

**FT100 S**  
**Installation and Operation Manual**

**Telenetics Corporation**  
**25111 Arctic Ocean**  
**Lake Forest, California 92630**

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IBM	International Business Machines Corporation
AT&T	American Telegraph & Telephone

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## **UPDATES**

Updates to the products and the manual are obtainable at participating Telenetics dealers and distributors, or directly from Telenetics.

## **FCC REQUIREMENTS**

This equipment complies with Part 68 of FCC Rules. Please note the following:

When you order service, the telephone company needs to know:

**A. The Facility Interface Code:**

04DU9-BN (1.544 Mbps superframe format (SF) without line power)  
04DU9-DN (1.544 Mbps SF and B8ZS without line power)  
04DU9-1KN (1.544 Mbps ANSI ESF without line power)  
04DU9-1SN (1.544 Mbps ANSI ESF and B8ZS without line power)

**B. The Service Order Code: 6.0N**

A signal power affidavit will be required to guarantee encoded analog content and billing protection unless this unit is used in combination with an XD type device or no encoded analog signals and billing information are transmitted. A SAMPLE AFFIDAVIT is attached. For most uses, the second box is appropriate.

**C. The USOC Jack Required: RJ48C**

In addition, if requested, please inform the telephone company of the make, model number and FCC registration number, which are on the label.

The telephone company may change technical operations or procedures affecting your equipment. You will be notified of changes in advance to give you ample time to maintain uninterrupted telephone service.

If you experience trouble with this telephone equipment, please contact

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for information on obtaining service or repairs. The telephone company may ask that you disconnect this equipment from the network until the problem has been resolved. If your equipment continues to disrupt the network the telephone company may temporarily disconnect service. If this occurs you will be informed of your right to file a complaint with the FCC.

## **WARNING**

This equipment uses, generates, and can radiate radio frequency energy interfering with radio communications if not installed and used in accordance with the instruction manual. It has been tested and complies with the limits for a Class A computing device according to FCC Rules, Part 15. Operation of this equipment in a residential area may cause interference. If it does, you must correct the cause of the interference. Shielded cables may be necessary with this unit to ensure compliance with the Class A limits.

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

## **SPECIAL REQUIREMENTS FOR CANADA**

Certain requirements exist for data communication products manufactured for use in Canada. Principle among these requirements is the application of the IC label as described below. However, certain data communication products do not require the IC label nor adherence to IC requirements. If this is the case the IC label will not be affixed to the units.

## **INDUSTRY CANADA (IC) REQUIREMENTS**

IC labels are affixed to each unit sold in Canada. This label has the certification number for that particular unit. The numbers are different for each model.

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

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

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment. For their own protection users should ensure that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

### **CAUTION**

Users should not attempt to make installation connections themselves, but should contact the appropriate electric inspection authority or electrician.

## **CANADIAN EMISSION REQUIREMENTS**

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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# Chapter 1

## Introduction

### GENERAL

The Telenetics FT 100S Fractional T1 CSU/DSU combines a single channel, fractional T1 DSU with a T1 ESF CSU. The unit interfaces customer premise data and voice equipment to a T1 transmission facility. High speed workstations, local and wide area networks (WANs), Private Branch Exchanges (PBXs), facsimiles, and host computers are examples of customer equipment which may communicate over public or private T1 networks using the FT 100S.

### FUNCTIONAL DESCRIPTION

The FT 100S receives serial data from the customer Data Terminal Equipment (DTE) and multiplexes it onto a 1.544 Mbps DS-1 signal. The DS-1 signal interfaces to the T1 network via an integral ESF CSU. The DTE ports enable data rates from 56 kbps to 1.536 Mbps. The unit complies with DTE interface standards for V.35 and supports all Fractional T1 applications.

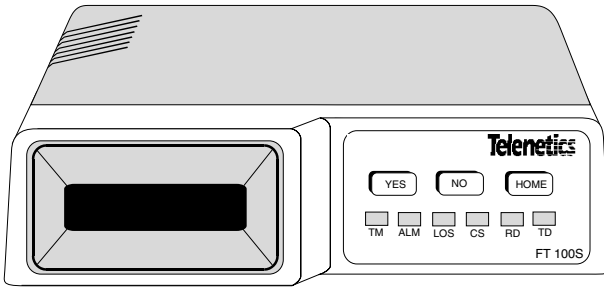
Network management and configuration for the FT 100S are provided by several methods. A Liquid Crystal Display (LCD) front panel accesses all configuration and diagnostic options. An RS-232 rear panel interface labeled **CONTROL** allows configuring and testing the unit via terminal, computer, or remotely via modem. When the RM16M model is installed in the LocalView Shelf, configuration and diagnostics are accessible via the LocalView terminal. Operating parameters are stored in nonvolatile memory.

## **PHYSICAL DESCRIPTION**

The FT 100S can be either a standalone desktop unit or a shelf mount model.

### **Front Panel**

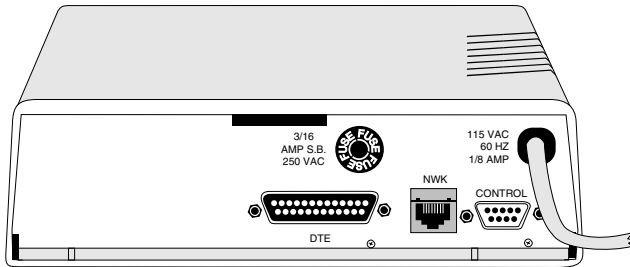
Three front panel pushbuttons, YES, NO, and HOME, enable user input. A front panel 32-character LCD allows menu driven user operation and real time unit status displays. DTE signal status can be monitored by six LEDs and the LCD on the front panel (Figure 1-1).



***Figure 1-1  
Front Panel***

**Rear Panel**

The rear panel (Figure 1-2) contains a power cord, fuse, an 8-pin RJ48C network interface connector, a 9-pin D-type interface connector for external control, and one 25-pin D-type DTE connectors. Since the FT 100S connects directly to the T1 network, it does not include an ON/OFF power switch.



***Figure 1-2  
Rear Panel***

## **FEATURES**

- UDS and Telenetics LocalView Shelf compatible
- V.35 synchronous interface
- All standard data rates:  $n \times 56$  kbps,  $n \times 64$  kbps (where  $n$  = number 1 to 24 of DS0 time slots-- 1.536 Mbps max)
- Fractional T1 compatible
- Uniform synthesized DTE transmit and receive clocks
- Flexible timing options
- Integral CSU
- B8ZS clear channel capability
- ESF or SF framing modes
- ESF diagnostics per AT&T 54016 and ANSI T1.403
- Built-in network and per channel loopback test capability
- Front panel LED status display for DTE ports
- Configuration and diagnostic options via: Front panel LCD, RS-232 control port, or Motorola LocalView

## Chapter 2 Installation

### GENERAL

This chapter provides installation information for the FT 100S. If changing hardware options to meet system requirements, refer to Chapter 3 before installation.



#### Note

*When requesting T1 network service, personnel operating this equipment must complete the affidavit in the front of this manual and file it with the telephone company providing service.*

### RECEIPT INSPECTION

Inspect the equipment carefully for damage that may have occurred in shipment. If there is damage or material shortage, contact the shipping agent and Telenetics authorized agent for advice and assistance. Retain the shipping container and packing material for possible future shipment.

The FT 100S arrives with the following components:

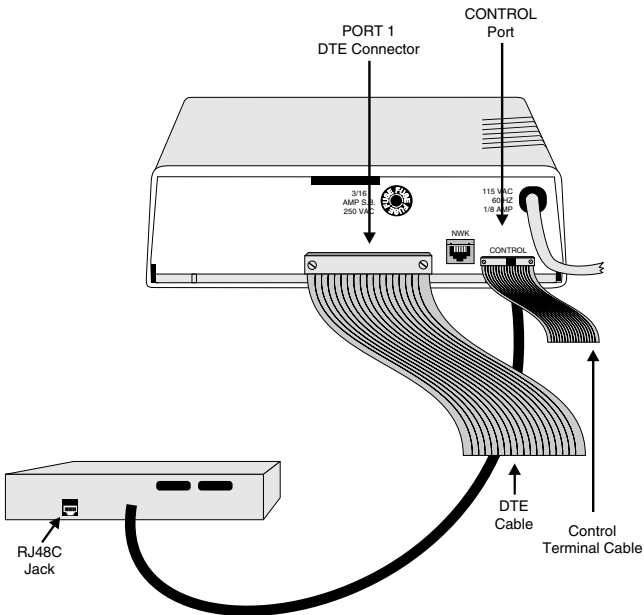
- Standalone housing containing two main circuit boards
- Two user specified piggyback interface boards/adapters
- Power transformer with cable
- T1 line cables
- V.35 adapter (included with V.35 unit)
- User's Guide

The following components must be supplied by the user:

- RS-449 adapter
- Control port adapter

## SITE PREPARATION

The installation area should be clean, well-lighted, and free from extremes of temperature, humidity, appreciable shock, and vibration. Allow sufficient space at the rear of the unit for cable clearance and air flow. See Figure 2-1.



**Figure 2-1**  
**Installation**



## CONNECTIONS



### Note

*Before connecting the unit to the network or the DTE, determine whether the factory setting for Network Transmit LBO is set as required or must be changed. Refer to Chapter 3.*

### FT 100S to Network

Network T1 line connections are made through a standard 8-pin RJ48C jack labeled **NWK** on the rear panel. Table 2-1 list pin connections for the network connector.

To connect the unit to the network,

**Table 2-1. Network Connector Pin Functions**

RJ48C Pin	Function
1	Network receive ring (R1)
2	Network receive tip (T1)
3	Not used
4	Network transmit (R)
5	Network transmit (T)
6	Not used
7, 8	Ground

1. Insert one end of the supplied cable into the unit's NWK jack.
2. Insert the other end into the RJ48C on the T1 Network interface connector.

### FT 100S to Remote Control Device

The 9-pin D-type male connector labeled **CONTROL** on the rear panel connects to the terminal that controls FT 100S operation, or to a modem connected to a remote terminal that controls the unit.

The interface is compatible with EIA RS-232 serial data operation and has pin functions like a DCE interface.

This is the same type of connector with the same pin connections as found on IBM PC/AT personal computers and compatibles so that standard cables can be used.

Pin connections for this interface are shown in Table 2-2.

**Table 2-2. Control Port Connector Pin Functions**

DB9 Pin	Function
1	Data carrier detect
2	Receive data
3	Transmit data
4	Data terminal ready
5	Ground
6	Data set ready
7	Request to send
8	Clear to send
9	Not used

To connect the unit to the network,

1. Insert one end of the cable into the unit's CONTROL port.
2. Insert the other end into the RS-232 connector on the controlling equipment.

## FT 100S to DTE

The 25-pin D-type female connector on the rear panel connect to the DTE. Table 2-3 and Table 2-4 show pin connections for the optional DTE connector available.

To connect the unit to the DTE,

1. Insert the DTE cable into the DTE connector on the unit.
2. Insert the opposite end into the designated DTE.
3. Secure the screws to complete the connection.

## V.35 Adapter Installation

The V.35 adapter is provided with the FT 100S. Optional adapters are available for converting the DTE connector to a 34-pin V.35 type connector or to a 37-pin RS-449 type connector. You can use the RS-449 adapter. The RS-449 adapter is not provided with the FT 100S. Pin connections for the V.35 and RS-449 adapters are listed in Table 2-3 and Table 2-4.

**Table 2-3. RS-530 / RS-449 Pin Functions**

RS-530 (DB25) Pin	RS-449 (DB37) Pin	Function
1	1	Protective ground
2	4	Transmit data A
3	6	Receive data A
4	7	Request to send A
5	9	Clear to send A
6	11	Data set ready A
7	19	Signal ground
8	13	Receive line signal detect A
9	26	Receive clock B
10	31	Receive line signal detect B
11	35	External transmit clock B
12	23	Transmit clock B
13	27	Clear to send B

**Table 2-3. RS-530 / RS-449 Pin Functions (Continued)**

14	22	Transmit data B
15	5	Transmit clock A
16	24	Receive data B
17	8	Receive clock A
18	10	Local loopback
19	25	Request to send B
20	12	Data terminal ready A
21	14	Remote loopback
22	29	Data set ready B
23	30	Data terminal ready B
24	17	External transmit clock A
25	18	Test mode

**Table 2-4. V.35 Functions (Part Number 5003769-01)**

<b>V.35 (DB25) Connector Pin</b>	<b>V.35 (34 pin V.35) Adapter Pin</b>	<b>Function</b>
1	A	Protective ground
2	P	Transmit data A
3	R	Receive data A
4	C	Request to send
5	D	Clear to send
6	E	Data set ready
7	B	Signal ground
8	F	Receive line signal detect
9-12	--	Not used
13	AA/a	Transmit clock B
14	S	Transmit data B
15	Y	Transmit clock A
16	T	Receive data B
17	V	Receive clock A
18	J	Local loopback
19	X	Receive clock B

**Table 2-4. V.35 Functions (Part Number 5003769-01)**

20	H	Data terminal ready
21	BB/b	Remote loopback
22	--	Not used
23	W	Ext transmit clock B
24	U	Ext transmit clock A
25	K	Test mode

**POWER**

Power is supplied through a 6-foot line cord with a grounded 3-wire plug (attached to the unit). If chassis ground is available through the third prong of the plug, a separate ground wire is not required.



## Chapter 3

# Hardware Configuration

### GENERAL

The FT 100S is factory configured to current industry standards. Because of the number of possible applications, the unit will require some option changes to fit a particular application.

This chapter describes the options that are configured with hardware on the printed circuit board (PCB). Hardware options are selected by two plug-on straps, a dip switch, and installing the interface adapter card. To access these options on the standalone unit, the cover must first be removed.

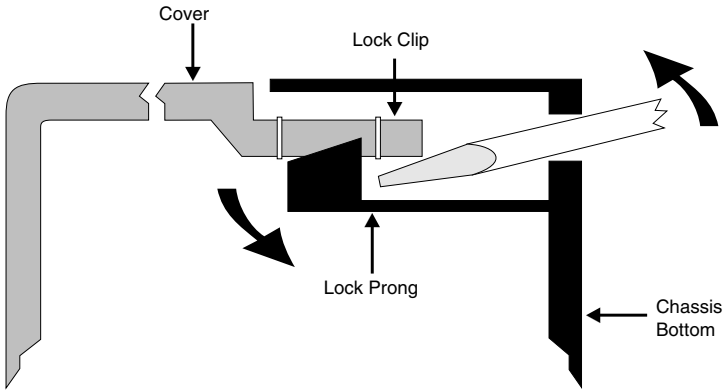
### COVER REMOVAL



#### Warning

*Do not remove the cover unless the power cord is unplugged.*

1. Place the unit on its side on a flat surface.
2. Insert a medium size flat screwdriver blade in one of the bottom rear latch slots. Do not push the screwdriver but lightly pry the handle away from the unit as shown in Figure 3-1. This disengages the lock prong from the latch locks.
3. Assist removal by pushing the cover from the chassis with your fingers on the unit rear edges. Repeat this procedure with the remaining latch slots.
4. To replace the cover, align the latch locks, rear guide grooves, and front lock tabs.
5. Press the cover in place until the latch locks engage the lock prongs.



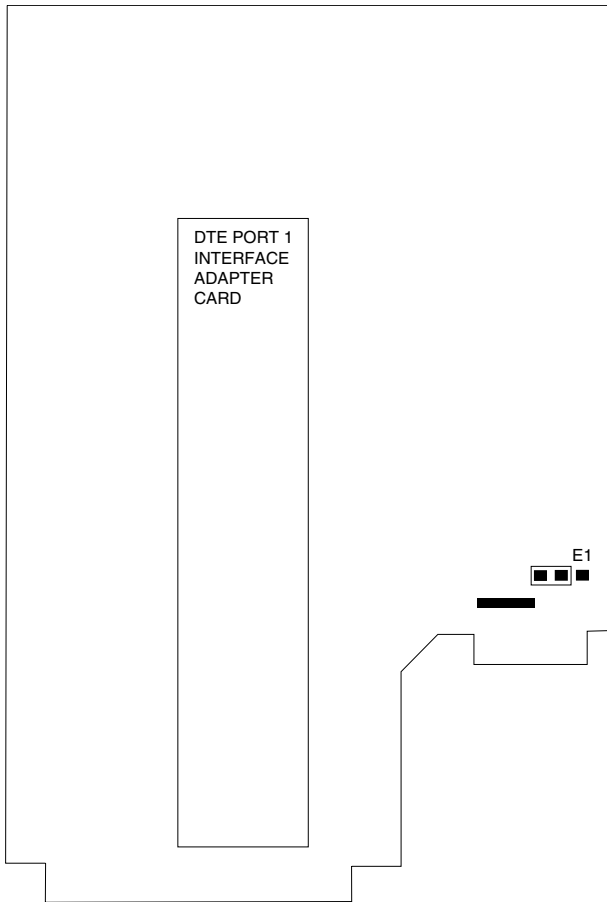
**Figure 3-1**  
**Cover Removal**

## CHANGING OPTION SETTINGS

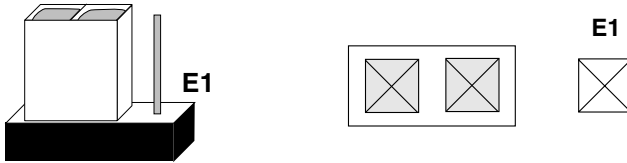
Figure 3-2 shows the positions of the option straps, the dip switch, and the interface adapter card on the main PCB. Figure 3-3 shows a typical strap application.

- To change a strap setting, lift the jumper strap off and insert it in the new position.





***Figure 3-2***  
***Strap and Adapter Card Locations***



**Figure 3-3**  
**Strap Application**

## Grounding

Signal ground is normally separated from chassis ground. If necessary, signal ground can be connected to chassis ground by moving the strap to E1.

## DTE INTERFACE OPTIONS

Several standard DTE interfaces are available.

Normally, the FT 100S is purchased with the required interface already installed. However, if application requirements change, the unit can be reconfigured.

The DTE interface type is selected by

- installing the appropriate adapter card onto the main printed circuit board and
- if required, installing an adapter for converting the DTE connector on the rear panel.

## Installing an Interface Card

The interface adapter card is located on the main printed circuit card as shown in Figure 3-2.

To remove a card, remove the stand off screws and carefully lift both ends of the card vertically to unplug the card.

Since the available interface adapter cards are used on various Tele-netics products, they may contain switches and straps that must be set according to the product on which they're to be used. For the FT 100S, the settings are described in the table below. Option cards that were installed at the factory should already be configured properly.

<b>V.35 Card</b>	<b>RS-530/449 Card</b>	
#4563699 or 4563956	#4563507	#4563137
Switches 3, 4, 6 ON 1, 2, 5, 7, 8, OFF	Strapped for CHNL	Strapped for TM

To install a card,

1. Ensure the card is configured correctly
2. Align the connectors
3. Firmly press the adapter card down at both ends until the card fully seats, and
4. Re-install stand off screws.

### **Using a Conversion Adapter**

A V.35 or RS-449 connector conversion adapter can be attached to the rear panel DTE connector. These adapters convert the existing 25-pin D-type DTE connector to a 34-pin V.35 connector or 37-pin RS-449 connector.



## Chapter 4

# Front Panel Option Selection

### GENERAL

FT 100S configuration options, operating status, and diagnostics can be observed or changed using the front panel pushbuttons with the LCD. The unit can also be controlled by the control port described in Chapter 6, or by the LocalView terminal when installed in the LocalView shelf.

### LCD MENUS

Three main menus provide

- Port status displays
- Diagnostic options
- Configuration options

Each main menu is supported by submenus, items, and options.

While most menu items allow selecting different options, some only display the current status of a signal or function. These provide status monitoring for such features as receive signal frame synchronization and alarm reporting.

Table 4-1 lists all menus.

### Using the Pushbuttons to Select Options

Generally, pressing NO scrolls vertically down the columns in Table 4-1 and pressing YES advances horizontally across the columns. Pressing HOME returns to the submenu or main menu header. If the pushbuttons are pressed and held, the FT 100S automatically scrolls through the menu at a rate of about 4 display advances per second. Options are selected by pressing the YES/NO pushbuttons in answer to prompts or questions. In some cases, option fields on the LCD blink. If this occurs and the displayed selection for the option should be changed, press NO to display another selection. If the displayed selection is the setting required, press YES to select it and advance to the next option field or submenu.

**Table 4-1. Menu Options**

MAIN MENU	SUBMENU	SUBMENU ITEM	OPTION
<b>M A I N  1</b>	Port Status Display?	Line Status:	Mode / Line Code / Framing / Receive Status
		Port 1 Status	Mode / Interface / Data Rate
<b>M A I N  2</b>	Diagnostic Options	T1 Tests?	T1 Local Loopback?
			YES / NO
			T1 Network Loopback?
			YES / NO
			Remote CSU Loopback?
			YES / NO
	DTE Port Tests?	Local Terminal Loopback?	YES / NO
		Remote Terminal Loopback?	YES / NO
		Remote Loopback?	YES / NO
		Remote Loopback with Test Pattern	YES / NO
		Test Pattern Test?	YES / NO
	Monitor DS0 Display	Channel    Data ##    nnnnnnnn	channels 1-24
	Performance History Display?	Error Free Seconds?	nn% (0-100)
		Error Events:	nn (0-65565)
		24 Hours Total?	ES / BES / SES /
		15 Minute Interval Data?	UAS / LOFC / LCVS (1-900 each)
<b>M A I N  3</b>	Configuration Options?	T1 Line Options?	Framing
			SF / ESF *
			Line Code
			AMI * / B8ZS
		Bit Stuffing	Enable Disable *
		ESF (PRM) Transmission	Enable Disable *

**Table 4-1. Menu Options (Continued)**

MAIN MENU		SUBMENU	SUBMENU ITEM	OPTION
M A I N  3  C O N T			ESF (AT&T) Mode	Enable Disable *
			Timing	Loop * / Internal / Port 1 / Port 2 / External (Port 2)
			Line LB	Enable / Disable *
			Payload LB	Enable / Disable *
			Idle Code	FF * / 7F
			Yellow Alarm	Enable * / Disable
			CSU/DSU LBO	CSU: 0, -7.5dB, -15dB DSX: 0-133 ft, 133-266 ft, 266-399 ft, 399-533 ft, 533-655 ft
	DTE Port Options? (V.35 or RS-530 interface card)		Select # of Time Slots	0 - 24 *
			Select Rate Multiple	56K bps 64K bps *
			Select Time Slots	Alternating Contiguous *
			Select Starting Time Slot	1 * - 24
			Transmit Clock Source	Internal * External
			Transmit Clock Polarity	Normal * Inverted
			Receive Clock Polarity	Normal * Inverted
			CTS Mode	Normal * Forced On
			RLSD Mode	Normal * Forced On
			TM Mode	Normal * Forced Off

**Table 4-1. Menu Options (Continued)**

MAIN MENU		SUBMENU	SUBMENU ITEM	OPTION
MAIN 3 CONT	Configuration Options? Cont.	DTE Port Options? <i>Cont.</i> (V.35 or RS-530 interface card)	LL Mode	Enable / Disable *
			RL Mode	Enable / Disable *
			Remotely Activated Loopback	Enable * Disable
		Control Port Options?	Mode	Terminal * Computer LocalView
			Baud Rate	300 600 1200 2400 4800 9600 19200 *
			Local Echo	On * / Off
			Status	Lock / Unlock *
			Set Time?	Set time
		Set Date?	Set data	

*\* factory default settings*

### Powerup Displays

On powerup, the FT 100S displays a sign-on message for 2 seconds which includes the software version number:

FT 100S  
VERSION x.xx

During this time, the unit performs a self diagnostic test.

If the test fails, a message appears describing the malfunction.



If the unit passes the test, the product name displays:

FT 100S  
T1 ESF CSU/DSU

PUSHBUTTON ACTION:

YES- None

NO- Advances to PORT STATUS DISPLAY?

HOME- Redisplays software version message.

## **PORT STATUS DISPLAY MAIN MENU 1**

Port Status  
Display?

This menu contains display-only messages for monitoring the status of the line and DTE ports.

PUSHBUTTON ACTION:

YES- Advances to LINE STATUS: display

NO- Advances to DIAGNOSTIC OPTIONS? menu

HOME- Returns to the FT 100S T1 CSU/DSU main menu header

## Line Status

### Line Status:

Mode LC Fram Rec Status

The line status display indicates the present status of the FT 100S / T1 network interface. The display includes the four status fields shown in the following table:

Status Field	Mode	Line Code	Framing	Receive Status
Possible Status	NORM	AMI	SF	SYNC
	LLB	B8Z	Fe	LOS
	NLB			AIS
	RLU			YEL
	PLB			
	RCLB			

The Mode field displays the present operating mode of the T1 network interface. Mode status indications are:

- NORM Normal operation
- LLB Local loopback
- NLB Network loopback
- RLU Remote loop up
- PLB Payload loopback
- RCLB Remote CSU loopback

The Line Code field displays the T1 line code option selected during configuration. To change the selection, refer to CONFIGURATION OPTIONS MAIN MENU 3 later in this chapter. Indications are:

- AMI Alternate mark inversion
- B8Z Binary 8-zero substitution

The Framing field displays the T1 framing option selected during configuration. Refer to CONFIGURATION OPTIONS MAIN MENU 3 later in this chapter. The framing status indications are:

- SF      Superframe (D4) framing
- Fe      Extended superframe (ESF) framing

The Receive Status field displays the status of the FT 100S T1 network receiver. The receive status indications are:

- SYNC    Frame synchronization is established.
- LOS      Loss of synchronization
- AIS      Alarm indication signal (unframed all ones) is being received.
- YEL      Yellow alarm signal is being received.

**PUSHBUTTON ACTION:**

YES-      None

NO-        Advances to Port 1 Status:

HOME-    Returns to PORT STATUS DISPLAY? menu

## **DTE Status**

### Port 1 Status:

*Mode   Interface   Data Rate*

This display indicates the selected DTE port status. The three fields of the display are:

Status Field	Mode	Interface	Data Rate
Possible Status	NORM LTL RTL RL RLTP RAL TP	V.35 RS-530	56K - 1536K

The Mode field displays the present operating mode of all FT 100S DTE port:

- NORM    Normal operation

- LTL        Local terminal loopback test
- RTL        Remote terminal loopback test
- RL         Remote loopback test
- RLTP      Remote loopback w/test pattern
- RAL        Remotely activated loopback test
- TP         Test pattern test

The Interface field displays the DTE interface configuration that was selected during hardware configuration for the DTE port (Chapter 3).

The Data Rate field displays the selected data bit rate for the DTE port. Rate values can range from 56 kbps to 1,536 kbps. Refer to the CONFIGURATION OPTIONS MAIN MENU 3 description in this chapter to change the data rate.

**PUSHBUTTON ACTION:**

YES-        None

NO-         Advances to LINE STATUS

HOME-      Returns to PORT STATUS DISPLAY? menu

**DIAGNOSTIC OPTIONS MAIN MENU 2**

Diagnostic  
Options?

This menu accesses the diagnostic tests, which are divided into four submenus:

- T1 tests
- DTE port tests
- DS0 monitor
- Performance history display

**PUSHBUTTON ACTION:**

YES-        Advances to T1 TESTS? submenu

NO-         Advances to CONFIGURATION OPTIONS? menu

HOME-      Returns to the FT 100S T1 CSU/DSU main menu header

## **T1 TESTS**

### **T1 Tests?**

The T1 line test modes include

- T1 Local Loopback
- T1 Network Loopback
- Remote CSU Loopback

**PUSHBUTTON ACTION:**

YES- Advances to T1 LOCAL LOOPBACK? test mode

NO- Advances to DTE PORT TESTS? submenu

HOME- Returns to DIAGNOSTICS OPTIONS? menu

## **T1 Local Loopback**

### **T1 Local Loopback?**

Figure 4-1 shows the unit in Local Loopback. This test loops the network T1 transmitter output to the receiver input at the network interface. Since the entire T1 data payload is looped back, the DTE port is also looped back. This allows the local DTE to test the local unit. The looped back T1 signal is also transmitted to the network to keep the network active.

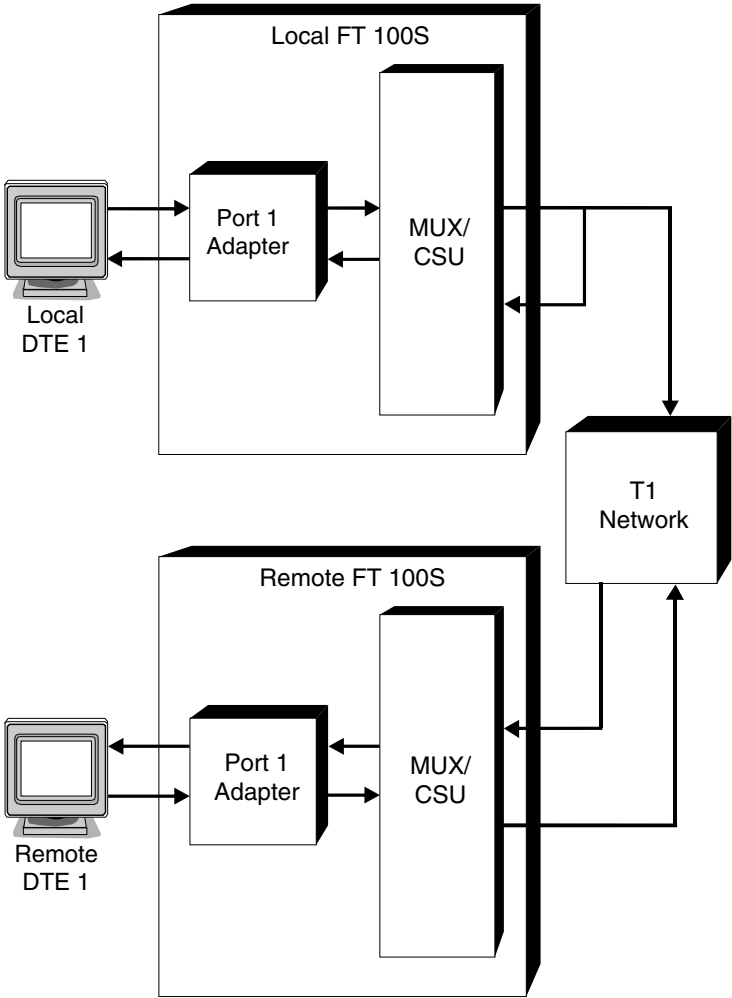
All TM LEDs light to indicate a T1 test in progress. Other LEDs function normally.

**PUSHBUTTON ACTION:**

YES- Enters Local Loopback; advances to T1 LOCAL IN PROGRESS - END?

NO- Advances to next test mode T1 NETWORK LOOPBACK?

HOME- Returns to T1 TESTS? submenu



**Figure 4-1**  
**T1 Local Loopback**

## **T1 Network Loopback**

**T1 Network  
Loopback?**

Figure 4-2 shows the unit in Network Loopback. The T1 network received signal is looped back to the network transmitter and also passed to the DTE port. The DTE port transmit signal is blocked. This allows testing the T1 network from a remote FT 100S, a remote CSU, or from the telephone company central office.

All TM LEDs light to indicate a T1 test in progress. Other LEDs function normally.

### **PUSHBUTTON ACTION:**

- YES- Enters network loopback; advances to T1 NETWORK LOOP IN PROGRESS - END?
- NO- Advances to Remote CSU Loopback?
- HOME- Returns to T1 TESTS? submenu

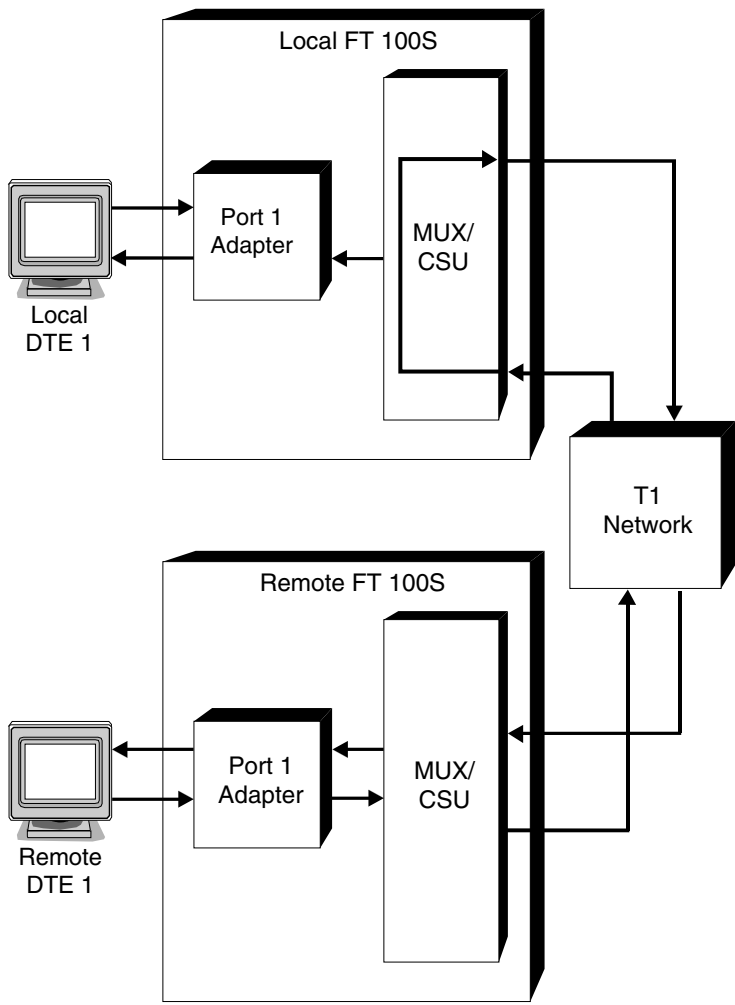
## **Remote CSU Loopback**

**Remote CSU  
Loopback?**

Figure 4-3 shows the unit in Remote CSU Loopback. When initiated, the local FT 100S transmits a loop-up code causing the remote unit to enter Remotely Activated Network Loopback. The loop-up code is transmitted until the remote unit enters loopback. The local unit then resumes normal operation. The remote unit enters loopback after the loop-up code has been received for at least 4 seconds.

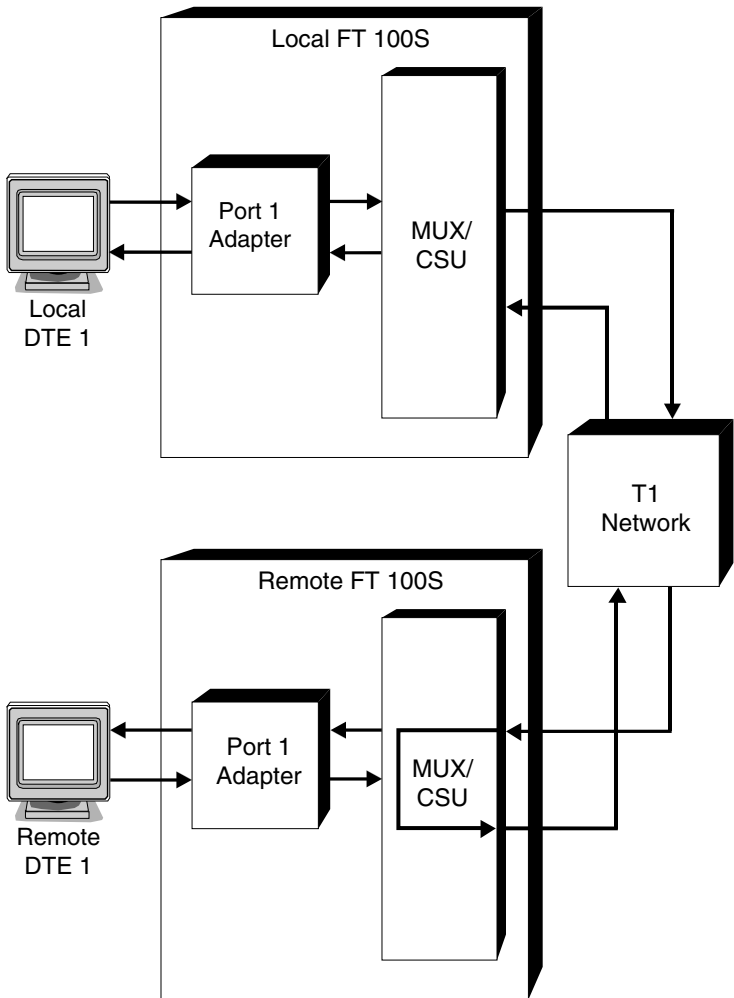
The FT 100S responds to the standard CSU inband loop codes and out-of-band ESF loop codes received on the FDL. When the loop-up code is detected, the unit initiates a T1 network loopback. The loopback is terminated when the loop-down code is received.

When Remote CSU Loopback is terminated, a loop-down code is transmitted causing the remote unit to return to normal operation.



**Figure 4-2**  
**T1 Network Loopback**





**Figure 4-3**  
**Remote CSU Loopback**

The loop-up and loop-down codes are compatible with AT&T and ANSI inband loop codes. Therefore, the remote unit can be another FT 100S or a standard CSU device.

Loop-up set code -- repeating bit pattern 10000. Loop-down reset code -  
- repeating bit pattern 100.

All TM LEDs light to indicate a T1 test is in progress. Other LEDs function normally.

**PUSHBUTTON ACTION:**

YES- Initiates Remote CSU loopback; advances to Remote CSU  
Loop in progress - End?

NO/

HOME- Returns to T1 Test? submenu

## **Test In Progress**

**XXX**  
**In Progress-End?**

This display indicates a test is in progress. *XXX* represents the particular test mode.

**PUSHBUTTON ACTION:**

YES- Terminates the test

NO- Advances to next test menu

HOME- Returns to top of the present test menu

## **DTE PORT TESTS**

**DTE Port Tests?**

This submenu display accesses these DTE port test modes:

- Local Terminal Loopback
- Remote Terminal Loopback
- Remote Loopback

- Test Pattern

**PUSHBUTTON ACTION:**

- YES- Advances to the first test mode DTE LOCAL TERMINAL LOOPBACK?
- NO- Advances to MONITOR DS0 DISPLAY? submenu
- HOME- Returns to DIAGNOSTIC OPTIONS? menu

**DTE Port Local Terminal Loopback**

DTE Loc Term  
Loopback?

Figure 4-4 shows DTE port in Local Terminal Loopback . Transmit data from the DTE is looped back to the DTE received data line. This allows testing the FT 100S interface adapter card and the cabling to the DTE port from the DTE.

The TM LED lights to indicate a test in progress. Other LEDs function normally.

**PUSHBUTTON ACTION:**

- YES- Enters local terminal loopback; advances to LOC TERM IN PROGRESS-END
- NO- Advances to REM TERM LOOPBACK? test mode
- HOME- Returns to DTE PORT TESTS? submenu

**DTE Port Remote Terminal Loopback**

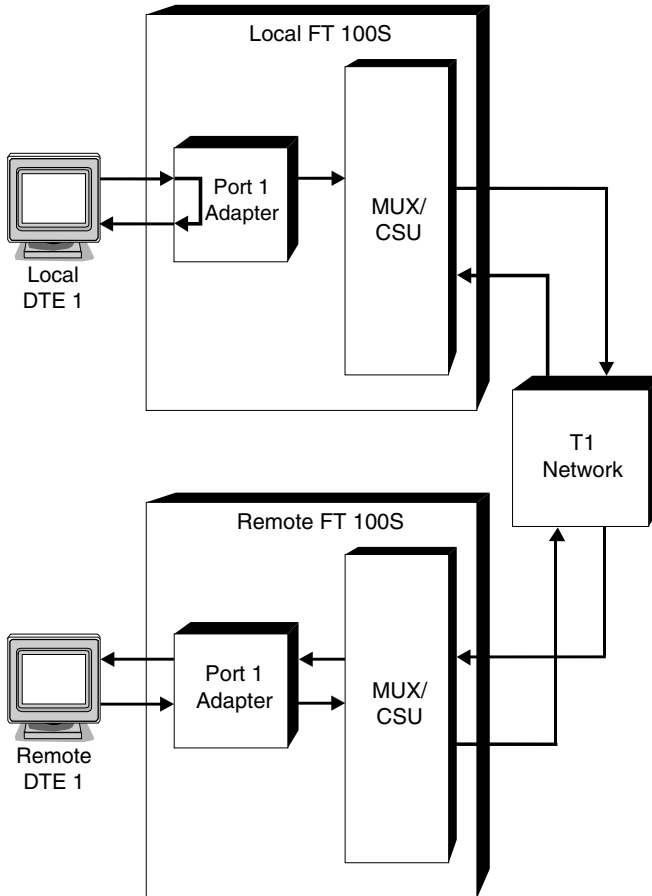
DTE Rem Term  
Loopback?

Figure 4-5 shows the DTE port in Remote Terminal Loopback. Received data from the remote DTE is looped back to the remote DTE. The received data is also passed to the local DTE.

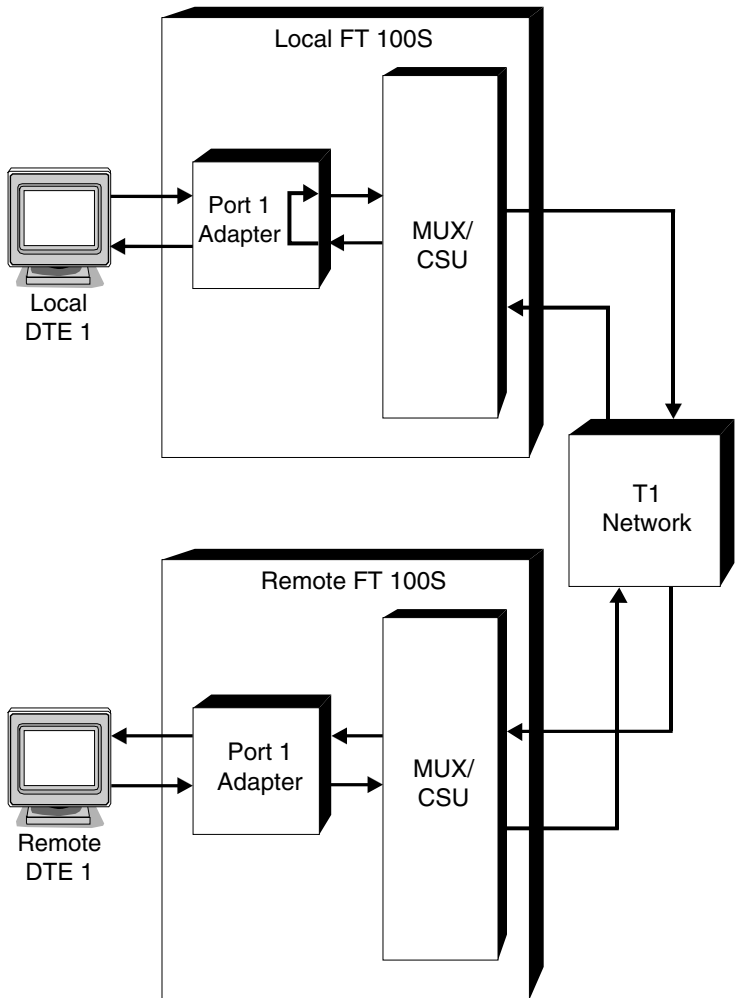
The TM LED lights to indicate a test in progress. Other LEDs function normally.

**PUSHBUTTON ACTION:**

- YES-** Enters remote terminal loopback; advances to REM TERM LOOP IN PROGRESS-END?
- NO-** Advances to REMOTE LOOPBACK? test mode
- HOME-** Returns to DTE PORT TESTS? submenu



**Figure 4-4**  
**DTE Port Local Terminal Loopback**



**Figure 4-5**  
**DTE Port Remote Terminal Loopback**

## DTE Port Remote Loopback

### DTE Remote Loopback

Figure 4-6 shows DTE port in Remote Loopback. The local FT 100S puts the DTE port on the remote FT 100S in remote terminal loopback by sending a (5 bit) repeating pattern (11110) transmitted inband for at least 5 seconds.

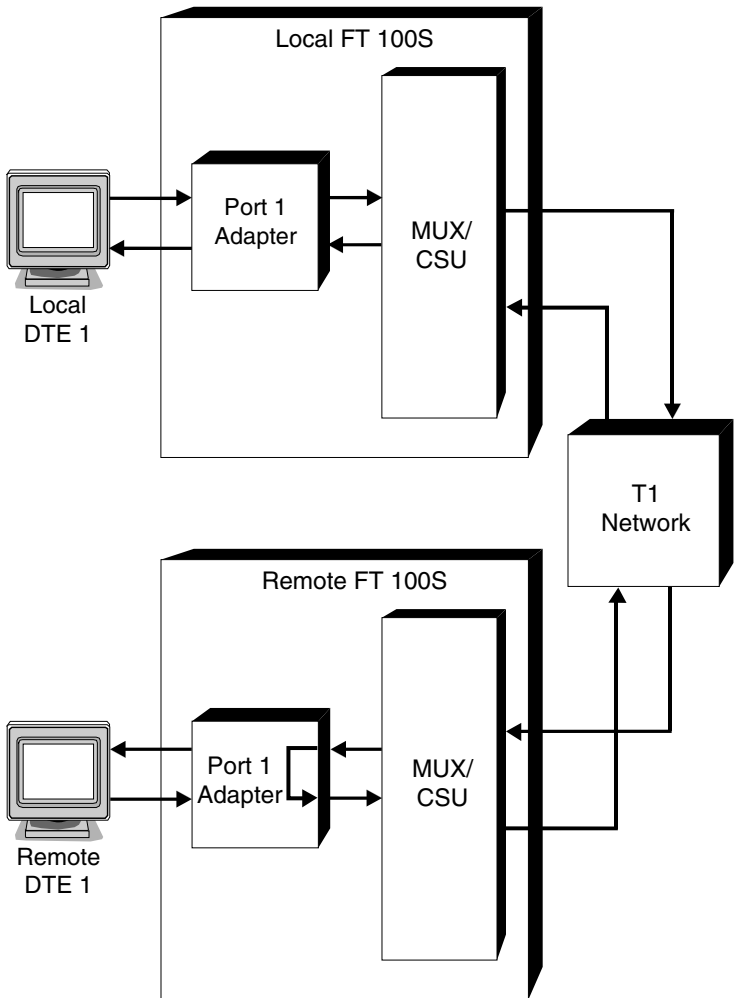
The loop pattern continues until the local FT 100S recognizes that the remote FT 100S is looped. As an option, the local DTE signal may be replaced by an internally generated test pattern.

The test pattern is transmitted to the remote FT 100S and monitored by the local FT 100S for errors indicated by an LCD message.

The TM LED lights to indicate a test in progress. On the remote FT 100S, the TM LED blinks to indicate a remotely activated test in progress. Other LEDs function normally.

#### PUSHBUTTON ACTION:

- YES- Enters remote loopback; advances to WITH TEST PATTERN?
- NO- Advances to TEST PAT TEST? mode
- HOME- Returns to DTE PORT TESTS? submenu



**Figure 4-6**  
**DTE Port Remote Loopback**

### With Test Pattern?

If a test pattern is selected with Remote Loopback, the local unit transmits a 511 test pattern and monitors the receive data signal for this test pattern. Error information is recorded and can be displayed (see Test Pattern Test).

#### PUSHBUTTON ACTION:

- YES- Sends a loop-up pattern to remote DSU with test pattern and advances to ATTEMPTING TO LOOP REMOTE DSU display
- NO- Sends loop-up pattern to remote DSU without test pattern and advances to ATTEMPTING TO LOOP REMOTE DSU display
- HOME- Returns to DTE PORT TESTS? submenu

#### Attempting to Loop Remote DSU

The local FT 100S is sending a loop pattern and waiting for an indication that the remote unit has entered loopback mode.

If the local unit does not receive the indication, it sends the loop-up code indefinitely until commanded otherwise.

A message appears on the LCD when the remote unit responds successfully followed by the IN PROGRESS-END? display.

#### PUSHBUTTON ACTION:

- YES- None
- NO/
- HOME Sends loopdown pattern and returns to test request display

#### DTE (xxx) In Progress - End?

The control port is in a test mode where *xxx* is either "Rem w /TP" or "Remote." If Remote Loopback with a Test Pattern is selected, the local unit is also sending and monitoring a 511 test pattern.



**PUSHBUTTON ACTION:**

- YES- Sends loopdown pattern and returns to test request display
- NO- Advances to BIT ERROR display
- HOME- Returns to DTE PORT TESTS? submenu

**Looping Down  
Remote DSU**

The local unit is sending a sequence requesting the remote unit to leave the loopback mode.

The loop-down code is a 5 bit repeating pattern (11100).

**PUSHBUTTON ACTION:**

YES/NO/

- HOME- Returns to DTE PORT TESTS? submenu

If the unit has been put into a loopback mode by a remote unit, this display appears:

**DTE Remotely  
Looped up - End?**

**PUSHBUTTON ACTION:**

- YES- Takes the unit out of loopback mode, but if the remote unit continues to send the loop-up pattern, the unit returns to loopback mode after a few seconds
- NO- None
- HOME- Returns to DTE PORT TESTS? submenu

## DTE Port Test Pattern

Test Pattern  
Test?

Figure 4-7 shows the DTE port in the Test Pattern Test. DTE transmitted data is replaced by an internally generated 511 test pattern and sent to the remote FT 100S. Also, local receive data is monitored for the same test pattern. An LCD message indicates detected test pattern errors.

The TM LED lights to indicate a test mode in progress. Other LEDs function normally.

### PUSHBUTTON ACTION:

YES- Enters test pattern test; advances to TEST PATTERN IN PROGRESS - END?

NO/

HOME- Returns to DTE PORT TESTS? submenu

## Test In Progress

XXX  
In Progress-End?

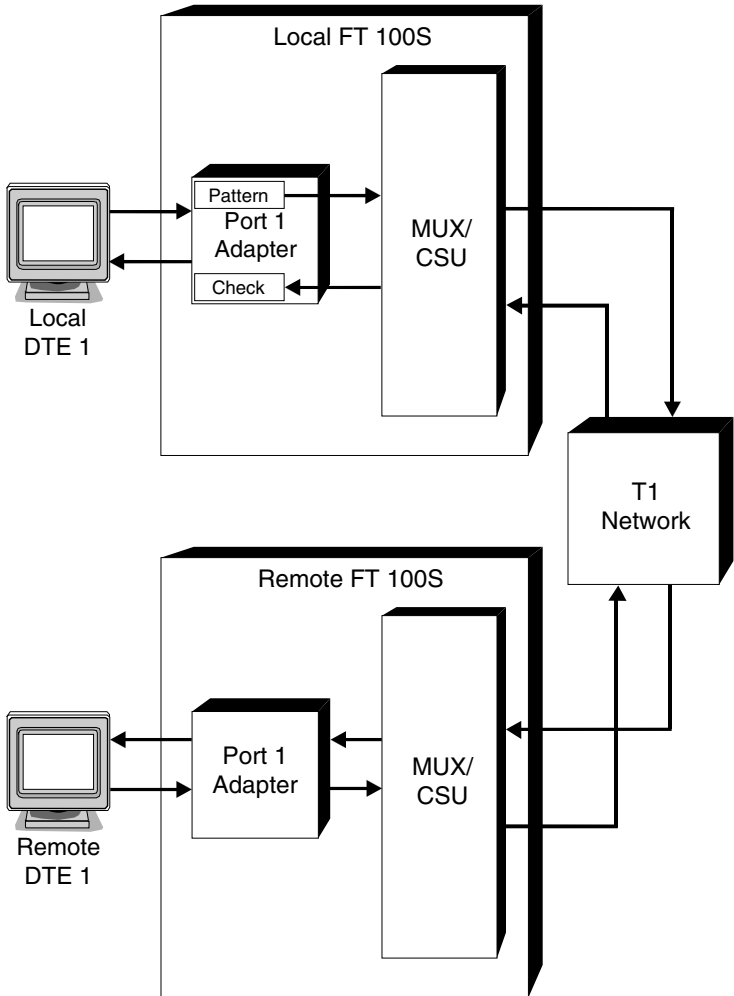
This display indicates a test is in progress. XXX represents the particular test mode.

### PUSHBUTTON ACTION:

YES- Terminates the test

NO- Advances to next test menu

HOME- Returns to top of the present test menu



**Figure 4-7**  
**DTE Port Test Pattern Test**

## Bit Errors Display

DTE Test Pat  
Bit Errors: *nnnnnn*

When a test includes a test pattern (RLTP or TP), this display shows the number of errored bits received since the test was entered or restarted.

### PUSHBUTTON ACTION:

- YES- No action
- NO- Advances to average BER display
- HOME- Returns to the top of the present test menu

## Average Bit Error Rate Display

DTE Test Pat  
Avg. BER: *n.nE-nn*

This display shows the average number of errored bits received since the test was entered or restarted. The value appears in exponential notation.

$$\text{Avg Ber} = \frac{\text{\# of bit errors}}{\text{total bits received}}$$

### PUSHBUTTON ACTION:

- YES- No action
- NO- Advances to the elapsed seconds display
- HOME- Returns to the top of the present test menu

## Elapsed Seconds Display

DTE Test Pat  
Elapsed Sec.: *nnnnn*

This display shows the number of seconds that have elapsed since the test was entered or restarted.

**PUSHBUTTON ACTION:**

- YES- No action
- NO- Advances to RESTART TEST?
- HOME- Returns to the top of the present test menu

**Restart Test Display**

DTE Test Pat  
Restart Test?

The user can reset the bit error count, average BER, and elapsed seconds for the test pattern tests if desired.

**PUSHBUTTON ACTION:**

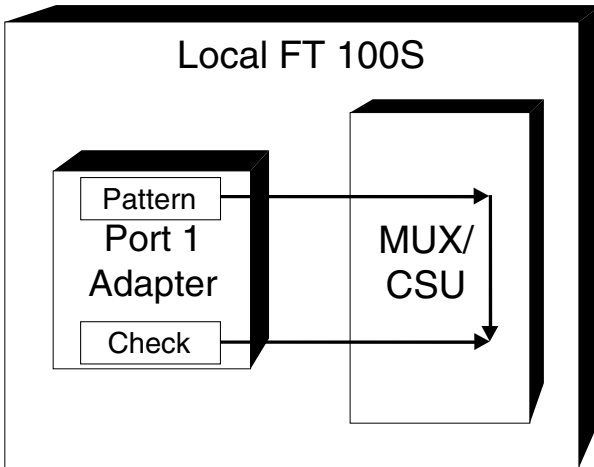
- YES- Restarts the error counters and returns to the BIT ERRORS display
- NO/
- HOME- Returns to the top of the present test menu

**SELF TEST**

Even though there is no singular self test command or function, there is self test capability in the FT 100S.

To execute a self test, first enter the T1 LOCAL LOOPBACK MODE previously described in this chapter. Next, with the T1 Local Loopback still active, enter the DTE TESTPATTERN MODE previously described in this chapter. Using the LCD, it is possible to determine if the unit is operating error free. Figure 4-8 shows the FT 100S in self test.

To terminate the FT 100S self test, the user must terminate the DTE TEST PATTERN MODE and the T1 LOCAL LOOPBACK MODE as described previously in this chapter.



*Figure 4-8*  
*FT 100S SelfTest Function*

## DS0 MONITOR

Monitor DS0  
Display?

The user can monitor activity on any selected DS0 data channel on the T1 network receive signal. Data displays on the LCD in an 8-bit field with the least significant bit to the right.

Use the YES/NO pushbuttons to select the DS0 channel number as described following the display diagram below.

**PUSHBUTTON ACTION:**

- YES- Enters DS0 monitor display  
NO- Advances to the PERFORMANCE HISTORY DISPLAY? submenu  
HOME- Returns to DIAGNOSTIC OPTIONS? menu

Channel Data  
# # nnnnnnnn

**PUSHBUTTON ACTION:**

- YES- Decrements the displayed channel number # #-# # = 1 to 24  
NO- Increments the displayed channel number # #  
HOME- Returns to the MONITOR DS0 DISPLAY? submenu

**PERFORMANCE HISTORY**

Performance  
History Display?

The FT 100S continuously monitors the network received signal for various error conditions. This information is accumulated, it is stored in nonvolatile memory, and it can be accessed and displayed on the LCD as well as via the external control port on the controlling DTE monitor. Refer to Chapter 6 for a description of performance history access by the control port.

The Performance History submenu first accesses these two error events:

- % Error free seconds
- Error count

**PUSHBUTTON ACTION:**

- YES- Advances to ERROR FREE SECS: display  
NO/  
HOME- Returns to DIAGNOSTIC OPTIONS? menu

## % Error Free Seconds

Error Free Secs:  
*nn %*

The percentage of error free seconds for the past 24 hours is displayed.

It is defined as

$$nn = (\text{\# of error free seconds}) / (\text{\# of total seconds}) \times 100$$

PUSHBUTTON ACTION:

YES-       None

NO-         Advances to the ERROR COUNT DISPLAY?

HOME-      Returns to PERFORMANCE HISTORY DISPLAY?  
              submenu

## Error Events

Error Events:  
*nnn*

This display indicates the total error event count *nnn* since the last time the count was reset.

If ESF framing is selected, an error event is either a CRC error or an Out of Frame Error (OOF).

If SF framing is selected, an error event is either a bipolar violation (BPV) or an OOF error.

PUSHBUTTON ACTION:

YES-       None

NO-         Advances to the CURRENT INTERVAL DISPLAY?

HOME-      Returns to PERFORMANCE HISTORY DISPLAY?  
              submenu



## Timed Error Data

Performance history is accumulated and stored in intervals of 15 minutes each for a maximum of 24 hours (96 intervals).

24 Hour Totals

15 min Interval  
Data?

These menus access displays recording error totals within

- the last 24 hours
- the current 15 minute interval
- or any 15 minute interval during the past 24 hour period.

The following error count displays may be accessed:

Interval ES  
# *nnn*

Interval BES  
# *nnn*

Interval SES  
# *nnn*

Interval UAS  
# *nnn*

Interval LOFC  
# *nnn*

Interval LCVS  
# *nnn*

The first column distinguishes the time option “menu” for that data. (The first column of each of the Current Interval displays includes the current interval second, 1 to 900.)

The second column records the total error count *nnn* per the specific type of error data:

ES	Errored seconds
BES	Bursty errored seconds
SES	Severely error seconds

UAS        Unavailable seconds  
LOFC      Loss of frame count  
LCVS      Line code violation seconds

The

15 Min Interval  
Data?

time menu prompt also accesses an

Interval # # ?

prompt which allows the user to indicate which 15 minute interval (01-96) in the last 24 hours should be displayed.

**PUSHBUTTON ACTION:**

- YES-        At each of the “menu” prompts (*current, 24 hours, or any 15 minutes*), YES advances to the first error count display within the “menu.” Within a time option menu, YES advances to the same error data type in the next interval. For example, if BES of interval 2 is currently displayed, pushing YES will advance to BES of interval 3.
- NO-        At "menu" prompts, NO scrolls through the time option "menus;" within a time option "menu," NO advances through the six error count displays.
- HOME-      Returns to PERFORMANCE HISTORY DISPLAY? submenu

**CONFIGURATION OPTIONS MAIN MENU 3**

Configuration  
Options?

This menu allows displaying and changing how the unit is configured to operate.

The four submenus are

- T1 line options
- DTE port options
- Control port options
- Set time and date

**PUSHBUTTON ACTION:**

YES- Advances to T1 LINE OPTIONS? submenu

NO/

HOME- Returns to the FT 100S T1 CSU/DSU main menu header

## **T1 LINE OPTIONS**

**T1 Line  
Options?**

This submenu allows viewing and changing the FT 100S / T1 line operating characteristics.

Options accessed by this submenu include

- T1 framing
- T1 line code
- ESF PRM transmission
- Bit Stuffing
- ESF reporting per 54016
- Timing
- Line loopback
- Payload loopback
- Idle code
- LBO

**PUSHBUTTON ACTION:**

- YES- Advance to T1 framing option display: T1 FRAMING = SF (ESF) CHANGE IT?
- NO- Advances to DTE PORT OPTIONS? submenu
- HOME- Returns to CONFIGURATION OPTIONS? menu

**T1 Framing**

T1 Framing = ESF  
Change It?

The T1 network signal framing mode can be set to either Superframe (SF or D4) or Extended Superframe (ESF) mode.

**PUSHBUTTON ACTION:**

- YES- Toggles between ESF and SF(D4)
- NO- Saves option selected
- HOME- Returns to T1 LINE OPTIONS? submenu

**Line Code**

T1 Framing = ESF  
Change It?

Select one of two options for the network T1 line code:

- AMI Alternate mark inversion
- B8ZS Binary 8-zero substitution: With B8ZS, a bipolar violation sequence replaces strings of 8 zeros in the transmit data and insures a minimum ones density to the network.

**PUSHBUTTON ACTION:**

- YES- Toggles between AMI and B8ZS
- NO- Saves option selected and advances to PRM option
- HOME- Returns to T1 LINE OPTIONS? submenu

## **Bit Stuffing**

Bit Stuff = EN  
Change It?

Bit stuffing for the network T1 line can be DISABLED or ENABLED when using the AMI line code option. This option does not apply to the B8ZS line code option.

### **PUSHBUTTON ACTION:**

- YES- Toggles between DISABLE and ENABLE
- NO- Saves option selected and advances to PRM option
- HOME- Returns to T1 LINE OPTIONS? submenu

## **ANSI Error History**

ESF (PRM) = OFF  
Change It?

### **ESF FRAMING OPTION ONLY**

Enable or disable transmission of the performance report message (PRM) defined by ANSI T1.403. When enabled, the PRM is transmitted toward the network once per second on the facility data link (FDL). The PRM contains error performance data accumulated during the previous 4 seconds.

### **PUSHBUTTON ACTION:**

- YES- Toggles between on and off
- NO- Saves option selected and advances to ESF AT&T mode option
- HOME- Returns to T1 LINE OPTIONS? submenu

## AT&T Error History

ESF (AT&T) = OFF  
Change It?

### ESF FRAMING OPTION ONLY

Enable or disable ESF error reporting as defined by AT&T publication 54016. ESF error reporting allows central office equipment to request the error performance history from the unit via the FDL. When the request is received, the unit transmits the 24-hour performance history to the central office also via the FDL.

### PUSHBUTTON ACTION:

- YES- Toggles between on and off
- NO- Saves option selected and advances to TIMING option
- HOME- Returns to T1 LINE OPTIONS? submenu

## Timing

Timing = LOOP  
Change It?

This option selects the timing mode. Selections are

- Loop The unit synchronizes all timing and clocks to the network T1 receive signal. In this mode, the unit supplies transmit and receive clocks to the DTE port. This is the most common selection when the unit is connected to a telephone company T1 service.
- Internal The unit synchronizes all timing and clocks to an internally generated timing source. In this mode, the unit supplies transmit and receive clocks to the DTE port.
- DTE The unit synchronizes all timing and clocks to the selected DTE's external transmit clock.

Either internal or DTE port timing can be useful in applications where the unit is directly connected to another FT 100S or T1 multiplexer, such as in local area networks and central office bypass connections. In these applications, only one unit should be selected for internal or DTE port timing while the other is selected for loop timing.

**PUSHBUTTON ACTION:**

- YES-        Scrolls timing options
- NO-        Saves option selected and advances to LINE LB option
- HOME-     Returns to T1 LINE OPTIONS? submenu

**Line Loopback**

Line LB = DIS  
Change It?

If Line Loopback is enabled, the unit enters into a network loopback when a Line Loopback code is detected on the network. This signal allows easier fault diagnosis by the T1 service provider. When this option is disabled, the unit ignores an incoming Line Loopback code.

**PUSHBUTTON ACTION:**

- YES-        Toggles between enabled and disabled
- NO-        Saves selected option and advances to PAYLOAD LB option
- HOME-     Returns to T1 LINE OPTIONS? submenu

**Payload Loopback**

Payload LB = DIS  
Change It?

This option is similar to Line Loopback except that the contents of the DS0s are reframed before being transmitted back out on the network.

**PUSHBUTTON ACTION:**

- YES-        Toggles between enabled and disabled
- NO-        Saves selected options and advances to IDLE CODE option
- HOME-     Returns to T1 LINE OPTIONS? submenu

## **Idle Code**

Idle Code = FF  
Change It?

Select the FF pattern for all ones or the 7F pattern to be inserted into unused DS0s.

**PUSHBUTTON ACTION:**

- YES-       Toggles between idle code FF and 7F
- NO-       Saves selected option and advances to Yellow Alarm
- HOME-     Returns to T1 LINE OPTIONS? submenu

## **Yellow Alarm**

Yellow Alm = DIS  
Change It?

This option setting determines whether or not Yellow Alarms will be sent out on the network.

**PUSHBUTTON ACTION:**

- YES-       Toggles between enabled and disabled
- NO/
- HOME -     Returns to T1 LINE OPTIONS? submenu



## **NETWORK LINE INTERFACE**

<Interface>, <LBO>  
Change It?

This option setting determines the T1 network line interface which may be either CSU or DSX-1.

When the CSU T1 network line interface is selected, the amount of line build-out (LBO) must also be selected. LBO is an artificial line circuit that provides line attenuation. The amount of LBO depends on the distance to the last T1 line repeater. The telephone company providing the service determines the amount of LBO required. The following ranges are available:

- 0 dB
- -7.5 dB
- -15dB

When the DSX-1 T1 network interface is selected, the line build-up is determined according to the line length. The following ranges are available:

- 0-133 ft
- 133-266 ft
- 266-399 ft
- 399-533 ft
- 533-655 ft

## **DTE PORT OPTIONS**

### **V.35 or RS-530 Interface Card**

DTE Port  
Options?

This submenu allows viewing and changing the DTE port operating characteristics. Options accessed by this submenu include:

- Port data rate

- DS0 time slot assignment
- Transmit clock source
- Transmit clock polarity
- Receive clock polarity
- Interface control signal options

**PUSHBUTTON ACTION:**

- YES- Advances to the port data rate display  
NO- Advances to CONTROL PORT OPTIONS? submenu  
HOME- Returns to CONFIGURATION OPTIONS? menu



**Note**

*The following options are displayed in blinking fields on the LCD. The option displayed is the present option selected. Pressing NO scrolls through the selections. When the desired selection is displayed, press YES.*

**Port Data Rate**

DTE Port <type>  
nn x rr = <rate>

Select the data rate from 56 kbps to 1.536 Mbps with the following simple multiplication:

$$\begin{array}{rcl} nn & & \text{(number of DS0 time slots)} \\ \times \quad rr & & \text{(rate multiple: 56 or 64 kbps)} \\ \hline & & = \text{data rate} \end{array}$$

The *nn* blinks to prompt the user to confirm the current number of DS0 time slots or to increment the number.

**PUSHBUTTON ACTION:**

- YES- Selects the number of DS0 time slots *nn* and blinks the rate multiple *rr*  
NO- Increments the number of DS0 time slots *nn*  
HOME- Returns to Port Number Selection

The display remains but the pushbutton action will now act differently so that the rate multiple can be changed:

DTE Port <type>  
*nn x rr = <rate>*

**PUSHBUTTON ACTION:**

- YES-       Selects the rate multiple *rr* and advances to DS0 time slot assignment display
- NO-        Toggles rate multiple between 56 and 64 kbps
- HOME-     Returns to Port Number Selection

**DS0 Grouping**

DTE Port <type>  
*xxxx CH: ff to ll*

This display allows assigning DS0 time slots to the selected port.

*xxxx* =       alternating or contiguous DS0 channels

*ff* =         first DS0 channel number

*ll* =         last DS0 channel used by the selected port -- automatically determined by *ff* and port data rate display *nn* selection

*xxxx* blinks to prompt the user to confirm the current selection or toggle to the other one.

**PUSHBUTTON ACTION:**

- YES-       Selects alternating or contiguous DS0 assignment *xxxx* and blinks the starting DS0 number *ff*
- NO-        Toggles between ALT and CONT DS0 assignment modes
- HOME-     Returns to Port Number Selection

DTE Port <type>  
*xxx CH: ff to ll*

**PUSHBUTTON ACTION:**

- YES- Selects the first DS0 channel number *ff* and advances to the transmit clock source display
- NO- Increments the starting DS0 number *ff* and displays the ending DS0 number *ll*
- HOME- Returns to Port Number Selection

**Transmit Clock Source**

DTE Port <*type*>  
Tx CLK = <*source*>

This display selects the DTE transmit clock source:

- Internal The unit uses the transmit clock output to clock DTE transmit data into the transmit buffer. Where the DTE is located near the unit, internal clock is usually selected.
- External The unit uses the external transmit clock from the DTE to clock DTE data. In applications with a high bit rate and a long DTE cable, it may be necessary to use the external clock option.

In external clock operation, the transmit clock output from the unit is routed to the DTE and sent back to the unit along with the data line. This eliminates any phase misalignment between the clock and data signal due to cable phase delay and insures a proper signal / clock relationship at the unit input.

**PUSHBUTTON ACTION:**

- YES- Selects the displayed option and advances to transmit clock polarity display
- NO- Toggles between INTERNAL and EXTERNAL options
- HOME- Returns to Port Number Selection

### Transmit Clock Polarity

DTE Port <type>  
Tx CLK = <polarity>

#### PUSHBUTTON ACTION:

- YES- Selects the displayed clock polarity option and advances to receive clock polarity display
- NO- Toggles between NORMAL and INVERT options
- HOME- Returns to Port Number Selection

### Receive Clock Polarity

DTE Port <type>  
Rx CLK = <polarity>

#### PUSHBUTTON ACTION:

- YES- Selects the displayed clock polarity option and advances to the CTS signal operation display
- NO- Toggles between NORMAL and INVERT options
- HOME- Returns to Port Number Selection

### CTS Signal Operation

DTE Port <type>  
CTS = <mode>

The CTS output may be selected for normal operation or forced on. When normal is selected, CTS is asserted approximately 10 ms after RTS is received.

#### PUSHBUTTON ACTION:

- YES- Selects the displayed CTS operation mode and advances to the RLSD signal operation display
- NO- Toggles between NORMAL and FORCED ON
- HOME- Returns to Port Number Selection

## RLSD Signal Operation

DTE Port <type>  
RLSD = <mode>

Select normal or forced on operation for RLSD output. Selecting normal turns RLSD on when the FT 100S T1 receiver has acquired frame synchronization and off when frame synchronization is lost or no signal is present.

### PUSHBUTTON ACTION:

- YES- Selects the displayed RLSD operation mode and advances to DSR signal operation display
- NO- Toggles between NORMAL and FORCED ON
- HOME- Returns to Port Number Selection

## DSR Signal Operation

DTE Port <type>  
DSR = <mode>

Select normal or forced on operation for DSR output. Selecting normal turns DSR on when the FT 100S T1 receiver has acquired frame synchronization and off when frame synchronization is lost or no signal is present.

### PUSHBUTTON ACTION:

- YES- Selects the displayed DSR operation mode and advances to TM signal operation
- NO- Toggles between NORMAL and FORCED ON
- HOME- Returns to Port Number Selection

## TM Signal Operation

DTE Port <type>  
TM = <mode>

The TM signal indicates to the DTE that the unit is in a test mode. Select normal or forced off operation for TM output. Selecting normal turns TM on if the unit is in a test mode.

### PUSHBUTTON ACTION:

- YES- Selects the displayed TM operation and advances LL signal operation
- NO- Toggles between NORMAL and FORCED OFF
- HOME- Returns to Port Number Selection

## LL Signal Operation

DTE Port <type>  
LL = <mode>

This option determines whether the unit acknowledges or ignores an LL signal from the DTE.

If enabled, the LL signal causes the DTE port to enter Local Terminal Loopback. Otherwise, the LL signal is ignored.

### PUSHBUTTON ACTION:

- YES- Selects the displayed LL operation mode and RL signal operation
- NO- Toggles between ENABLE and DISABLE
- HOME- Returns to Port Number Selection

## RL Signal Operation

DTE Port <type>  
RL = <mode>

This option determines whether the unit acknowledges or ignores an RL signal from the DTE.

If enabled, the RL signal causes the DTE port to enter Remote Terminal Loopback. Otherwise, the RL signal is ignored.

**PUSHBUTTON ACTION:**

- YES-       Selects displayed RL operation mode
- NO-        Toggles between ENABLE and DISABLE
- HOME-     Returns to Port Number Selection

**Remote Loopback Operation**

DTE Port <type>  
RA/RTL = <mode>

This option determines whether the unit acknowledges or ignores a loop-up pattern from the remote CSU/DSU.

Enable     The unit goes into Remote Terminal Loopback when the loop sequence is detected.

Disable    The unit ignores the sequence.

**PUSHBUTTON ACTION:**

- YES-       Selects displayed RA/RTL mode
- NO-        Toggles between ENABLE and DISABLE
- HOME-     Returns to Port Number Selection

**CONTROL PORT OPTIONS**

Control Port  
Options?

This submenu allows selecting the control port operating characteristics. The unit can be externally controlled by a terminal or computer connected to the rear panel RS-232 CONTROL port or by the Local-View terminal when installed in the LocalView shelf. Chapter 6 describes control port operation.



The options are

- Control mode
- Baud rate
- Local echo
- Status

PUSHBUTTON ACTION:

YES- Advances to control mode

NO- Advances to SET TIME submenu

HOME- Returns to CONFIGURATION OPTIONS? menu

## **Control Mode**

Mode = *<mode>*  
Change It?

The control port mode options are

**Terminal** allows operation with a standard ASCII terminal or computer connected to the control port. Responses from the unit are formatted ASCII text screens.

**Computer** allows operation with a computer or modem connected to the control port. Responses from the unit are short unformatted ASCII messages.

**LocalView** allows operation with the LocalView Management System when installed in a LocalView shelf. In this mode, the rear panel control port is not used.

PUSHBUTTON ACTION:

YES- Scrolls the options

NO- Selects the displayed mode and advances to the baud rate option

HOME- Returns to CONTROL PORT OPTIONS? submenu

## **Baud Rate**

Bit Rate = <rate>  
Change It?

The baud rate options are:

- 300
- 600
- 1200
- 2400
- 4800
- 9600
- 19200

PUSHBUTTON ACTION:

YES-        Scrolls through the baud rate options

NO-         Advances to LOCAL ECHO

HOME-      Returns to CONTROL PORT OPTIONS? submenu

## **Local Echo**

Local Echo = ON  
Change It?

This option determines whether or not the unit echoes characters back to the control port terminal.

PUSHBUTTON ACTION:

YES-        Toggles between on and off

NO-         Advances to control port status

HOME-      Returns to CONFIGURATION OPTIONS? menu

## **SETTING A PASSWORD**

Status = Unlock  
Change It?

This submenu gives the user the option of requiring a password for remote access to the unit via the control port.

When the status is “Lock”, the control port will prompt the user to enter the password. Refer to Chapter 6 for details on password operation and settings.

When unlocked, no password prompt is displayed on the control terminal.

### **PUSHBUTTON ACTION:**

YES- Toggles between lock and unlock

NO/

HOME- Returns to CONFIGURATION OPTIONS? menu

## **SET TIME AND DATE**

These options allow setting the realtime clock to the current time and date. The unit uses the realtime clock for performance history time and date stamping. When the performance history is accessed through the control port, the time and date are displayed along with the error history.

hh : mm : ss  
Set Time?

### **PUSHBUTTON ACTION:**

YES- Advances to hour display; accepts current setting for hour, minute, second displays

NO- Advances to SET DATE? option; in hour, minute, second displays, increments digits for setting

HOME- Returns to CONFIGURATION OPTIONS? menu

Month dd, year  
Set Date?

PUSHBUTTON ACTION:

- YES- Advances to month display; accepts current setting for month, day, and year displays
- NO- Returns to CONFIGURATION OPTIONS? menu; in month, day, and year displays, increments digits for setting
- HOME- Returns to CONFIGURATION OPTIONS? menu

## Chapter 5 Operation

### GENERAL

After installation and configuration, the FT 100S operates automatically and unattended.

### CONTROLS AND INDICATOR

The FT 100S front panel contains three pushbuttons (YES, NO, HOME), a 2 line by 16 character LCD, and six light emitting diode (LED) indicators. Almost all configuration options and diagnostic features can be accessed by using the LCD and pushbuttons. Chapter 4 describes front panel option selection.

### LED DESCRIPTION

The six front panel LEDs on the FT 100S consist of the following:

#### TD

Transmit data indicates activity on the DTE transmit data line. Flashing indicates data is being transmitted. Solid ON indicates a low state on the transmit data line, and a solid OFF indicates a high state or no data being transmitted.

#### RD

Receive data indicates activity on the DTE receive data line. Flashing indicates data is being received. Solid ON indicates a low state on the receive data line, and a solid OFF indicates a high state or no data being received.

**CS**

Clear to send indicates the status of the DTE clear to send signal.

**LOS**

Loss of sync indicates that the unit has either lost the network T1 frame sync or the signal.

**ALM**

Alarm indicates an alarm condition exists on the T1 network interface.

**TM**

Test mode indicates that the unit is in a network or DTE test mode.

## Chapter 6

# Control Port Operation

### GENERAL

The rear panel port labeled **CONTROL** provides the connection for configuration and status display via terminal monitor.

The control port is an EIA-232 compatible serial interface. Table 2-2 lists pin connections for this interface. The interface is the same as the serial I/O connector on AT style personal computers so that standard cables can be used.



#### Note

*Connection applications are shown in Figure 6-2 and Figure 6-3.*

### Using Control Port Commands

Control port commands are entered from the control keyboard and consist of short character strings followed by a carriage return which select and display the various menus and options.

Figure 6-1 provides a menu flow chart indicating the access path via command through the available menus.

Any command or option choice can be entered from any screen. This feature allows easier configuration changes when the user is familiar with the command strings.

Refer to Chapter 4, Front Panel Option Selection, for further information on options.

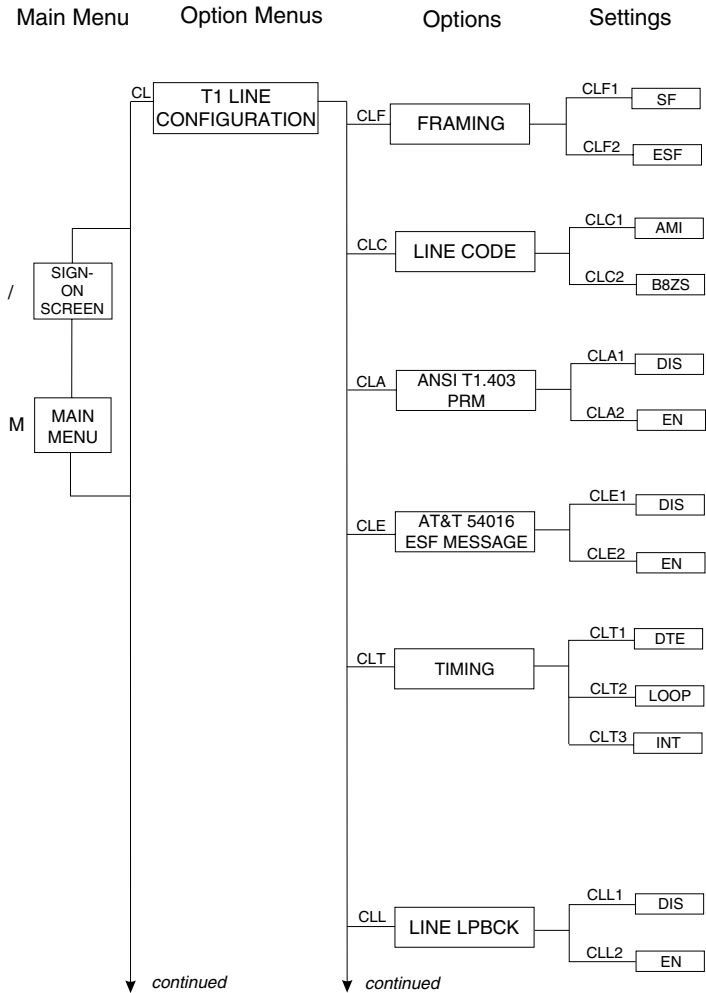
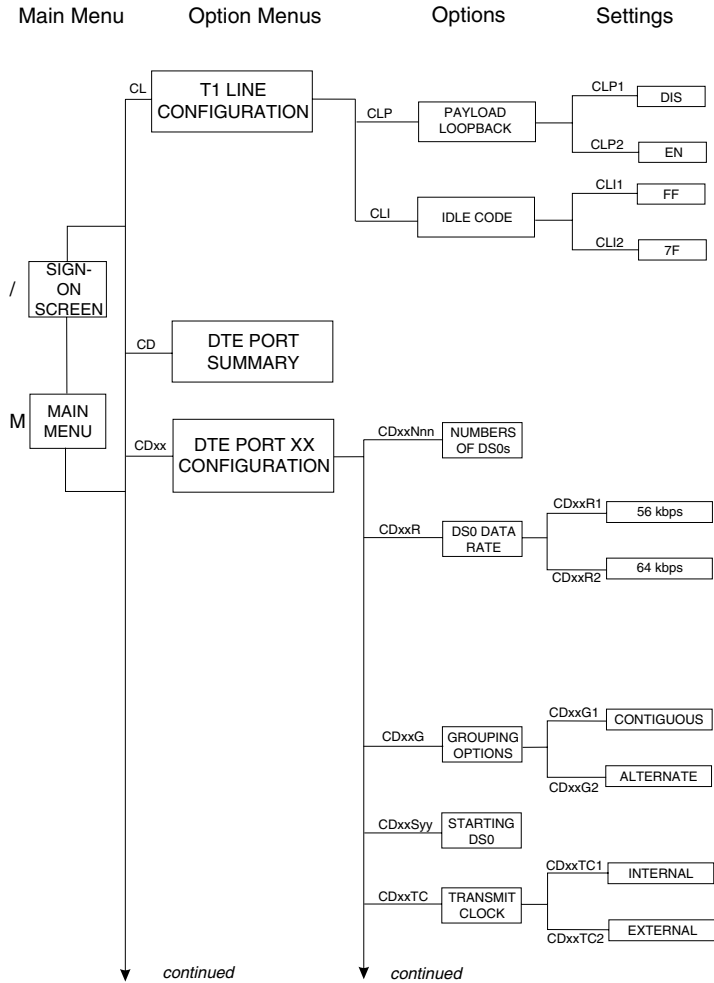


Figure 6-1  
Menu Flow Chart





**Figure 6-1 Cont.**  
**Menu Flow Chart**

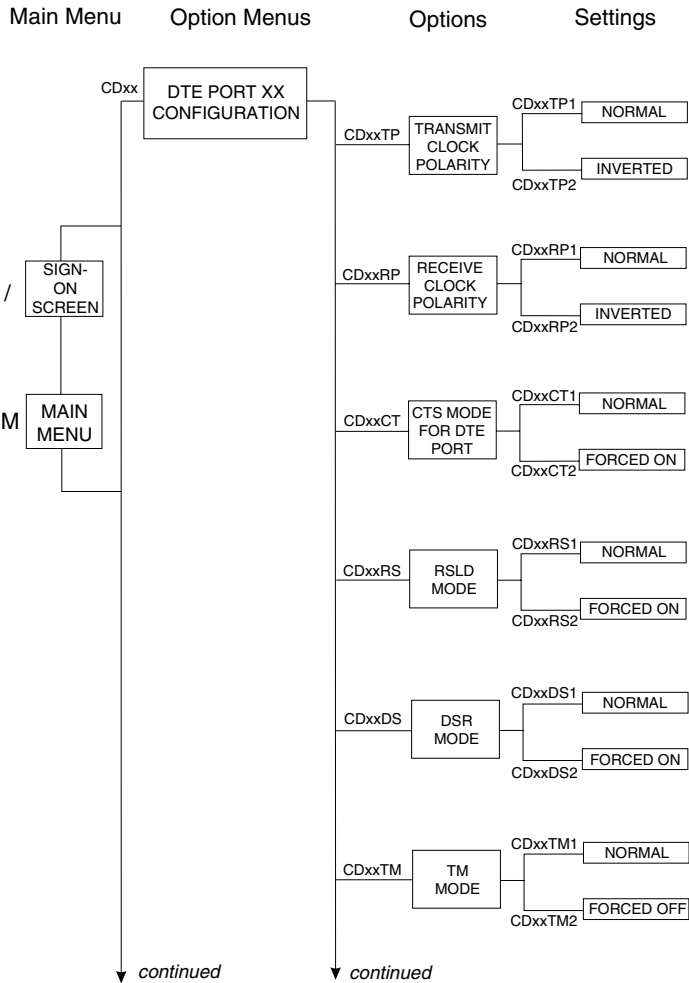
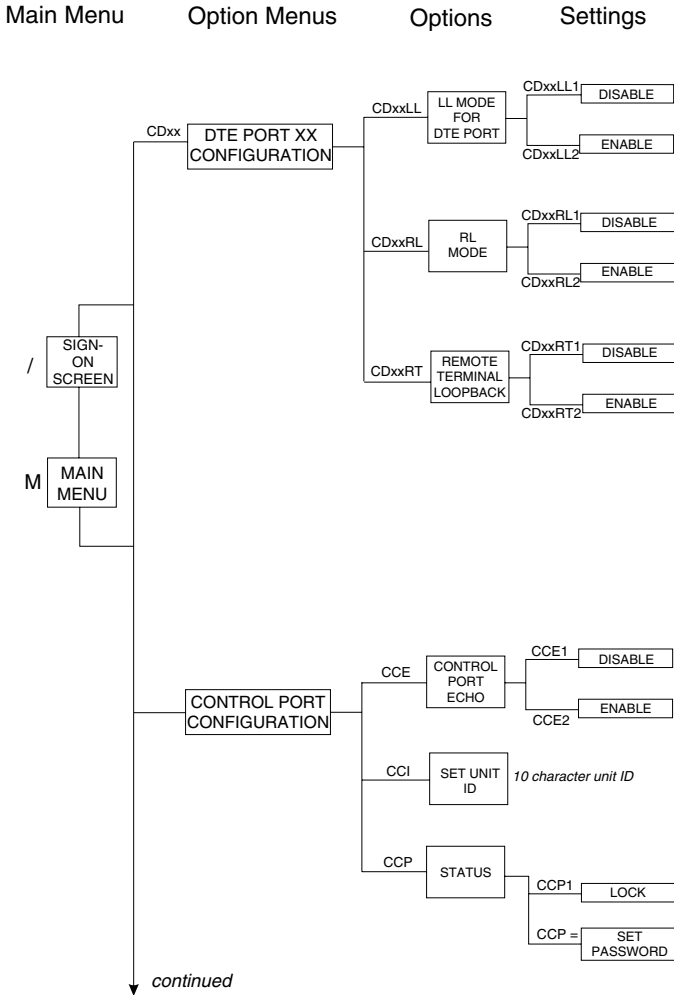
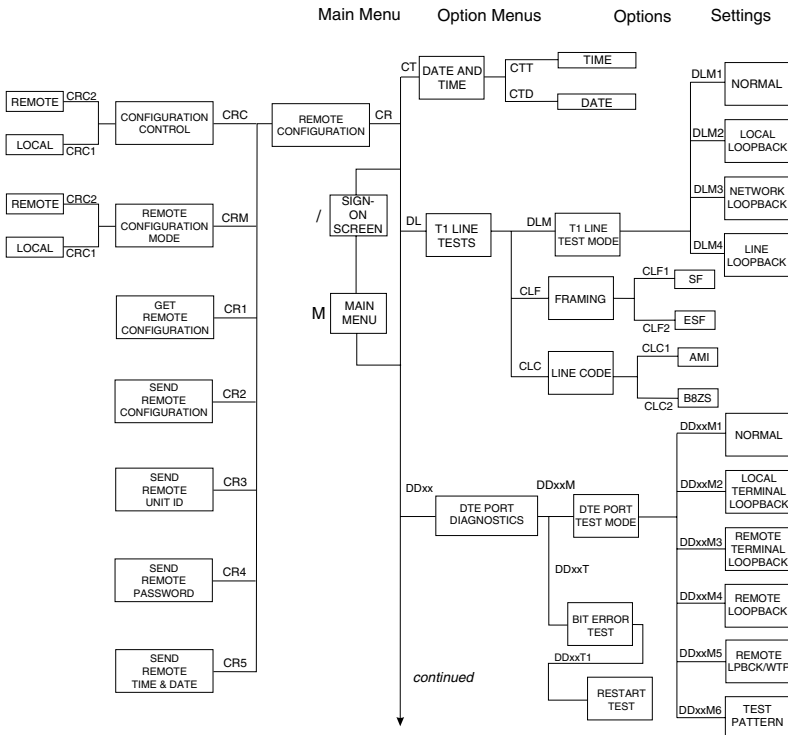


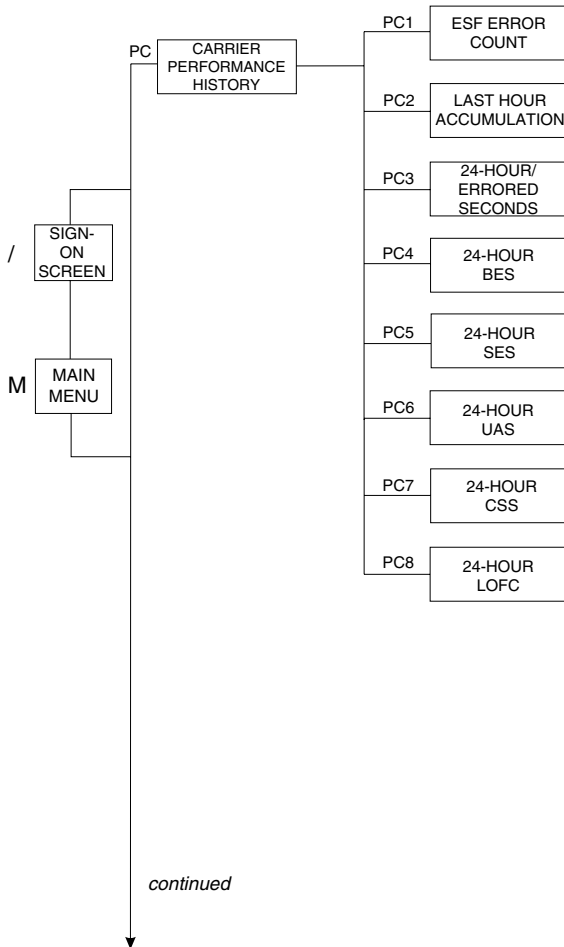
Figure 6-1 Cont.  
Menu Flow Chart



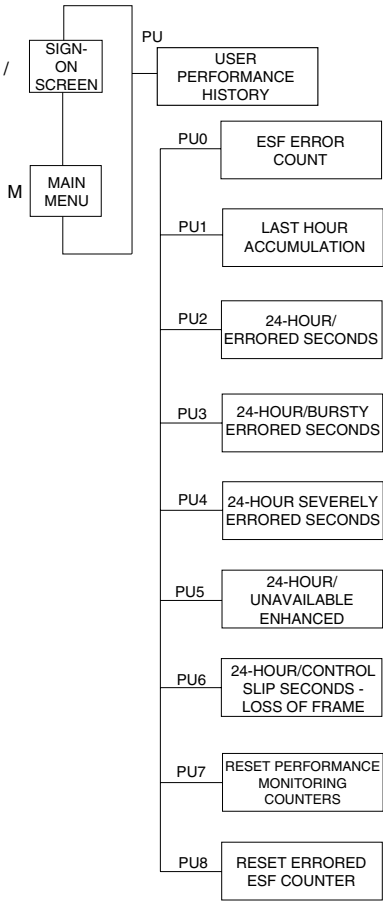
**Figure 6-1 Cont.  
Menu Flow Chart**



**Figure 6-1 Cont.  
Menu Flow Chart**



**Figure 6-1 Cont.**  
**Menu Flow Chart**



**Figure 6-1 Cont.  
Menu Flow Chart**

## **CONNECTING TO A TERMINAL**

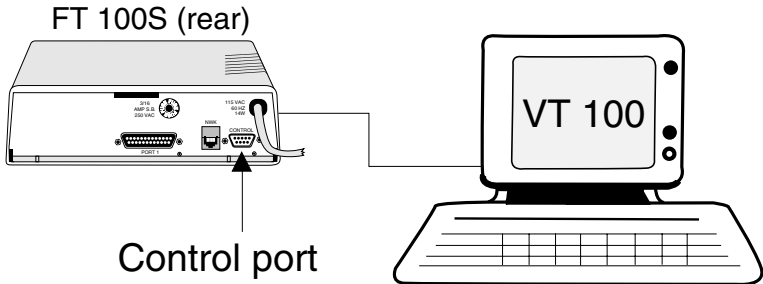
To operate the unit with a CRT terminal:

1. Connect the FT 100S control port to a terminal with a standard PC 25 pin to 9 pin conversion cable. Refer to Table 2-2 for pin connections.
2. Using the front panel, select terminal operation and the desired control port baud rate, and enable local character echo if desired.

Word length is fixed at 8 data bits with 1 stop bit and no parity.

3. Enter a / on the keyboard to display the sign-on screen:

The following illustration shows connection application to a terminal.



**Figure 6-2**  
**Terminal Connection**

## CONNECTING TO A MODEM

The FT 100S can be controlled remotely by a telephone line modem connected to the control port.

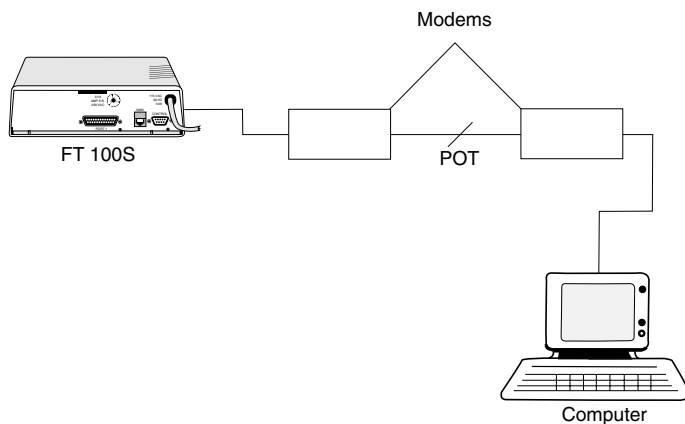
While not required, it is recommended that a modem with an error control protocol like MNP be used for remote control to prevent control command errors from accidentally reconfiguring the unit.

1. Connect a null modem device or crossover cable between the FT 100S control port and modem. Refer to Table 2-2 for control port pin connections.
2. Using the front panel, select terminal operation, the desired control port baud rate, and local echo if desired.

Word length is fixed at 8 data bits with 1 stop bit and no parity.

3. Enter a / on the keyboard to display the sign-on screen.

The following illustration shows connection application to a modem.



**Figure 6-3**  
**Modem Connection**



## **CONNECTING TO LOCALVIEW**

An FT 100S can be used in the LocalView System. To do this, select LocalView mode from the FT 100S front panel.

The FT 100S now operates under the control of the LocalView controller card using the device driven mode as described in the LocalView System User's Manual.

In LocalView, select the FT 100S. Operation and option selection for the FT 100S are the same as in direct communications between the unit and a terminal.

To end communications between the unit and LocalView, press the ESC key. The LocalView controller card returns to the LocalView Network Map.

## MAIN MENU

The Main Menu accesses all other menus, configuration commands, and option settings. After the illustrations of the first three menus, this manual discusses the menus without further illustrations.

Enter any command from any screen for faster configuration changes. You do not have to choose options only from the menu or option selections currently displayed. Appendix B lists all menus and options.

Enter M to display the Main Menu. See Figure 6-4.

```
=====
      TIME: 15:01:01                      FT100S                      DATE: 12/05/96
                                     FT100S
                                     MAIN MENU
=====
      T1 LINE CONFIGURATION:  CL
      DTE PORT SUMMARY:      CD
      DTE PORT xx CONFIGURATION: CDxx
      CONTROL PORT CONFIGURATION: CC
      SET TIME & DATE:        CT
      REMOTE CONFIGURATION COMMANDS: CR

      T1 LINE DIAGNOSTICS:     DL
      DTE PORT xx DIAGNOSTICS: DDxx

      CARRIER PERFORMANCE HISTORY: PC
      USER PERFORMANCE HISTORY:  PU
=====
ENTER SELECTION:
```

**Figure 6-4**  
**Main Menu**

Entering	Displays
CL	T1 Line Configuration Options: <ul style="list-style-type: none"><li>• Framing</li><li>• Line code</li><li>• ANSI.403 PRM</li><li>• AT&amp;T 54016 ESF message</li><li>• Timing</li><li>• Line loopback</li><li>• Payload loopback</li><li>• Idle code</li></ul>
Entering	Displays
CD	DTE Port Summary
CDxx	Port xx Configuration Options: <ul style="list-style-type: none"><li>• Numbers of DS0s</li><li>• Data rate</li><li>• Grouping options</li><li>• Starting DS0</li><li>• Transmit clock</li><li>• Transmit clock polarity</li><li>• Receive clock polarity</li><li>• CTS mode</li><li>• RSLD</li><li>• DSR</li><li>• TM</li><li>• Local loopback</li><li>• Remote loopback</li><li>• Remote terminal loopback</li></ul>
CC	Control Port Configuration Options: <ul style="list-style-type: none"><li>• Echo</li><li>• Status</li></ul>
CT	Time and Date Options

DL	T1 Line Test Options: <ul style="list-style-type: none"><li>• Normal, local loopback</li><li>• Network loopback</li><li>• Line loopback</li><li>• Framing</li><li>• Line code</li></ul>
DDxx	the DTE Port Test Options: <ul style="list-style-type: none"><li>• Local terminal loopback</li><li>• Remote terminal loopback</li><li>• Remote loopback with test pattern</li><li>• Test pattern</li></ul>
PC	Carrier Performance Options
PU	User Performance Options

## **T1 LINE CONFIGURATION**

Enter CL	to display the T1 Line Configuration Option Menu.
Entering	Displays
CLF	T1 Framing Select SF or ESF.
CLC	T1 Line Code Select AMI or B8ZS.
CLA	ANSI T1.403 PRM (Performance Report Message) Select disable or enable.
CLE	AT&T ESF 54016 Message Select disable or enable.
CLT	T1 Timing Select DTE, loop or internal.

CLL	Line Loopback Select enable or disable.
CLP	Payload Loopback Select enable or disable.
CLI	Idle code Select FF or 7F.

Example: To select the T1 Framing option,

Entering CLF at the ENTER SELECTION prompt displays the two choices for T1 framing:

Superframe (SF) or Extended superframe (ESF)

Entering CLF2 chooses ESF framing.

Figure 6-5 shows the screen after this sequence of commands.

```

=====
TIME: 15:01:48                                DATE: 12/05/96
                                FT100S
                                LOCAL
                                T1 LINE CONFIGURATION MENU
=====
                                FRAMING : CLF  ESF
                                LINE CODE : CLC  B8ZS
                                ANSI T1.403 PRM : CLA  ENABLE
                                AT&T 54016 ESF MESSAGE : CLE  ENABLE
                                T1 TIMING : CLT  INTERNAL
                                LINE LOOPBACK : CLL  ENABLE
                                PAYLOAD LOOPBACK : CLP  ENABLE
                                IDLE CODE : CLI  FF
                                YELLOW ALARM : CLY  ENABLE
=====
ENTER SELECTION:

```

**Figure 6-5**  
**T1 Line Configuration Menu**

Any command can be used to display a menu or set another option can be selected at this point.

[illegible]

The twenty-four columns indicate which DS0s are selected for each port.

The rates for individual DS0s and whole ports are displayed along with the port type, which is determined from the interface card that is installed in the unit.

### DTE PORT CONFIGURATION (V.35, RS-530, RS-232 CARD)

Enter CDxx to display DTE Configuration Options.

Entering      Displays

CDxxNnn	Number of DS0s Select 00 through 24.
---------	---

CDxxR	DS0 Rate Select 56 or 64 kbps.
-------	-----------------------------------

CDxxG	DS0 Grouping
	Select alternate or contiguous.

CDxxSyy      Starting DS0  
Select 01 through 24.

CDxxTC	Transmit Clock Select internal or external.
CDxxTP	Transmit Clock Polarity Select normal or inverted.
CDxxRP	Receive Clock Polarity Select normal or inverted.
CDxxCT	CTS Mode Select normal or forced on.
CDxxRS	RLSD Select normal or forced on.
CDxxDS	DSR Mode Select normal or forced on.
CDxxTM	TM (test) Mode Select normal or forced on.
CDxxLL	Local Loopback Select disable or enable.
Entering	Displays
CDxxRL	Remote Loopback Select disable or enable.
CDxxRT	Remote Terminal Loopback Select disable or enable.

## **CONTROL PORT CONFIGURATION**

Entering	Displays
CC	the Control Port Configuration Menu, which allows the user to select the desired external control port operating mode. The mode and bit rate are only displayed here. The echo option is selectable.
CCE	Echo Options. Select disable if double characters appear on terminal or enable if no characters appear.
CCI	Unit Identification Code Select up to 10 characters.
CCP	<p>Password: When the control port status is locked, the unit asks for the correct password upon initiating terminal control mode or locking the terminal. This prevents unauthorized users from altering option settings (applicable if a modem is used with the control port of the FT 100S). Entering the correct password unlocks the control port.</p> <p>If the control port status is unlocked, no password prompt appears.</p> <p>Set or change the password using the CCP=command in control mode. The control port may be locked or unlocked at any time from the LCD front panel.</p>

## **TIME AND DATE**

Entering	Displays
CT	the Update Time And Date Menu, which allows setting the time and date. The unit contains an onboard battery driven realtime clock used as the reference for error history reporting.
CTThh:mm:ss	to update the time, where hh is the hour, mm is the minute, and ss is the second.



CTDdd/mm/yy to update the date, where dd is the day, mm is the month, and yy is the year.

## **T1 LINE TEST OPTIONS**

Entering	Displays
DLM	the T1 Line Tests Menu, which allows initiating tests and monitoring the network portion of the unit. (Refer to “DIAGNOSTIC OPTIONS MAIN MENU 2” section in Chapter 4 section if needed.)
DLM1	to initiate a T1 Local Loopback.
DLM2	to initiate a T1 Network Loopback.
DLM3	to terminate T1 Loopbacks.
DLM4	to initiate a Line Loopback.

## **DTE PORT TESTS**

Entering	Displays
DDxxM	the DTE Port Test Menu. (Refer to “DIAGNOSTIC OPTIONS MAIN MENU 2” section in Chapter 4 section if needed.)
DDxxM1	to return to normal operation.
DDxxM2	to activate a Local Terminal Loopback.
DDxxM3	to activate a Remote Terminal Loopback.
DDxxM4	to activate a Remote Loopback.
DDxxM5	to activate a Remote Loopback with Test Pattern.
DDxxM6	to activate a Test Pattern.

## **PERFORMANCE HISTORY**

The FT 100S continuously monitors the network received signal for error conditions and alarms.

Performance history information is stored in nonvolatile memory and can be accessed and displayed by the local user or transmitted to a remote FT 100S or other T1 terminating facility used for network management.

Entering PC      carrier performance history

or

PU user performance history

displays the carrier or user performance history menu.

These two main menus for performance history are described after the sections that list and describe the various error conditions.

## **ERROR CONDITION CATEGORIES**

The unit monitors these error events:

- ESF error count
- SF error count
- Errored seconds
- Bursty errored seconds
- Severely errored seconds
- Unavailable seconds
- Loss of frame count
- Controlled slip second
- Line code violation seconds
- % error free seconds

### **Error Events**

ESF Error Count (ESF framing only) contains a count of ESF error events. An ESF error event is either a CRC error or an Out of Frame Error (OOF).

SF Error Count (SF framing only) contains a count of SF error events. An SF error event is either a bipolar violation (BPV) or an out of frame error.

Error Second (ES) is any second in which an ESF (or SF) error event occurred.

Bursty Errored Second (BES)

ESF framing      is an errored second with more than one but less than 320 ESF error events with no OOF detected.

SF framing      is an errored second with more than one but less than 320 SF error events with no OOF detected.

Severely Errored Second (SES)

ESF framing      is an errored second either with an OOF detected or with 320 or more ESF errored events.

SF framing      is an errored second either with an OOF detected or with 320 or more SF errored events.

Unavailable Second (UAS) is a count of seconds in which service is unavailable. An unavailable state is declared at the onset of 10 consecutive SES and is cleared at the onset of 10 consecutive seconds with no SES. Also, an unavailable state is declared during power off times of less than 24 hours. If the CSU power is off for more than 24 hours, all error history is reset.

Controlled Slip Second (CSS) any second with a replication or deletion of a DS1 frame. This data is not detected by the FT 100S, but can be retrieved from the AT&T 54016 compatible equipment.

Loss of Frame Count (LOFC) is the number of times a loss of frame is declared. Loss of frame is declared after 2.5 seconds of continuous loss of signal or OOF. Loss of frame is cleared after 2.5 seconds of no loss of signal or OOF.

Line Code Violation Second (LCVS) is any second with one or more bipolar violations. If B8ZS coding is selected, only bipolar violations which are not part of the B8ZS code are counted.

% Error Free Seconds is defined as  $\{(\text{\# of error free seconds}) / (\text{\# of total seconds}) \times 100\}$ . The # of total seconds is counted from the last error history reset to a maximum of 24 hours.

## **Error Reporting Menus**

The performance menus allow the user to select error history display options. Error data for the preceding 24 hours is accumulated in 15 minute intervals and stored in error history registers (nonvolatile memory). Two sets of error history registers are maintained by the unit.

### **ESF Per AT&T Pub 54016**

When selected for AT&T 54016 ESF mode, the two error history registers maintained by the unit are the following:

Carrier Error History Registers are reserved for use by the carrier or remote T1 interface. The Carrier (or far end T1 terminating equipment) can read these registers over the ESF Data Link (FDL) using the TABS protocol defined by AT&T 54016. The local user can obtain a display of the carrier's error history registers but cannot reset them.

User Error History Registers are for use by the local user. These registers can be displayed and reset if preferred by the local user.

### **ESF Per ANSI T1.403**

When selected for ANSI T1.403 ESF mode, the two error history registers are the following:

Local Error History Registers contains error data pertaining to the locally received signal from the network.

Carrier Error History Register contains error data pertaining to the remotely received signal. This error data is the accumulation of received Performance Report Messages (PRMs) received by the CSU from the network and is a measure of the error performance of the T1 line as observed by the T1 network receive equipment. The PRM protocol is described in ANSI Standard T1.403.

**SF Error**

When SF framing is selected, the two error history reporting registers are the same as in AT&T 54016. The only difference is that the carrier cannot read the carrier registers since there is no FDL.

**Local Error History ANSI T1.403**

The local performance history allows display of error history data accumulated by the local FT 100S when ANSI T1.403 ESF mode is selected.

The Local 1-Hour Performance Data screen displays a summary of error history accumulated during the previous hour. Also displayed are the 24-hour totals for each error count.

The Local 24-Hour Performance Data screen displays all accumulated 15-minute intervals during the previous 24 hours.

**Remote Error History Per AT&T 54016**

When in the AT&T 54016 ESF mode, remote error history is available over the ESF data link as defined by AT&T Technical Reference 54016. The desired remote error history information may be requested by entering the appropriate selection preceded by an 'R' (see below). If the request is successful, the proper report is displayed. If the request is unsuccessful, the status line indicates an ESF data link communications error.

The Remote ESF Performance Data report shows ESF errors counted at the remote FT 100S and the status of the Payload Loopback.

The Remote 1-Hour Performance Data report displays the ES, UAS, BES, SES, CSS and LOFC performance data gathered at the remote FT 100S for the last hour period (the data is stored in 15-minute intervals).

The Remote 24-Hour Performance Data reports display their respective error event performance data gathered at the remote FT 100S for the last 24-hour period (the data is stored in 15-minute intervals).

### **Carrier Performance History**

The Carrier Performance History Menu allows viewing error performance data accumulated by the FT 100S when in the AT&T 54016 ESF mode or SF mode. The user can view these registers, but cannot reset the data. The 'R' in the command string is used to gather remote error history information if desired.

Entering	Displays
(R)PC1	the ESF error count.
(R)PC2	to request the 1-hour performance report.
(R)PC3	to request the 24-hour ES report
(R)PC4	to request the 24-hour BES report.
(R)PC5	to request the 24-hour SES report.
(R)PC6	to request the 24-hour UAS report.
(R)PC7	to request the 24-hour CSS report.
(R)PC8	to request the 24-hour LOFC report.

### **User Performance History**

The User Error History Menu allows for displaying the user error history options when AT&T 54016 ESF mode or SF mode is selected. The 'R' in the command string is used to gather remote error history information if desired.

Entering	Displays
(R)PU0	the ESF error count.
(R)PU1	the previous 1-hour accumulation of error data.
(R)PU2	to display the previous 24-hour accumulation of errored seconds.

(R)PU3	the previous 24-hour accumulation of bursty errored seconds data.
(R)PU4	the previous 24-hour accumulation of Severely Error Seconds data.
(R)PU5	the previous 24-hour accumulation of unavailable seconds data.
(R)PU6	the previous 24-hour accumulation of control slip seconds and loss of frame count data.
(R)PU7	to reset the performance monitoring counters.
(R)PU8	to reset the errored ESF counter.

## REMOTE FT 100S CONFIGURATION

The FT 100S has the capability of configuring a remote FT 100S or FT 100 using the ESF Facility Data Link (FDL) and a proprietary protocol. Remote configuration is accomplished through the use of the control port or LocalView. Since the ESF Data Link is utilized for this feature, the framing option on all units must be selected for "ESF".

### Note

*Changing remote framing from ESF to SF will disable remote configuration and may cause errors.*

The following is a description of the various command strings used in remotely configuring an FT 100S or FT 100.

## Configuration Control                      CRC

The choice for this option determines whether the information displayed for the various control port screens pertains to the local unit or remote unit. If the configuration control is selected for remote configuration, all the information displayed on the various option and summary screens shows the configuration of the remote unit at the time that its configuration was last downloaded (CR1 command). If the configuration control is selected for local configuration, the configuration information is that of the local unit.

### **Remote Configuration Mode      CRM**

The choice for this option determines which FT 100S or FT 100 may actually handle all of the configuration for both units. The FT 100S or FT 100 that is selected for slave mode may be configured from the master unit and request the configuration from the master unit but may not change it.

### **Get Remote Configuration      CR1**

This command initiates the actual downloading of the remote FT 100S or FT 100's configuration information. Once this is complete, the option and summary screens for the remote unit may be viewed by selecting the configuration control on the local unit for remote configuration.

### **Send Remote Configuration      CR2**

This command initiates actual transmission of the configuration information across the data link to the remote FT 100S or FT 100.



#### **Note**

*The remote FT 100S or FT 100's configuration is not actually updated until this command is successfully executed.*

When changes are made to the various configuration options for the remote FT 100S or FT 100, they are stored in the local FT 100S. Therefore, that information must be sent across the network using this command before the remote unit reflects any of the changes made.

### **Send Remote Unit ID      CR3**

Sends the remote units ID across the data link after being determined and entered at the local unit.

### **Send Remote Password      CR4**

Sends the remote units password across the data link after being determined and entered at the local unit.

### **Send Remote Time and Date      CR5**

Sends the remote units time and date across the data link after being determined and entered at the local unit.



## **COMMAND ENTRY**

The following is an example of a screen when a command is entered from the control port.

```
clf
.....
LOCAL T1 LINE FRAMING STATUS: ESF
CLF1: SF CLF2: ESF
ENTER OPTION:
```

***Figure 6-7***  
***Command Entry Screen***



## Chapter 7 Maintenance

### GENERAL

The unit contains no electronic components that can be serviced or replaced by the user. Repairs should not be attempted by the user.



#### **Warning**

*Disconnect AC/DC power before performing maintenance. Although dangerous voltage levels are not exposed, disconnecting power will ensure an electric shock hazard is not present.*

### FUSE

If the AC power fuse or the external power input fuse fails, replace it with one of equal rating. Repeated failure indicates a more serious problem. If this happens, refer to the section on maintenance.

### MAINTENANCE

The unit provides maintenance free service. Periodically it is necessary to remove dust that has collected on internal components. Remove dust with a soft bristle brush and low pressure air or vacuum.

Before attempting diagnostic tests, check that all connectors and plugs are firmly inserted. The test procedures will identify the faulty component in a bad communications link.



## Chapter 8

### Troubleshooting

#### GENERAL

This section discusses basic troubleshooting and also provides information on where to find further help, if necessary. In nearly all cases where you have a problem with the FT 100S, you can quickly resolve the problem with a few simple steps. This section deals with the most common problems that you might encounter during installation and while operating your FT 100S.



#### **Caution**

*Do not attempt to repair the FT 100S yourself. Both FCC and IC regulations prohibit user servicing.*

The first step is to identify where in the system the problem lies.

Before you begin troubleshooting, consider the following:

- Has the problem always been there, or did it start recently?
- If the problem started recently, what has changed since the FT 100S last worked? Are you trying to communicate with a different remote device, or has the remote device's configuration changed?
- Is the problem intermittent, or can you duplicate it at will? Does the FT 100S work with other remote devices?

The answers to these questions may help you identify the source of the problem. If you do not know where the problem lies, or if the problem seems to be in the FT 100S, the following troubleshooting tips may help you pinpoint and correct the problem. Each describes a problem symptom, and explains the possible causes and solutions. If the problem persists even after following the troubleshooting procedures, contact Telenetics for assistance. See Service and Support at the end of this guide.

## COMMON QUESTIONS AND ANSWERS

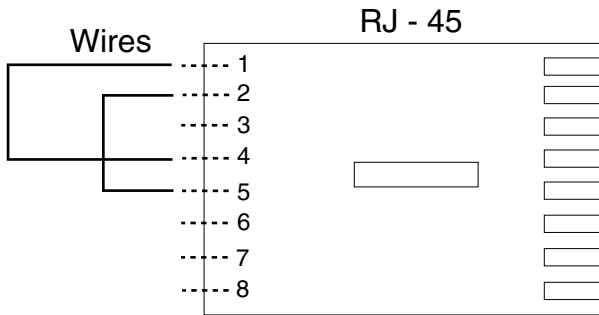
1. Why won't the FT 100S respond to the Central Office's request for error history?
  - **Possible Solution:** Either the option is disabled or the Central Office is not requesting the same format that the FT 100S is configured to send. Determine which type of error history (ANSI/AT&T) is being requested and verify selection on the FT 100S.
2. Can my service provider put the FT 100S into a network loopback to test the connection to the device?
  - **Possible Solution:** The line loopback option on the FT 100S must be enabled before the FT 100S will respond to a loopback code from the network service provider. Set the Line Loopback option to Enabled and have the service provider attempt the loopback again.
3. Why do I keep getting intermittent CRC errors or pattern slips?
  - **Possible Solution:** A common occurrence is that the T1 timing source on one or both of the units in the circuit are improperly selected. It is important that only ONE point (local, remote, or telco) provides master timing source and that all other points synchronize to that master timing source. Reference the "Timing" section on page 4-34 for descriptions of timing options.
4. Whenever I try to run B8ZS line coding, I get errors when I try to run data, but if I select NONE or B7SUB line coding it works fine. What is wrong?
  - Contact the service provider and verify that the T1 connection supports B8ZS on all trunks of the connection and that no trunks are AMI only.



### Note

*Sometimes incorrect wiring only causes marginal failures that standard troubleshooting cannot pin point. Always re-check the connections into the unit and any other equipment associated with the circuit. Also, check the actual pin outs against the wiring diagrams.*

*The following cable illustration may be helpful in troubleshooting problems.*



**Figure 8-1**  
**Network Loopback Cable**

## **BEFORE YOU CONTACT TELENETICS**

Our technical support staff will be glad to help you. In order to make your call to them as clear and helpful as possible, please complete this worksheet in its entirety before you contact Telenetics.

Make sure you have gone through the troubleshooting procedures.

Write down the name of your product:

Write down the serial number found on the bottom of the unit:

\_\_\_\_\_

Write down the document number found on the bottom right corner of the User's Guide title page: \_\_\_\_\_

Have the following information available:

- What tests, if any, you have run and what the results were (loopback test, for example);
- What the LED status indicators have indicated, if anything.

Have the equipment running (as your problem permits).

Contact Technical at: (949) 455-4000



## Appendix A Specifications

### NETWORK INTERFACE

#### LINE RATE

1.544 Mbps  $\pm$ 75 bps

#### Line Code

Bipolar, AMI or B8ZS

#### Input Signal

+3.5 dBDSX to -34 dBDSX

#### Output Signal

DSX-1 w/LBO

#### Transmit LBO

Selectable 0, 7.5, 15 dB

#### Receive LBO

Automatic

#### Impedance

100 ohms nominal

#### Framing

SF or ESF

#### Jitter Tolerance

Per AT&T pub 62411

#### Connector

RJ48C 8-pin modular jack

### NETWORK LOOPBACK CODES

#### Set Code

10000 per AT&T pub 54016

**Reset Code**

100 per AT&T pub 54016

**Detection Time**

5 secs per AT&T pub 54016

**DTE INTERFACE**

**Data Port Configuration**

V.35 or RS-530/449

**Data Rates**

n x 56 kbps or n x 64 kbps  
(n=1 to 24 DS0 time slots)  
=from 56 kbps to 1.536 Mbps

**Electrical**

V.35 or RS-530/449

**Connector**

25-pin D-type female, adapters available

**CONTROL PORT**

**Electrical**

RS-232

**Rate**

300 to 19200 bps, asynchronous, 8 bit data, no parity

**Connector**

9-pin D-type male connector, IBM PC/AT PC compatible

**POWER SUPPLY**

**Power Source**

115 Vac

**Power Consumption**

6 watts, typical

**MECHANICAL**

**Dimensions**

Shelf module - 9.5" x 6.3" x 0.9"

Single unit housing - 10" x 7" x 2"

**ENVIRONMENTAL**

**Operating Temperature**

0 to 50 deg C

**Storage Temperature**

-40 to 70 degrees C

**Relative Humidity**

0 to 95% noncondensing



## Appendix B

# Control Port Command Quick Reference

### GENERAL

The following table contains quick reference guide for Control port commands.

**Table B-1. Control Port Commands**

Control Port Commands	Option	Menu Location
/	Accesses sign-on screen	
M	Accesses main menu	
CL	T1 line configuration	Main
CD	DTE port summary	
CDxx	DTE port xx configuration	
CC	Control port configuration	
CT	Update time and date	
DL	T1 line tests	
DDxx	DTE port xx tests	
PC	Carrier performance display	
PU	User performance display	
CLF	Framing	T1 line
CLL	Line code	
CLP	ANSI T1.403 PRM (performance report message)	
CLM	AT&T 54016 message	
CLT	Timing	
CDxxN	Number of DS0s	DTE port
CDxxR	DS0 rate	
CDxxG	DS0 grouping	
CDxxRP	Receive clock polarity	
CDxxS	Starting DS0	
CDxxTC	Transmit clock	

Control Port Commands	Option	Menu Location
CDxxTP	Transmit clock polarity	
CDxxCT	CTS mode	
CDxxRS	RLSD mode	
CDxxDS	DSR mode	
CDxxTM	TM mode	DTE port <i>cont.</i>
CDxxLL	LL mode	
CDxxRL	RL mode	
CCE	echo	Control Port
CTThh:mm:ss	time update	
CTDdd/mm/yy	date update	
DL1	T1 Local Loopback	T1 line tests
DL2	T1 Network Loopback	
DL3	T1 Loopbacks	
DDxxM1	Local Terminal Loopback	DTE port tests
DDxxM2	Remote Terminal Loopback	
DDxxM3	Remote Loopback	
DDxxM4	Remote Loopback with Test Pattern	
DDxxM5	Test Pattern	
DDxxM6	Port xx test	
(R)PC1	ESF error count	Carrier performance history
(R)PC2	1-hour performance	
(R)PC3	24 hour ES	
(R)PC4	24 hour BES	
(R)PC5	24 hour SES	
(R)PC6	24 hour UAS	
(R)PC7	24 hour CSS	
(R)PC8	24 hour LOFC	

<b>Control Port Commands</b>	<b>Option</b>	<b>Menu Location</b>
(R)PU1	ESF error count	User performance history
(R)PU2	1-hour performance	
(R)PU3	24-hour ES	
(R)PU4	24-hour BES	User performance history <i>cont.</i>
(R)PU5	24-hour SES	
(R)PU6	24-hour UAS	
(R)PU7	24-hour CSS	
(R)PU8	24-hour LOFC	
(R)PU9	24-hour LCVS	
(R)RU1	reset performance monitoring counters	
(R)RU2	reset ESF error counter	





## Appendix C

### T1 Overview

#### GENERAL

T1 refers to the primary digital telephone carrier system used in North America. T1 is one line type of the PCM T-carrier hierarchy listed in Table C-1. T1 describes the cabling, signal type, and signal regeneration requirements of the carrier system.

*Table C-1. PCM T-Carrier Hierarchy*

Line	Signal	Line Rate	Number of TDM Channels
T1	DS-1	1.544 Mbps	24
T1C	DS-1C	3.152 Mbps	48
T2	DS-2	6.312 Mbps	96
T3	DS-3	44.736 Mbps	672
T4	DS-4	274.176 Mbps	4032

T1 was first installed in the early 1960s and was used only to carry voice trunks between central offices. Since then, T1 facilities have been provided by telephone companies to customers who need many outside lines. Since a T1 line supports up to 24 simultaneous voice and / or data calls, a large savings in both cable and service cost can be realized by replacing many individual local loops with a single T1 link to the Central Office. In addition to telephone-company provided T1 services, many private T1 networks have been implemented such as LAN gateways and PBX-to-PBX links.

The signal transmitted on a T1 line, referred to as the DS1 signal, consists of serial bits transmitted at the rate of 1.544 Mbps. The type of line code used is called Alternate Mark Inversion (AMI).

The AMI line code is produced by transmitting a pulse for logic one data bits and no pulse for logic zero data bits. The signal is called AMI because pulses alternate in polarity for each logic one bit. If the first one bit in a bit stream is a + 3V pulse, the next one bit will be a - 3V pulse on the T1 line.

Since zero bits are no pulses, the AMI code does not allow long strings of zero data. A minimum ones density is required on the T1 line so that receiving equipment and line repeaters can recover clocking information. An alternative line code which allows long strings of zeros is called bipolar with eight zero substitution (B8ZS). This method replaces strings of eight zeros with a specific double bipolar violation sequence. The double bipolar violation sequence consist of two bipolar violations. The bipolar violation sequence is recognized by receiving equipment and converted back to zeros. The violation sequence provides the necessary pulse density.

## **FRAMING FORMATS**

The Data Signal Level Zero (DS0) is the standard 64 kbps data signal used for both voice and data transmission on a T1 line. The T1 signal is organized as a series of frames with 24 DS0 time slots and 1 framing time slot for each frame. Each DS0 time slot consists of an 8-bit data channel while the framing time slot is just one bit long. This results in a single frame which is 193 bits long (24 channels x 8 bits per channel + 1 frame bit). The resulting frame rate is 8000 frames per second (1.544 Mbps).

Figure C-1 shows the Superframe Format (SF). SF framing, also known as D4 framing and the M24 multiplexer format, defines a group of 12 frames as a superframe. The 193rd bit of each frame is referred to as the multiframe alignment bit or F bit. T1 receiving equipment uses the F bit to identify the beginning of a superframe as well as the position of each frame in the superframe.

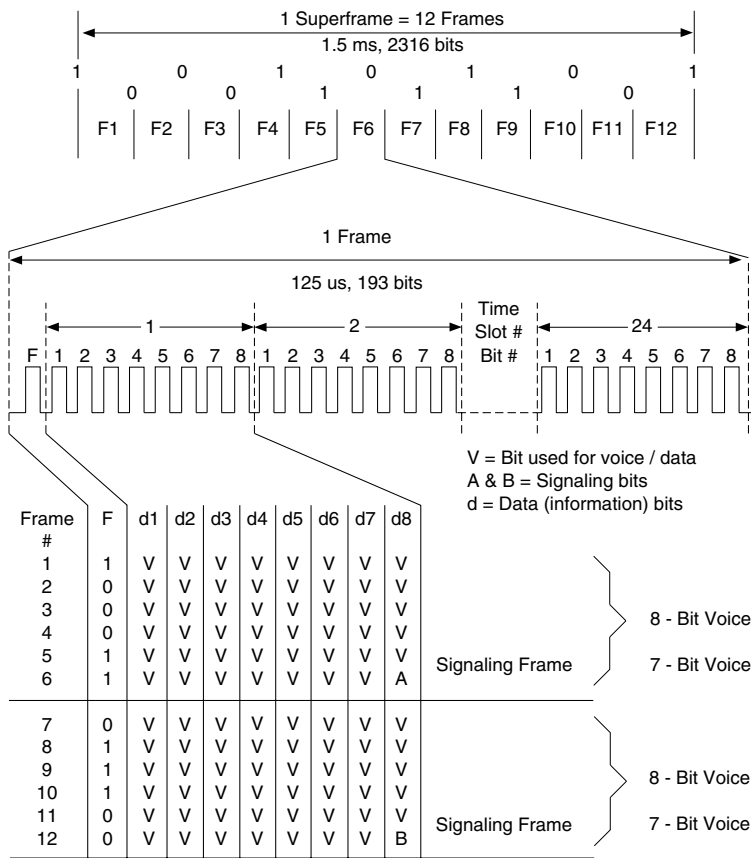


Figure C-1  
Superframe Format

Call supervision signaling for each channel is presented in bit 8 of every channel during frames 6 and 12 of the superframe. This process is called Robbed Bit Signaling. The signaling information is used for establishing and terminating calls. This method of signaling prevents the use of the entire 64 kbps DS0 channels for data (non-voice). Therefore, only 56

kbps (7 bits per DS0) data can be transmitted without the inherent error due to signaling. Voice transmission is unaffected by robbed bit signaling.

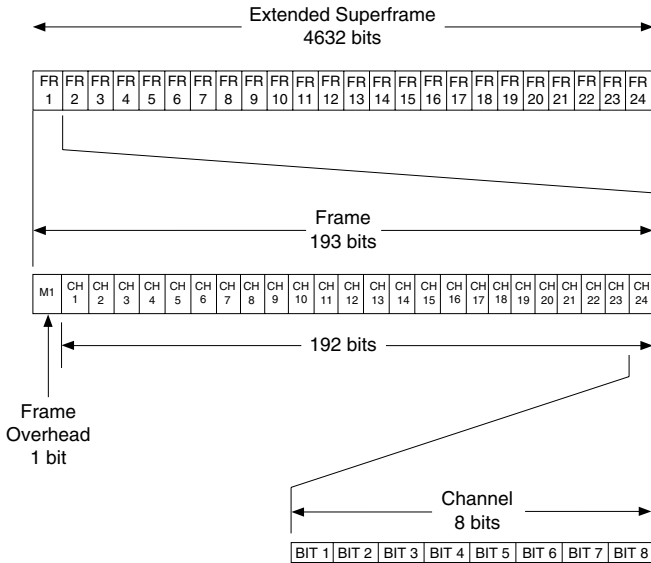
## **ESF Framing**

Figure C-2 shows the Extended Superframe Format (ESF). ESF format or Fe framing is the newest DS1 framing format. This format extends the multiframe structure from a 12 frame superframe to a 24 frame extended superframe. Data channeling for ESF framing is the same as SF (24 DS0 channels per frame), but the function of the framing (F) bit position in each frame is redefined for ESF. The new F bit contains the following three functions:

- Cyclic redundancy check
- Facility data link
- Framing pattern sequence

This redefinition of the F bit allows several new features for maintenance and performance monitoring which are not available with SF framing.

The Cyclic Redundancy Check (CRC-6) is an error check sequence which is transmitted in the F bit position. The T1 receiving equipment receives this sequence and compares it with a locally computed check value which is based on the received data in all DS0 channels in the extended superframe. This process gives the equipment the ability to detect most errors which occur in the DS1 signal. The CRC-6 data is transmitted at a rate of 2 kbps.



**Figure C-2**  
**Extended Superframe Format**

The Facility Data Link (FDL) is also transmitted in the F bit position and provides a separate low speed data channel on the T1 circuit which does not interfere with the main data transmission. This out-of-band data channel can be used for communicating general maintenance information or for transmitting user defined information within the T1 link. Two standard protocols for error maintenance data communication over the FDL exist and are discussed below. The data rate for the FDL is 4 kbps.

The third function provided in the F bit position is the Framing Pattern Sequence (FPS). The 2 kbps bit sequence defines frame and multiframe boundaries and allows location of the CRC-6 and FDL bits by the receiving equipment.

Call supervision signaling is provided in the same way as SF framing (Robbed Bit Signaling) with one difference. Since the extended super-frame is 24 frames long, frames 18 and 24 in addition to frames 6 and 12 contain signaling information in bit 8 of each DS0 channel.

An alternative method of providing signaling is called Common Channel Signaling. Instead of robbing a bit from each data channel, an entire DS0 channel is reserved for signaling. Since bits are no longer robbed in the remaining 23 data channels, these channels may be used for 64 kbps data transmission. This is the preferred method for achieving clear channel capability in the emerging Integrated Services Digital Network (ISDN) environment.

### **Framing Format Conversion**

Much of the presently installed customer T1 equipment is compatible only with SF framing. When ESF lines are installed, conversion from ESF to SF at the customer premise may be necessary to use SF equipment. A CSU with this conversion option usually performs the conversion. The conversion process replaces the ESF F bit sequence with the SF F bit sequence on the receive side and inserts the ESF F bit sequence on the network transmit side.

### **PERFORMANCE MONITORING**

An operator or network manager can monitor the quality of a T1 link to enable quick response to line or equipment failure. Also, monitoring equipment can maintain a line quality history to identify increasing error rate trends.

SF T1 equipment is limited to monitoring the following conditions:

- BPV count. Receiving Equipment can detect and count bipolar violations to measure error caused by line or repeater problems. Logic errors or errors in data encoding which the transmitting equipment or repeaters can introduce cannot be detected.
- LOS. Loss of signal.
- Ones density. T1 specifications require a minimum pulse density of 12.5%. CSUs insert pulses in the outgoing signal if necessary to insure the minimum density is transmitted.

ESF framing allows logic errors to also be detected due to the CRC-6 error check sequence embedded in the F bit. When the receiving equipment obtains error information, it can communicate the information to the far end of the T1 link over the FDL channel. Two standard protocols report errors using the FDL: AT&T Publication 54016 and ANSI T1.403.

The AT&T method requires that the T1 terminating equipment, the CSU for example, maintain a 24-hour performance error history. This error history is transmitted to the Central Office over the FDL after an error history request message is received from the Central Office. In many CSUs, an alternate set of registers is maintained in the CSU to allow customer access to the same error information.

The ANSI method requires that the CSU transmit a performance report message (PRM) each second over the FDL. This PRM is not sent to any specific remote location, but is broadcast so that any PRM receiving device on the T1 line can intercept the message. Rather than transmitting an entire 24-hour history, the PRM contains error information pertaining to only the previous 4 seconds. It is the responsibility of the PRM receiver to accumulate the information and store it for 24 hours or the time desired. This method allows performance monitoring points at different locations along a T1 network so that error localization can be determined.

Other proprietary methods of collecting and reporting ESF error information have been implemented to enhance the remote T1 device maintenance capabilities. Besides ESF error information, CSU configuration and loop testing functions can be performed remotely using the FDL data channel. Since these added features are nonstandard, equipment from different manufacturers is not compatible as far as the proprietary functions are concerned.





# Service and Support

## GENERAL

The following list of direct telephone numbers can quickly put you in touch with the service or party of your choice. Remember, at Telenetics, total customer satisfaction is only a phone call away.

## TELENETICS TECHNICAL SUPPORT CENTER

Telephone: (949) 455-4000

This number connects you with Telenetics. Use this number to gain access to our experienced staff members trained to provide you with the best service and support Telenetics has to offer.

- *Technical Telephone Support.* Contact our Technical Support Group if you cannot identify or solve a technical problem with your Telenetics product. Be prepared to provide the model number of the equipment requiring support (recorded prompts will provide some assistance with this).
- *On-site Service Activity or Status.* Access this feature to initiate an on-site service call or to obtain the status or estimated time of arrival (ETA) for an existing on-site request.
- *Equipment Installation, Removal or Upgrade.* Use this feature to schedule the installation, removal or upgrade of your Telenetics products.
- *Request Unit Replacement, Factory Repair Services or Status.* Access this feature to obtain information about under-warranty unit replacements, unit replacement of non-contracted equipment, factory repair services, or the status of a unit replacement or equipment returned for repair.

## **CUSTOMER RESPONSE CENTER**

Telephone: (949) 455-4000      FAX: (949) 455-4010

Use this number to obtain product specifications and descriptive literature on Telenetics products.

## **INTERNET/WORLD WIDE WEB**

Telenetics has a home page on the Internet. It provides a variety of product information, including specifications, frequently asked questions (FAQs), and other topics.

<http://www.telenetics.com>

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