot	The specified module is either not in its slot or is not making proper contact with the backplane connectors.
TPP Card Disabled	The specified card has been disabled using the special dual-port RAM location.
TPP Partial s/w	The module is unable to get a complete program download.
TPP Temp Alert	The module detects that the board is overheating.
Chn/DB25 Fail	The channel is unable to pass data normally.

Alarm Message	Definition
TPP and OPP Alarms (Cont.)	
DB25 Xmt/Rcv	The DB25 transmit or receive timing signal has failed significantly enough to interrupt data flow or cause buffer overflow.
DB25 Xmt Clk	The DB25 transmit data flow has been disrupted by a timing-related failure or loss of external receive clock.
DB25 Rcv Clk	The DB25 receive data flow has been disrupted by a timing-related failure or loss of external receive clock.
Chn/DB25 Perf	The ability of the channel to pass data, while not lost, is seriously compromised.
Cr Congestion	A TPP circuit has an excessive number of frames being discarded due to sustained congestion.
TPP/OPP Cfg Err	Not all of the required plug-in modules are present, or jumpers are incorrectly set.
TPP Lost Alarms	The module has an alarm which it was not able to insert.
Modem / Modem Port / Supervisor Port Alarms	
DSR Off	The internal DSR (Data Set Ready) signal of the modem is Off. This indicates a hardware failure in the modem.
Mdm Link Level	Communications through modem port at a specified node level have been disrupted. This means a failure.
Svr Link Level	Communications through the supervisor port at a specified node have been disrupted. This is an indication of a failure in the link (Supervisor port is J20 for a TMS-3000 port and J6 for a TMSC port).
Power Supply	
Faulty Supply	A failure condition (usually a low or high voltage level) has been reported by a power supply.
TMS Controller Link Level Alarms	
Note that these alarms are not significant if they reflect transient failures. They are important if a condition remains active for some period of time.	
Operational	Point-to-point communications between the TMS-3000 and the local TMS-3000 node are proceeding without problems. Message occurs during system initialization or after a communications failure has been corrected.
Inoperative	Point-to-point communications between the TMS-3000 and the local node have failed. This disconnects the Controller from the network until communications are restored through correction or a modem link to another node.
Inop - DM Rcvd	A Disconnect Mode message has been received from the local TMS-3000 due to a failure in communications between the Controller and the node. The Controller attempts to communicate after receiving this message.
Inop - Busy	The local TMS-3000 node cannot communicate with the Controller because of messaging traffic problems in the network or in an ESCC.
Inop - FRMR Rcv	The local TMS-3000 node has received an invalid data frame from the Controller.
Command Disc	The local TMS-3000 node has received a disconnect command from the Controller.
Level 1 Fail	A hardware failure (probably related to serial communications) occurred within the Controller.

Alarm Message	Definition
TMS Controller Packet Level	
Note that these alarms are not significant if they reflect transient failures. They are important if a condition remains active for some period of time.	
Inop - NEF Rcvd	A Not Expected Frame (NEF) of data was received from the local TMS-3000 node. This generally indicates invalid or garbled data.
Init Required	The local TMS-3000 node has no System Controller software and requires a System Controller Program Download (see Download).
Init State	A System Controller Program Download is currently in progress. The local TMS-3000 node is currently in the initialization state.
Init UI State	An unnumbered information packet is being exchanged between the Controller and the remote node. This step is necessary in establishing a dial backup link.
UI Terminated	The dial backup link is being established and the Controller can enter into normal supervisory communications with the remote node. When normal communications begin, this alarm message clears.
Operational	The Controller is able to communicate with the specified TMS-3000 node. This message occurs during system initialization or after a communications failure is corrected.
Offline	The specified node is not responding to communications from the Controller.
User Reset	The Controller has generated a reset of the packet level communications between the Controller and the TMS-3000 network.
Remote Reset	A TMS-3000 node requests a reset of packet level communications between the Controller and the network.
User Set Online	The Controller has declared the specified node to be on-line (capable of communicating with the Controller).
Busy Reset	Packet level communications between the TMS-3000 and the specified node have been reset. The reset attempts to correct communications problems caused by high System Controller CPU use at the node.
NEF Reset	Packet level communications between the Controller and the specified node have been reset. The reset occurred because a Not Expected Frame (NEF — generally invalid or garbled data) was received from the node by the Controller.
RSTC Reset	An invalid Reset Confirmed message was received from the node. This indicates that the node reset its packet level communications without receiving a reset command from the Controller.
User Delete	Packet level communication between the Controller and the specified node was shut down due to its deletion.
User Shutdown	A packet level communication between the Controller and the specified node was shutdown.
Universal MM+V4 AUTOFRAME Module	
A/F Fault	The AUTOFRAME module at the specified Universal MM+V4 node is either out of its shelf slot or has failed a self test.
Node Mismatch	The node type configured for the node does not agree with the firmware installed in the AUTO FRAME Module.
S/W Rev. Error	AUTOFRAME software is not compatible with the ACC.
Chn Minor Alarm	This alarm occurs when any channel on the Universal MM+V4 is in alarm condition.
Universal MM+V4 T/R Logic Module	
T/R Fault	A hardware failure has occurred on the Transmit/Receive Logic Module, Clock Generator or Expansion Module of the specified Universal MM+V4 node.

Alarm Message	Definition
CCM Alarms	
CCM Not In Slot	The CCM is not in its slot or is not making proper contact with the backplane connectors.
Board Failure	This message occurs when a problem exists within a module in a specified slot.
CCM Cnfg Error	The module type configured for the slot does not match the module occupying the slot.
CCM Clk Fail	The clock generator circuits of the specified CCM are not operating properly.
Supply Cfg Err	The power available on the node is less than the selection made during configuration.
Mdm Failure	On-board modem failure.
CCM AutRed Swap	CCM AUTO REDUNDANT SWAP indicates the CCM card switched out-of-service automatically.
CCM ManRed Swap	CCM MANUAL REDUNDANT SWAP indicates that the CCM card is switched out-of-service manually, either by Controller diagnostics command or by using the DSBL button
CCM Lost Alarms	Alarms have been lost due to an alarm queue being full.
CCM Bus Error	CCM has detected a problem and isolated itself from the bus.
LIM Alarms	
LIM Not In Slot	The LIM is not in its slot or is not making proper contact with the backplane connectors.
Board Failure	A problem exists within the module in the specified slot.
LIM Cnfg Error	The module type configured for the slot does not match the module occupying the slot.
LIM Failure	A non-redundant card, or both cards of a redundant pair, has requested to be switched out-of-service.
Red Alarm	Loss of carrier (not applicable to V.11, V.35 or BQ LIMs).
Out of Net Sync	The D4 frame is out of sync (not applicable to V.11, V.35 or BQ LIMs).
Out-of-service	One or more DS0s on a subaggregate are out-of-service (not applicable to V.11, V.35 or BQ LIMs).
Abnormal Statn	Abnormal Station Code indicates that the remote end has a problem (not applicable to V.11, V.35 or BQ LIMs).
LIM Sagg Down	The subaggregate has lost communications or the remote end is in boot.
Sagg Threshold	The subaggregate exceeds the user specified threshold rate (applies to TMS-type subaggregates only).
Sagg Out Of Sync	Loss of synchronization pattern has occurred over a specified period of time.
LIM Link Down	Specified LIM not communicating with its remote counterpart.
LIM Bus Error	DFP Read Back error
LIM AutRed Swap	LIM AUTO REDUNDANT SWAP indicates the LIM card switched out-of-service automatically.
LIM ManRed Swap	LIM MANUAL REDUNDANT SWAP indicates that the LIM is switched out-of-service manually, either by Controller diagnostics command or by using the DSBL button
Remote X.50 Subaggregate	Any alarm reported by the remote X.50 device, probably an out-of-sync condition.
Port Down	Port Down indicates that the out of frame bit on the port interface is set (or clear) consistently during the port failure (or restoral) time.

Alarm Message	Definition
LIM Alarms (Cont.)	
Local Block Error Threshold Exceeded	Local Block Error Threshold Exceeded indicates that the near end block error rate exceeds the port error threshold.
Remote Block Error Threshold Exceeded	Remote Block Error Threshold Exceeded indicates that the far end block error rate exceeds the port error threshold.
OCM Data/Voice Channel Module Alarms	
Chn NotInSlot	The specified module is either not in its slot or is not making proper contact with the backplane connectors.
Board Failure	A problem exists within the module in the specified slot.
Chn Cnfg Error	The module type configured for the slot does not match the module occupying the slot.
Dropped Channel	A configuration problem, usually because of lack of bandwidth, has caused a channel to be excluded from service.
Chn Rcv Clock	The receive data flow has been disrupted by a timing related failure.
Chn Xmt Clock	The transmit data flow in the channel module has been disrupted by a timing related failure.
Chn OutOf Sync	The voice channel module in the specified channel slot cannot synchronize with its remote counterpart.
Chn Bus Error	DFP Read Back error
V54 Test Mode	V54 Test Mode detected
Port Down (BQ Channel Only)	Port Down indicates that the out of frame bit on the port interface is set (or clear) consistently during the port failure (or restoral) time.
Chn DCD Alarm	This alarm occurs when the Data Carrier Detect Lead drops on a channel configured with the DCD Alarm option.
Note that, although the following three table subsections (Operator/ Maintenance, Operator Diagnostics, and IAR) are reported as alarms, they actually are a record of operator action/intervention and IAR actions.	
Operator/Maintenance	
User Login	This occurs whenever an operator logs into the on-line network.
User Logout	This occurs whenever an operator logs out of the network.
Set Date/Time	This occurs whenever an operator sets the system date/time.
Shutdown Cntrl	Shutdown Controller occurs whenever an operator manually shuts off a network controller.
Master	Master Initiation occurs when a controller becomes Master due to operator action or loss of communications with the current Master.
Subordinate	Subordinate Initiation occurs when a controller becomes a Subordinate due to operator action or merger with another Master.
Alarm DB Active	Alarm Data Base Activated occurs when the operator enables alarm collection into the data base.
Shut Audible	Audible Alarm Shutoff occurs when the operator shuts off the audible alarm via a function key.

Alarm Message	Definition
Operator Diagnostics	
ESCC Red Swap	ESCC Redundant Swap Diagnostic indicates that the operator has initiated a forced redundant swap of the designated ESCC.
ACC Loopback	ACC Loopback Diagnostic indicates that the operator has initiated a loopback on the designated aggregate.
ACC Failure Sim	ACC Failure Simulation Diagnostic indicates that the operator has initiated a failure simulation on the designated aggregate.
CIC Loopback	CIC Loopback Diagnostic indicates that the operator has initiated a Loopback on the designated Channel Interface Card.
Port Loopback	Port Loopback Diagnostic indicates the operator has initiated a port loopback on the CDA/IAC/OCM port.
Sagg Lpk CDA-T1, CDA-E1, IAC-T1, IAC-E1, OCM	SAGG Loopback Diagnostic indicates that the operator has initiated a subaggregate loopback on the CDA/IAC/OCM.
Sagg Fail Sim	SAGG Failure Simulation Diagnostic indicates that the operator has initiated a subaggregate failure simulation.
LIM Failure Sim	LIM Failure Simulation Diagnostic indicates that the operator has initiated a LIM failure simulation.
IAR	
Circuit Failure	IAR Circuit Failure occurs when a configuration problem has caused IAR to exclude a channel from service.
Backbone Change	IAR Backbone Change occurs when an operator makes a data base change that affects basic network layout.
Data Base Change	IAR Data Base Change occurs when an operator makes a data base change that does not affect basic network layout.
Optimization	IAR Circuit Route Optimization occurs on either a timed basis or on user request.
Cnfg Transition	IAR Configuration Transition happens because of TOR, DRR or a user request.
Link Up ACC, CDA-T1, CDA-E1, IAC-T1, IAC-E1	IAR Link Up takes place when IAR does a route recalculation link-up event.
Link Dn ACC, CDA-T1, CDA-E1, IAC-T1, IAC-E1	IAR Link Down occurs when IAR does a route recalculation link down event.
System Init	IAR System Initialization occurs when IAR sets up the recovery subsystem upon power up, regains communications to the local node (or a new network).
Code Download	IAR Code Download occurs when IAR downloads code to one or more system elements when recognizing incorrect software.
Net Operational	IAR Network Operational occurs when IAR completes downloading and activating all required and available nodes.
IAR Complete	IAR Complete occurs when IAR completes an action or series of connected actions. If a failure occurs, "IAR Failed x of y nodes" is shown.

Summary

The TMS-3000 Alarm routines provide an up-to-date report on network problems. Alarm messages report network failures within seconds of problem occurrences. They report changes in failure characteristics and when the problem has been corrected.

In this chapter we covered the various alarm status and diagnostics routines. We also explained the format for alarm messages.

What's Next?

Chapter 39 covers Software Integrity.

39 Software Integrity

Overview

Integrity of system software, hardware, and firmware is essential for proper network operation. If one module contains incorrect software, hardware, or firmware, or is operating under an improper configuration, the resulting failures can affect a large section of the network.

There are two screens for Software Integrity: `Software Integrity` and `Node Integrity`. The format for Node Integrity differs, depending on the kind of node (TMS or OCM).

Topics covered in this chapter are:

NOTE

During the process of upgrading software, some restrictions and inaccuracies may apply. For specific software upgrade procedures, refer to Chapter 1.

Types of Integrity

Integrity information is broken up into three areas: Software Integrity, Hardware Integrity, and Firmware Integrity. Hardware and Firmware Integrity are covered in the *chapters on Status and Diagnostics.*

Software Integrity

Responses to software integrity requests from the Controller include:

Software version number.

Configuration version number for each configured group.

Network creation time for each configured group.

Configuration download time for each configured group.

The Controller polls for software integrity information at a regular interval of no less than once every ten seconds and no more than once every five seconds while you are in the Software Integrity subsystem of the TMS. The Controller also polls for software integrity information on an as needed basis in support of Configuration Download.

The Software Integrity routines are selectable from the TMS Main Menu for an on-line network. You should use these routines whenever you download configuration data or new software to any part of the network. The screens symbolically report the status of each software element in the network, using green for the elements that are part of the current set of revisions, red for those elements that are inconsistent with the rest of the network, and yellow for those elements that are in transition.

With GTS software, simply selecting new mux software files causes a background download. You should use the Software Integrity routine to verify that all nodes have received the correct software before proceeding with the upgrade. In a download, each node must receive data and then report the correct revision level back to the Controller. The Software Integrity routines should also be selected whenever any equipment is replaced at a node. This allows you to verify that software at the node is at the proper revision level.

Before using the Software Integrity routine, the configuration must be active and the network on-line. To view Software Integrity, use the **`F3`** key to display the `TMS Main Menu`. Select **`Software Integrity`** and press `Enter`.

When you choose **`Software Integrity`** from the `TMS Main Menu`, the first screen that appears, `Software Integrity`, provides a list of nodes in the network. Each node is represented by one line in the screen. The first item in a line is the symbolic name of the node. The next section in the screen reports the name of the active configuration and the corresponding configuration number (mapping) of the node. The section following that reports the status of configuration data at the node. Then, there are sections for reporting the status of revision lists, system software resident on the ESCCs, and system software resident on the cards themselves.

In general, a green asterisk indicates correct revisions or data. A red asterisk reflects some inconsistency with the Controller data base. Yellow asterisks typically indicate either a temporary or transitory state.

Node Name

This field shows, in alphabetical order, the node names of the network.

Configuration Name

This field displays the currently active TOR configuration (out of a possible 16).

Configuration NUR

The `NUR` field represents the Network ID, the Network Update Time, and the Network Controller Revision. There are two columns displaying the name and status of the current active configuration; one column displaying the status of the configuration stored in EEPROM at the node. These columns use the following mnemonics to identify the status of the configurations:

`N` (Network ID) – This field reports whether the on-line network at the Controller matches the on-line network being used by the node. If the `N *` is displayed in red, there is an inconsistency between the network selected for on-line access in the Controller and the network that was last downloaded to that node.

`U` (Update Time) – This field indicates whether the last configuration download time stored in the Controller matches the time stored at the node. Two probable causes for the `U *` being reported in red are (1) a modification of the configuration in the Controller and (2) a failure during the download operation of the node.

R (Network Controller Revision) – This field indicates whether the Controller software has been revised since the configuration was last downloaded to the node. If the R * is displayed in red, download the configuration to the node again.

There are three NUR columns for active configuration. TMS nodes use only the first column. OCM-2000 nodes, which can connect to up to two TMS nodes simultaneously (and derive their TMS configuration from these connected nodes), use the first two columns to display this information. The third column is used only by OCM-2000 nodes and displays information for common configuration information loaded to an OCM node.

The Stored columns summarize the stored configuration in a TMS-3000 node. In the case of OCM-2000 nodes, each stored column is a summary of the two stored TMS configurations.

PC REV LST, SW/RL ACT, SW/RL STO

These fields show whether or not there are any discrepancies in the revision lists and/or software revisions between those stored in the Controller and in the ESCCs. The acronyms are defined as follows:

PC REV LST - PC Revision List

SW/RL ACT - Software Revision List Active

SW/RL - Software Revision List Stored

The I and O represent In-Service ESCC and Out-of-Service ESCC.

Card Revs

These fields (numbered 1-16, for the 16 slots in a TMS node) show which slots have cards with a software revision level not agreeing with the governing revision list.

On a TMS node, a green * indicates that everything matches. A red * means that there is a mismatch for the card in that slot, and the Node Integrity screen for that node should be accessed to look at the specific problem. If there is no card in a slot, the field is blank.

OCM nodes may have up to 32 slots (two shelves, 16 slots each). Therefore, each of the 16 columns represents up to two slots in an OCM node. The column labeled 1 summarizes information for the first slot of shelves 1 and 2 (slots 1 and 17), column 2 summarizes information for the second slot of shelves 1 and 2 (slots 2 and 18), and so on. As with TMS nodes, green says that everything is okay, while red indicates a problem which you should look into via the Node Integrity screen for that node. If a red 1 is displayed in a column, that means a problem exists in the slot in shelf 1. A red 2 means that the problem exists in that slot in shelf 2. If an * is shown, the color applies to that slot in one or both shelves. If there is no card in the slot in either shelf, the field is blank.

Node Integrity Screen, TMS-3000

Highlight the node name in the Software Integrity screen and press Enter to bring up the Node Integrity screen for the highlighted node. This screen reports specific revision levels and information for all components summing to asterisks in the Software Integrity screen.

The Node Integrity screen has two pages for TMS-3000 and TMSC nodes (which differ slightly because the slot numbering scheme differs between the two node types), and three pages for OCM-2000 nodes.

Whenever the `Software Integrity` screen indicates problems at a node, choose the **`Node Integrity`** screen for that node to focus on the specific inconsistencies detected.

The following describes the fields on page 1 of the Node Integrity screen for a TMS node:

Config. Active/Stored

Information for the active (configuration in RAM) and stored (in non-volatile memory) configuration is displayed. Configuration data reported is as follows:

`Name` – The name of the present configuration.

`Network Name` – The network that was on-line when the configuration was downloaded or `NO NETWORK` to indicate that the network is not one of those stored in the Controller.

`Update Time` – The last time that the configuration was updated by IAR.

`Ctl Rev` – The revision level of the Controller software at the time the configuration was downloaded. Following are some other values which may be displayed in this field:

> `No_Rev` – No revision is stored in the TMS-3000.
>
> `ADR.ER` – Occurs in this field if either the node address switches are incorrect or a module is moved into a new node without clearing the configuration data base.
>
> `RE.MOD` – Occurs in this field whenever the nodal configuration data base is modified via the local maintenance console.
>
> `SLV.DN` – Occurs in this field whenever the 6809 processor on the ESCC is in boot.

`OutSrv ESCC -` This field shows `Fault`, `Match`, or `Link Down`.

> `Fault -` The configuration on the in-service ESCC doesn't match the configuration on the out-of-service ESCC.
>
> Link Down - The in-service ESCC and out-of service ESCC can't talk to each other.
>
> `Match` means everything is okay.

Slot Num

Equipment slot number in the node.

Equipment Type

Type of equipment inserted in the slot.

Software Revision

This field displays the revision of the program file that is currently running in the card. The volatile cards, such as ACC and CIC, do not have their own software revisions, but use the same one as that of the ESCCs. The software revision is in red if, after the software activation, it does not match the one in the ESCC revision list, or the one in the Stored file of the ESCC. For TPP/OPP, since the Controller does not download code to the TPP/OPP (they are managed by IMS), there are no entries in the revision list for these cards. Yet the Controller still gets the software version from the ESCC and is displayed as is.

The following describes the fields on page 2 of the Node Integrity screen for a TMS node:

SW Type

This column lists the names of the available software types possible.

TMS Controller Rev Lists Active/Stored

These two columns display the `Active` and `Stored` revision lists currently kept in the Controller data base. Program files missing from the proper Controller directory are in red. (This happens only if the files are accidentally deleted from the Controller after the revision list is created). Otherwise, revisions in the `Active` column always display in green. The same rules apply to the `Stored` column, with the exception that if a value in the `Stored` column differs from its corresponding value in the `Active` column, it is displayed in yellow.

In Service ESCC Revs List Active

This column displays the `Active` revision list held by the In-service ESCC. Revisions in this column are displayed in green if they match those in the Controller active revision list. Otherwise, they are displayed in red.

In Service ESCC Revs List Stored

This column displays the `Stored` revision list held by the in-service ESCC. Revisions in this column are displayed in green if they match those in the Controller stored revision list. Otherwise, they are displayed in red.

In Service ESCC SW Files Active

This column lists revisions of the `Active` software files that are actually on the in-service ESCC. Revisions in this column are in green if they match those in the In-service ESCC active list. A percentage-received value is displayed in yellow if the file is in the process of being downloaded. Otherwise, non-matching revisions are displayed in red.

In the cases of non-volatile card software files (e.g., ACM, CDA-T1, and IAC), the ESCC does not hold the active versions of these files. Therefore, their revision fields under the `In Service ESCC SW Files Active` column display white `*`.

In Service ESCC SW Files Stored

This column displays revisions of the `Stored` software files that are actually on the in-service ESCC. Revisions in this column are displayed in green if they match those in the in-service ESCCs stored list. A percentage-received value is displayed in yellow if the file is in the process of being downloaded. Otherwise, non-matching revisions are displayed in red.

Out of Service ESCC Revs List Active

This column displays the `Active` revision list held by the out-of-service ESCC. Revisions in this column are displayed in green if they match those in the Controller active list. They are displayed in yellow if the `Out of service ESCC Update` field is disabled, or in red if enabled.

Out of Service ESCC Revs List Stored

This column displays the `Stored` revision list held by the out-of-service ESCC. Revisions in this column are displayed in green if they match those in the Controller stored list. They are displayed in yellow if the `Out of service ESCC Update` field is disabled, or in red if enabled.

Out of Service ESCC SW Files Active

This column displays revisions of the `Active` software files that are actually on the out-of service ESCC. Revisions in this column are displayed in green if they match the revisions in the out-of-service ESCC active list. A percentage-received value is displayed in yellow if the file is in the process of being downloaded. Otherwise, non-matching revisions are displayed in red.

In the cases of non-volatile card software files (e.g., CDA-T1 & IAC) the ESCC does not keep the active versions of these files. Therefore, their revision fields under the `Out of service ESCC SW Files Active` column are displayed in white `*`.

Out of Service ESCC SW Files Stored

This column displays revisions of the `Stored` software files that are actually on the out-of service ESCC. Revisions in this column are displayed in green if they match the revisions in the out-of service ESCC stored list. A percentage-received value is displayed in yellow if the file is in the process of being downloaded. Otherwise, non-matching revisions are displayed in red.

DTStamp Matches PC:

This field indicates whether the date/time stamp of the revision list on the node matches the date/time stamp of the revision list on the Controller. If they match, a green `Yes` displays in the field at the bottom of the screen. Otherwise, a red `No` displays. You can see this field under the four rev-lists fields (`Active/Stored` columns) that are under `In Service ESCC` and `Out of service ESCC Rev Lists` and `SW Files`.

OCM Node Integrity Screen, Page 1

The top two lines of this screen are the same as the previously discussed Node Integrity Screen (*See Figure 39-1*).

The top half of the screen describes the stored and active configurations.

An OCM-2000 has up to two active/stored TMS configurations (one for/from each link), as it can be connected simultaneously to one or two different TMS nodes. So, you can have two active/stored displays of TMS configuration information.

A third display of information may appear for common configuration. Since this information is not directly related to a particular link, the columns for connection information remain blank.

Screen Colors

For `PC Rev Lists`, if the Active and Stored files exist on the Controller and the `Stored` revision string matches the `Active` revision string, then both strings are displayed in green. If the Active and Stored files exist on the Controller and the `Stored` revision string does *not* match the `Active` revision string, then the active string is displayed in green with the stored string displayed in yellow.

If the Active file does not exist on the Controller, red asterisks (`*`) are displayed for the PC Rev Lists Active string. If the Stored file does not exist on the Controller, red asterisks (`*`) are displayed for the `PC Rev List Stored` string. If neither the Active nor Stored list exists on the Controller, you see blanks for both strings.

If the active CCM revision string matches the Active Controller revision string, the `CCM Rev List Active` string is displayed in green. Otherwise, it is displayed in red.

If the stored CCM revision string matches the stored Controller revision string, the `CCM Rev List Active` string is displayed in green. Otherwise, the string is displayed in red.

```
Node Integrity                    NET2                              08-APR-1996 16:23:33
Node:  F1                     Addr:  F0001      Type:  OCMS
A  OCM   Connected
/  LIM   TMS Node      P     Config                                     Ctl    Out_Sv
S  S1 Bd  Adr Sl P Bd   B     Name      Network Name   Update Time     Rev     CCM
A  0   1   54  0 B  7  1   No Cnfg     NO NETWORK                 V220g   Match
S                            No Cnfg     NO NETWORK                   V220g   Match
A  7   1   26  3 B  1  2     No Cnfg     NO NETWORK                   V220g   Match
S                            No Cnfg     NO NETWORK                   V220g   Match

A  7   1   26  3 B  1  2     No Cnfg     NO NETWORK                   V220g
S                            No Cnfg     NO NETWORK                   V220g

SW Type         PC Rev Lists    CCM Rev Lists
              Active  Stored      Active    Stored          DTStamp Matches PC
CCM           2.2.0A  2.2.0.A     2.2.0.A   2.2.0A            Active    Stored
DPV-CMN       DPV.AA  DPV.AA      DPV.AA    DPV.AA             Yes       Yes
DPV-IMBE      IMB.AA  IMB.AA      IMB.AA    IMB.AA
DPV-FAX       ******* NOFAX.A     *******   NOFAX.A

A/S  Active/Stored    Sl  Slot    P  Port    Bd  Bundle    PB  Priority Bundle
```

Figure 39-1 OCM Node Integrity Screen, Page 1

The following list defines the screen items:

A/S

Active/Stored Configuration. `A` in this field indicates active, and `S` in this field indicates stored LIM configuration data.

OCM LIM Sl Bd

The OCM LIM slot and bundle connected to the TMS node. These fields are used only for TMS configuration links.

Connected TMS Node

These fields are used only for TMS subaggregate links.

`Adr` – Connected TMS node address. This is the address of the TMS node to which the LIM is connected.

`Sl` – The slot number of the connected CDA card. This is the TMS node slot number to which the LIM is connected.

`P` – The CDA port to which the LIM is connected (TMS node port number).

`Bd` – Bundle ID of the LIM.

`PB` – The priority bundle identifies which group determines the configuration, if the groups disagree.

Config Name

Name of the configuration.

Network Name

Name of the network.

Update Time

Configuration download time.

Ctl Rev (Control Rev)

Controller software revision number.

Out_Sv CCM (Out-of-Service CCM)

This field displays the status of in-service and out-of-service configurations. If both are the same, a green `Match` is displayed. If they are different, a red `Fault` is displayed. If the intercommunications CCM link is down, a red `Down` is shown.

SW Type (Software Type)

This field displays the types of downloadable software for the OCM node. There are four file types:

- CCM
- DPV
- DPV Voice Algorithm
- DPV FAX Algorithm

PC Rev List

These fields (`Active` and `Stored`) display the active and stored software revision strings that are stored in the Controller revision list.

CCM Rev List

These fields (`Active` and `Stored`) display the active and stored CCM software revision strings that are stored in the Controller revision list.

OCM Node Integrity Screen, Pages 2 and 3

The following is a description of the screen colors fields found on page 2 of the OCM Node Integrity screen (*See Figure 39-2*).

```
Node Integrity                 NET2                     08-APR-1996 16:23:33
Node:  F1                    Addr:  F0002     Type:  OCMS         Page 2 of 3

Slot            -------COMMON-------  ---DPV ALGORITHM---     -----DPV FAX-----
Num  Card Type    -REVLIST- -SOFTWARE- -REVLIST- -SOFTWARE-  -REVLIST- -SOFTWARE-
                  ACT   STO   ACT   STO  ACT  STO  ACT  STO    ACT STO   ACT STO
01   CCM/RED     AD12A  ***   AD12A ***
02                ***   AD12A ***   AD12A
03
04
05
06   DPV/FXS     CM01A CM01A CM01A CMO1A IM01 IM01 IM01 IM01
07
08
09
10   DPV/E&M     CM01A CM01A CM01A CMO1A IM01 IM01 IM01 IM01
11
12
13         Note that page 3 of this screen is for slots 17 - 32.
14
15
16
```

Figure 39-2 OCM Node Integrity Screen, Page 2

Screen Colors, Pages 2 and 3

Card types are displayed in white.

The CCM revision list (REVLIST) columns follow the same color rules as described earlier for Page 1 of the screen.

The software revision list (SOFTWARE) columns have these rules:

- If the active or stored revision string represents the percentage of code downloaded, the percentage value is displayed in yellow.
- If the software revision string matches the CCM revision list, the string is displayed in green.
- If the software revision string does *not* match the CCM revision list, the string is displayed in red.

Note that page 3 of the OCM Node Integrity is for OCM Shelves. It has the same format as that of page 2, except that the slot numbers range from 17 to 32.

Slot Number

Represents the slot numbers in the OCM shelf or enclosure.

Card Type

Represents the card type for each card in the OCM node to which code has been downloaded. These are either CCM or DPV cards.

COMMON REVLIST ACT

Represents the active common code revision string listed in the OCM revision list. For a CCM, the active common code refers to the active CCM code. For a DPV card, the active common code refers to the active DPV code.

COMMON REVLIST STO

Represents the stored common code revision string listed in the OCM revision list. For a CCM, the stored common code refers to the stored CCM code. For a DPV card, the stored common code refers to the stored DPV code.

COMMON SOFTWARE ACT

Represents the active common code software revision. For a CCM, the active common software is the CCM code which resides on the in-service CCM. For a DPV card, the active common software is the active DPV common software, located on the DPV card.

COMMON SOFTWARE STO

Represents the stored common code software revision. For a CCM, the stored common software is the CCM code, found on the out-of-service CCM. For a DPV card, the stored common software is the stored DPV common software, located on the DPV card.

DPV ALGORITHM REVLIST ACT

Represents the active DPV voice algorithm revision string listed in the revision list on the CCM.

DPV ALGORITHM REVLIST STO

Represents the stored DPV voice algorithm revision string listed in the revision list on the CCM.

DPV ALGORITHM SOFTWARE ACT

Represents the active DPV voice algorithm software revision on the CCM.

DPV ALGORITHM SOFTWARE STO

Represents the stored DPV voice algorithm software revision on the CCM.

DPV FAX REVLIST ACT

Represents the active DPV fax algorithm revision string listed in the revision list on the CCM.

DPV FAX REVLIST STO

Represents the stored DPV fax algorithm revision string listed in the revision list on the CCM.

DPV FAX SOFTWARE ACT

Represents the active DPV fax algorithm revision on the DPV card.

DPV FAX SOFTWARE STO

Represents the stored DPV fax algorithm revision on the DPV card.

Summary

Integrity of system software, hardware, and firmware is essential for proper network operation. If one module contains incorrect software, hardware, or firmware, or is operating under an improper configuration, the resulting failures can affect a large section of the network.

In this chapter we covered Software and Node Integrity for TMS-3000 and OCM-2000 nodes.

What's Next?

Chapter 40 covers the Download routines.

40 Download

Overview

The download routines provide various download functions for distributing data from the Controller to each TMS-3000 network. New software releases for TMS-3000 node hardware are downloaded to the network by these routines.

NOTE

During the process of upgrading software, some restrictions and inaccuracies may apply. For specific software upgrade procedures, refer to Chapter 1.

Software download occurs in the background, initiated by changing the stored revision list on the Controller. The Controller then downloads the modified stored revision list to every node in the network. Each node then requests software according to the stored list it received from the Controller or a neighboring node/controller.

When a software background download is initiated, only the local node (the one connected to the Controller) receives the download first.

The nodes communicate with each other to get the proper files as specified in the Stored Revision List in the Controller.

You may initiate a Circuit Route Optimization, System Verification, or Download Configuration as required.

If a download to a node fails, don't try to begin normal operations; try to determine why the download failed and correct the problem.

Topics covered in this chapter are:

- Download
  - Circuit Route Optimization
  - Initiate System Verification
  - Modify/Activate Software Revision List
  - Download Configuration as required
  - Force Supervisory Route Restoral
  - Delete User/Periodic Queued Requests
  - Delete User/Periodic/Alarm Queued Requests

Download

To view the Download/Activate screen, display the `TMS Main Menu`. Select Download and press `Enter`. The `Download/Activate` menu appears (*See Figure 40-1*). The upper left portion of the screen displays information about TOR, IAR, SRR, and DRR. The right part of the screen contains queued restoral commands.. Figure 40-1 is an example of what you might see if you initiate a `Force Supervisory Route Restoral` (This function is enabled when IAR defaults are set. *See Chapter 15.*)

```
Download/Activate  NET1                                         02-APR-1996 09:37:54
TOR:                                              |      Restoral: Current Activity
IAR:                                                Check SVR Routes
SRR:                                              |
DRR:
                                                  |      Restoral: Queued Events
                                                    Check SVR Routes
Circuit Route Optimization                        | SVR Route Restoral
                                                    Check SVR Routes
Initiate System Verification                      | SVR Route Restoral

Modify/Activate Software Revision List            |

Download Configuration As Required                |

Force Supervisory Route Restoral                  |

Delete User/Periodic Queued Requests              |

Delete User/Periodic Alarm Queued Requests        |
```

Figure 40-1 Download/Activate Screen

Circuit Route Optimization

This routine optimizes the routing of all nodes in the network using the IAR process. The routine is performed when you wish to optimize bandwidth use in the systems. The IAR algorithm avoids disturbing existing circuits after a number of failure/recovery events because bandwidth use may not be optimized.

When you select this routine from the `Download/Activate` menu, the Controller prompts you with the following question:

```
Are you sure you want to initiate IAR optimization?
```

Enter **`Y`** or **`N`**. If you enter yes, the IAR process starts calculating node and circuit routing based on the downloaded configuration.

The status line indicates when the IAR optimization is initiated and completed.

When using Circuit Route Optimization, circuits may be disturbed for several seconds until the new routing is stabilized.

Initiate System Verification

This routine verifies the system by doing a sanity check of the network. It also verifies the revision lists in each of the ESCC nodes, and, if different from the Controller, downloads the list. Do this routine after a new ESCC goes into service (upgrade) to ensure that the ESCC is running the proper version, or if alarm queued requests have been deleted, or if you are concerned that IAR has not correctly recognized the condition of links within the network. Additionally, it does a Download Configuration as Required.

Modify/Activate Software Revision List

Selecting this routine brings up the `Software Revision List` screen.

`File Type` — This field indicates the type of software file that the ESCC requests for a background download. For TMS-3000, ten system software files are available — `ESCM`, `ESCS`, `EACC`, `ECIC`, `ACM`, `OCM`, `IAC-NTT`, `IAC-CCITT`, `CDA-T1`, and `CDA-E1`. For OCM-2000, four system software files are available — `CCM`, `DPV-COMMON`, `DPV-IMBE`, and `DPV-FAX`.

`Revision List` — There are two groups of file revisions lists displayed on the screen, a `Stored` file and an `Active` file revision list. Each revision field specifies a revision string of its corresponding software file being used (or stored) in the network.

Software files can be de-selected if they are not needed by the network. This prevents their download to the network, decreasing the download time. This is accomplished by leaving the appropriate `Revision List` field blank, or if there are files listed in the fields, selecting **`None`** from the File Selection list, or typing spaces over the field to blank it out.

`Out-of-Service ESCC Update` (Enable/Disable) — This field is usually set to **`Enable`**, meaning that the revision lists on the out-of-service ESCC are automatically updated by the in-service ESCC. But if the capability of using Software Version Fallback is desired (e.g., during software upgrade, *Chapter 1*), set the field to **`Disable`**.

<<**`Fallback`**>> — This selection allows you to fall back to the previous software version if the `Out-of-Service ESCC Update` field is set to **`Disable`**.

`Select Stored Files Revisions`— This selection brings up the revision strings of all software files currently stored in the Controller and permit you to select them.

`Activate Stored Software Files`— This selection activates the stored software in the node. It also copies files in the stored revision list on the Controller to the active revision list on the Controller.

NOTE

Selecting and saving new file revisions causes the Controller to non-disruptively download the stored revision list to the nodes.

Due to ESCC memory limits, you can select only one IAC file.

The Software Integrity screens indicate whether each node has received correct software and configuration data. You should always select the Software Integrity routine after initiating a background download by changing the stored revision list.

Download Configuration as Required

The `Download Configuration As Required` routine downloads the current configuration to every node in the network that does not have the latest configuration. The Controller only downloads configuration to a node that has compatible software.

Force Supervisory Route Restoral

This option allows you to force a download of supervisory routing tables to all nodes.

After selecting **Force Supervisory Route Restoral**, supervisory routing tables are updated and downloaded. In normal operation this is an automatic function. If supervisory routing does not recover automatically, this function can be used as a manual override. If you do need to use this procedure to recover supervisory routing, report this to General DataComm Service.

Delete User/Periodic Queued Requests

If you choose more than one configuration or program download, the operations are queued in the order that you select them. Since download operations take some time to complete, you may decide to cancel a download operation. **Delete User/Periodic Queued Requests** removes all user requests which compromises the following: Download, Circuit Optimization and System Verification Requests from the queue (these requests were invoked by the user). But this *does not* delete requests that are queued by the system, such as IAR requests. To delete *all* requests, including those from the system, select **Delete User/Periodic/Alarm Queued Requests**. That also removes all periodic requests from the queue (consisting of periodic system verification checks performed for reasons of a sanity check on the TMS-3000 system).

Delete User/Periodic Queued Requests affects the **Download Configuration As Required routine**. A single download operation cannot be interrupted. Once download starts, you must wait until it completes.

If you select several operations and then use this routine, use **Software Integrity** to verify that all nodes have the same program and configuration data. Avoid leaving the network in an indeterminate state.

Delete User/Periodic/Alarm Queued Requests

This routine deletes all user requests (Download, Circuit Optimization and System Verification Requests) and periodic requests (Periodic System Verification Checks) sitting in the queue. It also removes all IAR events generated by alarms that have been received (i.e., link failed, link recovered, supervisory route restorals, and supervisory route checks.)

Use Delete User/Periodic/Alarm Queued requests only under conditions where you intend to load new software or do major system maintenance.

Summary

Download routines provide various download functions for distributing data from the Controller to each TMS-3000 network. New software releases for TMS-3000 node hardware are downloaded to the network by these routines.

In this chapter we covered the download routines.

What's Next?

Chapter 41 covers the Network Maintenance routines.

41 Network Maintenance

Overview

The Network Maintenance routines perform useful functions for the Controller and protect the system from catastrophic failure. Certain XENIX functions (such as floppy disk formatting and printing configuration files) are performed from within Network Maintenance. Selections permit you to print configuration parameters and delete, rename, and copy network routines when making major changes to a network. For example, if you are changing the equipment configuration of one or more nodes, you may copy the existing network and modify the copy. You may then maintain the existing network until installations are complete, and then download the new network configuration. You can also print a hard copy version of all network routing generated by IAR and IAR test.

NOTE *Back up Configuration files on a diskette. In the event of fixed disk failure or other forms of file corruption, the backup disk can be used to restore configuration information.*

Topics covered in this chapter are:

- Network Maintenance
    - Document Network Configuration Files
    - Save Network Configuration Files
    - Restore Network Configuration Files (off-line network only)
    - Identify a Floppy Disk
    - Format a Floppy Disk
    - Copy Network
    - Delete Network (off-line network only)
    - Rename Network (off-line network only)
    - Convert Network Configuration Files for TMS-4000

Network Maintenance

To access Network Maintenance, log into a network or use the **`F3`** key to display the `TMS Main Menu`. Highlight **`Network Maintenance`** and press `Enter`.

The `Network Maintenance` screen for the off-line network (*See Figure 41-1*) contains the following menu selections:

```
Network Maintenance                 Net1                        21-APR-1996 13:34:30

                 Document Network Configuration Files
                 Identify a Floppy Disk
                 Restore Network Configuration Files
                 Save Network Configuration Files
                 Convert Network Configuration Files for TMS-4000
                 Copy Network
                 Delete Network
                 Rename Network
                 Format a Floppy Disk
```

Figure 41-1 Network Maintenance (Off-Line)

The `Network Maintenance` screen for the on-line network (*See Figure 41-2*) contains the following menu selections:

```
Network Maintenance                 Net1                    21-APR-1996 13:35:50

                 Document Network Configuration Files
                 Identify a Floppy Disk
                 Save Network Configuration Files
                 Convert Network Configuration Files for TMS-4000
                 Copy Network
                 Format a Floppy Disk
```

Figure 41-2 Network Maintenance (On-Line)

The following describes each `Network Maintenance` menu selection and its parameters:

Document Network Configuration Files

When **`Document Network Configuration Files`** is selected, a `Document Network Data` submenu allows four options. These are described in the following paragraphs. A sample of the submenu is provided in *Figure 41-3.*

```
Document Network Data             Net1                      21-APR-1996 13:35:50

                        Cancel Document of Network Data
                        Document Network Data

                        Cancel Document of IAR Data
                        Document IAR Data as below

               IAR Name       TOR/DRR Config             Select
               CURRENT        CNFG2                      Selected

                              Destination: File

                 Setup Printer          Print/Delete Saved File
```

Figure 41-3 Document Network Data

Document Network Data

The `Document Network Data` routine prints all network parameters currently displayed. It runs as a background process. You may initiate the routine and then continue to perform most other Controller functions, but you may not save changes to a configuration in the network being documented. That is, you may use the Modify Configuration routines to enter changes, but cannot exit from saving the modified data base until the document network process is finished.

If you change the network name of a queued network, the network does not print because networks are queued by name. To print the renamed network, select **`Document Network Data`** under the new name.

If you are printing a large network, the print operation could take more than an hour to complete. Use **`Cancel Document Network Data`** to abort a previous print process.

As a quick alternative, use **`Ctrl-P`** to print any Controller screen. For minor changes to a network, you may not wish to print the entire configuration. The printout includes several different sections:

- Node Information — this section contains all configuration parameters contained in all three networks. The organization of this section allows you to configure or check a network from the information provided in the printout. Information presented for each node includes:

  Node name, address, type, node phone number, street, city state, zip, contact name, and contact phone number.

  Main shelf configuration, with slot location of all common cards.
- TMS Controller Information — lists the Controllers name, connected node name, address, controller priority value, DBU phone number and type.
- Serial Port Information — lists the port number, applications, communications mode, data rate, and security type.
- IAR Test Script — contains the script name and the actual IAR test script.
- System Defaults — reports, IAR, IAR restoral, scheduled optimization, load balancing optimization, and optimization scheduling.
- Assigned Routing Priorities Grouped By Circuit Rates
- Default Aggregate Parameters — reports, delay, error rate, availability, initiation and restoral value timers. The aggregate attribute and link qualifier names are also reported.
- Circuit attributes and link qualifier names are reported.
- Network Clocking Configurations — lists the node name, address, clocking level, master source, and clock rate.
- TOR Information — lists the daily, weekend, and Holiday 1 and Holiday 2 schedules.
- DRR Information
- Circuit Profile information — lists the profile name, delay, error rate, link availability, link/circuit attribute names, and network wide OCM node defaults.
- Special Rates
- Equipment Information for this node — contains the main shelf configuration for all cards with slot location, address, port number, subaggregate number, DS0 number, DS0 count, and aggregate name.

- Configuration for each slot — lists the configuration of each CIC, ACC, CDA, TPP, IAC, and ESCC.

  The remaining bandwidth for each CIC, CDA, TPP, IAC, and ACC.

  The circuits configured through each CIC. Local channel number, circuit name, and circuit type are listed.

  Port A and Port B configuration information for CDA and IAC.

  DB25 port configuration information for TPP.

  The bundle details for each CDA and IAC.

- Circuit Configuration — lists the configuration parameters for each circuit in each of the three configurations for the network. All information currently provided by the Circuit Configuration screen is included for each circuit.

The circuit configuration section provides two parcels of information (on each page printout) for all circuits. The first portion (top of the sheet) lists the following information: name, class, circuit type, data rate, down rate, interface type, starting node, address, slot number, channel number, end node, address, slot number, and for each circuit, channel interface priority value.

The second portion (bottom of the sheet) lists:

- Each circuit name and circuit type.
- Specific parameters for that circuit type (timing for synchronous channels, EIA levels for voice channels, etc.).
- Specific settings and labels for the interface types.

The information on the circuit configuration is provided in up to 25-circuit increments. Any Controller password with Examine Configuration privileges provides access to the document.

Cancel Document of Network Data

To cancel the request, select **`Cancel Document of Network Data`** from the `Document Network Data` submenu. A message confirms the cancellation.

Document IAR Data as Below

`Document IAR Data as Below` prints the current routing of all circuits in the network. You may select whether to print the current routing configuration and/or the routing results of various network simulations (performed with an IAR Offline Test).

NOTE

If you have not yet been on line with the Controller and network, there is no entry for current routing configuration.

On the lower portion of the `Document Network Data` submenu, `IAR Name` and `TOR/DRR Config Name` appears. A third field labeled `Select` allows you to select which configuration to print from. Move the cursor to highlight the `Select` field and press `Enter` to toggle the field. Select `Selected` and press `Enter` if you want to print the information from the currently displayed IAR name and TOR/DRR configuration.

After the **Select** field is selected, you are ready to print using `Document (print) IAR Data as Below`. Highlight **Document IAR Data as Below** and press `Enter`.

The following information is included in the printout:

- IAR Event History
- IAR Bandwidth for each individual node.
- Primary and Secondary Supervisory Routes For All Nodes — node name, address, slot number, port number, and link name.
- Circuit data — contains circuit name, type of circuit, address, slot number, port number, board number, and link name.

Setup Printer

`Setup Printer` allows you to setup printer types and options as well as destinations for the Alarm Log, Alarm Report, Configuration Report, and Print Screen.

To select a printer type, highlight **Setup Printer** field and press `Enter` to bring up the `Setup Printer/File` screen. The options shown in this screen change according to the printer type to display only those modes applicable to the printer in question. Upon exiting this screen, the current mode selections are saved to disk, and they are read back the next time you enter the screen.

Options allow you to modify the character format sent to the printer. To display the character format options, highlight the `Options` field and press `Enter`. Pressing `Enter` again changes the option. For example, the formats for an **IBM Proprinter** are: **Bold/No Bold**, **Single-Strike**, **Double-Strike**, **Compressed**, **Pica**, **Elite**, or **Quality**.

Option formats vary with the type of printer selected. Select **Double-Strike** and the characters are printed bold and much wider. Select **Compressed** to reduce the spacing between characters, allowing more characters per line. The compressed format allows use of standard 8 1/2-inch by 11-inch wide paper to print the network configuration. Select **Bold** to print very dark characters across the paper.

If you have a `Configuration Report` set for **File**, you may, at a later time, send this file to a printer, floppy disk, or read it on the screen.

The printer runs at a maximum speed of 200 characters per second. Most print functions run in a low-priority background mode, so that actual printer speed may be slower than 200 characters per second.

The following describes the various printer types:

IBM ProPrinter- The IBM Proprinter (or equivalent) is the standard printer for the Controller. The Proprinter uses a parallel interface. Still the default printer, it supports **Compressed**, **Quality**, **Pica**, **Elite**, and **Double-Strike**. You can choose more than one of these options.

The Proprinter has one bank of configuration switches located at the left rear of the printer, underneath a removable plastic panel. The XENIX operating system requires certain switch settings for this switch bank:

Switch 3 (Automatic Line Feed) OFF

Switch 6 (Automatic Carriage Return) ON

Switch 7 OFF

To connect a Proprinter to the Controller, a cable must be extended between the 25-pin parallel port connector in slot 1 of the Controller, and the parallel Centronics connector at the left rear corner of the Proprinter.

Refer to the IBM Proprinter Guide to Operations for more information on the Proprinter.

TMS-3000 software allows other printers to be used with the Controller. These printers and their options are listed below.

Tandy Dot Matrix Printer - Options available include **Compressed**, **Quality**, **Pica**, **Elite**, and **Microfont**.

Also supported is the **IBM Emulation** mode of the Tandy, in which mode Microfont is not supported, but **Double-Strike** is. On both printers, more than one simultaneous mode is possible.

Generic Line Printer - No options are supported, but two types of generic printers are available.

Choice **#1** supports printers which expect a carriage return at the end of each line. Choice **#2** is for printers which expect a new line. If unsure which category your printer fits, try both.

Hewlett-Packard LaserJet, **ThinkJet**, **QuietJet** series printers - The only available option is Portrait vs. Landscape printing modes. For documentation printouts, Landscape is better suited, and is the default.

Qume Sprint 1155 - No options supported.

Texas Instruments 855 - Options available include Compressed, Quality, Pica, and Elite mode printing. Only one can be selected.

The system remembers your chosen options until you alter them.

When using a PS/2 model 8580 as the TMS Controller, you may have to reset one default printer from **LP0** to **LP1**. To perform this change, do the following steps:

1. Shutdown GTS through Controller Maintenance using **Shutdown (Disable Auto Login**.
2. Reboot the system.
3. At login: prompt type **root** and enter password if necessary.
4. At the # prompt, type the following:

   lpinit

Answer these questions:

1. Do you wish to continue? y/n

   Type **y**. Press Enter .
2. Select – **reconfigure an existing printer**
3. Enter the name of the printer to reconfigure.

   Type **linepr**. Press Enter .
4. Select – **associate a new device with a printer**

5. Select – **`Parallel`**
6. Enter a device.

   Type **`LP1`**. Press `Enter` .
7. Type **`q`** to quit.

Print/Delete Saved File

You can perform various functions on files saved to the hard drive:

`To Screen` - Allows you to view files on the screen before you print or delete them. The screen shows you 80 columns of text, so if you are viewing a Document Network file which is up to 132 columns, some line wrapping may occur.

`DOS disk` - Transfers a selected file to a DOS format disk. For this function, you need a 3.5-inch 1.44 Mbyte disk. If the file is larger than one disk, you are advised of how many disks you need. This function also formats the disk for you.

`XENIX disk` - Transfers a selected file to a XENIX mount format disk. It can be mounted at the XENIX prompt and viewed or edited. Formatting and large file handling is done automatically.

`LP0` - Spools a file to Line Printer 0 (default printer).

`LP2` - Spools a file to Line Printer 2.

You may also use this screen to delete files.

Some important points to consider:

For XENIX and DOS disks, you're required to use a high density, double-sided floppy disk whenever the **`Document Network Data`** or **`Document IAR Data`** field is selected.

When a disk format is selected, the disk is automatically formatted before a file is copied onto it. Previously stored files are lost during formatting.

There can only be one configuration placed on each disk.

If the DOS option is not installed on your hard drive (installed using procedures in *Chapter 5 of GDC 036R303-000, Installing the XENIX Distribution System*), you cannot select the DOS Format Disk option. If, later, you decide to install DOS, follow these steps:

1. Shutdown the Controller, Disabling Auto login (See *Chapter 42, Controller Maintenance*).
2. After rebooting and at the `login:` prompt, log in as **`root`**.
3. At the # prompt, type **`custom`**

Select **`1 operating system`**

Select **`1 install one or more packages`**

Type **`DOS`**. Press `Enter` . You are prompted for SCO XENIX release disks. When finished, type **`q`** for quit. Select **`Control-D`** and log in as **`gts`**.

The standard printout is in a 132-character format. It requires standard 14- by 11-inch line printer paper unless the compressed option is chosen.

Save Network Configuration Files

This routine copies all configuration data for the displayed network from the hard disk onto a diskette. Perform this operation at regular intervals to guard against loss of system data due to hard disk failure.

If such a failure happens, **`Restore Configuration Files`** can transfer all files to a replacement hard disk. If you have not saved your configurations, they all have to be entered again through the keyboard.

You must use formatted disks for this operation. **`Format a Floppy Disk`** performs the required formatting operation. When you select this routine, a prompt instructs you to insert a formatted disk. Once you answer **`y`** to the **`Continue?`** prompt, all configuration files on the hard disk are stored on the diskette.

Restore Network Configuration Files (off-line network only)

This routine transfers configuration data from a diskette to the hard disk. The files transferred in this manner become the configuration data base for the currently displayed network. This occurs even if the currently displayed network and the network to be restored have different names. This routine is typically used after a hard disk failure or if the data base becomes corrupted.

The network configuration files loaded from diskette replace existing files (for the currently displayed network) on the hard disk. The network name stored on floppy disk replaces the current network name.

Do not use this routine unless you intend to overwrite existing files with the backup files from floppy disk.

Follow screen instructions for insertion of the diskette. Subsequent screen instructions indicate completion of the loading and allow you to reboot the system. Conversion is provided only for MSO V3.0.1 and all later GTS versions. If you wish to convert from earlier MSO versions (earlier than V3.0.1), you must first use an MSO V3.0.1 Controller to convert the earlier version to MSO V3.0.1. The procedure for converting such versions is as follows:

1. To restore any MSO V3.0.1 network to GTS V2.2.0 or later version software you must create (or log onto) an off line network and select **`Network Maintenance`** from the main menu. On the `Network Maintenance` screen select **`Restore Network Configuration Files`**. The prompt:

```
Retaining current PC software revision list,     continue? [Default YES(YN)]:
```

appears. If you wish to retain the software revision list that is currently running and active in the Controller, select **`Y`**. You are prompted to insert the diskette. The network on the diskette is then restored on the Controller. The nodal software used will be the files in the Controller revision list.

Select **`N`** if you do not want to use the revision list that is in the Controller. The prompt:

```
Replace the PC software revision list with one on     disk [Default NO(Y/N)]:
```

appears. This prompt is to alert you that the referenced mux software files (**objs**) in the diskette revision list are not necessarily on the Controller and/or in the nodes. If you select

N then no configuration or revision list data is restored from the floppy. If you select **Y** the prompt:

```
Are the obj’s in the disk’s revision list in the PC?[Default NO (Y/N)]
```

appears. This is a final check to make sure that the objs on the floppy diskette’s revision list are installed on the PC. If you select **N** nothing is restored. But if you answer **Y** you are prompted to insert the diskette. At this time, the network, along with the revision list in use when it was saved, is restored.

The older configuration data is read from the floppy disk, and the following occurs:

- X.50 termination circuits are deleted.
- Old tail node types are converted to Universal MM+ V4.
- GTS aggregate interface type Bell-303 is converted to EIA 422 and T1D4E interface type is converted to T1D4/FT1.
- TPP circuit: If circuit number is >64, the circuit is deleted.
- TPP/OPP port rates lower than 19.2 KHz are adjusted to 19.2 KHz.
- TPP-TPP, OPP-OPP, and OPP-OPP circuits with rates less than 19.2 KHz are deleted.
- IAC phone number checking options are adjusted.

2. Any details concerning the conversion of earlier revisions are covered in release notes.

Identify a Floppy Disk

This routine checks a diskette inserted into the disk drive of the Controller. All disks containing GTS software can be identified.

When you select the routine from the `Network Maintenance` menu, the Controller prompts you to insert a diskette into the disk drive. Once you do so, and answer **`y`** to the **`Continue?`** prompt, the Controller attempts to read the disk. The following results may be reported:

- `Floppy cannot be identified` — The diskette does not contain TMS-3000 related information.
- For Network Configuration and Alarm Backup disks

  `File Type:` (Network Configuration or Alarm)

  Network Name:

  `System Version:` (software revision level)

  `Time Stamp ID:` (time/date software was released)

  `Disk in Set:` (disk number in sequence of disks, e.g., third disk in set of four).
- For all others:

  `System Version:` (the revision level of the software under which the network was saved)

  `Time Stamp ID:` (date and time when network was stored on diskette)

  `Disk in Set:` (same as for system software disk above)

  `Disk Type:` (type of software contained on disk)

Format a Floppy Disk

This routine formats diskettes. Formatting is required before saving TMS-3000 configuration files. **Save Configuration Files** does not work properly unless you format the diskette first.

The formatting operation destroys any previous data stored on the diskette. A prompt warns you of this possibility and lets you avoid the operation.

Convert Network Configuration Files for TMS-4000

Convert Network Configuration Files for TMS-4000 is used to prepare for upgrade of your TMS-3000 network controller. The TMS-4000 controller is a Sun SPARCstation which requires different data formats than the TMS-3000 Controller, and the required conversions must be performed on the TMS-3000 Controller.Without this conversion, the TMS-4000 controller is unable to access the standard network configuration save disks.

The TMS-4000 Controller has no 5 1/4" floppy disk drives. If your default floppy disk drive is not a 3 1/2" device, you must change it using **Change Default Floppy Drive** under Controller Maintenance before proceeding (*Refer to Chapter 42*).

The conversion operation is a disk-to-disk process. It does not operate on the current TMS-3000 network, but only on saved network files. The files to be converted must be up-to-date with respect to the TMS Controller, or an error will result. To verify that the files are of the proper revision level, execute **Identify a Floppy Disk** on the network save disk, and verify that System Version is at the correct GTS V2.2.0 revision level. If it is not, restore the network into an available off-line network and save the files again. Once the network you wish to convert is available on the correct disk size and in the correct, up-to-date file format, you need one or more formatted 3.5" floppy disks to receive the converted network configuration. Select **Convert Network Configuration Files for TMS-4000** and press Enter. The screen prompts you first for the network save disk or disks, and then for the disk or disks to hold the converted files. Information is displayed about the progress of the conversion process as it proceeds. The converted files can be restored only by the TMS-4000 Controller. But, for your convenience, the TMS-3000 is able to identify these converted disks.

Copy Network

This routine copies an existing network to create a new network.

The primary purpose for copying a network is to prepare for a new equipment installation. You may copy your existing network and make the modifications required for the new equipment additions. When new equipment is installed, you may make the new network on-line, and download the new configuration. This routine should always be the first step when making major modifications to the network.

Up to three networks may exist in the Controller system at one time. You must enter Network Maintenance for an existing network and copy that network configuration to a new network name. Select **Copy Network** and the screen prompts you for the name of the new network (16 characters maximum). The copy process begins when you enter the network name and press Enter. All passwords are transferred as part of the copy process.

Delete Network (off-line network only)

This routine deletes an entire TMS-3000 network. The basic purpose for deleting a network is to remove it from the data base after a new network has been created and placed on-line. You then have the capacity to create a new network when required.

You must be in the network that you wish to delete. Select **`Delete Network`** from the `TMS Main Menu`; a prompt warns you that all configuration files will be deleted. If you answer **`y`** to the prompt, the Controller deletes all files for the network from the Controller data base. The `Network Access` menu returns to the Controller screen. You can select an existing network or create a new one.

Rename Network (off-line network only)

This routine changes the name of an existing network. To rename a network, you must be in the network you wish to rename. To rename a network other than the currently selected network, use the **`F3`** or **`F4`** key to display the `Network Access` menu. Log into the network that you wish to rename. Select **`Network Maintenance`** from the `TMS Main Menu`. Select **`Rename Network`**. Enter the new name as a string entry (16 characters maximum). The network is renamed when you press `Enter`.

Summary

The Network Maintenance routines perform useful functions for the Controller and protect the system from catastrophic failure.

In this chapter we covered the Network Maintenance routines.

What's Next?

Chapter 42 covers the Controller Maintenance routines.

42 Controller Maintenance

Overview

The Controller Maintenance routine consists of 10 routines that pertain specifically to the Controller. Included are routines that pertain to floppy disks, loading software releases, setting the date and time, examining software versions, printing, and Controller port configuration. Two routines for Controller shutdown are also included in Controller Maintenance.

Topics covered in this chapter are:

- Controller Maintenance
  - Identify a Floppy Disk
  - Change Default Floppy drive
  - Load a Software Release
  - Set Date and Time for System
  - Examine Software Versions
  - Print Saved File
  - Configure Serial Ports
  - Configure Parallel Ports
  - Normal Controller Shutdown
  - Shutdown (Disable AutoLogin)

Controller Maintenance

The Controller Maintenance screen (*See Figure 42-1*) is shown below:

```
Controller Maintenance          Net1                        28-APR-1996 11:44:48

        Identify a Floppy Disk          Change Default Floppy Drive

        Load a Software Release         Set Date and Time for System

        Examine Software Versions       Print Saved File

        Configure Serial Ports          Configure Parallel Ports

        Normal Controller Shutdown      Shutdown (Disable Auto Login)
```

Figure 42-1 Controller Maintenance

`Identify a Floppy Disk` performs a check of an unknown diskette inserted in the disk drive of the Controller. Diskettes that contain operating system or configuration files are identified with this check.

`Change Default Floppy Drive` allows you to select the default floppy drive type (either 3.5-inch or 5.25-inch) used in the Controller.

`Load a Software Release` allows you to install future upgrades of GTS software.

`Set Date and Time for System` allows you to modify the date and time of the Controller. Use this routine to correct changes in time zone, daylight savings, or leap year.

`Examine Software Versions` allows you to examine the installed software versions.

`Print Saved File` allows you to perform six functions. You can send a file that was previously saved to LP0, LP2, a XENIX format disk, a DOS format disk, and to Screen (allows you to review a file before taking action). You may also delete files.

`Configure Serial Ports` allows you to enter interface parameters for communication between the Controller and external devices.

`Configure Parallel Ports` allows you to setup printer types as well as destinations for Alarm Log, Alarm Report, Configuration Report, and Print Screen.

`Normal Controller Shutdown` performs a "clean" shutdown of the TMS-3000 and XENIX operating systems.

`Shutdown (Disable Auto Login)` allows you to either disable the autologin function or allow the system to be rebooted from a remote terminal.

Identify a Floppy Disk

This routine checks a diskette inserted in the disk drive of the Controller. Disks containing system software or network configurations are identified, even if no label or an incorrect label has been applied to the diskette. The procedure identical to the one described in *Chapter 41*.

Change Default Floppy Drive

If you have more than one floppy drive, this routine lets you change the default floppy drive type in the Controller. Two types of floppy drives are available on the Controller: 5.25-inch and 3.5-inch. Both must be high-density drives.

You may have to change the drive type when loading a new software release (e.g., you've received an updated set of GTS software on 3.5-inch disks), when saving configuration files onto a floppy, or when using the Identify or Format a Floppy Disk routines. Use the following procedure for changing the default floppy:

On the `Controller Maintenance` screen, highlight **`Change Default Floppy Drive`**. Press `Enter` .

The following prompt appears:

```
Current Device 0, drive type 5.25 (or 3.5) change? Y/[N]
```

Type **`y`**. Press `Enter`

```
Enter Logical Drive 0, 1 ->
```

The logical drive is the logical number that XENIX uses to access your drive. This depends on the cables going to the floppy disk controller card and the floppy drive inside the Controller.

Select the drive you want to change to by entering either **`0`** or **`1`**. The next prompt appears:

```
Enter Drive Type 1-5.25   2-3.5 ->
```

Enter the drive type you want to be the default drive. Enter 1 for the 5.25-inch drive or 2 for the 3.5-inch drive. Press `Enter`.

NOTE *Performing the mninstall procedure sets the default drive to the drive that was mounted to do the mninstall procedure. This can be changed later in the Controller Maintenance screen. The mninstall procedure is part of Loading GTS Software in Chapter 5, GDC 036R303-000.*

When completed, a message stating:

```
Default drive is now:
```

should appear and one of the following:

`fd096dsl5` (device 0 5.25", high-density)
`fd196ds15` (device 1 5.25", high-density)
`fd0135ds18` (device 0 3.5", high-density)
`fd1135ds18` (device 1 3.5", high-density)

Load a Software Release

This routine allows you to install upgrades of GTS software. Select **`Load a Software Release`** from the `Controller Maintenance` menu. The Controller prompts you to insert the first release diskette into the disk drive. When you answer **`y`** to the `Continue?` prompt, the Controller attempts to read the disk. Refer to *GDC 036R303-000* and *Chapter 1, System Startup* of this manual for more information on loading a software release.

Set Date and Time for System

This routine sets a date and/or time for the Controller.

The Controller has a battery-based clock, which keeps time whether or not power is applied to the system.

The date and time are entered into the system when the Controller is manufactured and the clock maintains the time from that point on. For this reason, you need to change the time/date only on rare occasions. These occasions may include:

- Daylight savings time changes
- Any requirements to move the Controller across a time boundary
- Gradual drift of the time-of-day away from accuracy

Time and date should be changed only if absolutely necessary. Alarm message files are in order of time and date. If you set the time back, you may duplicate or overlap the time/dates entered for some alarms. After you select the routine, the screen prompts you with this warning message:

```
Warning: Alarm History may be corrupted: Continue ? [Default No (Y/N)]
```

To continue the routine, enter **`y`**. You are then prompted to enter the new date and time. The format for the entry is DD-MMM-YY HH:MM (the time is entered in the 24-hour military format). You must include the dashes in the date, the space between date and time, and the colon between hours and minutes as part of the entry. For example, the correct entry for 3:30 P.M. on August 28th, 1995 is:

`28-AUG-95 15:30`

Press `Enter` after making the entry; the Controller enters the new time, and a `Complete` message appears.

Examine Software Versions

This routine allows you to examine the type of software installed in the Controller. The routine displays the software versions, names and release notes that are installed on the system. The following example (*See Figure 42-2*) shows GDC related software items, version number, serial number, and installation date (DD:MM) and time (HH:MM:SS). Pressing any key exits this screen and returns you to the Controller Maintenance menu. You can also examine the types of system related software that are installed on the system, such as XENIX or INFORMIX.

```
Software Item   Version   Serial Number    Install Date          Notes
   TMS-GTS     GTS 2.20lf-4    ######     26-JUL  01:00:00   PressEnter
   TMS-GTS     GTS 2.20lf-128  #####      26-JUL  01:00:00
```

Figure 42-2 Examine Software Versions

To examine software release notes in the Controller, select the field labeled **`Press`** `Enter`.

Use the cursor up/down keys to scroll through the release notes on the screen. When you are done reading the notes, press **`F3`** to return to the previous screen.

Print Saved File

`Print Saved File` allows you to perform six functions. You can send a previously saved file to **`LP0`**, **`LP2`**, **`XENIX disk`**, **`DOS disk`**, and **`To Screen`** (allows you to review a file before taking action). You may also **`Print File`** and **`Delete File`**.

The XENIX Format disk is a mount type, meaning that the disk must be mounted to read the contents. The DOS disk produces a DOS formatted disk with a DOS file on it. The printer provides a hard copy of all files. *If you need to install the DOS option, refer to Chapter 41.*

NOTE

When a disk is reformatted, previously stored files are deleted.

Configure Serial Ports

This routine changes the interface parameters for the Serial I/O Ports on the Controller. Serial Port 0 is used as the interface port between the Controller and the local TMS-3000 node. When you use Port 0 for the Network I/O, the following default parameters are selected:

- Data Rate: Auto is selected.
- Parity: Even
- Stop Bits: 1
- Data Bits: 8

Serial Port 1 is configured for an EIA/TIA-232-E local TTY or an external modem. Serial Port 1 can be used as the interface to an external modem for Dial Backup and Dial-in TTY applications.

VT100 Emulator

Serial Port 1 may also be configured for VT100 emulation. After the configuration is saved, select **Alt-F2** (press the **Alt** and **F2** keys simultaneously). Type **VT100**, press Enter and follow the screen prompts. This allows you to connect to a CSU 551, TMS Maintenance Console, or Universal MM+ V4 AUTOFRAME. You can toggle back and forth between this screen and the Controller screen by pressing **Alt-F1** for Controller and **Alt-F2** for VT100. Note that the VT100 emulator supports only limited functions. You may then hook up the Controller to the CSU 551, Maintenance Console, or Universal MM+ V4 AUTOFRAME by connecting a cable, *GDC 028H303*, from Com 2, Serial Port One to the unit. The port configuration may be changed by toggling the **Communication Mode** and **Data Rate** fields in the Configure Serial Ports screen.

Serial Input/Output Port Display

To view the Serial Input/Output Port display, log into a network or use the **F3** key to display the TMS Main Menu. Move the cursor keys to highlight **Controller Maintenance** Press Enter. Select **Configure Serial Ports** Press Enter. The I/O Ports Configuration screen appears. To change a port parameter, move the cursor to the desired field, and press Enter until the correct value appears.

If extra I/O ports are required, a Digiboard DigiChannel PC/4e or Digiboard DigiChannel PC/8i+ can be mounted inside the Controller. These cards expand the available options. When the Multiport I/O card is installed in the Controller, the I/O Port Configuration screen contains additional field selections that appear under Port and Application. Refer to *GDC 036R303-000* for installing and applying this card.

The following selections for each parameter on this screen are described below:

Port – The number of the I/O port being configured. 00 for Serial Port 0, 01 for Serial Port 1. If the Digiboard DigiChannel PC/4e is installed, Ports # 00-05 appear. If the Digiboard DigiChannel PC/8i+ is installed, Ports # 00-09 and S (Sync.) port appear. Ports 00 and 01 are used for the Controller. The selection for Ports 02-05 for the Digiboard DigiChannel PC/4e are for external applications. Note that, if only one serial port is installed, the Digiboard numbers are offset by one.

Application – Defines what the port is being configured for. Port 00 selection is **Network I/O**. Port 01 selections are **Dial Backup**, **Local TTY**, **Dialin TTY**, and **Not in Use**. The choices you can select for ports 02-09 for the Digiboard DigiChannel are: **Local TTY**, **Dialin TTY**, **MEGAVIEW**, **MEGAVIEW DU**, and **Sound Alarm**. S (Sync) is for synchronous communication to the local TMS node. **ESCC Sync 10** should be selected.

Communications Mode – Defines the serial communication parameters of the I/O port. Selects if this is **Async** or **Sync** channel: **6**, **7**, or **8 data** bits; **1** or **2 stop** bits; and **even**, **odd**, or **no parity**.

Data Rate – Defines the speed (bits per second) in which the I/O port communicates to an external device. Selections are **300**, **1200**, **2400**, **4800**, and **9600 Hz**. Ports configured for Network I/O cannot be modified (Data Rate reads Auto).

`Security` – This field defines an error checking method used by the Controller. Two methods are available, **`CRC 16`** (Cyclic Redundancy Check 16-bits) and **`LRC`** (Longitudinal Redundancy Check). You can also select **`None`**.

When the application for Ports 0-7 are modified, the communication mode and data rate fields also change.

For some applications, the data rate can also be manually changed by highlighting this field with the cursor keys and selecting the rate. Use *Table 42-1* to configure the Serial I/O port on a TMS-3000.

If any changes have been made to the data rates or communication modes the display prompts you with the following message:

```
Save port configuration as is ? [Default Yes (Y/N)].
```

Before returning to the main menu, press `Enter` to save the serial I/O port data. Press **`N`** to restore the original configuration.

Configuration of a MEGAVIEW Interface can be found in *GDC 036R303-000.*

Configure Parallel Ports

Configure Parallel Ports allows you to setup printer types as well as destinations for Alarm Log, Alarm Report, Configuration Report, and Print Screen.

To select a printer type, highlight Configure Parallel Ports and press `Enter` to bring up the Setup Printer/File screen. This screen is described in *Chapter 41 in the Setup Printer* section.

Table 42-1 Serial I/O Port Configuration

Port	Application	Communication Mode	Data Rate	Security
All	Network I/O	Async/8 data/1 stop/even parity	Auto	LRC
1 – 9	Local TTY	Async/8 data/1 stop/no parity	2400, 4800, 9600, 19200	None
1 – 9	Dial-in TTY	Async/8 data/1 stop/no parity	300, 1200, 2400, 9600, 19200	None
1 – 9	Dial Backup	Async/8 data/1 stop/no parity	Auto	CRC 16
1 – 9	Sound Alarm	N/A	N/A	N/A
1	VT100	Async/8 data/1 stop/no parity	2400, 4800, 9600, 19200	None
		Async/7 data/1 stop/even parity	2400, 4800, 9600, 19200	None
S	ESCC Sync	Sync	19200	CRC16
1 – 9	Not in use	N/A	N/A	N/A

Port		Application	Communication Mode	Data Rate	Security
Digiboard 8i+	**Digiboard 4e**				
2 – 9	2 – 5	MEGAVIEW	Async/8 data/1 stop/no parity	1200, 2400, 4800, 9600	None
2 – 9	2 – 5	MEGA-VIEW DU	Async/8 data/1 stop/no parity	1200, 2400	None

Normal Controller Shutdown

TMS-3000 software incorporates an automatic login feature. This feature restores the TMS operating system without having to proceed through prompts after reboot. This feature is especially useful following temporary or accidental power loss to the Controller.

GDC 036R303-000 contains the procedure for installing the TMS operating system and Auto Login feature. The Auto Login feature is installed using the mninstall routine.

If the Auto Login feature is enabled, the Controller automatically reboots TMS after a power loss or disruption on the line. The first screen appearing after the reboot is the `TMS Control System` (GDC logo). If required, IAR immediately begins automatic restoral of the network.

When the Auto Login feature is disabled, the `xenix386! login:` prompt appears. You then login as gts to run the TMS operating system.

Highlight Normal Controller Shutdown and press `Enter`. If Auto Login is enabled, the following prompts appear during Normal Controller shutdown:

```
Are you sure ? [Default NO (Y/N)]:
```

Answer **y** if you want to shut down the Controller.

The next prompt appears:

```
Floppy drive must be empty : Continue? [Default YES (Y/N)]:
```

Answer **y**.

After a short time, the message appears

```
**   Normal System Shutdown  **
**    Safe to Power Off      **
           - or -
**   Hit any key to Reboot   **
```

You may now power off the Controller.

If the Auto Login feature was disabled when powering off the Controller, the same prompts appear in addition to the following:

```
Enable auto login ? [Default YES (Y/N)]:
```

If you answer **y**, when the Controller is powered up, the Auto Login feature automatically reboots the TMS software.

Shutdown (Disable Auto Login)

From the Controller Maintenance screen, you can also select:

`Shutdown (Disable Auto Login)`

This routine disables the Auto Login function. With Auto Login disabled, you can either install GTS using the mninstall routine or run GTS from a remote (nonconsole) terminal.

With the **`Shutdown (Disable Auto Login)`** field highlighted, press `Enter`. The following prompts appear:

```
Are you sure? Autologin will be disabled - [Default No (Y/N)]:
```

Answer **`y`** if you want to disable Auto Login. After the system is shutdown and rebooted, you may run GTS from the remote terminal.

The next prompt appears:

```
Floppy Drive must be Empty:  Continue? [Default YES (Y/N)]
```

Answer **`y`**. You see the message:

```
Shutting down, please wait
```

The message appears

```
**   Normal System Shutdown  **

**     Safe to Power Off     **

            - or -

**   Hit any key to Reboot   **
```

You may now power off the Controller.

When the system shutdown message appears, you may run GTS from the remote terminal. When the `xenix 386! login:` prompt appears, you must login as **`gts`** to run the GTS software.

Summary

In this chapter, we covered the Controller Maintenance menu which consists of 10 routines that pertain specifically to the Controller.

What's Next?

Chapter 43 covers the Dial backup procedures.

43 Dial Backup

Overview

The dial backup routines establish and terminate switched network connections between the Controller and a remote node. In this chapter we cover the procedures for initiating and terminating dial backup. Requirements for the dial backup modem are also covered.

Topics covered in this chapter are:

Dial backup

To support dial backup, a modem must be connected to Serial Port 1 or a port on the DigiBoard DigiChannel PC/4e or PC/8i+ card in the Controller. At the remote node an external modem may be connected to the node. General DataComm modems that support an AT command set are listed later in this chapter.

All telephone numbers and passwords for dial backup are entered when you configure the remote node. When you initiate dial backup, the Controller retrieves the information from the data base and performs the dialing operation. In addition, the configuration of Serial Port 1 (or a port on the DigiBoard DigiChannel card) on the Controller is modified to support the dial backup connection. The data rate and format of the port is changed to match those of the remote modem port.

Once a dial backup connection is established, it remains until you select the Terminate Dial Backup routine to end it or the communication line is interrupted. The supervisory channel is extended from the Controller to the node at the remote end of the dial backup connection and to any other node connected by aggregate trunk to that remote node. You may perform diagnostics, obtain status displays, download configuration data, and perform other on-line network functions through the dial backup link.

The dial backup feature is not designed to allow recovery from failures of the communications link to the local node. Routing tables assume that the path to any controller in the system is the same as the path to the connected node. Therefore, if the Controller and the local node are both still operational, but different paths are required to access them, it is impossible to generate coherent routing tables. Communication is impossible to the "local node" via dial backup.

In general, this is not a limitation since the local node is hooked up to the Controller. Further, there is no problem when the local node fails; the problem occurs only when the local node is still active but not accessible via direct connect. Several solutions are possible:

- You may dial in to the supervisor port of a remote node and assume the address of a controller associated with that node. This solution is not, strictly speaking, a dialup solution but rather a direct connection to another node.
- You may configure a dummy node as the local node and assign the Controller via the Controller Configuration screen as attached to that node.

An alternate method provides a true dial backup solution but contains several restrictions, one of which is that the previous dial-up solutions cannot be used in a multiple controller environment. Configure a dummy node as the local node and assign the Controller via the login screen. The dummy node should have no connections to the remainder of the system. The destination node of the dial backup, however, must have a controller configured as connected to it. No controller should be directly connected to this node. *Note that this dialup solution cannot be used with any redundant controllers attached to the system.*

In a multiple controller environment, only the master controller can initiate a dial backup. *Figure 43-1* shows how dial backup can restore supervisory data paths in a network. In this illustration, supervisory data paths normally extend from node A to nodes B and E via aggregate trunks. Supervisory communication reaches nodes C and D from node B and reaches nodes F and G from node E. If the aggregate trunk between nodes A and E fails, the supervisory data path is cut off for nodes E, F, and G. None of these nodes are able to communicate with the Controller. A dial-up modem link restores supervisory communications to all nodes. Node E communicates through the modem link (and through node A) to the Controller. Nodes F and G communicate through node E, the modem link (and node A) to the Controller.

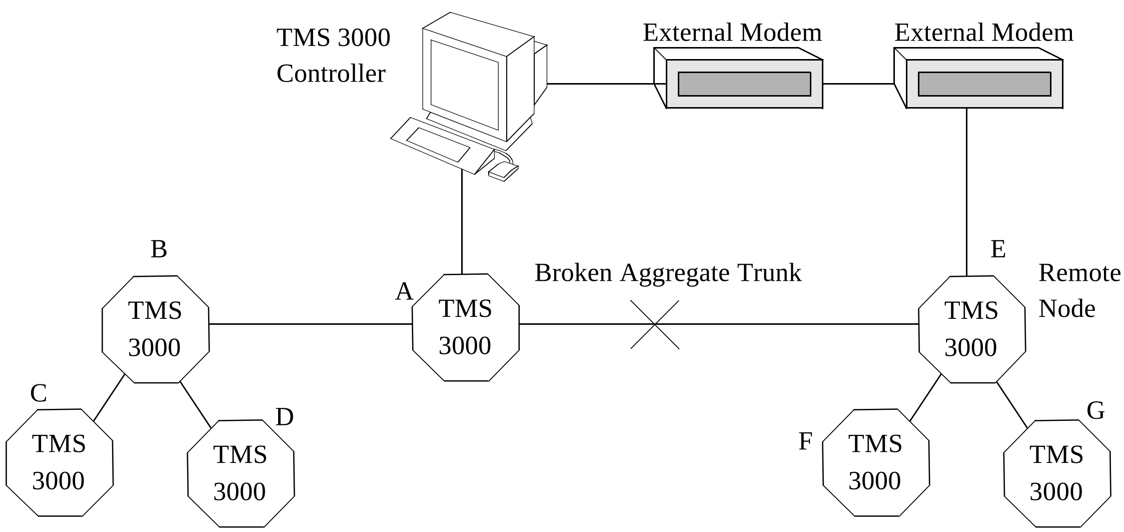


Figure 43-1 Dial Backup in a TMS-3000 Network

The following describes the three routines that are used for Dial Backup:

Initiate Dial Backup

This routine establishes a dial backup connection between the Controller and a selected remote node. Before selecting this routine, you must install and configure the components of the dial backup connection. The following must be complete:

- An AT-command compatible modem must be connected to Serial Port 1 (or a port on the DigiBoard DigiChannel card) of the Controller.

- The modem (MDM) port of the remote node must be configured for **External** Modem.

The telephone number and the dialing type for remote node must be entered in the modem port configuration. The data rate of the modem must be entered in the modem port configuration. The telephone number and dialing type of the Controller must be entered in the Controller Configuration screen. To enter that screen select **Create/Modify Controller** from the Configuration Main Menu .

The external modem must be connected to the MDM port of the node and appropriate VF line connections must be complete. Other modems that support an AT command set may also be used. Refer to DBU Modem in this chapter.

The configuration currently active in the node must match the on-line configuration in the Controller, so password configurations match.

To access Dial Backup, log into a network or use the **F3** key to display the TMS Main Menu . Highlight Dial Back Up and press Enter . The Dial Back Up screen appears.

Select **Initiate Dial Back Up** from the Dial Backup menu. You are prompted to select the node that you are dialing. Enter the node name or press Enter and use the cursor to select a node from the list of nodes.

Once the remote node is specified, the Controller determines if a supervisory data path exists between it and the node. If a path exists, the dial backup link is not necessary. In this case, the Controller screen reports that dial backup is not necessary and asks if you wish to continue.

The Controller then dials the remote node. If the dial operation fails, the screen reports the reason for the failure.

NOTE

During dial backup, while waiting for the MUX node to dial back, the Controller can lock up in the Dial Backup screen for as long as 220 seconds.

If data rates are incorrectly set, you may be prompted to change the modem data rates, after which the Controller dials again. But this step does not always guarantee a successful dial backup connection. If the port at the remote node is set to an inaccurate data rate, the password cannot be verified.

When the dial backup connection is established, the screen reports:

```
Dial Back Up Completed
```

The dial backup connection remains, regardless of whether or not the normal supervisory data path is restored, until **Terminate Dial Backup** is selected or the communication line is interrupted to end the connection.

If you check the Network Status or Network Diagnostics screen, the remote node involved in the dial backup connection reports:

```
DBU - Port1 - Lcl
```

under the Access Port heading. All other ports whose supervisory data path extends through the dial backup connection report:

```
DBU - Port1 - Rmt
```

under the `Access Port` heading. The screen also indicates if you have successfully restored the supervisory data paths through the dial backup connection.

Terminate Dial Backup

This routine ends an existing dial backup connection. To end a dial backup connection correctly, you must terminate a dial backup connection using this selection. When you terminate dial backup, the Controller ensures that supervisory communication is restored to the normal supervisory data paths (if possible).

To terminate dial backup, select **`Dial Back Up`** from the `TMS Main Menu`. On the `Dial Back Up` screen, select **`Terminate Dial Back Up`** and press `Enter`. When the connection is ended, the display should report:

```
Dial Back Up Terminated
```

The Network status screens in Diagnostics and Status should show all nodes communicating through Port 0 of the Controller (as long as the normal supervisory data paths are functioning).

If the dial backup link drops unintentionally, the message `Dial Backup Line Drop` appears with the time of the drop displayed on the status line.

Dial Backup Modem

There are many AT compatible desktop modems available on the market today. Unfortunately, each modem has its own factory default characteristic setup that makes the modem behave differently from other modems. The modem functional requirements, selectable setup, and the TMS-3000 setup for the dial backup modem are described in the following paragraphs.

The Dial Backup (DBU) Modem must have these functional requirements to operate with the TMS-3000 :

Hayes AT Command Compatibility:	Required
Auto Baud:	Required
Auto Answering:	Required
Data Rates:	Supports 300, 1200, 2400, 4800, 9600, 19200 baud
Data Format:	l0-bit asynchronous
Character Format:	8-data bits with no parity, 1-stop bit

Dial backup does *not* function if the modem Microcom Networking Protocol (MNP) or a Feature Enhancement Module (FEM) is enabled.

You must set up the DBU modem as follows:

Modem setup can be done via any non-intelligent terminal provided that character format of the terminal is 8-bits data, no parity, and 1-stop bit.

The AT commands can be placed into the modem via the TMS-3000 Maintenance Console after the modem is connected to the console and powered up. Please refer to *GDC 036R303-000, Appendix C* and the modem manual for details. The following modem setup procedures are required prior to connecting the modem to the Controller serial port or the modem port of the TMS-3000 node.

1. Most modems can automatically determine character format, but some modems require switch settings. If so, select the desired data mode word length (10 bits) via switch.
2. Enter command **AT&F** — Factory default, reset modem to the known state. (Since all Hayes AT compatible modems run 10-bit data formats, the AT characters enable the modem to automatically adjust the parity format).
3. Enter command **ATBn** — Select the modem handshake protocol that is compatible to the local carrier. (n=0, ITU-T), (n=l, Bell 212A)
4. Enter command **AT&Pn** — Select the Pulse Make/Break ratio that is compatible to the local carrier. (n=0, U.S.), (n=l, U.K.)
5. Enter command **AT&W** — Save the setup.

Some modems may need manual setups for character format or baud rate. See the modem manual for more details.

The TMS-3000 does not send the reset to the factory default command (AT&F). The following commands are automatically sent by TMS to program the modem:

- AT&Al — Disable 5-speed fallback/fall forward.
- AT&S0, AT&D1, AT&C1 — DSR always on.

  Data terminal operation: On to off transition of DTR while in the data mode causes the modem to return to command mode.

  DCD (data carrier detection) is real.
- ATS0=3 — Auto answering after 3 rings (enable auto answer).
- ATS10=014 — Lost carrier to hang up time (1.4 sec).

If the modem is not in the data mode, these commands are sent every five minutes to the modem which is connected to the TMS-3000 node.

Summary

The dial backup routines establish and terminate switched network connections between the Controller and a remote node.

In this chapter we covered how to initiate and terminate dial backup. We also covered the modem requirements for dial backup.

What's Next?

Chapter 44 defines the types of status line messages. Also provided is a list of status line messages and their definition.

44 Status Line Messages

Overview

Tables 44-1 through 44-7 define messages that appear on the status line of the Controller screen. The Controller generates these messages to report the progress of processes occurring at individual TMS-3000 nodes or in the network in general.

Status Line Format — There are several fields of information in a status line message. The number of fields varies with each message. The date and time of message generation appears to the left of the message. The process that is reporting the message is next, followed by a colon. The text follows next. Some messages also include a communication error message, preceded by a colon, at the right side of the status line. This message reports a specific communications failure. A communication error message may help identify the cause of the failure described in the rest of the status message.

Status Line Messages covered in this chapter are:

System Error

Communication Error

Set Date and Time

Supervisory Route Restoral

IAR Initiation and Downline

Multiple Controller

Document Network

System Error

Table 44-1 defines a group of messages called System Error Messages. These messages can occur during most of the processes listed above. They represent serious failures in the normal operation of the system and are typically due to software or data base related problems in the Controller or a network node. Any message that contains the word "fatal" indicates that the process involved terminated because of the problem reported. If the Controller displays a System Error message, write down all information in the message. These messages can help identify a specific failure. Contact GDC if the Controller displays any System Error message.

Table 44-1 System Error Messages

Status Line Message	Definition
Get active - unrecognized network	The Controller cannot find a network by the specified name.
Get active - unrecognized configuration	The Controller does not recognize a network configuration by its specified name.
Get networks - set network fatal problem	The Controller cannot obtain the data base for the currently active network.

Communications Error

The messages defined in *Table 44-2* reflect specific communication failures. These messages are presented on the right side of the status line and appear simultaneously with other status line messages displayed on the left side of the status line. The communications error messages point to a specific communications failure which has caused or contributed to the failure reported by the accompanying status line messages.

Table 44-2 Communication Error Messages

Status Line Message	Definition
Message timeout	An expected internal communication from a currently running process has not been received within a time-out period.
Message overrun	A catastrophic failure has generated more internal communication messages than the system can handle. Some information has been lost.
Post mail error Read mail error	An internal communications failure has occurred.
Packet comm error	A communications failure has occurred between the Controller and some remote network node. (In most situations, the accompanying status line message indicates which node.)
Local comm error	A communications failure has occurred in the Controller.
No such node	An internal communications message has presented an invalid node number.
Link comm error	A communications failure has occurred between the Controller and the local node.

Set Date and Time

Table 44-3 defines the status line messages related to the Set Date and Time for System routine (one of the Maintenance routines).

These messages report the success of the nodes in receiving the changed time reference and updating time reports.

Supervisory Route Restoral

Table 44-4 defines the status line messages related to supervisory route restoral. These messages occur when the Controller attempts to generate and download new supervisory routes for the network.

Table 44-3 Set Time and Date Messages

Status Line Message	Definition
Set time - set network fatal problem	The Controller cannot obtain the data base for the currently active network.
Set time - get nodes fatal problem	The Controller cannot obtain the node configuration for the active network.
Set time - local node address not set	The address of the local node was incorrectly set.
Set time - node n failed	The reported node either did not receive the new time reference or did not implement it.
Set time - subordinate controller on node n failed	The reported controller either did not receive the new time reference or did not implement it.

IAR Initiation/Download

Table 44-5 defines the status line messages for IAR initiation and IAR download. These messages report the status of IAR during start up and after loading into all nodes in the network. Note, ACM status line messages are not available in this software release.

NOTE

Since many of the alarm messages are identical, Table 44-5 combines the alarm messages for CDA-T1 and IAC Modules.

Table 44-4 Supervisory Route Restoral Messages

Status Line Message	Definition
Supervisory route - send restart failed	An attempt to recover a supervisory route to a node failed. The node was unable to communicate with the Controller.
Supervisory route download failed	The Controller attempted to download new supervisory routes to a node, but the download operation failed.
Supervisory route restoral complete	Supervisory route restoral procedure has been executed completely.
Supervisory route download failed on node n	The Controller attempted to download new supervisory routes to a specified node, but the download operation failed.
Successfully recovered packet level for node n	Communication between the Controller and a node has been restored.
Failed to recover packet level for node n	An attempt to recover communications between the Controller and the node has failed.
No supervisory path to node n	The Controller is unable to communicate because a node is disconnected in the network.
No comm with local node - route restoral aborted	The Controller cannot communicate with the local node, so the restoral is aborted.
Supervisory route restoral not required	An automatically initiated supervisory route restoral was found to be unnecessary.

Table 44-5 IAR Initiation and Download Messages

Status Line Message	Definition
Undefined controller - unplug cable to local node	The Controller is unable to identify the local node. The user should disconnect from the local node.
Retrying OCM/TMS activation	In the first attempt at activation, not all nodes responded correctly. The Controller tries activation once again.
Send initiate failed	The Controller did not begin the activation properly, and the process has failed.
Waiting for initiation confirmations	The Controller has sent out activation commands and is expecting responses from each node.
Sending OCM/TMS activate swap	The Controller is ordering nodes to substitute all parameters of the reported configuration for the previously active configuration.
Send OCM/TMS swap failed	A swap command was sent from the Controller to all network nodes. The transmission was unsuccessful.
Initiate failed on node n	The specified node was unable to calculate a frame for the current configuration sent from the Controller.
Initiate Failure: node n slave processor inoperational	Node n did not initiate because the slave processor on the ESCC does not operate.
Swap failed on node n	The reported node did not activate the configuration.
No download no slots defined: node n	Slot numbers have not been defined for specific modules to download code.
Sending TMS/OCM configuration data: node n	Transport Management Configuration data is being sent to node n in the network.
Get sw revs - send local pkt failed	The Controller was unable to successfully communicate with the local node in an attempt to find software revision levels.
Get revs - node n pkt failed	The Controller was unable to successfully communicate with node n in an attempt to find its revision levels.
Configuration download not required	Download of configuration is not required for this node (contains the current configuration).
Downloading revision list to	Downloading revision list to ESCCs.
Download - integrity record send failed	An attempt to download a new verification record resulted in a failure.
Configuration download not required in node n	Node n has the proper configuration already loaded. It is unnecessary to download to this node.
No comm. with local node - revision list download aborted	The Controller cannot communicate with the local node, so the revision list download is aborted.
No comm. with local node-configuration download aborted	The Controller cannot communicate with the local node, so configuration download is aborted.
Download - Send SVR Packet Failed	A packet of the supervisor code was not downloaded successfully.
Download - Send Local Pkt Failed	Code download packet from Controller was not received by its destination.
Configuration download skipped-not master of node n	This controller is unable to download configuration to node n. It is not currently master of this node.
Partial configuration download proceeding to node n	A partial download is taking place to node n.
Full configuration download proceeding to node n	A full configuration data download is taking place to node n.
Configuration download failed on node n	A configuration download to node n has failed.

Status Line Message	Definition
Configuration download successful on node n	A configuration download was successful to node n, no errors found.
Configuration data download complete with n failures	Configuration download has been completed and n number of download errors were found.
Required dnld - comm to node n failed	Download cannot commence. Node n communication error.
No download - no supervisory path	Configuration download cannot be performed in the node because there is no supervisory path to it.
Configuration/activation download successful on node n.	Configuration and activation of node succeeded.
Initiate failure: node n not owned by any controller	Node n did not initiate because it was not owned by any controller in the network.
Initiate failure: node n owned by another controller	Node n did not initiate because it was owned by a different controller in the network.
Initiate failure: node n activate sequence aborted	Node n did not initiate because the activate sequence was being aborted.
Initiate warning: node n, slot m failed	The multiplexer was unable to successfully perform the initiate command for node n, slot m.
Network operational	All nodes have activated the configuration without problems.
Network operational with n failure(s) out of n node(s)	The configuration has successfully activated with n failures out of n node(s).
Clock optimization failed on node n.	The clock reset/optimization attempt for node n was unsuccessful.
Retrying configuration download to node n	The Controller is making an additional attempt to download configuration to node n.
Initiating IAR - check node ownership	Checks to see if configuration download is needed to any node which has just become owned by this controller.
Downloading configuration to node n	Downloading of configuration data from the Controller to node n in progress.
Initiating IAR	An IAR is being initiated. The specific events follow.
Initiating IAR - system initialization	IAR is reading the data base, checking system status, etc., preparing for on-line operation.
Initiating IAR - completing IAR tasks	IAR activities which were postponed for optimal system performance are being completed. Activities such as download and data base writes may be postponed.
Initiating IAR off-line test	The IAR (Intelligent Automatic Routing) off-line test has been initiated.
IAR off-line test complete	The IAR off-line test has finished.
Initiating IAR - data base modification	Modifications which don't require a backbone change have been made to the configuration.
Initiating IAR - route optimization	A circuit route is being optimized through the IAR routine.
IAR - route optimization	The subordinate controller is performing a circuit route optimization.
Initiating IAR - system verification	A system verification check has initiated the IAR routine.
Initiating IAR - event(s) received from master controller	IAR is processing an event from the master controller.
Initiating IAR - backbone configuration modification	The backbone configuration of the network was modified by the user. IAR attempts to recalculate all routes through the network.
Initiating IAR - supervisory route restoral	IAR has begun to calculate new Primary routes in the network.

Status Line Message	Definition
Initiating IAR - download code	The specified software type was downloaded without failures.
Initiating IAR - download as required	IAR requires the complete configuration to be down-loaded into the network to properly route all circuits.
Initiating IAR - activate stored revision list initiated	Activating stored revision list on ESCCs.
Initiating IAR - disable OOS-ESCC update initiated	Disable out-of-service ESCC update.
Initiating IAR - download stored revision list initiated	Downloading stored revision list to ESCCs.
Initiating IAR - enable OOS-ESCC update initiated	Enable out-of-service ESCC update.
Initiating IAR - verify revision list initiated	Checks revision lists on ESCCs and downloads revision lists if necessary.
Checking revision lists in node n/ALL nodes	The Controller downloads the latest revision lists if they are not up-to-date on the node.
Revs download failed	Revision list download failed to a node.
Revision list download failed on node n	Revision list download failed to node n.
IAR - link failed: node x, slot y, subagg z]	A [sub]aggregate has failed. The IAR routine attempts to re-route the network around the failed link.
IAR - link recovered: node x, slot y, subagg z]	The IAR is in the process of recovering a [sub]aggregate link in the network.
IAR - activate backup: node x, slot y, subagg z	An IAC backup link is being activated on the specified subaggregate.
IAR - deactivate backup: node x, slot y, subagg z	The specified IAC backup link is being deactivated.
IAR - activating configuration n	The network is transitioning to configuration n.
IAR - backbone configuration modification	The subordinate controller is initiating IAR for a backbone configuration change.
IAR - data base modification	Subordinate Controller is initiating IAR for a data base modification.
IAR tasks aborted - controller becoming a slave	It has been detected that the Controller has become a slave. Continuation of the current IAR event is unnecessary and is aborted.
IAR complete - waiting for event(s) from master controller	The subordinate controller has processed the backbone change but cannot generate an IAR until the event(s) are received from the master controller. IAR results are invalid until these events are received.
IAR complete	IAR is complete. All circuits and subaggregate routes established.
Can't find link in node n	The Controller cannot find the aggregate link to node n.
Queued requests deleted	Response to download screen, request deleted
TOR - set network fatal problem	The network does not reset after a TOR.
TOR - read TOR fatal problem	Controller can't read the TOR date needed to complete the problem.

Multiple Controller

Table 44-6 defines the status line messages used in a network configured with multiple (redundant) controllers. These messages report the status of the redundant controllers during initial configuration and operation in a network.

Table 44-6 Multiple Controller Messages

Status Line Message	Definition
Local controller is not configured	The local controller was not configured in the on-line network.
Change of on-line network pending, wait for completion	The local controller is warned of a change of the on-line network from the master controller.
Local controller becoming subordinate due to merge	The local controller is becoming a subordinate controller due to a network merge.
Merge failed, local controller still a master	The network merge has failed. The local controller remains a master.
Local controller deleted from network, please shutdown	The local controller was removed from the network. The controller must be powered down by the user.
Local node is owned by local controller	An attempt to seize the local node succeeded. The local node is now owned by the local controller.
Local node is not owned by local controller	An attempt to seize the local node failed. The local node is not owned by the local controller.
Switch of controller mastership failed	A command executed to change the mastership of the master controller has failed.
Merge with master controller failed.	A merge of one master controller to another master has failed.
Local controller is now master due to operator action	A local controller has become the master due to a switch mastership command submitted by the user.
Local controller is now subordinate due to operator action	A local controller has become the subordinate due to a switch mastership command submitted by the user.
Local controller is now subordinate due to merge	The local controller has become the master controller as the result of a network merge.
Local controller becomes Subordinate in 10 seconds	The local controller begins the transition from master to slave controller in 10 seconds.
Local controller becomes Master in 10 seconds	The local controller begins the transition from slave to master controller in 10 seconds.
Configuration download from master successful	Configuration data was successfully downloaded from the master controller to the local controller.
Configuration download from master failed	An attempt to download configuration from the master controller to the local controller was unsuccessful.
Switch of mastership initiated	Mastership switchover from a local controller is taking place.
Switch of mastership failed, original master replaced	The switching of mastership from the master controller to a subordinate has failed. Original master remains as master.
Local controller not ready for switch, try later	The local controller is not ready for a user initiated switchover. Try at a different time.
Switch of mastership not possible - download in progress	A mastership switchover cannot be executed during a configuration download.
Switch of mastership failed - local controller still master	Mastership switchover of the local controller has failed. The local controller is still the master.
Switch of mastership already in progress	A user initiated master switchover is rejected due to a switchover already in progress.

Status Line Message	Definition
Switch of mastership failed due to communication failure	Master switchover has failed. A communication error has occurred in the network.
Switch of mastership ignored - target already master	An attempt to switch mastership to this controller is ignored because it is already the master.
Cannot switch Mastership - target permanent subordinate	The specified controller is a permanent slave and therefore cannot become the master controller.
Cannot switch Mastership - target is in a different network	The specified controller is on-line with a different network than the local controller.
Cannot switch Mastership - target has invalid network	The specified controller does not have a valid network at this time.
Switch of mastership not possible - merge in progress	A switch of mastership is not possible because the network is currently merging.
Local node or controller was not configured	A local node or controller was never properly configured in the on-line network.
On-line network changed	The user has changed the on-line network from the master controller.
Operator privilege access violation	Warns the operator that the off-line network logged onto has become on-line.
System error - unknown reset	A system error has occurred due to a reset of unknown origin. Reboot the master controller if the operation is impaired.
Change of network completed	The process of changing an on-line network from one to another is completed on the local (subordinate) controller.

Document Network

Table 44-7 defines the status line messages related to network documentation in a Controller.

Table 44-7 Document Network Messages

Status Line Message	Definition
Sent to printer	Network Data will start printing now.
Finished documenting	Documentation has finished.
Copy to disk successful	Network data is now on the floppy disk.
Being copied to disk	Network data is being copied to floppy disk.
Not copied, problem with floppy disk	A problem exists with either the floppy disk or floppy drive.

Summary

In this chapter we defined the messages that appear on the status line of the Controller screen. The Controller generates these messages to report the progress of processes occurring at individual TMS-3000 nodes or in the network in general.

What's Next?

Tables A-1 through A-12 in Appendix A list data rates for TMS to TMS nodes for each type of TMS class circuit in the TMS-3000. *Tables A-13 through A-19* list data rates for TMS to OCM and OCM to OCM circuits.

A Circuit Rates

Overview

Tables A-1 through A-12 list data rates for TMS to TMS nodes for each type of TMS class circuit in the TMS-3000. These rates are shown as found in the `Circuit Rate Selection` screen.

Note that the following circuit types have only one or two rates available:

ACM-D — 64 K PCM and 320 K

G.703 — 64 K, 128 K, *or* 256 K. Supports *one* of these three rates depending on the G.703 card version.

CADM — 16 K

TOR — 8 and 9.6 K

Table A-1 Synchronous Channel Rates

50	75	100	150	200	300	400	600	800
900	1.000 K	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K	24.00 K	25.00 K	28.00 K	28.80 K	32. 00 K	36.00 K	38.40 K
39.00 K	40.80 K*	48.00 K	50.00 K	56.00 K	57.60 K	64.00 K	72.00 K	76.80 K
96.00 K	100.0 K	112.0 K	115.2 K	128.0 K	144.0 K	153.6 K	168.0 K**	192.0 K
224.0 K	230.4 K	256.0 K	280.0 K*	288.0 K	307.2 K	320.0 K*	336.0 K**	338.0 K*
384.0 K	392.0 K*	394.0 K*	448.0 K**	460.8 K	504.0 K*	512.0 KÜ	560.0 K*	576.0 K
616.0 K*	640.0 K*	672.0 K**	704.0 K*	728.0 K*	768.0 K	784.0 K*	832.0 K*	840.0 K*
896.0	921.6 K	952.0 K*	960.0 K*	1.008 M*	1.024 M	1.064 M*	1.088 M*	1.120 M*
1.152 M	1.176 M*	1.216 M*	1.232 M*	1.280 M*	1.288 M*	1.344 M**	1.408 M*	1.472 M*
1.528 M*	1.536 M***	1.544 MÜ	1.600 M*	1.664 M*	1.728 M*	1.792 M*	1.856 M*	1.920M
1.984 M*								

* Requires external clock
** Requires that ESCC option switches be set for 1.344 (S3-5 ON)
*** Requires that ESCC option switches be set for 1.536 (S3-4 ON)
Ü Maximum rate for Digital Bridge synchronous circuits

Table A-2 Isochronous Channel Rates

75	100	150	200	300	400	600	800	900
1.000 K	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.600 K	4.000 K	4.800 K
7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K	16.00 K	19.20 K	24.00 K
28.80 K	32.00 K	36.00 K	48.00 K	57.60 K	64.00 K			

Table A-3 Asynchronous Channel Rates

75	100	150	200	300	400	600	800	900
1.000 K	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K	4.000 K
4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K	16.00 K
19.20 K								

Table A-4 Transition-Encoded Rates

75	100	150	200	300	400	600	800	900
1.000 K	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.600 K	4.000 K	4.800 K
7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K	16.00 K	19.20 K	24.00 K
28.80 K	32.00 K	36.00 k	48.00 K	57.60 K	64.00 K			

Table A-5 CVSD Channel Rates

14.40 K	16.00 K	19.20 K	24.00 K	25.00 K	28.00 K	28.80 K	32.00 K	36.00 K
38.40 K	48.00 K	56.00 K	57.60 K	64.00 K				

Table A-6 U-ADPCM Rates

16.00 K	24.00 K	32. 00 K	CC32K	A32 K	NA32 K	64K PCM

Table A-7 ASP Channel Rates

10.00 K	11.00 K	12. 00 K	14.00 K	16.00 K

Table A-8 TID-III Data Channel Rates

1.200 K	2.400 K	3.200 K	4.800 K	6.400 K	9.600 K	12.00 K	19.20 K	38.40 K
72.00 K	76.80 K	100.0 K	112.0 K	153.6 K	224.0 K	288.0 K	576.0 K	1.152 M

Table A-9 VLBRV Channel Rates

2.400 K	4.800 K	9.600 K

Table A-10 CELP Channel Rates

4.800 K	6.400 K	9.600 K

Table A-11 ACM-UVC and ACM-V Rates

16.00 K	24.00 K	32. 00 K	CC32K	A32 K	NA32 K	64K PCM

Table A-12 TPP Rates

50	75	100	150	200	300	400	600	800
900	1.000 K	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K	24.00 K	25.00 K	28.00 K	28.80 K	3.200 K	36.00 K	38.40 K
39.00 K	40.80 K	48.00 K	50.00 K	56.00 K	57.60 K	64.00 K	72.00 K	76.80 K
96.00 K	100.0 K	112.0 K	115.2 K	128.0 K	144.0 K	153.6 K	168.0 K	192.0 K
224.0 K	230.4 K	256.0 K	280.0 K	288.0 K	307.2 K	320.0 K	336.0 K	338.0 K
384.0 K	392.0 K	394.0 K	448.0 K	460.8 K	504.0 K	512.0 K	560.0 K	576.0 K
616.0 K	640.0 K	672.0 K	704.0 K	728.0 K	768.0 K	784.0 K	832.0 K	840.0 K
896.0 K	921.6 K	952.0 K	960.0 K	1.008 M	1.024 M	1.064 M	1.088 M	1.120 M
1.152 M	1.176 M	1.216 M	1.232 M	1.280 M	1.288 M	1.344 M	1.408 M	1.472 M
1.528 M	1.536 M	1.544 M	1.600 M	1.664 M	1.728 M	1.792 M	1.856 M	1.920 M
1.984 M								

Tables A-13 through A-19 list data rates for TMS to OCM, OCM to OCM, and OCM Dual Private Voice circuits.

Table A-13 Synchronous, Isochronous, and Transition-Encoded Channel Rates (TMS-OCM single data card and OCM-OCM single data card)

300	600	1.200 K	1.600K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K	24.00 K	28.00 K	28.80 K	32.00 K	36.00 K	38.40 K	48.00 K
56.00 K	57.60 K	64.00 K	72.00 K	76.80 K	96.00 K	112.0 K	115.2 K	128.0 K
144.0 K	153.6 K	192.0 K	224.0 K	230.4 K	256.0 K	288.0 K	320.0 K	384.0 K
448.0 K	460.8 K	512.0 K	576.0 K	640.0 K	704.0 K	768.0 K	832.0 K	896.0 K
960.0 K	1.024 M	1.088 M	1.152 M	1.216 M	1.280 M	1.344 M	1.408 M	1.472 M
1.536 M	1.544 M	1.600 M	1.664 M	1.728 M	1.792 M	1.856 M	1.920 M	1.984 M
2.048 M								

Table A-14 Synchronous, Isochronous, and Transition-Encoded Channel Rates (TMS-OCM dual data card)

300	600	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K	24.00 K	28.00 K	28.80 K	32.00 K	36.00 K	38.40 K	

Table A-15 Synchronous, Isochronous, and Transition-Encoded Channel Rates (OCM-OCM single data card)

300	600	1.200 K	1.600K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K	24.00 K	28.00 K	28.80 K	32.00 K	36.00 K	38.40 K	48.00 K
56.00 K	57.60 K	64.00 K	72.00 K	76.80 K	96.00 K	112.0 K	115.2 K	128.0 K
144.0 K	153.6 K	192.0 K	224.0 K	230.4 K	256.0 K	288.0 K	320.0 K	384.0 K
448.0 K	460.8 K	512.0 K	576.0 K	640.0 K	704.0 K	768.0 K	832.0 K	896.0 K
960.0 K	1.024 M	1.088 M	1.152 M	1.216 M	1.280 M	1.344 M	1.408 M	1.472 M
1.536 M	1.544 M	1.600 M	1.664 M	1.728 M	1.792 M	1.856 M	1.920 M	1.984 M
2.048 M								

Table A-16 Synchronous, Isochronous, and Transition-Encoded Channel Rates (OCM-OCM dual data card)

300	600	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K	24.00 K	28.00 K	28.80 K	32.00 K	36.00 K	38.40 K	

Table A-17 Asynchronous Channel Rates (TMS-OCM single data card and TMS-OCM dual data card)

300	600	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K							

Table A-18 Asynchronous Channel Rates (OCM-OCM single data card and OCM-OCM dual data card)

300	600	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K	24.00 K	28.00 K	28.80 K	32.00 K	36.00 K	38.40 K*	

* Single data channel card only.

Table A-19 IMBE (OCM Dual Private Voice) Rates

2.400 K	4.800 K	6.400 K	8.000 K	9.600 K

B X.50 Switching

Overview

The TMS-3000 CDA is capable of switching X.50 type subrate circuits. These circuits are carried in up to 32 X.50 type frames. The total number of circuits cannot exceed the total CDA card limit of 256 channels for CDA-256 and 126 channels for CDA-128.

The TMS-3000 Controller provides the interface for entering configuration, displaying status and alarms, and invoking diagnostics.

The X.50 format is an ITU-T multiplex standard for a gross bit rate of 64 kHz. It is a preferred multiplexing scheme that can be used for international links between countries. For these international links, the gross bit rate standard and framing information should be contained within the 64 kHz capability. Framing is described later in this appendix.

Figures B-1 through B-3 show some examples of X.50 applications. In *Figure B-1* , an X-50 multiplexer feeds into the public network on an individual 64K line. This "X.50 DS0" is transported to the TMS-3000 via the CDA-E1 card where it is demultiplexed in accordance with the ITU-T X.50 recommendations. The individual subrate channels (W, X, Y, and Z) are translated into TMS format. Channels W and Y are terminated in local Universal Data cards while channels X and Z are sent to a remote OCM for termination.

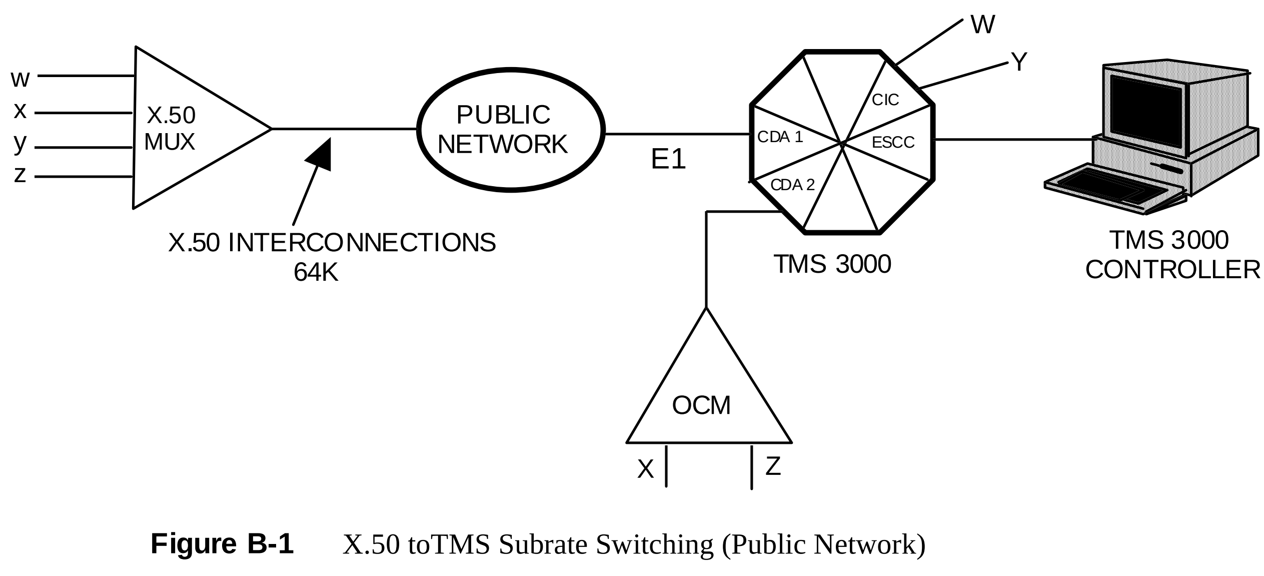


Figure B-1 X.50 toTMS Subrate Switching (Public Network)

Figure B-2 shows an application nearly identical to that of Figure B-1. However, no public network exists, and TMS-3000 #1 is used as a network digital crossconnect. As before, the X.50 multiplexer is accessed via a 64K circuit. Entering TMS-3000 #1 on a clear channel, this X.50 DS0 is combined into an E-1 stream for transport to TMS-3000 #2. Here it is translated into TMS format, and the subrate channels are sent to final destinations (W and Y to local UDCs, X and Z to remote OCM 2).

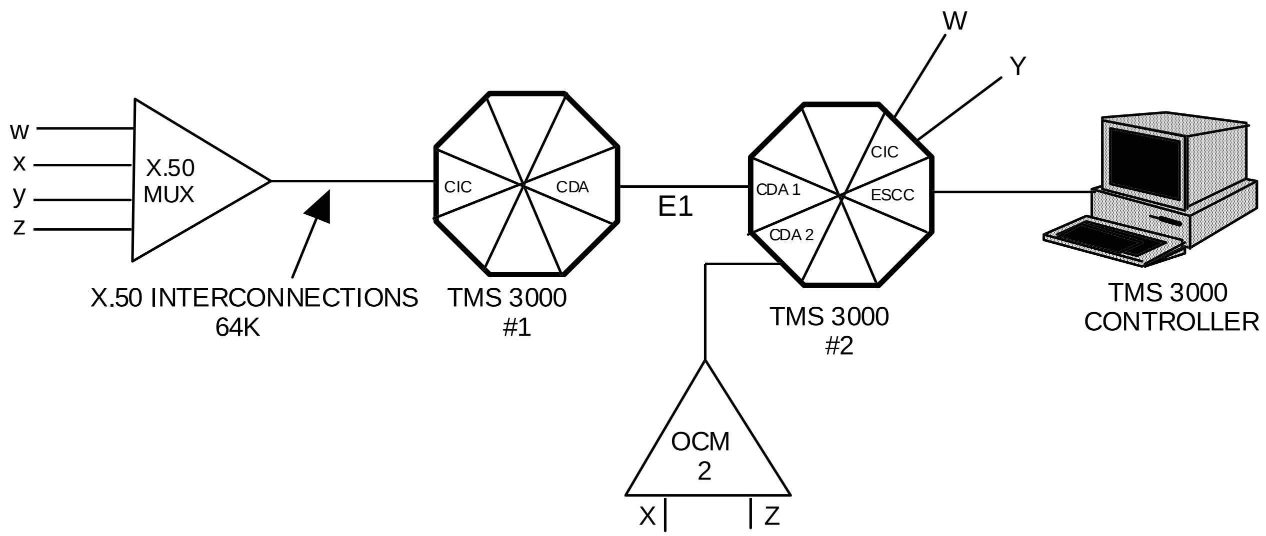


Figure B-2 X.50 toTMS Subrate Switching (TMS Grooming)

The *Figure B-3* application places the TMS-3000 and X.50 CDA as the device that actually demultiplexes each 64K DS0 and then recombines them into another stream for transport back into the network. The subrate channels X and Z are "groomed" off of the X.50 public network and sent to a remote OCM. Subrate channel W at X.50 MUX 1 is sent on subaggregate A through the network to the TMS-3000 CDA where it is sent back through the network to subaggregate B to X.50 MUX 2.

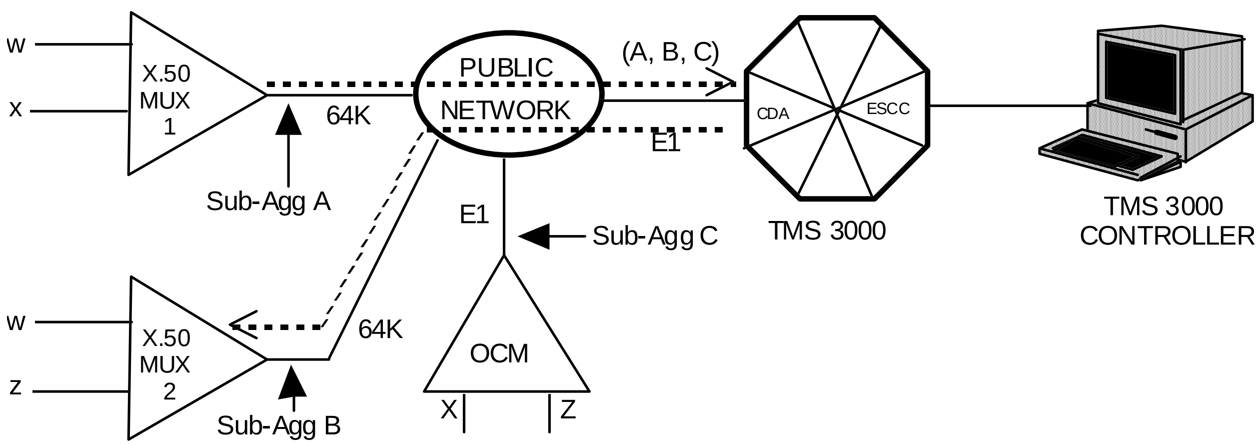


Figure B-3 X.50 to X.50 Switching (Public Network)

Configuration

The purpose of this section is to illustrate the screens specific to the X.50 interface which are available at the TMS controller. In some cases, only items which are unique to X.50 are explained. For screens which require more than just minor explanation, the screens are illustrated, followed by a discussion of the configurable options.

CDA Bundle Configuration Screen

An X50S (X.50 Switching) Bundle type is selectable. Bundle Name is the only configurable item for this bundle type on this screen. To access the bundle detail screen highlight, with the cursor, the Bundle ID number for an X50S bundle type and press **<Enter>**.

CDA Bundle Details

Options or fixed settings for the fields shown in *Figure B-4* are as follows.

`Subagg Type`: Jog Field

`X50d2` (default)

`X50d3`

X50d2 refers to X.50 Division 2. The X50d2 frame consists of 80 envelopes. X50d3 refers to X.50 Division 3. The X50d3 frame consists of 20 envelopes. Rates below 2400 can terminate on X50d2 bundles only.

`Conditioning`: Information Field

`Channel Mark Hold`

`Error Threshold`

`Off`

`Aggregate Sync Rate`: Information field

`7600 Hz` for X50d3

`7200 Hz` for X50d2

```
CDA-E1 Bundle Details    X50SW                 16-JUN-1996 14:10:12
X50 Switching Subaggregate Name F2A

----------------------------------------------------------------------

               Local Node      Slot         DS0
Name                  Addr           Port
 A                    1        3      A     04

Subagg          Conditioning        Error       Aggregate
Type        Circuit    Signaling    Threshold   Sync Rate

X50d2        Channel Mark Hold        OFF        7200 Hz

                         Examine Bandwidth
```

Figure B-4 Bundle Details

Circuit Configuration

An X.50 switching circuit starts at a CDA X.50 subaggregate and is converted to TMS format for transport through the TMS network. It then terminates on a TMS channel card or is built into an X.50 frame on another CDA X.50 subaggregate. An X.50 subaggregate, as a circuit destination point, is available for TMS class circuits with an X50S interface. The X50S interface can be selected for SYNC (synchronous) and ASYNC (asynchronous) types of circuits. The circuit is not downspeedable, and one end of the circuit has to be a CDA X.50 subaggregate.

A description of the configurable items that are new or changed with the addition of X.50 switching capability is provided below.

`Type`: Jog Field

The available circuit types such as `SYNC`, `ASYNC`, etc. are selected here. For a CDA to CDA circuit (i.e. not terminating in a TMS/OCM channel card), the data circuit is fully transparent, and the `Type` field does not have any particular meaning.

`Interface`: Jog Field

In addition to other interface types, `X50S` (X.50 Switching) is available.

`Nos` (Number) `Data and Stop` (Asynchronous circuit)

`Xmit/Recv Clock` (Synchronous circuit): Jog Fields

These are a standard set of values for the corresponding circuit type. Note that these fields are meaningful only for the TMS Channel termination end of the circuit. For a CDA to CDA circuit, this line will not appear.

`Transmit EIA`: Information field

This field reflects the value of Control 1 on the TMS side and the S-bit on the CDA side.

`F-On` (Forced-On) is the only available state.

End CDA Port: Jog Field

`Port A` or `Port B`: for the CDA end of the circuit

`******`: for the TMS channel termination point

`End DS0 Num`: Jog Field

`1 - 31` for CDA-E1

`1 - 24` for CDA-T1

`**` for TMS channel

`End Channel Num`: Poke point for the CDA end of the circuit

Input field for the TMS channel end

For the TMS channel end, this field allows you to configure a channel number. For the CDA end of the circuit, this is an entry point to the X.50 subaggregate Channel St Pos Selection (Channel Start Position Selection) screen.

Figures B-5 and B-6 are two examples of the Circuit Configuration screen. Note that the only available routing is `Automatic`.

```
Circuit Configuration          X50SW                  16-JUN-1996 14:20:12
Name AB            .001   Class  TMS      Type  SYNC    Interface X50S
Rate  9.600K

Xmit/Recv Clock  INT-INT
                        S-bit                    CL1
Transmit EIA            F-On                     F-On

End Node Name           A     (001)    SEL        B  (002)    SEL
End Node Type           TMS-3000                  TMS-3000
End Equip Slot          03                        15
End CDA Port            Port A                    ******
End DS0 Num             02                        **
End Channel Num         03                        05

Profile    DEFAULT        Routing Priority 2      Preemption Pri 2
Routing    Automatic
TOR/DRR    CNFG1      E
Configs

     Create by Default           Modify Another         Delete
     Create by Template          Duplicate              Rename
```

Figure B-5 Termination on a TMS Channel

```
Circuit Configuration    X50SW                 16-JUN-1996 15:25:12
Name AB                  .001   Class  TMS     Type  SYNC   Interface X50S
Rate  9.600K


                        S-bit                   S-bit
Transmit EIA            F-On                    F-On

End Node Name           A     (001)    SEL       B  (002)    SEL
End Node Type           TMS-3000                 TMS-3000
End Equip Slot            03                     05
End CDA Port            Port A                   Port B
End DS0 Num             02                       01
End Channel Num           03                      01

Profile    DEFAULT      Routing Priority 2    Preemption Pri 2
Routing    Automatic
TOR/DRR    CNFG1      E
Configs

         Create by Default     Modify Another      Delete
        Create by Template    Duplicate           Rename
```

Figure B-6 Termination on a CDA X.50

The `Channel St Pos Selection` (Channel Start Position Selection) screen *(Figure B-7)* is accessible from the Circuit Configuration screen once the CDA End Channel Num poke point has been highlighted and you press `Enter`. Using the cursor movement keys, you can select the channel start position in the X.50 subaggregate frame. Only valid start positions are displayed on the screen, and only available ones are selectable. Frame positions occupied by the channel are dynamically shown on the bottom of the screen. In the case of multiple distribution algorithms existing for the same rate (e.g. 19.20K), the poke point SELECT DISTRIBUTION appears on the screen and is used to change the channel framing distribution.

The example below is for a 9.6 K channel.

```
Channel St Pos Selection        X50SW           16-JUN-1996 15:45:12
Name X50SW1    .001    Class  TMS    Type  SYNC   Interface X50S
                 Node                              CDA
Rate    Name                   Adr         Slot    Port    DS0
9.6K    A                     (001)         03       A      02

------------------------Channel Start Positions------------------------

                         01   02   03   04   05




 Selected Channel  01 occupies envelopes: 1,6,11,16,21,26,31,36,
41,46,51,56,61,66,71,76
```

Figure B-7 CDA Channel Start Position Selection

Status

Subaggregate Status — The X.50 subaggregate is displayed as a one-sided subaggregate. This is the same as a CLEAR bundle. No indication of the status of the X.50 circuits that terminate on that subaggregate is shown on the screen.

Circuit Status — There are no Status or Diagnostics available on the CDA side of an X.50 switching circuit. The Circuit Status screen of the circuit that terminates on a TMS channel card is accessible through the Circuit selection screen or the Channel Summary screen of that card.

Diagnostics

Subaggregate Diagnostics — The X.50 subaggregate behaves the same as a DTEC or CLEAR subaggregate.

Channel Diagnostics — Channel diagnostics are the same as usual on the TMS side of the circuit. There are no diagnostics on the CDA side.

X.50 Framing

X.50 uses an 8-bit envelope structure for connecting to X.50 service. The envelope is shown below.

1	2	3	4	5	6	7	8
F			Information Bits				S

The F-bit is used to hold a unique framing pattern for X.50. The S-bit is a status bit and controls the decoding of the information bits. If the status bit is a logic 1, the information bits carry channel data. If the status bit is a logic 0, the information bits carry network control information.

The 8-bit envelopes are assembled into frames based on 80 envelopes (division 2) or 20 envelopes (division 3). Channel rates supported by X.50 are derived from the repetition rate of the envelopes in the frame.

9.6 K – repeats every five envelopes

4.8 K – repeats every ten envelopes

2.4 K – repeats every twenty envelopes

600 – repeats every eighty envelopes (division 2 only)

Framing Pattern

X.50 Division 2, utilizing the 80-envelope pattern, provides multiplexing for subrate data onto a 64 kHz circuit. Similarly, Division 3, utilizing an 20-envelope pattern, provides multiplexing for subrate data onto a 64 kHz circuit. For Division 2, the framing pattern continues for 80 frames and repeats itself; In Division 2, the pattern repeats after 20 frames.

X.50 Phases

In the X.50 multiplexed stream up to five 9.6K channels can be supported. These five position sets are called phases. The framing pattern is divided into five phases (1 through 5) of 16 envelopes each (Division 2) or 4 envelopes each (Division 3). One byte is transmitted from each phase in succession. Each phase can contain one 9.6K channel or two 4.8K channels or four 2.4K channels or sixteen 0.6K channels.

A 19.2 K channel uses two phases *(See Table B-1)*. To configure a frame that is compliant with ITU-T X.54, you have to configure channels with the start positions from phases you want those channels to belong to. If you start filling up the X.50 switching subaggregate with circuits of the highest rate and the lowest start position and proceed to the lower rates and higher start positions, the frame will come out naturally.

An example of a 20 envelope frame for a 9.6K channel is shown below.

|<--------------------------------------- 20 8-bit envelopes --------------------------------------->|

1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
**					**					**					**				

8-bit envelopes for a 9.6K channel

Table B-1 X.54

Configuration Number	Phase Number					Configuration Number	Phase Number				
	1	2	3	4	5		1	2	3	4	5
00	**48**										
01	9.6	9.6	9.6	9.6	9.6	**29**	9.6	4.8	2.4	0.6	0.6
02	9.6	9.6	9.6	9.6	4.8	**30**	9.6	4.8	0.6	0.6	0.6
03	9.6	9.6	9.6	9.6	2.4	**31**	9.6	2.4	2.4	2.4	2.4
04	9.6	9.6	9.6	9.6	0.6	**32**	9.6	2.4	2.4	2.4	0.6
05	9.6	9.6	9.6	4.8	4.8	**33**	9.6	2.4	2.4	0.6	0.6
06	9.6	9.6	9.6	4.8	2.4	**34**	9.6	2.4	0.6	0.6	0.6
07	9.6	9.6	9.6	4.8	0.6	**35**	9.6	0.6	0.6	0.6	0.6
08	9.6	9.6	9.6	2.4	2.4	**36**	4.8	4.8	4.8	4.8	4.8
09	9.6	9.6	9.6	2.4	0.6	**37**	4.8	4.8	4.8	4.8	2.4
10	9.6	9.6	9.6	0.6	0.6	**38**	4.8	4.8	4.8	4.8	0.6
11	9.6	9.6	4.8	4.8	4.8	**39**	4.8	4.8	4.8	2.4	2.4
12	9.6	9.6	4.8	4.8	2.4	**40**	4.8	4.8	4.8	2.4	0.6
13	9.6	9.6	4.8	4.8	0.6	**41**	4.8	4.8	4.8	0.6	0.6
14	9.6	9.6	4.8	2.4	2.4	**42**	4.8	4.8	2.4	2.4	2.4
15	9.6	9.6	4.8	2.4	0.6	**43**	4.8	4.8	2.4	2.4	0.6
16	9.6	9.6	4.8	0.6	0.6	**44**	4.8	4.8	2.4	0.6	0.6
17	9.6	9.6	2.4	2.4	2.4	**45**	4.8	4.8	0.6	0.6	0.6
18	9.6	9.6	2.4	2.4	0.6	**46**	4.8	2.4	2.4	2.4	2.4
19	9.6	9.6	2.4	0.6	0.6	**47**	4.8	2.4	2.4	2.4	0.6
20	9.6	9.6	0.6	0.6	0.6	**48**	4.8	2.4	2.4	0.6	0.6
21	9.6	4.8	4.8	4.8	4.8	**49**	4.8	2.4	0.6	0.6	0.6
22	9.6	4.8	4.8	4.8	2.4	**50**	4.8	0.6	0.6	0.6	0.6
23	9.6	4.8	4.8	4.8	0.6	**51**	2.4	2.4	2.4	2.4	2.4
24	9.6	4.8	4.8	2.4	2.4	**52**	2.4	2.4	2.4	2.4	0.6
25	9.6	4.8	4.8	2.4	0.6	**53**	2.4	2.4	2.4	0.6	0.6
26	9.6	4.8	4.8	0.6	0.6	**54**	2.4	2.4	0.6	0.6	0.6
27	9.6	4.8	2.4	2.4	2.4	**55**	2.4	0.6	0.6	0.6	0.6
28	9.6	4.8	2.4	2.4	0.6	**56**	0.6	0.6	0.6	0.6	0.6

C EC Declaration

EC Declaration of Conformity for Electromagnetic Compatibility and Safety

We, General DataComm Inc., declare under our sole legal responsibility that the following products conform to the following relevant harmonized standards, the reference numbers of which have been published in the Official Journal of the European Communities:

Electromagnetic Compatibility — (EMC Directive 89/336/EEC):

- The affixing of the CE mark is based on compliance with directive 89/336/EEC as amended by directive 93/68/EEC.
- EN 55022 (Based on CISPR 22), Specification for limits and methods of measurement of radio interference characteristics of information technology equipment.
- EN 55024 Limits and methods of measurement of the immunity to Electro-Magnetic interference for information technology equipment.
- EN 50081-1(Based on IEC 801), Electromagnetic compatibility generic emissions standard Part 1: Residential, Commercial and light industry.
- EN 50082-1 Electromagnetic compatibility generic immunity standard Part 1: Residential Commercial and light industry.

Low Voltage Directive — (LVD 73/23/EEC):

- The affixing of the CE mark is based on compliance with directive 73/23/EEC as amended by directive 93/68/EEC.
- EN 60950 Safety of Information Technology Equipment including Electrical Business Equipment.
- EN 41003 Particular Safety Requirements for Equipment to be connected to Telecommunications Networks.

Equipment List

TMS Channel Cards	
036M078-001	UDC/232/V.24/V.2036M078-002
036M078-002	UDC/422/V.11
036M078-003	UDC/423/V.10
036M078-004	UDC/V.35
GS936M014-001	TDC-2 (256K0
GS936M014-002	TDC-5 (512K0
036P265-003	UVC/ADPCM
036M285-002	CELP Voice Channel w/Fax
036M285-003	CELP Voice Channel
036M285-004	CELP 9.6K Voice Channel w/Fax
036M285-005	CELP 9.6K Voice Channel
036P270-001	Echo Canceller
036M335-001	ACM II/E1
TMS 3000 Options	
036M337-001	ESCC (Enterprise System Control Card)
036P302-001	RCC (Redundancy Control Card)
036P307-002	ECC-II (Expansion Common Card)
S-036P042-001	Sync Status Module
S-036B001-002	CP-12 Adapter (Expansion Shelf)
S-036P001-001	CP (422/423/449 Ext. Adapter)
039P002-001	DLD=M (Ext. Line Driver
OCM*TMS 2000 Feeder	
036M486-002	2121 Standalone Enclosure w/CCM N/R
036M481-001	2220 Shelf w/CCM, N/R
036M481-002	2320 Shelf w/CCM, Redundant
036M482-001	2230 Shelf w/CCM, NR -48VDC
OCM 1000 Point-to-Point	
036M488-002	1120 Standalone Enclosure, w/CCM, N/R
036M484-001	1220 Shelf w/CCM, N/R
036M484-002	1320 Shelf w/CCM, Redundant
OCM*TMS 1000/2000 LIM Cards	
036M410-002	E-1
036P436-002	V.35 LIM
036P436-001	V.11 LIM
036P437-001	Subrate LIM (RS232/V.28)
Expansion Shelf (OCM*TMS 1000/2000)	
010M065-001	MS-1 AC Expansion Shelf 220/240V
010M066-001	MS-1 DC Expansion Shelf

Data Channel Cards	
036P413-001	DDC (RS-232)
036P410-001	HS SDC (RS-232)
036P410-002	HS SDC (V.35)
036P410-003	HS SDC (RS-422)
036P410-004	HS SDC (RS-423)
LAN/Frame Relay Cards	
036M450-003	OPP/Ethernet
036M450-004	OPP/Ethernet w/o Packet Bus
036M451-001	OPP Token Ring *(-003 non-existent P/N)*
036M451-004	OPP Token Ring w/o Packet Bus
Voice Signaling (2W/4W E&M)	
036M420-006	PCM/ADPCM-No Echo
036M420-003	PCM/ADPCM-w/Echo
036M420-028	CELP No Fax
036M420-025	CELP w/Fax
Voice Signaling (2W FXS)	
036M420-004	2W FXS/ADPCM/No Echo
036M420-001	2W FXS/ADPCM w/Echo
036M420-026	
036M420-023	
Spares and Options	
036M040-004	CCM-4
036M040-005	CCM-5
TMS-3000 Compact Shelf	
036M357-001	TMS Compact w/ESCC, N/R
036M357-002	TMS Compact w/ESCC, Redundant
Module Interface	
036P041-001	EIF-E (RS232/V.24)
TMS-3000 Channel Cards	
036M078-005	Hyper UDC/422
036M078-006	Hyper UDC/V.35
TMS-3000 Options	
036P365-001	Universal I/O red.
036P351-001	Sync Status Module
OCM*TMS 2000 Feeder	
036M482-001	2230 Shelf w/CCM, N/R, -48
Data Channel Module	
036P416-001	OCM G.703 Data Channel

Voice Signaling (2W FXO)	
036M420-005	2W FXO/ADPCM - No Echo
036M420-002	2W FXO/ADPCM w/ Echo
036M420-027	2W FXO/CELP No Fax
036M420-023	2W/4W FXS/CELP w/Fax
036M420-024	2W FXO/CELP w/Fax
Minimux Plus Basic Assembly	
G036B003-015	Minimux Plus Enclosure 220/240V
G036B015-002	Minimux Plus Exp. Encl.
TMS-3000 Compact	
036M358-001	TMS Compact w/ESCC, N/R
036M358-002	TMS Compact w/ESCC, Redundant
Module Interface	
036P064-001	EIF-G (64K Co-Direct)
036P066-001	EIF-C (64K Contra-Direct)
Data Channel Cards	
036P243-001	TMS G.703 Data Channel
036P414-001	X.50 Quad Data Card

A Circuit Rates

Overview

Tables A-1 through A-12 list data rates for TMS to TMS nodes for each type of TMS class circuit in the TMS-3000. These rates are shown as found in the `Circuit Rate Selection` screen.

Note that the following circuit types have only one or two rates available:

ACM-D — 64 K PCM and 320 K

G.703 — 64 K, 128 K, *or* 256 K. Supports *one* of these three rates depending on the G.703 card version.

CADM — 16 K

TOR — 8 and 9.6 K

Table A-1 Synchronous Channel Rates

50	75	100	150	200	300	400	600	800
900	1.000 K	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K	24.00 K	25.00 K	28.00 K	28.80 K	32. 00 K	36.00 K	38.40 K
39.00 K	40.80 K*	48.00 K	50.00 K	56.00 K	57.60 K	64.00 K	72.00 K	76.80 K
96.00 K	100.0 K	112.0 K	115.2 K	128.0 K	144.0 K	153.6 K	168.0 K**	192.0 K
224.0 K	230.4 K	256.0 K	280.0 K*	288.0 K	307.2 K	320.0 K*	336.0 K**	338.0 K*
384.0 K	392.0 K*	394.0 K*	448.0 K**	460.8 K	504.0 K*	512.0 KÜ	560.0 K*	576.0 K
616.0 K*	640.0 K*	672.0 K**	704.0 K*	728.0 K*	768.0 K	784.0 K*	832.0 K*	840.0 K*
896.0	921.6 K	952.0 K*	960.0 K*	1.008 M*	1.024 M	1.064 M*	1.088 M*	1.120 M*
1.152 M	1.176 M*	1.216 M*	1.232 M*	1.280 M*	1.288 M*	1.344 M**	1.408 M*	1.472 M*
1.528 M*	1.536 M***	1.544 MÜ	1.600 M*	1.664 M*	1.728 M*	1.792 M*	1.856 M*	1.920M
1.984 M*								

* Requires external clock
** Requires that ESCC option switches be set for 1.344 (S3-5 ON)
*** Requires that ESCC option switches be set for 1.536 (S3-4 ON)
Ü Maximum rate for Digital Bridge synchronous circuits

Table A-2 Isochronous Channel Rates

75	100	150	200	300	400	600	800	900
1.000 K	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.600 K	4.000 K	4.800 K
7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K	16.00 K	19.20 K	24.00 K
28.80 K	32.00 K	36.00 K	48.00 K	57.60 K	64.00 K			

Table A-3 Asynchronous Channel Rates

75	100	150	200	300	400	600	800	900
1.000 K	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K	4.000 K
4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K	16.00 K
19.20 K								

Table A-4 Transition-Encoded Rates

75	100	150	200	300	400	600	800	900
1.000 K	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.600 K	4.000 K	4.800 K
7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K	16.00 K	19.20 K	24.00 K
28.80 K	32.00 K	36.00 k	48.00 K	57.60 K	64.00 K			

Table A-5 CVSD Channel Rates

14.40 K	16.00 K	19.20 K	24.00 K	25.00 K	28.00 K	28.80 K	32.00 K	36.00 K
38.40 K	48.00 K	56.00 K	57.60 K	64.00 K				

Table A-6 U-ADPCM Rates

16.00 K	24.00 K	32. 00 K	CC32K	A32 K	NA32 K	64K PCM

Table A-7 ASP Channel Rates

10.00 K	11.00 K	12. 00 K	14.00 K	16.00 K

Table A-8 TID-III Data Channel Rates

1.200 K	2.400 K	3.200 K	4.800 K	6.400 K	9.600 K	12.00 K	19.20 K	38.40 K
72.00 K	76.80 K	100.0 K	112.0 K	153.6 K	224.0 K	288.0 K	576.0 K	1.152 M

Table A-9 VLBRV Channel Rates

2.400 K	4.800 K	9.600 K

Table A-10 CELP Channel Rates

4.800 K	6.400 K	9.600 K

Table A-11 ACM-UVC and ACM-V Rates

16.00 K	24.00 K	32. 00 K	CC32K	A32 K	NA32 K	64K PCM

Table A-12 TPP Rates

50	75	100	150	200	300	400	600	800
900	1.000 K	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K	24.00 K	25.00 K	28.00 K	28.80 K	3.200 K	36.00 K	38.40 K
39.00 K	40.80 K	48.00 K	50.00 K	56.00 K	57.60 K	64.00 K	72.00 K	76.80 K
96.00 K	100.0 K	112.0 K	115.2 K	128.0 K	144.0 K	153.6 K	168.0 K	192.0 K
224.0 K	230.4 K	256.0 K	280.0 K	288.0 K	307.2 K	320.0 K	336.0 K	338.0 K
384.0 K	392.0 K	394.0 K	448.0 K	460.8 K	504.0 K	512.0 K	560.0 K	576.0 K
616.0 K	640.0 K	672.0 K	704.0 K	728.0 K	768.0 K	784.0 K	832.0 K	840.0 K
896.0 K	921.6 K	952.0 K	960.0 K	1.008 M	1.024 M	1.064 M	1.088 M	1.120 M
1.152 M	1.176 M	1.216 M	1.232 M	1.280 M	1.288 M	1.344 M	1.408 M	1.472 M
1.528 M	1.536 M	1.544 M	1.600 M	1.664 M	1.728 M	1.792 M	1.856 M	1.920 M
1.984 M								

Tables A-13 through A-19 list data rates for TMS to OCM, OCM to OCM, and OCM Dual Private Voice circuits.

Table A-13 Synchronous, Isochronous, and Transition-Encoded Channel Rates (TMS-OCM single data card and OCM-OCM single data card)

300	600	1.200 K	1.600K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K	24.00 K	28.00 K	28.80 K	32.00 K	36.00 K	38.40 K	48.00 K
56.00 K	57.60 K	64.00 K	72.00 K	76.80 K	96.00 K	112.0 K	115.2 K	128.0 K
144.0 K	153.6 K	192.0 K	224.0 K	230.4 K	256.0 K	288.0 K	320.0 K	384.0 K
448.0 K	460.8 K	512.0 K	576.0 K	640.0 K	704.0 K	768.0 K	832.0 K	896.0 K
960.0 K	1.024 M	1.088 M	1.152 M	1.216 M	1.280 M	1.344 M	1.408 M	1.472 M
1.536 M	1.544 M	1.600 M	1.664 M	1.728 M	1.792 M	1.856 M	1.920 M	1.984 M
2.048 M								

Table A-14 Synchronous, Isochronous, and Transition-Encoded Channel Rates (TMS-OCM dual data card)

300	600	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K	24.00 K	28.00 K	28.80 K	32.00 K	36.00 K	38.40 K	

Table A-15 Synchronous, Isochronous, and Transition-Encoded Channel Rates (OCM-OCM single data card)

300	600	1.200 K	1.600K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K	24.00 K	28.00 K	28.80 K	32.00 K	36.00 K	38.40 K	48.00 K
56.00 K	57.60 K	64.00 K	72.00 K	76.80 K	96.00 K	112.0 K	115.2 K	128.0 K
144.0 K	153.6 K	192.0 K	224.0 K	230.4 K	256.0 K	288.0 K	320.0 K	384.0 K
448.0 K	460.8 K	512.0 K	576.0 K	640.0 K	704.0 K	768.0 K	832.0 K	896.0 K
960.0 K	1.024 M	1.088 M	1.152 M	1.216 M	1.280 M	1.344 M	1.408 M	1.472 M
1.536 M	1.544 M	1.600 M	1.664 M	1.728 M	1.792 M	1.856 M	1.920 M	1.984 M
2.048 M								

Table A-16 Synchronous, Isochronous, and Transition-Encoded Channel Rates (OCM-OCM dual data card)

300	600	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K	24.00 K	28.00 K	28.80 K	32.00 K	36.00 K	38.40 K	

Table A-17 Asynchronous Channel Rates (TMS-OCM single data card and TMS-OCM dual data card)

300	600	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K							

Table A-18 Asynchronous Channel Rates (OCM-OCM single data card and OCM-OCM dual data card)

300	600	1.200 K	1.600 K	1.800 K	2.000 K	2.400 K	3.200 K	3.600 K
4.000 K	4.800 K	6.400 K	7.200 K	8.000 K	9.600 K	12.00 K	14.00 K	14.40 K
16.00 K	19.20 K	24.00 K	28.00 K	28.80 K	32.00 K	36.00 K	38.40 K*	

* Single data channel card only.

Table A-19 IMBE (OCM Dual Private Voice) Rates

2.400 K	4.800 K	6.400 K	8.000 K	9.600 K

B X.50 Switching

Overview

The TMS-3000 CDA is capable of switching X.50 type subrate circuits. These circuits are carried in up to 32 X.50 type frames. The total number of circuits cannot exceed the total CDA card limit of 256 channels for CDA-256 and 126 channels for CDA-128.

The TMS-3000 Controller provides the interface for entering configuration, displaying status and alarms, and invoking diagnostics.

The X.50 format is an ITU-T multiplex standard for a gross bit rate of 64 kHz. It is a preferred multiplexing scheme that can be used for international links between countries. For these international links, the gross bit rate standard and framing information should be contained within the 64 kHz capability. Framing is described later in this appendix.

Figures B-1 through B-3 show some examples of X.50 applications. In *Figure B-1*, an X-50 multiplexer feeds into the public network on an individual 64K line. This "X.50 DS0" is transported to the TMS-3000 via the CDA-E1 card where it is demultiplexed in accordance with the ITU-T X.50 recommendations. The individual subrate channels (W, X, Y, and Z) are translated into TMS format. Channels W and Y are terminated in local Universal Data cards while channels X and Z are sent to a remote OCM for termination.

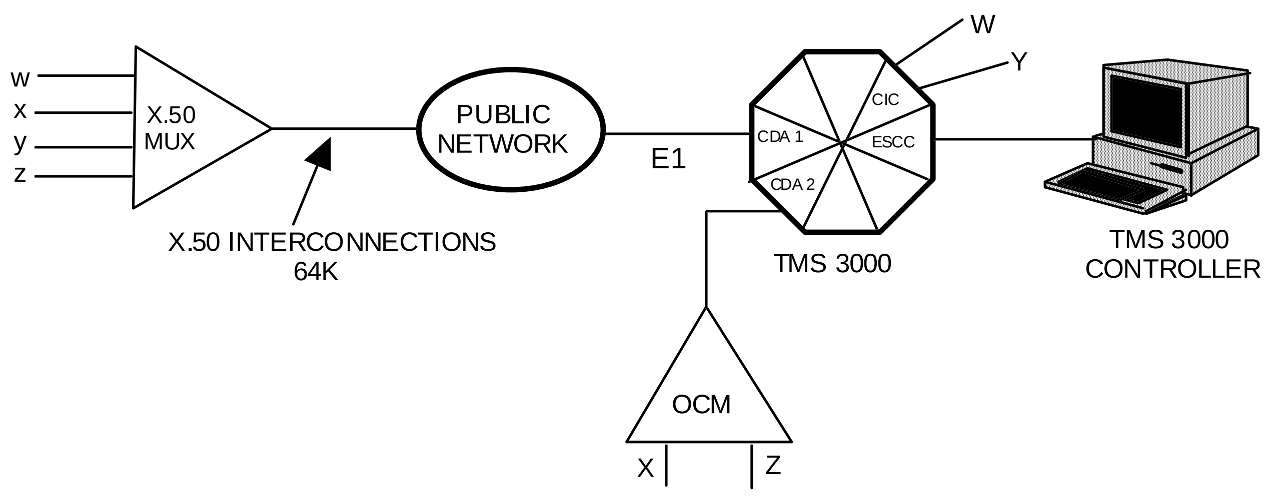


Figure B-1 X.50 toTMS Subrate Switching (Public Network)

Figure B-2 shows an application nearly identical to that of Figure B-1. However, no public network exists, and TMS-3000 #1 is used as a network digital crossconnect. As before, the X.50 multiplexer is accessed via a 64K circuit. Entering TMS-3000 #1 on a clear channel, this X.50 DS0 is combined into an E-1 stream for transport to TMS-3000 #2. Here it is translated into TMS format, and the subrate channels are sent to final destinations (W and Y to local UDCs, X and Z to remote OCM 2).

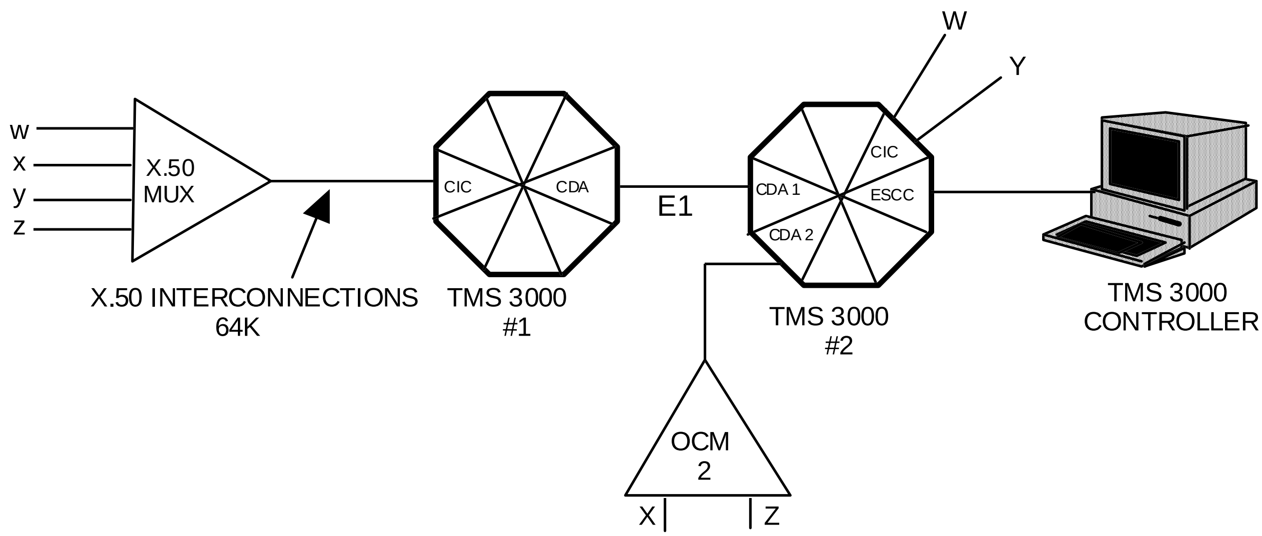


Figure B-2 X.50 toTMS Subrate Switching (TMS Grooming)

The *Figure B-3* application places the TMS-3000 and X.50 CDA as the device that actually demultiplexes each 64K DS0 and then recombines them into another stream for transport back into the network. The subrate channels X and Z are "groomed" off of the X.50 public network and sent to a remote OCM. Subrate channel W at X.50 MUX 1 is sent on subaggregate A through the network to the TMS-3000 CDA where it is sent back through the network to subaggregate B to X.50 MUX 2.

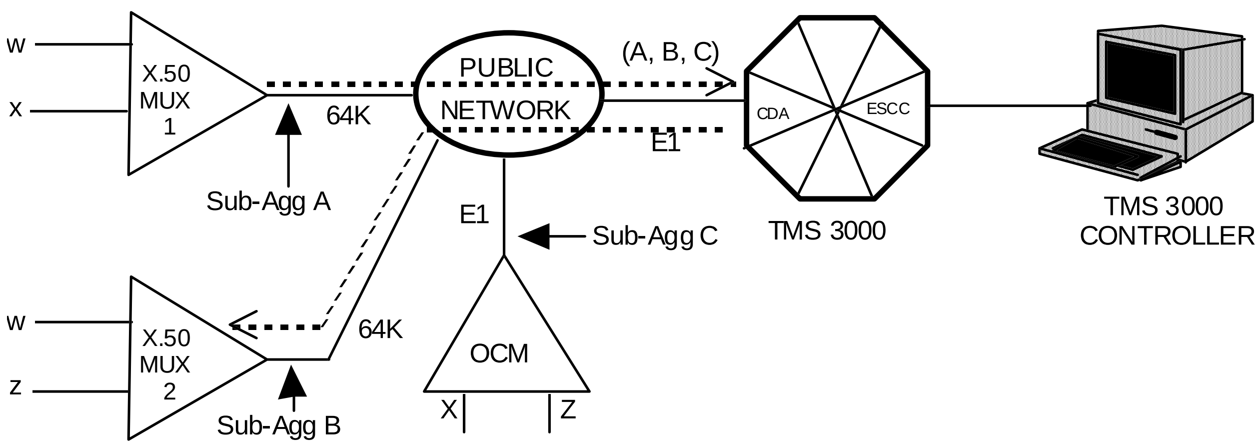


Figure B-3 X.50 to X.50 Switching (Public Network)

Configuration

The purpose of this section is to illustrate the screens specific to the X.50 interface which are available at the TMS controller. In some cases, only items which are unique to X.50 are explained. For screens which require more than just minor explanation, the screens are illustrated, followed by a discussion of the configurable options.

CDA Bundle Configuration Screen

An X50S (X.50 Switching) Bundle type is selectable. Bundle Name is the only configurable item for this bundle type on this screen. To access the bundle detail screen highlight, with the cursor, the Bundle ID number for an X50S bundle type and press **<Enter>**.

CDA Bundle Details

Options or fixed settings for the fields shown in *Figure B-4* are as follows.

`Subagg Type`: Jog Field

`X50d2` (default)

`X50d3`

X50d2 refers to X.50 Division 2. The X50d2 frame consists of 80 envelopes. X50d3 refers to X.50 Division 3. The X50d3 frame consists of 20 envelopes. Rates below 2400 can terminate on X50d2 bundles only.

`Conditioning`: Information Field

`Channel Mark Hold`

`Error Threshold`

`Off`

`Aggregate Sync Rate`: Information field

`7600 Hz` for X50d3

`7200 Hz` for X50d2

```
CDA-E1 Bundle Details    X50SW                 16-JUN-1996 14:10:12
X50 Switching Subaggregate Name F2A

----------------------------------------------------------------------

               Local Node      Slot         DS0
Name                  Addr           Port
 A                    1         3      A     04

Subagg         Conditioning        Error       Aggregate
Type        Circuit    Signaling   Threshold   Sync Rate

X50d2        Channel Mark Hold        OFF        7200 Hz

                         Examine Bandwidth
```

Figure B-4 Bundle Details

Circuit Configuration

An X.50 switching circuit starts at a CDA X.50 subaggregate and is converted to TMS format for transport through the TMS network. It then terminates on a TMS channel card or is built into an X.50 frame on another CDA X.50 subaggregate. An X.50 subaggregate, as a circuit destination point, is available for TMS class circuits with an X50S interface. The X50S interface can be selected for SYNC (synchronous) and ASYNC (asynchronous) types of circuits. The circuit is not downspeedable, and one end of the circuit has to be a CDA X.50 subaggregate.

A description of the configurable items that are new or changed with the addition of X.50 switching capability is provided below.

`Type`: Jog Field

The available circuit types such as `SYNC`, `ASYNC`, etc. are selected here. For a CDA to CDA circuit (i.e. not terminating in a TMS/OCM channel card), the data circuit is fully transparent, and the `Type` field does not have any particular meaning.

`Interface`: Jog Field

In addition to other interface types, `X50S` (X.50 Switching) is available.

`Nos` (Number) `Data and Stop` (Asynchronous circuit)

`Xmit/Recv Clock` (Synchronous circuit): Jog Fields

These are a standard set of values for the corresponding circuit type. Note that these fields are meaningful only for the TMS Channel termination end of the circuit. For a CDA to CDA circuit, this line will not appear.

`Transmit EIA`: Information field

This field reflects the value of Control 1 on the TMS side and the S-bit on the CDA side.

`F-On` (Forced-On) is the only available state.

End CDA Port: Jog Field

`Port A` or `Port B`: for the CDA end of the circuit

`******`: for the TMS channel termination point

`End DS0 Num`: Jog Field

`1 - 31` for CDA-E1

`1 - 24` for CDA-T1

`**` for TMS channel

`End Channel Num`: Poke point for the CDA end of the circuit

Input field for the TMS channel end

For the TMS channel end, this field allows you to configure a channel number. For the CDA end of the circuit, this is an entry point to the X.50 subaggregate Channel St Pos Selection (Channel Start Position Selection) screen.

Figures B-5 and B-6 are two examples of the Circuit Configuration screen. Note that the only available routing is `Automatic`.

```
Circuit Configuration          X50SW                  16-JUN-1996 14:20:12
Name AB            .001   Class  TMS      Type  SYNC    Interface X50S
Rate  9.600K

Xmit/Recv Clock  INT-INT
                        S-bit                     CL1
Transmit EIA            F-On                      F-On

End Node Name           A     (001)    SEL        B  (002)    SEL
End Node Type           TMS-3000                   TMS-3000
End Equip Slot          03                         15
End CDA Port            Port A                     ******
End DS0 Num             02                        **
End Channel Num         03                         05

Profile     DEFAULT        Routing Priority 2      Preemption Pri 2
Routing     Automatic
TOR/DRR     CNFG1      E
Configs

     Create by Default           Modify Another          Delete
     Create by Template          Duplicate               Rename
```

Figure B-5 Termination on a TMS Channel

```
Circuit Configuration    X50SW                  16-JUN-1996 15:25:12
Name AB                 .001   Class  TMS     Type  SYNC   Interface X50S
Rate  9.600K


                      S-bit                  S-bit
Transmit EIA          F-On                   F-On

End Node Name         A     (001)    SEL       B  (002)    SEL
End Node Type         TMS-3000                 TMS-3000
End Equip Slot          03                     05
End CDA Port          Port A                   Port B
End DS0 Num           02                       01
End Channel Num         03                      01

Profile     DEFAULT      Routing Priority 2    Preemption Pri 2
Routing     Automatic
TOR/DRR     CNFG1      E
Configs

         Create by Default     Modify Another      Delete
        Create by Template    Duplicate           Rename
```

Figure B-6 Termination on a CDA X.50

The `Channel St Pos Selection` (Channel Start Position Selection) screen *(Figure B-7)* is accessible from the Circuit Configuration screen once the CDA End Channel Num poke point has been highlighted and you press `Enter`. Using the cursor movement keys, you can select the channel start position in the X.50 subaggregate frame. Only valid start positions are displayed on the screen, and only available ones are selectable. Frame positions occupied by the channel are dynamically shown on the bottom of the screen. In the case of multiple distribution algorithms existing for the same rate (e.g. 19.20K), the poke point `SELECT DISTRIBUTION` appears on the screen and is used to change the channel framing distribution.

The example below is for a 9.6 K channel.

```
Channel St Pos Selection       X50SW           16-JUN-1996 15:45:12
Name X50SW1    .001    Class  TMS    Type  SYNC    Interface X50S
                 Node                               CDA
Rate    Name                     Adr         Slot    Port    DS0
9.6K    A                       (001)         03      A      02

------------------------Channel Start Positions------------------------

                         01   02   03   04   05




 Selected Channel  01 occupies envelopes: 1,6,11,16,21,26,31,36,
41,46,51,56,61,66,71,76
```

Figure B-7 CDA Channel Start Position Selection

Status

Subaggregate Status — The X.50 subaggregate is displayed as a one-sided subaggregate. This is the same as a CLEAR bundle. No indication of the status of the X.50 circuits that terminate on that subaggregate is shown on the screen.

Circuit Status — There are no Status or Diagnostics available on the CDA side of an X.50 switching circuit. The Circuit Status screen of the circuit that terminates on a TMS channel card is accessible through the Circuit selection screen or the Channel Summary screen of that card.

Diagnostics

Subaggregate Diagnostics — The X.50 subaggregate behaves the same as a DTEC or CLEAR subaggregate.

Channel Diagnostics — Channel diagnostics are the same as usual on the TMS side of the circuit. There are no diagnostics on the CDA side.

X.50 Framing

X.50 uses an 8-bit envelope structure for connecting to X.50 service. The envelope is shown below.

1	2	3	4	5	6	7	8
F			Information Bits				S

The F-bit is used to hold a unique framing pattern for X.50. The S-bit is a status bit and controls the decoding of the information bits. If the status bit is a logic 1, the information bits carry channel data. If the status bit is a logic 0, the information bits carry network control information.

The 8-bit envelopes are assembled into frames based on 80 envelopes (division 2) or 20 envelopes (division 3). Channel rates supported by X.50 are derived from the repetition rate of the envelopes in the frame.

9.6 K – repeats every five envelopes

4.8 K – repeats every ten envelopes

2.4 K – repeats every twenty envelopes

600 – repeats every eighty envelopes (division 2 only)

Framing Pattern

X.50 Division 2, utilizing the 80-envelope pattern, provides multiplexing for subrate data onto a 64 kHz circuit. Similarly, Division 3, utilizing an 20-envelope pattern, provides multiplexing for subrate data onto a 64 kHz circuit. For Division 2, the framing pattern continues for 80 frames and repeats itself; In Division 2, the pattern repeats after 20 frames.

X.50 Phases

In the X.50 multiplexed stream up to five 9.6K channels can be supported. These five position sets are called phases. The framing pattern is divided into five phases (1 through 5) of 16 envelopes each (Division 2) or 4 envelopes each (Division 3). One byte is transmitted from each phase in succession. Each phase can contain one 9.6K channel or two 4.8K channels or four 2.4K channels or sixteen 0.6K channels.

A 19.2 K channel uses two phases *(See Table B-1)*. To configure a frame that is compliant with ITU-T X.54, you have to configure channels with the start positions from phases you want those channels to belong to. If you start filling up the X.50 switching subaggregate with circuits of the highest rate and the lowest start position and proceed to the lower rates and higher start positions, the frame will come out naturally.

An example of a 20 envelope frame for a 9.6K channel is shown below.

|<--------------------------------------- 20 8-bit envelopes --------------------------------------->|

1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
**					**					**					**				

8-bit envelopes for a 9.6K channel

Table B-1 X.54

Configuration Number	Phase Number 1	2	3	4	5	Configuration Number	Phase Number 1	2	3	4	5
00			**48**								
01	9.6	9.6	9.6	9.6	9.6	**29**	9.6	4.8	2.4	0.6	0.6
02	9.6	9.6	9.6	9.6	4.8	**30**	9.6	4.8	0.6	0.6	0.6
03	9.6	9.6	9.6	9.6	2.4	**31**	9.6	2.4	2.4	2.4	2.4
04	9.6	9.6	9.6	9.6	0.6	**32**	9.6	2.4	2.4	2.4	0.6
05	9.6	9.6	9.6	4.8	4.8	**33**	9.6	2.4	2.4	0.6	0.6
06	9.6	9.6	9.6	4.8	2.4	**34**	9.6	2.4	0.6	0.6	0.6
07	9.6	9.6	9.6	4.8	0.6	**35**	9.6	0.6	0.6	0.6	0.6
08	9.6	9.6	9.6	2.4	2.4	**36**	4.8	4.8	4.8	4.8	4.8
09	9.6	9.6	9.6	2.4	0.6	**37**	4.8	4.8	4.8	4.8	2.4
10	9.6	9.6	9.6	0.6	0.6	**38**	4.8	4.8	4.8	4.8	0.6
11	9.6	9.6	4.8	4.8	4.8	**39**	4.8	4.8	4.8	2.4	2.4
12	9.6	9.6	4.8	4.8	2.4	**40**	4.8	4.8	4.8	2.4	0.6
13	9.6	9.6	4.8	4.8	0.6	**41**	4.8	4.8	4.8	0.6	0.6
14	9.6	9.6	4.8	2.4	2.4	**42**	4.8	4.8	2.4	2.4	2.4
15	9.6	9.6	4.8	2.4	0.6	**43**	4.8	4.8	2.4	2.4	0.6
16	9.6	9.6	4.8	0.6	0.6	**44**	4.8	4.8	2.4	0.6	0.6
17	9.6	9.6	2.4	2.4	2.4	**45**	4.8	4.8	0.6	0.6	0.6
18	9.6	9.6	2.4	2.4	0.6	**46**	4.8	2.4	2.4	2.4	2.4
19	9.6	9.6	2.4	0.6	0.6	**47**	4.8	2.4	2.4	2.4	0.6
20	9.6	9.6	0.6	0.6	0.6	**48**	4.8	2.4	2.4	0.6	0.6
21	9.6	4.8	4.8	4.8	4.8	**49**	4.8	2.4	0.6	0.6	0.6
22	9.6	4.8	4.8	4.8	2.4	**50**	4.8	0.6	0.6	0.6	0.6
23	9.6	4.8	4.8	4.8	0.6	**51**	2.4	2.4	2.4	2.4	2.4
24	9.6	4.8	4.8	2.4	2.4	**52**	2.4	2.4	2.4	2.4	0.6
25	9.6	4.8	4.8	2.4	0.6	**53**	2.4	2.4	2.4	0.6	0.6
26	9.6	4.8	4.8	0.6	0.6	**54**	2.4	2.4	0.6	0.6	0.6
27	9.6	4.8	2.4	2.4	2.4	**55**	2.4	0.6	0.6	0.6	0.6
28	9.6	4.8	2.4	2.4	0.6	**56**	0.6	0.6	0.6	0.6	0.6

C EC Declaration

EC Declaration of Conformity for Electromagnetic Compatibility and Safety

We, General DataComm Inc., declare under our sole legal responsibility that the following products conform to the following relevant harmonized standards, the reference numbers of which have been published in the Official Journal of the European Communities:

Electromagnetic Compatibility — (EMC Directive 89/336/EEC):

- The affixing of the CE mark is based on compliance with directive 89/336/EEC as amended by directive 93/68/EEC.
- EN 55022 (Based on CISPR 22), Specification for limits and methods of measurement of radio interference characteristics of information technology equipment.
- EN 55024 Limits and methods of measurement of the immunity to Electro-Magnetic interference for information technology equipment.
- EN 50081-1(Based on IEC 801), Electromagnetic compatibility generic emissions standard Part 1: Residential, Commercial and light industry.
- EN 50082-1 Electromagnetic compatibility generic immunity standard Part 1: Residential Commercial and light industry.

Low Voltage Directive — (LVD 73/23/EEC):

- The affixing of the CE mark is based on compliance with directive 73/23/EEC as amended by directive 93/68/EEC.
- EN 60950 Safety of Information Technology Equipment including Electrical Business Equipment.
- EN 41003 Particular Safety Requirements for Equipment to be connected to Telecommunications Networks.

Equipment List

TMS Channel Cards	
036M078-001	UDC/232/V.24/V.2036M078-002
036M078-002	UDC/422/V.11
036M078-003	UDC/423/V.10
036M078-004	UDC/V.35
GS936M014-001	TDC-2 (256K0
GS936M014-002	TDC-5 (512K0
036P265-003	UVC/ADPCM
036M285-002	CELP Voice Channel w/Fax
036M285-003	CELP Voice Channel
036M285-004	CELP 9.6K Voice Channel w/Fax
036M285-005	CELP 9.6K Voice Channel
036P270-001	Echo Canceller
036M335-001	ACM II/E1
TMS 3000 Options	
036M337-001	ESCC (Enterprise System Control Card)
036P302-001	RCC (Redundancy Control Card)
036P307-002	ECC-II (Expansion Common Card)
S-036P042-001	Sync Status Module
S-036B001-002	CP-12 Adapter (Expansion Shelf)
S-036P001-001	CP (422/423/449 Ext. Adapter)
039P002-001	DLD=M (Ext. Line Driver
OCM*TMS 2000 Feeder	
036M486-002	2121 Standalone Enclosure w/CCM N/R
036M481-001	2220 Shelf w/CCM, N/R
036M481-002	2320 Shelf w/CCM, Redundant
036M482-001	2230 Shelf w/CCM, NR -48VDC
OCM 1000 Point-to-Point	
036M488-002	1120 Standalone Enclosure, w/CCM, N/R
036M484-001	1220 Shelf w/CCM, N/R
036M484-002	1320 Shelf w/CCM, Redundant
OCM*TMS 1000/2000 LIM Cards	
036M410-002	E-1
036P436-002	V.35 LIM
036P436-001	V.11 LIM
036P437-001	Subrate LIM (RS232/V.28)
Expansion Shelf (OCM*TMS 1000/2000)	
010M065-001	MS-1 AC Expansion Shelf 220/240V
010M066-001	MS-1 DC Expansion Shelf

Data Channel Cards	
036P413-001	DDC (RS-232)
036P410-001	HS SDC (RS-232)
036P410-002	HS SDC (V.35)
036P410-003	HS SDC (RS-422)
036P410-004	HS SDC (RS-423)
LAN/Frame Relay Cards	
036M450-003	OPP/Ethernet
036M450-004	OPP/Ethernet w/o Packet Bus
036M451-001	OPP Token Ring *(-003 non-existent P/N)*
036M451-004	OPP Token Ring w/o Packet Bus
Voice Signaling (2W/4W E&M)	
036M420-006	PCM/ADPCM-No Echo
036M420-003	PCM/ADPCM-w/Echo
036M420-028	CELP No Fax
036M420-025	CELP w/Fax
Voice Signaling (2W FXS)	
036M420-004	2W FXS/ADPCM/No Echo
036M420-001	2W FXS/ADPCM w/Echo
036M420-026	
036M420-023	
Spares and Options	
036M040-004	CCM-4
036M040-005	CCM-5
TMS-3000 Compact Shelf	
036M357-001	TMS Compact w/ESCC, N/R
036M357-002	TMS Compact w/ESCC, Redundant
Module Interface	
036P041-001	EIF-E (RS232/V.24)
TMS-3000 Channel Cards	
036M078-005	Hyper UDC/422
036M078-006	Hyper UDC/V.35
TMS-3000 Options	
036P365-001	Universal I/O red.
036P351-001	Sync Status Module
OCM*TMS 2000 Feeder	
036M482-001	2230 Shelf w/CCM, N/R, -48
Data Channel Module	
036P416-001	OCM G.703 Data Channel

Voice Signaling (2W FXO)	
036M420-005	2W FXO/ADPCM - No Echo
036M420-002	2W FXO/ADPCM w/ Echo
036M420-027	2W FXO/CELP No Fax
036M420-023	2W/4W FXS/CELP w/Fax
036M420-024	2W FXO/CELP w/Fax
Minimux Plus Basic Assembly	
G036B003-015	Minimux Plus Enclosure 220/240V
G036B015-002	Minimux Plus Exp. Encl.
TMS-3000 Compact	
036M358-001	TMS Compact w/ESCC, N/R
036M358-002	TMS Compact w/ESCC, Redundant
Module Interface	
036P064-001	EIF-G (64K Co-Direct)
036P066-001	EIF-C (64K Contra-Direct)
Data Channel Cards	
036P243-001	TMS G.703 Data Channel
036P414-001	X.50 Quad Data Card

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