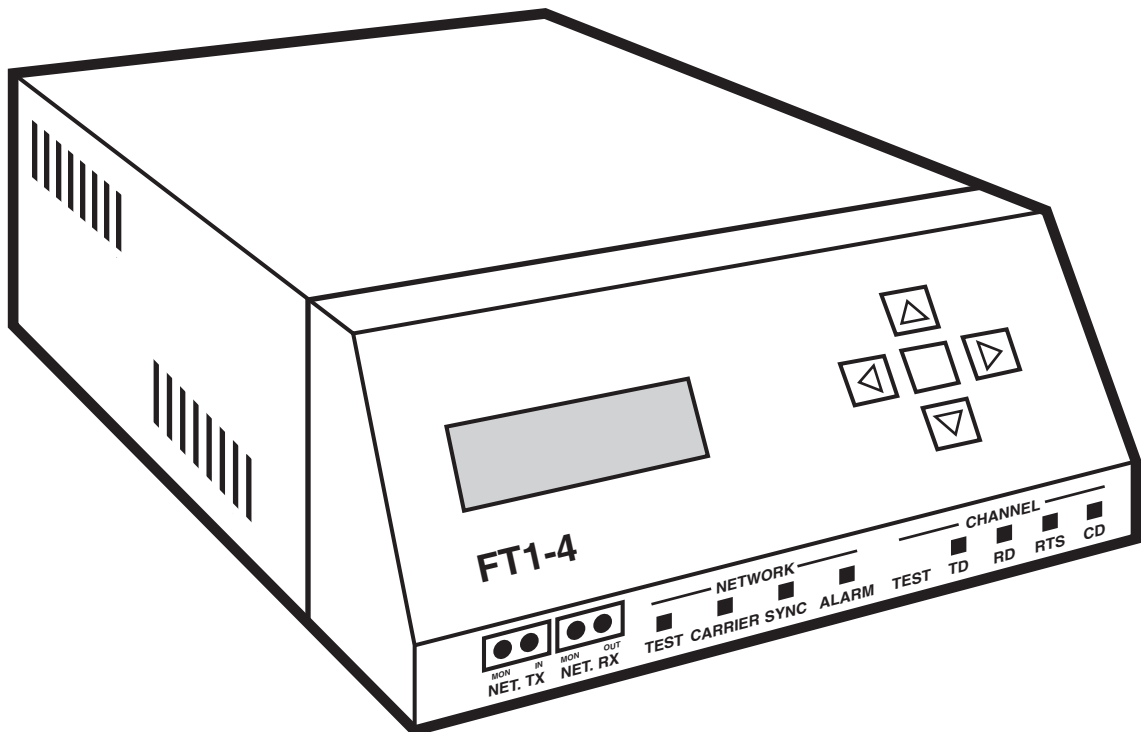




MARCH 1996  
MT200A-449/449-R2  
MT200A-35/232-R2  
MT200A-449/232-R2  
MT200A-P35/449-R2  
MT200A-P35/232-R2  
MT200A-P35/P35-R2  
MT200A-P35/35-R2  
MT200A-35/449-R2  
MT200A-35/35-R2  
MT202A-P35-R2  
MT202A-35-R2  
MT202A-449-R2

# FT1-2

# FT1-4



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INDUSTRY CANADA  
RADIO FREQUENCY INTERFERENCE STATEMENTS**

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

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

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

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

**INSTRUCCIONES DE SEGURIDAD (Normas Oficiales Mexicanas Electrical Safety Statement)**

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá de lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico debe ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
  - A: El cable de poder o el contacto ha sido dañado; u
  - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
  - C: El aparato ha sido expuesto a la lluvia; o
  - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
  - E: El aparato ha sido tirado o su cubierta ha sido dañada.

DS&G Registration Number .....US Safety: E1717

CSA Registration Number — Canadian Safety:.....LR1717

FCC Registration Number: .....GBRUSA-18118-DE-N

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# 1. Specifications

## Configuration

- Front Panel LCD and Keypad
- ASCII Terminal
- Four Configuration Storage Banks

## Multiplexing Technique

- Byte Interleaved

## Aggregate

- Recommended Cable Requirement: Twisted Shielded Pair
- Line Rate: 1.544 Mbps +/- 50 bps
- Line Format: AMI or B8ZS
- Framing Format: D4 or ESF(ANSI T1.403 or AT&T Pub. 54016)
- Pulse Characteristics: AT&T 62411 Compliance
- Output Amplitude: 2.4 to 3.3 V peak to base
- Receiver sensitivity: 0 to - 26 Db
- Line Buildout(CSU): 0Db, -7.5 Db,-15 Db
- Line Distance(DSX-1 Mode): 0 to 655 Feet
- Line Distance(CSU Mode): 0 to 6000 Feet with 22 AWG
- Interface: RJ48
- Density Monitoring: 1 of 8, 1 of 16, 1 of 64 or None

## Performance Monitoring

- 15 Minute Intervals
- 24 Hour History Maintained
- Information Includes
- CRC6 Errors
- Out Of Frame Events
- Error Events

- Errored Seconds
- Severely Errored Seconds
- Failed Signal State
- Failed Seconds
- Bipolar Violations

## Internal CSU

- Meets FCC Part 68 requirements
- Meets AT&T Pub 62411
- Local and Remote Loopback Diagnostics
- Type I Keep-Alive Signal

## Clocking Modes

- Internally Provided
- External From Network (loop)
- External From Channel 1
- Station Clock or External From Channel 3

## DTE Channels

- 2/4 Data Channels
- Dual Port RS 232 (DS0B SRDM Formatted) 2.4, 4.8, 9.6, and 19.2kb/s

### DTE Channels, Interfaces, and Connectors

- |                    |   |
|--------------------|---|
| MT200A-35/35.....  | (4) DTE channels: each CCITT V.35 interface; (4) 34-pin M block (female).   |
| MT200A-35/232..... | (4) DTE channels: (2) CCITT V.35 interface; (2) EIA RS-232 interface; (2) 34-pin M block (female); (2) DB25 (female). |
| MT200A-35/449..... | (4) DTE channels: (2) CCITT V.35 interface; (2) EIA RS-449 interface; (2) 34-pin M block (female); (2) DB37 (female). |

DTE Channels, Interfaces, and Connectors (con.)

- MT200A-232/232 .....(4) DTE channels:  
(4) EIA RS-232 interface;  
(4) DB25 (female).
- MT200A-449/449 .....(4) DTE channels:  
(4) EIA RS-449 interface;  
(4) DB37 (female).
- MT200A-449/232 .....(4) DTE channels: (2) EIA  
RS-449 interface; (2) EIA  
RS-232 interface; (2) DB37  
(female); (2) DB25  
(female).
- MT200A-P35/P35 .....(4) DTE channels: (2) D4  
PBX direct interface; (2)  
CCITT V.35 interface; (2)  
T1 modular; (2) 34-pin M  
block (female).
- MT200A-P35/35 .....(4) DTE channels: (1) D4  
PBX direct interface; (3)  
CCITT V.35 interface; (1)  
T1 modular; (3) 34-pin M  
block (female).
- MT200A-P35/449 .....(4) DTE channels: (1) D4  
PBX direct interface; (1)  
CCITT V.35 interface; (2)  
EIA RS-449; (1) T1  
modular; (1) 34-pin M  
block (female); (2) DB37  
(female).
- MT202A-35 .....(2) DTE channels: (2)  
CCITT V.35 interface; (2)  
34-pin M block (female).
- MT202A-232 .....(2) DTE channels: (2) EIA  
RS-232 interface; (2) DB25  
(female).
- MT202A-449 .....(2) DTE channels: (2) EIA  
RS-449; (2) DB37  
(female).
- MT202A-P35 .....(2) DTE channels: (2)  
PBX direct interface; (2)  
T1 modular connectors.

- Density: Alternate DS0, Bit 7 stuffing, None
- Selectable DTE Channel Rates N x 56 Kbps:

8, 16, 24, 32, 40, 48, 56, 64, 112, 168, 192, 224,  
280, 320, 336, 448, 560, 672, 840, 960, 1120, 1344.

- Selectable DTE Channel Rates N x 64 Kbps:

8, 16, 24, 32, 40, 48, 64, 128, 192, 256, 320, 384,  
512, 640, 768, 960, 1280, 1536.

- D4 PBX Port Interface

-D4 /ESF Frame Format

-N x 64 Kbps where N=1 through 24

-AMI/B8ZS

-Output Amplitude: 2.4 to 3.3 V peak to peak

-Receive Sensitivity: 0 to -26dB

-Performance Monitoring

\*Bipolar Violations

\*Synchronization Loss

\*Frame Bit Errors

-Fractional T1 service

**Compatibilities**

- AT&T Pub 62411
- AT&T Pub 54019A
- AT&T Pub 54016
- Carrier T1 Service Offerings
- Carrier Fractional T1 Service Offerings
- ESF Software Selectable (AT&T Pub. 54016 &  
ANSI T1.403)

**Approvals**

- FCC Parts 15 and 68
- DS&G:UL 479
- DS&G:CSA C22.2 No. 220-M1980

**Diagnostics**

- Local and Remote Aggregate Loopbacks
- Local and Remote CSU Loopbacks
- Local and Remote Individual Channel Loopbacks
- Internal 511 BERT Test Generator
- Tx/Rx Monitor Jacks and Network In and Network Out Jacks

**Front Panel Network Indicators**

- Test
- Carrier
- Synchronization
- Alarm

**Front Panel DTE Channel Indicators**

- Test
- Carrier Detect
- Transmit Data
- Receive Data
- Request To Send

**Terminal Interface**

- RJ48
- 300, 1200, 2400, 4800, or 9600 Baud

**Printer Interface**

- RJ48
- 300, 1200, 2400, 4800, or 9600 Baud

**Standalone Unit**

- Size: 3.5"H x 8.5"W x 13.5"D  
(8.9 x 21.6 x 34.3 cm)
- Weight: 6.75 lbs. (3.1 kg)
- Power: 115 VAC/60 Hz
- Power Dissipation: 25 Watts

**Environmental**

- Temperature: 32° — 122°F (0° — 50° C)
- Relative Humidity: 0% to 95% non-condensing



## 2. Introduction

### 2.1 GENERAL

The FT1-4 is a high speed T1 format processor and four channel multiplexor. It is capable of processing data from four unique channels at speeds from 2.4Kbps to 1.536Mbps, depending upon the format and density requirements of the application. It provides all the framing and density requirements for data transmission across predefined network facilities, such as ACCUNET. It is available in a variety of models that provide support (exclusive or combined) for one or more of the following interfaces: V.35; RS-232; RS-449; PBX. (For more information about DTE channel interfaces and connectors, see *1.0, Specifications*, pp. 5-6.)

The FT1-2 is identical to the FT1-4 in design, but provides two DTE channels instead of four. There are four FT1-2 models available; each provides support for one of the following interfaces: V.35; RS-232; RS-449; PBX. (For more information about DTE channel interfaces and connectors, see *1.0, Specifications*, pp. 5-6.)

The FT1-4, because of its unique design, is able to accept timing information from any clock. Timing information may be derived from the receive data, an external DTE, from the internal crystal oscillator, or station clock. All configurations are software selectable, allowing the user to reconfigure the system by simply performing a series of software interactive commands. Station Clock and Channel 3 External are mutually exclusive. Depending upon the software revision, the operator can select either station clock or Channel 3 external but not both.

The FT1-4 has a series of software selectable diagnostics that allow the user to quickly and accurately troubleshoot the FT1-4 and the associated network.

### 2.2 PURPOSE

The purpose of this document is to present to the reader the information to understand the operation, installation, and programming procedures associated with the FT1-4. Chapter 1 presents the specifications for this unit. Chapter 2

gives a brief description of the unit along with its optional features and applications. Chapter 3 presents the installation and the initial power-up procedures. Chapter 4 explains the interactive programming procedures associated with the FT1-4.

### 2.3 FRONT PANEL CONTROLS AND INDICATORS

The FT1-4 contains all the controls and indicators to configure, monitor, diagnose and operate the system. The front panel contains the 32 character LCD array, the menu selection function keys, four bantam jack receptacles for network data monitoring and test signal injection, and a series of LEDs that reflect the status of both the network and the selected channel.

### 2.4 MENU SELECTION FUNCTION KEYS

The menu selection function keys are a set of five pushbuttons located on the upper right portion of the front panel. These keys allow the operator to scroll "up,down,right and left" through the menu selection process displayed on the Liquid Crystal Display panel. The center function key is the ENTER key which allows the operator to select particular actions or items.

### 2.5 NETWORK DATA MONITORING

The four bantam jacks on the front of the unit allow the operator to monitor both network transmit and receive functions, together with the ability to inject an override bipolar signal into the network via either the transmit logic or disconnect the unit from the network via the receive logic. For additional information on the use of these jacks, refer to the Network Diagnostics section in Chapter 4, Programming.

## 2.6 NETWORK LEDs

There are four LEDs associated with the network function of the unit. They monitor the TEST, CARRIER, SYNC, and ALARM function of the unit.

**TEST LED** (red) is illuminated when the unit is in an aggregate or network test mode. The TEST mode is invoked when the unit is in any of the local or remote aggregate or network loopback states or if the unit is generating an in-band pattern to invoke any of these loopbacks.

**CARRIER LED** (green) is illuminated when the carrier receive signal is present.

**SYNC LED** (green) is illuminated when the unit is in sync with the remote unit.

**ALARM LED** (red) is illuminated for one-half second while any one of the following exists:

- Out Of Frame(OOF)
- Bipolar Violation
- Yellow Alarm Received
- Red Alarm State.

## 2.7 CHANNEL LEDs

The five LEDs below the Channel heading represent the status of the channel defined by a LCD function within the diagnostic function.

**TEST LED** (red) is illuminated whenever the specified channel is in any of the local or remote channel loopback states or if the channel is generating a test signal.

**Channel TD** (green) LED is illuminated when the specified channel is transmitting a space.

**Channel RD** (green) LED is illuminated when the specified channel is receiving a space.

**Channel RTS** (green) LED is illuminated when the specified channel's Request to Send function is active.

**Channel CD** (green) LED is illuminated when the specified channel's Data Detect function is active.

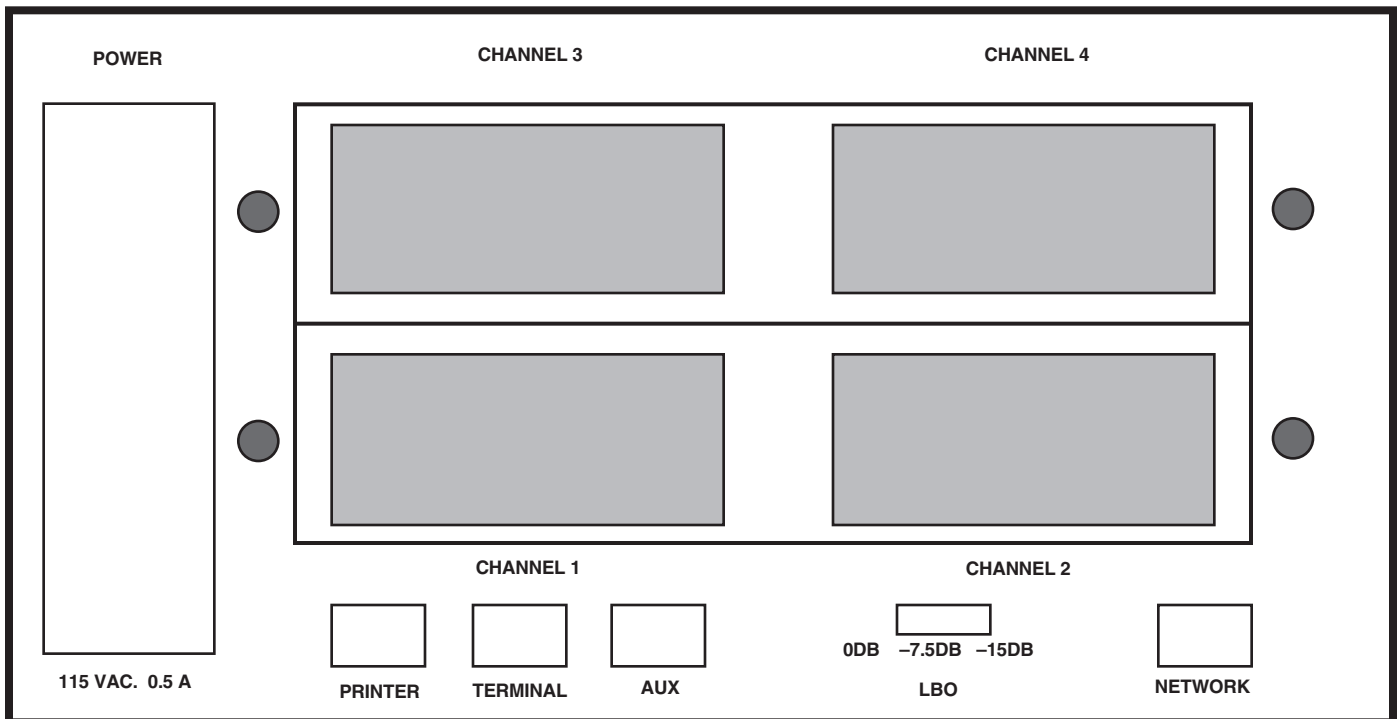


Figure 2-1. Rear Panel Connections for the MT200A-35/35. This model provides four 34-pin M block (female) connectors and support for the CCITT V.35 interface for each DTE channel.

## 2.8 REAR PANEL CONTROLS AND INDICATORS

The rear panel (Refer to Figure 2-1) of the FT1-4 permits access to all the physical interface connections necessary to connect the FT1-4 into a network. In addition to the physical interface connections, there are two switches mounted on the rear panel of the FT1-4: the Power ON/OFF switch and the Line Build Out (LBO) switch. When operating as a channel service unit (CSU), the setting of the Line build Out function is dictated by the carrier and must be set as the carrier specifies. Otherwise the LBO Switch should be set to 0dB position. The power switch is a simple ON/OFF function.

## 2.9 CHANNEL INTERFACE CONNECTIONS

There are four DTE channel interfaces (each is a female connector) on the FT1-4; there are two channels on the FT1-2. The cable associated with channel 1 must be connected to the female connector labelled CHANNEL 1, etc. Below are the pin-outs (for male connectors on your cables) for the V.35, RS-232, and RS-449 interfaces.

### V.35 Pin Out (34-pin male connector)

PIN	FUNCTION
A.....	GROUND
D.....	CTS
E.....	DSR
F.....	DCD
P.....	SD(A)
R.....	RD(A)
S.....	SD(B)
T.....	RD(B)
U.....	TT(A)
V.....	RT(A)
W.....	TT(B)
X.....	RT(B)
Y.....	ST(A)
AA.....	ST(B)

### RS-232 Pin Out (DB25 male connector)

1.....	Protective Ground
2.....	Transmitted Data
3.....	Received Data
4.....	Request to Send
5.....	Clear to Send
6.....	Data Set Ready
7.....	Signal Ground/Common Return
8.....	Received Line Signal Detector
9.....	+ Voltage
10.....	- Voltage
11.....	-----
12.....	Secondary Received Line Signal Indicator
13.....	Secondary Clear to Send
14.....	Secondary Transmitted Data
15.....	DCE Transmitter Signal Element Timing
16.....	Secondary Received Data
17.....	Receiver Signal Element Timing
18.....	-----
19.....	Secondary Request to Send
20.....	Data Terminal Ready
21.....	Signal Quality Detector

22.....	Ring Indicator
23.....	Data Signal Rate Selector
24.....	DTE Transmitter Signal Element Timing
25.....	-----

### RS-449 Pin Out (DB37 male connector)

1.....	Shield
2.....	Signal Rate Indicator
3.....	-----
4.....	Send Data (A)
5.....	Send Timing (A)
6.....	Receive Data (A)
7.....	Request ToSend (A)
8.....	Receive Timing (A)
9.....	Clear To Send (A)
10.....	Local Loopback
11.....	Data Mode(A)
12.....	Terminal Ready (A)
13.....	Receiver Ready (A)
14.....	Remote Loopback
15.....	Incoming Call
16.....	Select Frequency
17.....	Terminal Timing (A)
18.....	Test Mode
19.....	Signal Ground
20.....	Receive Common
21.....	-----
22.....	Send Data (B)
23.....	Send Timing (B)
24.....	Receive Data (B)
25.....	Request to Send (B)
26.....	Receive Timing (B)
27.....	Clear to Send (B)
28.....	Terminal in Service
29.....	Data Mode
30.....	Terminal Ready (B)
31.....	Receiver Ready (B)
32.....	Select Standby
33.....	Signal Quality
34.....	New Signal
35.....	Terminal Timing (B)
36.....	Standby/Indicator
37.....	Send Common

### 2.9.1 PRINTER PORT

This is an asynchronous serial interface port that can operate at 300, 1200, 2400, 4800, or 9600 baud. The interface format may be either 7 or 8 data bits per character with odd, even, or no parity. The character set standard ASCII. These parameters may be selected from the front panel function keys. Table 2-2 lists the pin assignments associated with the printer connector.

### 2.9.2 TERMINAL PORT

This is an asynchronous serial interface port that can operate at 300, 1200, 2400, 4800, or 9600 baud. The interface format may be either 7 or 8 data bits per character with odd, even, or no parity. The character set standard ASCII. These parameters may be selected from the front panel function keys. Table 2-2 lists the pin assignments associated with the terminal connector.

**Table 2-2. Printer/Terminal Connector Pinout**

PIN	FUNCTION
1	CTS
2	DCD
3	RD
4	DTR
5	TD
6	DIGITAL GROUND
7	DSR
8	RTS

**2.9.3 AUXILIARY CONNECTION**

The Auxiliary Connection is an RJ48C modular type connector used to interface station clock to the unit. The pin out for this connector is listed in Table 2-3. When viewing the connector from the rear of the unit the connector pins are defined from left to right and numbered 1 through 8.

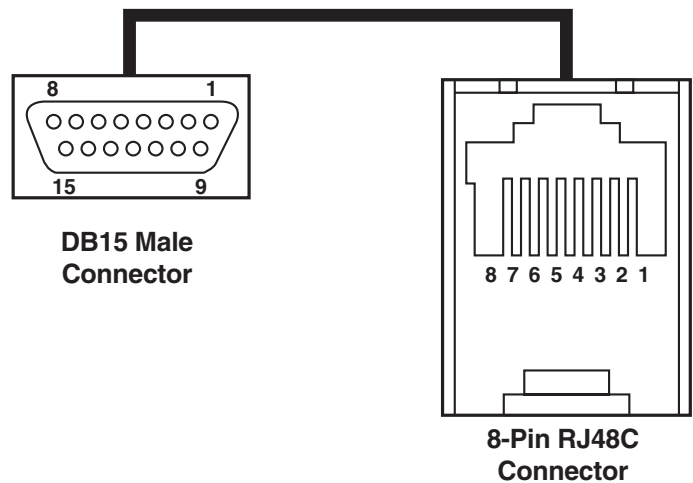
**Table 2-3. Auxillary Connector Pinout**

PIN	FUNCTION
1	SYNC (ACTIVE LOW, TTL)
2	STATION (A-LEAD, RS422)
3	STATION (B-LEAD, RS422)
4	NC
5	ALARM (RESERVED, TTL)
6	DIGITAL GROUND
7	+5 VOLTS
8	NC

**2.9.4 NETWORK CONNECTION**

The Network connector is a RJ48C modular type connector with a RJ48C-to-DB15 pigtail cable optionally supplied with the unit. Refer to Figure 2-2. (Note that the pin order on the cable connector are opposite of the pin order on the RJ48C connector on the FT1-4.)

DB15	RJ48C	Signal
1	5	TX TIP
3	2	RX TIP
9	4	TX RING
11	1	RX RING
2 and 7	7 and 8	GND



**Figure 2-3. Network Connector: DB15-to-RJ48 pigtail cable.**

# 3. Installation

## 3.1 INTRODUCTION

This chapter contains the information necessary to plan, perform and verify the mechanical and electrical installation of the FT1-4. Before installing an FT1-4, read and completely understand the information in this chapter.

## 3.2 SITE PREPARATION

The FT1-4 should be installed within 7 feet of a grounded AC outlet furnishing 115/230vac. The equipment location should be clean, well lighted, and conform to the standards for computer equipment installations. Allow a 36 inch clearance both front and back for access during operation and maintenance of the equipment. When connecting the interface cables, allow 4 feet of slack in the cables so that the unit may be moved to perform service without disconnecting the cabling.

## 3.3 INSTALLATION PROCEDURE

Before installing the FT1-4 system, carefully read and understand the entire installation procedure.

### 3.3.1 UNPACKING

Although we take great care to insure that the FT1-4 is properly packaged so that it will not be damaged during transit, it is the customer's responsibility to verify that the unit arrives undamaged.

1. Carefully remove all packing material from the FT1-4.
2. Inspect the equipment for damage that may have occurred during shipment. If any damage is noted, contact the shipping agent and the manufacturer.

## NOTE

**The FT1-4 shipping carton is designed to ensure that the device arrives at the customer's location undamaged. If it ever becomes necessary to move the FT1-4 to another location, it is advisable to save the shipping carton for such use.**

## CAUTION!

**Before continuing with the installation procedure, ensure that the POWER switch, located on the rear panel, is in the OFF(0) position.**

## 3.4 EQUIPMENT CABLING

Depending upon the particular interface(s) associated with the FT1-4, there are certain cabling procedures for individual applications.

### 3.4.1 NETWORK CABLING

The Network connector is a RJ48 modular type connector with a RJ48-to-DB15 pigtail cable. Depending upon the configuration of the network either connect the network line cable directly into the unit or first connect the supplied RJ48-to-DB15 pigtail cable into the unit and then connect the network line cable to the DB15 end of the supplied pigtail cable. Refer to Figure 2-3.

### 3.4.2 DTE CHANNEL CABLING

The FT1-4 is configured to use one or more of the following connectors, depending upon the model: 34-pin M block, female (V.35 interface); DB25, female (RS-232); DB37, female (RS-449); RJ connector, female (PBX direct interface). The cable for Channel 1 data must be attached to the interface connector labelled Channel 1 at the rear of the FT1-4; and so on for channels 2, 3, and 4.

### 3.4.3 ASCII TERMINAL, PRINTER INTERFACE, AND AUXILIARY INTERFACE CONNECTORS

The ASCII terminal port, the printer port, and the Auxiliary Interface are currently inactive for the FT1-2 and the FT1-4.

#### NOTE

**The Auxiliary, Printer, and Terminal ports are available on this unit, but they are currently inactive. If you have questions concerning these ports, please contact your dealer.**

### 3.4.4 POWER CABLE

Power to the FT1-4 or the FT1-2 is supplied via a seven foot AC Power Cable. Insert the power cable female connector into the power connector at the rear of the unit. Insert the power cable male connector into a grounded AC power connector. At this time power is not applied to the unit.

#### NOTE

**Before connecting the power cable to the FT1-4 or FT1-2, ensure that the power ON/OFF switch, located on the rear of the FT1-4, is in the OFF (0) position.**

### 3.5 INITIAL POWER UP

To apply power to the FT1-4 or FT1-2, position the ON/OFF switch to the ON (1) position. The unit responds by displaying the top menu function on the LCD.

At this time the unit is ready for initial configuration. Refer to Chapter 4 for the programming instructions.

# 4. Operation (Programming)

## 4.1 INTRODUCTION

The FT1-4 is controlled by a series of simple commands that the operator can select by viewing the LCD display and interacting with the Function keys on the front panel. These programming functions are illustrated in Figure 4-1.

### 4.1.1 MODIFY CONFIGURATION

To modify a configuration or to build a configuration for storage in a memory bank, first enter the correct information in the worksheet beginning on the next page. This worksheet should be copied so that when completed it can be saved for future reference. Before completing the worksheet, the user should have a complete understanding of the setup of the FT1-4 format processor. Refer to both the MODIFY THE AGGREGATE and MODIFY THE CHANNEL subsections in this manual before completing this worksheet.

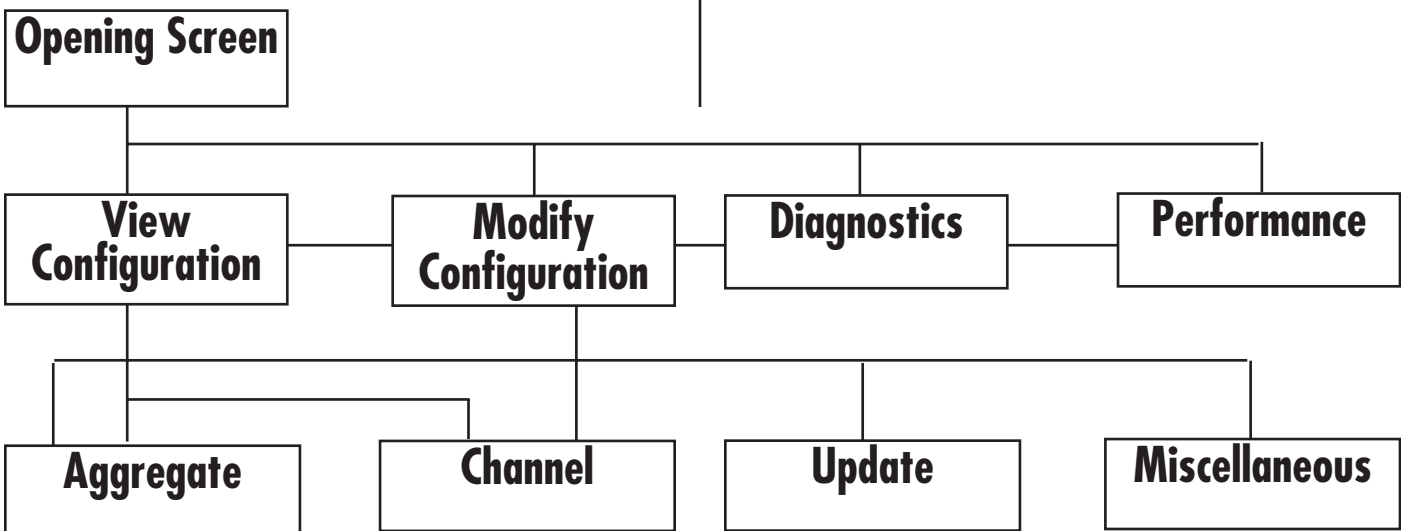


Figure 4-1. Programming

# Modify Configuration Worksheet

**CUSTOMER NAME:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**CUSTOMER LOCATION:** \_\_\_\_\_

**CONFIGURATION:** \_\_\_\_\_

## AGGREGATE CONFIGURATION

1. NETWORK TIMING:

- A. INTERNAL(MASTER)
- B. LOOP (SLAVE)
- C. EXTERNAL (CHANNEL 1 TCE) NOTE 1
- D. EXTERNAL (CHANNEL 3 TCE) NOTE 1

*or*

- E. STATION CLOCK NOTE 2

### NOTE 1

If either the External Channel 1 TCE or External Channel 3 TCE selection is made, then the associated channel timing must be set to Loop 1 Timing. When operating in this mode, the FT1-4 derives network timing from the DTE.

### NOTE 2

If station clock is selected, then the system allows the user to select the station clock rate. The station clock rate may be any rate from 8kb/s to 1.544mb/s in multiples of 8kb/s.

2. FREQUENCY

\_\_\_\_\_

3. NETWORK FRAMING:

- A. D4 \_\_\_\_\_
- B. ESF(ANSI) \_\_\_\_\_
- C. ESF(54016) \_\_\_\_\_

### NOTE 3

The two types of ESF refer to the protocol employed to handle messages within the facility data link. ANSI refers to the American National Standards Instituto Specification - T1.403.

54016 refers to the AT&T Technical Reference 54016. Consult your service provider to determine the correct selection for your application.

4. NETWORK LINE CODE:

- A. AMI \_\_\_\_\_
- B. B8ZS \_\_\_\_\_

5. NETWORK INTERFACE:

- A. CSU \_\_\_\_\_
- B. DSX-1 \_\_\_\_\_

6. OUTPUT PULSE: (DSX-1 Mode Only. Verify that the LBO Switch is in the 0dB position.)

- A. 0 - 133 FT \_\_\_\_\_
- B. 133- 266 FT \_\_\_\_\_
- C. 266 - 399 FT \_\_\_\_\_
- D. 399 - 533 FT \_\_\_\_\_



E. 533 - 655 FT \_\_\_\_\_

**7. LBO SETTING:**

A. -1 5dB \_\_\_\_\_

B. -7.5dB \_\_\_\_\_

C. 0dB \_\_\_\_\_

**NOTE 4**

**When operating in the DSX-1 Mode, the LBO Switch must be in the 0dB position.**

**8. DTE Channel Multiples:**

N x 56 KBPS \_\_\_\_\_

N x 64 KBPS \_\_\_\_\_

Selectable N x 56 Rates: 8, 16, 24, 32, 40, 48, 56, 64, 112, 168, 192, 224, 280, 320, 336, 448, 560, 672, 840, 960, 1120, and 1344 Kbps.

Selectable N X 64 Rates: 8, 16, 24, 32, 40, 48, 64, 128, 192, 256, 320, 384, 512, 640, 768, 960, 1280, and 1536 Kbps.

**NOTE 5**

**This selection does not have any correlation with the Density Format employed when the FT1-4 builds the T1 Frame: that is, N x 56 KBPS does not imply "bit 7 stuffing" and N x 64 KBPS does not imply "clear channel". These density selections are a per channel basis within the channel configuration.**

**8. DENSITY MONITOR:**

A. 1 IN8 \_\_\_\_\_

B. 1 IN 16(DEFAULT)

C. 1 IN64 \_\_\_\_\_

D. NONE \_\_\_\_\_

**NOTE 6**

**This selection is most critical when the CSU functionality is selected and the FT1-4 must protect against density violations. It is recommended that the user consult the service provider with regards to this selection.**

**CHANNEL CONFIGURATION**

1. CHANNEL NUMBER: \_\_\_\_\_

2. CH DENSITY:

A. NONE (CLR CH) \_\_\_\_\_

B. ALTERNATE DS0 \_\_\_\_\_

(Alternate DS0 Stuffing) \_\_\_\_\_

C. BIT 7 STUFFING \_\_\_\_\_

(1 In 8 Bit Density Inserted) \_\_\_\_\_

3. CHANNEL DATA RATE: \_\_\_\_\_

4. STARTING DS0 NUMBER: \_\_\_\_\_

5. CHANNEL TIMING:

A. LOOP 1 \_\_\_\_\_ (Send timing is loop backed to the FT1-4 as Terminal Timing via the DTE)

B. LOOP 2 \_\_\_\_\_ (Send timing is loop backed as terminal timing internally to the FT1-4.)

6. CLOCK INVERT:

A. ON \_\_\_\_\_

B. OFF \_\_\_\_\_

**NOTE 7**

**This selection, when ON, inverts the clock selected in Step 5 above. It is most applicable when LOOP 2 Timing is selected.**

7. DATA INVERT

A. ON \_\_\_\_\_

B. OFF \_\_\_\_\_

STORE CONFIGURATION IN BANK

\_\_\_\_\_

OR UPDATE CURRENT CONFIGURATION

\_\_\_\_\_

**4.1.2 AGGREGATE CONFIGURATION**

Using the completed worksheet as a guide, enter the aggregate information into the FT1-4 as follows:

1. Select MODIFY CONFIGURATION by scrolling down from the top level sign-on message and then right or left until the MODIFY CONFIGURATION selection appears.
2. When the MODIFY CONFIGURATION selection appears on the LCD, scroll down, then right or left until the AGGREGATE function appears on the LCD.
3. Scroll down to the TIMING function and then right or left until the desired selection appears on the LCD.
4. If Station Clock is selected, the next selection down is Station Clock Frequency. Scroll right or left to select the desired rate.
5. Scroll down to the FRAMING function and then scrolling right or left, select either D4 or ESF framing.

6. Select the NETWORK LINE CODE by scrolling down and then right or left until the desired line code appears on the LCD.
7. Scroll down to the NETWORK INTERFACE selection and select CSU or DSX-1 as desired.
8. If in the DSX-1 mode, the OUTPUT PULSE is the next selection that must be entered. Scroll down to the OUTPUT PULSE function and then right or left until the desired distance is displayed.
9. The next display down is the LBO switch setting. This cannot be changed from the front panel; it can only be viewed. It maybe changed with the slide switch at the rear of the unit.
10. Scrolling down through the displays, the next function is the DTE CHANNEL MULTIPLES selection. Select either N x 64K or N x 56K by scrolling either right or left. This selection dictates what rates are available for all channels.
11. The last selection in the AGGREGATE CONFIGURATION function is DENSITY MONITOR. Scroll right or left until the desired selection is displayed.

**4.1.3 CHANNEL CONFIGURATION**

Using the completed worksheet as a guide, enter the channel(s) information into the FT1-4 as follows:

1. Scroll down from the MODIFY CONFIGURATION and then either right or left until the CHANNEL function is displayed.
2. Scroll down and then right or left until the desired channel number is displayed.
3. Scroll down and then right or left until the correct CH DENSITY selection is displayed.
4. Again scroll down until the DATA RATE function is displayed and then right or left until the desired rate is displayed.
5. The next selection to be made is the STARTING ADDRESS. Scroll down and right or left until the desired starting address is displayed.
6. CHANNEL TIMING is the next function to be accessed. Select either LOOP 1 or LOOP 2 by scrolling right or left until the desired timing is displayed.

7. **CLOCK INVERT** is the next function to be determined. Select either **ON** or **OFF** by scrolling right or left after the **CLOCK INVERT** function is displayed.

8. **DATA INVERT** is the next function to be displayed during the channel configuration operation. Once displayed, select either **ON** or **OFF** by scrolling right or left until the desired alternative is displayed.

#### 4.1.4 UPDATE CONFIGURATION

When either the **AGGREGATE** or the **CHANNEL** or both functions have been changed it is necessary to **UPDATE** the current configuration or **STORE** the changes in a configuration bank. If it is determined that the latest changes are not desired, then the operator can also **CLEAR** the latest entries made during configuration function. The operator can also retrieve a previously stored configuration from any one of the four storage banks available in the FT1-4.

#### 4.1.5 UPDATE FUNCTION

To update the FT1-4 configuration previously entered or retrieved, perform the following steps.

1. Scroll down from the **MODIFY CONFIGURATION** menu and then right or left until **UPDATE** appears on the LCD.
2. Scroll down to the display **TO UPDATE CONFIG** **PRESS ENTER**. If the configuration is correct depress the **ENTER** key. The updated configuration is brought online.

#### 4.1.6 STORE CONFIGURATION

To store a configuration defined during the **MODIFY CONFIGURATION** function, perform the following steps.

1. Scroll down from the **MODIFY CONFIGURATION** and then right or left until the **UPDATE** function appears on the LCD.
2. Scroll right or left until the **STORE CONFIGURATION** function appears on the screen.
3. Scroll down and then right or left until the desired storage bank number appears on display.
4. When the desired storage bank number appears on the display, depress **ENTER**.

#### 4.1.7 RETRIEVE CONFIGURATION

To retrieve a previously stored configuration, perform the following procedure.

1. Scroll down from the **MODIFY CONFIGURATION** and then right or left until the **RETRIEVE CONFIGURATION** function appears on the display.
2. Scroll down and then right or left until the desired storage bank number appears on the display.
3. Depress **ENTER**. The desired configuration has been retrieved. To bring this configuration online perform an **UPDATE** configuration operation.

If the operator attempts to retrieve from a storage bank that does not contain a configuration, the following message is displayed:

### ILLEGAL CONFIG

If there is a configuration available, then the following message appears:

### RETRIEVED

**4.2 View Configuration**

The VIEW CONFIGURATION function (see Figure 4-2) allows the operator to step through the both the aggregate and channel(s) configurations presently setup to run the FT1-4. Although both the aggregate and each channel configuration may be viewed, they may not be altered while in this menu selection. A lower case “v” appears in the lower right hand corner of the display to indicate that the unit is accessing the VIEW function. To escape from this function or any other function depress the UP arrow key until the top level sign on message appears on the LCD.

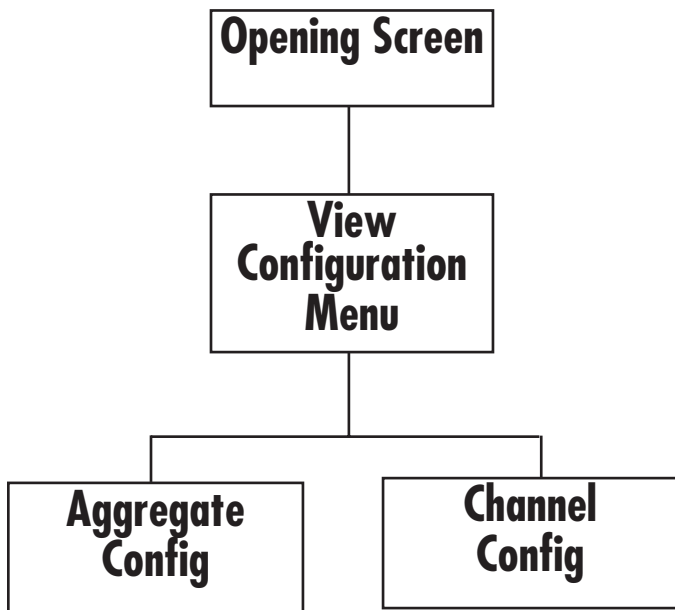


Figure 4-2. View Configuration

**4.3 Aggregate Configuration**

If the AGGREGATE (See Figure 4-3) function is selected for viewing, the first display is the type of NETWORK TIMING presenting employed by the aggregate to transmit data to the network. There are three types of timing available for the FT1-4. They are Internal (Master), External (EXT CH1 TCE, EXT CH3 TCE or STATION CLOCK), and Loop (SLAVE).

**NOTE**

If station clock is selected, the user is directed to specify the exact station clock speed(8Kbps to 1.544Mbps in 8Kbps multiples) by scrolling through the speed selection menu that follows the NETWORK TIMING menu. Station Clock must be supplied at the Auxiliary port as a balanced signal per RS-422 Electrical Requirements.

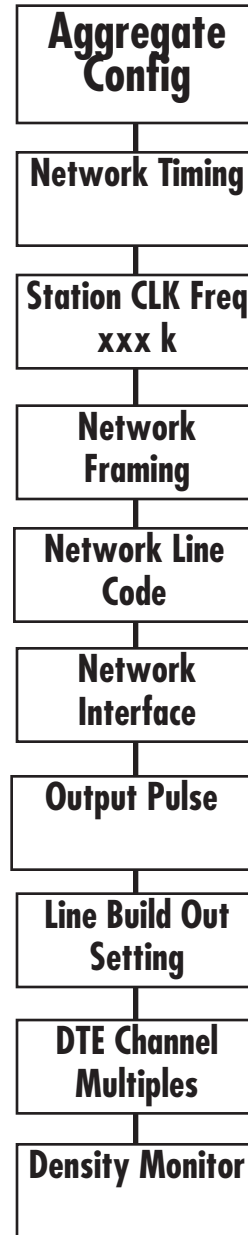


Figure 4-3. The View Aggregate Programming

The next function to be viewed is NETWORK FRAMING. There are three types of Network Framing available on the FT1-4. They are Superframe Format(D4), ANSI Extended Super Frame(ESF), or 54016 ESF. Depending upon what is currently set up on the system, either one or the other is displayed.

Following the NETWORK FRAMING function, the operator may view the NETWORK LINE CODE presently enabled. The line code is either Alternate Mark Inversion(AMI) or Bipolar 8 Bit Zero Suppression(B8ZS).

The next display down allows the operator to view the current NETWORK INTERFACE being employed by the FT1-4. There are two interfaces presently available. They are either the CSU type or the DSX-1 type of interface.

Depending upon the type of interface presently employed in the system, the next display is either the state of the Line Build Switch or the distance associated with the output pulse. The state of the Line Build Out is displayed when the network interface is the CSU type. The distance associated with the output pulse is displayed when the network interface type is DSX-1.

Channel Data Rates are specified as either N x 64k or N x 56k. When the selection is made the operator has the choice of two sets of unique channel data rates that may be selected.

Finally, the density monitor function is displayed. The DENSITY MONITOR will reflect one of the four choices that can be made during the modify configuration selection. They are:

**1 in 8**

**1 in 16**

**1 in 64**

**NONE.**

## 4.4 View Channel Configuration

To VIEW the channel configuration (see Figure 4-4), enter the VIEW CONFIGURATION function and depress the DOWN ARROW. This displays either the AGGREGATE or CHANNEL function depending on the way the unit was last accessed. If the word AGGREGATE is displayed, then depress the right or left arrow key and the word channel will appear. When the word CHANNEL appears, depress the down arrow and one of the four channels will appear in the LCD display. To VIEW an individual channel, depress the right or left arrow key until the number of the desired channel appears in the LCD.

Depress the down arrow and the first of the channel configuration functions comes into view - CH DENSITY. Depending on the current configuration of the FT1-4, one of the following is displayed on the LCD:

**NONE(CLR CH)**

**ALTERNATE DSO**

**BIT 7 STUFFING.**

Once the CH DENSITY function has been viewed, the operator can access the data rate associated with the selected channel by depressing the down arrow. Included in the data rate display is the count of the number of DSOs necessary to support the desired rate.

Following the data rate display, the starting address of the selected channel is displayed. This is a DSO number from one to twenty-four.

The next function down is the TIMING MODE previously selected for the particular channel being accessed. Depending on the type of timing required for the channel function, either LOOP 1 or LOOP 2 is displayed on the LCD.

The next function to be displayed is the INVERT CLOCK information. This function is either ON or OFF depending upon the particular application.

Next, the DATA INVERT function is displayed. This function is either ON or OFF depending upon the particular configuration.

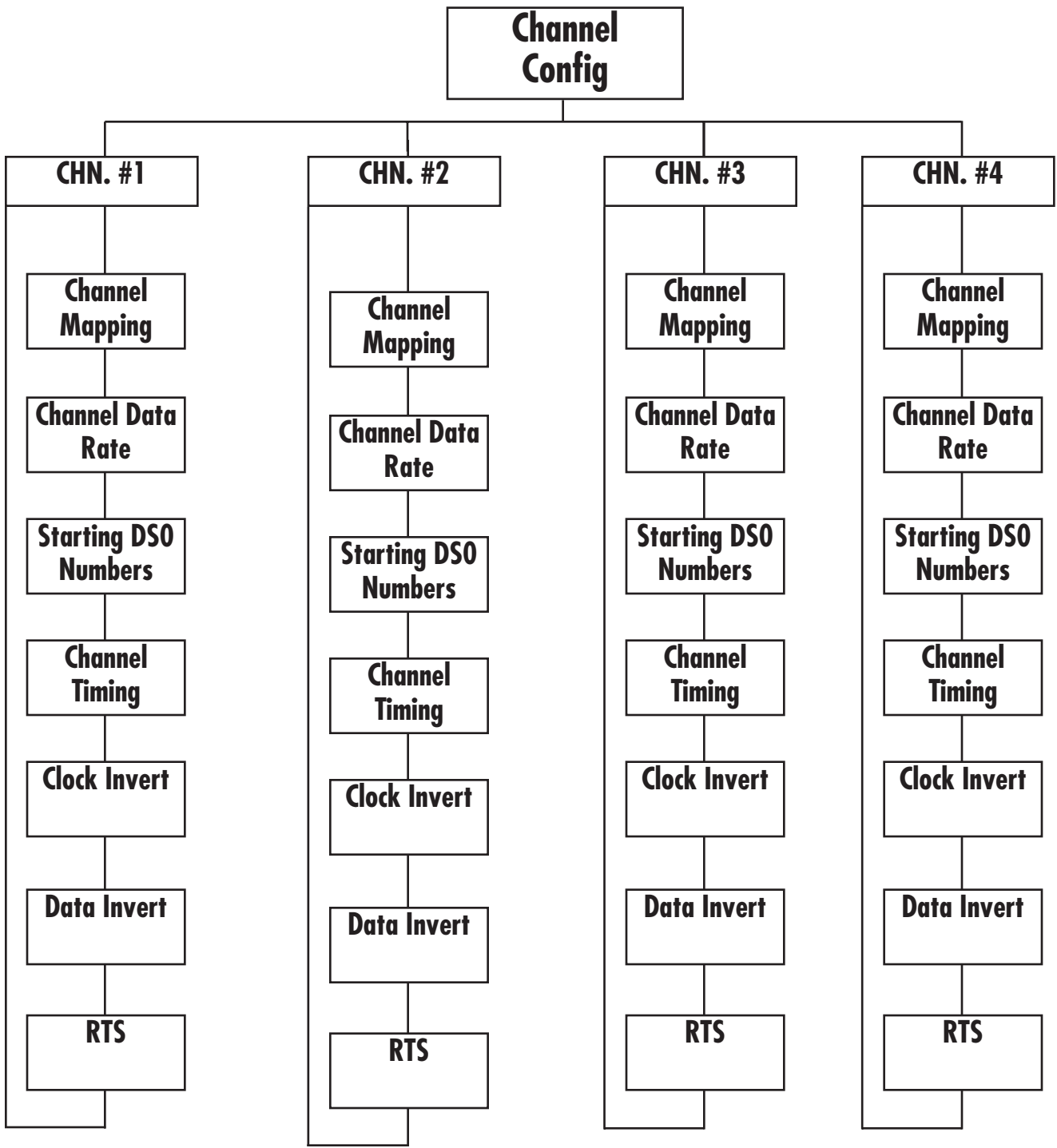


Figure 4-4. View Channel Configuration.

### 4.5 Modify Configuration

The MODIFY CONFIGURATION function allows the operator to initially program the FT1-4, change any of the parameters already programmed, perform the update function, or address the miscellaneous functions available with the FT1-4.

When accessing the MODIFY CONFIGURATION function, the letter “m” appears in the lower right hand corner of the display to indicate that the operator is in the MODIFY CONFIGURATION section. To configure the FT1-4 for your configuration, scroll through the AGGREGATE and CHANNEL sections making the required changes by using the right and left function keys. If it is decided that the configuration previously entered is not required, go to the update section and invoke the CLEAR CONFIGURATION command. After making all the desired changes, go to the UPDATE section and invoke the UPDATE LOCAL UNIT command to actually bring the modified configuration on line.

Within the AGGREGATE and CHANNEL sections, when a difference exists between the displayed selection and the downloaded selection, the letter “m” will blink in the selected display as well as the top level display. Note, that the VIEW configuration always represents the down-loaded configuration.

Changes within the MISCELLANEOUS section such as TIME/DATE, PRINTER, and TERMINAL configurations, take place immediately and do not require an UPDATE command.

### 4.6 Modify The Aggregate

To initially program or to modify the existing aggregate parameters(See Figure 4-5), depress down arrow and then either the right or left arrow until the words AGGREGATE CONFIGURATION appears in the LCD. Then depress the down arrow and the function TIMING appears along with the default or current selection for the TIMING source. There are three (optional four) alternatives available at this location. They are INTERNAL (MASTER), LOOP (SLAVE), EXTERNAL CHANNEL 1 TCE (an optional EXTERNAL CHANNEL 3 TCE), or STATION CLOCK.

**NOTE**

In the version of the FT1-4 that accepts STATION CLOCK, the EXTERNAL

CHANNEL 3 TCE selection is not available. If STATION CLOCK is specified, the user must specify the exact station clock speed(any speed is acceptable from 8kb/s to 1.544Mb/s in 8kb/s increments). It depends upon the speed of the station clock itself and must correspond to that speed.

If the operator intends to use the on-board crystal associated with the FT1-4 for the timing source, then the selection to made is INT(MASTER). If the

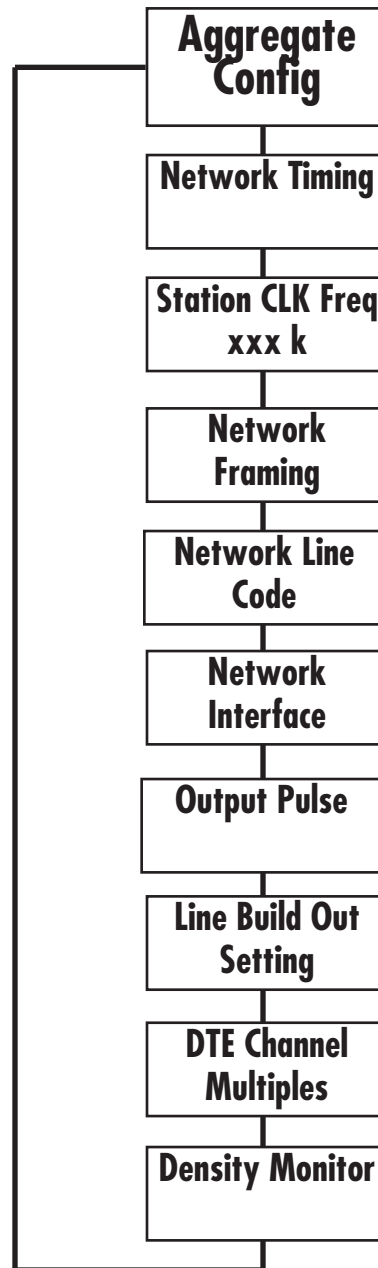


Figure 4-5. Modify the Aggregate

transmission of data is to be timed from the Channel 1 Terminal Timing Signal then the selection is EXTERNAL. When the operator wants to time the data transmission with the timing signal derived from the network receive data then the proper selection is LOOP.

Once the AGGREGATE TIMING function has been determined, the NETWORK FRAMING type may be entered. There are three framing types available to choose from with the FT1-4. They are D4 or two types of Extended Superframe (ESF). The D4 selection allows the unit to operate over traditional T1 transmission lines. If available, either Extended Superframe format offers enhanced monitoring of network integrity.

The next selection is the NETWORK LINE CODE. Choices for the Bipolar network data encoding scheme are either the Alternative Mark Inversion (AMI) method or the B8ZS method.

Following the NETWORK LINE CODE entry, the type of NETWORK INTERFACE is specified. The system may be configured in one of two ways. The network interface type will be either a CSU or DSX-1. Again the Network Line Code will appear as either the last configuration or as the default state.

The next selection to be made depends on the type of interface previously selected. If DSX-1 is selected then the OUTPUT pulse must be specified. If the CSU is selected then the OUTPUT PULSE selection is ignored.

Depending on the distance to the external CSU or other device, the user must define the OUTPUT PULSE. Within the OUTPUT PULSE section, the user can scroll through the four selections by depressing the right or left directional key until the appropriate distance is displayed on the LCD. The four selections are:

- 000- 133 Feet
- 133- 266 Feet
- 266- 399 Feet
- 399- 533 Feet
- 533 - 655 Feet.

The Line Build Out is the next selection in the AGGREGATE configuration menu. The setting of the switch is specified by the operating company

and the actual positioning of the switch is accomplished on the rear panel of the FT1-4. There are three positions available with the LINE BUILDOUT switch. They are:

- 15 Db
- 7.5 Db
- 0 Db

This display reflects what has been selected at the rear panel. If DSX-1 is chosen as the network interface, then the LBO switch must be set to the 0dB position. If the FT1-4 is in the DSX-1 mode and the LBO switch is not in the zero position, then the system displays the message:

### ILLEGAL LBO SETTING

If this occurs, position the LBO switch, at the rear of the unit, to 0dB.

The DTE CHANNEL MULTIPLES is the next information that is specified. It is specified as either N x 64k or N x 56k depending on the desired set of channel data rates. N x 64k provides the following rates to choose from: 8, 16, 24, 32, 40, 48, 64, 128, 192, 256, 320, 384, 512, 640, 768, 960, 1280, 1536 (Kbps).

N x 56k provides the following rates to choose from: 8, 16, 24, 32, 40, 48, 56, 64, 112, 168, 192, 224, 280, 320, 336, 448, 560, 672, 840, 960, 1120, 1344 (Kbps).

### NOTE

**If channels rates are programmed and the N x 64 or the N x 56 entry is changed, then the data rate information is corrupted and must be re-entered.**

This selection does not have any correlation with the Density Format employed when the FT1-4 builds the T1 Frame: that is, N x 56 KBPS does not imply "bit 7 stuffing" and N x 64 KBPS does not imply "clear channel". These density selections are a per channel basis within the channel configuration.

The last display is the DENSITY MONITOR function. The DENSITY MONITOR must reflect one of the following four choices:



1 in8

1 in 16 (default)

1 in 64

NONE.

## NOTE

**If data does not conform to the density specified, then the data integrity can not be guaranteed.**

If the first choice is selected, and 8 consecutive zeros are detected in the network transmit data stream then the eighth zero is forced to the one state. If the second choice is selected, and 16 consecutive zeros are detected in the network data stream, then the sixteenth zero is forced to a one state. If the third choice is selected, and 64 consecutive zeros are detected in the transmit data stream then the 64th zero is forced to a one state. finally, if NONE is selected, then the density is not monitored. Note, if B8ZS is selected then DENSITY MONITORING should be specified as NONE. Using the right or left arrow keys scroll through the selections until the desired DENSITY appears on the LCD.

## 4.7 Modify Channel

The MODIFY CHANNEL functions(See Figure 4-6) allow the operator to configure the individual channels to correspond to the required application.

When it is necessary to initially configure a channel or to change a channel configuration already in place, the first function to accomplish is the actual channel selection process. Scrolling right from the AGGREGATE CONFIGURATION selection, the CHANNEL CONFIGURATION function is entered. At this time scroll through the channel numbers until the number of the desired channel appears on the LCD. Depress the down function key and the CH DENSITY function appears on the screen.

The CH DENSITY function defines how the individual channel's data is formatted into the T1 frame. One of three types of channel mapping is selected on a per channel basis:

**NONE(CLR CH)**

**ALTERNATE DS0**

**BIT 7 STUFFING**

If NONE (CLR CH) is selected then data is mapped as 8 bits per DS0. If ALTERNATE DS0 is selected, then data is mapped as 8 bits per DS0, into alternate DS0s, while all ONES are inserted into the remaining DS0s. Note, this method requires twice the normal amount of bandwidth. Finally, if BIT 7 STUFFING is selected, data is mapped as 7 bits per DS0 and the eighth bit is forced to a ONE state. Scroll through the CH DENSITY selections until the desired mapping function is displayed.

The next function to be defined is the specific data rate associated with the channel being configured. To assign a data rate to an individual channel, bring up the DATA RATE display and scroll through the data rate selection until the desired rate is displayed.

## NOTE

**If the actual data rate was previously programmed and the channel mapping is changed then the data rate is corrupted.**

## NOTE

**Once a data rate is selected for an individual channel, then only the data rates remaining are displayed on the LCD for the other channels.**

Following the data rate selection, the next function down is the starting address for this individual channel or the first DS0 assigned to this channel. Note, that illegal addresses are not displayed. When configuring the next channel notice that only the available DS0 addresses are displayed on the LCD.

## 4.8 Channel Timing

Depending on the requirements of the type of equipment attached to the individual channel, the channel timing must be specified as one of two modes. The modes are LOOP 1 or LOOP 2. Loop 1 timing, the preferred mode, is when the attached equipment transmits a clock signal (terminal timing or Transmit Clock External) along with the transmit

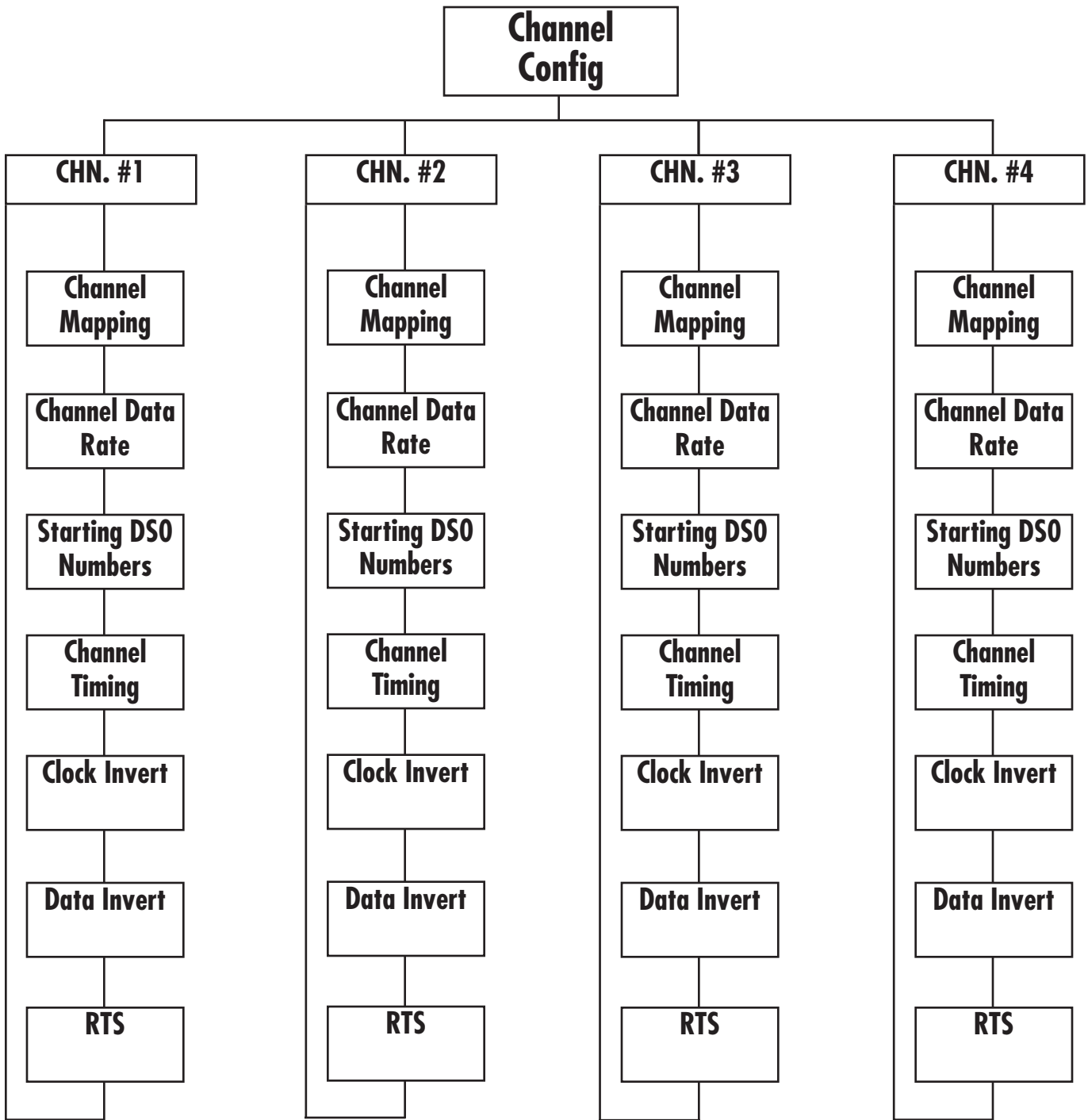


Figure 4-6. Modify Channel Configuration.

data and the FT1-4 using this for its channel timing. The Loop 2 timing is specified when the attached equipment does not transmit a clocking signal to be used by the FT1-4. In this mode, the clock transmitted from the FT1-4 to the DTE, SEND TIMING, is used. If Loop 1 Timing is selected and the clock is not present at these leads, the FT1-4 will default to Loop 2 Timing until the clock becomes active.

For a more complete understanding of the timing options and the associated selections, refer to Table 4-1.

INVERT CLOCK when selected as ON, inverts the clock selected by the channel timing mode. This is often used when LOOP 2 timing is selected. When INVERT DATA is ON, the channel data is inverted

over the network. Selection A causes the FT1-4 to ignore the DTE's RTS status and holds it constantly ON. Selection B enables the FT1-4 to multiplex the status of RTS(as dictated by the DTE) with the data for transmission across the network. This status is received by the remote channel and interpreted as DCD. In this mode, RTS must be turned on by the DTE to transmit data.

### 4.9 The Update Function

The UPDATE function(See Figure 4-7)allows the operator to perform four unique FT1-4 programming operations. They are the actual UPDATE operation, STORE as many as four alternative configurations, RETRIEVE any one of the four alternative configurations, and CLEAR any configuration currently being modified.

SELECTION	SOURCE	COMMENTS
INT (Master).....	On board crystal .....	None
Loop (Slave) .....	Received Clock .....	None
Ext. Ch. 1 TCE .....	Channel 1 Terminal Timing.....	Channel 1 must be in Loop 1 Timing
Ext. Ch. 3 TCE .....	Channel 3 Terminal Timing.....	Channel 3 must be in Loop 1 Timing
Station Clock .....	Station .....	Station Clock Rate must be specified

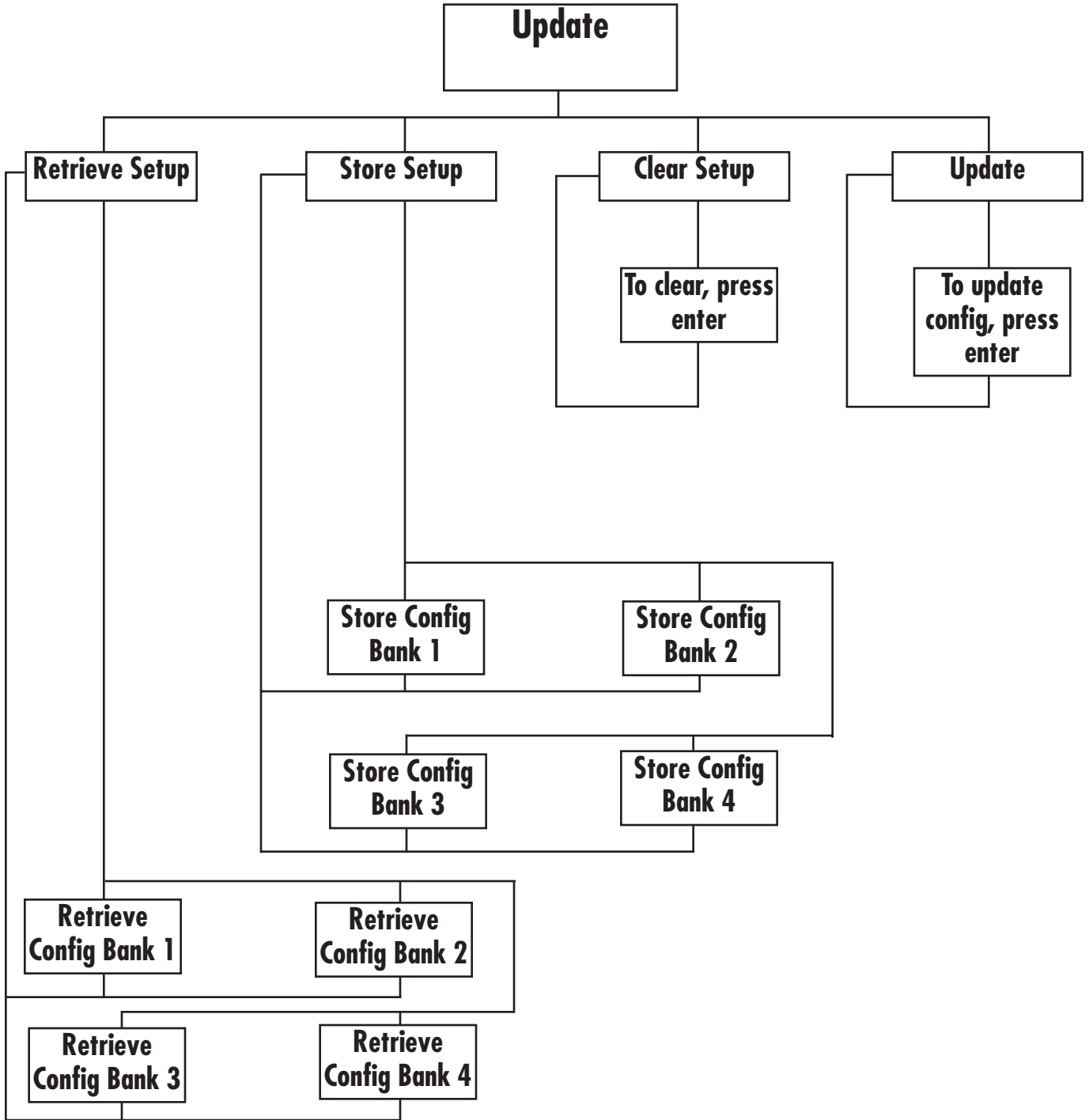
**Table 4-1. Timing Selections.**

**NOTE**

If EXT(CH1 TCE) or EXT(CH3 TCE) is chosen for timing and the data rate for the corresponding channel is not specified, then the UPDATE will default to MASTER TIMING.

**4.9.1 RETRIEVE CONFIGURATION**

To retrieve a previously stored configuration, enter the RETRIEVE SETUP mode (See Figure 4-7) and then scroll through the four storage banks to access the desired configuration. To retrieve the desired configuration, press ENTER. If a configuration is present, then the LCD will display the message: RETRIEVED. If the configuration is missing then



the LCD will display the message: ILLEGAL. When the desired configuration is accessed, it may be viewed with the MODIFY function to verify its contents. If the configuration is not the desired configuration then clear it by entering the CLEAR CONFIG. If the configuration is correct, then use the UPDATE function to bring the configuration on-line.

## NOTE

**If the Aggregate Timing specified in the retrieved configuration is EXT(CH3 TCE) and only one channel card is installed, the Timing will default to MASTER timing. Channel 3 and 4 information will also be cleared.**

### 4.9.2 STORE CONFIGURATION

To store a configuration generated during the MODIFY CONFIGURATION function, enter the STORE CONFIGURATION function (see Figure 4-7) and scroll through the STORE CONFIGURATION BANKS until the desired bank is accessed and then depress the ENTER key. This configuration is accessible through the RETRIEVE SETUP function.

### 4.9.3 CLEAR CONFIGURATION

The CLEAR CONFIGURATION function (See Figure 4-7) allows the operator to erase any configuration modification accomplished before the UPDATE function is activated to implement the modified configuration. Once the modified configuration is cleared, the system reverts back to the previous controlling configuration. To clear a presently modified configuration depress the ENTER key while in CLEAR CONFIGURATION.

### 4.9.4 UPDATE

The UPDATE function (See Figure 4-7) performs the actual configuration change from what is presently controlling the operation of the system to the new modified configuration or to a previously stored and accessed configuration. To change the operating configuration, enter the UPDATE function and then depress ENTER. The new configuration immediately takes control of the FT1-4. During an UPDATE operation, all pushbuttons are inoperative.

## NOTE

**If the timing is specified as EXT(CH1 or CH3), but data is not available then the system defaults to MASTER timing.**

## 4.10 Miscellaneous

The Miscellaneous function (See Figure 4-8) allows the operator to set the Date and Time and configure both the printer and terminal ports.

### 4.10.1 DATE AND TIME

The date and time allow the operator to set the current date and time so that all reports and alarms will have the proper date/time stamp. To set the correct time, scroll down through the current time to the SET TIME COMMAND. Then depress ENTER. This allows the operator to access the SET HOURS function. The clock may be either a 24 hour or a 12 hour clock. To select the type of clock depress the right or left key until the desired type of clock is displayed. Then scroll through the numbers until the correct hour is displayed. Then press the down key.

To set the minutes function enter the SET MINUTES command. Scroll through the numbers 1 through 59 using the right or left arrow. When the correct number is displayed depress down.

## NOTE

**To exit from the set time function, depress the ENTER key.**

To set the correct date scroll down through the current date to the SET DATE COMMAND. Then depress enter. This allows the operator to access the SET MONTH function. Scroll right or left until the number (1 -12) corresponding to the desired month appears on the screen. Then depress DOWN KEY.

Depressing the down key displays the SET DAY function. Scrolling right or left through this function displays the numbers 1 through 31 which corresponded to the days of the month. Depress DOWN KEY to select the correct day.

Depressing the down key displays the SET YEAR comment. Scrolling through this function with the right or left arrows allows the user to select the correct year. Depress the DOWN key when the correct year is specified.

**NOTE**

Depressing the ENTER key will exit the user from this function.

**4.10.2 TERMINAL/PRINTER FUNCTIONS**

The terminal and printer functions are not implemented at this time.

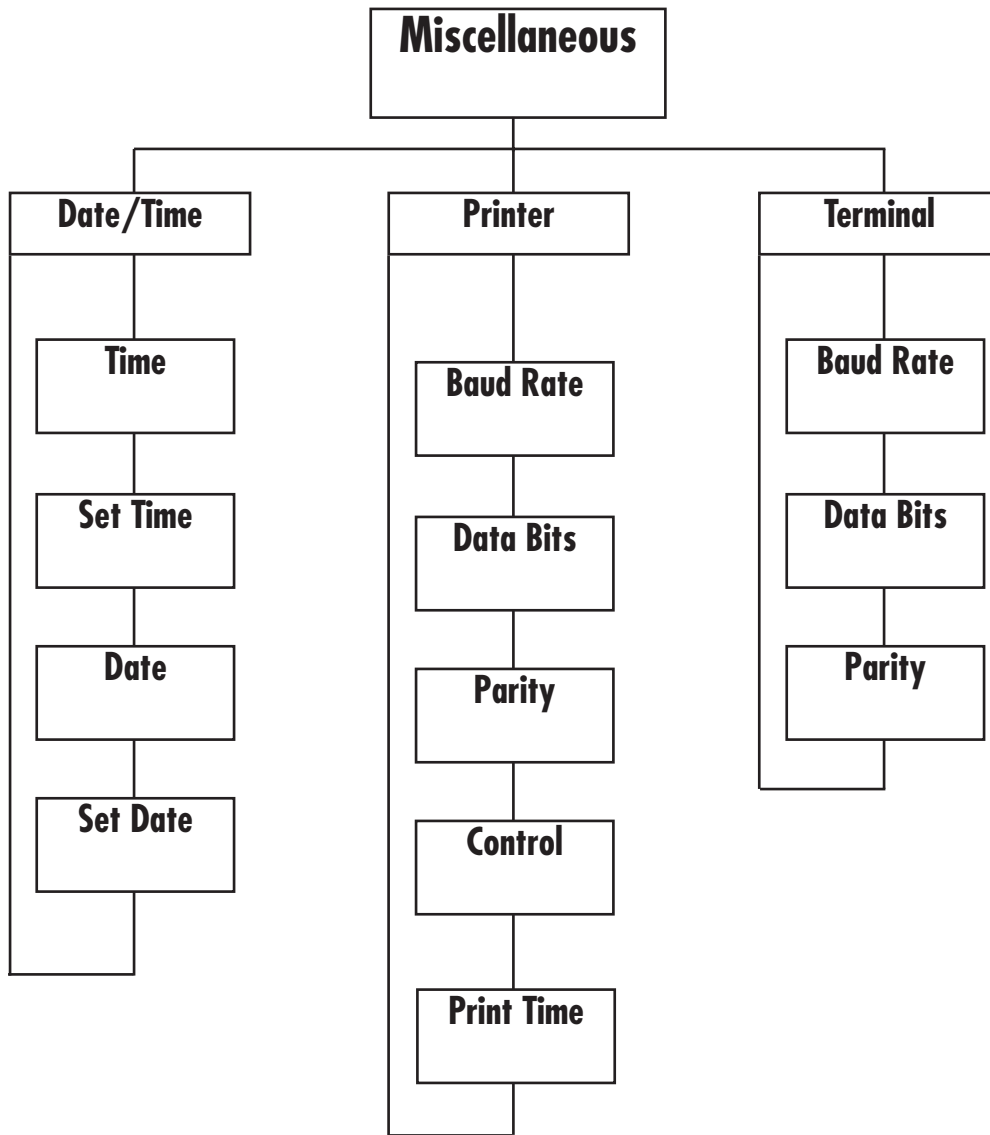


Figure 4-8. Miscellaneous.

## 4.11 Performance

There is a difference between failure and approaching failure in T1 networks. By monitoring the vital signs of the network a user can predict a network failure and via preventative maintenance avert extensive down time. The performance monitoring encompasses: Cyclic Redundancy Check 6, Out Of Frame events, Superframe errors events, Errored Seconds, Severely Errored Seconds, Failed Signal State, Failed Seconds, and Bipolar Violations. In addition, there is an alarm function and the ability to clear or freeze registers. Separate banks of information are maintained for both the user and the service provider. The user bank of information is completely controlled (cleared or frozen) by the user while the service provider bank of information can be controlled (cleared or frozen) only from the network. Refer to Figure 4-9 on the next page for the following discussion.

### 4.11.1 CYCLIC REDUNDANCY CHECK 6

The Cyclic Redundancy Check 6 function (ESF only) permits the unit sending the data to perform a calculation on the data using a predefined algorithm. The result of which is sent along with data. The receiving unit strips out this calculation, performs the same calculation on the data, and then compares the two results. If the results compare, then the data is valid. If the calculations do not compare, then there is a CRC 6 error. The CRC 6 mechanism permits the user a complete view of the T1 transmission quality. It can be translated into a bit error rate. The assumption can be made that each CRC error is equal to one bit error. Therefore, monitoring the CRC errors gives the user an accurate indicator of degrading transmission performance. This makes it possible to initiate repairs before a critical outage occurs.

To clear this register, invoke the CLEAR ERROR EVENTS or CLEAR ALL REGISTERS function.

### 4.11.2 OUT OF FRAME EVENTS

When any two of four consecutive frame-synchronizing bits are incorrect, the Out Of Frame event occurs and OOF register is incremented. If this occurs, it indicates that the FT1-4 can no longer guarantee that it is synchronized with the data stream. It then begins searching the data stream for a framing bit pattern in an attempt to resynchronize. This also is a serious problem because without the framing synchronization, the

data has no beginning or end and the data must be invalid. The information is accessed by the user only and the storage register is cleared by either the Clear All Register command or the Clear Error Events Command

### 4.11.3 SUPERFRAME ERROR EVENT REGISTER

The SuperFrame Error Event Register is the same as the OOF when in the D4 operation. This information is stored in a 16 bit register and is accessed by both the user and the network. The information is cleared by either the Clear Error Events or the Clear All Registers Commands.

### 4.11.4 EXTENDED SUPERFRAME ERROR EVENT REGISTER

The Extended SuperFrame Error Event function is an accumulation of the OOF events and the CRC 6 errors previously defined. This information is stored in a 16 bit register and is accessed by both the user and the network. The information is cleared by either the Clear Error Events or the Clear All Registers Commands.

### 4.11.5 CURRENT ERRORED SECONDS

This information is a count of the number of real time seconds containing one or more ESF/SF error events. The processor polls the ESF/SF Error Events Register every second and increments the Current Errored Seconds register if an event has occurred. This count continues for 15 minutes and then the register is cleared and a new count is initiated. A history of this register is contained in the History of Errored Seconds Registers. This register is cleared with the clear all register function.

## NOTE

**All "current" error displays are updated each second and contain the number of errors followed by the number of seconds into the current interval.**

### 4.11.6 HISTORY OF ERRORED SECONDS

A history of the Errored Seconds contains the record of the previous ninety-six 15 minute intervals of errored seconds. This register is cleared with the clear all register function.

### 4.11.7 ERRORED SECONDS TOTAL

The total of the Errored Seconds is a computation of ninety-six 15 minute interval totals. This register is cleared by the clear all register function.

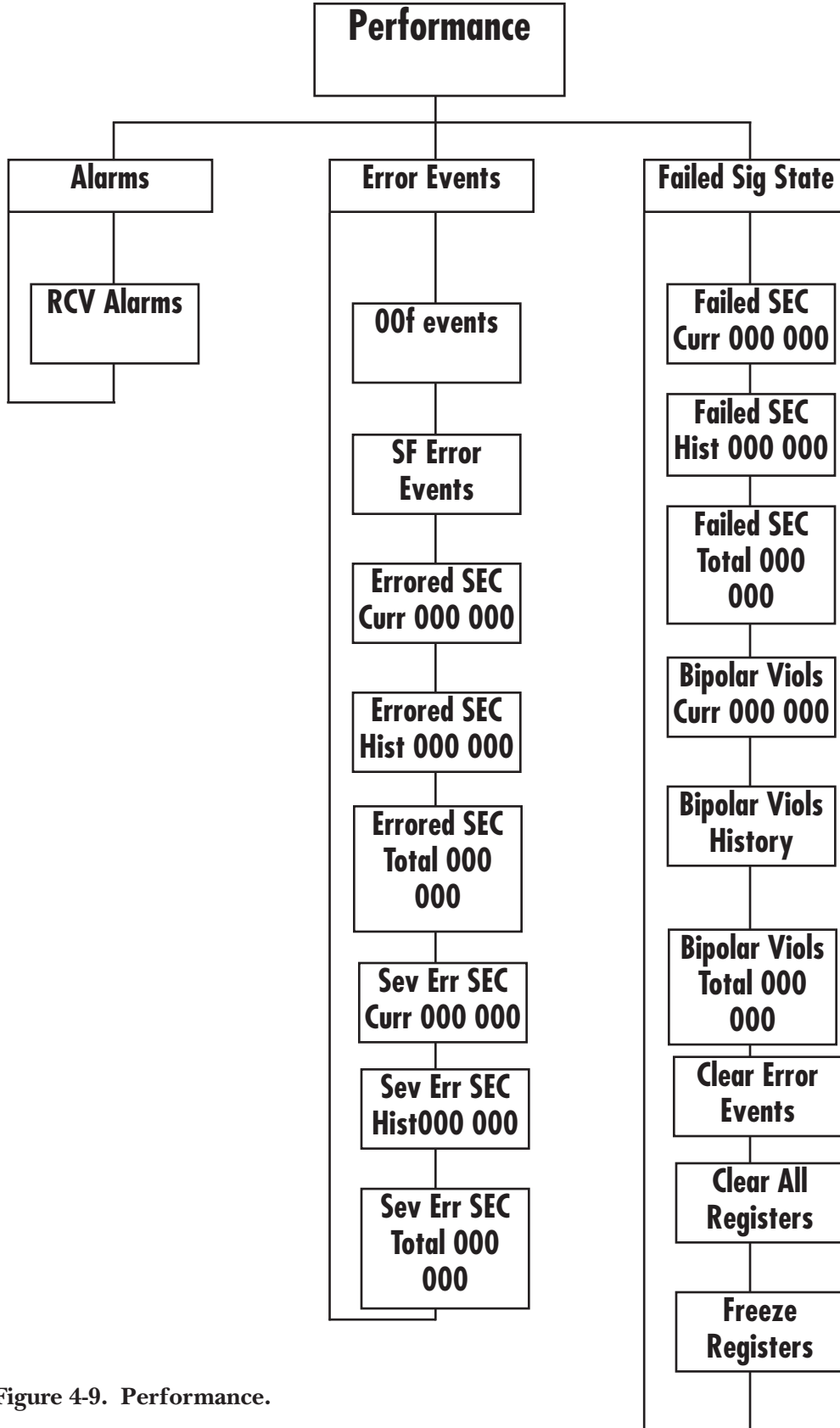


Figure 4-9. Performance.



#### 4.11.8 CURRENT SEVERELY ERRORED SECONDS

If more than 320 CRC 6 errors or one OOF Event occurs during a second, a Severely Errored Second has occurred. The contents of this register can be accessed by both the user and the network. This count continues for 15 minutes and then the register is cleared and a new count is initiated. A history of this register is maintained in the Severely History Errored Seconds register. This register is cleared with the clear all register function.

#### 4.11.9 HISTORY OF SEVERELY ERRORED SECONDS

A history of the Severely Errored Seconds contains the record of the previous ninety-six 15 minute intervals of errored seconds. This register is cleared with the clear all register function.

#### 4.11.10 ERRORED SECONDS TOTAL

The Errored Seconds Total is the summation of ninety-six 15 minute intervals.

#### 4.11.11 FAILED SIGNAL STATE

A failed signal state is present (indicated if YES is displayed) when 10 consecutive severely errored seconds have been counted. This state exists until 10 consecutive seconds without a severely errored second have passed. During a Failed Signal State, errored seconds are not counted. Failed Signal State is available to both the user and the network.

#### 4.11.12 CURRENT FAILED SECONDS

For every second that a Failed Signal State exists, the Failed Second Register is incremented. This information is available to both the user and the network. A 24 hour history of 15 minute intervals is maintained as well as the total number of failed signal states for the previous 24 hours. This register is cleared with the clear all register function.

#### 4.11.13 BIPOLAR VIOLATIONS

A running total of the received bipolar violations is maintained for user access only. It is maintained in 15 minute intervals as the Current Bipolar Violations. A 24 hour record is maintained of the 15 minute intervals. This is called a History of the Bipolar Violations. A total History of the bipolar violations is also maintained.

#### 4.11.14 CLEAR ERROR EVENTS

The Clear Error Events allows the user to clear all error event registers. They are: ESF error events, OOF events, and CRC 6 error event registers. They are user registers only.

#### 4.11.15 CLEAR ALL REGISTERS COMMAND

This command allows the user to clear all the Performance registers, including all History Registers, so that the Performance Monitoring function can be re-initiated. They are user registers only.

#### 4.11.16 FREEZE REGISTERS

This command is applicable only to the user registers. When On, all counts are inhibited and the time of day that this occurs is recorded. When OFF, everything operates normally.

#### 4.11.17 ALARMS

There are four alarm states that can be displayed on the LCD. They are Red alarm, Yellow alarm, Loss of Sync and Bipolar Violations. A Red alarm indicates that there has been a loss of sync for two-and-one-half (2.5) seconds. This alarm is cleared when the system is "in sync" for 10 consecutive seconds. If a Red alarm condition exists in a FT1-4 then that unit transmits a Yellow alarm to the remote FT1-4. Therefore if a unit receives a Yellow alarm it indicates that the remote unit is in Red alarm state. Yellow alarm format for D4 transmission is a zero in Bit 2 of all channels. If the network is an ESF network then the Yellow alarm format is a repeating pattern of FF (HEX) on the khz facility data link. If a Bipolar violation occurs and no other alarm is present, the display will indicate a bipolar violation.

### 4.12 Diagnostics

The diagnostics function allows the operator to perform a series of loopbacks and to generate test signals that will aid in the troubleshooting of the FT1-4 and the network itself. The diagnostic functions performed are local channel loopback, local aggregate loopback, local network loopback, remote CSU loopback, remote aggregate loopback, remote channel loopback, and test pattern generation. For this discussion refer to Figure 4-10.

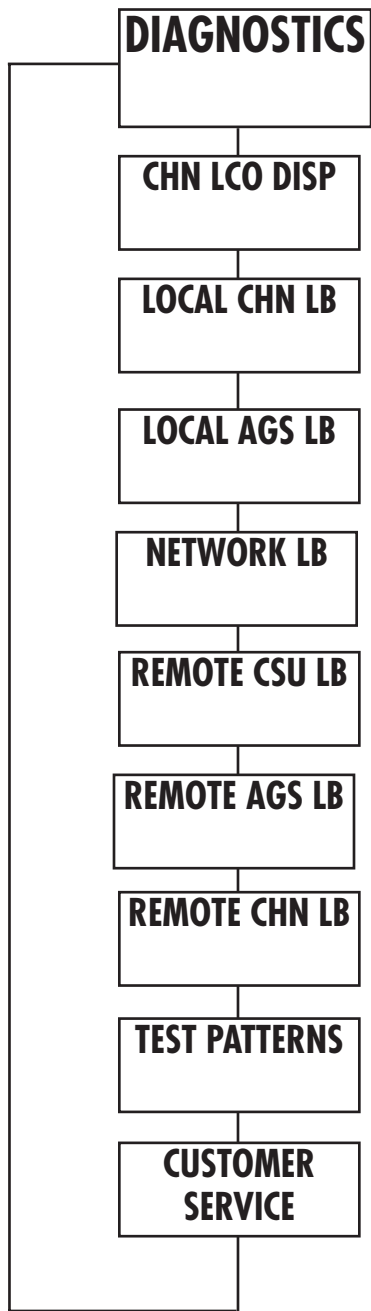


Figure 4-10. Diagnostics.

**4.12.1 LOCAL CHANNEL LOOPBACK**

The Local Channel Loopback, when selected, verifies the integrity of the individual channel under test. To perform this test, enter the Diagnostic function and scroll down to the LOCAL CHN LPBK function. To turn this function ON depress the ENTER key. To turn the function OFF depress the ENTER again.

**4.12.2 LOCAL AGGREGATE LOOPBACK**

This loopback occurs on the network side of the local transmit and receive logic. The unit continues to transmit data across the network but also loops the data back to its own receiver circuitry. To access this loopback scroll down through the diagnostic function until the Local Aggregate Loopback function is displayed on the LCD. To activate this loopback depress the ENTER key. To disable this loopback depress the ENTER key again. When in this Loopback Mode and the unit is in Loop Timing, it will default to Internal Timing until the loopback is disabled.

**4.12.3 LOCAL NETWORK LOOPBACK**

This loopback allows the operator to disconnect the local side of the network by transmitting the data recovered from the network. To activate this loopback at the Local Network Loopback function, depress the ENTER key. When complete, depress the ENTER again and the loopback is disabled.

**NOTE**

**When locally activating Local Network Loopback, the unit must not be the unit supplying timing to the network.**

**4.12.4 REMOTE CSU LOOPBACK**

The Remote CSU Loopback allows the operator to test the operation of the local channel, the aggregate, and the remote CSU logic. To activate this test, depress the ENTER key. When complete, depress the ENTER key again and the loopback is disabled. Activating this test from a loop timed unit, causes the unit to default to Interval Timing.

#### 4.12.5 REMOTE AGGREGATE LOOPBACK

The Remote Aggregate Loopback allows the operator to test the entire system from the local unit through the network to the remote FT1-4's transmit and receive front end. To activate this test, scroll through the diagnostic function until the Remote Aggregate Loopback function appears on the LCD. Then depress ENTER. The system displays the message ACTIVATING for 8 seconds. Then the message ON is displayed. Depressing the ENTER key again, clears this loopback. Activating this test from a loop timed unit, causes the unit to default to Internal Timing.

#### 4.12.6 REMOTE CHANNEL LOOPBACK

This test verifies the operation of the local channel, the aggregate/network, the remote aggregate section including the interface to the remote channel card. The entire remote unit is tested except for the DTE transceivers. If this test is successful, but end-to-end data transmission is unsuccessful, then the remote channel card may be defective.

#### 4.12.7 TEST PATTERN

### NOTE

**BERT can only be run on one channel at a time.**

When this function is activated, the local unit transmits and expects to receive a 511 test pattern. There are two displays associated with this test. They are: OUT OF SYNC, and a numerical display that counts the number of bit errors since sync acquisition (32 consecutive correct bits). When this count reaches 65,536 the counter freezes. To clear the counter depress the ENTER key and the system restarts the counter. The OUT OF SYNC display indicates the local unit is not receiving the generated 511 pattern or that the unit is receiving the pattern but that it contains more than 25% errors.

Excessive bit errors implies that there is a problem in the data path. Now the Internal BERT, in conjunction with the other diagnostics tests, can isolate the problem.

Errors maybe injected into the 511 pattern generated by the FT1-4 by depressing the right or left function keys while in the Bit Error Monitor display.

# APPENDIX C:

## Performance Display Overview

The information presented below provides an explanation of all the front panel interactive displays which an operator encounters within the PERFORMANCE menu. All categories within the menu structure are in compliance with AT&T specifications - Bell Pubs 62411 and 54016.

The PERFORMANCE menu can be used in either aggregate framing mode, D4, or ESF. When used in the ESF mode, the device will yield the most information. A full understanding of the following basic terms allows for better isolation of problems at the aggregate level.

### Performance Display Terminology

**OUT OF FRAME (OOF)** - This condition exists when two out of any four consecutive frame bits received from the network are incorrect.

**D4 ERROR EVENT** - Occurs when a superframe contains an Out Of Frame event. Available only when in D4 framing format.

**CRC6 ERRORS** - Occurs when the CRC6 summation, generated by the local device and based on the incoming DS1 signal, does not match the CRC6 field contained in the DS1 signal from the network. Available only when in ESF framing format.

**ESF ERROR EVENTS** - Occurs when an extended superframe contains either CRC6 errors, OOF events, or both. Available only when in ESF mode.

**ERRORED SECONDS(ES)** - A second with one or more ESF/D4 errored events. These may be either CRC6 error events or OOF events.

**SEVERELY ERRORED SECONDS (SES)** - A second with greater than or equal to 320 CRC6 errors or any number of OOF events.

### FAILED SECONDS UNAVAILABLE SECONDS

**(UAS)** - A count of one second intervals during which transmissions are so broken up, service is considered unavailable.

**FAILED SIGNAL STATE** - Declared after a sequence of ten consecutive severely errored seconds. Return to service is declared after receipt of ten consecutive seconds without a severely errored second.

**BIPOLAR VIOLATION BPV)** - Indicates the presence, in the DS1 signal, of two consecutive bits with the same polarity. This is a violation to the Alternate Mark Inversion.

The flow of the PERFORMANCE menu is such that an operator can check four basic types of events:

- a) Errored Seconds
- b) Severely Errored Seconds
- c) Failed Seconds
- d) Bipolar Violations.

Within each type of event, three areas may be accessed:

- 1) CURRENT
- 2) HISTORY
- 3) TOTAL

These are defined as follows:

- 1) **CURRENT** - Provides counts of seconds and events which occur in the current 15 minute interval. Resets at the end of the 900 second time interval.
- 2) **HISTORY** - Provides a count of events which occurred in the past 96 time intervals contained within the ONS 400 history map.
- 3) **TOTAL** - Provides a count of events which occurred in the past 24 hour cycle. This will only be cleared when the user clears all registers.

The user may access any of the above areas for each of the event types; Errored Seconds, Severely Errored Seconds, Failed Seconds, and Bipolar Violations. The following explanations are applicable, *regardless* of event type.

### **CURRENT**

xxx    yyy    mu/mm

xxx - The number of events which occurred within the current 15 minute interval.

yyy - Time, in terms of seconds, which has elapsed in the current 15 minute interval. At 900, the whole display resets and the next interval commences.

mu/mn - Indicates whether the values being monitored are on the user (mu) or network (mn) side of the FT1-4 unit.

### **HISTORY**

xxx yy/zz mu/mn

xxx - Number of events which were present during the interval which is currently specified by yy. For example, if xxx reads 22, there were 22 events which were recorded at the interval specified by yy.

yy - This is the number of the interval which the operator is currently viewing. By depressing either the right or left cursor keys, the user may view all past 96 intervals and each interval's event record.

zz - Indicates the current number of intervals in the history. The maximum number of periods which may accrue is 96.

mu/mn- The operator may toggle between user registers and network registers.

### **TOTAL**

xxxxx 24HOURS mu/mn

xxxxx - Provides an accumulative total of events which occurred in the prior twenty four hour period.

mu/mn- The operator may toggle between user registers and network registers.



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