1558A
APS

TXPORT® TRANSPORT

Reference Manual
34-00228
2nd Edition

Table of Contents

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General

1.0 Introduction

The TxPORT 1558A APS (Automatic Protection Switch) unit provides automatic T1 service restoration from a degraded or failed T1 facility to a standby T1 facility. See the 'Operation' chapter for a typical APS application. Switching from the failed line (Path A or Path B) to the standby (Path A or Path B) is based upon user definable switching alarm thresholds (errored seconds, consecutively severely errored seconds, loss of signal, loss of frame). The 1558A APS is fully compatible with all industry standard APS equipment that complies with PUB 54017, 1991.

1.1 Design Highlights

The APS unit is designed so that it can be configured to support a wide variety of user applications. The key features and functions are:

- Mission-Critical Automatic Protection Switching from a Fail or Impaired T1 Facility to a Standby T1 Facility
- D4 or ESF Framing,
- AMI or B8ZS Line Coding
- Integral ESF CSUs (TR 54016 compliant)
- 24 Hour Performance History
- Revertive and Non-revertive Operation
- User-Definable Alarm Switching Thresholds
- Proactive Call-on-Alarm Reporting (requires manager)
- Desk Top or Rack Mount
- Redundant Power Configurations (AC or DC)
- Bantam Test Access Jacks
- Complies with AT&T 54017 Automatic Protection Switching, 1991
- FCC, DOC, UL, and CSA Compliant

1.2 Specifications

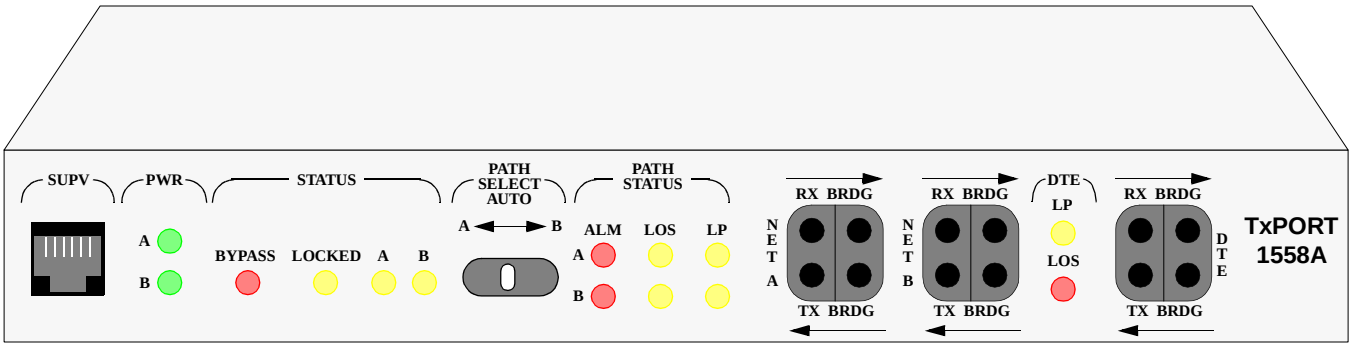
T1 Network Interface

Line Rate:	1.544 Mbps
Framing:	ESF
Line Code:	AMI or B8ZS
DS1 Interface:	+1 to -27 dB ALBO, 100 Ω (± 5%)
Connector:	RJ48 jack
Overvoltage Protection:	Primary and Secondary lightning fusing for line cross
ESF Mode:	Pass/Block Facility Data Link to/from Network

CPE (Equipment Interface)

Line Rate:	1.544 Mbps
Framing:	D4 or ESF
Line Code:	AMI or B8ZS
DSX Interface:	DSX -1 to -6 dB (ALBO), RJ48 jack, 100 Ω (± 5%), 0 to 655 ft.
Connector:	RJ48 jack

1558A Automatic Protection Switch for customer premise



ESF Mode:	Pass/Block Facility Data Link to/from DTE

Diagnostics

Line Loop:	Signal regeneration only (bidirectional)
Payload Loop:	Signal regenerated with new frame synchronization, CRC6, and data.
Loop Activation and De-activation:	Industry standard formats (54016, 62411, T1-403)

Jack Access

Network Side:	Bantam jacks Tx, Rx, & Bridging for Transmit and Receive paths
DTE Side:	Bantam jacks Tx, Rx, & Bridging for Transmit and Receive paths

Alarms

Contacts:	Normally Opened (NO) and Normally Closed (NC)
Rating:	0.6A @ 125 VAC 2.0A @ 30 VDC

Power

Unit:	Dual Inputs (Power A and Power B bus)
Range:	-20 to -56 VDC, ≤150 mA, 10 W, 35 BTUs

Mechanical

Mounting:	Desk, wall, or rack installation (comes with 19” rack mount hardware)
Dimensions:	17.25" W, 1.75" H, 12" D
Weight:	5 lbs.

Environmental

Operating Temp:	0° to 50° C (32° to 122°F)
Storage Temp:	-20° to 85° C (-4° to 185°F)
Humidity:	95% maximum (non-condensing)

Compatibility

PUB 54017:	Automatic Protection Switching Equipment, 1991
TR 62411:	T1 interface and CSU specifications
PUB 54016:	ESF requirements
UL 1549, Part 2:	Electrical

Industry Listings

FCC Registration: FXKUSA-22709-XB-N

UL/CSA File Number: LR 62298

1.3 FCC Requirements

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user is required to correct the interference at his own expense.

Shielded cables must be used to ensure compliance with the Class A FCC limits.

WARNING: 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.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

1) This device may not cause harmful interference.

2) This device must accept any interference received, including interference that may cause undesired operation.

Notice to Users of 1.544 Mb/s Service: The following instructions are provided to ensure compliance with FCC Rules, Part 68:

1) All direct connections to T1 lines must be made using standard plugs and jacks.

2) The following information may be required by the local telephone company when applying for leased line facilities:

Port ID	REN / SOC	FIC	USOC
P/N/12 - 00635	6.0 N	04DU9-BN 04DU9-DN 04DU9-IKN 04DU9-ISN	RJ48C

3) If the unit appears to be malfunctioning, it should be disconnected from the telephone lines until you learn whether the source of trouble is your equipment or the telephone line. If your equipment needs repair, it should not be reconnected until it is repaired.

4) The unit has been designed to prevent harm to the T1 network. If the telephone company finds that the equipment is exceeding tolerable parameters, they can temporarily disconnect service. In this case, the telephone company will give you advance notice, if possible.

5) Under FCC rules, no customer is authorized to repair this equipment. This restriction applies regardless of whether the equipment is in or out of warranty.

6) If the telephone company alters their equipment in a manner that will affect the use of this device, they must give you advance warning so that you can have the opportunity for uninterrupted service. You will be advised of your right to file a complaint with the FCC.

7) The attached affidavit must be completed by the installer.

8) In the event of equipment malfunction, all repairs should be performed by our company or an authorized agent. It is the responsibility of users requiring service to report the need for service to our company or to one of our authorized agents.

1.4 Canadian Emissions Requirements

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

NOTE: End users should use existing 48 VDC battery sources or a CSA certified power supply.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques (de la class A) prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

1.5 Warranty

TxPORT warrants each unit against defects in material and workmanship for a period of five years from the date the unit was shipped to the customer. If the unit malfunctions at any time during the warranty period, TxPORT will repair, or at TxPORT's option, replace the unit free of charge.

The remedies listed herein are the users sole and exclusive remedies. TxPORT shall not be liable for any indirect, direct, incidental or consequential damages. The owner must return the unit to the factory, shipping prepaid and packaged to the best commercial standard for electronic equipment. TxPORT will pay shipping charges for delivery on return. The customer is responsible for mode and cost of shipment to TxPORT. This warranty does not apply if the unit has been damaged by accident, misuse or as a result of service or modification by other than TxPORT personnel.

When returning the unit for warranty work, a Return Material Authorization (RMA) number must be obtained from customer service at the address/phone number given at the end of this chapter. When calling TxPORT to obtain a Return Material Authorization number or to arrange service, please have the following information available:

- Model number(s) and serial number(s) for the unit(s).
- Reason for return and symptoms of problem.
- Warranty status (if known).
- Purchase order number to cover charges for out-of-warranty items.
- Name and phone number of person we can contact if we have questions about the unit(s).
- Mode of shipment required (second day air is the normal mode of shipment for all returned material unless otherwise specified).

As soon as TxPORT has the above information, the RMA that must accompany the item(s) returned can be issued.

1.6 Ordering Numbers

The 1558A is shipped from the factory with the following standard items:

- The 1558A unit (the part number is F-1558-001A-1111)
- The 1558A reference manual
- 19" rack mount hardware
- Local Access PC software
- One PC to 1558A data interface cable
- AC to DC wall power transformer
- Three 10' RJ48 modular T1 cables

The following is a list of the standard and optional equipment which may also be needed.

Part Number	Equipment
F-1558-001A-1111	1558A unit with Dual Integral ESF CSU's, -20 to -56 VDC operation or 110 VAC operation.
6-3030-035-1	19" Rack Mount Hardware for 1558A. Standard with 1558A unit.
6-3030-036-1	23" Rack Mount Hardware for 1558A. Ordered as an option to the 1558A.
9-1558A-003-1	PC DOS Local Access software on 3.5" Disk. Allows the user to access unit performance, status, and configuration information and to perform local loop testing.
9-1001-029-2	PC to 1558A data cable, 10' DB9 to 6-pin modular. Standard with 1558A unit.
30-00087	110 VAC to -48 VDC (200 mA max.) wall transformer unit, 10' power cable. Standard with 1558A unit.
9-1001-004-010	RJ48 8-pin modular 10' cable. Three cables come standard with the 1558A unit. Contact the factory for additional cable lengths and types.
F-1559-000-XXXX	1559 APSM Manager. Used for central site management of one or more co-located 1558A units. Can be ordered as AC or DC power, one or two internal modems, 19' or 23' rack hardware. Contact the factory for additional information.

1.7 TxPORT Customer Service

Address: TxPORT
127 Jetplex Circle
Madison, Alabama 35758

Telephone: 800-926-0085 or
205-772-3770

Sales/Administration FAX: 205-772-3388
Manufacturing FAX: 205-772-8280

Customer Service Returns: 800-926-0085, ext. 227

Product Technical Support
Normal Hours - 8 a.m. to 5 p.m. Central, Monday – Friday

Telephone: 800-285-2755 or
205-772-3770

Emergency - Nights / Weekends / Holidays:
Telephone: 800-285-2755
E-Mail (Internet address): support@txport.com

Installation

2.0 General

Proper installation of the 1558A unit involves the following key steps:

- Site Survey and Preparation
- Unpacking and Inspecting Equipment
- Equipment Mounting
- T1, Alarm, and Power Connections
- Setting Equipment Options
- Preservice Testing

The following paragraphs contain information and instructions to assist the user in preparing the 1558A for operation. It is recommended that the user sequentially follow the site preparation and unit installation steps described.

2.1 Site Preparations

The following site preparations should be performed before starting installation of the 1558A APS unit. First, determine the location of 1558A unit and perform the following:

A) Determine the distance from the APS unit to the AC outlet, or if connecting to a DC external power source, the distance to this source. The 1558A is shipped from the factory with a 110 VAC to -48 VDC wall transformer (10 ft. cord). If external DC is being used, insure that 26 gauge wire is on hand to wire the external DC power source to the 1558A unit. The maximum current draw of the 1558A is ≤80 milliamps at -48 VDC.

B) Determine the distance from the T1 facility demark and the actual location of the 1558A. After determining distance, verify that the proper cable lengths and types have been ordered to connect from the T1 demark to the 1558A unit. The 1558A is shipped with three RJ48 modular T1 cable, 10 feet in length.

C) Normally, the provider of the T1 facility will provide the required LBO setting (transmit signal level) required for connection to the T1 facilities. This value should be used when setting the 1558A LBO transmit values (0, 7.5, 15, or 22 db) in the 1558A unit. If the value cannot be obtained from the provider, the LBO transmit values for Path A and Path B should be set to 0 db.

D) Determine the distance between the 1558A unit and the terminating DTE equipment. This distance will be used when you set the DSX transmit LBO value for the DTE T1 port on the 1558A unit. The maximum distance that the 1558A DTE DSX receive will operate is 1,400 feet (using ABAM cable, 26 gauge, shielded wiring).

E) Verify that the T1 line is operating properly before you attempt to install the 1558A unit. Both of the T1 lines should be checked for error free operation for at least 1 hour to insure that they are performing error free.

F) If the unit is going to installed in a 19' equipment be rack, verify that there is enough rack space available in the rack (requires 1.75 inches per 1558A unit). Four pan head (type 12-24 x 1/2 inch) screws are provided for mounting the unit. An optional 23" rack mount kit is available for applications using this size rack.

G) Verify that no external CSUs (channel service units) are installed at the location where the 1558A is being installed.

NOTE: The 1558A unit provides internal ESF CSU functions and cannot operate properly if another CSU is also co-located with the 1558A.

2.2 Unpacking and Inspection

This unit is carefully packaged to prevent damage in shipment. Upon receipt, inspect the shipping container for damage. If the shipping container or cushioning material is damaged, notify the carrier immediately and make a notation on the delivery receipt that the container was damaged (if possible, obtain the signature and name of the person making delivery). Retain the packaging material until the contents of the shipment have been checked for completeness and the instrument has been checked both mechanically and electrically.

If the contents of the shipment are incomplete or, if there is mechanical damage or defect, notify TxPORT. If the shipping container is also damaged, or the cushioning material shows signs of stress, notify the carrier of the damage as well as TxPORT. Keep the shipping materials for carrier's inspection. TxPORT will arrange for repair or replacement without waiting for claim settlement.

2.3 Mounting

If the 1558A is to be installed in an equipment rack, simply mount the 1558A in the equipment rack using the provided mounting screws and rack mount adaptors (the 1558A can be ordered with either 19" or 23" rack mount adaptors). If the equipment is to be desk top installed, the user may remove the provided rack mount adaptors and set the unit on any flat surface. Once the equipment has been physically located, the following rear panel wiring connections should be performed.

2.4 Wiring & Connections

There are several wiring connections that must be performed to install the APS unit. The following paragraphs describe how to attach the APS unit to the associated T1 lines, power connections, alarm connections, and COM BUS connections. Figure 2-1 should be used as a reference for the following paragraphs concerning installation of the 1558A APS unit.

2.4.1 Chassis Ground Connection

The 1558A unit should be connected to a good earth ground. To connect ground to the unit, attach a 26 gauge or larger wire from the rear panel screw terminal labeled 'GND' to a good earth ground.

Caution: Voltages in excess of 100 VDC may be present on the T1 telecommunications lines. Before connecting the APS unit to telecommunication lines, insure that the rear panel screw terminal labeled 'GND' has been connected to a good earth ground.

2.4.2 DC Power Connections

The rear panel screw terminal labeled '-DC' and 'RTN' are used to connect -20 to -56 VDC to the 1558A. The 1558A may be wired with redundant power inputs by wiring an external source to both the PWR A and PWR B -DC/RTN terminals. To connect power to the APS unit, perform the following.

PWR A Wiring: Connect an external power source (-20 to 56 VDC) to the rear panel screw terminal labeled PWR A 'DC' and 'RTN'. If using the provided AC to DC wall power transformer, connect the RED wire to the 'RTN' terminal, the BLACK wire to the '-DC' terminal and the GREEN wire to the 'GND' terminal.

PWR B Wiring: Connect an external power source (-20 to 56 VDC) to the rear panel screw terminal labeled PWR B 'DC' and 'RTN'. If using the provided AC to DC wall power transformer, connect the RED wire to the 'RTN' terminal, the BLACK wire to the '-DC' terminal and the GREEN wire to the 'GND' terminal.

2.4.3 Alarm Connections

The 1558A has alarm contacts provided at the rear panel screw terminals labeled 'COMMON', 'NC', and 'NO'. The alarm relay is operated when power is present to the 1558A. To connect the APS alarm relay to an external customer alarm surveillance system, perform the following:

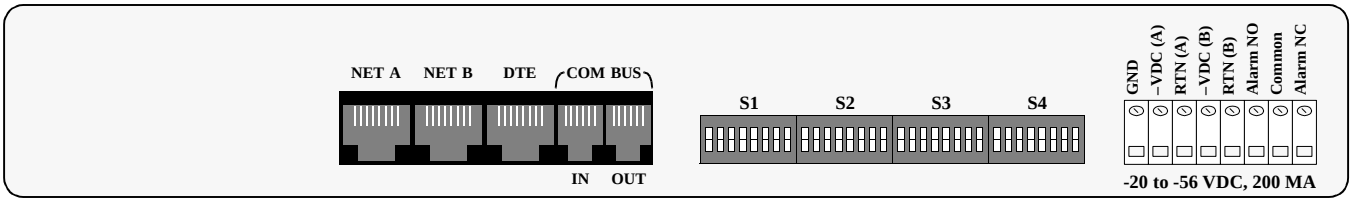
- Connect a 26 gauge wire to the rear panel screw terminal labeled 'COMMON' to the external alarm system.
- Connect a 26 gauge wire to the rear panel screw terminal labeled 'ALARM NO' (normally open) or to 'ALARM NC (normally closed) to the external alarm system. Note that the alarm relay is normally operated when power is connected to the unit.

2.4.4 T1 Connections

All T1 lines are connected to the APS unit using modular 8-pin RJ48 cables (three 10' cables come with the unit). Insert the RJ48 connectors into the rear panel receptacles labeled NET A, NET B, and DTE. Connect the other ends of the cable to the appropriate T1 A and B facility equipment and to the DTE equipment. The DTE port is *not* designed for direct connection to a TELCO T1 facility. The modular pin outs and their functions are shown in the following table.

Pin	NET A & B, RJ48	DTE RJ48
1	Data In, Tip	Data Out, Tip
2	Data In, Ring	Data Out, Ring
3	Not Used	Not Used
4	Data Out, Tip	Data In, Tip
5	Data Out, Ring	Data In, Ring
6	Not Used	Not Used
7	Not Used	Not Used

Figure 2-1 1558A Rear View



Pin	NET A & B, RJ48	DTE RJ48
8	Not Used	Not Used

2.4.5 COM Bus Connections

The rear panel COM BUS connectors (IN/OUT) are used to communicate to/from the optional APS 1559 site manager. These connections are only used when a 1559 Network manager is co-located with the 1558A(s). Bus connections from the manager to one or more 1558A units is done in a daisy chain fashion. That is, the COM BUS Out from the 1559 is connected to the COM BUS IN of the 1558A and the COM BUS OUT of the 1558A is connected to the COM BUS IN of the 1559. Physically, the connections to the COM Bus IN/OUT are RJ11, 6-pin miniature modular jacks. The function of the six pins associated with the jacks are shown below.

PIN	COM BUS IN	COM BUS OUT
1	Not Used	Not Used
2	Signal Ground	Signal Ground
3	Data, output	Data, Output
4	Data, input	Not Used
5	Signal Ground	Signal Ground
6	Not Used	Not Used

2.5 Configuration Modes

Any time that the 1558A unit is initialized (power removed, then reapplied), all key configuration data is read by the 1558A CPU and implemented based upon the particular configuration boot mode options selected by the user. There are four possible configuration boot modes:

- Configure/Boot from Switches (refer to Section 2.5.1).
- Configure/Boot from ROM (refer to Section 2.5.2).
- Configure/Boot from RAM (refer to Section 2.5.3).
- Configure/Boot from Manager. This requires the optional 1559 manager (refer to Section 2.5.4).

The following sections describe how to set up the 1558A to boot using one of the above modes as well as other general operating parameters.

NOTE: All factory default settings in this manual are shown underlined.

2.5.1 Switch Configuration

After the equipment has been unpacked and inspected and mounted, the next step is to configure the unit. All unit options are set by the switch positions on four 8-position DIP switches (S1, S2, S3 and S4) on the rear of the 1558A unit. The 1558A is shipped from the factory with all option switches in the OFF (factory default) position. The following paragraphs briefly describe the 1558A option switches.

NOTE: After all of the option switches have been set to the desired mode of operation, recycle the power to the unit. At power up, the CPU will read and implement the switch settings selected by the user.

Option Switch S1

This 8-position DIP switch is used to set the following unit options:

- Block/Pass ESF data link configurations
- Regeneration or Pass CRC
- Master or Slave Card Operation
- Boot alarm parameters from ROM or RAM
- Boot general parameters from Switches, ROM, RAM, or Manager

The following table describes the DIP switch settings controlled by Switch S1.

Position	Switch S1 Description
1	OFF = DTE/NET, Block Data Link ON= DTE/NET, Pass Data Link
2	OFF= NET/DTE, Block Data Link ON= NET/DTE, Pass Data Link
3	OFF = DTE/NET, Regen. CRC ON= DTE/NET, Pass CRC
4	OFF = NET/DTE, Regen. CRC ON= NET/DTE, Pass CRC
5	OFF = Card Function, Slave ON= Card Function, Master
6	OFF = ARM from ROM ON= ARM from RAM
7,8	OFF,OFF = Boot from Switches OFF,ON = Boot from Manager ON,OFF = Boot from RAM ON,ON = Boot from ROM

Option Switch S2

This 8-position DIP switch is used to set the following unit options:

- Alarm on Framing Errors

- Alarm on Loss of Signal
- AMI/B8ZS Line Coding for DTE and NET
- CSU Functions Enabled/Disabled
- Path Revert, Enabled/Disabled
- DTE Framing ESF/D4 (NET framing is fixed as ESF)

The following table describes the DIP switch settings controlled by Switch S2.

Position	Switch S2 Description
1	OFF = Framing Errors, Enabled ON = Framing Errors, Disabled
2	OFF = LOS, Enabled ON= LOS, Disabled
3	OFF = NET/B, B8ZS ON = NET/B, AMI
4	OFF = NET/A, B8ZS ON = NET/A, AMI
5	OFF = DTE/B8ZS ON = DTE/AMI
6	OFF = CSU Mode, Enabled ON = CSU Mode, Disabled
7	OFF = Revert, Disabled ON = Revert, Enabled
8	OFF = DTE, ESF ON = DTE, D4

Option Switch S3

This is an 8-position DIP switch. It is used to set the 1558A unit address ID for the NET A hardware and the NET B hardware. Unique addresses must be optioned for each 1558A unit when multiple units are co-located and a 1559 Site Manager is being used. If no manager is being used, the user should leave the DIP switches in the factory default positions (all in the OFF or DOWN position). This configures the unit for NET A address 1 and NET B address 2. The following table indicates how to configure the address settings for the first six 1558A units.

*APS Mgr. Unit Pos.	NET A/B Address	Pos 1	Pos 2	Pos 3	Pos 4	Pos 5 - 8
1.01	1/2	ON	OFF	OFF	OFF	OFF
1.02	3/4	ON	ON	OFF	OFF	OFF
1.03	5/6	ON	OFF	ON	OFF	OFF
1.04	7/8	ON	ON	ON	OFF	OFF
1.05	9/10	ON	OFF	OFF	ON	OFF
1.06	11/12	ON	ON	OFF	ON	OFF

NOTE: When connecting to the SUPV port using the APS local access software, the 1558A NET A/B addresses are viewed as a single unit address and are displayed as 1.01 for addresses 1 and 2, 1.02 for addresses 3 and 4, etc.

Option Switch S4

This is an 8-position DIP switch. The following tables indicate how to set the DIP switches for the various LBO and DSX level settings. Note that S4-8 is not used (spare).

Positions 1 - 4 are used to set the LBO transmit level for the NET A and NET B T1 signals. The factory default is 0 db for the LBO settings.

LBO	NET A		NET B	
	S1	S2	S3	S4
0.0 DB	OFF	OFF	OFF	OFF
7.5 DB	OFF	ON	OFF	ON
15.0 DB	ON	OFF	ON	OFF
22.5 DB	ON	ON	ON	ON

Positions 5 - 7 are used to set the DSX signal level (in feet) for the DTE port. The factory default is 0 to 133 feet for the DTE DSX setting.

DTE DSX Value	S5	S6	S7
1 to 133 ft.*	OFF	OFF	OFF
134 to 266 ft.	OFF	OFF	ON
267 to 533 ft.	OFF	ON	OFF
534 to 655 ft.	ON	OFF	OFF

2.5.2 ROM Configuration

The 1558A may be configured to boot operational parameters from the internal ROM (read only memory). To configure the 1558A to boot from ROM, set S1-7 and S1-8 to the ON position and S1-6 to the OFF position. With these settings, the 1558A will always boot (at power up) the unit configuration parameters from the internal ROM settings. The ROM unit parameters are listed below:

- Block ESF data link, both directions
- Regenerate CRC6, both directions
- Slave Operation
- B8ZS line coding, both directions
- ESF framing, both directions
- Revert mode, disabled
- Availability timer set to 60 seconds
- Errored seconds set to 20
- Consecutively errored seconds set to 2

- Loss of frame set to Enabled
- Loss of signal set to Enabled

In addition to setting the ROM configuration options, the user must also manually configure the following options:

- LBO transmit level setting for both NET A and NET B
- DSX transmit level/distance setting for the DTE T1 port
- 1558A unit address (if optional 1559 manager is installed)

2.5.3 RAM Configuration

The 1558A can be optioned to boot all alarm and operating parameters from the battery backed RAM at power up. To configure the 1558A for this mode of operation simply set S1-7 to ON, and S1-8 to OFF. Note that the following unit options must still be manually configured by the user:

- LBO transmit level setting for both NET A and NET B
- DSX transmit level/distance setting for the DTE T1 port
- 1558A unit address (if optional 1559 manager is installed)

2.5.4 Manager Configuration

The 1558A may be configured and controlled using the optional 1559 APSM site manager. The manager, co-located with one or more 1558A units (up to 56), provides both local and remote access and control/alarm reporting to one or more remote locations. When the 1558A has been configured to 'Boot from Manager', the 1559 can access and change all options except the following:

- 1558A Address
- 1558A LBO and DSX Levels
- Boot Mode (Switches, RAM, ROM, Manager)

To configure the 1558A to 'Boot from Manager', set S1-7 to OFF and S1-8 to ON. For additional information concerning the use and operation of the 1559 manager, refer to the TxPORT 1559 APSM reference manual.

Unit configuration of the 1558A APS is now complete. The final steps to complete installation is to perform the 1558A preservice testing steps describe in the following sections.

2.6 Preservice Testing

The preservice test checks the operational integrity of the 1558A unit. The local pre-service testing is made independently of any DTE or T1 connections. The end-to-end testing requires that the T1 facilities be connected to the unit and that the user has a T1 test set. Figure 2-2 on page 2-6 illustrates the testing described in the following preservice steps. Testing will verify:

- Path Integrity for Path A and Path B (local)
- Path Integrity for Path A and Path B (end-to-end)

The following T1 test equipment and miscellaneous cables will be required to perform the preservice tests:

- Two T1 test sets (one required at each APS location)
- Two cables to go from the T1 test sets to the unit RJ48 DTE connectors at both ends.

Before proceeding, the user should read and understand the background information presented in the following paragraphs concerning the basic operation theory of an APS service (also refer to Figure 3-1 on page 3-2).

APS service is different from "normal" point-to-point T1 service. The 1558A APS unit accepts a single source signal from the attached DTE equipment, verifies signal density, duplicates the signal, and then transmits it on two T1 lines (Path A, Transmit and Path B, Transmit). This duplication and dual transmission is also done at the far end APS equipment (if applicable).

In addition to the unique transmitting function performed by the APS, the unit also performs a unique receiving function. There are two identical signals being received from two T1 lines by the APS equipment (Path A, Receive and Path B, Receive). The 1558A constantly monitors both of these lines for satisfactory signal performance. In the event that the present active receive line exceeds an alarm value, the APS will automatically switch the service from the failed receive path to the standby receive path. The active receive signal is the path connected to the DTE equipment.

Once a path has declared an alarm condition from Errored Seconds, Consecutively Severely Errored Seconds, Loss of Frame, or Loss Of Signal, it will not be available for service until a 2-minute interval has been detected that was completely error free. At that time, the path alarm circuitry will be reset and then the path will be ready to accept service.

2.6.1 Path A Preservice Testing

Perform the following test steps to verify that the 1558A can run error free data from the DTE port to the NET A port and back (local loop test). The test setup for performing this test is depicted in Figure 2-2 on page 2-6.

1) Connect a T1 test set to the DTE RJ48 jack at the rear of the 1558A unit. The test set should be configured to generate a T1 signal that matches the options previously set in the 1558A unit (D4 or ESF, AMI or B8ZS) and configured to supply clock to the 1558A.

NOTE: If the 1558A DTE is configured for AMI operation, the test sets must be set up to generate either a 511, 2047, or 1:7 pattern. If the 1558A is configured for B8ZS on the DTE and NET sides, any pattern may be used (511, 2047, 1:7, QRSS, 3:24, etc.). When sending a 1:7 pattern, though, some T1 test sets inherently cause generation of a yellow alarm condition.

2) Verify that there is no connection at the NET A jack.

3) Manually operate the front panel Path Select Switch to the (A) position. This forces and locks the unit to Path A. The following unit status LEDs associated with Path A testing should be illuminated on the unit:

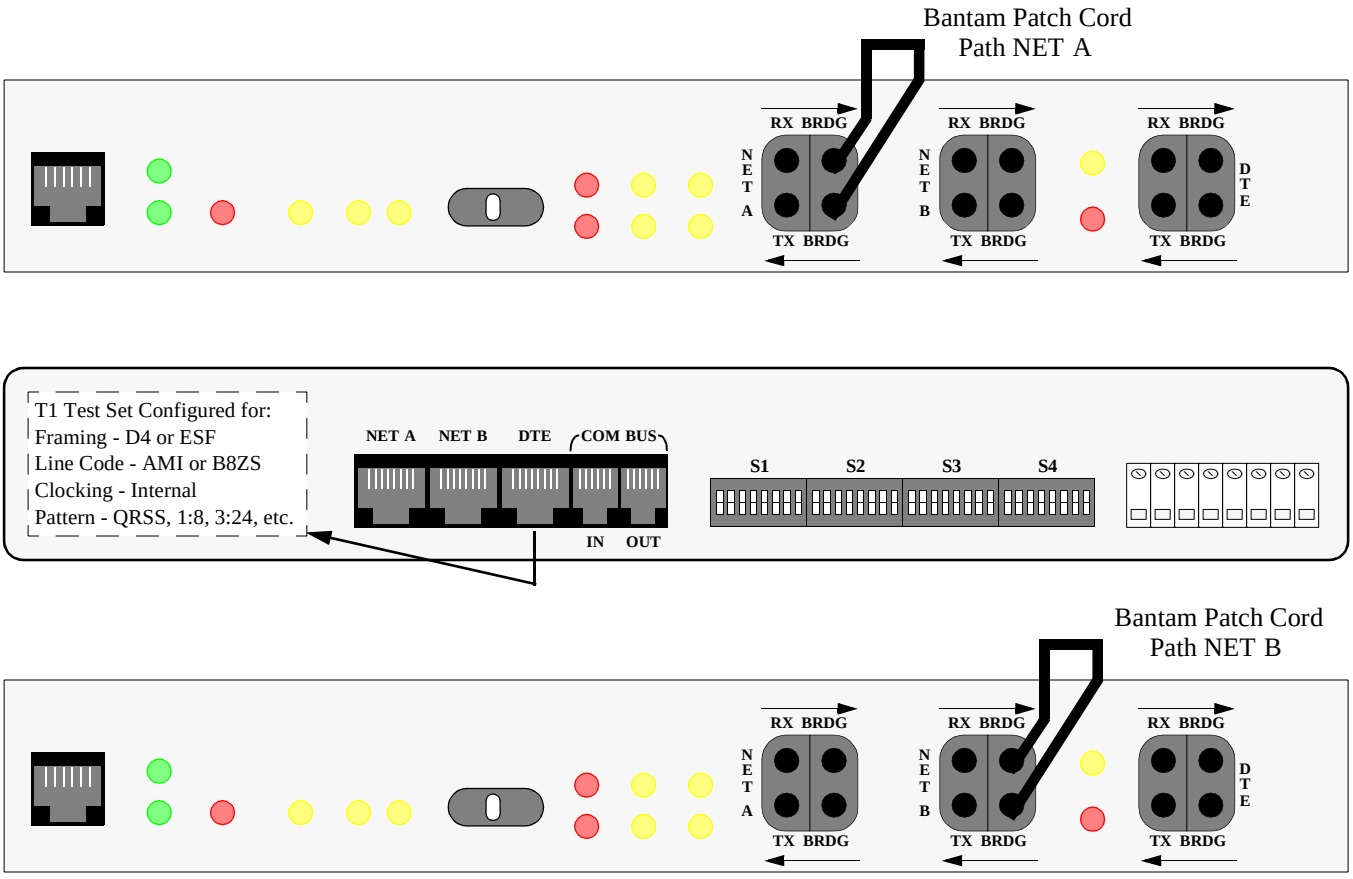
- Power A or B LED ON (green)
- Status 'Locked' LED ON (yellow)
- Status Path Active 'A' ON (green)
- The Path Status, Alarm A (red) LED may be ON or OFF depending on the alarm timer setting (0 to 900 seconds) configured in the 1558A.

4) The 1558A unit is now looped back to the DTE port and the T1 test set should be running in sync and error free. If not, verify that the T1 test set framing and line coding setting match the settings configured in the 1558A.

The 1558A unit is now looped back to the DTE port and the T1 test set should be indicating that it is detecting pattern sync and running error free. If "yes" proceed to Path B, Preservice Testing. If "no", verify that Steps 1 - 4 have been completed properly. If there is still a problem, perform the following:

- Loop the T1 test set to itself and verify that test set runs error free.
- Verify that the T1 test set is properly configured to operate with the options set in the 1558A (D4 or ESF, AMI or B8ZS).
- Also verify that the T1 test set is configured to supply clock (internal).

Figure 2-2 Local 1558A Test Diagram, Path A and Path B



2.6.2 Path B Preservice Testing

Perform the following test steps to verify that the 1558A can run error free data from the DTE port to the NET B Port and back (local loop test). The test setup for performing this test is depicted in Figure 2-2.

1) Connect a T1 test set to the DTE RJ48 jack at the rear of the 1558A unit. The test set should be configured to generate a T1 signal that matches the options previously set in the 1558A unit (D4 or ESF, AMI or B8ZS) and configured to supply clock to the 1558A (internal).

NOTE: If the 1558A DTE is configured for AMI operation, the test sets must be set up to generate either a 511, 2047, or 1:7 pattern. If the 1558A is configured for B8ZS on the DTE and NET sides, any pattern may be used (511, 2047, 1:7, QRSS, 3:24, etc.). When sending a 1:7 pattern, though, some T1 test sets inherently cause generation of a yellow alarm condition.

2) Verify that there is no connection at the NET B jack.

3) Manually operate the front panel Path Select Switch to the (B) position. This forces and locks the unit to Path B. The following status LEDs associated with Path A testing should be illuminated on the unit:

- Power A or B LED ON (green)
- Status 'Locked' LED ON (yellow)
- Status Path Active 'B' ON (green)
- The Path Status, Alarm B (red) LED may be ON or OFF depending on the alarm timer setting (0 to 900 seconds) configured in the 1558A)

4) The 1558A unit is now looped back to the DTE port and the T1 test set should be running in sync and error free. If not, verify that the T1 test set framing and line coding setting match the settings configured in the 1558A.

The 1558A unit is now looped back to the DTE port and the T1 test set should be indicating that it is detecting pattern sync and running error free. If so, the preservice local testing is complete. If not, verify that Steps 1 - 3 have been completed properly. If there is still a problem, perform the following:

- Loop the T1 test set to itself and verify that test set runs error free.
- Verify that the T1 test set is properly configured to operate with the options set in the 1558A (D4 or ESF, AMI or B8ZS).
- Also verify that the T1 test set is configured to supply clock (internal).

2.6.3 Results

The stand-alone preservice testing verifies the operational integrity of the 1558A. If either Path A or Path B failed, but not both, and the options have been verified, the user should contact the factory for additional assistance (refer to the 'General' chapter).

2.6.4 End-to-End Pre-Service Testing

The following paragraphs describe preservice APS testing of the 1558A when it is initially connected to the T1 facilities (Path A and Path B) and is configured with another 1558A APS at the far end.

After completing the stand-alone preservice test procedures, the 1558A is ready to be connected to the Path A and Path B T1 facilities for verification of end-to-end operation. These test procedures will verify the following:

- End-to-End Error Performance of Path A
- End-to-End Error Performance of Path B

The following steps assume that there is a near end unit and a far end unit and a technician with a T1 test set located at both the near and the far end of the APS service.

1) Attach the Path A and Path B T1 facilities to the respective NET A and NET B modular jacks at the rear of the unit (both near and far locations).

2) There are four basic methods of configuring the 1558A which directly impact the settings used in the test sets. Configure both T1 test sets per one of the following scenarios:

- 1558A DTE side configured for D4 framing and T1 NET sides configured for ESF.
- 1558A DTE side configured for ESF framing, and NET sides configured for ESF.
- 1558A DTE side configured for AMI line coding and NET sides configured for B8ZS line coding.
- 1558A DTE side configured for B8ZS line coding and NET sides configured for B8ZS line coding.

NOTE: If the 1558A DTE is configured for AMI operation, the test sets must be set to generate either a 511, 2047, or 1:7 pattern. If the 1558A is configured for B8ZS operation, any pattern may be used (511, 2047, 1:7, QRSS, 3:24, etc.). When sending a 1:7 pattern, though, some T1 test sets inherently cause generation of a yellow alarm condition.

Make sure that one of the test sets is set for internal and that the other is set for recovered clock.

3) Once the test sets have been configured similar to the 1558A units, connect the near and the far test set to the DTE RJ48 jack located at the rear of the 1558A units.

4) Operate the Service Select switch on the 1558A to the Path A position at both the near and far 1558A units. This forces both units to use Path A as the receive signal source. Once this is done, both test sets should indicate pattern sync at both the near and far locations. Run test for 15 minutes. Test should be error free at both ends. If errors are detected, repeat test for another 15 minutes. If errors are still detected, a problem exists in the T1 facility. Refer problem to appropriate channels for resolution.

5) Operate the Service Select switch on the 1558A unit to the Path B position at both the near and far 1558A units. This forces both units to use Path B as the receive signal source. Run test for 15 minutes. Test should be error free at both ends. If errors are detected, repeat test for another 15 minutes. If errors are still detected, a problem exists in the T1 facility. Refer problem to appropriate channels for resolution.

6) After completing the end-to-end testing of both Path A and Path B, connect the DTE equipment.

This completes the end-to-end operational check for the 1558A. The unit is now ready to support automatic protection switching.

2.7 Bypass Test

The 1558A supports a “bypass” mode of operation which allows the NET A path to be physically connected directly to the DTE port. In this mode, all active electronics are removed. The only components in the transmission paths while the BYPASS mode is active are line protection components and test access jacks. The BYPASS mode of operation is automatically implemented when either of the following occurs:

- Power is removed from the unit (external power failure)
- CPU detects an internal operational fault. If this occurs, the front panel ‘BYPASS’ LED (red) will be on to indicate that the 1558A has detected a unit fault and that it is now operating in the BYPASS mode.

During BYPASS, their is no signal regeneration. Typically, the transmit and receive levels to/from the T1 demark and the terminating DTE will perform satisfactorily. However, there is the potential that the signal levels will be unusable by either the DTE equipment or by the T1 facility equipment.

To verify that the BYPASS mode will work in your particular application, perform the following steps:

1) First, end-to-end testing must be complete. If so, proceed to step 2.

2) Remove the external power from the 1558A unit. Note that all front panel LED indicators go off. The 1558A will automatically implement the BYPASS mode which connects the NET A T1 facility directly to the DTE port.

3) With the power still off, verify that the DTE equipment is operating. If so, this application will support the BYPASS mode. If the DTE is not operating, this means that the signal levels either to the DTE or from the DTE are to low for proper operation without signal regeneration. If this is the case, then BYPASS mode will not be viable for this particular application.

NOTE: The bypass mode requires that the DTE port and the DTE equipment must be set for the same framing and line coding as the T1 facility (ESF and AMI or B8ZS).

Operation

3.0 Introduction

The 1558A provides the capability to automatically switch from a “defective” T1 service to a standby facility. This capability minimizes any actual service outage to the customer. Typically, switching from the active to the standby path is transparent to the user (voice “hitless” with minimal impact on data services). The 1558A Automatic Protection Switch (APS) equipment is compatible with AT&T TR 54017, Addendum, February, 1991. When the 1558A is configured for internal ESF CSU operation, it is fully compatible with AT&T TR 54016 ESF CSU requirements.

3.1 Applications

APS T1 protection service (per TR 54017) is either provided by a Common Carrier (AT&T or MCI, etc.) or by the customer. When a Common Carrier provides the service, APS equipment is installed in the central office and at the customer premise location(s). In the case of customer provided APS, the customer installs a 1558A at both ends of the mission-critical service. Figure 3-1 on page 3-2 depicts some of the more common APS applications.

TxPORT APS equipment must be installed in pairs (one TxPORT unit at one end of the service and another unit at the other end of the service). One unit of the pair must be configured for ‘Master’ mode and the other as Slave mode.

3.2 General Operation

The 1558A constantly monitors the status and quality of the path signal (A and B) received on both the active access path and standby access path. In general, the status and quality of the signal is based on the ESF parameters described in Section 3.1 of TR 54016 and additional parameters described in this document and in TR 54017, 1991. If the performance of the active path is determined to be impaired, the protection switching equipment will automatically select the standby access path if that path is ready for service (not in an alarm or a maintenance state). The level of impairment at which a transfer is accomplished is dependent upon the alarm threshold values set in the equipment.

Following a switch, the former standby access path becomes the active path. The 1558A continues to monitor both of the incoming data streams after a switch has occurred. If both active and standby access paths exceed their specified thresholds, service will be maintained on the currently active access path.

The switch from the active to the standby path is completely independent of any external equipment. Switching from an active path to a standby path only involves the receive paths (Path A and Path B), not the transmit paths.

3.2.1 Revertive and Non-Revertive Switching

The default configuration of the 1558A APS provides non-revertive protection. Specifically, this means that service, when transferred to the standby path, remains on the new path until its performance degrades past the threshold settings. This is in contrast to the optional revertive mode which returns service to the default path when it has returned to a minimal level of error free performance.

3.2.2 Default Power-Up Path

The desire for geographically diverse routing may also result in diversity in the medium of transmission (copper, fiber, microwave, etc.). Certain media have higher intrinsic performance criteria and are therefore the service of preference. To accommodate this preference, on power up, the 1558A APS unit forces the Path A as the active path.

3.2.3 Loss of Signal / Loss of Frame

When a loss of signal is detected from the DTE side, the 1558A units generates an AIS signal towards the facility paths (Paths A and B).

When a LOS (Loss Of Signal) is detected on the active path from the facility side of the APS, the 1558A will immediately switch the service to the standby facility (assuming that the standby path is not in an alarm or a maintenance state and the LOS alarm is enabled). If the standby path is in an alarm state, the service will remain on the failed path until the alarm condition clears on the standby path.

Optionally, in the event that there is a signal present but it is so impaired that it results in a LOF (Loss Of Frame), the 1558A shall immediately switch after detecting 32 consecutive framing errors (approximately 93 milliseconds) to the standby path (assuming that it is not in an alarm or a maintenance state and the LOF alarm is enabled).

3.2.4 Bipolar Violations

The 1558A APS units will not allow BPV (Bipolar Violations) in the DS-1 data stream unless they are used for B8ZS (Bipolar 8 Zero Substitution) encoding for clear channel capability. Where used, the B8ZS code will be employed to prevent the generation of an all zero octet.

3.2.5 CSU Loopbacks

Two ESF CSU loopbacks are provided in the 1558A unit (CSU Line Loop and CSU Payload Loop). These loops can be activated and deactivated by TR 54016 ESF messages, or Inband per TR 62411. To insure maximum service availability, the following special conditions shall be applied to CSU loopback actuation via the ESF data link messages:

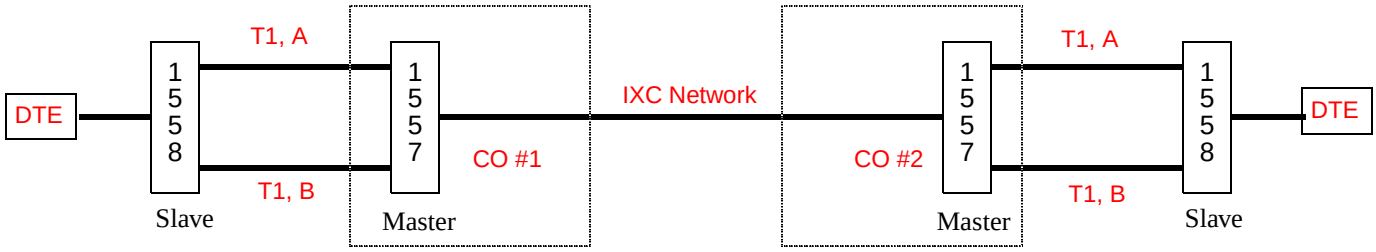
- A CSU Line Loop or Payload can't be activated on the active path.
- If the CSU Line Loop or Payload Loop activate signal is received by both paths simultaneously, no change of LB state shall occur, regardless of their current states.

The "one-way" protection characteristic of the APS can result in split-service operation. That is, service from the 1558A near APS to the 1558A far APS via one access path while the 1558A far APS to the 1558A near APS service is on the other access path. This is desirable to minimize service disruptions. However, normal maintenance and fault isolation techniques can't be carried out while service is being delivered in the split mode. Service to and from the APS must be forced to a common access, either manually or via maintenance message, before the standby path LB can be activated.

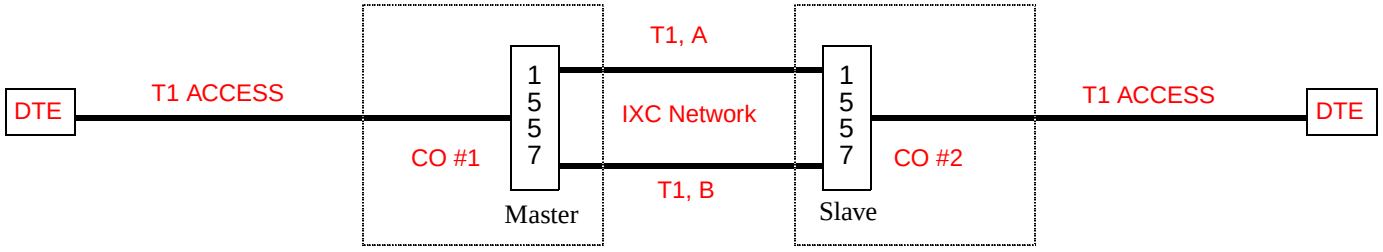
3.2.6 Forced/Locked Capability

A manual path select control is provided on the APS which selectively forces service to either Path A or Path B and effectively inhibits the other path from accepting service. The manual service select control supersedes all automatic

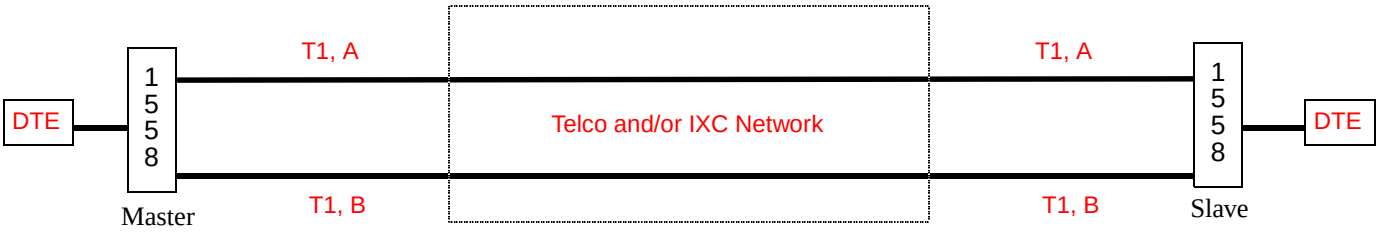
Figure 3-1 Typical APS Applications



IXC Local Loop APS application, both ends



IXC Network APS application



Customer Provided end-to-end APS Application

transfers and forces the path not inhibited to carry the service, regardless of its status or condition.

3.2.7 APS Switching Time

Two times are of significance in specification of the APS protection switching function. The first is the latency period between the point when the switching criteria is satisfied on the active access path and the point at which restoration occurs on the standby access path. This time is less than 50 milliseconds.

The second is the duration of the switching transient event associated with physically moving service from the active to the standby access path. The 1558A APS can complete the transition from active to standby path within 1 bit time.

The decision to transfer service from the active path to the standby path, and vice-versa, is based on a priority system, where the highest priority condition that satisfies a transfer controls, regardless of the conditions in lower priorities.

- Priority 1 – LB Status:
  If the standby path's LB is activated, then service shall remain on the active path.
- Priority 2 – Failed Status:
  If the standby path is in a failed state then service shall remain on the active path. A failed state could be a result of excess ES, CSES, LOS, or LOF.
- Priority 3 – Error Event Threshold Criteria:
  This level of transfer is based on the occurrence of 1 second events within the current 15 minute interval as described in the TR 54017 Addendum.

Each error event requires storage for the following values: threshold setting, current count, and a service transfer flag. The threshold setting for the events (ES and CSES) may range from 1 to 900 seconds. Transfer of service is based only on these events.

If the threshold of an event is 0, that event is inactive and is not a criterion for transfer of service. The current count tallies the total number of error event seconds within the current 15 minute interval. This count is reset at the beginning of a new 15 minute interval.

The service transfer flag is set for the event that causes a transfer of service. It allows the cause of the service transfer to be determined even after the current count has been reset at the beginning of a new interval. This flag is reset when a service transfer acknowledgment message is received, which is described in the next section.

3.2.8 APS Switching Parameters

The 1558A unit switches from the active line to the standby line based upon user definable alarm parameters. The alarm performance parameters that can configured by the user are Errored Seconds, Consecutively Severely Seconds, Loss of Signal, and Loss of Framing. These alarm parameters and their definition are described below.

Errored Seconds (ES) - The user can define that the 1558A switches from the active line to the standby line when a certain number of errored seconds have been detected during the current 15 minute performance interval (900 seconds). The ES threshold can be set from 0 (setting this parameter to a zero value disables ES switching) to 900 seconds. The 1558A is configured at the factory with 20 errored seconds as the default errored second value. The definition of an ES is a second containing one or more CRC errors.

Consecutive Severely Errored Seconds (CSES) - The user can define that the 1558A switches from the active line to the standby line when a certain number of Consecutive Severely Errored Seconds have been detected during the current 15 minute performance interval (900 seconds). The CSES threshold can be set from 0 (setting this parameter to a zero value disables CSES switching) to 900 seconds. The 1558A is configured at the factory with 2 consecutive severely errored seconds as the default CSES value. The definition of a CSES is when two or more consecutive SES have been detected (note that CSES are transparent to the boundary between 15 minute intervals). A severely errored second is defined as a second containing 320 or more ESF errors.

Loss of Signal (LOS) - The user can define that the 1558A switches from the active line to the standby line when a loss of signal state has been detected. The 1558A is shipped from the factory with loss of signal parameter enabled. The definition of a loss of signal is when the receive signal from the network contains ≥175 consecutive bit intervals containing all zeros (no pulses). The condition will be cleared when one or more intervals contain a one.

Loss of Frame (LOF) - The user can define that the 1558A switches from the active line to the standby line when a loss of frame error state has been detected. The 1558A is shipped from the factory with the loss of frame parameter enabled. An LOF alarm condition occurs when 32 or more consecutive ESF frames contain frame bit errors.

When the current count of either ES or CSES is greater than or equal to the threshold setting or when a LOS or LOF (if enabled) is detected, the service shall be transferred from the active path to the standby path as long as the standby path is available (not in an alarm state or in a looped state). A requirement for the standby path to be available is that the timer circuitry, described below, is not active and a LOS or LOF condition does not exist.

3.2.9 Line Availability Timer

The line availability timer is used to quantify when a path is eligible to accept service.Line availability is determined by the APS by observing a defined window of time in which no active error events have occurred. The APS line availability timer can be set to any value from 0-900 seconds. This value represents the minimum amount of time, free of active error events, that must expire before this path is declared as ready to accept service. The factory default setting for the line availability timer is 60 seconds.

The line availability timer requires storage for the timer setting and the active timer count. If the timer setting is 0, the timer circuitry is disabled and the path is always available for service, assuming that there are no active alarm conditions present. If the timer setting is set to a value ranging from 1 to 900 seconds and a service transfer takes place, the standby unit initializes the active timer count to the timer setting. When the timer expires, this standby path becomes available for a service transfer. This timed period must be free of errors for all active events. If an error occurs, the active timer count is reset.

When operated in the optional revertive mode, the path availability timer serves to force restoration of service back to the default access, Path A. That is, when service is switched from Path A, it will remain on the standby path (Path B) only until Path A's availability timer expires. The factory default is Revert set to OFF.

3.2.10 Status and Performance Information

The current status and performance parameters are stored in the internal registers of the 1558A. Access to this information is via the 1559 APSM site manager (optional) or the LAPS (local access protection switch) PC software. The LAPS software is shipped with each 1558A unit.

The following information can be viewed by the user using either the 1559 APS Site Manager or the provided APS Local Access DOS Software.

- This path is currently carrying the service.
- This path is currently in a failed state.
- This path is currently in an inhibit state.
- The LB of this path is currently activated.
- The other path is currently in a failed state.
- The other path is currently in an inhibit state.
- The LB of the other path is activated.
- The manual locked control state.
- Current status
- Current interval Occurrences
- Current interval Duration
- Current Interval Timer
- Occurrences - Intervals, 1 through 96
- Duration - Intervals, 1 through 96
- Valid Intervals Total
- Occurrences, 24-hour value
- Duration, 24-hour total
- 30-day switch occurrence history

3.2.11 Configuration Modes

Any time that the 1558A unit is initialized (power removed, then reapplied), all key configuration data is read by the 1558A CPU and implemented based upon the particular boot mode options selected by the user (see Installation Section for additional information). The four possible BOOT mode configurations are described below:

1) **Boot from Switches** - At power up, the 1558A CPU reads the values set at the rear panel option switches and configures the unit per those switch settings.

2) **Boot from Manager** - At power up the CPU sends a message to the 1559 APS manager for a download of 1558A unit configuration information. Note that this mode requires that a 1559 site manager be installed.

3) **Boot from RAM** - At power up, the 1558A CPU reads the unit configuration from the battery backed RAM data.

4) **Boot from ROM** - At power up, the 1558A CPU reads the factory firmware default values from ROM. The factory default ROM configuration option settings are:

- Block data link, both directions
- Regenerate CRC6, both directions
- Slave operation
- B8ZS line coding, both directions
- ESF framing, both directions
- Revert mode, disabled
- Availability timer set to 60 seconds
- Errored seconds set to 20
- Consecutively errored seconds set to 2
- Loss of frame set to enabled
- Loss of signal set to enabled

3.3 Front Panel Controls & Indicators

The front panel of the APS unit contains several LED indicators, a SUPV access port, a path select switch, and several bantam test access jacks. The following paragraphs briefly describe the operation of these items (refer to Figure 3-2 and the 1558A Configuration at the end of this manual).

3.3.1 Supervisor Port

The front panel SUPV port allows the user to connect to the 1558A via a PC running the supplied APS LAPS (Local Access protection software) application. This user interface software allows the user to gain access to the unit configuration data, unit status, unit performance, and perform local and remote loopback testing.

Electrically, the SUPV port is RS232 and the data format is 19.2 Kb, asynchronous. The cable used to connect the PC to the SUPV port is a DB9 (female) to 6-pin modular cable. This cable is provided with the 1558A unit. The pin functions for the SUPV port are shown in the following table.

Pin	SUPV Port Wiring
1	Not Used
2	Ground
3	Data, Out
4	Data, In
5	Ground
6	Not Used

3.3.2 Power Indicators

The 1558A has two green power LED indicators (Power A and Power B). One or both of the indicators will be ON when a nominal power source of -20 to -56 VDC is present on the rear panel PWR A and PWR B screw terminals, respectively. The indicator(s) will be OFF if the power is not present at the respective power screw terminals. Only one power input is required to operate the unit. If power redundancy is crucial, both the Power A and Power B inputs should be wired to an external -20 to -56 VDC source. The 1558A unit is shipped with a single 110 VAC to -48 VDC wall power unit.

3.3.3 Bypass Indicator

The red BYPASS LED indicates whether or not the 1558A is presently in a BYPASS mode of operation. The LED will be ON if the unit has detected a CPU watchdog operational fault. The LED will be OFF under normal operation.

When active, the BYPASS mode connects the NET A T1 facility directly to the DTE port. In this mode, all of the active electronics are bypassed. That is, the only elements in the path are passive line protection circuitry components for the NET A port and the DTE port. During BYPASS operation, the 1558A acts only as a passive device and does not perform any signal regeneration functions.

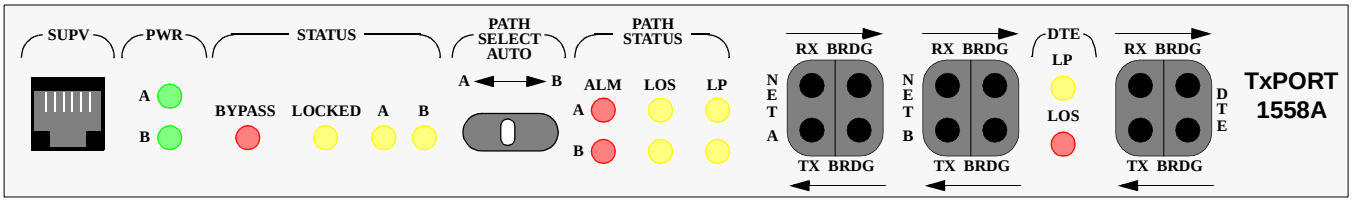
Activation of the BYPASS mode occurs when either the CPU watchdog timer circuitry is defective (indicates a CPU or software problem) or when power is removed from the unit. The BYPASS mode is terminated when either the CPU watchdog circuitry is determined to be normal or when power is restored to the unit.

3.3.4 Locked Indicator

The user can manually force and lock either the A or B T1 path as the active path by moving the PATH SELECT switch from the AUTO position to either the A or B Path Select positions. This action will force the 1558A to use the selected path. Also, the 1558A is now manually locked to this path and will not switch from it, even if the selected path is in a failed state or subsequently fails. When the 1558A has been manually forced to either the A or B PATH, the amber LOCKED LED indicator will be on. Moving the PATH SELECT switch back to the AUTO position will turn off the LOCKED LED and restore normal APS operation.

Caution: Placing the 1558A in a manually locked mode prevents the unit from performing automatic protection switching.

Figure 3-2 1558A Front View



3.3.5 Status Indicators

The 1558A front panel STATUS A and B LEDs (amber) indicate which of the two T1 receive paths (A or B) is presently being utilized to provide service to the CPE equipment.

3.3.6 Manual Path Selector Switch

The front panel manual PATH SELECT switch is used to force the 1558A to use either the A or B path as the active line. If the user momentarily moves the switch to either the A or B position and then returns the switch to the normal/center position, the 1558A will force service to the selected path (A or B). If the user leaves the switch in the manual A or B position, the 1558A will LOCK the service to this path and turn on the LOCKED LED.

3.3.7 Path Status Alarm Indicators

The 1558A alarm circuitry is driven by the alarm parameters defined by the user at time of installation. The user definable alarm parameters are ES (errored seconds), CSES (consecutively errored seconds), LOS (loss of signal), LOF (consecutively ESF errored frames). When any of these alarm thresholds are met or exceeded, the ALARM LED indicator (red) will be on for the path (A or B) that has “failed”.

3.3.8 Path Status LOS Indicators

The 1558A LOS (loss of signal) Path A and B indicators (amber) will be ON when no T1 pulses are being detected on the receive signal paths from the network. The definition of loss of signal is no pulses for 175 bit times. The loss of signal state will be cleared when one or more data pulses are detected on the receive path. After the pulses are detected, the respective LOS indicator will be turned OFF.

3.3.9 Path Status Loop Indicators

The 1558A can respond to CSU loop commands (both inband and FDL) and local or remote APS loop commands. When a loop has been activated (Path A, B, or DTE) the respective front panel LP LED indicator (amber) will be ON. If no loop is active, the LP indicator will be OFF.

3.3.10 Bantam Test Access Jacks

Bantam test access jacks and bridge/monitor jacks are provided to gain physical access to the T1 Path A (NET A), T1 Path B (NET B), and the T1 DTE path. The placement of the jacks is depicted in Figure 4-2 on page 4-11. The function of these jacks is described in the following table.

Path A/B Jacks	Function
Transmit (TX) to T1 facility (upper left jack)	Allows the user to gain access to the transmit T1 path towards the T1 facility. Inserting a test cord into this jacks disconnects the 1558A from the T1 facility
Receive (RX) from T1 facility (lower left jack)	Allows the user to gain access to the receive T1 path from the T1 facility. Inserting a test cord into this jacks disconnects the 1558A from the T1 facility
Transmit Bridge (BRDG) to T1 facility (upper right jack)	Allows the user to bridge/monitor the transmit T1 signal towards the T1 facility. Note, test set must be set to the bridge termination mode.
Receive Bridge (BRDG) from T1 facility (lower right jack)	Allows the user to bridge/monitor the receive T1 signal from the T1 facility. Test set must be set to the bridge termination mode.

DTE Jacks	Function
Transmit (TX) into the 1558A from the DTE equipment (upper left jack)	Allows the user to gain access to the transmit T1 path from the DTE into the 1558A. Inserting a test cord into this jacks disconnects the 1558A from the DTE equipment
Receive (RX) from the 1558A to the DTE equipment. (lower left jack)	Allows the user to gain access to the transmit T1 path from the 1558A to the DTE equipment. Inserting a test cord into this jacks disconnects the 1558A from the DTE equipment
Transmit Bridge (BRDG) to T1 facility (upper right jack)	Allows the user to bridge/monitor the transmit T1 signal coming from the DTE equipment.Note, test set must be set to the bridge termination mode.
Receive Bridge (BRDG) to DTE equipment.(lower right jack)	Allows the user to bridge/monitor the receive T1 signal coming from the 1558A to the DTE equipment.Note, test set must be set to the bridge termination mode.

3.3.11 DTE Loop Indicator

The 1558A DTE port can be looped either locally or remotely by receipt of soft commands generated either from the LAPS software interface or from a far end unit. When a loop has been activated, the front panel DTE LP indicator (amber) will be ON. If no loop is active, the DTE LP indicator will be OFF. Note that a DTE loop interrupts service.

3.3.12 DTE LOS Indicator

The 1558A LOS (loss of signal) DTE port indicator (amber) will be ON when no T1 pulses are being detected on the receive path from the CPE equipment. A loss of signal con-

dition occurs if there are no pulses for 175 or more bit times. The loss of signal state will be cleared when one or more data pulses are detected on the receive path. After the pulses are detected, the LOS LED indicator will be turned OFF.

3.4 Rear Panel Connections

All APS unit wiring connections and option switches are located on the rear panel of the 1558A unit. The function and description of these items are discussed in the following paragraphs (refer to Figure 3-3 and the 1558A Configuration Guide at the end of this manual).

3.4.1 COM Bus Connections

The two 6-pin modular connectors labeled COM BUS IN and COM BUS OUT on the rear panel may be used to connect to the optional 1559 APSM site manager. These ports are wired to allow daisy chaining one or more units off of the APSM (the OUT port is connected to the IN port from unit to unit). The COM BUS IN and OUT connectors are physically RJ11, 6-pin modular jacks. The function of the 6 pins are described in the table below. For additional information concerning the site manager, consult the TxPORT 1559 manual.

PIN	COM BUS IN	COM BUS OUT
1	Not Used	Not Used
2	Signal Ground	Signal Ground
3	Data, output	Data, Output
4	Data, input	Not Used
5	Signal Ground	Signal Ground
6	Not Used	Not Used

3.4.2 Network T1 Connections

The NET A and the NET B T1 modular jacks are used to connect the 1558A to the T1 facilities using RJ48 modular cables. Physically, the 1558A NET A and NET B connectors are RJ48, 8-pin modular connector. The usage of each of the eight pins found in the connector are described in the table below. The 1558A unit comes with three ten foot RJ48 cables (NET A, NET B, and DTE).

PIN	NET A	NET B
1	Data In, Tip	Data In, Tip
2	Data In, Ring	Data In, Ring
3,6	Not Used	Not Used
4	Data Out, Tip	Data Out, Tip
5	Data Out, Ring	Data Out, Ring
7,8	Not Used	Not Used

3.4.3 DTE T1 Connection

The DTE T1 modular jack is used to connect the 1558A to the customer premise equipment using a RJ48 modular cable. Physically, the DTE connector is RJ48, 8-pin modular connector. The DTE T1 port is *not* designed connect directly to a TELCO T1 facility. The 1558A unit comes with three ten foot RJ48 cables (NET A, NET B, and DTE).The usage of each of the eight pins found in the connector are described in the following table.

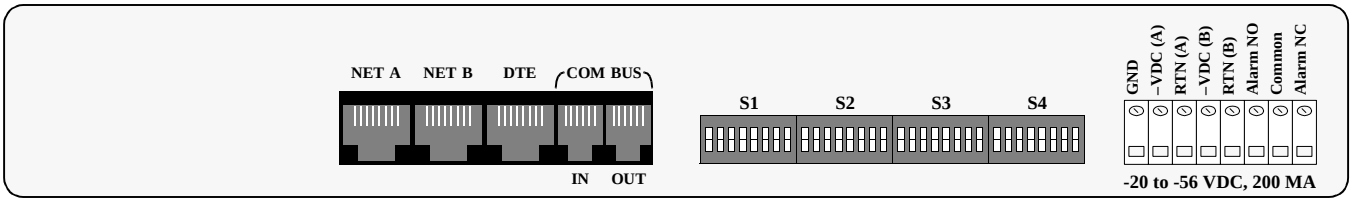
PIN	DTE
1	Data In, Tip
2	Data In, Ring
3,6	Not Used
4	Data Out, Tip
5	Data Out, Ring
7,8	Not Used

3.4.4 Screw Terminal Connections

Several screw terminals are provided at the rear of the unit for connecting external power and alarm wiring. All connections to these terminals strip should be made using 26-gauge wire, or larger. The purpose of these terminals is briefly described as follows:

Ground: This terminal is used to connect the chassis ground to an external earth ground.

Figure 3-3 1558A Rear View



Pwr A Terminals (-DC, RTN): These two terminals are used to connect an external -20 to -56 VDC power source to the 1558A. The positive side of the external power source should be connected to RTN and the negative side to -DC.

Pwr B Terminals (-DC, RTN): These two terminals are used to connect a redundant (second) external -20 to -56 VDC power source to the 1558A. The positive side of the external power source should be connected to RTN and the negative side to -DC.

Alarm Terminals (Com, NO, NC): These three terminals are used to connect the APS unit alarm relay contacts to external alarm alert equipment. The APS unit alarm relay contacts can be wired as Normally Open or Normally Closed. The contacts are rated at 2 amps @ 30 VDC. When the APS is powered, the alarm relay is in the operated state and the NO (normally open) contacts are open and the NC (normally closed) contacts are closed.

3.5 Option Switch Functions

The 1558A rear panel has four 8-position DIP switches for configuration purposes. Refer to Section 2.5.1 on page 2-3 and the 1558A Configuration Guide at the end of this manual for instructions on setting switches. The following paragraphs explain the operational functions of these switches.

Switch S1

Block/Pass FDL: The 1558A can be configured to either block or pass the 4 kb ESF facilities data link (FDL) from the NET A/B path to the DTE port and from the DTE port to the NET A/B ports.

Regenerate/Pass CRC: The 1558A can be configured to either regenerate or pass CRC from the network to the DTE port and from the DTE port to the network.

Master/Slave: The 1558A can be configured as either a master or slave unit. The key difference between a master and slave 1558A unit is that a master 1558A unit can access and control a remote slave 1558A but a slave unit cannot access and control a master.unit.

ARM ROM/RAM: The 1558A can be configured to boot the alarm thresholds from either the ROM or from the unit's RAM. The ROM defaults are ES = 20, CSES = 2, LOS = Yes, LOF = Yes, and Line Availability Timer = 60.

Boot Modes: The 1558A unit configuration can be set at power up by the parameters stored in the ROM, RAM, option switches, or from the optional 1559 site manager.

Switch S2

Framing Errors: The 1558A can be optioned to alarm based upon receipt of 32 or more consecutive framing errors. This parameter can also be disabled.

Loss of Signal: The 1558A can be configured to alarm based upon loss of signal for > 175 bit intervals. The parameter can also be disabled.

AMI/B8ZS: The 1558A can be configured for either AMI line coding or B8ZS line coding.

CSU Mode: The 1558A can be configured to ignore CSU loop and performance commands (disable) or to respond to CSU loop and performance commands (enable).

Path Revert: The 1558A can be configured to revert back to Path A after a failure (enable) or to remain on Path B (disable). Revert should be enabled if the user has a preference for the Path A loop facilities.

DTE Framing: The 1558A DTE port can be configured to operate in the D4 framing mode or in the ESF framing mode. Note that the NET A and B paths are always operated in the ESF mode.

Switch S3

If multiple 1558A units are co-located at a site and if the site is being managed by a 1559 APS site manager, this eight position DIP switch is used to configure a unique address for each of the 1558A units being managed by the 1559.

Typically, there will not be a 1559 located with the 1558A and the factory default address (Address 1/2) can be used (all switches in the OFF position). If multiple units are located with a 1559, simply set each unit to a unique address using Switch S3 (see the Installation chapter for instructions on setting addresses).

Switch S4

Option Switch S4 is used to configure the LBO value for the NET A and NET B ports and the DSX level for the DTE port The NET A and NET B LBO value that can be set are 0, 7.5, 15.0, and 22.5 db. The DTE DSX values can be set for 133 feet, 266 feet, 399 feet, 533 feet, and 655 feet.

The next section discusses the general operation and use of the LAPS (Local Access Protection Switch) software.

LAPS Operation

4.0 Introduction

Access to key 1558A configuration, performance, and testing functions can be locally performed by the user by installing the provided 1558A LAPS (Local Access Software) on a PC computer and attaching the provided PC to 1558A cable to the front panel SUPV port. The following sections describe the features and functions of the 1558A Local Access software and how to install the software on a PC.

4.1 LAPS Installation

It is recommended that the user copy the LAPS software to a directory on the PC hard drive and then store the original disk in a safe place. The following steps will assist the user in installing the LAPS software.

1) Power up the PC to be used and insert the LAPS software into the A floppy drive. From the C drive DOS prompt enter the following command:

```
C:\> md laps
```

The PC creates a directory on the C drive named LAPS

2) At the DOS command line, enter the following:

```
C:\> cd laps
```

The PC responds by displaying `C:\LAPS`

3) From this prompt enter the following DOS command:

```
C:\LAPS> copy A:*.*
```

4) The PC copies all files to the directory called LAPS. When the prompt indicates that all files have been copied, remove and store the original disk in a safe place.

5) After removing the disk in drive A, enter the following:

```
C:\LAPS> laps 1    (or laps 2)
```

Entering ‘LAPS 1’ or ‘LAPS 2’ directs the program to use either COM 1 or COM 2. The computer responds by launching the LAPS application. Once the application is running, the user log on screen will be displayed and the user is prompted to “Press the Enter key to begin”. Once the <return> key is pressed, the LAPS main menu is displayed.

6) Attach the provided PC/LAPS data cable from the PC COM port to the SUPV port on the 1558A. Installation of LAPS and the physical connection to the 1558A is now complete.

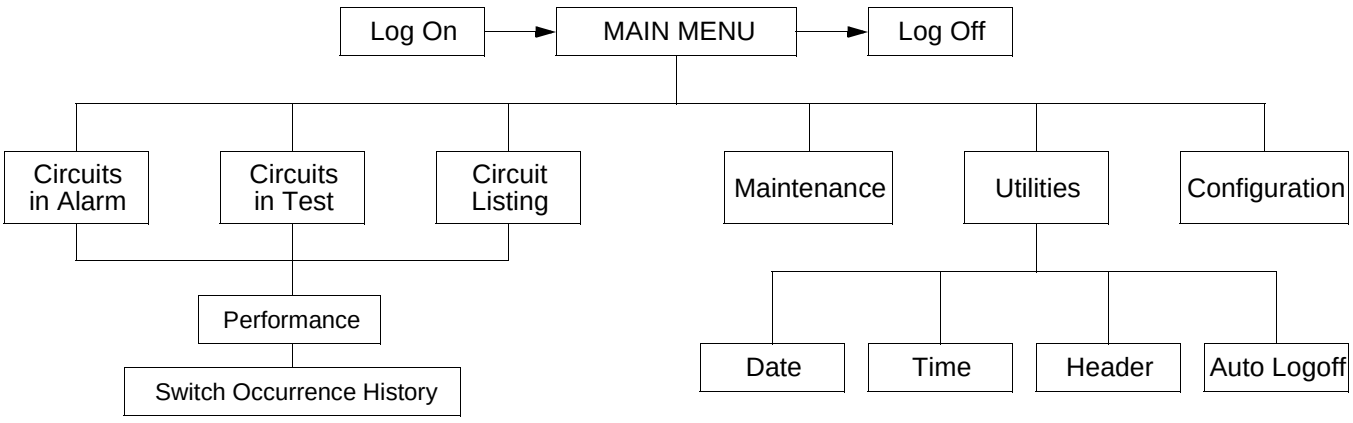
The user should read and understand the following LAPS user interface information before attempting to use the LAPS software.

4.2 Screens And Menus

4.2.1 Common Screen Elements

The LAPS user interface is a user friendly, menu driven system. The available menus for the LAPS interface are shown in Figure 4-1. Each LAPS screen has several components that are common to all screens and will be discussed in this section only. The following paragraphs cover each of these components individually. Refer to the Main Menu screen

Figure 4-1 LAPS Menu Tree



(Screen 4-2 on page 4-3) which depicts these common screen elements.

Date and Time: The top right corner of the LAPS screen always displays the current date and time. The date and time can be set as described in Section 4.7 on page 4-9.

Revisions: The LAPS software revision level is shown below the time. Refer to these numbers when contacting the factory with hardware or software related inquiries.

Location Header: The location name is displayed in the center of the second display line.The header can be changed under the Utilities menu.

Menu Title: The menu title (fourth line, center) denotes the general classification of the user interface that the user presently has accessed.

Messages: The message lines (bottom two) show alerts, error messages, help messages and to accept typed, user input. The use of typed input will be expanded upon in sections of this manual where it is directly applicable.

Alarms and Tests Messages: The right hand side of the message line is used to alert the user that there are active alarm or test states present in the unit. If their are active alarms or circuit test states, the message line will display “Alarms and/or Tests”. If there are no circuits in alarm or in test, the Alarms/Tests message will not be displayed.

4.2.2 Cursor Controls

The LAPS software utilizes a highlighted cursor to make selections from menus and to select fields within screens that are to be operated upon. The cursor can be moved using the standard terminal cursor control keys, which are <backspace>, <up arrow>, <down arrow>, <left arrow>, <right arrow>, <page up>, <page down>, and <delete>.

For PC computers which do not have these particular keys or have only some of them, a set of cursor control commands are supported. Each of these commands is effected by holding down the <Ctrl> key while pressing a command key. The available commands are listed in the following table. These commands may be freely mixed with the use of the normal cursor command keys at the user’s discretion.

Keyboard Command	Alternate Command
< left arrow >	< Ctrl - S >
< right arrow >	< Ctrl - D >
< up arrow >	< Ctrl - E >
< down arrow >	< Ctrl - X >
< backspace >	< Ctrl - H >
< delete >	< Ctrl - Z >
<page up>	<Ctrl - R>
<page down>	<Ctrl - C>
<update display>	<Ctrl - U>

4.2.3 User Log On

Once the user has booted the LAPS software and connected the PC to the SUPV port of the 1558A unit, the Log On screen will appear on the PC display (see Screen 4-1). To access the LAPS user menus, simply depress the <Return/Enter> key. The LAPS system responds by displaying the LAPS Main Menu.

4.3 Main Menu Screen

The Main Menu lists the main functions that the user can select and access. The primary user interfaces are shown in the Menu Tree (Figure 4-1 on page 4-1) and the Main Menu screen (Screen 4-2 on page 4-3). Use the terminal

Screen 4-1 Log On Screen

```
Copyright 1991 TxPORT, All rights reserved


TxPORT APS Manager
Thu Jun 22 09:55:34 1995


Press Enter to begin
```

arrow keys or cursor control commands to highlight the desired submenu. Once a selection has been made, press <return> to activate it. Refer to the cursor control commands detailed in Section 4.2.2.

The Main Menu and any subsequent sub menu may be exited by pressing <esc>. If the Main Menu is exited, LAPS returns the user back to the Log On screen. This is a valid way to end a user session. If any other menu is exited, the user is returned to the previous screen. The following sections discuss the key user submenus and their uses.

4.4 Circuit List Screens

4.4.1 Circuits in Alarm

The Circuits in Alarm screen (similar to Screen 4-3) displays a list of all circuits which currently are in an alarm condition. Not that any 1558A units that have been placed in an Out of Service or Unused state do not report alarms. Only 1558A units that are in an In Service state and are in alarm will be posted to the Circuits in Alarm display.

4.4.2 Circuits in Test

The Circuits in Test screen (similar to Screen 4-3) displays a list of all circuits which currently are in test mode. A circuit is deemed to be in test mode if it has any kind of a loop established. Circuits do not have to be “In Service’ to be in test mode. Refer to Section 4.2.6 for details concerning operations within this screen.

4.4.3 Circuit List

The Circuit List Screen (Screen 4-3) lists all circuits known to the 1559.

4.4.4 Circuit List Screen Manipulation

The three screens involving a circuit list (Circuits in Alarm, Circuits in Test, and Circuit List) are all displayed and manipulated in the same manner. Each circuit’s identification and status is displayed using the following fields.

NOTE: Pressing the <esc> key will take the user back to the previous circuit list screen.

Pos: This field specifies the circuit’s unit address. Stand alone 1558A units are assigned address starting with shelf 1, position 1, 2, 3, etc. The factory default address setting of a 1558A is shelf 1, position 1 (1.01). Additional information concerning the unit address is discussed in the Installation sections of this manual.

State: The current state of the circuit has the following possible definitions:

Unused: The circuit has never been installed or configured.

Out Service: The circuit has been: 1) manually taken out of active service, 2) installed but never put into service, or 3) configured but never installed.

In Service: The circuit has been installed and configured and is currently in use.

Circuit ID: The first line in this field is the circuit name assigned by the user for the NET A T1 facility. The second line is the circuit name assigned by the user for the NET B T1 facility. Circuit names are defined by the user with the Configuration menu (Screen 4-7 on page 4-8).

Near: This field shows the current status of a protected span’s two T1 lines as viewed from the 1558A unit. This status is derived from the number (or absence) of errors in the received data and from the status of the protection switch at the CO. The top line in the field depicts the status of Line A. The second line depicts the status of Line B. This

Screen 4-2 Main Menu

```
                          TxPORT 1559 APS Manager              Date: MM/DD/YY
                            <APS LOCAL ACCESS>                 Time: HH:MM:SS
                                                               Ver.  X.XX
---------------------------------- Main Menus ----------------------------------

                          Circuits in Alarm
                          Circuits in Test
                          Circuit List
                          Maintenance
                          Configuration
                          Utilities
                          Log Off

---------------------------------- Messages ------------------------------------
                                                                        Alarms
                                                                        Tests
```

field will show one of the following status indicators for each line:

(dashed line): No status is available for this circuit.

Active: The CO is actively using the received data from this line and the line has no alarm conditions.

Standby: The CO is not actively using this line, but it is not in an alarm condition and may be used if needed by the APS.

Failed: The line has an alarm condition and is therefore in a failed state. The APS may not switch to this line.

Soft Inhibit: The CO has inhibited this line via software. This line may not be used as the active line by the APS.

Man. Inhibit: The CO has inhibited this line via a hardware switch on the APS. This line may not be used as the active line by the APS.

Reset: This line is in a reset condition. A momentary status that may appear at the time the attached APS is reset.

PL LP: This line has a payload loop active.

Line LP: This line has a line loop active.

Fac. LP: This line has a facility loop active.

Eq LP: This line has a equipment loop active.

CSU Loop: This line has a CSU loop active. This status only appears for far end units.

Far: This field shows the current status of the protected span's T1 lines as received at the far end 1558A unit. The content of this field is the same as that defined above for the "Near" field. Note that only 1558A units configured as Master will display both Near and Far status. A 1558A configured as a Slave will only display status for the Near, not the Far.

The circuits are displayed in order by the shelf number and the position within the shelf (unit address). Each Circuit List Screen shows a maximum of six circuits at one time. The next six circuits, if any, can be viewed by pressing <page down>. To show the six preceding circuits, press <page up>. An individual circuit can be specified at any time by entering the position designator at the message line prompt, Shelf/Pos: and pressing <return>. This designator must be typed as it is displayed. For example, the APS device in position 3 of shelf 1 would be specified as '1.03' or '1.3'.

In any circuit list, a single circuit's position designator will always be selected by a highlighted cursor. The cursor control keys may be used to move this cursor from one circuit to another. If the cursor is moved down from the last position on the screen, the circuit list will scroll up, showing the next successive selection at the bottom of the screen. If the cursor is moved up from the top of the screen, the list will scroll down.

The cursor's position is used to select a specific circuit for displaying detailed performance data. Pressing <return> while a circuit is selected will cause a Performance Screen to be displayed for that circuit (see next section). This screen is only accessible from the three types of circuit screens discussed in this section.

4.4.5 Performance Screen

The Performance screen (Screen 4-4) is only accessible from the Circuits in Alarm, Circuits in Test, and Circuit List screens. The Performance screen allows the user to view detailed performance data for a particular circuit.

In addition to the normal fields in the top section of the screen, the Performance Screen shows the circuit's two ID

Screen 4-3 Circuit List

```
                          TxPORT 1559 APS Manager              Date: MM/DD/YY
                            <APS LOCAL ACCESS>                 Time: HH:MM:SS
                                                               Ver.  X.XX
---------------------------------- All Circuits ----------------------------------
Pos       State          Circuit ID                Near        Far

1.01     In Service    HICAP 1234                  Active      Active
                       HICAP 5678                  Standby     Standby
1.02     Unused                                  ------------
                                                 ------------
1.03     Unused                                  ------------
                                                 ------------
1.04     Unused                                  ------------
                                                 ------------
1.05     Unused                                  ------------
---------------------------------- Messages ----------------------------------

Shelf/Pos:
```

headers along with the circuit's position designator. All of these are found in the upper left corner of the display.

NOTE: Pressing the <esc> key will take the user back to the previous circuit list screen.

The Performance screen contains four fields which can be altered by the user. The function of these three fields is discussed in the following paragraphs:

Target: Signifies which section of the selected circuit is presently displayed. Pressing <space bar> will change this field to the next selection. The choices are: 'Side A, Near', 'Side B, Near', 'Side A, Far', and 'Side B, Far'. Far Targets can only be accessed if the far unit is a slave 1558A.

'Near' refers to the data received by the 1558A that the user is physically attached. 'Far' refers to the data received at the 1558A unit at the remote or far end. Detailed information is displayed for each selection as described in the following paragraphs.

Reset ESF Events: This field is both a display field and a user command field. It shows the running total of ESF error events for the circuit section selected in the 'Target' field. This count accumulates until it reaches 65535 or is reset by the user. The count can be reset by moving the highlighted cursor to this field and pressing <return>. Note that only 1558A units configured as the Master are allowed to reset the ESF performance registers. Slave units are not allowed to reset performance registers.

Reset Event Regs: This is a command field. Moving the cursor to this field and pressing <return> will cause all interval data for the selected circuit section to be cleared. Note that only 1558A units configured as Master are allowed to reset the ESF performance registers. Slave units are not allowed to reset performance registers. The performance interval data is discussed in more detail below.

SWO History: This command field is used to access the 30 day Switch Occurrence History screen. To access this information, move the cursor highlight to the SWO History field and press <return>. The system responds by displaying the Occurrence History display (see Screen 4-5). This display lists the last thirty day completed periods (24 hours) and the number of switch occurrences for each of those days. The Far SWO occurrences can be viewed from the master 1558A by selecting Net End Far. Note that Slave units cannot access far information.

The remainder of the fields in the Performance Screen are for display only. They are defined as follows:

Status: The status of the currently selected circuit section. This status is the same as that detailed for "Near" on the previous page.

24 Hr.% Error Free: This is the percentage of intervals that were error free in the last 24 hours or since the event registers were last cleared.

Completed Intervals: The number of 15-minute intervals for which performance data has been collected. The maximum number is 96 (there are 96 fifteen minute intervals in a 24 hour period).

Event Free Intervals: The number of intervals that performance data has been collected without ESF error events.

(Interval Data): Per AT&T technical references 54016 and 54017, the interval data consists of Errored Seconds (ES), Consecutive Severely Errored Seconds (CSES), Loss of Frame Count (LOFC), Switch Occurrences (SWO), Duration (DUR), Unavailable Seconds (UAS), Severely Errored

Screen 4-4 Performance

```
ID: HICAP 1234              TxPORT 1559 APS Manager            Date: MM/DD/YY
ID: HICAP 5678                <APS LOCAL ACCESS>               Time: HH:MM:SS
Shelf/Pos: 1.01                                                Ver.  X.XX/X.XX
---------------------------------- Performance-----------------------------------
Target: [Side A, Near]           Status:  Active          24 Hr. % Error Free:
95%
Reset ESF Events:    128             SWO History:          Completed Intervals:
80
Reset Event Regs:                                      Event Free Intervals: 76

 Time  Interval     ES     CSES      LOFC      SWO      DUR      UAS      SES      BES
08:01  Current       0        0         0        0      481        0        0        0
-----  24 Hour       9        0         0        8    72001        0        9        0
10:15    [1]         1        0         0        0      899        0        9        0
15:00    [78]        0        0         0        1      476        0        0        0
14:45    [79]        5        0         0        6      435        0        5        0
14:30    [80]        3        0         0        1      888        0        3        0
---------------------------------- Messages -----------------------------------
                                                                          Alarms
```

Seconds (SES), and Bursty Errored Seconds (BES). The value of each of these parameters is displayed for the current interval for the total of the last 24 hours, and for each valid interval in the last 24 hours.

NOTE: The parameters shown on the Performance Screen are updated in one minute intervals. An update may be forced by pressing <Ctrl - U> on the keyboard.

NOTE: The CSES field is updated once every two seconds. This is done because CSES is a self-clearing field and CSES events might not be viewed if the CSES field was updated at a slower rate.

4.5 Maintenance Screen

The Maintenance Screen (Screen 4-6) allows the user to perform test and maintenance functions on a selected circuit. Upon entering this screen, the selected circuit will be the last one chosen on any previous screen. The circuit can be changed at any time by typing a new circuit shelf/position number. It makes no difference which field is currently highlighted as long as the 'Shelf/Pos:' prompt is showing on the bottom display line. The selected circuit can also be decremented or incremented by pressing <page down> or <page up> respectively.

The Position, State, Circuit ID, and Status of the currently selected circuit will be displayed near the top of the Maintenance Screen. The format of this data is the same as that detailed previously in the Circuit List section (refer to Section 4.4.3 on page 4-3).

The highlighted cursor marks the currently selected field within the Maintenance Screen. Selections within any of the fields may be changed by pressing <space bar>. A new field may be selected with the terminal arrow keys or cursor control commands. A new selection is activated when <return> is pressed with the cursor still positioned on that field. The actions initiated by each field are detailed below:

Clear Tests: Resets any active loopbacks and turns off any applied patterns.

Clear Alarms: Resets alarms at the specified end of the circuit (Near/Far). Activating this field has the same effect as the Line Availability Timer expiring, without the user having to wait. The choices are: Near / Far.

Force: Causes the selected line to become the actively received line. If the selected line was previously locked, this command will also serve to unlock it. The choices are: Side A, Near / Side B, Near / Side A, Far / Side B, Far.

Lock: Causes service to be locked to the selected line. If the selected line is currently in standby, the APS will switch to the selected line before locking. The choices are: Side A, Near / Side B, Near / Side A, Far / Side B, Far.

Unlock: Unlocks the selected end of the protected span so that the APS is allowed to use either line. The choices are: Near / Far.

Target: Chooses the line on which loop and pattern data will be transmitted. This selection may not be changed while a test is in progress. The choices are: Side A / Side B.

Loop: Causes the selected loop to be initiated on the line selected by 'Target'. The LAPS software does not check the validity of the loop command. It is possible for the user to

Screen 4-5 Occurrence History

```
ID: HICAP 1234                TxPORT 1559 APS Manager              Date: MM/DD/YY
ID: HICAP 5678                  <APS LOCAL ACCESS>                 Time: HH:MM:SS
Shelf/Pos: 1.01                                                    Ver.  X.XX
------------------------------ Occurrence History ------------------------------
Net End [Near]

30 Day Occurrance History
     1.     8          11. -----          21. -----
     2.     0          12. -----          22. -----
     3.     0          13. -----          23. -----
     4.     4          14. -----          24. -----
     5.     0          15. -----          25. -----
     6.     1          16. -----          26. -----
     7.     0          17. -----          27. -----
     8.     2          18. -----          28. -----
     9. -----          19. -----          29. -----
    10. -----          20. -----          30. -----

---------------------------------- Messages ----------------------------------
                                                                       Alarms
                                                                       Tests
Shelf/Pos:
```

specify a loop that is illegal (i.e. looping the active line). No error message will be generated but the illegal action will not be executed. The choices are: CO Payload, CO Line, CO Facility, CO Equipment, CPE Payload, CPE Line, CSU, and Net. Loop descriptions and operation are discussed in Section 4.3.

NOTE: When 'Net' is chosen as the type in the Loop or Unloop field, the user has the option of specifying the 5-bit pattern to be transmitted. Using the arrow keys or cursor control commands, the user may move the cursor to the bit field. A five-bit pattern of 1s and 0s may then be typed by the user.

Unloop: Takes down the specified loop.

Pattern: Specifies which pattern will be transmitted during test. When the 3 or 5-bit, user-defined pattern is chosen, the user may type in any pattern of 1s and/or 0s to be transmitted. Pressing <return> with the cursor positioned on this field will cause the pattern to be transmitted for the period of time specified in 'Test Time'. The choices are: QRSS, 1:8, 3:24, all Ones, all Zeros, user definable 3-bit, and user definable 5-bit.

Test Time: Defines the run-time of test pattern generation and error accumulation and starts the test. Pressing <return> with the cursor positioned on this field will cause the selected pattern to be transmitted for the specified period of time. If the Maintenance menu is exited, pattern testing is halted. The choices are: 15 Minutes, 30 Minutes, 45 Minutes, 1 Hour, and Continuous.

Runtime: Shows the amount of time elapsed since a timed Pattern test began. Note that this field only appears on the screen when a test is running.

Near CRC Errors: A display-only field for viewing the number of CRC errors which are received at the Near Target receive path.

Far CRC Errors: A display-only field for viewing the number of CRC errors which are received at the Far Target receive.Far CRC Errors are only reported if the 1558A is configured as a Master. Slave 1558A units do not report Far CRC Errors.

Reset Errors: Pressing <return> with the cursor positioned on this field causes both the Near and Far CRC accumulators to be cleared (only if Master 1558A).

4.6 Configuration Screen

The Configuration Screen (Screen 4-7) allows the user to both view and set the configuration parameters for the 1558A equipment. A circuit may be configured at anytime, before or after the hardware is installed. To implement changes in the unit configuration, first place the Service State to the Out of Service or Unused state. The LAPS software will not allow a user to change the configuration of an IN SERVICE unit. Once one or more fields have been modified, the user must press <return> or attempt to exit the screen by pressing <esc>. The user will then see the prompt "Accept changes?" (Y/N)'. If the user responds by pressing <Y>, only then will the configuration changes take effect. A response of <N> will cause LAPS to ignore all requested changes and to restore the original unit configuration param-

Screen 4-6 Maintenance

```
                          TxPORT 1559 APS Manager              Date: MM/DD/YY
                            <APS LOCAL ACCESS>                 Time: HH:MM:SS
                                                               Ver.  X.XX
---------------------------------- Maintenance-----------------------------------
Pos      State           Circuit ID               Near      Far
1.01    In Service     HICAP 1234               Active     Active
                       HICAP 5678               Failed     Standby
---------------------------------------  ---------------------------------------
           Clear Tests                          Target:   [Side A]
           Clear Alarms:  [Near]
                                                Loop:     [CO Payload]
           Force:    [Side A, Near]             Unloop:   [CO Payload]
           Lock:     [Side A, Near]
           Unlock:   [Near]                     Pattern:    [QRSS]
                                                Test Time:  [15 Minutes]

Near CRC Errors:   123                          Reset Errors
Far CRC Errors:    65535
---------------------------------- Messages -----------------------------------
                                                                        Alarms

Shelf/Pos:
```

eters. If the screen is exited with a <N> response, reentering the Configuration Screen will show that all fields have been returned to their previous values.

Configuration Screen fields have the following functions:

Shelf/Position: Defines the circuit that is being configured. This field may be changed by typing a new value or by incrementing or decremented it with the <page down> and <page up> keys, respectively.

Net End: Defines which end of the circuit is being configured or viewed. The choices are: Near / Far (Far only available if 1558A is a Master)

Service Status: Indicates the service status of the circuit. This field also determines if the remainder of the fields in this screen can be changed or only viewed. The following selections may be made for this field:

In Service: The circuit is currently in service and all alarm and Call on Alarm features are functional. No configuration parameters can be altered for a circuit that is in service.

Out Service: The circuit is not currently in service. Alarms will function but the LAPS will not show the circuit on the Circuits In Alarm display. Also, if the optional 1559 site manager is installed, the 1559 will not initiate a Call on Alarm. All other fields may be altered as described in the following paragraphs.

Unused: The circuit is no longer defined.

Revision: This field displays the hardware and software revision for this particular unit.

Circuit A: This field displays the descriptive name of Line A of the pair of T1 lines connected to the 1558A.

Circuit B: This field displays the descriptive name of Line B of the pair of T1 lines connected to the APS.

Errored Seconds: This field is used to define the Errored Seconds threshold for an APS service (as specified in AT&T TR54017). The value may be set from 0 to 900.

Consecutive SES: This field is used to define the Consecutive Severely Errored Seconds threshold for an APS service (as specified in AT&T TR54017). The value may be set from to 0 to 900.

Line Avail. Timer: This field sets the time interval for which each path's Line Activity Timer remains active. The value can be set from 0 to 900 seconds.

LOS State: This field determines if the circuit's APS will alarm on Loss of Signal error state. If On is selected, the 1558A will alarm immediately on LOS. The choices are: Off / On.

LOF State: This field determines if the circuit's APS will alarm on Loss of Frame error state. If On is selected, the 1558A will alarm immediately on LOF. The choices are: Off / On.

Revert: If this field is set to On, the 1558A will always restore the APS service back to the NET A path when the NET A path meets the following criteria; (1) no alarm conditions are active on the NET A path, and (2) the Line Availability timer setting has expired (0 to 900 seconds, user definable). The REVERT field can be set to either ON or OFF.

Screen 4-7 Configuration

```
                          TxPORT 1559 APS Manager              Date: MM/DD/YY
                            <APS LOCAL ACCESS>                 Time: HH:MM:SS
                                                               Ver.  X.XX
------------------------------- Configuration---------------------------------
Shelf/Position: [1.01]                Circuit A:  HICAP 1234
Net End:        [NEAR]                Circuit B:  HICAP 5678
Service Status: [In Service]
Revision:  [x.xx/x.xx]
----------------------------------- Actual -----------------------------------
Errored Seconds:    20
Consecutive SES:    2                      DTE Framing:           ESF
Line Avail. Timer:  60                     Eq. Side Linecode:     AMI
LOS State:  ON                             Fac. Side A Linecode:  AMI
LOF State:  ON                             Fac. Side B Linecode:  AMI
Revert:     OFF
CRC, Fac. to Eq:  Pass                     A:   LBO Level (0 db)
CRC, Eq. to Fac:  Pass                     B:   LBO Level (0 db)
Data Link, Fac. to Eq:  Block              Eq:  DSX Level (0 - 133)
Data Link, Eq. to Fac:  Block              Boot from:  ROM
---------------------------------- Messages ----------------------------------
                                                                       Alarms
                                                                       Test
Shelf/Pos:
```

CRC, Fac. to Eq: Determines whether data passed from the network (facility) side to the equipment side of an APS will be passed with the CRC that was received or if a new CRC will be generated. The choices are: Pass / Regen.

CRC, Eq. to Fac: Determines whether data passed from the equipment side to the network (facility) side of an APS will be passed with the CRC that was received or if a new CRC will be generated. The choices are: Pass / Regen.

Data Link, Fac. to Eq: Determines if data received on the Facility Data Link (FDL) from the facility side of the APS will be passed to the equipment side. If 'Blocked', all FDL traffic to the equipment side of the APS will be originated in the APS. The choices are: Pass / Block.

Data Link, Eq. to Fac: Determines if data received on the Facility Data Link (FDL) from the equipment side of the APS will be passed to the network, or facility side. If 'Blocked', all FDL traffic to the network side of the APS will be originated in the APS. The choices are: Pass / Block.

DTE Framing: Selects the type of framing for the equipment side of the APS. The choices are: ESF / D4.

Eq. Side Line code: Sets the equipment side line coding. The choices are: AMI / B8ZS.

Fac. Side A Line code: Sets the facility side line coding for Line A. The choices are: AMI / B8ZS.

Fac. Side B Line code: Sets the facility side line coding for Line B. The choices are: AMI / B8ZS.

LBO Level, A: Displays the setting of the LBO level select switch for network Line A. This field is a read only field and may only be manually changed by the user (see Installation section).

LBO Level, B: Displays the setting of the LBO level select switch for network Line B. This field is a read only field and may only be manually changed by the user (see Installation section).

DSX Level, Eq: Displays the setting of the DSX level select switch for the equipment side of the APS. This field is a read only field and may only be manually changed by the user (see Installation section).

Boot from: Displays the current setting of the APS switches which determine the source of boot-time configuration data. The choices are: Switches / ROM / RAM / APSM.

4.7 Utilities Screen

The Utilities Screen (Screen 4-8) allows the user to set the Date, Time, Location Header, and the Auto Log Off interval. The following paragraphs describe these items.

Date: Selecting this field causes 'Date' to be prompted on the bottom display line. The user may enter a new date in the form MM/DD/YY. Pressing <return> completes the change.

Time: Selecting this field causes'Time:' to be prompted on the bottom display line. The user may enter a new time in the form HH:MM:SS. Pressing <return> completes the change.

Location Header: The Location Header is a string displayed at the top of each terminal screen. This field may only contain up to 24 characters.

Auto Log Off: This field sets the time period for the Auto Log Off feature, which logs the current user off the system if there are no keys pressed for the period specified in this field. When Auto Log Off occurs, the effect is the same as selecting 'Log Off' or pressing <esc> while in the main menu. The choices are: Never / 15 Minutes / 30 Minutes / 45 Minutes / 1 Hour.

Screen 4-8 Utilities

```
                          TxPORT 1559 APS Manager              Date: MM/DD/YY
                            <APS LOCAL ACCESS>                 Time: HH:MM:SS
                                                               Ver.  X.XX
---------------------------------- Utilities-------------------------------------


                                  Date
                                  Time
                                  Location Header
                                  Auto Log Off: [15 Minutes]


---------------------------------- Messages ------------------------------------
                                                                          Alarms
                                                                          Test
Shelf/Pos:
```

4.8 Loopback Operations

The 1558A has several loops that can be initiated by the user to assist in trouble shooting T1 transmission path problems (see the Block Diagram in Figure 4-2). It is important to note that the types of loops that a 1558A unit can send or respond too is dependent upon the manual unit option settings (master/slave). It is also important to note that APS service must be installed in pairs, one configured as the master and the other as the slave. In addition, each APS pair must be configured to operate in either the normal mode or in the transparent mode. The normal mode allows the slave unit to respond to CSU loop commands and 54016 commands. The transparent mode disables all CSU functions of the slave unit.

In most applications, APS service is provided by an IXC. In these applications, the APS equipment located in the central office will always be configured for Master/Normal and the APS equipment located at the customer's premise will be configured for Slave/Normal.

The loop types that LAPS can initiate from the front panel SUPV port of a unit configured as a Master are:

- CO Payload Loop
- CO Line Loop
- Co Facility Loop
- CO Equipment Loop
- NPC Payload Loop (Transparent mode only)
- CPE Payload
- CPE Line
- CSU Loop
- NET Loop (Telco network interface)

The loop types that LAPS can initiate from the front panel SUPV port of a unit configured as a Slave are:

- Local Facility Loop
- Local Equipment Loop

Before performing loops and unloops, it is important to understand that the user must carefully set up and select the desired loopback. It is recommended that the user follow the steps listed below when setting up a loopback.

1) From the Main Menu, select the Maintenance screen

2) From the Maintenance screen, decide which Path is to be looped (A or B).

3) If necessary, force the 1558A to use the Path (A or B) that is not to be looped.

4) Lock this Path (A or B). This prevents the 1558A from switching the active line to the test line during testing.

Caution: The LAPS software and 1558A hardware will not allow a user to loop an active line or BERT an active line. Only a line shown in the Standby mode or Inhibited mode can be looped or BERT tested.

5) Initiate the desired local/remote loop.

The following sections describe in detail how to perform loops and unloops of the 1558A equipment. Note that all loops and unloops are performed at the Maintenance screen.

The location of the various loops is depicted in the 1558A Block Diagram shown in Figure 4-2 on page 4-11. The remainder of this chapter discusses these loops. Reference to this block diagram may provide clarification.

4.8.1 Near CO Payload Loop

Target the path (A or B) that you want to test by moving the cursor highlight to the Target field and then, using the space bar, toggle the field until it displays the to side that you want to loop (Side A or Side B). After you have selected either the A or B side as the target for testing, move the cursor highlight to the Loop field and toggle the field, using the space bar, until the field displays CO Payload. Then momentarily depress the <return/enter> key. The LAPS will initiate a payload loop of the selected target. After a few moments, notice that the NEAR status field has changed from Soft Inhibit or Standby to PL LP. Also note that the near 1558A front panel Loop LED indicator is on.

A payload loopback loops the incoming T1 signal back to the network. The T1 signal is regenerated (both CRC and signal level). In addition to looping the signal back to the network, the signal is also passed to the 1558A DTE port.

To unloop the unit, move the cursor highlight to the Unloop field and toggle the field, using the space bar, until CO Payload is displayed. Then depress the <return/enter> key. The LAPS will issue a payload unloop command. After a few moments note that the NEAR status field changes from PL LB to Soft Inhibit or Standby. Also note that the LP LED indicator on the 1558A turns off. The CO Payload loop is now off.

4.8.2 CO Line Loop

Target the path (A or B) that you want to test by moving the cursor highlight to the Target field and then, using the space bar, toggle the field until it displays the to side that you want to loop (Side A or Side B). After you have selected either the A or B side as the target for testing, move the cursor highlight to the Loop field and toggle the field, using the space bar, until the field displays CO Line. Then momentarily depress the <return/enter> key. The LAPS will initiate a CO Line loop of the selected target. After a few moments, notice that the NEAR status field has changed from Soft Inhibit to Line LP. Also note that the 1558A front panel Loop LED indicator is on.

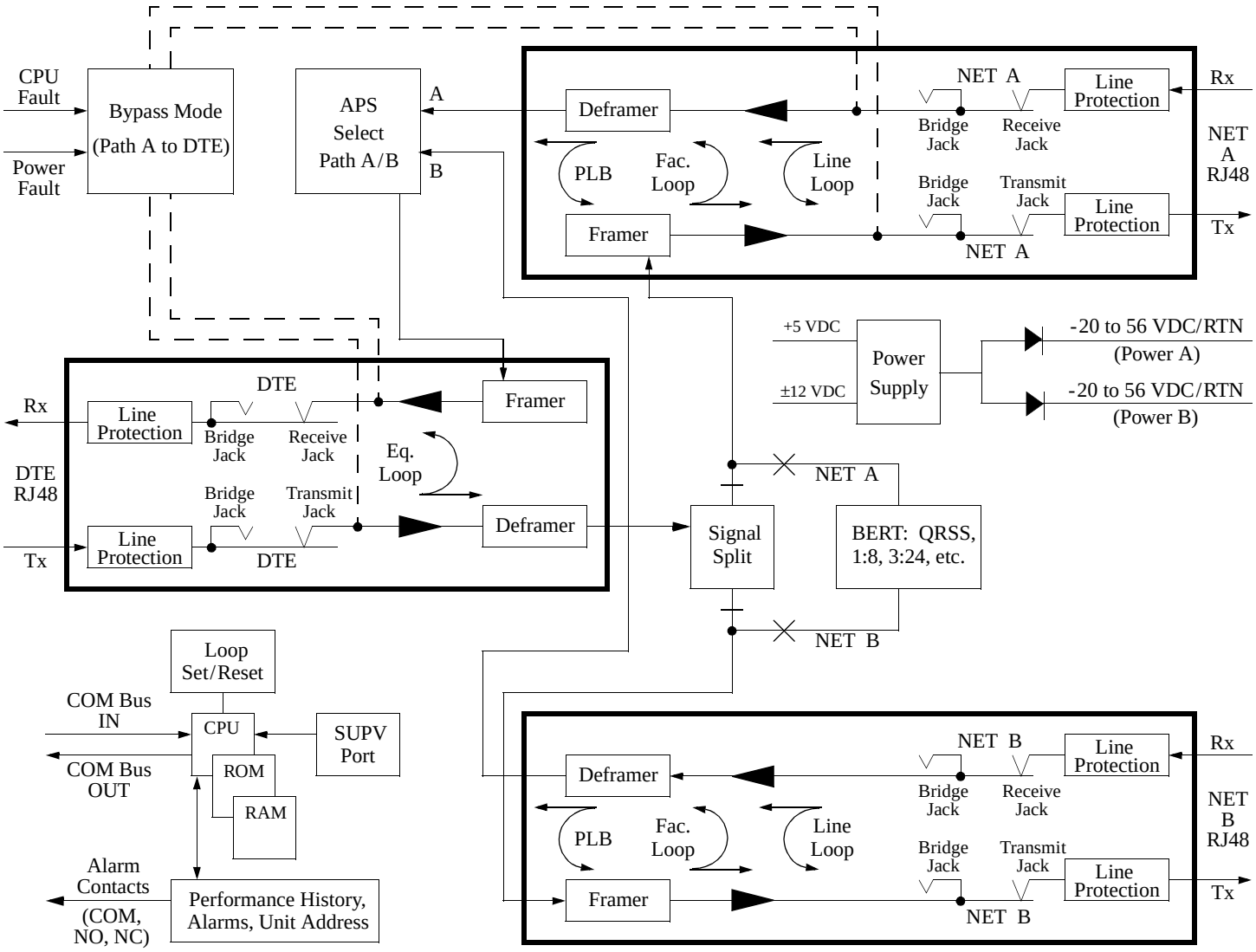
A Line loopback loops the incoming T1 signal from the facility back to the network. Only the T1 signal level is regenerated, not the CRC. In addition to looping the signal back to the network, the signal is also passed to the 1558A DTE port.

To unloop the unit, simply move the cursor highlight to the Unloop field and toggle the field, using the space bar, until CO Line is displayed. Then depress the <return/enter> key. The LAPS will issue a line unloop command. After a few moments note that the NEAR status field changes from Ln Lp to Soft Inhibit or Standby. Also note that the LP LED indicator on the 1558A turns off. The CO Line loop is now off.

4.8.3 CO Facility Loop

Target the path (A or B) that you want to test by moving the cursor highlight to the Target: field and then, using the spacebar, toggle the field until it displays the to side that you want to loop (Side A or Side B). After you have selected either the A or B side as the target for testing, move the cursor highlight to the Loop field and toggle the field, using the space bar, until the field displays CO Facility. Then momentarily depress the <return/enter> key. The LAPS will initiate a CO Facility loop of the selected target. After a few moments, notice that the NEAR status field has changed from Soft Inhibit or Standby to Fac LP. Also note that the 1558A front panel Loop LED indicator is on.

Figure 4-2 1558A Block Diagram



A facility loopback loops the outgoing T1 signal back to the 1558A receive. The T1 signal level is regenerated and, depending on the user option (regenerate CRC yes/no), the CRC will or will not be regenerated. In addition to looping the signal back to the 1558A receive, the signal is also transmitted to the network (see the block diagram in Figure 4-2).

To unloop the unit, simply move the cursor highlight to the Unloop field and toggle the field, using the space bar, until CO Facility is displayed. Then depress the <return/enter> key. The LAPS will issue a line unloop command. After a few moments note that the NEAR status field changes from Fac Lp to Soft Inhibit or Standby. Also note that the LP indicator on the unit turns off. The CO Line loop is now off.

4.8.4 CO Equipment Loop

A DTE equipment loopback loops the incoming T1 signal coming into the DTE (Tx) port back to the DTE port (Rx). Only the T1 signal level is regenerated, not the CRC. In addition to looping the signal back to the DTE port, the signal is also transmitted to the network.

To initiate a CO Equipment Loop, first target the path (A or B) that you want to test by moving the cursor highlight to the Target: field and then, using the spacebar, toggle the field until it displays the side that you want to loop (Side A or Side B). After you have selected either the A or B side as the target for testing, move the cursor highlight to the Loop field and toggle the field, using the space bar, until the field displays CO Equipment. Then momentarily depress the <return/enter> key. The LAPS will respond by sending the following message to the user, ***"Warning! This loop disrupts active service. Perform Loop? (Y/N)."*** If the user enters y (yes), the system will initiate a DTE Equipment loop. After a few moments, notice that the NEAR status fields for both the A and B circuits has changed from Soft Inhibit or Standby to Eq Lp. Also note that the 1558A front panel DTE Loop LED indicator is on. If the user enters N (no) when prompted with the warning message, the LAPS system ignores the CO equipment loop command.

To unloop the unit, simply move the cursor highlight to the Unloop field and toggle the field, using the space bar, until CO Equipment is displayed. Then depress the <return/enter> key. The LAPS will issue an Equipment unloop command. After a few moments note that the NEAR status field changes from Eq Lp to Soft Inhibit or Standby. Also note that the LP LED indicator on the 1558A turns off. The CO Equipment loop is now off.

4.8.5 CPE Payload

A CPE Payload loopback is used to loop the far slave 1558A unit from the master unit. At the far slave unit, the CPE Payload loopback loops the incoming T1 signal (RX) coming from the network (NET A or NET B) port back to the network (TX, NET A or NET B). Both the signal and CRC are regenerated. In addition to looping the signal back to the network, the signal is also transmitted to the DTE port.

To initiate a CPE Payload loop, first target the path (A or B) that you want to test by moving the cursor highlight to the Target: field and then, using the spacebar, toggle the field until it displays the side that you want to loop (Side A or Side B). After you have selected either the A or B side as the target for testing, move the cursor highlight to the Loop field and toggle the field, using the space bar, until the field displays CPE Payload. Then momentarily depress the <return/enter> key. The LAPS will respond by sending the appropriate loop command to the far slave unit. After a few moments, notice that the FAR status field has changed from Soft Inhibit or Standby to PL LP. Also note that the 1558A far slave 1558A Loop LED indicator is on.

To unloop the unit, simply move the cursor highlight to the Unloop field and toggle the field, using the space bar, until CPE Payload is displayed. Then depress the <return/enter> key. The LAPS will issue an unloop command. After a few moments note that the FAR status field changes from PL LP to Soft Inhibit or Standby. Also note that the Loop LED indicator on the far slave 1558A turns off. The CPE Payload loop is now off.

4.8.6 CPE Line

A CPE Line loopback is used to loop the far end slave 1558A unit from the master unit. At the far end slave unit, the CPE Line loopback loops the incoming T1 signal (RX) coming from the network (NET A or NET B) port back to the network (TX, NET A or NET B). Only the signal is regenerated by a CPE Line loop. In addition to looping the signal back to the network, the signal is also transmitted to the DTE port.

To initiate a CPE Line loop, first target the path (A or B) that you want to test by moving the cursor highlight to the Target: field and then, using the spacebar, toggle the field until it displays the side that you want to loop (Side A or Side B). After you have selected either the A or B side as the target for testing, move the cursor highlight to the Loop field and toggle the field, using the space bar, until the field displays CPE Line. Then momentarily depress the <return/enter> key. The LAPS will respond by sending the appropriate loop command to the far end slave unit. After a few moments, notice that the FAR status field has changed from Soft Inhibit or Standby to Loop. Also note that the far slave 1558A Loop LED indicator is on.

To unloop the unit, simply move the cursor highlight to the Unloop field and toggle the field, using the space bar, until CPE Line is displayed. Then depress the <return/enter> key. The LAPS will issue an unloop command. After a few moments note that the FAR status field changes from Loop

back to Soft Inhibit or Standby. Also note that the Loop LED indicator on the far slave 1558A turns off. The CPE Line loop is now off.

4.8.7 CSU Loop

The 1558A, when configured as a Slave unit with the CSU mode Enabled, will respond to industry standard CSU loop and unloop commands. A CSU loopback loops the incoming T1 signal (RX) coming from the network (NET A or NET B) back to the network (TX). Only the signal is regenerated by a CSU loop. In addition to looping the signal back to the network, the signal is also transmitted to the DTE port.

To initiate a CSU loop, first target the path (A or B) that you want to test by moving the cursor highlight to the Target: field and then, using the spacebar, toggle the field until it displays the side that you want to loop (Side A or Side B). After you have selected either the A or B side as the target for testing, move the cursor highlight to the Loop field and toggle the field, using the space bar, until the field displays CSU. Then momentarily depress the <return/enter> key. The LAPS will respond by sending the appropriate loop command to the far end slave unit. After several seconds, notice that the FAR status field has changed from Soft Inhibit or Standby to Loop. Also note that the far end slave 1558A front panel Loop LED indicator is on.

To unloop the unit, simply move the cursor highlight to the Unloop field and toggle the field, using the space bar, until CSU is displayed. Then depress the <return/enter> key. The LAPS will issue an unloop command. After several seconds, note that the FAR status field changes from Loop to Soft Inhibit or Standby. Also note that the Loop LED indicator on the far slave 1558A turns off. The CSU loop is now off.

4.8.8 NET Loop

The NET loop command is used to generate 5-bit patterns towards the far end equipment. These patterns may be used to loop a network interface device or a CSU. To initiate a 5-bit NET pattern, first target the path (A or B) that you want to test by moving the cursor highlight to the Target: field and then, using the spacebar, toggle the field until it displays the side that you want to loop (Side A or Side B). After you have selected either the A or B side as the target for testing, move the cursor highlight to the Loop field and toggle the field, using the space bar, until the field displays NET. Note that when the NET command is selected, a user definable 5-bit code field is also displayed [10000]. This 5-bit field can be set to any combination of ones and zeros by moving the cursor highlight to this field and then entering the desired combination of ones and zeros at the message prompt.

The most common network interface loop up 5-bit pattern is [11000]. The most common unloop 5-bit pattern for network interface devices is [11100]. After selecting the 5-bit pattern, move the cursor back to the Loop field and press the <return> key. The LAPS responds by sending the selected NET 5-bit code to the far end equipment for 5 seconds or more.

To unloop the network interface device, simply move the cursor to the Unloop field and toggle it with the spacebar, until NET is displayed. Note that when the NET command is selected, a user definable 5-bit code is displayed [11100]. This field may be set to any combination of ones and zeros by entering the desired combination. The most common network interface unloop command is [11100]. After pressing <return>, the LAPS will issue a NET unloop command for 5 seconds or more, after which, the NET device should be unlooped.

4.8.9 NPC Payload Loop

The NPC Payload loopback is used to loop a far end slave unit that is configured to operate in the transparent mode. In this mode the far end slave card will not respond to any ESF CSU commands. Normally, this application is used only by an IXC internal network protection applications. Note that a NPC Payload loop is functionally the same type as a CPE Payload loopback.

A NPC Payload loopback is used to loop the slave 1558A unit from the master unit. At the far end slave unit, the NPC Payload loopback loops the incoming T1 signal (RX) coming from the network (NET A or NET B) port and loops this signal back to the network (TX). Both the signal and CRC is regenerated. In addition to looping the signal back to the network, the signal is also transmitted to the DTE port.

To initiate a NPC Payload loop, first target the path (A or B) that you want to test by moving the cursor highlight to the Target: field and then, using the spacebar, toggle the field until it displays the side that you want to loop (Side A or Side B). After you have selected either the A or B side as the target for testing, move the cursor highlight to the Loop field and toggle the field, using the space bar, until the field displays NPC Payload. Then momentarily depress the <return/enter> key. The LAPS will respond by sending the appropriate loop command to the far slave unit. After a few moments, notice that the FAR status field has changed from Soft Inhibit or Standby to PL LP. Also note that the far end 1558A front panel Loop LED indicator is on.

To unloop the unit, simply move the cursor highlight to the Unloop field and toggle the field, using the space bar, until NPC Payload is displayed. Then depress the <return/enter> key. The LAPS will issue an unloop command. After a few moments note that the FAR status field changes from PL LP to Soft Inhibit or Standby. Also note that the Loop LED indicator on the far slave 1558A turns off. The NPC Payload loop is now off.

4.9 BERT Testing

The user can perform BERT testing by accessing the Maintenance screen. In the lower right hand and left hand portions of the display are the command/toggle/information fields that are used for BERT testing. These fields and their use are discussed below.

Pattern: Specifies which pattern will be transmitted during test. When the 3 or 5-bit, user-defined pattern is chosen, the user may type in any pattern of 1s and/or 0s to be transmitted. Pressing <return> with the cursor positioned on this field will cause the pattern to be transmitted for the period of time specified in 'Test Time'. The choices are: QRSS, 1:8, 3:24, all Ones, all Zeros, user definable 3-bit, and user definable 5-bit.

NOTE: If the 1558A DTE is configured for AMI operation, the test sets must be set to generate either a 511, 2047, or 1:7 pattern. If the 1558A is configured for B8ZS operation, any pattern may be used (511, 2047, 1:7, QRSS, 3:24, etc.). When sending a 1:7 pattern, though, some T1 test sets inherently cause generation of a yellow alarm condition.

Test Time: Defines the run-time of test pattern generation and error accumulation and starts the test. Pressing <return> with the cursor positioned on this field will cause the selected pattern to be transmitted for the specified period of time. If the Maintenance menu is exited, pattern testing is halted. The choices are: 15 Minutes, 30 Minutes, 45 Minutes, 1 Hour, and Continuous.

Runtime: Shows the amount of time elapsed since a timed Pattern test began. Note that this field only appears on the screen when a test is running.

Near CRC Errors: A display-only field for viewing the number of CRC errors which are received at the Near Target receive path.

Far CRC Errors: A display-only field for viewing the number of CRC errors which are received at the Far Target receive.Far CRC Errors are only reported if the 1558A is configured as a Master. Slave 1558A units do not report Far CRC Errors.

Reset Errors: Pressing <return> with the cursor positioned on this field causes both the Near and Far CRC accumulators to be cleared (only if Master 1558A).

It is important to understand that the 1558A does not allow testing (loop or BERT) on the active path. To perform testing on a given path the user must first configure the path to the Standby mode, Soft Inhibit mode or Manual Inhibit mode. Once the path to be tested is in one of these modes, the LAPS will allow the user to perform testing.

BERT testing can be performed either to loopbacks or straight away to the far end. To perform a BERT test, the user should follow the steps discussed below.

1) Select the path to be tested using the TARGET toggle field.

2) Move the cursor highlight to the Pattern field and then, using the spacebar, toggle the field until the desired user pattern is display. The available patterns are; QRSS, 1:8, 3:24, all Ones, all Zeros, user definable 3-bit, and user definable 5-bit.

3) Next, move the cursor highlight to the Test Time field and then, using the spacebar, toggle the field to the desired test time. The choices are 15 minutes, 30 minutes, 1 Hour, 24 Hours, and Continuous.

4) After performing Steps 1 - 3, move the cursor highlight to either the Test Time or Pattern field and then momentarily depress the <enter/return> key. The system will immediately begin to generate the selected pattern on the selected path for the selected time interval. Observing the Near and Far end CRC errors counters will assist the user in determining if the error problem is occurring in the transmit or receive path.

Note: The LAPS system cannot generate loops while a BERT test is in process. Also, if the user exits the 'Maintenance' screen while a BERT is running, the BERT stops.

While running the test, the user may reset the CRC error counters by moving the cursor highlight to the Reset Errors field and momentarily depress the <enter/return> key. This will reset the Near and Far CRC error counters to zero. Performing an error reset does not stop the BERT test in progress.

The user may stop the BERT test at any time by simply moving the cursor highlight to either the Pattern or Test Time command fields and then depress the <enter/return > key. The system responds by turning off the Runtime clock display. To restart the test, simply depress the <enter/return> key again. The system responds by applying the selected BERT pattern and restarting the Runtime clock display.

Index