TMS 3000

Transport Management System

Installation & Operation

036R303-000
Issue 12
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Documentation

Revision History - GDC P/N 376R303-000

Issue	Date	Description of Change
10	January 2006	Update TMS-3000 Controller to Pentium-IV-based system.
11	February 2006	Corrections and clarifications
12	February 2012	Minor corrections and clarifications

Related Publications

Document Description	Document Number
TMS 3000 System Installation & Operation Manual	036R303-000
OCM 2000 System Installation and Operation Manual	036R340-000
MiniMux TDM Installation & Operation Manual	036R333-000
GTS Software Operation Manual Manual	036R603-V500 or later
GTS Software Release Notes	036R903-V500 or later
Sync Status Module Instructions Manual	036R452-000
Sync Status Module with Enhancement Addendum	S-036R042-001
VLBRV Module Installation and Operation Manual	036R475-000
T1-DS0 Module Installation and Operation Manual	036R477-000
Digital Bridging Card Installation and Operation Manual	036R478-000
Turbo Data Channel Card Installation and Operation Manual	036R479-000
CELP Channel Card Installation and Operation Manual	036R480-000
Turbo Data Channel-2, -5	036R483-000
T1-FT1 Module Installation and Operation Manual	036R485-000
TMS Packet Processor Addendum	036R302-A7

Document Description	Document Number
Quad Stat Mux Channel Card Installation and Operation Manual	036R305-000
OCM Packet Processor	036R342-000
TMS-3000 Maintenance Console User Guide Manual	036R610-000
OCM-2000 Maintenance Console User Guide Manual	036R611-000
GPS-8A Power Supply Installation & Operation Manual	035R007-000
GPS-8B Power Supply Installation & Operation Manual	035R009-000
DPS-8A Power Supply Installation & Operation Manual	041R162-000
DPS-8B Power Supply Installation & Operation Manual	041R166-000
TMS-3000 Maintenance Console Operation Manual	036R610-000
OCM-2000 Maintenance Console Operation Manual	036R610-000

-REV is the hardware revision (**-000**, **-001**, etc.)
-VREF is the most current software version (**-V600** is Version 6.0.0.)
In addition to the publications listed above, always read the Release Notes for your products.

5 TMS Controllers

6 Maintenance

Preface

Scope of this Manual

This manual describes how to install and configure the GDC Transport Management System 3000 (TMS 3000), and how to monitor and manage network devices. The information contained in this manual has been carefully checked and is believed to be entirely reliable. This information is intended for installers, service technicians and users and assumes a working knowledge in the design, planning and management of IP networks.

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Manual Organization

Chapter , 1 Shelf Installation contains diagrams and procedures for unpacking, shelf mounting, and cable and wire connections of the TMS-3000.

Chapter , 2 Common Card Installation contains installation and optioning procedures for common cards of the TMS-3000.

Chapter , 3 Channel Card Installation describes the installation and optioning procedures for the channel modules of the TMS-3000.

Chapter , 4 Front Panel Operation describes the front panel indicators and test points on each TMS module.

Chapter , 5 TMS Controllers describes the TMS-3000 Controller function keys, screen format, and basic controller procedures such as configuration, startup, maintenance procedures and guidelines for multi-controller network environments.

Chapter , 6 Maintenance provides routine maintenance, corrective maintenance, and troubleshooting procedures for the TMS-3000.

Chapter , 7 Connector Pin Assignments contains tables that list pin assignments for various system connectors and modules.

Appendix A, Technical Characteristics defines the specifications of the TMS-3000 system.

Appendix B, TMS-3000 Maintenance Console describes the local terminal connection to a node.

Appendix C, Agency Regulations provides important compliance information for installations in the United Kingdom and Ireland.

Safety Information

This manual should be read in its entirety and all procedures completely understood before installing or operating the unit, including all notes, cautions and warnings (examples below). The CAUTION, WARNING, and DANGER statements that appear throughout this manual are intended to provide critical information for the safety of both the service engineer and operator. These statements also enhance equipment reliability. The following definitions and symbols for CAUTION, WARNING, and DANGER as they are used comply with ANSI Z535.2, American National Standard for Environmental and Facility Safety Signs, and ANSI Z535.4, Product Safety Signs and Labels, issued by the American National Standards Institute. .

Note *Indicates a note. It is something you should be particularly aware of; something not readily apparent. A note is typically used as a suggestion.*

Important *Indicates an emphasized note. It is something you should be particularly aware of; something not readily apparent. Important is typically used to prevent equipment damage.*

CAUTION *indicates conditions or practices that can cause damage to equipment or loss of data.*

WARNING *indicates an imminently hazardous situation which, if not avoided, may result in minor to moderate injury. It may also be used to alert against unsafe practices.*

DANGER *indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.*

Safety Guidelines

- Always use caution and common sense, especially when unsafe conditions or potentially hazardous voltages are present.
- Repairs must be performed by qualified service personnel only.
- To reduce the risk of electrical shock, do not operate equipment with the cover removed.
- 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.
- Never install telephone wiring during an electrical storm.

Antistatic Precautions

This product may contain static-sensitive devices that are easily damaged by ESD (electrostatic discharge). ESD occurs when a person whose body has built up static electricity touches a computer component. ESD can cause computer components to fail. Take proper handling, grounding and precautionary ESD measures when installing parts or cards. Keep parts and cards in antistatic packaging when not in use or during transport. If possible, use antistatic pads on floor and workbench. When handling components, 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.

Compliance

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, auβer die Dose entspricht den Vorschriften für Feuchträume. Berühren Sie unisolierte Telefonleitungen oder Einrichtungen nicht, auβer 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.

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.20
036M078-002	UDC/422/V.11
036M078-003	UDC/423/V.10
036M078-004	UDC/V.35
073M078-007	UDC/X.21 (X.27)
GS936M014-001	TDC-2 (256K)
G5936M014-002	TDC-5 (512K)
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)
036P347-002	ECC-II (Expansion Common Card)
S-036P042-001	Sync Status Module
S-036B001-002	CP-12 Adapter (Expansion Shelt)
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 100012000)

010M064-001	MS-1 AC Expansion Shelf 117V
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	PCMIADPCM No Echo
036M420-003	PCMIADPCM 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	2W FXS CELP 9.6 Kbps
036M420-023	2W FXS CELP 9.6 Kbps w/Fax

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	E1F-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. Enclosure

S-036B016-001 MiniMux Exp. Shelf 117V

036M333-029 MiniMux Plus 117V w/UAF+, ETR+ Analog Clk Gen Assy

G036M003-0I5 MiniMux Plus 220/240V w/UAF+, ETR+, Analog Clk Gen Assy

TMS-3400 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)

036P043-001 EIF-P (RS 422/423/MIL-188)

Data Channel Cards

036P243-001 TMS G.703 Data Channel

036P414-001 X.50 Quad Data Card

Support Services and Training

General DataComm offers two comprehensive customer support organizations dedicated to pre-and post-sale support services and training for GDC products. ***Corporate Client Services*** and ***Factory-Direct Support & Repair*** assist customers throughout the world in the installation, management, maintenance and repair of GDC equipment. Located at GDC's corporate facility in Naugatuck, Connecticut USA, these customer support organizations work to ensure that customers get maximum return on their investment through cost-effective and timely product support.

Corporate Client Services

Corporate Client Services is a technical support and services group that is available to GDC customers throughout the world for network service and support of their GDC products. Customers get the reliable support and training required for installation, management and maintenance of GDC equipment in their global data communication networks. Training courses are available at GDC corporate headquarters in Naugatuck, Connecticut, as well as at customer sites.

Factory Direct Support & Repair

GDC provides regular and warranty repair services through ***Factory Direct Support & Repair*** at its U.S. headquarters in Naugatuck, Connecticut. This customer support organization repairs and refurbishes GDC products, backed by the same engineering, documentation and support staff used to build and test the original product. Every product received for repair at Factory Direct Support & Repair is processed using the test fixtures and procedures specifically designed to confirm the functionality of all features and configurations available in the product.

As part of GDC's Factory Direct program, all product repairs incorporate the most recent changes and enhancements from GDC Engineering departments, assuring optimal performance when the customer puts the product back into service. Only GDC's ***Factory Direct Support & Repair*** can provide this added value.

Contact Information

General DataComm, Inc. 6 Rubber Avenue Naugatuck, Connecticut 06770 USA ***Attention: Corporate Client Services*** Telephones: 1 800 523-1737 1 203 729-0271 Fax: 1 203 729-3013 or 1 203 729-3014 Email: clientservices@gdc.com	General DataComm, Inc. 6 Rubber Avenue Naugatuck, Connecticut 06770 USA ***Attention: Factory Direct Support & Repair*** Telephones: 1 800 523-1737 1 203 729-0271 Fax: 1 203 723-2883 Email: factorydirect@gdc.com
Hours of Operation: Monday - Friday 8:30 a.m. - 5:00 p.m. EST (excluding holidays) http://www.gdc.com	

1 Shelf Installation

Overview

This chapter contains information on the installation of the TMS-3000. Unpacking, shelf mounting, cable and wire connections, option selection, and system timing are all discussed here. *Figure 1-1* shows the rear panel of the TMS-3000 shelf.

Many tables and diagrams are required to provide sufficient installation information for the TMS-3000 system. Most of the tables and diagrams in this chapter appear with the TMS-3000 module with which they are associated.

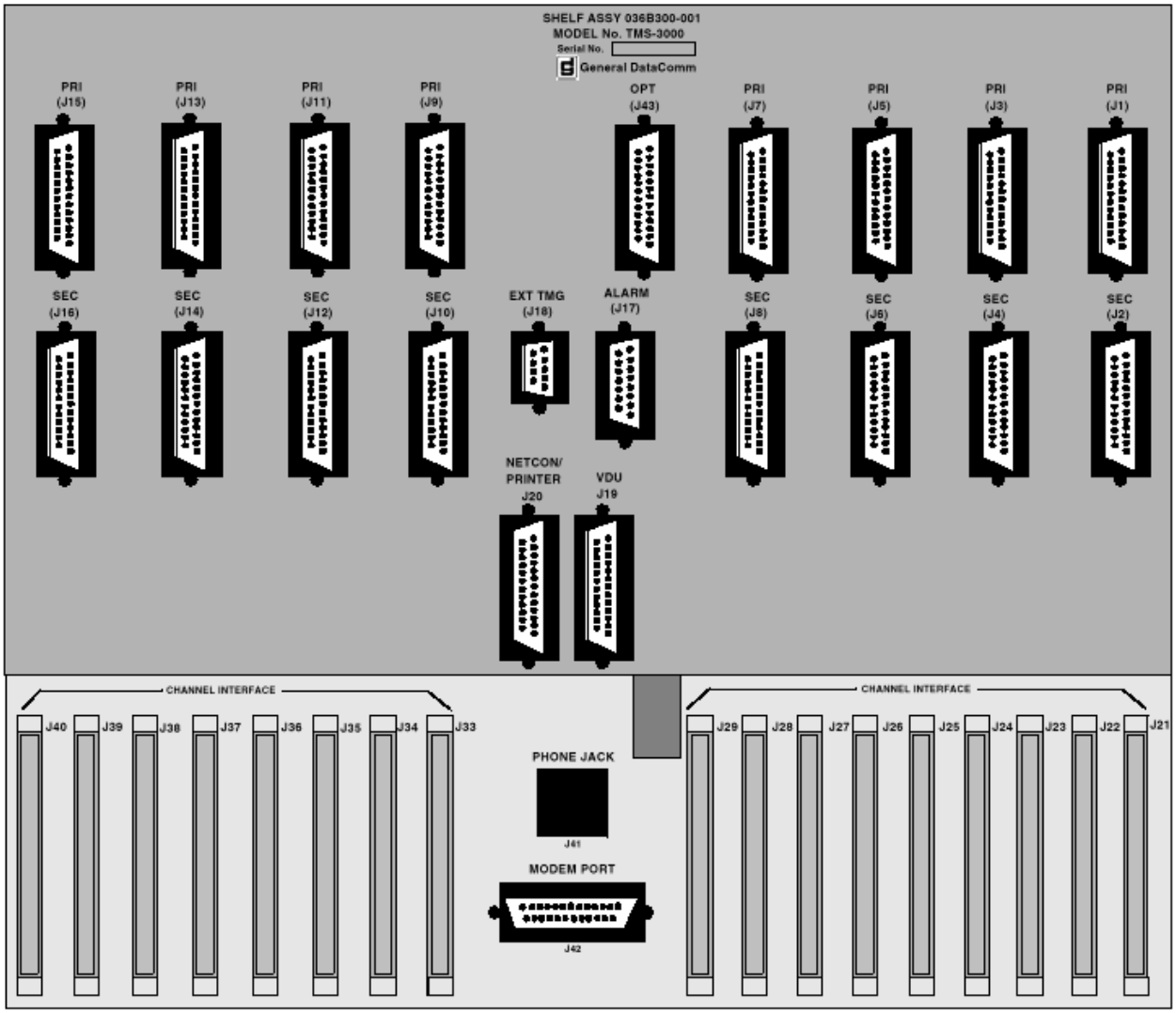


Figure 1-1 TMS-3000 Shelf, Rear Panel

Unpacking and Inspection

These steps detail the unpacking and inspection requirements for the TMS-3000.

1. Remove any extra packing material from the unit.
2. Place the TMS-3000 unit so that you can easily access the front and back of the unit.
3. Remove each spare module from its individual carton. Do not discard carton or packing material; save it for transporting or reshipping if necessary.
4. Inspect the components for visible signs of damage. If you see any damage, notify the shipper immediately.
5. Check the packing list to see if you have all components (module types, quantities, etc.).
6. Verify that the components of the unit and factory settings on the various modules are properly configured for your TMS-3000 applications.

The documentation package which comes with your system determines proper set-up and card arrangements for your system. In particular, ensure that:

1. Each card is in its proper slot in the TMS-3000 shelf. Correct locations are given in your Network Documentation Package. Module locations for a completely filled redundant node are illustrated in *Figure 1-2* (In a non-redundant system, each slot marked "SEC." on the diagram has a blank filler panel). Check that channel cards are in their correct slots. Note that installation of TPP (TMS Packet processor) cards is covered in *GDC 036R302-A7*.
2. Correct aggregate interface piggybacks or interface modules are installed on the ACM (ADPCM Compression Module), the CDA (Combined Digital Aggregate) module, and the ACC (Aggregate Control Card).

Installation

The TMS-3000 is usually shipped already mounted in a GDC EP-2M or EP-4 cabinet. If your TMS-3000 is already mounted, go to *Step 5* below. Otherwise, follow these directions:

1. If the TMS-3000 shelf assembly is not being mounted in a rack, install it in a reasonably well-ventilated location. Do not locate directly above other equipment (such as power supplies) which generate large quantities of heat. The ambient temperature should not exceed 122^{o} F (50^{o} C).
2. If the TMS-3000 is being rackmounted, install it in a standard 19-inch rack. Two GDC cabinets are available for that purpose:

   EP-2T — 30 in. (76 cm) by 23 in. (59 cm) by 24 in. (61 cm) with two fans

   EP-4 — 76 in. (193 cm) by 23 in. (59 cm) by 26 in. (66 cm) with blower

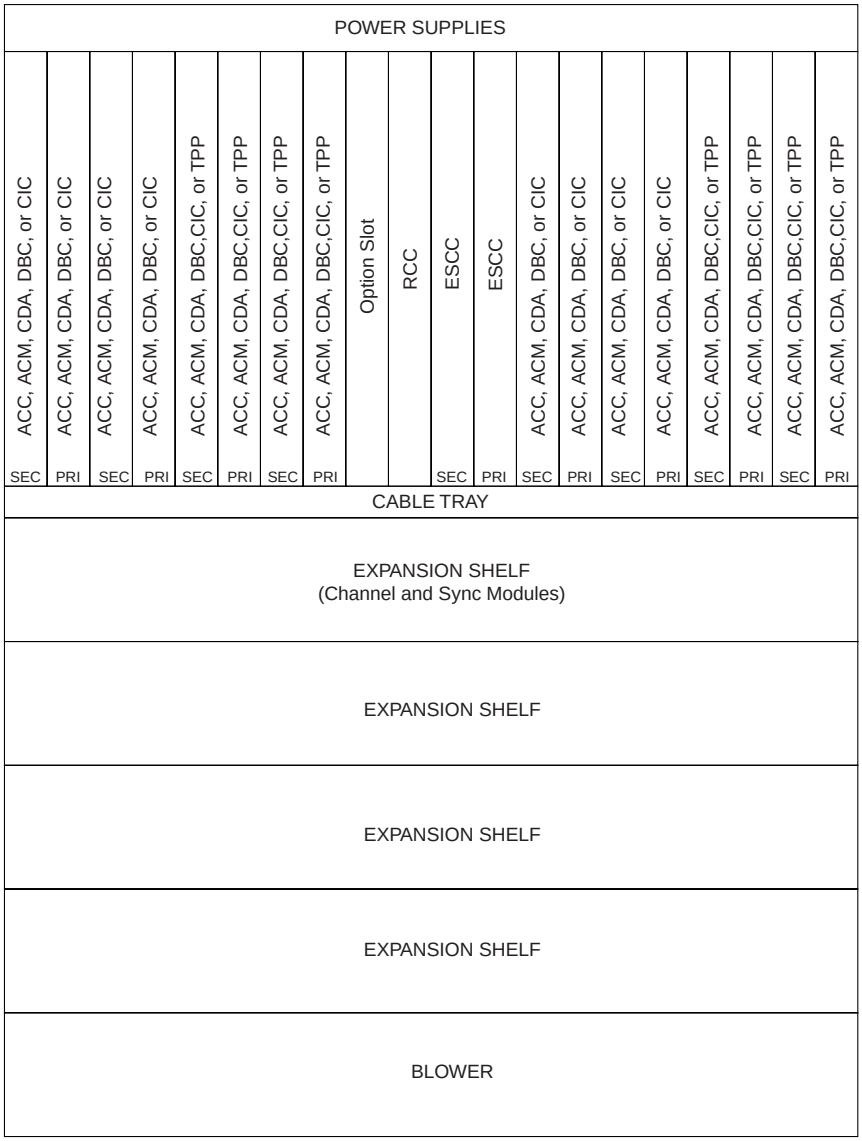


Figure 1-2 TMS-3000 Module Locations

NOTE: The EP-4 cabinet comes wired with a 20-ampere rated line cord and a twist-lock NEMA L5-20P type plug. This mates with a NEMA 20R type receptacle which must be available adjacent to the installation.

3. Provide the following vertical rack space for each TMS-3000 shelf component:

   GPS-8A,GPS-8B. DPS-8A, or DPS-8B — 7 in. (18 cm)

   TMS-3000 shelf — 14 in. (36 cm)

   16-channel expansion shelf — 7 in. (18 cm)

   32-channel expansion shelf — 14 in. (36 cm)

NOTE: IMPORTANT! Air must be forced through the rack. A blower capable of moving 300 cfm (cubic feet per minute) must be installed at the bottom of the shelves. Three exhaust fans capable of moving 100 cfm must be installed at the top of the cabinet. Ideal external ambient temperature is between 77°and 93°F (25°and 30°C). Operation between 32° and 124° F (0° and 50°C) is allowable only when equipment is mounted in a GDC EP-2T, EP-2M, and EP-4 cabinets (assuming proper airflow requirements have been met).

4. Connect dc power harness on rear of main shelf assembly to the GPS-8A, GPS-8B, DPS-8A, or DPS-8B. The drawing package includes a wire list for the harness, where you see the terminal connections for each wire. Connections to the power supply are made by inserting the wire into the appropriate power supply terminal and tightening the screw that fits into the terminal. Alarm connections between the power supplies and the TMS-3000 main shelf is described later in this chapter.

   Location of power supply connectors on the TMS-3000 Harness Card are shown in *Figure 1-3*. *Table 1-1* lists the wire color coding for the power supply harness.

5. Check that power supply Power On/Power Off switch is Off. If GPS-8A or GPS-8B is being used, connect power cord to grounded ac outlet; if DPS-8A or DPS-8B, connect to –48 V battery (*Refer to the Instruction Manual for the appropriate power supply*.)

NOTE: IMPORTANT! Do not apply primary power until all connections have been made and all options implemented.

Table 1-1 Power Supply Harness Color Codes

Power Supply Harness Wire	Terminal Connection
Orange	+12 V dc
Purple	–12 V dc
White/Red	+5 V dc
White/Black	GND

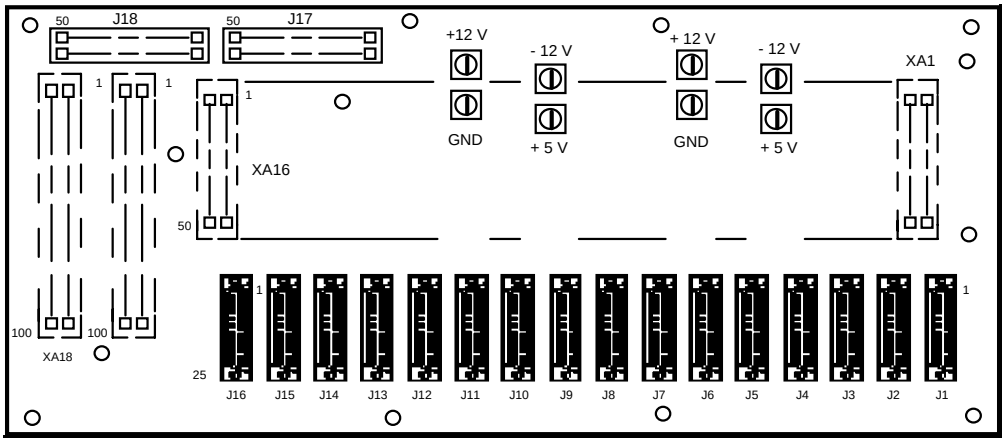


Figure 1-3 Power Supply Connectors on TMS-3000 Expansion Harness Card

AC Power On/Off Procedure for a TMS-3000

GDC products contain voltage sensing circuits that ensure that proper reset signals are generated during power up/down switching. These circuits are designed to protect the electronics from lock-ups and memory loss for ac transients and power on/off conditions. Switching power on/off via a branch circuit breaker can generate unpredictable transient conditions since inductive and/or capacitive loads connected to the branch affect the voltage on/off sensing circuits. To ensure reliable operation, use the following procedure to turn TMS-3000 power on:

1. Turn the branch circuit breaker on first. This gives transients, due to heavy inductive and capacitive line loads, time to settle.
2. If the communication product is mounted in a cabinet equipped with a local circuit breaker, such as a GDC EP-4 cabinet, turn the local breaker on next.
3. Turn off the dc power supplies mounted in the node.
4. To turn TMS-3000 Power off, reverse the power-on procedure by first turning off the dc power supplies.

Fused Links

Fused links in the interface circuits protect the TMS-3000 from damages during operation. To prevent large circulating currents due to differences in ground potential, the TMS-3000 should be powered by the same power source as the equipment with which it interfaces. If you don't know if the equipment is powered by the same power source, confirm that a potential difference of less than 0.25 V rms (as measured by a high impedance digital multimeter or equivalent) exists between the grounding circuits of the respective power outlets.

NOTE: IMPORTANT! TMS-3000 incorporates internal fused links which may open if the ground potential exceeds 0.25 V rms between this unit and equipment interfaced with this unit. Do not apply power to the TMS-3000 until you have finished connecting it to peripheral equipment.

Fused links on the TMS-3000 are located on the rear of the harness card.

Each interface circuit (both channel and aggregate) contains a fused link between the chassis ground (earth) connector pin (Pin 1 of the 25-pin connector) and the chassis ground circuit of the TMS-3000. Each link is located directly below each 25-pin connector. Each link appears as an extremely thin solder line, with one end connected to the chassis ground plane on the harness card. Fused links that have opened because of excessive ground currents between equipment can be restored as follows:

1. Normalize the potential difference between associated grounding circuits to less than 0.25 V rms (as measured with a high impedance digital multimeter or equivalent).
2. Disconnect all power connections.
3. Restore fused link with a single strand of No. 32 to 40 AWG gauge copper wire (No. 32 is the standard strand of seven-strand No. 24 gauge wire). Solder the single strand to the appropriate terminals on the rear of the harness card.
4. Reconnect power connections and resume normal operations.

NOTE: IMPORTANT! When several cabinets are installed together, use a copper braided ground strap between the cabinets to ensure sufficient grounding.

Compliance With Subpart J, Part 15 of FCC Rules

For full compliance with Subpart J of Part 15 of FCC rules (governing radiated RF energy from computing devices), use shielded cables with metal hooded connectors for all TMS-3000 aggregate and channel connections. Each cable hood must make firm contact with TMS-3000 frame ground.

At the end of the cable hood are two screws that should be screwed in firmly to make ground contact. The hooded cable grounding arrangement is illustrated in *Figure 1-4*.

Follow this procedure when using customer supplied cables. Unshielded cables or improperly installed shielded cables may interfere with nearby radio communications.

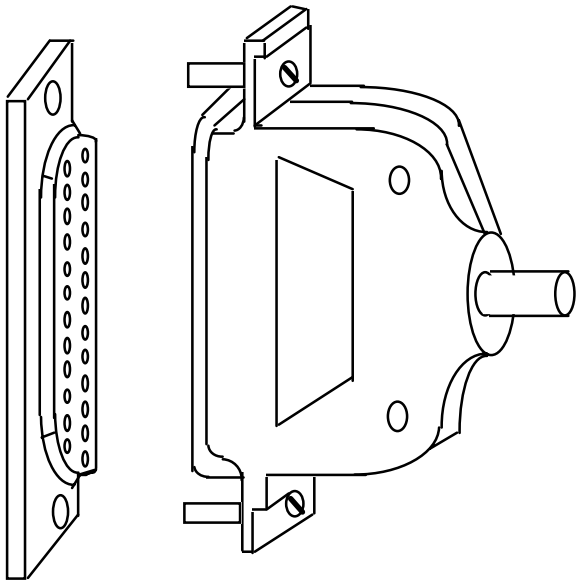


Figure 1-4 Typical Hooded Cable Grounding Arrangement

Power Supply to TMS-3000 Alarm Connections

Any TMS-3000 node can report power supply failures (as an alarm condition) to the Controller. Two separate power supply failures (Primary and Secondary) are reported. To enable node reporting of power supply failures, make the following connections (the metal backplane shield on the main shelf must be removed to make these connections):

Primary power supply Alarm Bus connector to TMS-3000 main shelf connector XA10A, Pin A14.

Secondary power supply Alarm Bus connector to TMS-3000 main shelf connector XA10A, Pin A2.

In most cases, TMS-3000 shelves are shipped from the factory already connected.

TMS-3000 Node External Timing Connections

GTS software is used to set each TMS-3000 node to receive a master timing reference signal from an external source or to be the master timing source for the network. In most cases, a reference timing signal is received from an aggregate and requires no special cabling. If timing is obtained from channel equipment, a special Y-cable splits timing from the other signals entering the channel interface and transports the timing signal to external timing connector J18 on the TMS-3000 main shelf backplane. Two cables are available for this purpose: 028H504-001 (for unbalanced signals) and 028H505-001 (for balanced signals, EIA-422 adapter required).

The 9-pin connector of the cable connects to J18; the 25-pin connectors mate to a TMS-3000 channel interface connector and to a 25-pin crossover cable, which connects to the data service unit or modem that supplies the reference timing signal.

Select "External" as the timing source for the node when using this arrangement. Any other external timing source connects directly to J18.

On the TMS-3000, 9-pin connector J18 (located on the rear backplane of the main shelf) lets you use a balanced or unbalanced external clocking source.

Table 1-2 provides pin functions and technical specifications for connector J18. *Figure 1-5* illustrates the J18 connector pins as viewed from the TMS-3000 rear backplane.

The TMS-3000 node also outputs an external timing source for transfer of timing. This output is a balanced RS-422 interface clock signal at the rate of 512 KHz and is phase locked with the node reference clock.

Table 1-2 External Clock Input (J18) Function

Pin No.	Function	Unbalanced Clock*	Balanced Clock*
1	Protective Ground	Signal Ground	Cable shield
2	External Timing Input A	Clock input	Clock A input
3	External Timing Input B	No connection	Clock B input
4-7	—	Not used	Not used
8	External Timing Output B		512 KHz Clock Output B
9	External Timing Output A		512 KHz Clock Output A
* See *Table 2-5* for ESCC option settings for balanced and unbalanced interfaces.			

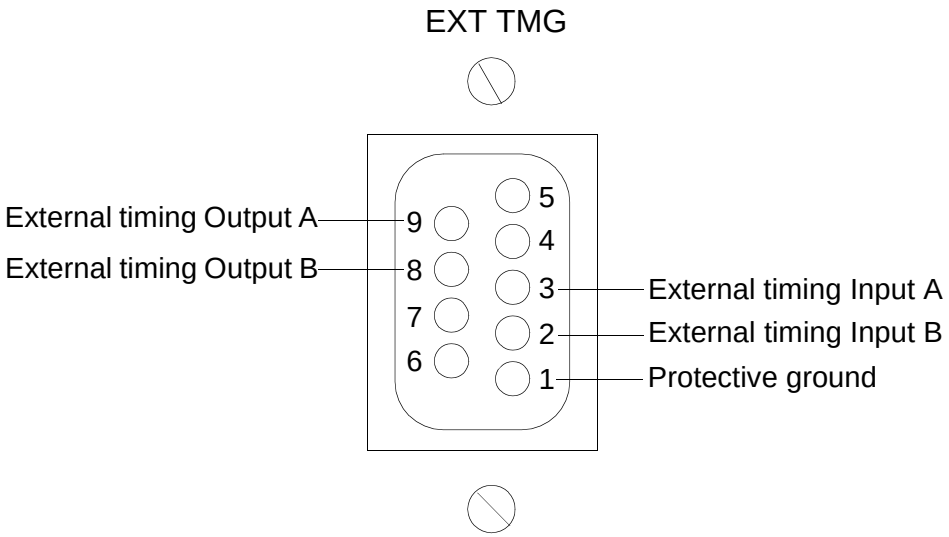


Figure 1-5 External Clock Connector (J18) TMS-3000 Rear Backplane View

Alarm Relay Connections

The RCC (Redundancy Control Card) in the TMS-3000 contains two relays — one for major alarms, and one for minor alarms — that allow connections to activate external equipment. The alarm relays are de-energized during normal operation and provide two sets each of normally open and normally closed contacts (Relay Type 2, Form C). Appropriate relays are energized to signal alarm conditions. Connections are made to a 15-pin connector, J17 on the TMS-3000 main harness card. *Table 1-3* lists the J17 pins used to connect the normally open or normally closed contacts of the relays to the external equipment.

Do not exceed maximum ratings of the relay contacts: 3 W, 0.25 A, 28 V.

Table 1-3 Alarm Relay Connections, Rear Panel Connector J17

Pin Number	Function	Relay State
1	Minor Alarm 2	Common (CO)
2	Major Alarm 2	Common (CO)
3	Spare	
4	Spare	
5	Major Alarm 2	Deenergized (NO)
6	Major Alarm 1	Deenergized (NO)
7	Minor Alarm 2	Deenergized (NO)
8	Minor Alarm 1	Deenergized (NO)
9	Major Alarm 1	Common (CO)
10	Spare	
11	Minor Alarm 1	Common (CO)
12	Major Alarm 2	Energized (NC)
13	Major Alarm 1	Energized (NC)
14	Minor Alarm 2	Energized (NC)
15	Minor Alarm 1	Energized (NC)

NOTE: IMPORTANT! The main harness backplane current rating is 1.4 A maximum. Any dc or ac voltage supplied by a power supply through the alarm port connector J17 should be fused accordingly. Failure to fuse the alarm port connector can result in severe damage to the TMS-3000 main harness backplane.

TMS-3000 Controller Interface Connections

Asynchronous

GDC 028H303 cable connects serial Port 1 of the Controller to connector J20 on the TMS-3000 backplane. You also need a shielded EIA/TIA-232-E extension cable (*GDC 027H506-XXX*). The two cables are combined in *GDC 027H004-XXX*.

Connect the Maintenance Console to the TMS-3000 using *GDC 028H305*. One end of the cable connects to EIA Connector J19 on the TMS-3000 backplane; the other end connects to the Maintenance Console connector marked *MODEM* or *COMM*. Connections at the Controller site are made to serial Port 1 located at the back of the controller. (*See Figure below*.).

NOTE: Some of the TMS common cards (ESCC, ACM, CDA, TPP, and OPP) have a front monitor port for connecting the Maintenance Console. The cable required for this connection is GDC 024H140.

Connections at the Controller site are made to serial Port 1 located at the back of the controller.

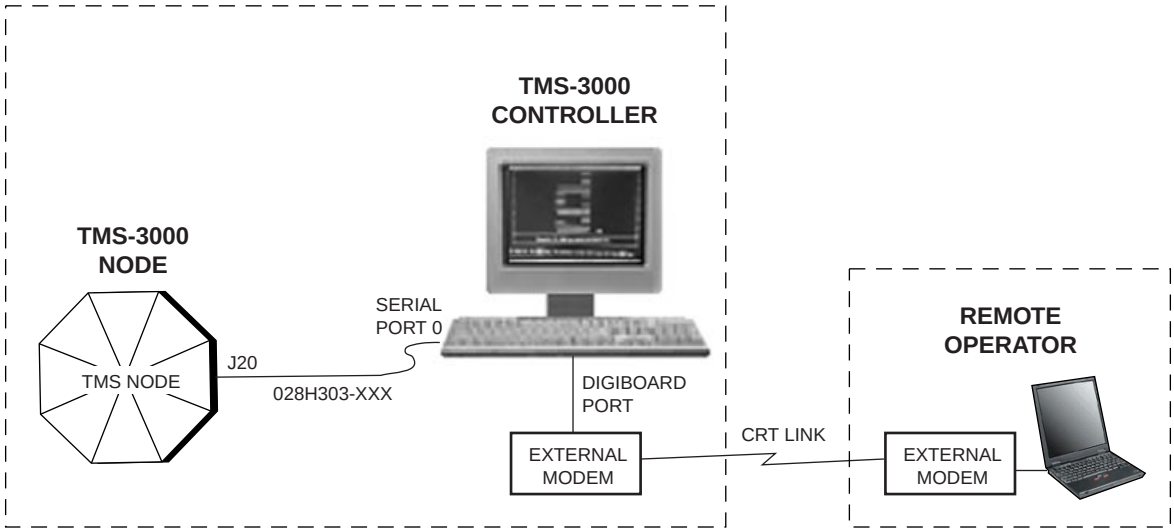


Figure 1-6 Controller Hookup to TMS-3000 Node

Supervisory Pass-Through Installation

Using *GDC 028H303-025 or 028H320*, connect the Controller output (Port 0) to connector J20 (TMS Controller Input) on the TMS-3000 Backplane of the node at the local site. Next, using *GDC 028H502-XXX*, connect the output connector (J42) of this node to J20 of the next node at the site. See Figure below.

The supervisory route continues using the same GDC Cables until the desired number of nodes at the site are connected. Utilizing the configuration screens of the Main Controller, software establishes the supervisory data communication path to each node at the site.

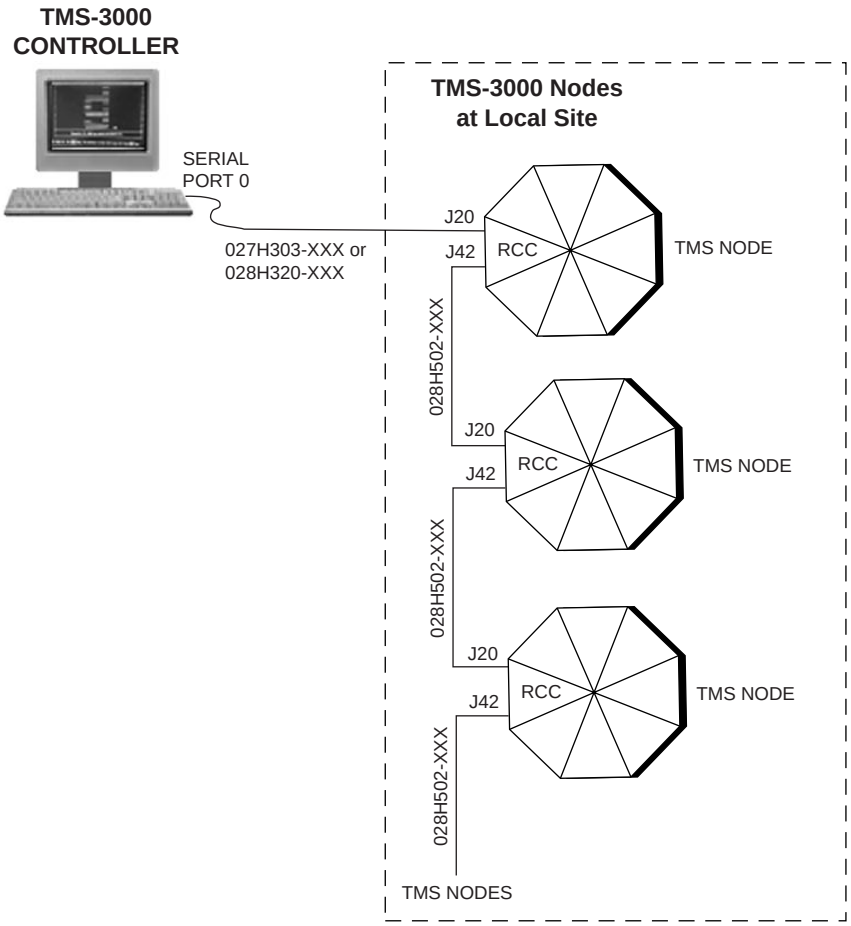


Figure 1-7 Supervisory Pass Through Installation

Dial Backup Connections

To install Dial Backup using two external modems:

1. Install cable 028H303 to the output port (Port 1) on the Controller. The DB-25 end of this cable connects to the input of an external auto-dial modem. The VF output of this external modem is connected into the phone line at the remote end. The output of the phone line connects into the remote external modem.
2. Utilizing *GDC 028H502-XXX*, connect one end to the output of the external modem. Connect the other side to J42 on the rear of the Main Shelf Backplane.
3. Using the main menu and node configuration screens of the Controller, proceed to initiate Dial Backup.

NOTE *Previous versions of the TMS-3000 Controller (GTS Version 2.2.0 and earlier) support dial backup from the controller to the node. GTS Version 5.0.0 does not support that specific dial backup application.*

2 Common Card Installation

Overview

The flexibility of the TMS-3000 system provides many options for TMS-3000 modules. By selecting certain options, the TMS-3000 can operate in many unique environments without needing extensive external interface equipment.

The TMS-3000 utilizes the following common cards in the main shelf:

- ACC (Aggregate Control Card)
- ACM (ADPCM Compression Module)
- CDA (Combined Digital Aggregate) Module
- CIC (Channel Interface Card)
- DBC (Digital Bridging Card)
- ESCC (Enterprise System Control Card)
- RCC (Redundancy Control Card)
- TPP (TMS Packet Processor)

NOTE: The terms "Card" and "Module" are commonly used and interchanged in the field (and in this manual).

The following sections provide part numbers and describe the methods of option selection and the options provided for each TMS-3000 common card. Detailed information about specific settings of option devices is given in a number of tables in this chapter. Option tables for each module are grouped with the drawings pertaining to that specific module.

A TMS-3000 system is shipped from GDC with a specific configuration selected through the devices described below. In most cases, the settings need not be changed during installation. Use the information provided here to check for correct settings and to determine necessary changes in the hardware configuration. If you are unsure of the correct setting for any device, contact GDC for technical assistance.

Part Numbers

The following tables can be used in procuring replacement assemblies and pc boards.

Table 2-1 TMS-3000 Shelf with Non-redundant Common Logic (036M56-001)

Equipment Supplied	Designation	GDC Part No.
Main Shelf Assembly	—	036B300-001
Assembly Filler Card	—	036C011-001
PCB Assembly, ESCC	—	036P336-001
PCB Assembly, Redundancy Control II	—	036P302-001

Table 2-2 TMS-3000 Shelf with Redundant Common Logic (036M356-002)

Equipment Supplied	Designation	GDC Part No.
Assembly Shelf TMS-3000	—	036B300-001
Assembly Filler Card TMS-3000	—	036C011-001
PCB Assembly, ESCC	—	036P336-001
PCB Assembly, Redundancy Control II	—	036P302-001

Table 2-3 TMS-3000 Non-redundant Expansion Shelf (036M302-001)

Equipment Supplied	Designation	GDC Part No.
Assembly Expansion Shelf TMS-3000	—	036B301-001
PCB Assembly, Expansion Card TMS-3000	—	036P307-002

Table 2-4 TMS-3000 Redundant Expansion Shelf (036M302-002)

Equipment Supplied	Designation	GDC Part No.
Assembly Expansion Shelf	—	036B301-001
PCB Assembly, Expansion Card TMS-3000	—	036P307-002

Option Selection

You can set ptional configurations on a module with program plugs, switches, jumper plugs, or resistor networks. Each option device is described below.

Program Plugs

Program plugs select different interface configurations on the Data Channel module and on the RS-422/423 Channel Adapter (if used). Program plugs may also provide nonstandard clock rates on the Clock Generator module. These plugs are factory-installed in accordance with intended system usage, but may be altered on site to change the operating configuration of the TMS-3000. A program plug is designated with the letters PP and a number (for example, PP1). The plug fits into a socket identified with the letters XPP and a number (for example, XPP1).

To remove a program plug:

1. Gently lift the plug from the socket with the extractor tongs provided with the TMS-3000.

To install a program plug:

1. Determine the correct pin alignment.
2. Carefully insert the program plug into the socket.

Switches

Switches are used to select various options on most modules. Option tables for each module provide information on the features obtained by each selection. Switches are designated by the letter S and a number (e.g., S2).

Several different types of switches may be used on TMS-3000 modules. Each type of switch is illustrated in *Figure 2-1*. A vertical or right angle switch must be set up (Off or Open) or down (On or Closed). A DIP switch must be placed On (Closed) or Off (Open). A double pole latch switch has no On or Off position. Both the DIP switches and the double pole latch switches are set according to silkscreen markings on the pc card; simply move the switches to the marking that indicates the desired function. The option tables indicate the silkscreen marking for each option selection. For vertical or right angle switches, the option tables indicate On (Closed) or Off (Open) positions to select each option.

Jumper Plugs

Jumper plugs complete different circuits when placed over certain pins of headers on a component board. Silkscreen markings on the board indicate the selections made by different jumper plug positions. The option tables for each module provide information on the features obtained by each selection. Jumper plugs are designated by the letter X and a number (e.g., X1).

Resistor Networks

The Data Channel module uses resistor networks to develop the signal voltage levels required by different interface standards. These networks must be changed when a channel is configured for a different interface standard (*Table 3-20* describes the switch, jumper, and resistor network required for each interface).

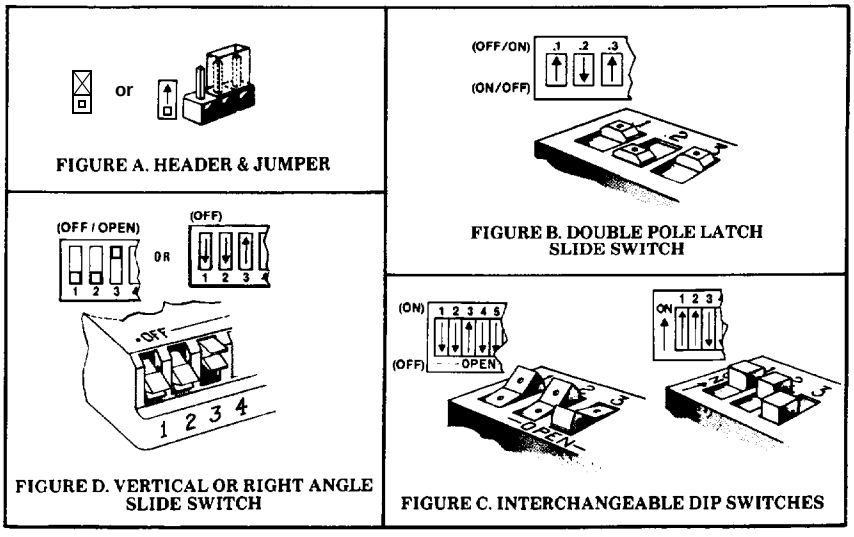


Figure 2-1 Option Switches and Jumpers

Enterprise System Control Card

This section covers ESCC options. Associated tables and drawings provide detailed installation information.

ESCC Option Selection

ESCC options are selected by varying the positions of option Switches S2, S3 and S4 that are located on the ESCC printed circuit board assembly, as illustrated in *Figure 2-2*. Use *Tables 2-5 and 2-6* to determine how to select each option.

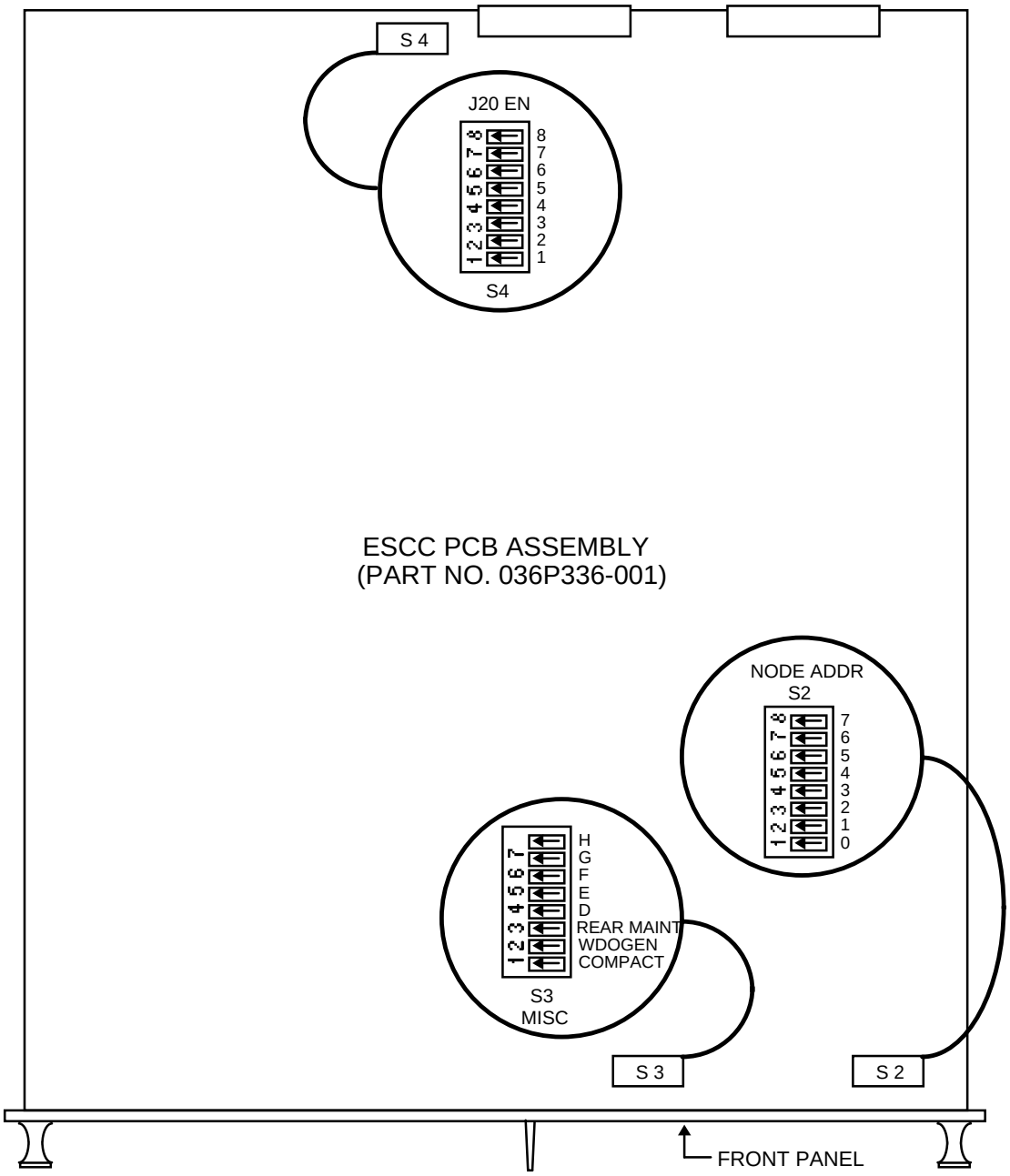


Figure 2-2 Option Switch Locations

Table 2-5 ESCC Option Description

Option	Selection	Switch	Setting	Description
Node Address	1 thru 126	S2-1 thru S2-7	*See Table 2-5*	Used to select the address for the node (*See Table 2-5*).
Node Type	Compact	S3-1	OFF	Configures ESCC for operation as a Compact node.
	TMS-3000	S3-1	ON*	Configures ESCC for operation as a TMS node.
Watchdog	Disabled	S3-2	OFF	Disables watchdog (for testing purposes).
	Enabled	S3-2	ON*	Enables watchdog.
Monitor Port	Back	S3-3	OFF*	Selects back port for maintenance console.
	Front	S3-3	ON	Selects front port for maintenance console.
Clock Bus 6 Frequency	Special Rate (PROG1)	S3-4	OFF	Selects special rate (PROG1) as clock frequency on Clock Bus 6.
	1.536 MHz.	S3-4	ON*	Selects 1.536 MHz as clock frequency on Clock Bus 6.
Clock Bus 7 Frequency	Special Rate (PROG2)	S3-5	OFF	Selects special rate (PROG2) as clock frequency on Clock Bus 7.
	1.344 MHz	S3-5	ON*	Selects 1.344 MHz as clock frequency on Clock Bus 7.
External Timing Source Impedance	Unbalanced	S3-6	OFF	Selects unbalanced impedance for an external timing source, if any, on serial Port J18. Choose unbalanced impedance for EIA-232-D and RS-423 interfaces.
	Balanced	S3-6	ON*	Selects balanced impedance for an external timing source, if any, on serial Port J18. Choose balanced impedance for V.35 and RS-422 interfaces.
J20 RSET	Disabled	S4-1	OFF	Disables signal RSET on serial Port J20.
	Enabled	S4-1	ON*	Enables signal RSET on serial Port J20.
J20 SER1TDATA	Disabled	S4-2	OFF	Disables signal SER1TDATA on serial Port J20.
	Enabled	S4-2	ON*	Enables signal SER1TDATA on serial Port J20.
J20 SER1DTR	Disabled	S4-3	OFF	Disables signal SER1DTR on serial Port J20.
	Enabled	S4-3	ON*	Enables signal SER1DTR on serial Port J20.
J20 TSET	Disabled	S4-4	OFF	Disables signal TSET on serial Port J20.
	Enabled	S4-4	ON*	Enables signal TSET on serial Port J20.
J20 SER1RDATA	Disabled	S4-5	OFF	Disables signal SER1RDATA on serial Port J20.
	Enabled	S4-5	ON*	Enables signal SER1RDATA on serial Port J20.
J20 SER1DSR	Disabled	S4-6	OFF	Disables signal SER1DSR on serial Port J20.
	Enabled	S4-6	ON*	Enables signal SER1DSR on serial Port J20.
J20 LOCKFREQINB	Disabled	S4-7	OFF	Disables signal LOCKFREQINB on serial Port J20.
	Enabled	S4-7	ON*	Enables signal LOCKFREQINB on serial Port J20.
J20 LOCKFREQINA	Disabled	S4-8	OFF	Disables signal LOCKFREQINA on serial Port J20.
	Enabled	S4-8	ON*	Enables signal LOCKFREQINA on serial Port J20.
Not Used	Not Used	S2-8, S3-7, S3-8	ON*	These option switches must be set in the ON position.
* Default selection				

Table 2-6 ESCC Node Address Option

Node Address	Switch Settings						
	S2-1	S2-2	S2-3	S2-4	S2-5	S2-6	S2-7
1	OFF	ON	ON	ON	ON	ON	ON
2	ON	OFF	ON	ON	ON	ON	ON
3	OFF	OFF	ON	ON	ON	ON	ON
4	ON	ON	OFF	ON	ON	ON	ON
5	OFF	ON	OFF	ON	ON	ON	ON
6	ON	OFF	OFF	ON	ON	ON	ON
7	OF	OFF	OFF	ON	ON	ON	ON
8	ON	ON	ON	OFF	ON	ON	ON
9	OFF	ON	ON	OFF	ON	ON	ON
10	ON	OFF	ON	OFF	ON	ON	ON
11	OFF	OFF	ON	OFF	ON	ON	ON
12	ON	ON	OFF	OFF	ON	ON	ON
13	OFF	ON	OFF	OFF	ON	ON	ON
14	ON	OFF	OFF	OFF	ON	ON	ON
15	OFF	OFF	OFF	OFF	ON	ON	ON
16	ON	ON	ON	ON	OFF	ON	ON
17	OFF	ON	ON	ON	OFF	ON	ON
18	ON	OFF	ON	ON	OFF	ON	ON
19	OFF	OFF	ON	ON	OFF	ON	ON
20	ON	ON	OFF	ON	OFF	ON	ON
21	OFF	ON	OFF	ON	OFF	ON	ON
22	ON	OFF	OFF	ON	OFF	ON	ON
23	OFF	OFF	OFF	ON	OFF	ON	ON
24	ON	ON	ON	OFF	OFF	ON	ON
25	OFF	ON	ON	OFF	OFF	ON	ON
26	ON	OFF	ON	OFF	OFF	ON	ON
27	OFF	OFF	ON	OFF	OFF	ON	ON
28	ON	ON	OFF	OFF	OFF	ON	ON
29	OFF	ON	OFF	OFF	OFF	ON	ON
30	ON	OFF	OFF	OFF	OFF	ON	ON
31	OFF	OFF	OFF	OFF	OFF	ON	ON
32	ON	ON	ON	ON	ON	OFF	ON
33	OFF	ON	ON	ON	ON	OFF	ON
34	ON	OFF	ON	ON	ON	OFF	ON

Node Address	Switch Settings						
	S2-1	S2-2	S2-3	S2-4	S2-5	S2-6	S2-7
35	OFF	OFF	ON	ON	ON	OFF	ON
36	ON	ON	OFF	ON	ON	OFF	ON
37	OFF	ON	OFF	ON	ON	OFF	ON
38	ON	OFF	OFF	ON	ON	OFF	ON
39	OFF	OFF	OFF	ON	ON	OFF	ON
40	ON	ON	ON	OFF	ON	OFF	ON
41	OFF	ON	ON	OFF	ON	OFF	ON
42	ON	OFF	ON	OFF	ON	OFF	ON
43	OFF	OFF	ON	OFF	ON	OFF	ON
44	ON	ON	OFF	OFF	ON	OFF	ON
45	OFF	ON	OFF	OFF	ON	OFF	ON
46	ON	OFF	OFF	OFF	ON	OFF	ON
47	OFF	OFF	OFF	OFF	ON	OFF	ON
48	ON	ON	ON	ON	OFF	OFF	ON
49	OFF	ON	ON	ON	OFF	OFF	ON
50	ON	OFF	ON	ON	OFF	OFF	ON
51	OFF	OFF	ON	ON	OFF	OFF	ON
52	ON	ON	OFF	ON	OFF	OFF	ON
53	OFF	ON	OFF	ON	OFF	OFF	ON
54	ON	OFF	OFF	ON	OFF	OFF	ON
55	OFF	OFF	OFF	ON	OFF	OFF	ON
56	ON	ON	ON	OFF	OFF	OFF	ON
57	OFF	ON	ON	OFF	OFF	OFF	ON
58	ON	OFF	ON	OFF	OFF	OFF	ON
59	OFF	OFF	ON	OFF	OFF	OFF	ON
60	ON	ON	OFF	OFF	OFF	OFF	ON
61	OFF	ON	OFF	OFF	OFF	OFF	ON
62	ON	OFF	OFF	OFF	OFF	OFF	ON
63	OFF	OFF	OFF	OFF	OFF	OFF	ON
64	ON	ON	ON	ON	ON	ON	OFF
65	OFF	ON	ON	ON	ON	ON	OFF
66	ON	OFF	ON	ON	ON	ON	OFF
67	OFF	OFF	ON	ON	ON	ON	OFF
68	ON	ON	OFF	ON	ON	ON	OFF

Table 2-6 ESCC Node Address Option (Cont.)

Node Address	Switch Settings						
	S2-1	S2-2	S2-3	S2-4	S2-5	S2-6	S2-7
69	OFF	ON	OFF	ON	ON	ON	OFF
70	ON	OFF	OFF	ON	ON	ON	OFF
71	OFF	OFF	OFF	ON	ON	ON	OFF
72	ON	ON	ON	OFF	ON	ON	OFF
73	OFF	ON	ON	OFF	ON	ON	OFF
74	ON	OFF	ON	OFF	ON	ON	OFF
75	OFF	OFF	ON	OFF	ON	ON	OFF
76	ON	ON	OFF	OFF	ON	ON	OFF
77	OFF	ON	OFF	OFF	ON	ON	OFF
78	ON	OFF	OFF	OFF	ON	ON	OFF
79	OFF	OFF	OFF	OFF	ON	ON	OFF
80	ON	ON	ON	ON	OFF	ON	OFF
81	OFF	ON	ON	ON	OFF	ON	OFF
82	ON	OFF	ON	ON	OFF	ON	OFF
83	OFF	OFF	ON	ON	OFF	ON	OFF
84	ON	ON	OFF	ON	OFF	ON	OFF
85	OFF	ON	OFF	ON	OFF	ON	OFF
86	ON	OFF	OFF	ON	OFF	ON	OFF
87	OFF	OFF	OFF	ON	OFF	ON	OFF
88	ON	ON	ON	OFF	OFF	ON	OFF
89	OFF	ON	ON	OFF	OFF	ON	OFF
90	ON	OFF	ON	OFF	OFF	ON	OFF
91	OFF	OFF	ON	OFF	OFF	ON	OFF
92	ON	ON	OFF	OFF	OFF	ON	OFF
93	OFF	ON	OFF	OFF	OFF	ON	OFF
94	ON	OFF	OFF	OFF	OFF	ON	OFF
95	OFF	OFF	OFF	OFF	OFF	ON	OFF
96	ON	ON	ON	ON	ON	OFF	OFF
97	OFF	ON	ON	ON	ON	OFF	OFF

Node Address	Switch Settings						
	S2-1	S2-2	S2-3	S2-4	S2-5	S2-6	S2-7
98	ON	OFF	ON	ON	ON	OFF	OFF
99	OFF	OFF	ON	ON	ON	OFF	OFF
100	ON	ON	OFF	ON	ON	OFF	OFF
101	OFF	ON	OFF	ON	ON	OFF	OFF
102	ON	OFF	OFF	ON	ON	OFF	OFF
103	OFF	OFF	OFF	ON	ON	OFF	OFF
104	ON	ON	ON	OFF	ON	OFF	OFF
105	OFF	ON	ON	OFF	ON	OFF	OFF
106	ON	OFF	ON	OFF	ON	OFF	OFF
107	OFF	OFF	ON	OFF	ON	OFF	OFF
108	ON	ON	OFF	OFF	ON	OFF	OFF
109	OFF	ON	OFF	OFF	ON	OFF	OFF
110	ON	OFF	OFF	OFF	ON	OFF	OFF
111	OFF	OFF	OFF	OFF	ON	OFF	OFF
112	ON	ON	ON	ON	OFF	OFF	OFF
113	OFF	ON	ON	ON	OFF	OFF	OFF
114	ON	OFF	ON	ON	OFF	OFF	OFF
115	OFF	OFF	ON	ON	OFF	OFF	OFF
116	ON	ON	OFF	ON	OFF	OFF	OFF
117	OFF	ON	OFF	ON	OFF	OFF	OFF
118	ON	OFF	OFF	ON	OFF	OFF	OFF
119	OFF	OFF	OFF	ON	OFF	OFF	OFF
120	ON	ON	ON	OFF	OFF	OFF	OFF
121	OFF	ON	ON	OFF	OFF	OFF	OFF
122	ON	OFF	ON	OFF	OFF	OFF	OFF
123	OFF	OFF	ON	OFF	OFF	OFF	OFF
124	ON	ON	OFF	OFF	OFF	OFF	OFF
125	OFF	ON	OFF	OFF	OFF	OFF	OFF
126	ON	OFF	OFF	OFF	OFF	OFF	OFF

ESCC Installation

To install the ESCC in the TMS-3000 shelf, proceed as follows:

1. Place the ESCC front panel Enable/Disable switch in the Disable position.
2. Position the ESCC in the receptacle guides (top and bottom) of the slot shown in *Figure 2-3* and carefully slide the ESCC into the receptacle until it stops. Tilt the top ejector knob up and the bottom ejector knob down and gently push the ESCC into the rear connector. The knobs automatically assume their normal position.
3. Place the ESCC front panel Enable/Disable switch in the Enable position.

Redundancy Control Card

Install the RCC in the correct slot as shown in Figure 2.3, below. The RCC is software controlled and therefore has no option selections on the card itself.

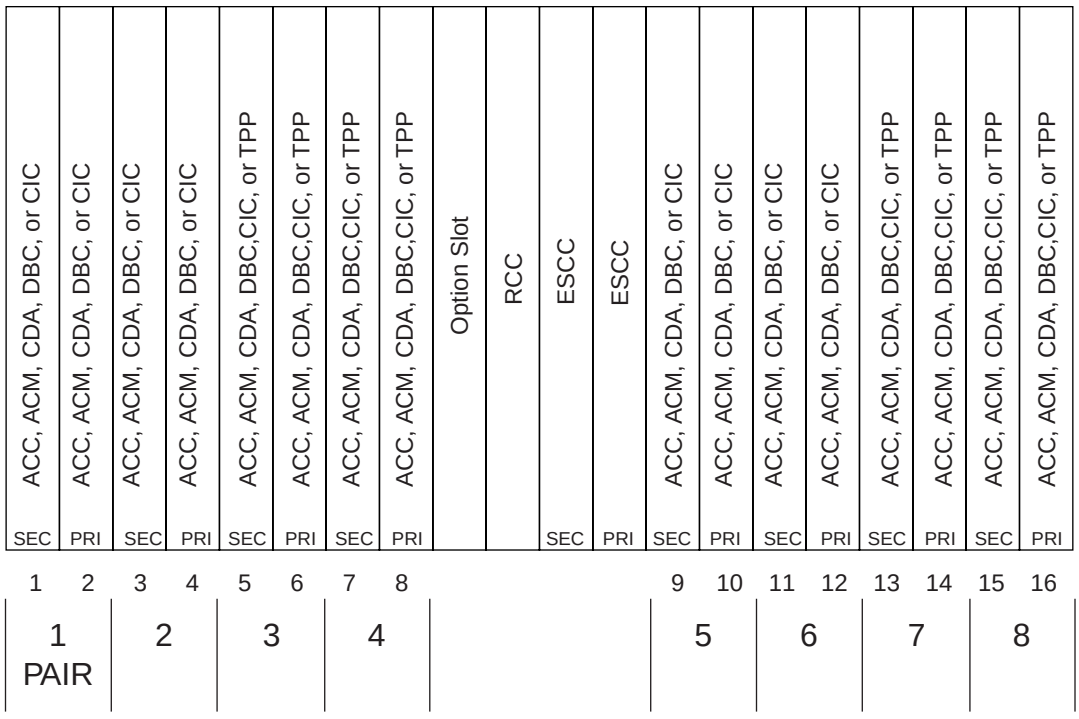


Figure 2-3 TMS-3000 Main Shelf Slot Locations

Aggregate Control Card

This section covers Aggregate Interface part numbers, connections, connector functions, options, and optional plug-in cards as well as associated tables and drawings to provide detailed installation information. *Table 2-7* breaks down assemblies into sub-assemblies that form the component information to be used to procure replacement assemblies and pc boards.

Table 2-7 Aggregate Control Card Assembly (036M313-006)

Equipment Supplied	Designation	GDC Part No.
PCB Assembly, Aggregate Control II	ACC-II	036P313-003
PCB Assembly Aggregate, Plug-In TMS-3000		036P314-001
Aggregate Interface plug-in cards:		
EIA/TIA-232-E/ITU-T V.28 Aggregate Interface	EIF-E	036P041-001
ITU-T V.35 Aggregate Interface	EIF-V	036P042-001
EIA RS-422/423/MIL-STD-188/ITU-T V.10/V.11 Aggregate Interface	EIF-P	036P043-001
T1/D4 1.544 Mbps Aggregate Interface	T1/D4	036P315-002
T1/D4 1.544 Mbps Aggregate Interface	T1/D4	036P315-003
T1-DS0 (N x 56/64 Kbps) Aggregate Interface	T1-DS0	036P335-001
T1-FT1 (N x 56/64 Kbps) Aggregate Interface	T1-FT1	036P335-002
ITU-T G.703 64 Kbps Codirectional Aggregate Interface	EIF-G	036P064-001
ITU-T G.703 2.048 Mbps 75-ohm Aggregate Interface	EIF-M1	036P065-001
ITU-T G.703 2.048 Mbps 12-ohm Aggregate Interface	EIF-M2	036P065-002
ITU-T G.703 64 Kbps Contradirectional Aggregate Interface	EIF-C	036P066-001
ITU-T G.703 256 Kbps 75-ohm Aggregate Interface	EIF-K1	336P065-001
ITU-T G.703 256 Kbps 120-ohm Aggregate Interface	EIF-K2	336P065-002
ITU-T G.704 2.048 Mbps 75/120 ohm Aggregate Interface	—	036P281-001

Aggregate Interface Connections

Aggregate Interface cables are connected to the DB-25 EIA connectors located in the upper half of the TMS-3000 Harness Card (backplane), from left to right in two rows of eight connectors. In the TMS-3000 system, aggregate interfaces require a matching Aggregate Interface Piggyback Card mounted on the ACC.

A list of Aggregate Interface cables is provided in *Table 2-8* along with a description of the applications for each cable. The connectors on the TMS-3000 backplane for the Aggregate interface cables are listed in *Table 2-9*.

Table 2-8 Aggregate Interface Cables

GDC Cable No.	Description	Application
028H502	EIA/TIA-232-E/ITU-T V.28	For all 232-E and ITU-T V.28 aggregate trunks. Available in 5-, 15-, 25-, and 50-foot lengths. Straight through cable.
027H507	ITU-T V.35	For ITU-T V.35 trunks — generally used for domestic applications. Available in 5-, 15-, and 25-foot lengths.
027H508	EIA RS-422/423 ITU-T V.10/V.11 MIL-STD 188C	For EIA RS-422 or 423, ITU-T V.10 or V.11, MIL-STD 188C aggregate trunks. Available in 5-, 15-, and 25-foot lengths, or other lengths up to 500 feet.
027H201	ATT DS (T1)	Standard connector for T1 lines, for connection to CSUs or other devices with F-DB15 connectors.
036H013	ITU-T V.35 (European)	For European V.35 applications. Available in 5-, 15-, or 25-foot lengths.
027H307	T1 or ITU-T G.703 25-pin connector to wire ends	For T1 or ITU-T G.703 connections where connections to trunk equipment are made using wire ends only (no connectors). Available in 25- or 75-foot lengths.
027H408	EIA/TIA-232-E (422 Signals)	Used for connection of RS-422 Aggregate to 422 Data Chan., Submux.
027H517	EIA/TIA-232-E (V.35 Signals)	Used for connection of ITU-T V.35 Aggregate Link to business equipment connector on the DS-1 shelf.
027H531	EIA/TIA-232-E (422 Signals)	Used for connection of RS-422 Aggregate Link to business equipment connector on the DS-1 Shelf.
027H316	T1/D4 to T1/D4 Y-cable	Used for non-redundant pairs of CDA modules in adjacent slots. Provides two T1 lines with DB-25 connectors.
027H245	T1-DS0	Standard connector for T1 lines, for connection to CSUs or other devices with 8-pin modular connectors.
027H227	T1-FT1	Standard connector for T1 lines, for connection to CSUs or other devices with DB25M connectors.

Table 2-9 TMS-3000 25-Pin Connector Functions

Connector	Function
J1-J16	Aggregate Cable Connectors
J-19	VDU (Maintenance Console Terminal)
J-20	TMS-3000 Controller
J-41	Internal VF Modem
J-42	External Modem Port
J-43	Optional Module

Aggregate Connector Functions — Redundancy and Diversity

Two Common Modules are redundant if the primary is in service, and its pair is in standby in case the primary fails. Aggregate trunks are diverse if the upper aggregate trunk connector on the backplane is in service and the lower connector is in standby. Although, functionally, redundancy and diversity are unrelated, a trade-off exists between the number of channels and the number of aggregates that can be accommodated. This trade-off exists because of the number of hardware connectors on the main shelf backplane.

As shown previously in *Figure 2-3*, the TMS-3000 Main Shelf has 20 slot positions. Of those 20, the four center slots are reserved for the controlling modules. The 16 remaining slots are used for either ACC, CDA, ACM, CIC, DBC, or TPP modules. Note that TPP is covered in *GDC 036R302-A7*.

Think of these remaining 16 slots as 8 pairs because primary and redundant modules must be positioned adjacent to one another on the Main Shelf. Also, each pair of connectors (upper and lower) on the backplane are associated with each pair of slots they are positioned behind.

Up to 16 ACM or CDA Modules can be inserted into the TMS-3000 main shelf. This provides up to 16 non-redundant ACM or CDA Modules or 8 redundant ACM or CDA pairs. Any unused module slots can be used by either ACCs or CICs.

When using 16 ACM or CDA Modules, special provisions for heat dissipation of the main shelf are required. *See Installation in Chapter 1*, which discusses the cooling requirements of the main shelf.

Remember also that the CIC performs the interface for up to 64 data and voice channels at the local node and sends a serial stream across the fast bus to the ACC(s). Only an ACC can perform the interface tasks for each aggregate trunk. A CIC therefore does not use the aggregate trunk connector positioned behind it.

One CIC must use both 50-pin ribbon cable connectors located on the backplane below each pair of slots. For this reason, Channel Interface modules always require two slot positions. If you choose to have a non-redundant CIC, the adjacent slot must be empty. Also, a CIC cannot be paired with an ACM, Aggregate Control or CDA Module. Notice in *Figure 2-11* that the primary module is always on the right; for example, Slot 1 is redundant and Slot 2 is primary.

When configuring an ACC, take the following steps to configure redundant or non-redundant modules and diverse or non-diverse aggregate trunks:

1. Select diversity or single aggregate (non-diverse) on both ACCs in the pair. Use the berg jumpers located on the ACC.
2. Select redundant or non-redundant on both ACCs. Use the berg jumpers located on the ACC.
3. Select the options on Aggregate Interface Piggybacks A and B for both ACCs. Both boards should be set the same.
4. For diversity, place the piggyback interface card for the lower connector on the right. Place the piggyback interface card for the upper connector on the left. *See Figure 2-4*.

Table 2-10 gives the aggregate connector functions. For each pair of slots, choose which of the following applies and connect as described. Note that odd and even numbered slots are as seen from the front of the TMS-3000, starting at the left with number 1.

A redundant pair with diversity — The upper connector (odd or even slot, piggyback A) is connected to the primary aggregate trunk, and the lower connector (odd or even slot, piggyback B) is connected to the secondary aggregate trunk.

A redundant pair without diversity — The upper connector (odd or even slot, piggyback A) is connected to the aggregate trunk. The lower connector is not used.

A non-redundant pair with diversity — The upper connector is connected to the primary aggregate trunk, and the lower connector is connected to the secondary aggregate trunk.

A non-redundant pair without diversity — An ACC in an odd-numbered slot uses the lower connector (piggyback B) for aggregate trunk connections; the ACC in an even-numbered slot uses the upper connector (piggyback A) for aggregate trunk connections.

NOTE: IMPORTANT! Do not use diversity in your system if you use AT&T's Automatic Protection Capability

NOTES: A TPP-LAN with two media adapters can draw up to 15 amps from the +5 volt power supplies. Consideration must be given to the maximum current drawn in a TMS-3000.

Consult General DataComm Service for information regarding the quantity of power supplies and backplane selects on TMS nodes containing more than two TPP cards or any number of TPP cards and more than three CDA, ACM, CIC or ACC cards.

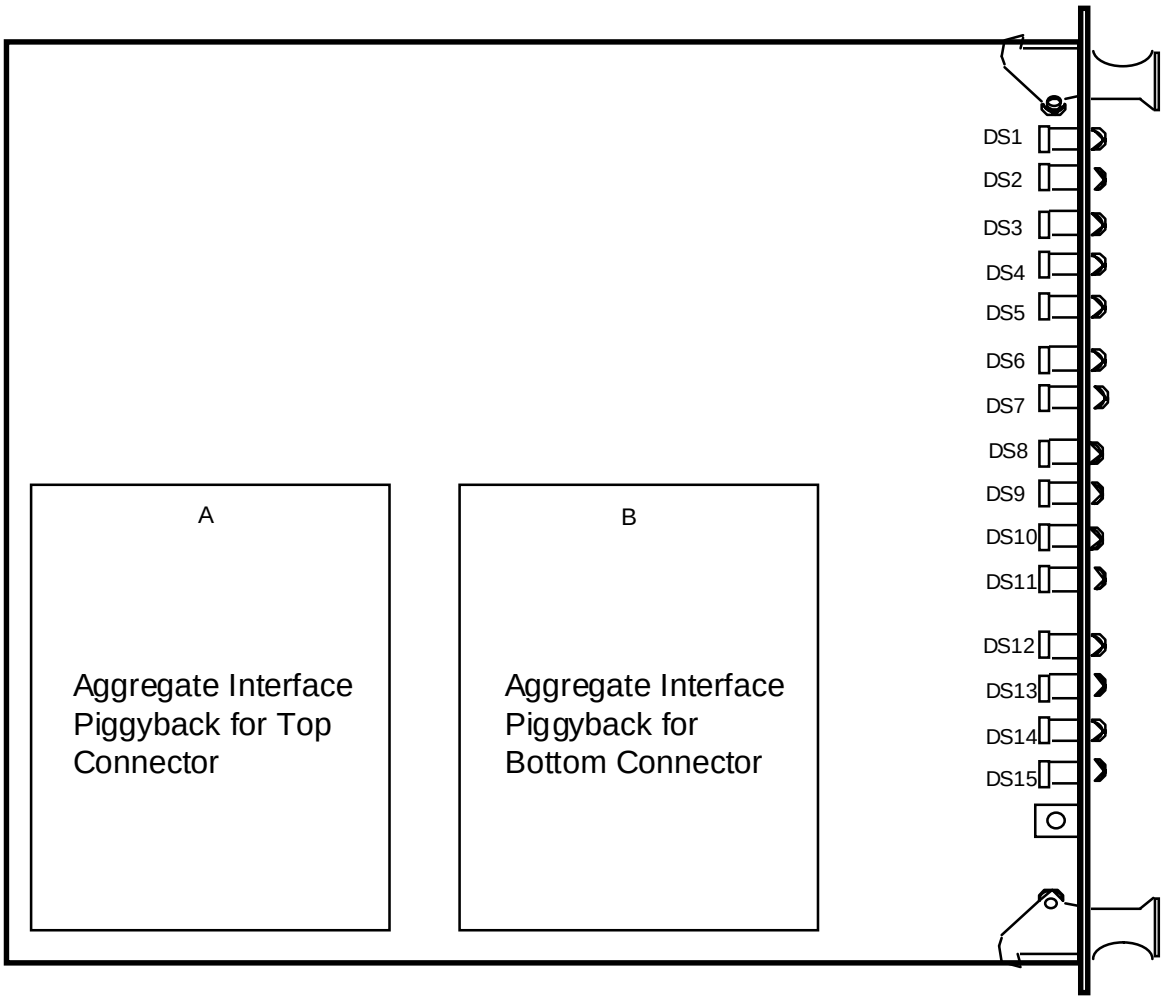


Figure 2-4 Aggregate Interface Piggyback Placement for Diversity

Table 2-10 Aggregate Connector Functions

Connector Number	Redundant, Diverse	Redundant, Non-diverse	Non-redundant, Diverse	Non-redundant, Non-diverse
J1	Slot 1 + 2 Primary Aggregate	Slot 1 + 2 Aggregate	Slot 1 or 2 * Primary Aggregate	Slot 1 Aggregate
J2	Slot 1 + 2 Secondary Aggregate	Not Used	Slot 1 or 2 * Secondary Aggregate	Slot 2 Aggregate
J3	Slot 3 + 4 Primary Aggregate	Slot 3 + 4 Aggregate	Slot 3 or 4 * Primary Aggregate	Slot 3 Aggregate
J4	Slot 3 + 4 Secondary Aggregate	Not Used	Slot 3 or 4 * Secondary Aggregate	Slot 4 Aggregate
J5	Slot 5 + 6 Primary Aggregate	Slot 5 + 6 Aggregate	Slot 5 or 6 * Primary Aggregate	Slot 5 Aggregate

J6	Slot 5 + 6 Secondary Aggregate	Not Used	Slot 5 or 6 * Secondary Aggregate	Slot 6 Aggregate
J7	Slot 7 + 8 Primary Aggregate	Slot 7 + 8 Aggregate	Slot 7 or 8 * Primary Aggregate	Slot 7 Aggregate
J8	Slot 7 + 8 Secondary Aggregate	Not Used	Slot 7 or 8 * Secondary Aggregate	Slot 8 Aggregate
J9	Slot 9 + 10 Primary Aggregate	Slot 9 + 10 Aggregate	Slot 9 or 10 * Primary Aggregate	Slot 9 Aggregate
J10	Slot 9 + 10 Secondary Aggregate	Not Used	Slot 9 or 10 * Secondary Aggregate	Slot 10 Aggregate
J11	Slot 11 + 12 Primary Aggregate	Slot 11 + 12 Aggregate	Slot 11 or 12 * Primary Aggregate	Slot 11 Aggregate
J12	Slot 11 + 12 Secondary Aggregate	Not Used	Slot 11 or 12 * Secondary Aggregate	Slot 12 Aggregate
J13	Slot 13 + 14 Primary Aggregate	Slot 13 + 14 Aggregate	Slot 13 or 14 * Primary Aggregate	Slot 13 Aggregate
J14	Slot 13 + 14 Secondary Aggregate	Not Used	Slot 13 or 14 * Secondary Aggregate	Slot 14 Aggregate
J15	Slot 15 + 16 Primary Aggregate	Slot 15 + 16 Aggregate	Slot 15 or 16 * Primary Aggregate	Slot 15 Aggregate
J16	Slot 15 + 16 Secondary Aggregate	Not Used	Slot 15 or 16 * Secondary Aggregate	Slot 16 Aggregate
* In this arrangement the ACC cannot be paired with another ACC. It must be next to an empty slot.				

ACC Options

ACC options are described in *Table 2-11* and option locations are shown in *Figure 2-5*.

IMPORTANT! The ACC (GDC 036P313-001) assembly contains a factory adjustment switch SW3 that should never be changed in the field. It controls a critical factory adjustment option which is set only when the PCB assembly is installed in a specialized test fixture at the factory. The purpose of SW3 is to fine tune the turn-on and turn-off times of the fast bus circuit Improper adjustment of this switch can cause erroneous data transfers between common cards and possible node failure.

Table 2-11 Aggregate Control Card Options

Feature	Selection	Switch (S), Jumpers (X)		Application
		Desig.	Pos.	
Watchdog Inhibit	Watchdog	X1	NORM	This selection is located on the Aggregate Control Piggyback. It is for in-house testing only. It should be left in the NORM position.
	Inhibit Watchdog	X1	INHIB W'DOG	
Redundancy	Redundant	X9	RED	Redundancy is selected if the ACC is part of a redundant pair.
	Non-redundant	X9	____ RED	____ RED is selected if the module is not part of a redundant pair.
Diversity	Diversity	X8	DIV	Diversity is selected if the ACC is interfacing two aggregate trunks.
	Single Aggregate	X8	____ DIV	____ DIV is selected if the module is interfacing one aggregate trunk.
NOTE: Jumper X1 is located on the Aggregate Control Piggyback Card.				

When configuring a non-redundant 128 ACC w/diversity, place the redundancy Jumper X9 into the redundant position. Otherwise, a configuration error appears on the Controller.

NOTE: Anytime the diversity Jumper X8 is selected on the ACC, check that the redundancy Jumper X9 is in its correct position.

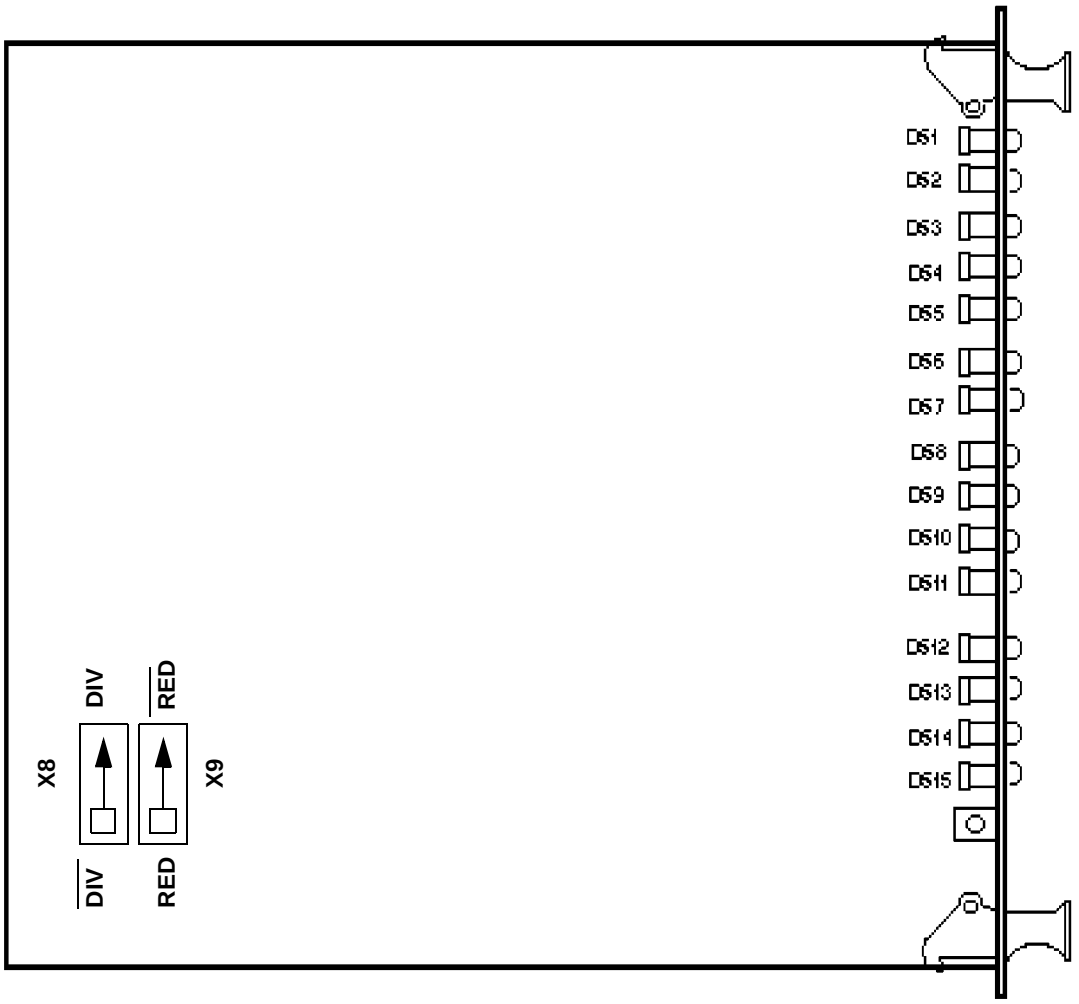


Figure 2-5 Aggregate Control Card Option Locations

Aggregate Interface Plug-In Card Options

Selectable hardware options are found on several of the Aggregate Interface Plug-In Cards used on the TMS-3000 system, such as the RS-422/423 card, the V.35 card (Rev. J and later), the T1/D4 card, and the G.704 card. This section describes the location and function of each hardware option on these four cards.

Note that two additional Aggregate Interface Plug-In Cards, the T1-DS0 card and the T1-FT1 card, are also used on the TMS-3000 system and have selectable hardware options. Refer to GDC 036R477-000 and 036R485-000 for complete information on these cards.

RS-422/423 Aggregate Interface Piggyback Options

With the EIA-RS-422/423 Aggregate Interface Piggyback card you must select the option for an RS-422 balanced interface or an RS-423 unbalanced interface. Option locations are shown in Figure 2-6 and are described in Table 2-12. .

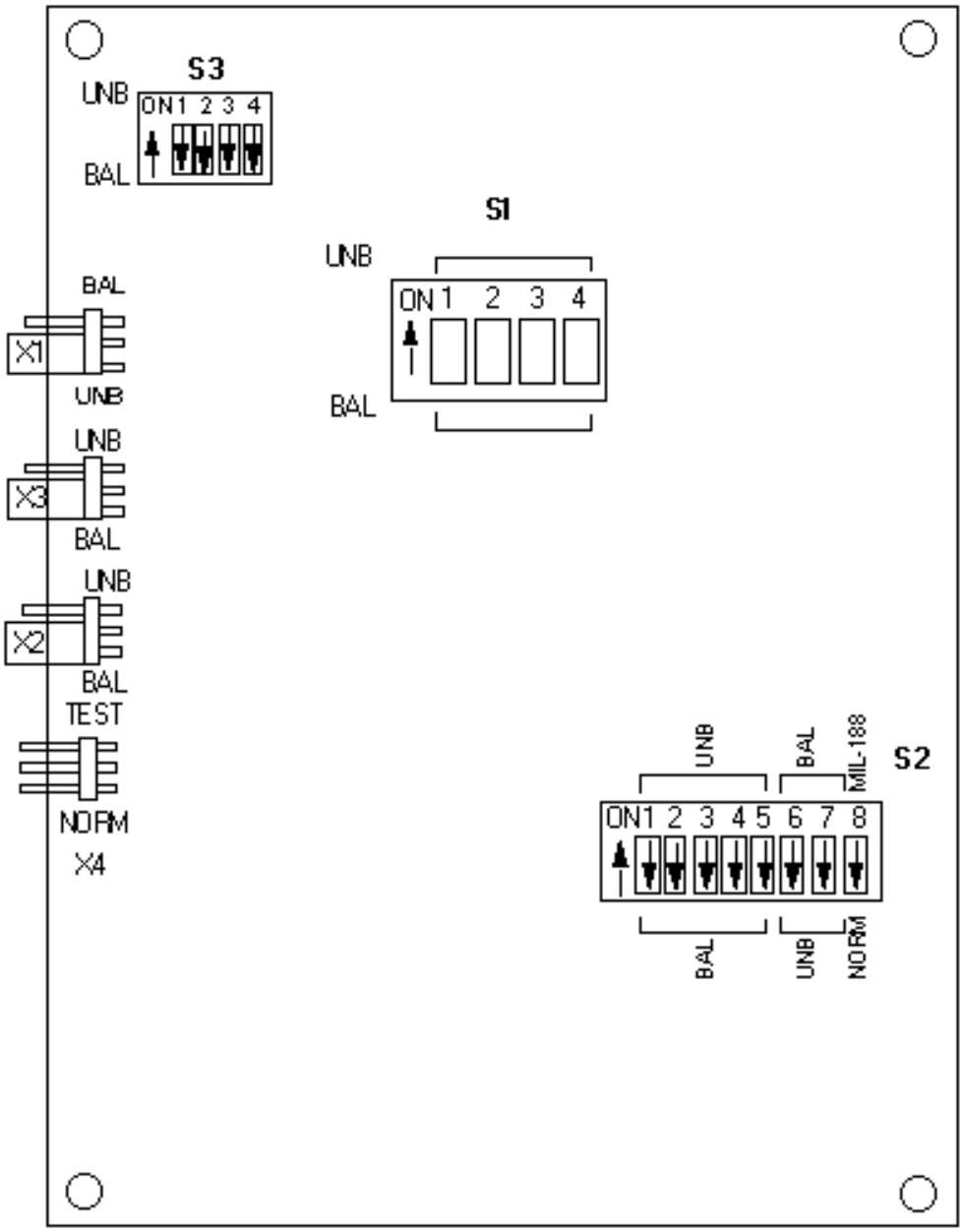


Figure 2-6 RS-422/423 Aggregate Interface Piggyback Option Locations

Table 2-12 RS-422/423 Aggregate Interface Piggyback Option Selections

Feature	S1-1 Thru S1-4 Pos.	S2-1,2-5 S3-1,4 Pos.	S2-6,7 Pos.	S2-8 Pos.	X1 Pos.	X2,X3 Pos.	Application
EIA-RS-422 (ITU-T V.11) Balanced Interface	BAL (Off)	BAL (Off)	BAL (On)	NORM (Off)	BAL	BAL	This piggyback may be set to operate in an RS-422 mode (equivalent to ITU-T V.11) balanced mode, or a MIL-STD-188-114 balanced mode.
MIL-STD-188-114 Balanced Interface	BAL (Off)	BAL (Off)	BAL (On)	MIL188 (On)	BAL	BAL	It may be set to operate in an RS-423 mode (equivalent to ITU-T V.10) unbalanced mode or a MIL-STD-188-114 unbalanced mode.
EIA RS-423 (ITU-T V.10) Unbalanced Interface	UNB (On)	UNB (On)	UNB (Off)	NORM (Off)	UNB	UNB	**NOTE:** Berg Header X4 on this card is used for test purposes only.
MIL-STD-188-114 Unbalanced Interface	UNB (On)	UNB (On)	UNB (Off)	MIL188 (On)	UNB	UNB	Do NOT place a jumper in either position on this header.

V.35 Aggregate Interface Piggyback Card

With the revised V.35 Aggregate Interface piggyback cards, Rev J and higher, the X2 jumper corrects a problem with the clocks and data being inverted on older revisions of the V.35 card. The jumper positions are shown in Figure 2-7 and described below.

- The X2 jumper must be in the INVERT position to ensure the V.35 card at Rev J and higher is backward compatible with all previous revisions of the V.35 card. This is the factory default position for the X2 jumper.
- The X2 jumper must be in the NORM position for all applications where a V.35 card is connected to an RS422, T1-FT1, or G.704 aggregate interface card at a remote location.

IMPORTANT! *It is important to note that the V.35 aggregate interface card cannot function unless the X2 jumper is properly installed in either the Invert or Normal position.*

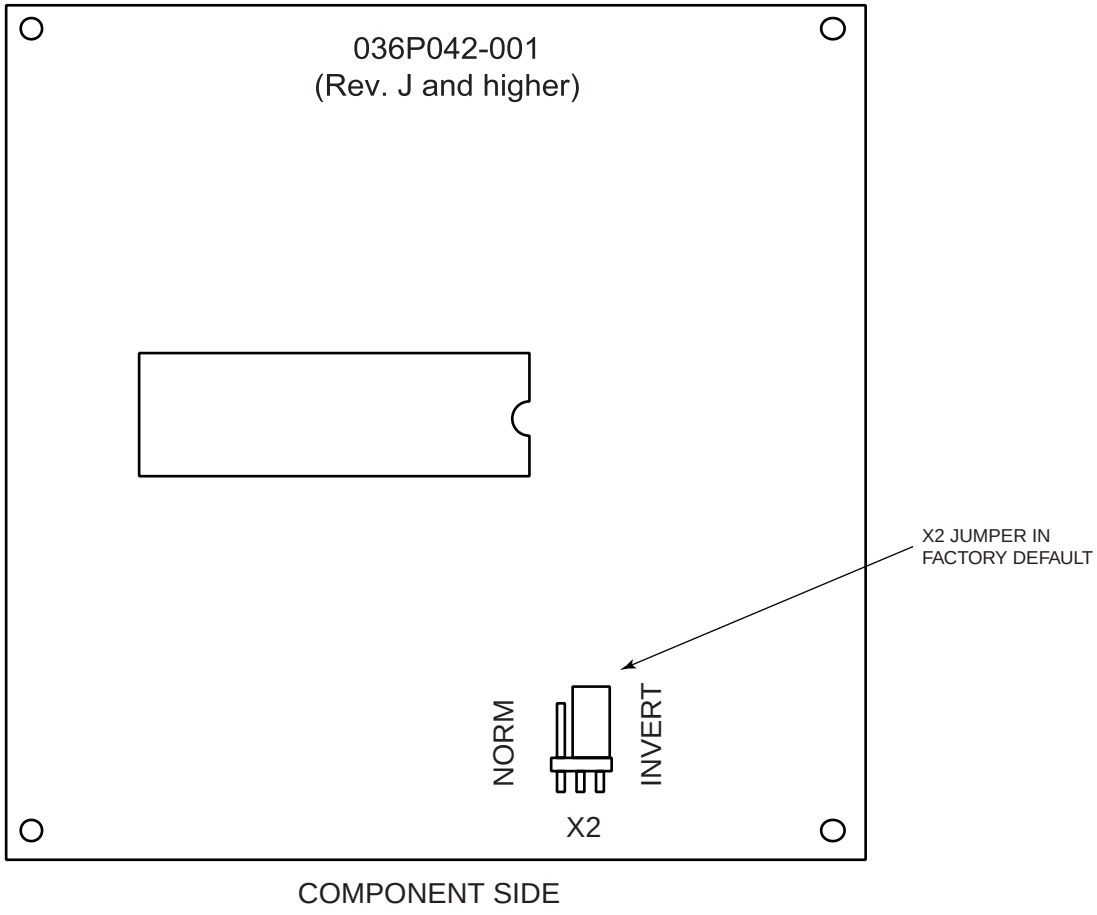


Figure 2-7 V.35 Aggregate Interface Piggyback Card

T1/D4 Aggregate Interface Piggyback

The latest version of the T1/D4 Aggregate Interface Piggyback card (*GDC 036P315-003*) can be used in a TMS-3000. It is installed on the ACC of the TMS-3000 shelf. Jumpers provide option selection for each application. *Figure 2-8* shows the physical location of the jumpers on the card. Options are described in *Table 2-13*.

The primary functions of the T1-D4 piggyback include the transmission and reception of the aggregate data stream as well as the insertion and detection of the D4 framing and synchronization patterns. The T1-D4 piggyback is also capable of local and remote alarm status reporting. These alarm status lines are currently monitored on the TMS system.

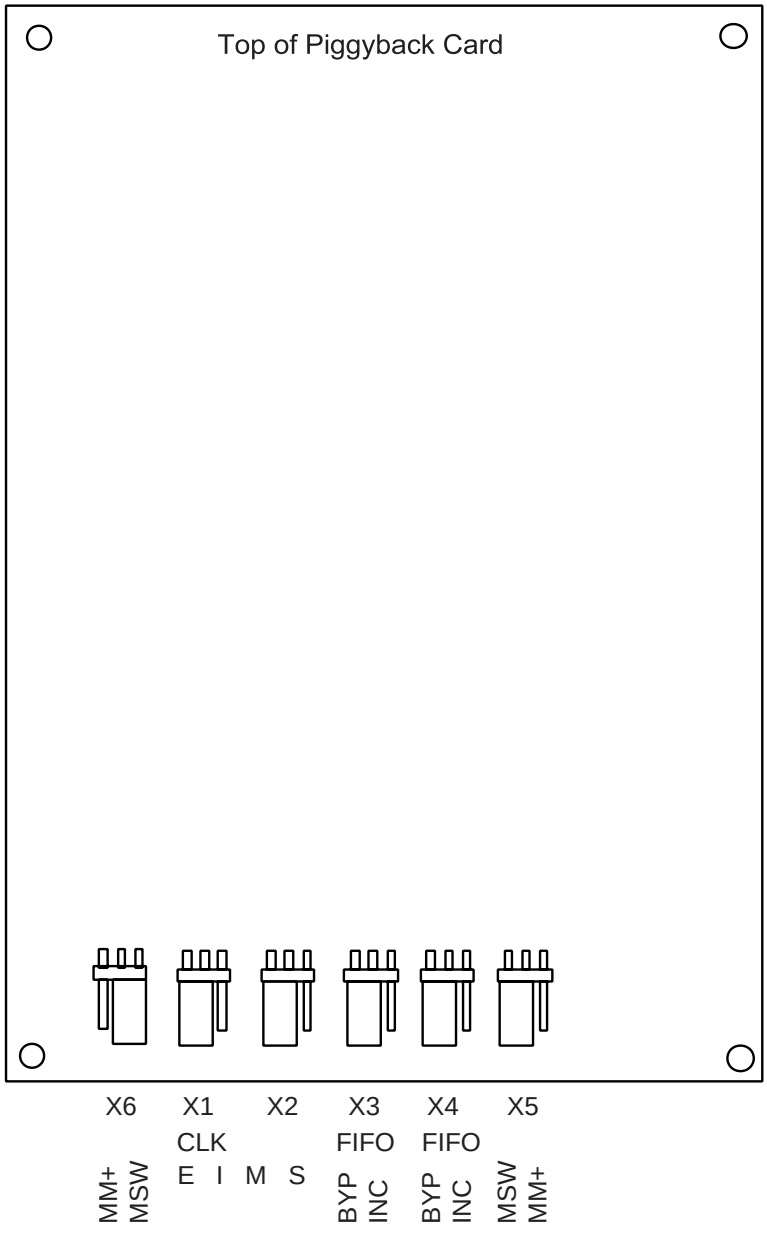


Figure 2-8 T1/D4 Aggregate Interface Piggyback (036P315-003)

Table 2-13 T1/D4 Piggyback Card (036P315-003) Option Selections

Feature	Selection	Jumper Desig.	Jumper Pos.	Application
Clock	External Internal	X1 X1	EXT INT	The EXT position selects the external clock supplied directly from the aggregate interface of the TMS-3000 ACC. The phase-lock loop of the T1/D4 piggyback card is bypassed in EXT mode. With X1 in the INT position, timing is selected from the output of the phase-lock loop on the T1/D4 piggyback card. When X1 is used in a TMS-3000, leave X1 in the EXT mode.
Master/Slave Timing	Master Slave	X2 X2	M S	This option selects an input to the phase-lock loop on the T1/D4 piggyback card. At a master timing node, select M, so that the external timing signal from the node is applied to the phase-lock loop. At a slave timing node, select S, so that timing from the aggregate link is applied to the phase-lock loop. When X1 is in the EXT position, the position of X2 does not matter in a TMS-3000.
Data FIFO Include/Bypass	Include Bypass	X3 X3	INC BYP	The INC position includes FIFO buffers in the data path. BYP bypasses the FIFO buffers. When the T1/D4 piggyback is used in a TMS-3000 node, select BYP for X3.
Clock FIFO Include/Bypass	Include Bypass	X4 X4	INC BYP	The INC position includes FIFO buffers in the timing path. BYP bypasses the FIFO buffers. When the T1/D4 piggyback is used in a TMS-3000 node, select BYP.
MSW/MM+	MSW MM+	X5+X6 X5+X6	MSW MM+	If the T1/D4 piggyback is used in a TMS-3000 node, place X5 and X6 in the MSW position.

T1-DS0 and T1-FT1 Aggregate Interface Piggyback

The T1-DS0 and T1-FT1 Aggregate Interface Piggyback Cards provide a specific electrical and functional interface on the high speed aggregate port of the TMS-3000, TMSC or MINIMUX TDM. The T1-DS0 card (*GDC 036P335-001*) is for use in Canada and the T1-FT1 card (*GDC 036P335-002*) is for use in the USA.

The main difference from other types of T1 interfaces available from GDC, is that the T1 serial bit stream (at the data rate of 1.544 Mbps) does not have to be fully utilized to carry voice and data information assembled by the associated multiplexer. Fractions of the T1 bit rate (in multiples of 56 or 64 Kbps) can be used by the multiplexer.

The T1-DS0 and T1-FT1 interfaces may be used for TELCO supplied services that are known as fractional T1. In a fractional T1 application, the TDM equipment can be connected to a Digital Access Cross Connect (DACS), to provide routing of individual (56 or 64 Kbps) DS0 channels to various remote locations.

The principal application for the T1-DS0 and T1-FT1 Aggregate Interface Piggyback Cards is to offer a T1 interface that takes advantage of fractional T1 services. Instead of paying for a full T1 line, you pay only for the bandwidth needed by selecting the number (N) of DS0 channels (where $1 \leq N \leq 24$). As bandwidth requirements change, you can change the number of DS0s. This is particularly useful at feeder nodes which typically have smaller bandwidth requirements.

The T1-DS0 (Canada) and T1-FT1 (USA) also provides an aggregate frame structure at 1.544 Mbps in accordance with ATT D4 or Extended SuperFrame (ESF) formats.

NOTE *For complete information on the T1-DS0 or T1-FT1 cards, refer to GDC manuals 036R447-000 or 036R485-000, respectively.*

G.704 Aggregate Interface Piggyback

Before mounting the G.704 Aggregate Interface Piggyback Card *(GDC 036P281)*, be certain all the options are configured. The G.704 card contains a 40-pin socket that mates with pins on the ACC. An optional connector, XP2, mates with a later version of the ACC (*GDC 036P313-003*). Line up the pins and gently press the G.704 card onto the ACC.

Using Switches S1 and S2 on the G.704 Aggregate Interface Piggyback Card, CRC4 multiframe, time Slot 16, synchronous/plesiochronous clocking mode and the elastic buffers may be selected in addition to the Transmit/Receive impedance at the aggregate and the line balance (*Figure 2-9)*. *Table 2-14* defines the option selections and describes the application of each. *Table 2-15* shows the buffer size/delay time of the plesiochronous buffers.

The ITU-T requires a provision to ground the outer conductor of a coaxial cable (unbalanced) when used with the G.704 interface. Either end of the cable (transmit or receive) may require grounding. Grounding of the aggregate signal DATA B on the G.704 Aggregate Interface Piggyback is performed as follows:

- Receive End — To connect RCVDATB to Signal Ground, move DIP Switch S2-8 on the G.704 Aggregate Interface Piggyback card to the UNB or closed (ON) position.
- Transmit End — To connect XMTDATB to Signal Ground, solder a zero ohm resistor (or a simple wire link) to future use resistor R11 (F/U R11) located on the right hand side of connector XP1 (*See Figure 2-9*).

Note that on the aggregate 25-pin D Connectors (J1 and J16 on the back of the main shelf), the grounded signals appear on the following connector pins: RCVDATAB (Pin 16) and XMTDATB (Pin 14). IMPORTANT! DO NOT GROUND BOTH ENDS OF THE SAME CABLE.

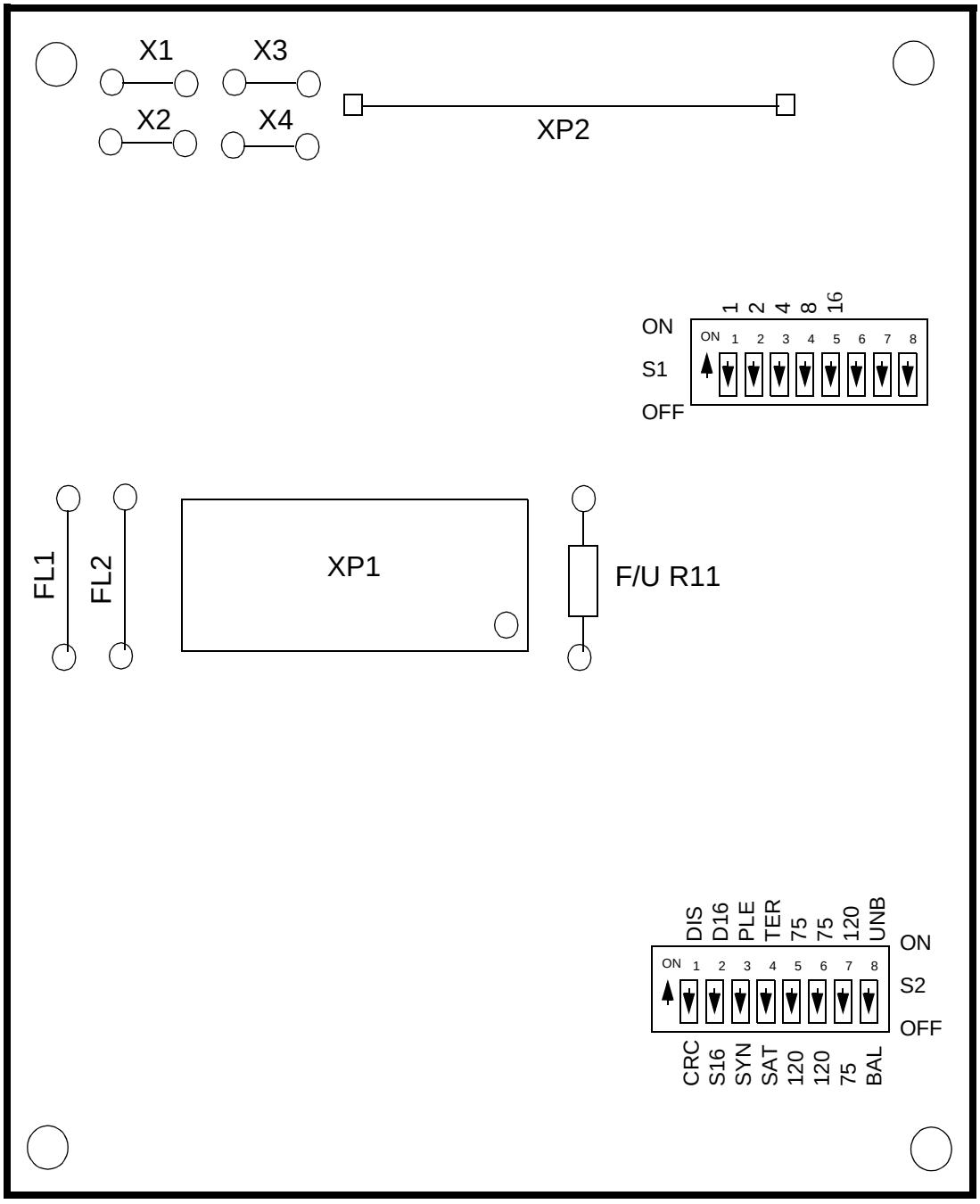


Figure 2-9 G.704 Aggregate Interface Piggyback Card (036P281-001)

Table 2-14 G.704 Aggregate Interface Piggyback Card Option Selections

Switch No.	Desig.	Position	Function	Application
S1-1	1	On Off	Value of 1 No value	Switch S1-1 through S1-5 define the value of N in N x 64. Add the values of the five switches together for the value of N. The switch setting affects the elastic buffer size for the synchronous buffer mode only.
S1-2	2	On	Value of 2	
		Off	No value	
S1-3	4	On	Value of 4	
		Off	No value	
S1-4	8	On	Value of 8	
		Off	No value	
S1-5	16	On	Value of 16	
		Off	No value	
S1-6 through S1-8		Off	Not used	Leave Switches S1-6 through 8 in the Off position.
S2-1	DIS	On	CRC4 multiframe disabled	CRC4 multiframe is not used.
	CRC	Off	CRC4 multiframe enabled	The CRC4 multiframe mode is enabled.
S2-2	D16	On	D16 Time slot	Time Slot 16 carries data.
	S16	Off	S16 Time slot	Time Slot 16 is skipped by data.
S2-3	PLE	On	Plesiochronous Clocking Mode	Place the G.704 in the Plesiochronous Clocking Mode if clocks at either end of an aggregate link are synchronized by two different master clocks or communicating via a satellite link. The elastic buffer depth is set by the TER/SAT (S2-4) switch operation.
	SYN	Off	Synchronous Clocking Mode	Place the G.704 in the Synchronous Clocking Mode if at both ends of the aggregate link the transmit and receive clocks are synchronized to the same master clock. The elastic buffer depth is set by hardware.
S2-4	TER	On	Terrestrial Elastic Buffer	Only used in the plesiochronous clocking mode. Selects ±256-bit elastic buffer.
	SAT	Off	Satellite Elastic	Used in the plesiochronous clocking mode. Selects ±2048-bit elastic buffer
S2-5	75 120	On Off	75Ω Impedance 120Ω Impedance	Setting to 120 provides a receive data line impedance of 120 ohms for the G.704. Setting at 75 provides a receive line impedance of 75 ohms.
S2-6	75	On	75Ω Impedance	Same as S2-5.
	120	Off	120Ω Impedance	
S2-7	120 75	On Off	120Ω Impedance 75Ω Impedance	Setting to 120 provides a transmit data line impedance of 120 ohms for the G.704. Setting at 75 provides a receive line impedance of 75 ohms.
S2-8	UNB	On	Unbalanced	Setting to UNB provides an unbalanced line condition.
	BAL	Off	Balanced	Setting to BAL provides a balanced line condition.

Table 2-15 G.704 Aggregate Interface Buffer Size

Mode	Value of N	Buffer Size(bits)	Max. Delay (Bit times)	Max. Delay (µsec)
Plesiochronous (Satellite)	—	±2048	4096	2000
Plesiochronous (Terrestrial)	—	±256	512	250
Synchronous	1	±16	32	16
Synchronous	2-3	±32	64	31
Synchronous	4-7	±48	96	47
Synchronous	8-31	±80	160	78

Combined Digital Aggregate (CDA) Module

The following paragraphs apply to both CDA-T1 and CDA-E1 unless otherwise specified. Insert the CDA Module into the shelf by pressing it in firmly. To remove the CDA Module, first press the Dsbl (disable) switch on the front panel once. All front panel LEDs should go off. The module is now in a low power mode and may be removed from the shelf in the usual manner. If the module is not removed, pressing the Dsbl switch once more reactivates the module and the INIT LED lights.

The CDA Module consists of four cards — the CDA base card, the CDA-T1 or CDA-E1 microprocessor plug-in card, and two CDA-T1 or CDA-E1 I/O cards. The CDA-T1 I/O card is the interface between the CDA base card and a T1 line, while the CDA-E1 I/O card provides the interface with CEPT G.732 and G.704 transmission formats. Each I/O plug-in card is a 6.25 X 6.75 inch printed circuit board and contains three connectors that mate with the base card. *Refer to Tables 2-16 and 2-17*.

Table 2-16 CDA-T1 Module (036M309-003)

Equipment Supplied	Designation	GDC Part No.
PCB Assembly, Base Card	—	036P309-001
PCB Assembly, I/O Piggyback (T1)	—	036P310-001
PCB Assembly, Micro Piggyback	—	036P316-001
PCB Assembly, I/O Piggyback (G.732 CEPT 2.048 MHz)	—	036P282-001

Table 2-17 CDA-E1 Module (036M328-002)

Equipment Supplied	Designation	GDC Part No.
PCB Assembly, Base Card	—	036P309-001
PCB Assembly, Micro Piggyback	—	036P316-001
PCB Assembly, I/O Piggyback (G.732 CEPT 2.048 MHz) (Qty. 2)	—	036P282-001

CDA Option Selections

The CDA base card contains a hardware jumper (X15) for redundancy. This jumper should be set to RED when using a redundant CDA pair or when using a non-redundant 256 CDA. It should be set to NRED when using a non-redundant 128 CDA. Note that when using a non-redundant 256 CDA, its paired slot must be empty. The CDA base card also contains Switch S2, which is a factory adjustment switch. Use of this switch may cause erroneous data transfers or complete node failure.

NOTE: IMPORTANT! Switch S2 should never be changed in the field. It controls a critical factory adjustment option which is set only when the PCB assembly is installed in a specialized test fixture at the factory. The purpose of Switch S2 is to fine tune the turn-on and turn-off times of the fast bus circuit. Improper adjustment of this switch can cause erroneous data transfers between common cards and possible node failure.

The CDA I/O cards operate in two modes, hardware and software. On power-up, the I/O card comes up in the hardware mode. The DIP Switch S1 on the I/O card establishes the configuration of the card. The I/O card continues to operate in hardware mode until the CDA receives configuration data from the Controller. At that time, the I/O card switches to software mode, using the settings defined in the configuration.

Figure 2-10 shows the location of DIP Switch S1 on the T1 I/O card, and *Table 2-18* defines the switch settings for the T1 I/O.

Figure 2-11 shows the base card, and *Figure 2-12* shows redundant and non-redundant cable connections. The E1 I/O card also provides the means to select the line impedance of the aggregate at either 75- or 120-ohms (Jumpers X1–X4). The TMS-3000 does not supply a coaxial connection to provide a 75-ohm unbalanced interface.

Figure 2-13 shows the location of DIP Switch S1 and Jumpers X1–X4 on the E1 I/O card, and *Table 2-21* defines the settings.

The CDA microprocessor card contains one Jumper, X9. This is the watchdog enable/disable and should always be set to enable.

CDA-T1/E1 Aggregate Interface Cable Connections

The CDA Module has two Input/Output cards. Each Input/Output card contains one port. Each port is dedicated to a specific backplane connector using a specific pinout arrangement. Since the ports are separate, they do not provide a diverse backup to each other. *Refer to Table 2-20.*

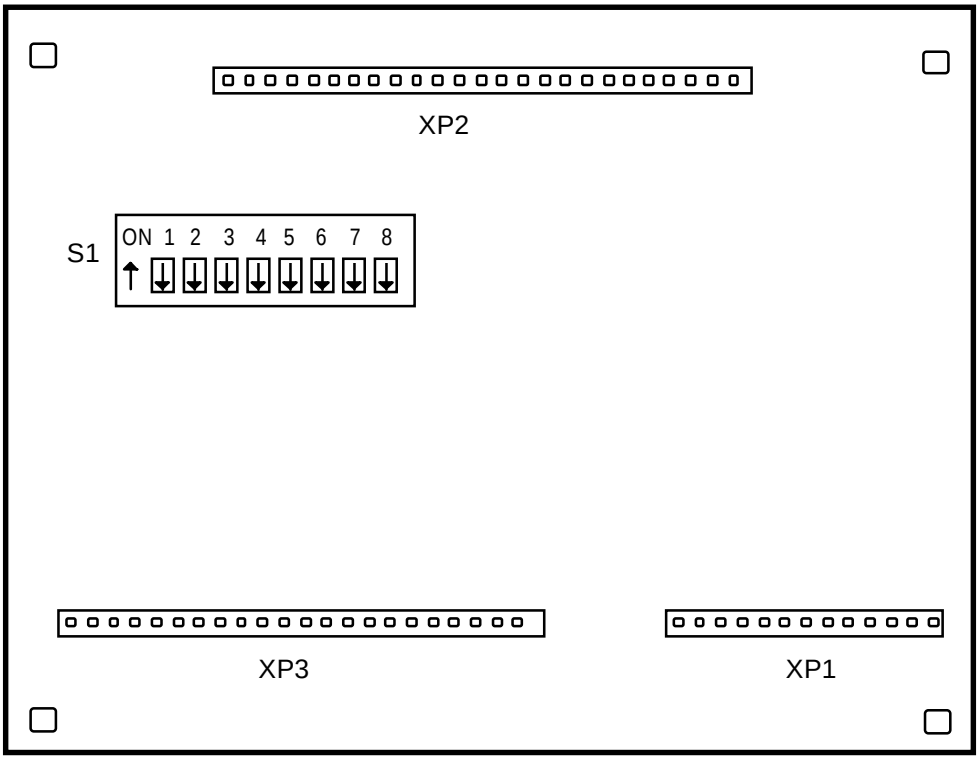


Figure 2-10 CDA-T1 I/O Plug-In Card, Option Locations

Table 2-18 CDA-T1 I/O Plug-In Card (036P310-001) Option Selections

Switch Number	Switch Position	Function	Application
S1-1 B8ZS/Dis	Off On	Enables B8ZS line coding Disables B8ZS line coding	Bit 8 Zero Suppression (B8ZS) is a technique designed to meet the spectral density specification. This technique creates an intentional double Bipolar violation at the transmitting end when 8 consecutive zeros are detected. Bipolar return to zero is the modulation technique used in T1 which requires subsequent marks of polarity opposite to the previous marks. The bipolar violation is detected and removed at the receive end of the network.
S1-2 Bit 7/ Trans	Off On	Bit 7 Substitution Enabled Transparent	In B7 substitution, ones density is implied. This means that bit (7) for select DS0 frames is set to one. When B7 is enabled, the bandwidth available for type subaggregates varies with each DS0 slot selecting "Trans'' bypasses this technique on the DS0 frame format.
S1-3 ESF/D4	Off On	Selects ESF Framing Selects D4 Framing	Two methods of framing exist in a DS1 data stream. A D4 frame consists of twelve 193-bit frames called a Superframe. An ESF retains the structure of D4, but consists of twenty-four 193-bit frames instead of twelve. ESF is known as Extended Superframe.
S1-5 (LEN2) S1-6 (LEN1) S1-7 (LEN2)	S1-5 S1-6 S1-7 On Off Off On On Off On Off On On Off Off Off On On Off On Off Off Off On Off Off Off On On On	Selects line length 0-220 ft. 220-440 ft. 440-655 ft. 0-133 ft. 266-399 ft. 399-533 ft. 533-655 ft. G.704, G.732 2.048 MHz (CEPT)	Clock and data extraction are improved by cable length transmit equalization. This feature allows line lengths of up to 655 feet to be used without the customary line build-out networks. With line transmit equalization, the pulse shape and amplitude at properly terminated receiving equipment conforms to AT&T standards. The line length selections support a three partition arrangement for MAT and ICOT, and a five partition arrangement for ABAM, PULP and PIC cables. Configure S1-5, 6, 7 to the proper length and cable type.
NOTE: S1-2 should always be in the ON position. Only B8ZS or Bit 7 substitution can be enabled at a time. Selecting both functions simultaneously is not allowed. **NOTE:** S1-8 is not used and should remain in the OFF position.			

Table 2-19 CDA Base Card Options

Feature	Selection	Switch (S), Jumpers (X)		Application
		Desig.	Position	
Redundant/ Non-Redundant CDA Module	Redundant Non-Redundant	X15 X15	RED NON-RED	Proper system operation requires that the CDA module knows whether it is redundant or not prior to program or configuration download. If using the CDA as a redundant pair, set this jumper to RED. If using the CDA as a non-redundant pair, set this jumper to NON-RED.

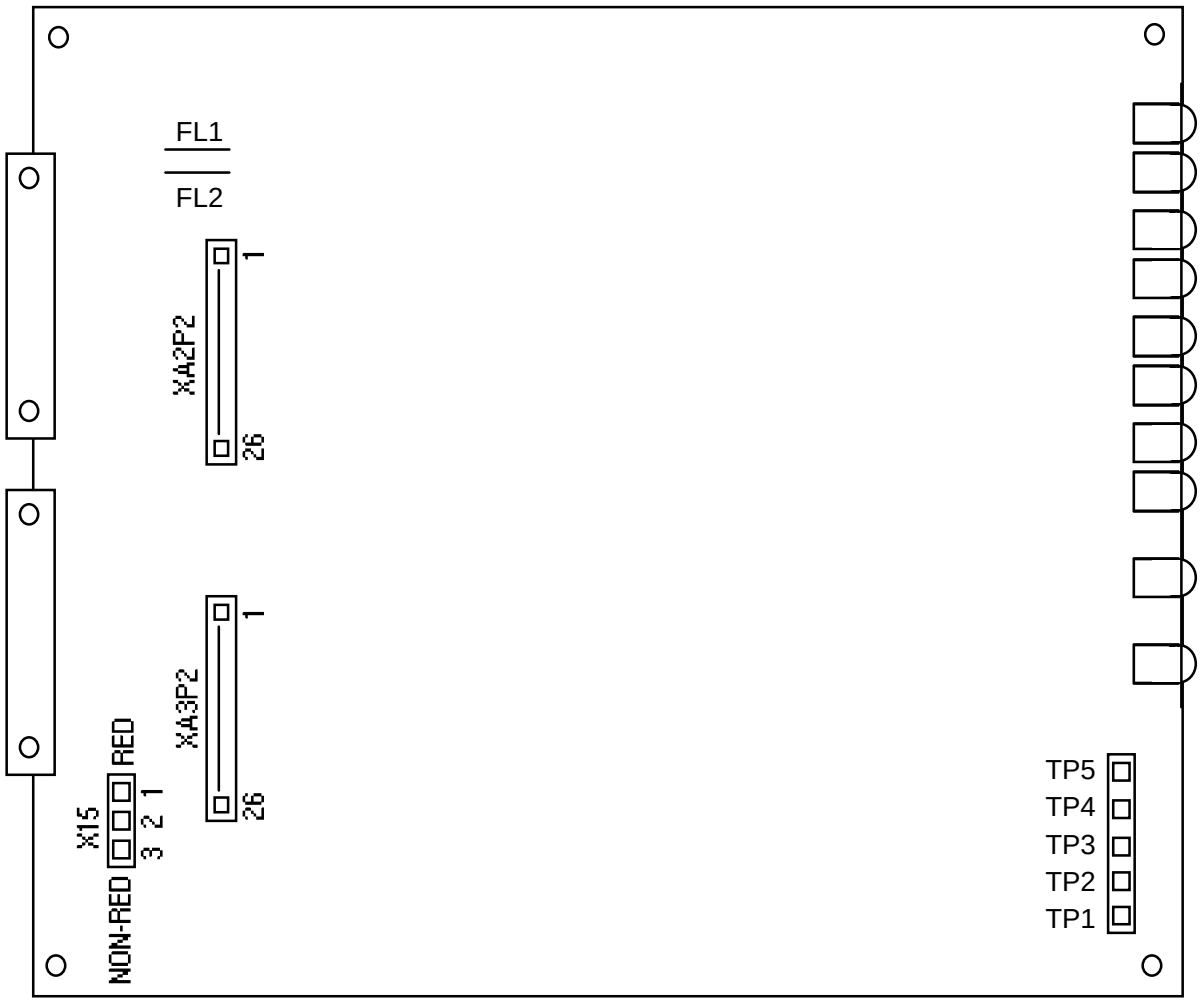
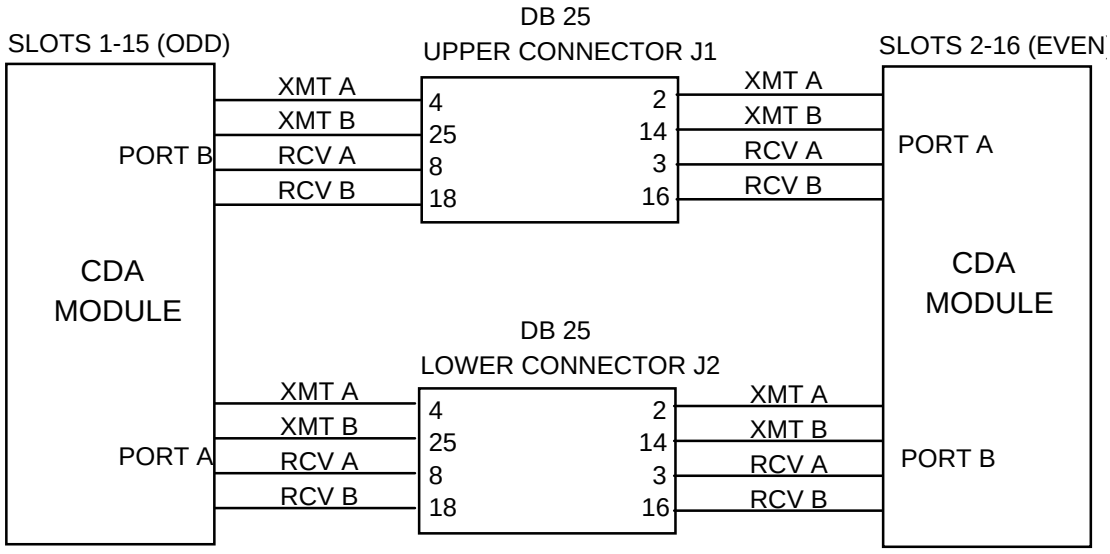


Figure 2-11 CDA Base Card Option Locations

In a redundant situation the CDA Module Input/Output ports are dedicated to one of the DB25 connectors on the backplane. Port 1 goes to the upper connector of the backplane, Port 2 to the lower connector. Use *GDC 027H201* which provides a standard connection to T1 lines.

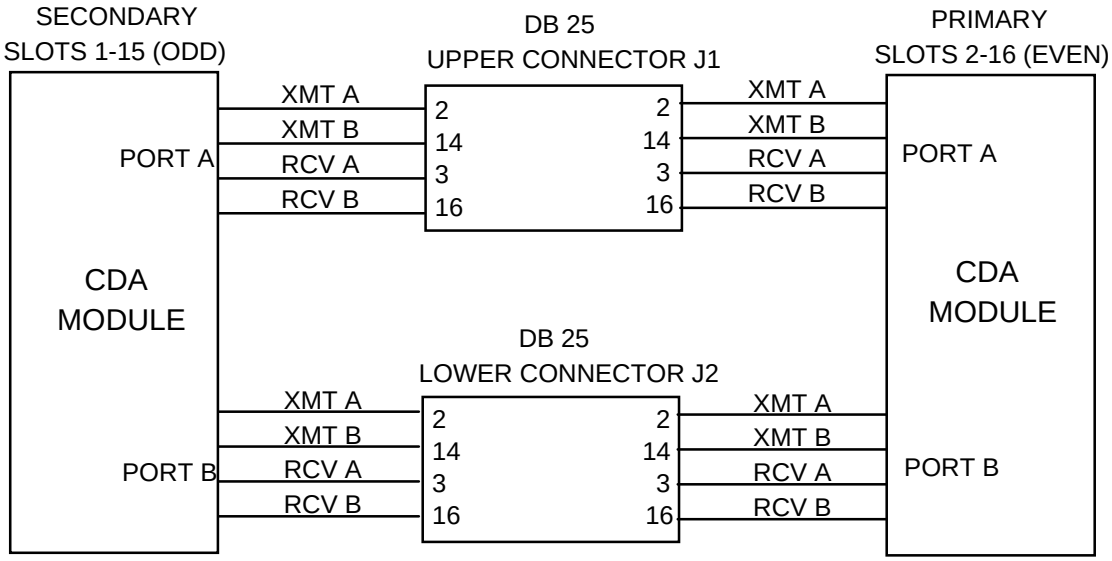
If non-redundant CDA Modules are used in adjacent slots, the Input/Output ports of each module use different pins of the same DB25 connector. They split externally through a "Y cable" (*GDC 027H316*) attached to the backplane. The module in the primary slot uses the upper portion of the upper connector for Port 1 and the upper portion of the lower connector for Port 2. The module in the secondary slot uses the lower portion of the lower connector for Port 1 and the lower portion of the upper connector for Port 2.

DB25 Pinout Configuration for a Redundant CDA Module is given in *Figure 2-12*, along with configuration for a non-redundant CDA Module in adjacent slots. *Table 2-20* contains the CDA aggregate cable connections.



Y-CABLE 027H316 IS REQUIRED TO ACCESS 1 (ODD) AGGREGATE INTERFACE.

FOR NON REDUNDANT MODULES IN ADJACENT SLOTS



CDA MODULES CONFIGURED AS A REDUNDANT PAIR OR ONE
NON-REDUNDANT CDA MODULE WITH THE ADJACENT SLOT EMPTY

Figure 2-12 DB25 Backplane Connections for CDA Module

Table 2-20 CDA Aggregate Cable Connections

Configuration	*Connector	Pins	Y Cable	CDA Port
Redundant	Upper DB-25	2,14,3,16	Not Used	Even or Odd Slot Port A
	Lower DB-25	2,14,3,16	Not Used	Even or Odd Slot Port B
Non-redundant	Upper DB-25	2,14,3,16	P2	Even Slot Port A
	(Odd number)	4,25,8,18	P3	Odd Slot Port B
	Lower DB-25	2,3,14,16	P2	Even Slot Port B
	(Even number)	4,25,8,18	P3	Odd Slot Port A

NOTE: Generally, Port A of either CDA Module in a redundant pair comes out on the upper DB-25 connector and Port B comes out on the lower DB-25 connector. When non-redundant modules are used in adjacent slots, Port A and Port B of the even-numbered slot come out on the upper and lower connectors as before, but Port A and Port B of the odd-numbered slot come out on alternate pins of these connections. The different ports are then split externally using a special Y-cable (*GDC 027H316*).

* This connector is located on the backplane of the main shelf. If a Y-cable is used, connect P1 of the Y-cable to this connector.

Table 2-21 CDA-E1 (G.732) I/O Plug-In Card Options

Feature	Selection	Switch(S), Jumpers(X)		Function
		Desig.	Position	
Receive Line Impedance	75 ohms 120 ohms	X1	75 120	Setting at 75 provides a line impedance of 75 ohms for the G.732. Setting at 120 provides a line impedance of 120 ohms.
Receive Line Impedance	75 ohms 120 ohms	X2	75 120	Setting at 75 provides a line impedance of 75 ohms for the G.732. Setting at 120 provides a line impedance of 120 ohms.
Transmit Line Impedance	75 ohms 120 ohms	X3	75 120	Setting at 75 provides a line impedance of 75 ohms for the G.732. Setting at 120 provides a line impedance of 120 ohms.
Receive Shield Ground	75 ohms 120 ohms	X4	75 120	Setting at 75 provides a ground reference on the Recv B lead for unbalanced interfaces (normally used with 75 ohm coaxial interfaces). Setting at 120 provides for a balanced Recv input (normal setting).
Transmit Shield Ground	Ground Open	X9	GND OPEN	GND selection provides a ground reference on the output port as recommended by G.703 for use with 75 ohm interfaces. OPEN selection is for use with a 120 ohm interface and provides a balanced interface at the output port.
CAS Signaling (TS16) Enabled. CRC-4 Disabled.		S1-1 On	S1-2 On	Switches S1-1 and S1-2 selects CAS, CRC-4, or both for use on the G.732 I/O plug-in card.
CAS Signaling (TS16) Disabled. CRC-4 Disabled.		Off	On	
CAS Signaling (TS16) Enabled. CRC-4 Enabled.		On	Off	
CAS Signaling (TS16) Disabled. CRC-4 Enabled.		Off	Off	

NOTE: Switches S1-3 and S1-4 remain in the OFF position.

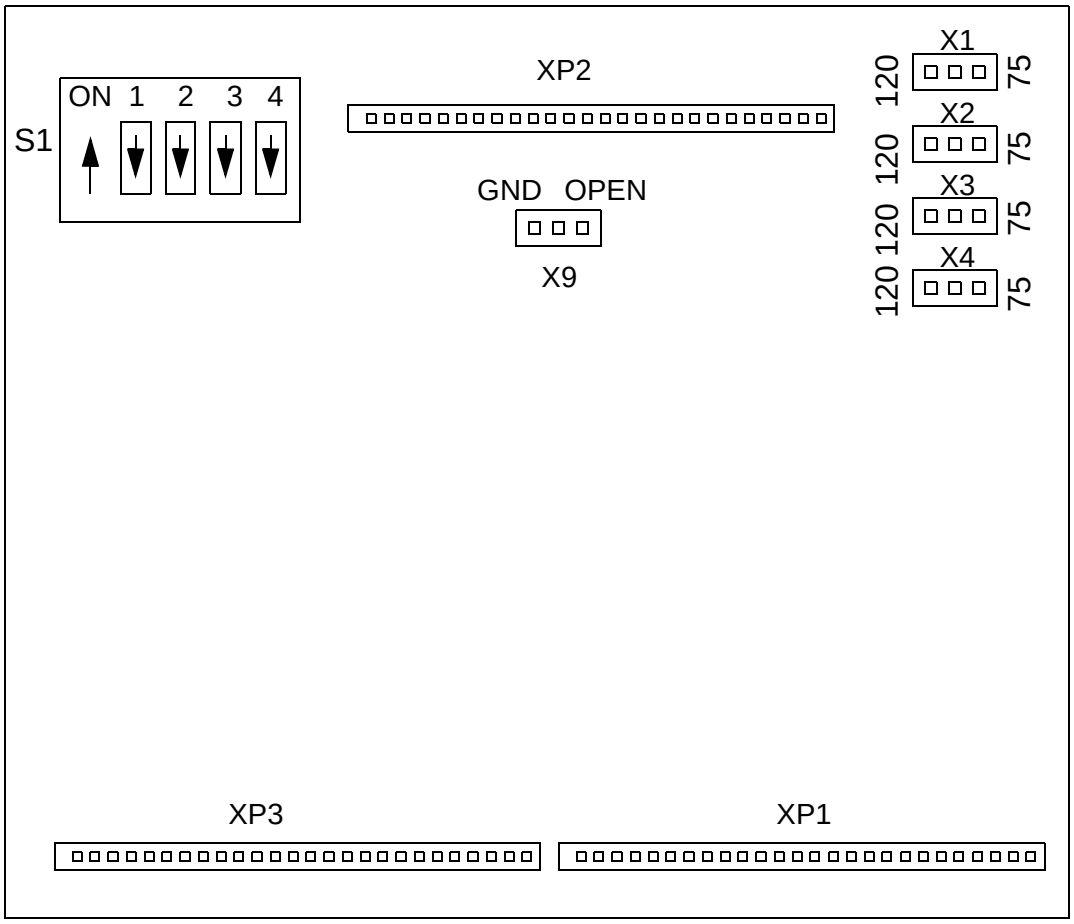


Figure 2-13 CDA-E1 I/O Plug-In Card Option Locations

ADPCM Compression Module (ACM)

Insert the ACM into the shelf by pressing it in firmly. To remove the ACM, first press the Dsbl (disable) switch on the front panel once. All front panel LEDs should go off. The module is now disabled and may be removed from the shelf in the usual manner. If the module is not removed, pressing the Dsbl switch once more resets the module. When the ACM is plugged in, it performs a reset.

Part Numbers

This section provides information to be used to procure replacement assemblies and pc boards. *Tables 2-22* and *2-23* break down assemblies into sub-assemblies that form the component.

Table 2-22 ACM/T1 Module (036M335-002)

Equipment Supplied	Designation	GDC Part No.
PCB Assembly, Base Card	—	036P332-001
PCB Assembly, Micro Piggyback	—	036P316-001
PCB Assembly, I/O Piggyback	—	036P310-001
PCB Assembly, ADPCM SMT Plug-In	—	036P333-001

Table 2-23 ACM/E1 (ITU-T) Module (036M335-001)

Equipment Supplied	Designation	GDC Part No.
PCB Assembly, Base Card	—	036P332-001
PCB Assembly, Micro Piggyback	—	036P316-001
PCB Assembly, I/O Piggyback	—	036P282-001
PCB Assembly, ADPCM SMT Plug-In	—	036P333-002

NOTE: IMPORTANT! A maximum of 12 ACMs (6 pairs) can be installed in the TMS-3000 main shelf regardless of the type of power supply used. Also, keep the ACM away from the end slots in the main shelf where there is minimal airflow.

ACM Option Selections

The ACM consists of four cards: the base card, one I/O plug-in card, a microprocessor plug-in card and an ADPCM SMT plug-in card. Available hardware options are located on the I/O plug-ins and base card. An Input/Output card is the interface between the ACM base card and the T1 line. It is a removable module so that different interfaces can be easily installed. The I/O Plug-in card allows for different interface parameters to be met.

The ACM connects to either of two DB-25 connectors on the backplane for link connections. The top connector is designated as "A", the bottom connector is designated as "B". The top connectors are the odd numbered J designations, the bottom connectors are even numbered.

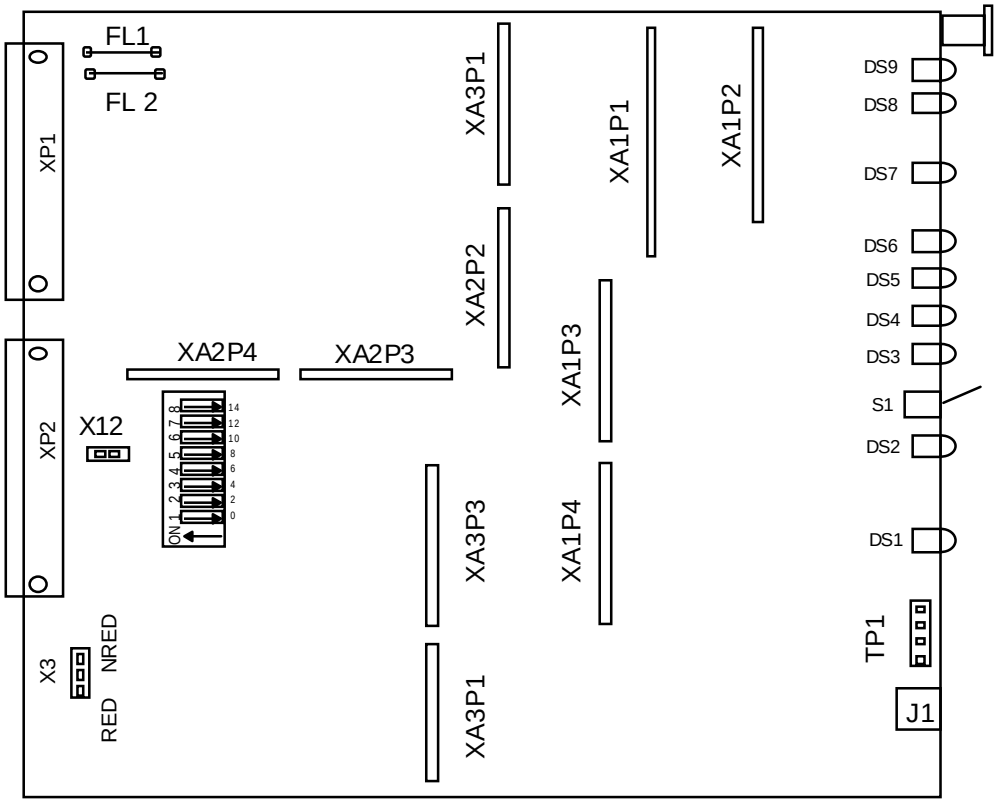
An ACM in Slot N, where N is odd, has its ports at DB-25 connector N+1. When the slot is even, the associated connector is N-1.

An ACM/E1 Module is used on the ITU-T network (2.048 Mbps). Refer to the CDA-E1 Module section to configure the ACM/E1 I/O card.

Configure most ACM options through the Controller software screens. *Refer to the Operation Manual for TMS-3000 Controller, GDC 036R603-Vnnn* for more information on ACM software options.

Jumper X3 is set on the base card for redundancy. Select the option for redundant or non-redundant operation on both ACM Modules. *Table 2-24* shows how to configure Jumper X3 on the ACM base card for redundant or non-redundant operation. *Figure 2-14* shows the location of Jumper X3. Switch S2 on the ACM base card sets the Fast Bus Timing. This switch is factory set and should not be adjusted.

Table 2-25 shows how to configure ACM (T1) I/O plug-in card DIP Switch S1. The location of S1 on the ACM (T1) I/O plug-in card is shown in *Figure 2-15.*



NOTE: Jumper X12 and Switch S2 are factory set. Do not change.

Figure 2-14 ACM Option Locations

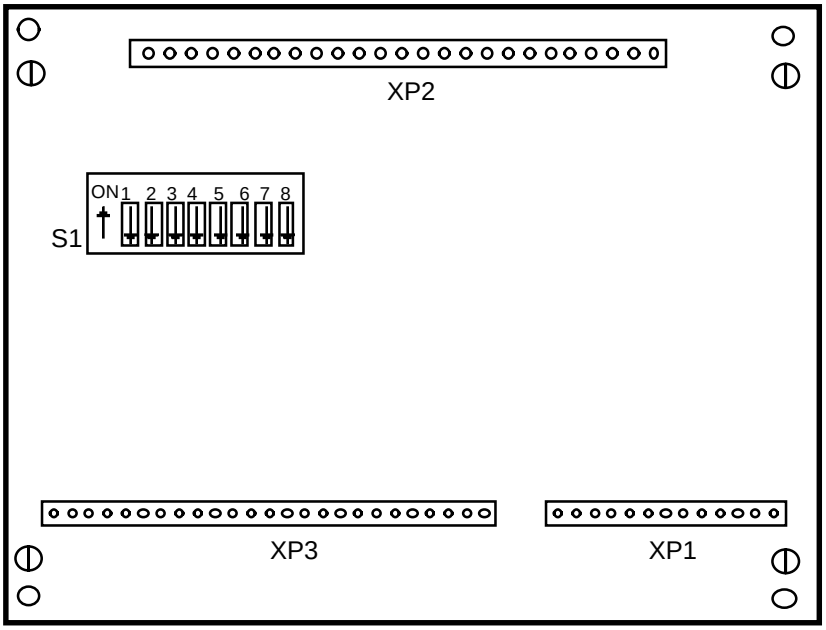


Figure 2-15 ACM/T1 I/O Plug-In Card, Option Locations

Table 2-24 ACM Option Selections

Feature	Selection	Switch (S), Jumpers (X)		Application
		Desig.	Position	
Redundant/ Non-Redundant ACM	Redundant	X3	RED	Proper system operation requires that the ACM knows whether it is redundant or not prior to program or configuration download. If using ACM as a redundant pair, set this jumper to RED. If using ACM as a non-redundant pair, set this jumper to NON-RED.
	Non-Redundant	X3	NON-RED	

Table 2-25 ACM/T1 I/O Plug-In Card Option Selections

Switch Number	Switch Position	Function	Application
S1-1 B8ZS/Dis	Off	Enables B8ZS line coding	Bit 8 Zero Suppression (B8ZS) is a technique designed to meet the spectral density specification. This technique creates an intentional double bipolar violation at the transmitting end when 8 consecutive zeros are detected. Bipolar return to zero is the modulation technique used in T1 which requires subsequent marks of polarity opposite to the previous marks. The bipolar violation is detected and removed at the receive end of the network.
	On	Disables B8ZS line coding	
S1-2 Bit 7/ Trans	Off	Bit 7 Substitution Enabled*	In B7 substitution, ones density is implied. This means that bit (7) for select DS0 frames is set to one. When B7 is enabled, bandwidth available for type subaggregates varies with each DS0 slot. Selecting "Trans'' bypasses this technique on the DS0 frame format.
	On	Transparent	
S1-3 ESF/D4	Off	Selects ESF Framing	Two methods of framing exist in a DS1 data stream. A D4 frame consists of twelve 193-bit frames called a Superframe. An ESF retains the structure of D4, but consists of twenty-four 193-bit frames instead of 12. ESF is known as Extended Superframe.
	On	Selects D4 Framing	
S1-5 (LEN2) S1-6 (LEN1) S1-7 (LEN2)	S1-5 S1-6 S1-7 On Off Off On On Off On Off On On Off Off Off On On Off On Off Off Off On Off Off Off On On On	Selects line length 0-220 ft. 220-440 ft. 440-655 ft. 0-133 ft. 266-399 ft. 399-533 ft. 533-655 ft. G.704, G.732 2.048 MHz (CEPT)	Clock and data extraction are improved by cable length transmit equalization. This feature allows line lengths of up to 655 feet to be used without the customary line build-out networks. With line transmit equalization, the pulse shape and amplitude at properly terminated receiving equipment conforms to AT&T standards. The line length selections support a three partition arrangement for MAT and ICOT, and a five partition arrangement for ABAM, PULP, and PIC cables. Configure S1-5, 6, 7 to the proper length and cable type.
*Bit 7 substitution is not used. Switch S1-2 should always be in the ON position. **NOTE:** S1-8 is not used and should remain in the OFF position.			

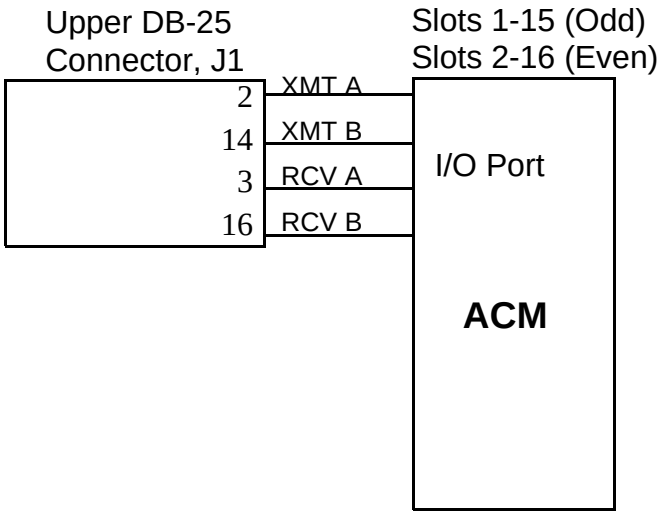
ACM Interface Cable Connections

The ACM has one Input/Output Card. This card contains two ports. Each port is dedicated to a backplane connector using a specific pinout arrangement. Since these ports are separate, they do not provide a diverse backup to each other.

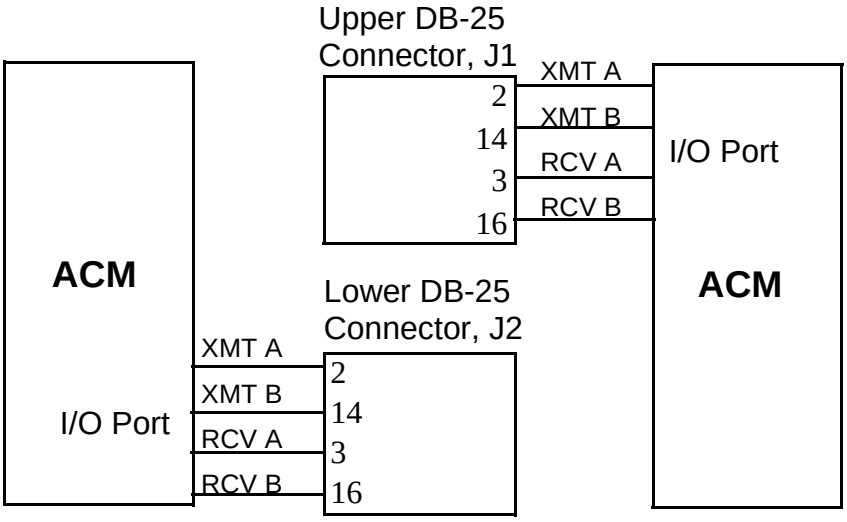
In a redundant situation, the ACM I/O ports are dedicated to one of the DB-25 connectors on the backplane. A redundant or non-redundant ACM in any slot has a standard aggregate pinout. *Refer to Table 2-10* to see the ACC connections.

The ACM aggregate pinout is: Pins 2 and 14 (Transmit Data) and Pins 3 and 16 (Receive Data). *GDC 027H201* provides a standard connection to T1 lines.

Figure 2-16 shows how the DB-25 aggregate pinout configuration appears for a pair of redundant ACMs. *Table 2-26* provides DB-25 aggregate pinout connectors for a pair of redundant ACMs.



A. ACMs configured as a redundant pair or one non-redundant ACM with adjacent slot empty



B. ACMs configured as a non-redundant ACM with the adjacent slot occupied

Figure 2-16 DB25 BP Connector for ACM Module

Table 2-26 ACM Aggregate Cable Connections

Configuration	*Connector	Pins	Y Cable	ACM Port
Redundant	Upper DB-25	2,14,3,16	Not Used	Even or Odd Slot Port A
Non-Redundant	Upper DB-25	2,14,3,16	Not Used	Even slot
	Lower DB-25	2,14,3,16	Not Used	Odd slot
*This connector is located on the backplane of the main shelf. If a Y-cable is used, connect P1 of the Y-cable to this connector.				

Channel Interface Card

This section covers Channel Interface ribbon cabling, module options and installation, and the use, installation, and cabling of Flex Cards.

Channel Interface Card to Expansion Shelf Ribbon Cabling

Refer to your Network Documentation Package for Ribbon Cabling installation instructions for your network. The plug-in locations for the Ribbon Cables on the Main Shelf Backplane and the Expansion Shelf Backplane are shown in *Figures 2-17 and 2-18*.

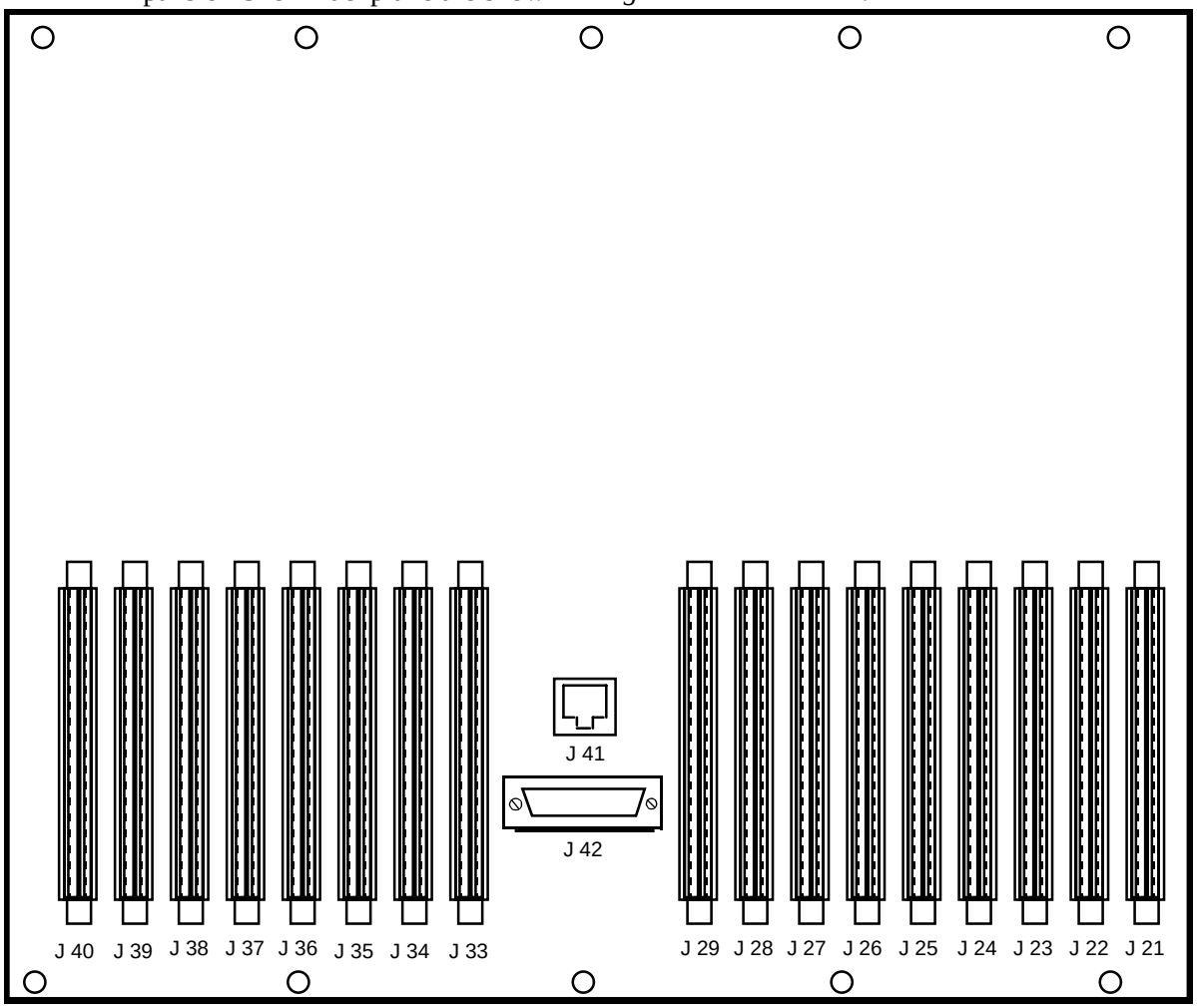


Figure 2-17 Main Shelf Backplane 50-Pin Ribbon Cable Connectors (Rear View)

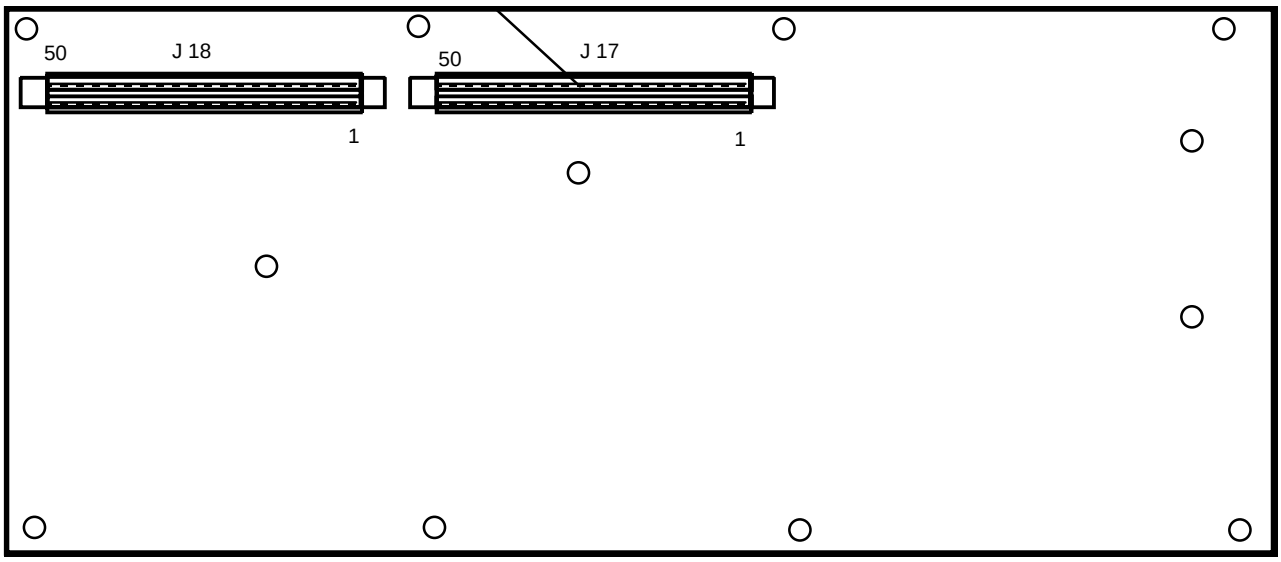


Figure 2-18 Expansion Shelf Backplane 50-Pin Ribbon Cable Connectors (Rear View)

Ribbon cables are extended from the 50-pin connectors for a CIC to each Expansion Shelf holding the channel modules that communicate through that CIC. Expansion shelves can be connected to the TMS-3000 using flex cards. Flex cards are described later in this section.

NOTE: All channels on an Expansion Shelf must communicate through the same CIC.

On the Main Shelf Backplane the 50-pin ribbon cable connectors are J21 through J29 and J33 through J40. On the Expansion Shelf Backplane the 50-pin ribbon cable connectors are J17 and J18.

NOTE: IMPORTANT! When connecting the ribbon cable to the Main Harness Backplane, pin 1 should be up. Pin 1 is identified by a colored tracer on one edge of the ribbon cabling.

The ribbon cable connectors are equipped with special latches that lock the cable into place. They are used to unseat rather than eject the cable. The cable must be removed by hand after it is unseated. Also, when inserting the cable, be sure to close the latches slightly before pushing the cable into locked position, otherwise the latches can be damaged.

The left eight ribbon cables on the Main Harness Backplane must be self-clipped to dress to the left and go through the guide. The right eight cables dress naturally to the right.

Two 50-pin ribbon cable connectors are associated with each pair of CICs (in a redundant system) or each single CIC (in a non-redundant system). In a non-redundant system, the CIC should be placed in the right-hand slot of a pair of slots; the left-hand slot must be left unoccupied. In a non-redundant system, you may not place an ACC in the slot not occupied by a redundant CIC. *Table 2-27* lists the association between each pair of TMS-3000 shelf slots and each pair of 50-pin ribbon connectors.

Table 2-27 TMS-3000 Shelf Channel Interface Ribbon Connectors and Associated Slot Numbers

TMS-3000 Shelf Slot Numbers	Associated Ribbon Connectors
1, 2	J21, J22
3, 4	J23, J24
5, 6	J25, J26
7, 8	J27, J28
9, 10	J33, J34
11, 12	J35, J36
13, 14	J37, J38
15, 16	J39, J40

Table 2-28 lists the Channel Interface Ribbon Cables. In *Table 2-28* the first 16 cables dress to the right for the connectors to the right of the center of the backplane. The second group of cables dress to the left for connectors to the left of the center of the backplane. *Figure 2-19* shows the correct cable numbers and cable configuration.

Table 2-28 CIC Expansion Ribbon Cabling

GDC Cable No.	Description
Cables Dressing to the Right* (Rear View)	
029H610-002	Main Harness to Expansion Shelf, length 2.5 ft
029H610-004	Cable 029H610-002 with 1.5-ft extension reaching an additional shelf
029H610-005	Cable 029H610-004 with 1.5-ft extension reaching an additional shelf
029H610-007	Cable 029H610-005 with 1.5-ft extension reaching an additional shelf
029H611-005	Main Harness to Expansion Shelf, length 5 ft
029H611-006	Cable 029H611-005 with 2.5-ft extension reaching an additional shelf
029H611-008	Cable 029H611-006 with 1.5-ft extension reaching an additional shelf
029H611-009	Cable 029H611-008 with 1.5-ft extension reaching an additional shelf
029H612-006	Main Harness to expansion Shelf, length 6.5 ft
029H612-008	Cable 029H611-006 with 1.5-ft extension reaching an additional shelf
029H612-009	Cable 029H612-008 with 1.5-ft extension reaching an additional shelf
029H612-011	Cable 029H612-009 with 1.5-ft extension reaching an additional shelf
029H613-009	Main Harness to Expansion Shelf, length 9 ft
029H613-010	Cable 029H613-009 with 1.5-ft extension reaching an additional shelf
029H613-011	Cable 029H613-010 with 1.5-ft extension reaching an additional shelf
029H613-013	Cable 029H613-011 with 1.5-ft extension reaching an additional shelf
Cables Dressing to the Left* (Rear View)	
029H614-002	Main Harness to Expansion Shelf, length 2.5 ft
029H614-004	Cable 029H614-002 with 1.5-ft extension reaching an additional shelf
029H614-005	Cable 029H614-004 with 1.5-ft extension reaching an additional shelf
029H614-007	Cable 029H614-005 with 1.5-ft extension reaching an additional shelf
029H615-005	Main Harness to Expansion Shelf, length 5 ft
029H615-006	Cable 029H615-005 with 1.5-ft extension reaching an additional shelf
029H615-008	Cable 029H615-006 with 1.5-ft extension reaching an additional shelf
029H615-009	Cable 029H615-008 with 1.5-ft extension reaching an additional shelf
029H616-006	Main Harness to Expansion Shelf, length 6.5 ft
029H616-008	Cable 029H616-006 with 1.5-ft extension reaching an additional shelf
029H616-009	Cable 029H616-008 with 1.5-ft extension reaching an additional shelf
029H616-011	Cable 029H616-009 with 1.5-ft extension reaching an additional shelf
029H617-009	Main Harness to Expansion Shelf, length 9 ft
029H617-010	Cable 029H617-009 with 1.5-ft extension reaching an additional shelf
029H617-011	Cable 029H617-010 with 1.5-ft extension reaching an additional shelf
029H617-013	Cable 029H617-011 with 1.5-ft extension reaching an additional shelf
*Be sure to connect each ribbon cable so that the colored tracer on the edge of the ribbon is up.	

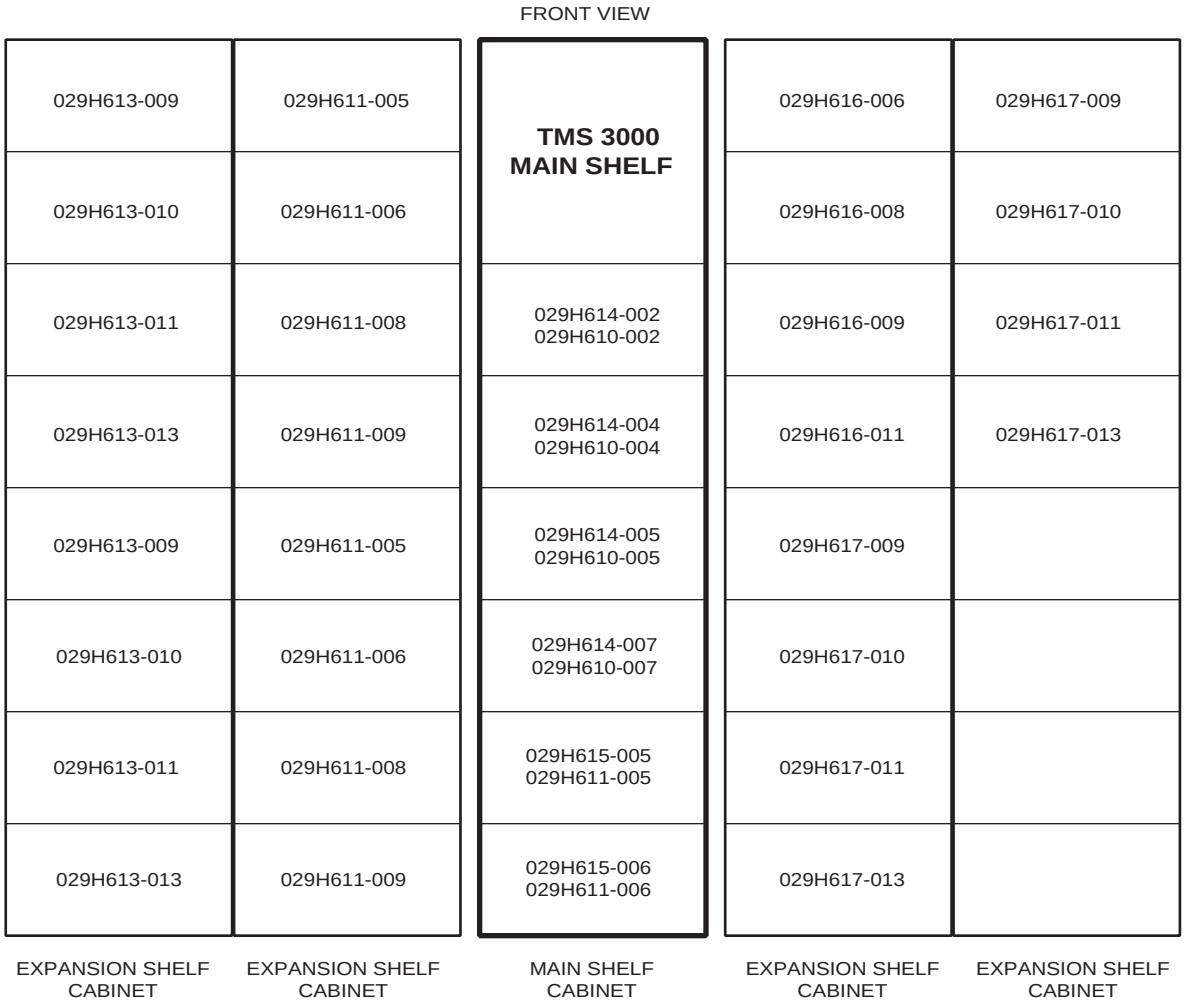


Figure 2-19 TMS-3000 Ribbon Cable Configuration

The above diagram is a front view of five cabinets. The center cabinet or “main shelf” cabinet houses the common cards. The other four are independent cabinets.

To connect the expansion shelves in the main cabinet:

Find the expansion shelf in the diagram that corresponds to the one that you are installing. The two numbers in the box are GDC cable numbers. These are the cables that can reach from the main shelf to that expansion shelf. Use the top number if the CIC you are connecting is on the right side of the main shelf (as viewed from the front). Use the bottom number if the CIC you are connecting is on the left side of the main shelf.

To connect the expansion shelves in an independent cabinet:

From the front of the cabinets finds the cabinet and expansion shelf that corresponds to the one you are installing. The number in the box is the GDC cable that you need. The position of the CIC on the main shelf does not matter when installing ribbon cables. Be sure to observe right and left position in relation to the main shelf cabinet.

Channel Interface Card Options

There is only one option on the CIC. It should be left in the NORM position. It is described in *Table 2-29* and its location is shown in *Figure 2-20*.

Table 2-29 CIC Options

Feature	Selection	Switch (S), Jumpers (X)		Application
		Desig.	Position	
Watchdog	Watchdog	X1	NORM	This selection is for in-house testing only. It should be left in the NORM position.
Inhibit	Inhibit Watchdog	X1	INHBT WDOG	
Frame Switching (for frame required software changes). See note below.		S1-7 S1-8	don't care Factory set*	CIC cannot switch at end of frame.
		S1-7 S1-8	Off Factory set*	CIC can switch at end of frame, but this capability has been disabled.
		S1-7 S1-8	On Factory set*	CIC can switch at end of frame.
—	—	S1, 1-6	—	These switches are reserved for future use. Leave all switches in the OFF position.
Note: S1-7 should be On if using GTS V2.2.0 or later, Off if using an earlier version. * For -2 version cards, the factory setting is Off. For -3 version cards, the factory setting is On.				

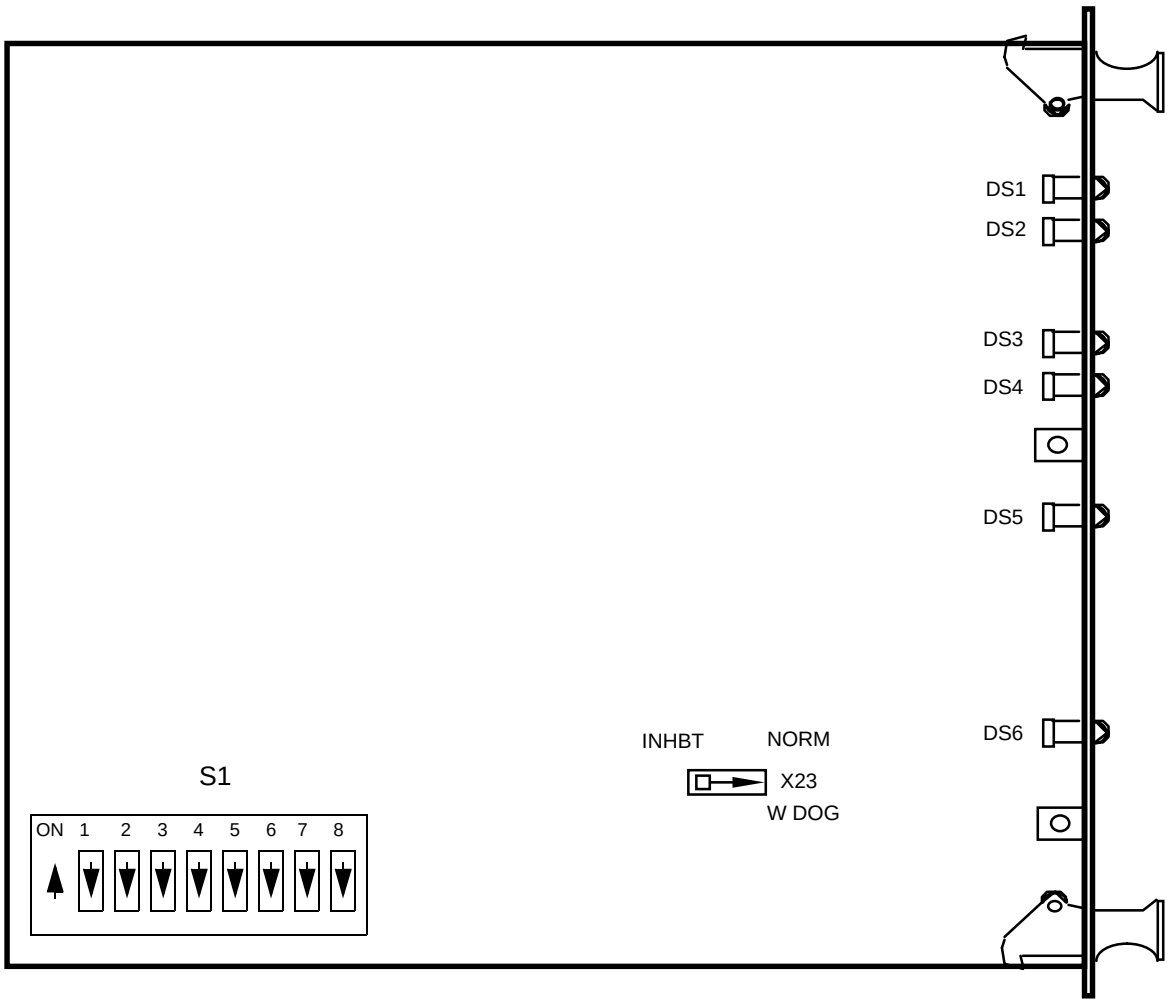


Figure 2-20 Channel Interface Card Option Location

The CIC (*GDC 036P304-002, -003*) assembly contains a factory adjustment Switch S2 that is used only for production testing. Use of the S2 may cause erroneous data transfers or complete node failure.

NOTE: IMPORTANT! Switch S2 should never be changed in the field. It controls a critical factory adjustment option which is set only when the PCB assembly is installed in a specialized test fixture at the factory. The purpose of Switch S2 is to fine tune the turn-on and turn-off times of the fast bus circuit. Improper adjustment of this switch can cause erroneous data transfers between common cards and possible node failure.

Channel Module Installation

All Data and Voice Channel Modules are installed in Expansion Shelves. Channel connections are made to 25-pin channel connectors J1 through J16 at the rear of the expansion shelf. *Refer to the Network Documentation Package* supplied with your system to determine the placement of each channel module in the Expansion Shelf.

Expansion Module

The Expansion Module has one option that selects which shelf the Expansion Module is on. Since each CIC can interface four shelves of channels, there are four selections. These are described in *Table 2-30*. The location of this option is shown in *Figure 2-21*.

Table 2-30 Expansion Module Options

Feature	Selection	Switch (S), Jumpers (X)		Application
		Desig.	Position	
Shelf Selection	EXP1	X1	EXP1	EXP1 is selected if the Expansion Module being addressed contains the first 16 channels interfaced by the CIC.
	EXP2	X1	EXP2	EXP2 is selected if the Expansion Module being addressed contains the 17th through 32nd channel interfaced by the CIC.
	EXP3	X1	EXP3	EXP3 is selected if the Expansion Module being addressed contains the 33rd through 48th channel interfaced by the CIC.
	EXP4	X1	EXP4	EXP4 is selected if the Expansion Module being addressed contains the 49th through 64th channel interfaced by the CIC.

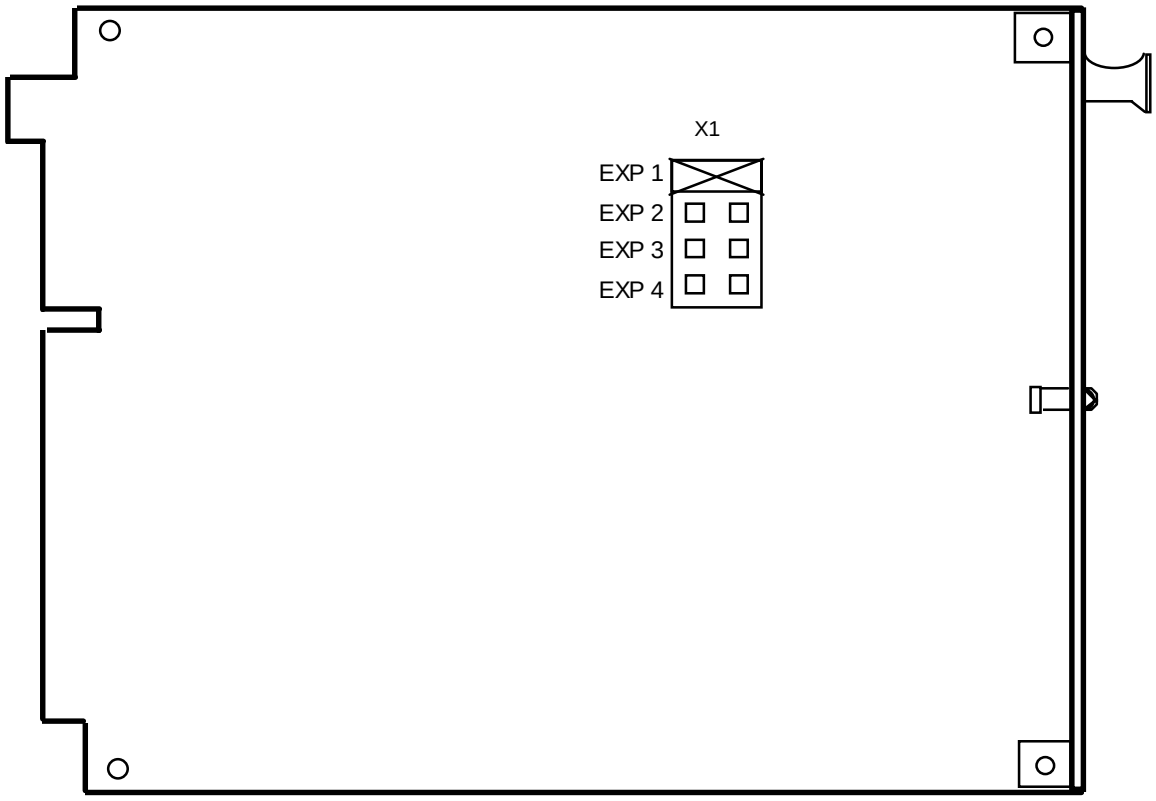


Figure 2-21 Expansion Module Option Locations

All channel modules at a TMS-3000 node reside in Expansion Shelves. A single Expansion Shelf holds up to 16 channel modules. An Expansion Module is required in each Expansion Shelf (two required for redundant operation). *See Figure 2-22.*

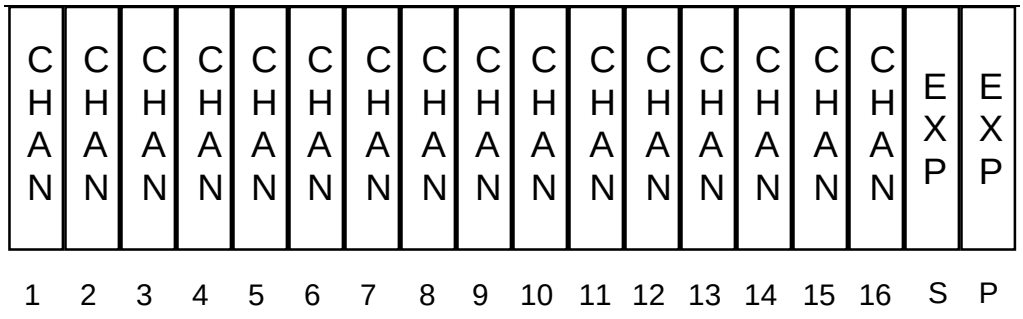


Figure 2-22 TMS-3000 Expansion Shelf

Flex Cards

A Flex Card is an actual pc board that replaces the ribbon cable assemblies previously used. *Figure 2-23* shows a typical Flex Card and how it is used to connect two expansion shelves. The Flex Cards mount between each expansion shelf. Two Flex Cards mount on the left side of each expansion shelf as viewed from the rear. The Flex Cards come in several different lengths to accommodate the number of shelves being connected. Each card has several 50-pin female connectors that provide electrical connections between each expansion shelf and a 50-pin male connector used to connect the Flex Card to a ribbon cable that goes to the main shelf assembly. Several ferrite beads are mounted on one card to reduce the amount of reflection interference from the last shelf to the first. Cutout slots on each card allow quick access to the EIA business equipment connectors. A redesigned rear cover mounts onto each expansion shelf to cover the flex cards and reduce radiated noise.

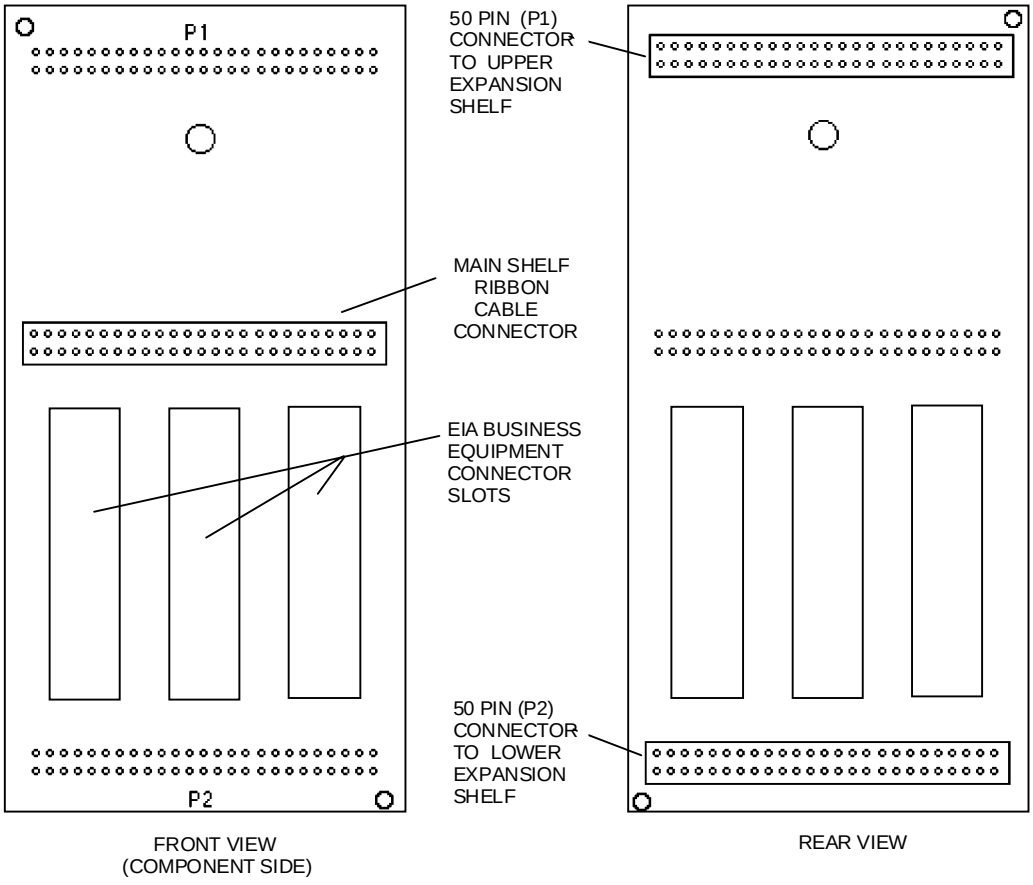


Figure 2-23 Flex Card Front and Rear View (036P091-001)

NOTE: To install flex cards, the expansion shelf must be Revision F or later. A kit is available that allows modification of older expansion shelves.

Flex Card Installation

A maximum of four expansion shelves can be connected to the TMS-3000 main shelf using Flex Card assemblies. *Refer to Figure 2-24* to determine the Flex Card assembly number needed for the application. In this drawing note that each area has four shaded portions corresponding to four expansion shelves. The middle column labeled "Main Shelf Cabinet" shows the following:

- When connecting between the main shelf and two expansion shelves, use Flex Card assemblies *GDC Part Nos. 036P090-001 and 036P091-001*.
- When connecting between the main shelf and three expansion shelves, use Flex Card assemblies *GDC Part Nos. 036P092-001 and 036P093-001*.
- When connecting between the main shelf and four expansion shelves, use Flex Card assemblies *GDC Part Nos. 036P094-001 and 036P095-001*.

The Flex Card assemblies mount where the ribbon cables were previously attached between expansion shelves. The lengths and number of connectors on each card are different to accommodate the number of expansion shelves configured for each channel group.

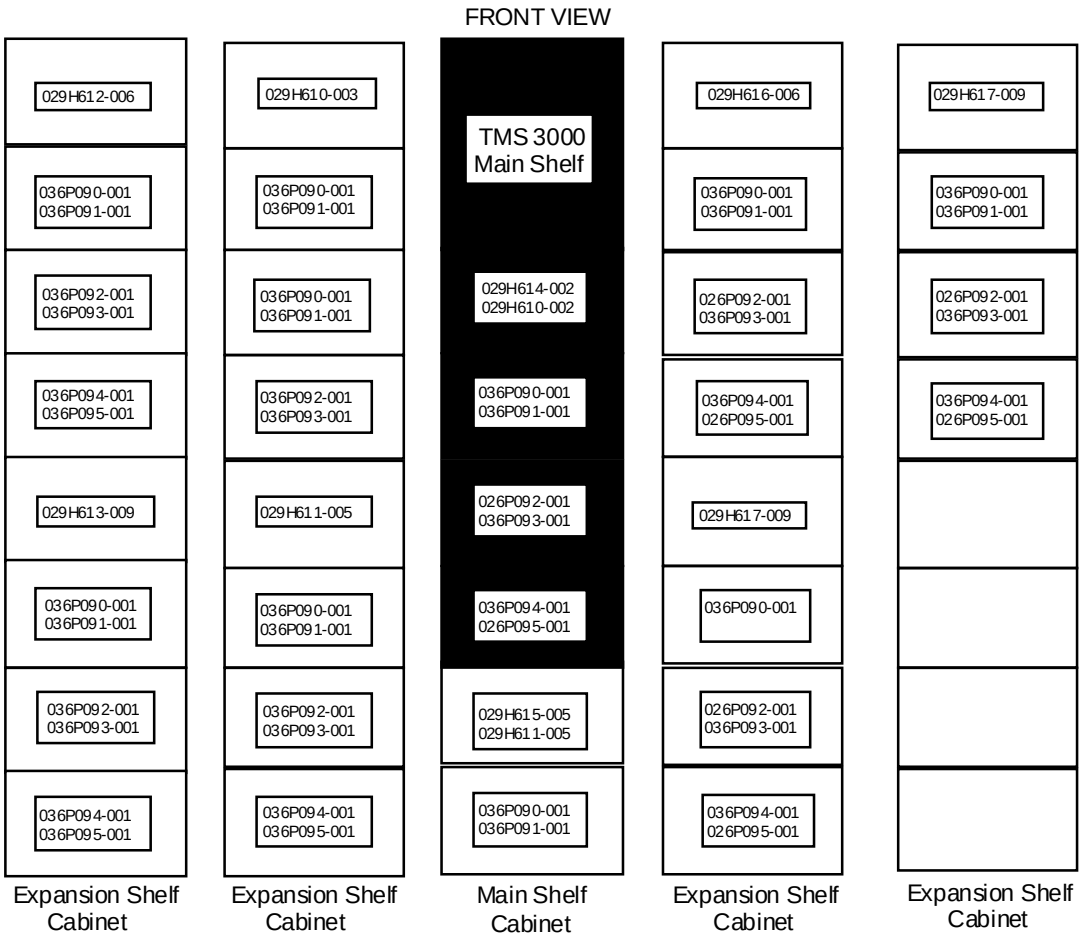
Figure 2-24 shows two Flex Cards mounted in a TMS-3000 with three expansion shelves.

NOTE: IMPORTANT! Turn the power off in the TMS-3000 when installing the Flex Card.

To install the Flex Card assembly in the main shelf cabinet, first determine the length of ribbon cable needed to run from the main shelf to the first expansion shelf. *Figure 2-24* lists two cable numbers on the first expansion shelf under the main shelf. These cables are 2.5 feet long. Longer lengths are available if required (*refer to Table 2-31)*.

Next, loosen all the expansion shelves in the cabinet, so that the shelves move freely.

Now, determine the length of the Flex Card needed using *Figures 2-24 and 2-25*. The top number is the assembly that mounts to the left-hand side; the bottom number is the assembly that mounts on the right-hand side.



The above diagram is a front view of five TMS-3000 cabinets. The center cabinet or “main shelf” cabinet houses the common cards. The other four are independent expansion shelf cabinets.

To connect expansion shelves in the main cabinet:

Find the expansion shelf in the diagram that corresponds to the one that you are installing. The two numbers in the top box are GDC cable numbers. Appropriate pairs of flat ribbon cables are still required to connect the main shelf to the first expansion shelf. The numbers below the first expansion shelf are the flex card part numbers. When connecting two shelves, use GDC 036P090-001 and 036P091-001. When connecting three expansion shelves, use GDC 036P092-001 and 036P093-001. When connecting four expansion shelves, use GDC 036P094-001 and 036P095-001.

To connect expansion shelves in an independent cabinet:

From the front of the cabinets, find the cabinet and expansion shelf that corresponds to the one you are installing. A flat ribbon cable is required to connect the first expansion shelf to the main shelf. The number below the first expansion shelf is the GDC flex card you need.

Figure 2-24 TMS-3000 Flex Card Configuration

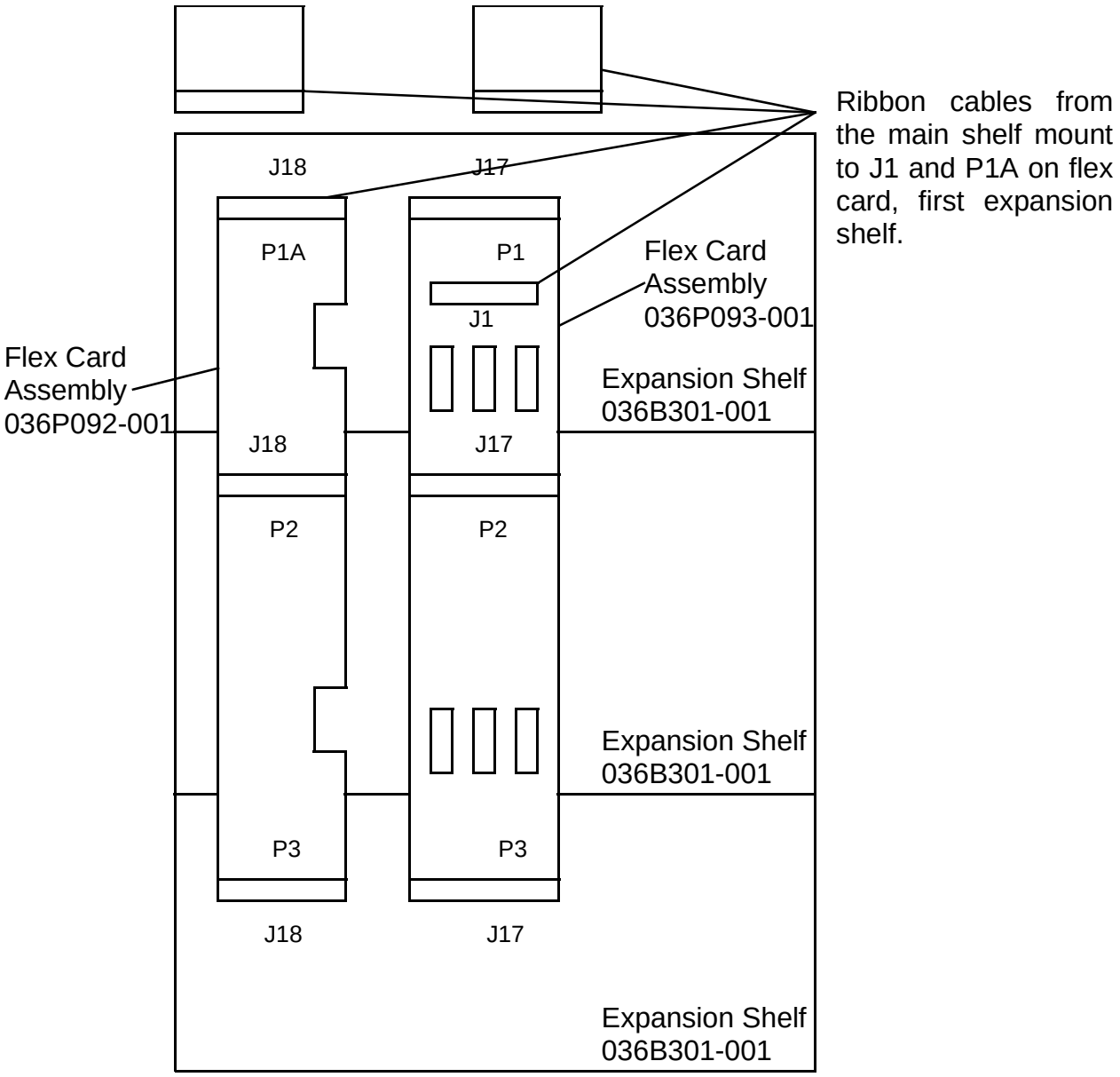


Figure 2-25 Flex Cards Connecting Three TMS-3000 Expansion Shelves

Connect the proper Flex Card assembly to each expansion module connector. If connecting two shelves, the lower female connector should line up with the second expansion shelf. Line up all pins and carefully insert each connector into each expansion shelf. Once the Flex Cards are properly seated, insert the guide pins* between the card and the expansion shelf. The ribbon cables from the main shelf plug into J1 and P1A of the Flex Card Assemblies. Finally, tighten the shelf mounting screws.

* Guide pins not required if using updated TMS-3000 expansion shelf.

NOTE: It is not necessary to install the Cable Filter Plug-In Cards between the expansion shelf and CIC assembly.

Connecting Flex Cards in an Independent Cabinet

When connecting expansion shelves in an independent cabinet, you must use a ribbon cable to connect the first or top expansion shelf to the TMS-3000 main shelf. Referring to the expansion shelf cabinet in *Figure 2-24*, two ribbon cables connect from the main shelf to the first expansion shelf of the Flex Cards. The numbers that follow below each successive expansion shelf show the flex card numbers necessary to attach additional shelves.

Table 2-31 Channel Interface Module Expansion Ribbon Cabling For TMS-3000 Using Flex Card Assemblies

GDC Cable No.	Description
Cables Dressing to the Right* (Rear View)	
029H610-002	Main Harness to Expansion Shelf, length 25 ft.
029H611-005	Main Harness to Expansion Shelf, length 5 ft.
029H612-006	Main Harness to Expansion Shelf, length 6.5 ft.
029H613-009	Main Harness to Expansion Shelf, length 59 ft.
Cables Dressing to the Left* (Rear View)	
029H614-002	Main Harness to Expansion Shelf, length 2.5 ft.
029H615-005	Main Harness to Expansion Shelf, length 5 ft.
029H616-006	Main Harness to Expansion Shelf, length 6.5 ft.
029H617-009	Main Harness to Expansion Shelf, length 9 ft.
*Be sure to connect each ribbon cable so that the colored tracer on the edge of the ribbon is up.	

Other Cards

Other technical manuals contain detailed information on some of the common cards. Refer to *the Preface. For OCM common cards refer to GDC 036R340-000 and its associated addendas.*

3 Channel Card Installation

Overview

The following sections describe the methods of option selection and the options provided for each TMS-3000 channel card. Detailed information concerning specific positioning of option selection devices is given in a number of tables in this chapter. Individual option tables for each module have been grouped with the drawings concerning that module. As with the common cards, optional configurations are implemented on a channel card by means of program plugs, switches, jumper plugs, or resistor networks.

Note that several channel modules are covered in separate publications. *Refer to the Preface for a complete list of those manuals.*

Data Channel Modules

Data Channel Module interface connections, options, and the TID-III module are presented in the following paragraphs, figures, and tables.

Part Numbers

Connections for data channels vary according to the type of interface required for that channel (i.e., EIA/TIA-232-E, RS-422, RS-423, V.35, etc.). *Table 3-1 through Table 3-18 lists the assembly part numbers for the different interfaces. Table 3-19 lists the cables provided for each interface type.*

Table 3-1 Data II Channel Module with EIA/TIA-232-E Interface (036M048-001)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMT, EIA/TIA-232-E	—	036M047-001
Data II Channel PC Assembly	—	036P236-001

Table 3-2 Data II Channel Module with RS-422 Interface (036M048-002)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMT, RS-422	—	036M047-002
Data II Channel PC Assembly	—	036P236-001

Table 3-3 Data II Channel Module with RS-423 Interface (036M048-003)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMT, RS-423	—	036M047-003
Data II Channel PC Assembly	—	036P236-001

Table 3-4 Data II Channel Module with V.35 Interface (036M048-004)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMT, V.35	—	036M047-004
Data II Channel PC Assembly	—	036P236-001

Table 3-5 Data III Channel Module with EIA/TIA-232-E Interface (036M058-001)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMTR, EIA/TIA-232-E	—	036M047-001
Data III Channel PCB Assembly	—	036P236-004

Table 3-6 Data III Channel Module with RS-422 Interface (036M058-002)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMTR, RS-422	—	036M047-002
Data III Channel PCB Assembly	—	036P236-004

Table 3-7 Data III Channel Module with RS-423 Interface (036M058-003)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMTR, RS-423	—	036M047-003
Data III Channel PCB Assembly	—	036P236-004

Table 3-8 Data III Channel Module with V.35 Interface (036M058-004)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMTR, V.35	—	036M047-004
Data III Channel PCB Assembly	—	036P236-004

Table 3-9 Data IV Channel Module with EIA/TIA-232-E Interface (036M079-001)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMT, EIA/TIA-232-E	—	036M047-001
Data IV Channel, PCB Assembly	—	036P236-007

Table 3-10 Data IV Channel Module with RS-422 Interface (036M079-002)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMT, RS-422	—	036M047-002
Data IV Channel, PCB Assembly	—	036P236-007

Table 3-11 Data IV Channel Module with RS-423 Interface (036M079-003)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMT, RS-423	—	036M047-003
Data IV Channel, PCB Assembly	—	036P236-007

Table 3-12 Data IV Channel Module with V.35 Interface (036M079-004)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMT, EIA/TIA-232-E	—	036M047-004
Data IV Channel PCB Assembly	—	036P236-007

Table 3-13 UDC Module with EIA/TIA-232-E Interface (036M078-001)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMT, EIA/TIA-232-E	—	036M047-001
Data IV Channel, PCB Assembly	—	036P236-007

Table 3-14 UDC Module with RS-422 Interface (036M078-002)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMT, RS-422	—	036M047-002
Data IV Channel, PCB Assembly	—	036P236-007

Table 3-15 UDC Module with RS-423 Interface (036M078-003)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMT, RS-423	—	036M047-003
Data IV Channel, PCB Assembly	—	036P236-007

Table 3-16 UDC Module with V.35 Interface (036M078-004)

Equipment Supplied	Designation	GDC Part No.
Interface Set, RCV/XMT, EIA/TIA-232-E	—	036M047-004
Data IV Channel PCB Assembly	—	036P236-007

Table 3-17 UDC Module with X.21 (X.27) Interface (036M078-007)

Equipment Supplied	Designation	GDC Part No.
Interface Set, XMT/RCV-422	—	036M047-002
Data Sync Channel PCB Assembly	—	036P236-010
Conn. Program Plug	—	209-014-116

Table 3-18 TID-III Data Channel (18607-201)

Equipment Supplied	Designation	GDC Part No.
TID-III	TID-III	18607-201
Transmitter Card	TX	18601-201
Receiver Card	RX	18602-200
NCO Card	NCO	18603-200

Table 3-19 Data Channel Interface Cables

GDC Cable No.	Description	Application
028H502	EIA/TIA-232-E	Used for all standard EIA/TIA-232-E applications. Available in 5-, 15-, 25-, 50-foot lengths.
027H408	RS-422/423 Cascade	Used to cascade RS-422/423 channel to aggregate interface of another TMS-3000 or TDM for mux to submux application. Available in 5-, 15-, 25-, 100-, 250-, or 500-foot lengths.
027H511	EIA/TIA-232-E to RS-422-423 adapter	Used when RS-422/423 interface is required, but with EIA/TIA-232-E controls only. Cable is one foot long.
027H407	RS-422/423 Tandem ITU-T G.703	Used for back-to-back RS-422/423 or ITU-T G.703 channels (where channels of two tandem TDMs or TMSs are directly connected). Available in 5-, 15-, 25-, or 50-foot lengths.
027H513	ITU-T V.35 to DB-25 cable (Male-Male)	Used for ITU-T V.35 channels. Available in 15-, 25-, or 50-foot lengths.
027H514	ITU-T V.35 to DB-25 adapter	Used for ITU-T V.35 channels, when V.35 cable is customer-supplied. Available in 1-foot length..
028H311	EIA/TIA-232-E	Crossover Cable — used to connect EIA/TIA-232-E channel to a modem.
027H410	ITU-T V.35	Crossover Cable — used to connect V.35 channel to business equipment connector on DS-1 Shelf.
027H518	RS-422	Crossover Cable — used to connect an RS-422 channel to business equipment connector on DS-1 Shelf.
027H521	ITU-T V.35	Crossover Cable — used to connect V.35 channel to a modem. Connects to 027H514 adapter.
028H415	V.54 unbalanced	Used for V.54 modem application with 54M8 interface.
G023H004	V.28 (M-M)	Used for data sync channel. Male-to-male connector.
G023H010	1-19 Way D (M-M)	1-19 Way D-cable. Male-to-male connector.
G023H019	V.28 Sync (M-M	V.28 Sync Channel Crossover Cable. Male-to-male connector
G024H015	Data II, V.35-DTE	Data Channel II, V.35 DTE applications. Male-to-male connector.
G024H016	Data II, V.35-DTE	Data Channel II, V.35 DTE applications. Male-to-female connector.

Interface Options

Option selections required to support each interface type are discussed in *Table 3-20 and Table 3-21*. The following interfaces may be selected (not applicable to G.703 channel card):

- EIA/TIA-232-E/ITU-T V.28
- MIL-STD-188C
- RS-423/MIL-STD-188-114 Unbalanced
- RS-422/MIL-STD-188-114 Balanced (no cable termination)
- RS-422/MIL-STD-188-114 Balanced (Transmit Data and Clock cable termination)
- V.35 Balanced Double Current

A DCE interface may be selected for connection to data terminal equipment; a DTE interface may be chosen for connection to data communication equipment. *Table 3-21* describes the selections.

Table 3-20 Data Channel Interface Options

Interface Selection	S1-1 Pos.	S1-2 Pos.	S1-3 Pos.	X21 Pos.	XRN7 (XMT) Resistor Network	XRN8 (RCV) Resistor Network	Application
EIA/TIA-232-E MIL-STD-188-114, V.28	NORM	OPEN	OPEN	NORM	RS-232 XMT 331-001-006	RS-232 RCV 331-002-006	The channel interface operates according to the interfaces shown in the table. To select an interface, you must set Switches S1-1 through S1-4 and Jumper X21 in the positions shown.
MIL-STD-188C	188	OPEN	OPEN	NORM	RS-232 XMT 331-001-006	RS-232 RCV 331-002-006	S1-1 selects either a MIL- STD-188C or a normal interface.
EIA-RS-423/ MIL-STD 188-114 Unbalanced	NORM	OPEN	OPEN	NORM	RS-423 XMT 331-001-005	RS-423 RCV 331-002-004	S1-2 and S1-3 select 100-ohm cable termination for Transmit Data and Transmit External Timing signals respectively, in an RS-422 interface arrangement.
EIA-RS-422/MIL-STD-188-114 Balanced (No cable termination)	NORM	OPEN	OPEN	422	RS-422 XMT 331-001-004	RS-422 RCV 331-002-005	The RS-422 arrangement is used with or without cable termination, as required by data equipment connected to the channel. Selection of termination provides increased noise immunity.
EIA-RS-422/ MIL-STD-188-114 Balanced (With cable termination)	NORM	422/ TER	422/ TER	422	RS-422 XMT 331-001-004	RS-422 RCV 331-001-005	Only one device can connect to the terminated interface. Up to ten devices can connect to the unterminated interface. Jumper plug X21 selects the RS-422 interface, with or without cable termination.
V.35 Balanced Double Current	NORM	OPEN	OPEN	NORM	Dual V.35 XMT 331-002-002	Dual V.35 RCV 331-002-003	For each interface, resistor networks RN7 and RN8 provide voltage levels required by the associated interface standard. (Switches and jumpers must be set as shown for each interface).

Table 3-21 Data Channel DCE/DTE Interface Option Selection

Feature	S1-4 Position	PP1 Position	Application
DCE (Data Communication Equipment) Interface	DCE	DCE	The Data Channel module communicates with data terminal equipment (CRTs, printers, CPU ports, etc.) by presenting a DCE interface; the module communicates with data communications equipment (modems, multiplexers, etc.) by presenting a DTE interface. Switch S1-4 selects the DCE or DTE interface. Program plug PP1 must also be positioned to select the proper signal interfacing. DTE and DCE markings are visible on opposite sides of program plug socket XPP1. When PP1 is positioned so that a notch (or pin 1) on the plug points to DTE, the DTE interface is selected. When PP1 is positioned so that the notch (or pin 1) points to DCE, the DCE interface is selected.
DTE (Data Terminal Equipment) Interface	DTE	DTE	In the DCE position PP1 passes data, timing and control signals straight through between equipment connected to the channel and circuitry on the Data Channel module. In the DTE position, signals are "crossed over'' to permit the proper communication between the module and data communication equipment connected to the channel. The crossovers are as follows: XMT DATA to RCV DATA RCV DATA to XMT DATA CA (Request to send) to CF (Carrier Detect) CF to CA RCV TMG (Receive Timing) to EXT TMG (External Timing) EXT TMG to RCV TMG RDY IN (Ready In) to RDY OUT (Ready Out) RDY OUT to RDY IN **NOTE:** If the system uses an EIA/TIA-232-E or RS-423 interface, and a synchronous modem is connected to a data channel interface, select the DTE positions for S1-4 and PP1. Also, disconnect the lead connected to pin 15 of the data channel connector. If the system uses a balanced RS-422 or V.35 interface, and a synchronous modem is connected to a Data channel interface, select the DCE positions for S1-4 and PP1. Additionally, a crossover cable must be used to complete the interface connections to the modem. The crossover cable serves to cross the data, timing, and control signals for compatibility with the synchronous modem pins, thereby eliminating potential timing problems.

NOTE: For the Data Channel Module, DTE/DCE component board designations are usually the opposite of the equipment to which the channel is connected. If you are connecting data terminal equipment (CRTs, printers, etc.) to the channel (with a straight through cable), place switches and program plugs in the DCE position. If you are connecting data communication equipment (modems, multiplexers, etc.) to the channel, place switches and program plugs in the DTE position.

When RS-422 or RS-423 is selected for a channel, the Data Channel module supplies only the data and timing signals at RS-422 or RS-423 specified voltage levels. The control signals operate at EIA/TIA-232-E levels. If your channel application requires RS-422 or RS-423 level control signals, you need an external Channel Interface Adapter. Option selections for the Channel Interface Adapter are described in *Table 3-22.*

Table 3-22 EIA RS-422/423 Channel Interface Adapter Option Selection

Feature	Selection	Switch(S)/Jumper(X)		Application
		Desig.	Position	
Data Communication Equipment (DCE) or Data Terminal Equipment (DTE) Connections	Adapter Connected to Data Communication Equipment	S1-1 S1-2	DCE DCE	When this adapter is connected to data communication equipment (modems, multiplexers, etc.) Switches S1-1 and S1-2 must be set in the DCE position. When the adapter is connected to data terminal equipment (CRTs, printers, CPUs, etc.) Switches S1-1 and S1-2 are set in DTE position. **NOTE:** *These designations are the reverse of the DTE and DCE designations for the Data II Channel module.* Program plug PP1 must also be positioned for DTE or DCE. This is done by positioning the plug so that the notch in the plug is adjacent to the DTE or DCE silkscreen markings on the card. The Data Channel module must be set for a DTE interface.
	Adapter Connected to Data Terminal Equipment	S1-1 S1-2	DTE DTE	
EIA-RS-422 or EIA-RS-423 Interface	RS-422	S1-3 S1-4 X1	422 422 422	To select an EIA RS-422 standard balanced interface, set S1-3, S1-4 and X1 in the 422 position. To select an EIA RS-423 standard unbalanced interface, set S1-3, S1-4, and X1 in the 423 position. Program plug PP2 in the adapter card must also be positioned for an RS-422 or 423 interface. This is done by positioning the plug so that the notch on the plug is adjacent to the 422 or 423 silkscreen markings on the card. The Data Channel module must also be set for an RS-422 or RS-423 interface.
	RS-423	S1-3 S1-4 X1	423 423 423	

NOTE: The following interface sets (Table 3-23 to Table 3-26) are available to change the interface type as required on existing Data II, Data III, Data IV, UDC and G.703 modules.

Table 3-23 Interface Set, RCV/XMT EIA/TIA-232-E (036M047-001)

Equipment Supplied	Designation	GDC Part No.
Resistor Network	RN8	331-002-006
Resistor Network	RN7	331-001-006
Resistor Network	—	036C010-001

Table 3-24 Interface Set, RCV/XMT RS-422 (036M047-002)

Equipment Supplied	Designation	GDC Part No.
Resistor Network	RN7	331-001-004
Resistor Network	RN8	331-002-005

Table 3-25 Interface Set, RCV/XMT RS-423 (036M047-003)

Equipment Supplied	Designation	GDC Part No.
Resistor Network	RN7	331-001-005
Resistor Network	RN8	331-002-004

Table 3-26 Interface Set, RCV/XMT V.35 (036M047-004)

Equipment Supplied	Designation	GDC Part No.
Resistor Network	RN7	331-002-002
Resistor Network	RN8	331-002-003

Digital Line Driver Adapter

A digital line driver adapter is available for applications where a channel device is separated from the TMS-3000 by some distance. All adapters mount in a CP-12 mounting panel and are connected to the back of the TMS-3000 shelf. The Data Channel uses a 16-bit transmit and receive buffer.

Data Channel Module Options

The following options may be selected for the Data Channel module (*Figure 3-1).* (*Refer to Chapter 7, Connector Pin Assignments*, for Channel Connector Pin assignments).

NOTE: Data IV and UDC channel modules contain several features that are available in later releases of TMS-3000 software.

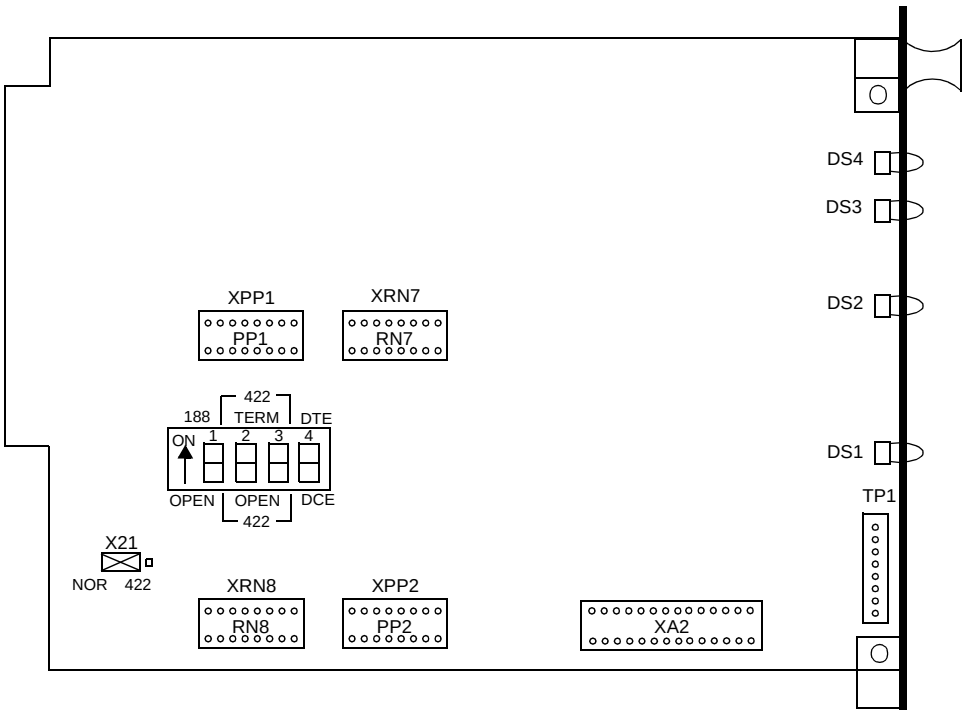


Figure 3-1 Data Channel Module Option Locations (GDC 036P236-007)

For the G.703 channel (*Figure 3-2*), there are two option jumpers. X1 is OCTETALM, which allows bipolar violations to be discontinued when the receive level signal is dropped. X2 is CHSNCLK, which allows enabling of an external clock for system phase locking. Both options are shown in their normal (option disabled) position.

Figure 3-3 shows the option and program plug locations for the Data Sync Channel and *Figure 3-4* shows the option and program plug locations for the UDC, X.21.

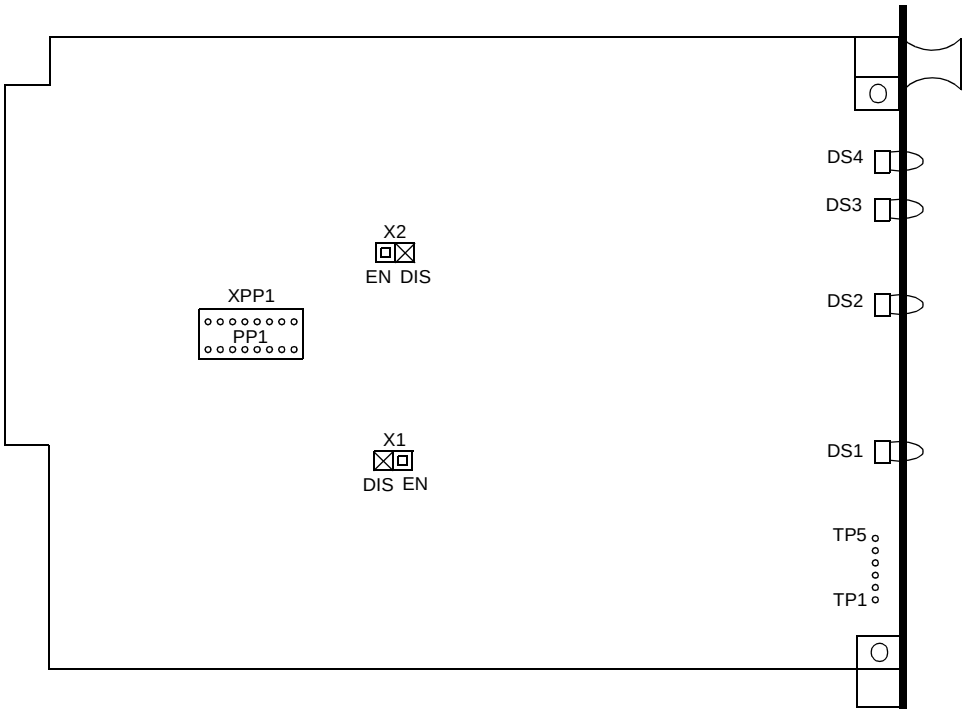


Figure 3-2 Data Channel Module Option Locations (G.703 Data Channel Card, GDC 036P243-001)

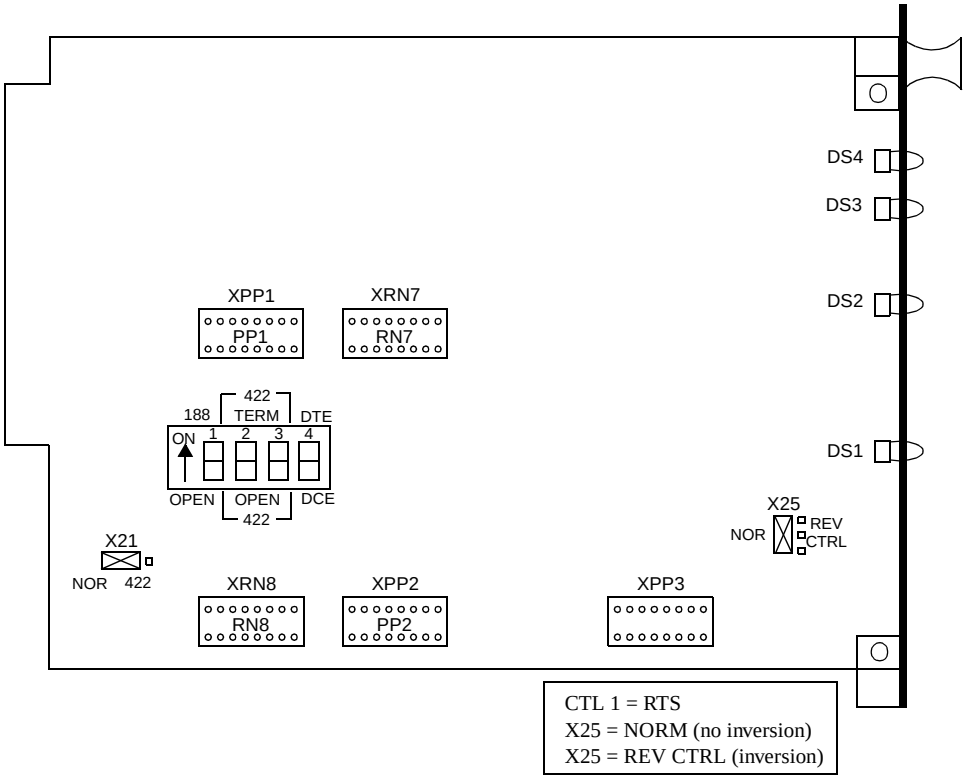


Figure 3-3 Data Sync Channel Card Option Locations (GDC 036P236-010)

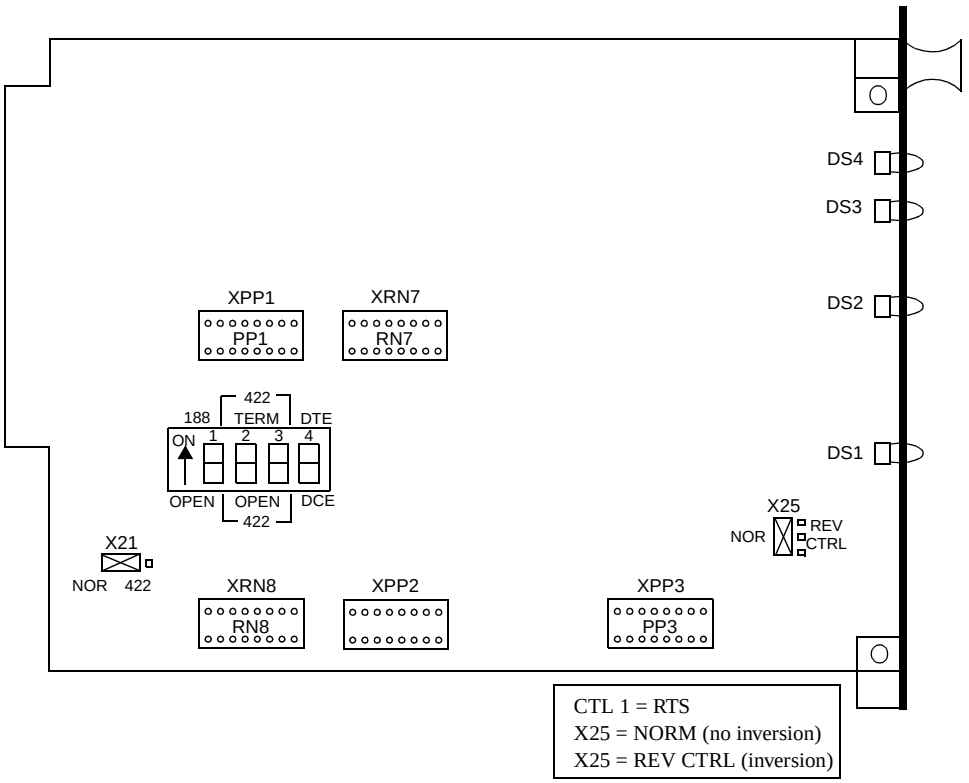


Figure 3-4 UDC, X.21(GDC 036M078-007)

Controls

Program plug PP2 (PP1 on G.703 Data Channel card) selects interface control signals to be multiplexed by the TDM and passed to the remote channel interface. Different plugs are used to support the control signal requirements of various communication circuits. *Figure 3-5* illustrates program plug PP1 positions (not applicable to G.703 channel card) while *Figure 3-6* illustrates PP3 positions. *Figure 3-7 (A-E)* shows each control plug and the channel interfaces implemented by installation of the plug. *Table 3-27* lists the part numbers for the program plugs.

Table 3-27 Program Plugs

Equipment Supplied	Designation	GDC Part No.
Resistor Network Special MM-01	PP2	331-001-010
Resistor Network Special MM-02	PP2	331-001-016
Resistor Network Special MM-05	PP2	331-001-015
Resistor Network Special V.54 MM-08	PP2	331-001-017
Resistor Network Special X.21	PP3	209-014-116

NOTE: Control signals for a data channel may be forced On or Off through the Controller interface. In some channel control arrangements, the channel configuration selected through the Controller holds control signals On or Off as part of the channel control scheme.

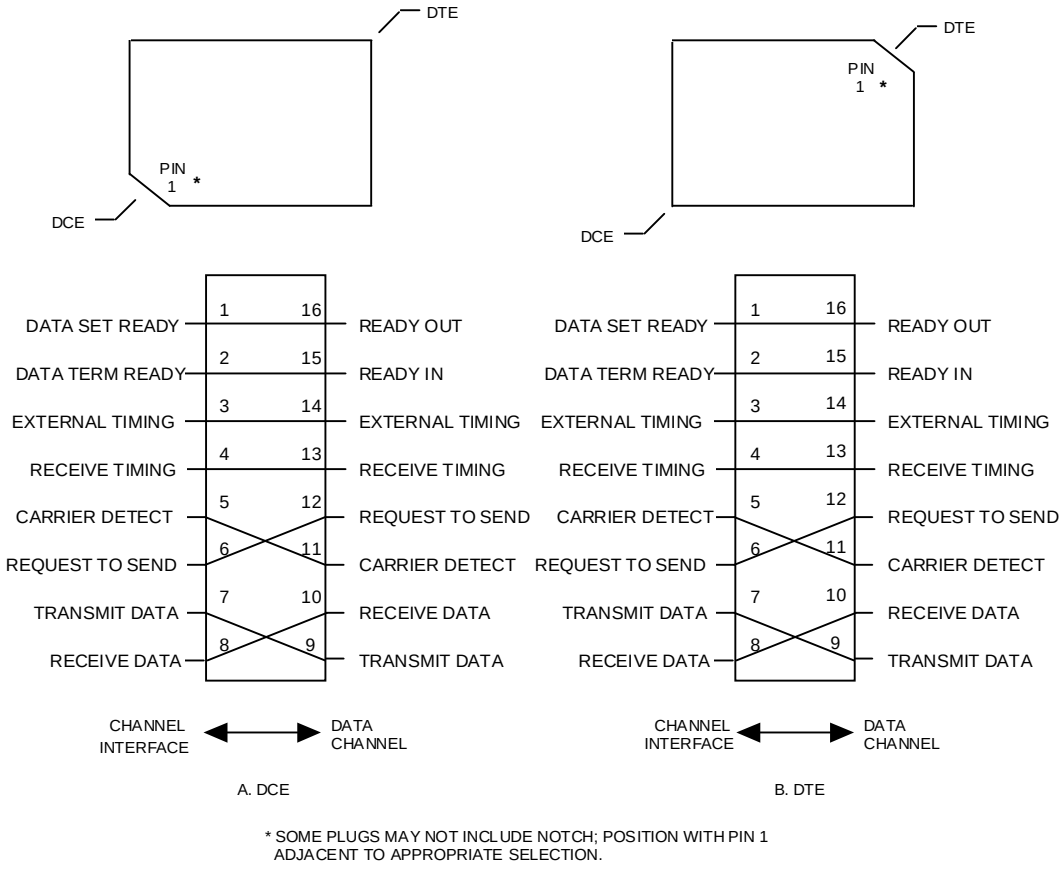


Figure 3-5 Data Channel Program Plug PP1 Positions (DCE/DTE)

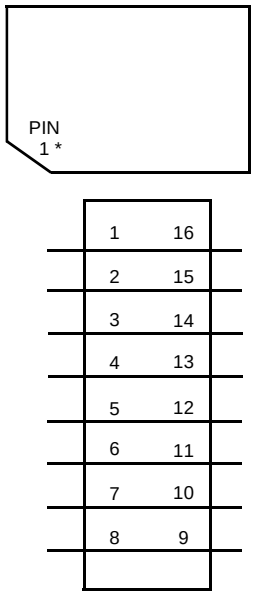
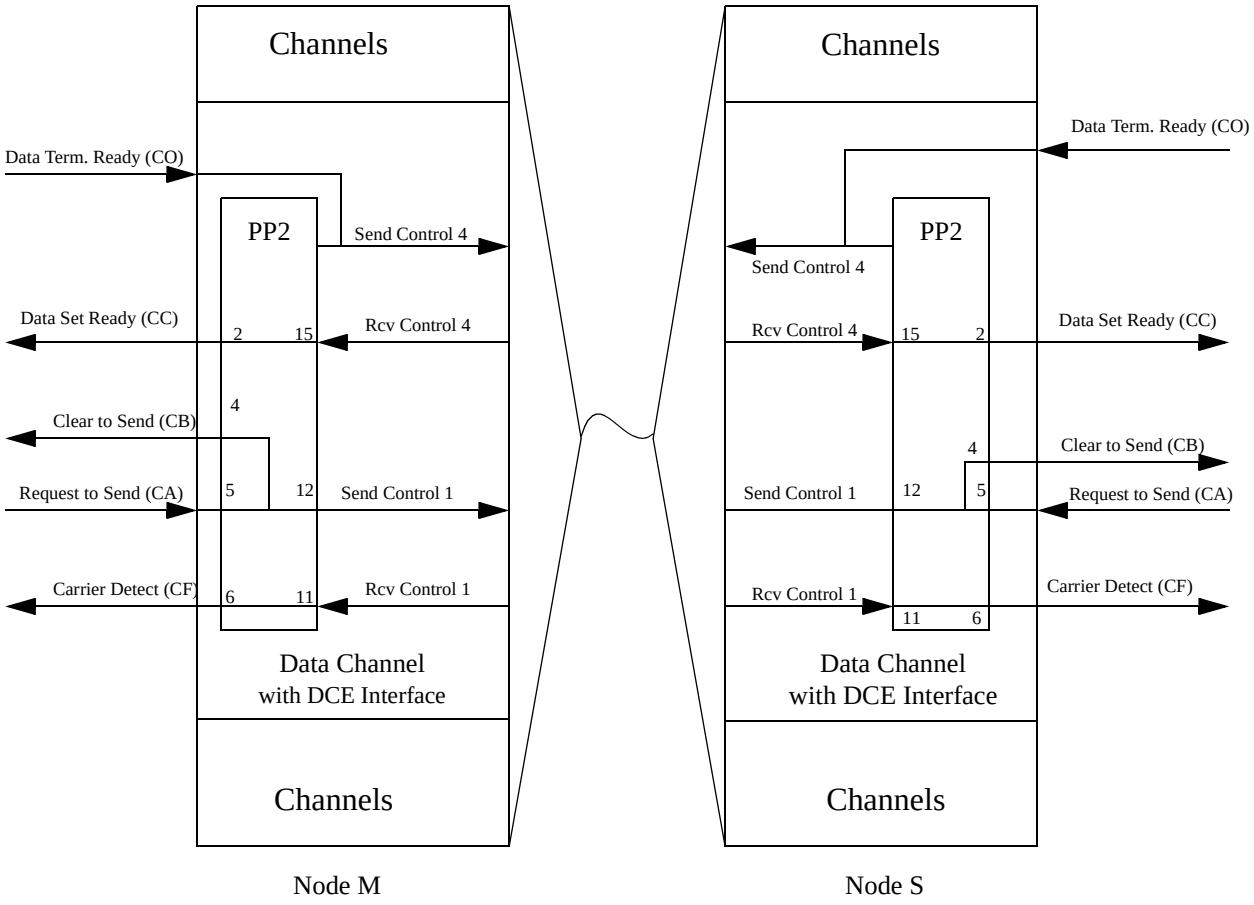


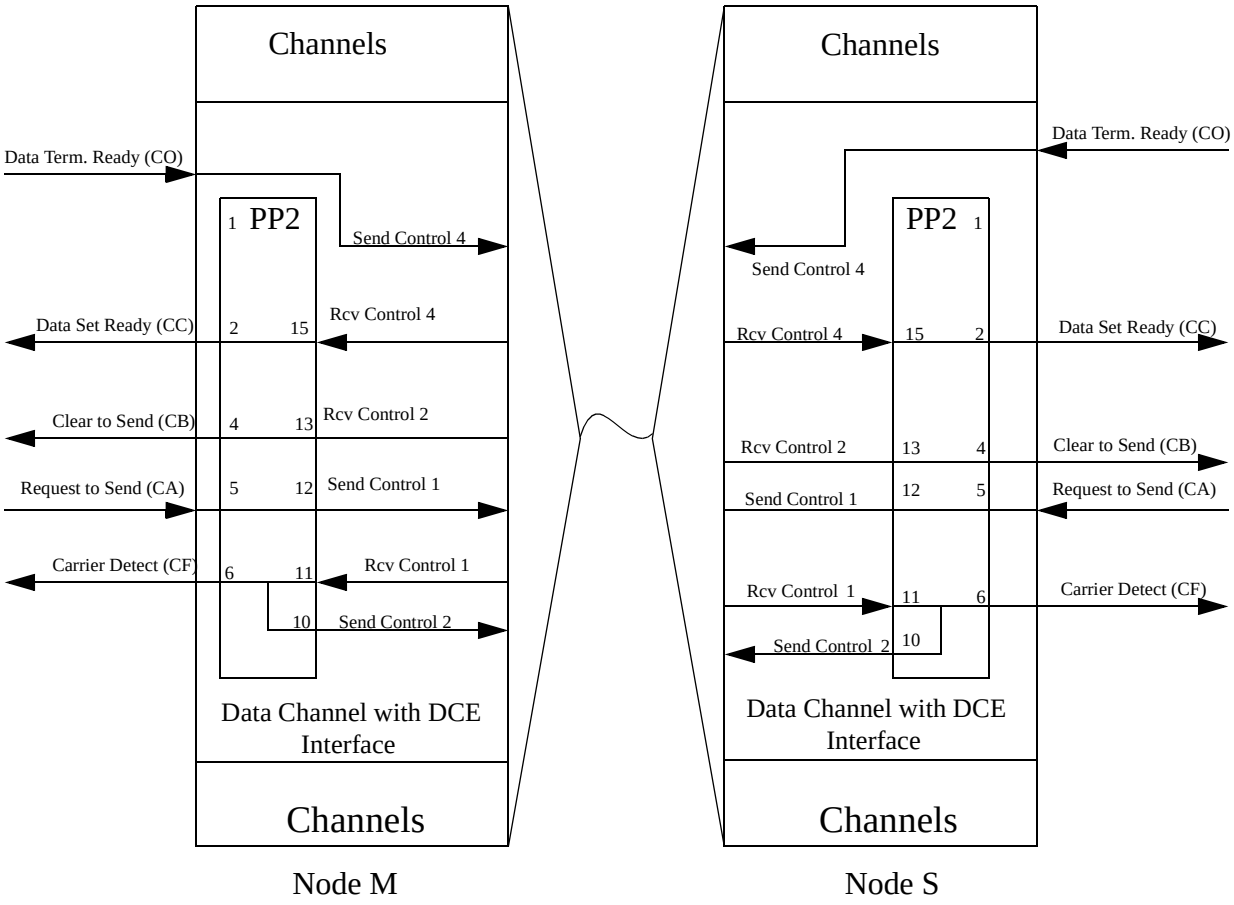
Figure 3-6 Plug PP3 Positions



A send control at one node becomes a receive control at the opposite node. For example, Request to Send is selected as Send Control 1 at Node M. Send Control 1 is transmitted across the link and becomes Receive Control 1 at the Node S data channel. PP2 at the Node S channel interface selects Receive Control 1 and sends it through the channel interface as Carrier Detect.

A. MM01 — CPU to Terminal — Local CTS Wrap

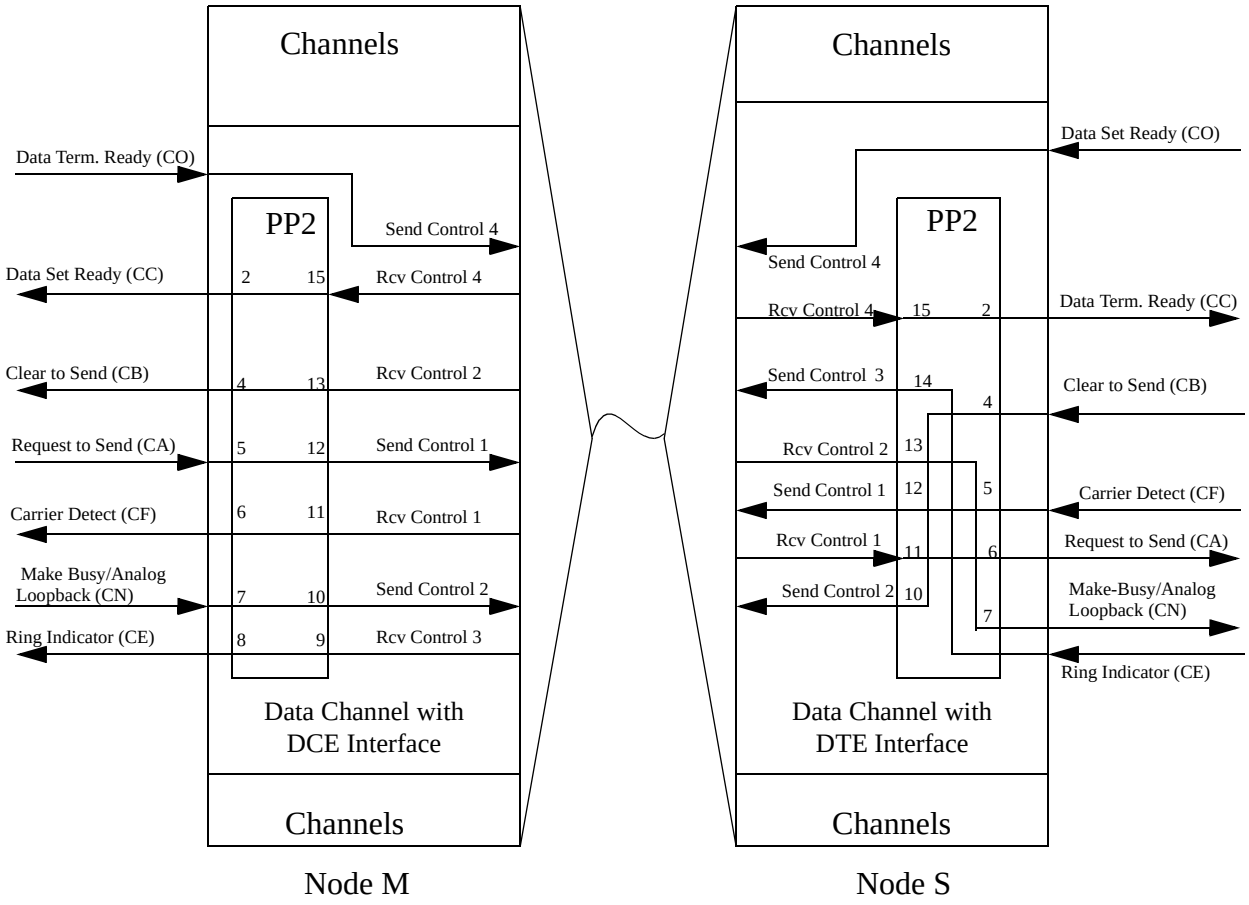
Figure 3-7 Data Channel Control Program Plugs (PP2) (Sheet 1 of 5)



A send control at one node becomes a receive control at the opposite node. For example, Request to Send is selected as Send Control 1 at Node M. Send Control 1 is transmitted across the link and becomes Receive Control 1 at the Node S data channel. PP2 at the Node S channel interface selects Receive Control 2 and sends it through the channel interface as Carrier Detect. MM02 is hand wired at GDC.

B. MM02 — CPU to Terminal — Remote CTS Wrap

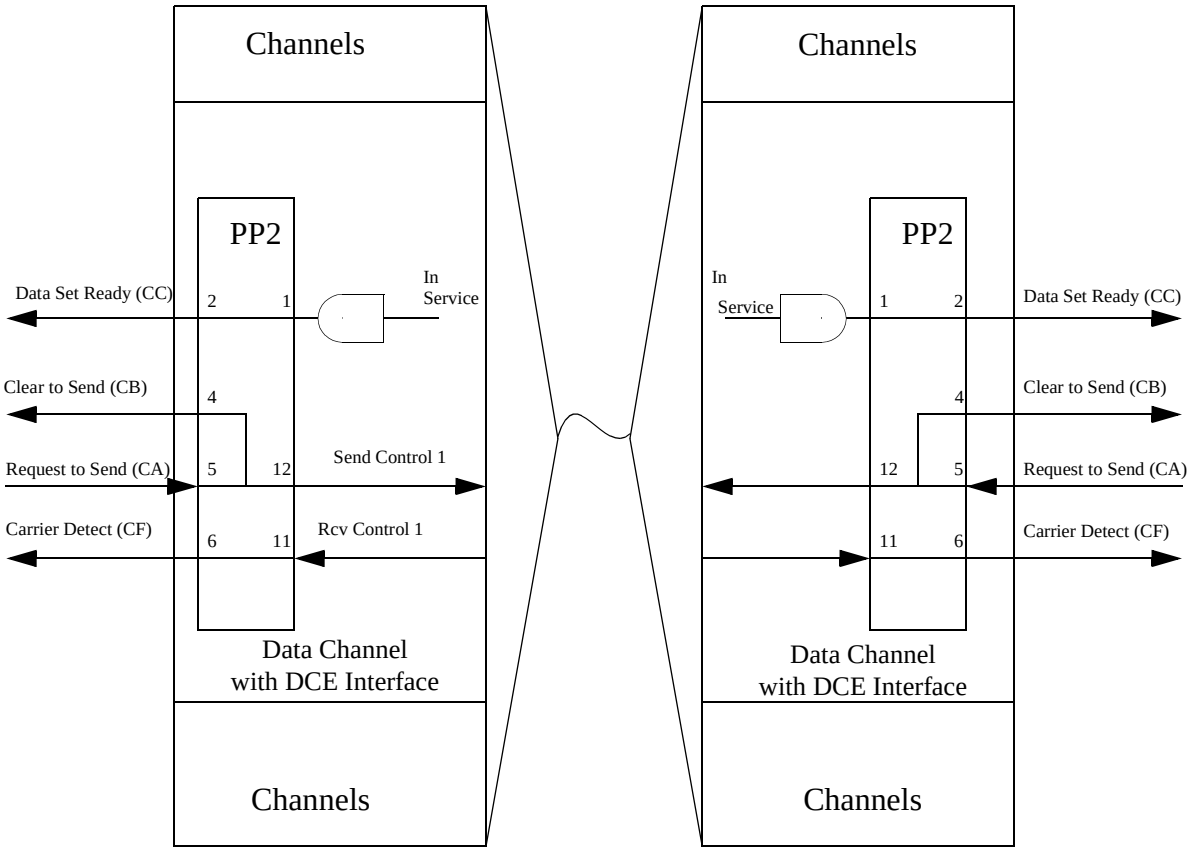
Figure 3-7 Data Channel Control Program Plugs (PP2) (Sheet 2 of 5)



A send control at one node becomes a receive control at the opposite node. For example, Data Terminal Ready is selected as Send Control 4 at Node M. Send Control 4 is transmitted across the link and becomes Receive Control 4 at the Node S data channel. PP2 at the Node S channel interface selects Receive Control 4 and sends it through the channel interface as Data Set Ready. MM02 is hand wired at GDC.

C. MM03 — CPU to Modem

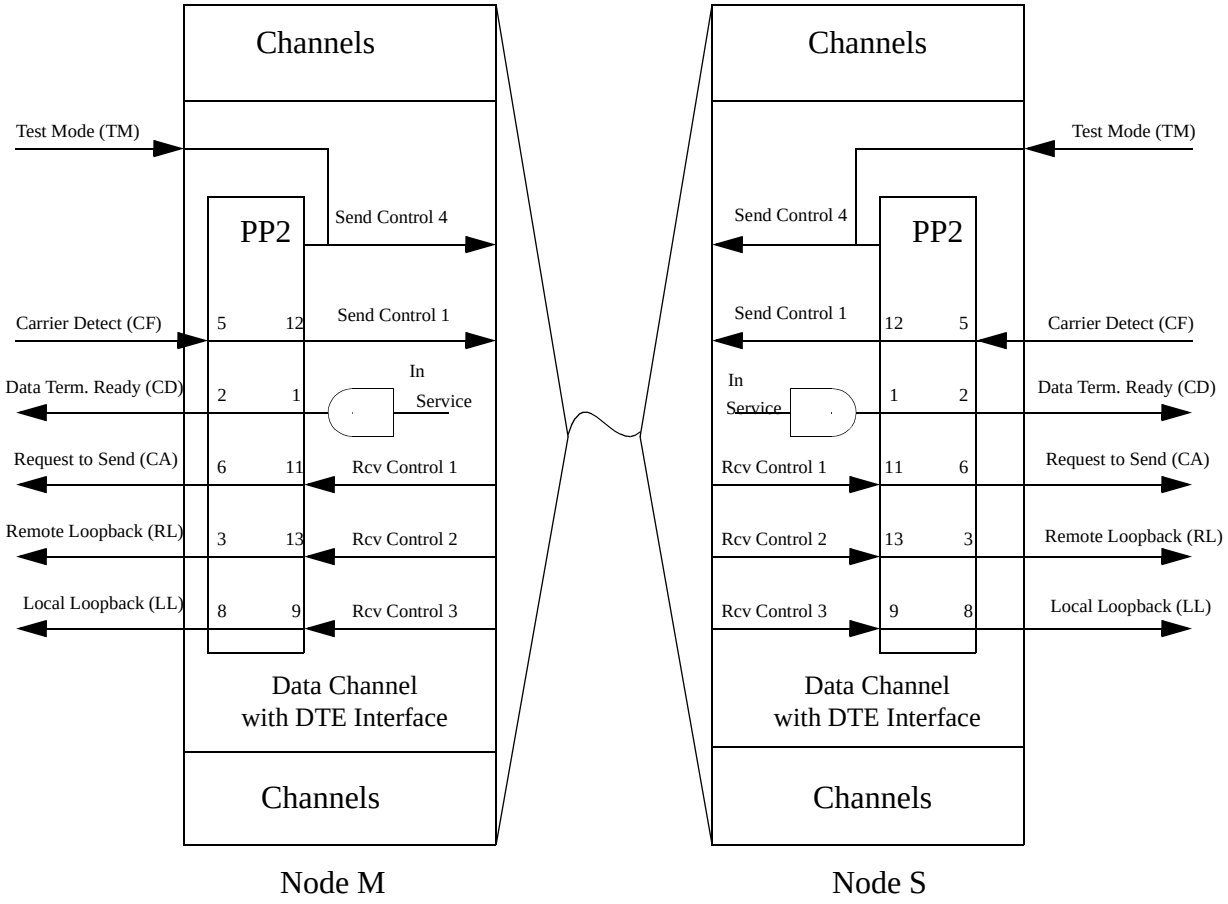
Figure 3-7 Data Channel Control Program Plugs (PP2) (Sheet 3 of 5)



A send control at one node becomes a receive control at the opposite node. For example, Request to Send is selected as Send Control 1 at Node M. Send Control 1 is transmitted across the link and becomes Receive Control 1 at the Node S data channel. PP2 at the Node S channel interface selects Receive Control 1 and sends it through the channel interface as Carrier Detect. The MM05 plug is basically the same as the MM01 plug except that Data Set ready (CC) is held high locally whenever the channel card is in service.

D. MM05 — CPU to Terminal — Local CTS Wrap

Figure 3-7 Data Channel Control Program Plugs (PP2) (Sheet 4 of 5)



A send control at one node becomes a receive control at the opposite node. For example, Carrier Detect is selected as Send Control 1 at Node M. Send Control 1 is transmitted across the link and becomes Receive Control 1 at the Node S data channel. PP2 at the Node S channel interface selects Receive Control 1 and sends it through the channel interface as Request to Send.

E. MM08 — V.54 Modem to V.54 Modem

Figure 3-7 Data Channel Control Program Plugs (PP2) (Sheet 5 of 5)

RS-422/423 Channel Adapter Options

If you use the RS-422/423 channel adapter (*Figure 3-8*) to obtain full RS-422 or RS-423 controls, you must select the 422 or 423 interface; Configure the interface to DTE or DCE devices (*See Figure 3-1 and Table 3-21*).

NOTE: *For the RS-422/423 channel adapters, DTE/DCE component board designations always refer to the equipment to which the adapter is connected. If you are connecting data terminal equipment (CRTs, printers, etc.) to the adapter, place switches and program plugs in the DTE position. If you are connecting data communication equipment (modems, multiplexers, etc.) to the adapter, place switches and program plugs in the DCE position.*

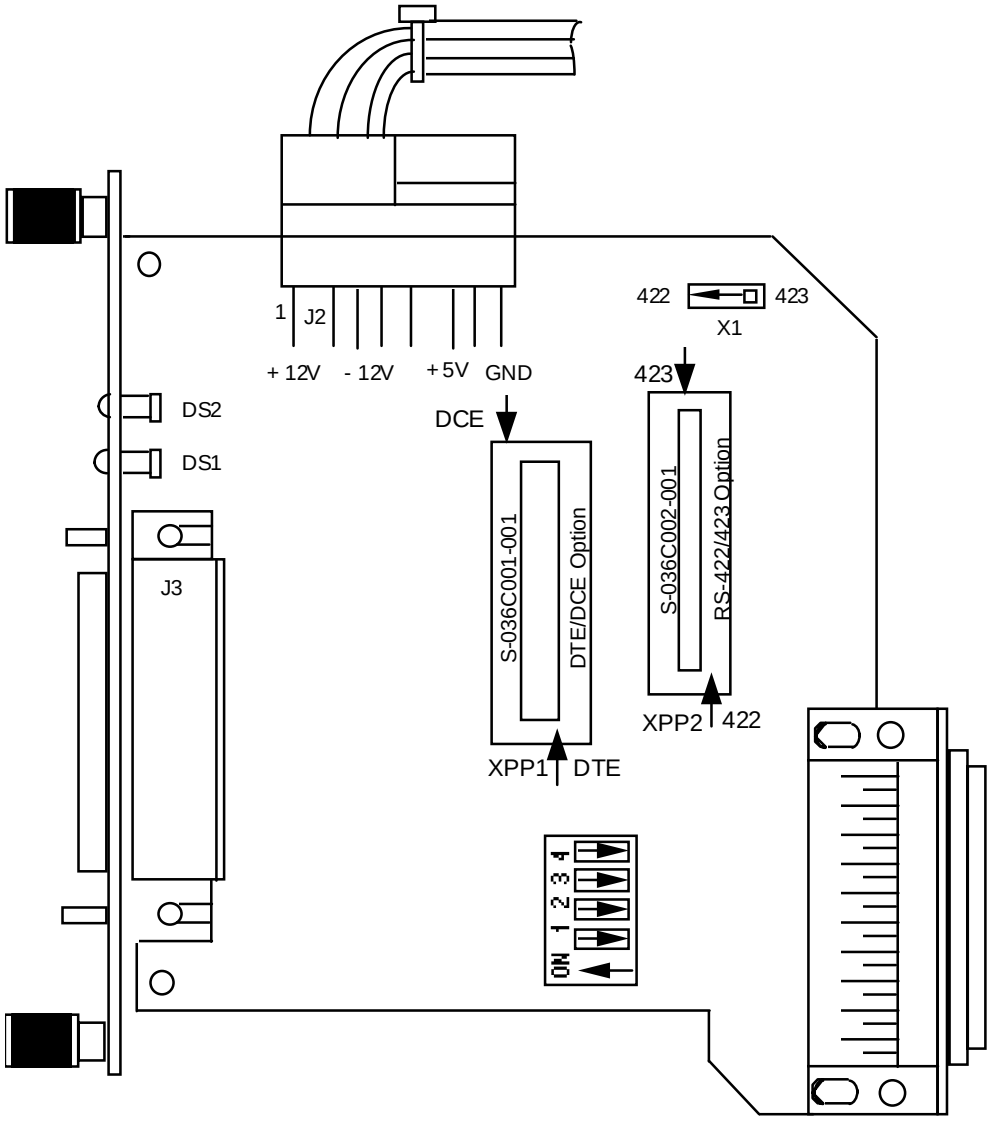


Figure 3-8 RS-422/423 Channel Interface Adapter Option Locations

TID-III (Time-Independent Data III) Module

Before attempting to set up or operate the TID-III Data Channel Module, you must first select a system application mode number. Five application modes, dependent upon your system requirements, are available to you .

TID-II (ECH-2) Emulation Mode (Modes 1-3)

These modes are applicable when you need TID-II performance characteristics over a communications link between two TID-III Data Channel Modules. The TID-II Emulation Mode gives you three (sub)modes, so that you can optimize communications depending upon channel rate and the characteristics of the channel input clock. These three operation modes are:

- Accuracy Tracking (Mode 1)

  This mode gives you extremely accurate input clock rates and when you want to track and output the clock rate with lowest possible offset. In this mode, the TID-III Data Channel Module tracks an input clock with accuracies as high as ± 0.006% depending upon the input rate.

- Program Tracking (Mode 2)

  This mode allows you to program the TID-III Data Channel Module to control signal input and output rate offsets and data delays within specified ranges, thereby optimizing communications for variable external clock characteristics.

- Input Tracking (Mode 3)

  This mode is similar to the ECH-11 emulation mode described below. This mode allows you to support communications where the input frequencies may vary ± 1.5% from the reference frequency due to external clock inaccuracies. When input clock inaccuracies are expected to exceed this threshold, select operation in Mode 4 (TID-I Emulation Mode).

TID-I (ECH-11) Emulation Mode (Mode 4)

This mode is applicable when you require TID-I performance characteristics over a communications link between two TID-III Data Channel Modules. Select Mode 4 when the channel input rate offsets are expected to be in the excess of ±1.5 % from the reference frequency due to the clock inaccuracies or instability. To select TID-I Emulation Mode, configure the TID-III Data Channel Module for Mode 4.

Automatic Tracking Mode (Mode 5)

Operation in the automatic tracking mode supports communications where input rates are subject to change in response to system configuration requirements. To operate in the automatic mode, select a maximum predetermined input rate, and the TID-III Data Channel Module supports all channel rates up to this pre-selected maximum. Operation in the automatic mode is supported only by the TID-III Data Channel Module; therefore, the remote end of the link must also be a TID-III Data Channel Module. To select Automatic Tracking Mode, configure the TID-III module for Mode 5.

The TID-III Data Channel Module can support special interface applications via an optional interface or data conversion requirement can be accommodated to customer specifications. Contact GDC with your specific requirements.

TID-III Configuration Requirements

With the variety of features and operation flexibility available with the TID-III Data Channel Module, it is important to review system communications requirements and constraints before attempting module set-up. Factors to consider are:

- Which type of TID-III Data Channel Module is on the remote end of the link (e.g., TID-I, II, or III)? The answer to this question directs you to one of the system application modes. If there are TID-III Data Channel Modules at both ends of the link, you can select any of the five application modes or three operating (sub)modes.
- What are the characteristics of the input and output clocks? Since all clocks exhibit varying degrees of inaccuracy, this answer allows you to select a mode/submode which optimizes communications with respect to clock accuracy and stability.
- Are there any special communications requirements, such as nonstandard rates or automatic alternate rates, on system configuration changes? If there are, consider the applicability of the automatic mode of operation.
- Are there any special module interface requirements (for example, a requirement to convert encoded data from one standard to another before channel input)? If there are, consult GDC regarding the applicability of our optional interface adapter piggyback.

Having reviewed the system application requirements and options, proceed with TID-III Data Channel Module setup.

TID-III Module Setup

Configure the TID-III Data Channel Module with both hardware and software options. The TID-III Data Channel Module is first configured by setting DIP switches on the transmitter board and several jumpers on the receiver board. The location of these devices is shown in *Figure 3-9 and Figure 3-10. Also refer to GDC 036R469-000, Instruction Manual for TID III* .

Application and operation mode settings are accomplished through software for the TMS-3000. A TID-III Control/Status screen is provided in software and is comparable to existing channel screens. For more information on configuring the TID-III Data Channel Module applications modes, *refer to the Operation Manual for TMS-3000 Controller, GDC 036R603-Vnnn*.

By properly configuring the program settings, the TID-III Data Channel Module is set up for the desired operating mode, isochronous channel input rate, and a corresponding TDM synchronous clock rate.

NOTE: *For the RS-422/423 channel adapters, DTE/DCE component board designations always refer to the equipment to which the adapter is connected. If you are connecting data terminal equipment (CRTs, printers, etc.) to the adapter, place switches and program plugs in the DTE position. If you are connecting data communication equipment (modems, multiplexers, etc.) to the adapter, place switches and program plugs in the DCE position.*

For operation in Modes 1 through 4, Jumper E1-E2 on the receiver board is installed. This jumper provides automatic module reset for conditions of FIFO buffer overflow/underflow. This jumper is not installed for operation in Mode 5, the automatic tracking mode.

On the receiver board, a jumper is configured between E3 and E5 (normal). In this position, the transmit clock is derived from encoded information in the data received from a remote TDM.

If the jumper is configured between E3 and E4 (optional), the transmit clock is the same as provided on the external clock inputs (EIA pins 4 and 5).

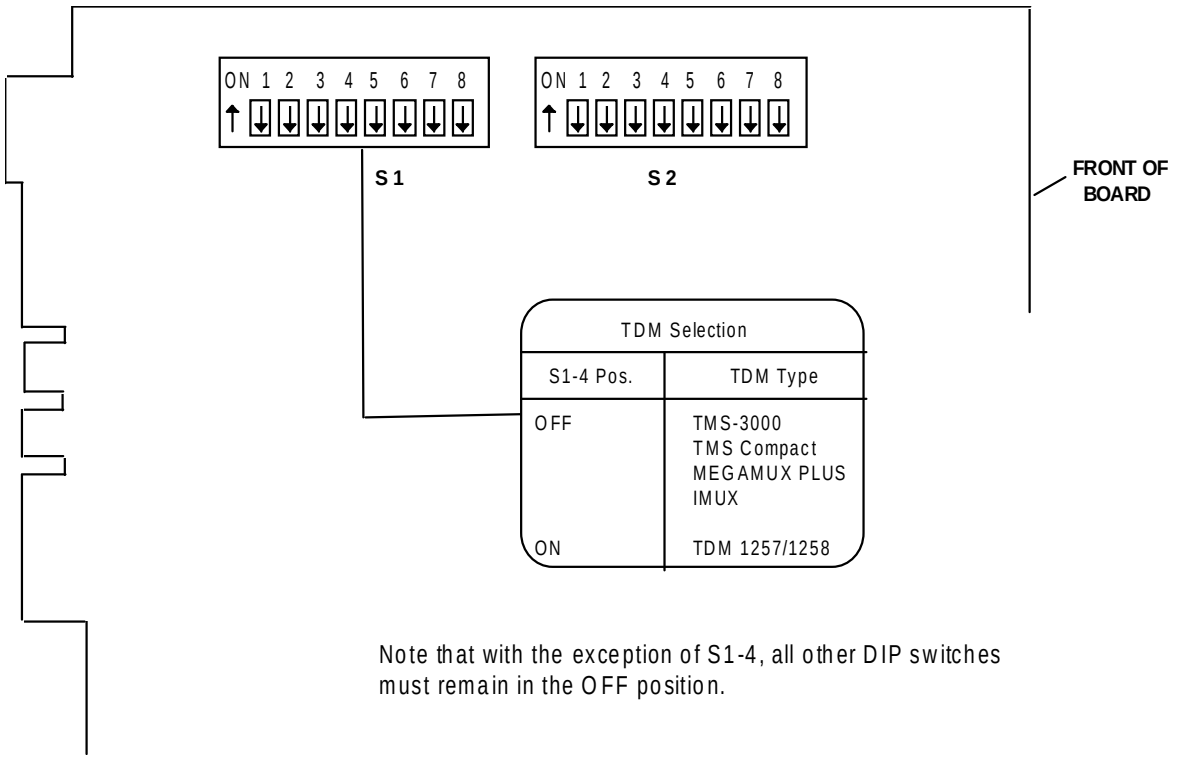


Figure 3-9 TID-III Data Channel Module Transmitter Assembly Option Locations

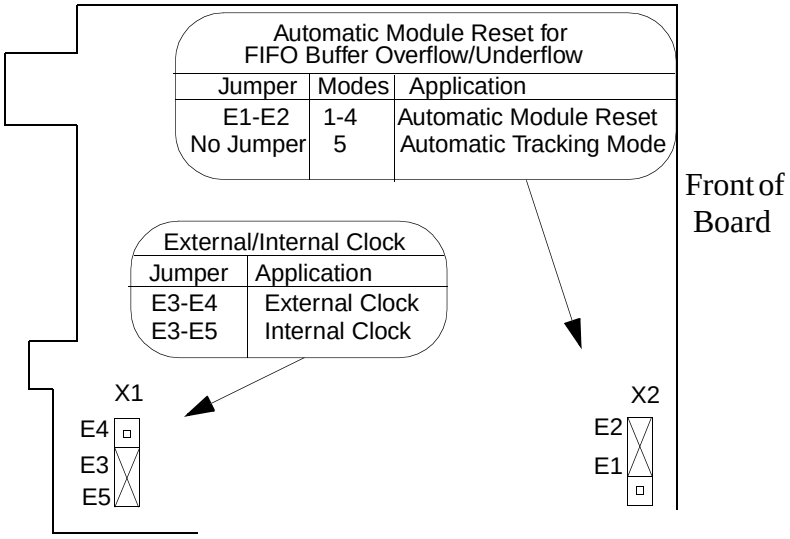


Figure 3-10 TID-III Data Channel Module Receiver Assembly Option Locations

Hyper Plug-In Card

The Hyper Plug-In Card is a plug-in option on the TMS-3000 and mounts onto a Data III Channel, Data IV Channel or Universal Data Channel (UDC) Module. In the TMS-3000 the Hyper Plug-In Card option allows data channels to operate error free in the presence of up to 32 bits of frame jitter.

If an application exists for a Hyper Plug-In Card on a circuit which is configured between two TMS-3000, a Hyper Plug-In Card should be installed on the Data III Channel, Data IV Channel, or UDC Module at both ends.

If an application exists for a Hyper Plug-In Card on a circuit which is configured between a TMS-3000 node and a MINIMUX TDM, a Hyper Plug-In Card should only be installed on the Data III Channel, Data IV Channel, or UDC Module in the TMS-3000 node.

NOTE: Because of increased delay time and translocation of data/control signals, do not use the Hyper Plug-In Card in low speed channel applications or in a polling environment.

All software parameters for the Hyper Plug-In Card (configuration, card type, status, alarms, diagnostics, etc.) are the same as for the synchronous Data III Channel, Data IV Channel, or Universal Data Channel Module.

The Controller cannot identify the need for this card nor can it read of its presence in the network. To the Controller, and a user, a Data III, IV or UDC Module with the Hyper Plug-In option appears exactly as a standard Data III Channel, Data IV Channel, or Universal Data Channel Module.

Part Numbers

Part numbers for the Hyper Plug-In card for use on a UDC module are listed in *Table 3-28*.

Table 3-28 Hyper-UDC Module, Parts List

Equipment Supplied	GDC Part No.
Hyper-UDC Module, RS-422	036M078-005
Hyper-UDC Module, V.35	036M078-006

Installation Procedures

Use the following procedures to install the Hyper Plug-In Card onto a Data III Channel, Data IV Channel or Universal Data Channel Module in the field:

This equipment contains electrostatic sensitive devices. Use ESD precautionary procedures when removing or inserting parts or printed circuit (pc) cards. Keep parts and pc cards in their antistatic packaging material until ready to install.

You should use an antistatic wrist strap, connected to the grounded equipment frame or chassis, when handling pc cards during installation, removal, or setting of on-board option switches. Do not use a conductive tool, such as a screwdriver or paper clip, to set the position of the option switches.

1. Remove IC chip U14 (40-pin sync LSI) from its socket on the Data III Channel, Data IV Channel or Universal Data Channel Module. See *Figure 3-11* for location of the sync LSI chip. Store the sync LSI chip in conductive foam for future use.
2. Remove the two mounting screws from the threaded standoffs on the Hyper Plug-In card.
3. Place the Hyper Plug-In card with the component side facing down towards the Data III Channel, Data IV Channel, or Universal Data Channel Module. Carefully align Pin 1 (of A1P1) on the Hyper Plug-In Card with Pin 1 of the 40-pin U14 IC socket (the vacated sync LSI chip). With all pins aligned, carefully press the Hyper Plug-In Card onto the Data III Channel, Data IV Channel or Universal Data Channel Module. *See Figure 3-12*.
4. The mounting holes on the Hyper Plug-In Card should align with the holes on the Data III Channel, Data IV Channel or Universal Data Channel Module.
5. Re-install the two mounting screws into the threaded standoffs located on the Hyper Plug-In Card.
6. Attach the label over the existing “Data Channel” or “UDC” marking located at the bottom of the Data III Channel, Data IV Channel, or Universal Data Channel Module.

The Hyper Plug-In Card contains no option settings. Once installed, it functions transparently. A Data III Channel, Data IV Channel or Universal Data Channel Module with the Hyper Plug-In Card is configured similar to a standard Data Channel Module.

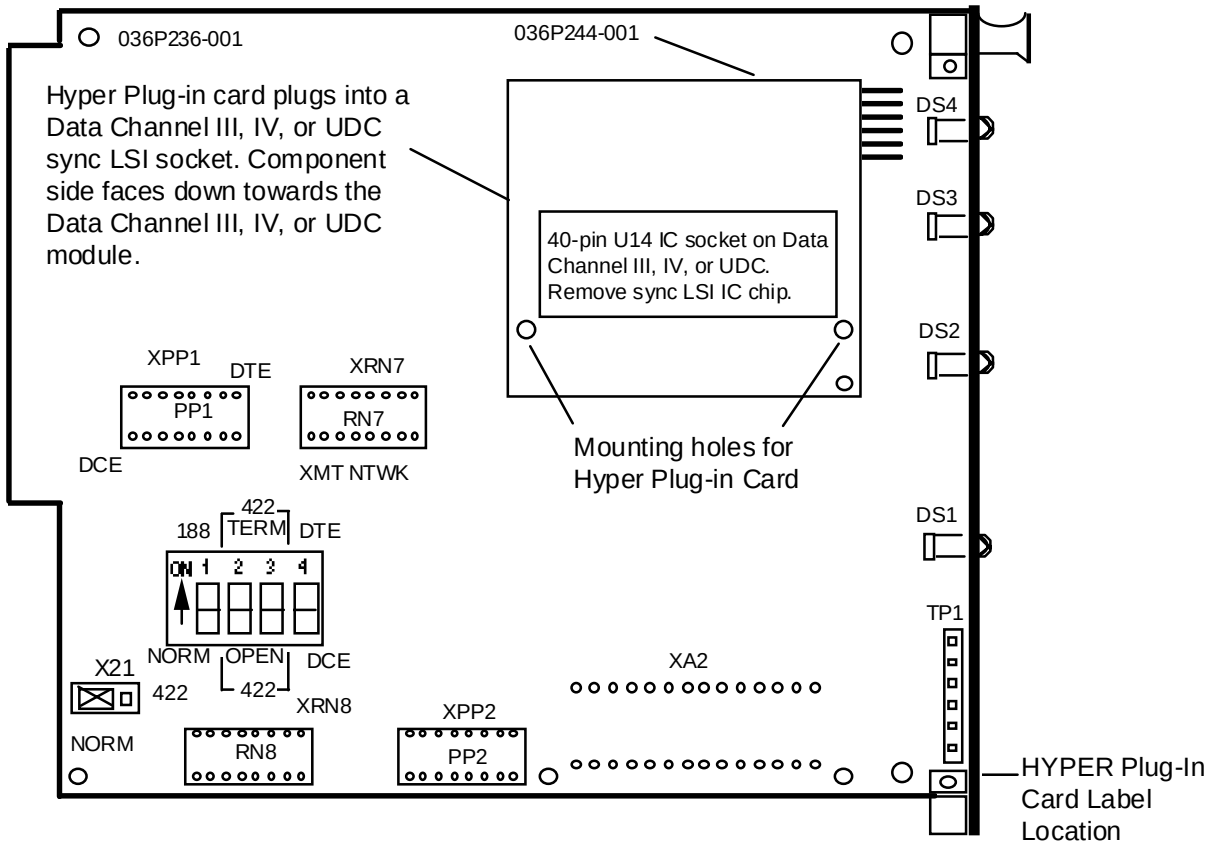


Figure 3-11 Data Channel Module with Hyper Plug-In Card Mounted

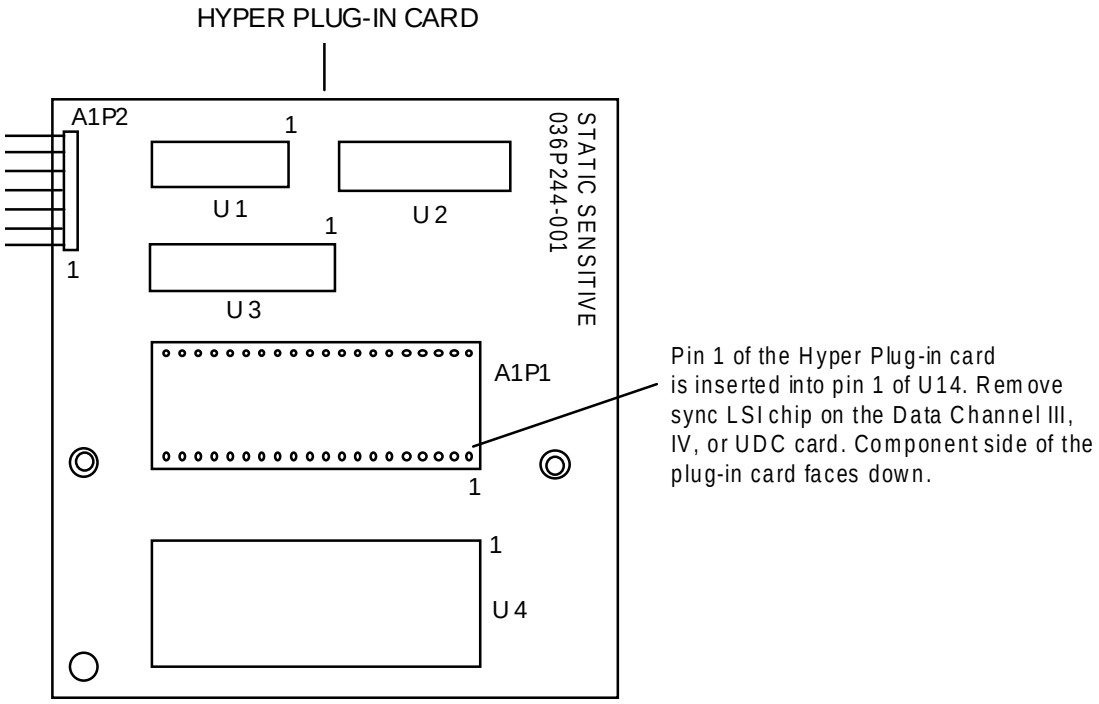


Figure 3-12 Hyper Plug-In Card

Hyper Plug-In Card Upgrade Kit

An upgrade kit allows you to mount the Hyper Plug-In card onto an existing Data III Channel, Data IV Channel or Universal Data Channel Module. The kit number is given in *Table 3-29*. The Hyper Plug-In Card kit can only be used with the Data Channel Module assemblies listed in *Table 3-30*.

Table 3-29 Hyper Plug-In Card, Upgrade Kit

Equipment Supplied	GDC Part No.
Hyper Plug-In Card Kit Contains the following:	036K244-001
Hyper Plug-In Card	036P244-001
Hyper ID label	036N023-001

Table 3-30 Upgradable Equipment List

Equipment Supplied	GDC Part No.
Data III Channel Module	036M058-002, -004
Data IV Channel Module	036M079-002, -004
Universal Data Channel Module	036M078-002, -004
NOTE: Do not use the Hyper Plug-In Card on Data Channel Modules with the EIA/TIA-232-E or RS-423 Interface set or with Data I/Data II Channel Modules.	

Voice Channel Modules

Voice II/CVSD, PCM, ADPCM, and ASP Channel Interface connections, options, and E and M signaling are covered in this section, as well as the Universal Voice Card and Echo Canceller Card.

Part Numbers

Table 3-31 through Table 3-34 are parts listings for voice channel modules.

Table 3-31 Voice II/ADPCM (036M200-004)

Equipment Supplied	Designation	GDC Part No.
ADPCM-2 PCB Assembly	ADPCM-2	036M251-002
PCM-2 PCB Assembly	PCM-2	036P250-002

Table 3-32 Voice II/ADPCM (With E And M) (036M201-004)

Equipment Supplied	Designation	GDC Part No.
ADPCM-2 PCB Assembly	ADPCM-2	036M251-002
PCM-2 PCB Assembly	PCM-2	036P250-002
EAM-1 PCB Assembly	EAM-1	036P252-001

Table 3-33 Voice II/ASP/16K (036M259-001)

Equipment Supplied	Designation	GDC Part No.
ASP Base Card	—	036P255-002
ASP Piggyback	—	036P259-001

Table 3-34 Voice II/ASP/Multi (036M259-002)

Equipment Supplied	Designation	GDC Part No.
ASP Base Card	—	036P255-002
ASP Piggyback	—	036P259-002

Voice II/CVSD and ASP Channel Interface Connections

Connections for voice channels are determined by the type of telephone equipment with which the voice channel interfaces. The requirements of various voice termination systems are too detailed to be covered thoroughly by this manual; use information from the Network Documentation Package and manuals for associated telephone equipment to determine the connection requirements of your system. In this manual, telephone equipment that connects to voice channels falls into three basic categories:

- Automatic Ringdown Circuits
- Direct Connections to PBX Circuits
- Tellabs and Other Voice Termination Systems (Tellabs is the standard voice termination system supplied by General DataComm).

Various standard cables supplied by GDC for voice channel connections are listed in *Table 3-35*. The options available for the Voice II/CVSD, Voice II/PCM and Voice II/ASP Channel modules are described in *Table 3-36 through Table 3-48*. *Refer to Chapter 7*, for channel connector pin assignments.

Voice II/CVSD Channel Module Options

The following options may be selected for the Voice II/CVSD Channel Module (*See Figure 3-13* for the location of each option selection device on the module).

Input and Output Signal Levels

Nominal levels may be selected for voice input and output, as described in *Table 3-36*. Attenuation or amplification of the input level (to compensate for cable losses or other irregularities) may be selected, as described in *Table 3-37*.

E and M Signaling Interfaces

By selecting various options, the Voice II/CVSD Channel module can be configured to support all E and M signaling types, as described in *Table 3-38*. *Figure 3-14* depicts the M-lead signaling interface circuits created by jumper plug positions. E-lead responses to loss of power and service interruption may also be selected, as described in *Table 3-39 and Table 3-40*.

Filter Clock

The filter clock of the voice channel helps determine the bandwidth of the voice output. Two sources may be selected for the filter clock: a clock signal at four times the data rate of the voice channel, or a 128-kHz clock signal. The criteria for selecting one clock or the other are discussed in *Table 3-36*.

Table 3-35 Voice II/CVSD And ASP Channel Connection Cables

GDC Cable No.	Description	Application
027H306	Voice Channel, DB-25 connector to spade lugs	Single channel connection; tip, ring, E-lead, M-lead, and ground brought out to spade lugs. Available in 5-, 15-, and 25-foot lengths.
027H409	Voice Channel, DB-25 connector to punch-down wire leads	Single channel connection; tip, ring, E-lead, M-lead, station battery, signal and station ground brought out to wire ends for punch-down applications. Available in 5-, 15-, and 25-foot lengths.
326H024	TMS-3000 to PBX; DB-25 connector to 50-pin Amphenol connector. Up to 8 voice channels	Used to connect up to eight voice channels to private branch exchange. 5-foot length only; requires 021H605-025 extension cable.
326H025	8-channel harness; DB-25 connector to 50-pin Amphenol connector	Used to connect up to eight voice channels to facility. Transmit and receive leads crossed over. Available in 5-foot length only. Requires 021H605-025 extension cable.
326H026	6-channel harness; DB-25 connector to 50-pin Amphenol connector	Used to connect up to six voice channels to facility.
326H021	TMS-3000 to Tellabs 266R shelf (6 voice channels)	Used to connect up to six voice channels to Tellabs 266AR shelf. Available in 5- or 15-foot lengths.
326H023	TMS-3000 to Tellabs 2366R shelf (12 voice channels)	Used to connect up to 12 channels to Tellabs 266AR shelf. Available in 5- or 15-foot lengths.
830-002S008	50-pin Amphenol male to male extension cable (25 pairs)	Used to connect 50-pin cables above to customer voice termination point (demark), (voice channel to PBX).
830-002S007	50-pin Amphenol male to female extension cable (25 pairs)	Used to connect Tellabs shelf to customer voice termination point (demark), (Tellabs Shelf to PBX).
G024H012	Voice Channel and E & M	Used for Voice Channel CVSD and ASP module types. Also used in E&M signaling applications.

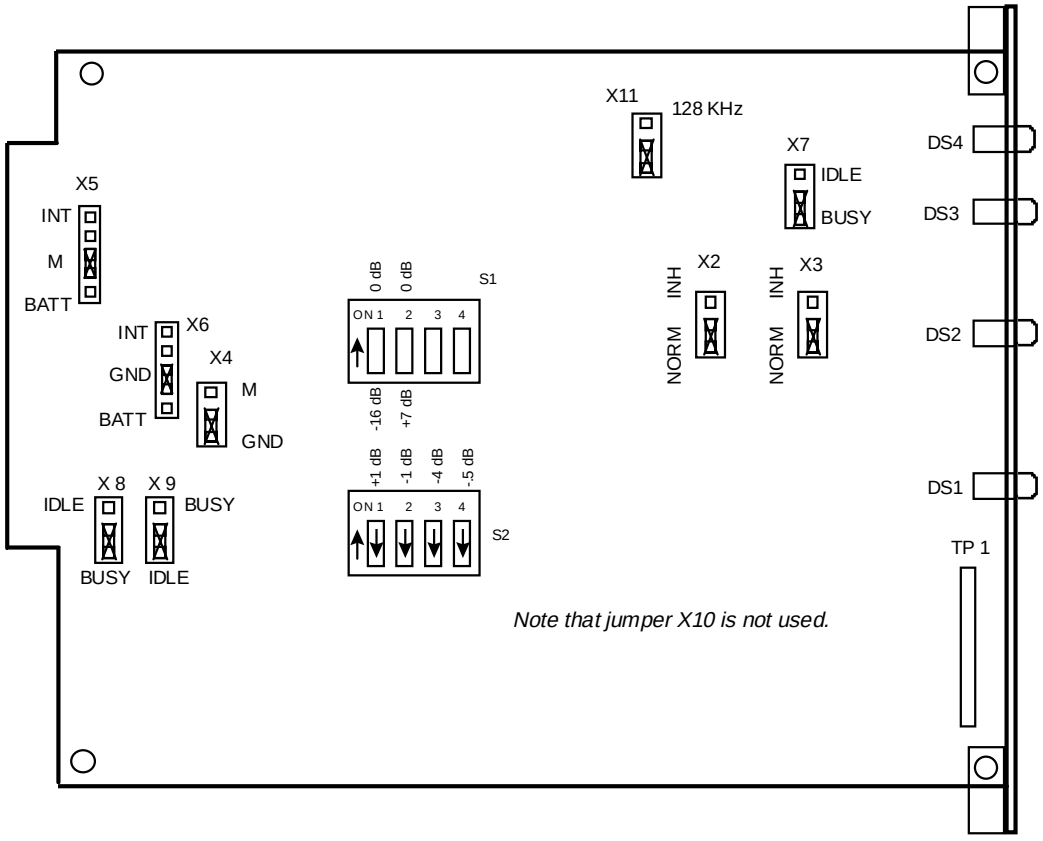


Figure 3-13 Voice II/CVSD Channel Module Option Locations

Table 3-36 Voice II/CVSD Channel Option Selection

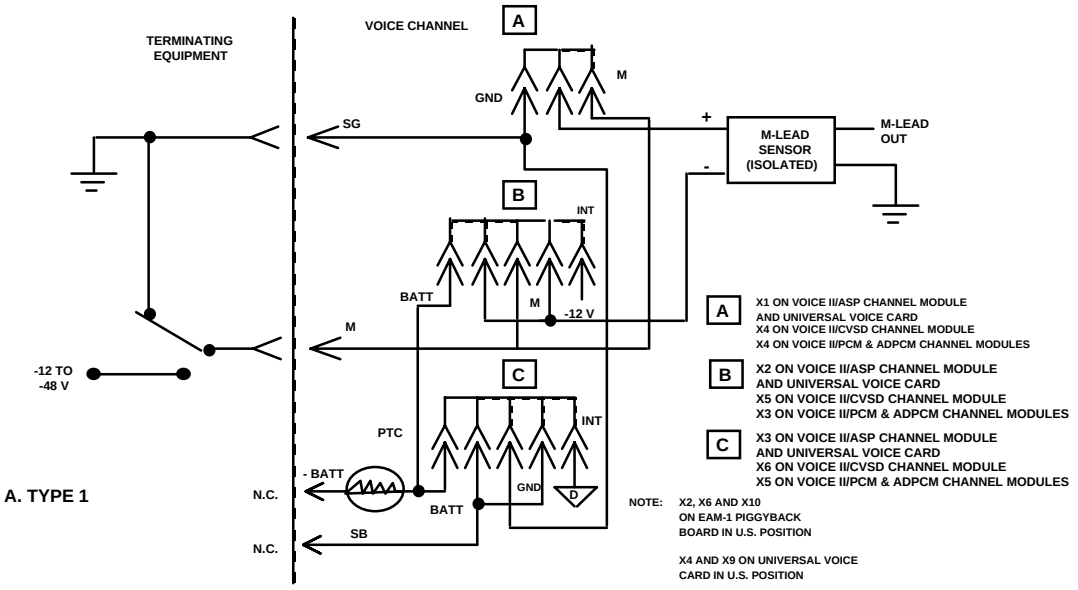
Feature	Selection	Switch(S) Jumper(X)		Application
		Desig.	Position	
Nominal Input Level	0 dBm	S1-1	0	The nominal input level is determined by the nominal output level of the telephone equipment connected to the channel.
	–16 dBm	S1-1	–16	Most systems specify either 0 dBm or –16 dBm as their nominal output. PBX systems generally require selection of 0 dBm; automatic ringdown or Tellabs and other voice termination systems generally require selection of –16 dBm. If actual output levels of connected equipment vary from the nominal levels of 0 dBm or –16 dBm, Switch S2 may be set to achieve some level of compensation.
Nominal Output Level	+7 dBm	S1-2	+7	The nominal output level for the Voice II Channel is either 0 dBm or +7 dBm.
	0 dBm	S1-2	0	This selection depends on the nominal input level specified for the telephone equipment connected to the channel. PBX systems generally require selection of 0 dBm; automatic ringdown or Tellabs and other voice termination systems generally require selection of +7 dBm. Adjustments to the actual measured output level of the voice channel may be made through the CRT interface by setting a degree of attenuation or amplification. The output selected by S1-2 may be varied from +1.5 dB above the nominal level to –6 dB below the level in 0.5 dB steps.
Filter Clock	128 kHz	X11	128 kHz	This selection should be made whenever the data clock for the voice channel (selected through the supervisory port interface in the Configuration routine) is greater than 32 kHz. The 128 kHz selection ensures that the frequency range of the voice output does not exceed telephone line limits.
	4X Data Clock	X11	4XDATA	This selection should be made whenever the data clock for the voice channel (selected through the supervisory port interface in the Configuration routine) is less than 32 kHz. When the data clock is 32 kHz, either position is acceptable.

Table 3-37 Voice II/CVSD Channel Input Level Adjustment Option

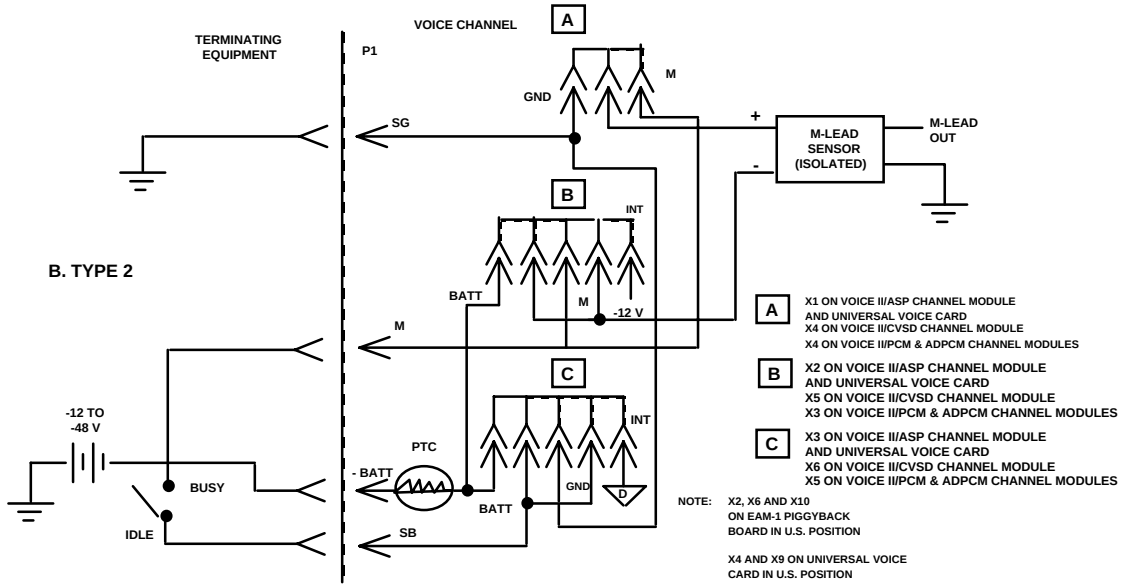
S2-1 (+1 dB)	S2-2 (–2 dB)	S2-3 (–4 dB)	S2-4 (+0.5 dB)	Input Compen-sation	Application
ON	OFF	OFF	ON	+1.5 dB	Switches S2-1 through S2-4 select attenuation or amplification for the voice input level. This compensates for cable losses or improper output levels from connected telephone equipment. The switch selects a level of compensation from +15 dB to –6.0 dB, in 0.5 dB steps. Each segment of Switch S2 selects a level of attenuation or amplification; the individual steps are added to produce a particular level. A level is selected to compensate for some measured deviation of the output level of equipment connected to the channel. The deviation is the difference between the actual level and the nominal level of 0 dBm and –16 dBm selected on Switch S1-1. For example, if the nominal level is 0 dBm, and the actual level is +2 dBm, selection of –2 dB would compensate for the difference between the nominal and measured input values.
ON	OFF	OFF	OFF	+1.0 dB	
OFF	OFF	OFF	ON	+0.5 dB	
OFF	OFF	OFF	OFF	0 dB	
ON	ON	OFF	ON	–0.5 dB	
ON	ON	OFF	OFF	–1.0 dB	
OFF	ON	OFF	ON	–1.5 dB	
OFF	ON	OFF	OFF	–2.0 dB	
ON	OFF	ON	ON	–2.5 dB	
ON	OFF	ON	OFF	–3.0 dB	
OFF	OFF	ON	ON	–3.5 dB	
OFF	OFF	ON	OFF	–4.0 dB	
ON	ON	ON	ON	–4.5 dB	
ON	ON	ON	OFF	–5.0 dB	
OFF	ON	ON	ON	–5.5 dB	
OFF	ON	ON	OFF	–6.0 dB	

Table 3-38 Voice II/CVSD Channel E And M Signaling Option Selection

Type	Berg Jumper Positions			Signaling States		Application
	X4	X5	X6	Idle	Busy	
1	GND	M	GND	0 Vdc	–12 to –48 Vdc	X4, X5, and X6 select the proper interface for different E & M signaling types. The jumper positions selected depend entirely on the E & M signaling type used by the voice equipment connected to a Voice Channel module. For most applications, the selections shown for Signaling Type 1 are used.
2	GND	M	BATT	Open	–12 to –48 Vdc	
3	GND	M	BATT	0 Vdc	–12 to –48 Vdc	
4	M	BATT	GND	Open	0 Vdc	
5	M	BATT	GND	Open	0 Vdc	
2*	M	INT	INT	Open	0Vdc	
* Back to back; i.e., when the VF interfaces of two voice II Channel modules are connected directly together.						

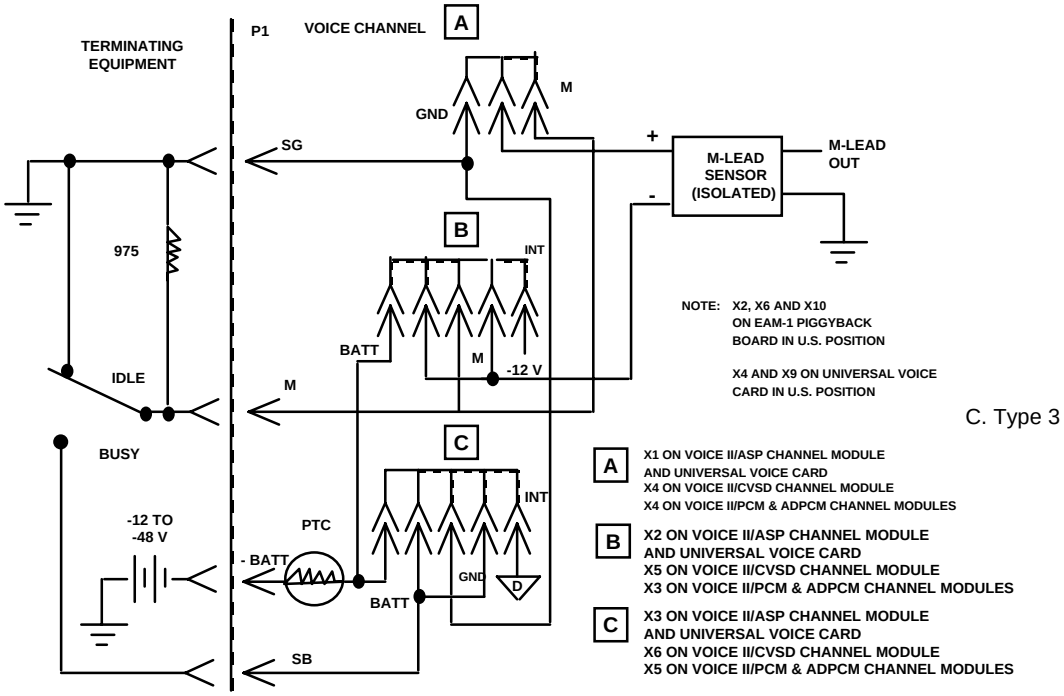


NOTE : **For Type I interface, the ground of the Signalling CKT and the ground of the Trunk CKT must be referenced to the same place for reliable operation. The GDC Type I interface is correctly pictured as:**



NOTE : **The additional external signal for -BATT may be common for multiple PCM cards and are not related to the Trunk CKT. 48 Volts is not presently available in the TMS and so an external source is required.**

Figure 3-14 M-Lead Signaling Interfaces (Sheet 1 of 4)



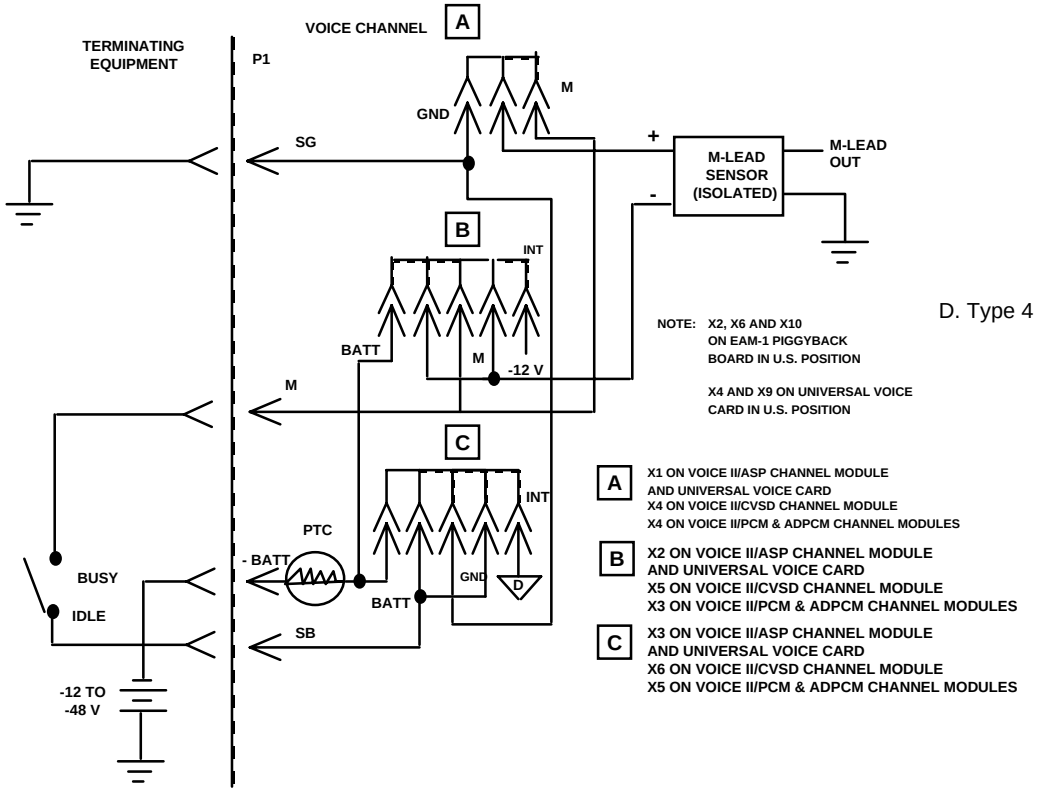


Figure 3-14 M-Lead Signaling Interfaces (Sheet 2 of 4)

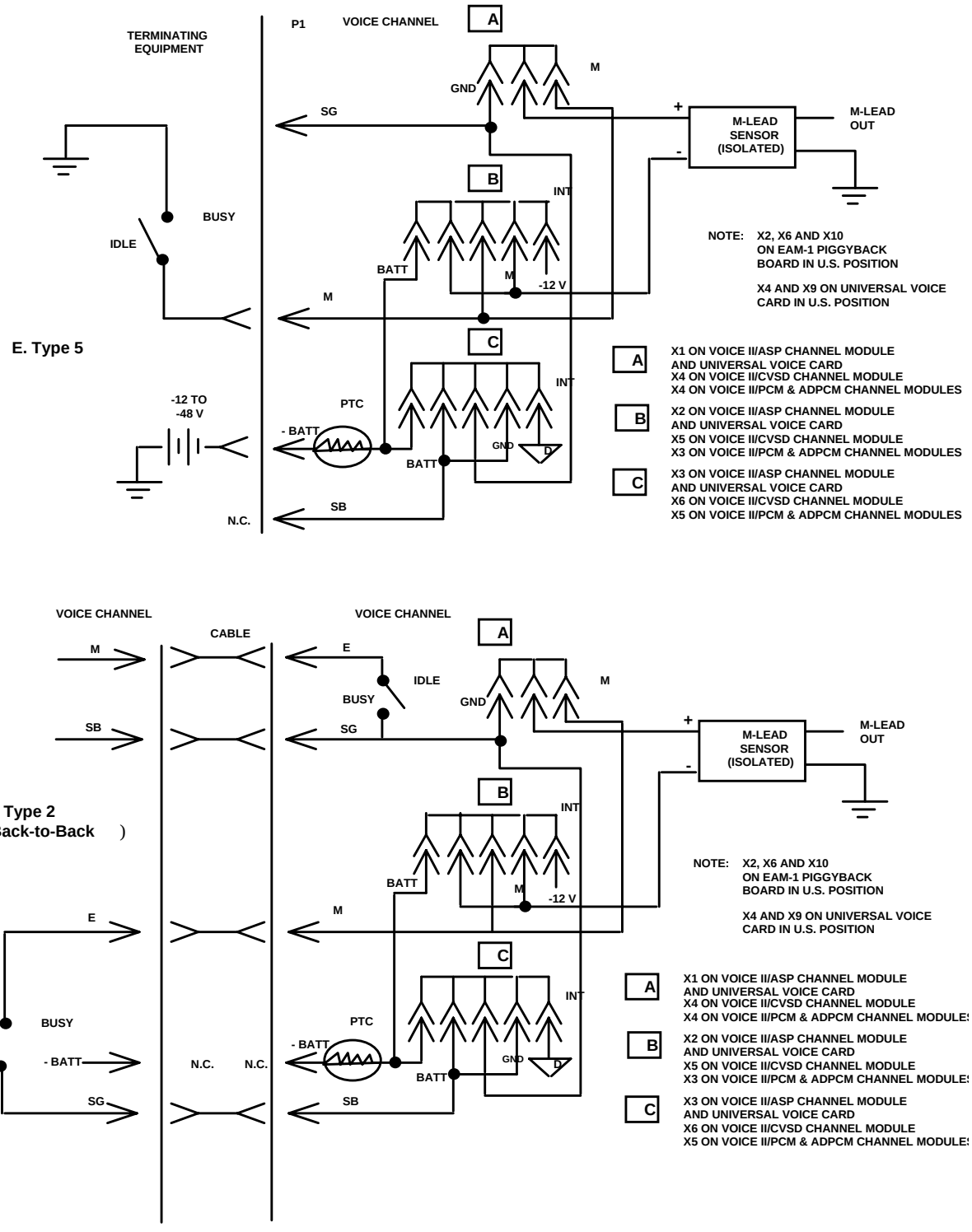
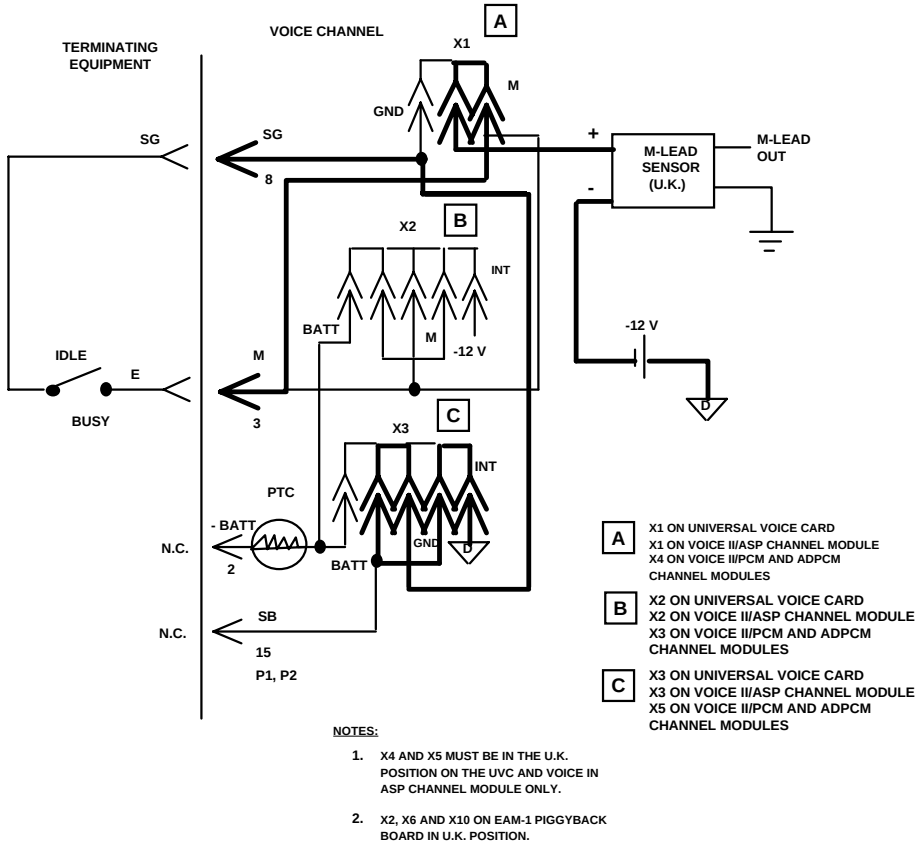


Figure 3-14 M-Lead Signaling Interfaces (Sheet 3 of 4)



G. U.K. OPERATION (SSDC5)

Figure 3-14 M-Lead Signaling Interfaces (Sheet 4 of 4)

Table 3-39 Voice II/CVSD Channel E-Lead Relay State Option Selection

Feature	X7 Position	X8 Position	X9 Position	Application
Loss of Power E-Lead Signaling State	Busy	Idle	Idle	With these three jumpers set in the position shown, the E-Lead (pin 24 on the DB-25 EIA connector) is in an Idle state during loss of power. The E' lead (pin 11 on the DB-25 EIA connector) is in a Busy state during loss of power. This selection is generally made for connections between the voice channel and automatic ringdown circuits.
	Idle	Busy	Busy	With these three jumpers set in the position shown, the E-Lead (pin 24 on the DB-25 EIA connector) is in a Busy state during loss of power. The E' lead (pin 11 on the DB-25 EIA connector) is in an Idle state during loss of power. This selection is generally made for connections between the voice channel and PBX systems, or Tellabs and other voice termination systems.

Table 3-40 Voice II/CVSD Channel E-Lead Out-of-Service Option Selection

Feature	X2 Position	X3 Position	Application
Service Interruption/ Loss of Sync Signaling Response	NORM	NORM	If TMS-3000 synchronization is lost or the channel is placed out of service, the E-Lead is forced to the Idle state for 2.5 seconds, and then reverts to the Busy state.
	INH	NORM	If TMS-3000 synchronization is lost or the channel is placed out of service, the E-Lead is forced to the Busy state 2.5 seconds after synchronization is lost.
	NORM	INH	If TMS-3000 synchronization is lost or the channel is placed out of service, the E-Lead is forced to the Idle state immediately.
	INH	INH	The E-Lead state is not changed due to loss of synchronization or channel placed out-of-service.

Table 3-41 E And M Signaling Option Selections (EAM-1 Board)

Signaling Type	Berg Jumper Positions			Signaling States		Berg Jumper Positions
	X4	**X3**	**X5**	**IDLE**	**BUSY**	**X2, X6, X10**
1	GND	M	GND	0 V dc	–12 to –48 V dc	U.S.
2	GND	M	BATT	OPEN	–12 to –48 V dc	U.S.
3	GND	M	BATT	0 V dc	–12 to –48 V dc	U.S.
4	M	BATT	GND	OPEN	0 V dc	U.S.
5	M	BATT	GND	OPEN	0 V dc	U.S.
2*	M	INT	INT	OPEN	0 V dc	U.S.
U.K.**	M	INT	INT/GND	OPEN	0 V dc	U.K.

* For back-to-back signaling with no external battery.

Application: X2-X5 and X10 select the proper interface for different E and M signaling types. The jumper positions selected depend entirely on the E and M signaling type used by the voice equipment connected to the Voice II/PCM or Voice II/ADPCM module.

** For SSDC5 signaling, two jumper plugs are required on X5, in both the INT and GND positions.

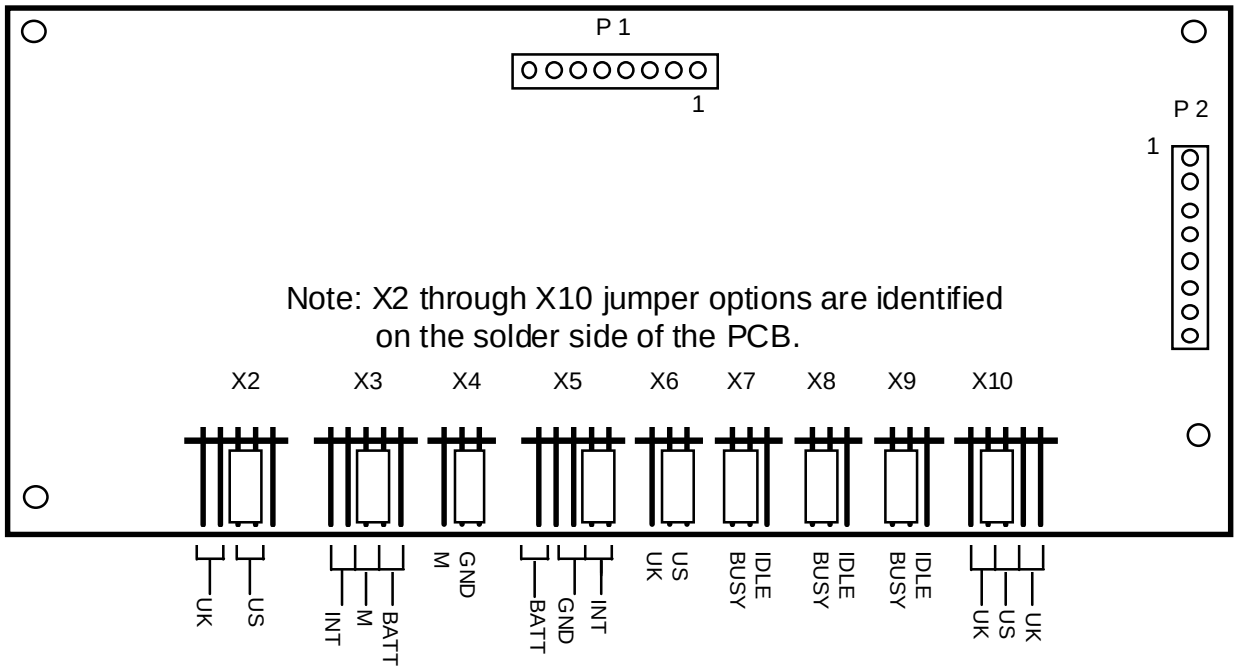


Figure 3-15 E and M Signaling Piggyback Card (EAM-1) Option Locations

Table 3-42 Idle/Busy E-Lead Option Selection (EAM-1 Board)

Jumper	Selection	Application
X7 X8 X9	BUSY BUSY BUSY	When the E-Lead is used for signaling, loss of TDM power results in a BUSY E-Lead.
X7 X8 X9	IDLE IDLE IDLE	When the E-Lead is used for signaling, loss of TDM power results in an IDLE E-Lead.
NOTE: The E'-Lead (P1-54) is the inverted state of the E-Lead (P1-56).		

Voice II/ASP Channel Module Options

The following options can be selected for the Voice II/ASP Channel Modules (*See Figure 3-16* for the location of each option selection device).

Input and Output Signal Levels

Nominal levels may be selected for voice input and output as described in *Table 3-43*. Attenuation of the input level (to compensate for cable losses or other irregularities) may be selected as described in *Table 3-44*.

E and M Signaling Interfaces

By selecting various options, the Voice II/ASP Channel Module can be configured to support all E and M signaling types, as depicted in *Table 3-45*. *Figure 3-14 (shown earlier in chapter)* depicts the M-lead signaling interface circuits created by jumper plug positions. E-lead polarity selection and E-lead responses to loss of power and service interruption can also be selected as described in *Table 3-46 through Table 3-48*.

Table 3-43 Voice II/ASP Channel Option Selection

Feature	Selection (dBm)	Switch(S), Jumper(X)		Application
		Desig.	Position	
Nominal Input Level	0 –16	S1-1 S1-1	OFF ON	The nominal input level is determined by the nominal output level of the telephone equipment connected to the channel. If actual output levels of connected equipment vary from the nominal levels, Switch S1 may be set to achieve some level of compensation.
Nominal Output Level	0 +7	S1-3 S1-3	OFF ON	The nominal output level for the ASP Channel is either 0 dBm or +7 dBm. This selection depends on the nominal input level specified for the telephone equipment connected to the channel. Adjustments to the actual measured output level of the voice channel may be made through the Controller by setting a degree of attenuation or amplification. The output selected by S1-3 may be varied from +1.5 dB above the nominal level to –6 dB below the level in 0.5 dB steps. *Refer to GDC 036R603-Vnnn*, for information on the output level.

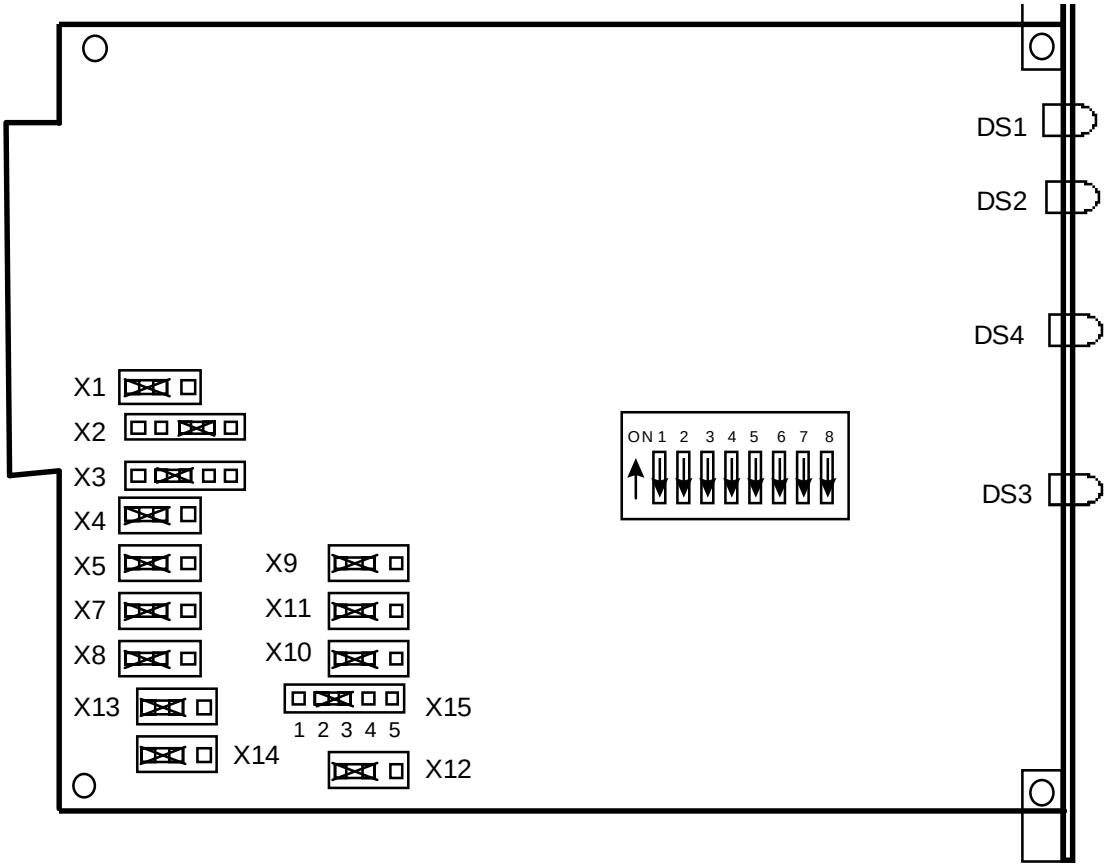


Figure 3-16 Voice II/ASP Channel Module Option Locations

Table 3-44 Voice II/ASP Channel Input Level Adjustment Option

S1-5 (+1 dB)	S1-6 (+0.5 dB)	S1-7 (–2 dB)	S1-8 (–4 dB)	Input Compensation (dB)	Application
ON	ON	OFF	OFF	+1.5	Switches S1-5 through S1-8 select attenuation or amplification for the voice input level. This compensates for cable losses or improper out-put levels from connected telephone equipment. The Switch selects a level of compensation from +1.5 dB to –6.0 dB in 0.5 dB steps. Each segment of Switch S1 selects a level of attenuation or amplification; the individual steps are added to produce a particular level. A level is selected to compensate for some measured deviation of the output level of equipment connected to the channel. The deviation is the difference between the actual level and the nominal level (selected on Switch S1-1).
ON	OFF	OFF	OFF	+11.0	
OFF	ON	OFF	OFF	+0.5	
OFF	OFF	OFF	OFF	0	
ON	ON	ON	OFF	–0.5	
ON	OFF	ON	OFF	–1.0	
OFF	ON	ON	OFF	–1.5	
OFF	OFF	ON	OFF	–2.0	
ON	ON	OFF	ON	–2.5	
ON	OFF	OFF	ON	–3.0	
OFF	ON	OFF	ON	–3.5	
OFF	OFF	OFF	ON	–4.0	
ON	ON	ON	ON	–4.5	
ON	OFF	ON	ON	–5.0	
OFF	ON	ON	ON	–5.5	
OFF	OFF	ON	ON	–6.0	

Table 3-45 Voice II/ASP VF Channel E And M Signaling Type Selection

Signaling Type	Berg Jumper Positions					Signaling States	
	X1	X2	X3	X15	X9,X10,X11,X12	IDLE	BUSY
1	2-3	2-3	2-3	2-3	1-2	0 Vdc OPEN	–12 to –48 Vdc
2	2-3	2-3	1-2	2-3	1-2	0 Vdc	–12 to –48 Vdc
3	2-3	2-3	1-2	2-3	1-2	OPEN	–12 to –48 Vdc
4	1-2	4-5	2-3	2-3	1-2	OPEN	0 Vdc
5	1-2	4-5	2-3	2-3	1-2	OPEN	0 Vdc
U.K.	1-2	4-5	2-3, 4-5	1-2, 3-4	2-3		0 Vdc

Table 3-46 Voice II/ASP Channel E-Lead Polarity Option Selection

Feature	Selection	X13, X14 Position	Application
E-Lead Polarity	Negative Polarity	1-2	Jumpers X13 and X14 select polarity for the E-Lead. These jumper positions depend on the requirements of the equip-ment connected to the ASP channel interface. Normally, the M-Lead detector of the channel equipment provides only a negative voltage and requires a negative polarity E-Lead setting. But if the M-Lead detector provides a positive voltage, the E-Lead polarity should be set to positive.
	Positive Polarity	2-3	

Table 3-47 Voice II/ASP Channel E-Lead State During Loss Of Power Option

Feature	E-Lead State	X4 Position	X5 Position	Application
Loss of Power E-Lead Signaling State	Idle	2-3	2-3	With this selection, the E-Lead is in an Idle state during loss of power.
	Busy	1-2	1-2	With this selection, the E-Lead is in a Busy state during loss of power.

Table 3-48 Voice II/ASP Channel E-Lead Service Interruption Options

Feature	ASP	Jumper Positions	Application
E-Lead State Upon Loss of Sync/Service Interruption	X7 X8	1-2 1-2	The E-Lead is forced Idle 0.5 seconds after sync loss, and then reverts to the Busy state after two seconds.
	X7 X8	2-3 1-2	The E-Lead is forced Busy two seconds after sync loss.
	X7 X8	1-2 2-3	The E-Lead is forced to the Idle state 0.5 seconds after sync loss.
	X7 X8	2-3 2-3	The E-Lead is not affected by loss of sync.

Universal Voice Card Channel Options

Option selection switches and headers are used to configure the various Universal Voice Card configurations to provide the desired voice encoding techniques, input and output levels, signaling types, and service interruption requirements. Voice encoding options, unique to each type of Universal Voice Card, are selected using Switch S1 on the card (*See Figure 3-17*). *Table 3-49* defines the switch positions, the corresponding part number of the Universal Voice Card, and the application of each voice type. Option selections for input and output levels, signaling types, and service interruption requirements are common for all versions of the card and are selected using Switch S2 and Headers X1 through X12 (*See Figure 3-17* and *Table 3-50 through Table 3-54*).

PCM Voice Encoding

Universal Voice Card P/N 036P265-002 is used for PCM voice encoding. This card furnishes PCM voice encoding at a synchronous data rate of 64 Kbps. Either U.S. or U.K. signaling types can be accommodated. PCM voice encoding with either 2 kHz or 800 Hz may be selected (*See Table 3-49*).

ADPCM Voice Encoding

Universal Voice Card P/N 036P265-003 is used for ADPCM voice encoding. The ADPCM option provides ADPCM voice encoding with 800 Hz overhead and software controlled variable synchronous data rates of 32 Kbps, 24 Kbps, or 16 Kbps with PCM-T (64 Kbps) fallback mode (*See Table 3-49*).

Input and Output Signal Level Option Selections

The PCM and ADPCM versions of the Universal Voice Card accept nominal input levels of –16 dBm and 0 dBm and provide nominal output levels of 0 dBm and +7 dBm. You can choose nominal input and output levels for the voice input and output as described in *Table 3-50*. Nominal input level may be adjusted (to compensate for cable losses or other irregularities) as described in *Table 3-51*. The nominal output level may also be adjusted to achieve additional compensation, but the adjustments are software selectable only. The output level adjustments have the same dBm range as the input level adjustments.

E and M Signaling Options

The E and M signaling subsystem gives you a means of supervisory pulse communications between local and remote telephone networks. The signaling data is transmitted over the same path as the voice data. But additional bandwidth is used for the E and M signaling information.

By selecting various options, the PCM or ADPCM versions of the Universal Voice Card can be configured to support seven types of E and M signaling as described in *Table 3-52*. The M-Lead signaling interface circuits created by the jumper plug positions were previously shown in *Figure 3-14*.

Idle/Busy E-Lead and Voltage Polarity Options

E-Lead inversion and loss of power states are selected by Jumpers X5 and X6 on the Universal Voice Card. These options select the state (BUSY or IDLE) that the E-Lead reverts to when TMS-3000 power is lost. Jumpers X7 and X8 on the Universal Voice Card select the voltage polarity for the E-Lead. The option selections are shown and described in *Table 3-53*.

Service Interruption Options

Four options are available for E-lead operation following either a loss of synchronization or an out-of-service condition. The available options are shown in *Table 3-54*.

Echo Canceller Option

Header X12 (*See Figure 3-17*) is provided for use with the Echo Canceller Piggyback Card. Header X12 allows selection between the incoming transmit PCM from the Codec NORM, or the PCM with echo cancellation from the Echo Canceller Piggyback Card (ECH). Place Jumper X12 in the ECH position if you are using the Echo Canceller Piggyback Card, otherwise it should be left in the NORM position.

Voice Channel Configuration Selections

The Universal Voice Card voice channel software configuration parameters are selected using the Controller for the Transport Management System. The available selections are:

- VF/dB Levels
- ADPCM — Selection of a reduced rate, or the PCM-T (64 Kbps) pass-through mode

Detailed configuration instructions are provided in *GDC 036R603-Vnnn*.

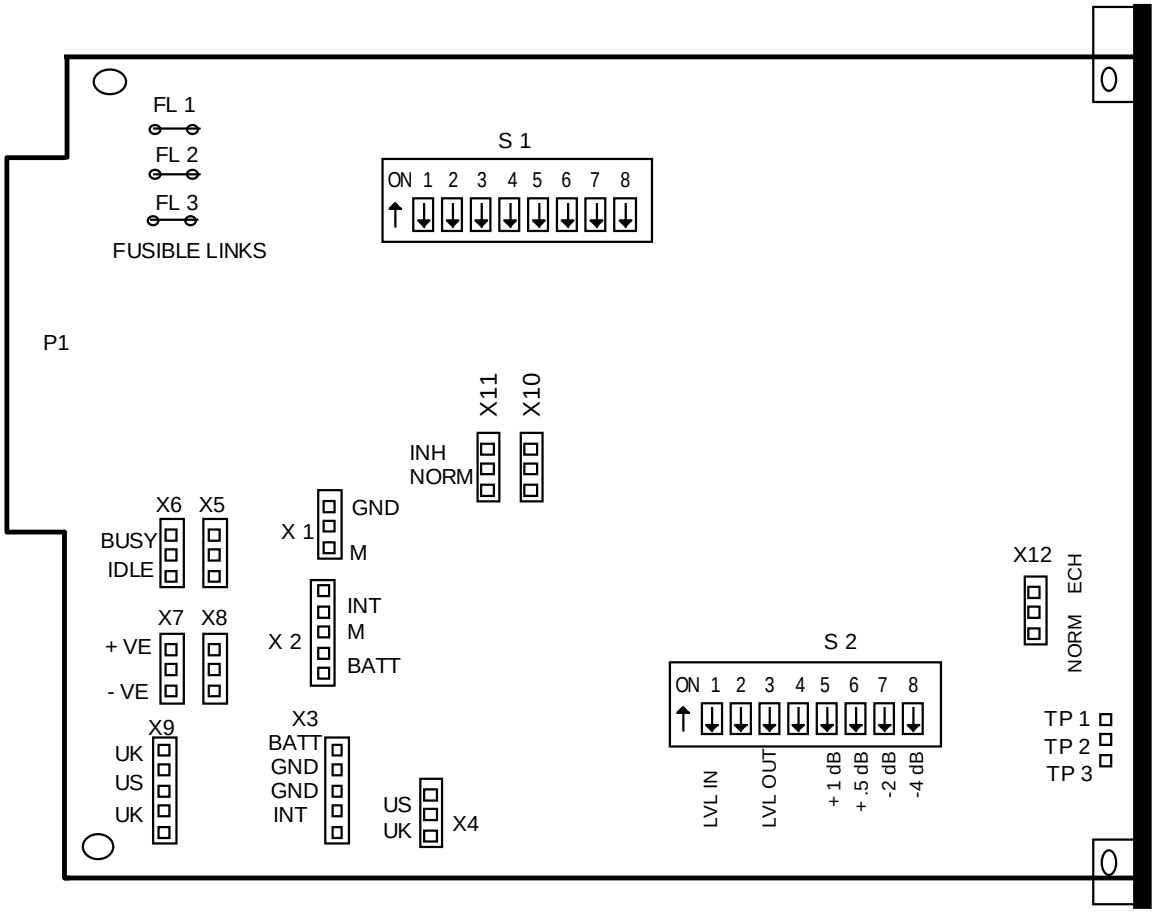


Figure 3-17 Universal Voice Card, Option Switch and Jumper Locations

Table 3-49 Universal Voice Card Voice Encoding Option Selections

Modulation	Voice Card Type	Switch Positions								UVC Used (GDC Part No.)	Application
		S1-1	S1-2	S1-3	S1-4	S1-5	S1-6	S1-7	S1-8		
PCM	PCM	ON	ON	ON	OFF	ON	ON	OFF	ON	036P265-002 036P265-003	Provides PCM encoding at 64 Kbps with-2 kHz over-head (for com-patibility with P/N 036P250 Voice II/PCM cards).
PCM-T	LO-HPCM-VF	OFF	ON	OFF	ON	ON	ON	OFF	OFF	036P265-002 036P265-003	Provides PCM encoding at 64 Kbps with 800-Hz overhead.
ADPCM	ADPCM	ON	ON	ON	ON	ON	ON	ON	OFF	036P265-003	Provides AD-PCM encoding at 32-KHz with 2 kHz overhead (for compatibility with P/N 036M200 and 036M201 cards).
UADPCM	UADPCM IF	OFF	ON	OFF	ON	OFF	ON	ON	OFF	036P265-003	Provides AD-PCM voice en-coding with variable rates and 800-Hz overhead.
ASP	ASP	OFF	ON	ON	OFF	ON	ON	OFF	OFF	036M265-001	Provides ASP en-coding at a rate of 16-KHz, A-law, PCM with PCM-T fallback mode.
ASP	MASP	OFF	ON	OFF	OFF	ON	ON	OFF	OFF	036M265-001	Provides variable rate ASP.
TOR	TOR VF	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	036P265-002 036P265-003	Provides TOR encoding
CADM	CADM VF	OFF	ON	ON	ON	ON	ON	OFF	ON	036P265-012	Provides CADM encoding, Mu-law PCM at 16-KHz.

Table 3-50 Universal Voice Card Input/Output Level Option Selections (Switch S2)

Feature	Selection (dBm)	Switch (S)		Application
		Desig.	Position	
Nominal Input Level	–16 0	S2-1 S2-1	ON OFF	The nominal input level is determined by the nominal output level of the telephone equipment connected to the channel. If actual output levels of connected equipment vary from the nominal levels, Switch S2 may be set to achieve an additional level of compensation.
Nominal Output Level	0 +7	S2-3 S2-3	OFF ON	The nominal output level for the channel is either 0 dBm or +7 dBm. This selection depends on the nominal input level specified for the telephone equipment connected to the channel. Adjusting output level to get more compensation is a software option.
Note: Switch S2 is located on the Analog Universal Voice Card.				

Table 3-51 Universal Voice Card Input Level Adjustment Options (Switch S2)

S2-5 (+1 dB)	S2-6 (+0.5 dB)	S2-7 (–2 dB)	S2-8 (–4 dB)	Input Compensation (dB)	Applications
ON	ON	OFF	OFF	+1,5	Switches S2-5 through S2-8 select attenuation or amplification for the voice input level. This compensates for cable losses or improper output levels from connected telephone equipment. The switch selects a level of compensation from +1.5 dB to –6.0 dB in 0.5 dB steps. Each segment of Switch S2 selects a level of attenuation or amplification; the individual steps are added to produce a particular level. A level is selected to compensate for some measured deviation of the output level of equipment connected to the channel. The deviation is the difference between the actual level and the nominal level (selected on Switch S2-1).
ON	OFF	OFF	OFF	+1.0	
OFF	ON	OFF	OFF	+0.5	
OFF	OFF	OFF	OFF	0	
ON	ON	ON	OFF	–0.5	
ON	OFF	ON	OFF	–1.0	
OFF	ON	ON	OFF	–1.5	
OFF	OFF	ONB	OFF	–2.0	
ON	ON	OFF	ON	–2.5	
ON	OFF	OFF	ON	–3.0	
OFF	ON	OFF	ON	–3.5	
OFF	OFF	OFF	ON	–4.0	
ON	ON	ON	ON	–4.5	
ON	OFF	ON	ON	–5.0	
OFF	ON	ON	ON	–5.5	
OFF	OFF	ON	ON	–6.0	

Table 3-52 Universal Voice Card E And M Signaling Option Selections

Signaling Type	Jumper Positions					Signaling States
	X1	X2	X3	X4, X9	IDLE	BUSY
1	GND	M	GND	U.S.	0 V dc	–12 to –48 V dc
2	GND	M	BATT	U.S.	OPEN	–12 to –48 V dc
3	GND	M	BATT	U.S.	0 V dc	–12 to –48 V dc
4	M	BATT	GND	U.S.	OPEN	0 V dc
5	M	BATT	GND	U.S.	OPEN	0 V dc
U.K. (SSDC5)	M	BATT	INT/GND	U.K.	OPEN	0 V dc
2*	M	INT	INT	U.S.	OPEN	0 V dc

* For back-to-back signaling with no external battery.

NOTE: Headers X1, X2, X3, X4, and X9 are located on the Universal Voice Card.

Table 3-53 Idle/Busy E-Lead And Voltage Polarity Option Selections

Jumper	Jumper Position	Application
X5 X6	BUSY BUSY	When the E-Lead is used for signaling, loss of TMS-3000 power results in a BUSY E-Lead.
X5 X6	IDLE IDLE	When the E-Lead is used for signaling loss of TMS-3000 power results in an IDLE E-Lead.
X7 X8	+VE +VE (Positive Polarity)	Jumpers X7 and X8 select polarity for the E-Lead. These jumper positions (+ or –) depend on the requirements of the interface. Normally, the M-Lead detector of the channel equipment will provide only a negative voltage and requires a negative (–) polarity E-Lead setting. But if the M-Lead detector provides a positive voltage, the E-Lead polarity should be set to positive (+).
X7 X8	–VE –VE (Negative Polarity)	

NOTE: Headers X5, X6, X7, and X8 are located on the Universal Voice Card.

Table 3-54 E-Lead Service Interruption Options

X10	X11	Application
NORM	NORM	The E-lead is forced to IDLE 0.5 seconds after a service interruption and reverts to BUSY after an additional 2.5 seconds.
NORM	INH	The E-Lead is forced to BUSY 3.0 seconds after a service interruption.
INH	NORM	The E-Lead is forced to IDLE 0.5 seconds after a service interruption.
INH	INH	The E-Lead is not affected by a service interruption.

NOTE: Headers X10 and X11 are located on the Universal Voice Card.

Echo Canceller Card

The Echo Canceller Piggyback Card is a double-sided, printed circuit card assembly with physical dimensions of 4.4 inches by 3.95 inches. It mounts on the Universal Voice Card and is supported by four standoffs. Electrical connections are made by means of a 13-pin header. The Echo Canceller Card contains one right-angle DIP switch mounted near its upper edge, enabling options to be selected without removing the card from the Universal Voice Card.

Echo Canceller Options

The Echo Canceller Card options are selected using Switches S1-1 through S1-5 on the Echo Canceller Card.

In the TMS-3000, the Residual Echo Suppressor option on the Echo Canceller Card is no longer supported. The use of this option may cause the Universal Voice Card to synchronize incorrectly after a loss of sync due to link errors. The Adaptive Bulk Delay feature now has a factory default value of 0 dBm .

Figure 3-18 locates option selection Switch S1. *Table 3-55* defines the option selections.

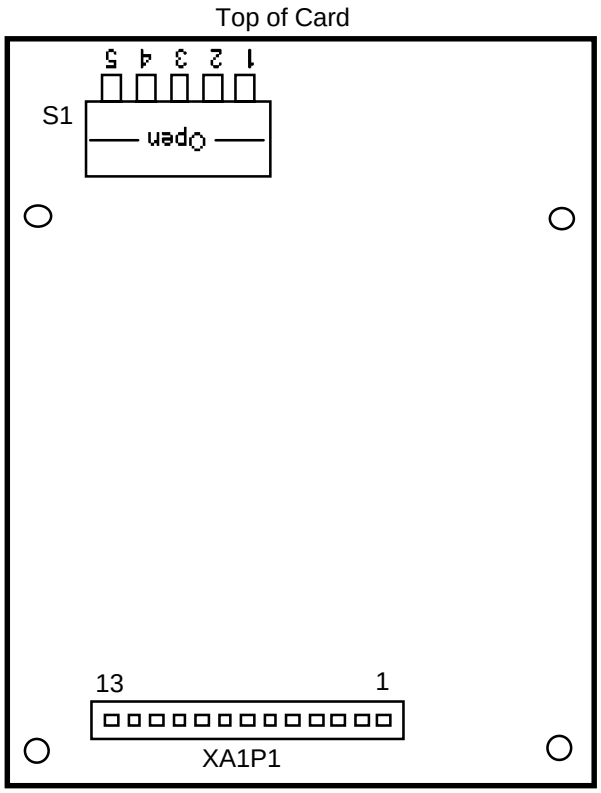


Figure 3-18 Echo Canceller Card Option Switch Location

Table 3-55 Echo Canceller Card Option Selections

Feature	Selection	Switch (S)		Application
		Desig.	Position	
Bulk Delay	0 ms fixed delay	S1-2 S1-3	Closed (Down) Closed (Down)	These switch positions control the length of the bulk delay. The bulk delay is required to enable echo cancellation on tail circuits with a delay in excess of 16 ms. In most situations, the bulk delay value can be determined by trying the three possible settings (0 ms, 7 ms and 14 ms) and then selecting the setting that provides the best results. In cases where the length of the tail circuit varies greatly with different call routings, then the "Adaptive Delay'' setting should be selected to allow the length of the bulk delay to adapt itself to the optimum value for each call. The Echo Canceller Adaptive Bulk Delay Algorithm may not function properly if the digital transmit and receive levels on the voice channel card are not set to be the same and the Echo Canceller may not converge to this situation. It is essential to adjust the gains and losses in the analog circuitry so that a 0 dBm signal at each end of the link results in the same signal level (measured in dBm) at the analog input/output of the PCM CODEC. Therefore, the factory default setting of Bulk Delay option is now 0 ms.
	7 ms fixed delay	S1-2 S1-3	Closed (Down) Open (Up)	
	14 ms fixed delay	S1-2 S1-3	Open (Up) Closed (Down)	
	Adaptive Delay (0 ms initially)	S1-2 S1-3	Open (Up) Open (Up)	
External Line Enable/Disable	Disable Always	S1-4 S1-5	Closed (Down) Closed (Down)	These switch positions control the operation of the external control line. The control line is used by external equipment to enable or disable the Echo Canceller, when required. With the switches set to the external control line. "Disable'' or "Enable'' position, the Echo Canceller is either disabled or enabled when the external control line is grounded.
	Enable Always	S1-4 S1-5	Open (Up) Open (Up)	
	Disable when external control line is grounded	S1-4 S1-5	Closed (Down) Open (Up)	
	Enable when external control line is grounded	S1-4 S1-5	Open (Up) Closed (Down)	With the switches set to the "Disable Always'' or "Enable Always'' position, the Echo Canceller is permanently disabled or enabled regardless of the state of the external control line.

NOTE: Switch S1-1 is to remain in Open (Up) position at all times.

The residual echo suppresser option on the Echo Canceller Card may cause the Universal Voice Card to synchronize incorrectly after a loss of sync due to link errors. The Adaptive Bulk Delay has a factory default of 0 dBm.

Variable Rate ASP Piggyback Card

Either a fixed or variable rate ASP Piggyback card may be installed on the Voice II/ASP or UVC/ASP Channel Module. With the *ASP Piggyback Card GDC 036P259-001* installed, fixed rate ASP at 16 Kbps is provided. With *ASP Piggyback Card, GDC 036P259-002* installed, variable rate ASP rates of 10, 11, 12, and 16 Kbps may be selected by means of the software. The location of option Switch S1 on the ASP Piggyback Card is shown in *Figure 3-18*. The option selections for fixed or variable rate ASP are described in *Table 3-56*.

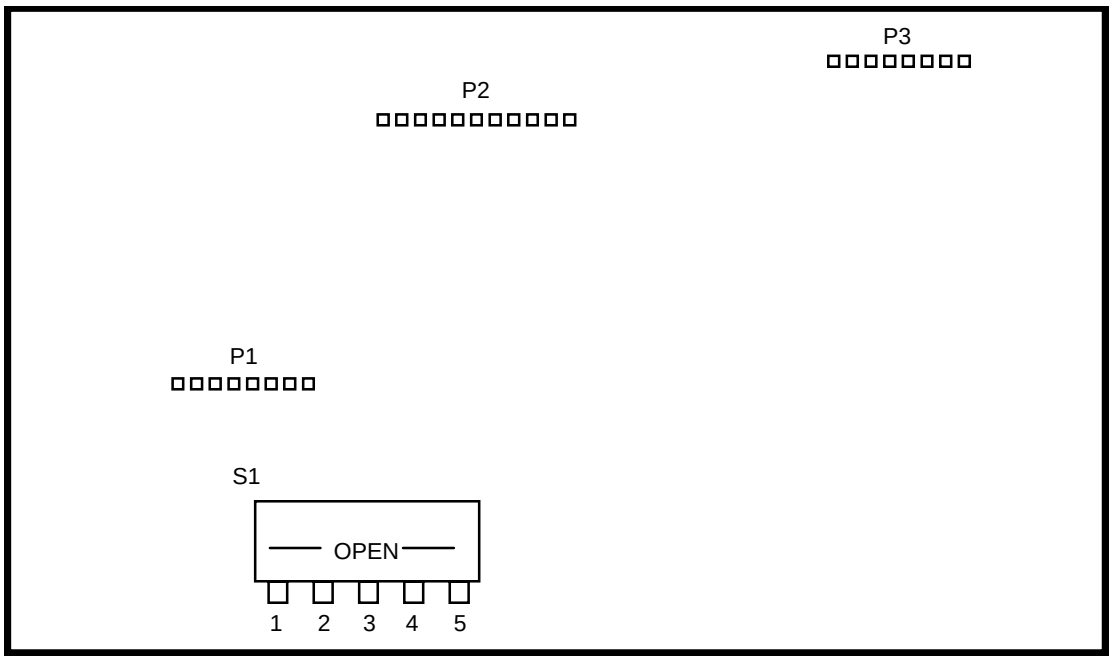


Figure 3-19 Fixed or Variable Rate ASP Piggyback Card, Option Switch S1 Location

Table 3-56 Fixed or Variable Rate ASP Piggyback Card, Option Switch S1 Selection

Switch	Fixed Rate ASP (ASP Piggyback Card 036P259-001)	Variable Rate ASP (ASP Piggyback Card 036P259-002)	Application
S1-1	ON	ON	Fixed rate ASP switch positions provide fixed rate ASP at 16 Kbps. Variable rate ASP switch positions provide software selectable, variable rates of 10, 11, 12, or 16 Kbps.
S1-2	OFF	OFF	
S1-3	OFF	OFF	
S1-4	ON	OFF	
S1-5	OFF	OFF	
		OFF	

Other Channel Cards

There are several other channel cards that can be used in the TMS-3000. The technical manuals that contain detailed information about these cards are listed in *the Preface*. *For OCM channel cards refer to GDC 036R340-000 and associated addendums*.

4 Front Panel Operation

Overview

This chapter provides information about the operation of the LED indicators and test points on the each front panel of TMS cards:

Figure 4-1: Enterprise System Control Card (ESCC) Front Panel (Part 1)

Figure 4-1: Enterprise System Control Card (ESCC) Front Panel (Part 2)

Figure 4-2: Redundancy Control Card (RCC) Front Panel

Figure 4-3: Aggregate Control Card (ACC) Front Panel

Figure 4-4: Channel Interface Card/Digital Bridging Card Front Panel

Figure 4-5: CDA Module Front Panel (T1 and E1 versions)

Figure 4-6: Expansion II Module (EXP) Front Panel

Figure 4-7: Data II Channel Module Front Panel

Figure 4-8: Data III Channel Module Front Panel

Figure 4-9: Data IV Channel Module Front Panel

Figure 4-10: Universal Data Channel Module (UDC) Front Panel

Figure 4-11: Voice II/CVSD Channel Module Front Panel

Figure 4-12: UVC/ASP Channel Module Front Panel

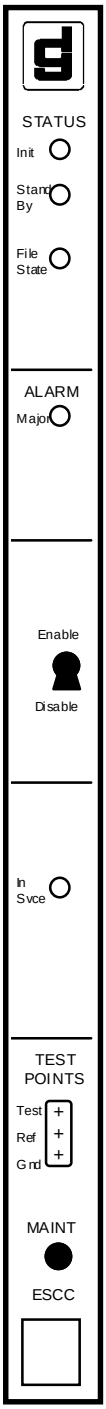
Figure 4-13: Voice II/ASP Channel Module Front Panel

Figure 4-14: TID III Data Channel Module Front Panel Switches and Indicators

Figure 4-15: ADPCM Compression Module (ACM) Front Panel

Figure 4-16: VLBRV Voice Channel Module Front Panel

Figure 4-17: CELP Voice Channel Module Front Panel

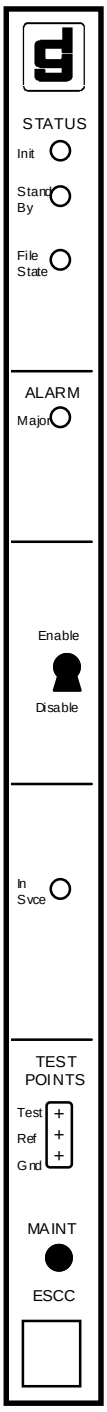


Name	Part	Description
Init	Status LED	Red LED lights during the ESCC initialization sequence (during initialization, the ESCC is not operational).*
Stand By	Status LED	Green LED lights if the ESCC is the idle card of a redundant pair of ESCCs.*
File State	Status LED	Yellow LED lights if the ESCC requires a download of its file system. Flashes when a download of the ESCC file system occurs.*
Major	Alarm LED	Red LED lights if the ESCC experiences a failure that affects its operation. Also lights at power-on reset, but turns off after positive status and self-tests are performed.
Enable-Disable	Switch	Permits installation and removal of the ESCC without disruption of the TMS 3000. Before installing or removing the ESCC into or from a shelf, place the switch in the Disable position. After installation, place the switch in the Enable position after the Init and Major LEDs are lit.
In Svce	LED	Green LED lights when the ESCC is operating.
Test	Test Point	Test point is the 8 kHz clock that is phase-locked to the node reference.
Ref	Test Point	Test point is the incoming reference clock from a master timing source.
Gnd	Test Point	Test point is the ground reference for the other two test points.
Maint	Jack	Connector is used to connect a monitoring device to the ESCC.

NOTE:

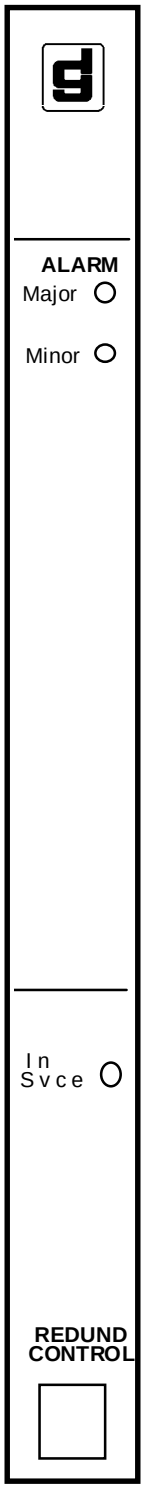
The Init, Standby and File Status LEDs interact when the ESCC card is initializing during a removal and replacement maintenance procedure. See details below. Before removing/replacing the ESCC module, refer to procedures and special considerations in Chapter 6.

Figure 4-1 Enterprise System Control Card Front Panel (Part 1)



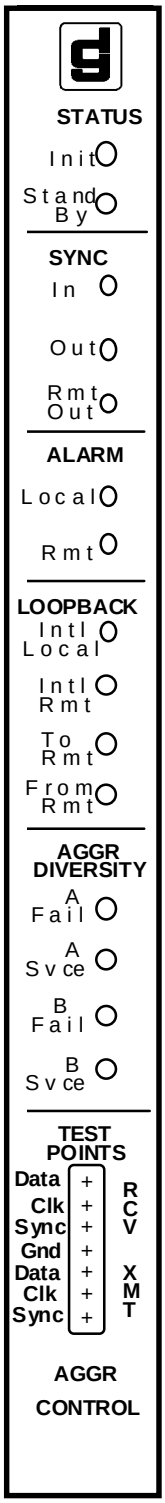
Init LED	Standby LED	File State LED	ESCC Status
On	Off	Off	ESCC is powering-up, running its internal self test, but has yet to determine the state of its file system.
Off	Off	Off	The ESCC has determined that its file system is correct (according to the version information received from the Controller) and it is executing its full feature software. This is the normal operating state for the In Service module.
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.

Figure 4-1 Enterprise System Control Card Front Panel (Part 2: Indicator Interaction)



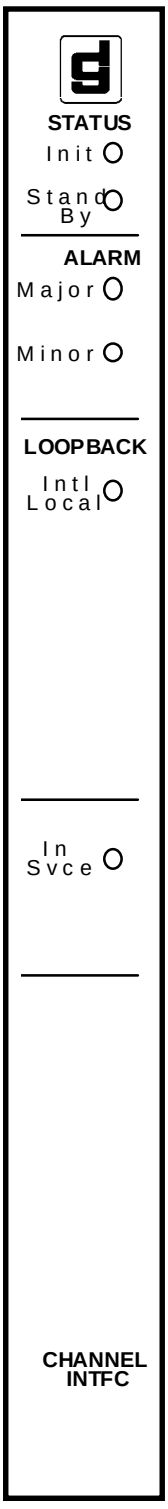
Name	Part	Description
Major	Alarm LED	Red LED lights when there is a failure of one of the common cards.
Minor	Alarm LED	Red LED lights when there is a failure of one of the channel cards.
In Svce	LED	Green LED lights when power is applied to the RCC.

Figure 4-2 Redundancy Control Card, Front Panel



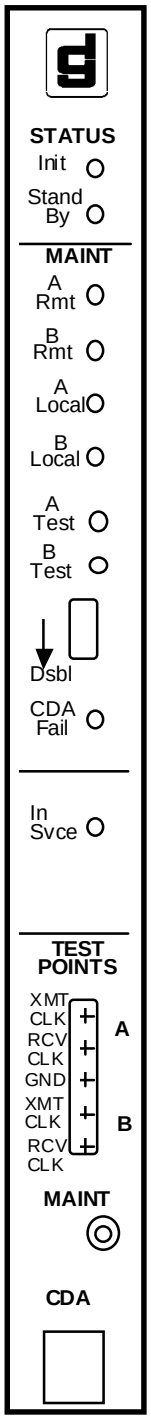
Name	Part	Description
Init	Status LED	Red LED lights during initialization sequence. The board cannot operate during this time.
Stand By	Status LED	Green LED lights if this is the standby card of a redundant pair.
In	Sync LED	Green LED lights when the card is synchronized with received data.
Out	Sync LED	Red LED lights when the card is not synchronized with received data.
Rmt Out	Sync LED	Red LED lights when remote end is not synchronized with its received data.
Local	Alarm LED	Red LED lights if there is a failure in this card. When the LED flashes rapidly, a local software transfer is occuring. When the LED flashes slowly, a remote software transfer is occuring.
Rmt	Alarm LED	Red LED lights if there is a failure in the remote end.
Intl Local	Loop-backLED	Red LED lights if there is an internal local loopback at the aggregate interface (Transmit data is looped back as received data).
Intl Rmt	Loop-backLED	Red LED lights if the remote ACC is in an internal local loopback (Transmit data looped back as receive data at remote aggregate interface).
To Rmt	Loopback LED	Red LED lights when receive data is looped back at the aggregate interface to the remote ACC.
From Rmt	Loopback LED	Red LED lights when data from the local ACC is looped back at the remote aggregate interface.
A(B) Fail	Diversity LED	Red LED lights when the "A (B)" aggregate is not receiving data.
A(B) Svce	Diversity LED	Green LED lights when the "A (B)" aggregate is passing data.
Data (RCV)	Test Point	Receive aggregate data isolated through a 1K ohm resistor.
Clk (RCV)	Test Point	Receive aggregate clock isolated through a 1K ohm resistor.
Sync (RCV)	Test Point	First bit of Frame Receive Not. This bit marks the beginning of each aggregate frame received from the remote aggregate interface (isolated through a 1K ohm resistor).
Gnd	Test Point	Ground Reference Point.
Data (XMT)	Test Point	Transmit aggregate data isolated through a 1K ohm resistor.
Clk (XMT)	Test Point	Transmit aggregate clock isolated through a 1K ohm resistor.
Sync (XMT)	Test Point	End of Frame Not. This bit marks the end of each frame transmitted to the remote aggregate interface (isolated through a 1K ohm resistor).

Figure 4-3 Aggregate Control Card, Front Panel



Name	Part	Description
Init	Status LED	Red LED lights during initialization sequence. The board cannot operate during this time. LED blinks when a local or remote software transfer takes place.
Stand By	Status LED	Green LED lights if this is the standby card of a redundant pair.
Major	Alarm LED	Red LED lights if there is a failure on this CIC.
Minor	Alarm LED	Red LED lights if there is a failure in one of the data or voice channel cards interfaced by this CIC.
Intl Local	Loopback LED	Red LED lights if there is an internal local loopback (Data received from a channel card is looped back to the channel card).
In Svce	LED	Green LED lights when card is in service.

Figure 4-4 Channel Interface Card/Digital Bridging Card, Front Panel

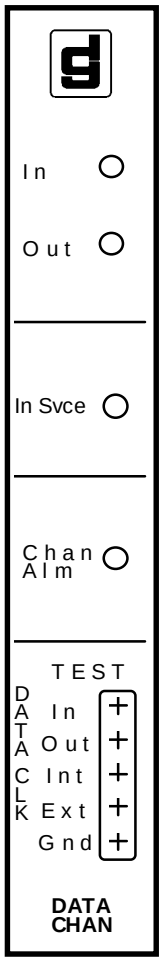


Name	Part	Description
Int	Status LED	Red LED lights during the initialization sequence. The board cannot operate during this time.
Stand By	Status LED	Green LED lights when the CDA module is in the standby mode. Mode is entered in the following ways: Module is inserted and used as a redundant mate to an already in-service module or the module is forced from in-service to standby via a software command from the TMS Controller.
A Rmt	Maint. LED	Amber LED lights if Port A link detects the DS1 remote alarm signal on its receive data stream.
B Rmt	Maint. LED	Amber LED lights if Port B link detects the DS1 remote alarm signal on its receive data stream.
A Local	Maint. LED	Red LED lights if Port A link has lost DS1 sync on its receive data stream.
B Local	Maint. LED	Red LED lights if Port B link has lost DS1 sync on its receive data stream.
A Test	Maint. LED	Red LED lights if the Port A link is under test and not in normal operation.
B Test	Maint. LED	Red LED lights if the Port B link is under test and not in normal operation.
Dsbl	Maint. Switch	Allows you to remove module from service without physically removing it from the shelf. If performed on an in-service CDA of a redundant pair, a redundant switch occurs. If performed on a non-redundant in-service module, module still goes into the standby mode. To return to in-service, toggle switch again, or a presettable software timer resets the module.
CDA Fail	Maint. LED	Red LED lights if the CDA has detected an internal hardware failure.
In Svce	LED	Green LED lights to indicate that the card is in-service.
XMT CLK	Test Point	Port A Transmit Clock isolated through a 1K ohm resistor.
RCV CLK	Test Point	Port A Receive Clock isolated through a 1K ohm resistor.
GND	Test Point	Ground
XMT CLK	Test Point	Port B Transmit Clock isolated through a 1K ohm resistor.
RCV CLK	Test Point	Port B Receive Clock isolated through a 1K ohm resistor.
MAINT	Jack	Port for connecting a maintenance terminal.

Figure 4-5 CDA Module Front Panel (T1 and E1 versions)

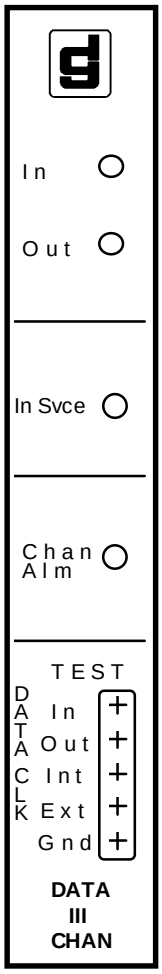
Name	Part	Description
In Svce	LED	In redundant systems, this green LED lights on the Expansion module that currently in operation. In non-redundant systems, this LED should always be lit.

Figure 4-6 Expansion II Module, Front Panel



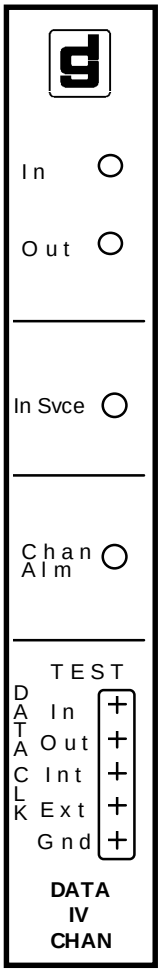
Name	Part	Description
In	LED	Amber LED lights when transmit data into a channel is a space.
Out	LED	Amber LED lights when receive data out of the channel is a space.
In Svce	LED	Green LED lights when the channel is entered in the currently active TMS configuration. This indicates that the card is either operating or prepared to operate according to the parameters entered for that channel in the active configuration.
Chan Alm	LED	Red LED lights when an alarm condition exists in the channel. *Alarm descriptions are in GDC 036R603-Vnnn*.
In	Test Point	Test point for transmit data into the channel. Test point isolated through a 10K ohm resistor.
Out	Test Point	Test point for receive data out of the channel. Test point isolated through a 10K ohm resistor.
Int	Test Point	Test point for internal clock used to process and transfer data between the channel card and the CIC.
Ext	Test Point	Test point for external clock. If DCE interface is selected for the channel, the external timing signal from pin 24 of the channel connector appears here. If DTE interface is selected, the receive timing signal from pin 15 of the channel connector appears here.
Gnd	Test Point	Signal Ground for all measurements.

Figure 4-7 Data II Channel Module Front Panel



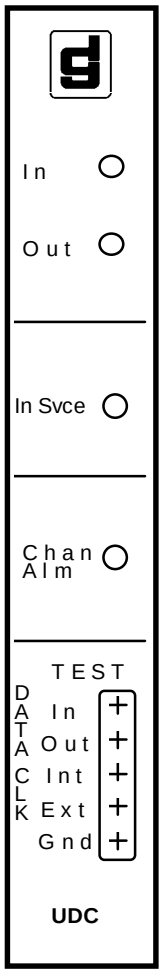
Name	Part	Description
In	LED	Amber LED lights when transmit data into a channel is a space.
Out	LED	Amber LED lights when receive data out of the channel is a space.
In Svce	LED	Green LED lights when the channel is entered in the currently active TMS configuration. This indicates that the card is either operating or prepared to operate according to the parameters entered for that channel in the active configuration.
Chan Alm	LED	Red LED lights when an alarm condition exists in the channel. *Alarm descriptions are in GDC 036R603-Vnnn*.
In	Test Point	Test point for transmit data into the channel. Test point isolated through a 10K ohm resistor.
Out	Test Point	Test point for receive data out of the channel. Test point isolated through a 10K ohm resistor.
Int	Test Point	Test point for internal clock used to process and transfer data between the channel card and the CIC.
Ext	Test Point	Test point for external clock. If DCE interface is selected for the channel, the external timing signal from pin 24 of the channel connector appears here. If DTE interface is selected, the receive timing signal from pin 15 of the channel connector appears here.
Gnd	Test Point	Signal Ground for all measurements.

Figure 4-8 Data III Channel Module Front Panel



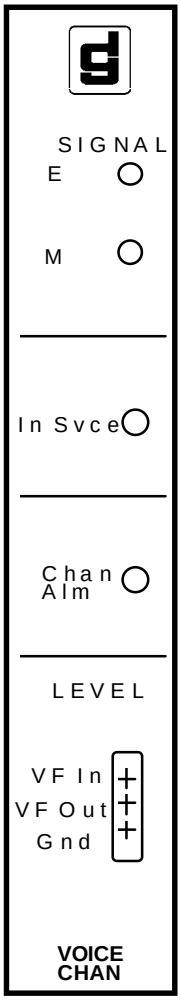
Name	Part	Description
In	LED	Amber LED lights when transmit data into a channel is a space.
Out	LED	Amber LED lights when receive data out of the channel is a space.
In Svce	LED	Green LED lights when the channel is entered in the currently active TMS configuration. This indicates that the card is either operating or prepared to operate according to the parameters entered for that channel in the active configuration.
Chan Alm	LED	Red LED lights when an alarm condition exists in the channel. *Alarm descriptions are in GDC 036R603-Vnnn.*
In	Test Point	Test point for transmit data into the channel. Test point isolated through a 10K ohm resistor.
Out	Test Point	Test point for receive data out of the channel. Test point isolated through a 10K ohm resistor.
Int	Test Point	Test point for internal clock used to process and transfer data between the channel card and the CIC.
Ext	Test Point	Test point for external clock. If DCE interface is selected for the channel, the external timing signal from pin 24 of the channel connector appears here. If DTE interface is selected, the receive timing signal from pin 15 of the channel connector appears here.
Gnd	Test Point	Signal Ground for all measurements.

Figure 4-9 Data IV Channel Module, Front Panel



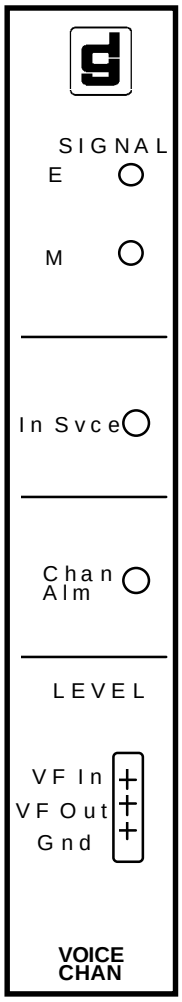
Name	Part	Description
In	LED	Amber LED lights when transmit data into a channel is a space.
Out	LED	Amber LED lights when receive data out of the channel is a space.
In Svce	LED	Green LED lights when the channel is entered in the currently active TMS configuration. This indicates that the card is either operating or prepared to operate according to the parameters entered for that channel in the active configuration.
Chan Alm	LED	Red LED lights when an alarm condition exists in the channel. *Alarm descriptions are in GDC 036R603-Vnnn*.
In	Test Point	Test point for transmit data into the channel. Test point isolated through a 10K ohm resistor.
Out	Test Point	Test point for receive data out of the channel. Test point isolated through a 10K ohm resistor.
Int	Test Point	Test point for internal clock used to process and transfer data between the channel card and the CIC.
Ext	Test Point	Test point for external clock. If DCE interface is selected for channel, the external timing signal from pin 24 of the channel connector appears here. If DTE interface is selected, the receive timing signal from pin 15 of the channel connector appears here.
Gnd	Test Point	Signal Ground for all measurements.

Figure 4-10 Universal Data Channel Module, Front Panel



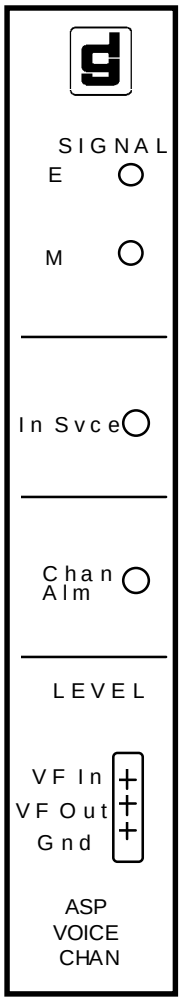
Name	Part	Description
E	Signal LED	Amber LED lights when the E-lead of the voice channel is busy.
M	Signal LED	Amber LED lights when the M-lead of the voice channel is busy.
In Svce	LED	Green LED lights when the channel is entered in the currently active TMS configuration. This indicates that the card is either operating or prepared to operate according to the parameters entered for that channel in the active configuration.
Chan Alm	LED	Red LED lights when an alarm condition exists in the channel. *Alarm descriptions are in GDC 036R603-Vnnn*.
VF In	Test Point	Test point for bridged measurement of Voice Channel VF input level. Test point isolated through a 10K ohm resistor.
VF Out	Test Point	Test point for bridged measurement of Voice Channel VF output level. Test point isolated through a 10K ohm resistor.
Gnd	Test Point	Ground for VF input and VF output measurement.

Figure 4-11 Voice II/CVSD Channel Module, Front Panel



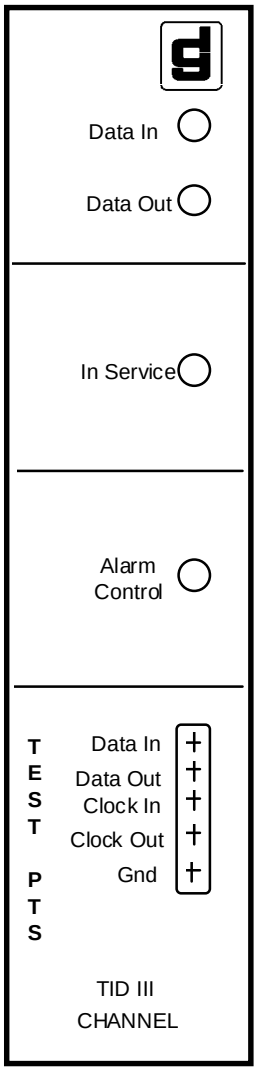
Name	Part	Description
E	Signal LED	Amber LED lights when the E-lead of the voice channel is busy.
M	Signal LED	Amber LED lights when the M-lead of the voice channel is busy.
In Svce	LED	Green LED lights when the channel is entered in the currently active TMS configuration. This indicates that the card is either operating or prepared to operate according to the parameters entered for that channel in the active configuration.
Chan Alm	LED	Red LED lights when an alarm condition exists in the channel. *Alarm descriptions are in GDC 036R603-Vnnn.*
VF In	Test Point	Test point for bridged measurement of Voice Channel VF input level. Test point isolated through a 10K ohm resistor.
VF Out	Test Point	Test point for bridged measurement of Voice Channel VF output level. Test point isolated through a 10K ohm resistor.
Gnd	Test Point	Ground for VF input and VF output measurement.

Figure 4-12 UVC/ASP Channel Module, Front Panel



Name	Part	Description
E	Signal LED	Amber LED lights when the E-lead of the voice channel is busy.
M	Signal LED	Amber LED lights when the M-lead of the voice channel is busy.
In Svce	LED	Green LED lights when the channel is entered in the currently active TMS configuration. This indicates that the card is either operating or prepared to operate according to the parameters entered for that channel in the active configuration.
Chan Alm	LED	Red LED lights when an alarm condition exists in the channel. *Alarm descriptions are in GDC 036R603-Vnnn*.
VF In	Test Point	Test point for bridged measurement of Voice Channel VF input level. Test point isolated through a 10K ohm resistor.
VF Out	Test Point	Test point for bridged measurement of Voice Channel VF output level. Test point isolated through a 10K ohm resistor.
Gnd	Test Point	Ground for VF input and VF output measurement.

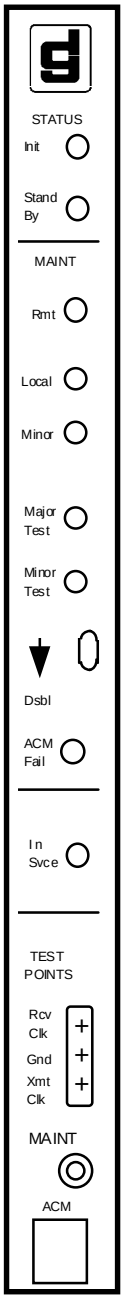
Figure 4-13 Voice II/ASP Channel Module, Front Panel



Name	Part	Description
Data In	LED	Indicates data activity is being transmitted by the module. A space (high) lights the amber LED.
DataOut	LED	Indicates data activity is being received by the module. A space (high) lights the amber LED.
In Svce	LED	Green LED lights when the TID-III channel is entered in the currently active TMS configuration. This indicates that the card is either operating or prepared to operate according to parameters entered for that channel in the active configuration.
Alarm Control	LED	Red LED lights when an alarm condition exists in the channel. Alarm messages are described in GDC 036R603-Vnnn.
Data in	Test Point	Transmit data into the channel. Test point is isolated through a 1K ohm resistor.
Data Out	Test Point	Transmit data out of the channel. Test point is isolated through a 1K ohm resistor.
Clock In	Test Point	The clock from the customer interface which is encoded and transmitted to the remote end. Test point is isolated through a 1K ohm resistor.
Clock Out	Test Point	The regenerative receive clock based on timing from the remote channel. Test point is isolated through a 1K ohm resistor.
Gnd	Test Point	Signal ground for all measurements.

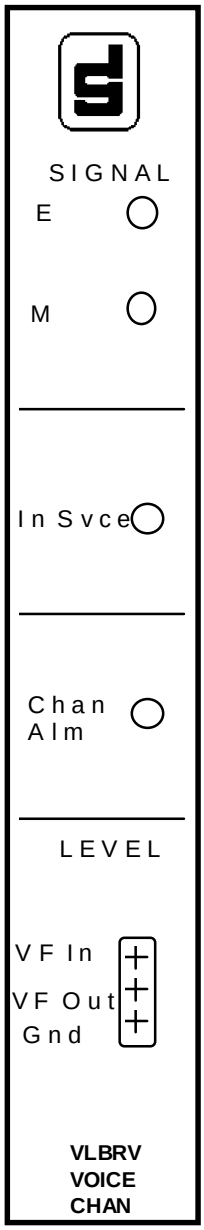
Figure 4-14 TID III Data Channel Module Front Panel Switches and Indicators

Note that any reset condition causes all LEDs to light for about one second.



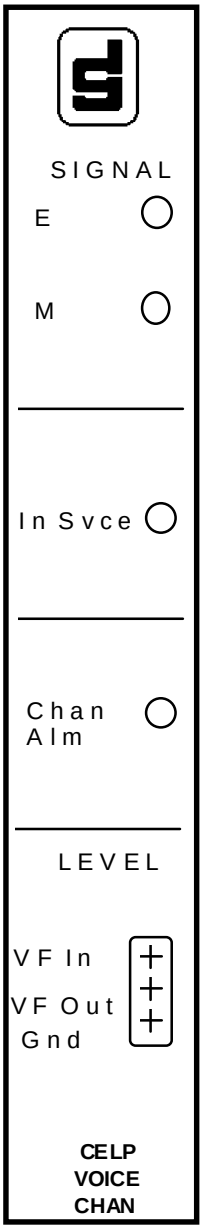
Name	Part	Description
Init	Status LED	Red LED lights when the ACM is executing the boot program.
Stand By	Status LED	Green LED lights during self diagnostic test. If a failure occurs, LED is de-activated making ACM unavailable for automatic redundancy operation. LED also indicates which ACM is attached to the aggregate. The LED is active after initialization and is controlled by a microprocessor. *ACM self diagnostic tests are described in Chapter 2*. If lit during a configuration download, it indicates the ACM is unconfigured, or the out-of-service card is ready to go in service.
Rmt	Maint. LED	Yellow LED lights when a receiving ACM has detected a yellow carrier fail alarm signal. The minimum detection time is 335-msec for a superframe format. Maximum detection time is 1-second. LED is disabled when the ACM is not in service. The remote alarm is the equivalent of the yellow CFA alarm.
Local	Maint. LED	Red LED is triggered by continuous loss of framing or by an intermittent out-of-frame condition in an incoming signal. The local alarm is the equivalent of the AT&T red alarm. The LED is disabled when the ACM is not in service during configuration download. When the Stand By LED and Local Alarm LED are both lit, it indicates incorrect configuration loaded due to incorrect hardware, PC board, or software version.
Minor	Maint. LED	Red LED lights when status transitions are reported from various areas in the ACM are detected (e.g., any channel having any type of fault).
Major Test	Maint. LED	Red LED informs you that a power on self-test is in progress. The LED flashes during a program download. The flashing persists as long as download packets are received from the node. If packets are not received for two seconds, the flashing stops; if the download resumes within the download failure timeout period, the flashing resumes as the next download packet is received.
Minor Test	Maint. LED	Red LED is on when the ACM is performing channel loopbacks only. The LED goes off when tests are completed.
Dsbl	Maint. Switch	Pressing the switch isolates the ACM from the port and the node. Press the switch before the board is removed from the shelf. This minimizes problems caused by the line drivers on the backplane. If the switch is toggled again before removing the card, the ACM reverts to a boot program. In a redundant system, toggling causes a redundant switch by forcing the ACM out-of-service. When the ACM is disabled, all front panel LEDs are off.
ACM Fail	Maint. LED	Red LED lights when the ACM fails a self diagnostic test or when it is unable to function properly in the boot program.
In Svce	LED	Green LED lights to indicate that the card is in-service.
Rcv Clk	Test Point	Receive Aggregate Clock isolated through a 1K ohm resistor.
Gnd	Test Point	Ground
Xmt Clock	Test Point	Transmit Aggregate Clock isolated through a 1K ohm resistor.
MAINT	Jack	Port for connecting a maintenance terminal.

Figure 4-15 ADPCM Compression Module, Front Panel



Name	Part	Description
E	Signal LED	Amber LED lights when the E-lead of the voice channel is busy. Output from the VLBRV is in the form of a solid state switch. Low resistance equals a busy condition (E-lead to ground).
M	Signal LED	Amber LED lights when the M-lead of the voice channel is busy. E-signal is a product of the remote channels M-signal.
In Svce	LED	Green LED lights when the channel is entered in the currently active TMS configuration. This indicates that the card is either operating or prepared to operate according to the parameters entered for that channel in the active configuration.
Chan Alm	LED	Red LED lights when an alarm condition exists in the channel. Alarm messages are described in GDC 036R603-Vnnn.
VF In	Test Point	For bridged measurement of voice channel VF input level to the transmit section. Isolated through a 10K ohm resistor. Input levels should be 0 dBm or –16.0 dBm.
VF Out	Test Point	For bridged measurement of voice channel VF output level from the receive section. Isolated through a 10K ohm resistor. Input levels should be 0 dBm or +7.0 dBm.
Gnd	Test Point	Analog ground point for VF input and VF output measurement.

Figure 4-16 VLBRV Voice Channel Module Front Panel



Name	LED	Description
E	Signal LED	Amber LED lights when the E-lead of the voice channel is busy. Output is in the form of a solid state switch. Low resistance equals a busy condition (E-lead to ground). E-signal is a product of the remote channels M-signal.
M	Signal LED	Amber LED lights when the M-lead of the voice channel is busy.
In Svce	Signal LED	Green LED lights when the channel is entered in the currently active TMS configuration. This indicates that the card is either operating or prepared to operate according to the parameters entered for that channel in the active configuration. When off, the channel is out-of-service and the control leads are conditioned.
Chan Alm	LED	Red LED lights when an alarm condition exists in the channel. Alarm messages are described in GDC 036R603-Vnnn.
VF In	Test Point	For bridged measurement of voice channel VF input level to the transmit section. Isolated through a 10K ohm resistor. Input levels should be 0 dBm or –16.0 dBm. This test point is a high impedance input and is not for injection of tones.
VF Out	Test Point	For bridged measurement of voice channel VF output level from the receive section. Isolated through a 10K ohm resistor. Input levels should be 0 dBm or +7.0 dBm.
Gnd	Test Point	Analog ground point for VF input and VF output measurement.

Figure 4-17 CELP Voice Channel Module, Front Panel

5 TMS Controllers

TMS Controller Overview

The TMS-3000 controller is an intuitive, PC-based management system that uses GDC's TMS Software (GTS) for end-to-end network configuration, control, alarm reporting, and diagnostics from up to six controller locations. The SCO OpenServer operating system, the Informix software and the GTS software is completely loaded and tested at General DataComm before your system is shipped.

The chapter provides basic information on the TMS Controller, including keyboard conventions, screen format, printer options, and basic controller procedures such as configuration, startup, maintenance procedures and guidelines for multi-controller network environments.

NOTE: Previous versions of the TMS-3000 Controller (GTS Version 2.2.0 and earlier) support two optional DigiBoard Multiport Input/Output cards in a XENIX-based workstation. GTS Version 5.0.0 and later is shipped from the factory on a PC-based Pentium IV-class workstation that includes one 4-port DigiBoard card.

NOTE If your TMS network has both older TMS-3000 controllers (Version 2.20 or lower) and newer controllers (Version 5.0.0 or higher), refer to the latest GTS Release Notes for additional guidelines.

NOTE Previous versions of the TMS-3000 Controller (GTS Version 2.2.0 and earlier) support dial backup from the controller to the node. GTS Version 5.0.0 does not support that specific dial backup application.

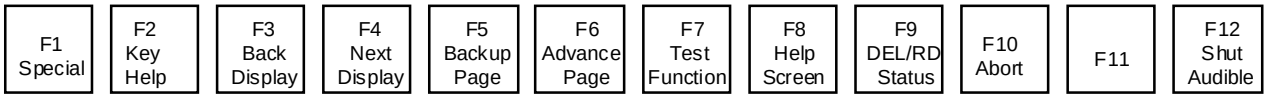
TMS-3000 Controller Operation Manuals & Help

Operation of the TMS-3000 Controller is described in the TMS-3000 Controller Operation Manual (036R603-V*nnn*, where V*nnn* refers to the software version). The information in that paper-based, PDF manual is also provided in a "disk-based" manual on the TMS-3000 Controller and embedded in the context-sensitive Help function. The disk-based manual provides:

- Menu-driven selection
- Cursor position selection method
- Option to have information displayed on the Controller CRT screen or printed from the Controller printer port.

Function Keys

The function keys (F1 through F12 at the top of the keyboard) are the primary means of selecting and exiting from TMS-3000 routines. The keys also step between display pages within a routine. These keys are illustrated and described below.



F1 Special

This key functions similarly to a shift key on a keyboard. It selects an alternate function for any function key or keys in the numeric key pad. Whenever the Special key must be used to obtain an alternate key function, this is indicated.

F2 Help

This key selects Help screens for the function keys and the numeric keypad keys. Once you have selected Help, select information on a key by pressing that key. The Help screen for that key appears. Help screens contain directions for returning to TMS-3000 displays.

F3 Back Display

This key steps backward through a sequence of displays and menus, reversing the steps that you followed to enter that routine. This is the normal method of exiting from a routine. Repeatedly pressing F3 brings you back to the TMS-3000 Main Menu.

Take care in using F3 to exit a Diagnostic routine. Some TMS-3000 tests continue to run until stopped. If you exit a test routine by using F3, make sure you end the test first if you don't want it to continue.`

F4 Next Display

This key steps forward through a display sequence in those instances where there is only one possible forward sequence (no menu or other choices required). In the Modify Node Equipment Routine, this key selects the Aggregate Configuration and Channel Configuration displays when the cursor is positioned at a parameter field for that node component in the Modify Node Equipment display.

F5 Backup Page

This key is used in routines that require more than one display page for a particular display. Pressing this key returns the previous display page to the screen.

F6 Advance Page

This key is used in routines that require more than one display page for a particular display. Pressing this key brings the next display page to the screen.

F7 Test Function

This key is used in status and diagnostic routines for channels. In specific applications, it is pressed to start a test or select a display (the screen directs you whenever this key is required).

F8 Help Screen

This key selects the Disk-Based Manual topic that is most relevant to the current operating routine.

F9 Del/Read Status

This key steps through the status messages displayed on the Status Line (the lower green line in all displays). Each message is deleted after it appears unless you press the F1 key before pressing the F9 key.

The message queues can hold up to forty messages. The messages report important events occurring in the system. When such an event occurs, the normal alarm information is overwritten by the resulting status message, and the line becomes yellow. You must then press the Status Message key up to forty times to return the normal alarm information to the status line.

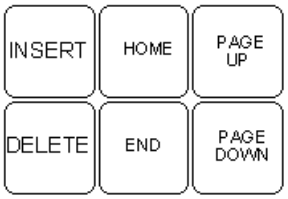
F10 Abort

This key aborts the retrieval of active or historical alarm messages from the alarm data base.

F12 Shut Audible

This key lets you turn off the terminal beep for the current alarm. When a new alarm is received, the beep resumes. To shut off the beep permanently, select NO for terminal beep in the Modify Alarm Handling screen.

Editing Keys



The editing keys (located in the block of keys at the right side of the keyboard) provide utilities for entering and changing information within configuration displays.

Insert

This key functions exactly like the `Enter` key in the main section of the keyboard. It may be used to:

- Select a menu item (with the cursor positioned at that entry)
- Step forward through a limited range of values
- Enter a response to a prompt (such as Y for Yes)

Home

This key restores a previously entered character string to a string field while the cursor is positioned at that field.

Page Up

This key deletes an entire character string in a field when the cursor is positioned at that field.

Delete

This key deletes a single character within a character string entry. The character at the current cursor position is deleted. Characters to the right of the cursor shift one position to the left.

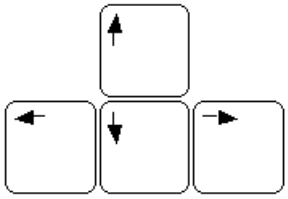
End

In a limited range entry, this key steps backward (that is, the reverse order from that obtained by the `Enter`/Step Forward key) through the list of selections.

Page Down

This key, when pressed alone, deletes all characters from the right of the cursor to the next space in the field. When pressed simultaneously with F1, it restores a word previously deleted by the Del Wrd key.

Cursor Position Keys



The cursor position keys move the cursor to desired menu/display locations.

Cursor Up

This key moves the cursor in an upward direction to the next highest modifiable parameter field on the screen. When the cursor reaches the topmost position on the screen, it “wraps” to the bottom of the screen when you press the key again.

Cursor Left

This key moves the cursor to the left, between each modifiable parameter field on the screen. When the cursor reaches the left-most position on the screen, it “wraps” to the left side of the screen and also moves up to the next row of modifiable fields. Within a character string field, the cursor moves only to the left until it reaches the left-most character position of the field. You must use the up or down cursor to exit the field.

Cursor Right

This key moves the cursor to the right between each modifiable parameter field on the screen. When the cursor reaches the right-most position on the screen, it “wraps” to the left side of the screen and also moves down to the next row of “live” fields. Within a character string field, the cursor moves to the right only until it reaches the right-most character position of the field. You must use the up or down cursor to exit the field.

Cursor Down

This key moves the cursor down to the next lowest modifiable parameter field on the screen. If the cursor reaches the bottom field, it “wraps” to the top of the field when you press the Cursor Down key. This key also moves the cursor out of a character string field. When the cursor leaves the field, the character string is complete until you reenter that field.

Alphanumeric/ASCII Keys

These keys are enabled by the Controller whenever a character string entry or numerical range entry is required. When entering a character string, you may use any character shown on the main keyboard (alphabet characters, numbers, punctuation marks, etc.). The first character of a character string must, however, be an alphabet character.

Enter Key

The Enter key is used in several ways to select, enter, and perform Controller operations.

- Select a menu item (with the cursor positioned at that entry)
- Step through a limited range of values for a configuration entry
- Enter a response to a prompt (such as Y for Yes)

Control Key Combinations

Combinations of the Ctrl (Control) key and various alphabet keys select specific controller functions, described below.

Screen Print/Control P

To print the current screen, press the Ctrl and the P keys simultaneously. The screen display is immediately printed to either LP0 or LP3, depending on which one was selected in Controller Maintenance (Configure Parallel Ports).

Flow Control/Control S

To "freeze" the screen, press the Ctrl and the S keys simultaneously. The display remains locked after this action. To resume normal operation, press any key on the keyboard.

Restore Field/Control X

This restores the previously stored character string to the field. Press the Ctrl and X keys simultaneously.

Refresh Screen/Control W

To refresh the screen, press the Ctrl and the W keys simultaneously. The reverse video disappears (except when the cursor is in a prompt or string field) until the next keystroke is entered.

Screen Format

TMS-3000 Control System information is framed within a screen format that provides as much information as possible concerning the current status of the system, regardless of what routine is running. The Controller screen is 80 characters wide, with 25 lines from the top to the bottom of the screen. The top line of the display is highlighted in green and reports the following:

- Name of Currently Displayed Menu or Routine
- Current Software Version or Network Currently Displayed
- Current Time/Date

The next 20 lines are the display window (or "page") for the TMS-3000 operating routines. All menus and displays occur on these 20 lines. Any display that contains too much information to fit into this window is divided into two or more pages. You use the Advance Page (F6) and Back-up Page (F5) to change pages for these displays.

Line 22 is reserved for system messages and prompts from the Controller. The messages report error conditions and indicate intermediate processes (such as Searching For Node) that may delay initiation of a routine. The prompts solicit information required in the course of a routine (node, circuit, or route names, for example) and enable you to save configuration changes before exiting a routine.

Line 23, called the alarm/status line and normally highlighted in green or yellow, reports network status information. The on-line network and active configuration are reported. The number of Active alarms (those alarm conditions which exist presently in the network) are reported in three categories — Major, Minor, and Warning.

A Major Alarm indicates a failure which could disrupt the flow of network traffic (usually disrupts a group of channels or an aggregate trunk). A Minor Alarm indicates a failure of a lesser extent (usually disrupts only a single channel). A Warning Alarm is for information about an event that has occurred in the system.

Line 23 also displays status messages from "asynchronous" processes occurring in the network. For example, a downloading operation in a complex network may take several minutes. Complete messages from the download appear in this status line.

This report facility frees the Controller to perform other tasks in the "foreground," while a time-consuming process runs in the "background."

The alarm/status line is blue whenever a status message is present. Up to forty status messages may be stored for display on the status line. The function key F9 is used to step through each status message present and delete them after display. You may read these messages without deleting them by pressing F1 before pressing the F9 key. With either display method, the green alarm line is eventually returned to the screen. As many as 40 such messages may be accessible through this line.

Lines 24 and 25 report the two most recent alarm messages received from the network by the Controller.

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

General Operating Procedures

TMS-3000 Controller operation is characterized by:

- Menu-Driven Selection of Operating Routines
- Cursor Position Selection Method
- Prompt/Message System Responses
- Predefined Key Functions
- Formatted Screen Displays

The first step in entering TMS-3000 operating procedures is password entry — you must enter a Login Name and a Password to gain access to the system.

The display then presents the TMS-3000 Main Menu. The tasks required to initialize, configure, and maintain a TMS-3000 system are represented by the entries in the main menu. MAIN MENU FUNCTIONS describes each item in the TMS-3000 Main Menu.

To select an entry from the main menu, move the cursor to the desired entry and press the `Enter` key. Another menu appears listing the operating routines that perform specific functions. Select an entry from this menu in the same manner. Depending on the particular task that you wish to perform, you may encounter another level of menus or enter the operating routine that performs the task.

As you step through menus to initiate a routine, you may need to specify a node or other device that the operating routine is directed toward. For example, to select a status display for a node, you must enter the symbolic name of that node. At these points, the system prompts you to enter the symbolic name or other information required and highlights a field where the entered characters appear.

A typical prompt is:

```
Enter Node Name:
```

You answer this prompt by typing in an already configured symbolic name for the node, and pressing the `Enter` key. If you make a mistake, such as typing the node name incorrectly, the system reports the problem through a message such as:

```
Node Does Not Exist. Continue? [Default YES (Y/N)]
```

To enter another node, answer **Yes** (or simply **Y**). Entering **No** (or **N**) returns you to the previous level of menus. If you press the `Enter` key without entering an answer, the default response shown is selected (in this case, pressing the `Enter` key is interpreted as a Yes response).

These prompts and messages always appear on line 22 of the screen. Whenever any event or problem occurs that should be reported, messages and prompts appear on that line.

When you reach an operating routine, a display related to that routine is presented. Depending on the exact nature of the routine, you probably must supply some information as you use the routine. The information is located in labeled fields in each display.

For example, the configuration routines require the entry of much specific information that defines equipment operation and desired modes of operation for the equipment at a node.

Several types of entries are used to supply information to the system. They are Cursor Position Entry, String Entry, and Limited Range Entry. For detailed descriptions of these entry types, refer to Entry Types.

After completing all entries, or having finished with an operating routine, press F3 to exit from the routine. You may have to respond to a prompt, such as:

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

Repeatedly pressing F3 brings you back to the TMS-3000 Main Menu. You also may have to answer prompts to return there.

Use the other Function Keys and Editing Keys to accomplish specialized operating functions in the TMS-3000 system. While most operations may be performed in the manner described above, these keys enable you to operate the system more efficiently.

Entry Types

Three types of entries supply information to the TMS-3000 controller. The entry types are:

- Cursor Position Entry
- String Entry
- Limited Range Entry.

Cursor Position Entry

This entry is made by moving the cursor (using the cursor position or “arrow” keys) to the desired field and pressing the `Enter` key. Normally, a cursor position entry selects an item from a menu. The menu may occupy an entire screen or only a small section of a screen.

When you move the cursor to a desired field, it becomes highlighted in white, with black letters.

Making a cursor position entry usually results in the initiation of a new routine. In some situations, a function may be selected for the current display. For example, some configuration displays contain a Delete field within them.

You may select the Delete field by positioning the cursor at that field and pressing `Enter`.

String Entry

Any symbolic name, password, number, or other sequence of characters that must be entered is a character string entry.

String entries perform several functions. A password allows access to a routine. A symbolic name represents some unique entity in the network (including the network itself) and functions as an address for that device. Some strings function only as reference information for an operator of a TMS-3000 Controller (for example, names and street addresses for node sites).

A numerical entry is a form of string entry. The only difference between a numerical string and any other character string is that each entry must be within some numerical range. For example, the node address of a TMS-3000 node must be between 1 and 126.

The TMS-3000 Controller does not accept any TMS node numbers higher than 126, or OCM node numbers higher than 9999.

To make a string entry, move the cursor to the desired field. The selected field is highlighted in cyan (light greenish-blue) and the characters are displayed in black. Enter the character string, and press the `Enter` key. The TMS-3000 Controller then accepts the string as complete. You may also move the cursor out of a string field using the up or down cursor position (arrow) keys. When the cursor leaves the field, the string is complete.

When you have completed an entry (by pressing the `Enter` key or moving the cursor out of the field) the TMS-3000 Controller checks the entry for correctness. A node name, for example, is not accepted if the name has already been used to identify another node. You can, however, apply the same name to two different logical components. A node and a circuit may both be named A, for example.

The editing keys on the keyboard (labeled Insert, Home, Page Up, Delete, End, and Page Down) support editing functions for character strings. While many of these functions are not required for string entry, they may enable greater speed and accuracy in character string entry.

If you enter a character string field and wish to exit it without entering a string, press the key marked Page Up. This key is the Delete Field editing key and deletes all characters in the field. The TMS-3000 Controller does not let you exit a string field while an invalid entry remains in the field.

When you highlight a character string field, the number of characters that may be included for that particular entry is indicated. A password may have up to 16 characters.

The number of characters allowed for the fields is:

- 16 – Network
- 8 – Configuration
- 16 – Node
- 20 – Circuit (including the ".nnn" extension)
- 16 – Group
- 16 – Trunk

Limited Range Entry

For many system parameters entered in a routine you must select one of a limited number of entries.

For example, a node type could be either a TMS-3000 node or a Universal MM+ V4 node. This particular parameter is selected as a limited range entry. The field displays sequentially each possible entry for the parameter, and you step through the range of entries until the proper choice appears.

To select a limited range entry, move the cursor to the desired field and press the `Enter` key repeatedly until the desired parameter appears. When you move the cursor to a limited range entry field, the field is highlighted in white, and the characters are displayed in blue.

CRT Link

An interactive control port for the TMS-3000 Controller may be extended to a remote site. This application uses the CRT link facility to control TMS-3000 through a remote operator's CRT.

Connections at the TMS-3000 Controller site are made to Serial Port 00 (com 0) at the back of the controller. The remote operator terminal supports all functions of the Controller keyboard. Keys F1 through F10 and F12 on the remote keyboard perform operations equivalent to those of the Controller keyboard (when used with the Controller).

The Controller is a single-user system. You cannot use the Controller interface and the CRT Link interface simultaneously.

If you log in through a CRT Link interface while another person is using the Controller console, the screen indicates that the software is busy on tty--.

To ensure that only one user is logged in to the controller at one time, follow these procedures when using the CRT Link to operate the TMS-3000 network:

1. Select the Configure Serial Ports routine (found under the Controller Maintenance Menu) and make sure that Port 1 is enabled and the data rate is correct.
2. Make sure that any network operations (such as diagnostics or downloads) have been completed. Return the Network Access menu to the controller CRT screen. Power must remain on in the Controller to operate the CRT Link.
3. Log in through the operator terminal that is being used as the CRT Link by typing **gts** at the `login` prompt.
4. When finished using the CRT Link interface, make sure that any operations initiated from the CRT Link interface have been completed. Then return to the `Network Access` menu and log out.

   After you log out using the CRT link, you have three minutes before control is lost and is taken over by the TMS Controller. To cancel this three-minute timer, log into a network on the CRT link interface.
5. Resume operations through the Controller interface. The serial port becomes disabled when returning from the CRT Link to the Controller. With the port disabled, no further operations are initiated through the CRT Link.

Printer Options

Controller software includes routines that print an entire network configuration, IAR data, Alarm Reports, or individual screens. These routines are described in *GDC 036R603-Vnnn, Chapter 41*.

Multiport I/O Card

The DigiBoard Multiport I/O card in the Controller provides an additional four I/O ports that are configured at the I/O Port Configuration screen.

NOTE: Previous versions of the TMS-3000 Controller (GTS Version 2.2.0 and earlier) supported a customer-supplied DigiBoard multiport I/O card with up to eight additional serial ports. The Pentium IV-class TMS-3000 Controller (GTS Version 5.0.0 and later) supports a total of five serial ports, Port 00 through Port 04, four of which are provided by an integral DigiBoard multiport I/O card.

Port Number/Application Selection

The port number field and the application field define the number of the I/O port being configured for a particular application:

- Port 00 (via Serial Port 0) is used exclusively for the TMS Controller. Selections are Network I/O or Not in Use.
- Port 01 through Port 04 (via DigiBoard Ports 1, 2, 3, or 4) can be configured for one of several applications. Selections are: Local TTY, Dialin TTY, Agg. Perf., Sound Alarm, Not in Use.

Communication Mode

Defines the serial communication parameters of the I/O port. Chooses if this is asynchronous; 7 or 8 data bits; 1 or 2 stop bits; and even, odd, or no parity.

Data Rates

Defines the speed (bits per second) in which the I/O port communicates to an external device. Selections are 300, 1200, 2400, 4800, 9600, and 19200 Hz. Ports configured for Network I/O cannot be modified.

Security

This field defines an error checking method the controller uses. You have two methods: CRC 16 (Cyclic Redundancy Check 16-bits) and LRC (Longitudinal Redundancy Check).

NOTE: More information on configuring the serial I/O ports is found in Chapter 42 of GDC 036R603-Vnnn.

Redundant TMS-3000 Controllers

Redundant controllers in a TMS-3000 network prevent interruption in the flow of network management due to single controller failure. Redundant controllers also allow you to access the network from different node localities.

In a TMS-3000 multi-controller environment, only one master controller serves as the point of control for the entire network. All other controllers (referred to as subordinates) serve as backups and as additional access points to the network. The master controller responsibility is to synchronize its on-line network configuration including IAR data with all subordinate controllers. TMS-3000 software supports up to five subordinate controllers and one master controller.

NOTE *Some performance degradation occurs as the number of subordinate TMS-3000 controllers increases.*

Controller and Network Configuration

Pre-configured master and subordinate controllers are required in order to launch a network with multiple controllers. The controller initially designated as the master should contain complete network and controller configurations for at least one of the three supported networks. You must select the desired on-line network at the master. After the master has finished downloading its configuration to all nodes in the network, it connects the subordinates to their designated nodes.

A dummy network may be created at the subordinate while off-line so that it can receive the download from the master. The name of this dummy network must be the same as the current on-line network at the master. The dummy network contains a minimum network configuration that includes the local node and remote node to which the master controller connects and a minimum controller configuration that includes the local controller and the master controller.Controller configuration contains the following information:

- Name of each controller in the network.
- Name and address of the node to which each controller connects.
- Priority for each controller (The priority number defines the order in which a subordinate controller becomes the new master controller in the event of a network separation).
- Phone numbers used for dial backup functionality, if required.

Primary User vs. the Master/Subordinate Controller

The primary user of a TMS-3000 network can relocate the mastership from one controller to another. From the master controller, you can:

- Modify on-line configuration data.
- Initiate a download.

On either the master or subordinate controller, the following tasks can be performed (provided that access is granted via the log-in user password protection):

- Modify off-line network configuration data.
- Examine configuration data (either on-line or off-line network).
- Examine status of controllers.
- Examine network status.
- Run diagnostics.
- Use the mail facility to pass information between users at different controllers.
- Initiate a mastership switchover if the user is a primary user.

Controlling/Propagating Data Base Changes

To provide redundancy against failure, each controller in the on-line network shall keep its local version of configuration, including IAR data, up-to-date. This ensures that if one controller fails, all relevant network data is still available in other controllers.

The master is responsible for synchronizing the data (as mentioned previously) to all subordinates. This ensures that data remains current for all controllers in the network. Whenever a change is made to the data on the master (either through an IAR or by modifying configuration data through the menu), the master controller tries to get the changes shipped across the network to subordinates.

For recovery purposes, the master can save a large number of changes on the hard disk (limited by the amount of available free disk space). In the event that a subordinate is missing the last few changes, the master can load only the missing changes (instead of the entire on-line network data). The subordinate is not allowed to select a network other than the Current Control Network (CCN) as the on-line network once the subordinate comes on-line.

When connecting a subordinate controller, make sure the files in the Modify SW Revision screen reflect the network and what's in the master controller. If a subordinate is connected/reconnected to the network, and the master finds a discrepancy between the two configurations, it either downloads the differences, or the entire on-line network configuration, including IAR data to the subordinate.

A subordinate controller can avoid lengthy downloads from the master if it starts up with a recent copy of the CCN. At a subordinate, you are not allowed to access the on-line network menu system when the local controller is in the process of updating a configuration change from the master. This is indicated by the message `Controller RESET Initiated` shown on the status line.

Network Startup Procedure

To simplify starting up the network using multiple controllers, both the network and controller configurations need to be populated. That is, the master controller is preassigned and contains a complete configuration data base of the on-line network. When you attach a subordinate controller to the network, wait until the master finishes downloading the network before proceeding. The start-up procedure is described below:

1. Disconnect all controllers from the network.
2. Power-on the master controller and logon to the system. If you are not sure how to do this, refer to *Chapter 1, System Startup in GDC 036R603-Vnnn*.
3. Populate off-line network configuration data using the Modify Configuration menu (The master should have complete configuration data of the network which is intended for on-line use).
4. Connect the Master Controller to the network. On the master, select the network populated in the previous step as the on-line network and initiate Download as Required.

   NOTE: Ensure that the controller contains all of the obj files which are selected in the Software Revision lists (Obj files are those software files that are held on the TMS-3000 cards). If this startup is for a new network, you must first select obj files for the stored list and download it to the nodes in the network. After all nodes have received their obj files, activate the stored revision list.

5. Wait for the master to complete downloading of the network.
6. Power-on the subordinate controller and configure a dummy network of the same name as the on-line network. *See Controller and Network Configuration earlier in this chapter* for an explanation of a dummy network.
7. Connect the subordinate controller to the network. At the subordinate, log on-line to this dummy network (This step is needed only if the logged on-line network is a dummy network).
8. The master downloads its on-line network configuration including IAR data to the subordinate and maintain configuration data synchronization between the two, thereafter.

   NOTE; In a network with multiple redundant controllers, check for consistency between controllers when the network is separated by a failure, then restored. You do this by entering the Controller Status screen.

Mastership Switchover

A primary user can request a switchover of the mastership to a subordinate. After the master has received a mastership-switchover request, it honors the request and prepares for the control transfer. But if the request is received at the master while IAR is still in progress, the master maintains its mastership until IAR is completed.

Before transfer of the mastership, a warning message appears on the status line on the master indicating a switchover. At the alternate subordinate, a message indicates whether the transaction is successful. At the new master, warning messages, which indicate that the Controller is becoming a master, appear on the screen. The switchover takes place immediately at the desired subordinate when it receives the request from the master. Therefore, before a primary user issues the request, you should inform the subordinate controller about the switchover.

NOTE; If a controller is configured as a Permanent Subordinate, it does not take over the mastership of the network

Network Separation

The master enforces its mastership by polling subordinates periodically. If a subordinate does not receive polling from the master within 210 seconds, the subordinate assumes it is separated from the master controller. This timing interval is initially set to 210 seconds, but can be set at 50 to 900 seconds in 10 second increments based on the size of the network. This change may be made on the `Controller Configuration` screen.

When a subordinate cannot communicate with the master and both controllers are up and running, the network becomes separated. In a multiple controller environment, link failures can cause the following problems in the network:

- The master controller becomes isolated from its subordinates.
- One subordinate becomes isolated from the rest of the controllers.
- A group of subordinates is isolated from the rest of the controllers.

In all cases, once the network is separated, the process of selecting a new master within each isolated sub-network begins. This process is done without intervention. The selection is based on controller priorities and addresses of the controllers. The one with the best controller priority value becomes the master of the isolated sub-network (The value of the controller priority is from 1 through 10. The smaller the value the better the controller priority). If more than one controller has the same controller priority, the one with the lowest address becomes the master.

After the new master establishes local node ownership, it broadcasts its existence to all other controllers. The subordinates reply indicating acceptance. When the master completes exchanging status with its subordinates, the process of data resynchronization and periodic network communication between the new master and subordinate controllers begins.

NOTE The selected master controller does not become a master of the network unless it successfully seizes the local node connected to it.

Network Restoral

When the links between isolated sub-networks are restored, the polling message from the master reaches controllers previously isolated from the network. When a master receives polling messages from other masters, the network restoral process begins.

Without intervention, the master which has a better switchover priority becomes the new master of the merged network. In the event that more than one master controller has the best controller priority, operator intervention becomes necessary to facilitate network restoral. Such intervention is accomplished by either changing the switchover priority of the local master controller or switching mastership via the Controller Diagnostic screen.

If you choose the first method after the local master controller priority value is changed, the master with the best controller priority is then allowed to take over the network. If the new selected master is not the controller you desire, you can perform a mastership switchover when the merge is completed, making the target controller the master.

We recommend that the controller priority not be set to either its largest (10) or smallest (1) value for controllers in the network. This leaves room for you to be able to force the local controller to become either a subordinate or master by either lowering or raising the local controller switchover priority. Once the new master establishes handshaking between itself and its subordinates, the next phase of network restoration begin. These are data resynchronization and periodic network communication between the new master and the subordinates. The CCN configuration data of the new master becomes the base for the CCN data of all subordinates.

Add, Remove or Move a Controller

Modifying the controller configuration at the master controller lets you add or remove a controller to/from the on-line network.

To add a controller to the on-line network:

1. Power-on the added controller.
2. On the added controller, if the intended on-line network does not exist, you can either restore the same network by using a floppy saved from the master or create a dummy network with the same on-line network name. *See Controller and Network Configuration description earlier in this chapter* for an explanation of dummy network.
3. Modify controller configuration on the master controller (via Create/Modify Controller menu selection).
4. Wait until the master finishes downloading this new configuration into all nodes in the network, then connect the added controller to the designated node.
5. Login to the intended on-line network on the added controller. This step may or may not be required depending on whether the selected network on the added controller is recognized by its local node. If the selected network on the added controller is not recognized by its local node, then you need to login.

To remove a controller from the network:

1. Disconnect the target controller from the network.
2. Delete the target controller from the controller configuration on the master controller.

Moving a Controller from one Node to Another

To move a controller from one node to another node in the same network, as long as both nodes are configured as controllers in the network configuration, do the following:

1. Unplug the controller from the node.
2. Wait for the `Controller Link Level port` (`0` or `10`) `inoperative` alarm.
3. Log out of the on-line network.
4. Log into the on-line network.
5. When queried for connected node name, type the new node name and press Enter.
6. Connect the controller to the new node.

Changing a Network

TMS-3000 supports three networks. Only the CCN (Current Control Network) has automatic enforcement of data consistency among controllers. CCN is defined as the current on-line network at the master. When you change the on-line network from the CCN to another on the master, a message appears on the screen. It warns that a massive download may follow between the master and subordinate controllers when such a switch is made.

When the subordinate detects the on-line network is being changed on the master, it logs you off automatically. A message appearing on the screen warns you a network change is in progress and to wait for its completion. When the network change has completed at the subordinate, a message indicating the change has completed appears.

Before the master completes downloading the new network configuration to all nodes, you are advised to not make any further changes on the master. You should not login before the network change has completed at the subordinate. Otherwise, the changing process on the subordinate may become disrupted. You may end up with several master controllers trying to control different on-line networks.

The process of on-line network changing on the subordinate may or may not involve receiving a download from the master. Downloading the new network to a subordinate takes place if such a network does not exist on the subordinate. If the subordinate has three networks, then the downloaded network replaces the one having the same network name or the current on-line network if the previous conditions do not prevail.

Otherwise, the downloaded network is added to the existing networks on the subordinate.

Upgrading Software

Operating (mux) software in a TMS-3000 network should be at the same software versions for optimal performance. When upgrading operating software in the system, all subordinate controllers should be disconnected from the network and upgraded off-line. Only after the network has been fully upgraded by the master controller should the subordinate controllers be reconnected into the network. Likewise, it is recommended that Controllers be upgraded to the same version of GTS software.

NOTE *For information on upgrading controllers from Version 2.2.0 and earlier to GTS Version 5.0.0 and later, refer to the latest GTS Release Notes or consult your GDC representative.*

Support Utilities for Multiple Users

Several screens provide communications between users in the same network. A Read Controller Mail display contains information such as which node the mail originated from, a date/time stamp when the message was sent, and the subject of the message. Additional information on Controller Mail facilities is presented in Controller Mail.

Although the Controller is capable of downloading configuration data from one controller to another, the system does not support downloading of actual operational software from one controller to another.

Remote Access to GTS via LAN/Telnet

GTS Version 2.2.0 and earlier

To run a management session with a GTS controller via the Telnet protocol, perform the following steps:

1. Leave your TMS controller on the GDC title screen.
2. Connect to your TMS Controller through your LAN by typing:

   `telnet` *<address>*
3. At the login prompt, log in as **`GTS`**.
   This immediately terminates the GTS on the TMS Controller, and runs it on your remote terminal session.
4. Once the title screen appears on your remote terminal, you have three minutes to log into a network.
5. When your management session is complete, log out to the GDC title screen.
   Your remote session is terminated and the TMS Controller will once again gain control.

GTS Version 5.0.0 and later:

You can run a management session with a GTS controller from a remote workstation via the Secure Shell (ssh) or Telnet protocols. For Windows-based workstations, the PuTTY client software must be installed at the remote workstation. Detailed information and procedures are provided in the latest Release Notes for GTS Version 5.0.0 or greater.

TMS Maintenance Console

A remote TMS-3000 node or TMSC node that does not have a TMS-3000 controller may need a separate Maintenance Console to initialize the node. The Maintenance Console sets up a single aggregate that communicates with the master TMS-3000 node or with another node that is already communicating with the master node. Once you have established communication, configuration information can be downloaded to the node. The Maintenance Console is intended for use by factory-authorized field service personnel.

NOTE *Some of the TMS common cards (ESCC, ACM, CDA, TPP and OPP) have a front monitor port for connecting the Maintenance Console. The cable required for this connection is GDC 024H140.*

NOTE *Refer to Appendix C of this manual for complete instructions and guidelines on the use of the Maintenance Console.*

6 Maintenance

Overview

This chapter provides routine maintenance for the TMS-3000. The troubleshooting information describes sequences of tests and other procedures which isolate TMS-3000 failures to a single replaceable module. For detailed instructions on performing a particular test, *refer to the Status and Diagnostics chapters* in *GDC 036R603-Vnnn*. Refer to the front panel drawings in *Chapter 4* of this manual to help you develop a basis of knowledge for informed troubleshooting.

Routine Maintenance

Performance of the following routine maintenance tasks considerably reduces "down time" due to equipment failure:

- Check alarm display on the Controller at least once a day to identify alarm conditions as soon as possible. Leave the Controller in the alarm screen display mode when otherwise inactive, so that newly reported alarms are observed immediately.
- Observe front panel indicators for signs of equipment failures. When checking indicator conditions, remember that green LEDs indicate normal operation when lit; red LEDs indicate an alarm condition when lit.
- Inspect cable connections for looseness, bent or missing pins, or damage to cable.

Corrective Maintenance

Corrective maintenance consists of troubleshooting a suspected fault to a system component (module, cable, etc.), removal of the malfunctioning item, and repair or replacement to restore normal operation. The next paragraphs describe the removing and replacing TMS-3000 modules and provide guidelines for spotting failures within the TMS-3000 system.

Maintenance Console

When a TMS network has a node with a Maintenance Console, you can set some aggregate parameters and perform basic maintenance functions from that local console. Refer to Appendix C of this manual for more information on Maintenance Console functions.

Technical Assistance and Training

For technical assistance, consult with your GDC representative or call General DataComm Support Services. Refer to the contact information provided in the Preface of this manual.

Hands-on training is available from General DataComm Professional Services. Courses range from basic data communications, modems and multiplexers, to complex network systems, and are offered at our Connecticut facility or at your location. Refer to the contact information provided in the Preface of this manual.

Removal and Replacement Guidelines

In many instances, removing and replacing TMS-3000 modules corrects a problem. When replacing modules, follow the instructions below to avoid unnecessary disruption of the system and possible module damage.

Removal of most common modules (or in-service common modules in a redundant system) stops data traffic through the system or through some segment of the system. Removal of any module may cause temporary disruption of the node. The following describes the effect of the removal of each of the common modules; be sure that you understand these consequences before removing a module from the shelf.

NOTE *GDC recommends periodically testing the "out of service" modules in a TMS-3000 that utilizes redundant common modules. In a TMS-3000, not all failures of the out-of-service module are detectable. Certain conditions may prevail causing disruption of the network when that module is placed into service.*

Basic Module Removal

To remove a module from its assigned receptacle in the TMS-3000, grasp the ejector knobs on the top and bottom of the module front panel. Tilt the top knob up and the bottom knob down to unhook the module, then guide it straight out from the receptacle.

NOTE *Be sure to review the information listed below for the specific module before removing or reinstalling it.*

Basic Module Installation

To reinsert a module in the TMS-3000 shelf, proceed as follows:

1. Verify correct module location by referring to your Network Documentation Package.
2. Select all options required on the module according to your Network Documentation Package (unless some problem with option configuration is found, reproduce the option selections made on the module being replaced). Make sure that any required program plugs or resistor networks are mounted on the module.
3. Position the module in the receptacle guides (top and bottom) and carefully slide the module into the receptacle until it stops. Tilt the top ejector knob up and the bottom ejector knob down and gently push the module into the rear connector. The knobs automatically assume their normal position.
4. When reinstalling the ESCC, make sure the Enable/Disable switch is in the Disable position before placing it into the Main Backplane. After the module is correctly seated, move the switch to the Enable position.

NOTE *Be sure to review the information listed below for the specific module before removing or reinstalling it.*

Enterprise System Control Card

Before removing the Enterprise System Control Card, place the Enable/Disable switch in the Disable position. In many instances, removing and replacing an ESCC corrects a problem, as described below.

ESCC Removal

To remove an ESCC from its assigned receptacle in the TMS-3000 shelf, proceed as follows:

1. If the ESCC is the in-service ESCC of a redundant pair, place it in the standby mode by using the diagnostics function of the Controller.
2. Place the ESCC front panel Enable/Disable switch in the Disable position.
3. Grasp the ejector knobs on the top and bottom of the ESCC front panel. Tilt the top knob up and the bottom knob down to unhook the ESCC, then guide it straight out from the receptacle.

NOTE: *Removing an ESCC in a non-redundant system, or the redundant pair of ESCCs in a redundant system, stops all data traffic on the node and isolates the node from the Controller.*

Removing the in-service ESCC in a redundant system causes the node to reinitialize. As a result, all data and communications traffic is interrupted for approximately 2 to 5 minutes. Therefore, before removing the in-service ESCC, use the Controller to switch it to the standby mode.

When replacing a defective ESCC with a spare, remember that software must be downloaded from the Controller at the master site.

ESCC Replacement/Installation

To reinsert an ESCC in the TMS-3000 shelf, proceed as follows:

1. Select the ESCC options.
2. Place the ESCC front panel Enable/Disable switch in the Disable position.
3. Position the ESCC in the receptacle guides (top and bottom) of the slot shown in *Figure 4-3* and carefully slide the ESCC into the receptacle until it stops. Tilt the top ejector knob up and the bottom ejector knob down and gently push the ESCC into the rear connector. The knobs automatically assume their normal positions.
4. Place the ESCC front panel Enable/Disable switch in the Enable position.

Redundancy Control Card

Removal of the Redundancy Control Card in a redundant system causes the primary module in each pair of redundant modules (the right-hand module of the pair) to become in-service except the ESCC in which the secondary card is in-service. In a non-redundant configuration, all common modules and expansion cards must be in the right-hand slot of each pair of slots; any common module or expansion cards in the left-hand slot are removed from operation except the ESCC which is in the left-hand slot.

Aggregate Control Card

Removal of the Aggregate Control Module in a non-redundant system, or the redundant pair of modules in a redundant system, stops data traffic on the associated aggregate trunk for that module and on any channel that is routed through that aggregate trunk.

CDA (Combined Digital Aggregate) Module

Removal of the CDA Module in a non-redundant system, or the redundant pair of modules in a redundant system, stops data traffic through the associated DS1 ports for that module and on any channels routed through the DS1 ports to a TMS-3000 node or associated D4 device. To remove the CDA Module, first press the Dsbl (disable) switch on the front panel once. All front panel LEDs should go off. The module is now in a low power mode and may be removed from the shelf in the usual manner. If the module is not removed, pressing the Dsbl switch once more reactivates the module and the INIT LED lights.

ACM

Removal of the ACM in a non-redundant system, or the redundant pair of modules in a redundant system, stops data traffic through the associated ports for that module and on any channels routed through the ports to a TMS-3000 node, DPBX or APBX.

To remove the ACM, first press the Dsbl (disable) switch on the front panel once. All front panel LEDs should go off. The module is now deactivated and may be removed from the shelf in the usual manner. If the module is not removed, toggling the Dsbl switch once more reactivates the module and the INIT LED lights.

Channel Interface Card

Removal of the Channel Interface Module in a non-redundant system, or the redundant pair of modules in a redundant system, stops data traffic on any channel that communicates through that module or pair of modules.

Removal of any other channel module disrupts data flow for that channel and causes minimal disruption of system data flow.

Troubleshooting Procedures

The diagnostic features of the TMS-3000 generally allow isolation of a failure to a single component within the system. The TMS-3000 has the following diagnostic features:

- Front Panel Alarm Indicators
- Controller Reported Alarms and Status Displays
- Data Path/Loopback Tests
- Maintenance Console Diagnostics
- Front Panel Test Points

Preliminary Checks

TMS-3000 problems may often be diagnosed by checking the condition of cables, power cords, and other mechanical connections. Incorrect TMS-3000 configuration entries may also be the cause of some problems. Perform the following preliminary checks before starting detailed troubleshooting procedures.

1. If no indicators on TMS-3000 are lit, check the ac power cord (or battery connections for system using DPS-8A or DPS-8B dc power supplies). Check the power supply for a blown fuse.
2. Inspect tightness and integrity of all connections, such as channel device cables and aggregate line connections.
3. If the TMS-3000 communicates at the aggregate level, but channels seem unable to pass data, check the configuration entries for those channels. This problem is most likely to occur when a new configuration is being activated.
4. If channels are correctly configured and appear to function normally, but do not seem to be communicating with connected channel devices, check the fused link located beneath the channel connector. *See Chapter 1 for more details on fused links*.

Alarms

Alarms are the first indication of problems in the TMS-3000 system. Alarms are divided into two categories: major alarms, representing failures which could disrupt system operation, and minor alarms, representing failures which could affect a single channel. Generally, common module failures are reported as major alarms, and channel module failures are reported as minor alarms.

Alarms are reported through the Controller, the Maintenance Console CRT, or front panel LEDs. You can also connect an additional alarm to the external alarm connector on the Main Shelf backplane. For a comprehensive evaluation of the condition of a system, you should note both the CRT reported alarm messages and front panel indicators.

Test Points

The test points located at the bottom of the ESCC, ACM, CDA, ACC, Voice Channel, and Data Channel Modules provide immediate indications of TMS-3000 functions. By connecting oscilloscope leads between test points and a reference point, a technician may observe data and clock signals and identify conditions that characterize proper or improper TMS-3000 operation. *Chapter 4 of this manual contains descriptions of each module front panel, including the test points. Pin assignments for the card connectors are defined in Chapter 7.* The following paragraphs suggest checks and comparisons that may be made with the front panel test points on each module.

Enterprise System Control Card

The ESCC test points provide immediate indications of TMS-3000 timing functions. By connecting oscilloscope leads between test points and a reference point, a technician may observe data and clock signals and identify conditions that characterize proper or improper TMS-3000 operation. *Chapter 4* of this manual contains descriptions of ESCC front panel, including the test points. The following paragraphs suggest checks and comparisons that may be made with the front panel test points on each module.

Each of the following frequencies is produced by a phase-lock loop: 18.432 MHz, 16.896 MHz and 1.544 MHz. After achieving phase lock with the master timing source, the 18.432-MHz primary frequency is used as a reference to create the other two primary frequencies of the clock bus of this node. The 18.432 MHz primary frequency is further divided to create the slower channel and aggregate frequencies.

The ESCC test point labeled “Test” is the 8-kHz prescaled frequency after it has been fed back to the phase detector from a phase-locked voltage controlled oscillator. The test point labeled “Ref” is the incoming frequency produced by a master timing source. The test clock must be synchronized to the Ref clock.

NOTE: Use this procedure for the in-service ESCC only. An out-of-service ESCC shows erroneous results if the node is configured for aggregate or external timing.

1. Place oscilloscope leads on the Test point and the Ref point. If they are frequency locked, the incoming clock from the master timing source is successfully being phase locked at this node.

2. Place oscilloscope leads on the Test point and the Aggregate Control XMT CLK test point. If they are frequency locked, the clock rate for that Aggregate Control Card's aggregate trunk has successfully gone through the ESCC divider circuits and the clock bus to the Aggregate Control Card.

3. Place oscilloscope leads on the Test point and a Channel Module XMT CLK test point. If frequency locked, the clock has made it through the ESCC divider circuits, the clock bus, and the Channel Interface divider circuits.

NOTE: A few incoming frequencies may not be an even multiple of the test signal and therefore, it may be difficult to determine frequency lock with an oscilloscope.

Aggregate Control Card

Check for the following conditions:

- RCV CLK and XMT CLK should be frequency locked with some jitter.
- Placing oscilloscope leads on RCV data and XMT data shows whether data is being received and transmitted.
- Placing oscilloscope leads on RCV sync and XMT sync shows whether the TDM is in sync. It also shows the size of frame being run.

ACM or CDA Modules

Check for the following conditions:

1. Place the leads of a dual trace oscilloscope on the XMT CLK A and RCV CLK A test points. Both patterns displayed should be frequency locked with some jitter.
2. Place the leads of a dual trace oscilloscope on the XMT CLK B and RCV CLK B test points. Both patterns displayed should be frequency locked with some jitter.

Data II, III, IV Channel or UDC Modules

Check for the following conditions:

- If the channel is active, data should be present on the DATA In and DATA Out test points.
- Receive data should be synchronized (no phase slippage) to the internal (INT) channel clock. If the channel is in the synchronous mode, the clock frequency is the same as the channel data rate; if the channel is in any other mode, the clock frequency is 16 times the channel data rate (except for Data IV Channel or UDC Modules).
- If channel is in synchronous mode and using external timing, internal (INT) and external (EXT) clock signals should be synchronized (no phase slippage).

Voice II or UVC Channel Modules

Check for the following conditions:

- If Voice Channel is active (busy) the voice signals in and out of the channel should be present at the IN and OUT test points.

7 Connector Pin Assignments

Overview

This chapter lists pin assignments for 25-pin aggregate and channel connectors. It also lists the pin assignments for the 5-pin external timing connector, the internal/external modem connector, the external alarm relay connector, echo canceller piggyback card, CDA module, TID-III Data Channel Module, and ACM Module.

- Aggregate Interface
  Tables 7-1 through 7-8 list pin assignments of the 25-pin aggregate connectors. The functions listed are determined by the type of aggregate piggyback card used on the associated Aggregate Control Card.
- Data Channel
  Table 7-9 lists pin assignments for the Data Channel connectors.
- Voice II Channel
  Table 7-10 lists pin assignments for the Voice II Channel connectors.
- External Timing
  Table 7-11 lists pin assignments for the external timing connector (J18) on the TMS-3000 backplane.
- Internal Modem
  Table 7-12 lists the pin assignments for the phone jack J41 located on the rear of the TMS-3000 main shelf. The phone jack connects to the internal GDC 212A modem on the Redundancy Control Card. Note that the internal modem is available only on earlier versions of the RCC (Version AH and earlier).
- External Modem
  Table 7-13 lists the pin assignments for the external modem Port J42 located on the rear of the TMS-3000 main shelf.
- External Alarm Relay
  Table 7-14 lists the pin assignments for the external alarm relay connector (J17) located on the rear of the TMS-3000 main shelf.
- CDA Module DB25 Output 25-Pin
  Table 7-15 lists the pin assignments for the Combined Digital Aggregate Module.
- TID-III Data Channel Module
  Table 7-16 lists the pin assignments for the TID-III Data Channel Module.
- ACM Module DB25 Output 25-Pin
  Table 7-17 lists the pin assignments for the ADPCM Compression Module.

ACC Aggregate Interface Connector Pinouts (25-pin)

Table 7-1 ITU-T G.703 256 KBPS Interface To Aggregate Line Transceiver

Pin No.	Signal Name	Description
1	Gnd	Chassis Ground
2	XMT DATA A	The “A’’ side of the transmit data pair.
3	RCV DATA A	The “A’’ side of the receive data pair.
14	XMT DATA B	The “B’’ side of the transmit data pair.
16	RCV DATA B	The “B’’ side of the receive data pair.

Table 7-2 ITU-T G.703 64 KBPS Codirectional Interface To Aggregate Line Transceiver

Pin No.	Signal Name	Description
1	Gnd	Chassis Ground
2	XMT DATA A	The “A’’ side of the transmit data pair.
3	RCV DATA A	The “A’’ side of the receive data pair.
14	XMT DATA B	The “B’’ side of the transmit data pair.
16	RCV DATA B	The “B’’ side of the receive data pair.

Table 7-3 T1/D4 1.544 MBPS Interface To Aggregate Line Transceiver

Pin No.	Signal Name	Description
1	Gnd	Chassis Ground
2	XMT DATA A	The “A’’ side of the transmit data pair.
3	RCV DATA A	The “A’’ side of the receive data pair.
14	XMT DATA B	The “B’’ side of the transmit data pair.
16	RCV DATA B	The “B’’ side of the receive data pair.

Table 7-4 ITU-T G.703 2.048 MBPS Interface To Aggregate Line Transceiver

Pin No.	Signal Name	Description
1	Gnd	Chassis Ground
2	XMT DATA A	The “A’’ side of the transmit data pair.
3	RCV DATA A	The “A’’ side of the receive data pair.
14	XMT DATA B	The “B’’ side of the transmit data pair.
16	RCV DATA B	The “B’’ side of the receive data pair.

Table 7-5 ITU-T G.703 64 KBPS Contradirectional Interface To Aggregate Line Transceiver

Pin No.	Signal Name	Description
1	Gnd	Chassis Ground
2	XMT DATA A	The “A’’ side of the transmit data pair.
3	RCV DATA A	The “A’’ side of the receive data pair.
13	RCV CLK B	Receive clock for B
14	XMT DATA B	The “B’’ side of the transmit data pair.
15	XMT CLK A	Transmit clock for A
16	RCV DATA B	The “B’’ side of the receive data pair.
17	RCV CLK A	Receive clock for A
19	XMT CLK B	Transmit clock for B

Table 7-6 ITU-T V.35 Interface To Aggregate Line Transceiver

Pin No.	Signal Name	Description
1	Gnd	Chassis Ground
2	XMT DATA A	The “A’’ side of the transmit data pair.
3	RCV DATA A	The “A’’ side of the receive data pair.
4	+V	+5V
12	EXT TIM B	External transmit clock for B
13	RCV CLK B	The receive clock for B
14	XMT DATA B	The “B’’ side of the transmit data pair.
15	XMT CLK A	Transmit clock for A
16	RCV DATA B	The “B’’ side of the receive data pair.
17	RCV CLK A	The receive clock for A
19	XMT CLK B	The transmit clock for B
20	+V	+5V
24	EXT TIM A	The external transmit clock for A

Table 7-7 RS-422/423, MIL-188-114 Interface To Aggregate LineTransceiver

Pin No.	Signal Name	Description
1	Gnd	Chassis Ground
2	XMT DATA A	The “A’’ side of the transmit data pair.
3	RCV DATA A	The “A’’ side of the receive data pair.
4	+V	+5V
12	EXT TIM B	External transmit clock for B
13	RCV CLK B	The receive clock for B
14	XMT DATA B	The “B’’ side of the transmit data pair.
15	XMT CLK A	Transmit clock for A
16	RCV DATA B	The “B’’ side of the receive data pair.
17	RCV CLK A	The receive clock for A
19	XMT CLK B	The transmit clock for B
20	+V	+5V
24	EXT TIM A	The external transmit clock for A

Table 7-8 EIA/TIA-232-E Interface To Aggregate LineTransceiver

Pin No.	Signal Name	Description
1	Gnd	Chassis Ground
2	XMT DATA	Transmit data
3	RCV DATA	Receive data
4	+V	+12V
7	SIG Gnd	Signal Ground
15	XMT CLK	Transmit clock
17	RCV CLK	Receive clock
20	+V	+12V
24	EXT TIM	External terminal timing
25	–V	–12V

Data Channel Connector Pinouts (25-pin)

Table 7-9 Data Channel Connector Pin Assignments

Pin No.	Signal Unbalanced (EIA/TIA-232-E/ RS-423)	Signal Balanced (RS-422/ITU-T V.35)	Signal Balanced (ITU-T G.703)	RS-422 Adapter	Signal Unbalanced V.54 Using MM08	X.21 (X.27)
1	Chassis Ground	Chassis Ground	Chassis Ground	Chassis Ground	Chassis Ground	Chassis Ground
2	Transmit Data	Transmit Data "A"	Transmit Data "A"	Xmt Data A	Transmit Data	SD-A
3	Receive Data	Receive Data "A"	Receive Data "A"	Receive Data A	Receive Data	RD-A
4	Request To Send*	Request to Send*	Request to Send*	RTS A, RTS B	Request to Send*	RTS-A
5	Clear To Send*	Clear To Send*	Clear To Send*	CTS A, CTS B		RTS-B
6	Ready Out* (DSR)	Ready Out* (DSR)	Ready Out* (DSR)	Rdy A, Rdy B	Test Mode*	DCD-B
7	Signal Ground	Signal Ground	Signal Ground	Signal Gnd	Signal Ground	Signal Ground
8	Carrier Detect*	Carrier Detect*	Carrier Detect*	DCD A, DCD B	Carrier Detect*	DCD-A
10	Non-Standard Control Signal*	Transmit/Receive Clock "B"	Nonstandard control signal	Xmt Data B	Remote Loopback	ST-B
11	Receive Ground	External Transmit Clock "B"		Xmt Clk B		TT-B
15/ 17**	Transmit/Receive Clock	Transmit/Receive Clock "A"		XmT/Rx Clk A	Transmit/Receive Clock	ST-A
20	Ready In* (DTR)	Ready In* (DTR)	Ready In* (DTR)	Rdy A, Rdy B	Ready Out (DTR)*	
22	Ring Indicator*	Transmit Data "B"	Transmit Data "B"	Xmt Data B	Local Loopback*	SD-B
24	External Transmit Clock	External Transmit Clock "A"		Xmt Clock A	External Transmit Clock	TT-A
25	Busy Out*	Receive Data “B’’	Receive Data “B’’	Receive Data B		RD-B

* Control signals are unbalanced, at EIA/TIA-232-E voltage levels.

** Pins 15 and 17 are tied together on backplane.

Voice II/CVSD and PCM Connector Pinouts (25-pin)

Table 7-10 Voice II/CVSD And PCM Channel Connector Pin Assignments*

Pin Number	Description
2	–BATT
3	M Lead
4	Receive Tip (RT)
5	Receive Ring (RR)
7	Signal Ground
8	Station Ground
10	Transmit Ring (TR)
11	E' Lead
15	Station Battery
24	E Lead
25	Transmit Tip (TT)
The E' lead is the same signal as the E lead, and provides no additional functions. The CVSD card had a type C relay driving the E Lead and so both NC and NO outputs were made available for customer use. The UVC connected the E and E' together. Station Ground (pin 8) is the SG lead which is paired with the E Lead. Signal Ground is an internal mux ground, and so is not normally used for signalling due to the added noise which may then be injected.	

External Timing Connector Pinouts

Table 7-11 External Timing Connector (J18) Pin Assignments

Pin Number	Description
1	Protected Ground
2	External Timing A (In)
3	External Timing B(In)
8	512 KHz Reference B (Out)
9	512 KHz Reference A (Out)

Internal Modem Connector Pinouts

Table 7-12 Phone Jack Internal Modem Connector Pin Assignments

Pin Number	Description
3	Tip
4	Ring
Note that the internal modem is available only on earlier versions of the RCC.	

External Modem Connector Pinouts

Table 7-13 External Modem Port J42 25-Pin Connector Pin Assignments

Pin Number	Description	
1	Protected Ground	
2	Send Data	(TD)
3	Receive Data	(RD)
4	Request to Send	(RTS)
5	Clear to Send	(CTS)
6	Data Set Ready	(DSR)
7	Ground	
8	Data Carrier Detect	(DCD)
12	Speed Mode Indicate	(SPD IND)
20	Data Terminal Ready	(DTR)
22	Ring Indicator	(RI)

Alarm Relay Connection Pinouts

Table 7-14 Alarm Relay Connections, Rear Panel Connector J17

Pin Number	Function	Relay State	
1	Minor Alarm 2	Common	(CO)
2	Major Alarm 2	Common	(CO)
3	Spare		
4	Spare		
5	Major Alarm 2	Deenergized	(NO)
6	Major Alarm 1	Deenergized	(NO)
7	Minor Alarm 2	Deenergized	(NO)
8	Minor Alarm 1	Deenergized	(NO)
9	Major Alarm 1	Common	(CO)
10	Spare		
11	Minor Alarm 1	Common	(CO)
12	Major Alarm 2	Energized	(NC)
13	Major Alarm 1	Energized	(NC)
14	Minor Alarm 2	Energized	(NC)
15	Minor Alarm 1	Energized	(NC)

CDA Module Connector Pinouts (25-pin)

Table 7-15 CDA Module DB25 Output 25-Pin Connector Pin Assignments

Pin Number	Signal Name	Description
1	Gnd	Chassis Ground
2	XMT DATA A	The “A" side of the transmit data pair
3	RCV DATA A	The “A" side of the receive data pair.
14	XMT DATA B	The “B" side of the transmit data pair.
16	RCV DATA B	The “B" side of the receive data pair.
These pins are used when the second CDA module is connected as a non-redundant pair in conjunction with the special Y cable.		
18	RCV DATA B	The “B" side of the receive data pair.
4	XMT DATA A	The “A" side of the transmit data pair.
8	RCV DATA A	The “A" side of the receive data pair.
25	XMT DATA B	The “B" side of the transmit data pair.

TID III Data Channel Connector Pinouts

Table 7-16 TID-III Data Channel Module EIA RS-422 Interface Connector Pin Assignments

Channel Card EIA Connector	Signal Description
1	Chassis Ground
7	Ground
17	Receive Clock A*
10	Receive Clock B*
3	Receive Data A*
25	Receive Data B*
24	Transmit Clock A**
11	Transmit Clock B**
2	Transmit Data A**
22	Transmit Data B**
5	External Clock A
4	External Clock B
20	Test Signal
6	Test Signal
* From TID Channel to User ** From User to TID Channel	

ACM Connector Pinouts

Table 7-17 ACM DB25 Output 25-Pin Connector Pin Assignments

Pin Number	Signal Name	Description
1	Gnd	Chassis Ground
2	XMT DATA A	The “A’’ side of the transmit data pair
3	RCV DATA A	The “A’’ side of the receive data pair.
14	XMT DATA B	The “B’’ side of the transmit data pair.
16	RCV DATA B	The “B’’ side of the receive data pair.

Appendix A: Technical Characteristics

Table A-1 TMS-3000 Specifications

Item	Specifications
Multiplexing Technique	Bit-interleaved, time division
Multiplexing Efficiency	Up to 99%, essentially unaffected by speed or mix of channels
Microcell Backplane Internal Data throughput	Bit mode: 16.896 Mbps Nibble mode: 45 Mbps Packet mode: 270 Mbps
Channel Capacity	Up to 512 channels of voice or data per node
Aggregate Interfaces	EIA/TIA-232-E/ITU-T V.28 ITU-T V.35 EIA RS-422 (ITU-T V.11), EIA RS-423 (ITU-T V.10), MIL-STD-188-114 T1/D4 1.544 Mbps T1 1.544 Mbps (non AT&T) ITU-T G.703 64 Kbps Codirectional ITU-T G.703 64 Kbps Contradirectional ITU-T G.703 256 Kbps ITU-T G.703 2.048 Mbps ITU-T G.704 2.048 Mbps Fiber Optic 1.544 Mbps or 2.048 Mbps
Aggregate Capacity	Up to 8 redundant or 16 non-redundant aggregate trunks per node
Aggregate Rate	From 2400 bps to 2.048 Mbps ó see Table 1-2 for listing of all standard rates.
Operating Environment	For equipment mounted in EP-2T,EP-2M, and EP-4: Temperature: 32 deg. F to 124 deg. F (0 deg. C to 50 deg. C), Derate operating temperature by 1 deg. C/1000 ft above sea level. 95% relative humidity non-condensing Altitude: 10,000 ft (3048 m)
Non-Operating Environment	- 4deg. F to +186 deg. F (- 40 deg. C to + 85 deg. C) 95% relative humidity, non- condensing Altitude: 40,000 ft (12,192 m)

Table A-2 Enterprise System Control Card Technical Characteristics

Item	Specifications
Internal Clock Accuracy	25 ppm
Timing Specifications	Meets ATT Pub 62411 specification: Stratum 4 Enhanced
Input/Output Ports	TMS Controller Port: async up to 19.2 Kbps Maintenance Port (front and rear): async up to 9600 bps External modem: async up to 9600 bps

Table A-3 CDA Module Technical Characteristics

Item	Specifications
Framing method	Bit oriented proprietary or Byte oriented (DS0)
Frame structure	D4 or ESF (CDA-T1), CEPT G.732 or G.704 (CDA-E1)
CDA module compatibility	DACS (Digital Access Cross-connect), D4 Devices and TMS-3000 w/CDA
Cross connection	Meets DSX-12 interconnect specification
CDA channel capacity	128 TMS-3000 channels (Non-redundant CDA pair) 256 TMS-3000 channels (Redundant CDA pair)
CDA line rate	T1: 1.544 Mbps E1: CEPT G.704 and G.732 - 2.048 Mbps
PLL Jitter Tolerance (Receiver)	Meets ATT Pub 62411 specification: Stratum 4 Enhanced
Input/Output Ports	Two DS1 ports support up to 48 DS0 channels per CDA-T1 module. Two DS1 ports support up to 32 DS0 channels per CDA-E1 module, (CEPT G.704, G.732)
Pulse Density Requirements	B8ZS or Bit 7 stuffing (suppression)

Table A-4 Data II, Data III, Data IV, UDC Modules Technical Characteristics

Item	Specifications
Data\ Rates (See Chapter 1 for listing of all standard channel rates.)	Synchronous: From 75 bps to 1.152 Mbps Asynchronous: From 0 to 19.2 Kbps Isochronous, Anisochronous: From 0 to 64 Kbps
Interfaces	EIA/TIA-232-E/ITU-T V.28/ITU-T V.28 ITU-T V.35 EIA RS-422 (ITU-T V.11), MIL-STD-188-114 Balanced (Data and Timing) EIA RS-423 (ITU-T V.10), MIL-STD-188-114 Unbalanced (Data and Timing)
Interface Signal Characteristics	DTE (Data Terminal Equipment) or DCE (Data Communications Equipment) may be chosen.

Table A-5 TID-III Data Module Technical Characteristics

Item	Specifications
Interface	Conforms to EIA RS-422 balanced differential interface for data and clock. Special application specific interfaces supported through interface piggyback.
Data Rates (Modes 1-4)	Channel rates, 1, 2, 2.4, 4, 4.8, 8, 9.6, 16, 32, 56, 64, 72, 96, 128, 192, 256, 512, 1024 Kbps *(See Note 1 below.)* Corresponding TDM rates: 1.2, 2.4, 3.2, 4.8, 6.4, 9.6, 12, 19.2, 38.4, 72, 76.8, 100, 112, 153.6, 224, 228, 576, 1152 Kbps.
Data Rates (Mode 5)	Any rate below pre-set meaximum standard channel rates. *(See Note 2 below.)*
Input Distortion	Includes Clock/Data Skew and Clock Asymmetry: Up to 25% maximum
Output Distortion	Includes Clock/Data Skew: Less than 2.5%
Input Rate Offset	Dependent on input rate and mode selected: From ±0.001% to ±2%.
Output Rate Accuracy	Dependent on input rate and mode selected: From ±0.001% to ±2%.
Output Clock Jitter	Rate Dependent: From ±20 ns (±2%) bit-to-bit jitter at 1024 Kbps to ±0.03%
Output Clock Jitter (Modes 1-3 and 5)	1 Kbps ±25 ms bit-to-bit jitter at 1024 to 512 Kbps. Less than ±0.75% at all other data rates.
End-to-End Channel Delay	With 384-bit output FIFO Buffer Delay Setting: 527 ±135 bits
	With 96-bit output FIFO Buffer Delay Setting: 239 ±50 bits. *(See Note 3.)*
Acquisition Time	Maximum of 512 bits with no errors detected and 768 bits with detected errors
Transparency	Transparent to any data pattern
Channel Capacity	Requires 2 contiguous channel card slots of a TDM Multiplexer shelf
Power Requirement	5 V at 3 A

Note *1. Other rates available. Consult GDC regarding availability of any specific desired rate not listed.*

Note *2. For rates 2 Kbps and above, the lower limit is 850 Hz. For the 1 Kbps rate, the lower limit is 150 Hz.*

Note *3. For input rate tracking mode 1, the output FIFO settles to almost full (27-bit delay for 96-bit tap) and buffer excursion is limited to ±10 bits.*

Table A-6 Voice II, CVSD Channel Technical Characteristics

Item	Specifications
Digital Interface	Synchronous
Impedance	600 ohms resistive ±10%
Return Loss	15 dB minimum, 300 to 3400 Hz
Longitudinal Balance	60 dB minimum, 300 to 3300 Hz
Usable Bandwidth	300 to 3300 Hz (3 dB points)
Input Levels	-16 or 0 dBm at transmitter input, switch selectable. - 6.0 to +1.5 dB of compensation available in 0.5 dB steps.
Output Levels	0 or +7 dBm at receiver output, switch selectable. - 6.0 to +1.5 dB of compensation available in 0.5 dB steps.
Performance Levels at 32 Kbps	Idle Channel Noise: 23 dBrnc0 maximum
	Cross Talk Loss: 60 dB minimum (0 dB Channel Gain) 48 dB minimum (23 dB Channel Gain)
Harmonic Distortion at 1004 Hz	-25 dBm0 maximum
Intermodulation Distortion	2nd order -40 dBm0 max. 3rd order -36 dBm0 max.
Dynamic Range	+3 to -50 dBm0
Level Stability	±0.25 dB
Channel Gain at 1004 Hz	0 ±0.5 dB or 23 ±0.5 dB (Nominal gain ± Trim)
Signal to Quantizing Noise	1004 Hz Test Tone: At -39 dBm0 Signal Level: 9 dB S/N At -27 dBm0 Signal Level: 25 dB S/N At -18 to +3 dBm0 Signal Level: 26 dB S/N
Frequency Response, 400 to 3200 Hz	-1.5 dB to +1 dB (Relative to 1004 Hz)
Envelope Delay	300 to 500 Hz: 700 µs 500 to 2400 Hz: 300 µs 800 to 2400 Hz: 100 µs 2400 to 2900 Hz: 300 µs 2900 to 3400 Hz: 700 µs
E and M signaling states	E-lead rela: Open = idle, Closed = busy M-lead detector: Compatible with Types 1-5 signaling interface M-lead input impedance: 10 kilohms minimum, diode-protected M-lead sensitivity: mA maximum
E-Lead Relay Contact Ratings	Maximum Current: 0.25 A Maximum Voltage: 100 volts (This is an operating parameter, not a transient parameter.) Minimum Resistance: 100 milliohms

Table A-7 Voice II, ASP Channel Module

Item	Specifications
4-Wire Interface	Impedance: 600 ohms resistive ±10%
	Return Loss: 20 dB minimum, 300 to 3400 Hz
	Longitudinal Balance: 56 dB minimum, 300 to 3400 Hz
	Usable Bandwidth: 300 to 3400 Hz (ASP Mode) 300 to 3400 Hz (PCM Mode)
	Nominal Input Levels: -16 dBm or 0 dBm (switch selectable) - 6.0 to +1.5 dB of compensation available in 0.5 dB steps (switch selectable)
	Nominal Output Levels: 0 dBm or +7 dBm (switch selectable) - 6.0 to +1.5 dB of compensation available in 0.5 dB steps (selected through supervisory port interface)
Voice Channel Performance (PCM mode)	Signal-to-total distortion ratio as function of input level (noise) -3 dBm0: 26.3 dB -6 to -27 dBm0: 33.9 dB -34 dBm0: 32.2 dB -40 dBm0: 27.6 dB -55 dBm0: 12.6 dB
Signal-to-total distortion ratio as function of input level (sine wave)	0 to ñ30 dBm0: 33 dB -40 dBm0: 27 dB -45 dBm0: 22 dB
Idle Channel Noise	-67 dBm0p (ITU-T Weighted) -23 dBrnc0 (C-Message Weighted)
Cross Talk Loss	-65 dB minimum (1.5 dB channel gain)
Intermodulation	35 dB maximum
Level Stability	10 minutes ±0.2 dB 1 year ±0.5 dB
Frequency Response	300 to 3000 Hz: 0 dB ±0.5 dB 3000 to 3400 Hz: 0 dB ñ1.8 dB +0.5 dB
Channel Gain at 800 Hz	±0.3 dB from nominal
Cross Talk Loss	-65 dB minimum (1.5 dB channel gain)
Envelope Delay	The absolute envelope delay at the frequency of minimum envelope delay is less than 600 microseconds. The minimum value is taken as reference for the envelope delay distortion.
Envelope Delay Distortion	500 to 600 Hz: 1.5 ms 600 to 100 Hz: 0.75 ms 1000 to 2600 Hz: 0.25 ms 2600 to 2800 Hz: 1.5 ms
Voice Channel Performance (ASP Mode)	Signal-to-Total Distortion: >20 dB at ñ40 dBm0 Input
Ratio (Sine wave input 700 to 1100 Hz)	>25 dB from ñ30 dBm0 to 0 dBm0 Input
Idle Channel Noise	-67 dBm0P (ITU-T Weighted), 23 dBrnC0 (C-Message Weighted)
Cross Talk Loss	-65 dB minimum (0 dB channel gain)
Variation of Gain with Input Level (802 Hz ref.)	±0.5 dB from ñ40 dBm0 to +2.5 dBm0 relative to level at ñ10 dBm0

Table A-7 Voice II, ASP Channel Module (Continued)

Item	Specifications
Level Stability	10 minutes: ±0.2 dB 1 year: ±0.5 dB
Frequency Response	300 Hz to 2400 Hz: 0 dB ±0.5 dB 2400 Hz to 3400 Hz: 0 dB -1.8 dB, +0.5 dB
Channel Gain at 800 Hz	±0.3 dB from nominal
Output Power Spectral Density	5 kHz to 9 kHz: -40 dBm 10 kHz: -42.5 dBm 50 kHz to 500 kHz: -70 dBm
Power Requirements	+5 V dc ±5% 230 mA max. +12 V dc ±10% 10 mA max. -12 V dc ±10% 30 mA max.

Table A-8 Universal Voice Module Technical Characteristics

Item	Specifications
Interface Characteristics	Impedance600 ohms resistive ±10% Return Loss20 dB minimum (300 to 3400 Hz) Longitudinal Balance56 dB minimum (300 to 3400 Hz) Usable Bandwidth300 to 3400 Hz
Signal to Total distortion Ratio	PCM Voice Channel and all PCM-T mode options (noise signal in accordance with ITU-T 0.131) Input level: -3 dB > 26.3 dB -6 dB > 33.9 dB -34 dB > 32.2 dB -40 dB > 27.6 dB -55 dB = 12.6 dB
	ADPCM Voice Channel Input level: -3 dB = 27 dB -6 dB = 34 dB -34 dB = 32 dB -40 dB = 28 dB -55 dB = 13 dB
	PCM Voice Channel ±3 dB at ñ50 to ñ55 dBm0 relative to channel level at -10 dBm Unspecified at less than -55 dBm0.
	ADPCM Voice Channel ±3 dB at -50 to -55 dBm0 relative to channel level at -10 dBm
Level Stability	10 minutes: ±0.2 dB
Frequency Response	300 Hz to 3000 Hz: 0 dB ±0.5 dB 3000 Hz to 3400 Hz: 0 dB +1.8 dB, -0.5 dB
Channel Gain at 800 Hz	±0.3 dB from nominal
Power Requirements	PCM: +5 V dc, 83 mA max; +12 V dc, 8 mA max; -12 V dc, 20 mA max.
	ADPCM: +5 V dc, 107 mA max; +12 V dc, 8 mA max; -12 V dc, 20 mA max.

Table A-9 Echo Canceller Power Requirements

Item	Specifications
Power Requirements	:Using TMS32030 Digital Signal Processor: +5 V dc ±5%, 330 mA, typical -12 V dc ±10%, 1.2 mA, typical
	Using TMS320C25 Digital Signal Processor: +5 V dc ±5%, 100 mA, typical -12 V dc ±10%, 1.2 mA, typical
Power Consumption	Using TMS-3000 32020 Digital Signal Processor: 1.6 Watts
	Using TMS320C25 Digital Signal Processor: 0.5 Watts

Table A-10 ADPCM Compression Module (ACM)

Item	Specifications
Framing method	Bit oriented proprietary to Byte oriented (DS0)
Frame structure	D4, T1/D4E, CEPT G.732
ACM Port Capability	DPBX, DACS Network or D4 devices
ACM module compatibility	Full TMS-3000 compatibility
ACM channel capacity	Up to 24 voice circuits compressed via GDC ADPCM compression techniques across a single DS1 line. Up to 30 voice circuits (E1 only) compressed via GDC ADPCM compression techniques across a single DS1 line.
ACM line rate	T1 DS1: 1.544 Mbps ACM/E1 (G.704 and G.732): 2.048 Mbps
PLL Jitter Tolerance	Meets ATT Pub. 62411 specification
ADPCM voice rates	64, 32, 24 and 16 Kbps
Input/Output Ports	One DS1 port supports up to 34 DS0 channels per ACM/T1 One DS1 port supports up to 30 DS0 channels (CEPT G.732) per ACM/E
Signaling Types Network	Robbed Bit, G.704 CAS Channel 16 Message Oriented Common Channel Signaling (CCS) In Band Signaling (SF, Tone type)
Channel	No ABCD Signaling (Inband or CCS) 2-State Signaling (A or E/M (ACM or UVC)) 4-State Signaling (A,B to ACM) 16-State Signaling (A,B,C,D to ACM only)
Signaling Conditioning Types	A0+B0 (On-Hook) A0+B1 (On-Hook, No ringing for FXS Loop Start & FX0 Ground Start) A0/1+B0/1 (On-Hook, then Off-Hook) A1/0/1+B1/0/1 (Off Hook, then Hook Flash) A1+B1 (Off-Hook or Disconnect/Blocked (ITU-T) A1/0+B1 (Off-Hook, then On-Hook, No ringing for FXS Ground Start)

Table A-11 TMS-3000 Power Requirements

Item	Specifications
Domestic Unit (USA, Canada, Japan)	Input Voltage Range: 85-129 V ac; Fuses: 8 Amp 3AG
Non-Domestic Unit (Europe)	Input Voltage Range: 175-242 V ac; Fuses: 5 Amp 5x20 mm
Non-Domestic Unit (United Kingdom)	Input Voltage Range: 204-264 V ac; Fuses: 5 Amp 5x20 mm
Frequency	50/60 Hz
Output Voltage and Current	+5.1 V +3.0%, -2.5% at 8 to 105 amps
3 MOPS non-redundant	+12 V ±10% at 0.25 to 12 amps
4 MOPS redundant	-12 V ±10% at 0.25 to 12 amps
Remote Alarm Relay Contact Rating	Maximum Current: 0.25 amp

Table A-12 TMS-3000 Power Consumption

Item	Specifications
CDA-T1	Maximum: 28.75 Watts [5.75 amps (+5 V dc) (±12 V dc)]
CDA-E1 with G.732 I/O Plug-In Card	Maximum: 27.0 watts [5.4 amps (+5 V dc) (0.2 amps ±12 V ac)]
Channel Interface Card	Maximum: 9.2 Watts [1.83 amps (+5 V dc) (±12 V dc)]
Enterprise System Control Card	Maximum: 20 Watts [4 amps (+5 V dc) 0.06 amps (-12 V dc)]
Redundancy Control Card	Maximum: 4.1 Watts [0.55 amps (+5 V dc), 0.10 amp (+12 V dc), 0.01 amp (-12 V dc)]
ACM Module	Maximum: 20.0 watts [4.0 amps (+5 V dc) (0.5 amps ±12 V ac)]
TPP-LAN	Maximum 75 Watts [15 amps (+5 Vdc)]
TPP-FR	Maximum 50 Watts [10 amps (+5 Vdc)]
Aggregate Control Card	Maximum: 18.5 Watts [3.6 amps (+5 V dc), 0.10 amp (+12 V dc)]
Harness Card	Maximum: 2.8 Watts [557 milliamps (+5 V dc) (+12 V dc)]
Aggregate Interface Plug-Ins	EIA/TIA-232-E Aggr Interface Plug-In: 0.5 Watts V.35 Aggr Interface Plug-In: 1.2 Watts RS-422/423 Aggr Interface Plug-In: 0.7 Watts WECO 303 Aggr Interface Plug-In: 1.5 Watts G.703 64 Kbps Codirectional Aggr Interface Plug-In: 1.0 Watts G.703 64 Kbps Contradirectional Agg Interface Plug-In: 0.4 Watts G.703 2.048 Mbps Aggr Interface Plug-In (75-ohm): 2.0 Watts G.703 2.048 Mbps Aggr Interface Plug-In (120-ohm): 1.9 Watts G.704 2.048 Mbps Aggr Interface Plug-In (75/120 ohm): 1.5 Watts
Expansion	0.2 Watts
Data II, Data III, Data IV Channel	EIA/TIA-232-E Interface: 1.9 Watts RS-422 Interface: 1.8 Watts RS-423 Interface: 1.7 Watts V.35 Interface: 1.7 Watts
Voice II/PCM Channel	1.4 Watts
ADPCM Plug-In	2.1 Watts
Voice II/CVSD Channel	1.9 Watts
Voice II/ASP Channel	1.6 Watts
Universal Voice Card PCM Voice	0.69 Watts
Universal Voice Card ADPCM Voice	0.81 Watts
Max Power Consumption for TMS-3000 Node with 96 local data channels, 4 redundant CIC, 4 redundant ACC, redundant ESCCs, and 1 Redundancy Control Card: 350 Watts	

Appendix B: TMS-3000 Maintenance Console

Note *IMPORTANT!*
The Maintenance Console should only be used by qualified, GDC-authorized field service personnel.

Overview

The TMS-3000 Maintenance Console are software packages used by qualified, GDC-authorized field service personnel to locally troubleshoot problems with communication links to that particular site. Maintenance Console software is designed to run on any PC or laptop with a EIA/TIA-232-E cable connection to the node. Only GDC-trained service personnel should conduct the use of maintenance consoles.

This section describes how to configure the I/O ports for communication with the TMS Controller directly (via J20), or via an internal/external modem (J42). Once communication is established, the Console can assist in diagnosing local problems by displaying read-only status screens for all common and channel modules. Limited diagnostics are also available for Aggregate Control, Channel Interface, and channel modules.

Terminal Connectivity

The Maintenance Console can run on any terminal that runs 1200 to 9600 baud, ASCII, on an EIA/TIA-232-E interface. The character format is asynchronous with 7 data bits, 1 start bit, 1 stop bit, and even parity. Console baud rate is set automatically when you press [Return].The Console terminal is connected to J19 of the TMS 3000 Main Shelf backplane at its 25-pin D-type connector. Pin designations are shown in *Table B-1*.

Table B-1 EIA/TIA-232-E Pin Designations

Pin No.	Symbol	Directions	Description
2	TXD	Out	Transmit Data
3	RXD	In	Receive Data
7	Sig GND	--	Signal Ground

Note *Some of the TMS common cards (ESCC, ACM, CDA, TPP and OPP) have a front monitor port for connecting the Maintenance Console. The cable required for this connection is GDC 024H140.*

Note *For the TMS Compact, J6 replaces J20 and J8 replaces J42 in the following procedures.*

System Startup

This section describes the initial power up of the Console, including the procedure for setting up the preliminary configuration if there is no node control software or if there has been an unexpected memory loss. Node Control software is downloaded via an aggregate, via J42, from the TMS Controller, or directly from the TMS Controller through J20 or J42.

Two different node startup procedures are described in the following paragraphs: startup with boot firmware and startup with node control software. When either of these procedures is performed, an operator at the TMS controller site should monitor network status to confirm that the TMS Controller is communicating with the node once the procedure is complete.

Note *For the ESCC, you are normally always in full-feature (not boot) software. If you are not, contact GDC for further instructions.*

Startup with Boot Firmware

In this situation the program and configuration information that was factory-loaded into the node has somehow been erased, or, for some reason, was never loaded into the node. In this case, you must configure the aggregate sufficiently to allow the node to communicate so that program and configuration information can then be downloaded.

After power-up on the ESCC, do not type any console keys until the In-Service or Standby LEDs are on. Hitting a key could cause an error, causing the ESCC to restart again.

Startup with Node Control Software

In this situation the node and the aggregate contain a complete set of software, but do not have the correct configuration information to communicate across the aggregate. In this case, the console does not need to be booted up. Console baud rate is set automatically by autobaud. By pressing [Return], the ESCC autobauds to console rates of 1200, 2400, 4800, or 9600 baud. By pressing the Break key, the ESCC autobauds again when the [Return] key is pressed.

1. Press the [Return] key on the console. The prompt **`ESCC>`** is displayed.
2. Type **`H`** and press [Return]. The Help menus is displayed.
3. Type **`VEQ`** and press [Return]. The current configuration information is displayed.
4. If any of the configuration information needs to be modified, follow the procedures detailed later in this section.

Note *It is strongly recommended that use of the Maintenance Console be conducted under the direction of an authorized GDC service representitive.*

TMS Controller Interface Baud Rate

The baud rate of the Controller Interface at the TMS node (the node local to the controller) and the PC Serial I/O Port 0 baud rate must agree. In the event of a direct connection to the TMS Controller, a rate of 9600 bps is recommended. When there is a modem link for dial backup use, baud rates of 1200 bps or 2400 bps are recommended. Refer to the MFP command later in this appendix for further details on setting baud rate.

Help Menu

The following is a description of the Console Main Menu. If you do not have loadable software, or have experienced an unexpected memory loss, follow the procedure Node Startup Procedures discussed earlier in this section. After powering up the Console, you see this screen:

```
HEL     - View Help
VCH     - View Chan.
VEQ     - View Equipment
VPT     - View Port Configuration
MNT     - (Re) Set Maint. Mode
CFM     - Configure Ext. Modem
DIA     - Perform Diag.
MFP     - Modify I/O Port Configuration
AGR     - Set Agg. Cfg. & Activation
```

To select an item from the HELP menu, type the three-letter command (all upper-case) and press [Return]. The selected display scrolls up with the **>** symbol displayed on the current line as a prompt. If you enter an unknown command or invalid data, a **???** message appears on the screen with an **ESCC>** prompt.

The following paragraphs describe each HELP menu selection.

HEL - View the Help Menu

The **HEL** command displays the HELP or Main Menu. It can be selected any time the **>** or the **Slave>** prompt is on the screen.

VCH - View Channel Information

The **VCH** command displays the configuration and status of a band of up to 64 channels. You can only view the running configuration; you cannot change it from the TMS Maintenance Console.

When you type **VCH**, the following prompt is displayed:

```
Slot # ? (1-16)
```

- If the Console is connected to a MEGAMUX TMS Compact or TMS 3000 Compact Node, the following prompt is displayed:

  ```
  Slot # ? (1-5)
  ```

- If the slot number you enter is not a Channel Interface Module, no information is displayed.

When correct slot parameters are entered, a screen similar to the following is displayed.

CHNL#	SHELF#1	SHELF#2	SHELF#3	SHELF#4
1	SYNC-28	ASYNC-23	UNDEF	UNDEF
2	ASYNC-01*	PCM-40	SYNC-28	SYNC-28
3	.	.	.	.
.	.	.	.	.
.	.	.	.	.
	.	.	.	.
16	SYNC-28	ASYNC-23	UNDEF	UNDEF

Figure B-1 Typical Channel Information Screen

The following lists the different types of channel cards and how they appear on the console:

1. Async: Asynchronous
2. Sync : Synchronous
3. Isoc: Isochronous
4. Pcm: Pulse Coded Modulation
5. Adpcm: Adaptive Differential Pulse Coded Modulation
6. Pcm-t: Pulse Coded Modulation with reduced overhead (also used for Acm-Pcm channel type)
7. Uadpcm: Universal Adaptive Differential Pulse Coded Modulation (with reduced overhead) (also used for Acm-UVC channel type)
8. Asp: Advanced Speech Processing
9. Cvsd: Continuously Variable Slope Delta Modulation
10. Cadm: Compressed Adaptive Differential Modulation
11. Tor: Thinned Out Residual
12. T-enc: Transition Encoded
13. Tid: Time Independent Data
14. Vlbrv: Very low bit rate voice
15. Celp: Codebook Excited Linear Predictable Coding

Note *On the Channel information screen, the numbers that accompany PCM, SYNC, ASYNC, etc., are code digits that represent standard or special data rates. Refer to Table B-4 for the corresponding rates.*

VEQ - View Equipment (TMS 3000 Node)

The **VEQ** command is used to view the currently running common modules on the TMS Main Shelf. When you type **VEQ**, a screen similar to the following is displayed:

				T1/D4		1's		
Slot #	Index #	Tx Clk	Ext Clk	NTT	Red	Den	Adr	Status
01	64	I	A	Y	Y	Y	5	In_alarm
02	UNDEF							
03	63	I	A	Y	Y	N	6	
.								
.								
.								
15	CIC							In_alarm
16	CIC							
P_scc	In_serv						3	
C_scc	Out_serv						3	

Figure B-2 Typical View Equipment Screen (TMS Node)

Slot # displays the number of each specific slot (1 to 16) in the equipment shelf.

Index # displays the type of common (card) module occupying the slot or an aggregate rate code:

- CIC: Channel Interface Module
- CDA: Combined Digital Aggregate Module
- CDA_E: Combined Digital Aggregate Module/E1 Version
- ACM: ADPCM Compression Module
- UNDEF: indicates that this slot is undefined in the currently running configuration.
- A number from 1 through 142 indicates an aggregate rate by code as defined in *Table B-4*. For example, **Index # 64** indicates that the Aggregate Control module in Slot 01 is running at 2048K baud.
- A number from 240 through 249 indicates a particular special channel rate by code as Special Channel Rates 1 through 10, respectively. This number can refer to any valid non-standard channel rate previously defined by the user at a TMS-3000 controller.

Note *Refer to Table B-4 for a list of digit codes for standard aggregate and channel rates, and special channel rates. Refer to the TMS-3000 Controller Manual (036R603-Vnnn), Chapter 19 for information on configuring a special channel rate.*

Tx Clk indicates the source of the transmit clock for the slot: **I** (internal) or **E** (external).

Ext Clk indicates the source of the external clock for the slot:

- **A** - the aggregate clock is used for timing.
- **R** - the timing signal is to be derived from the aggregate receive data or the aggregate receive clock.

T1/D4 NTT shows whether the T1/D4 or NTT interface is in use for the slot: **Y** (yes) or **N** (no).

Red indicates whether the system is redundant:

- **Y** - a redundant system
- **N** - a non-redundant 64 system

1's Den indicates whether Ones Density is used: **Y** (yes) or **N** (no).

Adr indicates the node address to which this aggregate is connected. The Adr column gives the address of the remote connected node if the module is an Aggregate Control module or the address of the local node if the module is a System Control module. For all other equipment types, nothing is entered.

Status indicates the alarm condition of the corresponding Aggregate Control module or Channel Interface module. If this field is blank, it indicates that this link is currently healthy, with no prevailing conditions to affect it.

- **Lnk_down** - this aggregate link is currently down.
- **Out_slot** - the module is not physically in the slot.
- **Out_serv** - this link is totally out of service.
- **In_alarm** - this link is currently in an alarm condition.
- ***** (askerisk) - this link is experiencing a major alarm condition.

VEQ - View Equipment (TMS Compact Node)

If the Console is connected to a TMS Compact node, typing **VEQ** will display a screen similar to the following:

```
                                    T1/D4          1's
Slot #      Index #  TxClk  Ext Clk  NTT    Red    Den    Addr   Status
01          62       I      A       Y      Y      Y      085
02          SET TO BACK UP:  1                             003    Out_serv
03          64       E      A       N      Y      N      003
04          CIC
05          CIC

P_scc       In_serv
S_scc       Out_serv
```

Figure B-3 Typical View Equipment Screen (TMS Compact Node)

Up to two aggregate trunks can be supported by a TMS Compact node. Each trunk requires one Aggregate Control module in the TMS Compact shelf. A third Aggregate Control module provides "1 of 2" redundant backup in a redundant system.

In the screen above, Slots 1 and 3 contain the Aggregate Control modules; Slot 2 contains the third Aggregate Control module (which provides the "1 of 2" redundant backup for the other two Aggregate Control modules). The Aggregate Control module in Slot 2 is currently set to back up the Aggregate Control module in Slot 1 in the event of a failure.

VPT - View Port Configuration

The **VPT** command is used to view port information. When you select **VPT**, a screen similar to the following is displayed:

Port	Rate	Data-Type	Parity	(J20) (J42) Timing/Modem	Data Bits
J20	4800	Async	Even		8
J42	1200	Async	Even		8
J19	Auto	Async	Even		7

Figure B-4 Typical View Port Configuration Display

MNT - Set or Reset Maintenance Mode

The **MNT** command is used to set the Console to Maintenance mode in order to run diagnostics. When set to maintenance mode, the network controller will be aware that a technician is on-site. During maintenance mode, no alarm messages are sent to the network controller.

When you type **MNT**, the following mode status message appears:

```
Current Mode: Normal
Change? (Y/N)
```

Type **Y** (yes) to change the current mode from **Normal** to **Maint**. After performing any necessary diagnostics, type **MNT** again to display the mode status message:

```
Current Mode: Maint
Change? (Y/N)
```

Type **Y** (yes) to return the current mode from **Maint Normal** back to **Normal**.

DIA - Perform Diagnostics

From the Maintenance Console, diagnostics may only be performed on the Aggregate Control Card (ACC) and the Channel Interface Card (CIC). Once the Console is set to Maint mode, the **DIA** command is used to initiate Diagnostic tests.

1. When you type DIA, the following prompt appears.

   ```
   1 = Equipment
   2 = Channel
   ```

2. To perform equipment diagnostics type **1** and press [Return]. The following prompts are displayed in successive order. You must respond to each of these prompts.

   ```
   Slot #? (1-16) [(1-5) for MEGAMUX TMS Compact]
   Lcl or Rem Lpbk, Stop Test? (L/R/S)
   ```

3. If the test is being performed successfully, the screen displays **OK**. If the console outputs an error code instead, look up the meaning of the error code in *Table B-2*.

4. The prompt: **Lcl or Rem Lpbk, Stop Test? (L/R/S)** continually repeats until type **S** to stop the test, or press the **Ctrl-X** keys to exit the diagnostic test.

5. When the equipment diagnostics terminate, **>** prompt or the **slave>** prompt reappears.

6. To perform channel diagnostics type **2** and press [Return]. The following prompts are= displayed in successive order. You must respond to each of these prompts:

```
Slot #? (1-16) [(1-5) for MEGAMUX TMS Compact]
Lcl or Rem Lpbk, Stop Test, Monitor BERT (L/R/S/M)
BERT? (Y/N)
```

7. If the test you initiated is being performed successfully, the screen displays **OK**. If the console outputs an error code instead, look up the meaning of the error code in *Table B-2*.

8. The prompt: **Lcl or Rem Lpbk, Stop Test, Monitor BERT? (L/R/S/M)** continually repeats until you type **S** to stop the test, or press the **Ctrl-X** keys to exit the diagnostic test.

9. When the equipment diagnostics terminate, **>** prompt or the **slave>** prompt reappears.

Note *The Monitor BERT feature is particularly useful for monitoring accumulated test pattern errors.*

Table B-2 Diagnostic Error Codes

Test Code	Description
01	Channel Test Fail
01	Controller test Fail - Hardware
03	Controller Test Fail - Aggregate Control or Channel Interface Not Responding or Not In Slot
04	Channel Not In Slot and/or Not Configured
05	Channel Tests Already in Progress

MFP - Modify I/O Port Configuration

This command is used to configure the two I/O ports on the Main Shelf backplane of the TMS node:

- Port 0 (J20) is used for the TMS Controller Port.
- Port 1 (J42) is used for the Internal/External Modem Port.

Note *The internal modem capability (Dial Backup) is supplied by the RCC module, Revision AH and earlier (GDC 036P302-001 or 036P302-002). Later versions of the RCC card do not support this function.*

Note *Port 2 (J19) was formerly used to configure the I/O interface for the terminal. Although Port 2 (J19) is displayed and selectable, any changes made will not take effect.*

Note *Port 0 may be configured for either Sync or Async operation when the port is to communicate with a TMS Controller at GTS Software Version 2.2.0 and earlier. For controllers at Version 5.0.0 and later, Port 0 can only be configured for Async operation.*

To configure the TMS Controller Port (J20) for sync operation, perform the following steps:

1. When you type **MFP**, the following options appear:

```
Modify Port:
0 - J20
1 - J42
2 - J19
```

2. Select **0** and press [Return]. The following options appear:

```
0-Sync
1-Async
Enter Serial I/F Type
```

3. Select **0** for sync and press [Return]. (Note that this selection is only valid for Controllers at GTS Ver. 2.2.0 or earlier.) The following prompt appears:

```
Enter Data Rate
```

4. At the prompt, enter the rate of **64**. The following options appear:

```
0 - J20 set to loop timing
1 - Ext device in loop timing
2 - Normal timing
```

5. After making your choice, the **slave>** prompt appears, indicating the port configuration is complete.

6. To deconfigure Port J20, select **1** for async, and enter **0** for the rate. When the **Slave>** prompt reappears, the port is deconfigured.

To configure the TMS Controller Port (J20) for async operation, perform the following steps:

1. When you type **MFP**, the following options appear:

```
Modify Port:
0 - J20
1 - J42
2 - J19
```

2. Select **0** and press [Return]. The following options appear:

```
0-Sync
1-Async
Enter Serial I/F Type
```

3. Select **1** for async and press [Return]. The following rate options appear:

```
0-Deconfigure for communications
1-300
2-1.2k
3-2.4k
4-4.8k
5-9.6k
6-19.2k
```

4. Select a rate choice (**0** through **6**) and press [Return].

5. The following communication parameters appear:

```
0-8 bits no parity
1-8 bits even parity
2-8 bits odd parity
3-7 bits even parity
4-7 bits odd parity
```

6. Make a selection (**0** through **4**) and press [Return].

7. After making your choice, the **slave>** prompt appears, indicating the port configuration is complete.

8. To deconfigure Port J20, select **1** for async, and enter **0** for the rate. When the **Slave>** prompt reappears, the port is deconfigured.

To configure the Internal/External Modem Port (J42), perform the following steps:

1. When you type **MFP**, the following options appear:

```
Modify Port:
0 - J20
1 - J42
2 - J19
```

2. Select **1** and press [Return]. The following options appear:

```
0-Passthru
1-Int Modem
2-Ext Modem - Pulse Dial
3-Ext Modem - Tone Dial
```

3. Make a selection and press [Return]. When you select option **1 Passthru**, the internal modem baud rate is automatically set to 1200. Otherwise, select from the following options:

```
0-Deconfigure for communications
1-300
2-1.2k
3-2.4k
4-4.8k
5-9.6k
6-19.2k
```

4. Make selection and press [Return]. The following options appear:

```
0-8 bits no parity
1-8 bits even parity
2-8 bits odd parity
3-7 bits even parity
4-7 bits odd parity
```

5. After selecting the parity and bits, the **Slave>** prompt appears, indicating the port configuration is complete.

6. To deconfigure Port J42, select either **Passthru** or **Ext. Modem**, and enter **0** for the rate. When the **Slave>** prompt reappears, the port is deconfigured.

CFM - Configure the External Modem

The **CFM** command is used to configure an external dial-back modem on Port J42.

1. When you type **CFM**, the current configuration for J42 is checked. If Port J42 is not configured as an external dial-back modem, the following message appears:

   ```
   Not Cfg'd for Ext Modem
   ```

2. The external modem is then checked to make sure it is currently online. If it is online, the message **On Line** is displayed and modem configuration cannot proceed until the current call is terminated.

3. The Console I/O is then internally routed to the external modem and the modems Help Menu is displayed on the screen.

4. Configure the modem as required. Refer to the documentation that accompanied your modem manual for detailed information on the modem command set.

5. To terminate the modem configuration session, press the **CTRL-X** keys.

AGR - Set Aggregate Parameters

The **AGR** command is used to set minimum aggregate configuration data and force the aggregates to run sync frames. Use this command when a node has no configuration or a bad configuration. In these cases, some of the Aggregate Control Modules at the local node are out-of-sync with those at remote nodes. No communications can be established between these nodes. When the AGR command is used, the TMS Controller can then download a more complete configuration.

1. Check the currently running node configuration by typing **VEQ** command and then press [Return]. The current node configuration is displayed.

2. Now type **AGR** and press [Return] to get the following prompts in successive order:

   ```
   Slot #? (1-16) [(1-5) for MEGAMUX TMS Compact]
   Agg Rate? (1 - 255)
   Tx Clk Source? (I/E)
   Ext Clk Source? (A/R)
   T1/D4 or NTT? (Y/N)
   Red. Agg? (Y/N)
   1's density? (Y/N)
   ```

3. Enter the slot number of the local aggregate that you are configuring and press [Return].

Note *IMPORTANT! For the TMS Compact node, only select Slot 1 or Slot 3 (the Aggregate Interface Cards) Selecting other Slots (2, 4, or 5) can cause the configurations for these slots to become corrupted.*

4. Enter the aggregate rate and then press [Return]. Refer to Table B as needed.

   - If you are using a T1DS0 interface, the aggregate index rate must be followed by the letter **T**. For example: **140T**.
   - If you are using a G.704 interface, the aggregate index rate must be followed by the letter **G**. For example: **122G**.

5. To select the transmit clock source (Tx Clk Source), external clock source (Ext Clk Source), and T1 or NTT refer to *Table B-3*. After entering these parameters, press [Return].

6. To select a redundant aggregate (Red. Agg), type **Y** and press [Return]. To select a nonredundant aggregate, type **N** and press [Return].
7. Select 1s density by typing **Y** (yes) or **N** (no), then press [Return].
   - For T1DS0 interface and Nx56k DS0s, answer Yes (Y).
   - For T1DS0 interface and Nx64k DS0s, answer No (N).
8. When the new aggregate parameters are accepted, a new prompt sign (**>**) appears.

Table B-3 Aggregate Interface Selections

Interface Type	Allowable Data Rates (bps)	Transmit Clock Source	External Clock Source	T1/D4 or NTT
64 K Contra	64 K	I	A	NO
BELL T1/D4	1.536 M	I	A	YES
NTT	192 K-1.536 M	I	A	YES
BELL T1	1.544 M	E	A	NO
CCITT 2.048 M	2.048 M	E	A	NO
64 K Codirectional	64 K	E	A	NO
CCITT V.35	4800-2.048 M	E	A	NO
BELL 303	19.2 K-230.4 K	E	A	NO
MIL-STD-188-11	4800-2.048 M	E	A	NO
RS-422 (V.11)	4800-2.048 M	E	A	NO
RS-423 (V.10)	4800-100 K	E	A	NO
EIA/TIA-232-E (V.24)	4800-19.2 K	I	A	NO
BELL T1-D4/E	1.472M, 1.536M	I	A	YES
64K CONTRA'L	64 K	I	A	NO
G704 (CCITT)	64K-1.984M N by 64K	I	A	YES
T1D4/DS0, FT	56K-1.344M N by 56K 64K-1.536M N by 64K	I	A	YES

Table B-4 Aggregate/Channel Rate Code Digits

Rate	Entry	Usage	Rate	Entry	Usage	Rate	Entry	Usage
0	62t	CDA	72000	41	Aggr/Chan	848000	82	Not Used
75	1	Channel	76800	42	Aggr/Chan	394000	83	Chan
100	2	Channel	96000	43	Aggr/Chan	1344000	84	Aggr (T1/D4-E only
150	3	Channel	100000	44	Aggr/Chan	1472000	85	Aggr
200	4	Channel	112000	45	Aggr/Chan	1528000	86	Aggr
300	5	Channel	115200	46	Aggr/Chan	1536000	87	Aggr (422)
400	6	Channel	128000	47	Aggr/Chan	10400	88	Tor Chan Rate
600	7	Channel	144000	48	Aggr/Chan	32800	89	ADPCM CC Chan Rate
800	8	Channel	153000	49	Aggr/Chan	50	90	Chan
900	9	Channel	192000	50	Aggr/Chan	39000	91	Chan
1000	10	Channel	224000	51	Aggr/Chan	40800	92	Chan
1200	11	Channel	230400	52	Aggr/Chan	168000	93	Aggr
1600	12	Channel	256000	53	Aggr/Chan	338000	94	Chan
1800	13	Channel	288000	54	Aggr/Chan	1536000	95	Aggr (NTT)
2000	14	Channel	384000	55	Aggr/Chan	8800	96	Tor Chan Rate
2400	15	Channel	460800	56	Aggr/Chan	10000	97	ASP Chan Rate
3200	16	Channel	512000	57	Aggr/Chan	11000	98	ASP Chan Rate
3600	17	Channel	576000	58	Aggr/Chan	12000	99	ASP Chan Rate
4000	18	Channel	768000	59	Aggr/Chan	12800	100	ASP Chan Rate
4800	19	Aggr/Chan	1024000	60	Aggr/Chan	15000	101	ASP Chan Rate
6400	20	Aggr/Chan	1152000	61	Aggr/Chan	16800	102	ASP Chan Rate
7200	21	Aggr/Chan	1536000	62	Aggr (T1/D4)	32800	103	ADPCM A Chan Rate
8000	22	Aggr/Chan	1544000	63	Aggr	24800	104	ADPCM Chan Rate
9600	23	Aggr/Chan	2048000	64	Aggr	32800	105	ADPCM NA Chan Rate
12000	24	Aggr/Chan	66000	65	Chan PCM	32800	106	ADPCM Chan Rate
14000	25	Aggr/Chan	34000	66	Chan ADPCM	320 K	107	Aggr/Chan
14400	26	Aggr/Chan	64800	67	Chan PCM	640 K	108	Aggr/Chan
16000	27	Aggr/Chan	1056000	68	Not Used	704 K	109	Aggr/Chan
19200	28	Aggr/Chan	2112000	69	Not Used	832 K	110	Aggr/Chan
24000	29	Aggr/Chan	3168000	60	Not Used	960 K	111	Aggr/Chan
25000	30	Aggr/Chan	4224000	71	Not Used	1.088 M	112	Aggr/Chan
28000	31	Aggr/Chan	5280000	72	Not Used	1.216 M	113	Aggr/Chan
28800	32	Aggr/Chan	6336000	73	Not Used	1.280 M	114	Aggr/Chan
32000	33	Aggr/Chan	7392000	74	Not Used	1.408 M	115	Aggr/Chan
36000	34	Aggr/Chan	3152000	75	Not Used	1.600 M	116	Aggr/Chan
38400	35	Aggr/Chan	6312000	76	Not Used	1.664 M	117	Aggr/Chan
48000	36	Aggr/Chan	921600	77	Aggr/Chan	1.728 M	118	Aggr/Chan
50000	37	Aggr/Chan	896000	78	Aggr/Chan	1.792 M	119	Aggr/Chan
56000	38	Aggr/Chan	448000	79	Aggr/Chan	1.856 M	120	Aggr/Chan
57600	39	Aggr/Chan	307200	80	Aggr/Chan	1.90 M	121	Aggr/Chan
64000	40	Aggr/Chan	2034000	81	Not Used	1.984 M	122	Aggr/Chan

Table B-4 Aggregate/Channel Rate Code Digits (Continued)

Rate	Entry	Usage	Rate	Entry	Usage	Rate	Entry	Usage
25	123	Aggr/Chan	952 K	133	Aggr/Chan	Rate 1	240	Special Chan Rate
280 K	124	Aggr/Chan	1.008 M	134	Aggr/Chan	Rate 2	241	Special Chan Rate
336 K	125	Aggr/Chan	1.064 M	135	Aggr/Chan	Rate 3	242	Special Chan Rate
504 K	126	Aggr/Chan	1.120 M	136	Aggr/Chan	Rate 4	243	Special Chan Rate
560 K	127	Aggr/Chan	1.176 M	137	Aggr/Chan	Rate 5	244	Special Chan Rate
616 K	128	Aggr/Chan	1.232 M	138	Aggr/Chan	Rate 6	245	Special Chan Rate
672 K	129	Aggr/Chan	1.288 M	139	Aggr/Chan	Rate 7	246	Special Chan Rate
728 K	130	Aggr/Chan	392 K	140	Aggr/Chan	Rate 8	247	Special Chan Rate
784 K	131	Aggr/Chan	328 K	141	Aggr/Chan	Rate 9	248	Special Chan Rate
840 K	132	Aggr/Chan	7.600 K	142	Not Used	Rate 10	249	Special Chan Rate

Note *Special Channel Rates are user-defined at a TMS Controller and displayed or entered as code digits 240 through 249 on the maintenance console VEQ or VCH screens.*

Appendix C: Agency Regulations

Note *This appendix supersedes any information contained in GDC 036R303-000. Before installing the equipment refer to the applicable national regulations within this document.*

Part 1: UK Regulations

This appendix must be read before connecting the equipment in the United Kingdom and, where appropriate, overrides any information provided in the text of the international manual. Any inquiries should be addressed to

GENERAL DATACOMM, INC.
6 Rubber Avenue
Naugatuck, Connecticut 06770
U.S.A.

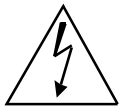
Equipment to which these regulations apply:

TMS-3000

Applicable Regulations

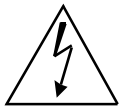
Safety Aspects

Safety protection for this equipment relies on the provision of a protective earth. This should be hardwired to the earth stud provided on the rear of the power supply shelf.



This equipment must be earthed.

Alternatively, the unit must be isolated from the PTO line interface before the mains plug, containing the protective earth, is removed. In such cases, the PTO line interface should not be hardwired.



Connect only equipment complying with BS6301 to the ports.

This equipment does NOT provide an isolation barrier between the PTO digital service and equipment connected to the ports. All equipment connected to the multiplexer ports should carry BS6301 approval, or be connected via an approved safety barrier.

It is possible to connect equipment having both BS6301 compliant and non-compliant ports to the multiplexer, thus creating a non-isolated path between hazardous voltages in the connected equipment and the PTO digital network. When connecting equipment of this type to the multiplexer, advice should be sought from a competent engineer.

Part 2: Telecommunication Attachment Details

This apparatus is approved for connection to Kilostream and Megastream services.

The approval of this equipment for connection to circuits provided by a Public Telecomms Operator is invalidated if the apparatus is subjected to any modification in any material way not authorised by British Telecomm or Telecomm Eireann. Misuse of the equipment by external software control or unconventional interconnection of auxiliary equipment, in such a way as to contravene relevant designated standards and regulatory specifications, shall invalidate the attachment approval.

Part 3: Attachment Information - UK

When completing the enclosed form for telecommunications attachment, the following details must be inserted for this equipment:

MODEL NUMBER	TMS-3000
ATTACHMENT APPROVAL No.	NS/1132/123/H/452743
AUTHORISED FOR CONNECTION	Megastream 2 private circuits
	Kilostream X21bis (V.28) private circuits
	Kilostream X21bis (V.35) private circuits
	Kilostream X21 (V.11) private circuits
	The PSTN utilising PCM and ADPCM encoding

Part 4: Attachment Information - Republic Of Ireland

MODEL NUMBER TMS-3000

ATTACHMENT APPROVAL NO.

AUTHORISED FOR CONNECTION

TELECOMMUNICATION ATTACHMENT DETAILS

GENERAL DATACOMM, INC.
6 Rubber Avenue
Naugatuck, Connecticut 06770 U.S.A.

Telephone 1-203-729-0271

SUBSCRIBER'S PROCEDURE

IF THERE IS NO APPROPRIATE TELECOMMUNICATION CONNECTION POINT WITHIN 3 METERS OF THE SITING OF THIS EQUIPMENT, DISPATCH THIS FORM TO YOUR LOCAL TELEPHONE AREA OFFICE AS A REQUEST FOR SERVICE CONNECTION.

FOR GENERAL DATACOMM PRODUCT SUPPORT Telephone (0734) 774868

SUBSCRIBER'S DETAILS

COMPANY

ADDRESS

POSTCODE

TELEPHONE TELEX

CONTACT NAME

* MODEL NO.

* ATTACHMENT APPROVAL NO. -- --/1132/--/-- --/-- -- -- -- -- --

* AUTHORISED FOR CONNECTION TO THE FOLLOWING SERVICE(S)

2-WIRE PSTN LINE

4-WIRE LEASED LINE

KILOSTREAM

MEGASTREAM

PLEASE COME AND FIT EXTENSION SOCKETS AS SOON AS POSSIBLE.

General DataComm

The Best Connections in the Business

WORLD HEADQUARTERS: General DataComm • 6 Rubber Avenue • Naugatuck, Connecticut • USA 06770