TDM-4A

FEDERAL COMMUNICATIONS COMMISSION

AND

INDUSTRY CANADA

RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

INSTRUCCIONES DE SEGURIDAD (Normas Oficiales Mexicanas Electrical Safety Statement)

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:

    A: El cable de poder o el contacto ha sido dañado; u

    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o

    C: El aparato ha sido expuesto a la lluvia; o

    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

    E: El aparato ha sido tirado o su cubierta ha sido dañada.

TRADEMARKS USED IN THIS MANUAL

Any trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.

Contents

1. Specifications

Main Channel
  Configuration— DTE
  Transmission Format — Synchronous
  Data Rate — Determined by external timing, up to 19,200 bps
  Interface — V.24/RS-232C
      Connector — DB25 male
      Control Signals — RTS, CTS, DCD, DTR, analog loopback (pin 18), remote digital loopback or signal quality (pin 21), RI (pin 22).

Subchannel Characteristics
  Configuration — DCE
  Number — 4
  Transmission Format — Asynchronous
  Data Rate — 300 to 19,200 bps, depending on mode
  Interface — V.24/RS-232C
      Control Signals — RTS, CTS, DTR, DCD
      Local Control Signal Transmitted End-to-End — RTS to DCD, DTR to CTS
      Character Code — 5, 6, 7, or 8 data bits
      Stop Bits — 1, 1.5, or 2
      Parity — Odd, even, none
      Connectors — 8-pin RJ-45 socket

Operating Modes
  Mode 1 — Four subchannels, each subchannel operating at 25% of main channel rate
  Mode 2 — Two subchannels, one operating at 25%, the other at 75%
  Mode 3 — Three subchannels, two operating at 25% and the third operating at 50%
  Mode 4 — Two sub-hannels, each subchannel operating at 50%
  Mode 5 — One subchannel, using the full main channel bandwidth

Nominal Subchannel Rates

Main Channel Rate		Sub-Channel Rate vs. Mode			
	1	2	3	4	5
19.2 kbps	4 x 4.8 kbps	1 x 4.8 kbps 1 x 14.4 kbps	2 x 4.8 kbps 1 x 9.6 kbps	2 x 9.6 kbps	1 x 19.2 kbps
14.4kbps	4 x 3.6 kbps	1 x 3.6 kbps 1 x 9.6 kbps	2 x 3.6 kbps 1 x 7.2 kbps	2 x 7.2 kbps	1 x 14.4 kbps
9.6 kbps	4 x 2.4 kbps	1 x 2.4 kbps 1 x 7.2 kbps	2 x 2.4 kbps 1 x 4.8 kbps	2 x 4.8 kbps	1 x 9.6 kbps
7.2 kbps	4 x 1.8 kbps	1 x 1.8 kbps 1 x 4.8 kbps	2 x 1.8 kbps 1 x 3.6 kbps	2 x 3.6 kbps	7.2 kbps
4.8 kbps	4 x 1.2 kbps	1 x 1.2 kbps 1 x 3.6 kbps	2 x 1.2 kbps 1 x 2.4 kbps	2 x 2.4 kbps	4.8 kbps
3.6 kbps	4 x 900 bps	1 x 900 bps 1 x 2.4 kbps	2 x 900 bps 1 x 1.8 kbps	2 x 1.8 kbps	3.6 kbps
2.4 kbps	4 x 600 bps	1 x 600 bps 1 x 1.8 kbps	2 x 600 bps 1 x 1.2 kbps	2 x 1.2 kbps	2.4 kbps
1.8 kbps	4 x 200 bps	1 x 200 bps 1 x 1.2 kbps	2 x 200 bps 1 x 900 bps	2 x 900 bps	1.8 kbps
1.2 kbps	4 x 300 bps	1 x 300 bps 1 x 900 bps	2 x 300 bps 1 x 600 bps	2 x 600 bps	1.2 kbps

Delays — End-to-End Data Delay: Less than 9.6 msec @ 19.2 kbps main channel data rate
   Single Character Delay: Less than 15 msec @ 19.2 kbps main channel data rate
   End-to-End Control Delay: Less than 9.6 msec @ 19.2 kbps main channel data rate

Panel Indicators — Main channel and subchannel activity indicators, TEST, OVF, LOS, and PWR

Test Modes — Subchannels: Local, reverse and remote loopback Main Channel Modem: Local analog and remote digital loopback

Control — Command Port: Any subchannel port Configuration Control: Downloading of configuration in either direction Configuration Method: Menu-driven configuration program, runs on any CRT terminal

Power — 115 or 230 VAC, 47 to 63 Hz, 4.6 W

Size — 1.7"H x 8.5"W x 9.5"D (4.3 x 21.5 x 24.1 cm)

Weight — 3.1 lb. (1.4 kg)

2. General Description

2.1 Functional Description

The TDM-4A is an advanced, user-configurable, compact four-channel time-division multiplexor.

The TDM-4A multiplexes up to four asynchronous data subchannels onto a single synchronous main channel. The aggregate data rate of the main channel equals the total data rate of the subchannels, without any overhead. The main channel data rate is determined by the clocks received on the main channel, in the range of 1,200 to 19,200 bps.

The TDM-4A can operate in 5 modes. The modes differ in the number of active subchannels, and in the way the main channel bandwidth is allocated to the subchannels:

• Mode 1— Four subchannels: each subchannel is allocated 25% of the main channel bandwidth.

• Mode 2— Two subchannels: 25% to one subchannel, 75% to the other.

• Mode 3 — Three subchannels: 25% to each of two subchannels and 50% to the third.

• Mode 4 — Two subchannels: 50% of the main channel bandwidth to each one.

• Mode 5 — One subchannel, using the full main channel bandwidth. For each subchannel, two RS-232 control signals are passed end-to-end in each direction: RTS to DCD, and DTR to CTS. Data and control are independently transferred. In addition, BREAK transfer is available: upon detection of a long sequence of logic 0 or spaces, BREAK is sent to the opposite side. Subchannel data word format (number of data bits, parity and number of stop bits) can be selected by the user.

You can program the operating mode and configuration of the TDM-4A, including subchannel characteristics and various system features. Password protection is used, to prevent unauthorized configuration changes.

You can carry out programming using any standard CRT terminal, connected to one of the TDM-4A subchannel connectors. You can select any subchannel as a command port, and use it to configure and perform diagnostics on both the local and the remote TDM-4A.

Configuration uses a simple, menu-driven facility. Configuration parameters are stored in non-volatile memory and are immediately available upon power-up. In addition, user configuration can be downloaded to, or uploaded from the remote TDM-4A.

To facilitate initial system configuration, the TDM-4A stores, in addition to the user-selected configuration, a set of default configuration parameters (the factory setting) that you can select via a jumper.

The TDM-4A has comprehensive diagnostics functions, including automatic self-test upon turn-on, local and remote subchannel loopback, and local and remote main channel loopback. Front panel indicators show the condition of each sub-channel, and main link status. In addition, the TDM-4A can control the V.54 pins (18 and 21) of the RS-232 interface serving the main link. This enables control over the analog and remote digital loopback functions of the modem connected to the TDM-4A.

2.2 Typical Applications

The TDM-4A uses time division multiplexing (TDM). The TDM technique yields a constant transmission delay, which does not vary with traffic load. In this respect, the TDM-4A has a significant advantage over statistical multiplexors, where delay varies over a wide range when traffic load changes.

The TDM-4A is therefore well-qualified for use in time-critical applications, e.g. applications which use polling techniques or use communication protocols with stringent time-out requirements.

Figure 2-1 shows a typical TDM-4A application, which supports polling techniques. In this application, the TDM-4A subchannels receive data provided by the host computer, and multiplex the subchannel data to form the aggregate data stream. The aggregate data is sent via modems to the remote TDM-4A, where it is demultiplexed and distributed to the local users.
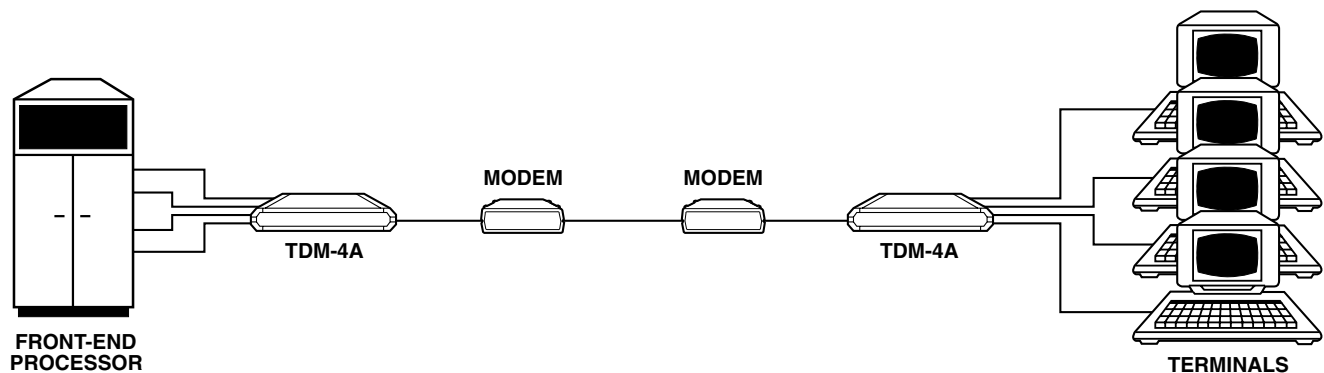

Fig. 2-1. Typical TDM-4A Application.

3. Installation

3.1 General

The TDM-4A standalone model is delivered completely assembled. The TDM-4A standalone model is designed for installation on top of a bench or shelf, or optionally mounted on a 19" rack (by means of a rack adapter).

Mechanical and electrical installation procedures for the TDM-4A are provided in the following paragraphs.

To prepare the TDM-4A for operation in your system, follow the steps listed in Table 3-1.

Table 3-1. Setting Up the TDM-4A.

Sequence No.	Action	Reference
1	Set the internal jumpers	Section 3.3, 3.4
2	Install the TDM-4A in the intended location	Section 3.5
3	Connect cables to the installed unit	Section 3.6
4	Operate the communication link to the remote TDM-4A	As required
5	Turn on the TDM-4A	Section 3.7
6	Configure the TDM-4A for operation in your system	Section 3.8, 3.9, 3.10

NOTE

You can either prepare the configuration on the local TDM-4A and transfer it to the remote TDM-4A, or copy the configuration of the remote TDM-4A to the local TDM-4A.

If you encounter a problem, refer to **Chapter 5** for test and diagnostic instructions.

3.2 Site and Power Requirements

3.2.1 POWER

Install within 1.5 m (5 feet) of a grounded AC outlet capable of furnishing 115 VAC or 230 VAC, in accordance with the nominal supply voltage of the unit.

3.2.2 AMBIENT REQUIREMENTS

The TDM-4A will operate properly in any ambient conditions suitable for operation of electronic computer equipment and peripherals. TDM-4A multiplexors, however, can operate without performance degradation over a wide range of temperatures (0 to 50°C [32 to 122°F]) at relative humidities up to 95%, non-condensing.

3.2.3 GROUNDING

The TDM-4A has a rear ground screw, ensuring grounding of all metal parts of the chassis.

3.3 Functions of the Internal Jumpers

3.3.1 GENERAL

The TDM-4A has three internal jumpers. Refer to Fig. 3-1, and use the following description.

INIT - NOR jumper

This jumper is used to select the default set of configuration parameters (the factory set-up) stored in the TDM-4A. The jumper has two positions:

- NOR — Normal operation. Upon power-up or reset, the TDM-4A uses parameters selected by the user, and stored in the TDM-4A non-volatile RAM.

- INIT — Initialization. Upon power-up or reset, the TDM-4A uses the default configuration (determined by the factory and common to all the TDM-4A units).

    To select the factory setup, turn the TDM-4A off, set the jumper to INIT, then apply power to the TDM-4A. The factory setup is loaded upon power-up.

Factory setting is NOR.

When delivered, the non-volatile memory of the TDM-4A is already loaded with the factory setup, so the TDM-4A is configured in accordance with the factory settings. You may have to select again the factory setup (INIT) in the following cases:

- After an unknown or erroneous configuration has been loaded into the TDM-4A, which either prevents communication between the control terminal and the TDM-4A, or proves difficult to trace and correct.

- The description of the configuration loaded into the TDM-4A has been lost, and it is therefore not possible to enter the configuration mode in the NOR mode. To avoid this inconvenience, always keep a record of the last configuration parameters (a typical record form is shown in Appendix B).

PIN 21 ON-OFF jumper

Pin 21 of the standard RS-232 interface can serve either as a signal quality indication (SQ) line, or as a remote loopback command line. The actual function of pin 21 depends on the specific model of modem in use, and this jumper allows adaption of the TDM-4A to the modem connected to the aggregate (main) link connector. The jumper has two positions:

- PIN 21 ON — Set the jumper to this position when the modem uses pin 21 as a remote loopback command line. This connects the internal TDM-4A pin 21 driver to this pin, and allows the user to control this modem function through the diagnostics screen.

- PIN 21 OFF — Set the jumper to this position when the modem uses pin 21 as a signal-quality-indication output. You should also use this position whenever in doubt about the actual function of the pin in the specific modem model you use. In this position, you no longer have control of the modem's remote loopback function from the diagnostics screen.

Factory setting is OFF.

CHAS GND jumper

This jumper controls the connection between the signal ground lines (pin 7 in all the TDM-4A's RS-232 DB25 or RJ-45 connectors) to the chassis ground line (pin 1). The appropriate position must be determined by the installation manager. The jumper has two positions:

   • CON (connect) — pins 1 and 7 connected

   • DIS (disconnect) — pins 1 and 7 not connected

Factory setting is DIS (Disconnect).

In addition to the jumpers listed above, the
TDM-4A may have several jumpers that were set by the manufacturer. Do not change the position of jumpers not listed above.
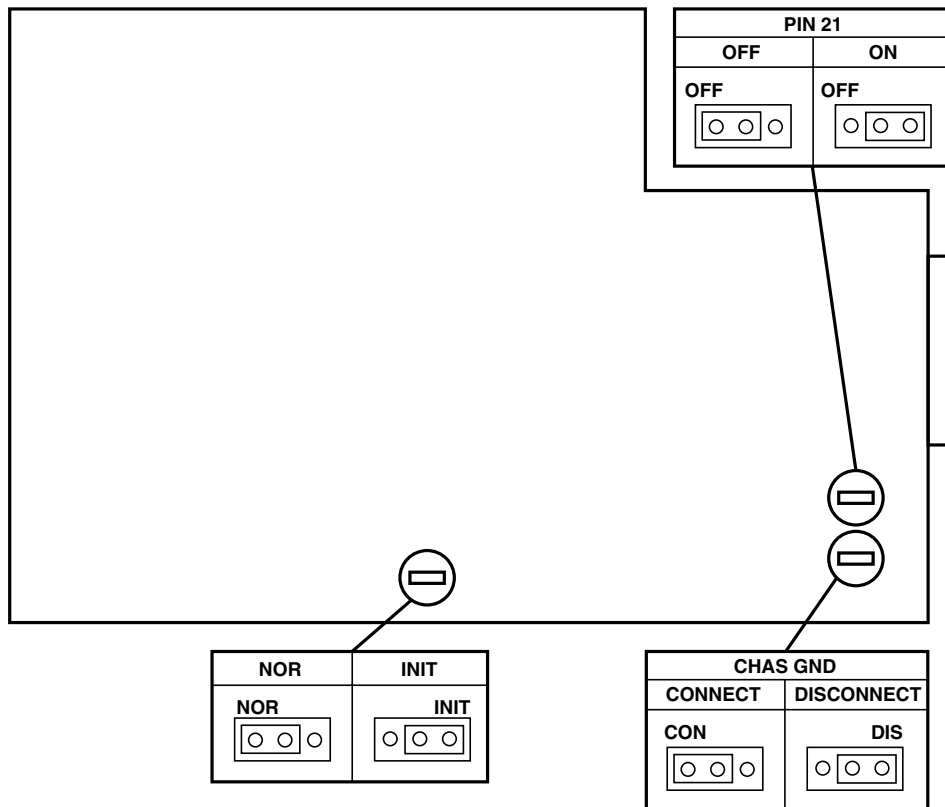
Fig. 3-1. TDM-4A Internal Jumpers.

3.4 Setting the Jumpers

WARNING

To avoid electric shock:

1. Always turn the power switch off.

2. Disconnect any cables connected to the main and subchannel connectors.

3. Disconnect the power cable from mains before opening the case of a TDM-4A.

CAUTION

The TDM-4A uses CMOS integrated circuits, which are sensitive to electrostatic discharge (ESD). To prevent ESD damage, always touch first the metallic case. Do not touch components on the printed circuit board, and hold the board by its sides.

• Access the printed circuit board of the TDM-4A unit as follows:

- Open the screw fastening the top cover to the case, and remove top cover.

• Refer to Fig. 3-1 and identify jumper locations. Set jumpers as required.

• Reinstall TDM-4A cover (for TDM-4A cards, reinsert in the assigned card slot), and fasten the screws. Do not exert excessive torque while tightening these screws.

3.5 Installation in 19" Racks

You can install the TDM-4A in 19" racks. The unit height is 1U (1.75"). The width of the standalone TDM-4A is slightly less than half of the available mounting width. Two rack adapter kits are available. One kit provides the hardware you need to install a single unit, and the other provides the hardware you need to install two units, side by side. Step-by-step instructions for each option appear in **Sections 3.5.1** and **3.5.2**.

WARNING

Disconnect the unit from AC power before you start the following procedures.

3.5.1 INSTALLATION OF SINGLE TDM-4A UNIT

The rack adapter kit for single-unit installation includes one short bracket and one long bracket. The brackets are fastened via screws to the two side walls of the case, as shown in Fig. 3-2.
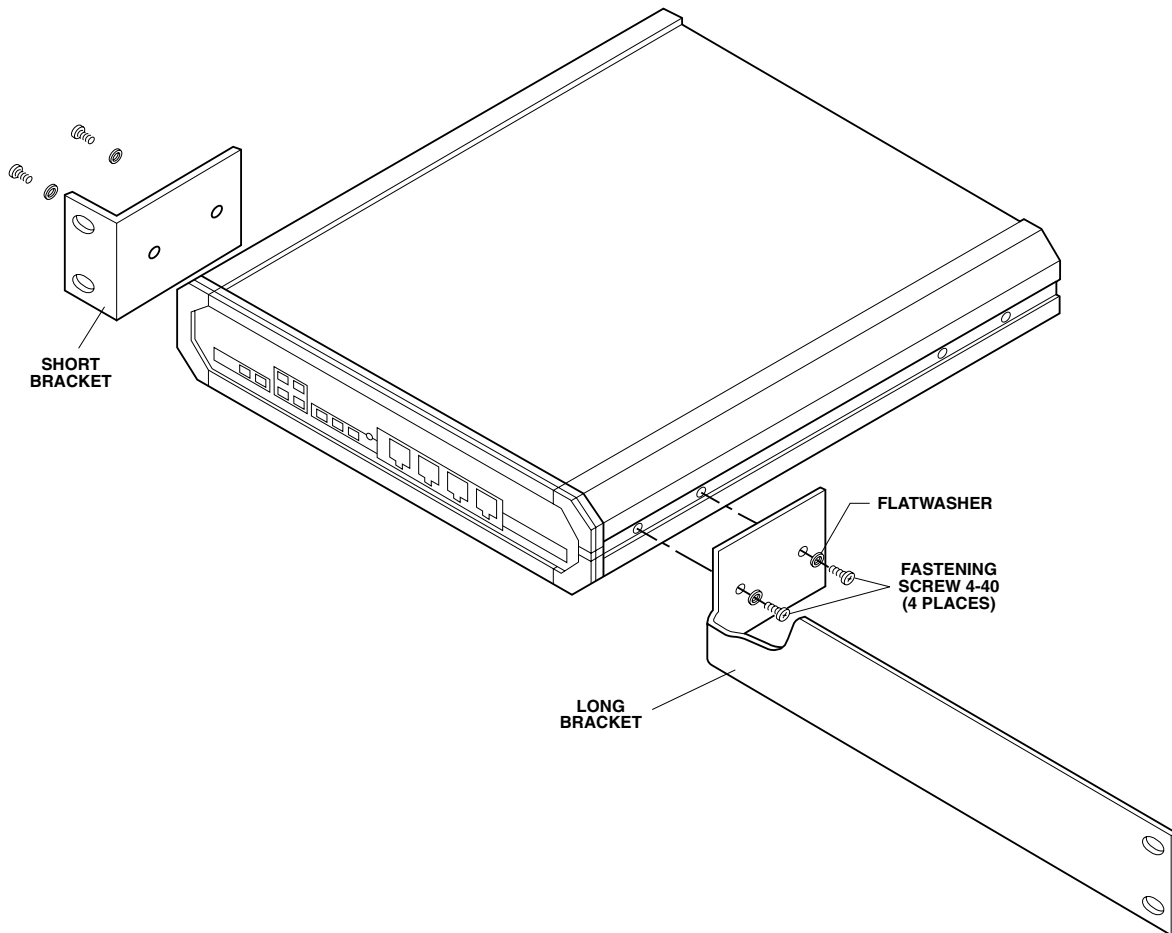
Fig. 3-2. Installation of Single TDM-4A Unit in 19" Rack.

To prepare the unit for rack installation, attach the two brackets to the side walls of the unit. Each bracket is fastened by means of two screws (with flatwashers), which are inserted into the two front holes on the side wall (nuts are already in place, on the inner side of the wall).

After attaching the brackets, the unit is ready for installation in the 19" rack. Fasten the brackets to the side rails of the 19" rack via four screws (not included in the kit), two each side.

3.5.2 INSTALLATION OF TWO TDM-4A UNITS

The adapter kit includes two adapter brackets, and various hardware for attaching the two units side by side. Refer to Fig. 3-3 and perform the following actions:

1. Remove cover from unit intended to be at the right-hand side.

2. Position one of the two U brackets (2) supplied in the kit on the slots inside of the inner left-hand wall, and align its holes with the holes on the wall.

3. Insert flat washers (3A) over one pair of long screws (3B) and screw them through the U bracket (2) into the holes on the wall.

4. Repeat steps 2 and 3 above for the other U bracket.

5. Hold the second unit close to the left wall of the opened unit, and using a screwdriver, drive the four screws until their ends emerge from the left wall and engage the holes on the right-hand of the second unit. Tighten each screw one turn at a time–do not tighten one screw completely! Continue to tighten the screws until their heads rest against the U bracket, and the two units are in contact.

6. Reinstall the cover (1) over the right-hand unit.

7. Fasten one adapter bracket (6A) to the side wall of each unit. Use the four short screws (6B) and flatwashers (6C) supplied in the kit.

8. The assembled units can now be fastened to the side rails of the 19" rack, by means of four screws (not included in the kit), two on each side.
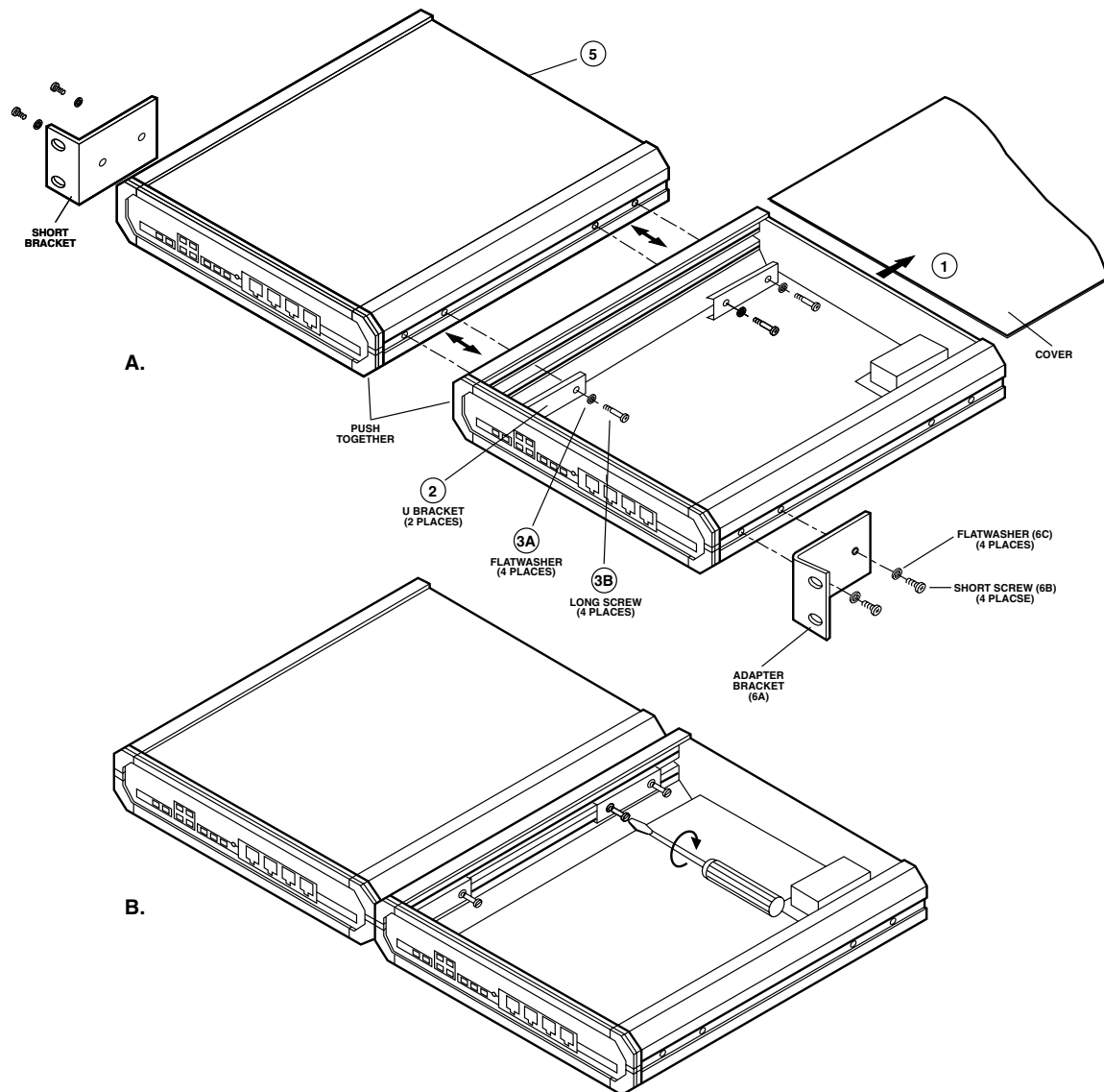
Fig. 3-3. Installation of Two TDM-4A Units in 19" Rack.

3.6 Cable Connections

3.6.1 GENERAL

The TDM-4A has one standard DB25 connector on the rear panel, serving the main channel, and four RJ-45 connectors on the front panel for the subchannels.

3.6.2 SUBCHANNEL CONNECTIONS

TDM-4A subchannel interfaces are configured as data communication equipment (DCE) interfaces, thereby allowing direct connection, via RS-232 port (straight-through) cables, to data terminal equipment (DTE). When modems are used to extend range (tail-end circuits), crossover cables are required. Subchannel interfaces are asynchronous, so clock signals are not supported or required. Appendix A lists pin allocation in TDM-4A subchannel connectors, and provides typical wiring diagrams for straight-through and cross-over cables.

3.6.3 MAIN (COMPOSITE) CHANNEL CONNECTION

TDM-4A aggregate channel interface is configured as a DTE interface, intended for connection to a synchronous modem. The modem must provide the clock signals that determine TDM-4A main channel data rate. **Appendix A** also lists the pin allocation for the TDM-4A main channel connector.

3.6.4 POWER CONNECTION

The TDM-4A has standard IEC three-prong connectors with integral fuse.

3.7 Turning On the TDM-4A

Always turn-on the modem connected to the TDM-4A before turning on the TDM-4A. Whenever possible, operate the link to the remote TDM-4A as well.

Connect the power cable to the AC mains connector on the rear panel and then to a standard grounded AC outlet. Set the rear-panel POWER switch to ON. The internal switch lamp and the front-panel PWR indicator should light.

3.7.1 INDICATIONS AFTER TURN-ON

Check that after a few seconds (during which the TDM-4A performs self-test), the LOS and OVF indicators are extinguished. If the link to the remote TDM-4A is not yet operational, the LOS indicator will flash or light continuously.

For additional information on TDM-4A indications, refer to **Chapter 4**.

3.8 TDM-4A Configuration Information

3.8.1 INTRODUCTION

The TDM-4A can operate in three modes:

1. *Normal operation mode,* described in detail in **Chapter 4**.

2. *Parameter configuration mode* (described in this chapter). Allows you to setup the parameters of the local and remote TDM-4A units. This mode provides two types of functions:

• Parameter-selection functions.

• System-management functions, used to display the current operating state of the two TDM-4A units operating in a link, to transfer configurations between the local and remote units, to activate new configurations, and to select the local password. These functions permit you to configure simultaneously the two TDM-4A units operating in a link by means of a terminal connected to one of them.

3. *Diagnostics mode.* ATSM-4 diagnostic functions include local, reverse and remote loops on each subchannel, and modem loops (analog and optionally remote digital loopback). Refer to **Chapter 4** for additional details.

The parameter configuration mode and the diagnostics mode are activated by the user from the command terminal, with the TDM-4A configuration program. While the TDM-4A is under your command, data transfer through the subchannel used for command is stopped. However, all the other subchannels continue normal data transfer using the existing parameters.

Te next section provides an outline of the available TDM-4A configuration parameters. **Section 3.9** provides step-by-step instructions for starting and ending configuration and diagnostics sessions and in-depth information on each menu, and explains the purpose of each parameter or diagnostics screen.

3.8.2 CONFIGURATION INFORMATION

TDM-4A has two types of configuration parameters:

1. System parameters, which affect both TDM-4A units connected in a link, and apply to all their sub-channels. System parameters are listed in Tables 3-2 and 3-3.

2. Sub-channel parameters, which affect only the operation of a single subchannel. Subchannel parameters are listed in Table 3-4.

The two TDM-4A units operating in a link must always use the same configuration. Using different configurations will garble the transmitted data.

To simplify the configuration procedures, the TDM-4A configuration program provides copy functions that permit you to transfer the prepared configuration from the local unit to the remote, or vice-versa.

Table 3-2. TDM-4A System Parameters and Factory Setup.

N	Parameter	Function	Available Selections	Factory Setup
1	Password	Controls access to configuration program.	Any two letters (upper and/or lower case)	RD (capital letters)
2	Main link data rate	Determines the main link data rate. Indirectly determines subchannel data rates.	1.2, 1.8, 2.4, 3.6, 4.8, 7.2, 9.6, 14.4, and 19.2 kbps	Equal to measured external clock frequency; 19.2 kbps when main clock is not present
3	Subchannel data rate NOTE: TDM-4A operating mode is automatically determined by the subchannel assignments	Determines the fraction of the main channel rate allocated to each channel. Actual data rate depends on the main channel rate (Table 3-2.)	Depends on mode (see Table 3-2). Assignable values are: not active (0), ¼, ½, ¾, and full bandwidth	¼ or main channel rate
4	Number of data bits	Number of data bits in the subchannel data frame.	5, 6, 7, or 8	8
5	DCD controls passing	Allow the local sublines to follow the remote RTS lines.	Subchannel DCD follow remote RTS, or DCD forced active (high)	Forced high

Table 3-1. TDM-4A System Parameters and Factory Set-up (continued).

N	Parameter	Function	Available Selections	Factory Set-up
6	CTS controls passing	Allow the local sub-channel CTS lines to follow the remote DTR lines.	Subchannel CTS follows remote DTR, or CTS forced active (high)	Forced high

Table 3-3. Available Subchannel Rates.

Main Channel Rate	Sub-Channel Rate vs Mode				
	1 (4x25%)	2 (1x25%+ 1x75%)	3 (2x25%+ 1x50%)	4 (2x50%)	5 (1x100%)
19.2 kbps	4 x 4.8 kbps	1 x 4.8 kbps 1 x 14.4 kbps	2 x 4.8 kbps 1 x 9.6 kbps	2 x 9.6 kbps	1 x 19.2 kbps
14.4 kbps	4 x 3.6 kbps	1 x 3.6 kbps 1 x 9.6 kbps	2 x 3.6 kbps 1 x 7.2 kbps	2 x 7.2 kbps	1 x 14.4 kbps
9.6 kbps	4 x 2.4 kbps	1 x 2.4 kbps 1 x 7.2 kbps	2 x 2.4 kbps 1 x 4.8 kbps	2 x 4.8 kbps	1 x 9.6 kbps
7.2 kbps	4 x 1.8 kbps	1 x 1.8 kbps 1 x 4.8 kbps	2 x 1.8 kbps 1 x 3.6 kbps	2 x 3.6 kbps	1 x 7.2 kbps
4.8 kbps	4 x 1.2 kbps	1 x 1.2 kbps 1 x 3.6 kbps	2 x 1.2 kbps 1 x 2.4 kbps	2 x 2.4 kbps	1 x 4.8 kbps
3.6 kbps	4 x 900 bps	1 x 900 bps 1 x 2.4 kbps	2 x 900 bps 1 x 1.8 kbps	2 x 1.8 kbps	1 x 3.6 kbps
2.4 kbps	4 x 600 bps	1 x 600 bps 1 x 1.8 kbps	2 x 600 bps 1 x 1.2 kbps	2 x 1.2 kbps	1 x 2.4 kbps
1.8 kbps	4 x 200 bps	1 x 200 bps 1 x 1.2 kbps	2 x 200 bps 1 x 900 bps	2 x 900 bps	1 x 1.8 kbps
1.2 kbps	4 x 300 bps	1 x 300 bps 1 x 900 bps	2 x 300 bps 1 x 600 bps	2 x 600 bps	1 x 1.2 kbps

Table 3-4. Subchannel Parameters and Factory Setup

N	Parameter	Function	Available Selections	Factory Set-up
1	PARITY	Type of parity used in subchannel data frame	Odd None Even	None
2	STOP BITS	Number of stop bits in subchannel data frame	1, 1.5, 2 (2 stop bits auto-matically preset with 5 data bits)	1

3.8.3 OUTLINE OF CONFIGURATION PROGRAM

The organization tree of the configuration program is shown in Fig. 3-4.

DISPLAY TDM-4A
ACTIVE STATE

DISPLAY REMOTE TDM-4A
ACTIVE STATE

DISPLAY USER
CONFIGURATION

MAIN MENU
0) DISPLAY TDM-4A ACTIVE STATE
1) DISPLAY REMOTE TDM-4A ACTIVE STATE
2) DISPLAY USER CONFIGURATION
3) SET USER CONFIGURATION
4) COPY/SEND TO REMOTE USER CONFIGURATION
5) DIAGNOSTICS
6) EXIT TO DATA TRANSFER MODE

SET USER CONFIGURATION
0) LOAD FACTORY SETUP TO USER SETUP (INIT)
1) SET LOCAL PASSWORD
2) SET MAIN LINK DATA RATE
3) SET DATA BITS
4) SET SUB-CHANNEL DATA RATE
5) SET SUB-CHANNEL STOP BITS AND PARITY
6) ENABLE/DISABLE DCD CONTROLS PASSING
7) ENABLE/DISABLE CTS CONTROLS PASSING

LOAD· · · · · · · · · ·
SET· · · · · · · · · ·
SET· · · · · · · · · ·
SET· · · · · · · · · ·
SET· · · · · · · · · ·
SET· · · · · · · · · ·
ENABLE· · · · · · · · · ·
ENABLE· · · · · · · · · ·

COPY/SEND TO REMOTE USER CONFIGURATION
1) SEND USER SETUP TO REMOTE TDM-4A
2) DISPLAY REMOTE USER SETUP
3) COPY REMOTE USER SETUP

SEND· · · · · · · · · ·
DISPLAY· · · · · · · · · ·
COPY· · · · · · ·

DIAGNOSTICS
1) DISPLAY STATE
2) DISPLAY REMOTE STATE
3) SET/CLEAR CH. LOCAL LOOP
4) SET/CLEAR CH. REVERSE LOOP-BACK
5) SET/CLEAR CH. REMOTE LOOP-BACK
6) SET/CLEAR MODEM LOOPS
7) CLEAR OVERFLOW FLAG
8) RESET THE UNIT

DISPLAY· · · · · · · · · ·
DISPLAY· · · · · · · · · ·
SET· · · · · · · · · ·
SET· · · · · · · · · ·
SET· · · · · · · · · ·
SET· · · · · · · · · ·
CLEARE· · · · · · · · · ·
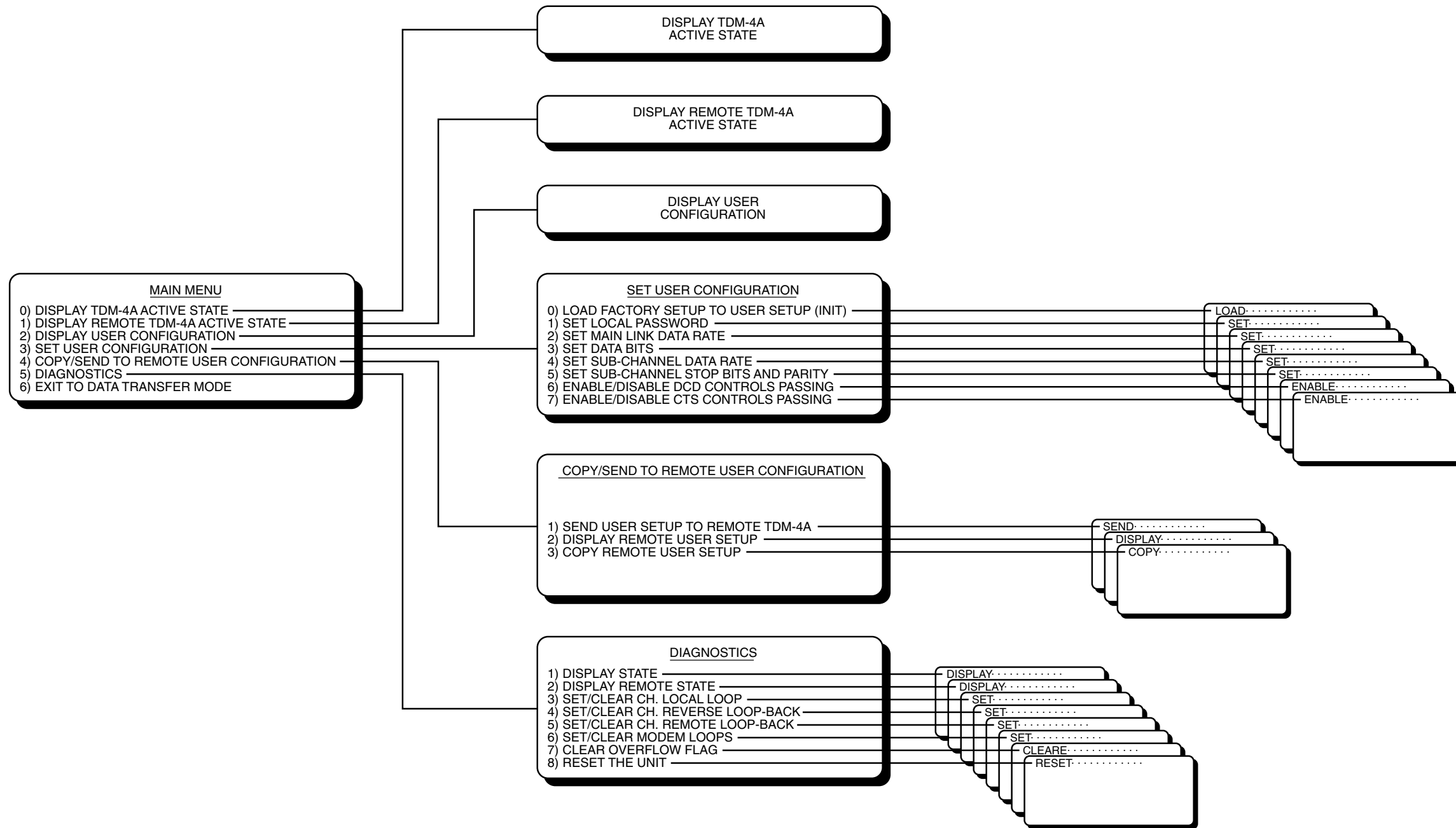RESET· · · · · · · · · ·

Fig. 3-4. TDM-4A Configuration Tree.

3.9 Starting the Configuration Program

3.9.1 USING THE TDM-4A CONFIGURATION PROGRAM

The TDM-4A configuration program is used to configure the TDM-4A for operation in your particular system. Here follows a detailed description of the configuration procedure. If you are already familiar with the TDM-4A or similar products, a quick-start guide is provided in **Section 3.11**.

The program provides all the tools you need to prepare a link for operation, efficiently and conveniently. The program helps you perform the correct actions by clearly showing the options you can select, indicating whether your selection was accepted or why it was rejected.

You can run the configuration program on any standard CRT terminal, connected to any one of the active subchannels. It is a simple menu-driven program that guides you through the various configuration steps:

1. At each step, you are presented with a screen that shows all the available options, and when applicable, shows the current selections. The screen also instructs you how to continue after each step in the procedure.

2. A standard selection procedure is used throughout: the available options are marked with numbers, and you indicate your selection by typing the option number.

3. After entering your selection, a confirmation message is displayed. You can then select how to continue:

• To leave the current screen, you type Q (upper case only). This returns you to the previous screen.

• To remain on the current screen, you press the carriage-return key. This enables you to select another option appearing on the current screen, as described in Step 2 above.

The program checks your entries and does not accept invalid entries. For example, if the program expects a numerical entry in a certain range, and you press a key outside this range, the program ignores your entry and waits for a valid response.

After a valid response is provided, it is saved in the user configuration memory, but it is not activated until you specifically approve the action, as explained below.

You can always stop and abort the configuration session at any point, by pressing the ESC key of the terminal (this inserts the ESC character [ASCII 27] in the data stream). However, any changes you make before you press the ESC key remain stored in the user configuration memory.

3.9.2 RECOMMENDED CONFIGURATION PROCEDURES

This paragraph explains how the TDM-4A treats the configuration data and presents recommended configuration procedures.

"User" versus "Active" Configuration

The TDM-4A program allows you to prepare a new configuration in the background. The current configuration is called the "active" configuration. The new configuration being prepared is called the "user" configuration. You can transfer the user configuration to the remote TDM-4A, so that you need not prepare the same configuration twice. You can also copy the user configuration from the remote TDM-4A.

All these actions are performed without disturbing the normal operation of the link, except that during the configuration session one of the subchannels is used by the terminal on which you prepare the configuration.

How the TDM-4A Stores the Configuration Data

To store the two variable configurations (user and active), the TDM-4A has two programmable stores (memories): one for the user configuration, the other for the active configuration.

- The user configuration is stored in a non-volatile memory (a memory that preserves the stored data even when the TDM-4A is not powered).

- Any changes to the TDM-4A configuration are always prepared in the non-volatile memory. Among other advantages, this means that the changes will not get lost when power fails in the course of a configuration session, or when you stop the configuration session before the new configuration is completed.

The active configuration is stored in the memory used by the internal TDM-4A microcomputer. This microcomputer can therefore use the stored data to control TDM-4A operation.

The active configuration memory is loaded with configuration data when the TDM-4A is turned on (or is reset). The loaded configuration data remains in use until replaced by a new configuration, or until the TDM-4A is powered off.

In addition to the variable configuration data, the TDM-4A stored a fixed set of configuration parameters, which cannot be altered by the user: the factory setup, described in **Section 3.3** (Tables 3-1, 3-2, 3-3, 3-4).

You can select the configuration data loaded upon turn-on (or reset) by means of the INIT/NOR jumper, as illustrated in Fig. 3-5.

- NOR: with the jumper set to NOR, you load the user configuration, that is, the configuration stored in the non-volatile memory.

- INIT: with the jumper set to INIT, you load the factory set-up (**Section 3.3**).

You can also load new configuration data into the active configuration memory even after the TDM-4A starts operating: for this purpose, use TDM-4A command mode. When using the command mode, any new configuration data is always transferred from the non-volatile memory, using the ACTIVE NEW SET UP screen.
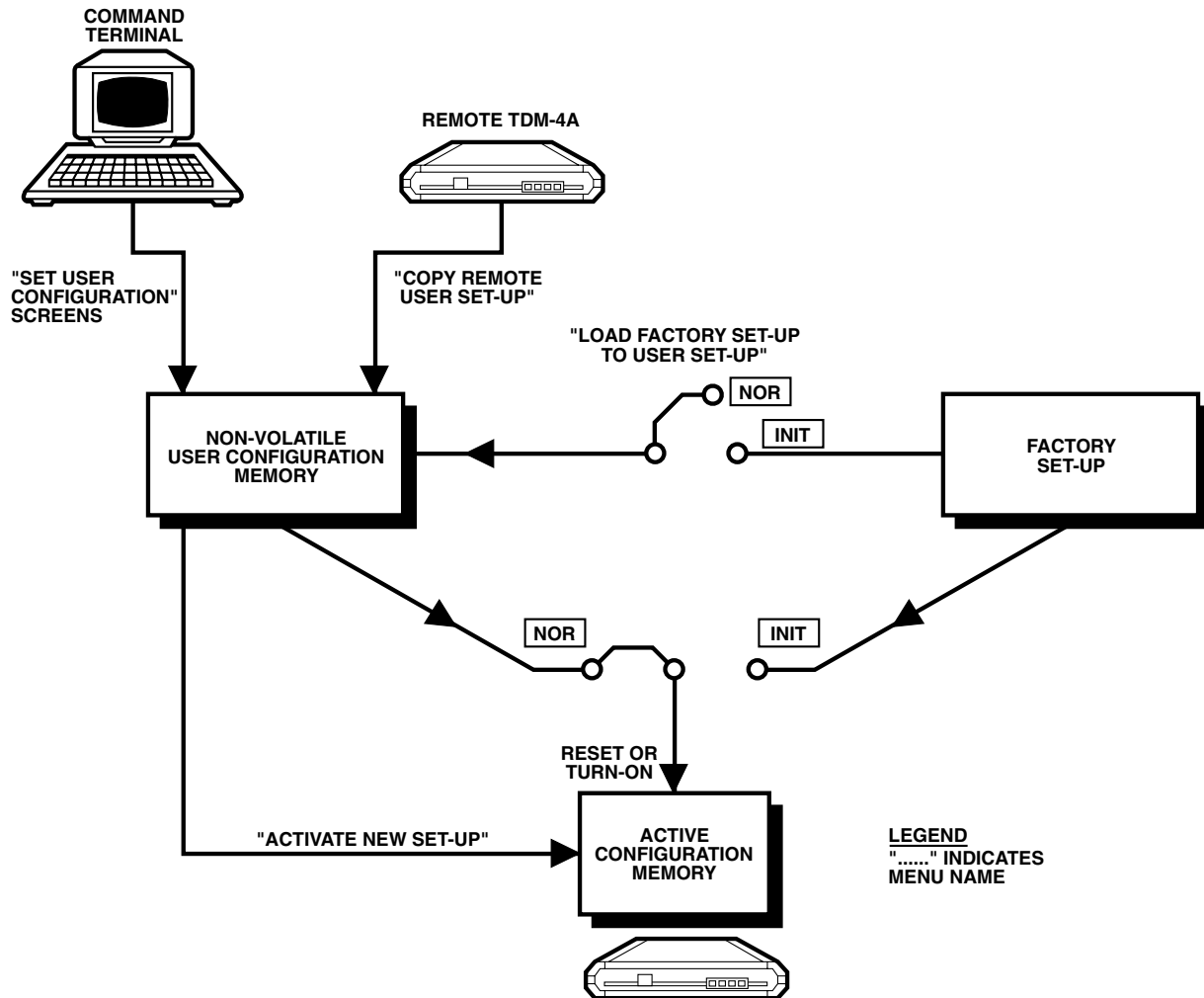
Fig. 3-5. Selecting the Active Configuration.

Changing the User Configuration

You can change the TDM-4A operating mode by preparing a new user configuration in the non-volatile memory, and then activating it. These changes are always made in the command mode. Figure 3-5 graphically shows the various ways you can change the user configuration:

• Prepare a new configuration using the command terminal connected to a local sub-channel.

• Copy the user configuration from the remote TDM-4A (this can also be performed from a command terminal connected to one of the sub-channels of the remote TDM-4A).

• Loading the factory setup as explained below.

How You Can Use the Factory Setup

The factory setup can be used in two ways:

• Loaded directly as the active configuration: Set the INIT/NOR jumper (**Section 3.3**) to INIT and turn the TDM-4A on (or reset it) with the jumper in this position.

• Loaded as user configuration: Set the INIT/NOR jumper to INIT and then selecting option 0, Load Factory Setup to User Setup, from the SET USER CONFIGURATION menu. After this action, the factory set-up is made the user configuration, which can then be activated. To preserve password protection, loading the factory setup in this way does not change the current password.

In either case, you must return the INIT/NOR jumper to NOR; otherwise it will not be possible to activate a different configuration.

NOTE

The TDM-4A is delivered with the factory setup selected as user and active configuration. Therefore, the default communication parameters for the command terminal are as follows:

Data rate: 4.8 kbps (or ¼ of main rate)

Data bits: 8

Parity: None

Stop bits: 1

Insertion of linefeed (LF) character after carriage return (CR) character: OFF.

Configuration Procedures

• Whenever possible, configure the two TDM-4A units together (while connected by the link).

• Select the factory setup as a starting point whenever you are not sure what the current configuration is, or when the current configuration is not compatible with the communication capabilities of the terminal you will use for configuring the TDM-4A.

• When you select the factory setup—that is, you set the INIT/NOR jumper to INIT and power on (or reset) the TDM-4A while the main channel is operating—the TDM-4A will identify the main channel rate, and set the subchannel data rate to 1/4 (see Table 3-3, Mode 1). If the main channel is not operating, the TDM-4A assumes 19.2 kbps (yielding 4.8 kbps for the subchannels).

• If the remote TDM-4A was already configured as required, and you are connected to it by an operating link, copy its configuration and skip the next step.

• Prepare the user configuration of the local TDM-4A, and send this configuration to the remote TDM-4A.

• Check again the local and remote user configurations.

• Exit the configuration program, using either of the following options:

- Exit and activate the new configuration. You can activate the new configuration when the local and remote TDM-4A are connected by an operating link, because activating the configuration at one end of the link automatically activates it at the other end.

- Exit without activating the new configuration. In this case, the new configuration remains in the TDM-4A user memory, and the TDM-4A continues to operate according to the old configuration. You can activate the new configuration whenever desired.

3.9.3 PREPARATION FOR THE CONFIGURATION SESSION

Turn on the TDM-4A. Whenever possible, establish communication with the remote TDM-4A.

Select one of the terminals connected to TDM-4A subchannels as a command (configuration) terminal, or connect a CRT terminal to one of the active ports of the TDM-4A.

When a new terminal is connected to the TDM-4A subchannel selected as the command port, program the communications parameters of this terminal according to those of the selected TDM-4A port (factory setup is 4800 bps, 8 data bits, 1 stop bit, no parity bit).

3.9.4 STARTING THE CONFIGURATION PROGRAM

NOTES

1. The following examples assume that the command mode is activated via subchannel 2.

2. TDM-4A commands requiring alphanumeric inputs are case-sensitive: observe use of lower-case and upper-case letters in the following examples:

• To start the configuration session, allow an idle period of at least one second, type @@@, then wait at least one second and type S. If you type any other character after the @@@ string, or wait more than ten seconds after the last @, the TDM-4A returns to the data transfer mode.

• After typing @@@, the TEST indicators of the TDM-4A light, and no other subchannel (of either the local or the remote TDM-4A) will accept a command to enter the command mode.

After you type S, the opening screen (Fig. 3-6) appears. Note the message at the top of the screen, which identifies the subchannel in use.

VER X.Y indicates the ATSM-4 hardware version.

```
                * COMMAND MODE IS ACTIVATED VIA CH-2 *



     ***********************************************************
     *                                                         *
     *              RAD DAT COMMUNICATION LTD                  *
     *                                                         *
     *                    ASTM-4                               *
     *                                                         *
     *                    VER X.Y                              *
     *                                                         *
     ***********************************************************



     ENTER ASTM-4 PASSWORD:
```

Fig. 3-6. TDM-4A Opening Screen.

• The configuration program requires the user to enter a password before proceeding any further. If you enter an incorrect password, the TDM-4A immediately returns to normal operation, and you must start the configuration session again. Enter the password, carefully observing the correct use of upper and lower-case characters. The password is not echoed to the screen. The factory setting is "RD."

If the password is rejected, you will see the screen shown in Fig. 3-7.

```
                *    COMMAND MODE IS ACTIVATED VIA CH-2 *

     ********************************************
     *                                          *
     *           WRONG PASSWORD                 *
     *                                          *
     *                                          *
     ********************************************



     *****   ASTM-4 IS IN DATA TRANSFER MODE *****
```

Fig. 3-7. Password Rejection Screen.

You must repeat the previous step again.

• If the password is accepted, the TDM-4A sends the main menu (Fig. 3-8).

```
                    * COMMAND MODE IS ACTIVATED VIA CH-2 *

MAIN MENU
*********

0. DISPLAY ATSM-4 ACTIVE STATE
1. DISPLAY REMOTE ATSM-4 ACTIVE STATE
2. DISPLAY USER CONFIGURATION
3. SET USER CONFIGURATION
4. COPY/SEND TO REMOTE USER CONFIGURATION
5. DIAGNOSTICS

Q. EXIT TO DATA TRANSFER MODE

ENTER YOUR CHOICE (0 - 5,Q,ESC) : 0
```

Fig. 3-8. TDM-4A Main Menu.

You can now start the actual configuration session.

NOTE

If the link between the local and the remote TDM-4A fails while the local TDM-4A is in the command mode, the remote TDM-4A immediately returns to the data transfer mode (its TEST indicator turns off). Any test loopbacks made on the remote TDM-4A are disconnected. The control lines of the sub-channels are forced to HIGH (active), and the BREAK state is cancelled. These actions occur even in case of a temporary loss of synchronization.

3.9.5 ENDING A CONFIGURATION SESSION

From this point on, whenever you want to end the configuration session, press Q as many times as necessary to obtain the screen shown in Fig. 3-9, or press ESC to abort the session. Review the previous paragraph for a detailed explanation of the activation procedure.

The screen shown in Fig. 3-9 reminds you that to activate the just-prepared configuration the next time the TDM-4A is turned on, the INIT/NOR jumper must be set at NOR.

The screen also allows you to exit without activating the newly prepared user configuration (the Q option). Nevertheless, the configuration remains in the user memory and can be activated at any time.

NOTE

The TDM-4A will display the ACTIVATE NEW SETUP screen only if you made changes to the user configuration. If you did not make any changes, the TDM-4A will go directly from the main menu to the message indicating the TDM-4A is in the data transfer mode.

```
                 *COMMAND MODE IS ACTIVATED VIA CH-2*

    ACTIVATE NEW SETUP.
    *****************

ACTIVATING NEW SETUP WILL CAUSE THE SYSTEM TO BE RESET.
*****************************************************

TO ACTIVATE NEW SETUP, SET JUMPER NOR/INIT
TO NOR POSITION AND PRESS RETURN/ENTER

TO EXIT WITHOUT ACTIVATING THE NEW SETUP TYPE Q
```
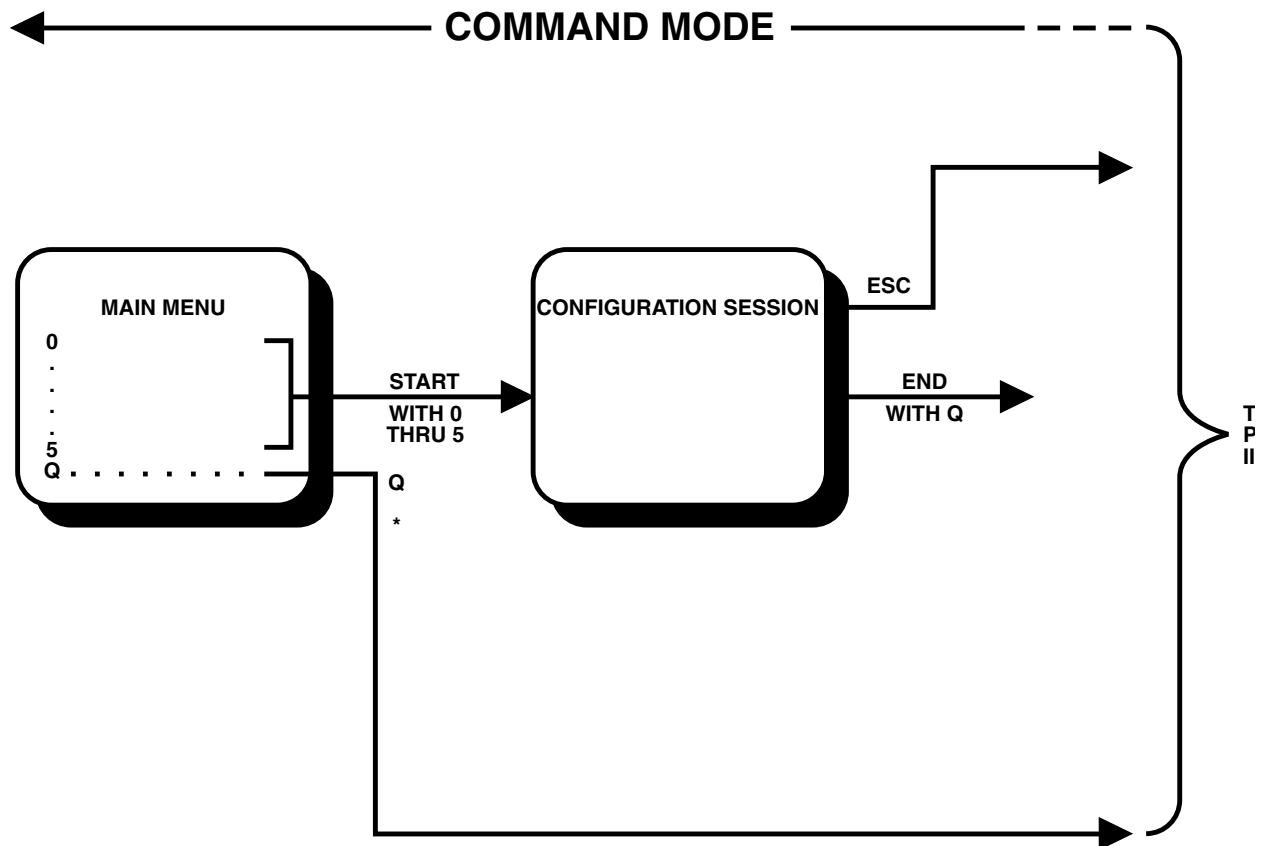
Fig. 3-9. Activate New Setup Screen.

When ready to activate the new setup, press RETURN/ENTER. You will see the message:

****RESET****

and the TDM-4A starts operating in accordance with the new setup.

The procedure you can use to end a configuration session is illustrated in Fig. 3-10.

Figure 3-10. Ending a Configuration Session (Part I).

3.10 Configuration Procedure

The following paragraphs present the menus and the data-entry screens contained in the configuration program.

These paragraphs describe menu and screen purpose, explain how to fill the desired data and present any supplementary information that may be required.

Table 3-5 lists the available menus and screens, their index numbers and the page on which you will find each screen. Use Table 3-5 in conjunction with Fig. 3-4.

Table 3-5. TDM-4A Configuration Program.

Index	Menu Screen
1	ATSM-4 MAIN MENU
2	ATSM-4 ACTIVE STATE Screen
3	REMOTE ATSM-4 ACTIVE STATE Screen
4	USER CONFIGURATION Screen
5	SET USER CONFIGURATION Menu
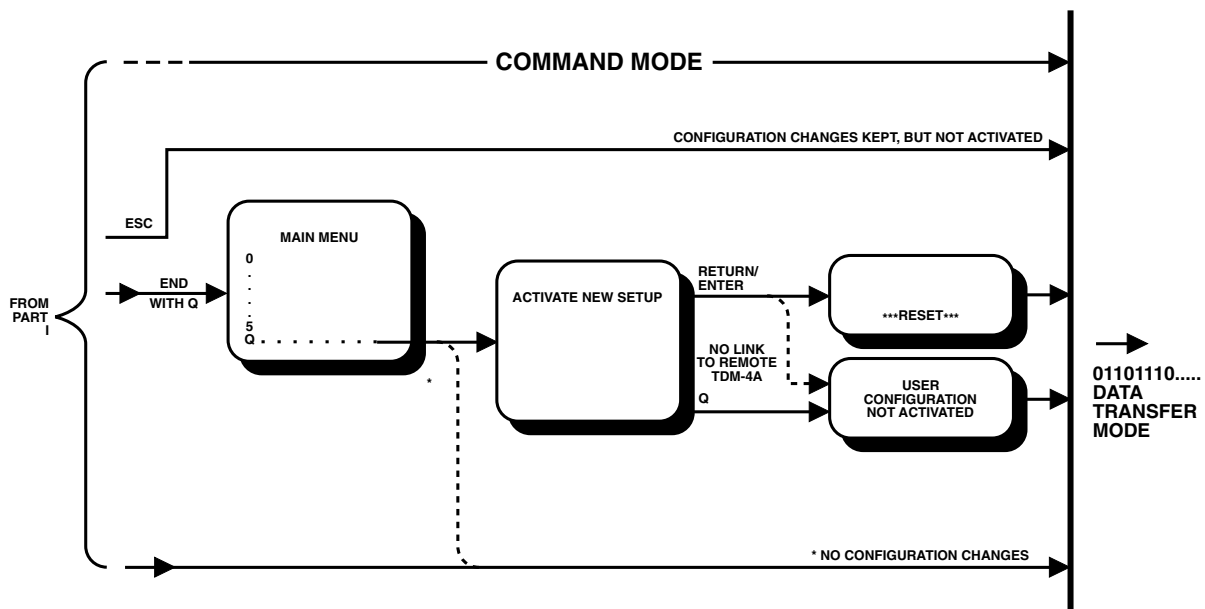
Fig. 3-11. Ending a Configuration Session (Part II).

1. TDM-4A MAIN MENU

Purpose: Select the task to be carried out.

Description: Refer to Fig. 3-8.

Table 3-6. TDM-4A Main Menu Functions.

Option	Item	Function
0	DISPLAY ATSM-4 ACTIVE STATE	Display the screen presenting the active state of the local TDM-4A.
1	DISPLAY REMOTE ATSM-4 ACTIVE STATE	Display the screen presenting the active state of the remote TDM-4A.
2	DISPLAY USER CONFIGURATION	Display the screen presenting the current user configuration.
3	SET USER CONFIGURATION	Display the menu used to select activities related to the preparation of the user configuration.
4	COPY/SEND TO REMOTE USER CONFIGURATION	Display the menu used to transfer user configurations between the local and remote TDM-4A.
5	DIAGNOSTICS	Display the menu used to select diagnostics activities.
Q	EXIT TO DATA TRANSFER MODE	End the current session.

Procedure

To select a configuration task, type the corresponding option number: The TDM-4A will switch to the corresponding screen.

   To end the configuration session, type Q.

2. TDM-4A ACTIVE STATE Screen

Purpose: Display the current state of the local TDM-4A.

Description: The screen presents the following information:

  1. State of DCD and DSR signals in the main channel connector: ON or OFF. For the TDM-4A to receive data, the DCD signal must be ON.

  2. MAIN LINK STATE: State of link to the remote TDM-4A (the main link):

    • REMOTE TDM-4A IN COMMAND MODE—Normal condition during a configuration session.

    • MODEM LOOP FOUND—The local TDM-4A receives its own main channel data, a condition usually caused by a loopback on the link to the remote TDM-4A.

- REMOTE TDM-4A NOT FOUND—No signal is received by the local main channel, because the remote TDM-4A is not operating, or is not yet connected, or there is a problem on the main link (e.g. loss of synchronization).

3. Actual nominal value of the main link data rate.

4. Number of data bits in the subchannel data frame.

5. Local TDM-4A software version (the version displayed on the opening screen—Fig. 3-7 is the TDM-4A hardware version).

6. Condition of the subchannel DCD and CTS lines:

   • FORCED TO HIGH: always active.

   • FOLLOW REMOTE RTS (or DTR, respectively).

7. Position of internal INIT/NOR jumper.

8. The data rate, number of stop bits and type of parity used by each subchannel. If a sub-channel is not active," 0bps" is displayed.

Procedure

After viewing the information, press <Enter>, or Q, to return to the main menu.

3. REMOTE TDM-4A ACTIVE STATE Screen

This screen is similar to screen No. 2, except that it presents the current state of the remote TDM-4A, as received in response to an enquiry request that was sent by the local TDM-4A when you selected option 1 on the main menu. This is indicated by the message REMOTE RESPONSE, appearing at the top of the screen.

4. USER CONFIGURATION Screen

Purpose: Display the current user configuration of the local TDM-4A.

Description: The screen presents the local password, the main link data rate, the subchannel DCD and CTS mode, and data rate, number of stop bits and parity selected for each subchannel. The information is presented in a form similar to that used on screen No. 2 to display the active state. The only difference is that subchannel data rate is shown as a fraction of the main channel bandwidth (¼, ½, ¾, FULL, or NOT ACTIVE), instead of the actual data rate.

NOTE

If the user configuration differs from the active state, the following note will appear at the top of the screen:

```
          USER CONFIGURATION NOT ACTIVATED
```

Procedure

After viewing the information, press <Enter>, or Q, to return to the main menu.

5. SET USER CONFIGURATION Menu

Purpose: Select the configuration tasks.

Description

```
                    *COMMAND MODE IS ACTIVATED VIA CH-2*

     SET USER CONFIGURATION
     ********************

     0.LOAD FACTORY SETUP TO USER SETUP (INIT)
     1.SET LOCAL PASSWORD
     2.SET MAIN LINK DATA RATE
     3.SET DATA BITS
     4.SET SUB-CHANNEL DATA RATE
     5.SET SUB-CHANNEL STOP BITS AND PARITY
     6.ENABLE/DISABLE DCD CONTROLS PASSING
     7.ENABLE/DISABLE CTS CONTROLS PASSING
     Q.EXIT TO MAIN MENU

     ENTER YOUR CHOICE (0 - 7,Q,ESC) :
```

Fig. 3-12. Set User Configuration Menu.

NOTE

If the user configuration differs from the active state, the following note will appear at the top of the screen:

```
 USER CONFIGURATION NOT ACTIVATED
```

Option 0. LOAD FACTORY SETUP TO USER SETUP (INIT)

To load the factory set-up to the user set-up, check that the jumper INIT/NOR is in the INIT position, then type 0.

   You will see the message:

```
FACTORY SETUP HAS BEEN MOVED TO MEMORY TYPE RETURN/ENTER/Q TO CONTINUE
```

   After you press <Enter> or Q, the message disappears and you can select again any one of the options listed on the menu.

   Do not forget to return the jumper to the NOR position before starting the preparation of a new configuration.

NOTE

Loading the factory setup does not change TDM-4A current operating mode.

Option 1. SET LOCAL PASSWORD Procedure

• Type 1. You will see the message:

```
 ENTER NEW PASSWORD :
```

followed by the current password, e.g. "RD."

Type the two letters of the new password, e.g. "by." The new password overwrites the previous password. You will see the message:

```
THE NEW PASSWORD IS:  by:   TYPE RETURN TO CONFIRM
```

You can now either confirm the password, or abort the change by pressing Q and continue using the previous password.

To confirm the new password, press <Enter>. You will see the message:

```
NEW PASSWORD HAS BEEN ACTIVATED, TYPE Q TO EXIT
```

The new password is already in effect. Pressing Q clears the lower part of the screen. You can now select any one of the options listed on the menu.

To abort the password change, press Q. You will see the message:

```
PASSWORD HAS NOT BEEN CHANGED.  TYPE Q TO EXIT
```

You can now select any one of the options listed on the menu.

Option 2. SET MAIN LINK DATA RATE

The main channel rate can be selected from one of the following values: 19.2, 14.4, 9.6, 7.2, 4.8, 2.4, 1.8, and 1.2 kbps (see also Table 3-2).

The selected main channel rate must correspond to the actual main channel data rate (determined by the clock signal supplied to the TDM-4A's main channel connector). If you configure a different rate and activate the configuration, the internal TDM-4A buffers will overflow and data transfer will not be possible. Overflow is indicated by the flashing of the OVF indicator (see the DIAGNOSTICS menu for instructions on resetting the overflow indication).

The TDM-4A has a special function that will help you automatically determine the correct main channel rate. This function is especially useful when installing a replacement TDM-4A in an existing installation.

To use this function, connect the TDM-4A to the operating link with the INIT/NOR jumper set to INIT. When the TDM-4A is turned on, it measures the actual main channel rate and loads the measured value into the active configuration.If when turned on, the TDM-4A does not receive clock signals from the modem, or the clock rate is not equal to one of the main channel rates listed above, the main channel rate is set to 19.2 kbps.

• Type 2. You will see the message:

```
CURRENT SETUP FOR MAIN LINK DATA RATE: 19200 BPS

TYPE RETURN/ENTER TO CHANGE, OR Q TO EXIT
```

The value 19200 is an example.

  • You can now either quit without changing the main channel rate, or select a new value.

    To quit, press Q. The lower part of the screen is cleared. You can now select again any one of the options listed on the menu.

    To select a new value, press <Enter>. You will see the message:

```
    MAIN LINK DATA RATE: 14400 BPS
```

Each pressing displays the next available value, cyclically. When the desired value is displayed, press Q. This stops the selection process, and you will see the message:

```
TYPE Q AGAIN TO UPDATE OR RETURN TO
EXIT
```

- To save the displayed value in the user configuration, press Q again. You will see the message:

```
NEW RATE HAS BEEN SAVED, TYPE Q TO EXIT
```

- To quit, press Q. The lower part of the screen is cleared. You can now select again any one of the options listed on the menu.

- To abort the process, press. You will see a message announcing that the new value has not been saved and instructing you to press Q to exit to the displayed menu.

Option 3. SET DATA BITS Procedure

The number of data bits you will select applies to all the subchannels.

- Type 3. You will see the message:

```
CURRENT SETUP FOR DATA BITS: 8 BITS

TYPE RETURN/ENTER TO CHANGE, Q TO EXIT

DATA BITS: 8 BITS
```

You can now either quit without changing, or select a new value.

   To quit, press Q. The lower part of the screen is cleared. You can now select again any one of the options listed on the menu:

```
TYPE Q AGAIN TO UPDATE OR RETURN TO EXIT
```

To select a new value, press <Enter>. You can now select again.

Each pressing displays the next available value, cyclically. When the desired value is displayed, press Q. This stops the selection process.

- To save the displayed value in the user configuration, press Q again. You will see the message:

```
NEW DATA BITS HAS BEEN SAVED, TYPE Q TO EXIT
```

- To quit, press Q. The lower part of the screen is cleared. You can now select again any one of the options listed on the menu.

- To abort the process, press . (period). You will see a message announcing that the new value has not been saved and instructing you to press Q to exit to the displayed menu.

Option 4. SET SUB-CHANNEL DATA RATE Procedure

Subchannel data rates are displayed and selected by means of a separate menu, accessed by option 4. The data rates are independently selected for each subchannel, as a fraction of the main channel rate (main channel rate is selected by means of option 3). The available selections are NOT ACTIVE (zero), ¼, ½, ¾, and FULL (one).

   When subchannel rate selections are completed, they are checked against the allowable configurations listed in Table 3-2 or 3-3. If the selected subchannel fractional rates do not add up to exactly "1," they are not accepted.

• Type 4. The TDM-4A displays the SET SUB-CHANNELS RATE menu, shown in Fig. 3-13.

```
                    *COMMAND MODE IS ACTIVATED VIA CH-2*

                         SET SUB-CHANNELS RATE
                         *********************

THE TOTAL RATE OF THE SUB-CHANNELS MUST BE EQUAL TO THE LINK RATE,
THEREFORE IT IS DISPLAYED AS A FRACTION OF THE MAIN BAUD RATE.

1.SET SUB-CHANNEL 1
2.SET SUB-CHANNEL 2
3.SET SUB-CHANNEL 3
4.SET SUB-CHANNEL 4
Q.EXIT TO SET USER CONFIGURATION MENU
 CURRENT STATE :
 CHANNEL :RATE
     CH1: 1/4 BAUD RATE
     CH2: 1/4 BAUD RATE
     CH3: 1/4 BAUD RATE
     CH4: 1/4 BAUD RATE
ENTER YOUR CHOICE :SET SUB-CHANNEL
```

Fig. 3-13. Set Sub-Channels Rate Menu.

For your convenience, the menu also displays the current subchannel rate allocations. If you do not intend to change the allocations, press Q. You can now select any one of the options listed on the menu

To start subchannel rate selection, type the number of the first subchannel you want to program. The following guideline appears.

SELECT: 0) NOT ACTIVE. 1) 1/4 RATE. 2) 1/2 RATE. 3) 3/4 RATE. 4) FULL BAUD RATE.

• Type the number of the desired rate. The CURRENT STATE field of the subchannel you selected is updated to reflect the new selection.

• Repeat the steps as necessary, for other subchannels.

• When the subchannel rate configuration is satisfactory, press Q.

• Your selections are now checked:

If selections are accepted, the TDM-4A displays again the SET USER CONFIGURATION menu.

If selections are not correct, they are rejected. You will see the message:

```
ERROR IN CONFIGURATION

TYPE RETURN/ENTER FOR NEW SETTING OR Q TO QUIT
```

Pressing <Enter> leaves you on this menu and you can make new selections, to correct the error.

Pressing Q brings the SET USER CONFIGURATION menu.

Option 5. SUB-CHANNEL STOP BITS AND PARITY

The number of stop bits and the parity are separately selected for each subchannel.

- The number of stop bits can be 1, 1.5 or 2. When you select 5 data bits, 2 stop bits are automatically preset on all the sub-channels, and this value can not be modified.

- The parity can be even, odd or none.

The selection procedure is two steps: selection of a subchannel,and then selection of desired number of stop bits and parity by means of a dedicated menu (Figures 3-14, 3-15).

Full Stop Bits and Parity Selection Procedure for 6, 7, or 8 Data Bits

- Type 5. You will see the message:

SELECT 1).CH12).CH23).CH34).CH4Q).EXIT

- If you do not intend to continue with the option 5, press Q. You can now select any one of the options listed on the menu.

- To continue with option 5, type the number of the desired subchannel. After the number is typed, the TDM-4A displays the SET SUB-CHANNEL STOP BITS AND PARITY menu (Fig. 3-12).

```
                   *COMMAND MODE IS ACTIVATED VIA CH-2*

    SET SUB-CHANNELS STOP BITS AND PARITY
    ***********************************

    1.SET 1 STOP BIT
    2.SET 1.5 STOP BITS
    3.SET 2 STOP BITS
    4.DISABLE PARITY
    5.PARITY ODD
    6.PARITY EVEN
    Q.EXIT TO SET USER CONFIGURATION MENU

    ENTER YOUR CHOICE - FOR SUB-CHANNEL - 2:

    STOP BITS: PARITY
    2          NONE
```

Fig. 3-14. Set Sub-Channel Stop Bits and Parity Menu (6, 7, or 8 Data Bits).

- For your convenience, the menu displays the number of the processed subchannel, and the current number of stop bits and parity type. If you do not intend to change, press Q. The TDM-4A switches to the SET USER CONFIGURATION menu.

- To change the settings, type the desired numbers: 1, 2, or 3 to change the number of stop bits, and 4, 5, or 6 to change parity. The display immediately reflects the selection.

- When done, press Q to return to the SET USER CONFIGURATION menu, where you can select another subchannel for processing.

Parity Selection Procedure (5 Data Bits)

When the number of data bits is set to 5, the menu shown in Fig. 3-14 is changed as shown in Fig. 3-15. The selection procedure remains unchanged, except that options 1, 2, and 3 of Fig. 3-14 no longer appear.

```
                    *COMMAND MODE IS ACTIVATED VIA CH-2*

     SET SUB-CHANNEL STOP BITS AND PARITY
     ***********************************

DATA BITS ARE SET TO 5 BITS,, 2 STOP IS AUTOMATICALLY SELECTED

4.DISABLE PARITY
5.PARITY ODD
6.PARITY EVEN
Q.EXIT TO SET USER CONFIGURATION MENU

ENTER YOUR CHOICE FOR SUB-CHANNEL 2:

STOP BITS     : PARITY
2               NONE
```

Fig. 3-15. Set Sub-Channel Stop Bits and Parity Menu (5 Data Bits).

Option 6. ENABLE/DISABLE DCD CONTROLS PASSING

The local DCD lines in the subchannel connectors can be either forced to high (active), or set to follow the RTS line in the connector of the corresponding subchannel of the remote TDM-4A.

• Type 6. You will see the message:

  CURRENT SUB-CHANNELS DCD IS FORCED TO HIGH TYPE RETURN/ENTER TO CHANGE OR
  Q TO QUIT

or

CURRENT SUB-CHANNELS DCD IS FOLLOWING   REMOTE RTS

TYPE RETURN/ENTER TO CHANGE OR Q TO   QUIT

• If you do not want to change the current state, press **Q.** You can now select any one of the options listed on the menu.

• To change the selection, press <Enter>. You will see the message:

  NEW SETUP HAS BEEN SAVED, TYPE Q TO EXIT

  You can now select any one of the options listed on the menu.

Option 7. ENABLE/DISABLE CTS CONTROLS PASSING

The local CTS lines in the subchannel connectors can be either forced to high (active), or set to follow the DTR line in the connector of the corresponding subchannel of the remote
TDM-4A.

• Type 6. You will see the message:

    CURRENT SUB-CHANNELS CTS IS FORCED TO HIGH

    TYPE RETURN/ENTER TO CHANGE OR Q TO QUIT

   or

    CURRENT SUB-CHANNELS CTS IS FOLLOWING REMOTE DTR

    TYPE RETURN/ENTER TO CHANGE OR Q TO QUIT

• If you do not want to change the current state, press Q. You can now select any one of the options listed on the menu.

• To change the selection, press <Enter> . You will see the message:

    NEW SETUP HAS BEEN SAVED, TYPE Q TO EXIT

   You can now select any one of the options listed on the menu.

6. COPY/SEND TO REMOTE USER CONFIGURATION Menu

Purpose: Transfer user configurations between the local and remote TDM-4A.

Description: The COPY/SEND TO REMOTE USER CONFIGURATION menu is shown in Fig. 3-16.

```
              *COMMAND MODE IS ACTIVATED VIA CH-2*

     COPY/SEND TO REMOTE USER CONFIGURATION
     ***********************************
1. SEND USER SETUP TO REMOTE ATSM-4
2. DISPLAY REMOTE USER SETUP
3. COPY REMOTE USER SETUP
Q. EXIT TO MAIN MENU

     ENTER YOUR CHOICE (1 - 3,Q,ESC) :
```

Fig. 3-16. Copy/Send to Remote User Configuration Menu.

Option 1. SEND USER SETUP TO REMOTE TDM-4A

This option is used to transmit the local user configuration to the remote TDM-4A, where it is saved as the new user configuration. This action is generally performed at the end of a configuration session, to prepare the remote TDM-4A for operation in accordance with the new configuration.

• Type 1. You will see the message:

```
USER SETUP IS DOWN-LOADED TO REMOTE
TYPE RETURN/ENTER/Q TO CONTINUE
```

After pressing or Q, the message disappears and you can select again any one of the options listed on the menu.

Option 2. DISPLAY REMOTE USER SETUP

This option is used to check the user configuration saved in the remote TDM-4A. This function should be used after sending the local configuration to the remote TDM-4A (option 1 above), in order to check that the configuration was correctly transferred to the remote TDM-4A.

The option is activated by typing 2. You will see a screen similar to the screen used to display the local user configuration (option 3 of the main menu), except that REMOTE RESPONSE is displayed at the top of the screen.

NOTE

If remote user configuration differs from the remote active state, the following note will be displayed of the top of the screen:

```
USER CONFIGURATION NOT ACTIVATED
```

Option 3. COPY REMOTE USER SETUP

This option is used to transfer the user configuration from the remote TDM-4A to the local TDM-4A. This option is very useful when installing a TDM-4A in an existing installation, because it saves the preparation of a configuration identical to that already present in the remote TDM-4A. The received configuration can be checked by means of option 3 of the main menu.

• Type 3. You will see the message:

```
USER SETUP IS LOADED FROM REMOTE
TYPE RETURN/ENTER/Q TO CONTINUE
```

After you press <Enter> or Q, the message disappears and you can select again any one of the options listed on the menu.

7. DIAGNOSTICS Menu

Purpose: Display diagnostics information regarding the local and remote TDM-4A, connect and disconnect TDM-4A and modem loops, clear the overflow (OVF) indication, and reset the local TDM-4A when necessary.

Chapter 5 presents the available loopback functions and explains how they are used.

Description: The DIAGNOSTICS menu is shown in Fig. 3-17.

```
                  *COMMAND MODE IS ACTIVATED VIA CH-2*

     DIAGNOSTICS
     **********

1. DISPLAY STATE
2. DISPLAY REMOTE STATE
3. SET/CLEAR CH. LOCAL LOOP
4. SET/CLEAR CH. REVERSE LOOP-BACK
5. SET/CLEAR CH. REMOTE LOOP-BACK
6. SET/CLEAR MODEM LOOPS
7. CLEAR OVER-FLOW FLAG
8. RESET THE UNIT
Q. EXIT TO MAIN MENU

ENTER YOUR CHOICE (1 - 8,Q,ESC) :
```

Fig. 3-17. Diagnostics Menu.

Option 1. DISPLAY STATE

After typing 1 on the DIAGNOSTICS menu, the TDM-4A displays a diagnostics state screen. A typical screen is shown in Fig. 3-18.

```
                  *COMMAND MODE IS ACTIVATED VIA CH-2*

     DIAGNOSTICS STATE
     *****************

     MODEM STATE
     ALB (PIN 18) : LOW
     RLB (PIN 21) : LOW

     CHANNEL     TX STATE          RX STATE          RTS   DTR   DCD   CTS

     CH1:        DATA TRANSFER     DATA TRANSFER     OFF   OFF   OFF   OFF
     CH2:        COMMAND MODE      COMMAND MODE      ON    OFF   OFF   OFF
     CH3:        DATA TRANSFER     DATA TRANSFER     OFF   OFF   OFF   OFF
     CH4:        DATA TRANSFER     DATA TRANSFER     OFF   OFF   OFF   OFF

     TYPE RETURN/ENTER/Q  TO CONTINUE
```

Fig. 3-18. Typical Diagnostics State.

The information presented on the screen is as follows:

MODEM STATE

   • ALB (PIN 18)—Pin 18 in the main channel connector is used to transfer the analog loopback command to the modem connected to the TDM-4A. The two possible states are:

   - LOW—loopback not activated

   - HIGH—loopback activated

      The state is changed by means of option 6 of the DIAGNOSTICS menu.

   • RLB (PIN 21)

      PIN 21 in the main channel connector can be used to transfer the remote loopback command to the modem connected to the ATSM-4, provided that the PIN 21 jumper is set to ON. The two possible states are:

   - LOW—loopback not activated

   - HIGH—loopback activated

      The state is changed by means of option 6 of the DIAGNOSTICS menu.

CHANNEL STATE

   • TX STATE—Shows the state of the local transmit path of each subchannel. The possible states are:

   - DATA TRANSFER—transfers user data.

   - COMMAND MODE—this sub-channel connects the terminal you are using now.

   - LOCAL LOOP—a local loop is connected on this subchannel. The state can be changed by option 3 of the DIAGNOSTICS menu.

   - REVERSE LOOP—a reverse loop is connected on this sub-channel. The state can be changed by option 4.

   - OVERFLOW—The buffer of this subchannel overflowed

   • RX STATE—Shows the state of the local receive path of each subchannel, in the same format used for the display of the TX STATE.

   • RTS, DTR, DCD, CTS—Show the state of the corresponding signal in each sub-channel connector, as found when you entered this screen. To take a new reading, select again this option.

When you no longer need this display, press <Enter> or Q. The TDM-4A displays again the DIAGNOSTICS menu.

Option 2. DISPLAY REMOTE STATE

Typing 2 causes the TDM-4A to display the diagnostics state of the remote TDM-4A, as found when the option is selected. The display is similar to that shown in Fig. 3-18, except that REMOTE RESPONSE appears at the top of the screen.

   Note that on the subchannel used for the command mode, the remote TX STATE is displayed as COMMAND MODE.

Option 3. SET/CLEAR CH. LOCAL LOOPBACK

The local loopback can be activated on any subchannel, except for the subchannel used for the command mode and on sub-channels which are not active.

During local loopback, the DCD and CTS lines of the subchannel are forced to high (active state). Refer to **Chapter 5** for a detailed description of this loop.

The local and reverse loopbacks of the same sub-channel can be activated simultaneously.

The connection state of a subchannel loopback is toggled each time the subchannel is selected.

NOTE

You can disconnect a local loopback from the terminal using the sub-channel by typing "@@S."

- Type 3. You will see the message:

```
SELECT 1).CH12).CH23).CH34).CH4Q).EXIT
```

- If you do not want to change the state of a local loopback, press Q. Pressing Q clears the lower part of the screen. You can now select any one of the options listed on the menu.

- To change the state of a local loopback, type the number of the sub-channel. When the loop is connected, you will see:

```
CHANNEL 1 SET TO LOCAL LOOP

TYPE RETURN/ENTER/Q TO CONTINUE
```

- After pressing <Enter> or Q, the message disappears and you can select again any one of the options listed on the menu.

- If you select the command subchannel (its number appears at the top of the screen, for example, "CH-2"), you will see the message:

```
CHANNEL 2 IS IN COMMAND MODE, COMMAND REJECTED.

TYPE RETURN/ENTER/Q TO CONTINUE
```

- When all local loops are set to the desired condition, press Q. Pressing Q clears the lower part of the screen. You can now select any one of the options listed on the menu.

Option 4. SET/CLEAR REVERSE LOOPBACK

The reverse loopback can be activated on any sub-channel, except for the subchannel used for the command mode and on subchannels which are not active. Refer to **Chapter 5** for a detailed description of this loop.

During local loopback, the DCD and CTS lines of the subchannel follow the local RTS and DSR lines, respectively.

The local and reverse loopbacks of the same sub-channel can be activated simultaneously.

In case the link to the remote TDM-4A fails (main channel DCD is not active), or there is a loss of synchronization of the main channel, all the reverse loopbacks are automatically disconnected.

Reverse loopbacks are controlled by the same method used to control local loopbacks.

No shortcut exists for disconnecting the reverse loopback after leaving the command mode. However, the user connected to the remote TDM-4A sub-channel can disconnect the loop by typing "@@@ S."

Option 5. SET/CLEAR REMOTE LOOPBACK

The remote loopback can be activated on each subchannel, except for the subchannel used for the command mode, and for subchannels which are not active. Refer to **Chapter 5** for a detailed description of this loop.

Remote loopbacks are controlled by the same method used to control local loopbacks.

You can disconnect a remote loopback from the terminal using the subchannel by typing "@@@S." If another subchannel is in the command mode, the loopback is disconnected; if no other sub-channel is in the command mode, the loopback is disconnected and the subchannel enters the command mode as usual.

Option 6. SET/CLEAR ANALOG AND REMOTE LOOPBACK

This option allows you to control the analog and remote loopback functions of the local and remote modems, respectively, serving the TDM-4A main channel. In order to actually use these functions, your modems must process the corresponding functions, and the internal jumper PIN 21 must be set to ON.

Each time you select a loopback function, its state is toggled, and the new state is displayed.

• Type 6. You will see the message:

```
THIS ACTION WILL HAVE EFFECT ONLY IF THE MODEM CAN RESPOND TO PINS 18/21
SELECT 1).ALB2).RLBQ).EXIT
```

• If you do not intend to change any modem loop, press Q. Pressing Q clears the lower part of the screen. You can now select any one of the options listed on the menu.

• To change either loop, type the corresponding number. For example, when selecting 1 for the first time (ALB—analog loopback), you will see the message:

```
ALB (PIN 18) SET TO HIGH
TESTING MAIN LINK STATE, WAIT ...
MAIN LINK  STATE  : MODEM LOOP FOUND
TYPE RETURN/ENTER/Q  TO CONTINUE
```

• After you press <Enter> or Q, the message disappears and you can select again any one of the options listed on the menu.

• When you select again 1, the message changes:

```
ALB (PIN 18) SET TO LOW
TESTING MAIN LINK STATE, WAIT ...
MAIN LINK  STATE   :  NO LOOP FOUND
TYPE RETURN/ENTER/Q  TO CONTINUE
```

Option 7. CLEAR OVERFLOW FLAG

The overflow flag is set when an overflow condition occurs on one or more of the sub-channels. Overflow usually occurs when the input data of a subchannel does not match (within 1%) the nominal rate of the subchannel selected by means of the SET USER CONFIGURATION function.

Since overflow does not occur under normal operating conditions, the overflow flag remains set, to attract user attention, even after overflow no longer occurs. While the overflow flag is set, the OVF indicator flashes.

To clear the overflow flag, type 7. You will see the message:

```
OVERFLOW FLAG RESET

TYPE RETURN/ENTER/Q  TO CONTINUE
```

The OVF indicator will turn off.

After you press <Enter> or Q, the message disappears and you can select again any one of the options listed on the menu.

Option 8. RESET THE UNIT Procedure

The reset action is similar to turning the TDM-4A off and then on again. After reset, the user configuration used by the TDM-4A depends on the position of the internal INIT/NOR jumper (see Fig. 3-5):

 • With the jumper at INIT, the factory setup is used.

 • With the jumper at NOR, the user configuration stored in the non-volatile memory is used.

The reset action disrupts data transfer through the subchannels.

 • Type 8. You will see the message:

```
TYPE 'Y' TO CONFIRM OR RETURN/ENTER TO EXIT:
```

To abort the reset action, press <Enter>. The message disappears and you can select any of the options listed on the menu:

To continue, press Y. You will see the message:

```
THE UNIT WILL BE RESET WITHIN 5 SEC.  TYPE ANY KEY TO STOP
```

This gives you another chance to change your mind. If you do nothing, the TDM-4A is reset, and you see the message:

```
RESET
```

If you want to continue preparing configuration changes after reset, you must enter the command mode again.

3.11 Quick Get-Started Guide

3.11.1 SCOPE

This paragraph provides concise instructions for preparing TDM-4A configuration. It is intended for users already familiar with the TDM-4A, and for experienced users who have a good basic understanding of data communication principles, and know the applications and characteristics of statistical multiplexors.

Use this guide together with Fig. 3-4: TDM-4A Configuration Tree. Whenever you want more details, refer to Tables 3-1, 3-2, 3-3, and 3-4.

Once you start the configuration program, the TDM-4A will tell you how to do any configuration action you want.

3.11.2 WHAT YOU NEED

You configure the TDM-4A from an ASCII data terminal connected to one of the TDM-4A sub-channels. The terminal communication parameters must match the parameters of the selected subchannel. If you do not know what these parameters are, or you just received a new TDM-4A, use the following default parameters:

Baud Rate, 4800 bps

Format of Data Word, 8 data bits

No parity bit

1 stop bit

The terminal must not insert linefeed (LF) characters after the carriage return (CR) character.

To initialize the TDM-4A to these parameters, turn the TDM-4A off, set its internal INIT/NOR jumper to INIT, and turn the TDM-4A on again. Return the INIT/NOR jumper to NOR before starting the configuration.

Whenever possible, establish communication with the remote TDM-4A before starting. In this way, you will be able to configure the two units from the terminal connected to the local TDM-4A, and to activate the newly prepared configuration.

If the TDM-4A main channel is connected to an operating modem while being initialized (turned on with the jumper INIT/NOR set to INIT), the actual subchannel data rate will be ¼ (Mode 1) of the main channel rate (4800 bps is ¼ of 19.2 kbps). See Table 3-3 for the actual values vs main channel rate.

3.11.3 CONFIGURATION INSTRUCTIONS

NOTE
Pay attention to use of capital letters whenever required.

If necessary, power up the TDM-4A, turn on the modem, establish communication with the remote TDM-4A and connect your terminal to one of the sub-channels. Check terminal communication parameters!

• Allow an idle period of at least one second, type "@@@," wait at least one second and type "S."

• The TDM-4A enters the command mode. Enter the password.

NOTE
The default password is RD. If you do not know the password, initialize the TDM-4A by means of the INIT/NOR jumper.

• The TDM-4A displays the MAIN MENU. Type 3 to enter the SET USER CONFIGURATION menu.

- Use Fig. 3-4 to plan your configuration actions. Record the configuration on the form given in Appendix B, then set all the necessary parameters of the local TDM-4A. Keep the filled-up form for reference!

- If you initialized the TDM-4A, modify the password as required. Record the password!

- When the link to the remote TDM-4A operates, return to the MAIN MENU and type 4 to select the COPY/SEND TO REMOTE USER CONFIGURATION.

- Type 1 to SEND USER SETUP TO REMOTE TDM-4A, then type 2 to DISPLAY REMOTE USER SETUP. Check that the remote TDM-4A's setup is identical to the local setup.

- Return to the MAIN MENU, type 1 and check that the INIT/NOR jumper is set to NOR.

- Exit the command mode by typing Q on the MAIN MENU, and activate the new configuration by pressing <Enter>.

4. Operation

4.1 Controls, Indicators, and Connectors

Table 4-1 lists the functions of the TDM-4A controls, indicators and connectors. The numbers under the heading "Item" refer to the identification numbers in Fig. 4-1.
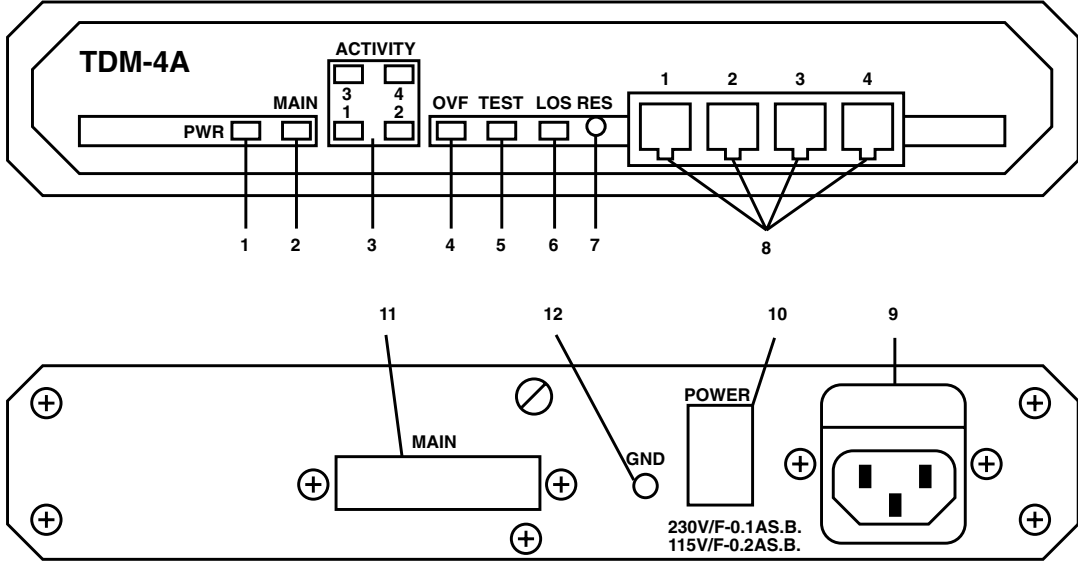

Fig. 4-1. Controls, Indicators and Connectors on the TDM-4A.

Table 4-1. TDM-4A Standalone Model Controls, Indicators and Connectors.

Item	Control	Indicator or Connector
1	PWR Indicator	Lights when the TDM-4A is operating.
2	Main (Composite) Channel Activity Indicator	Lights when the main channel is active (receives or transmits data).
3	Subchannel Activity Indicators	Indicators, one for each subchannel, light when the corresponding subchannel is active (receives or transmits data).
4	OVF Indicator	Lights when the data rate of the modem connected to the main channel differs from the configured data rate of the TDM-4A. Flashes when an overflow condition occurred on one or more subchannels.
5	TEST Indicator	Lights to indicate that the TDM-4A is in the command mode (initiated either from a local subchannel or from a remote subchannel). Flashes when one of the test loopbacks is active. In either case, traffic through the corresponding subchannels is interrupted.
6	LOS Indicator	Indicates TDM-4A synchronization status: Condition Indication Off TDM-4A powered and synchronized with the remote TDM-4A. Flashing TDM-4A not synchronized with the remote TDM-4A. Lights TDM-4A main channel DCD line is not active (modem does not receive a signal from the remote end of the link).
7	RESET Push-button	Resets TDM-4A internal circuits (including the data buffers) and initiates the power-up self-test.
8	Subchannel Connectors	Connections to TDM-4A sub-channels (one for each subchannel).
9	Power Connector	AC power connector with integral fuse.
10	Power Switch	Turns the TDM-4A on.
11	Main (Composite) Channel Connector	Connection to main (composite) channel.
12	GND Post	Connection to external ground.

4.2 Operating Instructions

4.2.1 GENERAL

After being prepared for operation as explained, the TDM-4A normally operates unattended. Operator intervention is only required when the TDM-4A is setup for the first time or must be adapted to new operational requirements. TDM-4A configuration is stored in a non-volatile memory, and is not affected when power is turned off.

4.2.2 TURN-ON

Connect the power cable to the TDM-4A's rear power connector, then set the power switch to ON. The PWR indicator should light.

   If the link to the remote TDM-4A is not yet operational, the LOS indicator will light (indicating that the local modem DCD line is not active) or will flash (indicating that the TDM-4A is not yet synchronized with the remote TDM-4A). Wait until the link becomes operational, and check that the LOS indicator extinguishes.

4.2.3 NORMAL OPERATION

During normal operation, the PWR and MAIN indicators should light continuously and the LOS, TEST and OVF indicators must remain off.

   Subchannel activity indicators flash according to the traffic load, and are extinguished when the subchannel is idle.

4.2.4 TURN-OFF

To turn the TDM-4A off, set the power switch to OFF.

4.3 What to Do in Case of Malfunction

Here is a list of actions that will help you return to normal operation in case a problem occurs. Additional information on TDM-4A diagnostics appears in **Chapter 5**.

4.3.1 PRELIMINARY ACTIONS

  • Check that the TDM-4A is powered (the PWR indicator should light).

  • Check that cables are properly connected.

  • Check that the equipment connected to the TDM-4A is powered and operates normally.

Table 4-2. Check TDM-4A indications.

N°	Indication	Probable Cause	Action
1	PWR not lit	1. AC power not connected	Check that the power cable is properly plugged into the TDM-4A power connector and into the wall wall outlet, and that AC power is available at this outlet.
		2. Blown fuse	Replace TDM-4A fuse with a fuse having the rating marked on the rear panel of the TDM-4A. If fuse blows again, replace the TDM-4A.
2	LOS lights continuously	1. Local modem DCD line is not high	Check whether the remote TDM-4A is powered on, and operates normally. Check also that the remote modem operates properly.
		2. Defective modem	Activate the ALB loop to check the local modem. Replace if defective.
3	OVF lights	TDM-4A configuration error	Check that the TDM-4A is configured to operate with the correct main channel rate. If the rate is correctly configured, check the data rate of the modem (especially check for operation on the fallback rate).
4	LOS flashes (MAIN indicator lights)	1. Remote TDM-4A not operational	Check whether the remote TDM-4A is powered on, and operates normally. Check also that the remote operates properly.
		2. Remote TDM-4A uses a different configuration	Check and correct the situation by loading and activating the proper configuration at both TDM-4A units.
		3. Problems in the communication link	Check whether communication equipment is powered and properly connected, then use the diagnostics functions described in **Chapter 5** to identify fault location: • Activate the ALB loop to check the local modem • Activate the RLB loop to check the link and the remote modem.
5	MAIN not lit	1. No signal received received from the modem connected to the TDM-4A	Check whether the modem is powered, operating and properly connected. Replace the cable connecting the TDM-4A to the modem.
		2. TDM-4A problem	Turn the TDM-4A off, then turn it on again or press RESET. If the modem operates normally, replace the TDM-4A.

Table 4-2. Check TDM-4A indications (continued).

N°	Indication	Probable Cause	Action
6	OVF flashes	Overflow condition	Enter the common mode and identify the subchannel causing the overflow indication and the cause for the overflow. A continued overflow condition can be caused by a difference between the actual rate at which data is applied to the local subchannel and the configured data rate. Clear the overflow flag.
7	TEST lights	TDM-4A in command mode	Check whether the TDM-4A is being configured, and wait until configuration is completed (at any time, only one subchannel can be in the command mode).
8	TEST flashes	TDM-4A test loop active	Enter command mode, and select DIAGNOSTICS STATE, to see whether one of the test loops is on. If a test loop is on, but is no longer needed, disconnect it.
9	One or more subchannel indicators are off	1. No traffic on the subchannel 2. TDM-4A configuration error 3. The terminal requires DCD and/or CTS FORCED TO HIGH	If traffic is expected, but no activity is indicated, check the terminal and its connections to the subchannel. Check that the subchannels are configured as active. Check and change if required.

Check configuration of local and remote TDM-4A and make sure it corresponds to the requirements of the equipment connected to its subchannels.

5. Diagnostics

5.1 General

TDM-4A diagnostics functions use a full set of test loops and front-panel indicators to give you the tools you need to rapidly identify faults that affect system operation.

The test loops available for diagnostics and test purposes are:

• Local subchannel loopback.

• Reverse subchannel loopback.

• Remote subchannel loopback.

• Modem loops:

- Analog loopback.

- Remote digital loopback (This option depends on the characteristics of the modem used on the main channel).

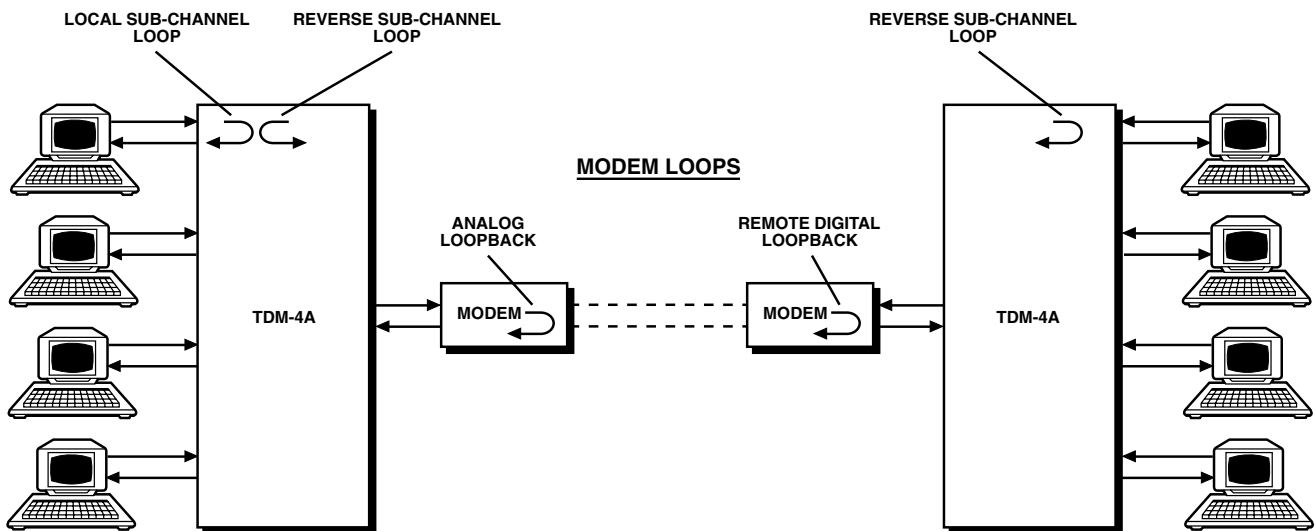The various test loops are identified in Fig. 5-1.

Fig. 5-1. Identification of TDM-4A Test Loops.

To locate a problem in the system, access the DIAGNOSTICS menu, display the local and remote diagnostics states to analyze the situation, and then perform test loops in the order given above.

All the test loops are initiated from the DIAGNOSTICS menu, which you can access from the main menu.

Section 5.2 describes the use of the test loops.

5.2 Description of Test Loops

Whenever a test loop is on, the TEST indicator will flash (unless you already entered the command mode: Then the TEST indicator lights steadily.) When performing a test loop on one of the sub-channels, no user data traffic can be carried by that subchannel.

5.2.1 LOCAL SUBCHANNEL LOOP

When a local subchannel loop is connected, the local transmit data is returned as receive data on the same subchannel. The TDM-4A will not accept a request to perform the loopback connection on inactive subchannels and on the subchannel used for the command mode.
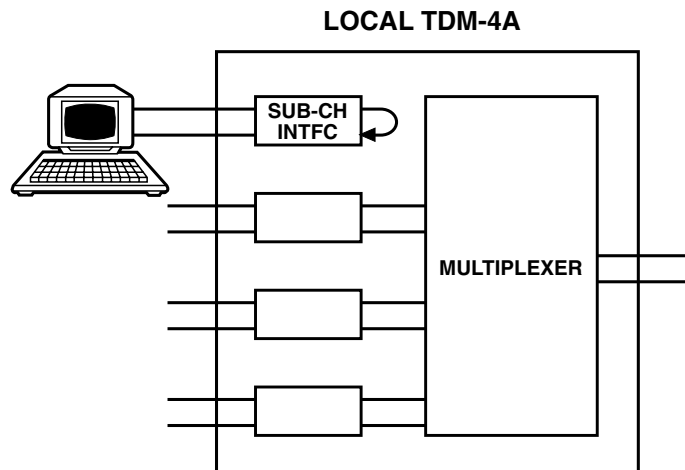

Fig. 5-2. Local Subchannel Loop.

As long as the loop is connected on a certain sub-channel, the subchannel's DCD and CTS lines are in the FORCED TO HIGH condition (active), regardless of the selection made for the normal operating mode. The subchannel activity indicator lights according to traffic. The equipment connected to the subchannel must receive its own transmit data without errors. Failure to do so usually indicates problems with the subchannel connection cable or with equipment connected to that subchannel.

In addition to the loop control procedure performed from the DIAGNOSTICS menu, the local loopback can be also cleared via a short-cut disconnect command: To disconnect, send the sequence "@@S" from the equipment connected to the subchannel.

5.2.2 REVERSE SUBCHANNEL LOOP

When a reverse subchannel loop is connected, the local subchannel returns the data received from the remote TDM-4A as transmit data on the same sub-channel. The local subchannel transmit path is disabled. The TDM-4A will not accept a request to perform the loopback connection on inactive subchannels or on the subchannel used for the command mode.
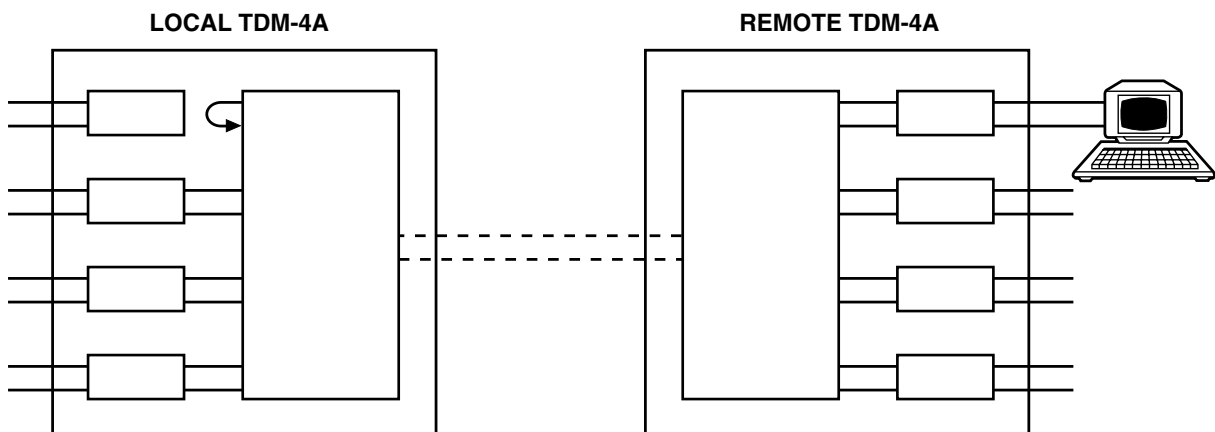

**Fig. 5-3. Reverse Subchannel Loop.**

As long as the loop is connected on a certain sub-channel, the subchannel DCD and CTS lines follow the local RTS and DTR condition, regardless of the selection made for the normal local operating mode. The equipment connected to the remote TDM-4A subchannel must receive its own transmit data without errors.

The reverse loopback will be automatically cleared when the main channel DCD line switches to OFF (not active), or there is loss of synchronization at the local TDM-4A.

5.2.3 REMOTE SUBCHANNEL LOOP

When a remote subchannel loop is connected, the local transmit data is returned by the remote TDM-4A as its transmit data on the same sub-channel. The TDM-4A will not accept a request to perform the loopback connection on inactive subchannels or on the subchannel used for the command mode.

The subchannel activity indicator lights according to traffic. The equipment connected to the local subchannel must receive its own transmit data without errors.
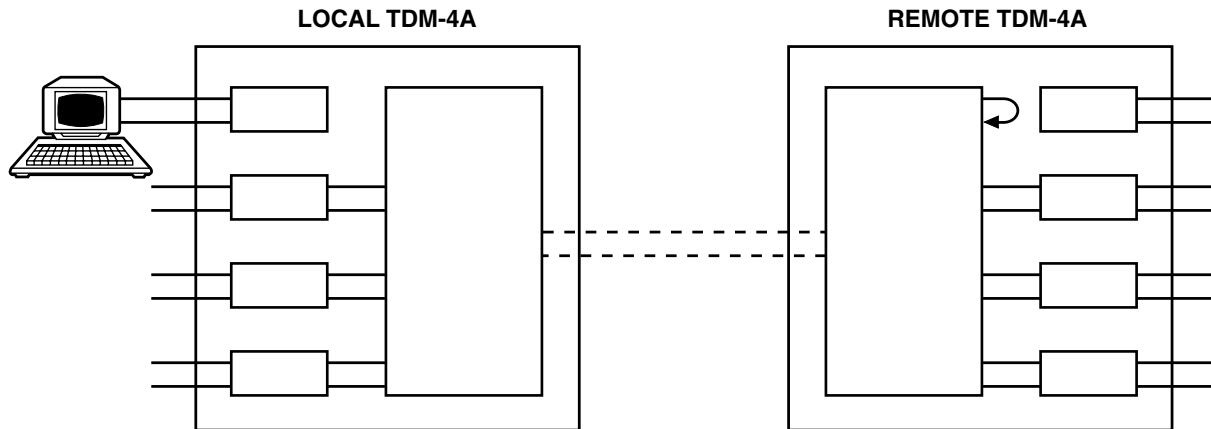
Fig. 5-4. Remote Subchannel Loop.

In addition to the loop control procedure performed from the DIAGNOSTICS menu, the remote loopback can be also cleared by means of a short-cut disconnect command: To disconnect, send the sequence "@@@S" from the equipment connected to the subchannel. Make a pause of one to ten seconds between the @@@ and the S. Since this is also the sequence used to activate the command mode, the TDM-4A will actually enter the command mode if no other (local or remote) subchannel is already in the command mode.

5.2.4 MODEM LOOPS

Analog modem loopback (ALB)

When the analog modem loop is connected, the main channel data transmitted by the local TDM-4A is returned to the receive line of the local TDM-4A after passing through the local modem, and the communication link is disconnected. All the data arriving from the remote TDM-4A while this loop is connected is lost. This loop tests the complete local TDM-4A, its main channel connection cable, and the local modem. As long as the loop is connected, the MAIN indicator of the local TDM-4A must light continuously, and the OVF and LOS indicators must be off.

Remote digital modem loopback (RLB)

When the remote digital modem loop is connected, the main channel data transmitted by the local TDM-4A is returned from the remote modem, after passing through the communication link and the local modem, to the receive line of the local TDM-4A. Any data transmitted from the remote TDM-4A is lost during loop connection. This loop tests the complete transmission path, including the local TDM-4A, the local and remote main channel connection cables, the communication link, and the local and remote modems.

As long as the loop is connected, the MAIN indicator of the local TDM-4A must light continuously, and the OVF and LOS indicators must be off.

Appendix A: Functional Interface Specifications

A.1 Main (Composite) Channel Interface

The TDM-4A main (composite) channel interface is configured as a synchronous DTE RS-232 interface, with a female DB25 connector. Pin allocation is listed in Table A-1.

Table A-1. Main (Composite) Channel Connector.

CCITT V.24 Circuit Number	EIA RS-232C Line	Pin	Signal Name	Description
101	AA	1	Protective Ground (GND)	Chassis ground (may be isolated from signal ground or connected to it)
102	AB	7	Signal Ground (SIG)	Common signal and DC power supply ground
103	BA	2	Transmit Data (TXD)	Serial digital transmit data from the TDM-4A
104	BB	3	Receive Data (RXD)	Receive data from modem
105	CA	4	Request to Send (RTS)	Continuous positive level from the TDM-4A
109	CF	8	Data Carrier Detect (DCD)	Data carrier detect indication from modem
107	CC	6	Data Set Ready (DSR)	Positive level from the TDM-4A when it operates
114	DB	15	Transmitter Signal Element Timing (TXC)	Transmit clock from modem
115	DD	17	Receiver Signal Element Timing (RXC)	Receive clock from modem

Table A-1. Main (Composite) Channel Connector (continued).

CCITT V.24 Circuit Number	EIA RS-232C Line	Pin	Signal Name	Description
141		18	Loop 3 Test Command	Control signal from TDM-4A: positive level commands the modem into analog loopback
108	CD	20	Data Terminal Ready (DTR)	Continuous positive level from TDM-4A
140		21	Loop 3 Test Command	Control signal from TDM-4A to modem. Positive level commands the attached modem to send a remote loopback command to the remote modem. If attached modem uses pin 21 as a signal quality indication output, set pin 21 to OFF, thereby disabling this function.
—	—	9	+5V	+5V supply line
—	—	10	-5V	-5V supply line
125	CE	22	Ring indicator (RI)	Not in use

A.2 Subchannel Interface

A.2.1 CONNECTORS

TDM-4A subchannel interfaces are configured as asynchronous DCE RS-232 interfaces. The sub-channel connectors have RJ-45 sockets.

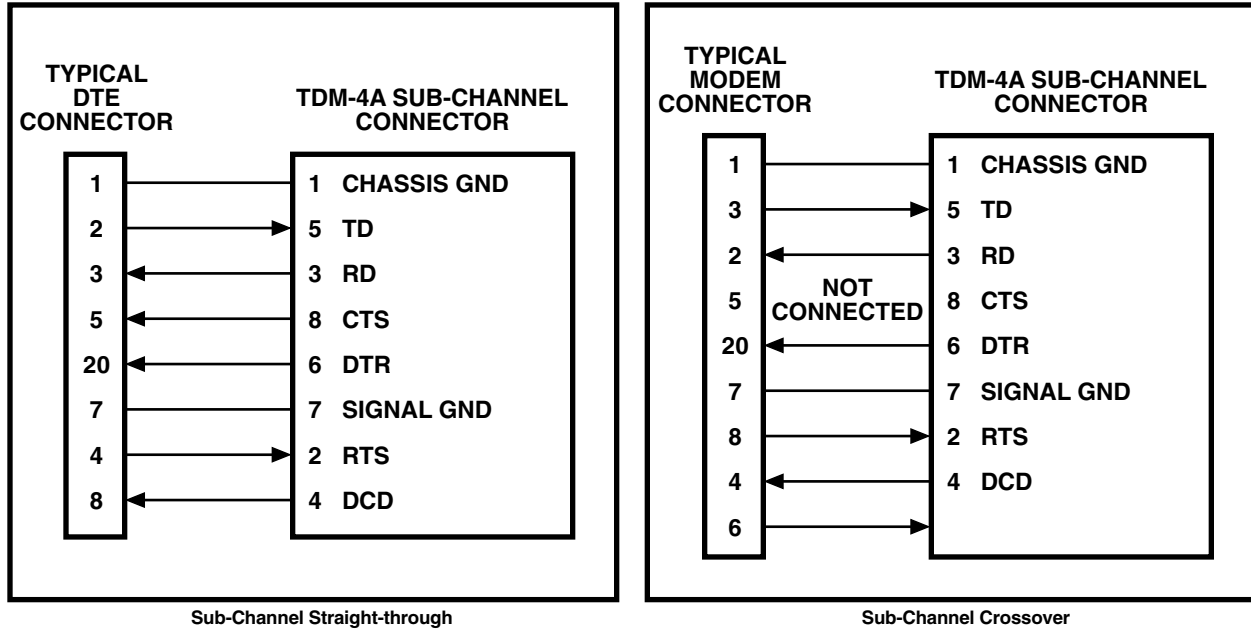Pin allocations are listed in Table A-2.

Table A-2. Subchannel Connectors.

CCITT V.24 Circuit	EIA RS-232C1Name	Pin	Signal	Description
101	AA	1	Protective Ground (GND)	Chassis ground (may be isolated from signal ground or connected to it)
102	AB	7	Signal Ground (SIG)	Common signal and DC power supply ground
103	BA	5	Transmit Data	Serial digital transmit data from a terminal or other source
104	BB	3	Receive Data	Receive data provided by TDM-4A receiver
105	CA	2	Request to Send (RTS)	Received by TDM-4A from DTE
106	CB	8	Clear to Send (CTS)	A positive level from the TDM-4A indicates that the terminal is allowed to send data. The TDM-4A sends positive level in accordance with the selected operating mode (FORCED TO HIGH or FOLLOWING REMOTE DSR)
109	CF	4	Data Carrier Detect (DCD)	The TDM-4A sends positive level in accordance with the selected operating mode (FORCED TO HIGH or FOLLOWING REMOTE RTS)
108	CD	6	Data Terminal Ready (DTR)	Received by the TDM-4A from the DTE

A.2.2 CABLING

Subchannel connection cables depend on application: a port ("straight-through") cable is generally used to connect the TDM-4A to a DTE, and a modem ("crossover") cable is used to connect the TDM-4A to a tail-end modem. (See Fig. A-1). Figure A-2 shows the recommended conductor color coding.

TYPICAL DTE CONNECTOR

TDM-4A SUB-CHANNEL CONNECTOR

1	1 CHASSIS GND
2	5 TD
3	3 RD
5	8 CTS
20	6 DTR
7	7 SIGNAL GND
4	2 RTS
8	4 DCD

Sub-Channel Straight-through

TYPICAL MODEM CONNECTOR

TDM-4A SUB-CHANNEL CONNECTOR

1	1 CHASSIS GND
3	5 TD
2	3 RD
5	8 CTS
20	6 DTR
7	7 SIGNAL GND
8	2 RTS
4	4 DCD
6	

NOT CONNECTED

Sub-Channel Crossover

Fig. A-1. Typical Subchannel Straight-through and Crossover Cable Wiring.

Contact	Color
1	Blue
2	Orange
3	Black
4	Red
5	Green
6	Yellow
7	Brown
8	Gray
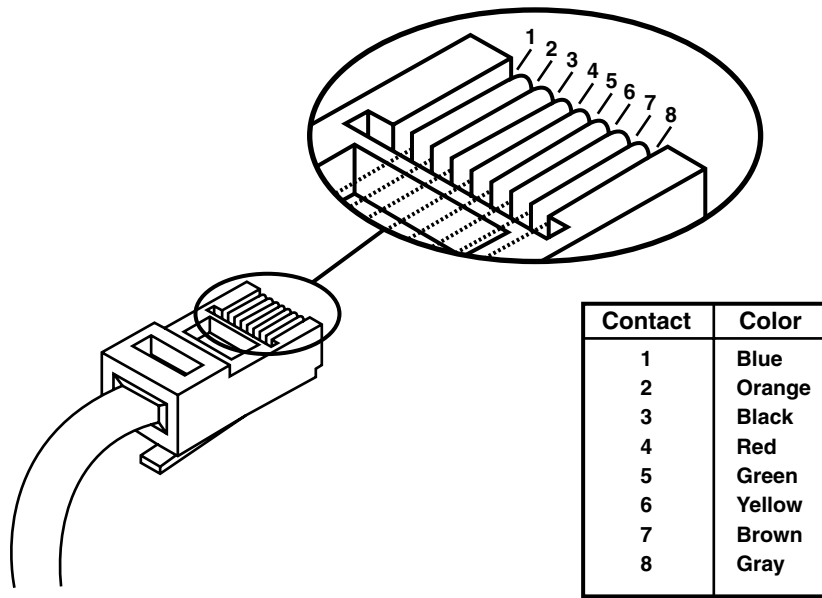
Fig. A-2. RJ-45 Plug and Typical Conductor Colors.

Appendix B: TDM-4A Configuration Record

This appendix presents a typical configuration record form. You can use this form as a worksheet during system configuration planning, and as a permanent record of the actual configuration.

TDM-4A CONFIGURATION RECORD FORM

Date:_____/_____/_____ Prepared by_____

Location_____   **Remote Location_____**

TDM-4A Serial Number_____   _____

Software Version_____   _____

System Data

Password_____   _____

Main Link Rate_____   _____

Number of Data Bits_____   _____

Subchannel DCD_____   _____

Subchannel CTS_____   _____

SUBCHANNEL CONFIGURATION

Subchannel	Data Rate	Stop Bits	Parity
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____
4	_____	_____	_____

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